A UNITED STATES DEPARTMENT OF COMMERCE PUBLICATION

TIDAL CURRENT CHARTS

PUGET SOUND SOUTHERN PART

Third Edition, 1973

U.S. DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL OCEAN SURVEY

TIDAL CURRENT CHARTS, PUGET SOUND, SOUTHERN PART

THIRD EDITION 1973

These current charts show the hourly directions and speeds of the tidal current in Puget Sound)southern part). They present a comprehensive view of the tidal current in the entire area and also provide a means for readily determining for any time the direction and speed of the current at various locations throughout many of the inlets and passages of the sound. The directions of the current are indicated by arrows and speeds in knots by figures. Observations of the current from the surface to a maximum depth of 20 feet were used in compiling these charts.

The charts may be used for any year and are referred to the times of "Maximum Flood" and "Maximum Ebb" at The Narrows (north end), Puget Sound. Daily predictions for this station are included in the publication "Tidal Current Tables, Pacific Coast of North America and Asia", published annually by the National Ocean Survey.

Non-tidal currents—These charts picture the flow of the tidal currents under normal weather conditions. Strong winds and freshets, however, bring about nontidal currents which may modify considerably by speeds and directions shown on the charts.

Use of charts—There are twelve charts; six are referred to "Maximum Flood" and six to "Maximum Ebb". The chart to be used for a desired time is determined by the difference between that time and the predicted time of the nearest "Maximum Flood" or "Maximum Ebb" for the Narrows (north end), as published in "Tidal Current Tables, Pacific Coast of North America and Asia". The chart with the legend that agrees most nearly with that difference is the one to be used.

Factors for correcting velocities:—The speeds shown on the charts represent the current at the time of tropic tides. They are the greater flood and greater ebb speeds at the time of the moon's maximum declination. However, the tidal current varies from day to day, principally in accordance with the phase, distance and declination of the moon. Therefore to obtain speeds for the particular day and hour, the plotted speeds on the chart must be modified accordingly. This is done by selecting from the tidal current tables the predicted speed of the "Maximum Flood" or "Maximum Ebb" to which the chart is referred. With this predicted speed enter the appropriate column of the following table and obtain the corresponding correction factor. The speeds on the tidal current chart are then multiplied by this factor to obtain the required speeds.

For the west end of Hale Passage and the north end of Peale Passage, the given average speeds of the current should not be modified by the use of the factors from the table.

The complexity of the current in Puget Sound, particularly the difference in speed between the two flood currents or the two ebb currents of each day, renders it impossible to construct a set of current charts which, through a simple procedure, always give accurate predictions. Some differences between the current as derived from these charts and actually encountered are, therefore, to be expected.

Factors for Correcting Speeds

When the predicted speed in The Narrows (north end) is—	Multiply speed on chart by—
Knots:	*Factor*
0.2—0.5	0.1
0.6—0.9	0.2
1.0—1.3	0.3
1.4—1.7	0.4
1.8—2.1	0.5
2.2—2.5	0.6
2.6—2.9	0.7
3.0—3.3	0.8
3.4—3.7	0.9
3.8—4.1	1.0
4.2—4.5	1.1
4.6—4.9	1.2
5.0—5.3	1.3
5.4—5.7	1.4
5.8—6.1	1.5

CAUTION NOTE: In The Narrows a "Maximum Ebb" often precedes a "Maximum Flood" by a time interval much shorter than the average interval of about 6 hours. When this interval becomes as short as 4 or 5 hours, two different charts may apply to the same times, and a different result for the current at these times will be obtained from each chart. (See instructions on inside back cover).

Example.—Suppose the direction and speed of the current in midchannel east of the south end of Fox Island are desired for 1:00 P.M. (1300 hrs.) on a day when the predictions for The Narrows (north end) as given in the "Tidal Current Tables, Pacific Coast of North America and Asia" are as follows:

SLACK WATER TIME	MAXIMUM CURRENT	
	TIME	VEL.
H.M.	H.M.	KNOTS
01 18	04 12	4.4F
07 33	10 38	3.3E
13 52	16 31	3.5F
19 32	22 46	3.6E

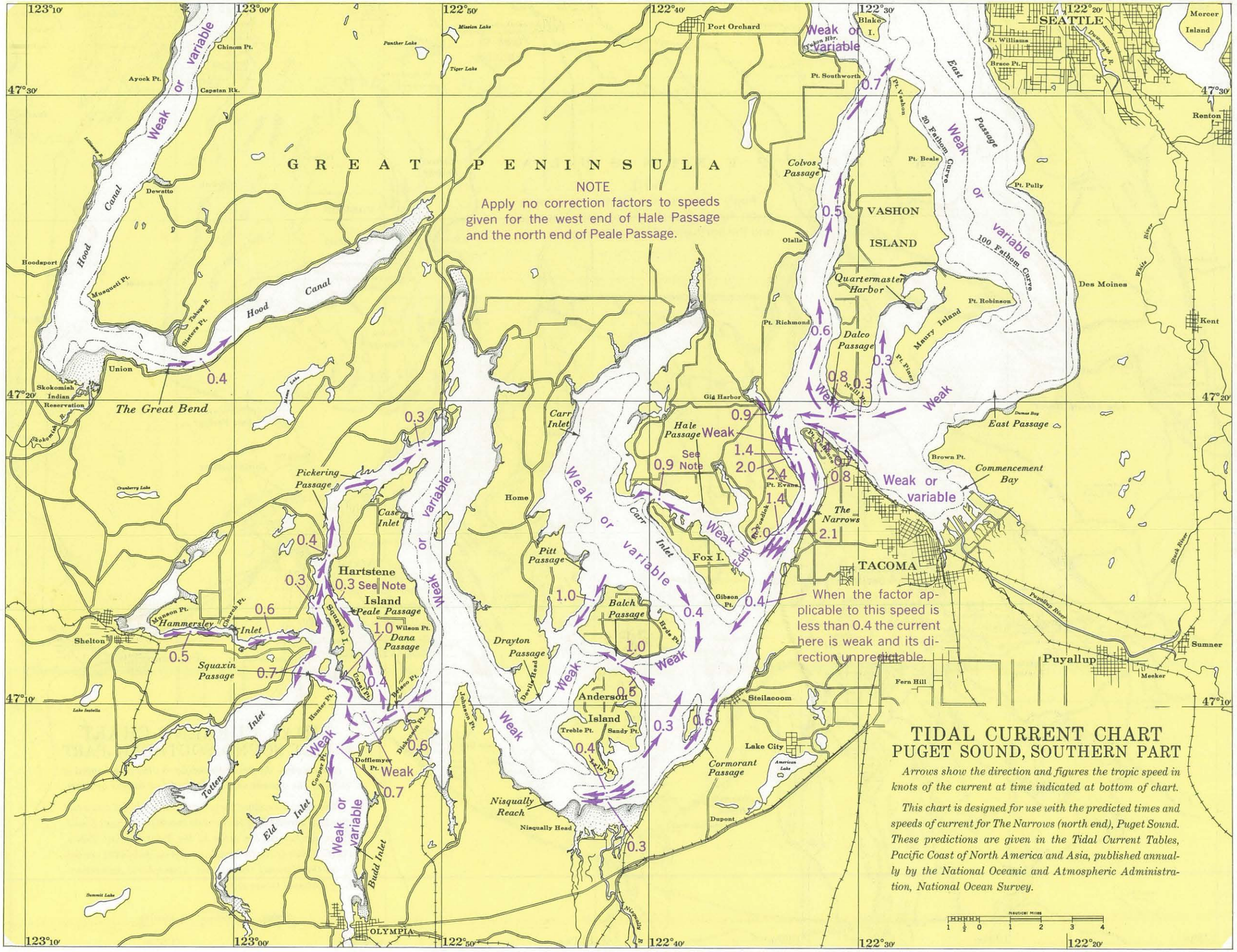
The desired time 1300 hrs., is $2^h\ 22^m$ after the nearest predicted maximum ebb at $10^h\ 38^m$. Therefore the chart to be used is the one designated "TWO HOURS AFTER MAXIMUM EBB AT THE NARROWS" (E+2). This chart indicates that the current in midchannel east of the south end of Fox Island is setting north-northeastward (ebbing) with a tropic speed of 1.6 knots. To determine the speed of the current for the particular day and hour, this tropic speed must be modified by a factor given in the table "Factors for correcting speeds". From the Tidal Current Tables the speed of the current at 1038 (time of maximum current used as reference) is 3.3 knots. For a predicted maximum speed of 3.3 knots, the table gives a factor of 0.8 to be applied to the speed on the chart. The approximate speed of the current in midchannel east of the south end of Fox Island is therefore $1.6 \times 0.8 = 1.3$ knots.

