

## SPECIFIED DISTANCE IN A DIRECTION, PATH GIVEN

Examples:

- “7.9 mi N Beatty, on US 95”
- “7 mi. W Santa Barbara on 101 ”

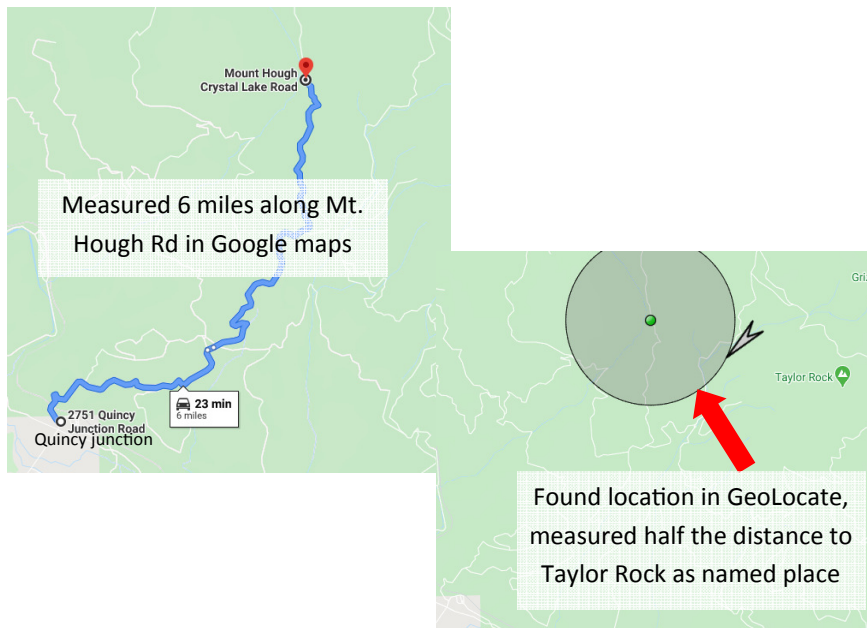
Coordinates

Find the geographic center of the named place as either a Bounded area or Undefined area, as appropriate. Use the measuring tool to follow the specified route for the given distance. Use the end point as the coordinates.

Error radius

Use half the measured distance from the selected coordinates to the center of the nearest named place. Make note of the named place that you measured to in the “Remarks” field on the search results page.

**Example 1:** “Mt. Hough Rd, 6 mi N of Quincy Junction”



# ILLUSTRATED GEOREFERENCING GUIDELINES

Using the point-radius method as per  
Wieczorek, Guo, & Hijmans, 2004



Note: this document is intended to supplement, rather than replace, the Georeferencing Protocol. For training and reference purposes, please refer to the full Georeferencing Protocol.

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## SPECIFIED DISTANCE IN A DIRECTION, NO PATH GIVEN

Examples:

- "50 miles W of Las Vegas"
- "3 km E of Sacramento"

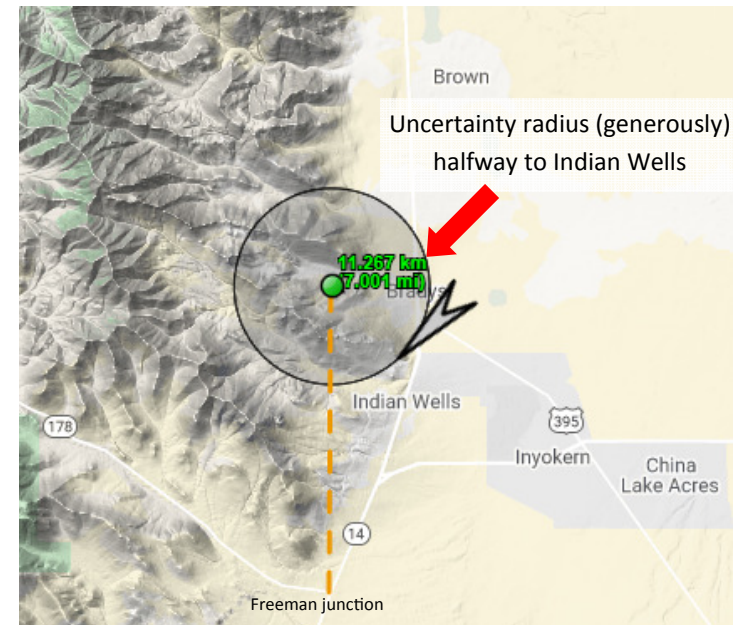
Coordinates

Find the center of the named place and measure the provided distance in the direction provided in the locality description.

