



US Army Corps
of Engineers
Los Angeles District

Coast of California Storm and Tidal Waves Study

State of the Coast Report San Diego Region



**Volume II — Appendices
Final — September 1991**

COAST OF CALIFORNIA STORM AND TIDAL WAVES STUDY
U.S. ARMY CORPS OF ENGINEERS, LOS ANGELES DISTRICT

STATE OF THE COAST REPORT
SEPTEMBER 1991

APPENDIX
TABLE OF CONTENTS

- A. Chronology of Major Events Along the San Diego Region
- B. Corps of Engineers Nearshore Profiles and Location Maps
- C. History Graphs of MHHW, MSL, MLLW, -5', -15', -30' Contour Positions for the Surveyed Profiles
- D. Tabulations for Seasonal Shoreline Change Results
- E. Historic Shoreline Position Plots, NOS and Aerial Photo Data
- F. Tabulations for Sediment Volume Change Along Corps of Engineers Survey Data
- G. Historical Chronology of Extreme Storm and Wave Events for the San Diego Region
- H. San Diego Bay Predicted Monthly Extreme High Tide Elevations
- I. Coast of California Storm and Tidal Waves Study Report Publications

APPENDIX A

CHRONOLOGY OF EVENTS ALONG THE SAN DIEGO COASTLINE

Oceanside Littoral Cell Time Line

<u>DATE</u>	<u>EVENT</u>	<u>DESCRIPTION</u>
1883	Dam Construction	Lake O'Neill on Santa Margarita River completed. End of dry period extending from 1842 (except for 1861-1862 floods).
1888	Pier Construction	1000-ft long wooden wharf completed at Wisconsin Ave.
1890	Pier Construction	Wharf destroyed and rebuilt, improvements made until 1920 without detrimental effect on adjacent beaches.
1916	Flood	Major flooding; Maximum 20th discharge from San Luis Rey River.
1922	Dam Construction	Henshaw Reservoir on San Luis Rey River completed.
1927	Pier Construction	Oceanside Pier, 1300-ft. long, and frontage walk constructed at present location.
1942	Harbor Construction	Del Mar Boat Basin constructed. 1.5 million cubic yards dredged and used to increase grade around basin.
1945	Sand Mining	220,000 cy dredged from entrance channel, material disposed upland.
1949	Dam Construction Hard Structure	Vail Dam on Santa Margarita River completed. Riprap placed along a 1000-ft long stretch at Wisconsin Avenue.
1950- 1952		Additional Riprap placed near Wisconsin Ave.
1952	Hard Structure	Two groins constructed at Wisconsin Avenue and one groin 1000 ft south.
1954	Hard Structure	Double, shore normal jetties constructed at the north and

		south ends of Agua Hedionda lagoon.
1954	Beachfill	Over 4 million cy of construction placed on beaches north and south of Agua Hedionda.
1955	Beachfill	111,00 cy nourishment primarily on beach south of Agua Hedionda discharge structures; material dredged from lagoon
	Beachfill	8000,000 cy nourishment on Oceanside Beach
1957	Beachfill	232,000 cy nourishment primarily on beach south of Agua Hedionda discharge structures; material dredged from lagoon
	Hard Structure	2300 ft. added to north breakwater and 130 ft. added to South Breakwater.
1957- 1958	El Nino	Strong El Nino Winter
1960	Beachfill	370,000 cy nourishment primarily on beach south of Agua Hedionda discharge structures; material dredged from lagoon
	Beachfill	41,000 cy nourishment at Oceanside Beach; material dredged from entrance
1961	Beachfill	481,000 cy nourishment at Oceanside Beach; material dredged from channel
	Beachfill	225,000 cy nourishment primarily on beach south of Agua Hedionda discharge structures; material dredged from lagoon
	Hard Structure	Construction of 400-ft. long south groin by City and 1000-ft long south jetty by Corps
1962	Hard Structure	Construction of 710-ft. long

		submerged north groin
1963	Harbor Const.	Oceanside Harbor completed.
1963	Beachfill	3.8 million cy nourishment at Oceanside Beach; 1.4 million cy excavated from harbor basin; 2.4 million cy of existing littoral dredged from lagoon; material bypassed south
	Beachfill	307,000 cy nourishment primarily beach south of Agua Hedionda discharge structures; material dredged from lagoon
1964	Beachfill	204,000 cy nourishment at San Onofre Beach south of Power Plant; sea cliff source
	Beachfill	94,000 cy nourishment at Capistrano Beach north of Capistrano Creek; from Capistrano Creek Groin constructed along the north bank of Capistrano Creek compartmentalize the beach between the Creek and Dana Point
1965	Beachfill	111,000 cy nourishment at Oceanside Beach between 3rd St. and 9th St.; material dredged from entrance
	Beachfill	222,000 cy nourishment primarily on beach south of Agua Hedionda discharge structures; material dredged from lagoon
1966	Beachfill	684,000 cy nourishment at Oceanside between 3rd St. and Wisconsin St.,; material dredged from entrance 255,000 cy nourishment at San Onofre Beach south of Power Plant; sea cliff source
	Beachfill	842,000 cy nourishment at Capistrano Beach south of Capistrano Creek; material from

		Capistrano 900,000 cy nourishment at Capistrano Creek; upland source
1967	Beachfill	178,000 cy nourishment at Oceanside Beach between 3rd St. and Tyson St.: material dredged from entrance 10,000 cy nourishment at San Onofre Beach south of Power Plant; sea cliff source
	Beachfill	159,000 cy nourishment primarily on south of Agua Hedionda discharge structures; material dredged from lagoon.
1968	Beachfill	434,000 cy nourishment at Oceanside Beach between San Luis Rey River mouth and Wisconsin St.; material dredged from entrance
	Hard Structure	380-ft. long extension of south jetty and 500-ft. long extension of south groin
1969	Beachfill	353,000 cy nourishment at Oceanside Beach between San Luis Rey River mouth and 3rd St.; material dredged from entrance
	Beachfill	365,000 cy nourishment at Capistrano Creek
	Beachfill	212,000 cy nourishment at Capistrano Beach south of Capistrano Creek; fill from Capistrano Creek 97,000 cy nourishment primarily on beach south of Agua Hedionda discharge structures; material dredged from lagoon
1970	Harbor Const. Beachfill	Dana Point Harbor completed 126,000 cy nourishment at Capistrano Creek; Dana Point construction material source
1971	Beachfill	552,000 cy nourishment at Oceanside Beach between 3rd St.

and Wisconsin St.;:material dredged from entrance

1972	Beachfill	259,000 cy nourishment at beaches north and south of Agua Hedionda discharge structures ;material dredged from lagoon
1972-1973	El Nino	Severe El Nino winter
1973	Beachfill	434,000 cy nourishment at Oceanside Beach between Tyson St. and Wisconsin St. ;material dredged from entrance Lake Skinner on Santa Margarita River. River completed.
1974	Beachfill	560,000 cy nourishment at Oceanside Beach between Tyson St. and Whitterby St. ;material dredged from entrance Beachfill 1.6 million cy nourishment at San Onofre Beach south of Power plant; offshore soure
	Beachfill	341,000 cy nourishment at beaches north and south of Agua Hedionda discharge structures; material dredged from lagoon
1976	Beachfill	550,000 cy nourishment at Oceanside Beach between Tyson St. and Whitterby St.;material dredged from entrance
	Beachfill	331,000 cy nourishment at beaches north and south of Agua Hedionda discharge structures; material dredged from lagoon
1977	Hard Structure	Revetment construction by U.S. Marine Corps
	Beachfill	318,000 cy nourishment at Oceanside Beach between Tyson St. and Whitterby St.;material dredged from entrance

	Beachfill	220,000 cy nourishment at San Onofre Beach south of Power Plant; offshore source
1978-		
1983	Wave Storm	Major wave storm period
1978	Beachfill	46,000 cy nourishment at San Onofre Beach south of Power Plant; offshore source
1979	Beachfill	398,000 cy nourishment at beaches north and south of Agua Hedionda discharge structures; materials dredged from lagoon
1981	Beachfill	863,000 cy nourishment at Oceanside Beach between 6th St. and Buccaneer St.; material dredged from entrance
	Beachfill	292,000 cy nourishment at beaches north and south of Agua Hedionda discharge structures; material dredged from lagoon
1982-		
1983	El Nino	Severe El Nino winter
	Beachfill	200,000 cy nourishment at San Onofre Beach south of Power Plant Beach 2000,000 cy nourishment at beaches north and south of Agua Hedionda discharge structures; material dredged from lagoon
1985	Beachfill	447,000 cy nourishment at beaches north and south of Agua Hedionda discharge structures; materials dredged from lagoon
1988	Beachfill	334,000 cy nourishment at beaches north of intake structures at Agua Hedionda; material dredged from lagoon
1984		475,000 dredged from Oceanside Harbor
1986		450,000 dredged from Oceanside Harbor

1988

**220,000 dredged from Oceanside
Harbor**

Mission Bay Littoral Cell Time Line

<u>DATE</u>	<u>EVENT</u>	<u>DESCRIPTION</u>
1876	Dike Construction	Dikes built to control San Diego outlet at present location, floods filled inner Mission Bay
1918	Dam Construction	Murray Reservoir on San Diego River completed
1925	Pier Construction Hard Structure	Crystal Pier completed Completion of 16000-ft long seawall at the Amusement Center, Mission Beach.
1928	Hard Structure	completion of 10,000-ft. long seawall (includes 1925 seawall) at the Amusement Center, Mission Beach
1935	Dam Construction	El Capitan Reservoir on San Diego River completed.
1938	Hard Structure	Completion of a 1000-ft. long rock revetment at Voltaire Street, Ocean Beach
1941	Hard Structure	Completion of a rock revetment at Newport Avenue, Ocean Beach.
1918-present	Hard Structure	Construction of seawalls at Sunset Cliffs.
1948	Beachfill	600,000 cy nourishment on 2000-ft. long reach at north end of Mission Beach; fill from Mission Bay dredging.
	Hard Structure	Entrance channel and jetty construction begun
1950	Hard Structure	Completion of 1500-ft. long South Jetty, 3800-ft. long Middle Jetty and 3300-ft. long North Jetty 67,000 cy nourishment at Ocean Beach ; fill from navigation channel dredging
1955	Hard Structure	Completion of 500-ft. long groin on

Ocean Beach ending at a depth of
3 ft. MLLW

1958	Beachfill	150,000 cy nourishment at Mission Beach; fill from entrance channel dredging
1962	Dam Construction	Chet Harriet Dam on San Diego River completed
1970	Hard Structure	Extension of South Jetty to 2060-ft. long and extension of Middle Jetty to 4280-ft. long
1973	Beachfill	230,000 cy nourishment at Pacific Beach; fill from entrance channel dredging
Mid '70's Sand Mining - 1988		Approximately 2,5000 cy/yr sand removal from Mission and Pacific Beachs as part of a beach cleaning programs; disposal on Fiesta Island
1984	Beachfill	30,000 cy nourishment at Ocean Beach south of groin; fill from entrance channel dredging
	Beachfill	246,000 cy nourishment at Mission Beach; fill from entrance channel dredging

Silver Strand Littoral Cell Time Line

<u>DATE</u>	<u>EVENT</u>	<u>DESCRIPTION</u>
1888	Hotel Construction	Construction of Hotel Del Coronado on Coronado Island
1893-1904	Hard Structure	Construction of 7500 foot long Zuniga Jetty at Mile 13.6; largest artificial barrier in cell
1897	Hard Structure	Construction of a curved groin at Mile 10, Hotel Del Coronado
1900	Hard Structure	Extension of the curved groin at Mile 10 to a total length of 1400 feet
1906-1907	Hard Structure	Construction of 5200 foot long Coronado Seawall at Mile 11-12
1910	Dam Construction	Completion of Morena Dam on Tijuana River, U.S. side of border
1921	Dam Construction	Completion of Barrett Dam on Tijuana River, U.S. side of border
1936	Dam Construction	Completion of Rodriguez Dam on Tijuana River, Mexican side of border
1941	Beachfill	Placement of 2.26 million cubic yards (cy) on Coronado Beach between Miles 12.6 and 13.6
1946	Beachfill	Placement of 26.2 million cy on beaches between Miles 8.8 and 10.8; material dredged from San Diego Bay
1957	Hard Structure	Construction of a 1000 foot long revetment on Imperial Beach at Mile 3.0
1959	Hard Structure	Construction of 600 foot long north groin on Imperial Beach at Mile 3.8
1961	Hard Structure	Construction of 400 foot long south groin on Imperial Beach at Mile 3.5

1963	Hard Structure	Extension of north groin on Imperial Beach to 720 feet
	Pier	Construction of Imperial Beach Pier
1967	Beachfill	Placement of 40,000 cy of fill at Mile 10
Unknown	Hard Structure	Construction of a 600 foot long steel pile bulkhead, Naval Radio Station at Mile 4.5
1975	Hard Structure	Construction of revetment on Playas de Tijuana Beach between Mile -0.5 and Mile -0.75
1976	Beachfill	Placement of 3.5 million cy between Miles 8.8 and 10.8
1977	Beachfill	Placement of 1.1 million cy between Miles 2.5 and 3.5; material dredged from San Diego Harbor
1985	Beachfill	Placement of 1.1 million cy between Miles 9.5 and 10.2

APPENDIX B

CORPS OF ENGINEERS NEARSHORE PROFILES AND LOCATION MAPS

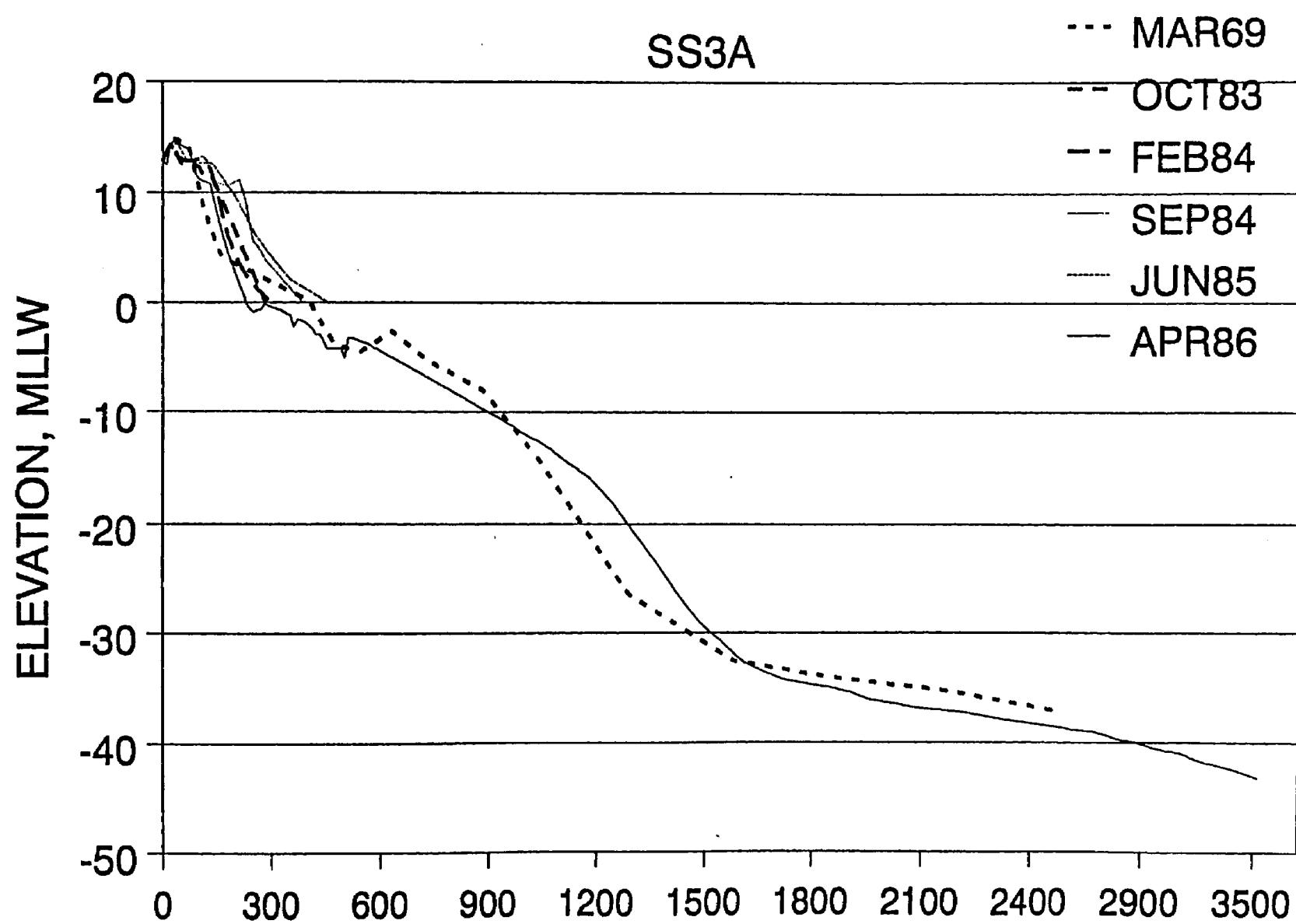
PLOTS EXPLANATIONS

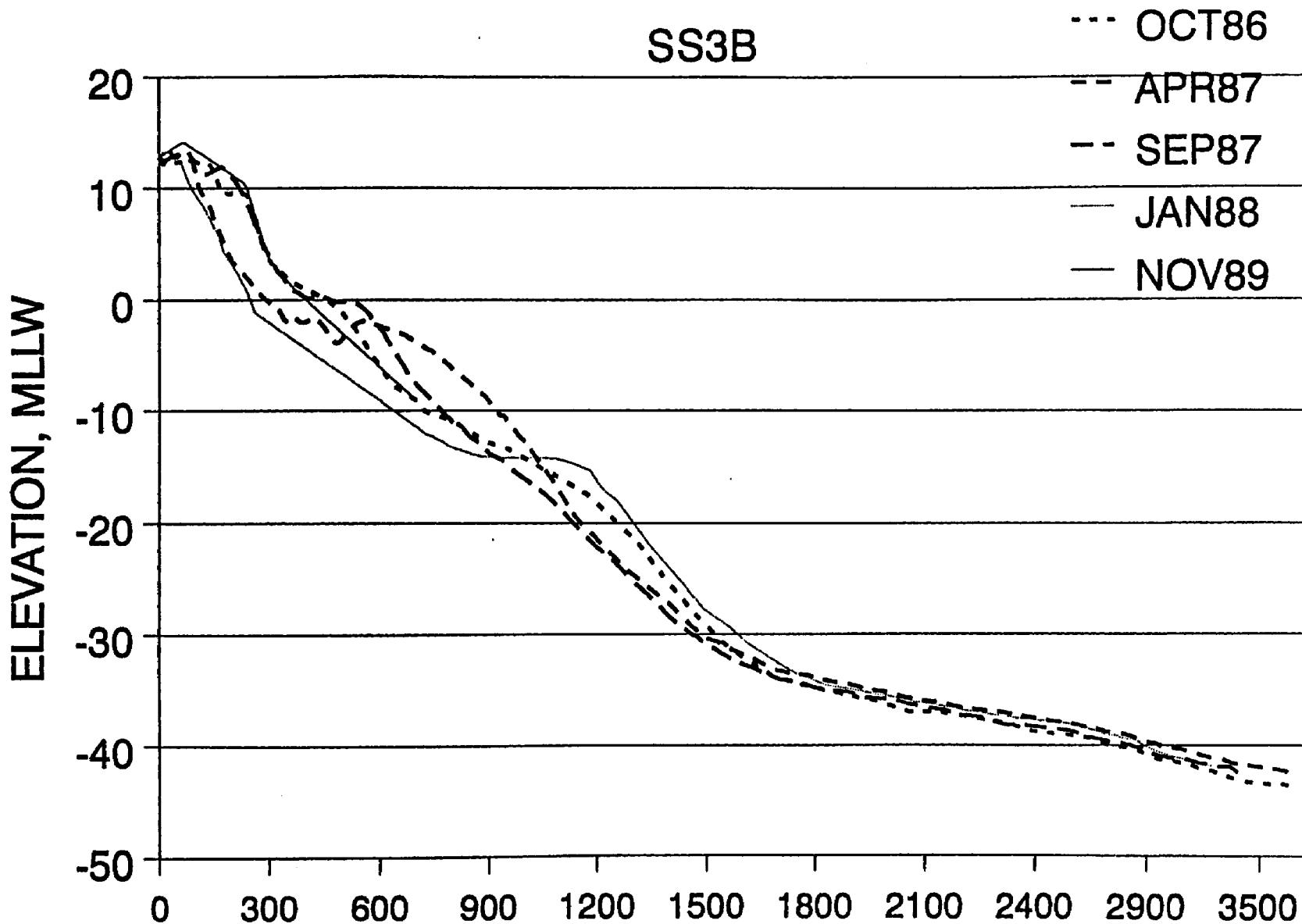
(1) Profiles Coordinates are

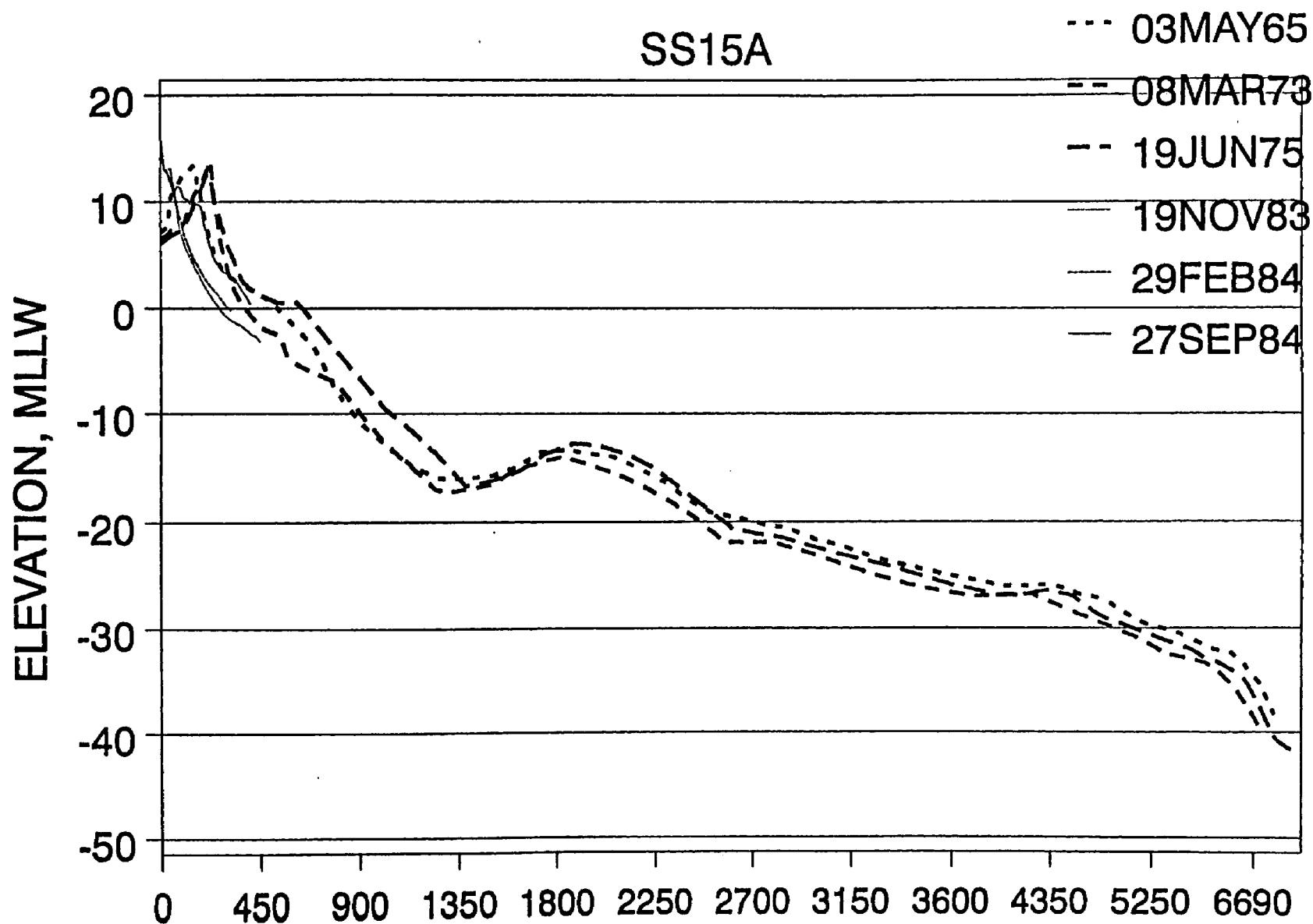
- (a) Horizontal = distance in feet from Benchmark (baseline)
- (b) Vertical = elevation from MLLW

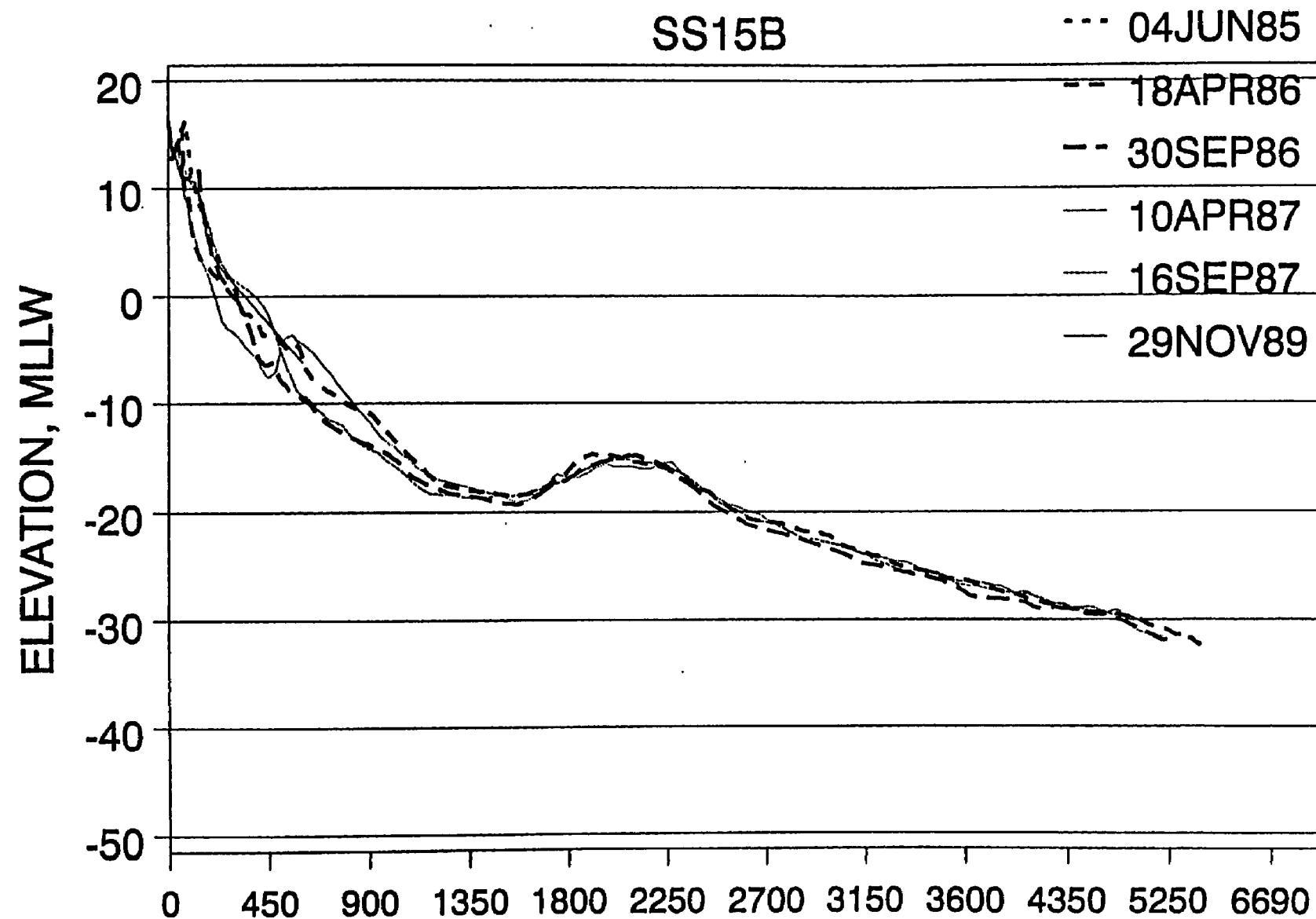
(2) Profile Locations, are given in Figures 3-1 and 3-2

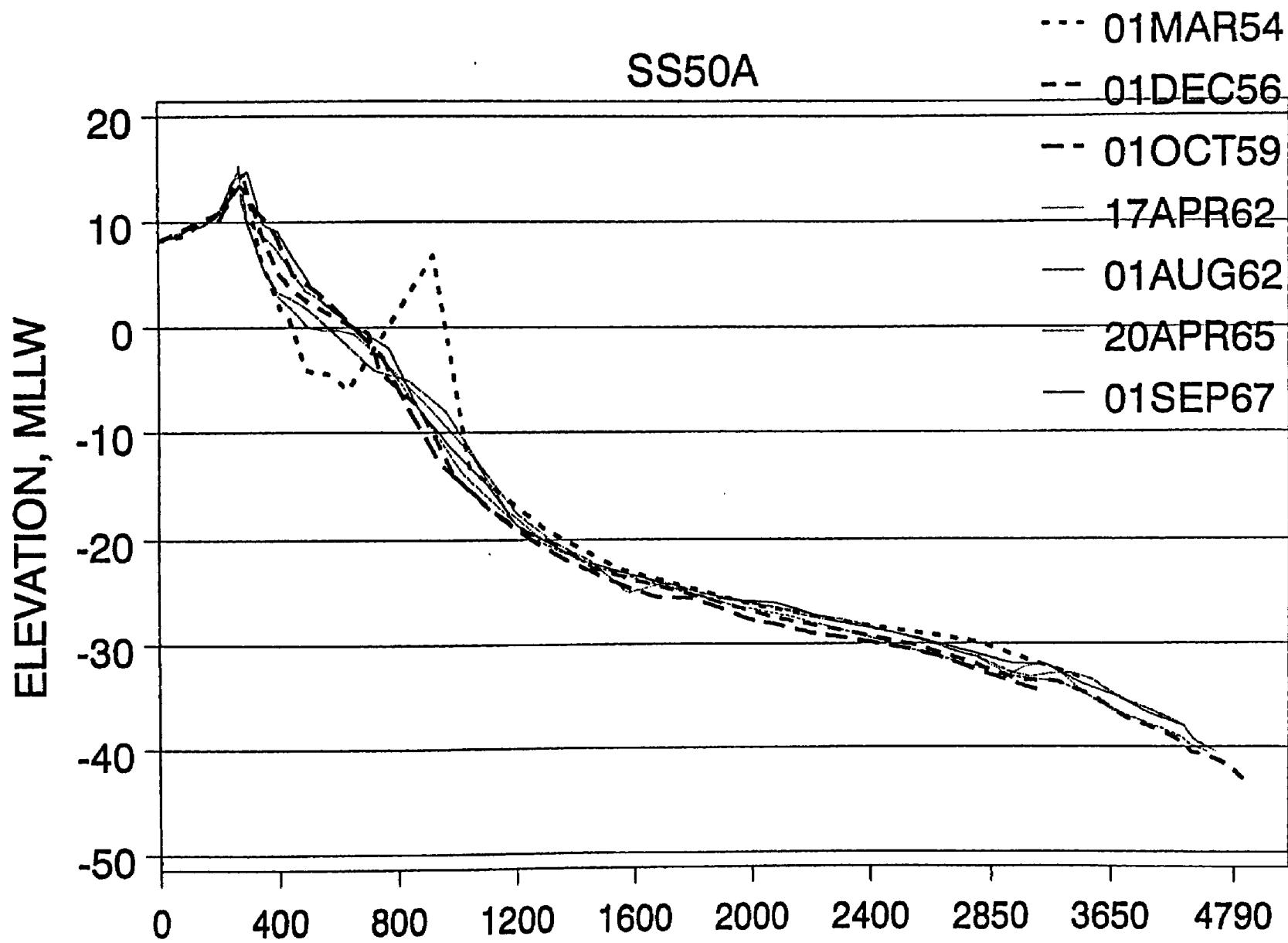
23 Historical Profiles Surveyed through 1989

