

Alaska Tideland Surveys

“Who, What, When, Where, How, Why”

A Paper Presented at the
37th Annual Alaska Surveying and Mapping Conference



By

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ABSTRACT

Alaska Tideland Surveys – the 5 w’s. Surveys of tideland parcels are unique in several ways. Typically all corners are monumented with witness corners. DNR is usually the fee owner of the parcel, and the landward boundary is usually the mean high water line. Frequently, the line is fixed and limiting, because of avulsion, or placement of fill. This paper will briefly discuss how an applicant applies for a tideland lease or conveyance and how to conduct the survey and obtain state approval. Presenter: Gerald Jennings

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Alaska Tideland Surveys

Introduction – who what why?

Title to most of the tide and submerged lands surrounding Alaska was vested in the State of Alaska under the Submerged Lands Act of May 22, 1953. Most of those lands remain in state ownership and in most cases, the state will lease, but retain fee title. As a surveyor, you will be contacted about Alaska Tideland Surveys (ATS) by a public or private party who desires to lease or acquire tidelands for various reasons such as construction of docks, bridges, harbors, log transfer facilities, etc.

Another situation in which you may need to conduct an ATS is to facilitate conveyance of tide and submerged lands to local communities under AS 38.05.820 or .825.

What are tidelands? The DNR Fact Sheet Titled: Tide & submerged Land Ownership (appendix A) discusses tideland ownership and what are tide and submerged lands. Tidelands are those lands between the mean high and the mean low tide lines. State owned submerged lands are located seaward of the mean low tide line and extending out three nautical miles. A definition of tidelands is also found in AS 38.05.965.

Why are tideland surveys required? For lease or patent, it is required under AS 38.04.045(b) “Before the issuance of a long-term lease under AS 38.05.070 or of a patent for state land, an official cadastral survey shall be accomplished, unless a comparable, approved survey exists that has been conducted by the federal Bureau of Land Management.”

When? The Application Process

Your client calls up and tells you that they need a survey. They want to build a dock and the state’s telling them that they need a survey. You respond, “I’ll be glad to help. At what step in your application at DNR?”. Sometimes applicants go for the survey too early. If you call the survey unit, we will ask for the ADL number, and we will check for a final decision. If the decision hasn’t been done yet, it is usually too early to get survey instructions, but not always. Occasionally, we will issue instructions based on an approved preliminary decision, but rarely before any decision is issued. We will need verification from the division’s adjudicator for instructions to go out before the final decision.

How To Conduct A Tideland Survey – Field Procedures

Before beginning the field survey, obtain survey instructions from DNR –see below.

Monumentation: For the “normal” ATS survey you will set four monuments, two on the upland extension of each sideline. Typically, the upland owner is the tideland applicant, however if not, you need to obtain permission for setting monuments on the uplands.

Monuments are to meet the standards for primary monuments (11AAC53.), which includes a requirement for setting accessories. However, we will entertain requests to waive accessories in areas of dense monumentation.

Monument Marking: There has been some confusion on this subject over the years. The confusion is the marking of the two witness corners which are set on a sideline's upland extension. Occasionally a survey will show one of the two monuments marked as a witness corner to the nearest true corner, with the second monument as witnessing the seaward corner. This works, but is not preferred. What doesn't work, is sometimes a survey shows both witness monuments as witnessing the same corner, with no differentiation of markings on the two witness monuments. If one is lost, it is difficult to determine which is remaining.

The preferred marking is to label the witness corners as wc 1 and wc 2 to the nearest true meander corner. This way, lining up the two monuments will give the lay person an approximation of the ATS survey parcel's sideline as it crosses the water. But if the true location became critical, it would be determined by grant boundary adjustment between the true meander corners on the opposite sidelines of the survey. This is because the two witness corners are typically set too close together to be dependable as an extension seaward.

How to determine the landward boundary: Often, there are two lines which need to be compared, the existing line of mean high water (MHW), and the record line as per the adjacent upland survey.

The approximate location of the true mean high water line is determined by the use of National Geodetic Survey tidal bench marks (or any other bench marks that have been determined from that source), and the MHW datum for the immediate body of water. Ref: 11AAC53.120(1). If no such bench marks exist within one mile, then tidal observations may be taken and used in conjunction with official tide tables for the immediate body of water. A note shall be placed on the plat stating either:

Mean high tide was determined by time coordinated tidal observations on month day yr as extrapolated from the NOAA Publication for the predictions of high and low waters for (year).

or

Mean high tide was determined from _____ tidal bench mark on month day yr from data supplied by NOAA. Bench Mark Elev.:

So, how exactly is this done in the field? Typically, you will set a temporary bench mark near the project and run levels from NGS bench mark or if there is no bench mark within one mile, you take time coordinated tide readings. See appendices B, C and D; "DETERMINING MEAN HIGH TIDE WHERE AN NGS BENCH MARK EXISTS" and "DETERMINING MEAN HIGH TIDE IN AREAS WHERE NO NGS BENCH

MARKS EXIST”. The published MHW elevation for a particular body of water can be found on NOS Nautical Charts, NOS Tidal Bench Mark Data Sheets, or from the predicted tide tables.

To determine the meander line of record, it is necessary to tie monumentation from the record survey. You tie the nearest monument of the record survey in each direction, and using grant boundary adjustment procedures, fit the record meanders between the recovered monuments.

Once you’ve established the two lines, what do you do with them? This will ordinarily be addressed in the survey instructions. State regulations 11AAC53.120 set the guidelines for whether to set the upland boundary at the one line or the other.

In cases where it is determined that there has been an avulsive event, such as fill placed, or uplift (or subsidence), etc, the best evidence of the last location of the MHW prior to the event is used to set the line as a fixed and limiting boundary. This is usually the last survey of record, although sometimes aerial photography, surveys not of record or other evidence may be used.

A 50 foot public access easement is required by AS 38.05.127 and 11AAC51.045. Unless the easement is specifically waived in the final decision, it is required to be shown on the plat. The easement is along the existing mean high water line. There has been confusion on this in the past as the easement is to follow the existing MHW, not necessarily the landward boundary of the survey, which sometimes follows the record MHW line instead.

Note that the public access easement is applied 50 feet seaward and 50 upland of the existing MHW on uplands owned by the state. Thus, those surveys which because of fill, extend upland of the existing MHW, will have the easement applied both directions.

Other Issues

Apportionment of tidelands: In cases of negotiated leases, the applicant’s tideland parcel is limited to tidelands adjacent to his upland parcel. Depending on the configuration of the shore, the surveyor may not be able to simply extend the upland boundary seaward, but should typically extend at the angle which bisects the shoreline meander. The surveyor must be aware of the adjacent upland owner’s rights to the tidelands.

How does accretion and erosion to the upland parcel’s affect the tidelands parcel? Where the landward boundary is ambulatory, the seaward boundary is fixed. Thus accretion to uplands, “erodes” away the tidelands parcel. Over time, a tideland parcel can disappear. On the other hand, erosion of the upland parcel, increases the size of the tideland parcel.

Where Do You Get Survey Instructions?

You have received a final decision, and you would like to get the lands surveyed, how do you get started? Send a request for survey instructions to DNR's Land Survey Unit. The request should include the ADL number, a description of the lands which you want to have surveyed at this time, and the \$225 fee. It is preferable that you only request for lands that you actually plan to survey, as they have a two year expiration, after which they would have to be extended or completely reissued depending on how much things have changed.

