

# YELL WIP Report

## NPS Retaining Wall Inventory Program Yellowstone National Park



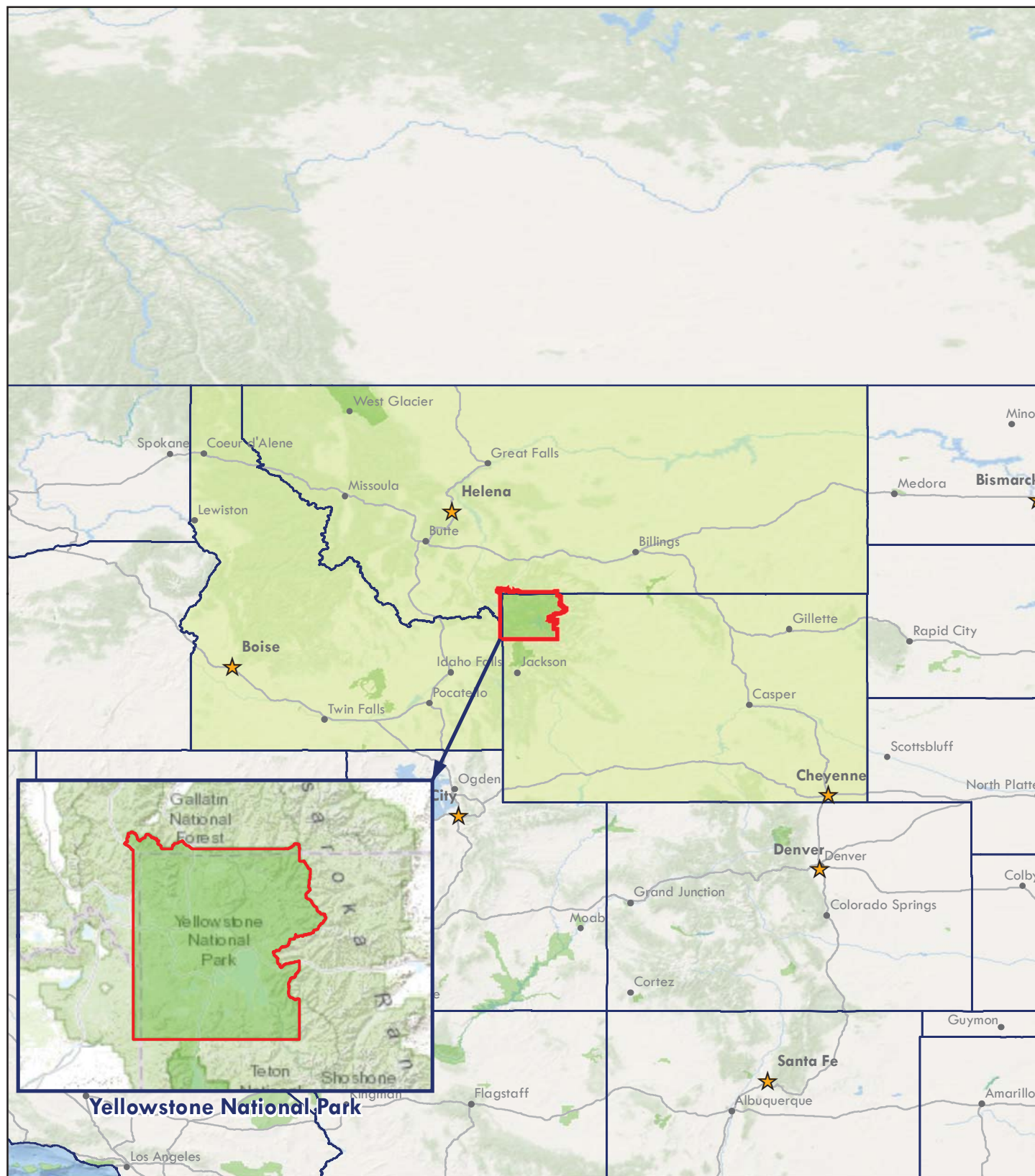
**Federal Lands Highway  
Road Inventory Program**

### Prepared By:

Federal Highway Administration  
Eastern Federal Lands Highway Division  
Road Inventory Program (RIP)

Data Collection Date: May 2007  
Report Date: November 2015

# Yellowstone National Park in Idaho, Montana and Wyoming



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community  
Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors





# Table of Contents

SECTION	PAGE NO.
1. INTRODUCTION	1 - 1
2. PARK RETAINING WALL LOCATION MAPS Retaining Wall Location Maps	2 - 1
3. TIER 1 - PARK RETAINING WALL OVERVIEW	3 - 1
4. TIER 2 - ROUTE RETAINING WALL OVERVIEW	4 - 1
5. TIER 3 - RETAINING WALL DETAILS	5 - 1
6. APPENDIX A - SUMMARY OF WIP DEFINITIONS AND ASSESSMENT CATEGORIES	A - 1

# Introduction



## Yellowstone National Park



**Federal Lands Highway  
Road Inventory Program**



## **Introduction**

The Federal Lands Highway Division (FLH) of the Federal Highway Administration (FHWA), in partnership with the National Park Service (NPS), has conducted a retaining wall inventory and condition assessment as part of the NPS Retaining Wall Inventory Program (WIP). This inventory provides information to the NPS Facility Management Software System (FMSS) regarding such things as type, size and location of retaining structures, as well as the condition of these facilities and consequences of failure. In addition, when wall and/or adjacent element deficiencies are identified, repair recommendations and estimated costs are also provided, suitable for use as FMSS work orders.

The main intent of this effort is to determine the backlog of needs associated with retaining wall assets – equipment features ascribed to the “parent” roadway asset. Inventory and condition assessments (pavement only) for the roads themselves are conducted under the NPS Road Inventory Program (RIP). Prior to development of the WIP, the vast majority of retaining walls were not accounted for in FMSS. Based on WIP inventory work to date, NPS wall assets are valued at well over \$400M. A second and equally important intent of this effort is to inform and improve project selection, prioritization, and development activities and processes at NPS regions/parks, FLH Division offices and the NPS Denver Service Center.

In support of WIP, a comprehensive procedures manual (available at the following link: <http://www.cflhd.gov/programs/techDevelopment/geotech/WIP/>) was developed to document the data collection and management process, wall attribute and element definitions, and team member responsibilities for conducting retaining wall inventories and condition assessments. This manual was used for nearly 3,500 wall assessments initially conducted between 2007 and 2008 within 34 national parks. WIP is supported by several key components described in the procedures manual, including a comprehensive training program for field inspectors, an Oracle-based database for long-term data management, unique data collection forms, a supporting field guide, and a wall repair/replace cost estimate guide.

Ultimately, condition assessments for retaining wall structures are expressed as deferred maintenance costs, which are then divided by current year replacement costs to arrive at a “Facility Condition Index” (FCI). Coupling this condition prioritization index with an “Asset Priority Index” (API), which measures the feature’s importance to the mission of the park, capital asset investments are made more efficiently. This approach appropriately focuses maintenance and construction priorities on value, rather than solely on cost. Wall inventory condition and cost data are transferred from the WIP database to FMSS, the primary asset documentation, management and planning platform maintained at each park. In addition, wall data are also provided to the Road Inventory Program to update equipment assets associated with the parent roadway asset.

Initial inventories were conducted based on RIP Cycle 3 data, but future planning has ensured updates to WIP will occur simultaneously with RIP. For long-term data management purposes, the WIP database will be linked to the larger, parent RIP database and be updated under the responsibility of the RIP Database Administrator.

This report is organized in a tiered approach from the broad park overview perspective (Tier 1) to a route overview perspective (Tier 2), then down to the details of each wall (Tier 3). Tier 1 presents park wall location maps and an overall park-specific summary narrative of the results of the wall inventory program. Tier 2 presents route overview maps with associated wall summary information. Tier 3 presents individual wall information in a three-page detailed format, including a photograph of each wall. Appendix A provides a condensed summary of wall inventory definitions and assessment categories to assist in reading this report.

# Park Retaining Wall Location Maps



**Yellowstone National Park**



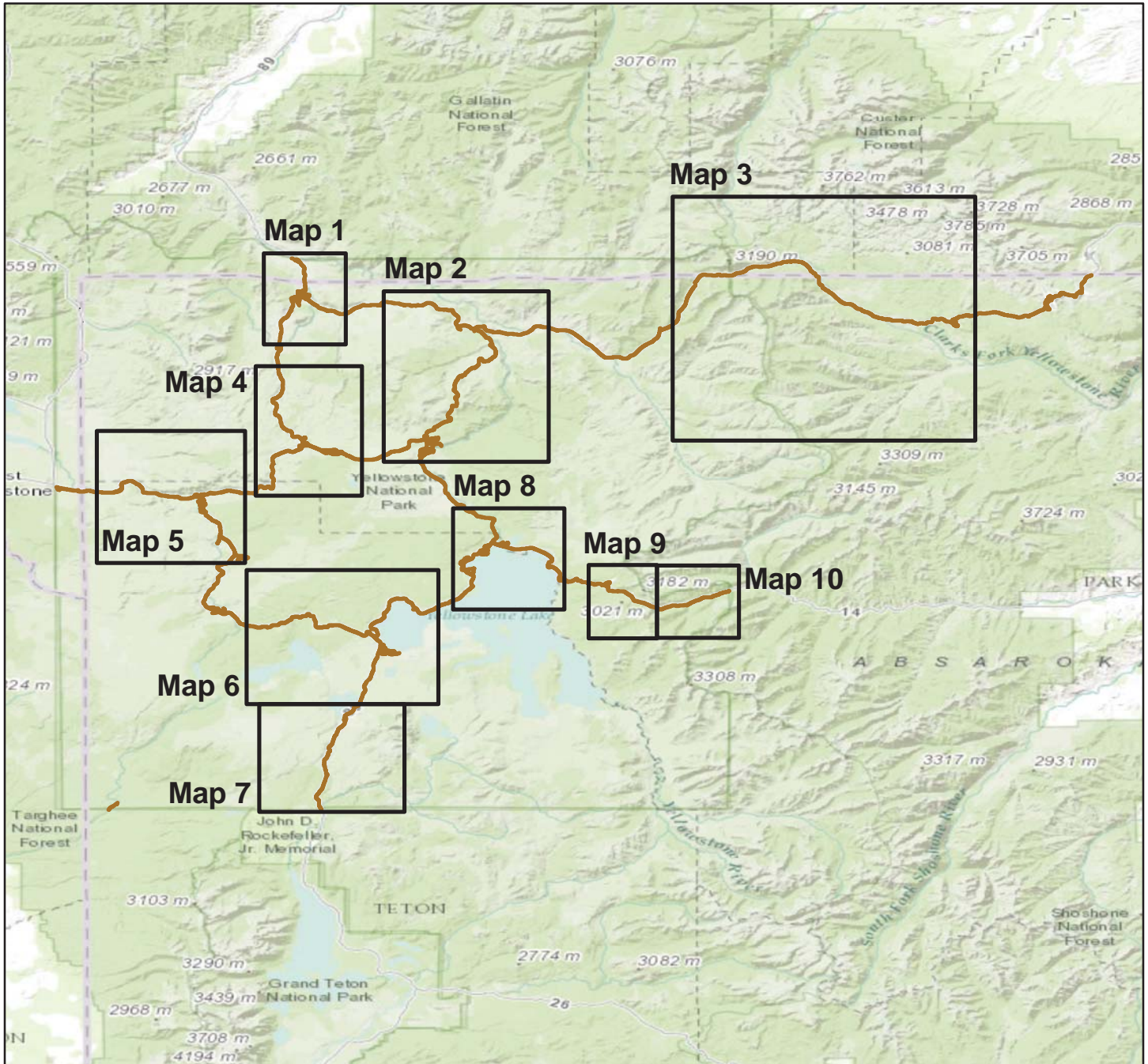
**Federal Lands Highway  
Road Inventory Program**



# Yellowstone National Park

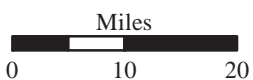
## WALL LOCATION MAP

### Key Map



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

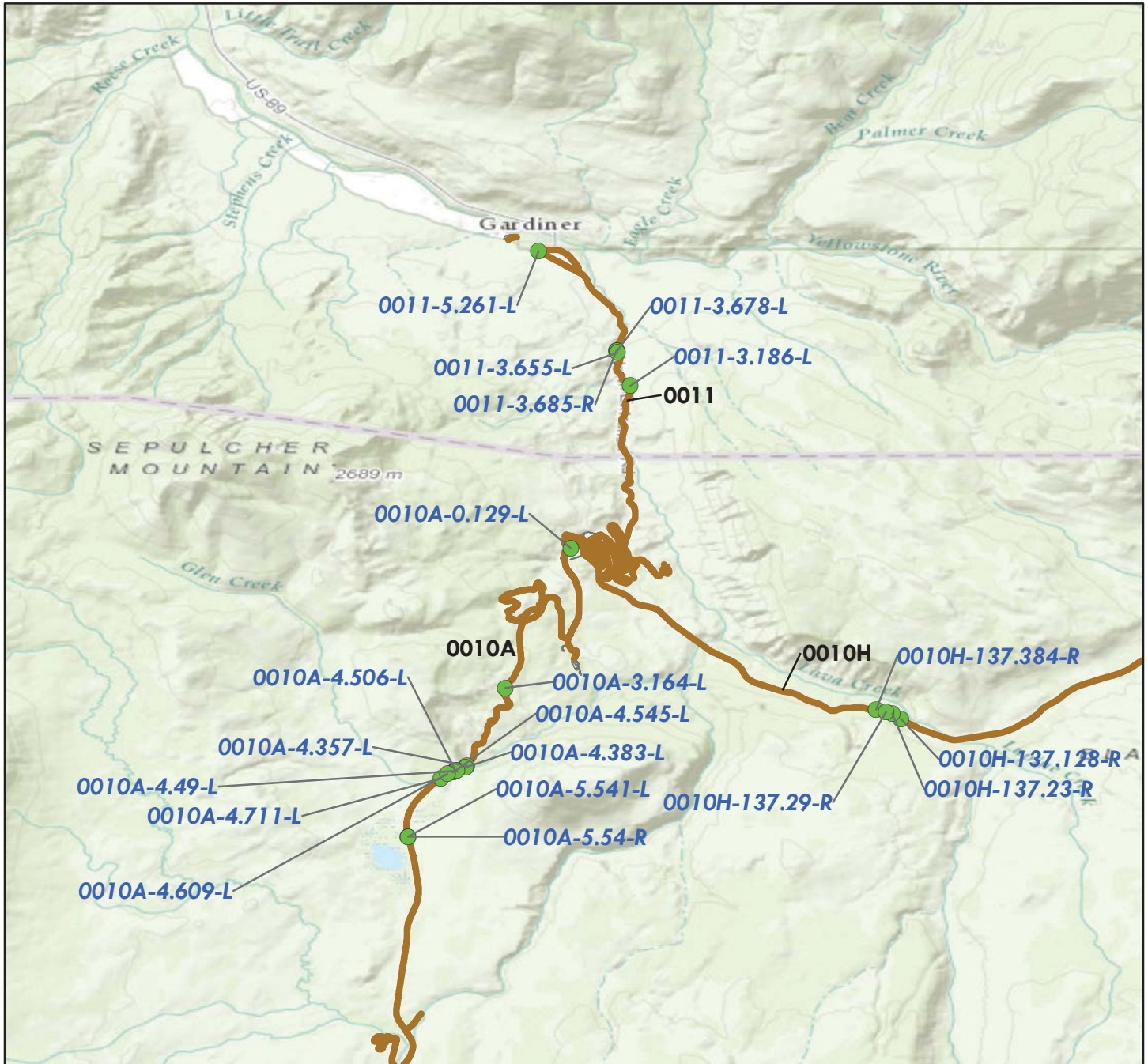
 RIP Collected Routes



# Yellowstone National Park

## WALL LOCATION MAP

### Map 1



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

- Wall Locations
- RIP Collected Routes

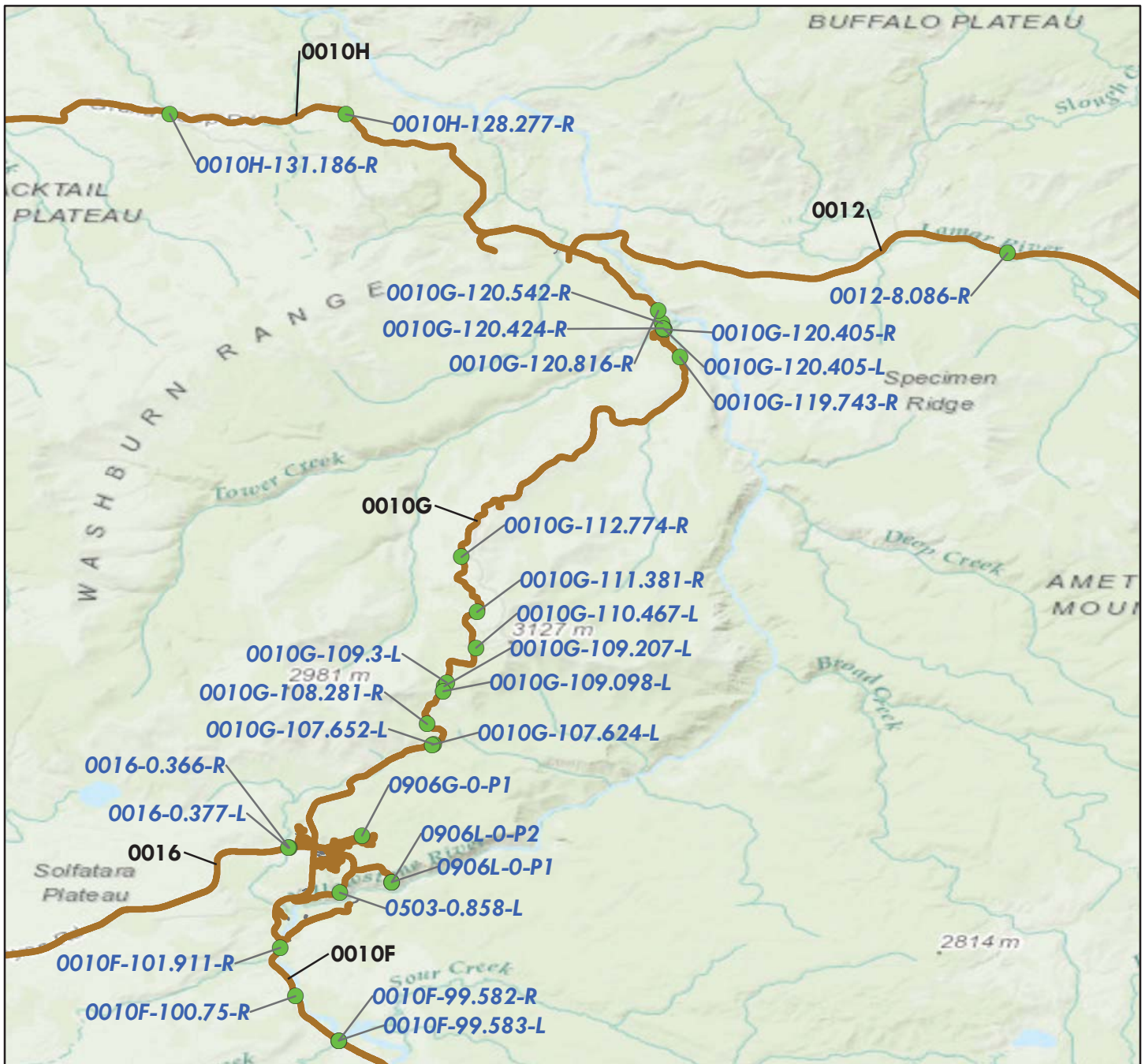




# Yellowstone National Park

## WALL LOCATION MAP

### Map 2



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

- Wall Locations
- RIP Collected Routes



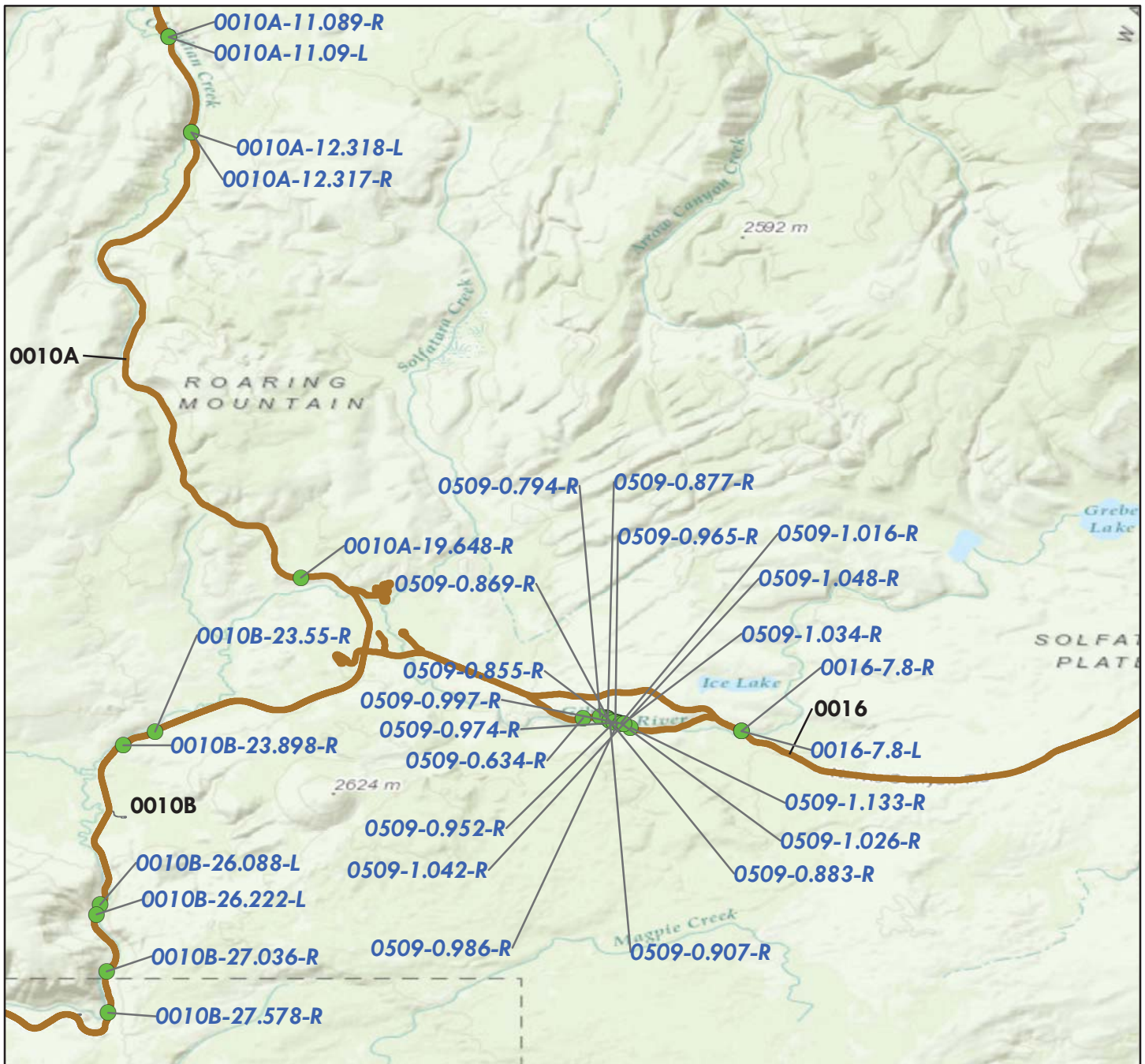




# Yellowstone National Park

## WALL LOCATION MAP

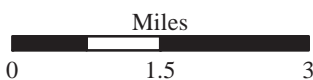
### Map 4



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

● Wall Locations

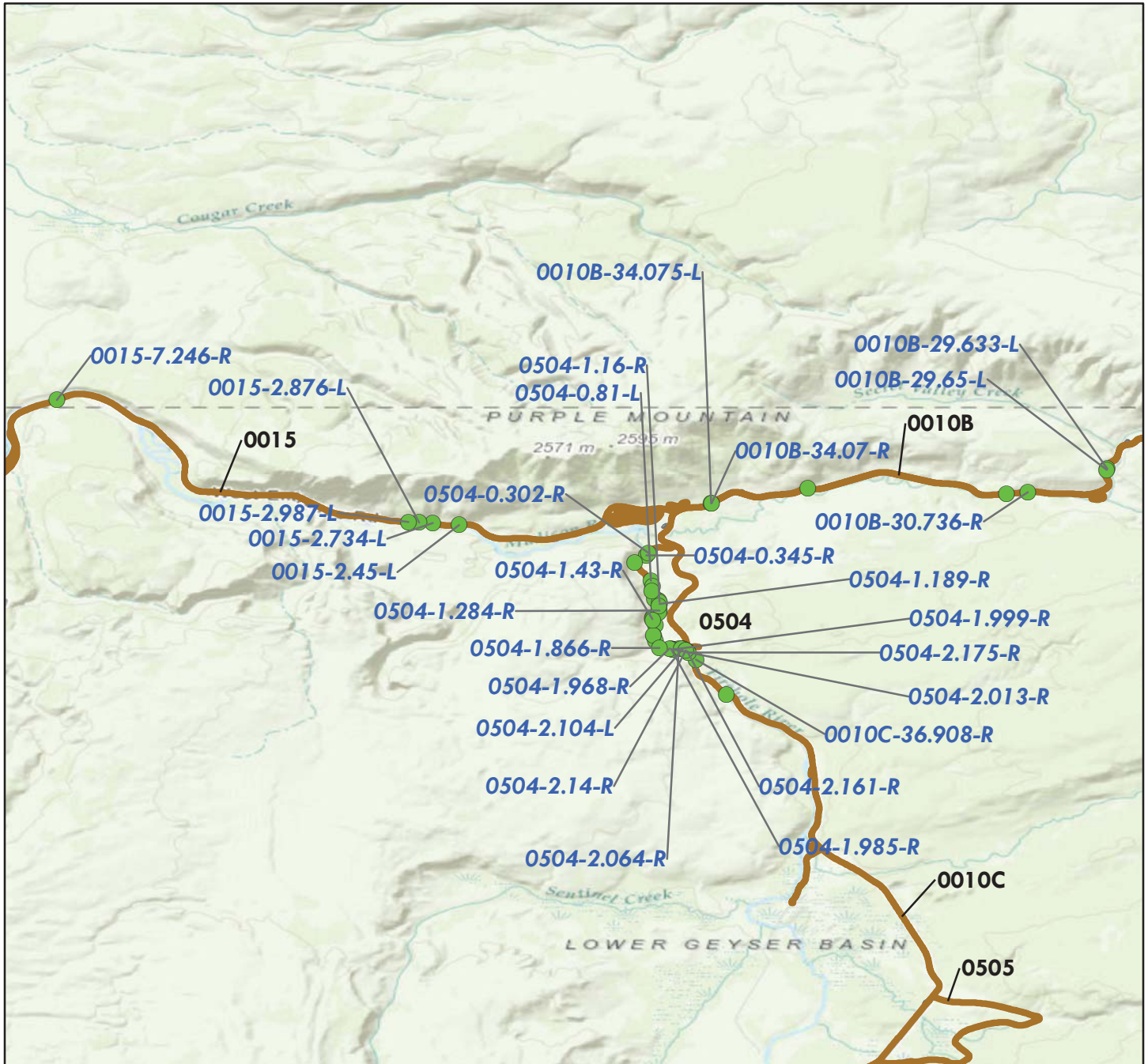
— RIP Collected Routes



# Yellowstone National Park

## WALL LOCATION MAP

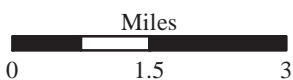
### Map 5



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

● Wall Locations (Not all labeled)

— RIP Collected Routes





# Yellowstone National Park

## WALL LOCATION MAP

### Map 6



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

● Wall Locations (Not all labeled)

— RIP Collected Routes

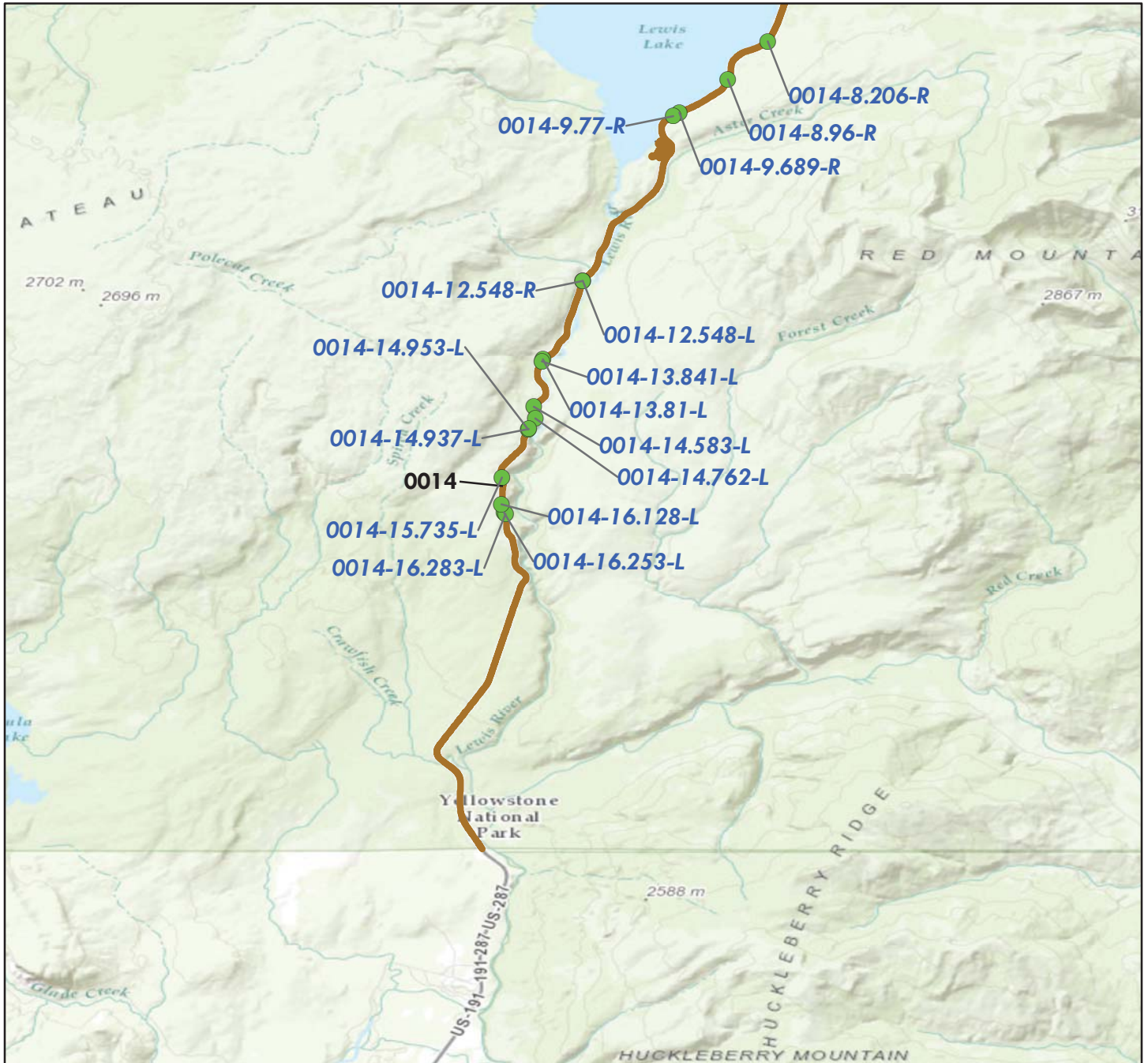




# Yellowstone National Park

## WALL LOCATION MAP

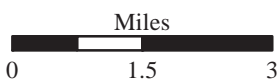
### Map 7



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

● Wall Locations

— RIP Collected Routes



# Yellowstone National Park

## WALL LOCATION MAP

Map 8



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

● Wall Locations  
— RIP Collected Routes

Miles  
0 1.5 3

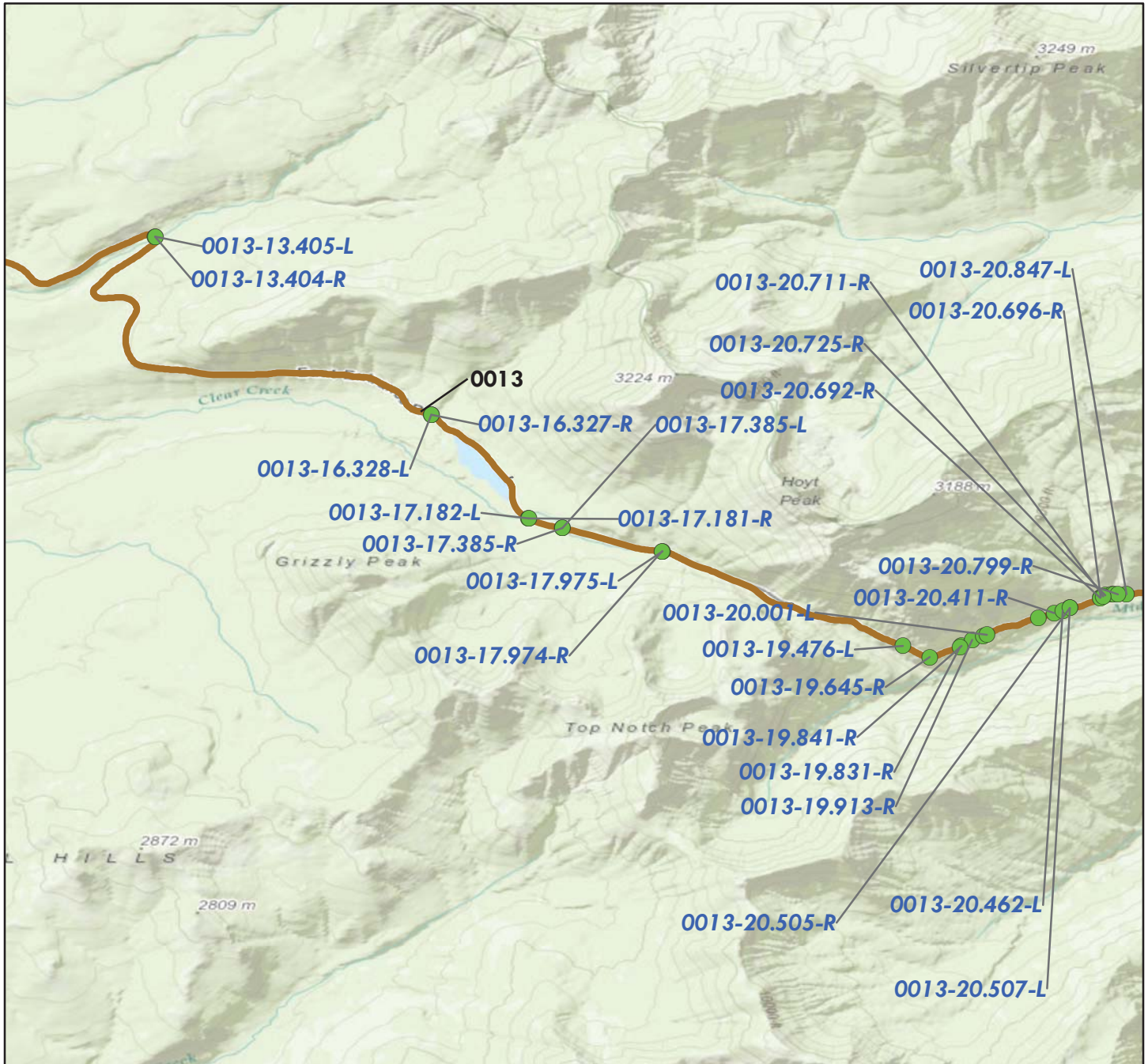




# Yellowstone National Park

## WALL LOCATION MAP

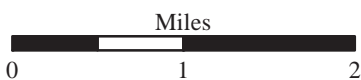
### Map 9



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

● Wall Locations (Not all labeled)

— RIP Collected Routes

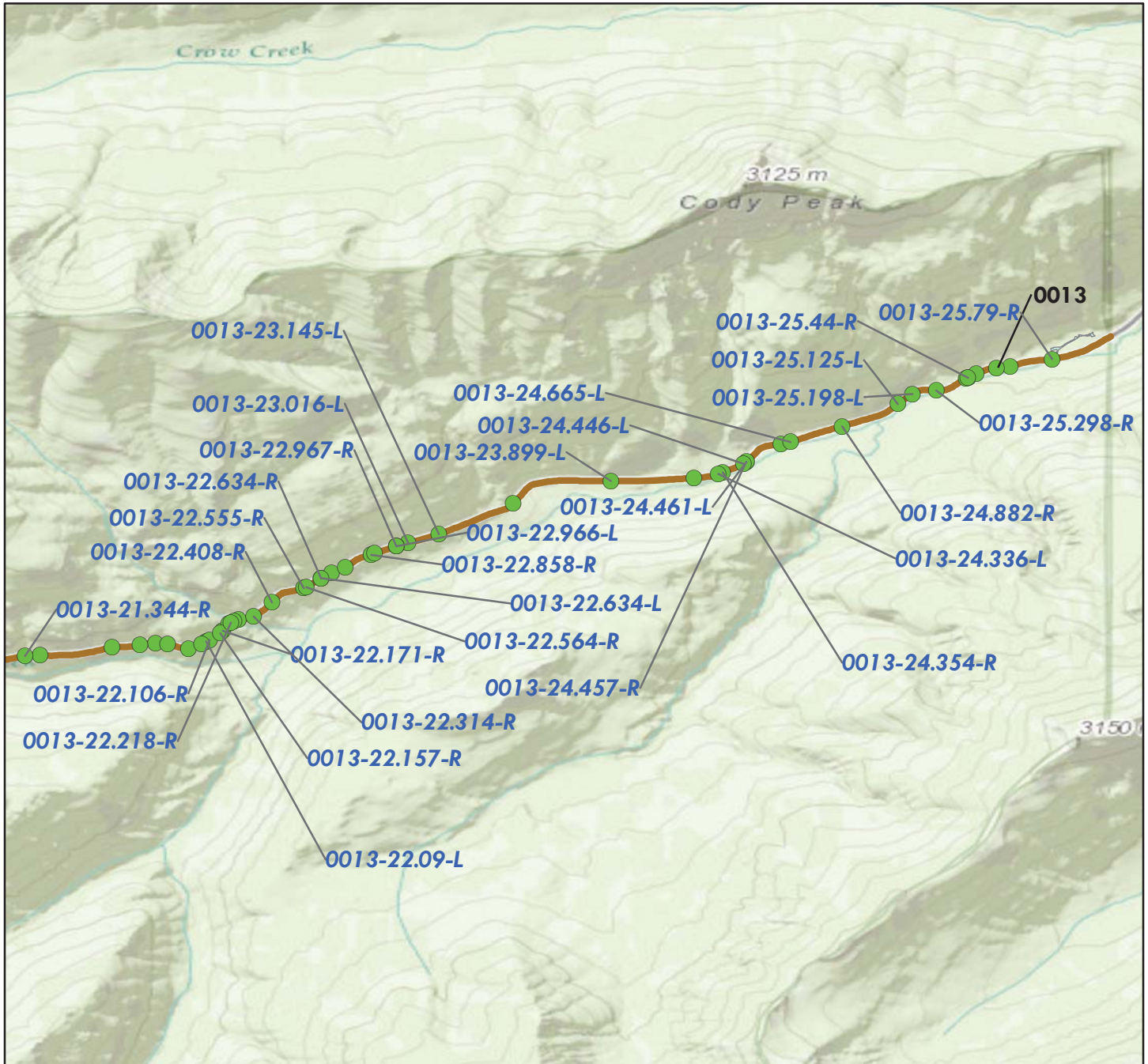




# Yellowstone National Park

## WALL LOCATION MAP

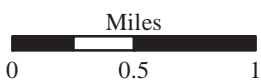
### Map 10



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

● Wall Locations (Not all labeled)

— RIP Collected Routes



# Tier 1 Park Retaining Wall Overview



**Yellowstone National Park**



**Federal Lands Highway  
Road Inventory Program**

## Parkwide Summary: Yellowstone National Park

Initial retaining wall inspections were conducted at Yellowstone National Park in 2007, and encompassed all known retaining wall structures associated with Park roadways - including structure's retaining cuts and fills, as well as qualifying headwalls at culverts. For the purposes of the assessment, walls must be a minimum of 4 feet in maximum height of retained earth and greater than 6 feet in maximum height for culvert headwalls. This does not include the height of parapet or guardwall above a retaining wall. In general, guardwall or parapets are not included in this assessment, but were inspected for Yellowstone National Park in 2009 under a separate effort as part of the Guardwall/Rail Inventory Program (GIP). A report for GIP is available under separate cover.

All paved roadways and parking areas listed in the RIP Route Identification Report were inspected for walls. Occasionally, unpaved routes not in RIP were inventoried due to their future programmatic addition at the park, which was a decision made on site specific to each park.

The following tables provide an overview of the findings of this inspection and assessment effort. In all, 266 walls were inventoried on the routes listed below.

**Table 1: Number of Walls by Route**

<b>Route Number</b>	<b>Route Name</b>	<b>No. of Walls</b>
0010A	MAMMOTH TO NORRIS ROAD	16
0010B	MADISON JUNCTION ROAD	13
0010C	MADISON TO OLD FAITHFUL ROAD	2
0010D	OLD FAITHFUL TO WEST THUMB ROAD	7
0010E	WEST THUMB TO FISHING BRIDGE ROAD	7
0010F	FISHING BRIDGE TO CANYON ROAD	15
0010G	CANYON TO TOWER ROAD	15
0010H	TOWER JUNCTION TO MAMMOTH ROAD	6
0011	NORTH ENTRANCE ROAD	5
0012	NORTHEAST ENTRANCE ROAD	3
0013	EAST ENTRANCE ROAD	87
0014	SOUTH ENTRANCE ROAD	20
0015	WEST ENTRANCE ROAD	5
0016	NORRIS CANYON ROAD	4
0018B	BEARTOOTH HIGHWAY (WYOMING STATE HIGHWAY 212)	2
0107	GULL POINT DRIVE	4
0503	NORTH RIM DRIVE	1
0504	FIREHOLE CANYON DRIVE	33



**Table 1: Number of Walls by Route**

Route Number	Route Name	No. of Walls
0509	VIRGINIA CASCADE DRIVE	18
0906G	CANYON CAMPGROUND SERVICE PARKING	1
0906L	INSPIRATION POINT PARKING	2

The following table shows the number of walls broken out by seven possible categories of basic wall function.

**Table 2: Number of Walls by Wall Function**

Wall Function	No. of Walls
BW - Bridge Wall	2
CW - Cut Wall	31
FW - Fill Wall	158
HW - Head Wall	64
SP - Slope Protection	11

The following table shows the primary wall types that were inventoried and assessed. There are 24 possible primary wall types, which are summarized in Appendix A.

**Table 3: Number of Walls by Primary Wall Type**

Primary Wall Type	No. of Walls
BM, Bin - Metal	11
CL, Cantilever - Concrete	15
CM, Crib - Metal	1
CP, Cantilever - Soldier Pile	2
CT, Crib - Timber	16
GC, Gravity - Mass Concrete	7
GD, Gravity - Dry Stone	109
GM, Gravity - Mortared Stone	87
MP, MSE - Precast Panel	1
MW, MSE - Welded Wire Face	16
SN, Soil Nail	1

The following table shows the number of walls by one of six categories of recommended action along with associated 2007 costs and the number of walls that are in each recommended action category. The majority of walls have a recommendation of *No Action* or *Monitor*; work orders were created for all other recommended actions.

**Table 4: Number of Walls by Recommended Action and Associated 2007 Cost**

<b>Recommended Action</b>	<b>2007 Repair Costs*</b>	<b>No. of Walls</b>
No Action	\$0	208
Monitor	\$0	0
Maintenance	\$11,206	17
Repair Elements	\$619,565	34
Replace Elements	\$111,290	4
Replace Wall	\$57,660	3
<b>Totals</b>	<b>\$799,721</b>	<b>266</b>

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

The following table categorizes the number of walls that fall into one of ten cost ranges, based on the prepared work orders. The locations, work descriptions, and cost of the recommended repairs for these walls are listed by individual wall in Tier 3 of this report.

**Table 5: Number of Walls Grouped by Associated 2007 Cost**

<b>Cost Range*</b>	<b>No. of Walls</b>
\$0	208
\$1 - \$25,000	50
\$25,001 - \$50,000	5
\$50,001 - \$100,000	2
\$100,001 - \$250,000	1
\$250,001 - \$500,000	0
\$500,001 - \$1,000,000	0
\$1,000,001 - \$2,000,000	0
\$2,000,001 - \$3,000,000	0
\$3,000,001 - \$4,000,000	0
<b>Total Number of Walls</b>	<b>266</b>

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



Routine inspection and performing the noted maintenance will greatly aid in the continued performance of all walls at Yellowstone National Park. Work orders for walls needing maintenance generally included items such as replacing missing stones, replacing mortar, filling voids at the top or bottom of fill walls, and clearing vegetation.

Work orders for walls needing localized element repairs generally included items such as adding riprap protection to the wall foundation, replacing missing sections of dry stone walls, replacing culverts, grouting voids in walls, and patching/restoring roadway pavement. While decaying mortar generally does not threaten wall stability in the near term, grout repair will extend the life of these walls.

Work orders for walls needing major repairs (replace elements or replace wall) generally include items such as foundation repair or replacement, fill voids, repair roadway shoulder, replace or extend retaining wall in either height or length, rebuild failed segments of walls, repair elements across 50% or more of the wall, remove and recompact backfill material, add scour protection (typically with riprap, concrete, or rock fill), and remove/reset culvert headwalls. Due to the large unit items associated with major repairs, recommendations vary by specific wall and are presented in Tier 3 of this report.

WIP identified 55 critically deficient walls nationally based on wall ratings less than 49 (poor/critical overall condition). The following table presents the walls in Yellowstone National Park that are on this list and have been elevated to the Park Regional Coordinators in a Regional Park Summary Memorandum. Generally, these are walls with major repair element recommendations that may be a priority for repair work in your park.

**Table 6: Number of Walls by Route**

<b>Wall Identification</b>	<b>Failure Consequence<sup>(1)</sup></b>	<b>Wall Rating<sup>(2)</sup></b>	<b>Recommended Action<sup>(3)</sup></b>	<b>2007 Repair Costs<sup>(4)</sup></b>
YELL-0012-21.213-R	MODERATE	42	REPAIR ELEMENTS	\$600
YELL-0504-1.430-R	MODERATE	34	REPLACE ELEMENTS	\$15,000
YELL-0504-1.985-R	HIGH	37	REPLACE ELEMENTS	\$24,000
YELL-0509-1.026-R	HIGH	30	REPLACE WALL	\$19,020

Notes: 1) Low consequence of failure and/or no recommended action may indicate repairs are not needed.

2) Wall ratings listed range from 0-49 (Poor/Critical).

3) Information was prepared for project planning purposes only. Actual repair work order scopes and actual costs will need to be evaluated based on current pay item unit prices for specific locations.