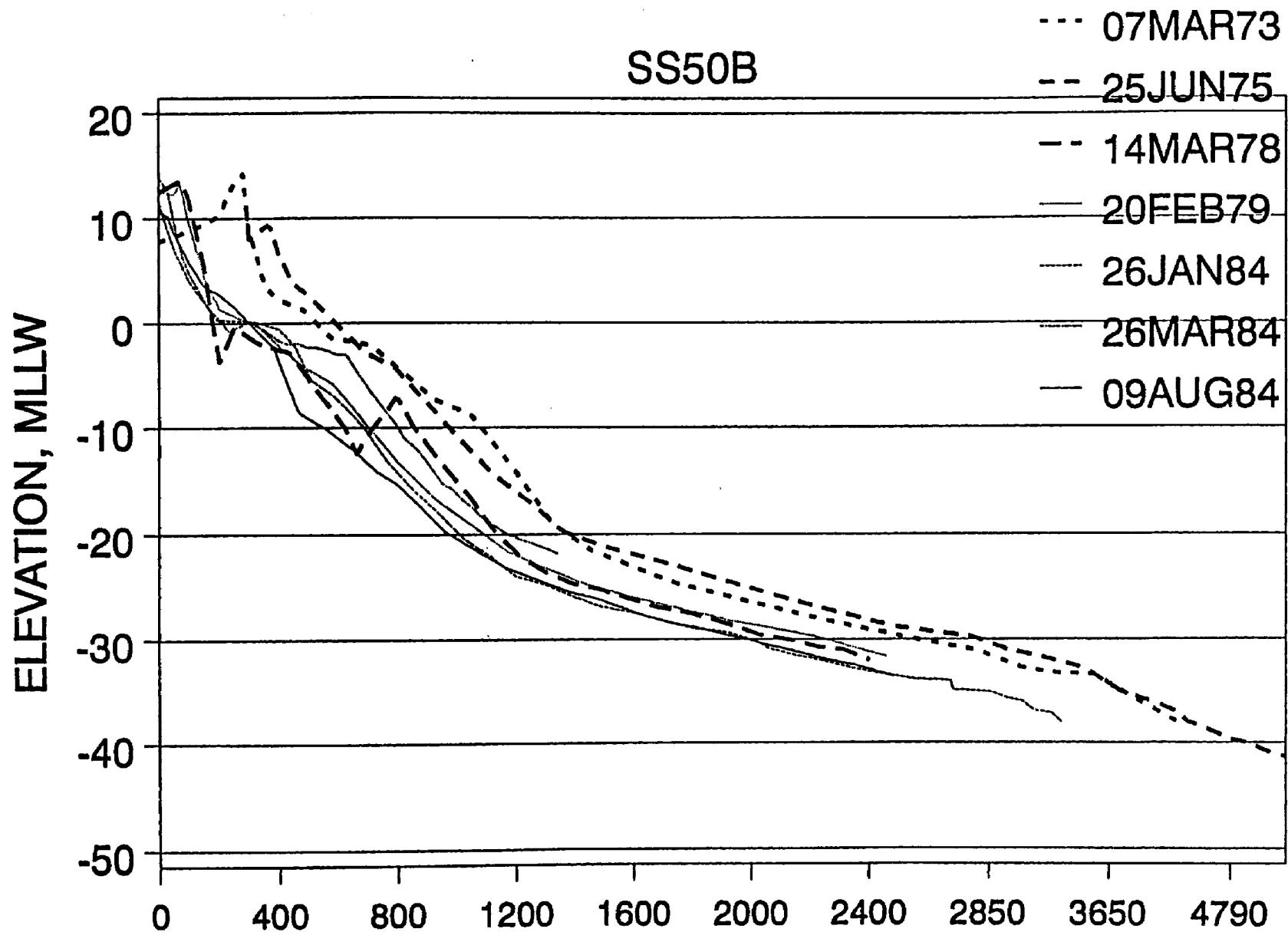


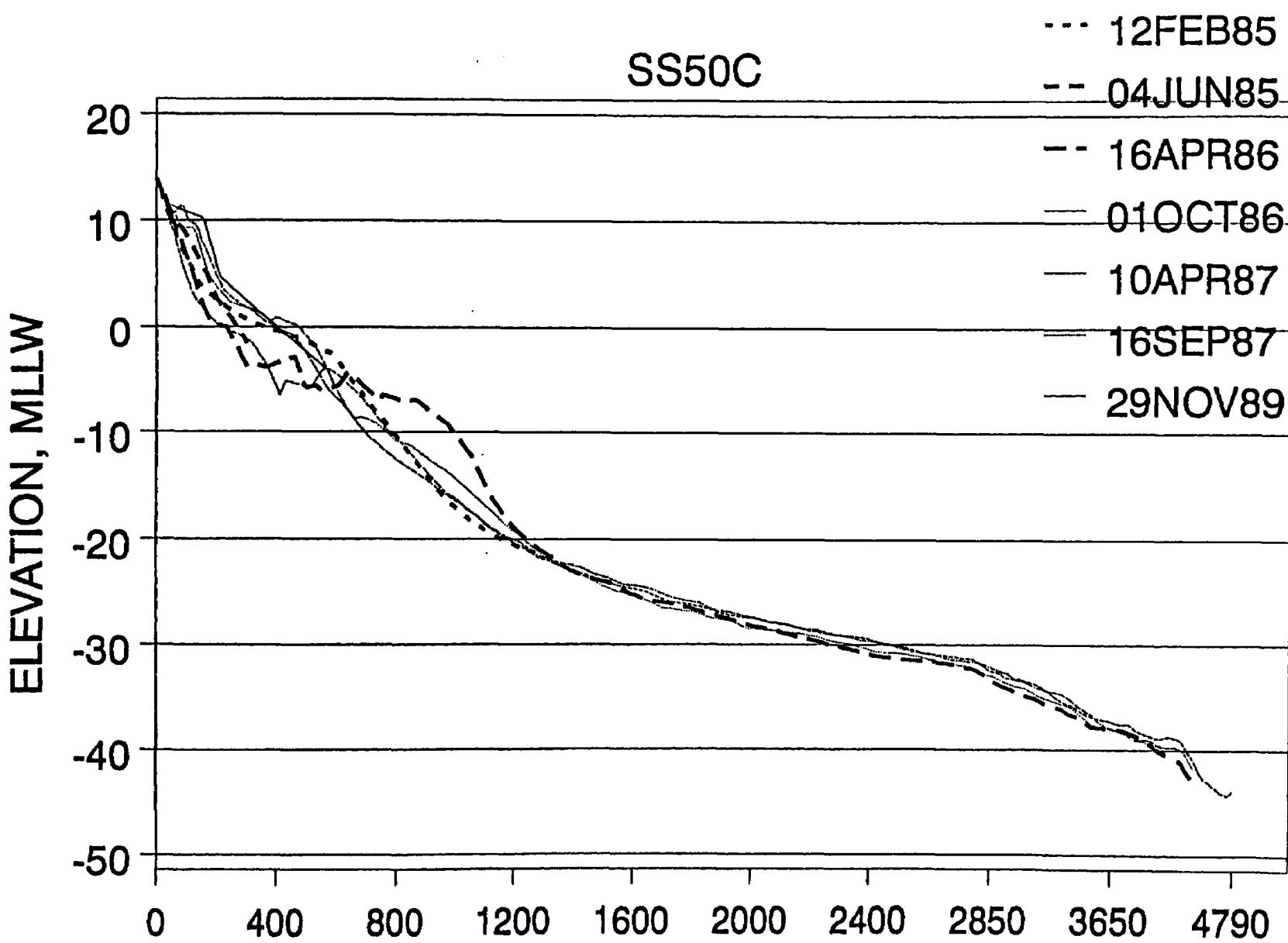


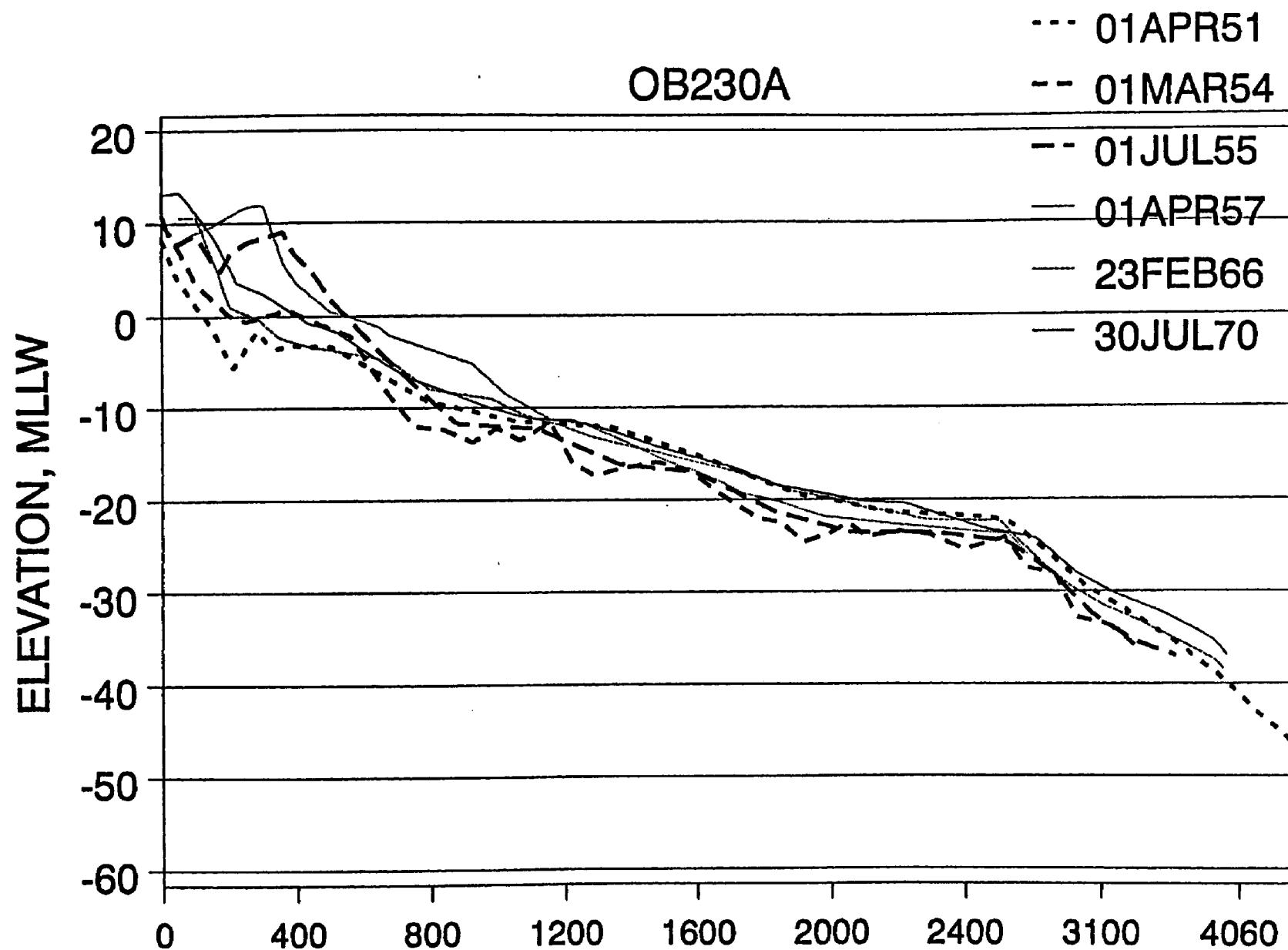


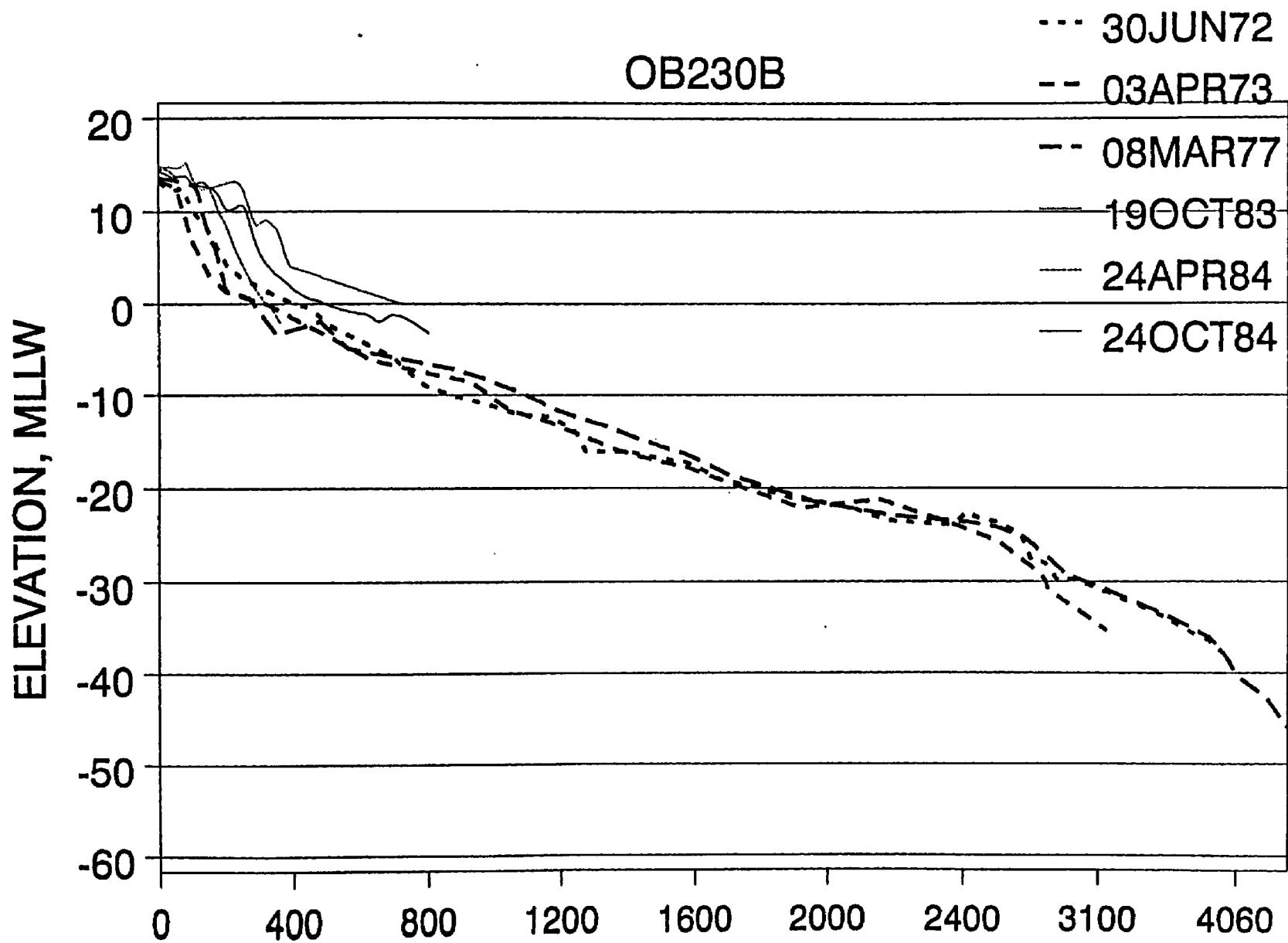


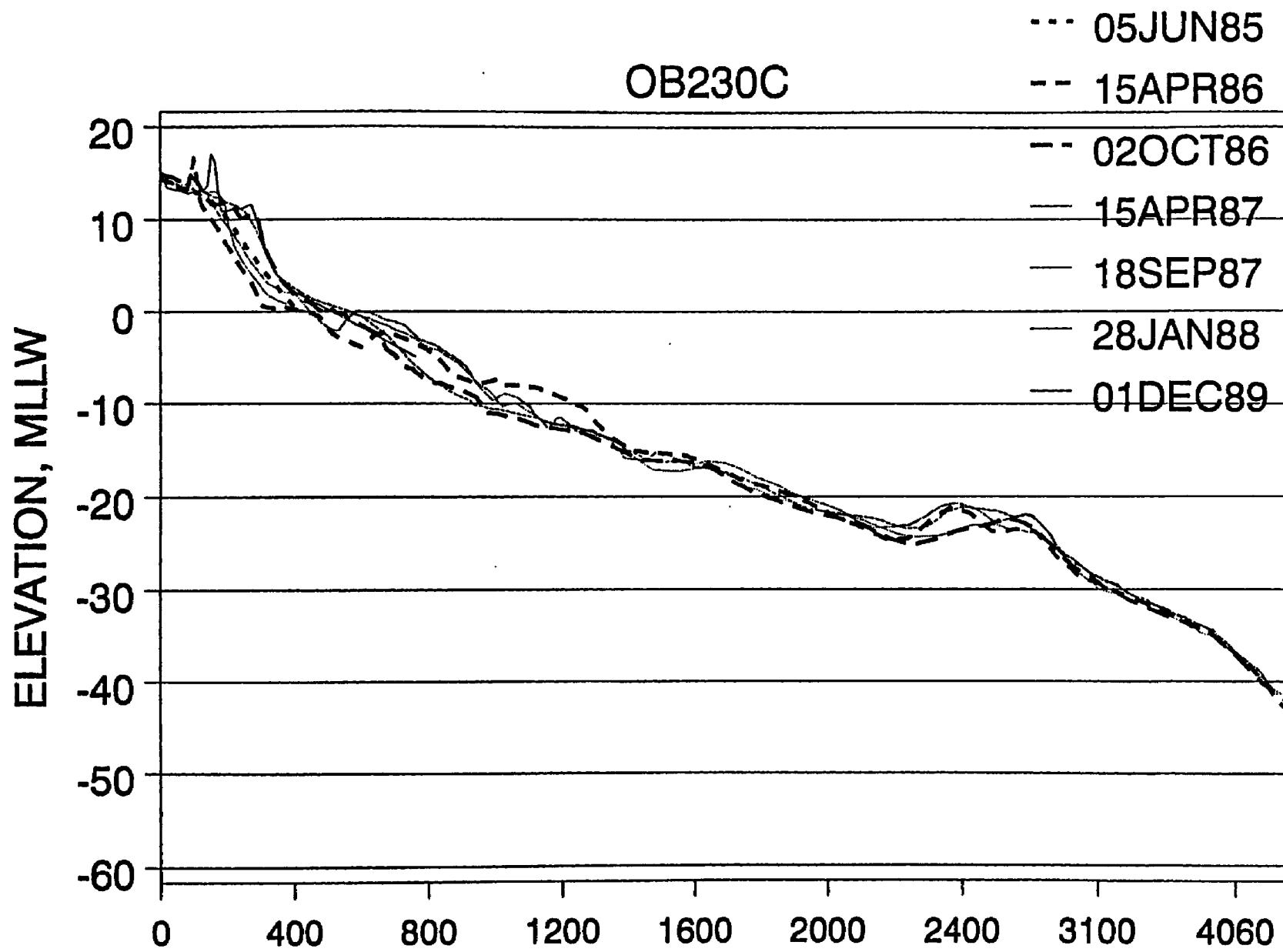




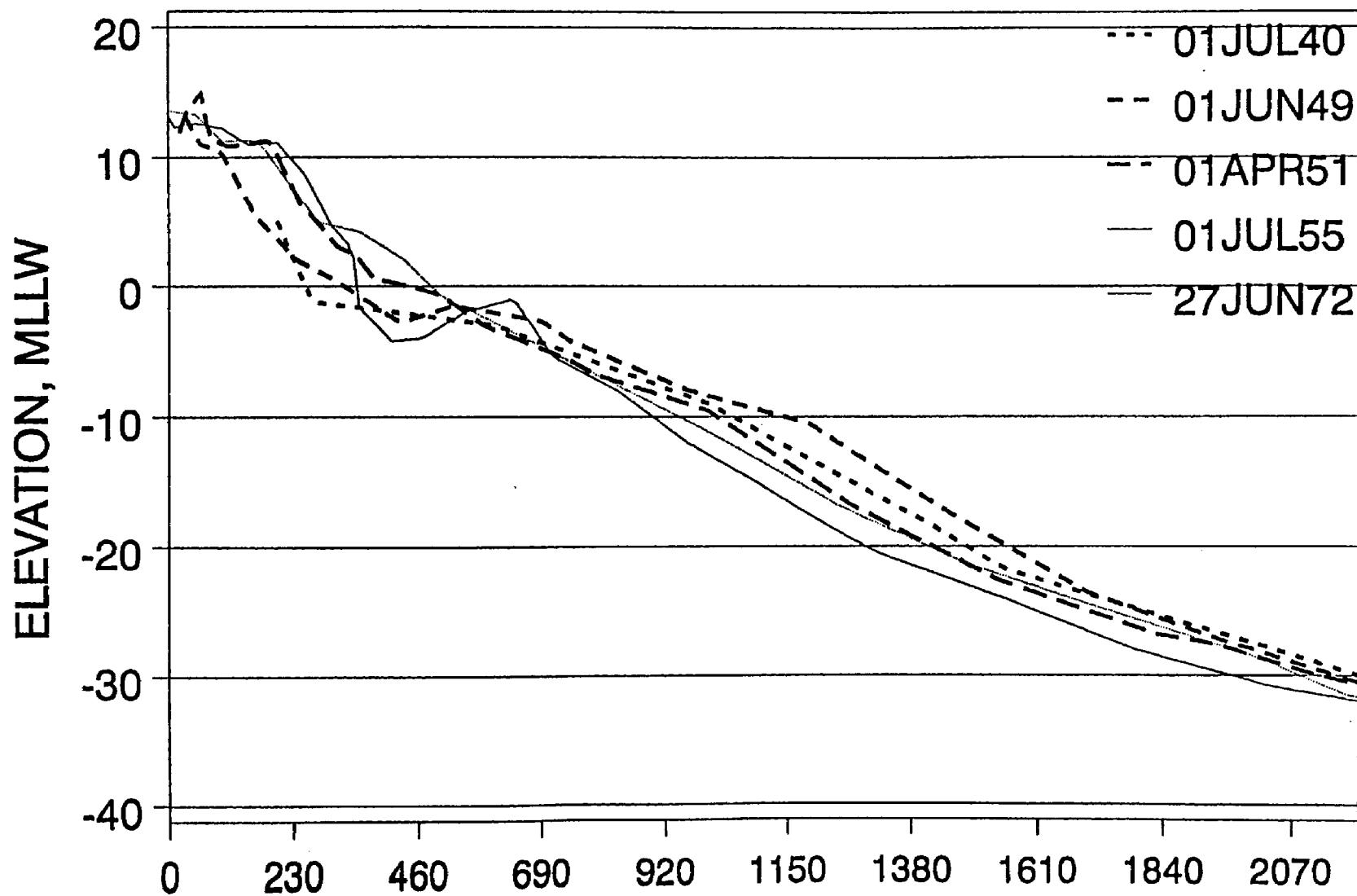




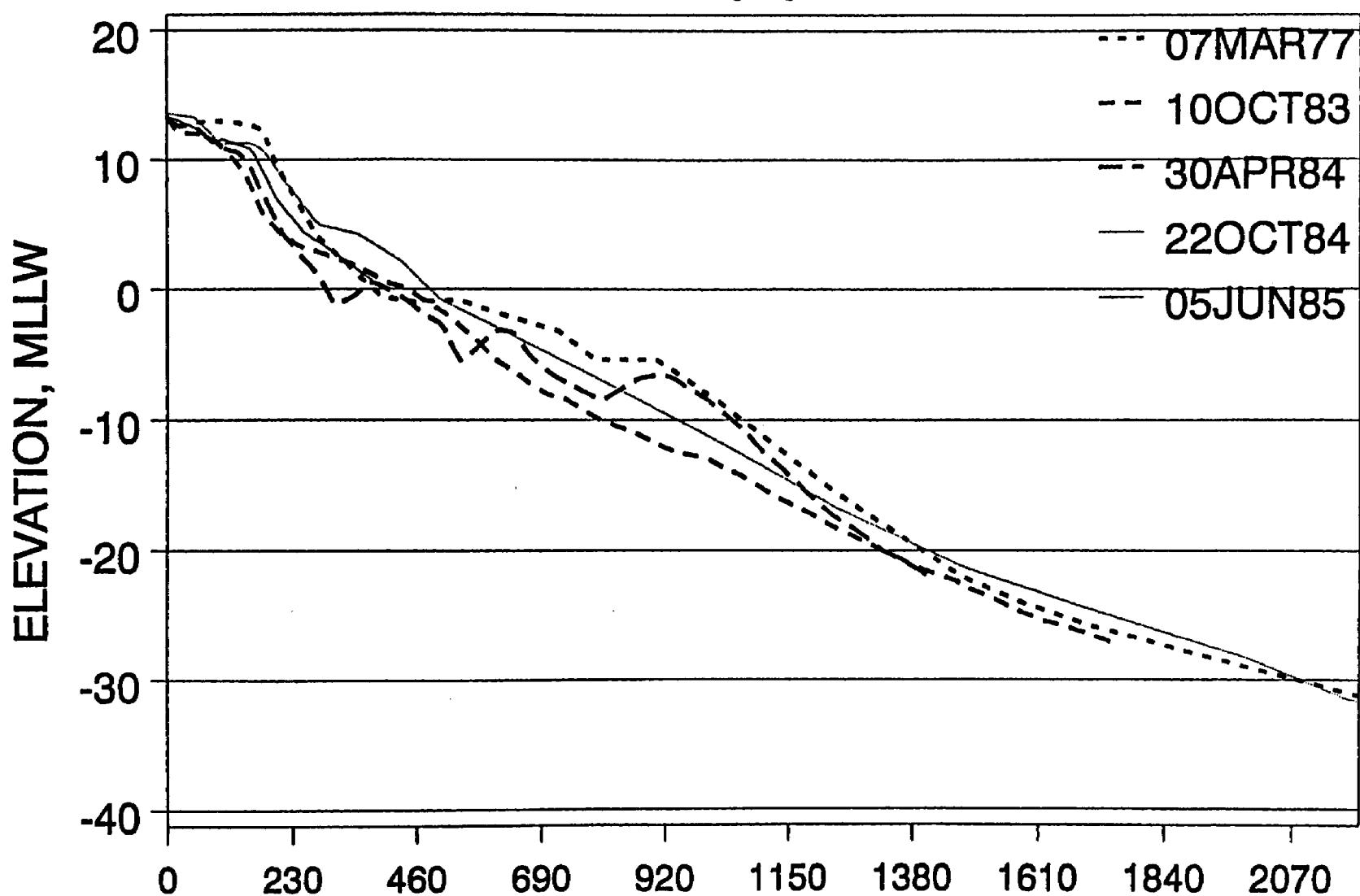




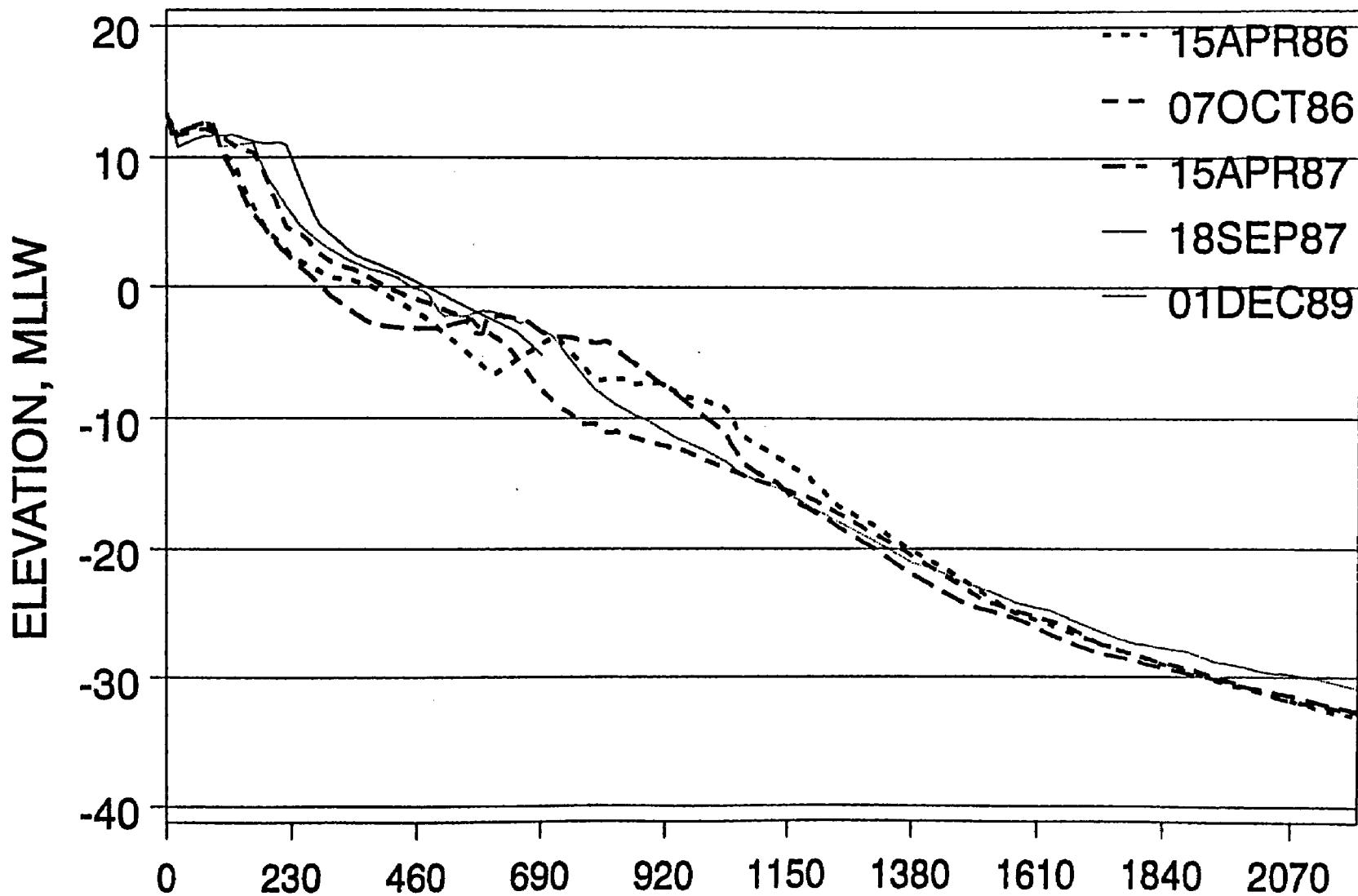
MB310A



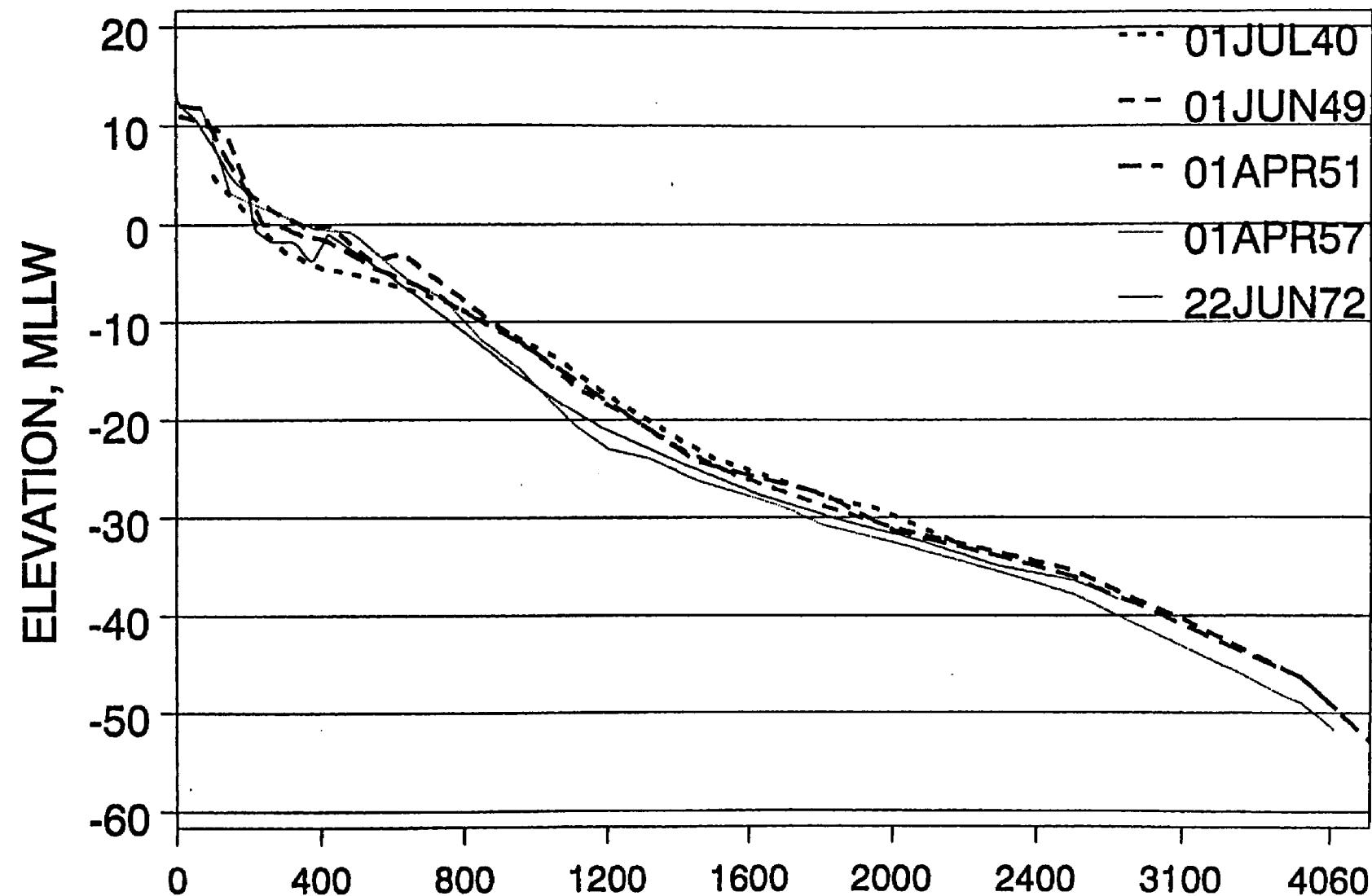
MB310B



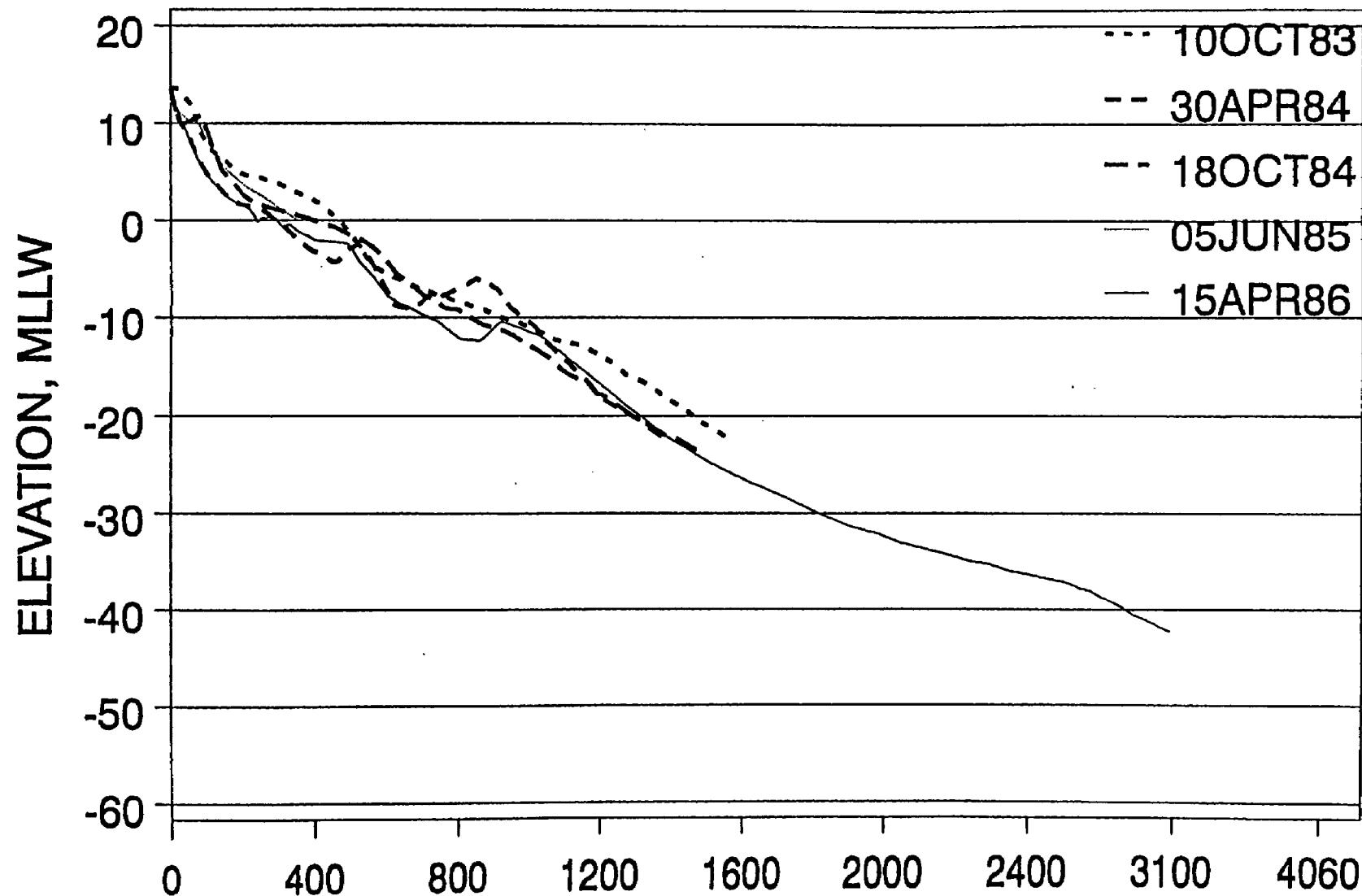
MB310C



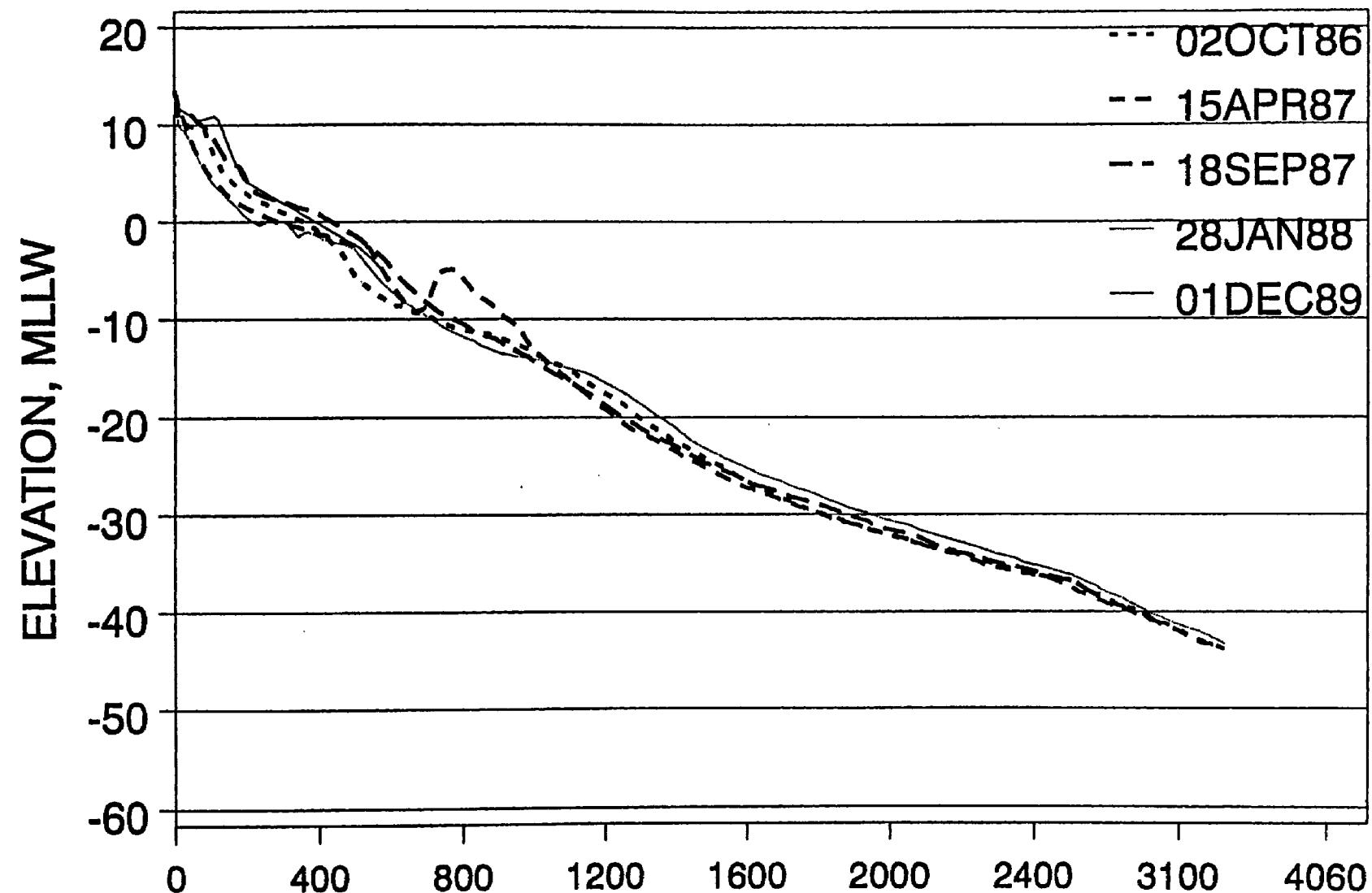
MB340A



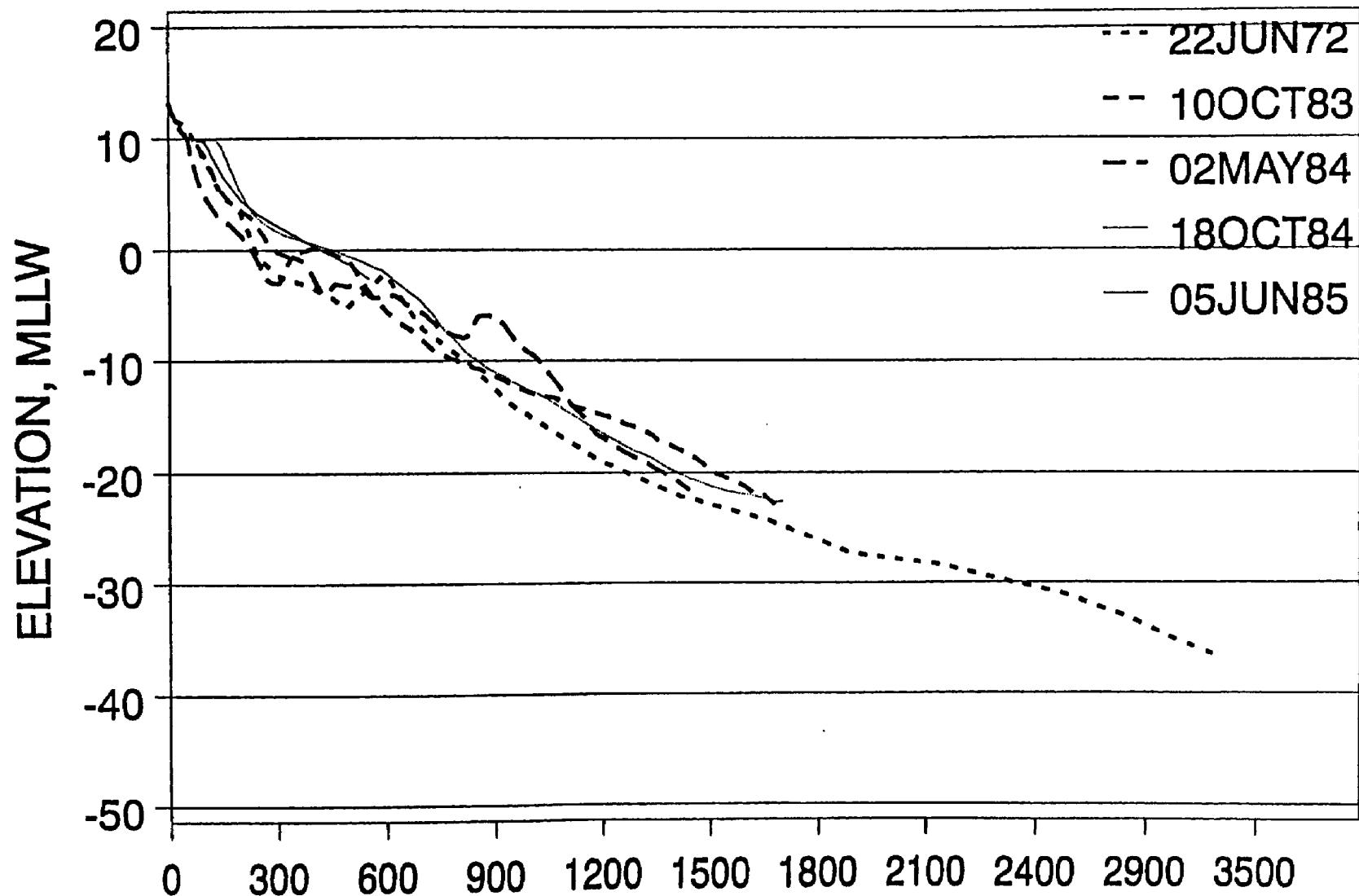
MB340B



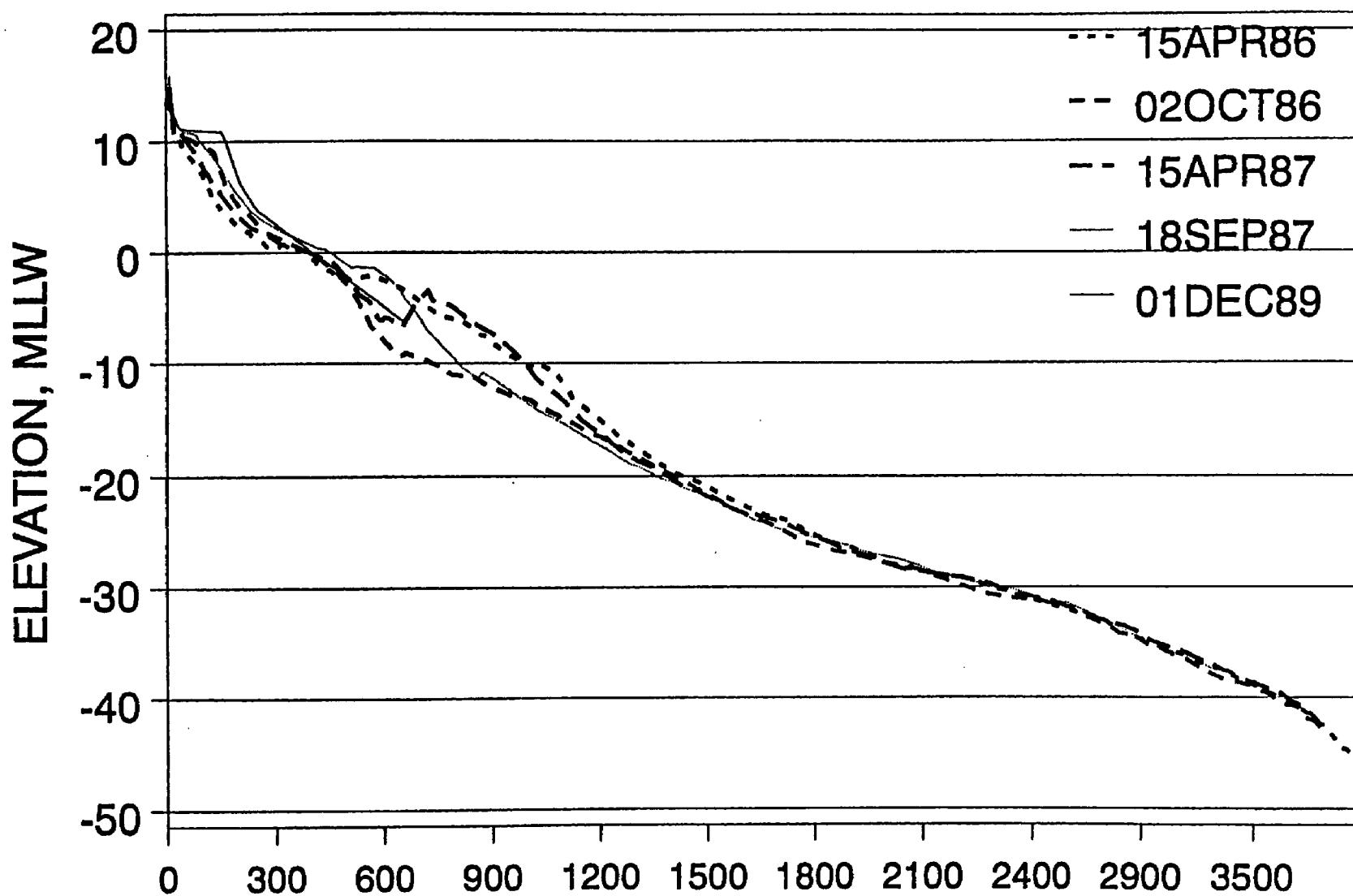
MB340C

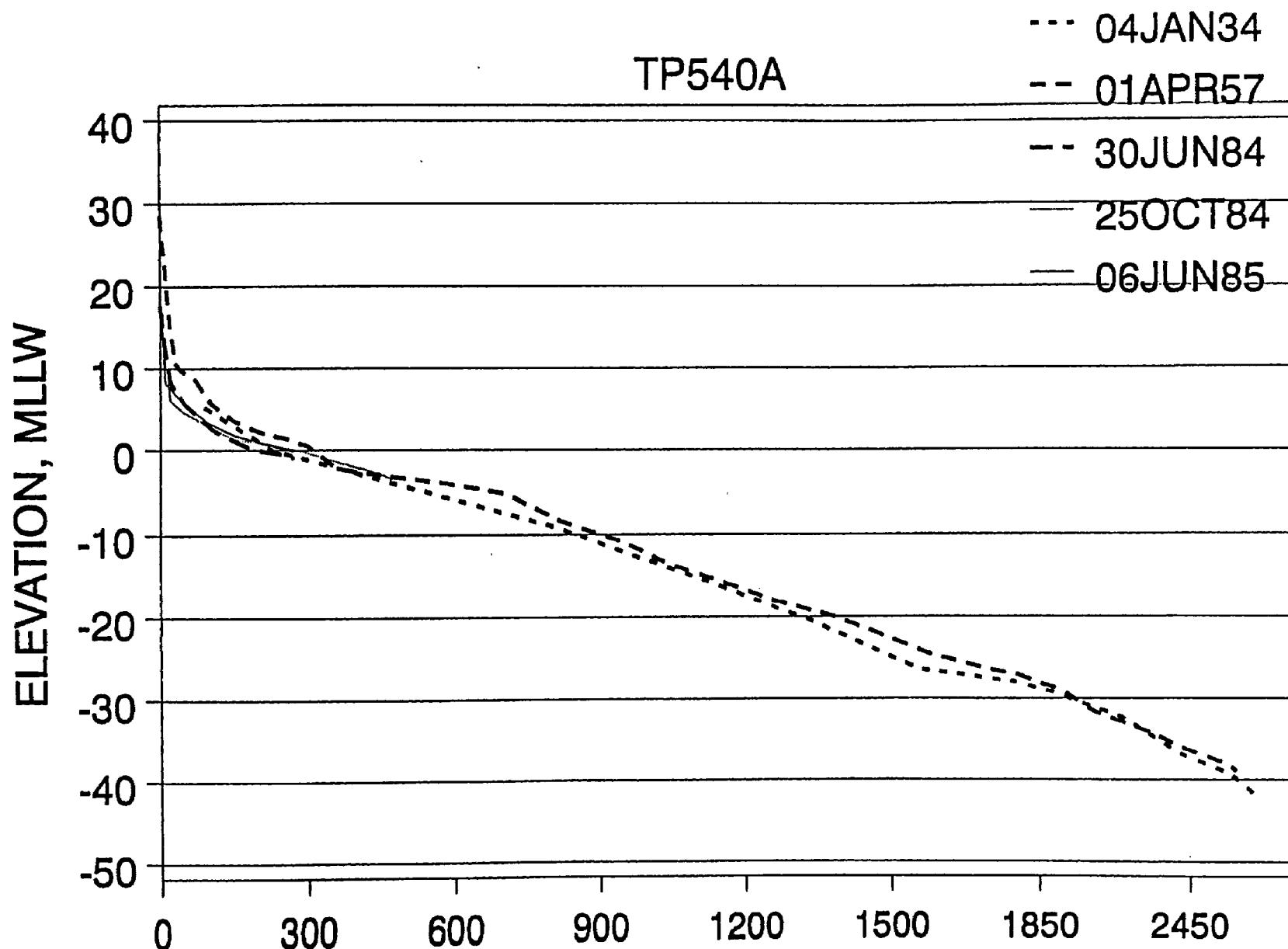


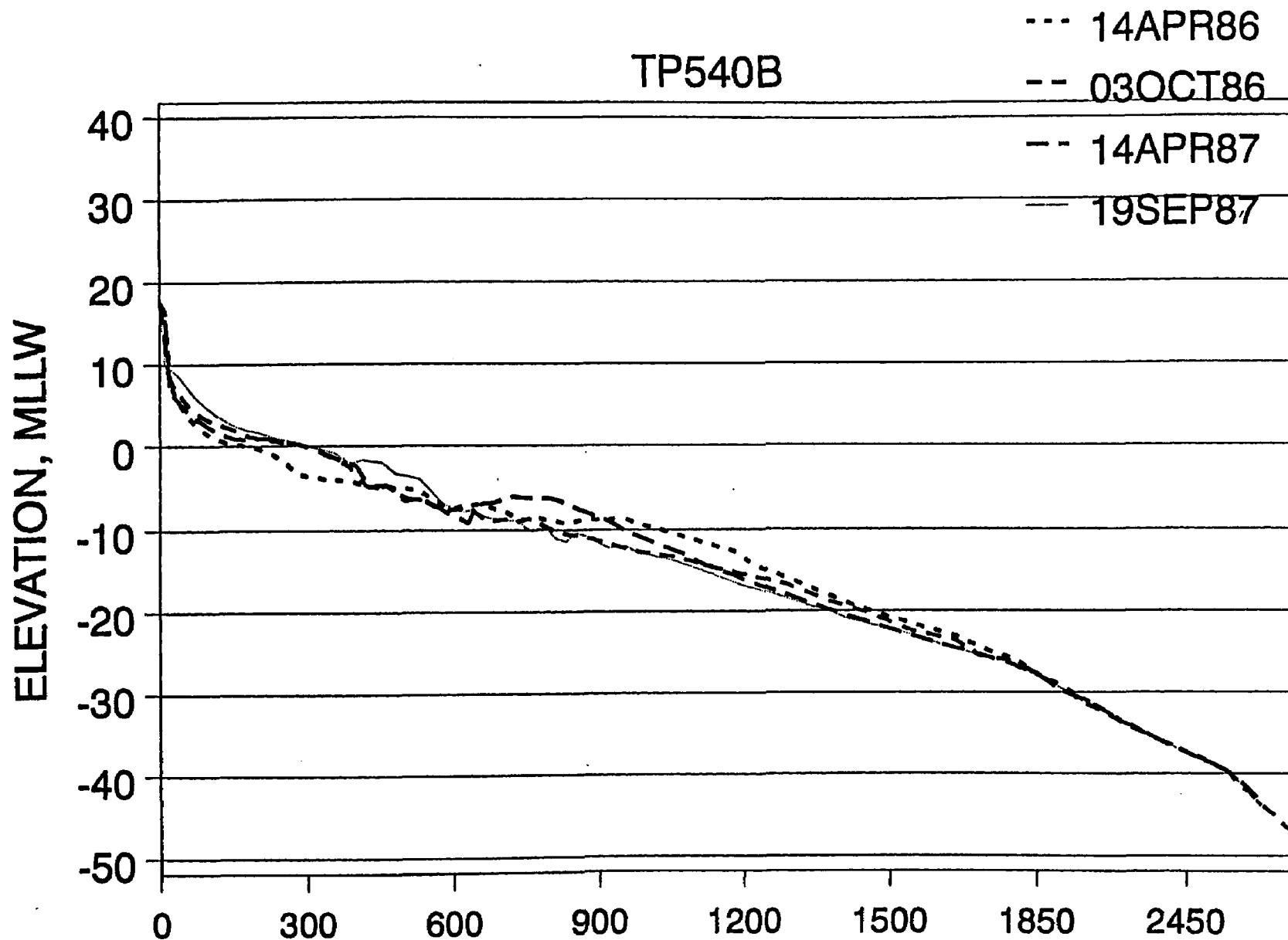
MB384A

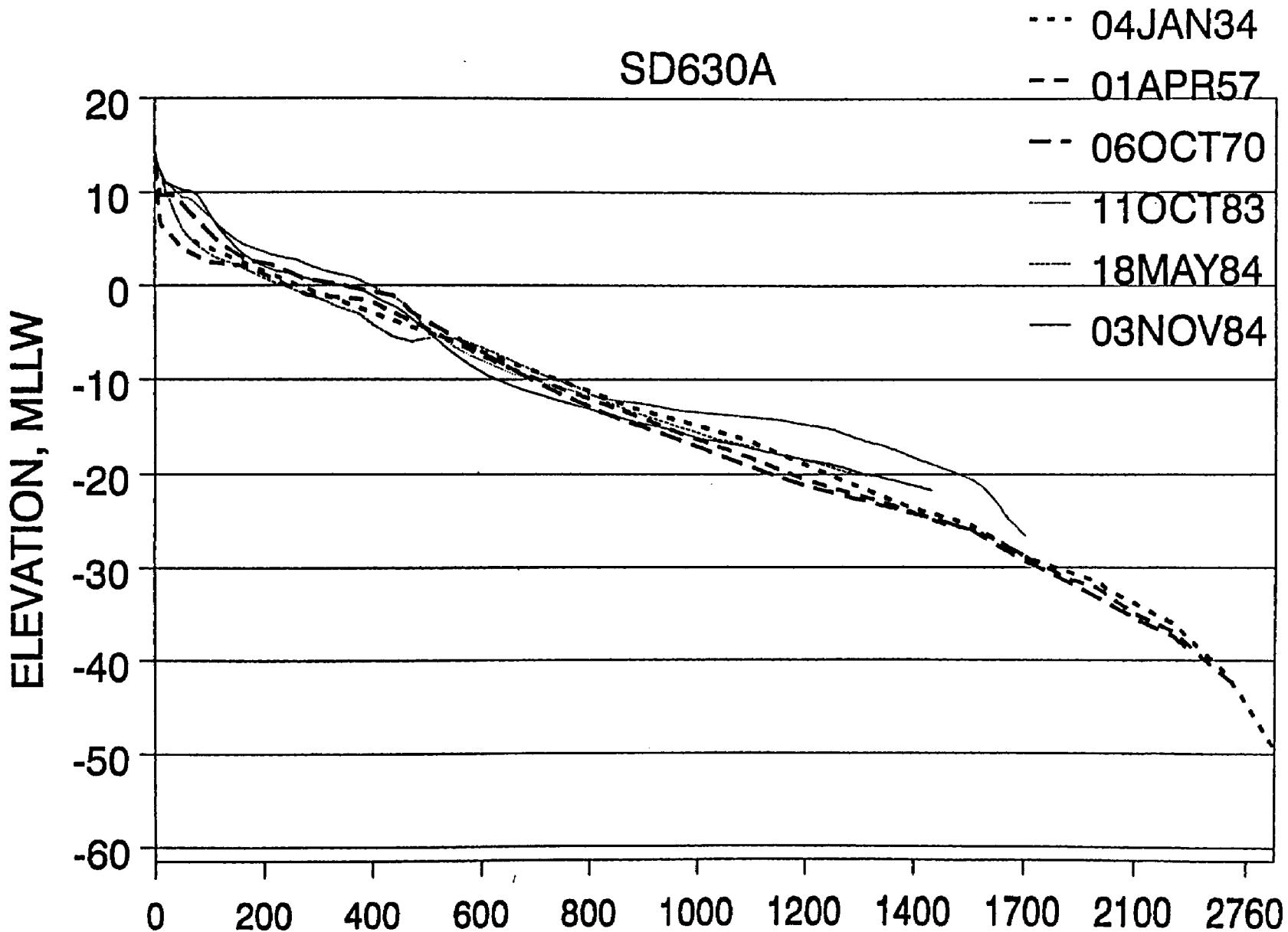


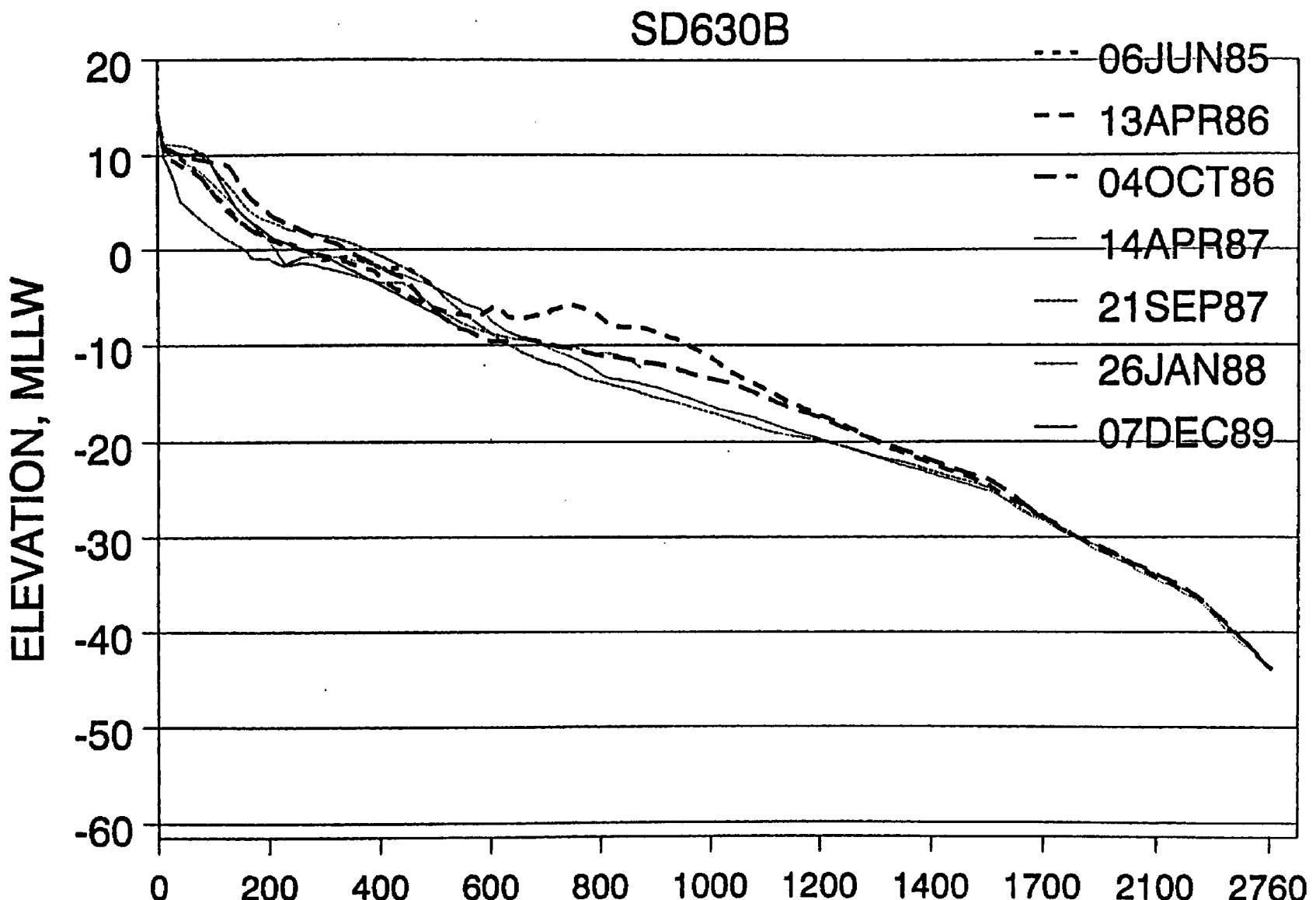
MB384B

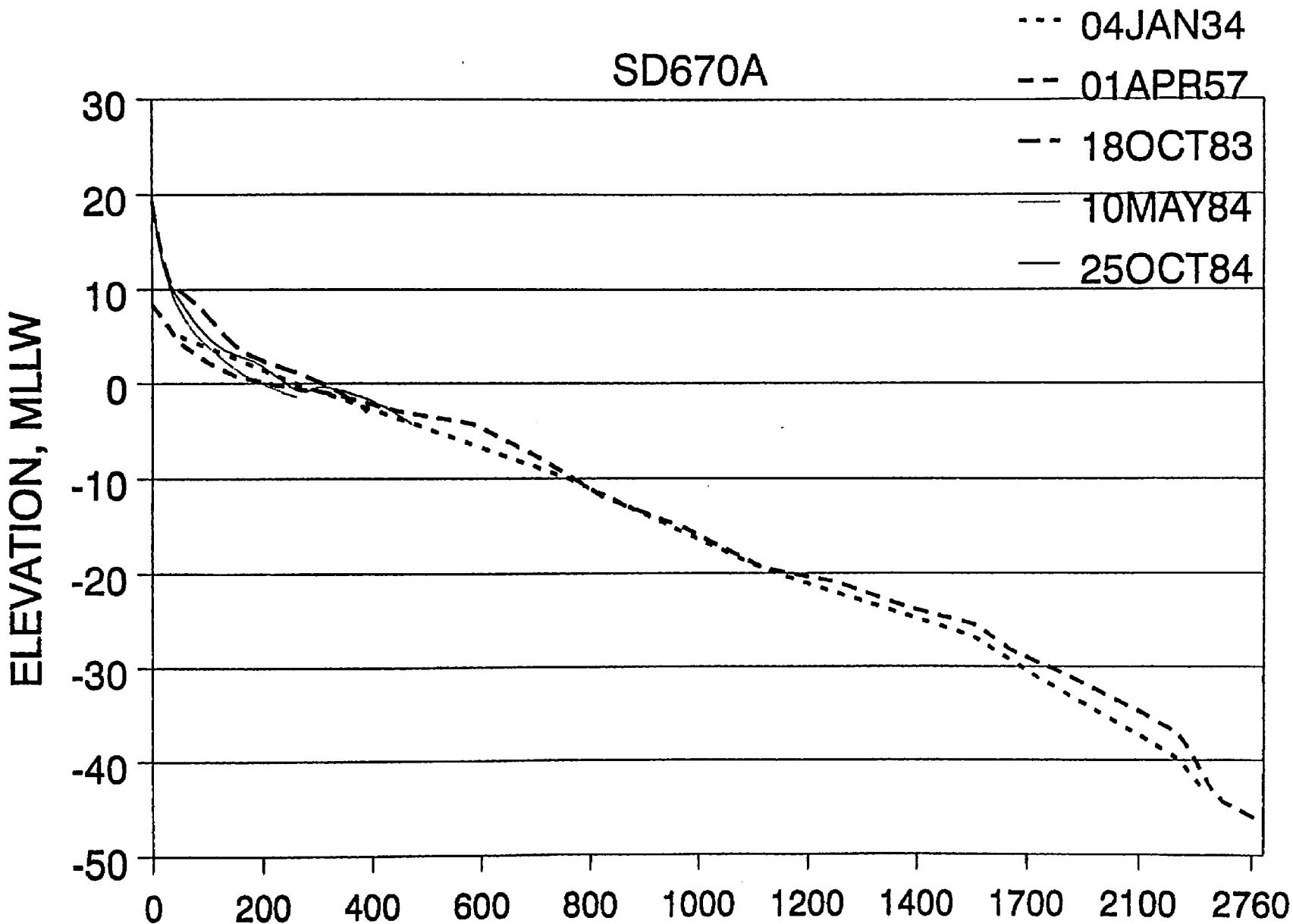


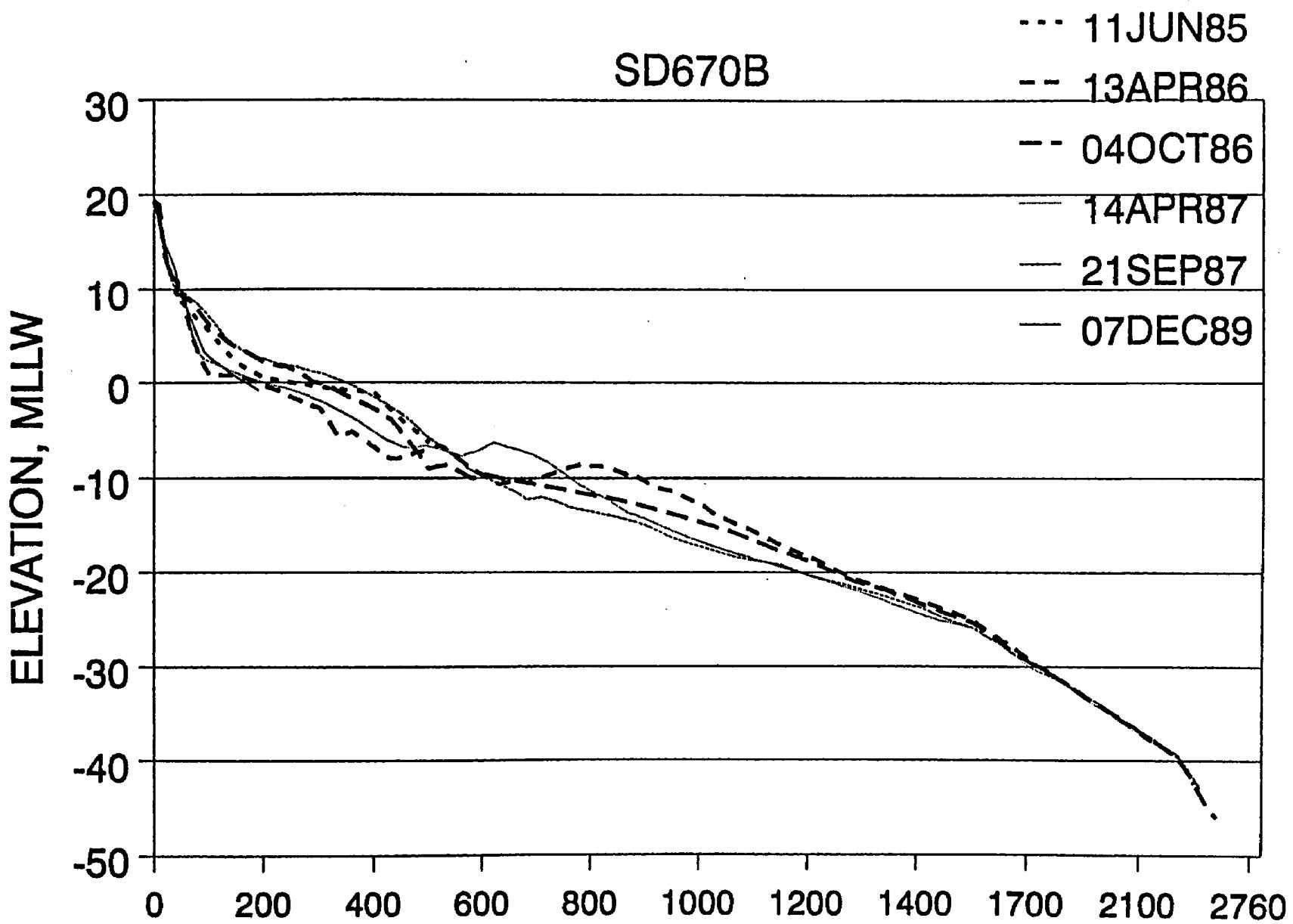


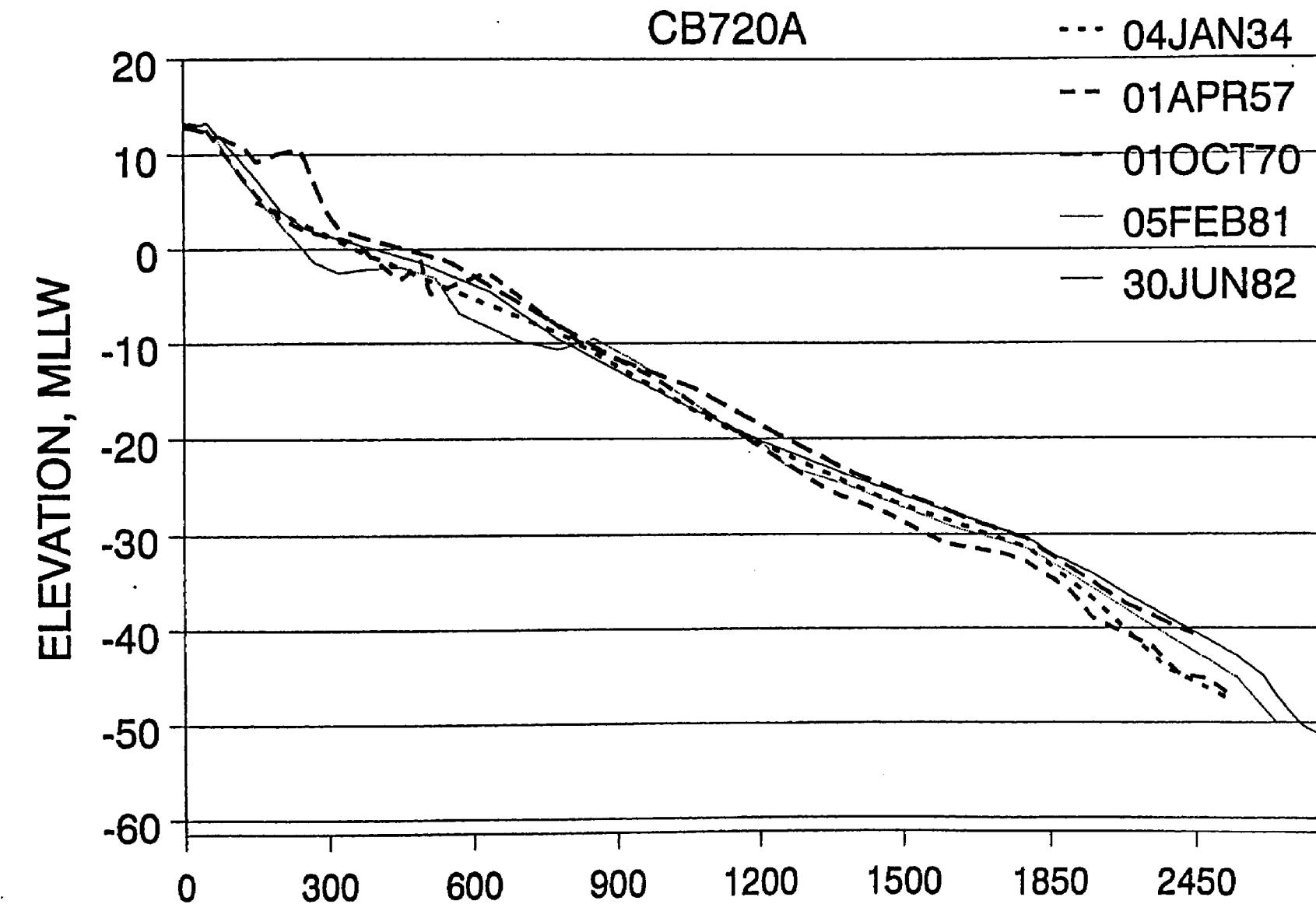


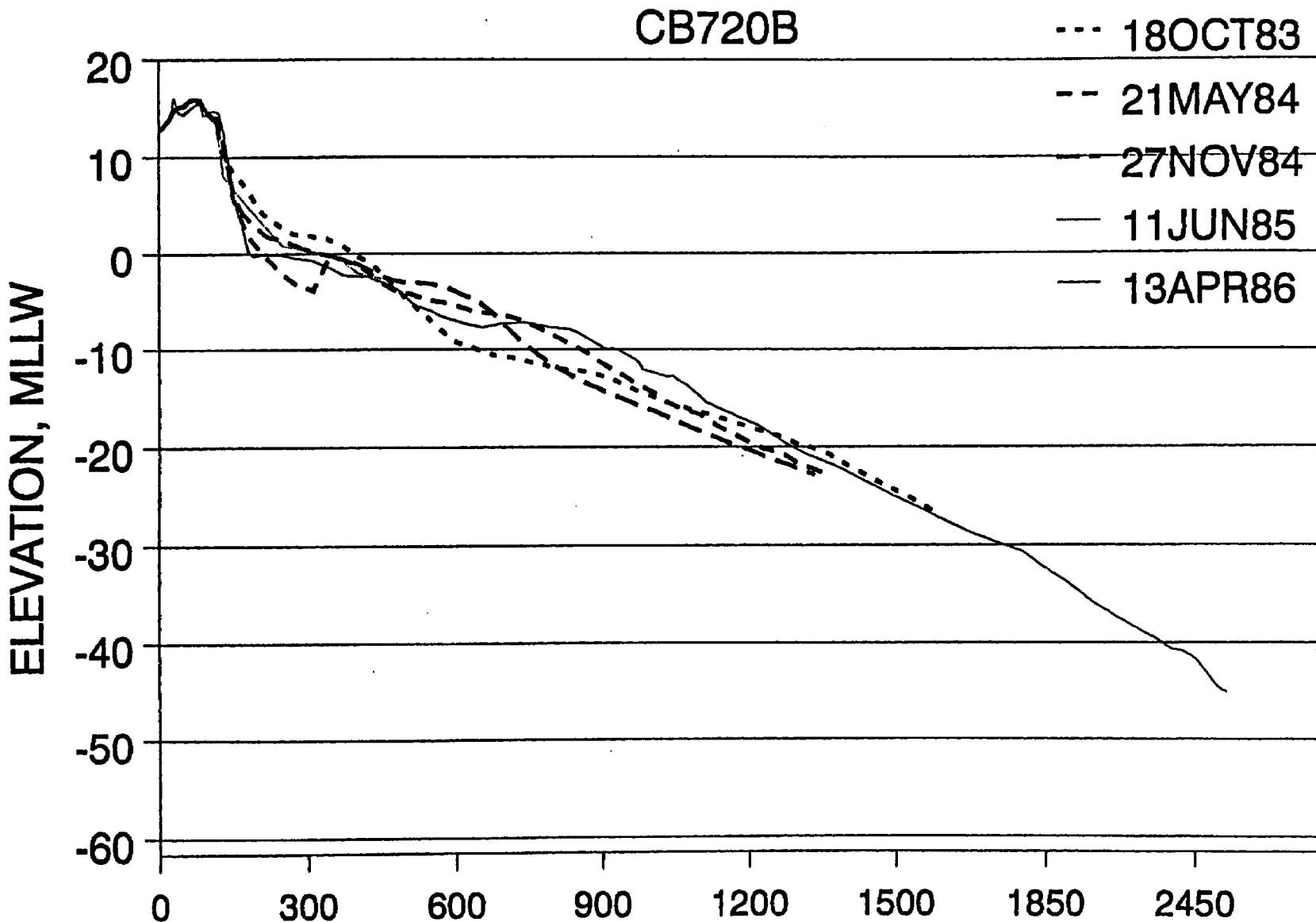


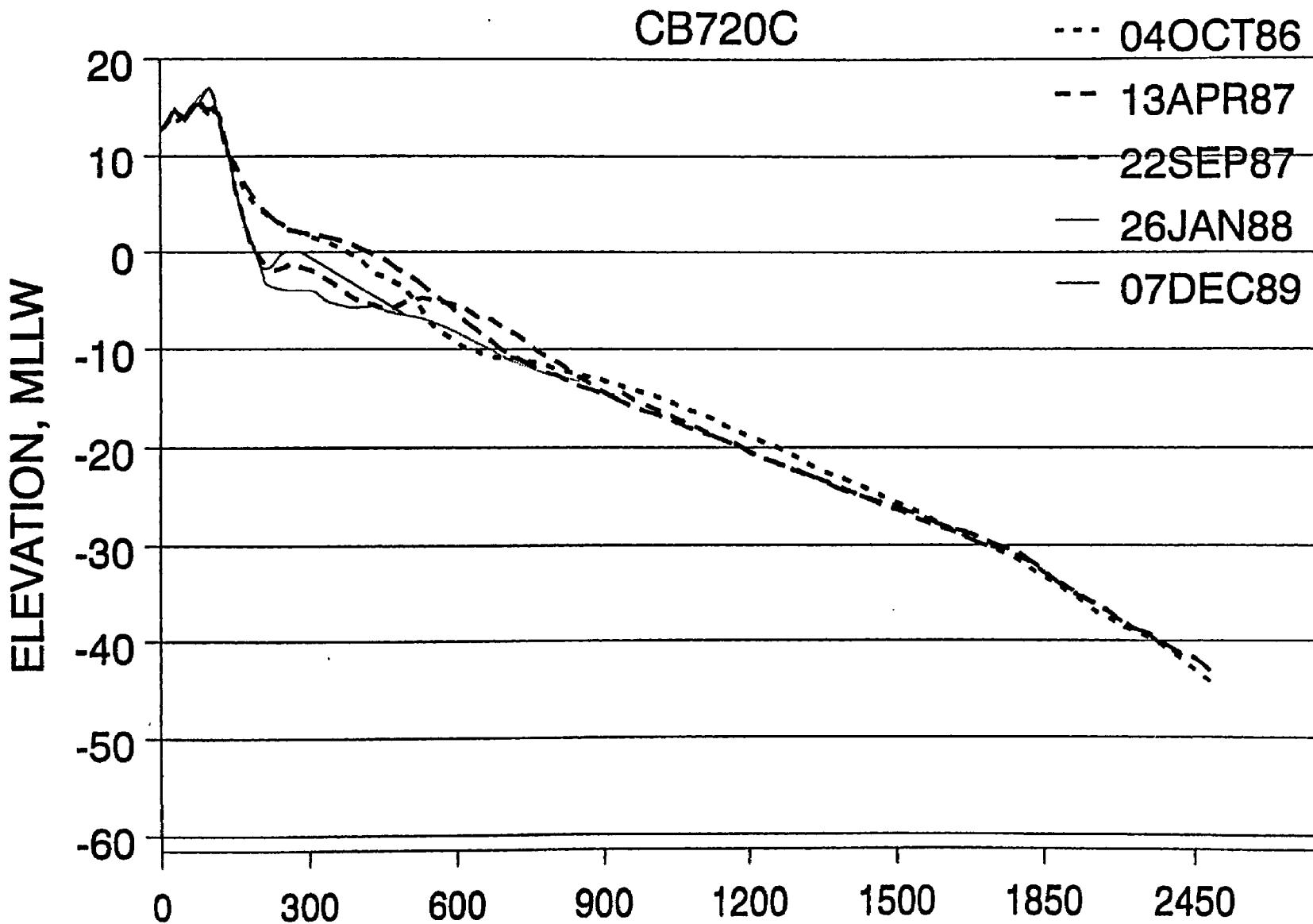


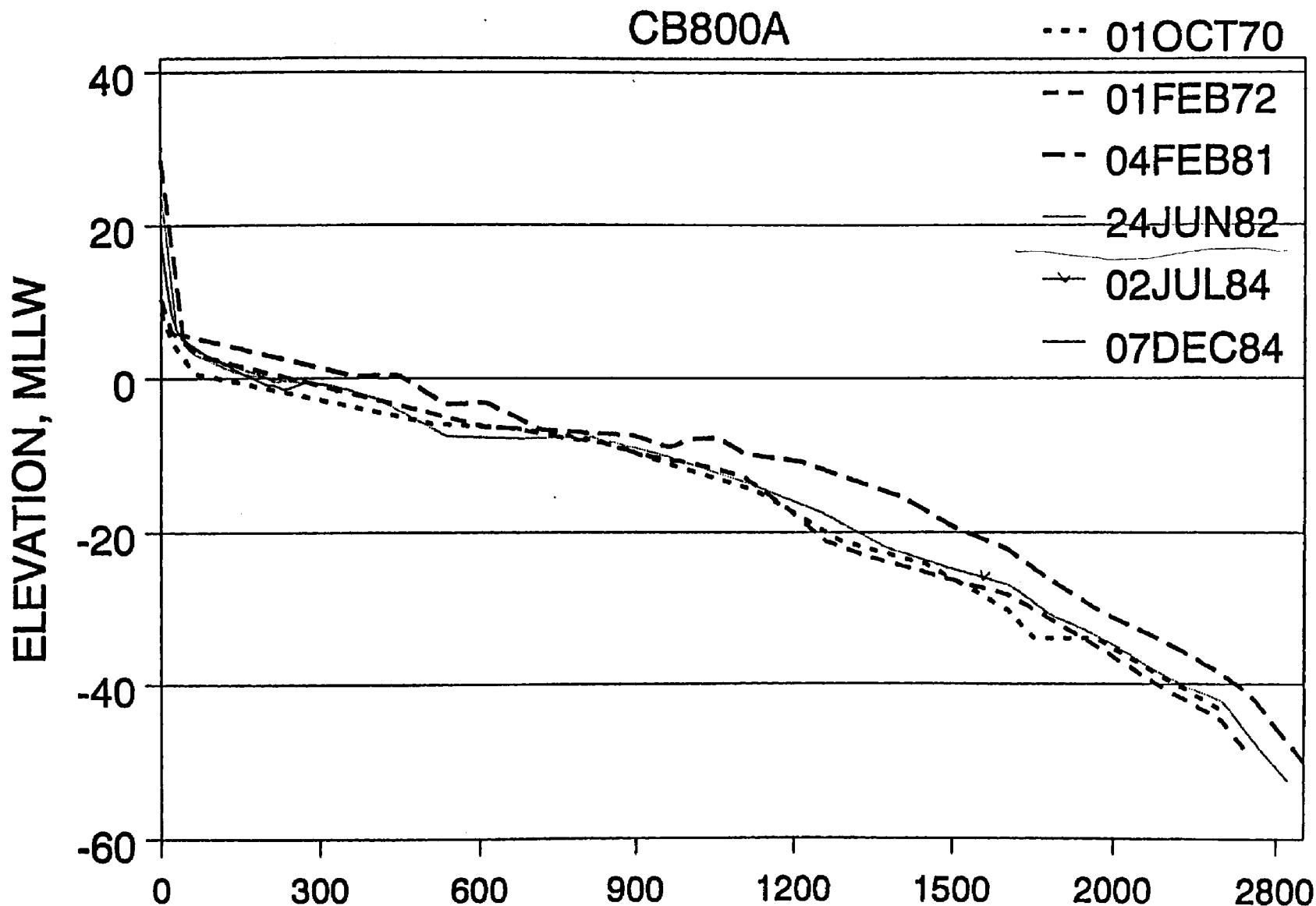


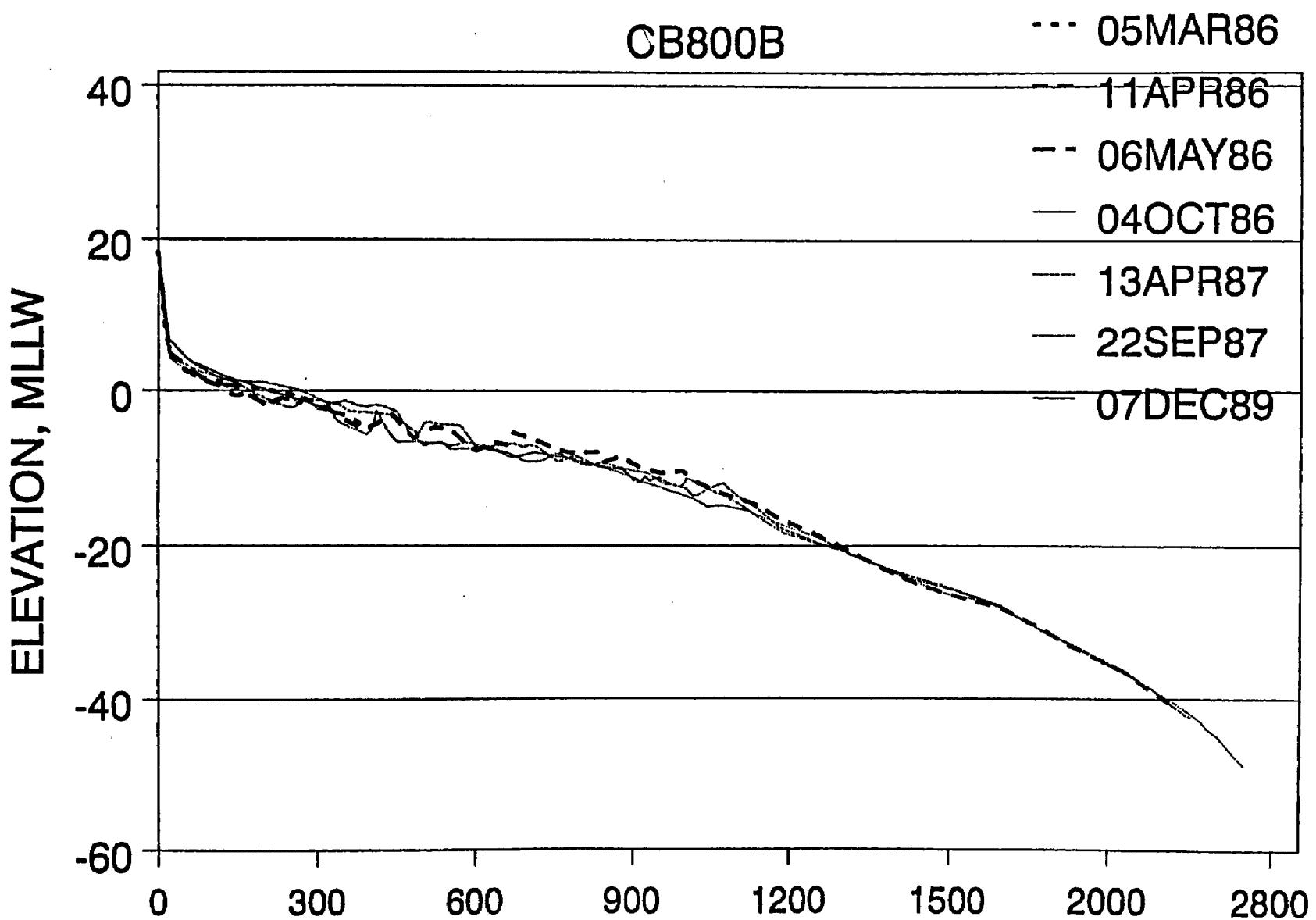


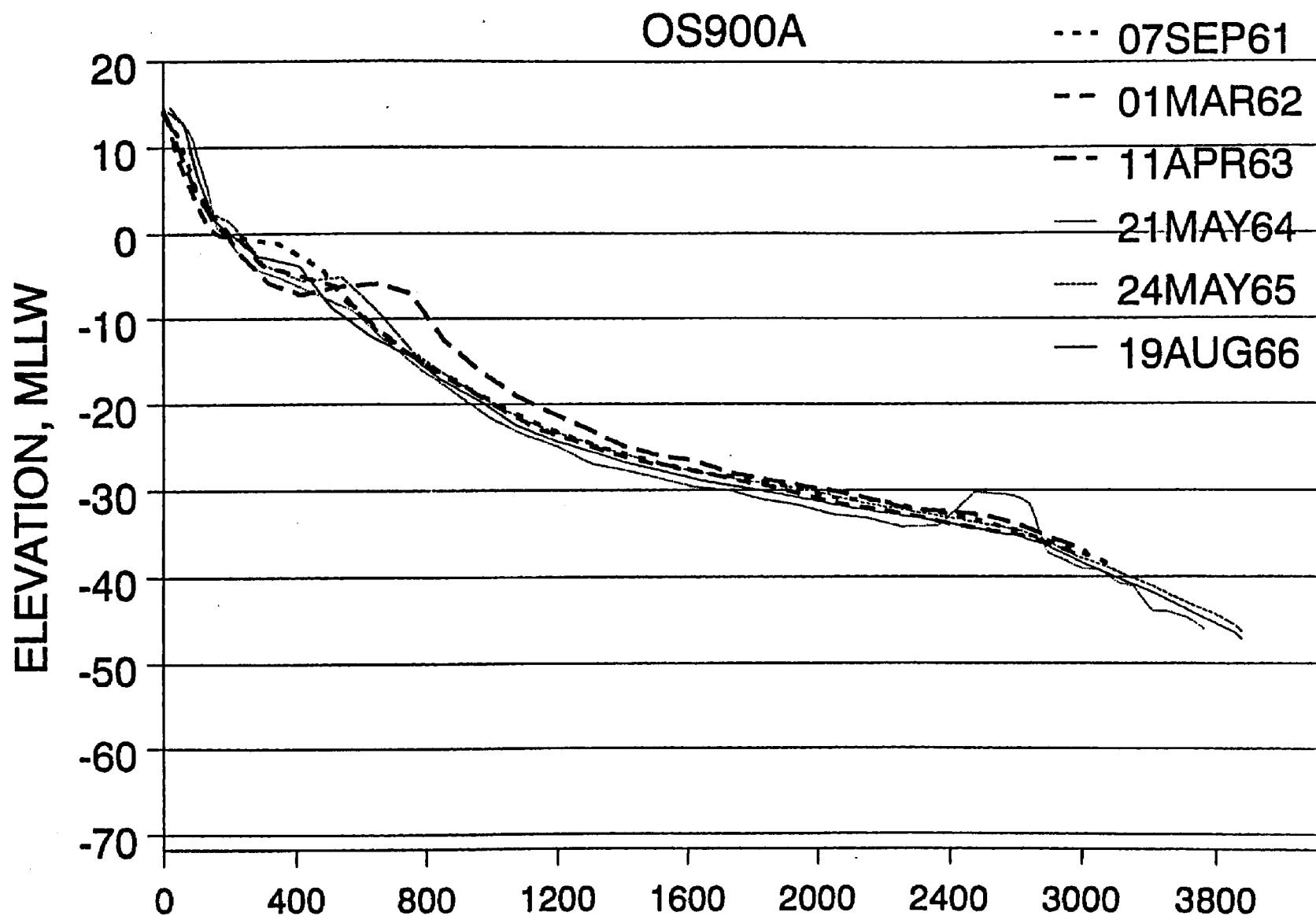


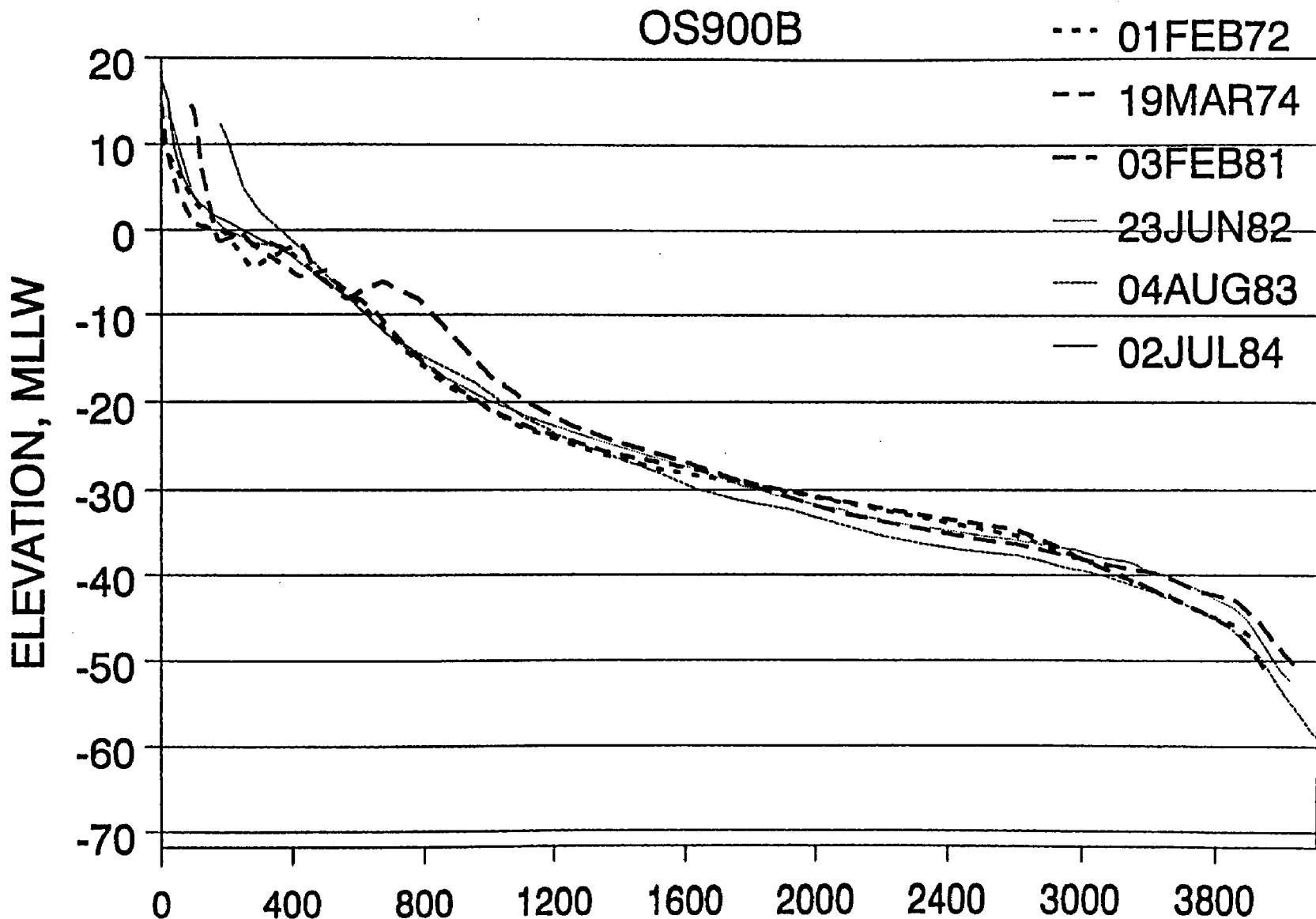


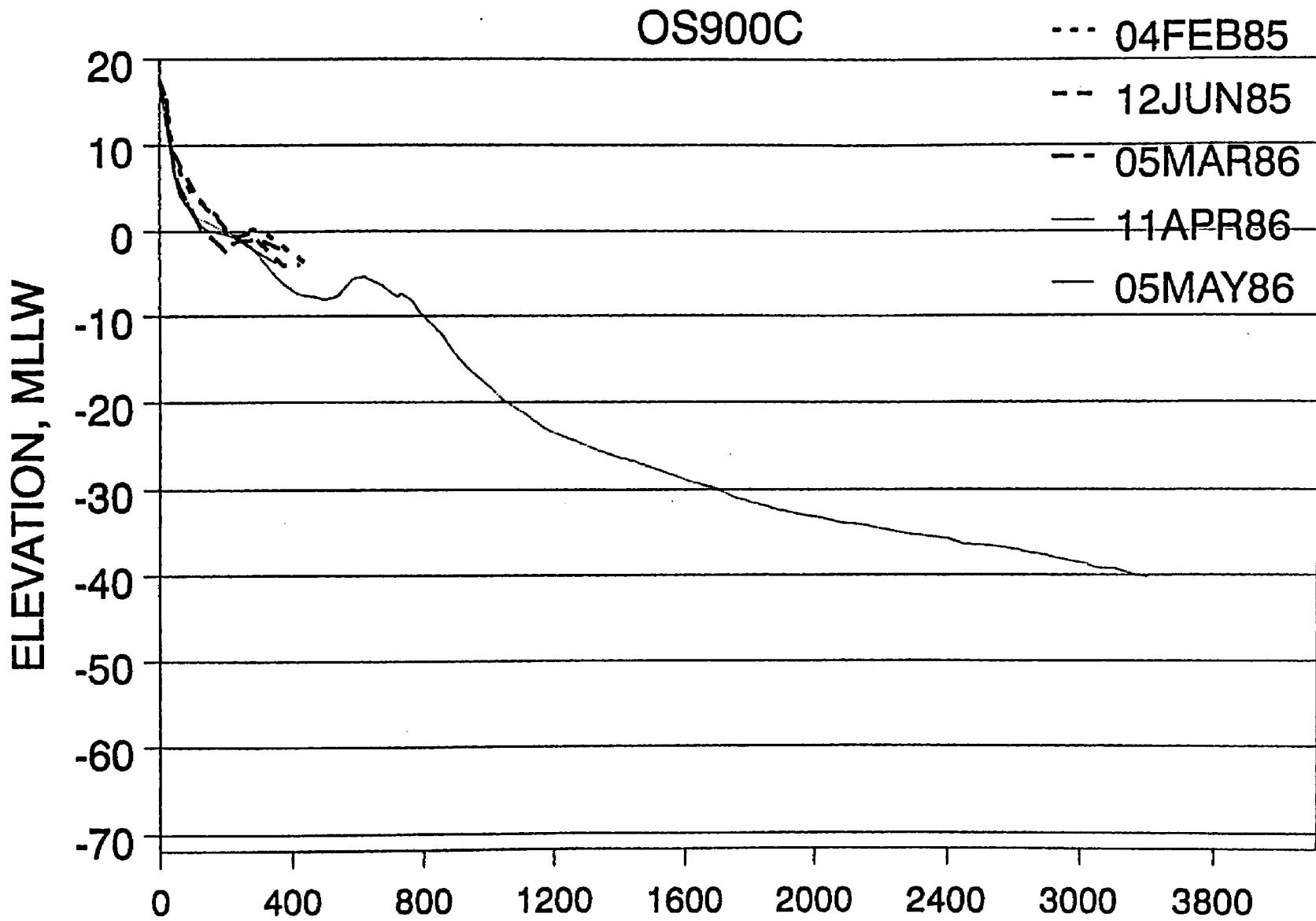


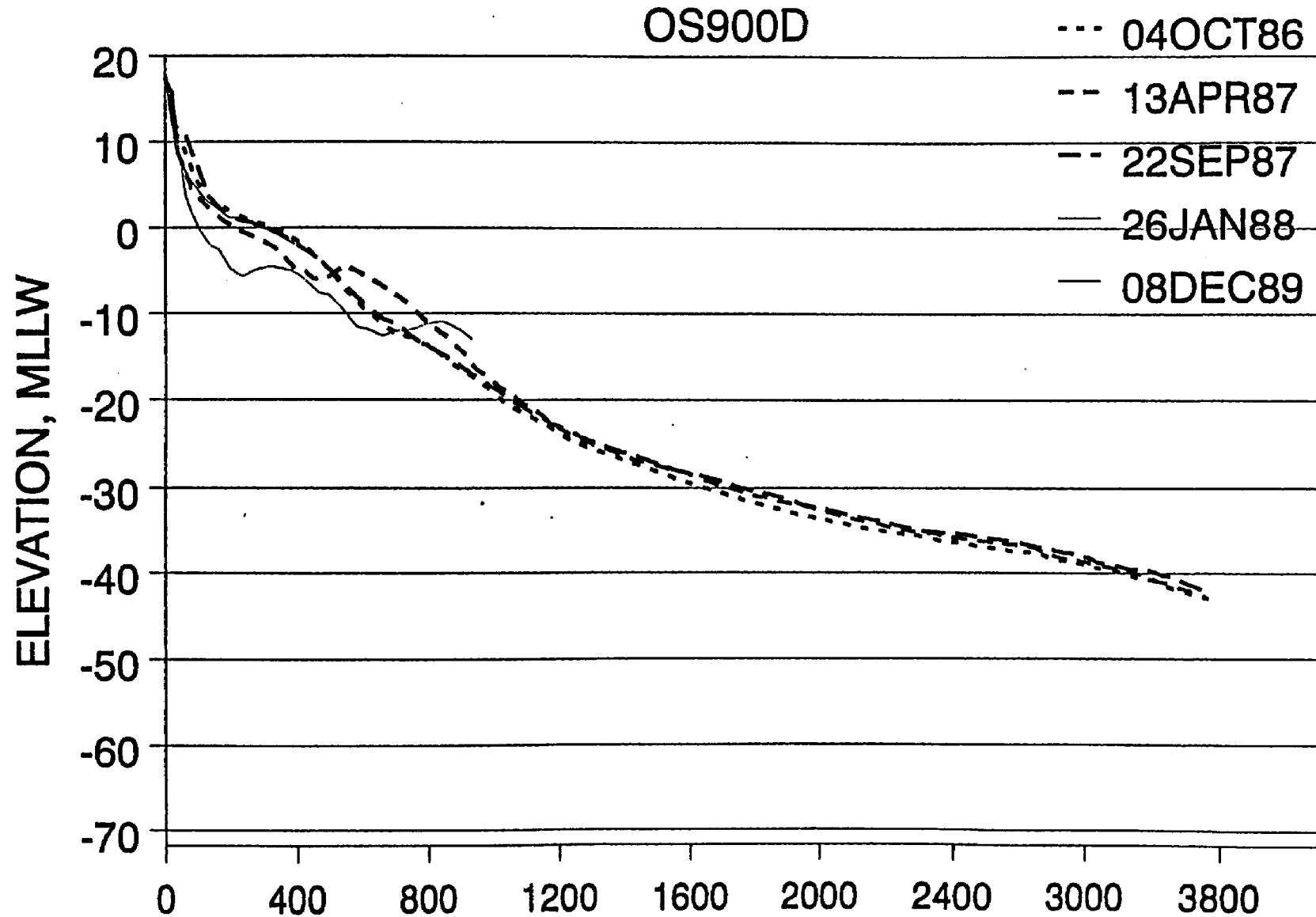












OS930A

--- 31JAN72

-- 23JUN82

-- 04AUG83

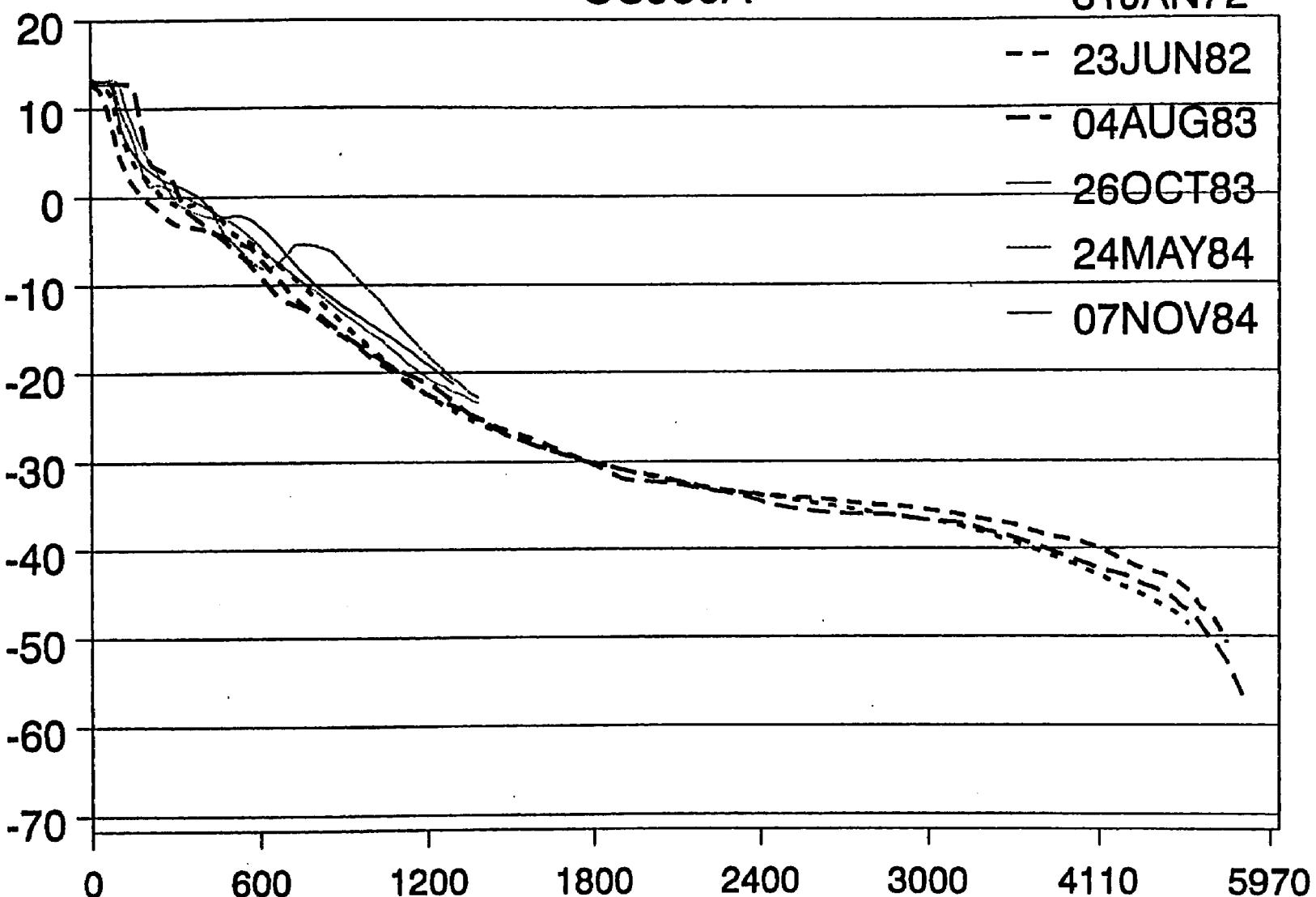
— 26OCT83

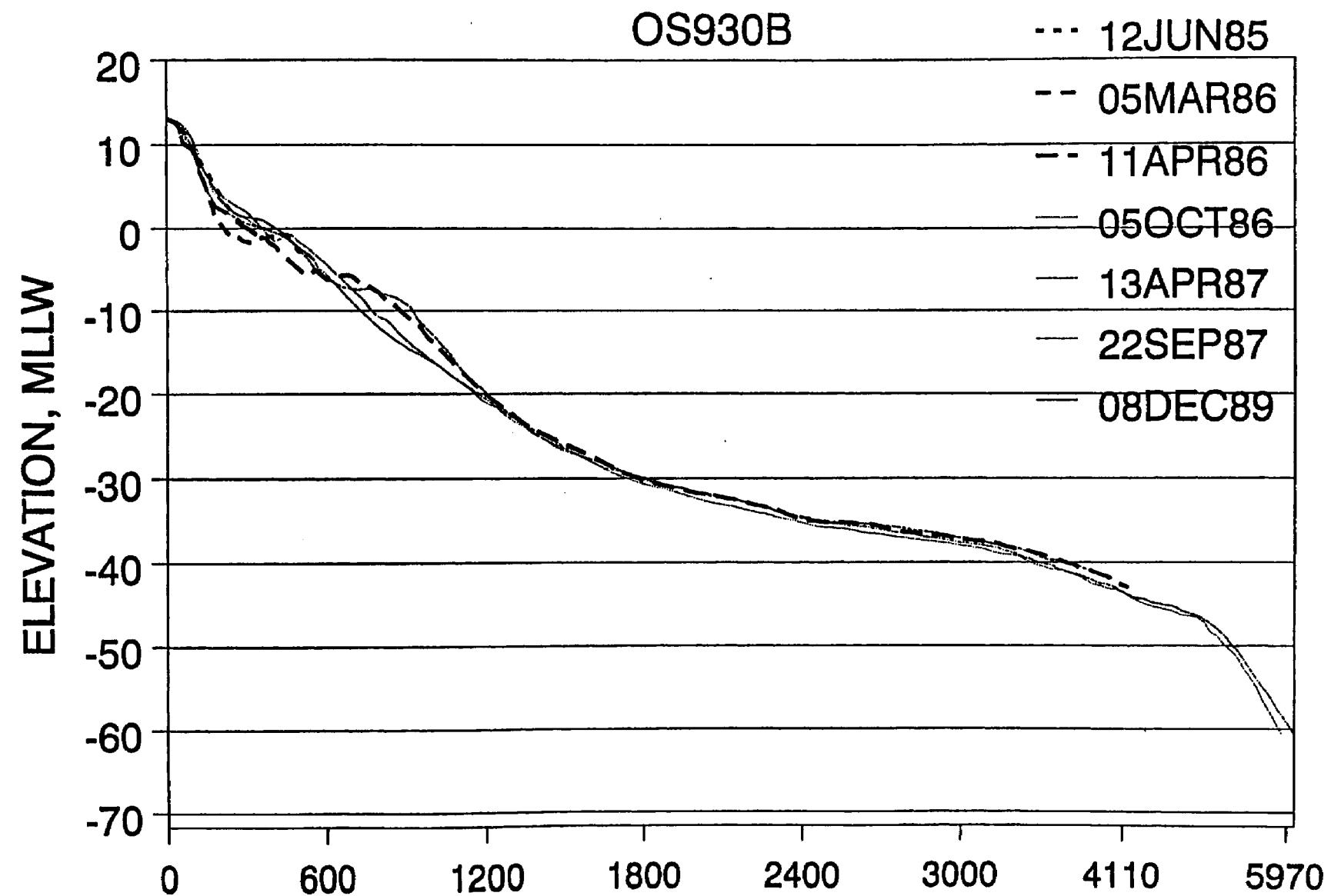
— 24MAY84

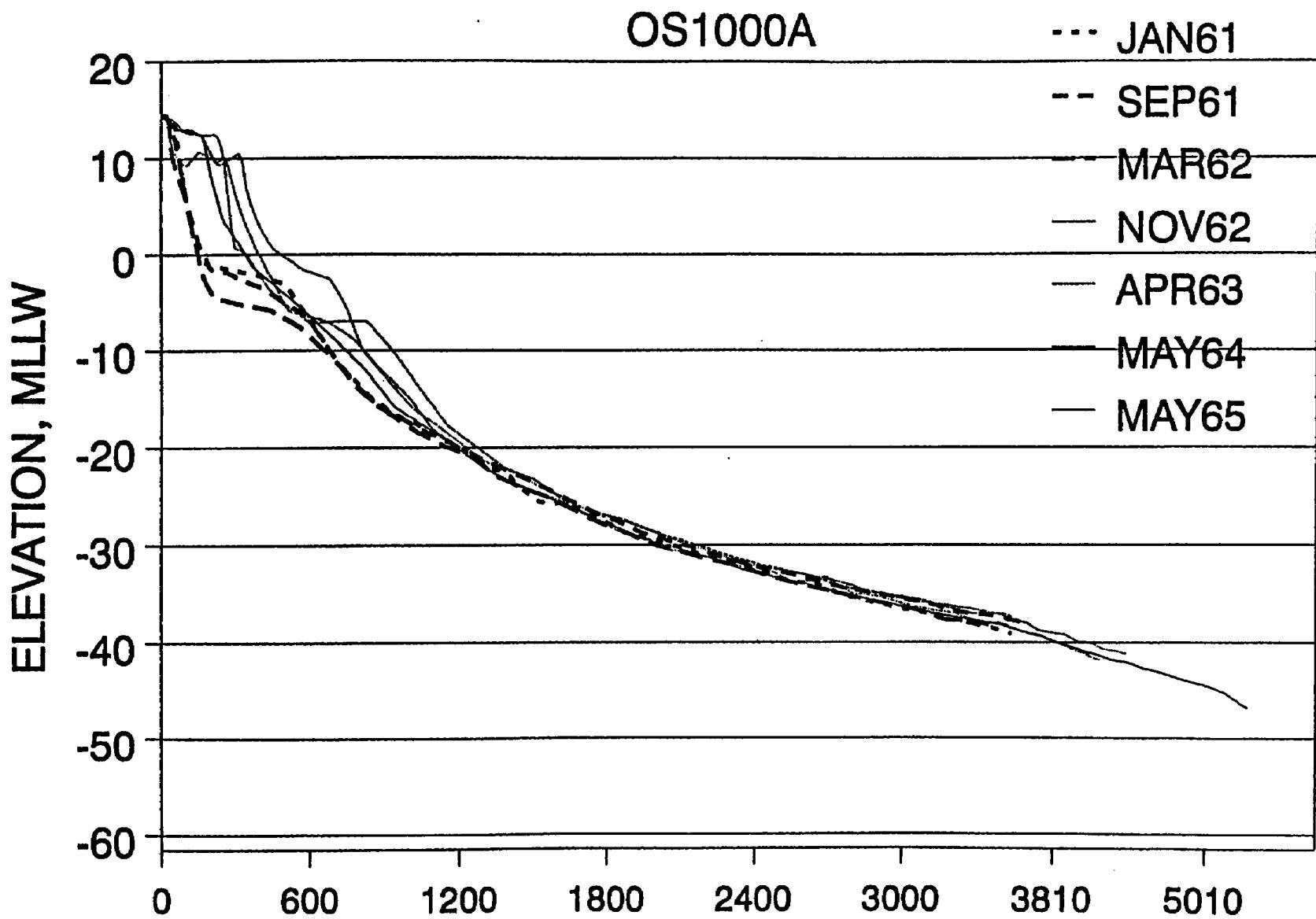
— 07NOV84

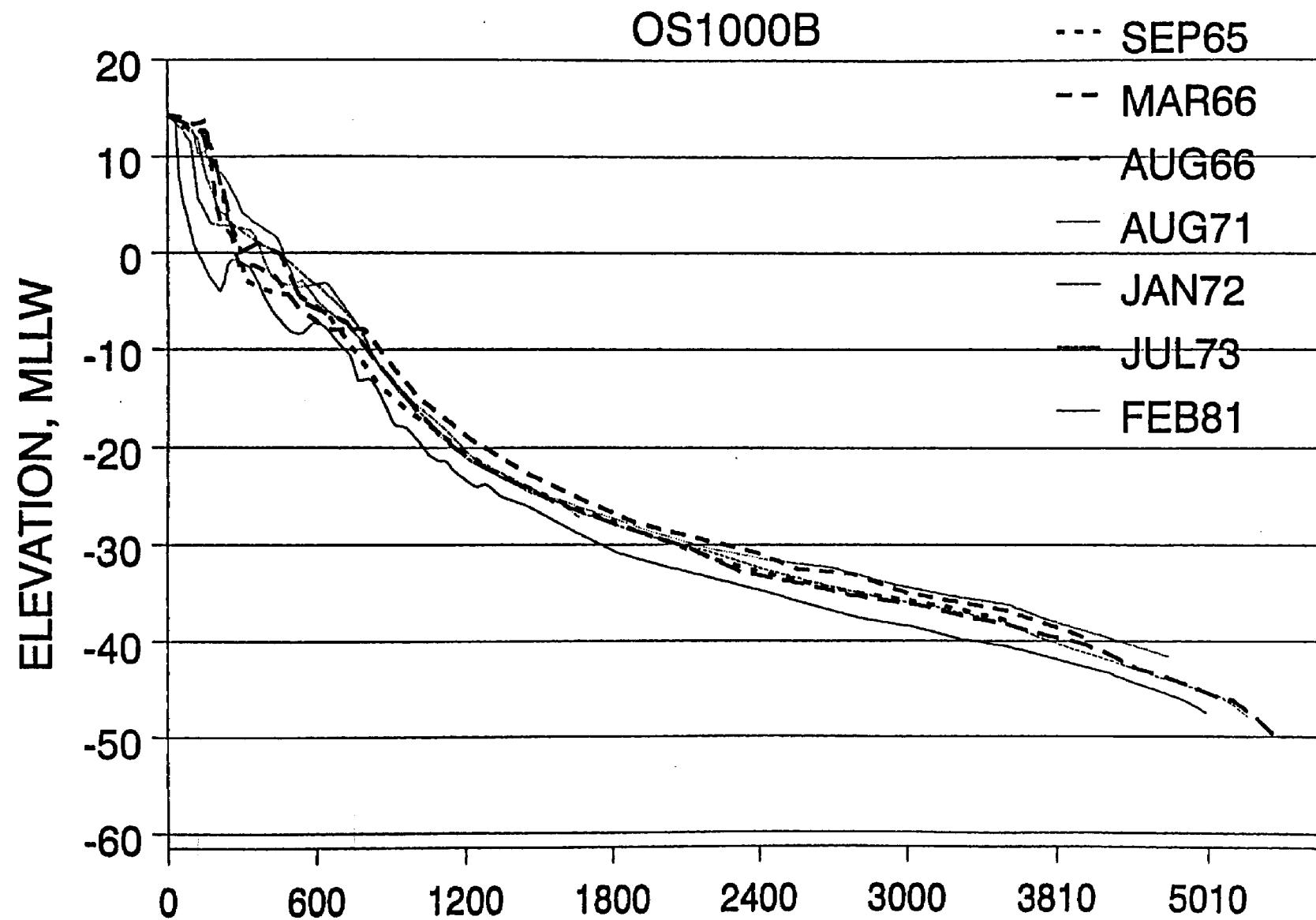
ELEVATION, MLLW

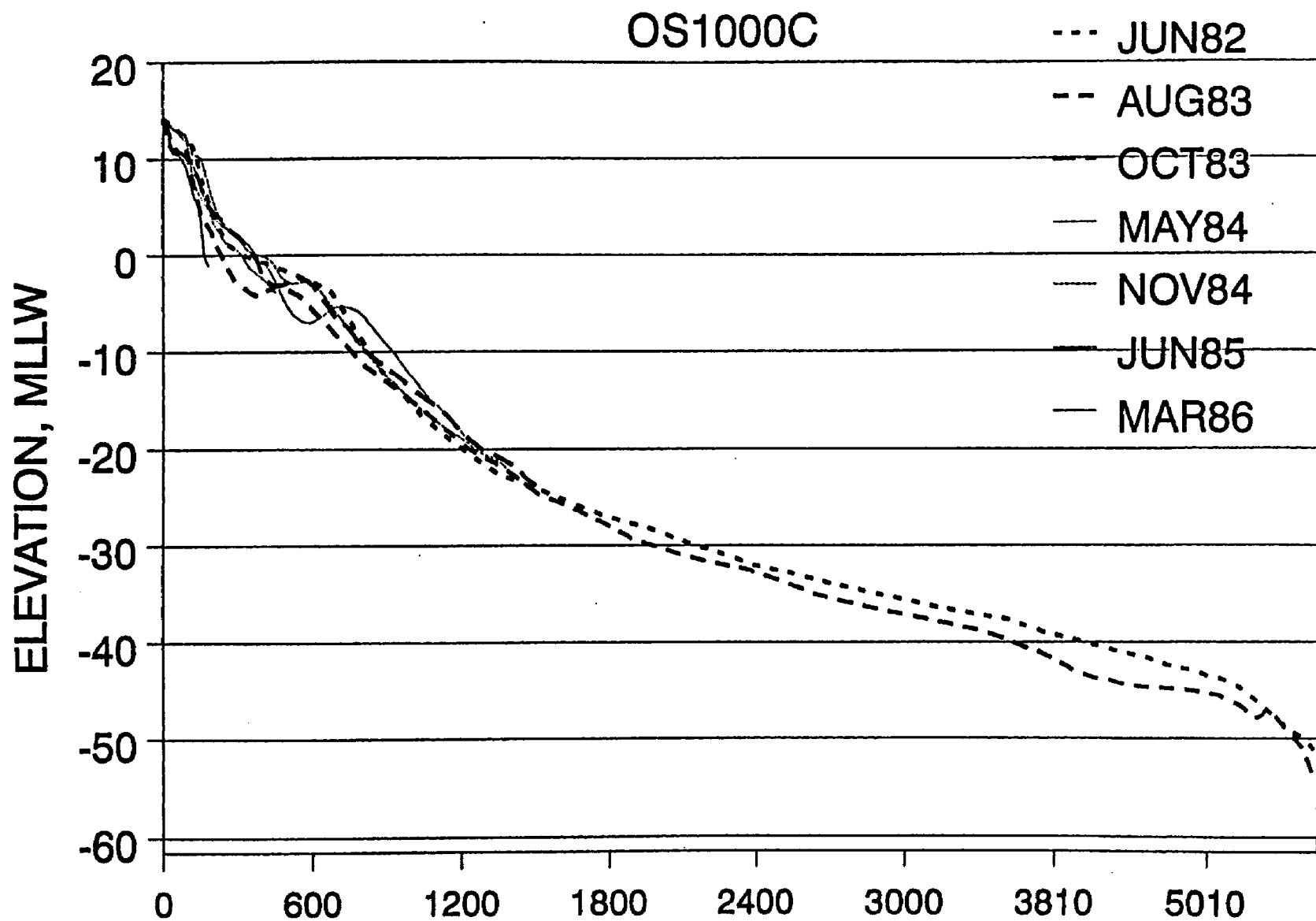
B-34

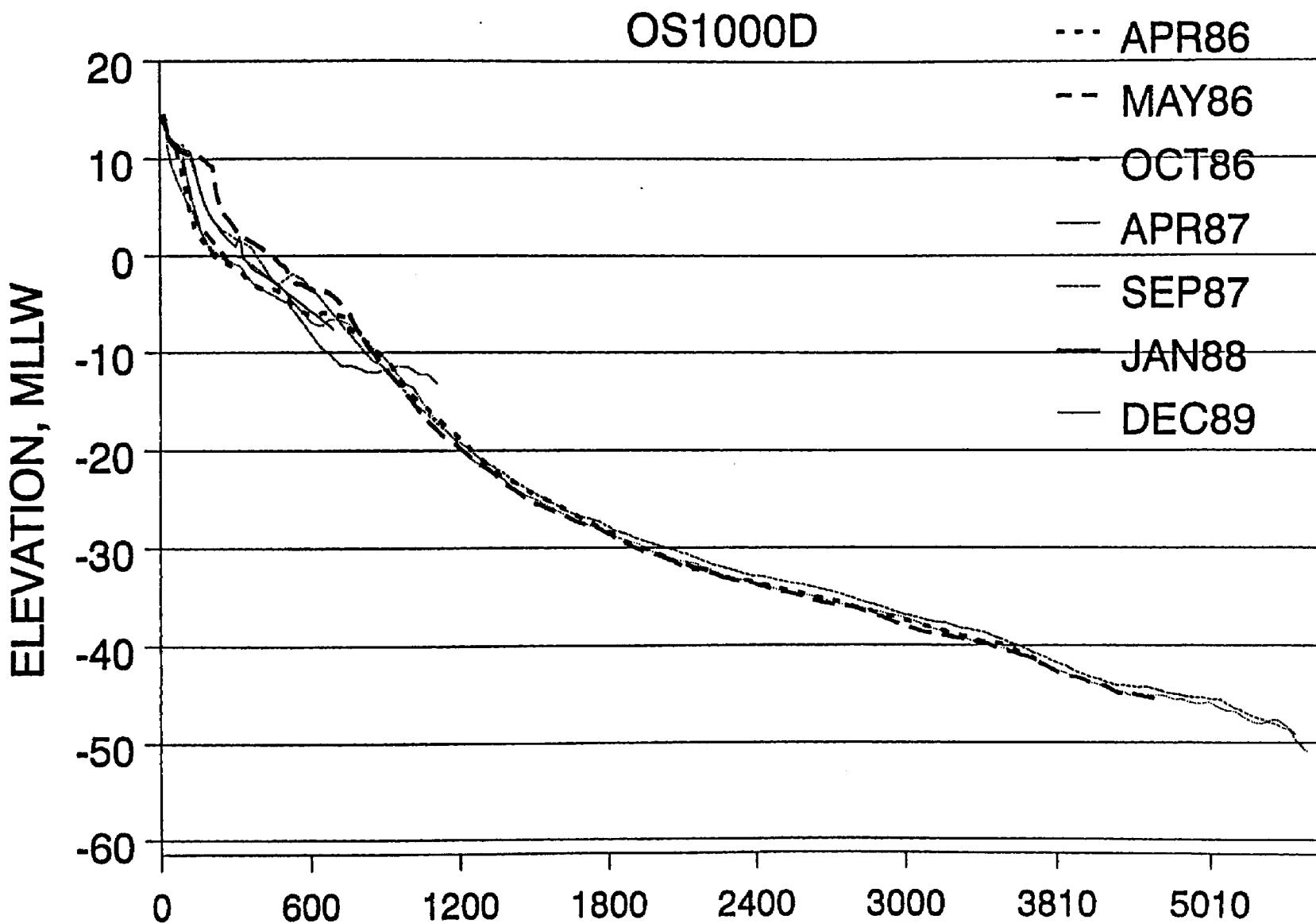


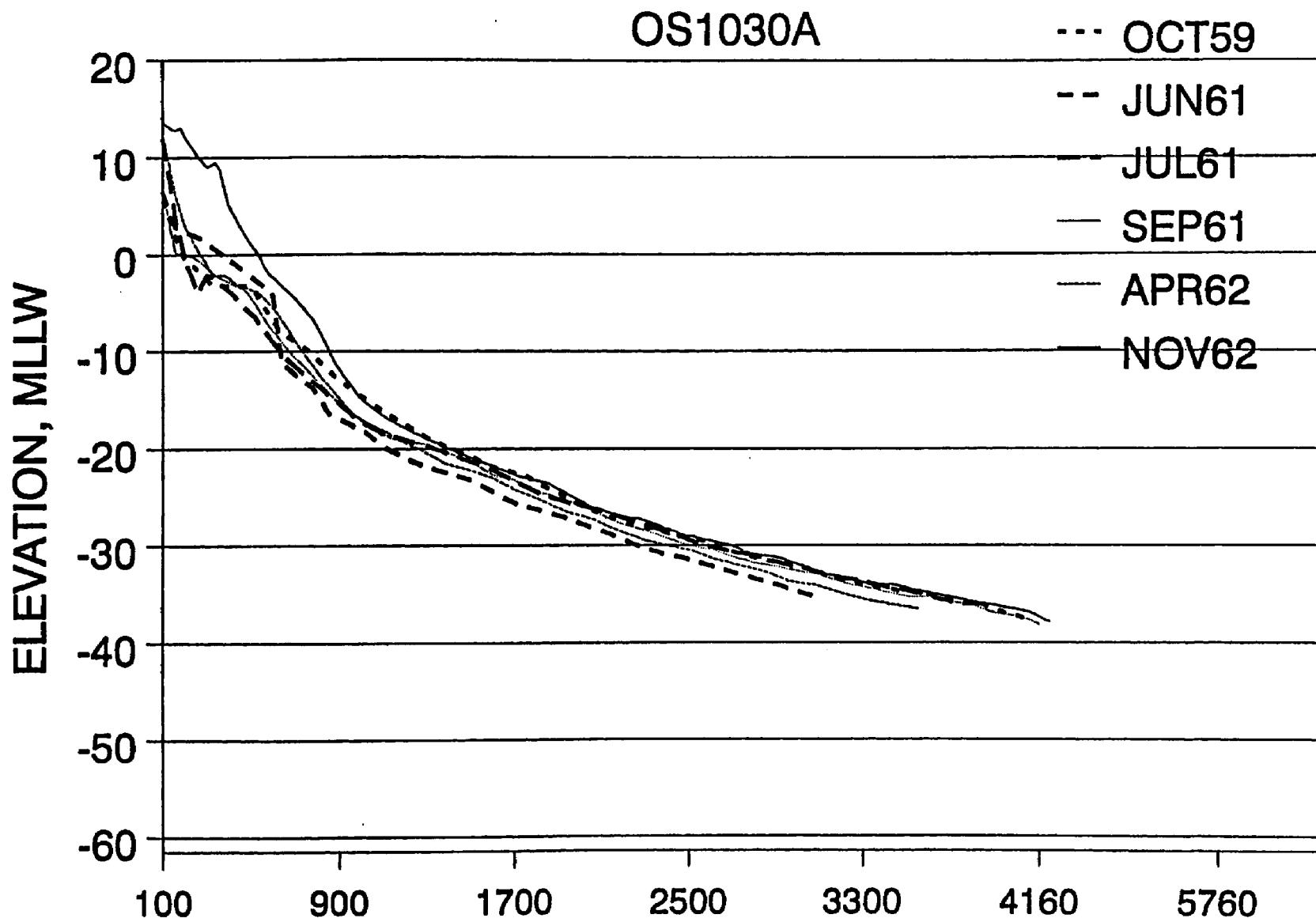


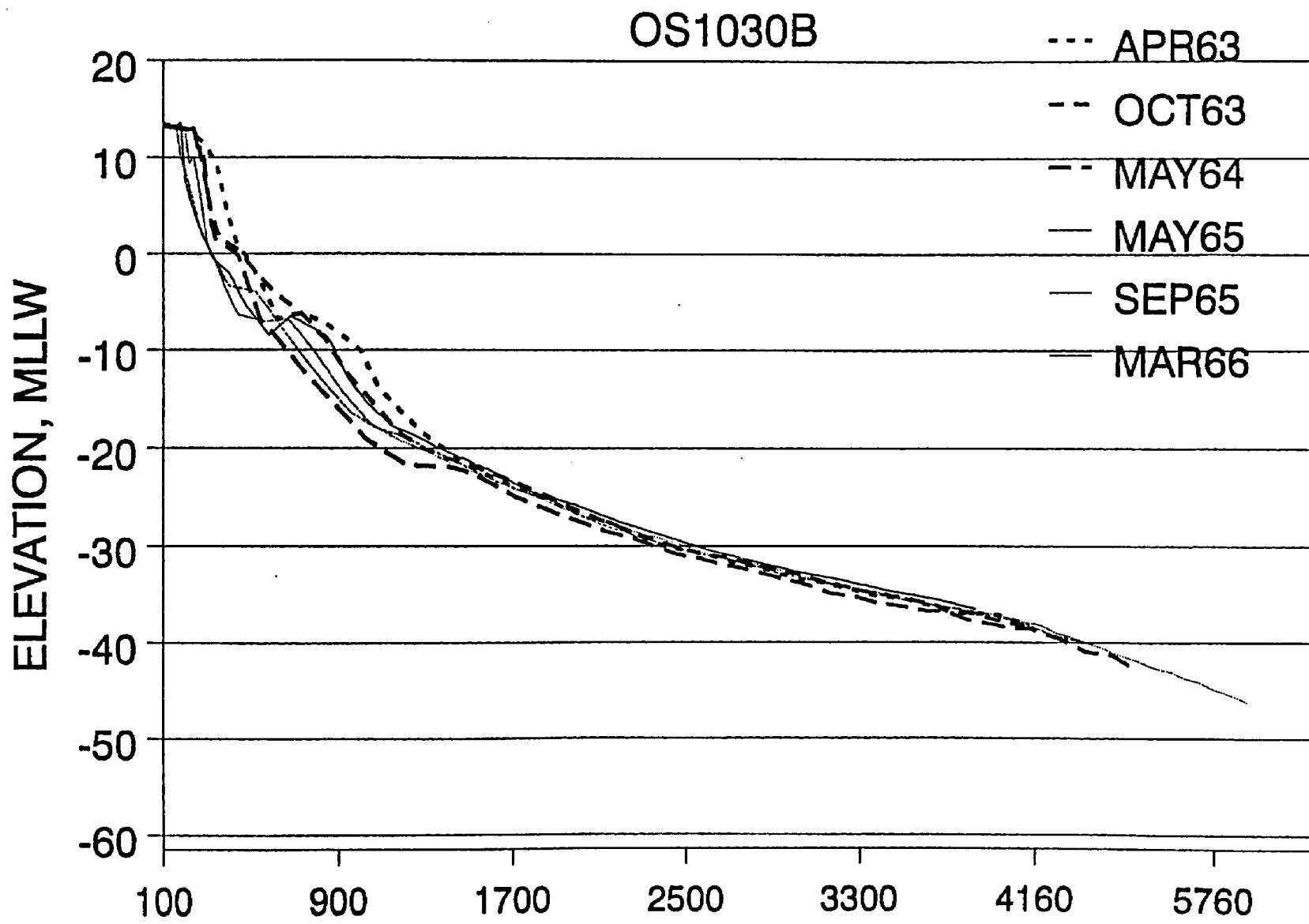


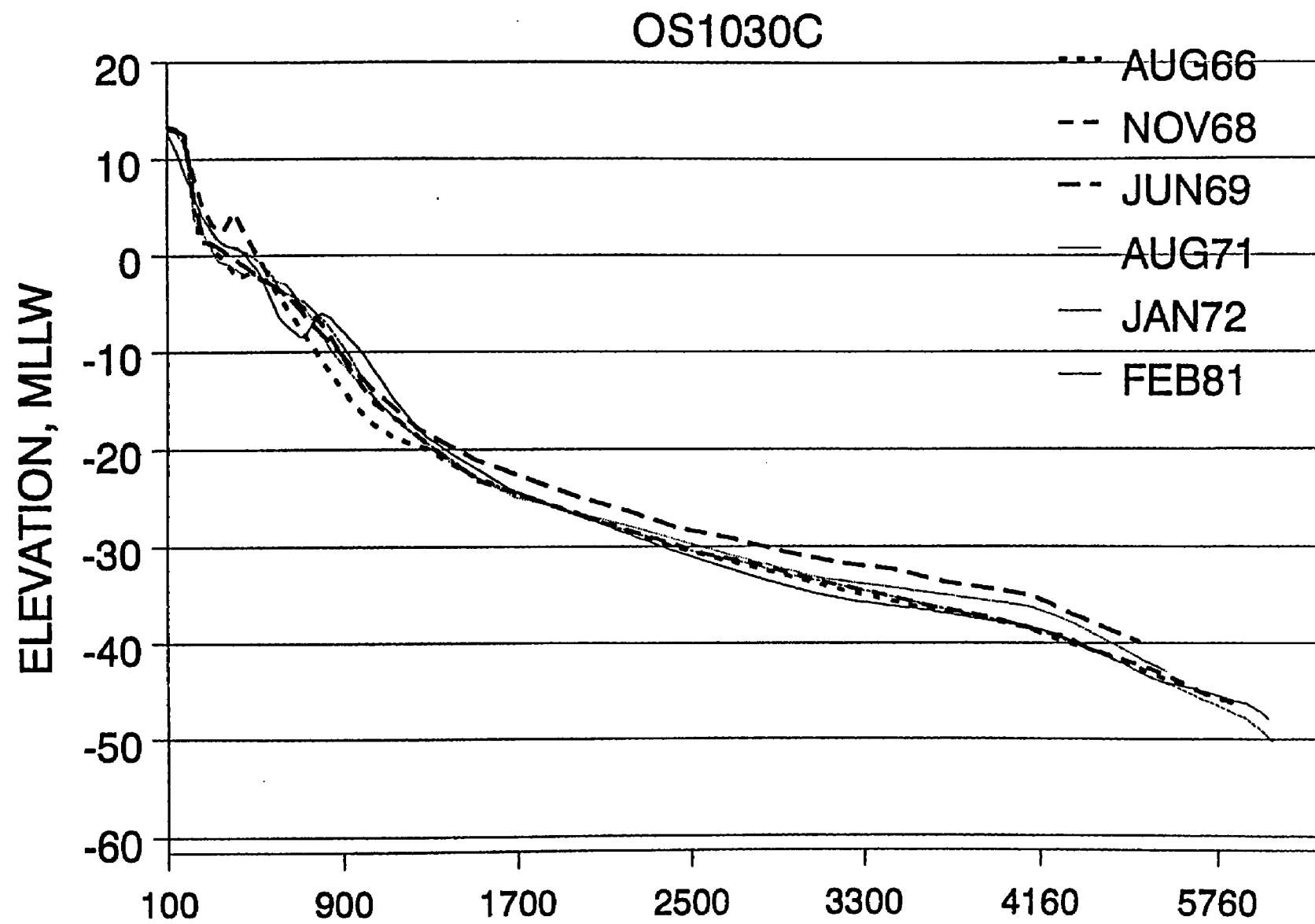


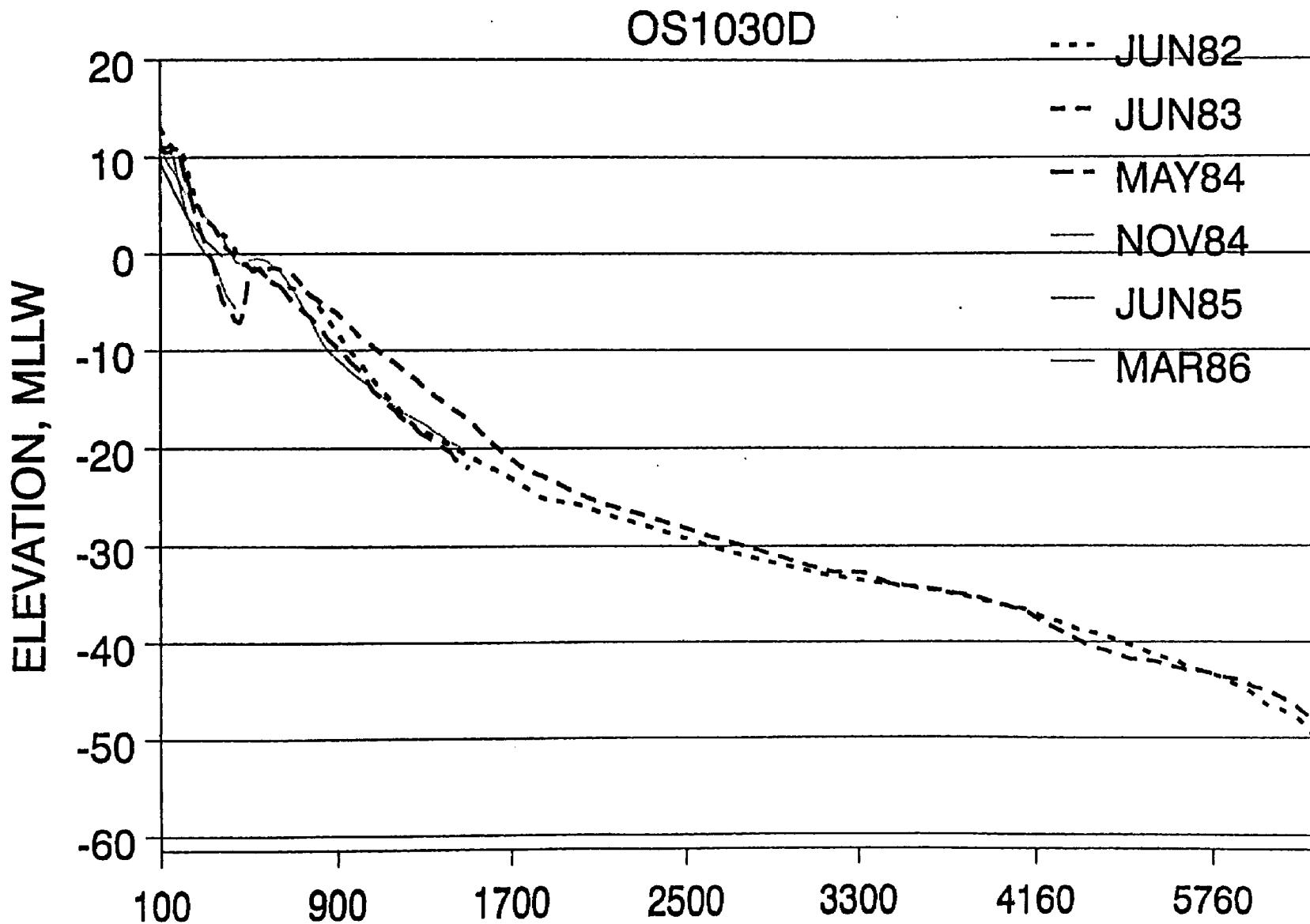


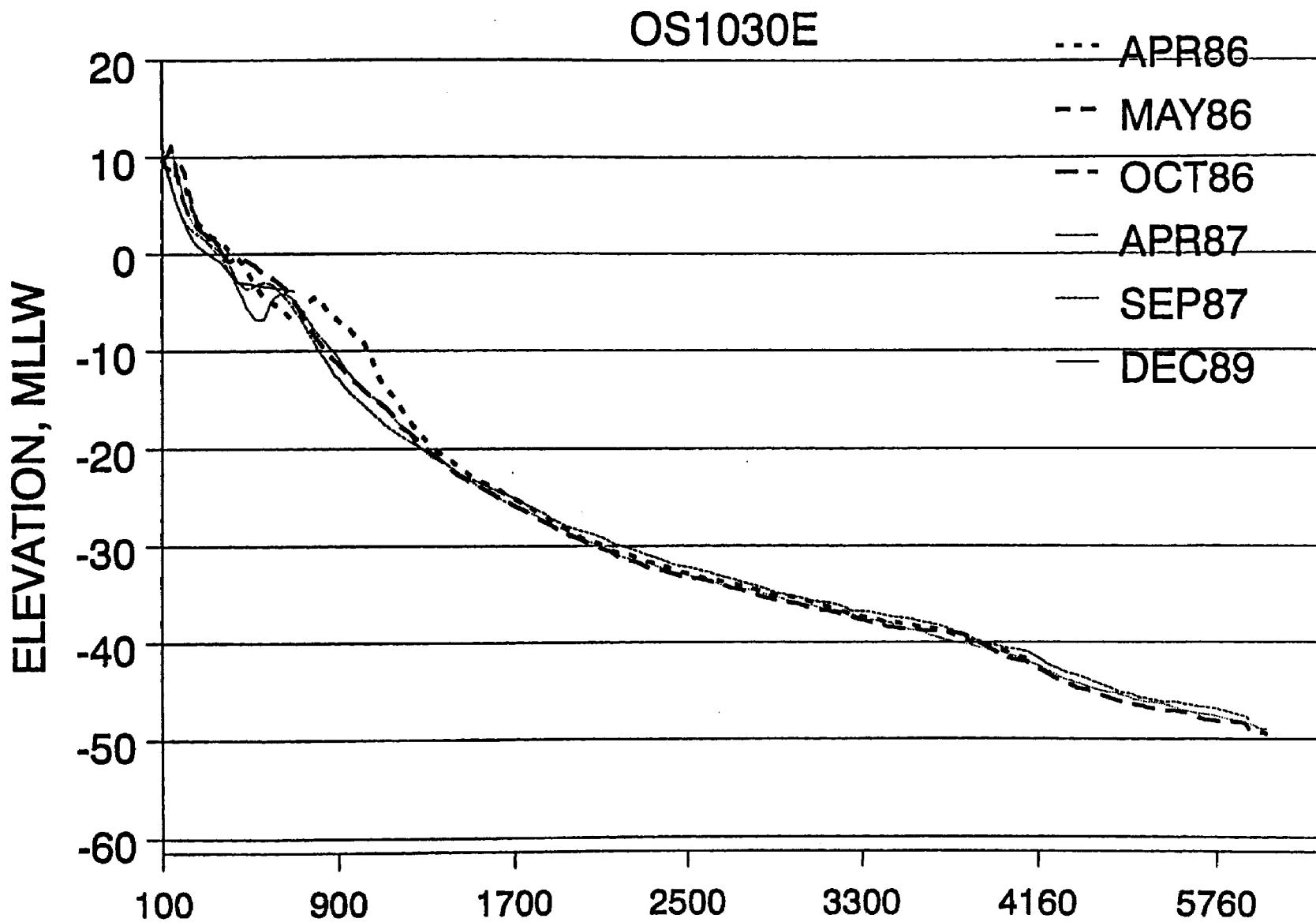


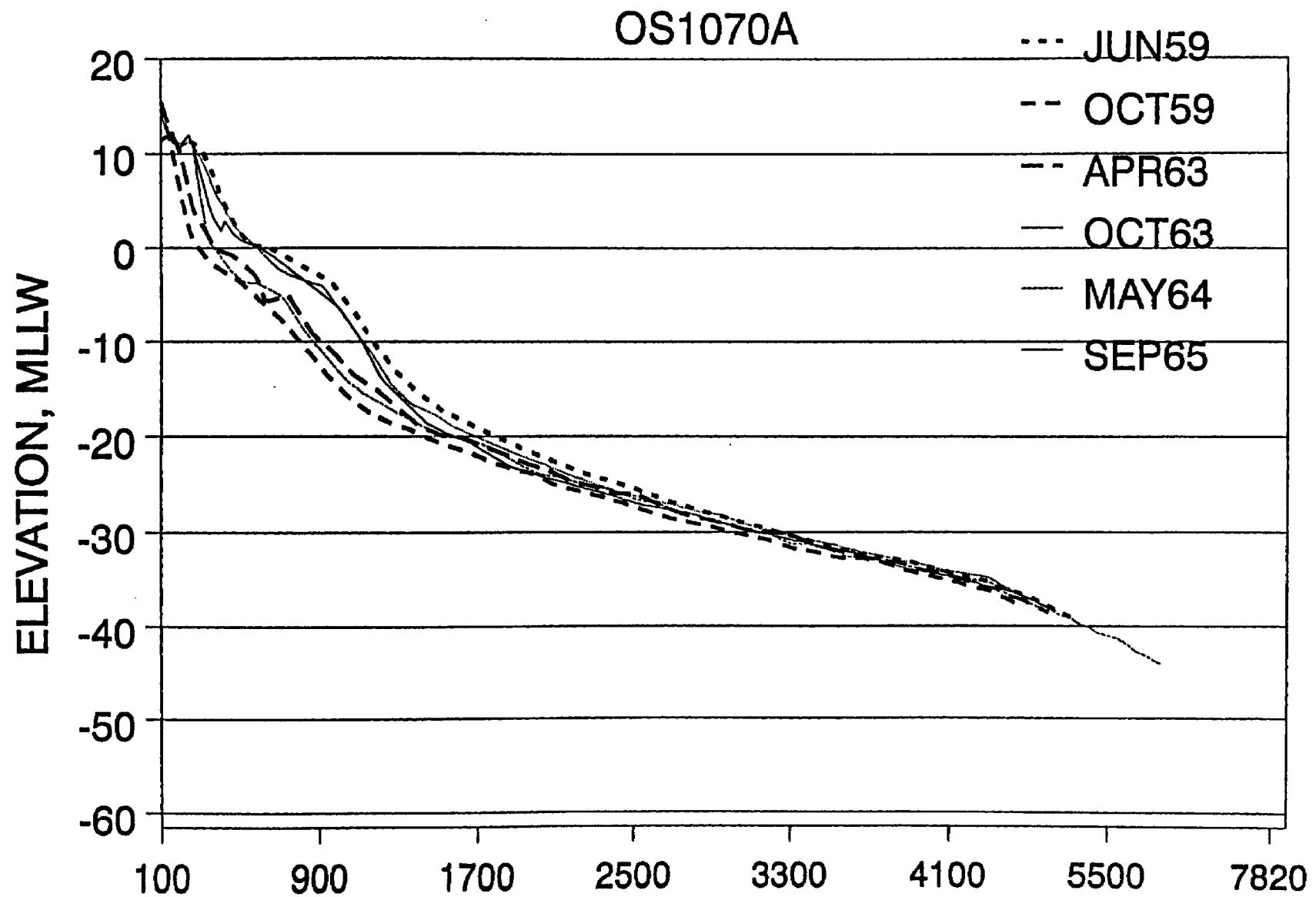


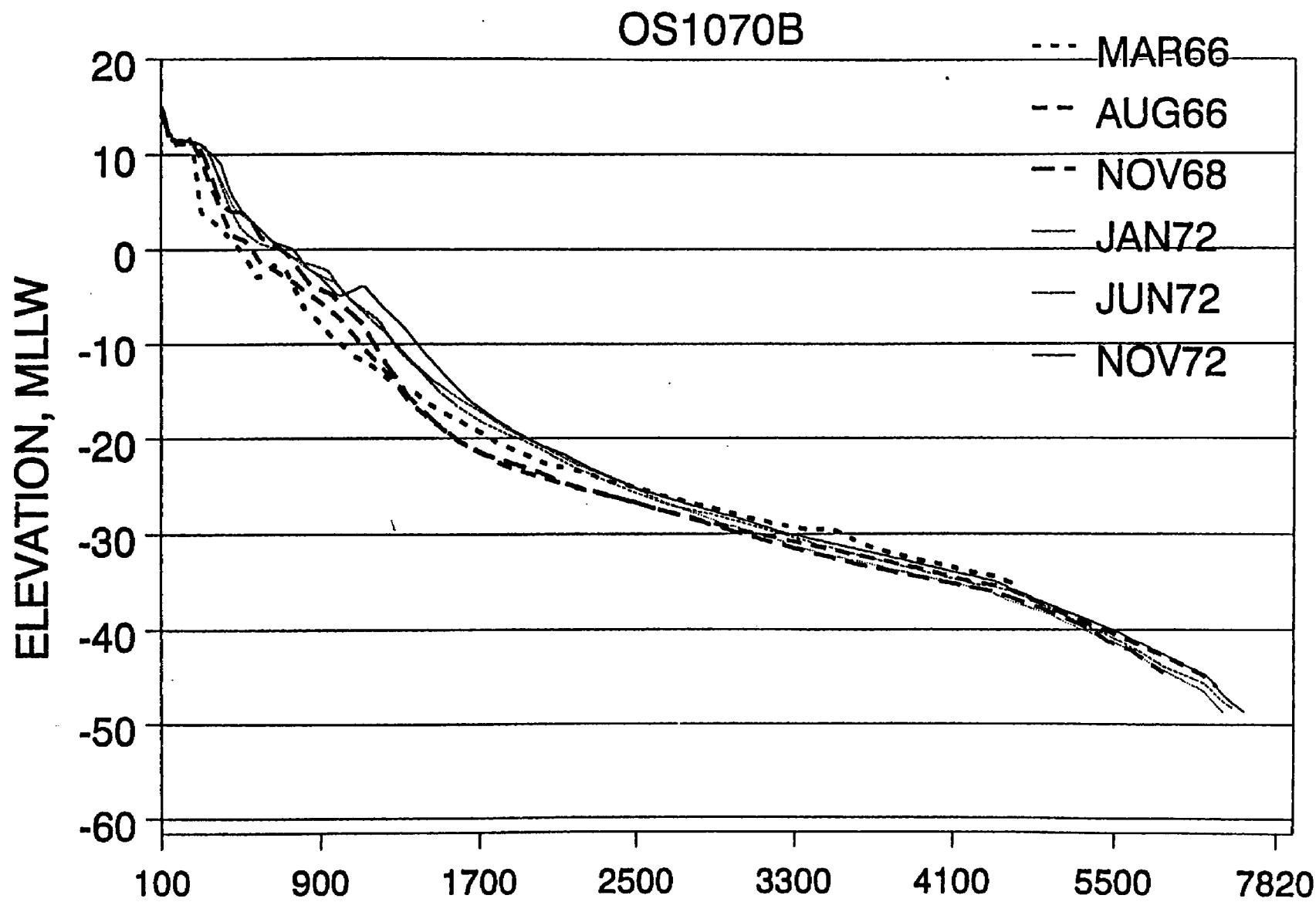


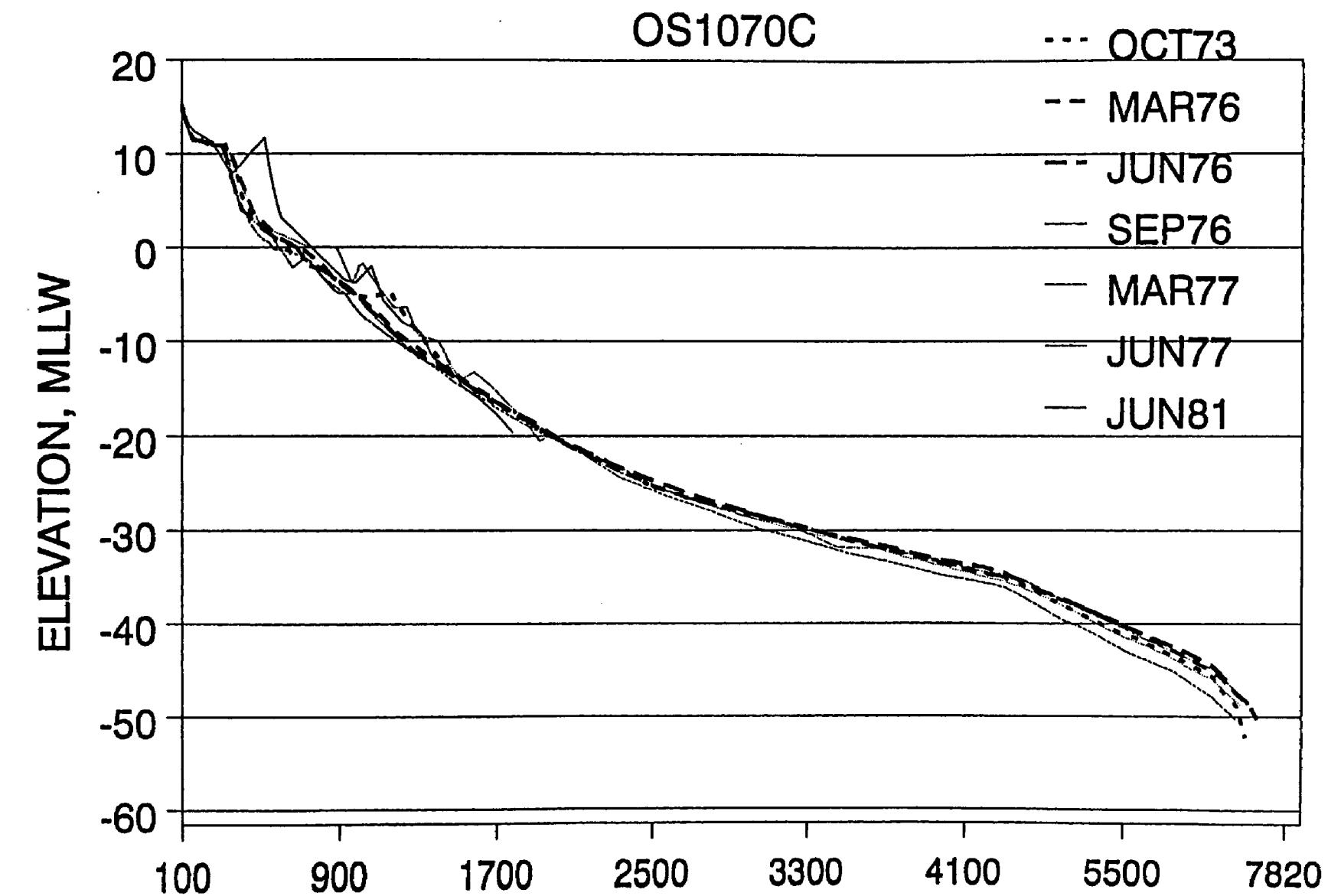












OS1070D

--- JUN82

-- JUN83

-- OCT83

— MAY84

— NOV84

— JUN85

— MAR86

ELEVATION, MLLW

B-48

20

0

-10

-20

-30

-40

-50

-60

100

900

1700

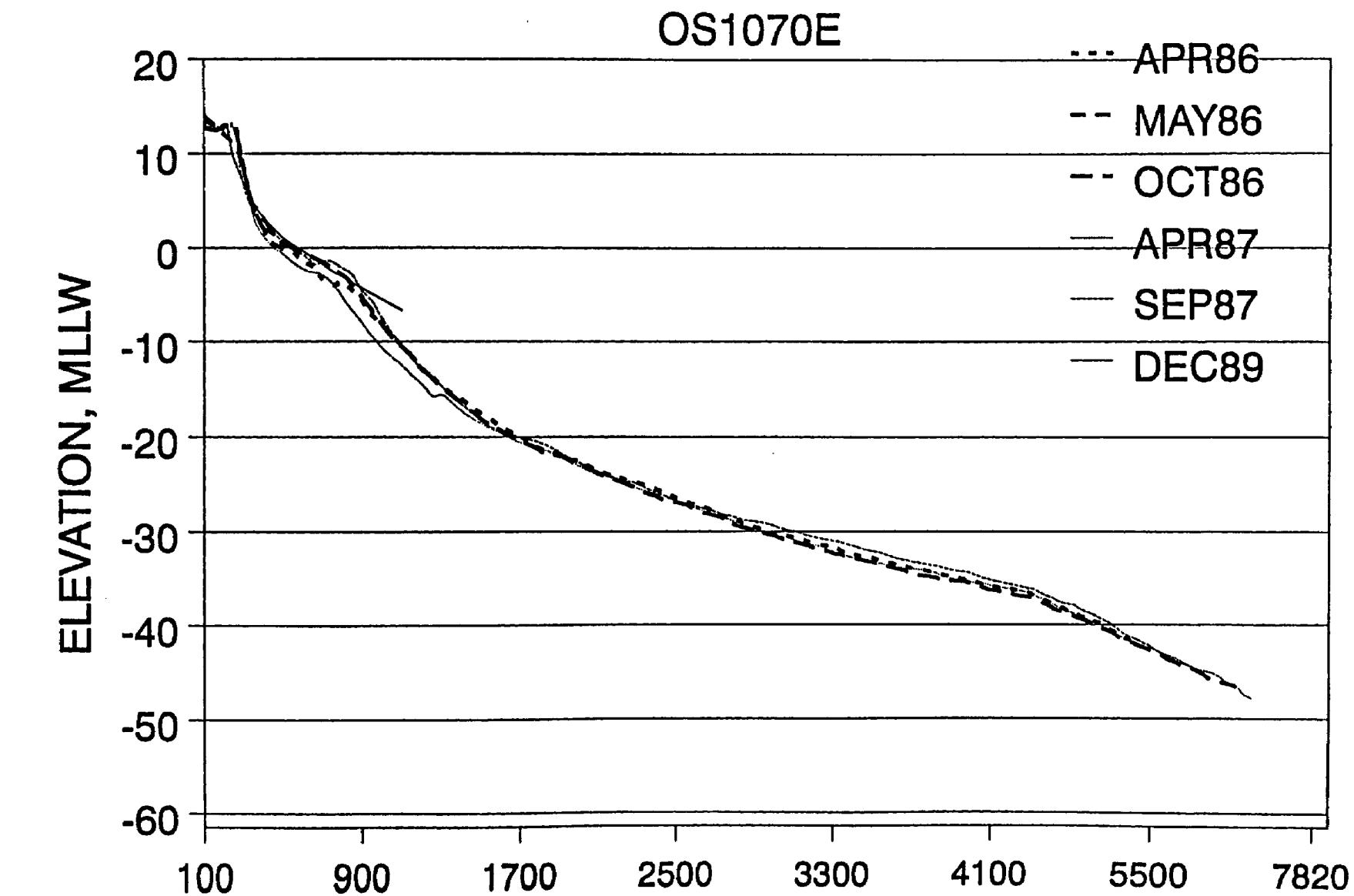
2500

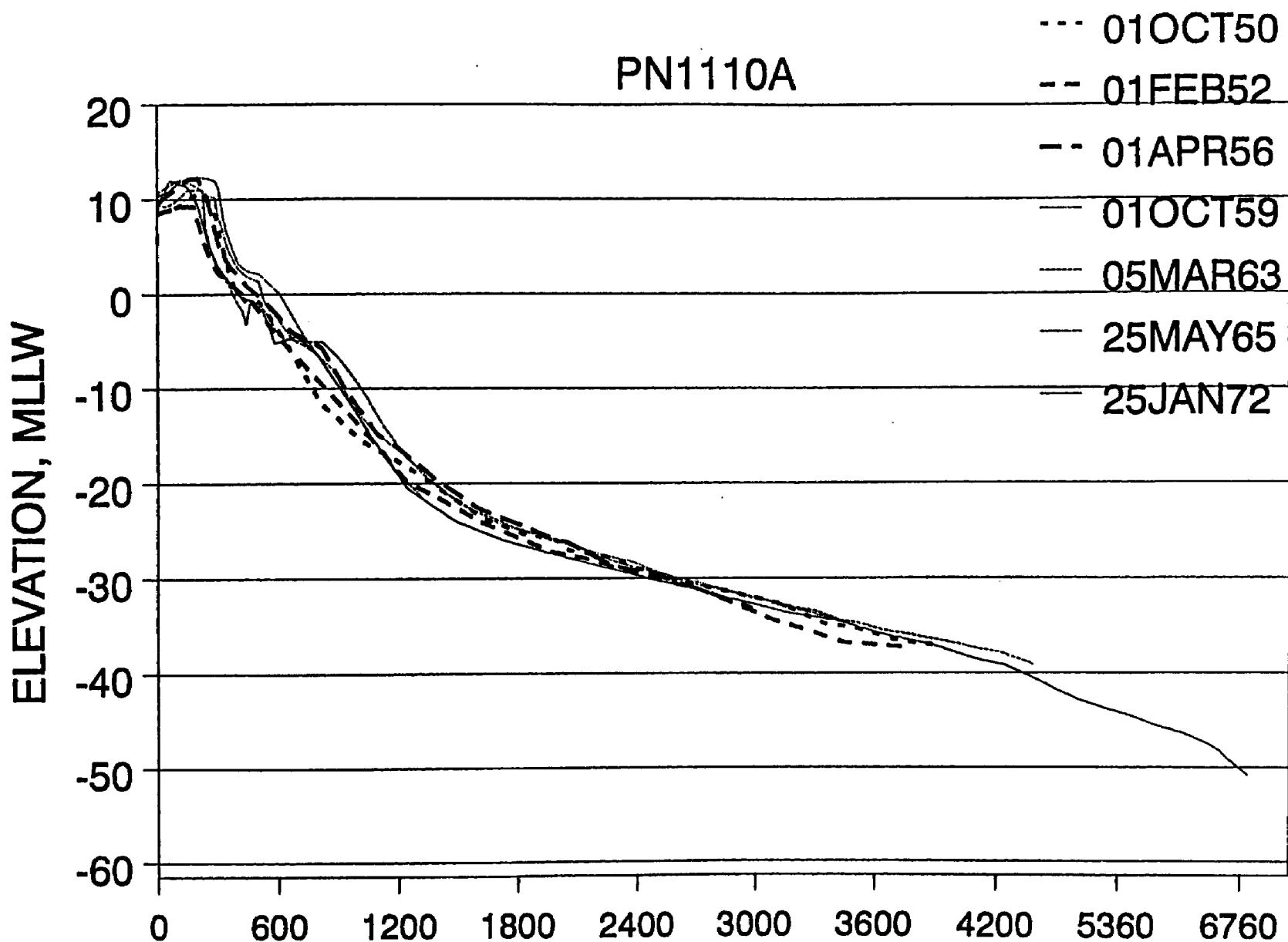
3300

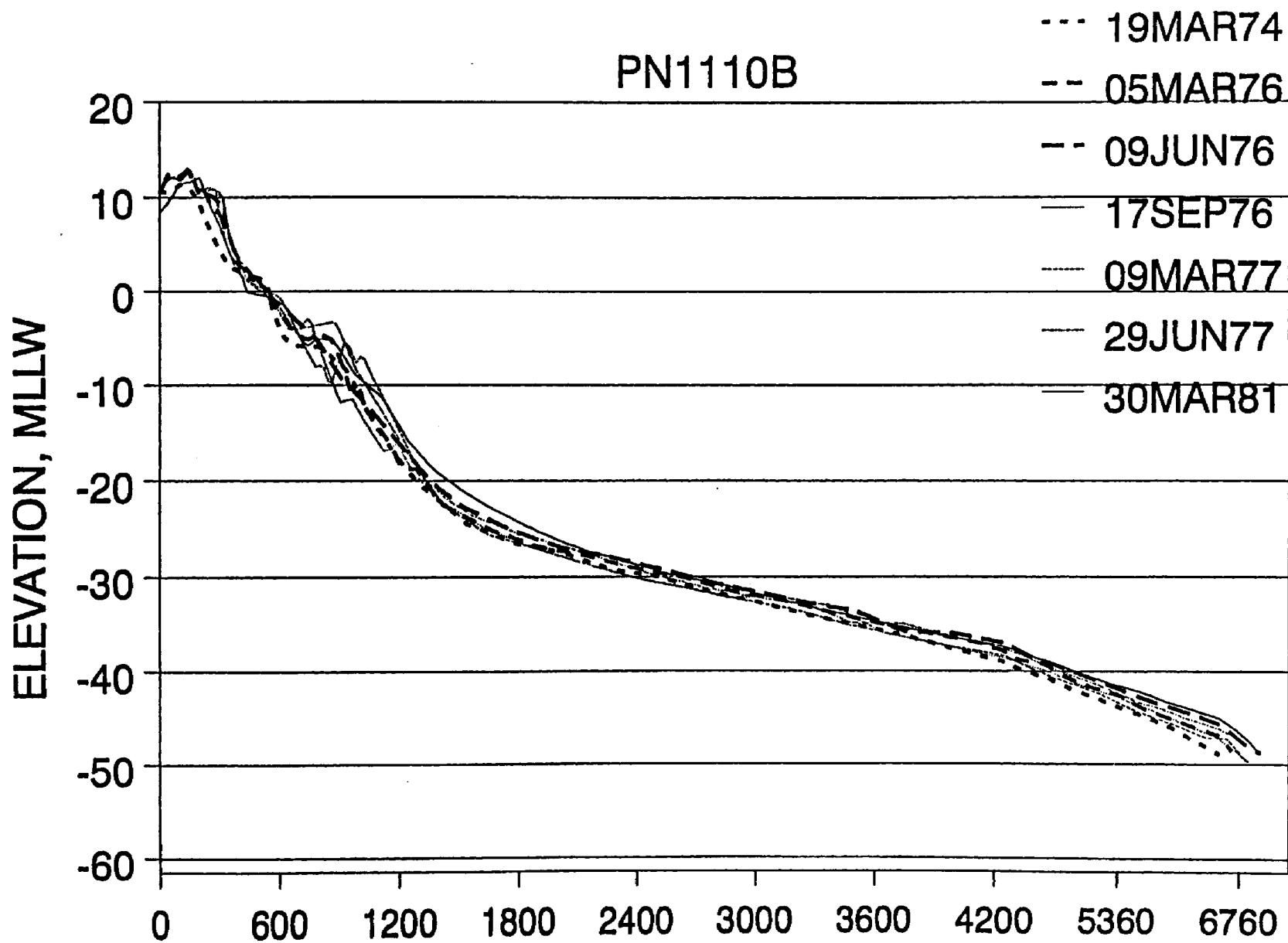
4100

5500

7820

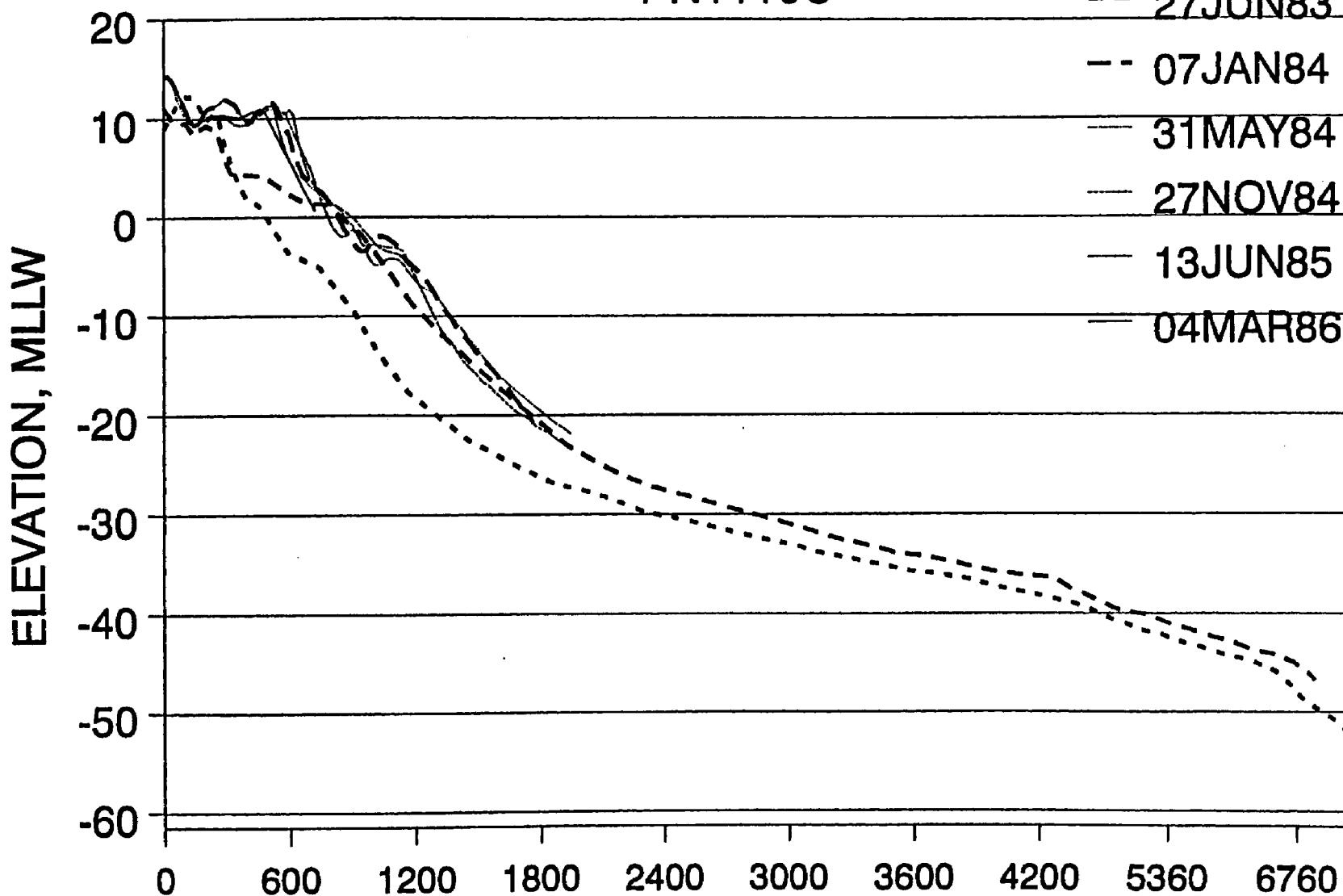


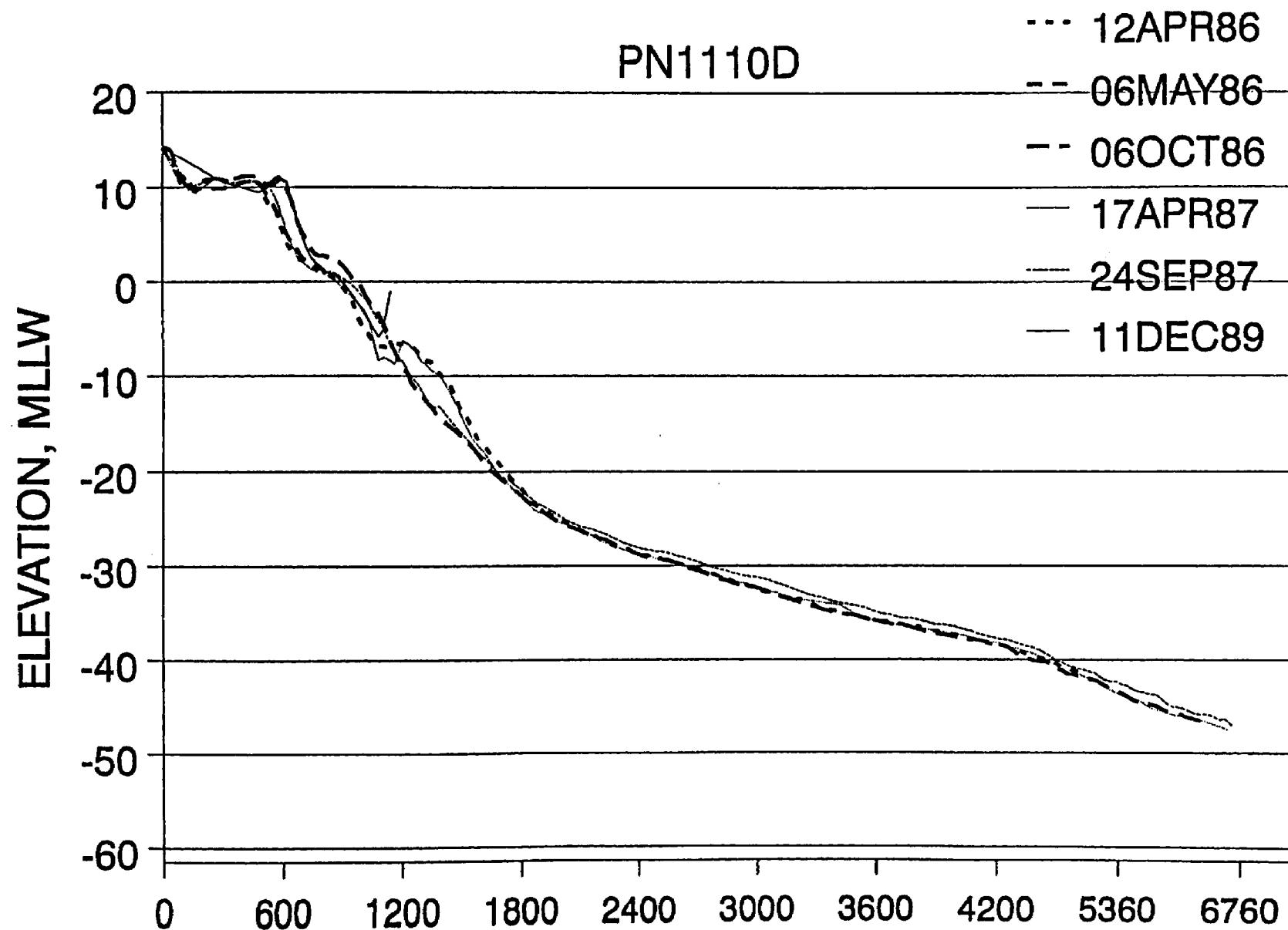


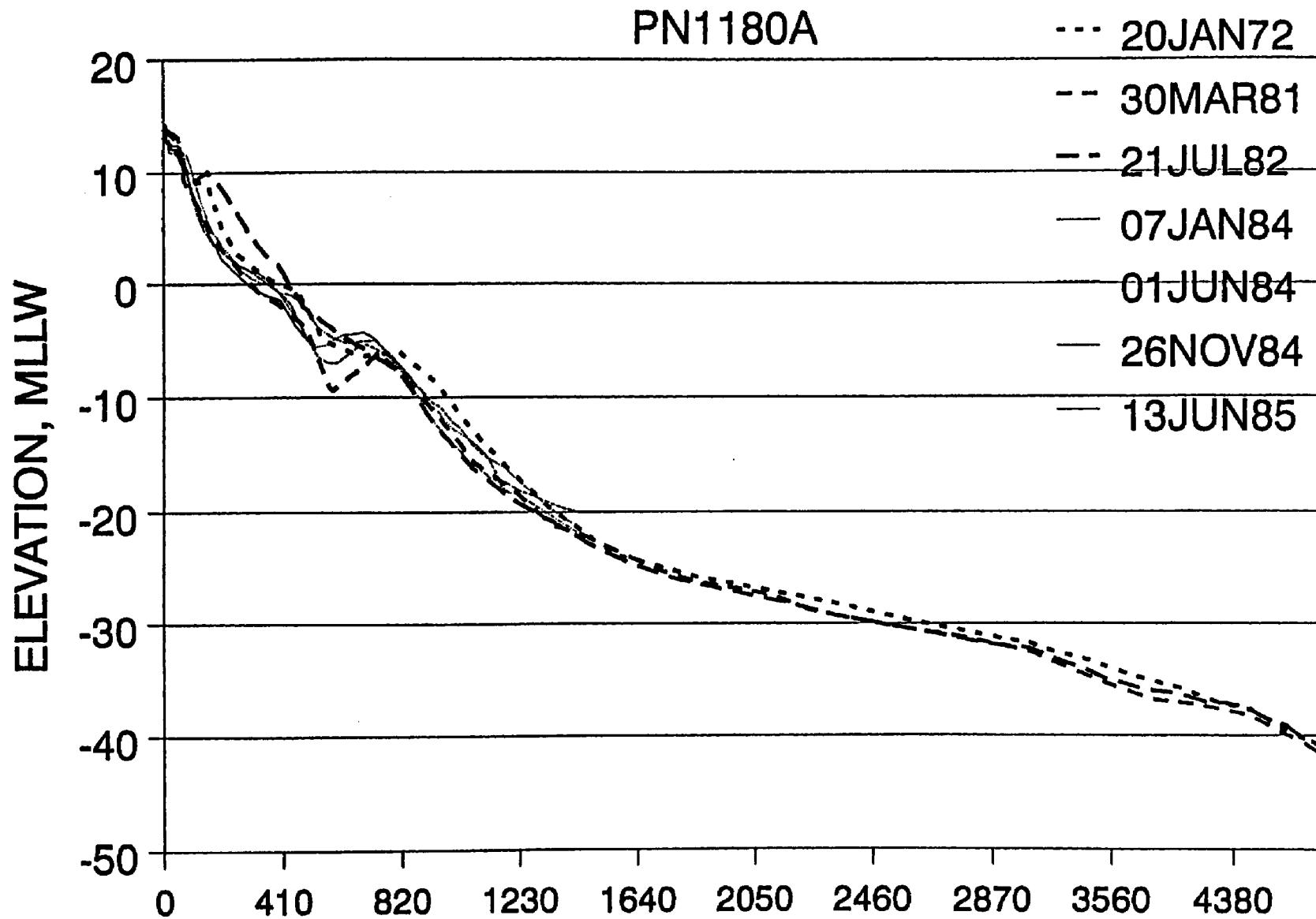


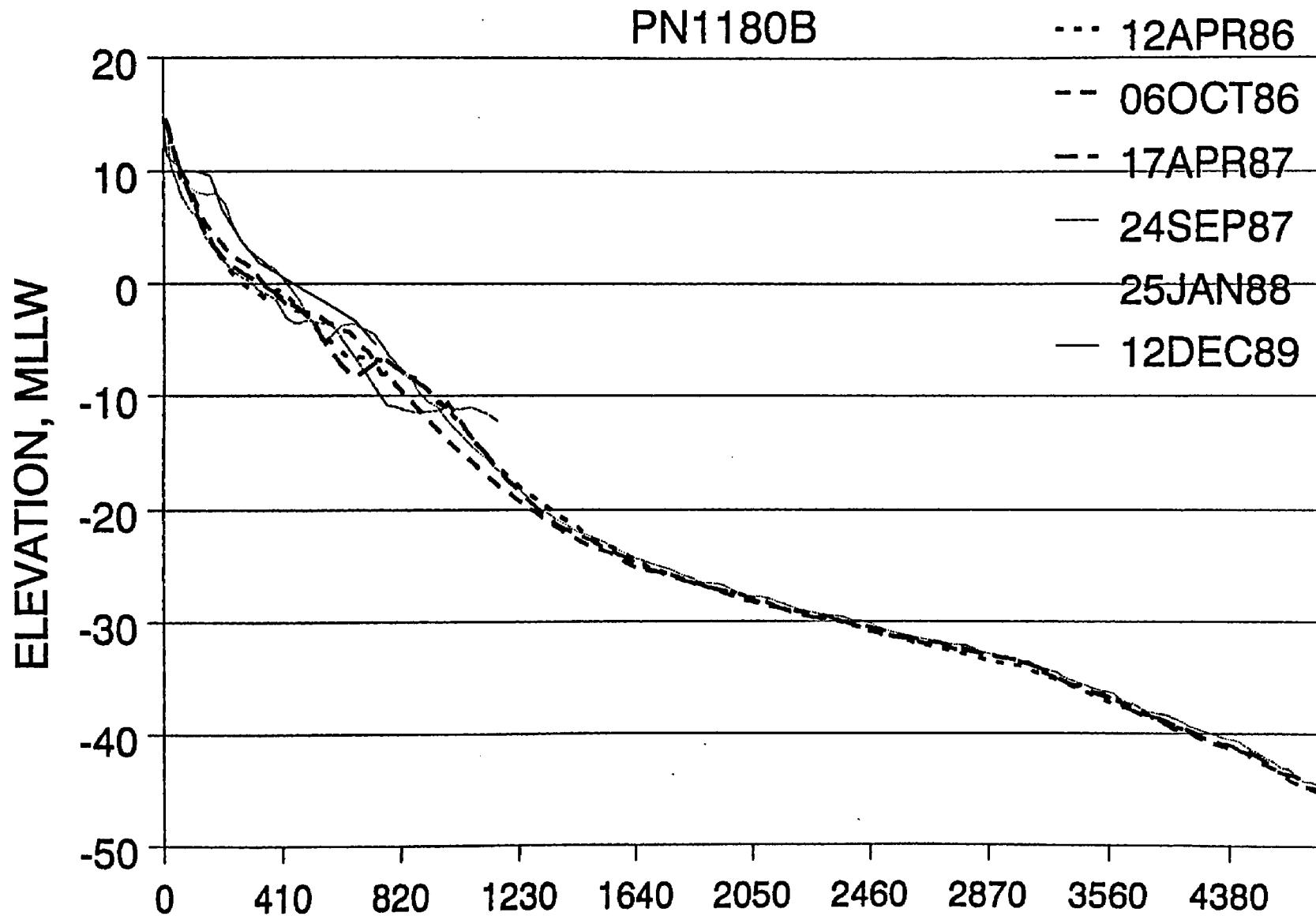
PN1110C

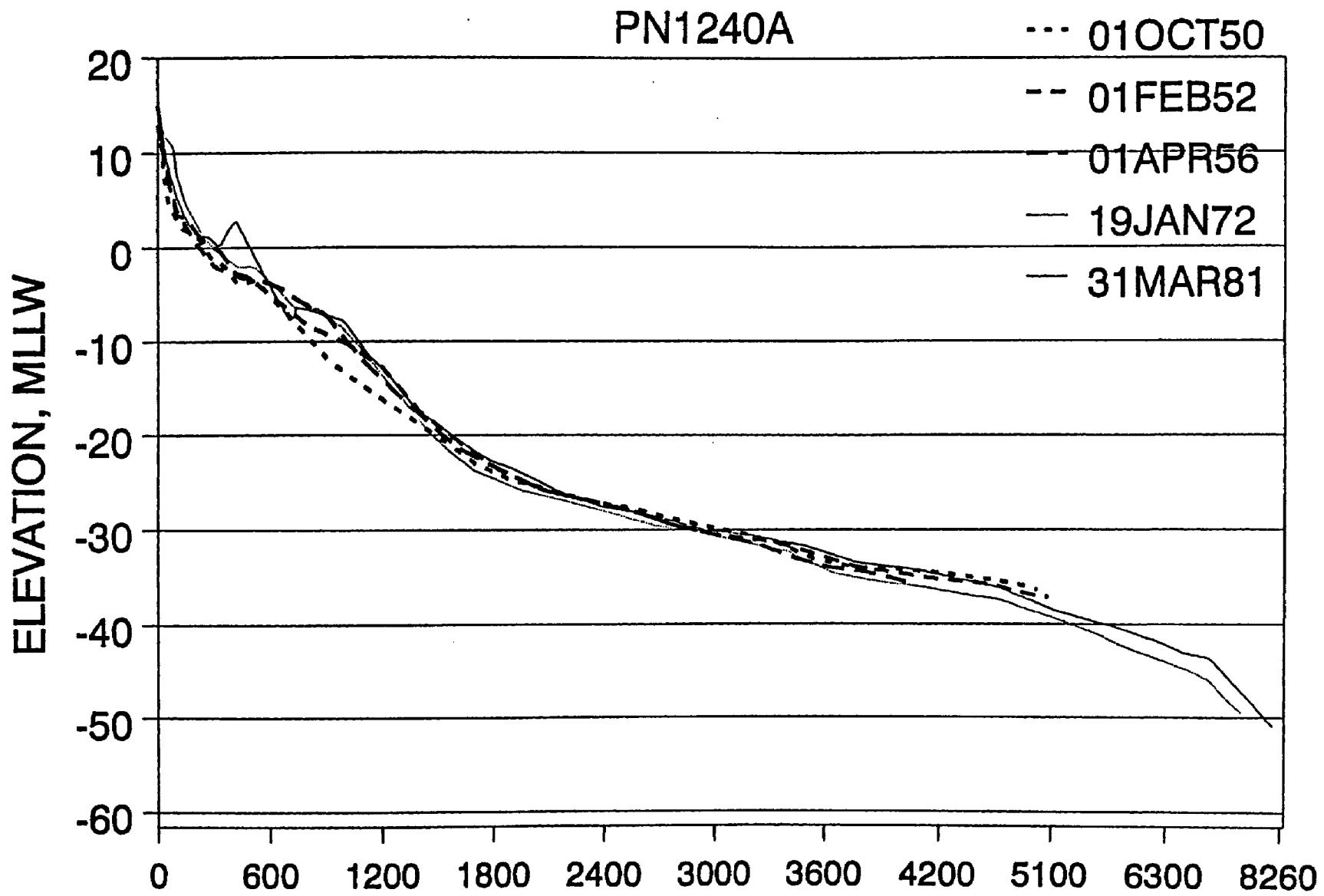
... 21JUL82
-- 27JUN83
-- 07JAN84
--- 31MAY84
— 27NOV84
— 13JUN85
— 04MAR86

