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Iconic Arizona Highway Victim of Wildfires & Floods

Improving State Route 88 Apache Trail: How to maintain the delicate balance of history, the changing environment and public access

Arizona State Route 88 – Apache Trail

President Theodore Roosevelt stated that "the Apache Trail combines the grandeur of the Alps, the glory of the Rockies, the magnificence of the Grand Canyon and then adds an indefinable something that none of the others have."

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Dustin Robbins, P.E.

- B.S. and M.S. in civil and environmental engineering, University of Nevada, Las Vegas
- Transportation project manager
- 15 years transportation experience
- Previous experience as project manager at the Federal Highway Administration, Central Federal Lands Highway Division

Arizona State Route 88 – Apache Trail

General Route Description

- 42 miles from Apache Junction to Roosevelt Dam
- Through Superstition Mountains
- Steep grades, narrow road bench
- Generally follows Salt River
- Scenic route from Phoenix to State Route 188

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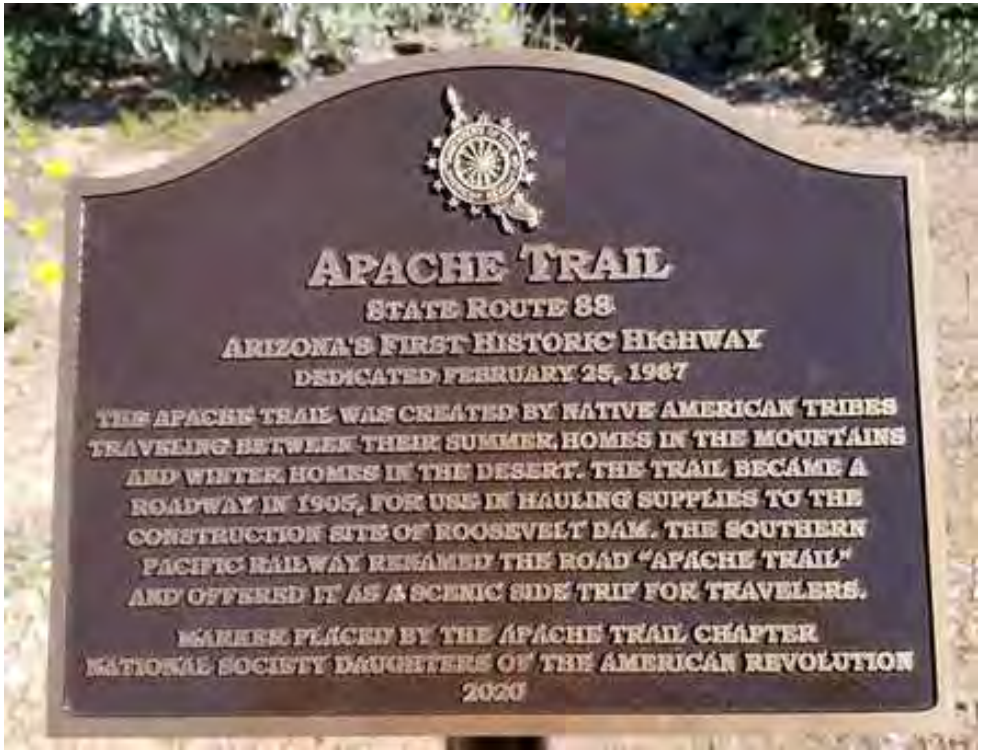
Arizona State Route 88 – Apache Trail
Historical Context

- Originally created by tribes including Apache and Yavapai
- Used for many generations



Arizona State Route 88 – Apache Trail
Historical Context

- Growing Phoenix area had a need to control the Salt River
- Roosevelt Dam commissioned in 1902
- Apache Trail required improvements to facilitate construction access

Arizona State Route 88 – Apache Trail
Historical Context

- Roadway built between 1903 and 1904
- Mostly built by hand
- Builders were mostly Native Americans, including Apache

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Arizona State Route 88 – Apache Trail Historical Context