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Depending on our workload, it may take a couple of months to get the instructions prepared. When the field work is complete, submit the project to DNR surveys for review. The review fee is \$200 for the first tract, plus \$50 per additional parcel.

If within a city or borough that exercises platting authority, you will need to go through the platting board for approval of the survey. When the survey meets DNR and local approval, the final plat will be signed by various parties and submitted for recording. The recording fee is \$20 for sheet 1, plus \$5 per additional sheet.

These fees are set out in 11 AAC 05.010 (a)(13) survey and platting.

(13) survey and platting

(A) issuance or amendment of survey instructions, \$50 for a remote recreational cabin site lease, replat, or right-of-way vacation, and \$225 for any other type of survey;

(B) plat review under AS 38.04.045 ,

(i) first review of first parcel or tract per plat, \$200, and \$50 for each additional parcel or tract per plat, with the second review at no charge;

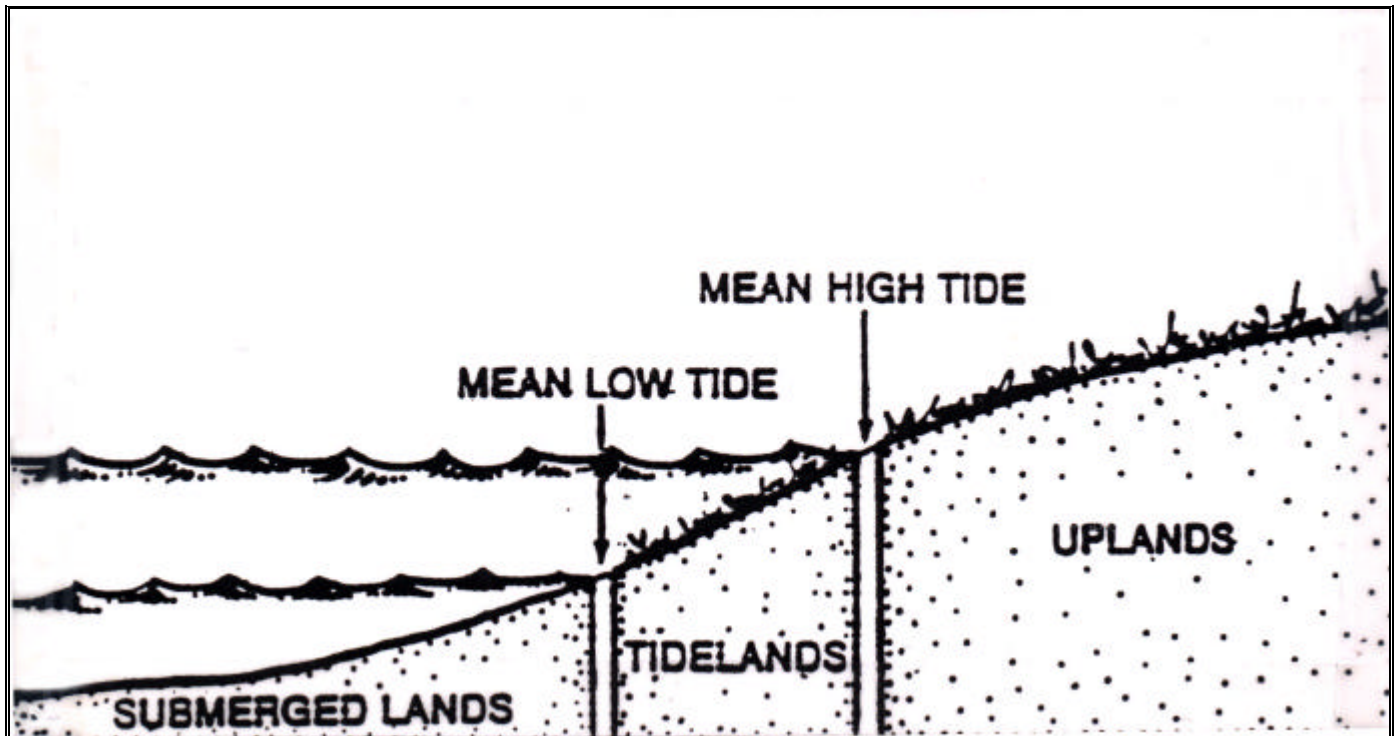
(ii) third and each additional review of first parcel or tract per plat, \$300 each, and \$100 for each additional parcel or tract per plat;

Fact Sheet

Title: Tide & Submerged Land Ownership

What are "tide and submerged" lands?

Tidelands include the land between mean (average) high and mean low tide. Submerged lands are seaward of mean low tide to three miles offshore. The tide and submerged lands include all land between the mean high tide line and three miles offshore of the mean low tideline.



Who owns tide and submerged lands in Alaska?

The State of Alaska owns most of the tide and submerged lands along its coastline. The submerged Lands Act of May 22, 1953 states that all lands permanently or periodically covered by tidal waters up to, but not above, the line of mean high tide and seaward to a line three geographical miles distant from the coast mean low tideline is owned by the state.

Can the state sell or lease its tide and submerged land?

As a general rule, the State cannot sell tide and submerged land. However, certain cities and individuals or corporations may acquire title to tide and submerged land occupied or developed on or before January 3, 1959, the date Alaska was admitted to the union. There are several programs under which a lease of state tidelands may be acquired.

Can I use state tide and submerged lands, even if the state doesn't own the uplands?

Yes, you can use state tide and submerged land, even if the uplands are not owned by the state. However, you must remember that you only have the right to use the land from mean high water seaward. You are also expected to respect the upland owner's rights and treat the land with care.

Does the federal government own tidelands adjacent to its conservation units, such as National Parks?

The question has been raised that the United States may own tidelands adjacent to certain federal withdrawals that exist prior to statehood. However, that question was answered on June 8, 1987 when the U.S. Supreme Court issued its decision in Utah v. United States. This decision established that federal land withdrawals made prior to statehood did not include land under navigable waters.

In that decision, the Supreme Court affirmed the longstanding policy that the federal government holds land under navigable waters for the ultimate benefit of a future state. In order for this not to be the case, congress would have to specifically include the land and clearly state that it intended that the state would not have title to it.

Tide and submerged lands were not included in any pre-statehood federal withdrawals within Alaska and there is no indication that Congress intended to take away the State of Alaska's title. The state therefore received title to all the tide and submerged lands at statehood.

Additionally, in the Alaska National Interest Lands Conservation Act, Congress did not take away the state's power to regulate state-owned submerged lands within or adjacent to federal Conservation System Units in Alaska. Many provisions in ANILCA recognize and respect the state's authority over state-owned land.

Where the uplands are within federal conservation units, the state has cooperated with federal land managers wherever possible. As a result, some special use restrictions may apply. Sometimes this cooperation is formally set out in a memorandum of understanding that discusses management issues and how they will be resolved.