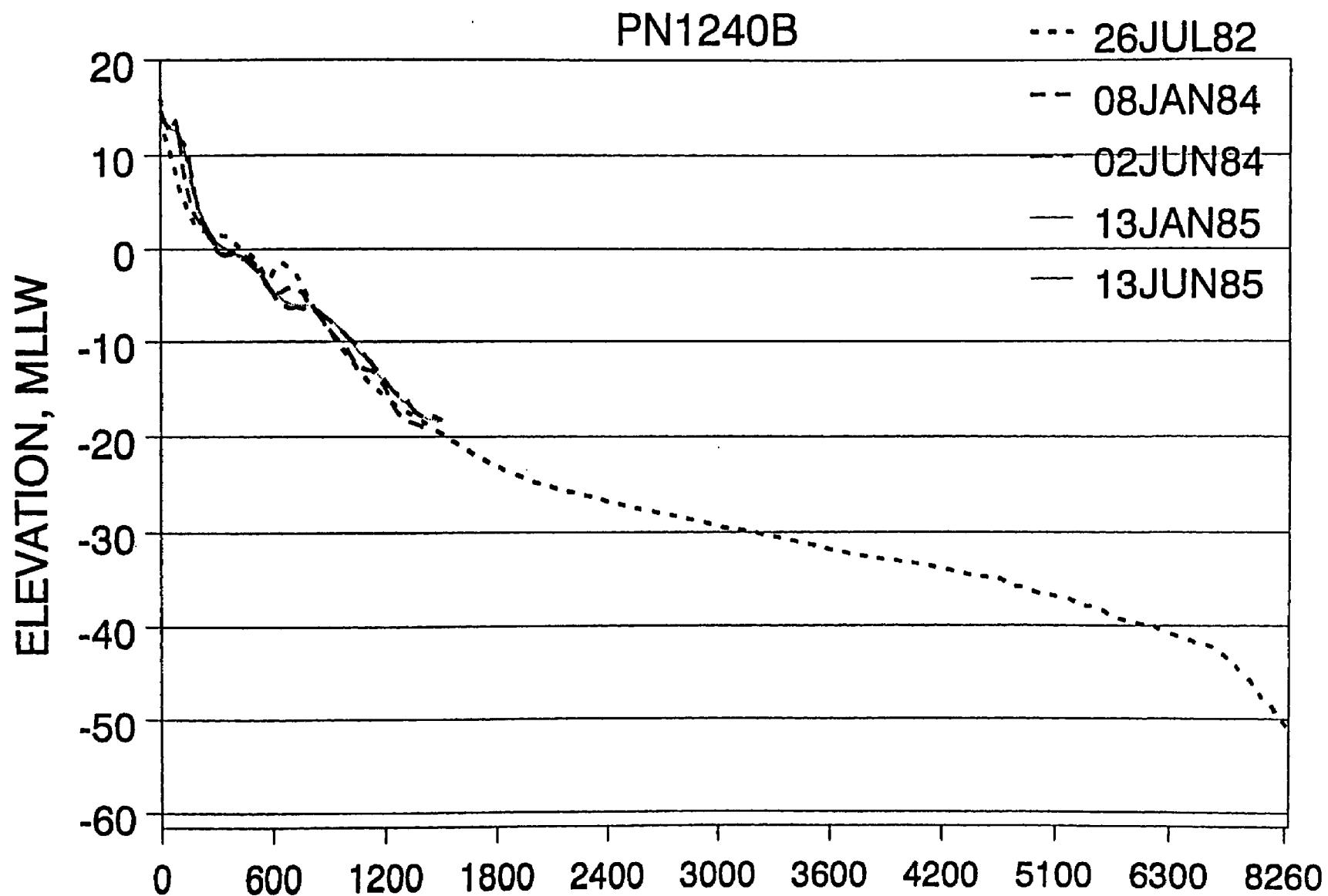


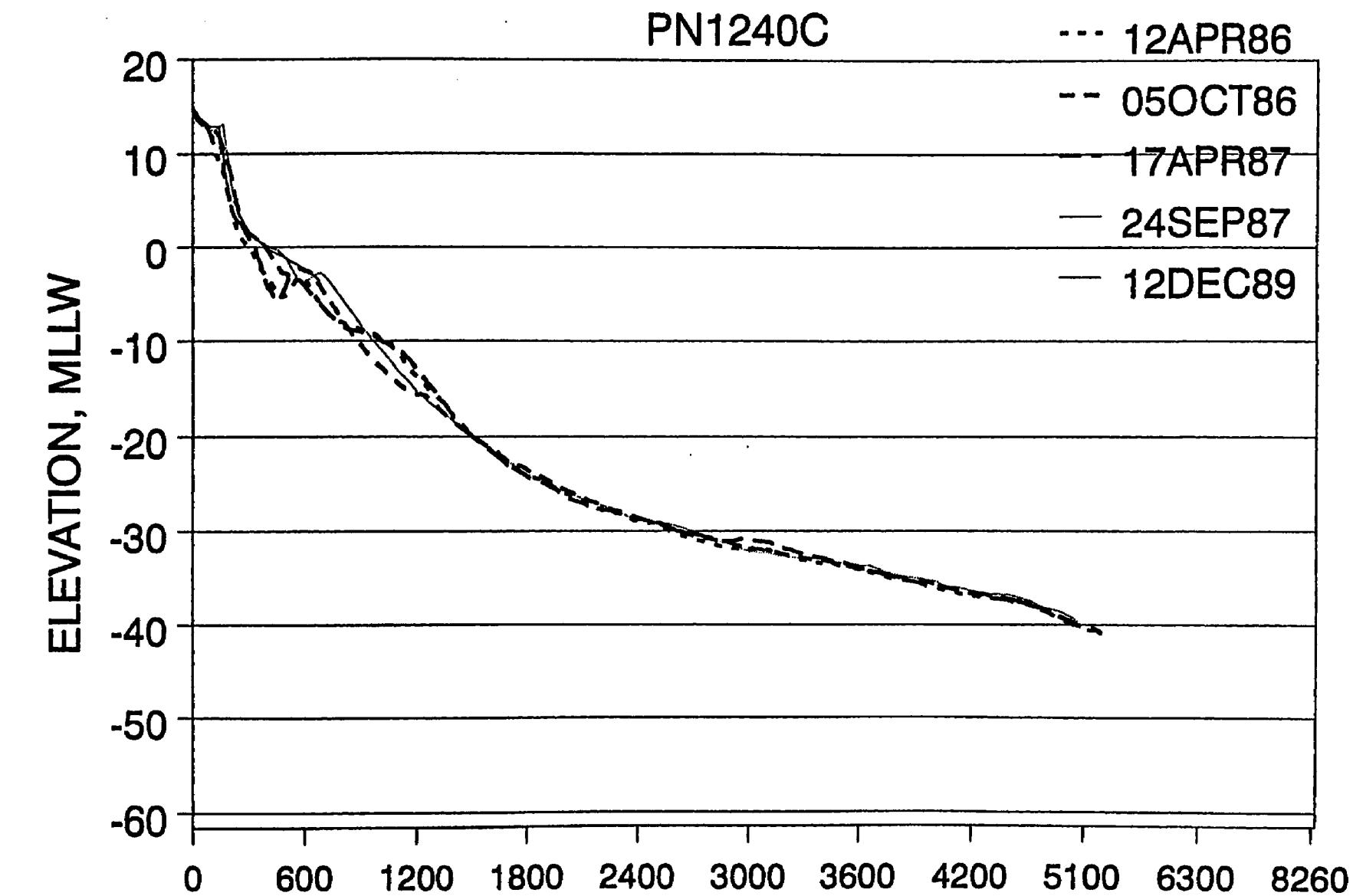


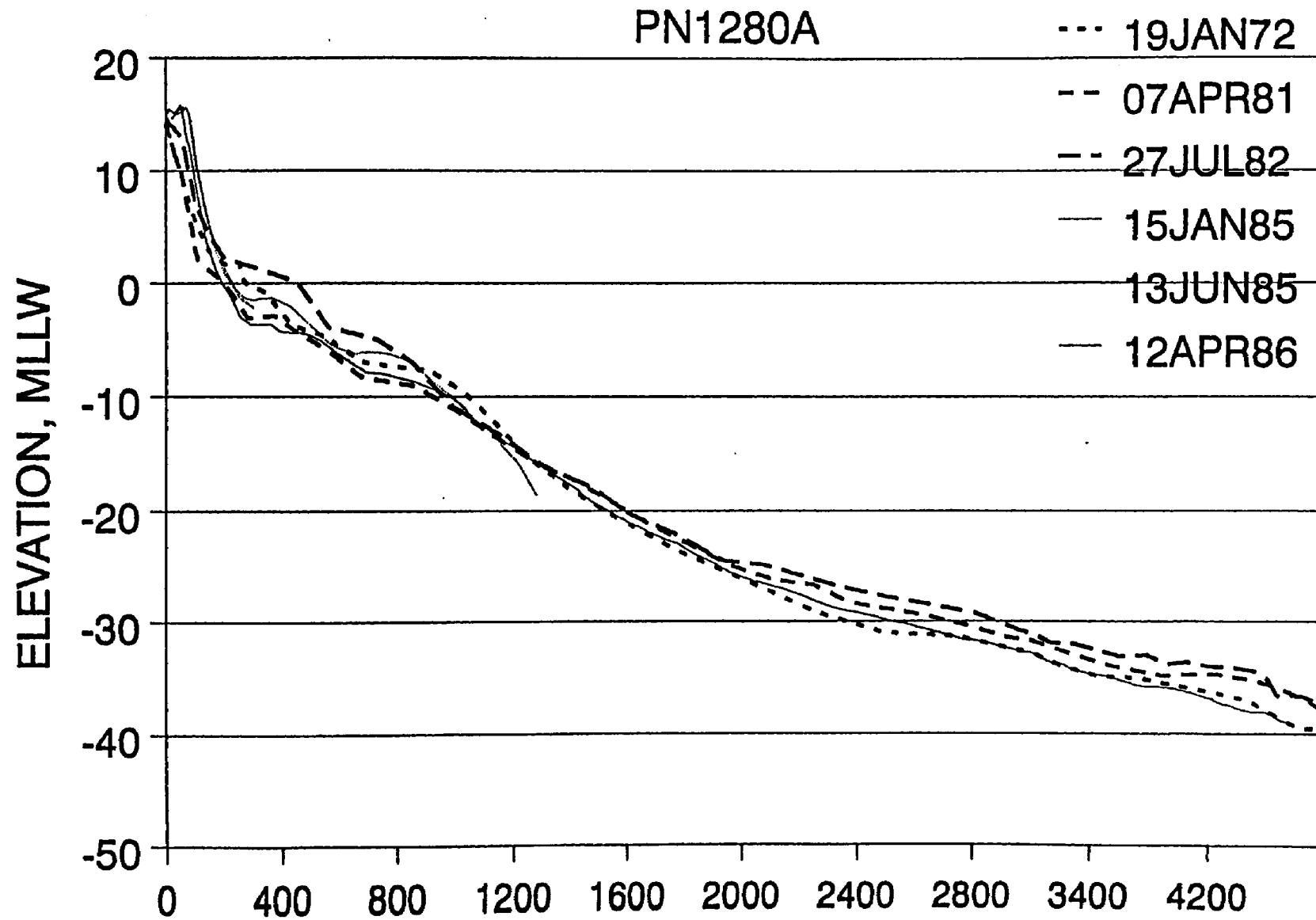


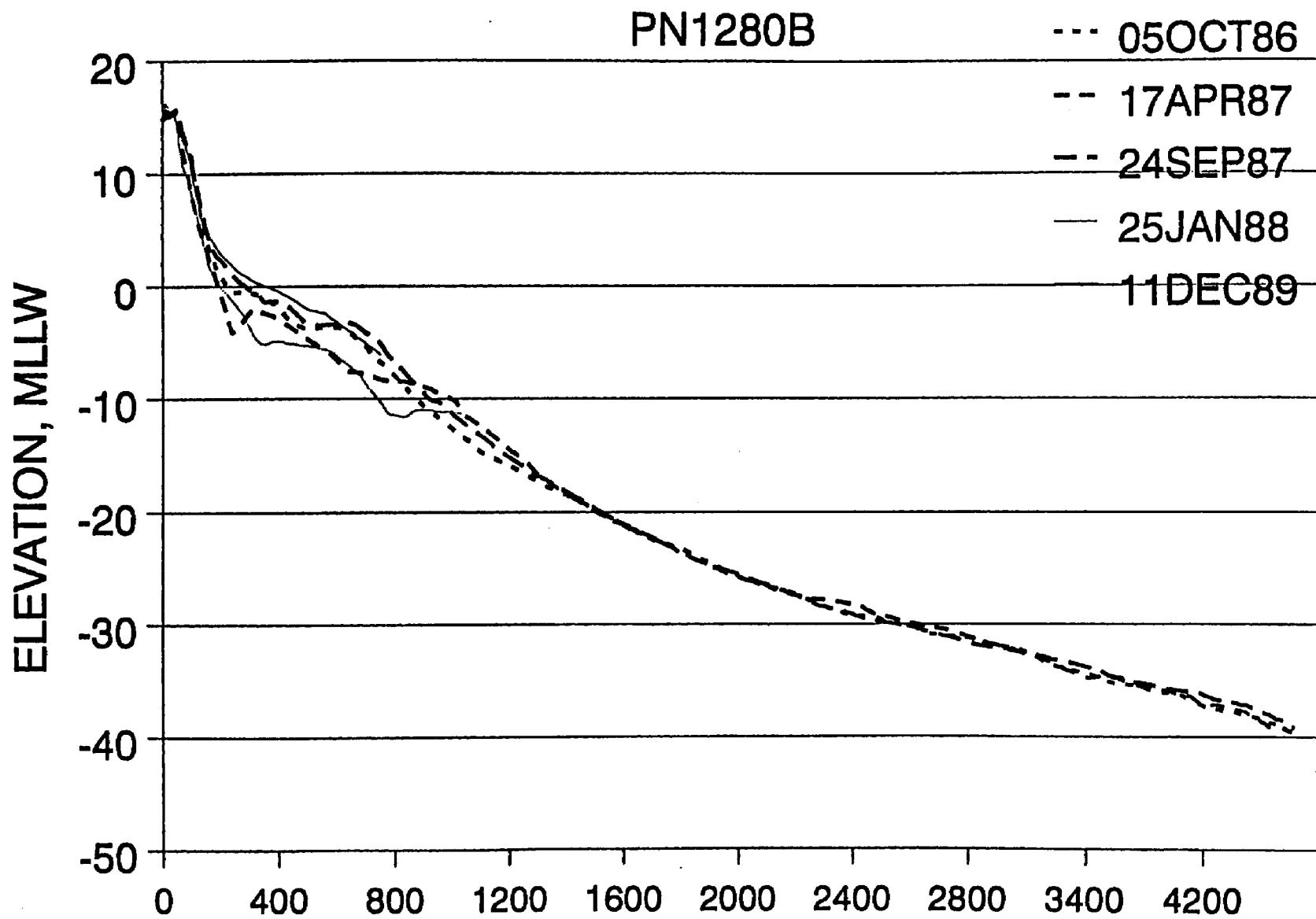


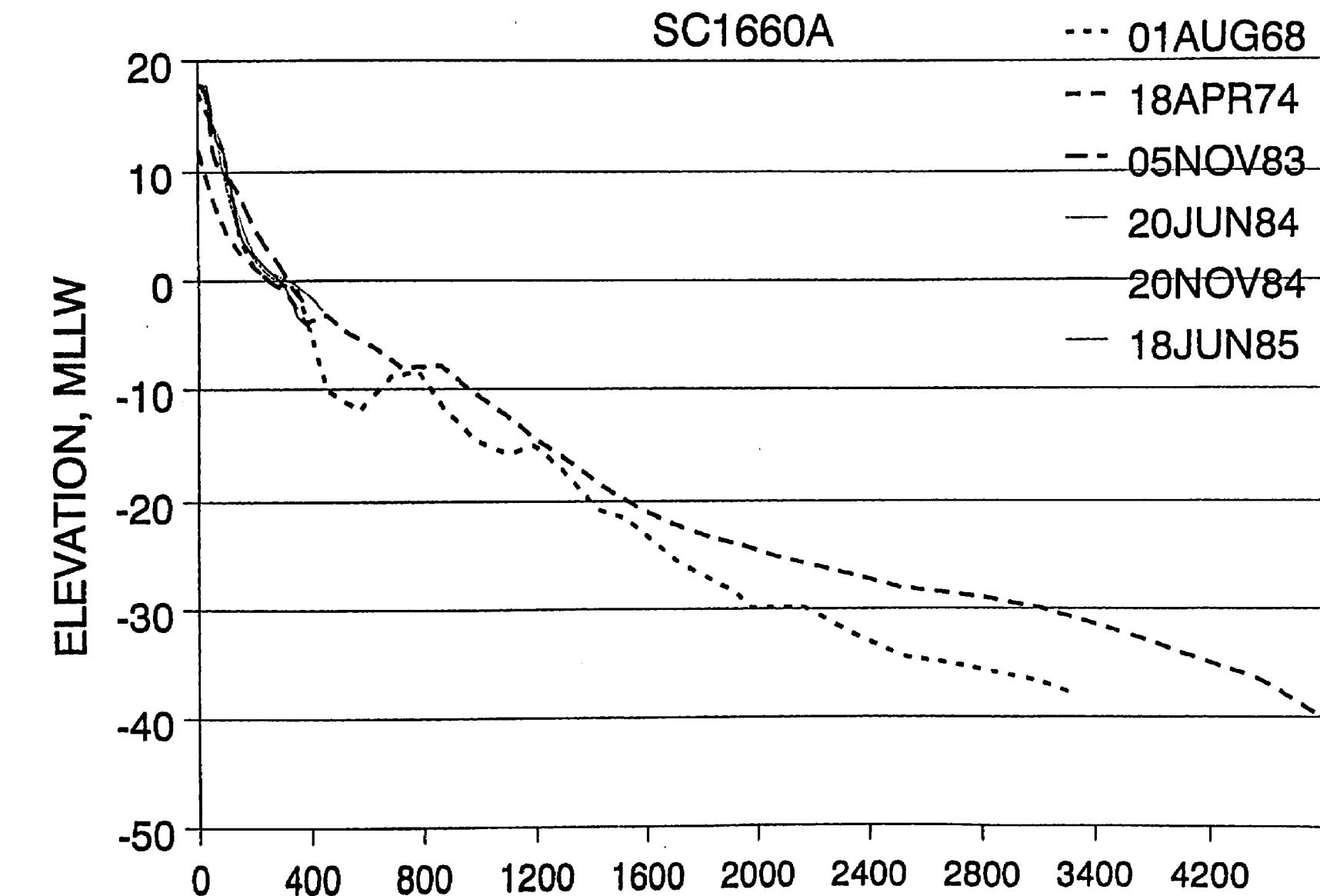


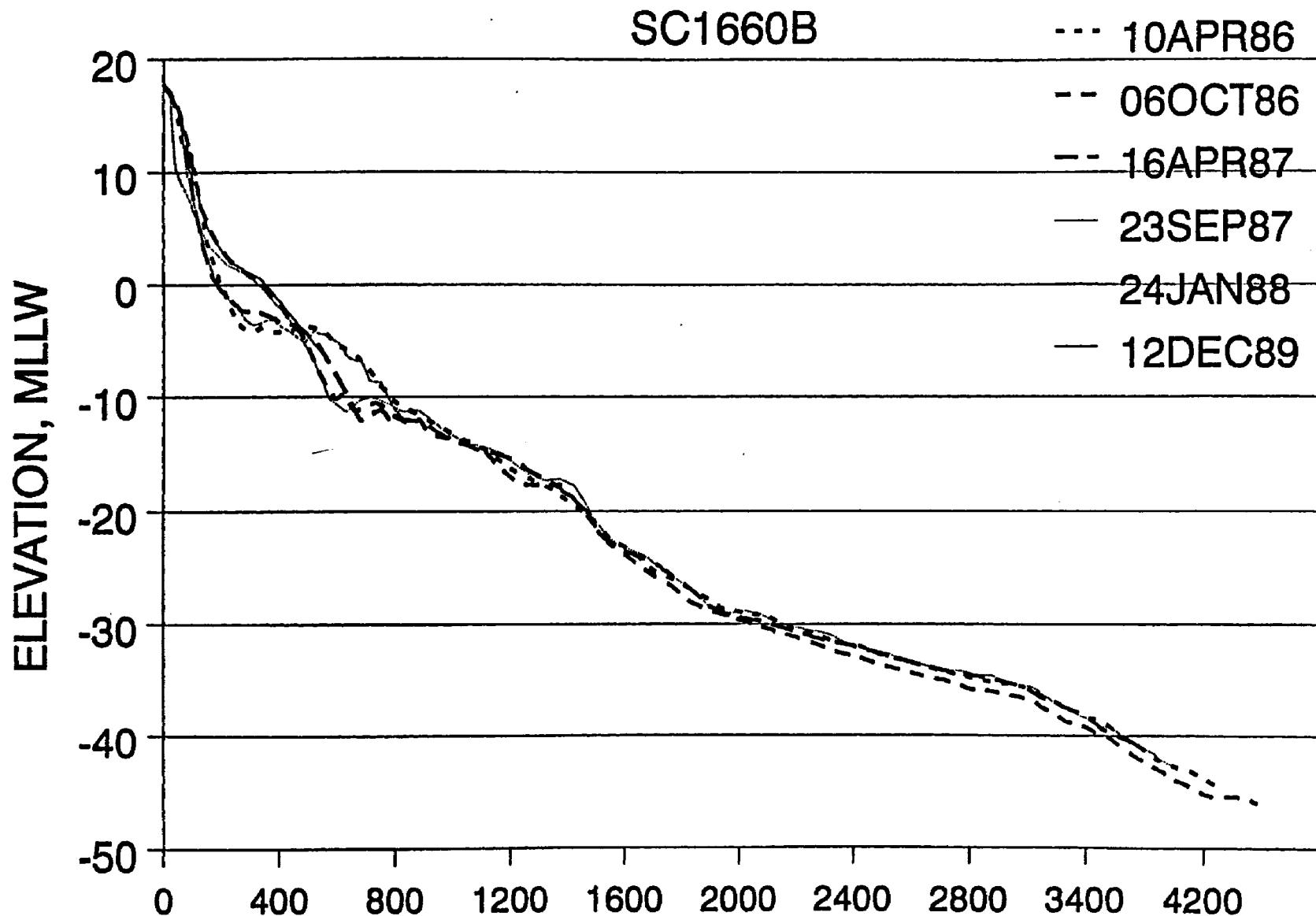


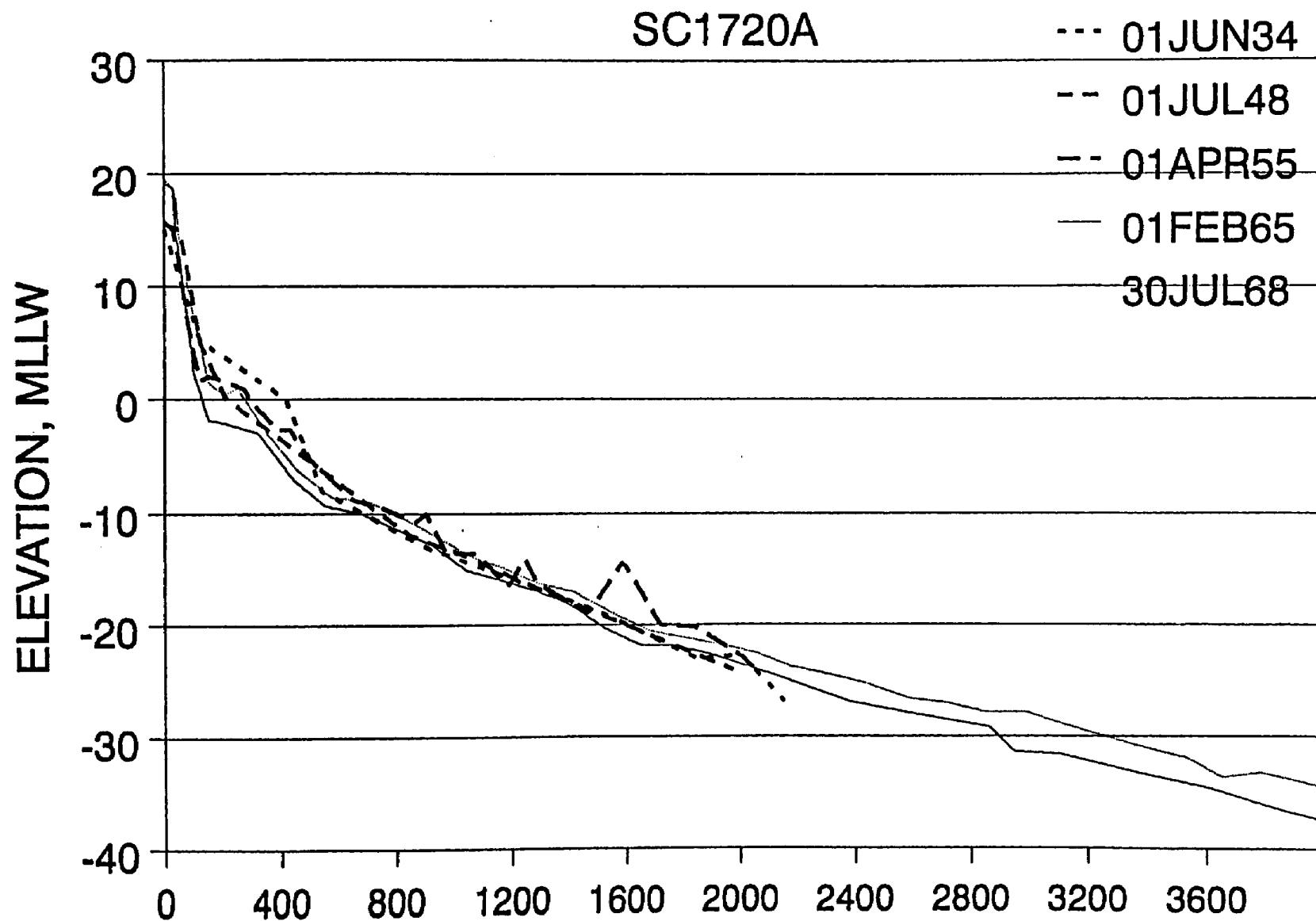


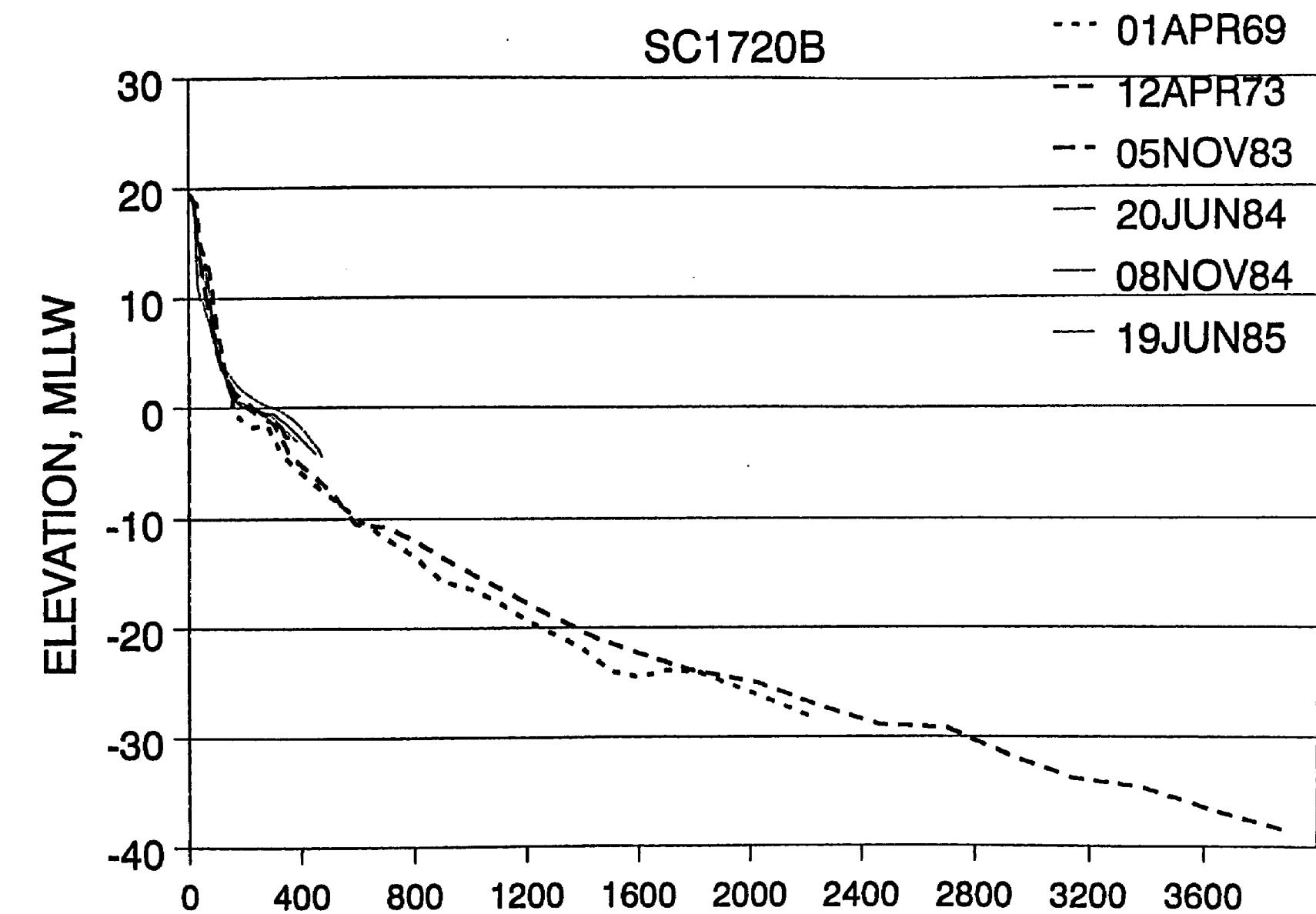


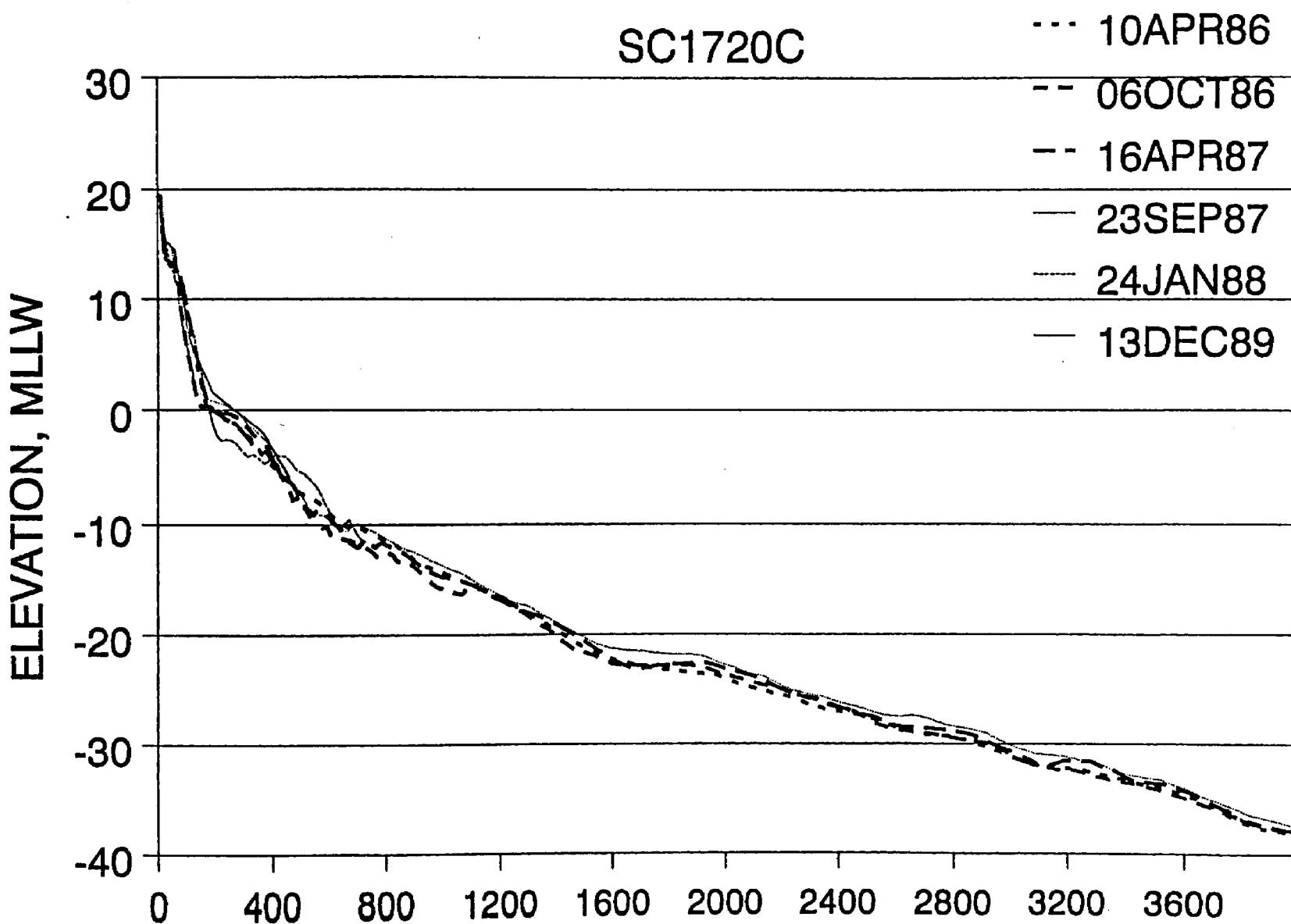




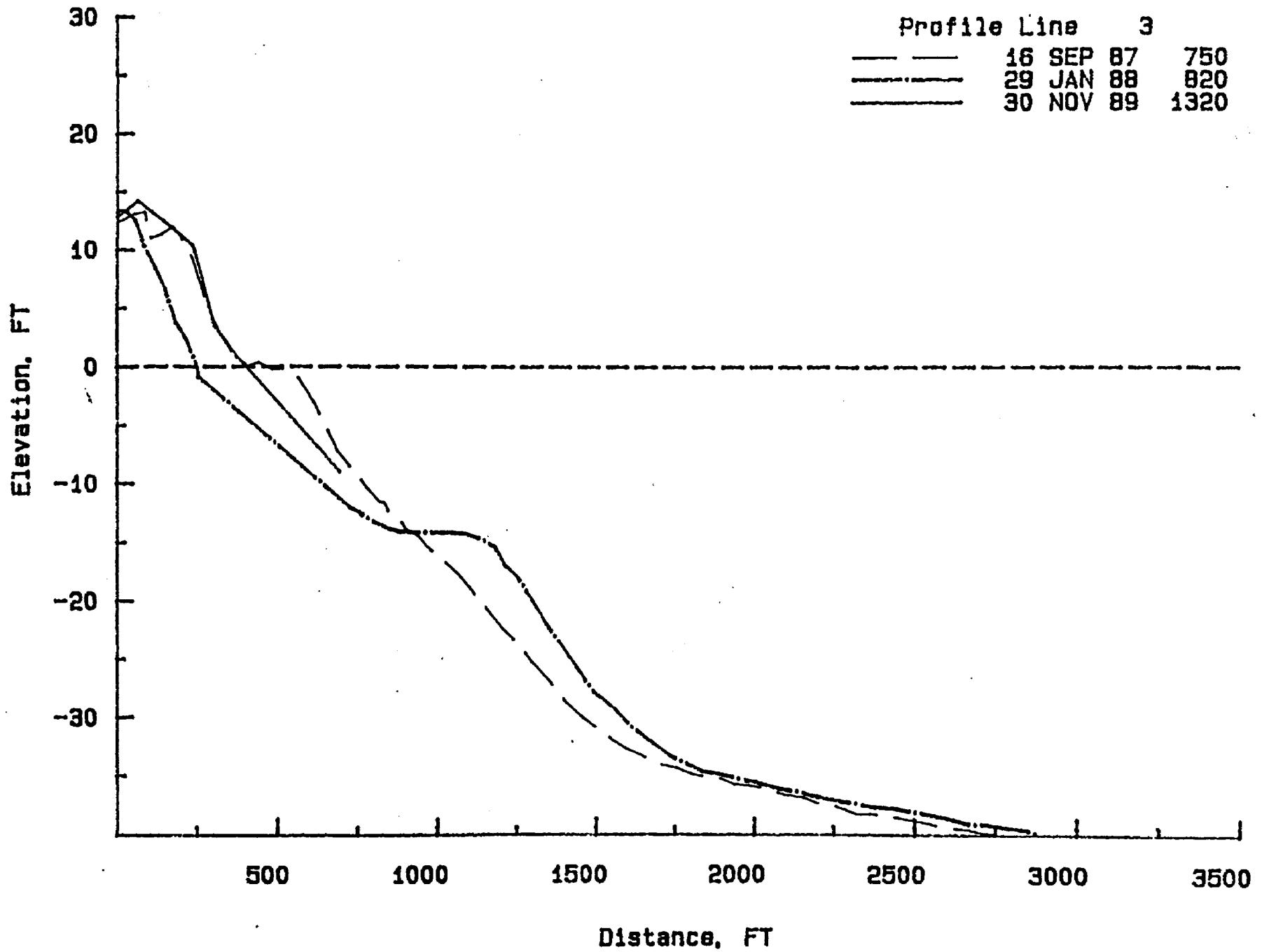




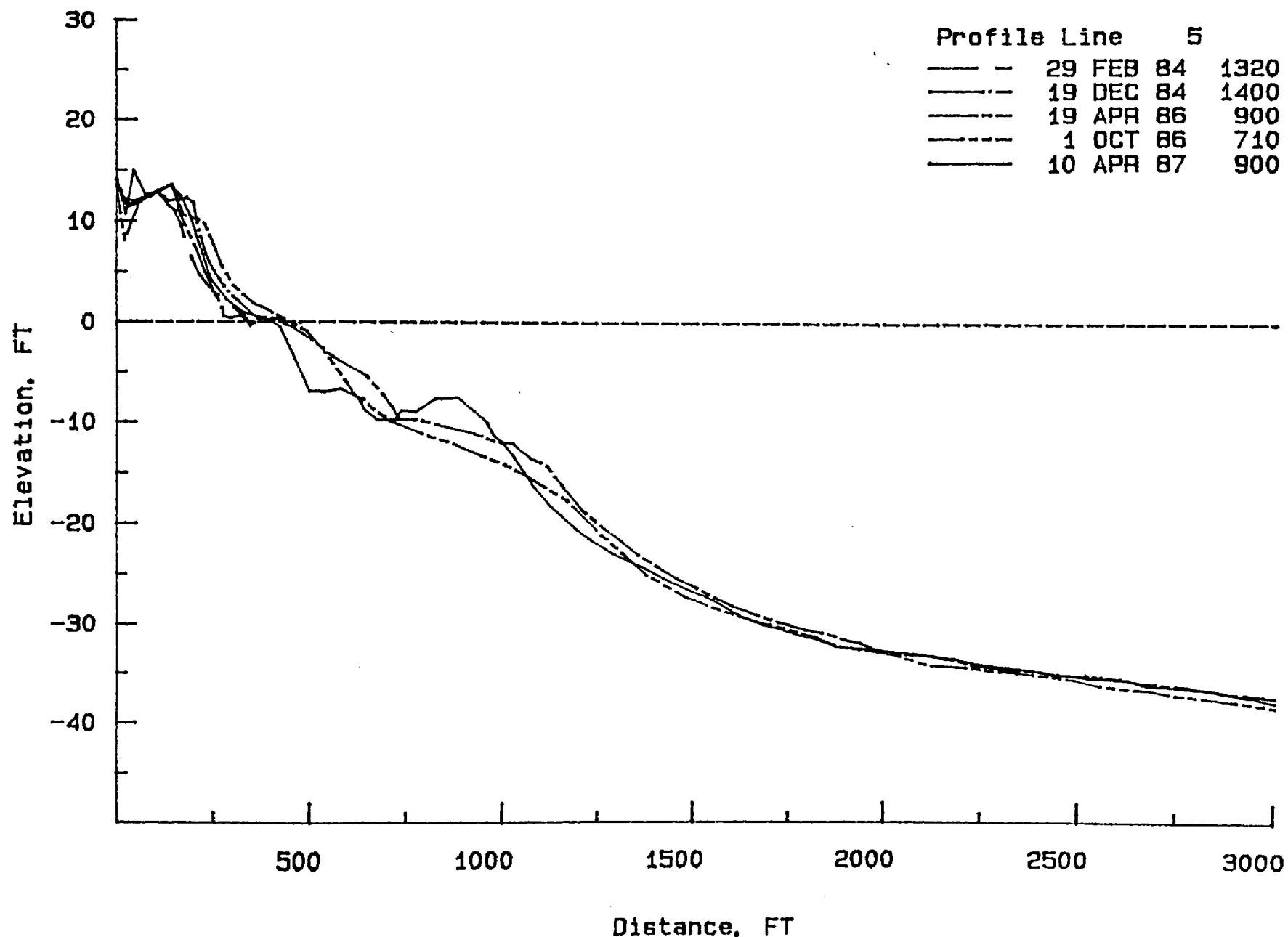


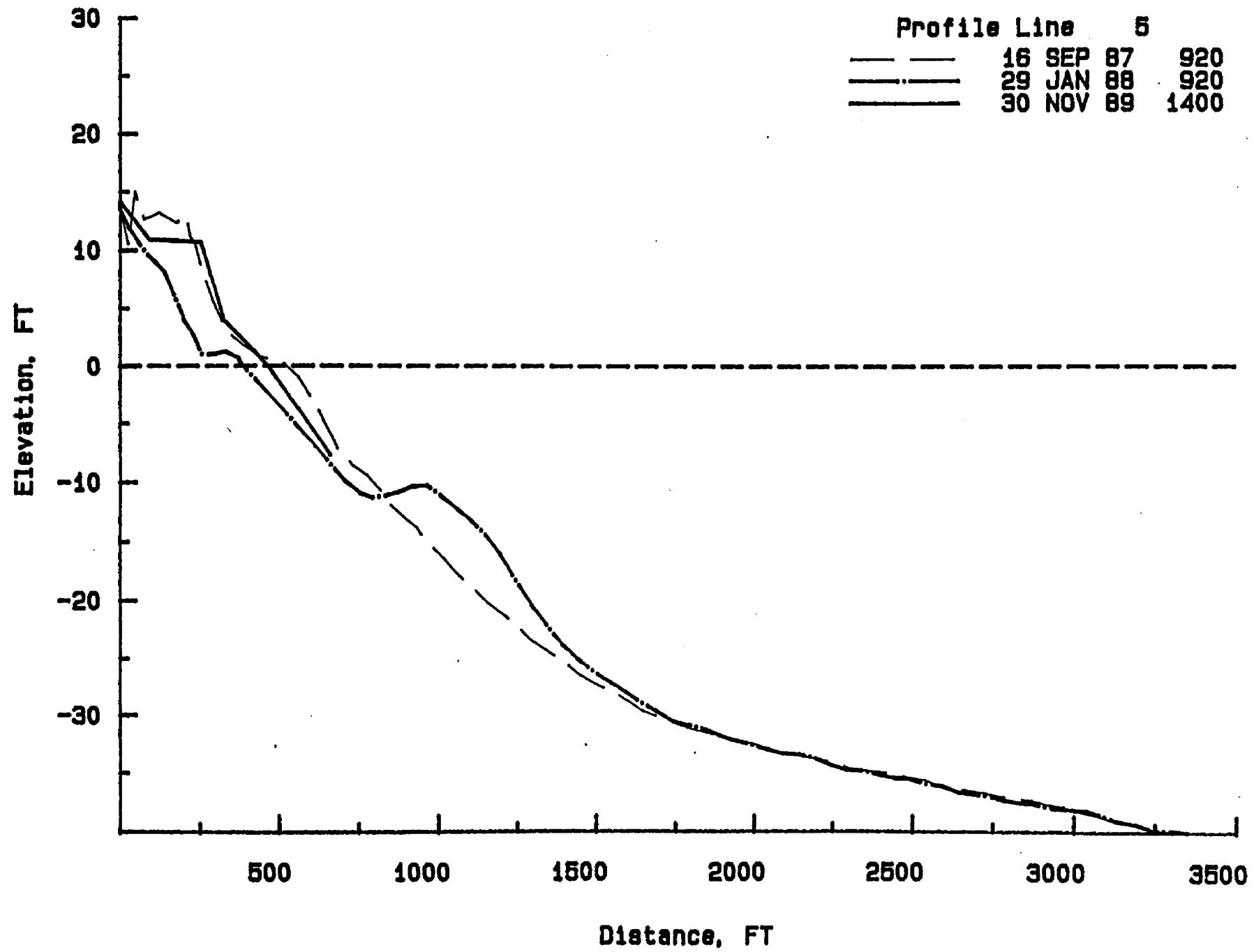


34 Non-Historical Profiles Surveyed from 1983 to 1989

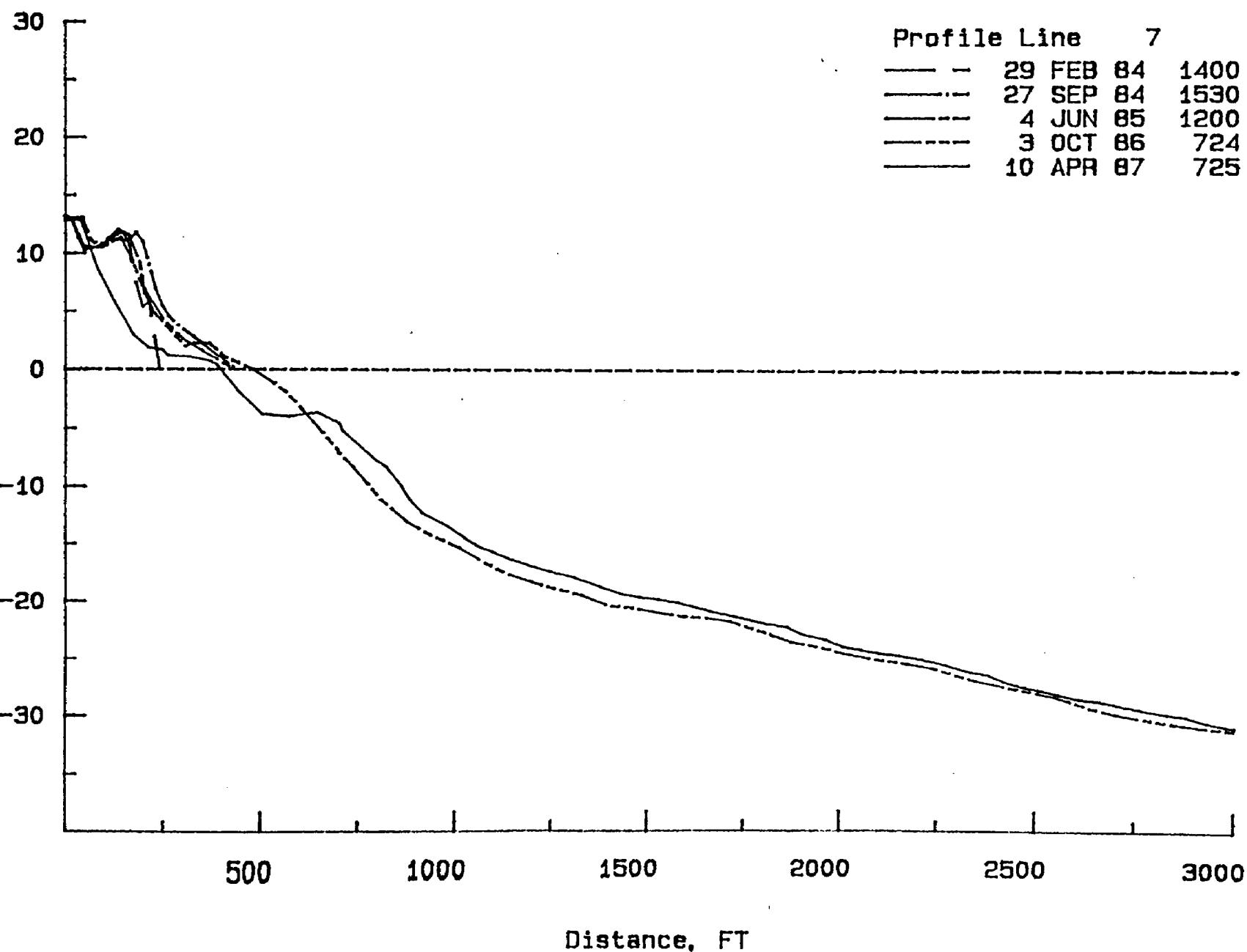


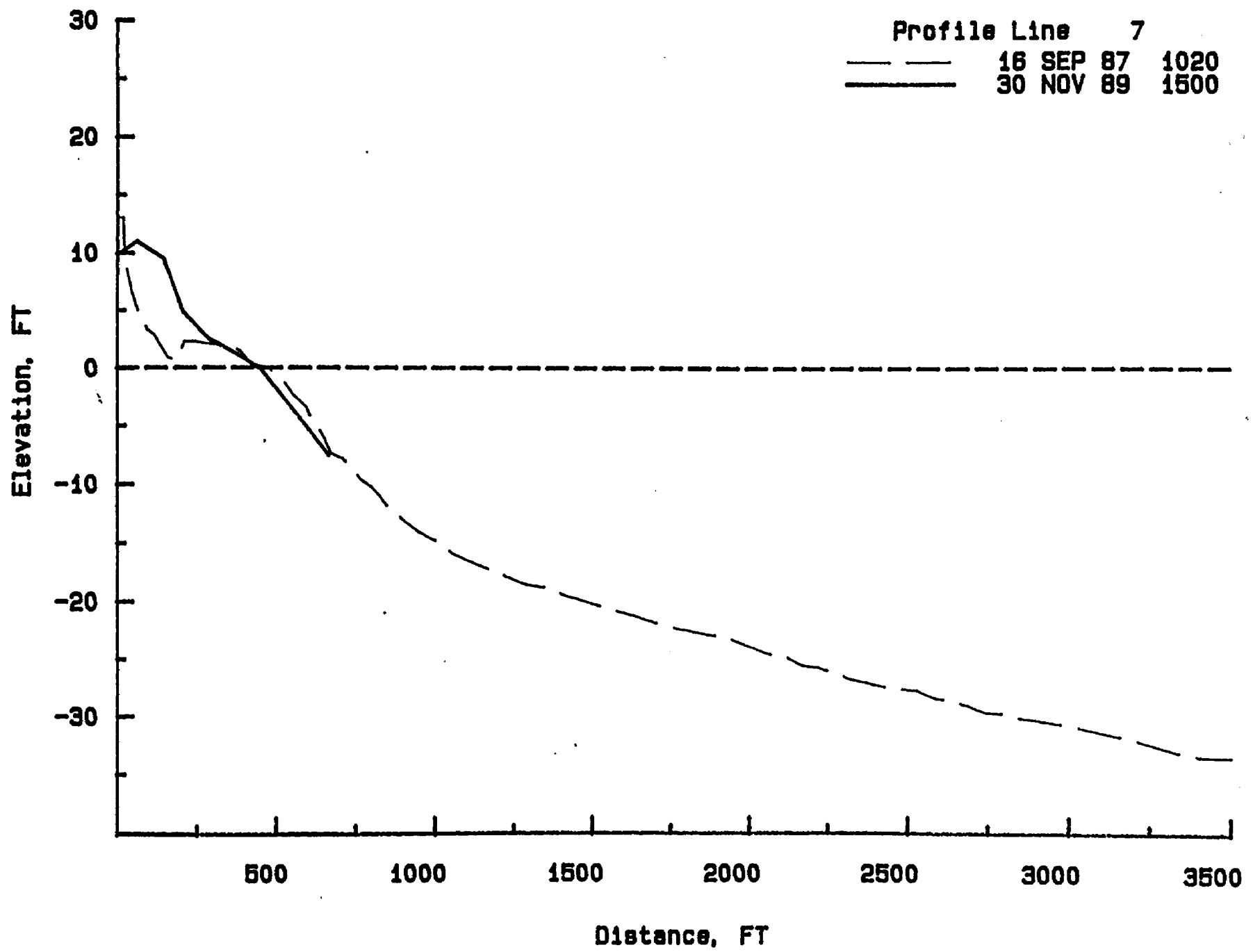
L9-B

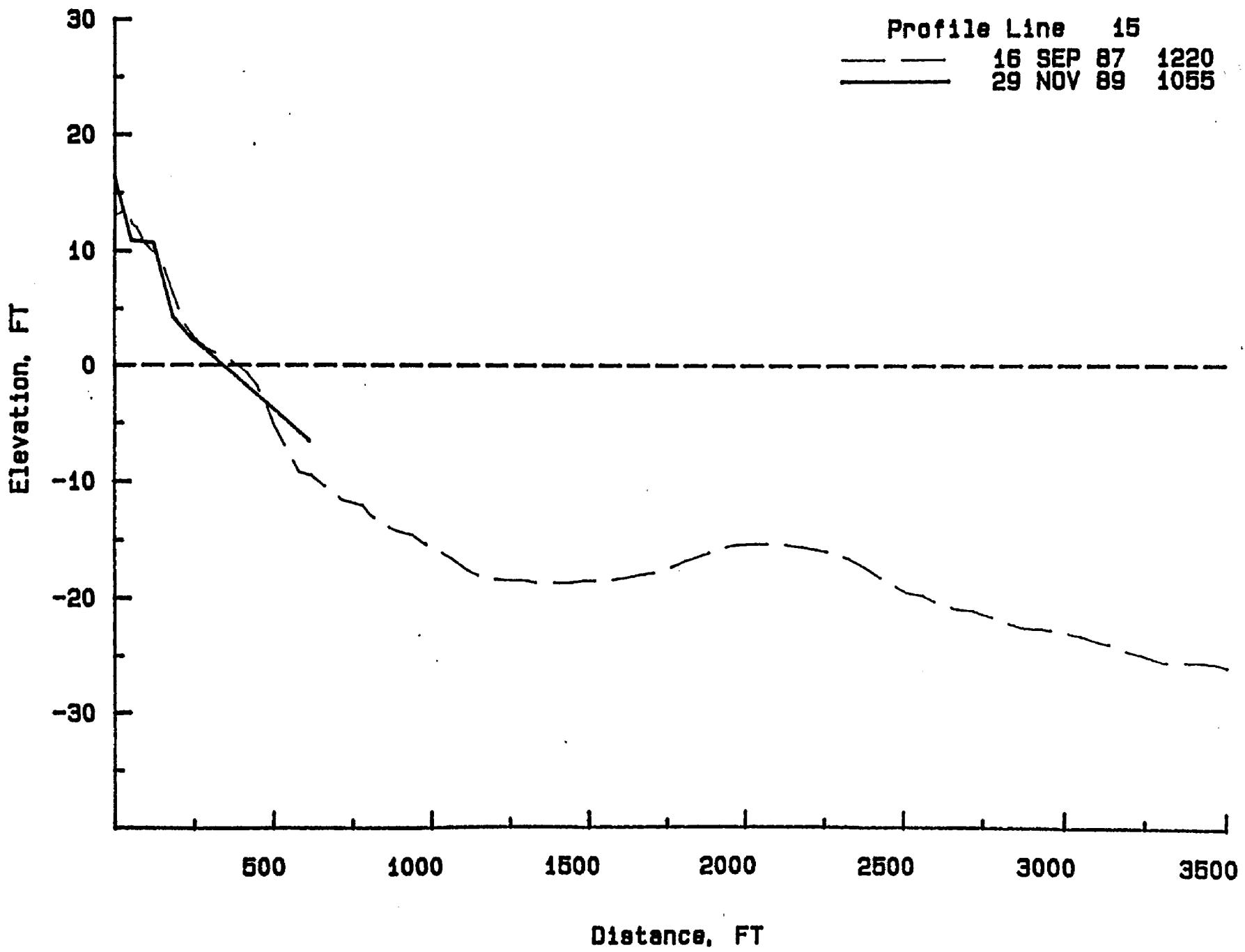




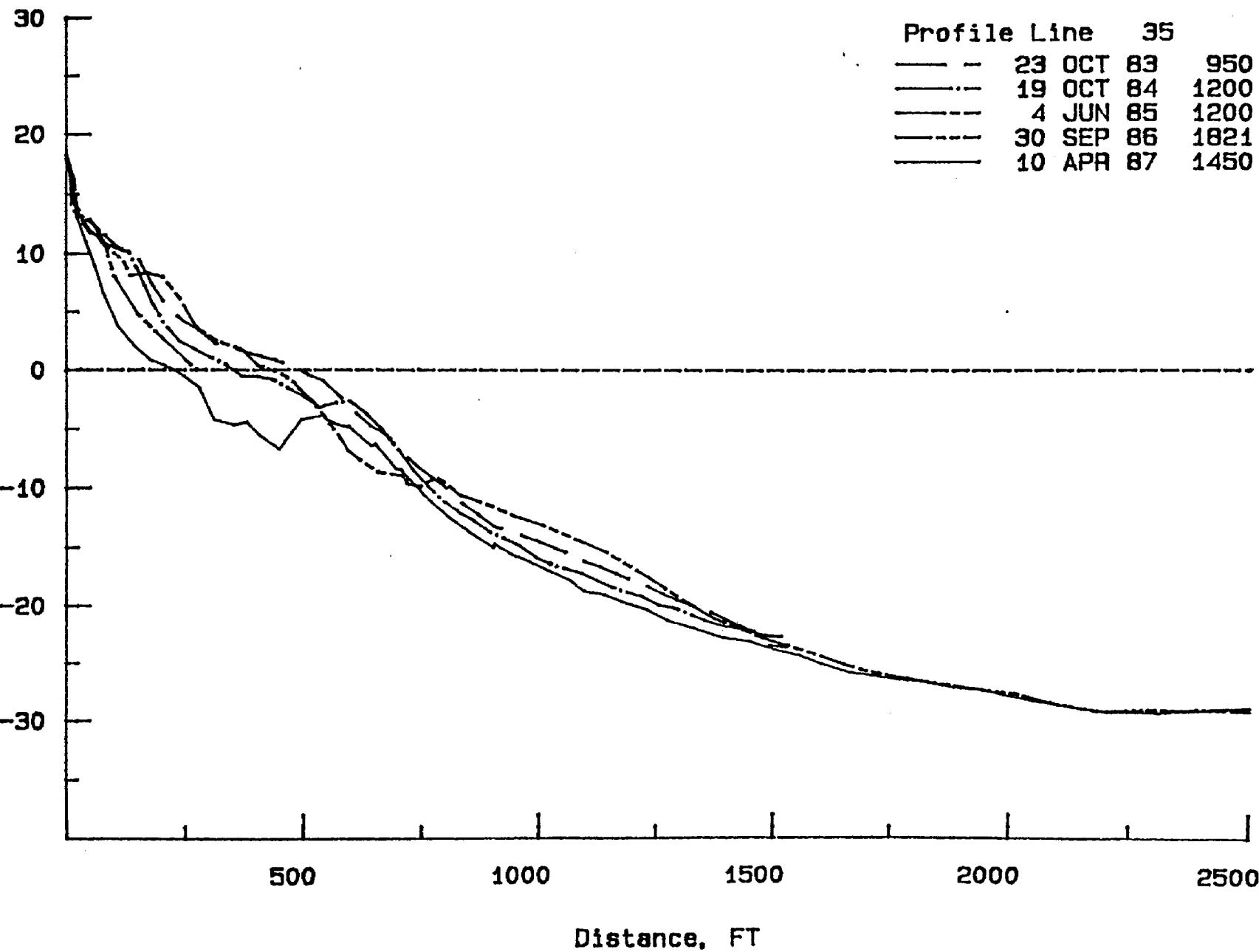
69-B

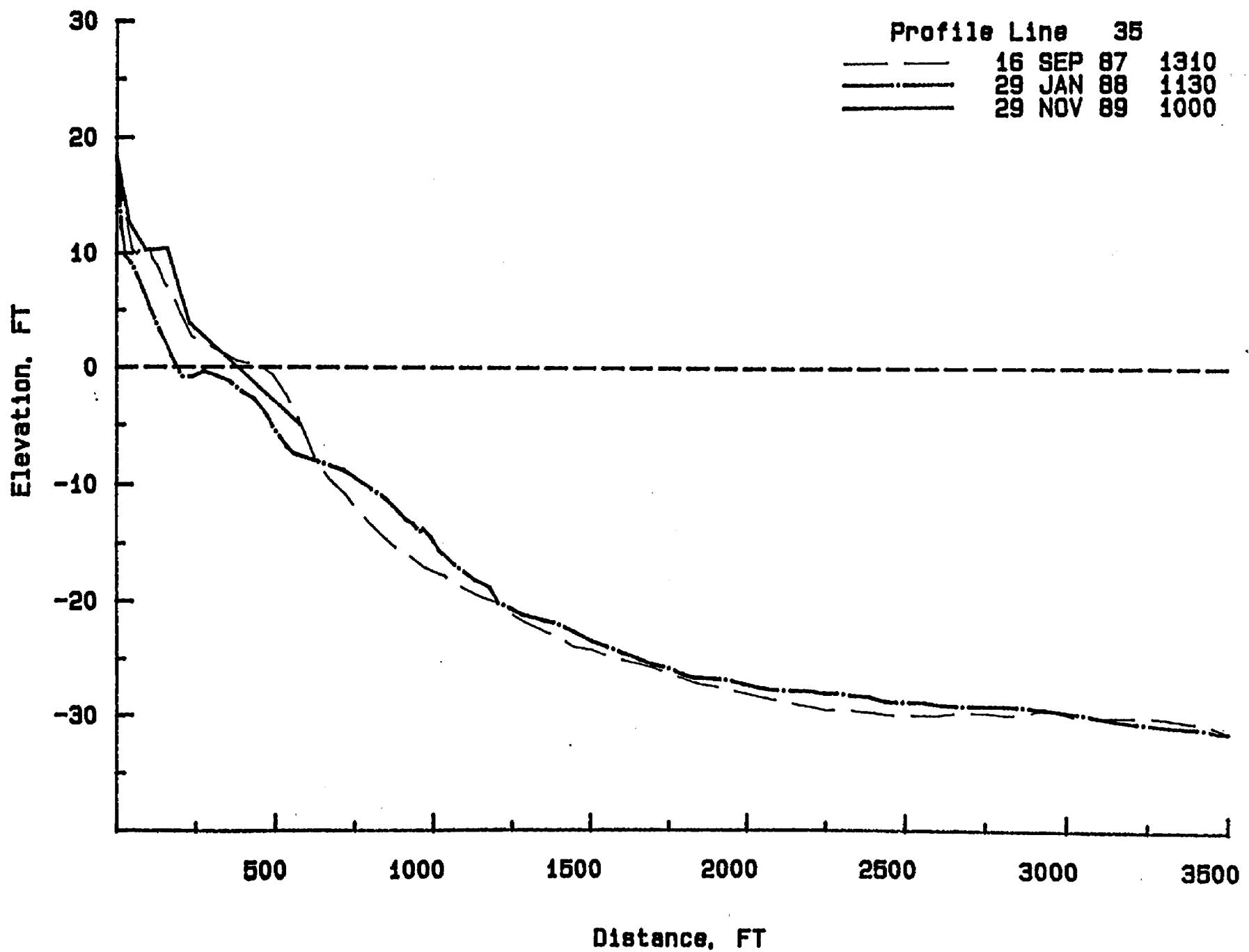


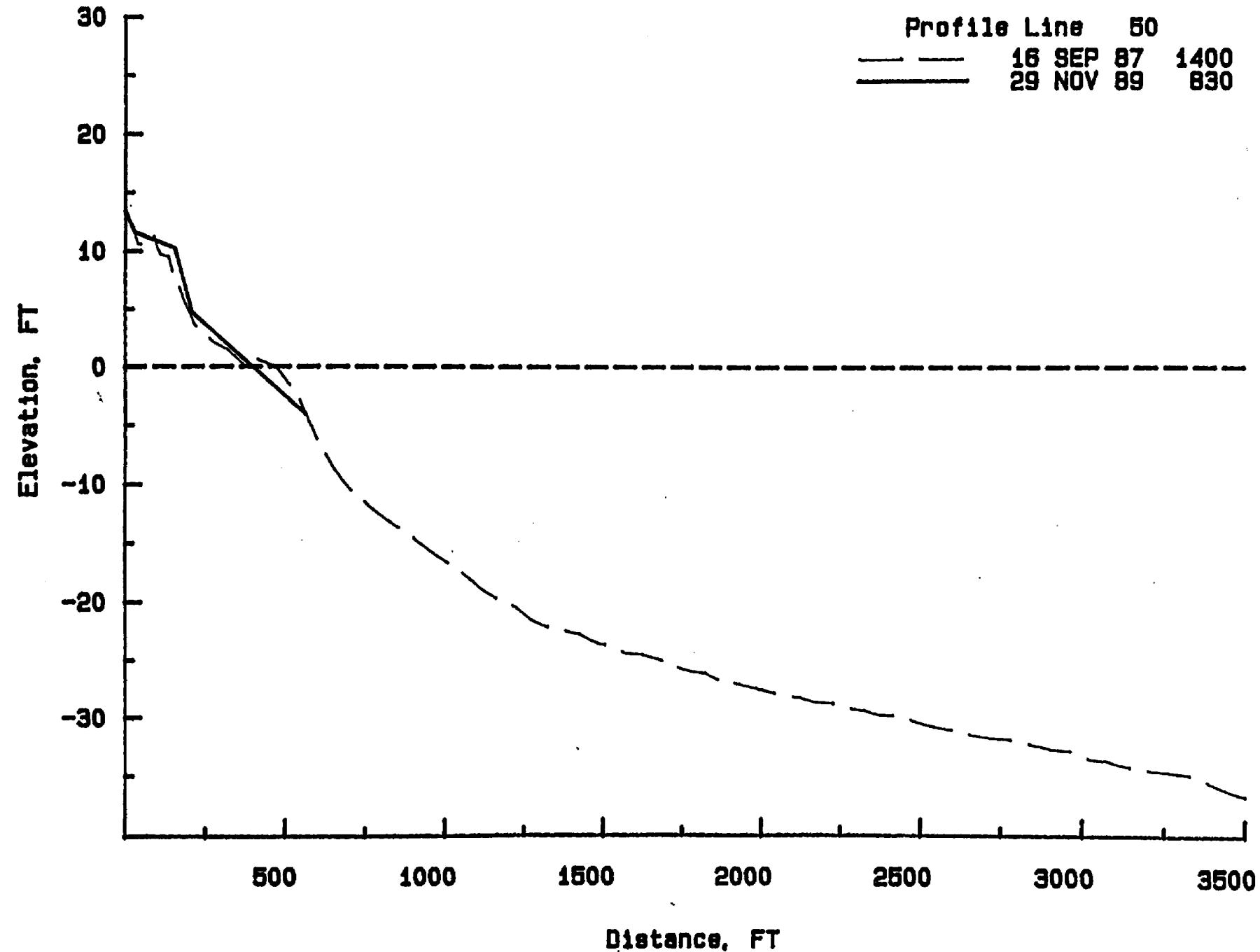


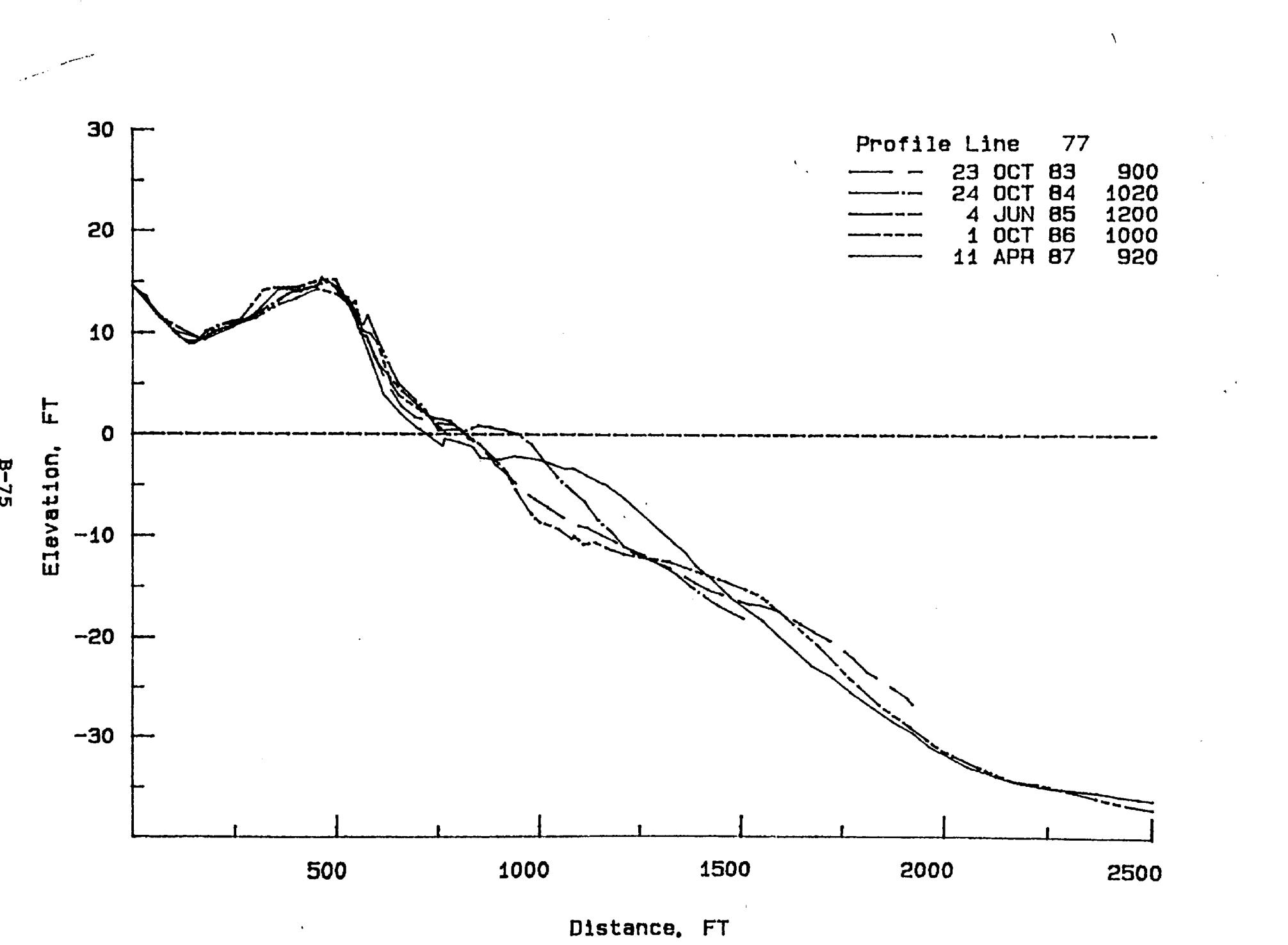


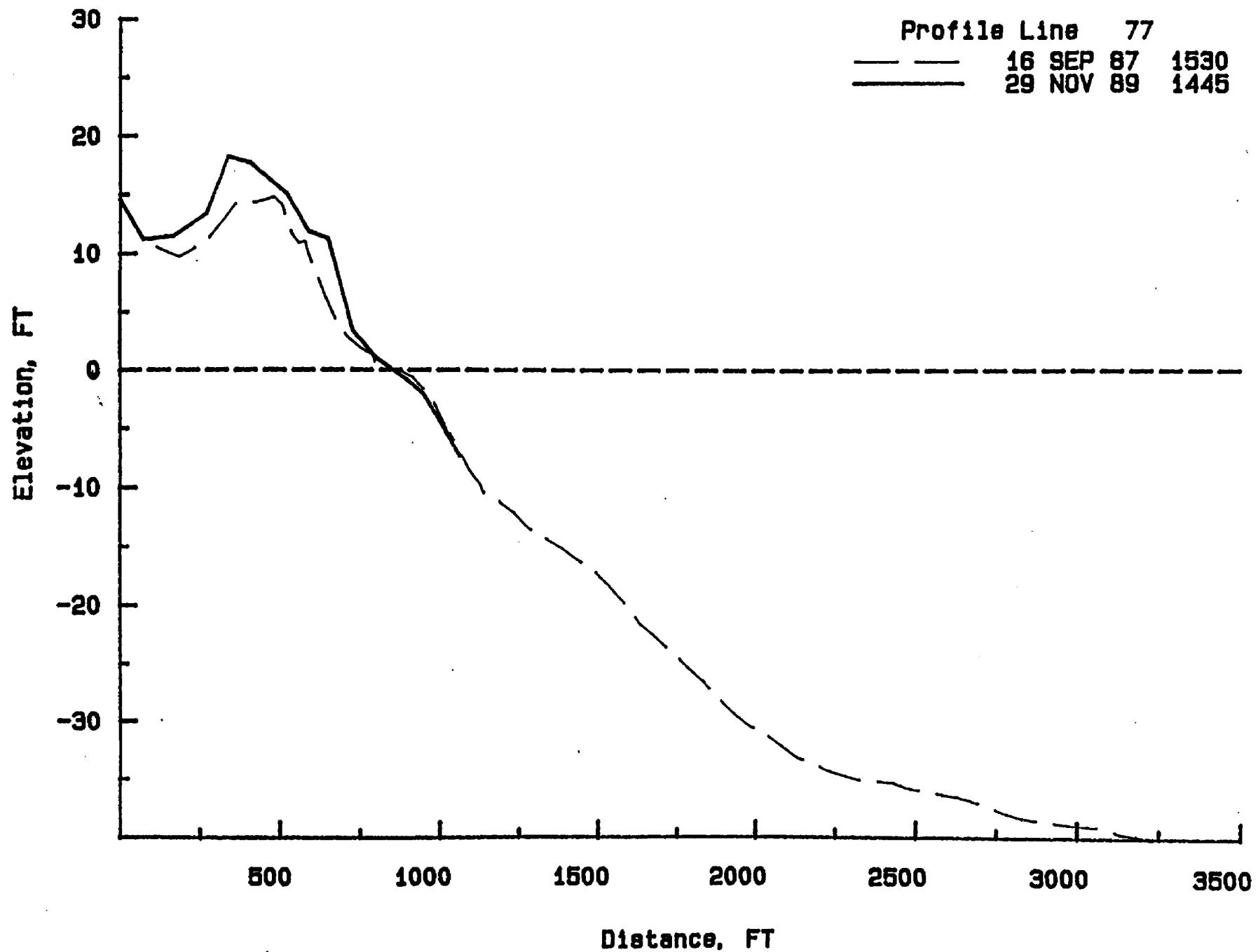
B-72



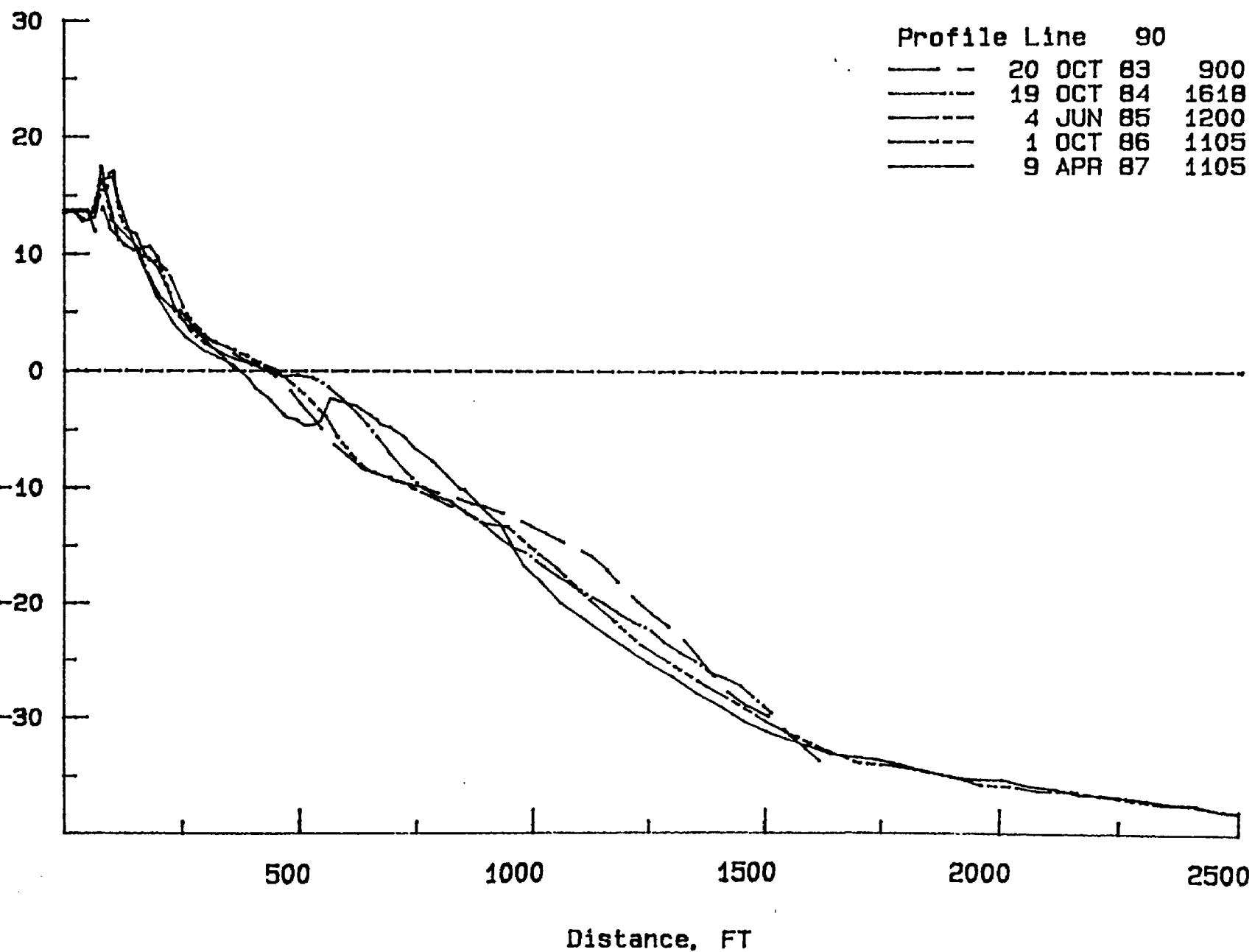


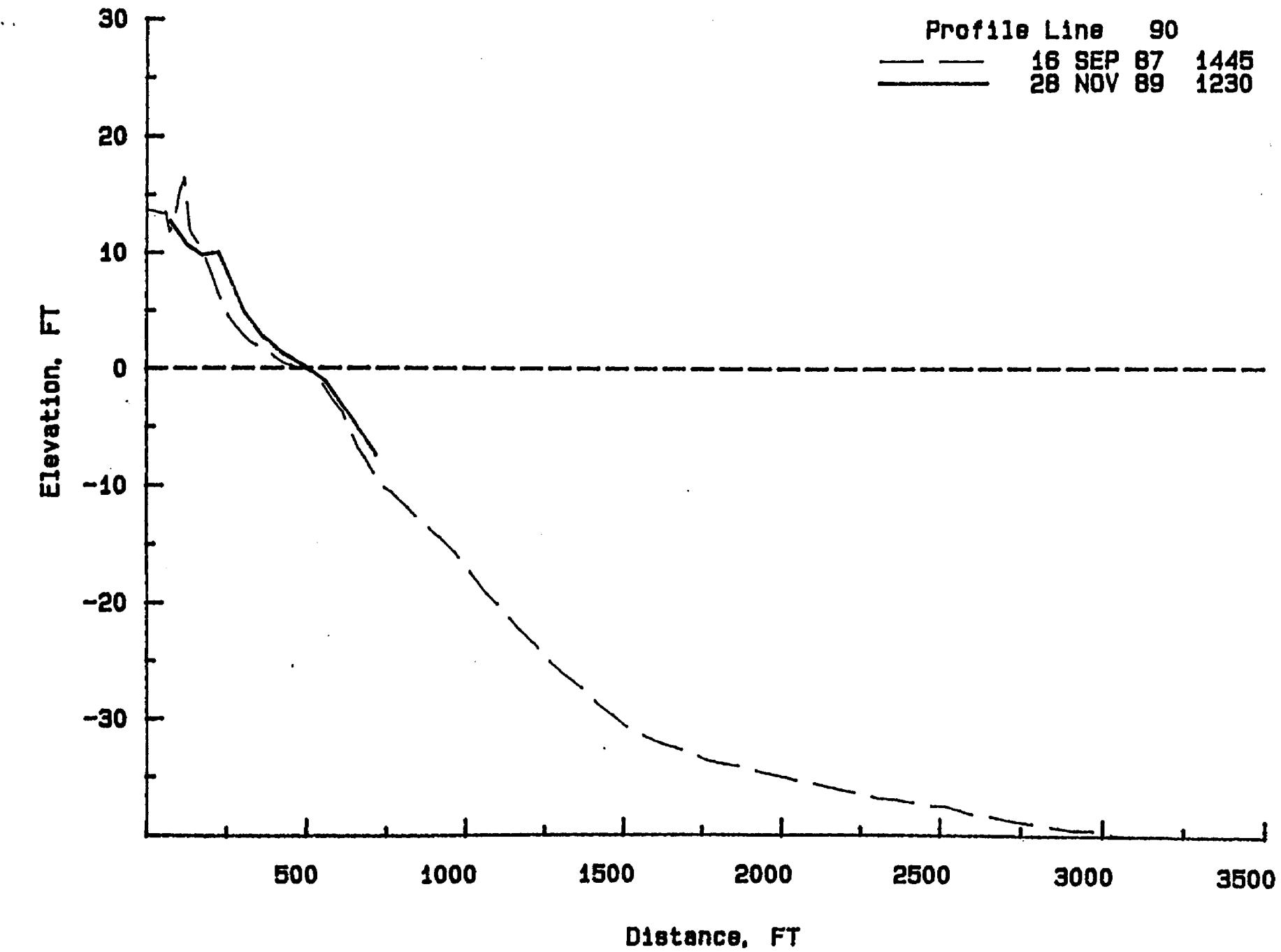




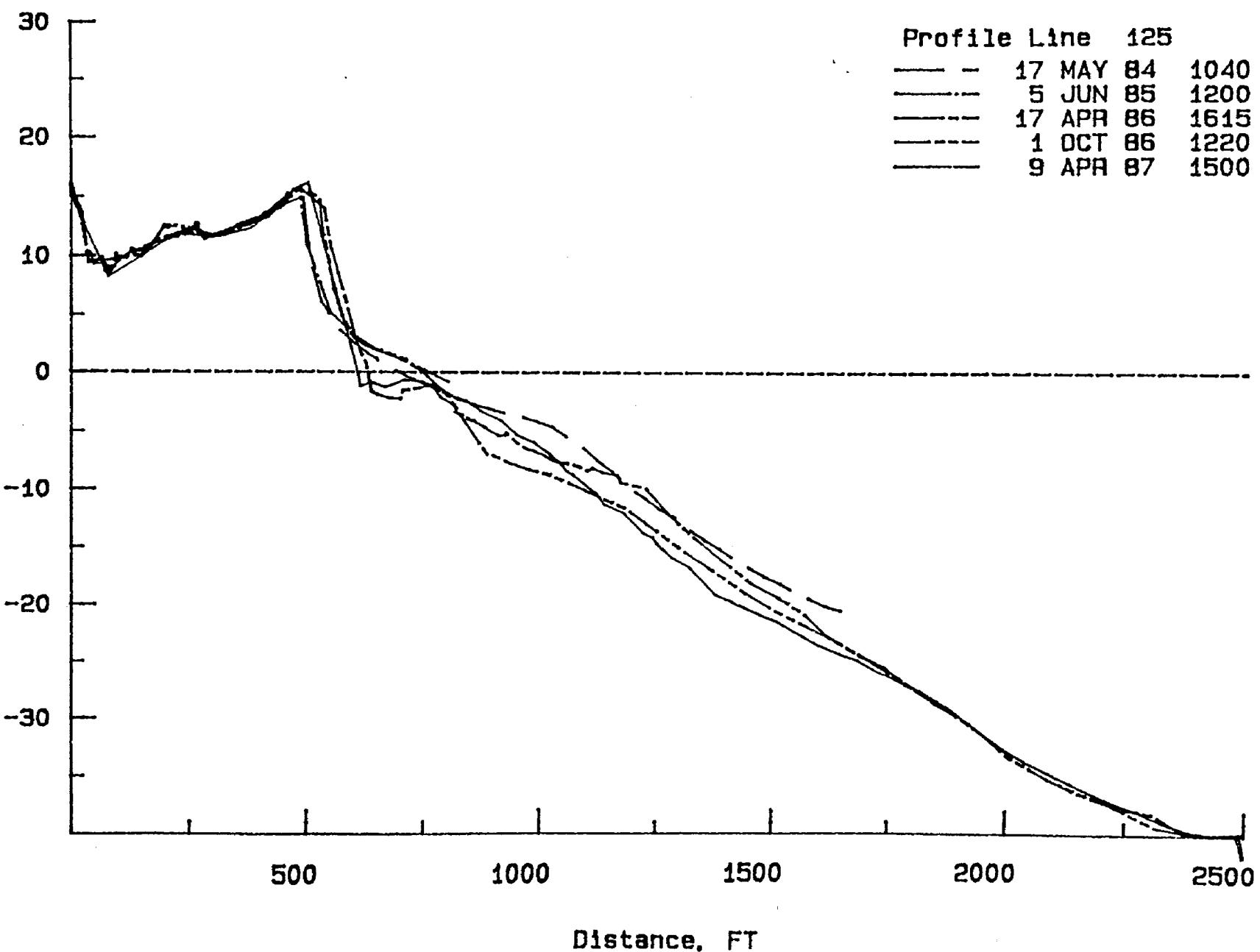


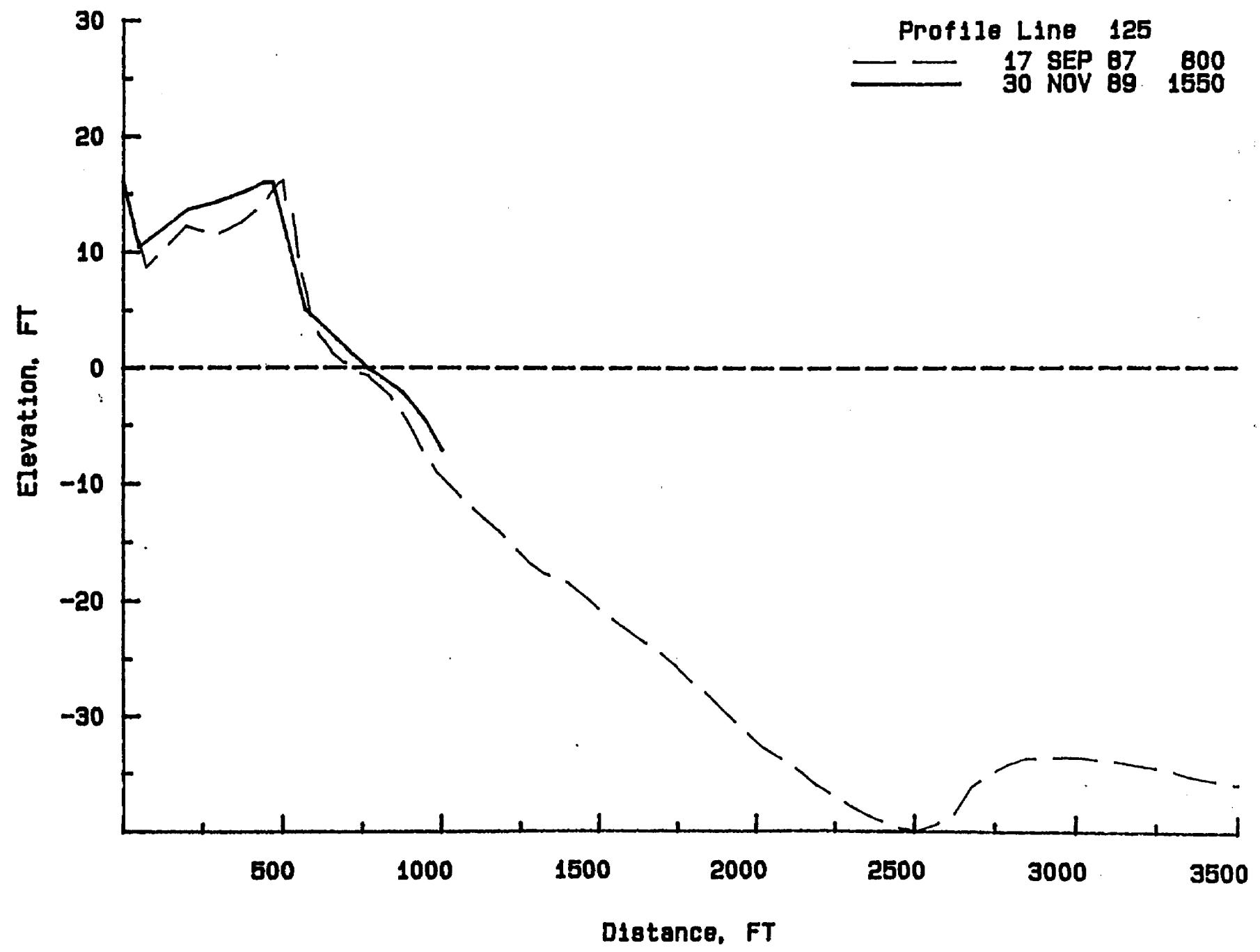
LL-8



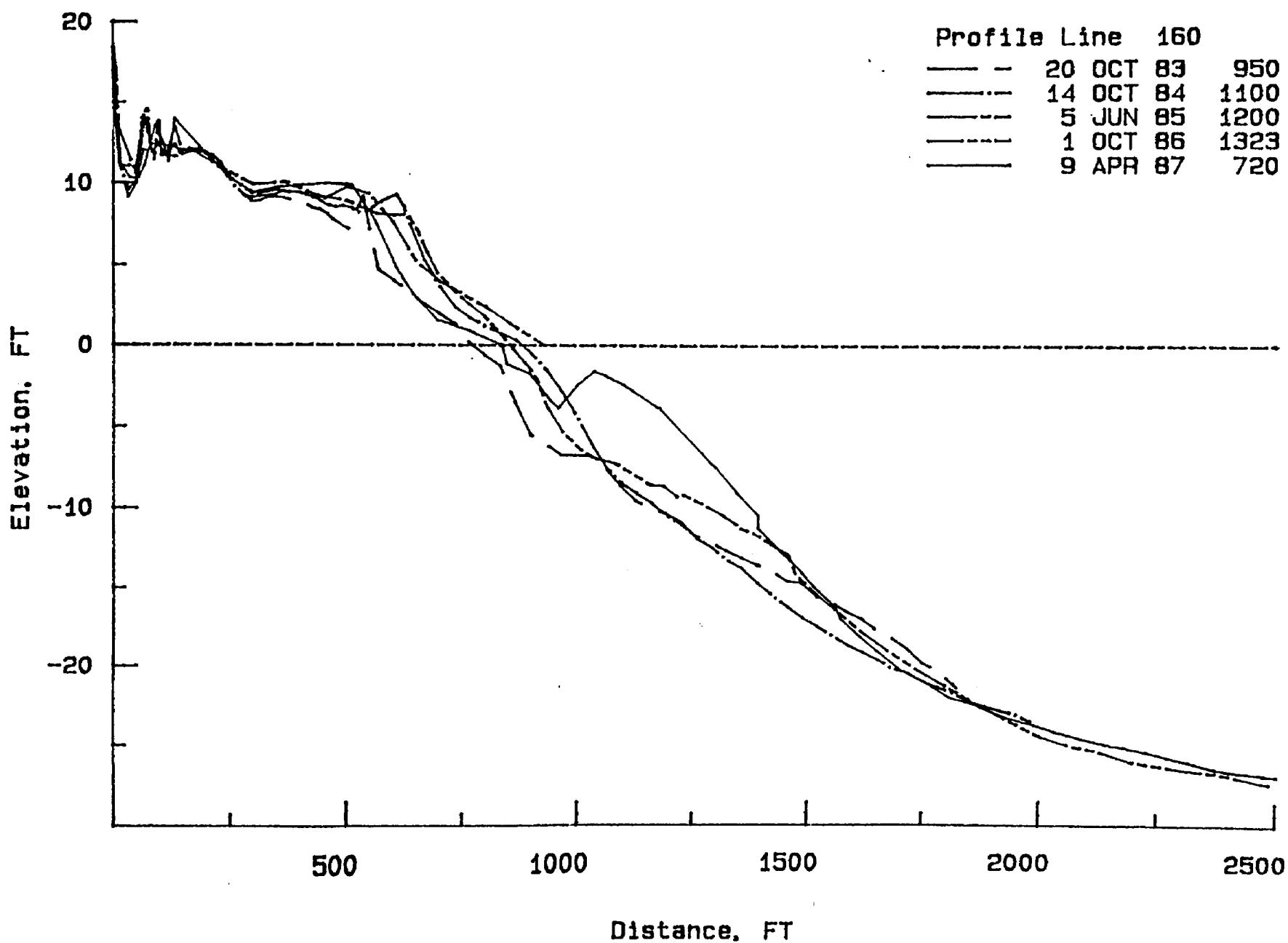


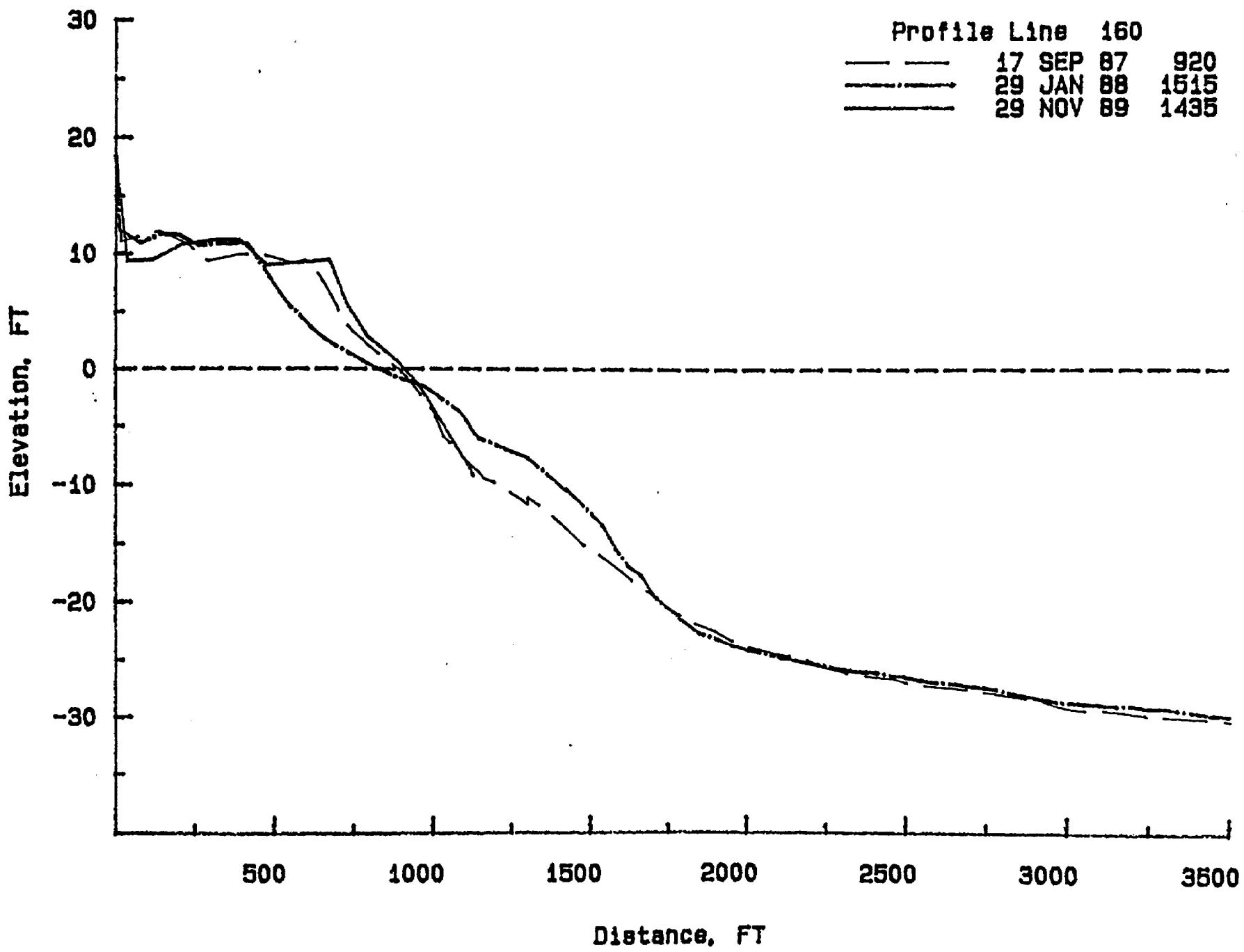
B-79



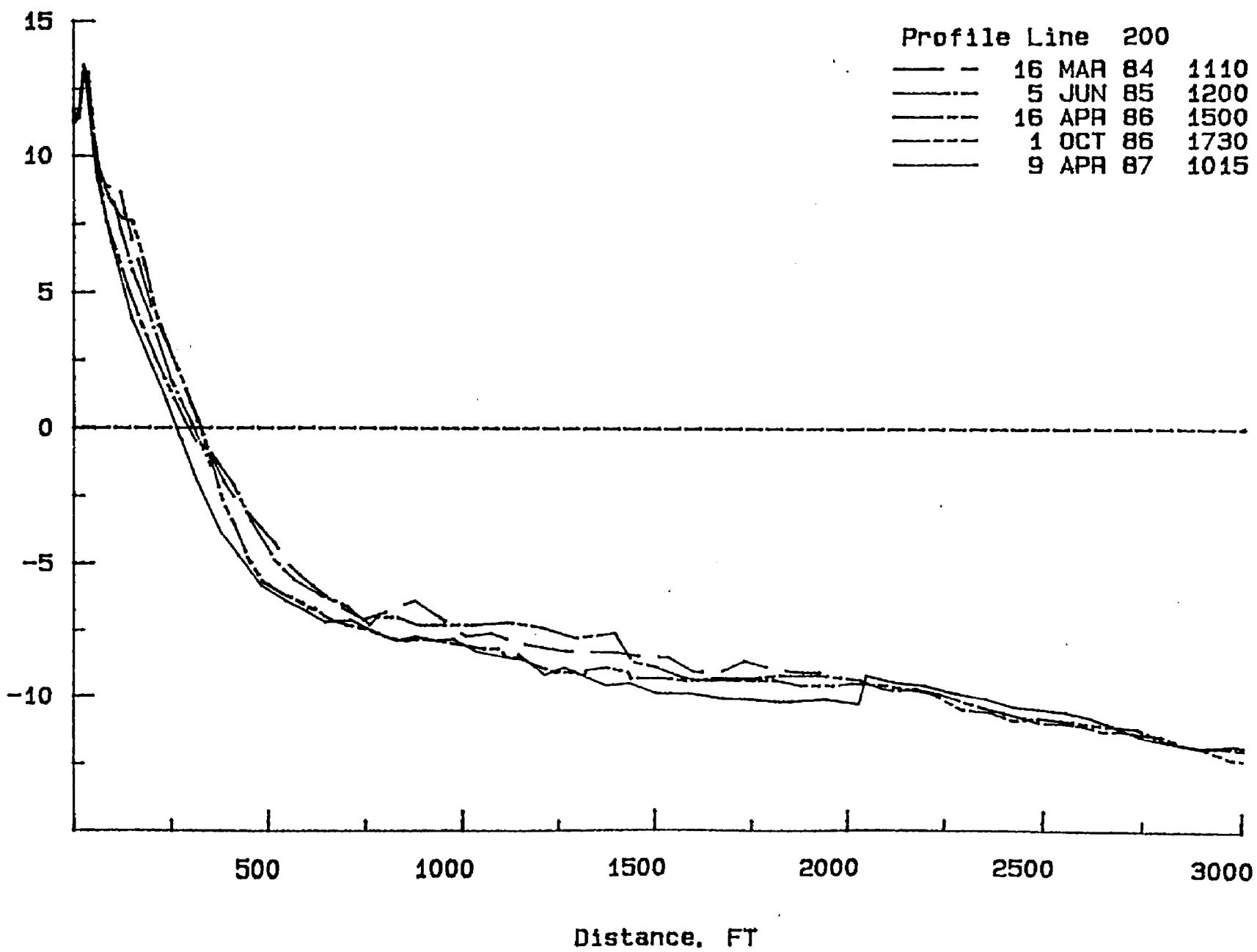


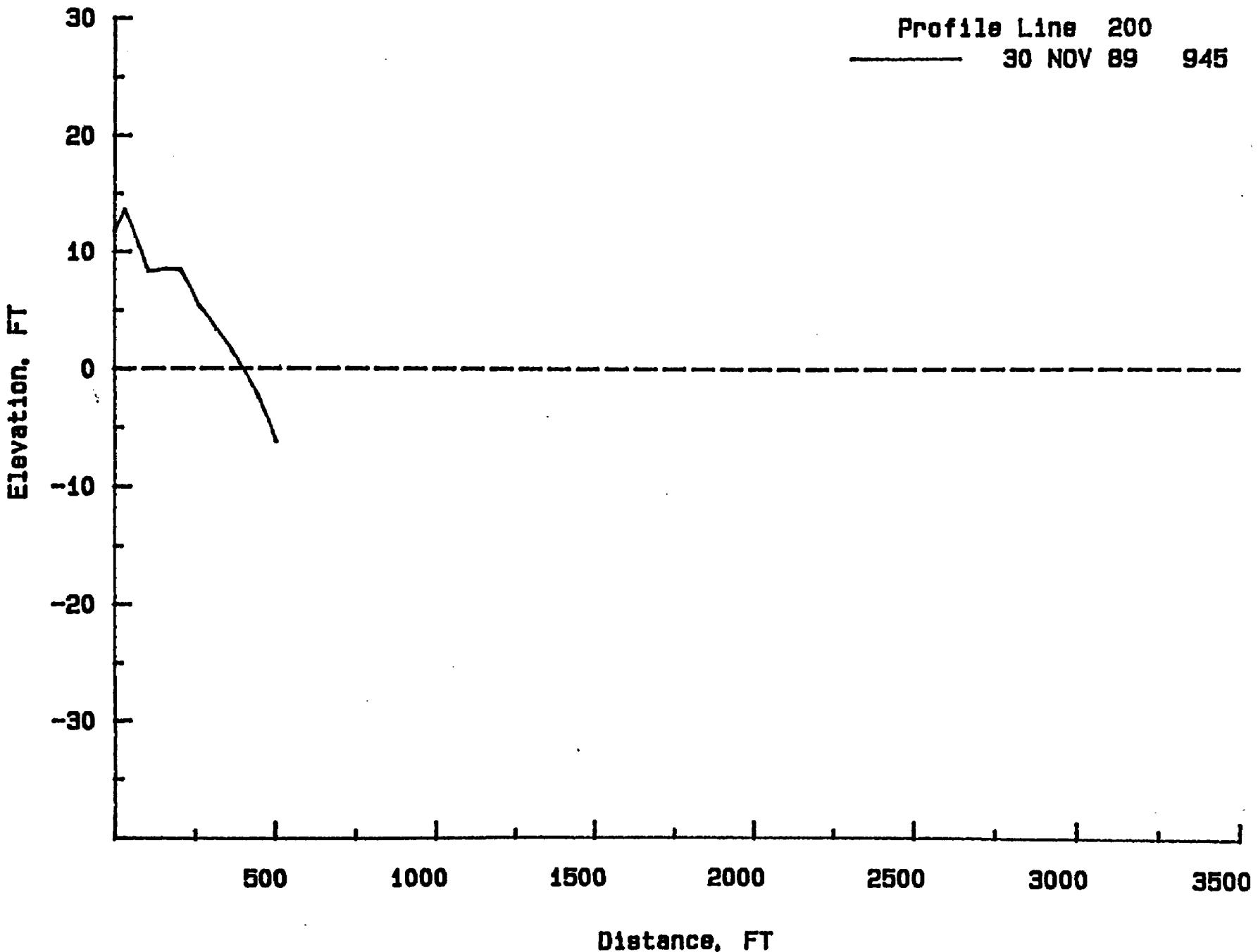
B-81



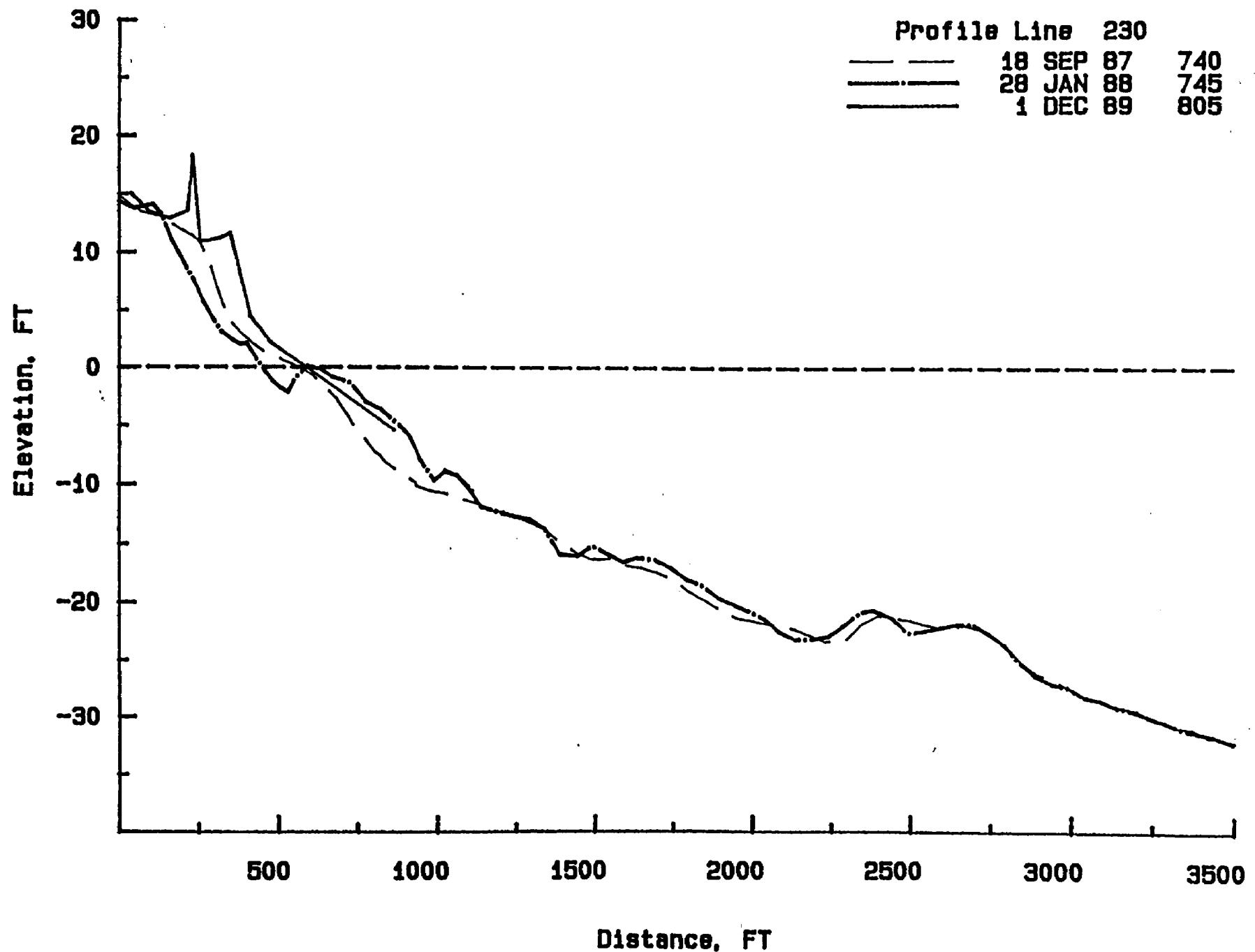


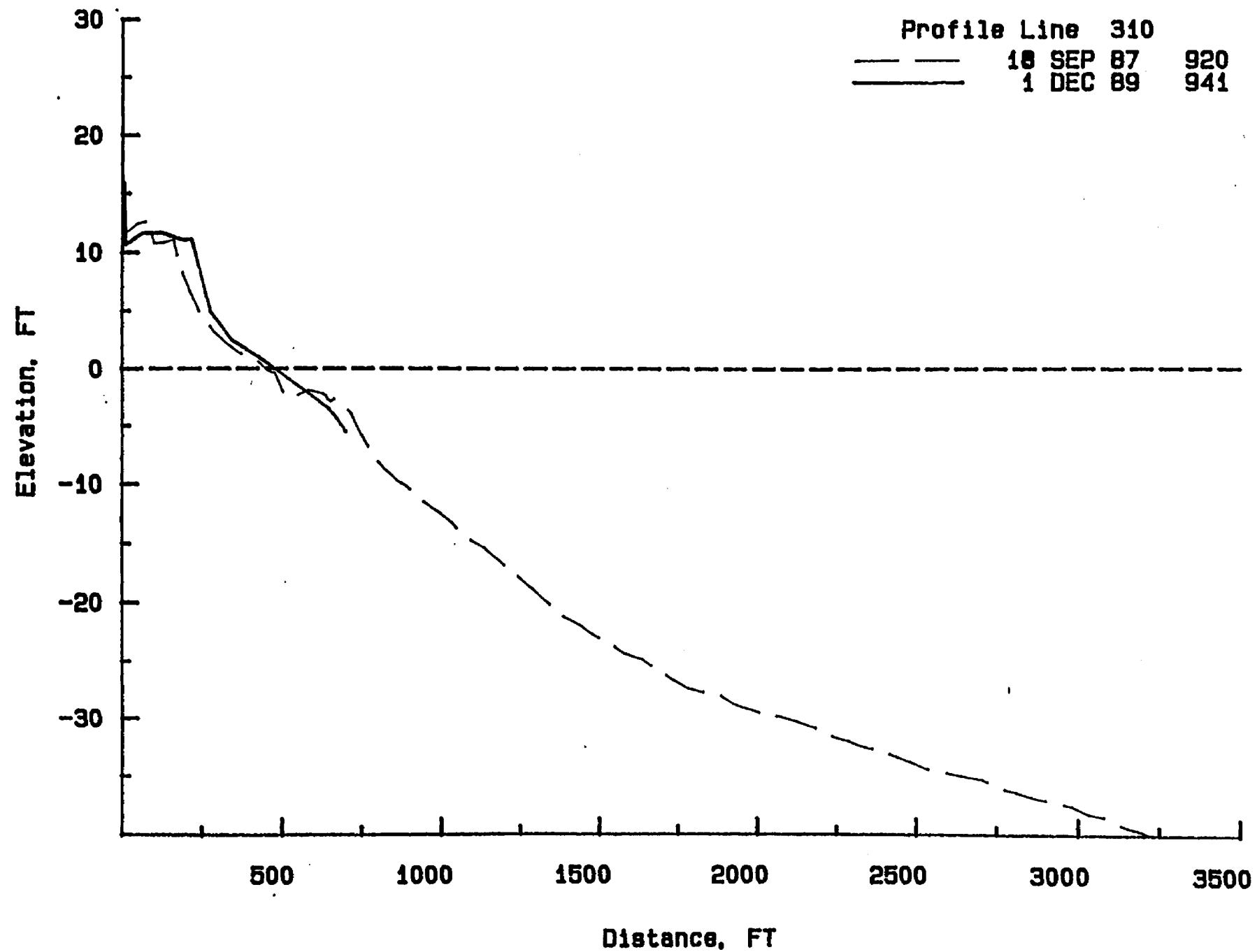
E-83

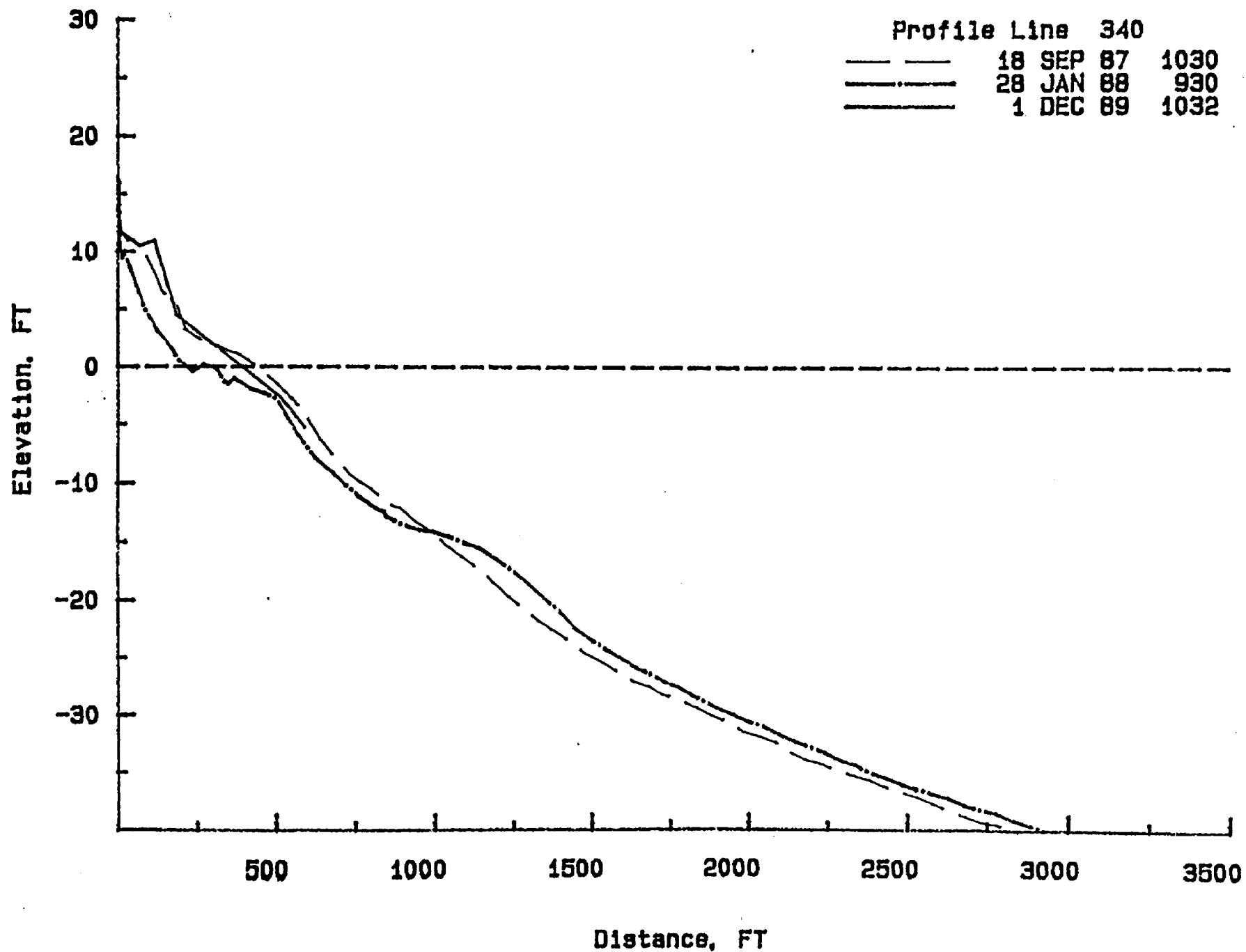


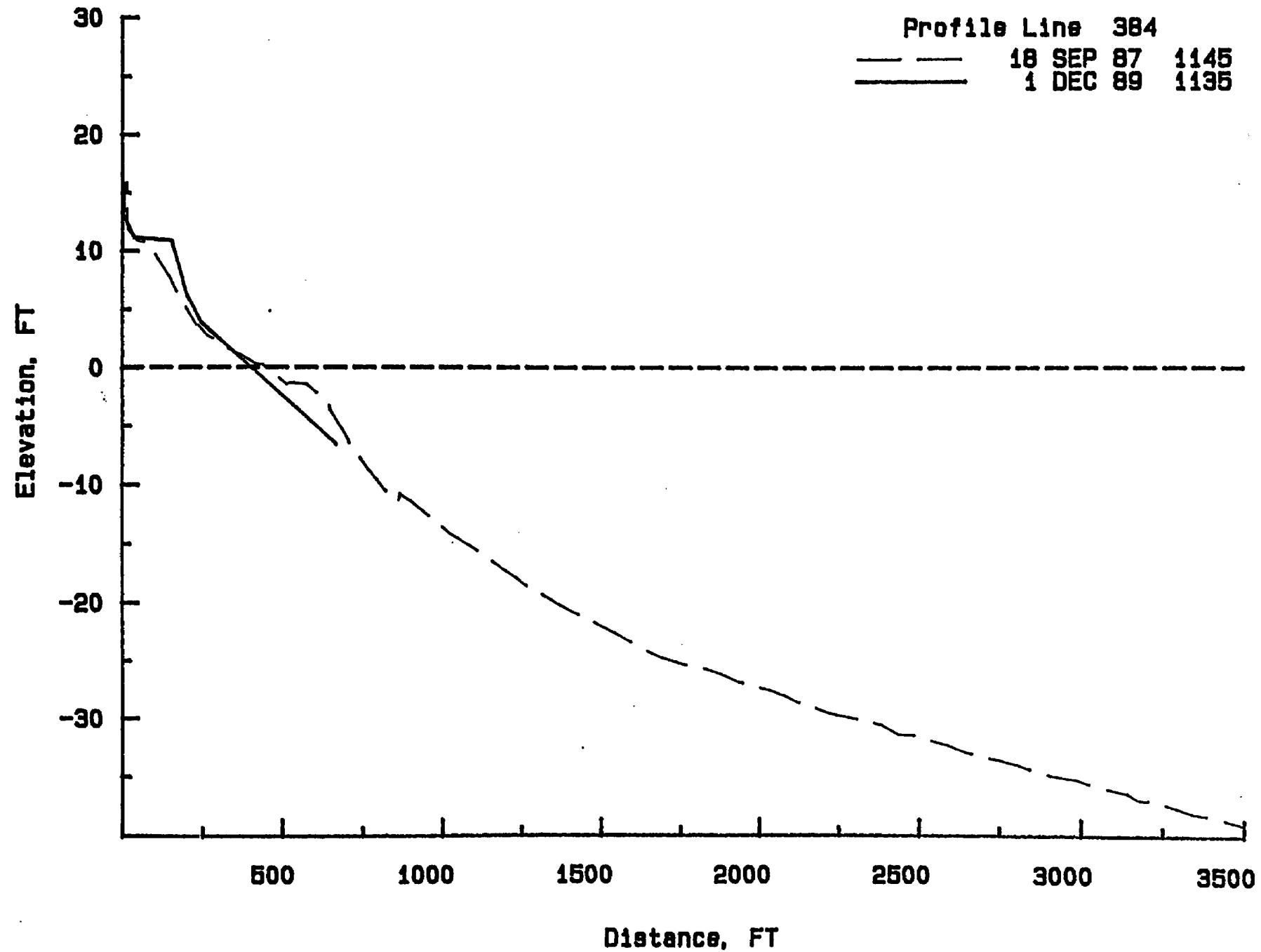


B-84

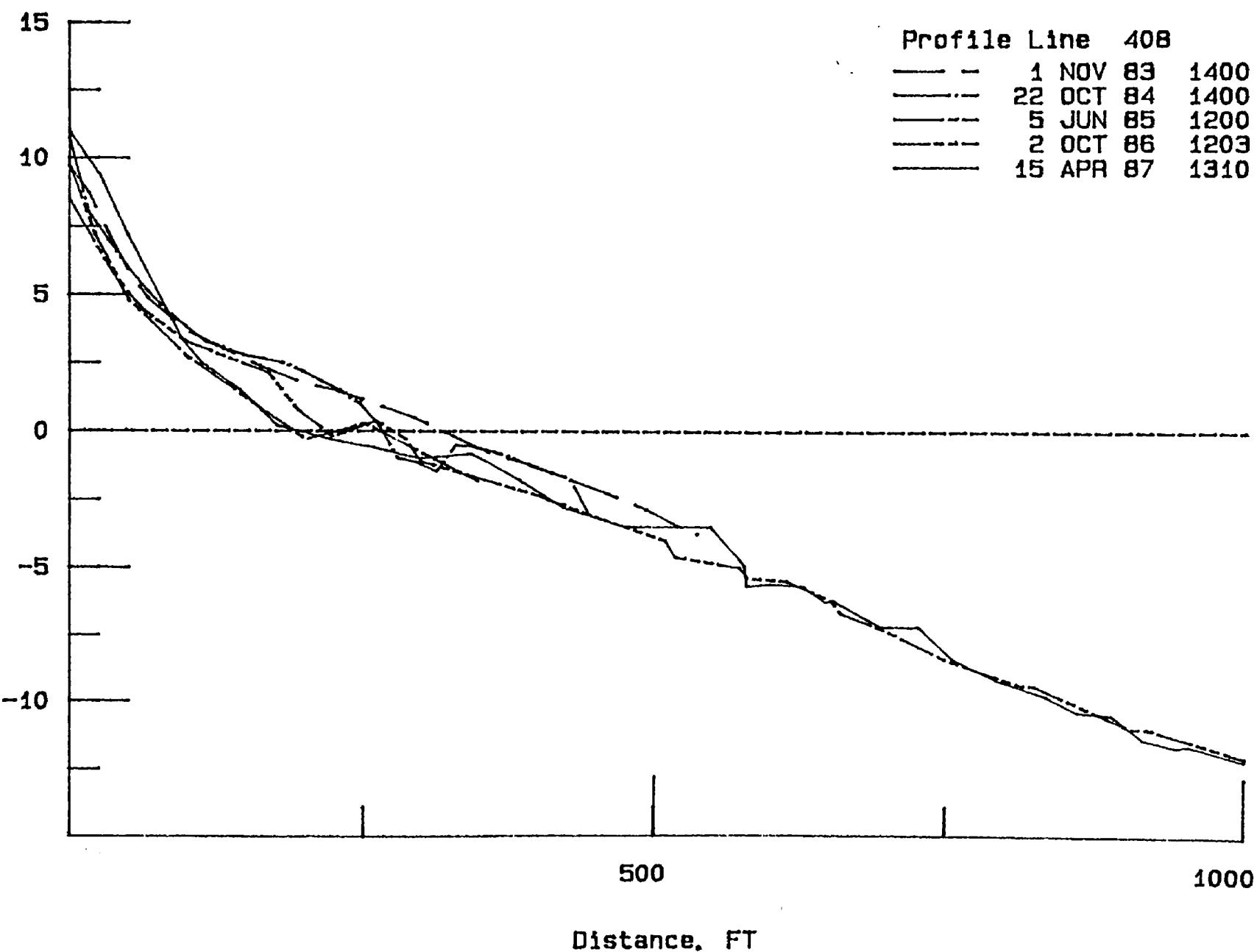


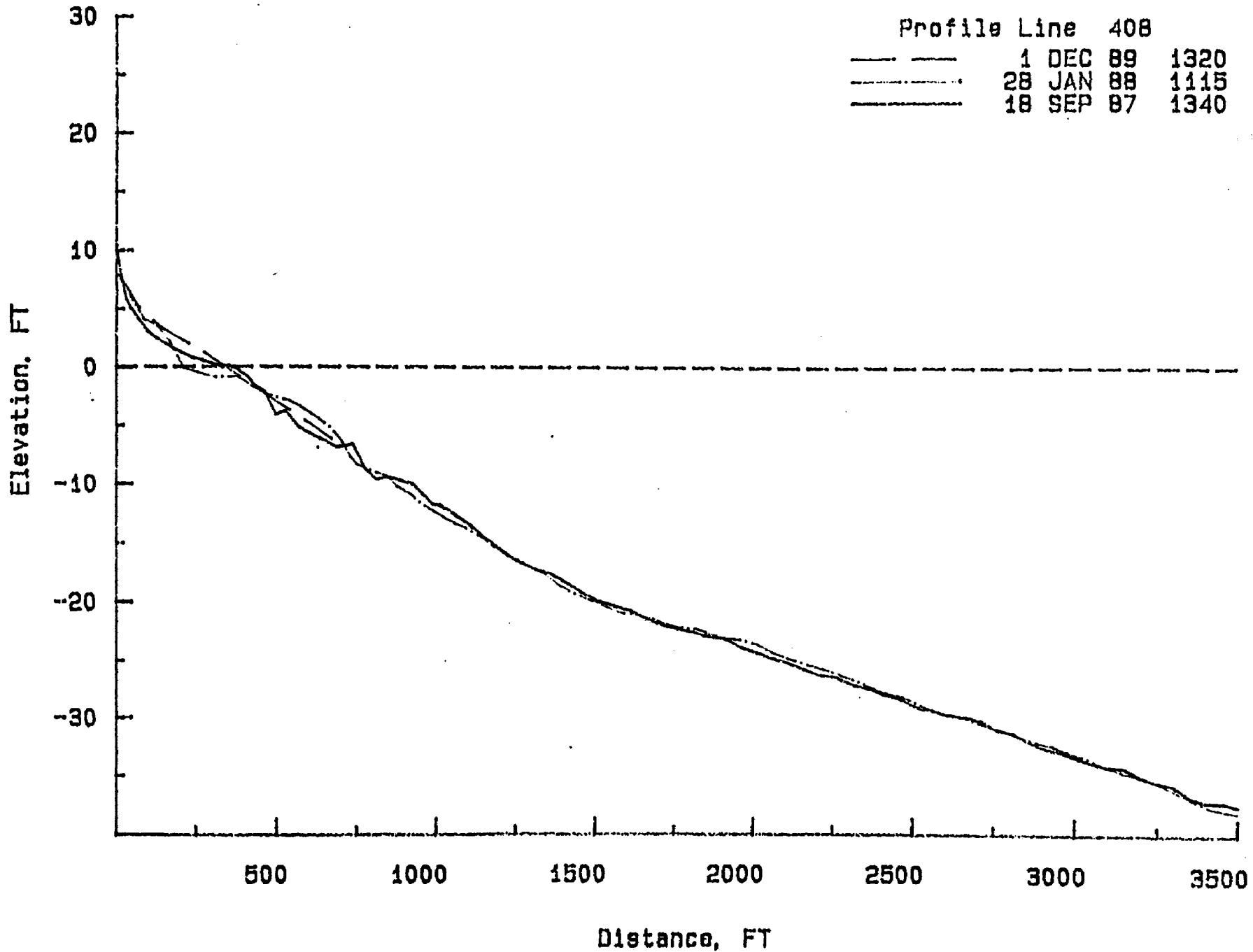




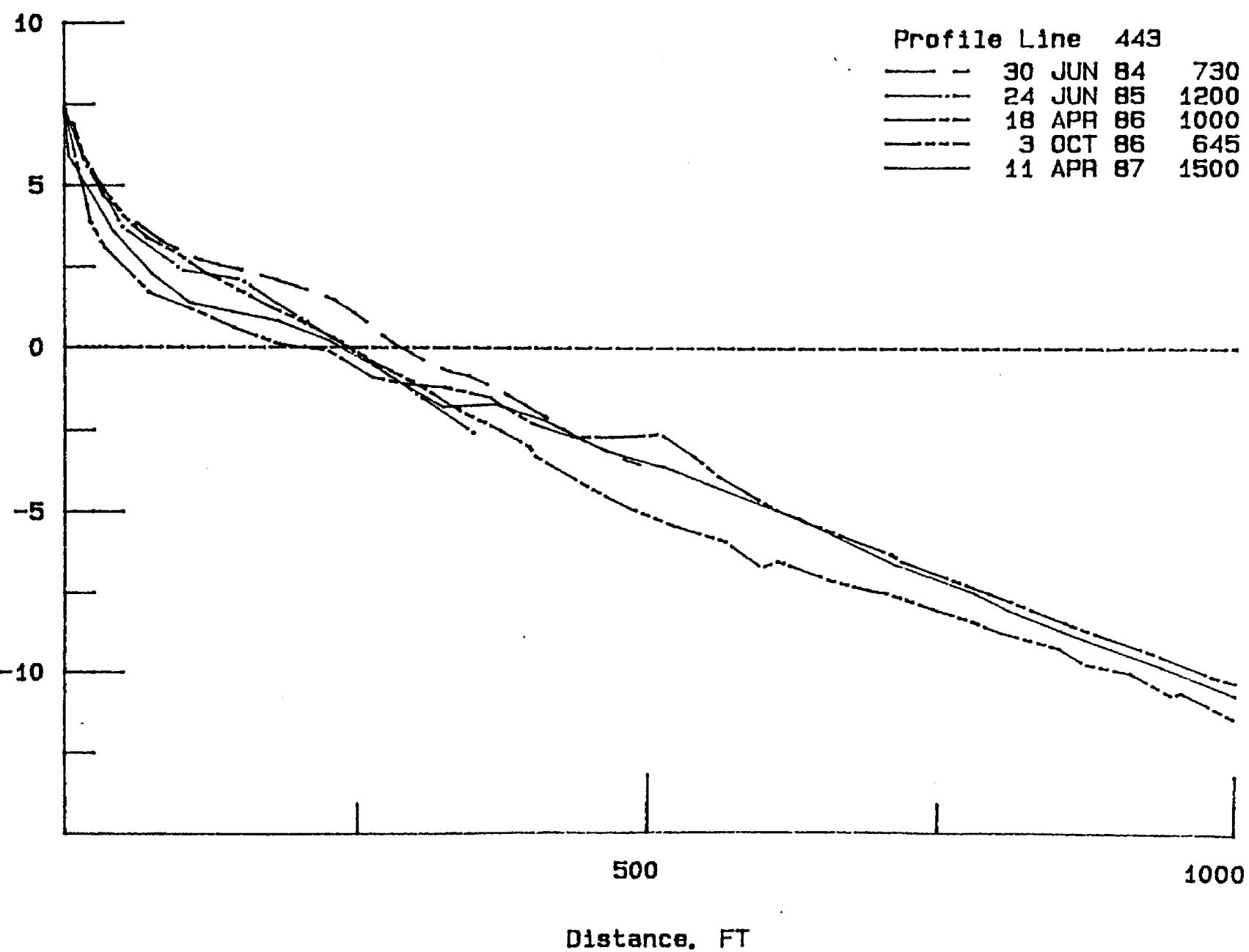


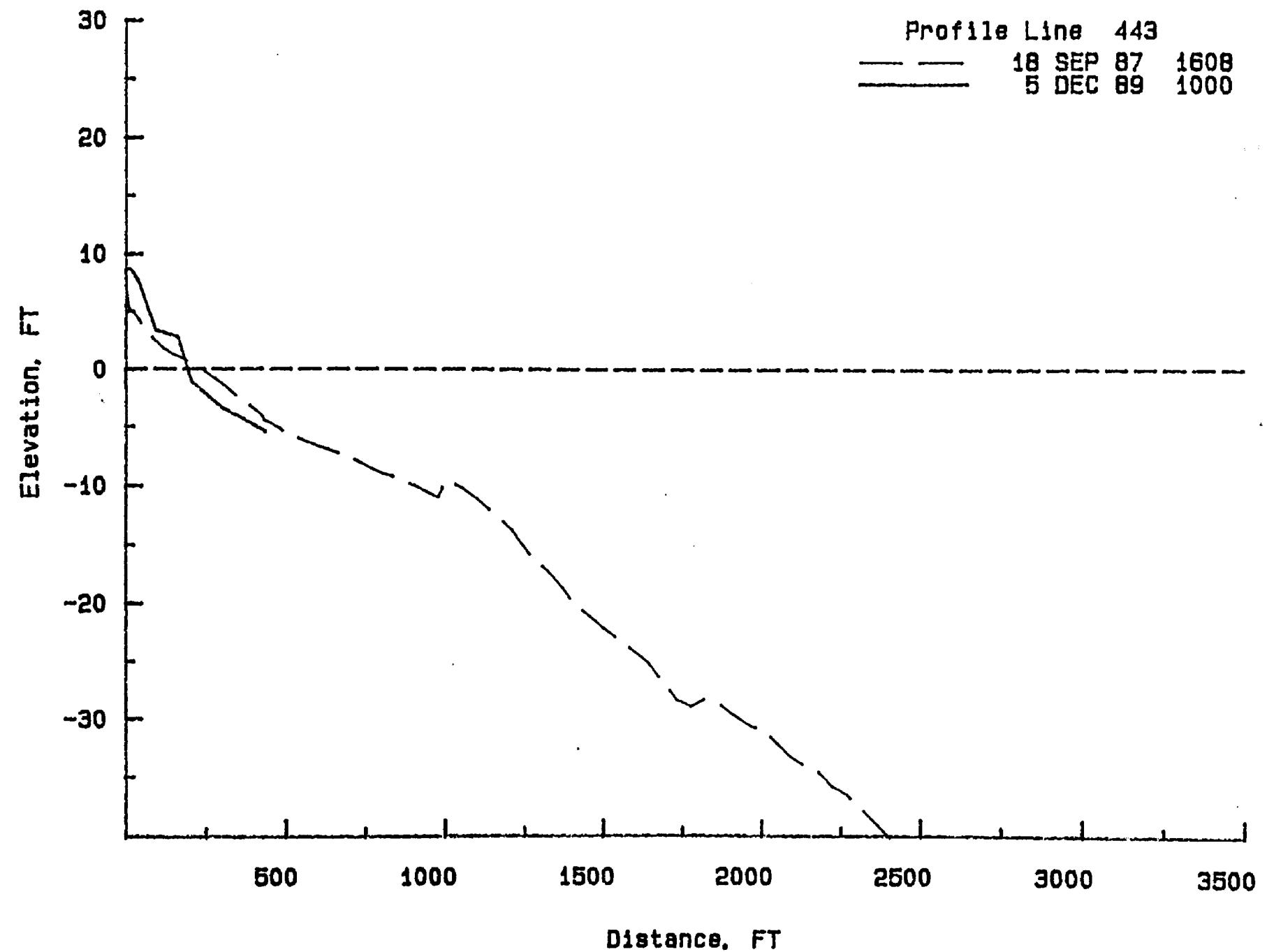
68-B



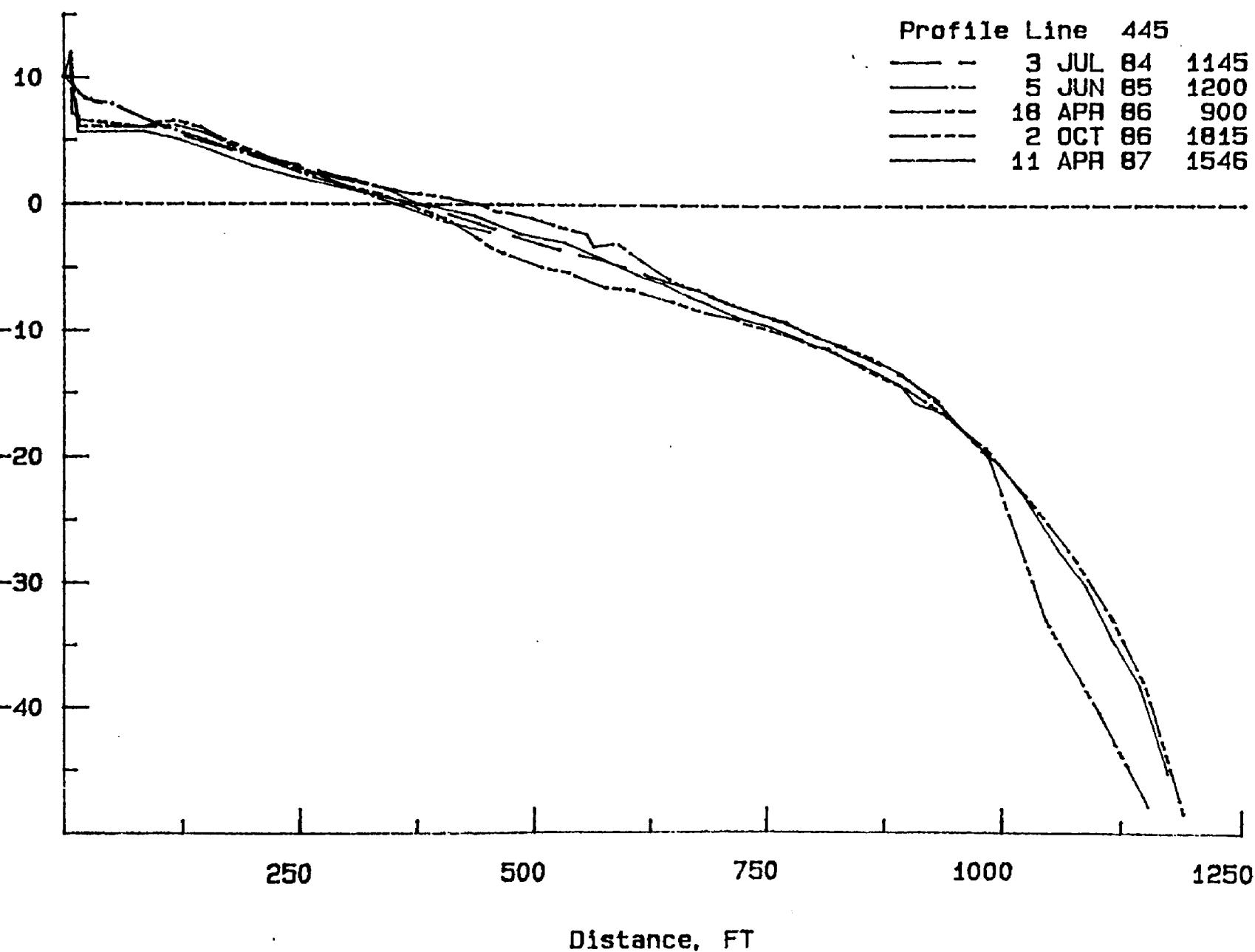


T6-B

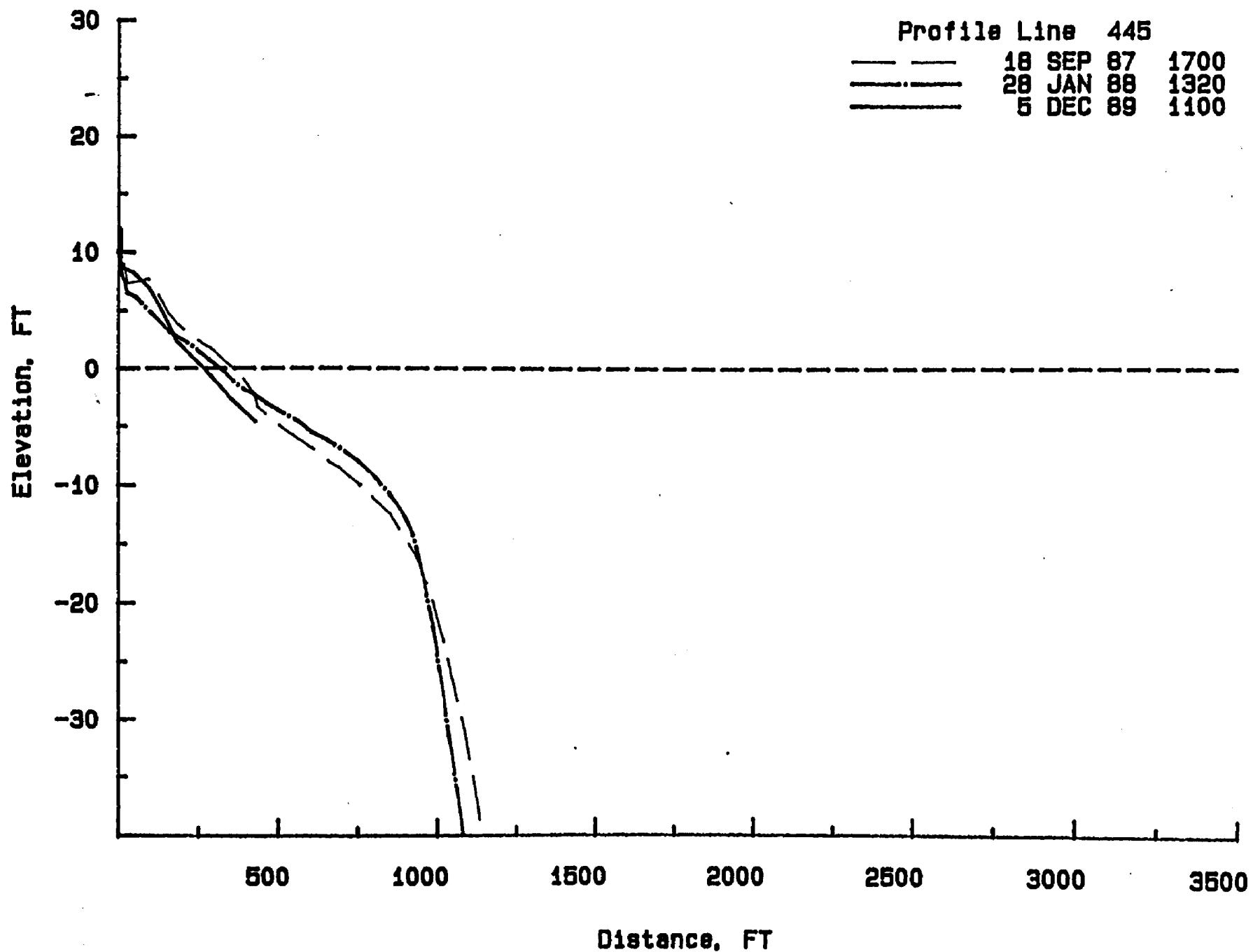


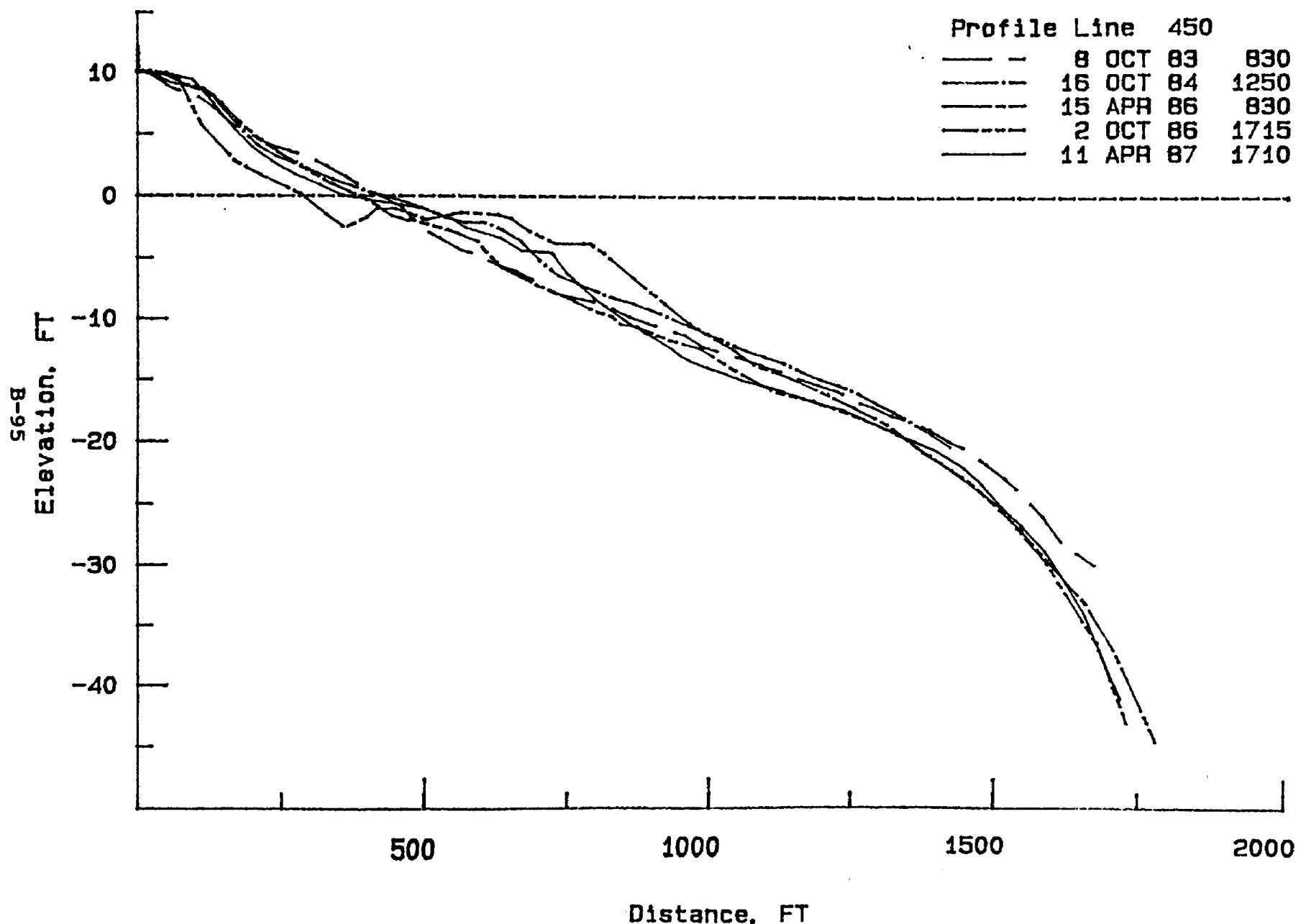


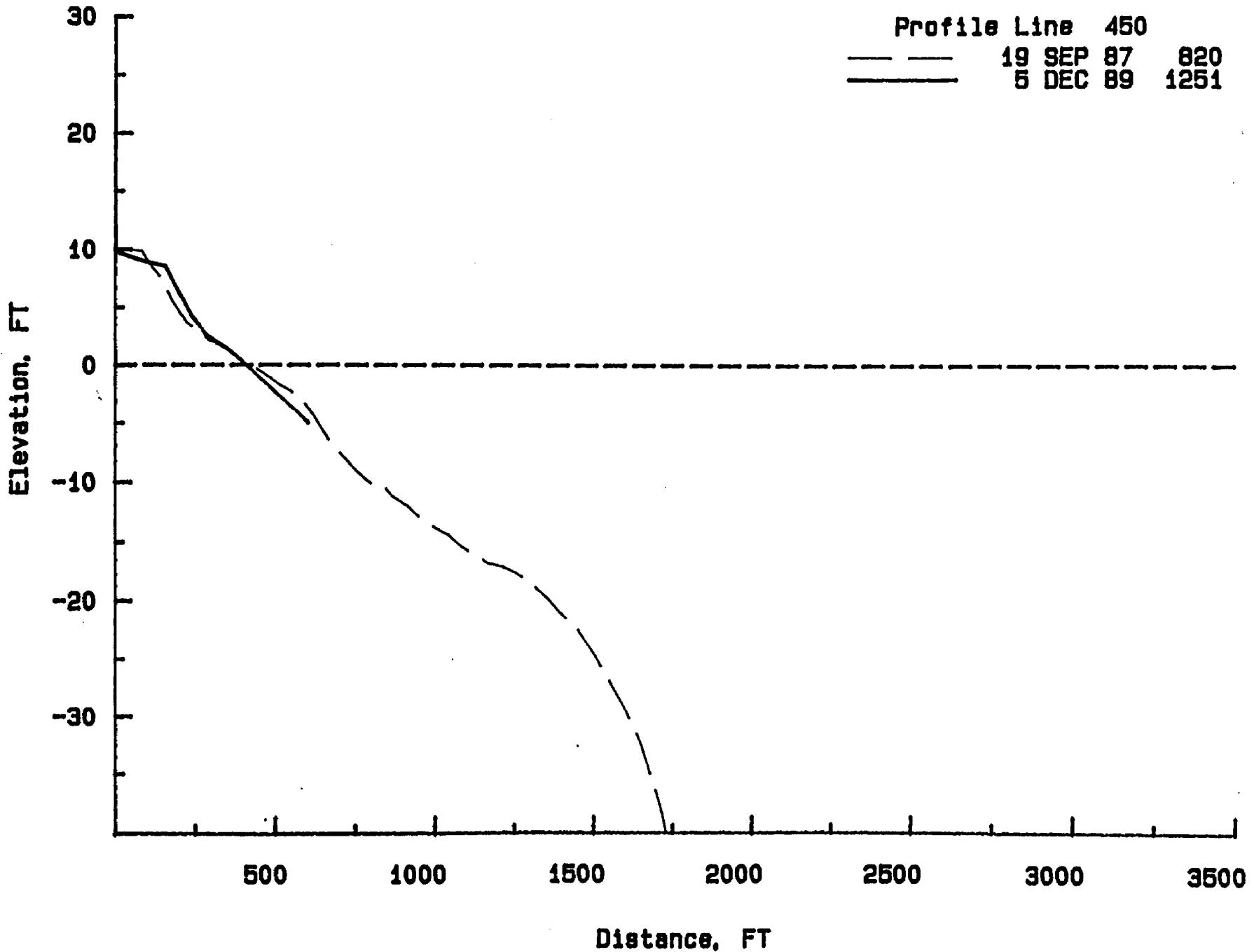
E-6-B

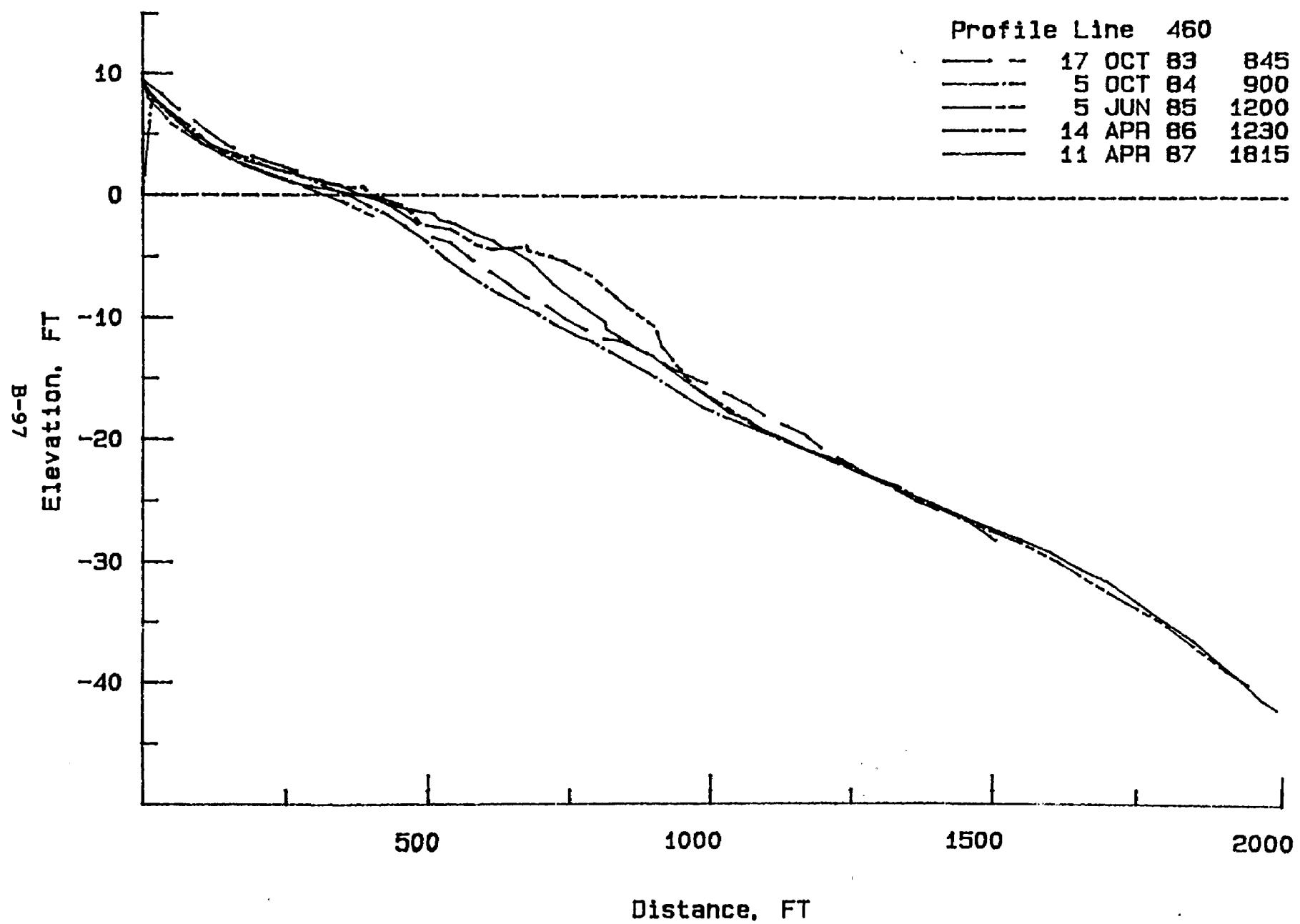


B-94

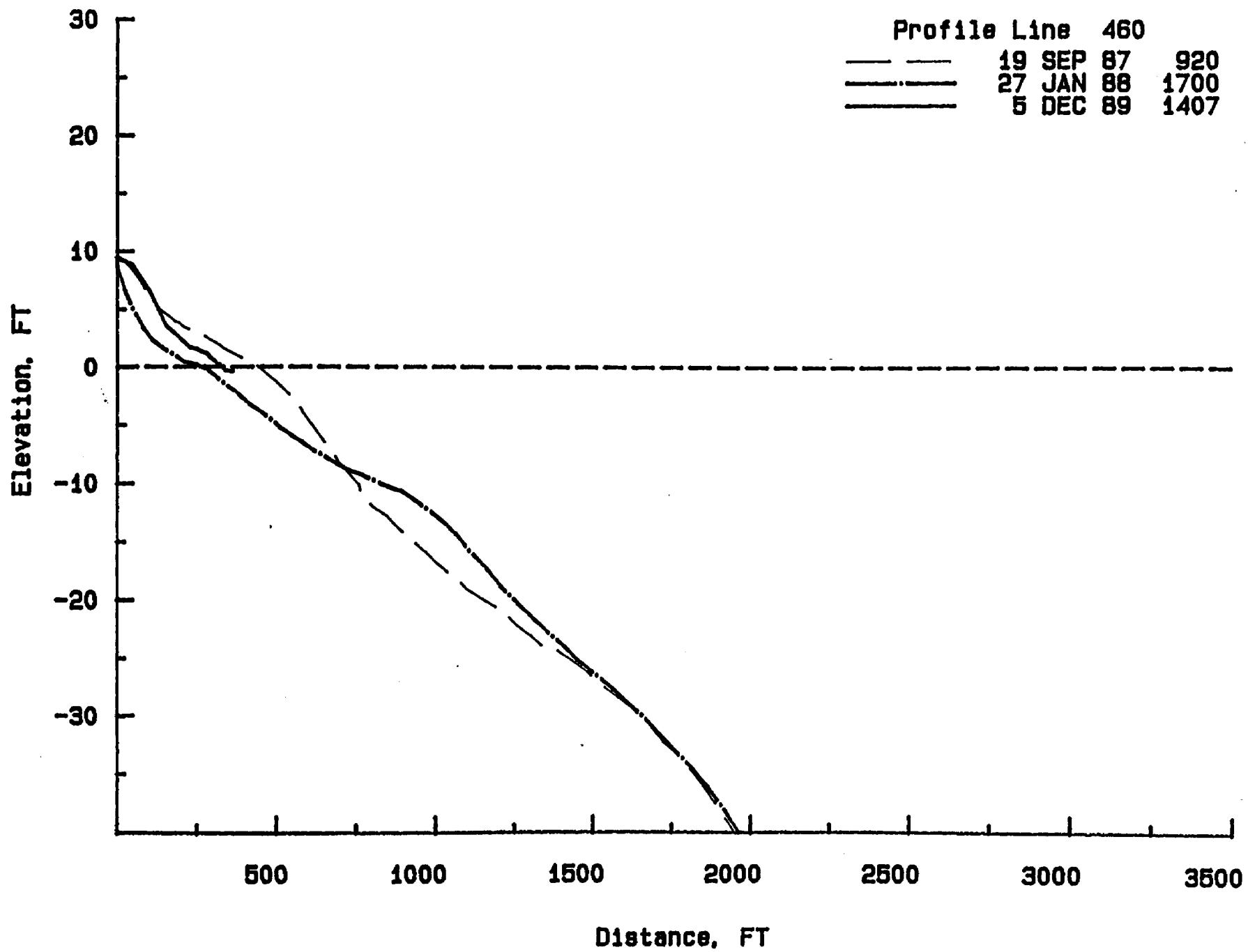




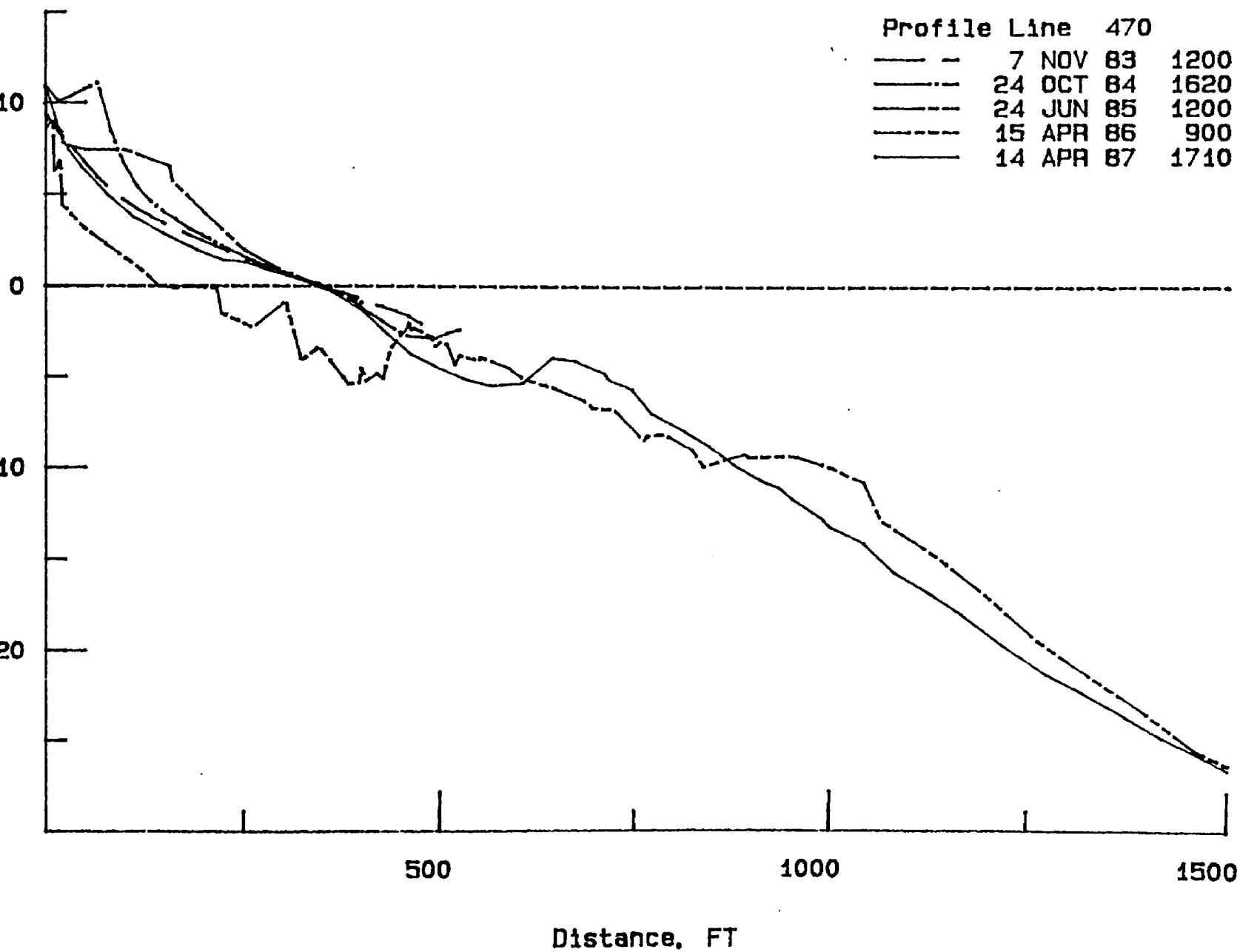




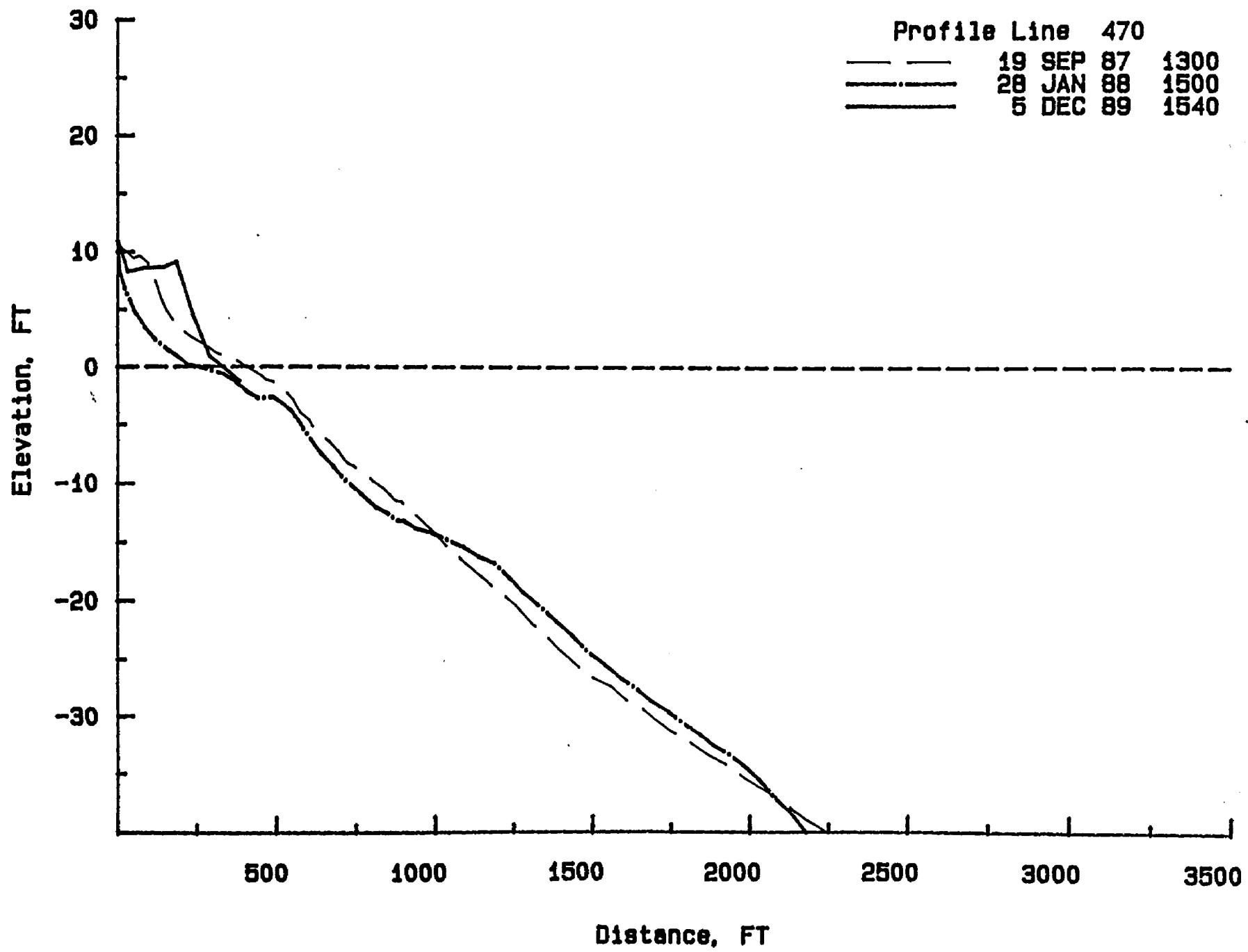
B-98

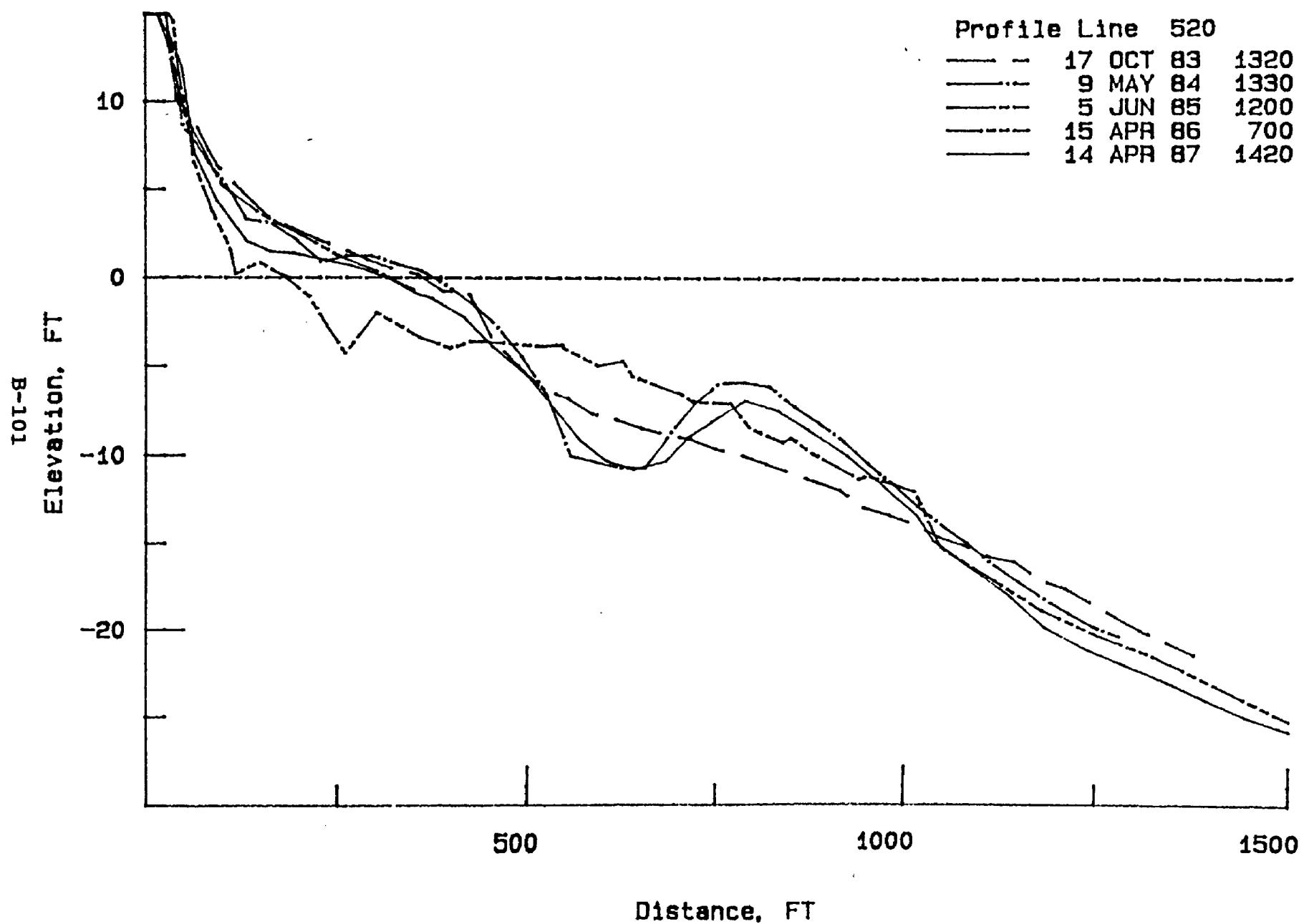


66-8

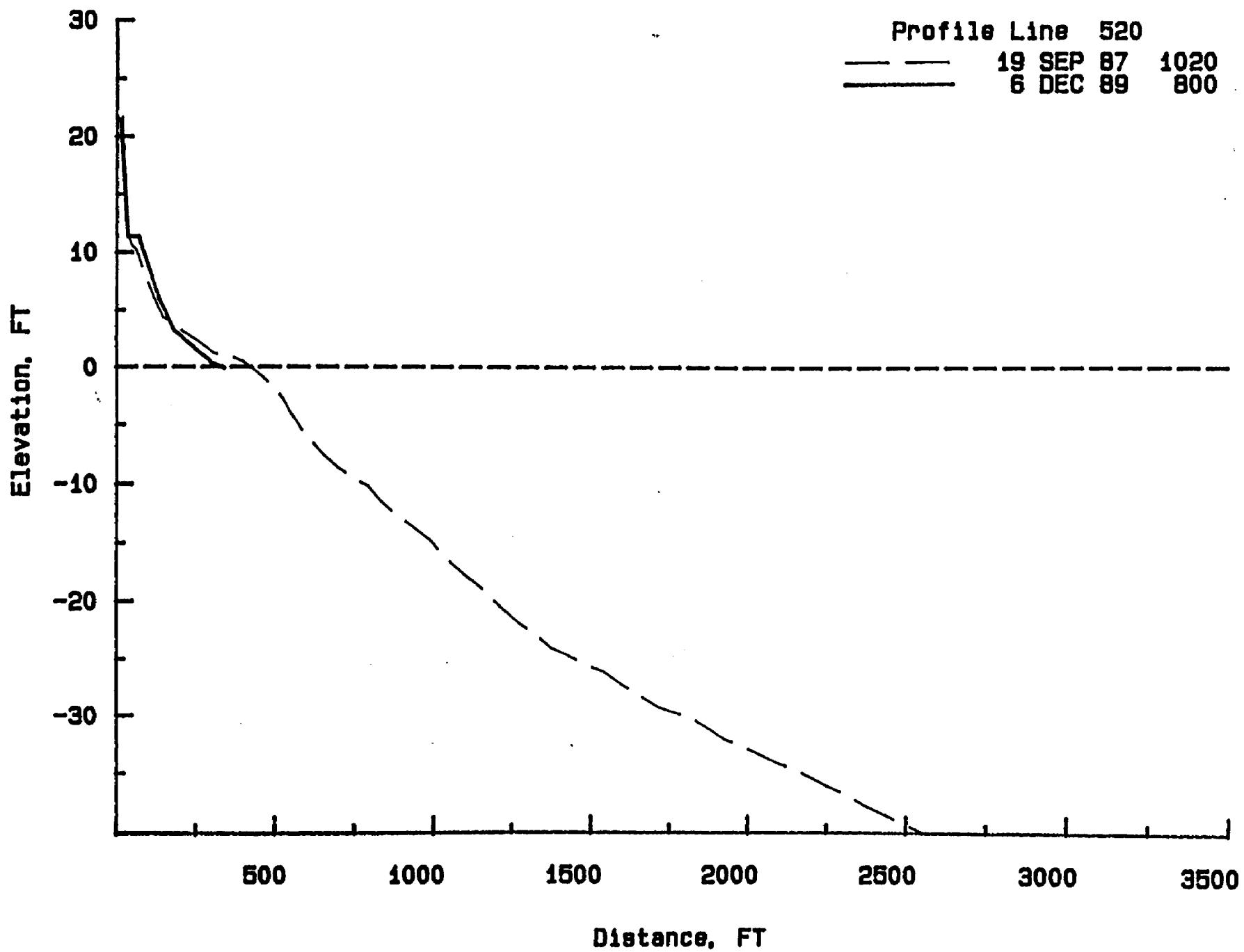


B-100

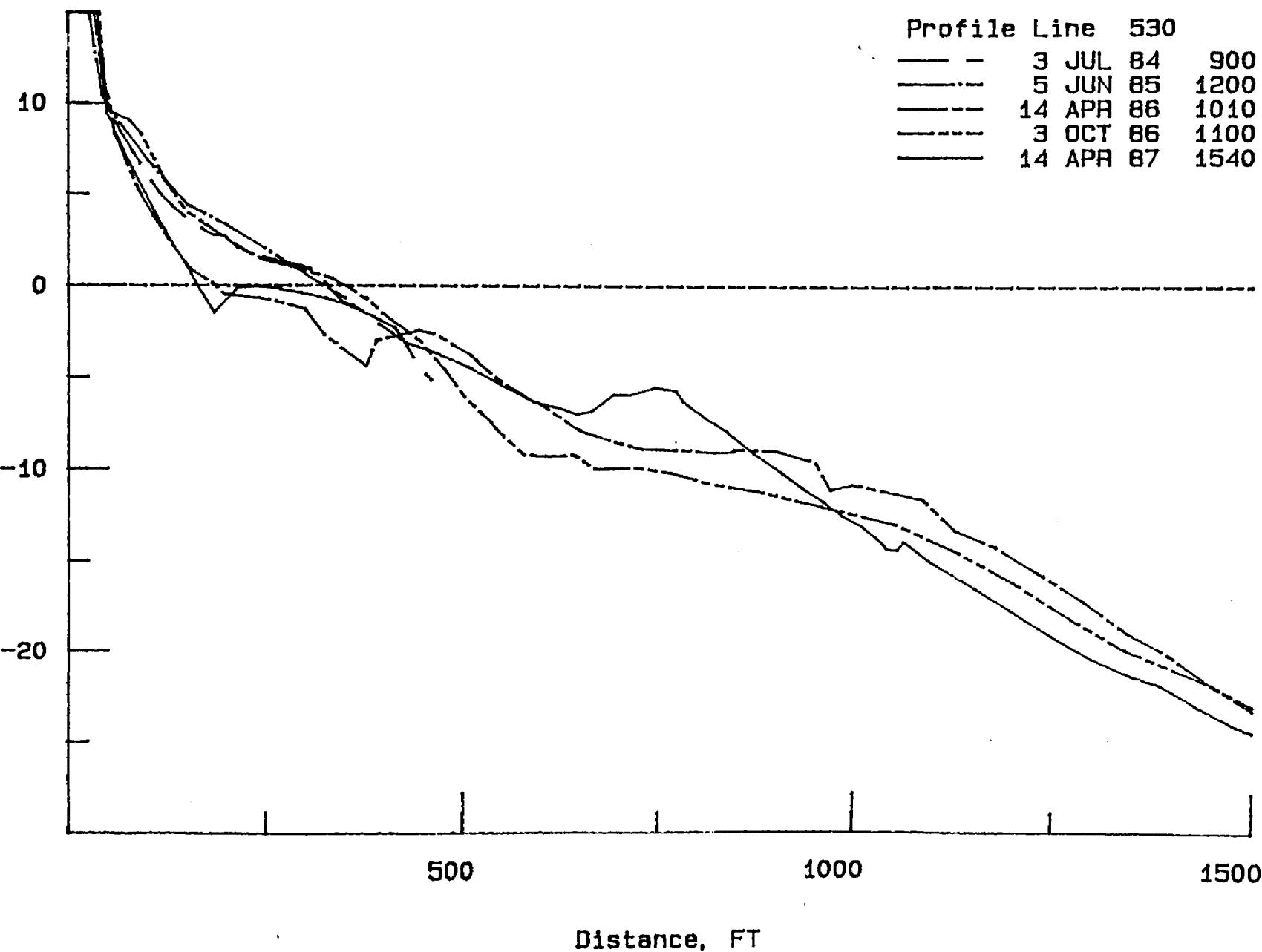


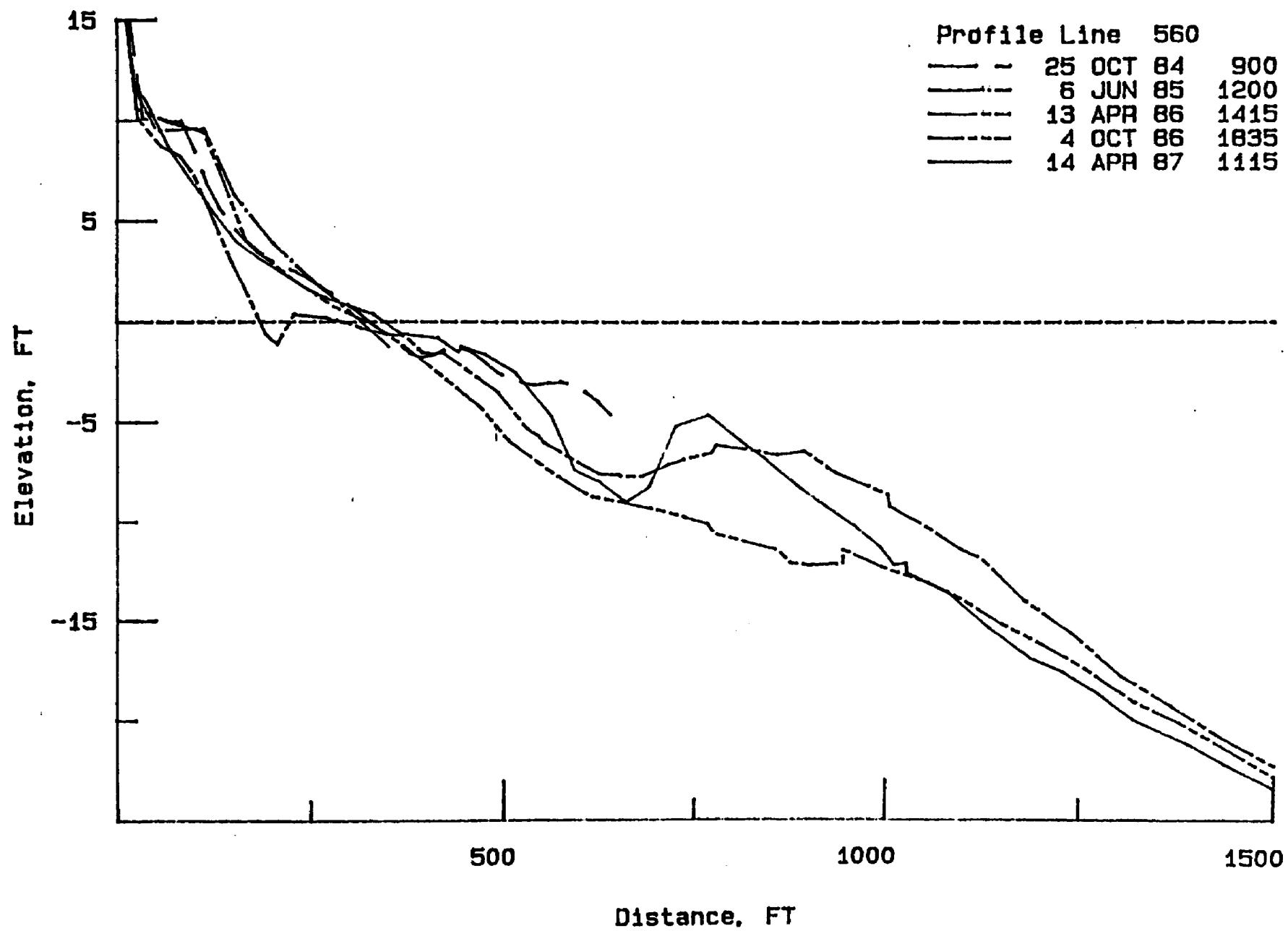


B-102

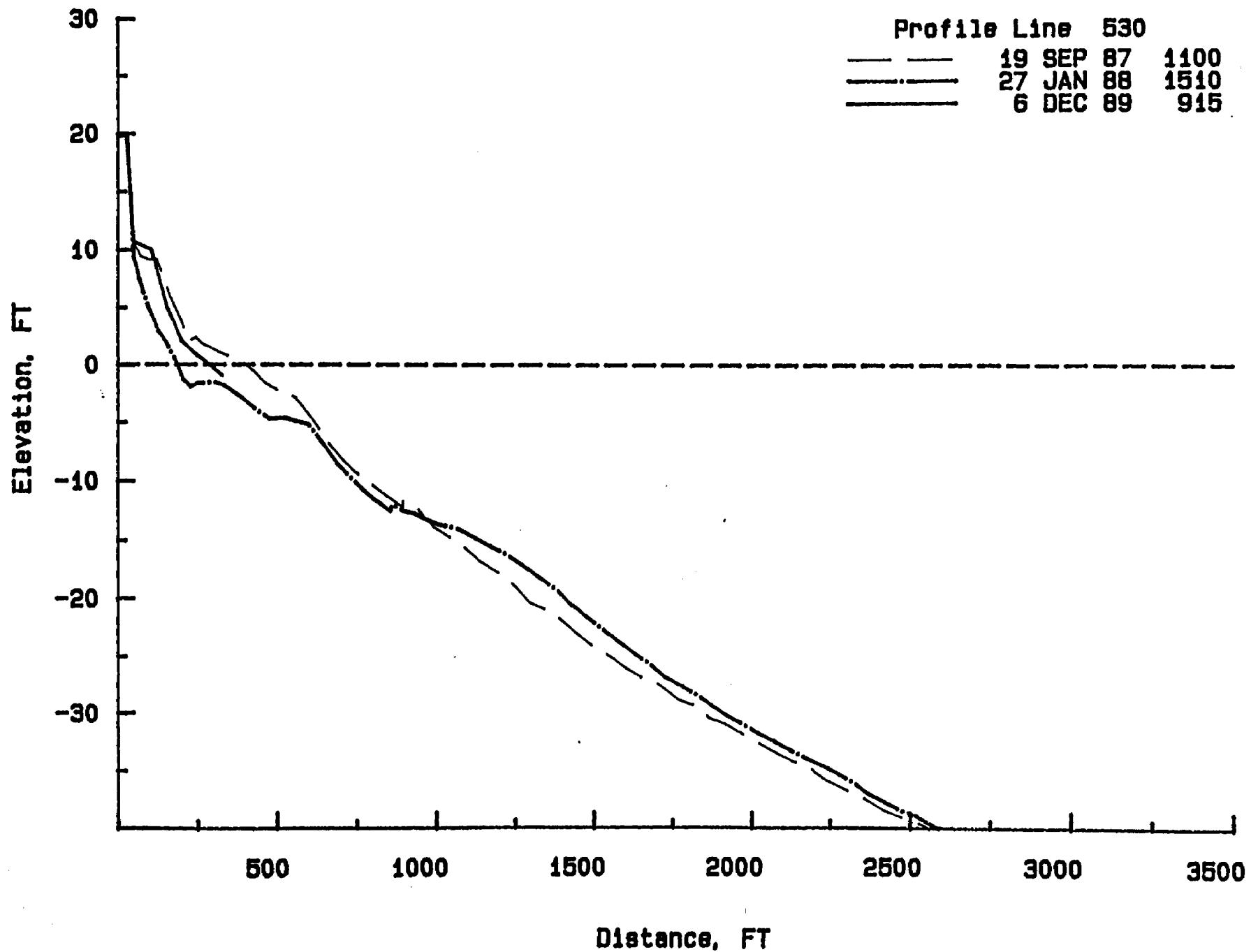


B-103

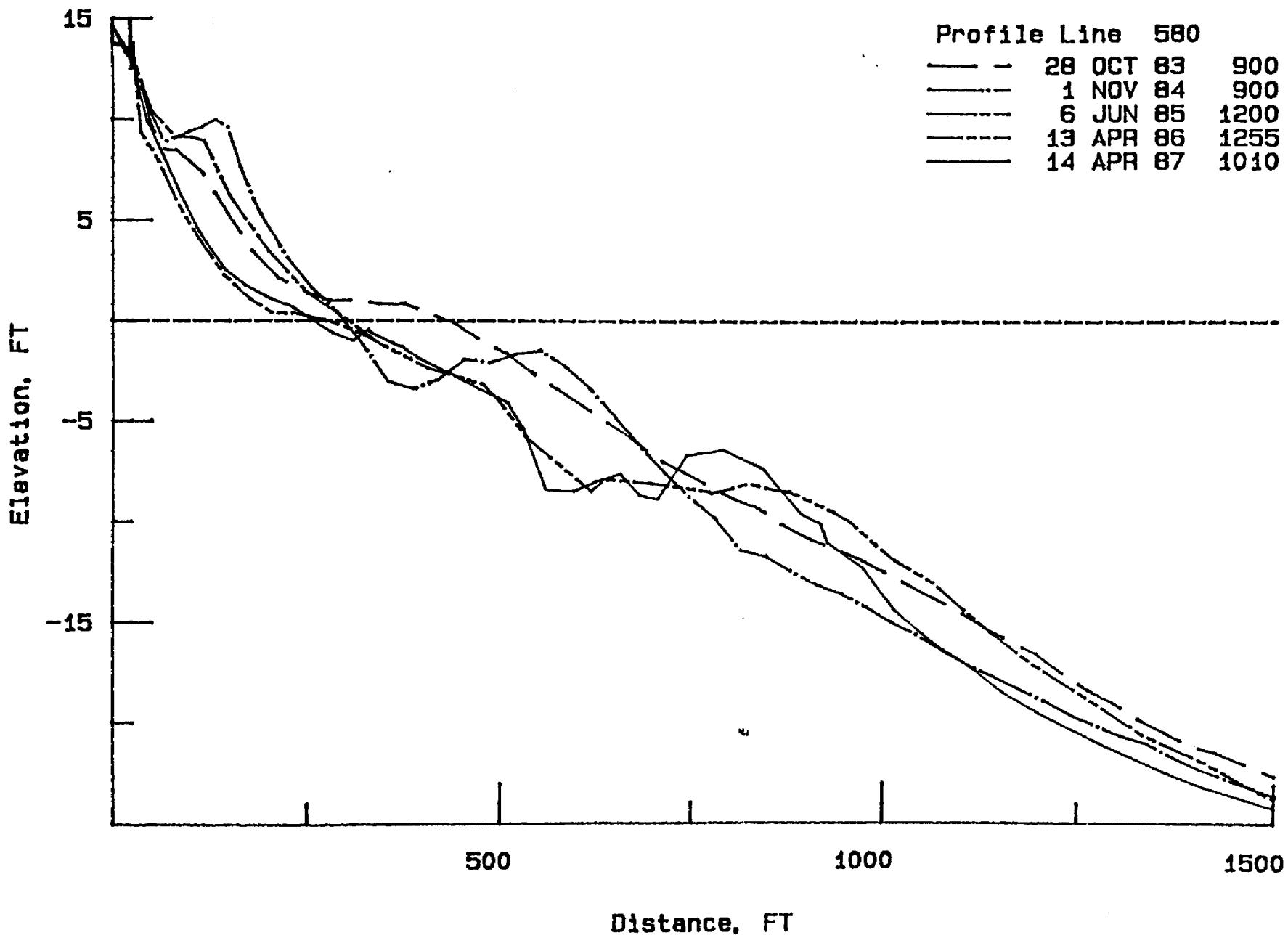




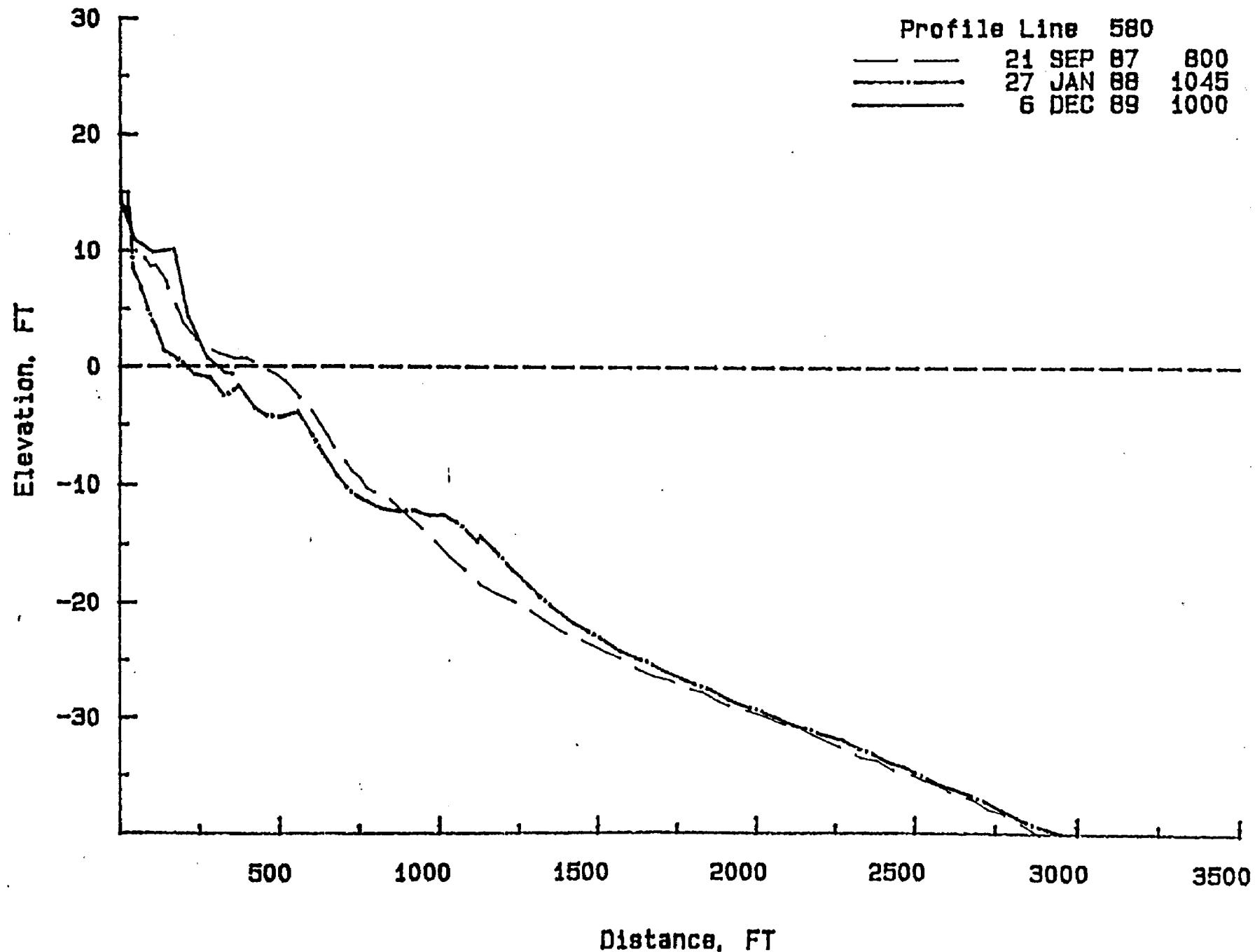
B-105



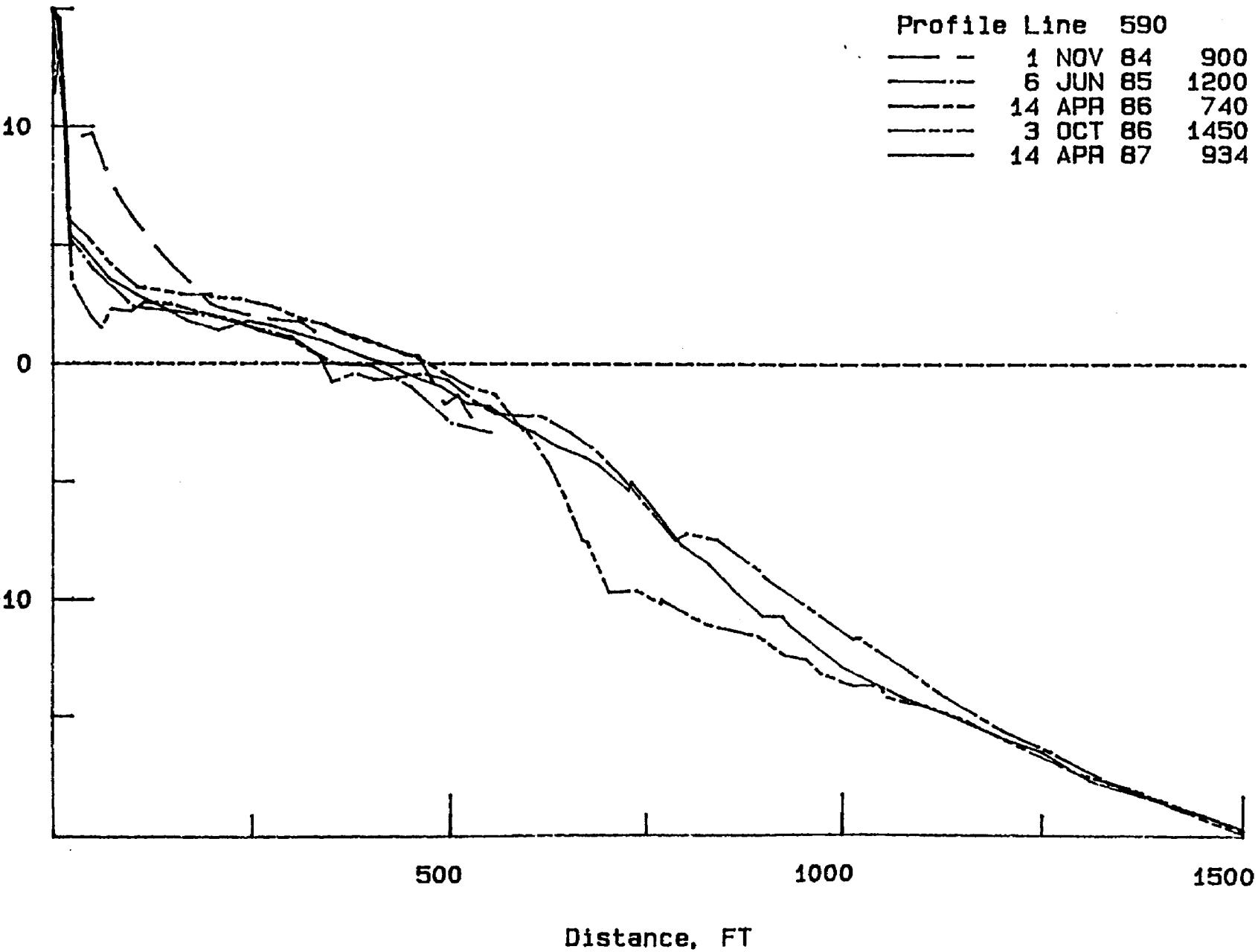
B-106

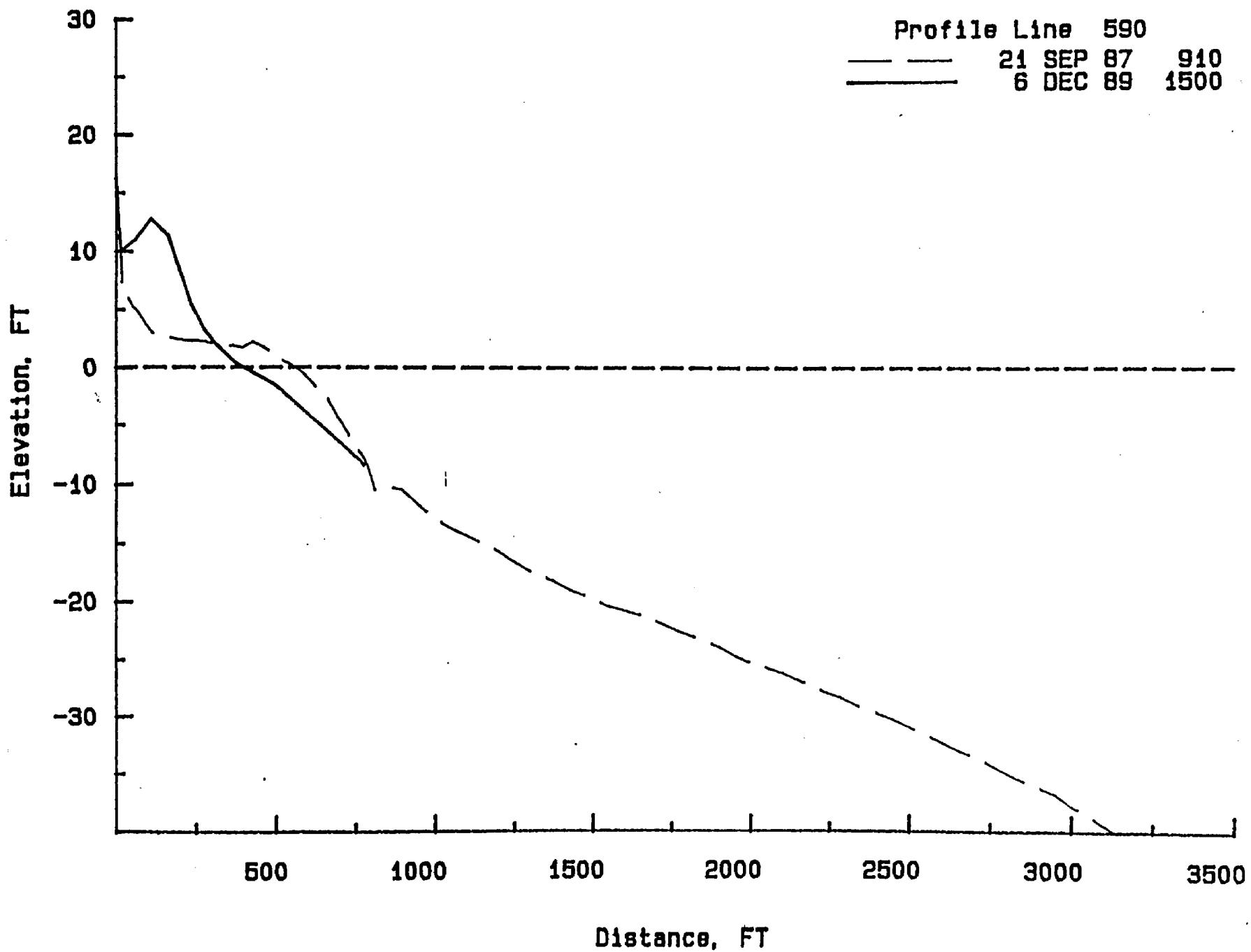


B-107

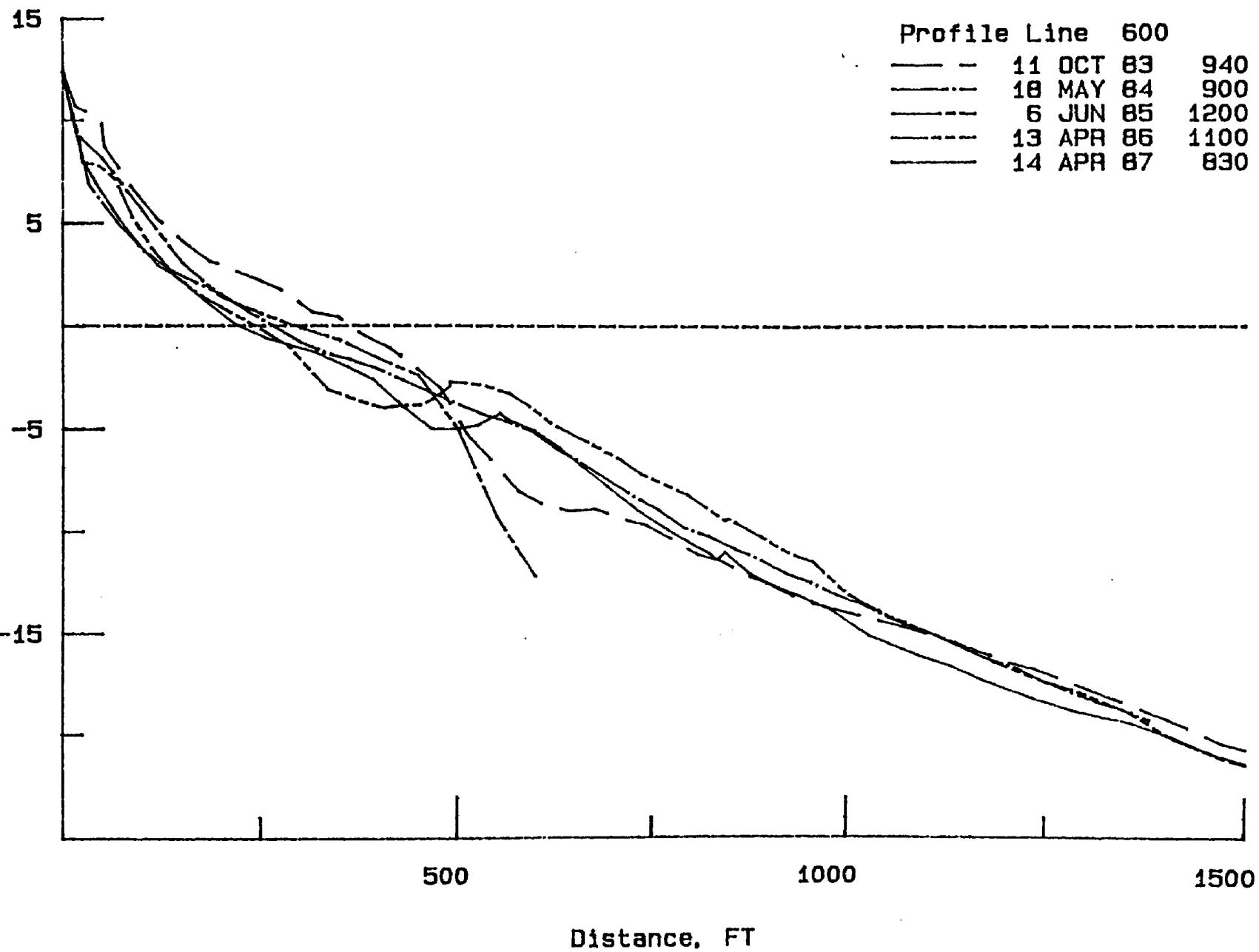


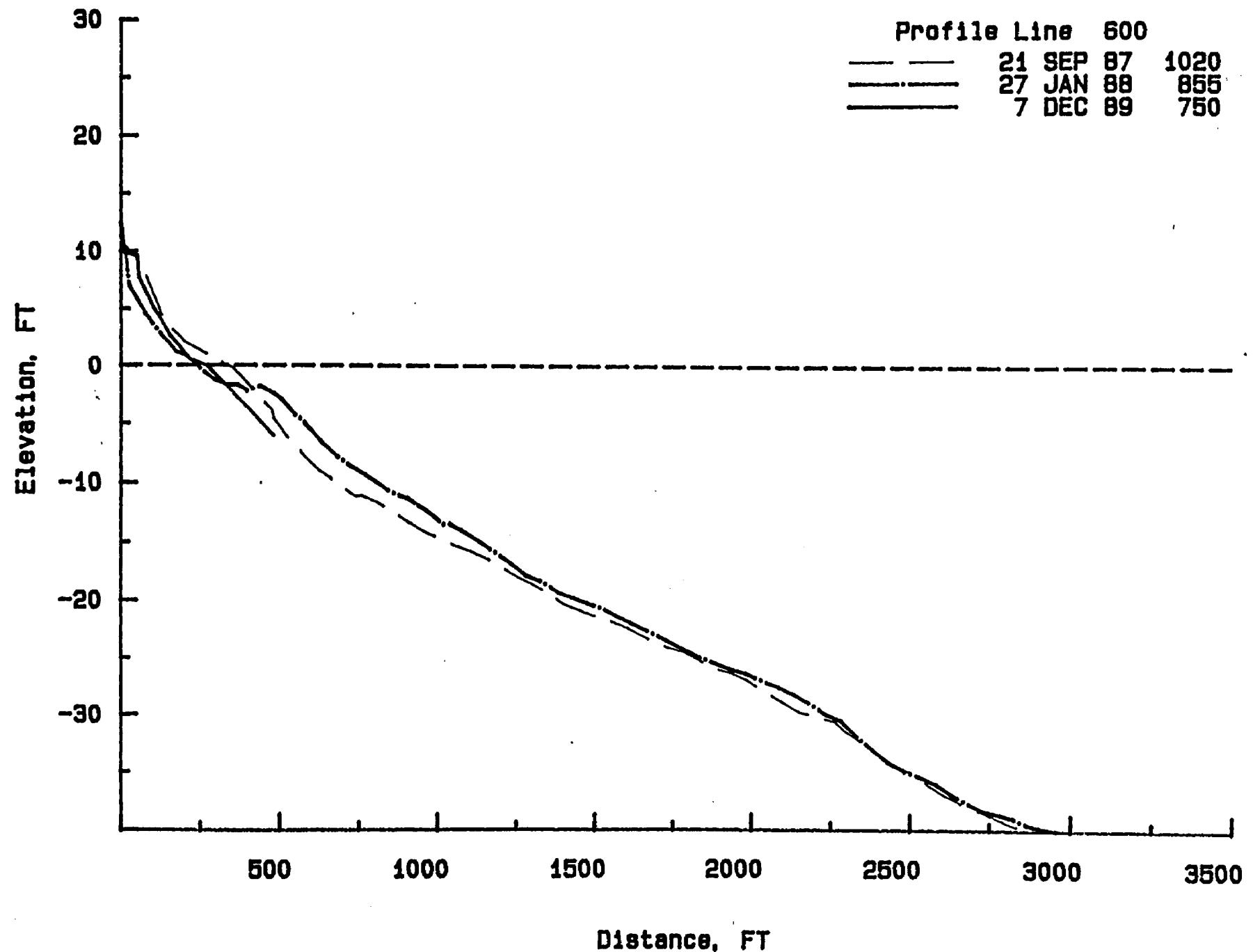
B-108

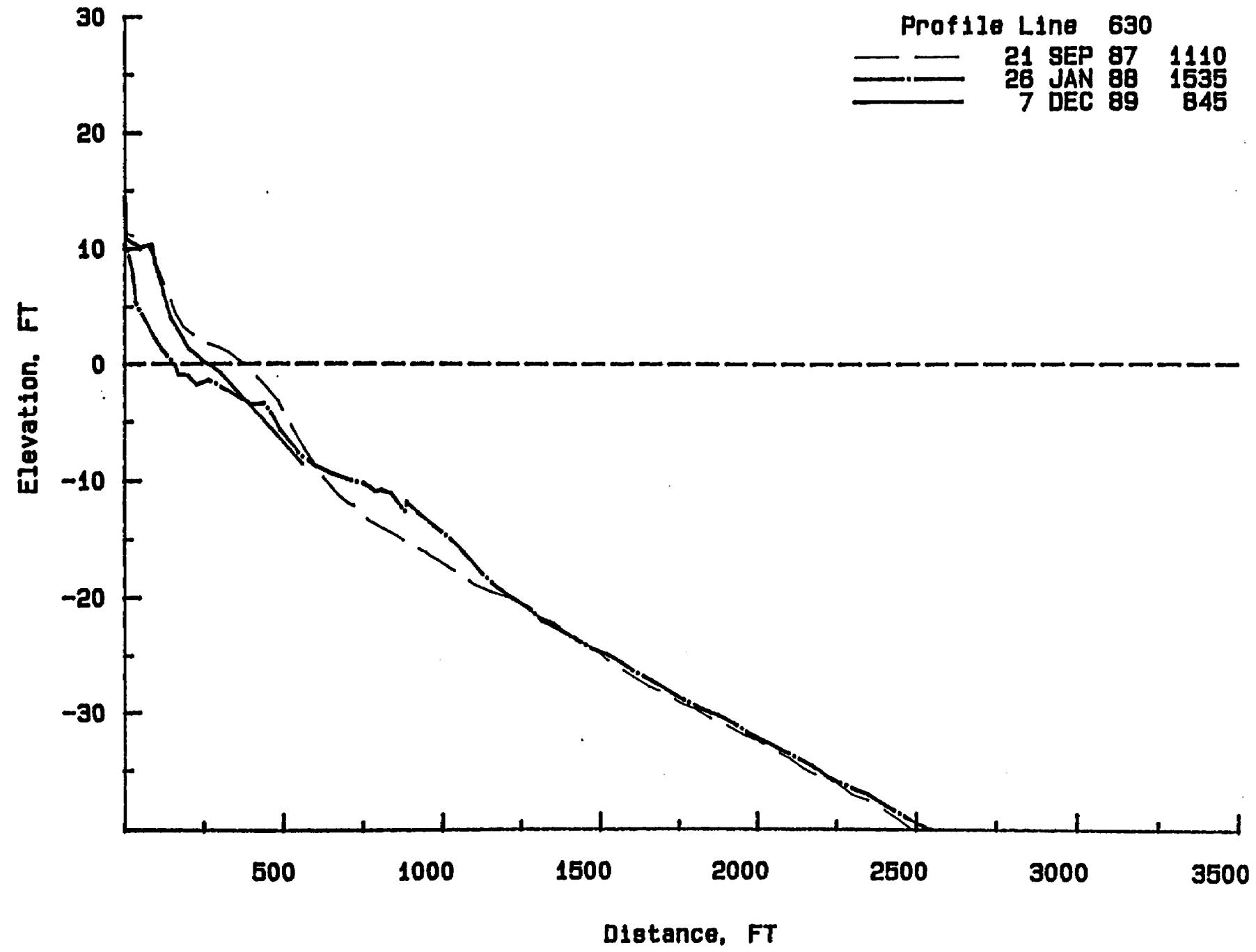


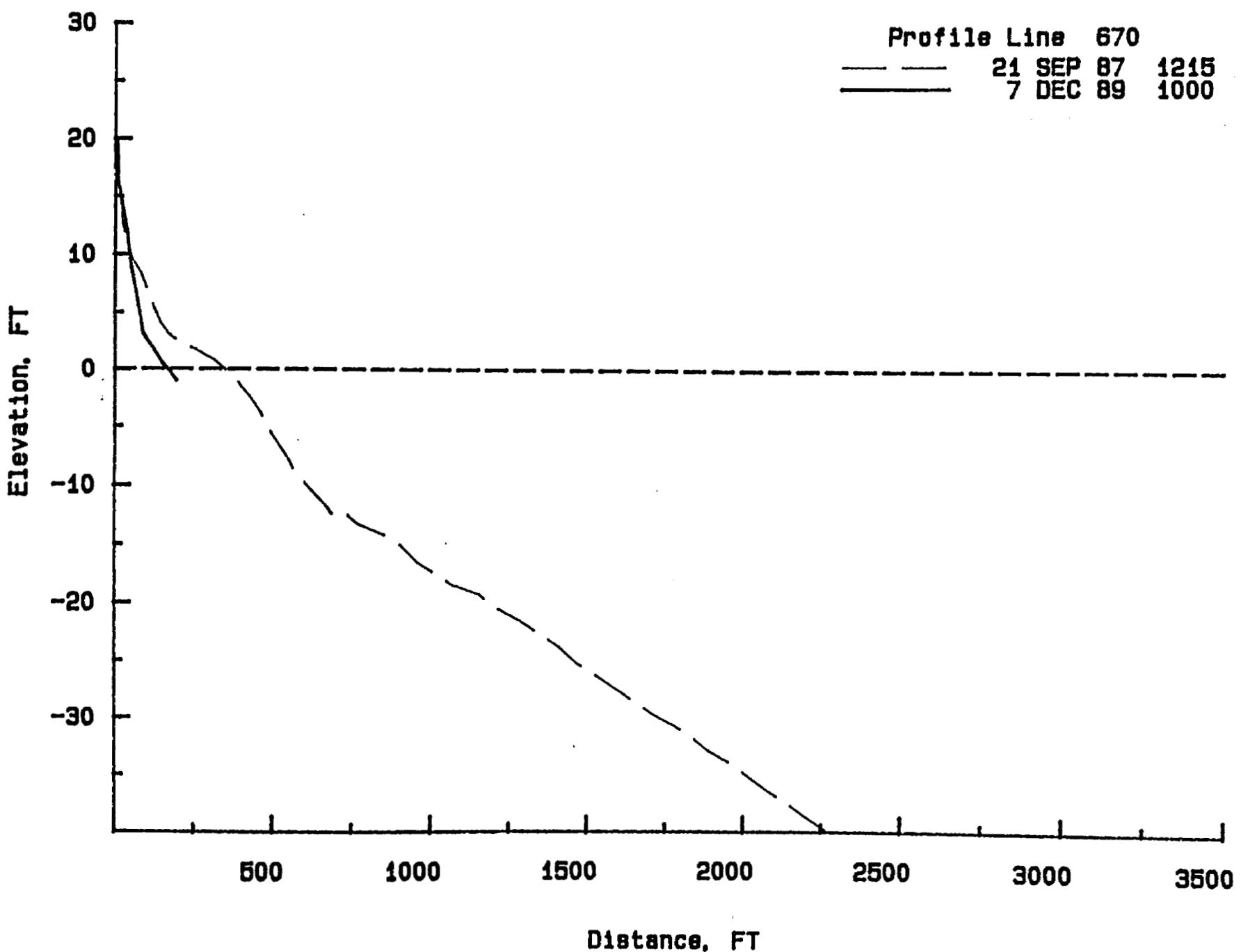


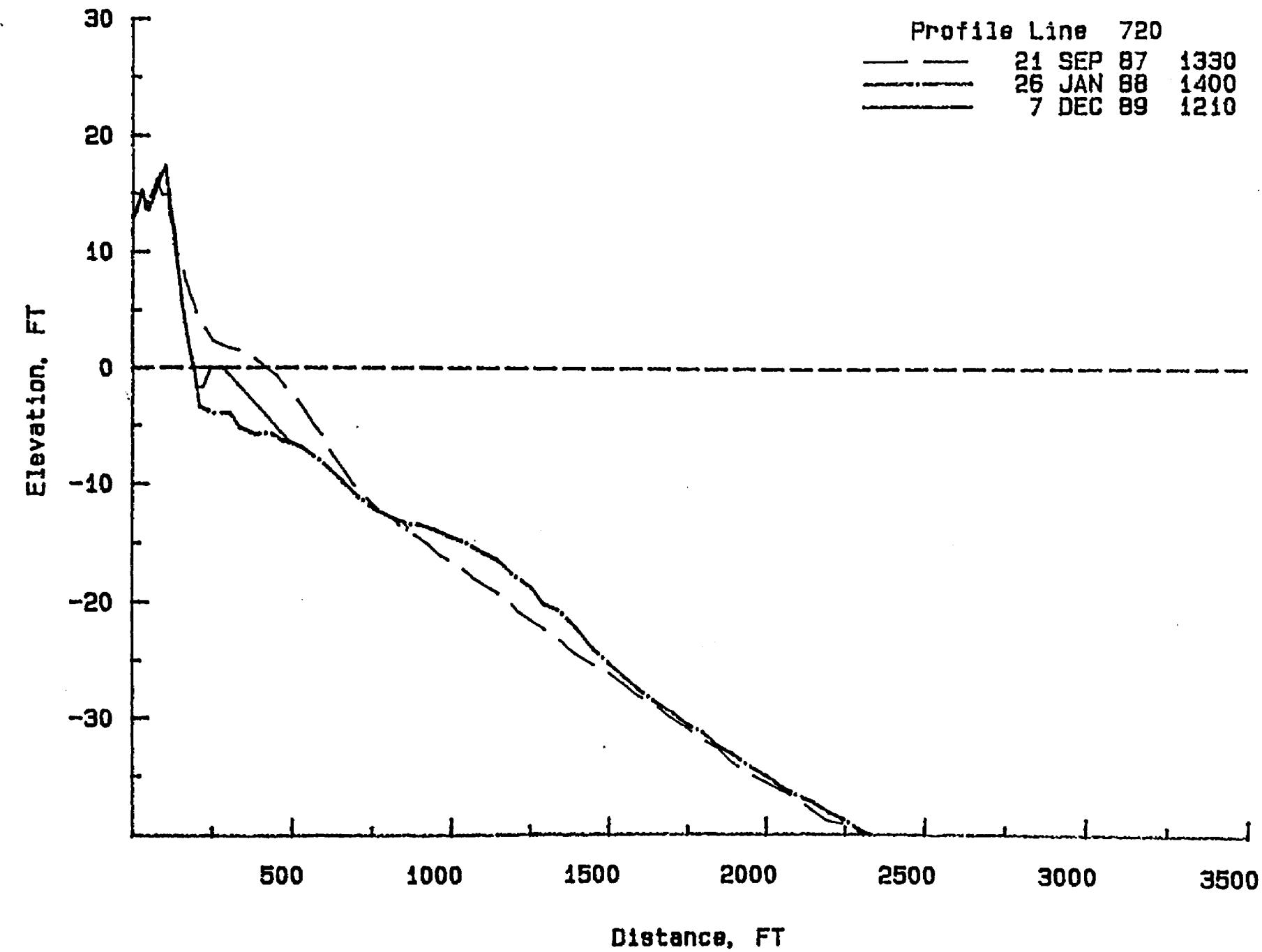
B-II-10



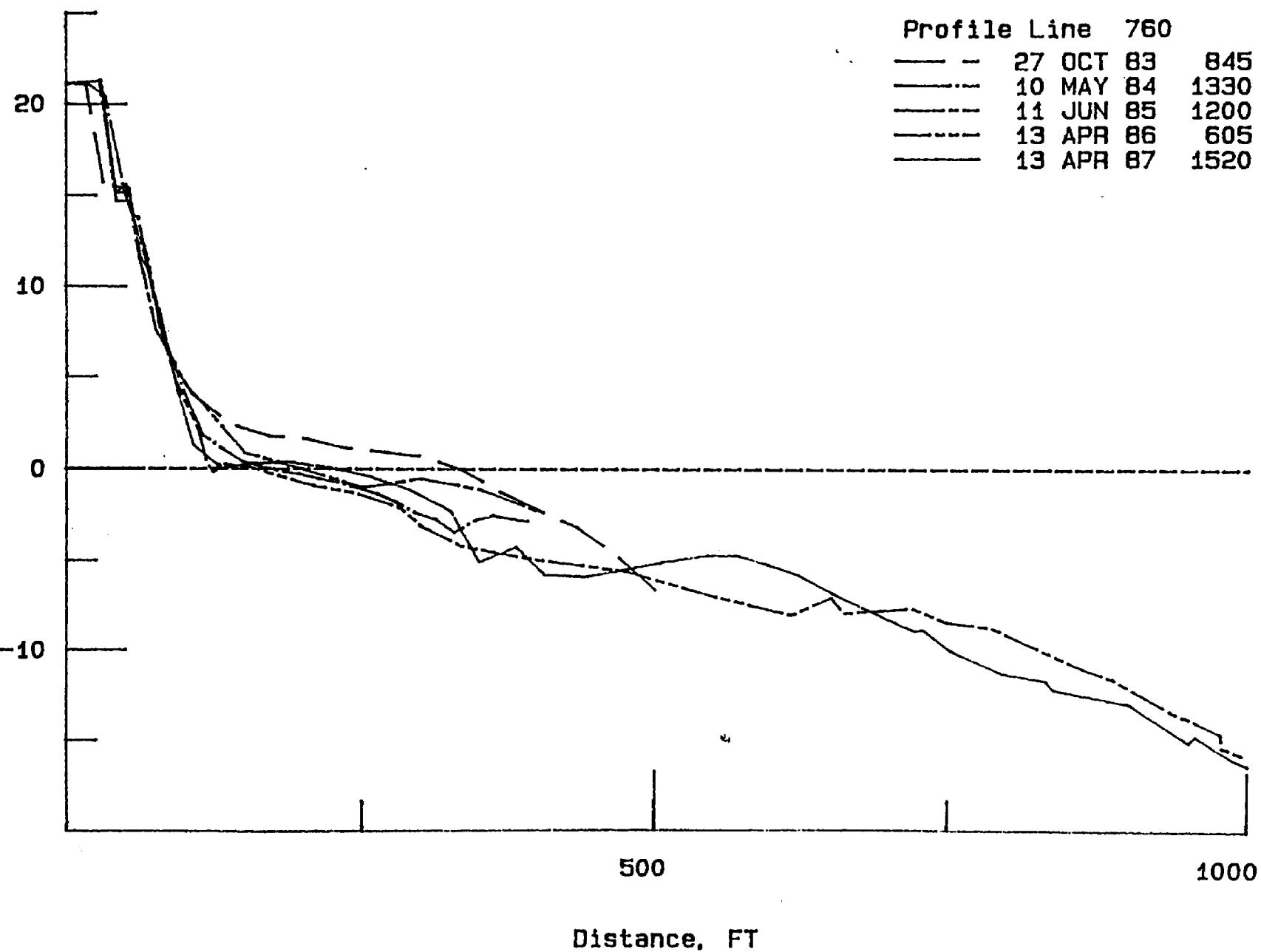




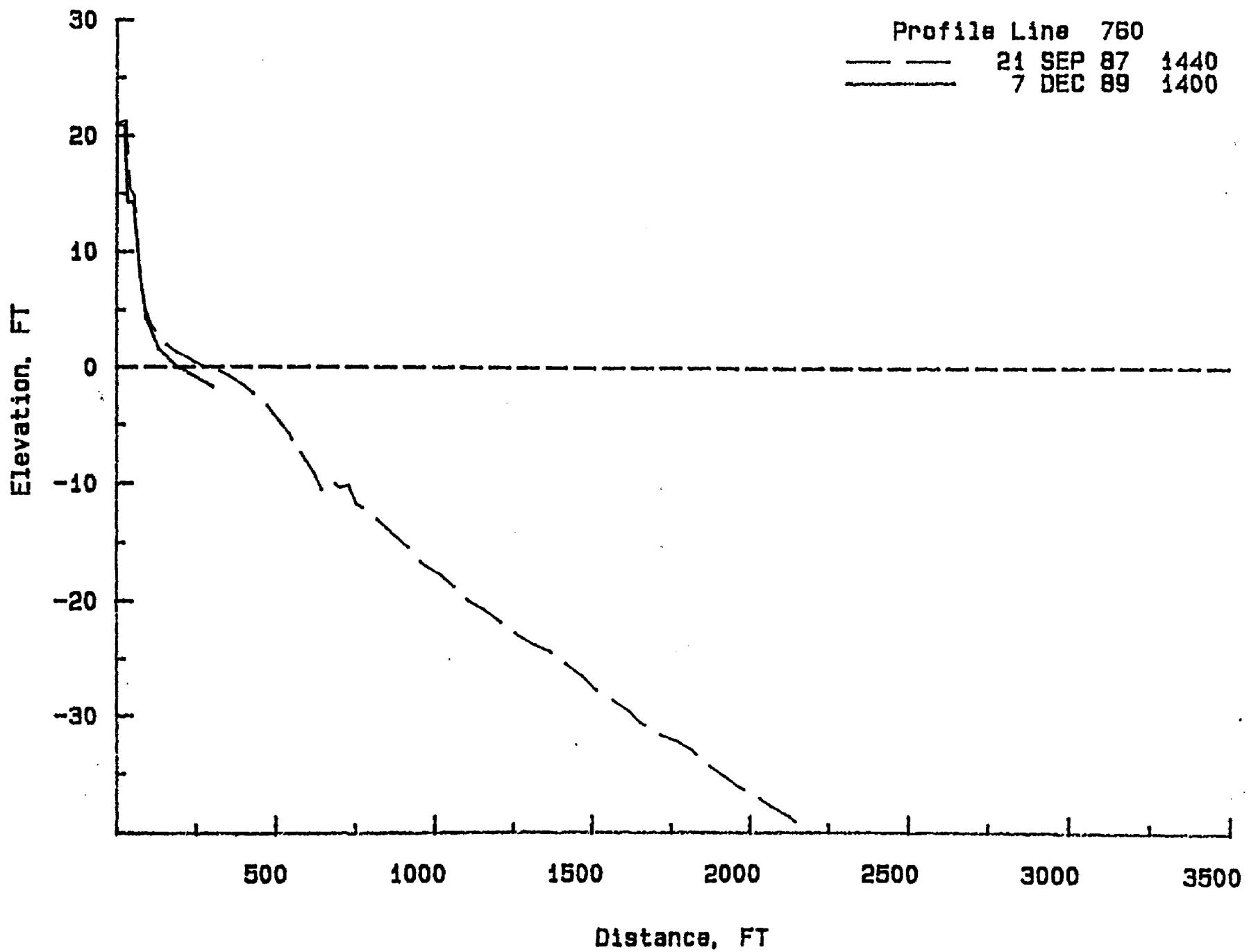


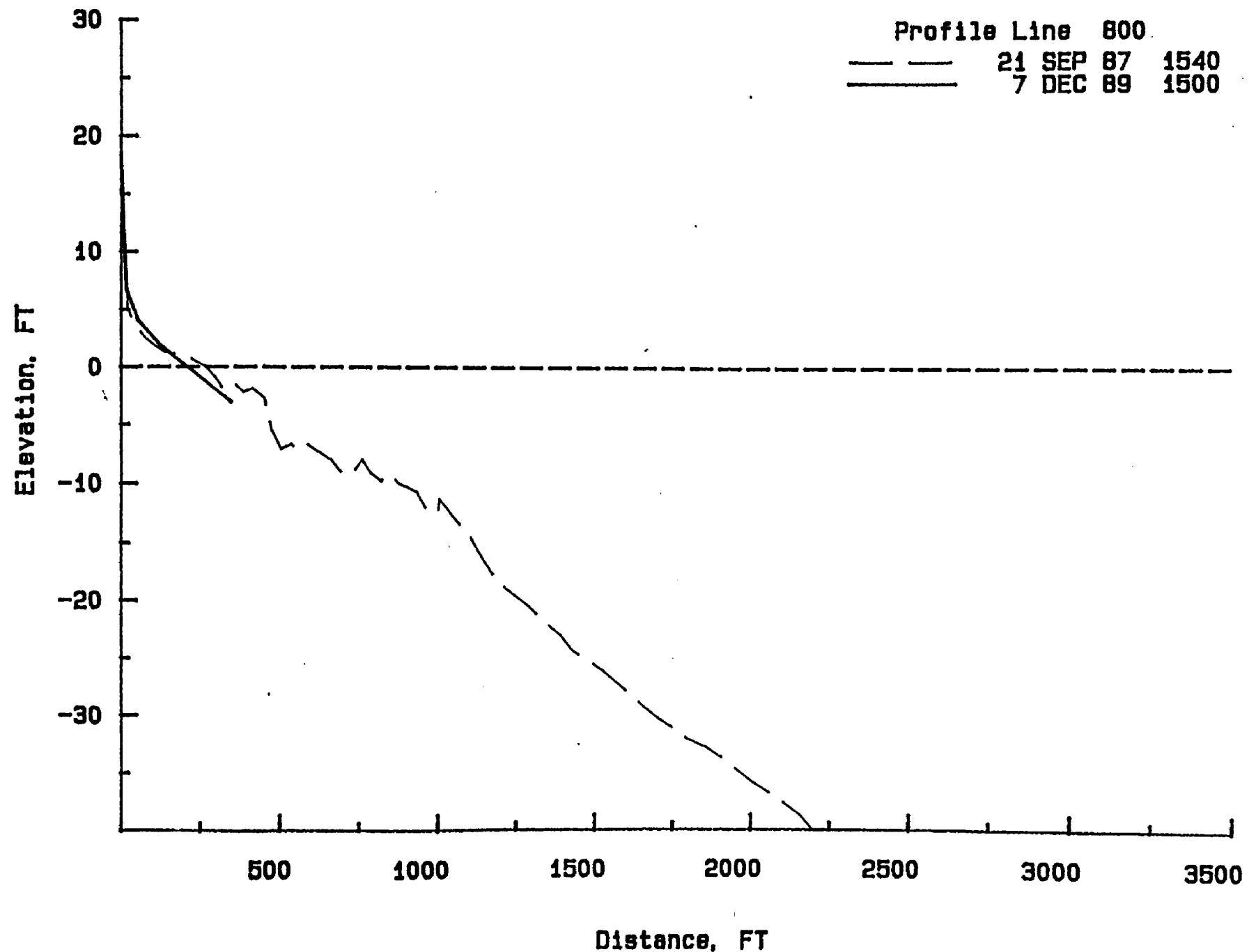


STL-B

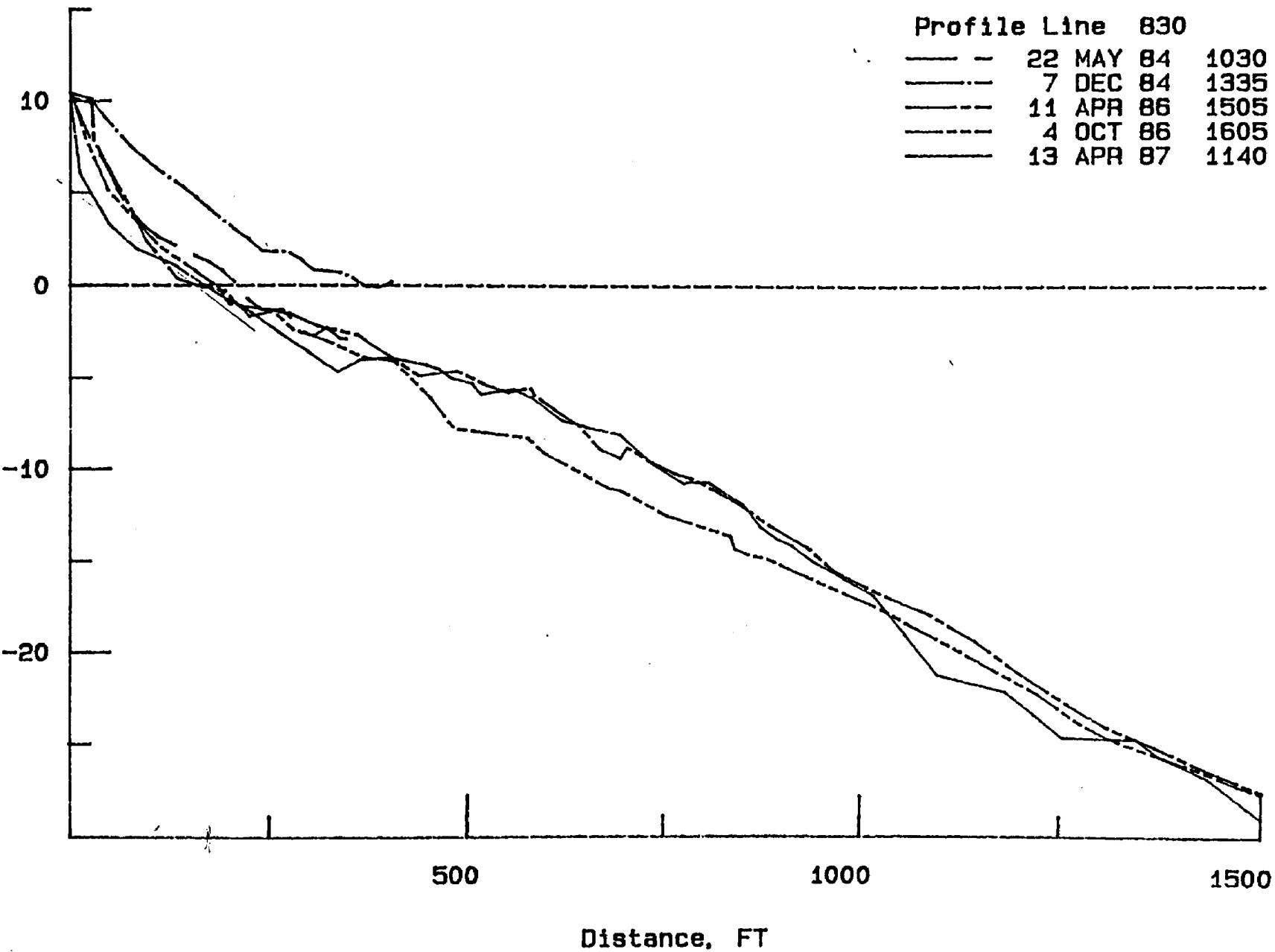


B-116

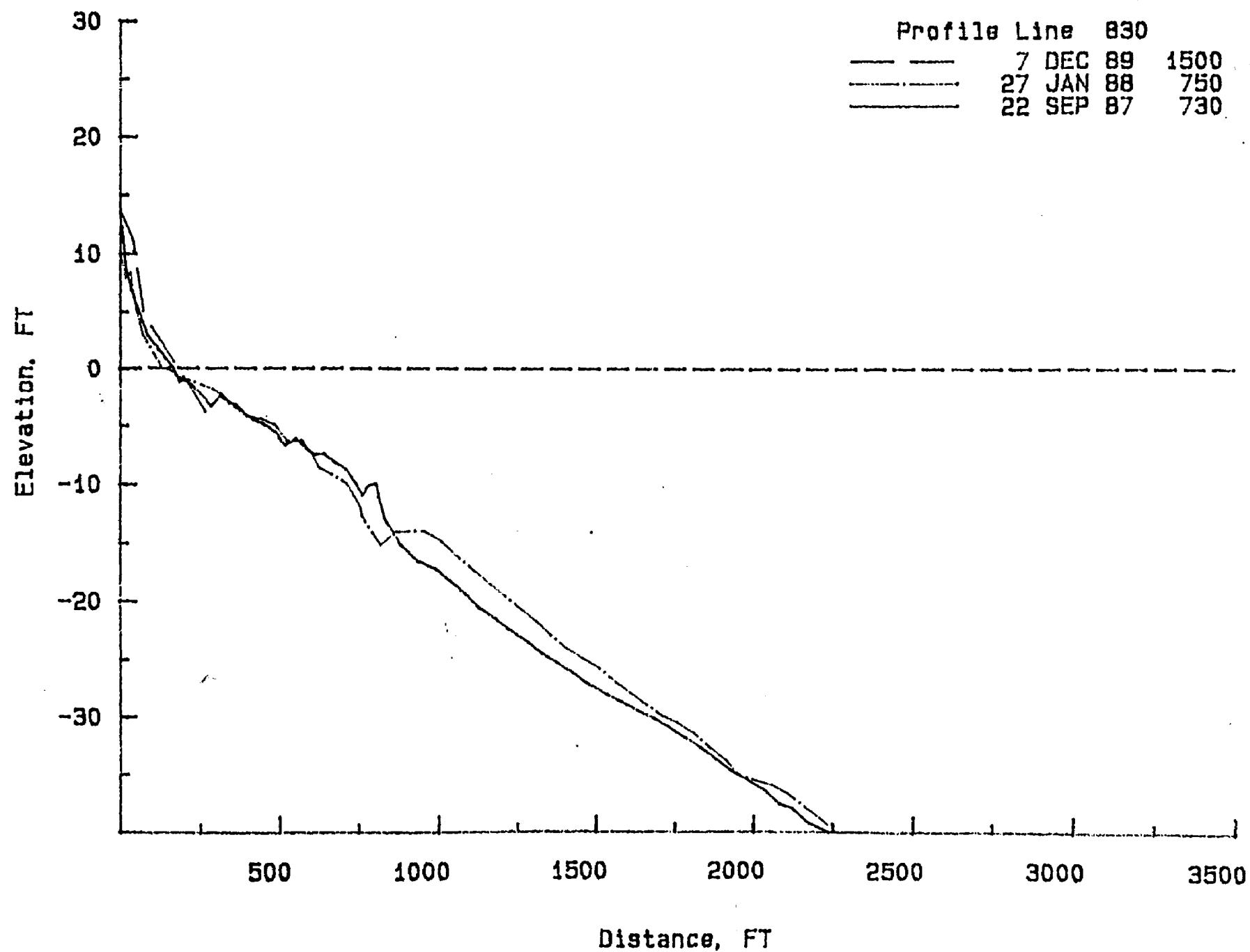




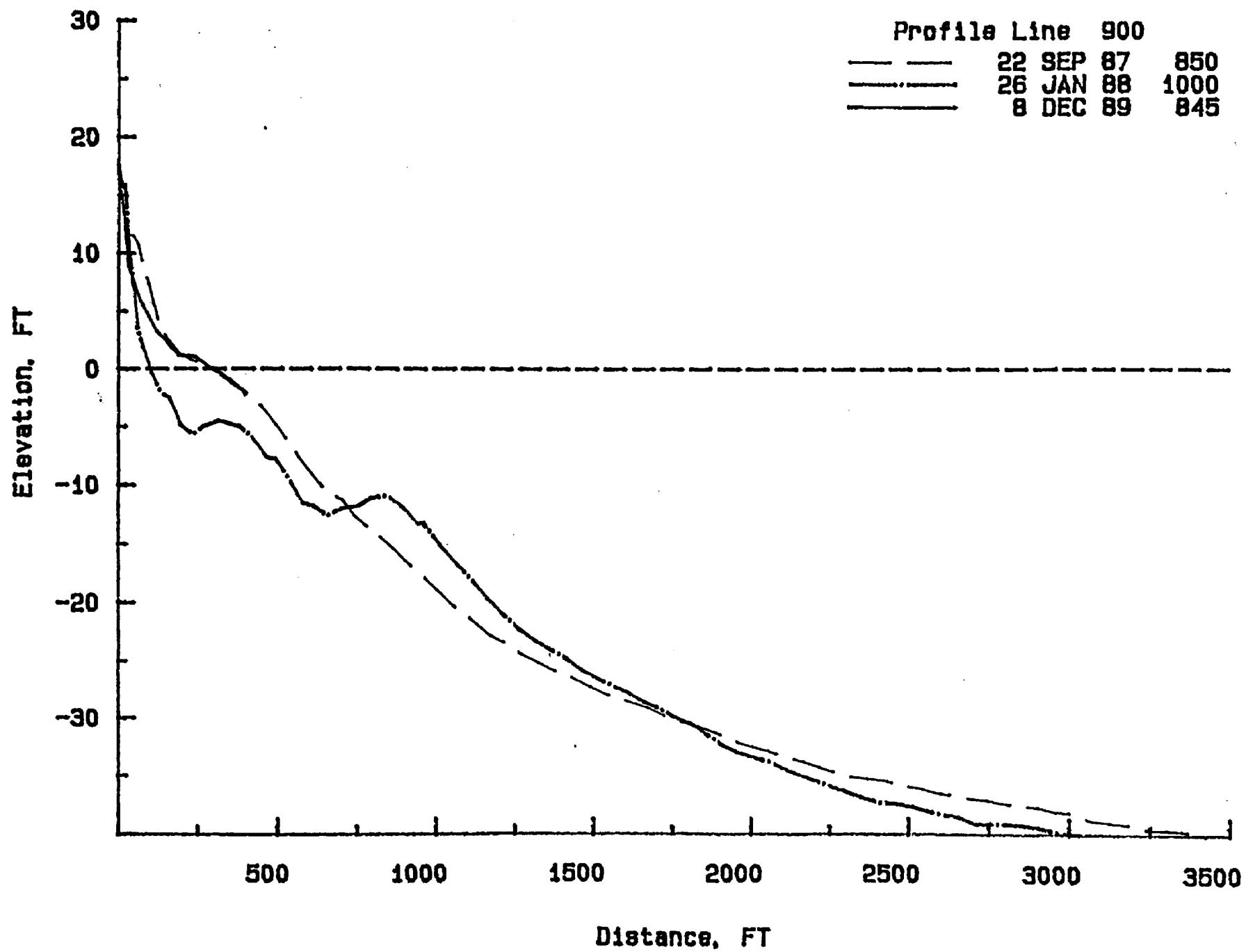
811-B

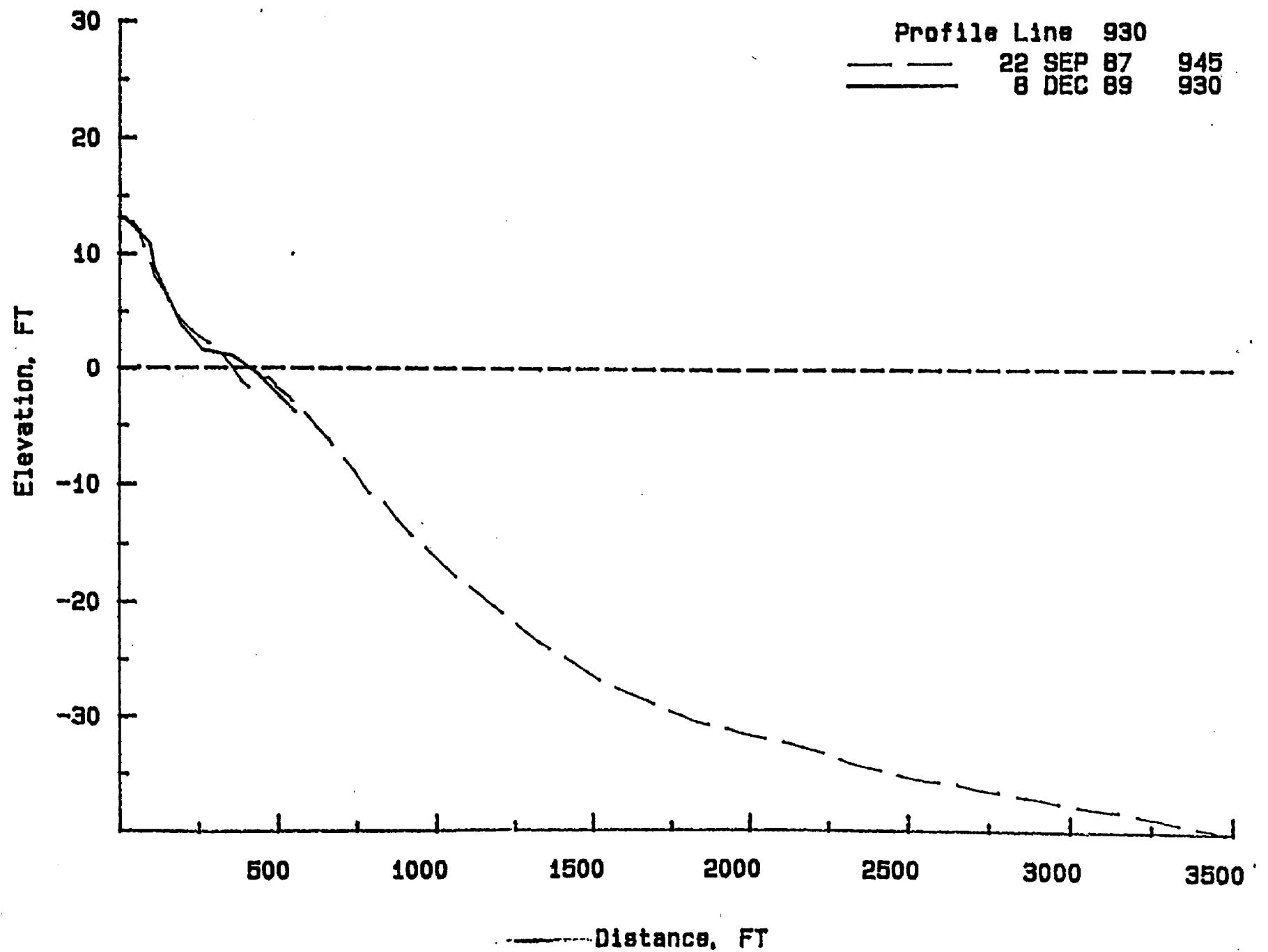


B-119

