MISCELLANEOUS PAPER H-71-10

GUIDE FOR THE USE OF HOURLY TIDAL DATA PLOTTING PROGRAM

by

L. L. Daggett

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FOREWORD

The data processing digital computer program described herein was developed in 1970 by the U. S. Army Engineer Waterways Experiment Station (WES) Hydraulics Division as part of a project to automate the processing of hydraulic estuary model data. The project was under the general supervision of Mr. E. P. Fortson, Jr., Chief, Hydraulics Division, and Mr. H. B. Simmons, Chief, Estuaries Branch. Dr. L. L. Daggett, Mathematical Hydraulics Group, was responsible for program development and documentation. Mr. T. C. Hill, Estuaries Branch, and Mr. M. B. Boyd, Mathematical Hydraulics Group, assisted in the program development. Because of the applicability of the program to other Hydraulics Division work, the publication of this paper was supported by In-House Laboratory Independent Research funds.

Directors of the WES during the program's development and preparation of this report were COL Levi A. Brown, CE, and COL Ernest D. Peixotto, CE. Technical Director was Mr. F. R. Brown.

CONTENTS

NOTATION

A, B, C = calibration coefficient matrices

DATAHB(I,1) = DATABH(I,1) = base time data column

DATAHB(I,2) = DATABH(I,2) = base tidal data column (after scaling, calibrating, and averaging)

DATAH1(I,1) = DATA1H(I,1) = 1st curve time data column

DATAH1(I,2) = DATA1H(I,2) = 1st curve tidal data column

DATAH2(I,1) = DATA2H(I,1) = 2nd curve time data column

DATAH2(I,2) = DATA2H(I,2) = 2nd curve tidal data column

DATAH3(I,1) = DATA3H(I,1) = 3rd curve time data column

DATAH3(I,3) = DATA3H(I,2) = 3rd curve tidal data column

DELTIM = increment by which TIME is increased

DELX = DELXH = DELXV = DELXS = DELXT = time increment of annotation of X-axis

DELYH = increment of increase of Y-axis annotation for tidal heights plots

DELYS = increment of increase of Y-axis annotation for salinity plots

DELYT = increment of increase of Y-axis annotation for temperature plots

DELYV = increment of increase of Y-axis annotation for velocity plots

DIFF1, DIFF2, DIFF3 = difference between 1st, 2nd, or 3rd curve data and base data, respectively, at the given TIME value

HBAVG = average value of base data

HBMAX = max Y value in base data

HBMAXT = time HBMAX occurred

HBMIN = min Y value in base data

HBMINT = time HBMIN occurred

HDATA (I,1) = DATAGH(I,1) = time data column

HDATA (I,2) = DATAGH(I,2) = tidal data column

HMAX = max Y value to be plotted

HMIN = min Y value to be plotted

HVAL = uncalibrated tidal data matrix

H1AVG = average value of 1st curve data

H1MAX = max Y value in 1st curve data

H1MAXT = time H1MAX occurred

H1MIN = min Y value in 1st curve data

H1MINT = time H1MIN occurred

H2AVG = average value of 2nd curve data

H2MAX = max Y value in 2nd curve data

H2MAXT = time H2MAX occurred

H2MIN = min Y value in 2nd curve data

H2MINT = time H2MIN occurred

H3AVG = average value of 3rd curve data

H3MAX = max Y value in 3rd curve data

H3MAXT = time H3MAX occurred

H3MIN = min Y value in 3rd curve data

H3MINT = time H3MIN occurred

IB, I1, I2, I3 = pointers used in building output tables for base, 1st, 2nd, 3rd curves, respectively

IBUFF = buffer for plot tape

IC = plot tape unit number

ICOND = test condition block matrix

IPOINT = station identity matrix

ITEST = test title matrix

LBY = standard lower bound on Y-axis annotation transferred to AXES

LBYH = standard lower bound on Y-axis annotation for tidal heights plots

LBYS = standard lower bound on Y-axis annotation for salinity plots

LBYT = standard lower bound on Y-axis annotation on temperature plots

LBYV = standard lower bound on Y-axis annotation for velocity plots

LENX = length of equally spaced portion of X-axis in inches

LENY = length of Y-axis in inches

MODEL = model title matrix

NCELL = number of the cell used in salinity meter

NCONDS = number of test condition cards to be read

NDATAB = number of base data values

NDATA1 = number of 1st curve data values

NDATA2 = number of 2nd curve data values

NDATA3 = number of 3rd curve data values

NPLAN = plan identity matrix

NPLANS = number of plans to be compared with a base on a plot

NPLOTS = number of plots to be plotted on a page

NREAD = number of HVAL's to be read

NSTA = number of stations to be placed on a page

SCALEH = scaling factor for tidal heights

SCALES = scaling factor for tidal salinities

SCALET = scaling factor for tidal temperatures

SCALEX = X scaling factor for graphing of data

SCALEY = Y scaling factor for graphing of data

SCALEV = scaling factor for tidal velocities

SPACEH = space between tick marks on Y-axis for tidal heights plots

SPACES = space between tick marks on Y-axis for salinity plots

SPACET = space between tick marks on Y-axis for temperature plots

SPACEX = space between tick marks on X-axis in inches

SPACEV = space between tick marks on Y-axis for velocity plots

TIME = time being searched for in building output tables

TIMEMX = max time to be searched for printout

TIMERR = half range for allowing time to be set equal to TIME

TIML = TIME - TIMERR, lower limit of time range

TIMU = TIME + TIMERR, upper limit of time range

TITLEH = title block title for tidal heights plots

TITLES = title block title for salinity plots

TITLET = title block title for temperature plots

TITLEV = title block title for velocity plots

XAXIS = X-axis title matrix

YAXISH = Y-axis title matrix for tidal heights plots

YAXISS = Y-axis title matrix for salinity plots

YAXIST = Y-axis title matrix for temperature plots

YAXISV = Y-axis title matrix for velocity plots

UBY = largest number to be annotated on Y-axis

SUMMARY

This report provides the required information for using the computer program described herein to calibrate and scale tidal data and to display these data in graphical and tabular form. The required input for the program is fully described, and the various output options are illustrated. Use of this digital computer program will allow more rapid and less expensive processing of hydraulic model data.

GUIDE FOR THE USE OF HOURLY TIDAL DATA PLOTTING PROGRAM

PART I: PURPOSE

1. A digital computer program has been written to automatically process data collected from estuarine models. In this program the computer accepts data from cards and generates plots and tables of the calibrated and scaled data. The data accepted may be hourly tidal heights, velocities, salinities, or temperatures. This program will allow more rapid and less expensive processing of hydraulic model data. This processing will also be more standardized and hence more repeatable. Value judgments may still be exercised where necessary.

PART II: APPLICATION

2. As stated previously, in this program the computer accepts data in the form of cards. Data collected from the estuarine model should be written on a special data form and continuation sheet (WES Form Nos. 1919 and 1919-1, respectively) for easy assembly for processing. General information (test conditions) other than actual data is read in once and normally will not need to be changed for a particular model and test program. The setup of input information is discussed in Part III.

3. The program produces three types of plots and tables depending on whether the data are for model verification, comparison of a base test with a number of plans, or display of base, model, or prototype data only. Up to three plots can be generated on a page. The size of these plots is preset (5.1 in. by 2.0 in.), and the plots are generated from the top of the page to the bottom. Thus, if only one plot is to be generated, that plot will be placed at the top of the page. Axes titles (names of variables on the ordinate and abscissa) and annotation information (variable magnitudes to be noted on the axes) are input to the program; thus the user determines what information is to be placed on the axes. However, if the data to be plotted do not fall within the range specified, the program will adjust the axis annotation so that the data will fit that particular plot.

4. Up to four curves can be drawn on each plot: curves for the base or prototype data plus those for three plans or the model data. Each curve is distinguished from the others as indicated in the legend. The curves are drawn by a third-order spline-fit technique that forces the curves to pass through each data point.*

5. The information in the title block (i.e. the model name, the test being conducted, and the title to be printed and written** for each

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* For a discussion of the spline-fit technique used, the reader is referred to T. N. E. Greville, "Data Fitting by Spline Functions," Technical Summary Report No. 893, June 1968, U. S. Army Mathematics Research Center, Madison, Wis.

** When describing what the program produces, "writing" refers to action that produces written information on the plot; "printing" refers to action that produces printed information on the tables.

type of gage) and the test condition block is entered by the user and hence can be adjusted by him.

6. The printed tables include the half-hourly data (hourly for salinities) input for each plot. These values are read in after they have been averaged, calibrated, and scaled; they are not values that are generated by the curve-fitting process. There is a separate table for each plot on a plate. The table also includes a comparison of the base and the plan, i.e. the difference between each set of half-hourly values. The time of occurrence and magnitude of the maximum and minimum values are printed for each plan. For the salinity and temperature tables, the average value over the complete tidal cycle is also given, and for the velocity tables, the ebb predominance is printed. At the bottom of each table a note is printed containing five lines that are read in by the program. These lines contain reference and unit information about the time reference, tidal height, velocity, salinity, and temperature data.

7. Two new techniques for identifying the model and testing program and the stations are suggested for use with this program. These are described in detail on WES Form Nos. 1919 and 1919-1 (see Appendix C). The model and testing program are described by a ten-digit number. This ten-digit number is divided into five two-digit coded numbers. The first two-digit number is the model number assigned to each physical model. The second represents the number of the study presently being conducted. The third identifies the test conditions (i.e. tidal range, inflows, etc.) for the test being conducted. The fourth number identifies the plan presently being tested. The final number describes the run presently being conducted under the previously described conditions.

8. The station identification number is likewise a coded number; however, it is alphanumeric. It consists of a letter, two numbers, a letter, and two numbers. The first letter identifies the type of gage being used for the measurement, e.g. H for tidal heights, V for velocities, S for salinities, and T for temperatures. The first set of numbers identifies the range on which the station is located; thus there may be ranges numbered from 0 to 99. The second letter denotes the station on that range at which the measurement is being taken. The last set of

numbers identifies the percent of depth, measured from the water surface to the model bottom, at which the measurement is being taken. This is a relative measurement and not a precise value. If this value is 0 to 10, 45 to 55, or 90 to 99, SURFACE, MID-DEPTH, or BOTTOM, respectively, will be written on the plot rather than the percent depth.

9. Examples of these plots and tables are contained in Part III.

PART III: USER INFORMATION

Program Facts

10. The program described herein is written in FORTRAN IV for a General Electric 427 computer. Input information is read via cards; output consists of printed information and a magnetic tape. The magnetic tape is used to drive a CALCOMP drum plotter which provides the plotted curves. The program uses logic unit 3 for the plot tape. The WES program number is 803-G9RO-148. The program flow chart and listing are presented in Appendixes A and B, respectively. The variables used are described in the Notation.

Input

11. The information to be input to the program can be divided into two major groups. The first group (general information data group) gives the program the information necessary to be used for title blocks, axes titles, and scales for all plots generated. This data group (data here can be alphanumeric information) generally remains the same throughout a particular study on any particular model, although data for cards two through five contain title information that may change between computer runs. The second group (repetitive data group) provides information about how many plots will be included on a particular plate, what stations will be plotted, how many curves are to be drawn on each plot, what plans these curves represent, and the data cards necessary for each curve on that plate. This group will be repeated for as many plates as are required with the actual data values changing as necessary.

General information data group

12. The general information data group is described below. An example of the form to be used in card punching is shown in fig. 1.

DATA SET 1. This data set consists of one card containing the model and test identification that will be written in the plate title block and printed in the table heading. Both titles must be centered within their

GENERAL PURPOSE DATA FORM

PROGRAM EXAMPLE OF TITLE DATA AND PARAMETER CARDS | DATE 3 JUNE 70

REQUESTED BY L. DAGGETT | PREPARED BY | CHECKED BY LLD | PAGE 1 OF 1

Card	
1-A	NEW YORK MODEL JAMAICA BAY TEST
2-A	VERIFICATION OF MODEL TIDAL HEIGHTS
2-B	EFFECTS OF PLAN 10 ON VELOCITIES
2-C	EFFECTS OF PLANS 10 AND 15 ON SALINITIES
2-D	EFFECTS OF PLANS 5, 10, AND 15 ON TEMPERATURES
3-A	5
3-B	TIDAL RANGE AT SANDY HOOK 4.7 FT
3-C	OCEAN SALINITY (TOTAL SALT) 18.3 PPT
3-D	HUDSON RIVER INFLOW 12000 CFS
3-E	RARITAN RIVER INFLOW 1770 CFS
3-F	NAVESINK AND SHREWSBURY INFLOW 256 CFS
4-A	NOTE: TIME IS EXPRESSED IN HOURS AFTER MOON'S TRANSIT OF 74TH MERIDIAN.
4-B	TIDAL HEIGHTS ARE IN PROTOTYPE FEET REFERRED TO MEAN LOW WATER.
4-C	VELOCITIES ARE EXPRESSED IN FEET PER SECOND.
4-D	SALINITIES ARE EXPRESSED IN PPT TOTAL SALT.
4-E	TEMPERATURES ARE EXPRESSED IN DEGREES FAHRENHEIT.
5-A	100.0 10.0 1.0 1.0
6-A	TIME IN HOURS AFTER MOON'S TRANSIT OF 74TH MERIDIAN
6-B	ELEVATION IN FT MLW VELOCITY IN FPS
6-C	SALINITY IN PPT TOTAL SALT TEMPERATURE IN F
7-A	-1. 1. .25 1.
7-B	-5. 1. .20 1.
7-C	10. 1. .20 1.
7-D	50. 2. .20 1.

WES FORM NO. 1233
SEPTEMBER 1962

Fig. 1. General information data group

respective columns so they will be centered in the plate title blocks.

Card 1-A Format (8A4, 8X, 8A4)

Cols	1-32	MODEL	Alphanumeric model title (centered within columns)
	41-72	ITEST	Alphanumeric test (or study) title (centered within columns)

DATA SET 2. This data set includes four cards that contain the main titles to be written in the title block for tidal height, velocity, salinity, or temperature plots. These titles will require three lines on each plate; therefore, for each title there will be three sets of columns. The information given in each column set should be centered in those columns. It is necessary to have all four cards.

Card 2-A Format (15A4)

Cols	1-20	TITLEH(1)-(5)	First line of tidal height title (should be centered)
	21-40	TITLEH(6)-(10)	Second line of tidal height title (should be centered)
	41-60	TITLEH(11)-(15)	Third line of tidal height title (should be centered)

Card 2-B Format (15A4)

Cols	1-20	TITLEV(1)-(5)	First line of velocity title (should be centered)
	21-40	TITLEV(6)-(10)	Second line of velocity title (should be centered)
	41-60	TITLEV(11)-(15)	Third line of velocity title (should be centered)

Card 2-C Format (15A4)

Cols	1-20	TITLES(1)-(5)	First line of salinity title (should be centered)
	21-40	TITLES(6)-(10)	Second line of salinity title (should be centered)
	41-60	TITLES(11)-(15)	Third line of salinity title (should be centered)

Card 2-D Format (15A4)

Cols	1-20	TITLET(1)-(5)	First line of temperature title (should be centered)
	21-40	TITLET(6)-(10)	Second line of temperature title (should be centered)
	41-60	TITLET(11)-(15)	Third line of temperature title (should be centered)

DATA SET 3. This data set contains the information necessary to generate a test condition block on each plate. The same block of information will be written on each plate.

Card 3-A Format (I4)

Cols	4	NCONDS	This parameter* informs the program how many cards, and hence lines, there will be of test condition information. There can be as many as five and must be at least one

Cards 3-B to 3-F Format (11A4)

Cols	1-44	ICOND	Each card contains one line of test condition block information. This will be written on each plot. There will be NCONDS cards as described above. Thus, if NCONDS is set to 3 there must be a card 3-B, 3-C, and 3-D included, no more and no less. These data should be balanced within the columns

DATA SET 4. This set of data must consist of five cards, each containing a line of data to be entered as a note at the bottom of the printed table. These cards may be used to enter information about the dimensions and datum bases of the values printed in the tables. Any of these cards may be left blank and will result in a blank line in the note.

Card 4-A Format (Literal format)

Cols	1-80		First line of note. It is suggested that the first six columns contain NOTE: B, where B = a blank column

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* There is a distinction between data and parameters that should be defined. A data group provides data, either numeric or alphanumeric, that are used in the program to generate the information produced on the plots and tables. A parameter or parameter group, on the other hand, is used by the program to set certain options available within the program.

Cards 4-B
to 4-E Format (Literal format)

Cols	1-80	Second through fifth lines of note, one line per card. It is suggested that the first six columns be left blank if the suggestion for card 4-A is followed

DATA SET 5. This data set contains the scaling factors for tidal height, velocity, salinity, and temperature data by which the calibrated model data will be multiplied to obtain the scaled prototype data. If the scaling is included in the calibration, these scaling factors should be set equal to 1.0. These are decimal values and must contain a decimal point. Any column can be left blank if that type of measurement is not to be used in the study.

Card 5-A Format (4F10.0)

Cols	1-10	SCALEH	Tidal height scaling factor
	11-20	SCALEV	Velocity scaling factor
	21-30	SCALES	Salinity scaling factor
	31-40	SCALET	Temperature scaling factor

DATA SET 6. This data set must contain three cards which contain the axes titles. These data should be centered within the respective columns. Columns may be left blank if the particular axis title will not be used.

Card 6-A Format (7A8)

Cols	1-56	XAXIS	The X-axis title will be the time axis

Card 6-B Format (4A8, 8X, 4A8)

Cols	1-32	YAXISH	Y-axis title for tidal height plots
	41-72	YAXISV	Y-axis title for velocity plots

Card 6-C Format (4A8, 8X, 4A8)

Cols	1-32	YAXISS	Y-axis title for salinity plots
	41-72	YAXIST	Y-axis title for temperature plots

DATA SET 7. The final data set in the general information group of cards contains the standard axes data. For the average model data of each data type (i.e., tides, velocities, salinities, or temperatures), a normal range of values must be selected. This range will define the values to be used in drawing the standard Y-axis. If the data to be plotted fall outside this standard range, the program will automatically

adjust this range so that all data for that particular plot will be within the limits of the plot. The value of SPACE (in inches) can be determined by equation 1.

$$\text{SPACE} = 2.0 \text{ in.} \left(\frac{\text{DELY}}{\text{UBY} - \text{LBY}} \right) \tag{1}$$

where UBY is the largest Y-value on the standard Y-axis (other variables are defined in card description below). It is suggested that SPACE be selected so that DELY/SPACE is a scale value on the engineers' rule. Values between tick marks can then be more easily read. If SPACE is selected to satisfy this criterion, UBY can be found from equation 1 to check that it is adequate. A decimal point must be included with each number. DELX should be equal to 1.0 for 12-hr cycles and 2.0 for 24-hr cycles. All four cards must be included.

Card 7-A Format (4F10.5)

Cols 1-10	LBYH	Lowest Y-value on that axis for tidal height plots
11-20	DELYH	Increment by which Y-values increase between tick marks for tidal height plots
21-30	SPACEH	Distance, in inches, between tick marks on Y-axis for tidal height plots
31-40	DELXH	Increment, in hours, by which X-axis values increase between tick marks for tidal height plots

Card 7-B Format (4F10.5)

Cols 1-10	LBYV	Lowest Y-value on that axis for velocity plots
11-20	DELYV	Increment by which Y-values increase between tick marks for velocity plots
21-30	SPACEV	Distance, in inches, between tick marks on Y-axis for velocity plots
31-40	DELXV	Increment, in hours, by which X-axis values increase between tick marks for velocity plots

Card 7-C	Format (4F10.5)		
Cols	1-10	LBYS	Lowest Y-value on that axis for salinity plots
	11-20	DELYS	Increment by which Y-values increase between tick marks for salinity plots
	21-30	SPACES	Distance, in inches, between tick marks on Y-axis for salinity plots
	31-40	DELXS	Increment, in hours, by which X-axis values increase between tick marks for salinity plots

Card 7-D	Format (4F10.5)		
Cols	1-10	LBYT	Lowest Y-value on that axis for temperature plots
	11-20	DELYT	Increment by which Y-values increase between tick marks for temperature plots
	21-30	SPACET	Distance, in inches, between tick marks on Y-axis for temperature plots
	31-40	DELXT	Increment, in hours, by which X-axis values increase between tick marks for temperature plots

Repetitive data group

13. The repetitive data group (the second group described in paragraph 11) consists of a series of cards, each representing one plate. Data sets 8, 9, and 10 will be repeated for as many plates as are required. Data set 11 is used only once for each computer run.

DATA SET 8. This data set is the control card for each page of plots.

Card 8-A	Format (I4, 6X, 3(A1, A3, A2, 4X), I5, 3(3X, A2))		
Cols	4	NPLOTS	The number of plots to be drawn on this page. NPLOTS may have a value from 1 to 3
	11-16	IPOINT(1)	The station identity of the first plot. See paragraph 8 for a description of this variable
	21-26	IPOINT(2)	The station identity of the second plot
	31-36	IPOINT(3)	The station identity of the third plot

Card 8-A (Continued)

Cols	45	NPLANS	This parameter identifies which form of plots and tables must be used and how many curves are to be drawn on each plot. If NPLANS equals 1, 2, or 3, the plot will be a comparison of 1, 2, or 3 plan designs to the base, respectively. If NPLANS equals 0, the plot will be a comparison of prototype to model data for verification. If NPLOTS equals -1, -2, or -3, only a base, model, or prototype curve will be drawn, respectively
	49-50	NPLAN(1)	The plan number of the first plan curve
	54-55	NPLAN(2)	The plan number of the second plan curve
	59-60	NPLAN(3)	The plan number of the third plan curve

DATA SET 9. This data set provides the data for calibration and the actual data values for either the prototype or base (not model or plans), depending on the value of NPLANS. If NPLANS equals -1, 1, 2, or 3, the data will be base data. If NPLANS equals -3 or 0, the data will be prototype data. If NPLANS equals -2, data set 9 is not to be included. Data set 9 information can be completely contained on WES Form Nos. 1919 and 1919-1, see Appendix C. Card 9-A is not to be included with temperature data. Card 9-B is included only when NCELL is greater than two.