Error radius

Use half the measured distance from the selected coordinates to the center of the nearest named place. Make note of the named place that you measured to in the "Remarks" field on the search results page.

**Example 1:** "7 mi N of Freeman Junction"



## DISTANCE IN UNNAMED DIRECTION

Examples:

- “5 km outside Calgary ”
- “2 mi from Cambria”

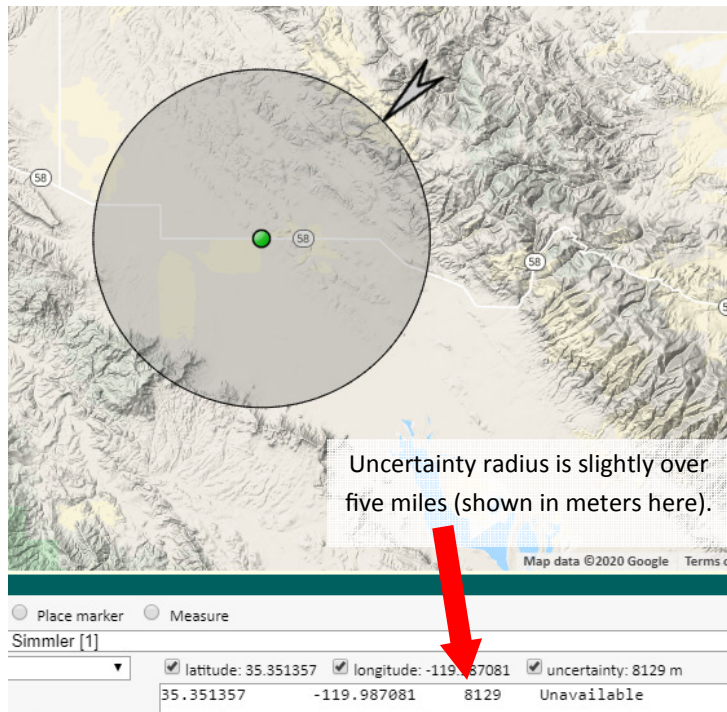
Coordinates

Determine the coordinates as either a **BOUNDED AREA** or **UNDEFINED AREA**, as appropriate.

Error radius

The length of the radius should be the same as the distance given in the locality description

**Example:** “5 mi from Simmler”



## GENERAL TIPS AND TRICKS

- **Always** explain your choice of coordinates and uncertainty radius estimation using the Georeference Remarks fields. This makes the data more reproducible and verifiable.
- Look for additional information in the **habitat** and **elevation** fields that may help you find the specific locality of a specimen. For example, knowing that a specimen was collected at 1000 ft. with “NE exposure” can help you understand which side of a mountain/hill the specimen was collected on.
- Not all specimens are georeference-able! If there is considerable uncertainty about a location, or if the locality data is suspect or potentially flawed/incomplete, make a note of the uncertainty in Georeference Remarks and do not apply coordinates to the record.
- Some areas are too large to georeference. Do not georeference areas to the county level or with an uncertainty radius of 8000m or greater.

### Source of point-radius protocol:

Wieczorek J, Guo Q, Hijmans RJ. 2004. The point-radius method for georeferencing locality descriptions and calculating associated uncertainty. *International Journal of Geographical Information Science*. 18(8):745-767.

