

DFIM	For Official Use Only
DAM FAILURE INUNDATION MAP	STUDY DAM ALAMO DAM
SEE PANEL LOCATOR OR MAP INDEX TO LOCATE PANEL	Aerial Map Series May 2015
National Inventory of Dams (NID) ID: AZ82203	Dam Owner: US Army Corps of Engineers
 US Army Corps of Engineers®	

PURPOSE AND USE

These inundation maps have been prepared in accordance with the Federal Guidelines for Dam Safety (FEMA Publication 64, FEMA 2004) to identify and delineate areas that could be affected by flooding in the event of a dam failure. The inundation maps support the dam owner and emergency management officials to facilitate timely notification and evacuation of areas affected by a dam failure or flood condition.

WARNING

This document is FOR OFFICIAL USE ONLY (FOUO). It contains information that may be exempt from public release under the Freedom of Information Act (5 USC 552). It is to be controlled, stored, handled, transmitted, distributed, and disposed of in accordance with USACE policy relating to FOUO information and it is not to be released to the public or other personnel who do not have a valid "need to know" without prior written approval of an authorized USACE official.

DISCLAIMER

This map has been compiled using the best information available and is believed to be accurate, however, its preparation required many assumptions. Actual conditions during a dam failure may vary from those assumed, so the accuracy cannot be guaranteed. The limits of flooding shown and the temporal data should only be used as a guideline for emergency planning and response actions. Actual areas inundated and inundation timing will depend on specific flooding and failure conditions and may differ from the areas shown on the maps.

MAPPING NOTES

The coordinate system used in the preparation of this map is Universal Transverse Mercator (UTM), horizontal datum is NAD 83, GRS80 spheroid. Differences in datum, spheroid or projection used in the production of map sheets for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of these maps. Flood elevations are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. Accuracy of the map scales for varying paper sizes is valid only if printed according to specification guidelines.

READING USNG LOCATIONS

The primary coordinate system displayed in these maps is the U.S. National Grid (USNG). A USNG location is composed of the world Grid Zone Designation (GZD), the two letter 100,000m grid ID, and the grid coordinate. To read USNG locations from these maps, locate the GZD and grid ID values at the bottom of each sheet. Then use the two-digit UTM principal digits displayed on the map. Ignore the small UTM superscript numbers that are provided for reference purposes. USNG coordinate strings can be 4, 6, 8, or 10 digits long; having coordinate precision of 1,000m, 100m, 10m or 1m. The left half of the coordinate string is the easting value and the right half is the northing value. The first two easting and northing digits should be the principal UTM digits as displayed on the map. Additional digits refine the accuracy of the coordinate pair. Additional resources pertaining to the USNG can be found at <http://www.fgdc.gov/usng/index.html>

DATA DEFINITIONS AND SOURCES

BACKGROUND DATA is provided via an online GIS Image server made available from ESRI. The data used in the street map series was developed by ESRI using ESRI basemap data, DeLorme basemap layers, Automotive Navigation Data (AND) road data, U.S. Geological Survey (USGS) elevation data, UNEP-WCMC parks and protected areas for the world, Tele Atlas Dynamap® and Multinet® street data for North America and Europe, and First American (CoreLogic) parcel data for the United States.

The World Imagery service used in the aerial photography map series is a compilation of imagery sources from around the world for use at various resolutions. United States imagery was provided by NASA, i-cubed, U.S. Geological Survey (USGS), U.S. Department of Agriculture Farm Services Agency (USDA FSA), GeoEye, and Aerials Express.

INUNDATION ELEMENTS were created from the modeling effort for this study. Floodplain boundaries (Normal High Pool and Maximum Inundation Areas) were computed using one dimensional HEC-RAS software from the USACE Hydrologic Engineering Center unless otherwise noted. More information regarding modeling methods used in this study is provided in the study report.

Failure wave arrival time points denote the elapsed time following initial dam breach, until increased flow directly resulting from dam breach arrives at a given location. Reference mile points indicate mileage downstream from the study dam along the modeled stream centerline. Cross sections data and flood wave arrival time points are based on data extracted from the dam break model results.

The source of most BASEMAP ELEMENTS is USACE CorpsMap data, which is a compilation of prominent nationwide datasets. Below are the nationwide datasets used for the source of base map data and the layers extracted from each:

- Homeland Security Infrastructure Program (HSIP): Airports, Heliports, Communication Facilities, Electric SubStations, Electric Generating Units, Fire Stations, Health Care Facilities, Police Stations, Schools, Railways and Municipality Boundaries.
- Environmental Systems Research Institute (ESRI): County, State, and International boundaries.
- FEMA Hazus data 2009 release: Emergency operations centers and potable water facilities.
- USACE AGC National Inventory of Dams (NID): USACE Dams, and Non-USACE Dams
- National Geospatial-Intelligence Agency (NGA): MGRS/USNG Grid

SHEET INDEX map sheets are derived from the USGS 7.5' Quadrangle Index.

