NPS Form 10-900
(3-82)

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United States Department of the Interior
National Park Service

National Register of Historic Places Inventory—Nomination Form

See instructions in *How to Complete National Register Forms*
Type all entries—complete applicable sections

For NPS use only
received MAY 8 1986
date entered JUN 5 1986

1. Name

historic Cameron Suspension Bridge

and/or common Cameron Suspension Bridge

2. Location

street & number U.S. Highway 89 N/A not for publication

city, town Cameron X vicinity of

state Arizona code 04 county Coconino code 005

3. Classification

Category	Ownership	Status	Present Use	
___ district	___ public	N/A occupied	___ agriculture	___ museum
___ building(s)	X private	___ unoccupied	___ commercial	___ park
X structure	___ both	___ work in progress	___ educational	___ private residence
___ site	**Public Acquisition**	**Accessible**	___ entertainment	___ religious
___ object	N/A in process	X yes: restricted	___ government	___ scientific
	___ being considered	___ yes: unrestricted	___ industrial	X transportation
		___ no	___ military	X other: pipeline

4. Owner of Property

name Four Corners Pipeline Company

street & number 5900 Cherry Avenue

city, town Long Beach N/A vicinity of state California

5. Location of Legal Description

courthouse, registry of deeds, etc. Coconino County Courthouse

street & number Aspen and North San Francisco Streets

city, town Flagstaff state Arizona

6. Representation in Existing Surveys

title Arizona Historic Engineering Site Inventory has this property been determined eligible? ___ yes X no

date May 18, 1978 ___ federal X state ___ county ___ local

depository for survey records History of Engineering Program, Texas Tech University

city, town Lubbock state Texas

7. Description

Condition		Check one	Check one
___ excellent	___ deteriorated	_X_ unaltered	_X_ original site
_X_ good	___ ruins	___ altered	___ moved date _____
___ fair	___ unexposed		

Describe the present and original (if known) physical appearance

SUMMARY

The Cameron Suspension Bridge spans the Little Colorado River north of the town of Cameron, which is located fifty-two miles north of Flagstaff on U.S. Highway 89 in north-central Arizona. The 1911 suspension bridge has a main span of 660 feet with a clear roadway width of 14'2" between curbs. To conquer the long span, engineers used a unique hybrid system of suspension cables combined with a through truss design. One of three suspension bridges in the state, the Cameron Suspension Bridge is the only example of this design type in Arizona.

PRESENT DESCRIPTION

The gorge of the Little Colorado River has vertical rock cliffs which separate the banks of the river from the elevated plateau that U.S. Highway 89 traverses. The rock cliffs are higher on the northern side of the bridge. For this reason, the south end of the bridge is lower than the north end by approximately ten feet. The river bed is nearly 100 feet below the deck at the center of the bridge.

Total length of the bridge is 680 feet, consisting of a single main span 660 feet long and two approach spans of ten feet each. These small approach spans serve to provide a link between the fixed ends of the bridge at the abutments and the expansion ends located at the tower piers. Abutments are reinforced concrete.

The superstructure is a hybrid suspension and truss design. A single-intersection Pratt through truss is held by the suspension cables. This truss consists of 44 fifteen-foot panels providing a vertical clearance of 15 feet between the portal and the deck. The main suspension cables are composed of seven individual two and one-quarter inch steel strands. These seven strands are individually anchored to seven eye-bars embedded in concrete footings cut into the solid rock of the upper canyon walls. The seven cables are clamped together to form one intertwined cable stay prior to passing over saddles supported by rollers on individual steel-frame towers at each end.

The four towers which hold up the suspension cables are constructed of structural steel mounted on reinforced concrete piers anchored in solid rock. Diagonal angle bars link the towers at each end, framing the main end portals. Distance from the near end of the eye-bar to the center of the tower on the south end of the bridge is 218' 2" and 165' 1" on the north end, a difference required by the geologic configuration of the canyon.

Upper and lower chords of the truss system consist of two vertical steel plates held together with riveted horizontal lacing. Vertical members are comprised of four angles laced and riveted together. Vertical panel posts and upper and lower chords are pin-connected to the steel beams which support the deck structure.

The present decking of the bridge is aluminum, replacing the original timber deck. Closed to all public access, the bridge now carries a sixteen-inch oil pipeline suspended between the upper and lower chords of the through truss. A chain link fence topped with barbed wire surrounds approaches at both ends of the bridge. The bridge is no longer used for vehicular or pedestrian traffic passage and serves only to carry the oil pipeline.

