

NAVAJO HOUSING AUTHORITY'S FLOOD HAZARD MITIGATION PROGRAM

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AECOM

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ESRI AEC SUMMIT – SAN DIEGO, CALIFORNIA

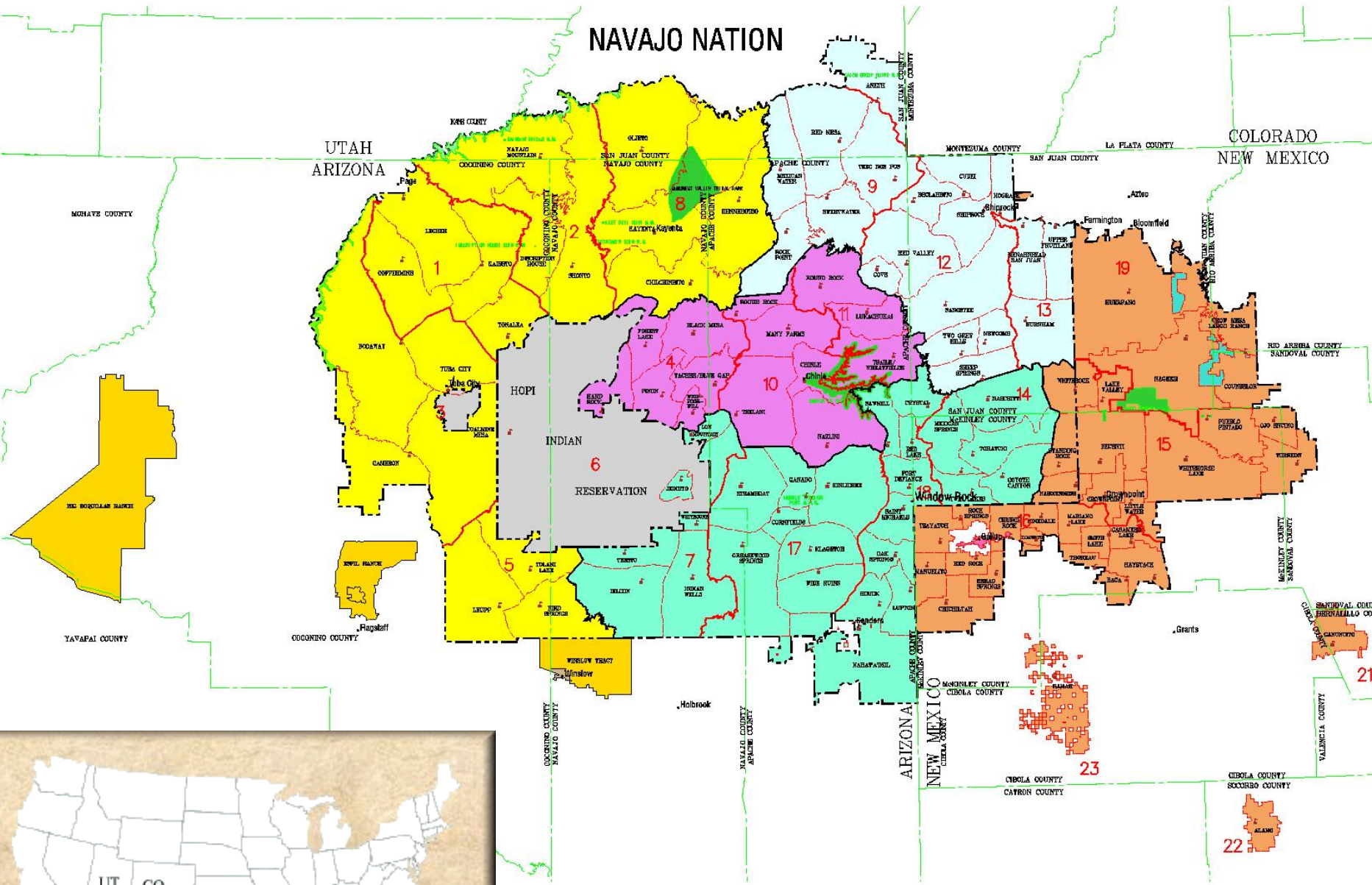


NAVAJO NATION PROFILE

- Largest land area and federally recognized tribe in the United States
- Over 27,000 square miles with a population of over 300,000 people. Covers Arizona, New Mexico, and Utah
- 110 Chapters/communities
- Navajo Housing Authority (NHA) is the largest Tribally Designated Housing Entity (TDHE) in the United States
- NHA manages over 9,000 homes
- Building thousands of new homes



NAVAJO NATION



27,000 square miles or 17.2 million Acres
110 Local Government Chapter Communities
304,000 Estimated population



VISION AND MISSION STATEMENT

VISION STATEMENT

- “Housing Our Nation By Growing Sustainable Communities.”

MISSION STATEMENT

- “Hooghandei haa hozhoogoo iinaa silaa’ do a’nooseelth (Center of Family Growth, Strength and Beauty). We are committed to building sustainable quality homes, promoting economic self-sufficiency and providing exemplary services through professionalism, leadership and respect.”



NAVAJO HOUSING AUTHORITY

- Tribal Designated Housing Authority
 - Home ownership and rental units
 - Housing Projects: New Developments, Modernizations, and Scatter Sites
- Self-insured
 - 100% HUD funded
 - Home Developer and Floodplain Manager
 - Maintain homes and repair home damage
 - Sustainable Development



NHA REQUIREMENTS

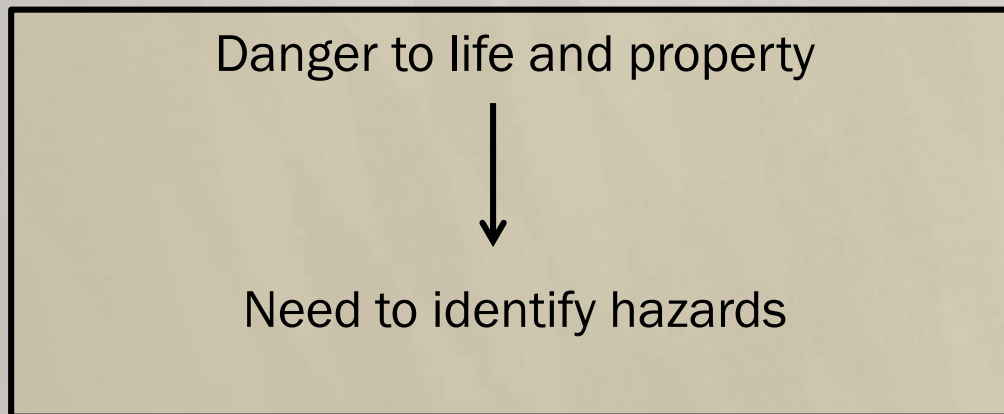
- HUD requirement to develop outside flood hazards
- Problem: No flood hazards identified in Navajo Nation
- Solution: Identify flood hazards for proper NHA planning and development of homes and communities.
- Identification of flood hazards has existed on the Navajo Nation for decades



Photo Credit: Navajo Times

TRIBAL ENTITIES UNDERREPRESENTED

- 34 out of 565 federally recognized Tribes have joined and are participating in FEMA's National Flood Insurance Program (NFIP)
 - 6% Tribal Entity participation rate in NFIP
 - 91% Non-Tribal Entity participation rate in NFIP
- Flood Hazards generally unknown on most tribal lands
- Existing roadblocks impede tribal participation