As the time $13^h\ 00^m$ is somewhat more than two hours after the nearest maximum current, which occurs at $10^h\ 38^m$, a more precise prediction may be obtained by interpolating between values obtained from the two charts designated "TWO HOURS AFTER MAXIMUM EBB AT THE NARROWS" (E+2) and "THREE HOURS AFTER MAXIMUM EBB AT THE NARROWS" (E+3).

The corrected speed as obtained above from the chart for two hours after maximum ebb is 1.3 knots setting north-north-eastward, while a corrected speed similarly obtained from the chart for three hours after maximum ebb is 0.6 knot setting approximately in the same direction. Interpolating between these values, the current in midchannel east of the south end of Fox Island at 1 p.m. is found to be setting north-northeast-ward with a speed of 1.0 knot.

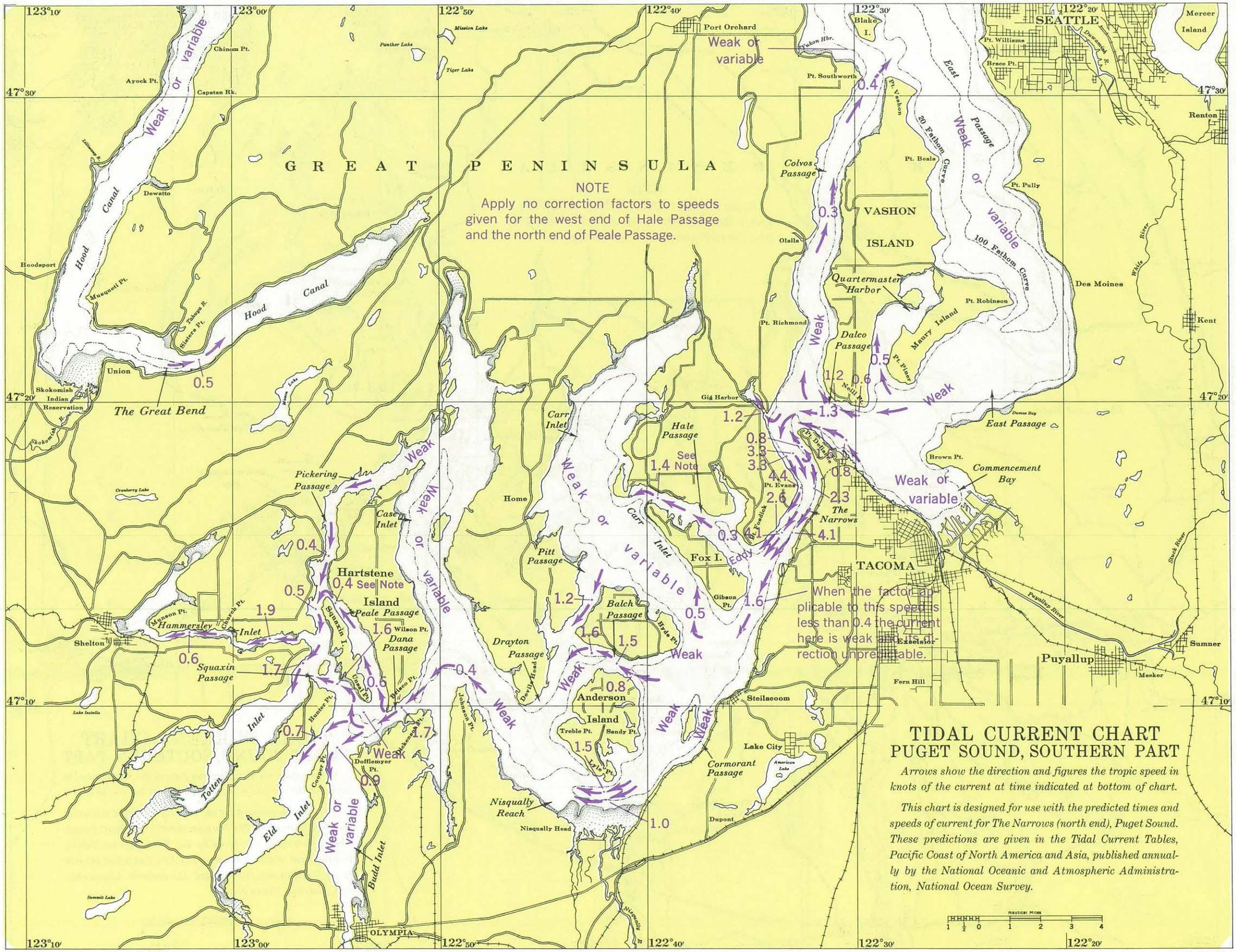
All persons using these charts are invited to send information or suggestions for increasing their usefulness to the Director, National Ocean Survey, NOAA, U.S. Department of Commerce, Rockville, Maryland 20852.

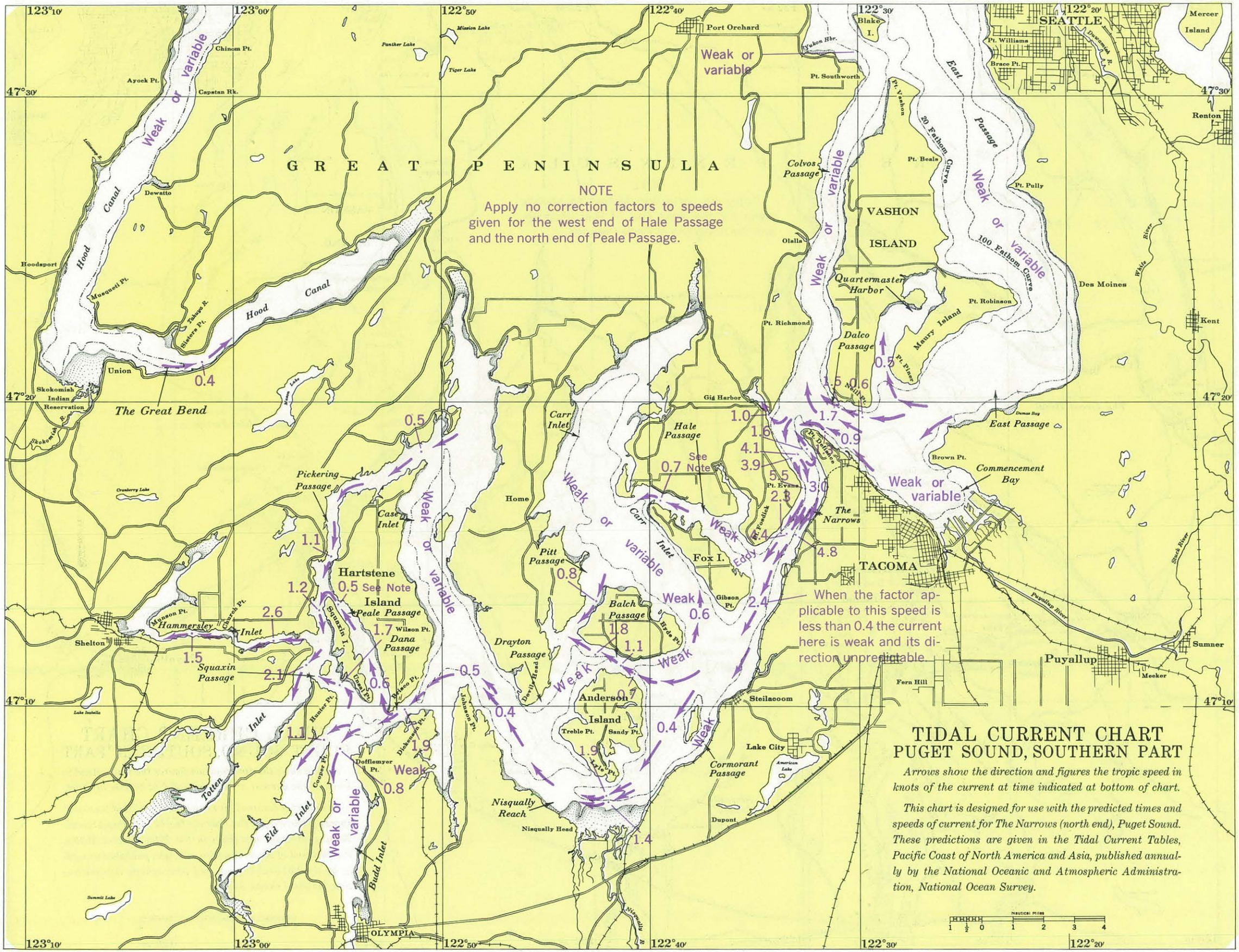
For sale by National Ocean Survey, NOAA, Rockville, Maryland 20852 or from Authorized Sales Agents



TWO HOURS BEFORE MAXIMUM FLOOD AT THE NARROWS (F–2)