For additional information contact:

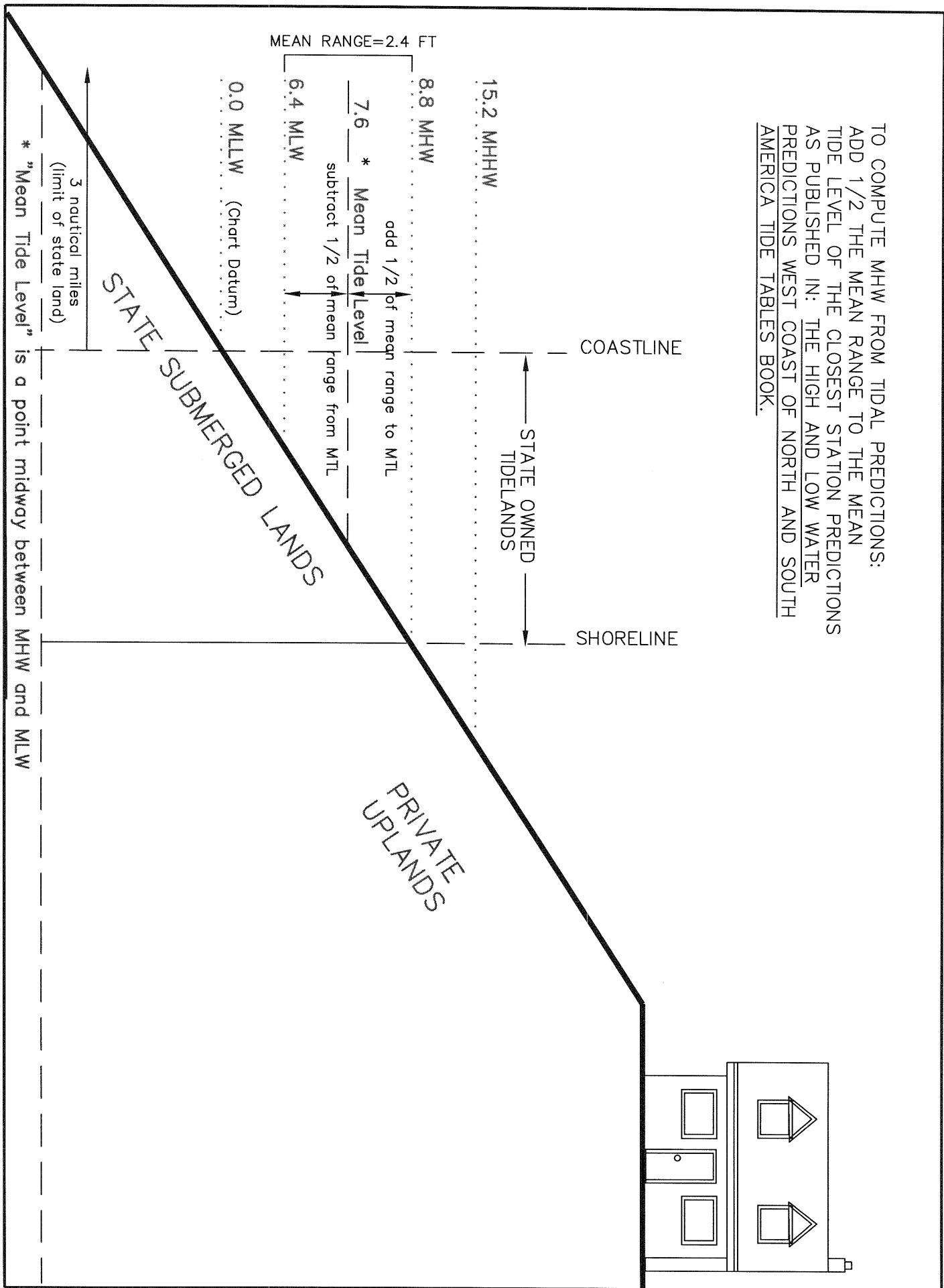
Department of Natural Resources
Division of Mining, Land & Water

Southcentral Regional Office
550 West 7th Avenue, Suite 900-C
Anchorage, AK 99501
Phone: 907-269-8503

Southeast Regional Office
400 Willoughby Avenue, 4th Floor
Juneau, AK 99801
Phone: 907-465-3400

Northern Regional Office
3700 Airport Way
Fairbanks, AK 99709
Phone: 907-451-2700

TO COMPUTE MHW FROM TIDAL PREDICTIONS:
 ADD 1/2 THE MEAN RANGE TO THE MEAN
 TIDE LEVEL OF THE CLOSEST STATION PREDICTIONS
 AS PUBLISHED IN: THE HIGH AND LOW WATER
 PREDICTIONS WEST COAST OF NORTH AND SOUTH
 AMERICA TIDE TABLES BOOK.



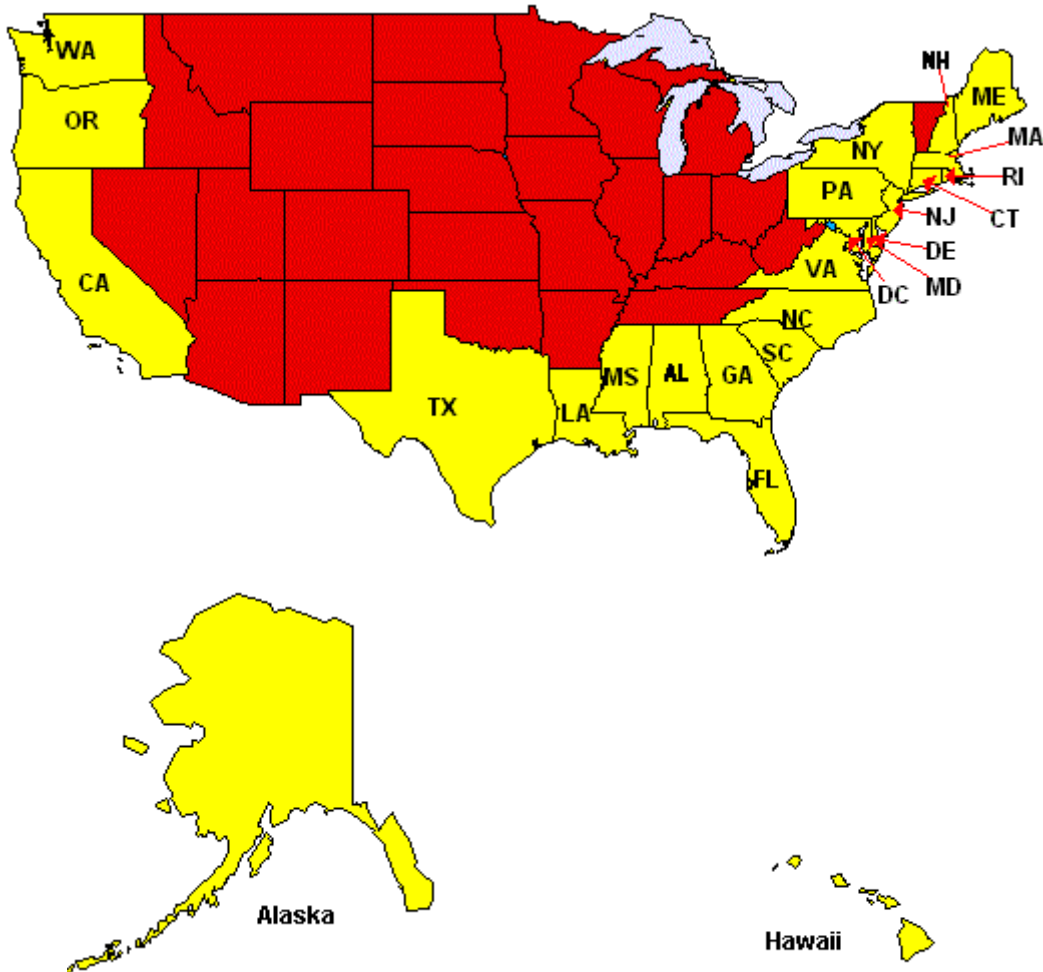
DETERMINING MEAN HIGH TIDE WHERE AN NGS BENCH MARK EXISTS

1. NOAA Primary Control Stations and related benchmark data can be obtained at <http://co-ops.nos.noaa.gov/bench.html> or the State of Alaska/ DNR at (907) 269-8521. *Example: Juneau.*
2. Using a level and rod, run differential levels from one of the Control Station bench marks to the project location.
3. Establish a point on each sideline of the ATS survey at the mean high water elevation. Measure the witness distance from these points to the witness monuments.
4. When the tide level reaches this elevation, field survey the meanders within the project.