## BOUNDED AREA

Examples:

- "Las Vegas"
- "Atascadero"

Coordinates

Estimate geographic center of named place

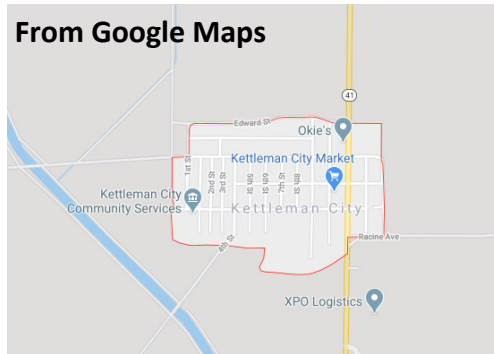
Error radius

Measure distance from center of named place to border of the named area that is furthest from the center

### CAUTION!

Some bounded areas are too large to georeference. Do not apply coordinates to county-level descriptions or larger.

From Google Maps

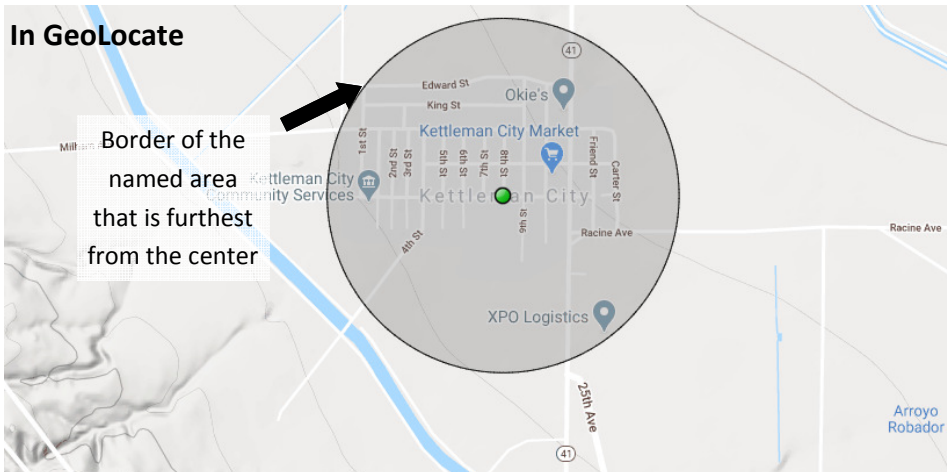


Example:

"Kettleman City"

In GeoLocate

Border of the named area that is furthest from the center



## DIRECTION ONLY, NO DISTANCE

Examples:

- "N of Berkeley"
- "SW of Gainesville"

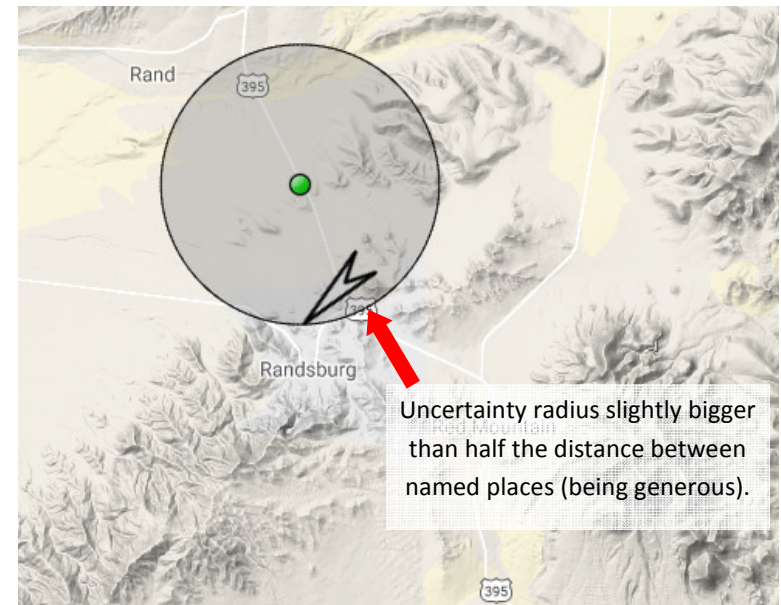
Coordinates

Use the midpoint between the centers of the specified named place and the nearest named place, where the nearest named place to use is in the specified direction. The nearest named place should be, for the first example, the nearest named place somewhere between NW and NE of Berkeley.

