

HISTORIC AMERICAN ENGINEERING RECORD  
UT-13

Southern Pacific Railroad: Ogden-Lucin cutoff trestle, 1902-04  
Crossing Great Salt Lake between Promontory Point and Lakeside, 40 mi. SW of  
Brigham City.  
Box Elder County  
Utah

HAER  
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Photographs and  
Written and Historical data

Historic American Engineering Record  
Heritage Conservation and Recreation Service  
Department of Interior  
Washington, DC 20243

Historic American Engineering Record

Ogden-Lucin Cutoff Trestle

HAER- UT-13

Location: Crossing Great Salt Lake between Promontory Point and  
Lakeside, 40 mi. SW of Brigham City.

Date: 1902-04

Owner: Southern Pacific Railroad (not in operation)

Condition: Still in use

Significance: Longest trestle (11.88 mi.) and fill project in the USA.

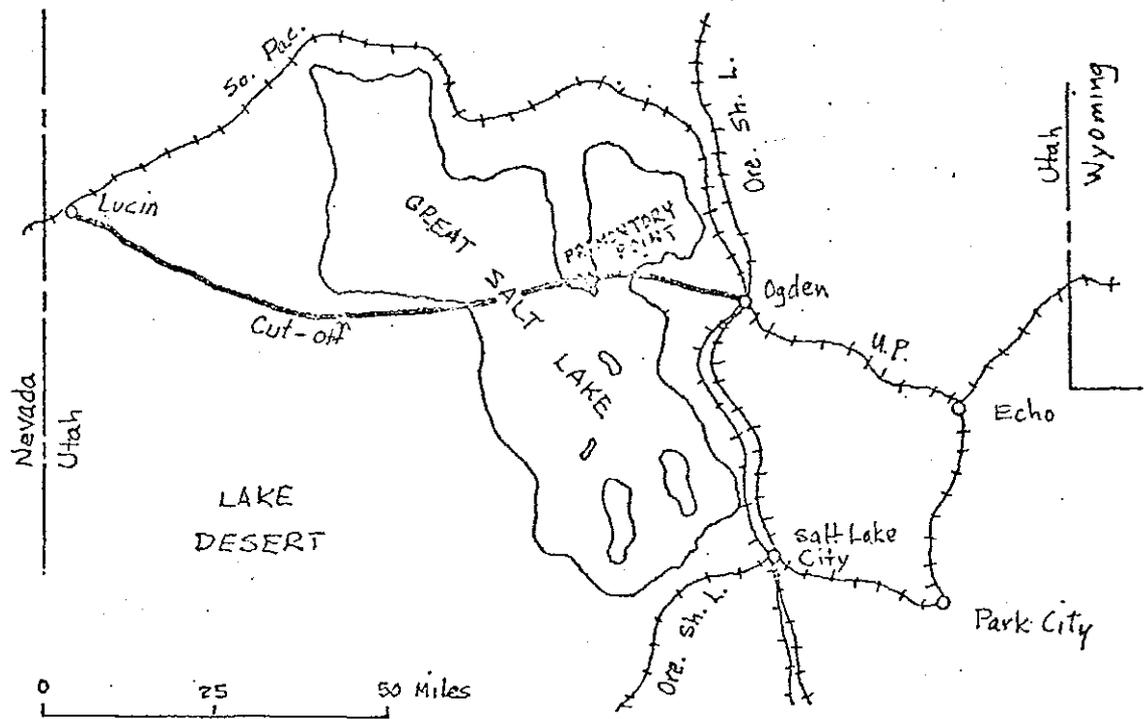
Historian: T. Allan Comp, PHD, 1972

OGDEN-LUCIN CUTOFF TRESTLE  
SOUTHERN PACIFIC RAILROAD

The great transcontinental railroad building contest between the Southern Pacific and Central Pacific } railroads ended at Promontory Summit, fifty-three miles west of Ogden, Utah, in 1869. The road as then constructed between Ogden on the east and Lucin on the west was 146.68 miles long, running some fifty miles north before turning west to skirt the Great Salt Lake. Two grades, Kilton Hill (4700 feet) and Promontory Hill (4900 feet) rose above the 4200 feet level of the lake and required a total of 1,515 feet of vertical climb. With grades of ninety feet to the mile and curves as sharp as ten degrees, the road was a slow and difficult one for a steam locomotive.