PUBLISHED BENCHMARK SHEETS

Below is a map of states and geographical areas where CO-OPS maintains Published Benchmark Sheets. Specific stations are listed within each area.



Non U.S. Bench Marks



Alaska Bench Marks

- 9450305 BOCA DE QUADRA , AK
- 9450460 KETCHIKAN, TONGASS NARROWS , AK
- 9450695 HUT POINT , AK
- 9450807 CONVENIENT COVE, HASSLER ISLAND , AK
- 9450811 FIN , AK
- 9450970 ENTRANCE TO ZIMOVIA STRAIT , AK
- 9451005 POINT HARRINGTON, SUMNER STRAIT , AK
- 9451037 VILLAGE ROCK, AK , AK
- 9451074 BUSHY ISLAND, SNOW PASSAGE , AK
- 9451124 STIKINE STRAIT , AK
- 9451204 WRANGELL, WRANGELL ISLAND , AK
- 9451218 VANK ISLAND, SUMNER STRAIT , AK

Click on station of interest.

The NOS bench mark sheets now contain links to corresponding NGS data sheets. Under the NOS vertical mark number (VM#) you may see a PID# link. Clicking on this link will bring up the corresponding NGS data sheet for that vertical mark.

For stations which do not list PID# links, the Latitude and Longitude of the station can be used to find data sheets for nearby PIDs by Clicking [HERE](#).

- [Home](#)
- [PORTS](#)
- [Predictions](#)
- [Observations](#)
- [Bench Marks](#)
- [FAQ](#)
- [Station Locator](#)
- [Publications](#)
- [About CO-OPS](#)
- [Product Info.](#)

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National Ocean Service

Page 1 of 8

Station ID: 9452210 PUBLICATION DATE: 11/02/1999
Name: JUNEAU, GASTINEAU CHANNEL, STEPHENS PASS
ALASKA
NOAA Chart: 17315 Latitude: 58° 17.9' N
USGS Quad: JUNEAU B-2 Longitude: 134° 24.9' W

To reach the tidal bench marks from the main Juneau Post Office main entrance at 9th and D Streets, proceed SW one block to Glacier Avenue, turn left onto Glacier Avenue and proceed 0.2 km (0.1 mi), bear left at the Y intersection onto Willoughby Avenue and follow it 0.3 km (0.2 mi) to Whittier Street, turn right onto Whittier Street and proceed 0.4 km (0.3 mi) (across Egan Drive) to the U.S. Coast Guard Pier. The bench marks are in the general vicinity. Turn right (SW) from the main Coast Guard pier and proceed 73.15 m (240.0 ft) to the tide house.

T I D A L B E N C H M A R K S

PRIMARY BENCH MARK STAMPING:

DESIGNATION: 945 2210 TIDAL 8
ALIAS: 8 1922

MONUMENTATION: Tidal Station disk VM#: 1188
AGENCY: U.S. Coast & Geodetic Survey (USC&GS) PID:
SETTING CLASSIFICATION: Building wall

The primary bench mark is an unstamped disk set vertically in the SE corner of the Goldstein Emporium Building on the west side of Seward Street between Front and Second Streets, 5.18 m (17.0 ft) south of the entrance to Miss Scarlett's

U.S. DEPARTMENT OF COMMERCE
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Page 6 of 8

Station ID: 9452210 PUBLICATION DATE: 11/02/1999
Name: JUNEAU, GASTINEAU CHANNEL, STEPHENS PASS
ALASKA
NOAA Chart: 17315 Latitude: 58° 17.9' N
USGS Quad: JUNEAU B-2 Longitude: 134° 24.9' W

T I D A L D A T U M S

Tidal datums at JUNEAU, GASTINEAU CHANNEL, STEPHENS PASS based on:

LENGTH OF SERIES: 5 YEARS
TIME PERIOD: January 1994 - December 1998
TIDAL EPOCH: 1960-1978
CONTROL TIDE STATION:

Elevations of tidal datums referred to Mean Lower Low Water (MLLW), in METERS:

HIGHEST OBSERVED WATER LEVEL (11/02/1948)	=	7.395
MEAN HIGHER HIGH WATER (MHHW)	=	4.962
MEAN HIGH WATER (MHW)	=	4.675
MEAN SEA LEVEL (MSL)	=	2.615
MEAN TIDE LEVEL (MTL)	=	2.580
MEAN LOW WATER (MLW)	=	0.485
MEAN LOWER LOW WATER (MLLW)	=	0.000
LOWEST OBSERVED WATER LEVEL (01/01/1991)	=	-1.663

Bench Mark Elevation Information

In METERS above:

Stamping or Designation	MLLW	MHW
945 2210 TIDAL 8	11.836	7.161
12 1945	18.203	13.528
2210 C 1982	8.960	4.285
2210 D 1984	10.844	6.169
2210 E 1984	10.343	5.668
2210 G 1984	10.340	5.665
945 2210 TIDAL 9	9.714	5.039
BM WG-91 1994 ELEVATION 29.26	9.156	4.481
2210 J 1997	9.737	5.062
2210 H 1997	9.990	5.315

DETERMINING MEAN HIGH TIDE IN AREAS WHERE NO NGS BENCH MARKS EXIST

1. In NOAA Tide Tables 2002, NOS High and Low Water Predictions or on the internet at: <http://co-ops.nos.noaa.gov/tpred2.html#AK> look up high tides and times for nearest Tide Station in Table 1. *Example: Juneau - June 12, 2002.*
 - A. Tide predictions in the NOAA Tide Predictions book are in Alaska Standard Time.
2. Look up nearest Place in Table 2. *Example: Cannery Cove, Phybus Bay.*
3. Add or subtract (or multiply by ratio factor) local correction factor to time of high tide in Table 1 to find predicted time of Local High Tide.
Example: 17:57-00:08 = 17:49.
4. Using a level and rod observe the rising tide from ½ hour before to ½ hour after predicted time of high tide taking a minimum of six observations on the rod. Mean the observations and using the level and rod locate the mean elevation on the beach and mark with a temporary bench. This is the approximate High Tide for this location on this day at this time (AM or PM).
5. Apply local Height difference from Table 2 to High Tide at the nearest Tide Station in Table 1. This will be the approximate elevation of the point marked in step 4. *Example: 13.0' x 0.90' = 11.7'.*
6. Find the Mean High Tide for this location by looking up the Local Mean Range in Table 2. Divide this number by 2. Add the result to the local mean Tide Level also found in Table 2. *Example: 12.24' / 2 = 6.12' 6.12' + 7.60' = 13.72.'*
7. Locate the Mean High Tide Line on the beach by subtracting or adding to the elevation of the marked point. In this case you would move the rod upland from the water line to the point of elevation 13.72 feet.

