



NYBG

Georeferencing Specimen Localities

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EXAMPLES

Feature – with Obvious Spatial Extent using GEOLocate

Feature – without Obvious Spatial Extent using Google Maps & MaNIS Georeferencing Calc.

Offset – Distance at a Heading using Google Maps & the MaNIS Georeferencing Calculator

Offset – Path using Google Maps and the MaNIS Georeferencing Calculator



Feature – with Obvious Spatial Extent

Example: Lisbon Falls, Lisbon Co., Maine (U.S.)

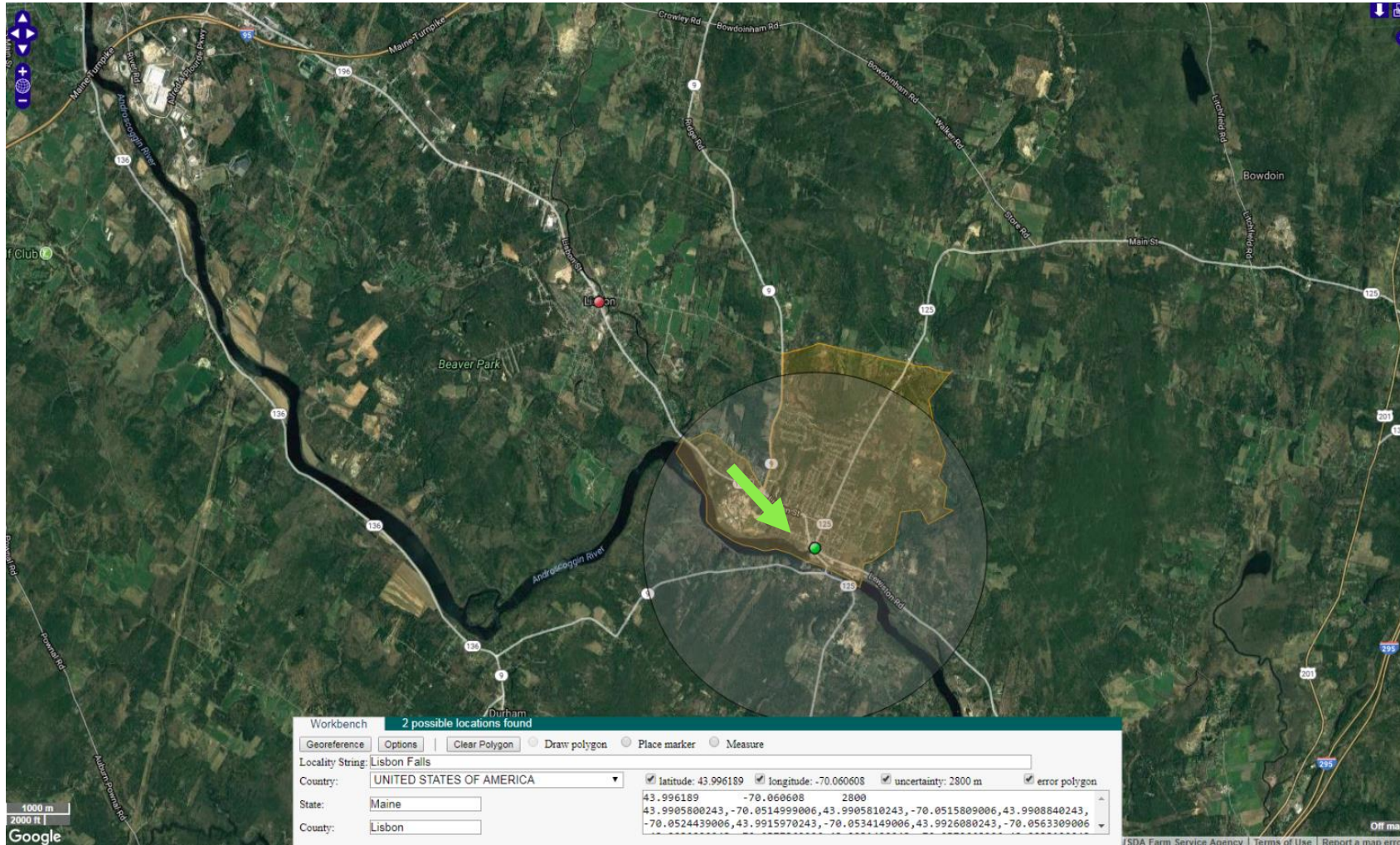
Procedure:

- Use GEOLocate to find coordinates and radial for the city
- Ensure coordinates are at corrected center of the city
- Edit radial to encompass area as precisely as possible (snap to feature)

GEOLocate is best for 'simple' localities and to find offsets at a heading



GEOLOCATE



GEOLocate finds coordinates within Lisbon Falls

Coordinates need to be shifted to a more appropriate center

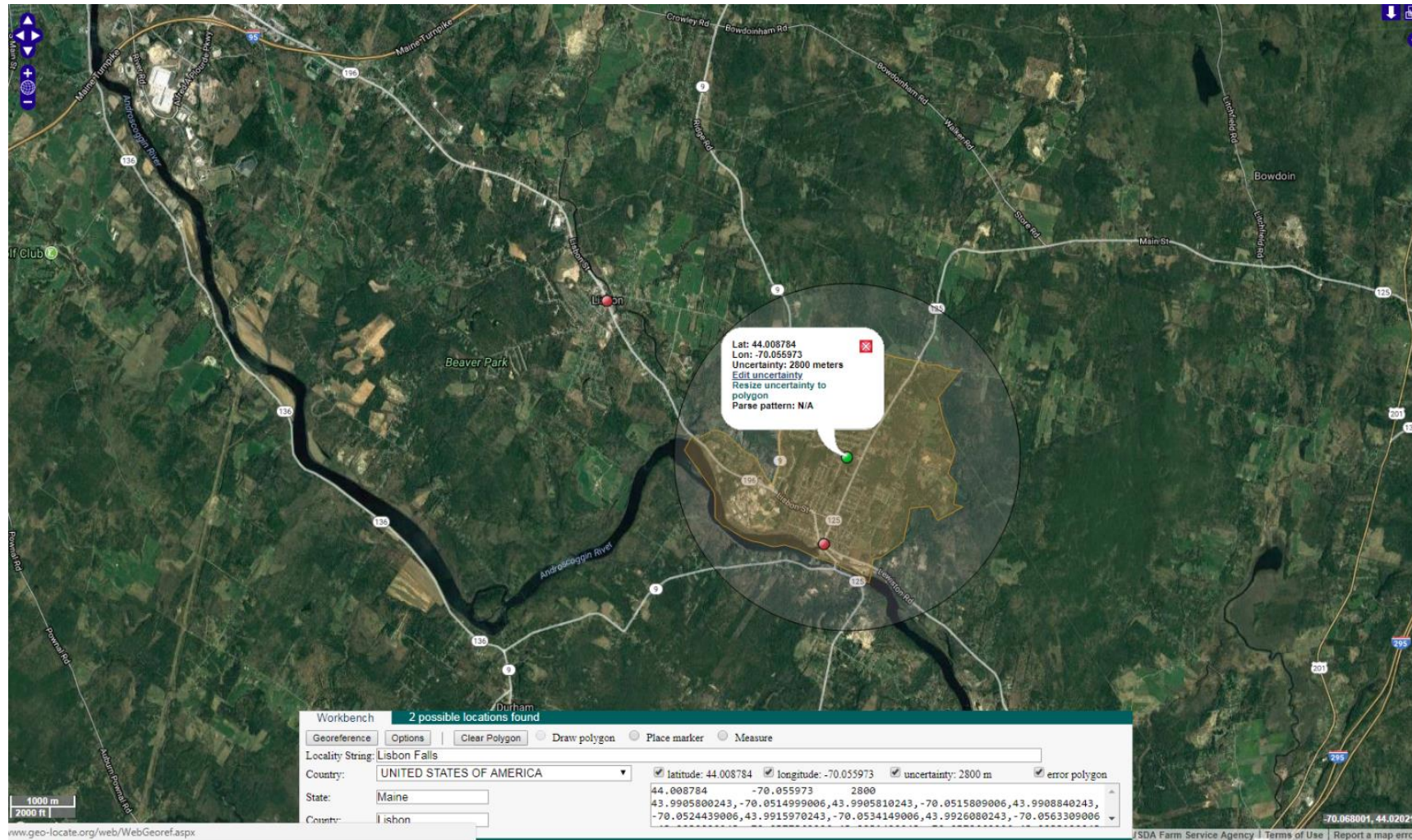
Uncertainty radius does not encompass entire area of city



