

Final Report
EVALUATION OF
RAILROAD GRADE CROSSINGS



For
Lander County
Battle Mountain, Nevada

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I Introduction

A. Background

The U.S. Government plans to begin the first geologic repository for permanent disposal of commercial spent nuclear waste and high-level radioactive waste (HLW) soon after the turn of the century. In order to meet this goal, the Office of Civilian Radioactive Waste Management (OCRWM) must carry out the responsibilities assigned to the Department of Energy (DOE) by the Nuclear Waste Policy of 1982 (NWPA, 1982) and revised in 1987, Nuclear Waste Policy Amendments Act (NWPAA, 1987) (DOE, 1990).

In accordance with the NWPAA, Yucca Mountain was designated as the site to be investigated as a potential repository for the disposal of high-level radioactive waste. The Yucca Mountain site is an undeveloped area located on the southwestern edge of the Nevada Test Site (NTS) in southern Nye County, about 100 miles northwest of Las Vegas. The site currently lacks rail service or an existing right-of-way. If the Yucca Mountain site is found suitable for the repository, rail service is desirable to the OCRWM Program because of the potential of rail transportation to reduce costs and the number of shipments relative to highway transportation. The use of Multi-purpose canisters (MPC) will require approximately 85 percent of the waste to be shipped by rail due to the canisters' weights (75ton and 125 ton).

OCRWM, under the responsibilities delegated to the DOE under the NWPAA, will design and implement a system for the transportation of high-level waste from commercial reactors and DOE facilities to the repository or other facilities in the waste management system. Transportation activities in Nevada focus on development of rail access to the Yucca Mountain site, evaluations of potential transportation activities, and response to transportation issues raised in Nevada.

DOE has not identified any preferred route and recognizes that transportation issues require full and open treatment under the National Environmental Policy Act. The issue of transportation will be included in public hearings to support the development of the Environmental Impact Statement (EIS) proceedings for either the Monitored Retrievable Storage (MRS) facility, the Yucca Mountain Project, or both.

Nevada has three main line routes (Figure 1), one owned by the Southern Pacific Transportation Company (SPTCo) and two owned by the Union Pacific Railroad (UPRR). Two of the main line routes pass through northern Lander County and Battle Mountain. It is possible that this corridor segment could be used for waste shipments directly to the repository or a MRS facility.

The SPTCo Overland Route extends 779 miles between Oakland, California, and Ogden, Utah. About 440 miles of the line spans northern Nevada, extending in a west-east direction roughly between Verdi, Nevada and Lucin, Utah. The SP enters the Humboldt River Valley near Lovelock, Nevada. Here the line begins to parallel the Humboldt River, whose valley provides a path for the track through most of Nevada.

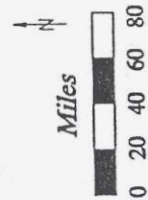
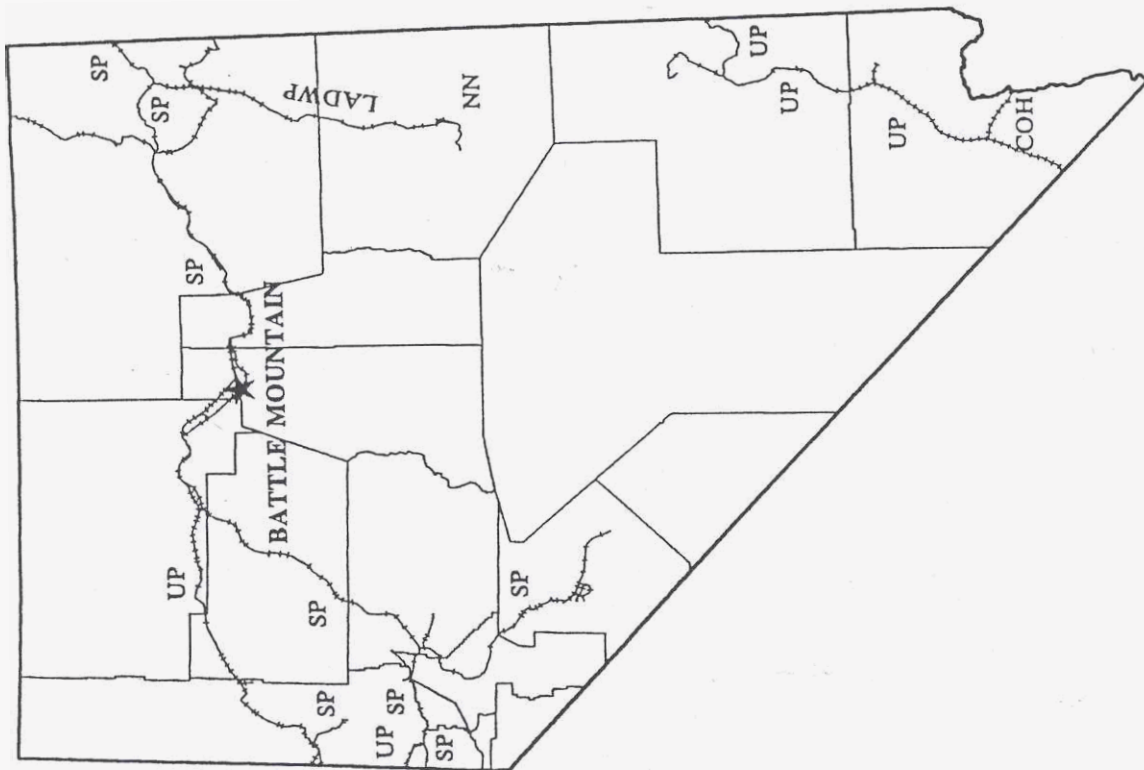