TABLE 1.—DAILY TIDE PREDICTIONS
Juneau, Alaska, 2001

Times and Heights of High and Low Waters

April				May				June																		
Time	Height		Time	Height		Time	Height		Time	Height		Time	Height													
	h	m		h	m		h	m		h	m		h	m												
	ft	cm		ft	cm		ft	cm		ft	cm		ft	cm												
1 Su ☉	0544 1247 1924	14.4 1.5 11.8	439 46 360	16 M	0107 0704 1404 2059	6.7 12.1 3.2 11.7	204 369 98 357	1 Tu	0100 0702 1348 2029	5.4 13.7 1.0 13.8	165 418 30 421	16 W	0147 0734 1409 2053	6.0 11.8 3.2 12.9	183 360 98 393	1 F	0320 0928 1526 2150	1.9 13.8 1.6 16.6	58 421 49 506	16 Sa	0301 0900 1456 2119	3.3 11.8 3.8 14.7	101 360 116 448			
2 M	0101 0710 1413 2054	6.0 13.9 1.3 12.5	183 424 40 381	17 Tu	0237 0832 1513 2157	6.3 12.1 2.9 12.6	192 369 88 384	2 W	0229 0830 1459 2132	4.5 13.9 0.7 15.0	137 424 21 457	17 Th	0256 0849 1507 2140	4.9 12.0 3.0 13.8	149 366 91 421	2 Sa	0418 1033 1620 2238	0.3 14.3 1.7 17.3	9 436 52 527	17 Su	0353 1002 1549 2203	1.8 12.5 3.3 15.7	55 381 110 479			
3 Tu	0238 0842 1527 2203	5.4 14.3 0.4 14.0	165 436 12 427	18 W	0343 0942 1606 2240	5.2 12.8 2.2 13.7	158 390 67 418	3 Th	0340 0945 1558 2224	2.7 14.6 0.3 16.3	82 445 9 497	18 F	0350 0951 1555 2219	3.5 12.7 2.7 14.8	107 387 82 451	3 Su	0507 1128 1708 2321	-1.0 14.9 1.8 17.8	-30 454 55 543	18 M	0440 1056 1637 2246	0.2 13.3 3.3 16.6	6 405 101 506			
4 W	0354 0959 1626 2255	3.7 15.4 -0.7 15.6	113 469 -21 475	19 Th	0431 1035 1647 2314	3.7 13.7 1.5 14.7	113 418 46 448	4 F	0436 1047 1649 2309	0.8 15.6 -1 17.5	24 475 -3 533	19 Sa	0434 1042 1637 2254	1.9 13.5 2.3 15.8	58 411 70 482	4 M	0551 1216 1752	-2.0 15.4 1.9	-61 469 58	19 Tu	0524 1145 1723 2328	-1.3 14.2 3.0 17.5	-40 433 91 533			
5 Th	0452 1100 1716 2339	1.7 16.6 -1.7 17.1	52 506 -52 521	20 F	0510 1118 1723 2344	2.2 14.6 1.0 15.7	67 445 30 479	5 Sa	0524 1140 1734 2350	-0.9 16.4 -0.2 18.4	-27 500 -6 561	20 Su	0514 1126 1716 2328	0.4 14.4 2.0 16.7	12 439 61 509	5 Tu	0001 0631 1300 1833	18.0 -2.6 15.6 2.2	549 -79 475 67	20 W	0607 1231 1808	-2.6 15.0 2.6	-79 457 79			
6 F	0541 1152 1800	-0.2 17.6 -2.2	-6 536 -67	21 Sa	0546 1156 1757	0.8 15.4 0.6	24 469 18	6 Su	0608 1227 1816	-2.2 16.8 -0.1	-67 512 -3	21 M	0552 1208 1754	-1.1 15.1 1.8	-34 460 55	6 W	0040 0710 1341 1913	17.9 -2.8 15.5 2.6	546 -85 472 79	21 Th	0011 0650 1316 1853	18.2 -3.6 15.7 2.3	555 -110 479 70			
7 Sa	0020 0625 1239 1841	18.4 -1.7 18.2 -2.2	561 -52 555 -67	22 Su	0012 0621 1232 1829	16.6 -0.5 15.9 0.4	506 -15 485 12	7 M	0028 0649 1311 1855	18.8 -3.0 16.9 0.4	573 -91 515 12	22 Tu	0001 0629 1248 1832	17.5 -2.5 15.6 1.8	533 -67 475 55	7 Th	0116 0748 1421 1952	17.6 -2.5 15.2 3.0	536 -76 463 91	22 F	0056 0734 1402 1938	18.7 -4.2 16.1 2.2	570 -128 491 67			
8 Su	0057 0707 1324 1921	19.1 -2.7 18.2 -1.7	582 -82 555 -52	23 M	0040 0655 1308 1901	17.2 -1.5 16.2 0.6	524 -46 494 18	8 Tu	0105 0728 1353 1934	18.8 -3.2 16.6 1.1	573 -98 506 34	23 W	0036 0708 1329 1911	18.1 -3.1 15.9 1.9	552 -94 485 58	8 F	0153 0825 1500 2030	17.0 -2.0 14.8 3.6	518 -61 451 110	23 Sa	0142 0819 1448 2026	18.7 -4.2 16.2 2.2	570 -128 494 67			
9 M	0134 0748 1407 1959	19.3 -3.1 17.7 -0.8	588 -94 539 -24	24 Tu	0109 0729 1344 1935	17.7 -2.2 16.2 0.9	539 -67 494 27	9 W	0140 0806 1434 2012	18.3 -3.9 15.9 2.0	558 -88 485 61	24 Th	0113 0748 1412 1951	18.3 -3.5 15.8 2.2	558 -107 482 67	9 Sa	0229 0903 1541 2111	16.3 -3.0 14.3 4.2	497 -40 436 128	24 Su	0230 0905 1536 2118	18.3 -3.7 16.2 2.4	558 -113 494 73			
10 Tu	0210 0828 1449 2037	18.9 -2.8 16.8 0.5	576 -85 512 15	25 W	0140 0806 1422 2010	17.9 -2.5 15.9 1.6	546 -76 485 49	10 Th	0216 0845 1516 2050	17.5 -3.1 15.1 3.1	533 -64 460 94	25 F	0153 0831 1457 2035	18.2 -3.4 15.6 2.8	555 -104 475 85	10 Su	0307 0942 1623 2154	15.4 -0.4 13.7 4.8	469 -12 418 146	25 M	0322 0954 1627 2215	17.4 -2.8 16.0 2.7	530 -85 488 82			
11 W	0246 0908 1532 2115	18.0 -2.0 15.5 1.9	549 -61 472 58	26 Th	0213 0845 1503 2047	17.7 -2.3 15.3 2.4	539 -70 466 73	11 F	0252 0925 1559 2131	16.5 -1.1 14.1 4.2	503 -34 430 128	26 Sa	0237 0917 1547 2124	17.7 -2.9 15.2 3.4	539 -88 463 104	11 M	0348 1024 1708 2244	14.4 0.6 13.3 5.3	439 18 405 162	26 Tu	0418 1046 1721 2319	16.2 -1.5 15.9 2.9	494 -46 485 88			
12 Th	0322 0950 1618 2155	16.9 -2.8 14.1 3.5	515 -24 430 107	27 F	0251 0928 1550 2130	17.3 -1.8 14.5 3.4	527 -55 442 104	12 Sa	0330 1007 1648 2217	15.3 0.1 13.2 5.2	466 3 402 158	27 Su	0327 1008 1642 2222	16.9 -2.0 14.7 4.0	515 -61 448 122	12 Tu	0434 1110 1757 2343	13.4 1.6 13.0 5.5	408 49 396 168	27 W	0524 1142 1818	14.9 -0.1 15.8	454 -3 482			
13 F	0401 1036 1710 2242	15.5 0.6 12.8 5.0	472 18 390 152	28 Sa	0334 1018 1646 2223	16.5 -1.0 13.7 4.5	503 -30 418 137	13 Su	0413 1056 1743 2313	14.1 1.3 12.4 6.0	430 40 378 183	28 M	0424 1105 1744 2331	15.8 -0.9 14.4 4.5	482 -27 439 137	13 W	0530 1202 1849	12.5 2.5 13.1	381 76 399	28 Th	0030 0633 1244 1918	2.9 13.6 1.3 15.8	88 415 40 482			
14 Sa	0446 1131 1816 2342	14.1 2.0 11.7 6.2	430 61 357 189	29 Su	0427 1118 1754 2331	15.4 0.0 13.1 5.3	469 0 399 162	14 M	0507 1154 1848	13.0 2.4 12.1	396 73 369	29 Tu	0532 1209 1850	14.6 0.1 14.5	445 3 442	14 Th	0051 0636 1259 1941	5.3 11.8 3.2 13.4	162 360 98 408	29 F	0145 0751 1349 2018	2.4 12.9 2.4 15.9	73 393 73 485			
15 Su	0544 1242 1938	12.8 2.9 11.3	390 88 344	30 M	0536 1229 1912	14.4 0.8 13.0	439 24 396	15 Tu	0026 0615 1301 1955	6.4 12.1 3.0 12.3	195 369 91 375	30 W	0051 0651 1318 1956	4.3 13.7 0.9 15.0	131 418 27 457	15 F	0200 0749 1359 2032	4.6 11.6 3.6 14.0	140 354 110 427	30 Sa	0256 0909 1454 2116	1.5 12.8 3.1 16.2	46 390 94 494			
								31 Th	0211 0813 1425 2056	3.3 13.5 1.4 15.8	101 411 43 482															