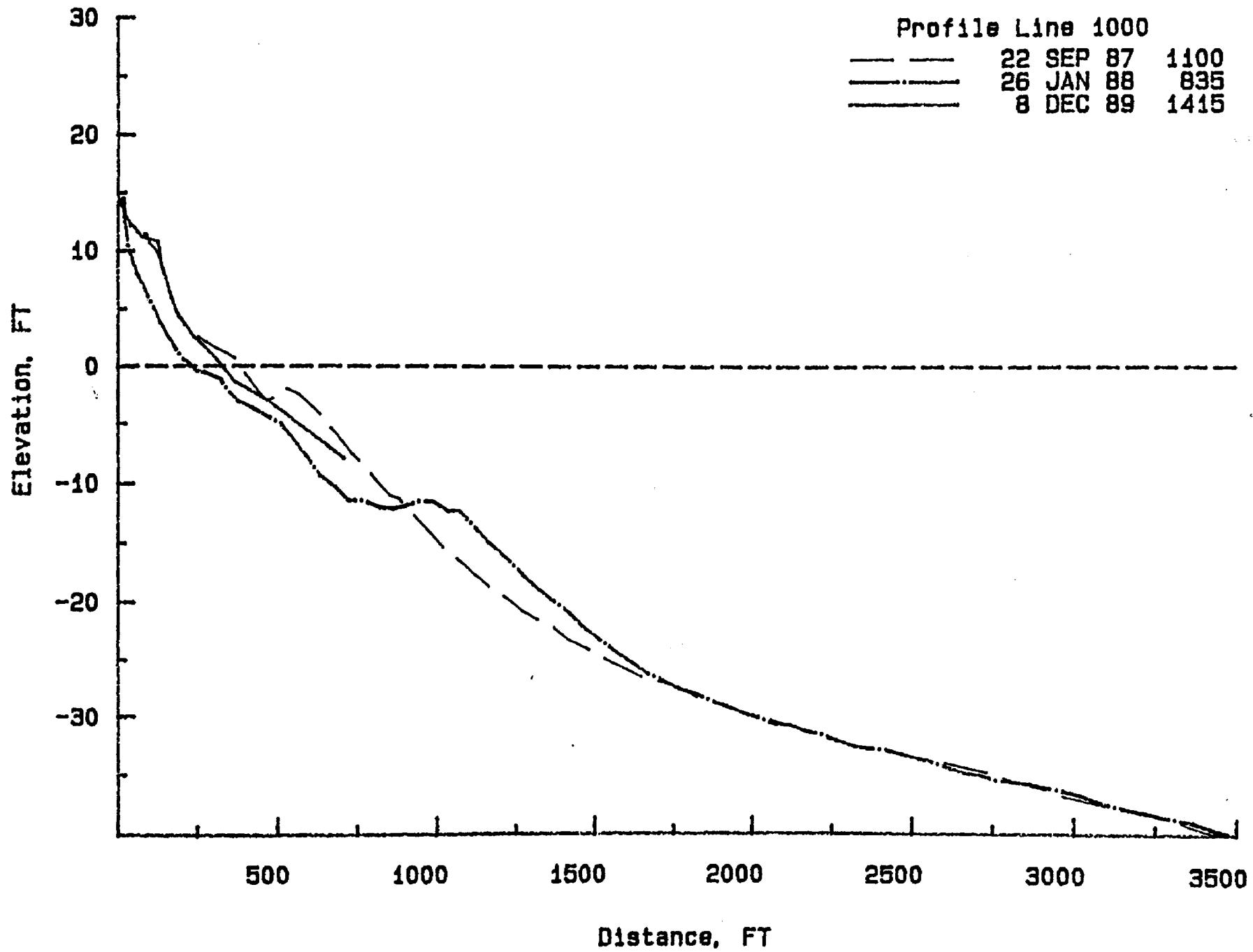


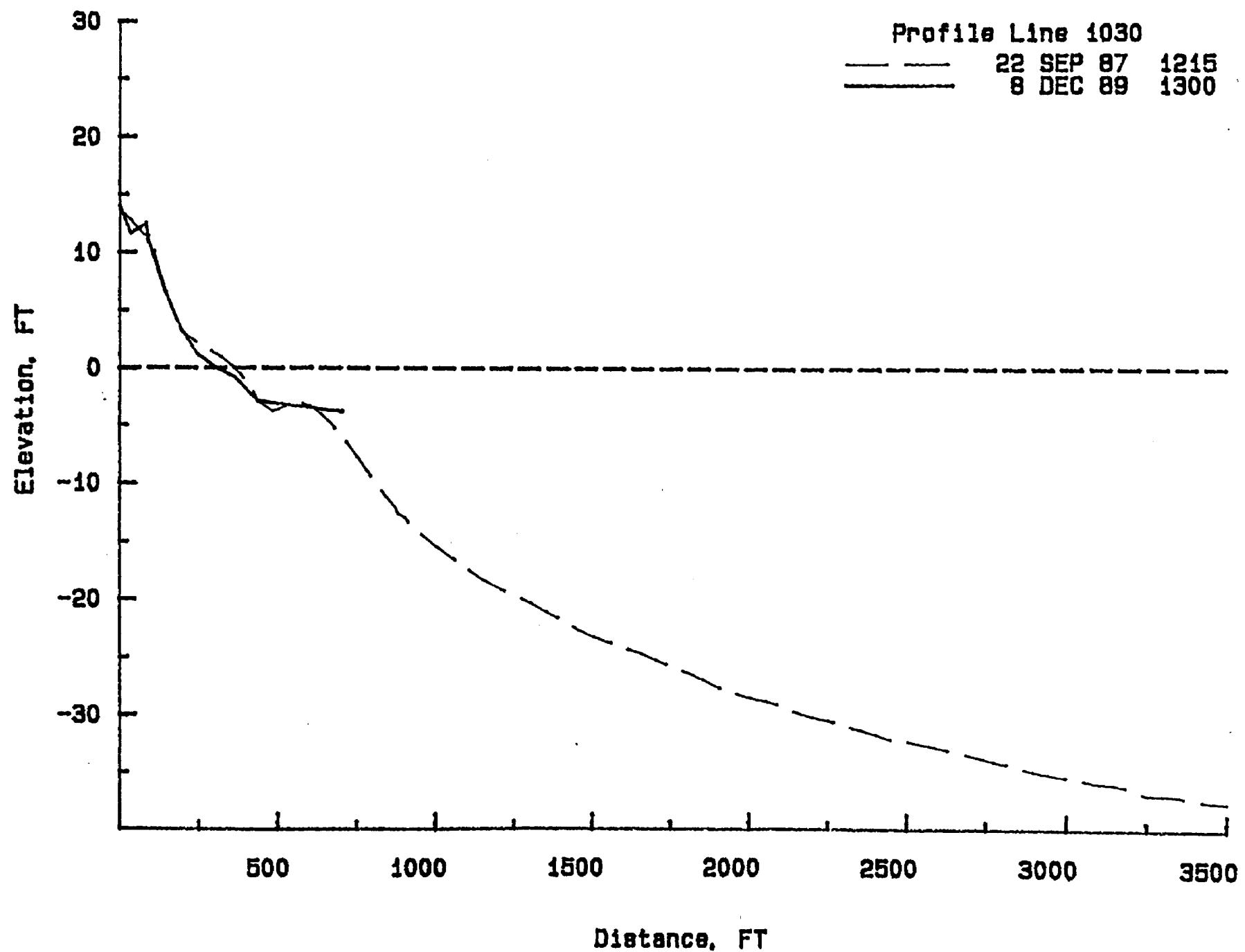
B-120



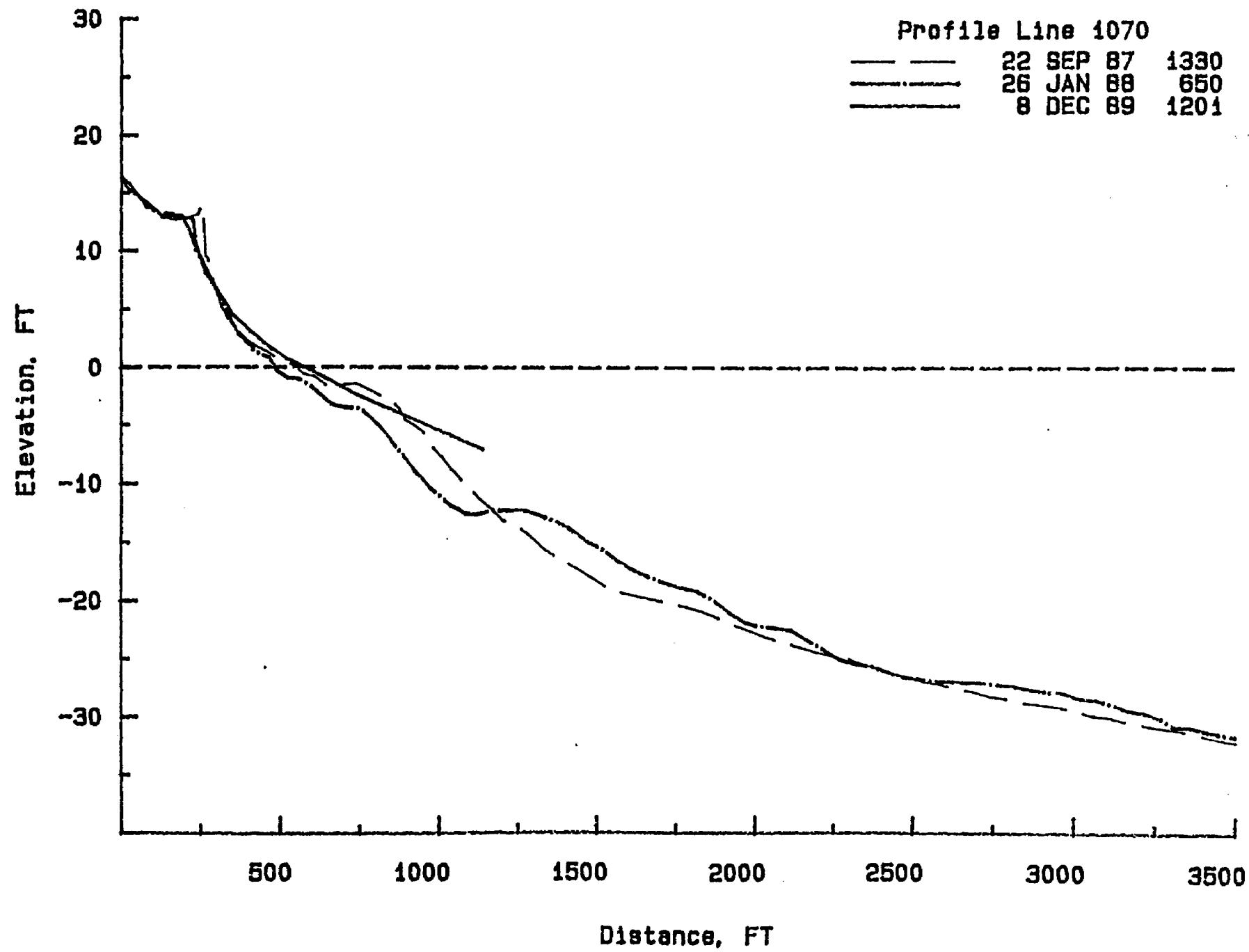


B-122

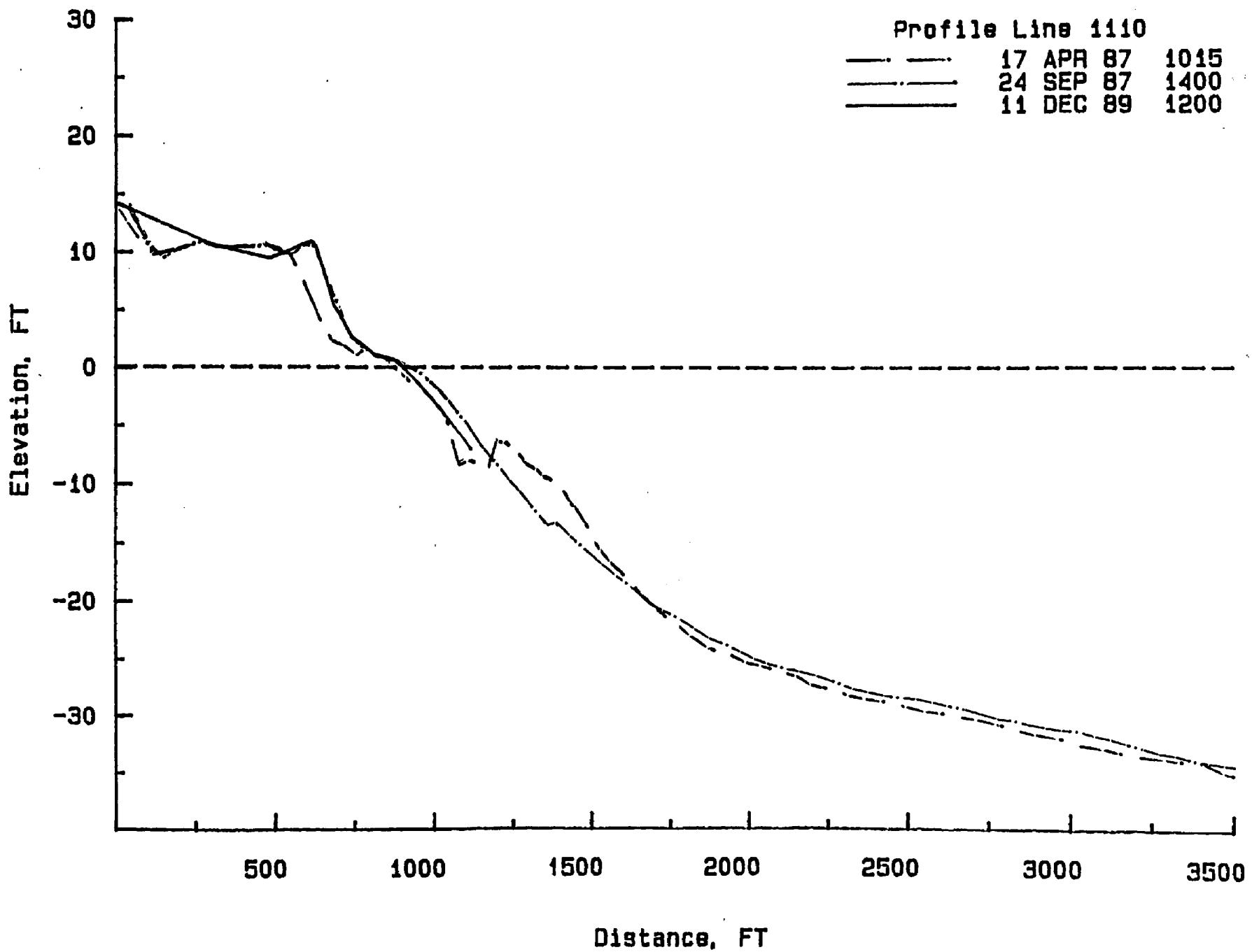




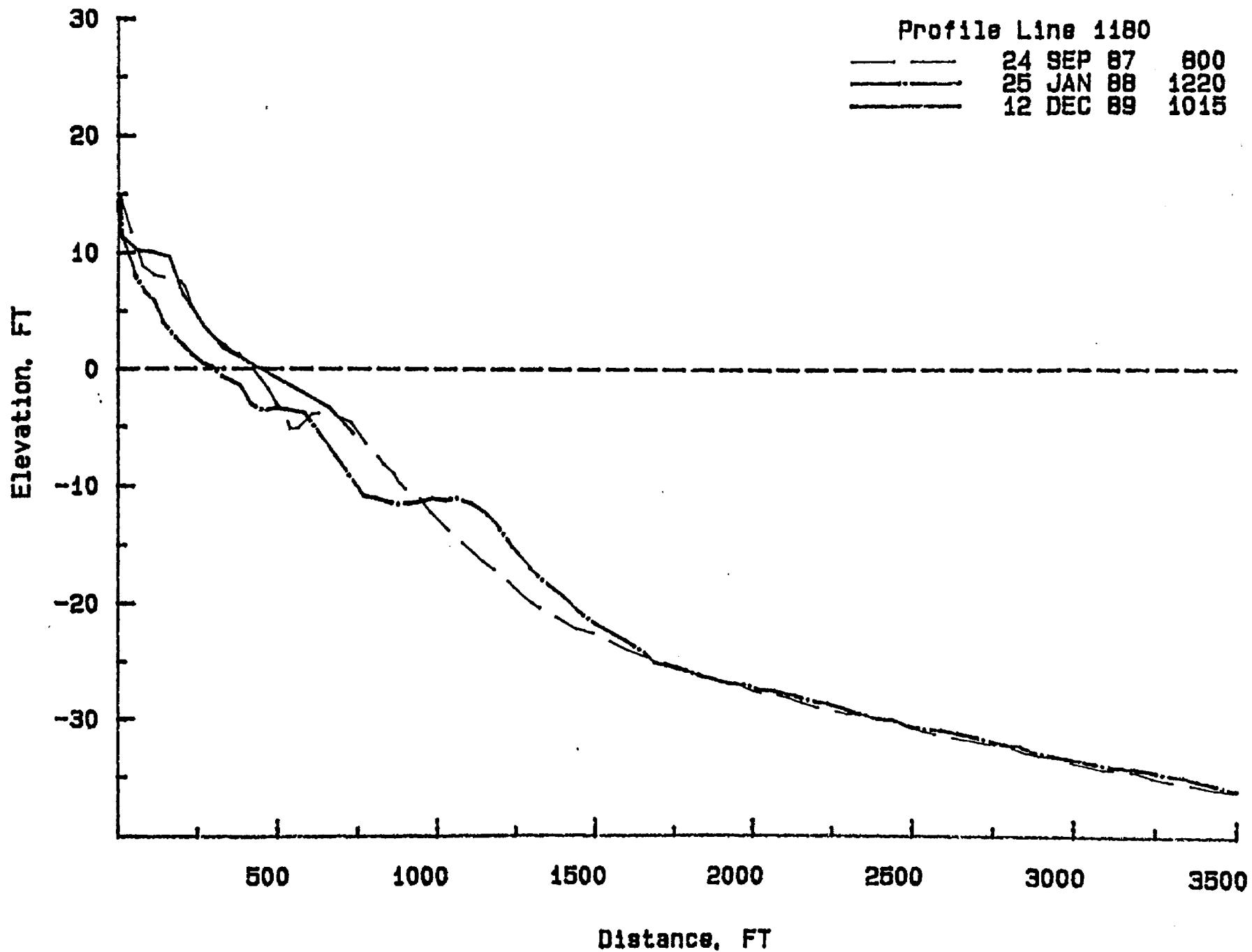
B-124



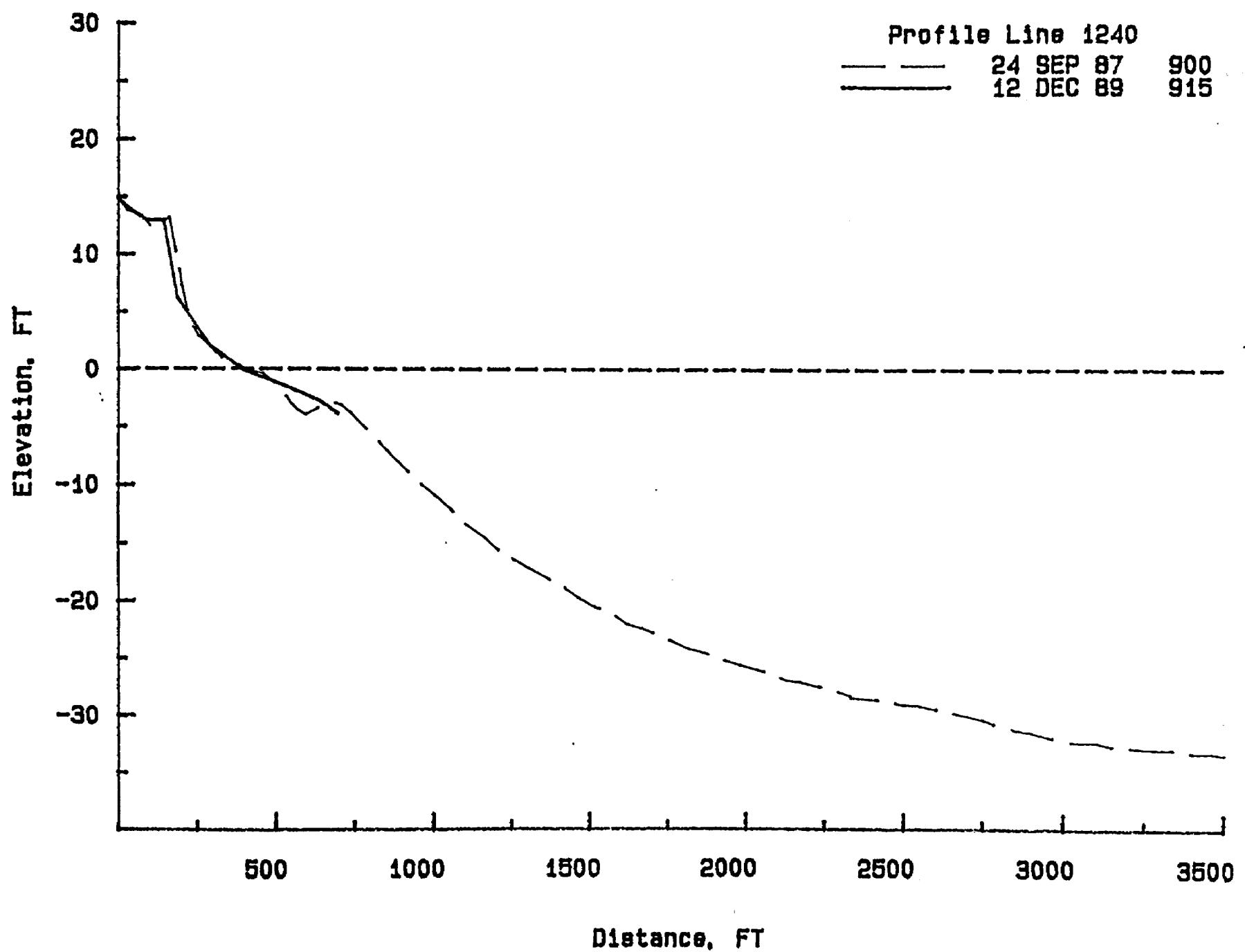
B-125



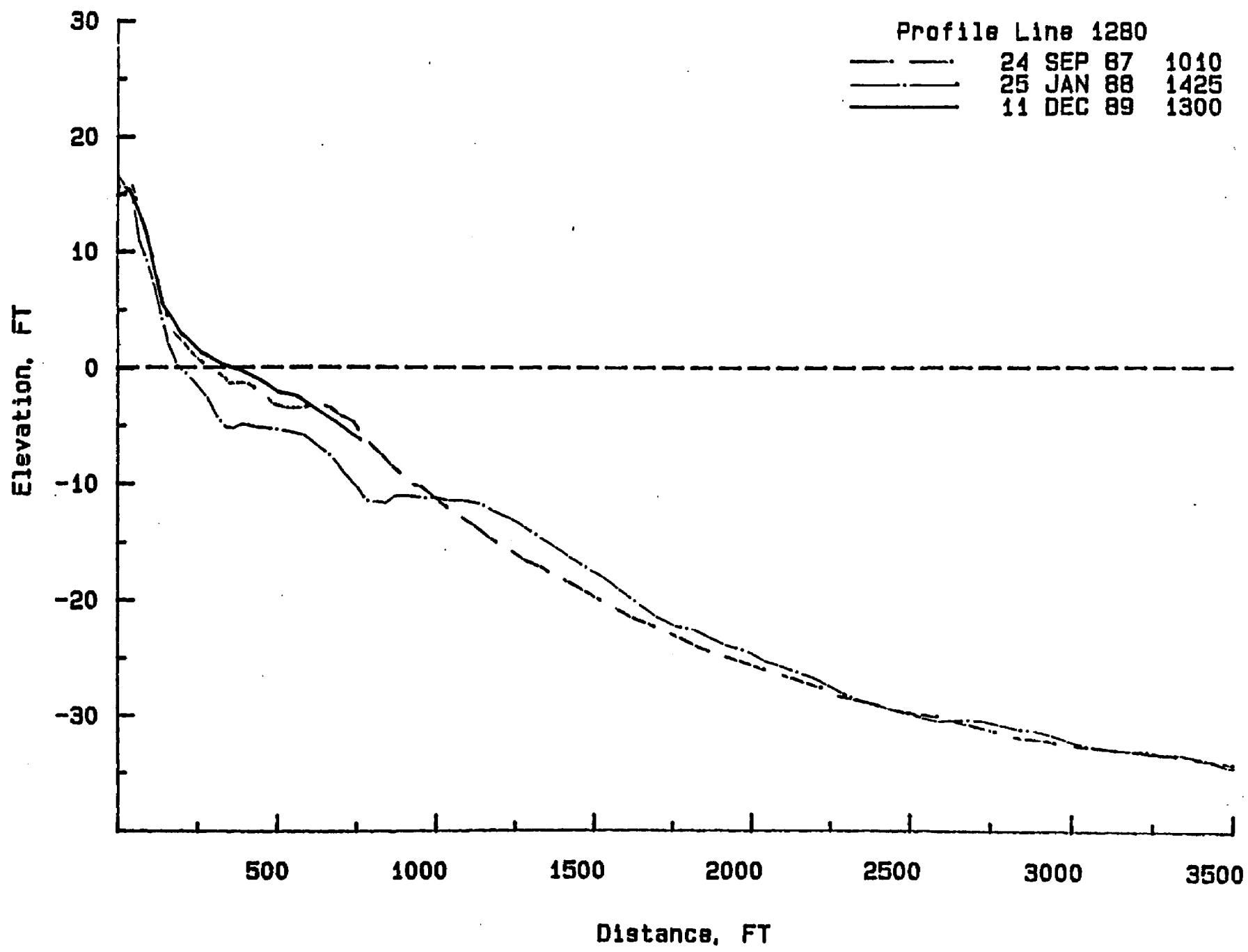
B-126



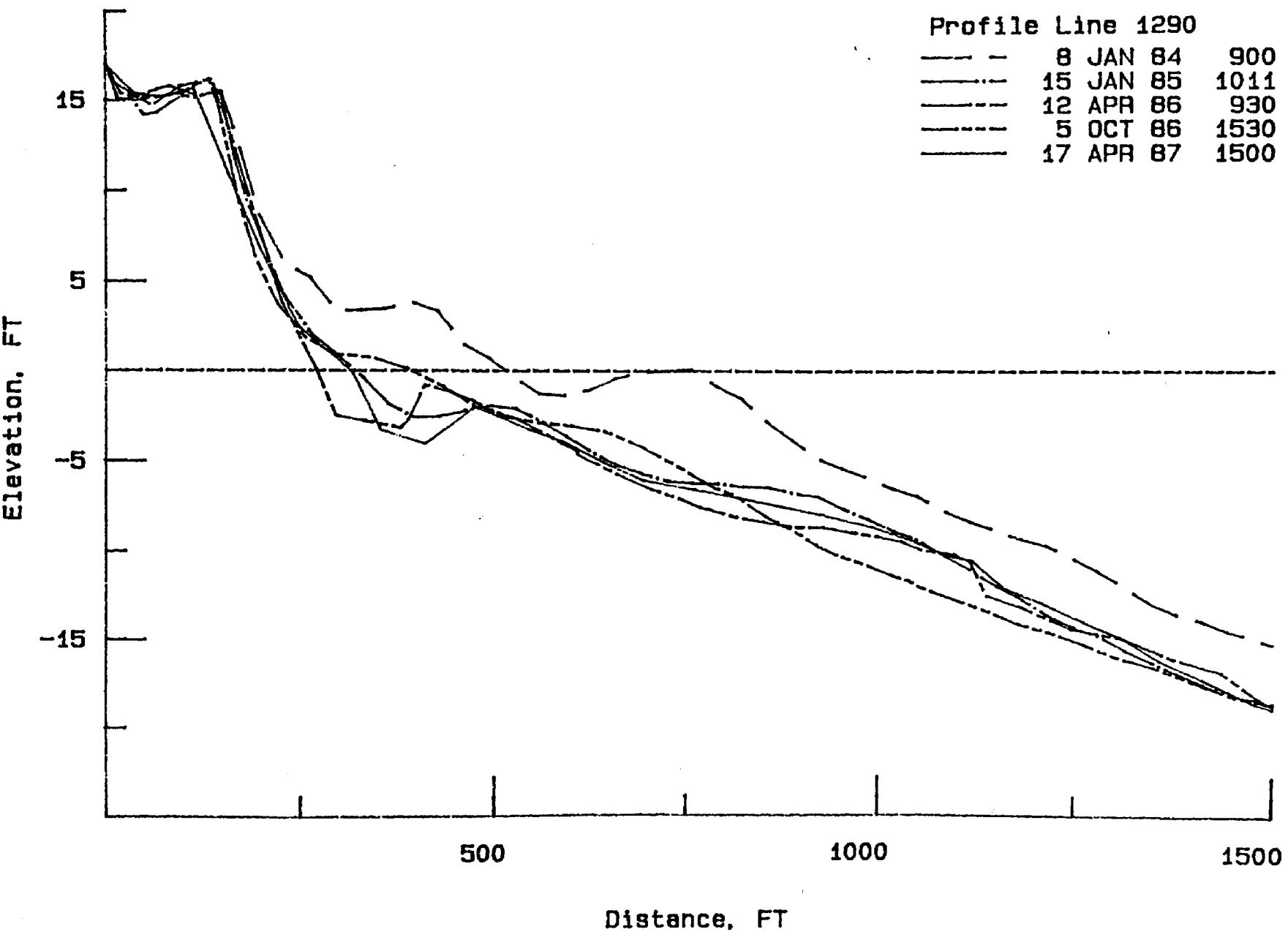
B-127



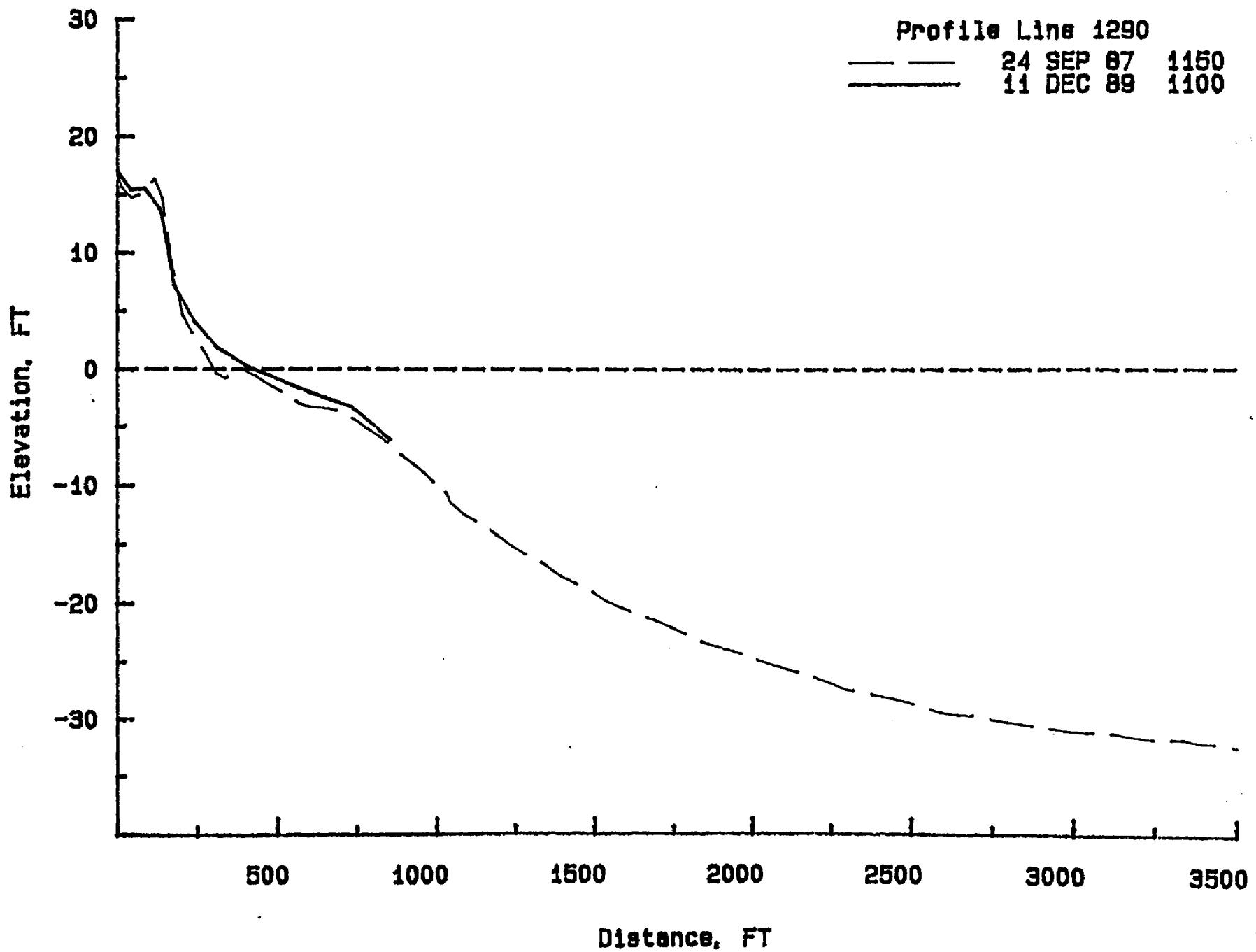
B-128



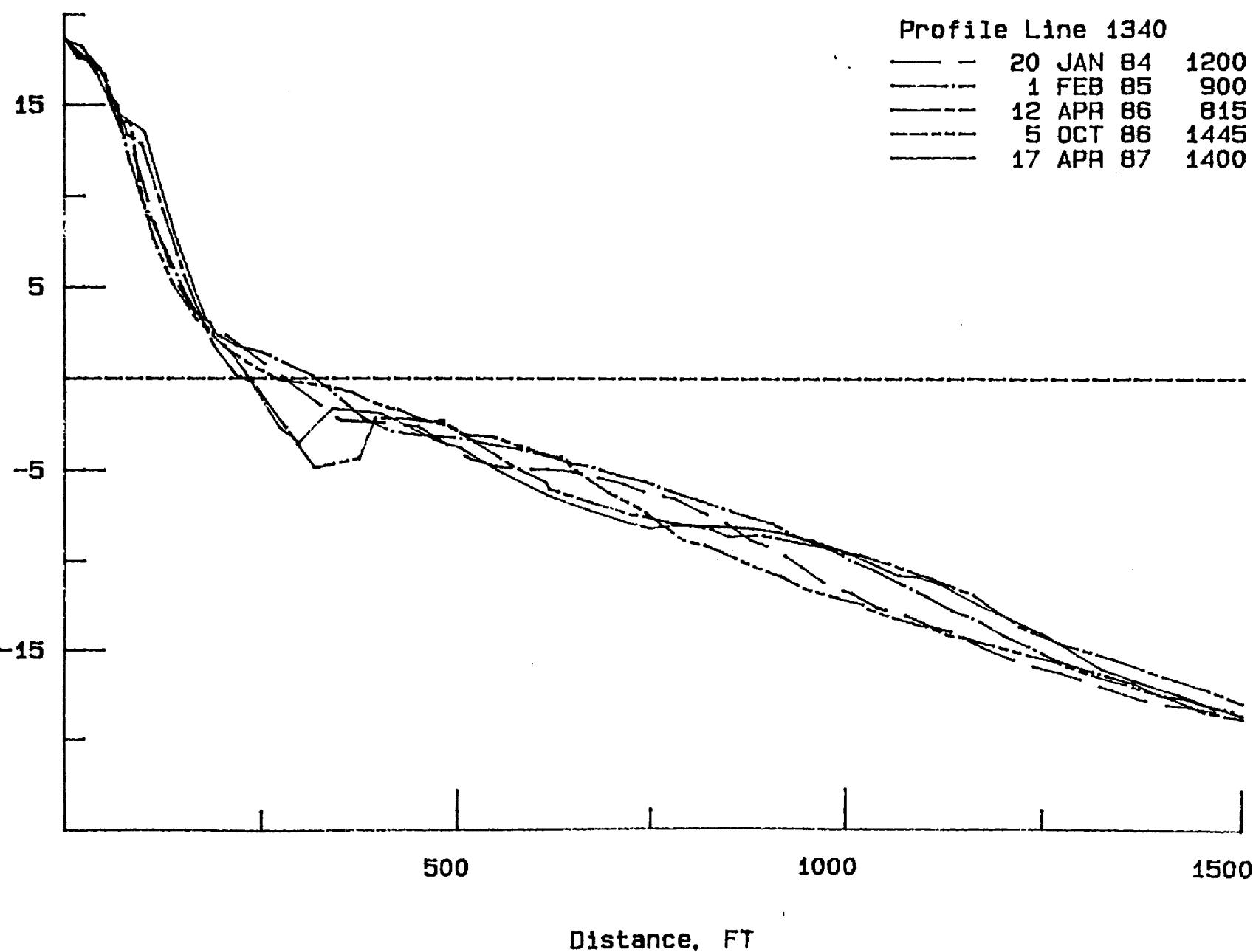
B-129

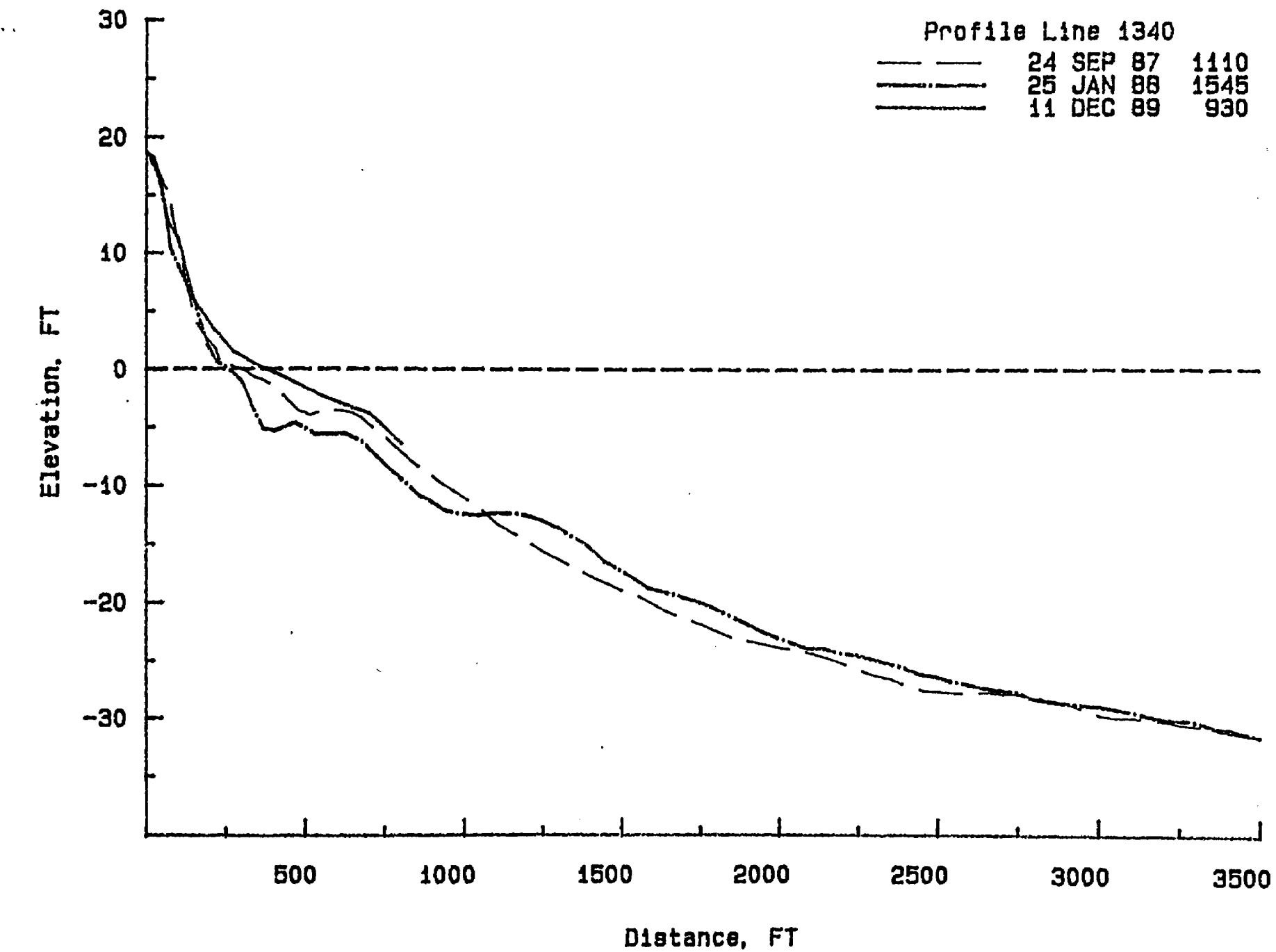


B-130

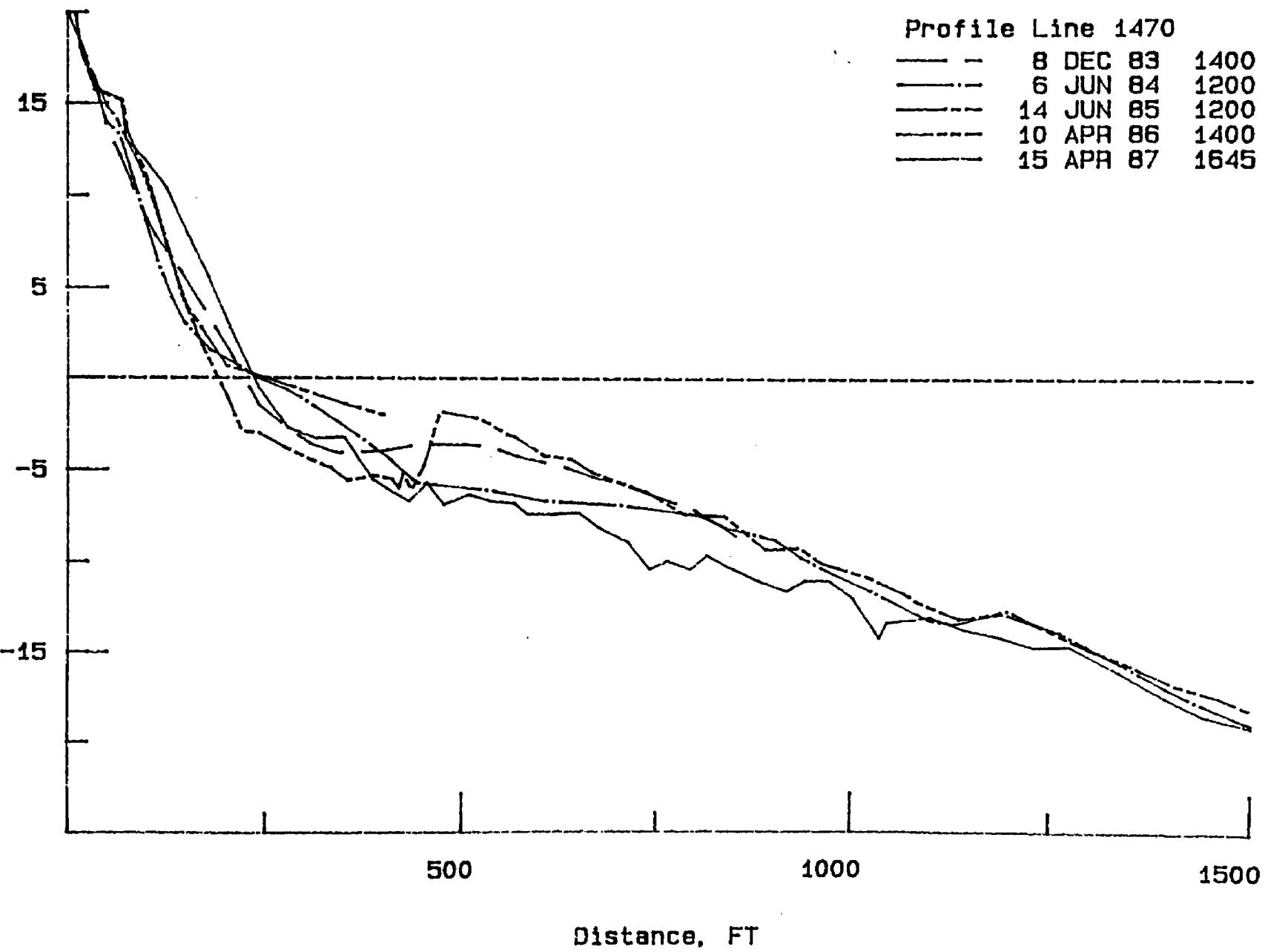


B-131

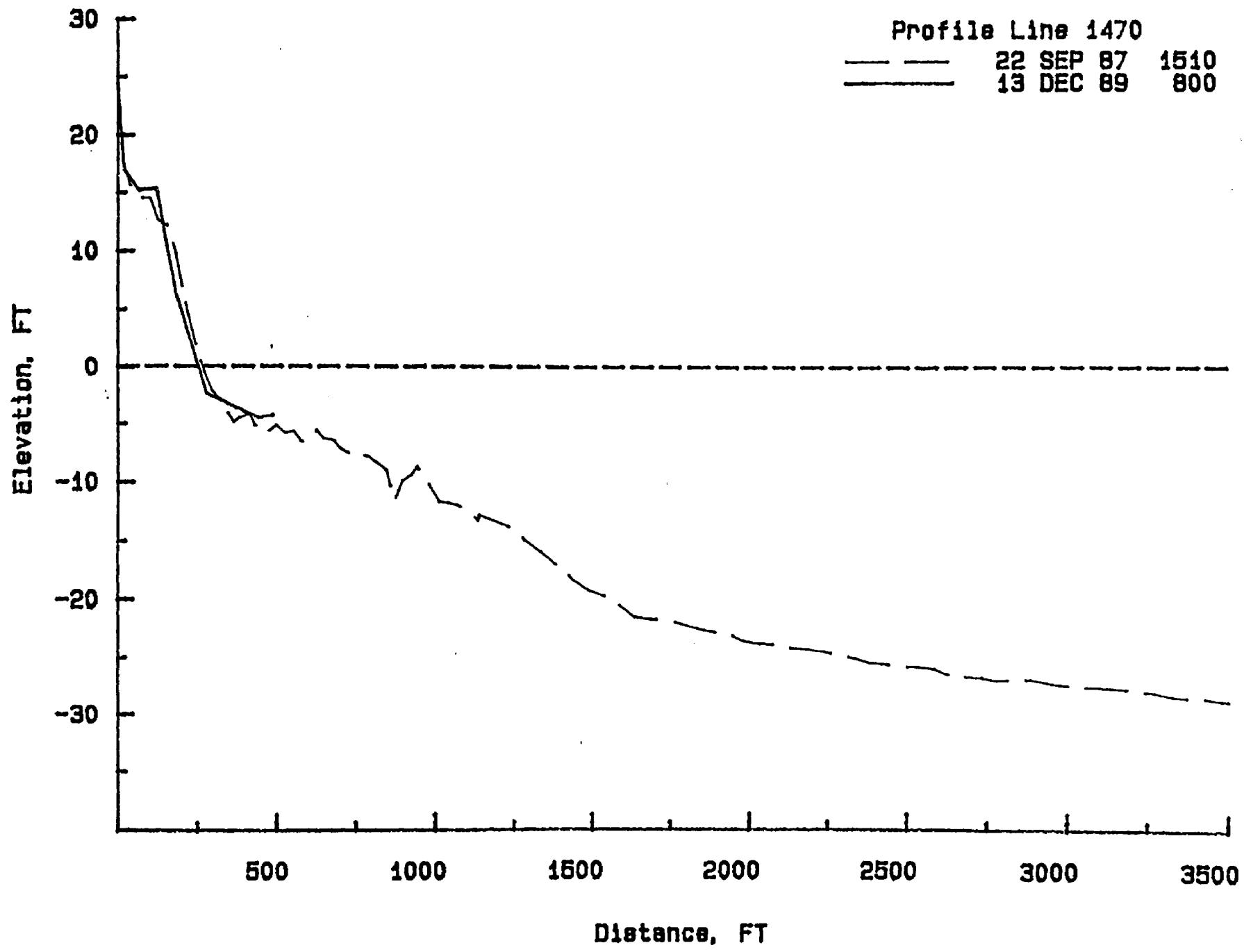




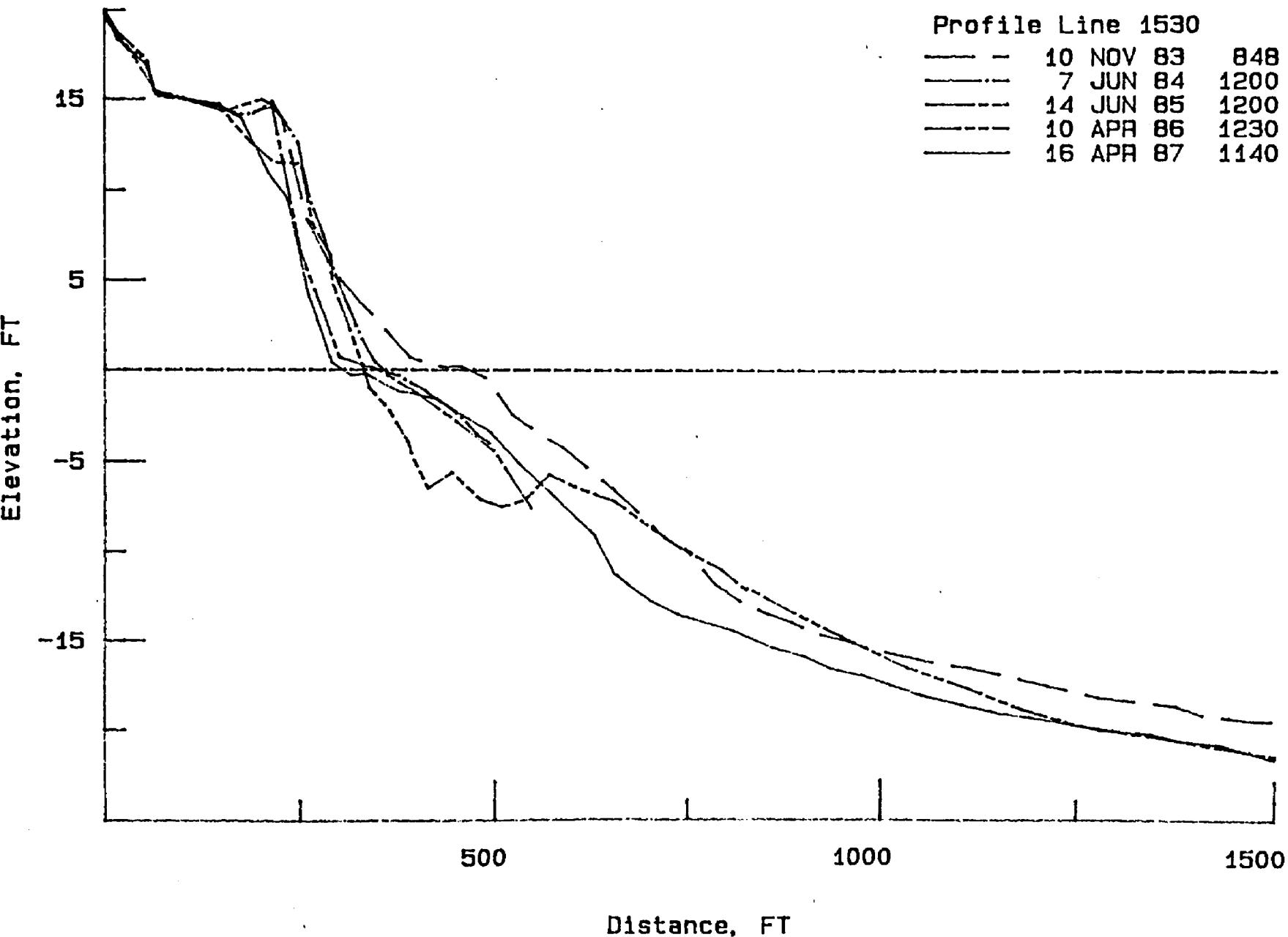
B-133

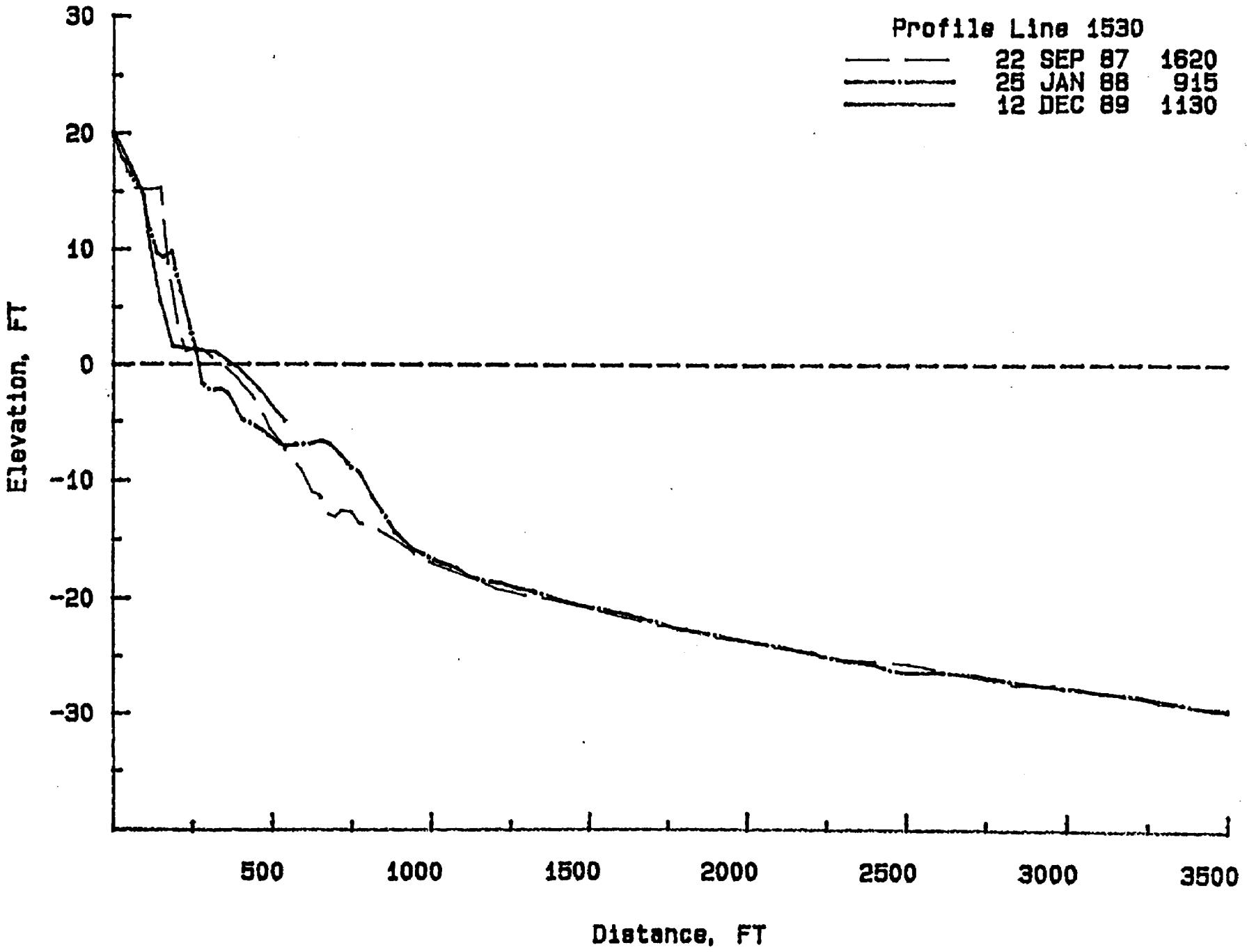


B-134

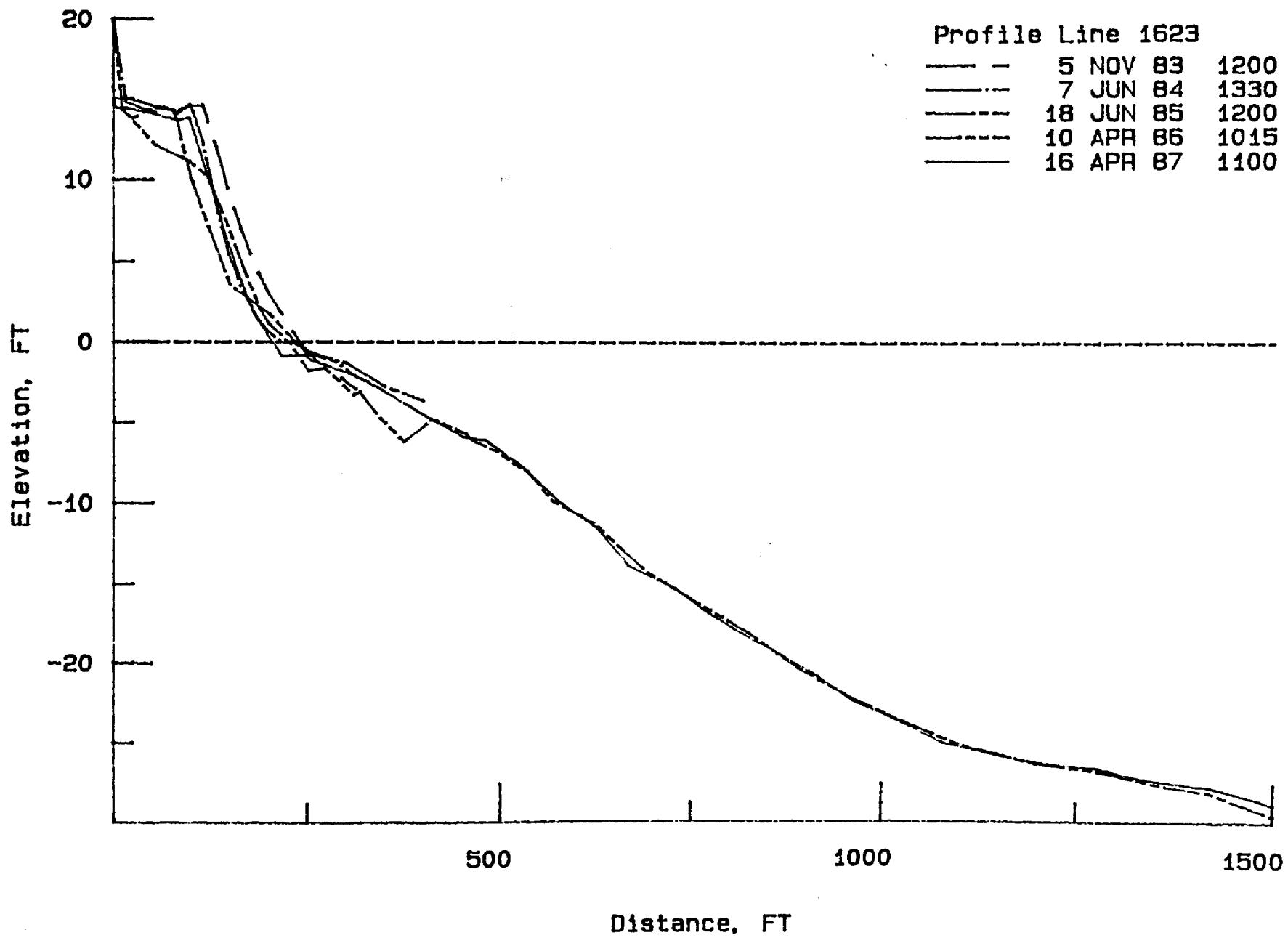


SCI-B

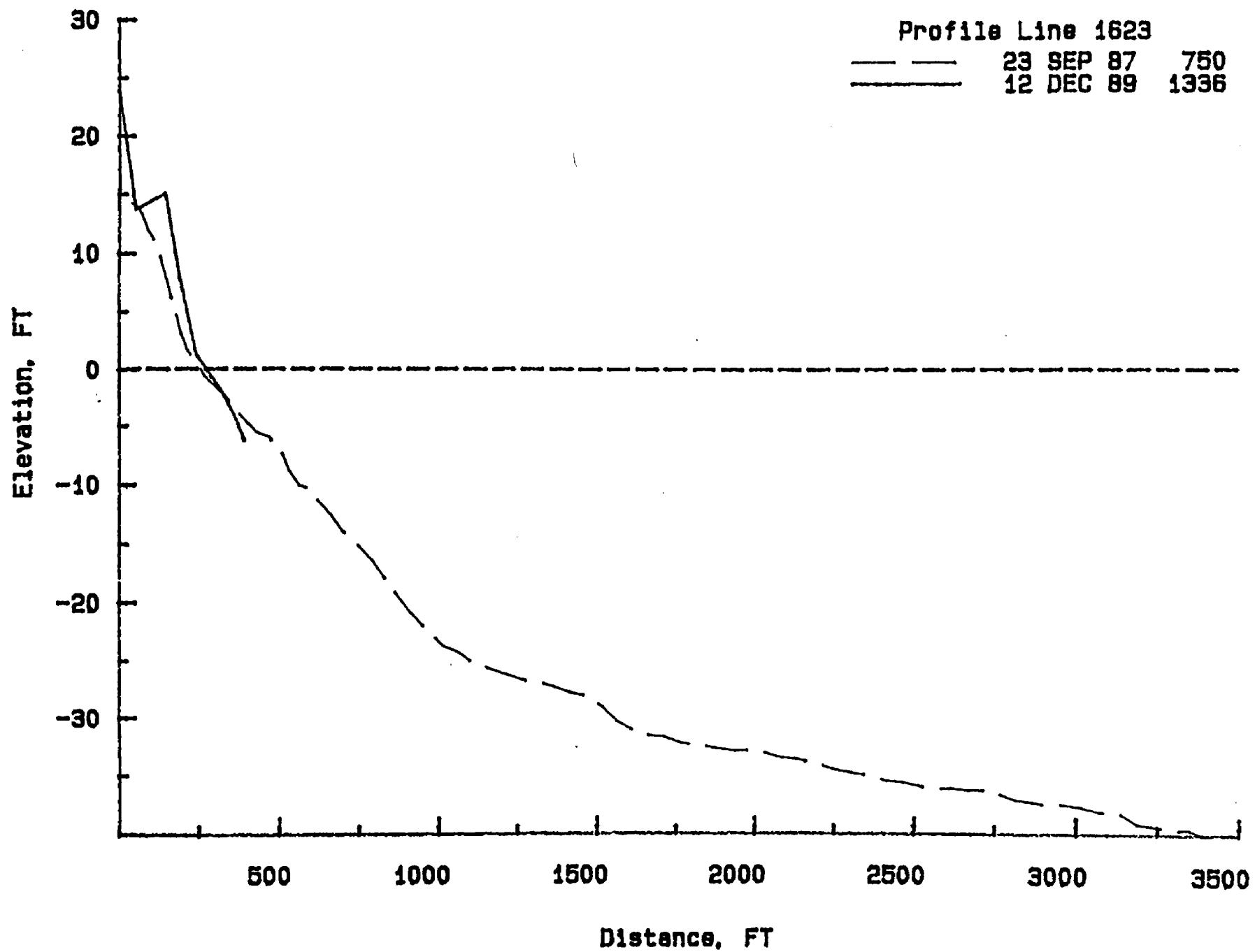


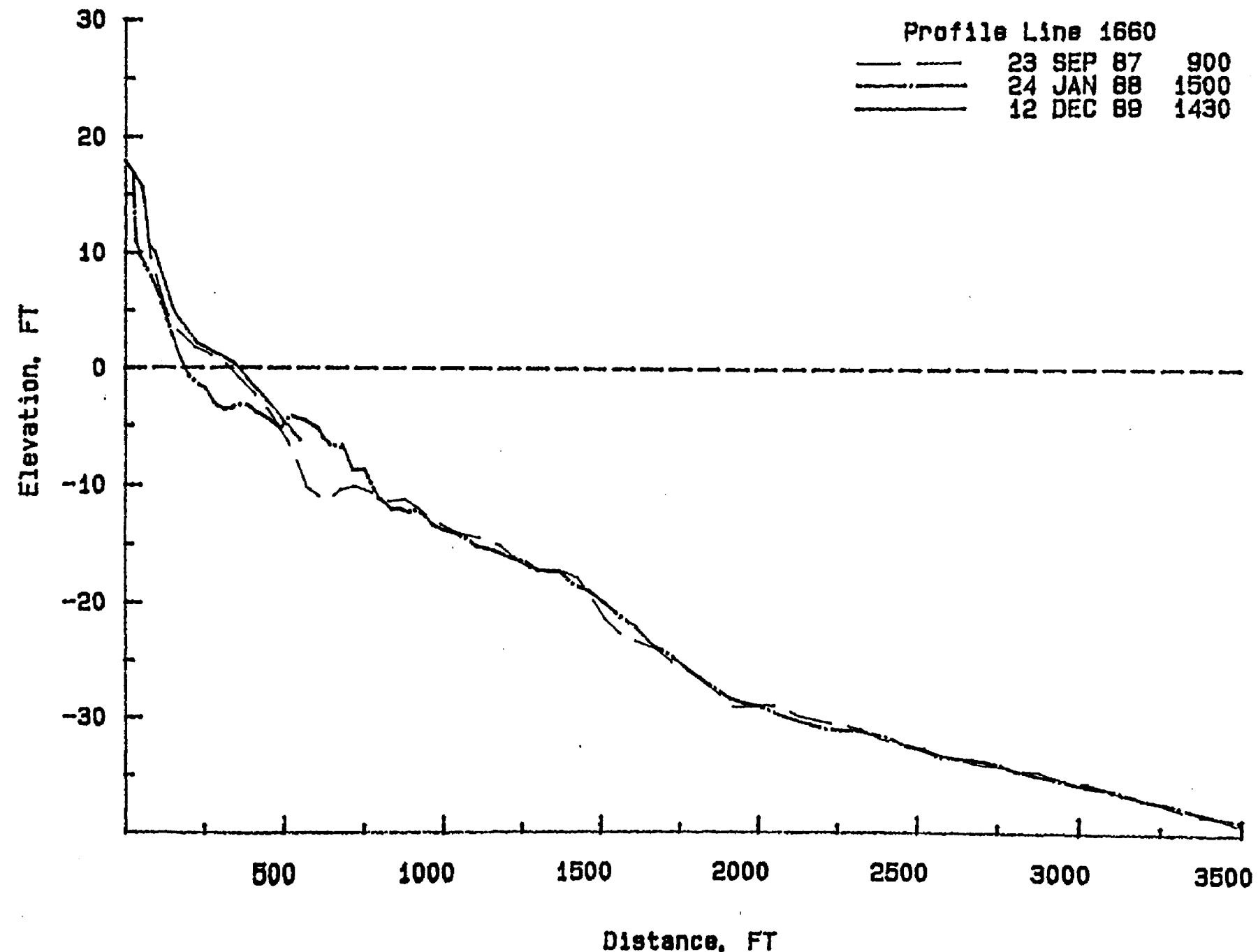


B-137

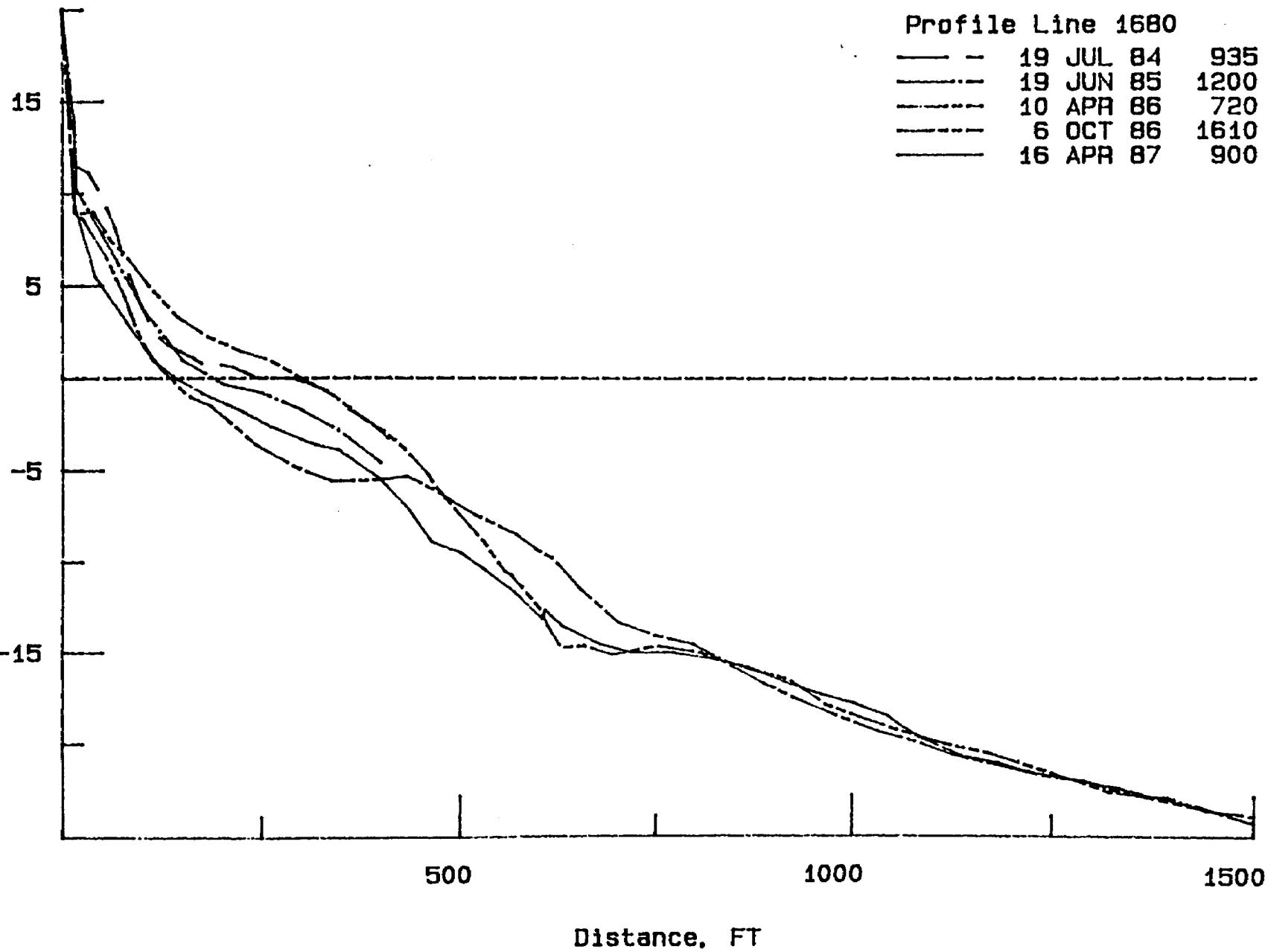


BCT-B

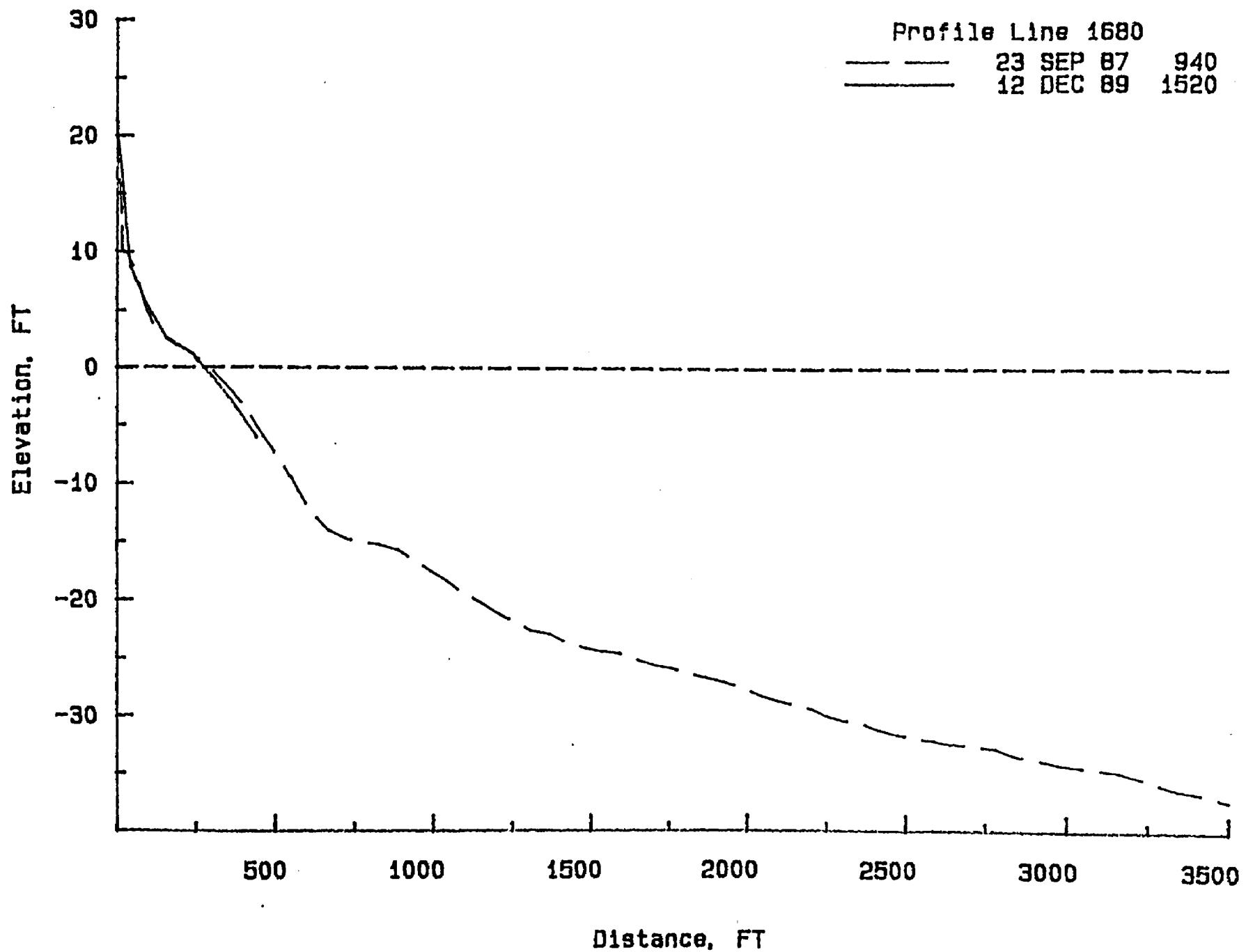


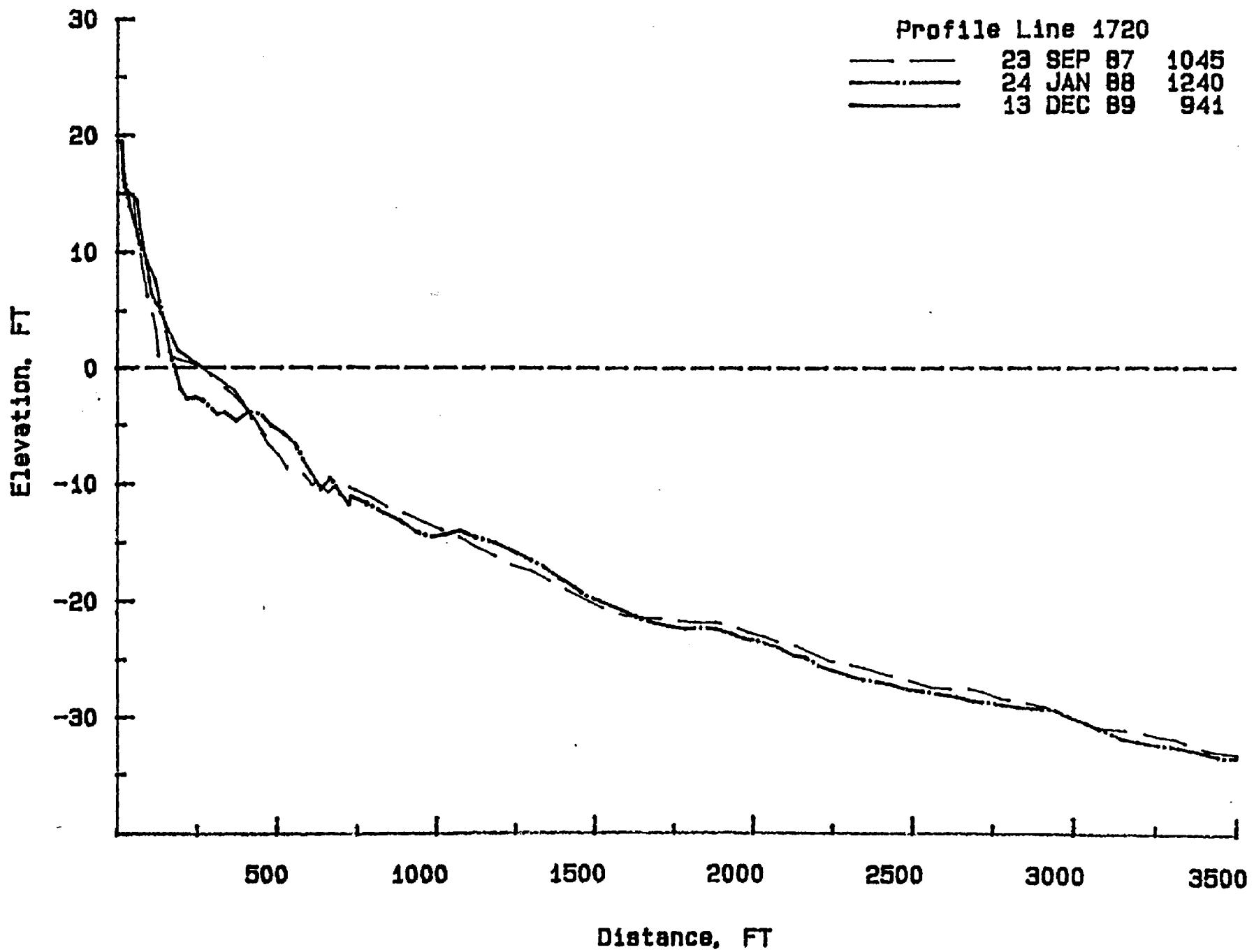


041-B



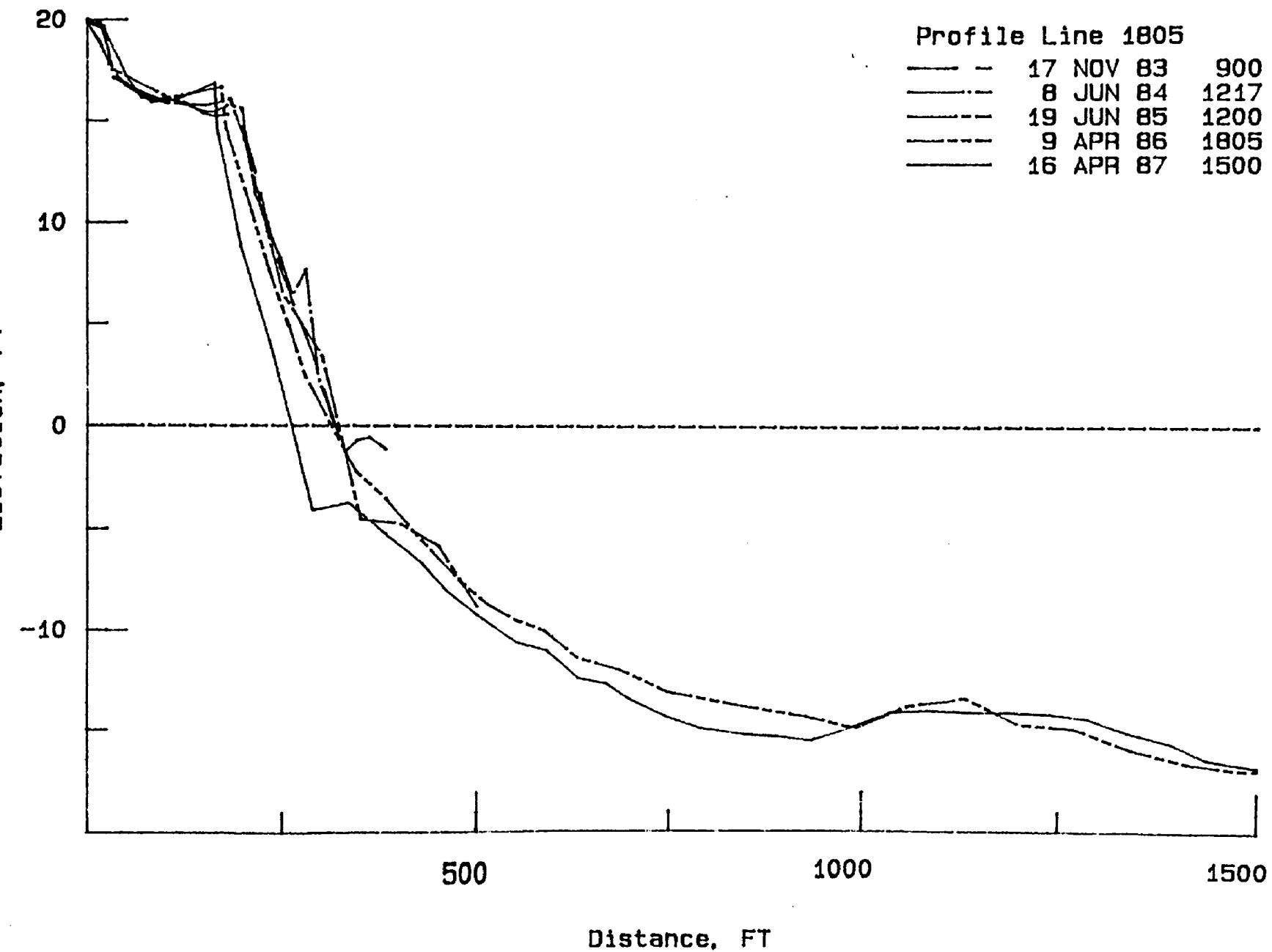
B-141

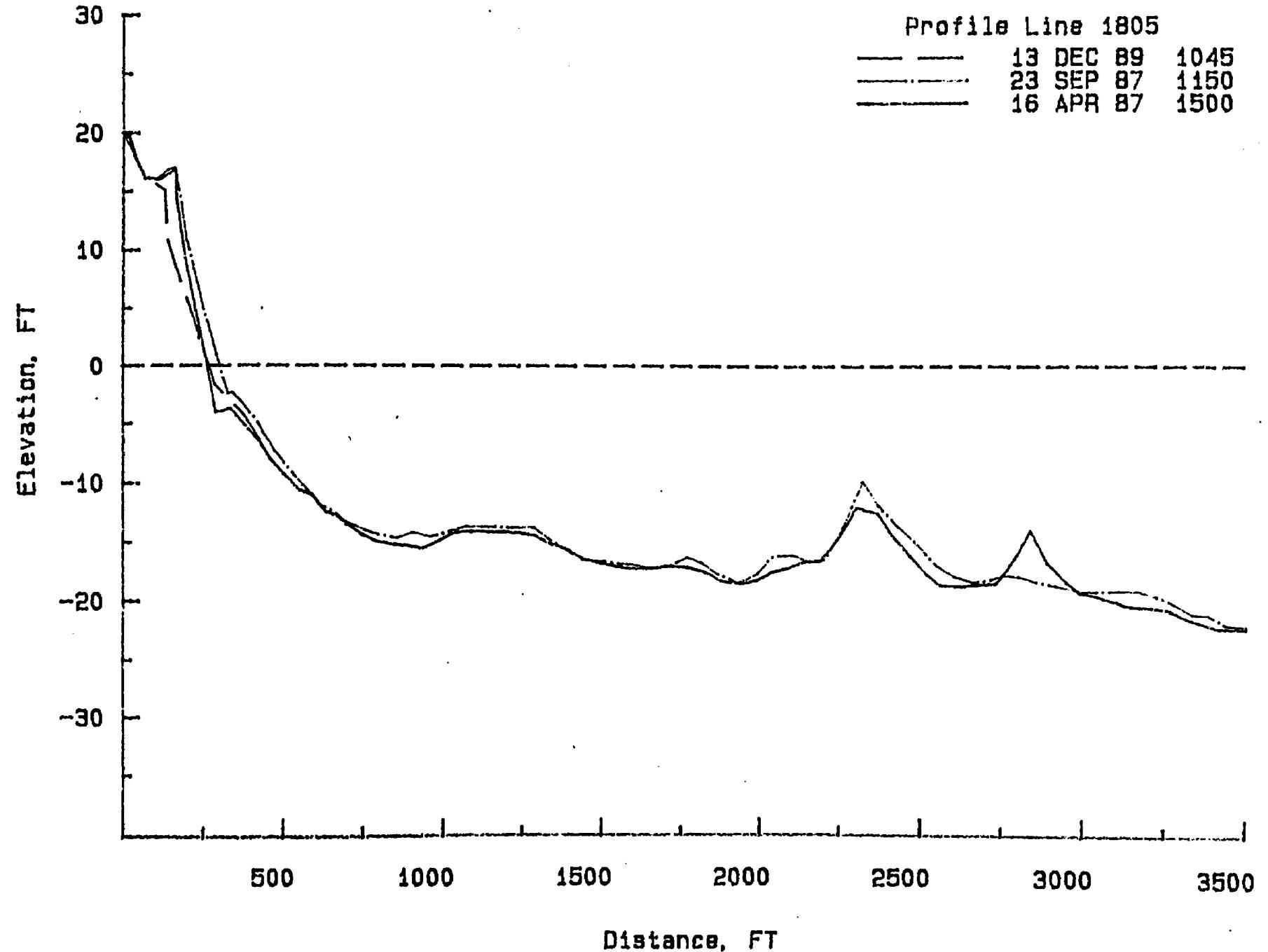




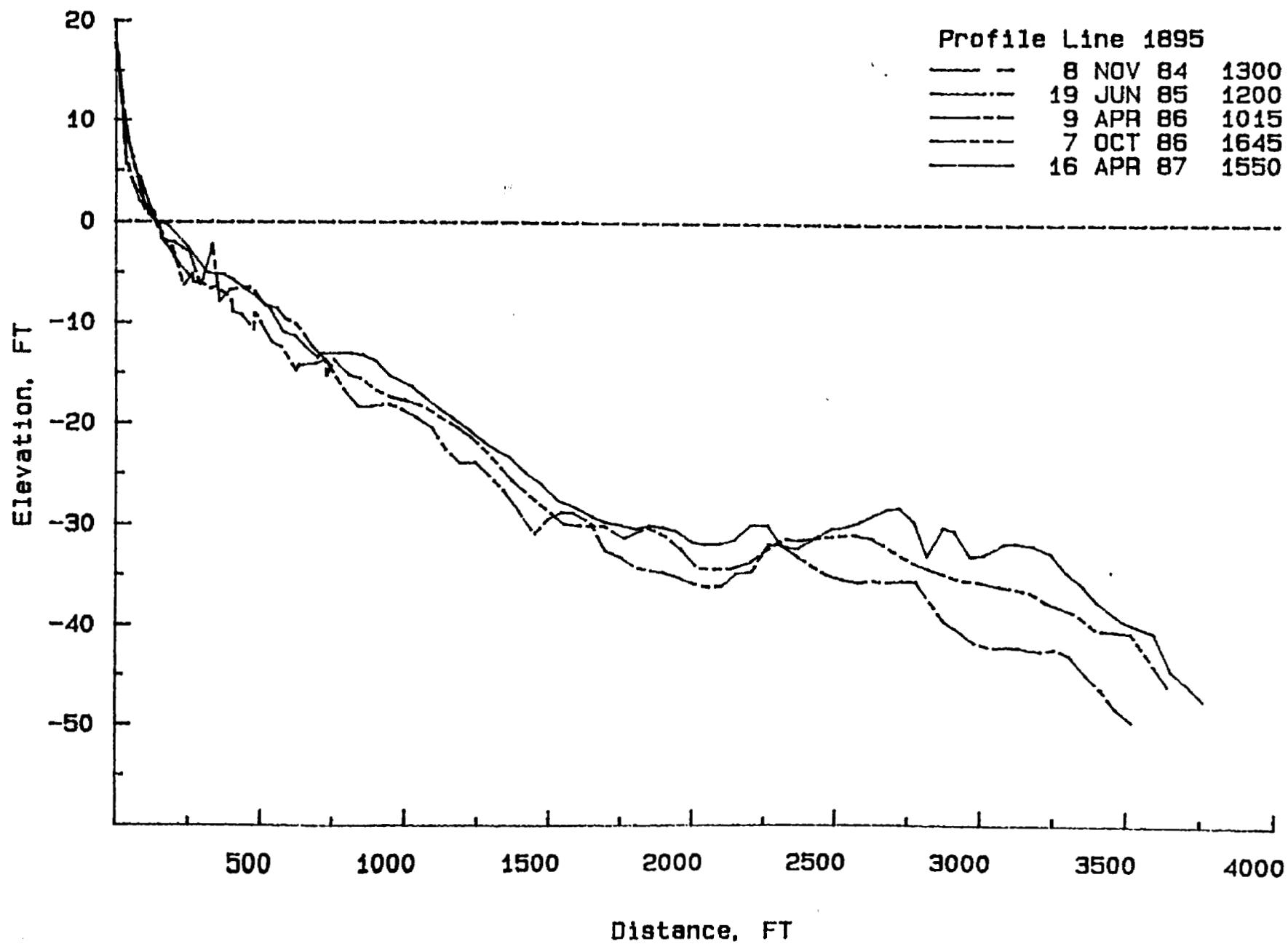
B-142

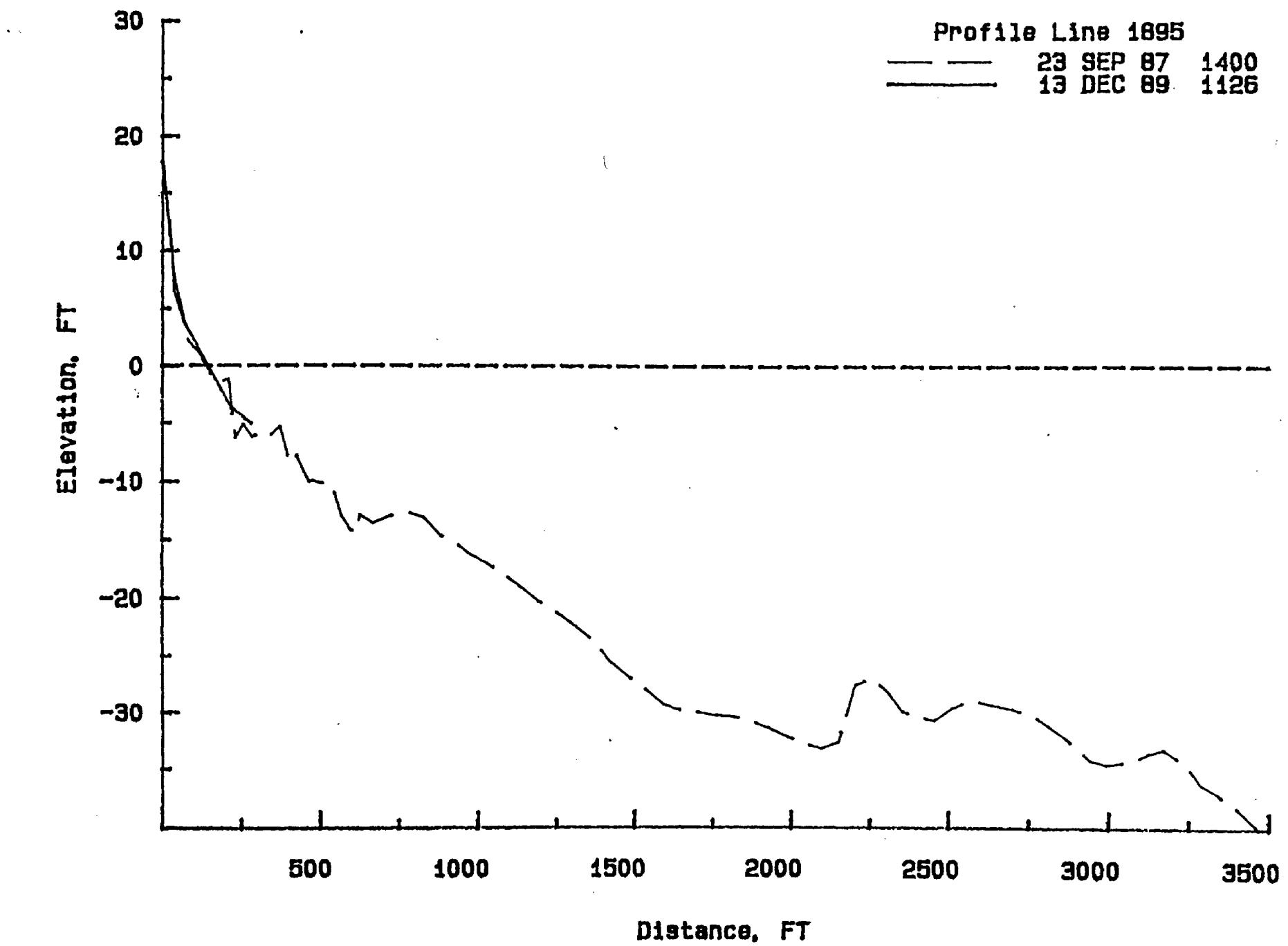
B-143

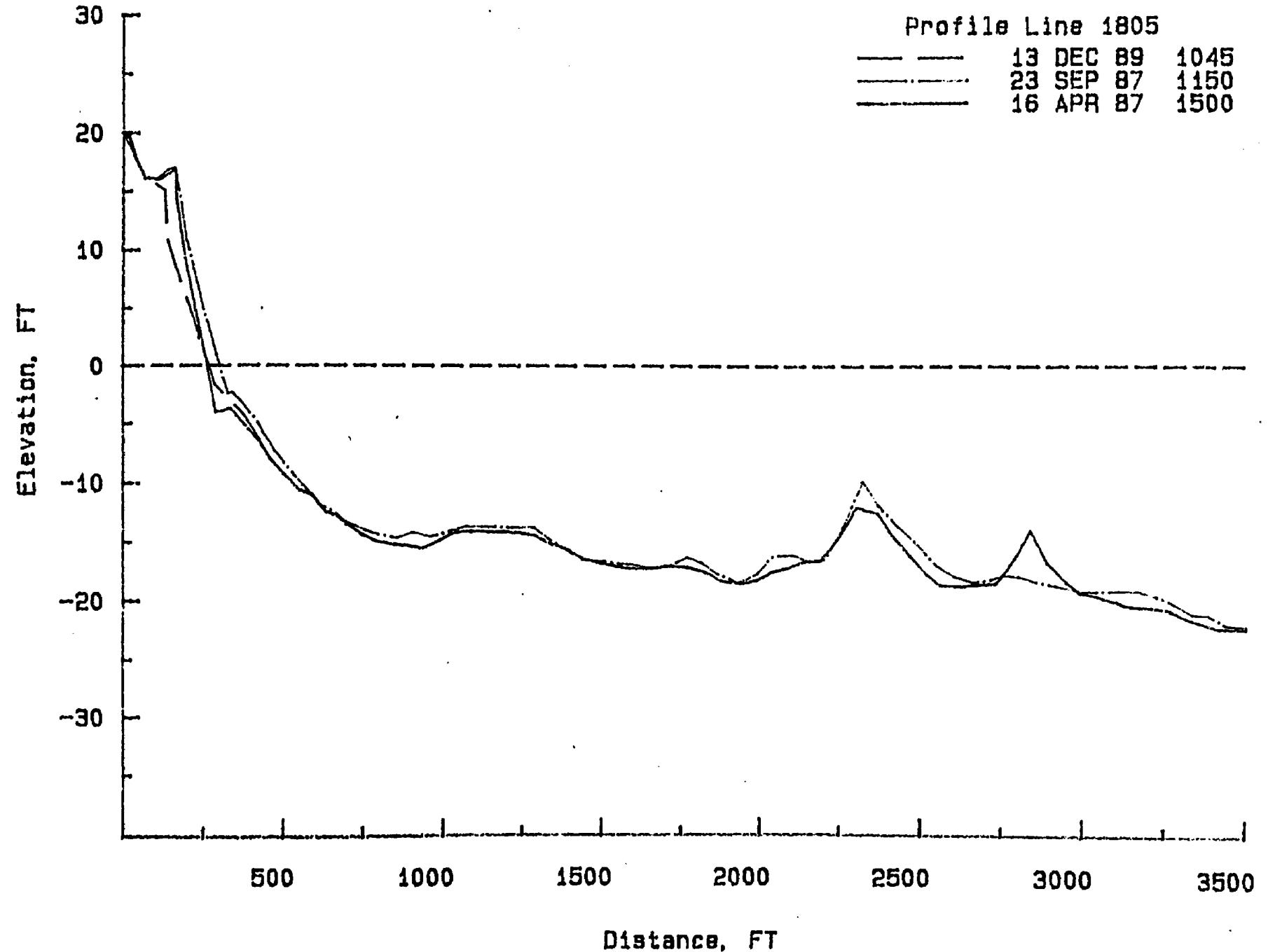


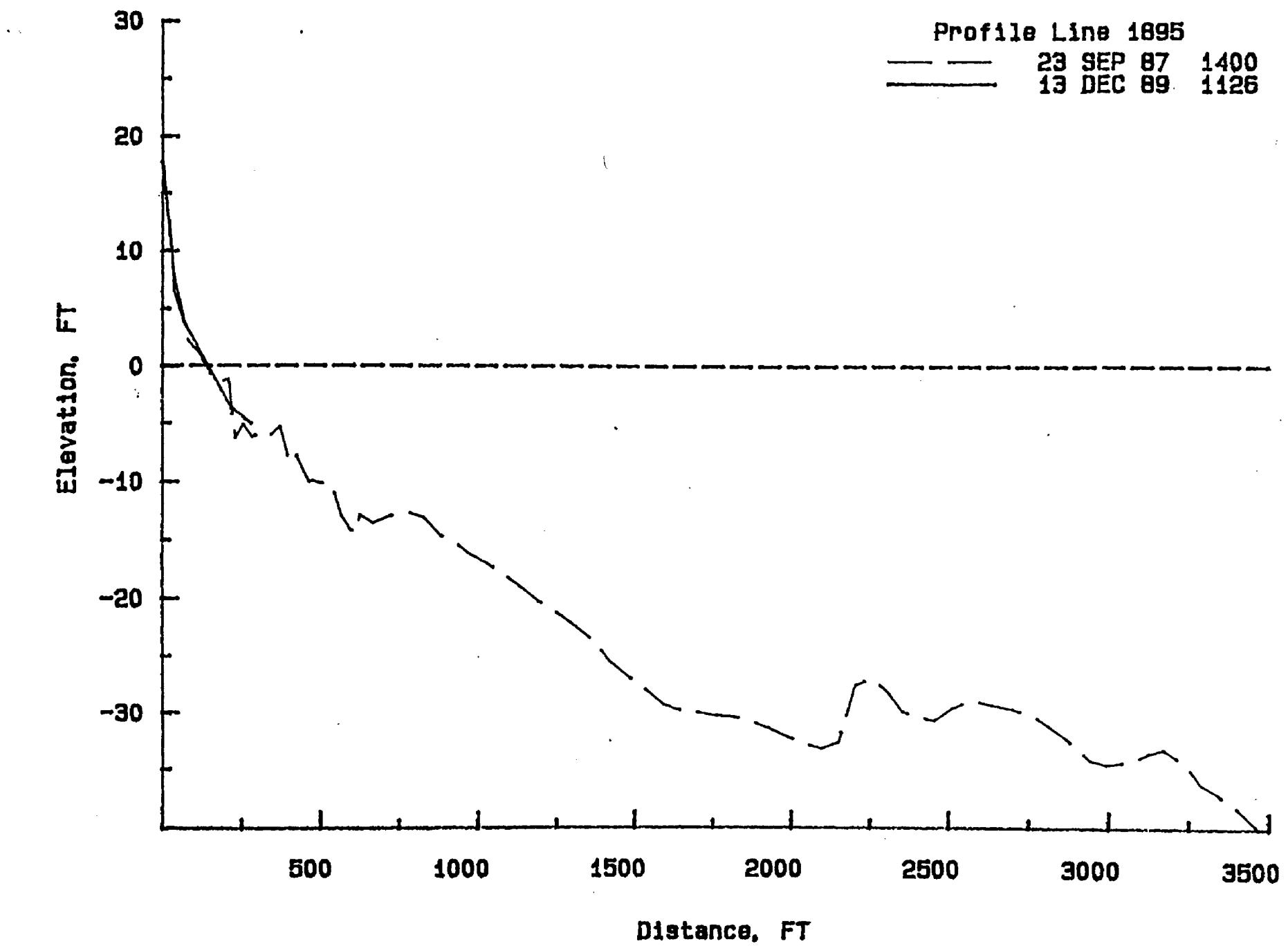


B-145

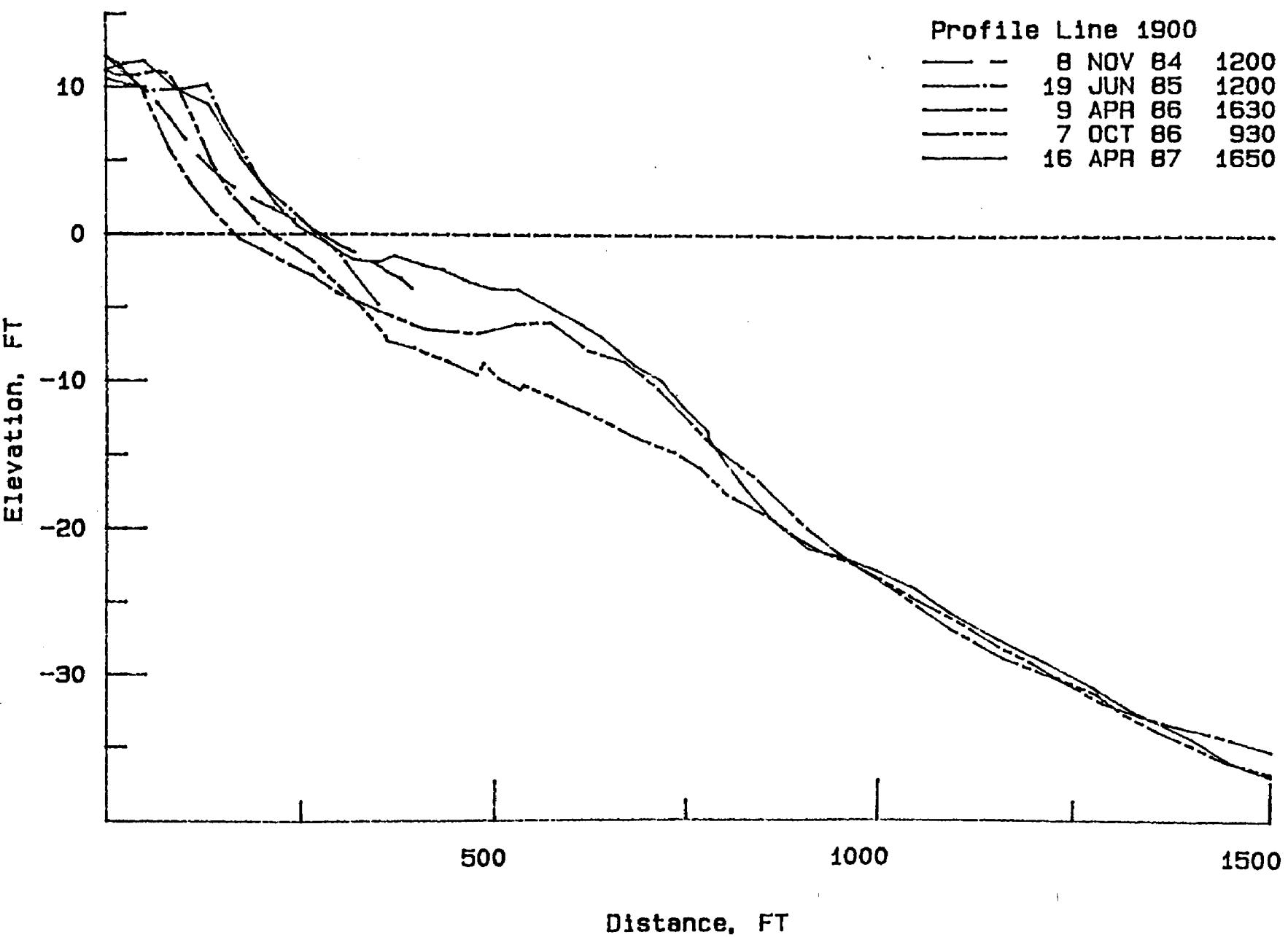




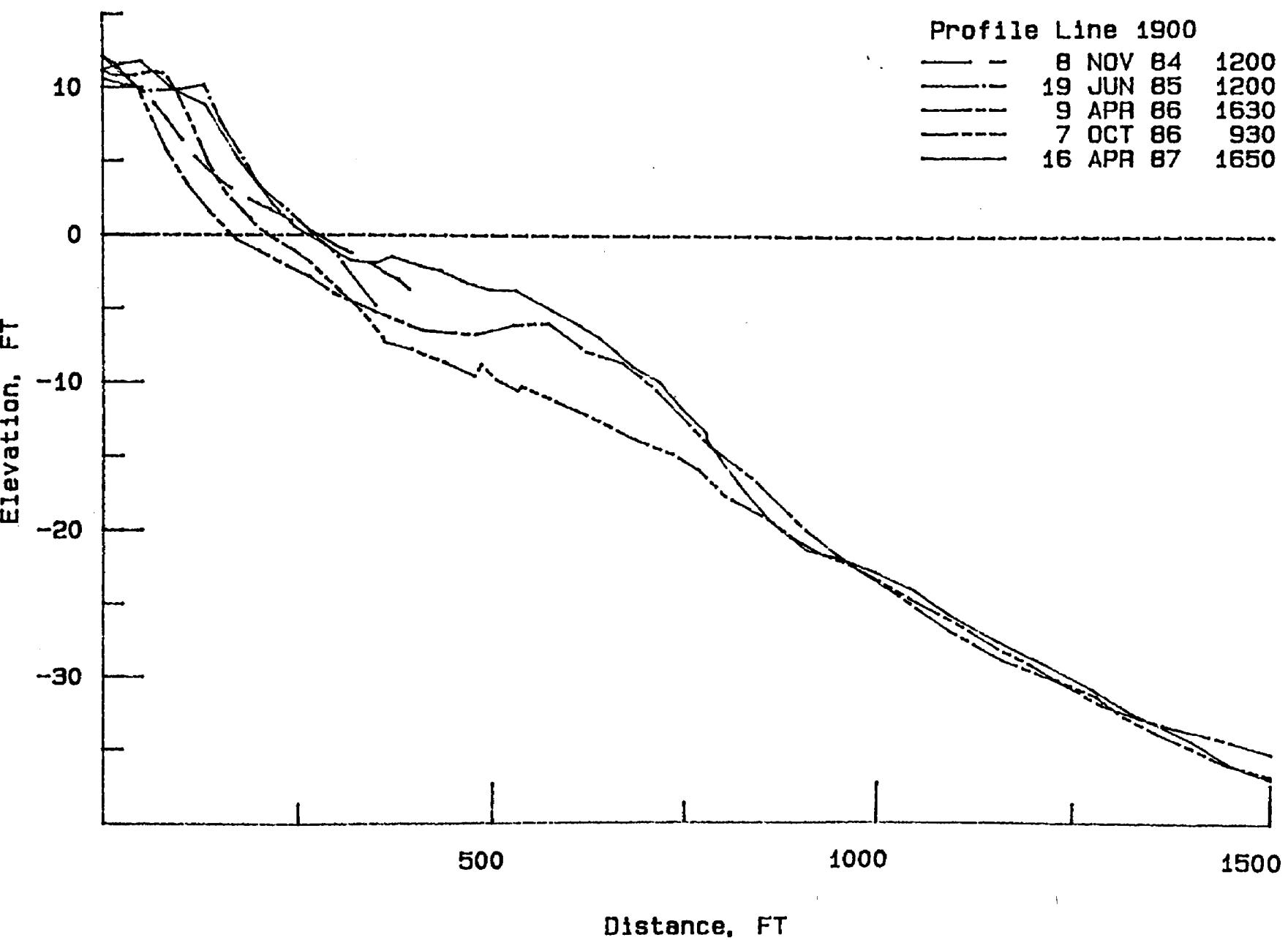




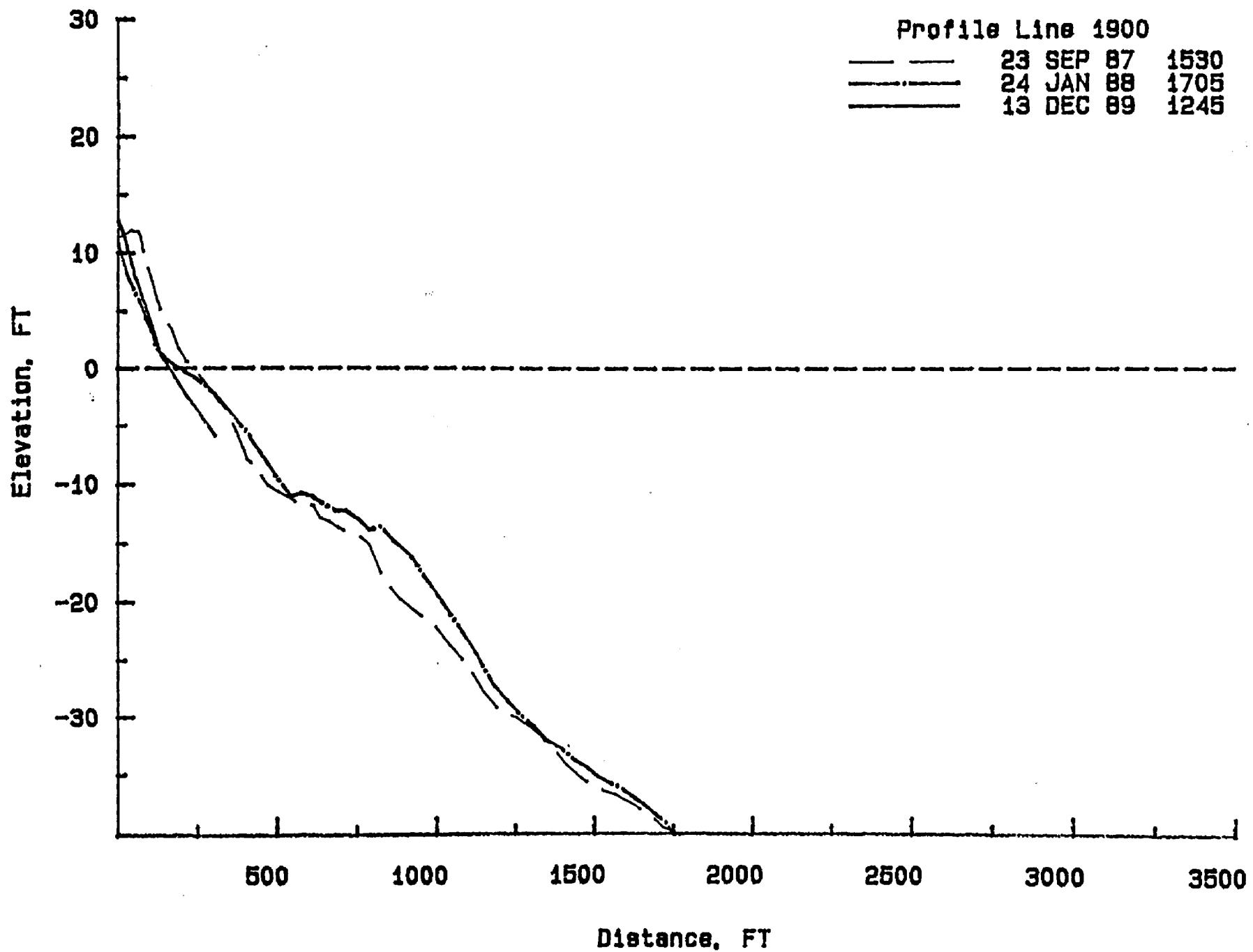
B-147



B-147



B-148



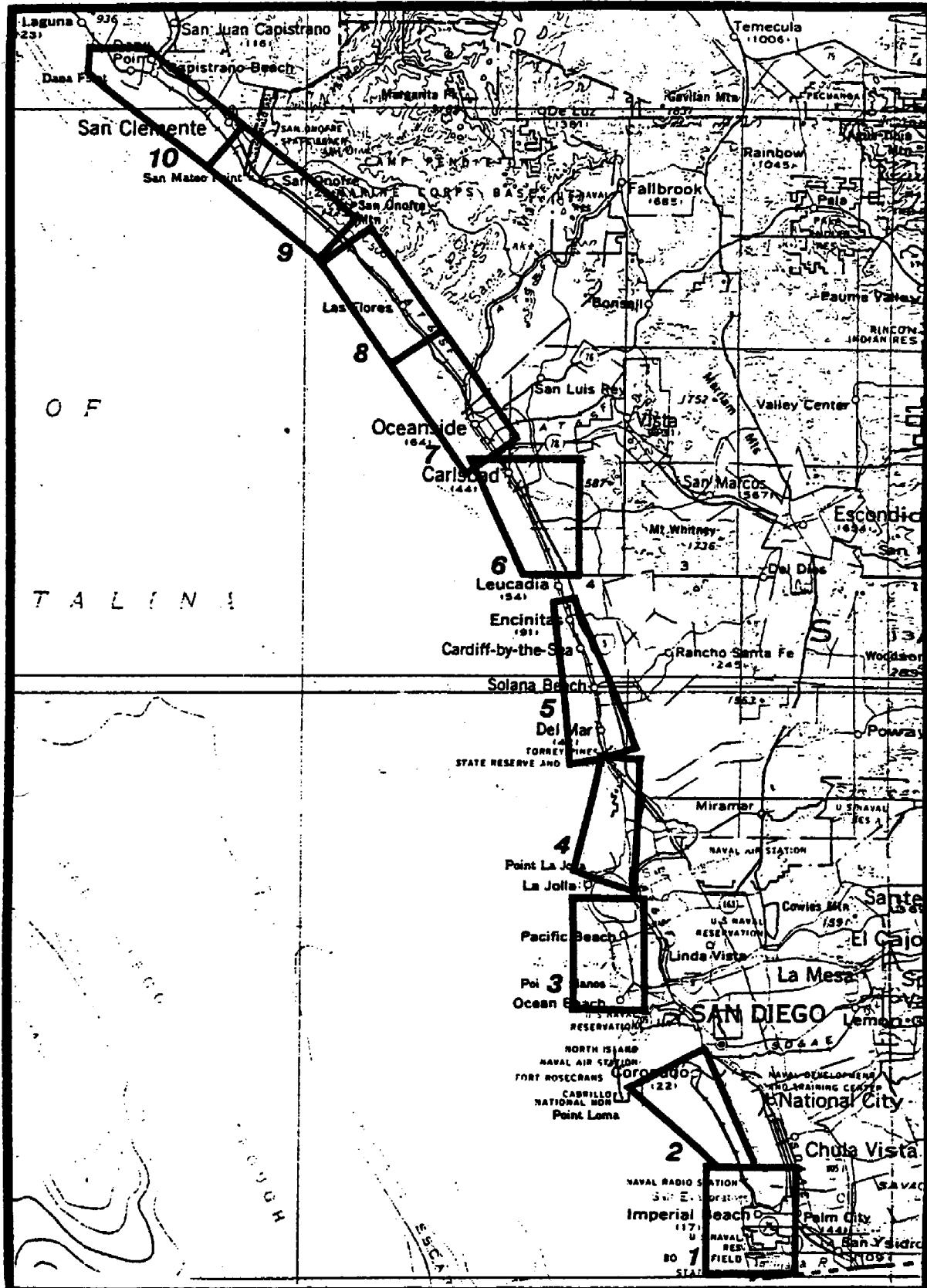


FIGURE A-1: INDEX TO RANGE LINE LOCATION MAPS

FIGURE A-2: RANGE LINE LOCATION MAP NO. 1

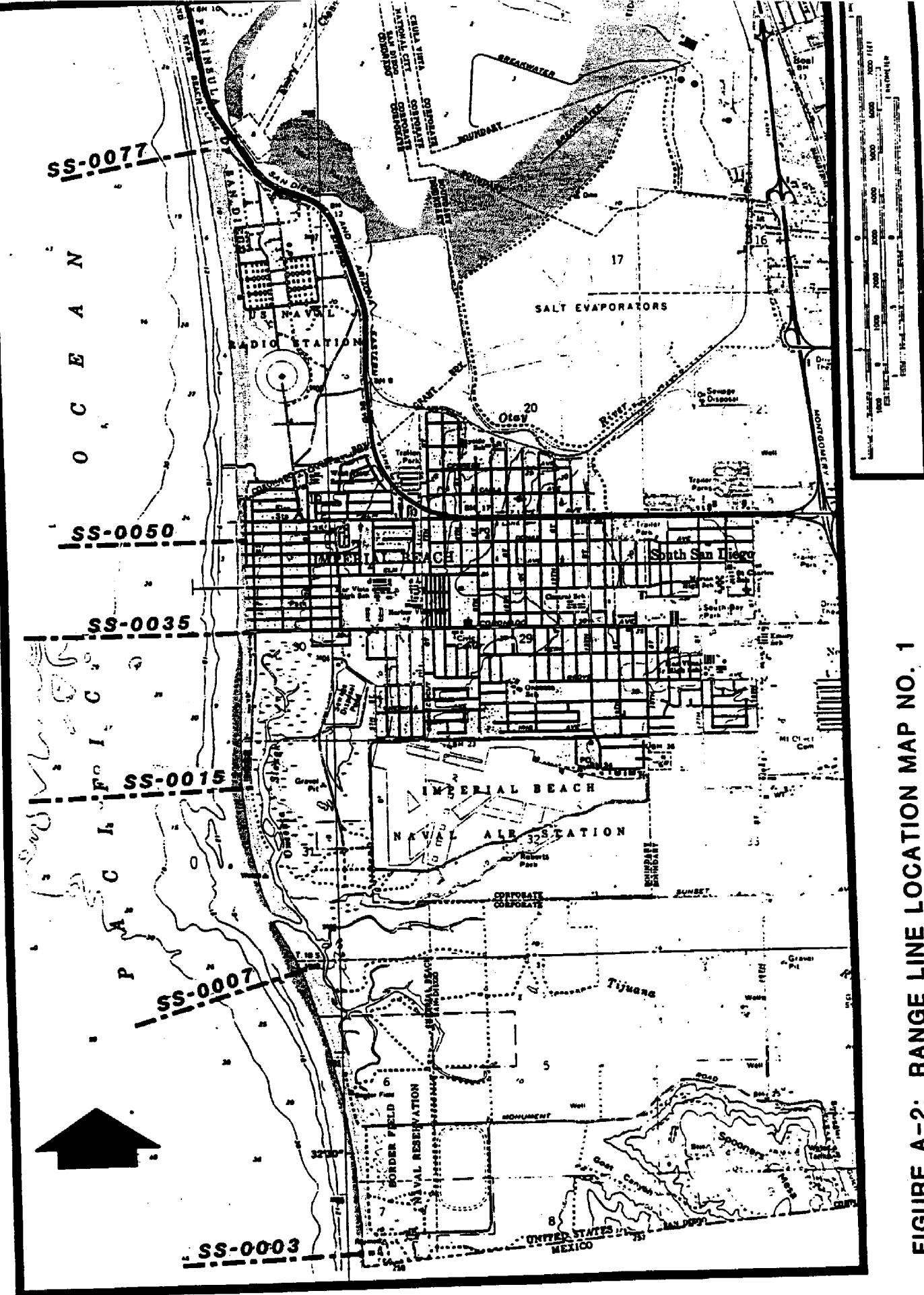
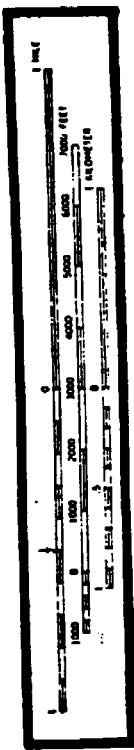


FIGURE A-3: RANGE LINE LOCATION MAP NO. 2



SS-0200

SS-0180

SS-0160

SS-0125

SS-0090

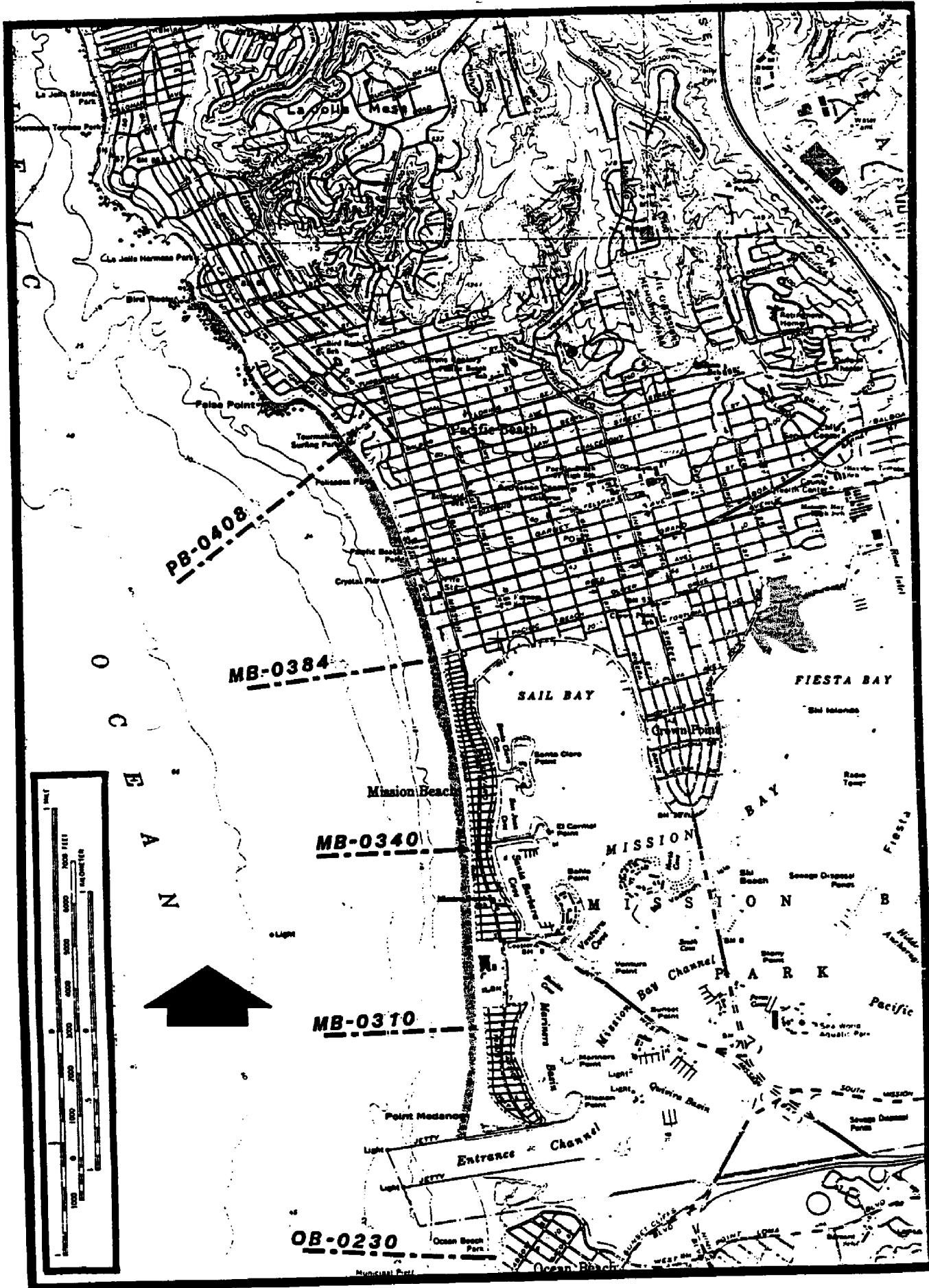


FIGURE A-4: RANGE LINE LOCATION MAP NO. 3

FIGURE A-5: RANGE LINE LOCATION MAP NO. 4

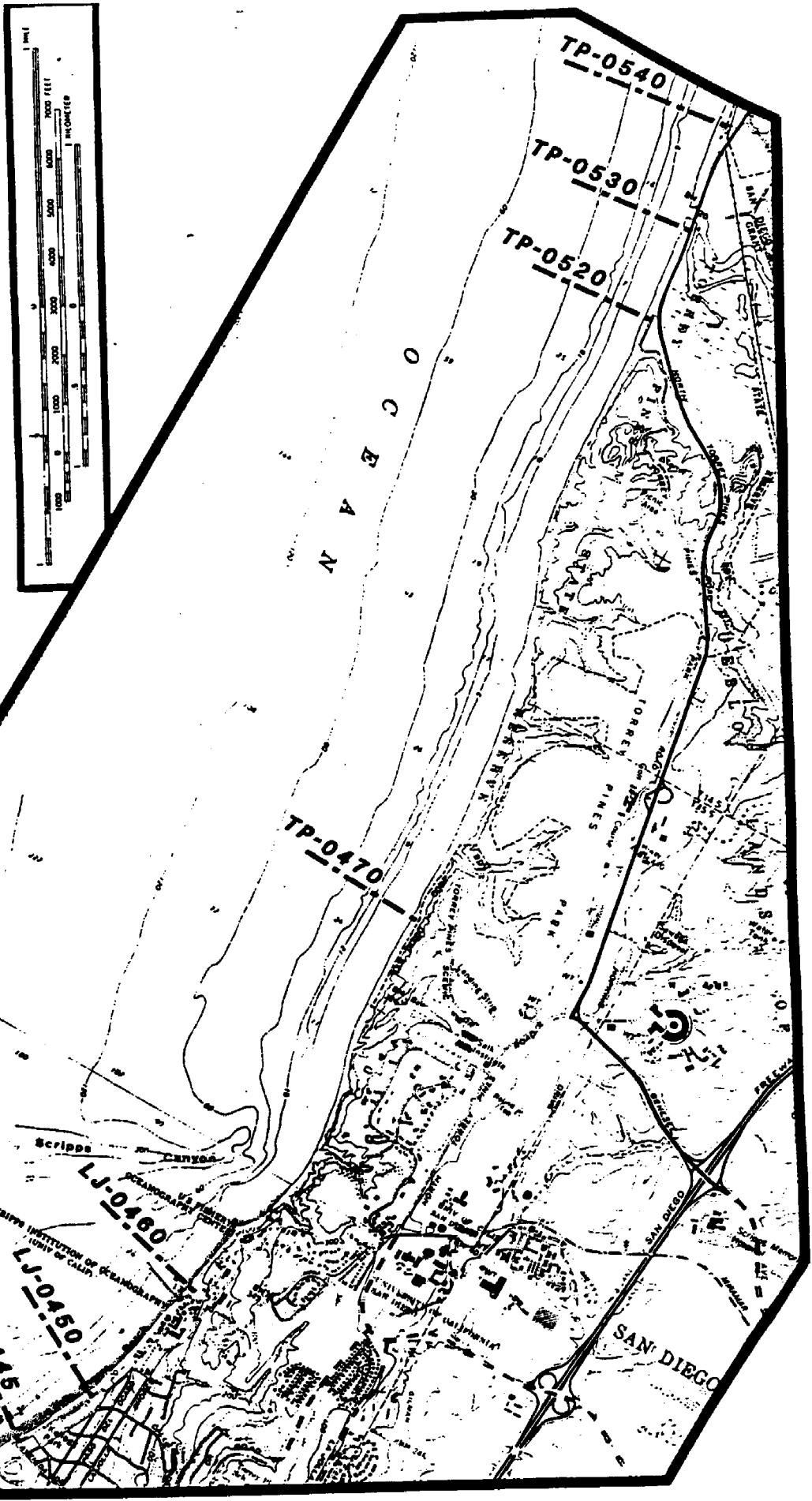


FIGURE A-6: RANGE LINE LOCATION MAP NO.

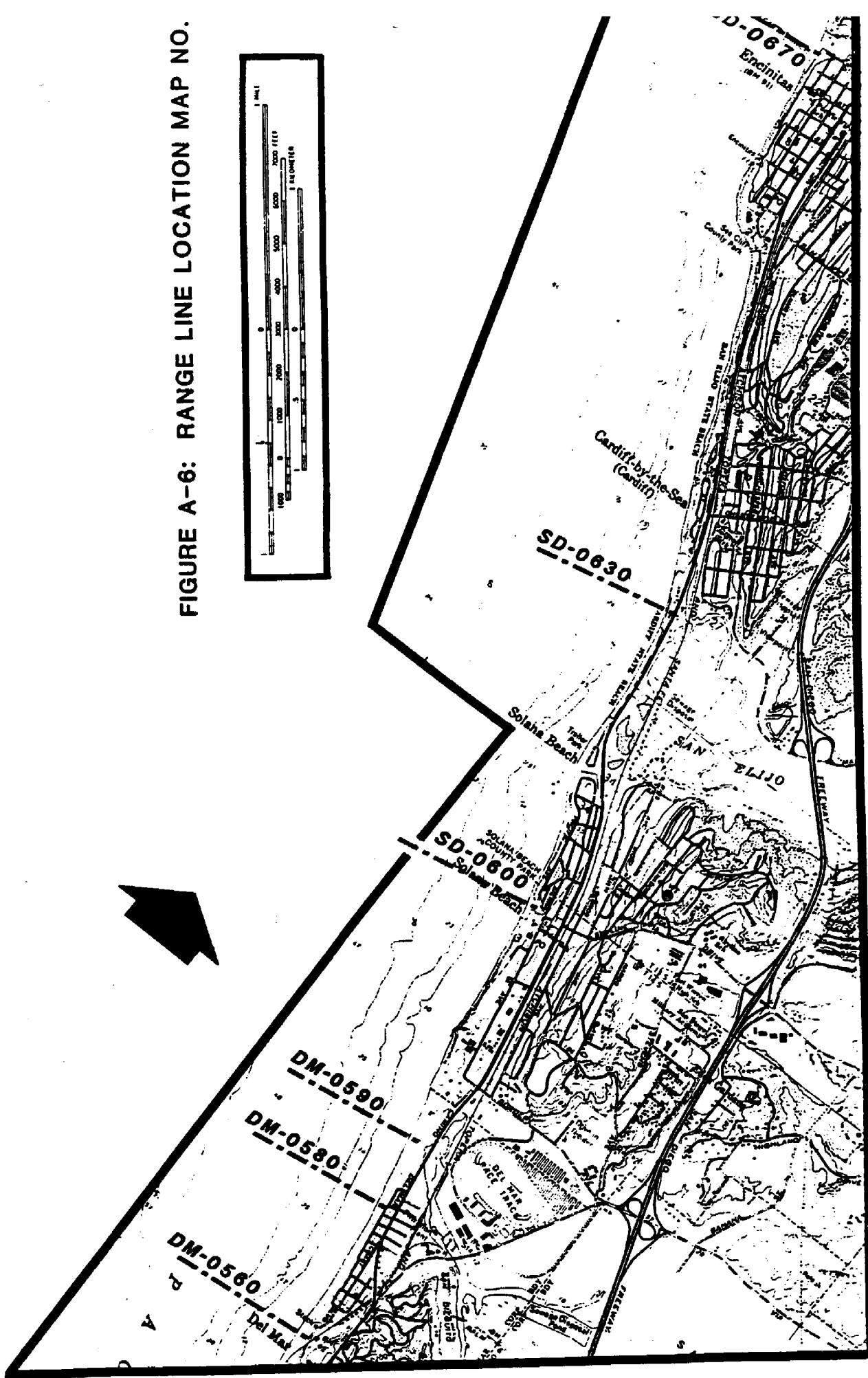


FIGURE A-7: RANGE LINE LOCATION MAP NO.6

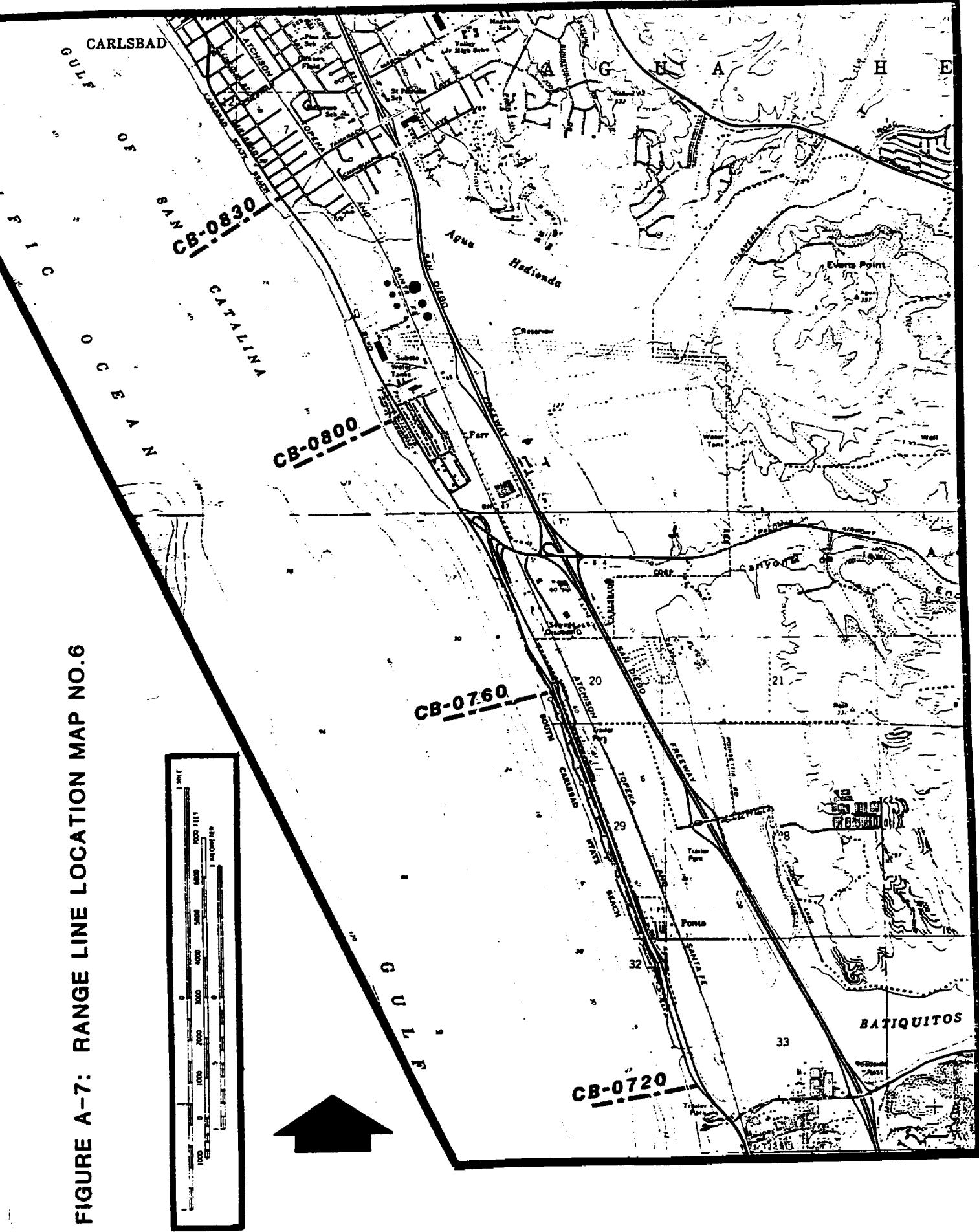


FIGURE A-8: RANGE LINE LOCATION MAP NO. 7

Scale
0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
1000 FT.
1000 M.

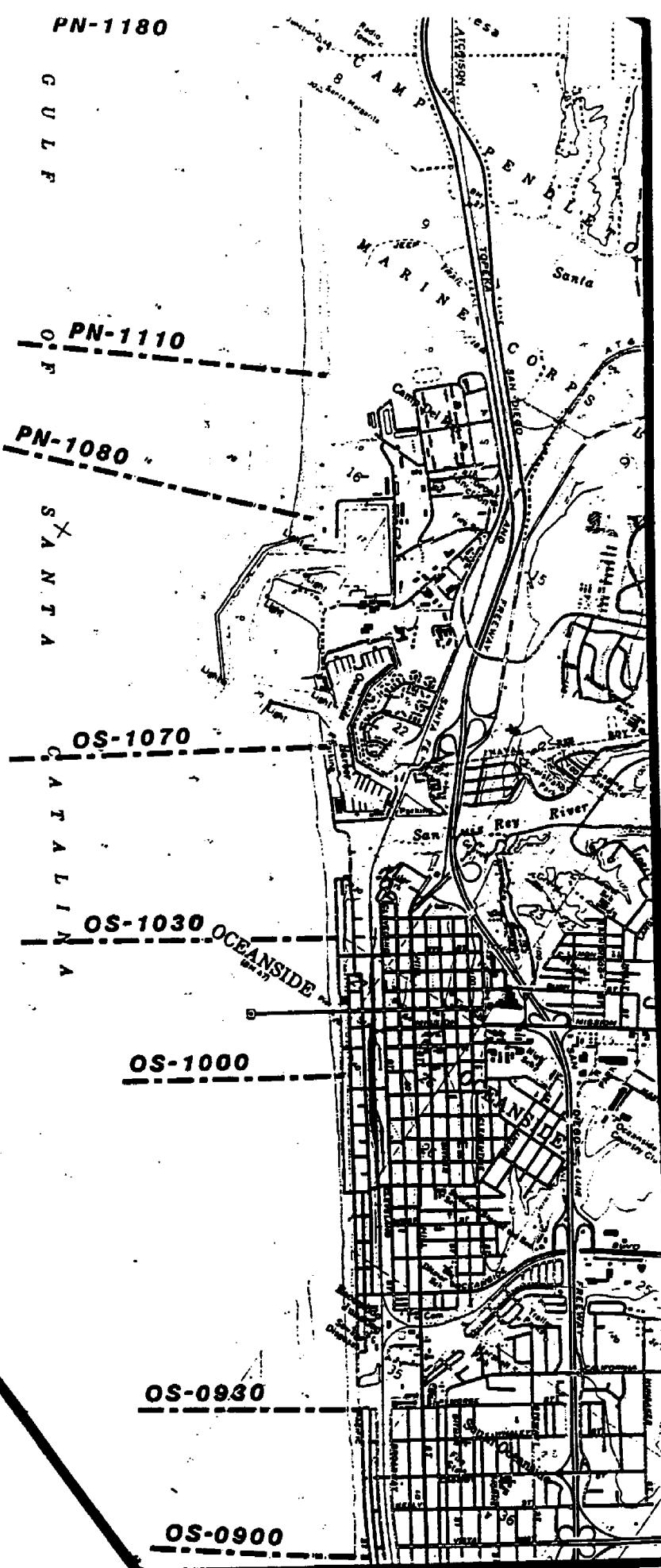
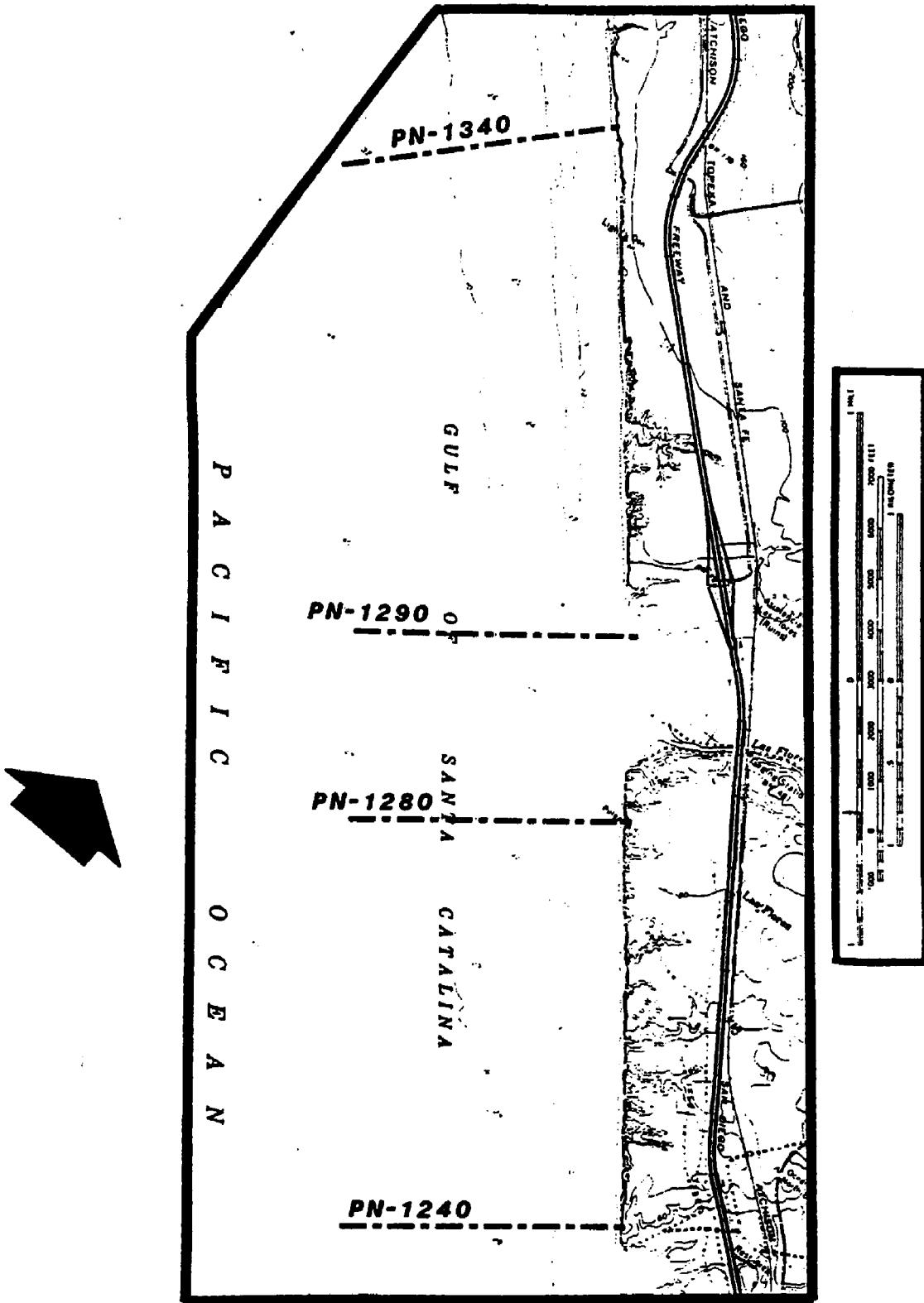


FIGURE A-8: RANGE LINE LOCATION MAP NO. 8



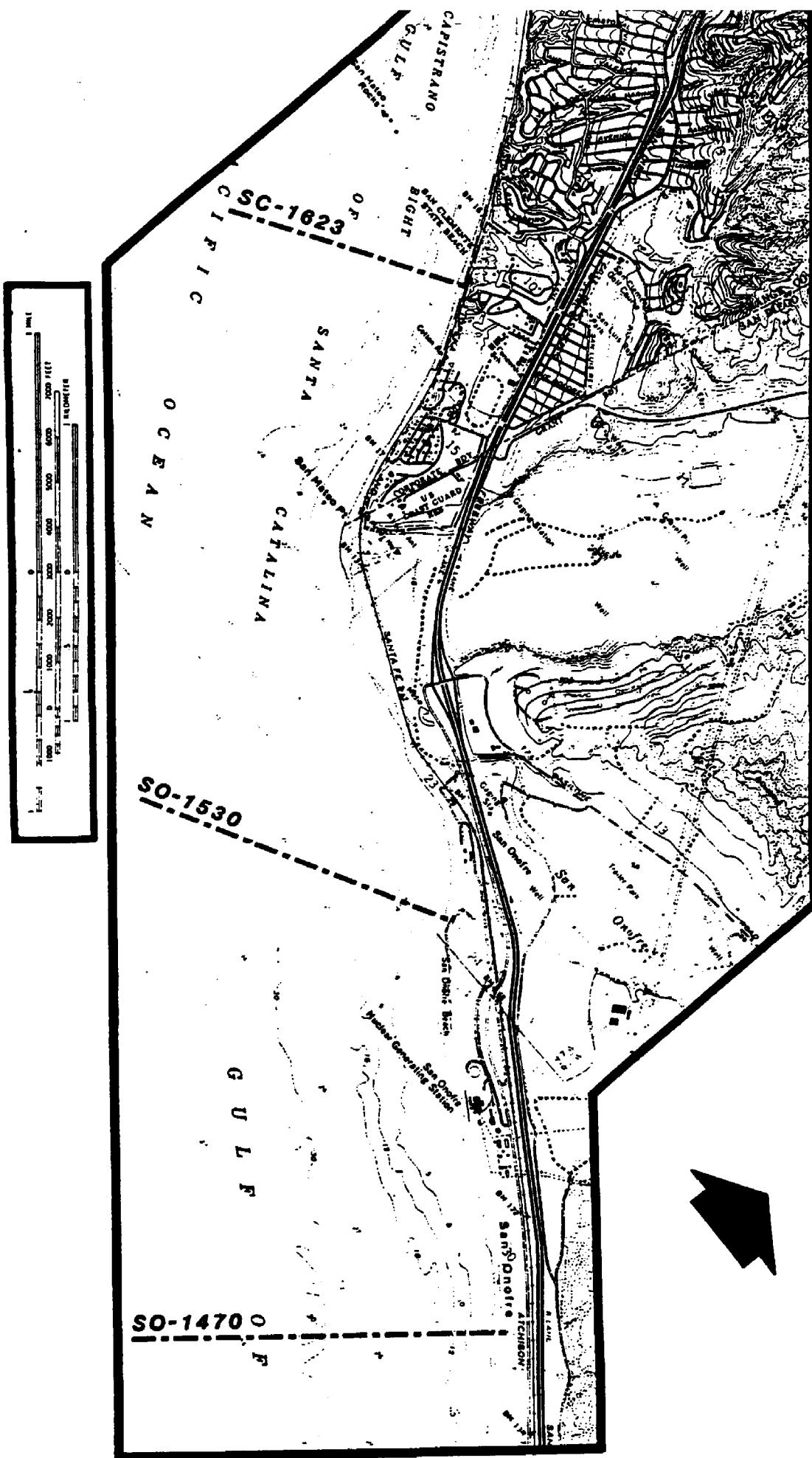
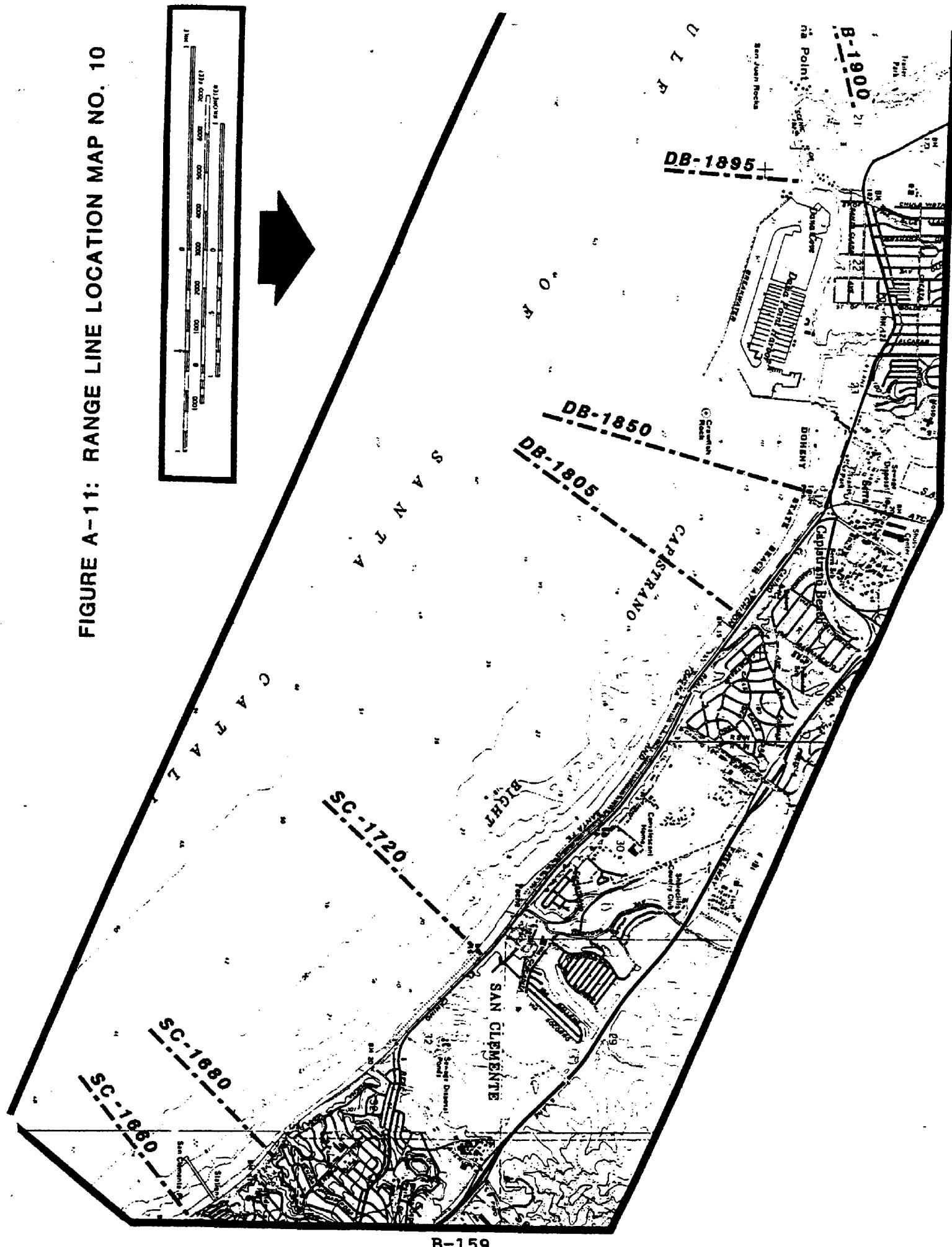


FIGURE A-10: RANGE LINE LOCATION MAP NO. 9

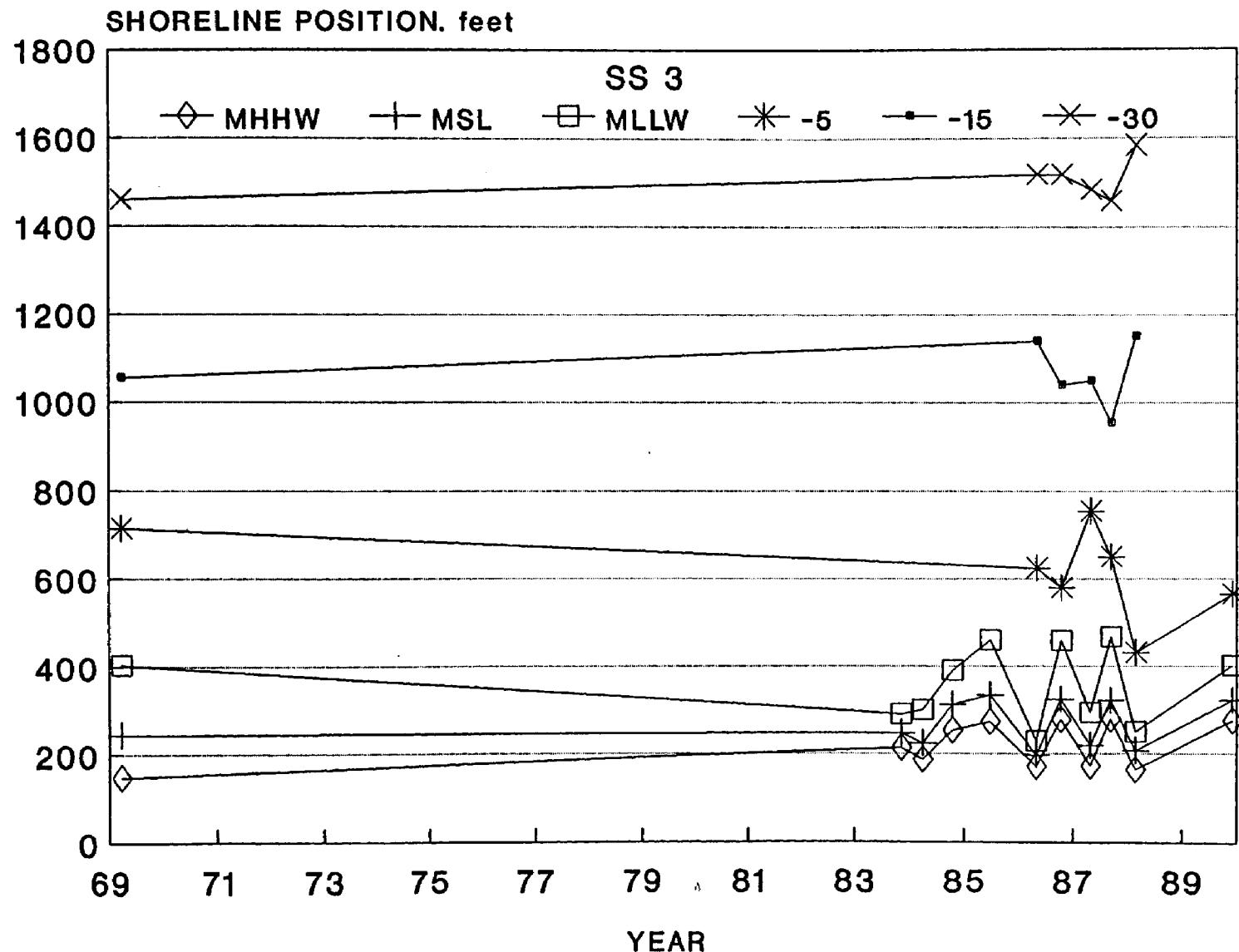
FIGURE A-11: RANGE LINE LOCATION MAP NO. 10



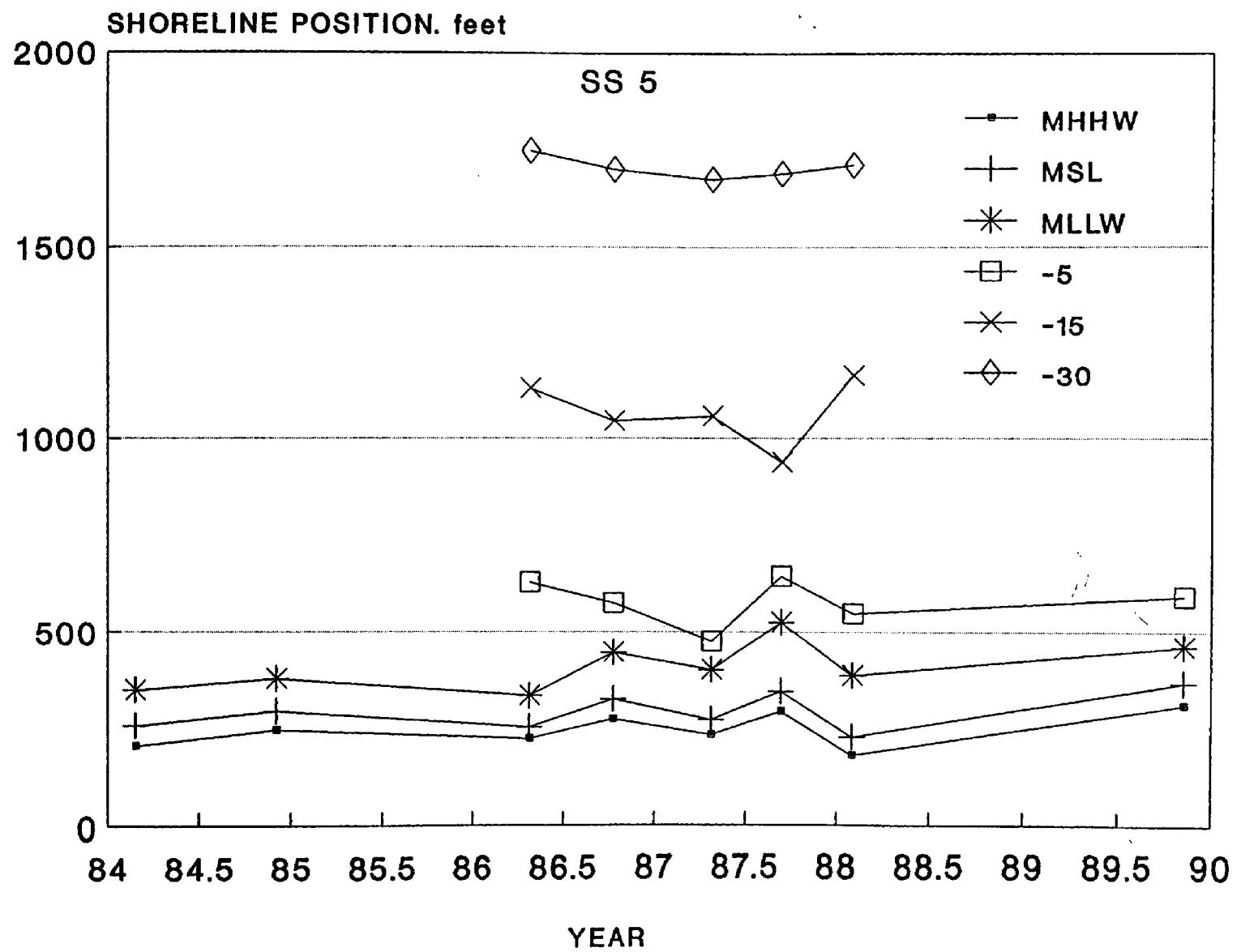
APPENDIX C

**TIME HISTORY GRAPHS OF THE MHHW, MSL, -5 FT,
-15 FT AND -30 FT CONTOUR POSITION
FOR THE SURVEYED PROFILES**

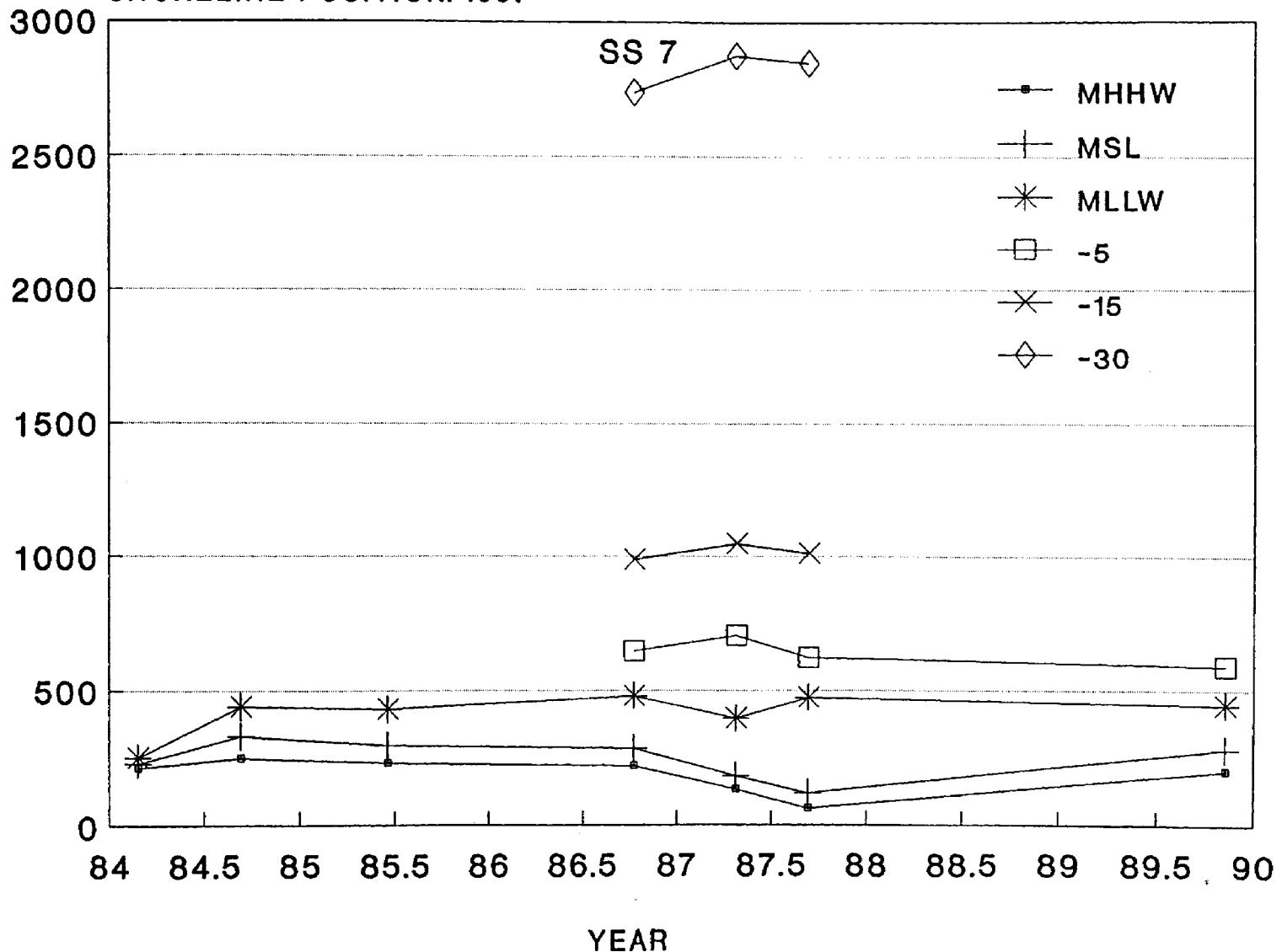
C-1



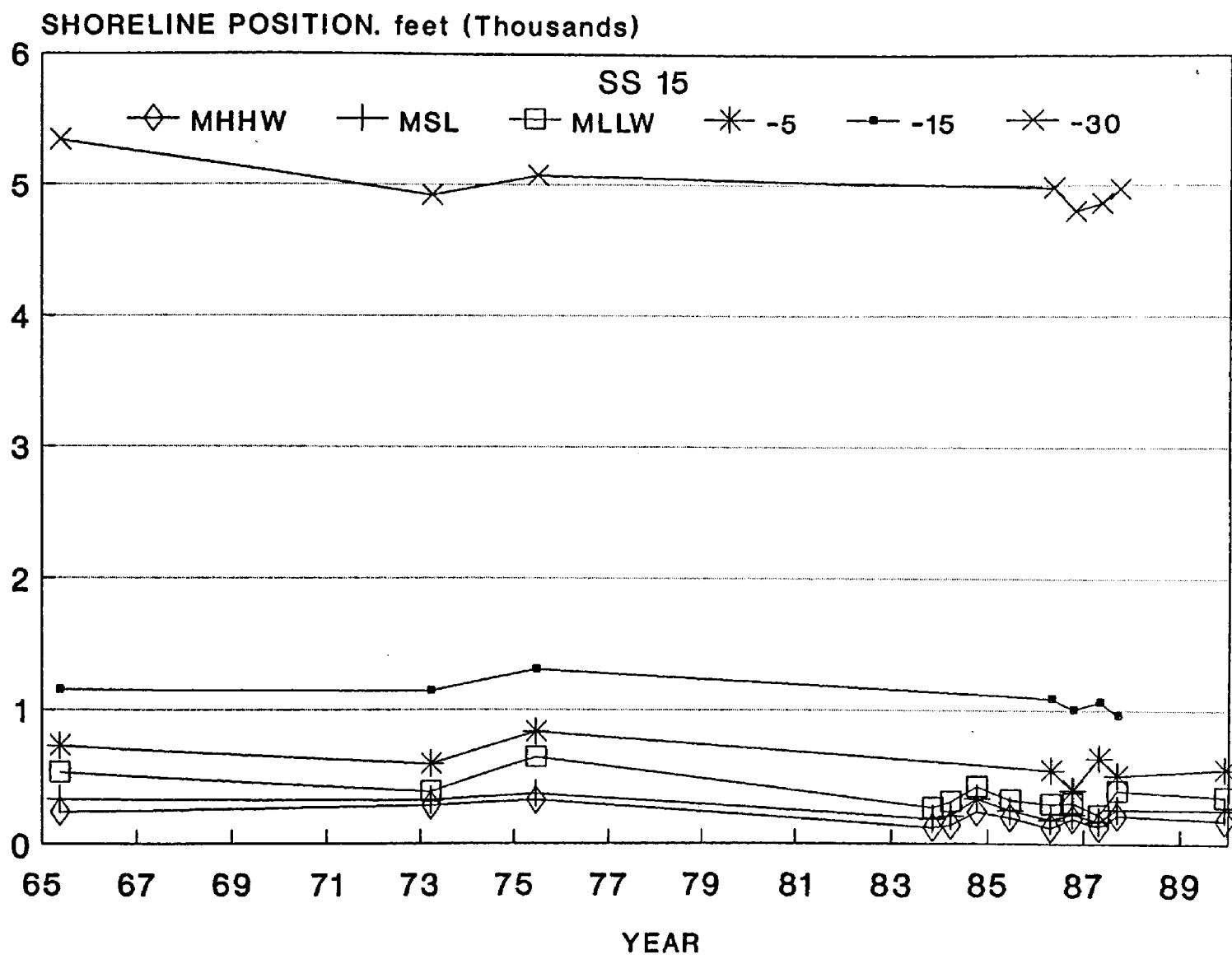
C-2



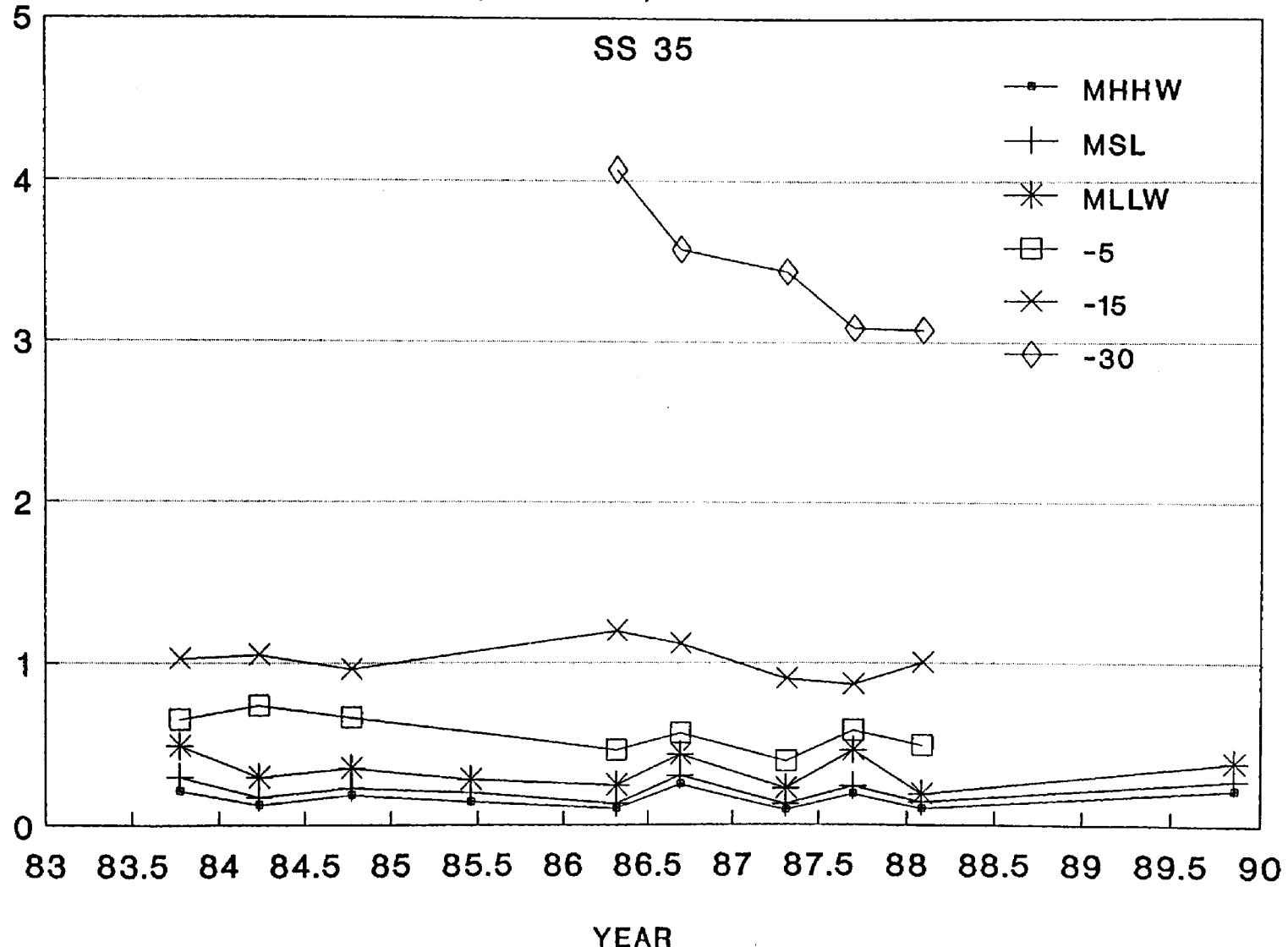
SHORELINE POSITION. feet



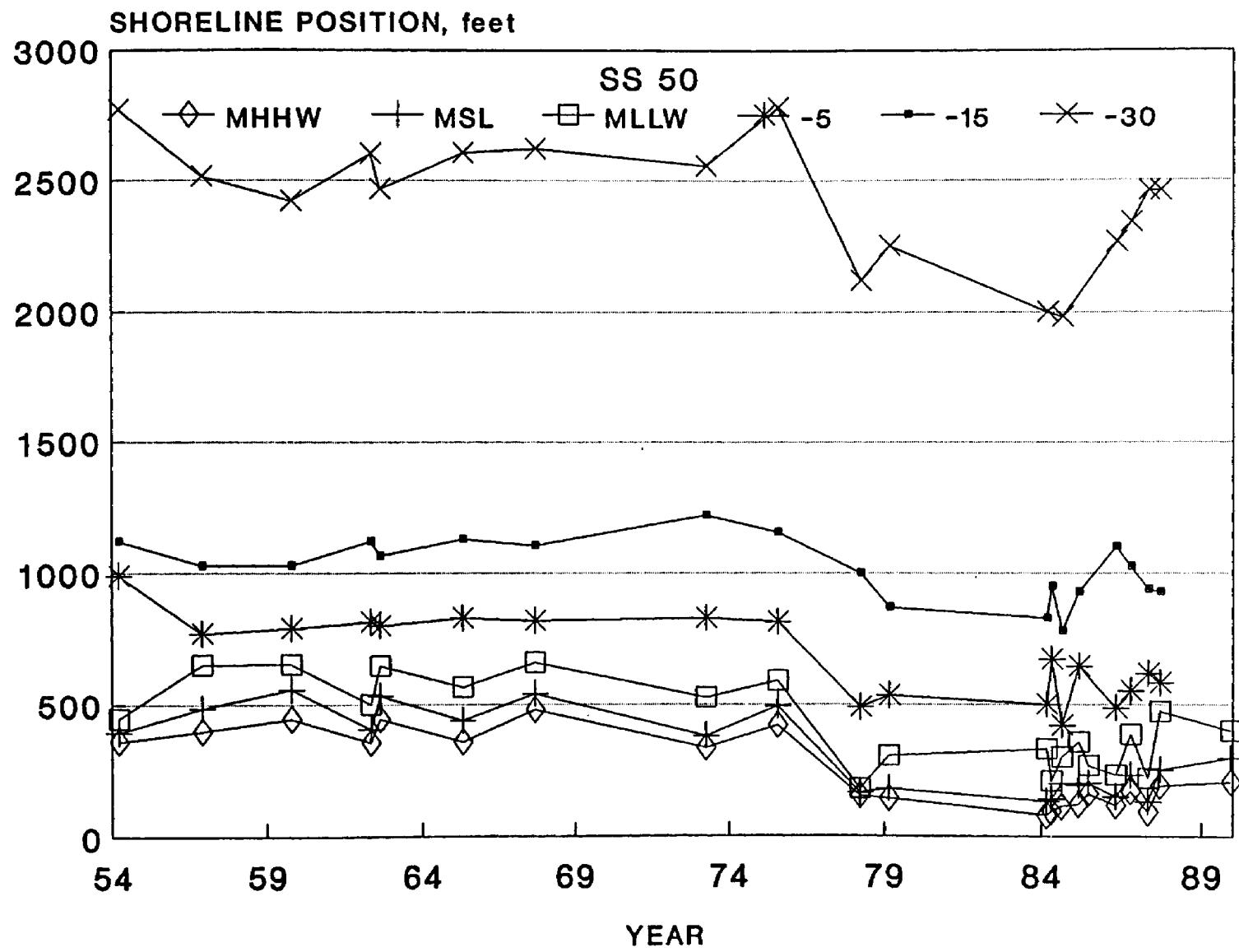
C-4



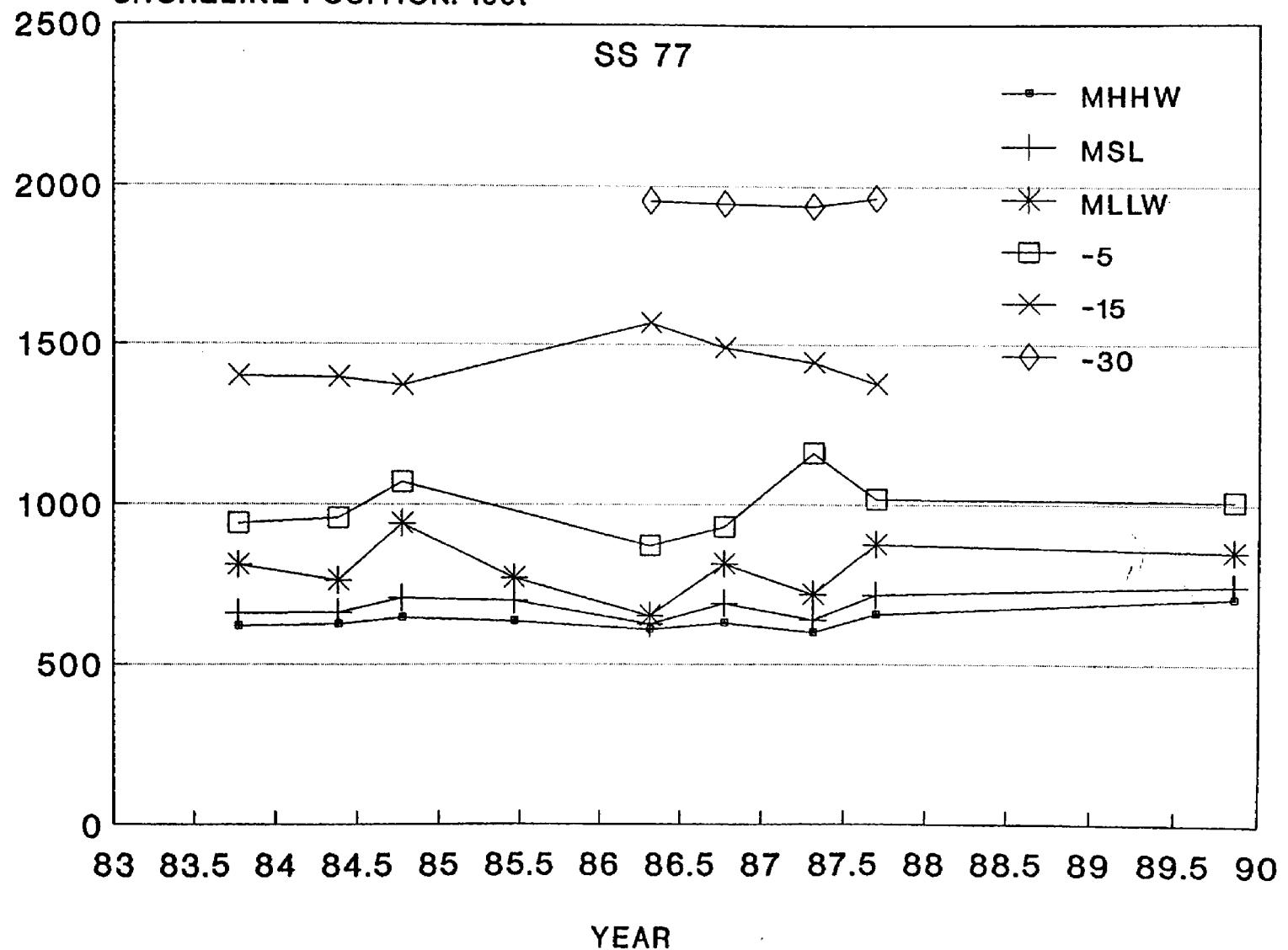
SHORELINE POSITION. feet (Thousands)