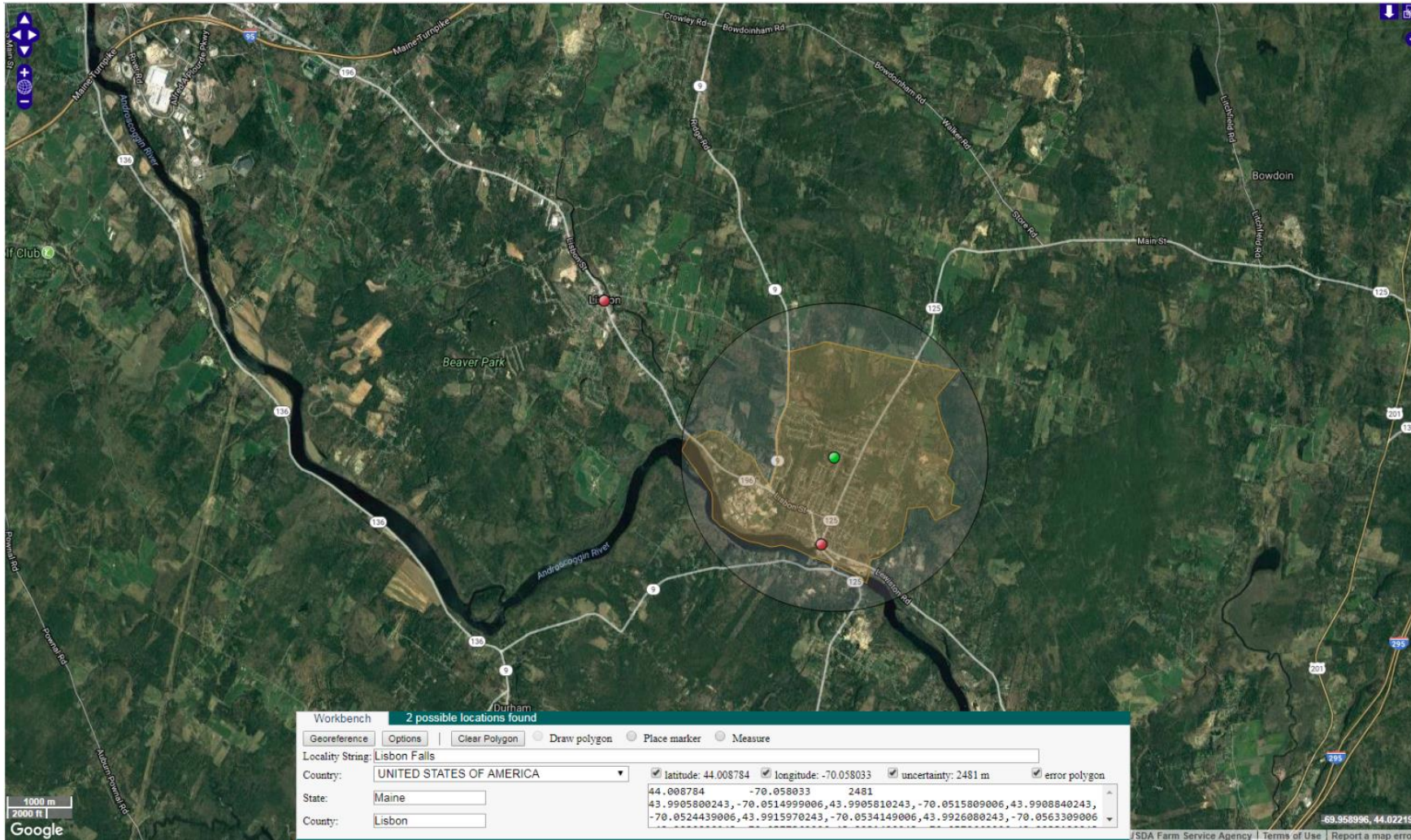
COORDINATE ADJUSTMENT

Adjust point to
be in approximate
center of region

Uncertainty
should encompass
entire area of
city (polygon)



EDIT UNCERTAINTY



Resize
uncertainty to
polygon (faster
than manually
editing the
radius)

Note: polygon of
city extent is
not always
displayed/known



Feature – without Obvious Spatial Extent

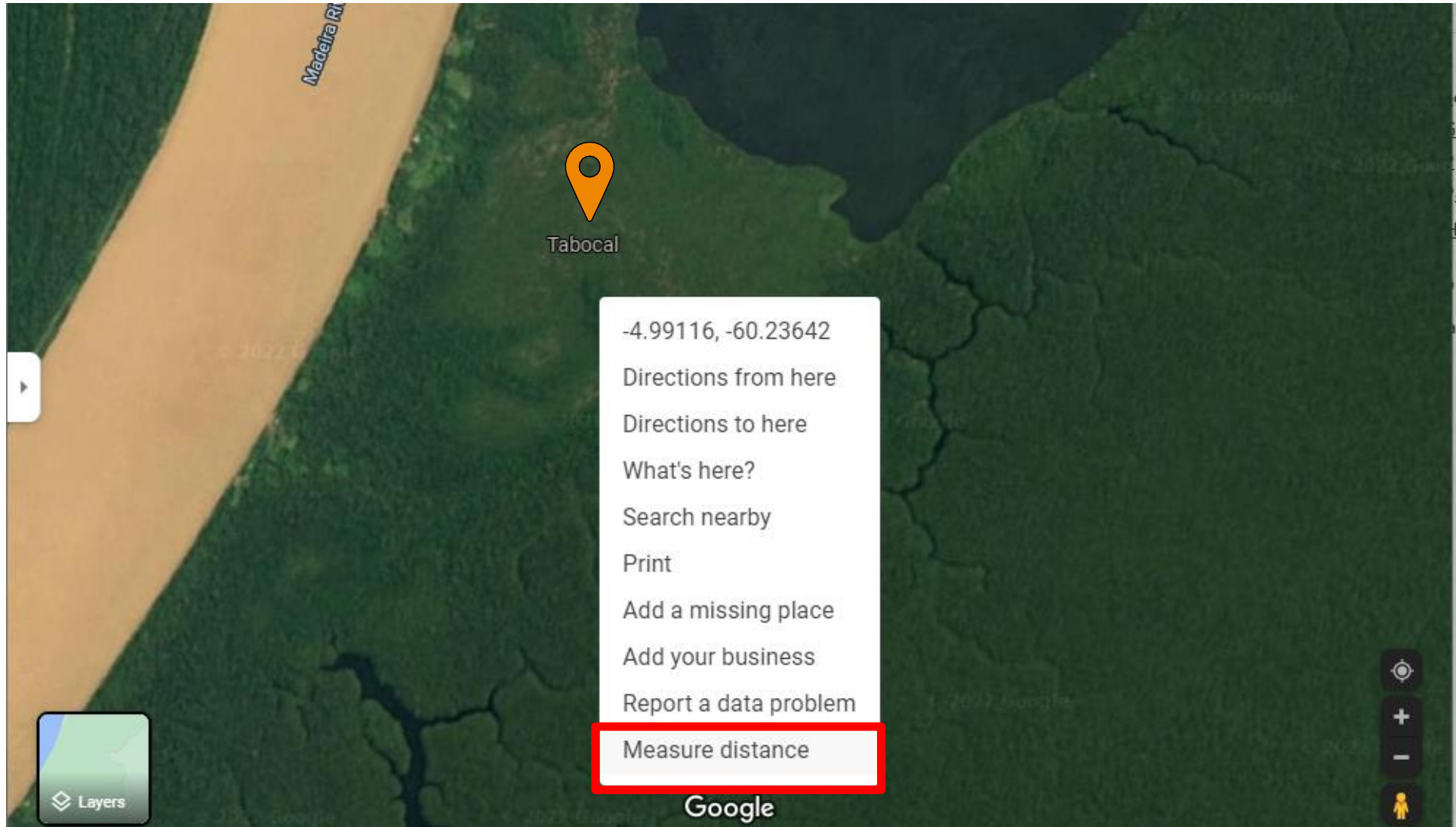
Example: Tabocal, Amazonas (Brazil)