INTEGRITY

The Cameron Suspension Bridge retains its original appearance and integrity although some changes have been made over time. Most of the changes are structural in nature and are not readily apparent. The major change to the bridge is the addition of the oil pipeline in 1958. The presence of the oil pipeline is somewhat intrusive; however, it does not appreciably alter the setting or feeling or engineering attributes of the bridge design. The pipeline does provide a viable economic reason for the continuing use of the Cameron Suspension Bridge, which was abandoned to vehicular traffic after 1958 when a new bridge was constructed to the east.

Over the years, routine maintenance and constant overloading led to changes in the structural portions of the bridge. In 1927 the original wood decking (1911) was replaced by a new wood deck. The purpose of this change was to reinforce the floor structure in order to carry heavy loads of structural steel destined for the Navajo Bridge construction site at Lees Ferry on the Colorado River (NR 8/13/81).

In 1936 the bridge decking was again replaced with new wood flooring. The supporting deck stringers were changed from nine lines of 3"x12" stringers to sixteen lines of 4"x12" stringers. Shortly thereafter, in early 1937, the bridge was the victim of a "sheep jam." The entire span of the bridge became tightly packed with sheep as they were being driven across the bridge. This massive overload caused the bridge to slip from one to five inches at all cable clamps. In March 1937 all of the clamps were jacked back into position and safety clamps were added. In 1948 the wood decking was replaced with aluminum sections.

After the abandonment of the bridge in 1958, it was purchased from the State of Arizona by the Four Corners Pipeline Company. The company used the bridge to carry a sixteen-inch oil pipeline across the Little Colorado River. The pipeline carried oil from fields in Farmington, New Mexico, to refineries in southern California. When the Atlantic-Richfield Company acquired the pipeline and bridge in 1977, the flow of oil was reversed. Due to a lack of refinery capacity in California, crude oil is piped from Long Beach, California, to Houston, Texas, refineries. The present Four Corners Pipeline Company, which holds title to the bridge, is a wholly owned subsidiary of ARCO.

8. Significance

Period	Areas of Significance—Check and justify below			
___ prehistoric	___ archeology-prehistoric	___ community planning	___ landscape architecture	___ religion
___ 1400–1499	___ archeology-historic	___ conservation	___ law	___ science
___ 1500–1599	___ agriculture	___ economics	___ literature	___ sculpture
___ 1600–1699	___ architecture	___ education	___ military	___ social/ humanitarian
___ 1700–1799	___ art	X engineering	___ music	___ theater
___ 1800–1899	X commerce	___ exploration/settlement	___ philosophy	X transportation
X 1900–	___ communications	___ industry	___ politics/government	___ other (specify)
		___ invention		

Specific dates 1911 **Builder/Architect** Midland Steel Company

Statement of Significance (in one paragraph)

SUMMARY

The Cameron Suspension Bridge, constructed in 1911, is significant for its association with the initial growth of Arizona's highway system as a major bridge which opened up the northern portion of the state to development. It also represents a large early construction project of the Office of Indian Affairs, which later went on to construct numerous other engineering projects on Indian reservations in Arizona and throughout the western states. A hybrid of suspension and truss forms, the bridge has engineering significance as the oldest surviving highway suspension bridge in the state and one that utilized novel engineering techniques to cross the wide canyon of the Little Colorado River. It is eligible for listing on the National Register under criteria A and C because of its historic associations and unique method of construction.

HISTORIC BACKGROUND/CONTEXT

The Office of Indian Affairs built the 680 foot long Cameron Suspension Bridge in 1911. The Office wanted to create both a communication link and transportation access between the Navajo and Hopi Reservations in northeastern Arizona and the city of Flagstaff. Located on the Santa Fe railroad line, Flagstaff was the transportation center of northern Arizona. Agricultural lands near Tuba City on the Moenkopi Plateau were starting to be developed by the Indian Irrigation Service and needed markets for their products as well as access to materials and services. The gorge of the Little Colorado River, though not so wide or deep as the Grand Canyon of the Colorado, nonetheless proved to be a formidable barrier to economic development of the reservations in northeastern Arizona because it kept them isolated from the rest of the Arizona Territory.

In 1911 the Office of Indian Affairs contracted with the Midland Steel Company of Kansas City, Missouri, to construct the bridge. The firm designed the longest single span suspension bridge in the territory. Because of the great distance involved in crossing the Little Colorado River Gorge, the firm utilized a combination Pratt through truss with the suspension design. To ensure maximum strength, the suspension cable used a bundle of seven individual cables twisted together, each with its own individual anchor. Despite these design precautions, the firm would only rate the capacity of the bridge at ten tons. Yet, the design proved successful, and by 1941 it carried a posted limit of 15 tons and routinely handled loads of 20 tons. At one time it carried a 25 ton load.