Card 9-A Format (19X, I1, 6F10.0)

Cols	20	NCELLS	The number of salinity cells to be used in calibrating salinity data. To be used with salinity data only
	21-30	A(1)	Calibration coefficient in first calibration equation with zero-order term
	31-40	B(1)	Calibration coefficient in first calibration equation with first-order term
	41-50	C(1)	Calibration coefficient in first calibration equation with second-order term
	51-60	A(2)	Calibration coefficient in second calibration equation with zero-order term
	61-70	B(2)	Calibration coefficient in second calibration equation with first-order term
	71-80	C(2)	Calibration coefficient in second calibration equation with second-order term

Card 9-B	Format (20X, 3F10.0)		This card is to be used only with salinities and only when three cells are used
Cols	21-30	A(3)	Calibration coefficient in third calibration equation with zero-order term
	31-40	B(3)	Calibration coefficient in third calibration equation with first-order term
	41-50	C(3)	Calibration coefficient in third calibration equation with second-order term
Card 9-C to Card 9-(N-1)*	Format	(19X, I1, 3.F4.1) for tidal heights (19X, I1, F4.1, 8X, 4F5.2) for velocities (19X, I1, F4.1, 29X, I1, 3F4.1) for salinities (19X, I1, F4.1, 42X, 2F4.1) for temperatures	
Cols	20	NREAD	This number of data values (usually the number of model runs) to be read into the program and averaged to represent the data value at the corresponding time. NREAD may be different on each card
	21-24	HDATA(I,1)	The time (hour) of the data value. The last data card for each test must read either 12.5 or 24.9
	25-28	Height (1)	Tidal height data value
	29-32	Height (2)	Tidal height data value to be used if NREAD = 2
	33-37	Velocity (1)	Velocity data value
	38-42	Velocity (2)	Velocity data value of NREAD ≥ 2
	43-47	Velocity (3)	Velocity data value if NREAD ≥ 3
	48-52	Velocity (4)	Velocity data value if NREAD = 4
	54	NCELL	Salinity cell calibration equation to be used with salinity data on this card. May change from card to card
	55-58	Salinity (1)	Salinity data value
	59-62	Salinity (2)	Salinity data value if NREAD ≥ 2
	63-66	Salinity (3)	Salinity data value if NREAD = 3
	67-70	Temperature (1)	Temperature data value
	71-74	Temperature (2)	Temperature data value if NREAD = 2

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* The number of cards to be included of this format is determined by the number of data values to be read into the program. Thus N-1 represents the last of the data values to be used for that curve, and N represents the last card in this data set.

Card 9-N Format (same as Card 9-C)

Cols	1-4	EOF	This card must be an End-Of-File (EOF) card with !!!! punched in columns 1-4. This must be the last card in data set 9

DATA SET 10. This data set provides the data for calibration and the actual data values for either the model or the plan (not prototype or base) being compared with the base, depending on the value of NPLANS. If NPLANS equals -1 or -3, data set 10 should not be included. If NPLANS equals -2 or 0, the data will be model data. If NPLANS is greater than 0, the values in this data set will be plan data. Data set 10 must be included once for each plan. Thus if NPLANS equals 2, there must be two data sets 10. Data set 10 has exactly the same cards and formats as data set 9; thus the complete description of cards for this data set will not be repeated here.

DATA SET 11. This data set notifies the program that there are no more plates to be plotted and no more data to be read.

Card 11-A Format (I4)

Cols	1-4	EOF	End of File card with !!!! punched in the first four columns

Card 11-B Format (I4)

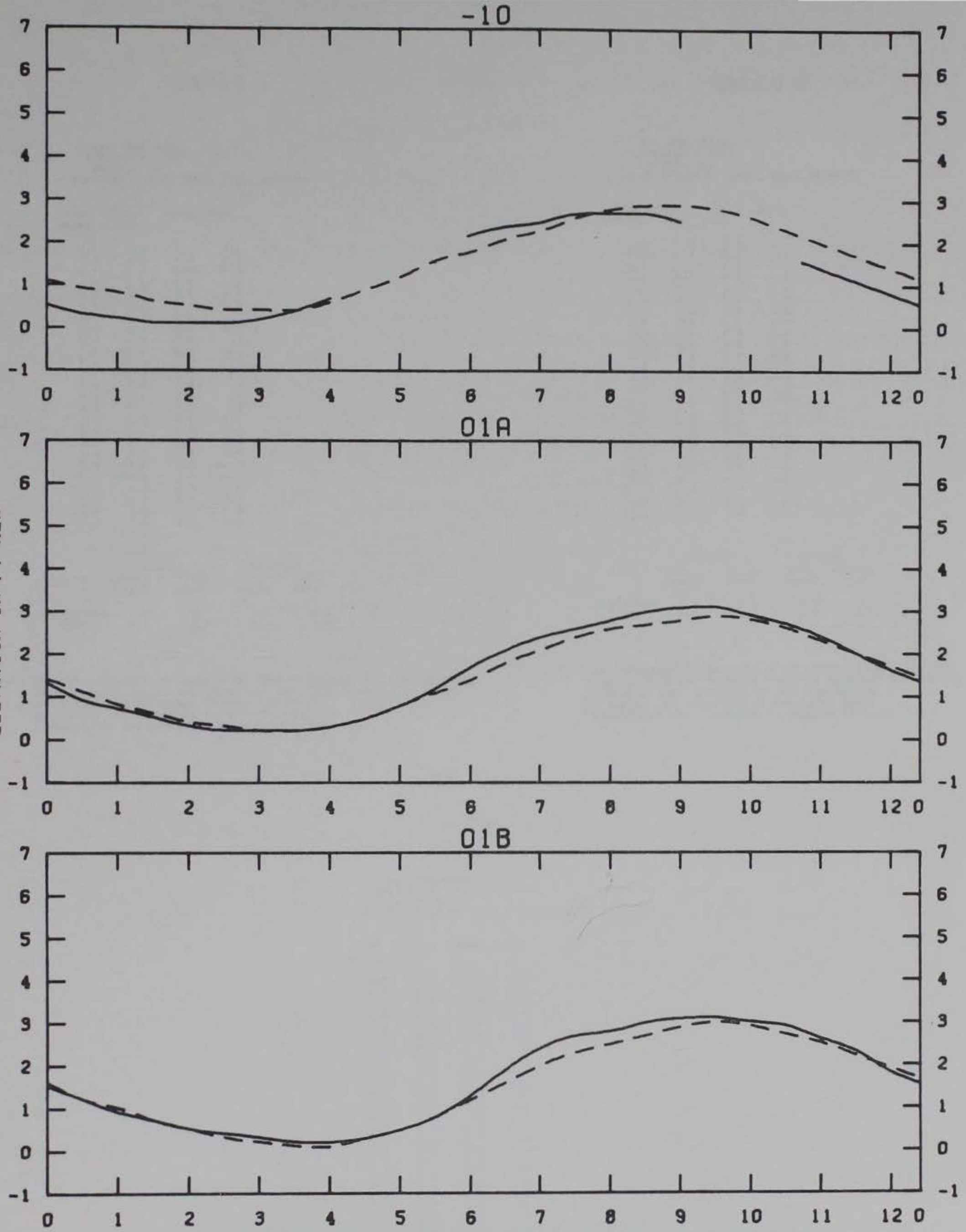
Cols	1-4	EOF	Same as above

Card 11-C Format (8X, A4)

Cols	9-12	.EOJ	End of Job card with .EOJ punched in columns 9-12

Output

14. Examples of typical output and variations that may be obtained using this program are provided in plates 1-8 and tables 1-16. The title of each plate and table contains a description of the condition being demonstrated. The data values used are not to be construed as being representative values. In some cases they are not. The tables following each plate represent the actual tables printed by the computer. This enables the engineer to see the calibrated and scaled data as well as giving him average values.



TIME IN HOURS AFTER MOON'S TRANSIT OF THE 74TH MERIDIAN

TEST CONDITIONS

TIDAL RANGE AT SANDY HOOK	4.7 FT
OCEAN SALINITY (TOTAL SALT)	18.3 PPT
HUDSON RIVER INFLOW	12.000 CFS
RARITAN RIVER INFLOW	1.770 CFS
NAVESINK AND SHREWSBURY INFLOW	256 CFS

LEGEND
PROTOTYPE ———
MODEL — — —

NEW YORK MODEL
SHREWSBURY TEST

VERIFICATION OF TIDAL HEIGHTS

STATIONS
-10. 01A. AND 01B

PLATE 1

Table 1

NEW YORK MODEL
SHREWSBURY TEST
STATION -1C
VERIFICATION OF MODEL TIDAL HEIGHTS

TIME HOURS	PROTO-TYPE	MODEL	DIFF.
0.0	0.5	1.1	0.6
0.5	0.3	0.9	0.6
1.0	0.2	0.8	0.6
1.5	0.1	0.6	0.5
2.0	0.1	0.5	0.4
2.5	0.1	0.4	0.3
3.0	0.2	0.4	0.2
3.5	0.4	0.4	0.0
4.0	0.7	0.6	-.1
4.5	*99.0	0.9	-*8.1
5.0	*99.0	1.2	-*7.8
5.5	*99.0	1.6	-*7.4
6.0	2.2	1.8	-.4
6.5	2.4	2.1	-.3
7.0	2.5	2.3	-.2
7.5	2.7	2.6	-.1
8.0	2.7	2.8	0.1
8.5	2.7	2.9	0.2
9.0	2.5	2.9	0.4
9.5	*99.0	2.8	-*6.2
10.0	*99.0	2.6	-*6.4
10.5	1.7	2.3	0.6
11.0	1.4	2.0	0.6
11.5	1.1	1.7	0.6
12.0	0.8	1.4	0.6

PLAN	MAXIMUM TIME HOURS	MAXIMUM TIDAL DATA	MINIMUM TIME HOURS	MINIMUM TIDAL DATA
PROTOTYPE	7.5	2.7	1.5	0.1
MODEL	8.5	2.9	2.5	0.4

NOTE: TIME IS EXPRESSED IN HOURS AFTER MOON'S TRANSIT OF 74TH MERIDIAN.
TIDAL HEIGHTS ARE IN PROTOTYPE FEET REFERRED TO MEAN LOW WATER.
VELOCITIES ARE EXPRESSED IN FEET PER SECOND.
SALINITIES ARE EXPRESSED IN PPT TOTAL SALT.
TEMPERATURES ARE EXPRESSED IN DEGREES FAHRENHEIT.

Table 2

NEW YORK MODEL
SHREWSBURY TEST
STATION 01A
VERIFICATION OF MODEL TIDAL HEIGHTS

TIME HOURS	PROTO-TYPE	MODEL	DIFF.
0.0	1.3	1.4	0.1
0.5	0.9	1.1	0.2
1.0	0.7	0.8	0.1
1.5	0.5	0.6	0.1
2.0	0.3	0.4	0.1
2.5	0.2	0.3	0.1
3.0	0.2	0.2	0.0
3.5	0.2	0.2	0.0
4.0	0.3	0.3	0.0
4.5	0.5	0.5	0.0
5.0	0.8	0.8	0.0
5.5	1.2	1.1	-.1
6.0	1.7	1.4	-.3
6.5	2.1	1.8	-.3
7.0	2.4	2.1	-.3
7.5	2.6	2.4	-.2
8.0	2.8	2.6	-.2
8.5	3.0	2.7	-.3
9.0	3.1	2.8	-.3
9.5	3.1	2.9	-.2
10.0	2.9	2.8	-.1
10.5	2.7	2.6	-.1
11.0	2.4	2.3	-.1
11.5	2.0	2.0	0.0
12.0	1.6	1.7	0.1

PLAN	MAXIMUM TIME HOURS	MAXIMUM TIDAL DATA	MINIMUM TIME HOURS	MINIMUM TIDAL DATA
PROTOTYPE	9.0	3.1	2.5	0.2
MODEL	9.5	2.9	3.0	0.2

NOTE: TIME IS EXPRESSED IN HOURS AFTER MOON'S TRANSIT OF 74TH MERIDIAN.
TIDAL HEIGHTS ARE IN PROTOTYPE FEET REFERRED TO MEAN LOW WATER.
VELOCITIES ARE EXPRESSED IN FEET PER SECOND.
SALINITIES ARE EXPRESSED IN PPT TOTAL SALT.
TEMPERATURES ARE EXPRESSED IN DEGREES FAHRENHEIT.

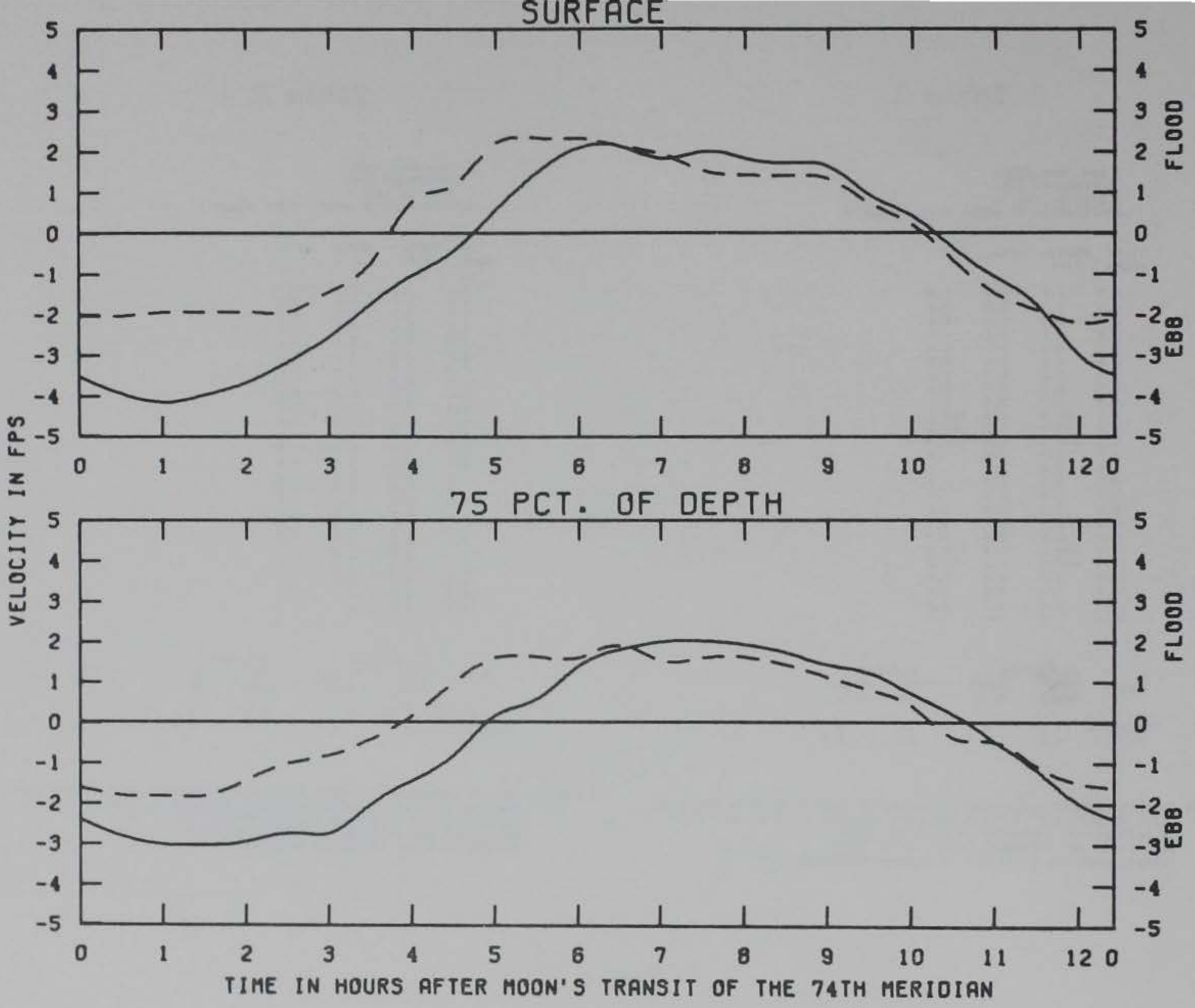
Table 3

NEW YORK MODEL
SHREWSBURY TEST
STATION 01B
VERIFICATION OF MODEL TIDAL HEIGHTS

TIME HOURS	PROTO-TYPE	MODEL	DIFF.
0.0	1.5	1.6	0.1
0.5	1.2	1.2	0.0
1.0	0.9	1.0	0.1
1.5	0.7	0.7	0.0
2.0	0.5	0.5	0.0
2.5	0.4	0.3	-.1
3.0	0.3	0.2	-.1
3.5	0.2	0.1	-.1
4.0	0.2	0.1	-.1
4.5	0.3	0.3	0.0
5.0	0.5	0.5	0.0
5.5	0.8	0.8	0.0
6.0	1.3	1.2	-.1
6.5	1.9	1.6	-.3
7.0	2.4	2.0	-.4
7.5	2.7	2.3	-.4
8.0	2.8	2.5	-.3
8.5	3.0	2.7	-.3
9.0	3.1	2.9	-.2
9.5	3.1	3.0	-.1
10.0	3.0	2.9	-.1
10.5	2.9	2.7	-.2
11.0	2.6	2.5	-.1
11.5	2.3	2.2	-.1
12.0	1.8	1.9	0.1

PLAN	MAXIMUM TIME HOURS	MAXIMUM TIDAL DATA	MINIMUM TIME HOURS	MINIMUM TIDAL DATA
PROTOTYPE	9.0	3.1	3.5	0.2
MODEL	9.5	3.0	3.5	0.1

NOTE: TIME IS EXPRESSED IN HOURS AFTER MOON'S TRANSIT OF 74TH MERIDIAN.
TIDAL HEIGHTS ARE IN PROTOTYPE FEET REFERRED TO MEAN LOW WATER.
VELOCITIES ARE EXPRESSED IN FEET PER SECOND.
SALINITIES ARE EXPRESSED IN PPT TOTAL SALT.
TEMPERATURES ARE EXPRESSED IN DEGREES FAHRENHEIT.



TEST CONDITIONS

TIDAL RANGE AT SANDY HOOK	4.7 FT
OCEAN SALINITY (TOTAL SALT)	18.3 PPT
HUDSON RIVER INFLOW	12.000 CFS
RARITAN RIVER INFLOW	1.770 CFS
NAVESINK AND SHREWSBURY INFLOW	256 CFS

LEGEND

BASE ———

PLAN 5 — — —

NEW YORK MODEL
SHREWSBURY TEST

EFFECTS OF PLANS ON VELOCITIES

STATION
00

PLATE 2

Table 4

NEW YORK MODEL
SHREWSBURY TEST
STATION 00 01

EFFECTS OF PLAN 5 ON
VELOCITIES

TIME HOURS	BASE TEST	PLAN 5	DIFF. 5-BASE	PLAN	DIFF.	PLAN	DIFF.
0.0	-3.2	-1.6	1.5				
0.5	-3.6	-1.6	1.9				
1.0	-3.8	-1.5	2.2				
1.5	-3.6	-1.5	2.0				
2.0	-3.3	-1.5	1.7				
2.5	-2.8	-1.5	1.2				
3.0	-2.2	-1.0	1.1				
3.5	-1.3	-.3	1.0				
4.0	-.6	0.8	1.4				
4.5	-.0	1.2	1.2				
5.0	0.6	2.2	1.6				
5.5	1.5	2.3	0.8				
6.0	2.1	2.3	0.2				
6.5	2.1	2.1	0.0				
7.0	1.8	1.9	0.1				
7.5	2.0	1.5	-.5				
8.0	1.8	1.4	-.4				
8.5	1.7	1.4	-.3				
9.0	1.6	1.3	-.3				
9.5	0.9	0.7	-.2				
10.0	0.4	0.2	-.2				
10.5	-.0	-.3	-.3				
11.0	-.7	-1.1	-.4				
11.5	-1.4	-1.5	-.1				
12.0	-2.7	-1.8	0.8				

PLAN	MAXIMUM TIME HOURS	MAXIMUM TIDAL DATA	MINIMUM TIME HOURS	MINIMUM TIDAL DATA	EBB PRE-DOMINANCE
BASE	6.0	2.1	1.0	-3.8	63.2
5	5.5	2.3	12.0	-1.8	44.1

NOTE: TIME IS EXPRESSED IN HOURS AFTER MOON'S TRANSIT OF 74TH MERIDIAN.
TIDAL HEIGHTS ARE IN PROTOTYPE FEET REFERRED TO MEAN LOW WATER.
VELOCITIES ARE EXPRESSED IN FEET PER SECOND.
SALINITIES ARE EXPRESSED IN PPT TOTAL SALT.
TEMPERATURES ARE EXPRESSED IN DEGREES FAHRENHEIT.