NHA BASE MAPPING

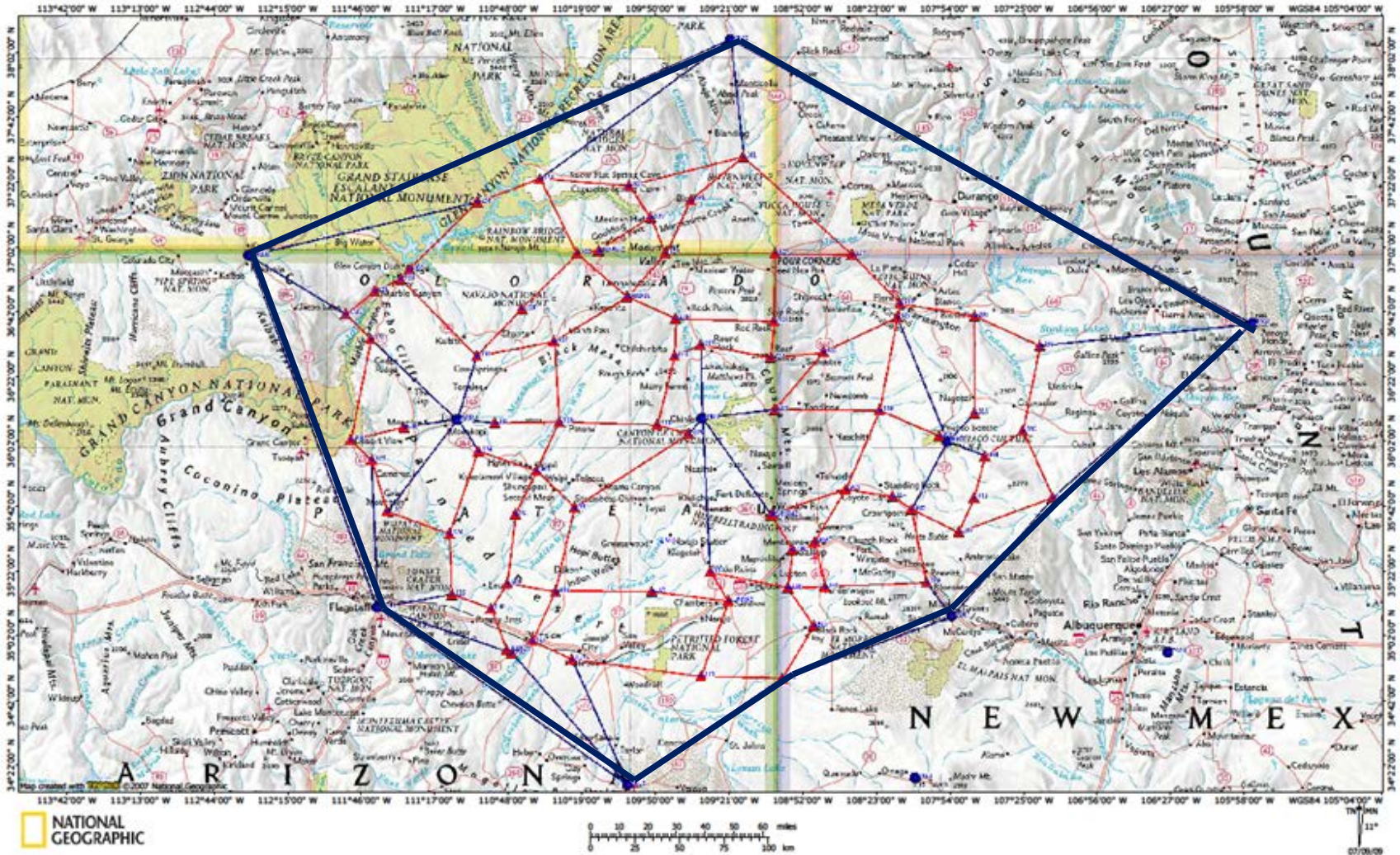
Coordinate Systems

- Problem: 5 State Plane coordinate systems, 2 UTM systems
- Solution: Unique Coordinate System: Stereographic Double
- Covers Entire Navajo Nation
- Meets Federal Geographic Data Committee (FGDC) & Federal Geodetic Control Committee (FGCC) Standards
- Single Navajo Nation Geospatial Database



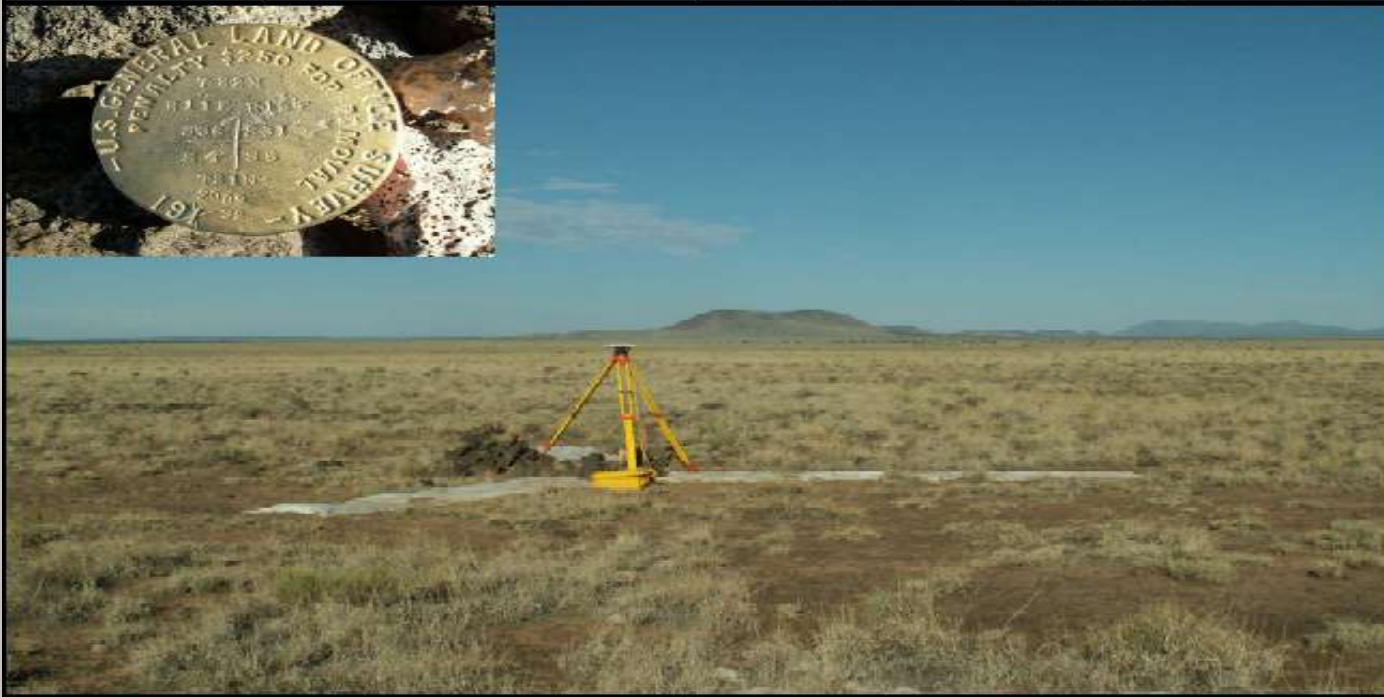
GEODETIC GROUND CONTROL

77 Control Points Acquired



GROUND CONTROL SURVEY

Point Designation	538	Record Date	August 12, 2009
Point Description	Found 3 1/4" Cap on Steel Pipe		
Coordinate Data			
Horz. Datum	Nad83(2007)	Latitude	35° 14' 37.08886" N
Epoch	2007.0	Longitude	111° 10' 00.21843" W
Vert. Datum	GRS80	Ell. Height (m)	1590.226
Vert. Datum	NAVD88	Orth. Height (m)	1614.19
Projection	Stereographic Double	Northing (m)	389603.876
Units	International Meter	Easting (m)	1348258.115



Notes

Station is an existing section corner monument.

