## HISTORIC BRIDGE INVENTORY

## Dead Indian Canyon Bridge

PROPERTY IDENTIFI	CATION		
county milepost location city/vicinity district	Coconino 0.00 13.2 mi W of Desert View Desert View 85	inventory number inventory route feature intersected USGS quadrangle UTM reference	00032 abd. US 64 Dead Indian Canyon Hellhole Bend 12.442160.3976693
STRUCTURAL INFO	RMATION		
main span number appr. span number degree of skew main span length structure length	3 0 0 116.0 301.8	main span type appr. span type guardrail type superstructure substructure	309 0 steel rigid-connected Warren deck truss concrete abutments, wingwalls and pier pedestals w/ braced steel piers
roadway width structure width HISTORICAL INFOR	24.0 26.0 MATION	floor/decking other features	concrete deck over steel stringers upper chord: 2 channels w/ cover plate and lacing; lower chord: 2 channels w/ batten plates; diagonal: wide flange; lateral bracing: l angle; floor beam: I- beam; welded steel baluster guardrails
construction date project number information source alteration date(s)	1934 RG391(A) ADOT bridge records	designer/engineer builder/contractor structure owner alterations	US Bureau of Public Roads Vinson & Pringle, Phoenix AZ Arizona Department of Transportation
NATIONAL REGISTE	ER EVALUATION		
inventory score	77	For additional infor National Register M NRHP eligibility NRHP criteria signif. statement	mation, see "Vehicular Bridges in Arizona 1880-1964" fultiple Property Documentation Form listed A <u>x</u> B <u>C x</u> well-preserved example of uncommon structural type, located on important route

### FORM COMPLETED BY

Clayton B. Fraser, Principal





date of photo.: November 2002 view direction: northwest northeast photo no.: 02.11.174 02.11.175

During the early 1930s, the Arizona Highway Department and the US Bureau of Public Roads undertook an extensive road buildings effort to provide automobile access from the East to Grand Canyon National Park's south rim. In 1929 the Navajo Bridge **[0051]** was completed over the Colorado River, opening Arizona from the north. The following year AHD contracted for FAP 95-B—the state's largest highway construction project to date—covering 95 miles between the bridge and Cameron. The BPR built the Cameron-Desert View Approach to the park, naming the 31-mile route the NavaHopi Highway.

About 13 miles west of Desert View, the route crossed Dead Indian Canyon, a broad, rocky chasm on the northern periphery of the Gray Mountains. For this crossing, BPR delineated a rigid-connected steel deck truss supported by braced steel piers. The structure was comprised of three Warren truss spans, with built-up box beams for the upper and lower chords, a concrete deck and welded steel guardrails. In keeping with the Rustic Style then in use by the Park Service, the bridge featured decorative stone veneer on the concrete abutments and wingwalls. The Bureau of Public Roads engineered this trestle in 1933 and awarded the contract for its construction on August 31 to Vinson and Pringle for \$45,000. The Phoenix-based contractors had completed the steel erection by January and in May had completed the bridge. Now designated State Highway 64, the road still provides important access to the park, although in a realignment the bridge has been abandoned in place. It stands in unaltered condition.

### SIGNIFICANCE STATEMENT

The significance of the Grand Canyon to Arizona has been well documented in commercial and developmental terms. As an important crossing in a major access road to the park, the Dead Indian Canyon Bridge is historically important, at least on a regional basis. In a real sense it formed the final link in the route opened five years earlier by the nationally significant Navajo Bridge. Technologically, although the bridge displays typical medium-span truss design, it is distinguished as a well-preserved example of truss bridge construction. Moreover, the stonework ties the bridge with the Rustic Style in an uncommon exercise of bridge aesthetics. Abandoned and in pristine condition, the Dead Indian Canyon Bridge is one of Arizona's more spectacular vehicular trusses.

TECHNOLOGICAL SIGNIFICANCE represents the work of a master possesses high artistic values represents a type, period or method of construction	HISTORICAL SIGNIFICANCEassociated with significant personsassociated with significant events or patternscontributes to historical district		ATIONAL REGISTER CRITERIA x Criterion A Criterion B x Criterion C
NATIONAL REGISTER ELIGIBILITY individually eligible <u>x</u> yes <u>no</u> contributes to district <u>yes x</u> no	AREA OF SIGNIFICANCE: PERIOD OF SIGNIFICANCE: THEME(S):	Transportation 1934-1964 Transportation	n; Engineering n: Highways

Structure No. 0032



Location Map

279

# HISTORIC BRIDGE INVENTORY

## Navajo Bridge

ed deck arch es blasted in stone ers s w/ cover plate and
ouilt-up channels w/ ? channels w/ double el lattice guardrails
., Kansas City MO ortation twin structure built
ona 1880-1964"  significant highway
C t

### FORM COMPLETED BY

Clayton B. Fraser, Principal



date of photo.: November 2002 view direction: northeast north photo no.: 02.11.182 02.11.183

In 1923 the Arizona Highway Department began planning for a bridge over the Grand Canyon of the Colorado River near Lee's Ferry. By October 1924 a connecting route (US 89) had been surveyed and preliminary surveys made for the bridge. Engineers originally considered a suspension bridge like the Cameron Bridge, then a through arch like the Topock Bridge, but eventually AHD Bridge Engineer Ralph Hoffman designed this long-span steel deck arch. With funding provided by the State of Arizona (\$290,000) and the Navajo Tribal Fund (\$100,000), AHD contracted with the Kansas City Structural Steel Company in June 1927 to fabricate and erect the arch. The contractors combated severe logistical problems to build the immense structure and by the following April had set the concrete foundations into the sheer canyon walls. The first steel was swung on April 16, 1928, the main span completed on June 14, 1929. Originally called the Grand Canyon or Lee's Ferry Bridge, it was renamed the Navajo Bridge in 1934. This remarkable structure has until the recent construction of a parallel span carried highway traffic in unaltered condition. Today it functions as a pedestrian bridge.