- Use Google Maps to locate coordinates of the area
- Measure from the coordinates to the approximate center of the nearest feature (of similar locality type)
- Divide distance in half to approximate the radial
- Input information into the MaNIS Georef. Calculator to find the uncertainty radius

Instructions are from previous version of the Quick Reference Guide (Wieczorek 2012) but in agreement with the updated guide (Zermoglio 2020)



PINNING YOUR LOCATION



To begin, right-click on the map where Google Maps displays the name of the location and select the "Measure distance" tool



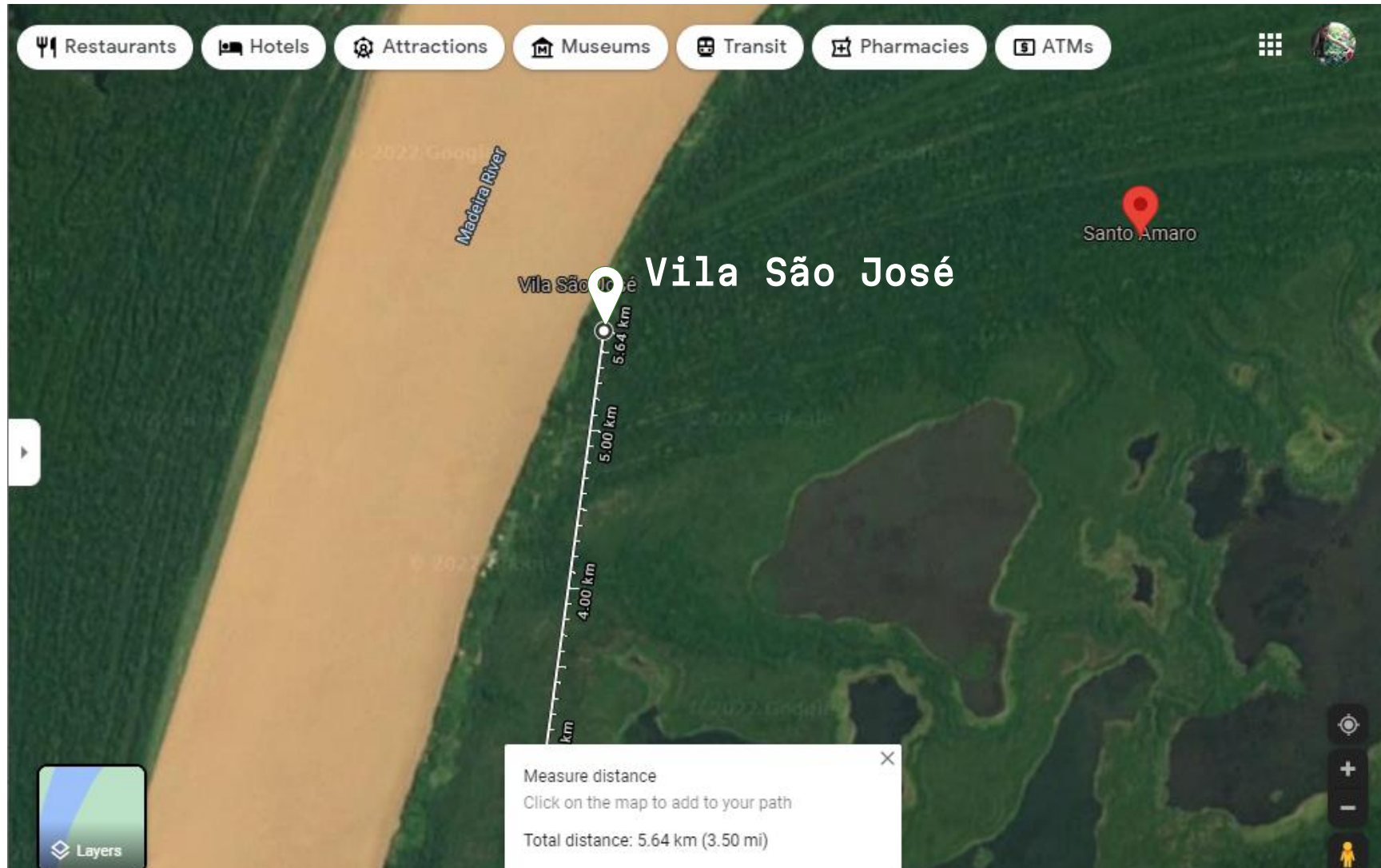
FIND NEAREST NAMED PLACE



To find the nearest named feature you must pan around the map



MEASURE



Vila São José is nearest; measure a straight line between centers of both features, then halve
distance = radial



RADIAL PROTOCOL



CALCULATOR PROCEDURE

GEOREFERENCING QUICK REFERENCE GUIDE

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LOCALITY TYPE	CALCULATION PROCEDURE (instructions on how to use the Georeferencing Calculator)
Named place Undefined Area: Locality refers to a geographic feature that does not have a clear spatial boundary <i>Example: "Pampa Grande" (the extent is 4.7 km given that the center of the nearest named place, "Colonia Mariano Sarratea" is 9.4 km distant)</i>	<p>Calculation Type: "Error only - enter Lat/Long for the actual locality"</p> <p>Locality Type: "Named place only" ←</p> <p>Coordinates: Determine the coordinates for the named place as well as possible using visible evidence near the label for the named place on the map.</p> <p>Extent: Use half the measured distance from the selected coordinates to the center of the nearest named place. Make note of the measure and the nearest named place in <u>georeferenceRemarks</u>.</p>



LOCALITY TYPE

Locality Type = Geographic
feature only

English ▾

Georeferencing Calculator

Locality Type: Geographic feature only (e.g., Bakersfield) ▾

Distance Converter: km ▾ = km ▾

Scale Converter: mm ▾ 1:24000 ▾ = km ▾

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[MaNIS Georeferencing Calculator](#)

Undefined Area: Tabocal, Município Borba, Amazonas (Brazil)



COORDINATE SOURCE, FORMAT, DATUM, PRECISION

- Coordinate Source: Google Maps > 2008
- Coordinate Format: Based on coordinate source (Google Maps) = decimal degrees
- Datum: WGS84 (Google Maps)
- Precision (of the coordinates): exact (Google Maps)

The screenshot shows the 'Georeferencing Calculator' interface. It includes a language dropdown set to 'English'. The 'Locality Type' is 'Geographic feature only (e.g., Bakersfield)'. The 'Coordinate Source' is 'Google Earth/Maps >2008', 'Coordinate Format' is 'decimal degrees', 'Datum' is '(WGS84) World Geodetic System 1984', and 'Precision' is 'exact'. There are input fields for 'Input Latitude', 'Input Longitude', 'Radial of Feature', 'Measurement Error', and 'Distance Units' (set to 'km'). Buttons for 'Calculate', 'Copy', and 'Go here' are present. Below these are fields for 'Latitude', 'Longitude', 'Uncertainty (m)', 'Datum', 'Precision', 'Date', 'Georeferenced by', and 'Protocol' (set to 'protocol not recorded'). At the bottom, there are 'Distance Converter' and 'Scale Converter' sections with input fields and unit dropdowns. The footer shows 'Version 20210127en' and 'Copyright 2020 Rauthiflor LLC'.