FIGURE 1

EXISTING NEVADA RAIL SYSTEM

- KEY**
- UP - UNION PACIFIC
 - SP - SOUTHERN PACIFIC
 - NN - NEVADA NORTHERN
 - LADWP - LOS ANGELES WATER AND POWER
 - COH - CITY OF HENDERSON

Through the project area, both railroads use the SP track for westbound and the UP for eastbound movements. The UP joins the SP at Winnemucca, approximately 45 miles to the west of the Battle Mountain area.

The UPRR Feather River Line extends 928 miles between Oakland, California, and Salt Lake City, Utah. This track was the former Western Pacific Railway (WP). About 427 miles of track cross northern Nevada, extending in a roughly east-west direction between Herlong, California and Wendover, Utah.

Due to possible SNF (Spent Nuclear Fuel) shipments along the northern, UP/SP corridor, Lander County prepared an initial assessment of operating conditions in 1992. At-grade crossings of the UP and SP main lines in the County were investigated as a factor in the overall evaluation of these corridors relative to the safe haulage of nuclear waste.

Road crossings in Lander County, particularly those in Battle Mountain, are heavily traversed by trucks hauling materials of a toxic and explosive nature. Additionally, there are several private at-grade crossings along the rail routes in northern Lander County which have limited safety and warning devices.

B. Scope and Purpose of Study

The 1992 study did not address the crossings themselves relative to safety and economy of maintenance. The purpose of the current investigation is to provide a detailed analysis of each active crossing with respect to its condition, safety protection, and recommendations for possible improvements. Specifically this report will:

Identify all public and private rail crossings along the SP and UP corridors in northern Lander County.

Describe the structural condition of each crossing to provide justification for recommended improvements.

Describe the safety protection present and its adequacy relative to the general surroundings, sight lines, and traffic.

- Provide a data base for future monitoring of use and wear rates which will be periodically updated.

C. Project Area Description

The project area includes the rail corridor from the Lander County line east to Eureka County (Figure 2). The corridor is approximately 22 miles in length. Within this corridor, the SP and UP operate mainline railroads which transverse the Humboldt River Valley. The Town of Battle Mountain, the major population center in Lander County, is located halfway along the corridor at the northern end of the Reese