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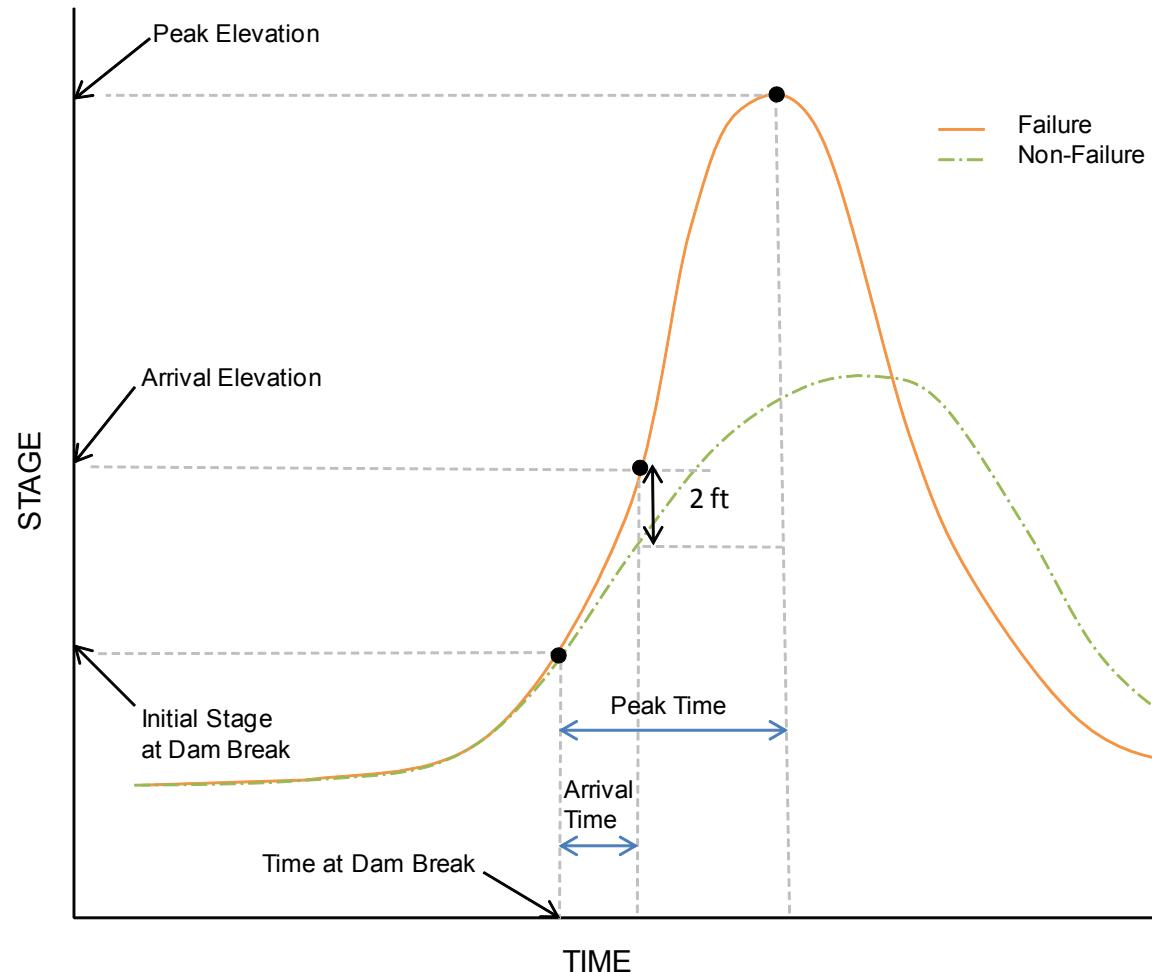
Reference mile points indicate mileage downstream from the study dam along the modeled stream centerline.

FAILURE WAVE ARRIVAL TIME

Failure wave arrival is calculated as the time at which the difference between the hydrograph from the failure simulation and the hydrograph from the corresponding non-failure simulation exceeds [X] feet. Failure wave arrival time points denote the elapsed time following initial dam breach, until increased flow directly resulting from dam breach arrives at a given location.