Undefined Area: Tabocal, Município Borba, Amazonas (Brazil)



LATITUDE AND LONGITUDE

Latitude & Longitude do not need to be entered – important only when calculating offset coordinates

The screenshot shows the 'Georeferencing Calculator' web application. It features a background map of South America. The interface includes several input fields and dropdown menus for configuring georeferencing data. At the bottom, there are sections for distance and scale conversion.

Latitude	Longitude	Uncertainty (m)	Datum

Precision	Date	Georeferenced by	Protocol
			protocol not recorded

Distance Converter: km = km

Scale Converter: mm 1:24000 = km

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Undefined Area: Tabocal, Município Borba, Amazonas (Brazil)



RADIAL

Radial of Feature: calculated radial of Tabocal

Measurement Error: 10m
(standard)

= Error associated with the georeferencer's ability to measure on the map

Distance Unit: m (must reflect the two fields above)

Georeferencing Calculator

English

Locality Type: Geographic feature only (e.g., Bakersfield)

Coordinate Source: Google Earth/Maps >2008

Coordinate Format: decimal degrees

Input Latitude: 0

Input Longitude: 0

Datum: (WGS84) World Geodetic System 1984

Precision: exact

Radial of Feature: 2820

Measurement Error: 10

Distance Units: m

Calculate Copy Go here

Latitude	Longitude	Uncertainty (m)	Datum

Precision	Date	Georeferenced by	Protocol
	2022-01-27T00:06:00		protocol not recorded

Distance Converter: km = km

Scale Converter: mm 1:24000 = km

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Undefined Area: Tabocal, Município Borba, Amazonas (Brazil)



CALCULATE

Uncertainty radius
is provided in
meters, regardless
of the input unit

Georeferencing Calculator

English ▾

Locality Type: Geographic feature only (e.g., Bakersfield) ▾

Coordinate Source: Google Earth/Maps >2008 ▾

Coordinate Format: decimal degrees ▾

Input Latitude: 0

Input Longitude: 0

Datum: (WGS84) World Geodetic System 1984 ▾

Precision: exact ▾

Radial of Feature: 2820

Measurement Error: 10

Distance Units: m ▾

Calculate Copy Go here

Latitude: 0 Longitude: 0 Uncertainty (m): 2838 Datum: (WGS84) World Geodetic System 1984

Precision: 0.0000001 Date: 2022-01-27T00:06: Georeferenced by: Protocol: protocol not recorded ▾

Distance Converter: km ▾ = km ▾

Scale Converter: mm ▾ 1:24000 ▾ = km ▾

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Undefined Area: Tabocal, Município Borba, Amazonas (Brazil)



Offset – Distance at a Heading

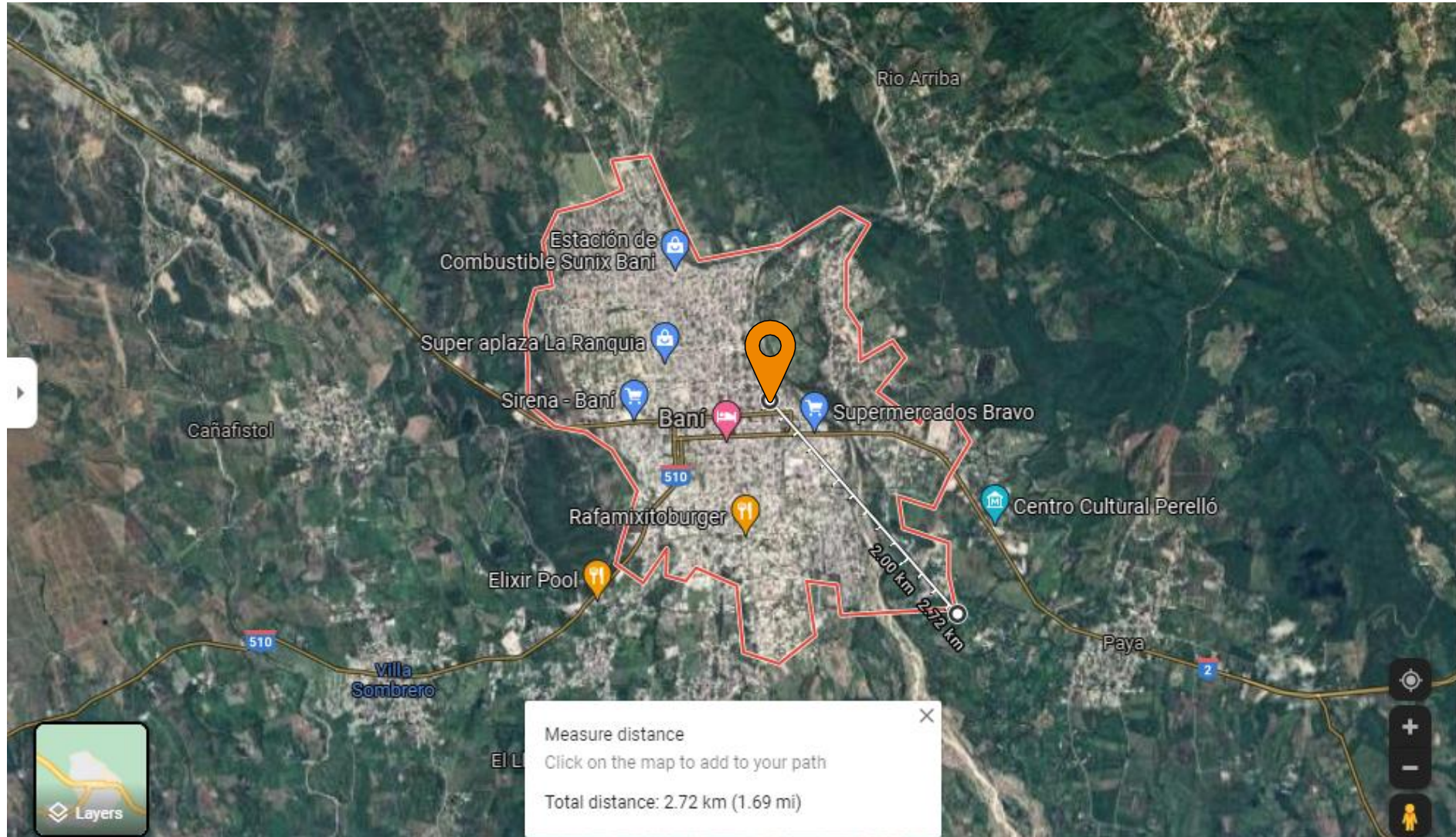
Example: 5km north of Baní, Dominican Republic

- Use Google Maps to locate coordinates of the city
- Find radial by measuring from coordinates to the farthest extent of the city
- Input information into the MaNIS Georeferencing Calculator to find the offset coordinates and the uncertainty radius.