A-3641-0(12)++


GREAT PENINSULA
NOTE
Apply no correction factors to speeds given for the west end of Hale Passage and the north end of Peale Passage.
When the factor applicable to this speed is less than 0.4 the current here is weak and its direction unpredictable.
TIDAL CURRENT CHART
PUGET SOUND, SOUTHERN PART
Arrows show the direction and figures the tropic speed in knots of the current at time indicated at bottom of chart.
This chart is designed for use with the predicted times and speeds of current for The Narrows (north end), Puget Sound. These predictions are given in the Tidal Current Tables, Pacific Coast of North America and Asia, published annually by the National Oceanic and Atmospheric Administration, National Ocean Survey.
Nautical Miles
1 ½ 0 1 2 3 4
SEATTLE
TACOMA
OLYMPIA
VASHON ISLAND
Hood Canal
The Great Bend
Colvos Passage
East Passage
Dalco Passage
Quartermaster Harbor
Pickering Passage
Hale Passage
Carr Inlet
Pitt Passage
Balch Passage
Drayton Passage
Peale Passage
Dana Passage
Squaxin Passage
Hammersley Inlet
Totten Inlet
Eld Inlet
Budd Inlet
Anderson Island
Nisqually Reach
Cormorant Passage
Commencement Bay
The Narrows
Tacoma Narrows
Weak or variable
Weak
0.4
0.5
0.3
1.2
0.6
1.3
0.8
3.3
4.4
2.6
2.3
4.1
0.3
1.6
1.5
0.4 See Note
1.4 See Note
1.9
1.7
0.7
0.9
1.0
1.7
0.8
1.5
0.6
1.2
1.6
Port Orchard
Port Southworth
Blake I.
Pt. Vashon
Pt. Beals
Pt. Richmond
Olalla
Gig Harbor
Pt. Defiance
Pt. Evans
Fox I.
Gibson Pt.
Brown Pt.
Pt. Williams
Brace Pt.
Mercer Island
Renton
Pt. Pully
Des Moines
Kent
Pt. Robinson
Maury Island
Pt. Piner
Dumas Bay
Stuck River
White River
Puyallup River
Sumner
Puyallup
Meeker
Fern Hill
Steilacoom
Lake City
American Lake
Dupont
Nisqually R.
Nisqually Head
Home
Case Inlet
Hartstene Island
Shelton
Union
Hoodsport
Dewatto
Ayock Pt.
Capstan Rk.
Chinom Pt.
Musqueti Pt.
Sisters Pt.
Tahuya R.
Lilliwaup R.
Skokomish Indian Reservation
Skokomish R.
Cranberry Lake
Lake Isabella
Summit Lake
Panther Lake
Mission Lake
Tiger Lake
Munson Pt.
Church Pt.
Squaxin I.
Hunter Pt.
Johnson Pt.
Dickenson Pt.
Dofflemyer Pt.
Cooper Pt.
Treble Pt.
Sandy Pt.
Lyle Pt.
Devil Head
Hyde Pt.
Eagle Pt.
Wilson Pt.
Johnson Pt.
Yukon Hbr.
Eagle Harbor
Foulweather Bluff
Point No Point
Double Bluff
Possession Point
Meadow Point
Kingston
Edmonds
Mukilteo
Everett
Marysville
Tulalip
Arlington
Stanwood
Camano Island
Whidbey Island
Port Susan
Skagit Bay
Saratoga Passage
Deception Pass
Oak Harbor
Coupeville
Port Townsend
Admiralty Inlet
Strait of Juan de Fuca
Dungeness Spit
Sequim Bay
Discovery Bay
Protection Island
Smith Island
Port Angeles
Freshwater Bay
Crescent Bay
Lake Crescent
Lake Sutherland
Lake Ozette
Ozette Lake
Quillayute River
La Push
Quillayute Needles
Destruction Island
Point Grenville
Hoh Head
Hoh River
Queets River
Queets
Clearwater River
Raft River
Quinault River
Lake Quinault
Quinault
Taholah
Point Chehalis
Grays Harbor
Westport
Point Brown
Point Hancock
Aberdeen
Hoquiam
Cosmopolis
Chehalis River
Montesano
Elma
Satsop River
Satsop
Oakville
Centralia
Chehalis
Bucoda
Tenino
Rainier
Yelm
Roy
Eatonville
Ashford
Mount Rainier
Mount Rainier National Park
Longmire
Paradise River
Nisqually River
Alder Lake
Packwood
Packwood Lake
Cowlitz River
Cowlitz
Toledo
Winlock
Vader
Lewis River
Woodland
Kalama
Kalama River
Columbia River
Longview
Kelso
Rainier
Clatskanie
Astoria
Megler
Knappton
Ilwaco
Cape Disappointment
Long Beach
Willapa Bay
Nahcotta
Tokeland
Raymond
South Bend
Willapa River
Naselle River
Naselle
Bay Center
Chinook
Ocean Park
Oysterville
Long Island
Cape Shoalwater
Grays River
Grays River
Skamokawa
Wallacut River
Puget Island
Cathlamet
Wahkiakum
Elochoman River
Elochoman
Cathlamet Bay
Skamokawa Creek
Deep River
Deep River
Naselle
Naselle River



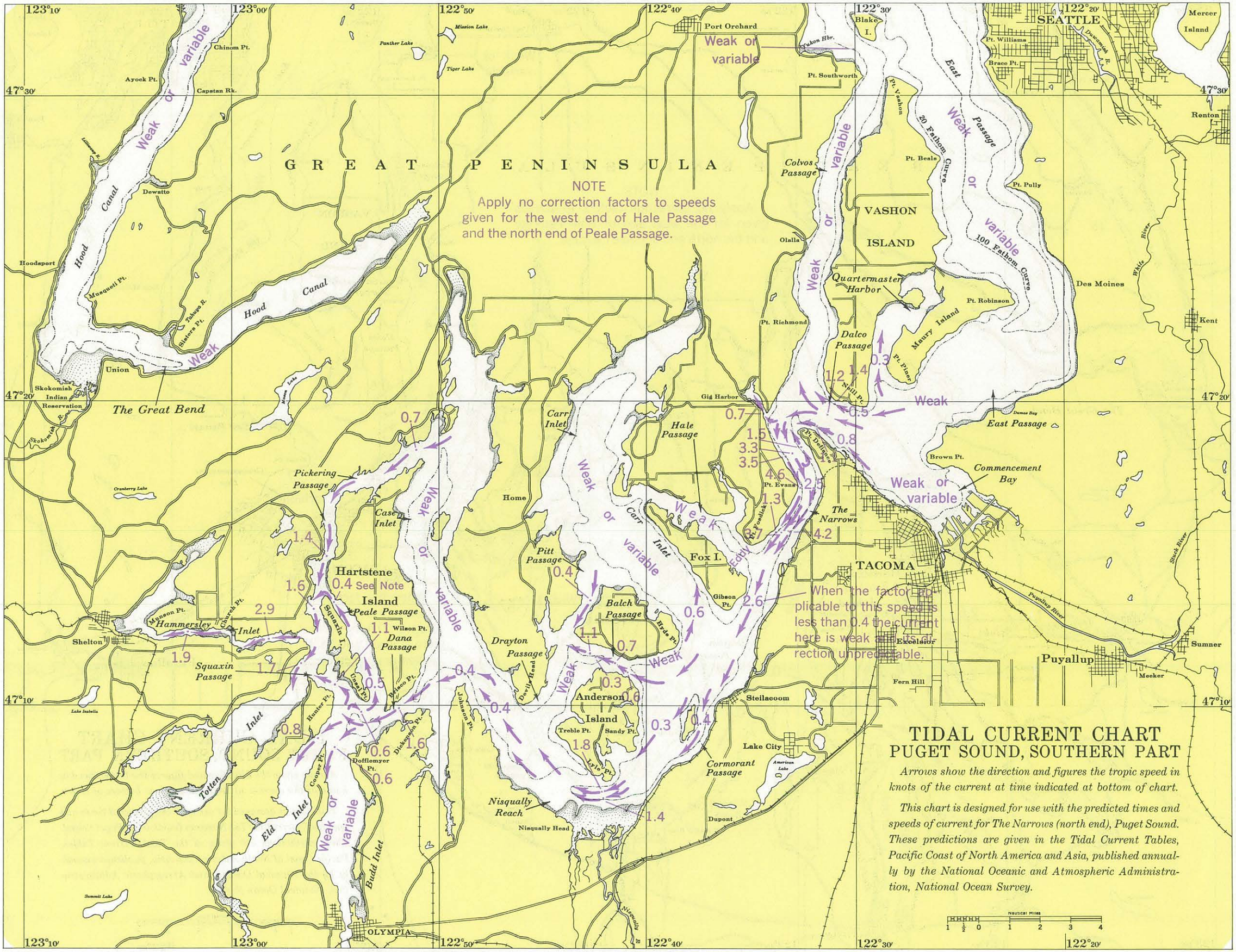
TIDAL CURRENT CHART
PUGET SOUND, SOUTHERN PART

Arrows show the direction and figures the tropic speed in knots of the current at time indicated at bottom of chart.