### SIGNIFICANCE STATEMENT

Construction of the Navajo Bridge marked a major event in Arizona history. After the highway linking it with Flagstaff was completed two years later, it played a pivotal role in the development of a vast region that covered two states. As the only crossing of the Colorado River for some 600 miles, the bridge has had a profound impact on the commerce and transportation of a rugged and remote part of Arizona. Its construction opened the state from the north, providing a valuable tourist route to Grand Canyon National Park and the rest of the state. As Ralph Hoffman himself admitted, the design of the Navajo Bridge contained little in the way of engineering innovation. Iron and steel deck arches had been part of the repertoire of civil engineers since the erection of the first all-iron bridge in 1779. Despite this, the Navajo Bridge did mark an important milestone of engineering design, logistical planning and construction supervision. It was the first steel deck arch built in Arizona and a nationally prominent example of this uncommon structural type. What makes this bridge technologically noteworthy is its immense scale, its inspired logistical planning and its breathtaking span over one of the most spectacular bridge sites in America. Although Hoffman was concerned primarily with functional aspects of the Navajo Bridge and not its appearance, this handsomely proportioned structure ranks among the country's most dramatic bridges. Flying high over the Grand Canyon, the Navajo Bridge is Arizona's most aesthetically and functionally successful example of civil engineering.

TECHNOLOGICAL SIGNIFICANCE represents the work of a master possesses high artistic values represents a type, period or method of construction	HISTORICAL SIGNIFICANCEassociated with significant personsassociated with significant events or patternscontributes to historical district		IONAL REGISTER CRITERIA Criterion A Criterion B Criterion C
NATIONAL REGISTER ELIGIBILITY individually eligible <u>×</u> yes no	AREA OF SIGNIFICANCE: 7 PERIOD OF SIGNIFICANCE: 1	Fransportation; 1929-1964	Engineering
contributes to district yes <u>x</u> no	THEME(S):	Fransportation:	Highways



## HISTORIC BRIDGE INVENTORY

### Pumphouse Wash Bridge

#### PROPERTY IDENTIFICATION 00079 county Coconino inventory number 387.35 milepost inventory route SR 89 A 14.2 mi S of Ict I-40 location feature intersected Pumphouse Wash city/vicinity Munds Park USGS quadrangle Mountainaire district 85 UTM reference 12.432904.3876037 STRUCTURAL INFORMATION main span number 5 302 main span type appr. span number () appr. span type degree of skew 22 guardrail type 9 main span length 40.0 superstructure steel I-beam stringer 160.0 substructure structure length concrete abutments, wingwalls and pier pedestals with braced steel piers floor/decking roadway width 28.0 concrete deck over steel stringers other features curved roadway over angled spans; decorative structure width 31.6 Jersey barrier guardrails with blind arcades HISTORICAL INFORMATION US Bureau of Public Roads designer/engineer construction date 1931 project number FHP 7-C builder/contractor Charles G. Willis & Sons, Los Angeles CA information source ADOT bridge records structure owner Arizona Department of Transportation alteration date(s) 1986 alterations guardrails replaced NATIONAL REGISTER EVALUATION For additional information, see "Vehicular Bridges in Arizona 1880-1964" National Register Multiple Property Documentation Form 39 NRHP eligibility listed inventory score NRHP criteria А В Сх signif. statement aesthetically distinguished example of common structural type

### FORM COMPLETED BY

Clayton B. Fraser, Principal



date of photo.: November 2002 view direction: southeast northeast photo no.: 02.11.198 02.11.199

For years Oak Creek Canyon north of Sedona was traversed over a narrow, winding dirt road. In 1930 the U.S. Bureau of Public Roads undertook an extensive upgrading of the highway as part of Forest Project 7. BPR staff engineers designed the highway and its structures and divided the construction into three intermediate sections. In December BPR awarded the first construction contract to road contractors C.G. Willis and Sons for an estimated \$187,000. Designated as Section C, this 2.89-mile segment extended from the top of Oak Creek Canyon Hill, about 13 miles south of Flagstaff, to just beyond the crossing of Pumphouse Canyon. In addition to the roadwork, the project entailed the erection of a substantial bridge that curved over Pumphouse Wash at the base of the hill.

As delineated by BPR engineers in October 1930, the Pumphouse Wash Bridge consisted of five spans of steel stringers supported by steel four-legged piers on concrete pedestals. Angled to form a broad curve un der the curved roadway, the longest simply supported span extended 40 feet. The bridge's superstructure carried a 28-foot-wide concrete deck, bounded on the sides by slotted concrete guardrails. It would contain over 250 cubic yards of concrete in the pedestals and deck, 37,500 pounds of reinforcing steel and some 147,000 of superstructural steel. Late in 1930 the contract to build the bridge was awarded to Charles G. Willis & Sons of Los Angeles. Under the supervision of BPR Resident Engineer E.J. McCracken, the contractors completed this section of highway—including the Pumphouse Wash Bridge—on October 24, 1931. The bridge has remained in place since, undergoing a rehabilitation and replacement of the guardrails by the Arizona Department of Transportation in 1986.

### SIGNIFICANCE STATEMENT

With its five steel spans carried high above a picturesque mountain streambed on steel piers, the Pumphouse Wash Bridge is beautifully sited along one of Arizona's most scenic routes, the Oak Creek Highway. Though technologically unadventurous, the structure is distinguished as the most handsome of the state's steel stringer vehicular bridges, with its distinctive curved roadway laid over angled spans of stringers on four-leg bents. Its rehabilitation has been sensitively handled, involving replacement of the original doghouse concrete guardrails with Jersey barriers with blind arcades.

