



UNIT  
**14**

# **WATER BOUNDARY LOCATION**

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## **Introduction**

Property boundary location along waterways in California is neither certain nor predictable because each situation is settled on its individual merits. However, there are guidelines useful to those answering questions on land surveying examinations, based on the basic concepts of property boundary location along California's waterways. Using these will not only provide a valuable test-taking aid, but will also serve as an introductory foundation for study and application beyond the examination and into real property surveying.

## Performance Expected on the Exams

Explain the effects of navigability on the title to the beds of lakes and rivers.

Explain the effects of avulsion on land title.

Explain the effects of erosion and accretion on land title.

Describe how you would locate the mean high tide line in the field.

Calculate the elevation of the mean high water line for a parcel of land given the NGVD elevation of mean lower low water of a tidal bench mark.

Describe effects of engineering works such as dams and breakwaters on land title of riparian and littoral property owners.

## Key Terms

Accretion	Navigability: in fact, by statute, susceptible
Alluvium	Ordinary high water mark
Artificial conditions	Ordinary low water mark
Avulsion	Public trust easement
Deed terms: to, along, with	Reliction
Erosion	Riparian
Last natural location	Sovereign lands
Littoral	Stream: center, thread
Mean high tide line	Swamplands
Mean low tide line	Tidal datums
Mean lower low tide	Tidelands
Meander: stream, lake, ocean	

## **Video Presentation Outline**

### **Introduction**

Boundary location along waterways is a marriage of four factors:

- The title held by the owners of land along and underneath waterways.
- Law, both common and statutory, that may be generally applicable on a state or national basis, or applicable to a specific water body, or even a specific site along a shore.
- Actual uses made of the waterway in the past, the present, or possibly in the future.
- Physical science for the effect of rainstorms, wet seasons, dry seasons, and years of ordinary rainfall.

### **Navigable and Non-navigable Waterways**

The beds of non-navigable waterways belong to adjacent upland owners. The beds of navigable waterways belong to the State.

- Determination of navigability.
- Effect of navigability on property boundaries.
- Boundaries defined along non-navigable lakes, rivers, or streams.
- Boundaries defined along navigable lakes, rivers, streams, or oceans.

### **Tidal Datums and Water Boundaries**

The mean high tide line is an elevation contour that can be located at any time by a surveyor using the proper information. It may or may not be a boundary line. The ordinary high water mark is the boundary by California statute. It may or may not be the same as the mean high tide line.

- Tidal datums in California.
- National Geodetic Survey Tidal Benchmark Program.
- Tidal datums as boundaries—field location.
- Comparing and reconciling legal terminology and scientific methodology.
- Apportioning by survey along non-tidal, non-navigable waterways.