This chart is designed for use with the predicted times and speeds of current for The Narrows (north end), Puget Sound. These predictions are given in the Tidal Current Tables, Pacific Coast of North America and Asia, published annually by the National Oceanic and Atmospheric Administration, National Ocean Survey.

A-3641-0(12)++

MAXIMUM FLOOD AT THE NARROWS (F)



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PUGET SOUND, SOUTHERN PART

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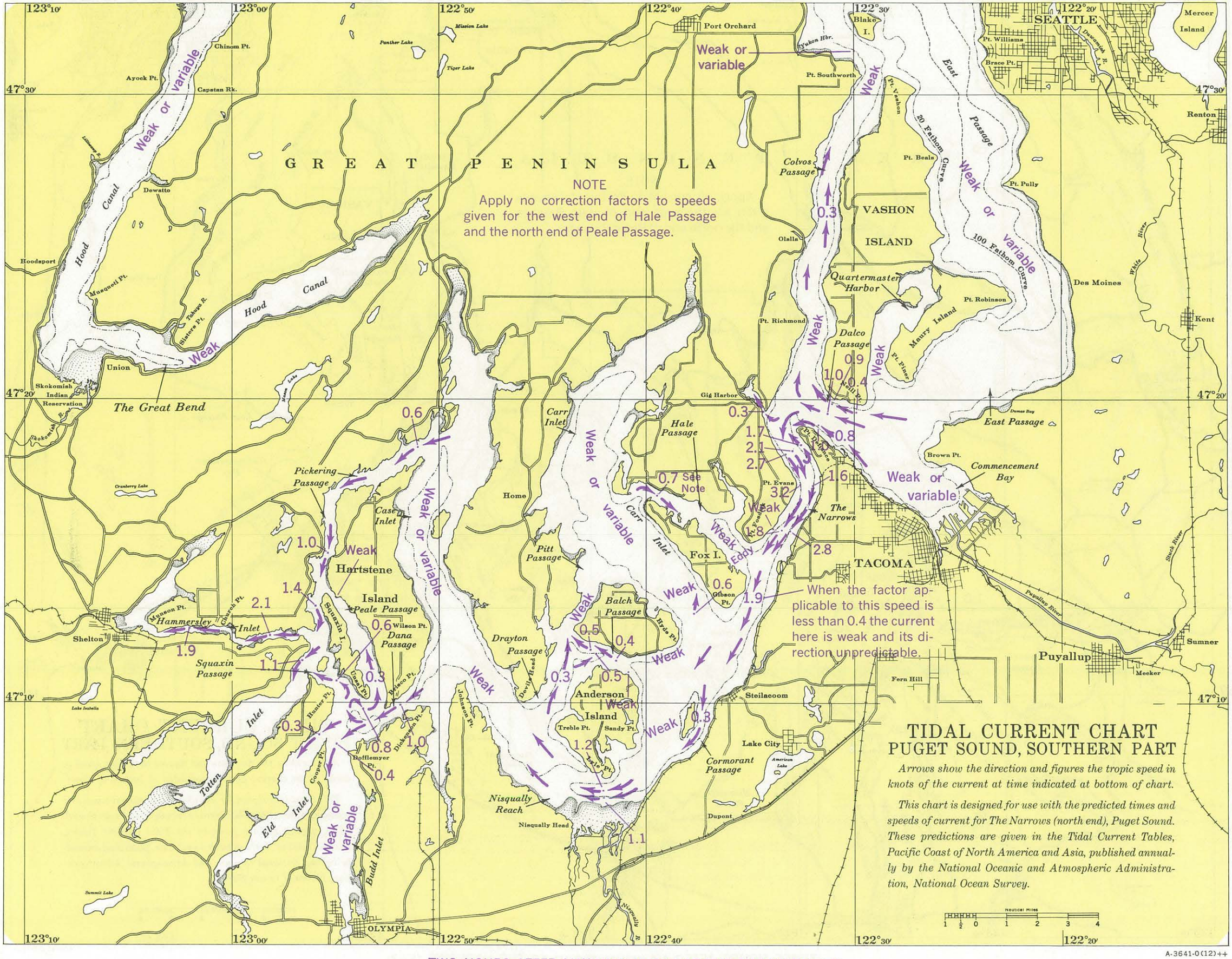
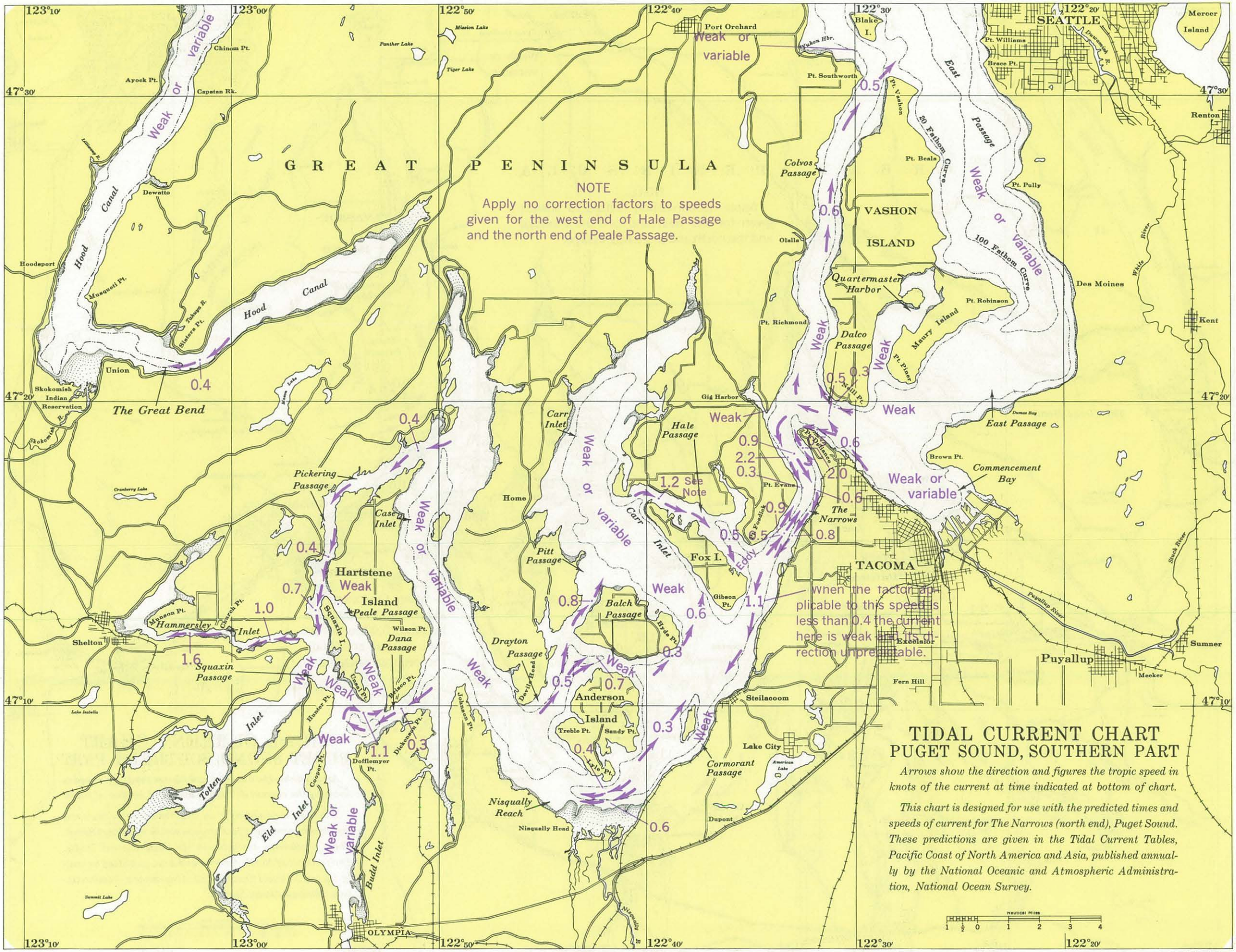
A-3641-0(12)++

ONE HOUR AFTER MAXIMUM FLOOD AT THE NARROWS (F+1)



A-3641-0(12)++

TWO HOURS AFTER MAXIMUM FLOOD AT THE NARROWS (F+2)