TECHNOLOGICAL SIGNIFICANCE represents the work of a master possesses high artistic values represents a type, period or method of construction	HISTORICAL SIGNIFICANCE associated with significant per associated with significant ev contributes to historical distri	NATIONAL REGISTER CRITERIA ersons Criterion A ents or patterns Criterion B ct Criterion C
NATIONAL REGISTER ELIGIBILITY	AREA OF SIGNIFICANCE:	Engineering
individually eligible <u>x</u> yes <u>no</u>	PERIOD OF SIGNIFICANCE:	1931-1964
contributes to district <u>yes x</u> no	THEME(S):	Transportation: Highways

Structure No. 0079



Location Map

# HISTORIC BRIDGE INVENTORY

## Midgley Bridge

PROPERTY IDENTIF	ICATION			
county	Coconino	inventory number	00232	
milepost	375.66	inventory route	SR 89 A	
location	1.6 mi E of Jct SR 179	feature intersected	Wilson Canyon	
city/vicinity	Sedona	USGS quadrangle	Munds Park	
district	85	UTM reference	12.432163.3860567	
STRUCTURAL INFO	RMATION			
main span number	1	main span type	311	
appr. span number	3	appr. span type	402	
degree of skew	0	guardrail type	6	
main span length	240.0	superstructure	steel two-hinge spandrel-braced deck arch	
structure length	374.0	substructure	concrete abutments and arch pedestals with stone masonry wingwalls	
roadway width	24.0	floor/decking	concrete deck over steel stringers	
structure width	27.2	other features	lower chord: 2 built-up channels w/ double lacing;	
			upper chord: 2 channels w/ double lacing; post: 2	
			channels w/ double lacing / wide flange; diagonal: 2	
			channels w/ batten plates; strut / lateral bracing: 2	
	MATCH		digles w/lacing, noor beam. I-beam	
HISTORICAL INFOR	MATION			
construction date	1939	designer/engineer, US Bureau of Public Roads		
project number	AFP 7-B(1)	builder/contractor	ontractor Lewis Brothers, Phoenix AZ	
information source	ADOT bridge records	structure owner	Arizona Department of Transportation	
alteration date(s)		alterations	El la develación de constante, constante de constante de la constante de la forma de familia de familia de fami	
NATIONAL REGIST	ER EVALUATION			
		For additional infor National Register M	mation, see "Vehicular Bridges in Arizona 1880-1964" Iultiple Property Documentation Form	
inventory score	70	NRHP eligibility	listed	
		NRHP criteria	A y B C y	
		signif. statement	outstanding, large-scale example of rare structural	
			type	
FORM COMPLETED	BY			
Clayton B. Frase	er, Principal		FRASERdesign	
			420 South County Road 23E	
			Loveland, Colorado 80537	

31 October 2004



date of photo: November 2002 view direction: west north photo no.: 02.11.203 02.11.206

In 1930 the U.S. Bureau of Public Roads undertook an extensive upgrading of the Oak Creek Highway between Sedona and Flagstaff in Coconino County. Funded as Arizona Forest Project 7, the construction was divided into several intermediate sections and let under a series of contracts during the early 1930s. The final link to complete the new highway was the erection of a major bridge over Wilson Canyon near Sedona. For this location, BPR engineers designed this medium-span steel deck arch, which resembled a scaled-down version of the immense Navajo Bridge [**0051**], completed in 1929. As delineated by BPR, the proposed structure was a two-hinge, spandrel-braced deck arch that extended 240 feet between the reinforced concrete arch pedestals. The two steel arch ribs were comprised of a built-up box beam made of twin channels with double lacing on top and bottom. These supported a series of W-beam and built-up columns upon which the I-beam steel floor beams rested. The floor beams in turn supported a reinforced concrete deck bounded on the edges by steel guardrails.

Early in 1938 the Bureau of Public Roads contracted with Lewis Brothers under AFP 7-B(1) to place the foundations and erect the arch. The Phoenix-based contractors began the excavation in the canyon walls for the arch pedestals on March 24, 1938, and pushed the construction throughout the summer under the supervision of BPR Resident Engineer V.G. Watson. The Lewis crew completed the steel structure on October 31. Dedicated in honor of local personage W.W. Midgley, who ranched cattle in the area in the 19<sup>th</sup> century, the Midgley Bridge has since carried traffic on US 89 Alternate. The superstructure remains unaltered, though steel Thrie beams have more recently been installed onto the original guardrails.

### SIGNIFICANCE STATEMENT

A number of long-span steel arches have been built on Arizona's roads, beginning with the breathtakingly lightweight through arch over the Colorado River at Topock [**priv.**], and including the Navajo Bridge, the Salt River Canyon Bridge [**0129**], the twin arches in Navajo County [**0215**], and a series of later structures. Of the deck arches, only the Navajo Bridge and the Midgley Bridge feature spandrel-braced arch configurations; the others have plate girder ribs. Although it suffers in comparison with the nationally significant Navajo Bridge is technologically significant as a well-preserved and picturesquely sited example of what must be considered an esoteric and inherently dramatic structural type. The bridge is historically noteworthy as the final link on the Oak Creek Highway between Sedona and Flagstaff, a beautiful and popular secondary route in central Arizona.

TECHNOLOGICAL SIGNIFICANCE represents the work of a master possesses high artistic values represents a type, period or method of construction	HISTORICAL SIGNIFICANCE associated with significant person associated with significant events contributes to historical district	NATIONAL REGISTER CRITERIA s or patterns Criterion B Criterion C
NATIONAL REGISTER ELIGIBILITY	AREA OF SIGNIFICANCE: TI	ransportation; Engineering
individually eligible <u>x</u> yes <u>no</u>	PERIOD OF SIGNIFICANCE: 19	039-1964
contributes to district <u>yes x</u> no	THEME(S): Tr	ransportation: Highways

111°45.000' W WGS84 111°44.000' W 111°46,000' W 34°54,000' N 34°54.000' N Mormor PACK Casner JEEF Tank 34°53.000" N 34°53.000' N bsta Sedona Canyo HOW Wa R Bear 34°52.000' N 34°52.000" N Sedona' \$333 WGS84 111'\*44.000' W 111°46.000' W 111°45.000' W TN /MN 12° 1000 METERS 1000 FEET 0 500 0 Printed from TOPO! ©2001 National Geographic Holdings (www.topo.com)

# HISTORIC BRIDGE INVENTORY

## Water Holes Canyon Bridge

PROPERTY IDENTIFI	CATION		
county milepost location city/vicinity district	Coconino 542.00 17.9 mi N Jct US 89A Page 85	inventory number inventory route feature intersected USGS quadrangle UTM reference	00508 US 89 Water Holes Canyon Lees Ferry 12.454670.4076890
STRUCTURAL INFOR	RMATION		
main span number appr. span number degree of skew main span length structure length roadway width structure width	1 2 0 53.0 139.0 34.0 39.0	main span type appr. span type guardrail type superstructure substructure floor/decking other features	107 104 6 concrete parabolic rigid frame concrete abutments and wingwalls concrete deck steel Thrie beam guardrails
HISTORICAL INFORI	MATION		
construction date project number information source alteration date(s)	1957 USBR USRS records ca1980	designer/engineer builder/contractor structure owner alterations	US Bureau of Reclamation Merritt-Chapman & Scott, New York NY Arizona Department of Transportation Thrie beam guardrails installed
NATIONAL REGISTE	REVALUATION	For additional infor	mation, see "Vehicular Bridges in Arizona 1880-1964"
inventory score	54	National Register M NRHP eligibility NRHP criteria signif. statement	Iultiple Property Documentation Form       eligible       A _xBC _x       outstanding example of uncommon structural type, altered

