

INTERSTATE COMMERCE COMMISSION

REPORT OF THE DIRECTOR OF THE BUREAU OF SAFETY IN RE
INVESTIGATION OF AN ACCIDENT WHICH OCCURRED ON THE
ATCHISON, TOPEKA & SANTA FE RAILWAY, COAST LINES,
AT JOSEPH CITY, ARIZ., ON AUGUST 7, 1930.

October 14, 1930.

To the Commission.

On August 7, 1930, there was a derailment of a passenger train on the Atchison, Topeka & Santa Fe Railway, Coast Lines, at Joseph City, Ariz., resulting in the death of 2 employees and the injury of 46 passengers.

Location and method of operation

This accident occurred on the Second District of the Albuquerque Division, extending between Gallup, N. M., and Winslow, Ariz., a distance of 127.9 miles, in the immediate vicinity of the point of accident, this is a single-track line over which trains are operated by time-table and train orders, no block signal system being in use. The accident occurred about three-fourths of a mile east of the east end of double track at Joseph City, at bridge C-263, which spans a stream known as Tanner wash; the stream flows from east to west on the north side of the track, and then goes under the bridge from north to south and empties in the Little Colorado River. Approaching from the west, the single-track portion of the railroad is tangent to and beyond the bridge; the grade for eastbound trains is 0.22 per cent ascending across the bridge. The track in this vicinity is laid with 90-pound rails, 33 feet in length, with about 22 ties to the rail-length, and is single-spiked, tie plated and ballasted with volcanic cinders.

Bridge C-263, located 4,554 feet east of the depot at Joseph City, was originally constructed about the year 1882, as a five-span open deck pile trestle, and was rebuilt during the winter of 1912, at which time the construction was changed to a five-span ballast-deck pile trestle. The bridge was 70 feet long, 15 feet wide, and approximately 16 feet above the bed of the stream; it consisted of six bents, each bent being composed of six piles, and the bents were spaced about 12 feet apart. The piles were 32 feet in length, with a maximum penetration of about 16 feet at the center of the bridge; the

interior bents were sway braced each way. The piles were capped with 12" x 12" x 16' creosoted Oregon pine caps, drifted to the piling with 3/4 x 22" drift bolts, and the deck stringers were so laid that the deck of the bridge was continuous and solid. Creosoted timbers were bolted in place to form guard rails and sides to retain the deck ballast in place. Crushed rock ballast was placed on the deck stringers to a depth of 10 inches under the ties, the track was in no manner fastened to the bridge. Each end of the bridge was protected by a bulkhead, and rip-rap protection was placed on the upstream side of the east end of the bridge.

It had practically stopped raining and the weather was partly cloudy in the immediate vicinity of the point of accident at the time the derailment occurred, about 9.02 p.m.

Description

Eastbound passenger train No. 8 consisted of one express refrigerator car, seven baggage cars, one coach, one chair car, one Pullman tourist car, and one Pullman sleeping car, in the order named, hauled by engine 3719, and was in charge of Conductor Evans and Engineman Bixby. The first, third, seventh, eighth, ninth, tenth, and twelfth cars were of all-steel construction, while the remainder were of steel-underframe construction. This train left Winslow, 22.3 miles west of Joseph City, at 8.25 p.m., on time, passed Joseph City depot at 9 p.m., according to the train sheet, two minutes late, entered upon the single-track, and shortly thereafter was derailed at bridge C-263 while traveling at a speed estimated to have been between 30 and 35 miles per hour.

Engine 3719, together with its tender, and the first three cars in the train, were derailed and came to rest on the stream bed and banks, damming the creek. Engine 3719 was south of and parallel with the collapsed trestle; its forward end being on the east bank of the stream and the cab buried in the stream bed; the tender was reversed, alongside and north of the engine. The first car came to rest at right angles to and across the forward end of the engine, the second car was also at right angles to and rested upon the cab of the engine and the tender, while the third car was derailed to the north and was headed down the west bank of the stream, its head end resting in the stream bed. The employees killed were the engineman and fireman.

Summary of evidence

Conductor F. L. Evans stated that the engine whistle was sounded approaching Joseph City and that he went out and looked at the train-order board; he saw the reflection of the headlight at this time and knew that it was burning properly. He then went back into the smoking compartment and started to work his tickets. Speed was reduced to about 15 miles per hour until the train passed through the switch leading from double to single-track, then it was increased, and the first he knew of anything wrong was on feeling the shock caused as a result of bridge C-263 collapsing under the weight of the train, at which time he estimated the speed to have been about 30 miles per hour, he did not think that any air-brake application was made prior to the accident. Immediately after the accident he went forward and on arrival at the bridge he observed that the wreckage had practically dammed the creek, the water being quite deep on the north side, probably 8 or 10 feet, although he did not measure it, he then went back to the telegraph office and summoned aid, returning to the scene of the wreck by automobile, and by this time the water had gone down considerably, being about 3 or 4 feet deep, although it was close to the top of the boiler head of the engine on the north side. Conductor Evans further stated that on leaving Winslow it was a little cloudy, but no rain, with occasional lightning and thunder to the north. He had not received any messages or instructions relative to storm conditions, and said that he was not concerned to any extent on this occasion. Conductor Evans had been working on the Albuquerque Division for about 25 years and was not aware of any previous trouble from water at bridge C-263; he had always considered this to be a dry wash. It was his opinion that the bridge had been weakened to such an extent by high water that came down the wash just prior to the accident, that it collapsed under the weight of the engine. The statements of Head Brakeman Huckabay, Flagman Harper, and Express Messenger Strawn, all of whom were riding back in cars in the train that were not derailed, were similar to those of Conductor Evans.