TIDAL CURRENT CHART
PUGET SOUND, SOUTHERN PART

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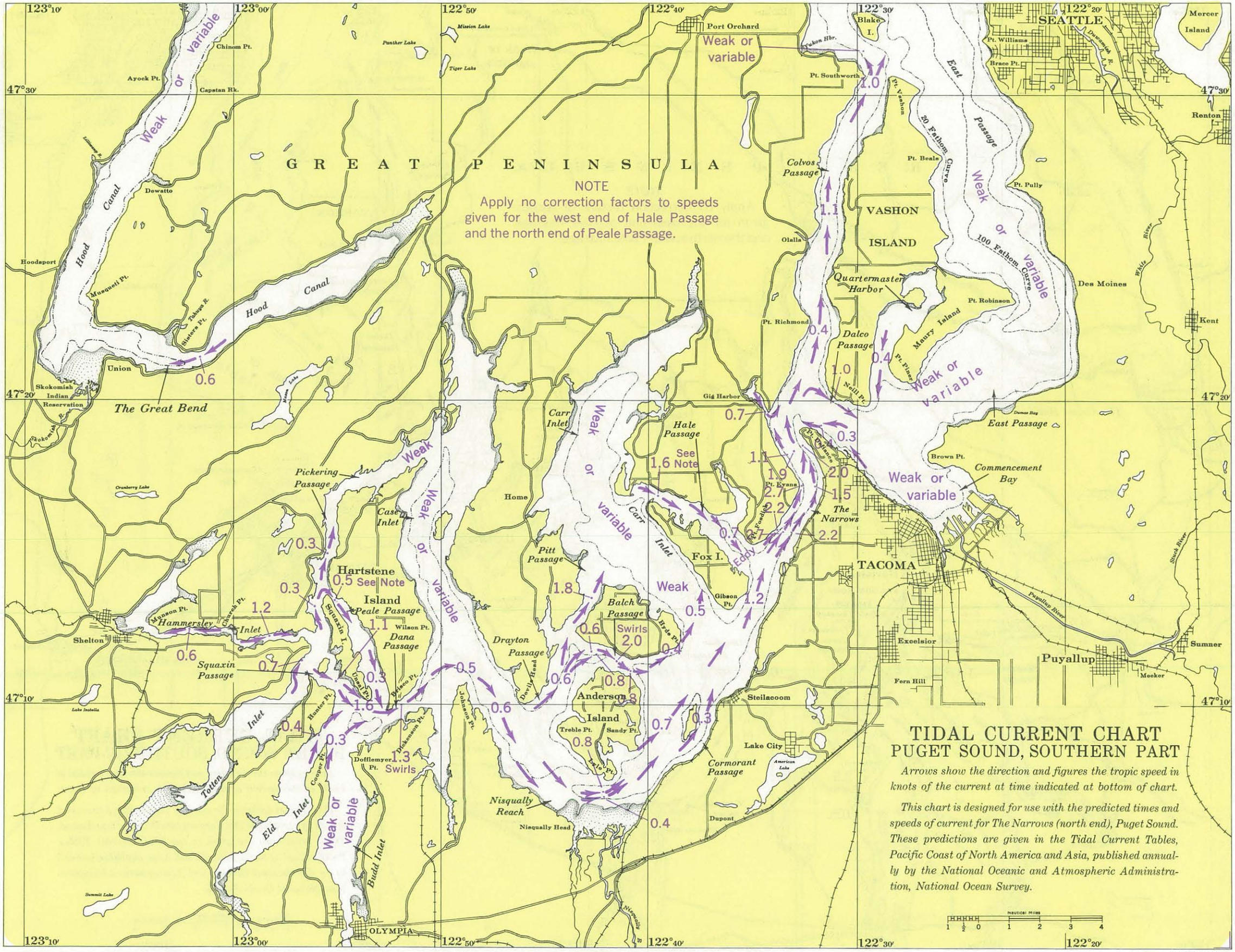
A-3641-0(12)++

THREE HOURS AFTER MAXIMUM FLOOD AT THE NARROWS (F+3)



TIDAL CURRENT CHART
PUGET SOUND, SOUTHERN PART

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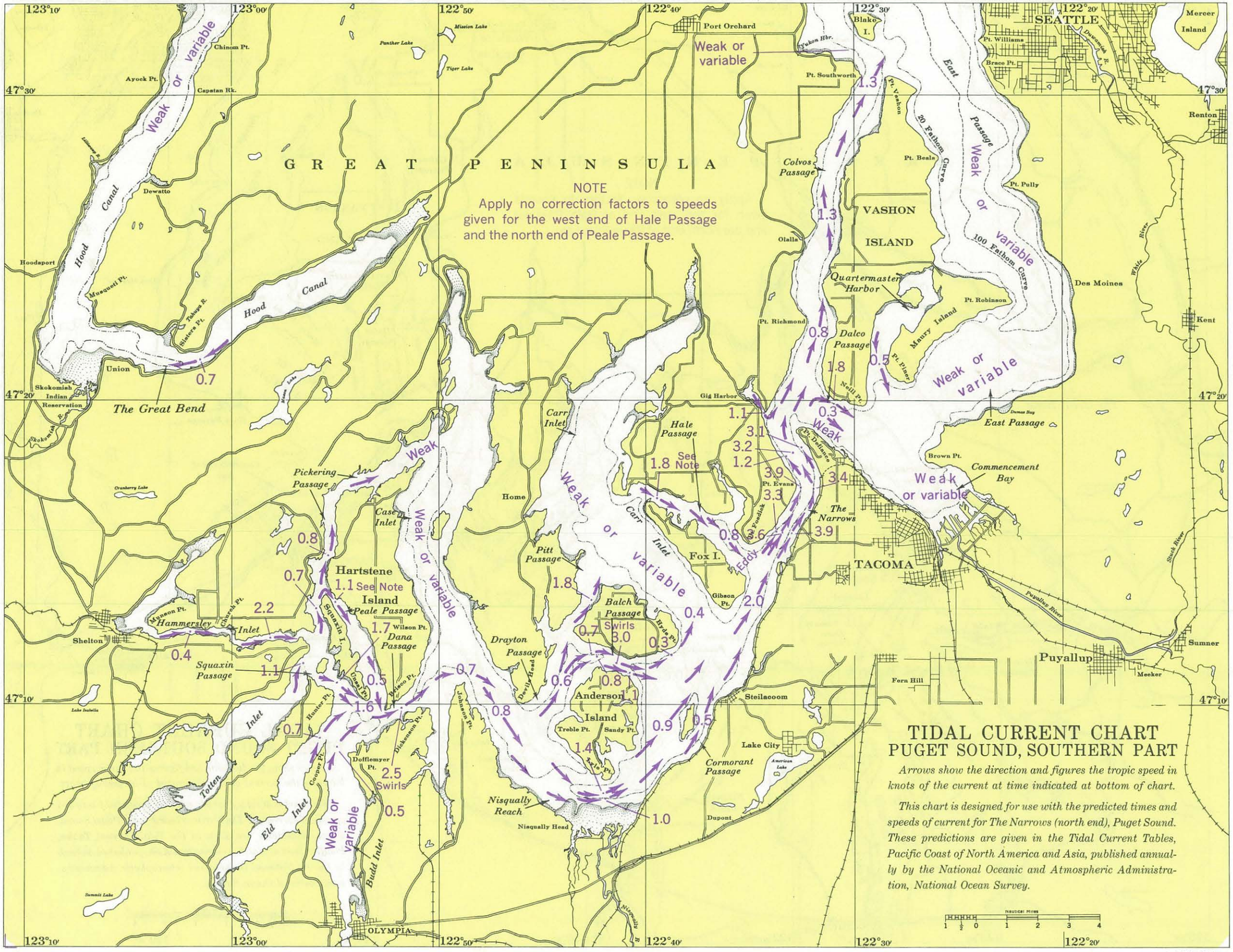
Nautical Miles
1 ½ 0 1 2 3 4

A-3641-0(12)++

TWO HOURS BEFORE MAXIMUM EBB AT THE NARROWS (E–2)