Table 5

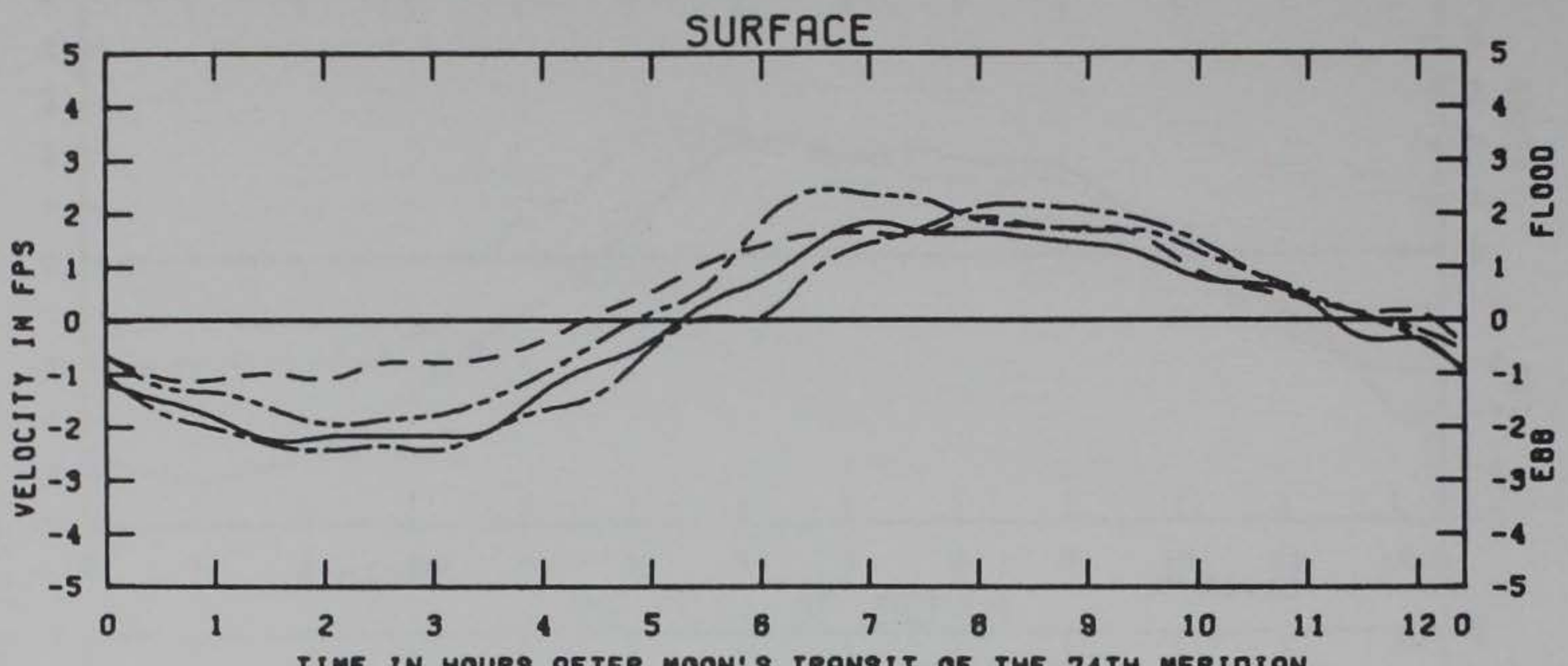
NEW YORK MODEL
SHREWSBURY TEST
STATION 00 75

EFFECTS OF PLAN 5 ON
VELOCITIES

TIME HOURS	BASE TEST	PLAN 5	DIFF. 5-BASE	PLAN	DIFF.	PLAN	DIFF.
0.0	-2.0	-1.2	0.8				
0.5	-2.5	-1.4	1.0				
1.0	-2.7	-1.4	1.2				
1.5	-2.7	-1.4	1.2				
2.0	-2.6	-1.0	1.5				
2.5	-2.4	-.6	1.7				
3.0	-2.4	-.4	1.9				
3.5	-1.6	-.0	1.6				
4.0	-1.0	0.2	1.2				
4.5	-.4	1.0	1.4				
5.0	0.2	1.6	1.4				
5.5	0.6	1.6	1.0				
6.0	1.4	1.6	0.2				
6.5	1.8	1.9	0.1				
7.0	2.0	1.5	-.5				
7.5	2.0	1.6	-.4				
8.0	1.9	1.6	-.3				
8.5	1.7	1.4	-.3				
9.0	1.4	1.1	-.3				
9.5	1.2	0.8	-.4				
10.0	0.7	0.4	-.3				
10.5	0.2	-.0	-.2				
11.0	-.1	-.1	0.0				
11.5	-.8	-.7	0.1				
12.0	-1.6	-1.1	0.5				

PLAN	MAXIMUM TIME HOURS	MAXIMUM TIDAL DATA	MINIMUM TIME HOURS	MINIMUM TIDAL DATA	EBB PRE-DOMINANCE
BASE	7.0	2.0	1.0	-2.7	59.6
5	6.5	1.9	0.5	-1.4	36.5

NOTE: TIME IS EXPRESSED IN HOURS AFTER MOON'S TRANSIT OF 74TH MERIDIAN.
TIDAL HEIGHTS ARE IN PROTOTYPE FEET REFERRED TO MEAN LOW WATER.
VELOCITIES ARE EXPRESSED IN FEET PER SECOND.
SALINITIES ARE EXPRESSED IN PPT TOTAL SALT.
TEMPERATURES ARE EXPRESSED IN DEGREES FAHRENHEIT.



TEST CONDITIONS

TIDAL RANGE AT SANDY HOOK	4.7 FT
OCEAN SALINITY (TOTAL SALT)	18.3 PPT
HUDSON RIVER INFLOW	12.000 CFS
RARITAN RIVER INFLOW	1.770 CFS
NAVESINK AND SHREWSBURY INFLOW	256 CFS

LEGEND

BASE ————
PLAN 5 — — —
PLAN 11 ——-——
PLAN 15 ——--——

NEW YORK MODEL
SHREWSBURY TEST

EFFECTS OF PLANS ON VELOCITIES

STATION
05

PLATE 3

Table 6

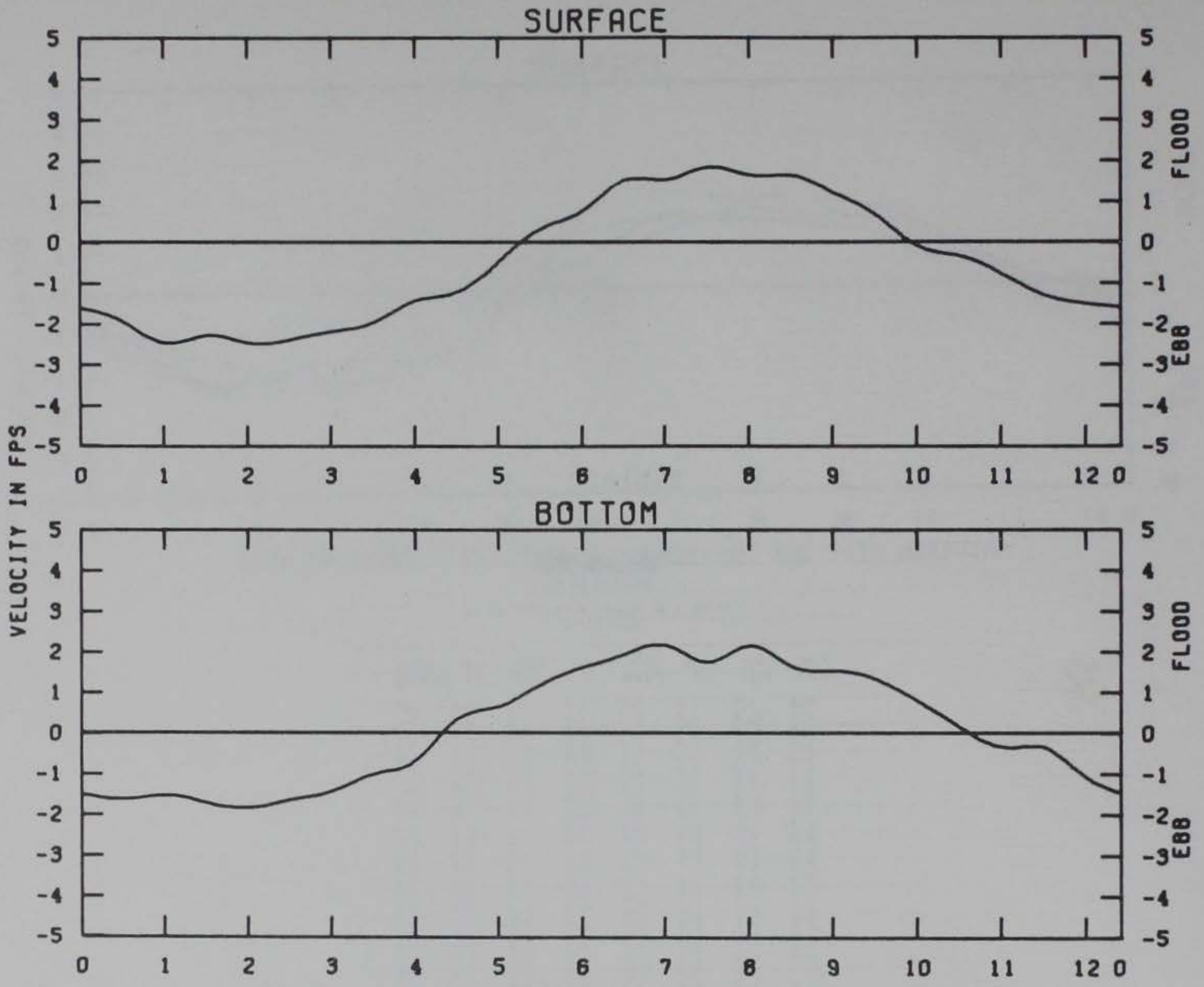
NEW YORK MODEL
SHREWSBURY TEST
STATION 05 01

EFFECTS OF PLANS 5,11, AND 15 ON
VELOCITIES

TIME HOURS	BASE TEST	PLAN 5	DIFF. 5-BASE	PLAN 11	DIFF. 11-BASE	PLAN 15	DIFF. 15-BASE
0.0	-.9	-.4	0.5	-.9	0.0	-.5	0.4
0.5	-1.2	-.8	0.4	-1.6	-.3	-1.1	0.1
1.0	-1.6	-.8	0.7	-1.9	-.3	-1.2	0.4
1.5	-2.0	-.7	1.3	-2.2	-.2	-1.5	0.5
2.0	-1.9	-.8	1.1	-2.3	-.4	-1.8	0.1
2.5	-1.9	-.5	1.4	-2.2	-.3	-1.7	0.2
3.0	-1.9	-.5	1.4	-2.3	-.4	-1.6	0.3
3.5	-1.8	-.4	1.4	-1.9	-.1	-1.3	0.5
4.0	-1.0	-.1	1.0	-1.5	-.5	-.8	0.2
4.5	-.5	0.1	0.6	-1.2	-.7	-.2	0.3
5.0	-.1	0.6	0.6	-.3	-.2	0.2	0.3
5.5	0.4	1.1	0.7	0.1	-.3	0.7	0.3
6.0	0.8	1.4	0.6	0.1	-.7	1.9	1.1
6.5	1.4	1.6	0.2	1.0	-.5	2.4	1.0
7.0	1.8	1.6	-.2	1.5	-.4	2.4	0.5
7.5	1.6	1.6	0.0	1.8	0.1	2.3	0.6
8.0	1.6	2.0	0.3	2.2	0.5	1.9	0.2
8.5	1.5	1.7	0.2	2.2	0.6	1.8	0.2
9.0	1.4	1.7	0.3	2.1	0.6	1.7	0.2
9.5	1.2	1.5	0.3	1.9	0.7	1.7	0.5
10.0	0.8	0.9	0.1	1.5	0.7	1.3	0.5
10.5	0.7	0.6	-.1	0.9	0.2	0.9	0.2
11.0	0.4	0.4	0.0	0.4	0.0	0.5	0.1
11.5	-.1	0.1	0.2	0.1	0.2	0.1	0.2
12.0	-.1	0.1	0.2	-.2	-.1	-.1	-.0

PLAN	MAXIMUM TIME HOURS	MAXIMUM TIDAL DATA	MINIMUM TIME HOURS	MINIMUM TIDAL DATA	EBB PRE-DOMINANCE
BASE	7.0	1.8	1.5	-2.0	52.0
5	8.0	2.0	0.5	-.8	22.4
11	8.0	2.2	2.0	-2.3	54.4
15	6.5	2.4	2.0	-1.8	37.8

NOTE: TIME IS EXPRESSED IN HOURS AFTER MOON'S TRANSIT OF 74TH MERIDIAN.
TIDAL HEIGHTS ARE IN PROTOTYPE FEET REFERRED TO MEAN LOW WATER.
VELOCITIES ARE EXPRESSED IN FEET PER SECOND.
SALINITIES ARE EXPRESSED IN PPT TOTAL SALT.
TEMPERATURES ARE EXPRESSED IN DEGREES FAHRENHEIT.



TEST CONDITIONS

TIDAL RANGE AT SANDY HOOK	4.7 FT
OCEAN SALINITY (TOTAL SALT)	18.9 PPT
HUDSON RIVER INFLOW	12.000 CFS
RARITAN RIVER INFLOW	1.770 CFS
NAVESINK AND SHREWSBURY INFLOW	256 CFS

LEGEND

BASE ———

NEW YORK MODEL
SHREWSBURY TEST

EFFECTS OF PLANS ON VELOCITIES

STATION
04

PLATE 4

Table 7

NEW YORK MODEL
SHREWSBURY TEST
STATION 04 01

BASE
VELOCITIES

TIME HOURS	BASE TEST	PLAN	DIFF.	PLAN	DIFF.	PLAN	DIFF.
0.0	-1.4						
0.5	-1.7						
1.0	-2.2						
1.5	-2.0						
2.0	-2.2						
2.5	-2.1						
3.0	-1.9						
3.5	-1.7						
4.0	-1.1						
4.5	-.9						
5.0	-.2						
5.5	0.4						
6.0	0.8						
6.5	1.5						
7.0	1.5						
7.5	1.8						
8.0	1.6						
8.5	1.6						
9.0	1.2						
9.5	0.7						
10.0	0.0						
10.5	-.1						
11.0	-.5						
11.5	-1.0						
12.0	-1.2						

PLAN	MAXIMUM TIME HOURS	MAXIMUM TIDAL DATA	MINIMUM TIME HOURS	MINIMUM TIDAL DATA	EBB PRE-DOMINANCE
BASE	7.5	1.8	1.0	-2.2	64.0

NOTE: TIME IS EXPRESSED IN HOURS AFTER MOON'S TRANSIT OF 74TH MERIDIAN.
TIDAL HEIGHTS ARE IN PROTOTYPE FEET REFERRED TO MEAN LOW WATER,
VELOCITIES ARE EXPRESSED IN FEET PER SECOND.
SALINITIES ARE EXPRESSED IN PPT TOTAL SALT.
TEMPERATURES ARE EXPRESSED IN DEGREES FAHRENHEIT.

Table 8

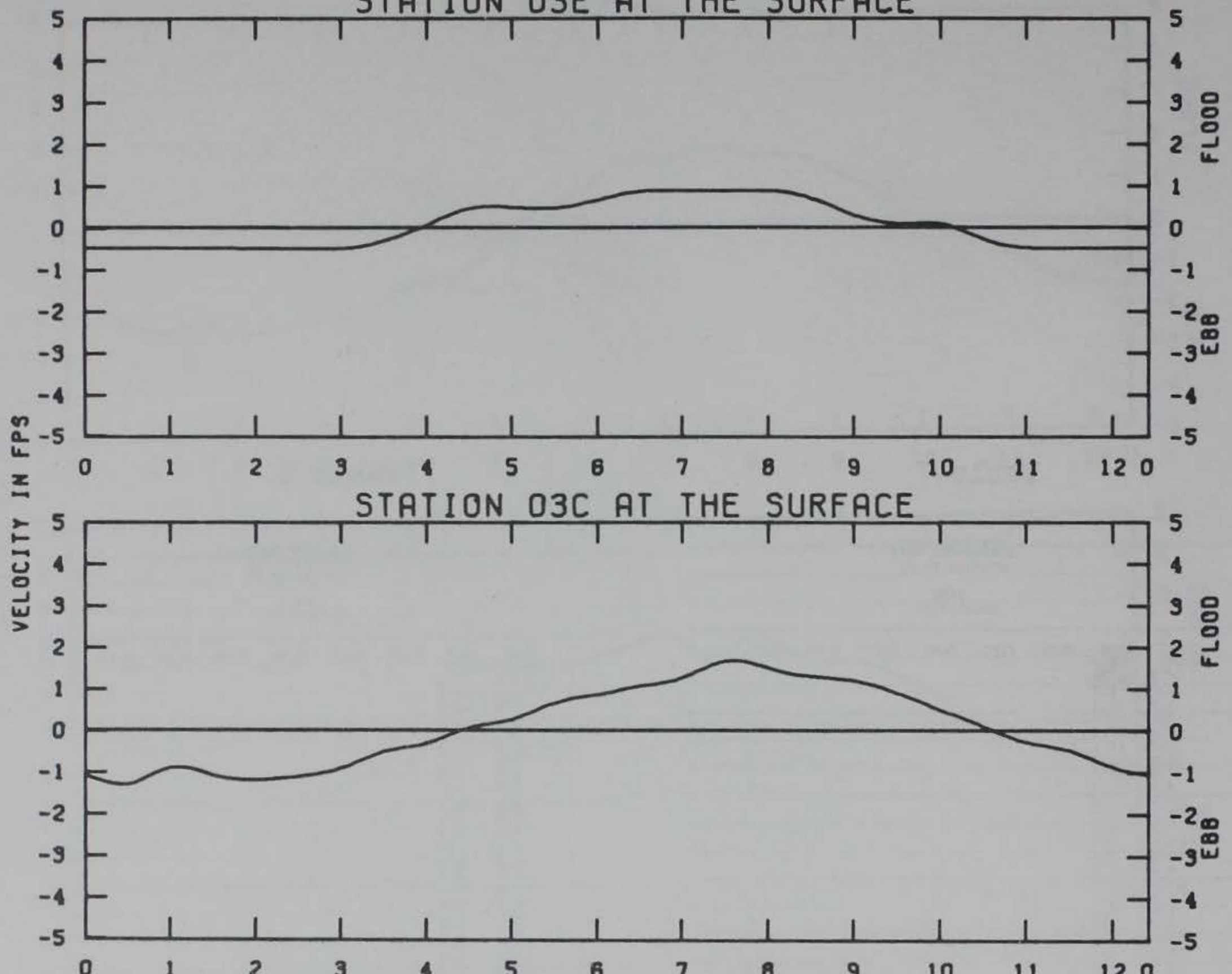
NEW YORK MODEL
SHREWSBURY TEST
STATION 04 99

BASE
VELOCITIES

TIME HOURS	BASE TEST	PLAN	DIFF.	PLAN	DIFF.	PLAN	DIFF.
0.0	-1.2						
0.5	-1.4						
1.0	-1.2						
1.5	-1.5						
2.0	-1.6						
2.5	-1.4						
3.0	-1.1						
3.5	-.7						
4.0	-.4						
4.5	0.4						
5.0	0.7						
5.5	1.2						
6.0	1.6						
6.5	2.0						
7.0	2.2						
7.5	1.7						
8.0	2.2						
8.5	1.6						
9.0	1.5						
9.5	1.3						
10.0	0.8						
10.5	0.1						
11.0	-.1						
11.5	-.1						
12.0	-.8						

PLAN	MAXIMUM TIME HOURS	MAXIMUM TIDAL DATA	MINIMUM TIME HOURS	MINIMUM TIDAL DATA	EBB PRE-DOMINANCE
BASE	7.0	2.2	2.0	-1.6	39.3

NOTE: TIME IS EXPRESSED IN HOURS AFTER MOON'S TRANSIT OF 74TH MERIDIAN.
TIDAL HEIGHTS ARE IN PROTOTYPE FEET REFERRED TO MEAN LOW WATER,
VELOCITIES ARE EXPRESSED IN FEET PER SECOND.
SALINITIES ARE EXPRESSED IN PPT TOTAL SALT.
TEMPERATURES ARE EXPRESSED IN DEGREES FAHRENHEIT.



TEST CONDITIONS

TIDAL RANGE AT SANDY HOOK	4.7 FT
OCEAN SALINITY (TOTAL SALT)	18.3 PPT
HUDSON RIVER INFLOW	12.000 CFS
RARITAN RIVER INFLOW	1.770 CFS
NAVESINK AND SHREWSBURY INFLOW	256 CFS

LEGEND
PROTOTYPE ———

NEW YORK MODEL
SHREWSBURY TEST

EFFECTS OF PLANS ON VELOCITIES

STATIONS
03E AND 03C

PLATE 5

Table 9

NEW YORK MODEL
SHREWSBURY TEST
STATION 03E01
VERIFICATION OF MODEL VELOCITIES

TIME HOURS	PROTO-TYPE	MODEL	DIFF.
0.0	-.3		
0.5	-.3		
1.0	-.3		
1.5	-.3		
2.0	-.3		
2.5	-.3		
3.0	-.3		
3.5	-.1		
4.0	0.1		
4.5	0.5		
5.0	0.5		
5.5	0.5		
6.0	0.7		
6.5	0.9		
7.0	0.9		
7.5	0.9		
8.0	0.9		
8.5	0.7		
9.0	0.3		
9.5	0.1		
10.0	0.1		
10.5	-.1		
11.0	-.3		
11.5	-.3		
12.0	-.3		

PLAN	MAXIMUM TIME HOURS	MAXIMUM TIDAL DATA	MINIMUM TIME HOURS	MINIMUM TIDAL DATA	EBB PRE-DOMINANCE
PROTOTYPE	6.5	0.9	0.0	-.3	31.9

NOTE: TIME IS EXPRESSED IN HOURS AFTER MOON'S TRANSIT OF 74TH MERIDIAN.
TIDAL HEIGHTS ARE IN PROTOTYPE FEET REFERRED TO MEAN LOW WATER.
VELOCITIES ARE EXPRESSED IN FEET PER SECOND.
SALINITIES ARE EXPRESSED IN PPT TOTAL SALT.
TEMPERATURES ARE EXPRESSED IN DEGREES FAHRENHEIT.