Engineman Murphy and Fireman MacClean, of west-bound extra 3244, which passed Joseph City at 6.26 p.m., gave testimony to the effect that at the time their train passed over bridge C-263, there was no evidence of water in Tanner wash. Engineman Murphy stated that the weather was a little cloudy at Joseph City and that over to the north there was a dark cloud from 8 to 15 miles away, and it looked as though it might be raining there; prevailing weather conditions, however, caused him no ap-

prehension, nor did they impress him as being such that section men should be out patrolling the track or that the dispatcher or section foreman be notified.

Engineman Iler and Fireman Eastman, of the lead engine of eastbound first-class train No. 22, which left Joseph City at 7.07 p.m., and Engineman Bailey and Fireman Christenson, of the second engine, as well as Conductor B. F. Evans, gave testimony to the effect that there was a small amount of water running in Tanner wash, not from bank to bank, but just in the center of the wash, from $1\frac{1}{2}$ to 3 feet deep, at the time their train passed over bridge C-203. It was cloudy but not raining at the time, although there was evidence of its having rained in that vicinity and it appeared as though there was a storm some distance away to the north, there was not enough water to attract particular attention nor anything about conditions at the bridge to cause alarm as to the safety of the track or bridge, otherwise proper notification would have been made to the dispatcher and the section men have been called out. In their experience, which covered a maximum period of 33 years, no trouble had been caused from high water at that point. Engineman Iler thought that a cloudburst or heavy rain storm must have occurred after his own train passed over the bridge, and was of the opinion that nothing could have been done to have prevented the accident.

Section Foreman Hartin, in charge of the section on which the accident occurred, stated that there was a light rainfall at Penzance, located 4.6 miles east of Joseph City, during the evening of the day of the accident; there was a very black cloud off to the north, he judged about 12 to 15 miles away, accompanied by lightning and thunder, evidently a heavy storm, which he kept under observation from about 5 to 7 p.m., when the clouds began to break, therefore, he maintained no further watch, thinking that there would be no trouble from high water in Tanner wash, and for that reason he did not patrol his section or advise the dispatcher about the cloudy condition to the north. Section Foreman Hartin further stated that work of putting in ties was performed at Joseph City during the morning of the day of the accident, west of bridge C-203; while this work was in progress, before noon, he went down under the bridge, and an inspection at that time disclosed the rip-rap and all parts of the bridge to be in good condition, the same as it had always been during the four years he had been on this section. No previous trouble had been experienced from high water in Tanner wash and he had never seen more than 3 feet of water in it prior to the accident.

Roadmaster Borden crossed bridge C-263 on a motor car the day prior to the accident, but saw nothing to indicate that the stream bed, rip-rap, or anything pertaining to the bridge, had been disturbed. He had never seen much water in Tanner wash, at no time to exceed 2 or 3 feet, during the time he had been roadmaster, almost nine years.

Operator McGinnis, at Joseph City, stated that about 5 or 5.20 p. m. he noticed clouds, lightning and thunder, about 7 or 10 miles away, to the north, apparently storming there. No rain fell at Joseph City, however, and he made no report to the dispatcher as the storm was a considerable distance away and caused him no apprehension. Operator McGinnis went outside the office when train No. 8 passed and at that time the headlight on the engine was burning.

Dispatcher Foulkes stated that he did not receive a report from any train crew, nor from the section foreman or the operator, relative to bad weather conditions, saying that he had no knowledge whatever that there was a storm to the north of Joseph City until after the accident.

Bridge Inspector Britt stated that he inspected the piling, stringers, caps and all parts of bridge C-263 during the afternoon of August 5th, but found nothing requiring attention. There was no change in the stream bed, so far as he could see, or any perceptible change in the approaches to the bridge, such as holes washing in, or the banks caving away.

W. F. Martens, General Foreman Bridges and Buildings and Water Service, stated that to his knowledge there had never before been more than 3 feet of water under bridge C-263, and the general condition of the stream had not changed a great deal. He last inspected the bridge, the annual inspection, on June 7, 1930, and there was nothing about the bridge to lead him to question its ability to handle water, or to think that it was not safe in every way. In his opinion, the bridge failed as a result of water flowing against the east bank of the stream at an acute angle with such force that the rip-rap was washed away and the channel scoured, weakening the bents, and that when the engine struck the east embankment it knocked the bridge down.