Error radius

Use half the distance between the centers of both named places. Be generous in the size of this error radius (i.e., err on the side of making it larger than usual) due to the high level of uncertainty.

Example: "N of Randsburg"





## BETWEEN TWO PLACES

Examples:

- “between Atascadero and San Luis Obispo”
- “between Sacramento River and Main”

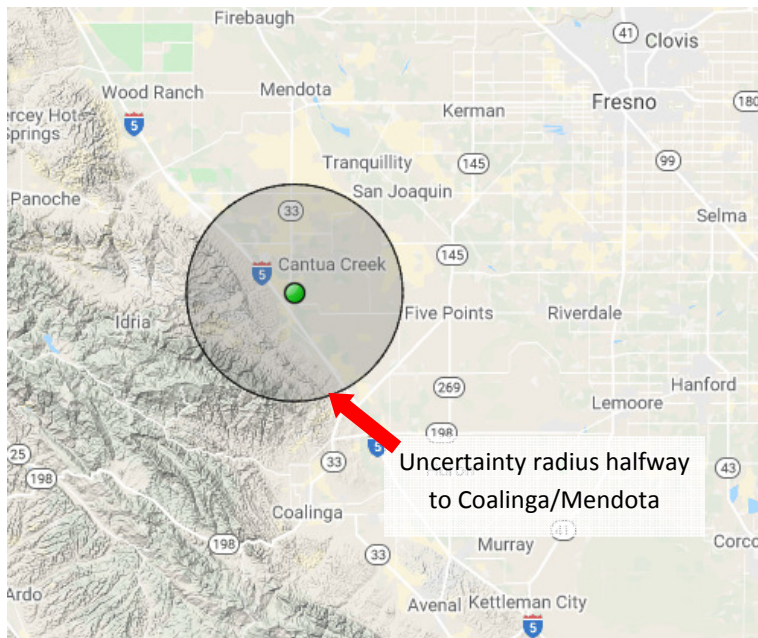
Coordinates

Use the midpoint between the centers of the two named places.

Error radius

Use half the distance between the centers of both named places.

**Example:** “between Mendota and Coalinga”



## UNBOUNDED AREA

Examples:

- “Hoosier Pass”
- “Hills south of Los Osos”

Coordinates

Use visual evidence on a (topographical) map to determine the approximate center of the named place.

Error radius

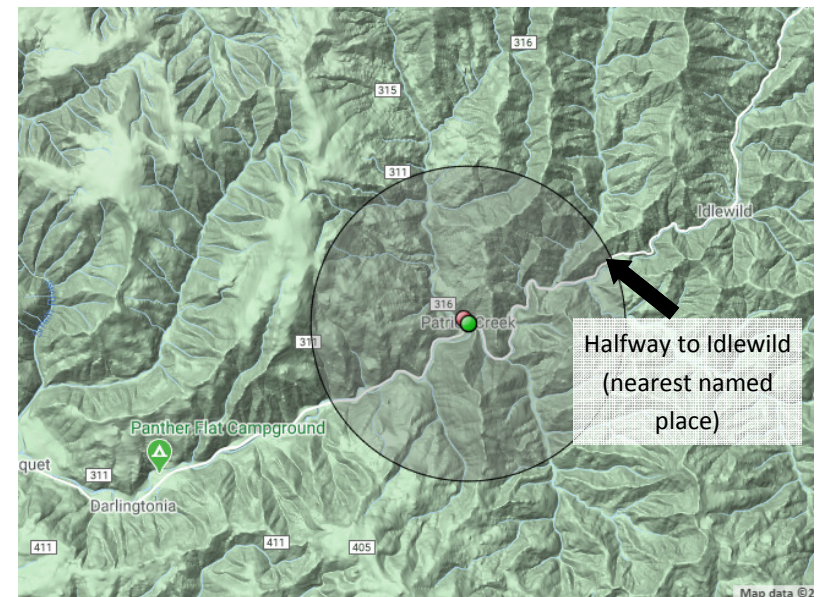
Use half the measured distance from the selected coordinates to the center of the nearest named place (that is outside the rough area encompassed by the unbounded, named place)

**Example:**

“Patrick Creek area”

**CAUTION!**

Some areas are too large to georeference.  
Do not georeference areas with an uncertainty radius of 8000m or greater.