TIDAL CURRENT CHART
PUGET SOUND, SOUTHERN PART

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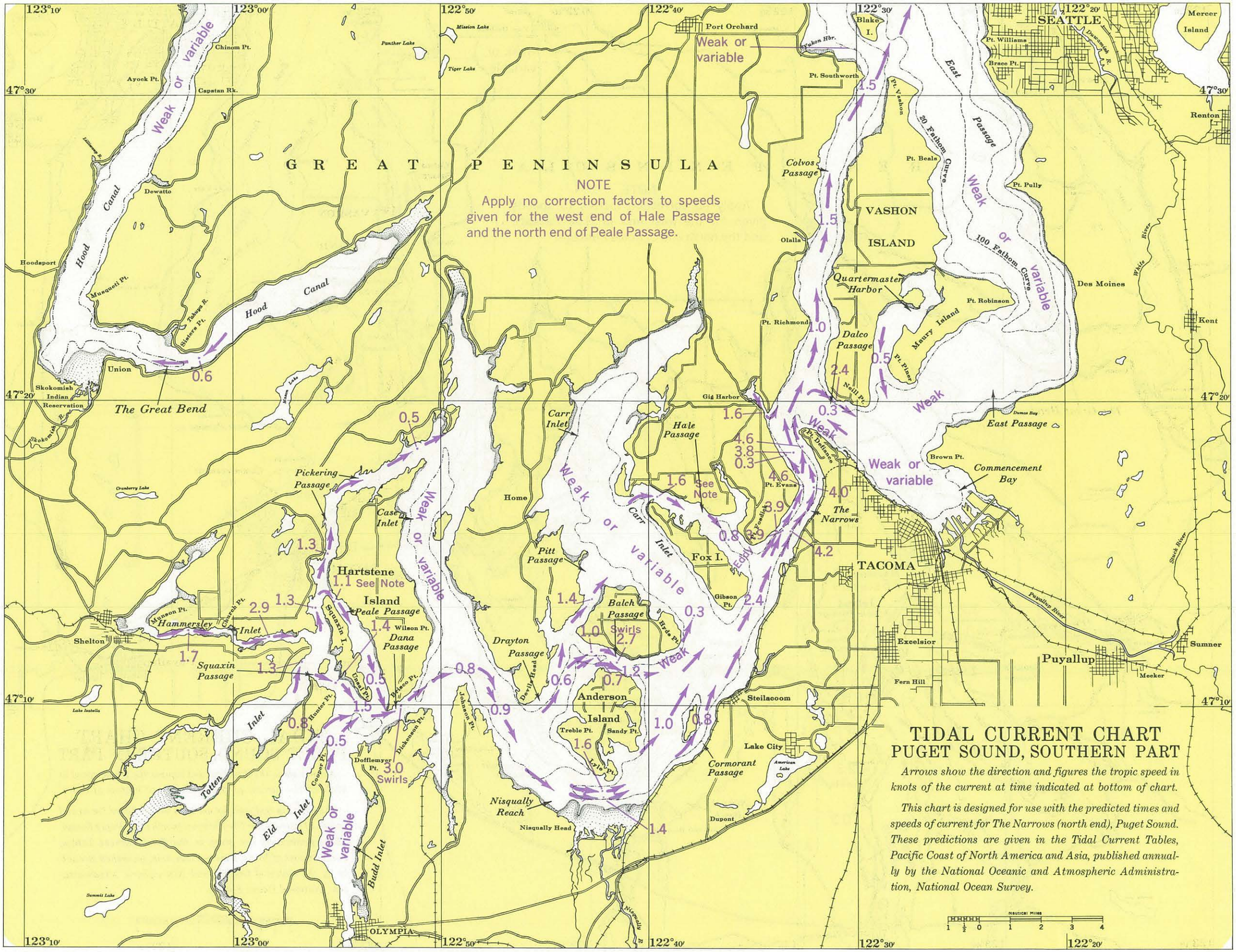
A-3641-0(12)++

ONE HOUR BEFORE MAXIMUM EBB AT THE NARROWS (E–1)



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PUGET SOUND, SOUTHERN PART

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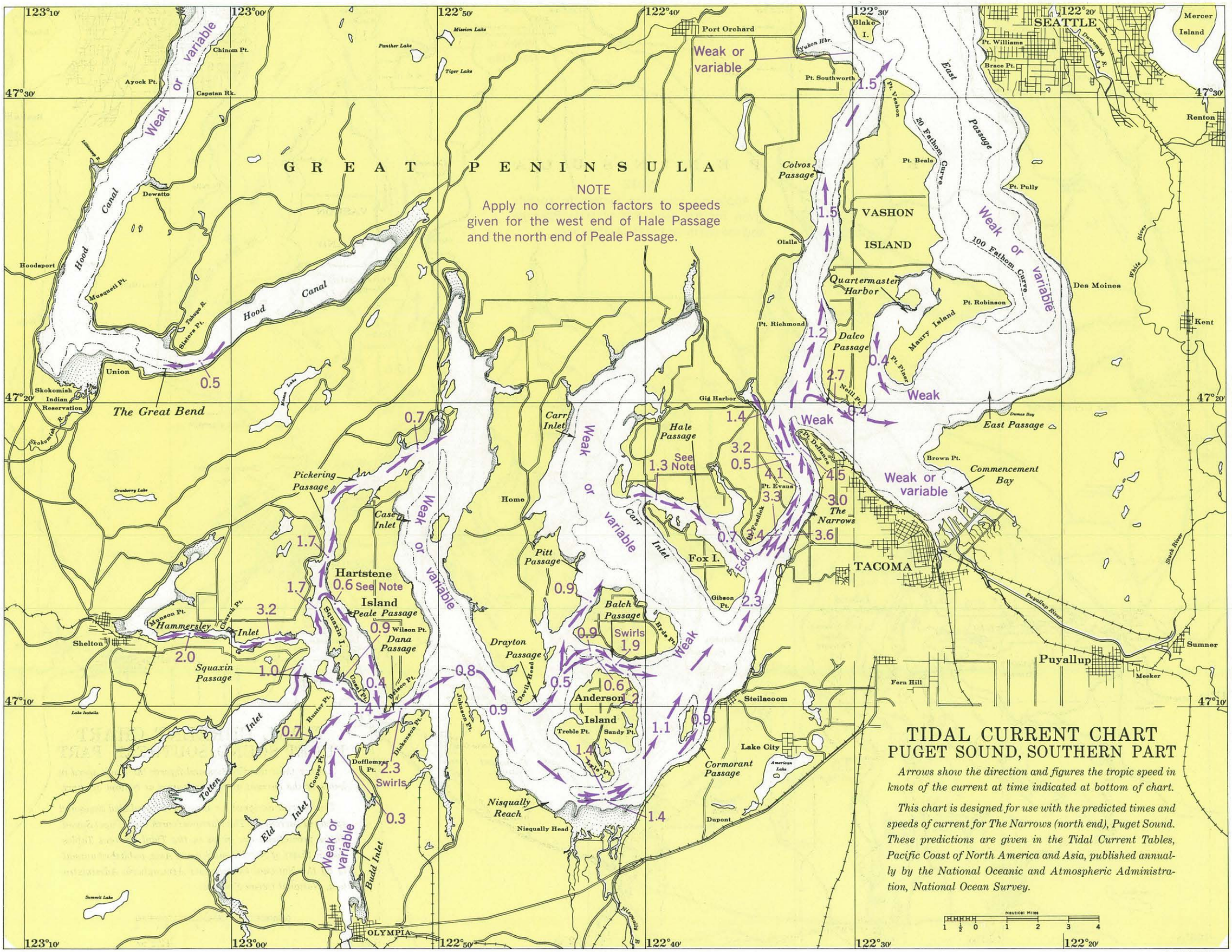
A-3641-0(12)++

MAXIMUM EBB AT THE NARROWS (E)



TIDAL CURRENT CHART
PUGET SOUND, SOUTHERN PART

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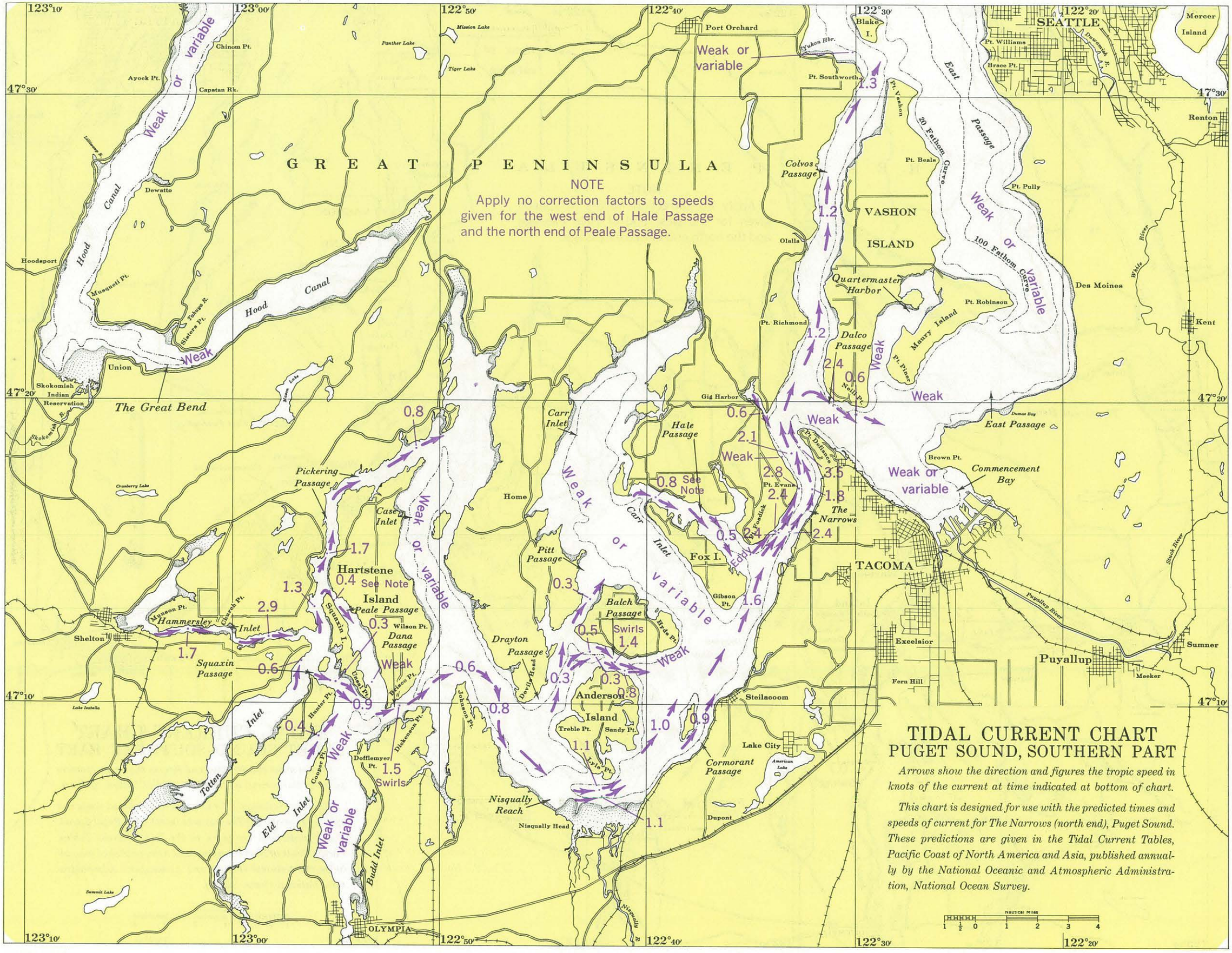
A-3641-0(12)++