FAILURE WAVE DATA TABLES reflect data from model output at locations on the map sheet. For 1D HEC-RAS models, data is calculated at the cross section shown on the map, these cross sections are selected from the model cross sections to represent the flow on each map sheet that intersects with the model centerline. For 2D models, data included in the failure wave data table reflect the model output at the model element location denoted on the maps by the lettered point.

Calculation of Failure Wave Data Tables Example



READING FACING PAGE GRAPHS

The graphs located on the pages adjacent to map sheets depict the inundation along the stream centerline as interpolated between model cross sections. The areas on the graphs are created at specific times throughout model run-time as shown in the legend and show the progression of the failure wave downstream from left to right on the graph.

The X axis of the graphs represents reference miles, or miles along the stream centerline downstream of the study dam. Water surface elevation is shown on the Y axis.

The gray polygon (Flow at Dam Break) represents the water surface at the time of failure, not at the initial timestep of the model. It may represent flooding caused by increased releases prior to failure.

Multiple sheets may be represented on the graph, dotted vertical lines represent the sheet boundaries as they intersect the stream centerline. All lettered cross sections that appear in the maps also appear in the profile graphs at the reference mile location they occupy in the maps.

Structure points that appear on the graphs do not depict actual real-world structures and are only used to depict the density of structures at a given reference mile and elevation range.

Infrastructure points shown on the graphs are shown at approximate elevations and reference miles (distance from the stream centerline is not taken into account).

BASEMAP ELEMENTS

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- Homeland Security Infrastructure Program (HSIP): Airports, Broadcast Communications, Chemical Industries, Colleges and Universities, Correctional Facilities, Electric Substations, Emergency Medical Services, Firestations, Fossil Fuel Electric Power Generation and Other Power Generation, Heliports, Hospitals, Hydroelectric Power Generation, Intermodal Shipping Facilities, Law Enforcement, Natural Gas Storage, Nuclear Electric Power Generation, Nuclear Fuel Manufacturing, Pipelines, Petroleum Bulk Stations and Terminals, Schools, Wastewater Treatment Plants, Railways and Municipality Boundaries.

- Environmental Systems Research Institute (ESRI): County, State, and International boundaries.

- FEMA Hazus data 2012 release: Potable Water Facilities.

- USACE AGC National Inventory of Dams (NID): USACE Dams, and Non-USACE Dams.

- National Levee Database (NLD): Closure Structure Lines, Floodwall Lines and Levee Centerlines.

- National Geospatial-Intelligence Agency (NGA): MGRS/USNG Grid

- United States Geological Survey (USGS): River Gages

- SHEET INDEX map sheets are derived from the USGS 7.5' Quadrangle Index.

INUNDATION ELEMENTS

*See Disclaimer

-  **Normal High Pool Inundation** - area inundated by dam failure occurring when pool elevation is at the 10% exceedance duration pool
 -  **Maximum Pool Inundation Area** - area inundated by dam failure occurring when pool elevation is at the top of the maximum inflow design flood (IDF) elevation
 -  **Sheet Index** - facilitates reference of individual map sheets to overall study area
 -  **Reference Mile** - mileage downstream from the study dam
 -  **Cross Section** - labeled by letter designator
-
- ## MODEL ELEMENTS
-  **Model River Centerline** - centerline used in the HEC-RAS model
 -  **Model Cross Sections** - model cross sections that contain information of water elevation in the channel
 -  **Model Storage Areas** - areas used to in hydrologic model that represent volumes of water
 -  **Model Scenario Inundation** - area inundated by model scenario (MH-F)
 -  **Depth at Time Series** - water depth in feet of selected scenario at selected time during the model
 - 0.1 - 2.0
 - >2.0 - 6.0
 - >6.0 - 15.0
 - >15.0

BASE MAP ELEMENTS

INFRASTRUCTURE LOCATIONS

-  Schools
-  Colleges and Universities
-  Broadcast Communications
-  Airports
-  Heliports
-  Law Enforcement
-  Correctional Facilities
-  Fire Stations - Fire Only
-  Fire Stations - Fire/EMS
-  Emergency Medical Services
-  Hospitals - General
-  USGS Gage
-  Wastewater Treatment Plants
-  Potable Water Treatment
-  Natural Gas Storage
-  Petroleum Bulk Stations and Terminals
-  Chemical Industries
-  Nuclear Fuel Manufacturing
-  Electric Substations
-  Fossil Fuel Electric and Other Power Generation
-  Nuclear Electric Power Generation
-  Hydroelectric Power Generation
-  Intermodal Shipping Facilities