# STREET ADDRESS

Examples:

- "1 Orchard Lane, Berkeley, CA"
- "319 Stadium Dr., Tallahassee, FL"

Coordinates

Locate the address using, e.g. Google maps

Error radius

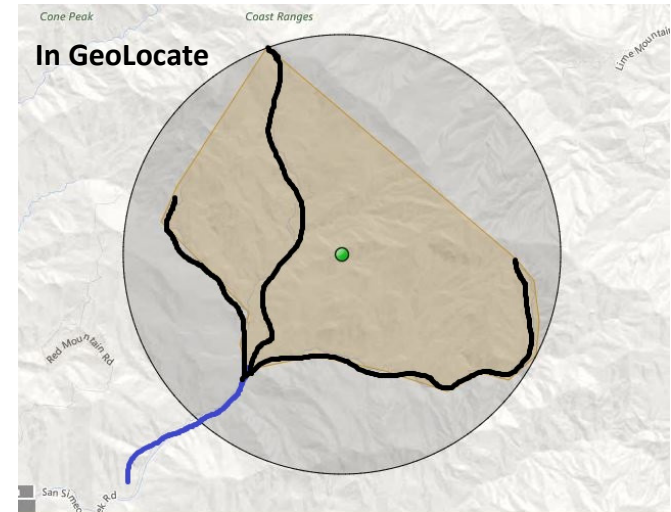
Use half the measured distance from the coordinates to the address on either side of the given address, or as far as necessary to encompass the whole address/parcel. If the address is too difficult to determine, use half the distance to the further end of the block.

**Example:**

"at 2270 N. Euclid in Upland, at residence"



**Example 2: "at headwaters of San Simeon Creek"**



The blue line is San Simeon Creek, but the black lines are named forks of the San Simeon Creek. Since we don't know which one is referred to here, we draw a polygon to encompass all of the forks and adjust the radius accordingly. The marker is placed at the midpoint of the polygon.

**Example 3: "mouth of Osos Creek"**

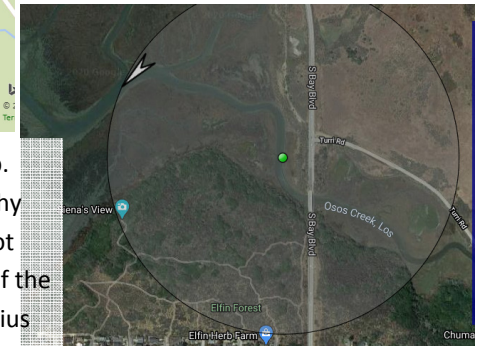


**Bing Maps**

...but not so much on a terrain map. Because the creek drains to a marshy area, here we chose to place the dot close to the "street maps" mouth of the creek, then use the uncertainty radius to indicate how uncertain we are about the collector's true meaning.

Here's a case in which the reality is more complicated than the protocol makes it out to be. It's easy to pinpoint the mouth of the creek on a street map....

**Google Satellite**



# MOUTH/HEADWATERS OF RIVER, CONFLUENCE OF WATERWAYS, TRAILHEAD

Examples:

- “headwaters of the Missouri River ”
- “Triangle Lake Trailhead”