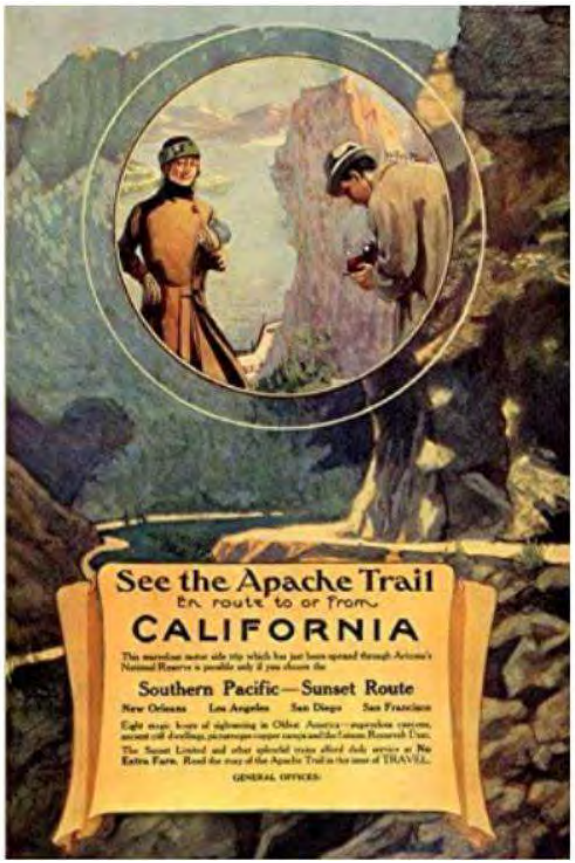
Timeline

- Dam constructed by 1911, little use for the road
- Transferred to ADOT in 1922
- Use shifted to scenic and recreational

Arizona State Route 88 – Apache Trail Historical Context

Timeline

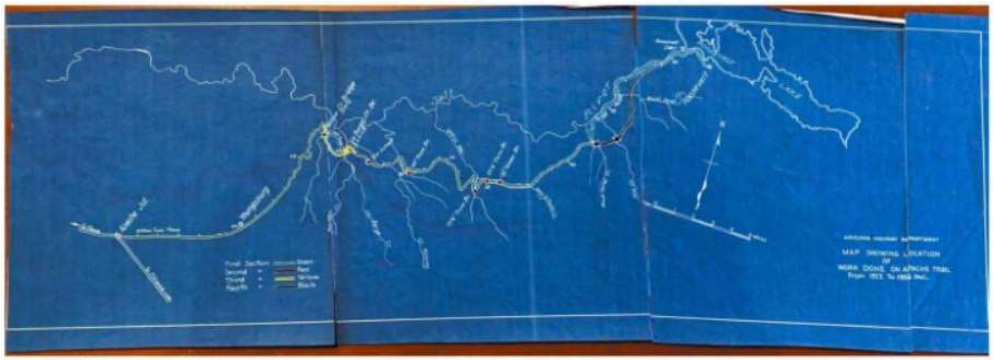
- Became tourist destination
- Named “Apache Trail” by the Southern Pacific Railroad



Arizona State Route 88 – Apache Trail
Historical Context

<u>Timeline</u>

- ADOT improved the route as needed
- Various eras of construction evident
- Designated a historic road in 1986



Arizona State Route 88 – Apache Trail Route Segments

3 Main Segments

- Apache Junction to Fish Creek Hill Overlook
- Fish Creek Hill Overlook to Apache Lake Marina
- Apache Lake Marina to Roosevelt Dam

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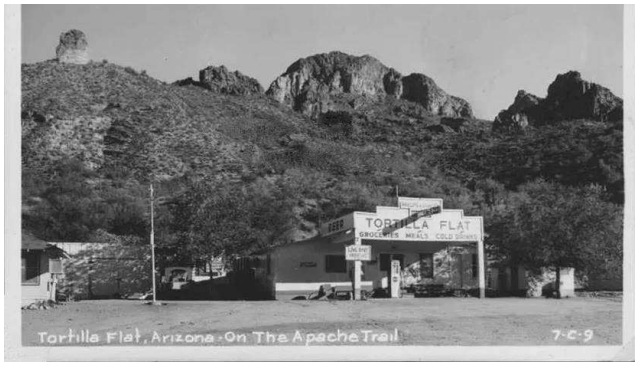
Arizona State Route 88 – Apache Trail
Route Segments

Segment 1 – Apache Junction to Fish Creek Hill Overlook

- Relatively flat, 19 miles long
- Paved by ADOT
- Popular store in Tortilla Flat



Arizona State Route 88 – Apache Trail Route Segments

<u>Segment 2 – Fish Creek Hill Overlook to Apache Lake Marina</u>

- Extremely steep, grades up to 18%
- Sharp curves
- Narrow bench
- Most scenic part of the route
- Unpaved and mostly unimproved from original construction

Arizona State Route 88 – Apache Trail Route Segments

<u>Segment 3 – Apache Lake Marina to Roosevelt Dam</u>

- Grades up to 12%
- Sharp curves with poor sight distance
- Narrow bench
- Unpaved
- Has seen many significant maintenance improvements