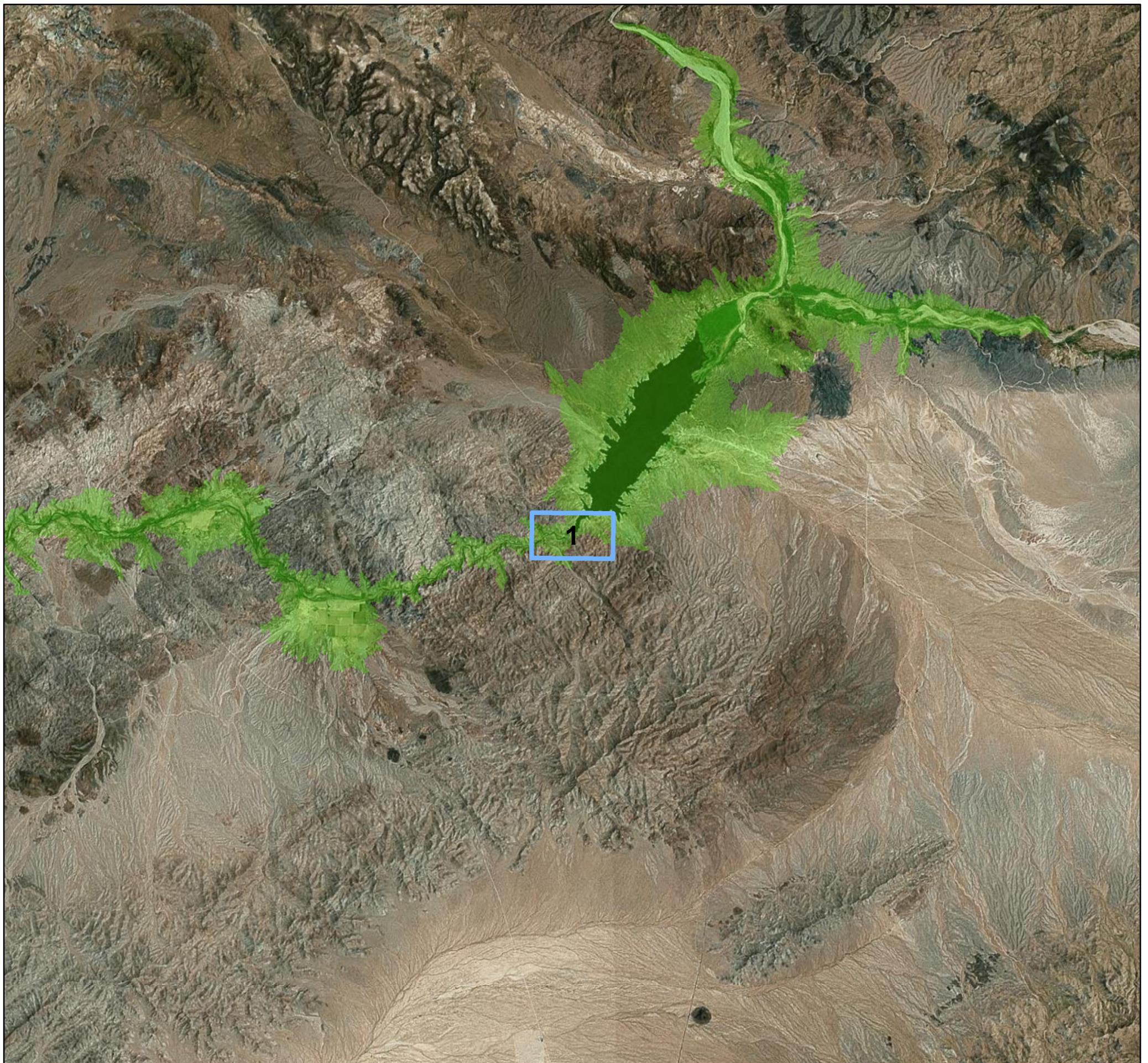