The turn of the century brought with it several major changes in the Southern Pacific Railroad. E. H. Harriman, new president of the road, initiated what became a \$240,000,000 program of reconstruction and improvement and one of the first projects was the extensive rehabilitation of 373 miles of the old Central Pacific line between Reno and Ogden. Among the most difficult and spectacular pieces of construction on this project was the Ogden-Lucin Cut-Off. Begun March 17, 1902 and completed on November 13, 1903, the

new cut-off was forty-three miles shorter than the old, involved no major grades, cut curvature to 1.5 degrees, and cost about \$5,000,000. A supplement to the Scientific American (May 21, 1904) termed the new road "perhaps the most noteworthy engineering achievement ever attempted in bridge-and-fill work" and concluded that "the Southern Pacific, by building the Ogden-Lucin cut-off, has crowned the science of long distance trestling-and-fill embankment construction."



The problem that confronted the Southern Pacific's Chief Engineer William Hood was fairly straightforward. As nearly as possible he was to construct a level, straight-line track from Ogden to Lucin. The Salt Lake City Commercial Club attempted to get the road to run southwest to the city and then north to Ogden, but the railroad calculated that this <sup>longer</sup> route would add \$1.50 per ton for each of the 600,000 tons of through freight carried by the railroad each year and the idea was abandoned. Thus it was that Hood then undertook the lake cut-off, despite the fact that it required taking the railroad to sea on ten miles of fill, eleven miles of temporary trestle (to be filled at a later point in time) and ten miles of permanent trestle. Stories of bottomless pits and "peculiar disasters" in the middle of the lake apparently impressed him little, and work began.

The road was built west from Ogden to the shores of the lake, crossing to Promontory Point on an embankment and trestle.\* <sup>The Point</sup> ~~Promontory~~ was crossed by 5.3 miles of heavy cut; the road then struck across the main body of the Great Salt Lake to Strong's Knob on the west shore. From there the road ran west to Lucin over an easy grade (100 feet in fifty-two miles). Chief Engineer Hood mentioned in an interview (Engineering News, February 27, 1902) that he was particularly anxious to get surveys and construction underway because

\*Promontory Point is not the point where the transcontinental railroad was first joined. This was farther north.

of the extremely low stage of water in the lake at that time.

Work on the land sections began in spring of 1902 with crews pushing west from Ogden and east from Lucin. The Ogden-Great Salt Lake portion required two steel bridges and forty-four masonry or steel culverts. Excavations for these openings were about 100 feet long and averaged twelve feet in width and thirteen feet in depth. For support, piles were driven in the bottom of the excavation then cut to a twelve-inch height. Concrete was then poured around and on the piles in eight-inch courses.

From the lake shore to the Promontory peninsula was a distance of 8.4 miles, most of which was bridged by temporary trestle which the railroad ~~was~~ <sup>intended to</sup> later fill. The first three miles were quite difficult owing to the low level of the lake which left behind a bed of mud as much as eight to ten feet thick beneath the salt crust. Construction tracks were laid on this surface as follows: planks were laid on the mud and 100 pound sand bags were then placed three layers deep. Cross timbers, 12" x 12" x 10' were then set on the sand bags and held by three stringers 8" x 16" x 30' upon which ties were set and temporary track laid. This temporary track was constructed just south of the permanent fill so that cars loaded with shale and gravel could be run out to dump their load on the north side to form the permanent embankment.

This fill continued out into the lake until the road reached water of four or five feet in depth. At that point

construction methods were changed over to pile driving operations. Eight floating pile drivers were stationed in four places at intervals of about one mile. Most of this section was temporary trestle ~~being~~ composed of four forty-foot piles capped with 12" x 12" timber. Each set of four piles (termed a bent) was spaced fifteen feet apart; 8" x 16" x 30' stringers held the caps together and formed the base for the track ties. Eventually the temporary trestle was to be filled, leaving the bents in place. By thus filling up the bed of the lake around the trestle, the company felt additional strength would be added. Where the current of the Bear River cut a channel into the lake bed, 600 feet of permanent, open trestle were installed. A hard-pan bottom in the channel provided excellent support for the five-piling bents.