4) 2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# **Tier 2**

## **Route Retaining Wall Overview**



**Yellowstone National Park**

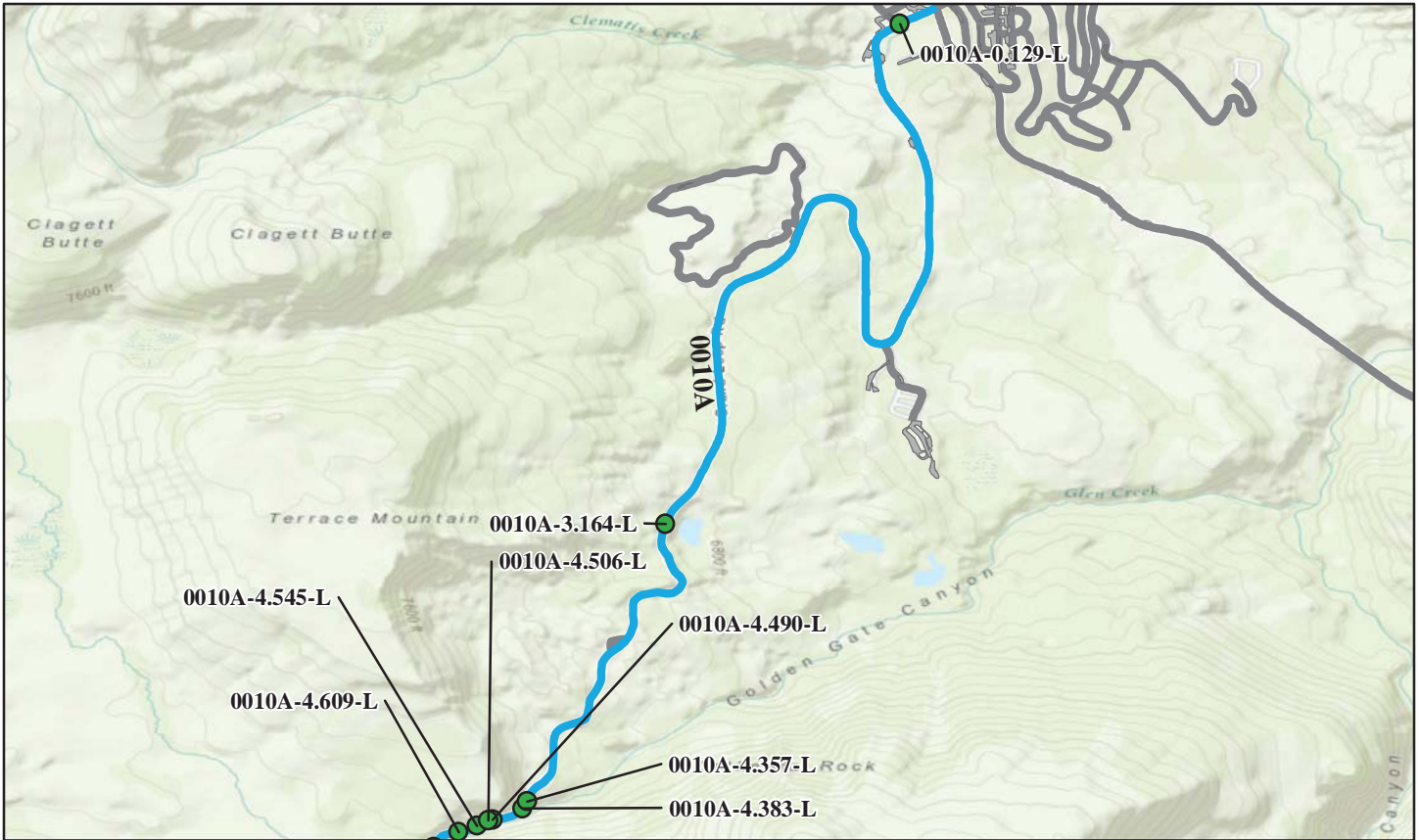


**Federal Lands Highway  
Road Inventory Program**



# Yellowstone National Park

## ROUTE 0010A: MAMMOTH TO NORRIS ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0010A-0.129-L 5/8/2007	1,109	118	Gravity - Dry Stone	Fill Wall	71	\$12,540.00
YELL-0010A-3.164-L 5/9/2007	2,332	150	Gravity - Dry Stone	Slope Protection	86	\$3,920.00
YELL-0010A-4.357-L 5/9/2007	535	127	Gravity - Mortared Stone	Fill Wall	90	\$0.00
YELL-0010A-4.383-L 5/9/2007	2,520	126	Cantilever - Concrete	Bridge Wall	100	\$0.00
YELL-0010A-4.490-L 5/9/2007	1,069	75	Cantilever - Concrete	Bridge Wall	88	\$1,030.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0010A: MAMMOTH TO NORRIS ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0010A-4.506-L 5/9/2007	473	74	Gravity - Mortared Stone	Fill Wall	90	\$0.00
YELL-0010A-4.545-L 5/9/2007	187	25	Gravity - Dry Stone	Fill Wall	77	\$16,665.00
YELL-0010A-4.609-L 5/9/2007	12,570	472	Gravity - Dry Stone	Slope Protection	72	\$0.00
YELL-0010A-4.711-L 5/9/2007	1,018	248	Gravity - Mortared Stone	Fill Wall	88	\$0.00
YELL-0010A-5.540-R 5/9/2007	119	28	Gravity - Mortared Stone	Head Wall	73	\$9,805.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0010A: MAMMOTH TO NORRIS ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

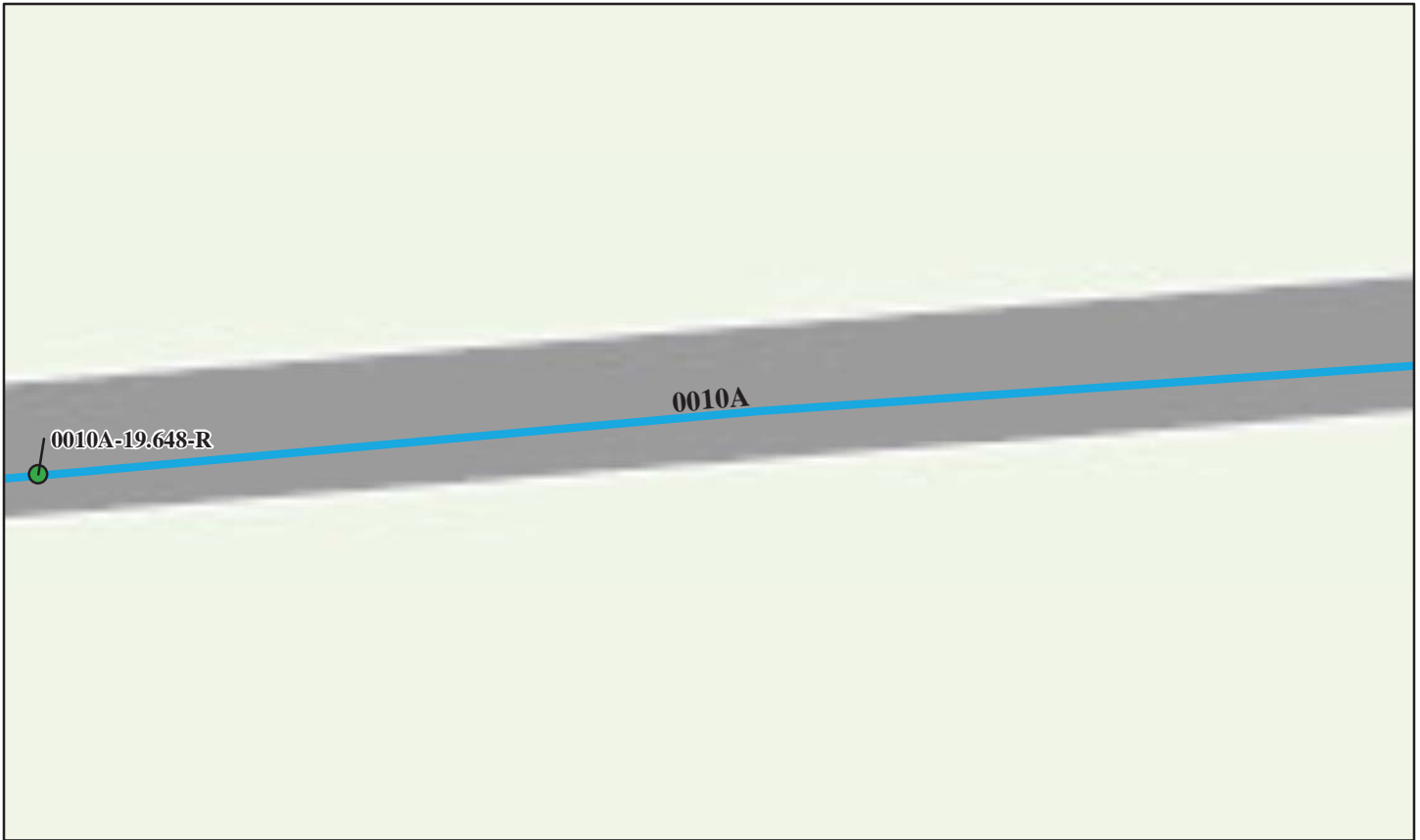
Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0010A-5.541-L 5/9/2007	94	28	Gravity - Mortared Stone	Head Wall	57	\$6,000.00
YELL-0010A-11.089-R 5/9/2007	146	31	Gravity - Mortared Stone	Head Wall	95	\$0.00
YELL-0010A-11.090-L 5/9/2007	146	31	Gravity - Mortared Stone	Head Wall	90	\$0.00
YELL-0010A-12.317-R 5/9/2007	72	19	Gravity - Mortared Stone	Head Wall	64	\$2,080.00
YELL-0010A-12.318-L 5/9/2007	171	25	Gravity - Mortared Stone	Head Wall	90	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Yellowstone National Park

## ROUTE 0010A: MAMMOTH TO NORRIS ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0010A-19.648-R 5/9/2007	704	128	Gravity - Dry Stone	Cut Wall	81	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0010B: MADISON JUNCTION ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0010B-23.550-R 5/14/2007	1,196	223	Gravity - Mortared Stone	Fill Wall	68	\$80,680.00
YELL-0010B-23.898-R 5/14/2007	1,600	270	Gravity - Dry Stone	Slope Protection	87	\$0.00
YELL-0010B-26.088-L 5/10/2007	3,396	382	Crib - Timber	Fill Wall	87	\$0.00
YELL-0010B-26.222-L 5/10/2007	1,846	142	Gravity - Dry Stone	Fill Wall	90	\$0.00
YELL-0010B-27.036-R 5/10/2007	1,148	132	Cantilever - Concrete	Fill Wall	98	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0010B: MADISON JUNCTION ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0010B-27.578-R 5/29/2007	878	121	MSE - Welded Wire Face	Fill Wall	90	\$0.00
YELL-0010B-29.633-L 5/14/2007	1,848	98	Gravity - Dry Stone	Slope Protection	87	\$1,520.00
YELL-0010B-29.650-L 5/14/2007	12,364	1,535	Gravity - Mortared Stone	Fill Wall	80	\$5,250.00
YELL-0010B-30.736-R 5/14/2007	1,919	290	Cantilever - Concrete	Cut Wall	93	\$0.00
YELL-0010B-30.947-L 5/14/2007	3,336	171	Gravity - Dry Stone	Fill Wall	76	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Yellowstone National Park

## ROUTE 0010B: MADISON JUNCTION ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0010B-33.030-R 5/14/2007	4,011	634	Cantilever - Concrete	Cut Wall	93	\$0.00
YELL-0010B-34.070-R 5/14/2007	81	23	Gravity - Mortared Stone	Head Wall	88	\$0.00
YELL-0010B-34.075-L 5/14/2007	85	24	Gravity - Mortared Stone	Head Wall	88	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0010C: MADISON TO OLD FAITHFUL ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0010C-36.908-R 5/15/2007	1,024	261	Gravity - Mortared Stone	Fill Wall	77	\$440.00
YELL-0010C-37.526-R 5/15/2007	3,043	667	Gravity - Dry Stone	Fill Wall	80	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0010D: OLD FAITHFUL TO WEST THUMB ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0010D-53.627-R 5/16/2007	4,108	187	Gravity - Dry Stone	Fill Wall	90	\$2,080.00
YELL-0010D-57.708-R 5/16/2007	624	156	Gravity - Mass Concrete	Fill Wall	90	\$0.00
YELL-0010D-57.770-R 5/16/2007	3,150	479	Gravity - Dry Stone	Fill Wall	80	\$55.00
YELL-0010D-57.933-R 5/16/2007	902	265	Gravity - Mortared Stone	Cut Wall	83	\$0.00
YELL-0010D-59.057-R 5/16/2007	585	78	Cantilever - Concrete	Fill Wall	89	\$880.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Yellowstone National Park

## ROUTE 0010D: OLD FAITHFUL TO WEST THUMB ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0010D-59.264-R 5/16/2007	1,965	221	Gravity - Mass Concrete	Fill Wall	85	\$0.00
YELL-0010D-60.362-L 5/16/2007	1,369	146	MSE - Precast Panel	Fill Wall	94	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0010E: WEST THUMB TO FISHING BRIDGE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

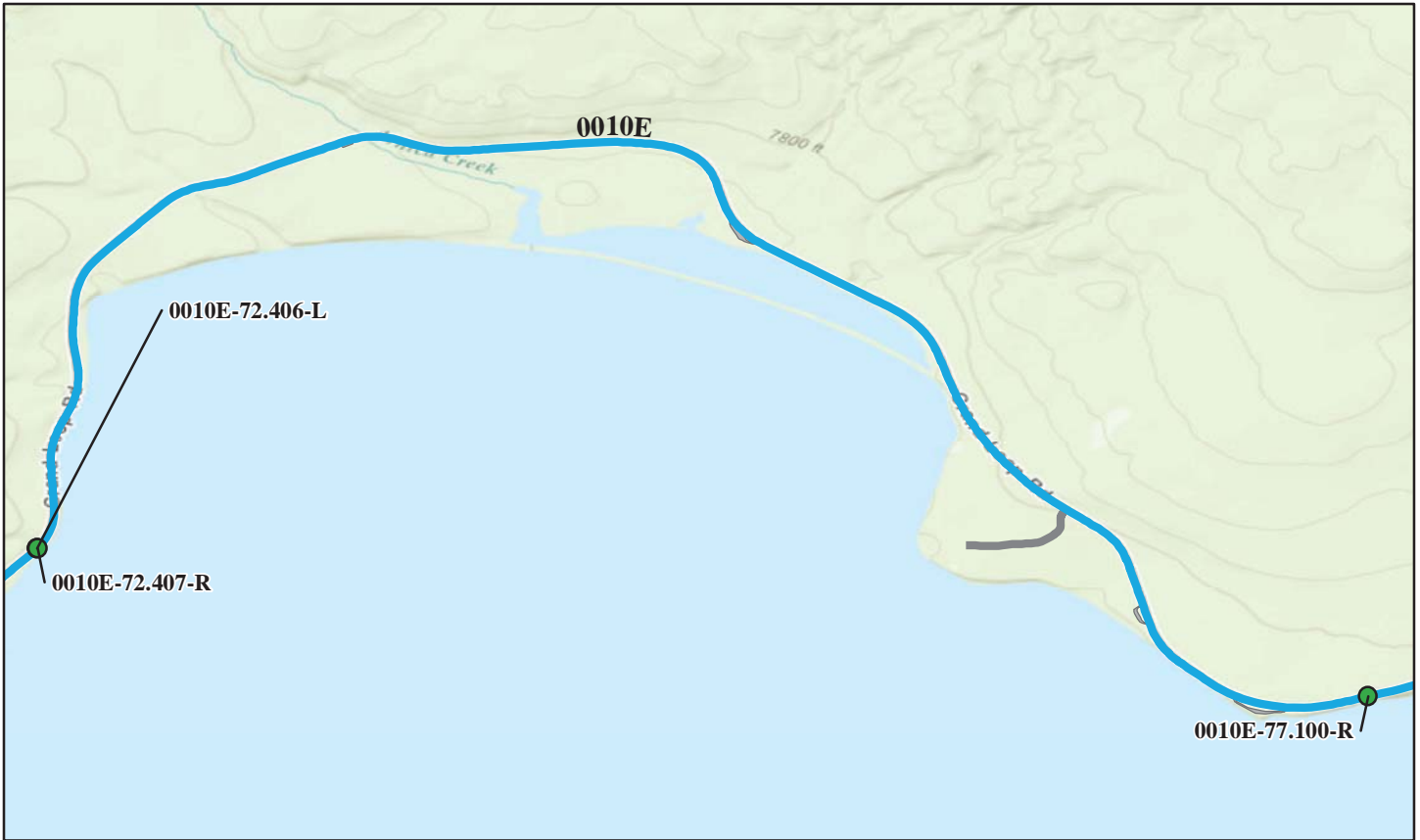
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0010E-70.642-R 5/16/2007	218	36	Gravity - Mortared Stone	Head Wall	83	\$0.00
YELL-0010E-70.643-L 5/10/2007	210	40	Gravity - Mortared Stone	Head Wall	90	\$0.00
YELL-0010E-71.484-R 5/16/2007	3,438	204	Gravity - Dry Stone	Fill Wall	90	\$0.00
YELL-0010E-71.707-R 5/16/2007	2,013	183	Gravity - Dry Stone	Fill Wall	80	\$0.00
YELL-0010E-72.406-L 5/16/2007	182	36	Gravity - Mortared Stone	Head Wall	90	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0010E: WEST THUMB TO FISHING BRIDGE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

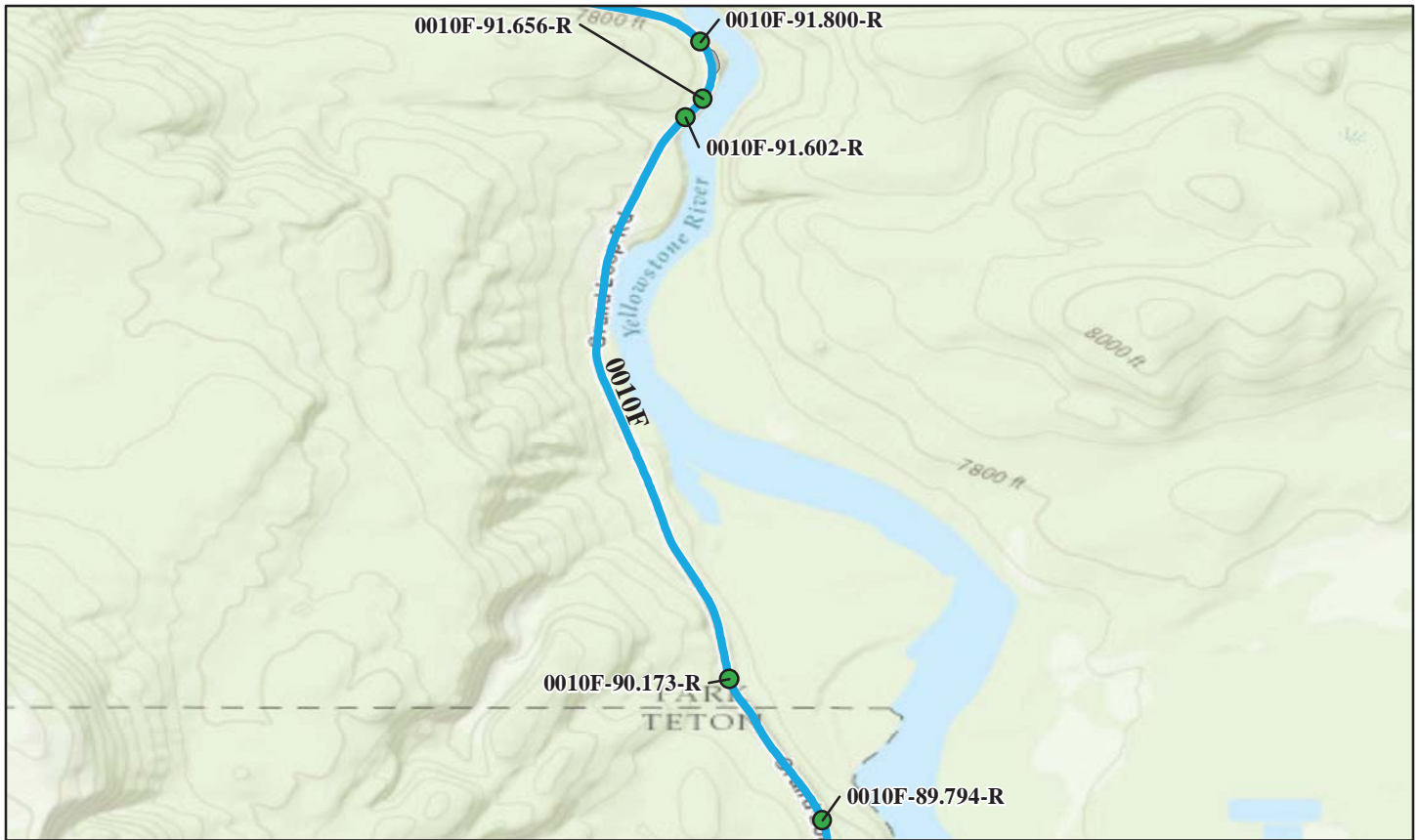
Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0010E-72.407-R 5/16/2007	182	36	Gravity - Mortared Stone	Head Wall	80	\$0.00
YELL-0010E-77.100-R 5/16/2007	3,890	150	Gravity - Dry Stone	Slope Protection	89	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Yellowstone National Park

## ROUTE 0010F: FISHING BRIDGE TO CANYON ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0010F-89.794-R 5/17/2007	3,024	125	Gravity - Dry Stone	Fill Wall	84	\$0.00
YELL-0010F-90.173-R 5/11/2007	4,892	294	Gravity - Dry Stone	Fill Wall	90	\$0.00
YELL-0010F-91.602-R 5/11/2007	1,529	88	Gravity - Dry Stone	Fill Wall	87	\$0.00
YELL-0010F-91.656-R 5/11/2007	3,453	178	Gravity - Dry Stone	Fill Wall	97	\$0.00
YELL-0010F-91.800-R 5/11/2007	1,778	275	Gravity - Dry Stone	Fill Wall	90	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0010F: FISHING BRIDGE TO CANYON ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

**Critical / Poor (0 - 49)**

**Fair (50 - 69)**

**Good to Excellent (70 - 100)**

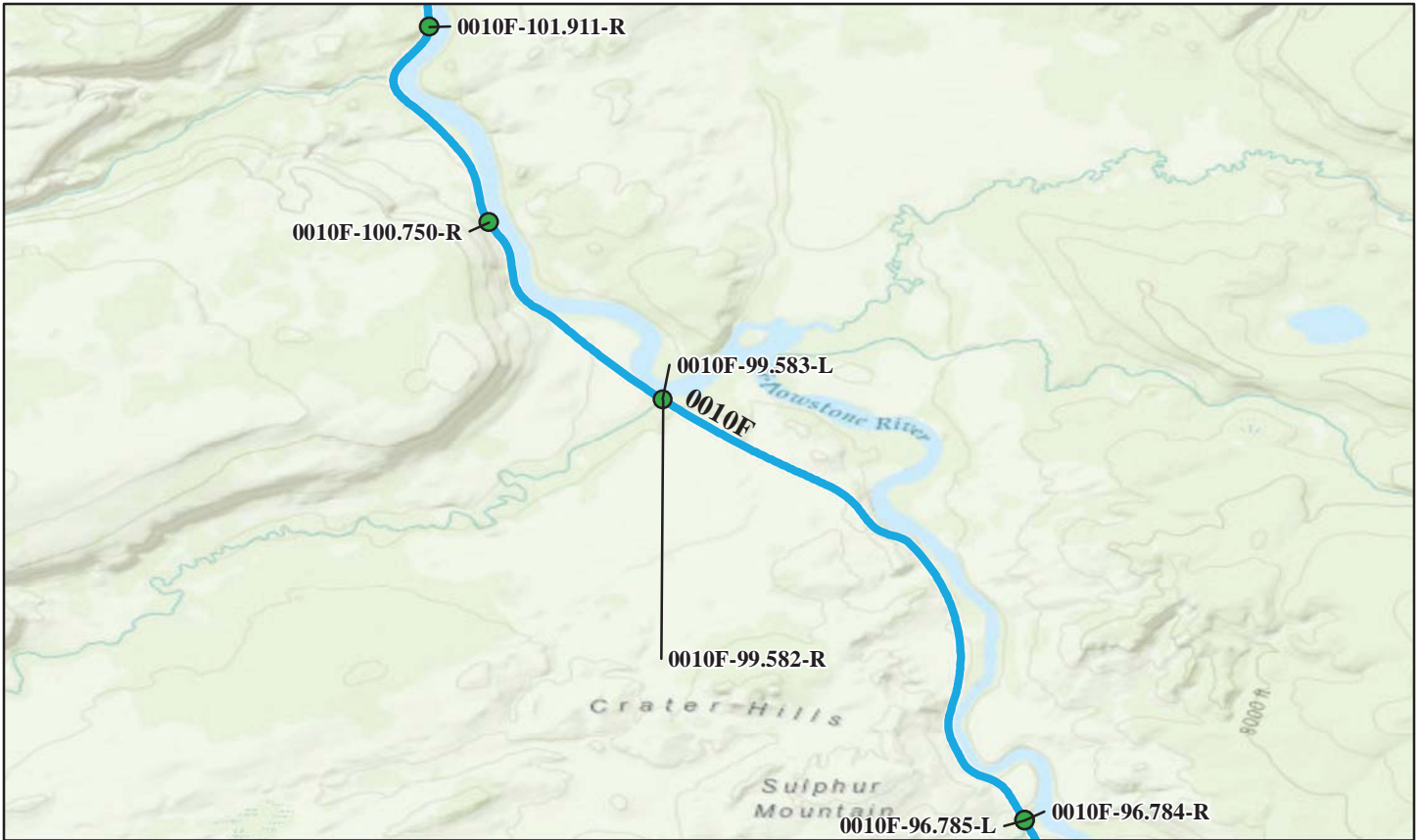
**No Data**

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0010F-93.140-R 5/11/2007	2,845	170	Gravity - Dry Stone	Fill Wall	87	\$0.00
YELL-0010F-94.872-R 5/11/2007	4,145	381	Gravity - Mortared Stone	Fill Wall	88	\$0.00
YELL-0010F-96.363-R 5/11/2007	320	46	Gravity - Mortared Stone	Head Wall	78	\$440.00
YELL-0010F-96.365-L 5/11/2007	376	58	Gravity - Mortared Stone	Head Wall	78	\$440.00
YELL-0010F-96.784-R 5/11/2007	272	50	Gravity - Mortared Stone	Head Wall	85	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0010F: FISHING BRIDGE TO CANYON ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0010F-96.785-L 5/11/2007	297	56	Gravity - Mortared Stone	Head Wall	76	\$440.00
YELL-0010F-99.582-R 5/11/2007	232	46	Gravity - Mortared Stone	Head Wall	83	\$440.00
YELL-0010F-99.583-L 5/11/2007	297	56	Gravity - Mortared Stone	Head Wall	59	\$32,440.00
YELL-0010F-100.750-R 5/11/2007	811	91	Gravity - Dry Stone	Fill Wall	90	\$0.00
YELL-0010F-101.911-R 5/11/2007	640	80	Gravity - Dry Stone	Fill Wall	87	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Yellowstone National Park

## ROUTE 0010G: CANYON TO TOWER ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

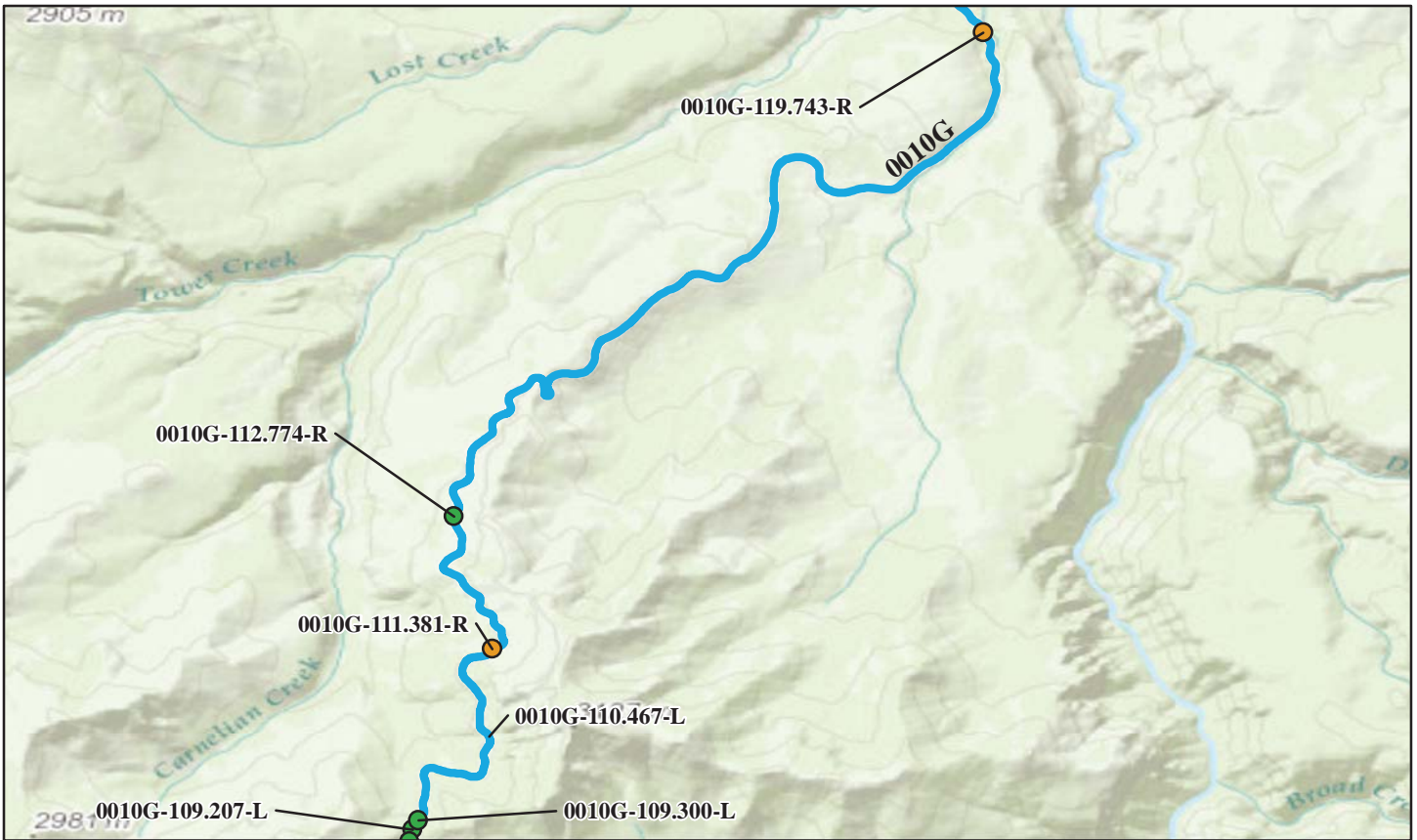
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0010G-107.624-L 5/17/2007	165	30	Gravity - Dry Stone	Cut Wall	66	\$0.00
YELL-0010G-107.652-L 5/17/2007	350	54	Gravity - Dry Stone	Cut Wall	81	\$0.00
YELL-0010G-108.281-R 5/17/2007	580	107	Gravity - Dry Stone	Fill Wall	70	\$0.00
YELL-0010G-109.098-L 5/18/2007	850	118	Gravity - Dry Stone	Cut Wall	80	\$0.00
YELL-0010G-109.207-L 5/18/2007	1,500	147	Gravity - Dry Stone	Cut Wall	71	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0010G: CANYON TO TOWER ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0010G-109.300-L 5/18/2007	650	130	Gravity - Dry Stone	Fill Wall	80	\$0.00
YELL-0010G-110.467-L 5/18/2007	475	113	Gravity - Dry Stone	Fill Wall	58	\$0.00
YELL-0010G-111.381-R 5/18/2007	650	103	Gravity - Dry Stone	Cut Wall	68	\$0.00
YELL-0010G-112.774-R 5/17/2007	420	105	Gravity - Dry Stone	Cut Wall	81	\$0.00
YELL-0010G-119.743-R 5/17/2007	3,000	333	Gravity - Dry Stone	Fill Wall	65	\$5,000.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0010G: CANYON TO TOWER ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

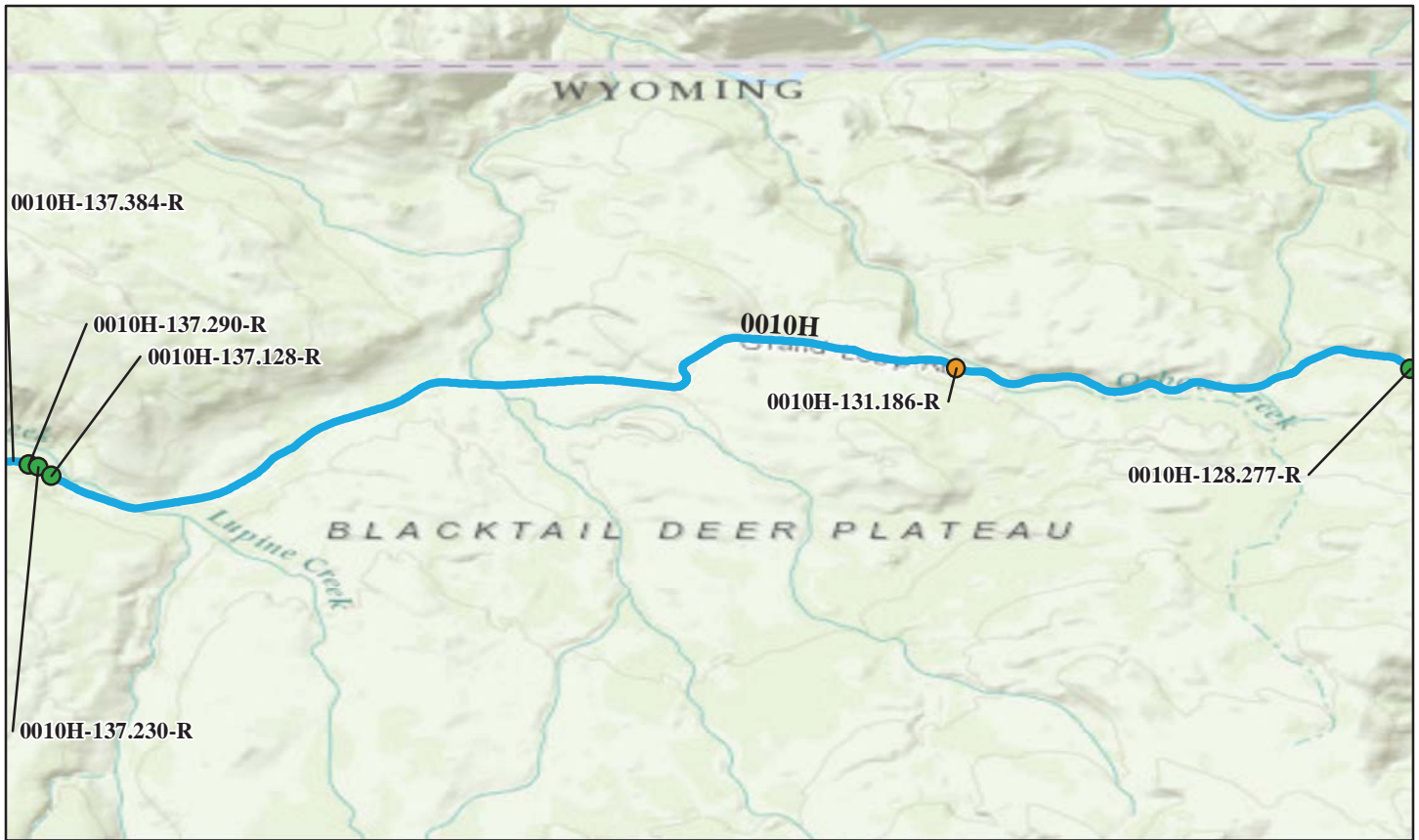
Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0010G-120.405-L 5/17/2007	1,240	103	Gravity - Mortared Stone	Head Wall	77	\$370.00
YELL-0010G-120.405-R 5/17/2007	1,150	96	Gravity - Mortared Stone	Head Wall	75	\$0.00
YELL-0010G-120.424-R 5/17/2007	10,000	410	Gravity - Dry Stone	Fill Wall	52	\$30,000.00
YELL-0010G-120.542-R 5/17/2007	3,000	125	Gravity - Dry Stone	Fill Wall	69	\$310.00
YELL-0010G-120.816-R 5/17/2007	8,400	1,400	Gravity - Mortared Stone	Fill Wall	58	\$165.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Yellowstone National Park

## ROUTE 0010H: TOWER JUNCTION TO MAMMOTH ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

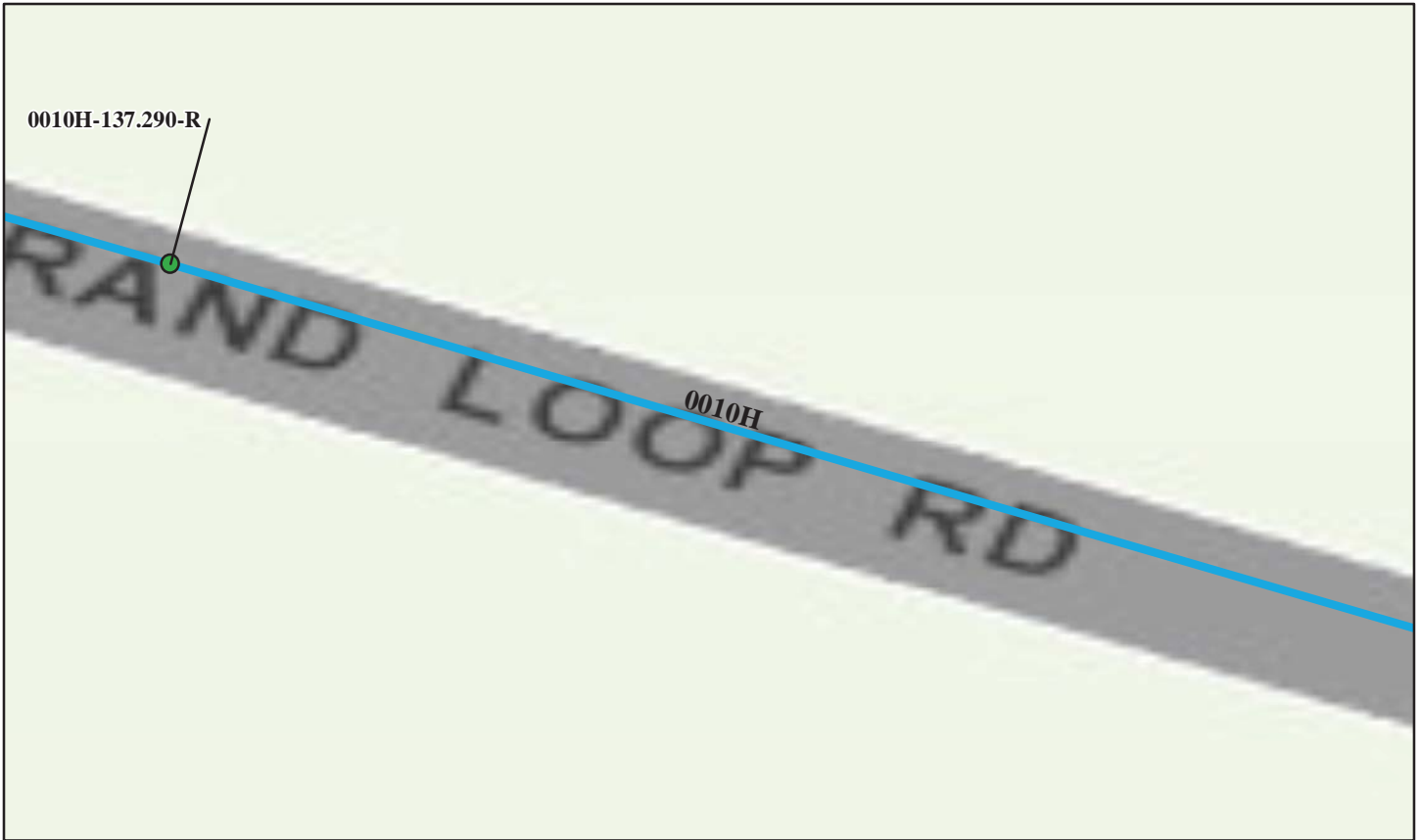
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0010H-128.277-R 5/15/2007	3,400	854	Gravity - Mortared Stone	Fill Wall	70	\$220.00
YELL-0010H-131.186-R 5/15/2007	500	166	Gravity - Mortared Stone	Fill Wall	69	\$420.00
YELL-0010H-137.128-R 5/15/2007	8,000	186	Gravity - Dry Stone	Fill Wall	74	\$0.00
YELL-0010H-137.230-R 5/15/2007	1,800	139	Gravity - Dry Stone	Fill Wall	80	\$0.00
YELL-0010H-137.290-R 5/15/2007	3,500	230	Gravity - Dry Stone	Fill Wall	76	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0010H: TOWER JUNCTION TO MAMMOTH ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

**Critical / Poor (0 - 49)**

**Fair (50 - 69)**

**Good to Excellent (70 - 100)**

**No Data**

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0010H-137.384-R 5/15/2007	600	100	Gravity - Mortared Stone	Fill Wall	62	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0011: NORTH ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0011-3.186-L 5/8/2007	1,700	170	Gravity - Mass Concrete	Fill Wall	83	\$0.00
YELL-0011-3.655-L 5/8/2007	1,116	120	Gravity - Dry Stone	Cut Wall	61	\$15,620.00
YELL-0011-3.678-L 5/8/2007	3,133	295	Bin - Metal	Cut Wall	85	\$2,521.00
YELL-0011-3.685-R 5/8/2007	5,536	414	Gravity - Dry Stone	Slope Protection	86	\$0.00
YELL-0011-5.261-L 5/8/2007	3,460	570	Gravity - Mortared Stone	Cut Wall	87	\$26,250.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Yellowstone National Park

## ROUTE 0012: NORTHEAST ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0012-8.086-R 5/16/2007	3,000	140	Gravity - Dry Stone	Fill Wall	78	\$0.00
YELL-0012-18.661-R 5/16/2007	2,000	230	Gravity - Dry Stone	Fill Wall	70	\$0.00
YELL-0012-21.213-R 5/16/2007	1,200	94	Gravity - Dry Stone	Fill Wall	42	\$600.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0013: EAST ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

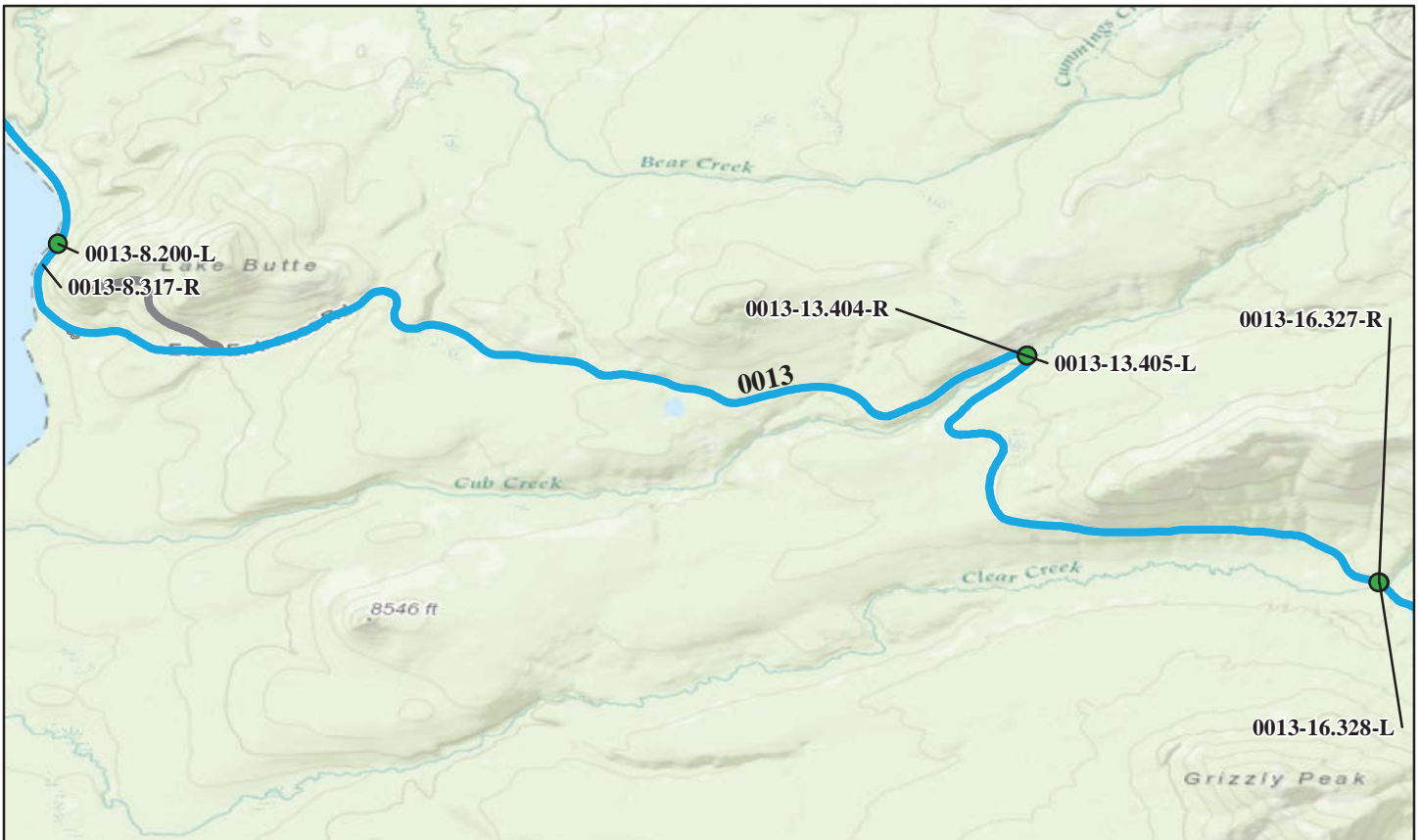
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0013-5.840-R 5/17/2007	7,677	1,036	MSE - Welded Wire Face	Fill Wall	100	\$0.00
YELL-0013-6.063-L 5/17/2007	4,944	1,346	Cantilever - Concrete	Cut Wall	93	\$0.00
YELL-0013-6.478-L 5/17/2007	1,110	252	Cantilever - Concrete	Cut Wall	90	\$0.00
YELL-0013-6.688-R 5/17/2007	400	80	Crib - Timber	Fill Wall	54	\$3,040.00
YELL-0013-8.200-L 5/17/2007	5,152	349	Soil Nail	Cut Wall	98	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0013: EAST ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

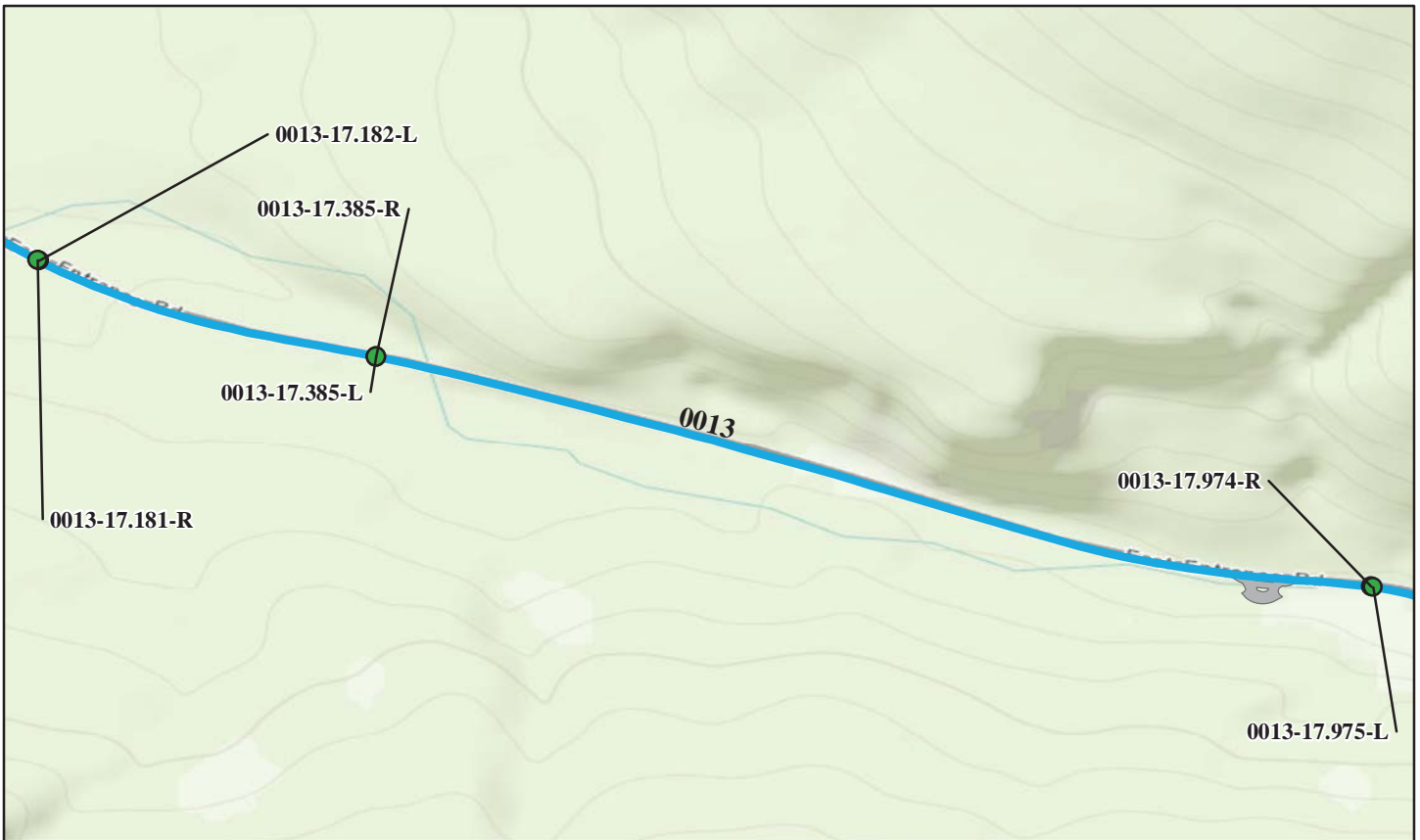
Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0013-8.317-R 5/17/2007	4,788	228	Gravity - Dry Stone	Fill Wall	58	\$225,000.00
YELL-0013-13.404-R 5/17/2007	453	56	Gravity - Mortared Stone	Head Wall	87	\$0.00
YELL-0013-13.405-L 5/17/2007	453	56	Gravity - Mortared Stone	Head Wall	85	\$0.00
YELL-0013-16.327-R 5/17/2007	121	31	Gravity - Mortared Stone	Head Wall	88	\$0.00
YELL-0013-16.328-L 5/16/2007	121	31	Gravity - Mortared Stone	Head Wall	90	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Yellowstone National Park

## ROUTE 0013: EAST ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

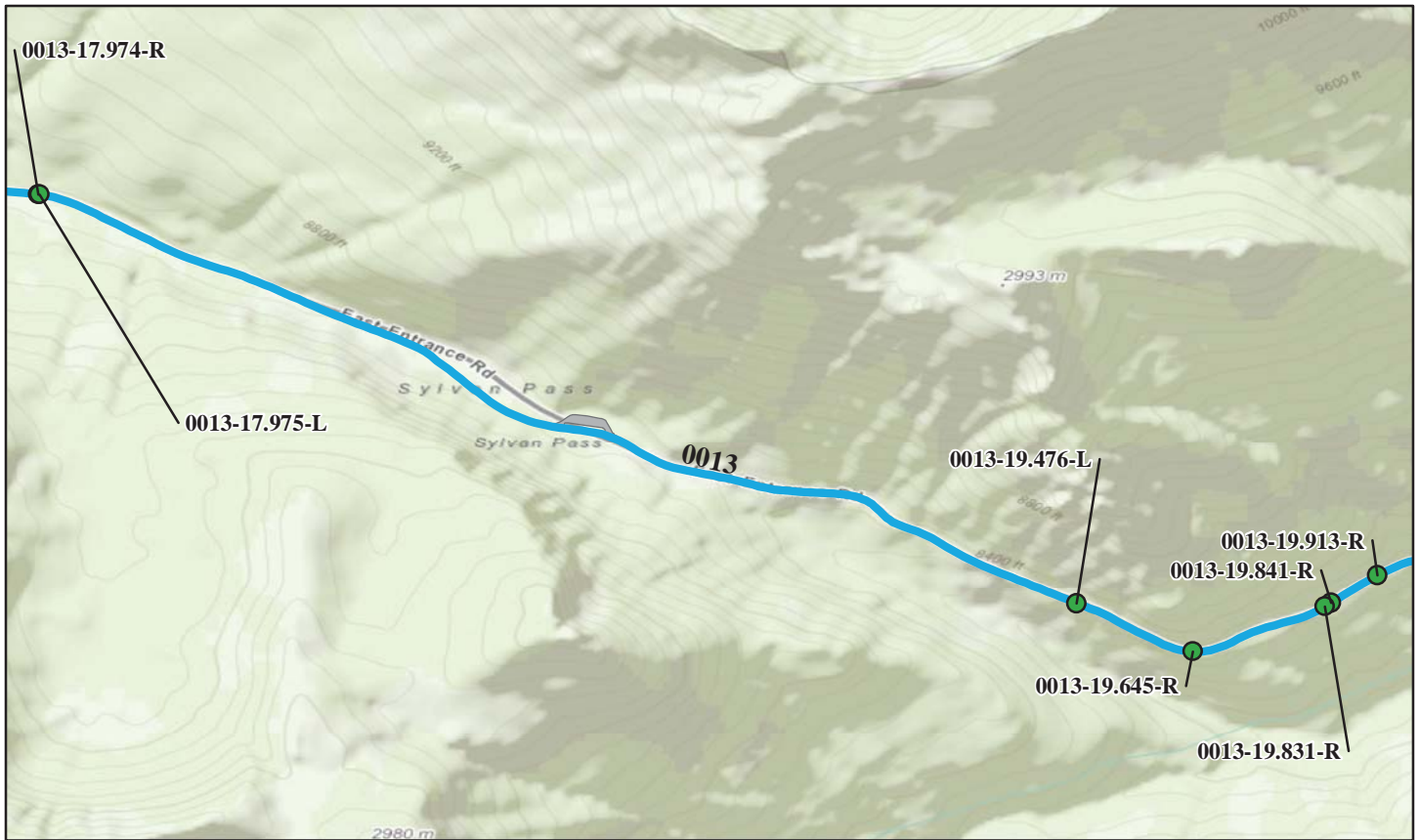
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0013-17.181-R 5/17/2007	71	24	Gravity - Mortared Stone	Head Wall	80	\$0.00
YELL-0013-17.182-L 5/17/2007	57	24	Gravity - Mortared Stone	Head Wall	90	\$0.00
YELL-0013-17.385-L 5/17/2007	64	19	Gravity - Mortared Stone	Head Wall	90	\$0.00
YELL-0013-17.385-R 5/17/2007	63	21	Gravity - Mortared Stone	Head Wall	78	\$0.00
YELL-0013-17.974-R 5/17/2007	96	26	Gravity - Mortared Stone	Head Wall	80	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0013: EAST ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0013-17.975-L 5/17/2007	115	26	Gravity - Mortared Stone	Head Wall	88	\$0.00
YELL-0013-19.476-L 5/17/2007	1,817	176	Gravity - Dry Stone	Cut Wall	100	\$0.00
YELL-0013-19.645-R 5/17/2007	18,791	911	MSE - Welded Wire Face	Fill Wall	95	\$0.00
YELL-0013-19.831-R 5/17/2007	833	64	Gravity - Mortared Stone	Fill Wall	73	\$0.00
YELL-0013-19.841-R 5/17/2007	4,506	395	Gravity - Mortared Stone	Fill Wall	71	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0013: EAST ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