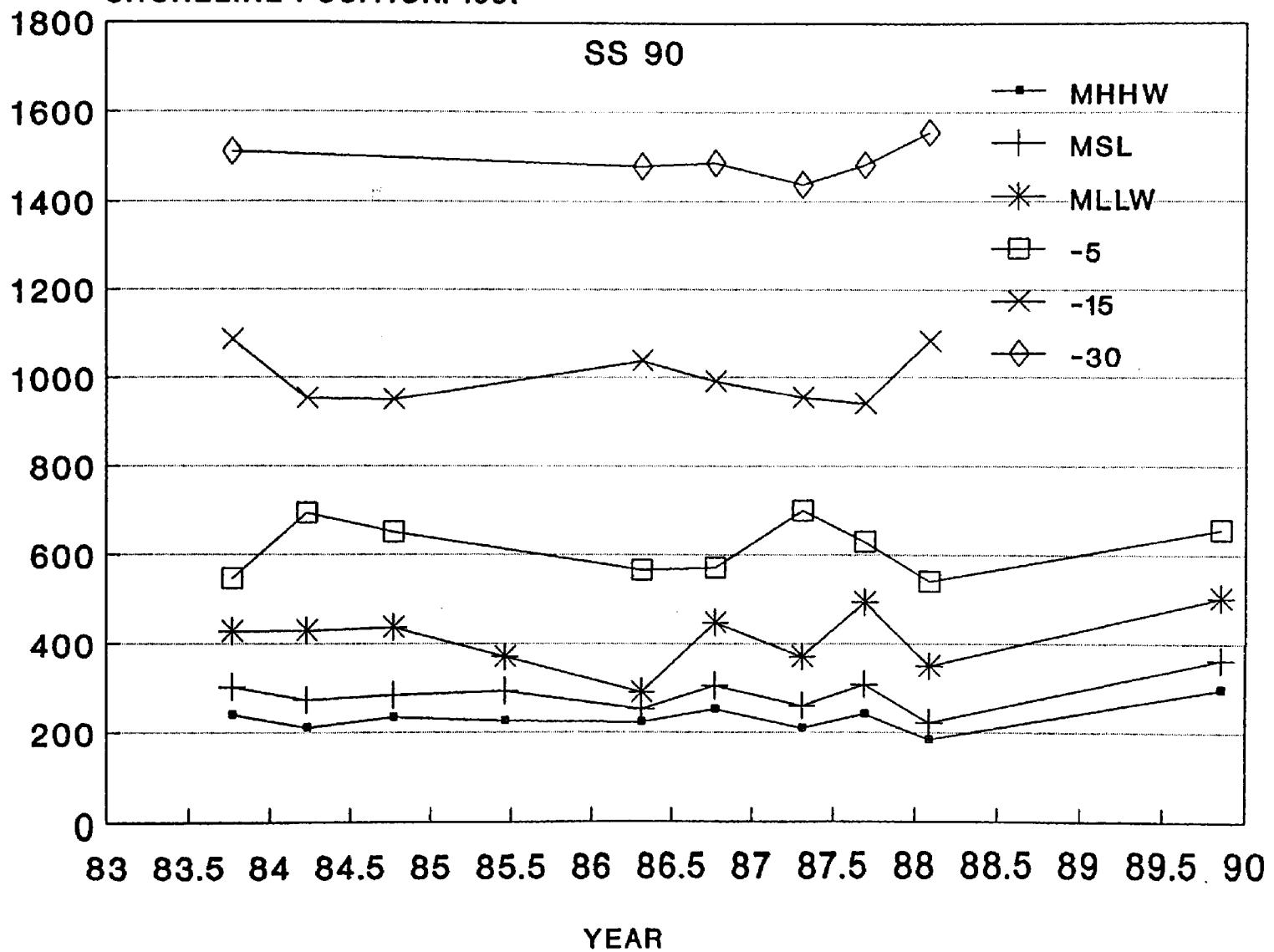
C-6



SHORELINE POSITION. feet

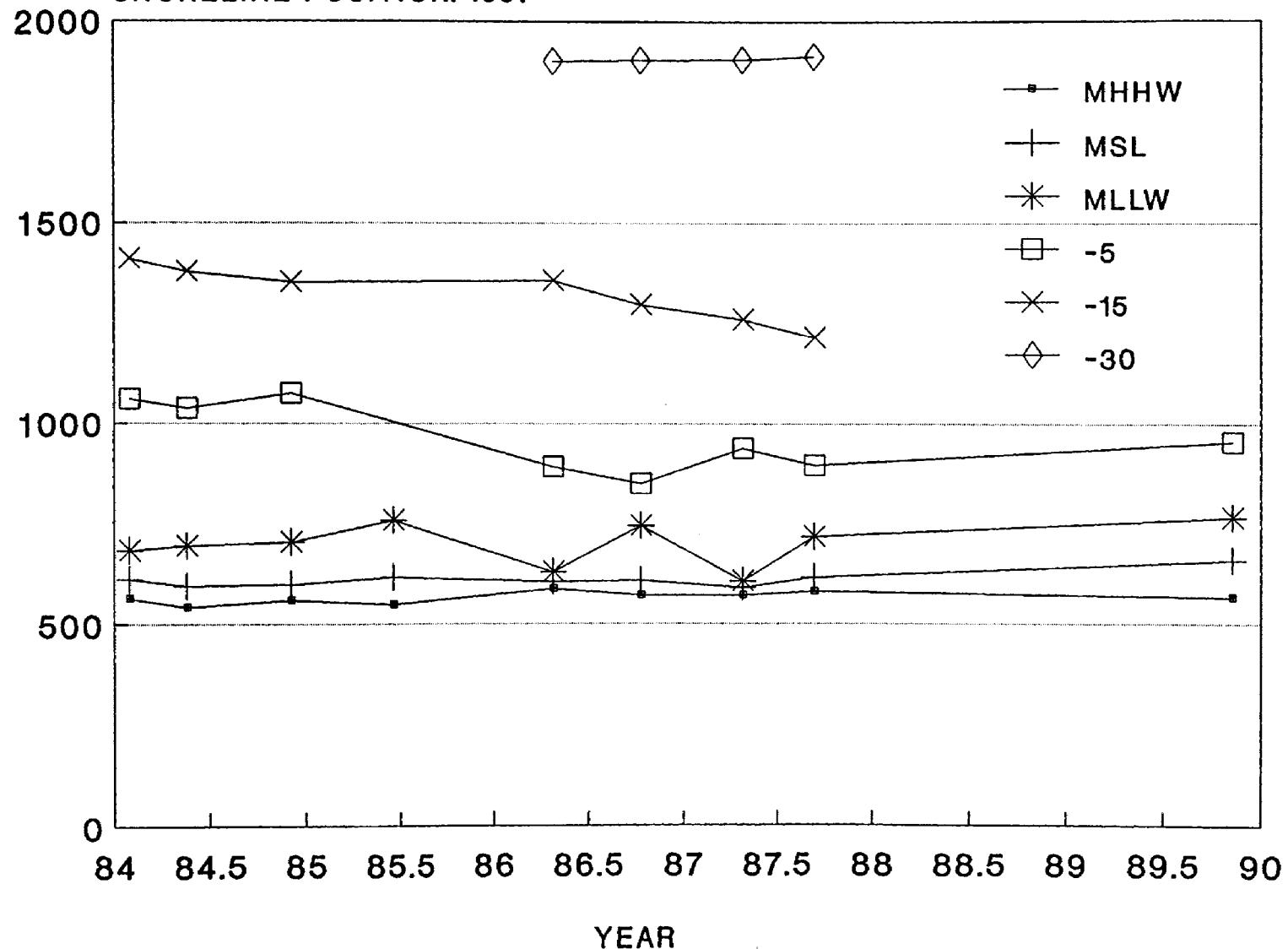


SHORELINE POSITION. feet

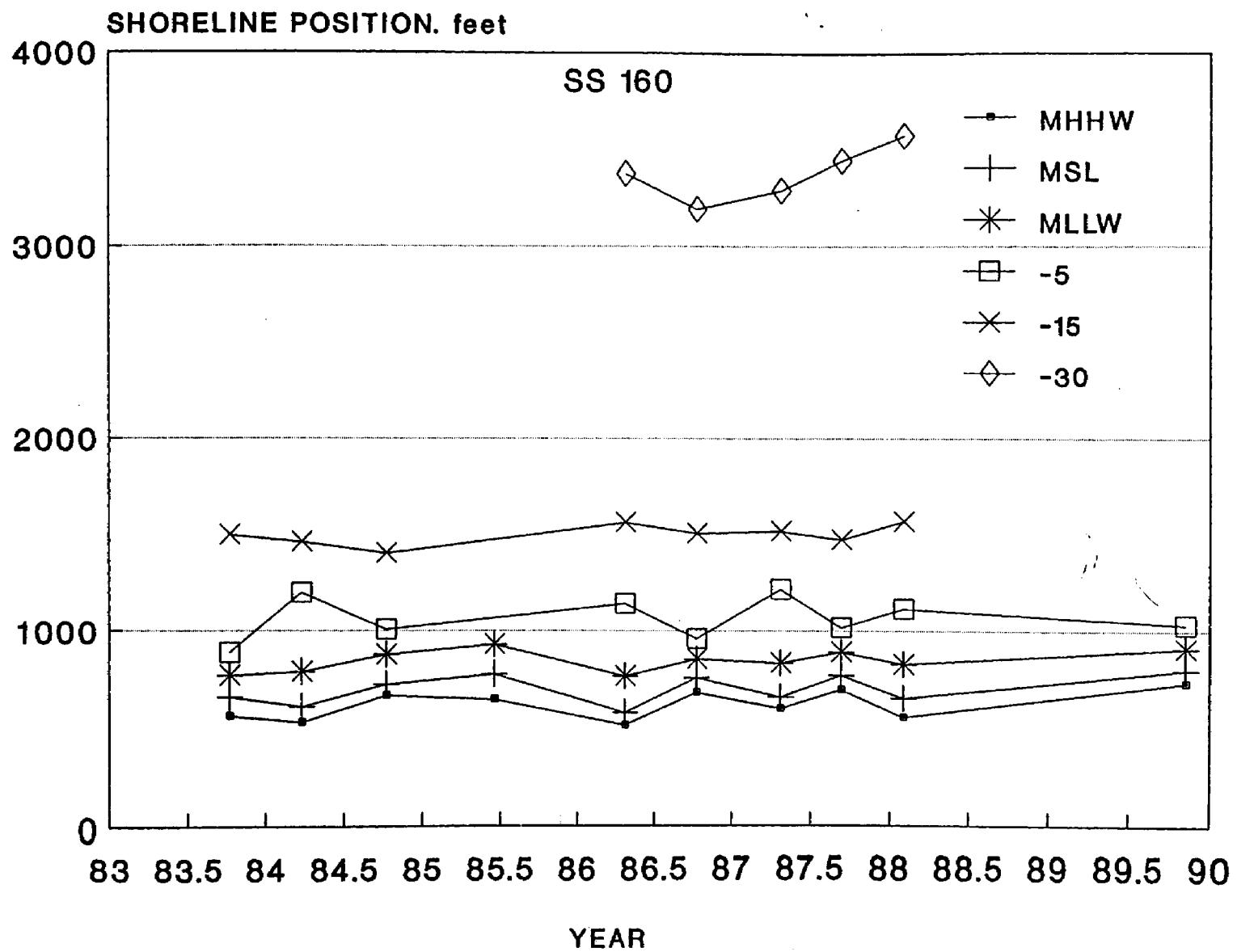


SHORELINE POSITION. feet

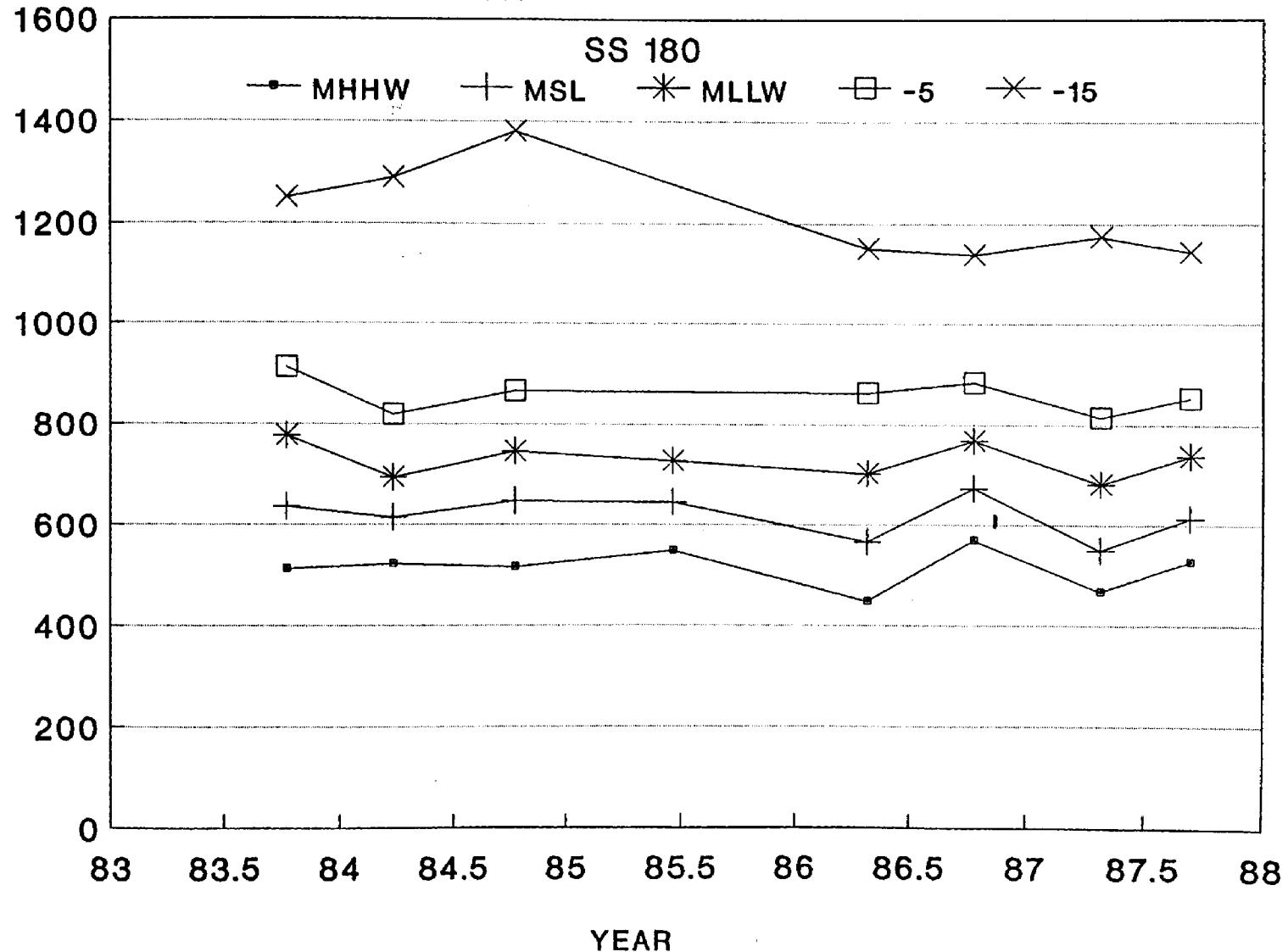
SS 125



C-10

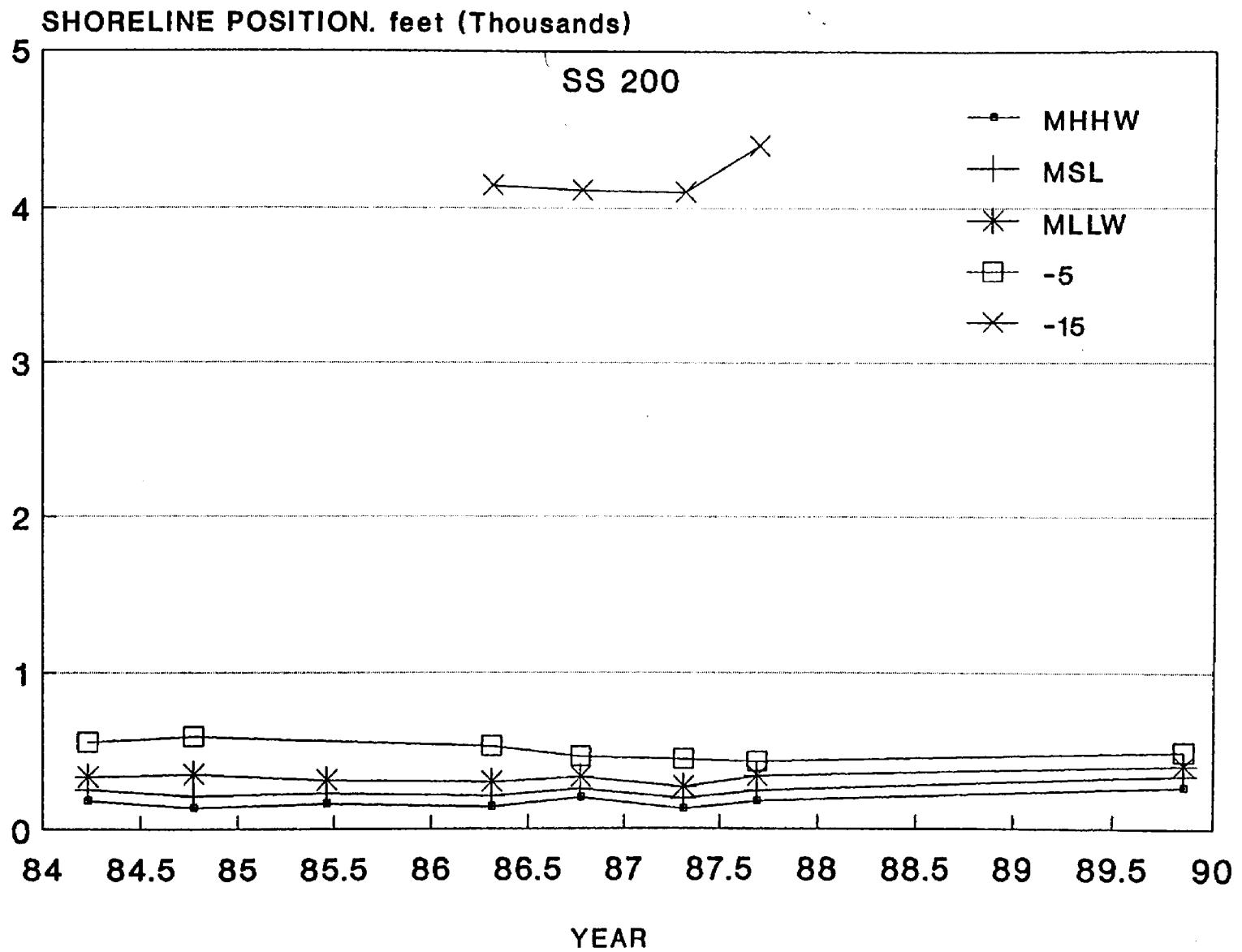


SHORELINE POSITION. feet

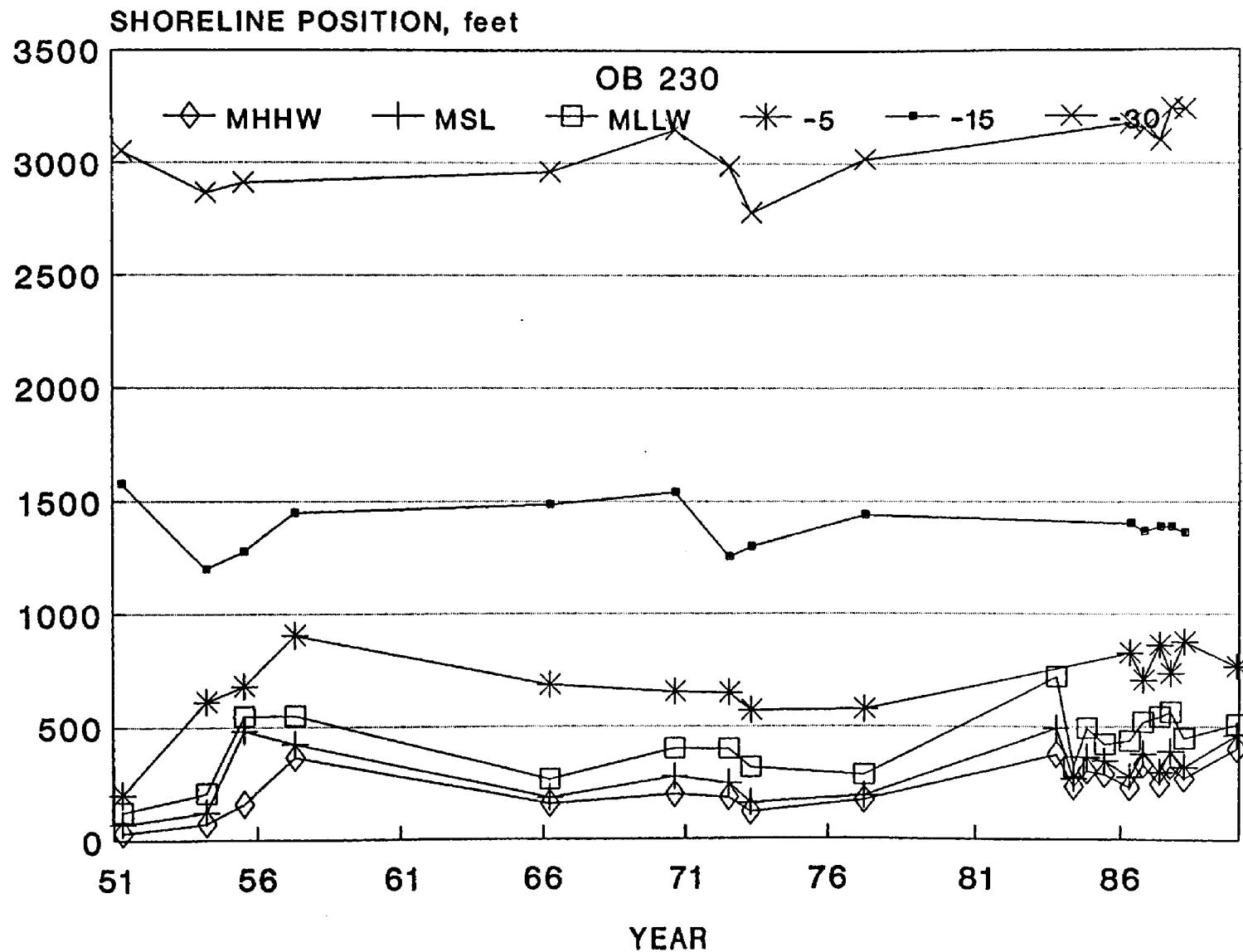


C-11

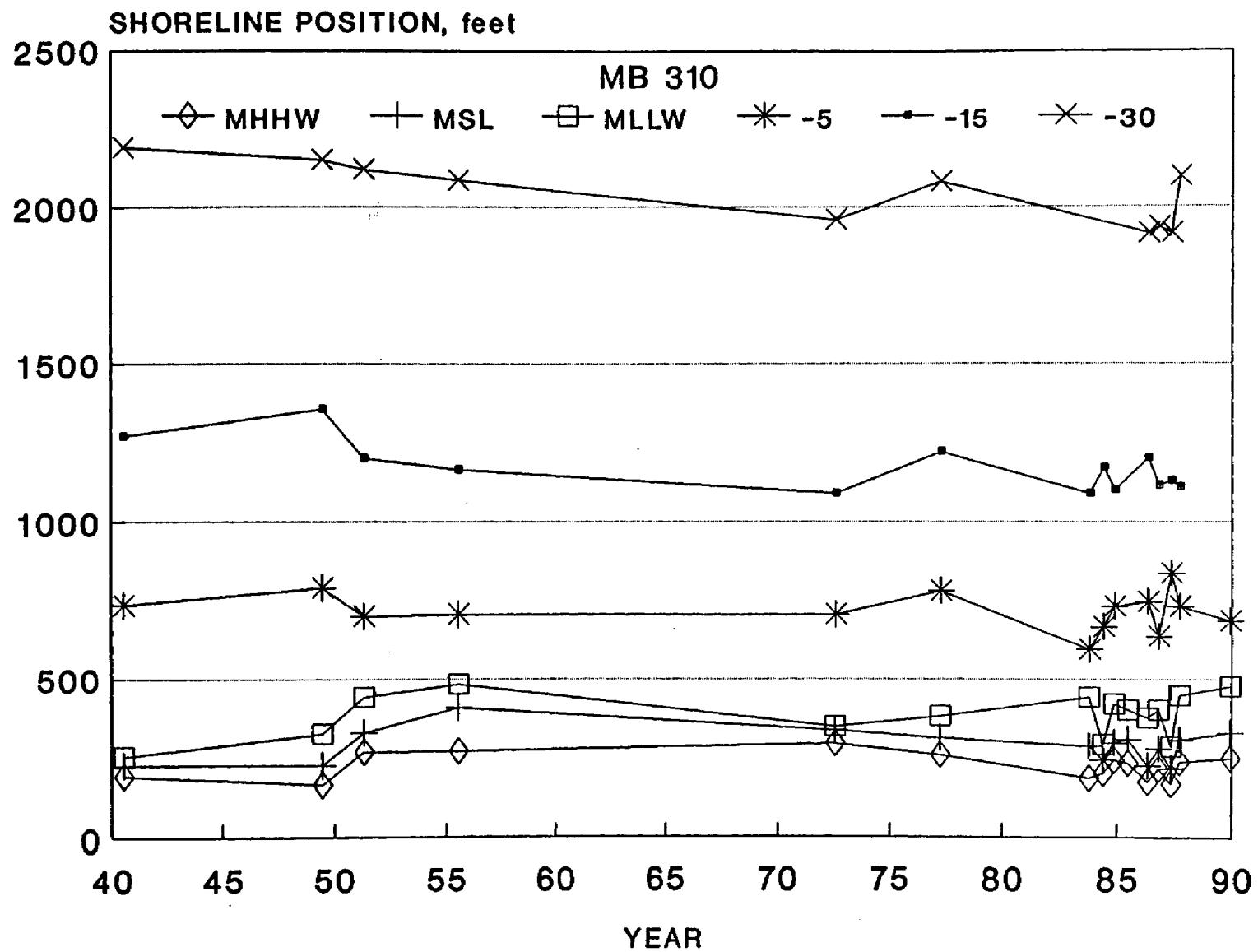
C-12



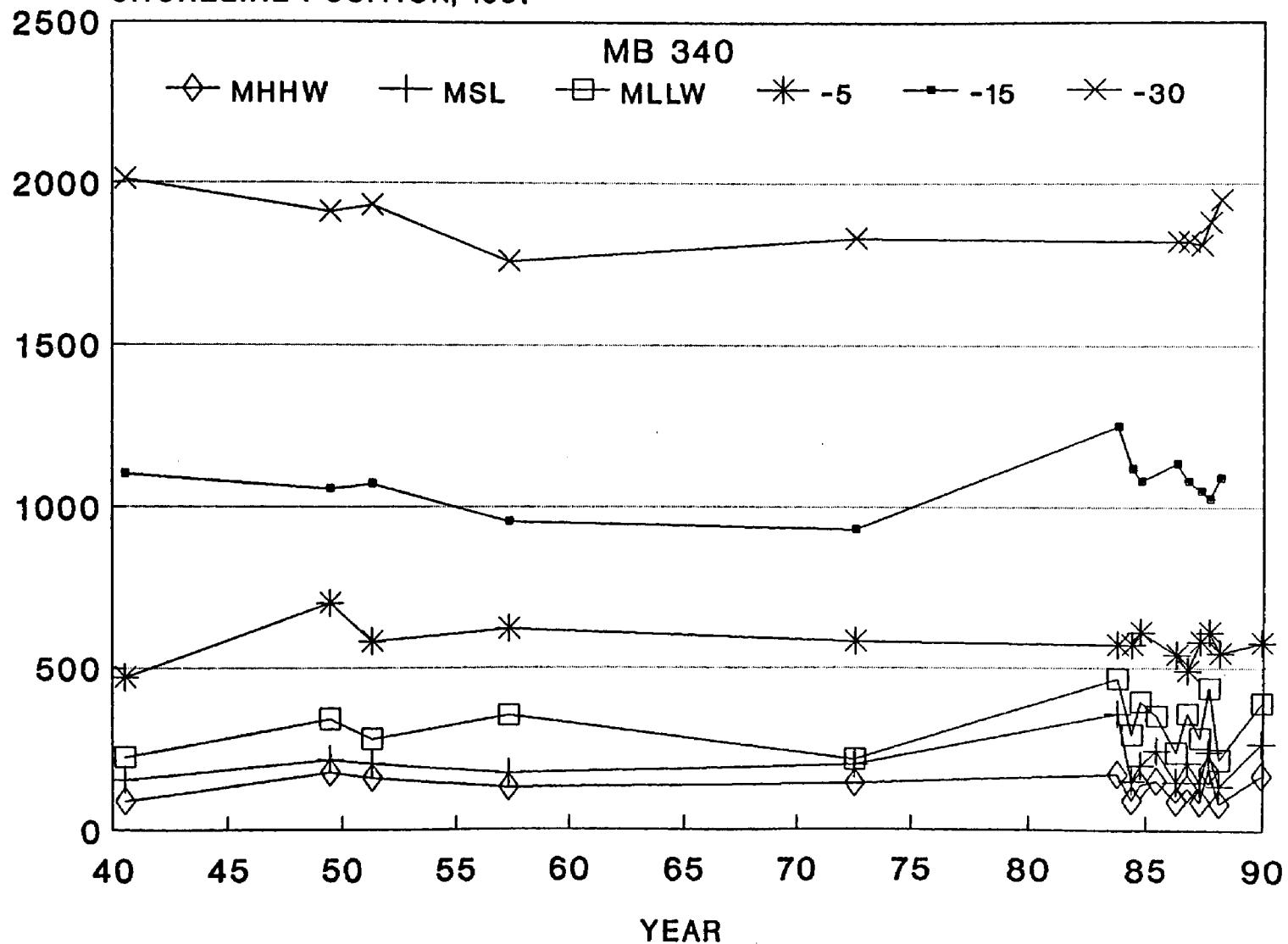
C-13



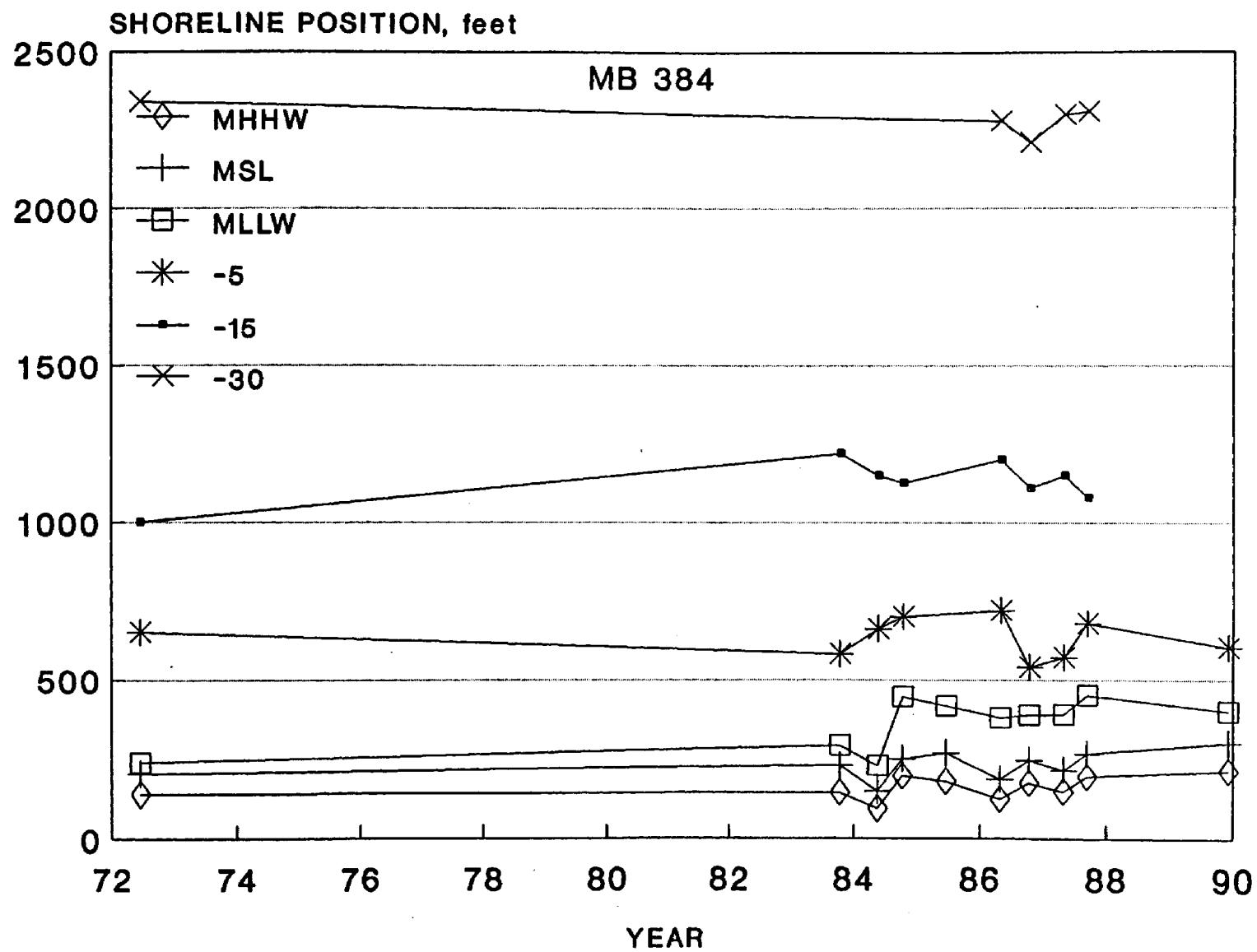
C-14



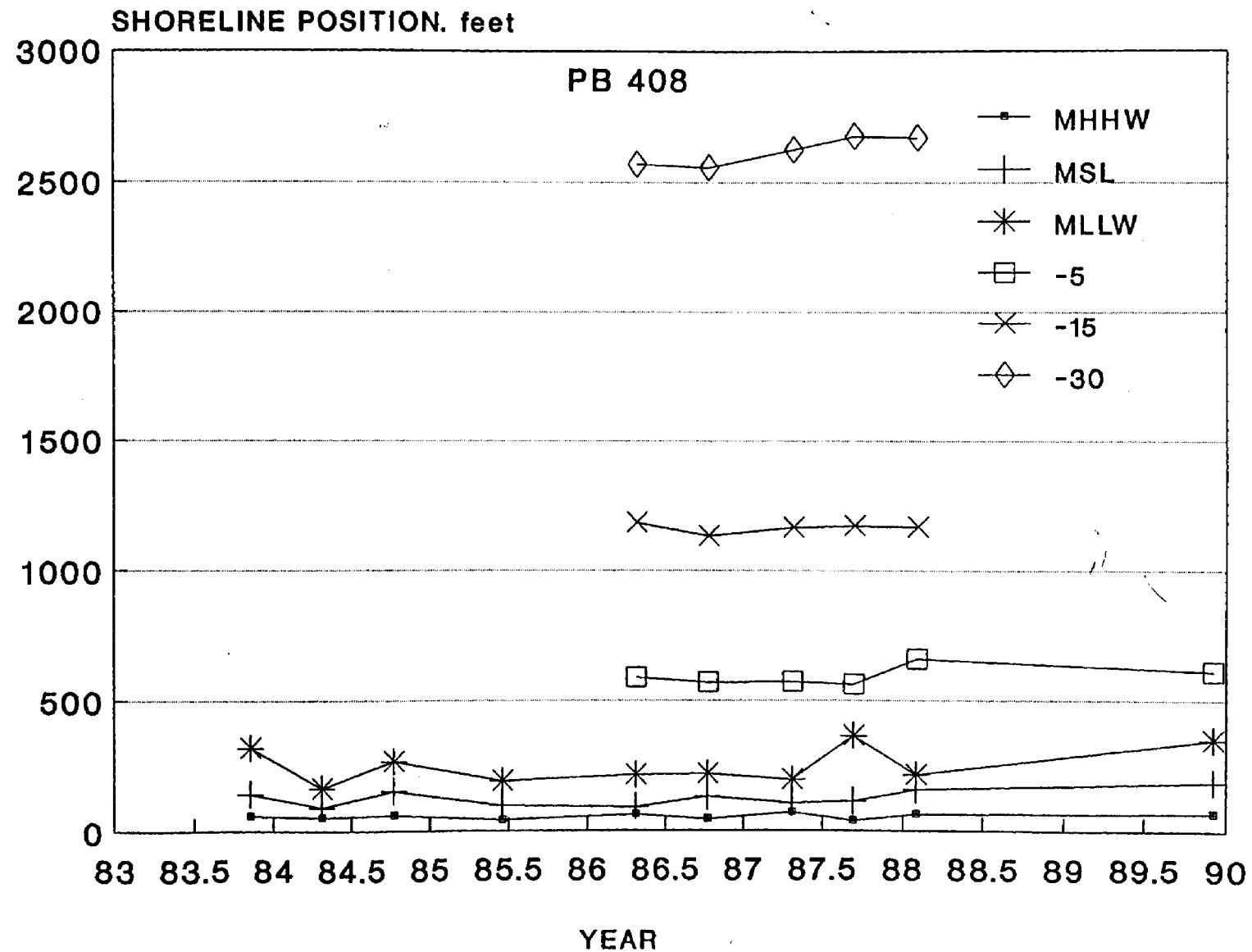
SHORELINE POSITION, feet



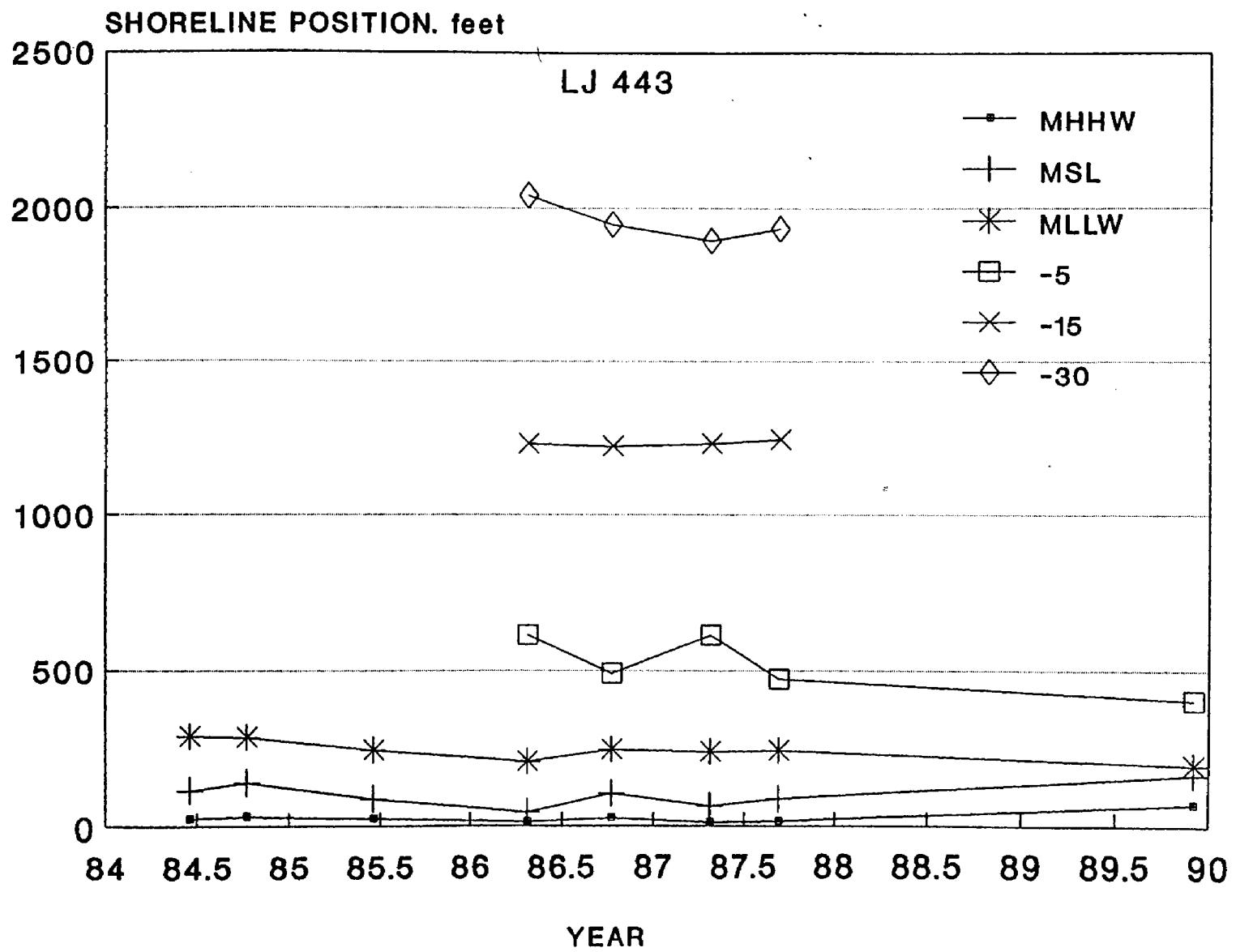
C-16



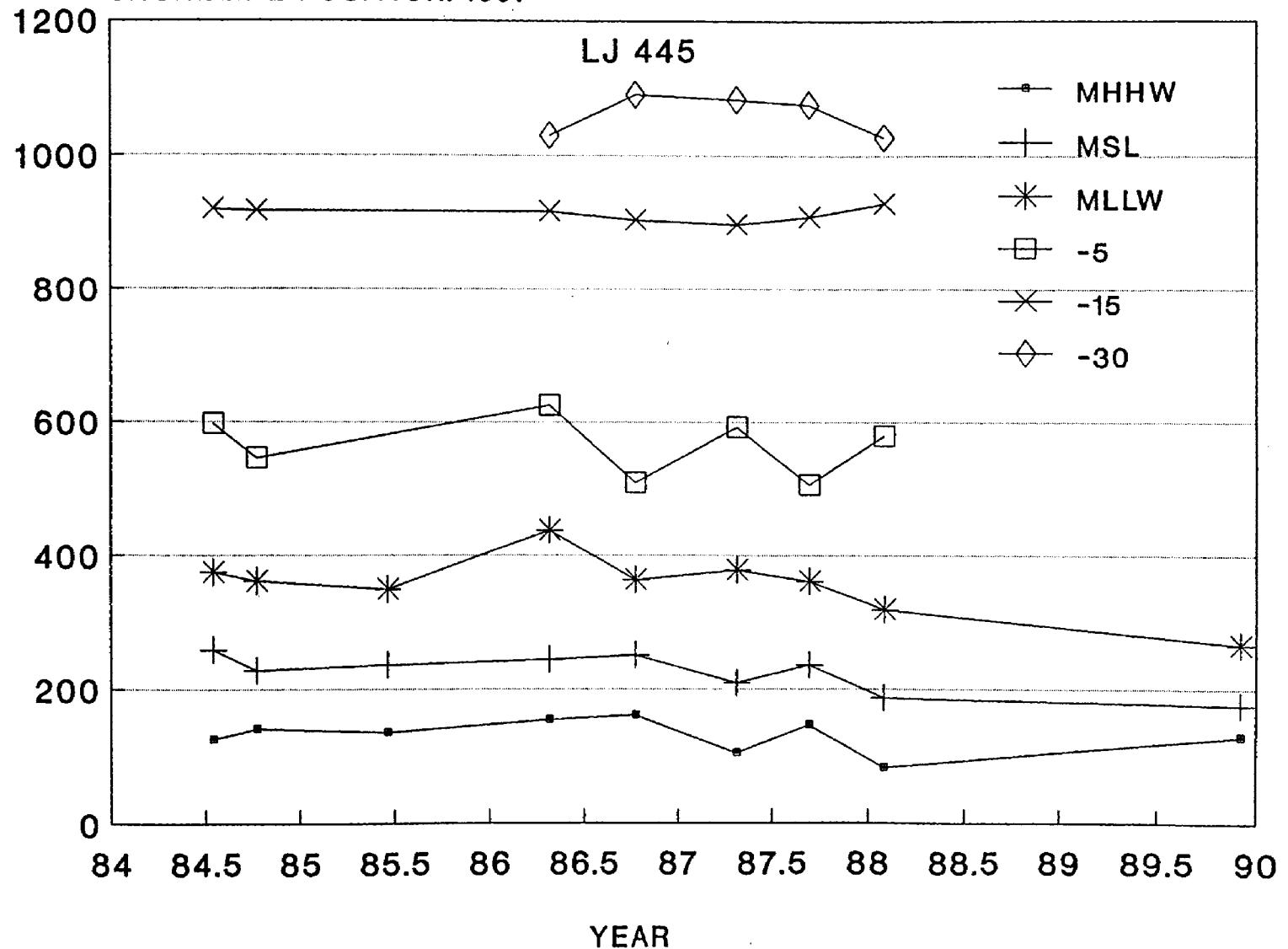
C-17



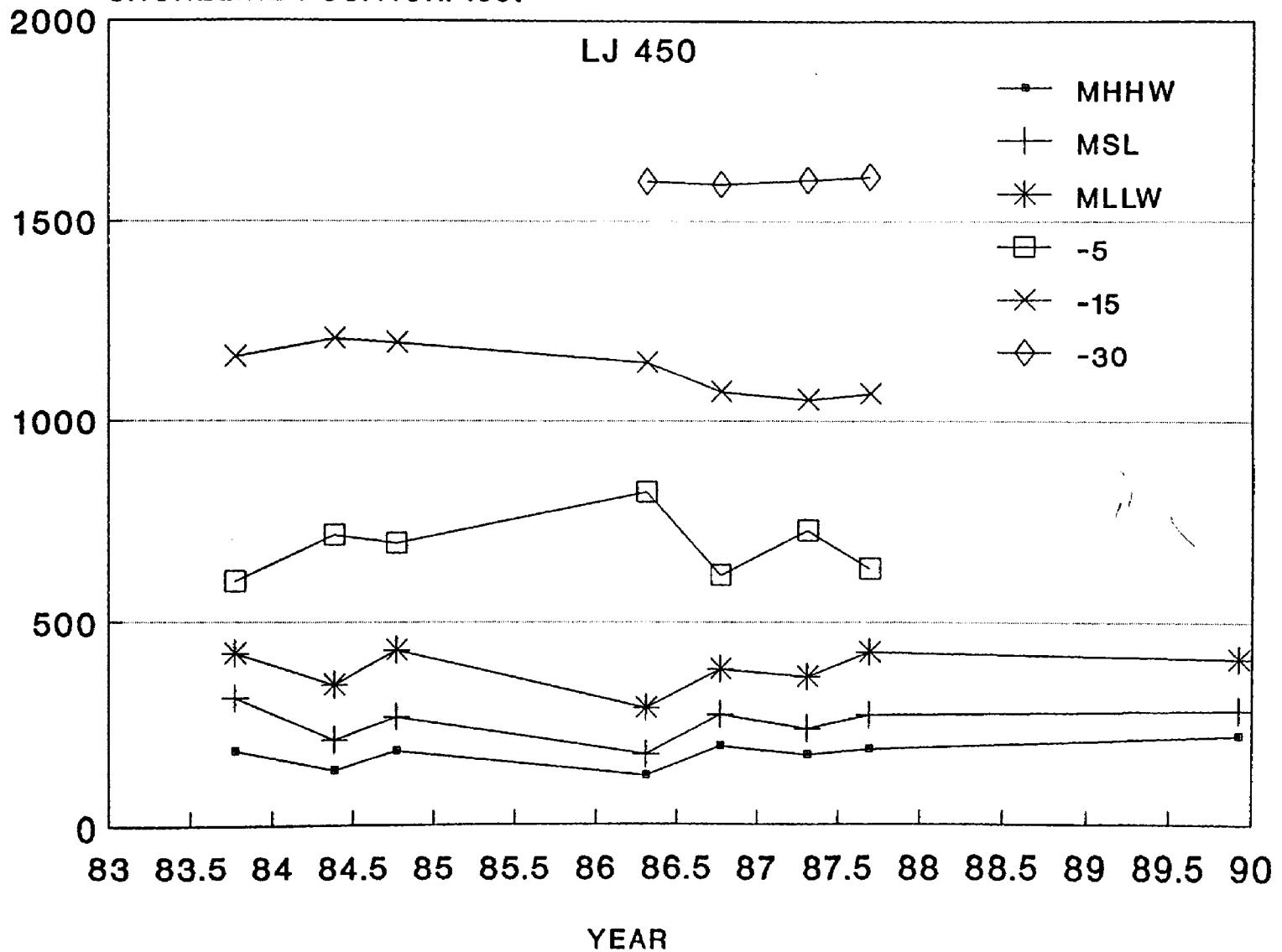
C-18

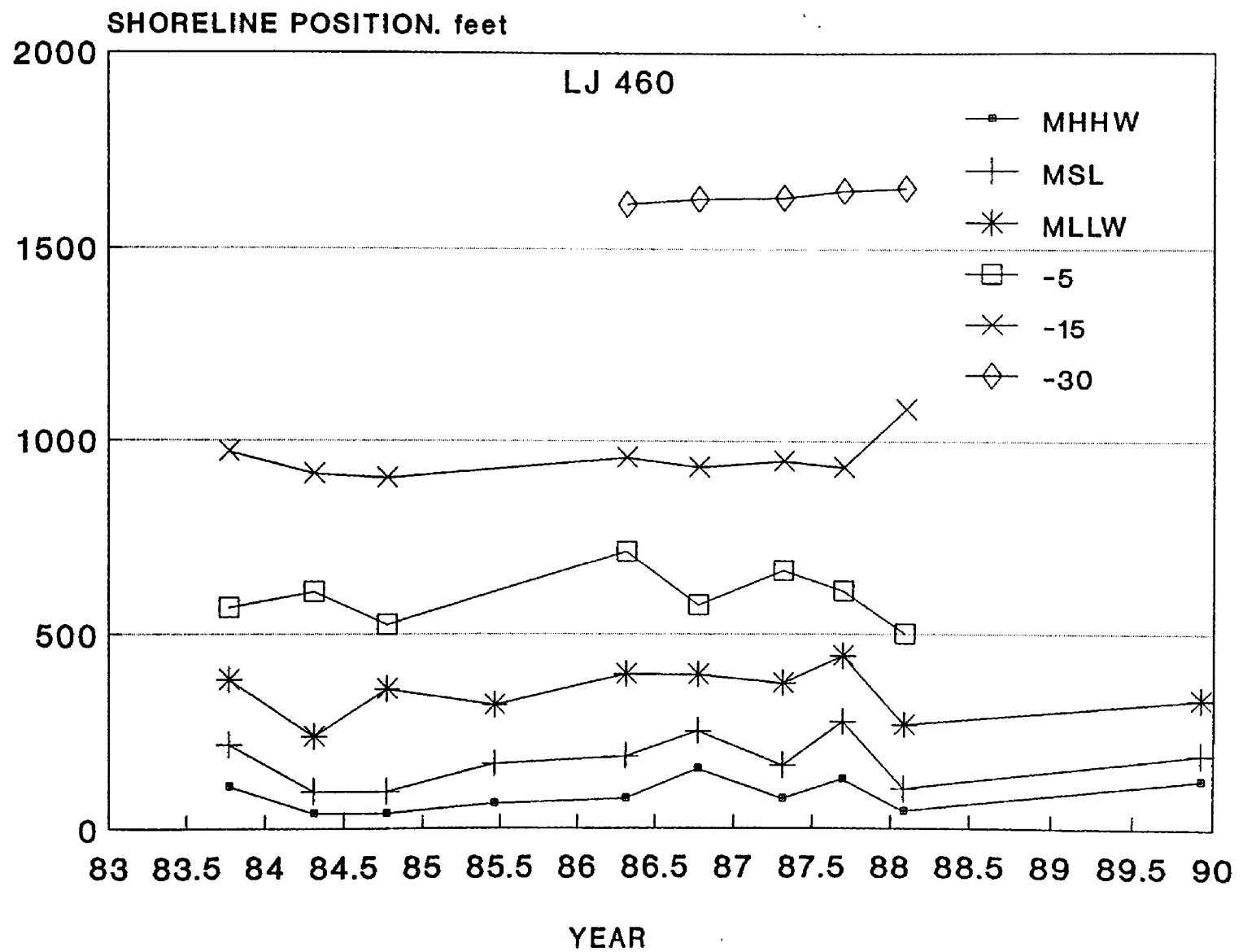


SHORELINE POSITION. feet

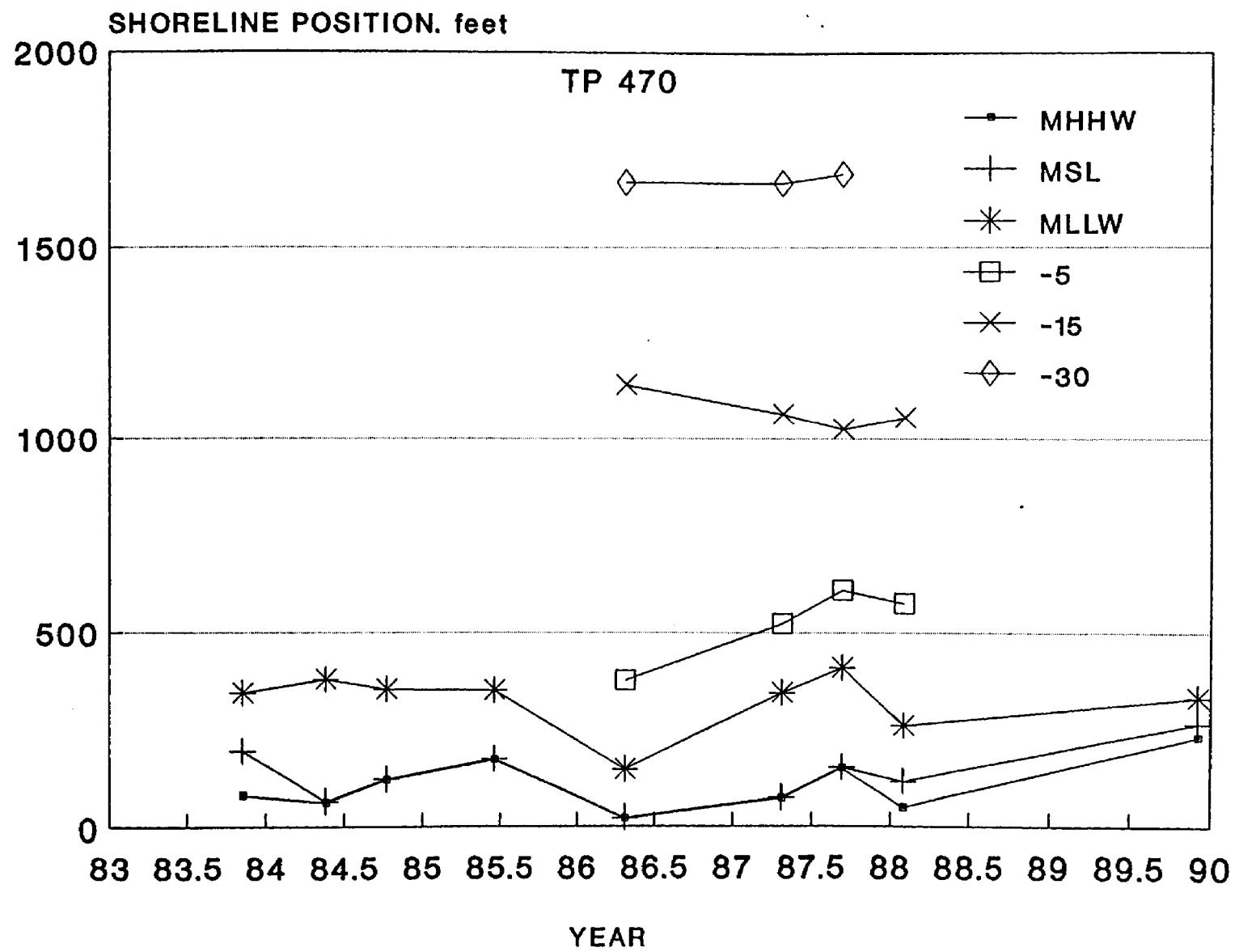


SHORELINE POSITION. feet

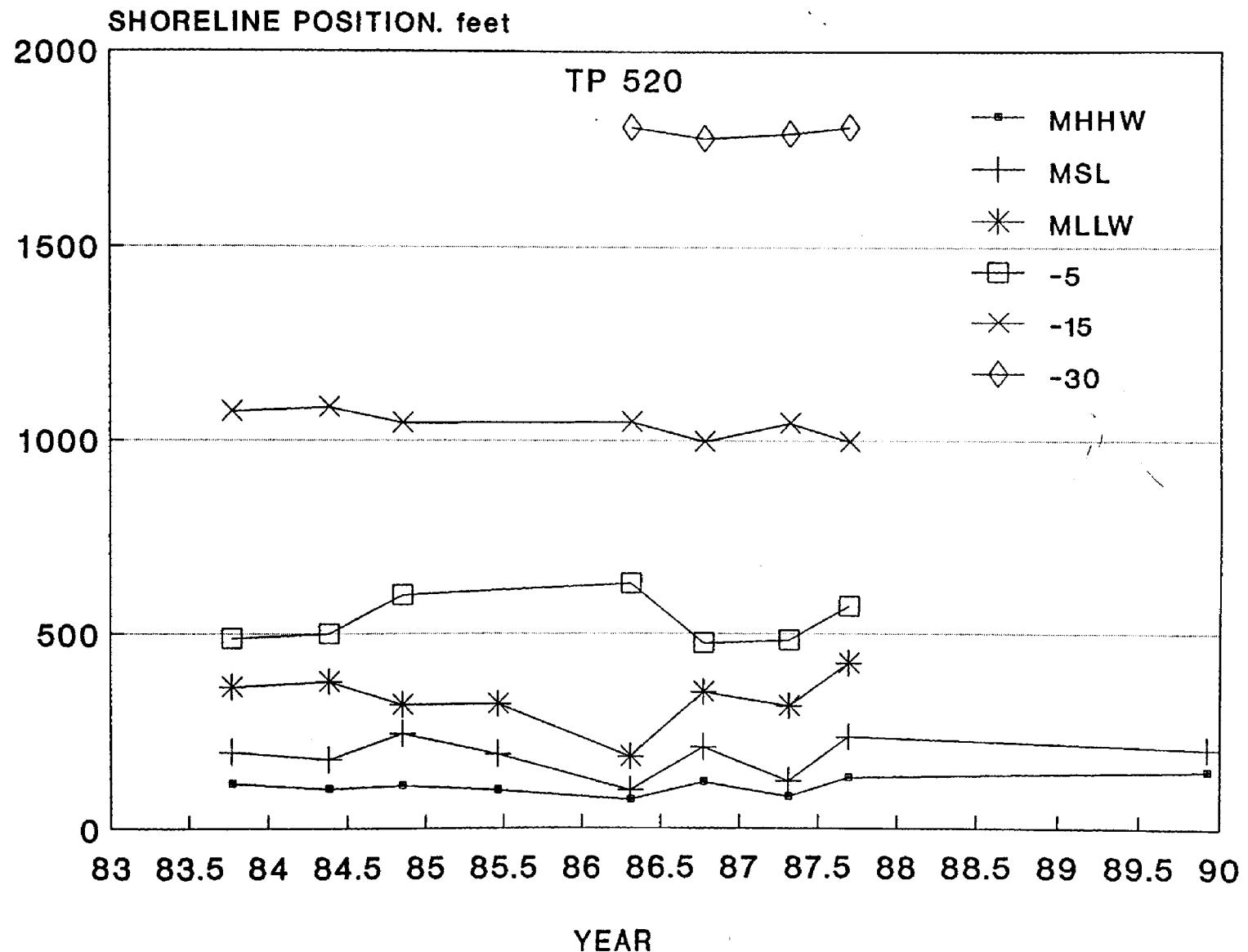


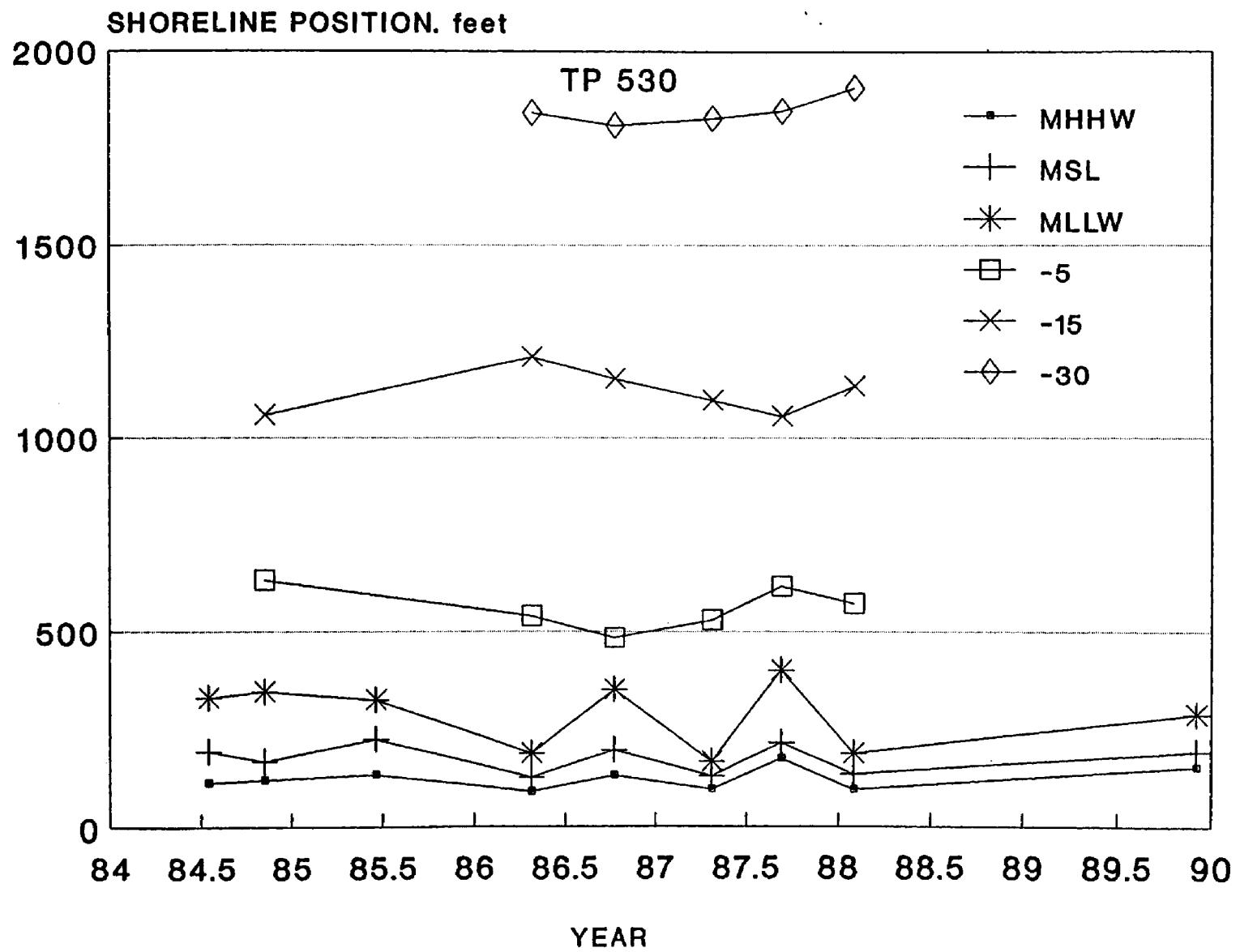


C-22

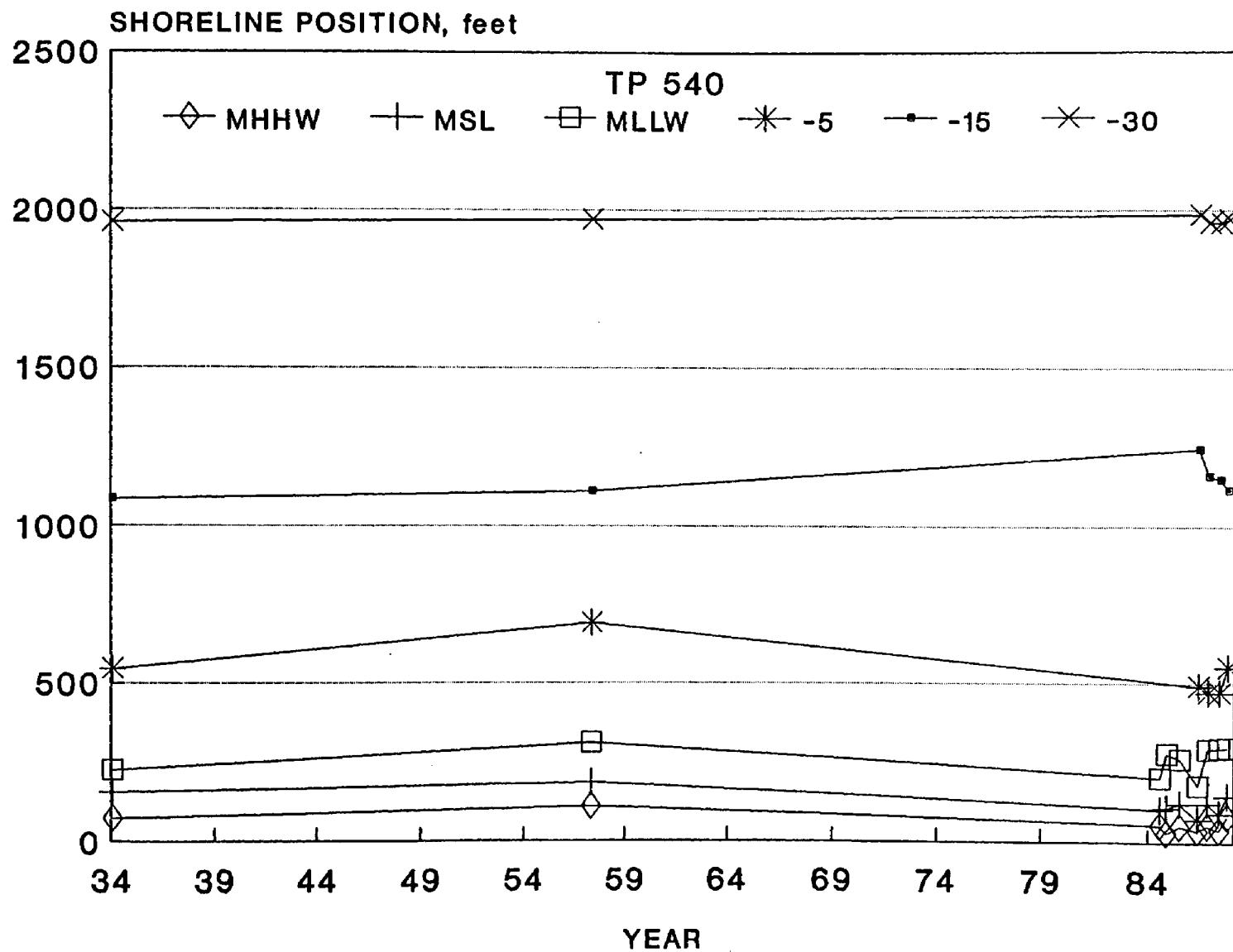


C-23

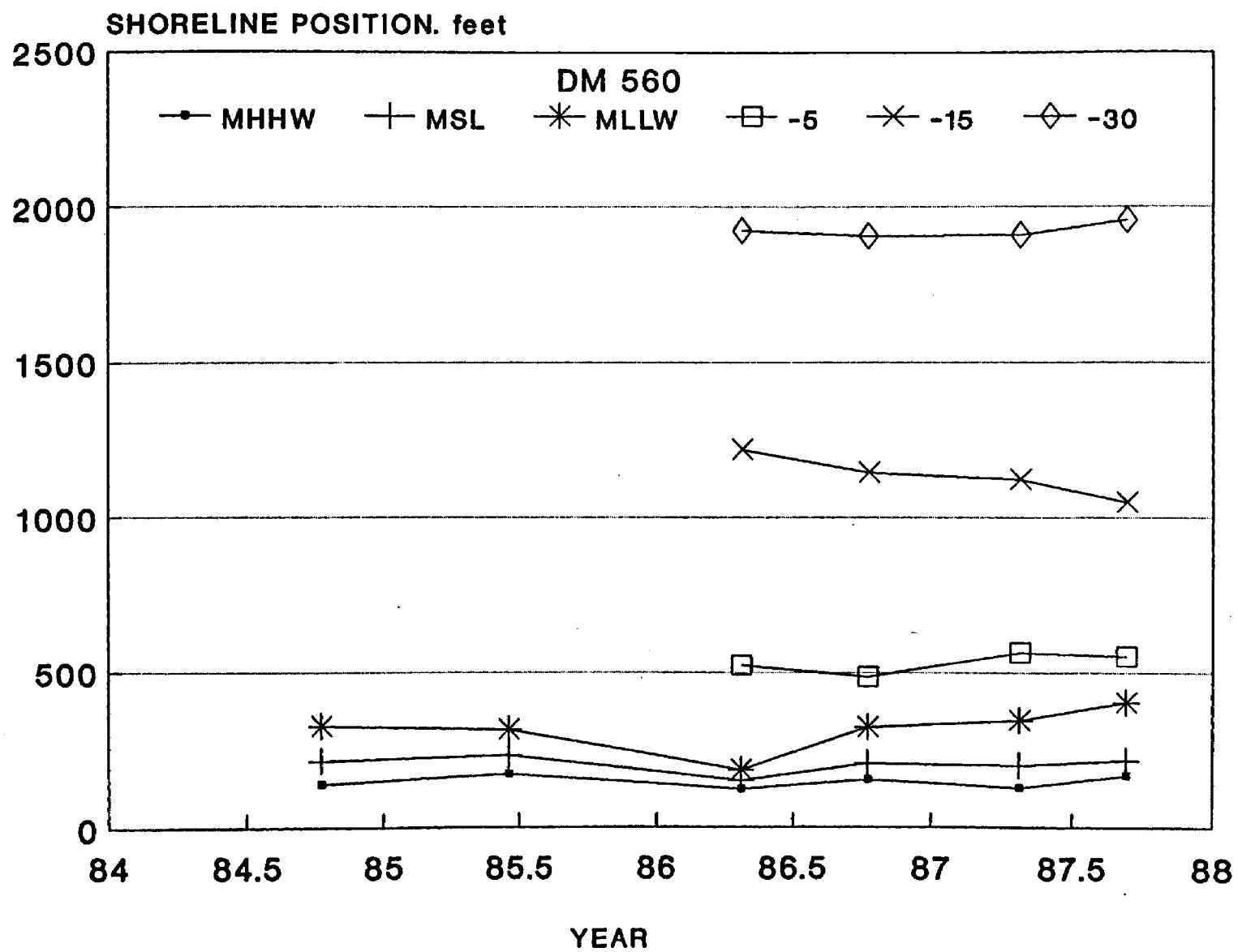




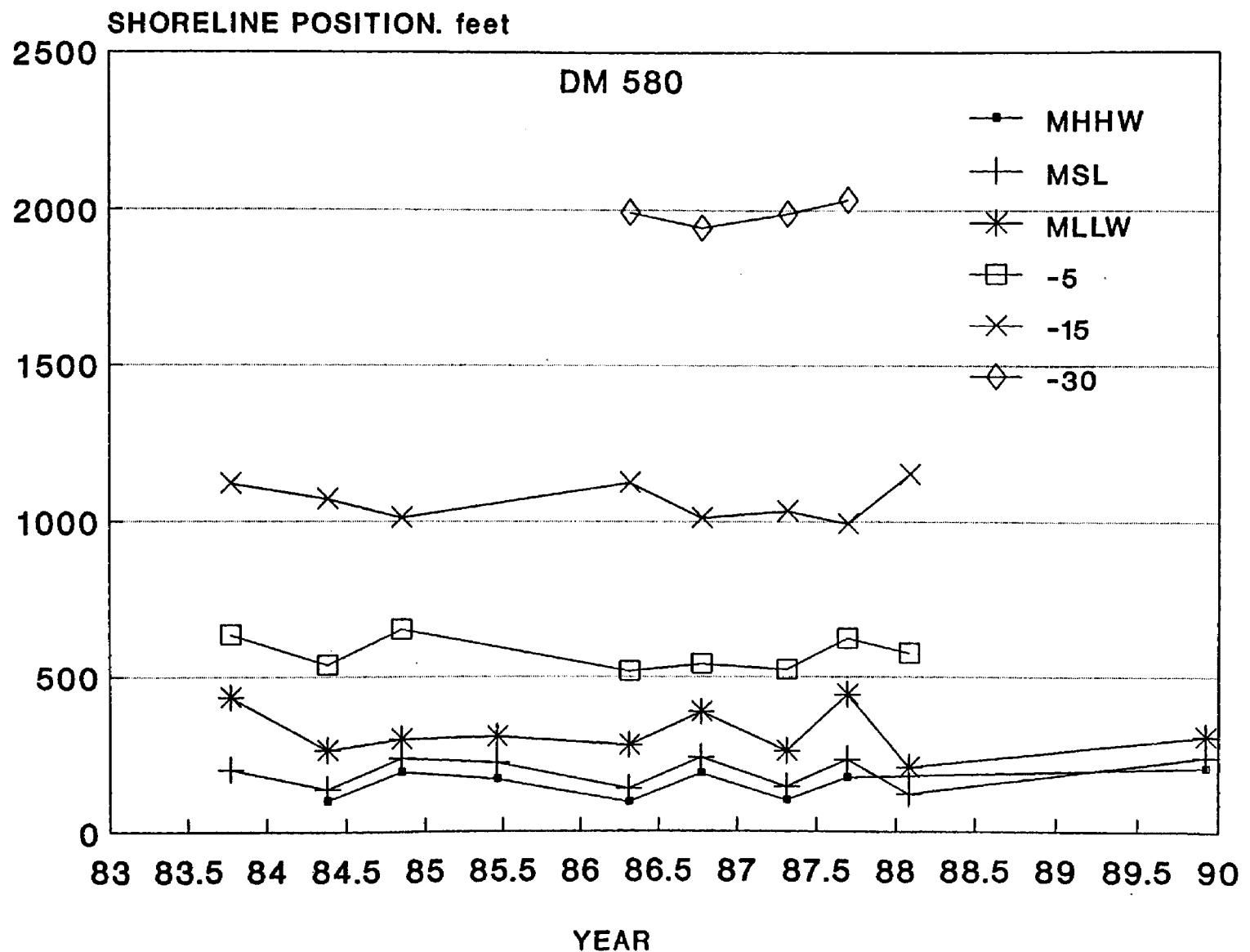
C-25



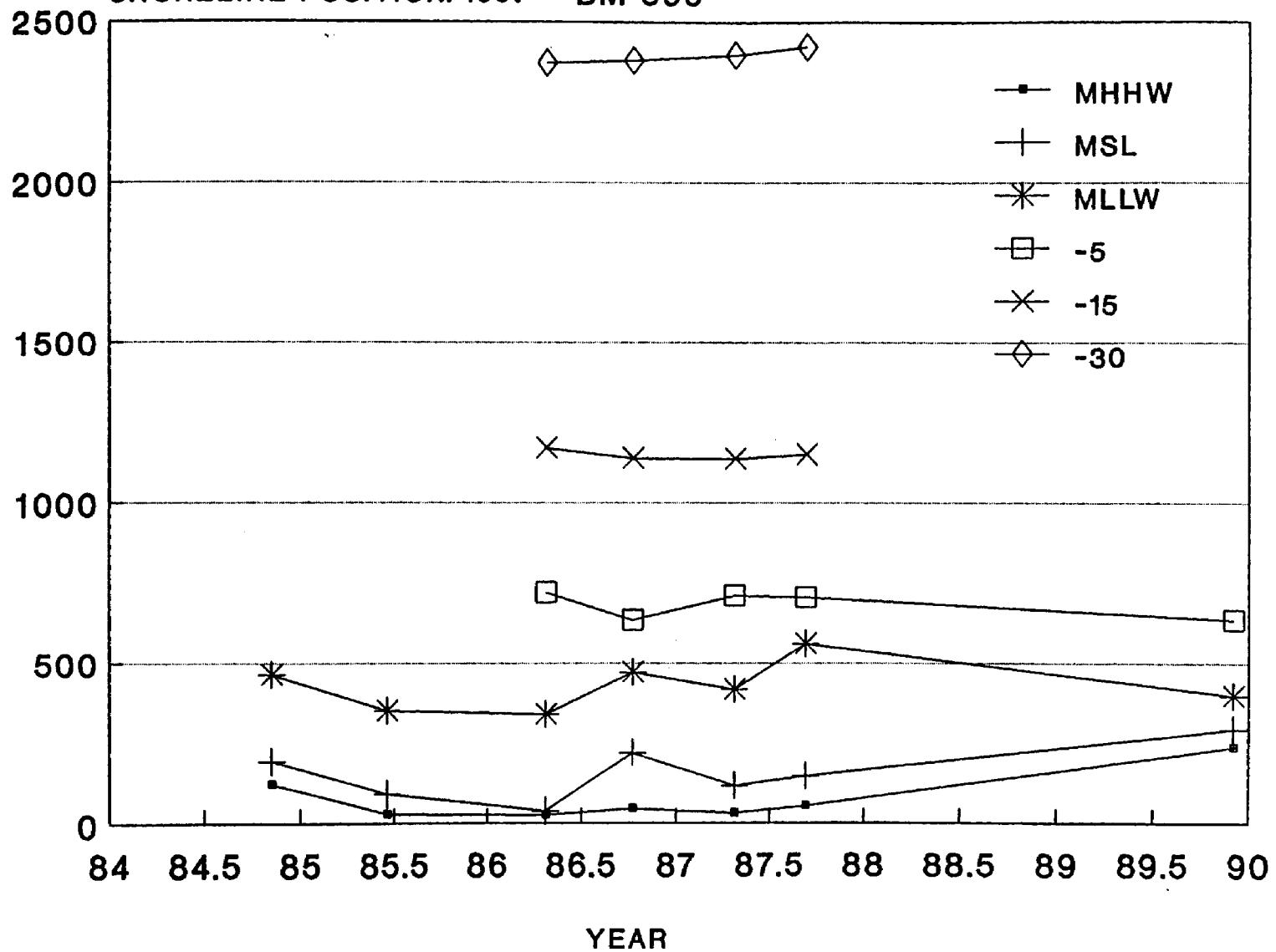
C-26

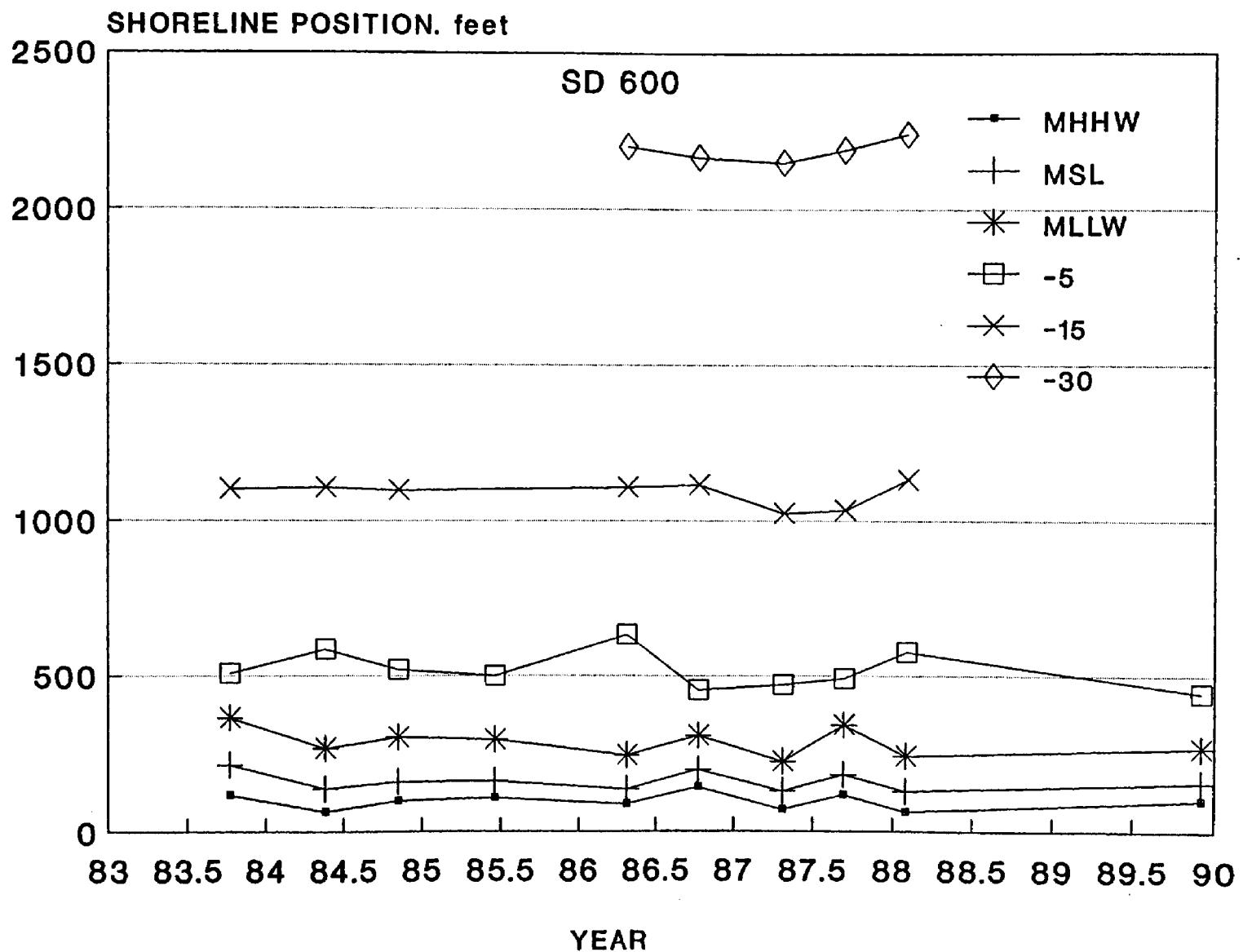


C-27

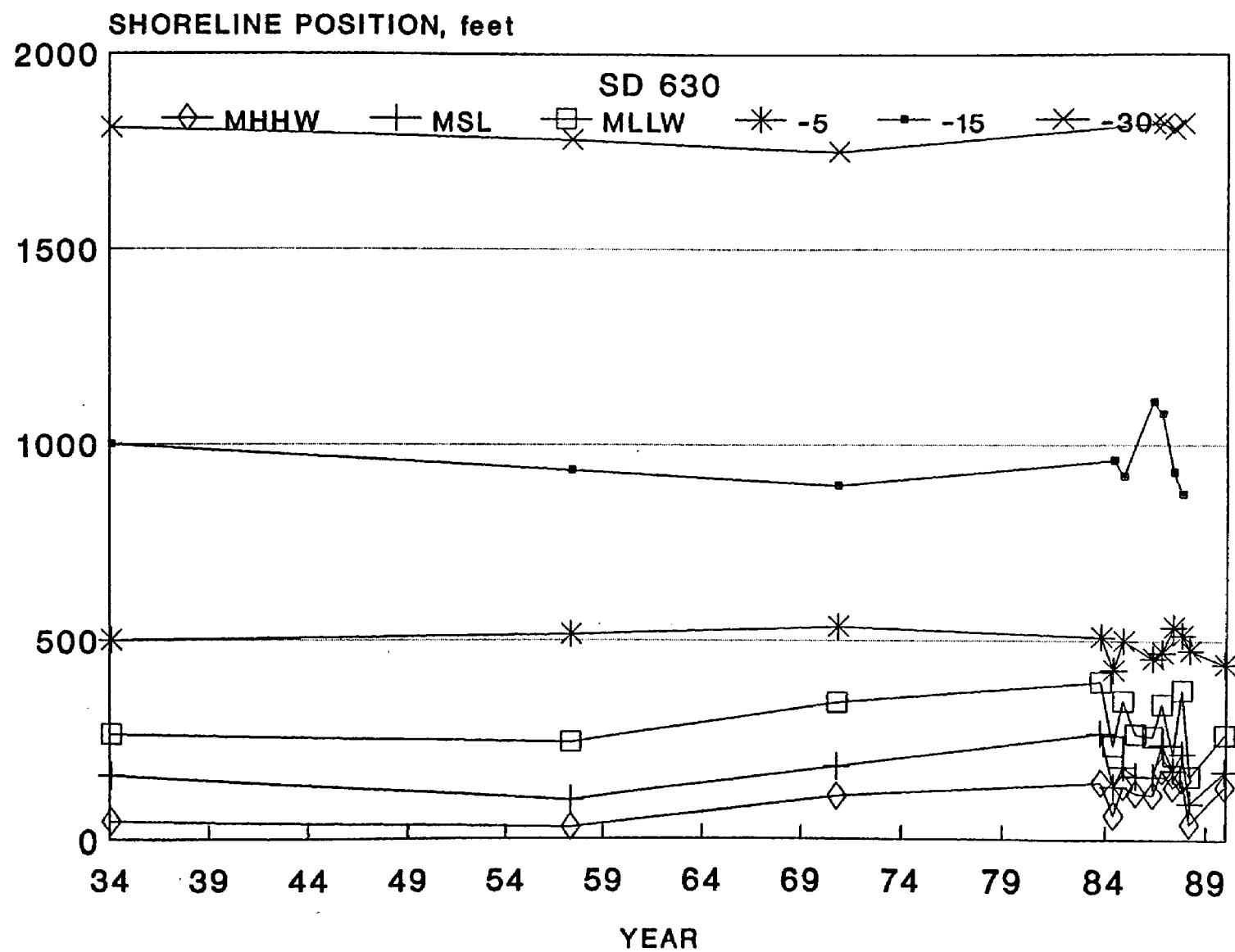


SHORELINE POSITION. feet DM 590

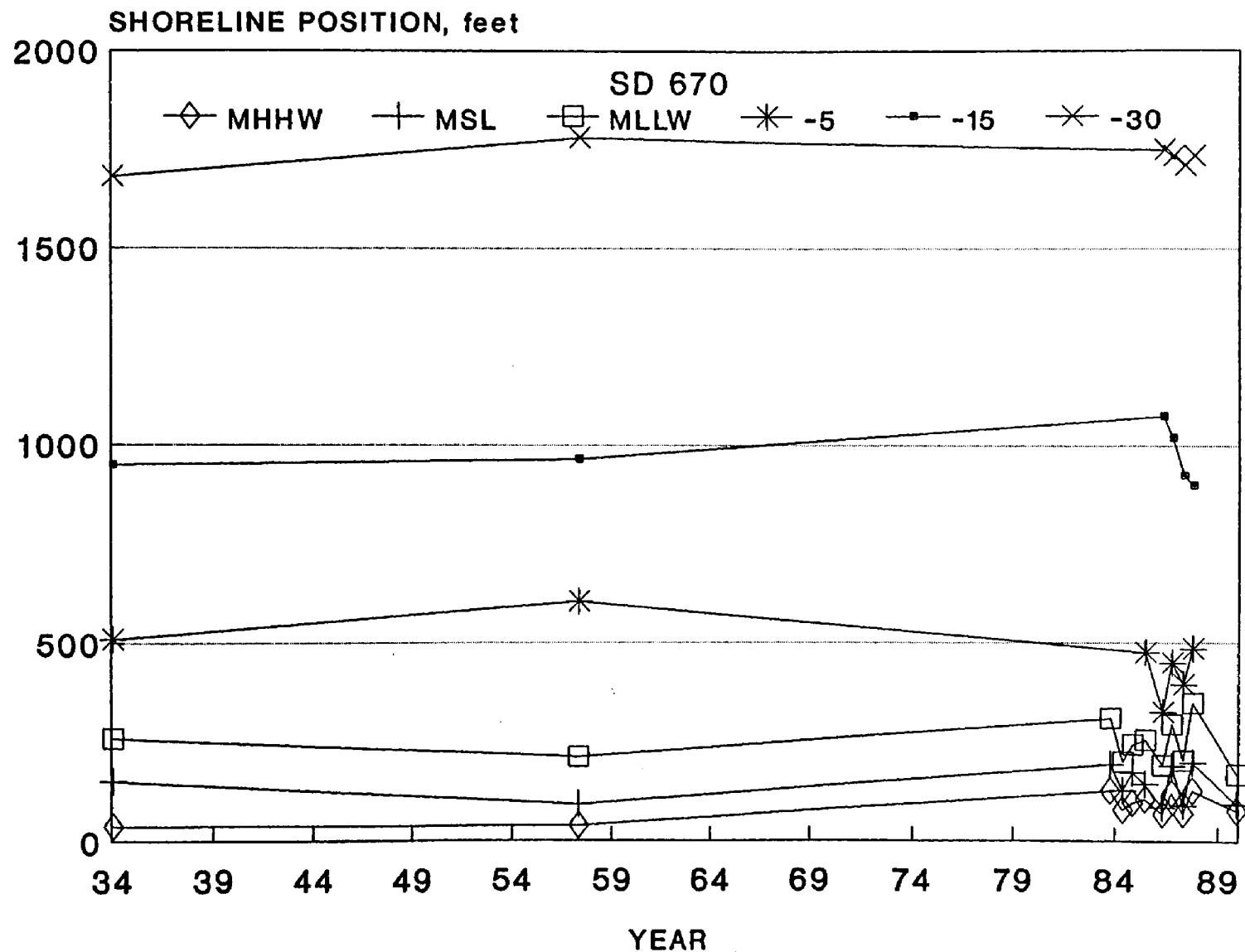




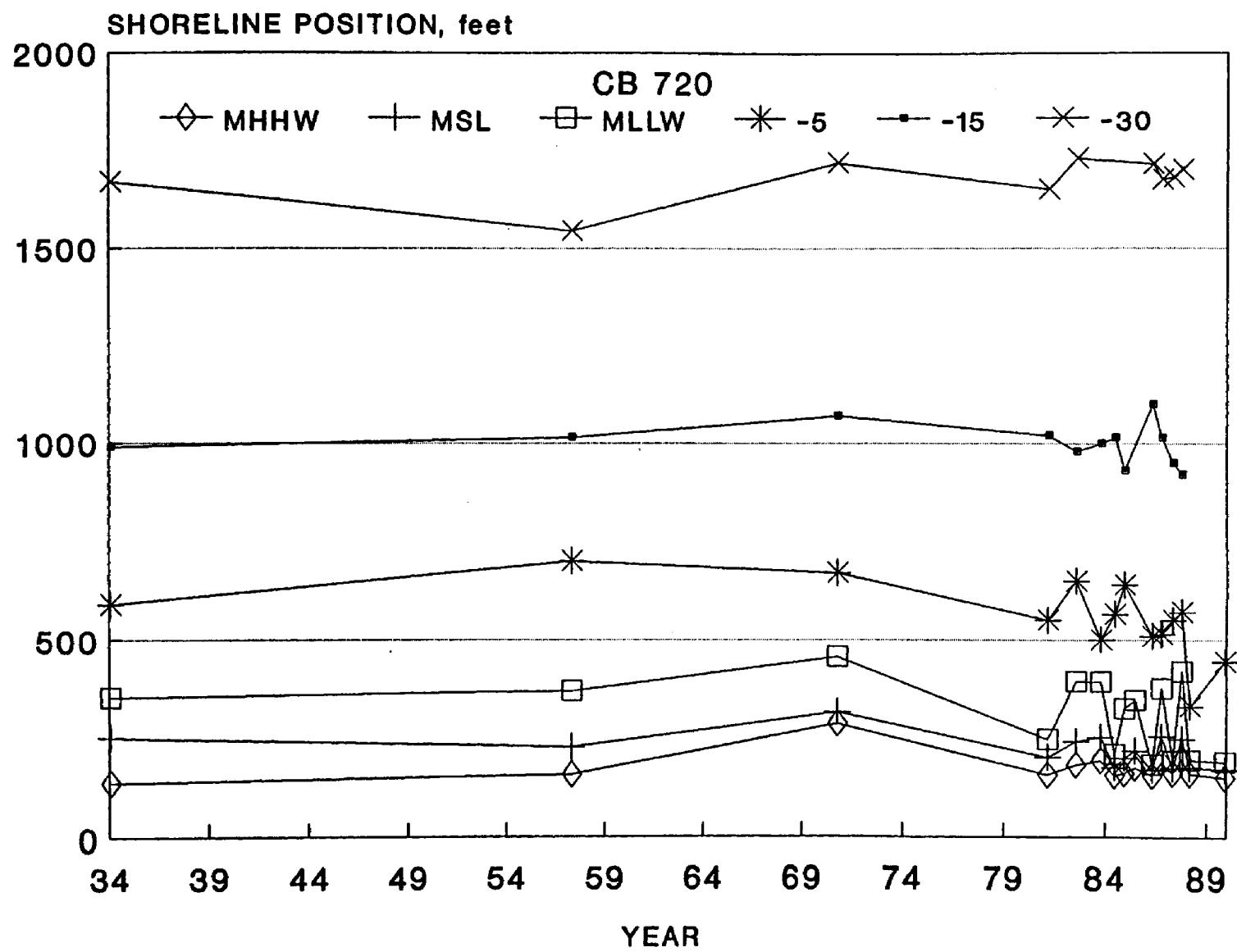
C-30



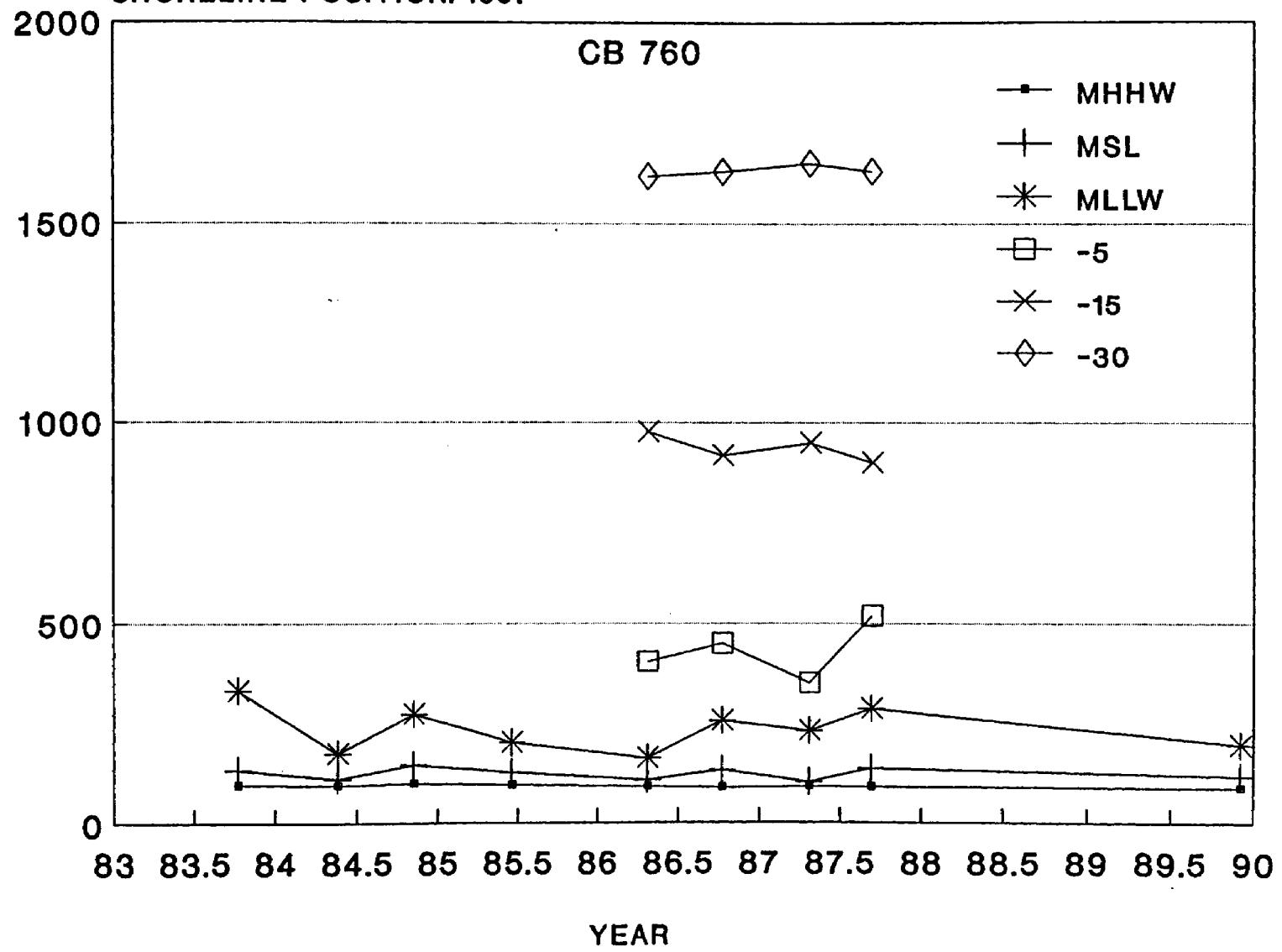
C-31



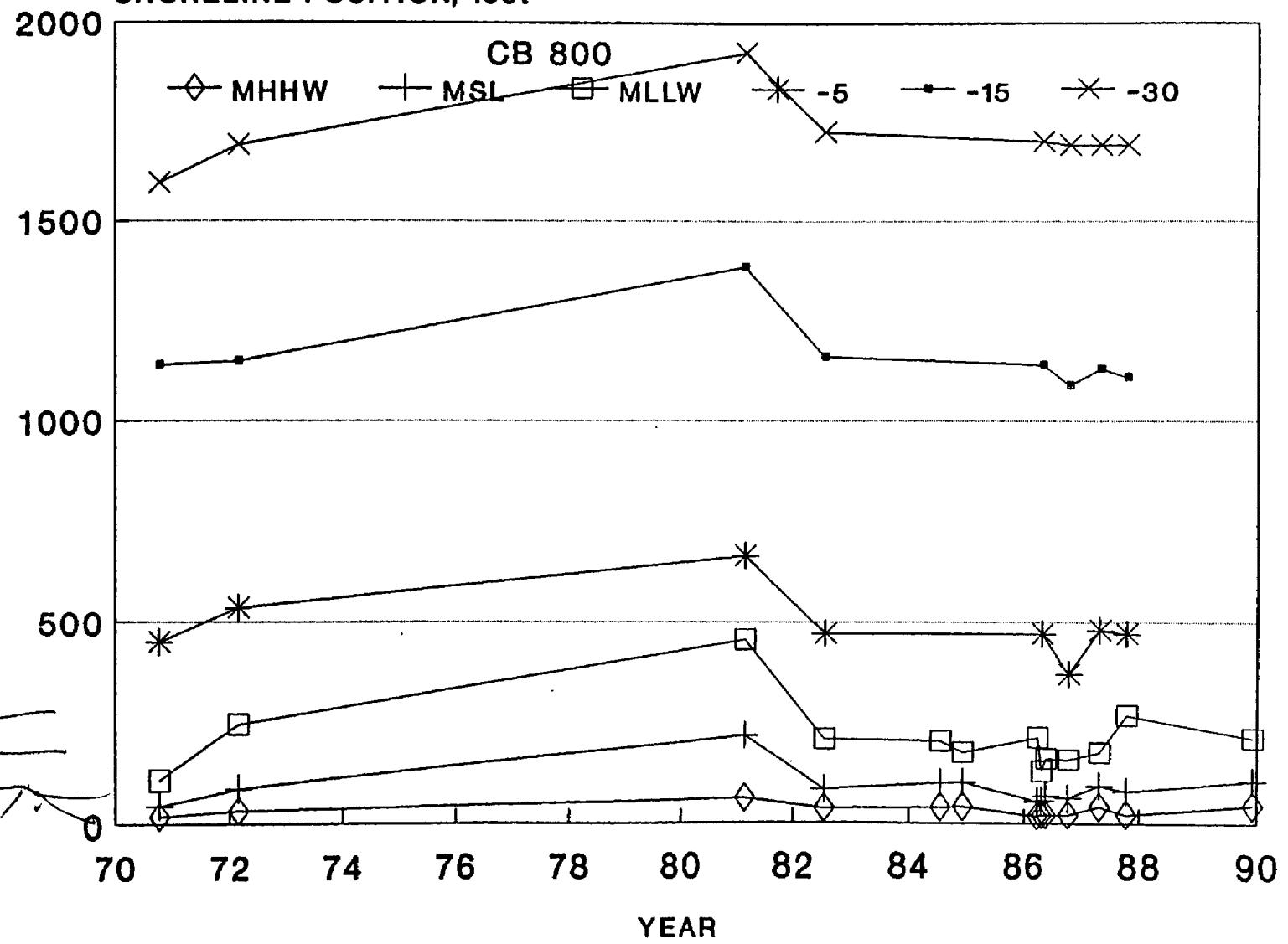
C-32



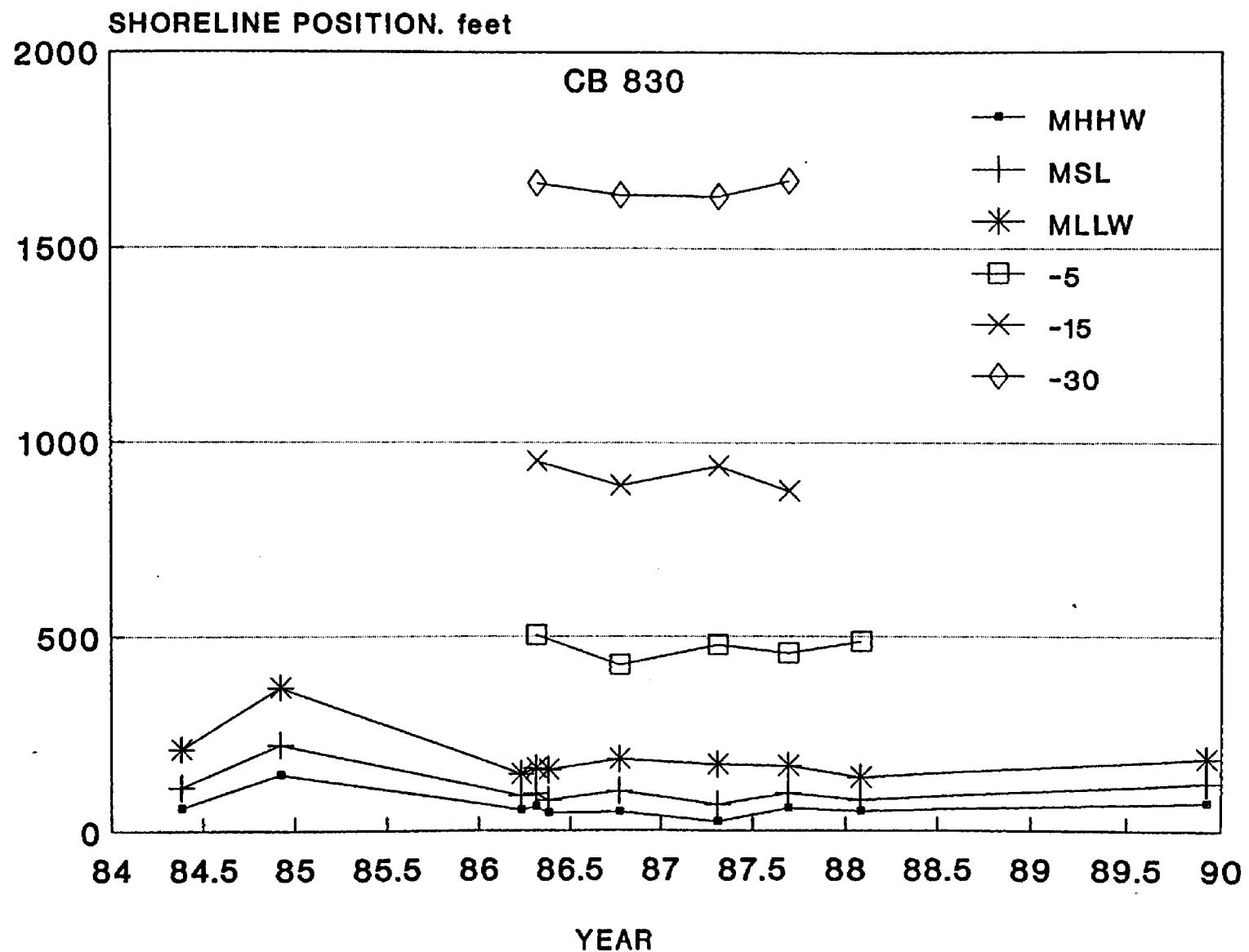
SHORELINE POSITION. feet



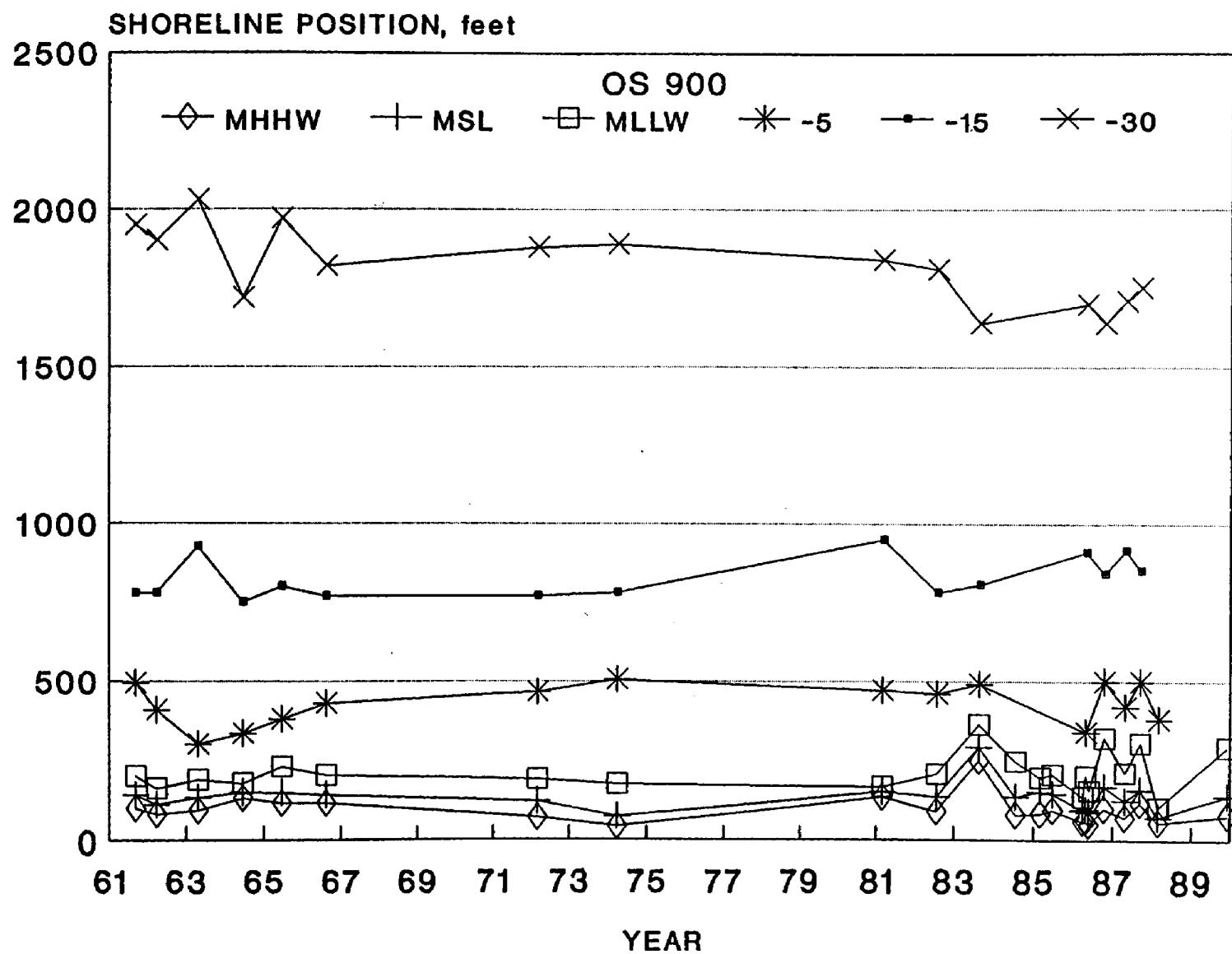
SHORELINE POSITION, feet



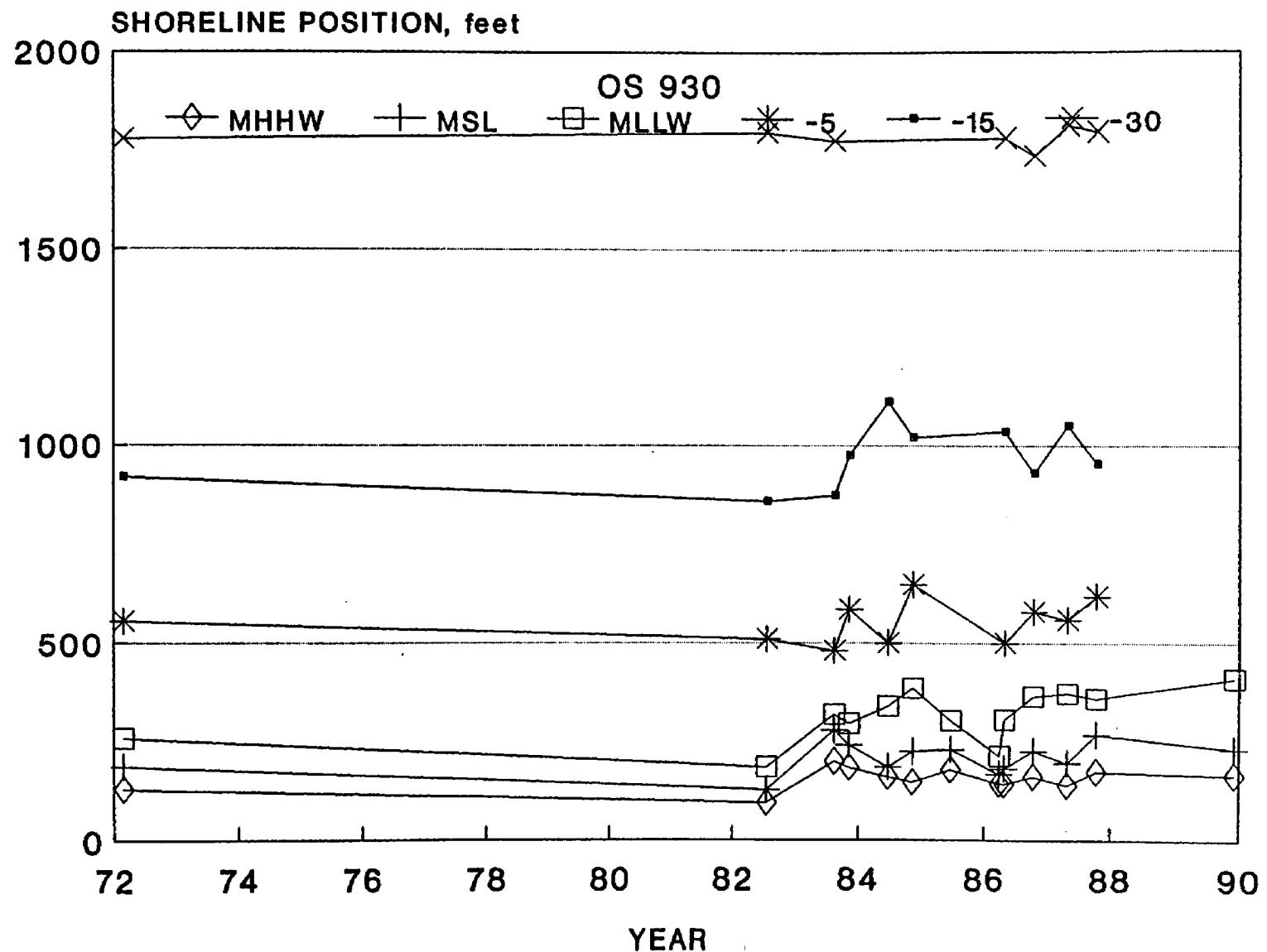
C-35



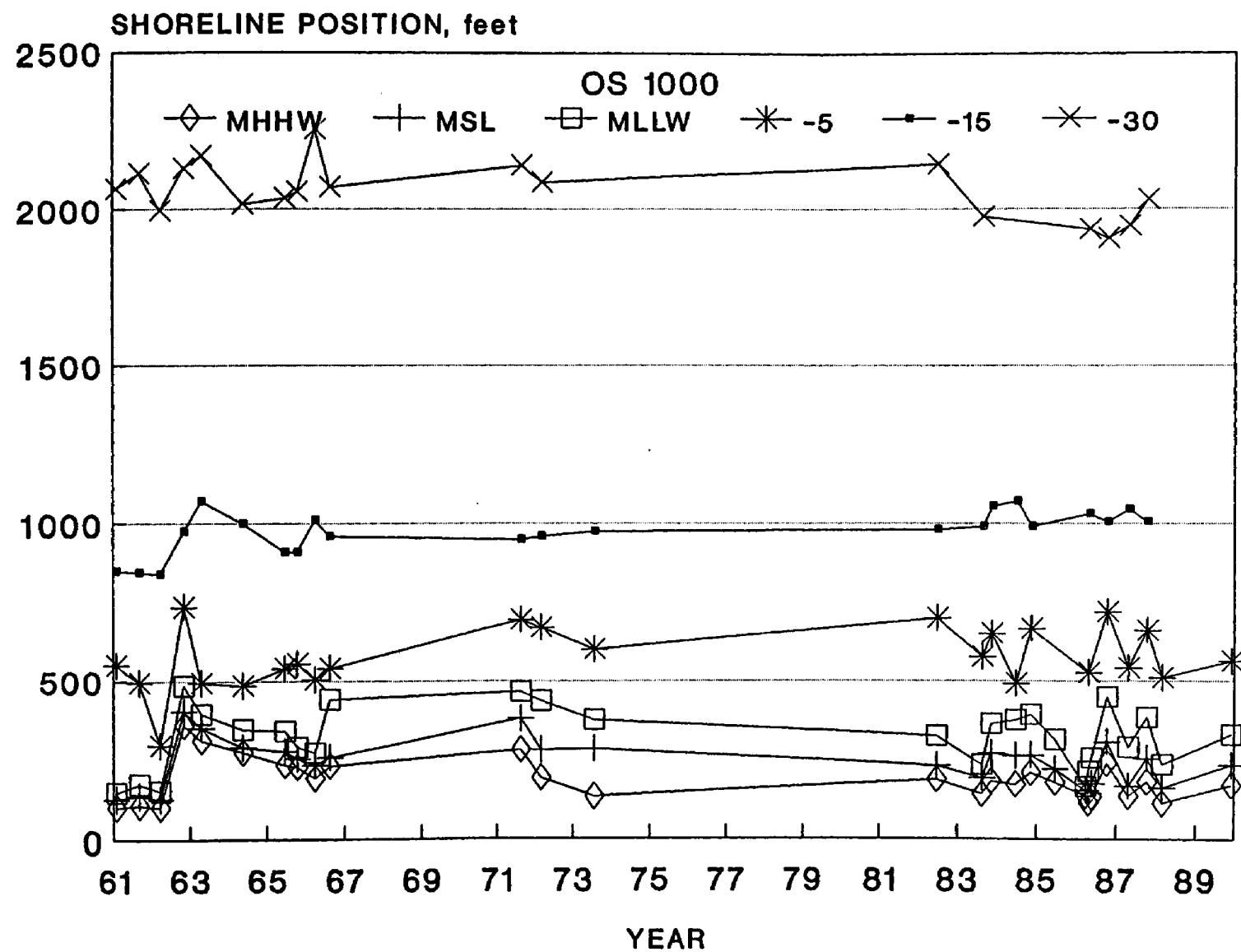
C-36



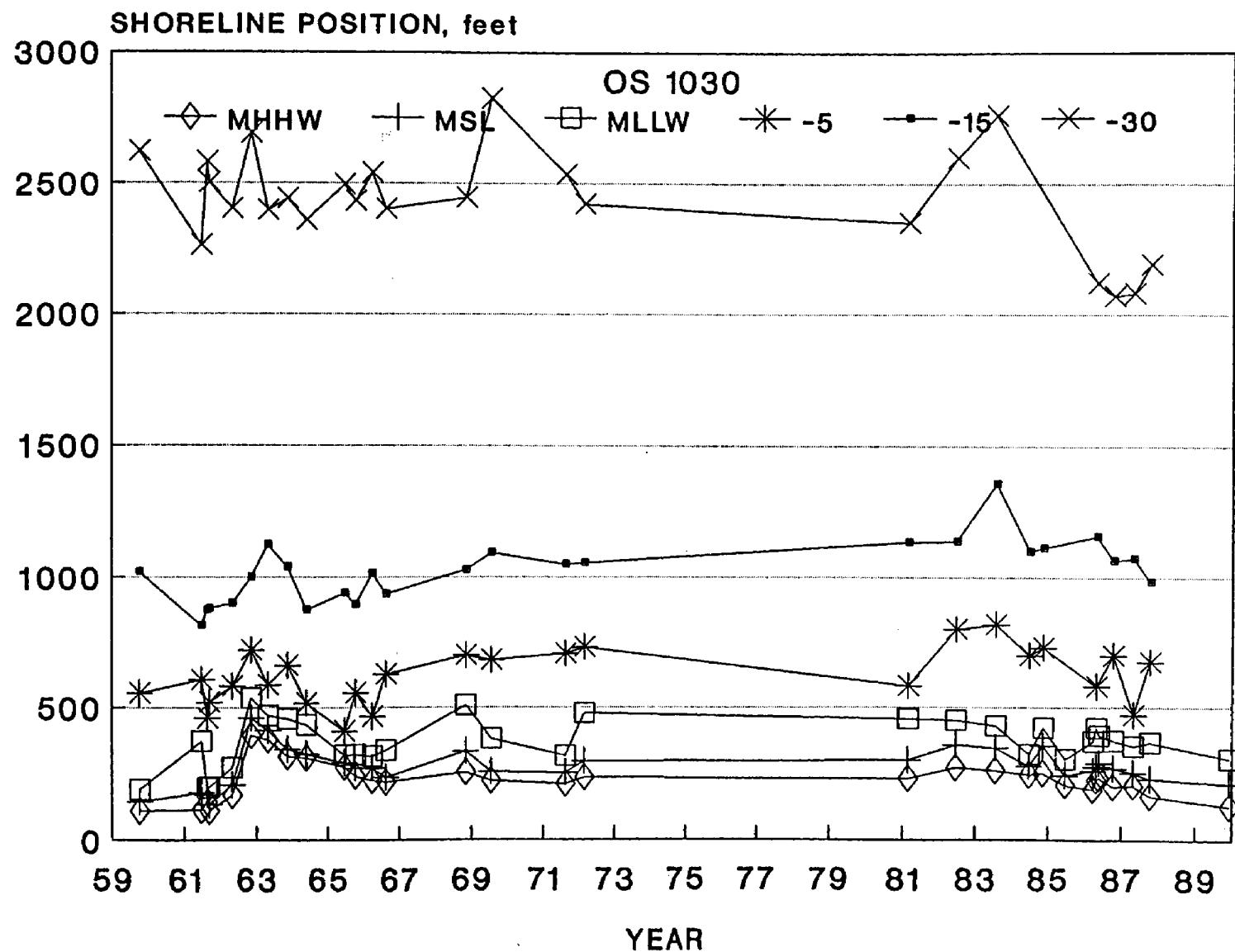
C-37



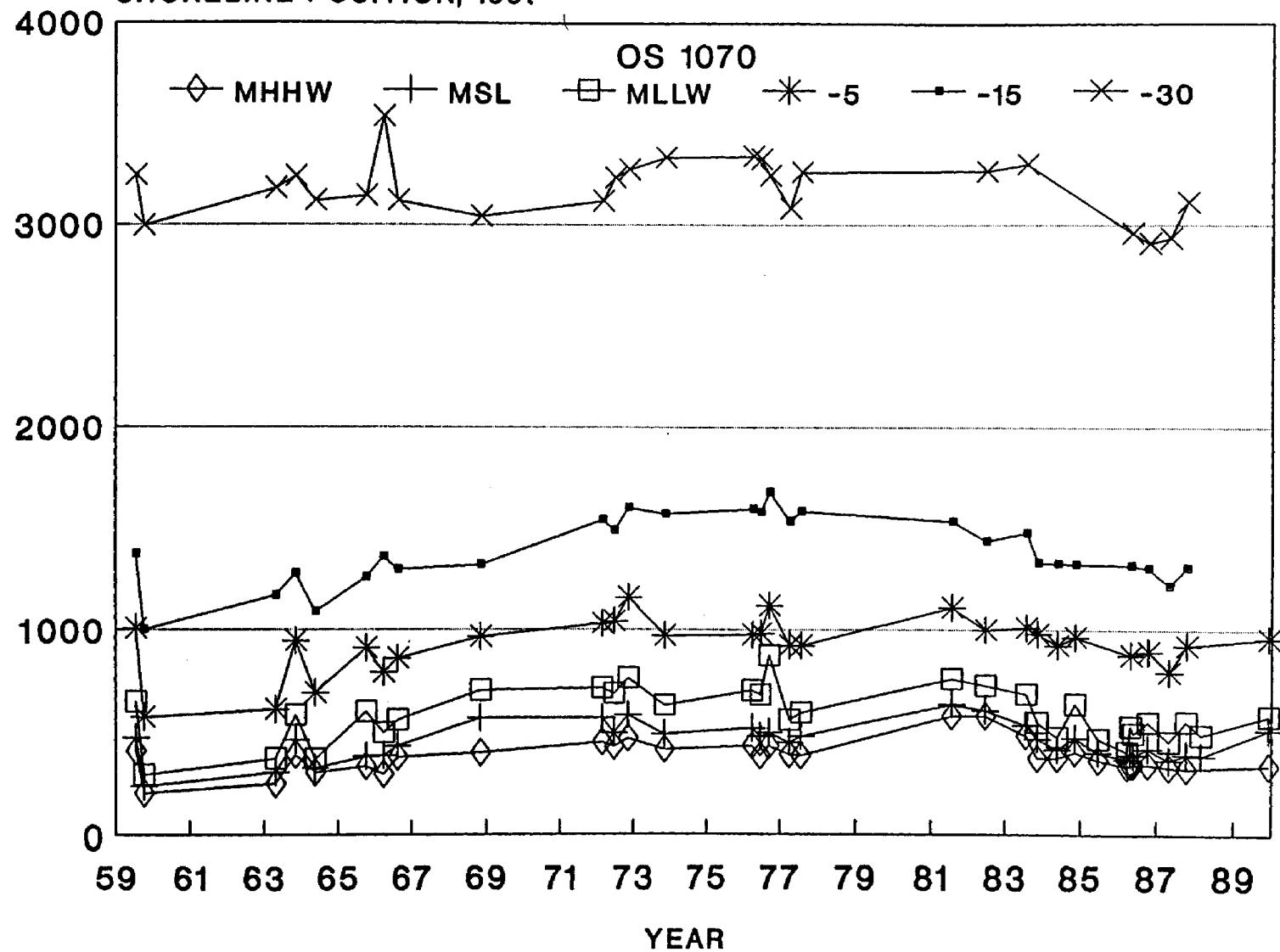
C-38



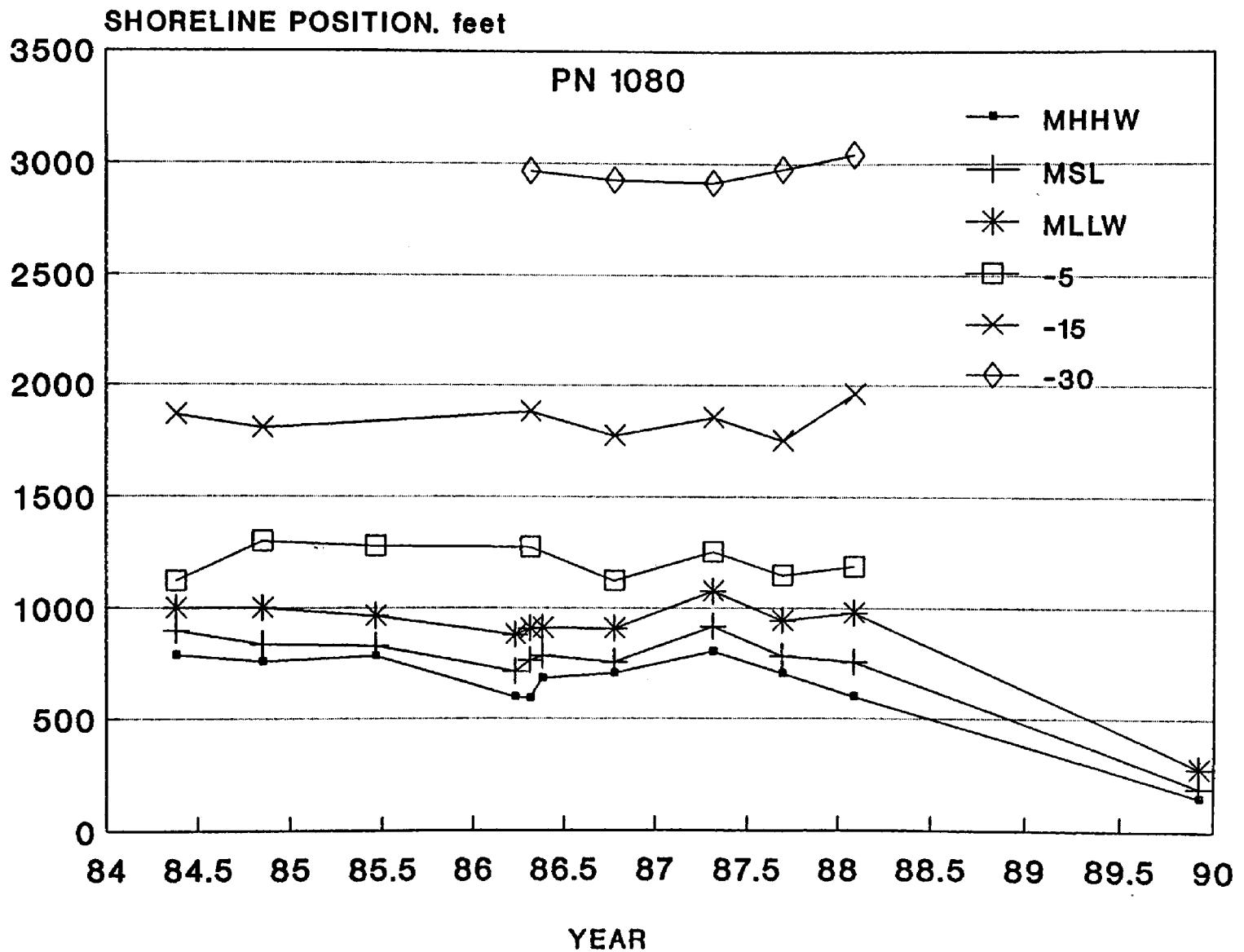
C-39



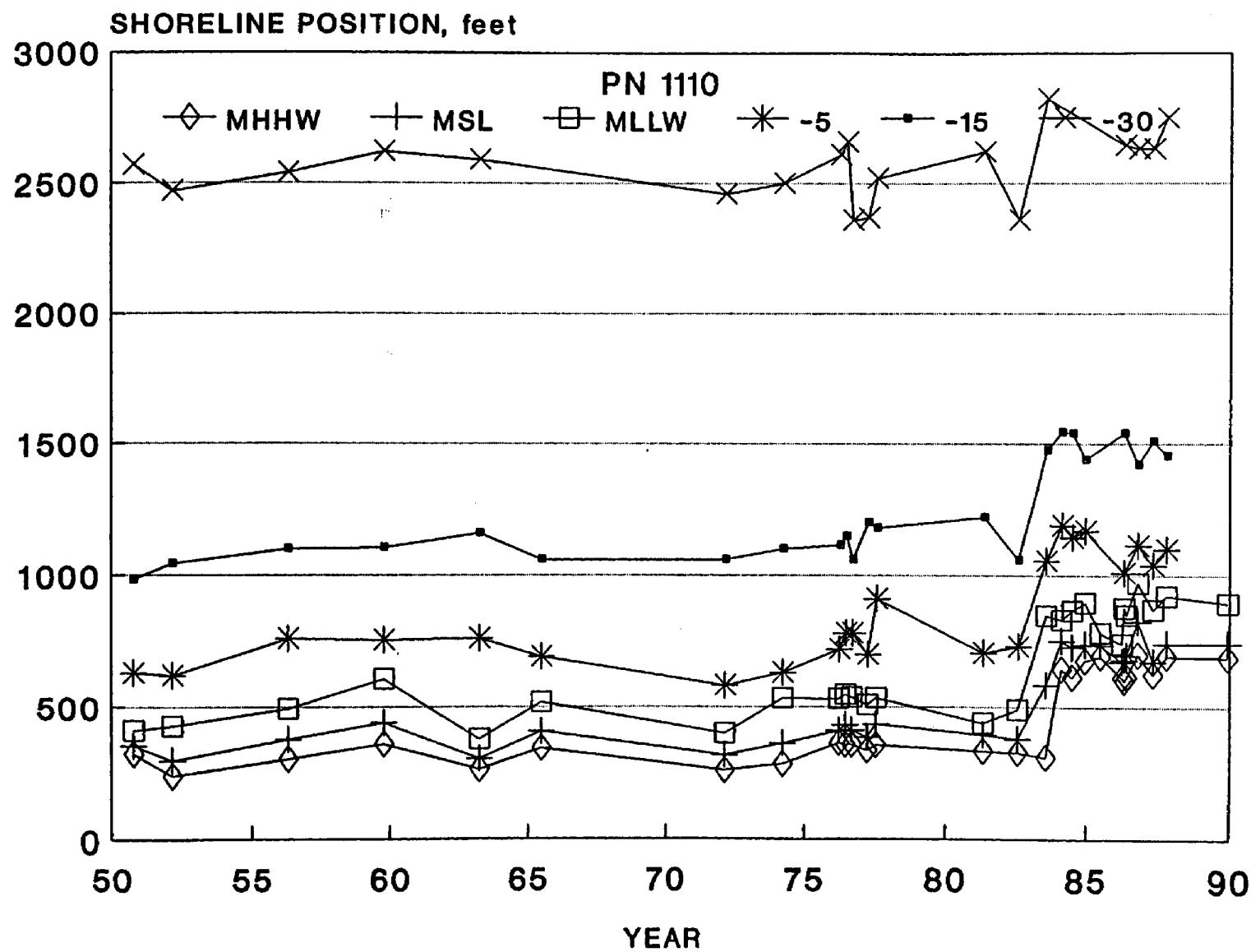
SHORELINE POSITION, feet



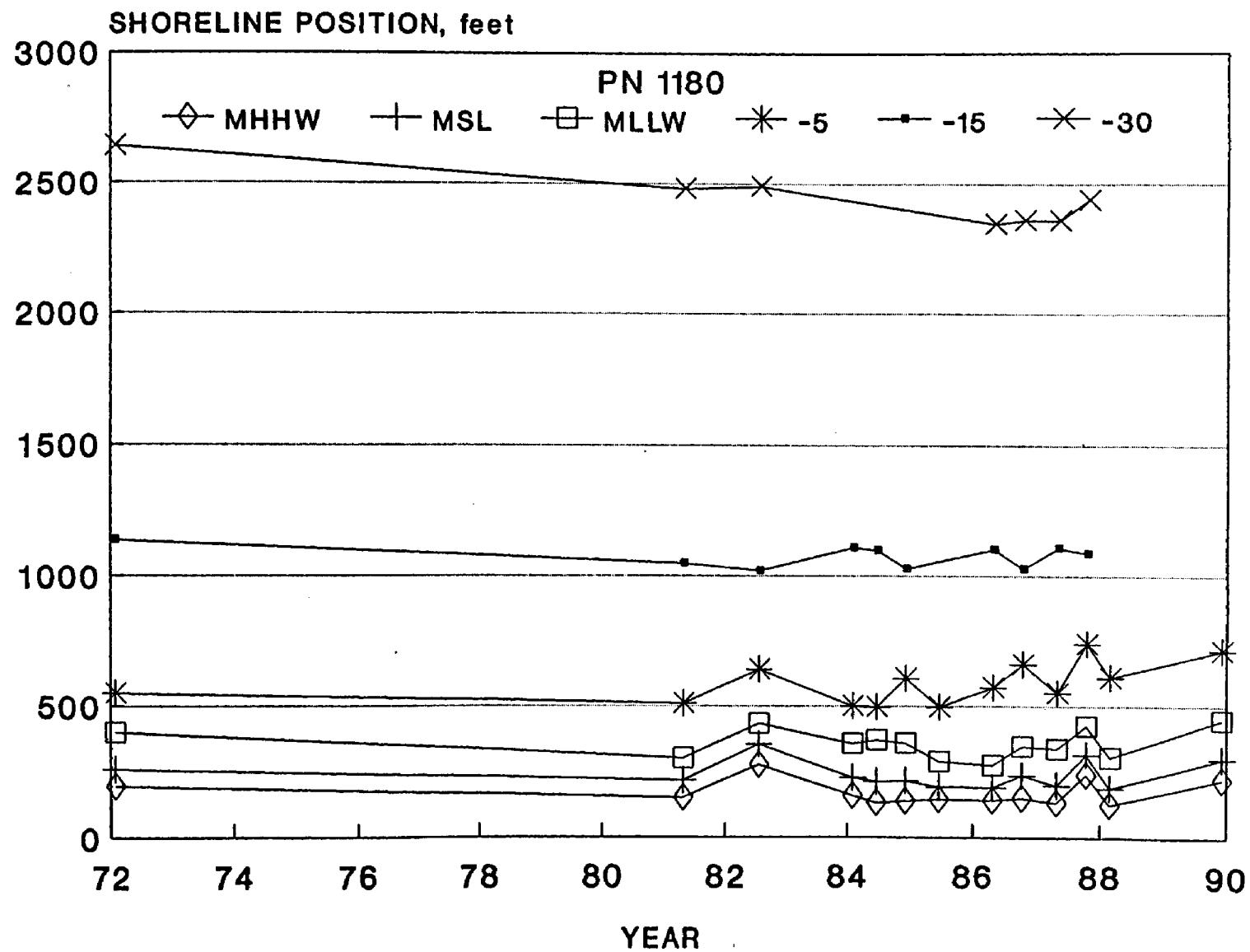
C-41



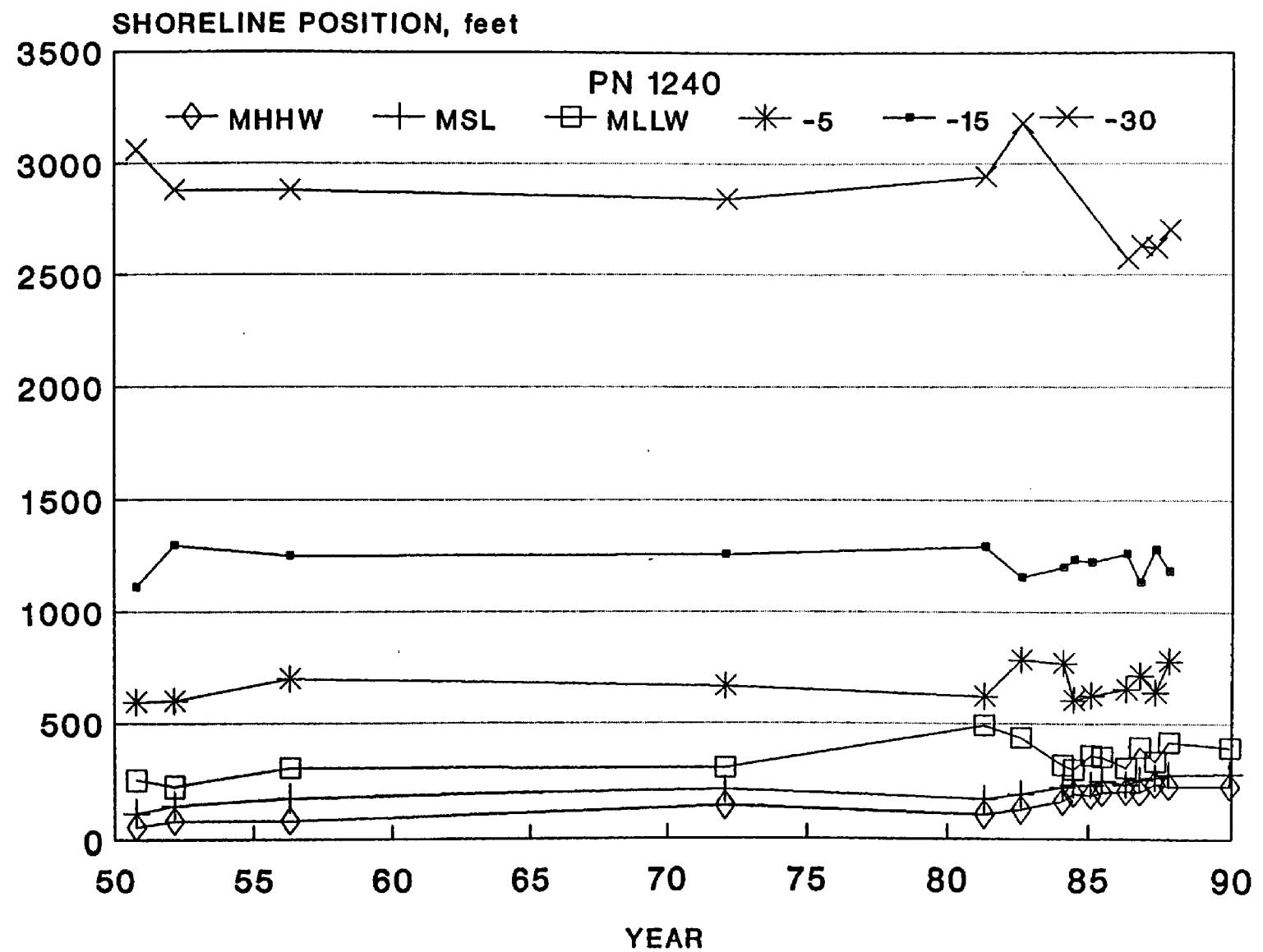
C-42



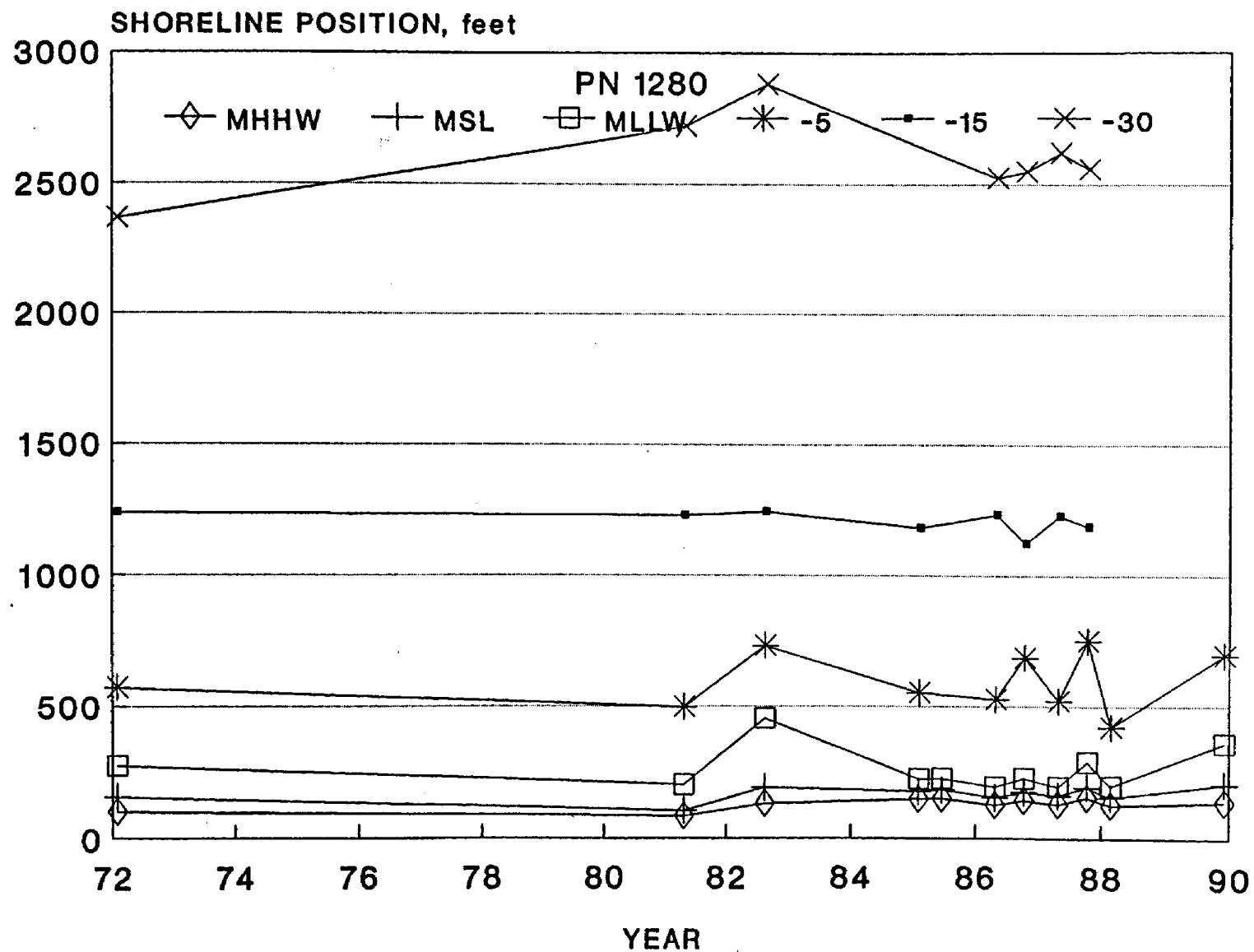
C-43

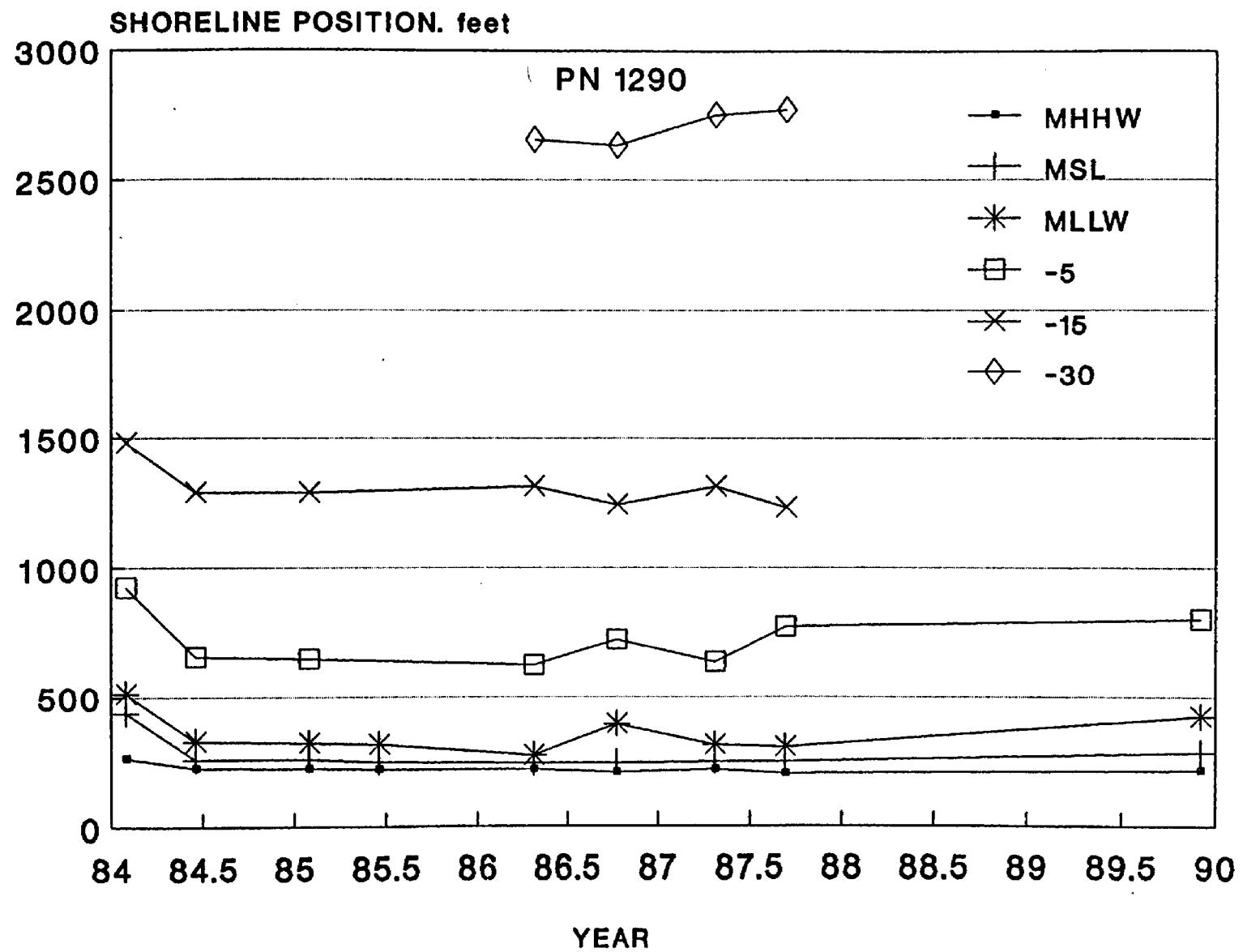


C-44

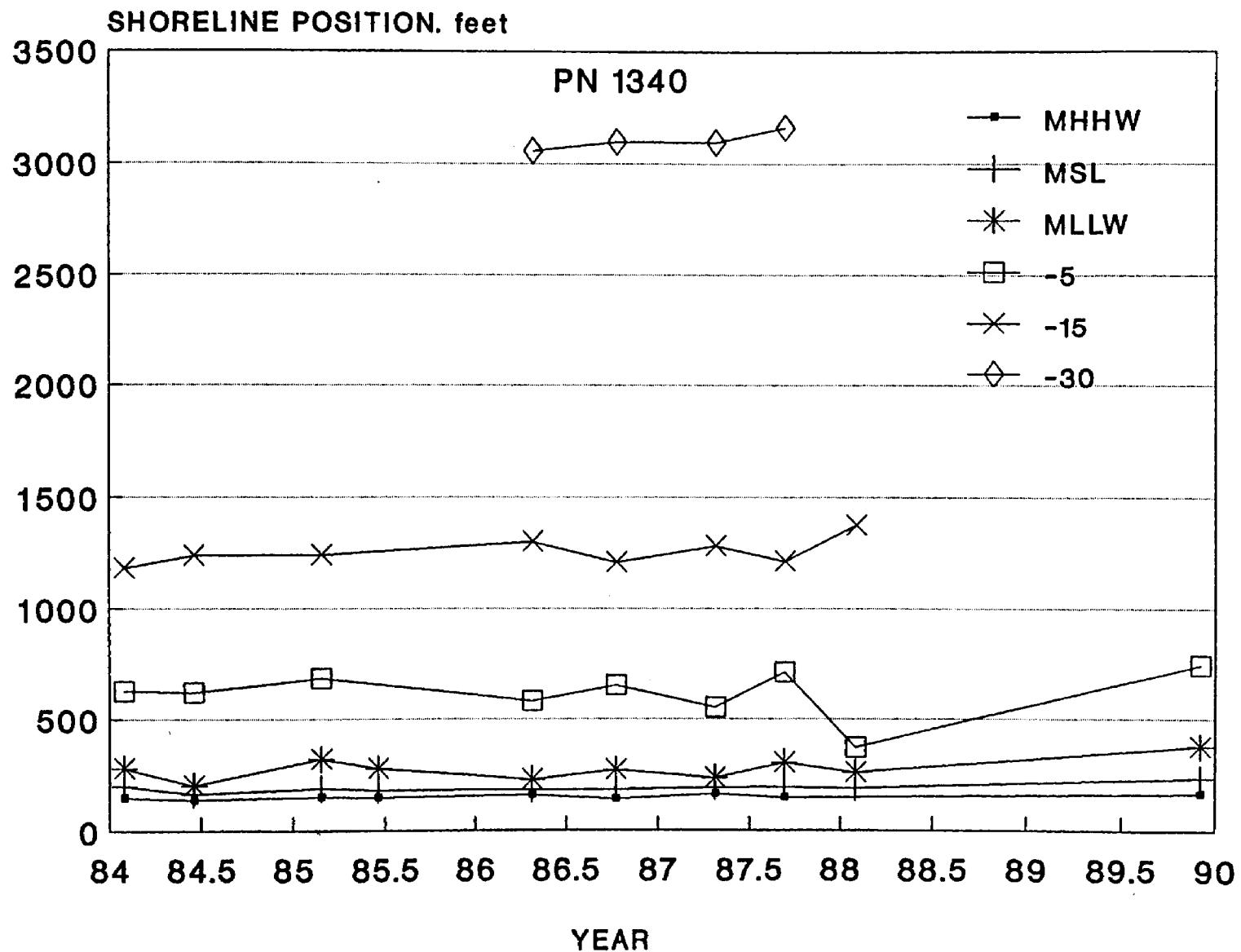


C-45

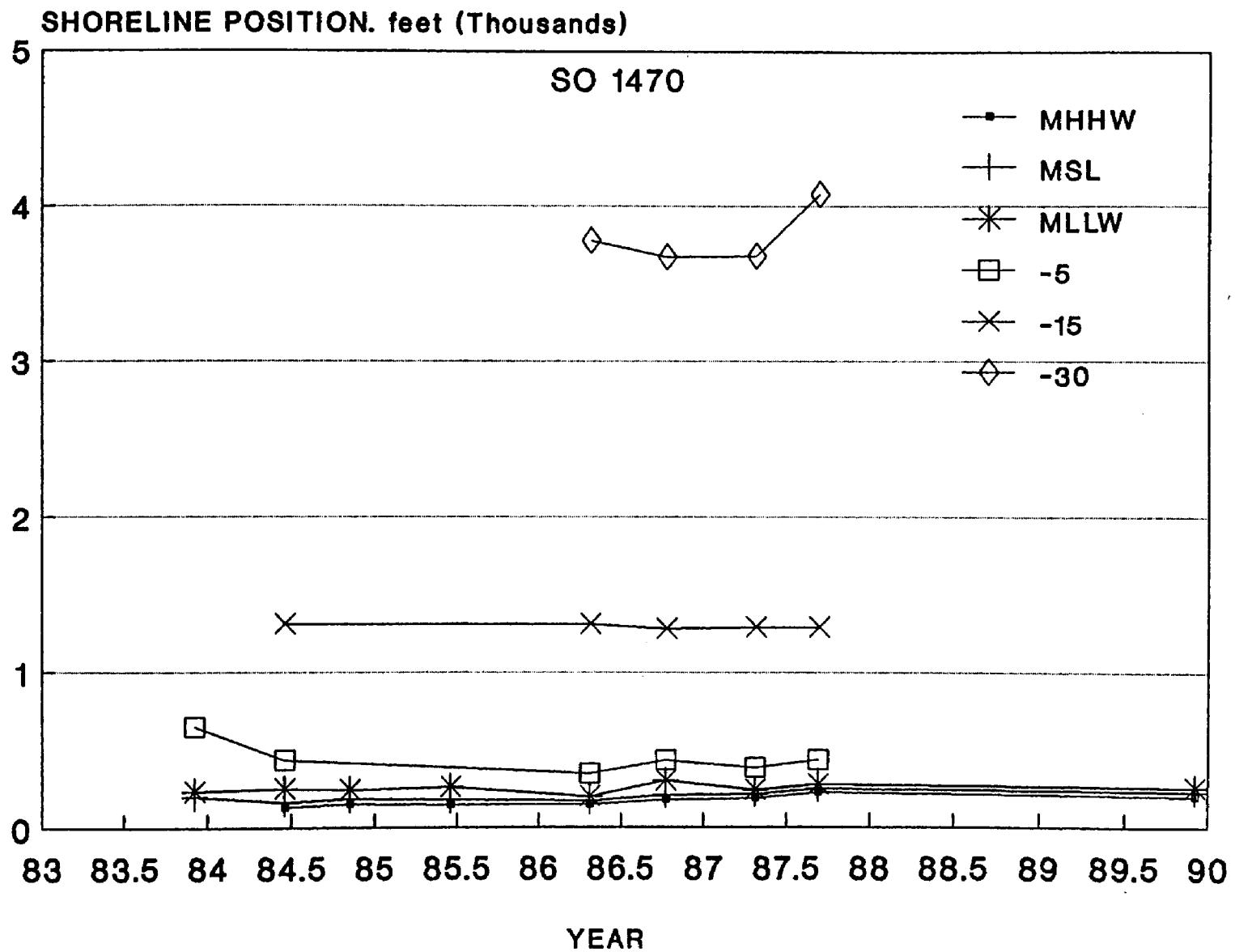




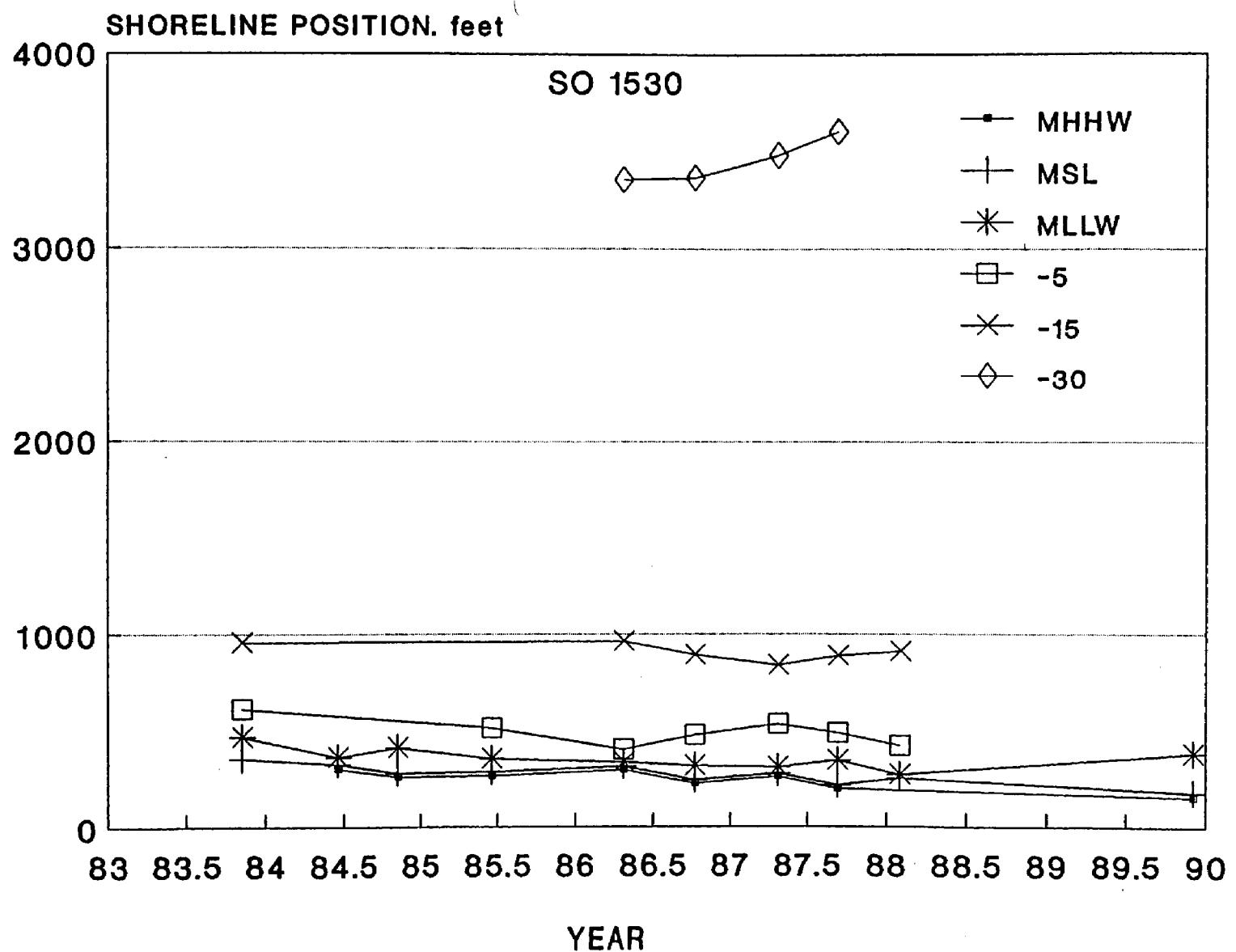
C-47



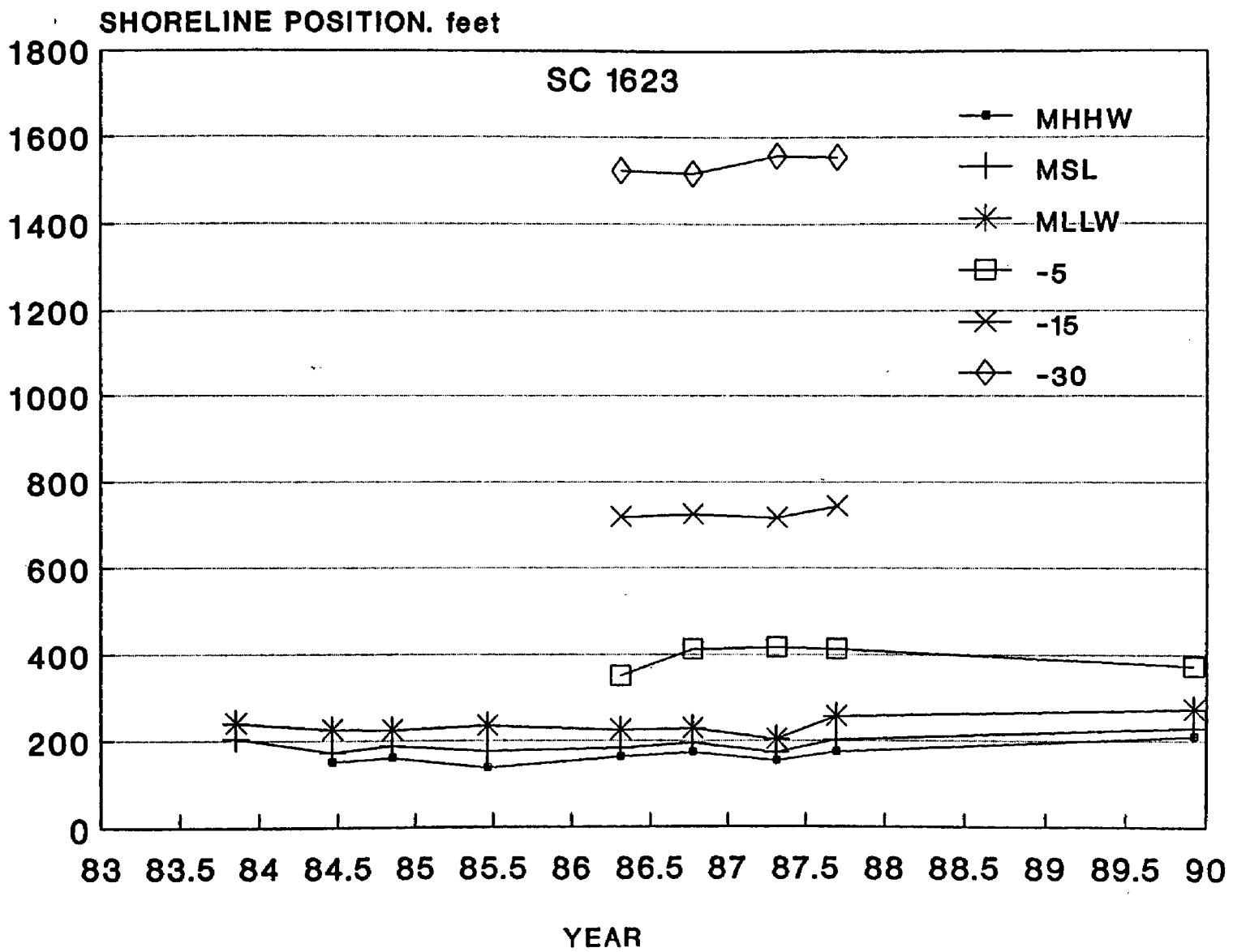
C-48



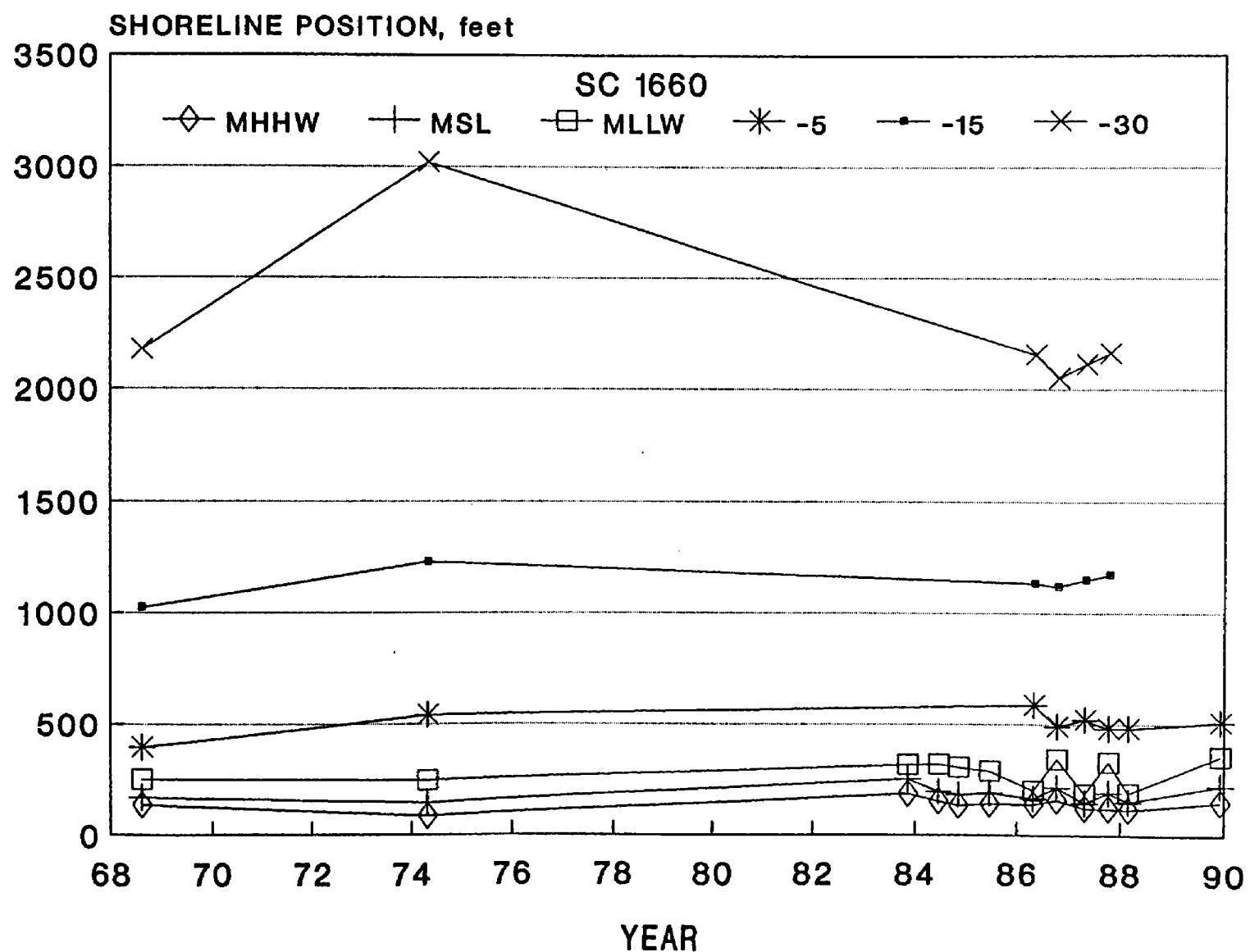
C-49



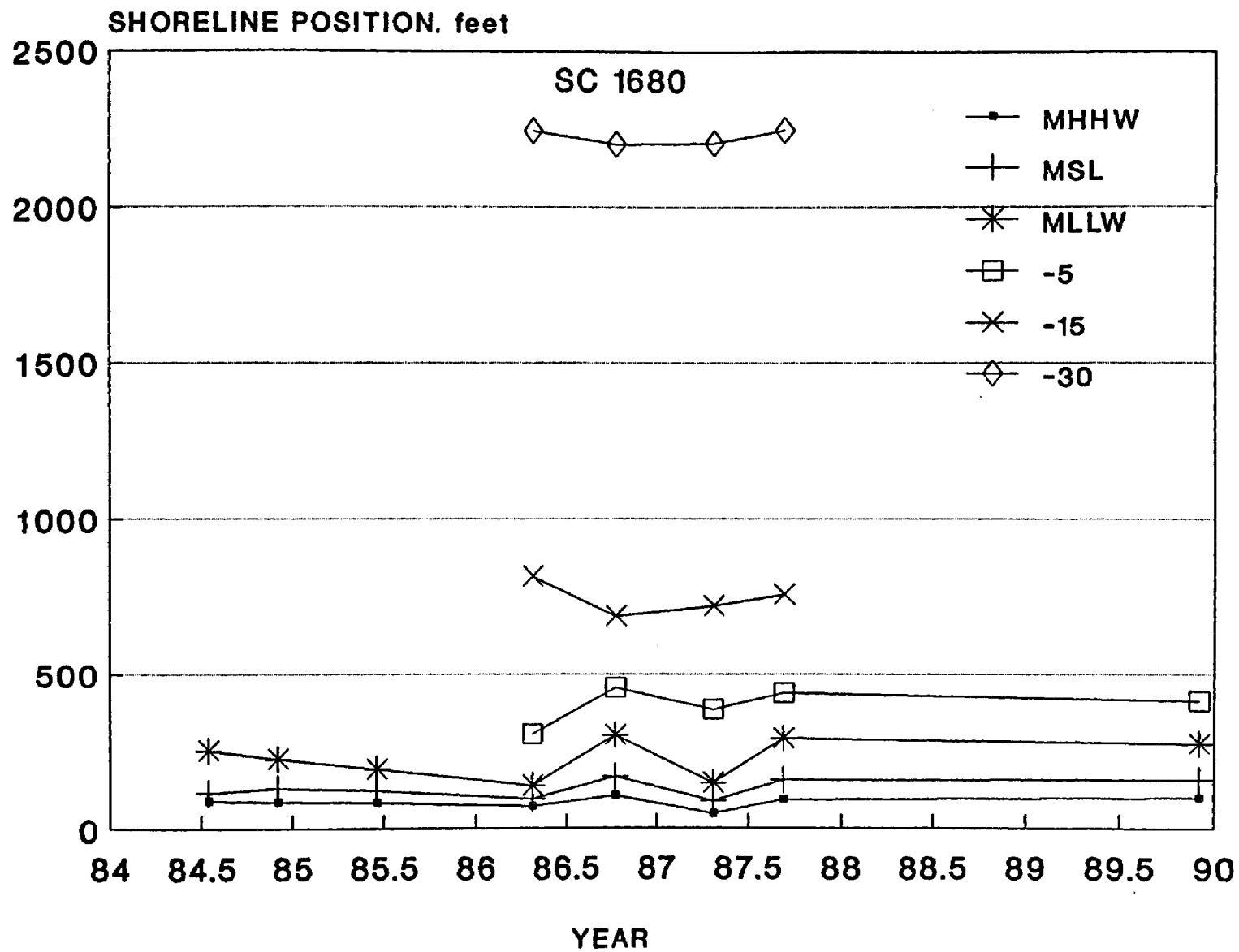
C-50



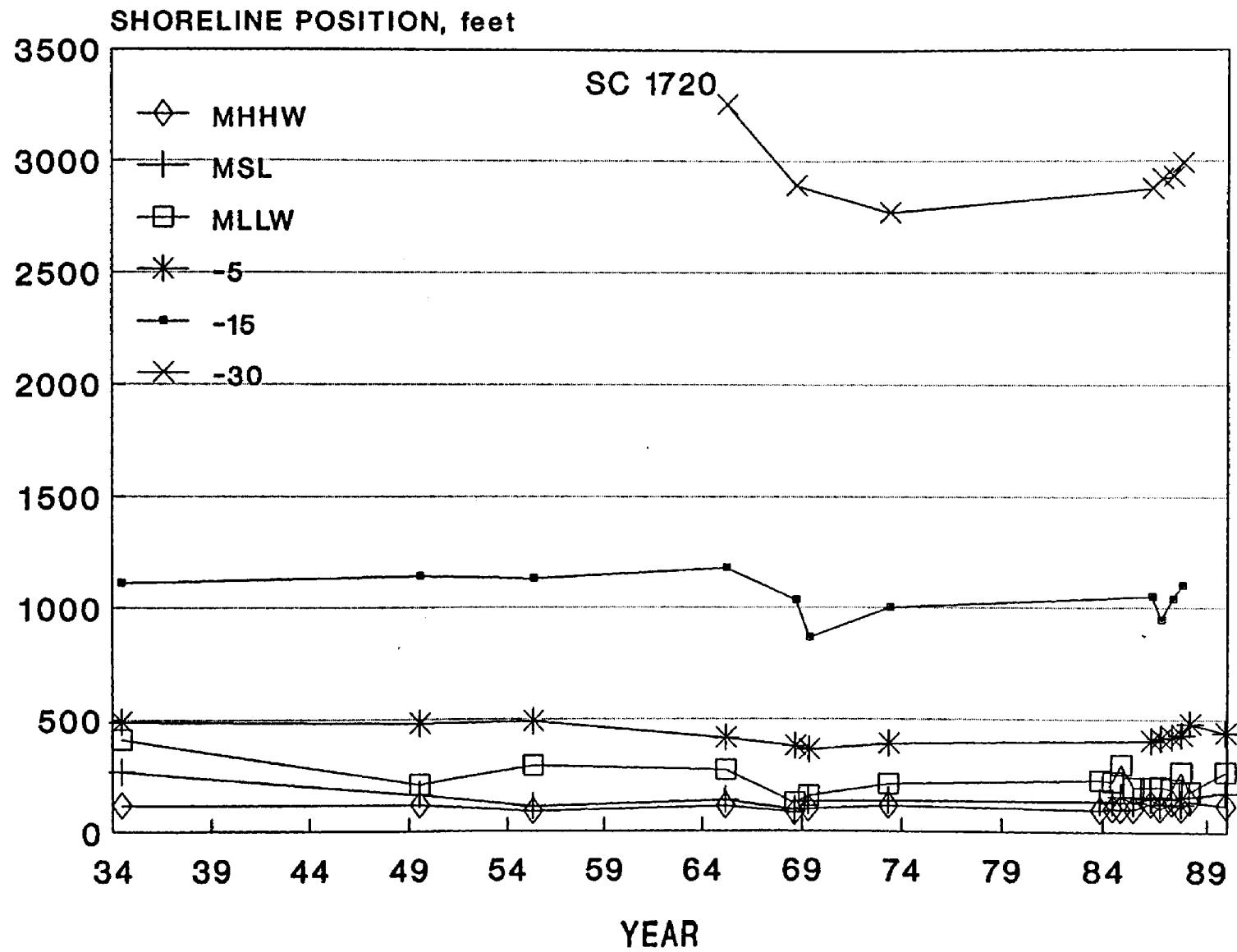
C-51



C-52

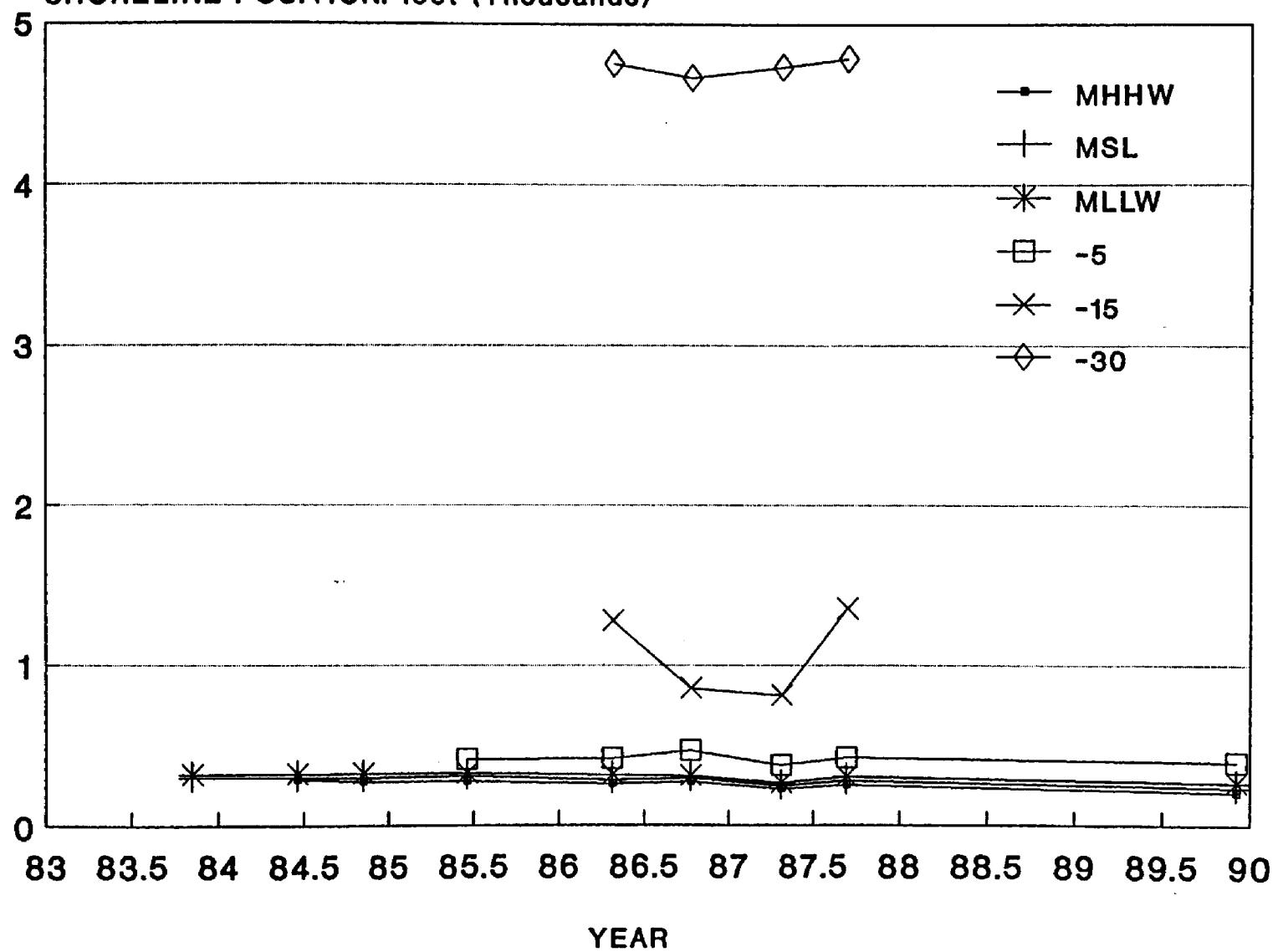


C-53

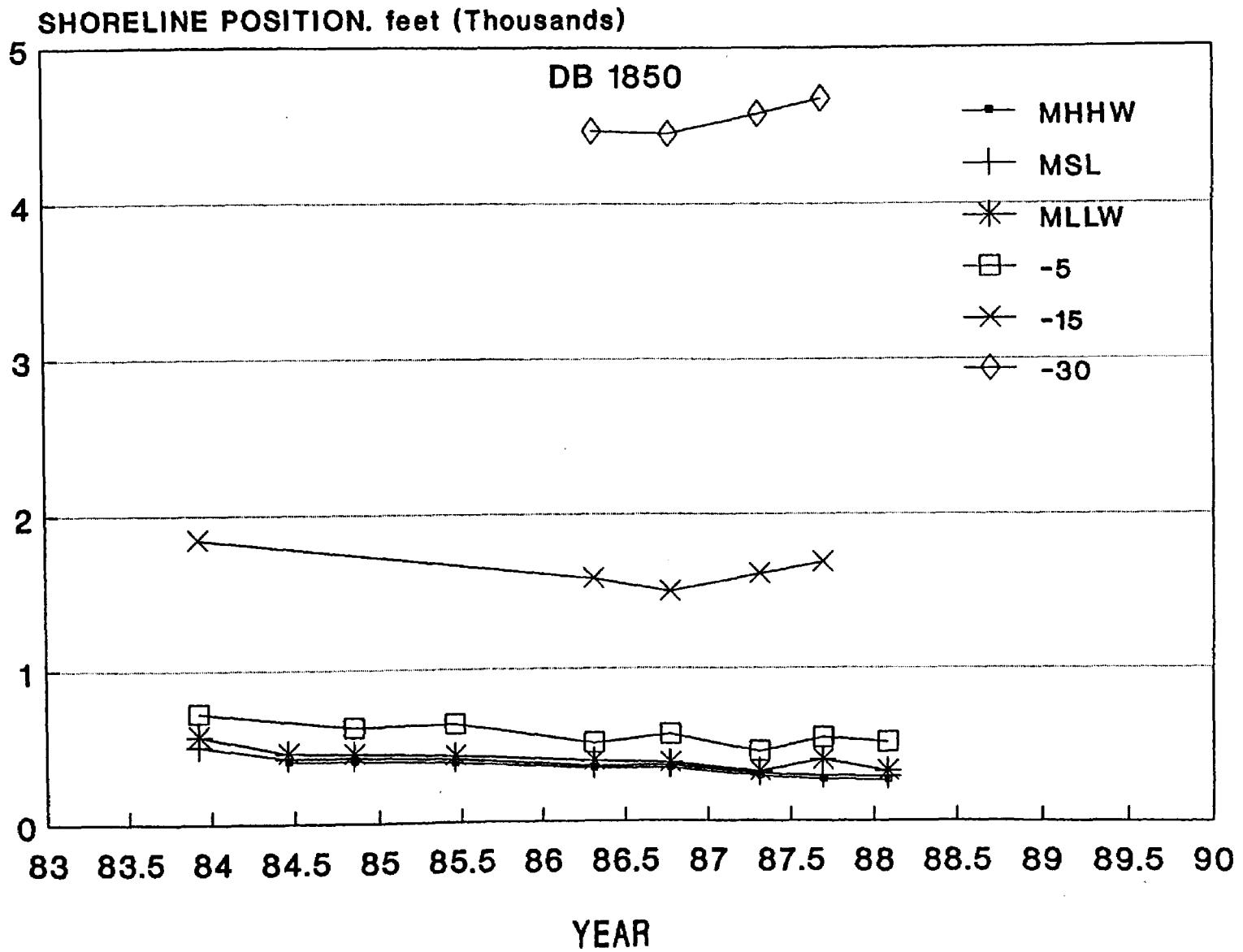


DB 1805

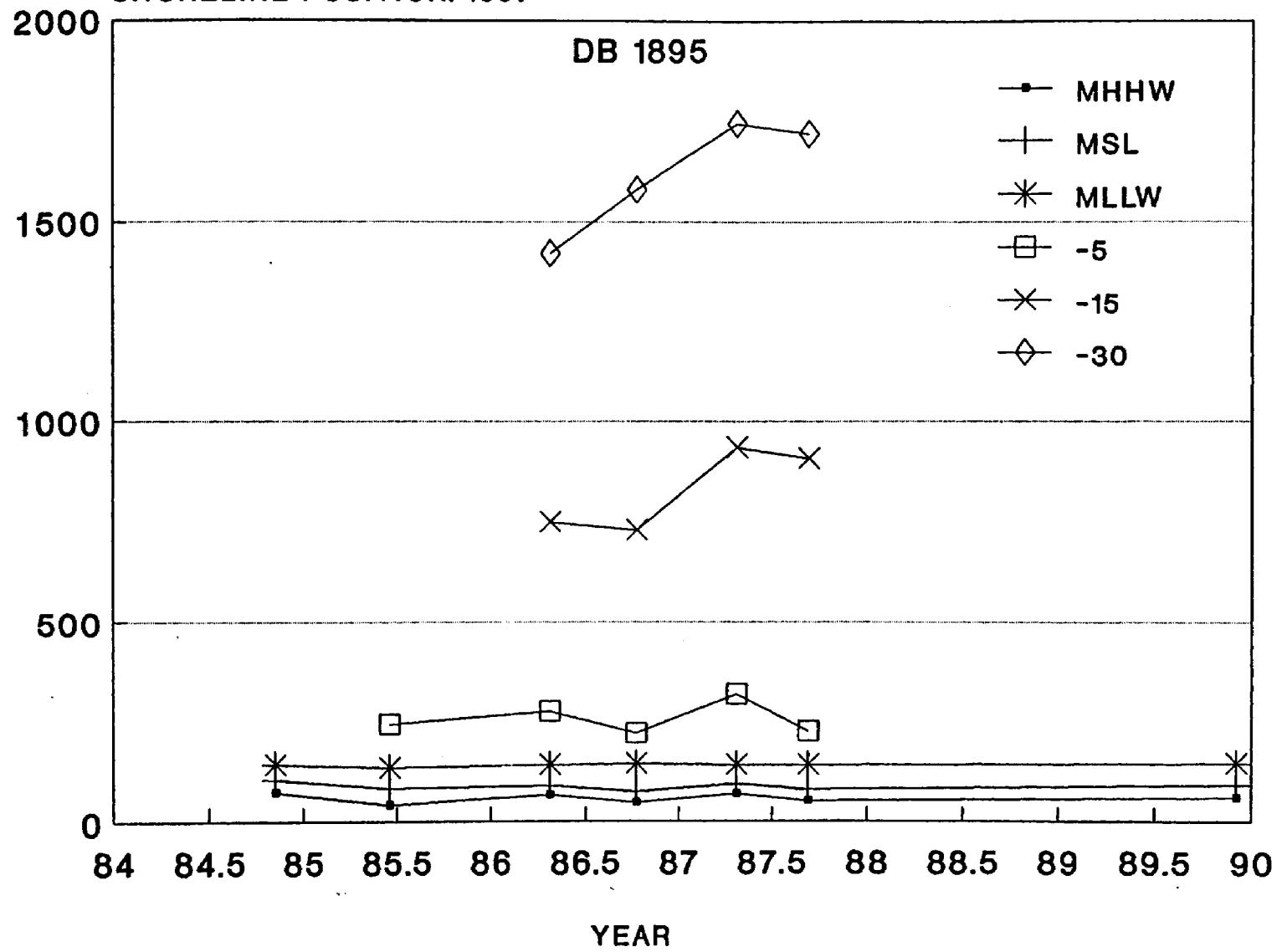
SHORELINE POSITION. feet (Thousands)



C-55

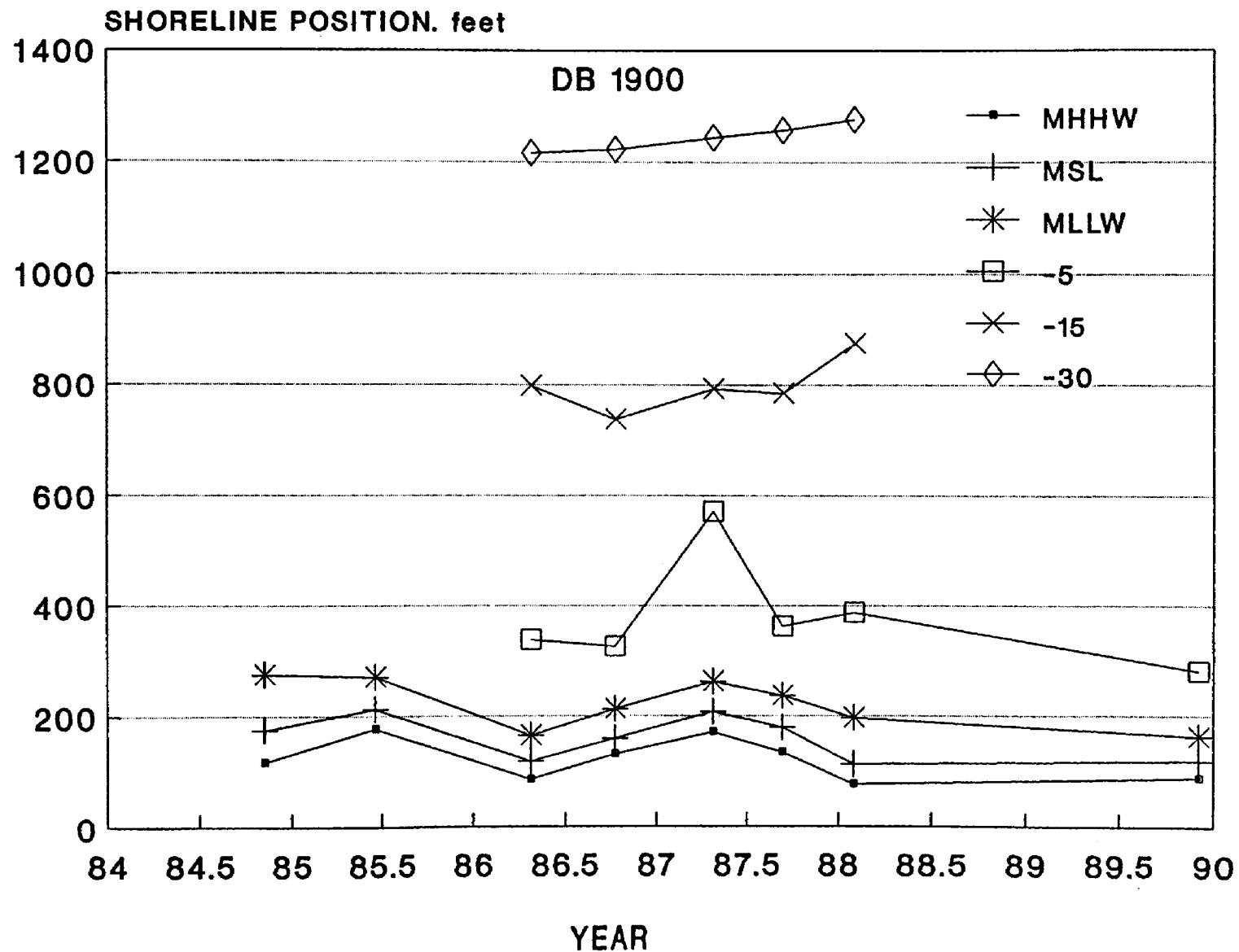


SHORELINE POSITION, feet



C-56

C-57



APPENDIX D

TABULATIONS FOR SEASONAL SHORELINE CHANGE RESULTS

NOTES:

1. Profiles locations are given in Figures 3.1 and 3.2 of Appendix A and Chapter 3.
2. delta = Shoreline seasonal movement as the difference between a given winter position and subsequent summer season position in feet.
3. max = refers to maximum measured summer accretion in feet.
4. min = refers to maximum measured winter erosion in feet.