### FORM COMPLETED BY

Clayton B. Fraser, Principal

Structure No. 0508



### PHOTO INFORMATION

date of photo.: November 2002 view direction: southeast west photo no.: 02.11.337 02.11.339

As early as the 1910s the U.S. Reclamation Service (predecessor to the Bureau of Reclamation) had begun planning a major dam over the Colorado River in the vicinity of John Lee's ferry. The project was studied intermittently and debated heatedly over the following years, until in April 1956 President Eisenhower signed the enabling legislation for the Colorado River Storage Project—the centerpiece of which would be the immense Glen Canyon Dam. Reclamation engineers immediately began finalizing the design of the dam and appurtenant structures. In April 1957 they received bids for the dam's construction, and awarded the contract to Merritt-Chapman & Scott for some \$118 million. In order to gain access to the remote northern Arizona site, they first graded a 25-mile-long highway from Bitter Springs to the river. The paved road and its drainage structures were completed by Christmas 1957.

One of the larger structures on the route was a bridge that spanned Water Holes Canyon 18 miles north of the junction with US 89A. For this Reclamation engineers delineated a three-span concrete rigid frame structure, with angled pedestals that extended from solid-rock foundations to join rigidly with the concrete deck. The Water Holes Canyon Bridge featured all-concrete construction, with concrete substructure, deck and guardrails. It was completed in 1957 with the adjacent roadway. The dam was dedicated in September 1966 and the access road became part of US 89. The Water Holes Canyon Bridge has carried relatively light traffic since then, with the replacement of its guardrails with steel Thrie beams as the only alteration of note.

### SIGNIFICANCE STATEMENT

As an integral crossing on a regionally important route associated with the construction of one of the West's most famous (and reviled) dams, the Water Holes Canyon Bridge enjoys a degree of historical significance for its contribution to northern Arizona transportation. The structure is technologically important as a well-preserved example of concrete rigid frame bridge construction. The Arizona Highway Department erected a number of concrete rigid frame bridges in the 1930s, but none like this adventurous structure designed by the Bureau of Reclamation. The Water Holes Canyon Bridge is unique among Arizona's historic structures in its angled and curved form, its handsome proportions and its method of construction.

TECHNOLOGICAL SIGNIFICANCE	HISTORICAL SIGNIFICANCE	NATIONAL REGISTER CRITERIA
represents the work of a master	associated with significant persons	<u>x</u> Criterion A
possesses high artistic values	associated with significant events or pattern	Criterion B
represents a type, period or method of construction	contributes to historical district	<u>x</u> Criterion C
NATIONAL REGISTER ELIGIBILITY	AREA OF SIGNIFICANCE: Engineer	ring
individually eligible <u>x</u> yes no	PERIOD OF SIGNIFICANCE: 1957-1964	l
contributes to district yes <u>x</u> no	THEME(S): Transpor	tation: Highways

Structure No. 0508



# HISTORIC BRIDGE INVENTORY

## Cameron Truss Bridge

PROPERTY IDENTIFI			
county milepost location city/vicinity district	Coconino 466.88 1.53 mi N Jct SR 64 Cameron 85	inventory number inventory route feature intersected USGS quadrangle UTM reference	00532 US 89 Little Colorado River Cameron North 12.462864.3970390
STRUCTURAL INFO	RMATION		
main span number appr. span number degree of skew main span length structure length roadway width structure width	3 1 0 296.0 714.0 30.0 35.0	main span type appr. span type guardrail type superstructure substructure floor/decking other features	409 302 9 steel rigid-connected cantilevered deck truss concrete abutments, wingwalls and bullnosed piers concrete deck with asphalt overlay concrete Jersey barrier guardrails with aluminum tubes
HISTORICAL INFOR	MATION		
construction date project number information source alteration date(s)	1959 F-037-2(1) ADOT bridge records 1969	designer/engineer builder/contractor structure owner alterations	Arizona Highway Department Vinson Construction Company, Phoenix AZ Arizona Department of Transportation superstructure repaired
NATIONAL REGISTE	ER EVALUATION		
inventory score	59	For additional infor National Register M NRHP eligibility NRHP criteria signif. statement	mation, see "Vehicular Bridges in Arizona 1880-1964" fultiple Property Documentation Form eligible A <u>x</u> B <u>C x</u> outstanding example of rare structural type; pivotal crossing of major route

### FORM COMPLETED BY

Clayton B. Fraser, Principal



date of photo.: November 2002 view direction: south southeast photo no.: 02.11.170 02.11.171

In 1911 Office of Indian Affairs erected a 660-foot-long steel suspension bridge at Cameron to improve commerce on the extensive Navajo and Hopi Reservations in northeastern Arizona Territory. Named after Senator Ralph Cameron, the Cameron Bridge soon spawned a trading post and small settlement as it provided the only access to this part of the state. With its 14-foot roadway and lightweight construction, the structure eventually proved to be a bottleneck to traffic, however. As a result, the Arizona Highway Department began planning a replacement structure here in 1956. As delineated by AHD, the new Cameron Bridge was configured as a three-span Warren deck truss with riveted connections. The distance between the superstructure and the riverbed below was too great to allow for traditional erection falsework, so AHD designed the Cameron Bridge as a cantilever truss, with a long central span counterbalanced on either end by shorter anchor spans. The center span extended almost 300 feet over the river's main channel; the approach spans extended about 185 feet each. The superstructure was held aloft by concrete pedestals on spread footings. The truss carried a concrete deck on steel stringers, which was bounded on both sides by aluminum beam guardrails. In August 1957 AHD awarded a contract for the bridge's construction to the Vinson Construction Company of Phoenix. The contractors started work on the bridge that summer, completing it the following year for a cost of over \$500,000. The Cameron Bridge was massive, consuming over 2,500 cubic yards of concrete and 1.2 million pounds of structural steel. Since its completion in 1959, it has carried traffic on US 89 in unaltered condition.