ONE HOUR AFTER MAXIMUM EBB AT THE NARROWS (E+1)



TIDAL CURRENT CHART
PUGET SOUND, SOUTHERN PART

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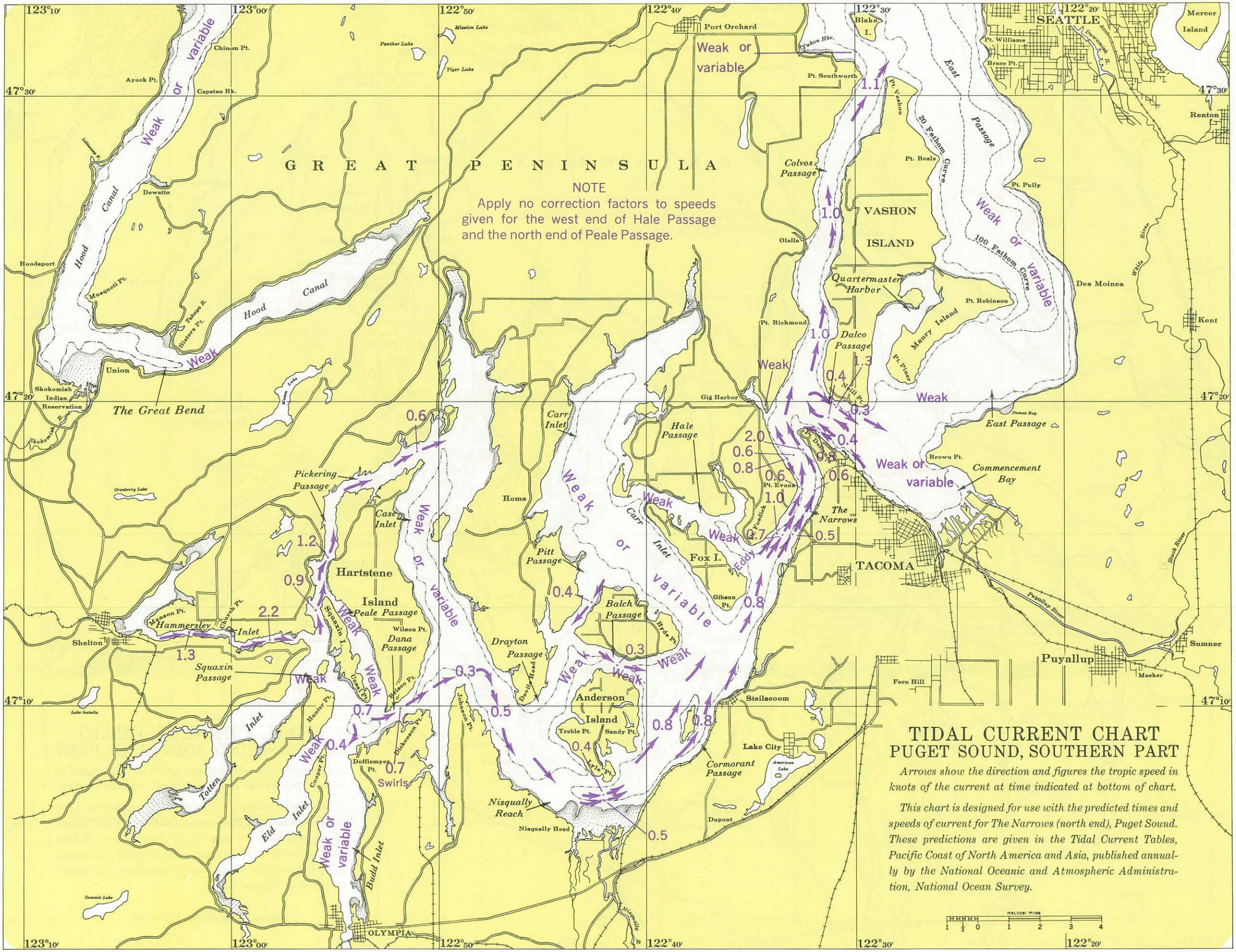
A-3641-0(12)++

TWO HOURS AFTER MAXIMUM EBB AT THE NARROWS (E+2)


123°10′
123°00′
122°50′
122°40′
122°30′
122°20′
47°30′
47°20′
47°10′
GREAT PENINSULA
NOTE
Apply no correction factors to speeds given for the west end of Hale Passage and the north end of Peale Passage.
Weak or variable
Weak
Hood Canal
The Great Bend
Port Orchard
Blake I.
Pt. Southworth
Yukon Hbr.
SEATTLE
Mercer Island
Renton
Pt. Williams
Brace Pt.
Duwamish R.
East Passage
20 Fathom Curve
100 Fathom Curve
Pt. Vashon
Pt. Beals
Pt. Pully
VASHON ISLAND
Colvos Passage
Olalla
Quartermaster Harbor
Pt. Robinson
Maury Island
Pt. Piner
Pt. Richmond
Dalco Passage
Des Moines
White River
Kent
Dumas Bay
Brown Pt.
Commencement Bay
Pt. Evans
The Narrows
TACOMA
Fox I.
Gibson Pt.
Eddy
Stuck River
Puyallup River
Sumner
Puyallup
Meeker
Fern Hill
Steilacoom
Lake City
American Lake
Cormorant Passage
Dupont
Nisqually Reach
Nisqually Head
Nisqually R.
Anderson Island
Treble Pt.
Sandy Pt.
Lyle Pt.
Drayton Passage
Dorrie Head
Johnson Pt.
Balch Passage
Byrd Pt.
Pitt Passage
Home
Carr Inlet
Hale Passage
Gig Harbor
Mission Lake
Carr Inlet
Pickering Passage
Case Inlet
Hartstene Island
Peale Passage
Wilson Pt.
Dana Passage
Squaxin I.
Squaxin Passage
Pelican Pt.
Dickenson Pt.
Dofflemyer Pt.
Swirls
Hammersley Inlet
Mason Pt.
Church Pt.
Shelton
Hunter Pt.
Goose Pt.
Totten Inlet
Eld Inlet
Budd Inlet
OLYMPIA
Summit Lake
Cranberry Lake
Lake Isabella
Skokomish Indian Reservation
Skokomish R.
Union
Hoodsport
Dewatto
Chinom Pt.
Ayock Pt.
Capstan Rk.
Panther Lake
Tiger Lake
Mission Lake
Musqueti Pt.
Tahuya R.
Bistore Pt.
Lilliwaup R.
1.1
1.0
1.0
1.3
0.4
0.3
0.4
2.0
0.6
0.8
0.6
0.6
1.0
0.7
0.5
0.4
0.8
0.3
0.8
0.8
0.4
0.5
0.5
0.6
1.2
0.9
2.2
1.3
0.7
0.4
0.7
Weak or variable
Weak
Weak or variable
Weak
Weak
Weak
Weak
Weak
Weak or variable
Weak or variable
Weak or variable
Weak
Weak
Weak
Weak
Weak
Weak

EFFECT OF THE MOON'S DECLINATION ON THE USE OF TIDAL CURRENT CHARTS

The Puget Sound, Southern Part Tidal Current Charts are calculated using the average flood duration is 6^h19^m and the yearly average ebb duration is 6^h06^m as tabulated in Table 1. The speeds were calculated using the average tropic speeds.