Arizona State Route 88 – 2017 Apache Trail Project Scope

<u>Segment 3 – Apache Lake Marina to Roosevelt Dam</u>

- Partnership with ADOT, Tonto National Forest and Federal Highway Administration – Central Federal Lands
- Part of Federal Lands Access Program, federal funding

Goal: Balance historic preservation while reducing maintenance burden

Arizona State Route 88 – Apache Trail
Project Scope

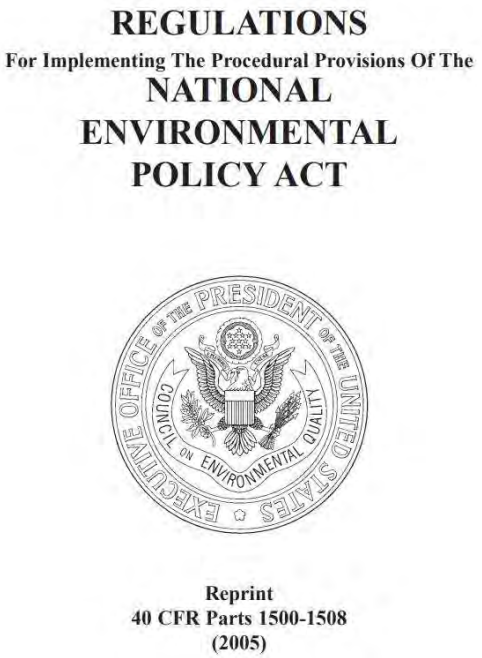
Mile Post	Image	Mile Post	Image
229.5		233.5	
229.6		234.5	
229.9			

- Vastly reduce maintenance burden with pavement
- Minor drainage improvements, where feasible
- Improve sight distance in select locations
- No widening

Arizona State Route 88 – Apache Trail Environmental Work

National Environmental Policy Act (NEPA) Process

- Led by FHWA – CFL
- Key items were cultural and public involvement
- Environmental assessment

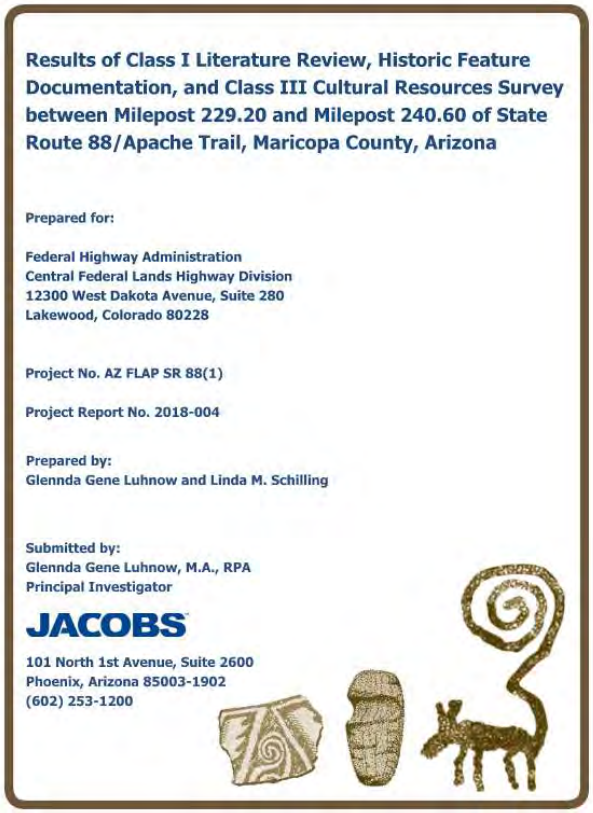

REGULATIONS
For Implementing The Procedural Provisions Of The
NATIONAL
ENVIRONMENTAL
POLICY ACT

Reprint
40 CFR Parts 1500-1508
(2005)

Arizona State Route 88 – Apache Trail Environmental Work

Cultural Resources

- Resource surveys complete
- Many sites identified
  - Native American
  - Road construction



Arizona State Route 88 – Apache Trail Environmental Work

Section 106 Consultation

- Engagement with the Arizona State Historic Preservation Office (SHPO)
- Consultation process
- Determination:
  - Adverse effect to historic properties
  - SHPO concurrence
- Required Mitigation and Memorandum of Agreement (summer 2019)

Section 106 of the National Historic Preservation Act (16 U.S.C. 470f) says . . .