9. Major Bibliographical References

See continuation sheet 4.

10. Geographical Data

Acreage of nominated property 1.5 acres

Quadrangle name Cameron **Quadrangle scale** 1:62500

UTM References

	Zone	Easting	Northing
A	12	462900	3970275
B	12	462850	3970715
C			
D			
E			
F			
G			
H			

Verbal boundary description and justification The boundaries for this nomination are a line and all the area 50 feet on either side of a line between points A and B. This will create a rectangle 100 feet wide and 660 feet long, and the bridge will be within that rectangle.

List all states and counties for properties overlapping state or county boundaries

state	N/A	**code**	**county**	N/A	**code**
state		**code**	**county**		**code**

11. Form Prepared By

name/title Don Abbe, Research Assistant — Revised by: Roger Brevoort, Arch.Hist., and Doug Kupel, Hist., Arizona SHPO

organization History of Engineering Program Texas Tech University **date** June 1980 — March 1986

street & number P.O. Box 4089 **telephone** (806) 742-2994 — (602) 255-4174

city or town Lubbock **state** Texas

12. State Historic Preservation Officer Certification

The evaluated significance of this property within the state is:

___ national X state ___ local

As the designated State Historic Preservation Officer for the National Historic Preservation Act of 1966 (Public Law 89-665), I hereby nominate this property for inclusion in the National Register and certify that it has been evaluated according to the criteria and procedures set forth by the National Park Service.

State Historic Preservation Officer signature Donna J. Schober

title State Historic Preservation Officer **date** May 5, 1986

For NPS use only

I hereby certify that this property is included in the National Register

Entered in the National Register

for Delores Byers **date** 6/5/86

Keeper of the National Register

Attest: **date**

Chief of Registration

GPO 911-399

ENGINEERING/STRUCTURAL SIGNIFICANCE

The Cameron Suspension Bridge is significant as a combination of two prevailing structural designs. In the early twentieth century, the Pratt truss and its variants became the standard truss design for highway bridges of many lengths. The depth of the canyon, however, required an innovative means of center support, a problem which the suspension design could resolve. It was chosen as the only practical type of support system which could be constructed without the substantial falsework required for a conventional long span steel arch. The depth of the Little Colorado River Gorge would have made that option prohibitive. At the same time the truss system would resolve the requirement for lateral strength and provide wind stiffening. The Cameron Suspension Bridge is significant in terms of bridge engineering due to its unique combination of two contemporary bridge forms to accommodate a long-span structure which utilized the structural advantages of both designs.

The success of the hybrid design of the Cameron Bridge also provides a clear design precedent for the McPhaul Suspension Bridge over the Gila River east of Yuma, Arizona (NR 8/13/81). Designed by the State of Arizona in 1928, the McPhaul Bridge uses the same combination of a suspension span with an internal stiffening truss. In this case, the unstable geology of the river bottom precluded any type of center support, so the suspension span as used at Cameron was again a practical choice.

HISTORIC SIGNIFICANCE

The completion of the Cameron Suspension Bridge had a profound impact on the commerce and transportation needs of a geographically rugged, remote, and isolated area. Combined with the growth of Arizona after the territory achieved statehood in 1912, the bridge proved instrumental in opening up the northeastern corner of the state to transportation and commerce.

Political leaders now looked beyond the Little Colorado to the state of Utah. Closely related by economic and social ties, the states of Utah and Arizona were separated by the Grand Canyon of the Colorado. The completion of the Cameron Suspension Bridge encouraged leaders of both states to bridge the Colorado and open the isolated Arizona strip country to development and to provide closer communication with Utah. By this time state route 89 was the only north/south highway in the state, starting at the town of Nogales on the Mexican border and continuing through Tucson, Phoenix, and Flagstaff.

The key to crossing the Colorado was the construction of the Navajo Bridge. Encouraged by the success of the Indian Service at Cameron, the state began contemplating a bridge across the Colorado as early as 1923. In 1924 preliminary survey work was completed,

and in 1927 construction of the Navajo Bridge began. Supplies for the construction project crossed the Cameron Bridge, strengthened for the job. Completed in 1928, the Navajo Bridge is listed on the National Register.

The completion of this vital transportation network assured that the growth of the northern portion of the state would continue. Because the route became a major state highway, the State of Arizona took over maintenance of the bridge in the late 1930's. The Cameron Suspension Bridge continued to carry traffic on the major northern highway between Arizona and Utah until 1958 when a new bridge was constructed immediately to the east. Today the Cameron Suspension Bridge continues its useful life, carrying a petroleum pipeline across the Little Colorado.