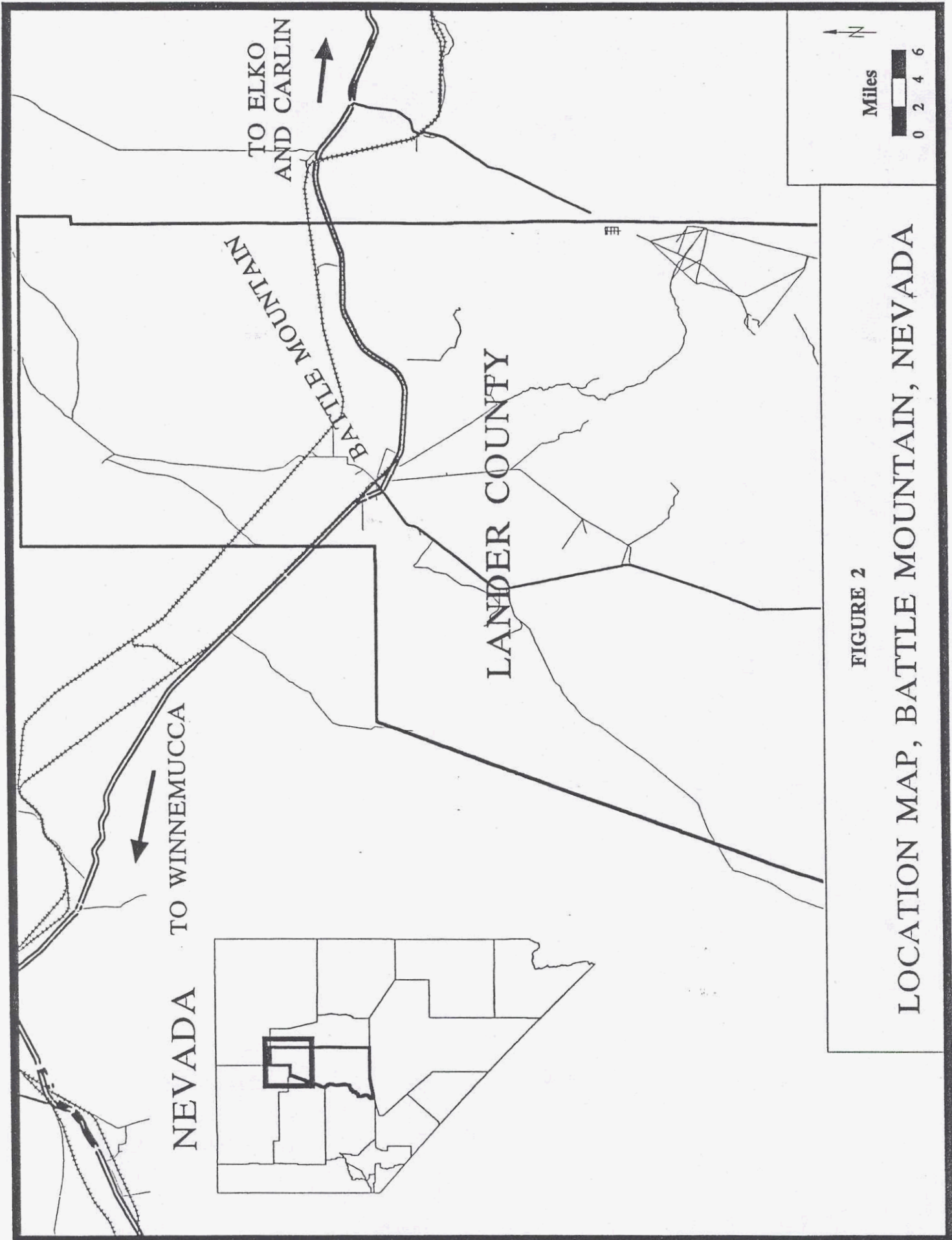


FIGURE 2

LOCATION MAP, BATTLE MOUNTAIN, NEVADA

River Valley. At Baffle Mountain the Reese River drains into the Humboldt River.

Battle Mountain, the County seat, has been a hub of activity for Lander County since the late 1860s. With the coming of the railroad, the town became a regional trading center for ranches, mines and communities in much of northern Nevada. Battle Mountain lies in the center of the most productive gold mining area in the United States. Baffle Mountain is approximately 230 miles east of Reno, adjacent to Interstate 80. The SP bisects Battle Mountain while the UP is located approximately 5 miles to the north.

The project area falls within the Basin and Range province and is characterized by generally north-south trending, isolated, elongated, subparallel mountain ranges separated by broad, intervening, nearly flat-floored valleys and basins. Battle Mountain and the rail corridor are within the Humboldt River Valley. The Humboldt River is a major perennial river in northern Nevada. The area surrounding the River is characterized as a broad alluvial flood plain with small wetlands and areas which are subject to periodic flooding.

Although several of the crossings experience limited use at this time, future development in the area could drastically change the number and type of vehicles crossing rail lines in northern Lander County. For example, the development of a mine site north of the rail corridor could significantly increase daily use, as well as the types of materials which may cross the railroad.

II. Analysis

A. Investigation

1. State of Nevada, Department of Transportation

ETS Pacific contacted the Safety Engineering Division in order to find available information about crossing standards, traffic densities, and safety conditions. The Division maintains an inventory which tabulates all of the railroad crossings in the State. This information is updated on a two year basis. The crossing inventory contains data that can be entered into a formula that produces a Hazardous Index that can be used in determining crossing protection requirements and priorities.

The information in the data base includes crossing number and location, highway and train average daily traffic (ADT) and speeds, accident history, cost benefit factors, type of protection, roadway type, and government jurisdiction. Information from this inventory which is relevant to the subject study has been included in Table 1 (Page 9).