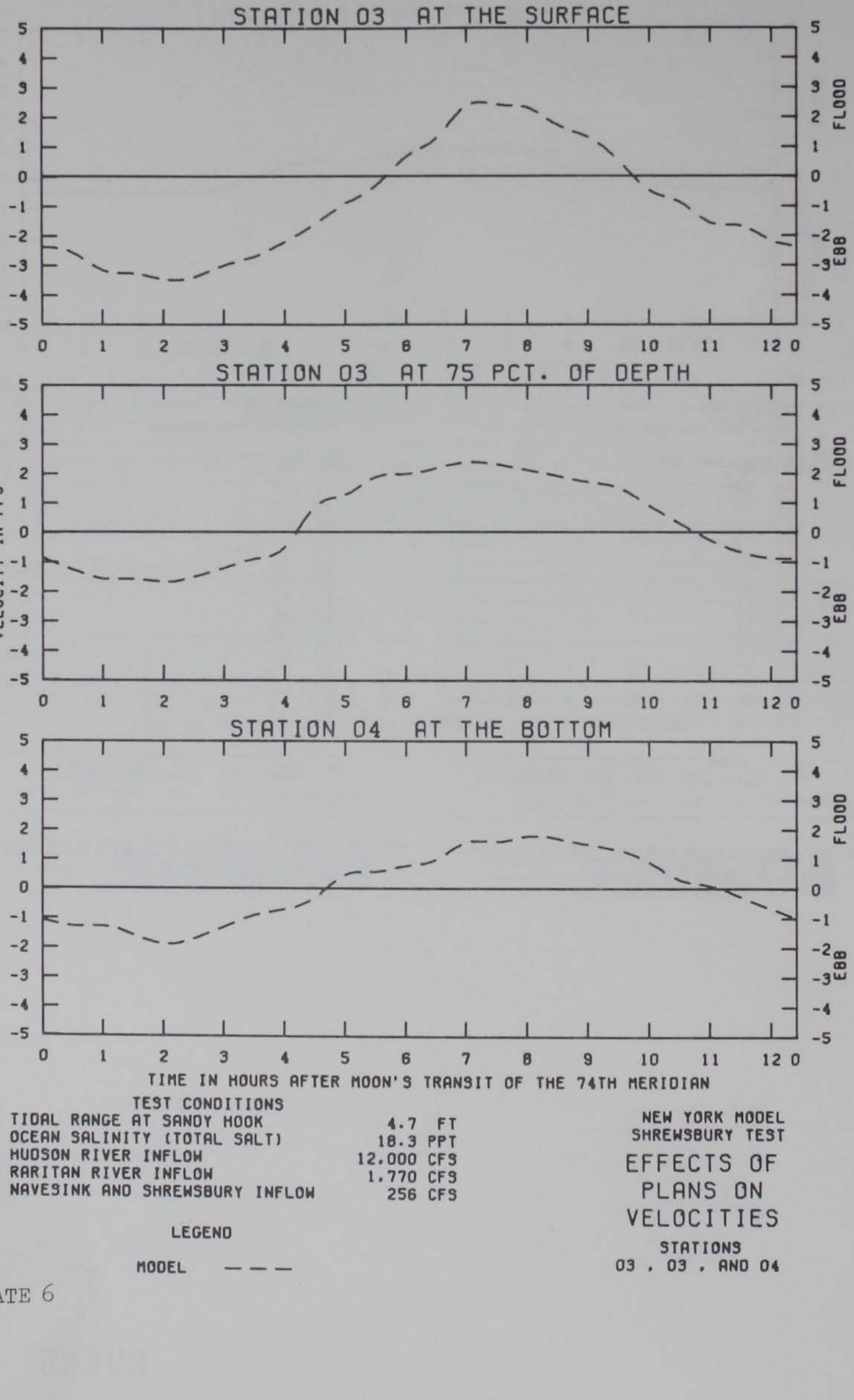
Table 10

NEW YORK MODEL
SHREWSBURY TEST
STATION 03C01
VERIFICATION OF MODEL VELOCITIES

TIME HOURS	PROTO-TYPE	MODEL	DIFF.
0.0	-.9		
0.5	-1.1		
1.0	-.7		
1.5	-.9		
2.0	-1.0		
2.5	-.9		
3.0	-.7		
3.5	-.3		
4.0	-.1		
4.5	0.1		
5.0	0.3		
5.5	0.7		
6.0	0.9		
6.5	1.1		
7.0	1.3		
7.5	1.7		
8.0	1.5		
8.5	1.3		
9.0	1.2		
9.5	0.9		
10.0	0.5		
10.5	0.1		
11.0	-.1		
11.5	-.3		
12.0	-.7		

PLAN	MAXIMUM TIME HOURS	MAXIMUM TIDAL DATA	MINIMUM TIME HOURS	MINIMUM TIDAL DATA	EBB PRE-DOMINANCE
PROTOTYPE	7.5	1.7	0.5	-1.1	40.1

NOTE: TIME IS EXPRESSED IN HOURS AFTER MOON'S TRANSIT OF 74TH MERIDIAN.
TIDAL HEIGHTS ARE IN PROTOTYPE FEET REFERRED TO MEAN LOW WATER.
VELOCITIES ARE EXPRESSED IN FEET PER SECOND.
SALINITIES ARE EXPRESSED IN PPT TOTAL SALT.
TEMPERATURES ARE EXPRESSED IN DEGREES FAHRENHEIT.



TEST CONDITIONS

TIDAL RANGE AT SANDY HOOK	4.7 FT
OCEAN SALINITY (TOTAL SALT)	18.3 PPT
HUDSON RIVER INFLOW	12.000 CFS
RARITAN RIVER INFLOW	1.770 CFS
NAVESINK AND SHREWSBURY INFLOW	256 CFS

LEGEND

MODEL — — —

NEW YORK MODEL
SHREWSBURY TEST

EFFECTS OF PLANS ON VELOCITIES

STATIONS
03 , 03 , AND 04

PLATE 6

Table 11

NEW YORK MODEL
SHREWSBURY TEST
STATION 03 01
VERIFICATION OF MODEL VELOCITIES

TIME HOURS	PROTO-TYPE	MODEL	DIFF.
0.0		-2.2	
0.5		-2.4	
1.0		-3.0	
1.5		-3.1	
2.0		-3.3	
2.5		-3.2	
3.0		-2.8	
3.5		-2.5	
4.0		-2.0	
4.5		-1.4	
5.0		-.7	
5.5		-.1	
6.0		0.7	
6.5		1.3	
7.0		2.4	
7.5		2.4	
8.0		2.3	
8.5		1.7	
9.0		1.3	
9.5		0.5	
10.0		-.3	
10.5		-.7	
11.0		-1.4	
11.5		-1.5	
12.0		-2.0	

PLAN	MAXIMUM TIME HOURS	MAXIMUM TIDAL DATA	MINIMUM TIME HOURS	MINIMUM TIDAL DATA	EBB PRE-DOMINANCE
MODEL	7.0	2.4	2.0	-3.3	72.2

NOTE: TIME IS EXPRESSED IN HOURS AFTER MOON'S TRANSIT OF 74TH MERIDIAN.
TIDAL HEIGHTS ARE IN PROTOTYPE FEET REFERRED TO MEAN LOW WATER.
VELOCITIES ARE EXPRESSED IN FEET PER SECOND.
SALINITIES ARE EXPRESSED IN PPT TOTAL SALT.
TEMPERATURES ARE EXPRESSED IN DEGREES FAHRENHEIT.

Table 12

NEW YORK MODEL
SHREWSBURY TEST
STATION 03 75
VERIFICATION OF MODEL VELOCITIES

TIME HOURS	PROTO-TYPE	MODEL	DIFF.
0.0		-.7	
0.5		-1.1	
1.0		-1.4	
1.5		-1.4	
2.0		-1.5	
2.5		-1.3	
3.0		-1.0	
3.5		-.7	
4.0		-.3	
4.5		0.9	
5.0		1.3	
5.5		1.9	
6.0		2.0	
6.5		2.2	
7.0		2.4	
7.5		2.3	
8.0		2.1	
8.5		1.9	
9.0		1.7	
9.5		1.5	
10.0		0.9	
10.5		0.3	
11.0		-.1	
11.5		-.5	
12.0		-.7	

PLAN	MAXIMUM TIME HOURS	MAXIMUM TIDAL DATA	MINIMUM TIME HOURS	MINIMUM TIDAL DATA	EBB PRE-DOMINANCE
MODEL	7.0	2.4	2.0	-1.5	33.5

NOTE: TIME IS EXPRESSED IN HOURS AFTER MOON'S TRANSIT OF 74TH MERIDIAN.
TIDAL HEIGHTS ARE IN PROTOTYPE FEET REFERRED TO MEAN LOW WATER.
VELOCITIES ARE EXPRESSED IN FEET PER SECOND.
SALINITIES ARE EXPRESSED IN PPT TOTAL SALT.
TEMPERATURES ARE EXPRESSED IN DEGREES FAHRENHEIT.

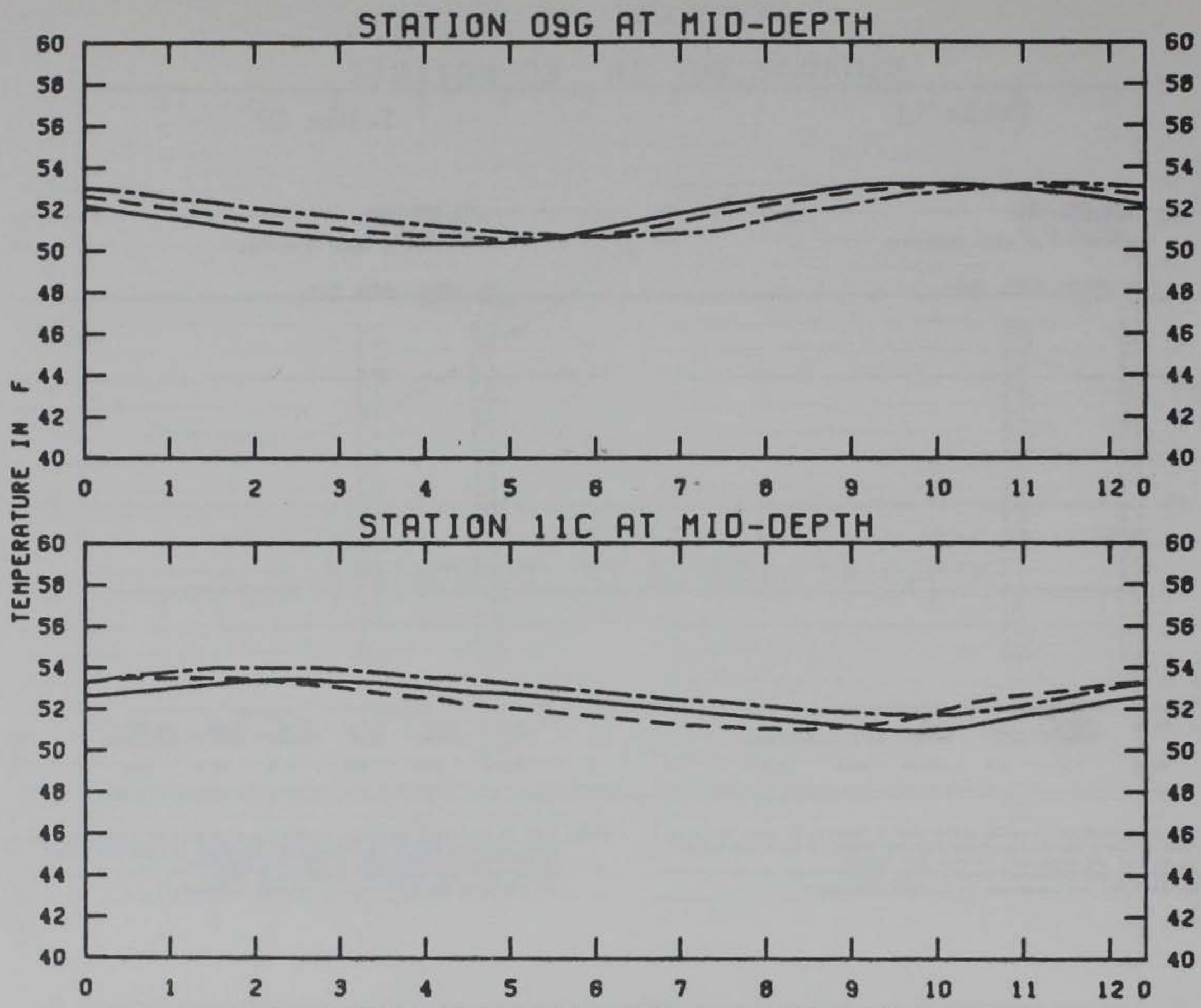
Table 13

NEW YORK MODEL
SHREWSBURY TEST
STATION 04 99
VERIFICATION OF MODEL VELOCITIES

TIME HOURS	PROTO-TYPE	MODEL	DIFF.
0.0		-.9	
0.5		-1.1	
1.0		-1.1	
1.5		-1.4	
2.0		-1.7	
2.5		-1.5	
3.0		-1.1	
3.5		-.7	
4.0		-.5	
4.5		-.1	
5.0		0.5	
5.5		0.6	
6.0		0.8	
6.5		1.0	
7.0		1.6	
7.5		1.6	
8.0		1.8	
8.5		1.7	
9.0		1.5	
9.5		1.3	
10.0		0.9	
10.5		0.3	
11.0		0.1	
11.5		-.1	
12.0		-.5	

PLAN	MAXIMUM TIME HOURS	MAXIMUM TIDAL DATA	MINIMUM TIME HOURS	MINIMUM TIDAL DATA	EBB PRE-DOMINANCE
MODEL	8.0	1.8	2.0	-1.7	44.0

NOTE: TIME IS EXPRESSED IN HOURS AFTER MOON'S TRANSIT OF 74TH MERIDIAN.
TIDAL HEIGHTS ARE IN PROTOTYPE FEET REFERRED TO MEAN LOW WATER.
VELOCITIES ARE EXPRESSED IN FEET PER SECOND.
SALINITIES ARE EXPRESSED IN PPT TOTAL SALT.
TEMPERATURES ARE EXPRESSED IN DEGREES FAHRENHEIT.



TEST CONDITIONS

TIDAL RANGE AT SANDY HOOK	4.7 FT
OCEAN SALINITY (TOTAL SALT)	18.9 PPT
HUDSON RIVER INFLOW	12.000 CFS
RARITAN RIVER INFLOW	1.770 CFS
NAVESINK AND SHREWSBURY INFLOW	256 CFS

LEGEND

BASE ———————
PLAN 5 — — —
PLAN 10 ——·——

NEW YORK MODEL
SHREWSBURY TEST

EFFECTS OF PLANS ON TEMPERATURES

STATIONS
09G AND 11C

PLATE 7

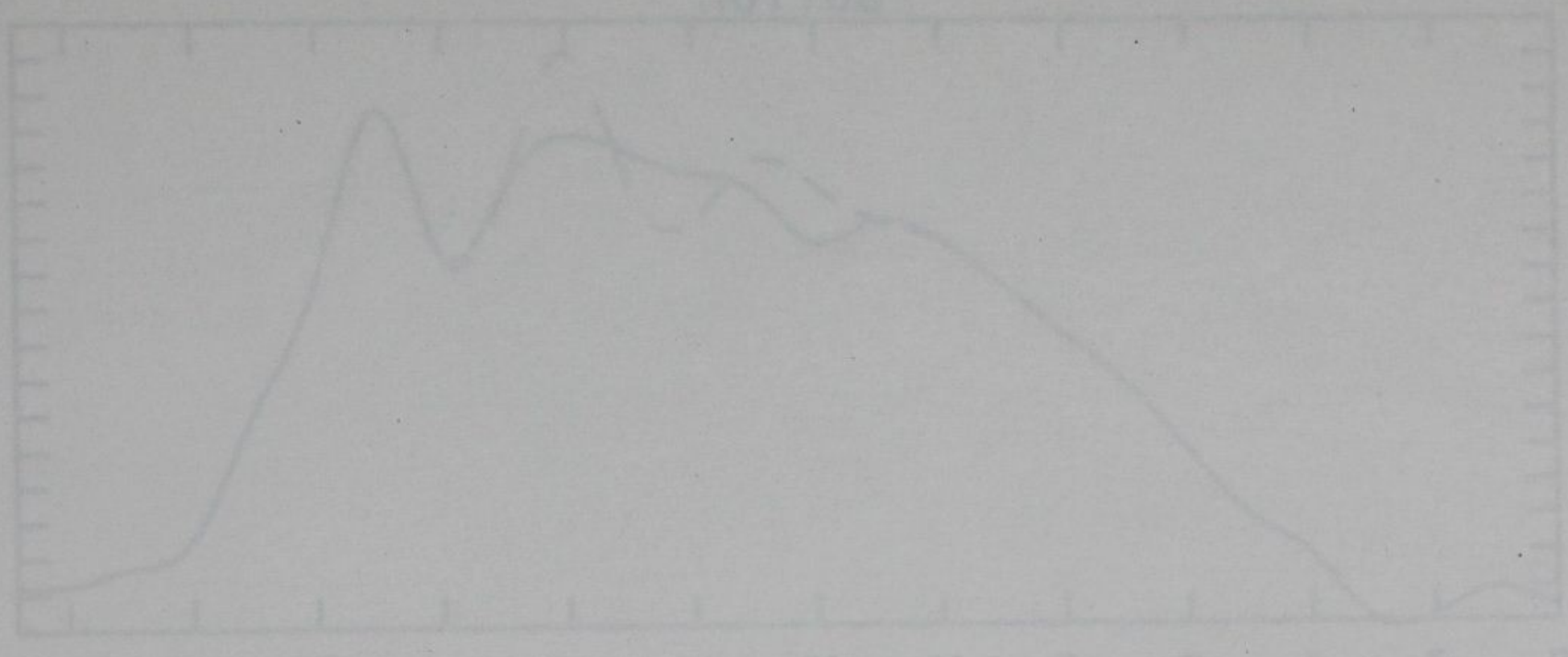


Table 14

NEW YORK MODEL
SHREWSBURY TEST
STATION 09G50

EFFECTS OF PLANS 5 AND 10 ON
TEMPERATURE

TIME HOURS	BASE TEST	PLAN 5	DIFF. 5-BASE	PLAN 10	DIFF. 10-BASE	PLAN	DIFF.
0.0	52.1	52.6	0.5	53.0	0.9		
0.5	51.8	52.3	0.5	52.8	1.0		
1.0	51.5	52.0	0.5	52.5	1.0		
1.5	51.2	51.7	0.5	52.3	1.1		
2.0	50.9	51.4	0.5	52.0	1.1		
2.5	50.7	51.2	0.5	51.8	1.1		
3.0	50.5	51.0	0.5	51.6	1.1		
3.5	50.4	50.8	0.4	51.4	1.0		
4.0	50.3	50.7	0.4	51.2	0.9		
4.5	50.3	50.6	0.3	51.0	0.7		
5.0	50.4	50.5	0.1	50.8	0.4		
5.5	50.6	50.6	0.0	50.7	0.1		
6.0	51.0	50.7	-.3	50.6	-.4		
6.5	51.4	51.0	-.4	50.7	-.7		
7.0	51.8	51.4	-.4	50.8	-1.0		
7.5	52.2	51.8	-.4	51.0	-1.2		
8.0	52.5	52.2	-.3	51.5	-1.0		
8.5	52.8	52.5	-.3	51.9	-.9		
9.0	53.1	52.8	-.3	52.2	-.9		
9.5	53.2	53.0	-.2	52.6	-.6		
10.0	53.2	53.1	-.1	52.8	-.4		
10.5	53.1	53.1	0.0	53.0	-.1		
11.0	52.9	53.1	0.2	53.2	0.3		
11.5	52.7	53.0	0.3	53.2	0.5		
12.0	52.4	52.8	0.4	53.1	0.7		

PLAN	MAXIMUM TIME HOURS	MAXIMUM TIDAL DATA	MINIMUM TIME HOURS	MINIMUM TIDAL DATA	AVERAGE
BASE	9.5	53.2	4.0	50.3	51.7
5	10.0	53.1	5.0	50.5	51.9
10	11.0	53.2	6.0	50.6	51.9

NOTE: TIME IS EXPRESSED IN HOURS AFTER MOON'S TRANSIT OF 74TH MERIDIAN.
TIDAL HEIGHTS ARE IN PROTOTYPE FEET REFERRED TO MEAN LOW WATER.
VELOCITIES ARE EXPRESSED IN FEET PER SECOND.
SALINITIES ARE EXPRESSED IN PPT TOTAL SALT.
TEMPERATURES ARE EXPRESSED IN DEGREES FAHRENHEIT.