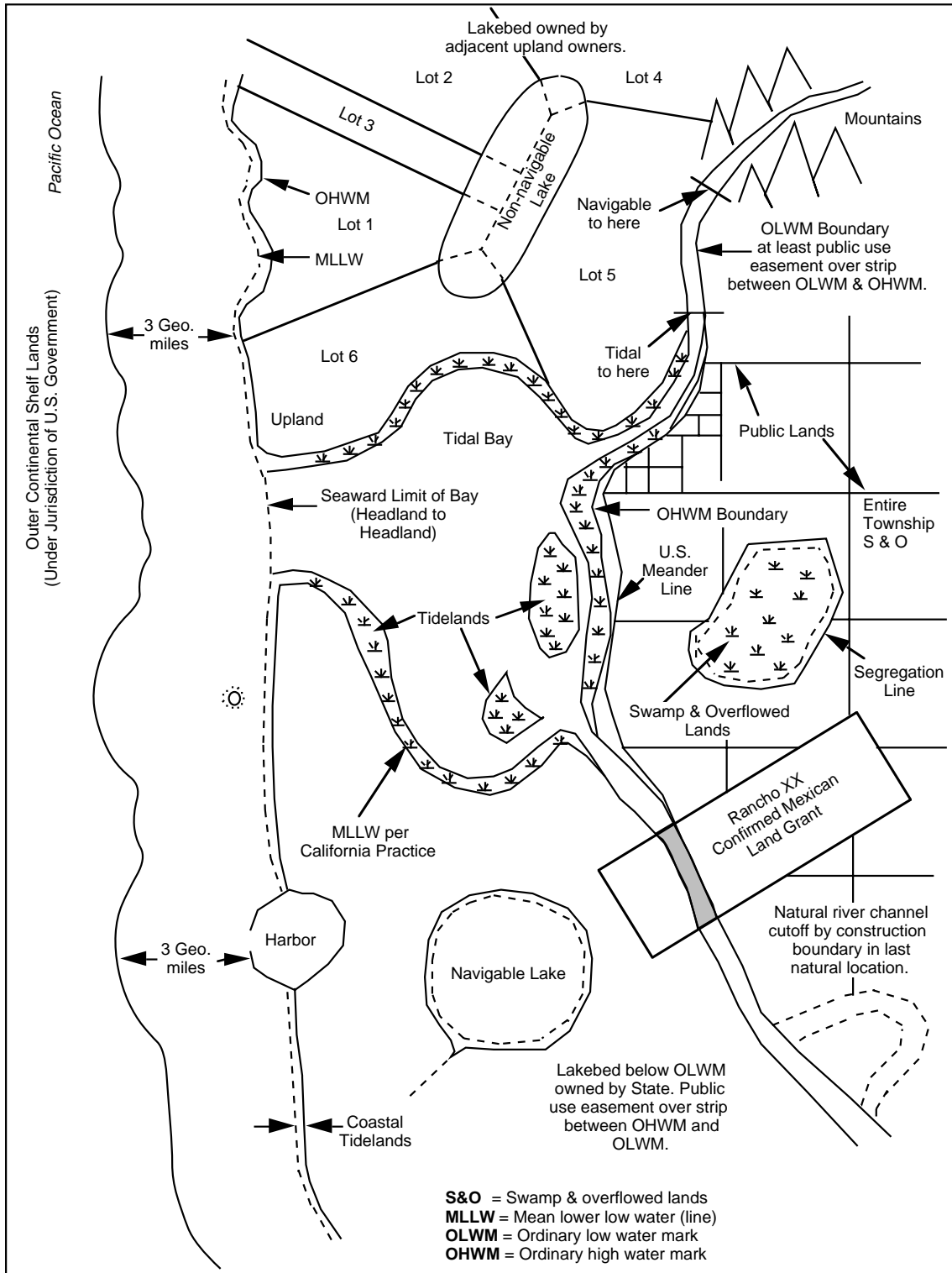


Figure 14-1. From "Water Boundaries for Land Surveyors," permission granted by Landmark Enterprises.

- Locating boundary lines along non-tidal lakes and rivers.
- Swamplands and tidelands in California.
- Locating boundaries along tidal waterways.

### **Factors Affecting Property Boundaries Along Waterways**

- Accretion and erosion.
- Artificial changes generally, and in California.
- Meander lines related to water boundaries.
- Land descriptions with certain and uncertain “calls.”
- Islands in streams—navigable and non-navigable.
- Senior grants of land bordering or including navigable waterways.

### **Sample Test Questions**

1. Describe one method for apportioning the bed of a cigar-shaped lake among several owners.
2. Describe two methods of apportioning ownership of accretion along a river between adjoining owners.
3. The lands beneath a non-tidal, navigable river, belong to \_\_\_\_\_.
4. The boundary of the uplands along the Pacific Coast in California is \_\_\_\_\_.
5. If a new island forms in the bed of a navigable river, who will be the owner?
6. In a land description, a “call” is made to a stream which is non-navigable. Title thus conveyed is to \_\_\_\_\_.
7. Define the term reliction. Explain how it differs from erosion.
8. Explain why United States public land surveyors run meandered bodies of water.
9. Define tidal epoch and explain its relationship to property boundaries along waterways.
10. Title to lands lying beneath a navigable waterway are usually vested in the \_\_\_\_\_.