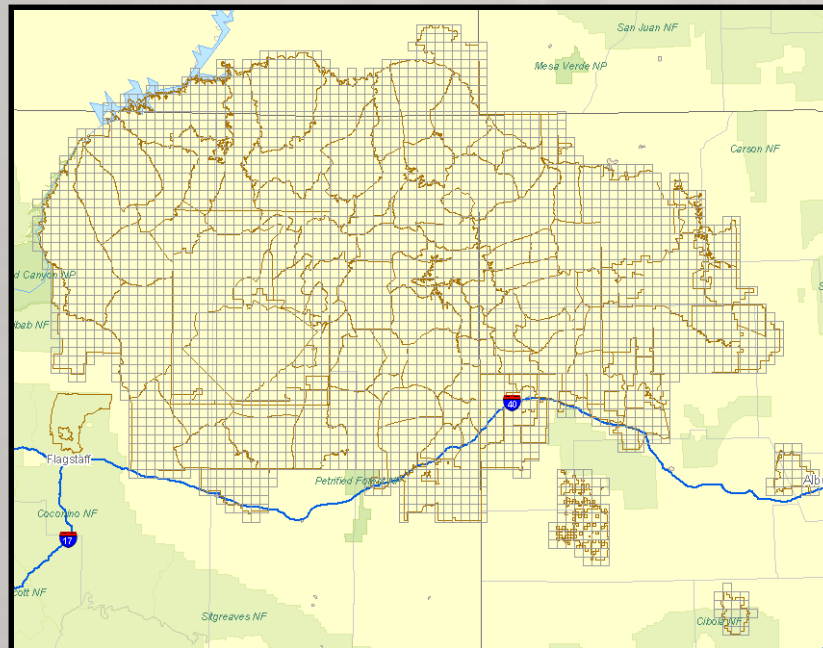
TIES:

Station is 1448.4 meters ESE of intersection BIA 6923 and BIA 6921
 Station is set in pile of lava rock 1.2 meters N of second pile of lava rock

NHA BASE MAPPING

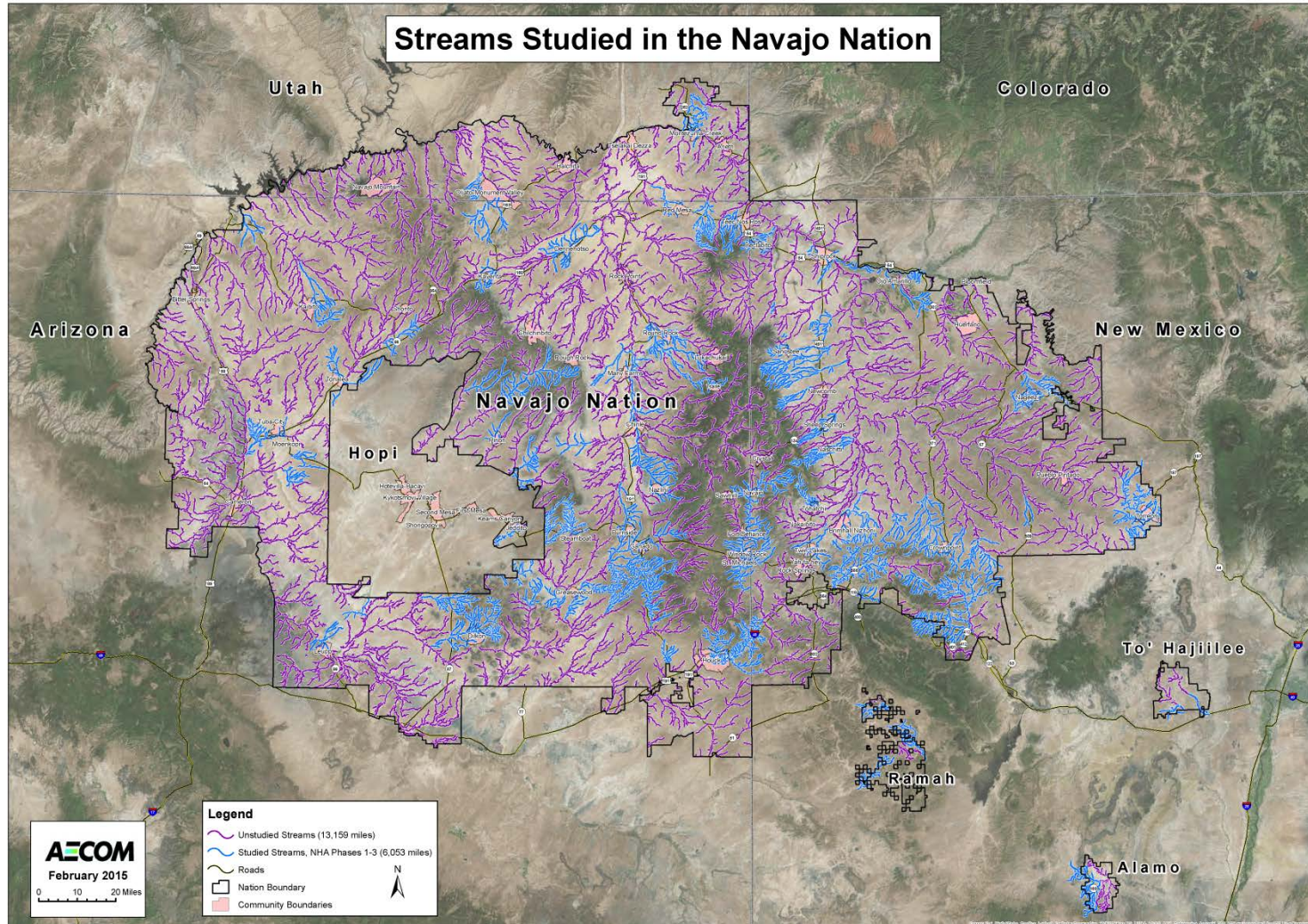
Collected seamless and accurate base map for the entire Navajo Nation: AeroMetric (Quantum Spatial) and Towill)

- Ground Control Survey
- Analytical Triangulation Control Extension
- Digital Orthophotography (B/W, Color, CIR)
- Digital Elevation Model (DEM) Generation