Table 15

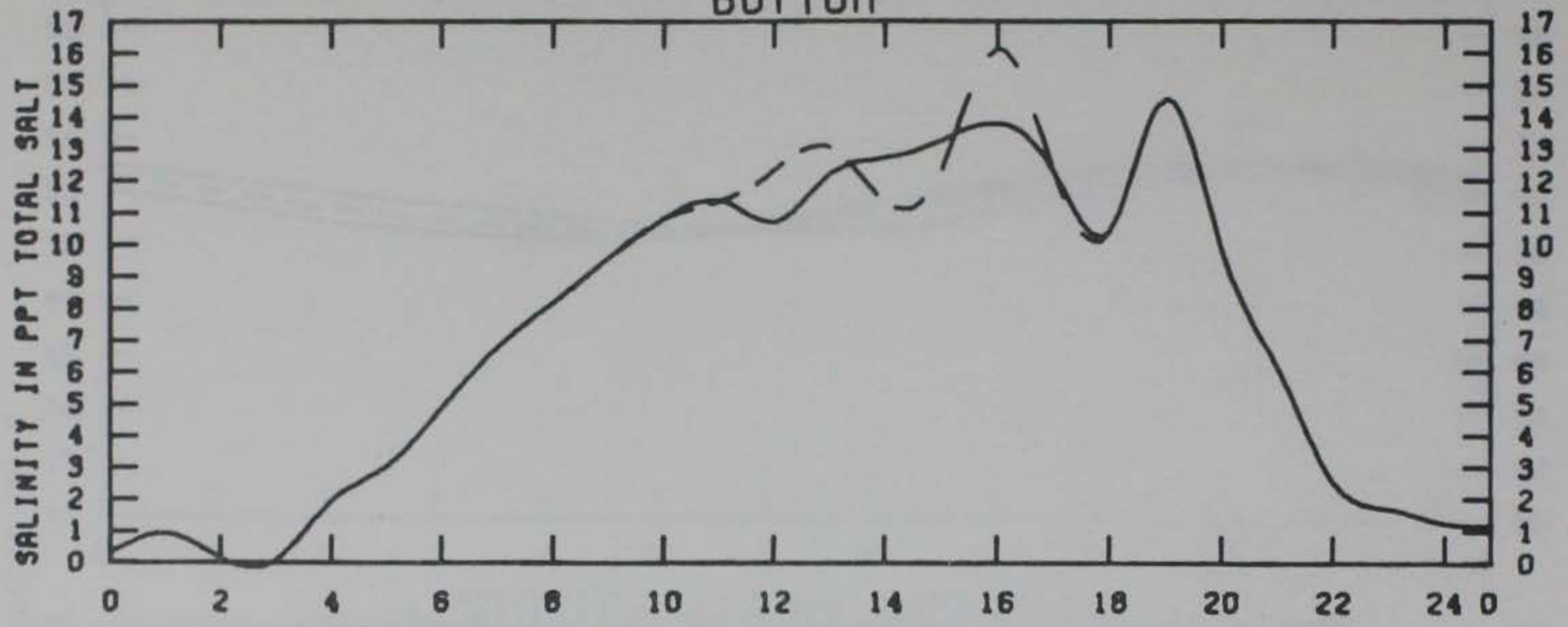
NEW YORK MODEL
SHREWSBURY TEST
STATION 11C50

EFFECTS OF PLANS 5 AND 10 ON
TEMPERATURE

TIME HOURS	BASE TEST	PLAN 5	DIFF. 5-BASE	PLAN 10	DIFF. 10-BASE	PLAN	DIFF.
0.0	52.6	53.3	0.7	53.3	0.7		
0.5	52.8	53.5	0.7	53.6	0.8		
1.0	53.0	53.5	0.5	53.8	0.8		
1.5	53.2	53.5	0.3	54.0	0.8		
2.0	53.4	53.4	0.0	54.0	0.6		
2.5	53.4	53.2	-.2	54.0	0.6		
3.0	53.3	53.0	-.3	53.9	0.6		
3.5	53.2	52.7	-.5	53.7	0.5		
4.0	53.0	52.5	-.5	53.5	0.5		
4.5	52.8	52.2	-.6	53.4	0.6		
5.0	52.7	52.0	-.7	53.2	0.5		
5.5	52.5	51.8	-.7	53.0	0.5		
6.0	52.3	51.6	-.7	52.8	0.5		
6.5	52.1	51.4	-.7	52.6	0.5		
7.0	51.9	51.2	-.7	52.4	0.5		
7.5	51.7	51.1	-.6	52.3	0.6		
8.0	51.5	51.0	-.5	52.1	0.6		
8.5	51.3	51.0	-.3	51.9	0.6		
9.0	51.1	51.2	0.1	51.8	0.7		
9.5	50.9	51.4	0.5	51.7	0.8		
10.0	51.0	51.9	0.9	51.7	0.7		
10.5	51.3	52.4	1.1	51.9	0.6		
11.0	51.7	52.7	1.0	52.2	0.5		
11.5	52.0	52.9	0.9	52.6	0.6		
12.0	52.4	53.2	0.8	53.0	0.6		

PLAN	MAXIMUM TIME HOURS	MAXIMUM TIDAL DATA	MINIMUM TIME HOURS	MINIMUM TIDAL DATA	AVERAGE
BASE	2.0	53.4	9.5	50.9	52.3
5	0.5	53.5	8.0	51.0	52.3
10	1.5	54.0	9.5	51.7	52.9

NOTE: TIME IS EXPRESSED IN HOURS AFTER MOON'S TRANSIT OF 74TH MERIDIAN.
TIDAL HEIGHTS ARE IN PROTOTYPE FEET REFERRED TO MEAN LOW WATER.
VELOCITIES ARE EXPRESSED IN FEET PER SECOND.
SALINITIES ARE EXPRESSED IN PPT TOTAL SALT.
TEMPERATURES ARE EXPRESSED IN DEGREES FAHRENHEIT.



TEST CONDITIONS

TIDAL RANGE AT SANDY HOOK	4.7 FT
OCEAN SALINITY (TOTAL SALT)	18.3 PPT
HUDSON RIVER INFLOW	12,000 CFS
RARITAN RIVER INFLOW	1,770 CFS
NAVESINK AND SHREWSBURY INFLOW	256 CFS

LEGEND

BASE ———

PLAN 5 — — —

NEW YORK MODEL
SHREWSBURY TEST

EFFECTS OF PLANS ON SALINITIES

STATION
05E

PLATE 8

Table 16

NEW YORK MODEL
SHREWSBURY TEST
STATION 05E99

EFFECTS OF PLAN 5 ON
SALINITIES

TIME HOURS	BASE TEST	PLAN 5	DIFF. 5-BASE	PLAN	DIFF.	PLAN	DIFF.
0.0	0.3	0.3	0.0				
1.0	0.9	0.9	0.0				
2.0	0.1	0.1	0.0				
3.0	0.1	0.1	0.0				
4.0	1.9	1.9	0.0				
5.0	3.0	3.0	0.0				
6.0	4.9	4.9	0.0				
7.0	6.8	6.8	0.0				
8.0	8.2	8.2	0.0				
9.0	9.6	9.6	0.0				
10.0	10.8	10.8	0.0				
11.0	11.4	11.4	0.0				
12.0	10.7	12.4	1.7				
13.0	12.2	13.0	0.8				
14.0	12.7	11.3	-1.5				
15.0	13.3	12.4	-.9				
16.0	13.8	16.1	2.3				
17.0	12.2	12.2	0.0				
18.0	10.4	10.4	0.0				
19.0	14.6	14.6	0.0				
20.0	9.8	9.8	0.0				
21.0	6.1	6.1	0.0				
22.0	2.5	2.5	0.0				
23.0	1.6	1.6	0.0				
24.0	1.2	1.2	0.0				

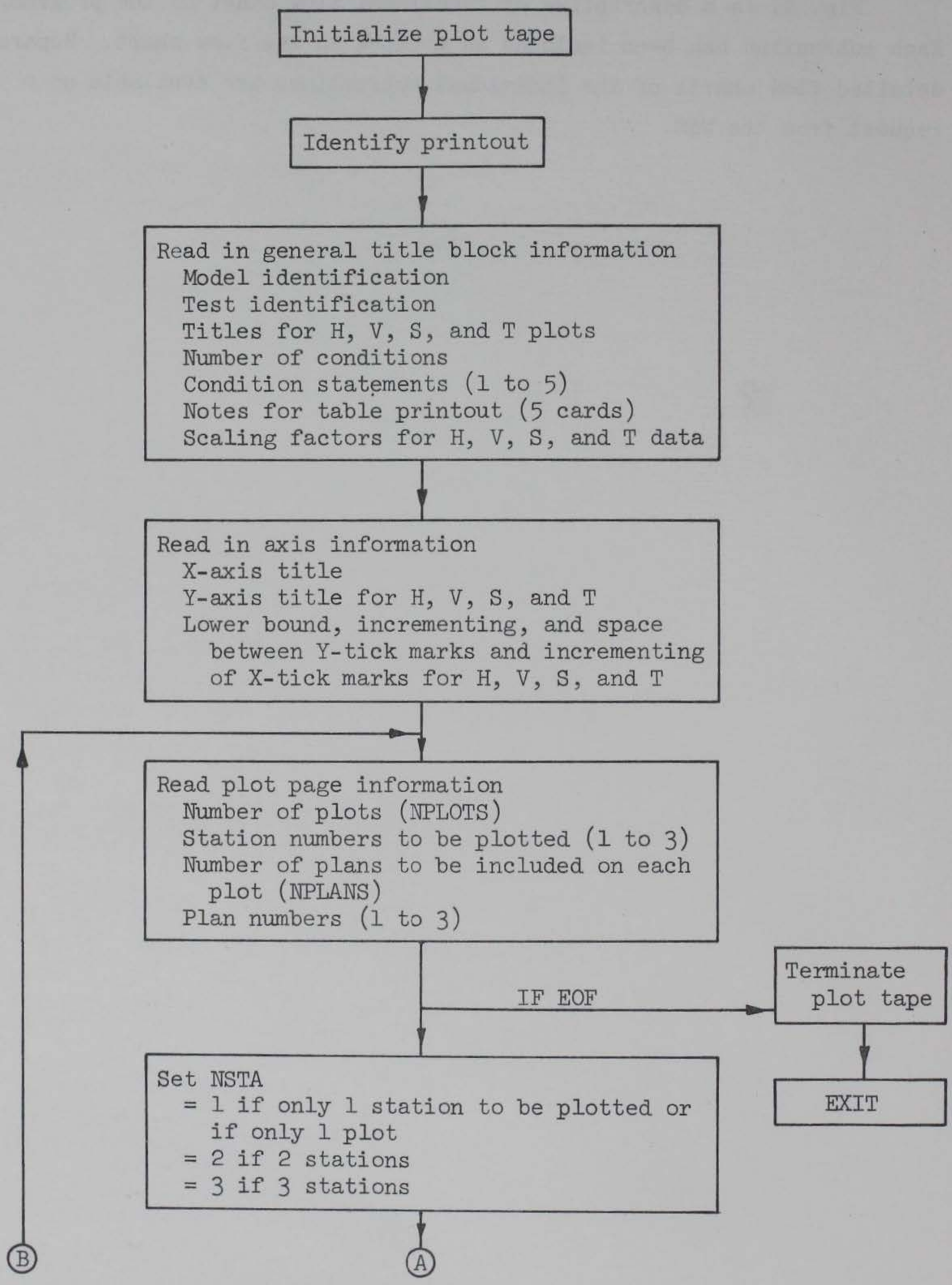
PLAN	MAXIMUM TIME HOURS	MAXIMUM TIDAL DATA	MINIMUM TIME HOURS	MINIMUM TIDAL DATA	AVERAGE
BASE	19.0	14.6	2.0	0.1	6.9
5	16.0	16.1	2.0	0.1	7.0

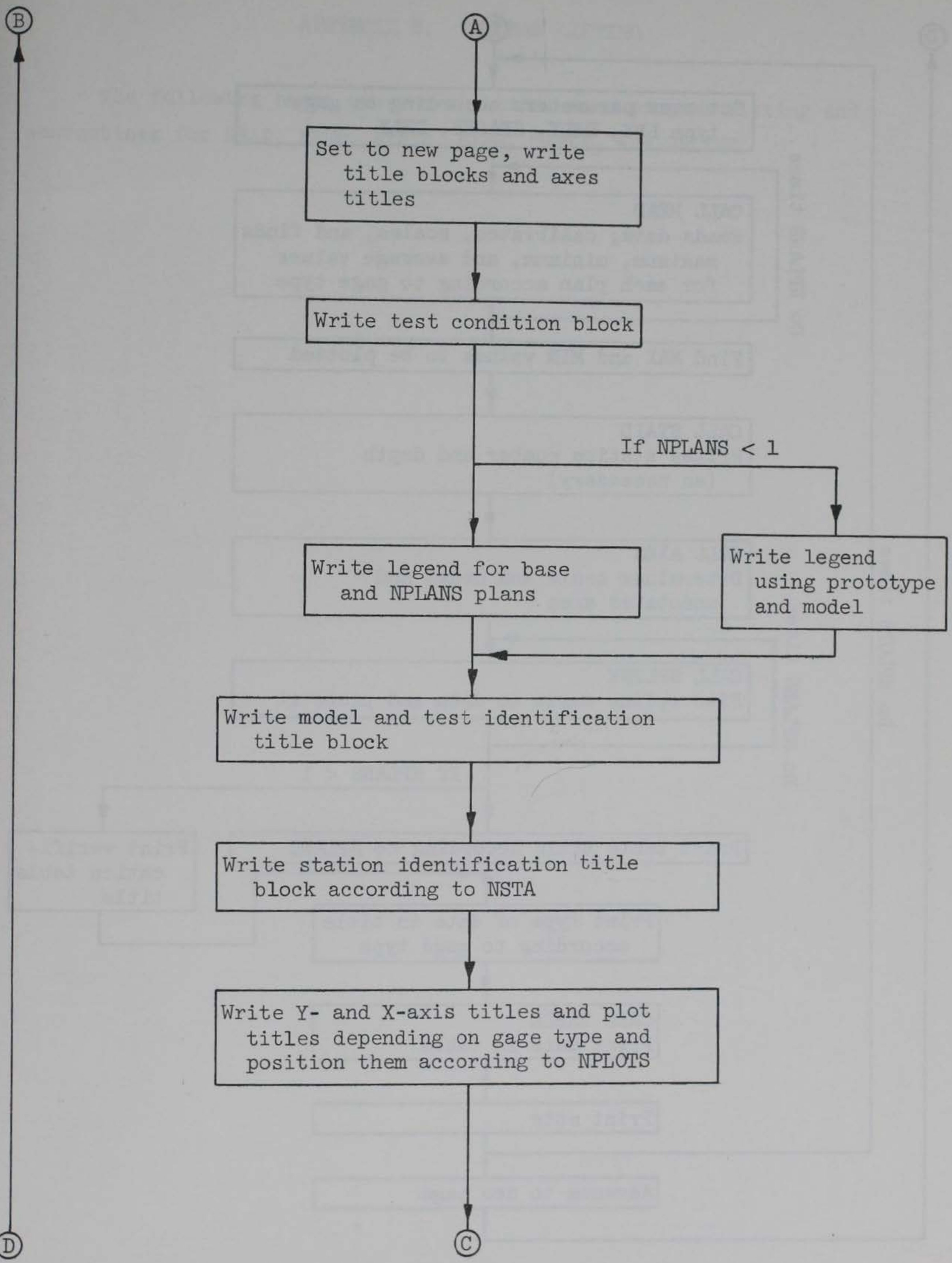
NOTE: TIME IS EXPRESSED IN HOURS AFTER MOON'S TRANSIT OF 74TH MERIDIAN.

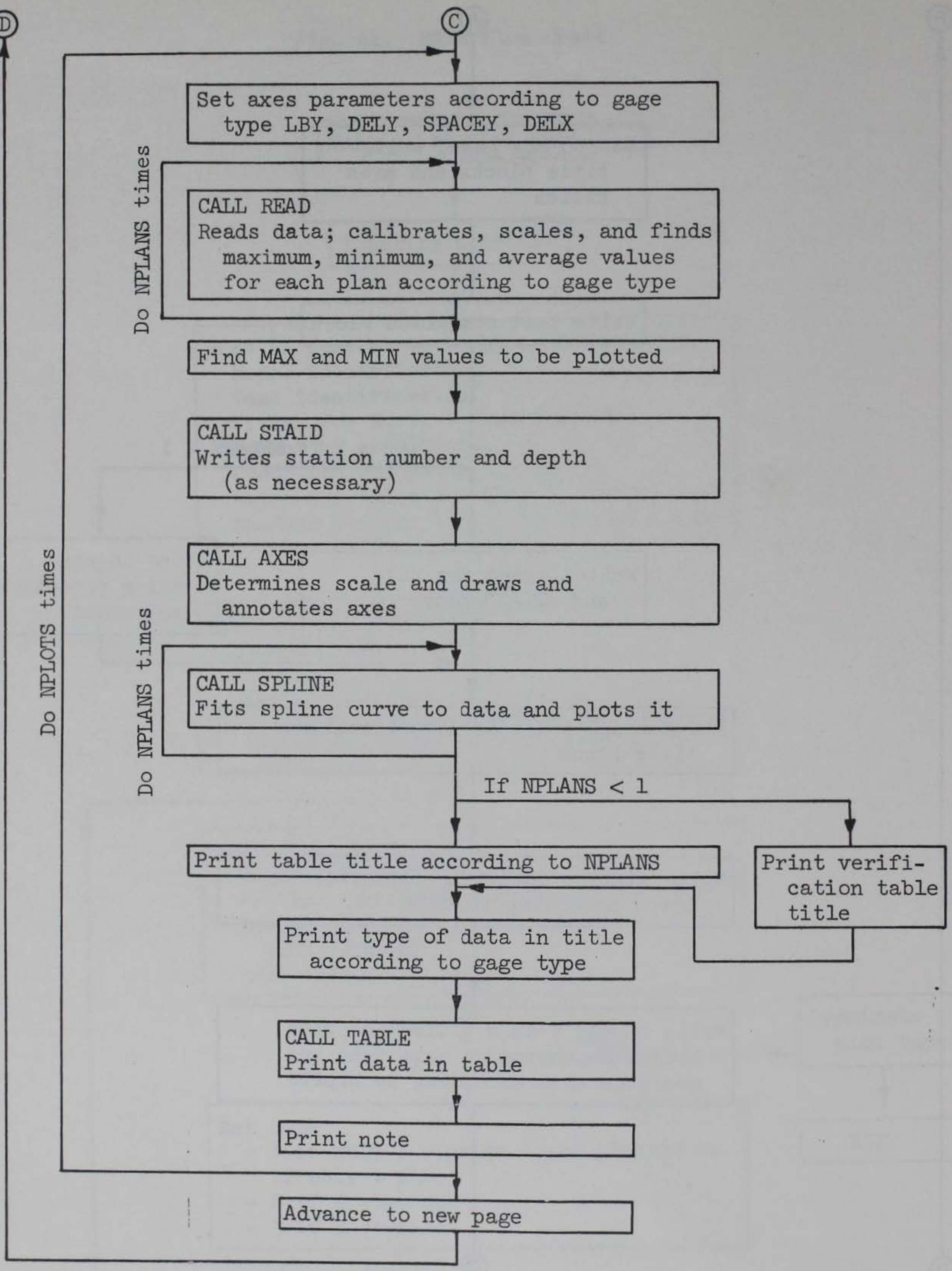
APPENDIX A: FLOW CHART

Fig. A1 is a descriptive or functional flow chart of the program. Each subroutine has been included as a block in the flow chart. Separate detailed flow charts of the individual subroutines are available upon request from the WES.