"The head of any Federal agency having direct or indirect jurisdiction over a proposed Federal or federally assisted undertaking in any State and the head of any Federal department or independent agency having authority to license any undertaking shall, prior to the approval of the expenditure of any Federal funds on the undertaking or prior to the issuance of any license, as the case may be, ***take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register.*** *The head of any such Federal agency shall afford the Advisory Council on Historic Preservation established under Title II of this Act a reasonable opportunity to comment with regard to such undertaking."*

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Arizona State Route 88 – Apache Trail
2019 Woodbury Fire & Flooding

- Fire June 8, 2019
- 123,875 acres burned
- Destabilization of watershed

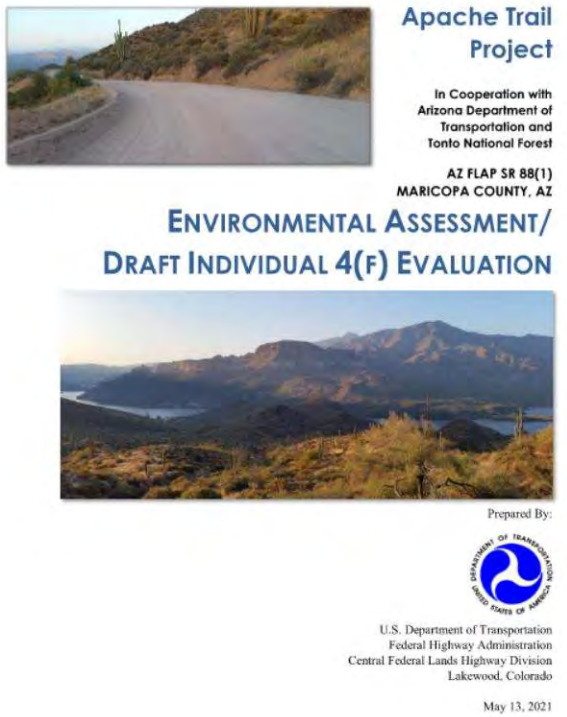
Arizona State Route 88 – Apache Trail
2019 Woodbury Fire & Flooding

- Tropical Storm Lorena September 23, 2019
- Tropical Storm Raymond November 19, 2019

Arizona State Route 88 – Apache Trail
2019 Woodbury Fire & Flooding

- Long term closure of segment 2
- Significant damage to segment 3
- Reevaluation of the project scope, purpose and need

Arizona State Route 88 – Apache Trail
Re-engage NEPA Process post event



Completing NEPA

- Completing State Historic Preservation Office (SHPO) consultation
- Development of historic properties treatment plan
- Development of Memorandum of Agreement
  - ADOT, Tonto National Forest (TNF) and tribes

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Arizona State Route 88 – Apache Trail
2019 Woodbury Fire & Subsequent Flooding

Impacts on SHPO consultation

- Meeting to discuss scope of project
- Reevaluation of priorities
- Storm showed the inadequacy of the drainage infrastructure
- May lose historic road and ability to drive it if drainage upgrades not made

Arizona State Route 88 – Apache Trail
Completing NEPA Process

Apache Trail Project

Historic Properties Treatment Plan for Cultural Resources between Milepost 229.20 and Milepost 240.60 of State Route 88/Apache Trail Maricopa County, Arizona

Prepared for:
Federal Highway Administration
Central Federal Lands Highway Division
Lakewood, Colorado 80228

Prepared by:
Patricia Ambacher, M.A.
Mark Bowen, M.A.
Glennda Gene Luhnow, M.A., RPA

Submitted by:
Glennda Gene Luhnow, M.A., RPA
Principal Investigator
Jacobs Engineering Group Inc.

August 2021

Historic Properties Treatment Plan (HPTP)

- Outlined interaction with historic properties during construction
- Included in construction contract

Arizona State Route 88 – Apache Trail
Completing NEPA Process

Memorandum of Agreement

- Parties were ADOT, Tonto National Forest and tribes
- Outlined mitigation commitments

Arizona State Route 88 – Apache Trail Mitigation Implementation

<u>Mitigation for Adverse Effects, Emphasis Public Education</u>

- Several meetings between ADOT, TNF, FHWA and SHPO
- Balanced desires from stakeholders
- Preservation of historic culverts and headwalls was not possible
- SHPO strongly desired a public education approach