SILVER STRAND CELL - SEASONAL SHORELINE CHANGES

SS 3	max =	127.12	max =	230.44	max =	106.77	max =	175	max =	195	max =	125
	min =	-136.62	min =	-231.9	min =	-114.81	min =	-220	min =	-100	min =	-35

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
MAR 1969	244.38		403.5		147.56		715		1055		1460	
OCT 1983	246.79	-22.4	290	10	213.4	-26.83						
FEB 1984	224.39	87.52	300	90	186.57	67.1						
SEP 1984	311.91		390		253.67							
JUN 1985	333.75	-136.62	460	-231.9	272.61	-101.41						
APR 1986	197.13	127.12	228.1	230.44	171.2	106.77	625	-45	1140	-100	1520	0
OCT 1986	324.25	-105.43	458.54	-164.99	277.97	-105.15	580	175	1040	10	1520	-35
APR 1987	218.82	102.84	293.55	173.68	172.82	106.2	755	-105	1050	-95	1485	-25
SEP 1987	321.66	-114.59	467.23	-218.27	279.02	-114.81	650	-220	955	195	1460	125
JAN 1988	207.07		248.96		164.21		430		1150		1585	
NOV 1989	322		403		275		565					

SS 5	max =	73.69	max =	122.17	max =	61.78	max =	166.8	max =	226.4	max =	22.2
	min =	-117.88	min =	-136.2	min =	-114.05	min =	-99.3	min =	-119.6	min =	-48.1

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
FEB 1984	258.24		350		204.9							
DEC 1984	295.91		380		246.71							
APR 1986	254.07	72.43	335.14	112.04	223.58	50.94	627.4	-52.7	1128.8	-83.8	1747	-48.1
OCT 1986	326.5	-53.7	447.18	-45.59	274.52	-41.14	574.7	-99.3	1045	11.4	1698.9	-23.3
APR 1987	272.8	73.69	401.59	122.17	233.38	61.78	475.4	166.8	1056.4	-119.6	1675.6	14.4
SEP 1987	346.49	-117.88	523.76	-136.2	295.16	-114.05	642.2	-94.5	936.8	226.4	1690	22.2
JAN 1988	228.61		387.56		181.11		547.7		1163.2		1712.2	
NOV 1989	368.6		462.4		311		590.8					

SILVER STRAND CELL- SEASONAL SHORELINE CHANGES

SS 7	max =	102.7	max =	190	max =	36.56	max =	58.3	max =	60.3	max =	136.3
	min =	-102.87	min =	-82.35	min =	-85.8	min =	-82.8	min =	-37.6	min =	-25.8
DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
FEB 1984	227.69	102.7	250	190	212.81	36.56						
SEP 1984	330.39		440		249.37							
JUN 1985	295.59		429.5		230.37							
OCT 1986	284.25	-102.87	478.47	-82.35	219.11	-85.8	648.4	58.3	989.3	60.3	2738	136.3
APR 1987	181.38	-62.05	396.12	76.5	133.31	-72.69	706.7	-82.8	1049.6	-37.6	2874.3	-25.8
SEP 1987	119.33		472.62		60.62		623.9		1012		2848.5	
NOV 1989	279.3		443.9		199.3		590.6					

D-2

SS 15	max =	132	max =	183	max =	93	max =	240	max =	60	max =	110
	min =	-70	min =	-92	min =	-75	min =	-150	min =	-105	min =	-180
DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
MAY 1965	325		527		238		725		1150		5340	
MAR 1973	314		381		279		585		1140		4920	
JUN 1975	362		639		312		830		1305		5070	
NOV 1983	179		262		119							
FEB 1984	200	132	304	116	134	93						
SEP 1984	332		420		227							
JUN 1985	242	-70	320	-29	189	-75						
APR 1986	172	42	291	7	114	64	540	-150	1090	-85	4980	-180
SEP 1986	214	-53	298	-92	178	-58	390	240	1005	60	4800	60
APR 1987	161	85	206	183	120	78	630	-130	1065	-105	4860	110
SEP 1987	246		389		198		500		960		4970	
NOV 1989	246		339		169							

SS 35	max = 171.56	max = 235.35	max = 145.27	max = 187.2	max = 134.96	max = -12.7
	min = -174.81	min = -268.35	min = -157.47	min = -170.2	min = -217.4	min = -491.2

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
OCT 1983	297.45	-123.33	490.64	-196.32	213.47	-86.59	650.8	85.3	1025.9	23.4		
MAR 1984	174.12	57.69	294.32	56.29	126.88	59.28	736.1	-72.9	1049.3	-88.2		
OCT 1984	231.81		350.61		186.16		663.2		961.1			
JUN 1985	201.32	-69.23	280	-36.32	141.52	-38.13						
APR 1986	132.09	171.56	243.68	186.19	103.39	145.27	457	105.4	1195	-79.1	4070	-491.2
SEP 1986	303.65	-174.81	429.87	-205.34	248.66	-157.47	562.4	-170.2	1115.9	-217.4	3578.8	-133.8
APR 1987	128.84	110.85	224.53	235.35	91.19	100.36	392.2	187.2	898.5	-32	3445	-355
SEP 1987	239.69	-95.68	459.88	-268.35	191.55	-88.46	579.4	-91	866.5	134.96	3090	-12.7
JAN 1988	144.01		191.53		103.09		488.4		1001.46		3077.3	
NOV 1989	273.1		381.2		213.9							

SS 50	max = 125	max = 255	max = 100	max = 225	max = 150	max = 120
	min = -103	min = -167	min = -78	min = -250	min = -170	min = -135

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
MAR 1954	394		446		358		990		1120		2770	
DEC 1956	484		650		398		770		1030		2515	
OCT 1959	556		653		445		790		1030		2420	
APR 1962	406	125	500	147	354	91	815	-15	1120	-55	2600	-135
AUG 1962	531		647		445		800		1065		2465	
APR 1965	439		564		357		630		1130		2605	
SEP 1967	540		659		479		820		1105		2620	
MAR 1973	379		526		335		830		1220		2555	
JUN 1975	493		590		419		815		1155		2780	
MAR 1978	163		178		150		490		1000		2120	
FEB 1979	177		304		141		535		870		2250	
JAN 1984	131		331		78		500		830		2000	
MAR 1984	139	58	209	91	91	19	670	-250	950	-170		
AUG 1984	197	-5	300	57	110	8	420	225	780	150	1980	
FEB 1985	192	7	357	-90	118	40	645		930			
JUN 1985	199	-53	267	-37	158	-44						
APR 1986	146	85	230	155	114	54	485	65	1100	-75	2265	75
OCT 1986	231	-103	385	-167	168	-78	550	65	1025	-85	2340	120
APR 1987	128	123	218	255	90	100	615	-35	940	-10	2460	0
SEP 1987	251		473		190		580		930		2460	
NOV 1989	296		407		203							

SILVER STRAND CELL- SEASONAL SHORELINE CHANGES

SS 77	max =	77.1	max =	164.27	max =	55.78	max =	230.9	max =	-46.8	max =	24.6
	min =	-74.11	min =	-120.12	min =	-28.63	min =	-143.8	min =	-78.2	min =	-7.9

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
OCT 1983	658.44		810.65		618.17		941.5		1400			
MAY 1984	660.76		761.04		625.02		957.1		1395.3			
OCT 1984	706.45		941.71		645.69		1069.7		1372.1			
JUN 1985	698.68	-74.11	770	-120.12	634.17	-26.81						
APR 1986	624.57	64.68	649.88	164.27	607.36	21.37	870.8	59.8	1567.6	-78.2	1953.9	-7.9
OCT 1986	689.25	-50.41	814.15	-96.54	628.73	-28.63	930.6	230.9	1489.4	-46.8	1946	-6
APR 1987	638.84	77.1	717.61	158.21	600.1	55.78	1161.5	-143.8	1442.6	-64.9	1940	24.6
SEP 1987	715.94		875.82		655.88		1017.7		1377.7		1964.6	
NOV 1989	745.5		852		705.9		1010					

D-4

SS 90	max =	52.29	max =	156.37	max =	32.06	max =	147	max =	141.7	max =	73.8
	min =	-85.74	min =	-144.65	min =	-57.66	min =	-88.5	min =	-132	min =	-47.2

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
OCT 1983	303.47	-29.57	428.44	1.38	240.46	-28.94	547	147	1084.1	-132	1510	
MAR 1984	273.9	10.73	429.82	6.14	211.52	22.92	694	-41.9	952.1	-1.6		
OCT 1984	284.63		435.96		234.44		652.1		950.5			
JUN 1985	293.06	-39.84	370	-78.66	225.91	-2.39						
APR 1986	253.22	52.29	291.34	156.37	223.52	29.05	566.5	4.7	1036.7	-46.7	1478.3	7.3
OCT 1986	305.51	-45.57	447.71	-77.26	252.57	-42.79	571.2	128.4	990	-36.8	1485.6	-47.2
APR 1987	259.94	48.61	370.45	123.84	209.78	32.06	699.6	-70.2	953.2	-13.2	1438.4	43
SEP 1987	308.55	-85.74	494.29	-144.65	241.84	-57.66	629.4	-88.5	940	141.7	1481.4	73.8
JAN 1988	222.81		349.64		184.18		540.9		1081.7		1555.2	
NOV 1989	363.6		504		296.9		656.8					

SILVER STRAND CELL- SEASONAL SHORELINE CHANGES

SS 125	max =	26.48	max =	116.11	max =	39.97	max =	88.9	max =	-25.8	max =	8.8
	min =	-18.67	min =	-138.93	min =	-20.94	min =	-42.1	min =	-59.4	min =	1.6

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
JAN 1984	611.64	-16.74	683.95	12.12	563.45	-20.94	1061	-23.6	1410	-32.3		
MAY 1984	594.9	4.38	696.07	9.29	542.51	17.19	1037.4	39	1377.7	-25.8		
DEC 1984	599.28	18.03	705.36	54.64	559.7	-11.08	1076.4		1351.9			
JUN 1985	617.31	-10.95	760	-129.95	548.62	39.97						
APR 1986	606.36	2.92	630.05	116.11	588.59	-16.33	892.1	-41.8	1355.5	-59.4	1901.8	2.6
OCT 1986	609.28	-18.67	746.16	-138.93	572.26	0.45	850.3	88.9	1296.1	-37.2	1904.4	1.6
APR 1987	590.61	26.48	607.23	110.92	572.71	8.26	939.2	-42.1	1258.9	-44.3	1906	8.8
SEP 1987	617.09		718.15		580.97		897.1		1214.6		1914.8	
NOV 1989	658.9		766.7		566.6		955					

D-5

SS 160	max =	179.07	max =	88.22	max =	165.99	max =	312.1	max =	95.9	max =	154.7
	min =	-200.08	min =	-162.6	min =	-142.08	min =	-196.7	min =	-60.6	min =	-182.9

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
OCT 1983	659.66	-47.28	771.53	18.65	563.9	-34.64	887.5	312.1	1498.1	-35		
MAR 1984	612.38	112.48	790.18	88.22	529.26	138.22	1199.6	-190.7	1463.1	-60.6		
OCT 1984	724.86		878.4		667.48		1008.9		1402.5			
JUN 1985	778.13	-200.08	930	-162.6	646.67	-131.84						
APR 1986	578.05	179.07	767.4	85.11	514.83	165.99	1141.7	-183.2	1562.7	-58.6	3372.9	-182.9
OCT 1986	757.12	-99.99	852.51	-21.61	680.82	-82.34	958.5	255.2	1504.1	11.8	3190	98.6
APR 1987	657.13	111.27	830.9	58.87	598.48	96.86	1213.7	-196.7	1515.9	-43.3	3288.6	154.7
SEP 1987	768.4	-115.41	889.77	-62.53	695.34	-142.08	1017	97.6	1472.6	95.9	3443.3	126.7
JAN 1988	652.99		827.24		553.26		1114.6		1568.5		3570	
NOV 1989	796.3		906.7		731.2		1033.1					

SILVER STRAND CELL- SEASONAL SHORELINE CHANGES

SS 180	max =	106.73	max =	66.28	max =	121.86	max =	47.4	max =	90.9
	min =	-122.75	min =	-87.48	min =	-102.94	min =	-93.6	min =	-29.6

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
OCT 1983	635.75	-22.17	777.05	-83.59	511.98	10.05	912.6	-93.6	1250	39.1		
MAR 1984	613.58	33.48	693.46	52.7	522.03	-6.54	819	47.4	1289.1	90.9		
OCT 1984	647.06		746.16		515.49		866.4		1380			
JUN 1985	644.23	-78.39	726.67	-24.43	548.13	-100.09						
APR 1986	565.84	106.73	702.24	66.28	448.04	121.86	862.6	21.3	1150.7	-12		
OCT 1986	672.57	-122.75	768.52	-87.48	569.9	-102.94	883.9	-68.3	1138.7	35.9		
APR 1987	549.82	63.33	681.04	57.03	466.96	60.09	815.6	38	1174.6	-29.6		
SEP 1987	613.15		738.07		527.05		853.6		1145			

SS 200	max =	51.52	max =	68.77	max =	57.38	max =	37.5	max =	294.9
	min =	-62.62	min =	-61.57	min =	-68.72	min =	-69	min =	-28

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
MAR 1984	247.26	-38.56	325.47	17.02	180.38	-43.17	549.5	37.5				
OCT 1984	208.7		342.49		137.21		587					
JUN 1985	226.14	-21.67	306.25	-13.05	161.58	-26.75						
APR 1986	204.47	44.01	293.2	30.08	134.83	57.38	524	-69	4142	-28		
OCT 1986	248.48	-62.62	323.28	-61.57	192.21	-68.72	455	-17	4114	-11.8		
APR 1987	185.86	51.52	261.71	68.77	123.49	44.87	438	-11.9	4102.2	294.9		
SEP 1987	237.38		330.48		168.36		426.1		4397.1			
NOV 1989	333.2		397.9		263.2		485					

MISSION BAY CELL - SEASONAL SHORELINE CHANGES

OB 230	max =	101	max =	172	max =	101	max =	155	max =	45	max =	140
	min =	-221	min =	-400	min =	-141	min =	-125	min =	-35	min =	-205
DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
APR 1951	71		124		30		200		1575		3050	
MAR 1954	124		207		75		610		1200		2865	
JUL 1955	482		547		160		680		1280		2910	
APR 1957	424		550		364		905		1450			
FEB 1966	183		265		158		685		1485		2960	
JUL 1970	275		401		198		655		1540		3150	
JUN 1972	248	-88	400	-84	184	-65	650	-80	1255	45	2985	-205
APR 1973	160		316		119		570		1300		2780	
MAR 1977	191		282		172		575		1440		3020	
OCT 1983	491	-221	720	-400	375	-141						
APR 1984	270	93	320	172	234	68						
OCT 1984	363		492		302							
JUN 1985	347	-71	420	16	289	-60						
APR 1986	276	101	436	82	229	101	825	-120	1405	-35	3175	-25
OCT 1986	377	-79	518	23	330	-85	705	155	1370	20	3150	-50
APR 1987	298	93	541	23	245	80	860	-125	1390	0	3100	140
SEP 1987	391	-73	564	-117	325	-56	735	140	1390	-25	3240	-5
JAN 1988	318		447		269		875		1365		3235	
DEC 1989	462		585		403							

MB 310	max =	91	max =	163	max =	69	max =	200	max =	80	max =	180
	min =	-86	min =	-151	min =	-60	min =	-110	min =	-85	min =	-20

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
JUL 1940	224		252		190		735		1270		2190	
JUN 1949	224		324		163		790		1355		2150	
APR 1951	327		442		266		700		1200		2120	
JUL 1955	408		483		269		705		1165		2085	
JUN 1972	335		346		292		705		1090		1960	
MAR 1977	310		380		257		780		1220		2080	
OCT 1983	285	-43	442	-151	184	14	595	70	1090	80		
APR 1984	242	54	291	129	198	42	665	65	1170	-70		
OCT 1984	296		420		240		730		1100			
JUN 1985	308	-86	400	-24	231	-60						
APR 1986	222	54	376	25	171	41	745	-110	1200	-85	1915	20
OCT 1986	276	-62	401	-117	212	-47	635	200	1115	15	1935	-20
APR 1987	214	91	284	163	165	69	835	-105	1130	-20	1915	180
SEP 1987	305		447		234		730		1110		2095	
DEC 1989	328		475		246		690					

MB 340	max =	92	max =	155	max =	99	max =	90	max =	65	max =	70
	min =	-206	min =	-221	min =	-104	min =	-65	min =	-130	min =	-10

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
JUL 1940	156		225		90		470		1100		2010	
JUN 1949	218		342		179		700		1055		1910	
APR 1951	205		280		162		580		1070		1930	
APR 1957	175		352		130		620		955		1760	
JUN 1972	201		215		143		580		930		1830	
OCT 1983	357	-206	466	-174	172	-81	570	0	1250	-130		
APR 1984	151	48	292	102	91	48	570	40	1120	-40		
OCT 1984	199		394		139		610		1080			
JUN 1985	243	-95	350	-112	151	-63						
APR 1986	148	59	238	119	88	41	540	-50	1135	-55	1820	0
OCT 1986	207	-59	357	-75	129	-43	490	90	1080	-30	1820	-10
APR 1987	148	92	282	155	86	99	580	30	1050	-25	1810	70
SEP 1987	240	-104	437	-221	185	-104	610	-65	1025	65	1880	70
JAN 1988	136		216		81		545		1090		1950	
DEC 1989	265		392		169							

OCEANSIDE CELL - SEASONAL SHORELINE CHANGES

MB 384	max =	61	max =	60	max =	52	max =	110	max =	40	max =	90
	min =	-83	min =	-37	min =	-56	min =	-180	min =	-90	min =	-70

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
JUN 1972	204		240		140		650		1000		2340	
OCT 1983	230		293		143		580		1220			
MAY 1984	148		227		92		660		1150			
OCT 1984	250		447		196		700		1125			
JUN 1985	268	-83	417	-37	178	-56						
APR 1986	185	61	380	9	122	52	720	-180	1200	-90	2280	-70
OCT 1986	246	-32	389	2	174	-27	540	30	1110	40	2210	90
APR 1987	214	53	391	60	147	46	570	110	1150	-70	2300	10
SEP 1987	267		451		193		680		1080		2310	
DEC 1989	301		403		212							

PB 408	max =	61.63	max =	169.2	max =	25.66	max =	97.3	max =	31.4	max =	69.3
	min =	-23.52	min =	-151.9	min =	-31.5	min =	-18.1	min =	-51.1	min =	-12.2

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
NOV 1983	143.34		317.55		58.26							
APR 1984	91.02	61.63	164	101.2	53.76	7.87						
OCT 1984	152.65		265.2		61.63							
JUN 1985	98.81	-6.92	190	22.82	42.43	20.36						
APR 1986	91.89	38.33	212.82	4.12	62.79	-17.45	588.6	-18.1	1186.8	-51.1	2569.3	-12.2
OCT 1986	130.22	-23.52	216.94	-23.04	45.34	25.66	570.5	3.2	1135.7	31.4	2557.1	69.3
APR 1987	106.7	6.1	193.9	169.2	71	-31.5	573.7	-10.6	1167.1	7.11	2626.4	51.9
SEP 1987	112.8	42	363.1	-151.9	39.5	24.6	563.1	97.3	1174.21	-4.21	2678.3	-5.9
JAN 1988	154.8		211.2		64.1		660.4		1170		2672.4	
DEC 1989	184.4		345.6		68.2		612.11					

OCEANSIDE CELL- SEASONAL SHORELINE CHANGES

LJ 443	max =	58.9	max =	38.8	max =	12.7	max =	122.9	max =	14.4	max =	38.9
	min =	-42.8	min =	-37.11	min =	-13	min =	-142.4	min =	-8.7	min =	-93.2

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
JUN 1984	113.8		287.1		23.3							
OCT 1984	137.5		283		31							
JUN 1985	86.5	-42.8	240.91	-37.11	23.4	-10.5						
APR 1986	43.7	58.9	203.8	38.8	12.9	12.7	614.7	-123.3	1229.2	-8.7	2041.8	-93.2
OCT 1986	102.6	-40	242.6	-7.18	25.6	-13	491.4	122.9	1220.5	8.8	1948.6	-53.1
APR 1987	62.6	21.6	235.42	4.61	12.6	2.1	614.3	-142.4	1229.3	14.4	1895.5	38.9
SEP 1987	84.2		240.03		14.7		471.9		1243.7		1934.4	
DEC 1989	160.7		193		68		405					

D-10

LJ 445	max =	26.9	max =	87.75	max =	41.4	max =	83.74	max =	20.2	max =	60.9
	min =	-50.5	min =	-74.15	min =	-63.5	min =	-115.9	min =	-12.8	min =	-48.3

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
JUL 1984	259.4		375.38		125.5		597.9		919.4			
OCT 1984	228		361.6		140.7		546		917.4			
JUN 1985	236.5	8	350	87.75	135	19.4						
APR 1986	244.5	6.3	437.75	-74.15	154.4	6.3	625.1	-115.9	916.8	-12.8	1030	60.9
OCT 1986	250.8	-40.9	363.6	14.76	160.7	-56.5	509.2	83.74	904	-6.8	1090.9	-7.7
APR 1987	209.9	26.9	378.36	-16.97	104.2	41.4	592.94	-86.74	897.2	11.7	1083.2	-7.3
SEP 1987	236.8	-50.5	361.39	-41.89	145.6	-63.5	506.2	73.4	908.9	20.2	1075.9	-48.3
JAN 1988	186.3		319.5		82.1		579.6		929.1		1027.6	
DEC 1989	175.7		266.9		127.9							

OCEANSIDE CELL - SEASONAL SHORELINE CHANGES

LJ 450	max =	100.2	max =	96.01	max =	73.2	max =	110.3	max =	15.2	max =	10.6
	min =	-35.6	min =	-19.11	min =	-21.8	min =	-205.8	min =	-73.1	min =	-6.1

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
OCT 1983	313.1		423		180.2		601.3		1161.3			
MAY 1984	207.9		345.82		133.8		716		1205.8			
OCT 1984	265.2		430.16		180.7		695.1		1195			
APR 1986	170.7	100.2	286.83	96.01	117.8	73.2	822.3	-205.8	1146.7	-73.1	1598.7	-6.1
OCT 1986	270.9	-35.6	382.84	-19.11	191	-21.8	616.5	110.3	1073.6	-20.5	1592.6	10.6
APR 1987	235.3	34.1	363.73	61.27	169.2	14	726.8	-93.4	1053.1	15.2	1603.2	7.6
SEP 1987	269.4		425		183.2		633.4		1068.3		1610.8	
DEC 1989	280.4		407.3		217.1							

LJ 460	max =	112.4	max =	121.54	max =	74	max =	89.9	max =	151.7	max =	18.5
	min =	-172.9	min =	-179.2	min =	-80.8	min =	-139.1	min =	-57	min =	3.5

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
OCT 1983	215.3	-120.2	382.52	-145.99	108.1	-68.7	567.4	41.3	971.4	-57		
APR 1984	95.1	0	236.53	121.54	39.4	0	608.7	-84.1	914.4	-10.7		
OCT 1984	95.1		358.07		39.4		524.6		903.7			
JUN 1985	163.9	19	316.67	80.47	63.8	12.6						
APR 1986	182.9	65.1	397.14	-1.27	76.4	74	713.3	-139.1	956.7	-24.6	1614.3	13.3
OCT 1986	248	-87.2	395.87	-22.23	150.4	-73.7	574.2	89.9	932.1	15.9	1627.6	3.5
APR 1987	160.8	112.4	373.64	70.96	76.7	48.7	664.1	-52.8	948	-16.7	1631.1	18.5
SEP 1987	273.2	-172.9	446.6	-179.2	125.4	-80.8	611.3	-110.1	931.3	151.7	1649.6	6.2
JAN 1988	100.3		265.4		44.6		501.2		1083		1655.8	
DEC 1989	187.6		330		123							

OCEANSIDE CELL - SEASONAL SHORELINE CHANGES

TP 470	max =	70	max =	65.42	max =	77.9	max =	85.4	max =	28.6	max =	23.5
	min =	-169	min =	-205.51	min =	-147.5	min =	-34.1	min =	-38.9	min =	23.5

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
NOV 1983	191.1	-49.1	343.16	35.99	78.7	-18						
MAY 1984	142		379.15		60.7							
OCT 1984	198		352.7		117.2							
JUN 1985	231	-169	350	-205.51	168	-147.5						
APR 1986	62		144.49		20.5		375.7		1140		1665.6	
APR 1987	155	70	343.93	65.42	69.1	77.9	523.7	85.4	1063.9	-38.9	1664	23.5
SEP 1987	225	-112.6	409.35	-151.35	147	-101	609.1	-34.1	1025	28.6	1687.5	
JAN 1988	112.4		258		46		575		1053.6			
DEC 1989	263.6		331.3		227.6							

D-12

TP 520	max =	112.7	max =	166.96	max =	47.4	max =	100.7	max =	46.8	max =	17
	min =	-90.1	min =	-135.56	min =	-36.7	min =	-154.4	min =	-49.3	min =	-28.4

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
OCT 1983	195.5		362.63		115.1		487.7		1073.8			
MAY 1984	176.5	65.5	376.2	-59.18	102.4	8.3	500.2	100.7	1084	-39.2		
NOV 1984	242	-53.4	317.02	1.16	110.7	-12.6	600.9		1044.8			
JUN 1985	188.6	-90.1	318.18	-135.56	98.1	-24.9						
APR 1986	98.5	107.7	182.62	166.96	73.2	45.4	630.3	-154.4	1046.9	-49.3	1806.2	-28.4
OCT 1986	206.2	-85.7	349.58	-36.28	118.6	-36.7	475.9	7.6	997.6	46.8	1777.8	12.2
APR 1987	120.5	112.7	313.3	110.1	81.9	47.4	483.5	89.2	1044.4	-47.8	1790	17
SEP 1987	233.2		423.4		129.3		572.7		996.6		1807	
DEC 1989	200.8				144.8							

OCEANSIDE CELL - SEASONAL SHORELINE CHANGES

TP 530	max =	86	max =	236.53	max =	79.1	max =	85	max =	77.7	max =	60.72
	min =	-98	min =	-214.25	min =	-80	min =	-57.5	min =	-56.8	min =	-33.1

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
JUL 1984	190.6	-26.8	328.24	17.53	109.8	7.4						
NOV 1984	163.8	57.4	345.77	-22.69	117.2	12.8	631.6		1058.1			
JUN 1985	221.2	-98	323.08	-138.42	130	-42.9						
APR 1986	123.2	70.2	184.66	165.14	87.1	40.5	541.2	-57.5	1208.9	-56.8	1841.2	-33.1
OCT 1986	193.4	-67.7	349.8	-186.88	127.6	-34.9	483.7	46.7	1152.1	-55.5	1808.1	19.6
APR 1987	125.7	86	162.92	236.53	92.7	79.1	530.4	85	1096.6	-41.6	1827.7	17.9
SEP 1987	211.7	-79.9	399.45	-214.25	171.8	-80	615.4	-44.1	1055	77.7	1845.6	60.72
JAN 1988	131.8		185.2		91.8		571.3		1132.7		1906.32	
DEC 1989	189.2		285.5		149.9							

D-13

TP 540	max =	55	max =	115	max =	43	max =	80	max =	-10	max =	10
	min =	-48	min =	-84	min =	-14	min =	-20	min =	-85	min =	-25

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
JAN 1934	158		228		75		545		1085		1960	
APR 1957	185		311		110		690		1110		1970	
JUN 1984	104		202		54							
OCT 1984	108		279		31							
JUN 1985	122	-48	262	-84	51	-13						
APR 1986	74	48	178	115	38	15	490	-20	1245	-85	1985	-25
OCT 1986	122	-30	293	2	53	-14	470	0	1160	-10	1960	0
APR 1987	92	55	295	3	39	43	470	80	1150	-35	1960	10
SEP 1987	147		298		82		550		1115		1970	

OCEANSIDE CELL - SEASONAL SHORELINE CHANGES

DM 560	max =	55.1	max =	138.8	max =	41.6	max =	79.1	max =	-20.8	max =	46.5
	min =	-82	min =	-130.9	min =	-49.5	min =	-37.6	min =	-73.6	min =	-16.1

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
OCT 1984	212.9		326.5		136.4							
JUN 1985	231.9	-82	314.7	-130.9	169.4	-49.5						
APR 1986	149.9	55.1	183.8	138.8	119.9	32.2	523.4	-37.6	1217.4	-73.6	1923.2	-16.1
OCT 1986	205	-5.8	322.6	22	152.1	-27.1	485.8	79.1	1143.8	-20.8	1907.1	2.1
APR 1987	199.2	17.1	344.6	58.2	125	41.6	564.9	-10.9	1123	-73	1909.2	46.5
SEP 1987	216.3		402.8		166.6		554		1050		1955.7	

DM 580	max =	100.4	max =	183.33	max =	93.4	max =	114.7	max =	157.7	max =	46.4
	min =	-111.1	min =	-236.61	min =	-91.8	min =	-47.1	min =	-113.1	min =	-50.4

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
OCT 1983	201.3		432.53		147		636.4		1121.6			
MAY 1984	136.3	99.7	262.4	35.17	99.3	92.9	539.2	114.7	1071	-59.4		
NOV 1984	236	-14.6	297.57	6	192.2	-23.7	653.9		1011.6			
JUN 1985	221.4	-83.9	303.57	-26.08	168.5	-75						
APR 1986	137.5	100.4	277.49	107.31	93.5	93.4	517.4	25.1	1124.4	-113.1	1994	-50.4
OCT 1986	237.9	-93.3	384.8	-126.69	186.9	-85.9	542.5	-19.7	1011.3	22.64	1943.6	46.4
APR 1987	144.6	86.7	258.11	183.33	101	72.8	522.8	101.7	1033.94	-40.94	1990	44.2
SEP 1987	231.3	-111.1	441.44	-236.61	173.8	-91.8	624.5	-47.1	993	157.7	2034.2	
JAN 1988	120.2		204.83		82		577.4		1150.7			
DEC 1989	238.2		303.6		204.1							

D-14

OCEANSIDE CELL - SEASONAL SHORELINE CHANGES

DM 590	max =	180.3	max =	145.83	max =	23.1	max =	76.6	max =	14.3	max =	25.4
	min =	-101.8	min =	-114.45	min =	-90.8	min =	-87.1	min =	-31.2	min =	8

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
NOV 1984	190.6	-101.5	464.45	-114.45	118.7	-90.8						
JUN 1985	89.1	-54.1	350	-11.76	27.9	-3.8						
APR 1986	35	180.3	338.24	132.01	24.1	17.8	722.3	-87.1	1169.5	-31.2	2373.1	8
OCT 1986	215.3	-101.8	470.25	-54.83	41.9	-13.4	635.2	76.6	1138.3	-2.6	2381.1	16.2
APR 1987	113.5	30.5	415.42	145.83	28.5	23.1	711.8	-5.3	1135.7	14.3	2397.3	25.4
SEP 1987	144		561.25		51.6		706.5		1150		2422.7	
DEC 1989	291.4		398		236.9		637.1					

D-15

SD 600	max =	61.3	max =	117.51	max =	53.2	max =	133.5	max =	99.1	max =	49.2
	min =	-67.9	min =	-100.67	min =	-71.9	min =	-179.2	min =	-91.9	min =	-34.6

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
OCT 1983	212.5		363.65		115.5		508		1100			
MAY 1984	135.3	22.9	265	35.18	62.1	34.8	586.7	-67.2	1106.4	-10		
NOV 1984	158.2	2.1	300.18	-7.32	96.9	7.9	519.5	-19.5	1096.4			
JUN 1985	160.3	-25.4	292.86	-50.72	104.8	-17.7	500	133.5				
APR 1986	134.9	61.3	242.14	64.47	87.1	53.2	633.5	-179.2	1107.5	9	2201.3	-34.6
OCT 1986	196.2	-67.9	306.61	-84.45	140.3	-71.9	454.3	15.7	1116.5	-91.9	2166.7	-15.4
APR 1987	128.3	52.6	222.16	117.51	68.4	46.6	470	21.4	1024.6	9.6	2151.3	38.7
SEP 1987	180.9	-53.4	339.67	-100.67	115	-54	491.4	85.9	1034.2	99.1	2190	49.2
JAN 1988	127.5		239		61		577.3		1133.3		2239.2	
DEC 1989	155.2		265.8		99		443.5					

OCEANSIDE CELL - SEASONAL SHORELINE CHANGES

SD 630	max =	82	max =	164	max =	72	max =	75	max =	-30	max =	15
	min =	-126.5	min =	-219	min =	-110	min =	-40	min =	-150	min =	-15

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
JAN 1934	157		262		45		500		1000		1810	
APR 1957	97		242		30		515		935		1780	
OCT 1970	179		343		105		535		895		1750	
OCT 1983	265		396		140		510					
MAY 1984	130	50	233	115	60	72	425	75	960	-40		
NOV 1984	180	-22	348	-85	132	-18	500		920			
JUN 1985	158	-2	263	-5	114	-4						
APR 1986	156	82	258	81	110	62	455	15	1110	-30	1820	0
OCT 1986	238	-65	339	-126	172	-43	470	65	1080	-150	1820	-15
APR 1987	173	42	211	164	129	21	535	-20	930	-55	1805	15
SEP 1987	215	-126.5	375	-219	150	-110	515	-40	875		1820	
JAN 1988	88.5		156		40		475					
DEC 1989	169		254		131		440					

SD 670	max =	107	max =	146	max =	58	max =	125	max =	-25	max =	25
	min =	-99	min =	-92	min =	-50	min =	-150	min =	-95	min =	-25

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
JAN 1934	151		260		38		510		950		1680	
APR 1957	91		210		38		605		965		1780	
OCT 1983	192		309		125							
MAY 1984	127		198		78							
OCT 1984	171		242		95							
JUN 1985	143	-58	254	-64	105	-37	475	-150				
APR 1986	85	104	190	104	68	51	325	125	1075	-55	1750	-15
OCT 1986	189	-99	294	-92	119	-50	450	-55	1020	-95	1735	-25
APR 1987	90	107	202	146	69	58	395	90	925	-25	1710	25
SEP 1987	197		348		127		485		900		1735	
DEC 1989	93		163		76							

OCEANSIDE CELL - SEASONAL SHORELINE CHANGES

CB 720	max =	85	max =	228	max =	37	max =	75	max =	-30	max =	20
	min =	-81	min =	-227	min =	-39	min =	-240	min =	-85	min =	-40

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
JAN 1934	250		353		135		590		990		1670	
APR 1957	226		370		155		700		1015		1545	
OCT 1970	315		457		285		670		1070		1720	
FEB 1981	200		246		155		550		1020		1650	
JUN 1982	240		394		180		650		980		1730	
OCT 1983	252		393		192		500		1000			
MAY 1984	174	25	208	117	154	5	565	75	1015	-85		
NOV 1984	199	19	325	22	159	15	640		930			
JUN 1985	218	-49	347	-165	174	-20						
APR 1986	169	85	182	195	154	33	510	5	1100	-85	1715	-40
OCT 1986	254	-81	377	-185	187	-28	515	35	1015	-65	1675	5
APR 1987	173	74	192	228	159	37	550	20	950	-30	1680	20
SEP 1987	247	-73	420	-227	196	-39	570	-240	920		1700	
JAN 1988	174		193		157		330					
DEC 1989	169		178		148							

CB 760	max =	35.6	max =	99.12	max =	5.1	max =	169.9	max =	30.1	max =	20.9
	min =	-30.6	min =	-72.24	min =	-4.2	min =	-100.7	min =	-57.46	min =	-19.5

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
OCT 1983	132.1		332.04		94.3							
MAY 1984	108.5	35.6	172.56	99.12	92.3	5.1						
NOV 1984	144.1	-19.2	271.68	-72.24	97.4	-3.8						
JUN 1985	124.9	-18.3	199.44	-39.38	93.6	-4.2						
APR 1986	106.6	24.2	160.06	94.24	89.4	-2	403.8	46.2	976.46	-57.46	1617.7	12.9
OCT 1986	130.8	-30.6	254.3	-26.45	87.4	2	450	-100.7	919	30.1	1630.6	20.9
APR 1987	100.2	34.5	227.85	55.76	89.4	-1.4	349.3	169.9	949.1	-47.7	1651.5	-19.5
SEP 1987	134.7		283.61		88		519.2		901.4		1632	
DEC 1989	115.08		192.5		86.4							

OCEANSIDE CELL- SEASONAL SHORELINE CHANGES

CB 800	max =	30	max =	95	max =	20	max =	110	max =	40	max =	0
	min =	-14	min =	-28	min =	-20	min =	-10	min =	-20	min =	0

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
OCT 1970	43		105		18		450		1140		1595	
FEB 1972	85		243		32		535		1150		1690	
FEB 1981	215		455		60		665		1385		1925	
JUN 1982	80		205		35		470		1160		1725	
JUL 1984	97	1	201	-28	38	2						
DEC 1984	98		173		40							
MAR 1986	52		211		18							
APR 1986	55	10	127	30	20	0	470		1140		1700	
MAY 1986	65		157		20							
OCT 1986	60	30	155	17	20	20	370	110	1090	40	1690	0
APR 1987	90	-14	172	95	40	-20	480	-10	1130	-20	1690	0
SEP 1987	76		267		20		470		1110		1690	
DEC 1989	102		203		42							

CB 830	max =	108.6	max =	159.63	max =	85.3	max =	51.7	max =	51	max =	40.5
	min =	-34.6	min =	-30.09	min =	-24.5	min =	-22.4	min =	-63.6	min =	-2.4

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
MAY 1984	111.4	108.6	209.09	159.63	58.3	85.3						
DEC 1984	220		368.72		143.6							
MAR 1986	88		143.71		52.6							
APR 1986	93.4	-15.6	158.34	-3.66	61.6	-16.3	503.6		952.5		1663.9	
MAY 1986	77.8		154.68		45.3							
OCT 1986	100.9	-34.6	181.97	-13.61	47.3	-24.5	426.8	51.7	889.4	51	1634.4	-2.4
APR 1987	66.3	28.3	168.36	-3.47	22.8	34.1	478.5	-22.4	940.4	-63.6	1632	40.5
SEP 1987	94.6	-17.4	164.89	-30.09	56.9	-8.1	456.1	30.3	876.8		1672.5	
JAN 1988	77.2		134.8		48.8		486.4					
DEC 1989	120.2		182.1		70.8							

OCEANSIDE CELL - SEASONAL SHORELINE CHANGES

OS 900	max =	34	max =	95	max =	44	max =	80	max =	75	max =	70
	min =	-86	min =	-204	min =	-59	min =	-120	min =	-65	min =	-50

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
1934			296								1865	
SEP 1961	141	-30	200	-39	98	-18	495	-85	780	0	1950	-50
MAR 1962	111		161		80		410		780		1900	
APR 1963	133		188		92		300		925		2030	
MAY 1964	149		177		130		335		750		1720	
MAY 1965	148		230		115		380		800		1970	
AUG 1966	141		202		115		430		770		1820	
FEB 1972	120		188		70		465		770		1880	
MAR 1974	74		174		42		505		780		1890	
FEB 1981	149		164		133		470		950		1840	
JUN 1982	134		205		89		460		780		1810	
AUG 1983	293		363		248		490		805		1640	
JUL 1984	134	17	247	-52	78	4						
FEB 1985	151	-7	195	10	82	12						
JUN 1985	144	-50	205	-70	94	-36						
MAR 1986	94		135		58							
APR 1986	95	-6	201	-46	59	-9	340		910		1700	
MAY 1986	89		155		50							
OCT 1986	166	-43	321	-111	97	-27	500	-80	840	75	1640	70
APR 1987	123	34	210	95	70	44	420	80	915	-65	1710	40
SEP 1987	157	-86	305	-204	114	-59	500	-120	850		1750	
JAN 1988	71		101		55		380					
DEC 1989	138		297		76							

D-19

OCEANSIDE CELL - SEASONAL SHORELINE CHANGES

OS 930	max =	71	max =	59	max =	34	max =	150	max =	120	max =	75
	min =	-61	min =	-88	min =	-35	min =	-20	min =	-105	min =	-45

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
1934			308								1867	
JAN 1972	187		260		130		555		920		1780	
JUN 1982	128		185		95		510		860		1800	
AUG 1983	277		316		200		480		875		1780	
OCT 1983	241		294		185		585		975			
MAY 1984	186	40	338	47	162	-14	500	150	1110	-90		
NOV 1984	226	4	385	-83	148	31	650		1020			
JUN 1985	230	-61	302	-88	179	-35						
MAR 1986	169		214		144							
APR 1986	182	43	304	59	142	20	500	80	1035	-105	1785	-45
OCT 1986	225	-30	363	8	162	-22	580	-20	930	120	1740	75
APR 1987	195	71	371	-13	140	34	560	60	1050	-95	1815	-15
SEP 1987	266		358		174		620		955		1800	
DEC 1989	230		413		165							

OCEANSIDE CELL- SEASONAL SHORELINE CHANGES

OS 1000	max =	89	max =	171	max =	46	max =	175	max =	100	max =	200
	min =	-142	min =	-161	min =	-106	min =	-200	min =	-80	min =	-185
DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
1934			368								2054	
JAN 1961	125	11	147	25	100	5	550	-55	850	-5	2065	50
SEP 1961	136	-10	172	-23	105	-5	495	-200	845	-5	2115	-120
MAR 1962	126		149		100		295		840		1995	
NOV 1962	405		485		360		735		975		2130	
APR 1963	352		395		310		495		1070		2170	
MAY 1964	288		347		273		485		1000		2015	
MAY 1965	277		341		232		540		910		2035	
SEP 1965	253	-20	290	-19	225	-35	555	-50	910	100	2055	200
MAR 1966	233	24	271	171	190	40	505	35	1010	-50	2255	-185
AUG 1966	257		442		230		540		960		2070	
AUG 1971	381	-101	465	-29	280	-90	695	-25	950	10	2140	-55
JAN 1972	280		436		190		670		960		2085	
JUL 1973	284		375		130		600		975			
JUN 1982	229		324		185		700		980		2145	
AUG 1983	190		233		140		575		990		1975	
OCT 1983	270		364		180		650		1055			
MAY 1984	261	2	375	17	170	38	490	175	1070	-80		
NOV 1984	263	-44	392	-80	208	-32	665		990			
JUN 1985	219	-68	312	-149	176	-42						
MAR 1986	151		163		134							
APR 1986	142	32	213	42	113	17	525		1030		1935	
MAY 1986	174		255		130							
OCT 1986	306	-142	449	-161	238	-106	720	-180	1005	40	1905	40
APR 1987	164	89	288	96	132	46	540	120	1045	-40	1945	85
SEP 1987	253	-94	384	-149	178	-68	660	-150	1005		2030	
JAN 1988	159		235		110		510					
DEC 1989	233		328		169							

D-21

OCEANSIDE CELL - SEASONAL SHORELINE CHANGES

OS 1030	max =	77	max =	163	max =	60	max =	205	max =	120	max =	380
	min =	-113	min =	-126	min =	-65	min =	-230	min =	-90	min =	-140

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
1934			489								2474	
OCT 1959	145		189		110		555		1020		2620	
JUN 1961	180		374		115		605		815		2260	
JUL 1961	171		196		145		460		875		2580	
SEP 1961	135	73	200	74	110	60	520	60	880	20	2500	-100
APR 1962	208		274		170		580		900		2400	
NOV 1962	461		536		395		720		1000		2690	
APR 1963	414	-71	468	-12	380	-65	585	75	1125	-85	2395	45
OCT 1963	343		456		315		660		1040		2440	
MAY 1964	325		434		310		515		875		2355	
MAY 1965	291		320		275		410		940		2495	
SEP 1965	270	0	322	-6	240	-15	555	-90	895	120	2430	110
MAR 1966	270	-33	316	23	225	-7	465	160	1015	-80	2540	-140
AUG 1966	237		339		218		625		935		2400	
NOV 1968	335	-79	508	-126	255	-32	700	-20	1030	65	2445	380
JUN 1969	256		382		223		680		1095		2825	
AUG 1971	253	42	315	163	210	25	705	25	1050	5	2535	-115
JAN 1972	295		478		235		730		1055		2420	
FEB 1981	300		454		230		580		1135		2350	
JUN 1982	356		451		270		800		1140		2600	
JUN 1983	347		430		260		820		1360		2760	
MAY 1984	278	77	322	100	245	6	700	30	1100	15		
NOV 1984	355	-113	422	-118	251	-45	730		1115			
JUN 1985	242	19	304	67	206	-16						
MAR 1986	261		371		190							
APR 1986	275	15	421	-27	227	7	580		1160		2120	
MAY 1986	290		394		234							
OCT 1986	269	-17	374	-22	199	5	700	-230	1065	10	2070	10
APR 1987	252	-22	352	14	204	-38	470	205	1075	-90	2080	110
SEP 1987	230		366		166		675		985		2190	
DEC 1989	212		305		127							

OCEANSIDE CELL - SEASONAL SHORELINE CHANGES

OS 1070	max =	160	max =	216	max =	140	max =	335	max =	110	max =	395
	min =	-92	min =	-314	min =	-55	min =	-200	min =	-145	min =	-420

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
1934			421								3095	
JUN 1959	469		648		405		1005		1375		3240	
OCT 1959	233		288		200		570		1000		2995	
APR 1963	299	160	367	216	245	140	610	335	1170	110	3175	60
OCT 1963	459		583		385		945		1280		3235	
MAY 1964	321		365		300		690		1090		3115	
SEP 1965	379	3	599	-104	330	-40	910	-120	1260	100	3140	395
MAR 1966	382	48	495	62	290	85	790	70	1360	-60	3535	-420
AUG 1966	430		557		375		860		1300		3115	
NOV 1968	566		702		395		965		1320		3040	
JAN 1972	566	-74	711	-27	445	-20	1030	10	1540	-50	3115	115
JUN 1972	492	86	684	78	425	40	1040	120	1490	110	3230	40
NOV 1972	578	-92	762	-135	465	-55	1160	-190	1600	-30	3270	60
OCT 1973	486		627		410		970		1570		3330	
MAR 1976	517	-41	700	-20	430	-50	975	5	1595	-15	3340	-15
JUN 1976	476		680		380		980		1580		3325	
SEP 1976	494	-48	871	-314	430	-45	1120	-200	1680	-145	3245	-165
MAR 1977	446	30	557	36	385	-5	920	0	1535	50	3080	180
JUN 1977	476		593		380		920		1585		3260	
JUN 1981	633		758		575		1110		1535			
JUN 1982	604		725		575		1000		1440		3265	
JUN 1983	532		686		480		1010		1480		3300	
OCT 1983	465		545		370		980		1335			
MAY 1984	413	56	473	164	369	31	925	40	1330	-5		
NOV 1984	469	-73	637	-172	400	-41	965		1325			
JUN 1985	396	-33	465	-63	359	-30						
MAR 1986	363		402		329							
APR 1986	389	-5	526	-34	335	1	875		1320		2960	
MAY 1986	384		492		336							
OCT 1986	415	-56	545	-93	337	-14	890	-100	1305	-85	2910	25
APR 1987	359	30	452	97	323	-6	790	130	1220	90	2935	175
SEP 1987	389	-8	549	-65	317		920		1310		3110	
JAN 1988	381		484									
DEC 1989	508		572		331							

OCEANSIDE CELL - SEASONAL SHORELINE CHANGES

PN 1080	max =	162.1	max =	168.63	max =	96	max =	177.3	max =	209.2	max =	63.2
	min =	-136.2	min =	-133	min =	-188.7	min =	-104.7	min =	-102.8	min =	-12.3
DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
1934			457								2335	
MAY 1984	899	-61.5	1001.21	-0.17	790.3	-33	1123.8	177.3	1866.4	-59.7		
NOV 1984	837.5	-6.8	1001.04	-36.75	757.3	27.7	1301.1	-21.9	1806.7			
JUN 1985	830.7	-117.4	964.29	-84.29	785	-188.7	1279.2					
MAR 1986	713.3		880		596.3							
APR 1986	763.4	20.6	908.05	1.95	592.8	90.4	1274.1		1881.1		2967.3	
MAY 1986	784		910		683.2							
OCT 1986	756.1	162.1	908.37	168.63	707	96	1123.6	129	1773.3	82.3	2926.7	-12.3
APR 1987	918.2	-136.2	1077	-133	803	-100	1252.6	-104.7	1855.6	-102.8	2914.4	63.2
SEP 1987	782	-27	944	35	703	-104	1147.9	41.2	1752.8	209.2	2977.6	62.4
JAN 1988	755		979		599		1189.1		1962		3040	

OCEANSIDE CELL- SEASONAL SHORELINE CHANGES

PN 1110	max =	169	max =	54	max =	340	max =	210	max =	140	max =	150
	min =	-154	min =	-114	min =	-82	min =	-80	min =	-100	min =	0
DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
1934			872								2638	
OCT 1950	351		409		320		630		985		2570	
FEB 1952	293		425		235		620		1045		2470	
APR 1956	375		493		300		760		1100		2540	
OCT 1959	439		605		357		755		1105		2620	
MAR 1963	300		376		258		760		1160		2590	
MAY 1965	406		517		340		690		1060			
JAN 1972	313		397		255		580		1060		2460	
MAR 1974	359		531		280		630		1100		2500	
MAR 1976	407	24	529	18	360	-5	720	60	1115	35	2610	50
JUN 1976	431		547		355		780		1150		2660	
SEP 1976	409	-26	537	-29	355	-22	780	-80	1060	140	2360	10
MAR 1977	383	51	508	27	333	19	700	210	1200	-20	2370	150
JUN 1977	434		535		352		910		1180		2520	
MAR 1981	393		438		330		705		1220		2620	
JUL 1982	378		489		325		730		1060		2360	
JUN 1983	582	169	847	-15	305	340	1055	135	1475	70	2825	
JAN 1984	751	-24	832	34	645	-31	1190	-45	1545	-5		
MAY 1984	727	11	866	31	614	62	1145	25	1540	-100		
NOV 1984	738	-2	897	-114	676	17	1170		1440			
JUN 1985	736	-63	783	-43	693	-82						
MAR 1986	673		740		611							
APR 1986	679	18	877	-28	599	17	1010		1540		2645	
MAY 1986	697		849		616							
OCT 1986	826	-154	972	-102	700	-76	1115	-75	1420	90	2630	0
APR 1987	672	69	870	54	624	69	1040	60	1510	-55	2630	120
SEP 1987	741		924		693		1100		1455		2750	
DEC 1989	742		1017		686							

OCEANSIDE CELL - SEASONAL SHORELINE CHANGES

PN 1180	max =	116	max =	87	max =	107	max =	190	max =	80	max =	80
	min =	-126	min =	-120	min =	-114	min =	-130	min =	-75	min =	0
DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
JAN 1972	259		400		195		550		1140		2640	
MAR 1981	216		300		150		510		1050		2480	
JUL 1982	353		433		275		640		1020		2490	
JAN 1984	227	-15	355	13	159	-26	500	-5	1110	-10		
JUN 1984	212	3	368	-12	133	6	495	110	1100	-70		
NOV 1984	215	-23	356	-69	139	6	605	-110	1030			
JUN 1985	192	-3	287	-13	145	-5	495	75				
APR 1986	189	46	274	71	140	9	570	90	1105	-75	2345	15
OCT 1986	235	-38	345	-9	149	-17	660	-110	1030	80	2360	0
APR 1987	197	116	336	87	132	107	550	190	1110	-20	2360	80
SEP 1987	313	-126	423	-120	239	-114	740	-130	1090		2440	
JAH 1988	187		303		125		610					
DEC 1989	297		303		220							

OCEANSIDE CELL - SEASONAL SHORELINE CHANGES

PN 1240	max =	23	max =	91	max =	37	max =	140	max =	145	max =	80
	min =	-16	min =	-62	min =	-12	min =	-165	min =	-125	min =	-10

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
OCT 1950	114		250		55		595		1110		3060	
FEB 1952	144		222		80		600		1295		2880	
APR 1956	173		302		80		700		1250		2880	
JAN 1972	205		300		135		665		1255		2840	
MAR 1981	165		490		100		620		1290		2940	
JUL 1982	185		435		120		785		1155		3180	
JAN 1984	217	10	313	-19	155	34	770	-165	1200	35		
JUN 1984	227	0	294	62	189	-8	605	20	1235	-10		
JAN 1985	227	17	356	-6	181	11	625		1225			
JUN 1985	244	-16	350	-49	192	6						
APR 1986	228	23	301	91	198	-3	655	60	1260	-125	2570	60
OCT 1986	251	9	392	-62	195	37	715	-75	1135	145	2630	-10
APR 1987	260	12	330	87	232	-12	640	140	1280	-95	2620	80
SEP 1987	272		417		220		780		1185		2700	
DEC 1989	275		398		220							

PN 1280	max =	31	max =	95	max =	23	max =	230	max =	105	max =	70
	min =	-40	min =	-92	min =	-27	min =	-330	min =	-110	min =	-60

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
JAN 1972	157		273		102		570		1240		2365	
APR 1981	105		200		83		495		1230		2720	
JUL 1982	190		453		130		730		1245		2880	
JAN 1985	175	7	223	2	146	3	550		1185			
JUN 1985	182	-30	225	-32	149	-22						
APR 1986	152	21	193	34	127	16	525	160	1235	-110	2525	25
OCT 1986	173	-12	227	-34	143	-14	685	-165	1125	105	2550	70
APR 1987	161	31	193	95	129	23	520	230	1230	-40	2620	-60
SEP 1987	192	-40	288	-92	152	-27	750	-330	1190		2560	
JAN 1988	152		196		125		420					
DEC 1989	203		360		136		695					

OCEANSIDE CELL- SEASONAL SHORELINE CHANGES

PN 1290	max =	5.2	max =	121.61	max =	12	max =	136.9	max =	69.8	max =	119.5
	min =	-184.5	min =	-187.59	min =	-37.9	min =	-270	min =	-192.8	min =	-23.2

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
JAN 1984	439.1	-184.5	514.07	-187.59	261	-37.9	925.9	-270	1482	-192.8		
JUN 1984	254.6	0.5	326.48	-6.13	223.1	-3.8	655.9	-8.2	1289.2	1.2		
JAN 1985	255.1	-9.6	320.35	-6.06	219.3	-3.4	647.7		1290.4			
JUN 1985	245.5	-5.3	314.29	-43.24	215.9	0						
APR 1986	240.2	1.3	271.05	121.61	215.9	-11.9	622.9	100.6	1315.3	-71.5	2655.7	-23.2
OCT 1986	241.5	5.2	392.66	-79.84	204	12	723.5	-86.7	1243.8	69.8	2632.5	119.5
APR 1987	246.7	0.3	312.82	-8.87	216	-16.2	636.8	136.9	1313.6	-81.5	2752	20
SEP 1987	247		303.95		199.8		773.7		1232.1		2772	
DEC 1989	282.9		424.6		214		803					

D-28

PN 1340	max =	24.3	max =	117.97	max =	24.9	max =	159.8	max =	163.6	max =	66.5
	min =	-35.6	min =	-79.1	min =	-18.7	min =	-341.1	min =	-94.3	min =	-2

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
JAN 1984	197.2	-35.6	278.91	-79.1	144.1	-8.1	627.9	-6.7	1183	58.9		
JUN 1984	161.6	24.3	199.81	117.97	136	11.2	621.2	64.5	1241.9	0.3		
FEB 1985	185.9	-6.5	317.78	-42.78	147.2	-2.3	685.7		1242.2			
JUN 1985	179.4	1.7	275	-48.11	144.9	11.3						
APR 1986	181.1	0.5	226.89	42.42	156.2	-18.7	581.2	70.6	1303.5	-94.3	3058	39.5
OCT 1986	181.6	8.4	269.31	-35.83	137.5	24.9	651.8	-100.4	1209.2	75.7	3097.5	-2
APR 1987	190	3.3	233.48	69.06	162.4	-16.6	551.4	159.8	1284.9	-71.1	3095.5	66.5
SEP 1987	193.3	-5.3	302.54	-43.27	145.8	10.8	711.2	-341.1	1213.8	163.6	3162	
JAN 1988	188		259.27		156.6		370.1		1377.4			
DEC 1989	234.1		375		163.5		744.9					

OCEANSIDE CELL - SEASONAL SHORELINE CHANGES

SO 1470	max =	38.7	max =	101.1	max =	35.5	max =	88.8	max =	10.5	max =	398.6
	min =	-31.8	min =	-59.95	min =	-25.3	min =	-218.8	min =	-29.4	min =	-104.3

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
DEC 1983	189	-31.8	223.28	19.15	150	-25.3	642	-218.8				
JUN 1984	157.2	20.4	242.43	-6.65	124.7	20.3	423.2		1312.7			
NOV 1984	177.6	-6.4	235.78	14.22	145	-4						
JUN 1985	171.2	-8.8	250	-59.95	141	-1.3						
APR 1986	162.4	38.7	190.05	101.1	139.7	29.6	335.7	88.8	1310.6	-29.4	3780	-104.3
OCT 1986	201.1	6	291.15	-55.69	169.3	12.1	424.5	-46.6	1281.2	10.5	3675.7	4.3
APR 1987	207.1	32.9	235.46	31.96	181.4	35.5	377.9	51.9	1291.7	-2.2	3680	398.6
SEP 1987	240		267.42		216.9		429.8		1289.5		4078.6	
DEC 1989	222.6		252.6		194.1							

SO 1530	max =	35.8	max =	50.43	max =	34.7	max =	72.4	max =	46.9	max =	119.2
	min =	-69.7	min =	-107.16	min =	-71.5	min =	-110	min =	-69.3	min =	9.3

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
NOV 1983	351.3	-31	464.62	-107.16	295	1.3	609.4		955.33			
JUN 1984	320.3	-44.9	357.46	50.43	296.3	-39.5						
NOV 1984	275.4	8.5	407.89	-57.89	256.8	5.1						
JUN 1985	283.9	26.3	350	-18.98	261.9	30	507.6	-110				
APR 1986	310.2	-69.7	331.02	-19.53	291.9	-71.5	397.6	72.4	961	-69.3	3356.7	9.3
OCT 1986	240.5	32.4	311.49	-7.19	220.4	34.7	470	58.1	891.7	-53.3	3366	117.3
APR 1987	272.9	-61.8	304.3	36.67	255.1	-61.8	528.1	-47.4	838.4	46.9	3483.3	119.2
SEP 1987	211.1	35.8	340.97	-73.78	193.3	27.7	480.7	-63.6	885.3	23.9	3602.5	
JAN 1988	246.9		267.19		221		417.1		909.2			
DEC 1989	174.6		374.2		148.5							

OCEANSIDE CELL- SEASONAL SHORELINE CHANGES

SC 1623	max =	28.8	max =	52.67	max =	25.4	max =	63	max =	26.9	max =	41.4
	min =	-32.7	min =	-24.52	min =	-26	min =	-4.4	min =	-7.8	min =	-6.4

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
NOV 1983	205	-32.7	240.38	-14.19	176	-26						
JUN 1984	172.3	15.7	226.19	-0.75	150	10.1						
NOV 1984	188	-12.4	225.44	8.96	160.1	-23						
JUN 1985	175.6	8.4	234.4	-9.49	137.1	25.4						
APR 1986	184	11.6	224.91	3.79	162.5	11.7	349.2	63	717.2	6.7	1522.6	-6.4
OCT 1986	195.6	-21.9	228.7	-24.52	174.2	-20.3	412.2	5.2	723.9	-7.8	1516.2	41.4
APR 1987	173.7	28.8	204.18	52.67	153.9	21.3	417.4	-4.4	716.1	26.9	1557.6	-3.4
SEP 1987	202.5		256.85		175.2		413		743		1554.2	
DEC 1989	230.2		272.6		210		372.7					

D-30

SC 1660	max =	51	max =	144	max =	17	max =	30	max =	30	max =	60
	min =	-70	min =	-157	min =	-34	min =	-95	min =	-15	min =	-105

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
AUG 1968	170		250		135		395		1025		2175	
APR 1974	145		246		85		540		1230		3020	
NOV 1983	253	-59	317	2	185	-33						
JUN 1984	194	-14	319	-14	152	-18						
NOV 1984	180	7	305	-16	134	6						
JUN 1985	187	-23	289	-90	140	-1						
APR 1986	164	51	199	144	139	17	585	-95	1135	-15	2155	-105
OCT 1986	215	-70	343	-157	156	-34	490	30	1120	30	2050	60
APR 1987	145	45	186	143	122	-2	520	-40	1150	25	2110	50
SEP 1987	190	-39	329	-142	120	-5	480	0	1175		2160	
JAN 1988	151		187		115		480					
DEC 1989	220		352		148		510					

OCEANSIDE CELL- SEASONAL SHORELINE CHANGES

SC 1680	max =	71.3	max =	164.14	max =	45.5	max =	151.9	max =	37.1	max =	42.3
	min =	-78.8	min =	-156.9	min =	-57.4	min =	-71.5	min =	-128.5	min =	-42.5

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
JUL 1984	112.9	14.7	249.07	-27.08	85.9	-2.1						
DEC 1984	127.6	-8.8	221.99	-33.53	83.8	-3.3						
JUN 1985	118.8	-26.3	188.46	-53.56	80.5	-12.7						
APR 1986	92.5	71.3	134.9	164.14	67.8	34.1	302.9	151.9	815.6	-128.5	2245.5	-42.5
OCT 1986	163.8	-78.8	299.04	-156.9	101.9	-57.4	454.8	-71.5	687.1	32.9	2203	3
APR 1987	85	67.1	142.14	147.4	44.5	45.5	383.3	54.4	720	37.1	2206	42.3
SEP 1987	152.1		289.54		90		437.7		757.1		2248.3	
DEC 1989	154.7		273.1		96.9		412.3					

SC 1720	max =	35	max =	76	max =	30	max =	50	max =	95	max =	60
	min =	-29	min =	-100	min =	-27	min =	-15	min =	-170	min =	10

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
JUN 1934	268		412		118		490		1110			
JUL 1949	163		210		118		480		1140			
APR 1955	112		293		90		490		1130			
FEB 1965	140		273		115		415		1180		3255	
JUL 1968	98	35	127	30	85	15	380	-15	1035	-170	2890	
APR 1969	133		157		100		365		865			
APR 1973	136		210		115		390		1000		2770	
NOV 1983	135	-5	228	-7	98	5						
JUN 1984	130	26	221	76	103	-4						
NOV 1984	156	-26	297	-100	99	2						
JUN 1985	130	18	197	1	101	26						
APR 1986	148	-25	198	1	127	-23	405	10	1050	-105	2875	45
OCT 1986	123	30	199	-9	104	28	415	5	945	95	2920	10
APR 1987	153	-29	190	75	132	-27	420	10	1040	60	2930	60
SEP 1987	124	32	265	-86	105	30	430	50	1100		2990	
JAN 1988	156		179		135		480					
DEC 1989	174		263		119							

OCEANSIDE CELL - SEASONAL SHORELINE CHANGES

DB 1805	max =	32.8	max =	42	max =	25	max =	48.4	max =	542.3	max =	66.8
	min =	-50.8	min =	-46.44	min =	-45.6	min =	-89.7	min =	-424.1	min =	-86.9

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
NOV 1983	295.2	1.2	316.91	2.94	270	16.5						
JUN 1984	296.4	-1.7	319.85	1.92	286.5	-15.3						
NOV 1984	294.7	10.2	321.77	-0.44	271.2	-0.7						
JUN 1985	304.9	-27.6	321.33	-9.35	270.5	-16.4	412.3	3.4				
APR 1986	277.3	16.6	311.98	-4.54	254.1	15.5	415.7	48.4	1277.1	-424.1	4754.9	-86.9
OCT 1986	293.9	-50.8	307.44	-46.44	269.6	-45.6	464.1	-89.7	853	-44.7	4668	66.8
APR 1987	263.1	32.8	261	42	224	25	374.4	47.8	808.3	542.3	4734.8	53.3
SEP 1987	275.9		303		249		422.2		1350.6		4788.1	
DEC 1989	234.6		266.7		203.9		392.9					

DB 1850	max =	1.6	max =	74.3	max =	2.7	max =	89.1	max =	113.9	max =	124.6
	min =	-80.3	min =	-113.47	min =	-70.2	min =	-129.6	min =	-85.8	min =	-12

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
DEC 1983	503.3	-80.3	572.1	-113.47	473	-70.2	719.5		1849			
JUN 1984	423	1.6	458.63	-7.72	402.8	2.7						
NOV 1984	424.6	-14.4	450.91	-16.19	405.5	-17.4	621.8					
JUN 1985	410.2	-48.9	434.72	-39.57	388.1	-39.9	639.2	-129.6				
APR 1986	361.3	1	395.15	-15.82	348.2	-1.9	509.6	55.7	1587.5	-85.8	4466	-12
OCT 1986	362.3	-54.4	379.33	-55.62	346.3	-55.1	565.3	-113.1	1501.7	113.9	4454	124.6
APR 1987	307.9	-17.2	323.71	74.3	291.2	-21.1	452.2	89.1	1615.6	76.4	4578.6	94.9
SEP 1987	290.7	-1.2	398.01	-76.51	270.1	-5.8	541.3	-31.6	1692		4673.5	
JAN 1988	289.5		321.5		264.3		509.7					

OCEANSIDE CELL - SEASONAL SHORELINE CHANGES

DB 1895	max =	20.1	max =	6.99	max =	24.6	max =	100.3	max =	205	max =	165
	min =	-21.2	min =	-8.52	min =	-31.4	min =	-94.3	min =	-26.6	min =	-25

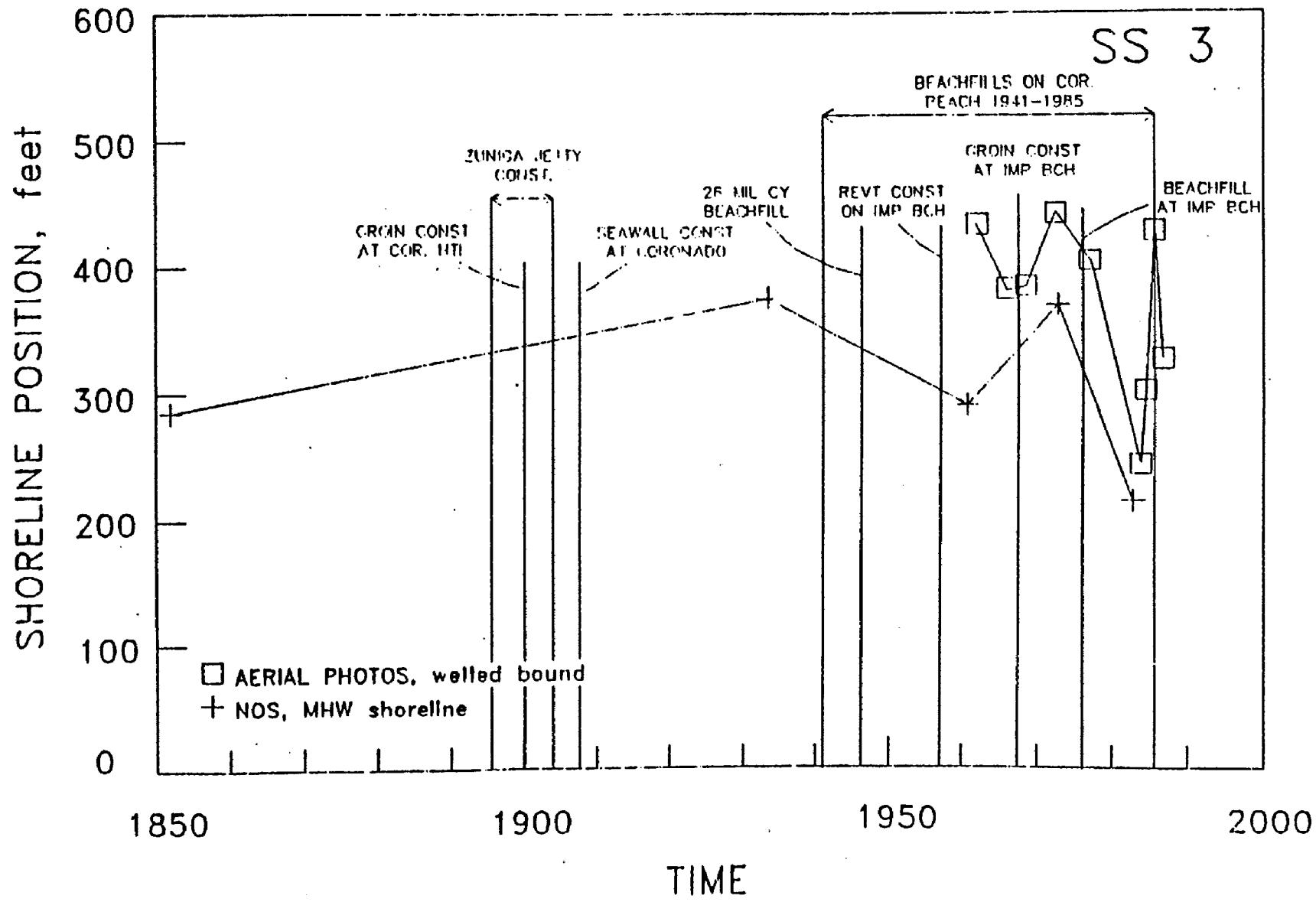
DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
NOV 1984	101.8	-21.2	140	-8.52	71.3	-31.4						
JUN 1985	80.6	6.5	131.48	6.99	39.9	24.6	241.7	33.3				
APR 1986	87.1	-15.7	138.47	2.92	64.5	-19.7	275	-56.8	749.4	-19.9	1421.4	158.6
OCT 1986	71.4	20.1	141.39	-3.17	44.8	21.3	218.2	100.3	729.5	205	1580	165
APR 1987	91.5	-14.1	138.22	0.78	66.1	-17.1	318.5	-94.3	934.5	-26.6	1745	-25
SEP 1987	77.4		139		49		224.2		907.9		1720	
DEC 1989	90.2		144.3		57.9							

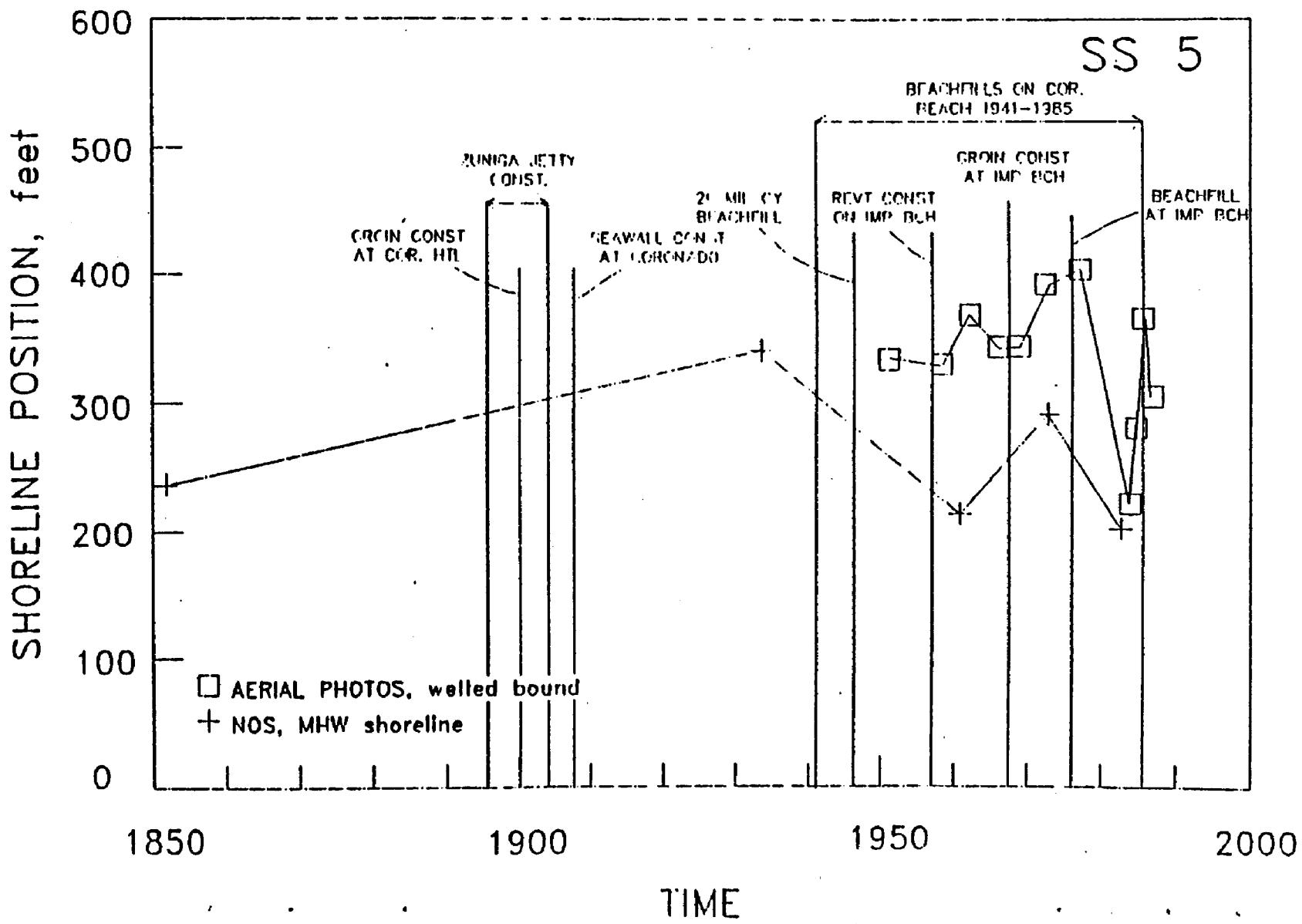
DB 1900	max =	48.3	max =	50.9	max =	59.8	max =	245.1	max =	90.3	max =	21.8
	min =	-94	min =	-106.35	min =	-91.4	min =	-208.3	min =	-61.6	min =	6

DATE	MSL	delta	MLLW	delta	MHHW	delta	-5 ft	delta	-15 ft	delta	-30 ft	delta
NOV 1984	175.5	36.5	276.27	-5.44	116.8	59.8						
JUN 1985	212	-94	270.83	-106.35	176.6	-91.4						
APR 1986	118	40.7	164.48	47.52	85.2	45.2	338.8	-12.2	798.3	-61.6	1216.5	6
OCT 1986	158.7	48.3	212	50.9	130.4	39.4	326.6	245.1	736.7	55.2	1222.5	21.8
APR 1987	207	-27.9	262.9	-25.87	169.8	-35.8	571.7	-208.3	791.9	-7	1244.3	12.4
SEP 1987	179.1	-67.2	237.03	-41.03	134	-58	363.4	24.5	784.9	90.3	1256.7	19.3
JAN 1988	111.9		196		76		387.9		875.2		1276	
DEC 1989	117.7		161.4		87.4		281.5					