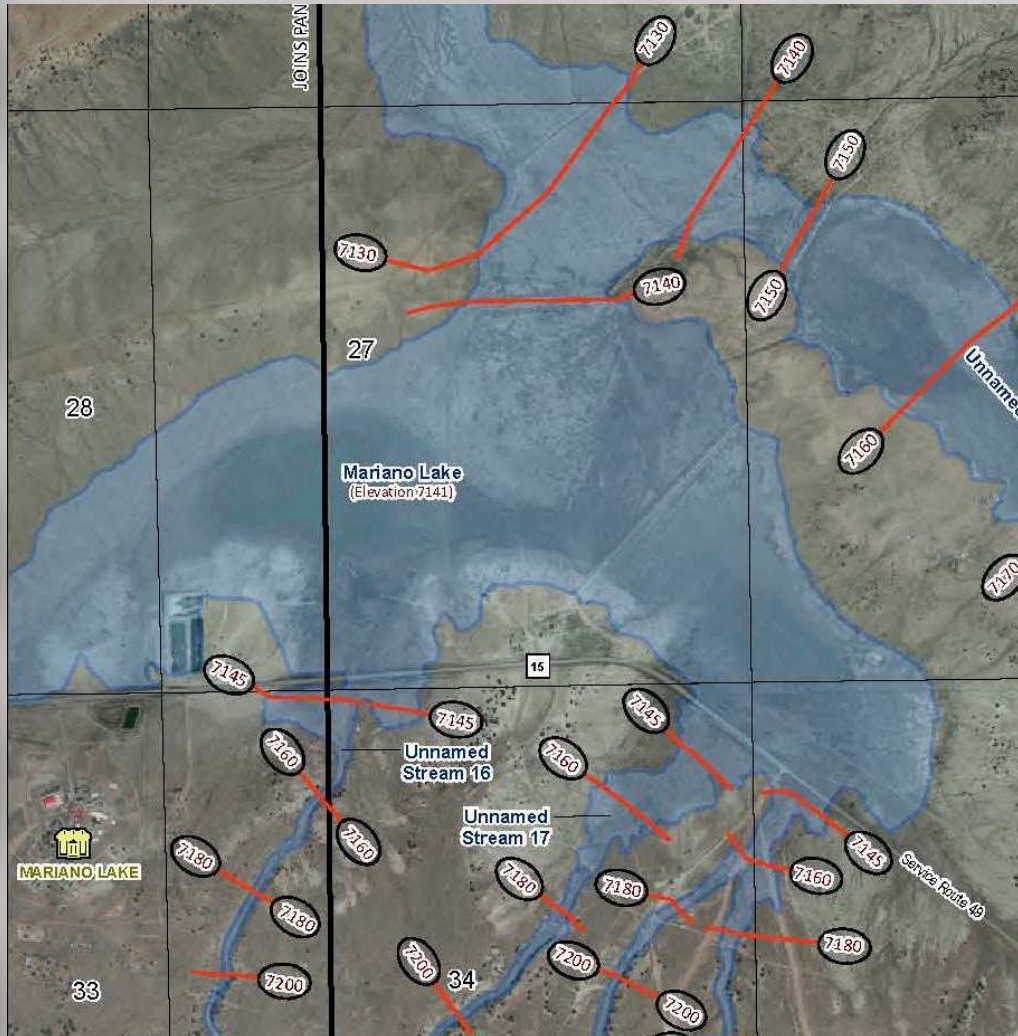


FLOODPLAIN ANALYSIS

- 6,000 miles to be studied (3,000 already completed and another 3,000 to be completed by 2016)



FLOODPLAIN PROJECT



- 1% annual chance floodplains (100-year)
- Approximate Model-Backed floodplains
- Maps include approximate water surface elevations
- Hydrology: 2008 USGS regression and gage data
- Hydraulics: HEC-RAS modeling
- Developed flood maps, report, and GIS database

FLOODPLAIN PROJECT

Beyond Floodplain boundariesDecision Making Tool

- Floodplain data: regulates new development in flood hazard areas
- 1% annual chance depth grids maps
- Hazard Mitigation Plan (Flood & Fire)
- Implemented a hazard mitigation strategy that upholds NHA's mission statement
- Sustainable Development

FLOODPLAIN PROJECT – NEW DEVELOPMENT

- Flood Hazard data being implemented into business processes
- It's about being better planners
- Any proposed HUD development require the completion of the 8 step process: Title 24, Section 55.20, of the U.S. Code of Federal Regulations

FLOODPLAIN PROJECT – HUD REQUIREMENTS

- 8 step process: Title 24, Section 55.20, of the U.S. Code of Federal Regulations

24 CFR Subtitle A (4-1-11 Edition)

Subpart C—Procedures for Making Determinations on Floodplain Management

§ 55.20 Decision making process.

The decision making process for compliance with this part contains eight steps, including public notices and an examination of practicable alternatives. The steps to be followed in the decision making process are:

(a) *Step 1.* Determine whether the proposed action is located in a 100-year floodplain (or a 500-year floodplain for a Critical Action). If the proposed action would not be conducted in one of those locations, then no further compliance with this part is required.

(b) *Step 2.* Notify the public at the earliest possible time of a proposal to consider an action in a floodplain (or in the 500-year floodplain for a Critical Action), and involve the affected and interested public in the decision making process.

(1) The public notices required by paragraphs (b) and (g) of this section may be combined with other project notices wherever appropriate. Notices required under this part must be bilingual if the affected public is largely non-English speaking. In addition, all notices must be published in an appropriate local printed news medium, and must be sent to federal, state, and local public agencies, organizations, and, where not otherwise covered, individuals known to be interested in the proposed action.

(2) A minimum of 15 calendar days shall be allowed for comment on the public notice.

(3) A notice under this paragraph shall state: the name, proposed location and description of the activity; the total number of acres of floodplain involved; and the HUD official and phone number to contact for information. The notice shall indicate the hours and the HUD office at which a full description of the proposed action may be reviewed.

(c) *Step 3.* Identify and evaluate practicable alternatives to locating the proposed action in a floodplain (or the 500-year floodplain for a Critical Action).

Office of the Secretary, HUD

(1) The consideration of practicable alternatives to the proposed site or method may include:

(i) Locations outside the floodplain (or 500-year floodplain for a Critical Action);

(ii) Alternative methods to serve the identical project objective; and

(iii) A determination not to approve any action.

(2) In reviewing practicable alternatives, the Department or a grant recipient subject to 24 CFR part 58 shall consider feasible technological alternatives, hazard reduction methods and related mitigation costs, and environmental impacts.

(d) *Step 4.* Identify the potential direct and indirect impacts associated with the occupancy or modification of the floodplain (or 500-year floodplain for a Critical Action).

(e) *Step 5.* Where practicable, design or modify the proposed action to minimize the potential adverse impacts within the floodplain (including the 500-year floodplain for a Critical Action) and to restore and preserve its natural and beneficial values. All critical actions in the 500-year floodplain shall be designed and built at or above the 100-year floodplain (in the case of new construction) and modified to include:

(1) Preparation of and participation in an early warning system;

(2) An emergency evacuation and relocation plan;

(3) Identification of evacuation route(s) out of the 500-year floodplain; and

(4) Identification marks of past or estimated flood levels on all structures.

(f) *Step 6.* Reevaluate the proposed action to determine:

(1) Whether it is still practicable in light of its exposure to flood hazards in the floodplain, the extent to which it will aggravate the current hazards to other floodplains, and its potential to disrupt floodplain values; and

(2) Whether alternatives preliminarily rejected at Step 3 (paragraph (c)) of this section are practicable in light of the information gained in Steps 4 and 5 (paragraphs (d) and (e)) of this section.

(g) *Step 7.* (1) If the reevaluation results in a determination that there is

no practicable alternative to locating the proposal in the floodplain (or the 500-year floodplain for a Critical Action), publish a final notice that includes:

(1) The reasons why the proposal must be located in the floodplain;

(ii) A list of the alternatives considered; and

(iii) All mitigation measures to be taken to minimize adverse impacts and to restore and preserve natural and beneficial values.