These charts are calculated for conditions when the tidal cycles are divided into six hourly intervals as shown in Figure 1. Each hourly chart is referred to the time of maximum current.

The duration of flood and ebb varies throughout the month in accordance with the moon's phases (see Figure 2). Equatorial currents occur semimonthly as a result of the moon's being over the equator. At these times the tendency of the moon to produce a diurnal inequality in the current is at a minimum. There are no problems during these periods when the floods and ebbs have durations that allow the selection of the normal six hourly charts. At tropic tides when the moon is in its maximum north or south declination the current exhibits a maximum diurnal inequality. At these times the lesser flood and ebb durations do not permit the selection of the proper chart.

Caution must be taken to insure that the chart selected will be referred to the predicted maximum current.

EXAMPLE: The speed and direction of the current are required east of Munson Pt. in Hammersley Inlet for 13^h20^m on a day when the predictions for The Narrows (North End) Puget Sound as given in the "Tidal Current Tables, Pacific Coast of North America and Asia" are as follows:

Slack Water Time	Maximum Time	Current Velocity
H M	H M	Knots
0226	0444	1.1E
0744	1020	1.9F
1240	1629	3.5E
2024	2328	3.8F

(See figure 3)

INSTRUCTIONS: Even though the desired time of 13^h20^m is closer to the maximum flood (10^h20^m) than the maximum ebb (1629), we note that the current at The Narrows (North End) is ebbing (Figure 3). The chart to use is E−2. More precise results may be obtained by interpolating between the two charts designated E−2 and F−2.

(E−2) 0.6 x f0.9 = 0.54 knots flooding @ 14^h20^m
(F+2) 1.9 x F0.5 = 0.95 knots flooding @ 12^h20^m

The approximate speed of the current east of Munson Pt. at 13^h20^m is 0.8 knots, flooding.

Note that the short duration of the two lesser flood and ebb phases did not permit the division of six hourly intervals as shown in Figure 3. At these times of short duration the tidal current charts should not be used.

TABLE 1
GREENWICH Intervals

Slack	Flood	Flood Duration	Slack	Ebb	Ebb Duration
H M	H M	H M	H M	H M	H M
07:32	10:17	06:19	01:26	04:14	06:06
Average Tropic Speed (Knots)					
Flood	Ebb				
4.1	3.8				

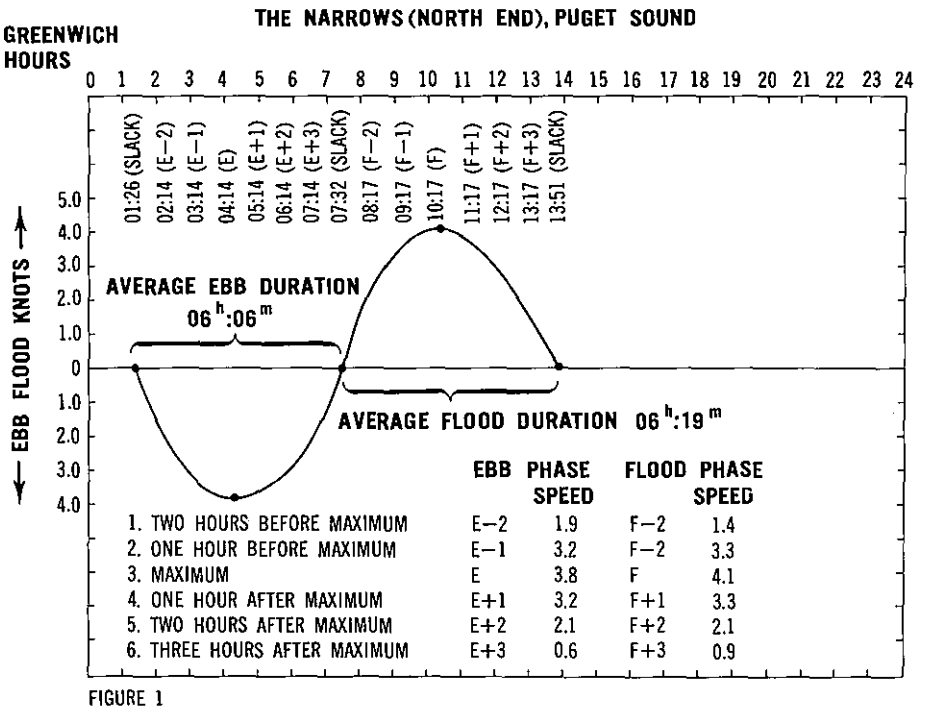
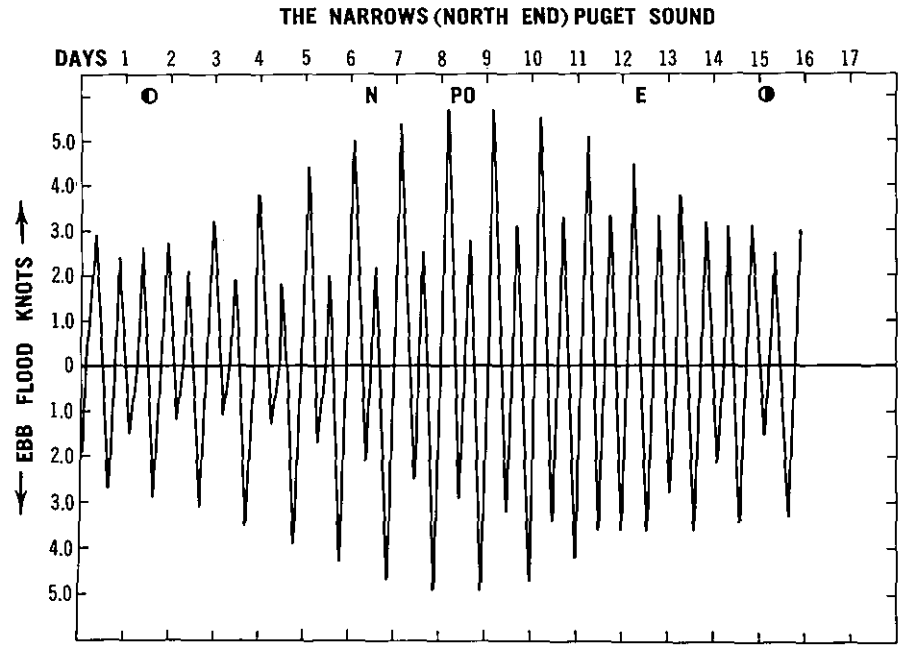


FIGURE 1



●, new moon; ◐, first quarter; ○, full moon; ◑, last quarter; E, moon on the Equator; N, S, moon farthest north or south of the Equator; A, P, moon in apogee or perigee;

FIGURE 2

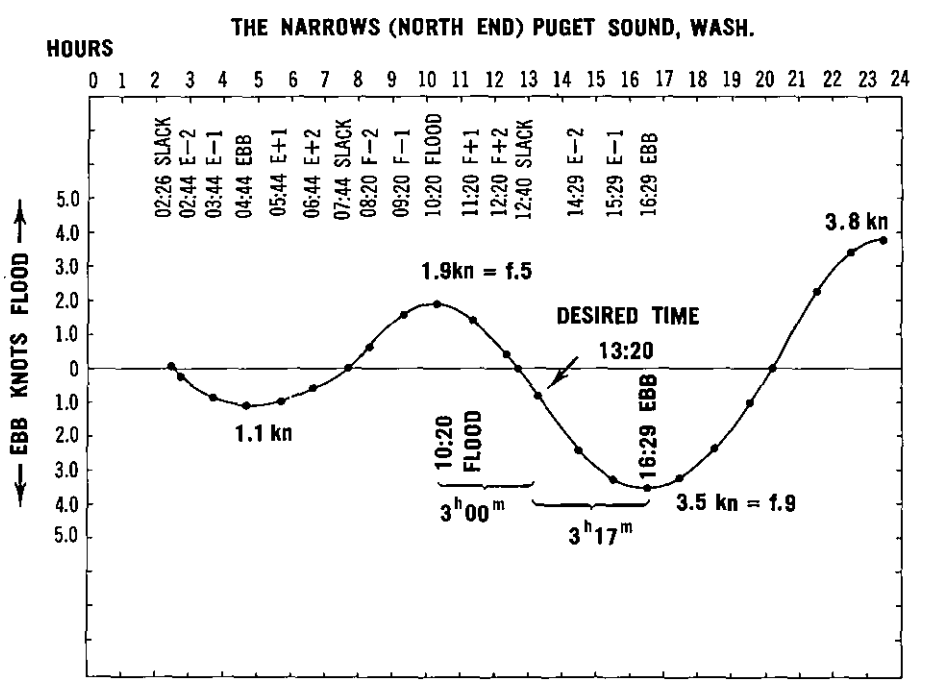


FIGURE 3