### SIGNIFICANCE STATEMENT

Both of the Cameron Bridges have had a profound impact on the commerce and transportation of a rugged, remote and isolated section of Arizona. As a pivotal crossing on this regionally important route, the Cameron Truss Bridge enjoys a degree of historical significance for its contribution to northern Arizona transportation. The structure is technologically important as a well-preserved example of large-scale bridge construction. Arizona erected a number of immense steel arches and cantilevered steel deck trusses in the 1940s and 1950s, most of which are impressively scaled spans placed in dramatic settings. A handful of these remain: the Queen Creek Bridge [0406] in Pinal County and the Pinto Creek Bridge [0351] in Gila County representing the arches, and the Guthrie Bridge [0352], the Hell Canyon Bridge [0483] in Yavapai County, and the Cameron Bridge representing the trusses. These were the state's most striking bridges of post-War period. With its clean proportions and grand scale, the Cameron Bridge numbers among Arizona's most spectacular steel spans.

TECHNOLOGICAL SIGNIFICANCE represents the work of a master possesses high artistic values represents a type, period or method of construction	HISTORICAL SIGNIFICANCE associated with significant per x associated with significant eve contributes to historical distric	NATIONAL REGISTER CRITERIA rsons <u>x</u> Criterion A ents or patterns <u>Criterion B</u> ct <u>x</u> Criterion C
NATIONAL REGISTER ELIGIBILITY	AREA OF SIGNIFICANCE:	Transportation; Engineering
individually eligible <u>x</u> yes <u>no</u>	PERIOD OF SIGNIFICANCE:	1959-1964
contributes to district <u>yes x</u> no	THEME(S):	Transportation: Highways



## HISTORIC BRIDGE INVENTORY

## Glen Canyon Bridge

PROPERTY IDENTIFI	CATION			
county	Coconino	inventory number	00537	
milepost	549.54	inventory route	US 89	
location	25.4 mi N Jct US 89A	feature intersected	Glen Canyon	
city/vicinity	Page	USGS quadrangle	Page	
district	85	UTM reference	12.456960.4087815	
STRUCTURAL INFO	RMATION			
main span number	1	main span type	311	
appr. span number	3	appr. span type	402	
degree of skew	0	guardrail type	1	
main span length	1030.0	superstructure	steel two-hinge spandrel-braced deck arch	
structure length	1271.0	substructure	concrete abutments and wingwalls	
roadway width	30.0	floor/decking	concrete deck	
structure width	41.0	other features	steel guardrails	
HISTORICAL INFOR	MATION			
construction date	1958	designer/engineer	Vengineer US Bureau of Reclamation	
project number	USBR DC-4800	builder/contractor	Merritt-Chapman & Scott, New York NY	
information source	USRS records	structure owner	Arizona Department of Transportation	
alteration date(s)	1976 2000	alterations	deck replaced; superstructural steel repaired	
NATIONAL REGISTE	R EVALUATION			
		For additional information, see "Vehicular Bridges in Arizona 1880-1964" National Register Multiple Property Documentation Form		
inventory score	69	NRHP eligibility	eligible	
		NRHP criteria	Ах В Сх	
		signif. statement	outstanding example of uncommon structural type; major crossing of major watercourse	

### FORM COMPLETED BY

Clayton B. Fraser, Principal



date of photo.: November 2002 view direction: southeast west photo no.: 02.11.337 02.11.339

As early as the 1910s the U.S. Reclamation Service (predecessor to the Bureau of Reclamation) had begun planning a major dam over the Colorado River in the vicinity of John Lee's ferry. The project was studied intermittently and debated heatedly over the following years, until in April 1956 President Eisenhower signed the enabling legislation for the Colorado River Storage Project-the centerpiece of which would be the immense Glen Canyon Dam. Reclamation engineers immediately began finalizing the design of the dam and appurtenant structures. In April 1957 they received bids for the dam's construction, and awarded the contract to Merritt-Chapman & Scott for some \$118 million. In order to gain access to the remote northern Arizona site, they first graded a 25-mile-long highway from Bitter Springs to the river. The paved road and its drainage structures were completed by Christmas 1957. At the damsite, the contractors began work on a long-span steel arch bridge that would span the canyon immediately below the proposed dam. They first erected a cableway to carry men, equipment and bridge parts across the canyon, then began work on the arch seats set into the cliffsides. As had been done on the Navajo Bridge 30 years earlier, the contractor erected the arch from the two sides, cantilevering the massive arms in sections toward the middle. Work continued on the bridge through the winter and spring of 1958. On August 6, the final chord section was lowered into place on the arch, and the superstructure was complete. The Glen Canyon Bridge was formally dedicated on February 29,1959, in a gala event that drew thousands of spectators from Arizona and Utah. Spanning over 1,000 feet high some 700 feet above the Colorado River (higher than any other bridge in the United States), the Glen Canyon Arch was immense. It featured a two-hinge design with a spandrel-braced arch, concrete deck and steel beam guardrails. Other than the installation of chain link fences flanking the sidewalks, the bridge remains unaltered.

### SIGNIFICANCE STATEMENT

As an integral crossing on a regionally important route associated with the construction of one of the West's most famous (and reviled) dams, the Glen Canyon Bridge enjoys a degree of historical significance for its contribution to northern Arizona transportation. The structure is technologically important as a well-preserved example of large-scale bridge construction. A number of massive steel arches and cantilevered steel deck trusses were built in Arizona in the 1940s and 1950s, most of which are impressively scaled spans placed in dramatic settings. A handful of these remain: the Queen Creek Viaduct in Pinal County and the Pinto Creek Bridge [0351] in Gila County representing the arches, and the Guthrie Bridge [0352], the Hell Canyon Bridge [0483] in Yavapai County, and the Cameron Bridge [0532] in Coconino County representing the trusses. These were the state's most striking bridges of post-War period.