The State has no jurisdiction over private crossings. The installation and maintenance is controlled by the railroads and the individual property owners. Because of this lack of authority, the data in the inventory is less extensive. The information includes crossing number and location, type (eg., industrial, recreational), protection, and accident history.

2. Lander County/Battle Mountain Area Rail Corridor Assessment

A review was made of the inspection reports from this earlier work in order to eliminate the need to retake data that was already available and to permit the current effort to focus on conditions specific to the purposes of this report. Of particular use were the physical dimensions and notes on traffic kinds and volumes.

3. Current Investigation

In November 1993, a visit was made to each crossing accessible by automobile. All of the SP crossings were investigated. Three of the inventoried UP crossings were not reached during this inspection. One of these crossings was observed in the earlier investigation and one has been abandoned. The UP Roadmaster was contacted regarding the ~~un-observed~~ crossings and this information has been included.

The current investigation provided definitive gradations for the condition descriptions of the crossing and track materials and the nature of the roadway approaches and visual obstructions. Also observations were made about the life remaining for the crossing materials and possible upgrades.

B. Findings

1. Tabulation - Table 1

The key findings of this investigation and analysis are shown in Table 1. This table is largely self-explanatory so the following text provides clarification for only those items that are subject to interpretation. In support of the tabulation, a map, Figure 3, has been prepared to show the locations of the crossings relative to the County road network. NDOT has inventoried some crossings that are now abandoned. These locations are shown for historical background purposes.

- Crossing Number

The AAR or DOT numbers were often missing, so for purposes of this report the numbers assigned by NDOT have been used.

Milepost (MP)

The railroad milepost as designated by NDOT has been used.

Length

The length is the dimension of the crossing material measured parallel to the track, across the width of the road.

Approach

There are two significant aspects to the roadway approach to a crossing - angle and grade. All of the crossings in the study area approached at a 90 degree angle which is the ideal.

On both main lines the track elevation is at or above surrounding, natural grade. This relationship results in all the crossings being level or having a "rise"(ascending road grade from both directions) at the track.

At certain of the private crossings, the roadway grade has been depressed from natural grade prior to rising over the track. NDOT calls this condition "humpback", it is so designated in the tabulation, and is further discussed under "visual obstructions".

Protection

Traffic control systems for at-grade highway-railroad crossings are either passive, which includes all signs and markings, or active, which includes signals and gates. The various devices that are present at each crossing are included in the tabulation.