Division Engineer Kline arrived at the scene of the accident about two hours after its occurrence, at which time there was about 18 inches of water running in the stream bed. The east approach to the bridge had been washed for about 20 feet east of the east bent, and the

first three bents were gone. A sounding was made which showed about 10 feet of water, indicating that the stream bed had been cut down during the high water. Rip-rap that was formerly near the east dump bent was washed down stream, and a large amount of it piled up in the middle of the stream about 100 feet south of the bridge. There were two piles broken off in bent 2 and one in bent 1; all the rest of the piling in the damaged portion of the bridge, which consisted of bents 1, 2, and 3, had disappeared. A 50-foot pile was the first to be redriven after the accident, and when the hammer was placed on the pile it dropped about 10 feet into the soil without any resistance, at every blow the pile dropped about 3 feet, until it reached a depth of approximately 42 feet, when it tightened, evidently encountering hard material. The temporary piling driven on the east temporary bent out of the stream bed drove hard, indicating adobe formation for a certain distance below, and then it broke into quicksand with very easy driving. Borings made since that time disclosed that the stream scoured down through the adobe layer into the quicksand, and the edge of the adobe was found by borings and traced across the stream bed, starting from the second bent from the west end and going diagonally across the stream bed to a point about 30 feet north of the track at the east end of the old bridge. The adobe layer reached to about 22 feet below the base of the rail, and then 18 feet of quicksand was encountered. Division Engineer Kline thought that the fact the high waters had never before broken through the adobe was the reason for not having had previous trouble at this point, although the run off is not great, that is, there are not many run offs in this area each year, and he did not recall any heavy run offs having occurred at bridge C-263 during the last four years. He stated that the waterway area of bridge C-263 before the washout of August 7th was 603 square feet. According to the drainage tables of the railroad, that size waterway will accommodate a drainage area of 24 square miles, the records show a drainage area of 7.8 square miles when the bridge was reconstructed in 1912. Subsequent to the accident, the drainage area was gone over roughly and found to be about 15 square miles. There was no record of high water or damage to bridge C-263 contained in the bridge records, and there had been very little change in the stream bed or general appearance of the channel except that the bends had widened a little. Division Engineer Kline stated that provided the three piles that were still in evidence after the wreck were in place, which apparently was the case as they were broken off in the wreck, the deck of the bridge would have been held up so that there would have been no visible sag and with the headlight burning brightly the bridge would have appeared to have

been intact to the engine crew. He thought that the east approach of the bridge fell first and that the second and third bents were practically washed out due to the scour and that when the engine started down it knocked over the bents. According to the testimony, he did not think that there was sufficient evidence of a storm to warrant the section foreman going out, the storm being a long distance off to the north; apparently a local cloudburst concentrated in a small area with no other evidence outside of rainfall. In his opinion, the washout was due to high water forming a whirlpool and breaking through the adobe formation, which on account of the scour of 3 feet in the stream bed was only a foot or so thick, this whirlpool breaking into the quicksand and undermining the three east bents of the bridge, also the rip-rap, dumping it into the water and carrying it downstream.

Conclusions

This accident was caused by bridge C-263 having been weakened by high water to such an extent that it collapsed under the weight of train No. 8.

The evidence indicates that a local cloudburst or heavy rain storm fell in the vicinity of bridge C-263 shortly before the accident occurred. Westbound extra 3244 passed Joseph City at 6.26 p.m., while eastbound first-class train No. 22 left Joseph City at 7.07 p.m., however, nothing unusual was noticed by the crews of these trains while passing over bridge C-263, and there was only a small amount of water in Tanner wash at the time. Just what depth of water was in the wash when the accident occurred is not known, but a sounding made about midnight, after the subsidence of flood water, at the location of bent 3, the bents being numbered from east to west, where the wreckage dammed the stream, showed that the stream bed had been cut down about 10 feet. No previous trouble had been experienced from high water in Tanner wash, however, the evidence was clear that a heavy volume of water had rushed down it on the night of August 7, scoured out the center of the stream, completely undermining bent 3, and a portion of bent 2, washing a considerable amount of the rip-rap protecting the dump of the east approach 100 to 150 feet downstream, and cutting in behind the bulkhead of bent 1 on the east bank and washing away 28 feet of the fill to a depth of 16.4 feet. The construction of the ballast deck was such, however, that even with the bridge damaged to this extent there would be little sag, if any, to the track structure, and there is no doubt that the existing condition could not have been seen by the engine

crew by means of the electric headlight in time to avert the accident.

The employees involved were experienced men, and at the time of the accident none of them had been on duty in violation of any of the provisions of the hours of service law.

Respectfully submitted,

W. P. BORLAND,

Director.