TECHNOLOGICAL SIGNIFICANCE represents the work of a master possesses high artistic values represents a type, period or method of construction	HISTORICAL SIGNIFICANCE associated with significant pe associated with significant ev contributes to historical distri	NA rsons vents or patterns ct	TIONAL REGISTER CRITERIA _ Criterion A _ Criterion B _ Criterion C
NATIONAL REGISTER ELIGIBILITY	AREA OF SIGNIFICANCE:	Engineering	Highways
individually eligible <u>x</u> yes <u>no</u>	PERIOD OF SIGNIFICANCE:	1958-1964	
contributes to district <u>yes x</u> no	THEME(S):	Transportation:	



### STATE OF ARIZONA

HISTORIC PROPERTY INVENTORY FORM

## HISTORIC BRIDGE INVENTORY

## Walnut Canyon Bridge

PROPERTY IDENTIFI	CATION			
county	Coconino	inventory number	09225	
milepost	0.00	inventory route	abd. Townsend-Winona Highway	
location	1.2 mi NW of Winona TI	feature intersected	Walnut Canyon	
city/vicinity	Winona	USGS quadrangle	Winona	
district	81	UTM reference	12.461665.3896610	
STRUCTURAL INFO	RMATION			
main span number	1	main span type	310	
appr. span number	0	appr. span type		
degree of skew	0	guardrail type	0	
main span length	100.0	superstructure	steel rigid-connected Parker through truss	
structure length	124.0	substructure	concrete abutments and wingwalls	
roadway width	19.0	floor/decking	concrete deck over steel stringers	
structure width	22.0	other features	steel lattice guardrails w/ concrete curbs	
HISTORICAL INFOR	MATION			
construction date	1924	designer/engineer	er US Bureau of Public Roads	
project number		builder/contractor		
information source	ADOT bridge records	structure owner	Coconino County	
alteration date(s)	c1950	alterations	stiffening plates added to truss	
NATIONAL REGISTI	ER EVALUATION			
		For additional information, see "Vehicular Bridges in Arizona 1880-1964" National Register Multiple Property Documentation Form		
inventory score	53	NRHP eligibility	listed	
		NRHP criteria	A B C _x	
		signif. statement	well-preserved example of uncommon structural type	

FORM COMPLETED BY

Clayton B. Fraser, Principal



date of photo.: November 2002 view direction: northwest northeast photo no.: 02.11.161 02.11.159

In 1922 the U.S. Bureau of Public Roads undertook two major road building projects in Arizona, using appropriations from the federal Forest Highways Fund. The first involved a 15½-mile section of the Prescott-Phoenix Highway in the Prescott National Forest between Prescott and White Spar. The second involved a 23½-mile portion of the Flagstaff-Winslow Highway (later US 66), which stretched between Flagstaff and Angel through Coconino National Forest. The largest structure involved on the Flagstaff-Angel project was a bridge over Walnut Creek, a mile north of Winona. For this, BPR engineers in Phoenix designed a rigid-connected through truss with a 100-foot span.

The Walnut Creek structure used a standard 100-foot-long, steel Parker web configuration, with built-up box beams for the upper chords and batten-plated angles for the lower. The truss was supported by reinforced concrete abutments and wingwalls. It carried a concrete deck on steel I-beams, which was bounded on both sides by steel lattice guardrails. The drawings were completed by June 1924 and the bridge itself later that year. The highway was subsequently realigned, and the bridge continued service as a county-road structure. It has more recently been abandoned in place with the construction of a replacement span here, and stands in unaltered condition.

### SIGNIFICANCE STATEMENT

In addition to the \$75 million per annum appropriated by Congress for federal highways in the early 1920s, some \$6.5 million was appropriated for construction of forest highways in the country's national forests. Based upon the appropriation, Arizona received \$216,507 in 1922. The Forest Highway funds could be used for local as well as state roads. The Walnut Canyon Bridge later became part of U.S. Highway 66—the major east-west transcontinental route across northern Arizona—and is historically significant as an early component of this important route. Technologically, the bridge is important as one of only four such Parker trusses identified by the inventory.

TECHNOLOGICAL SIGNIFICANCE represents the work of a master possesses high artistic values represents a type, period or method of construction	HISTORICAL SIGNIFICANCE associated with significant persons associated with significant events or pattern contributes to historical district	NATIONAL REGISTER CRITERIA          x       Criterion A         s       Criterion B         Criterion C
NATIONAL REGISTER ELIGIBILITY individually eligible <u>x</u> yes <u>no</u> contributes to district <u>yes x</u> no	AREA OF SIGNIFICANCE: Transpor PERIOD OF SIGNIFICANCE: 1923-1964 THEME(S): Transpor	tation; Engineering tation: Highways



# HISTORIC BRIDGE INVENTORY

### Cameron Suspension Bridge

#### PROPERTY IDENTIFICATION county Coconino inventory number private 466.88 milepost inventory route abd. US 89 0.1 mi N of Cameron location feature intersected Little Colorado River city/vicinity Cameron USGS guadrangle Cameron North district 85 UTM reference 12.462830.3970405 STRUCTURAL INFORMATION main span number 1 main span type 313 appr. span number () appr. span type degree of skew guardrail type 0 0 main span length 660.0 superstructure steel suspension bridge w/ fixed steel towers structure length 680.0 substructure concrete pier pedestals and deadmen roadway width 14.2 floor/decking aluminum grate over steel stringers structure width 17.0 other features main suspension cable: 7 woven steel cables clamped together; cast steel cable cradles; round steel eyebar suspenders; steel lattice guardrails; pinconnected Pratt through stiffening truss HISTORICAL INFORMATION construction date 1911 designer/engineer W.H. Code project number builder/contractor Midland Bridge Company, Kansas City MO information source ADOT bridge records structure owner Questar Southern Trails Pipeline alteration date(s) 1947 1959 alterations deck replaced; bridge abandoned in place and pipeline added NATIONAL REGISTER EVALUATION For additional information, see "Vehicular Bridges in Arizona 1880-1964" National Register Multiple Property Documentation Form inventory score 89 NRHP eligibility listed NRHP criteria В Сх A x one of Arizona's most historically and signif. statement technologically significant vehicular spans

### FORM COMPLETED BY

Clayton B. Fraser, Principal



date of photo.: November 2002 view direction: south southeast photo no.: 02.11.165 02.11.171

In the early 1900s the U.S. Indian Irrigation Service and the Office of Indian Affairs made a concerted effort to improve commerce on the extensive Navajo and Hopi Reservations in northeastern Arizona Territory. Key to this was a proposed bridge over the Little Colorado river to link the reservations with Flagstaff. OIA contracted with the Midland Bridge Company of Kansas City, Missouri, to engineer and build the long bridge. The canyon at this location was both wide and deep with steep-sided walls, requiring a single-span structure that could be erected without falsework. To solve the problem, Midland Chief Engineer W.H. Code designed this 660-foot-long suspension structure.