Time meridian 135° W. 0000 is midnight. 1200 is noon.
Heights are referred to mean lower low water which is the chart datum of soundings.

TABLE 2 - TIDAL DIFFERENCES AND OTHER CONSTANTS

No.	PLACE	POSITION		DIFFERENCES				RANGES		Mean Tide Level
		Latitude	Longitude	Time		Height		Mean	Diurnal	
				High Water	Low Water	High Water	Low Water			
	ALASKA Meares Passage to Davidson Inlet-cont. Time meridian, 135° W	North	West	h	m	ft	ft	ft	ft	ft
	<i>Davidson Inlet-cont.</i>			on Sitka, p.128						
1613	El Capitan Island	55° 56'	133° 20'	-0 11	-0 10	+0.9	-0.1	8.7	10.8	5.6
1615	Cyrus Cove, Sea Otter Sound	55° 55'	133° 24'	-0 16	-0 12	+1.1	0.0	8.8	10.9	5.8
1617	Marble Passage	55° 57'	133° 26'	-0 14	-0 09	+1.0	0.0	8.7	10.9	5.8
1619	Marble Island	56° 00'	133° 28'	-0 19	-0 15	+0.8	-0.1	8.6	10.7	5.6
1621	Holbrook, Kosciusko Island	56° 02'	133° 30'	-0 10	-0 06	+0.9	-0.1	8.7	10.8	5.6
1623	Edna Bay	55° 57'	133° 40'	-0 20	-0 08	+0.9	0.0	8.6	10.8	5.7
	Sumner Strait									
1625	Coronation Island	55° 54'	134° 07'	-0 16	-0 17	+0.8	0.0	8.5	10.7	5.6
1627	Pole Anchorage, Kosciusko Island	55° 57'	133° 49'	-0 22	-0 22	+1.4	-0.1	9.2	11.4	5.9
1629	Port McArthur, Kuiu Island	56° 04'	134° 07'	-0 11	-0 07	+0.6	-0.1	8.4	10.6	5.5
1631	Kell Bay, Affleck Canal, Kuiu Island	56° 09'	134° 08'	+0 01	+0 01	+1.3	0.0	9.0	11.2	5.9
1633	Point St. Albans	56° 05'	133° 58'	-0 17	-0 13	+1.4	0.0	9.1	11.3	5.9
1635	Shakan Bay Entrance	56° 08'	133° 37'	-0 13	-0 12	+1.8	0.0	9.5	11.7	6.2
1637	Shakan Strait, Kosciusko Island	56° 08'	133° 28'	-0 09	-0 10	+1.9	-0.1	9.7	11.7	6.2
1639	El Capitan Passage	56° 04'	133° 19'	-0 05	+0 02	+0.9	-0.1	8.7	10.8	5.6
1641	Port Beauclerc, Kuiu Island	56° 17'	133° 57'	-0 14	-0 12	+1.9	-0.1	9.7	11.9	6.2
1643	Port Protection, Prince of Wales Island	56° 19'	133° 36'	-0 13	-0 11	+2.4	0.0	10.1	12.4	6.4
1645	Reid Bay	56° 23'	133° 53'	-0 11	-0 19	+2.5	0.0	10.2	12.4	6.5
1647	Sumner Island	56° 25'	133° 48'	-0 19	-0 12	+2.6	0.0	10.3	12.6	6.6
				on Ketchikan, p.120						
1649	Red Bay, Prince of Wales Island	56° 18'	133° 19'	+0 03	+0 07	-0.8	0.0	12.2	14.6	7.6
1651	Level Islands	56° 28'	133° 06'	+0 03	+0 04	-0.4	0.0	12.6	15.0	7.8
1653	Butterworth Island, Duncan Canal	56° 32'	133° 04'	-0 04	+0 03	0.0	0.0	13.0	15.3	8.0
1655	Duncan Canal, Kupreanof Island	56° 34'	133° 04'	+0 15	+0 16	-0.2	-0.1	12.9	15.2	7.8
1657	Grief Island, Duncan Canal	56° 37'	133° 03'	+0 15	+0 12	+0.1	-0.1	13.2	15.4	8.0
1659	Castle Islands, Duncan Canal	56° 39'	133° 09'	+0 27	+0 12	+0.1	-0.1	13.2	15.5	8.0
1661	St. John Harbor, Zarembo Island	56° 26'	132° 57'	+0 09	+0 05	-0.7	-0.2	12.5	14.6	7.6
1663	Greys Island	56° 31'	132° 33'	+0 06	+0 04	+0.2	0.0	13.2	15.6	8.1
	Wrangell Narrows									
1665	Point Lockwood, Woewodski Island	56° 33'	132° 58'	+0 20	+0 15	+0.2	+0.1	13.1	15.7	8.1
1667	Finger Point, Lindenbug Peninsula	56° 41'	132° 57'	+0 29	+0 41	+1.2	0.0	14.2	16.7	8.6
1669	Anchor Point	56° 38'	132° 56'	+0 20	+0 35	+0.6	0.0	13.6	16.0	8.3
1671	Petersburg	56° 49'	132° 57'	+0 09	+0 26	+0.3	-0.1	13.4	15.7	8.1
	Keku Strait									
1673	Monte Carlo Island	56° 32'	133° 46'	+0 02	+0 03	-2.8	-0.1	10.3	12.5	6.6
1675	Seclusion Harbor, Kuiu Island	56° 33'	133° 52'	+0 05	+0 02	-3.0	-0.2	10.2	12.3	6.4
1677	Beck Island	56° 39'	133° 43'	+0 08	+0 31	-1.6	-0.1	11.5	13.8	7.1
1679	The Summit	56° 41'	133° 44'	+0 31	+0 37	+0.3	+0.1	13.2	15.7	8.2
1681	Entrance Island	56° 49'	133° 47'	+0 22	+0 31	-0.7	0.0	12.3	14.7	7.6
1683	Port Camden, Kuiu Island	56° 44'	133° 55'	+0 03	+0 04	-1.5	0.0	11.5	13.9	7.2
1685	Hamilton Bay, Kupreanof Island	56° 55'	133° 50'	+0 03	+0 04	-1.6	0.0	11.4	13.8	7.2
1687	Kake	56° 58'	133° 56'	+0 05	+0 12	-1.4	-0.1	11.7	14.0	7.3