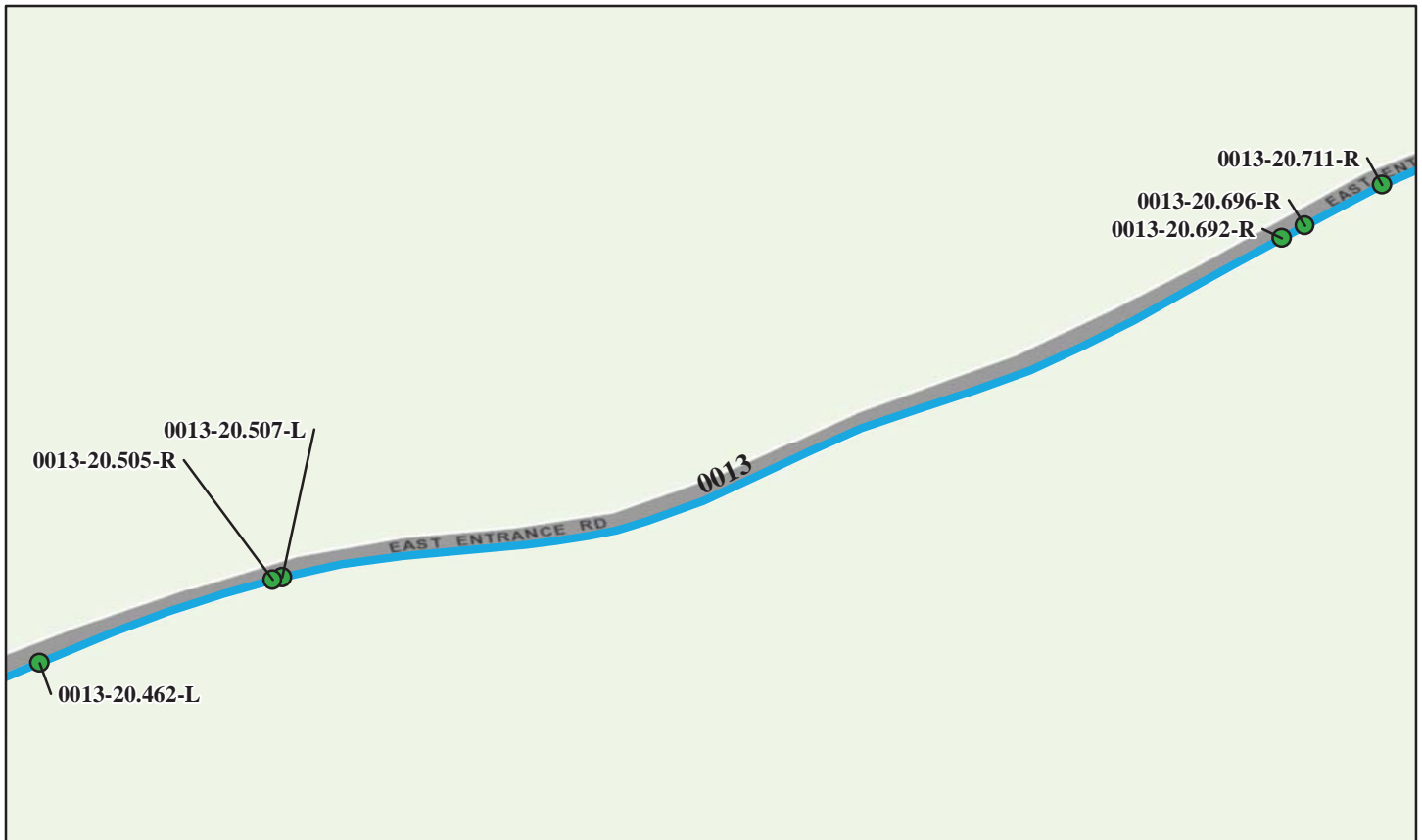
Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0013-19.913-R 5/17/2007	295	72	Bin - Metal	Fill Wall	71	\$0.00
YELL-0013-19.979-L 5/17/2007	6,698	551	Gravity - Dry Stone	Cut Wall	100	\$0.00
YELL-0013-20.001-L 5/17/2007	38	8	Gravity - Mortared Stone	Head Wall	97	\$0.00
YELL-0013-20.317-L 5/17/2007	2,108	162	Cantilever - Soldier Pile	Cut Wall	99	\$0.00
YELL-0013-20.411-R 5/17/2007	2,519	213	Gravity - Dry Stone	Fill Wall	74	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Yellowstone National Park

## ROUTE 0013: EAST ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

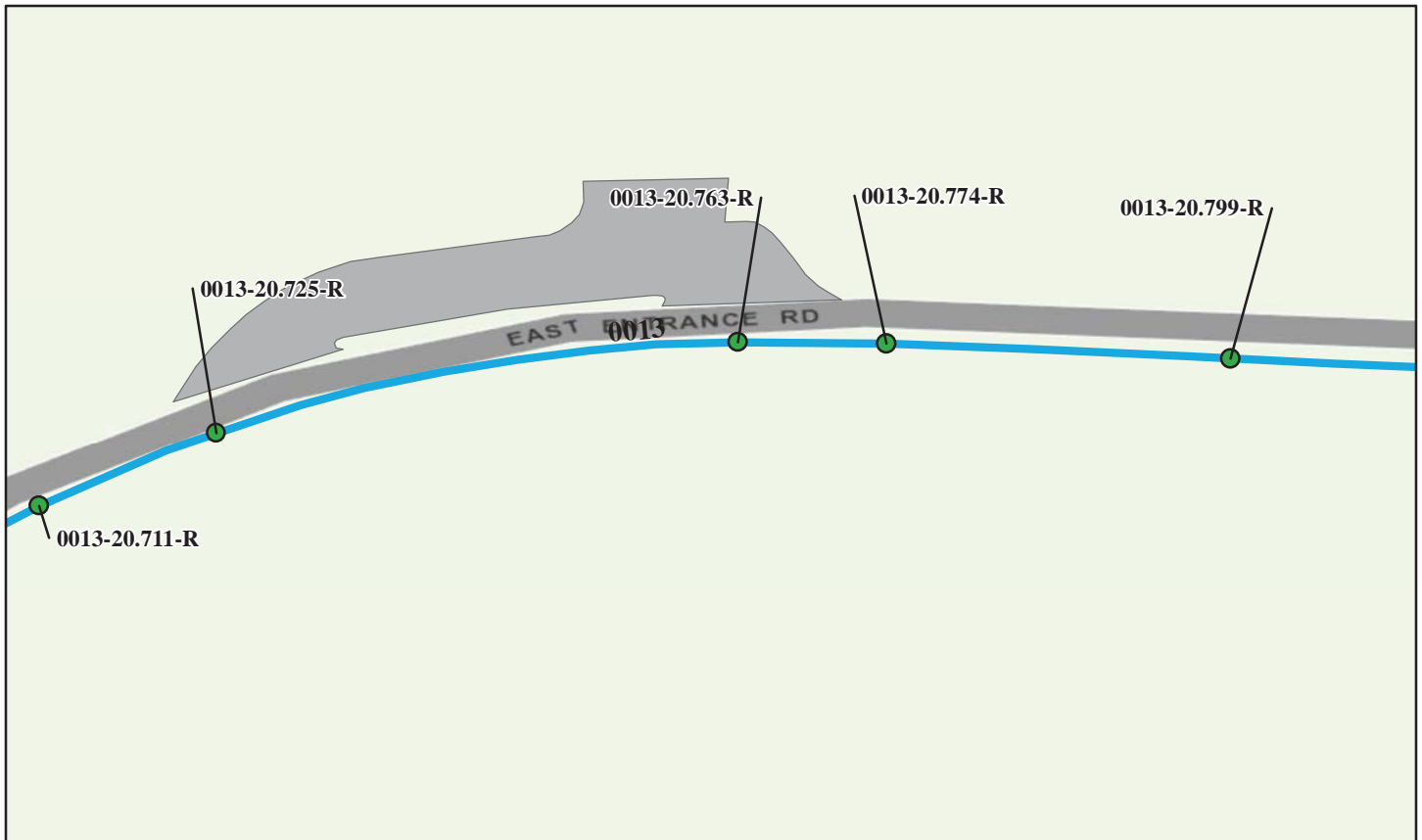
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0013-20.462-L 5/17/2007	4,001	327	Gravity - Dry Stone	Cut Wall	99	\$0.00
YELL-0013-20.505-R 5/17/2007	59	12	Gravity - Mortared Stone	Head Wall	97	\$0.00
YELL-0013-20.507-L 5/17/2007	59	12	Gravity - Mortared Stone	Head Wall	97	\$0.00
YELL-0013-20.692-R 5/17/2007	180	20	Bin - Metal	Fill Wall	83	\$0.00
YELL-0013-20.696-R 5/17/2007	781	81	Gravity - Mortared Stone	Fill Wall	80	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0013: EAST ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0013-20.711-R 5/17/2007	220	40	Bin - Metal	Fill Wall	77	\$0.00
YELL-0013-20.725-R 5/17/2007	365	80	Bin - Metal	Fill Wall	84	\$0.00
YELL-0013-20.763-R 5/17/2007	188	45	Bin - Metal	Fill Wall	77	\$0.00
YELL-0013-20.774-R 5/17/2007	480	40	Gravity - Mortared Stone	Fill Wall	83	\$0.00
YELL-0013-20.799-R 5/17/2007	563	56	Gravity - Mortared Stone	Fill Wall	80	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0013: EAST ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0013-20.847-L 5/17/2007	1,472	134	Gravity - Dry Stone	Cut Wall	96	\$0.00
YELL-0013-21.344-R 5/22/2007	1,454	90	Gravity - Dry Stone	Fill Wall	80	\$0.00
YELL-0013-21.407-R 5/22/2007	1,511	202	MSE - Welded Wire Face	Fill Wall	98	\$0.00
YELL-0013-21.699-R 5/22/2007	2,565	472	MSE - Welded Wire Face	Fill Wall	99	\$0.00
YELL-0013-21.812-R 5/22/2007	709	109	MSE - Welded Wire Face	Fill Wall	98	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Yellowstone National Park

## ROUTE 0013: EAST ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

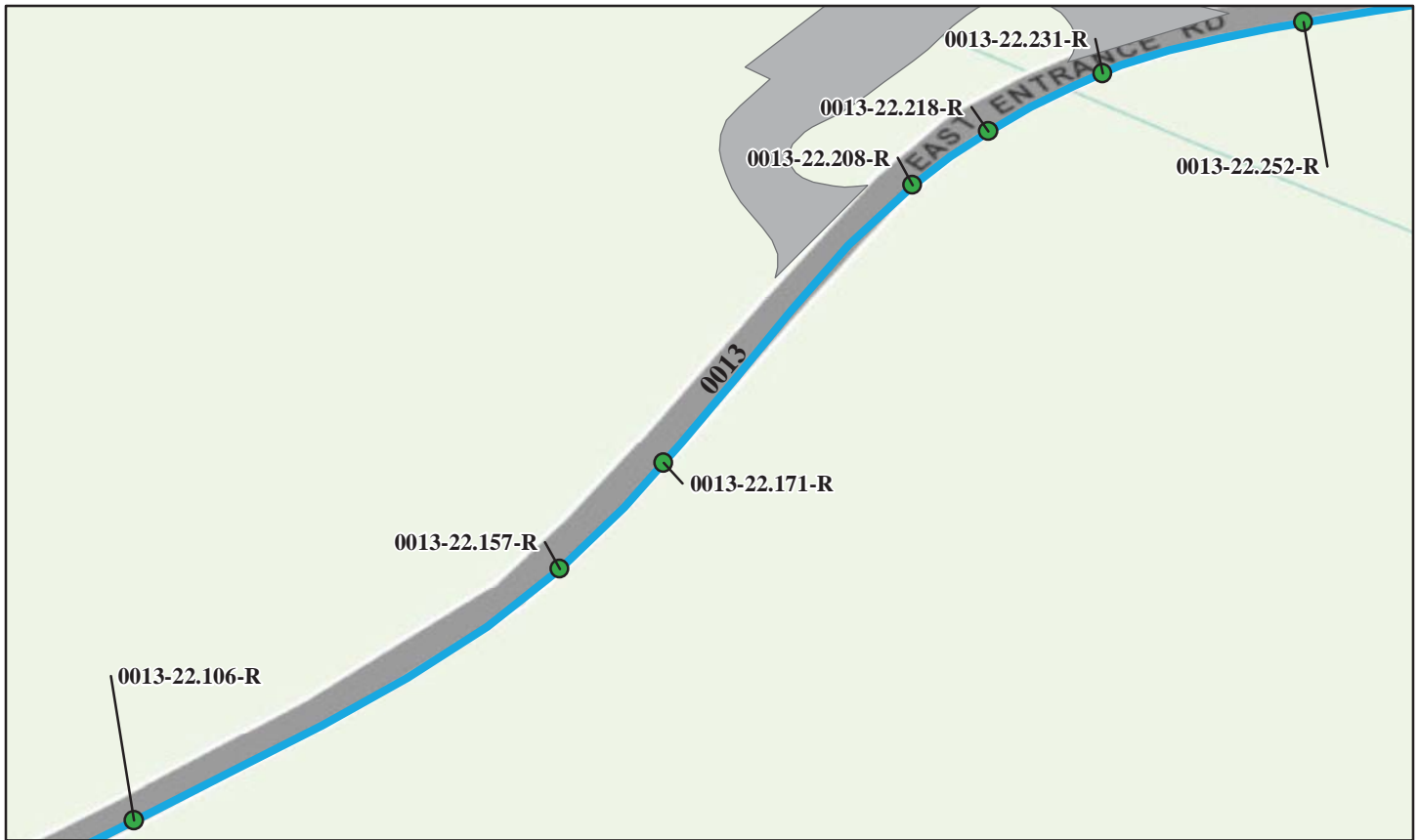
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0013-21.876-R 5/22/2007	555	98	Bin - Metal	Fill Wall	80	\$0.00
YELL-0013-21.926-L 5/22/2007	4,506	373	Cantilever - Soldier Pile	Cut Wall	100	\$0.00
YELL-0013-22.012-R 5/22/2007	358	65	MSE - Welded Wire Face	Fill Wall	98	\$0.00
YELL-0013-22.070-L 5/22/2007	1,272	53	Gravity - Dry Stone	Cut Wall	96	\$0.00
YELL-0013-22.090-L 5/22/2007	2,398	141	Gravity - Dry Stone	Cut Wall	96	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0013: EAST ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0013-22.106-R 5/22/2007	828	188	MSE - Welded Wire Face	Fill Wall	98	\$0.00
YELL-0013-22.157-R 5/22/2007	268	45	MSE - Welded Wire Face	Fill Wall	98	\$0.00
YELL-0013-22.171-R 5/22/2007	145	30	Bin - Metal	Fill Wall	78	\$0.00
YELL-0013-22.208-R 5/22/2007	193	55	MSE - Welded Wire Face	Fill Wall	100	\$0.00
YELL-0013-22.218-R 5/22/2007	701	197	Bin - Metal	Fill Wall	81	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0013: EAST ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

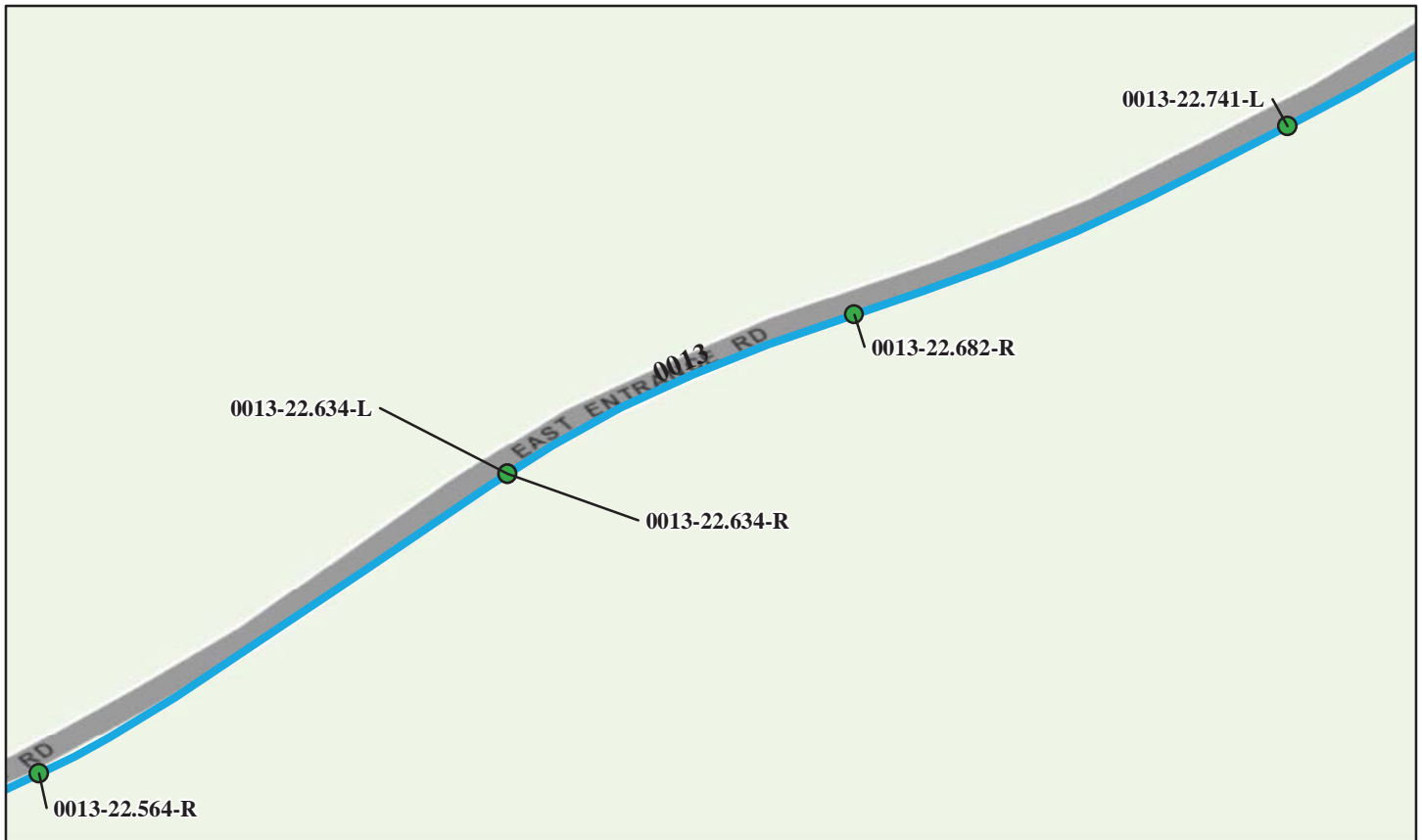
Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0013-22.231-R 5/22/2007	435	87	Bin - Metal	Fill Wall	81	\$0.00
YELL-0013-22.252-R 5/22/2007	1,380	153	MSE - Welded Wire Face	Fill Wall	97	\$0.00
YELL-0013-22.314-R 5/22/2007	2,330	185	MSE - Welded Wire Face	Fill Wall	95	\$0.00
YELL-0013-22.408-R 5/22/2007	1,524	148	MSE - Welded Wire Face	Fill Wall	97	\$0.00
YELL-0013-22.555-R 5/22/2007	300	30	Crib - Metal	Fill Wall	90	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Yellowstone National Park

## ROUTE 0013: EAST ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

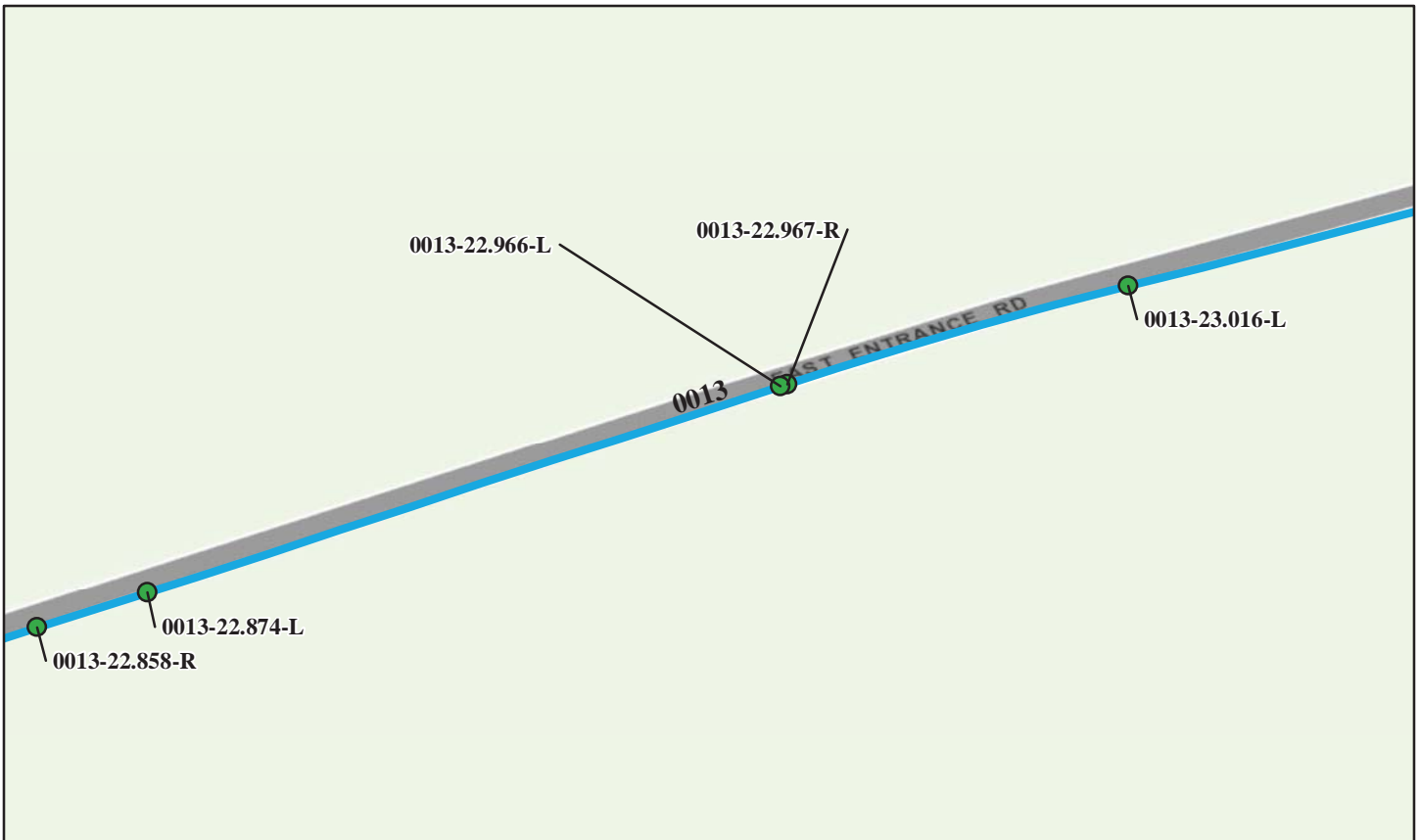
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0013-22.564-R 5/22/2007	1,871	192	MSE - Welded Wire Face	Fill Wall	97	\$0.00
YELL-0013-22.634-L 5/22/2007	72	12	Gravity - Mortared Stone	Head Wall	95	\$0.00
YELL-0013-22.634-R 5/22/2007	72	12	Gravity - Mortared Stone	Head Wall	98	\$0.00
YELL-0013-22.682-R 5/22/2007	8,227	470	MSE - Welded Wire Face	Fill Wall	97	\$0.00
YELL-0013-22.741-L 5/22/2007	990	76	Gravity - Dry Stone	Cut Wall	100	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0013: EAST ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0013-22.858-R 5/22/2007	9,095	511	MSE - Welded Wire Face	Fill Wall	97	\$0.00
YELL-0013-22.874-L 5/22/2007	69	23	Gravity - Mortared Stone	Head Wall	97	\$0.00
YELL-0013-22.966-L 5/22/2007	84	28	Gravity - Mortared Stone	Head Wall	95	\$0.00
YELL-0013-22.967-R 5/22/2007	132	32	Gravity - Mortared Stone	Head Wall	95	\$0.00
YELL-0013-23.016-L 5/22/2007	1,821	190	Gravity - Dry Stone	Cut Wall	98	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0013: EAST ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0013-23.145-L 5/22/2007	2,630	221	Gravity - Dry Stone	Cut Wall	96	\$0.00
YELL-0013-23.473-R 5/22/2007	275	50	Bin - Metal	Fill Wall	80	\$0.00
YELL-0013-23.899-L 5/22/2007	48	12	Gravity - Mortared Stone	Head Wall	97	\$0.00
YELL-0013-24.236-L 5/22/2007	48	12	Gravity - Mortared Stone	Head Wall	97	\$0.00
YELL-0013-24.336-L 5/22/2007	60	12	Gravity - Mortared Stone	Head Wall	98	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0013: EAST ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0013-24.354-R 5/22/2007	48	12	Gravity - Mortared Stone	Head Wall	95	\$0.00
YELL-0013-24.446-L 5/22/2007	48	12	Gravity - Mortared Stone	Head Wall	97	\$0.00
YELL-0013-24.457-R 5/22/2007	122	26	Gravity - Mortared Stone	Head Wall	97	\$0.00
YELL-0013-24.461-L 5/22/2007	111	26	Gravity - Mortared Stone	Head Wall	88	\$0.00
YELL-0013-24.623-L 5/22/2007	60	12	Gravity - Mortared Stone	Head Wall	97	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Yellowstone National Park

## ROUTE 0013: EAST ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

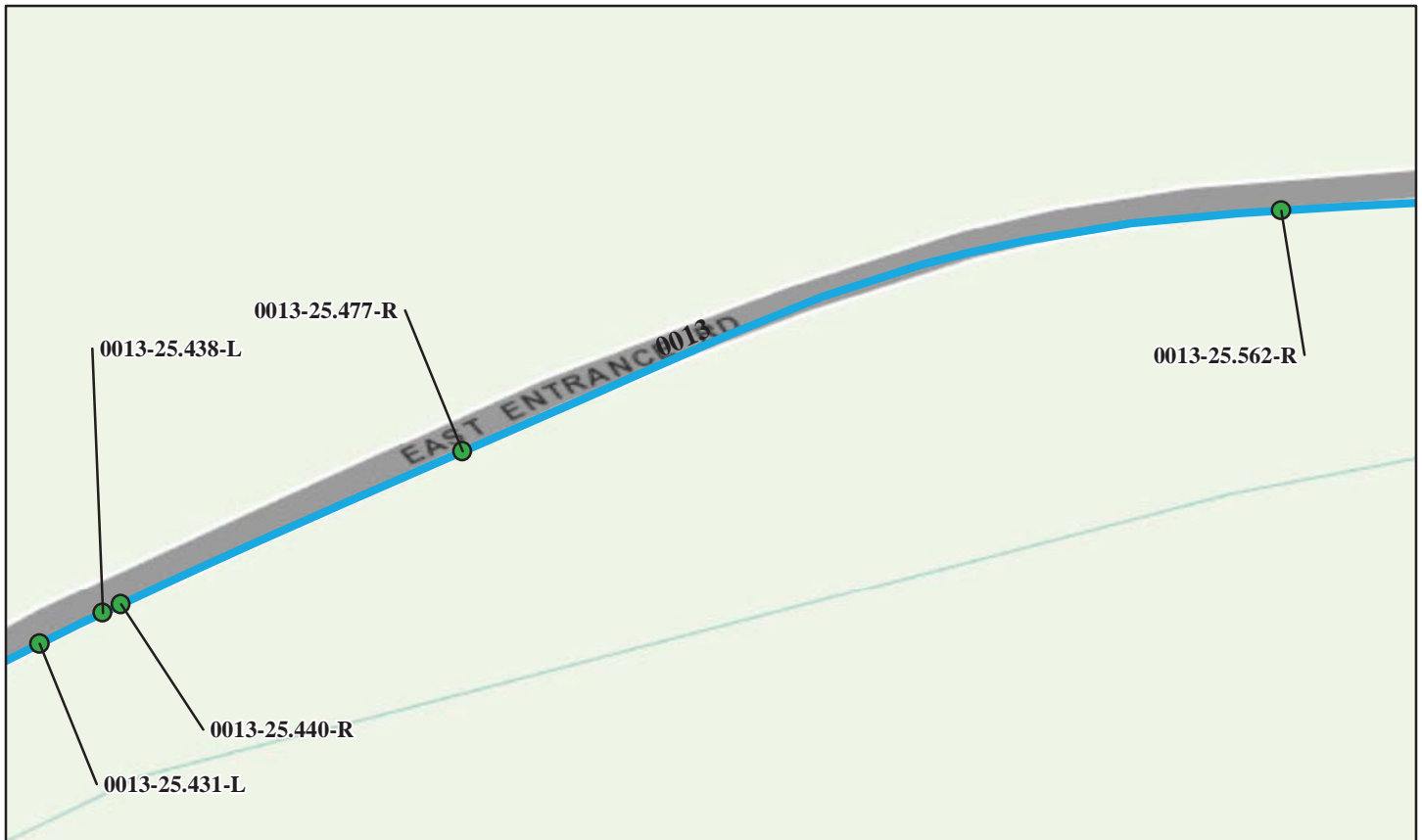
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0013-24.665-L 5/22/2007	60	12	Gravity - Mortared Stone	Head Wall	97	\$0.00
YELL-0013-24.882-R 5/22/2007	3,407	447	Gravity - Dry Stone	Slope Protection	87	\$0.00
YELL-0013-25.125-L 5/22/2007	1,471	166	Gravity - Dry Stone	Cut Wall	96	\$0.00
YELL-0013-25.198-L 5/22/2007	5,595	517	Gravity - Dry Stone	Cut Wall	96	\$0.00
YELL-0013-25.298-R 5/22/2007	1,837	218	Gravity - Dry Stone	Slope Protection	87	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0013: EAST ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0013-25.431-L 5/22/2007	1,314	210	Gravity - Dry Stone	Cut Wall	90	\$0.00
YELL-0013-25.438-L 5/22/2007	84	30	Gravity - Mortared Stone	Head Wall	97	\$0.00
YELL-0013-25.440-R 5/22/2007	86	25	Gravity - Mortared Stone	Head Wall	97	\$0.00
YELL-0013-25.477-R 5/22/2007	1,610	115	Gravity - Dry Stone	Slope Protection	87	\$0.00
YELL-0013-25.562-R 5/22/2007	750	50	Gravity - Dry Stone	Fill Wall	90	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0013: EAST ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0013-25.617-R 5/22/2007	3,332	196	Gravity - Dry Stone	Slope Protection	87	\$0.00
YELL-0013-25.790-R 5/22/2007	1,736	267	Gravity - Dry Stone	Slope Protection	84	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0014: SOUTH ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0014-7.094-L 5/21/2007	88	20	Gravity - Mortared Stone	Head Wall	80	\$0.00
YELL-0014-7.094-R 5/21/2007	88	20	Gravity - Mortared Stone	Head Wall	78	\$0.00
YELL-0014-7.245-L 5/21/2007	78	21	Gravity - Mortared Stone	Head Wall	80	\$0.00
YELL-0014-7.248-R 5/21/2007	123	26	Gravity - Mortared Stone	Head Wall	90	\$0.00
YELL-0014-8.206-R 5/21/2007	383	84	Gravity - Mortared Stone	Fill Wall	82	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Yellowstone National Park

## ROUTE 0014: SOUTH ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

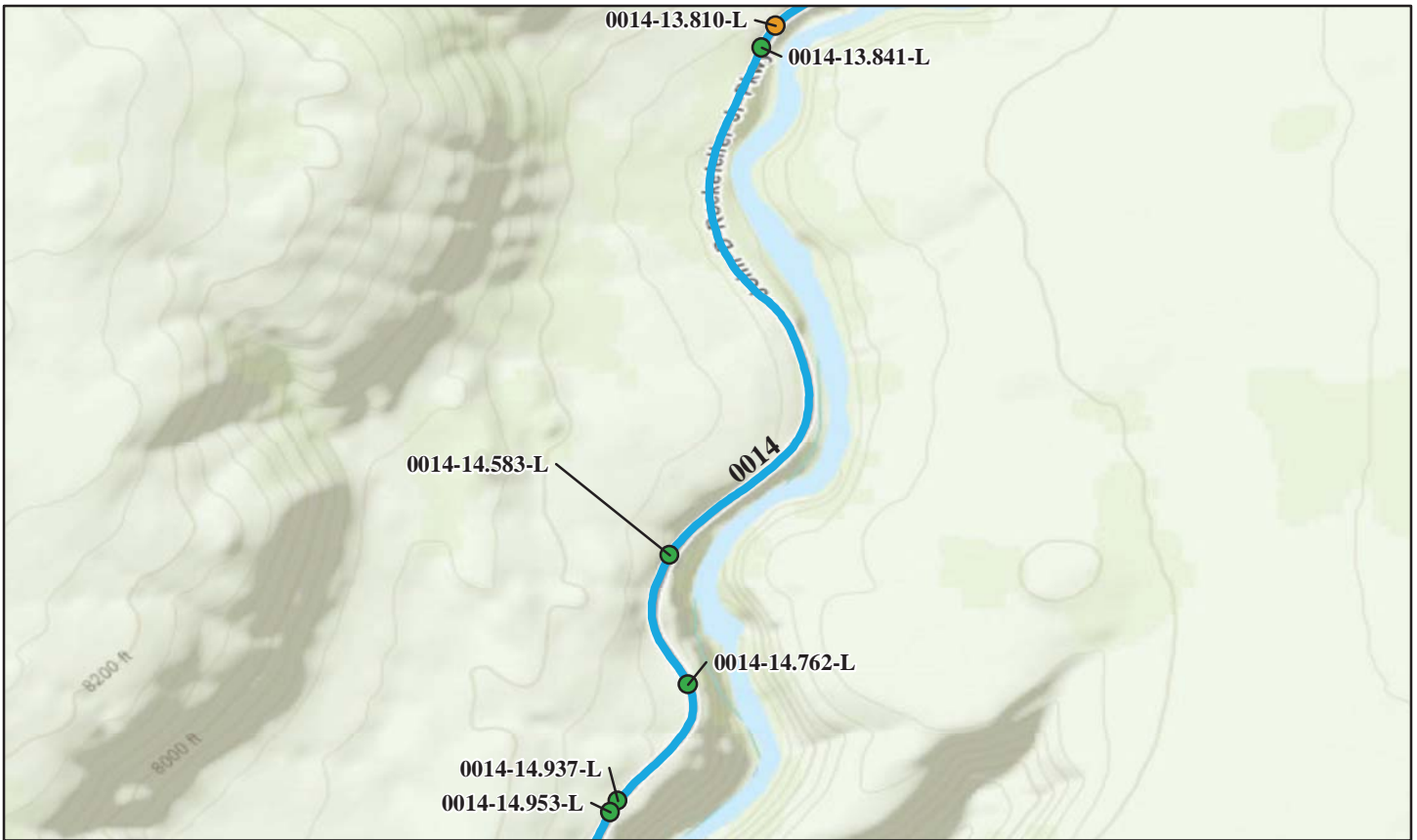
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0014-8.960-R 5/21/2007	332	56	Gravity - Dry Stone	Fill Wall	90	\$0.00
YELL-0014-9.689-R 5/21/2007	894	244	Gravity - Mortared Stone	Fill Wall	88	\$0.00
YELL-0014-9.770-R 5/21/2007	979	198	Gravity - Mortared Stone	Fill Wall	80	\$0.00
YELL-0014-12.548-L 5/21/2007	105	30	Gravity - Mortared Stone	Head Wall	78	\$0.00
YELL-0014-12.548-R 5/21/2007	105	30	Gravity - Mortared Stone	Head Wall	90	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0014: SOUTH ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0014-13.810-L 5/21/2007	1,053	99	Gravity - Dry Stone	Fill Wall	67	\$60,250.00
YELL-0014-13.841-L 5/21/2007	1,046	159	Gravity - Dry Stone	Fill Wall	77	\$0.00
YELL-0014-14.583-L 5/21/2007	500	115	Gravity - Mortared Stone	Fill Wall	88	\$0.00
YELL-0014-14.762-L 5/21/2007	280	28	Gravity - Dry Stone	Fill Wall	77	\$0.00
YELL-0014-14.937-L 5/21/2007	1,980	148	Gravity - Dry Stone	Fill Wall	84	\$440.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0014: SOUTH ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0014-14.953-L 5/21/2007	1,125	180	Gravity - Mortared Stone	Fill Wall	88	\$0.00
YELL-0014-15.735-L 5/21/2007	577	79	Gravity - Dry Stone	Fill Wall	87	\$0.00
YELL-0014-16.128-L 5/21/2007	3,532	244	Gravity - Dry Stone	Fill Wall	74	\$0.00
YELL-0014-16.253-L 5/21/2007	231	71	Crib - Timber	Fill Wall	73	\$3,790.00
YELL-0014-16.283-L 5/21/2007	979	121	Gravity - Mortared Stone	Fill Wall	87	\$440.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0015: WEST ENTRANCE ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0015-2.450-L 5/14/2007	5,337	428	Gravity - Dry Stone	Fill Wall	83	\$0.00
YELL-0015-2.734-L 5/14/2007	3,105	345	Gravity - Dry Stone	Fill Wall	87	\$0.00
YELL-0015-2.876-L 5/14/2007	3,850	350	Gravity - Dry Stone	Fill Wall	87	\$0.00
YELL-0015-2.987-L 5/14/2007	3,300	300	Gravity - Dry Stone	Fill Wall	87	\$0.00
YELL-0015-7.246-R 5/14/2007	7,371	638	Gravity - Dry Stone	Fill Wall	84	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Yellowstone National Park

## ROUTE 0016: NORRIS CANYON ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0016-0.366-R 5/11/2007	210	45	Gravity - Mass Concrete	Head Wall	52	\$6,200.00
YELL-0016-0.377-L 5/11/2007	150	45	Gravity - Mass Concrete	Head Wall	77	\$600.00
YELL-0016-7.800-L 5/10/2007	204	34	Cantilever - Concrete	Head Wall	90	\$0.00
YELL-0016-7.800-R 5/10/2007	204	34	Cantilever - Concrete	Head Wall	90	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0018B: BEARTOOTH HIGHWAY (WYOMING STATE HIGHWAY 212)



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

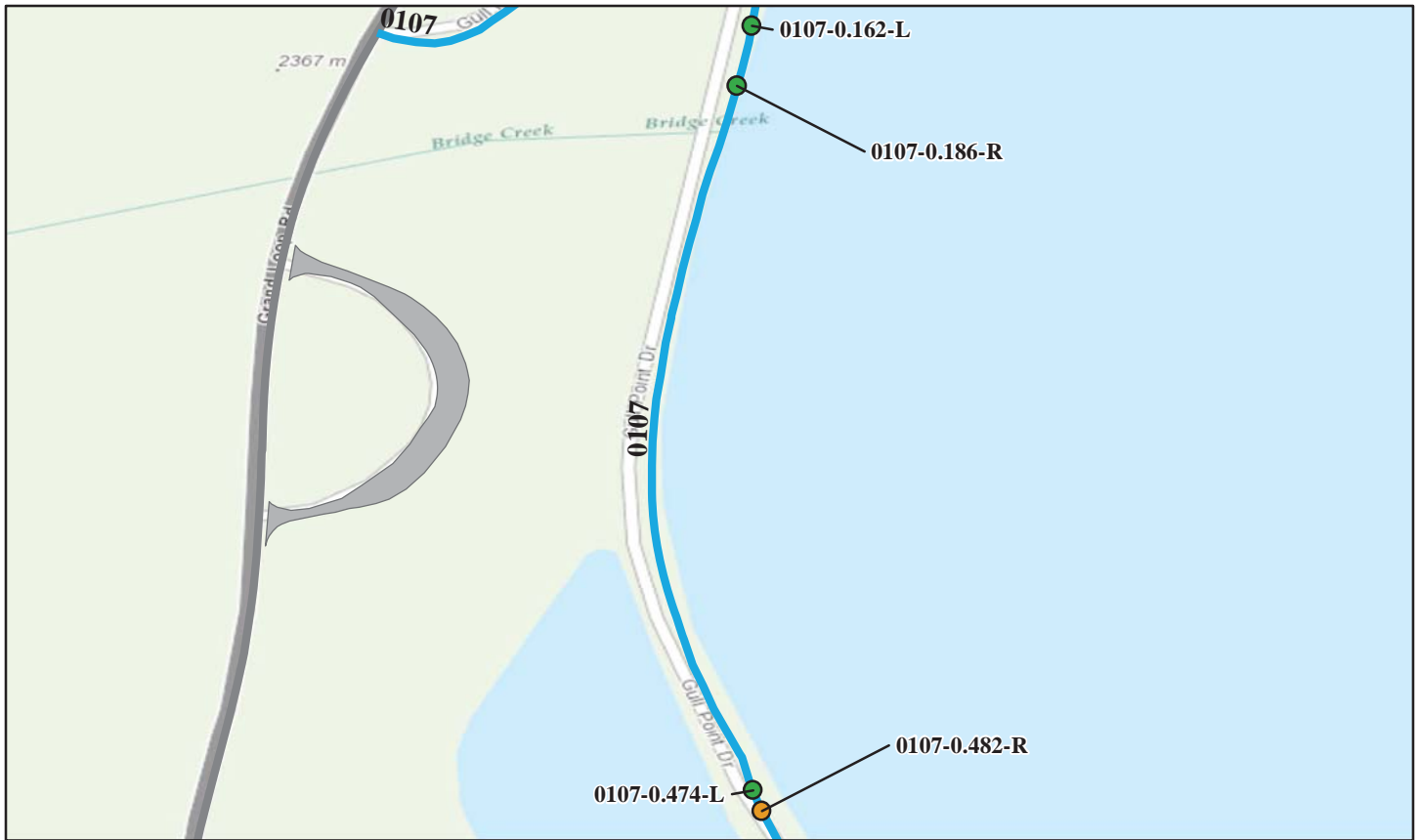
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0018B-13.124-L 5/16/2007	247	34	Gravity - Mass Concrete	Head Wall	70	\$0.00
YELL-0018B-13.124-R 5/16/2007	309	68	Gravity - Mass Concrete	Head Wall	67	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0107: GULL POINT DRIVE



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0107-0.162-L 5/21/2007	590	162	Cantilever - Concrete	Fill Wall	77	\$0.00
YELL-0107-0.186-R 5/18/2007	104	27	Cantilever - Concrete	Head Wall	77	\$0.00
YELL-0107-0.474-L 5/21/2007	94	23	Cantilever - Concrete	Head Wall	87	\$0.00
YELL-0107-0.482-R 5/21/2007	94	23	Cantilever - Concrete	Head Wall	68	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0503: NORTH RIM DRIVE



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Retaining Wall Condition Legend – Wall Condition Rating						
Critical / Poor (0 - 49)		Fair (50 - 69)		Good to Excellent (70 - 100)		No Data
Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0503-0.858-L  5/18/2007	200	50	Gravity - Mortared Stone	Fill Wall	77	\$0.00
*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.						



# Yellowstone National Park

## ROUTE 0504: FIREHOLE CANYON DRIVE



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0504-0.302-R 5/15/2007	798	145	Gravity - Dry Stone	Fill Wall	87	\$0.00
YELL-0504-0.345-R 5/15/2007	1,199	218	Gravity - Dry Stone	Fill Wall	58	\$10,000.00
YELL-0504-0.502-R 5/15/2007	1,935	311	Gravity - Dry Stone	Fill Wall	61	\$50,000.00
YELL-0504-0.810-L 5/15/2007	500	100	Gravity - Dry Stone	Fill Wall	84	\$0.00
YELL-0504-0.905-R 5/15/2007	755	85	Crib - Timber	Fill Wall	89	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0504: FIREHOLE CANYON DRIVE



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

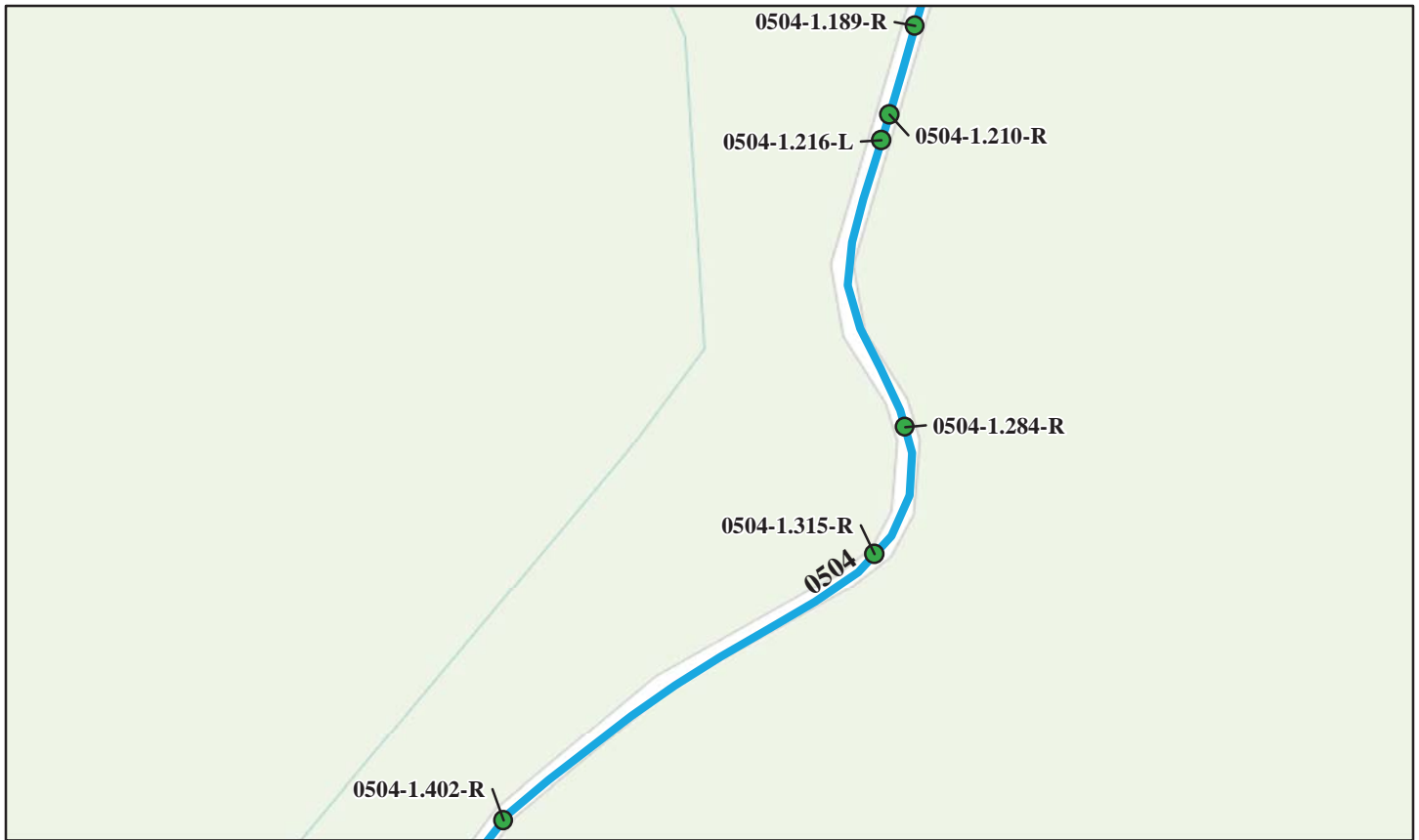
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0504-0.967-R 5/15/2007	6,922	156	Gravity - Dry Stone	Fill Wall	90	\$0.00
YELL-0504-1.092-R 5/15/2007	605	62	Gravity - Dry Stone	Fill Wall	86	\$0.00
YELL-0504-1.116-L 5/15/2007	1,105	185	Gravity - Dry Stone	Fill Wall	87	\$0.00
YELL-0504-1.136-R 5/15/2007	380	95	Gravity - Dry Stone	Fill Wall	87	\$0.00
YELL-0504-1.160-R 5/15/2007	1,912	120	Gravity - Dry Stone	Fill Wall	80	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0504: FIREHOLE CANYON DRIVE



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

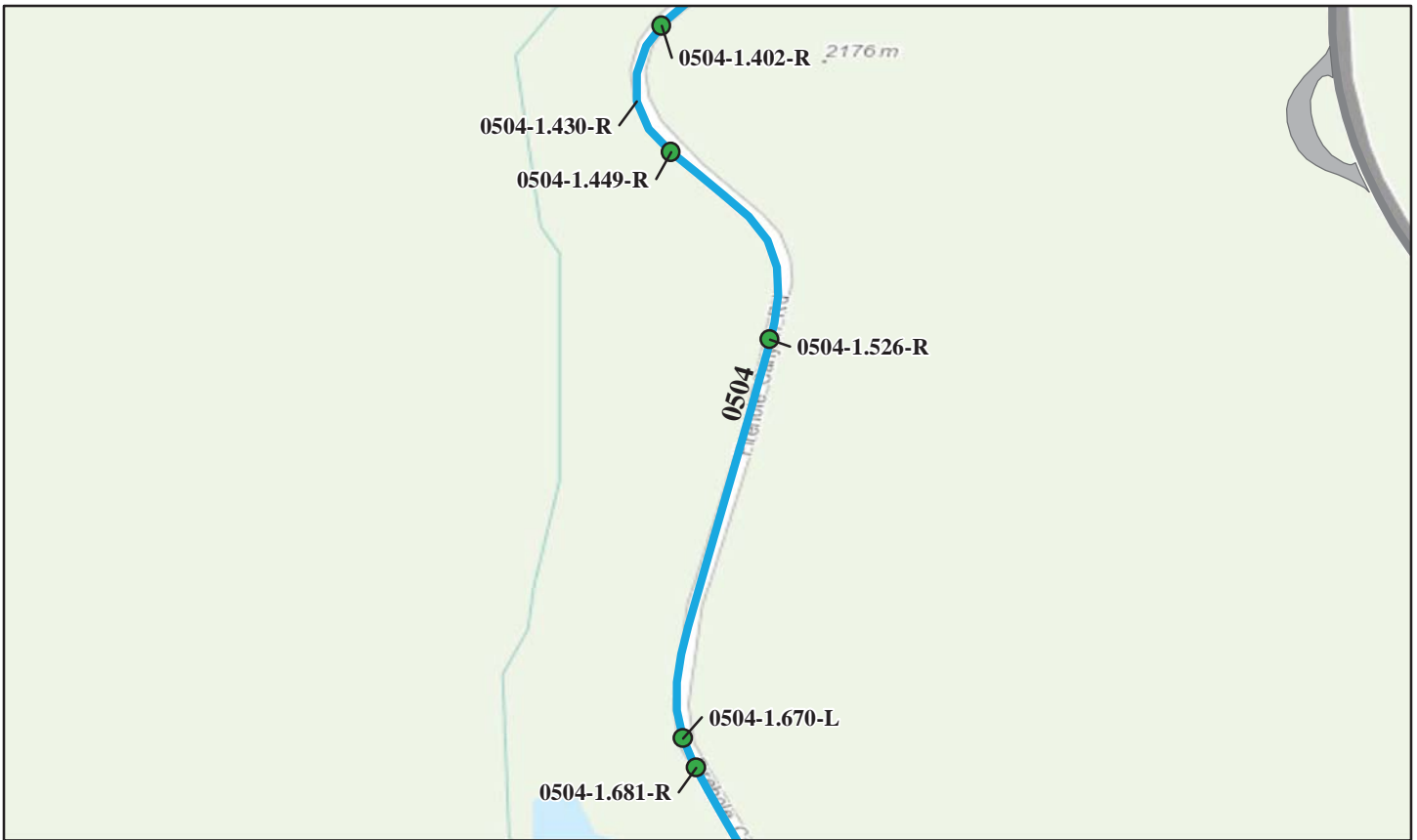
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0504-1.189-R 5/15/2007	105	30	Gravity - Mortared Stone	Fill Wall	83	\$0.00
YELL-0504-1.210-R 5/15/2007	916	194	Gravity - Dry Stone	Fill Wall	90	\$0.00
YELL-0504-1.216-L 5/15/2007	957	165	Gravity - Dry Stone	Fill Wall	90	\$0.00
YELL-0504-1.284-R 5/15/2007	1,204	159	Gravity - Dry Stone	Fill Wall	84	\$0.00
YELL-0504-1.315-R 5/15/2007	8,137	457	Gravity - Mortared Stone	Fill Wall	76	\$16,000.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0504: FIREHOLE CANYON DRIVE