Fig. A1. MAIN Flow Chart




B
A
Set to new page, write title blocks and axes titles
Write test condition block
If NPLANS < 1
Write legend for base and NPLANS plans
Write legend using prototype and model
Write model and test identification title block
Write station identification title block according to NSTA
Write Y- and X-axis titles and plot titles depending on gage type and position them according to NPLOTS
D
C


D
C
Set axes parameters according to gage type LBY, DELY, SPACEY, DELX
Do NPLANS times
CALL READ
Reads data; calibrates, scales, and finds maximum, minimum, and average values for each plan according to gage type
Find MAX and MIN values to be plotted
CALL STAID
Writes station number and depth (as necessary)
CALL AXES
Determines scale and draws and annotates axes
Do NPLOTS times
Do NPLANS times
CALL SPLINE
Fits spline curve to data and plots it
If NPLANS < 1
Print table title according to NPLANS
Print verification table title
Print type of data in title according to gage type
CALL TABLE
Print data in table
Print note
Advance to new page

APPENDIX B: PROGRAM LISTING

The following pages present the tidal data program listing and subroutines for READ, FIND, STAID, AXES, TABLE, and SPLINE.

```
                C                    **********
                C     THIS PROGRAM PLOTS TIDAL DATA DURING A TIDAL CYCLE
                C     THERE ARE THREE PLOTS PER PAGE
                C     MODEL AND TEST IDENTIF*CATION,TEST CONDITIONS, AND TITLE ARE
                C         READ IN BY CARDS
                C                    **********
      1               DIMENSION DATAHB(100,2),DATAH1(100,2),DATAH2(100,2),DATAH3(100,2)
      2               DIMENSION IBUFF(1600),MODEL(8),ITEST(8),ICOND(11,6),IPOINT(3,3)
      3               DIMENSION NPLAN(3),YAXISH(4),XAXIS(7),YAXISV(4),YAXISS(4)
      4               DIMENSION YAXIST(4)
      5               INTEGER TITLEH(15),TITLEV(15),TITLES(15),TITLET(15)
      6               REAL LBYH,LBYV,LBYS,LBYT,LBY
                C
                C     *** INITIALIZE PLOT TAPE ***
                C
      7               REWIND 3
      8               IC= 3
      9               CALL PLOTS(IBUFF(1),1600,IC)
     10               CALL FACTOR(1.5)
     11               CALL PLOT(0.0,-30.0,-3)
     12               PRINT 9001
                C
                C     *** READ GENERAL TITLE BLOCK INFORMATION ***
                C
     13               READ 8000,(MODEL(I),I=1,8),(ITEST(I),I=1,8)
     14               READ 8030,(TITLEH(I),I=1,15)
     15               READ 8030,(TITLEV(I),I=1,15)
     16               READ 8030,(TITLES(I),I=1,15)
     17               READ 8030,(TITLET(I),I=1,15)
     18               READ 8005,NCONDS
     19               READ 8010,((ICOND(I,J),I=1,11),J=1,NCONDS)
     20               READ 9060
     21               READ 9061
     22               READ 9062
     23               READ 9063
     24               READ 9064
     25               READ 9070,SCALEH,SCALEV,SCALES,SCALET
                C
                C     *** READ AXES INFORMATION ***
                C
     26               READ 8040,(XAXIS(I),I=1,7)
     27               READ 8050,(YAXISH(I),I=1,4),(YAXISV(I),I=1,4)
     28               READ 8050,(YAXISS(I),I=1,4),(YAXIST(I),I=1,4)
     29               READ 8060,LBYH,DELYH,SPACEH,DELXH
     30               READ 8060,LBYV,DELYV,SPACEV,DELXV
     31               READ 8060,LBYS,DELYS,SPACES,DELXS
     32               READ 8060,LBYT,DELYT,SPACET,DELXT
                C
                C     *** READ NO. OF PLOTS ON THIS PAGE,STATIONS,NO.OF PLANS PER PLOT,
                C         AND PLAN NOS. ***
                C
     33          10 READ 8020,NPLOTS,((IPOINT(I,J),I=1,3),J=1,3),NPLANS,(NPLAN(I),I=1,
                1013)
     34               CALL EOFTST(50,JJ)
```

```
      35          GO TO(20,9999),JJ
                C
                C     *** SET NSTA=1 IF 1 PLOT OR ALL PLOTS AT SAME STATION
                C                    =2 IF 2 STATIONS
                C                    =3 IF 3 STATIONS ***
                C
      36       20 DO 4000 I=1,100
      37          DO 4000 J=1,2
      38          DATAHB(I,J)= 0.0
      39          DATAH1(I,J)= 0.0
      40          DATAH2(I,J)= 0.0
      41    4000  DATAH3(I,J)= 0.0
      42          NSTA= 1
      43          GO TO(1030,1000,1000),NPLOTS
      44    1000  IF(IPOINT(2,1).EQ.IPOINT(2,2)) GO TO 1010
      45          NSTA= 2
      46    1010  GO TO(1030,1030,1020),NPLOTS
      47    1020  IF(IPOINT(2,1).EQ.IPOINT(2,3)) GO TO 1030
      48          NSTA= 3
                C
                C     *** SET TO NEW PAGE AND WRITE TEST CONDITION BLOCK ***
                C
      49    1030  CALL PLOT(0.0,3.0,-3)
      50          CALL PLOT(0.0,10.5,2)
      51          CALL PLOT(8.0,10.5,2)
      52          CALL PLOT(8.0,0.0,2)
      53          CALL PLOT(0.0,0.0,2)
      54          CALL SYMBOL(2.34,2.23,0.07,15HTEST CONDITIONS,00.,15)
      55          YTEST= 2.11
      56          DO 21 J=1,NCONDS
      57          CALL SYMBOL(1.5,YTEST,0.07,ICOND(1,J),00.,44)
      58       21 YTEST= YTEST-0.12
             C
             C     *** WRITE LEGEND BLOCK ***
             C
             C     *** IF NPLANS= 0    , THE RESULTING PLOT WILL BE A PLOT OF
             C     PROTOTYPE VERSUS MODEL DATA FOR VERIFICATION. ***
             C
             C
             C     *** IF NPLANS= -1 , -2 , OR -3, THE RESULTING PLOT WILL BE A
             C     SINGLE PLOT OF BASE, MODEL, OR PROTOTYPE DATA, RESPECTIVELY. ***
             C
      59          IF(NPLANS.EQ.-1) GO TO 11
      60          IF(NPLANS.GE.1) GO TO 11
      61          CALL SYMBOL(2.61,1.35,0.07,6HLEGEND,00.,6)
      62          IF(NPLANS.EQ.-2) GO TO 16
      63          CALL SYMBOL(2.31,1.23,0.07,10HPROTOTYPE ,00.,10)
      64          CALL PLOT(2.97,1.26,3)
      65          CALL PLOT(3.4185,1.26,2)
      66          IF(NPLANS.EQ.-3) GO TO 12
      67       16 CALL SYMBOL(2.37,1.11,0.07,6HMODEL ,00.,6)
      68          CALL PLOT(2.97,1.14,3)
      69          CALL PLOT(3.0735,1.14,2)
      70          CALL PLOT(3.1425,1.14,3)
```

```
      CALL PLOT(3.2460,1.14,2)
      CALL PLOT(3.3150,1.14,3)
      CALL PLOT(3.4185,1.14,2)
      GO TO 12
C
C     *** IF NPLANS=1 OR MORE,RESULTING PLOT WILL BE OF BASE VERSUS
C         NPLANS PLANS ***
C
   11 CALL SYMBOL(2.61,1.35,0.07,6HLEGEND,00.,6)
      CALL SYMBOL(2.37,1.23,0.07,4HBASE,00.,4)
      CALL PLOT(2.97,1.26,3)
      CALL PLOT(3.4185,1.26,2)
      IF(NPLANS.EQ.-1) GO TO 12
      YLEGND= 1.11
      DO 22 J=1,NPLANS
      CALL SYMBOL(2.37,YLEGND,0.07,5HPLAN ,00.,5)
      CALL SYMBOL(999.,YLEGND,0.07,NPLAN(J),00.,2)
      GO TO (13,14,15),J
   13 CALL PLOT(2.97,1.14,3)
      CALL PLOT(3.0735,1.14,2)
      CALL PLOT(3.1425,1.14,3)
      CALL PLOT(3.2460,1.14,2)
      CALL PLOT(3.3150,1.14,3)
      CALL PLOT(3.4185,1.14,2)
      GO TO 22
   14 CALL PLOT(2.97,1.02,3)
      CALL PLOT(3.1425,1.02,2)
      CALL PLOT(3.1770,1.02,3)
      CALL PLOT(3.2115,1.02,2)
      CALL PLOT(3.2460,1.02,3)
      CALL PLOT(3.4185,1.02,2)
      GO TO 22
   15 CALL PLOT(2.97,0.90,3)
      CALL PLOT(3.1080,0.90,2)
      CALL PLOT(3.1425,0.90,3)
      CALL PLOT(3.1770,0.90,2)
      CALL PLOT(3.2115,0.90,3)
      CALL PLOT(3.2460,0.90,2)
      CALL PLOT(3.2805,0.90,3)
      CALL PLOT(3.4185,0.90,2)
   22 YLEGND= YLEGND-0.12
C
C     *** WRITE MODEL AND TEST TITLE BLOCKS ***
C
   12 CALL SYMBOL(5.2,2.16,0.07,MODEL(1),00.,30)
      CALL SYMBOL(5.2,2.04,0.07,ITEST(1),00.,30)
C
C     *** WRITE STATION ID ACCORDING TO NSTA ***
C
      GO TO(23,24,25),NSTA
   23 CALL SYMBOL(5.95,1.28,0.07,7HSTATION,00.,7)
      CALL SYMBOL(6.10,1.16,0.07,IPOINT(2,1),0.0,3)
      GO TO 2090
   24 CALL SYMBOL(5.95,1.28,0.07,8HSTATIONS,0.0,8)
```

```
115          CALL SYMBOL(5.80,1.16,0.07,IPOINT(2,1),0.0,3)
116          CALL SYMBOL(999.,1.16,0.07,5H AND ,00.,5)
117          CALL SYMBOL(999.,1.16,0.07,IPOINT(2,2),00.,3)
118          GO TO 2090
119       25 CALL SYMBOL(5.95,1.28,0.07,8HSTATIONS,0,0,8)
120          CALL SYMBOL(5.65,1.16,0.07,IPOINT(2,1),0.0,3)
121          CALL SYMBOL(999.,1.16,0.07,2H, ,00.,2)
122          CALL SYMBOL(999.,1.16,0.07,IPOINT(2,2),00.,3)
123          CALL SYMBOL(999.,1.16,0.07,6H, AND ,00.,6)
124          CALL SYMBOL(999.,1.16,0.07,IPOINT(2,3),00.,3)
             C
             C     *** WRITE YAXIS, XAXIS, AND PLOT TITLE ACCORDING TO NPLOTS FOR
             C         POSITION AND GAGE TYPE FOR CONTENT ***
             C
125     2090 GO TO(3000,3010,3020),NPLOTS
126     3000 IF(IPOINT(1,1).EQ.1HH) GO TO 1040
127          IF(IPOINT(1,1).EQ.1HV) GO TO 1050
128          IF(IPOINT(1,1).EQ.1HS) GO TO 1060
129          CALL SYMBOL(5.2,1.835,0.105,TITLET(1),0.0,20)
130          CALL SYMBOL(5.2,1.650,0.105,TITLET(6),0.0,20)
131          CALL SYMBOL(5.2,1.465,0.105,TITLET(11),0.0,20)
132          CALL SYMBOL(1.44,7.400,0.07,YAXIST(1),90.,32)
133          GO TO 27
134     1040 CALL SYMBOL(5.2,1.835,0.105,TITLEH(1),0.0,20)
135          CALL SYMBOL(5.2,1.650,0.105,TITLEH(6),0.0,20)
136          CALL SYMBOL(5.2,1.465,0.105,TITLEH(11),0.0,20)
137          CALL SYMBOL(1.44,7.400,0.07,YAXISH(1),90.,32)
138          GO TO 27
139     1050 CALL SYMBOL(5.2,1.835,0.105,TITLEV(1),0.0,20)
140          CALL SYMBOL(5.2,1.650,0.105,TITLEV(6),0.0,20)
141          CALL SYMBOL(5.2,1.465,0.105,TITLEV(11),0.0,20)
142          CALL SYMBOL(1.44,7.400,0.07,YAXISV(1),90.,32)
143          GO TO 27
144     1060 CALL SYMBOL(5.2,1.835,0.105,TITLES(1),0.0,20)
145          CALL SYMBOL(5.2,1.650,0.105,TITLES(6),0.0,20)
146          CALL SYMBOL(5.2,1.465,0.105,TITLES(11),0.0,20)
147          CALL SYMBOL(1.44,7.40,0.07,YAXISS(1),90.0,32)
148       27 CALL SYMBOL(2.4472,7.21,0.07,XAXIS(1),0.0,57)
149          GO TO 26
150     3010 IF(IPOINT(1,1).EQ.1HH) GO TO 1070
151          IF(IPOINT(1,1).EQ.1HV) GO TO 1080
152          IF(IPOINT(1,1).EQ.1HS) GO TO 1090
153          CALL SYMBOL(5.2,1.835,0.105,TITLET(1),0.0,20)
154          CALL SYMBOL(5.2,1.650,0.105,TITLET(6),0.0,20)
155          CALL SYMBOL(5.2,1.465,0.105,TITLET(11),0.0,20)
156          CALL SYMBOL(1.44,6.20,0.07,YAXIST(1),90.,32)
157          GO TO 28
158     1070 CALL SYMBOL(5.2,1.835,0.105,TITLEH(1),0.0,20)
159          CALL SYMBOL(5.2,1.650,0.105,TITLEH(6),0.0,20)
160          CALL SYMBOL(5.2,1.465,0.105,TITLEH(11),0.0,20)
161          CALL SYMBOL(1.44,6.20,0.07,YAXISH(1),90.,32)
162          GO TO 28
163     1080 CALL SYMBOL(5.2,1.835,0.105,TITLEV(1),0.0,20)
164          CALL SYMBOL(5.2,1.650,0.105,TITLEV(6),0.0,20)
```

```
                    CALL SYMBOL(5.2,1,465,0.105,TITLEV(11),0.0,20)
                    CALL SYMBOL(1.44,6.20,0.07,YAXISV(1),90.,32)
                    GO TO 28
            1090    CALL SYMBOL(5,2,1,835,0.105,TITLES(1),0,0,20)
                    CALL SYMBOL(5.2,1.650,0.105,TITLES(6),0,0,20)
                    CALL SYMBOL(5,2,1,465,0.105,TITLES(11),0,0,20)
                    CALL SYMBOL(1.44,6.20,0.07,YAXISS(1),90.,32)
              28    CALL SYMBOL(2,4472,4.800,0.07,XAXIS(1),0.0,57)
                    GO TO 26
            3020    IF(IPOINT(1,1).EQ.1HH) GO TO 2000
                    IF(IPOINT(1,1).EQ.1HV) GO TO 2010
                    IF(IPOINT(1,1).EQ.1HS) GO TO 2020
                    CALL SYMBOL(5.2,1,835,0.105,TITLET(1),0,0,20)
                    CALL SYMBOL(5.2,1.650,0.105,TITLET(6),0,0,20)
                    CALL SYMBOL(5.2,1,465,0.105,TITLET(11),0.0,20)
                    CALL SYMBOL(1.44,5.00,0.07,YAXIST(1),90.,32)
                    GO TO 29
            2000    CALL SYMBOL(5,2,1,835,0.105,TITLEH(1),0,0,20)
                    CALL SYMBOL(5.2,1.650,0.105,TITLEH(6),0.0,20)
                    CALL SYMBOL(5.2,1,465,0.105,TITLEH(11),0.0,20)
                    CALL SYMBOL(1.44,5.00,0.07,YAXISH(1),90.,32)
                    GO TO 29
            2010    CALL SYMBOL(5,2,1,835,0.105,TITLEV(1),0,0,20)
                    CALL SYMBOL(5.2,1.650,0.105,TITLEV(6),0,0,20)
                    CALL SYMBOL(5.2,1,465,0.105,TITLEV(11),0.0,20)
                    CALL SYMBOL(1.44,5.00,0.07,YAXISV(1),90.,32)
                    GO TO 29
            2020    CALL SYMBOL(5,2,1,835,0.105,TITLES(1),0,0,20)
                    CALL SYMBOL(5.2,1.650,0.105,TITLES(6),0,0,20)
                    CALL SYMBOL(5.2,1,465,0.105,TITLES(11),0.0,20)
                    CALL SYMBOL(1.44,5.00,0.07,YAXISS(1),90.,32)
              29    CALL SYMBOL(2,4472,2.39,0.07,XAXIS(1),0.0,57)
                C
                C     *** SET TO 1ST PLOT ON PAGE ***
                C
              26    CALL PLOT(1.72,7.55,-3)
                C
                C     ***  REPEAT TO STEP 125 NPLOTS TIMES ***
                C
                    DO 125 J=1,NPLOTS
                C
                C     *** SET AXES PARAMETERS ACCORDING TO GAGE TYPE ***
                C
                    IF(IPOINT(1,1).EQ.1HH) GO TO 2030
                    IF(IPOINT(1,1).EQ.1HV) GO TO 2040
                    IF(IPOINT(1,1).EQ.1HS) GO TO 2050
                    LBY= LBYT
                    DELY= DELYT
                    SPACEY= SPACET
                    DELX= DELXT
                    GO TO 2060
            2030    LBY= LBYH
                    DELY= DELYH
                    SPACEY= SPACEH
```

```
      DELX= DELXH
      GO TO 2060
 2040 LBY= LBYV
      DELY= DELYV
      SPACEY= SPACEV
      DELX= DELXV
      GO TO 2060
 2050 LBY= LBYS
      DELY= DELYS
      SPACEY= SPACES
      DELX= DELXS
C
C     *** READ IN DATA, CALIBRATE, SCALE, AND FIND MAX, MIN, AND AVG
C         FOR EACH PLAN ACCORDING TO GAGE TYPE ***
C
 2060 IF(NPLANS.EQ.-2) GO TO 2070
      CALL READ(HBMAX,HBMIN,HBTMAX,HBTMIN,HBAVG,DATAHB,NDATAB,IPOINT,
     1SCALEH,SCALEV,SCALES,SCALET)
      IF(NPLANS.LE.-1) GO TO 30
 2070 CALL READ(H1MAX,H1MIN,H1TMAX,H1TMIN,H1AVG,DATAH1,NDATA1,IPOINT,
     20701SCALEH,SCALEV,SCALES,SCALET)
      IF(NPLANS.LT.2) GO TO 30
      CALL READ(H2MAX,H2MIN,H2TMAX,H2TMIN,H2AVG,DATAH2,NDATA2,IPOINT,
     1SCALEH,SCALEV,SCALES,SCALET)
      IF(NPLANS.LT.3) GO TO 30
      CALL READ(H3MAX,H3MIN,H3TMAX,H3TMIN,H3AVG,DATAH3,NDATA3,IPOINT,
     1SCALEH,SCALEV,SCALES,SCALET)
C
C     *** FIND MAX AND MIN VALUES TO BE PLOTTED ***
C
   30 HMAX= HBMAX
      HMIN= HBMIN
      IF(HMAX.GE.H1MAX) GO TO 40
      HMAX= H1MAX
   40 IF(HMIN.LE.H1MIN) GO TO 50
      HMIN= H1MIN
   50 IF(NPLANS.LT.2) GO TO 90
      IF(HMAX.GE.H2MAX) GO TO 60
      HMAX= H2MAX
   60 IF(HMIN.LE.H2MIN) GO TO 70
      HMIN= H2MIN
   70 IF(NPLANS.LT.3) GO TO 90
      IF(HMAX.GE.H3MAX) GO TO 80
      HMAX= H3MAX
   80 IF(HMIN.LE.H3MIN) GO TO 90
      HMIN= H3MIN
C
C     *** WRITE STA. NO., DRAW AXES AND ANNOTATE, AND GRAPH DATA ***
C
   90 CALL STAID(IPOINT,J,NSTA)
      CALL AXES(HMAX,HMIN,SCALEX,DELX,LBY,DELY,SPACEY,IPOINT,SCALEY)
      IF(NPLANS.EQ.-2) GO TO 95
      CALL SPLINE(DATAHB,SCALEY,LBY,SCALEX,NDATAB,1,IPOINT,PREDMB)
      IF(NPLANS.LE.-1) GO TO 100
```

```
                250       95 CALL SPLINE(DATAH1,SCALEY,LBY,SCALEX,NDATA1,2,IPOINT,PREDM1)
                251          IF(NPLANS.LT.2) GO TO 100
                252          CALL SPLINE(DATAH2,SCALEY,LBY,SCALEX,NDATA2,3,IPOINT,PREDM2)
                253          IF(NPLANS.LT.3) GO TO 100
                254          CALL SPLINE(DATAH3,SCALEY,LBY,SCALEX,NDATA3,4,IPOINT,PREDM3)
                255      100 CALL PLOT(0.0,-2.410,-3)
                           C
                           C     *** PRINT TABLE OF VALUES PLOTTED, DIFFERENCES FROM THE BASE
                           C         VALUES, AND THE MAX,MIN, AND AVG FOR EACH PLAN ***
                           C
                           C
                           C     *** PRINT SPECIAL TITLE FOR VERIFICATION, OTHERWISE PRINT
                           C         REGULAR TITLE ***
                           C
                256          IF(NPLANS.EQ.-1) GO TO 112
                257          IF(NPLANS.LT.1) GO TO 104
                258      112 PRINT 9000,(MODEL(I),I=1,8),(ITEST(I),I=1,8),IPOINT(2,J),IPOINT(3,
                             1J)
                           C
                           C     *** PRINT TITLE ACCORDING TO NO. OF PLANS ***
                           C
                259          IF(NPLANS.EQ.-1) GO TO 113
                260          GO TO(101,102,103),NPLANS
                261      101 PRINT 9011,NPLAN(1)
                262          GO TO 105
                263      102 PRINT 9012,NPLAN(1),NPLAN(2)
                264          GO TO 105
                265      103 PRINT 9010,NPLAN(1),NPLAN(2),NPLAN(3)
                266          GO TO 105
                267      104 PRINT 9013,(MODEL(I),I=1,8),(ITEST(I),I=1,8),IPOINT(2,J),IPOINT(3,
                             1041J)
                268          GO TO 105
                269      113 PRINT 9019
                           C
                           C     *** PRINT DATA ACCORDING TO GAGE TYPE ***
                           C
                270      105 IF(IPOINT(1,1).EQ.1HH) GO TO 4010
                271          IF(IPOINT(1,1).EQ.1HV) GO TO 4020
                272          IF(IPOINT(1,1).EQ.1HS) GO TO 4030
                273          PRINT 9014
                274          GO TO 4040
                275     4010 PRINT 9015
                276          GO TO 4040
                277     4020 PRINT 9016
                278          GO TO 4040
                279     4030 PRINT 9017
                280     4040 IF(NPLANS.EQ.-1) GO TO 114
                281          IF(NPLANS.LT.1) GO TO 4050
                282      114 PRINT 9020,(NPLAN(I),NPLAN(I),I=1,NPLANS)
                283          GO TO 106
                284     4050 PRINT 9018
                           C
                           C     *** PRINT DATA ***
                           C
```

```
285       106 CALL TABLE(DATAHB,DATAH1,DATAH2,DATAH3,NPLANS,IPOINT,DELX)
                C
                C     *** PRINT AVG IF DATA IS S OR T TYPE, OTHERWISE DO NOT PRINT
                C         AVG ***
                C
286             IF(IPOINT(1,1).EQ.1HV) GO TO 108
287             IF(IPOINT(1,1).EQ.1HS.OR.IPOINT(1,1).EQ.1HT) GO TO 110
288             PRINT 9030
                C
                C     *** PRINT MAX AND MIN VALUES ***
                C
289             IF(NPLANS.EQ.-1) GO TO 121
290             IF(NPLANS.LT.1) GO TO 107
291       121   PRINT 9040,HBTMAX,HBMAX,HBTMIN,HBMIN
292             IF(NPLANS.LT.0) GO TO 120
293             PRINT 9050,NPLAN(1),H1TMAX,H1MAX,H1TMIN,H1MIN
294             IF(NPLANS.LT.2) GO TO 120
295             PRINT 9050,NPLAN(2),H2TMAX,H2MAX,H2TMIN,H2MIN
296             IF(NPLANS.LT.3) GO TO 120
297             PRINT 9050,NPLAN(3),H3TMAX,H3MAX,H3TMIN,H3MIN
298             GO TO 120
                C
                C     *** PRINT SPECIAL MAX,MIN TABLE FOR VERIFICATION ***
                C
299       107   IF(NPLANS.EQ.-2) GO TO 115
300             PRINT 9045,HBTMAX,HBMAX,HBTMIN,HBMIN
301             IF(NPLANS.EQ.-3) GO TO 120
302       115   PRINT 9055,H1TMAX,H1MAX,H1TMIN,H1MIN
303             GO TO 120
304       108   PRINT 9032
305             IF(NPLANS.EQ.-1) GO TO 116
306             IF(NPLANS.LT.1) GO TO 109
            C
            C     *** PRINT MAX, MIN, AND EBB PREDOMINANCE VALUES ***
            C
307       116   PRINT 9041,HBTMAX,HBMAX,HBTMIN,HBMIN,PREDMB
308             IF(NPLANS.LT.0) GO TO 120
309             PRINT 9051,NPLAN(1),H1TMAX,H1MAX,H1TMIN,H1MIN,PREDM1
310             IF(NPLANS.LT.2) GO TO 120
311             PRINT 9051,NPLAN(2),H2TMAX,H2MAX,H2TMIN,H2MIN,PREDM2
312             IF(NPLANS.LT.3) GO TO 120
313             PRINT 9051,NPLAN(3),H3TMAX,H3MAX,H3TMIN,H3MIN,PREDM3
314             GO TO 120
            C
            C     *** PRINT SPECIAL MAX, MIN, AND PREDOMINANCE TABLE FOR
            C         VERIFICATION ***
            C
315       109   IF(NPLANS.EQ.-2) GO TO 119
316             PRINT 9046,HBTMAX,HBMAX,HBTMIN,HBMIN,PREDMB
317             IF(NPLANS.EQ.-3) GO TO 120
318       119   PRINT 9056,H1TMAX,H1MAX,H1TMIN,H1MIN,PREDM1
319             GO TO 120
320       110   PRINT 9031
321             IF(NPLANS.EQ.-1) GO TO 111
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```
      IF(NPLANS.LT.1) GO TO 117
C
C     *** PRINT MAX, MIN, AND AVG VALUES ***
C
  111 PRINT 9041,HBTMAX,HBMAX,HBTMIN,HBMIN,HBAVG
      IF(NPLANS.LE.-1) GO TO 120
      PRINT 9051,NPLAN(1),H1TMAX,H1MAX,H1TMIN,H1MIN,H1AVG
      IF(NPLANS.LT.2) GO TO 120
      PRINT 9051,NPLAN(2),H2TMAX,H2MAX,H2TMIN,H2MIN,H2AVG
      IF(NPLANS.LT.3) GO TO 120
      PRINT 9051,NPLAN(3),H3TMAX,H3MAX,H3TMIN,H3MIN,H3AVG
      GO TO 120
C
C     *** PRINT SPECIAL MAX, MIN, AND AVG TABLE FOR VERIFICATION ***
C
  117 IF(NPLANS.EQ.-2) GO TO 118
      PRINT 9046,HBTMAX,HBMAX,HBTMIN,HBMIN,HBAVG
      IF(NPLANS.EQ.-3) GO TO 120
  118 PRINT 9056,H1TMAX,H1MAX,H1TMIN,H1MIN,H1AVG
C
C     *** PRINT NOTE ***
C
  120 PRINT 9059
      PRINT 9060
      PRINT 9061
      PRINT 9062
      PRINT 9063
  125 PRINT 9064
C
C     *** ADVANCE TO NEW PAGE ***
C
      CALL PLOT(11.0,-30.0,-3)
      GO TO 10
 8000 FORMAT(8A4,8X,8A4)
 8005 FORMAT(I4)
 8010 FORMAT(11A4)
 8020 FORMAT(I4,6X,3(A1,A3,A2,4X),I5,3(3X,A2))
 8030 FORMAT(15A4)
 8040 FORMAT(7A8)
 8050 FORMAT(4A8,8X,4A8)
 8060 FORMAT(4F10.5)
 9000 FORMAT(1H1,23X,8A4,/,24X,8A4,/,33X,"STATION ",A3,A2)
 9001 FORMAT(1H1,/////////,30X,10H**********,/,20X,"PROGRAM- HOURLY TIDA
     9001L DATA PLOTS",/,20X,"BY DAGGETT- HYDRAULICS",/,20X,"PROGRAM NO. 80
     900123-G9R0-148",/,30X,10H**********)
 9010 FORMAT(1H0,22X,17HEFFECTS OF PLANS ,A2,1H,,A2,6H, AND ,A2,4H ON )