	Frederick Sound			on Juneau, p.124						
1689	Dry Strait	56° 37'	132° 34'	-0 18	-0 03	-0.2	0.0	13.5	16.1	8.3
1691	Cosmos Point	56° 39.8'	132° 37.0'	-0 05	-0 05	*0.98	*0.99	13.47	16.00	8.43
1693	Ideal Cove, Mitkof Island	56° 40'	132° 38'	-0 09	-0 05	-0.2	0.0	13.5	16.1	8.3
1695	Leconte Bay	56° 47.3'	132° 30.1'	0 00	+0 03	*0.98	*0.99	13.42	15.94	8.28
1697	Brown Cove	56° 53'	132° 48'	-0 14	-0 10	-0.3	-0.1	13.5	15.8	8.2
1699	Thomas Bay	57° 00'	132° 47'	+0 07	+0 07	-0.8	-0.1	13.0	15.4	8.0
1701	Portage Bay, Kupreanof Island	57° 00'	133° 19'	-0 19	-0 15	-0.7	0.0	13.0	15.5	8.1
1703	Cleveland Passage, Whitney Island	57° 13'	133° 30'	-0 01	+0 03	-1.2	-0.1	12.6	15.0	7.8
1705	The Brothers	57° 17.7'	133° 47.8'	-0 06	-0 03	*0.91	*0.94	12.40	14.74	7.68
1707	Pybus Bay, Admiralty Island	57° 18'	134° 08'	+0 03	-0 02	-1.9	-0.1	11.9	14.3	7.4
1709	Cannery Cove, Pybus Bay	57° 18.4'	134° 08.0'	-0 08	-0 06	*0.90	*0.94	12.24	14.63	7.60
1711	Eliza Harbor, Liesnoi Island	57° 10'	134° 17'	-0 19	-0 19	-1.9	-0.1	11.9	14.3	7.4
1713	Eliza Harbor, Admiralty Island	57° 11.3'	134° 17.2'	-0 06	-0 04	*0.87	*0.92	11.79	14.10	7.35
1715	Herring Bay	57° 06.8'	134° 22.8'	-0 08	-0 07	*0.84	*0.91	11.44	13.70	7.16
1717	Saginaw Bay, Kuiu Island	56° 54.2'	134° 18.2'	-0 12	-0 15	*0.84	*0.96	11.34	13.67	7.18
	Stephens Passage									
1719	Port Houghton, Robert Islands	57° 18'	133° 28'	-0 21	-0 17	-0.8	-0.1	13.0	15.4	8.0
1721	Hobart Bay	57° 24'	133° 25'	-0 06	+0 03	-1.1	-0.1	12.7	15.1	7.8
1723	Good Island, Gambier Bay	57° 29'	133° 54'	-0 03	+0 04	-1.4	-0.1	12.4	14.8	7.7
1725	Windham Bay	57° 33'	133° 30'	0 00	0 00	-1.1	-0.1	12.7	15.1	7.8
1727	Rasp Ledge, Seymour Canal	57° 41'	134° 02'	+0 06	+0 05	-0.7	+0.1	12.9	15.6	8.2
1729	Windfall Harbor, Seymour Canal	57° 52'	134° 16'	+0 14	+0 18	-0.2	0.0	13.5	16.0	8.3
1731	Holkham Bay, Wood Spit	57° 43'	133° 35'	+0 03	+0 06	-0.8	-0.1	13.0	15.4	8.0
1733	Sawyer Island, Tracy Arm	57° 52.7'	133° 11.4'	+0 02	+0 06	*0.97	*1.01	13.32	15.83	8.25
1735	Port Snettisham, Point Styleman	57° 58'	133° 53'	-0 12	-0 06	-0.4	-0.1	13.4	15.8	8.2
1737	Port Snettisham, Crib Point	58° 05.7'	133° 44.3'	-0 03	-0 03	*0.98	*0.97	13.40	15.86	8.23

Endnotes can be found at the end of table 2.

- Possession Sound, Port Susan, Skagit Bay area
- Rosario Strait

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ALASKA



- Dixon Entrance and Portland Canal
- Revillagigedo Channel and Tongass Narrows
- Behm Canal
- Clarence Strait
- Cordova Bay and Dall Island
- Meares Passage to Davidson Inlet
- Sumner Strait and Wrangell Narrows
- Keku Strait, Fredrick Sound, Stephens Passage
- Lynn Canal and Chatham Strait
- Baranof Island, Salisbury Sound, Chichagof Island
- Cross Sound and Icy Strait
- Gulf of Alaska
- Prince William Sound
- Kenai Peninsula and Cook Inlet
- Kodiak and Afgonak Islands
- Alaska Peninsula
- **Aleutian Islands**
 - Unimak and Unalaska Islands
 - Umnak, Yunaska, Atka Islands
 - Adak, Kanaga, Tanaga, Rat and Attu Islands
- Bristol Bay
- Kusokwim Bay and Bering Sea
- Norton Sound, Bering Strait, and Arctic Ocean

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Pacific Islands

- Marianas Islands
- Caroline, Marcus and Wake Islands
- Marshall Islands
- Gilbert Islands and North Pacific Detached Islands

Petersburg +0 09 +0 26 +0.3 -0.1

Keku Strait

Station	Time Diff.		Hgt. Diff.	
	High	Low	High	Low
Monte Carlo Island	+0 02	+0 03	-2.8	-0.1
Seclusion Harbor, Kuiu Island	+0 05	+0 02	-3.0	-0.2
Beck Island	+0 08	+0 31	-1.6	-0.1
The Summit	+0 31	+0 37	+0.3	+0.1
Entrance Island	+0 22	+0 31	-0.7	0.0
Port Camden, Kuiu Island	+0 03	+0 04	-1.5	0.0
Hamilton Bay, Kupreanof Island	+0 03	+0 04	-1.6	0.0
Kake	+0 05	+0 12	-1.4	-0.1