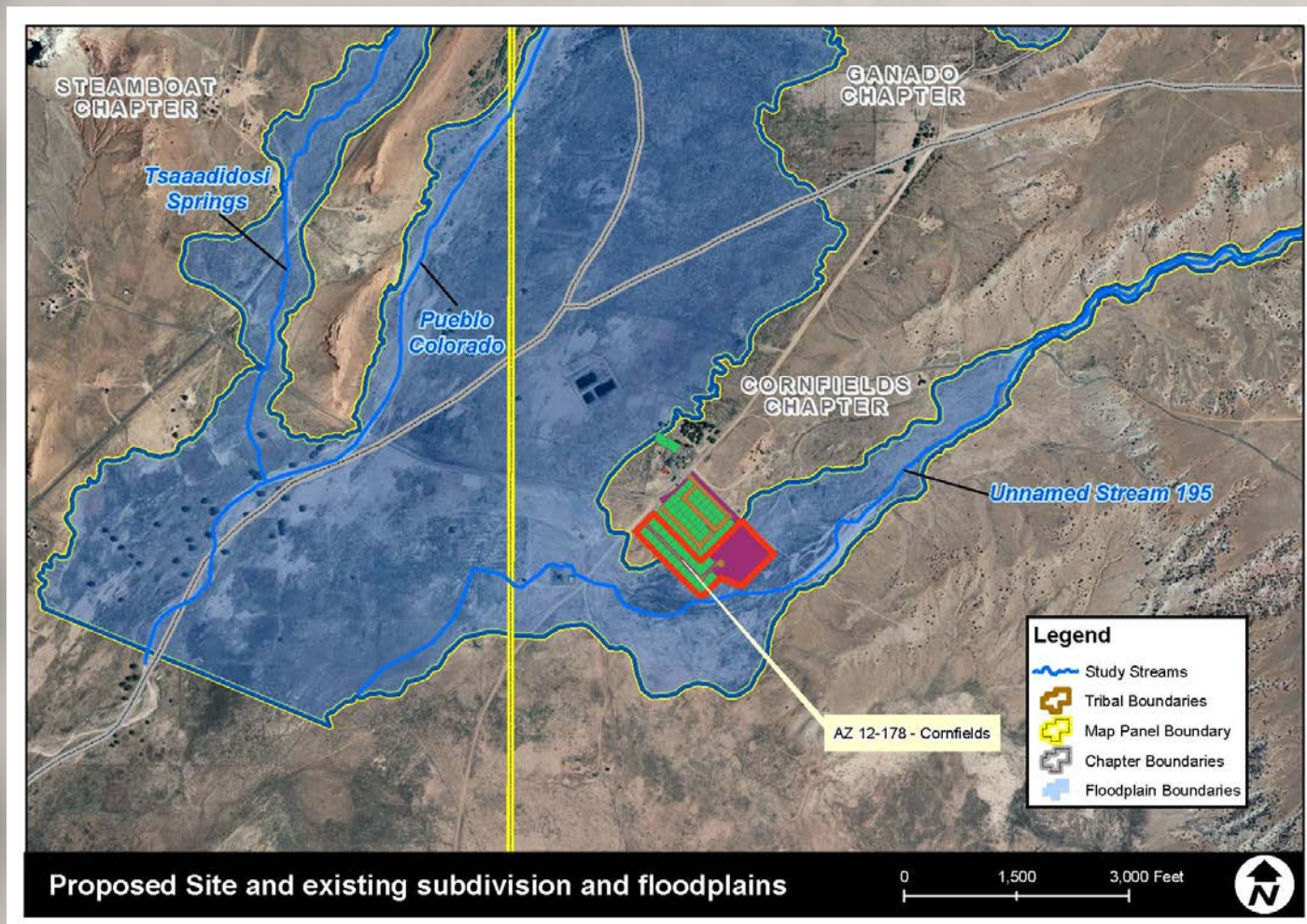
(2) In addition, the public notice procedures of § 55.20(b)(1) shall be followed, and a minimum of 7 calendar days for public comment before approval of the proposed action shall be provided.

(h) *Step 8.* Upon completion of the decision making process in Steps 1 through 7, implement the proposed action. There is a continuing responsibility to ensure that the mitigating measures identified in Step 7 are implemented.



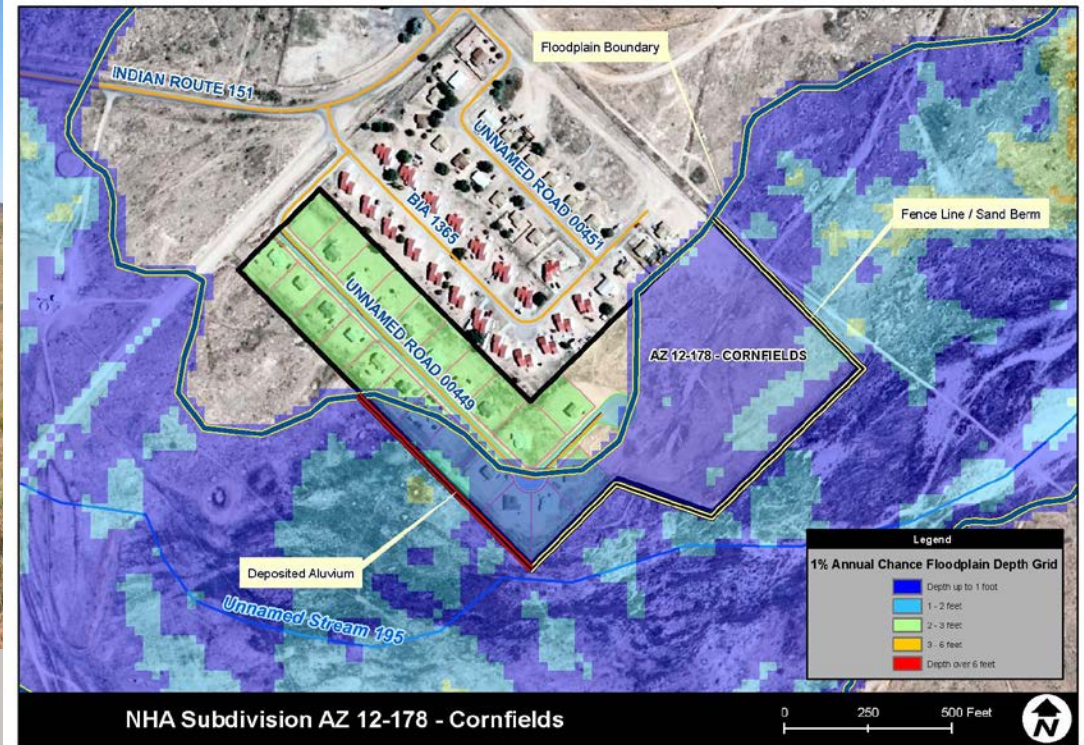
FLOODPLAIN PROJECT – CASE STUDY #1

- Cornfields, AZ – New development of 28 units
- Completed 8 step process: Title 24, Section 55.20 CFR Regulations