 9011 FORMAT(1H0,29X,16HEFFECTS OF PLAN ,A2,4H ON )
 9012 FORMAT(1H0,25X,17HEFFECTS OF PLANS ,A2,5H AND ,A2,4H ON )
 9013 FORMAT(1H1,5X,8A4,/,6X,8A4,/,15X,"STATION ",A3,A2,/,1H+,11X,
     90131"VERIFICATION OF MODEL")
 9014 FORMAT(34X,11HTEMPERATURE,//)
 9015 FORMAT(34X,13HTIDAL HEIGHTS,//)
 9016 FORMAT(34X,10HVELOCITIES,//)
 9017 FORMAT(34X,10HSALINITIES,//)
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      9018 FORMAT(10X," TIME  PROTO-  MODEL  DIFF.",/,10X,"HOURS   TYPE",/)
      9019 FORMAT(1H0,37X,4HBASE)
      9020 FORMAT(10X," TIME   BASE   PLAN   DIFF.  PLAN   DIFF.  PLAN   DIFF
     90201.",/,10X,"HOURS   TEST",4X,A2,2X,A2,"-BASE",3X,A2,2X,A2,"-BASE",
     902023X,A2,2X,A2,"-BASE",/)
      9030 FORMAT(1H0,//,21X,"MAXIMUM",10X,"MINIMUM",/,10X,"PLAN",4X,"TIME",
     903015X,"TIDAL    TIME    TIDAL",/,18X,"HOURS    DATA     HOURS   DATA"
     90302,/)
      9031 FORMAT(1H0,//,21X,"MAXIMUM",10X,"MINIMUM",/,10X,"PLAN",4X,"TIME",
     903115X,"TIDAL    TIME    TIDAL",/,18X,"HOURS    DATA     HOURS   DATA"
     90312,"    AVERAGE",/)
      9032 FORMAT(1H0,//,21X,"MAXIMUM",10X,"MINIMUM",/,10X,"PLAN",4X,"TIME",
     903215X,"TIDAL    TIME    TIDAL   EBB PRE-",/,18X,"HOURS    DATA    ",
     90322"HOURS   DATA    DOMINANCE",/)
      9040 FORMAT(11X,"BASE",3X,4(F5.1,4X))
      9041 FORMAT(11X,"BASE",3X,5(F5.1,4X))
      9045 FORMAT(8X,"PROTOTYPE",1X,4(F5.1,4X))
      9046 FORMAT(8X,"PROTOTYPE",1X,5(F5.1,4X))
      9050 FORMAT(12X,A2,4X,4(F5.1,4X))
      9051 FORMAT(12X,A2,4X,5(F5.1,4X))
      9055 FORMAT(10X,"MODEL",3X,4(F5.1,4X))
      9056 FORMAT(10X,"MODEL",3X,5(F5.1,4X))
      9059 FORMAT(1H0,//)
      9060 FORMAT("
     90601                          ")
      9061 FORMAT("
     90611                          ")
      9062 FORMAT("
     90621                          ")
      9063 FORMAT("
     90631                          ")
      9064 FORMAT("
     90641                          ")
      9070 FORMAT(4F10.0)
      9999 CALL PLOT(10.0,-30.0,999)
           CALL EXIT
           END
```

```
      1          SUBROUTINE READ(MAX,MIN,MAXT,MINT,AVG,HDATA,IDATA,IPOINT,SCALEH,
                1SCALEV,SCALES,SCALET)
                C
                C     *** THIS SUBROUTINE READS IN DATA, CALIBRATES AND SCALES IT, AND
                C     FINDS THE MAX,, MIN,, AND AVG, VALUES, ***
                C
                C     *** IDATA IS A COUNTER TO DETERMINE THE NO, OF DATA POINTS,
                C     HDATA- COL, 1 IS THE TIME OF DATA VALUE, COL, 2 IS DATA VALUE, ***
                C
      2          DIMENSION HDATA(100,2),IPOINT(3,3),A(3),B(3),C(3),HVAL(4)
      3          REAL MAX,MIN,MAXT,MINT
                C
                C     *** INITIALIZE COUNTERS AND DATA ***
                C
      4          IDATA= 1
      5          NREAD= 1
      6          AVG= 0.0
      7          HDATA(1,2)=0.0
                C
                C     *** SELECT READ AND CALIBRATE PROCEDURE ACCORDING TO GAGE TYPE ***
                C
      8          IF(IPOINT(1,1).EQ.1HT) GO TO 4000
      9          IF(IPOINT(1,1).EQ.1HS) GO TO 3000
     10          IF(IPOINT(1,1).EQ.1HV) GO TO 2000
                C
                C     *** READ, CALIBRATE, AND SCALE TIDAL HEIGHTS ACCORDING TO
                C          H= SCALEH*(H'+A(1)) ***
                C
     11          READ 9000,A(1),B(1),C(1)
     12          READ 9010,NREAD,HDATA(1,1),(HVAL(I),I=1,NREAD)
     13          IF(NREAD.EQ.0) NREAD=1
     14          SCALE= SCALEH/NREAD
     15          DO 10 I=1,NREAD
     16       10 HDATA(1,2)= HDATA(1,2)+ HVAL(I) +A(1)
     17          HDATA(1,2)= HDATA(1,2)*SCALE
     18          MAX= HDATA(1,2)
     19          MIN= MAX
     20          MAXT= HDATA(1,1)
     21          MINT=MAXT
     22       20 IDATA= IDATA+1
     23          READ 9010,NREAD,HDATA(IDATA,1),(HVAL(I),I=1,NREAD)
     24          CALL EOFTST(50,JJ)
     25          GO TO(25,9999),JJ
     26       25 IF(NREAD.EQ.0) NREAD= 1
     27          HDATA(IDATA,2)= 0.0
     28          SCALE= SCALEH/NREAD
     29          DO 30 I=1,NREAD
     30       30 HDATA(IDATA,2)= HDATA(IDATA,2)+ HVAL(I)+ A(1)
     31          HDATA(IDATA,2)= HDATA(IDATA,2)*SCALE
     32          CALL FIND(MAX,MIN,MAXT,MINT,HDATA,IDATA)
     33          GO TO 20
                C
                C     *** READ, CALIBRATE, AND SCALE VELOCITIES ACCORDING TO
                C          V= SCALEV*(A(1)+ B(1)*V') ***
```

```
      C
 2000 READ 9000,A(1),B(1),C(1)
      READ 9020,NREAD,HDATA(1,1),(HVAL(I),I=1,NREAD)
      IF(NREAD.EQ.0) NREAD= 1
      SCALE= SCALEV/NREAD
      DO 2010 I= 1,NREAD
 2010 HDATA(1,2)= HDATA(1,2)+ A(1)+B(1)*HVAL(I)
      HDATA(1,2)= HDATA(1,2)*SCALE
      MAX= HDATA(1,2)
      MIN= MAX
      MAXT= HDATA(1,1)
      MINT= MAXT
 2020 IDATA= IDATA+1
      READ 9020,NREAD,HDATA(IDATA,1),(HVAL(I),I=1,NREAD)
      CALL EOFTST(50,JJ)
      GO TO(2025,9999),JJ
 2025 IF(NREAD.EQ.0) NREAD= 1
      HDATA(IDATA,2)= 0.0
      SCALE= SCALEV/NREAD
      DO 2030 I=1,NREAD
 2030 HDATA(IDATA,2)= HDATA(IDATA,2)+ A(1)+B(1)*HVAL(I)
      HDATA(IDATA,2)= HDATA(IDATA,2)*SCALE
      CALL FIND(MAX,MIN,MAXT,MINT,HDATA,IDATA)
      GO TO 2020
C
C     *** READ, CALIBRATE, AND SCALE SALINITIES ACCORDING TO
C           S= SCALES*(A(NCELL)+ B(NCELL)*S'+ C(NCELL)*S'*2) ***
C
 3000 READ 9005,NCELLS,A(1),B(1),C(1),A(2),B(2),C(2)
      IF(NCELLS.GT.2) READ 9000,A(3),B(3),C(3)
      READ 9030,NREAD,HDATA(1,1),NCELL,(HVAL(I),I=1,NREAD)
      IF(NREAD.EQ.0) NREAD=1
      SCALE= SCALES/NREAD
      DO 3010 I=1,NREAD
 3010 HDATA(1,2)=HDATA(1,2)+A(NCELL)+(B(NCELL)+C(NCELL)*HVAL(I))*HVAL(I)
      HDATA(1,2)=HDATA(1,2)*SCALE
      MAX= HDATA(1,2)
      MIN= MAX
      AVG= MAX
      MAXT= HDATA(1,1)
      MINT= MAXT
 3020 IDATA= IDATA+1
      READ 9030,NREAD,HDATA(IDATA,1),NCELL,(HVAL(I),I=1,NREAD)
      CALL EOFTST(50,JJ)
      GO TO(3025,9999),JJ
 3025 IF(NREAD.EQ.0) NREAD=1
      HDATA(IDATA,2)= 0.0
      SCALE= SCALES/NREAD
      DO 3030 I=1,NREAD
 3030 HDATA(IDATA,2)=HDATA(IDATA,2)+A(NCELL)+(B(NCELL)+C(NCELL)*HVAL(I))
30301*HVAL(I)
      HDATA(IDATA,2)= HDATA(IDATA,2)*SCALE
      AVG= AVG+HDATA(IDATA,2)
      CALL FIND(MAX,MIN,MAXT,MINT,HDATA,IDATA)
```

```
                GO TO 3020
C
C       *** READ, CALIBRATE, AND SCALE TEMPERATURES ACCORDING TO
C           T= SCALET*T' ***
C
 4000   READ 9040,NREAD,HDATA(1,1),(HVAL(I),I=1,NREAD)
        IF(NREAD.EQ.0) NREAD=1
        SCALE= SCALET/NREAD
        DO 4010 I=1,NREAD
 4010   HDATA(1,2)= HDATA(1,2)+ HVAL(I)
        HDATA(1,2)= HDATA(1,2)*SCALE
        MAX= HDATA(1,2)
        MIN= MAX
        AVG= MAX
        MAXT= HDATA(1,1)
        MINT= MAXT
 4020   IDATA= IDATA+1
        READ 9040,NREAD,HDATA(IDATA,1),(HVAL(I),I=1,NREAD)
        CALL EOFTST(50,JJ)
        GO TO(4025,9999),JJ
 4025   IF(NREAD.EQ.0) NREAD=1
        HDATA(IDATA,2)= 0.0
        SCALE= SCALET/NREAD
        DO 4030 I=1,NREAD
 4030   HDATA(IDATA,2)= HDATA(IDATA,2)+ HVAL(I)
        HDATA(IDATA,2)= HDATA(IDATA,2)*SCALE
        AVG= AVG+HDATA(IDATA,2)
        CALL FIND(MAX,MIN,MAXT,MINT,HDATA,IDATA)
        GO TO 4020
 9000   FORMAT(20X,3F10.0)
 9005   FORMAT(19X,I1,6F10.0)
 9010   FORMAT(19X,I1,3F4.1)
 9020   FORMAT(19X,I1,F4.1,8X,4F5.2)
 9030   FORMAT(19X,I1,F4.1,29X,I1,3F4.1)
 9040   FORMAT(19X,I1,F4.1,42X,2F4.1)
 9999   IDATA= IDATA-1
        DATANO= FLOAT(IDATA)
        AVG= AVG/DATANO
        RETURN
        END
```

```
      SUBROUTINE FIND(MAX,MIN,MAXT,MINT,HDATA,IDATA)
C
C     *** THIS SUBROUTINE FINDS THE MAX. AND MIN. VALUES OF THE DATA ***
C
      DIMENSION HDATA(100,2)
      REAL MAX,MIN,MAXT,MINT
      IF(MAX.GE.HDATA(IDATA,2)) GO TO 10
      MAX= HDATA(IDATA,2)
      MAXT= HDATA(IDATA,1)
      GO TO 20
   10 IF(MIN.LE.HDATA(IDATA,2)) GO TO 20
      MIN= HDATA(IDATA,2)
      MINT= HDATA(IDATA,1)
   20 RETURN
      END
```

```
      SUBROUTINE STAID(IPOINT,J,NSTA)
C
C     *** THIS SUBROUTINE DETERMINES TYPE AND LOCATION OF STATION AND
C         DEPTH ID TO BE WRITTEN FOR EACH GRAPH ***
C
      DIMENSION IPOINT(3,3)
      IF(IPOINT(1,1).EQ.1HH) GO TO 500
      IF(NSTA.EQ.1) GO TO 600
C
C     *** WRITE STATION ID AND DEPTH IF MORE THAN ONE STATION ON PAGE***
C
      IF(IPOINT(3,J).LT.4H00  .OR.IPOINT(3,J).GT.4H10  ) GO TO 10
      CALL SYMBOL(1.326,2.03,0.105,8HSTATION ,00.,8)
      CALL SYMBOL(999.,2.03,0.105,IPOINT(2,J),00.,3)
      CALL SYMBOL(999.,2.03,0.105,15H AT THE SURFACE,00.,15)
      GO TO 9999
   10 IF(IPOINT(3,J).LT.4H45  .OR.IPOINT(3,J).GT.4H55  ) GO TO 20
      CALL SYMBOL(1.350,2.03,0.105,8HSTATION ,00.,8)
      CALL SYMBOL(999.,2.03,0.105,IPOINT(2,J),00.,3)
      CALL SYMBOL(999.,2.03,0.105,13H AT MID-DEPTH,00.,13)
      GO TO 9999
   20 IF(IPOINT(3,J).LT.4H90  .OR.IPOINT(3,J).GT.4H99  ) GO TO 30
      CALL SYMBOL(1.299,2.03,0.105,8HSTATION ,00.,8)
      CALL SYMBOL(999.,2.03,0.105,IPOINT(2,J),00.,3)
      CALL SYMBOL(999.,2.03,0.105,14H AT THE BOTTOM,00.,14)
      GO TO 9999
   30 CALL SYMBOL(1.204,2.03,0.105,8HSTATION ,00.,8)
      CALL SYMBOL(999.,2.03,0.105,IPOINT(2,J),00.,3)
      CALL SYMBOL(999.,2.03,0.105,4H AT ,00.,4)
      CALL SYMBOL(999.,2.03,0.105,IPOINT(3,J),00.,2)
      CALL SYMBOL(999.,2.03,0.105,14H PCT. OF DEPTH,00.,14)
      GO TO 9999
C
C     *** WRITE ONLY STATION ID FOR HEIGHTS ***
C
  500 CALL SYMBOL(2.442,2.03,0.105,IPOINT(2,J),00.,3)
      GO TO 9999
C
C     *** WRITE ONLY DEPTH IF ALL GRAPHS ARE AT ONE STATION ***
C
  600 IF(IPOINT(3,J).LT.4H00  .OR.IPOINT(3,J).GT.4H10  ) GO TO 610
      CALL SYMBOL(2.217,2.03,0.105,7HSURFACE,00.,7)
      GO TO 9999
  610 IF(IPOINT(3,J).LT.4H45  .OR.IPOINT(3,J).GT.4H55  ) GO TO 620
      CALL SYMBOL(2.115,2.03,0.105,9HMID-DEPTH,00.,9)
      GO TO 9999
  620 IF(IPOINT(3,J).LT.4H90  .OR.IPOINT(3,J).GT.4H99  ) GO TO 630
      CALL SYMBOL(2.268,2.03,0.105,6HBOTTOM,00.,6)
      GO TO 9999
  630 CALL SYMBOL(1.857,2.03,0.105,IPOINT(3,J),00.,2)
      CALL SYMBOL(999.,2.03,0.105,14H PCT. OF DEPTH,00.,14)
 9999 RETURN
      END
```

```
      1          SUBROUTINE AXES(MAXH,MINH,SCALEX,DELX,LBY,DELY,SPACEY,IPOINT,
                1SCALEY)
                C
                C     *** THIS SUBROUTINE SETS SCALES, DRAWS AND ANNOTATES AXES ***
                C
      2          DIMENSION IPOINT(3,3)
      3          REAL LENX,LENY,LBY,MAXH,MINH
                C
                C     *** INITIALIZE STANDARD PARAMETERS AND SET INITIAL SCALES ***
                C
      4          SPACEX=0.415
      5          LENX= 4.980
      6          LENY= 2.0
      7          LABEL= 4H
      8          SCALEX= SPACEX/DELX
      9          SCALEY= SPACEY/DELY
     10          UBY= LBY+LENY/SCALEY
     11          IF(LBY.GT.MINH) GO TO 10
     12          IF(UBY.LT.MAXH) GO TO 10
                C
                C     *** IF MAX AND MIN DATA ARE WITHIN YAXIS LIMITS DRAW AND
                C         ANNOTATE AXES ***
                C
     13        5 CALL AXIS13(0.0,0.0,LABEL,4,0.07,LENY,-1,1,LBY,DELY,SPACEY,1,0)
     14          CALL AXIS13(0.0,LENY,LABEL,4,0.00,LENX,-1,0,LBX,DELX,SPACEX,1,0)
     15          CALL PLOT(4.980,LENY,3)
     16          CALL PLOT(5.1543,LENY,2)
     17          CALL AXIS13(0.0,0.00,LABEL,-4,0.07,LENX,-1,0,LBX,DELX,SPACEX,1,0)
     18          CALL PLOT(4.980,0.00,3)
     19          CALL PLOT(5.1543,0.00,2)
     20          CALL SYMBOL(5.1243,-0.18,0.07,1H0,0.0,1)
     21          CALL AXIS13(5.1543,0.,LABEL,-4,0.07,LENY,-1,1,LBY,DELY,SPACEY,1,0)
                C
                C     *** IF DATA IS VELOCITY, DRAW ZERO LINE AND WRITE EBB AND
                C         FLOOD LABELS ***
                C
     22          IF(IPOINT(1,1).NE.1HV) GO TO 100
     23          CALL SYMBOL(5.48,0.40,0.07,3HEBB,90.,3)
     24          CALL SYMBOL(5.48,1.32,0.07,5HFLOOD,90.,5)
     25          ZERO= (0.0-LBY)*SCALEY
     26          CALL PLOT(5.1543,ZERO,3)
     27          CALL PLOT(0.0,ZERO,2)
     28        7 GO TO 100
                C
                C     *** IF MIN IS LESS THAN LOWEST Y AXIS VALUE OR MAX IS GREATER
                C         THAN LARGEST Y AXIS VALUE, CHANGE LBY AND HENCE UBY, BUT
                C         KEEP SPACEY SAME ***
                C
     29       10 IF(MINH.GE.0.0) GO TO 20
     30          LBY=AINT(MINH)-1.0
     31          GO TO 30
     32       20 LBY= AINT(MINH)
     33       30 UBY= LBY+LENY/SCALEY
                C
```

```
C     *** IF MAX IS GREATER THAN LARGEST Y AXIS VALUE, CHANGE UBY,
C         SPACEY, AND SCALEY, OTHERWISE GO DRAW AXIS ***
C
      IF(UBY.LT.MAXH) GO TO 60
      GO TO 5
   60 IF(MAXH.GE.0) GO TO 70
      UBY= AINT(MAXH)
      GO TO 80
   70 UBY= AINT(MAXH)+1.0
   80 SPACEY= DELY*LENY/(UBY-LBY)
      SCALEY= SPACEY/DELY
      GO TO 5
  100 RETURN
      END
```

```
      1          SUBROUTINE TABLE(DATABH,DATA1H,DATA2H,DATA3H,NPLANS,IPOINT,DELX)
                 C
                 C     *** THIS SUBROUTINE GENERATES A TABLE OF VALUES PLOTTED ON THE
                 C     GRAPHS SIMULTANEOUSLY,  TIMERR= THE ERROR ALLOWED IN SELECTING
                 C     A DATA POINT  FOR A GIVEN TIME,  TIME IS INCREMENTED IN TIME STEPS
                 C     = DELTIM, ***
                 C
      2          DIMENSION DATABH(100,2),DATA1H(100,2),DATA2H(100,2),DATA3H(100,2),
                1IPOINT(3,3)
                 C
                 C     *** INITIALIZE PARAMETERS ***
                 C
      3          TIMERR=0.0003
      4          DELTIM=0.5
      5          IF(IPOINT(1,1).EQ.1HS) DELTIM= 1.0
      6          TIME=0.0
      7          IB=1
      8          I1=1
      9          I2=1
     10          I3=1
     11          TIMEMX= 12.42*DELX
     12        5 TIML= TIME-TIMERR
     13          TIMU= TIME+TIMERR
                 C
                 C     *** SEARCH TO FIND DATA AT GIVEN TIME VALUE +OR- TIME ERROR
                 C         FOR BASE ***
                 C
     14          IF(NPLANS.EQ.-2) GO TO 20
     15       10 IF(DATABH(IB,1).GT.TIML.AND.DATABH(IB,1).LT.TIMU) GO TO 16
     16          IF(DATABH(IB,1).GT.TIMU) GO TO 15
     17          IB=IB+1
     18          GO TO 10
     19       15 IB= IB-1
     20          DATABH(IB,2)= 99999.
                 C
                 C     *** SEARCH TO FIND DATA AT GIVEN TIME VALUE +OR- TIME ERROR
                 C         FOR PLAN 1 ***
                 C
     21       16 IF(NPLANS.LT. 0) GO TO 91
     22       20 IF(DATA1H(I1,1).GT.TIML.AND.DATA1H(I1,1).LT.TIMU) GO TO 30
     23          IF(DATA1H(I1,1).GT.TIMU) GO TO 25
     24          I1=I1+1
     25          GO TO 20
     26       25 I1= I1 -1
     27          DATA1H(I1,2)= 99999.
                 C
                 C     *** CALCULATE DIFFERENCE BETWEEN PLAN 1 DATA AND BASE ***
                 C
     28       30 IF(NPLANS.EQ.-2) GO TO 92
     29          DIFF1= DATA1H(I1,2)-DATABH(IB,2)
                 C
                 C     *** SEARCH TO FIND DATA AT GIVEN TIME VALUE +OR- TIME ERROR
                 C         FOR PLAN 2 ***
                 C
```

```
      IF(NPLANS.LT.2) GO TO 90
   40 IF(DATA2H(I2,1).GT.TIML.AND.DATA2H(I2,1).LT.TIMU) GO TO 50
      IF(DATA2H(I2,1).GT.TIMU) GO TO 45
      I2=I2+1
      GO TO 40
   45 I2= I2 -1
      DATA2H(I2,2)= 99999.
C
C     *** CALCULATE DIFFERENCE BETWEEN PLAN 2 DATA AND BASE ***
C
   50 DIFF2= DATA2H(I2,2)-DATABH(IB,2)
      IF(NPLANS.LT.3) GO TO 80
C
C     *** SEARCH TO FIND DATA AT GIVEN TIME VALUE +OR- TIME ERROR
C         FOR PLAN 3 ***
C
   60 IF(DATA3H(I3,1).GT.TIML.AND.DATA3H(I3,1).LT.TIMU) GO TO 70
      IF(DATA3H(I3,1).GT.TIMU) GO TO 65
      I3=I3+1
      GO TO 60
   65 I3= I3 -1
      DATA3H(I3,2)= 99999.
C
C     *** CALCULATE DIFFERENCE BETWEEN PLAN 3 DATA AND BASE ***
C
   70 DIFF3= DATA3H(I3,2)-DATABH(IB,2)
C
C     *** PRINT DATA AND TIMES ACCORDING TO NPLANS ***
C
      PRINT 100,TIME,DATABH(IB,2),DATA1H(I1,2),DIFF1,DATA2H(I2,2),DIFF2,
     1DATA3H(I3,2),DIFF3
      GO TO 95
   80 PRINT 110,TIME,DATABH(IB,2),DATA1H(I1,2),DIFF1,DATA2H(I2,2),DIFF2
      GO TO 95
   90 PRINT 120,TIME,DATABH(IB,2),DATA1H(I1,2),DIFF1
      GO TO 95
   91 PRINT 130,TIME,DATABH(IB,2)
      GO TO 95
   92 PRINT 140,TIME,DATA1H(I1,2)
   95 TIME= TIME+DELTIM
      IF(TIME.LE.TIMEMX) GO TO 5
  100 FORMAT(11X,8(F5.1,2X))
  110 FORMAT(11X,6(F5.1,2X))
  120 FORMAT(11X,4(F5.1,2X))
  130 FORMAT(11X,2(F5.1,2X))
  140 FORMAT(11X,F5.1,9X,F5.1)
      RETURN
      END
```

```
      1          SUBROUTINE SPLINE(DATAGH,SCALEY,LBY,SCALEX,N,IDPLAN,IPOINT,PREDOM)
                 C
                 C     *** THIS SUBROUTINE PRODUCES A SPLINE-FIT CURVE THROUGH THE
                 C         SCALED DATA(IN INCHES ON GRAPH) AND DRAWS APPROPRIATE TYPE
                 C         LINE ACCORDING TO PLAN BEING GRAPHED ***
                 C
      2          DIMENSION DATAGH(100,2),X(100),Y(100),T(300),DELY(100),H(100),
                1H2(100),B(100),S2(100),C(100),SS2(300),SS(300),S3(100)
      3          DIMENSION IPOINT(3,3)
      4          REAL LBY
                 C
                 C     *** INITIALIZE PARAMETERS ***
                 C
      5          IPAGE= 1
      6       10 N1=N-1
      7          EPSLN=0.0005
                 C
                 C     *** DETERMINE TIMES AT WHICH SPLINE-FIT CURVE WILL BE CALCULATED
                 C         FOR GRAPHING ***
                 C
      8       30 M= 150
      9          DELT= 0.415/12.
     10          T(1)= 0.0
     11          M1= M-1
     12          DO 40 I=2,M1
     13       40 T(I)= T(I-1)+DELT
     14          T(M)= 5.153
                 C
                 C     *** SCALE DATA FOR GRAPHING ***
                 C
     15          DO 50 I=1,N
     16          X(I)= DATAGH(I,1)*SCALEX
     17       50 Y(I)=(DATAGH(I,2)-LBY)*SCALEY
                 C
                 C     *** FIT SPLINE TO DATA ***
                 C
     18          DO 60 I=1,N1
     19          H(I)= X(I+1)-X(I)
     20       60 DELY(I)= (Y(I+1)-Y(I))/H(I)
     21          DO 80 I=2,N1
     22          H2(I)= H(I-1)+ H(I)
     23          B(I)= 0.5*H(I-1)/H2(I)
     24          DELSQY=(DELY(I)-DELY(I-1))/H2(I)
     25       70 S2(I)= 2.*DELSQY
     26       80 C(I)= 3.*DELSQY
     27       90 S2(1)= 0.
     28          S2(N)= 0.
     29          OMEGA= 1.0717968
     30      100 ETA= 0.
     31          DO 120 I=2,N1
     32          W=(C(I)-B(I)*S2(I-1)-(0.5-B(I))*S2(I+1)-S2(I))*OMEGA
     33          IF(ABS(W)-ETA) 120,120,110
     34      110 ETA= ABS(W)
     35      120 S2(I)= S2(I)+W
```

```
      130 IF(ETA-EPSLN) 140,100,100
      140 DO 150 I=1,N1
      150 S3(I)=(S2(I+1)-S2(I))/W(I)
C
C     *** GENERATE DATA FOR GRAPH FROM SPLINE ***
C
      160 DO 250 J=1,M
          I=1
          IF(T(J)-X(1)) 200,240,170
      170 IF(T(J)-X(N)) 190,220,201
      180 IF(T(J)-X(I)) 230,240,190
      190 I= I+1
          GO TO 180
C
C     *** NOTIFY IF TIME TO CALCULATE CURVE IS OUT OF RANGE OF DATA ***
C
      200 IF(IPAGE.NE.1) GO TO 205
          PRINT 210,J
          IPAGE= 2
          GO TO 250
      201 PRINT 210,J
          M=J-1
          M1= M-1
          GO TO 255
      205 PRINT 211,J
      210 FORMAT(1H1,I4," ARGUMENT OUT OF RANGE")
      211 FORMAT(I5," ARGUMENT OUT OF RANGE")
          GO TO 250
      220 I=N
      230 I=I-1
      240 HT1= T(J)-X(I)
          HT2= T(J)-X(I+1)
          PROD= HT1*HT2
          SS2(J)= S2(I)+HT1*S3(I)
          DELSQS=(S2(I)+S2(I+1)+SS2(J))/6.
          SS(J)= Y(I)+HT1*DELY(I)+PROD*DELSQS
      250 CONTINUE
C
C     *** SET TO 1ST VALUE ***
C
      255 CALL PLOT(T(1),SS(1),3)
          J= 0
C
C     *** PLOT CURVE USING LINES AS IN LEGEND TO DISTINGUISH CURVES ***
C
          GO TO(260,280,330,380),IDPLAN
C
C     *** BASE OR PROTOTYPE ***
C
      260 DO 270 I=2,M
      270 CALL PLOT(T(I),SS(I),2)
          GO TO 9999
C
C     *** CURVE 1 OR MODEL ***
```

```
                C
  73          280 DO 320 I=2,M
  74              J= J+1
  75              GO TO(290,290,290,300,310),J
  76          290 CALL PLOT(T(I),SS(I),2)
  77              GO TO 320
  78          300 CALL PLOT(T(I),SS(I),3)
  79              GO TO 320
  80          310 CALL PLOT(T(I),SS(I),3)
  81              J=0
  82          320 CONTINUE
  83              GO TO 9999
                C
                C     *** CURVE 2 ***
                C
  84          330 DO 370 I=2,M
  85              J= J+1
  86              GO TO(340,340,340,340,340,350,340,360),J
  87          340 CALL PLOT(T(I),SS(I),2)
  88              GO TO 370
  89          350 CALL PLOT(T(I),SS(I),3)
  90              GO TO 370
  91          360 CALL PLOT(T(I),SS(I),3)
  92              J= 0
  93          370 CONTINUE
  94              GO TO 9999
                C
                C     *** CURVE 3 ***
                C
  95          380 DO 420 I=2,M
  96              J= J+1
  97              GO TO(390,390,390,390,400,390,400,390,410),J
  98          390 CALL PLOT(T(I),SS(I),2)
  99              GO TO 420
 100          400 CALL PLOT(T(I),SS(I),3)
 101              GO TO 420
 102          410 CALL PLOT(T(I),SS(I),3)
 103              J= 0
 104          420 CONTINUE
                C
                C     *** IF DATA IS VELOCITY, DETERMINE EBB PREDOMINANCE BY 100* SUM
                C         OF EBB VELOCITIES / SUM OF TOTAL EBB AND FLOOD VELOCITIES ***
                C
 105         9999 IF(IPOINT(1,1).NE.1HV) GO TO 9000
 106              TOTALV= 0.0
 107              EBBV= 0.0
 108              DO 500 J=1,M1
 109              V= (SS(J)/SCALEY)+LBY
 110              TOTALV= ABS(V)+TOTALV
 111              IF(V.GE.0.0) GO TO 500
 112              EBBV= EBBV+V
 113          500 CONTINUE
 114              PREDOM = -100.*EBBV/TOTALV
 115         9000 RETURN
```