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0504-1.402-R 5/15/2007	1,492	112	Gravity - Dry Stone	Fill Wall	80	\$0.00
YELL-0504-1.430-R 5/17/2007	440	40	Gravity - Dry Stone	Fill Wall	34	\$15,000.00
YELL-0504-1.449-R 5/15/2007	2,629	255	Gravity - Mortared Stone	Fill Wall	71	\$0.00
YELL-0504-1.526-R 5/15/2007	1,377	370	Gravity - Dry Stone	Fill Wall	80	\$0.00
YELL-0504-1.670-L 5/15/2007	908	165	Gravity - Dry Stone	Fill Wall	87	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Yellowstone National Park

## ROUTE 0504: FIREHOLE CANYON DRIVE



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0504-1.681-R 5/15/2007	1,318	170	Gravity - Dry Stone	Fill Wall	87	\$0.00
YELL-0504-1.749-R 5/15/2007	509	144	Gravity - Dry Stone	Fill Wall	90	\$0.00
YELL-0504-1.866-R 5/15/2007	3,952	364	Gravity - Dry Stone	Fill Wall	73	\$1,320.00
YELL-0504-1.968-R 5/15/2007	295	38	Gravity - Dry Stone	Fill Wall	84	\$0.00
YELL-0504-1.985-R 5/15/2007	200	40	Gravity - Dry Stone	Fill Wall	37	\$24,000.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0504: FIREHOLE CANYON DRIVE



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0504-1.999-R 5/15/2007	473	61	Gravity - Dry Stone	Fill Wall	74	\$0.00
YELL-0504-2.013-R 5/15/2007	1,337	125	Gravity - Dry Stone	Fill Wall	52	\$31,250.00
YELL-0504-2.064-R 5/15/2007	772	105	Gravity - Mortared Stone	Fill Wall	78	\$17,740.00
YELL-0504-2.090-R 5/15/2007	749	94	Gravity - Mortared Stone	Fill Wall	68	\$15,340.00
YELL-0504-2.104-L 5/15/2007	407	93	Gravity - Dry Stone	Fill Wall	87	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0504: FIREHOLE CANYON DRIVE



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0504-2.140-R 5/15/2007	455	35	Gravity - Mortared Stone	Fill Wall	80	\$0.00
YELL-0504-2.161-R 5/15/2007	175	66	Gravity - Dry Stone	Fill Wall	68	\$7,000.00
YELL-0504-2.175-R 5/15/2007	342	86	Gravity - Dry Stone	Fill Wall	80	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0509: VIRGINIA CASCADE DRIVE



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

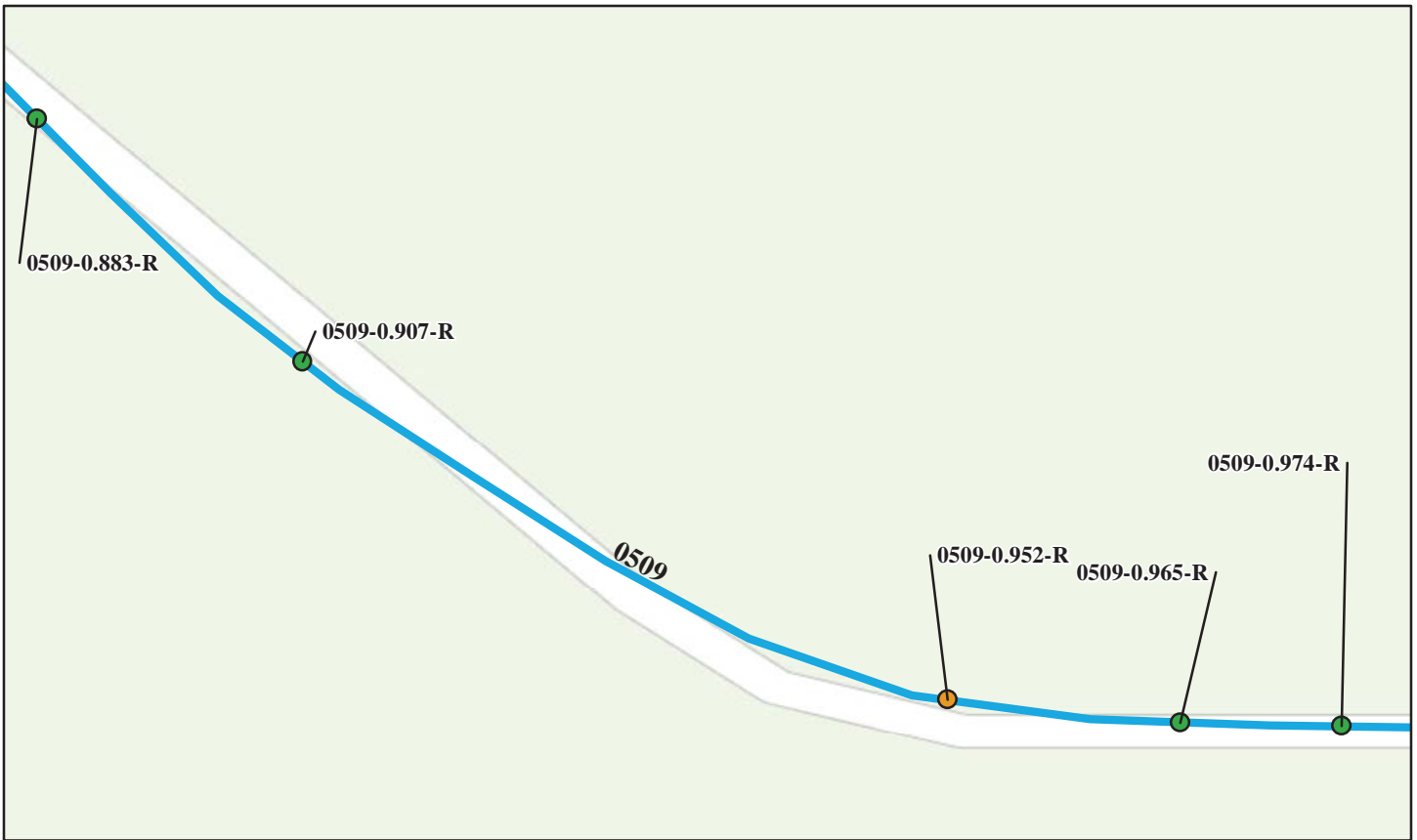
Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0509-0.634-R 5/10/2007	580	65	Crib - Timber	Fill Wall	83	\$440.00
YELL-0509-0.794-R 5/10/2007	755	110	Crib - Timber	Fill Wall	82	\$440.00
YELL-0509-0.855-R 5/10/2007	375	50	Crib - Timber	Fill Wall	90	\$0.00
YELL-0509-0.869-R 5/10/2007	541	50	Crib - Timber	Fill Wall	87	\$0.00
YELL-0509-0.877-R 5/10/2007	934	33	Crib - Timber	Fill Wall	71	\$11,950.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Yellowstone National Park

## ROUTE 0509: VIRGINIA CASCADE DRIVE



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

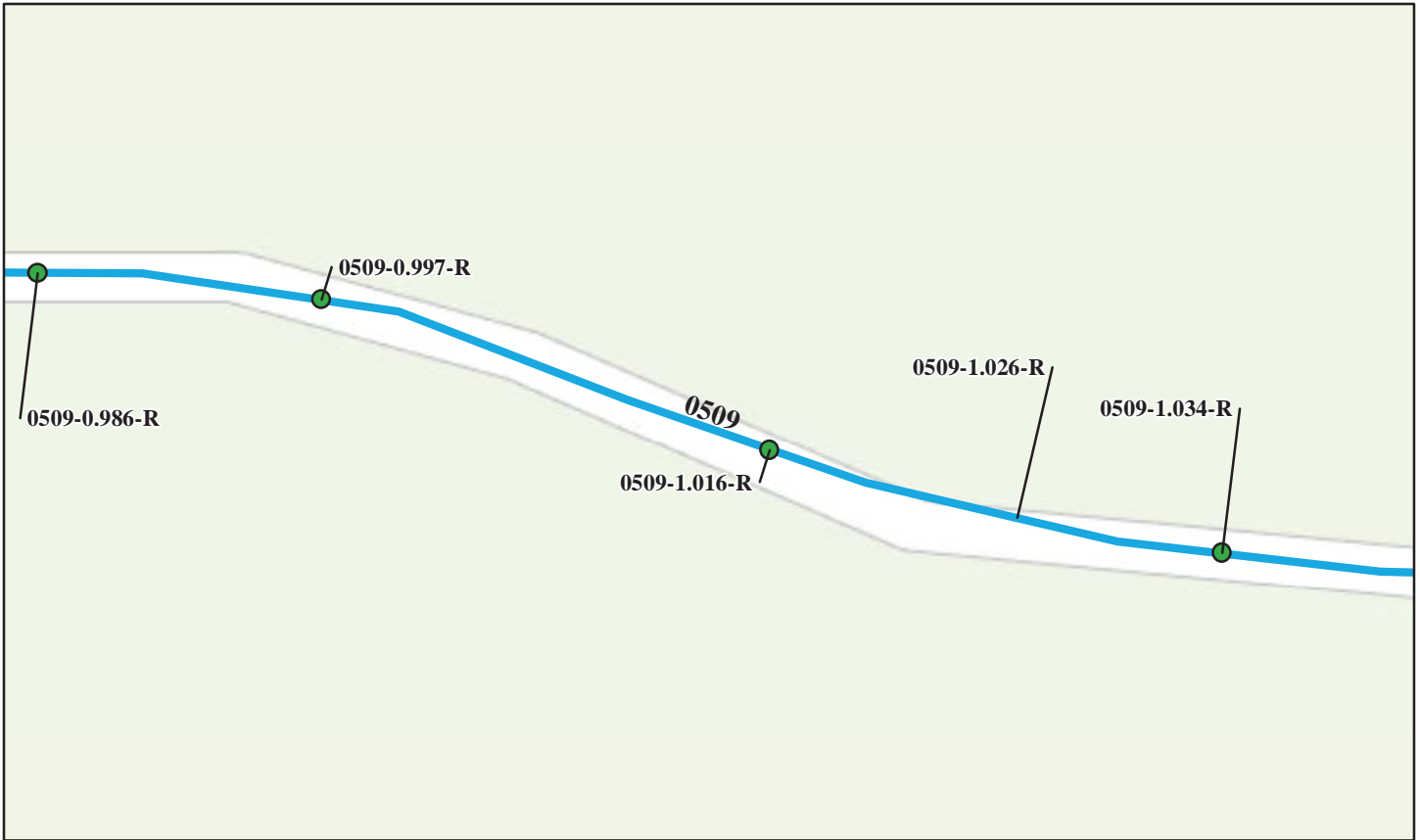
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0509-0.883-R 5/10/2007	561	44	Crib - Timber	Fill Wall	80	\$0.00
YELL-0509-0.907-R 5/10/2007	864	107	Crib - Timber	Fill Wall	78	\$5,920.00
YELL-0509-0.952-R 5/10/2007	336	71	Gravity - Dry Stone	Fill Wall	65	\$12,040.00
YELL-0509-0.965-R 5/10/2007	120	12	Crib - Timber	Fill Wall	93	\$0.00
YELL-0509-0.974-R 5/10/2007	60	10	Crib - Timber	Fill Wall	93	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0509: VIRGINIA CASCADE DRIVE



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0509-0.986-R 5/10/2007	257	18	Gravity - Dry Stone	Fill Wall	73	\$3,000.00
YELL-0509-0.997-R 5/10/2007	176	22	Crib - Timber	Fill Wall	93	\$220.00
YELL-0509-1.016-R 5/10/2007	315	30	Crib - Timber	Fill Wall	88	\$0.00
YELL-0509-1.026-R 5/10/2007	288	25	Gravity - Dry Stone	Fill Wall	30	\$19,020.00
YELL-0509-1.034-R 5/10/2007	176	32	Gravity - Dry Stone	Fill Wall	77	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0509: VIRGINIA CASCADE DRIVE



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

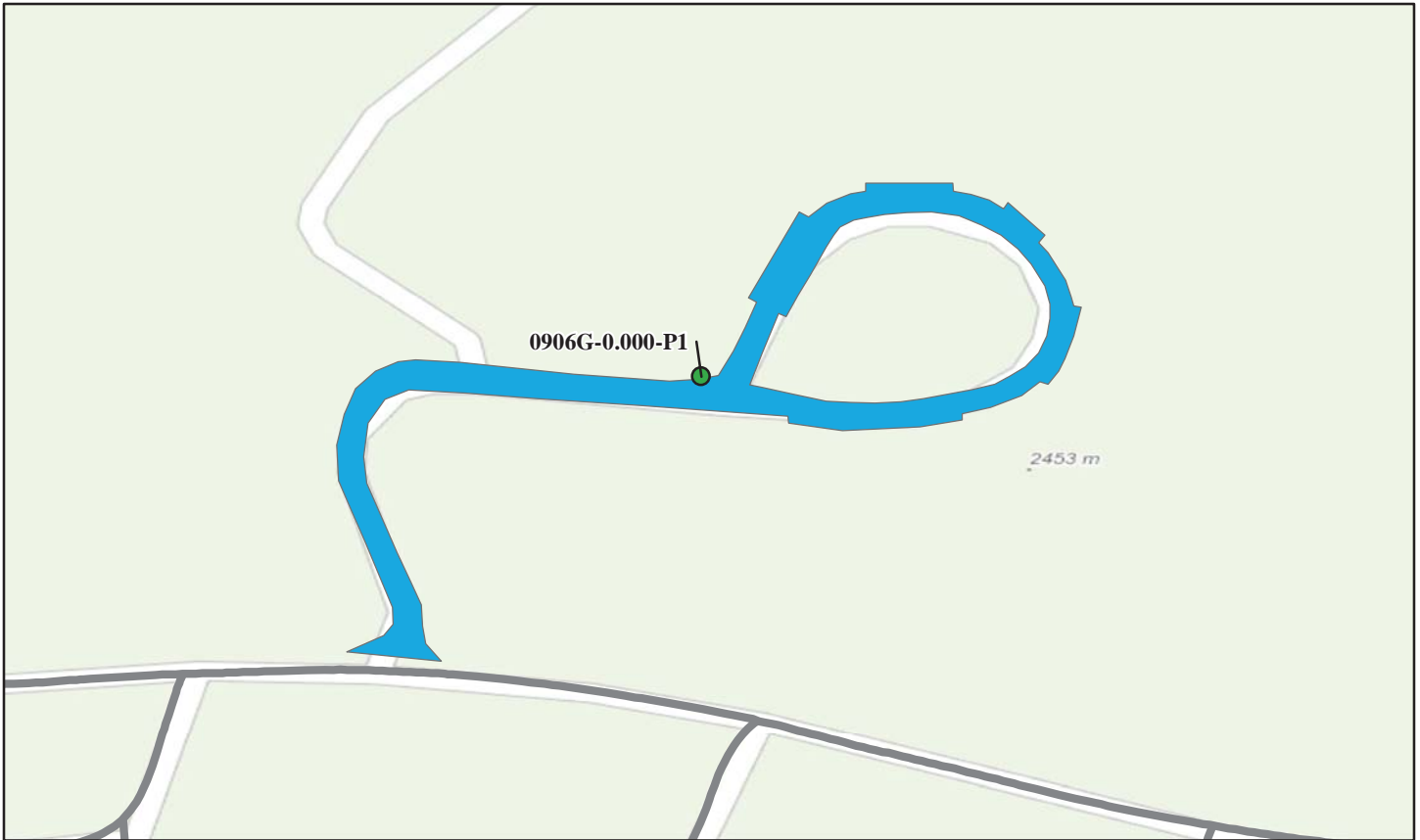
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0509-1.042-R 5/10/2007	315	30	Crib - Timber	Fill Wall	86	\$220.00
YELL-0509-1.048-R 5/10/2007	799	89	Gravity - Mortared Stone	Fill Wall	74	\$440.00
YELL-0509-1.133-R 5/10/2007	600	80	Gravity - Dry Stone	Fill Wall	90	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Yellowstone National Park

## ROUTE 0906G: CANYON CAMPGROUND SERVICE PARKING



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

**Critical / Poor (0 - 49)**

**Fair (50 - 69)**

**Good to Excellent (70 - 100)**

**No Data**

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0906G-0.000-P1 5/18/2007	1863	507	Cantilever - Concrete	Cut Wall	81	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Yellowstone National Park

## ROUTE 0906L: INSPIRATION POINT PARKING



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

### Retaining Wall Condition Legend – Wall Condition Rating

**Critical / Poor (0 - 49)**

**Fair (50 - 69)**

**Good to Excellent (70 - 100)**

**No Data**

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
YELL-0906L-0.000-P1 5/18/2007	2558	423	Gravity - Dry Stone	Fill Wall	80	\$0.00
YELL-0906L-0.000-P2 5/18/2007	479	118	Gravity - Dry Stone	Fill Wall	80	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

## Tier 3 Retaining Wall Details



**Yellowstone National Park**



**Federal Lands Highway  
Road Inventory Program**

<b>Wall ID:</b>	YELL-0010A-0.129-L		
<b>Route Name:</b>	MAMMOTH TO NORRIS ROAD		
<b>Inspection Date:</b>	May 08, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	71	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-Placed Stone Wall supporting fill slope, Some repair necessary to restore to functional condition.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	118	<b>Face Area (sq.):</b>	1109
<b>Average Wall Height (ft.):</b>	9	<b>Face Angle (deg.):</b>	73
<b>Maximum Wall Height (ft.):</b>	17	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium - Combination of bulging, sagging, and missing stones indicate repair is necessary.		7
WALL FOUNDATION MATERIAL 8.00	Firm stable foundation except at start where first 17 ft. is undermined.		7
PLACED STONE 8.00	Angular 2 ft. minus stones with little-to-no weathering well interlocked. Stones missing in two sections (2 ft. x 3 ft and 2 ft. x 6 ft.) near top. Bulging and batter distortion throughout.		7
LATERAL SLOPE 0.50	Stable slope, well vegetated at both ends. Surface drainage problem at start.		8
ROAD/SIDEWALK/SHOULDER 0.50	Road sags over top of wall, no should distress.		8
DOWNSLOPE 0.50	Gentle well vegetated downslope.		9
WALL DRAINS 0.50	No evidence of internal drainage distress noted.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	1. Replace new rock in voids and rechalk loose stones throughout: Use local angular rock. Labor: 2 x 48 hr, x \$55/hr = \$5280. 2. Rebuild stacked-rock foundation (30 sq. ft.) at start		
<b>Repair Cost:</b>	\$12,540		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0010A: MAMMOTH TO NORRIS ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0010A\_0.129\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010A-3.164-L		
<b>Route Name:</b>	MAMMOTH TO NORRIS ROAD		
<b>Inspection Date:</b>	May 09, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	86	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Slope Protection	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed stone wall providing slope protection for fill slope. Performing well.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	150	<b>Face Area (sq.):</b>	2332
<b>Average Wall Height (ft.):</b>	15	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	31	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well. Need drainage protection from road runoff.		9
WALL FOUNDATION MATERIAL 8.00	Steep stable slope of firm soil, well vegetated.		9
PLACED STONE 8.00	Angular 2.5 ft. minus rock well interlocked, only slightly weathered. No bulging or batter distress noted.		8
DOWNSLOPE 0.50	Steep stable natural slope, well vegetated.		9
LATERAL SLOPE 0.50	Steep stable natural slopes on both sides, well vegetated.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road, shoulder, or guardrail distress noted		9
WALL DRAINS 0.50	No evidence of internal drainage distress.		9
CURB/BERM/DITCH 1.00	Erosion rill about 3 ft. deep at end of wall from road runoff.		6
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	Repair downdrain from shoulder and rearmour slope with large stones in a 35 ft. x 6 ft. x 2 ft. section. Use local material. Excavator 8 hr. x \$150/hr = \$1200 Dump Truck		
<b>Repair Cost:</b>	\$3,920		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0010A: MAMMOTH TO NORRIS ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0010A\_3.164\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010A-4.357-L		
<b>Route Name:</b>	MAMMOTH TO NORRIS ROAD		
<b>Inspection Date:</b>	May 09, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry wall supporting fill, performing well.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	127	<b>Face Area (sq.):</b>	535
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	9	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well. No action needed.		9
WALL FOUNDATION MATERIAL 8.00	Firm soil with no distress evident.		9
MORTAR 8.00	Very little evidence of debonding and cracking, little-to-no weathering.		9
STONE MASONRY 8.00	Angular rock with very little weathering. No evidence of batter distress or bulging.		9
DOWNSLOPE 0.50	Steep stable rocky slope with sparse vegetation.		9
LATERAL SLOPE 0.50	Steep stable rocky slopes on both sides with sparse vegetation.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0010A: MAMMOTH TO NORRIS ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010A\_4.357\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010A-4.383-L		
<b>Route Name:</b>	MAMMOTH TO NORRIS ROAD		
<b>Inspection Date:</b>	May 09, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	100	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Bridge Wall	<b>Primary Wall Type:</b>	Cantilever - Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Fractured Fin Concrete
<b>General Description:</b>	Bridge support		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	126	<b>Face Area (sq.):</b>	2520
<b>Average Wall Height (ft.):</b>	20	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	20	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as intended		10
WALL FOUNDATION MATERIAL 8.00	No distress, 5ft flat bench on top of a 32% slope		10
CONCRETE 8.00	No distress noted		10
DOWNSLOPE 0.50	Stable fill, 32% slope, sparse vegetation, no erosion		9
WALL DRAINS 0.50	3" wall drains along wall base, no distress noted		9
LATERAL SLOPE 0.50	Bridge		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0010A: MAMMOTH TO NORRIS ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0010A\_4.383\_L\_1.jpg**



<b>Wall ID:</b>	YELL-0010A-4.490-L		
<b>Route Name:</b>	MAMMOTH TO NORRIS ROAD		
<b>Inspection Date:</b>	May 09, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	88	<b>Maintenance Action:</b>	Maintenance
<b>Wall Description</b>			
<b>Wall Function:</b>	Bridge Wall	<b>Primary Wall Type:</b>	Cantilever - Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Plain Concrete
<b>General Description:</b>	Cast in-place concrete wall retaining fill at bridge abutment. Performing well.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	75	<b>Face Area (sq.):</b>	1069
<b>Average Wall Height (ft.):</b>	14	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	19	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - wall is performing well.. Downspout culvert from road drain needs to be maintained.		9
WALL FOUNDATION MATERIAL 8.00	Firm stable soil adjacent to rock outcrop. Steep stable talus covered slope below.		9
CONCRETE 8.00	No cracking, spalling, or weathering distress noted. No batter distress.		9
DOWNSLOPE 0.50	Steep stable talus covered slope with sparse vegetation.		8
LATERAL SLOPE 0.50	Bridge at start, steep stable talus covered slope at end		8
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage problems. Internal drains installed.		9
CULVERT 1.00	Culvert to drain road surface is partially collapsed and plugged.		5
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	Clear plugged culvert and replace end section. Laborers 2 x 8 hr x \$55/hr = \$880. Materials = \$150		
<b>Repair Cost:</b>	\$1,030		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

## **ROUTE 0010A: MAMMOTH TO NORRIS ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0010A\_4.490\_L\_1.jpg**



**YELL\_0010A\_4.490\_L\_2.jpg**

<b>Wall ID:</b>	YELL-0010A-4.506-L		
<b>Route Name:</b>	MAMMOTH TO NORRIS ROAD		
<b>Inspection Date:</b>	May 09, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry wall support fill approach to bridge. Performing well.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	74	<b>Face Area (sq.):</b>	473
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well. No action needed.		9
WALL FOUNDATION MATERIAL 8.00	Firm soil on a 3 ft. wide bench with steep stable talus-covered natural slope below. No distress noted.		9
MORTAR 8.00	Little-to-no debonding, cracking, or weathering distress noted		9
STONE MASONRY 8.00	Sound angular stones with no weathering distress noted.		9
DOWNSLOPE 0.50	Stable 3 ft. wide bench with steep stable talus-covered slope below. Sparse vegetation.		9
LATERAL SLOPE 0.50	Bridge at start and steep stable talus-covered slope at end. Sparse vegetation.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress noted.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

## **ROUTE 0010A: MAMMOTH TO NORRIS ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0010A\_4.506\_L\_1.jpg**



<b>Wall ID:</b>	YELL-0010A-4.545-L		
<b>Route Name:</b>	MAMMOTH TO NORRIS ROAD		
<b>Inspection Date:</b>	May 09, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	77	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Wall is not parallel to road		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	25	<b>Face Area (sq.):</b>	187
<b>Average Wall Height (ft.):</b>	7	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	17	<b>Vertical Offset (ft.):</b>	-5
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium		7
WALL FOUNDATION MATERIAL 8.00	No distress noted		9
PLACED STONE 8.00	Face is plumb, stones are weathering and cracking. Missing stones at top of wall 6ft x 2ft area. Excellent interlock. Isolated voids		7
DOWNSLOPE 0.50	34% slope, poorly vegetated		8
LATERAL SLOPE 0.50	Same as downslope, In place rock on one side		8
UPSLOPE 0.50	Poorly vegetated, graveled, 5ft vertical up to parking area		8
WALL DRAINS 0.50	No drainage distress evident		9
CURB/BERM/DITCH 1.00	Start of wall slightly exposed due to raveling		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	1- Re-chink entire wall face with dry laid stone, dig out isolated/badly weathered stones, salvage stones to use on site. 2- Rebuild wall top. 2ft x 6ft, use rock salvaged on site. 3- Extend wall start by 3ft to reduce ravel. Re-chinking = 187sq		
<b>Repair Cost:</b>	\$16,665		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

## **ROUTE 0010A: MAMMOTH TO NORRIS ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0010A\_4.545\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010A-4.609-L		
<b>Route Name:</b>	MAMMOTH TO NORRIS ROAD		
<b>Inspection Date:</b>	May 09, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	72	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Slope Protection	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry placed stone wall providing slope protection for fill slope. Shows stability distress which will require monitoring and possibly future replacement with MSE wall..		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	472	<b>Face Area (sq.):</b>	12570
<b>Average Wall Height (ft.):</b>	26	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	54	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium - Wall is still performing but not well. Indications of long-term instability causing bulging and road and guard wall sagging. Need to monitor sagging. May need someday to remove upper portion of fill to unload the slope and install an MSE wall.		7
WALL FOUNDATION MATERIAL 8.00	Angular talus on extremely steep but marginally stable slope. No vegetation.		8
PLACED STONE 8.00	Angular rock of various sizes, well interlocked and grouted at intermittent locations. Bulging throughout but most severe in first 60 ft. Which also has guard wall and road sagging		7
DOWNSLOPE 0.50	Angular talus on steep but marginally stable slope. No vegetation.		8
LATERAL SLOPE 0.50	Angular talus on steep but marginally stable slope. No vegetation.		8
WALL DRAINS 0.50	No evidence of internal drainage distress.		9
ROAD/SIDEWALK/SHOULDER 1.00	Road sagging and cracked for first 100 ft. most severe from 50 to 100 ft from start. Guard wall also sagging in this section. Evidence of prior repairs to this section.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

## **ROUTE 0010A: MAMMOTH TO NORRIS ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0010A\_4.609\_L\_1.jpg**



<b>Wall ID:</b>	YELL-0010A-4.711-L		
<b>Route Name:</b>	MAMMOTH TO NORRIS ROAD		
<b>Inspection Date:</b>	May 09, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	88	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone wall that helps support the roadway		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	248	<b>Face Area (sq.):</b>	1018
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	7	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as intended		9
WALL FOUNDATION MATERIAL 8.00	No signs of distress in foundation		9
MORTAR 8.00	Localized areas of distress, nothing severe, slight debonding of mortar		8
STONE MASONRY 8.00	Slight weathering of stone, nothing to severe		9
LATERAL SLOPE 0.50	Well vegetated, not overly steep		9
ROAD/SIDEWALK/SHOULDER 0.50	Good shape, no signs of distress		9
WALL DRAINS 0.50	No signs of distress		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

## **ROUTE 0010A: MAMMOTH TO NORRIS ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0010A\_4.711\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010A-5.540-R		
<b>Route Name:</b>	MAMMOTH TO NORRIS ROAD		
<b>Inspection Date:</b>	May 09, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	73	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Gravity mortared stone at culvert inlet. Need repair.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	28	<b>Face Area (sq.):</b>	119
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium - wall is performing well at the present time but needs repair.		7
WALL FOUNDATION MATERIAL 8.00	Firm soil with no scour damage.		9
MORTAR 8.00	Mortar shows cracking, spalling and moderate shallow weathering throughout.		6
STONE MASONRY 8.00	Stones are angular and show no distress. Some stones are loose due to mortar weathering.. No batter distortion or scour damage.		7
DOWNSLOPE 0.50	Stable gravelly riverbed, moderate scour potential.		8
LATERAL SLOPE 0.50	Grassy stable fill slopes on both sides.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	Replace stones with local angular material and repoint entire headwall. Reset and replace missing stones. LABORERS 2 x 8 hr. x \$55/hr. = \$880		
<b>Repair Cost:</b>	\$9,805		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

## **ROUTE 0010A: MAMMOTH TO NORRIS ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0010A\_5.540\_R\_1.jpg**



<b>Wall ID:</b>	YELL-0010A-5.541-L		
<b>Route Name:</b>	MAMMOTH TO NORRIS ROAD		
<b>Inspection Date:</b>	May 09, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	57	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone may be a façade on a concrete box		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	28	<b>Face Area (sq.):</b>	94
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Low		4
WALL FOUNDATION MATERIAL 8.00	No distress noted		9
STONE MASONRY 8.00	Top stones are missing, looks like it could have been hit)		4
MORTAR 8.00	Mortar is cracking with large voids. 2"-3" cracks, with some debonding Complete separation of mortar from stone in center section of headwall		5
CULVERT 0.50	Box culvert 4' x 8', no distress noted		9
LATERAL SLOPE 0.50	No signs of distress noted, well vegetated		9
ROAD/SIDEWALK/SHOULDER 0.50	No signs of distress noted		9
WALL DRAINS 0.50	No signs of distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	Rebuild center section of headwall. 1- Stone work = 30 sqft @ \$160.00 sqft = \$4,800. 2- excavator = 8 hrs @ \$150.00 hr = \$1,200. Will use existing stone on site, need some mortar. Total = \$6,000		
<b>Repair Cost:</b>	\$6,000		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0010A: MAMMOTH TO NORRIS ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010A\_5.541\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010A-11.089-R		
<b>Route Name:</b>	MAMMOTH TO NORRIS ROAD		
<b>Inspection Date:</b>	May 09, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	95	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Headwall on a culvert, with wing walls		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	31	<b>Face Area (sq.):</b>	146
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as intended		9
WALL FOUNDATION MATERIAL 8.00	No distress noted		10
MORTAR 8.00	Very slight debonding of mortar, otherwise no distress		9
STONE MASONRY 8.00	No distress noted		10
WALL DRAINS 0.50	No problems evident		9
CULVERT 0.50	No distress noted, concrete arch pipe 9ft x 6ft		10
LATERAL SLOPE 0.50	Stable road fill		10
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0010A: MAMMOTH TO NORRIS ROAD**

## **Retaining Wall Condition Photos**

**Condition photos are not available for YELL-0010A-11.089-R.**



<b>Wall ID:</b>	YELL-0010A-11.090-L		
<b>Route Name:</b>	MAMMOTH TO NORRIS ROAD		
<b>Inspection Date:</b>	May 09, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Gravity mortared stone wall at culvert inlet. Performing well.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	31	<b>Face Area (sq.):</b>	146
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing wall, no action necessary.		9
WALL FOUNDATION MATERIAL 8.00	Firm soil, no scour damage.		9
MORTAR 8.00	Only a minimal amount of cracking, debonding and shallow weathering noted.		9
STONE MASONRY 8.00	Angular stones are unlettered, no batter displacement or scour damage.		9
DOWNSLOPE 0.50	Stable gravelly riverbed. Moderate scour potential.		8
LATERAL SLOPE 0.50	Well vegetated stable fill slopes on both sides.		9
ROAD/SIDEWALK/SHOULDER 0.50	No evidence of road or shoulder distress.		9
WALL DRAINS 0.50	No evidence of internal drainage distress noted.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0010A: MAMMOTH TO NORRIS ROAD**

## **Retaining Wall Condition Photos**

**Condition photos are not available for YELL-0010A-11.090-L.**

<b>Wall ID:</b>	YELL-0010A-12.317-R		
<b>Route Name:</b>	MAMMOTH TO NORRIS ROAD		
<b>Inspection Date:</b>	May 09, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	64	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone wall at culvert inlet. Need repair.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	19	<b>Face Area (sq.):</b>	72
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium - wall is still performing but needs foundation repair for better bearing.		7
WALL FOUNDATION MATERIAL 8.00	Significant scour erosion of the foundation.		4
STONE MASONRY 8.00	Stones show very little weathering stress but several are missing at the bottom causing loss of bearing.		6
MORTAR 8.00	Slight cracking and debonding, minimal weathering except at bottom.		8
DOWNSLOPE 0.50	Gravelly riverbed scoured under foundation. Moderate scour potential.		8
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress noted.		9
LATERAL SLOPE 1.00	Raveling fill slopes on both sides, but not affecting the structure.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	Excavate foundation replace missing stones and reset loose stones at bottom to restore bearing. Use angular rock from local source. Excavator: 8 hr. x \$150/hr. = \$1200		
<b>Repair Cost:</b>	\$2,080		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0010A: MAMMOTH TO NORRIS ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010A\_12.317\_R\_1.jpg**



<b>Wall ID:</b>	YELL-0010A-12.318-L		
<b>Route Name:</b>	MAMMOTH TO NORRIS ROAD		
<b>Inspection Date:</b>	May 09, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Concrete Arch Pipe, with mortared wing walls		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	25	<b>Face Area (sq.):</b>	171
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	9	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as intended		9
WALL FOUNDATION MATERIAL 8.00	No distress noted		9
MORTAR 8.00	Slight debonding of the Mortar		9
STONE MASONRY 8.00	No distress noted		9
CULVERT 0.50	No distress noted, performing as intended		9
LATERAL SLOPE 0.50	Stable Lateral slope, road fill material		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0010A: MAMMOTH TO NORRIS ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010A\_12.318\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010A-19.648-R		
<b>Route Name:</b>	MAMMOTH TO NORRIS ROAD		
<b>Inspection Date:</b>	May 09, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	81	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry placed stone wall supporting cut.. Rock has moderate weathering which is not affecting structure at this time.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	128	<b>Face Area (sq.):</b>	704
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	47
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>	
PERFORMANCE 8.00	Medium - wall is still performing well and is actually not needed in this through cut. Rock is moderately weathered but is not affecting the structure.	8	
WALL FOUNDATION MATERIAL 8.00	Firm soil, no foundation distress or undermining noted.	9	
PLACED STONE 8.00	Angular rock shows moderate weathering distress which is not affecting structure at this time. Interlocked well with minimum voids. No batter distress or bulging.	7	
LATERAL SLOPE 0.50	Stable road cut on both sides. Wall is installed in a through cut. Slopes outside the cut are gentle and well vegetated.	9	
ROAD/SIDEWALK/SHOULDER 0.50	No road or ditch distress noted.	9	
UPSLOPE 0.50	Flat-topped slope in through cut. Well vegetated.	9	
WALL DRAINS 0.50	No evidence of internal drainage distress noted.	9	
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

## **ROUTE 0010A: MAMMOTH TO NORRIS ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0010A\_19.648\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010B-23.550-R		
<b>Route Name:</b>	MADISON JUNCTION ROAD		
<b>Inspection Date:</b>	May 14, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	68	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry wall supporting fill slope at turnout.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	223	<b>Face Area (sq.):</b>	1196
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	77
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium - Needs repairs.		7
WALL FOUNDATION MATERIAL 8.00	Generally firm soil on steep slope except from approximately 11 feet from the start where foundation is undermined for a length of approximately 30 feet.		7
MORTAR 8.00	Mortar only slightly weathered - moderate to severe cracking and debonding throughout. Missing stone where mortar is missing.		6
STONE MASONRY 8.00	Generally only slight weathering, except top stones. Top stones are spalling or missing throughout and loose where present.		7
DOWNSLOPE 0.50	Steep rocky and tree covered to river.		8
ROAD/SIDEWALK/SHOULDER 0.50	No road distress. Shoulder eroded where top stones are missing.		8
WALL DRAINS 0.50	Underdrain installed in area of undermining. Little evidence of internal drainage		8
LATERAL SLOPE 0.50	Steep rocky and tree covered on both sides.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	Reset and replace missing top course of stones. 223 feet long x 1 foot top course height = 223 sq. ft. 223 sq. ft. at \$160/sq. ft. = \$35,680. Repoint mortar over half the area of the wall. 1196 sq. ft. / 2 = ~600 sq. ft. 600 sq. ft. x \$75/sq.ft. = \$45,000		
<b>Repair Cost:</b>	\$80,680		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0010B: MADISON JUNCTION ROAD**

**Retaining Wall Condition Photos**

**Condition photos are not available for YELL-0010B-23.550-R.**

<b>Wall ID:</b>	YELL-0010B-23.898-R		
<b>Route Name:</b>	MADISON JUNCTION ROAD		
<b>Inspection Date:</b>	May 14, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Slope Protection	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry placed slope protection with stone masonry guardrail.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	270	<b>Face Area (sq.):</b>	1600
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	47
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	-4
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Performing as intended.		9
WALL FOUNDATION MATERIAL 8.00	Firm gravelly soil.		9
PLACED STONE 8.00	Subrounded with minor weathering and small voids. Stone is on average two-foot minus.		8
DOWNSLOPE 0.50	Grasses and trees, stable steep slope swallowing towards river.		9
LATERAL SLOPE 0.50	Heavily forested on both ends.		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted.		9
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0010B: MADISON JUNCTION ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010B\_23.898\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010B-26.088-L		
<b>Route Name:</b>	MADISON JUNCTION ROAD		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Crib - Timber
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	Gravity - Mortared Stone
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Compound wall- 212 ft of placed stone and 170 ft of treated timber crib		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	382	<b>Face Area (sq.):</b>	3396
<b>Average Wall Height (ft.):</b>	8	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	12	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as intended		9
WALL FOUNDATION MATERIAL 8.00	No distress noted - riverbed,		8
BIN OR CRIB 8.00	Treated timber is newer- no distress noted 14' x 5' area of piping 64' from beginning of wall with some other areas of small piping		8
STONE MASONRY 8.00	No distress noted, slight weathering and stone are well interlocked		10
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted- some erosion in shoulder due to road runoff		8
LATERAL SLOPE 0.50	No distress noted, well vegetated		9
WALL DRAINS 0.50	No distress noted		9
DOWNSLOPE 1.00	Riverbed, moderate scour potential		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0010B: MADISON JUNCTION ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0010B\_26.088\_L\_1.jpg**



**YELL\_0010B\_26.088\_L\_2.jpg**



<b>Wall ID:</b>	YELL-0010B-26.222-L		
<b>Route Name:</b>	MADISON JUNCTION ROAD		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stone wall, acting as a fill wall		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	142	<b>Face Area (sq.):</b>	1846
<b>Average Wall Height (ft.):</b>	13	<b>Face Angle (deg.):</b>	46
<b>Maximum Wall Height (ft.):</b>	13	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as intended		9
WALL FOUNDATION MATERIAL 8.00	Foundation is in the river bed, no distress noted		9
PLACED STONE 8.00	Large 3 ft minus stone, interlocked very well, no distress noted		9
DOWNSLOPE 0.50	River bed		9
LATERAL SLOPE 0.50	Fill Material, well vegetated, 32% slope, stable		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0010B: MADISON JUNCTION ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010B\_26.222\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010B-27.036-R		
<b>Route Name:</b>	MADISON JUNCTION ROAD		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	2002
<b>*Wall Rating:</b>	98	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Cantilever - Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Stone Veneer
<b>General Description:</b>	Stone faced fill wall		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	132	<b>Face Area (sq.):</b>	1148
<b>Average Wall Height (ft.):</b>	8	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as intended		10
WALL FOUNDATION MATERIAL 8.00	Firm soil, no distress noted		9
CONCRETE 8.00	No distress noted		10
MORTAR 8.00	No distress noted		10
STONE MASONRY 8.00	No distress noted		10
DOWNSLOPE 0.50	Gentle slope to river bed		10
LATERAL SLOPE 0.50	Well vegetated, gentle slope and bridge		10
WALL DRAINS 0.50	Drains installed, no distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0010B: MADISON JUNCTION ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010B\_27.036\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010B-27.578-R		
<b>Route Name:</b>	MADISON JUNCTION ROAD		
<b>Inspection Date:</b>	May 29, 2007	<b>Approximate Year Built:</b>	2002
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	MSE - Welded Wire Face
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Stone
<b>General Description:</b>	MSE with welded wire baskets and a rockery face.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	121	<b>Face Area (sq.):</b>	878
<b>Average Wall Height (ft.):</b>	7	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as designed		9
WALL FOUNDATION MATERIAL 8.00	Firm gravelly soil		9
PLACED STONE 8.00	5 foot minus, some small voids, little weathering,		9
WIRE/GEOSYNTHETIC FACING 8.00	Welded wire baskets with geogrid		9
DOWNSLOPE 0.50	Gentle and forested		9
LATERAL SLOPE 0.50	Beginning has vegetated moderate slope, end has geo-wrapped wall that is scheduled to be removed in 2008		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress		9
WALL DRAINS 0.50	No distress		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0010B: MADISON JUNCTION ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010B\_27.578\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010B-29.633-L		
<b>Route Name:</b>	MADISON JUNCTION ROAD		
<b>Inspection Date:</b>	May 14, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Slope Protection	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry placed stone slope protection.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	98	<b>Face Area (sq.):</b>	1848
<b>Average Wall Height (ft.):</b>	18	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	27	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		9
WALL FOUNDATION MATERIAL 8.00	Firm veneer of soil over weather bedrock. No undermining.		9
PLACED STONE 8.00	Minor weathering of stone surface. Well interlocked, angular to sub-sounded, 3-foot minus stone. Bulges to 50 degrees at base.		8
DOWNSLOPE 0.50	Gentle, tree covered sloped.		9
LATERAL SLOPE 0.50	Start - steep stable well vegetated trees. End - stone masonry wall.		9
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	Replace and reset stone on both ends of wall. 2 laborers x 4 hours x \$55/hour = \$440. Excavator 4 hours x \$150 = \$600. Dump Truck 4 hours x \$120 = \$480. Total = \$1,520. Use local material. There is a pullout for staging. Steep lateral slopes		
<b>Repair Cost:</b>	\$1,520		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0010B: MADISON JUNCTION ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010B\_29.633\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010B-29.650-L		
<b>Route Name:</b>	MADISON JUNCTION ROAD		
<b>Inspection Date:</b>	May 14, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Fill wall supporting pullout and road.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	1535	<b>Face Area (sq.):</b>	12364
<b>Average Wall Height (ft.):</b>	8	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	34	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		8
WALL FOUNDATION MATERIAL 8.00	Prior repairs. Localized area of undermining and overstepping. Rock and soil.		8
MORTAR 8.00	Some debonding and some cracking.		8
STONE MASONRY 8.00	Slight weathering, some decomposition and couple stone missing.		8
DOWNSLOPE 0.50	Very steep rocky slope.		8
LATERAL SLOPE 0.50	Slope protection at start. Grass slope at end.		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress.		9
WALL DRAINS 0.50	No distress. Noted 1.5-inch drain installed.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	Grout void at base of wall - approximately 50 sq. ft. 50 sq.ft. x \$105/sq.ft. = \$5,250		
<b>Repair Cost:</b>	\$5,250		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0010B: MADISON JUNCTION ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010B\_29.650\_L\_1.jpg**



<b>Wall ID:</b>	YELL-0010B-30.736-R		
<b>Route Name:</b>	MADISON JUNCTION ROAD		
<b>Inspection Date:</b>	May 14, 2007	<b>Approximate Year Built:</b>	2001
<b>*Wall Rating:</b>	93	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Cantilever - Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Simulated Stone
<b>General Description:</b>	Concrete cantilever wall with simulated stone face support road cut.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	290	<b>Face Area (sq.):</b>	1919
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	78
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as designed		9
WALL FOUNDATION MATERIAL 8.00	Firm gravelly soil.		9
CONCRETE 8.00	Excellent - as new.		10
LATERAL SLOPE 0.50	Weathered rock cut on both ends. Raveling on the start side.		8
UPSLOPE 0.50	Steep, approximately 45 degrees, with some grass.		8
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0010B: MADISON JUNCTION ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010B\_30.736\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010B-30.947-L		
<b>Route Name:</b>	MADISON JUNCTION ROAD		
<b>Inspection Date:</b>	May 14, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	76	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	Gravity - Mortared Stone
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Compound wall consisting of dry place stone and stone masonry wall. Masonry stone in poor condition.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	171	<b>Face Area (sq.):</b>	3336
<b>Average Wall Height (ft.):</b>	19	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	37	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Performing as intended, however the stone masonry is potentially problematic.		8
WALL FOUNDATION MATERIAL 8.00	Firm gravelly soil over weathered rock.		9
STONE MASONRY 8.00	Spalling beyond mortar ( mortar is sticking out past stone).		6
PLACED STONE 8.00	Minor weathering, subrounded to subangular, and good interlocking between stones.		7
MORTAR 8.00	Appears fine, possibly repointed in the past, little to some debonding and little cracking.		8
DOWNSLOPE 0.50	Steep weathered rock with some trees and sparse grasses.		8
LATERAL SLOPE 0.50	Both ends consist of weathered rock slope with some trees and sparse grasses.		8
WALL DRAINS 0.50	No distress.		8
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0010B: MADISON JUNCTION ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010B\_30.947\_L\_1.jpg**