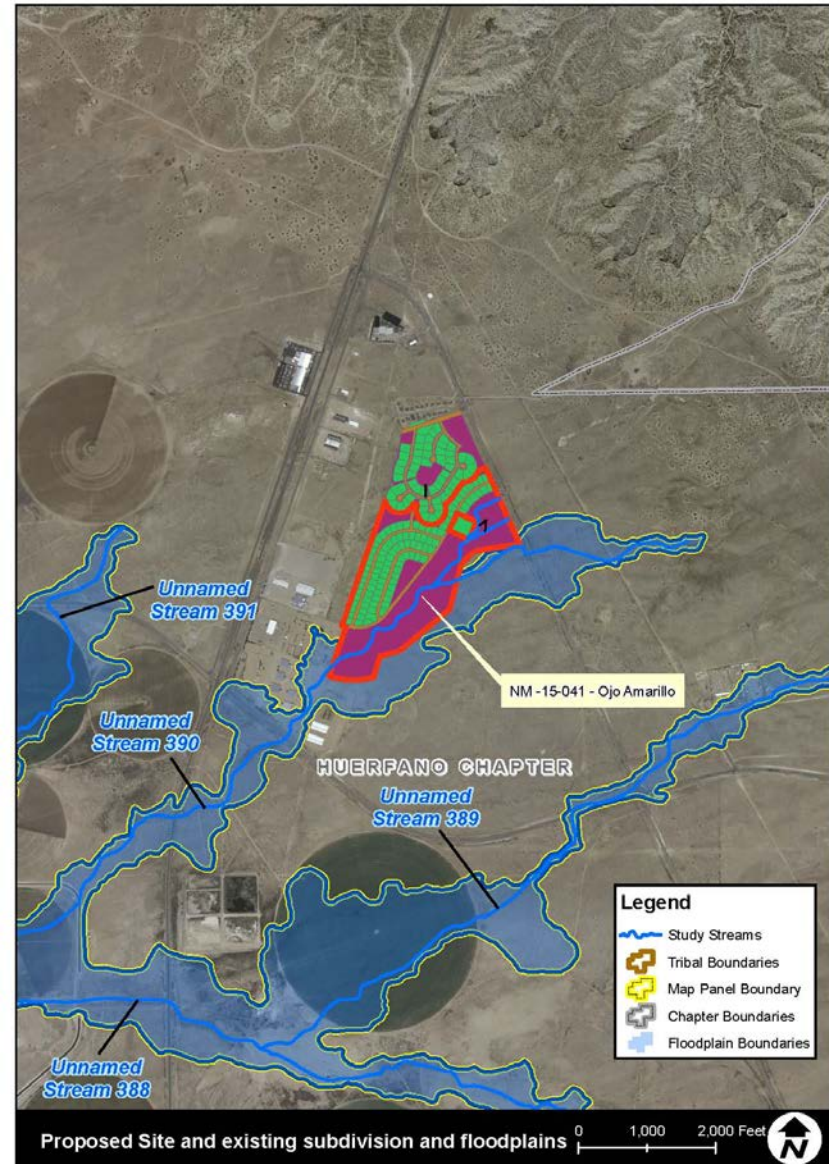
FLOODPLAIN PROJECT – CASE STUDY #1

➤ Outcome:



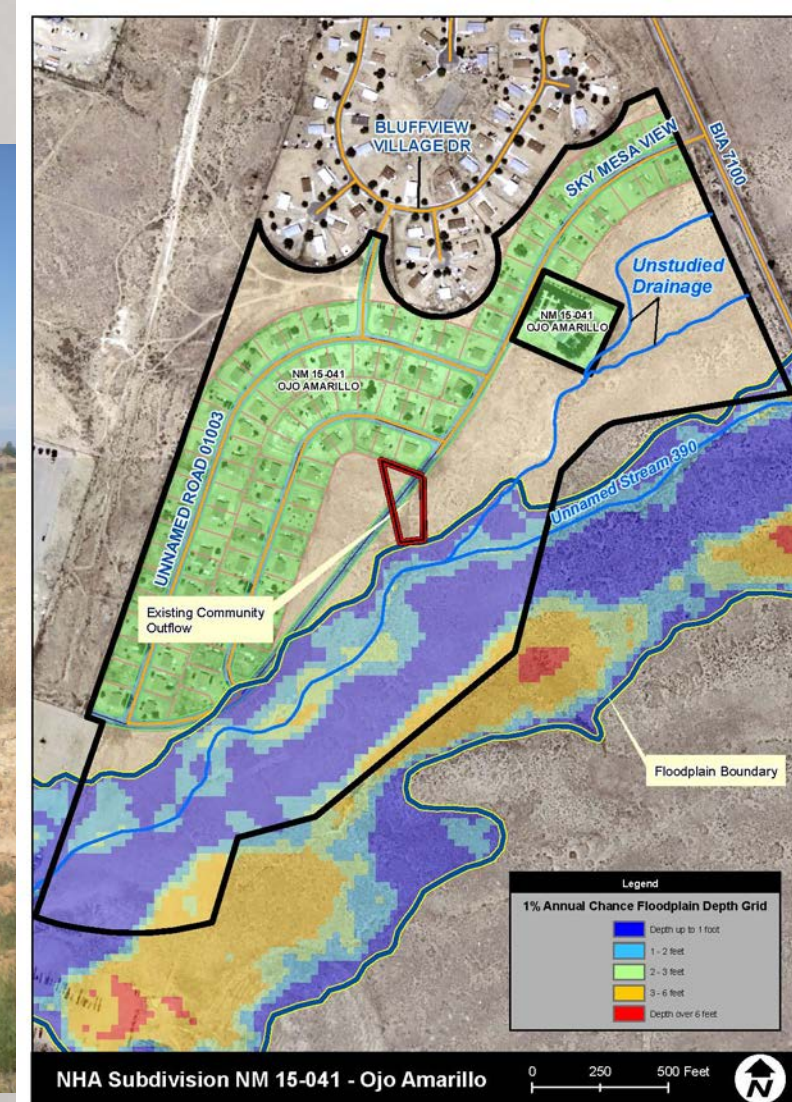
FLOODPLAIN PROJECT – CASE STUDY #2

- Ojo Amarillo, NM – New development of 147 units
- Completed 8 step process: Title 24, Section 55.20 CFR Regulations