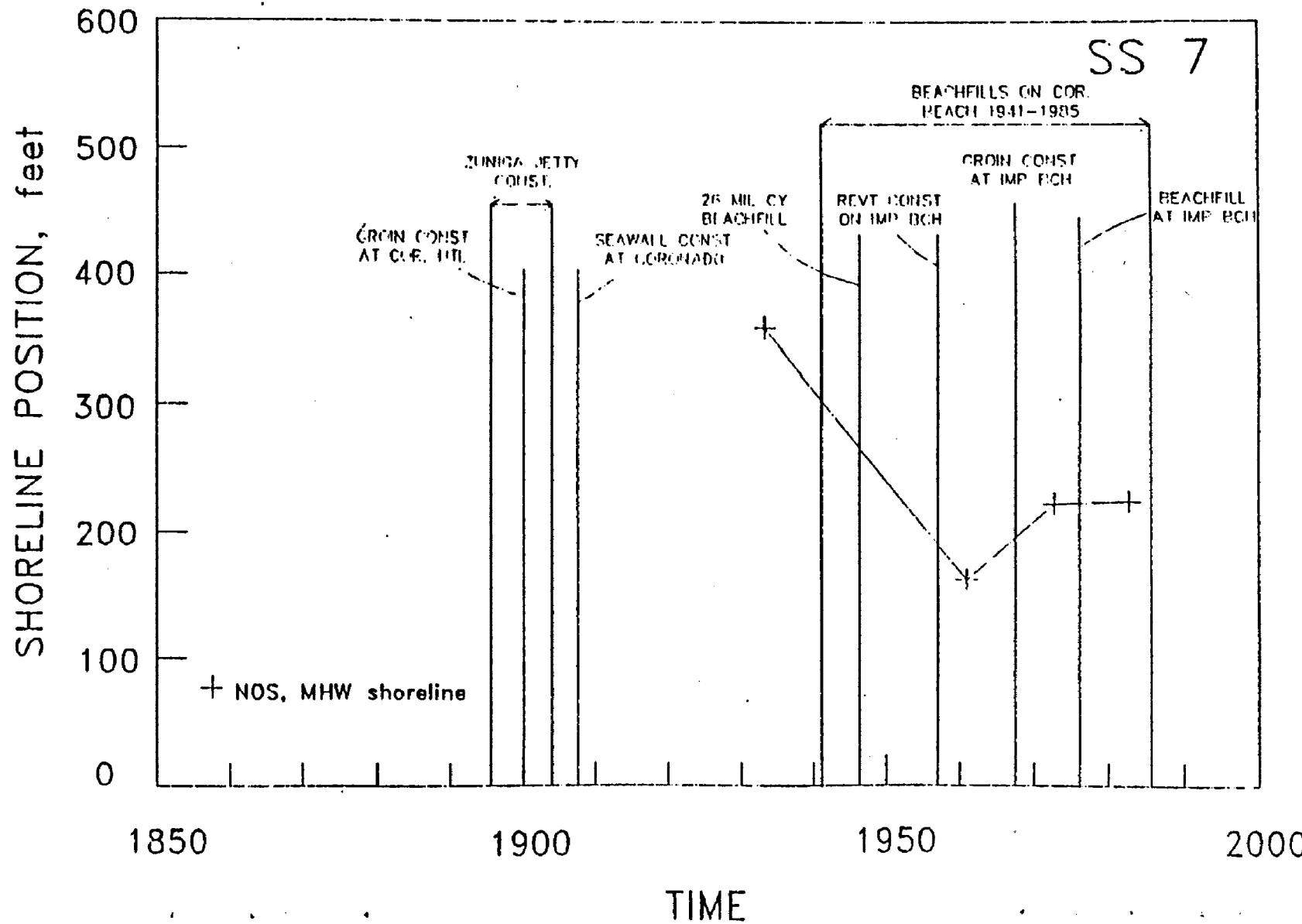
APPENDIX E

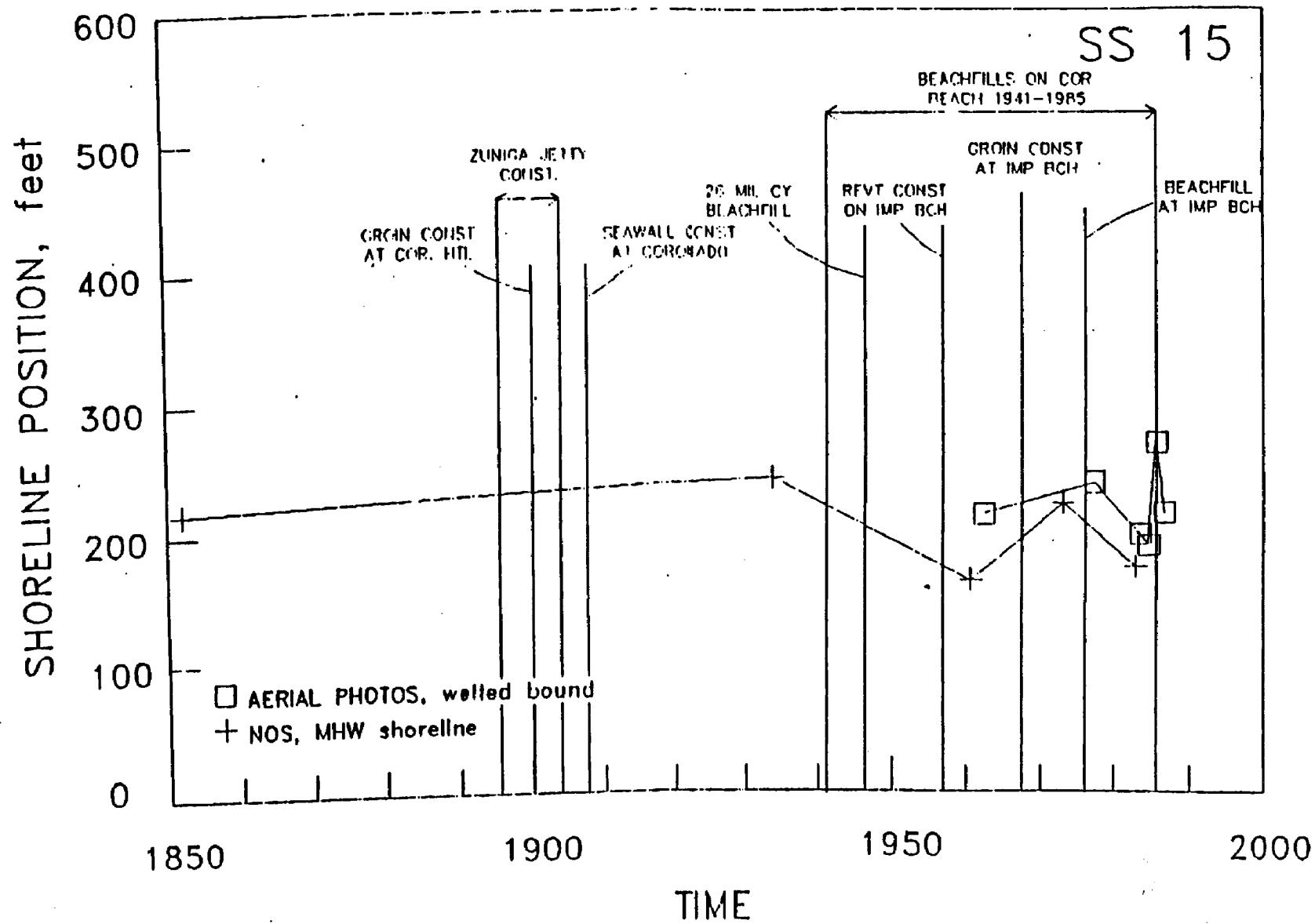
**HISTORIC SHORELINE POSITION PLOTS FROM
NOS AND AERIAL PHOTOGRAPHS**

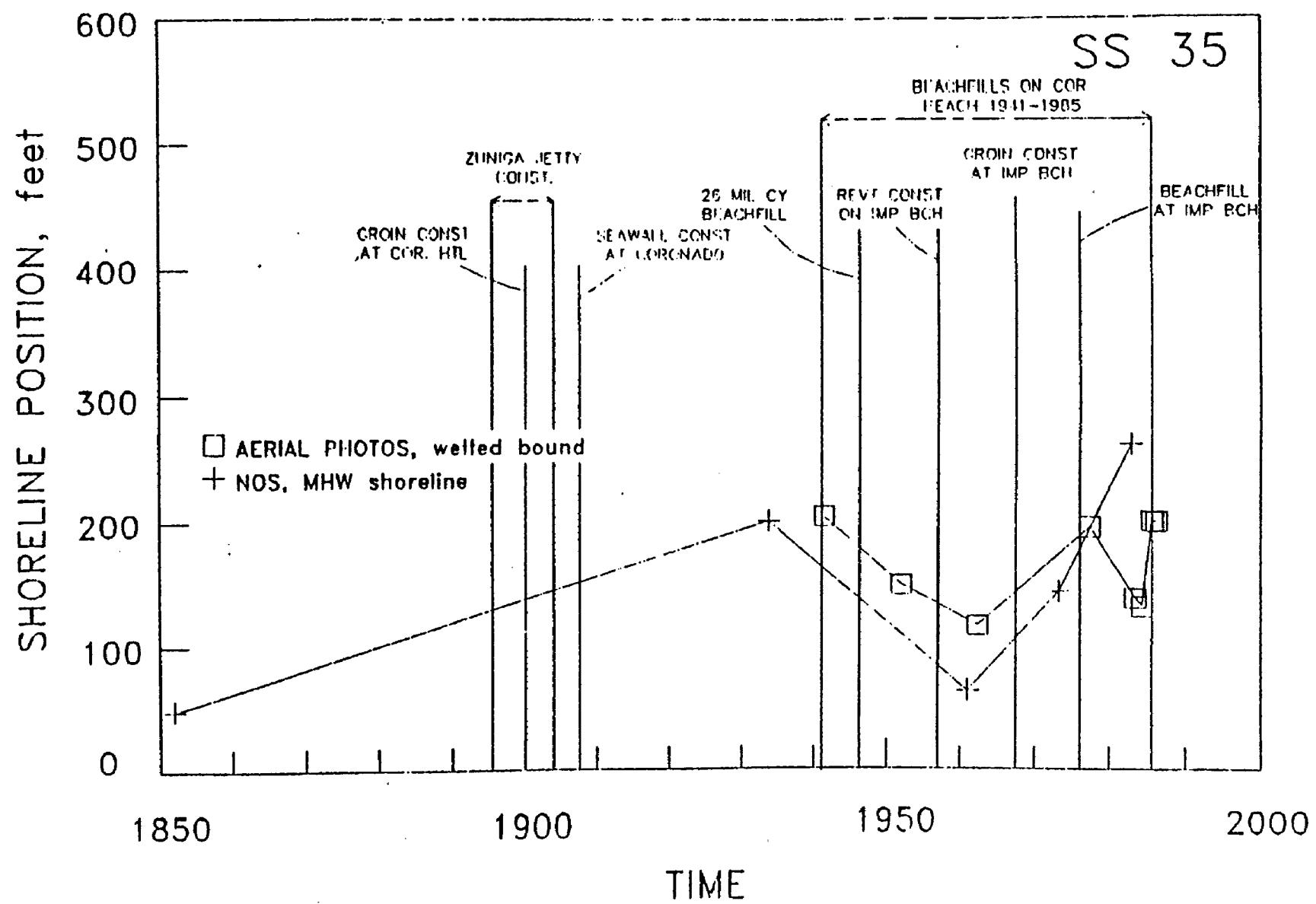


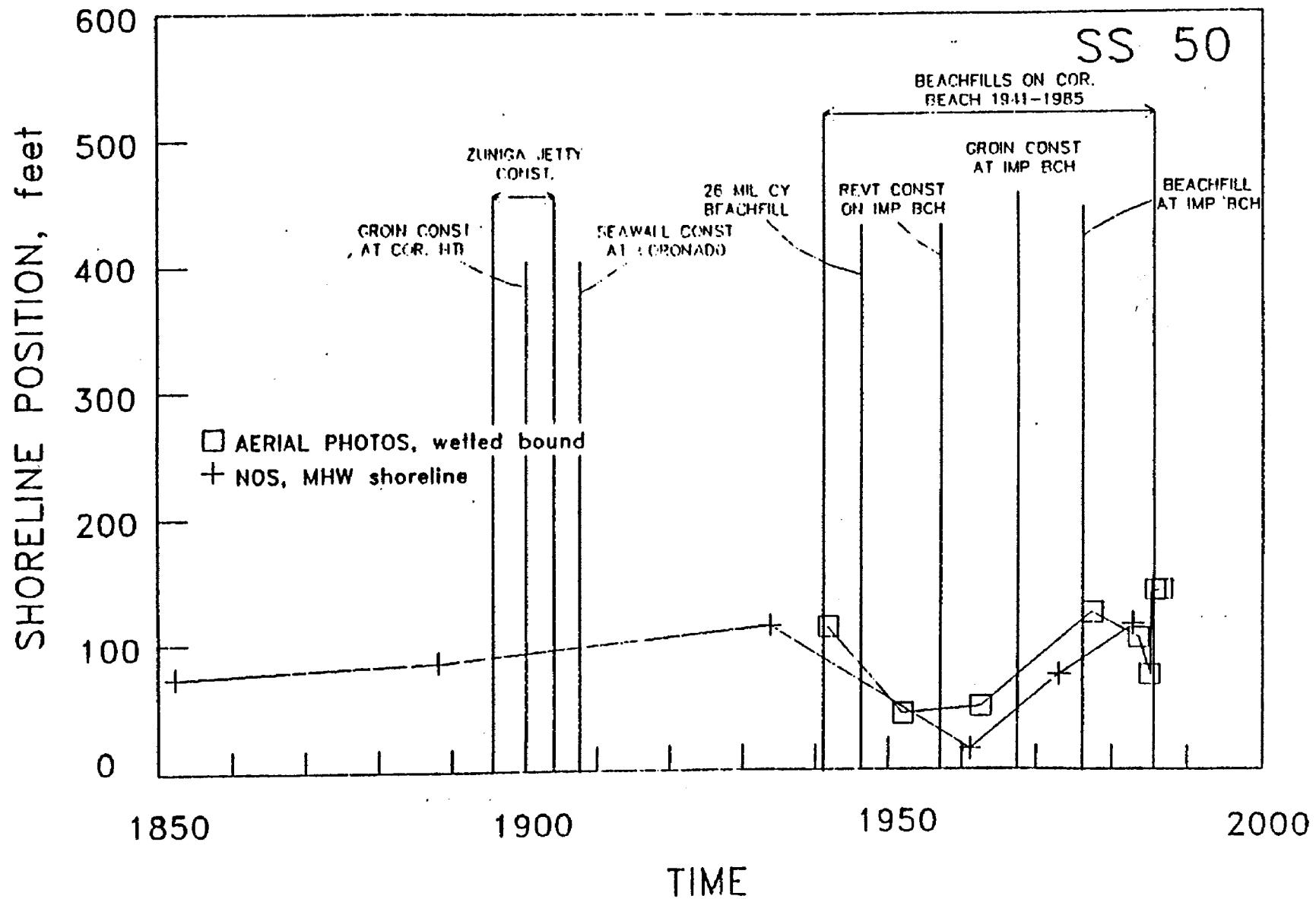


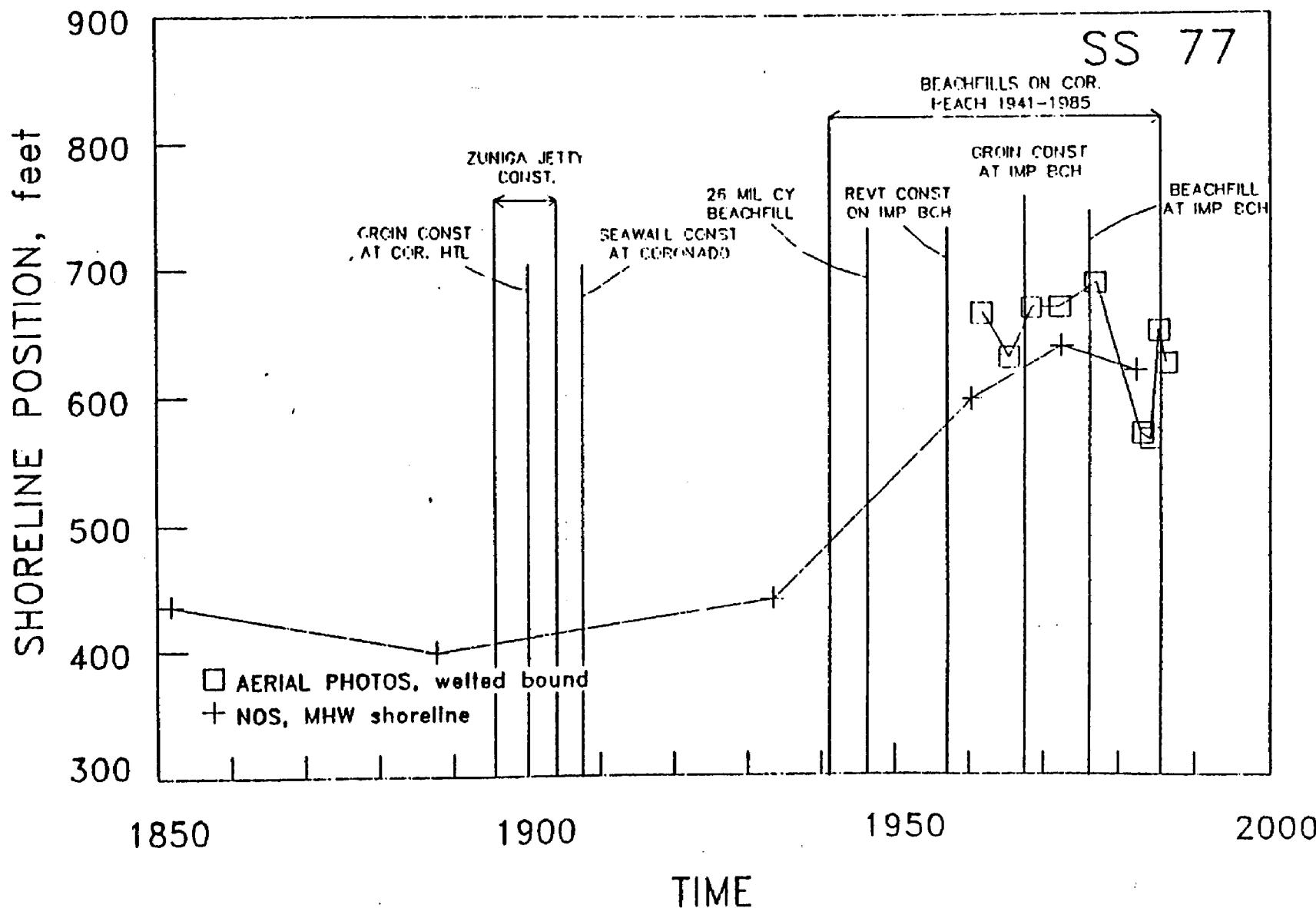
E-E

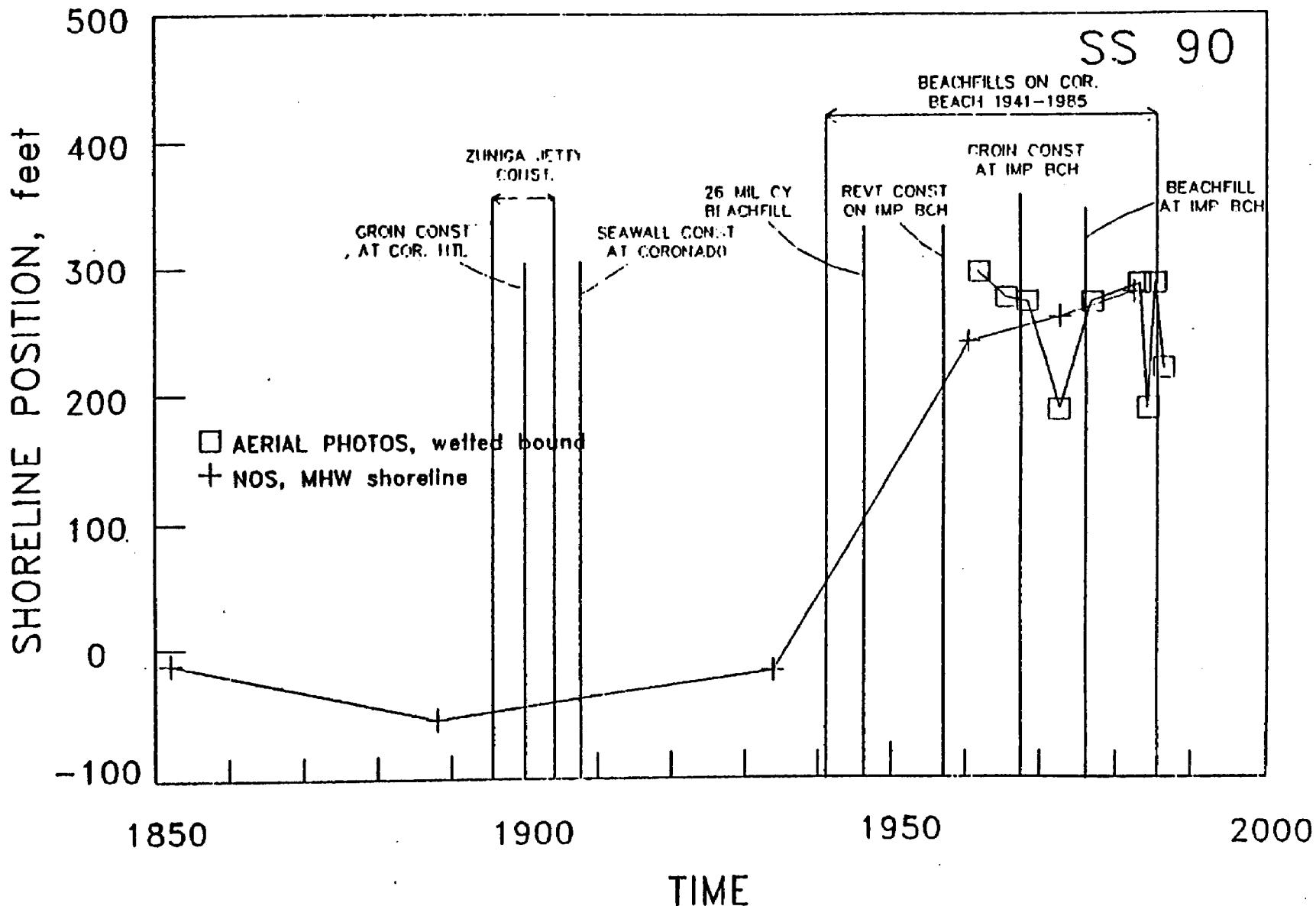


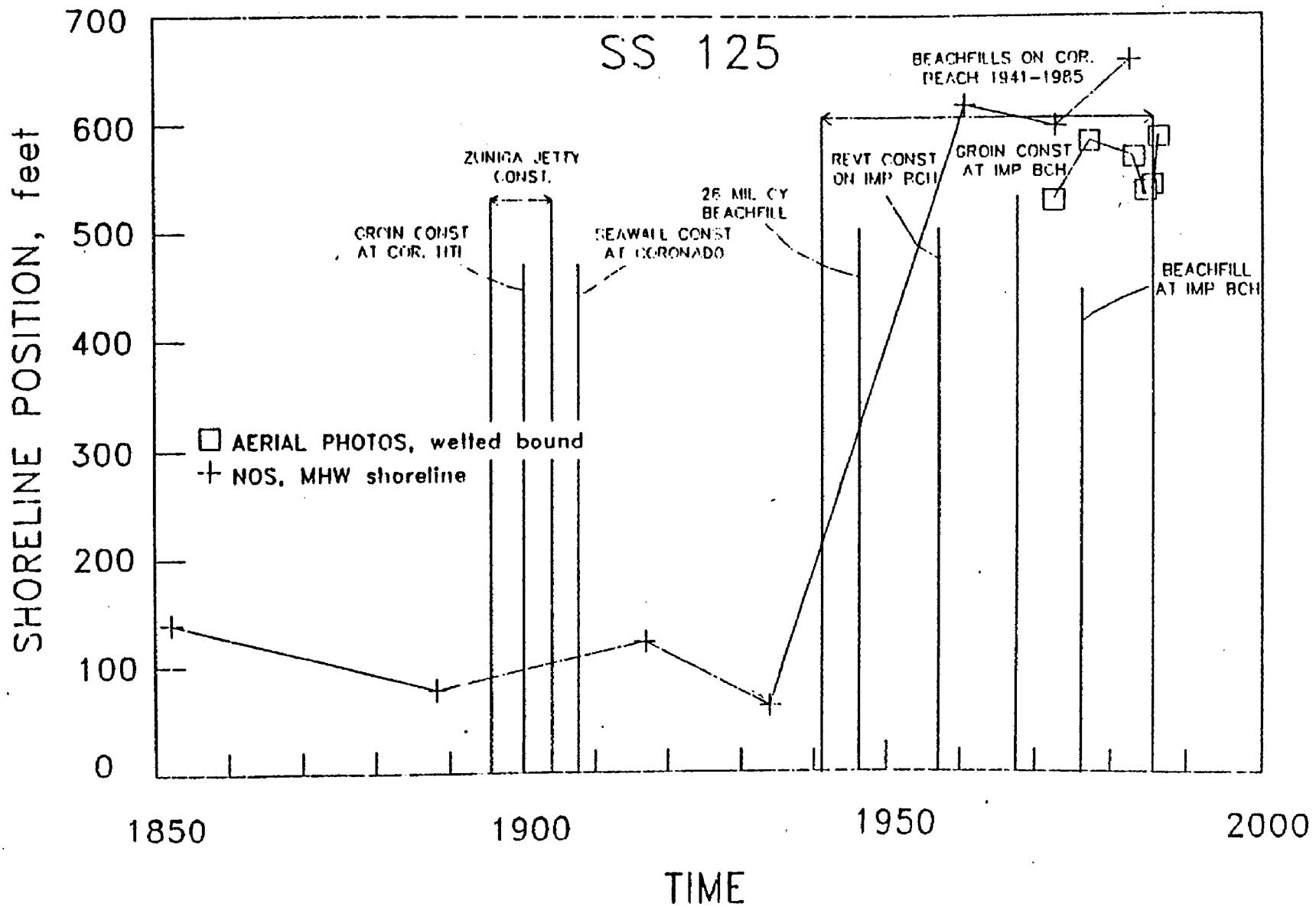


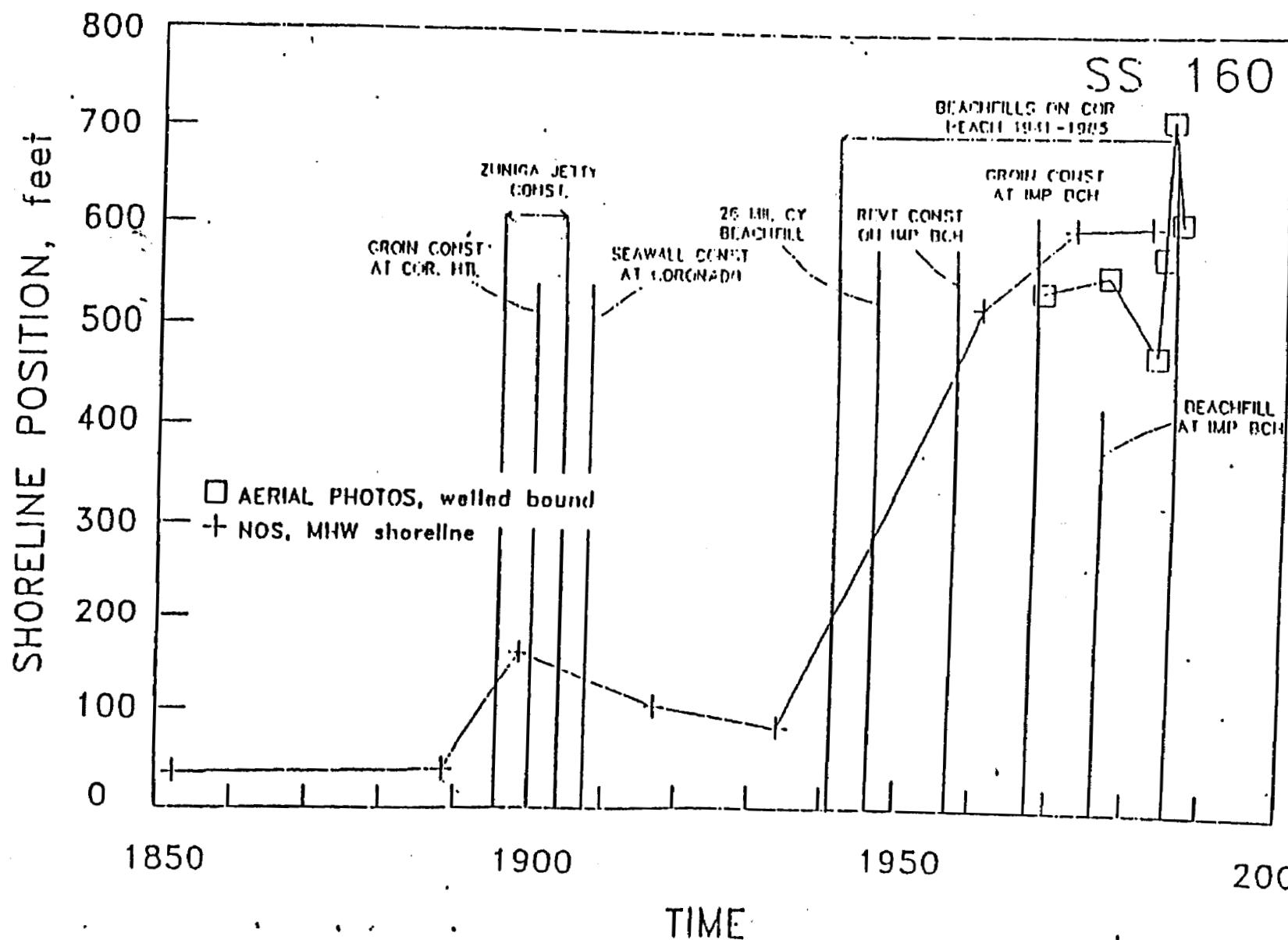


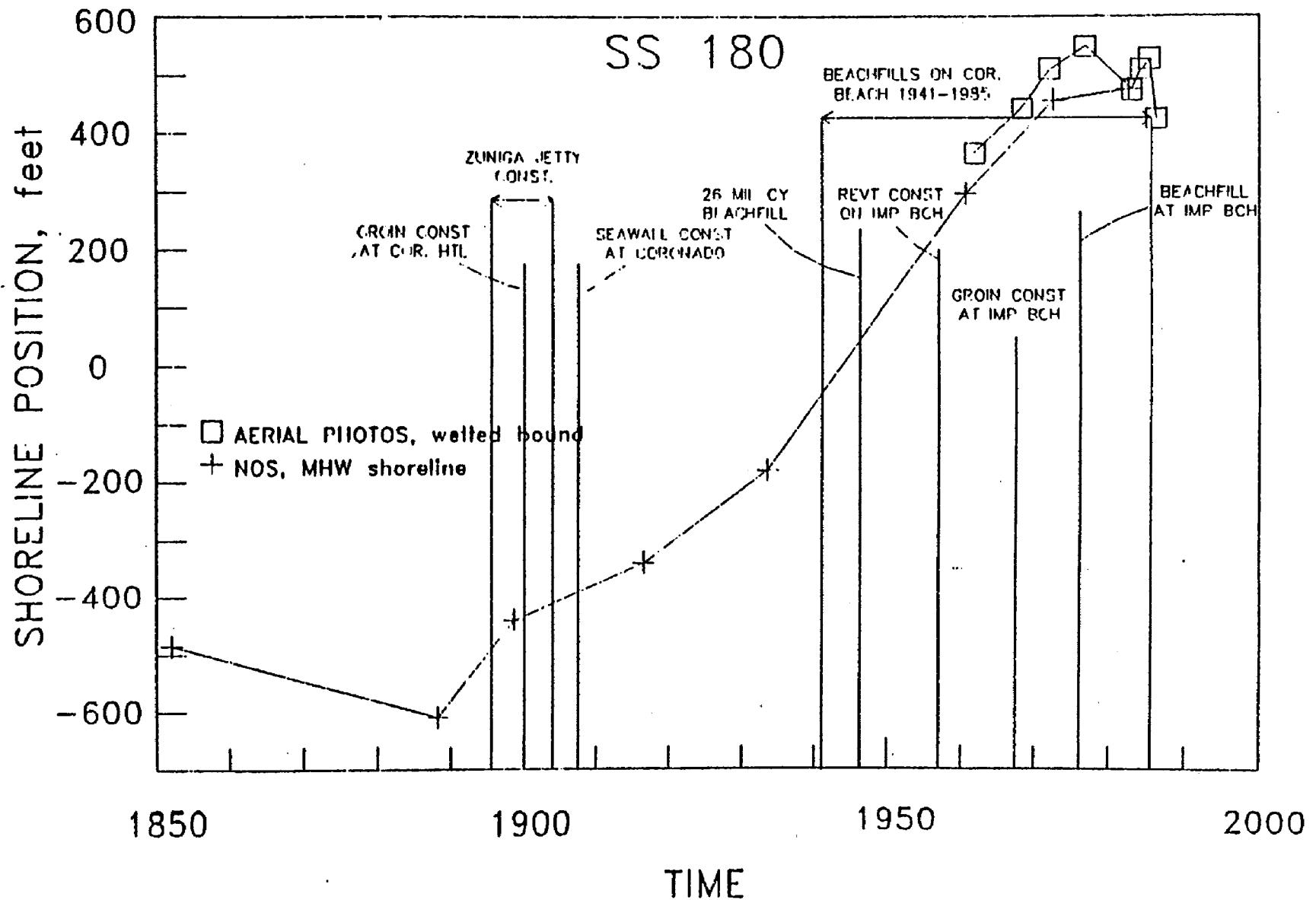


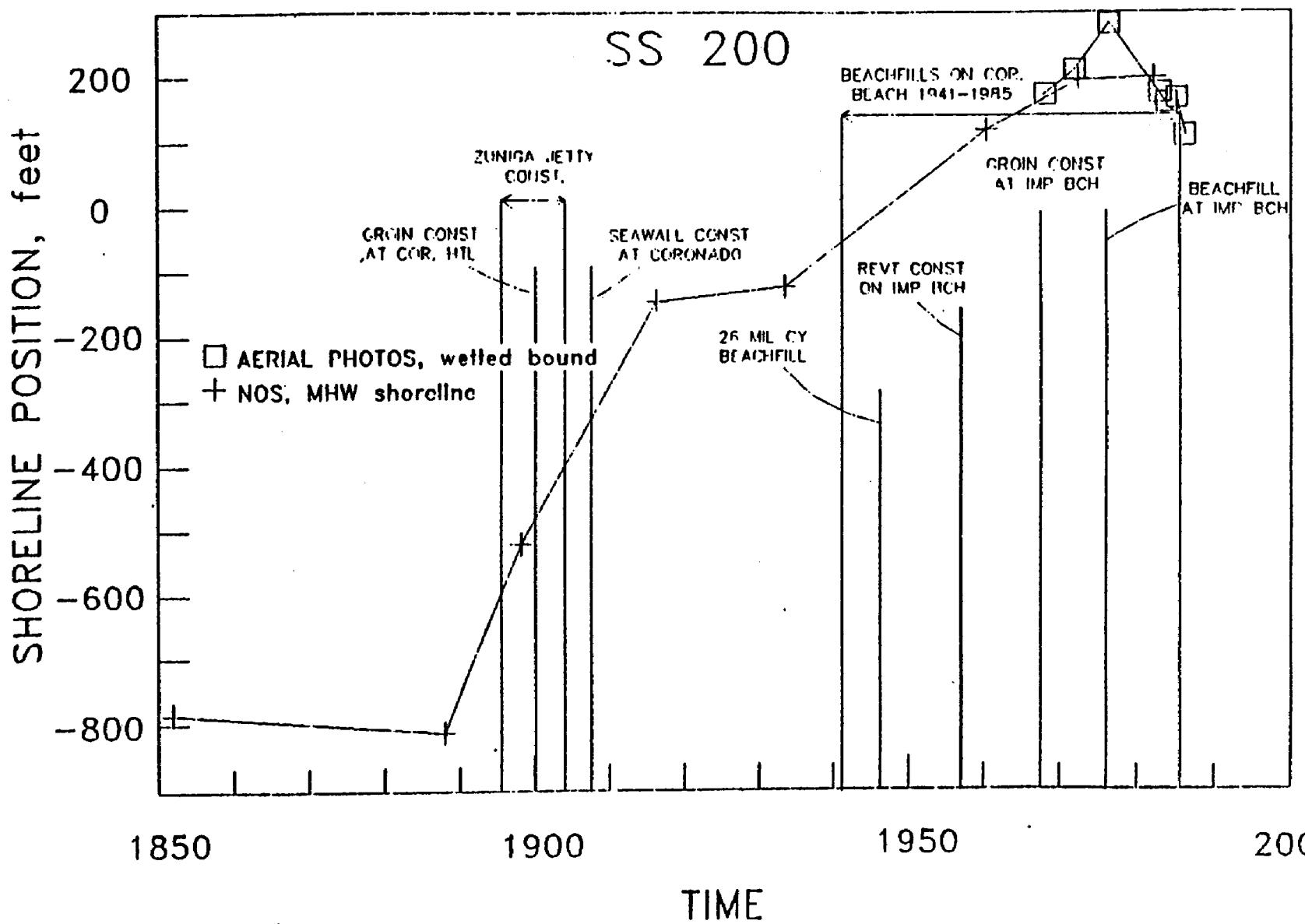


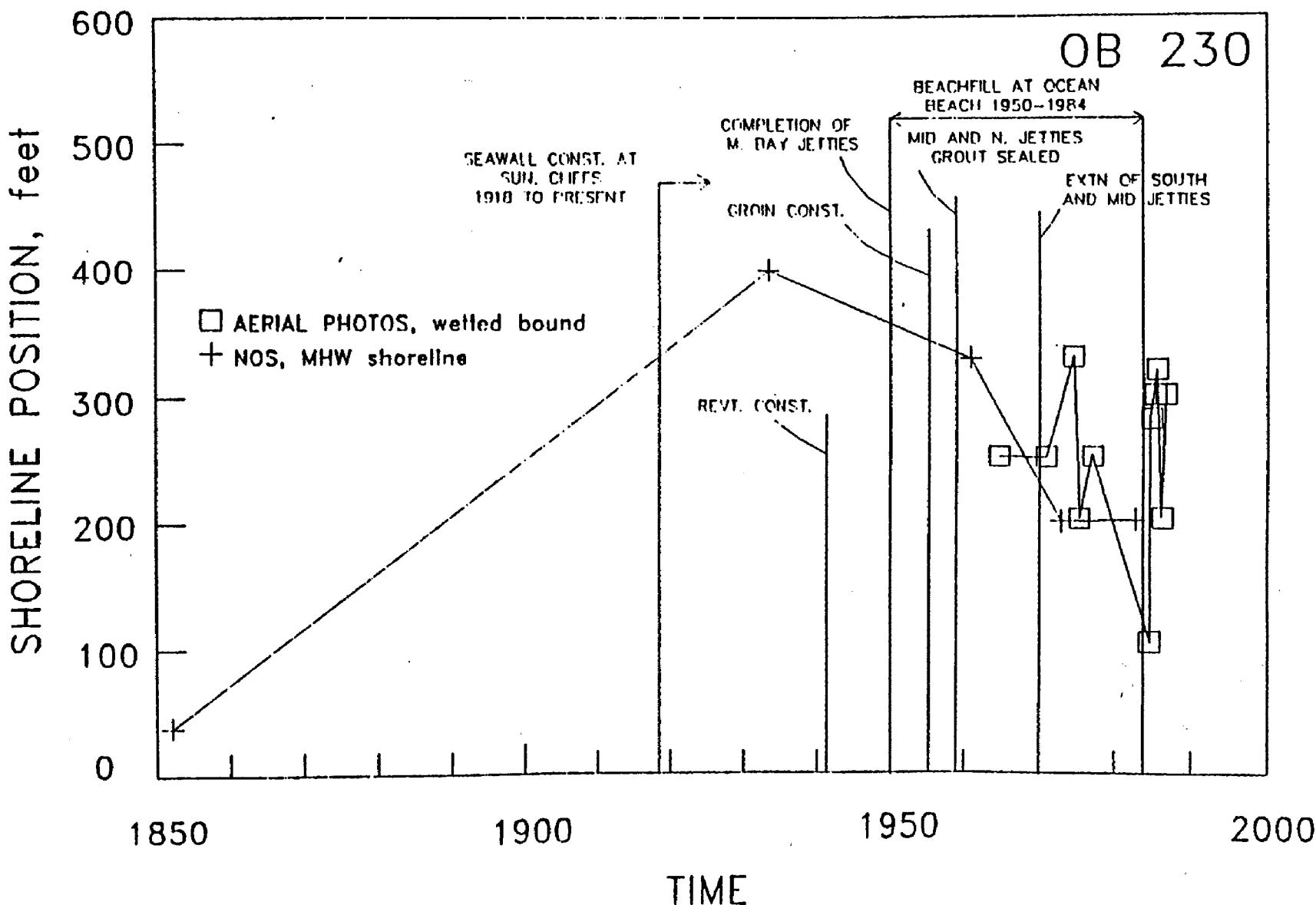


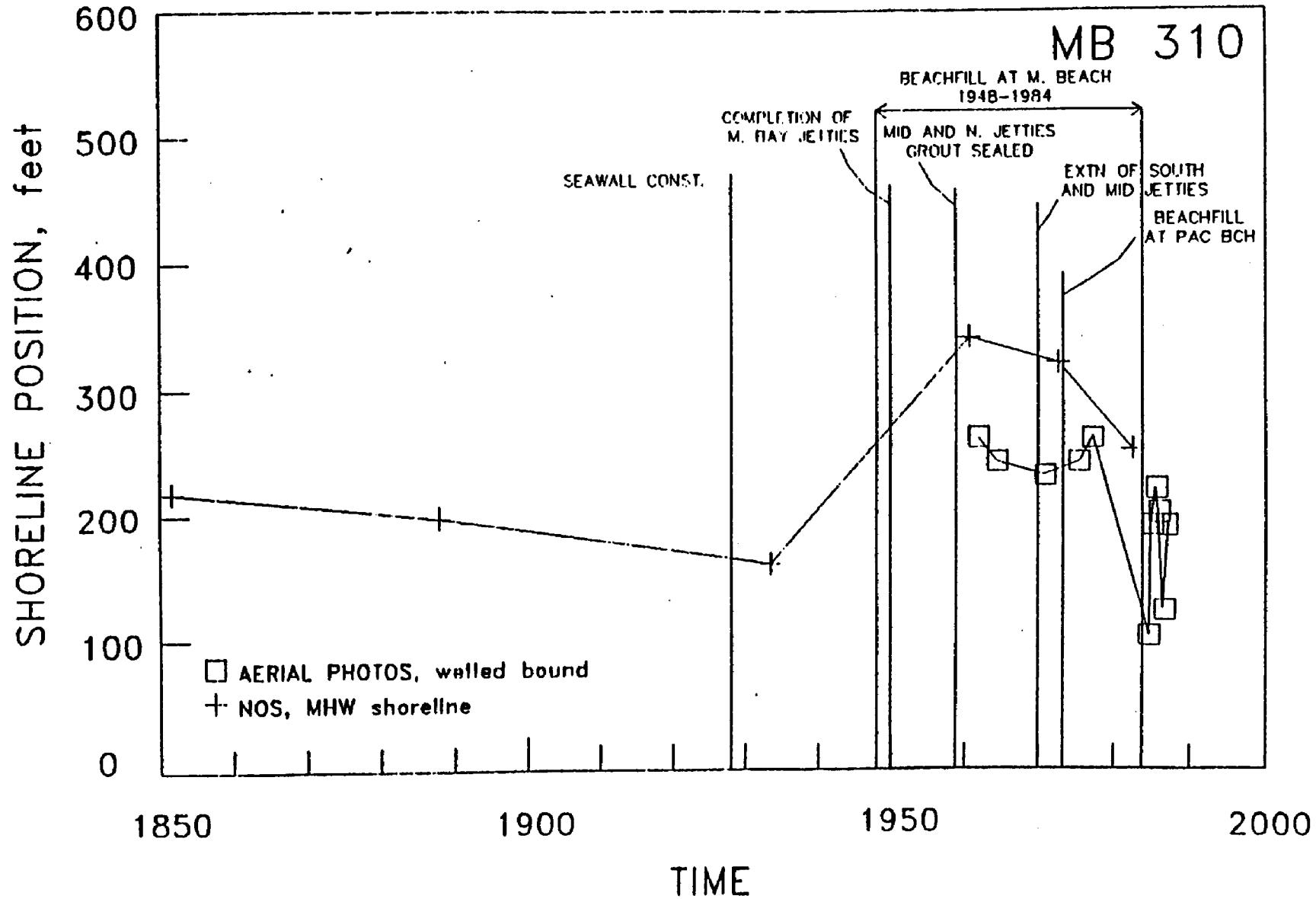




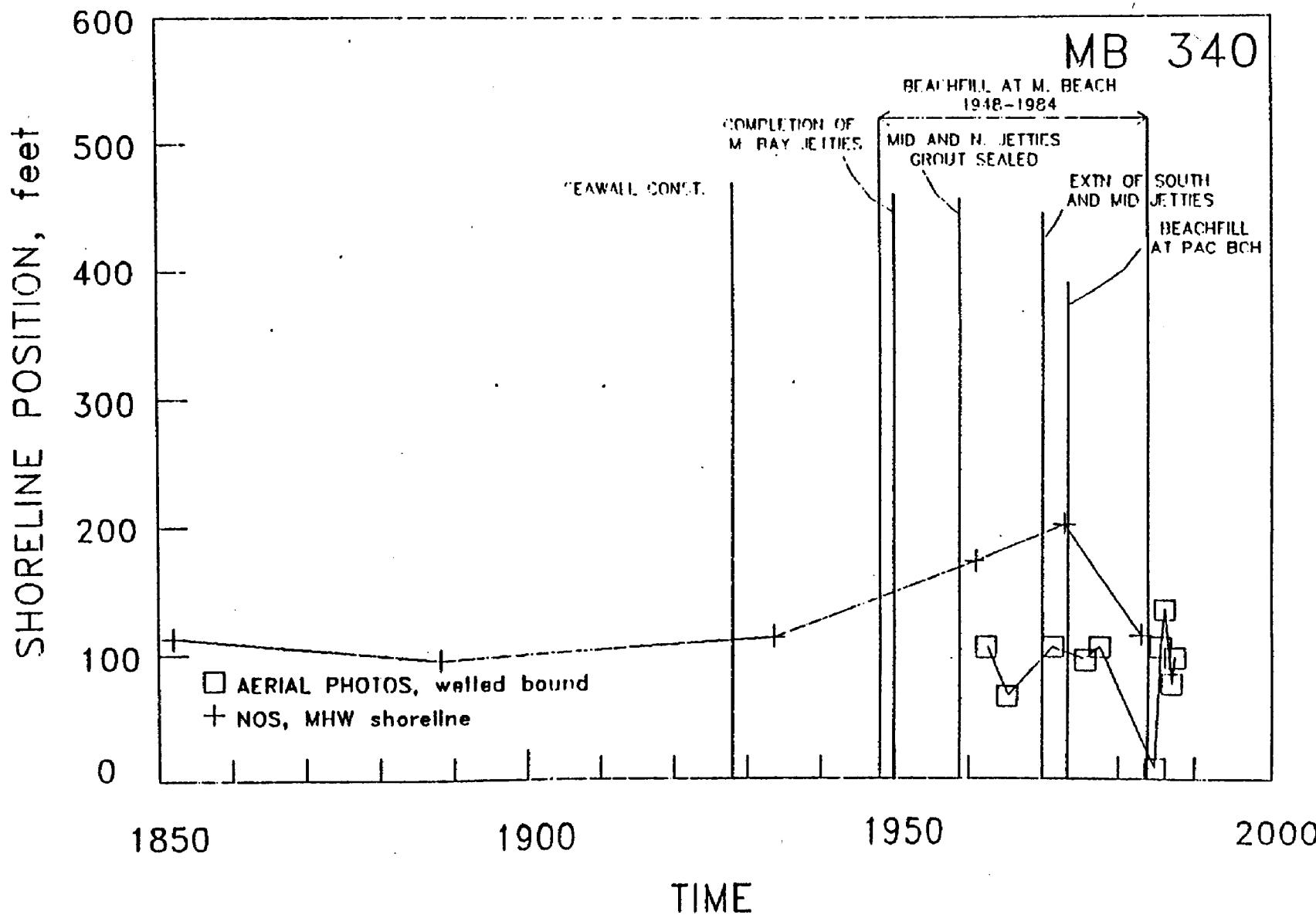


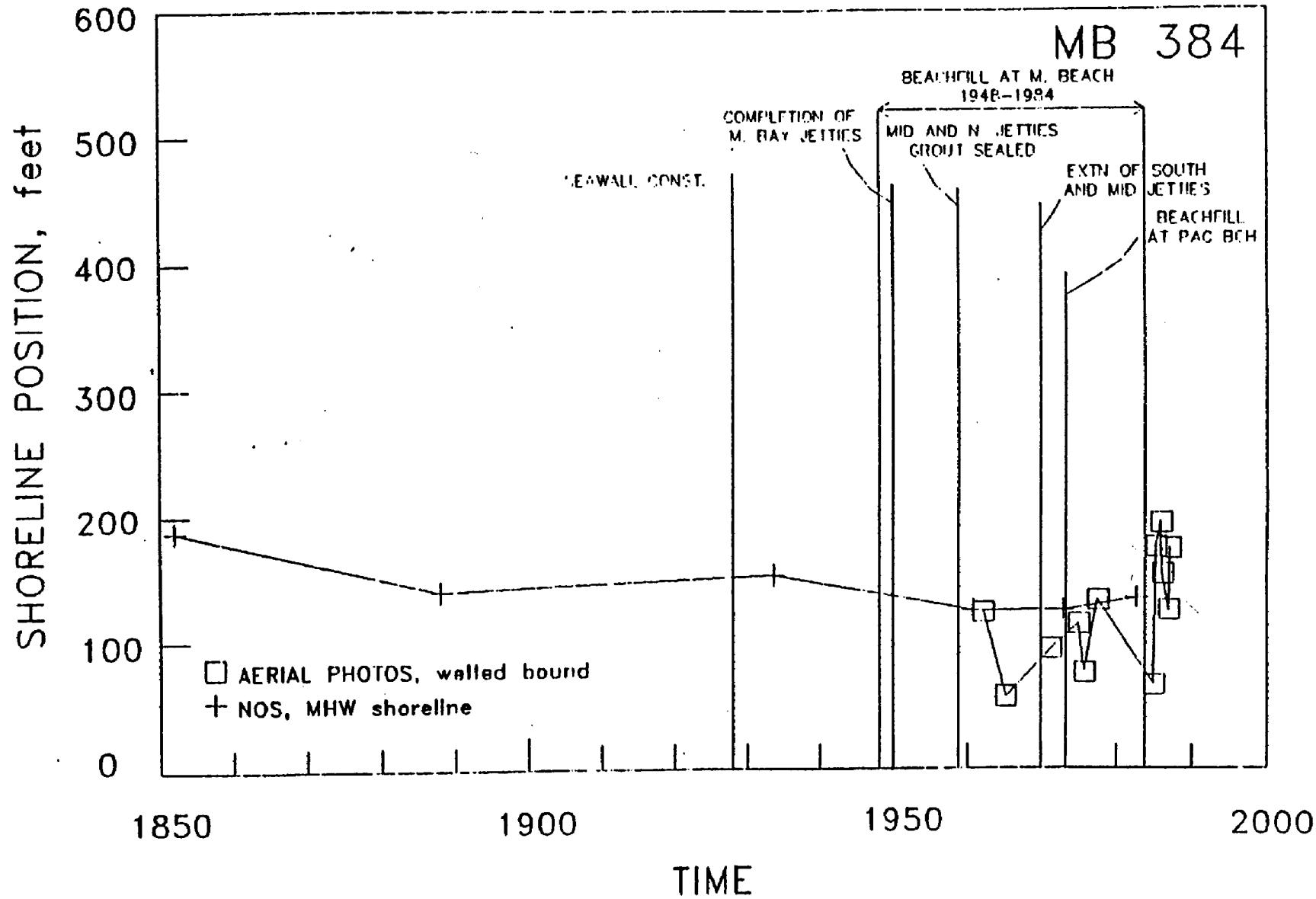


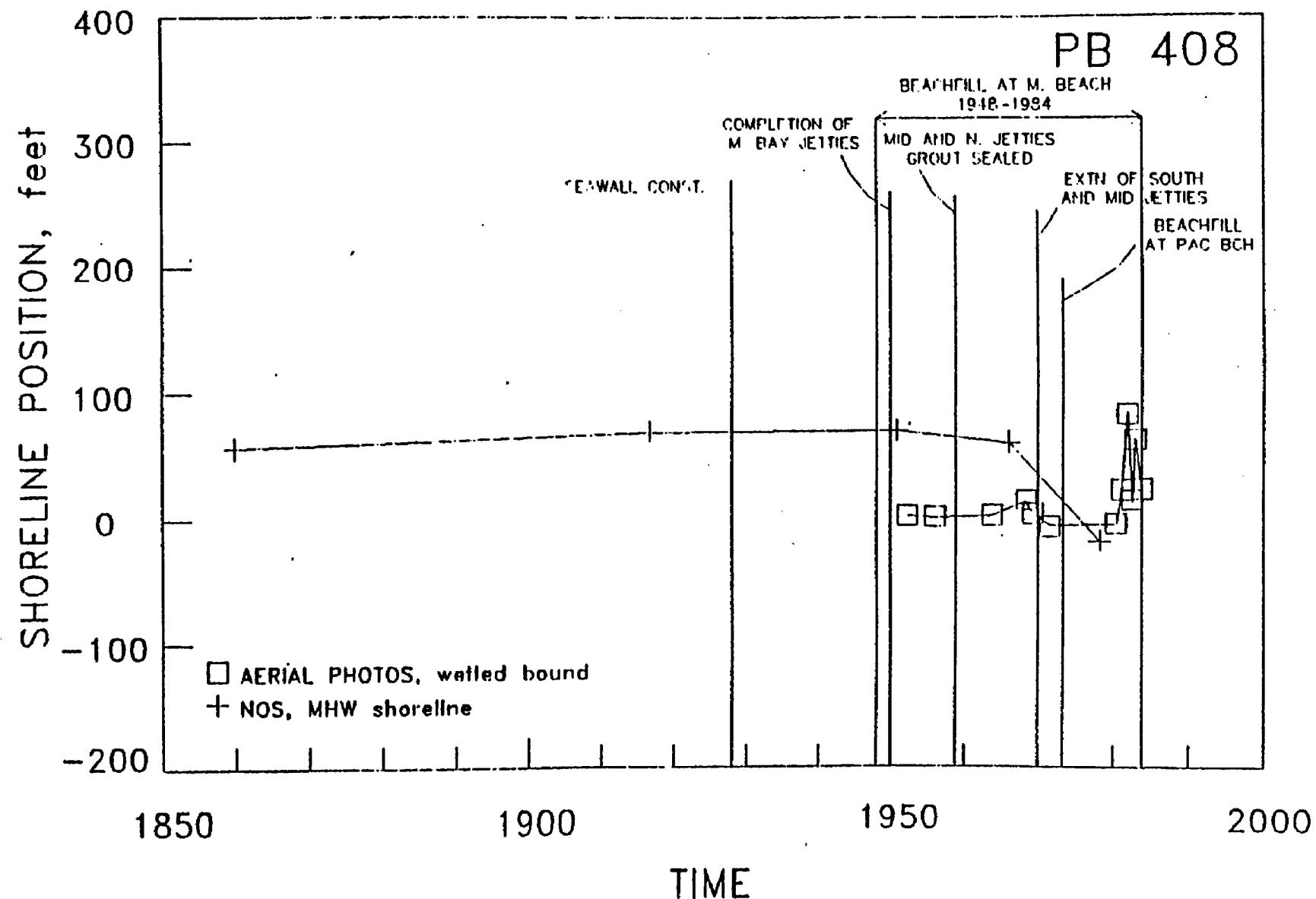


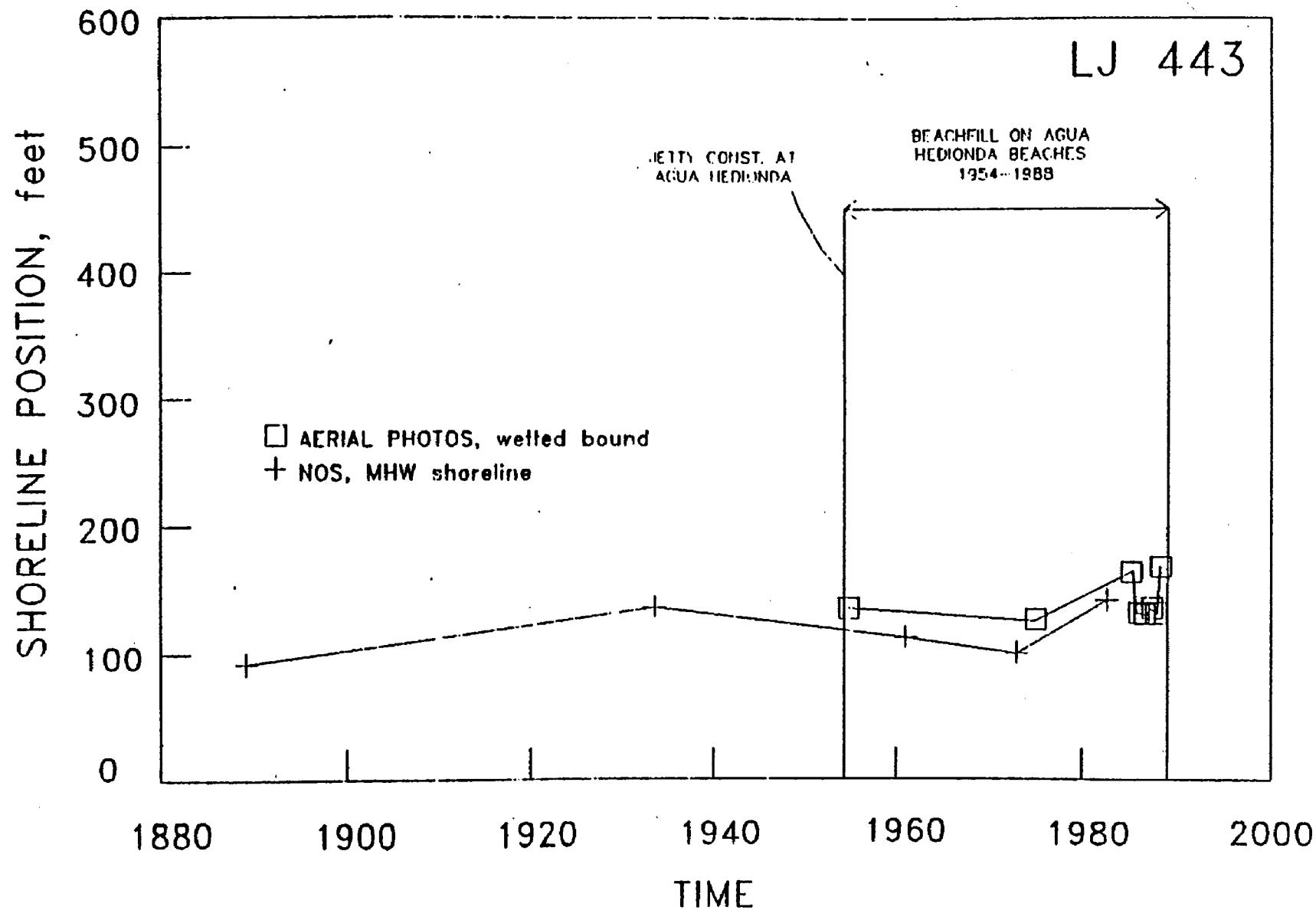


SI-3

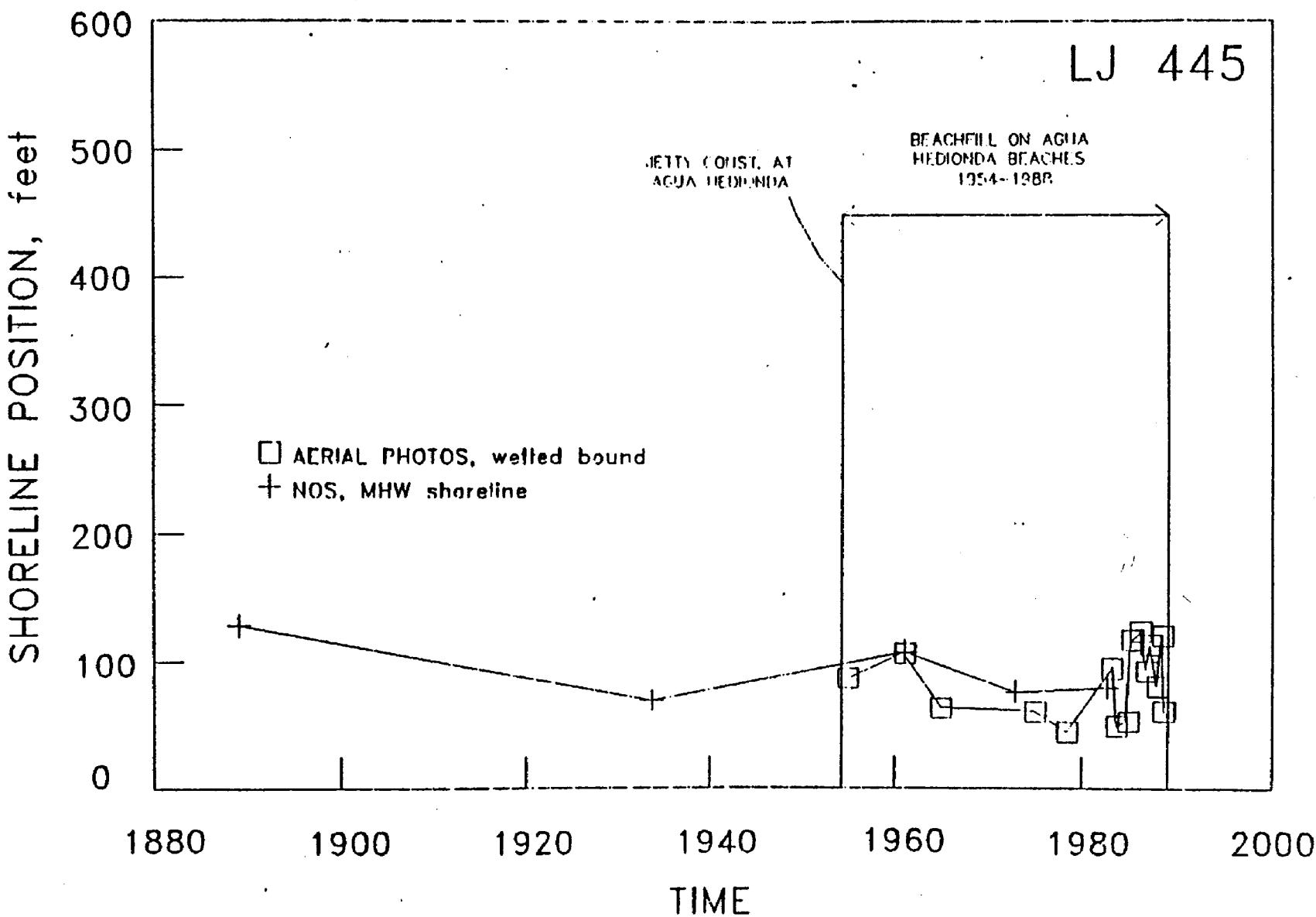


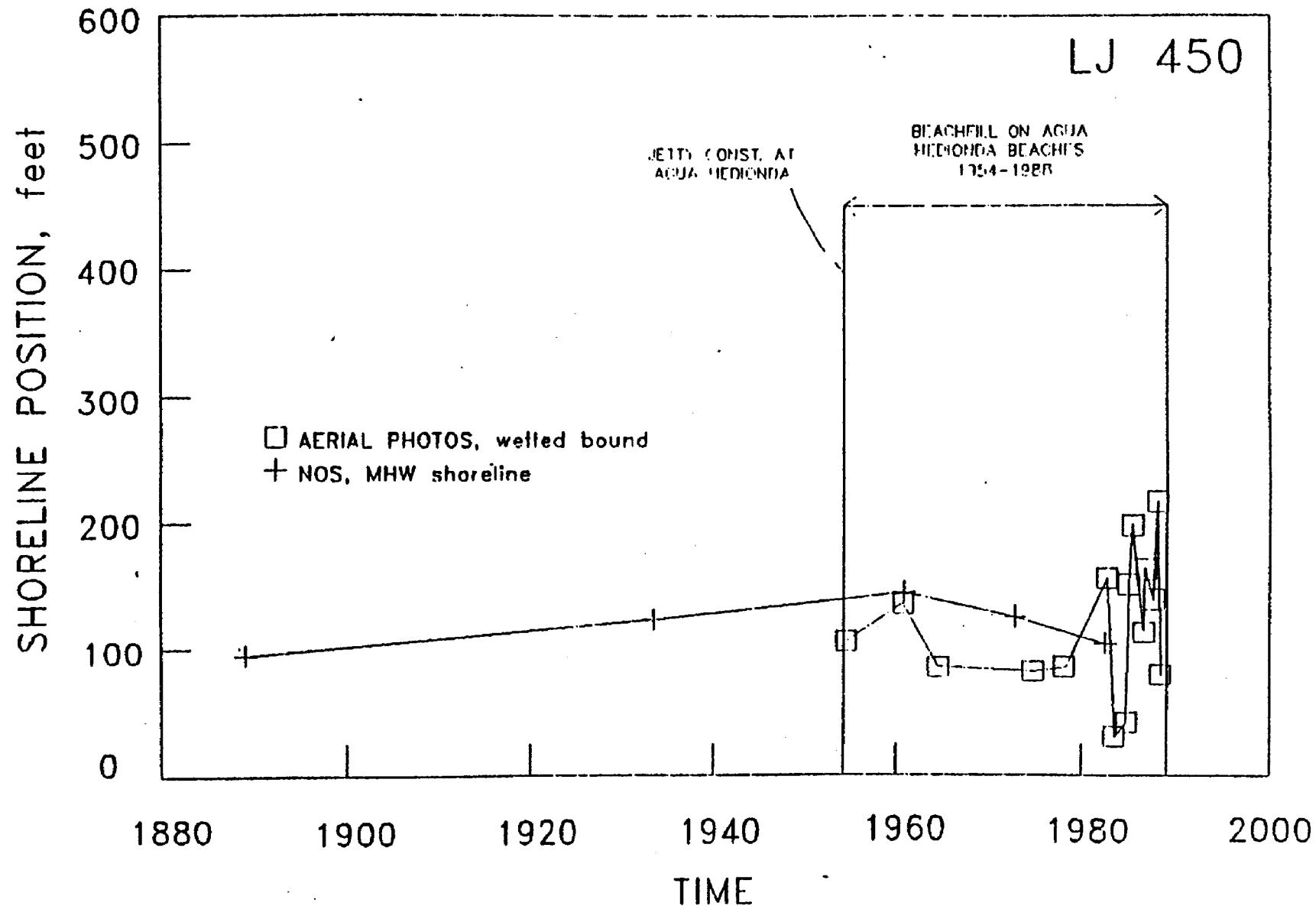


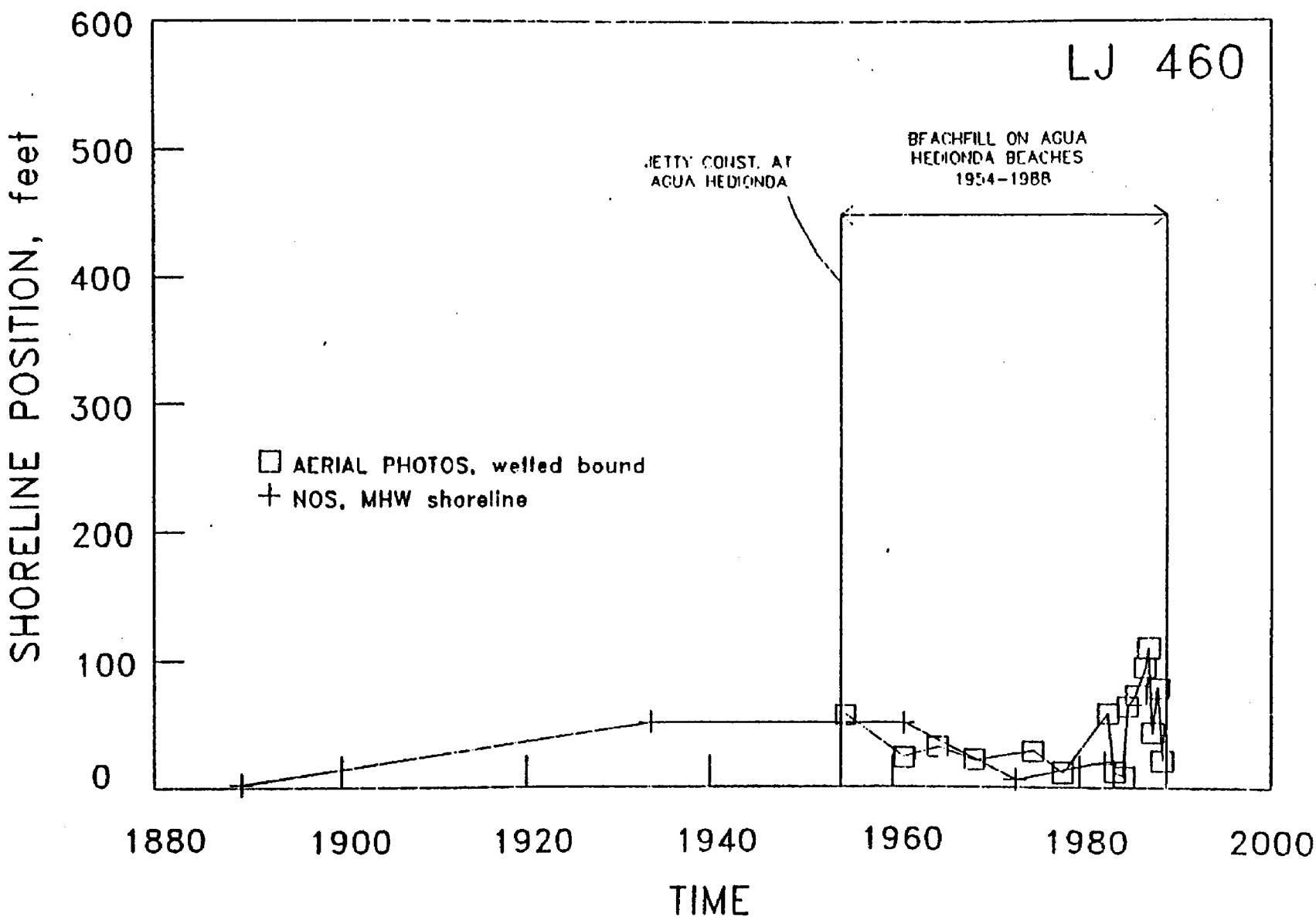


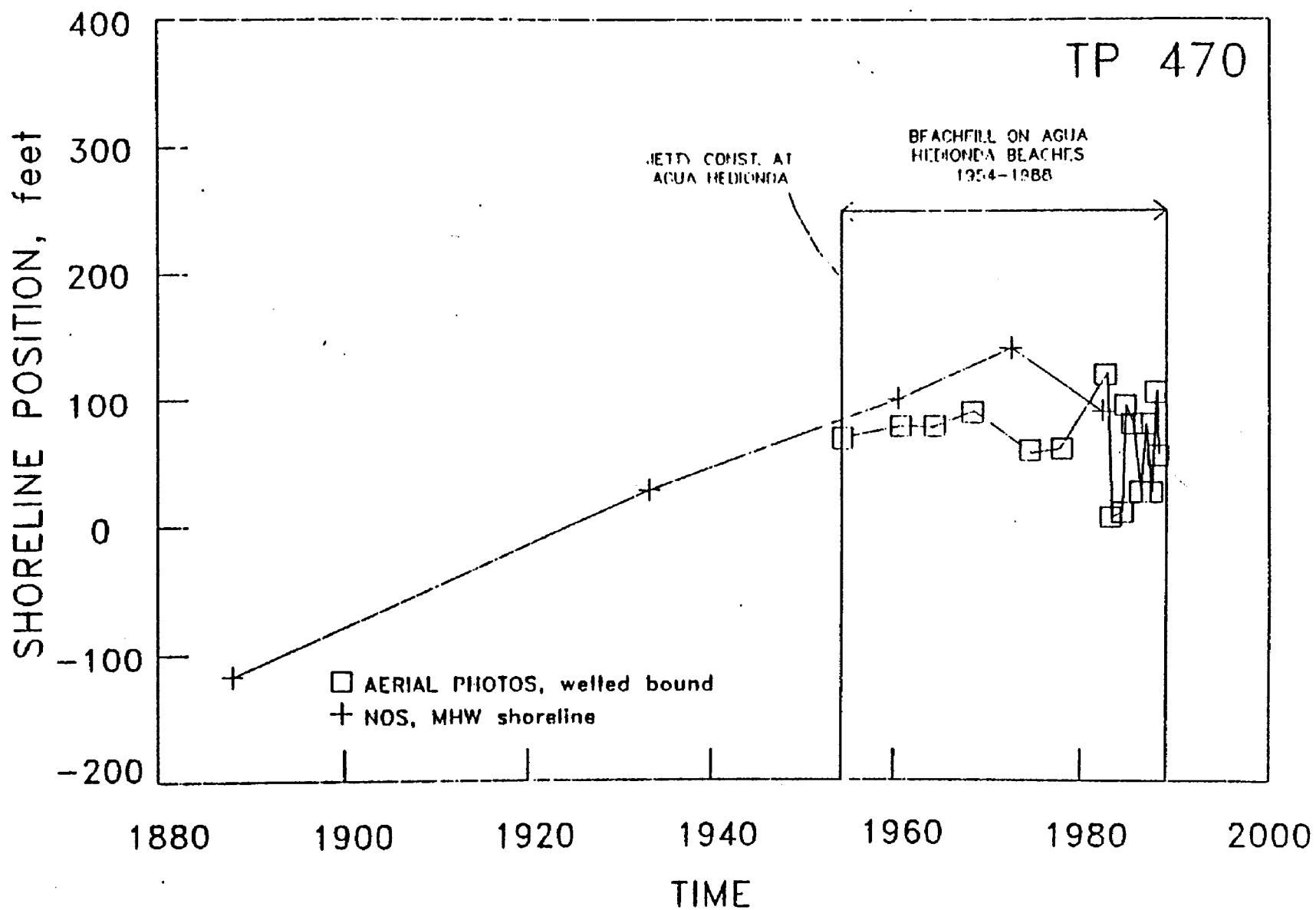


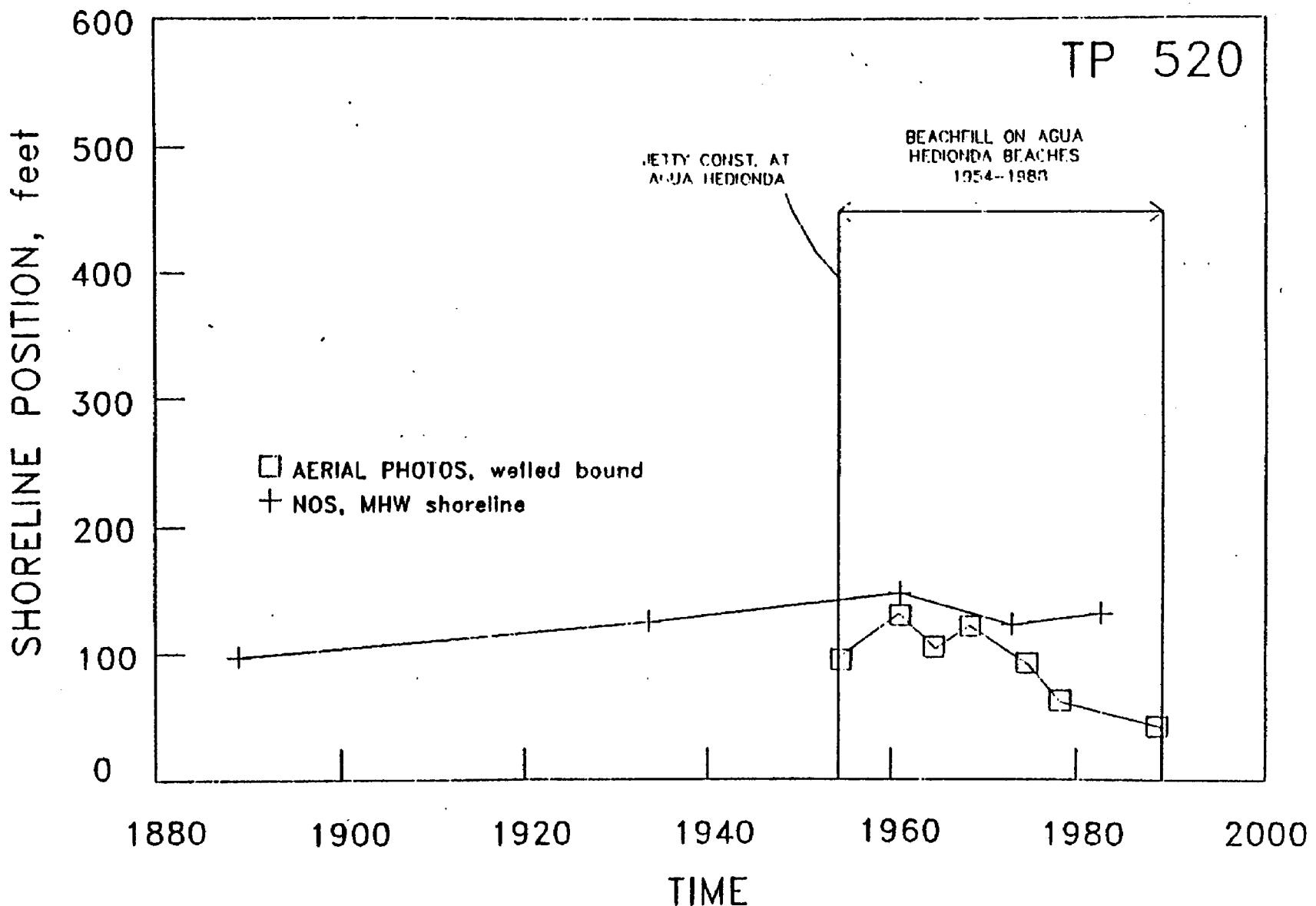
E-19

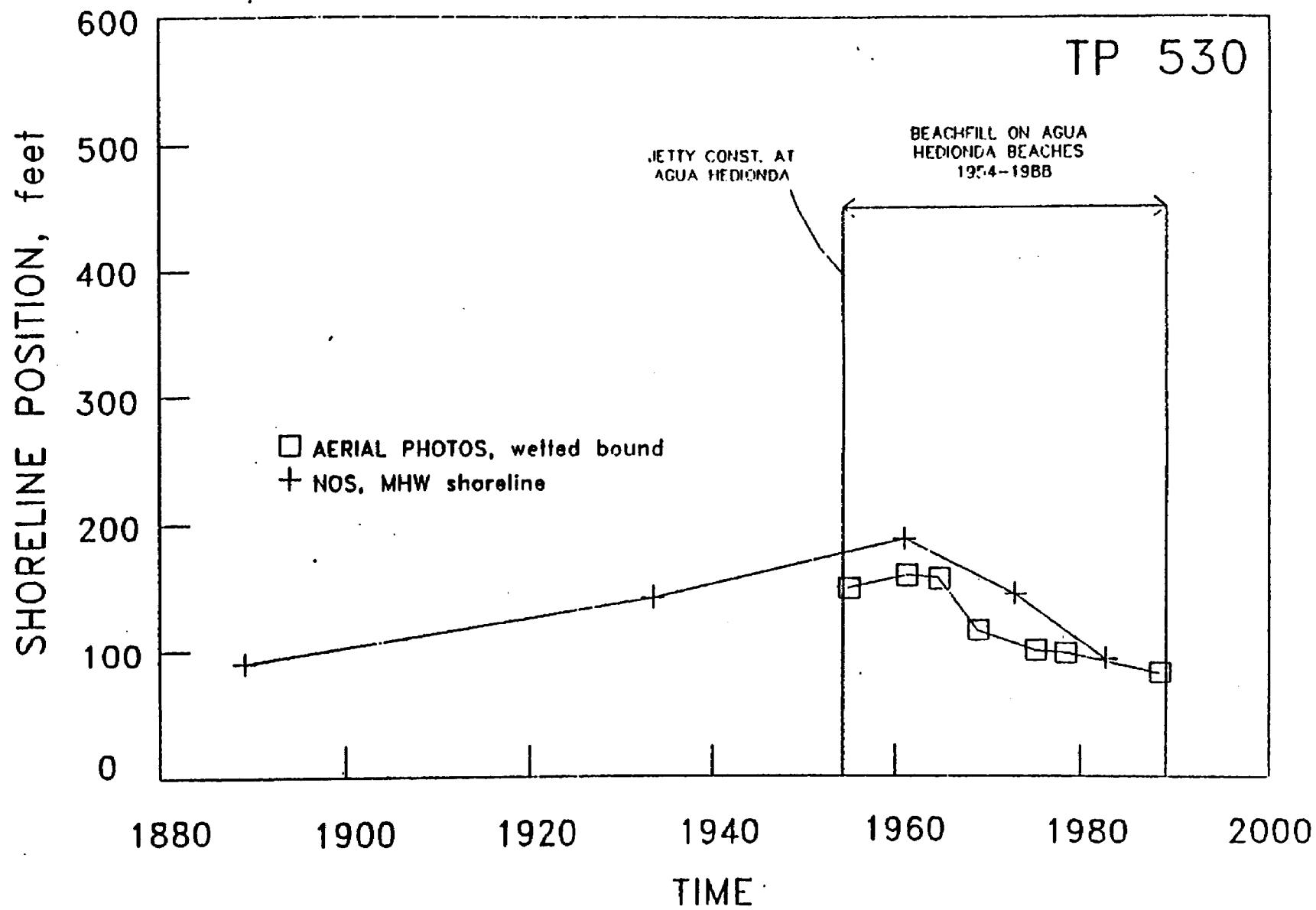




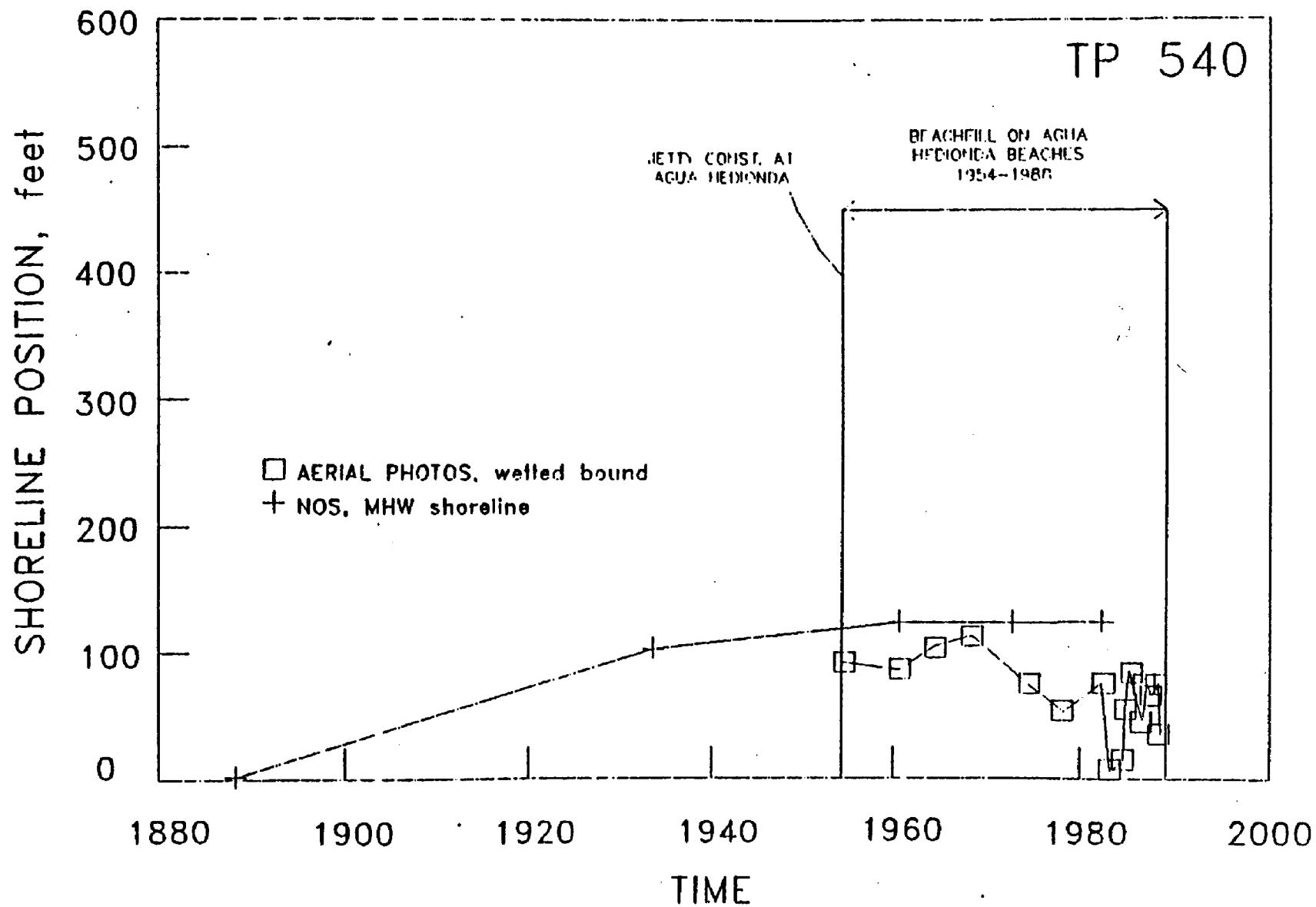




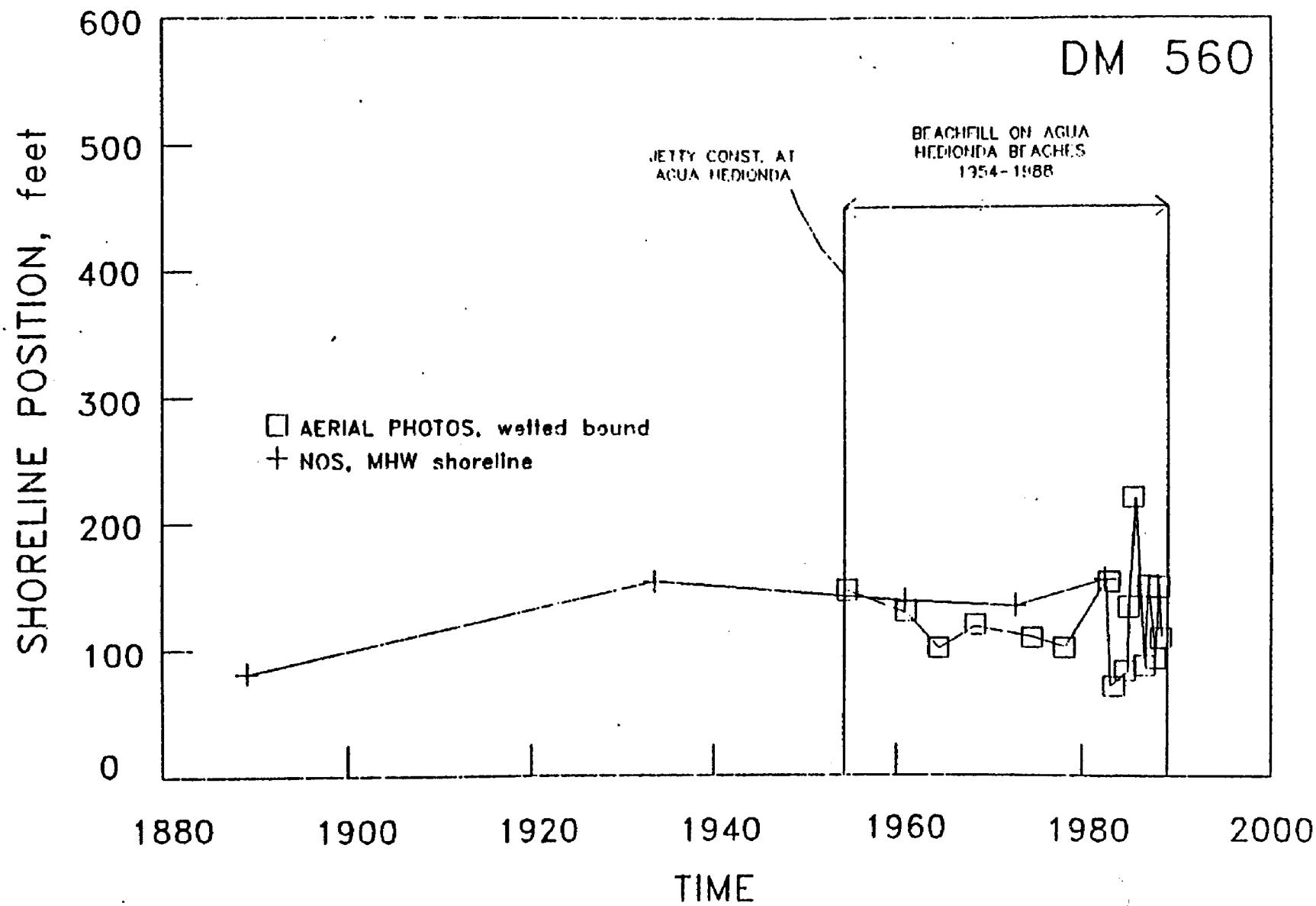


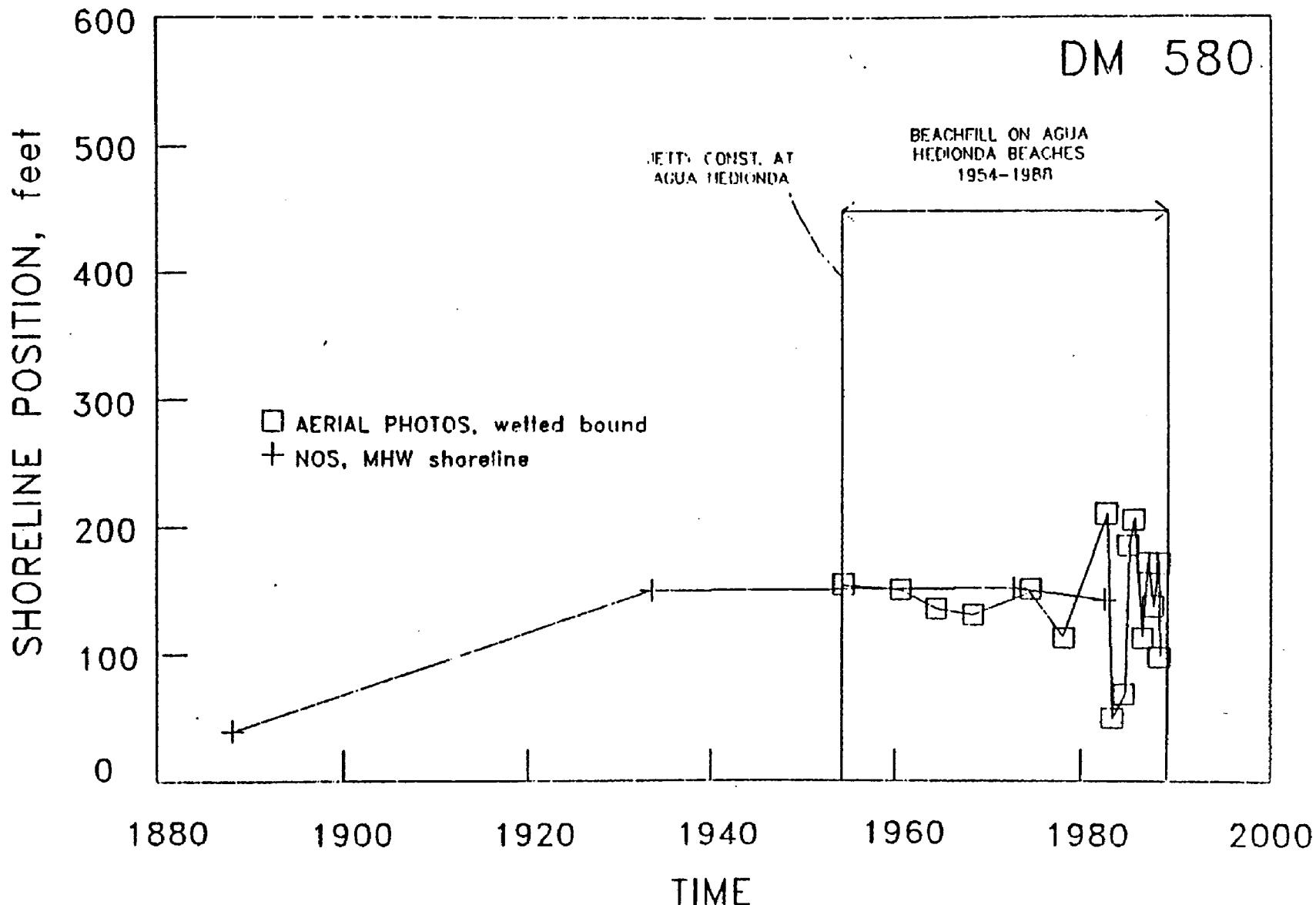


E-25

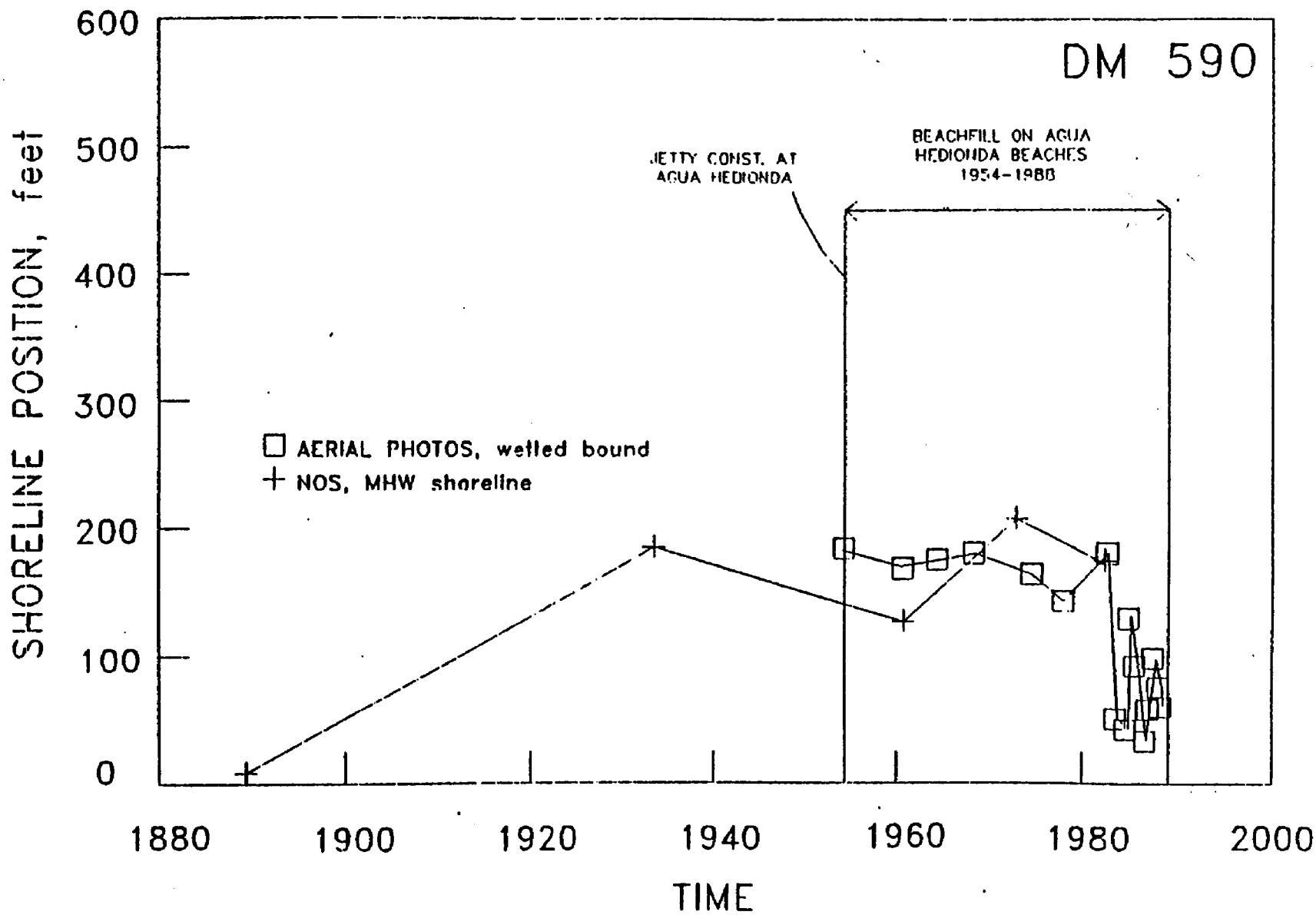


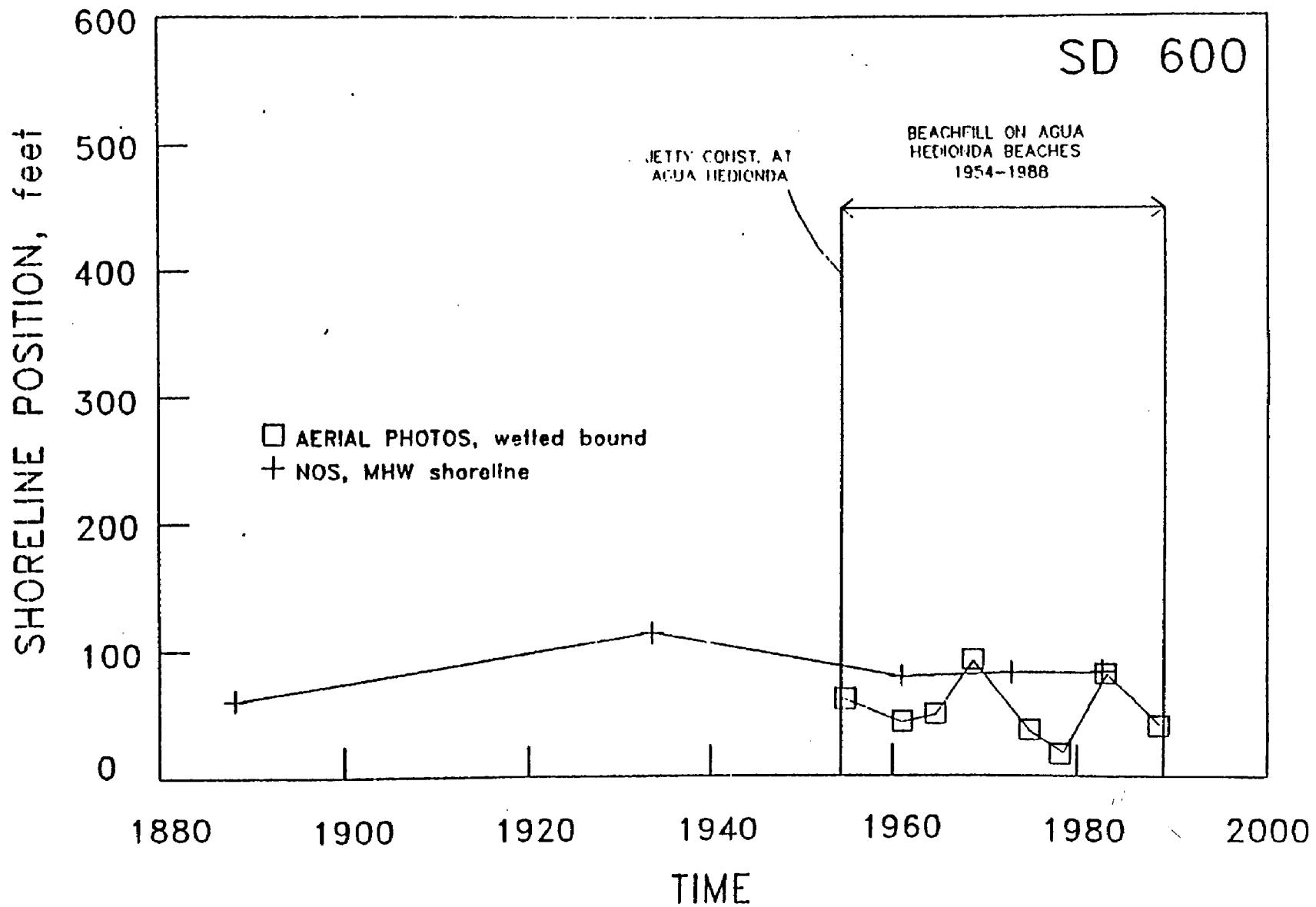
E-26

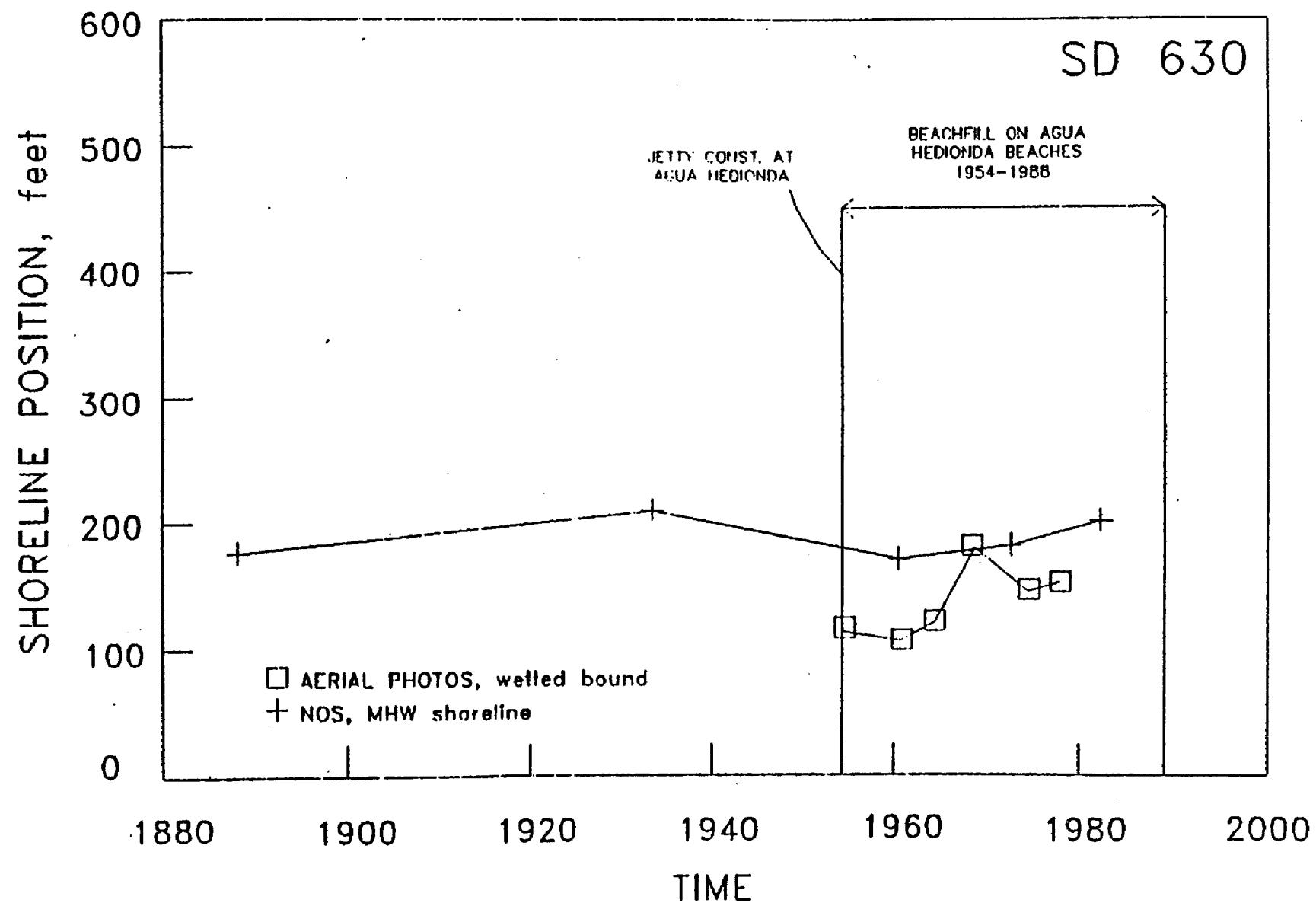


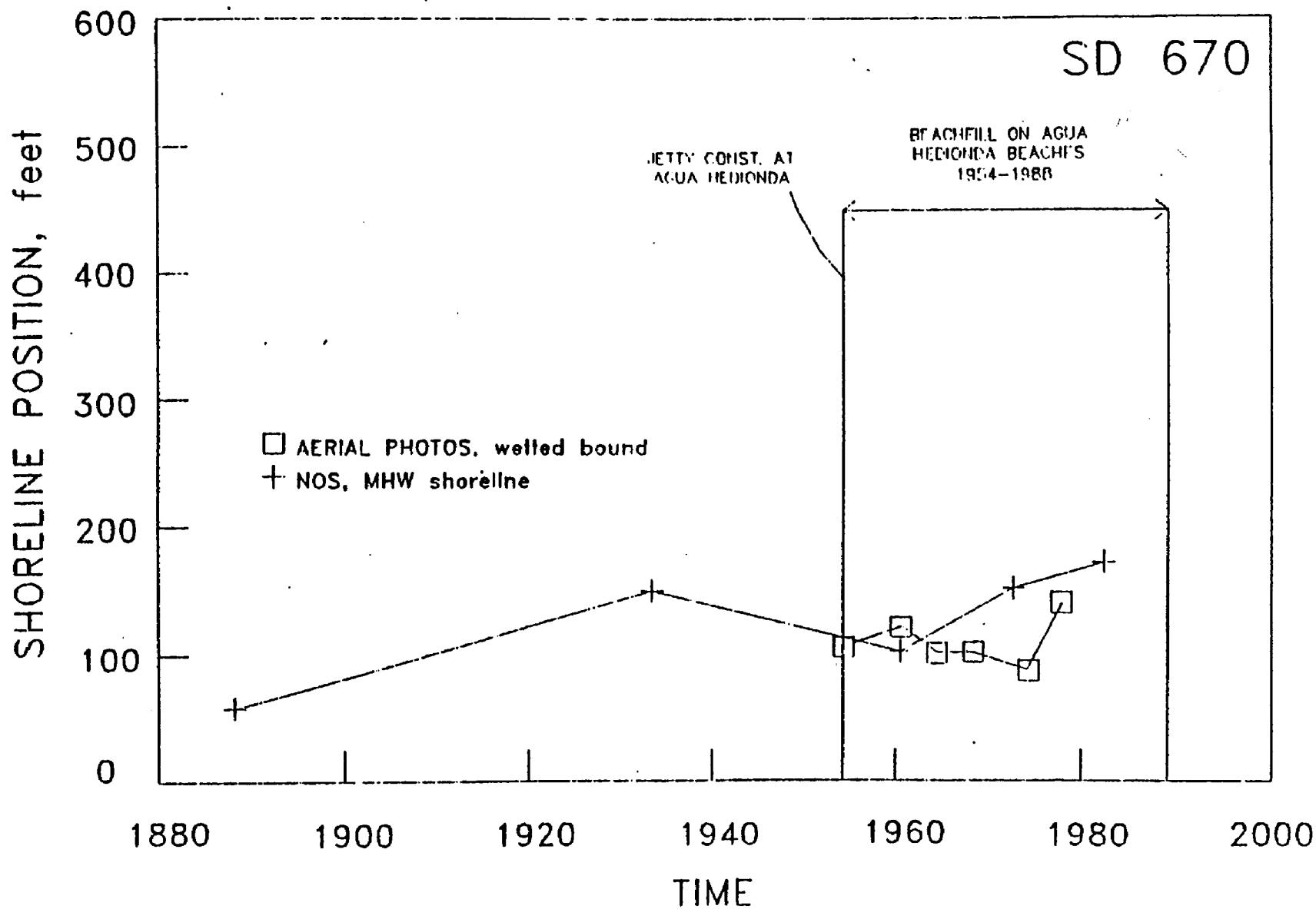


E-28

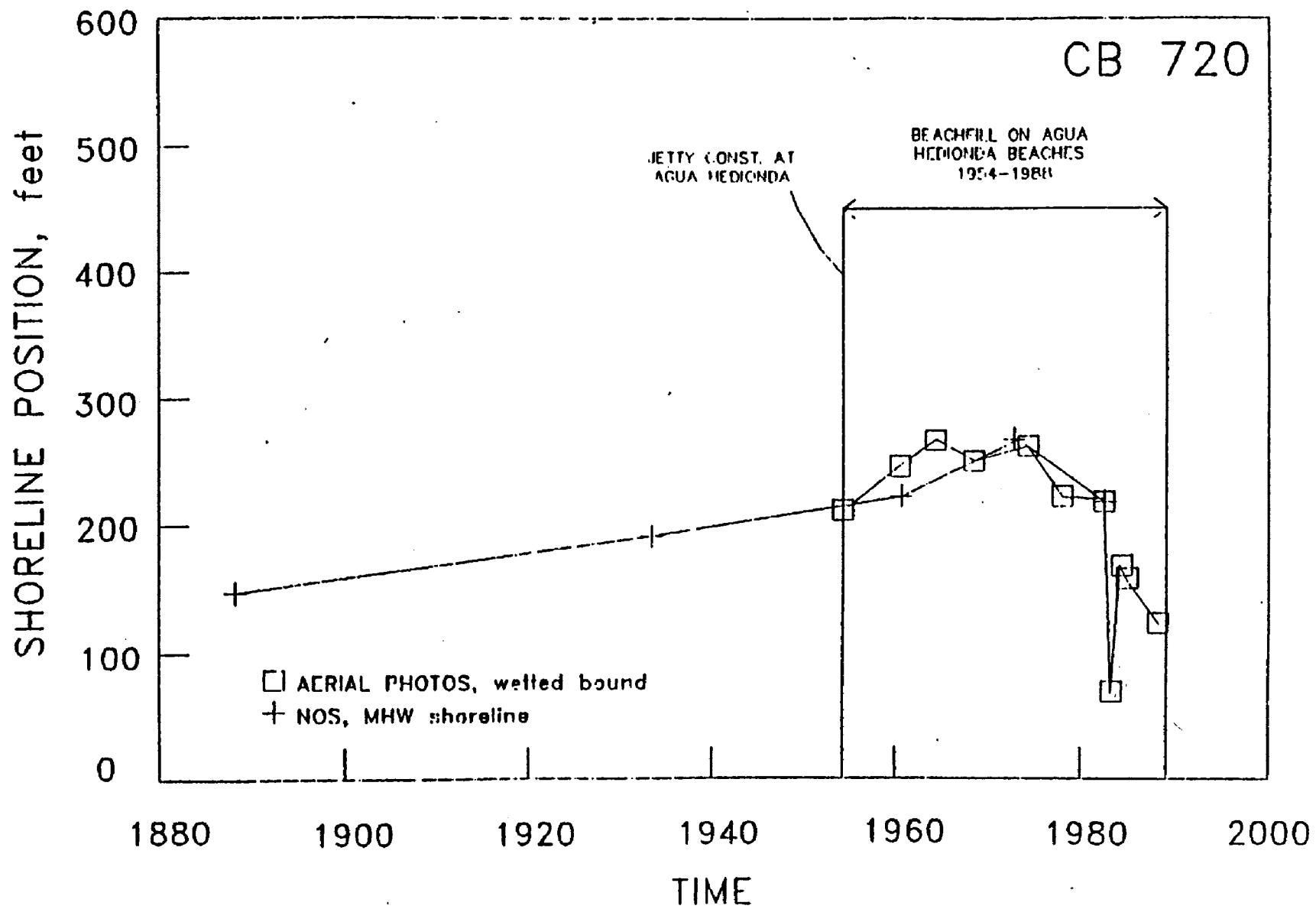




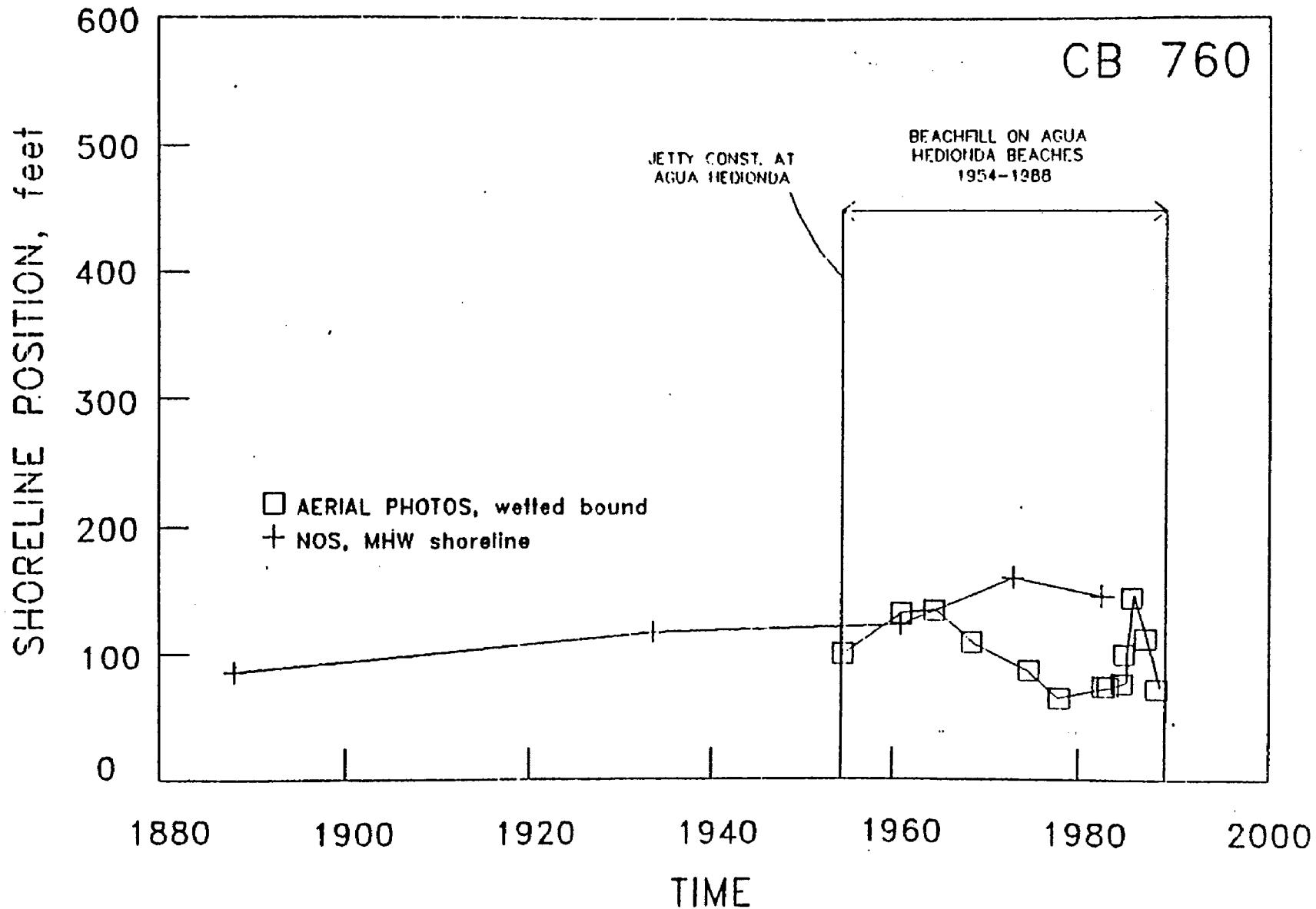


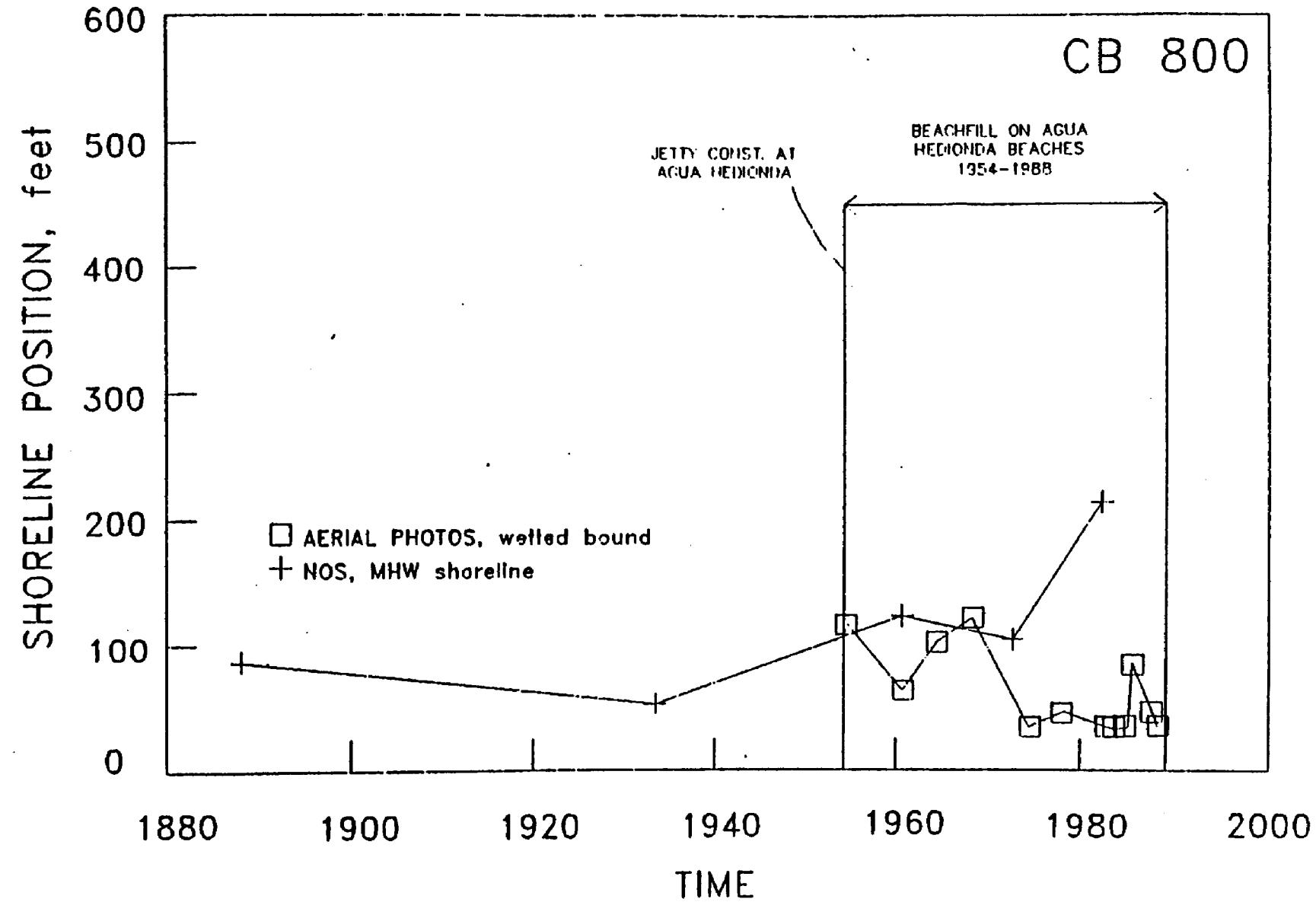


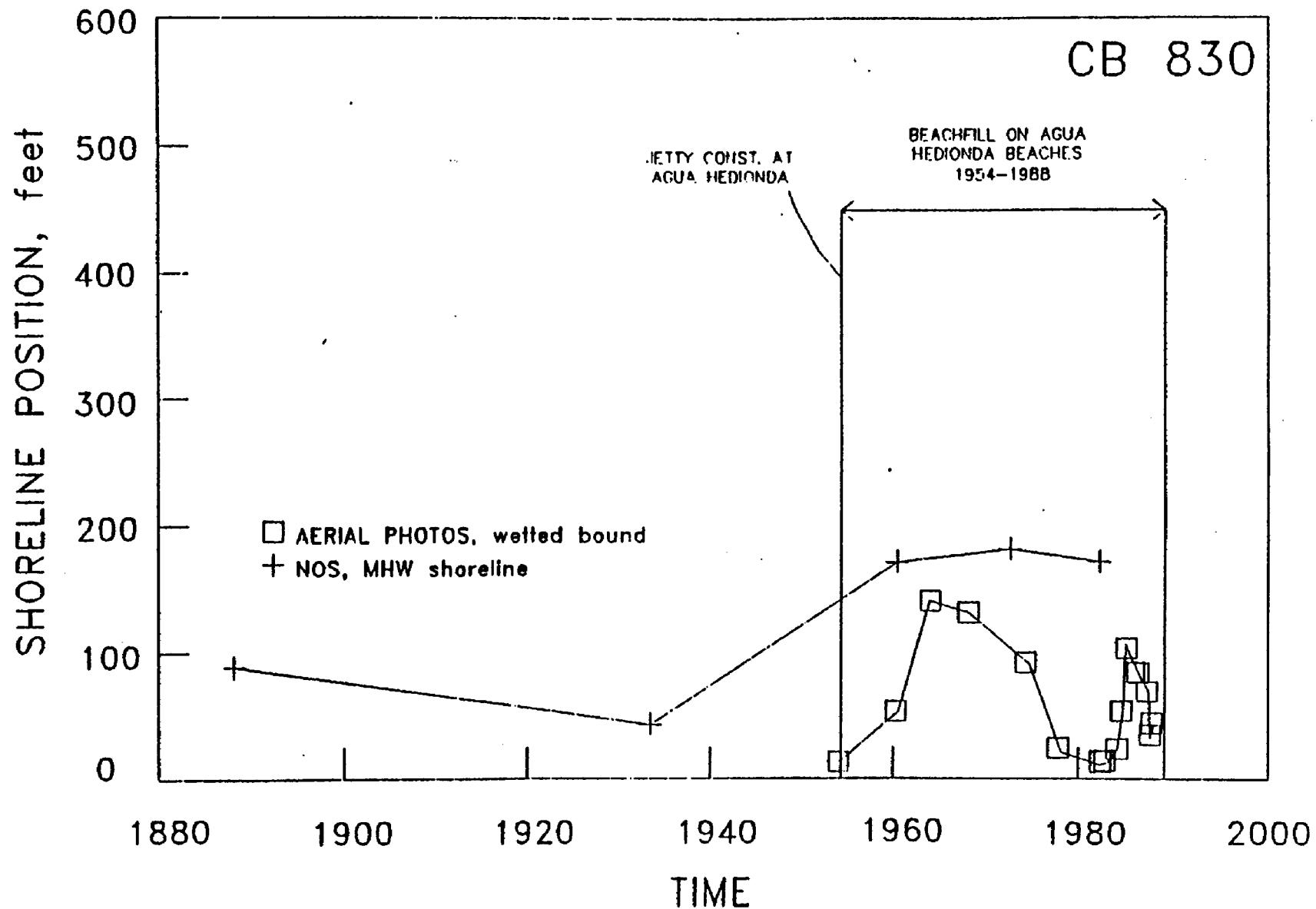
E-32.

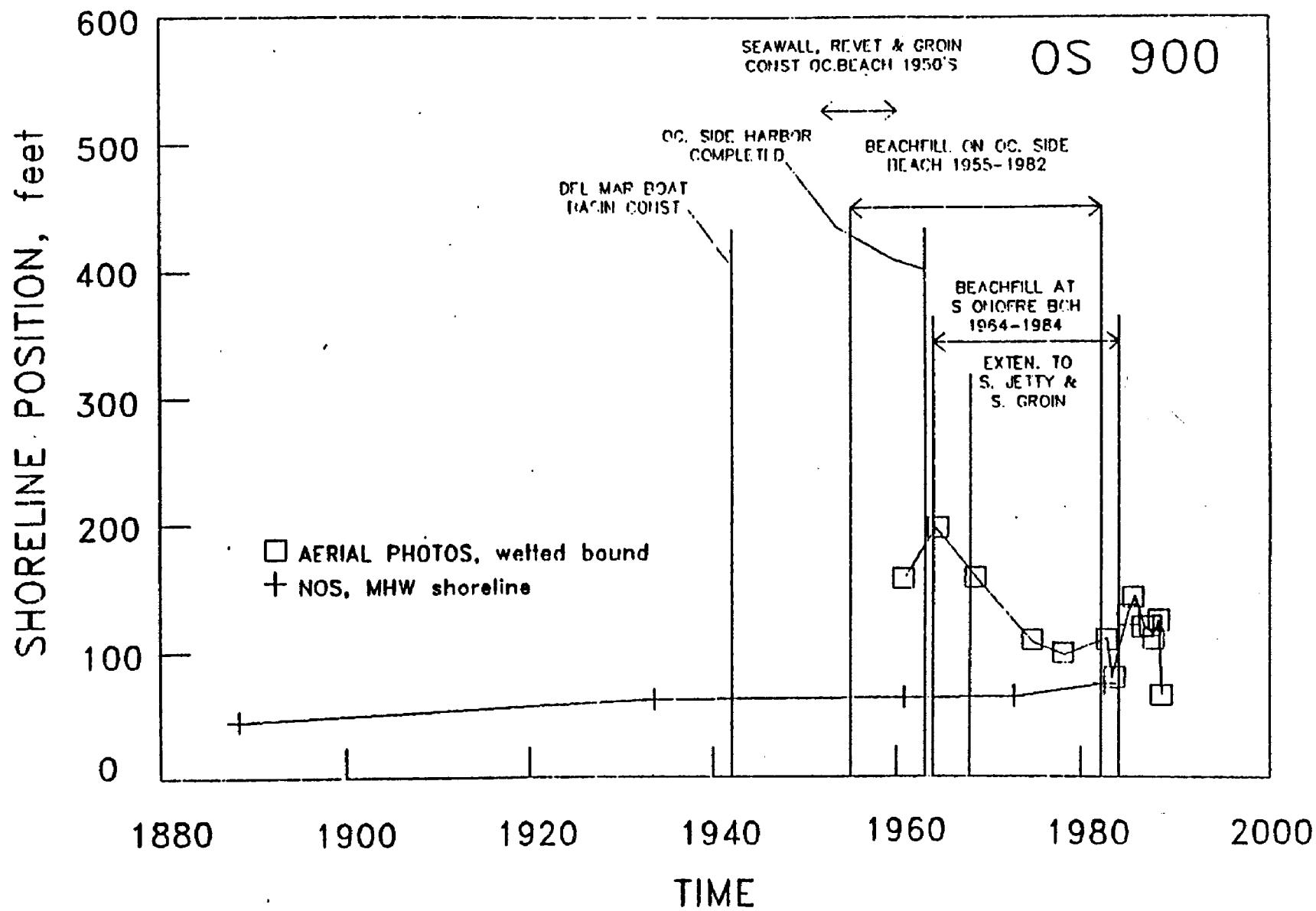


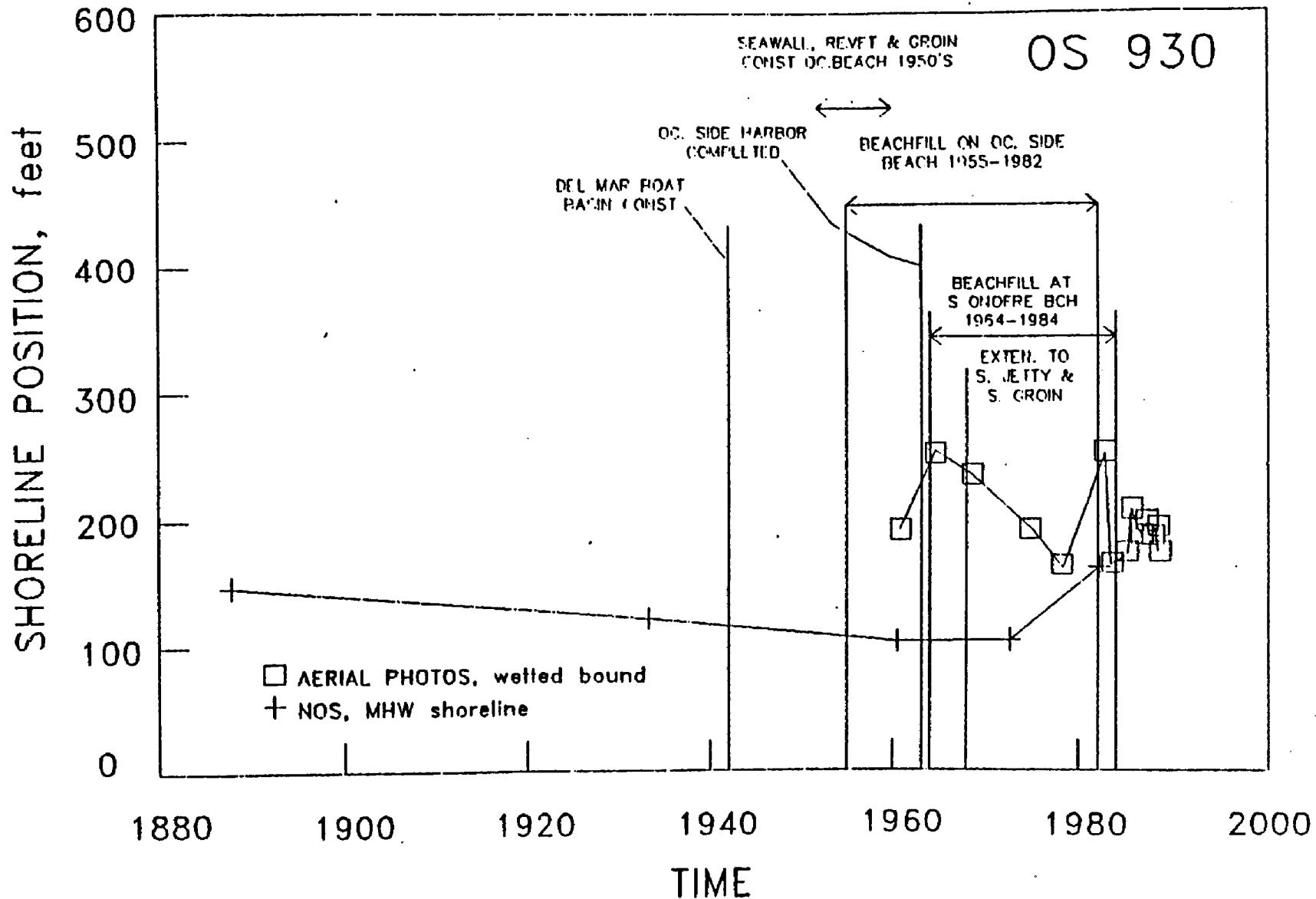
E-33

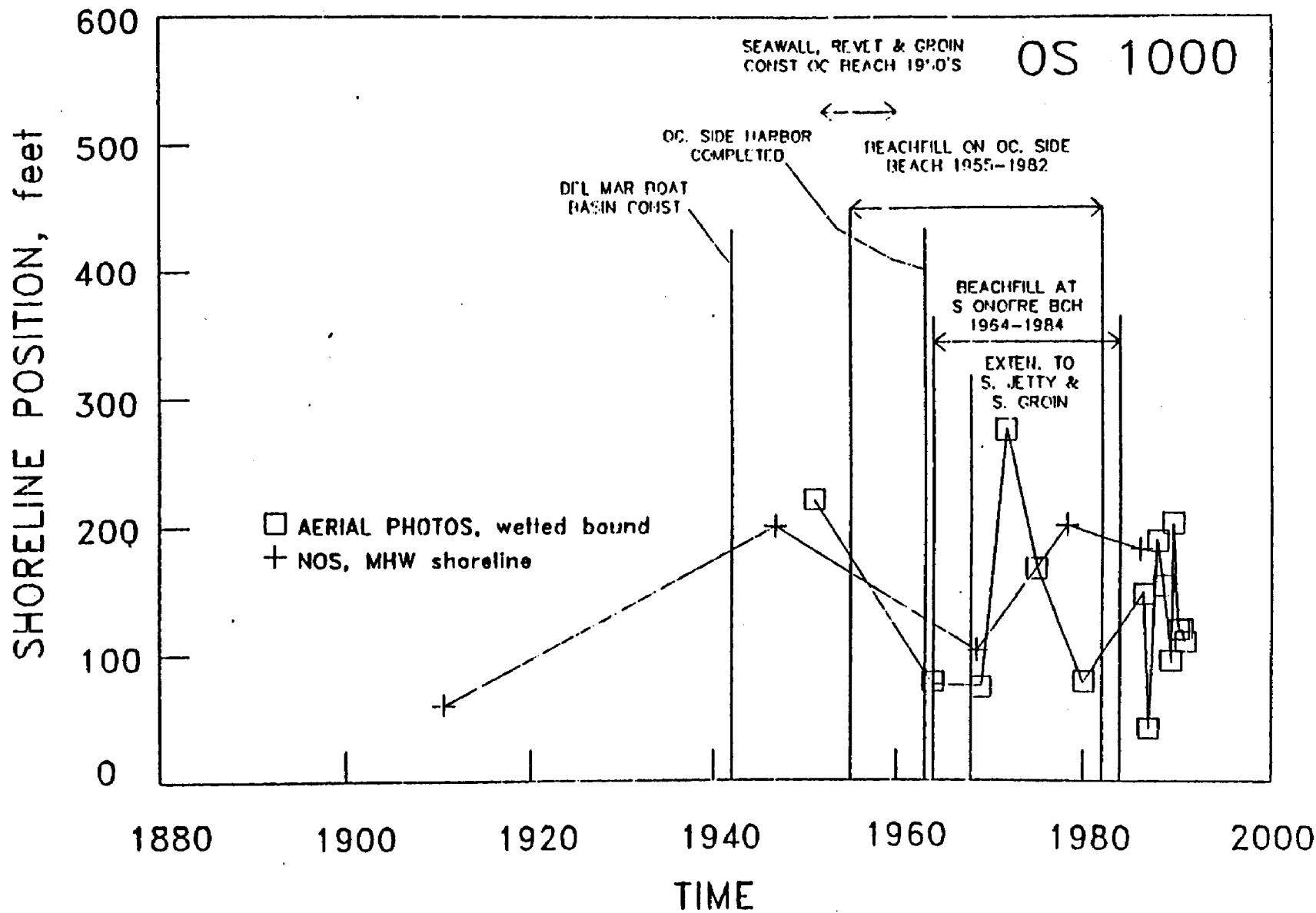


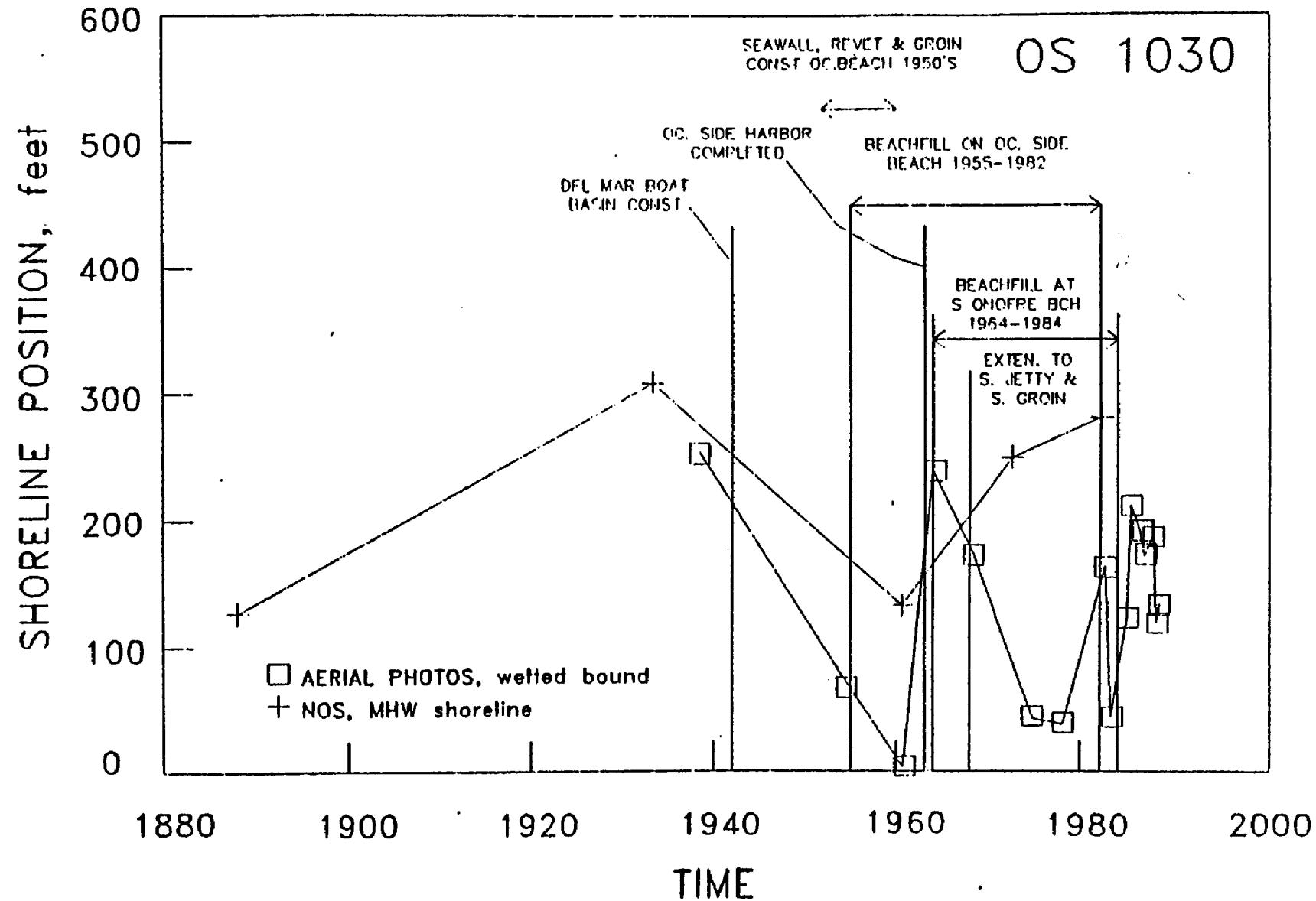


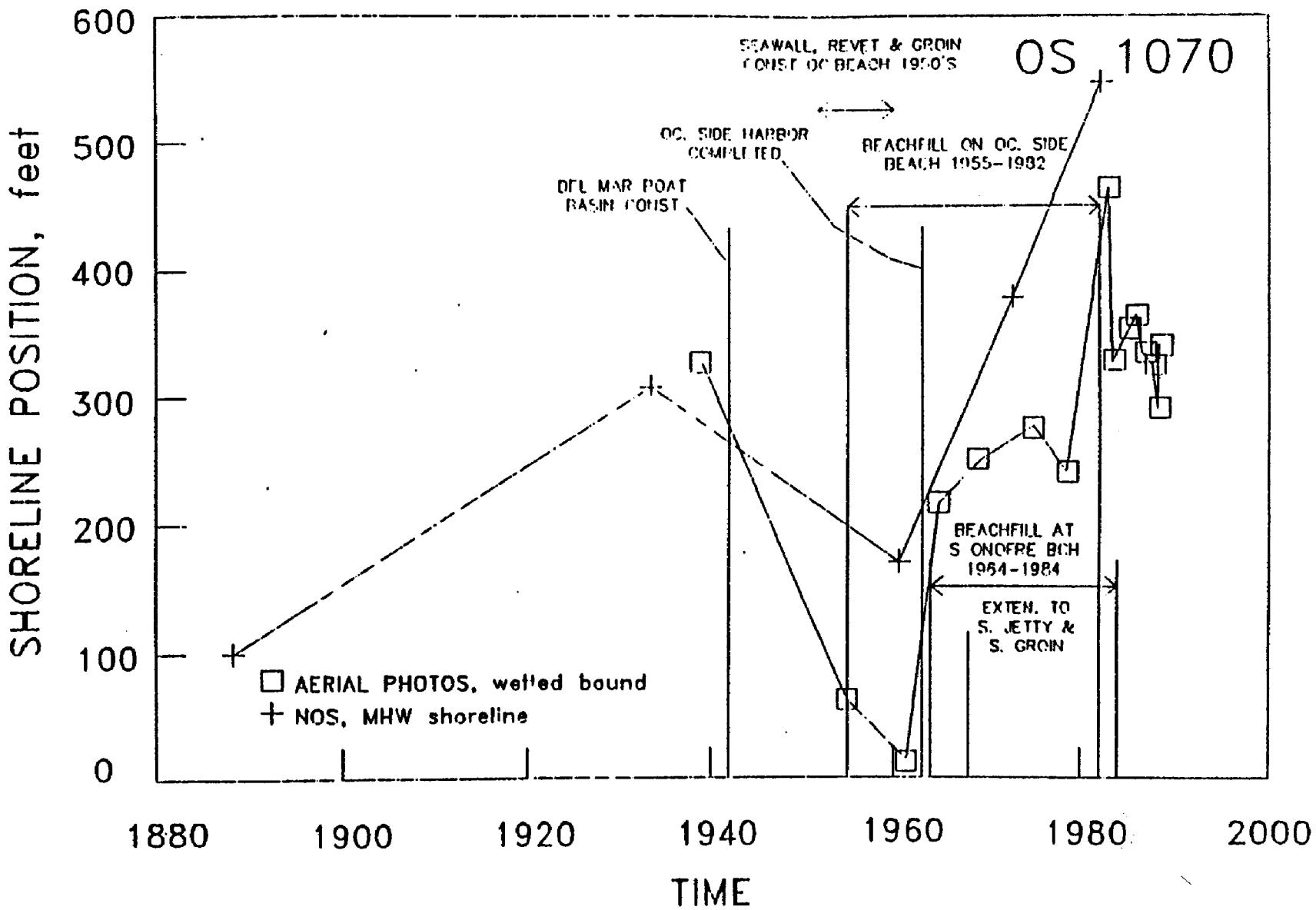


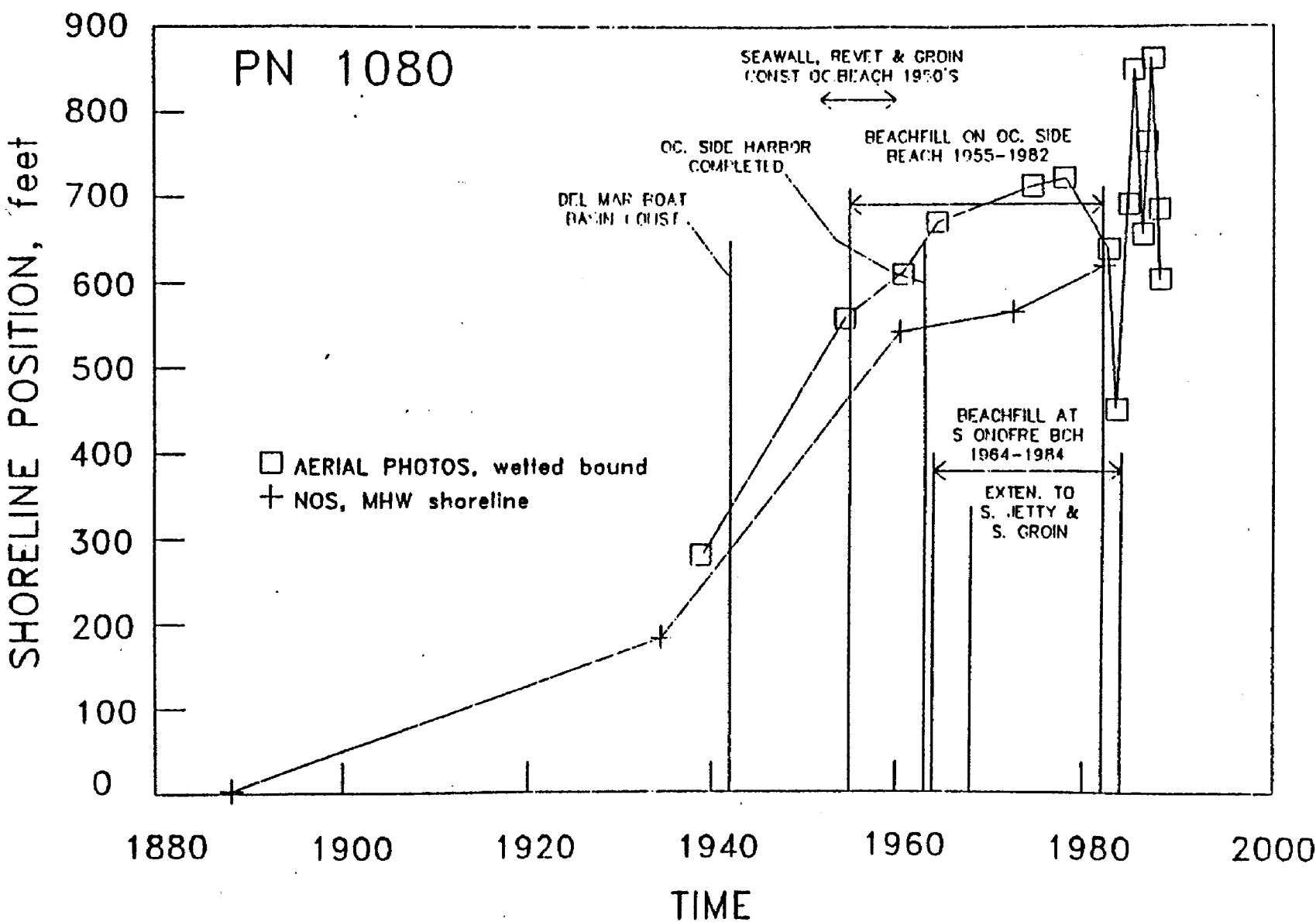


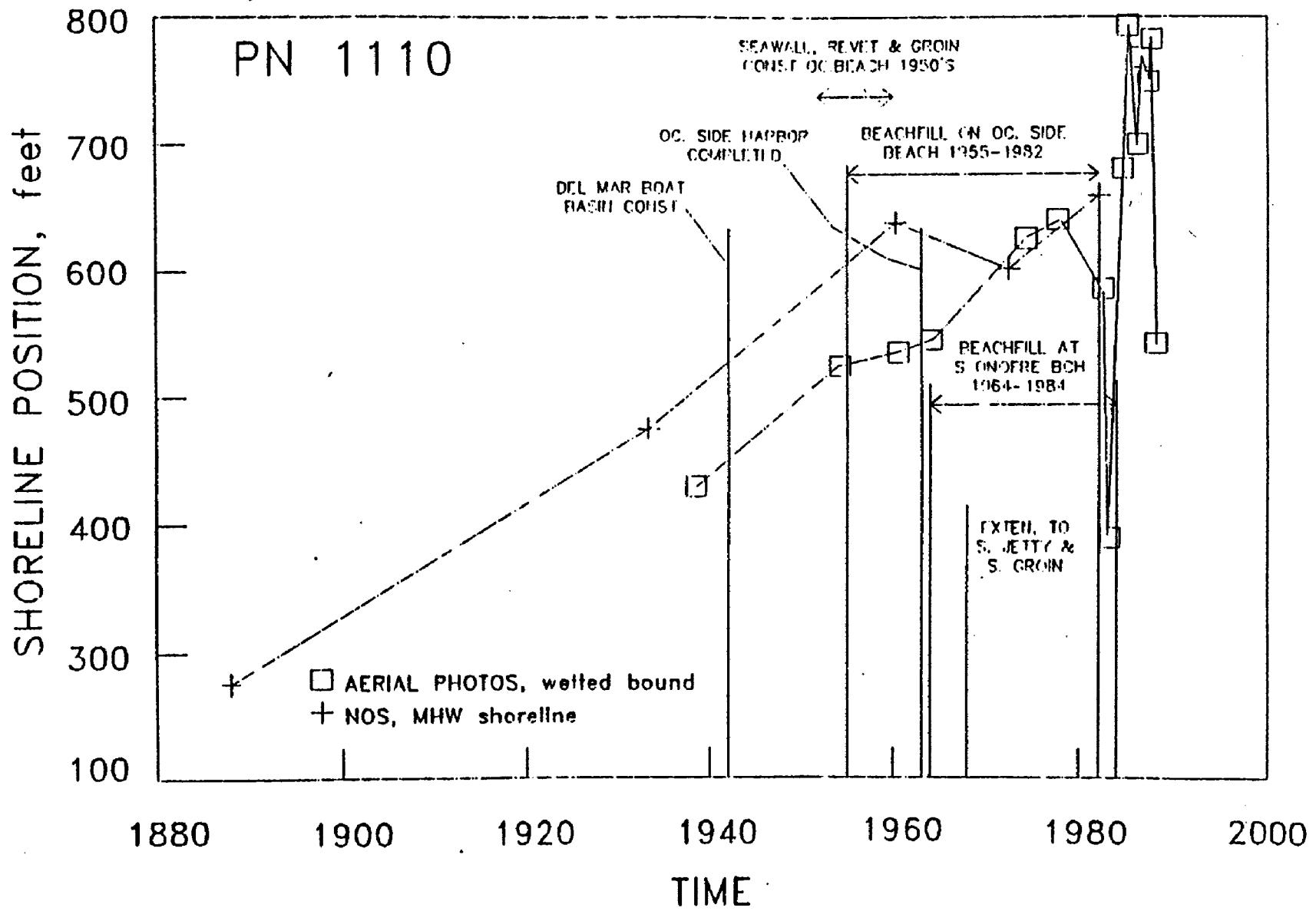


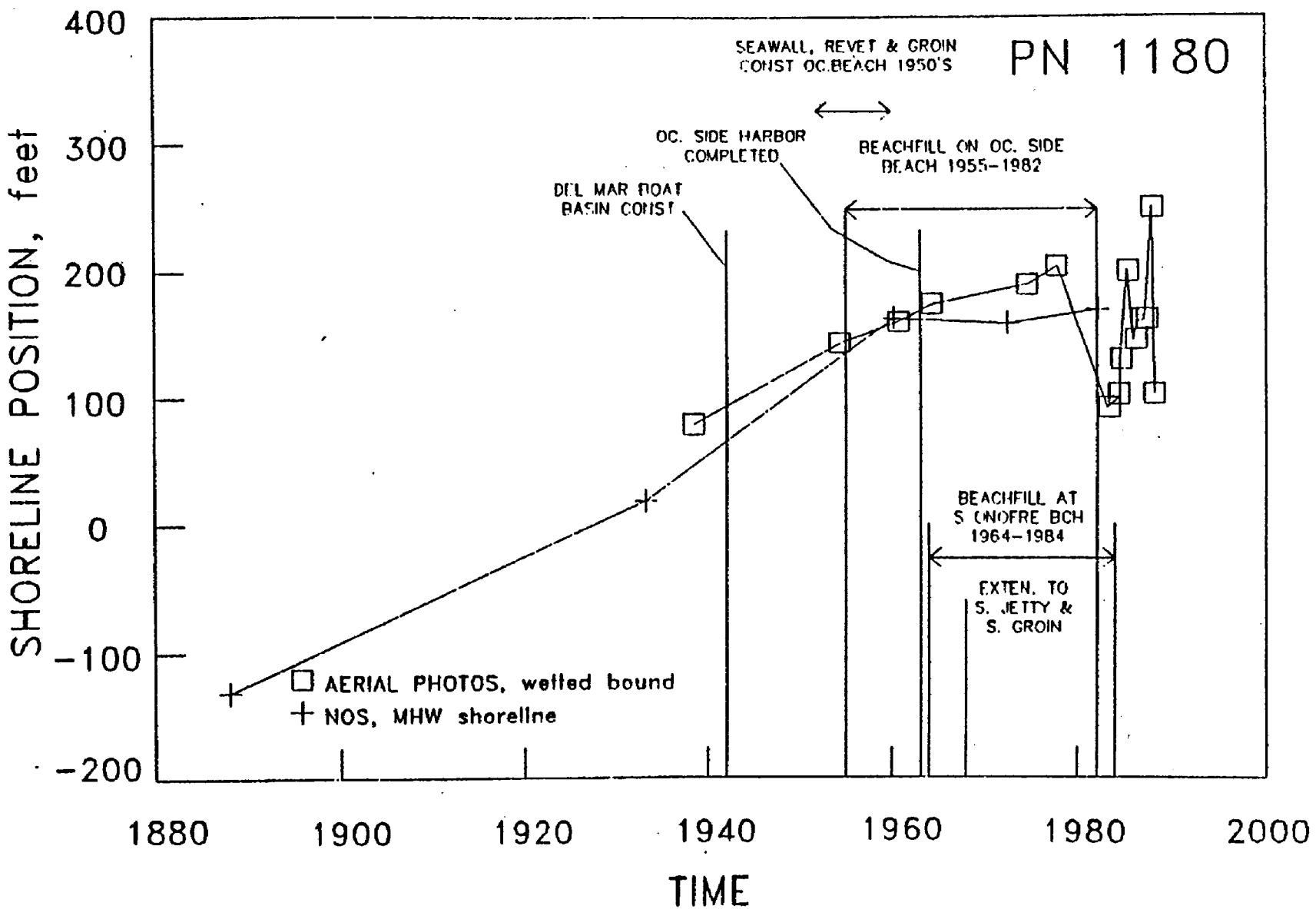


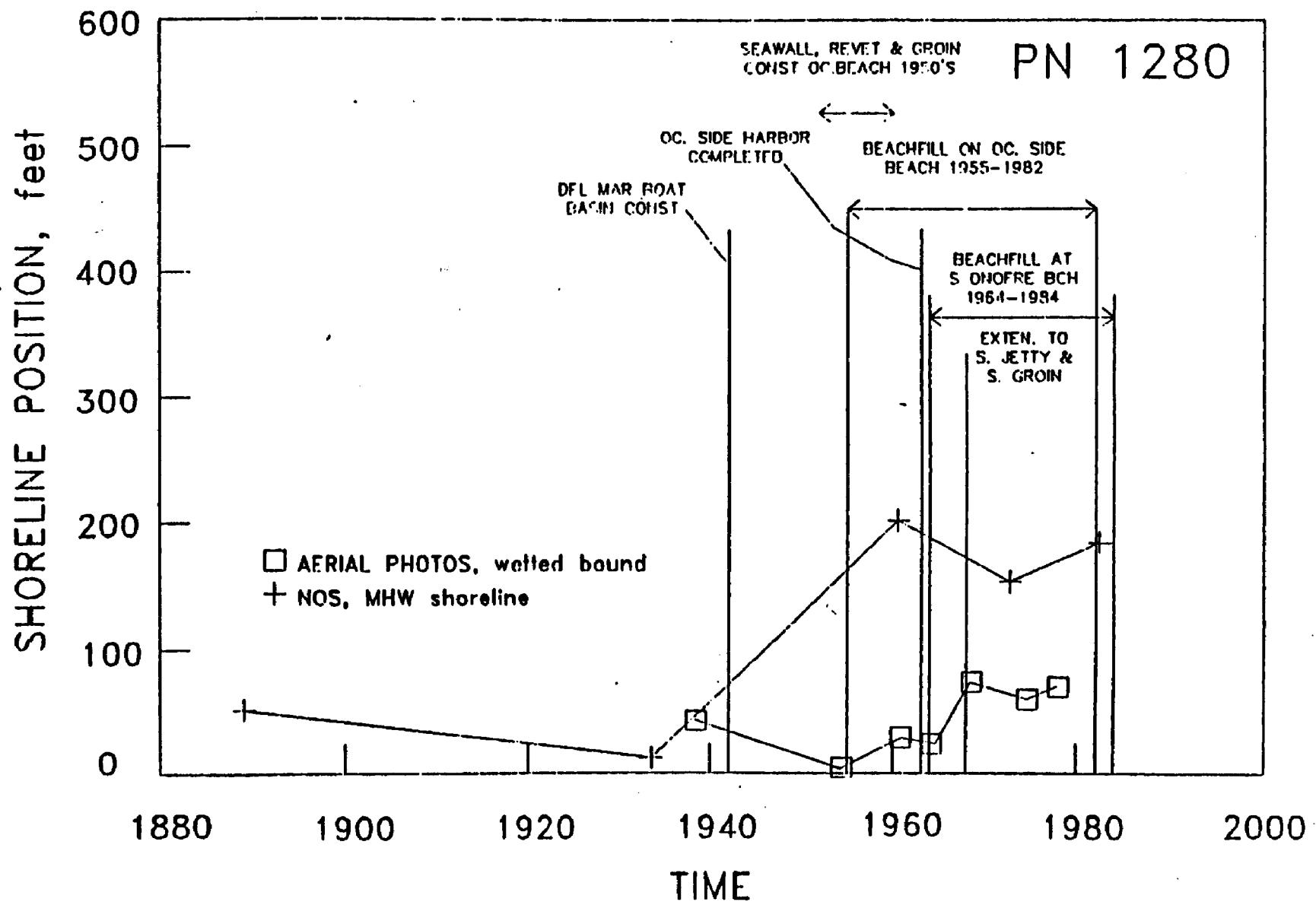


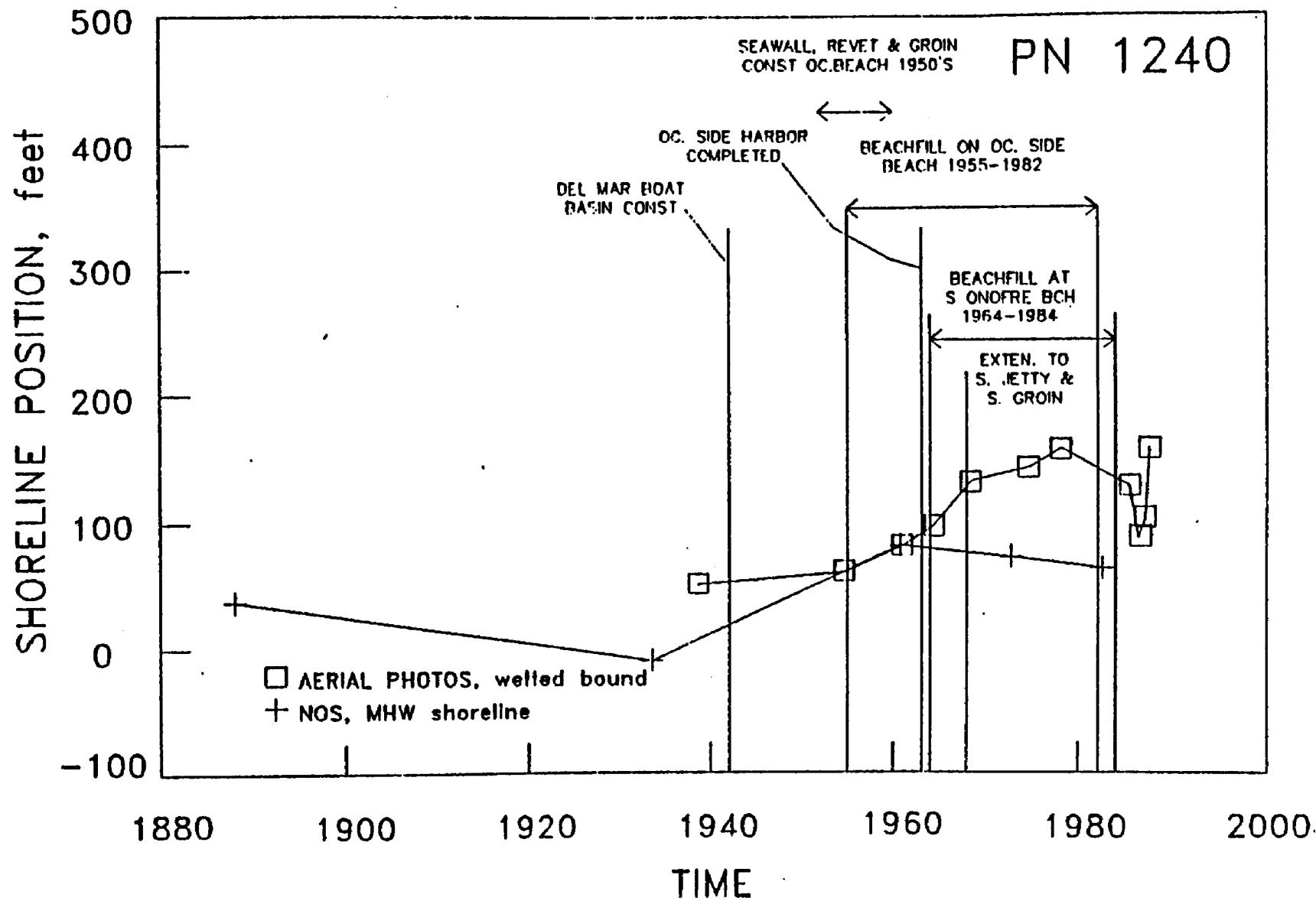




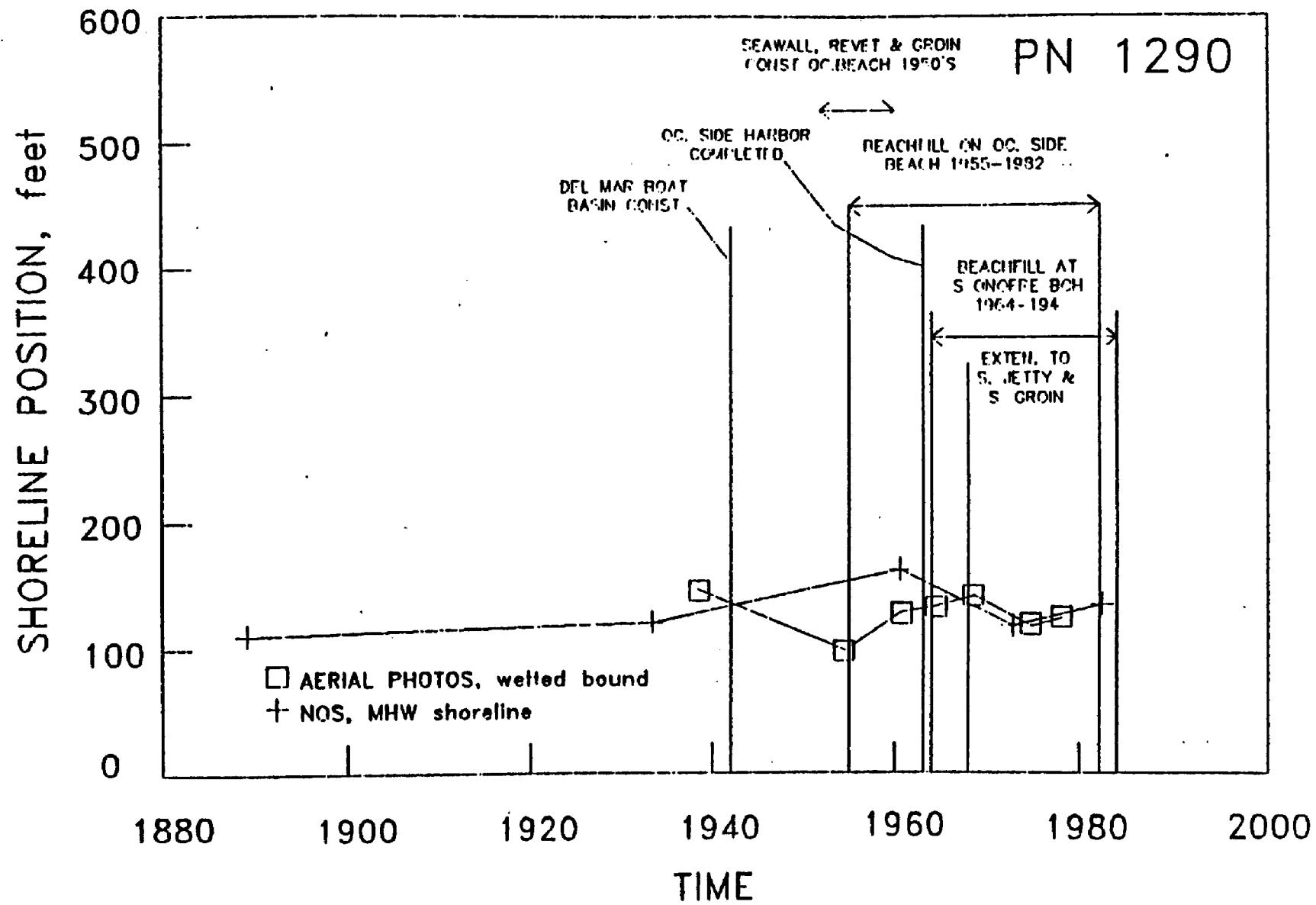


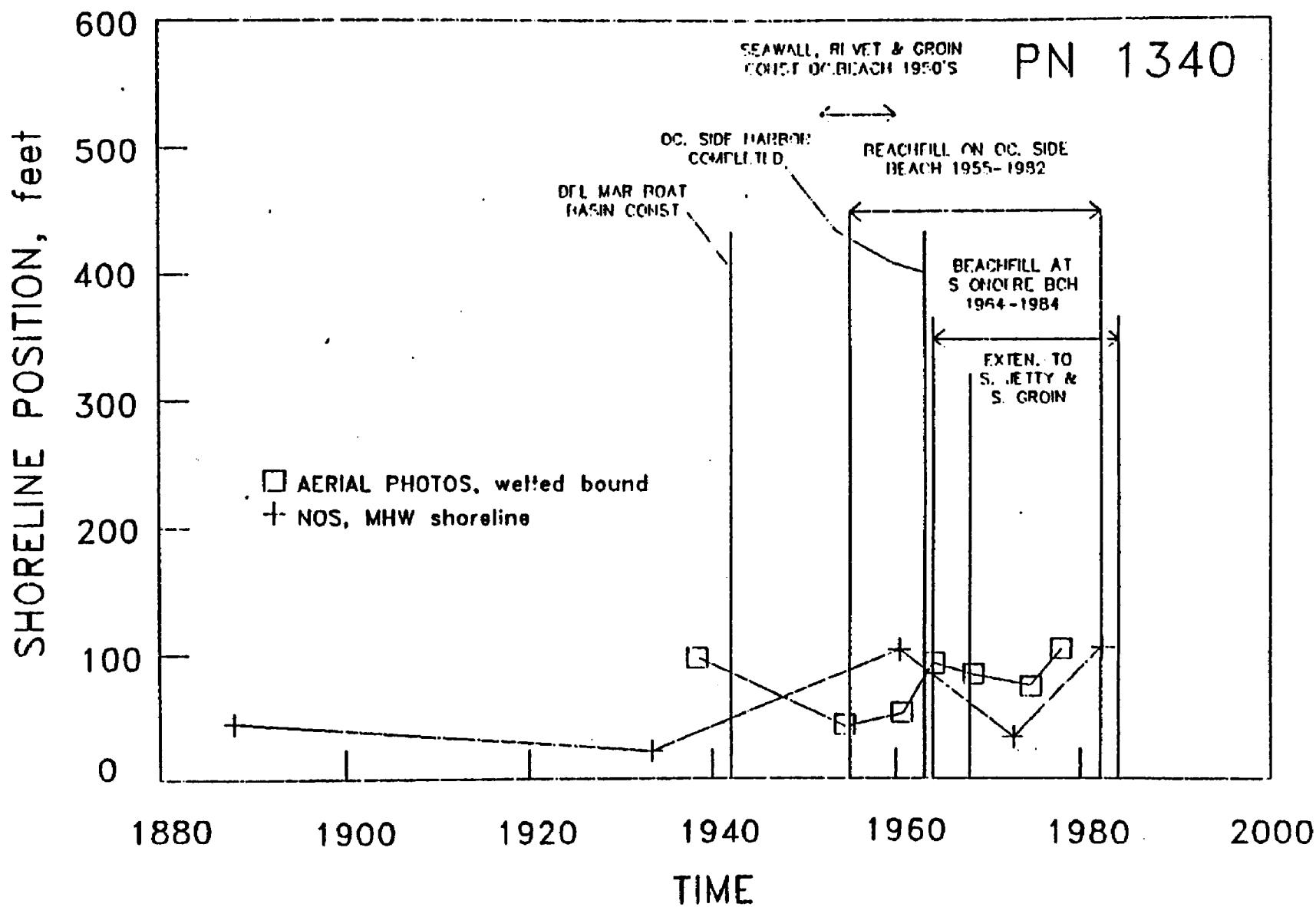


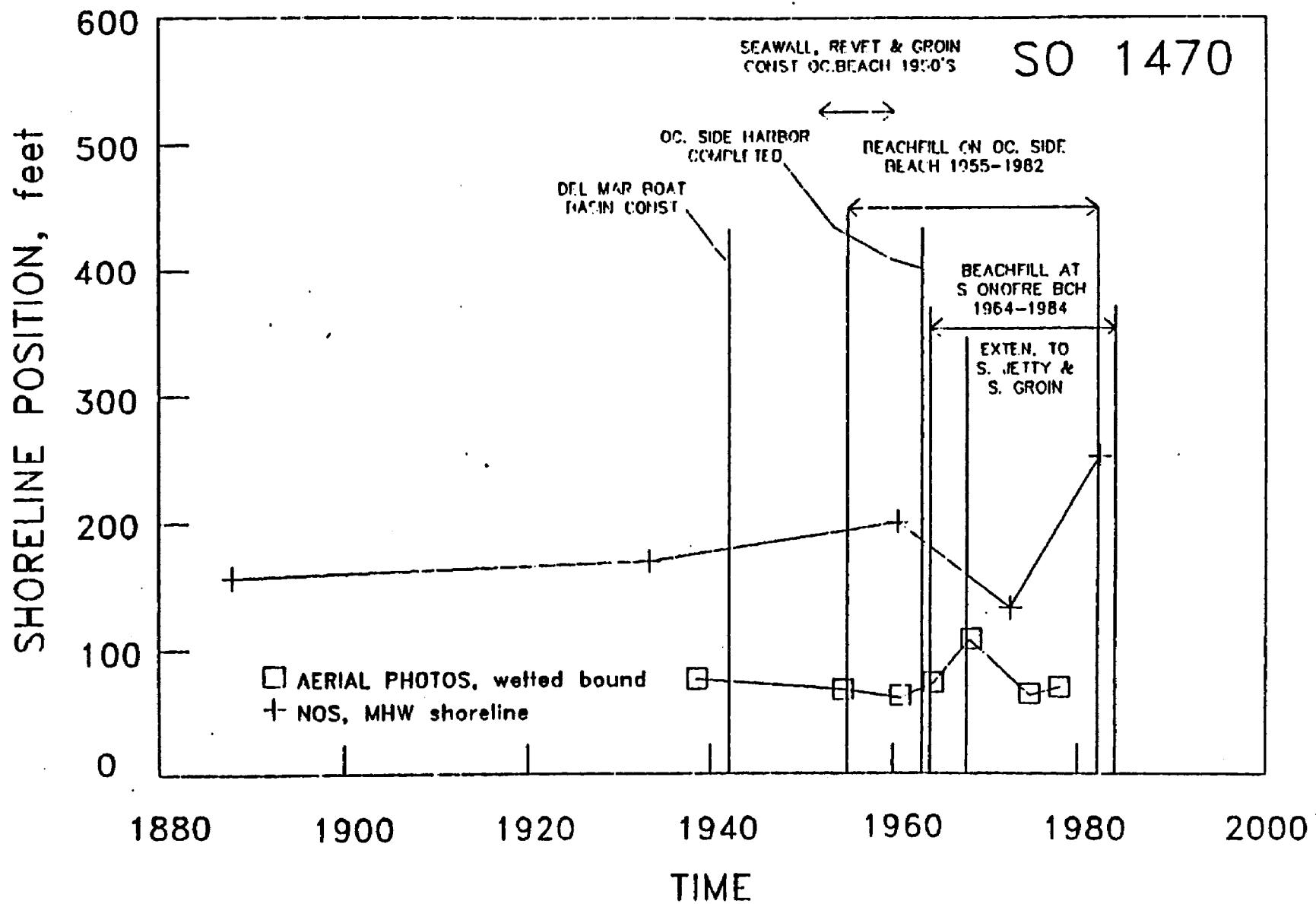




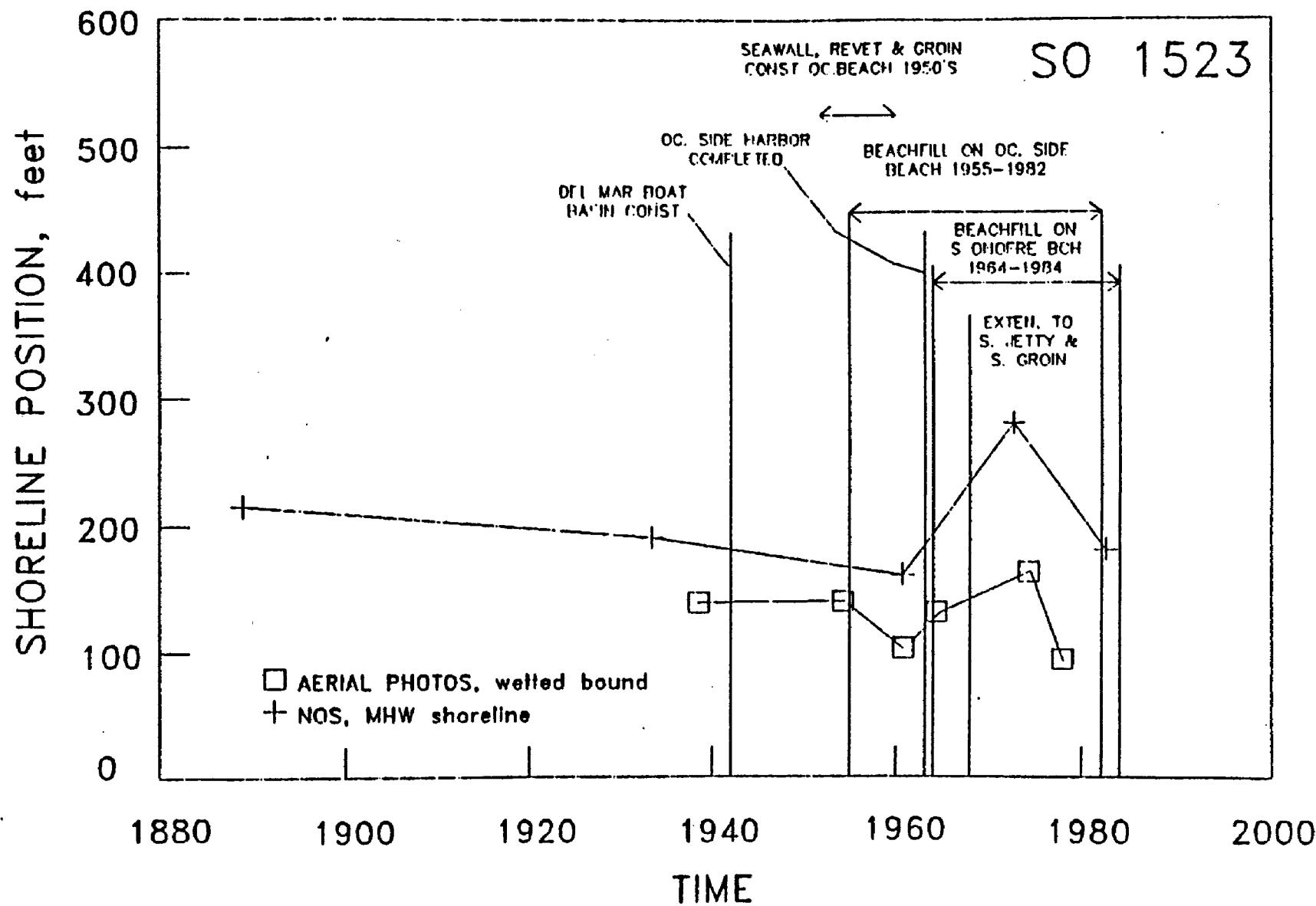
E-46

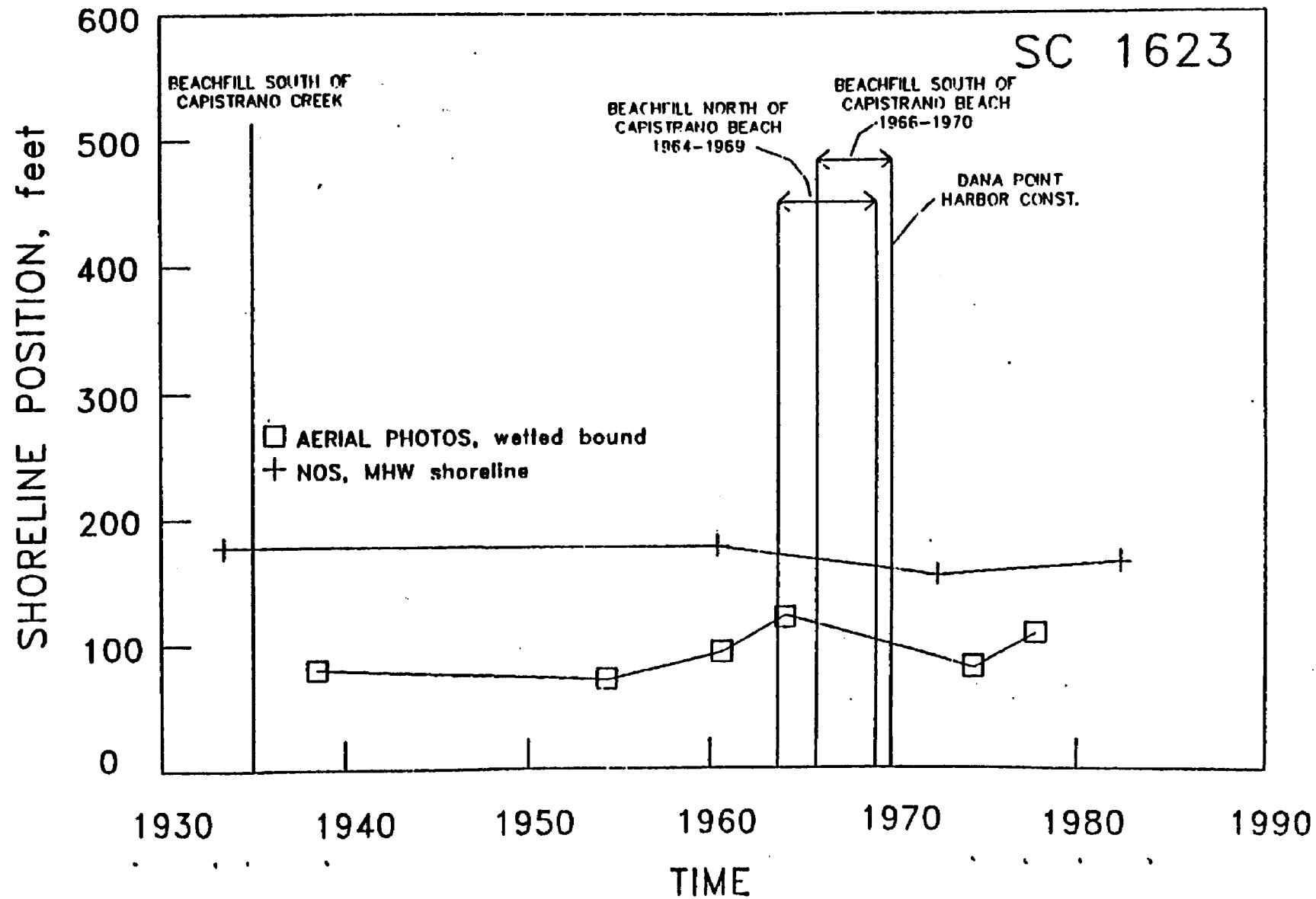


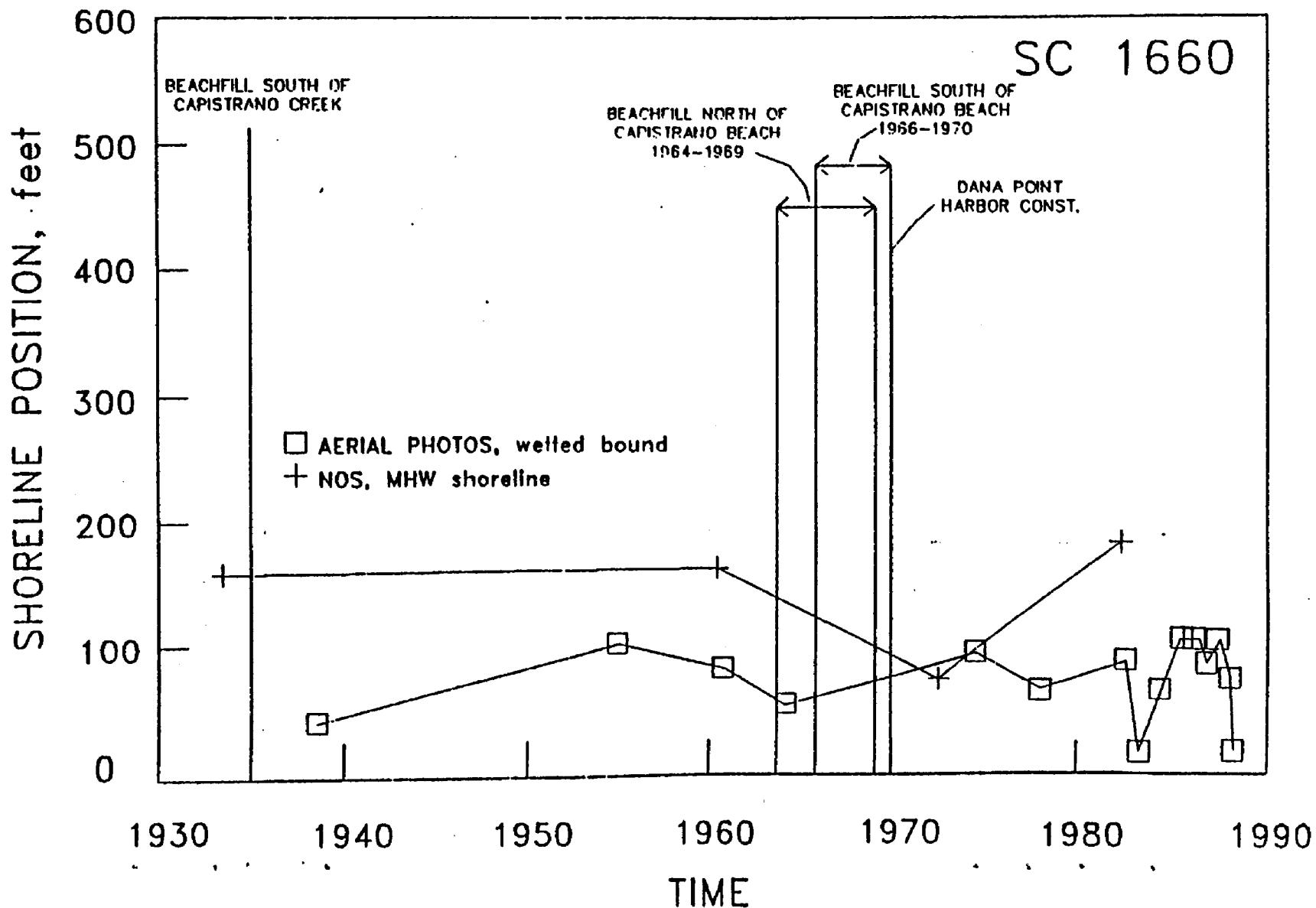


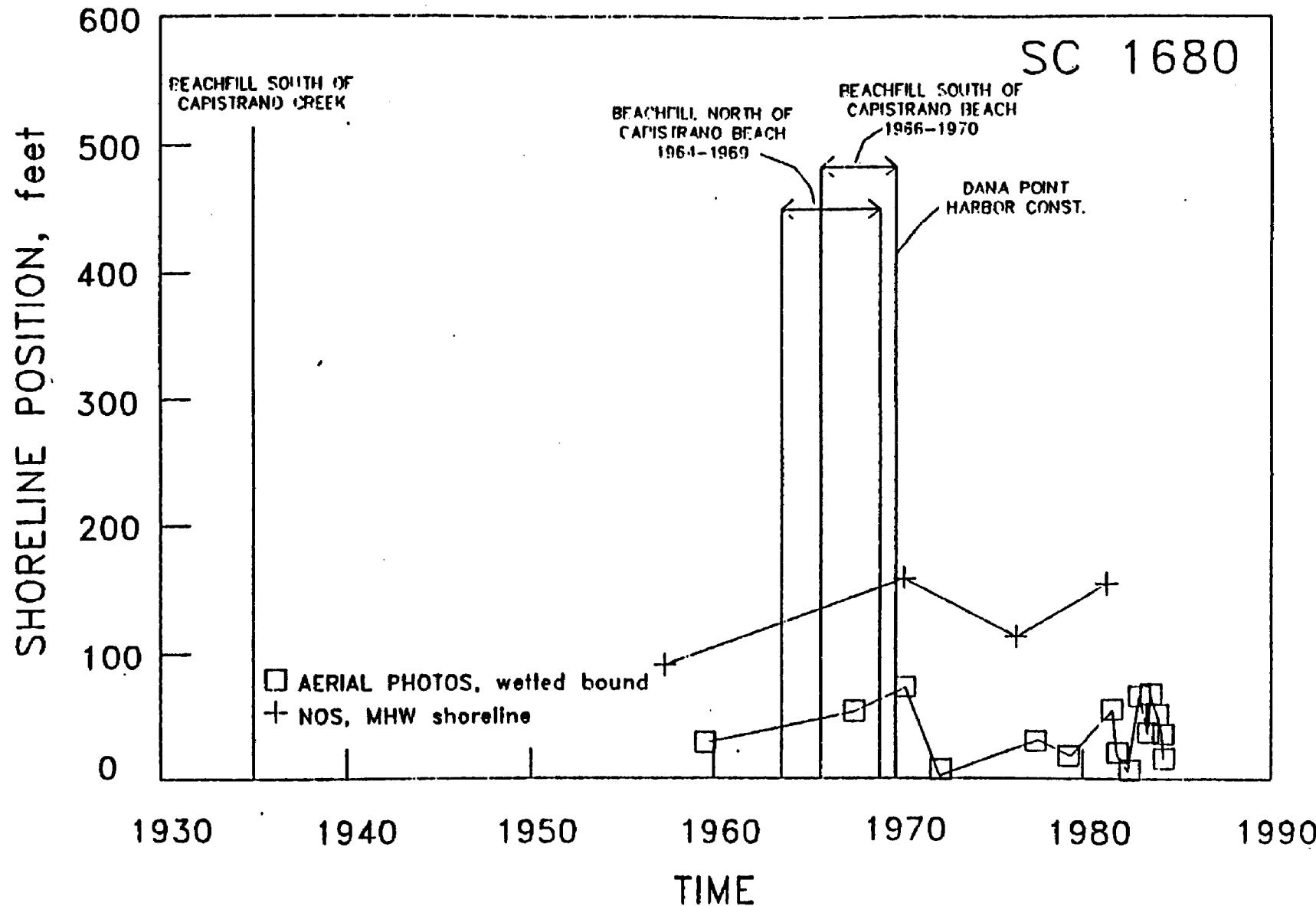


E-49

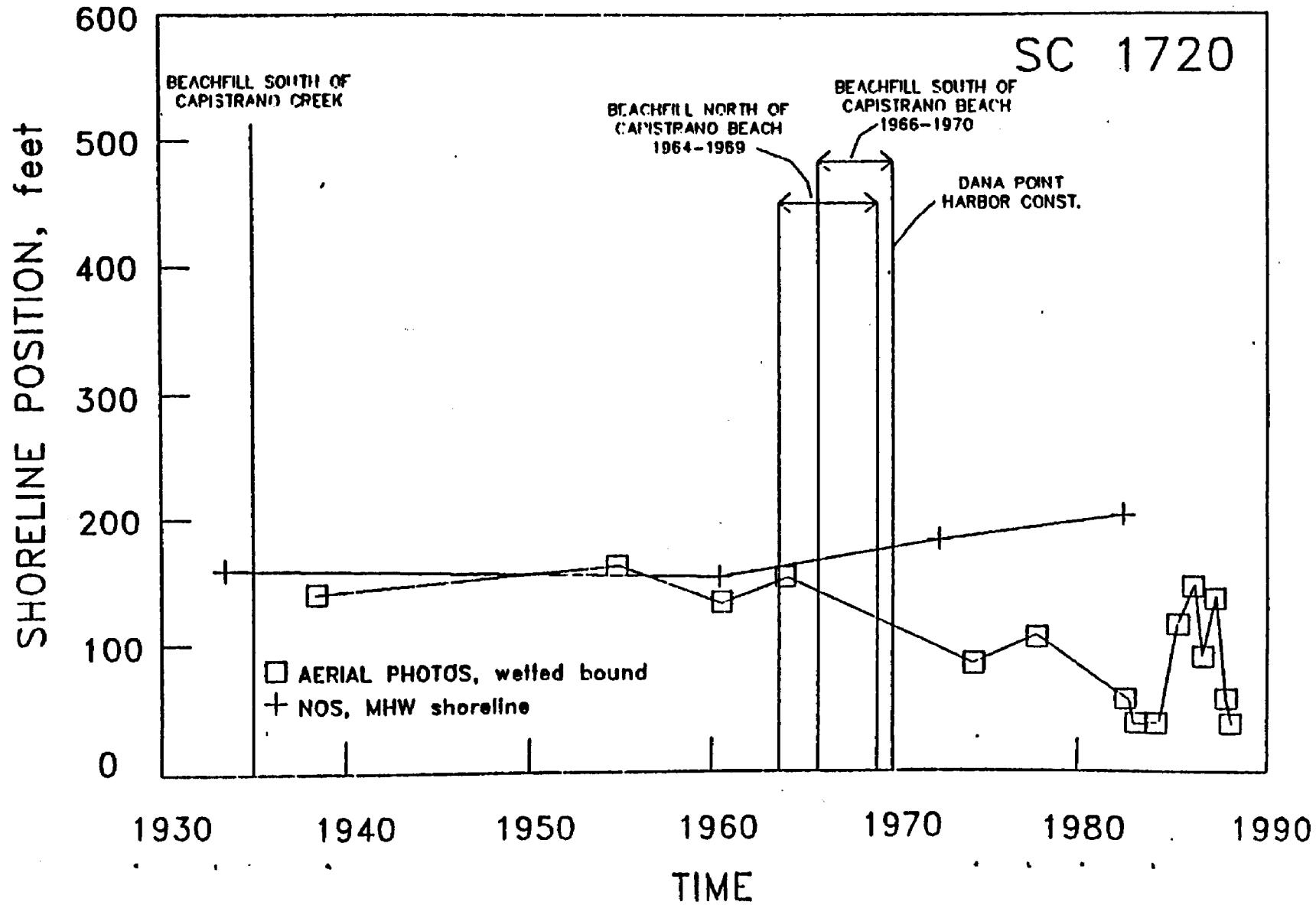


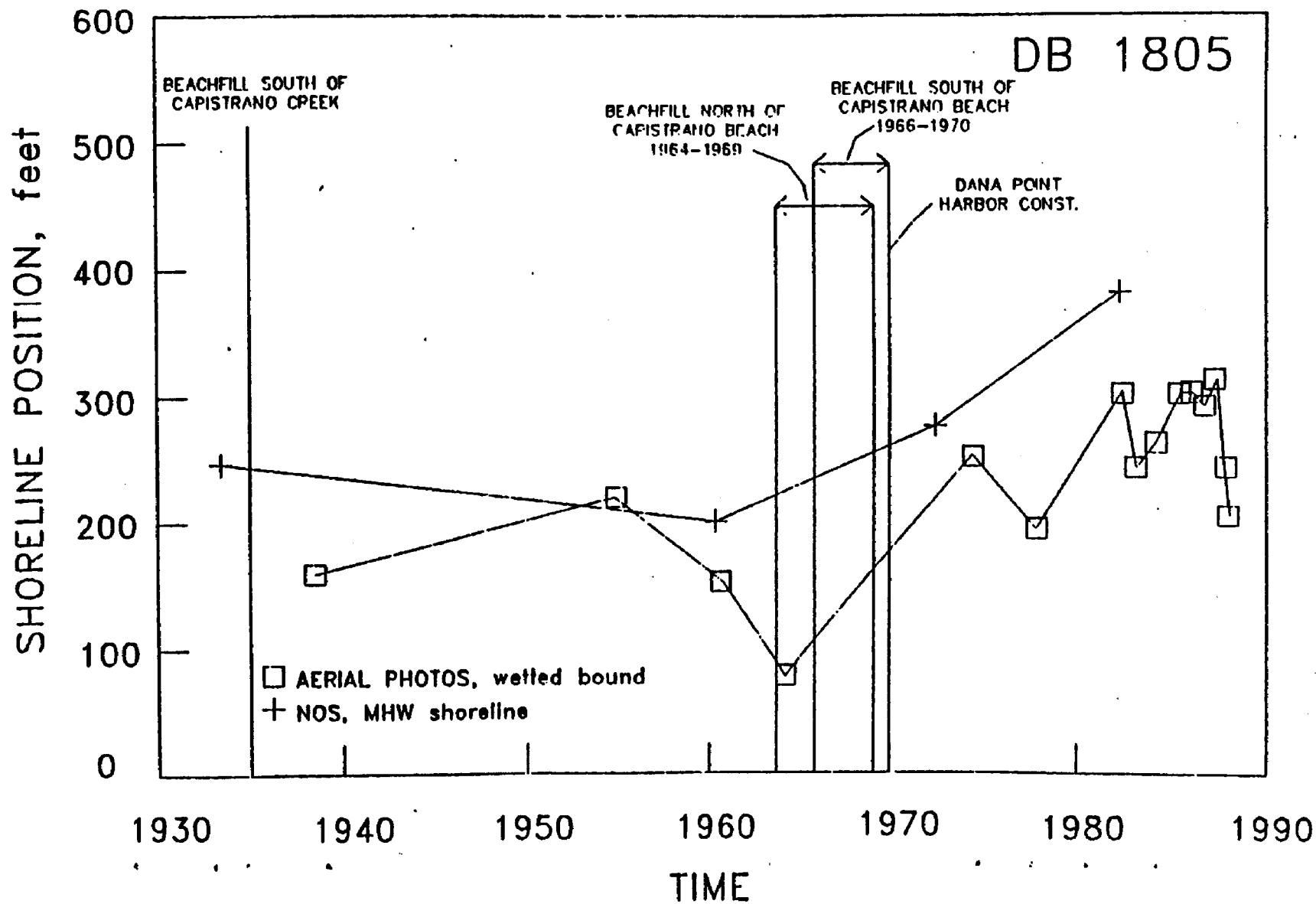




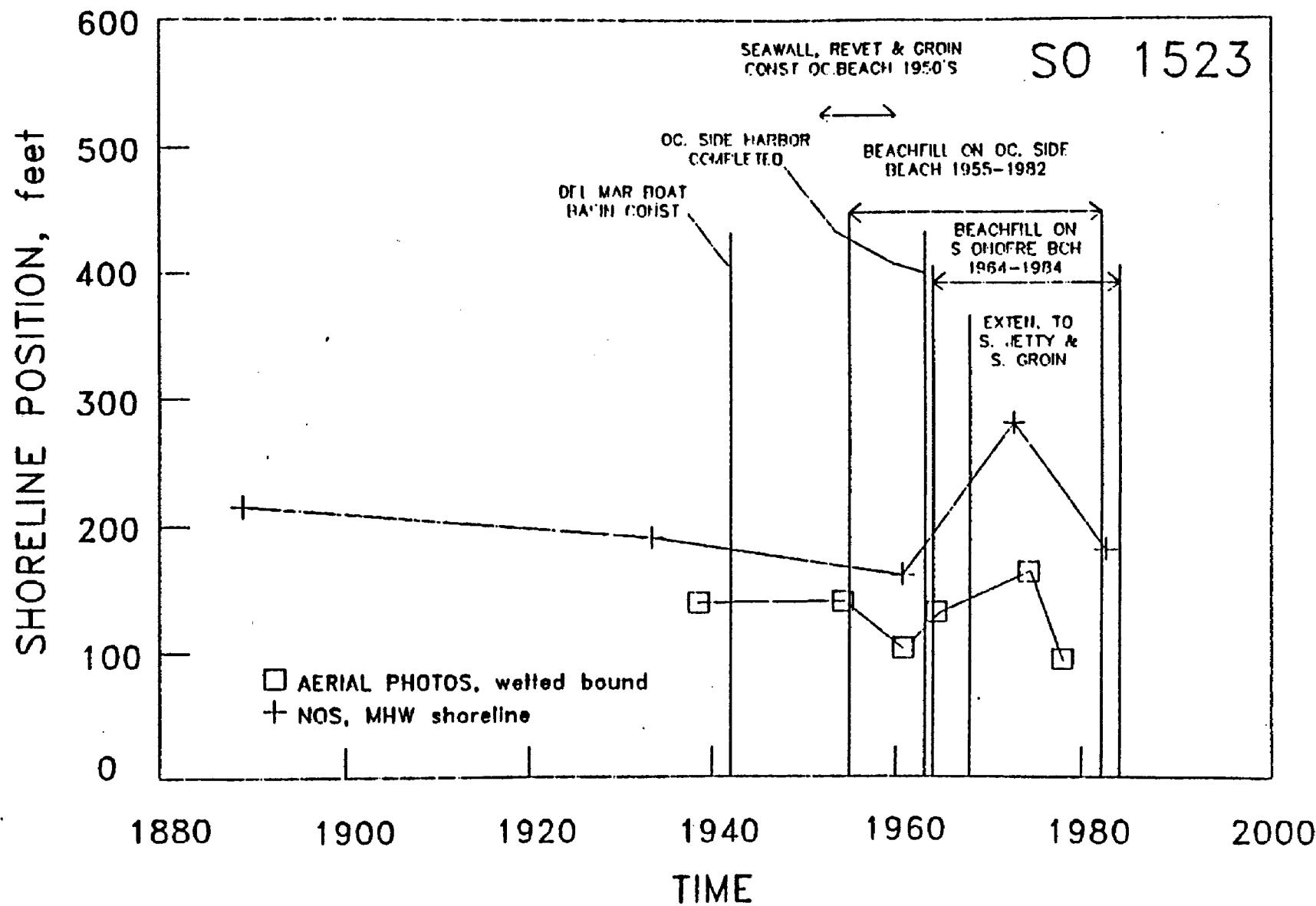


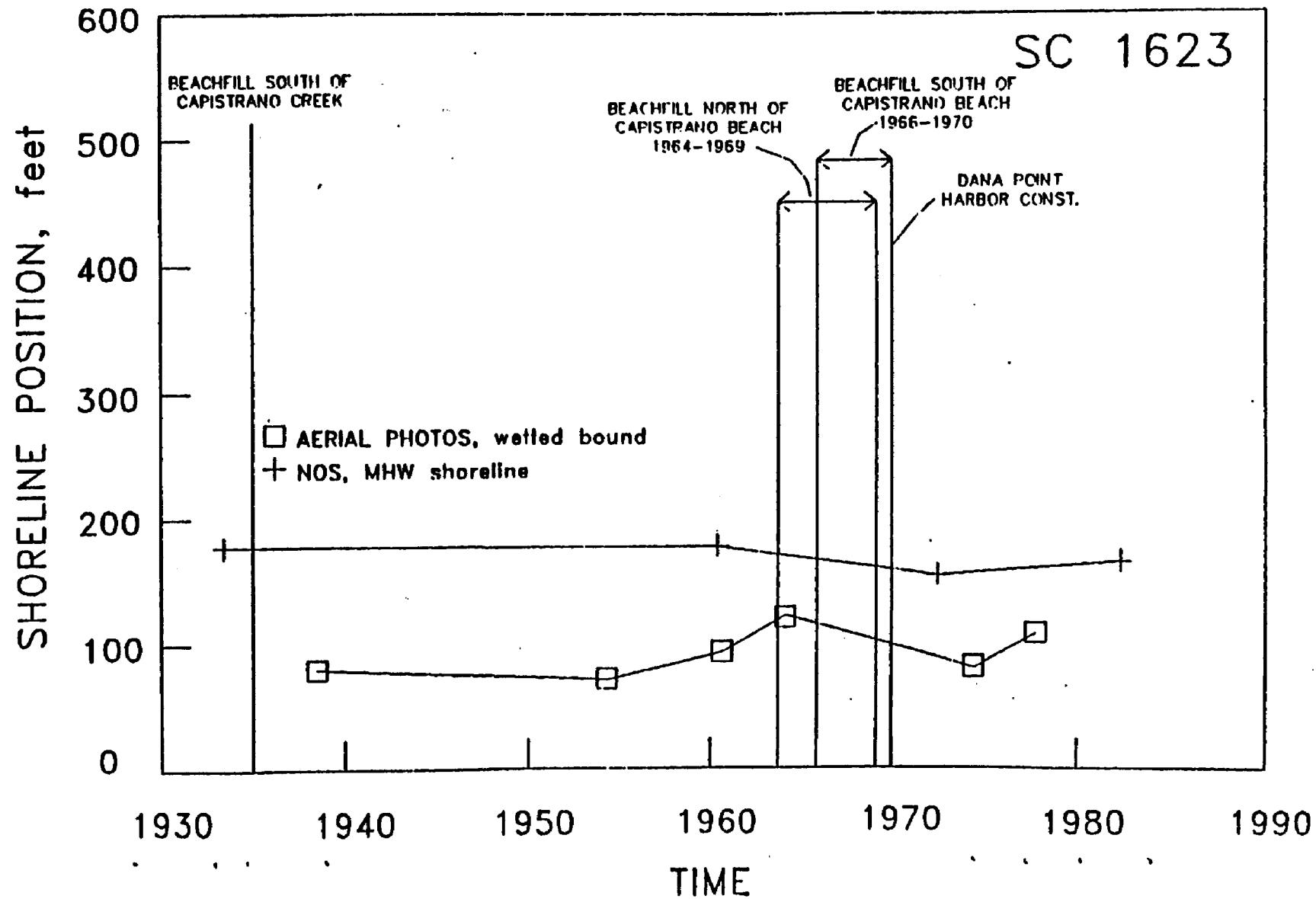
E-53

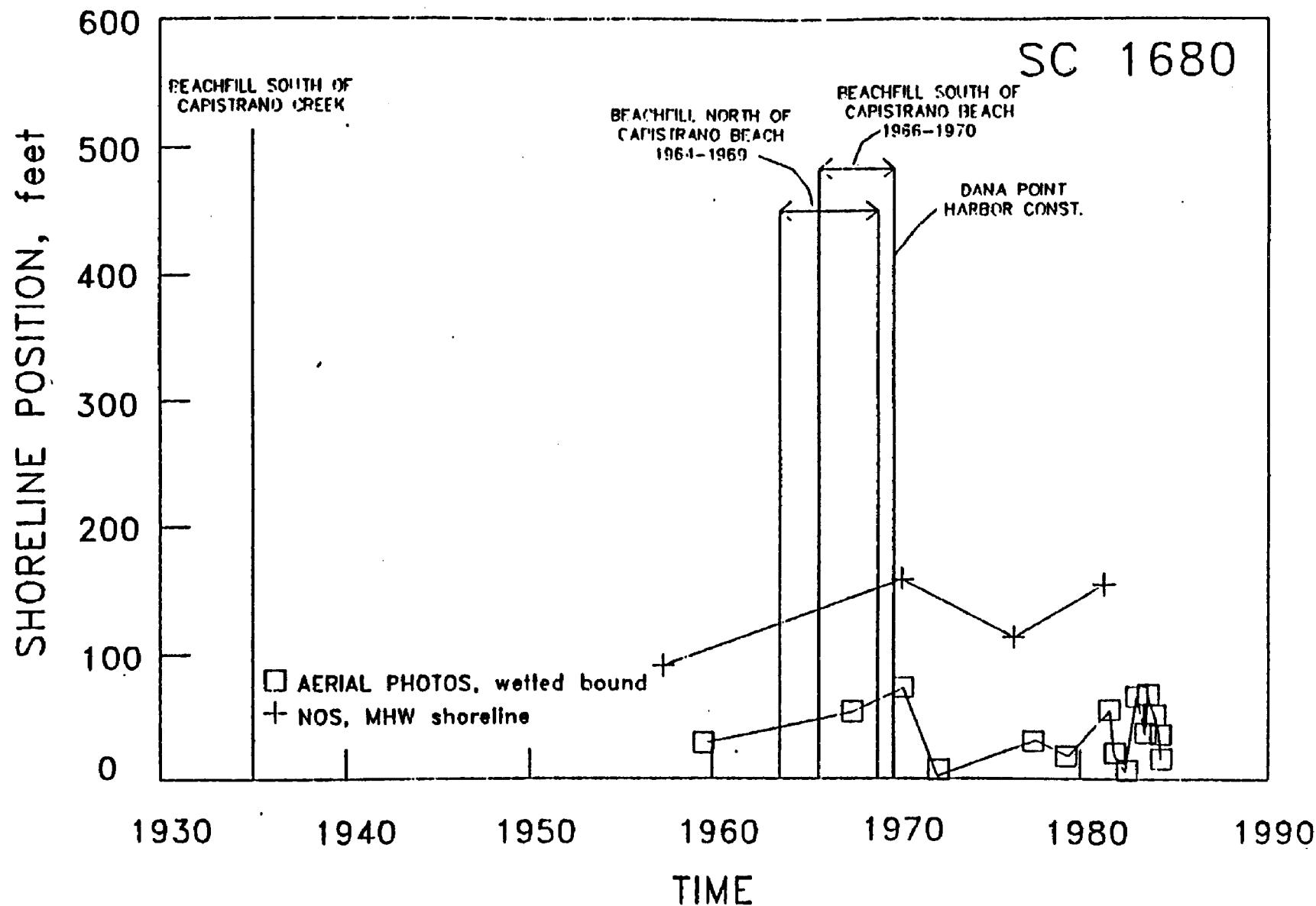




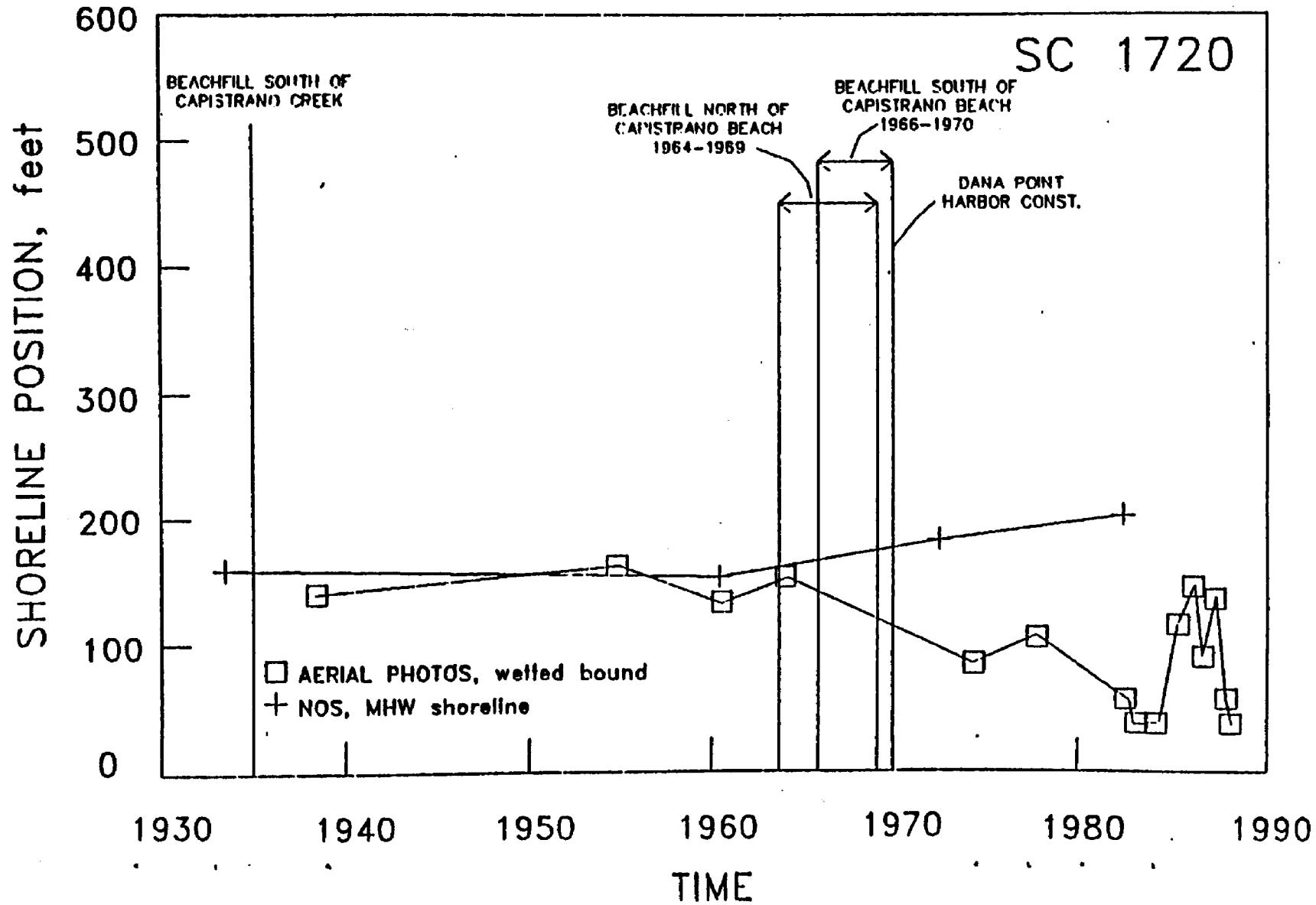
E-49

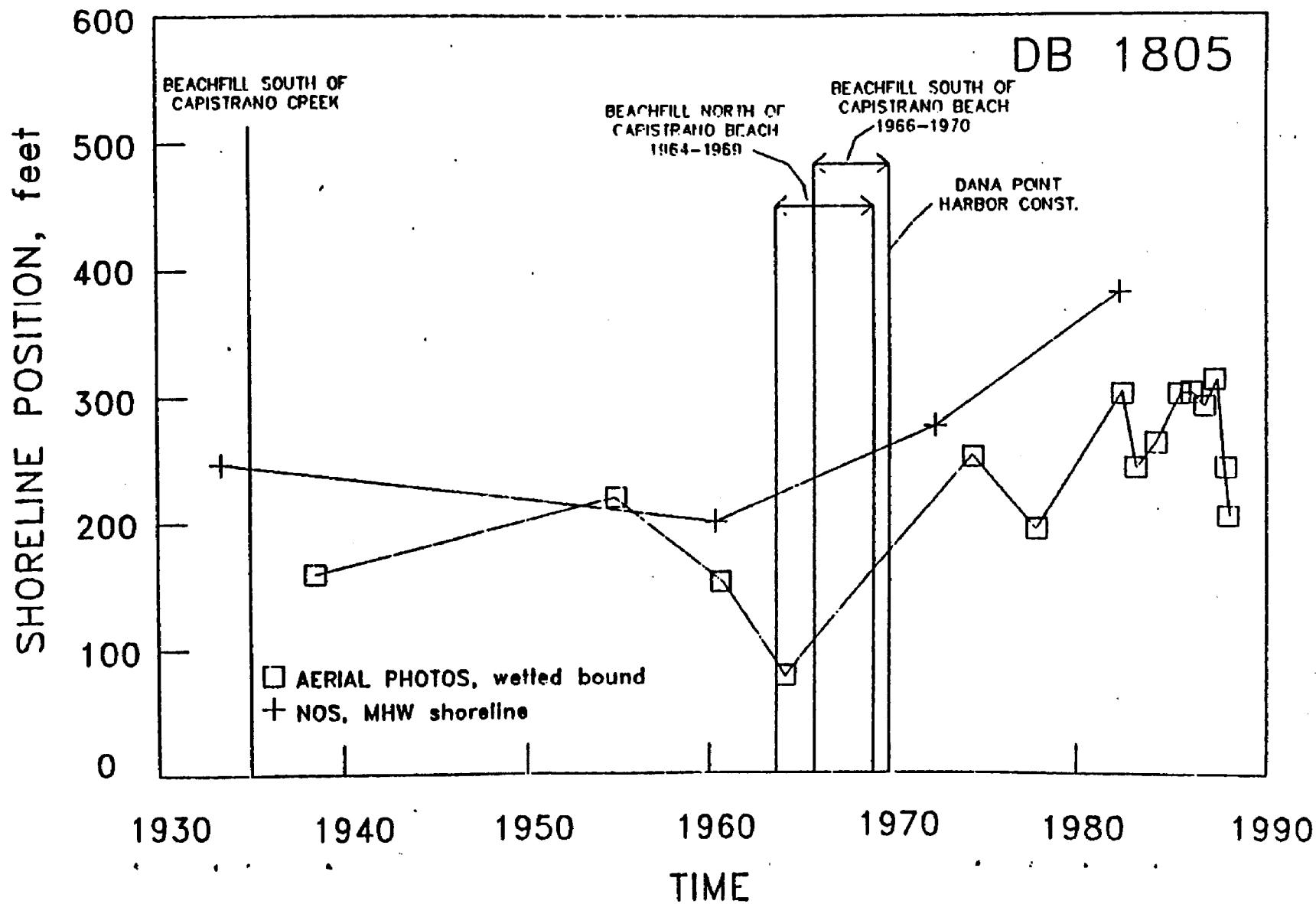


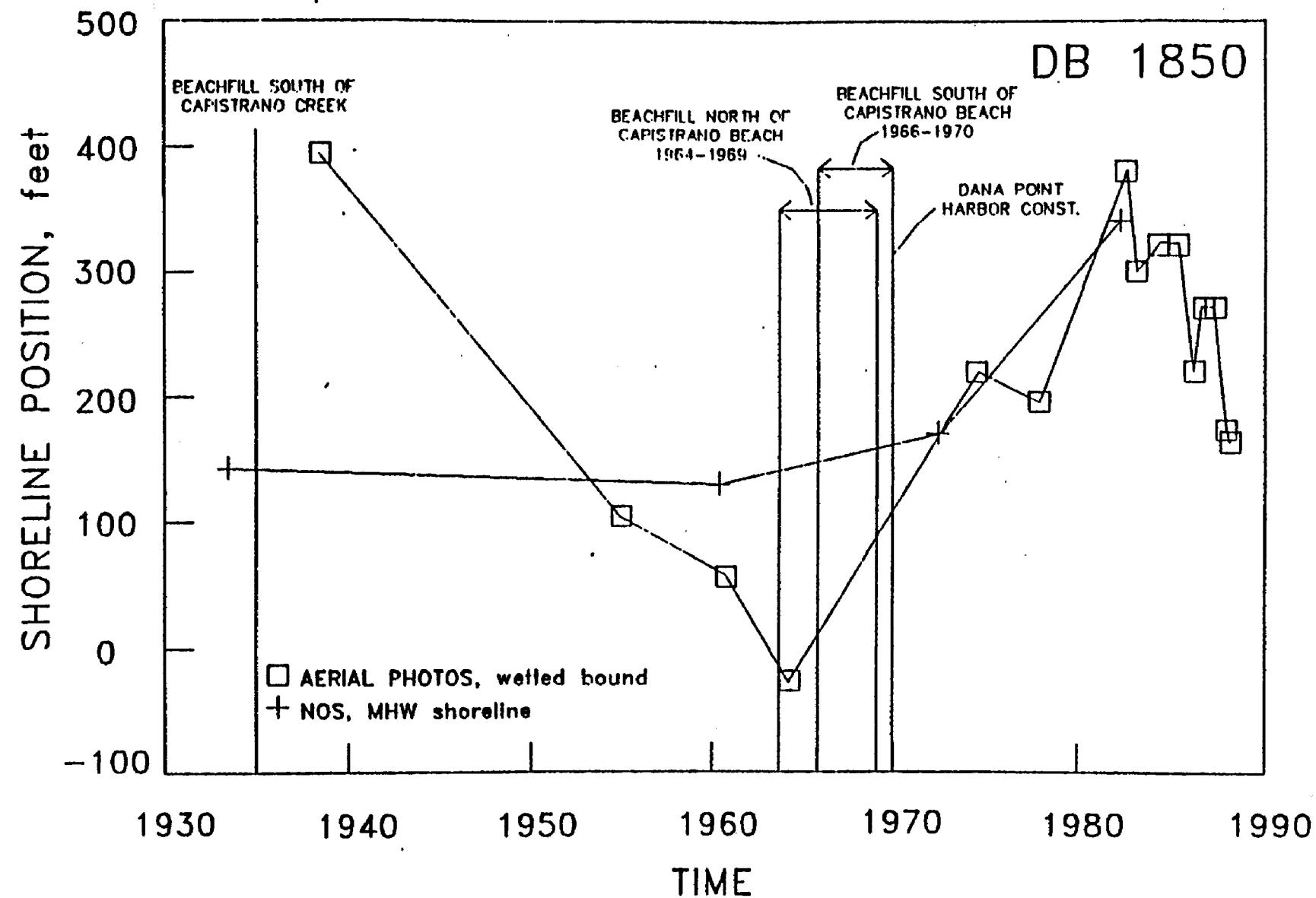




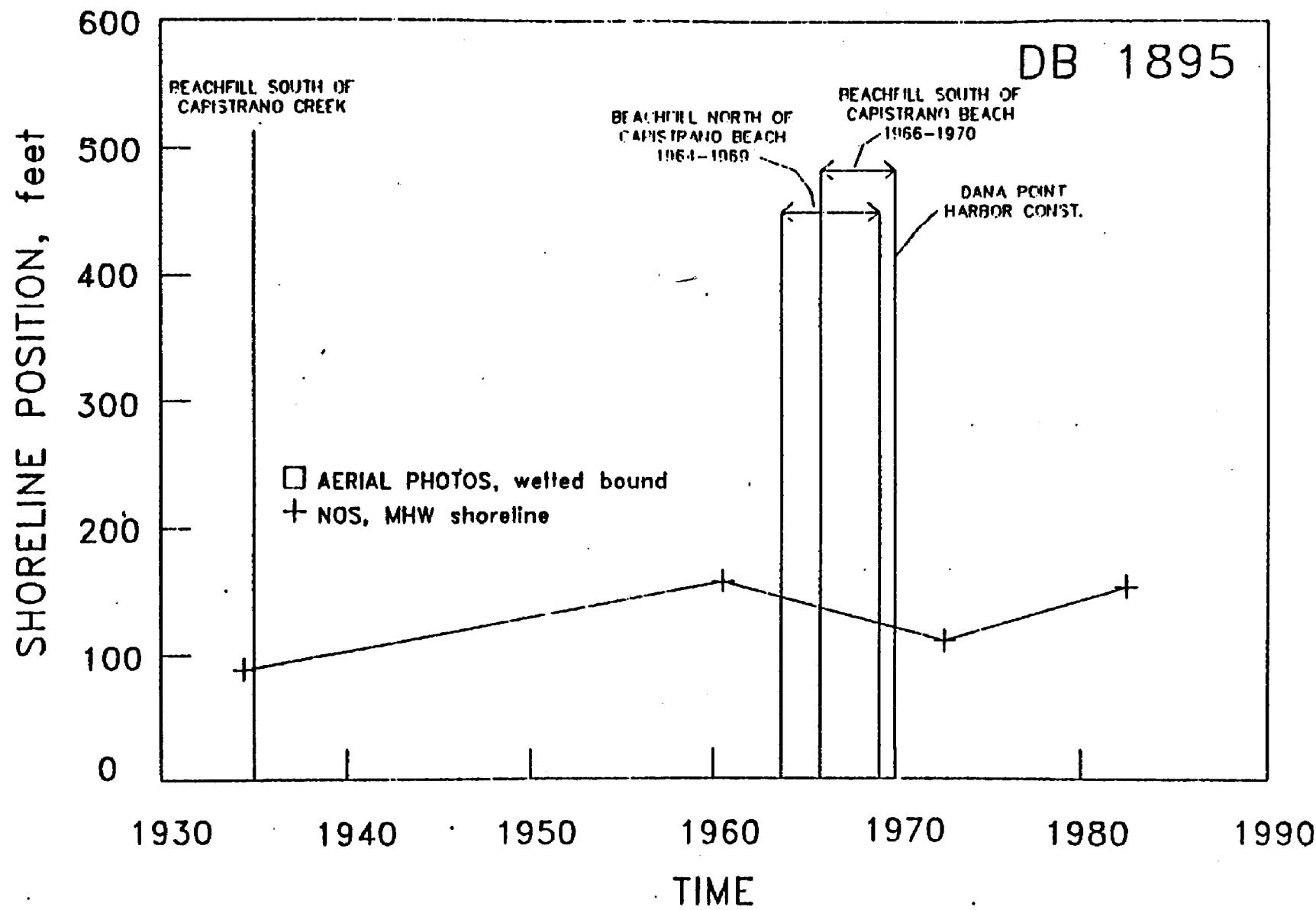
E-53



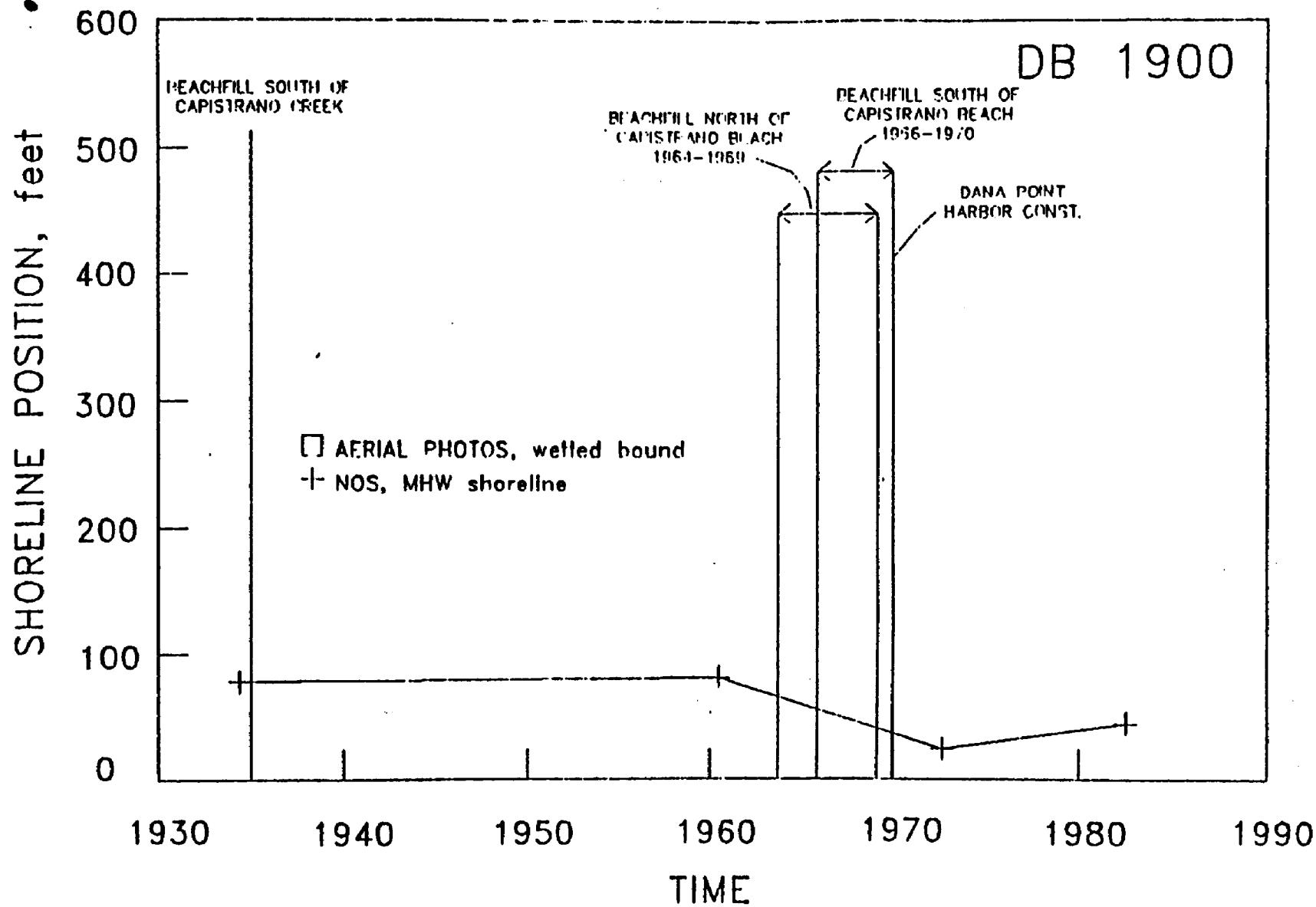




95-3



L5-E





APPENDIX F

TABULATIONS FOR SEDIMENT VOLUME CHANGE ALONG COE PROFILES

Notes:

1. Profiles locations are given in Figures 3.1 and 3.2 of Chapter 3 and Appendix A.

2. delta = seasonal volume change

max = maximum observed seasonal sediment accretion in accretion (in Y^3/ft)

min = Minimum observed seasonal sediment erosion (in Y^3/ft)

SILVER STRAND CELL - SEASONAL VOLUME CHANGES (CU YD/lin. ft)

SS 3	max =	24.23	max =	34.85	max =	42.68	max =	3.61	max =	16.52
	min =	-29.1	min =	-40.59	min =	-135.4	min =	-62.75	min =	-49.15

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
MAR 1969	-1.64		-2.62		-0.29		-13.47			
OCT 1983	10.72	-1.04	14.46	-3.5						
FEB 1984	9.68	14.39	10.96	21.88						
SEP 1984	24.07		32.84							
JUN 1985	23.33	-17.81	34.11	-29.37						
APR 1986	5.52	15.94	4.74	26.94	-34.23	42.68	24	3.61	-8.55	-7.97
OCT 1986	21.46	-21.46	31.68	-31.68	8.45	-8.45	27.61	-27.61	-16.52	16.52
APR 1987	0	24.23	0	34.85	0	32.66	0	-9.4	0	-49.15
SEP 1987	24.23	-29.1	34.85	-40.59	32.66	-135.4	-9.4	-62.75	-49.15	-25.46
JAN 1988	-4.87		-5.74		-102.74		-72.15		-74.61	
NOV 1989	33.03		43.55							

SS 5	max =	12.81	max =	19.29	max =	64.93	max =	25.72	max =	25.5
	min =	-40.88	min =	-52.05	min =	-102.04	min =	-39.54	min =	-83.52

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
FEB 1984	-13.57		-15.74							
DEC 1984	-1.57		0.27							
APR 1986	-6.61	4.94	-7.74	10.55	10.43	7.86	42.57	-39.54	58.02	-83.52
OCT 1986	-1.67	1.67	2.81	-2.81	18.29	-18.29	3.03	-3.03	-25.5	25.5
APR 1987	0	12.81	0	19.29	0	64.93	0	25.72	0	17.2
SEP 1987	12.81	-40.88	19.29	-52.05	64.93	-102.04	25.72	-17.04	17.2	-24.87
JAN 1988	-28.07		-32.76		-37.11		8.68		-7.67	
NOV 1989	5.78		13.7							

SS 7	max =	8.9	max =	15.22	max =	-23.13	max =	29.65	max =	48.58
	min =	-19.6	min =	-28.81	min =	-39.54	min =	-57.58	min =	-43.36

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
FEB 1984	16.41	8.9	22.56	15.22						
SEP 1984	25.31		37.78							
JUN 1985	20.93		31							
OCT 1986	19.6	-19.6	28.81	-28.81	39.54	-39.54	-29.65	29.65	-48.58	48.58
APR 1987	0	-13.86	0	-20.81	0	-23.13	0	-57.58	0	-43.36
SEP 1987	-13.86		-20.81		-23.13		-57.58		-43.36	
NOV 1989	7.71		15.5							

April 1987 is common reference dateline for volume difference calculations

SILVER STRAND CELL- SEASONAL VOLUME CHANGES (CU YD/lin. ft)

SS 15	max =	18.98	max =	28.38	max =	42.57	max =	100.14
	min =	-16.34	min =	-23	min =	-20.77	min =	-131.25

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
MAY 1965	20.33		33.13		142.08		406.6			
MAR 1973	17.14		32.12		103.76		162.22			
JUN 1975	14.69		33.86		190.62		416.39			
NOV 1983	-0.34		0.51							
FEB 1984	0.46	18.98	3.05	28.38						
SEP 1984	19.44		31.43							
JUN 1985	20.35	-15.32	27.61	-23						
APR 1986	5.03	11.31	4.61	17.25	25.67	-20.77	31.11	-131.25		
SEP 1986	16.34	-16.34	21.86	-21.86	4.9	-4.9	-100.14	100.14		
APR 1987	0	16.09	0	23.61	0	42.57	0	-12.94		
SEP 1987	16.09		23.61		42.57		-12.94			
NOV 1989	12.5		18.08							

SS 35	max =	19.21	max =	34.33	max =	75.63	max =	25.64
	min =	-23.09	min =	-39.08	min =	-90.74	min =	-175.49

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
OCT 1983	22.25	-13.34	36.54	-23.71	121.7	-37.44				
MAR 1984	8.91	10.63	12.83	16.48	84.26	8.88				
OCT 1984	19.54		29.31		93.14					
JUN 1985	9.65	-5.77	15.73	-10.98						
APR 1986	3.88	19.21	4.75	34.33	32.6	58.14	199.98	-24.49		
SEP 1986	23.09	-23.09	39.08	-39.08	90.74	-90.74	175.49	-175.49		
APR 1987	0	14.85	0	25.2	0	75.63	0	25.64		
SEP 1987	14.85	-18.01	25.2	-26.75	75.63	-71.08	25.64	15.81		
JAN 1988	-3.16		-1.55		4.55		41.45			
NOV 1989	25.44		37.88							

April 1987 is common reference dateline for volume difference calculations

SILVER STRAND CELL- SEASONAL VOLUME CHANGES (CU YD/lin. ft)

SS 50	max =	17.76	max =	27.93	max =	87.53	max =	70.41	max =	57.39
	min =	-13	min =	-21.35	min =	-68.88	min =	-55.09	min =	-11.72
DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
MAR 1954	48.56		74.46		259.53		405.9			
DEC 1956	54.94		86.68		228.03		300.54		332.11	
OCT 1959	46.15		74.94		216.65		252.9			
APR 1962	11.32	4.36	21.86	12.23	147.96	21.64	274.93	-21.8		
AUG 1962	15.68		34.09		169.6		253.13		285.49	
APR 1965	45.6		72.56		214.5		337.93		441.53	
SEP 1967	68.67		107.44		264.47		381.36			
MAR 1973	39.29		62.72		208.32		365.63			
JUN 1975	13.26		28.67		156.67		346.24		524.09	
MAR 1978	19.43		23.97		10.4		-45.71			
FEB 1979	13.78		18.32		27.93		-57.18			
JAN 1984	-6.54		-7.22		-2.22		-165.43			
MAR 1984	1.25	-3.88	1.63	-1.01	42.66	-68.88				
AUG 1984	-2.63	6.14	0.62	6.69	-26.22	87.53	-209.86			
FEB 1985	3.51	6.04	7.31	8.95	61.31					
JUN 1985	9.55	-6.06	16.26	-10.78						
APR 1986	3.49	9.51	5.48	15.87	30.18	26.05	69.03	-13.94	6.26	5.46
OCT 1986	13	-13	21.35	-21.35	56.23	-56.23	55.09	-55.09	11.72	-11.72
APR 1987	0	17.76	0	27.93	0	71.98	0	70.41	0	57.39
SEP 1987	17.76		27.93		71.98		70.41		57.39	
NOV 1989	23.36		35.81							

SS 77	max =	15.05	max =	18.58	max =	42.09	max =	23.67	max =	33.03
	min =	-12.73	min =	-16.42	min =	-0.91	min =	-23.63	min =	-16.27
DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
OCT 1983	1.64		3.82		-41.44					
MAY 1984	3.89		6.46		-16.98					
OCT 1984	7.65		13.44		11.76					
JUN 1985	-4.63	2.31	0.18	-2.34						
APR 1986	-2.32	15.05	-2.16	18.58	-77.99	42.09	-28.92	5.25	-16.76	-16.27
OCT 1986	12.73	-12.73	16.42	-16.42	-35.9	35.9	-23.67	23.67	-33.03	33.03
APR 1987	0	10.9	0	17.29	0	-0.91	0	-23.63	0	3.74
SEP 1987	10.9		17.29		-0.91		-23.63		3.74	
NOV 1989	67.86		78.19							

April 1987 is common reference dateline for volume difference calculations

SILVER STRAND CELL- SEASONAL VOLUME CHANGES (CU YD/lin. ft)

SS 90	max =	6.58	max =	8.21	max =	38.68	max =	14.41	max =	48.01
	min =	-21.8	min =	-28.34	min =	-74.89	min =	-20.37	min =	-39.62

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
OCT 1983	-4.07	-2.65	-0.72	-5.35	-22.81	38.68	57.19			
MAR 1984	-6.72	6.58	-6.07	8.21	15.87	-6.03				
OCT 1984	-0.14		2.14		9.84					
JUN 1985	-3.53	5.88	-1.09	3.95						
APR 1986	2.35	4.59	2.86	8.16	-13.63	10.15	35.4	-15.03	58.3	-39.62
OCT 1986	6.94	-6.94	11.02	-11.02	-3.48	3.48	20.37	-20.37	18.68	-18.68
APR 1987	0	1.96	0	5.6	0	11.26	0	14.41	0	48.01
SEP 1987	1.96	-21.8	5.6	-28.34	11.26	-74.89	14.41	-5.49	48.01	-38.07
JAN 1988	-19.84		-22.74		-63.63		8.92		9.94	
NOV 1989	5.09		14.25							

SS 125	max =	14.7	max =	16.42	max =	16.14	max =	1.16	max =	40.82
	min =	-11.28	min =	-13.13	min =	-22.57	min =	-37.07	min =	-88.03

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
JAN 1984	3.1	-11.28	3.29	-13.13	42.29	-22.57				
MAY 1984	-8.18	5.52	-9.84	6.84	19.72	16.14				
DEC 1984	-2.66	-4.57	-3	-4.36	35.86					
JUN 1985	-7.23	14.7	-7.36	16.42						
APR 1986	7.47	-2.01	9.06	-3.11	5.91	-8.66	56.96	-37.07	47.21	-88.03
OCT 1986	5.46	-5.46	5.95	-5.95	-2.75	2.75	19.89	-19.89	-40.82	40.82
APR 1987	0	8.21	0	9.46	0	4.43	0	1.16	0	19.81
SEP 1987	8.21		9.46		4.43		1.16		19.81	
NOV 1989	28.42		31.04							

SS 160	max =	24.04	max =	40.67	max =	63.06	max =	56.51
	min =	-21.07	min =	-36.83	min =	-16.84	min =	-38.05

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
OCT 1983	-16.21	-3.02	-18.36	-6.34	-100.12	63.06				
MAR 1984	-19.23	19	-24.7	31.21	-37.06	-2.18				
OCT 1984	-0.23		6.51		-39.24					
JUN 1985	3.07	-21.07	10.73	-36.83						
APR 1986	-18	24.04	-26.1	40.67	-41.6	8.58	-18.46	-38.05		
OCT 1986	6.04	-6.04	14.57	-14.57	-33.02	33.02	-56.51	56.51		
APR 1987	0	9.98	0	19.69	0	-16.84	0	-20.56		
SEP 1987	9.98	-17.25	19.69	-29.29	-16.84	-0.05	-20.56	43.61		
JAN 1988	-7.27		-9.6		-16.89		23.05			
NOV 1989	12.98		26.29							

April 1987 is common reference dateline for volume difference calculations

SILVER STRAND CELL- SEASONAL VOLUME CHANGES (CU YD/lin. ft)

SS 180	max =	18.18	max =	31.2	max =	47.98
	min =	-14.11	min =	-24.29	min =	-57.54

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
OCT 1983	-6.29	17.76	1.65	15.77	46.58	-21.26				
MAR 1984	11.47	-6.36	17.42	-4.64	25.32	13.53				
OCT 1984	5.11		12.78		38.85					
JUN 1985	7.39	-14.11	16.59	-24.29						
APR 1986	-6.72	18.18	-7.7	31.2	9.56	47.98				
OCT 1986	11.46	-11.46	23.5	-23.5	57.54	-57.54				
APR 1987	0	10.7	0	16.7	0	35.08				
SEP 1987	10.7		16.7		35.08					

SS 200	max =	6.64	max =	11.37	max =	69.78
	min =	-7.95	min =	-14.36	min =	-42.36

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
MAR 1984	8.25	-6.61	14.02	-10.5						
OCT 1984	1.64		3.52							
JUN 1985	4.44	-3.13	8.68	-5.69						
APR 1986	1.31	6.64	2.99	11.37	70.96	-28.6				
OCT 1986	7.95	-7.95	14.36	-14.36	42.36	-42.36				
APR 1987	0	5.58	0	10.16	0	69.78				
SEP 1987	5.58		10.16		69.78					
NOV 1989	20.5		34.79							

April 1987 is common reference dateline for volume difference calculations

MISSION BAY CELL- SEASONAL VOLUME CHANGES (CU YD/Lin. ft)

OB 230	max =	28.92	max =	38.33	max =	21.66	max =	57.16	max =	80.09
	min =	-35.11	min =	-50.79	min =	-36.69	min =	-56.8	min =	-36.92
DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
APR 1951	-60.74		-82.14		-233.21		-165.35		-270.13	
MAR 1954	-55.3		-72.28		-177.66		-343.21			
JUL 1955	-26.79		-8.66		-47.95		-153.84			
APR 1957	4.4		15.97		37.3					
FEB 1966	-30.31		-39.9		-133.98		-105.66			
JUL 1970	-24.01		-28.7		-90.15		-7.87			
JUN 1972	-28.46	-11.17	-34.24	-18.31	-109.66	-36.69	-191.74	-56.8		
APR 1973	-39.63		-52.55		-146.35		-248.54			
MAR 1977	-22.02		-30.63		-112.76		-133.22		-191.72	
OCT 1983	30.84	-35.11	44.59	-50.79						
APR 1984	-4.27	13.84	-6.2	21.34						
OCT 1984	9.57		15.14							
JUN 1985	0.09	-10.61	4.65	-16.82						
APR 1986	-10.52	28.92	-12.17	38.33	-26.98	21.66	11.92	-26.43	23.68	-36.92
OCT 1986	18.4	-18.4	26.16	-26.16	-5.32	5.32	-14.51	14.51	-13.24	13.24
APR 1987	0	15.76	0	23.73	0	2.08	0	57.16	0	80.09
SEP 1987	15.76	-16.99	23.73	-22.23	2.08	7.14	57.16	21.64	80.09	26.31
JAN 1988	-1.23		1.5		9.22		78.8		106.4	
DEC 1989	18.63		26.24							