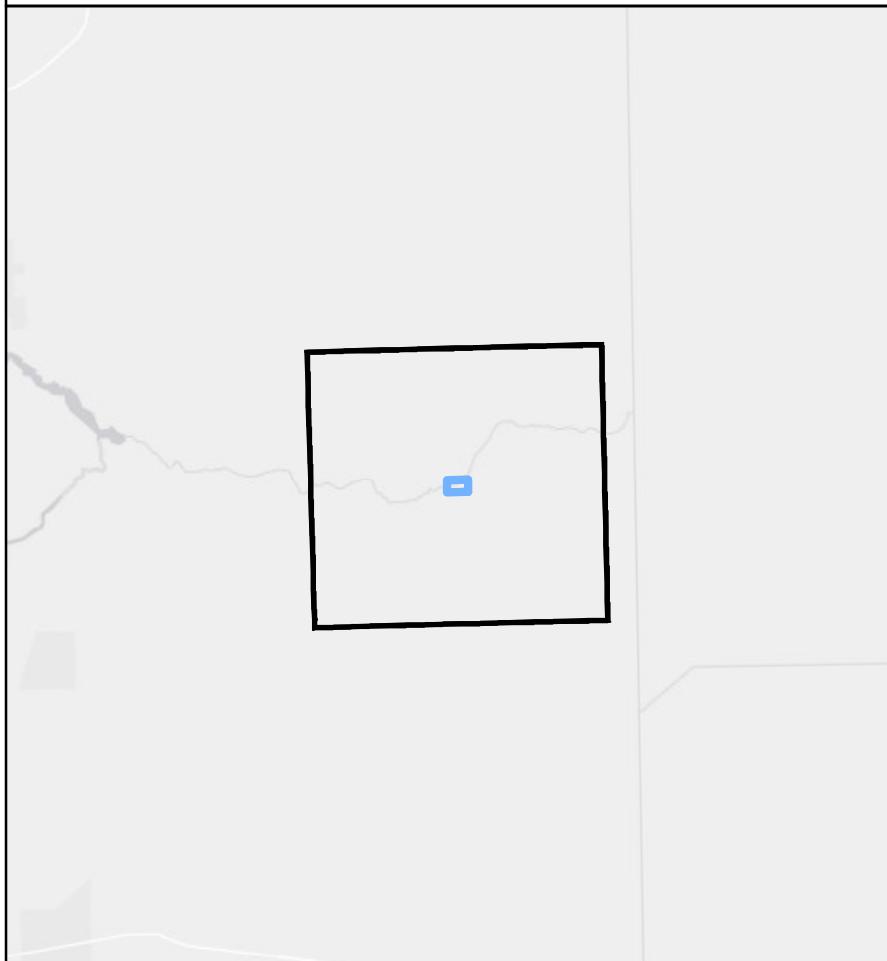
BOUNDARIES AND TRANSPORTATION