BIBLIOGRAPHICAL REFERENCES

McLane, G.L., Senior Highway Engineer, to C.H. Sweeteer, District Engineer, San Francisco, California, October 3, 1941. Manuscript letter and reports on Cameron Suspension Bridge, from "Antique Bridges" Files, Structures Section, Arizona Department of Transportation, Phoenix, Arizona.

Parker, Bud, Representative of Four Corners Pipeline Company, to Don Abbe. Oral Interview 5-27-80.

Price, William N. and Martin, Toney to John V. Young, August 5, 1968. Manuscript letter, 2 lvs. "Antique Bridges" File, Structures Section, Arizona Department of Transportation, Phoenix, Arizona.

Wesch, W.P., "Little Colorado Bridge at Cameron," October 3, 1941, 2 lvs. "Antique Bridges" File, Structures Section, Arizona Department of Transportation, Phoenix, Arizona.

Wesch, W.P., et al, to W.R. Hutchins, et al, December 1, 1941. Manuscript report on Cameron Bridge, 6 lvs. "Antique Bridges" File, Structures Section, Arizona Department of Transportation, Phoenix, Arizona.

Wesch, W.P. and Hartford, F.D., "Report on Cameron Bridge," Phoenix, Arizona Department of Transportation, 1941, 10 p.

PREV. LISTED
8600 1206

HABS/HAER INVENTORY

See "HABS/HAER Inventory Guidelines" before filling out this card.

1. NAME(S) OF STRUCTURE
Cameron Bridge (Little Colorado River Bridge)

2. LOCATION
U.S. Highway 89 over the Little Colorado River
Cameron; unplatted T29N R9E
Coconino County , Arizona 005

3. DATE(S) OF CONSTRUCTION
1911

4. USE (ORIGINAL/CURRENT)
highway bridge / pipeline bridge

5. RATING
individually listed, NRHP: state significance

6. CONDITION
fair / good

owner: Four Corners Pipeline Company

7. DESCRIPTION

span number : 1
span length : 660.0'
total length: 680.0'
roadway wdt.: 14.2'

superstructure: steel suspension w/braced steel towers a pin-connected Pratt through truss
substructure : concrete abutments and wingwalls w/ concrete anchors
floor/decking : aluminum grate (added in 1940)
other features: main suspension cable: 7 woven steel cables clamped together; cast steel cable cradles; round steel eyebar suspenders; steel lattice guardrails; stiffening truss: 2 channels w/ webbing, lower chord: 2 rectangular eyebars, vertical: 2 channels w/ webbing; diagonal: 1 square eyebar

8. HISTORICAL DATA

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 northeast Arizona Territory. Key to this was a crossing of 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 a bridge. The crossing was both wide and deep, requiring a single-span structure which could be erected without falsework, and Midland Chief Engineer W.H. Code designed this long-span suspension structure with through truss spans. Midland erected the bridge in 1911. Named after 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 in unaltered condition.

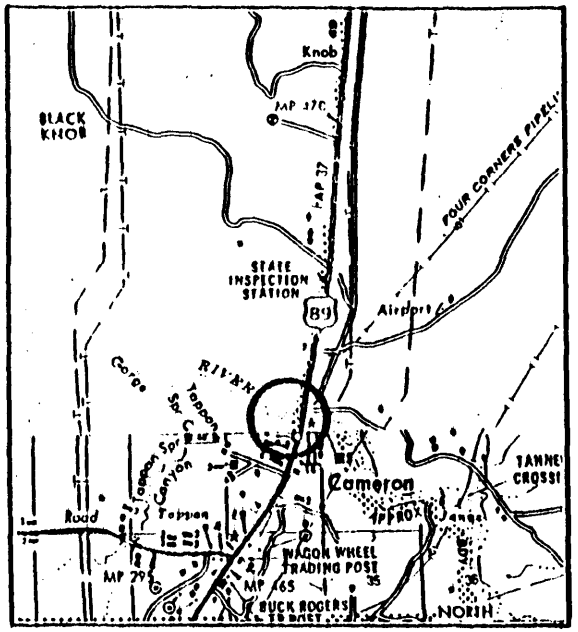
9. SIGNIFICANCE

The Cameron Bridge 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. The bridge provided a second important entrance to Grand Canyon National Park and prompted the later construction of the Navajo Bridge over the Colorado River. Because of their exotic nature and expensive erection costs, suspension bridges were infrequently erected. The Cameron Bridge is notable as the earlier of the two vehicular suspension bridges remaining in Arizona: an important hybrid of suspension and truss engineering. One of the few bridges dating from Arizona's territorial period, the Cameron Bridge is one of the state's most historically and technologically significant vehicular spans.