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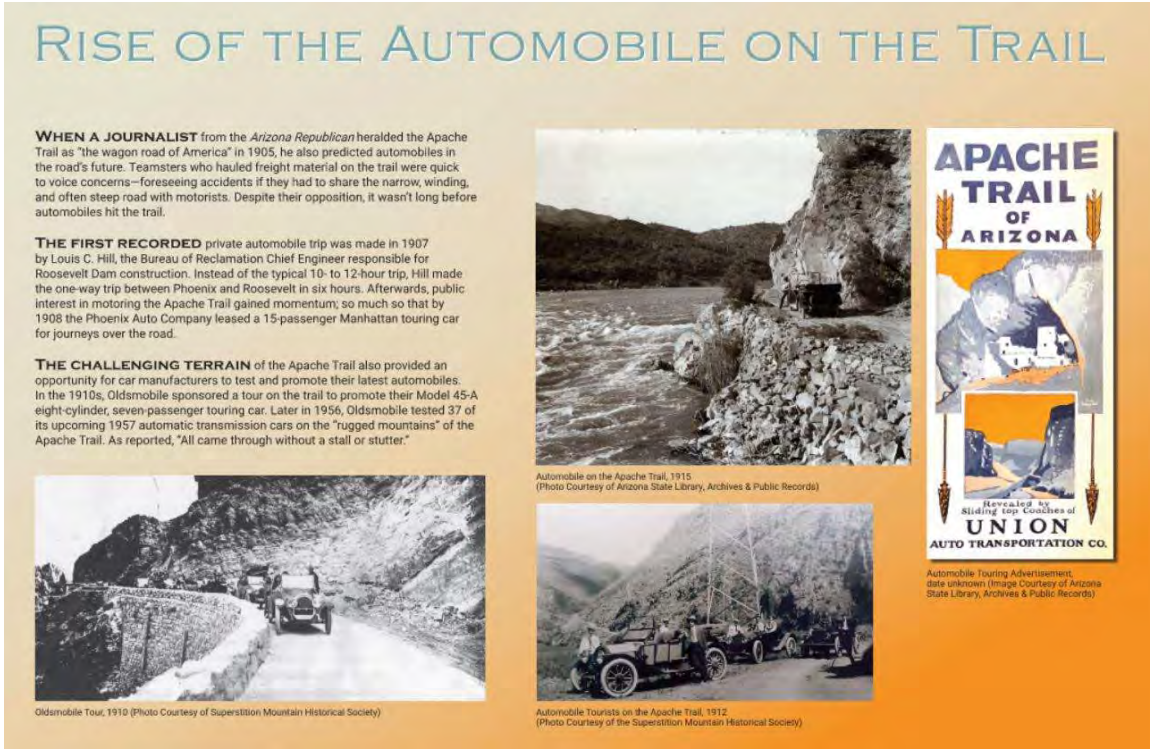
Arizona State Route 88 – Apache Trail
Mitigation Implementation – Public Education

Interpretative Panels

- Nine roadside interpretive panels
- Complement existing panels
- Located throughout Apache Trail



A Feat of Engineering with No Blueprint

While the alignment for the Apache Trail had been surveyed, the Bureau of Reclamation constructed the road with no formal engineering plans. The survey solidified the Bureau's understanding that the route was in rugged and unforgiving terrain, and not an ideal location for a road.

Early construction work was grueling and performed by a diverse workforce, including native Apache and Pima (Akimel O'odham) people. Road crews worked primarily by hand labor with limited equipment. To expedite rock excavation, dynamite was used to blast through hillsides, forming many of the switchbacks on the road. Retaining walls were constructed to overcome the steep topography and support the road under heavy freight wagons, and later automobile traffic. Largely attributed to the skilled labor of Apache workers, the stone walls were constructed with the rock at hand. Some walls measured more than 10 feet high and 100 feet long. The walls were initially dry-laid stone until the cement plant near Theodore Roosevelt Dam was constructed between 1903 and 1904, after which concrete mortar was used.

As construction progressed, the road was in a state of constant improvement. Newly completed road segments were subsequently realigned and upgraded to eliminate river crossings. The base of the road was improved where desert sands eroded or rutted under wagon traffic, and rockfall repairs were required to maintain passenger traffic and mail service.

The rugged terrain encountered during pre-construction surveys near Mormon Flat, early 1900s (Photo Courtesy of the Salt River Project)

One of the many dry-laid, stone walls on the Apache Trail, 1905 (Photo Courtesy of the Salt River Project)

Workers excavate through hillside south of the Theodore Roosevelt Dam construction area; com
it remains the route traveled today (Photo Courtesy of the Salt River Project)

The original Apache Trail roadbed over Three Mile Wash which was later inundated by Apache Lake in 1927 (Photo Courtesy of the Salt River Project)

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Riding in Style on the Apache Trail

Stagecoach on the Apache Trail at Fish Creek Station, early 1900s
(Photo Courtesy of Arizona State Library, Archives & Public Records)

From stagecoaches to motorcoaches, tourists flocked to what the Southern Pacific Railroad called a "matchless motor tour." Bowen & Grover inaugurated travel between Mesa and the dam in 1904. Their passengers were carried as far as the road was finished by buckboard wagon and then had to mount horses for a 28-mile ride. At the bottom of Fish Creek Hill, they changed to a vehicle to complete the journey. In 1905, William A. Kimball ordered eight-seat and 10-seat Concord stagecoaches. This prompted Kimball's competition, J. Holdren and Sons, to purchase a 14-passenger automobile for the journey between Mesa and Roosevelt, which was promised to reach a speed of "20 miles an hour."