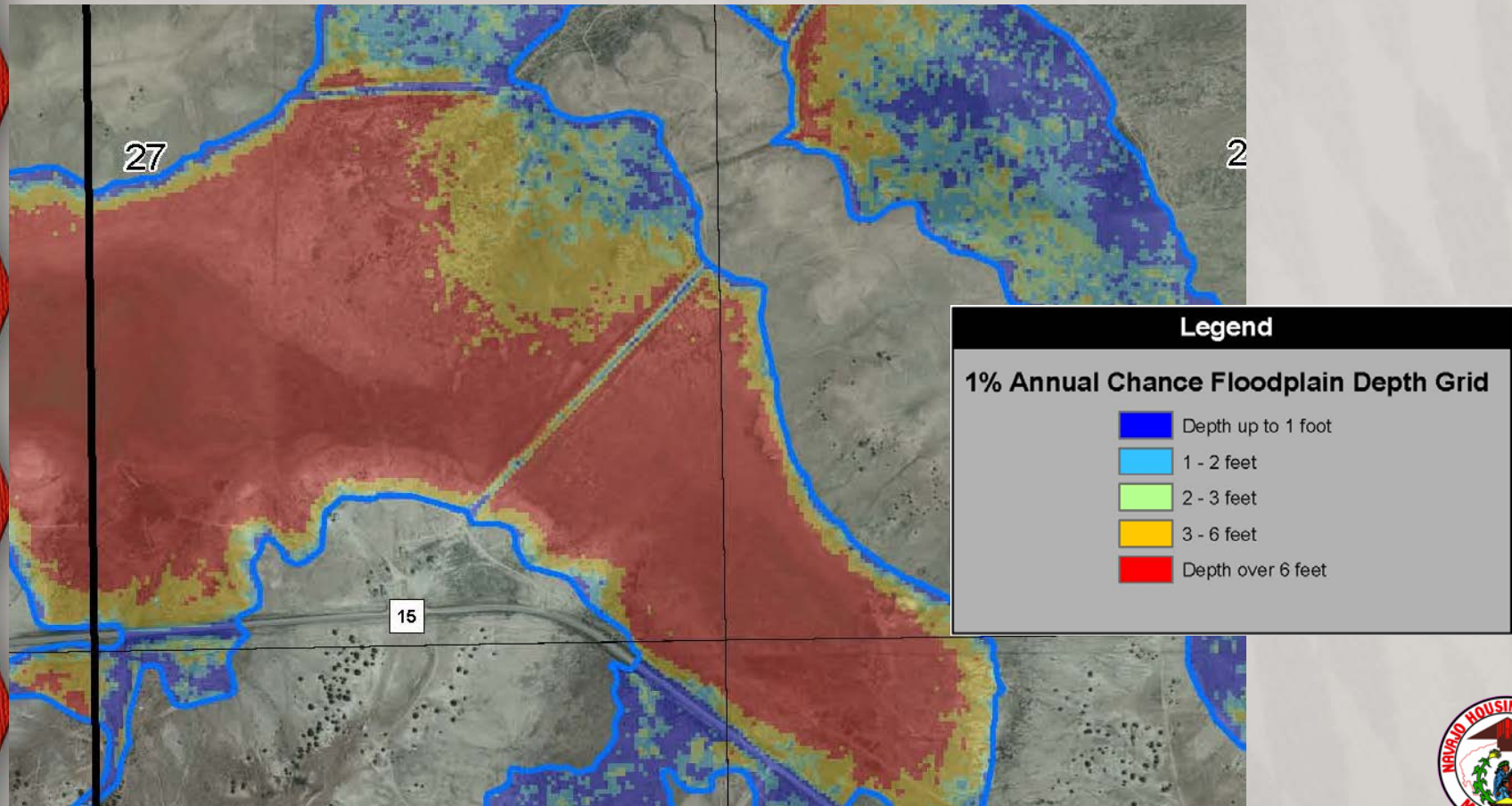
FLOODPLAIN PROJECT – CASE STUDY #2

➤ Outcome:



DEPTH GRID MAPS

- Derived from subtracting ground elevation from the 1% Annual Chance flood depth
- Communicates flood risk by flood depth



DEPTH GRIDS

Shiprock, New Mexico



INTERACTIVE WEB MAPPING TOOL

NAVJO HOUSING AUTHORITY
MAY 1, 1963

Home Account Log Out Edit My Account

kayenta Search Clear Results

Zoom In Zoom Out Pan Basemap Measure Identify

Layers

Upload KML

- NHA Base Data
- NHA Floodplains
 - Water Surface Elevations
 - Map Panel Boundary
 - Study Streams
 - Survey Control Points
 - Floodplain Boundaries
- NHA Homes and Roads
- NHA Subdivisions and Parcels
- NHA Landmarks

Navajo Nation (1 of 3)

Name: Navajo Nation
Description: Navajo Nation Reservation
[Zoom to](#)

Navajo Housing Authority

Esri, HERE, DeLorme, TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

* These layers contain DRAFT data, which is still being developed and has not been through a quality review.

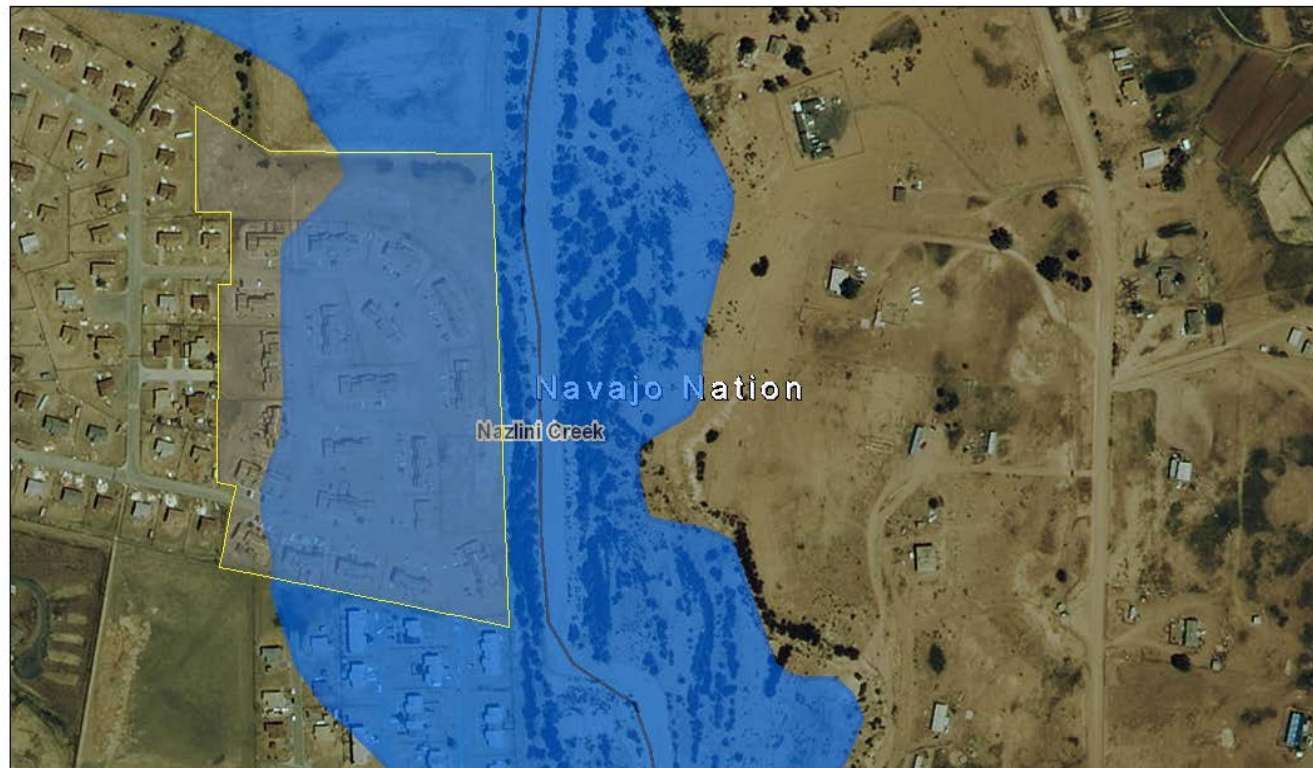
3D PERSPECTIVE

- 3D Perspective provides site suitability for future construction of homes and utilities

FLOODPLAIN PROJECT – EXISTING DEVELOPMENT

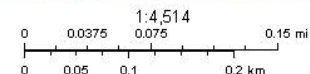
- Project: Modernize 150 existing homes in Chinle, AZ
- Process: Follow 8 Step Process: Title 24, Section 55.20 CFR

AZ12/85/86/87- Chinle, AZ



June 6, 2015

- Study Streams
- Floodplain Boundaries
- ▭ Navajo Nation
- ▭ Hopi Reservation
- ▭ US States