**YELL\_0010B\_30.947\_L\_2.jpg**

<b>Wall ID:</b>	YELL-0010B-33.030-R		
<b>Route Name:</b>	MADISON JUNCTION ROAD		
<b>Inspection Date:</b>	May 14, 2007	<b>Approximate Year Built:</b>	2001
<b>*Wall Rating:</b>	93	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Cantilever - Concrete
<b>Surface Treatment:</b>	Stain	<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Simulated Stone
<b>General Description:</b>	Cut wall supporting weathered rock slope.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	634	<b>Face Area (sq.):</b>	4011
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	-4
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as new, performing as designed.		9
WALL FOUNDATION MATERIAL 8.00	Firm gravelly soil.		9
CONCRETE 8.00	As new		10
LATERAL SLOPE 0.50	Weathered rock slope with minor raveling		9
UPSLOPE 0.50	Steep, stable slope with little grass.		9
WALL DRAINS 0.50	No distress noted. Drain holes observed at face		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0010B: MADISON JUNCTION ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010B\_33.030\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010B-34.070-R		
<b>Route Name:</b>	MADISON JUNCTION ROAD		
<b>Inspection Date:</b>	May 14, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	88	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry headwall and wing walls at 4-foot by 4-foot box culvert.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	23	<b>Face Area (sq.):</b>	81
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-4
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		9
WALL FOUNDATION MATERIAL 8.00	Very good, firm.		9
MORTAR 8.00	Slight debonding and slight cracking.		8
STONE MASONRY 8.00	Intact, competent.		9
CULVERT 0.50	No distress.		9
LATERAL SLOPE 0.50	Gentle vegetated slope.		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress.		9
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0010B: MADISON JUNCTION ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010B\_34.070\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010B-34.075-L		
<b>Route Name:</b>	MADISON JUNCTION ROAD		
<b>Inspection Date:</b>	May 14, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	88	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry head wall over culvert.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	24	<b>Face Area (sq.):</b>	85
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-4
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		9
WALL FOUNDATION MATERIAL 8.00	Firm.		9
MORTAR 8.00	Slight debonding and slight cracking.		8
STONE MASONRY 8.00	Fine intact rock.		9
LATERAL SLOPE 0.50	Gentle grassy slope.		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress.		9
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0010B: MADISON JUNCTION ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010B\_34.075\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010C-36.908-R		
<b>Route Name:</b>	MADISON TO OLD FAITHFUL ROAD		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	77	<b>Maintenance Action:</b>	Maintenance
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone Masonry Wall supporting fill slope, in good condition but needs maintenance to correct piping damage at back of wall caused by runoff from road shoulder.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	261	<b>Face Area (sq.):</b>	1024
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	72
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium - wall is still performing well but needs maintenance to correct piping damage. Mortar needs to be monitored.		8
WALL FOUNDATION MATERIAL 8.00	Wall toe is in Firehole River. Moderate scour potential but no evidence of scour distress to wall. No undermining noted.		8
MORTAR 8.00	Moderate debonding, cracking, spalling and weathering with many voids. No loose stones. Not affecting structure at this time. Needs to be monitored.		6
STONE MASONRY 8.00	2 ft. minus stones, angular and well interlocked. Little weathering and spalling distress noted.		9
DOWNSLOPE 0.50	Stable river channel with moderate scour potential		8
WALL DRAINS 0.50	Wall has piping holes behind top stones at intermittent locations probably from shoulder runoff. No evidence of internal drainage distress.		8
LATERAL SLOPE 0.50	Stable gentle fill slopes on both sides with sparse grass and tree cover.		9
ROAD/SIDEWALK/SHOULDER 1.00	Road shows no distress, runoff from shoulder is causing piping at upper wall stones.		6
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	Fill piping holes at top of wall at entire length and compact. Use local materials. 2 Laborers x 4 hr. = 8 hr. x \$55/hr = \$440		
<b>Repair Cost:</b>	\$440		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0010C: MADISON TO OLD FAITHFUL ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010C\_36.908\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010C-37.526-R		
<b>Route Name:</b>	MADISON TO OLD FAITHFUL ROAD		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stone fill wall supporting embankment fill.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	667	<b>Face Area (sq.):</b>	3043
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	75
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		8
WALL FOUNDATION MATERIAL 8.00	Riverbed.		8
PLACED STONE 8.00	Intact,, 3-foot minus rock with good interlocking and few voids.		8
DOWNSLOPE 0.50	River at wall face - high scour potential.		8
LATERAL SLOPE 0.50	Gentle grass covered slope.		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress.		8
WALL DRAINS 0.50	No distress.		8
CULVERT 0.50	As new.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0010C: MADISON TO OLD FAITHFUL ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010C\_37.526\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010D-53.627-R		
<b>Route Name:</b>	OLD FAITHFUL TO WEST THUMB ROAD		
<b>Inspection Date:</b>	May 16, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	Maintenance
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry placed stone wall supporting a fill		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	187	<b>Face Area (sq.):</b>	4108
<b>Average Wall Height (ft.):</b>	21	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	25	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- wall performing as intended but culvert needs to be cleaned		9
WALL FOUNDATION MATERIAL 8.00	firm soil, well vegetated with grass		9
PLACED STONE 8.00	No distress noted, minimal weathering and minimal voids, well interlocked		9
WALL DRAINS 0.50	No sign of internal drainage distress, but there is seepage under toe		8
DOWNSLOPE 0.50	gentle stable slope, well vegetated with trees		9
LATERAL SLOPE 0.50	stable fill slopes, well vegetated		9
ROAD/SIDEWALK/SHOULDER 0.50	No signs of distress in road or shoulder		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	1-Repair broken culvert - Salvage stones and excavate seepage from toe back to broken culvert, repair culvert, backfill, compact, and replace stones, excavator 8hrs @ \$150.00hr = \$1,200, 2 laborers x 8hr = 16hrs @ \$55.00hr = \$880.00.		
<b>Repair Cost:</b>	\$2,080		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0010D: OLD FAITHFUL TO WEST THUMB ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010D\_53.627\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010D-57.708-R		
<b>Route Name:</b>	OLD FAITHFUL TO WEST THUMB ROAD		
<b>Inspection Date:</b>	May 16, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mass Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Fractured Fin Concrete
<b>General Description:</b>	Fractured fin finish, concrete fill wall supporting roadway embankment.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	156	<b>Face Area (sq.):</b>	624
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	4	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as designed.		9
WALL FOUNDATION MATERIAL 8.00	Firm gravelly soil.		8
CONCRETE 8.00	As new.		10
DOWNSLOPE 0.50	Moderately steep, sandy gravelly slope with minor raveling. Heavy-loose rip-rap at bottom.		8
LATERAL SLOPE 0.50	Heavy-loose rip-rap (large rock - some large voids). Stable.		8
WALL DRAINS 0.50	No distress.		9
ARCHITECTURAL FACING 0.50	As new.		10
ROAD/SIDEWALK/SHOULDER 0.50	No distress.		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0010D: OLD FAITHFUL TO WEST THUMB ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010D\_57.708\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010D-57.770-R		
<b>Route Name:</b>	OLD FAITHFUL TO WEST THUMB ROAD		
<b>Inspection Date:</b>	May 16, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	Maintenance
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stack fill wall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	479	<b>Face Area (sq.):</b>	3150
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	11	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		8
WALL FOUNDATION MATERIAL 8.00	Firm gravelly soil.		8
PLACED STONE 8.00	Heavy-loose rip-rap. Largely intact rock with some large voids.		8
LATERAL SLOPE 0.50	Heavy-loose rip-rap with little to some large voids.		8
ROAD/SIDEWALK/SHOULDER 0.50	No road distress. One small wash in shoulder, approximately 30 feet from end of wall.		8
WALL DRAINS 0.50	No distress.		9
DOWNSLOPE 1.00	Rocky slope with little raveling.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	Fill erosion channel in shoulder with local material. The work may require some traffic control signage. There is a pull-out along the road - opposite of the erosion channel. One hour of labor = \$55.00		
<b>Repair Cost:</b>	\$55		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0010D: OLD FAITHFUL TO WEST THUMB ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010D\_57.770\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010D-57.933-R		
<b>Route Name:</b>	OLD FAITHFUL TO WEST THUMB ROAD		
<b>Inspection Date:</b>	May 16, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	83	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone Masonry Wall supporting cut slope, performing well, mortar needs monitoring.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	265	<b>Face Area (sq.):</b>	902
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	5	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well, mortar needs to be monitored for further deterioration.		8
WALL FOUNDATION MATERIAL 8.00	Toe at edge of pavement. Appears firm and stable with no distress.		9
MORTAR 8.00	Slight to moderate debonding and cracking. Last 60 ft. of wall has moderate to severe weathering. Evidence of repointing at intermittent locations.		7
STONE MASONRY 8.00	Minor weathering and spalling distress, no batter or bulging distress.		9
UPSLOPE 0.50	Snow covered but appears stable with no evidence of raveling.. Rocky with sparse vegetation.		8
LATERAL SLOPE 0.50	Steep but stable slopes on both sides, well vegetated with tree cover.		9
ROAD/SIDEWALK/SHOULDER 0.50	No evidence of road distress.		9
WALL DRAINS 0.50	No evidence of internal drainage distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0010D: OLD FAITHFUL TO WEST THUMB ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010D\_57.933\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010D-59.057-R		
<b>Route Name:</b>	OLD FAITHFUL TO WEST THUMB ROAD		
<b>Inspection Date:</b>	May 16, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	89	<b>Maintenance Action:</b>	Maintenance
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Cantilever - Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Brick Veneer
<b>General Description:</b>	Concrete cantilever wall with brick veneer. Mortar has disintegrated along top course of blocks and cap blocks.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	78	<b>Face Area (sq.):</b>	585
<b>Average Wall Height (ft.):</b>	7	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as new.		9
WALL FOUNDATION MATERIAL 8.00	Firm, gravelly soil.		9
CONCRETE 8.00	No distress.		9
DOWNSLOPE 0.50	Stable, gravelly rock slope.		8
LATERAL SLOPE 0.50	Steep embankment soil slope with trees and grass.		8
ROAD/SIDEWALK/SHOULDER 0.50	As new.		9
WALL DRAINS 0.50	No distress.		9
ARCHITECTURAL FACING 1.00	Concrete block as new. Mortar is cracking and falling out at top of wall and debonding in a few other areas.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	2 laborers x 8 hours x \$55/hour = \$880. Steep down slope and narrow shoulder will may maintenance more difficult.		
<b>Repair Cost:</b>	\$880		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0010D: OLD FAITHFUL TO WEST THUMB ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010D\_59.057\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010D-59.264-R		
<b>Route Name:</b>	OLD FAITHFUL TO WEST THUMB ROAD		
<b>Inspection Date:</b>	May 16, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	85	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mass Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Brick Veneer
<b>General Description:</b>	Concrete Gravity Wall with Brick Veneer supporting fill slope, performing well, cap bricks need to be monitored.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	221	<b>Face Area (sq.):</b>	1965
<b>Average Wall Height (ft.):</b>	8	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	11	<b>Vertical Offset (ft.):</b>	-13
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well, cap layer of brick veneer needs to be monitored.		8
WALL FOUNDATION MATERIAL 8.00	Firm soil, no undermining, no batter or bulging distress.		9
MORTAR 8.00	Mortar in veneer shows little distress except in cap layer where there is much debonding and cracking and some cap bricks are broken or loose.		8
CONCRETE 8.00	No evidence of internal distress.		9
DOWNSLOPE 0.50	Steep but stable fill slope, well vegetated.		9
LATERAL SLOPE 0.50	Steep stable well vegetated slopes on both sides.		9
WALL DRAINS 0.50	No evidence of internal drainage distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0010D: OLD FAITHFUL TO WEST THUMB ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010D\_59.264\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010D-60.362-L		
<b>Route Name:</b>	OLD FAITHFUL TO WEST THUMB ROAD		
<b>Inspection Date:</b>	May 16, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	94	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	MSE - Precast Panel
<b>Surface Treatment:</b>	Painted	<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Fractured Fin Concrete
<b>General Description:</b>	Precast panel MSE wall supporting roadway embankment.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	146	<b>Face Area (sq.):</b>	1369
<b>Average Wall Height (ft.):</b>	9	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as new.		9
WALL FOUNDATION MATERIAL 8.00	Firm, gravelly soil.		9
CONCRETE 8.00	As new.		10
MANUFACTURED BLOCK/BRICK 8.00	As new.		10
DOWNSLOPE 0.50	Stable embankment fill slope, many small trees and sparse grass with a little raveling.		8
LATERAL SLOPE 0.50	Stable embankment fill slope, many small trees and sparse grass with a little raveling.		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress.		9
WALL DRAINS 0.50	No distress.		9
ARCHITECTURAL FACING 0.50	As new.		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0010D: OLD FAITHFUL TO WEST THUMB ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010D\_60.362\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010E-70.642-R		
<b>Route Name:</b>	WEST THUMB TO FISHING BRIDGE ROAD		
<b>Inspection Date:</b>	May 16, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	83	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry headwall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	36	<b>Face Area (sq.):</b>	218
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		8
WALL FOUNDATION MATERIAL 8.00	Lake bed.		8
MORTAR 8.00	Few cracks and areas of debonding.		8
STONE MASONRY 8.00	Slightly weathered, intact, competent rock.		9
LATERAL SLOPE 0.50	Heavy-loose rip-rap.		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress.		9
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0010E: WEST THUMB TO FISHING BRIDGE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010E\_70.642\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010E-70.643-L		
<b>Route Name:</b>	WEST THUMB TO FISHING BRIDGE ROAD		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry headwall supporting a culvert		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	40	<b>Face Area (sq.):</b>	210
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as intended		9
WALL FOUNDATION MATERIAL 8.00	Stable stream channel, minimal scour potential		9
MORTAR 8.00	No distress noted, minimal cracking, slight debonding		9
STONE MASONRY 8.00	No distress noted		9
DOWNSLOPE 0.50	Lake shore, no distress noted		9
LATERAL SLOPE 0.50	stable fill slopes with sparse vegetation		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress		9
WALL DRAINS 0.50	No evidence of internal drainage distress		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0010E: WEST THUMB TO FISHING BRIDGE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010E\_70.643\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010E-71.484-R		
<b>Route Name:</b>	WEST THUMB TO FISHING BRIDGE ROAD		
<b>Inspection Date:</b>	May 16, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Placed stone- wall supporting fill		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	204	<b>Face Area (sq.):</b>	3438
<b>Average Wall Height (ft.):</b>	16	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	25	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		9
WALL FOUNDATION MATERIAL 8.00	No distress noted, firm soil		9
PLACED STONE 8.00	No distress noted - well interlocked, voids minimal		9
DOWNSLOPE 0.50	No distress, well vegetated		9
LATERAL SLOPE 0.50	No distress, well vegetated		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		9
WALL DRAINS 0.50	No evidence of internal drainage distress		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0010E: WEST THUMB TO FISHING BRIDGE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010E\_71.484\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010E-71.707-R		
<b>Route Name:</b>	WEST THUMB TO FISHING BRIDGE ROAD		
<b>Inspection Date:</b>	May 16, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stack fill wall supporting roadway embankment.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	183	<b>Face Area (sq.):</b>	2013
<b>Average Wall Height (ft.):</b>	11	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	22	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		8
WALL FOUNDATION MATERIAL 8.00	Firm soil and no undermining observed.		8
PLACED STONE 8.00	Interlocking, intact, competent, slightly weathered, 2-foot minus rock. Few small voids.		8
DOWNSLOPE 0.50	Stable moderately steep forested slope.		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress observed in the roadway or shoulder.		8
WALL DRAINS 0.50	No distress.		8
LATERAL SLOPE 1.00	Steep, forested embankment fill slopes.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0010E: WEST THUMB TO FISHING BRIDGE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010E\_71.707\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010E-72.406-L		
<b>Route Name:</b>	WEST THUMB TO FISHING BRIDGE ROAD		
<b>Inspection Date:</b>	May 16, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Headwall supporting culvert inlet performing well, 5 ft x 5 ft box culvert		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	36	<b>Face Area (sq.):</b>	182
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Performing as intended		9
WALL FOUNDATION MATERIAL 8.00	Stream channel, no distress noted, minimal scour potential		9
MORTAR 8.00	Minimal debonding and cracking		9
STONE MASONRY 8.00	No distress noted		9
DOWNSLOPE 0.50	Stable stream channel, no distress noted		9
LATERAL SLOPE 0.50	Stable fill slopes, sparse vegetation		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0010E: WEST THUMB TO FISHING BRIDGE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010E\_72.406\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010E-72.407-R		
<b>Route Name:</b>	WEST THUMB TO FISHING BRIDGE ROAD		
<b>Inspection Date:</b>	May 16, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry head wall and wing walls around 5 ft x 5 ft box culvert.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	36	<b>Face Area (sq.):</b>	182
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		8
WALL FOUNDATION MATERIAL 8.00	Compact to firm gravelly, sandy soil. Stable, no undermining observed.		8
MORTAR 8.00	Some debonding, few cracks, minor weathering.		8
STONE MASONRY 8.00	Intact, competent rock with little weathering.		8
DOWNSLOPE 0.50	Flat, gravelly sand beach.		8
LATERAL SLOPE 0.50	Embankment fill slope with large rocks, trees, and sparse grass.		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress in road or shoulder observed.		8
WALL DRAINS 0.50	No distress.		8
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0010E: WEST THUMB TO FISHING BRIDGE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010E\_72.407\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010E-77.100-R		
<b>Route Name:</b>	WEST THUMB TO FISHING BRIDGE ROAD		
<b>Inspection Date:</b>	May 16, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	89	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Slope Protection	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Placed stone for wall protection fill- less than 45% slope but needs to be monitored for lateral slope failure		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	150	<b>Face Area (sq.):</b>	3890
<b>Average Wall Height (ft.):</b>	25	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	31	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall is protecting slope well but adjacent slopes are over steepened and require monitoring		8
WALL FOUNDATION MATERIAL 8.00	Lake shoreline, gravelly, no undermining		9
PLACED STONE 8.00	2ft minus stone, no distress noted		10
DOWNSLOPE 0.50	Lake shore with moderate scour potential		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		9
WALL DRAINS 0.50	No signs of distress noted		10
LATERAL SLOPE 1.00	Over steepened and raveling		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0010E: WEST THUMB TO FISHING BRIDGE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010E\_77.100\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010F-89.794-R		
<b>Route Name:</b>	FISHING BRIDGE TO CANYON ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	84	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed Stone Wall supporting fill, performing well, no action required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	125	<b>Face Area (sq.):</b>	3024
<b>Average Wall Height (ft.):</b>	24	<b>Face Angle (deg.):</b>	47
<b>Maximum Wall Height (ft.):</b>	35	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well, no action required.		9
WALL FOUNDATION MATERIAL 8.00	Firm soil with gentle slope below, no undermining.		8
PLACED STONE 8.00	2 ft. minus stones, angular with little weathering distress, well interlocked, slight bulge at the tallest section.		8
DOWNSLOPE 0.50	Gentle stable slope well vegetated with grass and trees.		9
LATERAL SLOPE 0.50	Gentle stable slopes well vegetated with grass and trees		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress,		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0010F: FISHING BRIDGE TO CANYON ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010F\_89.794\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010F-90.173-R		
<b>Route Name:</b>	FISHING BRIDGE TO CANYON ROAD		
<b>Inspection Date:</b>	May 11, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed Stone Wall supporting fill, performing well, no action required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	294	<b>Face Area (sq.):</b>	4892
<b>Average Wall Height (ft.):</b>	16	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	27	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well, no action required.		9
WALL FOUNDATION MATERIAL 8.00	Firm soil on stable gentle slope, no undermining.		9
PLACED STONE 8.00	1.5 ft. minus stones, angular and well interlocked, very little weathering distress, no bulging distress.		9
DOWNSLOPE 0.50	Gentle slope well vegetated with trees and grass.		9
LATERAL SLOPE 0.50	Gentle slopes well vegetated with trees and grass.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage problems.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0010F: FISHING BRIDGE TO CANYON ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010F\_90.173\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010F-91.602-R		
<b>Route Name:</b>	FISHING BRIDGE TO CANYON ROAD		
<b>Inspection Date:</b>	May 11, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed stone Wall performing well, no action required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	88	<b>Face Area (sq.):</b>	1529
<b>Average Wall Height (ft.):</b>	17	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	18	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well, no action required.		9
WALL FOUNDATION MATERIAL 8.00	Firm soil, no undermining.		9
PLACED STONE 8.00	3 ft. minus sub angular stones moderately well interlocked with some voids to 12 in., minimal weathering, no bulging distress noted.		8
DOWNSLOPE 0.50	Gentle slope well vegetated with grass and trees.		9
LATERAL SLOPE 0.50	Gentle slopes well vegetated with grass and trees.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0010F: FISHING BRIDGE TO CANYON ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010F\_91.602\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010F-91.656-R		
<b>Route Name:</b>	FISHING BRIDGE TO CANYON ROAD		
<b>Inspection Date:</b>	May 11, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	97	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed rockery wall built in 2003.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	178	<b>Face Area (sq.):</b>	3453
<b>Average Wall Height (ft.):</b>	20	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	27	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Wall performing as intended		10
WALL FOUNDATION MATERIAL 8.00	Solid soil		9
PLACED STONE 8.00	No weathering and good interlock		10
WALL DRAINS 0.50	No distress		9
DOWNSLOPE 0.50	Gentle with vegetation		10
LATERAL SLOPE 0.50	Forested		10
ROAD/SIDEWALK/SHOULDER 0.50	No distress		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0010F: FISHING BRIDGE TO CANYON ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010F\_91.656\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010F-91.800-R		
<b>Route Name:</b>	FISHING BRIDGE TO CANYON ROAD		
<b>Inspection Date:</b>	May 11, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed Stone Wall supporting fill, performing well, no action required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	275	<b>Face Area (sq.):</b>	1778
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	56
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well, no action is required.		9
WALL FOUNDATION MATERIAL 8.00	Firm soil on gentle slope, no undermining distress noted.		9
PLACED STONE 8.00	2 ft. minus angular stones, well interlocked, minimal weathering, no bulging distress noted.		9
DOWNSLOPE 0.50	Gentle stable slope, well vegetated with trees and grass.		9
LATERAL SLOPE 0.50	Gentle stable slopes, well vegetated with trees and grass.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress noted.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0010F: FISHING BRIDGE TO CANYON ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010F\_91.800\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010F-93.140-R		
<b>Route Name:</b>	FISHING BRIDGE TO CANYON ROAD		
<b>Inspection Date:</b>	May 11, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed Stone Wall supporting fill slope, performing well, no action required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	170	<b>Face Area (sq.):</b>	2845
<b>Average Wall Height (ft.):</b>	16	<b>Face Angle (deg.):</b>	46
<b>Maximum Wall Height (ft.):</b>	17	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well, no action is required.		9
WALL FOUNDATION MATERIAL 8.00	Firm soil on gentle slope, high water might reach toe, moderate scour potential but no scour distress or undermining noted.		8
PLACED STONE 8.00	2 ft. minus angular stone, well interlocked, minimal weathering distress no bulging distress noted.		9
DOWNSLOPE 0.50	Gentle grassy slope to edge of river.		9
LATERAL SLOPE 0.50	Steeper but stable slopes, well vegetated with grass and trees.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress noted.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0010F: FISHING BRIDGE TO CANYON ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010F\_93.140\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010F-94.872-R		
<b>Route Name:</b>	FISHING BRIDGE TO CANYON ROAD		
<b>Inspection Date:</b>	May 11, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	88	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone Masonry Wall supporting fill, performing well, no action is required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	381	<b>Face Area (sq.):</b>	4145
<b>Average Wall Height (ft.):</b>	10	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	16	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	HIGH - wall is performing well, no action is required.		9
WALL FOUNDATION MATERIAL 8.00	Firm soil and rock fill on gentle slope, no undermining noted.		9
STONE MASONRY 8.00	3 ft. minus sub angular stones, slight surface spalling, no deep weathering. No bulging or batter distress noted.		8
MORTAR 8.00	Minimal debonding, cracking, spalling and weathering. Well-fitted joints.		9
DOWNSLOPE 0.50	Soil or rock fill on gentle slope with sparse vegetation above Sulfur Caldera.		9
LATERAL SLOPE 0.50	Stable fill slopes, well vegetated with trees and grass.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress noted.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0010F: FISHING BRIDGE TO CANYON ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010F\_94.872\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010F-96.363-R		
<b>Route Name:</b>	FISHING BRIDGE TO CANYON ROAD		
<b>Inspection Date:</b>	May 11, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	78	<b>Maintenance Action:</b>	Maintenance
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone Masonry Headwall at box culvert outlet, still performing but needs repair for scour damage.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	46	<b>Face Area (sq.):</b>	320
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	12	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium - headwall is still performing but needs repair of scour damage.		8
WALL FOUNDATION MATERIAL 8.00	Toe is scoured out in riverbed material and undermined at both ends of wall.		7
MORTAR 8.00	Minimal debonding, spalling, cracking, minor near-surface weathering.		8
STONE MASONRY 8.00	2 ft. minus angular stones, well interlocked, slight spalling at surface but no deep weathering noted. No batter or bulging distress.		8
LATERAL SLOPE 0.50	Gentle stable grassy fill slopes.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress.		9
DOWNSLOPE 1.00	Gravelly streambed with moderate scour potential.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	Fill scour holes with rock. Use local materials. 2 Laborers x 4 hr. = 8 hr. x \$55/hr. = \$440		
<b>Repair Cost:</b>	\$440		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0010F: FISHING BRIDGE TO CANYON ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010F\_96.363\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010F-96.365-L		
<b>Route Name:</b>	FISHING BRIDGE TO CANYON ROAD		
<b>Inspection Date:</b>	May 11, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	78	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Gravity stone headwall		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	58	<b>Face Area (sq.):</b>	376
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	12	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium, performing well with a slight scour		8
WALL FOUNDATION MATERIAL 8.00	Some distress at corners of box culvert		7
MORTAR 8.00	Some cracking, slight debonding of mortar		8
STONE MASONRY 8.00	Some distress of foundation at box culvert		8
CULVERT 0.50	No signs of distress noted		9
LATERAL SLOPE 0.50	Well vegetated, gentle slope		9
ROAD/SIDEWALK/SHOULDER 0.50	No signs of distress noted		9
WALL DRAINS 0.50	No signs of distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	Repair scour at inlet. 1 - 2 laborers for 4 hrs = 8 hrs, 8 hrs @ \$55.00 = \$440.00. 2 - Use existing material found on site.		
<b>Repair Cost:</b>	\$440		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0010F: FISHING BRIDGE TO CANYON ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010F\_96.365\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010F-96.784-R		
<b>Route Name:</b>	FISHING BRIDGE TO CANYON ROAD		
<b>Inspection Date:</b>	May 11, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	85	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone Masonry Headwall at culvert outlet, performing well, no action is required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	50	<b>Face Area (sq.):</b>	272
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	9	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well, no action is required.		9
WALL FOUNDATION MATERIAL 8.00	Gravelly streambed with moderate scour potential but no scour distress noted.		8
STONE MASONRY 8.00	3 ft. minus angular stones with minor spalling and shallow weathering except for two stones at north end with spalling back to about 3 inches.		8
MORTAR 8.00	Minimal debonding, cracking, spalling and weathering.		9
DOWNSLOPE 0.50	Gravelly streambed with moderate scour potential.		8
LATERAL SLOPE 0.50	Stable fill slopes with sparse vegetation.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No internal drainage distress noted.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0010F: FISHING BRIDGE TO CANYON ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010F\_96.784\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010F-96.785-L		
<b>Route Name:</b>	FISHING BRIDGE TO CANYON ROAD		
<b>Inspection Date:</b>	May 11, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	76	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone head wall		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	56	<b>Face Area (sq.):</b>	297
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	9	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>	
PERFORMANCE 8.00	Medium- wall has a slight scour	8	
WALL FOUNDATION MATERIAL 8.00	Some scour at corners of box culvert	7	
STONE MASONRY 8.00	Some scour at corners of box culvert	7	
MORTAR 8.00	Some cracking of mortar, with some slight debonding	8	
CULVERT 0.50	No signs of distress noted	9	
LATERAL SLOPE 0.50	Gentle, well vegetated slope	9	
ROAD/SIDEWALK/SHOULDER 0.50	No signs of distress noted	9	
WALL DRAINS 0.50	No signs of distress noted	9	
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	1- Repair scour @ box culvert ends, 2 laborers @ 4 hrs = 8 hrs total, 8 hrs @ \$55.00 hr = \$440.00. 2- Use existing material found on site		
<b>Repair Cost:</b>	\$440		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0010F: FISHING BRIDGE TO CANYON ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010F\_96.785\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010F-99.582-R		
<b>Route Name:</b>	FISHING BRIDGE TO CANYON ROAD		
<b>Inspection Date:</b>	May 11, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	83	<b>Maintenance Action:</b>	Maintenance
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone Masonry Headwall at culvert outlet, performing well but needs maintenance for scour damage.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	46	<b>Face Area (sq.):</b>	232
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	9	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - wall is performing well but needs maintenance to remove heavy spalling from several stones at stream level and rock up scour holes.		8
WALL FOUNDATION MATERIAL 8.00	Gravelly streambed with some scour damage near ends.		8
STONE MASONRY 8.00	3 ft. minus angular stones with minor spalling and shallow weathering throughout except at the streambed where spalling is locally heavy on some stones. No batter distress..		8
MORTAR 8.00	Minimal debonding, cracking, spalling, or shallow weathering distress noted.		9
DOWNSLOPE 0.50	Gravelly streambed with moderate scour potential.		8
LATERAL SLOPE 0.50	Stable fill slopes with sparse grassy vegetation.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	Scale spalling from base rocks and rock up these locations and fill scour holes. Use local durable rock material. 2 Laborers x 4 hr. = 8 hr. x \$55/hr = \$440		
<b>Repair Cost:</b>	\$440		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0010F: FISHING BRIDGE TO CANYON ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010F\_99.582\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010F-99.583-L		
<b>Route Name:</b>	FISHING BRIDGE TO CANYON ROAD		
<b>Inspection Date:</b>	May 11, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	59	<b>Maintenance Action:</b>	Replace Wall
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone head wall with a box culvert		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	56	<b>Face Area (sq.):</b>	297
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	9	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>	
PERFORMANCE 8.00	Low- wing walls are failing	4	
WALL FOUNDATION MATERIAL 8.00	Some scour at corners of box culvert	7	
STONE MASONRY 8.00	Moderate weathering, wing walls are failing, some scour at corners of box culvert	4	
MORTAR 8.00	Some cracking with some slight debonding of mortar	8	
LATERAL SLOPE 0.50	Rocky with some vegetation	8	
CULVERT 0.50	No signs of distress noted	9	
ROAD/SIDEWALK/SHOULDER 0.50	No signs of distress noted	9	
WALL DRAINS 0.50	No signs of distress noted	9	
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	1- Rebuild wing walls - 200sqft masonry @ \$160.00 sqft = \$32,000. 2- Repair scour at corners of box culvert - 2 laborers @ 4 hrs = 8hrs total, 8 hrs @ \$55.00 hr = \$440.00		
<b>Repair Cost:</b>	\$32,440		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0010F: FISHING BRIDGE TO CANYON ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010F\_99.583\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010F-100.750-R		
<b>Route Name:</b>	FISHING BRIDGE TO CANYON ROAD		
<b>Inspection Date:</b>	May 11, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed Stone Wall supporting fill slope, performing well, no action required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	91	<b>Face Area (sq.):</b>	811
<b>Average Wall Height (ft.):</b>	8	<b>Face Angle (deg.):</b>	46
<b>Maximum Wall Height (ft.):</b>	12	<b>Vertical Offset (ft.):</b>	-3
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well, no action is required.		9
WALL FOUNDATION MATERIAL 8.00	Firm soil on steep stable slope to riverbank, well vegetated with trees and grass. No evidence of river scour undermining bank.		9
PLACED STONE 8.00	1.5 ft. minus angular rock well interlocked, minimal weathering distress, no bulging distress noted.		9
DOWNSLOPE 0.50	Steep stable tree covered slope to riverbank. No undermining noted.		8
LATERAL SLOPE 0.50	Steep stable tree covered slopes to riverbank.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress,		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0010F: FISHING BRIDGE TO CANYON ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010F\_100.750\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010F-101.911-R		
<b>Route Name:</b>	FISHING BRIDGE TO CANYON ROAD		
<b>Inspection Date:</b>	May 11, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed Stone Wall supporting fill slope, Performing well, no action required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	80	<b>Face Area (sq.):</b>	640
<b>Average Wall Height (ft.):</b>	8	<b>Face Angle (deg.):</b>	46
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - wall is performing well, no action is required.		9
WALL FOUNDATION MATERIAL 8.00	Firm soil near steep stream bank about 6 ft. high with scour potential but no local scour damage noted, no undermining.		8
PLACED STONE 8.00	1.5 ft. minus angular stones well interlocked, minimal weathering and no bulging distress noted.		9
DOWNSLOPE 0.50	Well vegetated but near steep 6 ft. high stream bank, no scour distress noted.		8
LATERAL SLOPE 0.50	Steep stable well vegetated fill slopes.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress noted.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0010F: FISHING BRIDGE TO CANYON ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010F\_101.911\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010G-107.624-L		
<b>Route Name:</b>	CANYON TO TOWER ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	66	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Rockery cut wall		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	30	<b>Face Area (sq.):</b>	165
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	62
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as intended. No signs of distress.		8
WALL FOUNDATION MATERIAL 8.00	Founded on soil. No signs of distress.		7
PLACED STONE 8.00	Hard, durable large boulder size rock.		9
ROAD/SIDEWALK/SHOULDER 0.50	Newly constructed road. Very good condition.		9
WALL DRAINS 1.00	None observed. No signs of drainage related issues.		7
LATERAL SLOPE 5.00	Wall start on 1.25:1 soil slope, minor sloughing. Wall end on slump, wet, unstable slope.		3
UPSLOPE 5.00	Unstable soil slope.		3
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0010G: CANYON TO TOWER ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010G\_107.624\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010G-107.652-L		
<b>Route Name:</b>	CANYON TO TOWER ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	81	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Rockery on cut side with stone mortared ditch at wall end.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	54	<b>Face Area (sq.):</b>	350
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	68
<b>Maximum Wall Height (ft.):</b>	7	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as intended. No signs of distress.		8
WALL FOUNDATION MATERIAL 8.00	No signs of distress or settlement.		8
PLACED STONE 8.00	Hard, durable rock.		9
CURB/BERM/DITCH 0.50	Aggregate ditch. Performing as intended. No signs of distress.		8
UPSLOPE 1.00	Steep 1:1 soil slope.		4
ROAD/SIDEWALK/SHOULDER 0.50	Newly constructed road. Very good condition.		9
LATERAL SLOPE 1.00	Ties into rock at wall start. 1.5:1 soil slope at wall end.		6
WALL DRAINS 1.00	None observed. No signs of drainage related issues.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0010G: CANYON TO TOWER ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010G\_107.652\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010G-108.281-R		
<b>Route Name:</b>	CANYON TO TOWER ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	70	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Gravity dry stacked fill wall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	107	<b>Face Area (sq.):</b>	580
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	62
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-3
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Functioning as intended. Newly constructed wall.		7
WALL FOUNDATION MATERIAL 8.00	On soft soil, however no indication of settlement or movement.		6
PLACED STONE 8.00	Hard, durable large boulder size rock. Several loose rocks along top of the wall.		8
DOWNSLOPE 0.50	Soil, no signs of erosion.		8
LATERAL SLOPE 0.50	Ties into moderate soil slopes.		8
CULVERT 1.00	Culvert outlet is not visible due to snow but appears to functioning.		7
ROAD/SIDEWALK/SHOULDER 1.00	Newly constructed road. Pavement is in very good condition, however shoulder is soft.		7
WALL DRAINS 1.00	None observed. No signs of drainage related issues.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0010G: CANYON TO TOWER ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010G\_108.281\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010G-109.098-L		
<b>Route Name:</b>	CANYON TO TOWER ROAD		
<b>Inspection Date:</b>	May 18, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Gravity dry stacked cut wall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	118	<b>Face Area (sq.):</b>	850
<b>Average Wall Height (ft.):</b>	7	<b>Face Angle (deg.):</b>	70
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Good. Performing as intended.		8
WALL FOUNDATION MATERIAL 8.00	Founded on aggregate. No signs of distress.		8
PLACED STONE 8.00	Hard, durable large boulder size rock with smaller rock filling in voids.		9
CURB/BERM/DITCH 0.50	Aggregate ditch. Performing as intended. No signs of distress.		8
UPSLOPE 1.00	Clayey soils. 1.5:1 slopes, marginally stable. Signs of creep on natural slope above.		4
ROAD/SIDEWALK/SHOULDER 0.50	Newly constructed road. Very good condition.		9
LATERAL SLOPE 1.00	Clayey soils. Marginally stable on wall end.		5
WALL DRAINS 1.00	None observed. No signs of drainage related issues.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0010G: CANYON TO TOWER ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010G\_109.098\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010G-109.207-L		
<b>Route Name:</b>	CANYON TO TOWER ROAD		
<b>Inspection Date:</b>	May 18, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	71	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Gravity dry stacked cut wall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	147	<b>Face Area (sq.):</b>	1500
<b>Average Wall Height (ft.):</b>	10	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as intended however slope drainage could cause premature failure.		5
WALL FOUNDATION MATERIAL 8.00	Founded on aggregate ditch and soil. No signs of distress.		8
PLACED STONE 8.00	Very large durable boulder size rock with smaller rock filling voids.		9
CURB/BERM/DITCH 0.50	Ditch in good shape, performing as intended.		8
LATERAL SLOPE 0.50	Clayey soil and moderate slope.		8
ROAD/SIDEWALK/SHOULDER 0.50	Newly constructed road. Very good condition.		9
WALL DRAINS 1.00	None observed. No signs of drainage related issues.		7
UPSLOPE 5.00	Clayey soils, 1.5:1 slope, steep grassy slope, toe of slump present above. Channel eroding above and within wall.		3
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0010G: CANYON TO TOWER ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010G\_109.207\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010G-109.300-L		
<b>Route Name:</b>	CANYON TO TOWER ROAD		
<b>Inspection Date:</b>	May 18, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Gravity dry stacked fill wall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	130	<b>Face Area (sq.):</b>	650
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	70
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Good condition, no indication of settlement or movement.		9
WALL FOUNDATION MATERIAL 8.00	Founded on soil but in good condition, no indication of settlement or movement.		7
PLACED STONE 8.00	Hard, durable large boulder size rock.		9
DOWNSLOPE 0.50	Soil, no signs of erosion.		8
LATERAL SLOPE 0.50	Ties into soil slopes.		8
WALL DRAINS 0.50	None observed. No signs of drainage related issues.		8
ROAD/SIDEWALK/SHOULDER 0.50	Newly constructed road. Very good condition.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0010G: CANYON TO TOWER ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010G\_109.300\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010G-110.467-L		
<b>Route Name:</b>	CANYON TO TOWER ROAD		
<b>Inspection Date:</b>	May 18, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	58	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Gravity dry stacked fill wall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	113	<b>Face Area (sq.):</b>	475
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	70
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Wall is performing as intended however soft shoulder and soft foundation may create future problems.		6
WALL FOUNDATION MATERIAL 8.00	Founded on soft soil, however no evidence of distress or settlement.		5
PLACED STONE 8.00	Good, hard, durable large boulder size rock.		8
LATERAL SLOPE 0.50	Soil slopes with moderate vegetation, 2:1.		8
WALL DRAINS 0.50	None observed. No signs of drainage related issues.		8
ROAD/SIDEWALK/SHOULDER 1.00	Newly constructed road. Very good condition. Soft shoulder.		6
DOWNSLOPE 5.00	Some erosion, rills and gullies present.		3
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0010G: CANYON TO TOWER ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010G\_110.467\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010G-111.381-R		
<b>Route Name:</b>	CANYON TO TOWER ROAD		
<b>Inspection Date:</b>	May 18, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	68	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Gravity dry stacked cut wall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	103	<b>Face Area (sq.):</b>	650
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	73
<b>Maximum Wall Height (ft.):</b>	7	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Wall performing as intended but not long enough.		7
WALL FOUNDATION MATERIAL 8.00	Founded on aggregate ditch and soil. Some snow cover. No signs of distress.		8
PLACED STONE 8.00	Very large durable boulder size rock with smaller rock filling voids.		8
UPSLOPE 1.00	Unstable soils with signs of recent sloughing.		4
WALL DRAINS 0.50	None observed. No signs of drainage related issues.		8
ROAD/SIDEWALK/SHOULDER 0.50	Newly constructed road. Very good condition.		9
LATERAL SLOPE 5.00	Sloughing soils at wall end.		3
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0010G: CANYON TO TOWER ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010G\_111.381\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010G-112.774-R		
<b>Route Name:</b>	CANYON TO TOWER ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	81	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Gravity dry stacked cut wall (rockery).		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	105	<b>Face Area (sq.):</b>	420
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	60
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-3
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as intended.		8
WALL FOUNDATION MATERIAL 8.00	Founded on aggregate shoulder and soil. No indication of settlement or movement.		8
PLACED STONE 8.00	Hard, durable large boulder size rock.		9
ROAD/SIDEWALK/SHOULDER 0.50	Newly constructed road. Good condition.		8
WALL DRAINS 0.50	None observed. No signs of drainage related issues.		8
LATERAL SLOPE 1.00	Soil, slump and seepage at wall end. Not affecting wall performance.		5
UPSLOPE 1.00	Clay soil, shows initial stages of vegetation, 1.5:1 slope.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0010G: CANYON TO TOWER ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010G\_112.774\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010G-119.743-R		
<b>Route Name:</b>	CANYON TO TOWER ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	65	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stacked fill wall with stone mortared guardwall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	333	<b>Face Area (sq.):</b>	3000
<b>Average Wall Height (ft.):</b>	9	<b>Face Angle (deg.):</b>	75
<b>Maximum Wall Height (ft.):</b>	20	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Functioning poor to fair, especially at wall start. Some repairs required at wall start.		5
WALL FOUNDATION MATERIAL 8.00	Founded on soil. No signs of settlement or distress.		7
PLACED STONE 8.00	Minor weathering, no missing stones, some deformation at wall start.		6
STONE MASONRY 8.00	Some deformation at wall start.		6
MORTAR 8.00	recently repaired, good condition, newly remortared.		8
TRAFFIC BARRIER/FENCE 0.50	Guard wall in good condition.		8
ROAD/SIDEWALK/SHOULDER 0.50	Roadway has recently be overlayed.		9
LATERAL SLOPE 1.00	Soil and boulders. Moderate slope. No signs of distress.		6
DOWNSLOPE 1.00	Soil and boulders. Moderate slope. No signs of distress.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	Repair roughly 100 square ft. 100 s.f. x \$50= \$5,000.		
<b>Repair Cost:</b>	\$5,000		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0010G: CANYON TO TOWER ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0010G\_119.743\_R\_1.jpg**



**YELL\_0010G\_119.743\_R\_2.jpg**

<b>Wall ID:</b>	YELL-0010G-120.405-L		
<b>Route Name:</b>	CANYON TO TOWER ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	77	<b>Maintenance Action:</b>	Maintenance
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone mortared headwall at inlet of Tower Creek (Tower Falls).		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	103	<b>Face Area (sq.):</b>	1240
<b>Average Wall Height (ft.):</b>	12	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	20	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as intended.		8
WALL FOUNDATION MATERIAL 8.00	Founded on creek bed. No signs of distress or settlement.		8
MORTAR 8.00	Older mortar on guard wall and newer mortar on headwall. Minor cracks.		7
STONE MASONRY 8.00	Hard, durable rock.		8
CULVERT 0.50	Concrete arch. No cracks or signs of distress.		8
LATERAL SLOPE 0.50	Ties into soil at wall start and rock at wall end. No signs of erosion.		8
ROAD/SIDEWALK/SHOULDER 0.50	Recent overlay.		8
WALL DRAINS 0.50	None observed. No signs of drainage related issues.		8
TRAFFIC BARRIER/FENCE 1.00	Guard wall is good shape except at wall start where it appears to be struck by vehicle.		5
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	4 hours labor x \$55 = \$220. 1 hour backhoe x \$150 =150. Total \$370		
<b>Repair Cost:</b>	\$370		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0010G: CANYON TO TOWER ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010G\_120.405\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0010G-120.405-R		
<b>Route Name:</b>	CANYON TO TOWER ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	75	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone mortared headwall at outlet of Tower Creek (Tower Falls).		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	96	<b>Face Area (sq.):</b>	1150
<b>Average Wall Height (ft.):</b>	11	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	25	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as intended. No signs of distress.		8
WALL FOUNDATION MATERIAL 8.00	Founded on creek bed. No signs of distress or settlement.		8
MORTAR 8.00	Older mortar on guard wall and newer mortar on headwall. Minor cracks.		6
STONE MASONRY 8.00	Hard durable rock.		8
CULVERT 0.50	Concrete arch. No cracks or signs of distress.		8
ROAD/SIDEWALK/SHOULDER 0.50	Recent overlay, no cracks.		8
TRAFFIC BARRIER/FENCE 0.50	Guard wall in good condition.		8
WALL DRAINS 0.50	None observed. No signs of drainage related issues.		8
LATERAL SLOPE 1.00	Ties into soil at wall start, v. minor sloughing. Ties into existing distressed fill wall at end. Does not appear to be affecting headwall,		5
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0010G: CANYON TO TOWER ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010G\_120.405\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010G-120.424-R		
<b>Route Name:</b>	CANYON TO TOWER ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	52	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	Gravity - Mortared Stone
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stacked fill wall with stone mortared guardwall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	410	<b>Face Area (sq.):</b>	10000
<b>Average Wall Height (ft.):</b>	24	<b>Face Angle (deg.):</b>	46
<b>Maximum Wall Height (ft.):</b>	33	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>	
PERFORMANCE 8.00	Steep wall failing at wall start. Wall transitions flatter at wall end.	4	
WALL FOUNDATION MATERIAL 8.00	Founded on stream channel and soil/boulder mix. Some minor undercutting along wall foundation.	5	
PLACED STONE 8.00	Minor weathering, failing at wall start. Loose stones in several areas along wall.	3	
STONE MASONRY 8.00	Hard, durable guard wall stone. Some missing caprock. Minor cracks.	6	
MORTAR 8.00	Older with some cracking as expected due to age.	7	
ROAD/SIDEWALK/SHOULDER 1.00	Some minor cracks and potholes, shoulder edge raveling.	5	
TRAFFIC BARRIER/FENCE 1.00	Guard wall in fair shape with a couple loose and missing caprock.	5	
WALL DRAINS 1.00	Metal drains visible. Functioning as intended.	6	
DOWNSLOPE 1.00	Loose rock between wall and channel. No undermining visible.	7	
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	600 s.f. x \$50 = 30,000. (may be less as existing rock can be re-used)		
<b>Repair Cost:</b>	\$30,000		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0010G: CANYON TO TOWER ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010G\_120.424\_R\_1.jpg**



**YELL\_0010G\_120.424\_R\_2.jpg**

<b>Wall ID:</b>	YELL-0010G-120.542-R		
<b>Route Name:</b>	CANYON TO TOWER ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	69	<b>Maintenance Action:</b>	Maintenance
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	Gravity - Mortared Stone
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stacked fill wall with stone mortared guardwall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	125	<b>Face Area (sq.):</b>	3000
<b>Average Wall Height (ft.):</b>	24	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	40	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Wall performing as intended, missing a couple of caprock pieces.		6
WALL FOUNDATION MATERIAL 8.00	Founded on soil, no signs of distress or settlement.		7
MORTAR 8.00	Minor cracks as expected for this older mortar.		7
PLACED STONE 8.00	Minor weathering, some loose rock near the top.		7
STONE MASONRY 8.00	Hard, durable guard wall stone, minor cracks.		8
TRAFFIC BARRIER/FENCE 0.50	Guard wall in good shape.		8
ROAD/SIDEWALK/SHOULDER 1.00	Road. Some block cracks, raveling along the shoulder edge, rutting, alligator cracks, all low to moderate severity.		5
DOWNSLOPE 1.00	Soil and loose rock above creek, no signs of erosion or distress.		6
LATERAL SLOPE 1.00	1:5:1 on soil slope. No signs of distress.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	2 hrs. x \$55 = \$110 2 stone x \$100 = \$200 Total \$310		
<b>Repair Cost:</b>	\$310		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0010G: CANYON TO TOWER ROAD**

**Retaining Wall Condition Photos**



**YELL\_0010G\_120.542\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010G-120.816-R		
<b>Route Name:</b>	CANYON TO TOWER ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	58	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	Gravity - Dry Stone
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone mortared and dry stacked fill wall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	1400	<b>Face Area (sq.):</b>	8400
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	72
<b>Maximum Wall Height (ft.):</b>	25	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Fair. Functioning as intended. Some (6 to 7) spots missing caprock.		7
WALL FOUNDATION MATERIAL 8.00	Some erosion undermining the wall foundation, beginning 1/3 of wall has severe undermining.		3
PLACED STONE 8.00	Some loose and missing rock.		6
MORTAR 8.00	Some minor cracks and small gaps.		7
STONE MASONRY 8.00	Hard durable rock, some weathering.		8
DOWNSLOPE 1.00	Over steepened and loose material.		4
LATERAL SLOPE 1.00	Gentle slope at start of wall. Moderately steep at wall end.		5
VEGETATION 1.00	Some brush and small trees but not affecting wall performance.		6
TRAFFIC BARRIER/FENCE 1.00	Guard wall in good condition, some stones missing.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	3 hours labor x \$55 = \$165		
<b>Repair Cost:</b>	\$165		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0010G: CANYON TO TOWER ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0010G\_120.816\_R\_1.jpg**



**YELL\_0010G\_120.816\_R\_2.jpg**

<b>Wall ID:</b>	YELL-0010H-128.277-R		
<b>Route Name:</b>	TOWER JUNCTION TO MAMMOTH ROAD		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	70	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	Gravity - Dry Stone
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone mortared gravity fill wall on outside curve.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	854	<b>Face Area (sq.):</b>	3400
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	75
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Good. Functioning as intended. Some missing guardrail stone.		7
WALL FOUNDATION MATERIAL 8.00	No signs of settlement or displacement.		8
MORTAR 8.00	Some spalling, some cracks, broken and missing in places.		6
PLACED STONE 8.00	Some weathering, spalling, some fractures.		7
STONE MASONRY 8.00	Some missing, some spalling.		7
WALL DRAINS 0.50	None. No signs of drainage related issues.		8
ROAD/SIDEWALK/SHOULDER 1.00	Some recent patching may be due to settlement. Some alligator cracking, minor rutting.		5
CULVERT 1.00	24" CMP, functioning as intended		7
DOWNSLOPE 1.00	Steep 1:1 average slope, well vegetated, no signs of erosion or distress.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	4 hours labor x \$55 = \$220		
<b>Repair Cost:</b>	\$220		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0010H: TOWER JUNCTION TO MAMMOTH ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010H\_128.277\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010H-131.186-R		
<b>Route Name:</b>	TOWER JUNCTION TO MAMMOTH ROAD		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	69	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone mortared gravity fill wall on inside curve.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	166	<b>Face Area (sq.):</b>	500
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	72
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Fair to good. No signs of distress, functioning as intended.		7
WALL FOUNDATION MATERIAL 8.00	No signs of settlement or displacement.		7
MORTAR 8.00	Some minor cracking and spalling.		7
PLACED STONE 8.00	Some weathering, spalling, and cracking.		7
STONE MASONRY 8.00	Some spalling and cracking.		7
LATERAL SLOPE 0.50	Gentle, no signs of distress.		8
DOWNSLOPE 1.00	1:1, moderate vegetation, over steepened in spots.		5
ROAD/SIDEWALK/SHOULDER 1.00	Minor transverse cracks.		5
WALL DRAINS 1.00	None. No signs of drainage related issues.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	4 hours labor x \$55 = \$220. 1Yard cut rock x \$200 = \$200. Total = \$420		
<b>Repair Cost:</b>	\$420		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0010H: TOWER JUNCTION TO MAMMOTH ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010H\_131.186\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010H-137.128-R		
<b>Route Name:</b>	TOWER JUNCTION TO MAMMOTH ROAD		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	74	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	Gravity - Mortared Stone
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone mortared top and bottom and dry stacked mid section of wall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	186	<b>Face Area (sq.):</b>	8000
<b>Average Wall Height (ft.):</b>	43	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	76	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Good, wall performing as intended. No signs of distress.		7
WALL FOUNDATION MATERIAL 8.00	No sign of distress or settlement.		8
MORTAR 8.00	Fair, some cracking on lower portion of wall.		6
PLACED STONE 8.00	Good, durable rock, little weathering, some minor spalling and cracking.		7
STONE MASONRY 8.00	Good, hard, durable guard wall and caprock.		9
VEGETATION 0.50	Some grass and soil on upper wall, no adverse affect on wall.		8
WALL DRAINS 0.50	None observed. No signs of drainage related issues.		8
TRAFFIC BARRIER/FENCE 0.50	Guard wall in very good condition.		9
DOWNSLOPE 1.00	1:1 to 1.5:1, moderate vegetation.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0010H: TOWER JUNCTION TO MAMMOTH ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0010H\_137.128\_R\_1.jpg**



**YELL\_0010H\_137.128\_R\_2.jpg**

<b>Wall ID:</b>	YELL-0010H-137.230-R		
<b>Route Name:</b>	TOWER JUNCTION TO MAMMOTH ROAD		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stacked fill wall with stone mortared guardwall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	139	<b>Face Area (sq.):</b>	1800
<b>Average Wall Height (ft.):</b>	12	<b>Face Angle (deg.):</b>	48
<b>Maximum Wall Height (ft.):</b>	17	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Good, wall performing as intended. No signs of distress.		8
WALL FOUNDATION MATERIAL 8.00	No sign of distress or settlement.		8
PLACED STONE 8.00	Good, durable rock, minor weathering.		7
MORTAR 8.00	No signs of cracks or spalling.		8
STONE MASONRY 8.00	Guard wall in very good condition, sound, durable rock.		9
WALL DRAINS 0.50	None observed. No signs of drainage related issues.		8
DOWNSLOPE 1.00	1.5:1, no erosion.		7
LATERAL SLOPE 1.00	1.5:1, moderate vegetation, no erosion.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0010H: TOWER JUNCTION TO MAMMOTH ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010H\_137.230\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0010H-137.290-R		
<b>Route Name:</b>	TOWER JUNCTION TO MAMMOTH ROAD		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	76	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	Gravity - Mortared Stone
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stacked fill wall with stone mortared guardwall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	230	<b>Face Area (sq.):</b>	3500
<b>Average Wall Height (ft.):</b>	15	<b>Face Angle (deg.):</b>	48
<b>Maximum Wall Height (ft.):</b>	23	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Wall performing as intended		7
WALL FOUNDATION MATERIAL 8.00	No sign of distress or settlement.		8
MORTAR 8.00	Newer, some gaps.		7
PLACED STONE 8.00	Some slight weathering.		7
STONE MASONRY 8.00	Hard durable rock, newer.		9
DOWNSLOPE 0.50	2:1, moderate to good vegetation, no erosion.		8
LATERAL SLOPE 0.50	1.5:1, no erosion.		8
WALL DRAINS 0.50	None observed. No signs of drainage related issues.		8
TRAFFIC BARRIER/FENCE 0.50	Guard wall newer, very good.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0010H: TOWER JUNCTION TO MAMMOTH ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010H\_137.290\_R\_1.jpg**