-  Municipality Boundary
-  County Boundary
-  State Boundary
-  International Boundary
-  Railway Lines

SHEET INDEX 1

Study Area: ALAMO DAM

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MAP ELEMENTS

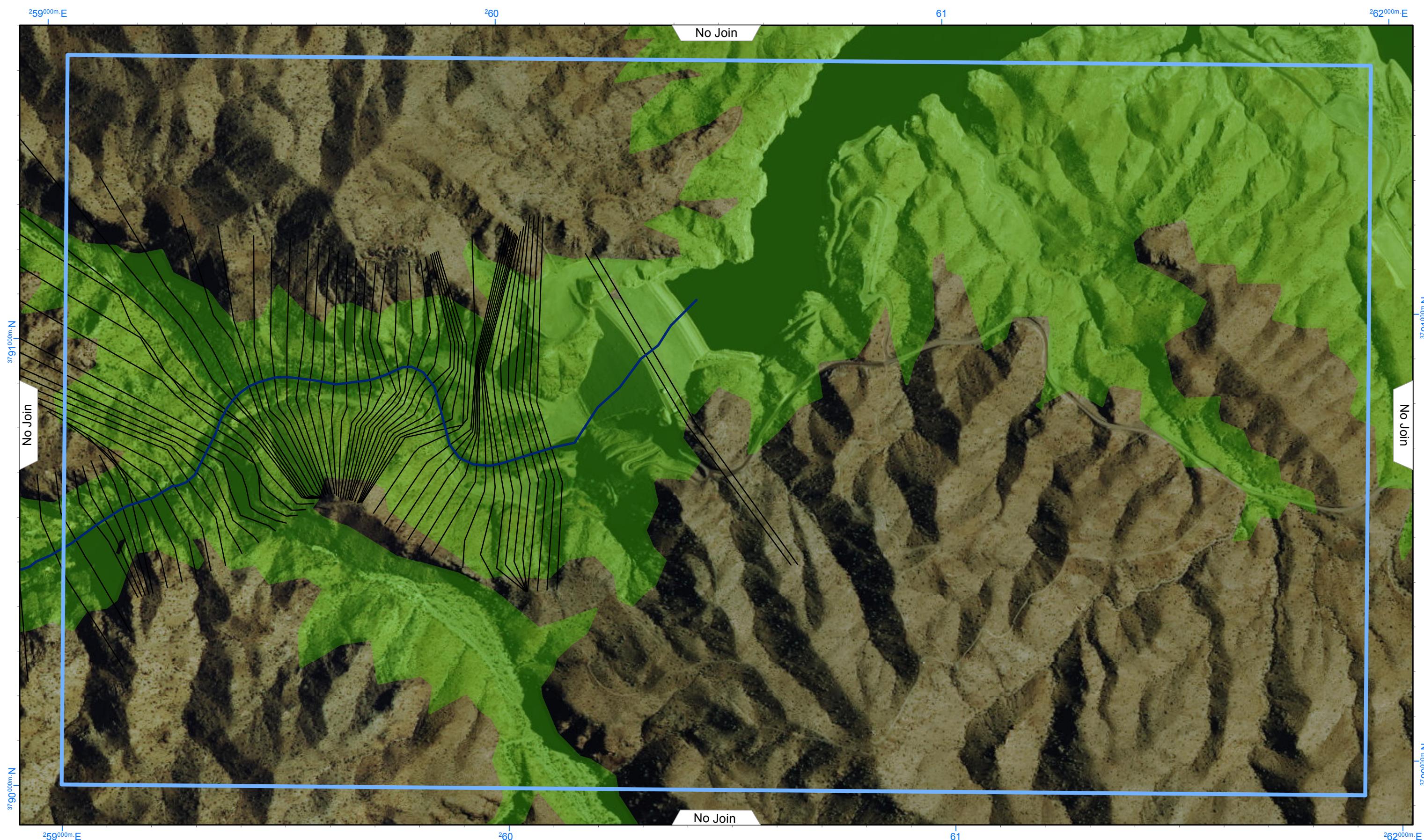


Maximum
Inundation Area



12 Standard Sheets





Flood Warning

USNG Grid Zone 12S
100,000 Meter Grid ID TC
Scale = 1:7920
0 0.05 0.1 0.2 0.3 0.4 Miles
0 0.05 0.1 0.2 0.3 0.4 Kilometers



Map Book ID:12STC5990
Map Library ID:1024
Map ID:12STC5900090000

18 May 2015

ALAMO DAM Flood Warning

Map ID:12STC5900090000

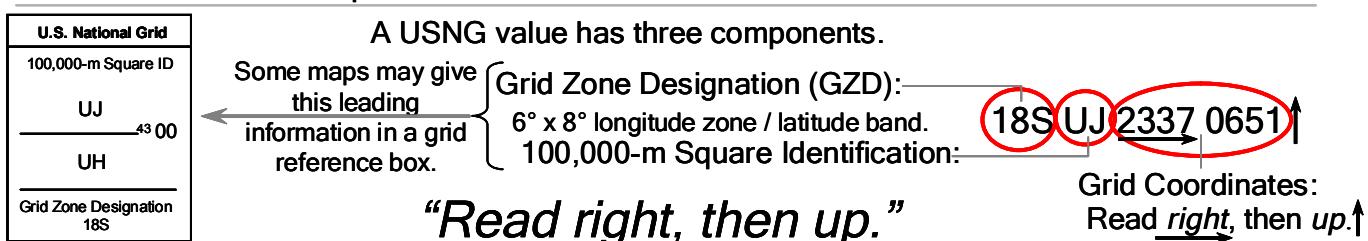
Reading US National Grid (USNG) Coordinates: "Read right, then up."

Information Sheet 1 in this series.

FGDC-STD-011-2001

From www.fgdc.gov/usng

The example below locates the Jefferson Pier at USNG: 18S UJ 23371 06519.