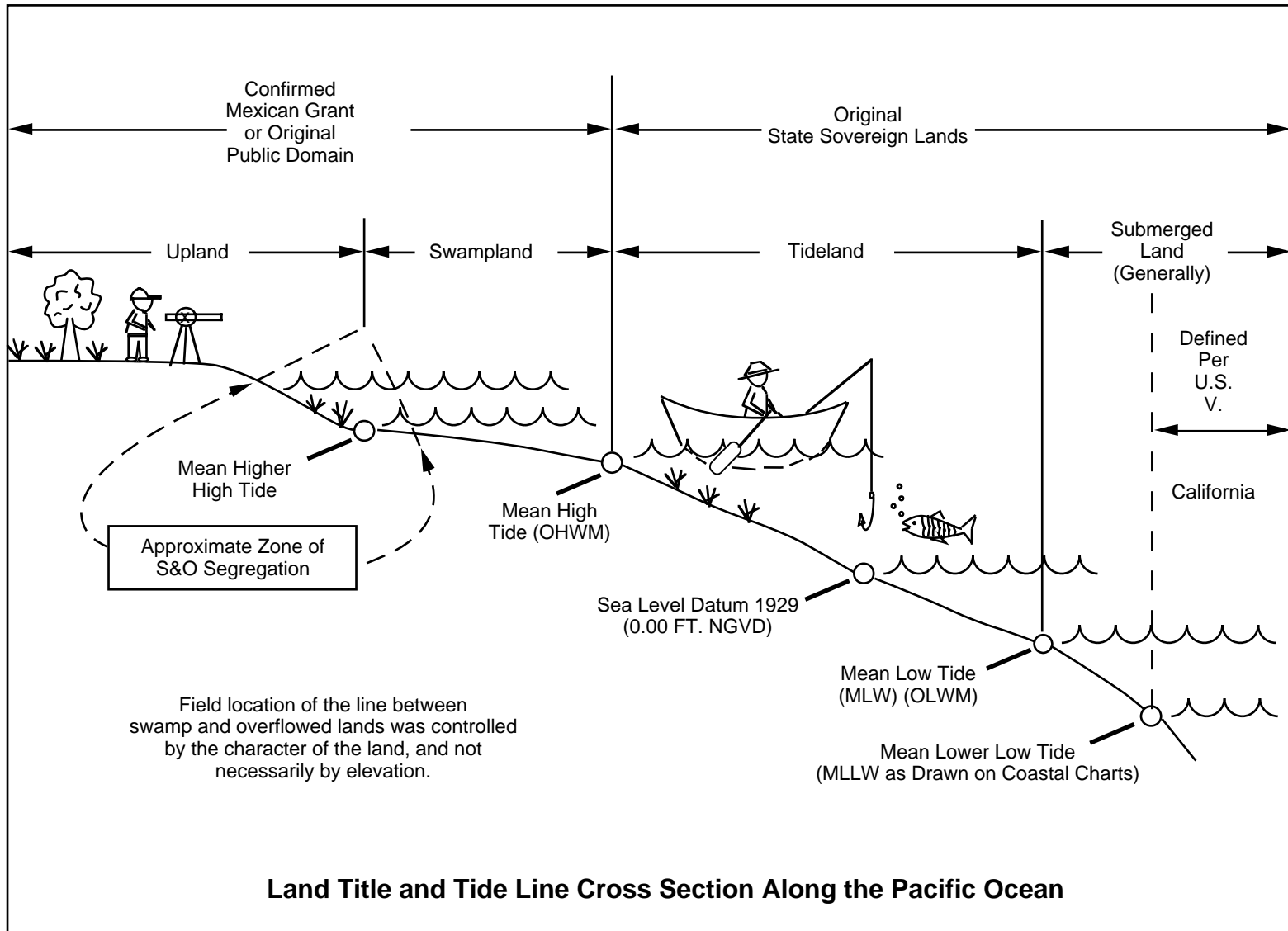
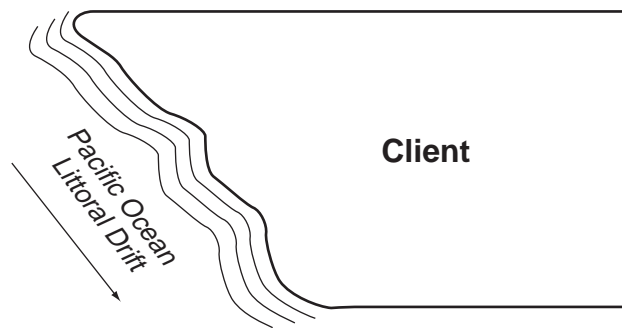
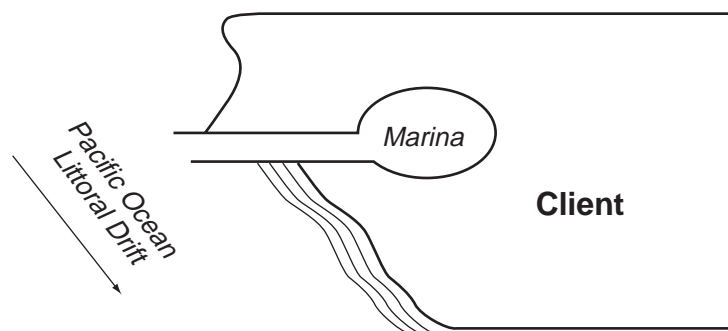


Figure 14-2. From "Water Boundaries for Land Surveyors," permission granted by Landmark Enterprises.

11. Describe the effect on property boundary lines when a meandered, non-navigable stream abandons its original bed by an avulsive action and forms a new bed. Who will own the new bed? The old bed?
12. Distinguish between the ordinary high water mark and the mean high tide line.
13. Describe how to locate, in the field, the mean high tide line when it is defined at the survey site as 4.73 ft above mean lower low water. The equation between mean lower low water and NGVD at the site is 1.89 ft, and the location is along the California coast.
14. Suppose you were asked to survey the deed description of the owner to a piece of property along the Pacific Ocean and the call was "...to the ordinary high water mark of the Pacific Ocean, thence along the Pacific Ocean to the section line between..." The original deed was dated January 7, 1866. It is clear from your research that the shore line is in a natural condition, as shown in the sketch below. How would you survey your client's property along the ocean? What factors would you consider? Describe the steps you would take.