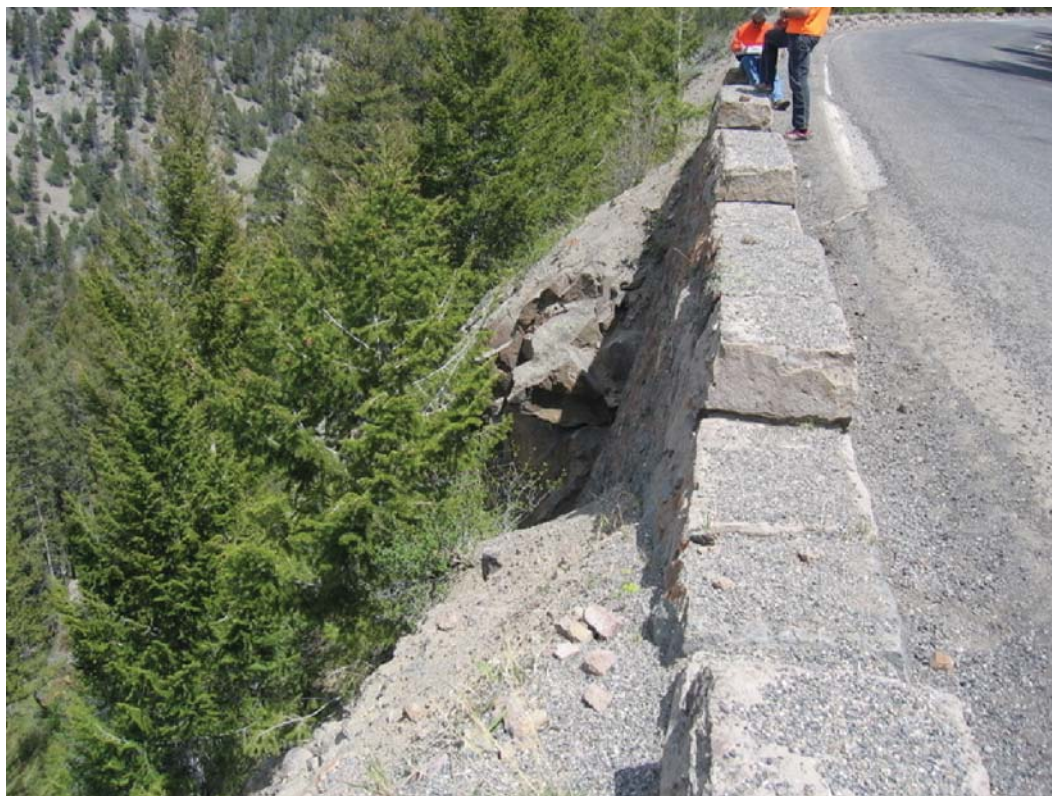
<b>Wall ID:</b>	YELL-0010H-137.384-R		
<b>Route Name:</b>	TOWER JUNCTION TO MAMMOTH ROAD		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	62	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone mortared fill wall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	100	<b>Face Area (sq.):</b>	600
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	72
<b>Maximum Wall Height (ft.):</b>	12	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Fair. Wall performing as intended.		7
WALL FOUNDATION MATERIAL 8.00	No sign of distress or settlement.		8
MORTAR 8.00	Minor cracks and small gaps.		7
STONE MASONRY 8.00	Hard, durable rock.		9
TRAFFIC BARRIER/FENCE 0.50	Guard wall in very good condition.		8
WALL DRAINS 0.50	None observed. No signs of drainage related issues.		8
LATERAL SLOPE 5.00	Very steep, some erosion.		2
DOWNSLOPE 5.00	Very steep, some erosion.		3
ROAD/SIDEWALK/SHOULDER 5.00	Recent patch most likely due to wall settlement.		3
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0010H: TOWER JUNCTION TO MAMMOTH ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0010H\_137.384\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0011-3.186-L		
<b>Route Name:</b>	NORTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 08, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	83	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mass Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Concrete wall of questionable type supporting the fill slope with the toe of the wall in the river. Performing well.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	170	<b>Face Area (sq.):</b>	1700
<b>Average Wall Height (ft.):</b>	10	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	12	<b>Vertical Offset (ft.):</b>	8
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well. No action needed..		9
WALL FOUNDATION MATERIAL 8.00	Toe of wall is under water and difficult to observe but no apparent current scour distress. Several rocks cabled together at toe for scour protection. Scour potential is moderate at this location.		8
CONCRETE 8.00	General good quality with some local spalling. Small stress distress at top near start of wall. One crack over a 3 ft x 3 ft. box culvert. No batter distress noted except for minor bulging at the start (may have been built that way).		8
LATERAL SLOPE 0.50	Steep and raveling at both ends, vegetation sparse.		8
UPSLOPE 0.50	Fill above wall is very raveled in over steepened slope (60 deg.). Not affecting the stability of the wall.		8
WALL DRAINS 0.50	No apparent internal drainage distress noted. No internal drains installed in the concrete.		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted in road or shoulder.		9
CULVERT 1.00	There are two approximate 30 in. cast-in-place culvert for surface drainage which are eroded badly with rebar showing in the bottom.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

## **ROUTE 0011: NORTH ENTRANCE ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0011\_3.186\_L\_1.jpg**



**YELL\_0011\_3.186\_L\_2.jpg**



<b>Wall ID:</b>	YELL-0011-3.655-L		
<b>Route Name:</b>	NORTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 08, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	61	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed stone wall at toe of steep raveling slope. Wall is in very-poor condition and need to be repaired. Steep raveling slope above has several hazard boulders at risk to wall and roadway.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	120	<b>Face Area (sq.):</b>	1116
<b>Average Wall Height (ft.):</b>	9	<b>Face Angle (deg.):</b>	55
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>	
PERFORMANCE 8.00	Low - wall is not performing its intended function and need to be repaired.	5	
WALL FOUNDATION MATERIAL 8.00	No foundation distress noted. Difficult to examine toe since ditch is filled with raveled material which overtopped wall.	9	
PLACED STONE 8.00	Angular stones are displaced and not interlocked. Upslope is raveling badly over the top of the wall. Sections of the wall are toppled.	4	
UPSLOPE 1.00	Oversteeped raveling slope with hazard boulders. Poorly vegetated.	4	
LATERAL SLOPE 0.50	Bridge at start and bin wall supporting stable slope at end. Not distress noted beyond wall.	9	
WALL DRAINS 0.50	No evidence of internal drainage distress	9	
ROAD/SIDEWALK/SHOULDER 1.00	No evidence of road distress. Ditch is filled with material which raveled over the top of the wall.	7	
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	Remove and salvage rock and restack. Use angular rock from local source. Scale down hazard boulders. 1. Repair wall - Excavator - 40 hr x \$150/hr. = \$6000, Dump truck 40 hr. x \$120/hr = \$48		
<b>Repair Cost:</b>	\$15,620		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0011: NORTH ENTRANCE ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0011\_3.655\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0011-3.678-L		
<b>Route Name:</b>	NORTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 08, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	85	<b>Maintenance Action:</b>	Maintenance
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Bin - Metal
<b>Surface Treatment:</b>	Galvanized	<b>Secondary Wall Type:</b>	Gravity - Dry Stone
<b>Secondary Surface Treatment:</b>	Painted	<b>Architectural Facing:</b>	
<b>General Description:</b>	Compound wall: 210 ft. of steel bin wall support the toe of an old slidemass and 85 ft. of dry placed stone supporting cut slope. Steel bin wall has moderate rusting in last 4 sections.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	295	<b>Face Area (sq.):</b>	3133
<b>Average Wall Height (ft.):</b>	10	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	13	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium - Wall is still performing its intended function. Maintenance of the bin wall surface is required and monitoring of the rusted-out sections in the last 4 bins.		8
WALL FOUNDATION MATERIAL 8.00	Firm soil - no evidence of settlement or undermining distress.		9
BIN OR CRIB 8.00	Paint is peeling throughout exposing galvanized steel surface. Last 4 bins have moderate rusted-out locations which do not appear to affect the structural integrity at this time. No batter distress noted.		7
PLACED STONE 8.00	Angular stones with good interlock and little- to-no weathering distress. Minimal void spaces.		10
UPSLOPE 0.50	Retained slide mass appears stable with relatively gentle slope to the scarp.		8
ROAD/SIDEWALK/SHOULDER 0.50	No road distress noted, no undermining of ditch.		9
WALL DRAINS 0.50	No evidence of internal drainage distress noted		9
LATERAL SLOPE 1.00	Dry placed-stone wall supporting the toe of a steep raveling slope at the start of the wall and stable cut slope in vegetated gentle slope at end. Placed-stone wall at start is in poor condition and is rated as a separate wall.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	Power wash and paint the surface of the steel bin wall. 2521 sq. ft. x \$ 1/sq. ft. = \$ 2521		
<b>Repair Cost:</b>	\$2,521		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

## **ROUTE 0011: NORTH ENTRANCE ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0011\_3.678\_L\_1.jpg**



**YELL\_0011\_3.678\_L\_2.jpg**

<b>Wall ID:</b>	YELL-0011-3.685-R		
<b>Route Name:</b>	NORTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 08, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	86	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Slope Protection	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-Placed Stone wall protecting fill slope from river scour. Large angular rock except for last 40 ft. which is smaller rounded rock. Performing well.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	414	<b>Face Area (sq.):</b>	5536
<b>Average Wall Height (ft.):</b>	13	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	15	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is protecting slope well. No work but monitor for future scour damage.		9
WALL FOUNDATION MATERIAL 8.00	Toe of wall is in river throughout but no apparent undermining from scour. Scour potential is very high at this sharp bend in the river.		8
PLACED STONE 8.00	Large 5 ft. minus angular rock with little-to-no weathering distress with good interlock (probably dumped) except for last 40 ft. which is smaller 2 ft. minus rounded rock. Entire length performing well with no apparent scour distress.		9
LATERAL SLOPE 0.50	Stable fill slopes on either end, well vegetated at start and sparse vegetation at end.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress.		9
DOWNSLOPE 1.00	River bed with very high scour potential but no apparent scour distress noted at this time.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0011: NORTH ENTRANCE ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0011\_3.685\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0011-5.261-L		
<b>Route Name:</b>	NORTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 08, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry wall supporting cut slope west of Roosevelt Arc. About 120 ft. of the wall has no backfill beginning about 270 ft. from the start.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	570	<b>Face Area (sq.):</b>	3460
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	7	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>	
PERFORMANCE 8.00	High - Wall is performing well with little-to-no indication of distress.	9	
WALL FOUNDATION MATERIAL 8.00	No distress. noted in firm soil foundation.	9	
MORTAR 8.00	Minor debonding and slight surficial weathering for most of wall except for a 35 ft. long section starting about 190 ft. from start of wall. In this section weathering is moderate (1 to 2 inches deep) or missing.	8	
STONE MASONRY 8.00	Sound angular stone with little to no weathering or cracking. Wall on batter with no bulging.	9	
UPSLOPE 0.50	Moderately steep slopes above wall which appear stable except for a hummocky section near the end of the wall.	8	
LATERAL SLOPE 0.50	More gentle slopes than behind wall, well vegetated.	10	
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted in road or ditch.	10	
WALL DRAINS 1.00	No internal drainage distress noted except in the 35 ft. section with moderate mortar weathering. Evidence that groundwater seepage between stones is causing mortar decay	7	
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	Repoint a 50 ft. section of wall starting about 190 ft. from wall beginning. Repoint 50 ft. x 7 ft section = 350 sq. ft x \$ 75.00 / sq. ft. = \$ 26,250		
<b>Repair Cost:</b>	\$26,250		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

## **ROUTE 0011: NORTH ENTRANCE ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0011\_5.261\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0012-8.086-R		
<b>Route Name:</b>	NORTHEAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 16, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	78	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	Gravity - Mortared Stone
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stacked fill wall with stone mortared guardwall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	140	<b>Face Area (sq.):</b>	3000
<b>Average Wall Height (ft.):</b>	21	<b>Face Angle (deg.):</b>	50
<b>Maximum Wall Height (ft.):</b>	33	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Good, wall performing as intended. No signs of distress.		8
WALL FOUNDATION MATERIAL 8.00	No sign of distress or settlement.		8
PLACED STONE 8.00	Good, durable rock, some missing stones near top of wall.		6
MORTAR 8.00	Minor gaps.		8
STONE MASONRY 8.00	Good, durable rock.		9
DOWNSLOPE 0.50	1.5:1, grassy slope, no erosion.		8
LATERAL SLOPE 0.50	Ties into rock at wall start. Gentle slope at wall end, no signs of erosion.		8
WALL DRAINS 0.50	None observed. No signs of drainage related issues.		8
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0012: NORTHEAST ENTRANCE ROAD**

**Retaining Wall Condition Photos**



**YELL\_0012\_8.086\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0012-18.661-R		
<b>Route Name:</b>	NORTHEAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 16, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	70	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stacked fill wall along Lamar River.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	230	<b>Face Area (sq.):</b>	2000
<b>Average Wall Height (ft.):</b>	8	<b>Face Angle (deg.):</b>	48
<b>Maximum Wall Height (ft.):</b>	13	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Wall performing as intended		7
WALL FOUNDATION MATERIAL 8.00	Founded along river, slight movement.		7
PLACED STONE 8.00	Durable rock, minor movement.		7
LATERAL SLOPE 1.00	1.5:1, moderate vegetation.		7
VEGETATION 1.00	Some sagebrush, no effect on wall performance.		7
WALL DRAINS 1.00	None observed. No signs of drainage related issues.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0012: NORTHEAST ENTRANCE ROAD**

**Retaining Wall Condition Photos**



**YELL\_0012\_18.661\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0012-21.213-R		
<b>Route Name:</b>	NORTHEAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 16, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	42	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stacked fill wall		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	94	<b>Face Area (sq.):</b>	1200
<b>Average Wall Height (ft.):</b>	12	<b>Face Angle (deg.):</b>	49
<b>Maximum Wall Height (ft.):</b>	17	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Poor, some wall rotation as evidence by guardrail and shoulder.		4
WALL FOUNDATION MATERIAL 8.00	Wall foundation showing signs of rotation and movement.		3
PLACED STONE 8.00	Moderately weathered, well graded, some pieces missing. Rock source from nearby cut consisting of breccia.		6
LATERAL SLOPE 0.50	Ties into rock at wall start. Gentle slope at wall end.		8
WALL DRAINS 0.50	None observed. No signs of drainage related issues.		8
VEGETATION 1.00	Some grass and brush but not affecting wall performance.		6
DOWNSLOPE 1.00	gentle grassy slope.		7
ROAD/SIDEWALK/SHOULDER 5.00	Shoulder and edge of pavement slumping.		3
TRAFFIC BARRIER/FENCE 5.00	Timber guardrail shows signs of rotation from wall movement.		3
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	This wall is in danger of failure in the future if a high rainfall event occurs. Recommend repair shoulder as a short-term fix and monitor wall for future movement. Replace pavement 60 sq. ft. x \$10 = \$600.		
<b>Repair Cost:</b>	\$600		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0012: NORTHEAST ENTRANCE ROAD**

**Retaining Wall Condition Photos**



**YELL\_0012\_21.213\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-5.840-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	100	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	MSE - Welded Wire Face
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Simulated Stone
<b>General Description:</b>	MSE wall with a simulated stone facing.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	1036	<b>Face Area (sq.):</b>	7677
<b>Average Wall Height (ft.):</b>	7	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall is performing as designed		10
WALL FOUNDATION MATERIAL 8.00	Firm soil, gentle slope		10
CONCRETE 8.00	Simulated stone, no distress noted		10
MORTAR 8.00	No distress noted, minimal debonding		10
WIRE/GEOSYNTHETIC FACING 8.00	No distress noted		10
CULVERT 0.50	two 4" cmp no distress		10
DOWNSLOPE 0.50	Gentle stable slope to lake shore		10
LATERAL SLOPE 0.50	Riprap stable fill slope		10
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_5.840\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-6.063-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	1996
<b>*Wall Rating:</b>	93	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Cantilever - Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Simulated Stone
<b>General Description:</b>	Concrete Cantilever wall supporting cut		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	1346	<b>Face Area (sq.):</b>	4944
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall is performing as designed		9
WALL FOUNDATION MATERIAL 8.00	Road bed, no distress noted		9
CONCRETE 8.00	Simulated stone, no distress noted		10
LATERAL SLOPE 0.50	Gentle slope that is well vegetated		9
UPSLOPE 0.50	Well vegetated, 40% slope		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		10
WALL DRAINS 0.50	Installed, no distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_6.063\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-6.478-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Cantilever - Concrete
<b>Surface Treatment:</b>	Stain	<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Simulated Stone
<b>General Description:</b>	Simulated stone face cut wall supporting gentle to moderately steep grass covered slope.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	252	<b>Face Area (sq.):</b>	1110
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	5	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as designed.		9
WALL FOUNDATION MATERIAL 8.00	Road sub grade.		9
CONCRETE 8.00	AS new.		9
LATERAL SLOPE 0.50	Gentle, grass covered slope.		8
UPSLOPE 0.50	Moderately steep, grass covered slope.		8
ARCHITECTURAL FACING 0.50	As new.		9
ROAD/SIDEWALK/SHOULDER 0.50	As new.		9
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_6.478\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-6.688-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	54	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Crib - Timber
<b>Surface Treatment:</b>	Preservative	<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Timber crib wall on steep slope. Erosion of soil from upslope through wall face.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	80	<b>Face Area (sq.):</b>	400
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	5	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Low - wall is not performing.		3
WALL FOUNDATION MATERIAL 8.00	Compact soil with a steep slope below. No undermining.		7
BIN OR CRIB 8.00	Timber cribbing as new.		9
ROAD/SIDEWALK/SHOULDER 0.50	Road and shoulder as new. No distress.		9
WALL DRAINS 0.50	No distress. Distress from above.		9
LATERAL SLOPE 1.00	Steep, highly altered rock and residual soil. Sparse grass and some raveling.		5
DOWNSLOPE 5.00	Steep, highly altered rock and residual soil. Sparse grass and some raveling.		3
UPSLOPE 5.00	Gentle loose soil slope eroding through face.		3
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	2 laborers x 8 hours x \$55/hour = \$880. Excavator 8 hours x \$150/hour = \$1,200. Dump truck 8 hours x \$120/hour = \$960. Total = \$3,040		
<b>Repair Cost:</b>	\$3,040		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_6.688\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-8.200-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	1996
<b>*Wall Rating:</b>	98	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Soil Nail
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Simulated Stone
<b>General Description:</b>	Soil nail wall with simulated stone facing		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	349	<b>Face Area (sq.):</b>	5152
<b>Average Wall Height (ft.):</b>	14	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	17	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		10
WALL FOUNDATION MATERIAL 8.00	No signs of distress noted		10
SHOTCRETE 8.00	No signs of distress noted		9
CONCRETE 8.00	Simulated stone, no distress noted		10
MORTAR 8.00	No distress noted		10
LATERAL SLOPE 0.50	Steep rocky slope, with sparse vegetation		8
UPSLOPE 0.50	Steep rocky slope, sparse vegetation		8
ROAD/SIDEWALK/SHOULDER 0.50	No signs of distress noted		10
WALL DRAINS 0.50	No evidence of internal drainage distress		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_8.200\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-8.317-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	58	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stack fill wall with a culvert and failed section in the middle.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	228	<b>Face Area (sq.):</b>	4788
<b>Average Wall Height (ft.):</b>	21	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	39	<b>Vertical Offset (ft.):</b>	-3
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Wall is failing.		4
WALL FOUNDATION MATERIAL 8.00	Moderately weathered rock steep slope, possible geothermal activity and undermining		7
PLACED STONE 8.00	Slight weathering, good interlock except where failed.		8
UPSLOPE 0.50	Firm soil with sparse to some vegetation.		8
WALL DRAINS 0.50	No distress.		9
CULVERT 1.00	Culvert - water going in to culvert at inlet, but running under culvert at outlet.		5
LATERAL SLOPE 1.00	Weathered rock - eroding. Sparse vegetation.		6
DOWNSLOPE 5.00	Failing under wall.		3
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	Fix toe with soldier pile wall at toe. Constructions of toe fix will require barge on lake or crane from road. 1500 sq.ft. soldier pile wall x \$110/sq.ft. = \$165,000. Repair approximately 25% of existing dry stack wall - 1200 sq.ft. rockery wall x \$50/sq.f		
<b>Repair Cost:</b>	\$225,000		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_8.317\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-13.404-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Head Wall over outlet of arch culvert on Cub Creek.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	56	<b>Face Area (sq.):</b>	453
<b>Average Wall Height (ft.):</b>	8	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	12	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		9
WALL FOUNDATION MATERIAL 8.00	Firm, gravelly soil.		9
MORTAR 8.00	Few cracks, some minor debonding.		8
STONE MASONRY 8.00	Intact, competent rock with very little weathering.		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress.		8
LATERAL SLOPE 0.50	Gentle, grass covered slope.		9
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_13.404\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-13.405-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	85	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Head Wall for arch culvert		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	56	<b>Face Area (sq.):</b>	453
<b>Average Wall Height (ft.):</b>	8	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	12	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		9
WALL FOUNDATION MATERIAL 8.00	Stable gentle slopes to creek bed, moderate scour potential		9
MORTAR 8.00	Low to moderate debonding and voids, minimal weathering		7
STONE MASONRY 8.00	Minor spalling and weathering		9
DOWNSLOPE 0.50	Stable gentle slopes, well vegetated		9
LATERAL SLOPE 0.50	stable fill slope, rocky		9
ROAD/SIDEWALK/SHOULDER 0.50	no road or shoulder distress		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_13.405\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-16.327-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	88	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Head wall over 6 ft x 5 ft box culvert		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	31	<b>Face Area (sq.):</b>	121
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	9
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as new.		9
WALL FOUNDATION MATERIAL 8.00	Streambed gravel.		8
MORTAR 8.00	AS new.		9
STONE MASONRY 8.00	Competent, intact rock with very little weathering.		9
LATERAL SLOPE 0.50	Gentle, gravelly slope with small trees.		9
UPSLOPE 0.50	Gentle, gravelly slope with small trees and sparse grass.		9
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_16.327\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-16.328-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 16, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry headwall supporting fill at culvert inlet		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	31	<b>Face Area (sq.):</b>	121
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	-4
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		9
WALL FOUNDATION MATERIAL 8.00	Rocky stream bank, moderate scour potential		9
MORTAR 8.00	Slight cracking and debonding		9
STONE MASONRY 8.00	No distress noted		9
DOWNSLOPE 0.50	Rocky stream channel		8
LATERAL SLOPE 0.50	Rocky fill slopes with sparse vegetation		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress		9
WALL DRAINS 0.50	No evidence of internal drainage distress		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_16.328\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-17.181-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Head wall over 6 ft x 3 ft box culvert.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	24	<b>Face Area (sq.):</b>	71
<b>Average Wall Height (ft.):</b>	2	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		8
WALL FOUNDATION MATERIAL 8.00	Streambed gravel.		8
MORTAR 8.00	Some debonding.		8
STONE MASONRY 8.00	Slight weathering and some cracking of the rock.		8
LATERAL SLOPE 0.50	Very shallow, gravelly slope with small trees.		9
ROAD/SIDEWALK/SHOULDER 0.50	As new.		9
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_17.181\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-17.182-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry headwall supporting fill at culvert inlet		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	24	<b>Face Area (sq.):</b>	57
<b>Average Wall Height (ft.):</b>	2	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	4	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as intended		9
WALL FOUNDATION MATERIAL 8.00	Sandy stream channel on gentle slope, low scour potential		9
MORTAR 8.00	Minor cracking and debonding of mortar		9
STONE MASONRY 8.00	No signs of distress noted		9
DOWNSLOPE 0.50	Sandy stream channel on gentle slope		9
LATERAL SLOPE 0.50	Stable fill slope on gentle grassy slope		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_17.182\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-17.385-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry head wall supporting fill at culvert outlet		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	19	<b>Face Area (sq.):</b>	64
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall is performing as designed		9
WALL FOUNDATION MATERIAL 8.00	Sandy stream channel on gentle slope, low scour potential		9
MORTAR 8.00	Minor debonding and cracking of mortar		9
STONE MASONRY 8.00	No signs of distress noted		9
DOWNSLOPE 0.50	Sandy stream channel on gentle slope		9
LATERAL SLOPE 0.50	Stable fill slopes on gentle grassy slopes		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted		9
WALL DRAINS 0.50	No signs of distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_17.385\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-17.385-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	78	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Head wall over 5 ft x 3 ft box culvert inlet.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	21	<b>Face Area (sq.):</b>	63
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as indented.		8
WALL FOUNDATION MATERIAL 8.00	Streambed gravel.		8
MORTAR 8.00	Some cracking and debonding.		7
STONE MASONRY 8.00	Little weathering.		8
LATERAL SLOPE 0.50	Gentle, gravelly slope with some little trees and grass.		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress.		9
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_17.385\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-17.974-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Head wall over 5 ft x 5 ft box culvert outlet.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	26	<b>Face Area (sq.):</b>	96
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		8
WALL FOUNDATION MATERIAL 8.00	Stream and lake bed.		8
MORTAR 8.00	Little debonding.		8
STONE MASONRY 8.00	Little weathering, few cracks.		8
LATERAL SLOPE 0.50	Gravelly embankment fill slope. Stable with sparse vegetation.		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress.		9
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_17.974\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-17.975-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	88	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry headwall at culvert inlet		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	26	<b>Face Area (sq.):</b>	115
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		9
WALL FOUNDATION MATERIAL 8.00	Firm soil and rocky stream channel, low scour potential		9
MORTAR 8.00	Slight cracking and debonding, moss covered		8
STONE MASONRY 8.00	Minimal weathering		9
DOWNSLOPE 0.50	Rocky stable stream channel and well vegetated banks		9
LATERAL SLOPE 0.50	Stable fill slope with sparse vegetation		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted, road under construction at this time		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_17.975\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-19.476-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	100	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	New dry laid rockery wall supporting cut slope		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	176	<b>Face Area (sq.):</b>	1817
<b>Average Wall Height (ft.):</b>	10	<b>Face Angle (deg.):</b>	75
<b>Maximum Wall Height (ft.):</b>	13	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		10
WALL FOUNDATION MATERIAL 8.00	Firm road ditch		10
PLACED STONE 8.00	New Rockery, no signs of distress noted		10
LATERAL SLOPE 0.50	Steep stable slope that is well vegetated with trees		10
ROAD/SIDEWALK/SHOULDER 0.50	No distress, road under construction at this time		10
UPSLOPE 0.50	Steep stable slope that is well vegetated with trees		10
WALL DRAINS 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**

**Condition photos are not available for YELL-0013-19.476-L.**

<b>Wall ID:</b>	YELL-0013-19.645-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	95	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	MSE - Welded Wire Face
<b>Surface Treatment:</b>	Stain	<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Simulated Stone
<b>General Description:</b>	New MSE wall with architectural face.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	911	<b>Face Area (sq.):</b>	18791
<b>Average Wall Height (ft.):</b>	20	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	23	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as designed.		10
WALL FOUNDATION MATERIAL 8.00	Rocky talus slope.		8
CONCRETE 8.00	new		10
WIRE/GEOSYNTHETIC FACING 8.00	New.		10
LATERAL SLOPE 0.50	Start - weathered outcrop. End - historic stone masonry wall.		8
WALL DRAINS 0.50	No distress.		9
ARCHITECTURAL FACING 0.50	New		10
ROAD/SIDEWALK/SHOULDER 0.50	Under construction.		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_19.645\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-19.831-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	73	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Historic stone masonry wall adjacent to new MSE wall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	64	<b>Face Area (sq.):</b>	833
<b>Average Wall Height (ft.):</b>	13	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	20	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as required.		8
WALL FOUNDATION MATERIAL 8.00	Firm, rocky sub grade.		8
MORTAR 8.00	Extensive debonding, cracking, and weathering - not effecting wall performance.		5
STONE MASONRY 8.00	Little weathering, well interlocked, one foot minus angular stone.		8
LATERAL SLOPE 0.50	Start - MSE wall. End - moderately weathered rock outcrop.		8
WALL DRAINS 0.50	No distress.		8
ROAD/SIDEWALK/SHOULDER 0.50	Under construction.		10
TRAFFIC BARRIER/FENCE 0.50	New.		10
DOWNSLOPE 1.00	Raveling with sparse vegetation.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_19.831\_R\_1.jpg**

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**

**Condition photos are not available for YELL-0013-19.841-R.**



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**

**Condition photos are not available for YELL-0013-19.841-R.**

<b>Wall ID:</b>	YELL-0013-19.913-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	71	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Bin - Metal
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Bin wall with new stone masonry guardwall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	72	<b>Face Area (sq.):</b>	295
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium - acceptable.		7
WALL FOUNDATION MATERIAL 8.00	Weathered rock and gravelly soil.		7
BIN OR CRIB 8.00	Surface rust - not effecting integrity of bin.		7
WALL DRAINS 0.50	No distress.		9
ROAD/SIDEWALK/SHOULDER 0.50	Under construction.		10
TRAFFIC BARRIER/FENCE 0.50	New.		10
DOWNSLOPE 1.00	Raveling weathered rock talus slope.		7
LATERAL SLOPE 1.00	Start - highly weathered rock outcrop. End - rock slope.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_19.913\_R\_1.jpg**

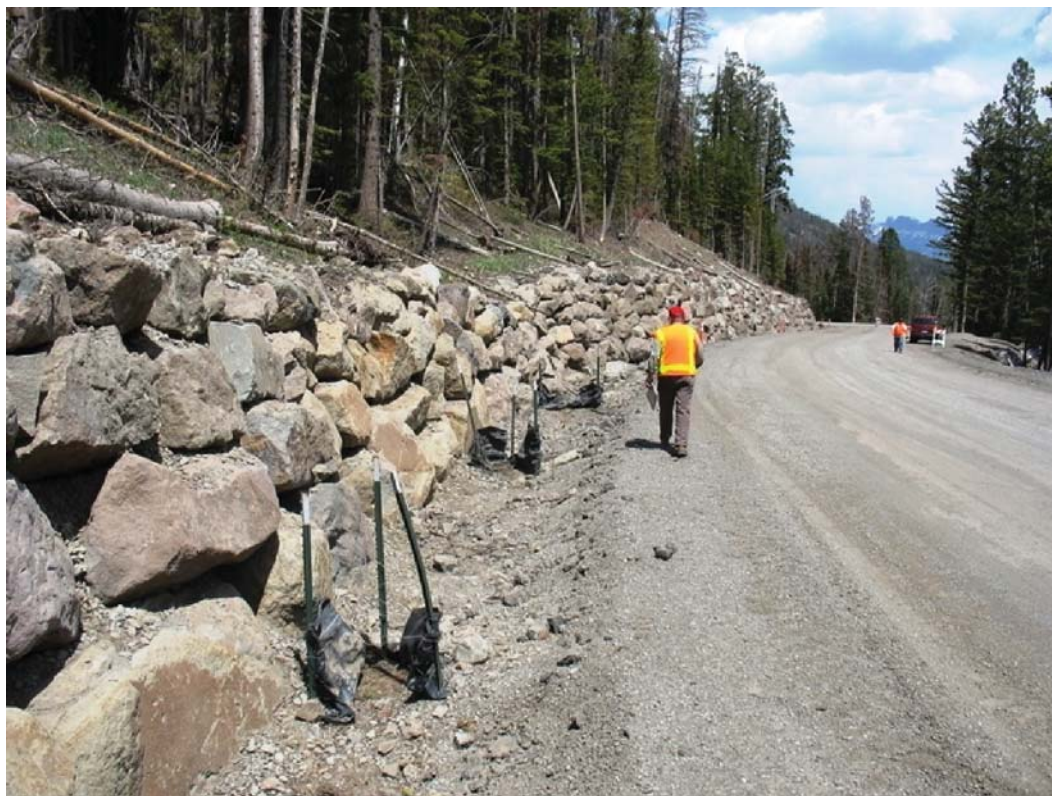
<b>Wall ID:</b>	YELL-0013-19.979-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	100	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	New dry laid rockery wall supporting cut slope		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	551	<b>Face Area (sq.):</b>	6698
<b>Average Wall Height (ft.):</b>	12	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	15	<b>Vertical Offset (ft.):</b>	-3
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as intended		10
WALL FOUNDATION MATERIAL 8.00	Firm road ditch		10
PLACED STONE 8.00	No signs of distress		10
LATERAL SLOPE 0.50	Steep slope and rock on both sides, stable, sparse vegetation		10
ROAD/SIDEWALK/SHOULDER 0.50	Road under construction at this time		10
UPSLOPE 0.50	steep but stable rocky slope		10
WALL DRAINS 0.50	No sign of distress		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_19.979\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-20.001-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	97	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Head wall on 30 in x 2 in CMP.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	8	<b>Face Area (sq.):</b>	38
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	5	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as new.		10
WALL FOUNDATION MATERIAL 8.00	Firm soil.		9
MORTAR 8.00	As New.		10
STONE MASONRY 8.00	As New.		10
LATERAL SLOPE 0.50	Roadway embankment fill.		9
WALL DRAINS 0.50	No distress.		9
CULVERT 0.50	As New.		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_20.001\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-20.317-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	99	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Cantilever - Soldier Pile
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	Gravity - Mass Concrete
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Stone
<b>General Description:</b>	Compound wall- Soldier pile wall with stone veneer with concrete gravity wing walls		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	162	<b>Face Area (sq.):</b>	2108
<b>Average Wall Height (ft.):</b>	13	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	15	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as intended		10
WALL FOUNDATION MATERIAL 8.00	Firm road ditch		10
CONCRETE 8.00	No signs of distress noted		10
LAGGING 8.00	No distress noted		10
MORTAR 8.00	No signs of distress noted		10
PILES AND SHAFTS 8.00	No signs of distress noted		10
ROAD/SIDEWALK/SHOULDER 0.50	No distress- road under construction at this time		10
UPSLOPE 0.50	steep cut slope that is stable and well vegetated		10
WALL DRAINS 0.50	No signs of distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_20.317\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-20.411-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	74	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry laid, stone wall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	213	<b>Face Area (sq.):</b>	2519
<b>Average Wall Height (ft.):</b>	11	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	27	<b>Vertical Offset (ft.):</b>	-30
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium - acceptable.		7
WALL FOUNDATION MATERIAL 8.00	Firm soil.		8
PLACED STONE 8.00	Rock is cracking, but is angular with good interlock. There is a slight bulge at bottom.		7
DOWNSLOPE 0.50	Grass and tree covered slope. The slope is moderately steep and appears stable.		8
LATERAL SLOPE 0.50	Forested slopes, appear stable.		8
WALL DRAINS 0.50	No distress.		9
UPSLOPE 1.00	Rocky embankment fill with some grass and little raveling.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_20.411\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-20.462-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	99	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	New dry laid rockery wall supporting a cut slope		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	327	<b>Face Area (sq.):</b>	4001
<b>Average Wall Height (ft.):</b>	12	<b>Face Angle (deg.):</b>	75
<b>Maximum Wall Height (ft.):</b>	14	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		10
WALL FOUNDATION MATERIAL 8.00	firm soil, no distress noted		10
PLACED STONE 8.00	No signs of distress noted		10
LATERAL SLOPE 0.50	steep but stable cut slope in shallow rock		8
UPSLOPE 0.50	stable cut slope, well vegetated		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress note, road under construction at this time		10
WALL DRAINS 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_20.462\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-20.505-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	97	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Headwall on 48 in diameter CMP outlet.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	12	<b>Face Area (sq.):</b>	59
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-3
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as new.		10
WALL FOUNDATION MATERIAL 8.00	Gravelly rock slope.		9
MORTAR 8.00	AS NEW.		10
STONE MASONRY 8.00	AS NEW.		10
DOWNSLOPE 0.50	Steep rock slope.		8
LATERAL SLOPE 0.50	Steep rock slope with raveling.		8
WALL DRAINS 0.50	No distress.		9
ROAD/SIDEWALK/SHOULDER 0.50	Under construction.		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_20.505\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-20.507-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	97	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Headwall over inlet of 48 in diameter CMP.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	12	<b>Face Area (sq.):</b>	59
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as new.		10
WALL FOUNDATION MATERIAL 8.00	Firm gravel.		9
MORTAR 8.00	New		10
STONE MASONRY 8.00	AS NEW.		10
LATERAL SLOPE 0.50	Embankment fill.		9
WALL DRAINS 0.50	No distress.		9
ROAD/SIDEWALK/SHOULDER 0.50	Under construction.		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_20.507\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-20.692-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	83	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Bin - Metal
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Metal bin wall supporting roadway embankment.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	20	<b>Face Area (sq.):</b>	180
<b>Average Wall Height (ft.):</b>	9	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	9	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium - acceptable.		8
WALL FOUNDATION MATERIAL 8.00	Rock outcrop and gravelly soil.		9
BIN OR CRIB 8.00	Good condition, surface rust not effect integrity of bin.		8
WALL DRAINS 0.50	No distress.		9
ROAD/SIDEWALK/SHOULDER 0.50	Under construction		10
DOWNSLOPE 1.00	Steep rock outcrop with some vegetation, generally stable with some raveling.		7
LATERAL SLOPE 1.00	Start - weathered rock slope with some trees and grass and some raveling. End - Masonry wall.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_20.692\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-20.696-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Historic fill wall with mortared stone		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	81	<b>Face Area (sq.):</b>	781
<b>Average Wall Height (ft.):</b>	9	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	15	<b>Vertical Offset (ft.):</b>	2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		8
WALL FOUNDATION MATERIAL 8.00	Minor undermining		8
MORTAR 8.00	Slight debonding		8
STONE MASONRY 8.00	Slight weathering with minor voids		8
DOWNSLOPE 0.50	Rocky, well vegetated, stable		8
LATERAL SLOPE 0.50	Begin- bin wall end-steep slope with vegetation		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_20.696\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-20.711-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	77	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Bin - Metal
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Metal bin wall supporting embankment fill.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	40	<b>Face Area (sq.):</b>	220
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium - Acceptable.		8
WALL FOUNDATION MATERIAL 8.00	Firm gravelly soil with no undermining.		8
BIN OR CRIB 8.00	Surface rust not affecting integrity of bin.		7
DOWNSLOPE 0.50	Steep forested slope.		8
WALL DRAINS 0.50	No distress.		9
ROAD/SIDEWALK/SHOULDER 0.50	Under construction.		10
LATERAL SLOPE 1.00	Steep forested slope with some raveling.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_20.711\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-20.725-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	84	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Bin - Metal
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Old steel bin wall with self-oxidizing finish, needs to be monitored for undermining		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	80	<b>Face Area (sq.):</b>	365
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Moderate- performing well but needs to be monitored for foundation undermining		8
WALL FOUNDATION MATERIAL 8.00	Firm but steep slope		8
BIN OR CRIB 8.00	No distress noted, self oxidizing steel		9
DOWNSLOPE 0.50	steep fairly stable slope with sparse vegetation		8
LATERAL SLOPE 0.50	steep fairly stable slope with sparse vegetation		8
WALL DRAINS 0.50	No distress noted		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted, road under construction at this time		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_20.725\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-20.763-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	77	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Bin - Metal
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Metal bin wall supporting embankment fill.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	45	<b>Face Area (sq.):</b>	188
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	7	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium - acceptable.		8
WALL FOUNDATION MATERIAL 8.00	Gravelly soil, firm.		7
BIN OR CRIB 8.00	Surface rust not effecting the integrity of the bin.		8
WALL DRAINS 0.50	No distress		9
ROAD/SIDEWALK/SHOULDER 0.50	Under construction.		10
DOWNSLOPE 1.00	Steep gravelly rock slope, some vegetation and some raveling.		7
LATERAL SLOPE 1.00	Steep gravelly rock slope, some vegetation and some raveling.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_20.763\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-20.774-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	83	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Historic mortared stone fill wall		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	40	<b>Face Area (sq.):</b>	480
<b>Average Wall Height (ft.):</b>	12	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	14	<b>Vertical Offset (ft.):</b>	1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		8
WALL FOUNDATION MATERIAL 8.00	Solid Rock outcrop		9
MORTAR 8.00	Slight debonding and weathering		8
STONE MASONRY 8.00	Slight weathering and minimal voids		8
DOWNSLOPE 0.50	Steep with no vegetation		8
LATERAL SLOPE 0.50	Rock outcrop on both ends		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_20.774\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-20.799-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Historic stone masonry wall supporting fill		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	56	<b>Face Area (sq.):</b>	563
<b>Average Wall Height (ft.):</b>	10	<b>Face Angle (deg.):</b>	77
<b>Maximum Wall Height (ft.):</b>	14	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium- wall performing as intended, monitor for undermining		8
WALL FOUNDATION MATERIAL 8.00	Firm but steep slope on shallow rock		8
MORTAR 8.00	Moderate cracking and slight debonding and weathering		7
STONE MASONRY 8.00	Minimal weathering and spalling		9
LATERAL SLOPE 0.50	In place rock outcrop, solid		9
WALL DRAINS 0.50	No signs of distress noted		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted, road is under construction at this time		10
DOWNSLOPE 1.00	Steep but stable slope with sparse vegetation		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_20.799\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-20.847-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	96	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	New dry laid rockery wall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	134	<b>Face Area (sq.):</b>	1472
<b>Average Wall Height (ft.):</b>	10	<b>Face Angle (deg.):</b>	70
<b>Maximum Wall Height (ft.):</b>	12	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as new.		10
WALL FOUNDATION MATERIAL 8.00	Firm, gravelly soil.		9
PLACED STONE 8.00	As New.		10
UPSLOPE 0.50	Stable heavily forested slope.		8
LATERAL SLOPE 0.50	Rock outcrops.		9
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_20.847\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-21.344-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stone wall supporting a fill Roadway under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	90	<b>Face Area (sq.):</b>	1454
<b>Average Wall Height (ft.):</b>	16	<b>Face Angle (deg.):</b>	50
<b>Maximum Wall Height (ft.):</b>	29	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Moderate- wall performing as intended		8
WALL FOUNDATION MATERIAL 8.00	Firm gravelly soil		8
PLACED STONE 8.00	Minor weathering, good interlock, minimal voids		8
DOWNSLOPE 0.50	Steep, gravelly rock slope with sparse vegetation		8
WALL DRAINS 0.50	No distress noted		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		10
LATERAL SLOPE 1.00	Raveling embankment slope		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_21.344\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-21.407-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	98	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	MSE - Welded Wire Face
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Stone
<b>General Description:</b>	Relatively new MSE Wall with rockery face supporting fill slope, performing as designed, no action us required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	202	<b>Face Area (sq.):</b>	1511
<b>Average Wall Height (ft.):</b>	7	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	11	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Relatively new wall performing as designed, no action is necessary.		10
WALL FOUNDATION MATERIAL 8.00	Steep rocky fill, appears stable, no batter or bearing distress noted.		9
PLACED STONE 8.00	Relatively new rockery face, no distress noted.		10
WIRE/GEOSYNTHETIC FACING 8.00	Relatively new wall with no internal distress noted.		10
DOWNSLOPE 0.50	Steep rocky fill, appears stable, sparse vegetation.		9
LATERAL SLOPE 0.50	Same as downslope but with some tree cover.		10
ROAD/SIDEWALK/SHOULDER 0.50	Road under construction, no distress noted.		10
WALL DRAINS 0.50	No evidence of internal drainage distress noted.		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_21.407\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-21.699-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2007
<b>*Wall Rating:</b>	99	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	MSE - Welded Wire Face
<b>Surface Treatment:</b>	Stain	<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Simulated Stone
<b>General Description:</b>	MSE wall that is supporting a fill with a simulated stone face Roadway is under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	472	<b>Face Area (sq.):</b>	2565
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		10
WALL FOUNDATION MATERIAL 8.00	Solid fill material, crushed rock		10
WIRE/GEOSYNTHETIC FACING 8.00	No distress noted		10
DOWNSLOPE 0.50	Rock riprap, moderately stable		8
LATERAL SLOPE 0.50	Steep stable rocky slope with sparse vegetation		8
WALL DRAINS 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_21.699\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-21.812-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	98	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	MSE - Welded Wire Face
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Stone
<b>General Description:</b>	Relatively new MSE Wall with Rockery Front supporting fill slope, performing as designed, no action required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	109	<b>Face Area (sq.):</b>	709
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	11	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Relatively new wall performing as designed, no action required.		10
WALL FOUNDATION MATERIAL 8.00	Steep colluvium, no batter or bearing distress noted.		9
PLACED STONE 8.00	Relatively new rockery with no distress noted.		10
WIRE/GEOSYNTHETIC FACING 8.00	Relatively new wall, no apparent internal distress noted.		10
DOWNSLOPE 0.50	Steep rocky colluvium, appears stable, sparse brush and tree cover.		10
LATERAL SLOPE 0.50	Same as downslope on both sides but more trees.		10
ROAD/SIDEWALK/SHOULDER 0.50	Road under construction, no distress noted.		10
WALL DRAINS 0.50	No evidence of internal drainage distress noted.		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_21.812\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-21.876-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Bin - Metal
<b>Surface Treatment:</b>	Painted	<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Metal bin wall that is supporting a fill Roadway is under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	98	<b>Face Area (sq.):</b>	555
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Moderate- wall performing well Monitor downslope		8
WALL FOUNDATION MATERIAL 8.00	Firm Gravely soil		8
BIN OR CRIB 8.00	Minor dents at top of wall, some paint has peeled off at top, no rust		8
WALL DRAINS 0.50	No distress noted		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		10
DOWNSLOPE 1.00	Steep slope with sparse vegetation		7
LATERAL SLOPE 1.00	Steep slope that is raveling, sparse vegetation		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_21.876\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-21.926-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	100	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Cantilever - Soldier Pile
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	Cantilever - Concrete
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Stone Veneer
<b>General Description:</b>	Beginning 18 ft of wall is a concrete wing wall End 38 ft of wall is a concrete wing wall Middle part of wall is a cantilever soldier pile wall		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	373	<b>Face Area (sq.):</b>	4506
<b>Average Wall Height (ft.):</b>	12	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	17	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as intended, road under construction		10
WALL FOUNDATION MATERIAL 8.00	No distress noted		10
CONCRETE 8.00	No distress noted		10
LAGGING 8.00	No distress noted		10
PILES AND SHAFTS 8.00	No distress noted		10
UPSLOPE 0.50	Steep with gravely material, sparse vegetation		9
LATERAL SLOPE 0.50	Solid rock cuts		10
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted, roadway is under construction at this time		10
WALL DRAINS 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_21.926\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.012-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	98	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	MSE - Welded Wire Face
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Stone
<b>General Description:</b>	Relatively new MSE Wall supporting fill slope with rockery face, performing as designed, no action is required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	65	<b>Face Area (sq.):</b>	358
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	9	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Relatively new wall performing as designed, no action is required.		10
WALL FOUNDATION MATERIAL 8.00	Firm soil on steep stable colluvium, no batter or bearing distress noted.		9
PLACED STONE 8.00	Relatively new rockery face with no distress noted.		10
WIRE/GEOSYNTHETIC FACING 8.00	Relatively new wall with no apparent internal distress.		10
DOWNSLOPE 0.50	Steep stable colluvium with sparse grass and brush.		10
LATERAL SLOPE 0.50	Same as downslope on both sides but has some trees.		10
ROAD/SIDEWALK/SHOULDER 0.50	Road under construction, no distress noted.		10
WALL DRAINS 0.50	No evidence of internal drainage distress noted.		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.012\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.070-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	96	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stacked Rockery supporting a Cut slope Roadway is under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	53	<b>Face Area (sq.):</b>	1272
<b>Average Wall Height (ft.):</b>	24	<b>Face Angle (deg.):</b>	75
<b>Maximum Wall Height (ft.):</b>	24	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as intended		10
WALL FOUNDATION MATERIAL 8.00	Firm crushed rock		9
PLACED STONE 8.00	No distress noted		10
LATERAL SLOPE 0.50	rock outcrop on beginning and end		9
UPSLOPE 0.50	Forested moderate slope		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.070\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.090-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	96	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stone rockery supporting cut slope roadway is under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	141	<b>Face Area (sq.):</b>	2398
<b>Average Wall Height (ft.):</b>	17	<b>Face Angle (deg.):</b>	75
<b>Maximum Wall Height (ft.):</b>	18	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		10
WALL FOUNDATION MATERIAL 8.00	firm crushed rock		9
PLACED STONE 8.00	No distress noted, 5ft minus rock		10
LATERAL SLOPE 0.50	Rock outcrop at beginning and end		8
UPSLOPE 0.50	Gentle well vegetated slope		8
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.090\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.106-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	98	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	MSE - Welded Wire Face
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Stone Veneer
<b>General Description:</b>	MSE wall with a Rockery face		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	188	<b>Face Area (sq.):</b>	828
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		10
WALL FOUNDATION MATERIAL 8.00	No distress noted, steep but stable fill		9
PLACED STONE 8.00	No distress noted		10
WIRE/GEOSYNTHETIC FACING 8.00	No distress noted		10
DOWNSLOPE 0.50	Steep but stable fill material		9
LATERAL SLOPE 0.50	Begin- steep but stable fill end- bin wall, no distress		10
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted, roadway under construction at this time		10
WALL DRAINS 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.106\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.157-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	98	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	MSE - Welded Wire Face
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Stone
<b>General Description:</b>	Relatively new MSE Wall with rockery face performing as designed, no action is required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	45	<b>Face Area (sq.):</b>	268
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Relatively new wall performing as designed, no action is required.		10
WALL FOUNDATION MATERIAL 8.00	Firm rocky colluvium, appears stable, no batter or bearing distress noted.		9
PLACED STONE 8.00	Relatively new rockery face, no distress noted.		10
WIRE/GEOSYNTHETIC FACING 8.00	Relatively new wall with no apparent internal distress noted.		10
DOWNSLOPE 0.50	Steep stable colluvium with sparse brush and grass.		10
LATERAL SLOPE 0.50	Same as downslope at start and rock outcrop at end.		10
ROAD/SIDEWALK/SHOULDER 0.50	Road under construction, no distress noted.		10
WALL DRAINS 0.50	No evidence of internal drainage distress noted.		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.157\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.171-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	78	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Bin - Metal
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Old metal bin wall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	30	<b>Face Area (sq.):</b>	145
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	80
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as designed		8
WALL FOUNDATION MATERIAL 8.00	Weathered rock outcrop		8
BIN OR CRIB 8.00	Metal bin wall with rust and light pitting, not affecting stability		7
DOWNSLOPE 0.50	Over steepened weathered rock with sparse vegetation		8
LATERAL SLOPE 0.50	Beginning is rock outcrop end is embankment fill with rip rap		8
WALL DRAINS 0.50	No distress		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.171\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.208-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	100	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	MSE - Welded Wire Face
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Stone Veneer
<b>General Description:</b>	MSE wall with Rockery face Roadway under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	55	<b>Face Area (sq.):</b>	193
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	5	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		10
WALL FOUNDATION MATERIAL 8.00	Steep but stable fill material		10
STONE MASONRY 8.00	No distress noted		10
WIRE/GEOSYNTHETIC FACING 8.00	No distress noted		10
DOWNSLOPE 0.50	Steep but stable fill material		9
LATERAL SLOPE 0.50	Begin- steep but stable with sparse vegetation End- Bin wall		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		10
WALL DRAINS 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.208\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.218-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	81	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Bin - Metal
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Older Steel Bin Wall, still performing well, but has moderate rusting and damage to top members. Need to monitor.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	197	<b>Face Area (sq.):</b>	701
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>	
PERFORMANCE 8.00	Medium - Wall is still performing but steel rusting and member damage need to be monitored.	8	
WALL FOUNDATION MATERIAL 8.00	Firm rocky colluvium which appears stable, no batter or bearing distress noted.	9	
BIN OR CRIB 8.00	Steel is moderately rusted and top members are damaged at several locations, currently not affecting the structure but need to monitor.	7	
DOWNSLOPE 0.50	Steep stable colluvium with sparse grass, brush and trees.	9	
LATERAL SLOPE 0.50	Same as downslope on both sides.	9	
WALL DRAINS 0.50	No evidence of internal drainage distress noted.	9	
ROAD/SIDEWALK/SHOULDER 0.50	Road under construction, no distress noted.	10	
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.218\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.231-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	81	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Bin - Metal
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Metal bin wall supporting a fill Roadway is under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	87	<b>Face Area (sq.):</b>	435
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	80
<b>Maximum Wall Height (ft.):</b>	5	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Moderate- Wall performing as designed		8
WALL FOUNDATION MATERIAL 8.00	Firm gravelly soil		8
BIN OR CRIB 8.00	No distress noted, surface rust not affecting stability		8
DOWNSLOPE 0.50	Steep rocky slope that is well vegetated		8
WALL DRAINS 0.50	No distress noted		9
LATERAL SLOPE 0.50	New MSE walls		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.231\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.252-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	97	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	MSE - Welded Wire Face
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Stone Veneer
<b>General Description:</b>	MSE wall with stone facing Roadway is under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	153	<b>Face Area (sq.):</b>	1380
<b>Average Wall Height (ft.):</b>	9	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		10
WALL FOUNDATION MATERIAL 8.00	Steep but stable fill material		9
STONE MASONRY 8.00	No distress noted		10
WIRE/GEOSYNTHETIC FACING 8.00	No distress noted, new wall		10
DOWNSLOPE 0.50	Steep but stable fill material		9
LATERAL SLOPE 0.50	Begin- bin wall End- steep with sparse vegetation		9
WALL DRAINS 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.252\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.314-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	95	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	MSE - Welded Wire Face
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Stone
<b>General Description:</b>	MSE wall with rockery facing.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	185	<b>Face Area (sq.):</b>	2330
<b>Average Wall Height (ft.):</b>	12	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	14	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	New wall		10
WALL FOUNDATION MATERIAL 8.00	Gravelly soil		8
PLACED STONE 8.00	New shot rock		10
WIRE/GEOSYNTHETIC FACING 8.00	New		10
DOWNSLOPE 0.50	Raveling rock soil and gravel, steep		8
LATERAL SLOPE 0.50	Gravelly embankment, steep		8
ARCHITECTURAL FACING 0.50	New shot rock		10
ROAD/SIDEWALK/SHOULDER 0.50	Newly constructed		10
WALL DRAINS 0.50	Installed slotted pipe, new		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.314\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.408-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	97	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	MSE - Welded Wire Face
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Stone
<b>General Description:</b>	New MSE wall with rockery facing.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	148	<b>Face Area (sq.):</b>	1524
<b>Average Wall Height (ft.):</b>	10	<b>Face Angle (deg.):</b>	70
<b>Maximum Wall Height (ft.):</b>	15	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Newly constructed		10
WALL FOUNDATION MATERIAL 8.00	Firm soil and rock		9
PLACED STONE 8.00	New shot rock		10
WIRE/GEOSYNTHETIC FACING 8.00	New tensar welded wire baskets with geogrid		10
DOWNSLOPE 0.50	Raveling moderately steep, no vegetation		8
LATERAL SLOPE 0.50	Raveling moderately steep, no vegetation		8
ROAD/SIDEWALK/SHOULDER 0.50	New construction		10
WALL DRAINS 0.50	Slotted pipe, new		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.408\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.555-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Crib - Metal
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Metal bin wall supporting a fill Roadway is under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	30	<b>Face Area (sq.):</b>	300
<b>Average Wall Height (ft.):</b>	10	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		9
WALL FOUNDATION MATERIAL 8.00	Stable fill material		9
BIN OR CRIB 8.00	No distress noted		9
DOWNSLOPE 0.50	Steep but stable slope with sparse vegetation		9
LATERAL SLOPE 0.50	Begin- steep but stable slope with sparse vegetation End- Rockery wall		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.555\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.564-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	97	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	MSE - Welded Wire Face
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Stone
<b>General Description:</b>	Relatively new MSE Wall with rockery face performing as designed, no action is required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	192	<b>Face Area (sq.):</b>	1871
<b>Average Wall Height (ft.):</b>	9	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	14	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Relatively new wall is performing as designed, no action is required.		10
WALL FOUNDATION MATERIAL 8.00	Firm fill and colluvium on apparently stable slope, no batter or bearing distress noted.		9
PLACED STONE 8.00	Relatively new rockery face, no distress noted.		10
WIRE/GEOSYNTHETIC FACING 8.00	Relatively new wall, no apparent internal distress noted.		10
DOWNSLOPE 0.50	Steep stable fill and colluvium, sparse grass, brush and tree cover.		9
LATERAL SLOPE 0.50	Same as downslope on both sides.		9
ROAD/SIDEWALK/SHOULDER 0.50	Road under construction, no distress noted.		10
WALL DRAINS 0.50	No evidence of internal drainage distress noted.		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.564\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.634-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	95	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry headwall for 48 in culvert.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	12	<b>Face Area (sq.):</b>	72
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-8
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	New construction		10
WALL FOUNDATION MATERIAL 8.00	Rocky soil		8
MORTAR 8.00	New construction		10
STONE MASONRY 8.00	New construction		10
DOWNSLOPE 0.50	Gravelly embankment, steep		8
LATERAL SLOPE 0.50	Gravelly embankment, steep		8
WALL DRAINS 0.50	No distress		9
CULVERT 0.50	New construction		10
ROAD/SIDEWALK/SHOULDER 0.50	New construction		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.634\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.634-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	98	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry headwall for 48 in culvert.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	12	<b>Face Area (sq.):</b>	72
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-4
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	New construction		10
WALL FOUNDATION MATERIAL 8.00	Rock		9
MORTAR 8.00	New construction		10
STONE MASONRY 8.00	New construction		10
WALL DRAINS 0.50	No distress		9
CULVERT 0.50	New		10
DOWNSLOPE 0.50	Shallow slope, embankment fill		10
LATERAL SLOPE 0.50	Shallow slope, embankment fill		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.634\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.682-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	97	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	MSE - Welded Wire Face
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Stone
<b>General Description:</b>	Tensor welded wire baskets with geogrid and rockery facing		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	470	<b>Face Area (sq.):</b>	8227
<b>Average Wall Height (ft.):</b>	17	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	23	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	New construction		10
WALL FOUNDATION MATERIAL 8.00	Soil and rock, stable		9
PLACED STONE 8.00	New construction		10
WIRE/GEOSYNTHETIC FACING 8.00	New construction		10
DOWNSLOPE 0.50	Forested and steep		8
LATERAL SLOPE 0.50	Beginning is forested slope, end is rock fill slope		8
ROAD/SIDEWALK/SHOULDER 0.50	New construction		10
WALL DRAINS 0.50	Slotted drain pipe, new construction		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.682\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.741-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	100	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Relatively new Rockery Wall supporting cut slope, performing as designed, no action is required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	76	<b>Face Area (sq.):</b>	990
<b>Average Wall Height (ft.):</b>	13	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	19	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Relatively new wall is performing as designed, no action is required.		10
WALL FOUNDATION MATERIAL 8.00	Firm road ditch, no bulging or bearing distress noted.		10
PLACED STONE 8.00	Relatively new rockery with 4 ft. minus sub angular stones, well interlocked, no weathering distress.		10
LATERAL SLOPE 0.50	Cut slopes in same material as upslope.		9
UPSLOPE 0.50	Steep, stable, well vegetated with grass, brush and trees		9
ROAD/SIDEWALK/SHOULDER 0.50	Road under construction, no distress noted.		10
WALL DRAINS 0.50	No evidence of internal drainage distress noted.		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.741\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.858-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	97	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	MSE - Welded Wire Face
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Simulated Stone
<b>General Description:</b>	Relatively new MSE Wall with simulated stone face supporting fill slope, performing as designed, no action is required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	511	<b>Face Area (sq.):</b>	9095
<b>Average Wall Height (ft.):</b>	17	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	21	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Relatively new wall is performing as designed, no action is required.		10
WALL FOUNDATION MATERIAL 8.00	Firm soil on steep rocky colluvium, no batter or bearing distress noted.		9
CONCRETE 8.00	Relatively new concrete face material, no distress noted.		10
WIRE/GEOSYNTHETIC FACING 8.00	Relatively new wall, no apparent internal distress noted.		10
DOWNSLOPE 0.50	Steep stable colluvium with sparse shrub and tree cover.		9
LATERAL SLOPE 0.50	Same as downslope on both sides.		9
WALL DRAINS 0.50	No evidence of internal drainage distress noted.		9
ROAD/SIDEWALK/SHOULDER 0.50	Road under construction, no distress noted.		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.858\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.874-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	97	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry headwall for 5x 4 box culvert.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	23	<b>Face Area (sq.):</b>	69
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	New construction		10
WALL FOUNDATION MATERIAL 8.00	Rock and soil		9
MORTAR 8.00	New construction		10
STONE MASONRY 8.00	New construction		10
LATERAL SLOPE 0.50	Gravelly embankment		9
WALL DRAINS 0.50	No distress		9
CULVERT 0.50	New construction		10
ROAD/SIDEWALK/SHOULDER 0.50	New construction		10
UPSLOPE 0.50	Road shoulder		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.874\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.966-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	95	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone headwall supporting a fill Roadway under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	28	<b>Face Area (sq.):</b>	84
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		9
WALL FOUNDATION MATERIAL 8.00	No distress noted, stable fill material		9
MORTAR 8.00	No distress noted		10
STONE MASONRY 8.00	No distress noted		10
DOWNSLOPE 0.50	Steep but stable fill material, sparse vegetation		9
LATERAL SLOPE 0.50	Steep with Rock outcrop at both ends		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		10
WALL DRAINS 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.966\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-22.967-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	95	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone head wall supporting a fill Roadway under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	32	<b>Face Area (sq.):</b>	132
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-3
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		9
WALL FOUNDATION MATERIAL 8.00	No distress noted, stable fill material		9
MORTAR 8.00	No distress noted		10
STONE MASONRY 8.00	No distress noted		10
DOWNSLOPE 0.50	Steep but stable slope with sparse vegetation		9
LATERAL SLOPE 0.50	steep but stable slope, sparse vegetation		9
WALL DRAINS 0.50	No distress noted		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_22.967\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-23.016-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	98	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	New dry laid rockery on cut side.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	190	<b>Face Area (sq.):</b>	1821
<b>Average Wall Height (ft.):</b>	9	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	12	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	New construction		10
WALL FOUNDATION MATERIAL 8.00	Firm gravelly soil		10
PLACED STONE 8.00	New construction, 6' minus stones		10
WALL DRAINS 0.50	Slotted pipe, new construction		10
LATERAL SLOPE 1.00	Gravelly steep slope with sparse vegetation		7
UPSLOPE 1.00	Raveling gravelly steep slope		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_23.016\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-23.145-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	96	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	New dry laid rockery on cut side.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	221	<b>Face Area (sq.):</b>	2630
<b>Average Wall Height (ft.):</b>	11	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	14	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	New construction		10
WALL FOUNDATION MATERIAL 8.00	Rocky embankment		9
PLACED STONE 8.00	New construction, 6' minus stones		10
LATERAL SLOPE 0.50	Rock outcrops		8
UPSLOPE 0.50	Heavy vegetation, shallow		9
WALL DRAINS 0.50	New construction, slotted pipe		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_23.145\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-23.473-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Bin - Metal
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Old metal bin wall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	50	<b>Face Area (sq.):</b>	275
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as designed		8
WALL FOUNDATION MATERIAL 8.00	Firm soil and rock		8
BIN OR CRIB 8.00	Rust and slight pitting, not affecting performance		8
DOWNSLOPE 0.50	Grassy slope to rock outcrop		8
LATERAL SLOPE 0.50	Rock outcrops		8
WALL DRAINS 0.50	No distress		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_23.473\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-23.899-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	97	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry headwall for 48 in pipe.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	12	<b>Face Area (sq.):</b>	48
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	4	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	New construction		10
WALL FOUNDATION MATERIAL 8.00	Gravelly firm soil		9
MORTAR 8.00	New construction		10
STONE MASONRY 8.00	New construction		10
LATERAL SLOPE 0.50	Embankment fill shallow slope		9
WALL DRAINS 0.50	No distress		9
CULVERT 0.50	New construction		10
ROAD/SIDEWALK/SHOULDER 0.50	New construction		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_23.899\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-24.236-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	97	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone headwall supporting a fill. Roadway under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	12	<b>Face Area (sq.):</b>	48
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	4	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		10
WALL FOUNDATION MATERIAL 8.00	Firm gravelly material		9
MORTAR 8.00	No distress noted		10
STONE MASONRY 8.00	No distress noted		10
CULVERT 0.50	No distress noted		9
LATERAL SLOPE 0.50	stable embankment fill		9
WALL DRAINS 0.50	No distress noted		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_24.236\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-24.336-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	98	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone headwall supporting a fill. Roadway under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	12	<b>Face Area (sq.):</b>	60
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	5	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		10
WALL FOUNDATION MATERIAL 8.00	Gravelly stream channel		9
MORTAR 8.00	No distress noted		10
STONE MASONRY 8.00	No distress noted		10
WALL DRAINS 0.50	No distress noted		9
CULVERT 0.50	No distress noted		10
LATERAL SLOPE 0.50	gravelly embankment fill		10
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_24.336\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-24.354-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	95	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone headwall supporting a fill. Roadway under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	12	<b>Face Area (sq.):</b>	48
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	4	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		9
WALL FOUNDATION MATERIAL 8.00	Stable fill material		9
MORTAR 8.00	No distress noted		10
STONE MASONRY 8.00	No distress noted		10
CULVERT 0.50	No distress noted		9
DOWNSLOPE 0.50	Steep but stable with sparse vegetation		9
LATERAL SLOPE 0.50	Embankment fill		9
WALL DRAINS 0.50	No distress noted		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_24.354\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-24.446-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	97	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone headwall supporting a fill. Roadway under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	12	<b>Face Area (sq.):</b>	48
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	4	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		10
WALL FOUNDATION MATERIAL 8.00	Firm gravelly material		9
MORTAR 8.00	No distress noted		10
STONE MASONRY 8.00	No distress noted		10
CULVERT 0.50	No distress noted		9
LATERAL SLOPE 0.50	stable embankment fill		9
WALL DRAINS 0.50	No distress noted		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_24.446\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-24.457-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	97	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone headwall supporting a fill. Roadway under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	26	<b>Face Area (sq.):</b>	122
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	7	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		10
WALL FOUNDATION MATERIAL 8.00	No distress noted, firm fill material		9
MORTAR 8.00	No distress noted		10
STONE MASONRY 8.00	No distress noted		10
DOWNSLOPE 0.50	Gradual well vegetated slope		9
LATERAL SLOPE 0.50	Stable fill material		9
WALL DRAINS 0.50	No distress noted		9
CULVERT 0.50	5' x 5' concrete box culvert, no distress noted		10
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_24.457\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-24.461-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	88	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Old historic Headwall at culvert inlet, performing well, no action is required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	26	<b>Face Area (sq.):</b>	111
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	7	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Old wall is performing well, no action is required.		9
WALL FOUNDATION MATERIAL 8.00	Ditch channel filled with duff, seldom runs water, no scour or bearing distress.		9
MORTAR 8.00	Some minor debonding, cracking or weathering.		8
STONE MASONRY 8.00	1 ft, minus stones, angular with tight joints, minimal weathering distress.		9
DOWNSLOPE 0.50	Gentle stable slope, well vegetated with trees and shrubs.		9
LATERAL SLOPE 0.50	Stable fill slopes on both sides.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_24.461\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-24.623-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	97	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone headwall supporting a fill. Roadway under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	12	<b>Face Area (sq.):</b>	60
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	5	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		10
WALL FOUNDATION MATERIAL 8.00	Streambed rocks		9
MORTAR 8.00	No distress noted		10
STONE MASONRY 8.00	No distress noted		10
CULVERT 0.50	No distress noted		9
LATERAL SLOPE 0.50	Gravelly soil		9
WALL DRAINS 0.50	No distress noted		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_24.623\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-24.665-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	97	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone headwall supporting a fill. Roadway under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	12	<b>Face Area (sq.):</b>	60
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	5	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		10
WALL FOUNDATION MATERIAL 8.00	No distress noted, firm fill material		9
MORTAR 8.00	No distress noted		10
STONE MASONRY 8.00	No distress noted		10
LATERAL SLOPE 0.50	No distress noted, firm fill material		9
UPSLOPE 0.50	Steep well vegetated slope		9
WALL DRAINS 0.50	No distress noted		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted- new road		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_24.665\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-24.882-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Slope Protection	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed Stone Wall protecting fill slope from scour damage, performing well, no action is required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	447	<b>Face Area (sq.):</b>	3407
<b>Average Wall Height (ft.):</b>	7	<b>Face Angle (deg.):</b>	48
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is protecting fill slope well, no action is required.		9
WALL FOUNDATION MATERIAL 8.00	Rocky creek channel with moderate-to-high scour potential but no scour distress noted, no bulging or bearing distress noted.		8
PLACED STONE 8.00	6 ft. sub angular stones with fair interlock, minimal weathering distress		9
DOWNSLOPE 0.50	Rocky creek channel with moderate-to-high scour potential.		8
LATERAL SLOPE 0.50	Gentle stable stream banks or fill slope, well vegetated with trees and brush.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_24.882\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-25.125-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	96	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stone rockery supporting a cutbank. Roadway is under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	166	<b>Face Area (sq.):</b>	1471
<b>Average Wall Height (ft.):</b>	8	<b>Face Angle (deg.):</b>	75
<b>Maximum Wall Height (ft.):</b>	16	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		10
WALL FOUNDATION MATERIAL 8.00	Firm gravelly soil		9
PLACED STONE 8.00	No distress noted		10
LATERAL SLOPE 0.50	Begin- Rock outcrop End- shallow slope that is grass covered		8
UPSLOPE 0.50	Relatively flat slope, stable		8
WALL DRAINS 0.50	No distress noted		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_25.125\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-25.198-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	96	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stacked stone Rockery supporting a cut slope. Roadway under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	517	<b>Face Area (sq.):</b>	5595
<b>Average Wall Height (ft.):</b>	10	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	11	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		10
WALL FOUNDATION MATERIAL 8.00	Solid fill material, no distress		9
PLACED STONE 8.00	No distress noted, well interlocked, new rockery		10
LATERAL SLOPE 0.50	Well vegetated		9
UPSLOPE 0.50	Well vegetated stable slope		9
WALL DRAINS 0.50	No distress noted		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_25.198\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-25.298-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Slope Protection	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed Stone Wall protecting fill slope from scour, performing well, no action is required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	218	<b>Face Area (sq.):</b>	1837
<b>Average Wall Height (ft.):</b>	8	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well and protecting the fill slope, no action is required.		9
WALL FOUNDATION MATERIAL 8.00	Rocky creek channel with moderate-to-high scour potential but no scour distress noted. No bulging or bearing distress noted.		8
PLACED STONE 8.00	6 ft. sub angular stones moderately interlocked, no weathering distress noted		9
DOWNSLOPE 0.50	Rocky creek channel with moderate-to-high scour potential.		8
LATERAL SLOPE 0.50	Gentle stream banks or fill slope, well vegetated with trees and shrubs.		9
ROAD/SIDEWALK/SHOULDER 0.50	Road is under construction, no distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress noted.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_25.298\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-25.431-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2005
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stone Rockery supporting a cut slope. Roadway under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	210	<b>Face Area (sq.):</b>	1314
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		9
WALL FOUNDATION MATERIAL 8.00	Gravelly firm soil		9
PLACED STONE 8.00	No distress noted		9
LATERAL SLOPE 0.50	Rock slope that is moderately steep		9
UPSLOPE 0.50	Moderately steep with sparse vegetation		9
WALL DRAINS 0.50	No distress noted		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_25.431\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-25.438-L		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	97	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone headwall supporting a fill. Roadway under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	30	<b>Face Area (sq.):</b>	84
<b>Average Wall Height (ft.):</b>	2	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		10
WALL FOUNDATION MATERIAL 8.00	Streambed rock		9
MORTAR 8.00	No distress noted		10
STONE MASONRY 8.00	No distress noted		10
LATERAL SLOPE 0.50	Stable embankment fill		8
CULVERT 0.50	No distress noted		9
WALL DRAINS 0.50	No distress noted		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_25.438\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0013-25.440-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	97	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone headwall. Roadway under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	25	<b>Face Area (sq.):</b>	86
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-3
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		10
WALL FOUNDATION MATERIAL 8.00	Gravely streambed material, no distress noted		9
MORTAR 8.00	No distress noted		10
STONE MASONRY 8.00	No distress noted		10
DOWNSLOPE 0.50	Riverbed material, no distress		9
LATERAL SLOPE 0.50	Stable fill material, well vegetated		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_25.440\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-25.477-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Slope Protection	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry placed stone protecting road from Middle creek. Roadway under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	115	<b>Face Area (sq.):</b>	1610
<b>Average Wall Height (ft.):</b>	14	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	14	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		9
WALL FOUNDATION MATERIAL 8.00	Rocky creek channel, moderate scour potential		8
PLACED STONE 8.00	No distress noted, moderate interlock		9
DOWNSLOPE 0.50	Middle creek channel, No distress noted		8
LATERAL SLOPE 0.50	Gentle stream banks, well vegetated with trees and shrubs		9
WALL DRAINS 0.50	No distress noted		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_25.477\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-25.562-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stacked Rockery supporting a fill. Roadway is under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	50	<b>Face Area (sq.):</b>	750
<b>Average Wall Height (ft.):</b>	15	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	15	<b>Vertical Offset (ft.):</b>	-4
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		9
WALL FOUNDATION MATERIAL 8.00	Streambed material, high scour potential		8
PLACED STONE 8.00	No distress noted		10
LATERAL SLOPE 0.50	Embankment fill with sparse vegetation		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_25.562\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-25.617-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Slope Protection	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry placed rock protecting road from Middle Creek. Roadway under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	196	<b>Face Area (sq.):</b>	3332
<b>Average Wall Height (ft.):</b>	17	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	17	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		9
WALL FOUNDATION MATERIAL 8.00	Stream channel, moderate scour potential		8
PLACED STONE 8.00	No distress noted		9
DOWNSLOPE 0.50	Middle creek, rocky stream channel		8
LATERAL SLOPE 0.50	Gentle stream banks that are well vegetated with trees and shrubs		9
WALL DRAINS 0.50	No distress noted		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_25.617\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0013-25.790-R		
<b>Route Name:</b>	EAST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 22, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	84	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Slope Protection	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stacked stone use for slope protection. Roadway under construction at this time		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	267	<b>Face Area (sq.):</b>	1736
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Moderate- wall performing as designed		9
WALL FOUNDATION MATERIAL 8.00	Stream bed channel		8
PLACED STONE 8.00	Good interlock, slight weathering		8
DOWNSLOPE 0.50	Middle creek at toe of wall, moderate scour potential		8
LATERAL SLOPE 0.50	Well vegetated gentle slopes		9
WALL DRAINS 0.50	No distress noted		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0013: EAST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0013\_25.790\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0014-7.094-L		
<b>Route Name:</b>	SOUTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry headwall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	20	<b>Face Area (sq.):</b>	88
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as designed		8
WALL FOUNDATION MATERIAL 8.00	Gravelly streambed		8
MORTAR 8.00	Some weathering, some debonding		8
STONE MASONRY 8.00	Intact competent stone		8
LATERAL SLOPE 0.50	Grass and trees, shallow to moderate embankment fill		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress		9
WALL DRAINS 0.50	No distress		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0014: SOUTH ENTRANCE ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0014\_7.094\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0014-7.094-R		
<b>Route Name:</b>	SOUTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	78	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Masonry headwall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	20	<b>Face Area (sq.):</b>	88
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as designed		8
WALL FOUNDATION MATERIAL 8.00	Gravelly streambed		8
MORTAR 8.00	Some weathering, some debonding		7
STONE MASONRY 8.00	Some missing stones at top otherwise good interlock		8
LATERAL SLOPE 0.50	Slight erosion at start, round rock armor at start, grassy embankment slope at end		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress		8
WALL DRAINS 0.50	No distress		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0014: SOUTH ENTRANCE ROAD**