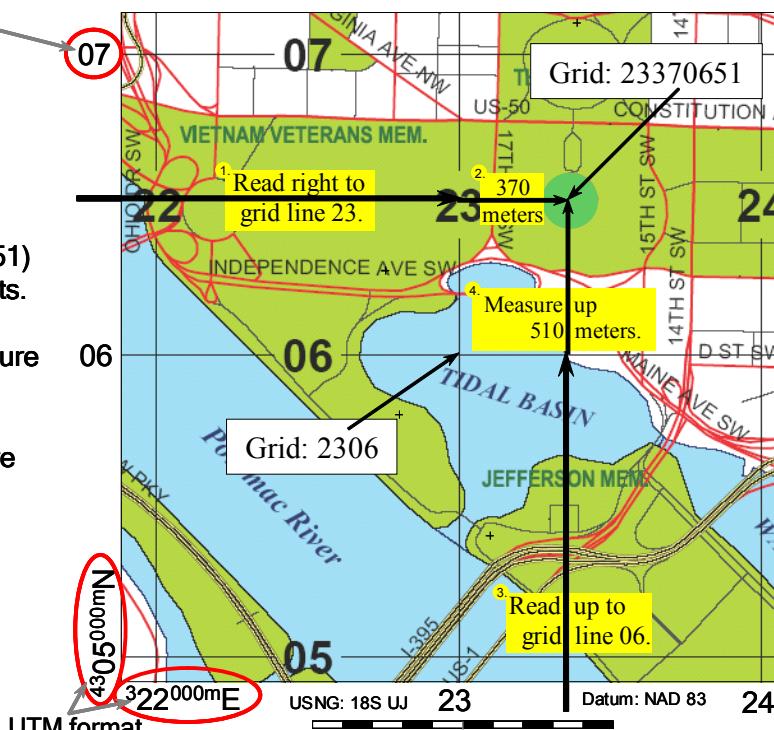


- Grid lines are identified by Principal Digits
Ignore the small superscript numbers like those in the lower left corner of this map.

Reading USNG Grid Coordinates.

- Coordinates are always given as an even number of digits (i.e. 23370651).
- Separate coordinates in half (2337 0651) into the easting and northing components.
- ¹ - Read right to grid line 23. Then measure right another 370 meters. (Think 23.37)
- ² - Read up to grid line 06. Then measure up another 510 meters. (Think 06.51)

Grid:	Examples:
228058	FDR Memorial:
231054	George Mason Memorial:
2338 0710	Zero Milestone:
2275 0628	DC War Memorial:
213017	Ft. Scott Park:



Ignore the small UTM superscript numbers that are provided for reference purposes. UTM numerical values are best suited for determining direction and distance as in surveying. USNG alpha-numeric values are best suited for describing particular locations because they can be given as only grid coordinates and with only the precision required for a particular task.

Users determine the required precision.
These values represent a point position (southwest corner) for an area of refinement.

- Four digits: 23 06 Locating a point within a 1,000-m square.
- Six digits: 233 065 Locating a point within a 100-m square (football field size).
- Eight digits: 2337 0651 Locating a point within a 10-m square (modest size home).
- Ten digits: 23371 06519 Locating a point within a 1-m square (parking space size).

A modest size home can be found or identified in a local area with only an 8-digit grid.

Full USNG: 18S UJ 2337 0651 - World wide unique.
Without Grid Zone Designation (GZD): UJ 2337 0651 - Regional areas.
Without GZD and 100,000-m Square ID: 2337 0651 - Local areas.

This illustrates how USNG coordinates can be used in a phone directory or advertisement like a universal map index value. Unlike classic atlas grids (i.e. B3), these can be used with any paper map using the national grid and in web map portals such as the Washington, DC GIS (<http://dcgis.dc.gov>) or The National Map. (<http://nwmviewwgc.cr.usgs.gov/viewer.htm>)

They can also be used in consumer GPS receivers to directly guide you to the location. This is especially beneficial at night, in heavy traffic, or after major disasters when street signs are missing.

Point of Interest	Street Address	USNG Grid:	Telephone:
Subway Sandwich & Salads	2030 M St., NW	2256 0826	223-2587
Subway Sandwich & Salads	430 8th St., SE	2698 0567	547-8200
Subway Sandwich & Salads	3504 12th St., NE	2740 1120	526-5999
Subway Sandwich & Salads	1500 Benning Rd, NE	2815 0757	388-0421

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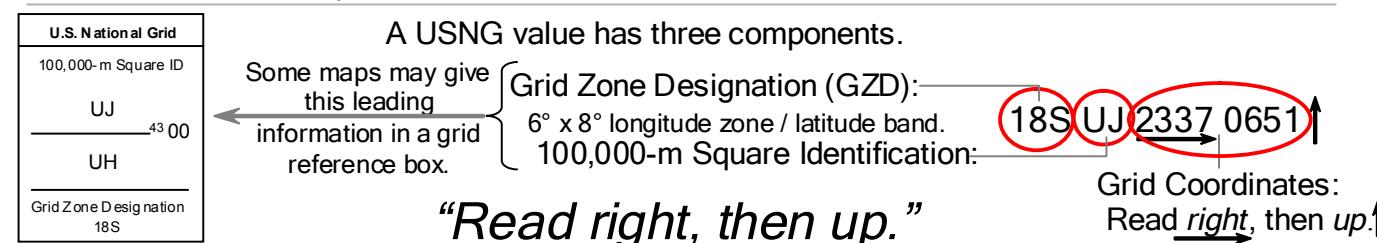
US National Grid (USNG) Coordinates: World wide context.