Auto touring companies heavily promoted the trail, along with the comfort and reliability of their latest motorcoaches. The Union Auto Transportation Company lauded their sliding top motorcoaches with the "disappearing tops." These motorcoaches had large passenger windows for taking in the dramatic views along the trail. The tops of the cars could be slid out of view, allowing passengers to be immersed in the scenery of the Superstition Mountains overhead. The Company bragged that you could practically drive them with no hands, with "the car picking out the course with the accuracy of a trained burro."

Union Auto Advertisement
for Sliding Motor Coach

Apache Trail Highway Touring Cars, date unknown
(Photo Courtesy of the Superstition Mountain Historical Society)

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An Engineering Challenge

The Fish Creek Hill section of the Apache Trail was once described by the local newspaper as "insurmountable." The road climbed the hill on a 10 percent grade along the base of a vertical cliff several hundred feet high. To get up the hill by buggy or loaded wagon took 45 minutes to an hour. Louis C. Hill, Bureau of Reclamation Chief Engineer, made the first recorded private automobile trip over the trail in 1907. Traveling by automobile reduced the trip to 16 minutes.

The challenging topography meant that it was the most expensive portion of the road to construct at an estimated $25,000 per mile and, therefore, was one of the last constructed. To create the required road width, 75-foot-high rock fills were required in some areas, and 60- to 70-foot-deep rock cuts were required in others. Retaining walls consisting of dry-laid stone were constructed to overcome the steep topography and support the road. Constructed by Apache laborers, some of these walls still exist along Fish Creek Hill.

Hauling freight over Fish Creek Hill, 1907 (Photo Courtesy of the Salt River Project)

ish Creek Hill before construction of the Apache Trail, early 1900s (Photo Courtesy of the Salt River Project)

View descending Fish Creek Hill, early 1900s (Photo Courtesy of the Salt River Project)

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The Work Continues

Despite declaring the road open in April 1905, maintenance, repair, and improvements continued. During dam construction, 1.5 million pounds of freight was hauled over the road each month using horse-drawn wagons that wore heavily on the road. Travel was also often interrupted by flooding.

After a flood on November 17, 1905, cement pipe culverts were installed to combat flood damage, the earliest of which was built in 1906. With completion of the Theodore Roosevelt Dam in 1911, the Bureau of Reclamation ceased maintenance of the road and it fell into disrepair. Prompted by U.S. Forest Service calls for road maintenance, the Bureau of Public Roads surveyed the Apache Trail in 1918 and found flood damage, steep grades, and the need for culvert and bridge replacements. Arizona Senator Marcus A. Smith bemoaned the condition of the road stating, "It is a disgrace for the most beautiful scenic highway in the United States to be left in such poor condition."

It wasn't until 1922, when the Bureau of Reclamation declared the Salt River Valley Water Users Association the agent of the road, that a series of maintenance projects was undertaken. The Association quickly transferred ownership to the State and the Arizona Highway Department began improvements that same year. Improvements were done in four road sections and included road widening and constructing new culverts, retaining walls, and bridges. Since much of the damage was done by water, not vehicles, the addition of culverts was critical to maintain the road. Newspaper accounts heralded these improvements stating, "The new concrete work and drainage on the highway constitutes exceptionally fine engineering. The water is drained under the road and the construction is permanent."

Pine Creek Bridge Construction, 1925 (Photo Courtesy of Arizona State Library, Archives & Public Records)

Flooding at the Theodore Roosevelt Dam, 1908 (Photo Courtesy of Arizona State Library, Archives & Public Records)

Heavy equipment, such as this portion of a 20-ton generator, were hauled to the Roosevelt Dam site (Photo Courtesy of the Salt River Project)

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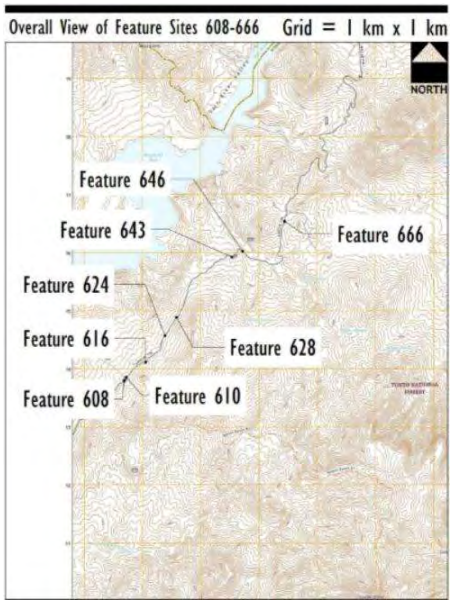
Arizona State Route 88 – Apache Trail Mitigation Implementation