**Retaining Wall Condition Photos**



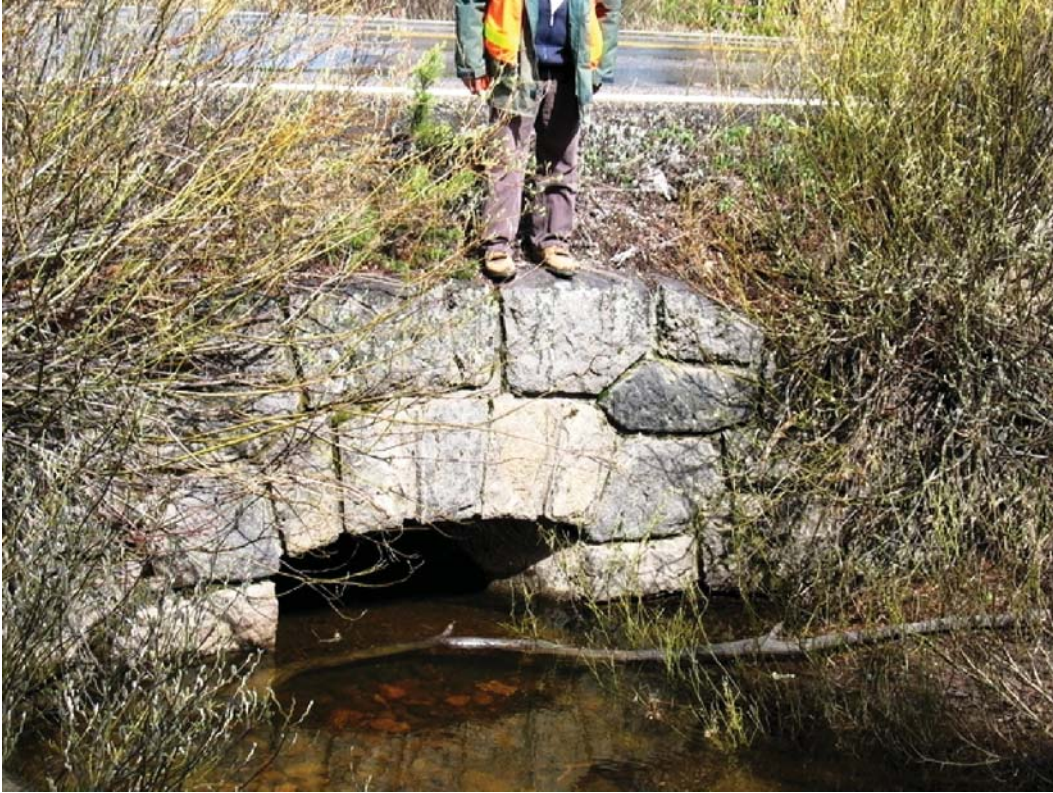
**YELL\_0014\_7.094\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0014-7.245-L		
<b>Route Name:</b>	SOUTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry headwall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	21	<b>Face Area (sq.):</b>	78
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as designed		8
WALL FOUNDATION MATERIAL 8.00	Gravelly streambed		8
MORTAR 8.00	Some weathering , mossy, slight debonding		8
STONE MASONRY 8.00	Intact competent rock		8
CULVERT 0.50	No distress		8
LATERAL SLOPE 0.50	Beginning has brush covered embankment, end has rip rap		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress		8
WALL DRAINS 0.50	No distress		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0014: SOUTH ENTRANCE ROAD**

**Retaining Wall Condition Photos**



**YELL\_0014\_7.245\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0014-7.248-R		
<b>Route Name:</b>	SOUTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone headwall supporting a fill, with a 5 ft box culvert		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	26	<b>Face Area (sq.):</b>	123
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		9
WALL FOUNDATION MATERIAL 8.00	Stable streambed material, Moderate scour potential		9
MORTAR 8.00	slight debonding, otherwise good condition		9
STONE MASONRY 8.00	Minimal weathering		9
LATERAL SLOPE 0.50	well vegetated stable slopes		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0014: SOUTH ENTRANCE ROAD**

**Retaining Wall Condition Photos**



**YELL\_0014\_7.248\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0014-8.206-R		
<b>Route Name:</b>	SOUTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	82	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry fill wall at Lewis Lake.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	84	<b>Face Area (sq.):</b>	383
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as planned		8
WALL FOUNDATION MATERIAL 8.00	Firm soil, sandy shoreline		9
MORTAR 8.00	Good shape, some debonding, some cracking		8
STONE MASONRY 8.00	Competent intact stone, little weathering		8
CULVERT 0.50	24" cmp 23' from start of wall		8
LATERAL SLOPE 0.50	Trees and grass on shallow embankment		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress		8
WALL DRAINS 0.50	No distress		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0014: SOUTH ENTRANCE ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0014\_8.206\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0014-8.960-R		
<b>Route Name:</b>	SOUTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-Placed stone wall supporting a fill.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	56	<b>Face Area (sq.):</b>	332
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	53
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		9
WALL FOUNDATION MATERIAL 8.00	firm stable soil		9
PLACED STONE 8.00	No distress noted, well interlock, 2' minus rock		9
DOWNSLOPE 0.50	Sandy well vegetated shoreline		9
LATERAL SLOPE 0.50	Stable fill slopes, well vegetated		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

## **ROUTE 0014: SOUTH ENTRANCE ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0014\_8.960\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0014-9.689-R		
<b>Route Name:</b>	SOUTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	88	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry wall supporting a fill.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	244	<b>Face Area (sq.):</b>	894
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	84
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as intended		9
WALL FOUNDATION MATERIAL 8.00	Firm soil on a stable well vegetated slope		9
STONE MASONRY 8.00	Minimal voids with a few guard wall stones missing		8
MORTAR 8.00	Minor debonding and weathering		9
CURB/BERM/DITCH 0.50	24" cmp cross drain		9
DOWNSLOPE 0.50	Well vegetated stable slope to shoreline		9
LATERAL SLOPE 0.50	well vegetated stable slope to shoreline		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress in roadway or shoulder		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0014: SOUTH ENTRANCE ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0014\_9.689\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0014-9.770-R		
<b>Route Name:</b>	SOUTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry fill wall above Lewis Lake.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	198	<b>Face Area (sq.):</b>	979
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as designed		8
WALL FOUNDATION MATERIAL 8.00	Firm sandy soil		8
MORTAR 8.00	Some cracking, some debonding, good condition		8
STONE MASONRY 8.00	Competent intact stone with little weathering		8
DOWNSLOPE 0.50	Shallow treed slope to lake		8
LATERAL SLOPE 0.50	Stable and forested		8
ROAD/SIDEWALK/SHOULDER 0.50	One crack parallel to wall		8
WALL DRAINS 0.50	No distress		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0014: SOUTH ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0014\_9.770\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0014-12.548-L		
<b>Route Name:</b>	SOUTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	78	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry headwall for box culvert.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	30	<b>Face Area (sq.):</b>	105
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	7	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as designed		8
WALL FOUNDATION MATERIAL 8.00	Gravelly streambed		8
MORTAR 8.00	Some debonding and cracking		7
STONE MASONRY 8.00	Intact competent stone, little weathering		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress		8
LATERAL SLOPE 0.50	Shallow grass covered and stable		9
WALL DRAINS 0.50	No distress		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0014: SOUTH ENTRANCE ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0014\_12.548\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0014-12.548-R		
<b>Route Name:</b>	SOUTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry headwall at culvert inlet		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	30	<b>Face Area (sq.):</b>	105
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	7	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		9
WALL FOUNDATION MATERIAL 8.00	Gravelly stream channel, stable		9
MORTAR 8.00	Minor weathering and cracking		9
STONE MASONRY 8.00	No distress noted		9
DOWNSLOPE 0.50	Gravelly streambed, stable		9
LATERAL SLOPE 0.50	stable fill slopes, that are well vegetated		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress of Roadway or shoulder noted		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

## **ROUTE 0014: SOUTH ENTRANCE ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0014\_12.548\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0014-13.810-L		
<b>Route Name:</b>	SOUTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	67	<b>Maintenance Action:</b>	Replace Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry placed stone wall supporting a fill, with severe stone degradation		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	99	<b>Face Area (sq.):</b>	1053
<b>Average Wall Height (ft.):</b>	10	<b>Face Angle (deg.):</b>	49
<b>Maximum Wall Height (ft.):</b>	15	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium- wall is still performing but rock is badly decaying, culvert needs to be replaced		6
WALL FOUNDATION MATERIAL 8.00	On steep shallow rock, seems unstable		7
PLACED STONE 8.00	Weathering, moderate spalling, loose stones, many stones breaking down into gravel sized particles		7
LATERAL SLOPE 0.50	rock outcrop at start, steep stable, well vegetated and natural slope at end		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		9
WALL DRAINS 0.50	No distress noted		9
CULVERT 1.00	Cross drain culvert, 24" cmp badly rusted and damaged at end		5
DOWNSLOPE 1.00	Shallow bedrock		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	1- Replace Rockery -rockery- 1000sqft @ \$50.00sqft = \$50,000. 2- Replace 24" cmp - 50ft @ \$205.00ft = \$10,250		
<b>Repair Cost:</b>	\$60,250		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0014: SOUTH ENTRANCE ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0014\_13.810\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0014-13.841-L		
<b>Route Name:</b>	SOUTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	77	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stacked fill wall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	159	<b>Face Area (sq.):</b>	1046
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	12	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as designed		8
WALL FOUNDATION MATERIAL 8.00	Firm gravelly and weathered rock		8
PLACED STONE 8.00	Some weathering, some voids, good interlock		7
LATERAL SLOPE 0.50	Gravelly rock slope with vegetation		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress		8
WALL DRAINS 0.50	No distress		9
DOWNSLOPE 1.00	Shallow vegetated slope to rock outcrop and cliff		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

## **ROUTE 0014: SOUTH ENTRANCE ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0014\_13.841\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0014-14.583-L		
<b>Route Name:</b>	SOUTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	88	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry wall supporting a fill.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	115	<b>Face Area (sq.):</b>	500
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	84
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall is performing as designed		9
WALL FOUNDATION MATERIAL 8.00	shallow in place rock		9
MORTAR 8.00	Minor cracking, debonding, and weathering		8
STONE MASONRY 8.00	No distress noted		9
CULVERT 0.50	24" cmp cross drain		8
DOWNSLOPE 0.50	Well vegetated slope over shallow bedrock		9
LATERAL SLOPE 0.50	Well vegetated slope with rock outcrops		9
ROAD/SIDEWALK/SHOULDER 0.50	No roadway or shoulder distress noted		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0014: SOUTH ENTRANCE ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0014\_14.583\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0014-14.762-L		
<b>Route Name:</b>	SOUTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	77	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stacked fill wall with moderately weathered rock		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	28	<b>Face Area (sq.):</b>	280
<b>Average Wall Height (ft.):</b>	10	<b>Face Angle (deg.):</b>	48
<b>Maximum Wall Height (ft.):</b>	14	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as planned		8
WALL FOUNDATION MATERIAL 8.00	Weathered rock		8
PLACED STONE 8.00	Moderately weathered with some voids and good interlock		7
DOWNSLOPE 0.50	Steep slope to cliff, grass covered and appears stable		8
LATERAL SLOPE 0.50	Beginning has rubble slope and end is shallow with grass covered embankment, both are stable		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress		8
WALL DRAINS 0.50	No distress		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

## **ROUTE 0014: SOUTH ENTRANCE ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0014\_14.762\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0014-14.937-L		
<b>Route Name:</b>	SOUTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	84	<b>Maintenance Action:</b>	Maintenance
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry placed stone supporting fill, Road runoff from shoulder causing piping behind stones		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	148	<b>Face Area (sq.):</b>	1980
<b>Average Wall Height (ft.):</b>	13	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	18	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- wall performing as intended, piping along shoulder needs minor maintenance		8
WALL FOUNDATION MATERIAL 8.00	Steep stable slopes, well vegetated with trees		9
PLACED STONE 8.00	Minor weathering, well interlocked		9
CULVERT 0.50	24" cmp, appears in good shape		8
WALL DRAINS 0.50	No distress noted		9
ROAD/SIDEWALK/SHOULDER 1.00	Shoulder has piping due to road runoff		5
DOWNSLOPE 1.00	Steep stable tree covered slope		7
LATERAL SLOPE 1.00	Steep stable tree covered slope		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	1- fill piping holes above wall -2 laborers, 8 hrs total, 8hrs @ \$55.00 hr = \$440.00		
<b>Repair Cost:</b>	\$440		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0014: SOUTH ENTRANCE ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0014\_14.937\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0014-14.953-L		
<b>Route Name:</b>	SOUTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	88	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry wall supporting fill		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	180	<b>Face Area (sq.):</b>	1125
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall is performing as designed		9
WALL FOUNDATION MATERIAL 8.00	Firm shallow in place rock		9
MORTAR 8.00	Minimal cracking and debonding		8
STONE MASONRY 8.00	No distress noted		9
DOWNSLOPE 0.50	Steep grassy stable slope		9
LATERAL SLOPE 0.50	Gentle slopes with sparse vegetation		9
ROAD/SIDEWALK/SHOULDER 0.50	No shoulder or roadway distress noted		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

## **ROUTE 0014: SOUTH ENTRANCE ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0014\_14.953\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0014-15.735-L		
<b>Route Name:</b>	SOUTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry placed stone wall supporting fill		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	79	<b>Face Area (sq.):</b>	577
<b>Average Wall Height (ft.):</b>	7	<b>Face Angle (deg.):</b>	50
<b>Maximum Wall Height (ft.):</b>	12	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		9
WALL FOUNDATION MATERIAL 8.00	Firm, steep, stable slope, well vegetated		8
PLACED STONE 8.00	No distress noted		9
DOWNSLOPE 0.50	Stable steep slope with sparse vegetation		9
LATERAL SLOPE 0.50	Stable steep slope with sparse vegetation		9
ROAD/SIDEWALK/SHOULDER 0.50	No shoulder or roadway distress noted		9
WALL DRAINS 0.50	No evidence of distress		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0014: SOUTH ENTRANCE ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0014\_15.735\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0014-16.128-L		
<b>Route Name:</b>	SOUTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	74	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry placed stone supporting a fill, Mortar has been dumped over a 75 ft section at highest point of wall. Also a 40 ft section of wall is undermining at highest point, needs to be monitored		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	244	<b>Face Area (sq.):</b>	3532
<b>Average Wall Height (ft.):</b>	14	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	22	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium- wall is performing as designed but needs to be monitored		8
WALL FOUNDATION MATERIAL 8.00	Undermined at highest section		7
PLACED STONE 8.00	Mortar dumped over a 70' section, slight bulge at highest point		7
DOWNSLOPE 0.50	Steep but stable slope that is well vegetated		8
LATERAL SLOPE 0.50	Steep stable slope that is well vegetated		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

## **ROUTE 0014: SOUTH ENTRANCE ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0014\_16.128\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0014-16.253-L		
<b>Route Name:</b>	SOUTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	73	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Crib - Timber
<b>Surface Treatment:</b>	Preservative	<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Timber crib fill wall supporting road fill.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	71	<b>Face Area (sq.):</b>	231
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	80
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as designed		7
WALL FOUNDATION MATERIAL 8.00	Firm gravelly soil		8
BIN OR CRIB 8.00	Timber crib, weathered, top row is failing, remaining rows in good shape		7
TRAFFIC BARRIER/FENCE 0.50	No distress		8
WALL DRAINS 0.50	No distress		9
UPSLOPE 1.00	Piping through top crib with loose chunks of asphalt		6
DOWNSLOPE 1.00	Steep with few trees, some raveling		7
LATERAL SLOPE 1.00	Steep with few trees		7
ROAD/SIDEWALK/SHOULDER 1.00	Minor distress on shoulder		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	75 square feet of timber crib @ \$10 per square foot = \$750.00. 2 Laborers for 8 hours each = 16 hours of labor @ \$55.00 per hour = \$880.00. 1 Excavator for 8 hours @ \$150.00 per hour = \$1200.00. 1 Dump truck for 8 hours @ \$120.00 per hour = \$960.00		
<b>Repair Cost:</b>	\$3,790		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0014: SOUTH ENTRANCE ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0014\_16.253\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0014-16.283-L		
<b>Route Name:</b>	SOUTH ENTRANCE ROAD		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	Maintenance
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry wall supporting fill, maintenance required at top of wall		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	121	<b>Face Area (sq.):</b>	979
<b>Average Wall Height (ft.):</b>	8	<b>Face Angle (deg.):</b>	84
<b>Maximum Wall Height (ft.):</b>	12	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall is performing as intended, piping along shoulder needs maintenance		8
WALL FOUNDATION MATERIAL 8.00	Firm soil that is well vegetated		9
MORTAR 8.00	Minor cracking, debonding and weathering		9
STONE MASONRY 8.00	No distress noted		9
DOWNSLOPE 0.50	Steep stable slope over shallow rock		8
LATERAL SLOPE 0.50	Steep stable slope that is well vegetated		8
WALL DRAINS 0.50	No distress noted		9
ROAD/SIDEWALK/SHOULDER 1.00	Runoff from shoulder at start of wall has caused voids		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	1- Place rock in eroded areas - 2 laborers = 8 hrs total, 8 hrs @ \$55.00 hr = \$440.00. Use local material on site		
<b>Repair Cost:</b>	\$440		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

## **ROUTE 0014: SOUTH ENTRANCE ROAD**

### **Retaining Wall Condition Photos**



**YELL\_0014\_16.283\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0015-2.450-L		
<b>Route Name:</b>	WEST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 14, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	83	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Fill wall of large (6-foot minus) stone supporting roadway embankment.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	428	<b>Face Area (sq.):</b>	5337
<b>Average Wall Height (ft.):</b>	12	<b>Face Angle (deg.):</b>	47
<b>Maximum Wall Height (ft.):</b>	13	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		8
WALL FOUNDATION MATERIAL 8.00	River bed moderate to high scout potential.		8
PLACED STONE 8.00	Intact, subangular interlocking 6-foot minus stone with little weathering.		9
LATERAL SLOPE 0.50	Gravelly embankment fill slope with trees - minor raveling.		8
WALL DRAINS 0.50	No distress.		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress.		9
UPSLOPE 0.50	Road shoulder trees and grass stable.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0015: WEST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0015\_2.450\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0015-2.734-L		
<b>Route Name:</b>	WEST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 14, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry placed stone support roadway embankment.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	345	<b>Face Area (sq.):</b>	3105
<b>Average Wall Height (ft.):</b>	9	<b>Face Angle (deg.):</b>	46
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		9
WALL FOUNDATION MATERIAL 8.00	Riverbed - moderate scour potential.		8
PLACED STONE 8.00	Interlocking component, intact rock.		9
CULVERT 0.50	As new - flowing clear/clean water.		9
LATERAL SLOPE 0.50	Gravelly embankment fill with trees and grass.		9
UPSLOPE 0.50	Road shoulder with trees and grass - stable.		9
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0015: WEST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0015\_2.734\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0015-2.876-L		
<b>Route Name:</b>	WEST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 14, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stacked gravity wall support embankment fill.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	350	<b>Face Area (sq.):</b>	3850
<b>Average Wall Height (ft.):</b>	11	<b>Face Angle (deg.):</b>	50
<b>Maximum Wall Height (ft.):</b>	11	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		9
WALL FOUNDATION MATERIAL 8.00	Riverbed - moderate scout potential. No scour noted at this time.		8
PLACED STONE 8.00	No distress		9
DOWNSLOPE 0.50	River bed.		9
LATERAL SLOPE 0.50	Gentle vegetated slope.		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress.		9
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0015: WEST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0015\_2.876\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0015-2.987-L		
<b>Route Name:</b>	WEST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 14, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Fill wall consisting of dry stacked rock to support roadway embankment.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	300	<b>Face Area (sq.):</b>	3300
<b>Average Wall Height (ft.):</b>	11	<b>Face Angle (deg.):</b>	46
<b>Maximum Wall Height (ft.):</b>	11	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>	
PERFORMANCE 8.00	High - as intended.	9	
WALL FOUNDATION MATERIAL 8.00	Riverbed - low scour potential.	8	
PLACED STONE 8.00	Intact, competent, interlocking, 6-foot minus stone.	9	
LATERAL SLOPE 0.50	Embankment fill with trees - stable.	9	
ROAD/SIDEWALK/SHOULDER 0.50	No distress.	9	
UPSLOPE 0.50	Road shoulder is grass and trees - stable.	9	
WALL DRAINS 0.50	No distress.	9	
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0015: WEST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0015\_2.987\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0015-7.246-R		
<b>Route Name:</b>	WEST ENTRANCE ROAD		
<b>Inspection Date:</b>	May 14, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	84	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Large rock, up to 8-foot, place to support roadway embankment.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	638	<b>Face Area (sq.):</b>	7371
<b>Average Wall Height (ft.):</b>	11	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	12	<b>Vertical Offset (ft.):</b>	-2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		9
WALL FOUNDATION MATERIAL 8.00	River bed gravels and low scour potential.		8
PLACED STONE 8.00	Large stone and large voids. Wall has consistent batter with no bulging. Stone has very little weathering and is competent and intact.		8
LATERAL SLOPE 0.50	Gravelly embankment fill soil, minor raveling, some trees.		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress.		9
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0015: WEST ENTRANCE ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0015\_7.246\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0016-0.366-R		
<b>Route Name:</b>	NORRIS CANYON ROAD		
<b>Inspection Date:</b>	May 11, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	52	<b>Maintenance Action:</b>	Replace Wall
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mass Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Concrete head wall		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	45	<b>Face Area (sq.):</b>	210
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	10
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>	
PERFORMANCE 8.00	Low - wing wall failed	4	
WALL FOUNDATION MATERIAL 8.00	No signs of distress in good section	7	
CONCRETE 8.00	Wing wall failed and is laying in stream. Remaining concrete in good shape	4	
LATERAL SLOPE 1.00	Good above good wing wall, well vegetated Slumping above failed wing wall - eroding towards road	4	
CULVERT 0.50	No sign of distress noted	9	
ROAD/SIDEWALK/SHOULDER 0.50	No sign of distress noted	9	
WALL DRAINS 0.50	No sign of distress noted	9	
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	1- Rebuild failed wing wall - 60 sqft concrete @ \$60.00 sqft = \$3,600. 2- Fix slump above failed wall - dump truck - 8hrs @ \$120.00 hr = \$960.00. Excavator - 8 hrs @ \$150.00 hr = \$1,200.00. Labor - 8 hrs @ \$55.00 hr = \$440.		
<b>Repair Cost:</b>	\$6,200		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0016: NORRIS CANYON ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0016\_0.366\_R\_1.jpg**



**YELL\_0016\_0.366\_R\_2.jpg**



<b>Wall ID:</b>	YELL-0016-0.377-L		
<b>Route Name:</b>	NORRIS CANYON ROAD		
<b>Inspection Date:</b>	May 11, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	77	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mass Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Cast concrete headwall. With a 6 ft x 10 ft culvert		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	45	<b>Face Area (sq.):</b>	150
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	7	<b>Vertical Offset (ft.):</b>	18
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>	
PERFORMANCE 8.00	Medium- wall is performing as designed	7	
WALL FOUNDATION MATERIAL 8.00	Gravelly stream bed, grass vegetation to toe of wall	9	
CONCRETE 8.00	Sound, no weathering or cracking, Top of wall displaced about 8" at west side	7	
DOWNSLOPE 0.50	Gravelly streambed with moderate scour potential	8	
LATERAL SLOPE 0.50	Stable with sparse vegetation	8	
WALL DRAINS 0.50	No internal drainage distress noted	9	
ROAD/SIDEWALK/SHOULDER 1.00	No road distress noted, shoulder is raveling but has sparse vegetation	7	
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	1- Reset west wing wall - excavator 4 hrs @ \$150.00 hr = 600		
<b>Repair Cost:</b>	\$600		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0016: NORRIS CANYON ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0016\_0.377\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0016-7.800-L		
<b>Route Name:</b>	NORRIS CANYON ROAD		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Cantilever - Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Concrete headwall with a 10 ft x 10 ft culvert		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	34	<b>Face Area (sq.):</b>	204
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	-18
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as intended		9
WALL FOUNDATION MATERIAL 8.00	Riverbed, no distress noted, moderate scour potential		8
CONCRETE 8.00	No distress noted		10
DOWNSLOPE 0.50	Riverbed, no distress noted		8
ROAD/SIDEWALK/SHOULDER 0.50	No signs of distress noted		9
WALL DRAINS 0.50	No signs of distress noted		9
LATERAL SLOPE 0.50	Stable fill, well vegetated		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0016: NORRIS CANYON ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0016\_7.800\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0016-7.800-R		
<b>Route Name:</b>	NORRIS CANYON ROAD		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Cantilever - Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Concrete headwall with a 10 ft x 10 ft culvert		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	34	<b>Face Area (sq.):</b>	204
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	-16
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as designed		9
WALL FOUNDATION MATERIAL 8.00	Riverbed material, moderate scour potential		8
CONCRETE 8.00	No distress noted		10
DOWNSLOPE 0.50	Riverbed, no distress noted		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		9
WALL DRAINS 0.50	No distress noted		9
LATERAL SLOPE 0.50	Stable fill material, well vegetated		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0016: NORRIS CANYON ROAD**

## **Retaining Wall Condition Photos**



**YELL\_0016\_7.800\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0018B-13.124-L		
<b>Route Name:</b>	BEARTOOTH HIGHWAY (WYOMING STATE HIGHWAY 212)		
<b>Inspection Date:</b>	May 16, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	70	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mass Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	Gravity - Mortared Stone
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Cast in place concrete headwall with gravity stone mortared wall ends at inlet.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	34	<b>Face Area (sq.):</b>	247
<b>Average Wall Height (ft.):</b>	7	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	-6
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Good, wall performing as intended. No signs of distress.		7
WALL FOUNDATION MATERIAL 8.00	Founded on natural stream channel, no signs of distress.		7
MORTAR 8.00	Minor spalling and cracking.		6
CONCRETE 8.00	Minor spalling, minor surface crack.		7
STONE MASONRY 8.00	Hard, durable rock.		8
WALL DRAINS 0.50	None observed. No signs of drainage related issues.		8
CULVERT 1.00	Multi-plate, 17' width with minor signs of corrosion.		7
LATERAL SLOPE 1.00	Wall start ties into boulders. Wall end ties into silty sand with minor sloughing.		7
UPSLOPE 1.00	Recently built fill slope, 2:1 grassy vegetation, no signs of erosion.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0018B: BEARTOOTH HIGHWAY (WYOMING STATE HIGHWAY 212)**

## **Retaining Wall Condition Photos**



**YELL\_0018B\_13.124\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0018B-13.124-R		
<b>Route Name:</b>	BEARTOOTH HIGHWAY (WYOMING STATE HIGHWAY 212)		
<b>Inspection Date:</b>	May 16, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	67	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mass Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Cast in place concrete headwall at outlet.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	68	<b>Face Area (sq.):</b>	309
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	16
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Good, wall performing as intended. No signs of distress. Wall observed during high flow velocity.		7
WALL FOUNDATION MATERIAL 8.00	Founded on natural stream channel, no signs of distress.		7
CONCRETE 8.00	Minor spalling, minor surface crack on start of wing wall.		6
WALL DRAINS 0.50	None observed. No signs of drainage related issues.		8
CULVERT 1.00	Multi-plate, 17' width with minor signs of corrosion.		7
LATERAL SLOPE 1.00	Wall start ties into boulders. Wall end ties into rock or large floater (boulder?).		7
UPSLOPE 1.00	Recently built fill slope, 2:1 grassy vegetation, no signs of erosion.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0018B: BEARTOOTH HIGHWAY (WYOMING STATE HIGHWAY 212)**

## **Retaining Wall Condition Photos**



**YELL\_0018B\_13.124\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0107-0.162-L		
<b>Route Name:</b>	GULL POINT DRIVE		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	77	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Cantilever - Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Fill wall supporting roadway along lake. Wall continues for an additional 750 ft under 4 ft minimum height.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	162	<b>Face Area (sq.):</b>	590
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	4	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Acceptable with concerns about batter and pavement		7
WALL FOUNDATION MATERIAL 8.00	Gravelly sand lake bed		8
CONCRETE 8.00	Minor hairline cracking, slight negative batter		8
LATERAL SLOPE 0.50	Beginning has rock fill and rip rap, end has wall under 4'		8
WALL DRAINS 0.50	No distress		9
ROAD/SIDEWALK/SHOULDER 1.00	Some cracking of pavement		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0107: GULL POINT DRIVE**