Note: Use GEOLocate when applicable (U.S., Canada, Europe)



COORDINATES & RADIAL



Locate coordinates of Bani center (18.2822270, -70.328719) and radial (2.72km to match offset units)



CALCULATOR PROCEDURE

GEOREFERENCING QUICK REFERENCE GUIDE

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LOCALITY TYPE	CALCULATION PROCEDURE (instructions on how to use the Georeferencing Calculator)
<div>Offset</div> <div>Offset at a heading</div> <div>Examples: "50 miles W of Las Vegas", "10 km E de Amamá"</div>	<p>Calculation Type: "Coordinates and error - enter the Lat/Long for the named place or starting point"</p> <p>Locality Type: <u>"Distance at a heading"</u> ←</p> <p>Coordinates: If "by road" or other path is specified in the locality description, use the method under Offset Along a Path. If the description could be interpreted reasonably either by a route or by air, use the method under More Than One Possibility. Otherwise, assume that the heading is "by air" and note this assumption in georeferenceRemarks. In this case use the coordinates of the geographic center of the named place as a starting point in the Georeferencing Calculator. These are not the coordinates of the locality, which will be given in the fields to the left of the Calculate button when it is clicked after all the fields above it have been entered.</p> <p>Extent: As for Named Places – Bounded Area or Named Places – Undefined Area, as appropriate.</p>



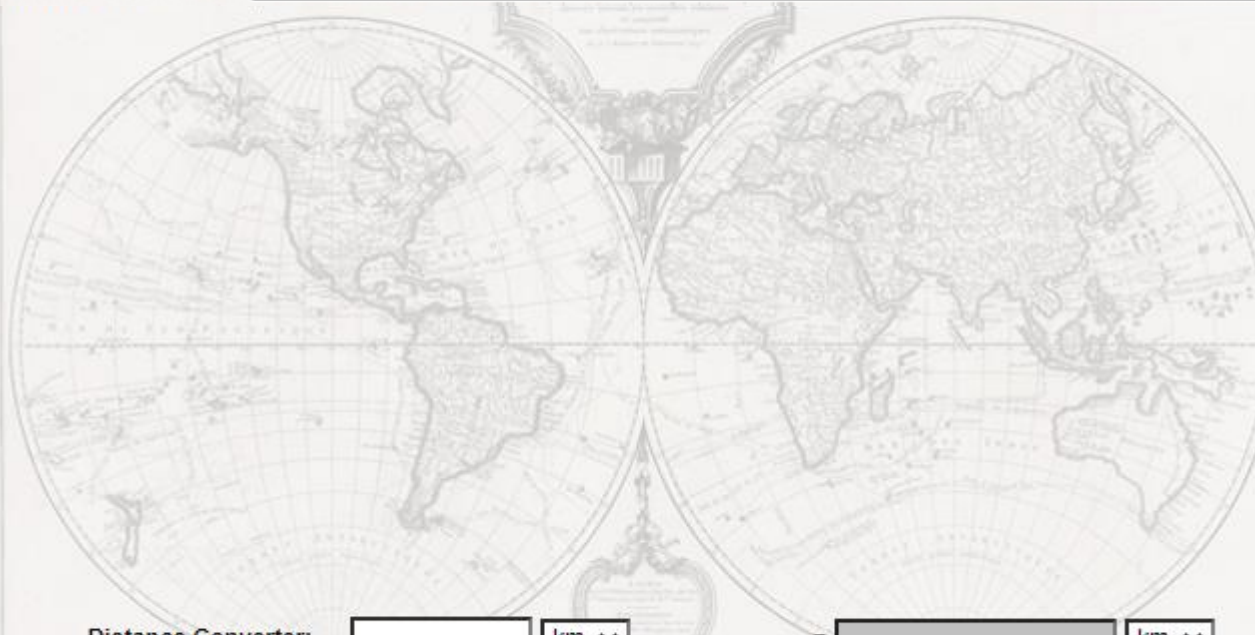
LOCALITY TYPE

Locality Type: Distance at a heading

English ▾

Georeferencing Calculator

Locality Type ▾ Distance at a heading (e.g., 10 mi E (by air) Bakersfield) ▾



Distance Converter: km ▾ = km ▾

Scale Converter: mm ▾ 1:24000 ▾ = km ▾

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Offset at a Heading: 5km N of Baní



COORDINATE SOURCE, FORMAT, DATUM, PRECISION

- Coordinate Source: **Google Maps > 2008**
- Coordinate Format: Based on coordinate source (Google Maps) = **decimal degrees**
- Input Latitude/Long.: **coordinates** must be entered in order to calculate the offset coordinates according to input parameters
- Datum: **WGS84** (Google Maps)
- Precision (of the coordinates): **exact** (Google Maps)

Georeferencing Calculator

English

Locality Type: Distance at a heading (e.g., 10 mi E (by air) Bakersfield)

Coordinate Source: Google Earth/Maps >2008

Coordinate Format: decimal degrees

Input Latitude: 18.282227044

Input Longitude: -70.32871990

Datum: (WGS84) World Geodetic System 1984

Precision: exact

Direction: degrees from N

Offset Distance:

Radial of Feature:

Measurement Error:

Distance Units: km

Precision: 1 km

Calculate Copy Go here

Latitude	Longitude	Uncertainty (m)	Datum

Precision	Date	Georeferenced by	Protocol
	2022-01-27T00:06:00		protocol not recorded

Distance Converter: km

Scale Converter: mm 1:24000

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Offset at a Heading: 5km N of Baní



OFFSET

Offset Direction: **N**

Offset Distance: **5(km)** –
according to locality description.

Radial of Feature: (Starting point
of offset)
City of Baní = **2.72(km)**

Measurement Error:
Always use 10m (or **0.01km**)

Distance Precision:
precision of 5km distance is **1km**

* Maintain consistency in
measurement units

The screenshot shows the 'Georeferencing Calculator' interface. The following fields are highlighted with red boxes:

- Direction: N
- Offset Distance: 5
- Radial of Feature: 2.72
- Measurement Error: .010
- Distance Units: km
- Precision: 1 km

The interface also includes a table for distance and precision conversions:

Distance	Precision
8 km	1 km
8.5 km	0.5 km
8.25 km	0.25 km
8.75 km	0.25 km
8.6 km	0.1 km
8.0 km	0.1 km
8.16 km	0.01 km

80 km	10 km
800 km	100 km
1000 km	500 km

Offset at a Heading: 5km N of Baní

CALCULATE

Offset coordinates and uncertainty radius (in meters) are provided.

Georeferencing Calculator

English ▾

Locality Type Distance at a heading (e.g., 10 mi E (by air) Bakersfield) ▾

Coordinate Source Google Earth/Maps >2008 ▾ Direction N ▾

Coordinate Format decimal degrees ▾

Input Latitude 18.282227044

Input Longitude -70.32871990

Datum (WGS84) World Geodetic System 1984 ▾

Precision exact ▾

Offset Distance 5

Radial of Feature 2.72

Measurement Error .010

Distance Units km ▾

Precision 1 km ▾

Calculate Copy Go here

Latitude	Longitude	Uncertainty (m)	Datum
18.3274008	-70.3287199	5883	(WGS84) World Geodetic System 1984

Precision 0.0000001 Date 2022-01-27T01:20: Georeferenced by Protocol protocol not recorded ▾

Distance Converter: km ▾ = km ▾

Scale Converter: mm ▾ 1:24000 ▾ = km ▾

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Offset at a Heading: 5km N of Baní