The main suspension cables were comprised of seven woven steel cables clamped together, which were tied into massive concrete deadmen at the four corners. These cables passed over cast steel cradles at the tops of the braced steel towers. The suspended span was stiffened by a pin-connected Pratt through truss with a roadway width of 14 feet. Midland erected the Cameron Bridge in 1911. Named after U.S. Senator Ralph Cameron, the Cameron Bridge soon spawned a trading post and small settlement. In 1937 the bridge almost collapsed under the weight of a sheep herd. Although its back stays and suspenders were damaged, the structure continued to carry traffic with only deck and stringer replacement until its replacement in 1959. The Cameron Bridge was subsequently purchased by the Four Corners Pipeline Company and now carries a natural gas pipeline without further alteration.

### SIGNIFICANCE STATEMENT

The Cameron Bridge has had a profound impact on the commerce and transportation of a rugged, remote and isolated section of Arizona. Its construction marked an important contribution to the region's economy by the Office of Indian Affairs and opened the Navajo Reservation and the remainder of the region to traffic from the south. As a pivotal part of the north-south territorial highway, the bridge provided an important entrance to Grand Canyon National Park from the populated areas of Arizona and proved pivotal in the later construction of the nationally significant Navajo Bridge [**0051**] over the Colorado River. Because of their exotic nature and expensive erection costs, suspension bridges were infrequently built in Arizona and the country. The Cameron Bridge is notable as the older of the two vehicular suspension bridges remaining in the state—a significant hybrid of suspension and truss engineering. One of the few bridges remaining from Arizona's territorial period, the Cameron Bridge over the Little Colorado is one of the state's most historically and technologically significant early spans.

TECHNOLOGICAL SIGNIFICANCE represents the work of a master possesses high artistic values represents a type, period or method of construction	HISTORICAL SIGNIFICANCE associated with significant pe associated with significant ev contributes to historical distri	NAT rsons <u>x</u> ents or patterns ct	IONAL REGISTER CRITERIA _ Criterion A _ Criterion B _ Criterion C
NATIONAL REGISTER ELIGIBILITY individuaily eligible <u>x</u> yes <u>no</u> contributes to district <u>yes x</u> no	AREA OF SIGNIFICANCE: PERIOD OF SIGNIFICANCE: THEME(S):	Transportation; 1911-1964 Transportation:	Engineering Highways



# HISTORIC BRIDGE INVENTORY

## Canyon Padre Bridge

PROPERTY IDENTIF	CATION		
county milepost location city/vicinity district STRUCTURAL INFO	Coconino 0.00 21.8 mi East Flagstaff Twin Arrows 85	inventory number inventory route feature intersected USGS quadrangle UTM reference	abd. abd. US 66 Canyon Padre Angell 12.473840.3891080
main span number appr. span number degree of skew main span length structure length roadway width structure width HISTORICAL INFOR	1 0 0 125.0 147.8 15.5 18.0 MATION	main span type appr. span type guardrail type superstructure substructure floor/decking other features	111 0 concrete filled spandrel Luten arch concrete abutments and wingwalls concrete deck over earth fill moulded concrete guardrails w/ paneled bulkheads and moulded, precast balusters; coved cantilever brackets
construction date project number information source alteration date(s) NATIONAL REGISTE	1914 ADOT bridge records	designer/engineer builder/contractor structure owner alterations	Topeka Bridge & Iron Company Topeka Bridge & Iron Company, Topeka KS Coconino County
inventory score	84	For additional inform National Register M NRHP eligibility NRHP criteria signif. statement	mation, see "Vehicular Bridges in Arizona 1880-1964" Iultiple Property Documentation Form listed A <u>x</u> B <u>C x</u> Arizona's first Luten arch, located on important route

### FORM COMPLETED BY

Clayton B. Fraser, Principal



date of photo.: November 2002 view direction: south southwest photo no.: 02.11.150 02.11.151

The Santa Fe Highway in northern Arizona crossed rugged Canyon Padre about 22 miles east of Flagstaff. Though not particularly deep or wide, this canyon in Coconino County formed a major topographical impediment to traffic. In 1913 Arizona State Engineer Lamar Cobb acted to bridge it. That year Division Engineer J.S. Barlow and Coconino County Engineer E. Ray Lamport located and surveyed a bridge site, delineating a 136-foot span for this crossing. The state engineer's office in July advertised for competitive proposals and designs. The Topeka Bridge & Iron Company of Kansas, western representative of Daniel Luten's National Bridge Company, was awarded the construction contract for \$7,900. Topeka Bridge designed a 140-foot Luten arch with a 16-foot-wide roadway that cantilevered over the arch's spandrels on both sides. The arch sprang from concrete abutments and featured Luten's trademark elliptical profile. Its deck was flanked on both sides by concrete guardrails with cast concrete balusters.

A Topeka Bridge crew began substructural excavation for the bridge in September 1913. Under the direction of Assistant Engineer W.H. Carruthers, the men completed the job in April 1914. Although its tightly curved approaches were dangerous, the Canyon Padre Bridge carried mainline traffic on the highway until its replacement in 1937. It now bears sparse local traffic on the Navajo Indian Reservation.