Frederick Sound

Station	Time Diff.		Hgt. Diff.	
	High	Low	High	Low
Dry Strait	-0 18	-0 03	-0.2	0.0
Cosmos Point	-0 05	-0 05	*0.98	*0.99
Ideal Cove, Mitkof Island	-0 09	-0 05	-0.2	0.0
Leconte Bay	0 00	+0 03	*0.98	*0.99
Brown Cove	-0 14	-0 10	-0.3	-0.1
Thomas Bay	+0 07	+0 07	-0.8	-0.1
Portage Bay, Kupreanof Island	-0 19	-0 15	-0.7	0.0
Cleveland Passage, Whitney Island	-0 01	+0 03	-1.2	-0.1
The Brothers	-0 06	-0 03	*0.91	*0.94
Cannery Cove, Pybus Bay	-0 08	-0 06	*0.90	*0.94
Eliza Harbor, Liesnoi Island	-0 19	-0 19	-1.9	-0.1
Eliza Harbor, Admiralty Island	-0 06	-0 04	*0.87	*0.92
Herring Bay	-0 08	-0 07	*0.84	*0.91
Saginaw Bay, Kuiu Island	-0 12	-0 15	*0.84	*0.96

Stephens Passage

Station	Time Diff.		Hgt. Diff.	
	High	Low	High	Low
Port Houghton, Robert Islands	-0 21	-0 17	-0.8	-0.1
Hobart Bay	-0 06	+0 03	-1.1	-0.1
Good Island, Gambier Bay	-0 03	+0 04	-1.4	-0.1
Windham Bay	0 00	0 00	-1.1	-0.1
Rasp Ledge, Seymour Canal	+0 06	+0 05	-0.7	+0.1
Windfall Harbor, Seymour Canal	+0 14	+0 18	-0.2	0.0
Holkham Bay, Wood Spit	+0 03	+0 06	-0.8	-0.1
Sawyer Island, Tracy Arm	+0 02	+0 06	*0.97	*1.01
Port Snettisham, Point Styleman	-0 12	-0 06	-0.4	-0.1
Port Snettisham, Crib Point	-0 03	-0 03	*0.98	*0.97
Taku Harbor	-0 03	-0 04	*0.97	*1.00
Greely Point, Taku Inlet	-0 01	-0 04	-0.6	-0.1
Taku Point, Taku Inlet	+0 14	+0 13	+0.4	0.0

JUNEAU Daily predictions

19	Su	1238am	L	5.6	635am	H	13.8	124pm	L	0.9	806pm	H	13
20	M	202am	L	5.2	758am	H	13.4	235pm	L	1.2	912pm	H	14
21	Tu	324am	L	3.9	922am	H	13.5	341pm	L	1.2	1010pm	H	15
22	W	430am	L	2.0	1036am	H	14.2	440pm	L	1.0	1101pm	H	16
23	Th	526am	L	-0.1	1139am	H	15.1	533pm	L	0.8	1148pm	H	18
24	F	616am	L	-1.9	1235pm	H	15.9	621pm	L	0.7			
25	Sa	1232am	H	18.9	702am	L	-3.3	125pm	H	16.4	707pm	L	0
26	Su	115am	H	19.3	746am	L	-4.0	213pm	H	16.6	751pm	L	1
27	M	157am	H	19.2	829am	L	-4.1	259pm	H	16.4	834pm	L	1
28	Tu	239am	H	18.7	912am	L	-3.6	345pm	H	15.8	918pm	L	2
29	W	321am	H	17.8	956am	L	-2.6	432pm	H	15.1	1003pm	L	3
30	Th	404am	H	16.6	1040am	L	-1.4	521pm	H	14.3	1051pm	L	4
31	F	450am	H	15.2	1128am	L	-0.1	613pm	H	13.6	1145pm	L	5

Juneau, Alaska

Tide Predictions (High and Low Waters)

June, 2002

NOAA, National Ocean Service

Daylight Saving Time

Day	Time	Ht.	Time	Ht.	Time	Ht.	Time	Ht.					
1	Sa	541am	H	13.9	1219pm	L	1.2	710pm	H	13.1			
2	Su	1249am	L	5.7	641am	H	12.7	117pm	L	2.3	809pm	H	13
3	M	203am	L	5.6	752am	H	11.9	219pm	L	3.0	906pm	H	13
4	Tu	314am	L	4.9	907am	H	11.7	319pm	L	3.5	956pm	H	13
5	W	414am	L	3.8	1015am	H	11.9	413pm	L	3.6	1040pm	H	14
6	Th	503am	L	2.4	1114am	H	12.4	500pm	L	3.6	1119pm	H	15
7	F	546am	L	1.1	1203pm	H	13.1	543pm	L	3.5	1155pm	H	15
8	Sa	625am	L	-0.1	1246pm	H	13.7	623pm	L	3.4			
9	Su	1230am	H	16.4	702am	L	-1.2	126pm	H	14.3	701pm	L	3
10	M	105am	H	16.9	739am	L	-2.0	205pm	H	14.7	739pm	L	3
11	Tu	140am	H	17.3	817am	L	-2.5	244pm	H	14.9	817pm	L	3
12	W	217am	H	17.4	856am	L	-2.8	324pm	H	14.9	857pm	L	3
13	Th	256am	H	17.3	937am	L	-2.7	407pm	H	14.9	940pm	L	3
14	F	339am	H	16.9	1020am	L	-2.3	452pm	H	14.8	1028pm	L	3
15	Sa	427am	H	16.2	1107am	L	-1.6	542pm	H	14.7	1124pm	L	4
16	Su	522am	H	15.3	1159am	L	-0.6	636pm	H	14.8			
17	M	1229am	L	4.1	627am	H	14.2	1256pm	L	0.4	733pm	H	15
18	Tu	143am	L	3.6	741am	H	13.4	159pm	L	1.3	832pm	H	15
19	W	259am	L	2.6	901am	H	13.0	304pm	L	2.0	931pm	H	16
20	Th	407am	L	1.1	1019am	H	13.3	407pm	L	2.4	1027pm	H	16
21	F	507am	L	-0.4	1127am	H	13.9	506pm	L	2.6	1120pm	H	17
22	Sa	600am	L	-1.8	1226pm	H	14.6	600pm	L	2.6			
23	Su	1209am	H	18.1	648am	L	-2.8	118pm	H	15.2	649pm	L	2
24	M	1256am	H	18.3	733am	L	-3.3	206pm	H	15.5	736pm	L	2
25	Tu	141am	H	18.3	816am	L	-3.4	251pm	H	15.6	820pm	L	2
26	W	223am	H	17.9	858am	L	-3.1	333pm	H	15.5	903pm	L	3
27	Th	305am	H	17.3	938am	L	-2.4	415pm	H	15.2	946pm	L	3
28	F	346am	H	16.4	1018am	L	-1.5	456pm	H	14.8	1030pm	L	3
29	Sa	428am	H	15.4	1058am	L	-0.4	538pm	H	14.3	1116pm	L	4
30	Su	512am	H	14.3	1139am	L	0.7	621pm	H	13.9			

Juneau, Alaska

Tide Predictions (High and Low Waters)

July, 2002

NOAA, National Ocean Service

Daylight Saving Time

Day	Time	Ht.	Time	Ht.	Time	Ht.	Time	Ht.					
1	M	1208am	L	4.6	601am	H	13.1	1223pm	L	1.9	706pm	H	13
2	Tu	107am	L	4.7	657am	H	12.1	112pm	L	3.1	754pm	H	13