The section of road crossing over the Promontory peninsula was 5.3 miles in length. In order to maintain road level, very heavy cuts were required.

Work was carried on from the western end of the project in much the same manner. Total length of this lake section was about twenty miles and again the combination of temporary and permanent trestling was employed, the latter totaling twelve miles in length. This permanent trestle lies in 30 to 35 feet of water and was constructed of five seventy-foot piles, each bent then being reinforced with heavy sash and sway braces. The same 12" x 12" caps and 8" x 16" x 30' stringers carried the track fifteen feet

above the level of the lake.

Construction of the roadbed on the trestle was the last step before opening the road. Rather than the usual open trestle with rail and ties directly connected to the rigid trestle, the Salt Lake trestle was ballasted with fifteen inches of gravel under the ties. As a result, the peculiar vibration and rumble often experienced by passengers when crossing a trestle, was eliminated. The single track portion of this ballasted deck trestle was sixteen feet wide, ~~while~~ both single and double track sidings and numerous extension platforms often increase this width. The road was laid with eighty pound rail.

Several additional factors, some expected and some not, complicated the work. A fresh water supply, essential to steam-driven machines as well as men, had to be secured. The railroad put down two artesian wells, the first two miles inland and the other out in the lake four miles from the eastern shore, but only the latter was successful. Even with one good well and more water hauled in from Ogden, some way of transporting the water to various stations in the lake had to be devised. The railroad's answer was the "Promontory," a specially constructed stern wheeler capable of carrying 30,000 gallons of fresh water. The boat was 127 feet long, twenty-two feet in beam and drew eighteen inches of water. Powered by two 500 h.p. engines, the boat held accommodations for officers and guests of the road, but was most often used to carry food, water, and other

supplies to the temporary stations on the lake.

Men working on the lake were often in the briny water and the company directed these men to wear rubber boots. Unfortunately, the brine soon rendered the rubber useless and the men abandoned the boots, going into the water in their normal attire. There were apparently few adverse effects; in fact, the Scientific American (op.cit.) reported that construction had "been attended with less loss of life and injury...than is usual on ordinary railroad track of equal mileage." No locomotives or cars were lost and few were even derailed, but Engineering News (November 27, 1902) knew of the heavy salt content in the water and noted that "Those who have scratches or sores on their persons have found that building a railroad across the lake is not such easy work."

Pile driving presented the greatest difficulty because of the differences in geology and sediments on the lake bottom. On some occasions the steam pile driver would not move the pile more than one or two inches with each blow. But once through this hard strata the pile would often drive quite easily. On other occasions the pile might be driven thirty to fifty feet and still continue to rise from a few inches to several feet during the brief pause between hammer blows. Perhaps the most dramatic moments occurred on the eastern section when one twenty-six foot pile was driven its entire length by one hammer blow. A second twenty-eight-foot pile was placed on top of the first

and again the hammer blow drove the pile to water level. Examination showed the bottom to be covered with fifty feet of mud deposited by the Bear River. To solve the problem forty-foot piles were driven into the mud then tied, capped, and braced. The railroad hoped this would hold while the construction trains dumped their loads of fill and gradually solidified the bottom.

All these problems overcome, the tracks from the east and west shores met near the center of the lake on November 13, 1903. A total of 38,256 piles had been driven, enough to stretch a total of 2.8 million lineal feet. On Thanksgiving Day, November 26, 1903 Southern Pacific President E. H. Harriman, in the presence of railroad dignitaries from all over the United States, drove a solid gold spike into the last tie and thus celebrated the completion of the Ogden-Lucin Cut-Off Trestle. The road was opened for regular traffic March 8, 1904, just nine days short of two years after the unprecedented project was begun. Scientific American (op.cit.) predicted in 1904 that the trestle would "ever stand as a fine monument of achievement to its builders." *With the heavy freight trains of the 1970's still* ~~in~~ <sup>in-1972</sup> one can only echo that praise.

*Crossing the trestle,*

*AT*  
T. Allan Comp  
Project Historian  
August, 1972

BIBLIOGRAPHY

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ADDENDUM TO:  
SOUTHERN PACIFIC RAILROAD, OGDEN-LUCIN CUTOFF  
TRESTLE  
Spanning Great Salt Lake  
Brigham City vicinity  
Box Elder County  
Utah

HAER UT-13  
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