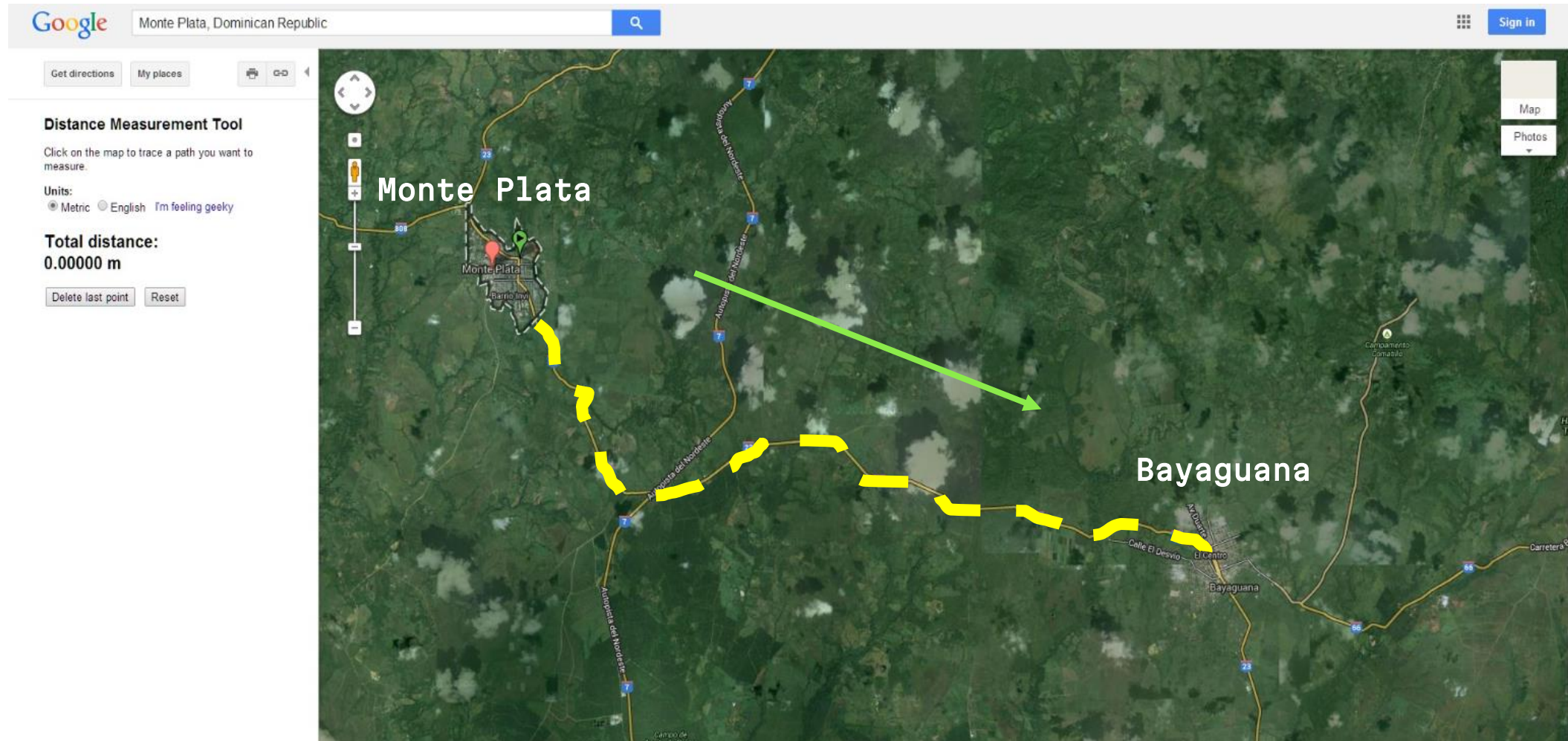
Offset – Offset along a Path

Example: 3km along Monte Plata–Bayaguana Road, D.R.

- Use Google Maps to locate road connecting the cities
- Measure 3km along road in specified direction (from Monte Plata toward Bayaguana) starting from first named place and capture coordinates
- Find radial by measuring from starting location of offset to farthest extent of linear feature within city bounds
- Input information into the MaNIS Georeferencing Calculator to find the uncertainty radius.



ASSESS



Locate road connecting the cities. Begin measuring offset from location where road comes nearest to Monte Plata center



COORDINATES

The screenshot displays the Google Maps interface with a search bar at the top containing "Monte Plata, Dominican Republic". On the left, the "Distance Measurement Tool" is active, showing a total distance of 2.99999 km. The main map area shows a road with a red line indicating the measured path. A popup window in the center-right of the map displays the coordinates "18.7882003-69.7738963". The bottom of the map includes a scale bar (100 ft / 20 m) and copyright information.

Google

Monte Plata, Dominican Republic

Get directions My places

Distance Measurement Tool

Click on the map to trace a path you want to measure.

Units: ☒ Metric ☐ English [I'm feeling geeky](#)

Total distance:
2.99999 km

Delete last point Reset

The page at <https://maps.google.com> says:

Latitude and Longitude

18.7882003-69.7738963

OK Cancel

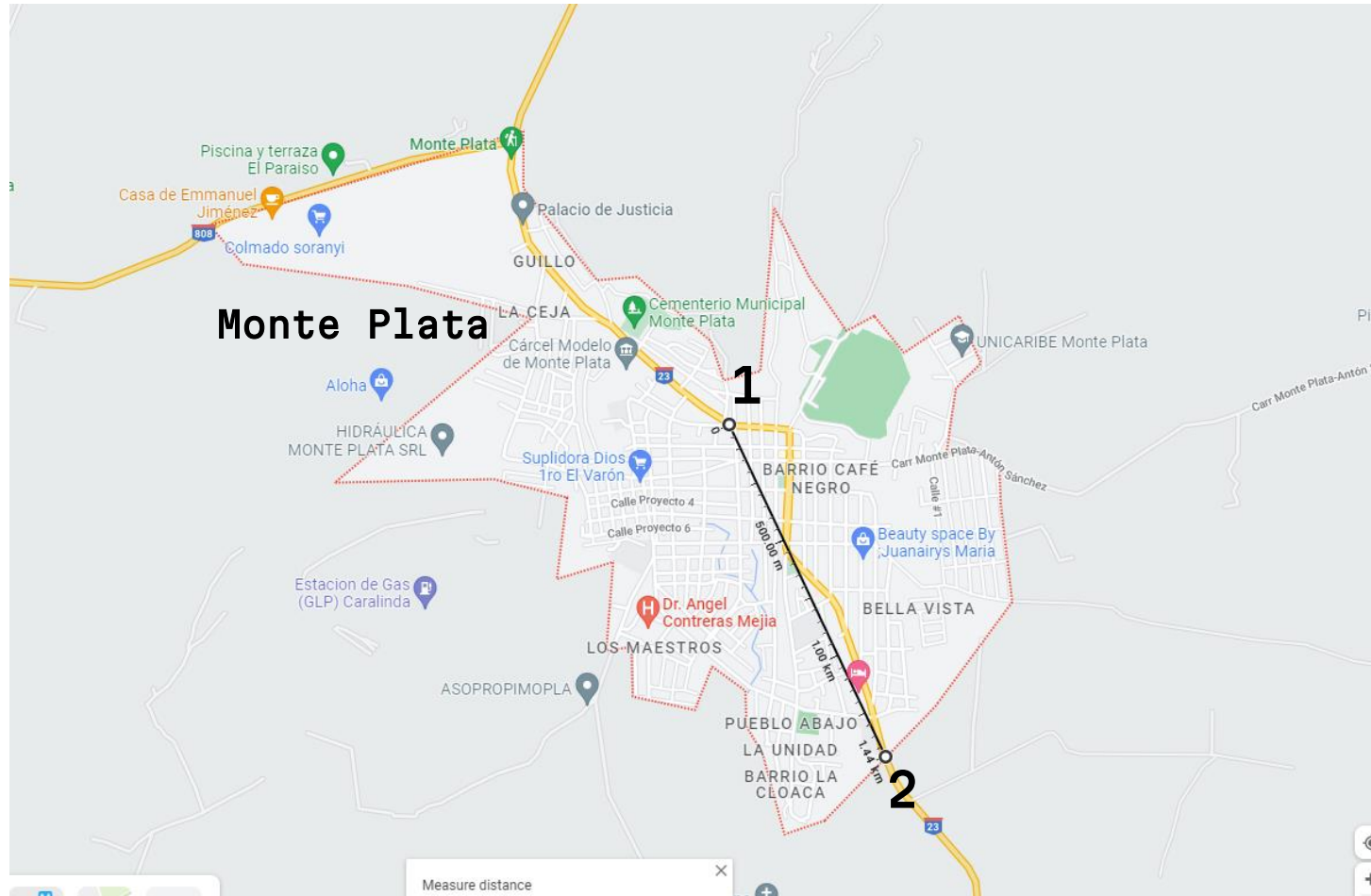
100 ft
20 m

Imagery ©2014 DigitalGlobe, Map data ©2014 Google Edit in Google Map Maker Report a problem