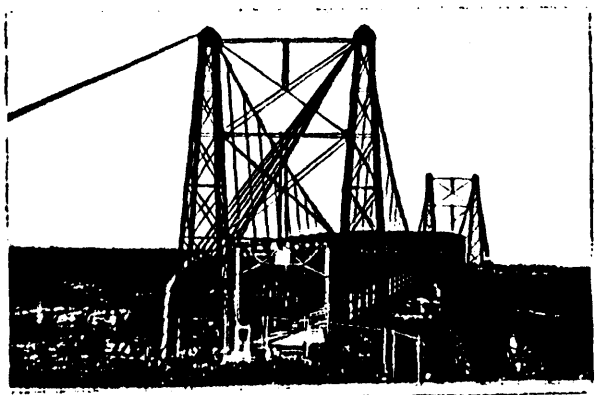
10. NAME(S) OF STRUCTURE

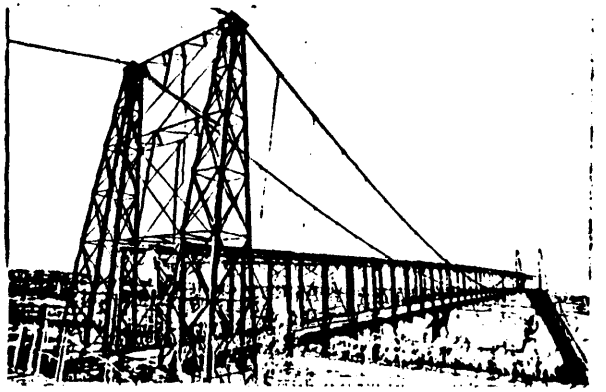
Cameron Bridge (Little Colorado River Bridge)

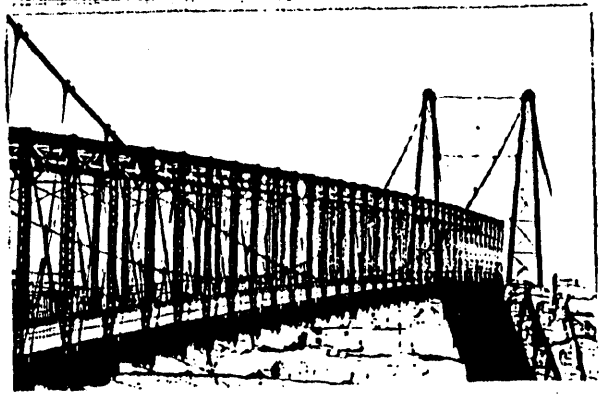
11. PHOTOS (W/ FILM ROLL & FRAME NO.) AND SKETCH MAP OF LOCATION



LOCATION MAP
TAKEN FROM DEPARTMENT OF TRANSPORTATION
GENERAL HIGHWAY MAP







12. SOURCES

Don Abbe , Roger Brevoort and Doug Kupel, National Register nomination for Cameron Bridge, June 1980.

Byrd Howell Granger, Arizona's Names, (Tucson: Treasure Chest Publications, 1983), page 111.

Field inspection by Clayton Fraser, 7 December 1986.

13. INVENTORIED BY:	AFFILIATION	DATE
Clayton B. Fraser	Fraserdesign Loveland Colorado	1 April 1987

1. Cameron Suspension Bridge
2. Cameron, Coconino County, Arizona
3. Don Abbe
4. September 9, 1979
5. History of Engineering Program
   Texas Tech University, Lubbock
6. General view of bridge from south,
   showing west elevation. Camera pointing
   north.
7. Photo 1 of 4

1. Cameron Suspension Bridge
2. Cameron, Coconino County, Arizona
3. Don Abbe
4. September 9, 1979
5. History of Engineering Program
   Texas Tech University, Lubbock
6. View south, showing west elevation of
   bridge.
7. Photo 2 of 4

1. Cameron Suspension Bridge
2. Cameron, Coconino County, Arizona
3. Don Abbe
4. September 9, 1979
5. History of Engineering Program
   Texas Tech University, Lubbock
6. View south, showing detail of cable
   anchors
7. Photo 3 of 4

1. Cameron Suspension Bridge
2. Cameron, Coconino County, Arizona
3. Don Abbe
4. September 9, 1979
5. History of Engineering Program
   Texas Tech University, Lubbock
6. View south along roadway from north
   end of bridge
7. Photo 4 of 4