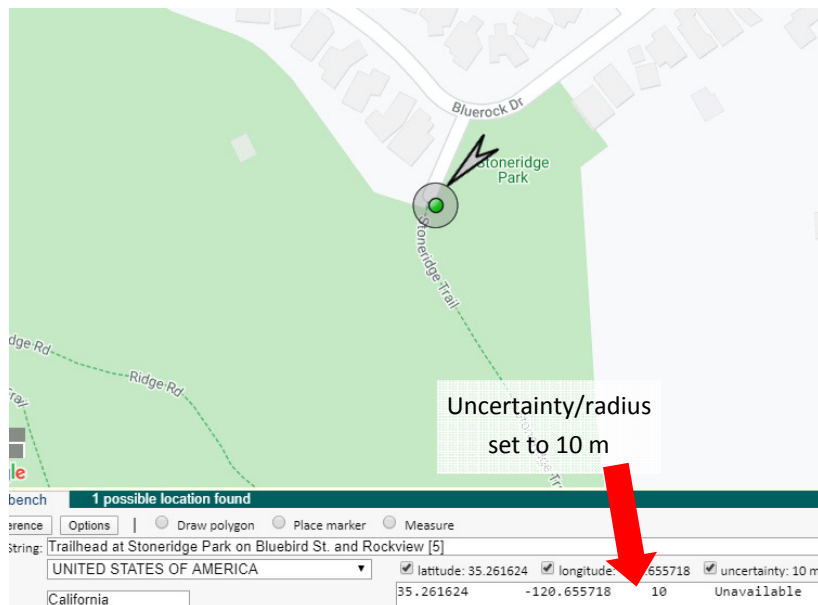
Coordinates

For a river mouth or confluence of waterways, select the midpoint of the line connecting the opposite shores where the waterways meet. For a river source, select the point of highest elevation on the river or create a boundary around the multiple streams contributing to the river and find the geographic center of that bounded area. For a trailhead, select the point where the trail begins.

Error radius

For a river mouth or confluence of waterways, use the distance from the chosen point to the shore. For a single river source or trailhead, use 10 m.

**Example 1:** “Trailhead at Stoneridge Park on Bluebird St. and Rockview”



# JUNCTION, INTERSECTION, CROSSING

Examples:

- “junction of Coora Rd. and E Siparia Rd.”
- “bridge over Willamette River ”

Coordinates

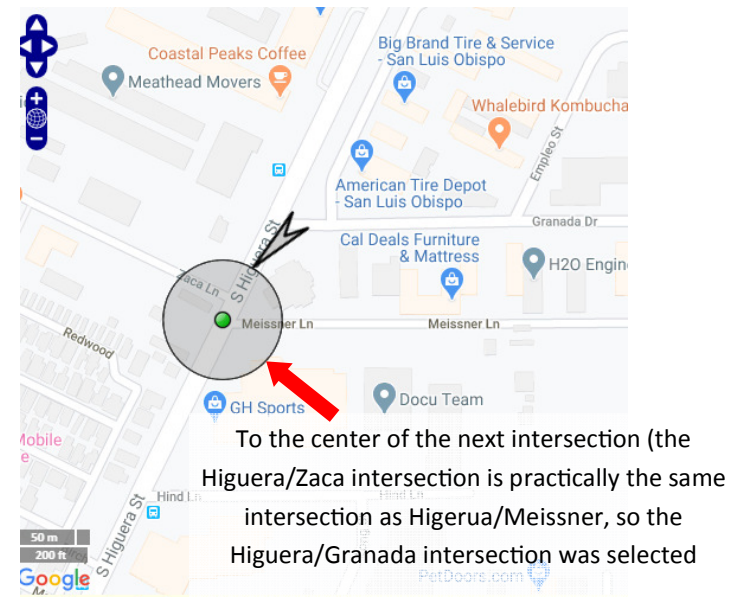
Use the coordinates of the center of the intersection.

Error radius

Use satellite or aerial images to find the extent of the intersection by measuring the distance from the center to the furthest part of it. If this is not possible, use the number of lanes of the larger of the two roads and multiply by 4 meters. If the locality is “near” the intersection, use half the distance to the nearest intersection or named place, whichever is less.