Would you conduct your project differently if your research uncovered, about midway between the ends of the property, breakwaters that had been constructed about 1950 to protect a man-made harbor? This alternative situation is shown below.



## Answer Key

1. The “long lake method” with the “pie method” at the ends of the lake would be the most equitable in dividing the bed among riparian owners. A median line is established at the thread of the lake. Division lines are erected perpendicular from the median line to the upland property lines. The ends of the lake are treated as arcs, with property lines converging toward the ends of the median line, in the manner of cutting a pie.
2. The “Proportionate shore-line method” divides the accreted land so that each riparian owner receives the same proportionate amount of water frontage. Regardless of whether the shoreline condition is concave, convex, or straight, the length of the new shoreline is in proportion to the length of the old. This method is the most commonly used for the division of accretions.

The “Proportionate acreage method” apportions each riparian owner an area of accreted land in relation to one’s former proportionate length of water frontage. While this method provides a more equitable division for particular cases, it lacks specified direction for the line of division in general applications.

3. The State.
4. The ordinary high water mark.
5. The ownership of an island formed in a navigable river, after the date of the admission of a state into the Union, belongs to the state.
6. Regardless of whether the “call” is specific or uncertain, the title, by law, is conveyed to the middle or thread of a non-navigable stream, except where the bed of the stream is held under another title.
7. Reliction is the gradual and imperceptible withdrawal of water resulting in the uncovering of land once submerged. Erosion is the washing away of land by water. Although erosion is usually considered an imperceptible action, the rate of erosion may be quite rapid.
8. A meander line run by a surveyor is for the purpose of platting the size and extent of a body of water and for the purpose of ascertaining the quantity of upland, not to determine the location of the bank of the body of water.



9. A tidal epoch is a periodic variation in the rise of water above sea level having a period of 19 years. The epoch is based upon theoretical considerations of an astronomical character and the continuous statistical observation of the rise of water above sea level in the United States since 1854.

The boundary between tidelands and upland ownership is the mean high tide line, which is an average height of all high waters at the place over a tidal epoch. Because the mean high tide line is a fluctuating line, the property boundary is also a moving boundary.

10. The State.
11. Avulsion has no effect on boundaries whether State or private. The land ownership remains as it was.
12. The ordinary high water mark is a legal term as cited in the Civil Code and the Public Resources Code defining the State's boundary. It can represent the natural condition of the shoreline. However, it can also be an adjudicated line rendered by a court decision.

The mean high tide line is a scientific term. It is the average of all high tides in an 19-year epoch of observation. It is an intersecting line of water and land on any given date. It may or may not be the boundary between the uplands and the State, depending on whether the shoreline is natural or artificial.

13. The topographic contour method is an acceptable procedure to locate the mean high tide line.

First, from the known data, the elevation of the mean high tide line must be determined. Mean lower low water = 0.00 ft. The elevation of the mean high tide line in this example is 2.84 ft NGVD ( $4.73 - 1.89 = 2.84$  ft).

From a known bench mark elevation, based on sea level datum, the topographic contour line of 2.84 ft is located on the shore by leveling and conventional horizontal surveying procedures. The rod person would place the rod at the mean high tide line elevation indicated by the level person. The horizontal bearing and distance of each point on the contour would be fixed by a theodolite operator from a known cadastral point. As each mean high tide line elevation is established along the subject property, a stake or lath is placed, thus providing a visual means to see or photograph the mean high tide line. The survey should be timed when the tide is low to avoid any hazardous surf.

14. Because the coast line of the Pacific Ocean is subject to erosion and accretion, it is probable the described 1866 ordinary high water mark would not be in the same location today and the property boundary would move with that line.

The ordinary high water mark may or may not be synonymous with the mean high tide line in reference to tidal waters. To survey the ordinary high water mark, the topographic contour method is an acceptable procedure. From technical data published by the National Oceanic and Atmospheric Administration, the elevation of the mean high tide line (ordinary high water mark) would be determined from a local tide station or interpolated between the two nearest stations. From a known bench mark elevation, based on sea level datum, the calculated topographic contour line is located on the shore by leveling and conventional horizontal surveying procedures. As each mean high tide line station is established along the subject property, it is fixed by bearing and distance from a known cadastral point. A stake or lath is placed at each elevation point on the shore, thus providing a visual means to see or photograph the mean high tide line. The survey should be timed when the tide is low to avoid any hazardous surf.

In California, an artificial influence, such as the construction of breakwaters, has no effect upon littoral boundaries between the State and upland owner. The boundary will remain as it existed, at the last natural location of the shoreline. Determining the last natural shoreline is dependent upon historical research to locate evidence of the shoreline before the artificial condition was introduced. Historic charts, maps, surveys, and historic tide station data are very informative when searching for the best available evidence of the location of the historic water lines.

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