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, IGP, Swisstopo, and the GIS User Community
Esri HERE, DeLorme, TomTom, Mapbox, OpenStreetMap contributors,



PROPOSED FLOODPLAIN MANAGEMENT POLICY

2 Prong Approach - guides development away from flood hazards and mitigate homes already in the floodplain

- 1. Freeboard Policy
- 2. Horizontal Set-Back Policy

Build quality homes in a safe location to safeguard the life and property of the Navajo Nation

PROPOSED FLOODPLAIN MANAGEMENT POLICY

Freeboard Policy

- Provide factor of safety in very flat terrain

Horizontal Set-Back Policy

- Set-back distance based on discharge and erosion factor
- Discharge unique for each flooding source

Select policy that provides greatest factor of safety to be implemented in specific context

OUTREACH & TRAINING

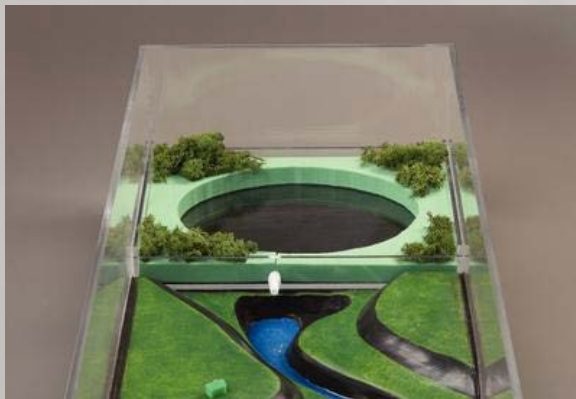


- Floodplain Videos produced in Navajo
- Floodplain Simulator
- Hazard Mitigation Plan

OUTREACH VIDEO IN NAVAJO

FLOODPLAIN SIMULATOR

- Simple, easy to use, and portable
- Hands on
 - ❖ 3 Different “Plug and Play” Headwaters
 - ❖ Can add a levee to modify floodplain
 - ❖ Can change the slope
 - ❖ Can modify rainfall intensity and amount over headwater
 - ❖ Staff gage used to measure river levels



FLOODPLAIN SIMULATOR



FIRE HAZARD MITIGATION

- Develop away from high and extreme fire hazards
- NHA is self-insured

Build quality homes in a safe location to safeguard the life and property of the Navajo Nation

FIRE HAZARD MITIGATION

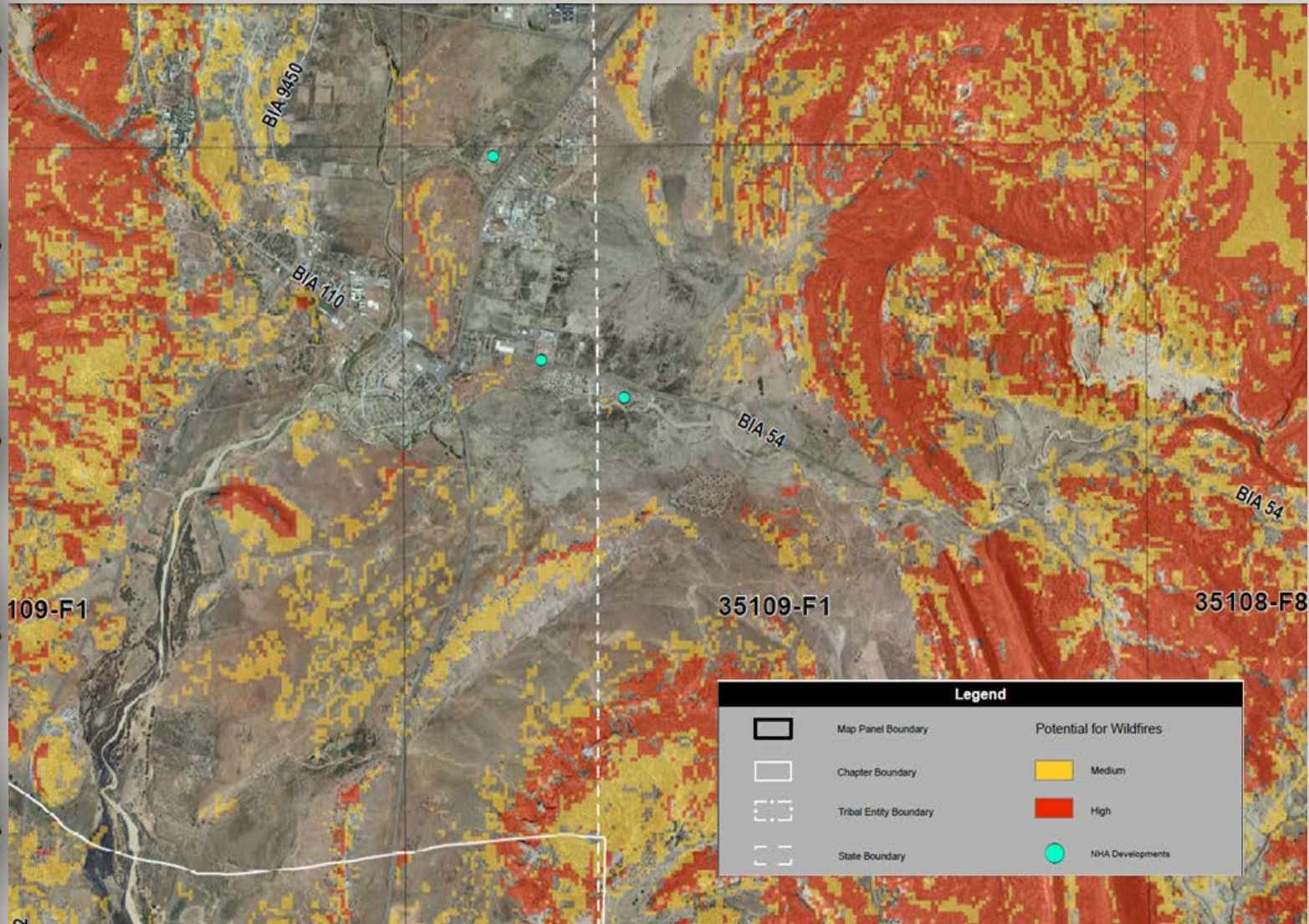
Fire Risk Categories

	Low Slope (0-5%)	Medium Slope (6-19%)	High Slope (20% and up)
Low Fuel Load (grass)	Moderate	Moderate	Moderate
Medium Fuel Load (shrub)	Moderate	High	Extreme
High Fuel Load (forest)	High	Extreme	Extreme

ASSAYI LAKE FIRE VIDEO – 3D TIME SEQUENCE

FIRE HAZARD MITIGATION

Wildfire Mapping being conducted on entire Navajo Nation



ENGINEERING & GIS AWARD WINNER



- 2014: Engineering Excellence award from ACEC in Water Category
- 2015: Esri Special Achievements in GIS (SAG) award

SUMMARY

NHA has taken important steps in flood and fire hazard mitigation:

1. Accurate and up-to-date base map
2. Identification of flood and fire hazards using the latest technologies
3. Following 8-step Flood Hazard Mitigation Alternative process
4. Hazard Mitigation Plan identifies best practices for planning and mitigation

This will lead to sustainable and safe development

NHA implementing floodplain management policy

This will safeguard NHA homes from future hazards and develop resilient communities

THANK YOU!