**Example:**

“near intersection of Meissner Rd and S Higuera St”





## RIVER, STREAM, ROAD, PATH

Examples:

- “Sacramento River ”
- “Los Osos Valley Road”

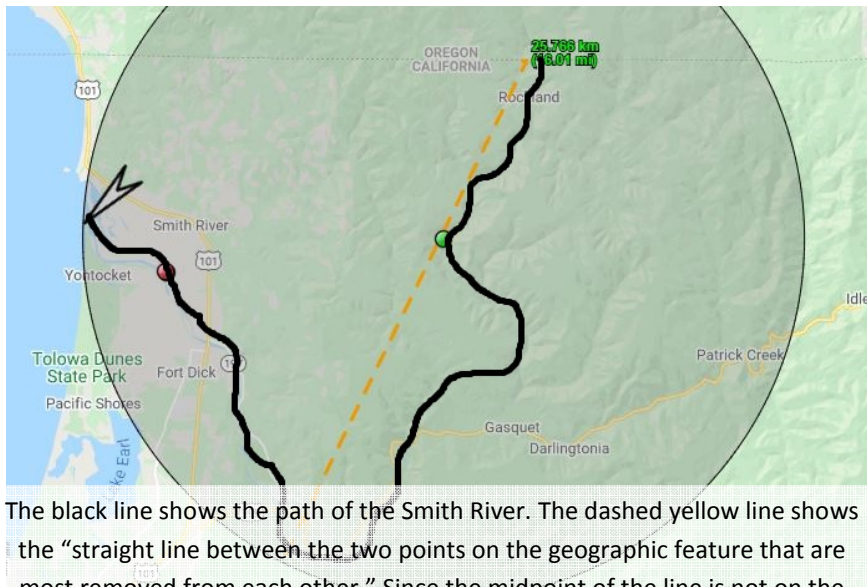
Coordinates

Make a straight line between the two points on the geographic feature that are most removed from each other, yet still within the administrative boundaries (e.g., county) specified in the locality description. Choose the point on the feature nearest to the midpoint of the line.

Error radius

Use one of the ends of the straight line that you made between the two points on the geographic feature that are most removed from each other, yet still within the specified administrative boundaries

**Example:** “California, Del Norte County, Smith River”



The black line shows the path of the Smith River. The dashed yellow line shows the “straight line between the two points on the geographic feature that are most removed from each other.” Since the midpoint of the line is not on the river, we find the point on the river closest to the midpoint of the line. Then the error radius extends to the furthest end point of that river (grey arrow).

## NEAR A NAMED PLACE

Examples:

- “vicinity of Mt. Hood”
- “near Sacramento”

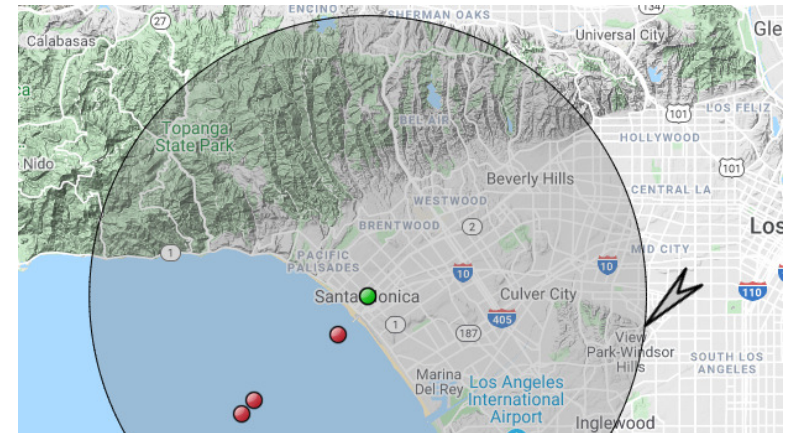
Coordinates

Determine the coordinates as either a **BOUNDED AREA** or **UNDEFINED AREA**, as appropriate.

Error radius

Determine the distance as either a Bounded area or Undefined area, as appropriate. Be generous in the size of this error radius (i.e., err on the side of making it larger than usual) since “near” and “vicinity” indicate a high level of uncertainty.

**Example:** “near Santa Monica”



Because this is a very vague locality description, we have to be very careful about how we indicate our uncertainty, which might require some extra research. From the record label, we found that the specimen was collected in 1891 and that the specimen was collected on “grassy hills”. Looking at the terrain map, we see some hills outside the bounded area of Santa Monica. Combined with this and the fact that the surrounding named places might not have existed in 1891, we will be generous with our error radius here.