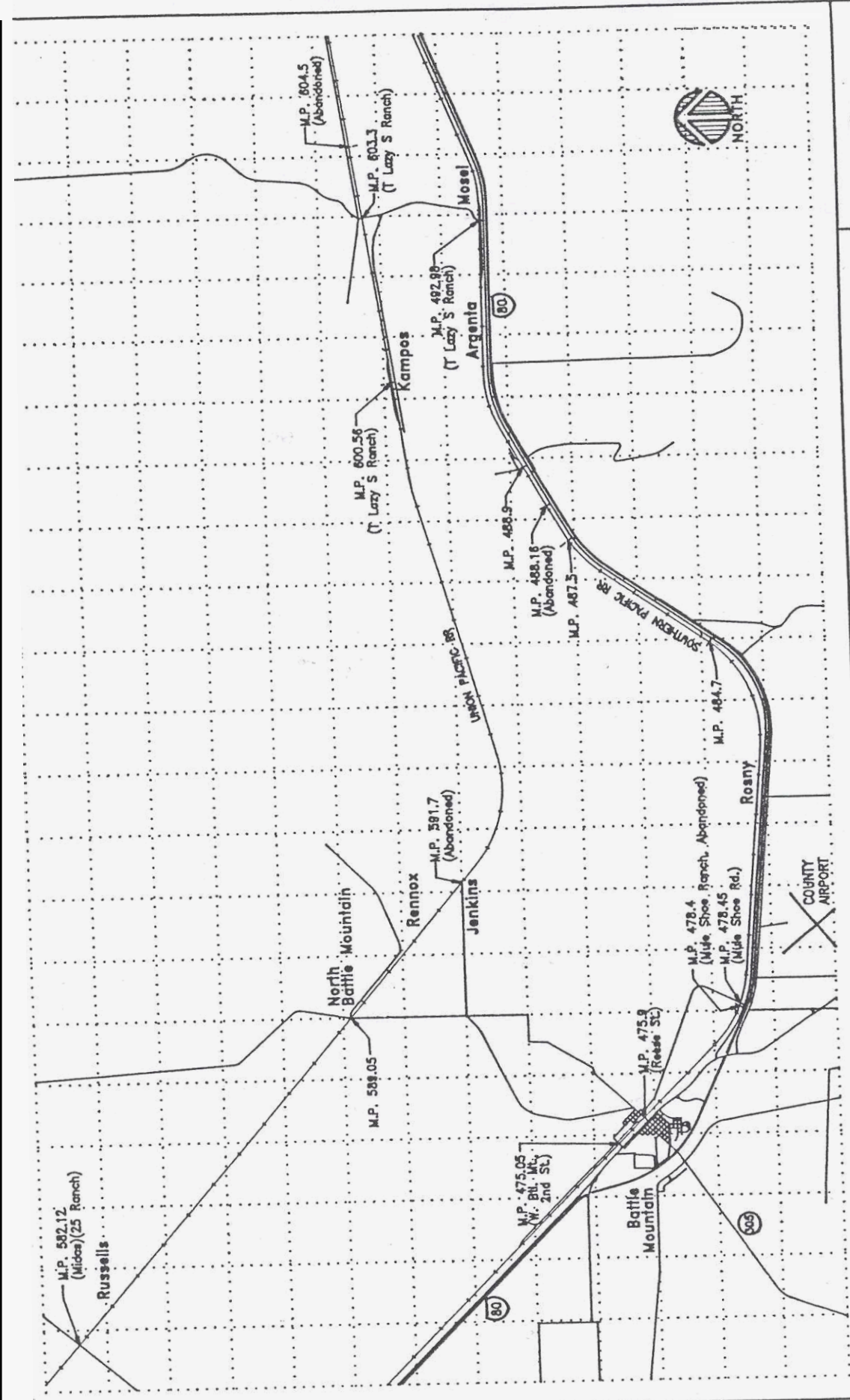


FIGURE 3
 LOCATION MAP, RAIL CROSSINGS
 LANDER COUNTY, NEVADA

Table 1
Railroad Crossing Inventory, SP and Up Mainlines
Lander County, Nevada

Milepost	RR	NDOT Xing #	Description / Location	Intersecting	Jurisdiction	Service
475.05	SP	7620940	West Battle Mtn. / North 2nd St.	Front Street	county	Business
475.90	SP	740816A	Reese Street	Front Street	State	Bus/Hwy806
478.45	SP	9120079	Mule Shoe Rd	Frontage Rd.	County	Industry
484.70	SP	740818N	Private Rd	Frontage Rd	Private	Recreation
487.50	SP	740819V	Private Rd.	Frontage Rd.	Private	Recreation
488.90	SP	740821W	Private Rd. / Baker/Hughes	Frontage Rd.	Private	Industry
492.98	SP	740822D	T Lazy S Ranch	Frontage Rd	Private	Ranch
582.12	UP	833441Y	Midas 25 Ranch		Private	Ranch
589.05	UP	833442F	North Battle Mtn. / Hwy 806		State	Industry
591.70	UP	833443M	Abandoned			
600.56	UP	833445B	T Lazy S Ranch	UP Access Rd.	Private	Ranch
603.30	UP	833446H	T Lazy S Ranch	UP Access Rd.	Private	Ranch
604.50	UP	833447P	Abandoned			

Table 1 (cont)
Railroad Crossing Inventory, Sp and UP Main Lines
Lander County, Nevada

Milepost	Length	Approach Grade	Protection	ADT		Accident History		Number of Tracks	MPH	
				Hwy	Train	No.	Descr.		Hwy	Train
475.05	3	Level	RXB, AG, MFL, BL, SL, RXR, AWS	468	24	0		2	25	45
475.90	3	Slight rise	RXB, AG, MFL, BL, SL, RXR, AWS	2620	22	1	PD	1	25	45
478.45	2	Slight rise	RXB, AG, MFL, BL	263	22	1	PD	1	25	45
484.70	6	Humpback	SS	Light	22	0		1	N/A	70
487.50	6	Slightrise	SS	Light	22	0		1	N/A	70
488.90	4	Level	NXB, AG, MFL, BL	Heavy	22	0		1	NIA	70
492.98	6	Slight rise	SS	Light	22	1	AF	1	NIA	70
582.12	4	Slightrise	None	Light	20	0		1	N/A	70
589.05	12	Slight Humpback	RXB, AG, MFL, BL, SL, RXR, AWS	325	20	0		1	55	70
591.70										
600.56	16	Rise 1 Side	None	Light	20	0		2	NIA	70
603.30	24	Humpback	None	Light	20	0		1	N/A	70
604.50										

Key to Abbreviations

- RXB Reflectorized X-Buck
- NXB Non-Reflectorized X-Buck
- SS Standard Stop Sign
- AG Automatic Gates
- MFL Mast Mount Flashing Lights
- BL Bells
- SL sloop Lines
- RXR RxR Pavement Markings
- AWS Advance Warning Signs
- ADT Average Daily Traffic
- PD Property Damage accidents
- AF Fatal accidents