MB 310	max =	13.41	max =	20.76	max =	28.31	max =	54.92		
	min =	-12.13	min =	-19.02	min =	-4.07	min =	-43.07		
DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
JUL 1940	0	0.79		-8.13		134.72				
JUN 1949	-2.85		-2.56		16.18		194.47			
APR 1951	22		32.03		44.2		134.47			
JUL 1955	21.95		37.15		55.25		138.35			
JUN 1972	28.09		40.13		28.07		29.81			
MAR 1977	26.38		35.16		77.47		157.86			
OCT 1983	3.27	4.26	6.38	3.99	-20.64	21.86				
APR 1984	7.53	10.58	10.37	14.7	1.22	25.86				
OCT 1984	18.11		25.07		27.08					
JUN 1985	13.63	-12.13	20.95	-19.02						
APR 1986	1.5	8.95	1.93	13.66	-8.42	-4.07	34.1	-43.07		
OCT 1986	10.45	-10.45	15.59	-15.59	-12.49	12.49	-8.97	8.97		
APR 1987	0	13.41	0	20.76	0	28.31	0	54.92		
SEP 1987	13.41		20.76		28.31		54.92			
DEC 1989	23.65		34.49							

April 1987 is common reference dateline for volume difference calculations

MISSION BAY CELL - SEASONAL VOLUME CHANGES (CU YD/lin. ft)

MB 340	max =	13.36	max =	22.09	max =	34.18	max =	30.44	max =	47.33
	min =	-15.39	min =	-28.6	min =	-70.91	min =	-30.68	min =	-0.43

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
JUL 1940	0		0.78		-45.04		13.35			
JUN 1949	17.18		24.97		46.25		68		135.47	
APR 1951	16.46		23.2		11.89		44.83		93.77	
APR 1957	13.12		16.18		22.4		-57.11		-72.39	
JUN 1972	10.05		15.59		-16.53		-73.24			
OCT 1983	14.96	-14.27	29.7	-28.6	53.54	-64.72				
APR 1984	0.69	10.17	1.1	15.14	-11.18	34.18				
OCT 1984	10.86		16.24		23					
JUN 1985	10.51	-9.59	18.07	-17.07						
APR 1986	0.92	6.19	1	10.9	-35.44	13.05	-3.83	-5.8	-3.92	4.35
OCT 1986	7.11	-7.11	11.9	-11.9	-22.39	22.39	-9.63	9.63	0.43	-0.43
APR 1987	0	13.36	0	22.09	0	31.27	0	30.44	0	47.33
SEP 1987	13.36	-15.39	22.09	-25.01	31.27	-70.91	30.44	-30.68	47.33	0.64
JAN 1988	-2.03		-2.92		-39.64		-0.24		47.97	
DEC 1989	19.43		28.66							

MB 384	max =	10.28	max =	15.86	max =	45.28	max =	78.16	max =	104.36
	min =	-8.59	min =	-15.18	min =	-41.05	min =	-100.87	min =	-113.82

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
JUN 1972	0.65		0.28		-58.25		-129.79			
OCT 1983	0		0.29		-38.63					
MAY 1984	-6.26		-12.4		-42.99					
OCT 1984	9.51		13.46		14.71					
JUN 1985	4.77	-8.59	8.46	-15.18						
APR 1986	-3.82	10.28	-6.72	15.86	-4.23	-41.05	22.71	-100.87	9.46	-113.82
OCT 1986	6.46	-6.46	9.14	-9.14	-45.28	45.28	-78.16	78.16	-104.36	104.36
APR 1987	0	9.53	0	14.09	0	10.06	0	-20.95	0	-29.97
SEP 1987	9.53		14.09		10.06		-20.95		-29.97	
DEC 1989	18.48		25.26							

PB 408	max =	5.7	max =	6.59	max =	11.09	max =	44.42	max =	77.48
	min =	-4.89	min =	-6.12	min =	-8.25	min =	-49.44	min =	-57.82

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
NOV 1983	-3.17		-2.58							
APR 1984	-3.77	0.53	-5.18	2.76						
OCT 1984	-3.24		-2.42							
JUN 1985	-5.42	5.7	-7.28	6.59						
APR 1986	0.28	-4.89	-0.69	-4.8	3.11	-8.25	5.02	-49.44	-19.66	-57.82
OCT 1986	-4.61	4.61	-5.49	5.49	-5.14	5.14	-44.42	44.42	-77.48	77.48
APR 1987	0	-4.86	0	-6.12	0	11.09	0	26.84	0	18.83
SEP 1987	-4.86	1.34	-6.12	4.37	11.09	10.09	26.84	17.23	18.83	15.69
JAN 1988	-3.52		-1.75		21.18		44.07		34.52	
DEC 1989	-4.18		-1.01							

April 1987 is common reference dateline for volume difference calculations

OCEANSIDE CELL- SEASONAL VOLUME CHANGES (CU YD/lin. ft)

LJ 443	max =	0.46	max =	3.52	max =	17.95	max =	10.56	max =	-3.41
	min =	-0.51	min =	-2.65	min =	-25.7	min =	-50.24	min =	-98.38

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
JUN 1984	0.41		2.63							
OCT 1984	0.65		4.48							
JUN 1985	0.39	-0.34	1.64	-2.65						
APR 1986	0.05	0.46	-1.01	3.52	1.9	-19.85	39.68	-50.24	101.79	-98.38
OCT 1986	0.51	-0.51	2.51	-2.51	-17.95	17.95	-10.56	10.56	3.41	-3.41
APR 1987	0	0.01	0	1.31	0	-25.7	0	-19.36	0	-10.56
SEP 1987	0.01		1.31		-25.7		-19.36		-10.56	
DEC 1989	5.02		10.69							

LJ 445	max =	8.37	max =	10.88	max =	9.27	max =	6.7		
	min =	-7.37	min =	-12.69	min =	-33.36	min =	-25.13		

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
JUL 1984	6.16		9.19		13.98					
OCT 1984	9.19		11.14		0.96					
JUN 1985	6.54	-4.92	9.22	-3.97						
APR 1986	1.62	2.34	5.25	3.01	24.09	-33.36	18.43	-25.13		
OCT 1986	3.96	-3.96	8.26	-8.26	-9.27	9.27	-6.7	6.7		
APR 1987	0	8.37	0	10.88	0	-7.76	0	-7.72		
SEP 1987	8.37	-7.37	10.88	-12.69	-7.76	-0.82	-7.72	-4.79		
JAN 1988	1		-1.81		-8.58		-12.51			
DEC 1989	7.44		6.91							

LJ 450	max =	6.77	max =	14.92	max =	16.77	max =	17.38	max =	19.56
	min =	-0.79	min =	-3.6	min =	-23.07	min =	-44.08	min =	-52.2

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
OCT 1983	-3.35		0.77		-14.01					
MAY 1984	-5.23		-8.75		5.03					
OCT 1984	-0.11		1.35		13.06					
APR 1986	-5.98	6.77	-11.32	14.92	6.3	-23.07	26.7	-44.08	32.64	-52.2
OCT 1986	0.79	-0.79	3.6	-3.6	-16.77	16.77	-17.38	17.38	-19.56	19.56
APR 1987	0	1.85	0	3.78	0	-8.99	0	-8.03	0	-1.94
SEP 1987	1.85		3.78		-8.99		-8.03		-1.94	
DEC 1989	3.86		8.46							

April 1987 is common reference dateline for volume difference calculations

OCEANSIDE CELL- SEASONAL VOLUME CHANGES (CU YD/lin. ft)

LJ 460	max =	10.42	max =	17.4	max =	14.27	max =	18.33	max =	24.07
	min =	-10.1	min =	-19.21	min =	-73.51	min =	-35.09	min =	15.89

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
OCT 1983	2.94	-5.85	6.9	-14.28	-12.75	-34				
APR 1984	-2.91	2.48	-7.38	8.67	-46.75	12.26				
OCT 1984	-0.43		1.29		-34.49					
JUN 1985	-1.56	1.24	-1.97	2.63						
APR 1986	-0.32	10.42	0.66	17.4	17.03	-12.43	24.16	-35.09		
OCT 1986	10.1	-10.1	18.06	-18.06	4.6	-4.6	-10.93	10.93	-15.89	15.89
APR 1987	0	5.48	0	12.64	0	14.27	0	18.33	0	24.07
SEP 1987	5.48	-7.9	12.64	-19.21	14.27	-73.51	18.33	-8.65	24.07	
JAN 1988	-2.42		-6.57		-59.24			9.68		
DEC 1989	6.67		10.16							

TP 470	max =	14.24	max =	21.38	max =	28.14	max =	19.16	max =	25.78
	min =	-16.01	min =	-26.43	min =	-67.4	min =	19.16	min =	25.78

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
NOV 1983	1.17	-1.59	2.99	-4.33						
MAY 1984	-0.42		-1.34							
OCT 1984	12.04		16.45							
JUN 1985	7.59	-10.42	16.65	-26.43						
APR 1986	-2.83		-9.78		-48.23		-11.22		-12.56	
APR 1987	0	14.24	0	21.38	0	28.14	0	19.16	0	25.78
SEP 1987	14.24	-16.01	21.38	-26.32	28.14	-67.4	19.16		25.78	
JAN 1988	-1.77		-4.94		-39.26					
DEC 1989	21.45		34.98							

TP 520	max =	4.23	max =	11.21	max =	48.89	max =	26.02	max =	29.67
	min =	-3.17	min =	-8.84	min =	-22.5	min =	-30.46	min =	-42.2

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
OCT 1983	0.56		5.29		14.69					
MAY 1984	-1.24	1.68	1.43	6.26	13.14	31				
NOV 1984	0.44	-0.76	7.69	-4.23	44.14					
JUN 1985	-0.32	0	3.46	-5.27						
APR 1986	-0.32	3.49	-1.81	10.65	-0.44	22.94	17.9	-30.46	20.05	-42.2
OCT 1986	3.17	-3.17	8.84	-8.84	22.5	-22.5	-12.56	12.56	-22.15	22.15
APR 1987	0	4.23	0	11.21	0	48.89	0	26.02	0	29.67
SEP 1987	4.23		11.21		48.89		26.02		29.67	
DEC 1989	7.92		14.64							

April 1987 is common reference dateline for volume difference calculations

OCEANSIDE CELL- SEASONAL VOLUME CHANGES (CU YD/lin. ft)

TP 530	max =	14.29	max =	22.48	max =	44.4	max =	35.94	max =	48.07
	min =	-11.9	min =	-19.89	min =	-71.74	min =	-30.08	min =	-41.55

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
JUL 1984	2.06	0.72	5.33	0.33						
NOV 1984	2.78	0.49	5.66	3.62	21.38					
JUN 1985	3.27	-1.92	9.28	-8.27						
APR 1986	1.35	6.09	1.01	10.95	-20.33	6.68	39.37	-30.08	44.86	-41.55
OCT 1986	7.44	-7.44	11.96	-11.96	-13.65	13.65	9.29	-9.29	3.31	-3.31
APR 1987	0	14.29	0	22.48	0	44.4	0	35.94	0	48.07
SEP 1987	14.29	-11.9	22.48	-19.89	44.4	-71.74	35.94	-22.2	48.07	-2.64
JAN 1988	2.39		2.59		-27.34		13.74		45.43	
DEC 1989	12.98		18.93							

TP 540	max =	3.87	max =	8.54	max =	18.44	max =	13.36	max =	16.56
	min =	-2.83	min =	-4.41	min =	4.68	min =	-36.6	min =	-40.69

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
JAN 1934	0		2.8		-1.93		-70.72		-62.11	
APR 1957	17.09		24.74		53.37		30.89			
JUN 1984	1.31		2.86							
OCT 1984	-1.22		-0.96							
JUN 1985	-0.82	2.18	1.08	-0.39						
APR 1986	1.36	1.47	0.69	3.72	-30.16	11.72	23.24	-36.6	24.13	-40.69
OCT 1986	2.83	-2.83	4.41	-4.41	-18.44	18.44	-13.36	13.36	-16.56	16.56
APR 1987	0	3.87	0	8.54	0	4.68	0	-18.48	0	-19.44
SEP 1987	3.87		8.54		4.68		-18.48		-19.44	

DM 560	max =	8.75	max =	12.36	max =	44.05	max =	42.46	max =	44.56
	min =	-9	min =	-15.26	min =	-28.24	min =	-78.7	min =	-87.52

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
OCT 1984	2.46		3.58							
JUN 1985	7.24	-9	11.44	-15.26						
APR 1986	-1.76	8.75	-3.82	12.36	-15.81	-28.24	36.24	-78.7	42.96	-87.52
OCT 1986	6.99	-6.99	8.54	-8.54	-44.05	44.05	-42.46	42.46	-44.56	44.56
APR 1987	0	8.11	0	11.19	0	-10.34	0	-28.15	0	-14.5
SEP 1987	8.11		11.19		-10.34		-28.15		-14.5	

April 1987 is common reference dateline for volume difference calculations

OCEANSIDE CELL- SEASONAL VOLUME CHANGES (CU YD/lin. ft)

DM 580	max =	15.33	max =	24.49	max =	53.39	max =	43.57	max =	59.2
	min =	-13.62	min =	-22.87	min =	-82.42	min =	-24.93	min =	-30.93

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
OCT 1983	5.06		10.01		50.53					
MAY 1984	1.15	13.56	0.7	22.94	8.27	37.98				
NOV 1984	14.71	-4.74	23.64	-6.83	46.25					
JUN 1985	9.97	-11.78	16.81	-19.37						
APR 1986	-1.81	15.33	-2.56	24.49	-6.74	32.48	35.47	-24.93	27.56	-30.93
OCT 1986	13.52	-13.52	21.93	-21.93	25.74	-25.74	10.54	-10.54	-3.37	3.37
APR 1987	0	10.63	0	17.87	0	53.39	0	43.57	0	59.2
SEP 1987	10.63	-13.62	17.87	-22.87	53.39	-82.42	43.57			
JAN 1988	-2.99		-5		-29.03					
DEC 1989	20.68		30.26							

DM 590	max =	0.35	max =	5.33	max =	25.5	max =	33.88	max =	52.35
	min =	-9.38	min =	-18.99	min =	-12.65	min =	-34.81	min =	-40.56

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
NOV 1984	9.19	-9.38	17.9	-18.99						
JUN 1985	-0.19	0.35	-1.09	-2.16						
APR 1986	0.16	-0.32	-3.25	5.33	1.17	-12.65	0.93	-34.81	-11.79	-40.56
OCT 1986	-0.16	0.16	2.08	-2.08	-11.48	11.48	-33.88	33.88	-52.35	52.35
APR 1987	0	0.02	0	2.35	0	25.5	0	27.69	0	29.82
SEP 1987	0.02		2.35		25.5		27.69		29.82	
DEC 1989	40.82		60.1							

SD 600	max =	9.16	max =	14.78	max =	28.91	max =	49.16	max =	28.66
	min =	-11.32	min =	-18.27	min =	-19.77	min =	-38.37	min =	-51.76

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
OCT 1983	7.43		13.3		22.55					
MAY 1984	-0.53	4.91	-0.66	7.82	12.54	0.17				
NOV 1984	4.38	-0.53	7.16	0.14	12.71	-19.77				
JUN 1985	3.85	-1.69	7.3	-3.81	-7.06	28.91				
APR 1986	2.16	9.16	3.49	14.78	21.85	-18.52	61.35	-38.37	76.26	-51.76
OCT 1986	11.32	-11.32	18.27	-18.27	3.33	-3.33	22.98	-22.98	24.5	-24.5
APR 1987	0	7.82	0	12.25	0	8.99	0	17.01	0	28.66
SEP 1987	7.82	-8.81	12.25	-13.63	8.99	-0.37	17.01	49.16	28.66	
JAN 1988	-0.99		-1.38		8.62		66.17			
DEC 1989	5.02		8.05							

April 1987 is common reference dateline for volume difference calculations

OCEANSIDE CELL- SEASONAL VOLUME CHANGES (CU YD/lin. ft)

SD 630	max =	12.03	max =	18.28	max =	31.93	max =	8.07	max =	21.24
	min =	-17.97	min =	-28.44	min =	-72.99	min =	-78.12	min =	-91.32

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
JAN 1934	-3.41		-8.07		-9.06		10.65		24.78	
APR 1957	-14.16		-23.21		-25.57		-38.35		-43.99	
OCT 1970	-4.04		-5.43		11.85		-22.22			
OCT 1983	2.16		5.65		26.09					
MAY 1984	-8.14	12.03	-14.15	18.28	-25.66	31.93				
NOV 1984	3.89	-5.71	4.13	-7.61	6.27					
JUN 1985	-1.82	-1.58	-3.48	-1.9						
APR 1986	-3.4	11.56	-5.38	18.2	15.76	-4.07	99.61	-21.49	107.56	-16.24
OCT 1986	8.16	-8.16	12.82	-12.82	11.69	-11.69	78.12	-78.12	91.32	-91.32
APR 1987	0	6.73	0	8.86	0	21.99	0	8.07	0	21.24
SEP 1987	6.73	-17.97	8.86	-28.44	21.99	-72.99	8.07		21.24	
JAN 1988	-11.24		-19.58		-51					
DEC 1989	4.34		4.33							

SD 670	max =	6.35	max =	13.29	max =	40.93	max =	19.03	max =	25.56
	min =	-4.33	min =	-10.96	min =	-14.93	min =	-48.64	min =	-53.63

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
JAN 1934	-1.17		0.04		24.85		11.98		1.8	
APR 1957	-14.05		-15.92		19.92		32.66		72.3	
OCT 1983	4.69		11.92							
MAY 1984	-2.56		-0.56							
OCT 1984	-0.41		3.77							
JUN 1985	1.89	-1.16	6.14	-5.54						
APR 1986	0.73	3.6	0.6	10.36	-26	40.93	41.84	6.8	46	7.63
OCT 1986	4.33	-4.33	10.96	-10.96	14.93	-14.93	48.64	-48.64	53.63	-53.63
APR 1987	0	6.35	0	13.29	0	35.83	0	19.03	0	25.56
SEP 1987	6.35		13.29		35.83		19.03		25.56	
DEC 1989	2.34		3.12							

April 1987 is common reference dateline for volume difference calculations

OCEANSIDE CELL - SEASONAL VOLUME CHANGES (CU YD/lin. ft)

CB 720	max =	3.72	max =	8.5	max =	52.4	max =	43.82	max =	44.57
	min =	-2.73	min =	-6.49	min =	-87.54	min =	-54.85	min =	-71.86

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
JAN 1934	0		2.27		53.67		59.55		39.79	
APR 1957	-18.34		-16.59		50.24		40.26		-9.41	
OCT 1970	8.24		20.77		109.07		160.82		177.76	
FEB 1981	-17.98		-17.25		-3.02		6.54		4.03	
JUN 1982	-12.57		-8.93		56.98		75.52		107.67	
OCT 1983	2.79		7.44		31.75					
MAY 1984	0.24	-0.14	-0.17	1.07	27.61	20.74				
NOV 1984	0.1	-2.73	0.9	-1.04	48.35					
JUN 1985	-2.63	3.29	-0.14	-0.01						
APR 1986	0.66	0.67	-0.15	5.88	26.19	0.56	107.38	-54.85	114.1	-71.86
OCT 1986	1.33	-1.33	5.73	-5.73	26.75	-26.75	52.53	-52.53	42.24	-42.24
APR 1987	0	3.72	0	8.5	0	52.4	0	43.82	0	44.57
SEP 1987	3.72	-1.78	8.5	-6.49	52.4	-87.54	43.82		44.57	
JAN 1988	1.94		2.01		-35.14					
DEC 1989	1.7		1.53							

CB 760	max =	1.71	max =	1.6	max =	13.68	max =	27.9	max =	32.74
	min =	-1.85	min =	-2.89	min =	5.31	min =	-23.59	min =	-19.36

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
OCT 1983	-2.3		-1.31							
MAY 1984	1.1	-0.36	0.95	1.6						
NOV 1984	0.74	-1.85	2.55	-2.89						
JUN 1985	-1.11	1.71	-0.34	0.98						
APR 1986	0.6	-1.06	0.64	-0.4	-11.45	5.31	-4.31	-23.59	-13.38	-19.36
OCT 1986	-0.46	0.46	0.24	-0.24	-6.14	6.14	-27.9	27.9	-32.74	32.74
APR 1987	0	-0.48	0	0.41	0	13.68	0	-8.92	0	-6.67
SEP 1987	-0.48		0.41		13.68		-8.92		-6.67	
DEC 1989	-3.57		-3.64							

April 1987 is common reference dateline for volume difference calculations

OCEANSIDE CELL- SEASONAL VOLUME CHANGES (CU YD/lin. ft)

CB 800	max =	1.94	max =	3.75	max =	32.68	max =	46.65	max =	46.85
	min =	-1.93	min =	-3.01	min =	-4.14	min =	-6.51	min =	-6.9

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
OCT 1970	-4.53		-7.49		-23.01		-28.42		-50.56	
FEB 1972	-3.08		-3.63		13.81		12.47		-1.89	
FEB 1981	12.22		19.72		108.37		295.39		384.8	
JUN 1982	5.44		4.5		6.46		40.41		49.86	
JUL 1984	0.85	-0.01	0.94	0.47						
DEC 1984	0.84		1.41							
MAR 1986	-2.25		-4.68							
APR 1986	-1.95	0.11	-3.64	0.74	-8.98		-1.69		-2.76	
MAY 1986	-1.84		-2.9							
OCT 1986	-1.94	1.94	-3.75	3.75	-32.68	32.68	-46.65	46.65	-46.85	46.85
APR 1987	0	-1.93	0	-3.01	0	-4.14	0	-6.51	0	-6.9
SEP 1987	-1.93		-3.01		-4.14		-6.51		-6.9	
DEC 1989	0.08		0.23							

CB 830	max =	8.09	max =	17.7	max =	11.84	max =	17.49	max =	57.97
	min =	-2.94	min =	-5.62	min =	-3.93	min =	13.93	min =	-0.23

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
MAY 1984	3.67	8.09	7.36	17.7						
DEC 1984	11.76		25.06							
MAR 1986	3.16		5.74							
APR 1986	4.91	-2.94	8.52	-4.52	15.56		46.55		63.78	
MAY 1986	1.97		4							
OCT 1986	2.58	-2.58	5.62	-5.62	-11.84	11.84	-17.49	17.49	0.23	-0.23
APR 1987	0	4.64	0	7.85	0	7.17	0	13.93	0	57.97
SEP 1987	4.64	-1.16	7.85	-2.12	7.17	-3.93	13.93		57.97	
JAN 1988	3.48		5.73		3.24					
DEC 1989	12.36		17.51							

April 1987 is common reference dateline for volume difference calculations

OCEANSIDE CELL- SEASONAL VOLUME CHANGES (CU YD/lin. ft)

OS 900	max =	9.1	max =	12.98	max =	15.57	max =	35.49	max =	70.97
	min =	-9.52	min =	-16.34	min =	-95.41	min =	-44.13	min =	20.57

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
SEP 1961	3.28	-5.64	5.86	-7.87	-3.44	-33.82	-29.57	-44.13		
MAR 1962	-2.36		-2.01		-37.26		-73.7			
APR 1963	1.08		3.07		-18.62		44.65			
MAY 1964	15.21		19.83		-31.29		-130.31		-49.94	
MAY 1965	10.49		14.37		-2.68		-24.06		73.4	
AUG 1966	13.25		16.73		-19.27		-90.27		-27.98	
FEB 1972	-7.68		-7.71		-35.19		-93.07		-20.85	
MAR 1974	-8.54		-11.83		-39.05		-78.21		6.99	
FEB 1981	8.21		12.35		18.96		76.63		118.68	
JUN 1982	2.05		3.29		-14.84		-38.11		30.89	
AUG 1983	9.03		17.35		30.23		-14.66		-58.29	
JUL 1984	1.3	-0.06	2.28	0.96						
FEB 1985	1.24	0.65	3.24	0.94						
JUN 1985	1.89	-4.77	4.18	-8.44						
MAR 1986	-2.88		-4.26							
APR 1986	-0.91	-3.63	-2.22	-4.52	-23.37		-23.96		-32.66	
MAY 1986	-4.54		-6.74							
OCT 1986	4.02	-4.02	7.33	-7.33	11.87	-11.87	-35.49	35.49	-70.97	70.97
APR 1987	0	9.1	0	12.98	0	15.57	0	-4.42	0	20.57
SEP 1987	9.1	-9.52	12.98	-16.34	15.57	-95.41	-4.42			20.57
JAN 1988	-0.42		-3.36		-79.84					
DEC 1989	-2.28		-0.68							

OS 930	max =	6.12	max =	8.92	max =	11.05	max =	55.95	max =	112.26
	min =	-5.34	min =	-8.14	min =	4.32	min =	-40.73	min =	-95.05

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
JAN 1972	-1.22		-1.82		-30.71		-103.09		-86.66	
JUN 1982	-8.78		-13.71		-81.6		-166.54		-76.14	
AUG 1983	21.97		27.71		-22.87		-105.8		-101.72	
OCT 1983	13.81		18.69		-3.34					
MAY 1984	7.13	-5.12	8.53	-4.79	6.25	4.32				
NOV 1984	2.01	1.41	3.74	3.74	10.57					
JUN 1985	3.42	-3.67	7.48	-8.14						
MAR 1986	-0.25		-0.66							
APR 1986	-0.78	6.12	-1.12	8.92	-15.88	11.05	-15.22	-40.73	-17.21	-95.05
OCT 1986	5.34	-5.34	7.8	-7.8	-4.83	4.83	-55.95	55.95	-112.26	112.26
APR 1987	0	3.27	0	7.89	0	9.68	0	-23.41	0	-43.59
SEP 1987	3.27		7.89		9.68		-23.41		-43.59	
DEC 1989	4.47		7.67							

April 1987 is common reference dateline for volume difference calculations

OCEANSIDE CELL- SEASONAL VOLUME CHANGES (CU YD/lin. ft)

OS 1000	max =	9.45	max =	13.66	max =	45.62	max =	84.25	max =	97.39
	min =	-19.17	min =	-30.87	min =	-94.35	min =	-77.22	min =	-149.72
DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
JAN 1961	-1.33	-1.5	-4.17	-1.5	-39.28	-13.17	-80.31	3.95		
SEP 1961	-2.83	-4.9	-5.67	-5.04	-52.45	-45.71	-76.36	-77.22		
MAR 1962	-7.73		-10.71		-98.16		-153.58			
NOV 1962	38.1		60.83		132.69		155.89		290.86	
APR 1963	43.57		61.61		86.06		143.83			
MAY 1964	46.09		59.12		56.79		51.76		139.94	
MAY 1965	29.34		39.31		35.89		10.64		85.02	
SEP 1965	28.55	-1.72	37.54	-4.45	21.62	2.39	-7.21	84.25		
MAR 1966	26.83	1.28	33.09	4.76	24.01	31.75	77.04	-41.87		
AUG 1966	28.11		37.85		55.76		35.17		103.92	
AUG 1971	25.98	-10.7	42.31	-19.3	95.25	-27.06	81.29	-34.95	280.46	-149.72
JAN 1972	15.28		23.01		68.19		46.34		130.74	
JUL 1973	3.43		4.46		24.17					
FEB 1981	-13.19		-19.71		-92.34		-221.91		-289.13	
JUN 1982	14.51		20.23		57.38		72.31		190.15	
AUG 1983	-0.49		0.84		-24		-25.08		-1.22	
OCT 1983	4.58		12.04		37.71					
MAY 1984	7.74	9.45	13.36	11.99	38.64	19.41				
NOV 1984	17.19	-7.35	25.35	-10.94	58.05					
JUN 1985	9.84	-13.16	14.41	-17.6						
MAR 1986	-3.32		-3.19							
APR 1986	-4.41	3.63	-6.46	5.53	-16.78		-5.39		-6.58	
MAY 1986	-0.78		-0.93							
OCT 1986	19.17	-19.17	30.87	-30.87	85.24	-85.24	69.48	-69.48	54.79	-54.79
APR 1987	0	7.97	0	13.66	0	45.62	0	54.91	0	97.39
SEP 1987	7.97	-17.66	13.66	-24.78	45.62	-94.35	54.91		97.39	
JAN 1988	-9.69		-11.12		-48.73					
DEC 1989	8.71		14.42							

April 1987 is common reference dateline for volume difference calculations

OCEANSIDE CELL- SEASONAL VOLUME CHANGES (CU YD/lin. ft)

OS 1030	max =	8.17	max =	12.86	max =	41.08	max =	78.79	max =	42.03
	min =	-14.55	min =	-20.93	min =	-40.72	min =	-60.54	min =	-66.24
DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
OCT 1959	-14.71		-24.21		-73.2		30.71			
JUN 1961	-14.71		-22.68		-34.8		-112.64			
JUL 1961	-9.21		-15.55		-88.87		-48.89			
SEP 1961	-14.71	8.17	-22.87	12.86	-75.37	38.18	-38.09	3.38		
APR 1962	-6.54		-10.01		-37.19		-34.71			
NOV 1962	42.8		62.79		124.53		244.46			
APR 1963	50.63	-14.55	67.34	-20.93	109.6	-27.77	211.8	-60.54		
OCT 1963	36.08		46.41		81.83		151.26			
MAY 1964	37.03		46.27		28.13		-22.29		136.25	
MAY 1965	23.78		29.94		-6.11		21		240.32	
SEP 1965	12.18	1.22	15.67	0.16	-11.14	6.1	3.44	78.79	208.63	
MAR 1966	13.4	-2.83	15.83	-4.62	-5.04	16.34	82.23	-58.9		
AUG 1966	10.57		11.21		11.3		23.33		198.53	
NOV 1968	15.4	-2.45	21.73	-7.42	79.27	-40.72	131.94	64.66	329.68	
JUN 1969	12.95		14.31		38.55		196.6			
AUG 1971	11.34	-0.97	11.97	2.3	34.13	30.61	89.97	31.64	382.57	-66.24
JAN 1972	10.37		14.27		64.74		121.61		316.33	
FEB 1981	3.64		7.31		36.53		123.08		268.61	
JUN 1982	14.11		21.48		89.21		230.06		529.31	
JUN 1983	9.44		16.92		103.43		383.47		681.93	
MAY 1984	7.33	-7.83	10.62	-3.79	19.59	41.08				
NOV 1984	-0.5	1.52	6.83	-6.36	60.67					
JUN 1985	1.02	-9.28	0.47	-9.3						
MAR 1986	-8.26		-8.83							
APR 1986	-2.73	3.05	-0.57	3.93	45.47		97.34		116.29	
MAY 1986	0.32		3.36							
OCT 1986	-1.94	1.94	-1.32	1.32	31.49	-31.49	29.55	-29.55	24.78	-24.78
APR 1987	0	-8.11	0	-11.47	0	-2.01	0	-7.65	0	42.03
SEP 1987	-8.11		-11.47		-2.01		-7.65			
DEC 1989	-9.4		-13.1							

April 1987 is common reference dateline for volume difference calculations

OCEANSIDE CELL- SEASONAL VOLUME CHANGES (CU YD/lin. ft)

OS 1070	max =	20.69	max =	35.53	max =	135.32	max =	218.93	max =	162.28
	min =	-8.01	min =	-15.15	min =	-89.79	min =	-153.79	min =	-230.95

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
JUN 1959	4.32		13.91		104.62		229.71			
OCT 1959	-35.49		-47.06		-137.41		-261.72			
APR 1963	-21.95	20.69	-28.63	35.53	-68.74	135.32	-83.98	218.93		
OCT 1963	-1.26		6.9		66.58		134.95			
MAY 1964	-12.14		-14.56		-66.28		-103.91		-10.39	
SEP 1965	-7.37	-5.22	-5.96	-8.13	52.4	-57.69	55.04	61.75		
MAR 1966	-12.59	10.87	-14.09	19.12	-5.29	51.18	116.79	-62.83		
AUG 1966	-1.72		5.03		45.89		53.96		170.42	
NOV 1968	3.86		17.6		109.79		129.2		189.9	
JAN 1972	13.08	-0.63	28.17	-4.06	148.32	-5.36	337.51	-22.97	395	30.71
JUN 1972	12.45	5.09	24.11	10.75	142.96	37.91	314.54	99.4	425.71	141.25
NOV 1972	17.54	-8	34.86	-15.15	180.87	-47.44	413.94	-47.18	566.96	-64.66
OCT 1973	9.54		19.71		133.43		366.76		502.3	
MAR 1976	11.21	-8.01	23.71	-12.68	120.51	-22.27	351.25	-13.95	505.59	1.63
JUN 1976	3.2		11.03		98.24		337.3		507.22	
SEP 1976	6.97	-0.89	19.1	-5.77	168.2	-89.79	410.88	-153.79	528.77	-230.95
MAR 1977	6.08	-3.51	13.33	-2.66	78.41	6.33	257.09	42.81	297.82	150.62
JUN 1977	2.57		10.67		84.74		299.9		448.44	
JUN 1981	36.74		62.08		207.42					
JUN 1982	36.9		61.1		177.08		276.64		393.29	
JUN 1983	31.33		47.71		153.51		354.05		503.62	
OCT 1983	8.09		14.9		80.78					
MAY 1984	9.45	2.86	14.46	6.94	41.43	60.78				
NOV 1984	12.31	-6.42	21.4	-11.33	102.21					
JUN 1985	5.89	-6.23	10.07	-9.53						
MAR 1986	-0.34		0.54							
APR 1986	1.5	-4.04	3.8	-4.19	33.98		82.13		93.26	
MAY 1986	-2.54		-0.39							
OCT 1986	-0.16	0.16	3.44	-3.44	49.76	-49.76	72.83	-72.83	51.97	-51.97
APR 1987	0	-2.92	0	-1.74	0	52.7	0	99.63	0	162.28
SEP 1987	-2.92	-4.03	-1.74	-1.46	52.7		99.63		162.28	
DEC 1989	-6.95		-3.2							

April 1987 is common reference dateline for volume difference calculations

OCEANSIDE CELL- SEASONAL VOLUME CHANGES (CU YD/lin. ft)

PN 1080	max =	24.5	max =	36.52	max =	131.61	max =	172.39
	min =	-55.1	min =	-69.65	min =	-97.15	min =	-139.53

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
MAY 1984	4.06	7.01	2.89	2.33	-21.05	-1.69				
NOV 1984	11.07	0.6	5.22	1.65	-22.74					
JUN 1985	11.67	-55.1	6.87	-69.65						
MAR 1986	-43.43		-62.78							
APR 1986	-47.58	13.53	-66.72	20.76	-105.96		-80.5			
MAY 1986	-34.05		-45.96							
OCT 1986	-24.5	24.5	-36.52	36.52	-131.61	131.61	-172.39	172.39		
APR 1987	0	-6.32	0	-17.8	0	-97.15	0	-139.53		
SEP 1987	-6.32	-28.75	-17.8	-35.12	-97.15	-29.21	-139.53	60.36		
JAN 1988	-35.07		-52.92		-126.36		-79.17			

PN 1110	max =	87.52	max =	111.31	max =	152.08	max =	66.45	max =	130.59
	min =	-25.18	min =	-33.66	min =	-58.24	min =	-27.07	min =	-5.19

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
OCT 1950	-66.93		-97		-304.4		-546.53			
FEB 1952	-85.22		-122.33		-331.52		-598.82			
APR 1956	-55.24		-85.46		-246.62		-431.72			
OCT 1959	-34.82		-59.49		-204.17		-396.56			
MAR 1963	-70.91		-106.36		-280.76		-460.96			
MAY 1965	-46.83		-73.77		-238.5					
JAN 1972	-68.35		-103.55		-294.53		-585.76		-621.84	
MAR 1974	-67.93		-99.81		-265.58		-531.08		-559.71	
MAR 1976	-42.43	-2.38	-67.91	-1.4	-215.29	-1.2	-460.11	43.78	-421.18	79.11
JUN 1976	-44.81		-69.31		-216.49		-416.33		-342.07	
SEP 1976	-40.97	-2.81	-65.83	-6.11	-219.15	-6.16	-496.52	35.54	-498.81	12.62
MAR 1977	-43.78	4.47	-71.94	7.45	-225.31	35.41	-460.98	66.45	-486.19	130.59
JUN 1977	-39.31		-64.49		-189.9		-394.53		-355.6	
MAR 1981	-57.29		-85.07		-231.56		-375.55		-314.51	
JUL 1982	-53.9		-82.79		-255.82		-528.37		-552.43	
JUN 1983	-72.62	87.52	-92.65	111.31	-107.91	152.08	-69.89		47.46	
JAN 1984	14.9	-7.41	18.66	-9.68	44.17	-21.76				
MAY 1984	7.49	14.55	8.98	18.54	22.41	27.2				
NOV 1984	22.04	-14.9	27.52	-13.7	49.61					
JUN 1985	7.14	-10.69	13.82	-17.84						
MAR 1986	-3.55		-4.02							
APR 1986	-0.79	-5.89	-2.13	-3.77	1.15		20.23		8.8	
MAY 1986	-6.68		-5.9							
OCT 1986	25.18	-25.18	33.66	-33.66	58.24	-58.24	27.07	-27.07	5.19	-5.19
APR 1987	0	20.96	0	27.61	0	40.19	0	41.5	0	94.79
SEP 1987	20.96		27.61		40.19		41.5		94.79	
DEC 1989	27.73		33.97							

April 1987 is common reference dateline for volume difference calculations

OCEANSIDE CELL- SEASONAL VOLUME CHANGES (CU YD/lin. ft)

PN 1180	max =	12.17	max =	22.52	max =	60.6	max =	71.25	max =	93.2
	min =	-18.6	min =	-29.87	min =	-81.85	min =	-30.22	min =	-19.26

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
JAN 1972	10.91		17.18		48.7		107.84		324.72	
MAR 1981	3.32		5.44		-11.7		-6.74		127.19	
JUL 1982	23.02		37.68		71.53		55.38		230.97	
JAN 1984	7	-4.73	9.92	-7.26	26.09	-17.58				
JUN 1984	2.27	1.25	2.66	1.74	8.51	17.46				
NOV 1984	3.52	0.86	4.4	0.59	25.97					
JUN 1985	4.38	-4.91	4.99	-5.25						
APR 1986	-0.53	1.95	-0.26	4.32	3.28	13.63	14.11	-30.22	-2.93	-19.26
OCT 1986	1.42	-1.42	4.06	-4.06	16.91	-16.91	-16.11	16.11	-22.19	22.19
APR 1987	0	12.17	0	22.52	0	60.6	0	71.25	0	93.2
SEP 1987	12.17	-18.6	22.52	-29.87	60.6	-81.85	71.25		93.2	
JAN 1988	-6.43		-7.35		-21.25					
DEC 1989	13.18		23.34							

PN 1240	max =	8.12	max =	10.6	max =	57.37	max =	40.39	max =	28.5
	min =	-3.33	min =	-3.37	min =	-21.36	min =	4.09	min =	22.53

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
OCT 1950	-45.61		-61.18		-87.38		-94.32			
FEB 1952	-42.52		-55.86		-72.85		-17.95			
APR 1956	-40.29		-52.83		-30.98		6.73			
JAN 1972	-28.62		-35.53		-5.67		-9.24		21.65	
MAR 1981	-36.53		-47.29		-0.64		69.1		215.74	
JUL 1982	-33.82		-42.46		17.23		63.19		310.95	
JAN 1984	-17.85	8.12	-23.83	10.6	10.28	1.73				
JUN 1984	-9.73	-3.33	-13.23	-3.37	12.01	6.06	.			
JAN 1985	-13.06	1.66	-16.6	2.21	18.07					
JUN 1985	-11.4	0.2	-14.39	0.64						
APR 1986	-11.2	3.57	-13.75	3.76	-15.6	36.96	-19.64	15.55	-51.03	28.5
OCT 1986	-7.63	7.63	-9.99	9.99	21.36	-21.36	-4.09	4.09	-22.53	22.53
APR 1987	0	2.48	0	2.92	0	57.37	0	40.39	0	
SEP 1987	2.48		2.92		57.37		40.39			
DEC 1989	-2.38		-2.43							

April 1987 is common reference dateline for volume difference calculations

OCEANSIDE CELL- SEASONAL VOLUME CHANGES (CU YD/lin. ft)

PN 1280	max =	7.77	max =	10.16	max =	71.6	max =	56.46
	min =	-8.78	min =	-11.28	min =	-94.87	min =	-13.29

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
JAN 1972	-14.48		-16.13		23.45		7.83			
APR 1981	-15.5		-20.31		-31.48		0.19			
JUL 1982	-5.24		-3.87		77.15		146.41			
JAN 1985	8.55	-0.6	10.1	-0.12	48.49					
JUN 1985	7.95	-5.4	9.98	-8.04						
APR 1986	2.55	3.38	1.94	5.12	-3.38	49.05	-7.65	20.94		
OCT 1986	5.93	-5.93	7.06	-7.06	45.67	-45.67	13.29	-13.29		
APR 1987	0	7.77	0	10.16	0	71.6	0	56.46		
SEP 1987	7.77	-8.78	10.16	-11.28	71.6	-94.87	56.46			
JAN 1988	-1.01		-1.12		-23.27					
DEC 1989	4.01		7.03							

PN 1290	max =	3.18	max =	2.67	max =	31.15	max =	7.38
	min =	-4.65	min =	-12.27	min =	-125.57	min =	3.56

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
JAN 1984	9.08	-4.16	17.72	-12.27	148.3	-125.57				
JUN 1984	4.92	-2.57	5.45	-2.6	22.73	-2.18				
JAN 1985	2.35	3.18	2.85	2.67	20.55					
JUN 1985	5.53	0.41	5.52	0.01						
APR 1986	5.94	-4.65	5.53	-5.39	-4.63	22.47	-9.66	3.56		
OCT 1986	1.29	-1.29	0.14	-0.14	17.84	-17.84	-6.1	6.1		
APR 1987	0	0.16	0	-0.76	0	31.15	0	7.38		
SEP 1987	0.16		-0.76		31.15		7.38			
DEC 1989	-2.64		-1.09							

PN 1340	max =	7.18	max =	9.26	max =	32.73	max =	22.63
	min =	-5.19	min =	-6.15	min =	-55.67	min =	-29.87

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
JAN 1984	-6.52	-0.41	-7.81	-1.49	10.02	-14.98				
JUN 1984	-6.93	-0.49	-9.3	0.79	-4.96	32.73				
FEB 1985	-7.42	0.03	-8.51	-0.47	27.77					
JUN 1985	-7.39	5.4	-8.98	5.87						
APR 1986	-1.99	-5.19	-3.11	-6.15	-5.33	13.92	7.24	-29.87		
OCT 1986	-7.18	7.18	-9.26	9.26	8.59	-8.59	-22.63	22.63		
APR 1987	0	-4.42	0	-5.53	0	26.29	0	15.2		
SEP 1987	-4.42	-4.78	-5.53	-4	26.29	-55.67	15.2			
JAN 1988	-9.2		-9.53		-29.38					
DEC 1989	-6.36		-4.08							

April 1987 is common reference dateline for volume difference calculations

OCEANSIDE CELL- SEASONAL VOLUME CHANGES (CU YD/lin. ft)

SO 1470	max =	15.54	max =	18.68	max =	49.87	max =	104.94
	min =	-1.09	min =	-4.14	min =	-24.65	min =	-62.21

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
DEC 1983	-12.51	-1.09	-14.99	-4.14						
JUN 1984	-13.6	4.63	-19.13	6.67	12.24					
NOV 1984	-8.97	1.19	-12.46	0.76						
JUN 1985	-7.78	1.49	-11.7	1.7						
APR 1986	-6.29	6.99	-10	9.61	28.49	-3.84	95.57	-62.21		
OCT 1986	0.7	-0.7	-0.39	0.39	24.65	-24.65	33.36	-33.36		
APR 1987	0	15.54	0	18.68	0	49.87	0	104.94		
SEP 1987	15.54		18.68		49.87		104.94			
DEC 1989	12.91		14.36							

SO 1530	max =	6.61	max =	9.82	max =	30.83	max =	13.9
	min =	-15.9	min =	-22.15	min =	-36.12	min =	-55.39

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
NOV 1983	10.94	3.31	16.58	1.83	59.89					
JUN 1984	14.25	-10.36	18.41	-14.28						
NOV 1984	3.89	2.82	4.13	3.42						
JUN 1985	6.71	0.37	7.55	2.89						
APR 1986	7.08	-13.69	10.44	-20.26	1.96	-32.79	46.34	-55.39		
OCT 1986	-6.61	6.61	-9.82	9.82	-30.83	30.83	-9.05	9.05		
APR 1987	0	-15.9	0	-22.15	0	-36.12	0	13.9		
SEP 1987	-15.9	-5.57	-22.15	-2.18	-36.12	-2.56	13.9			
JAN 1988	-21.47		-24.33		-38.68					
DEC 1989	-32.5		-42.19							

SC 1623	max =	6.85	max =	8	max =	12.18	max =	19.58	max =	48.91
	min =	-9.55	min =	-11.86	min =	-2.75	min =	1.34	min =	-26.87

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
NOV 1983	9.65	-5.81	12.35	-8.54						
JUN 1984	3.84	-0.18	3.81	0.86						
NOV 1984	3.66	-9.55	4.67	-11.86						
JUN 1985	-5.89	1.13	-7.19	3.32						
APR 1986	-4.76	6.85	-3.87	8	-9.43	12.18	-10.96	1.34	16.29	-26.87
OCT 1986	2.09	-2.09	4.13	-4.13	2.75	-2.75	-9.62	9.62	-10.58	10.58
APR 1987	0	0.55	0	2.91	0	8.54	0	19.58	0	48.91
SEP 1987	0.55		2.91		8.54		19.58		48.91	
DEC 1989	26.79		32.39							

April 1987 is common reference dateline for volume difference calculations

OCEANSIDE CELL- SEASONAL VOLUME CHANGES (CU YD/lin. ft)

SC 1660	max =	4.36	max =	5.54	max =	12.84	max =	33.74	max =	44.13
	min =	-10.46	min =	-11.97	min =	-27.69	min =	-23.28	min =	-75.78

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
AUG 1968	0.59		2.32		-11.88		-25.33			
APR 1974	-25.55		-27.69		12.46		213.67			
NOV 1983	2.59	1.42	10.72	-2.87						
JUN 1984	4.01	-4.92	7.85	-6.71						
NOV 1984	-0.91	4.36	1.14	4.68						
JUN 1985	3.45	-0.61	5.82	-1.11						
APR 1986	2.84	2.71	4.71	5.54	20.55	7.14	34.02	-23.28	37.74	-75.78
OCT 1986	5.55	-5.55	10.25	-10.25	27.69	-27.69	10.74	-10.74	-38.04	38.04
APR 1987	0	-1.86	0	-0.13	0	12.84	0	33.74	0	44.13
SEP 1987	-1.86	-10.46	-0.13	-11.97	12.84	-9.94	33.74			44.13
JAN 1988	-12.32		-12.1		2.9					
DEC 1989	2.02		6.43							

SC 1680	max =	6.28	max =	11.34	max =	53.11	max =	67.31	max =	84.25
	min =	-5.53	min =	-10.86	min =	-57.14	min =	-53.62	min =	-18.86

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
JUL 1984	8.15	-5.53	11.51	-4.98						
DEC 1984	2.62	1.94	6.53	1.21						
JUN 1985	4.56	-3.21	7.74	-4.73						
APR 1986	1.35	3.21	3.01	7.85	7.07	50.07	29.91	23.71	15.42	3.44
OCT 1986	4.56	-4.56	10.86	-10.86	57.14	-57.14	53.62	-53.62	18.86	-18.86
APR 1987	0	6.28	0	11.34	0	53.11	0	67.31	0	84.25
SEP 1987	6.28		11.34		53.11		67.31			84.25
DEC 1989	9.67		15.6							

SC 1720	max =	6.33	max =	7.42	max =	12.11	max =	57.86	
	min =	-6.86	min =	-6.98	min =	-10.38	min =	-26.02	

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
JUN 1934	-11.68		-7.35		45.34					
JUL 1949	-1.69		-1.89		24.93					
APR 1955	-11.12		-14.85		23.1					
FEB 1965	0.9		-0.57		15.05		167.72			
JUL 1968	-5.69	1.73	-10.62	4.41	-33.54	12.11	-7.65			
APR 1969	-3.96		-6.21		-21.43					
APR 1973	2.13		0.56		-2.09		-83.74			
NOV 1983	-6.64	1.25	-9.24	1.1						
JUN 1984	-5.39	-6.86	-8.14	-5.92						
NOV 1984	-12.25	6.33	-14.06	5.68						
JUN 1985	-5.92	4.59	-8.38	6.49						
APR 1986	-1.33	-3.27	-1.89	-5.53	1.07	-10.38	-18.22	-26.02		
OCT 1986	-4.6	4.6	-7.42	7.42	-9.31	9.31	-44.24	44.24		
APR 1987	0	-4.38	0	-6.98	0	1.74	0	57.86		
SEP 1987	-4.38	3.79	-6.98	6.79	1.74	0.73	57.86			
JAN 1988	-0.59		-0.19		2.47					
DEC 1989	0.65		1.36							

OCEANSIDE CELL- SEASONAL VOLUME CHANGES (CU YD/lin. ft)

DB 1805	max =	7.39	max =	10.24	max =	31.49	max =	93.82
	min =	-12.64	min =	-17.38	min =	-52.77	min =	-26.3

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
NOV 1983	11.34	1.9	16.28	2.66						
JUN 1984	13.24	0.81	18.94	0.03						
NOV 1984	14.05	-2.48	18.97	-1.98						
JUN 1985	11.57	-3.52	16.99	-5.93						
APR 1986	8.05	4.59	11.06	6.32	33.92	18.85	30.04	-3.74		
OCT 1986	12.64	-12.64	17.38	-17.38	52.77	-52.77	26.3	-26.3		
APR 1987	0	7.39	0	10.24	0	31.49	0	93.82		
SEP 1987	7.39		10.24		31.49		93.82			
DEC 1989	-16.22		-17.51							

DB 1850	max =	13.63	max =	13.38	max =	23.35	max =	92.21
	min =	-29.36	min =	-33.97	min =	-62.36	min =	-25.24

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
DEC 1983	62.07	-26.54	80.59	-33.97	205.92					
JUN 1984	35.53	3.19	46.62	3.43						
NOV 1984	38.72	-7.34	50.05	-8.99						
JUN 1985	31.38	-29.36	41.06	-33.23						
APR 1986	2.02	13.63	7.83	13.38	39.01	23.35	-12.77	-25.24		
OCT 1986	15.65	-15.65	21.21	-21.21	62.36	-62.36	-38.01	38.01		
APR 1987	0	-1.8	0	-3.36	0	21.44	0	92.21		
SEP 1987	-1.8	-2.74	-3.36	-3.32	21.44	-10.15	92.21			
JAN 1988	-4.54		-6.68		11.29					

April 1987 is common reference dateline for volume difference calculations

OCEANSIDE CELL- SEASONAL VOLUME CHANGES (CU YD/lin. ft)

DB 1895	max =	2.32	max =	3.46	max =	36.64	max =	105.67	max =	262.56
	min =	-3.49	min =	-5.32	min =	-32.14	min =	-47.98	min =	-75.46

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
NOV 1984	2.13	-3.49	2.83	-5.32						
JUN 1985	-1.36	2.32	-2.49	3.03						
APR 1986	0.96	-2.28	0.54	-4	-4.5	-32.14	-106.76	1.09	-440.35	177.79
OCT 1986	-1.32	1.32	-3.46	3.46	-36.64	36.64	-105.67	105.67	-262.56	262.56
APR 1987	0	-0.49	0	-1.97	0	-27.46	0	-47.98	0	-75.46
SEP 1987	-0.49		-1.97		-27.46		-47.98		-75.46	
DEC 1989	-0.36		-1.04							

DB 1900	max =	11.32	max =	16.13	max =	88.12	max =	120.96
	min =	-16.18	min =	-24.88	min =	-74.89	min =	-92.55

DATE	MHHW	delta	MSL	delta	-10	delta	-30	delta	-40	delta
NOV 1984	-11.74	11.32	-16.21	16.13						
JUN 1985	-0.42	-15.91	-0.08	-24.88						
APR 1986	-16.33	10.56	-24.96	14.66	-80.77	-7.35	-84.74	-36.22		
OCT 1986	-5.77	5.77	-10.3	10.3	-88.12	88.12	-120.96	120.96		
APR 1987	0	-4.48	0	-7.74	0	-74.89	0	-92.55		
SEP 1987	-4.48	-16.18	-7.74	-22.1	-74.89	-20.88	-92.55	38.17		
JAN 1988	-20.66		-29.84		-95.77		-54.38			
DEC 1989	-15.59		-23.96							

April 1987 is common reference dateline for volume difference calculations

APPENDIX G

**HISTORICAL CHRONOLOGY OF EXTREME STORM AND
WAVE EVENTS FOR THE SAN DIEGO REGION**

INTRODUCTION

This chronology of severe storm and extreme sea level events for the San Diego region was prepared using historical sources of information such as newspaper articles, journal articles, documented eyewitness accounts and archival documents. In addition, any coastal erosion or structural damage occurring in conjunction with the storm and wave events have been included.

The chronology is composed as a list, with entries that begin with the date, specific or approximate, of the event. This is followed by a brief description, and the reference enclosed in brackets. A list of references is provided at the end of the chronology. For periodical references such as newspapers or journals, the particular issue is denoted by:

[Reference #, Date, Page #: Column #]

The most frequently cited source is the San Diego Union. The Union has been indexed by the San Diego Public Library for the years 1872-1983. References to storms, floods and tides are all included in this chronology. The index consists of summaries of articles archived on microfilm and accessed through a keyword index. However, there were gaps in the chronology, which led to using alternate sources. The report by H.B. Lynch, Reference [1], summarized old Mission records and journals, including events from 1769 to 1830. Accounts of various explorers provided further information up to 1845. The period of 1860-1864 was described in the second reference, the journal of William Brewer. The historical Climatological Records, Reference [4], also provided some useful rainfall information for 1860-1861, but lacked specifics on weather and storms. Some interesting perspectives on general seasonal events as well as specific storms in San Diego was provided by the article by Kuhn and Shepard, Reference [5]. The Marine Adviser's report, Reference [7], described some wave events in the twentieth century, as well as describing some particular major storms, while the Cayan and Flick Report, Reference [9], provided long-term weather pattern information such as El Nino and periods of extreme sea level in the Pacific. Various other journals were used for particular periods not covered by other sources.

CHRONOLOGY OF EXTREME STORM AND WAVE EVENTS IN SAN DIEGO

1670-1755

Period of heavy rainfall, with a respite only from 1720-1730. [12,Apr 3,1983]

1769

May Period of excessive rainfall in Southern California.[1]

1770

Jan 7 A few days previous the L.A. River flooded its bed.[1]

1771

Winter Floods occurred in basins throughout Southern California during the winter of 1770-71.[1]

1772

Winter Floods occurred in S. California basins during the winter of 1771-72. [1]

1776

Winter Floods occurred during the winter of 1775-76 throughout S. California basins.[1]

Jan 1 Santa Ana River flowing too fast to cross it, although it was not too deep.[1]

1780

Period of heavy rainfall; floods occurred in S. California basins.[1]

1781-1810

Rainfall shortage; drought in 1795 caused food shortages.[1]

1810-1820

Period of excessive rain and floods during the winters of 1810-11,1814-15, 1816-17,1820-21.[1]

1821

October Flood in Mission Valley flowed bank to bank and washed away the garden of the Royal Artillery of Spain at the foot of the Presidio.[2]

1825

Large flood; rivers of the county were so swollen that their beds, their banks, and the adjoining lands were greatly damaged.[1] The San Diego River turned its course from Mission Bay to San Diego Bay.[3,Jun 15,1877]

1834

Winter of 1833-34 was very rainy.[1]

1840

Winter of 1839-40 was a severe winter. An immense quantity of rain for forty days and nights fell without cessation, and the whole county was flooded.[1]

1842

Winter of 1841-42 brought large floods.[1]

1853

Winter San Diego River restored back to its former channel.[3,May 23,1873,2:1-2]

1854

Winter Storms threaten work to be done on San Diego River.[Tbid]

1855

Winter Dam rebuilt to put San Diego River back on previous course.[3,Jun 15,1877]

1857

Winter Dam washed away.[3,Jun 15,1877]

1860

Nov 16 1.85 inches of rain at New San Diego.[4]

Nov 19 4.70 inches of rain at New San Diego.[4]

December Rain throughout December.[4]

Dec 16 Heavy rain, .40 inches at New San Diego.[4]

Dec 26 1.22 inches of rain at New San Diego.[4]

1861

- Jan 3-4 Rain severest in 11 years; 6-7 inches fell in 40 hours, with damage losses in the thousands of dollars.[2]
- Jan 6-8 Rain fell for 70 hours without cessation. The San Gabriel River was impassable.[2]
- Sep 23 1.45 inches of rain at New San Diego.[4]
- Dec 31 1.30 inches of rain at New San Diego.[4]

1862

- Dec,1961-
Jun,1962 Noachian Deluge - it rained from Dec 1861 to Jun 1862; destroying 25% of California's taxable property. The state of California declared bankruptcy. Earthquakes and floods greatly damaged the San Diego area; Mission Valley was flooded causing severe damage. [5]
- February Unusually high tides and heavy surf from the storm sent large quantities of water into Mission Bay, preventing the draining of the Mission Valley flood.[5]
- Water covered the area from Mission Bay to Old Town.[3,May 23,1873,2:1-2]

1863

- January Much rain, season total of 3.3 inches.[3,May 23,1873]
- Nov 11 The first rains of the season.[2]

1867

- March The San Diego River overflowed, flooding the same area as the flood of 1862 but not causing nearly as much damage.[3,May 23,1873,2:1-2]

1874

- Winter Freshet in the San Diego River flooded flatlands.[3,Jun 15,1877,1:4]
- Jan 23 The Tijuana River flooded, forcing settlers to move. Yuma (AZ) streets were running with water after the meeting of the Gila and Colorado Rivers flooded.[3,Jan 23,1874]
- Jan 24 Three-fourths of Yuma had water three to six feet deep in the streets. [3,Jan 24,1874]

1880

- Jan 1 Recent heavy rains greatly damaged roads and bridges throughout San Diego County. Bridge on the new road to National City washed out, and in Paradise Valley, some bridges and fencing were lost.[3,Jan 1,1880]
- Feb 9-12 A windy storm came with winds that were southerly at first, but then changed their direction to the west and northwest. [3,Feb 12,1980]
- Feb 12 Storm brings heavy winds and snow in the back country.[3,Feb 12 1980]
- Apr 23 The worst storm season since 1861, telegraph lines are down, railroads suffered damage. San Diego County has so far escaped serious damage.[3,Apr 23,1880]
- Aug 10-18 Nearly 2 inches of rain in San Diego; lightning and thunder as well. The storm stayed south of Los Angeles.[3,Aug 19,1880]
- Aug 17 The worst storm in the history of San Diego hit, but much damage was prevented. The fierce storms were a result of "lapping over" of the Sonora rains.[3,Aug 19,1880,4:2]
- Nov 18 The entire county is experiencing high winds and dust storms. The wind reached 60 mph in Campo. [3,Nov 18,1880,4:3]

1882

- Aug 9 Lightning in the east all night.[3,Aug 9,1882]

1883

- Jan 21-22 The lowest tides of the year are at 2:45pm on Jan 21 and at 3:15pm on Jan 22.[3,Jan 20,1883]
- Aug 27 Eruption of Krakatoa volcano.[14]
- Nov 28-29 One of the lowest tides of the year; 8 inches below mean low water.[3,Nov 28,1883,3:1]
- Dec 17 Heavy winds in Spring Valley.[3,Dec 19,1883]

1884

- Jan 23 Heavy shower of rain at Temecula.[3,Jan 27,1884,3:1]
- Jan 26 Several showers, 0.2 inches of rain measured at Signal Office.[3,Jan 27,1884,3:2]
- Jan 27-30 Unusually heavy southeast winds, considerable damage done to the railroad embankment south of the steamship wharf, washed away in a number of places. Storm total of 1.14 inches of rain, bringing the season total to 5.14 inches.[3,Jan 30,1884,3:1-2]
- Jan 31-Feb 1 Steady warm rain.[3,Feb 2,1884]

- Feb 2-3 Train schedules were interrupted by rainstorms, which brought the seasonal rainfall total to 6.24 inches.[3,Feb 3,1884,3:2-3]
- Feb 5 The San Diego River was the highest in six years. The 11 day rain total was 4.36 inches, making the total for the season 8.75 inches. The railroad tracks to Yuma were washed away for eight miles. [3,Feb 5,1884,3:1]
- Feb 6 Heavy rain, winds, and hail from the southwest. Considerable damage was done including several roofs blown off of houses in Old Town. The San Diego River was full to the bank and emptied an immense volume of water into Mission Bay. The river has not been this high since 1878.[3,Feb 7,1884,3:1-2]
- Feb 7 Rain continues in Jamul and Pine Valley with little damage. The bridge at the entrance to the Santa Margarita Valley was washed out.[3,Feb 8,1884,3:1,2]
- Feb 10 The rain begins again with a thirteen-day storm total now of 6.39 inches of rain and a seasonal total of 10.78 inches. [3,Feb 12,1884,3:1]
- Feb 14 Oceanside reported 13 inches of rain in 14 days.[5]
- Feb 15 Rain in the mountains; Bear Valley reports a seasonal total of 12.33 inches; 4 inches of snow at Julian. The bridge across the Chollas Valley creek was washed away.[3,Feb 16,1884,3:1,2]
- Feb 18 Storm ends, leaving much damage, especially to the railroads. Rainfall total now 14.51 inches for the season. [3,Feb 19,1884,3:2]
- In Encinitas, the Jan 26-Feb 18 storm total was 17 inches, bringing the season total there to 23 inches.[3,Feb 23,1884,3:1]
- Feb 29 During the late floods, the channel of the San Dieguito River changed its course; it now runs on the north side of the valley, formerly being on the south side.[3,Feb 29,1884,3:1]
- Mar 3 Rain, but not too heavy.[3,Mar 4,1884,3:1]
- Mar 23-25 Tide predictions of Mr. J.W. Mumford include an extreme low tide of three inches below mean lower water at 12:30pm on Mar 23, 1:15pm on Mar 24 and 1:45pm on Mar 25.[3,Mar 23,1884,3:1]
- Mar 24 A gale stirs up the ocean to such an extent that the whalers at Ballast Point could not go outside.[3,Mar 25,1884,3:1]
- Mar 27 A heavy gale of wind, accompanied by rain, came from the southeast.[3,Mar 28,1884,3:1]
- Apr 1 The bridge at Sweetwater washed away.[3,Apr 2,1884,3:1]
- Apr 5-11 Southeast gale off of Southern California coast.[3,Apr 15,1884,3:2]
- Apr 10 Extensive cloudburst in Soledad, flooding the county in both Rose's Canon and Cordero, where bridges and railroad tracks were washed out.[3,Apr 12,1884,3:1]
- May 15-16 Storm brings two inches of rain to Potrero. [3,May 17,1884,3:1]

- May 29 Flood through Sweetwater Canyon reported causing serious loss.[3,May 29,1887,3:1]
- Jul 1 Bridge which crossed the Colorado River between Yuma and California on the line of the Southern Pacific gave way. The river was high and a violent wind prevailed.[3,Jul 6,1884,3:4]
- 1885
- Aug 18 A sand storm continued for two hours. A severe thunderstorm in Mesa Grande, accompanied by strong wind and hail.[3,Aug 19,1885,3:1,4]
- 1886
- Jan 11-20 Rain, wind and high ocean waves for ten days. Train service stopped on Jan 19.[3,Jan 25,1886,3:5;Jan 26,1886,2:1]
- Mar 17 Heavy rain accompanied by a southeast wind hit San Diego; many of the streets were flooded.[3,Mar 18,1886,3:1]
- 1887
- Feb 10 Rainstorm in San Diego brings snow to Campo.[3,Feb 11,1887,3:3]
- Feb 14-15 Rain and gale winds cause much damage in the streets but little at the waterfront.[3,Feb 16,1887,3:2]
- Apr 11 Twelve to sixteen inches of snow at Cuyamaca and snowing heavily at the rate of one inch per hour.[3,Apr 12,1887,5:1]
- May 2 San Diego visited by a heavy wind from the northwest; high waves prevented boating.[3,May 3,1887]
- Oct 7 The wind blew almost a gale, raising a great cloud of dust over the city and causing high waves in the bay. Breakers were unusually heavy on the beach.
[3,Oct 8,1887,3:1,4:2]
- Oct 18 A high wind prevailed, and the tides were extremely high, morning and evening.[3,Oct 19,1887,5:4]
- Dec 1 Severe windstorm in downtown San Diego causes considerable damage.[3,Dec 3,1887,5:4]
- Coronado suffered greatly as well. [3,Dec 3,1887,5:7]
- Dec 21 A blustery wind in National City did considerable damage. [3,Dec 22,1887,5:7]
- Dec 29-30 A heavy gale of wind in San Diego. Rain flooded the streets.[3,Dec 30,1887]

1888

- Jan 5 Wind and rain - one of the heaviest storms of the season. [3,Jan 5,1888,5:6;Feb 6,1888,5:5]
- Jan 16 Snowstorm in Campo - five feet on the mountains.[3,Jan 17,1888,8:2]
- Mar 14 Continuous rain in Campo causes bottoms to fall out of roads, bridges to wash out.[3,Mar 14,1888,2:1]
- Oct 18 A high wind prevailed, and the tides were extremely high in both the morning and evening.[3,Oct 19,1888]
- Dec 22 Great storm in Coronado. Waves up to 30 feet at the Hotel del Coronado; tons of rocks and kelp deposited on the beach. [3,Dec 25,1888,5:1-2]

1889

- Jan 15 Rainstorm for a few days in San Diego.[3,Jan 15,1889,1:4]
- Mar 15-19 The storm totally wrecked a schoolhouse in downtown San Diego, but there were no fatalities. Possibly the heaviest storm of the season.[3,Mar 16,1889,5:1,8:1;Mar 17,1889,5:1]
- Oct 12-14 In Encinitas the worst storm ever on record occurred: 7.58 inches of rain fell in 8 hours. The lowlands were completely flooded.[3,Oct 15,1889,1:4],[5]
- December Floods close in magnitude to those of 1884 - bridges were washed away.[15]

1890

- Mar 19 Unusual gale with violent ocean waves causes considerable damage in San Diego. A wharf was partially destroyed.[3,Mar 21,1890,5:2]

1891

- February Destructive floods on all major rivers east of the Rocky Mts.[5]
- Feb 23-24 Strong rains overflow rivers and flood valleys throughout San Diego County. Storm total of 2.56 inches of rain bringing the seasonal total to 9 inches.[3,Feb 24,1891]
- Feb 26-28 Disaster in Tijuana from flooding; Tijuana will have to be rebuilt on higher ground.[3,Feb 27,1891,1:1]
- Thirty inches of rain at Bear Valley in 37 hours. 11.5 inches in 80 minutes at Campo.[5]
- Mar 23 Storm wrecked the mission in Santo Domingo as well as washing away a dam.[3,Mar 24,1891,5:3]

1892

Feb 10 Sudden downpour caused Otay Creek to overflow and washed out railroad track in National City and Otay. The Tijuana River was also overflowing.[3,Feb 15,1892]

1893

Mar 24 Tijuana River overflowing, causing much damage and destruction in the Otay Valley.[3,Mar 24,1893,5:3]

1894

Aug 3 Unusually high tide of Wednesday afternoon overflowed the boulevard between this city and National City.[3,Aug 3,1894,5:1]

Aug 26-27 Electrical storm brings warm rain and a close hot night.[3,Aug 27,1894,5:1]

1895

Jan 17 Disastrous floods in Mission Valley and elsewhere; reservoirs full and overflowing; railroads blockaded, bridges down and track submerged.[3,Jan 17,1895,5:1,2,3]

Jan 18 Country at head of Mission Bay badly flooded. Fresh downpour.[3,Jan 19,1895,5:3]

Jan 20 Much damage done by the rain, flood renewed. Many thousand dollars lost in the downpour.[3,Jan 20,1895,5:3]

Jan 24 Large losses from the flood in the Tijuana Valley.[3,Jan 24,1895,5:3]

Jan 25 Phenomenal rainfall during the storm in the mountains. Several feet of snow reported; an earthquake accompanied the flood.[3,Jan 25,1895,5:3]

1901

Mar 30 Lightning almost destroys a house in Lakeview.[3,Mar 31,1901,5:1]

1902

Dec 17-18 Strong waves destroyed part of Terminal Island in Los Angeles. The two day storm dropped .81 inches of rain at Santa Ana.[3,Dec 18,1902]

Dec 19 Big flood at Imperial. Salton River a rushing torrent; communication interrupted, considerable damage done.[3,Dec 19,1902,5:3]

1903

Winter El Nino Winter of moderate severity.[9],[20]

Aug 18 Severe lightning, thunder and rain in Cuyamaca, and the neighborhood of Julian to the south and west.[3,Aug 19,1903,4:3]

1905

Winter El Nino Winter of moderate severity.[9],[20]

1909

Feb 20-21 Westerly wind blew at 18-28 mph bringing .59 inches of rain. This makes the season total 7.59 inches.[3,Feb 22,1909]

1912

Winter Very severe El Nino Winter.[9],[20]

Mar 8-10 High wind and rain from the west; 3.48 inches of rain total for the storm. Seasonal total of 6.09 inches. La Jolla suffered much damage. [3,Mar 10,1912]

1914

Jan 25 Severe storms along both the Pacific and Atlantic coastlines. Little damage to San Diego, but high waves.[3,Jan 26,1914]

Feb 21 Heavy precipitation, 9.83 inches for the season. Discharge from the San Diego River of 2,300 cubic feet/sec.[23]

1915

Winter El Nino Winter of moderate severity.[9],[20]

Jan 28-30 Storm originating in Hawaii brought snow and rain to San Diego, but little coastal damage. In Newport, streets were torn up and beach houses damaged. Damages to coastal property estimated at \$250,000 - \$500,000.[7],[6,Jan 30,1915]

Feb 1-3 Storm brings .26 inches of rain, season total 10.35 inches.[3,Febr 3,1915]

Feb 11 Heavy precipitation in downtown San Diego; 14.41 inches for the season. Discharge in Mission Gorge of 70,200 cubic ft/sec.[23]

Apr 29-May 1 Violent storm. In Ocean Beach, part of the boardwalk was washed away. High winds and waves caused much destruction.[3,May 2,1915]

1916

- Jan 14-20 Storm front from central California brought heavy rains to San Diego and caused severe flooding. Rainfall totals at the San Diego River basin were: .53 in.(Jan 14),.95 in.(Jan 16),1.55 in.(Jan 17),.31 in.(Jan 18),
San Diego River overflowed its banks.[3,Jan 17,1916,1:7]
San Diego County in a state of flood; bridges washed out. Biggest storm in the history of San Diego.[3,Jan 18,1916,1:1;Jan 19,1916,1:7]
- Jan 24-29 Another storm hits San Diego; property damage great. Otay Dam broke and flooded valley.[3,Jan 28,1916,1:7;3:2]
Much of Sweetwater Valley destroyed.[3,Jan 29,1916,1:3]
12 inches of rain in 17 days, every major bridge seriously damaged. Morena reservoir overflowed; Lower Otay reservoir dam broke. [3,Feb 12,1979]
Two severe storms, heavy floods, especially in the southern portion of the county.[16]
Daily rainfall totals at the San Diego River Basin: .21 in.(Jan 25),

1918

- March 12 San Diego River high, discharge at Mission Gorge/Santee of 12,000 cubic ft./sec. Seasonal precipitation of 8.04 inches in downtown San Diego.[23]

1919

- Winter Very severe El Nino Winter.[9],[20]

1921

- Sep 25-Oct 1 Swells from the southeast off of Baja California.[7]
Dec 21 Bridges at Torrey Pines grade and San Juan Capistrano washed out. Three day rain brought 4.35 inches.[3,Dec 21,1921,1:4]
Dec 26 San Diego River very high; peak discharge at Mission Gorge/Santee is 16,700 cubic ft./sec. Heavy seasonal precipitation of 18.65 inches.[23]
Dec 27 Damage from floods in all parts of the county. Lake Hodges running over.[3,Dec 27,1921,1:1;Dec 28,1921,1:8]
Dec 30 Storm total yields 12 inches of rain; this was exceeded only by the flood of 1916.[8,Dec 30,1921,1:1]

1922

Aug-Sep Tropical storm Hyacinth affects southern watershed regions.[16]

1924

Winter Weak El Nino Winter.[20]

1926

Winter Severe El Nino Winter.[20]

April Coastal tornadoes and waterspouts sighted in San Diego.[16]

1927

Feb 11-16 Storm floods city streets; highways between San Diego and Tijuana flooded.[3, Feb 15, 1927, 1:1, 3]

Bridges destroyed, roads torn out.[3, Feb 16, 1927, 1:1]

Suspended transportation facilities, flooded water courses, lost houses, destroyed bridges plague San Diego.[3, Feb 17, 1927, 1:1, 4, 7:2]

Worst storm damage at Sweetwater, Otay, San Ysidro and Tijuana at the border.[3, Feb 21, 1927, 1:2, 3:4]

Storm totals: 10.70 inches of rain in El Cajon; season total 17.32 inches. Bridges at Lakeside washed out.[8, Feb 18, 1927, L:1, 1:4, 6]

San Diego River very high; 45,400 cubic ft/sec discharge at Mission G Gorge/Santee. Seasonal precipitation in downtown San Diego of 14.74 inches.[23]

1930

Apr 20-24 Damage at Long Beach breakwater. Estimated height of waves 15-18 feet in depths of 37-27 feet.[7]

Nov 23 High wind, up to 186 mph causes much damage in San Diego.[3, Nov 23, 1930, 1:6]

1931

Winter El Nino Winter of moderate severity.[9], [20]

Oct 1 Windstorm carries dust out over the ocean making use of fog horn necessary; heat and rain in mountain districts.[3, Oct 2, 1931, 3:6]

1932

Sep 30 An inland tropical storm affected the southern regions of San Diego.[16]

1933

Winter Weak El Nino Winter.[20]

1934

Summer Southerly winds originating in the southern hemisphere brought 30 foot breakers to the Newport-Balboa area; many roads and piers destroyed. [5]

Aug 21-22 Swells from the southeast.[7]

Sep 3-15 Swells from the southeast.[7]

Dec 1-2 Windstorms in the eastern mountains was most severe in years; wind of gale proportions in Pine Valley.[3,Dec 3,1934,1:7]

1936

Jul 18-19 Swells from the southeast.[7]

Jul 28-Aug 3 Swells from the southeast.[7]

Dec 28 Storm batters San Diego; heavy loss to shipping. Rain total of 2.31 inches. Lake Hodges up by 2 feet. [3,Dec 28,1936,1:2;Dec 29,1936,1:2]

Dec 31 Gale whips San Diego, bringing more rain. Blizzard hits Lagunas. [3,Dec 31,1936,1:5]

1937

Jan 8 More snow in the mountains, rain in city.[3,Jan 6,1937,1:4]

Jan 14 New storms due.[3,Jan 14,1937,1:6]

Feb 6-9 Storm from Hawaii hits San Diego bringing rain and snow to the back country.[3,Feb 6,1937,1:2]

Feb 7 San Diego River high, discharge at Mission Gorge/Santee iof 14,200 cubic ft./sec. Seasonal precipitation of 15.93 inches in downtown San Diego.[23]

Feb 14 Storm sweeps coast, San Diego gets a steady drizzle.[3,Feb 14,1937,1:7]

Mar 11-19 Rain and wind storm approaching from the sea.[3,Mar 15,1937,1:5]

Mar 23 Record rainfalls at Escondido. Snow, hail and rain all over the county. [3,Mar 23,1937,1:2]

1938

- Jan-Feb Stormy, considerable rainfall.[7]
- Feb 27 Driving rain and wind lashed into San Diego. Two storms moving in from the ocean. Storm caused considerable damage.[3,Feb 28,1938,1:1]
- Mar 1 All San Diego dams near to overflow as storm continues. Seasonal total is 2.1 inches below normal.[3,Mar 1,1938,1:1]
- Mar 2-7 65 mph gale hits Escondido, rain to San Diego.[3,Mar 2,1938,3:1]
Heavy rains in the back country. High wind up to 50 mph. No serious damage done.[3,Mar 3,1938,1:1]
- Total rainfall from storm 4.17 inches, bringing the season's total to 8.19 inches.[3,Mar 4,1938,4:1]
- Extensive flooding throughout Southern California.[3,Mar 5,1938,1:4,8; Mar 6,1938,1:4,8]

1939

- Jul 10-11 Swells from the southeast.[7]
- Sep 15-25 Tropical storm from South America. This storm was the most damaging storm of the century in Southern California. In Baja California, damage was estimated at \$1 million. Wave and wind damage along Southern California coast.[7,p.27]
Wave heights of 12-20 feet with some up to 40 feet were reported.[7]

1940

- Winter El Nino Winter of moderate severity.[20]
- Dec 23 3.5 inches of rain in 24 hours in San Diego. First storm moved east, second storm approached from the north. Winds reached gale force by afternoon.[22]
- Dec 24 In San Diego 3.6 inches of rain in 24 hours, with continued heavy rain; in Escondido, the heaviest gales in 25 years were reported. Oceanside recorded a storm total of 6 inches.[22]
- Dec 25 In Oceanside pounding seas with high spring tides damaged the shoreline. Sand bags used to protect El Sereno Court; wave damage at Wisconsin St. ramp. Foundations of homes were undermined by the waves. [22]
- Dec 26 High surf and tide smash over seawall at Mission Beach causing coastal damage in both Ocean Beach and Mission Beach.[3,Dec 27,1940,1:1,A:2-7]

In Ocean Beach 25 foot high waves and a 7.1 ft. spring tide smashed over the beach, toppled one house and threatened others. Rock bulwark constructed to stop force of waves that washed over the boulevard into Mission Bay. One thousand sand bags were placed in front of houses to stop erosion of foundations.[22]

- Dec 27 In Mission Beach, streets were covered with kelp, sand and rocks that were washed over the sea wall.[22]
- Dec 31 Rain-weakened roadbed collapsed under freight engine. The engine and three freight cars fell over the cliff, killing three trainmen. Prior to the storm, a concrete retaining wall had been built by the railroad company to protect this portion of the track. The wall was undermined by storm waves.[22]

1941

- Winter El Nino winter of moderate severity.[20]
Seasonal rainfall totaled nearly 25 inches. Water ran 3 feet deep over Padre Dam in Mission Gorge.[5]
- March Period of extreme sea levels.[9]
- April 13 San Diego River high; 9,250 cubic ft/sec discharge at Mission Gorge/Santee. Heavy seasonal precipitation - 24.74 inches in downtown San Diego.[23]
- Dec 11 Loud lightning and thunderstorm hits San Diego.[3,Dec 11,1941,1:2-3]

1942

- Winter Severe El Nino Winter.[9],[20]

1943

- Jan 20-25 Windstorm in San Diego blew down power lines, trees, and ripped apart shops in downtown San Diego.[3,Jan 23,1943,1:6]
The wind reached up to 70 mph. At Oceanside an 100'x100' platform at the end of the pier was destroyed.[3,Jan 24,1943,A1:2-3,7-8]
- Rainfall of 3.36 inches for the storm. A violent wind caused much damage.[3,Jan 25,1943,A1:1]
- Dec 6 Rain, hail, sleet and snow in San Diego County. The Lagunas under 6 inches of snow, Pine Valley received 2 inches.[3,Dec 7,1943,A1:3-4,2:5]
- Dec 9 Winds in the county ranged from 24 mph at Lindbergh Field to 54 mph at Lyons Peak. No damage reported.[3,Dec 10,1943,A1:1]
- Dec 11 Flooding in downtown San Diego causes little damage.[3,Dec 11,1943,A1:3,B2-4]

Dec 12 Storm rainfall totaled 4.55 inches, bringing season total to 5.29 inches. Flooding throughout the county.[3,Dec 12,1943,A1:2-4]

1944

Winter Weak El Nino Winter.[20]

Jan 25 Hail and rainstorm in San Diego. Water entered the Marine Room at La Jolla. Snow was 12-15 inches deep at 6000 feet. Storm total of .95 inches of rain, season total of 8.96 inches.[3,Jan 26,1944,A1:1-4,A3:2]

Wind velocities over 30 mph. High tides of 7.3, 7.4 feet.[3,Jan 25,1944, A1:1-4,A2:3]

Feb 20 Wind, rain, hail and snow storm swept through San Diego County bringing 1.24 inches of rain and 10-12 inches of snow in the mountains.[3, Feb 21,1944,A1:1,A6:2-4]

Feb 23 Rainfall reaches 1.78 inches.[3, Feb 23,1944,A1:4,A3:8]

Many areas flooded. Storm rainfall total of 2.27 inches. Season total of 11.95 inches.[3, Feb 24,1944,A1:7-8,A2:2-4]

Feb 25 Season total reaches 12.35 inches with a storm total of 2.67 inches. The Tijuana River valley flooded. Landslides near Campo and in Cariso Gorge.[3, Feb 25,1944,A1:3,A2:6]

Feb 27 Seven consecutive days of rain, the most since 1936; causing Lake Hodges to overflow and Rodriguez Dam to spill over.[3, Feb 27,1944,A1:1,A2]

Mar 1 Rain, nearly .5 inch and a wind of 30 mph.[3, Mar 3,1944,A11:3]

Mar 15 Winds expected along coast, storm warnings for small craft. Wind at Laguna estimated at 90 mph.[3, Mar 15,1944,A1:6]

Apr 27 Snow and sleet in the mountains while rain fell in the city. [3, Apr 28,1944,A1:5-6]

Nov 11-14 Winds 25-30 mph. No damage reported.[3, Nov 12,1944,A1:3]

Lashing storm with winds of 37 mph cause much damage and brought snow to the mountains and Laguna.[3, Nov 13,1944,A1:1-4]

6 inches of rain at Julian. Streets closed in Ocean Beach.[3, Nov 14,1944 ,A1:4,A2:2-3]

San Diego River overflowed, flooding roads and homes.[3, Nov 15,1944,A1:2-4]

1945

Feb 24 Hail in downtown San Diego.[3, Feb 25,1945,A1:4]

Mar 4-6 Rain and wind along the coast, heavy snow in the mountains. Wind reached 24 mph; many roads closed and reservoirs full.[3, Mar 5,1945,A1:1]

Mar 23 Wind up to 45 mph along the coast, but little damage. One foot of snow in the mountains.

Aug 18 Rainstorm broke 72-year record, swept out bridges, and flooded Imperial County. High waves along the coast.[3,Aug 19,1945,A1:3,B:5]

Dec 22 Wind and heavy rains; small craft warning issued.[3,Dec 23,1945,A1:8]

Dec 25 Little damage done. Rain runoff and high tide covered 5 acres at the foot of Torrey Pines grade.[3,Dec 25,1945,A1:1]

1946

Jan 13 High winds in the mountains. Storm warnings from Ventura to the Mexican border.[3,Jan 13,1946,A1:2-3]

Feb 3 Moderately high winds, heavy rainfall, and snow in the higher elevations.[3,Feb 4,1946,A1:4]

Mar 15 Winds of 39-42 mph in the city, as well as .06 inches of rain in the city; county readings up to .25 inches.[3,Mar 15,1946,A1:3,A2:2;]

Mar 28-30 Heavy showers and wind; wind at the weather bureau up to 36 mph. [3,Mar 31,1946,A1:1-4,A4:1-4]

Sep 27-29 Tropical hurricanes off Baja California brings thunderstorms to the mountains.[3,Sep 28,1946,B1:1;9,1929,1946,A:6-7]

Nov 8 Rain, snow, hail and high seas; first snow of the year at high altitudes in the county.[3,Nov 9,1946,A1:1-3,A3:2-4]

Nov 11 Month's highest tide - 7.4 feet.[3,Nov 11,1946]

Nov 11-14 Rainfall in 3-day storm of .99 inches. 18 inches of snow reported at Palomar; 6.58 inches of rain in Los Angeles.[3,Nov 14,1946,A1:8,A2:3; Nov 15,1946,A1:3,A3:1]

Nov 23 Mild winds and .51 inches of rain in San Diego in one day. [3,Nov 24,1946,A1:2,A2:1]

1947

Winter El Nino Winter.[9]

Dec 1 The worst electrical storm in 9 years with wind and hail. Streets were flooded; the rainfall total was .85 inches.[3,Dec 2,1947,A1:1-3,A3:2-7]

1948

Feb 23 High waves caused partial collapse of the Oceanside Pier; winds up to 35 mph and snow in the mountains. Water backed up 2 feet deep on Mission Blvd. in Mission Beach.[3,Feb 24,1948,A1:4,A4:1-8]

Mar 24 Heavy rain and 30 mph wind causes damage; drops .46 inches of rain in the city.[3,Mar 25,1948,A1:7-8]

1950

Dec 9 7.8 foot tide, highest of the year, causes flooding in Mission Beach and Pacific Beach.[3,Dec 10,1950,B1:2]

1952

Winter Weak El Nino Winter.[9],[20]

Mar 13-14 Tropical storm.[7]

November Period of extreme sea level.[9]

1953

Winter El Nino Winter of moderate severity.[20]

Jan 16 High tides and waves cause damage to Crystal Pier at Pacific Beach and battered a seawall at Imperial Beach.[3,Jan 17,1953,9:1-3]

Jul 2 Swells from the southeast.[7]

1954

January Period of extreme sea level.[9]

1955

Jan 7 Month's highest tide: 7.5 feet at 7:49am. Low tide at 3:01pm. [3,Dec 26,1955,17:1]

1956

Feb 24 Storm does damage at Del Mar Fairgrounds. The storm brought hail to Chula Vista and El Cajon.[3,Feb 25,1956,1:1-3,10:1-5]

Mar 31 Highways 80 and 99 between El Centro and Indio closed because of high winds and blowing sand.[3,Apr 1,1956,1:8]

Apr 13 Freak wind strikes Chula Vista, damaging homes.[3,Apr 14,1956,1:1-8]

1957

Dec 19-21 High tides and waves cause damage and flooding at S. Mission Beach. 7.2 foot tide at Bayside Lane.[3,Dec 19,1957,3:1;Dec 20,1957,17:1]

1958

Winter Very severe El Nino Winter.[20]

Jan-Feb Period of extreme sea level.[9]

Jan 18-19 High tides cause more flooding at S. Mission Beach.[3,Jan 18,1958,13:4-5]

Feb 3 Imperial Beach suffered from 6.9 foot tide lashed by winds.[3,Feb 4,1958, 13:7-8]

Feb 14 Storm waves and tide of 5.7 feet undermined homes in Imperial Beach. [3,Feb 15,1958,17:5]

Apr 4 6.7 foot tide and winds threatened homes in Imperial Beach and Mission Beach and nearly flooded Silver Strand highway south of Coronado.] [3,Apr 5,1958,1:7]

October Coastal tornadoes and waterspouts sighted in San Diego.[16]

1959

Jan 6 Fast moving rainstorm dumped more than 1 inch of rain in 1 hour. Many coastal homes flooded; much property damage in La Jolla and Pacific Beach.[3,Jan 7,1959,1:8]

Feb 1-6 25 Pacific Beach residents filed claims against the city for \$91,550 damage to their property caused by the Jan 6 storm. They claimed property value depreciation of \$50,930.[3,Feb 17,1959,14:2-3]

April Period of extreme sea level.[9]

May Gale force winds caused damage all along the coast.[16]

Jul 1 Rain, wind, thunder and lightning from a retreating tropical storm at sea hit the county mountain and desert areas. At Borrego Springs flooding of some areas reported; wind damage also.[3,Jul 2,1959,1:5]

Aug 2 Violent thunderstorm in Imperial Valley; 40-45 mph winds.[3,Aug 3,1959,13:6]

Sep 11 Freakish rain and high winds accompany a record 102 degree temperature. A wind funnel swept through E. San Diego.[3,Sep 12,1959,1:7-8]

1960

Jan 19 Midwinter thaw caused much damage to railroads.[3,Jan 19,1960,B2:6]

Feb 8-11 Worst sandstorm in 10 years in Borrego area. Chill winds bring snow to Lagunas; San Diego coastline gets 6-8 foot waves. [3,Feb Nov 60,1:6-7,17:1-3]

Dec 18 High tides flood Ocean Beach. Water surged over small levee of flood control canal at Longbranch.[3,Dec 19,1960,13:1]

1961

Jan 4 City of Pacific Beach authorizes payment of \$4000 to residents for the storm of Jan 6,1959.[3,Jan 4,1951,18:2-3]

Jan 5 High surf and a record high tide of 7.4 feet at San Diego. [3,Jan 16,1961,1:1-2; 1,192,1961,1:1-2]

Jan 16 San Diego shoreline battered with high waves up to 10 feet.[3,Jan 17,1961,6:5]

Jul 25 High tide broke a dike in Ocean Beach, trapping cars.[3,Jul 26,1961,18:1]

Aug 4 A summer storm brought showers throughout metropolitan San Diego and thunderstorms in the mountains, causing at least 2 flash floods. [3,Aug 5,1961,1:1-3,3:1-5]

Oct 8 Waterspouts, wind, rain, snow, hail, thunder, lightning and dust spread over San Diego county causing damage in some areas. [3,Oct 9,1961,1:4-8,3:1-8]

Nov 13 Clouds of dust rolled over San Diego and other areas of Southern California, blotting out the sun.[3,Nov 14,1961,1:7-8]

1962

Sep 22 Scattered thunderstorms brought sporadic rain to San Diego county. Lightning caused a brush fire; some rain was reported in El Cajon and La Mesa.[3,Sep 23,1962,1:4-5]

1963

Major eruptions of Agung volcano on Bali.[13]

Feb 9 Mission Bay was damaged by a drought-breaking rainstorm. Waves tore away boulders in Mariners and Ventura Coves.[3,Feb 13,1963,13:8]

May 12 Strong rip currents off of La Jolla threaten swimmers.[3,May 13,1963,17:3]

1964

Apr 2 Strong winds occurred in San Diego county, Imperial Valley and the ocean. 100 mph gusts caused considerable damage in E. San Diego County mountains.[3,Apr 3,1964,1:3,3:1-3]

Jun 26 A sudden storm hit the Borrego Desert, causing a flash flood and a brush fire that burned more than 50 acres. No property damage reported. [3,Jun 27,1964,17:5-6]

Aug 7 Unexpectedly high winds out of Mexico kicked dust and sand all over San Diego County. Winds up to 32 mph. [3,Aug 8,1964,1:1-2]

1965

- Sep 2 Hurricane Emily moved northwest toward San Diego, but brought only rain, high waves and strong winds.[3,Sep 2,1965,25:6-7]
- Nov 17 Heavy rain caused many drainage problems. The high ocean prevented drainage near the coast.[3,Nov 21,1965,27:8]
- Nov 21 San Diego County faced the greatest flood and landslide dangers in its history. High tides stopped drainage, and flooded several areas such as S. Pacific Beach and Mission Beach.[3,Nov 23,1965,1:8]
- Dec 9-12 High water and mud from Forester Creek flooded several homes in Santee. [3,Dec 10,1965,1:7-8,3:1-8]
- Rivers and creeks throughout the county were full to overflowing, causing widespread flooding and considerable damage.[3,Dec 10,1965,4:5-6]
- The fourth big storm in 4 weeks; flooding in Mission Beach was increased by a 7.2 foot high tide at 8:48am that filled storm drains with seawater and let rainwater back up.[3,Dec 10,1965,1:7-8]
- The downpour created major flooding at Barnett Ave at the underpass at U.S. 101.[3,Dec 11,1965,1:6-8,2:5]
- Worst flood in 25 years, but only small amounts of damage. Road damages of \$50,000, says county road commissioner.[3,Dec 12,1965,13:8]
- Dec 14 River overflowing causes evacuation near border.[3,Dec 14,1965,1:6-8]
- Assistant city manager says storms in November and December cost city \$382,000.[3,Dec 17,1965,4:1-2]
- Hail, mud and slashing rain create flooding and mudslides in Poway and Bonita.[3,Dec 15,1965,2:4,3:4-8]
- Dec 27 Houses sliding out in Santee.[3,Dec 27,1965,19:6-8,3:1-8]
- Dec 28 \$1.2 million damage to publicly owned property damaged by recent rains.[3,Dec 28,1965,13:7-8]

1966

- Winter Moderately severe El Nino Winter.[20]
- Jan 6 Storm damaged public property in San Diego - an estimated \$1.5 million in damage.[3,Jan 6,1966,17:3]
- Feb 6 Heavy rains, minor flooding throughout the city, causing evacuations in Santee.[3,Feb 7,1966,1:7-8,3:1-5]

- Apr 18 Storm centered over Utah hits San Diego County with scattered rainfall and gusty winds that reached speeds estimated at 90 mph in the mountains. Winds of 35 mph whitedapped the ocean.[3,Apr 19,1966,1:3-4]
- May 27 Governor Brown promised \$1.5 million in federal flood relief funds to several areas in Southern California including San Diego.[3,May 28,1966,1:8]
- Sep 18 Rain, accompanied by high winds, thunder and lightning causes extensive damage in Imperial Valley.[3,Sep 20,1966,3:1-3]
- Oct 4 Storm continues in San Diego after hitting Imperial Valley with damaging flash floods and giving San Diego its first measurable rain in 5 months; Imperial Valley drenched with the heaviest single rain in at least 3 years, storm total of .53 inches.[3,Oct 5,1966,1:]
- Nov 7 Massive storm hits San Diego with the heaviest rain in 8 months, and the strongest wind in 8 years; gusty south winds exceeded gale velocities of 40 mph.[3,Nov 8,1966,1:1-2]
- Dec 5 Powerful storm hits San Diego, widespread flooding is the worst since last December, even worse in Santee.[3,Dec 6,1966,1:8]
- Dec 6 Winds with heavy flood waters turned Escondido into a disaster area, washed out a bridge in Mission Valley, and closed streets throughout the county. Damage estimated at more than \$60,000.[3,Dec 7,1966,1:8,3:5-8,4:5-6]
- Dec 7 The muddy waters of Escondido Creek dropped below the danger point; the city predicted total damages would reach \$100,000-\$200,000. The city's new flood control channel was ripped up in 3 sections; damage of \$80,000.[3,Dec 8,1966,3:2-4]

1967

- Jan 22 The first major storm of 1967 brings wind, hail, rain and snow; flooding in many areas including Mission Valley and Santee.[3,Jan 23,1967,1:7-8]
- Apr 18 Heavy showers struck San Diego area, causing flooding; Via Zapador in Santee flooded.[3,Apr 19,1967,1:6-7]
- Aug 14-16 50 mph winds lashed Imperial Valley causing considerable damage; winds blew sand into the air.[3,Aug 15,1967,1:6]
- Sep 10 Tropical storm Lilly spotted 650 miles southwest of San Diego moving northeast along the coast at 10 mph. Winds from the S-SE of 25-35 mph; swells from the south of 5-6 feet with breakers of 6-8 feet at 12-18 second intervals.[3,Sep 10,1967,A14:1]
- Nov 21-22 Offshore storm caused widespread flooding and lashed San Diego with thundershowers and hail.[3,Nov 22,1967,1:3-8]
- Nov 27 Two more storms expected.[3,Nov 28,1967,1:1-2]
- Dec 18 Storm from Nevada brought new snow to county mountains, dropped more than 1 inch of rain in some areas. Winds of 40 mph at Shelter Island. [3,Dec 19,1967,1:7-8]

1968

- Apr 1 Storm dumps rain and snow, driven by high winds, on the county. .30 inches of rain measured at Lindbergh Field.[3,Apr 2,1968,1:6]
- May 12 Storm dumped .5 inches of rain and 1 inch of snow in San Diego County; .06 inches measured at Lindbergh Field. At Julian, .54 inches of rain fell, accompanied by hail.[3,May 13,1968,1:8]
- Jul 6 Storm from the south hit San Diego and Imperial counties, dropping nearly 1 inch of rain and causing widespread damage in the desert. The storm was accompanied by twister-like winds of 60 mph. .03 inches of rain measured at Lindbergh Field.[3,Jul 7,1968,1:1-2]
- Dec 19 High tides with 40 mph winds caused some property damage.[3,Dec 20,1968,B2:7-8]

1969

- Feb 19 Chilling storm delivered rain, snow, hail, high winds and lightning. Nine inches of snow at Laguna, eight inches at Palomar Mountain.[3,Feb 20,1969, B1:2-5]
- Feb 22 More than 1 inch of rain in San Diego, 1 foot of snow in the mountains. [3, Feb 23,1969,1:4-7]
- Feb 24 Record rain, up to 12.5 inches in 48 hours. Flood waters mounted in Northern San Diego County, threatening several communities. [3, Feb 26,1969,1:6]
- Mar 7 Damage to public property in North San Diego from January rainstorm estimated at \$1 million. The hardest hit areas were Oceanside and Escondido.[3,Mar 7,1969,B1:5-7]
- Mar 13 A frigid storm brought 1/4-1/2 inch of rain and up to 7 inches of snow to San Diego County.[3,Mar 14,1969,B1:7-8]
- Mar 21 Electrical storm with thunder, rain, hail and gusty winds drenched the city. Freezing rain and hail fell in the mountains.[3,Mar 22,1969,1:3-5]
- Mar 25 The county voted for support for legislation which would allow 60% state repayment for storm damage to public property.[3,Mar 25,1969,B3:1]
- Jul 11 Tropical storm hits San Diego area with hail, thunder, lightning and heavy rain.[3,Jul 12,1969,B1:2-3]
- July 17 Tropical storm Bernice brought swells of 2 feet from the southwest with breakers of 3-4 feet at 12-15 second intervals. Southwesterly winds of 8-15 mph.[3,July 7,1969,A10:1]
- Aug 16 Worst August storm on record; rainstorm, accompanied by lightning and high winds dropped .40 inches of rain in less than 40 minutes. [3,Aug 17,1969,B3:1-2]
- Sep 5 Storm whipped across Imperial Valley, leaving a trail of wind and rain damage. Winds reaching 60 mph generated up to 8 foot waves and blocked out the sun with clouds of dust.[3,Sep 8,1969,1:2-3]

1970

- Winter Weak El Nino Winter.[9]
- Aug 26 A fast-moving dust and rainstorm with winds up to 60mph caused minor damage in the Borrego Springs area.[3,Aug 27,1970,B1:6,3:6-8]
- Nov 29 Major storm brought heavy rain and wind to the county, causing power failures and flooding streets. More than 1 inch of rain to most county areas.[3,Nov 30,1970,1:6-8,3:1-8]
- Nov 30 New storm brings showers and wind; the storm total at Lindbergh Field was 1.19 inches.[3,Dec 1,1970,B1:8,3:1-8]
- Dec 21 Severe storm battered San Diego County and caused flooding in Tijuana. The storm hit the coast with stiff winds and up to 1 inch of rain. Up to 25 inches of snow in the mountains.[3,Dec 22,1970,1:8,3:1-8]

1971

- Jan 2 Storm batters San Diego county with damaging winds - up to 40 mph along the coast. Heavy rains and several inches of snow in the mountains. [3,Jan 3,1971,1:8]
- Feb 23 Cold, unstable storm brought hail, rain, snow, thunder and lightning and funnel clouds to San Diego County.[3,Feb 24,1971,1:1,3:1-8]
- Mar 13 Storm front from the north reached San Diego. Rain or snow fell over most of the area.[3,Mar 14,1971,B1:7-8]
- Apr 14 Rain, snow and a small tornado; approximately .68 inches of rain occurred in the area.[3,Apr 15,1971,1:6-8,3:1-8]
- Apr 25 Storm brings rain and high winds. .02 inches of rain at Lindbergh Field, bringing the season total to 6.89 inches.[3,Apr 26,1971,B1:8]
- May 21 Storm with 80 mph winds in mountains and blowing sand and dust to desert areas. No damage reported.[3,May 22,1971,B1:5]
- Aug 2 Tropical storm hit parts of San Diego County with rains, thunder and lightning.[3,Aug 3,1971,B1:6-7]
- Oct 16-17 Rain, snow, hail and high winds swept through the county, bringing .68 inches of rain to San Diego.[3,Oct 17,1971,1:1]
- The storm moved northeast after dropping 2.09 inches of rain in some areas.[3,Oct 18,1971,1:5-7,3:1-8]
- Dec 13 Winds cause damage in San Diego; gusts of 40-50 mph. Low temperatures, .23 inches of rain at Lindbergh Field.[3,Dec 13,1971,B1:5-7]
- Dec 27 Rain, fog, snow, and ice from a new winter storm that swept down from the north. More than .5 inches in most areas.[3,Dec 28,1971,1:2-4,3:1-8]

1972

- Apr 19 Chilling storm system from the gulf of Alaska swept eastward last night after dropping snow, hail and rain. Up to 5 inches of snow in the mountains.[3,Apr 20,1972,B1:1-3,B3:4-7]
- Jun 20 Pouring rain, thunder, and lightning caused power outages, and flooded roads; rainfall measured .28 inches in the city.[3,Jun 21,1972,B1:6-8]
- Aug 8-10 52 mph winds caused severe damage in Imperial Valley; the storm blew in from the northeast; winds averaged 29 mph with gusts up to 52 mph. [3,Aug 10,1972,B3:5-6]
- Aug 30 Tropical storm Gwen was 300 miles west-southwest of San Diego; the storm brought winds of 15-25 mph and 4-6 foot swells with breakers of 6-8 feet at 10-15 second intervals.[3,Aug 30,1972;A10]
- Sep 5-6 Tropical storm Hyacinth moved up from Mexico and soaked the county; rainfall was 1.11 inches at Lake Henshaw.[3,Sep 7,1972,B1:6-7]
- The storm was 450 miles southwest of San Diego moving north at 12 knots. It brought winds of 12-21 mph and waves with breakers of 3-5 feet at 10-13 second intervals to San Diego.[3,Aug Sep 5,1972;B17:1]
- Oct 6 Tropical storm Joanne swept by San Diego; rainfall at Mt. Laguna was .37 inches; flash floods hit parts of Imperial Valley, as well as the Colorado River Valley.[3,Oct 7,1972,B1:4-5,B2:2-4]
- Nov 16 Autumn rainstorm lashed San Diego County, dumping about 1 inch of rain in some areas; and flooding streets. .60 inches of rain at Pt. Loma, and 1.14 inches at Palomar Airport, 1.07 inches at Lindbergh Field. [3,Nov 17,1972,B1:8]
- Dec 21 San Diego Bay almost overflowing because of high tide

1973

- Winter Severe El Nino Winter.[9],[20]
- Feb 11-16 Storm driven by destructive winds, dropped rain, hail and snow and caused damage all over San Diego county. More than 1 inch of rain fell on inland areas.[3,Feb 12,1973,B1:7-8;3:1-8]
- More rain and wind damage in San Diego. Widespread flooding along Stadium Way in Mission Valley.[3,Feb 13,1973,B1:1]
- Feb 15 Storm brought thunder, lightning, hail and snow to various parts of the county. Moist, cold, unstable air accompanied the storm.[3,Feb 16,1973,B1:1-2]
- Mar 11 Rainstorm dumped .71 inches of rain at Lindbergh Field and covered the mountains with 5 inches of snow. The latest in a series of weather systems which have followed the storm track, which shifted south of the normal path.[3,Mar 12,1973,A1:1-8,B1:7-8]

- Mar 14 Chilling wind, rain and snow in San Diego county, accompanied by thunder and lightning.[3,Mar 14,1973,B1:2-3]
- Mar 20 Storm brought .64 inches of rain to Lindbergh Field, causing flooding all over the county and new snow in the mountains. Snow that fell in the mountains was accompanied by 60 mph gusts.[3,Mar 21,1973,B1:4]
- Apr 20 A squall system occurred across most of San Diego County, causing considerable damage in National City.[3,Apr 21,1973,B1:8]
- Jun 8 Hurricane Ava, a tropical storm in the Pacific with winds of 140 mph was about 1100 miles from San Diego.[3,Jun 9,1973,B1:5-6,B3:1-3]
- Jul 20-21 Ocean waves higher than usual: a hurricane 1200 miles south of San Diego sends south to southwest swells to San Diego.[3,Jul 20,1973,B1:6-7;Jul 21,1973,B1:8]
- Jul 25 Approximately 6-8 foot high waves generated by distant tropical storm Emily hit county beaches and sent fog inland to Lindbergh Field. Emily is 450 miles southwest of La Paz, Baja California, and is headed west.[3,Jul 26,1973,B1:2,A3:1-5]
- Aug 1 An electrical storm hit Coronado and Pt. Loma with lightning; light rain south of Tijuana.[3,Aug 2,1973,B1:4]
- Aug 2 Thunderstorms hit mountain areas throughout Southern California. Rain at Cuyamaca State Park measured .6 inches.[3,Aug 3,1973,B1:6]
- Aug 19-20 Imperial Valley was belted by rain, lightning and wind gusts. Many areas experienced power outages.[3,Aug 21,1973,B3:4-5]
- Oct 1 Hurricane Katherine, 600 miles southwest of La Paz, Baja California, kicks up 3-6 foot breakers in San Diego.[3,Oct 2,1973,B1:8]
- Oct 13-14 The highest tides of the month: 6.8 feet at 10:09 on Oct 13 and at 10:48 on Oct 14. The lowest were -.6 feet at 5:04pm on Oct 13 and at 5:53pm on Oct 14.[3,Sep 23,1973,18:5-6]

1974

- Jan 1 Storm blew into San Diego County with 80 mph winds that brought rain, sleet and snow. The storm swept in from the north.[3,Jan 2,1974,B1:6-7]
- Jan 5 Snow and rain battered the county, flooding city streets and knocking out power. The storm arrived from the Northern California coast and swept east to the mountain states.[3,Jan 6,1974,B1:3-5,B3:3-5]
- Jan 6-8 Warm rain - a total of 2.86 inches - drenched San Diego, finally retreating toward Baja California; some damage reported.[3,Jan 9,1974, B1:2-4]
- Mar 8 A Pacific storm swept into the county bringing hail, snow and high winds up to 40 mph along the coast.[3,Mar 9,1974,B1:2-4]

1975

Nov 28 Snow, hail, lightning and rain from the 2 day storm. The storm caused many power failures throughout the county.[3,Nov 29,1975,B1:6-7]

1976

Mar 1-3 A blustery storm dropped hail, rain and snow in San Diego.[3,Mar 4,1976, B1:7,1:3-6,3:1-8]

Sep 9-12 Tropical storm Kathleen brought heavy rains to San Diego, flooded Imperial Valley.[3,Sep 5,1978,B1,4]

Sep 19 Flooding in Imperial and Riverside counties caused much damage. [3,Sep 20,1976,B1:2-3]

Sep 22 Flash flood watches and another storm in San Diego.[3,Sep 25,1976,B1:3-4]

Oct 1 Hurricane Liza battered La Paz, Baja California with 100 mph winds and 6 inches of rain.[3,Sep 5,1978,B1,4]

1977

Winter El Nino Winter of moderate severity.[9],[20]

Mar 1 Big wind blew in, doing \$60,000 damage to a building under construction; gusts reached 61 mph at Mt. Laguna and 42 mph at San Diego State. [3,Mar 2,1977,B1:5-7]

Mar 16 Buildings struck by lightning when a major storm front ripped through the city and county; the storm from the north brought with it lightning, thunder, hail and rain.[3,Mar 17,1977,1:2-4]

Mar 25 Rain, hail, snow in the mountain areas and thunderstorms accompanied by lightning struck the county; rainfall varied from 1.54 inches at Julian to .18 inches at Pt. Loma. [3,Mar 26,1977,1:2-3]

May 8 A storm hit San Diego County, causing power failures and flooding streets. 1.07 inches of rain fell, bringing the season's total to 7.58 inches.[3,May 9,1977,1:4-7,3:1-7]

May 9 Record rainfall in San Diego: Palomar Mountain received 3.43 inches, Lindbergh Field 1.65 inches.[3,May 10,1977,B1:2]

Jul 18 Hail, rain, thunder and lightning swept across Mt. Laguna and some of the rain spilled over into the Borrego Springs area. Flash flood watches were issued for the mountains and adjacent desert areas of San Diego and Riverside counties.[3,Jul 19,1977,4:1-2]

Aug 13-15 Tropical storm Doreen brought rain and wind to San Diego; 2.31 inches of rain at Lindbergh Field, and an estimated \$25 million in agricultural damage.[3,Sep 5,1978;B1,4]

Sep 25 Tropical storm Florence broke up within 425 miles of San Diego. Breakers of 6-8 feet at intervals of 12 seconds; winds of 12-20 mph. [3,Sep 25,1977; B15]

1978

- Jan 11 San Diego County was declared a disaster area, clearing the way for federal loans since last month's rainstorms. San Diego's losses estimated at \$10.2 million.[3,Jan 11,1978,1:5]
- Jan 15 Powerful rainstorm inflicted death and damage, flooded homes, streets and highways. 2.65 inches of rain at Lindbergh Field.[3,Jan 16,1978,1:5-7]
- Jan 16 Damage from the storm of Jan 15 estimated at least \$110,000 damage to public and private property.[3,Jan 17,1978,4:5-6]
- Jan 17 New storm to San Diego forced evacuations in Fallbrook and Escondido. [3,Jan 17,1978,1:6-7]
- Jan 17 Storm that rained .91 inches downtown swept into Arizona. The season total is now 9.80 inches.[3,Jan 18,1978,1:5]
- Jan 18 Recent storm and month-long series of rains sent floodwaters over the banks of both the San Luis Rey and Santa Margarita Rivers. Rainfall of more than 2 inches in some areas.[3,Jan 18,1978,B3:3-7]
- Jan 19 A 5-minute tornado-like windstorm with 60 mph gusts hit Fallbrook and caused considerable damage.[3,Jan 20,1978,A1:1]
- Jan 20 San Diego County and City are requesting a state of emergency be declared because of damage from rains in the past 2 weeks. Estimated damage total is \$16.5 million with \$2 million of that in Fallbrook. [3,Jan 20,1978,B3:2-3]
- Jan 28 Heavy rainfall earlier in the month caused \$250,000 damage to city streets and drainages systems. Repairs are to be financed by the city's Street Division budget pending any federal disaster aid the city might receive.[3,Jan 28,1978,B3:6-7]
- Mar 1 Rainstorm with thunder and lightning, gale force winds. .90 inches of rain in downtown San Diego, bringing the season total to 14.95 inches.[3,Mar 2,1978]
- Mar 2 Lakes Hodges and Poway are both overflowing.[3,Mar 3,1978,1:7]
- Mar 4-5 Storms cause erosion and damage along the coast.[3,Mar 6,1978]
- Mar 5 Floodwaters poured over the top of Lake Hodges Dam at more than 2 million gallons per minute.[3,Mar 5,1978,B1:1-3]
- Mar 7 Mudslides in San Diego County.[3,Mar 7,1978]
- Mar 11 Rainstorms do much damage in Lakeside.[3,Mar 11,1978]
- Mar 12 Storm front accompanied by thunder, lightning, hail and heavy showers , causing power failures and street flooding.[3,Mar 12,1978,B1:3]
- Mar 13 San Diego city declared a disaster area with estimated \$15.6 million in damage. Rivers are overflowing throughout county.[3,Mar 13,1978]

- Mar 16 Officials assist residents whose homes and businesses were damaged by recent county storms.[3,Mar 16,1978,B3:5-6]
- Feb 5-Mar 13 Presidentially declared official disaster period in San Diego.[3,Mar 29,1978 ,D1:5]
- Sep 3-6 Hurricane Norman brought increased thunderstorm activity to San Diego city.[3,Sep 4,1978].[16]
- Thunderstorm hits Mt. Laguna with rain.[3,Sep 5,1978]
- Sep 5 Tropical storm Norman, 450 miles south-southwest of San Diego, moving north at 15 mph brings rain to San Diego. South-southwesterly winds of 17-32 mph, south swells of 3-6 feet with breakers of 6-12 feet at 10 second intervals. Breakers reached up to 12 feet at south facing beaches. [3,Sep 5,1978;D5]
- Dec 18-20 Violent storm hits county with heavy rain, snow, high winds, flooding and even a tornado in Oceanside; tornado caused \$15,000 damage. [3,Dec 19,1978,1:1-4]
- The storm dumped 19 inches of snow and almost 7 inches of rain in San Diego's mountain areas. Parts of Baja California were flooded. [3,Dec 20,1978,1:2-4]

1979

- Jan 5 Storm front accompanied by sporadic winds dropped intermittent rains throughout the county. Waterspout observed offshore.[3,Jan 6,1979,B1:6]
- Jan 26 Del Mar and Imperial Beach homes face serious flooding from high tides: 7.1 feet at 7:23am on Jan 26.[3,Jan 26,1979,B1:1]
- Jan 31 Potent storm swept through county, with torrential rains, and snow in the desert. Flooding in the streets.[3,Feb 1,1979,1:5-6]
- Mar 20-22 18 inches of snow along with 2 inches of rain fell during the storm; Lower San Diego County areas had rain and hail.[3,Mar 21,1979,1:5]
- Mar 27-28 Heavy rains flooded streets and caused overflowing at several reservoirs; Mission Valley flooded.[3,Mar 29,1979,B1:1]
- Jun 3 Lightning caused several brush fires and thunderstorms over much of San Diego County as a disturbance from the Baja coast drifted through the area.[3,Jun 4,1979,B5:4-5]
- Jul 23 Hurricane Dolores brought waves of up to 8 feet to many local beaches. The highest reported breakers were at Oceanside, due to the west-facing beaches. The storm is breaking up 600 miles south-southwest of San Diego.[3,Jul 23,1979;D24]
- Dec 31 Storm off coast produces high waves of 5-8 feet off of San Diego. High tide reaches 6.9 feet.[3,Dec 31,1979,B1:5-6]

1980

- Jan 1 In Imperial Beach, waves swept into streets near the coast.[3,Jan 2,1980,B1:5-6]

- Jan 13 Major storm; observed maximum significant wave height 11.0 feet, Maximum peak period 12.0 sec.[17]
- Jan 29-30 Hurricane force winds accompanied by torrential rains caused much damage in San Diego.[3,Jan 30,1980,4:1-6]
- Baja damage in storm estimated at \$100 million.[3,Feb 1,1980,B1:5-6]
- Many streets closed by flooding in San Diego County.[3,Jan 31,1980,4:1-6]
- Feb 2 County flood loss estimated at \$5.7 million.[3,Feb 2,1980,B1:2-3]
- Feb 4 Release of water from Rodriguez Dam at 950 gallons/sec caused minor flooding in the South Bay area.[3,Feb 4,1980,B3:6]
- Feb 6 Board of Supervisors declared San Diego County a disaster area following last week's storms.[3,Feb 6,1980,B1:1]
- Feb 9 San Diego county sustained \$15 million in flood damage last week. [3,Feb 9,1980,B2:1-2]
- Feb 13-21 Six storms in nine days.[17]
- Feb 16 New storm hits county and Baja: widespread street flooding. [3,Feb 17,1980,B1:5-6,B3:1-6]
- Feb 17-21 Period of Extreme Sea Level.[9]
- Storm dropped up to 5 inches of rain in San Diego County, flooding streets and overflowing 5 dams.[3,Feb 19,1980,1:1]
- Observed Maximum Significant wave height of 18 feet, Maximum peak period 15 sec.[17]
- State of emergency declared in San Diego County.[3,Feb 20,1980,1:6]
- Flooding of San Luis Rey River in Oceanside caused fatalities and extensive property damage.[19]
- Sixth Pacific storm in 8 days hit San Diego on Feb 20.[3,Feb 21,1980,3:2-5]
- Relentless storms spread havoc throughout San Diego County.[3,Feb 21,1980,1:6]
- Maximum breakers of 10-15 feet[19]
- Mudslides, raging creeks and rivers affect several areas including De Luz and Mission Valley.[3,Feb 21,1980,B1:1-5;Feb 22,1980,1:2-4]
- Feb 22 Damages estimated at \$100 million dollars for storm.[3,Feb 23,1980,1:2-4]
- Total rainfall was 5-15 inches near the coast and 15-30 inches over the foothill and mountain areas.[19]

About 200 horses were evacuated from Del Mar Fairgrounds after San Dieguito River overflowed.[3 Feb 22, 1980:2:6]

Floodwaters of Sweetwater River covered large areas of the Chula Vista Municipal Golf Course.[3 Feb 23, 1980, B3:2-4]

Feb 27-28 Observed Maximum Significant Wave Height of 12.0 feet, Maximum Peak period 13.0 sec.[17]

Mar 2 Storm damage to country roads and bridges estimated at \$20 million. [3,Mar 2,1980,B1:1-6]

Mar 7 Latest storm dropped 3.5 inches in San Diego County before moving east [3, Mar 7, 1980, 1:5]

San Diego Supervisors accepted \$1.2 million to be used to repair flood damaged areas in the county.[3,Mar 7,1980,B8:6]

Mar 18 Major storm, with observed max. sig. wave ht. 10.0 feet, max. peak period of 10.0 sec.[17]

Mar 21 Electrical storm drops rain, hail, and snow.[3,Mar 22,1980,B2:5-6]

Apr 13 Three communities on the shore of the Salton Sea were flooded when wind-generated waves caused the collapse of dikes at Salton Sea Beach and Desert shores.[3,Apr 13,1980 3:2]

May 1 Thunder and lightning along with scattered showers hit San Diego. [3, May 2, 1980, B3:1-2]

May 14 \$7 million in claims against the city have been filed by property owners in South Bay whose homes were damaged by a pipeline to Tijuana during heavy flooding.[3, May 14, 1980, B3:5]

May 29 It will cost the county \$33.6 million to make flood repairs to damaged roads, culverts, and bridges.[3 May 29, 1980, B3:6]

Aug 13 The county will receive \$2.9 million of the \$11 million requested in federal disaster aid to repair flood damaged roads and bridges. [3, Aug 14, 1980, B1:5-6]

1981

Jan 20 High waves and tides combined to flood beachfront condos in Imperial Beach; damage done to Ocean Beach Pier. [3 Jan 21, 1981, B1:1-5]

Jan 21-22 Major storm in San Diego, observed max. sig. wave ht. 16.0 feet, max. peak period 20.0 sec.[17]

Jan 27-28 Storm with max. sig. wave ht. 18.0 feet, max. peak period 14.0 sec observed.[17]

Feb 24 Blustery weather dumped 1 inch of rain in less than an hour in parts of the county. Lightning and high winds caused considerable power outages.[3, Feb 27, 1981, B1:6]

Observed max. sig. wave ht. 11.0 feet, max. peak period 14.0 sec.[17]

- Mar 4-6 Period of extreme sea level.[9]
Storm dumped 1.24 inches of rain at Lindbergh Field, and up to 3 inches in some areas of the county; snow in the mountains. [3,Mar 5,1981,B1:1-4;Mar 7,1981,B1:3]
Jul 5 Tropical storm Beatriz brings west-southwesterly winds of 12-18 mph; southwest swells of 2-3 feet, breakers of 2-4 feet at 12 second intervals.[3,Jul 6,1981,A10]
Nov 13 Observed max. sig. wave ht. 12.0 feet, max. peak period 13.0 sec.[17]

1982

- Jan 2-3 Storm brought snow to the mountains, 7 inches at Mt. Laguna.[3,Jan 3,1982, B1:1-2]
Observed max. sig. wave ht. 17.0 feet, max. peak period. 14.0 sec.[17]
Jan 18-19 Major storm, observed max. sig. wave ht. 13.0 feet, max. peak period 15.0 sec.[17]
Jan 20-21 Storm dumped heavy snow in the mountains throughout Southern California. [3,Jan 22,1982,B1:6]
Jan 28-29 Major storm, observed max. sig. wave ht. 14.0 feet, max. peak period 16.0 sec.[17]
Feb 22-23 Observed max. sig. wave ht. 13.0 feet, max. peak period 12.0 sec.[17]
Mar 2 Major storm, observed max. sig. wave ht. 15.0 feet, max peak period 14.0 sec.[17]
Mar 4 El Chichon volcano in Mexico erupted.[10]
Mar 12 Unexpected thunderstorm hit sections of East County with heavy rain, accompanied by lightning and thunder. Flooding in Imperial County. [3,Mar 13,1982,B1:1-5]
Mar 14 Storm brought downpour of more than 1 inch over much of the county. [3,Mar 15,1982,1:1-4]
Mar 14-15 Observed max. sig. wave ht. 13.0 feet, max. peak period 15.0 sec.[17]
Mar 16 Rain continues, bringing flooding to San Marcos and Escondido. [3,Mar 16,1982,B1:1-6]
Mar 18 Storm dumped 2 inches of rain; with hailstorms in Clairemont and Mira Mesa.[3,Mar 19,1982,B1:2-6]
Mar 29-30 Major storm, observed max. sig. wave ht. 15.0 feet, max. peak period 15.0 sec. [17]
Apr 1 Blustery storm blew into San Diego County, dumping .4 inches of rain in 2 hours.[3,Apr 2,1982,B1:1-4]
Aug 23 Flash flood watch in effect for mountain, foothill and desert areas as a result of the unstable air mass over the entire southwest.[3,Aug 24,1982, B3:6]

- Nov 9-10 Series of storms swirled over San Diego county, bringing cold rains and high winds with gusts up to 35 mph.[3, Nov 10, 1982, 1:2-4]
- Punishing rain and hail, ferocious winds and thunder and lightning continues.[3, Nov 11, 1982, 1:1-4]
- Nov 29-30 Period of extreme sea level.[9]
- Nov 30 Third Alaskan storm system hit San Diego County with heavy rains and winds up to 57 mph; storm dumped more than 5 inches of rain at Lindbergh Field, Mt. Laguna received 3.65 inches. [3, Dec 1, 1982, 1:2-6, B1:1-3]
- 50 mph wind blew away much of the recently restored beachfront along the Strand; a \$2.5 million sand-hauling project of the Corps of Engineers.[3, Dec 1, 1982, B1:1-4]
- Dec 1 High waves and tides along the California coast closed Silver Strand highway linking Coronado to Imperial Beach; causes other damage in La Jolla and Mission Bay.[3, Dec 2, 1982, 1:2-5]
- The La Jolla Marine Room was the victim of gale force storm that sent waves smashing through its surfside windows.[3, Dec 2, 1982, B1:3-5]
- Dec 8 Storm in San Diego produced high winds in Northeast San Diego County. [3, Dec 9, 1982, B2:1-3]
- Dec 9 A storm that was pushed off track by winds from the north went through San Diego and drove east to Imperial Valley.[3, Dec 10, 1982, 1:1-6]
- Dec 17 About \$10,000 damage done to the Ocean Beach Pier as high tide and heavy surf battered San Diego's coastline; breakers ranged from 10-12 feet. [3, Dec 18, 1982, B1:1-6, 3:2-5]
- Dec 22 Major winter storm causes massive blackout throughout California, Arizona and Nevada.[3, Dec 23, 1982, 1:1-6]
- 1983
- Winter Reversal in storm currents in the Pacific: they now run from south to north.[11, p.5]
- Severe El Nino Winter.[9], [20]
- Jan 18-20 Major storm, max. sig. wave ht. 16.0 feet, max. peak period 17.0 sec observed. [17]
- Jan 23-25 A Pacific storm 700 miles from San Diego brought 12 foot waves; caused the closing of the Ocean Beach and Crystal Piers.[3, Jan 24, 1983, B1:1-3]
- Heavy rains sent mudslides across highways and high winds and heavy surf pounded beaches.[3, Jan 25, 1983, 1:1-4]
- Storm moved as much as 25 feet of built-up sand and rock protection from the base of cliffs up and down the county's coastline.[11, p.3]
- Observed max. sig. wave ht. 18.0 feet, max. peak period 20 sec.[17]

- Jan 26-29 Battering surf of up to 15 feet is the result of a series of intense storms in the Pacific.[3,Jan 26,1983,B2:1-3]
- Observed max. sig. wave ht. 24 feet, max. peak period 20 sec.[17]
- Crystal Piers was heavily damaged by waves as high as 15 feet.[12,Dec 2,1986, I:3]
- Winter storm brings high tides and pounding surf to San Diego County coastline; Del Mar and Oceanside declared states of emergency. [3,Jan 28,1983,1:1-6]
- In Mission Beach, high tides overflowed the seawall and flooded several homes with water and sand. High tide and waves tore a 200-foot section off the end of Crystal Pier.[3,Jan 28,1983,B4:1-8,E1:1-2]
- Maximum wave heights at La Jolla 6-11.5 feet with a wave period of 5-9 sec. At the Mission Bay entrance, max. wave ht. was 13-19 feet, period 15-17 sec.[3,Jan 28,1983]
- Jan 29-31 Two subtropical storms carrying up to 2 inches of rain and gale force winds of 40-50 mph hits San Diego, coincident with high January tides.[3,Jan 29,1983,1:1-6]
- Feb 1 An estimated \$6 million in damage was inflicted by the storm of Jan 27-28.[3,Feb 1,1983]
- Feb 2-3 Storm dumped more than 1 inch of rain; brought snow to the mountains. Damage in Baja California and San Diego estimated at \$32.7 million damage.[3,Feb 4,1983,1:1-4]
- Feb 10 San Diego County, with estimated damages now of \$14 million, was declared a disaster area by President Reagan.[3,Feb 10,1983,B1:1-3]
- Feb 11-12 High surf and tides pound San Diego's coastline.[3,Feb 12,1983,B1:1-2]
- Feb 12-14 Major storm, observed max. sig. wave ht. 18 feet, max. peak period 22.0 sec.[17]
- A day of heavy surf inundated Mission Beach on Feb 13.[3,Feb 14,1983,B1:1-4]
- Feb 18-21 Major storm, observed max. sig. wave ht. 15 feet, max. peak period 18 sec. [17]
- Feb 28-Mar 2 Observed max. sig. wave ht. 23 feet, max. peak period 21 sec.[17]
- A severe Pacific storm unleashed high winds and intense rains on San Diego County; flooding low-lying areas and overflowing many dams. Waves of up to 14 feet; many homes flooded in South Bay.[3,Mar 1,1983, 1:1-4;Mar 2,1983,1:2-6,B1:1]
- Rain for the seventh consecutive day. Raging surf caused by severe storm, ripped off a section of the Imperial Beach Pier.[3,Mar 3,1983,B1:1-3]
- Mar 4 8-day storm leaves \$3.4 million in property damage; contamination in Mission Bay.[3,Mar 4,1983,1:1-4]
- Mudslide in Encinitas at Encinitas Blvd. and Interstate 5.[3,Mar 6,1983,B1:3-6]
- Mar 8 Major storm, observed max. sig. wave ht. 16.0 feet, max. peak period 18.0 sec.[17]

- Mar 15 Office of Emergency Services report estimates storm damage at \$14.2 million.[3,Mar 15,1983,3:2]
- Damages of storms of 1982-1983 estimated at \$50-75 throughout California.[10]
- Mar 17-18 Major storm, observed max. sig. wave ht. 14.0 feet, max. peak period 20.0 sec.[17]
- May 10 Coastal storms during the winter took away much sand from local beaches.[3,May 10,1983,B1:1-6]
- Jul 10 Normal than higher tide caused temporary flooding in the Sports Arena area, also on Midway Drive.[3,Jul 11,1983,B3:4-6]
- Aug 6 Thunderstorms fed by moist tropical air from Mexico rolled through San Diego, bringing unusual lightning and brush fires, also .01 inches of rain.[3,Aug 7,1983,1:1-4]
- Aug 8 High tides caused flooding of the Strand in Oceanside; flooding in Mission Beach and downtown. The unusually high tides - 7.7 feet - when combined with 6-10 foot high waves brought flooding to coastal areas, Oceanside in particular danger.[3,Aug 9,1983,B1:3-6,B1:4]
- Aug 14 Downpour brought lightning and thundershowers and caused a series of accidents.[3,Aug 15,1983,B1:2-6,1:4]
- Sep 29 First winter storm of the season; 12 inches of rain at Lindbergh Field.[3,Sep 30,1983,B9:1-5]
- Oct 1 Unseasonable Pacific storm over San Diego produces heavy showers.[3,Oct 1,1983,B1:4-6]
- Oct 2 35 families in Oceanside left homeless when an apartment complex collapsed due to accumulation of rainwater above the ceilings. [3,Oct 3,1983,B1:1-6]

1984

- Aug 12 Tropical storm Iselle brings wind and surf to San Diego; west- southwesterly winds of 14-20 mph, breakers of 5-8 feet on south- facing beaches at 14 second intervals.[3,Aug 12,1984;B1]

1985

- Aug 29 Tropical storm Olaf was 1200 miles southeast of San Diego bringing winds and humidity to the county.[3,Aug 29,1985,B1,B11]

1986

- Aug 28 Tropical storm Javier offshore brought west-southwesterly winds of up to 15 knots and heavy surf to south-facing beaches. Surf of 3-6 feet at 14 second intervals, with a maximum of 10 feet on south- facing beaches.[3,Aug 28,1986,A14]

Sept-Oct Unexpected heavy rainstorms, lower than normal temperatures.[11]

Dec 31 High tides of 7.8 feet flood coastal areas.[14,Dec 31,1986]

1988

Jan 17 A strong extratropical low pressure system approached the Southern California coast. Strong winds, high waves and thunderstorms impacted the area. Deep-water waves of 33 feet were measured at the Begg Rock Buoy. A barometric pressure of 29.25 inches was recorded at Los Angeles. Coastal damage was sustained throughout Southern California from Santa Barbara to the U.S. - Mexico border. Redondo Beach's King Harbor suffered severe damage.

References

- [1] Lynch,H.B.,
Rainfall and Stream Run-off in Southern California Since 1769, Metropolitan Water District of Southern California, Los Angeles, CA, August 1931.
- [2] Brewer, W.H.,
Up and Down California in 1860-1864—The Journal of William H. Brewer, F.P. Farquhar,ed., Univ. of Calif. Press, 2nd edition, 1966, 583pp.
- [3] San Diego Union.
- [4] *Climatological Records, 1819-1892*, U.S. Weather Bureau, National Archives, Washington, D.C., 1942. Microfilm.
- [5] Kuhn, G.G. and Shepard, F.P.,
"Should Southern California Build Defenses Against Violent Storms Resulting in Lowland Flooding As Discovered In Records of Past Century," *Shore And Beach*, V.49, No.4, 1981.
- [6] San Diego Herald Examiner.
- [7] Marine Advisors,
Design Waves For Proposed Small Craft Harbor At Oceanside, California, Marine Advisors, La Jolla, March 1960.
- [8] Lakeside Journal.
- [9] Flick, R.E. and Cayan, D.R.,
"Extreme Sea Levels on the Coast of California", *19th Coastal Engineering Conference Proceedings*, ASCE, Houston, 1984.
- [10] Vista Morning Press.
- [11] Encinitas Post Dispatch.
- [12] Los Angeles Times.
- [13] National Wildlife, Jan/Feb 1984.

APPENDIX H

**SAN DIEGO BAY PREDICTED MONTHLY
EXTREME HIGH TIDE ELEVATIONS**

PREDICTED MONTHLY EXTREME HIGH TIDES FOR SAN DIEGO, CALIFORNIA

DATE	FT.(MLLW)	:	DAYS OF THE MONTH		
Jan-84	7.5	:	18		
Feb-84	7.3	:	16		
Mar-84	6.8	:	16		
Apr-84	6.6	:	15	16	
May-84	7.0	:	14		
Jun-84	7.1	:	12	29	
Jul-84	7.4	:	27	28	
Aug-84	7.4	:	25	26	
Sep-84	6.9	:	23		
Oct-84	7.3	:	25		
Nov-84	7.5	:	22	23	
Dec-84	7.4	:	21		
Jan-85	7.0	:	7	8	19
Feb-85	7.1	:	5		20
Mar-85	6.8	:	6		
Apr-85	6.6	:	6		
May-85	7.1	:	4	5	
Jun-85	7.4	:	2	30	
Jul-85	7.5	:	1		
Aug-85	7.1	:	15		
Sep-85	6.8	:	13		
Oct-85	7.1	:	15	16	
Nov-85	7.6	:	13		
Dec-85	7.7	:	11	12	
Jan-86	7.5	:	9	10	
Feb-86	7.1	:	7	8	
Mar-86	6.5	:	8		
Apr-86	6.9	:	25		
May-86	7.3	:	23	24	
Jun-86	7.7	:	21		
Jul-86	7.7	:	20		
Aug-86	7.5	:	18		
Sep-86	6.8	:	15	16	
Oct-86	6.7	:	6		
Nov-86	7.3	:	3	30	
Dec-86	7.8	:	31		
Jan-87	7.6	:	1	29	
Feb-87	7.0	:	26	27	
Mar-87	6.2	:	27		
Apr-87	6.4	:	27		
May-87	6.9	:	13	14	
Jun-87	7.4	:	11	12	
Jul-87	7.7	:	10	11	
Aug-87	7.8	:	8		
Sep-87	7.3	:	5	6	
Oct-87	6.8	:	8		
Nov-87	7.2	:	22		
Dec-87	7.5	:	21		
Jan-88	7.6	:	19		
Feb-88	7.3	:	16	17	
Mar-88	6.6	:	16		
Apr-88	6.7	:	16	17	

PREDICTED MONTHLY EXTREME HIGH TIDES FOR SAN DIEGO, CALIFORNIA

DATE	FT.(MLLW)	:	DAYS OF THE MONTH		
May-88	6.9	:	14	15	
Jun-88	7.3	:	29	30	
Jul-88	7.6	:	28		
Aug-88	7.4	:	25	26	
Sep-88	7.0	:	27		
Oct-88	7.4	:	25		
Nov-88	7.4	:	22	23	
Dec-88	7.2	:	21	22	
Jan-89	7.2	:	8		
Feb-89	7.2	:	6		
Mar-89	6.7	:	6		
Apr-89	6.8	:	6	7	
May-89	7.2	:	5		
Jun-89	7.3	:	2	3	
Jul-89	7.3	:	1	2	
Aug-89	7.1	:	15	16	
Sep-89	6.8	:	17	18	
Oct-89	7.4	:	16		
Nov-89	7.7	:	13		
Dec-89	7.7	:	12		
Jan-90	7.4	:	10		
Feb-90	6.9	:	8		
Mar-90	6.6	:	28		
Apr-90	7.1	:	25		
May-90	7.5	:	24		
Jun-90	7.6	:	21	22	
Jul-90	7.6	:	20	21	
Aug-90	7.2	:	18		
Sep-90	6.5	:	3	15	16
Oct-90	7.0	:	6		
Nov-90	7.5	:	3	4	
Dec-90	7.8	:	2	31	
Jan-91	7.7	:	1		
Feb-91	6.7	:	26	27	
Mar-91	6.1	:	29	30	
Apr-91	6.6	:	15	16	
May-91	7.1	:	14		
Jun-91	7.6	:	12		
Jul-91	7.8	:	11		
Aug-91	7.6	:	8		
Sep-91	7.0	:	6		
Oct-91	6.9	:	24	25	
Nov-91	7.4	:	22		
Dec-91	7.6	:	21	22	
Jan-92	7.6	:	19		
Feb-92	7.2	:	17		
Mar-92	6.4	:	19		
Apr-92	6.6	:	16	17	
May-92	6.9	:	31		
Jun-92	7.5	:	30		
Jul-92	7.6	:	28	29	
Aug-92	7.3	:	26		

PREDICTED MONTHLY EXTREME HIGH TIDES FOR SAN DIEGO, CALIFORNIA

DATE	FT. (MLLW)	:	DAY OF THE MONTH
Sep-92	7.0	:	27
Oct-92	7.3	:	26
Nov-92	7.3	:	23
Dec-92	7.1	:	10 11
Jan-93	7.3	:	8
Feb-93	7.2	:	6
Mar-93	6.6	:	7
Apr-93	6.8	:	6 7
May-93	7.1	:	5
Jun-93	7.2	:	3
Jul-93	7.1	:	1 2 18 19
Aug-93	7.1	:	16 17
Sep-93	6.9	:	17 18
Oct-93	7.4	:	16
Nov-93	7.6	:	13 14
Dec-93	7.5	:	12 13
Jan-94	7.1	:	10 11
Feb-94	6.6	:	8 9
Mar-94	6.6	:	28
Apr-94	7.0	:	25 26
May-94	7.4	:	24
Jun-94	7.5	:	22
Jul-94	7.3	:	20 21
Aug-94	6.9	:	18 19
Sep-94	6.5	:	4
Oct-94	7.0	:	6 7
Nov-94	7.5	:	4
Dec-94	7.7	:	2 3
Jan-95	7.6	:	1
Feb-95	6.5	:	27
Mar-95	6.2	:	1
Apr-95	6.6	:	15 16
May-95	7.1	:	14 15
Jun-95	7.5	:	12
Jul-95	7.6	:	11
Aug-95	7.4	:	9
Sep-95	6.8	:	6 7
Oct-95	7.0	:	25
Nov-95	7.4	:	22 23
Dec-95	7.6	:	21 22
Jan-96	7.5	:	19 20
Feb-96	7.0	:	17 18
Mar-96	6.3	:	17
Apr-96	6.3	:	16 17
May-96	6.9	:	31
Jun-96	7.5	:	30
Jul-96	7.6	:	29
Aug-96	7.3	:	27
Sep-96	6.7	:	27 28
Oct-96	7.0	:	26
Nov-96	7.0	:	24
Dec-96	7.2	:	11

PREDICTED MONTHLY EXTREME HIGH TIDES FOR SAN DIEGO, CALIFORNIA

DATE	FT.(MLLW)	:	DAYS OF THE MONTH		
Jan-97	7.4	:	9		
Feb-97	7.3	:	7		
Mar-97	6.7	:	7	8	
Apr-97	6.5	:	7		
May-97	6.8	:	6		
Jun-97	6.9	:	3	4	20
Jul-97	7.3	:	19	20	
Aug-97	7.3	:	17		
Sep-97	6.9	:	15		
Oct-97	7.1	:	16	17	
Nov-97	7.3	:	14		
Dec-97	7.3	:	13		
Jan-98	7.0	:	11	27	28
Feb-98	6.8	:	25	26	
Mar-98	6.4	:	29		
Apr-98	6.9	:	26		
May-98	7.2	:	25		
Jun-98	7.3	:	22	23	
Jul-98	7.2	:	21		
Aug-98	7.0	:	7		
Sep-98	6.9	:	5		
Oct-98	6.9	:	7		
Nov-98	7.3	:	4	5	
Dec-98	7.6	:	3		
Jan-99	7.5	:	1		
Feb-99	6.7	:	1		
Mar-99	6.4	:	1		
Apr-99	6.5	:	16	17	
May-99	7.1	:	15		
Jun-99	7.5	:	13		
Jul-99	7.6	:	12		
Aug-99	7.4	:	9	10	
Sep-99	6.8	:	7	8	
Oct-99	7.0	:	26		
Nov-99	7.5	:	23	24	
Dec-99	7.7	:	22		
Jan-2000	7.6	:	20		
Feb-2000	7.1	:	18	19	
Mar-2000	6.4	:	18		
Apr-2000	6.0	:	6	17	18
May-2000	6.8	:	31		
Jun-2000	7.5	:	30		
Jul-2000	7.7	:	30		
Aug-2000	7.4	:	27	28	
Sep-2000	6.7	:	25		
Oct-2000	6.7	:	27		
Nov-2000	7.0	:	13		
Dec-2000	7.4	:	11	12	
Jan-2001	7.6	:	9	10	
Feb-2001	7.5	:	7	8	
Mar-2001	7.0	:	8		
Apr-2001	6.3	:	8		

PREDICTED MONTHLY EXTREME HIGH TIDES FOR SAN DIEGO, CALIFORNIA

DATE	FT. (MLLW)	:	DAY OF THE MONTH	
May-2001	6.7	:	23	
Jun-2001	7.2	:	21	22
Jul-2001	7.6	:	20	
Aug-2001	7.6	:	18	
Sep-2001	7.2	:	15	
Oct-2001	6.9	:	17	18
Nov-2001	7.2	:	15	
Dec-2001	7.2	:	30	31
Jan-2002	7.3	:	28	29
Feb-2002	7.1	:	26	27
Mar-2002	6.5	:	27	
Apr-2002	6.8	:	26	27
May-2002	7.1	:	25	26
Jun-2002	7.2	:	23	
Jul-2002	7.1	:	10	
Aug-2002	7.4	:	8	
Sep-2002	7.2	:	5	6
Oct-2002	6.9	:	7	8
Nov-2002	7.4	:	5	
Dec-2002	7.6	:	4	
Jan-2003	7.4	:	2	
Feb-2003	6.9	:	16	
Mar-2003	6.5	:	17	
Apr-2003	6.8	:	17	
May-2003	7.3	:	16	
Jun-2003	7.5	:	13	14
Jul-2003	7.5	:	12	13
Aug-2003	7.3	:	10	
Sep-2003	6.8	:	8	
Oct-2003	7.2	:	26	27
Nov-2003	7.7	:	24	
Dec-2003	7.8	:	23	
Jan-2004	7.5	:	21	
Feb-2004	7.0	:	18	19
Mar-2004	6.3	:	18	
Apr-2004	6.3	:	6	7
May-2004	7.0	:	5	
Jun-2004	7.5	:	3	30
Jul-2004	7.7	:	1	2
Aug-2004	7.4	:	1	28
Sep-2004	6.6	:	25	26
Oct-2004	6.8	:	16	
Nov-2004	7.3	:	13	14
Dec-2004	7.7	:	12	
Jan-2005	7.7	:	10	
Feb-2005	7.5	:	8	
Mar-2005	6.8	:	8	9
Apr-2005	6.4	:	25	26
May-2005	7.0	:	24	
Jun-2005	7.5	:	22	
Jul-2005	7.8	:	21	
Aug-2005	7.7	:	18	

PREDICTED MONTHLY EXTREME HIGH TIDES FOR SAN DIEGO, CALIFORNIA

DATE	FT. (MLLW)	:	DAY OF THE MONTH	
Sep-2005	7.1	:	16	
Oct-2005	7.0	:	18	
Nov-2005	7.1	:	15	16
Dec-2005	7.4	:	31	
Jan-2006	7.5	:	29	
Feb-2006	7.1	:	26	27
Mar-2006	6.6	:	30	
Apr-2006	6.9	:	27	
May-2006	7.1	:	26	
Jun-2006	7.0	:	23	24
Jul-2006	7.3	:	10	11
Aug-2006	7.5	:	8	9
Sep-2006	7.2	:	6	
Oct-2006	7.2	:	8	
Nov-2006	7.5	:	5	6
Dec-2006	7.5	:	4	
Jan-2007	7.2	:	2	
Feb-2007	7.0	:	17	
Mar-2007	6.5	:	20	
Apr-2007	7.0	:	17	18
May-2007	7.3	:	16	
Jun-2007	7.4	:	13	14
Jul-2007	7.4	:	13	
Aug-2007	7.1	:	10	11
Sep-2007	6.9	:	28	29
Oct-2007	7.5	:	27	
Nov-2007	7.7	:	24	25
Dec-2007	7.7	:	23	24
Jan-2008	7.4	:	21	
Feb-2008	6.8	:	19	
Mar-2008	6.2	:	6	
Apr-2008	6.7	:	7	
May-2008	7.2	:	5	
Jun-2008	7.6	:	3	
Jul-2008	7.7	:	2	
Aug-2008	7.4	:	1	
Sep-2008	6.5	:	18	
Oct-2008	7.1	:	16	
Nov-2008	7.5	:	13	14
Dec-2008	7.8	:	13	
Jan-2009	7.7	:	10	11
Feb-2009	7.3	:	8	
Mar-2009	6.5	:	8	9
Apr-2009	6.7	:	26	
May-2009	7.2	:	24	25
Jun-2009	7.6	:	22	
Jul-2009	7.8	:	21	
Aug-2009	7.5	:	18	19
Sep-2009	6.8	:	16	
Oct-2009	7.0	:	18	
Nov-2009	7.0	:	4	15
Dec-2009	7.6	:	31	16

PREDICTED MONTHLY EXTREME HIGH TIDES FOR SAN DIEGO, CALIFORNIA

DATE	FT. (MLLW)	:	DAY OF THE MONTH
Jan-2010	7.6	:	1
Feb-2010	6.9	:	27
Mar-2010	6.6	:	30
Apr-2010	6.8	:	27
May-2010	6.9	:	26
Jun-2010	7.1	:	12
Jul-2010	7.5	:	11
Aug-2010	7.5	:	9
Sep-2010	7.0	:	6
Oct-2010	7.2	:	8
Nov-2010	7.4	:	5
Dec-2010	7.3	:	4
Jan-2011	7.2	:	19
Feb-2011	6.9	:	17
Mar-2011	6.6	:	20
Apr-2011	7.0	:	18
May-2011	7.2	:	16
Jun-2011	7.3	:	14
Jul-2011	7.2	:	13
Aug-2011	6.9	:	27
Sep-2011	7.1	:	29
Oct-2011	7.5	:	27
Nov-2011	7.7	:	25
Dec-2011	7.5	:	23
Jan-2012	7.1	:	21
Feb-2012	6.6	:	7
Mar-2012	6.2	:	7
Apr-2012	6.8	:	7
May-2012	7.2	:	5
Jun-2012	7.5	:	3
Jul-2012	7.6	:	2
Aug-2012	7.2	:	1
Sep-2012	6.6	:	18
Oct-2012	7.2	:	16
Nov-2012	7.6	:	14
Dec-2012	7.8	:	13
Jan-2013	7.5	:	10
Feb-2013	7.0	:	8
Mar-2013	6.3	:	9
Apr-2013	6.8	:	26
May-2013	7.2	:	24
Jun-2013	7.6	:	22
Jul-2013	7.6	:	21
Aug-2013	7.3	:	19
Sep-2013	6.6	:	17
Oct-2013	6.7	:	18
Nov-2013	7.1	:	4
Dec-2013	7.5	:	3
Jan-2014	7.6	:	1
Feb-2014	6.8	:	1
Mar-2014	6.6	:	1
Apr-2014	6.5	:	27
			28

PREDICTED MONTHLY EXTREME HIGH TIDES FOR SAN DIEGO, CALIFORNIA

DATE	FT. (MLLW)	:	DAYS OF THE MONTH		
May-2014	6.6	:	14	15	26
Jun-2014	7.1	:	12	13	
Jul-2014	7.5	:	11	12	
Aug-2014	7.5	:	9		
Sep-2014	7.0	:	7		
Oct-2014	6.9	:	8	9	
Nov-2014	7.1	:	6	7	
Dec-2014	7.2	:	22		
Jan-2015	7.3	:	20		
Feb-2015	7.0	:	18		
Mar-2015	6.4	:	18	19	
Apr-2015	6.7	:	18	19	
May-2015	7.0	:	17		
Jun-2015	7.0	:	14	15	
Jul-2015	7.2	:	30	31	
Aug-2015	7.1	:	28		
Sep-2015	6.9	:	29		
Oct-2015	7.3	:	27	28	
Nov-2015	7.4	:	25	26	
Dec-2015	7.3	:	24		
Jan-2016	6.9	:	22	23	
Feb-2016	6.8	:	8		
Mar-2016	6.5	:	8		
Apr-2016	6.6	:	8		
May-2016	7.0	:	6	7	
Jun-2016	7.3	:	4		
Jul-2016	7.4	:	3		
Aug-2016	7.2	:	1		
Sep-2016	6.6	:	15		
Oct-2016	7.1	:	17		
Nov-2016	7.5	:	14	15	
Dec-2016	7.6	:	13	14	
Jan-2017	7.4	:	11	12	
Feb-2017	7.0	:	9		
Mar-2017	6.3	:	10		
Apr-2017	6.7	:	26	27	
May-2017	7.2	:	25	26	
Jun-2017	7.6	:	23		
Jul-2017	7.6	:	22		
Aug-2017	7.3	:	20		
Sep-2017	6.6	:	17	18	
Oct-2017	6.5	:	7	8	
Nov-2017	7.1	:	5		
Dec-2017	7.5	:	3	4	
Jan-2018	7.7	:	2		
Feb-2018	7.2	:	1		
Mar-2018	6.9	:	1		
Apr-2018	6.2	:	28	29	
May-2018	6.8	:	16		
Jun-2018	7.3	:	13	14	
Jul-2018	7.7	:	12		
Aug-2018	7.7	:	10		

PREDICTED MONTHLY EXTREME HIGH TIDES FOR SAN DIEGO, CALIFORNIA

DATE	FT. (MLLW)	:	DAY OF THE MONTH
Sep-2018	7.2	:	7 8
Oct-2018	6.6	:	9 10
Nov-2018	7.0	:	23 24
Dec-2018	7.4	:	23
Jan-2019	7.5	:	21
Feb-2019	7.3	:	18 19
Mar-2019	6.7	:	19
Apr-2019	6.5	:	19
May-2019	6.8	:	17 18
Jun-2019	6.9	:	15
Jul-2019	7.5	:	31
Aug-2019	7.5	:	1
Sep-2019	6.9	:	27
Oct-2019	7.1	:	28 29
Nov-2019	7.3	:	26
Dec-2019	7.2	:	25
Jan-2020	7.2	:	11
Feb-2020	7.2	:	9
Mar-2020	6.8	:	8 9
Apr-2020	6.5	:	8 9
May-2020	7.0	:	7
Jun-2020	7.3	:	5
Jul-2020	7.3	:	3
Aug-2020	7.2	:	18
Sep-2020	6.9	:	15 16
Oct-2020	7.1	:	18
Nov-2020	7.5	:	15 16
Dec-2020	7.6	:	14
Jan-2021	7.4	:	12
Feb-2021	6.9	:	10
Mar-2021	6.3	:	30
Apr-2021	6.9	:	27 28
May-2021	7.4	:	26
Jun-2021	7.6	:	23 24
Jul-2021	7.6	:	22 23
Aug-2021	7.2	:	20 21
Sep-2021	6.7	:	5
Oct-2021	6.7	:	8 9
Nov-2021	7.3	:	5 6
Dec-2021	7.7	:	4
Jan-2022	7.7	:	2 3
Feb-2022	7.4	:	1
Mar-2022	6.9	:	1
Apr-2022	6.5	:	18
May-2022	7.1	:	16
Jun-2022	7.5	:	14
Jul-2022	7.8	:	13
Aug-2022	7.7	:	10 11
Sep-2022	7.2	:	8
Oct-2022	6.8	:	26 27
Nov-2022	7.3	:	24 25
Dec-2022	7.6	:	23 24

PREDICTED MONTHLY EXTREME HIGH TIDES FOR SAN DIEGO, CALIFORNIA

DATE	FT.(MLLW)	:	DAYS OF THE MONTH		
Jan-2023	7.7	:	21		
Feb-2023	7.4	:	19		
Mar-2023	6.6	:	19	20	
Apr-2023	6.5	:	19	20	
May-2023	6.7	:	18	19	
Jun-2023	7.0	:	4	5	
Jul-2023	7.7	:	31		
Aug-2023	7.7	:	1		
Sep-2023	6.8	:	27	30	
Oct-2023	7.2	:	29		
Nov-2023	7.2	:	26	27	
Dec-2023	7.1	:	13	14	
Jan-2024	7.4	:	11	12	
Feb-2024	7.4	:	9		
Mar-2024	6.9	:	9		
Apr-2024	6.7	:	9		
May-2024	7.1	:	7		
Jun-2024	7.2	:	5		
Jul-2024	7.3	:	21		
Aug-2024	7.4	:	18		
Sep-2024	7.0	:	16		
Oct-2024	7.3	:	18	19	
Nov-2024	7.6	:	16		
Dec-2024	7.5	:	14	15	
Jan-2025	7.2	:	12	13	
Feb-2025	6.7	:	10	11	26 27
Mar-2025	6.6	:	30	31	
Apr-2025	7.1	:	27	28	
May-2025	7.4	:	26	27	
Jun-2025	7.5	:	24	25	
Jul-2025	7.4	:	23		
Aug-2025	7.0	:	20	21	
Sep-2025	6.7	:	5	6	
Oct-2025	7.1	:	8	9	
Nov-2025	7.6	:	6		
Dec-2025	7.8	:	5		
Jan-2026	7.7	:	3		
Feb-2026	7.3	:	1		
Mar-2026	6.6	:	1		
Apr-2026	6.8	:	18		
May-2026	7.3	:	17		
Jun-2026	7.6	:	14	15	
Jul-2026	7.8	:	13		
Aug-2026	7.6	:	11		
Sep-2026	6.9	:	8	9	
Oct-2026	7.2	:	27		
Nov-2026	7.6	:	25		
Dec-2026	7.8	:	24		
Jan-2027	7.6	:	21	22	
Feb-2027	7.1	:	19	20	
Mar-2027	6.3	:	20		
Apr-2027	6.5	:	20		

PREDICTED MONTHLY EXTREME HIGH TIDES FOR SAN DIEGO, CALIFORNIA

DATE	FT. (MLLW)	:	DAYS OF THE MONTH		
May-2027	6.7	:	6	7	
Jun-2027	7.2	:	4	5	
Jul-2027	7.6	:	3	4	31
Aug-2027	7.7	:	1		
Sep-2027	6.8	:	30		
Oct-2027	7.1	:	29	30	
Nov-2027	7.1	:	27		
Dec-2027	7.4	:	14		
Jan-2028	7.5	:	12		
Feb-2028	7.3	:	9	10	
Mar-2028	6.6	:	9		
Apr-2028	6.8	:	9		
May-2028	7.0	:	7	8	
Jun-2028	7.1	:	22	23	
Jul-2028	7.4	:	21		
Aug-2028	7.3	:	19		
Sep-2028	7.0	:	20		
Oct-2028	7.4	:	18	19	
Nov-2028	7.5	:	16		
Dec-2028	7.4	:	15		
Jan-2029	7.0	:	1	13	29
Feb-2029	6.6	:	27	28	30
Mar-2029	6.7	:	30	31	
Apr-2029	7.2	:	28		
May-2029	7.4	:	27		
Jun-2029	7.4	:	24	25	
Jul-2029	7.2	:	23	24	
Aug-2029	7.0	:	9		
Sep-2029	6.7	:	11		
Oct-2029	7.3	:	9		
Nov-2029	7.6	:	6	7	
Dec-2029	7.7	:	5		
Jan-2030	7.5	:	3		
Feb-2030	7.0	:	1		
Mar-2030	6.4	:	21		
Apr-2030	6.9	:	18	19	
May-2030	7.3	:	17		
Jun-2030	7.6	:	15		
Jul-2030	7.6	:	13	14	
Aug-2030	7.3	:	11		
Sep-2030	6.7	:	29	30	
Oct-2030	7.3	:	27	28	
Nov-2030	7.6	:	25	26	
Dec-2030	7.8	:	24		

APPENDIX I

**COAST OF CALIFORNIA STORM AND TIDAL
WAVES STUDY REPORT PUBLICATIONS**

APPENDIX I
COAST OF CALIFORNIA STORM AND TIDAL WAVES STUDY

REPORT PUBLICATIONS

Note:

Publication author is the U.S. Army Corps of Engineers (USACOE), Los Angeles District, Los Angeles, CA, unless otherwise noted.

<u>Reference No.</u>	<u>Title</u>
<u>1984</u>	
CCSTWS 84-1	Annual Report, 1983, April 1984, 67 p.
CCSTWS 84-2	Nearshore Bathymetric Survey Report No. 1, Nearshore Research Group, Scripps Institution of Oceanography, La Jolla, CA, April 1984, 142 p.
CCSTWS 84-3	San Diego Region Plan of Study, April 1984, 34 p.
CCSTWS 84-4	Geomorphology Framework Report, Dana Pt. to the Mexican Border, September 1984, 150 p.+.
CCSTWS 84-5	Sediment Sampling: Dana Pt. to the Mexican Border (November 1983-January 1984), November 1984, 80+ p.
<u>1985</u>	
CCSTWS 85-1	Annual Report, 1984, April 1985, 37 p.
CCSTWS 85-2	Geomorphology Framework Report, Monterey Bay, U.S. Geological Survey, Menlo Park, December 1985, 100+ p.
CCSTWS 85-3	Nearshore Bathymetric Survey Report, San Diego Region (November 1983-February 1985), Ocean Engineering Research Group, Scripps Institution of Oceanography, La Jolla, CA, December 1985, 560 p.
CCSTWS 85-4	Southern California Coastal Processes, Annotate Bibliography, December 1985, 401 p.
CCSTWS 85-5	Geotechnical Data Inventory, Southern California Coastal Zone, December 1985, 100+ p.
CCSTWS 85-6	Southern California Shoreline Socioeconomic Data Summary, POD Inc., Santa Ana, CA, December 1985, 195 p.

APPENDIX I
COAST OF CALIFORNIA STORM AND TIDAL WAVES STUDY

REPORT PUBLICATIONS
(Continued)

Note:

Publication author is the U.S. Army Corps of Engineers (USACOE), Los Angeles District, Los Angeles, CA, unless otherwise noted.

<u>Reference No.</u>	<u>Title</u>
CCSTWS 85-7	Meteorological Data Inventory, Southern California Coastal Zone, DMA Consulting Engineers, Marina del Rey, CA, December 1985, 150+ p.
CCSTWS 85-8	Hydrologic Data Inventory, Southern California Coastal Zone, DMA Consulting Engineers, Marina del Rey, CA, December 1985, 102 p. + Appendix
CCSTWS 85-9	Hydraulic Data Inventory, Southern California Coastal Zone, December 1985, 35p.
CCSTWS 85-10	Shoreline Movement Data Report, Portugese Point to the Mexican Border (1852-1982), USACOE Waterways Experiment Station, Vicksburg, MS, December 1985, 49 p.
CCSTWS 85-11	Littoral Zone Sediments, San Diego Region (October 1983-June 1984), University of Southern California, Los Angeles, CA, December 1985, 200+ p.

1986

CCSTWS 86-1	Southern California Coastal Processes Data Summary, Jaykim Engineers, La Jolla, CA, February 1986, 572 p.
CCSTWS 86-2	Southern California Coastal Photography and Beach Profile Index, February 1986, 150 + p.
CCSTWS 86-3	Annual Report, 1985, July 1986, 45 p.

APPENDIX I
COAST OF CALIFORNIA STORM AND TIDAL WAVES STUDY

REPORT PUBLICATIONS
(Continued)

Note:

Publication author is the U.S. Army Corps of Engineers (USACOE), Los Angeles District, Los Angeles, CA, unless otherwise noted.

<u>Reference No.</u>	<u>Title</u>
<u>1987</u>	
CCSTWS 87-1A	Consolidated Plan of Study, March 1987, 200+ p.
CCSTWS 87-1B	Annual Report, January 1986-July 1987, October 1987, 46 p.
CCSTWS 87-2	Coastal Cliffs Sediment Report, Ajina, Del Mar, CA, June 1987, 150+ p.
CCSTWS 87-3	Silver Strand Preliminary Sediment Budget, Moffatt and Nichol Engineers, Long Beach, CA, December 1987, 157 p.
CCSTWS 87-4	Oceanside Cell Preliminary Sediment Budget, Tekmarine, Inc., Pasadena, CA, December 1987, 157 p.
CCSTWS 87-5	Northern California Coastal Processes, Annotated Bibliography, USACOE San Francisco District, December 1987, 491 p.
CCSTWS 87-6	Literature Data Base User's Manual, USACOE San Francisco District, December 1987, 32 p.
CCSTWS 87-7	Northern California Coastal Photography, Beach Profile and Bathymetry Index, USACOE San Francisco District, December 1987, 97 p.
CCSTWS 87-8	Northern California Wave, Wind, Tide, and River Discharge Index, USACOE San Francisco District, December 1987, 108 p.
CCSTWS 87-9	San Diego Region Wind Transport and Wave Overwash Report, Tekmarine, Inc., Pasadena, CA, December 1987, 36 p.
CCSTWS 87-10	Shoreline Movement Investigations Report, Portugese Point to the Mexican Border (1852-1982), Moffatt and Nichol Engineers, Long Beach, CA, December 1987, 124 p.

APPENDIX I
COAST OF CALIFORNIA STORM AND TIDAL WAVES STUDY

REPORT PUBLICATIONS
(Continued)

Note:

Publication author is the U.S. Army Corps of Engineers (USACOE), Los Angeles District, Los Angeles, CA, unless otherwise noted.

<u>Reference No.</u>	<u>Title</u>
<u>1988</u>	
CCSTWS 88-1	Socioeconomic Data Summary, Northern California Shoreline, USACOE San Francisco District, January 1988, 43 p.
CCSTWS 88-2	Sedimentation in Submarine Canyons -- San Diego County, California (1984-1987), Moffatt and Nichol Engineers, Long Beach, CA, April 1988, 115 p.
CCSTWS 88-3	River Sediment Discharge Study, San Diego Region, Simons, Li and Associates, Newport Beach, CA, August 1988, 100+ p. + Appendices
CCSTWS 88-4	Shoreline Position Study - San Diego Region (1982 - 1983), Tekmarine, Inc., Pasadena, CA, August 1988, 10 p.
CCSTWS 88-5	Sand Thickness Survey Report, San Diego Region, Tekmarine, Inc., Pasadena, CA, August 1988, 21 p.
CCSTWS 88-6	Historic Wave and Sea Level Data Report, San Diego Region, Moffatt and Nichol Engineers, Long Beach, CA, January 1989, 100+ p.
CCSTWS 88-7	Mission Bay Littoral Cell, Preliminary Sediment Budget Report, Moffatt and Nichol Engineers, Long Beach, CA, December 1988, 129 p.
CCSTWS 88-8	Coastal Cliff Sediments, San Diego Region, Dana Pt. to the Mexican Border, Brian A. Robinson and Associates, Van Nuys, CA, December 1988, 200+ p.

APPENDIX I
COAST OF CALIFORNIA STORM AND TIDAL WAVES STUDY

REPORT PUBLICATIONS
(Continued)

Note:

Publication author is the U.S. Army Corps of Engineers (USACOE), Los Angeles District, Los Angeles, CA, unless otherwise noted.

<u>Reference No.</u>	<u>Title</u>
<u>1990</u>	
CCSTWS 90-1	Fourier Grain Shape and Mineralogic Analysis of Sand Samples for the San Diego Region, December 1989, 200+ p.
CCSTWS 90-2	Oceanside Littoral Cell Sediment Budget Report, Moffatt and Nichol Engineers, Long Beach, CA, February 1990, 200+ p.