Historic American Buildings Survey / Historic American Engineering Record (HAER) Documentation

- HAER standards
- Documented 15 culverts with character-defining features
- Documented before construction
- Archived in Library of Congress



HISTORIC AMERICAN ENGINEERING RECORD

APACHE TRAIL FROM MILEPOST 229.2 TO 240.6
(State Route 88)

HAER No. AZ-101-A

Location: Tortilla Flat vicinity, Maricopa County, Arizona

The Apache Trail (State Route 88) that is the subject of this document is a linear resource interspersed with fifteen identified water drainage culverts. These coordinates were obtained in 2021, using a handheld Trimble 7X Global Positioning System (GPS) unit capable of submeter accuracy. The coordinate datum is North American Datum 1983. The Apache Trail culvert locations have no restriction on their public release.

Milepost 229.20 Latitude: 33.56340, Longitude: -111.24050
Milepost 229.26 Latitude: 33.56409, Longitude: -111.24000
Milepost 229.55 Latitude: 33.56655, Longitude: -111.23630
Milepost 229.94 Latitude: 33.57072, Longitude: -111.23270
Milepost 230.14 Latitude: 33.57311, Longitude: -111.23100
Milepost 231.17 Latitude: 33.58272, Longitude: -111.22030
Milepost 231.36 Latitude: 33.58352, Longitude: -111.21830
Milepost 232.24 Latitude: 33.58842, Longitude: -111.21060
Milepost 236.76 Latitude: 33.63399, Longitude: -111.19690
Milepost 237.31 Latitude: 33.63991, Longitude: -111.19580
Milepost 237.90 Latitude: 33.64607, Longitude: -111.19350
Milepost 238.65 Latitude: 33.65279, Longitude: -111.18590
Milepost 239.52 Latitude: 33.65854, Longitude: -111.17940
Milepost 239.72 Latitude: 33.65831, Longitude: -111.17610
Milepost 240.48 Latitude: 33.66575, Longitude: -111.16920

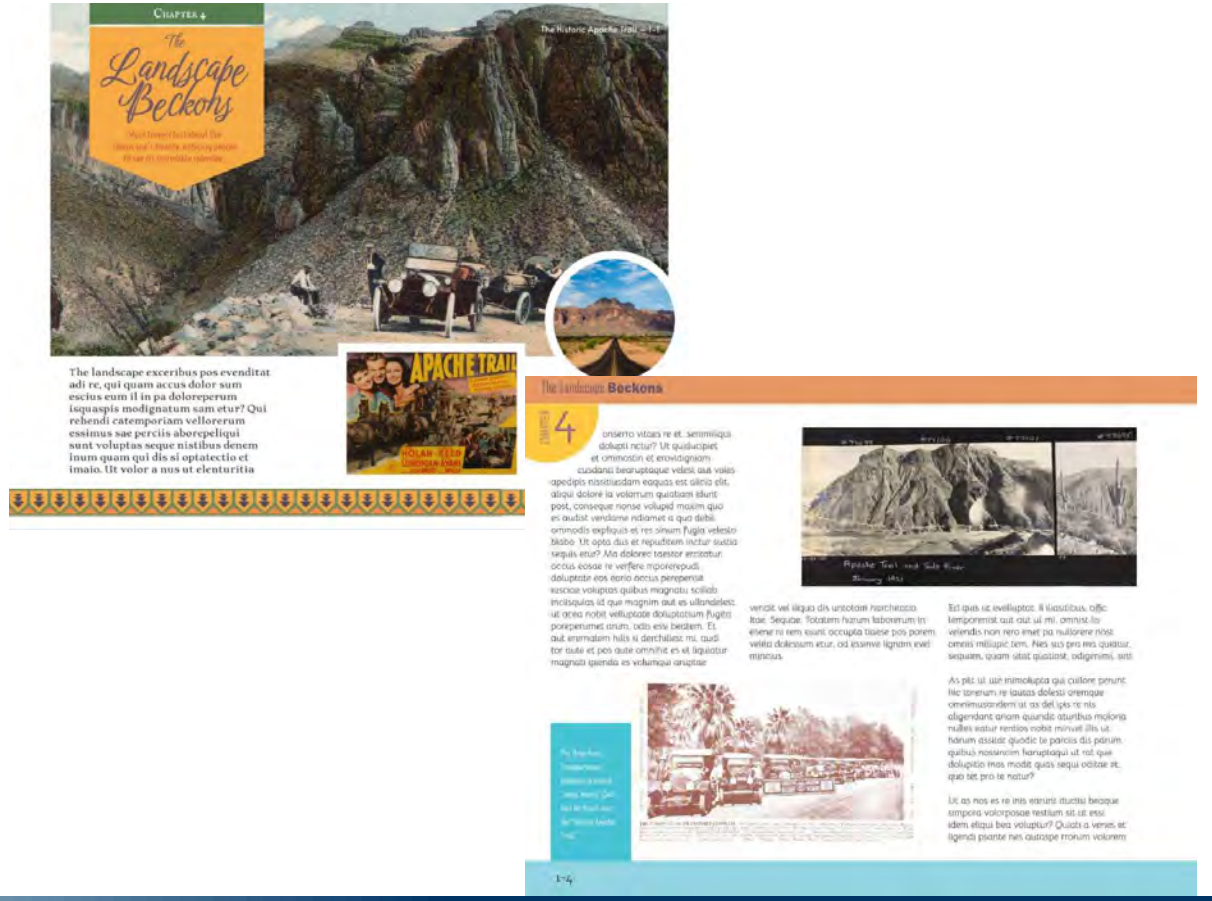
Present Owner/ Occupant: Under the jurisdiction of Tonto National Forest