Table 1 (cont)
 Railroad Crossing Inventory, Sp and UP Main Lines
 Lander County, Nevada

Milepost	type of roadway	Condition	Visual Obstructions (by Quadrant)	General Surroundings	Date of Last Crossing Opening
475.05	Paved	Good	NE limited to 1500' +/-	Open country, Limited Industrial @ NE	1987-8
475.90	Paved	Good	SE/SW Limited	Downtown, Commercial	1991-2
478.45	Paved	Good	None	Flat, Open Grassland	unknown
484.70	Dirt	Fair-Poor	Dip before track	Open Grassland	unknown
487.50	Gravel	Fair-Poor	For 200' SE & 90' SW - Berm & Vegetation	Open Grassland, Fences	Unknown
488.90	Gravel	Excellent	None	Open Grassland	unknown
492.98	Gravel	Fair	None	Open Grassland	Unknown
582.12	Gravel	Good	None	Open Grassland	unknown
589.05	Paved	Good	None	Open Grassland	
591.70					
600.56	Gravel	<i>Good</i>	Trees each side, cars on siding	Trees	1986
603.30	Gravel	<i>Good</i>	Dip before track	Open Grassland	Recent
604.50					

Table 1 (cont)
 Railroad Crossing Inventory, Sp and UP Main Lines
 Lander County, Nevada

Milepost	Crossing Type	Material Condition	Flangeway Depth x Width	Gage Variance	Estimated Life (Years)
475.05	Lubber	Excellent	2.25 x 2.5	0	15-20
475.90	Lubber	Excellent	2.25 x 2.5	0	15-20
478.45	lubber	Good	1.5-3 x 3.0	+.25"	10-12
484.70	Timber	Poor	BR x 3.0	0	5
487.50	Timber	Fair-Poor	BR x 3.0	0	8
488.90	Timber	Fair-Poor	BR-1 x 3.0	-.25"	8
492.98	Timber	Fair	BR x 3.0	-.125"	10-12
582.12	Timber	Excellent		-	15
589.05	Concrete	Good	1.75 x 3.5	+.25 to .5"	10-12
591.70					
600.56	Timber	Good			10-12
603.30	Timber	Excellent			20
604.50					

Key to Abbreviations

BR Base of Rail

Table 1 (cont)
 Railroad Crossing Inventory, Sp and UP Main Lines
 Lander County, Nevada

Milepost	Comments	Improvements
475.05	+/- 7A. @ W. End settled 1.5 to 1.75". Heavy truck traffic	None Required
475.90	Used by mine trucks I chemicals	None Required
478.45	Heavy truck traffic	Install Rubber or Concrete (possible when opened)
484.70		Infill dip to flatten xing, add 2nd field side timber on S. ,replace Timber
487.50		Replace field timbers, add 2 to each field side, cut down berm & vegetation
488.90	Heavy truck traffic	Replace east end timbers
492.98		None Required
582.12		Install signs
589.05		None Required
591.70		
600.56		Install signs
603.30	Appears new	Install signs, flatten grade
604.50		

Track Condition

The railroad track structure is good to excellent throughout. The rail weight on the SP is 136# and on the UP it is 133#. Rail is No.1 relay quality. Both lines use CWR (Continuous Welded Rail). The use of CWR improves the maintainability of the crossing by eliminating the movement that occurs at rail joints.

Crossties are 7"x9" and predominately No.1 with some No.2 from MP487.5 westward. Ballast is in good condition. OTM (tie plates, spikes, and anchors) are of No.1 relay quality.

Gage is tabulated because instances of slight variations were found. Line and surface are excellent except for the passing siding at North Second Street where they are good to fair.

Flangeways

A flangeway, in the case of a crossing, is the space between the rail and the gage- side surface material (timber, Concrete, etc.) which provides a passageway for the portion of the car wheel that protrudes down from the running surface of the rail. Flangeway depths and widths are shown because clear flangeways are important for the safe passage of trains. On the other hand, widths that are too great cause a rough ride for the crossing vehicle.

2. Accident History

According to SP records, there is no evidence of any vehicle/train accidents and/or train derailments in Lander County. However, local officials could recall at least three derailments and at least one pedestrian death due to train operations in the Battle Mountain area. In talking to the local shippers in Battle Mountain, only one accident in nine years could be recalled (vehicle driver error). According to UP records, there have been no vehicle/train accidents and/or train derailments in Lander County. In talking to the local shippers in North Battle Mountain, no accidents could be recalled (Lander County, 1993).