Zoom in and precisely measure along the road to the offset distance stated (toward the city of Bayaguana); capture coordinates



RADIAL



The starting node of the ruler (1) marks the starting location for the offset, the second node (2) marks the farthest reaches of the road within city limits



CALCULATOR PROCEDURE

GEOREFERENCING QUICK REFERENCE GUIDE

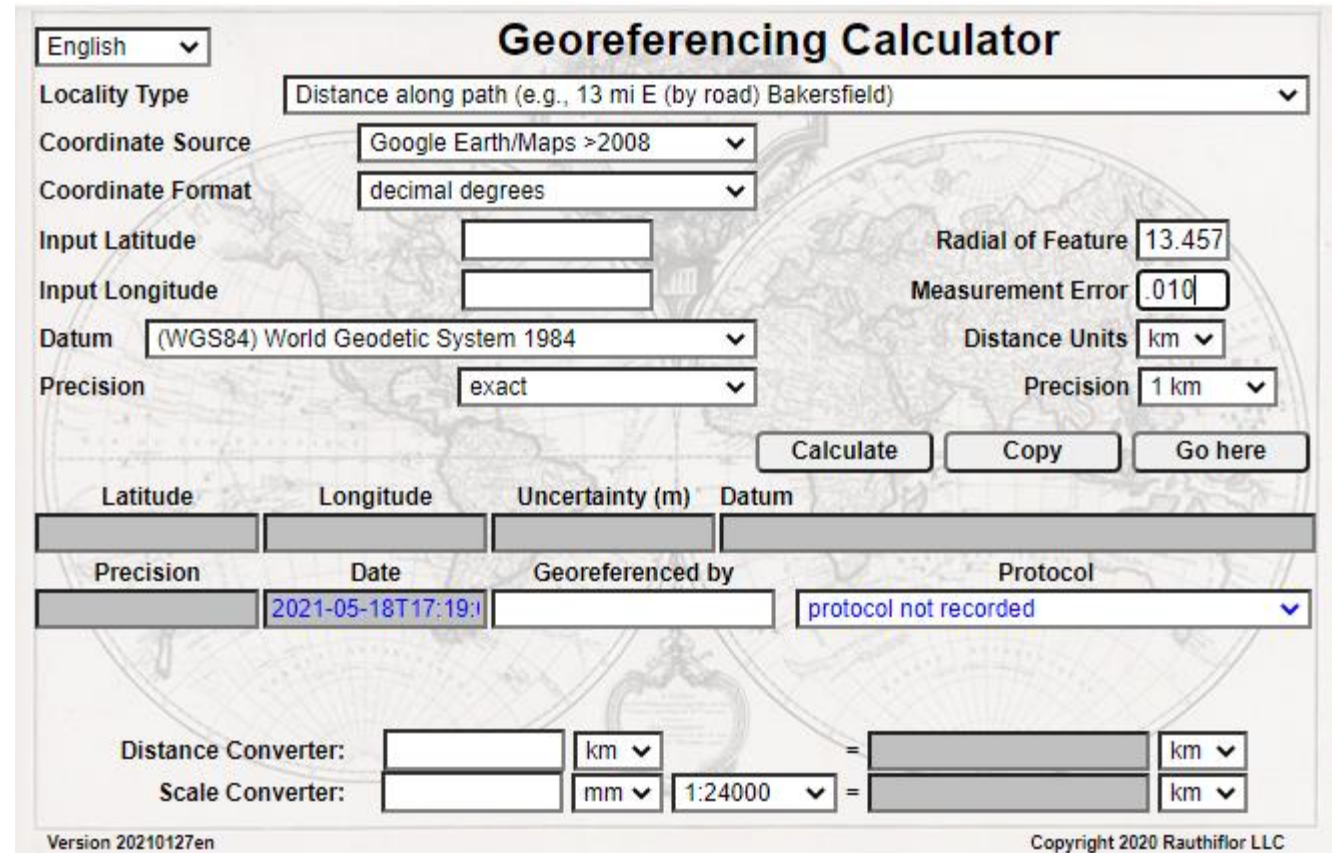
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LOCALITY TYPE	CALCULATION PROCEDURE (instructions on how to use the Georeferencing Calculator)
<div>Offset</div> <div>Offset along a path</div> <div>Examples: "7.9 mi N Beatty, on US 95", "3 km en el Rio Jimenez arriba de Anita Grande", "left bank of the Mississippi River, 16 mi downstream from St. Louis", "Ruta Nacional 81, 8 km W de Ingeniero Guillermo Nicasio Juárez"</div>	<p>Calculation Type: "Error only - enter Lat/Long for the actual locality"</p> <p>Locality Type: <u>"Distance along a Path"</u> ←</p> <p>Coordinates: Find the center of the named place as you would for Named Place – Bounded Area or Named Place – Undefined Area, as appropriate. Use a measuring tool on a printed or digital map to follow the specified route for the given distance. Use the end point as the coordinates. If no specific path is specified in the locality description, be sure to note in georeferenceRemarks which path was measured.</p> <p>Extent: As for Named Place – Bounded Area or Named Place – Undefined Area, as appropriate.</p>



LOCALITY TYPE

Locality Type: Distance along a path



Georeferencing Calculator

English ▾

Locality Type: Distance along path (e.g., 13 mi E (by road) Bakersfield) ▾

Coordinate Source: Google Earth/Maps >2008 ▾

Coordinate Format: decimal degrees ▾

Input Latitude:

Input Longitude:

Datum: (WGS84) World Geodetic System 1984 ▾

Precision: exact ▾

Radial of Feature: 13.457

Measurement Error: 010

Distance Units: km ▾

Precision: 1 km ▾

Calculate Copy Go here

Latitude	Longitude	Uncertainty (m)	Datum

Precision	Date	Georeferenced by	Protocol
	2021-05-18T17:19:1		protocol not recorded ▾

Distance Converter: km ▾ = km ▾

Scale Converter: mm ▾ 1:24000 ▾ = km ▾

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Offset Along a Path: 3km along Monte Plata – Bayaguana road (road 23) in D.R.