APPENDIX C: ESTUARY DATA FORM

1. U. S. Army Engineer Waterways Experiment Station Form Nos. 1919 and 1919-1 (figs. C1 and C2, respectively) were developed for use with the data processing program discussed in the main text of this report. Through the judicious use of these forms the work in preparing data to be processed by this program will be minimized.

2. The heading information on these forms is primarily for use by the project engineer. The model, meter number, and date are essential items. The meter number and date will allow determination of the required calibration coefficients.

3. In the data area of the form, the model and test identification and the station identification numbers need be entered only once per form. The model and test identification number is a series of coded numbers, two numbers to a set. The first two describe the particular model. The second two identify the particular study being conducted on that model. The third set of numbers identifies the test conditions being used when these data were being collected. The fourth set of numbers identifies the plan being used. The last pair identifies the run being made using all the previously described conditions.

4. The station identification number is similarly a series of coded letters and numbers. The first is a letter that describes the gage type (see the note in the heading on the form). The following is a two-digit number that identifies the range at which the measurements were made, thus allowing up to 100 ranges. The third series is a letter that identifies the station number and describes its position across the range. The final series is a two-digit number that defines the relative depth of the measurement, in percent of depth: 0 percent is at the surface and 99 percent is at the bottom. This value is only relative and need not be accurate.

5. The number of cells defines the number of salinity cells used and needs to be completed only once on the first card. Calibration coefficients are not required for temperatures. Only one coefficient (A_1) is required for tidal heights and two (A_1 and B_1) for velocities. Salinities may require all nine coefficients if three cells are used. The numbers placed

here can fill only ten columns (including decimal point and sign) and must contain a decimal point.

6. The No. of Readings column must be completed for each line used and must be only in column 20. This number describes how many readings of the particular gage being used are recorded on this line.

7. The time column may be recorded in hours to the nearest tenth of an hour. Time must be recorded in ascending order. It is important to have a data value recorded for 12.5 or 24.8 hr, depending on the tidal cycle used, as the last point. Heights, velocity, salinity, or temperature columns may be completed using the respective columns depending on the gage being used (must correspond with station identification number). Up to two readings are available for heights, four for velocities, three for salinities, and two for temperatures. These readings will be averaged and the average value used for the corresponding time. If fewer readings are recorded, use the left-most columns for recording data. Note the decimal points recorded on the forms.

8. The Cell No. column must be completed and identifies which set of calibration coefficients must be used with these salinity readings. This value will be from 1 to 3 and must be in column 54.

9. It would be desirable to have the date of the test punched on all of the cards so that the card data can be identified separate from the data form. Columns 75-80 are provided for this.

10. When the model is a 24-hr model, it will be necessary to use data form 1919-1. This is used since no new calibration coefficients are necessary.

11. The final item to be recorded on a data form following the last data card is an end of file (EOF) mark. This is four exclamation marks in columns 1-4 (!!!!). This must follow each group of data to be input into the program.

12. When completed the form will contain the data for each measurement at each station for every condition run on the model. The sheets can then be ordered for use in the data processing program as desired. For example, if one desires to compare the surface and bottom velocities at a given station between the base plan and plans 5 and 6, he would assemble

the data forms in the order of base surface velocities, plan 5 surface velocities, plan 6 surface velocities, base bottom velocities, plan 5 bottom velocities, and plan 6 bottom velocities. He would then add a form containing page control card information (completed as described in paragraph 12, main text) to the front of these forms and have them punched. Finally, he would add in front of these cards the nonrepetitive control cards, assuming the titles are proper, and submit all of the cards for a computer run. Thus, one may use the forms rather than the cards to change data comparisons.

ESTUARY DATA FORM

MODEL	TEST SERIES	PLAN NUMBER	METER NUMBER
OBSERVER	CHECKED BY	DATE	PAGE OF

NOTE: PROBE TYPE SYMBOLS ARE AS FOLLOWS: H = TIDAL HEIGHTS; V = VELOCITIES (- = EBB, + = FLOOD); S = SALINITY; T = TEMPERATURE

MODEL & TEST I.D.	STATION I.D.	NO. OF CELLS	CALIBRATION COEFFICIENTS $Y = A_i + B_i X + C_i X^2$ WHERE i = CELL NUMBER OF SALINITY METER					
			A_1	B_1	C_1	A_2	B_2	C_2
			A_3	B_3	C_3			

MODEL NUMBER	STUDY NUMBER	TEST CONDITION NUMBER	PLAN NUMBER	RUN NUMBER	PROBE TYPE	RANGE NUMBER	STATION NUMBER	PERCENT OF DEPTH	NO. OF READ.	TIME ( )	HEIGHTS (FT) (1)	HEIGHTS (FT) (2)	VELOCITY (REV/10 SEC) (1)	VELOCITY (REV/10 SEC) (2)	VELOCITY (REV/10 SEC) (3)	VELOCITY (REV/10 SEC) (4)	CELL NO.	SALINITY (OHM) (1)	SALINITY (OHM) (2)	SALINITY (OHM) (3)	TEMPERATURE (°F) (1)	TEMPERATURE (°F) (2)	DATE MO DAY YR

NOTE: PLEASE REPRODUCE THE FIRST 17 COLUMNS ON EACH CARD PUNCHED EXCEPT FOR THE LAST CARD WHICH IS AN EOF CARD.

WES FORM NO. 1919
MAY 1970

Fig. C1. WES Form No. 1919

ESTUARY DATA FORM (CONTINUATION SHEET)

MODEL	TEST SERIES	PLAN NUMBER	METER NUMBER
OBSERVER	CHECKED BY	DATE	PAGE OF

NOTE: PROBE TYPE SYMBOLS ARE AS FOLLOWS: H = TIDAL HEIGHTS; V = VELOCITIES (− = EBB, + = FLOOD); S = SALINITY; T = TEMPERATURE

MODEL & TEST I.D. (cols 1–11)	STATION I.D. (cols 12–17)	NO. OF READ. (18–20)	TIME ( ) (21–24)	HEIGHTS (FT) (1) (25–28)	HEIGHTS (FT) (2) (29–32)	VELOCITY (REV/10 SEC) (1) (33–37)	VELOCITY (REV/10 SEC) (2) (38–42)	VELOCITY (REV/10 SEC) (3) (43–47)	VELOCITY (REV/10 SEC) (4) (48–52)	CELL NO. (53–54)	SALINITY (OHM) (1) (55–58)	SALINITY (OHM) (2) (59–62)	SALINITY (OHM) (3) (63–66)	TEMPERATURE (°F) (1) (67–70)	TEMPERATURE (°F) (2) (71–74)	DATE MO DAY YR (75–80)
MODEL NUMBER; STUDY NUMBER; TEST CONDITION NUMBER; PLAN NUMBER; RUN NUMBER	PROBE TYPE; RANGE NUMBER; STATION NUMBER; PERCENT OF DEPTH															

NOTE: PLEASE REPRODUCE THE FIRST 17 COLUMNS ON EACH CARD PUNCHED EXCEPT FOR THE LAST CARD WHICH IS AN EOF CARD.

WES FORM NO. 1919-1
MAY 1970

Fig. C2. WES Form No. 1919-1

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13. ABSTRACT

This report provides the required information for using the computer program described herein to calibrate and scale tidal data and to display these data in graphical and tabular form. The required input for the program is fully described, and the various output options are illustrated. Use of this digital computer program will allow more rapid and less expensive processing of hydraulic model data.

DD FORM 1 NOV 68 1473 REPLACES DD FORM 1473, 1 JAN 64, WHICH IS OBSOLETE FOR ARMY USE.

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