Information Sheet 2 in this series.

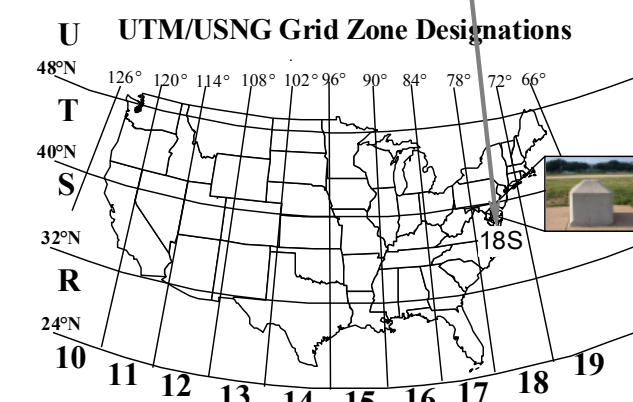
FGDC-STD-011-2001

From www.fgdc.gov/usng

The example below locates the Jefferson Pier at USNG: 18S UJ 23371 06519.



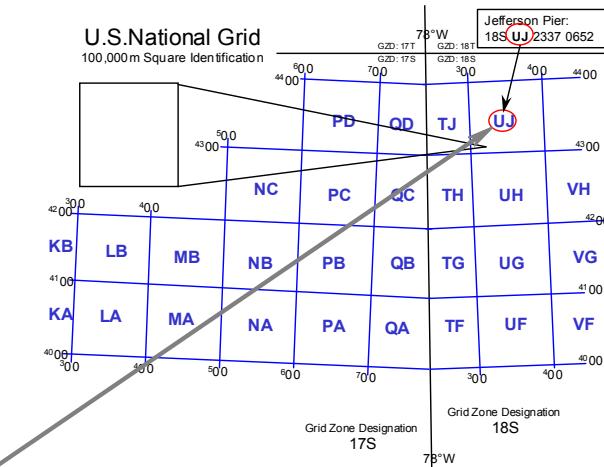
USNG values have three components as seen above. The Grid Zone Designation gives a USNG value world-wide context with 60 longitudinal zones each 6° wide. Zones 10 - 19 cover the conterminous US as seen below left. Zones are divided into 8° latitudinal bands. Together these zones and bands compose Grid Zone Designations. Example: 18S



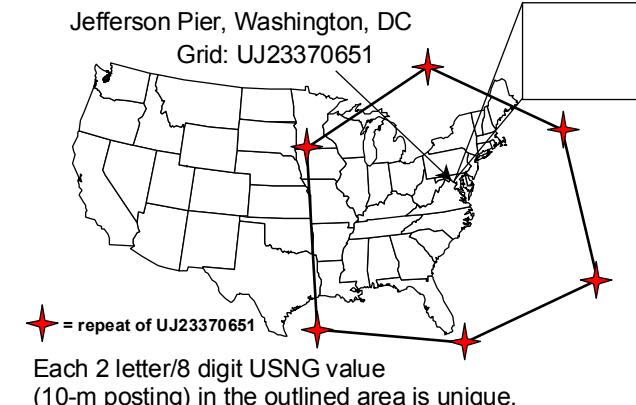
100,000-m Square Identifications

Example: UJ

GZDs are further subdivided into 100km x 100km squares with 100,000-m Square Identifications. In this example, the Jefferson Pier is located in UJ. These squares are organized and lettered so they do not repeat themselves but every 18°, which is approximately 1,000 miles in the mid-latitudes. The illustration at right depicts how far one must go before the letters UJ repeat. This ensures a given value such as UJ 2337 0651 is unique out of the entire state it is located in - as well as all surrounding states - with the exception of Alaska.



The Power of Truncated USNG Values



In general, people in a local community use the grid coordinates alone--for example: 233 065. The same numbers recur about every 60 miles, normally that will cause no problem when the general location is understood. This is similar to the way you tell someone only the last digits of a phone number when the area code is obvious. If there is a possibility of confusion include the letter pair too - for example: UJ 233 065. A letter pair recurs about every 1000 miles, so even in a disaster relief project there will be no other point with those coordinates nearby. Full USNG coordinates such as 18S UJ 233 065 are worldwide unique. Typically a GPS or other electronic device requires coordinates in that form since unlike a human it doesn't intuitively understand the general location from context. You should always give full coordinates whenever abbreviated coordinates might not be clear or when listing them on letterhead, a business card or advertisement.

Ed: 20061117-USNGInstruct_Nov6