Present Use: The Apache Trail section that is the subject of this document is accessed via the intersection of State Route 88 and State Route 188, near Theodore Roosevelt Dam. The section is currently closed at the Apache Lake Vista parking and picnic area. Given this closure, the road is currently more focused in use than it has been historically when it served through traffic. The earthen road currently provides recreational access for the campgrounds, hiking trails, boat launches, and the Apache Lake Marina, among other services of the Tonto National Forest. The Salt River Project staff use the road to access the Theodore Roosevelt Dam facilities and associated features the U.S. Bureau of Reclamation (Reclamation) oversees downriver.

Arizona State Route 88 – Apache Trail
Mitigation Implementation

<u>Coffee Table Book</u>

- Primary mitigation investment
- Meant to tell the story of Apache Trail
- Both print and digital
- Different from existing book
- Commissioned drone photographs



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Arizona State Route 88 – Apache Trail Construction Considerations

(f) Project Specific Commitments.

(1) Provide a qualified archaeologist to conduct archaeological monitoring supervised by a principal investigator meeting the Secretary of Interior's Professional Qualification Standards (36 CFR Part 61; 48 FR 44738-44739) to monitor when performing headwall and culvert construction near features with a known potential for buried walls. Provide documentation of qualifications to CO for approval.

(2) Provide a qualified archeologist to monitor all ground disturbance near features with a known potential for buried walls. Locations are below:

1256+10	1271+14	1275+44	1287+75
1290+67	1296+25	1308+62	1313+53
1317+67	1334+94	1338+50	1342+91
1356+84	1365+55	1403+70	1417+08
1420+22	1488+49	1501+68	1506+92
1559+92	1646+29	1687+90	

(3) Provide a qualified archaeologist to flag Environmentally Sensitive Areas, as indicated on plan sheets, prior to construction and provide an archeological/historic awareness program regarding features that need to be preserved and/or monitored during construction.

(4) Follow the *Historic Properties Treatment Plan* and *Monitoring and Discovery Plan* (Appendix B) for the project. Qualified archaeologist will submit a technical report of findings to the CO for approval within 30 days following conclusion of monitoring fieldwork.

(5) Provide a qualified biologist(s) to present an environmental awareness program, conduct bird nest surveys, monitor vegetation clearing activities, and handle Sonoran desert tortoises during vegetation clearing.

- Contract requirements
- Contractor to install panels
- Unanticipated discoveries
- Areas likely to have buried headwalls
- Archeological monitoring

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Construction starts Sept. 2022

- $18 million contract
- Difficulties associated with topography
- Maintenance of traffic
- Remoteness
- Marina stakeholders
- Negotiated night closures Monday-Thursday
- Completion scheduled spring 2024

Arizona State Route 88 – Apache Trail Conclusions

<u>Climate change: More Extreme Wildfires and Flooding are Growing Environmental Threats</u>

- Biological resources
- Historic resources
- Maintenance and resiliency
- Environmental aspects of entering the field of transportation engineering

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Arizona State Route 88 – Apache Trail Conclusions

Transportation Engineers and Project Managers

- Context matters
- Engage with the NEPA process
- Include stakeholders

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