### SIGNIFICANCE STATEMENT

In the ten years after securing a patent in 1900, Daniel B. Luten built some 4,000 Luten—or horseshoe—arches across the United States. Though not one of Luten's larger customers, the State of Arizona did contract for design and/or construction of about a dozen of his long-span arches in the 1910s and early 1920s. The Canyon Padre Bridge is distinguished as the state's first Luten arch, designed by Luten himself and erected by his western firm, the Topeka Bridge & Iron Company. Additionally, the bridge is historically important as an intact portion of a nationally significant route. Alternately known as the Santa Fe Highway (in Arizona) and the National Old Trails Highway (its national designation), it has served historically as the principal east-west transcontinental route across northern Arizona. Although its guardrails are deteriorated somewhat from repeated collisions, the Canyon Padre Bridge accrues an additional degree of integrity of setting from the fact that the adjacent roadway is relatively unimproved. The highway was rerouted before it was paved along this stretch, leaving the road and bridge in essentially original condition. The Canyon Padre Bridge is among a small number of early structures that convey a feeling of what it was like to travel Arizona's state highways in the 1920s and 1930s.

TECHNOLOGICAL SIGNIFICANCE represents the work of a master possesses high artistic values represents a type, period or method of construction	HISTORICAL SIGNIFICANCE associated with significant persons associated with significant events or p contributes to historical district	NATIONAL REGISTER CRITERIA <u>×</u> Criterion A Criterion B <u>×</u> Criterion C
NATIONAL REGISTER ELIGIBILITY	AREA OF SIGNIFICANCE: Tran	sportation; Engineering
individually eligible <u>x</u> yes <u>no</u> no	PERIOD OF SIGNIFICANCE: 1914-	1964
contributes to district <u>yes x</u> no	THEME(S): Tran	sportation: Highways

Structure No.: abandoned



### STATE OF ARIZONA

HISTORIC PROPERTY INVENTORY FORM

# HISTORIC BRIDGE INVENTORY

## Canyon Diablo Bridge

PROPERTY IDENTIFI	CATION		
county milepost location city/vicinity district	Coconino 0.00 at Two Guns Two Guns 85	inventory number inventory route feature intersected USGS quadrangle UTM reference	private abd. US 66 Canyon Diablo Meteor Crater 12.491290.3885865
STRUCTURAL INFO	RMATION		
main span number appr. span number degree of skew main span length structure length roadway width structure width	1 0 0 128.0 146.0 16.0 18.0	main span type appr. span type guardrail type superstructure substructure floor/decking other features	111 0 concrete filled spandrel Luten arch concrete abutments and wingwalls concrete deck over earth fill paneled concrete parapet wall (upstream); pierced concrete parapet wall (downstream); plain, tapered cantilever brackets
HISTORICAL INFOR	MATION		
construction date project number information source alteration date(s)	1915 ADOT bridge records	designer/engineer builder/contractor structure owner alterations	Topeka Bridge & Iron Company Topeka Bridge & Iron Company, Topeka KS private
NATIONAL REGISTE	REVALUATION		
inventory score	79	For additional inform National Register M NRHP eligibility NRHP criteria signif. statement	mation, see "Vehicular Bridges in Arizona 1880-1964" lultiple Property Documentation Form listed A <u>x</u> B <u>C x</u> well-preserved, long-span example of uncommon structural type, located on important route

### FORM COMPLETED BY

Clayton B. Fraser, Principal



date of photo.: November 2002 view direction: south northwest photo no.: 02.11.143 02.11.148

Canyon Diablo historically formed a barrier to the Atchison Topeka & Santa Fe Railroad, delaying its construction progress across northern Arizona in 1881 as the track-building crew waited for timbers to build a trestle here. The Santa Fe Highway, which loosely followed the railroad, also encountered this rocky chasm just west of Two Guns in Coconino County. In 1914 Arizona State Engineer Lamar Cobb selected and surveyed the site for a bridge over the canyon and purchased plans and specifications for a long-span concrete arch from the Topeka Bridge & Iron Company of Kansas for \$500. Topeka designed a standard 128-foot Luten arch similar to the one the company had completed over Canyon Padre earlier that year.

Like the Canyon Padre structure [**abd.**], the Canyon Diablo bridge featured a 16-foot-wide roadway that cantilevered over the arch's spandrels on both sides. The arch sprang from concrete abutments and featured Luten's trademark elliptical profile. The volatile nature of the watercourse was illustrated by the concrete parapet walls; the downstream wall was pierced with slots, while the upstream wall was solid to protect the roadway from floodwaters. Late in 1914 the state engineer's office let the construction contract to the lowest bidder, Thomas Maddock of Williams, Arizona, for \$9,000. Using concrete and reinforcing steel supplied by the state, Maddock built the Canyon Diablo Bridge that winter. It was opened to traffic on March 17, 1915. Maddock himself later succeeded Cobb as the Arizona State Engineer. The Canyon Diablo Bridge and the adjacent roadway carried mainline traffic until the highway was rerouted in the 1930s. The bridge now stands abandoned in unaltered condition.

### SIGNIFICANCE STATEMENT

The Canyon Diablo Bridge is historically noteworthy for its association with US 66. Alternately known as the Santa Fe Highway (in Arizona) and the National Old Trails Highway (its national designation), the road has served historically as the principal east-west transcontinental route across northern Arizona. Only the Ocean-to-Ocean Highway, which passed through Yuma, Phoenix and Safford, carried more traffic in the state. Built in the 1910s when the highway was in its formative stage, the Canyon Diablo Bridge was an integral part of this significant route. Technologically, the bridge is distinguished as the second Luten arch built in Arizona, predated only a year by the Canyon Padre Bridge. The State of Arizona built long-span Luten arches at several major river crossings in the 1910s, before this patented structural type fell from favor with civil engineers. Though now abandoned, the Canyon Diablo Bridge is an important early example of vehicular bridge construction in Arizona using a proprietary design.

TECHNOLOGICAL SIGNIFICANCE represents the work of a master possesses high artistic values represents a type, period or method of construction	HISTORICAL SIGNIFICANCE associated with significant perso associated with significant even contributes to historical district	NATIONAL REGISTER CRITERIA ons <u>x</u> Criterion A its or patterns <u>Criterion B</u> <u>x</u> Criterion C
NATIONAL REGISTER ELIGIBILITY	AREA OF SIGNIFICANCE: T	Transportation; Engineering
individually eligible <u>x</u> yes <u>no</u>	PERIOD OF SIGNIFICANCE: 1	915-1964
contributes to district <u>yes x</u> no	THEME(S): T	Transportation: Highways

![](_page_43_Figure_2.jpeg)