During the course of preparing this report, on November 14, 1993, at approximately 10:14 a.m., a fatal accident did occur at the T Lazy S Ranch crossing MP492.98. This crossing is in good condition, it is protected with stop signs, and visibility is unobstructed. The vehicle was operated by a ranch hand familiar with the crossing. The citation indicated, "inattentive driving and failed to stop". The lesson is that at-grade crossings, no matter how harmless they may seem, are a risk at any time.

C. Jurisdictions

1. Public

Traffic control devices are all signs, signals, markings, and devices placed on, over, or adjacent to a street or highway by authority of a public body having jurisdiction to regulate, warn, or guide traffic. In Nevada the governmental agency having this responsibility is the Public Service Commission (PSC). By Nevada statute this authority extends to public railroad crossings.

It is accepted practice that the decision to use a particular device at a particular location should be made on the basis of an engineering study of the location. The "engineer" in this case is the Department of Transportation, Safety Engineering Division. The Division uses the information in the inventory, described above, to advise the PSC on the recommended type of protection for a given crossing.

2 Private

The government does not have authority over private crossings. The installation, protection, and maintenance are the responsibility of the railroad and the property owner. In the study area the SP installs and maintains the crossings while the owners pay for the initial installation. In the case of the UP the owners maintain the surface of the crossings. The kind of protection is left to agreement between the parties.

As noted in the tabulation, private crossing protection currently consists of either stop signs or nothing. Usually, on lightly travelled public roads, one would see a RAILROAD CROSSING (crossbuck) sign, as a minimum. The use of STOP signs is usually limited to special cases and are in addition to crossbucks. The UP would normally use a yellow, PRIVATE CROSSING sign of their own standard, but none are present in the northern Lander County corridor.

D. Standards

1. Crossing Structure

a. Principles

There are no established "standards" as such for the construction of at-grade crossings. Through experience, various "principles" have evolved which have proven to result in safe and efficient crossings:

- The roadway should intersect the track(s) at an angle as close to 90 degrees as possible.

The approach should be straight, at least for 100'.

The intersection should be **free** of visual obstructions in **all 4** quadrants.

- The crossing should have the same number of lanes as the road and, as a minimum, be as wide as the approach. Ideally the crossing should be 3-4' wider than the approach.

The crossing grade should be level and parallel to the track grade for a distance of 3-4' beyond the outer rail.

At 30' beyond the outer rail, the roadway grade should be no lower than 9" nor higher than 3" from the crossing grade. The Federal Highway Administration is in the process of releasing standards similar to these.

Flangeways should be 2" deep by 2 1/2" wide.

The ballast and subgrade should be stable and well drained.

b. Surfaces

As with the physical arrangement, there are no standards as such for the materials used in crossings. Experience has dictated the selection. Factors involved in the selection of surface material include type and/or importance of the crossing, anticipated type and volume of roadway and railway traffic, and subgrade characteristics.

The materials currently, typically in use include timber, asphalt, and concrete. Historically timber has been considered the least expensive and to have the shortest life expectancy. Asphalt ranks next and concrete has the highest cost but lasts the longest. However, with the recent increases in wood costs, the other materials have become much more competitive. There are also modular systems available which include precast concrete, rubber, steel, and high density polyethylene.

2. Protection

There are standards for traffic control devices for public streets and highways. These standards have been developed by the National Committee on Uniform Traffic Control Devices and are published in the Manual on Uniform Traffic Control Devices by the U.S. Department of Transportation, Federal Highway Administration. State manuals are mandated to conform to the national standard. Protection consists of passive and active systems. Passive systems include signage and roadway markings. Active systems are signals. The Manual provides standards for the design and application of devices, but it does not constitute a legal requirement for an installation of a particular device at any given location. Again, that decision is left to the governing agency. However, once a decision is made to install a device, the design must conform to the national standard.

III. Recommendations

A. General

As can be seen in Table 1 and in the discussion in Section II.B.1., most of the crossings achieve most of the principles described above. The roadways all intersect the railroad track at a 90 degree angle. The lengths of the crossings are all at least as long as the road approach is wide. The flangeways are all at least as large as desired. The ballast and subgrade are all sound, with no signs of drainage problems. In the recommendations that follow, comparisons to the principles will be made only in those cases where deviations were noted.