COORDINATE SOURCE, FORMAT, DATUM, PRECISION

- Coordinate Source: Google Maps > 2008
- Coordinate Format: Based on coordinate source (Google Maps) = decimal degrees
- Datum: WGS84 (Google Maps)
- Precision (of the coordinates): exact (Google Maps)

The screenshot shows the 'Georeferencing Calculator' interface. At the top left is a language dropdown set to 'English'. The main title is 'Georeferencing Calculator'. Below it are several input fields: 'Locality Type' (a text box with 'Distance along path (e.g., 13 mi E (by road) Bakersfield)'), 'Coordinate Source' (a dropdown set to 'Google Earth/Maps >2008'), 'Coordinate Format' (a dropdown set to 'decimal degrees'), 'Input Latitude' (an empty text box), 'Input Longitude' (an empty text box), 'Datum' (a dropdown set to '(WGS84) World Geodetic System 1984'), and 'Precision' (a dropdown set to 'exact'). To the right of these are 'Radial of Feature' (13.457), 'Measurement Error' (.010), 'Distance Units' (km), and 'Precision' (1 km). Below these are three buttons: 'Calculate', 'Copy', and 'Go here'. A table below the buttons has columns for 'Latitude', 'Longitude', 'Uncertainty (m)', and 'Datum'. Below the table are fields for 'Precision', 'Date' (2021-05-18T17:19:), 'Georeferenced by', and 'Protocol' (protocol not recorded). At the bottom are 'Distance Converter' and 'Scale Converter' sections with input boxes and dropdowns for units and scale. The footer shows 'Version 20210127en' and 'Copyright 2020 Rauthiflor LLC'.

Offset Along a Path: 3km along Monte Plata – Bayaguana road (road 23) in D.R.



RADIAL

Radial of Feature: **Extent of the linear feature** within the bounds of the starting location (city of Monte Plata). Enter extent in the same units as the offset distance

Measurement Error: Use 10m (= **0.010km**)

Distance Precision: Dependent on the offset distance. The 3km offset = **1km** distance precision.

Distance Precision
3km → **1km**

Georeferencing Calculator

English

Locality Type: Distance along path (e.g., 13 mi E (by road) Bakersfield)

Coordinate Source: Google Earth/Maps >2008

Coordinate Format: decimal degrees

Input Latitude:

Input Longitude:

Datum: (WGS84) World Geodetic System 1984

Precision: exact

Radial of Feature: 13.457

Measurement Error: .010

Distance Units: km

Precision: 1 km

Calculate Copy Go here

Latitude	Longitude	Uncertainty (m)	Datum

Precision	Date	Georeferenced by	Protocol
	2021-05-18T17:19:1		protocol not recorded

Distance Converter: km

Scale Converter: mm 1:24000

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Offset Along a Path: 3km along Monte Plata – Bayaguana road (road 23) in D.R.



MANIS: CALCULATE

Uncertainty radius provided in meters

The screenshot shows the 'Georeferencing Calculator' interface. The 'Locality Type' is 'Distance along path (e.g., 13 mi E (by road) Bakersfield)'. The 'Coordinate Source' is 'Google Earth/Maps >2008' and the 'Coordinate Format' is 'decimal degrees'. The 'Input Latitude' and 'Input Longitude' are both '0'. The 'Datum' is '(WGS84) World Geodetic System 1984' and the 'Precision' is 'exact'. The 'Radial of Feature' is '13.457', the 'Measurement Error' is '.010', the 'Distance Units' are 'km', and the 'Precision' is '1 km'. The 'Calculate' button is highlighted. Below the input fields, the results are displayed: 'Latitude' is '0', 'Longitude' is '0', 'Uncertainty (m)' is '13975' (highlighted with a red box), and 'Datum' is '(WGS84) World Geodetic System 1984'. The 'Precision' is '0.0000001', the 'Date' is '2021-05-18T19:11:2', 'Georeferenced by' is empty, and 'Protocol' is 'protocol not recorded'. At the bottom, there are 'Distance Converter' and 'Scale Converter' sections. The 'Distance Converter' shows a value of '1' in 'km'. The 'Scale Converter' shows a value of '1' in 'mm' and a scale of '1:24000'. The footer indicates 'Version 20210127en' and 'Copyright 2020 Rauthiflor LLC'.

Latitude	Longitude	Uncertainty (m)	Datum
0	0	13975	(WGS84) World Geodetic System 1984

Precision	Date	Georeferenced by	Protocol
0.0000001	2021-05-18T19:11:2		protocol not recorded

Distance Converter: km = km

Scale Converter: mm 1:24000 = km

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Offset Along a Path: 3km along Monte Plata – Bayaguana road (road 23) in D.R.



QUESTIONS?



[Google Maps](#)

[GEOLocate Web Application](#)

[MaNIS Georef. Calculator](#)

[Georef. Quick Ref. Guide](#)

NYBG



CREDITS

This is an updated compilation of information provided by the iDigBio's first Train-the-Trainers Georeferencing Workshop (put together by K. Watson, S. Gottschalk, S. Ascencio, 2013), altered to fit NYBG georeferencing needs over the years (<https://www.idigbio.org/content/idigbios-first-train-trainers-georeferencing-workshop>)

Georeferencing Quick Reference Guide (2020)

Zermoglio PF, Chapman AD, Wieczorek JR, Luna MC & Bloom DA. 2020. Georeferencing Quick Reference Guide. Copenhagen: GBIF Secretariat. <https://doi.org/10.35035/e09p-h128>

Georeferencing Quick Reference Guide (2012): consolidated guide for inputs for the MaNIS Georeferencing Calculator

Wieczorek J, Bloom D, Constable H, Fang J, Koo M, Spencer C & Yamamoto K (2012) Georeferencing Quick Reference Guide, version 2012-10-08. <https://www.idigbio.org/wiki/images/1/1e/GeoreferencingQuickReferenceGuide.pdf>

BioGeomancer Guide to Best Practices for Georeferencing (2006) is a basis for documentation of collecting & georeferencing protocols:

Chapman, A.D. and J. Wieczorek (eds). 2006. Guide to Best Practices for Georeferencing. Copenhagen: Global Biodiversity Information Facility. <https://www.gbif.org/document/80536/biogeomancer-guide-to-best-practices-in-georeferencing> (2006 version). Chapman AD & Wieczorek JR (2020) Georeferencing Best Practices. Copenhagen: GBIF Secretariat. <https://doi.org/10.15468/doc-gg7h-s853> (2020 version)

The MaNIS Georeferencing Calculator is a JavaScript application used in finding an uncertainty radius that incorporates all possible sources of error in the georeferencing process (tool: <http://georeferencing.org/georefcalculator/gc.html>, manual: <http://georeferencing.org/georefcalculator/docs/GeoreferencingCalculatorManual.pdf>)



RESOURCES

Bloom DA, Wiecek JR & Zermoglio PF (2020) Georeferencing Calculator Manual. Copenhagen: GBIF Secretariat.

<https://doi.org/10.35035/gdwq-3v93>

Chapman AD & Wiecek JR (2020) Georeferencing Best Practices. Copenhagen: GBIF Secretariat. <https://doi.org/10.15468/doc-gg7h-s853>

Spencer C, Yamamoto K, Fang J, Constable H, Koo M, & Wiecek J (2008) Georeferencing for Dummies.

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TDWG (2018) Darwin Core quick reference guide. Biodiversity Information Standards (TDWG). <https://dwc.tdwg.org/terms/>

Wiecek J (2001) MaNIS/HerpNet/ORNIS Georeferencing Guidelines. University of California, Berkeley: Museum of Vertebrate Zoology.

http://georeferencing.org/georefcalculator/docs/52_GeorefGuide.html

Wiecek J & Bloom DA (2015) Manual for the Georeferencing Calculator. University of California, Berkeley: Museum of Vertebrate Zoology. <http://georeferencing.org/gci2/docs/GeoreferencingCalculatorManualv2.html>

Wiecek J, Guo Q & Hijmans R (2004) The point-radius method for georeferencing locality descriptions and calculating associated uncertainty. International Journal of Geographical Information Science. 18: 745-767. <https://doi.org/10.1080/13658810412331280211>