A word about abandoned crossings. Crossings are decommissioned by removing the crossing surface materials. This removal eliminates the grade required to allow a vehicle to roll over the rails, essentially returning the track to its non-crossing condition. The abandonment does not, however, remove the existing roadway. When one wishes to ensure that no one tries to use the abandoned roadway over the track, additional steps are required. For example, one of the abandoned crossings on the SP had three pieces of rail driven vertically into the ground to block the approach. Another common practice is to excavate a ditch diagonally across the roadway to prevent vehicle passage.

1. surfaces

Overall the grade crossings are in good condition. The railroad track structure is first class. The crossing materials at the public crossings are appropriate for the current use, with the possible exception of Muleshoe Road. The crossing materials and/or approach geometry at certain of the private crossings could be improved.

The Union Pacific considers that the next level of upgrade for a timber crossing is to install concrete. This change would be extreme for most of the lightly used private crossings. For heavy industrial or mining crossings, concrete crossings would not be unreasonable.

2. Protection

The traffic safety devices at the public crossings include most of the active and passive systems that are currently recognized by the FHA. At the private UP crossings there are no warning signs and these should be installed.

The UP considers the next level of upgrade from signs is to install signals and gates. As with going to a concrete surface, this improvement would not be warranted, with the possible future exception of heavy industrial or mining roads. For planning purposes, the cost to construct an active system would be on the order of \$65,000.

B. Crossing Specific

Recommendations for upgrades are noted in Table 1. Following is an explanation of each of the possible improvements, delineated by milepost designation, including justification and opinion of probable cost. Although these upgrades are technically defensible, the light traffic and low accident rate indicate no particular urgency in implementation. In the advent of significant increases of hazardous materials or mining truck traffic and/or nuclear waste trains, these situations should be given more immediate attention.

MP478.45: The current crossing material is timber. An upgrade to rubber or concrete would be reasonable due to the heavy truck traffic. There is no urgency for this improvement **so** it is recommended that this upgrade be considered whenever the crossing is replaced. Probable cost **\$14,000**.

MP484.70: This crossing is missing **two** field side timbers on the south and as a result the surface is not level and parallel sufficiently beyond the rail. As a minimum, these timbers should be added. The condition of the existing timbers is poor, with an estimated remaining life of 5 years. Since this is a lightly used recreational crossing, replacement of the timbers is not critical but should be considered as a potential improvement. Probable cost - field timbers only: \$180; all timbers: \$1,100.

A more potentially hazardous condition is the "humpback" in the approach to the crossing. This defect violates the principle of maintaining relatively level grade out 30' from the track. When a vehicle is in the depression, vision down the tracks is limited. Also a low underclearance vehicle could get hung up on the crossing. The fix would be to fill the dip on both sides of the track. Probable cost: \$2,800.

MP487.50 This crossing has only one timber on each field side and both are in poor condition. Even though the timbers are missing, the approach grade is adequate. Vision is obstructed on the south side by an earth berm with vegetation on it. Recommended improvements are installation of 3 each field side timbers and cut down of the berm and vegetation. Probable cost - timbers: \$550; cut down: \$600.

MP488.90: Although the crossing road to Frontage Road is in a straight alignment, the haul roads to Baker/Hughes veer off closer than 100' from the track. This arrangement violates the principle of being able to see both ways on the track at the same time. The remedy for this situation would be to realign the haul roads. This solution exceeds an improvement to the crossing so no attempt **to** evaluate this option has been made.

The timbers on the east half of the crossing are in poor condition. This crossing experiences heavy, industrial **truck** traffic. For this reason, the replacement of the east end gage and field timbers is recommended. Probable cost: \$900.

MP582.12: This crossing has no traffic control devices; signs should be installed; probable cost \$800.

MP589.05: Although the road crossing intersects at 90 degrees, it lies in the throat of an "s" curve. This configuration violates the principle of the straight approach for at least 100' either side of the crossing, Realignment of the road is the solution, which is beyond the scope of this evaluation.

MP600.56: This crossing road intersects the UP access road on the south and therefore does not have the 100' long straight approach. Since this is a 2-track crossing, parked railroad cars on the siding track can obscure vision along the main line when approaching from the north. Trees in the area can also limit vision. Because nothing can be done about cars on the siding, the only improvement would be to remove selected trees. An attempt to evaluate this option was not pursued.

This crossing also has no warning devices. An improvement would be to install signs. The probable cost would be \$800.

MP603.30: The approach to this crossing from the north is not straight for 100'. Also on the north, the crossing is not level for the 3-4' beyond the rail. In addition the entire grade is a humpback condition which violates the 100' level approach principle and can impair vision. Even though the crossing appears to have been recently installed, it has no safety devices. Recommended improvements - fill the dips and install either crossbucks or stop signs. Probable cost - dip fill: \$4,200; signs: \$800.

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