## **Retaining Wall Condition Photos**



**YELL\_0107\_0.162\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0107-0.186-R		
<b>Route Name:</b>	GULL POINT DRIVE		
<b>Inspection Date:</b>	May 18, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	77	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Cantilever - Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Concrete Headwall		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	27	<b>Face Area (sq.):</b>	104
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	4	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as designed		8
WALL FOUNDATION MATERIAL 8.00	Sand and gravel lake bed		8
CONCRETE 8.00	Extensive cracking less than 1/8" thick with some reaching 1/4", not effecting performance		7
DOWNSLOPE 0.50	Lake		8
LATERAL SLOPE 0.50	Vegetated moderate slope		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress		8
WALL DRAINS 0.50	No distress		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0107: GULL POINT DRIVE**

## **Retaining Wall Condition Photos**



**YELL\_0107\_0.186\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0107-0.474-L		
<b>Route Name:</b>	GULL POINT DRIVE		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Cantilever - Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Concrete cantilever headwall with a 5 ft box culvert		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	23	<b>Face Area (sq.):</b>	94
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	4	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as intended		9
WALL FOUNDATION MATERIAL 8.00	Sandy lake shore, no distress noted		9
CONCRETE 8.00	Minimal cracking in guard wall above culvert, otherwise in good condition		8
DOWNSLOPE 0.50	Sandy stream channel that outlets into lake		9
LATERAL SLOPE 0.50	Short concrete wall at road with sandy beach to lake		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0107: GULL POINT DRIVE**

## **Retaining Wall Condition Photos**



**YELL\_0107\_0.474\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0107-0.482-R		
<b>Route Name:</b>	GULL POINT DRIVE		
<b>Inspection Date:</b>	May 21, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	68	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Cantilever - Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Concrete headwall with concrete spalling off of top and face exposing rebar.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	23	<b>Face Area (sq.):</b>	94
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	4	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Wall is performing as planned but should be monitored for further distress		7
WALL FOUNDATION MATERIAL 8.00	Gravelly sand lake bed		8
CONCRETE 8.00	Concrete is spalling off of face and top exposing rebar		5
LATERAL SLOPE 0.50	Shallow grass covered embankment fill		8
ROAD/SIDEWALK/SHOULDER 0.50	Minor cracking of roadway		8
WALL DRAINS 0.50	No distress		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

**ROUTE 0107: GULL POINT DRIVE**

## **Retaining Wall Condition Photos**



**YELL\_0107\_0.482\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0503-0.858-L		
<b>Route Name:</b>	NORTH RIM DRIVE		
<b>Inspection Date:</b>	May 18, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	77	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	Crib - Timber
<b>Secondary Surface Treatment:</b>	Preservative	<b>Architectural Facing:</b>	
<b>General Description:</b>	Historic stone masonry supporting road with timber crib downslope. Timber crib is failing and scheduled to be replaced in 2008 by fhwa.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	50	<b>Face Area (sq.):</b>	200
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	75
<b>Maximum Wall Height (ft.):</b>	4	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as designed		8
WALL FOUNDATION MATERIAL 8.00	Trail supported by timber crib		8
MORTAR 8.00	Slight debonding, slight cracking, some weathering		7
STONE MASONRY 8.00	Some weathering, intact competent stone, good interlock		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress		9
WALL DRAINS 0.50	No distress		9
OTHER SECONDARY ELEMENT 1.00	Timber crib with extensive undermining of foundation, scheduled to be replaced in 2008 by FHWA		6
DOWNSLOPE 1.00	Steep altered rock slope, some raveling		7
LATERAL SLOPE 1.00	Embankment fill		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0503: NORTH RIM DRIVE**

## **Retaining Wall Condition Photos**



**YELL\_0503\_0.858\_L\_1.jpg**



**YELL\_0503\_0.858\_L\_2.jpg**



<b>Wall ID:</b>	YELL-0504-0.302-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed Stone Wall supporting fill slope, performing well, no action is required/		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	145	<b>Face Area (sq.):</b>	798
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	54
<b>Maximum Wall Height (ft.):</b>	11	<b>Vertical Offset (ft.):</b>	-5
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well, no action is required.		9
WALL FOUNDATION MATERIAL 8.00	Riverbed with moderate scour potential.		8
PLACED STONE 8.00	5-to-6 ft. stones on top & 2-to-3 ft. stones on bottom, no weathering.		9
LATERAL SLOPE 0.50	Beginning has gentle slope, rocky at other end with a GD wall.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_0.302\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-0.345-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	58	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stacked rock wall supporting roadway embankment and protecting roadway embankment from river.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	218	<b>Face Area (sq.):</b>	1199
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	49
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Low - wall on verge of no longer performing due to missing and weathered stone.		5
WALL FOUNDATION MATERIAL 8.00	Undermining river bed. Moderate scour potential.		7
PLACED STONE 8.00	Missing many stones at many locations. Stones are slightly to highly to weathered.		5
WALL DRAINS 0.50	No distress.		8
LATERAL SLOPE 1.00	Steep raveling embankment fill with some trees and sparse grass.		6
ROAD/SIDEWALK/SHOULDER 1.00	Minor cracking in pavement. Shoulder appears stable.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	Repair/Replace approximately 200 sq. ft. of missing or highly weathered dry stack stone. 200 sq.ft. x \$50/sq.ft. = \$10,000		
<b>Repair Cost:</b>	\$10,000		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_0.345\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-0.502-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	61	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Placed stone fill wall holding road embankment and protecting embankment from river.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	311	<b>Face Area (sq.):</b>	1935
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Low - wall on verge of not performing.		5
WALL FOUNDATION MATERIAL 8.00	Riverbed - Low to moderate scour potential.		7
MANUFACTURED BLOCK/BRICK 8.00	Slightly to moderately weathered and some missing stones.		6
WALL DRAINS 0.50	No distress.		9
LATERAL SLOPE 1.00	Raveling - sparse vegetation.		6
ROAD/SIDEWALK/SHOULDER 1.00	Minor cracking in pavement. Shoulder has some grass and trees with little raveling present.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	Repair approximately 50% of dry stack stone wall. ~2,000sqft x 50% = 1,000 sq.ft. 1,000sqft x \$50/sqft = \$50,000		
<b>Repair Cost:</b>	\$50,000		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_0.502\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-0.810-L		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	84	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stacked rock with forest intrusion (trees growing from face).		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	100	<b>Face Area (sq.):</b>	500
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	5	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		8
WALL FOUNDATION MATERIAL 8.00	Firm gravelly soil.		9
PLACED STONE 8.00	Intact, competent stone.		8
LATERAL SLOPE 0.50	Steep stable treed slope.		8
DOWNSLOPE 0.50	Flat forested slope.		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress in roadway and shoulder appears stable.		9
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_0.810\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0504-0.905-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	89	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Crib - Timber
<b>Surface Treatment:</b>	Preservative	<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Treated timber crib wall supporting roadway embankment through small gully.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	85	<b>Face Area (sq.):</b>	755
<b>Average Wall Height (ft.):</b>	8	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	11	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as designed.		9
WALL FOUNDATION MATERIAL 8.00	Gravelly fill and loose rock, moderate to high potential for undermining.		8
BIN OR CRIB 8.00	Treated timber - as new.		10
LATERAL SLOPE 0.50	Rock outcrops - moderately weathered.		8
WALL DRAINS 0.50	No distress.		8
DOWNSLOPE 1.00	Large (3-foot) loose rock, potential for sliding and undermining wall. Steep slope with river at bottom.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_0.905\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-0.967-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed Stone Wall supporting fill slope, performing well, no action is required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	156	<b>Face Area (sq.):</b>	6922
<b>Average Wall Height (ft.):</b>	44	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	52	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>	
PERFORMANCE 8.00	High - Wall is performing well, no action is required.	9	
WALL FOUNDATION MATERIAL 8.00	Flat bench, no distress noted.	9	
PLACED STONE 8.00	Angular Stones well interlocked, minimal weathering, no bulging distress noted,	9	
LATERAL SLOPE 0.50	Beginning is a rock face, end is steep with no vegetation and sloughing into river.	8	
DOWNSLOPE 0.50	Flat well vegetated with rock.	9	
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.	9	
WALL DRAINS 0.50	No evidence of internal drainage distress noted.	9	
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_0.967\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-1.092-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	86	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stack fill wall supporting roadway embankment.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	62	<b>Face Area (sq.):</b>	605
<b>Average Wall Height (ft.):</b>	9	<b>Face Angle (deg.):</b>	48
<b>Maximum Wall Height (ft.):</b>	18	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		9
WALL FOUNDATION MATERIAL 8.00	Firm soil and rock.		9
PLACED STONE 8.00	Intact competent rock with few small voids.		8
DOWNSLOPE 0.50	Flat - top of rock outcrop, appears stable.		8
LATERAL SLOPE 0.50	Rock slopes with minor raveling.		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress.		8
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_1.092\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-1.116-L		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Fill wall to support road embankment.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	185	<b>Face Area (sq.):</b>	1105
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		9
WALL FOUNDATION MATERIAL 8.00	Firm soil.		9
STONE MASONRY 8.00	Intact, interlocking, 2-foot minus rock with few small voids.		8
DOWNSLOPE 0.50	Flat forested slope.		9
LATERAL SLOPE 0.50	Gentle forested slopes.		9
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_1.116\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0504-1.136-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed Stone Wall supporting fill slope, performing well, no action is required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	95	<b>Face Area (sq.):</b>	380
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well, no action is required.		9
WALL FOUNDATION MATERIAL 8.00	Firm soil , no undermining or bearing distress noted.		9
PLACED STONE 8.00	2 ft. minus angular stones well interlocked, a few small voids		8
DOWNSLOPE 0.50	Flat and tree covered.		9
LATERAL SLOPE 0.50	Well vegetated stable slopes on both sides.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No internal drainage distress noted.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_1.136\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-1.160-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stacked rock fill wall to support roadway embankment.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	120	<b>Face Area (sq.):</b>	1912
<b>Average Wall Height (ft.):</b>	15	<b>Face Angle (deg.):</b>	54
<b>Maximum Wall Height (ft.):</b>	32	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		8
WALL FOUNDATION MATERIAL 8.00	Firm soil and rock outcrop.		8
PLACED STONE 8.00	2-foot minus intact rock with good interlock with few voids and no bulging.		8
DOWNSLOPE 0.50	Moderately steep rock slope - stable with grass and trees.		8
LATERAL SLOPE 0.50	Start - gentle slope of rock and soil. End - rock outcrop.		8
WALL DRAINS 0.50	No distress.		8
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_1.160\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-1.189-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	83	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry wall on rock outcrop.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	30	<b>Face Area (sq.):</b>	105
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	75
<b>Maximum Wall Height (ft.):</b>	7	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		8
WALL FOUNDATION MATERIAL 8.00	Rock outcrop and firm soil.		9
MORTAR 8.00	Good condition weathered back approximately 3 inches back from face - not affecting wall performance.		7
STONE MASONRY 8.00	Intact, competent rock in good condition.		9
ROAD/SIDEWALK/SHOULDER 0.50	Minor distress in roadway.		8
LATERAL SLOPE 0.50	Rock outcrops.		9
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_1.189\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-1.210-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stack fill wall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	194	<b>Face Area (sq.):</b>	916
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	9	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		9
WALL FOUNDATION MATERIAL 8.00	No distress - flat firm soil.		9
PLACED STONE 8.00	Slight weathering.		9
CULVERT 0.50	No distress.		9
LATERAL SLOPE 0.50	Vegetated rock.		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress in roadway.		9
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_1.210\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-1.216-L		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stack fill wall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	165	<b>Face Area (sq.):</b>	957
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	7	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		9
WALL FOUNDATION MATERIAL 8.00	No distress. Flat firm soil.		9
PLACED STONE 8.00	Slight weathering and small voids.		9
CULVERT 0.50	No distress.		9
LATERAL SLOPE 0.50	Vegetated - no distress.		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress in roadway.		9
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_1.216\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0504-1.284-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	84	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stack fill wall supporting roadway embankment.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	159	<b>Face Area (sq.):</b>	1204
<b>Average Wall Height (ft.):</b>	7	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	17	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		8
WALL FOUNDATION MATERIAL 8.00	Firm gravelly soil - stable.		9
PLACED STONE 8.00	Intact, competent 2-foot minus rock with small voids.		8
CULVERT 0.50	As new - dry.		9
DOWNSLOPE 0.50	Gentle forested slope - stable.		9
LATERAL SLOPE 0.50	Start - rock outcrop -stable. End - stone masonry wall.		9
ROAD/SIDEWALK/SHOULDER 0.50	Minor cracking in roadway.		9
WALL DRAINS 0.50	No distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_1.284\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-1.315-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	76	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone fill wall 20 ft x 5 ft section of loose rock near begin of wall that needs to be repaired		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	457	<b>Face Area (sq.):</b>	8137
<b>Average Wall Height (ft.):</b>	17	<b>Face Angle (deg.):</b>	75
<b>Maximum Wall Height (ft.):</b>	42	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Moderate- wall performing well, mortar should be monitored, loose rock near beginning of wall needs to be repaired		8
WALL FOUNDATION MATERIAL 8.00	Solid bedrock material, well vegetated		9
MORTAR 8.00	Mortar is very weathered, completely gone in places, but is not affecting the performance of the wall		6
STONE MASONRY 8.00	Well interlocked, minimal voids, loose rock near begin needs to be repaired		7
DOWNSLOPE 0.50	rock bench, well vegetated		9
LATERAL SLOPE 0.50	Dry placed stone at beginning and end		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	1- Rebuild 100sqft of wall - 100sqft @ \$160.00 sqft = \$16,000. Use existing material that is on site		
<b>Repair Cost:</b>	\$16,000		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_1.315\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-1.402-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stack fill wall to support embankment.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	112	<b>Face Area (sq.):</b>	1492
<b>Average Wall Height (ft.):</b>	13	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	27	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		8
WALL FOUNDATION MATERIAL 8.00	Rock outcrop and firm gravelly soil - difficult access.		8
PLACED STONE 8.00	Intact, competent, interlocking, no bulging, few missing stones, difficult to access, few small voids.		8
DOWNSLOPE 0.50	Stable with trees, steep rock outcrop to cliff.		8
ROAD/SIDEWALK/SHOULDER 0.50	Minor roadway distress - not related to wall.		8
WALL DRAINS 0.50	No distress.		9
LATERAL SLOPE 1.00	Start - stone masonry wall. End - steep rock slope some raveling.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_1.402\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-1.430-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 17, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	34	<b>Maintenance Action:</b>	Replace Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stacked rockery supporting a fill		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	40	<b>Face Area (sq.):</b>	440
<b>Average Wall Height (ft.):</b>	11	<b>Face Angle (deg.):</b>	50
<b>Maximum Wall Height (ft.):</b>	22	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Low- 60% of wall has failed		3
WALL FOUNDATION MATERIAL 8.00	Steep and gravelly		4
PLACED STONE 8.00	60% of wall has failed and is gone		2
DOWNSLOPE 1.00	Steep and gravelly		4
LATERAL SLOPE 0.50	Rock outcrop on both ends		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	1- Rebuild 300 sqft of dry laid stone - 300sqft @ \$50.00 sqft = \$15,000		
<b>Repair Cost:</b>	\$15,000		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_1.430\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-1.449-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	71	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry fill wall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	255	<b>Face Area (sq.):</b>	2629
<b>Average Wall Height (ft.):</b>	10	<b>Face Angle (deg.):</b>	75
<b>Maximum Wall Height (ft.):</b>	20	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Mortar in poor shape, but not affecting wall performance.		8
WALL FOUNDATION MATERIAL 8.00	Firm soil and rock outcrop - no undermining.		8
MORTAR 8.00	Weathered, debonded, cracked, missing.		5
STONE MASONRY 8.00	Largely intact, 3-foot minus rock with consistent batter.		7
CULVERT 0.50	Fine, dry, see through.		8
DOWNSLOPE 0.50	Gentle forested slope then steep outcrop cliffs.		8
LATERAL SLOPE 0.50	Outcrops of largely intact rock.		8
WALL DRAINS 0.50	No distress.		8
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_1.449\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-1.526-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stack stone supporting embankment.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	370	<b>Face Area (sq.):</b>	1377
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	50
<b>Maximum Wall Height (ft.):</b>	19	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		8
WALL FOUNDATION MATERIAL 8.00	Firm, gravelly soil and weathered rock outcrop. No undermining.		8
PLACED STONE 8.00	2-foot minus interlocking, intact, some voids, some missing stones.		8
DOWNSLOPE 0.50	Stable, steep rock outcrop with trees and small plants.		8
LATERAL SLOPE 0.50	Stable, steep forested slopes.		8
ROAD/SIDEWALK/SHOULDER 0.50	Minor cracks in roadway not due to performance of the wall.		8
WALL DRAINS 0.50	No distress.		8
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_1.526\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-1.670-L		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed stone Wall supporting fill slope, performing well, no action is required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	165	<b>Face Area (sq.):</b>	908
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	11	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well, no action is required.		9
WALL FOUNDATION MATERIAL 8.00	Firm soil on flat stable surface, well vegetated with tree cover, no undermining or bearing distress noted.		9
PLACED STONE 8.00	Angular stones well interlocked, some slight voids, minimal weathering, slight bulge noted.		8
DOWNSLOPE 0.50	Stable slope well vegetated with trees.		9
LATERAL SLOPE 0.50	Gentle slopes well vegetated with trees.		9
WALL DRAINS 0.50	No evidence of internal drainage distress noted.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_1.670\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0504-1.681-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed Stone Wall supporting fill slope, performing well, no action is required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	170	<b>Face Area (sq.):</b>	1318
<b>Average Wall Height (ft.):</b>	7	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	16	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>	
PERFORMANCE 8.00	High - Wall is performing well, no action is required.	9	
WALL FOUNDATION MATERIAL 8.00	Firm soil on flat surface, well vegetated, no bulging or bearing distress noted.	9	
PLACED STONE 8.00	Angular stones well interlocked, some slight voids, minimal weathering.	8	
DOWNSLOPE 0.50	Flat stable ground well vegetated with tree cover.	9	
LATERAL SLOPE 0.50	Stable slopes well vegetated with tree cover.	9	
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.	9	
WALL DRAINS 0.50	No evidence of internal drainage distress noted.	9	
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0504: FIREHOLE CANYON DRIVE**

### **Retaining Wall Condition Photos**



**YELL\_0504\_1.681\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-1.749-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed Stone Wall supporting fill slope, performing well, no action is necessary.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	144	<b>Face Area (sq.):</b>	509
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	46
<b>Maximum Wall Height (ft.):</b>	9	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well, no action is required.		9
WALL FOUNDATION MATERIAL 8.00	Firm colluvial soil over shallow in-place rock. No undermining or bearing distress noted.		9
PLACED STONE 8.00	2 ft. minus angular stones well interlocked with minimal weathering. No bulging distress noted.		9
DOWNSLOPE 0.50	Moderately steep but stable slope, tree covered, some rock outcrops.		9
LATERAL SLOPE 0.50	Steep stable slopes both sides, tree covered.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress noted.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_1.749\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-1.866-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	73	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stack fill wall supporting roadway embankment.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	364	<b>Face Area (sq.):</b>	3952
<b>Average Wall Height (ft.):</b>	10	<b>Face Angle (deg.):</b>	47
<b>Maximum Wall Height (ft.):</b>	22	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		7
WALL FOUNDATION MATERIAL 8.00	Firm, gravelly soil - no undermining.		8
PLACED STONE 8.00	Intact, interlocking, 2-foot minus rock with few small voids and occasional missing stones. Slight bulge in bottom third of wall.		7
DOWNSLOPE 0.50	Stable rock slope to river.		8
LATERAL SLOPE 0.50	Stable rock slope with sparse to some vegetation.		8
WALL DRAINS 0.50	No distress.		8
CULVERT 1.00	Culvert drop structure as new. Culvert through wall plugged.		5
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	Repair/Replace approximately 25 missing stones. 2 laborers * 8 hours * \$55/hour = \$880. Use local material. Cleanout culvert - 2 laborers * 4 hours * \$55/hour = \$440.		
<b>Repair Cost:</b>	\$1,320		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0504: FIREHOLE CANYON DRIVE**

### **Retaining Wall Condition Photos**



**YELL\_0504\_1.866\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-1.968-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	84	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed Stone Wall supporting fill slope, performing well but need to monitor for further undermining.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	38	<b>Face Area (sq.):</b>	295
<b>Average Wall Height (ft.):</b>	7	<b>Face Angle (deg.):</b>	52
<b>Maximum Wall Height (ft.):</b>	16	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well but need to monitor for further undermining.		9
WALL FOUNDATION MATERIAL 8.00	In-place rock at toe, slight undermining, need to monitor.		8
PLACED STONE 8.00	Angular stones with good interlock, slight voids, slight weathering		8
DOWNSLOPE 0.50	Very steep in place rock.		9
LATERAL SLOPE 0.50	Beginning is in-place rock, end is flat slope with sparse vegetation.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress noted.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_1.968\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-1.985-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	37	<b>Maintenance Action:</b>	Replace Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Failed dry stack fill wall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	40	<b>Face Area (sq.):</b>	200
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	50
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>	
PERFORMANCE 8.00	Failed.	1	
WALL FOUNDATION MATERIAL 8.00	Weathered rock outcrop.	8	
PLACED STONE 8.00	Stone weathered to point that wall has failed. Rock is not reusable to reconstruct wall.	1	
DOWNSLOPE 0.50	Gentle grass covered slope.	8	
LATERAL SLOPE 0.50	Weathered rock outcrops.	8	
WALL DRAINS 0.50	None observed	8	
ROAD/SIDEWALK/SHOULDER 1.00	Minor distress - does not appear to be related to wall failure.	7	
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	Replace existing failed wall with stone face MSE wall. 200 sq.ft. x \$50/sq.ft. = \$10,000 for stone face, 200 sq.ft. x \$70/sq.ft. = \$14,000 for MSE wall. Total = \$24,000		
<b>Repair Cost:</b>	\$24,000		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_1.985\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-1.999-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	74	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry -placed Stone Wall supporting fill slope, still performing but has moderate to severe stone degradation which is currently not affecting the structure but needs to be monitored.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	61	<b>Face Area (sq.):</b>	473
<b>Average Wall Height (ft.):</b>	7	<b>Face Angle (deg.):</b>	48
<b>Maximum Wall Height (ft.):</b>	16	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>	
PERFORMANCE 8.00	Medium - Wall is still performing but stones are degrading severely and need to be monitored.	7	
WALL FOUNDATION MATERIAL 8.00	Firm soil on gentle stable slope, no undermining noted.	9	
PLACED STONE 8.00	1 ft. minus stone well interlocked but with moderate to severe spalling and weathering. Many voids and bulging. Degradation has not progressed to the extent that the structure is in eminent danger of failure but needs to be monitored.	6	
ROAD/SIDEWALK/SHOULDER 0.50	No road distress noted, shoulder has apparently eroded in the past and been refilled.	8	
DOWNSLOPE 0.50	Gentle stable slope with sparse tree cover.	9	
LATERAL SLOPE 0.50	Rock outcrops on both sides.	9	
WALL DRAINS 0.50	No evidence of internal drainage distress noted.	9	
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_1.999\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-2.013-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	52	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stack fill wall, top four ft has disintegrated.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	125	<b>Face Area (sq.):</b>	1337
<b>Average Wall Height (ft.):</b>	10	<b>Face Angle (deg.):</b>	55
<b>Maximum Wall Height (ft.):</b>	21	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Moderate - replace top stones.		5
WALL FOUNDATION MATERIAL 8.00	Weathered bedrock.		8
PLACED STONE 8.00	Highly weathered, nearly soil along the top four feet of the wall.		2
DOWNSLOPE 0.50	Steep slope with some vegetation.		8
LATERAL SLOPE 0.50	Weathered bedrock outcrop.		8
ROAD/SIDEWALK/SHOULDER 0.50	Minor cracks in roadway, not related to wall.		8
WALL DRAINS 0.50	No distress.		8
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	Repair/replace upper 4 to 6 feet with local stone. 625 sq.ft. of rockery replacement x \$50/sq.ft. = \$31,250. Narrow road will require traffic control.		
<b>Repair Cost:</b>	\$31,250		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0504: FIREHOLE CANYON DRIVE**

### **Retaining Wall Condition Photos**



**YELL\_0504\_2.013\_R\_1.jpg**



**YELL\_0504\_2.013\_R\_2.jpg**

<b>Wall ID:</b>	YELL-0504-2.064-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	78	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone fill wall with a 40 ft section of foundation undermined		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	105	<b>Face Area (sq.):</b>	772
<b>Average Wall Height (ft.):</b>	7	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	14	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as intended		9
WALL FOUNDATION MATERIAL 8.00	30' from start the foundation is undermined for about 40'		5
MORTAR 8.00	Slight debonding but otherwise in good shape		8
STONE MASONRY 8.00	Slight weathering		9
DOWNSLOPE 0.50	fairly steep but stable bedrock, sparse vegetation		9
LATERAL SLOPE 0.50	In place rock on both ends		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	1- Repair undermined foundation - 10 yds concrete @ \$1,470 yd = \$14,700, excavator 8 hrs @ \$150.00 hr = \$1,200, dump truck 8 hrs @ \$120.00 hr = \$960.00, 2 laborers 16 hrs @ \$ 55.00 hr = \$ 880.00		
<b>Repair Cost:</b>	\$17,740		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_2.064\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-2.090-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	68	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone masonry supporting roadway embankment.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	94	<b>Face Area (sq.):</b>	749
<b>Average Wall Height (ft.):</b>	7	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		8
WALL FOUNDATION MATERIAL 8.00	Residual soil and weathered rock. 30 to 35 feet of foundation undermined.		6
MORTAR 8.00	Debonding, cracking, moderate weathering, some missing.		5
STONE MASONRY 8.00	Little weathering, some cracking, largely intact.		8
LATERAL SLOPE 0.50	Slightly weathered rock outcrop.		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress.		8
WALL DRAINS 0.50	No distress.		8
DOWNSLOPE 1.00	Steep gravelly rock slope with sparse vegetation.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	Repair three sections of undermined foundation; one 20-foot section and two 6-foot sections. 10 cy concrete * \$1,230/cy = \$12,300. Excavator 8 hours * \$150/hour = \$1,200. Dump 8 hours * \$120/hour = \$960. 2 Laborers * 8 hours * \$55/hour = \$880. Total: \$15,340		
<b>Repair Cost:</b>	\$15,340		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_2.090\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-2.104-L		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed Stone Wall supporting fill, performing well, no action is required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	93	<b>Face Area (sq.):</b>	407
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well, no action is required.		9
WALL FOUNDATION MATERIAL 8.00	Firm soil, no bulging or bearing distress noted.		9
PLACED STONE 8.00	Angular stones well interlocked, small voids, slight weathering does not affect the function of the wall.		8
DOWNSLOPE 0.50	Gentle tree covered slope.		9
LATERAL SLOPE 0.50	Gentle tree covered slopes on both sides.		9
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress noted.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_2.104\_L\_1.jpg**

<b>Wall ID:</b>	YELL-0504-2.140-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stone Masonry Wall supporting fill slope, performing well but mortar is severely weathered and needs to be monitored.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	35	<b>Face Area (sq.):</b>	455
<b>Average Wall Height (ft.):</b>	13	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	13	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well but need to monitor the mortar for further degradation and loose stones.		8
WALL FOUNDATION MATERIAL 8.00	Firm soil on gentle stable slope, no undermining or bearing distress noted.		9
MORTAR 8.00	Moderate to severe debonding and weathering. Often missing. Not affecting the structure due to the excellent interlock of stones.		6
STONE MASONRY 8.00	2 ft. minus angular atones well interlocked, no loose stones, minimal spalling or weathering, no batter distress noted		9
DOWNSLOPE 0.50	Gentle colluvial slope with sparse grass and tree cover.		9
LATERAL SLOPE 0.50	Rock outcrops on both sides.		9
WALL DRAINS 0.50	No evidence of internal drainage distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**

**Condition photos are not available for YELL-0504-2.140-R.**

<b>Wall ID:</b>	YELL-0504-2.161-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	68	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stacked stone rockery supporting a fill		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	66	<b>Face Area (sq.):</b>	175
<b>Average Wall Height (ft.):</b>	2	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	9	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>	
PERFORMANCE 8.00	Low- section of wall has failed	6	
WALL FOUNDATION MATERIAL 8.00	Solid rock outcrop	9	
PLACED STONE 8.00	Weathering, large voids, first 30' of wall has failed, hasn't affected the road	5	
DOWNSLOPE 0.50	Vertical rock for aprox 20' then gentle slope	8	
LATERAL SLOPE 0.50	begin- rock outcrop end- steep but well vegetated	9	
ROAD/SIDEWALK/SHOULDER 0.50	Road shows no signs of distress	9	
WALL DRAINS 0.50	No distress noted	9	
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	1- Repair first 31ft of wall - 140 sqft rockery @ \$50.00 sqft = \$7,000		
<b>Repair Cost:</b>	\$7,000		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_2.161\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0504-2.175-R		
<b>Route Name:</b>	FIREHOLE CANYON DRIVE		
<b>Inspection Date:</b>	May 15, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry laid fill wall.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	86	<b>Face Area (sq.):</b>	342
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	60
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - as intended.		8
WALL FOUNDATION MATERIAL 8.00	Firm soil and rock.		8
PLACED STONE 8.00	Slightly weathered stone, some voids.		8
DOWNSLOPE 0.50	Steep rock outcrop.		8
LATERAL SLOPE 0.50	Steep rock outcrop.		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress.		8
WALL DRAINS 0.50	No distress.		8
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	MODERATE		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0504: FIREHOLE CANYON DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0504\_2.175\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0509-0.634-R		
<b>Route Name:</b>	VIRGINIA CASCADE DRIVE		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	83	<b>Maintenance Action:</b>	Maintenance
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Crib - Timber
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Treated Timber Crib Wall supporting fill slope, performing well, no action required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	65	<b>Face Area (sq.):</b>	580
<b>Average Wall Height (ft.):</b>	8	<b>Face Angle (deg.):</b>	75
<b>Maximum Wall Height (ft.):</b>	11	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>	
PERFORMANCE 8.00	High - wall is performing well, needs maintenance to corrected piping damage.	8	
WALL FOUNDATION MATERIAL 8.00	Steep apparently stable shallow soil over rock ledge, no undermining.	8	
BIN OR CRIB 8.00	Only minor weathering in timber, no batter or bulging distress, no loss of material between lateral members.	9	
DOWNSLOPE 0.50	Steep but apparently stable over rock ledge, sparse vegetation.	8	
LATERAL SLOPE 0.50	Steep but relatively stable tree covered colluvium on both sides.	8	
WALL DRAINS 0.50	No evidence of internal drainage distress..	9	
ROAD/SIDEWALK/SHOULDER 1.00	Minor pavement cracking in road runoff from shoulder causing some piping damage at 4 locations, needs maintenance.	7	
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	Fill piping holes at top of wall and compact t. Use local materials. 2 Laborers x 4 hr. = 8 hr. x \$55/hr. = \$440		
<b>Repair Cost:</b>	\$440		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

## **ROUTE 0509: VIRGINIA CASCADE DRIVE**

### **Retaining Wall Condition Photos**



**YELL\_0509\_0.634\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0509-0.794-R		
<b>Route Name:</b>	VIRGINIA CASCADE DRIVE		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	82	<b>Maintenance Action:</b>	Maintenance
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Crib - Timber
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Treated Timber Wall supporting fill slope with older and newer sections, still performing well, needs piping and raveling maintenance.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	110	<b>Face Area (sq.):</b>	755
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium - Wall is still performing well but needs maintenance to fill piping holes throughout and raveling at start of wall. Monitor wood in older sections.		8
WALL FOUNDATION MATERIAL 8.00	About 2 ft. of firm colluvium over in-place rock.		9
BIN OR CRIB 8.00	Newer copper-treated sections have no weathering distress, older tar-treated sections have slight weathering but no rotten wood exposed. Cribbs show no batter or bulging distress. Minimal loss of material from piping at top.		8
DOWNSLOPE 0.50	Shall in-place rock, sparse tree covered.		8
WALL DRAINS 0.50	No evidence of internal drainage distress.		9
LATERAL SLOPE 1.00	Steep fill at beginning of wall, sloughing exposing end of crib. Needs to be rocked up.		7
ROAD/SIDEWALK/SHOULDER 1.00	No road distress noted, Runoff from shoulder causing some piping damage throughout and rifling at start of wall. Needs maintenance to correct.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	Fill piping holes throughout and rock up raveling hole at start of wall. Use local materials. 2 Laborers x 4 hr. = 8 hr. x \$55/hr. = \$440		
<b>Repair Cost:</b>	\$440		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0509: VIRGINIA CASCADE DRIVE**

### **Retaining Wall Condition Photos**



**YELL\_0509\_0.794\_R\_1.jpg**



**YELL\_0509\_0.794\_R\_2.jpg**

<b>Wall ID:</b>	YELL-0509-0.855-R		
<b>Route Name:</b>	VIRGINIA CASCADE DRIVE		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Crib - Timber
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Timber crib fill wall		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	50	<b>Face Area (sq.):</b>	375
<b>Average Wall Height (ft.):</b>	7	<b>Face Angle (deg.):</b>	69
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as intended		9
WALL FOUNDATION MATERIAL 8.00	No signs of distress		9
BIN OR CRIB 8.00	Treated timber, no signs of distress, minimal weathering		9
LATERAL SLOPE 0.50	Sparse vegetation at start, rock outcrop on end		8
DOWNSLOPE 0.50	Lightly forested, steep, 45% slope		9
ROAD/SIDEWALK/SHOULDER 0.50	No signs of distress		9
WALL DRAINS 0.50	No signs of distress		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0509: VIRGINIA CASCADE DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0509\_0.855\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0509-0.869-R		
<b>Route Name:</b>	VIRGINIA CASCADE DRIVE		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Crib - Timber
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Newer treated timber crib supporting fill slope, performing well, no action required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	50	<b>Face Area (sq.):</b>	541
<b>Average Wall Height (ft.):</b>	10	<b>Face Angle (deg.):</b>	75
<b>Maximum Wall Height (ft.):</b>	13	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Wall is performing well, no action is required.		9
WALL FOUNDATION MATERIAL 8.00	Stable steep colluvium, no undermining, sparse tree cover.		8
BIN OR CRIB 8.00	No evidence of wood weathering, no batter or bulging distress noted.		9
DOWNSLOPE 0.50	Steep stable colluvium with sparse tree cover.		8
LATERAL SLOPE 0.50	In-place rock at start of wall, another crib wall at end.		9
ROAD/SIDEWALK/SHOULDER 0.50	No evidence of road or shoulder distress.		9
WALL DRAINS 0.50	No evidence of internal drainage distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0509: VIRGINIA CASCADE DRIVE**

### **Retaining Wall Condition Photos**



**YELL\_0509\_0.869\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0509-0.877-R		
<b>Route Name:</b>	VIRGINIA CASCADE DRIVE		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	71	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Crib - Timber
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Treated timber crib fill wall		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	33	<b>Face Area (sq.):</b>	934
<b>Average Wall Height (ft.):</b>	28	<b>Face Angle (deg.):</b>	47
<b>Maximum Wall Height (ft.):</b>	42	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium		8
WALL FOUNDATION MATERIAL 8.00	Lower bin material has eroded out wall bottom 6'-10' up wall there is a large void beneath wall Along entire wall foundation there is a 2' - 3' void		5
BIN OR CRIB 8.00	Ends of timber have slight weathering Slight bulge in face approx. 30' down		8
DOWNSLOPE 0.50	Very steep and rocky		8
LATERAL SLOPE 0.50	Bin wall @ start of wall and Rock face @ end of wall		9
ROAD/SIDEWALK/SHOULDER 0.50	No signs of distress noted		9
WALL DRAINS 0.50	No signs of distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	1- Repair wall foundation - 10 yds lean concrete @ \$175.00 yd = \$1750.00. 2- Build a 10' x 6' cantilever wall - 60 sqft @ \$170.00 sqft = \$10,200.		
<b>Repair Cost:</b>	\$11,950		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0509: VIRGINIA CASCADE DRIVE**

### **Retaining Wall Condition Photos**



**YELL\_0509\_0.877\_R\_1.jpg**



**YELL\_0509\_0.877\_R\_2.jpg**

<b>Wall ID:</b>	YELL-0509-0.883-R		
<b>Route Name:</b>	VIRGINIA CASCADE DRIVE		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Crib - Timber
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Older Treated Timber Crib supporting fill, performing well, no action required.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	44	<b>Face Area (sq.):</b>	561
<b>Average Wall Height (ft.):</b>	12	<b>Face Angle (deg.):</b>	48
<b>Maximum Wall Height (ft.):</b>	23	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High - Older wall is performing well, need to monitor the potential for undermining.		8
WALL FOUNDATION MATERIAL 8.00	On fractured in-place rock, no undermining.		8
BIN OR CRIB 8.00	Only minor weathering distress in timber, no bulging distress, slight sag in top 2 logs not affecting structure at this time.		8
DOWNSLOPE 0.50	Fractured rock with about the same slope as the wall.		8
ROAD/SIDEWALK/SHOULDER 0.50	Some evidence of past pavement repair and filling of piping holes, no current distress noted.		8
LATERAL SLOPE 0.50	In-place rock on both sides.		9
WALL DRAINS 0.50	No evidence of internal drainage distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0509: VIRGINIA CASCADE DRIVE**

### **Retaining Wall Condition Photos**



**YELL\_0509\_0.883\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0509-0.907-R		
<b>Route Name:</b>	VIRGINIA CASCADE DRIVE		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	78	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Crib - Timber
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	Gravity - Dry Stone
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Compound Wall - 21 ft. of Rockery, 31 ft. of Newer Treated Timber Crib, and 55 ft. of Rockery. Still performing but rockery need repair of face stones and crib needs piping maintenance.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	107	<b>Face Area (sq.):</b>	864
<b>Average Wall Height (ft.):</b>	8	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	16	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>	
PERFORMANCE 8.00	Medium - Wall is still performing, but beginning rockery section need repair of face stones and piping damage at top of crib needs to be corrected.	8	
WALL FOUNDATION MATERIAL 8.00	Firm colluvium over shallow in-place rock.	8	
PLACED STONE 8.00	Beginning 21 ft. Rockery is large 3 ft. minus moderately weathered volcanic stones with good interlock. Surface weathering has progressed to 3 in. depth. Some voids and loss of bearing from highly weathered stones. Need to reset and replace badly weath	6	
BIN OR CRIB 8.00	No timber weathering noted. No batter or bulging distress.	9	
DOWNSLOPE 0.50	Steep Colluvium over shallow in-place rock.	8	
LATERAL SLOPE 0.50	Steep but apparently stable colluvium with sparse timber cover.	8	
ROAD/SIDEWALK/SHOULDER 0.50	No road distress noted. Piping damage at top of crib wall from shoulder runoff needs to be corrected.	8	
WALL DRAINS 0.50	No evidence of internal drainage problems.	9	
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	1. For the 21 ft. of rockery at the start of the wall, remove and reset face stones to improve interlock. Replace highly weathered stones as needed. Salvage suitable stones from on-site. 2. Fill and compact piping voids at top of crib. Use local material		
<b>Repair Cost:</b>	\$5,920		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0509: VIRGINIA CASCADE DRIVE**

### **Retaining Wall Condition Photos**



**YELL\_0509\_0.907\_R\_1.jpg**



**YELL\_0509\_0.907\_R\_2.jpg**

<b>Wall ID:</b>	YELL-0509-0.952-R		
<b>Route Name:</b>	VIRGINIA CASCADE DRIVE		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	65	<b>Maintenance Action:</b>	Replace Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed Stone Wall supporting fill, with severely degraded stones, no longer performing, needs to be replaced.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	71	<b>Face Area (sq.):</b>	336
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	7	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	POOR - First 40 ft. of wall is no longer functional and needs to be replaced. Last 31 ft. is a different rock material and is still performing.		5
WALL FOUNDATION MATERIAL 8.00	On in-place rock and no distress noted.		9
PLACED STONE 8.00	First 40 ft. of wall length has severely degraded stones (crumbling and exfoliated), has bulging distress and is no longer functional. Last 31 ft. has a different type of stone which is not as weathered and does not have bulging distress.		5
DOWNSLOPE 0.50	Steep colluvium over shallow in-place rock.		8
LATERAL SLOPE 0.50	Steep but apparently stable colluvium with sparse tree cover.		8
WALL DRAINS 0.50	No evidence of internal drainage distress.		9
ROAD/SIDEWALK/SHOULDER 1.00	No road distress noted. Shoulder is sloughing and missing in sections.in first 40 ft. of wall length.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	Remove the first 40 ft. section of the wall and replace it with a new rockery of more durable stone. Remove 40 ft. x 4.5 ft wall = 180 sq. ft.& replace with new rockery: Excavator 8 hr. x \$150/hr. = \$1200		
<b>Repair Cost:</b>	\$12,040		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0509: VIRGINIA CASCADE DRIVE**

### **Retaining Wall Condition Photos**



**YELL\_0509\_0.952\_R\_1.jpg**



**YELL\_0509\_0.952\_R\_2.jpg**

<b>Wall ID:</b>	YELL-0509-0.965-R		
<b>Route Name:</b>	VIRGINIA CASCADE DRIVE		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	93	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Crib - Timber
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Treated timber fill wall		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	12	<b>Face Area (sq.):</b>	120
<b>Average Wall Height (ft.):</b>	10	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	2
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as intended		9
WALL FOUNDATION MATERIAL 8.00	Solid rock, no distress noted		10
BIN OR CRIB 8.00	Treated timber, newer, No distress noted		9
DOWNSLOPE 0.50	Steep, Rock, no distress noted		9
LATERAL SLOPE 0.50	Rock, no distress noted		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0509: VIRGINIA CASCADE DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0509\_0.965\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0509-0.974-R		
<b>Route Name:</b>	VIRGINIA CASCADE DRIVE		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	93	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Crib - Timber
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Treated timber crib, fill wall		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	10	<b>Face Area (sq.):</b>	60
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as intended		9
WALL FOUNDATION MATERIAL 8.00	Bed Rock, no distress noted		10
BIN OR CRIB 8.00	Treated timber, looks newer		9
DOWNSLOPE 0.50	steep rock slope, no distress noted		9
LATERAL SLOPE 0.50	Rock, no distress noted		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		9
WALL DRAINS 0.50	No internal drainage distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0509: VIRGINIA CASCADE DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0509\_0.974\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0509-0.986-R		
<b>Route Name:</b>	VIRGINIA CASCADE DRIVE		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	73	<b>Maintenance Action:</b>	Repair Elements
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stone fill wall		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	18	<b>Face Area (sq.):</b>	257
<b>Average Wall Height (ft.):</b>	14	<b>Face Angle (deg.):</b>	71
<b>Maximum Wall Height (ft.):</b>	19	<b>Vertical Offset (ft.):</b>	3
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium - 10' of dry laid stone failed		6
WALL FOUNDATION MATERIAL 8.00	Rock, no distress noted		9
PLACED STONE 8.00	Dry laid top 6' - Rocks are cracked, with voids and loose stones Mortared bottom- some bulging, good interlock, 10' section @ beginning failed causing erosion		6
MORTAR 8.00	Slightly weathered, some debonding		8
DOWNSLOPE 0.50	Rock - steep 45% slope		8
LATERAL SLOPE 0.50	Rock		9
ROAD/SIDEWALK/SHOULDER 0.50	No signs of distress noted		9
WALL DRAINS 0.50	No signs of distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	1- Rebuild beginning of wall - 60 sqft dry laid stone @ \$50.00 sqft = \$3,000.		
<b>Repair Cost:</b>	\$3,000		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

## **ROUTE 0509: VIRGINIA CASCADE DRIVE**

### **Retaining Wall Condition Photos**



**YELL\_0509\_0.986\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0509-0.997-R		
<b>Route Name:</b>	VIRGINIA CASCADE DRIVE		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	93	<b>Maintenance Action:</b>	Maintenance
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Crib - Timber
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Treated timber crib wall		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	22	<b>Face Area (sq.):</b>	176
<b>Average Wall Height (ft.):</b>	8	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	-3
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Piping not effecting performance		9
WALL FOUNDATION MATERIAL 8.00	In place rock		10
BIN OR CRIB 8.00	No signs of distress noted		9
ROAD/SIDEWALK/SHOULDER 0.50	Piping in road edge 2 areas - 2' to 3' deep		8
WALL DRAINS 0.50	No drainage issues evident		9
LATERAL SLOPE 0.50	Rock both sides		10
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	1- Fill piped area along road - 4 hrs labor @ \$55.00 hr = \$220.00. 2- use material on site		
<b>Repair Cost:</b>	\$220		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0509: VIRGINIA CASCADE DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0509\_0.997\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0509-1.016-R		
<b>Route Name:</b>	VIRGINIA CASCADE DRIVE		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	88	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Crib - Timber
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	Gravity - Dry Stone
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Treated timber crib at start = 240 sqft Rockery at end = 75 sqft		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	30	<b>Face Area (sq.):</b>	315
<b>Average Wall Height (ft.):</b>	10	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	21	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	High- Wall performing as intended		9
WALL FOUNDATION MATERIAL 8.00	Placed stone on solid rock		9
PLACED STONE 8.00	Slight surface weathering, good interlock, minor voids		8
BIN OR CRIB 8.00	Treated timber - newer		9
DOWNSLOPE 0.50	Steep rock and soil		8
LATERAL SLOPE 0.50	Rock		9
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted		9
WALL DRAINS 0.50	No distress noted		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

**Yellowstone National Park**  
**ROUTE 0509: VIRGINIA CASCADE DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0509\_1.016\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0509-1.026-R		
<b>Route Name:</b>	VIRGINIA CASCADE DRIVE		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	30	<b>Maintenance Action:</b>	Replace Wall
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed Stone Wall failed, no longer supporting fill. Needs to be replaced with new rockery keyed into in-place rock.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	25	<b>Face Area (sq.):</b>	288
<b>Average Wall Height (ft.):</b>	11	<b>Face Angle (deg.):</b>	57
<b>Maximum Wall Height (ft.):</b>	14	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>	
PERFORMANCE 8.00	POOR - Wall has failed and needs to be replaced with new rockery keyed into in-place rock.	2	
WALL FOUNDATION MATERIAL 8.00	Steep colluvial trough between two rock outcrops. Depth of new wall has to be extended through colluvium..	5	
PLACED STONE 8.00	Failed wall, mostly gone except for small quantity on either end at contact with in-place rock. Failed section extends to edge of pavement.	1	
WALL DRAINS 0.50	No evidence that internal drainage caused the failure.	8	
LATERAL SLOPE 0.50	In-place rock outcrops on both sides.	9	
DOWNSLOPE 1.00	Colluvium on steep marginally stable slope over shallow in-place rock.	7	
ROAD/SIDEWALK/SHOULDER 5.00	Road shows no distress. Shoulder completely gone to edge of pavement.	3	
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	Remove minor amounts of material remaining from edge of failed wall and replace with a new rockery keyed into in-place rock on both sides and bottom. New wall area = 25 ft. x 14 ft. = 350 sq. ft. Excavator - 4 hr.		
<b>Repair Cost:</b>	\$19,020		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0509: VIRGINIA CASCADE DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0509\_1.026\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0509-1.034-R		
<b>Route Name:</b>	VIRGINIA CASCADE DRIVE		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	77	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-placed Stone Wall still supporting fill, has several steel rods driven vertically into the foundation rock to help support toe. Toe support needs to be monitored.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	32	<b>Face Area (sq.):</b>	176
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	55
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium - still performing but rock weathering and toe support need to be monitored.		8
WALL FOUNDATION MATERIAL 8.00	Founded on in-place rock with no distress noted.		9
PLACED STONE 8.00	6 ft. minus rock moderately weathered but still well interlocked. A few stones missing. Not affecting the structure at this time.		6
DOWNSLOPE 0.50	Stable but steep in-place rock		8
LATERAL SLOPE 0.50	In-place rock outcrops on both sides.		8
ROAD/SIDEWALK/SHOULDER 0.50	No road or shoulder distress noted.		9
WALL DRAINS 0.50	No evidence of internal drainage distress.		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0509: VIRGINIA CASCADE DRIVE**

### **Retaining Wall Condition Photos**



**YELL\_0509\_1.034\_R\_1.jpg**



**YELL\_0509\_1.034\_R\_2.jpg**

<b>Wall ID:</b>	YELL-0509-1.042-R		
<b>Route Name:</b>	VIRGINIA CASCADE DRIVE		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	86	<b>Maintenance Action:</b>	Maintenance
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Crib - Timber
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Treated timber crib wall		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	30	<b>Face Area (sq.):</b>	315
<b>Average Wall Height (ft.):</b>	10	<b>Face Angle (deg.):</b>	81
<b>Maximum Wall Height (ft.):</b>	11	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>	
PERFORMANCE 8.00	High - Wall shows some piping	8	
WALL FOUNDATION MATERIAL 8.00	Solid rock, no distress noted	9	
BIN OR CRIB 8.00	treated timber, no signs of distress noted	9	
DOWNSLOPE 0.50	Steep, soil is stable	9	
WALL DRAINS 0.50	No signs of distress noted	9	
LATERAL SLOPE 1.00	Rock walls at both sides- some distress at beginning of wall	7	
ROAD/SIDEWALK/SHOULDER 1.00	Some distress - Shoulder sloughing in spots due to piping	7	
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	1- Repair areas of piping - 4 hrs labor @ \$55.00 hr = \$220.00. 2- Use material on site		
<b>Repair Cost:</b>	\$220		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



# **Yellowstone National Park**

## **ROUTE 0509: VIRGINIA CASCADE DRIVE**

### **Retaining Wall Condition Photos**



**YELL\_0509\_1.042\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0509-1.048-R		
<b>Route Name:</b>	VIRGINIA CASCADE DRIVE		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	74	<b>Maintenance Action:</b>	Maintenance
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	Gravity - Dry Stone
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Compound Wall with a 6 ft. high Dry-placed Stone Wall on top of a 10 ft. high Stone Masonry Wall, still performing but need to be monitored for overall wall stability.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	89	<b>Face Area (sq.):</b>	799
<b>Average Wall Height (ft.):</b>	8	<b>Face Angle (deg.):</b>	57
<b>Maximum Wall Height (ft.):</b>	16	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Medium - still performing but needs shoulder maintenance to protect top stones and monitoring of overall stability.		7
WALL FOUNDATION MATERIAL 8.00	Very steep marginally stable colluvium. No undermining.		7
STONE MASONRY 8.00	Smaller stones moderately weathered but well interlocked, face is irregular and poorly crafted, several horizontal steel plates driven into the side hill for support		7
MORTAR 8.00	Minor bonding, cracking and weathering distress. A few voids.		8
PLACED STONE 8.00	3 ft. minus stone with slight surface weathering, well interlocked, some voids and bulging near the end.		8
DOWNSLOPE 0.50	Steep but marginally stable colluvium.		8
LATERAL SLOPE 0.50	Another wall at start and in-place rock at end.		9
WALL DRAINS 0.50	No evidence of internal drainage distress.		9
ROAD/SIDEWALK/SHOULDER 1.00	Road shows no distress, shoulder has intermittent failed sections in placed stones.		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	Reset top stones at shoulder and recompact shoulder material. Use local material. 2 Laborers x 4 hr. = 8 hr. x \$55/hr. = \$440		
<b>Repair Cost:</b>	\$440		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

## **ROUTE 0509: VIRGINIA CASCADE DRIVE**

### **Retaining Wall Condition Photos**



**YELL\_0509\_1.048\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0509-1.133-R		
<b>Route Name:</b>	VIRGINIA CASCADE DRIVE		
<b>Inspection Date:</b>	May 10, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Stacked rock @ pullout just before the wall. Ineffective as retaining structure. Not considered. Wall is riprap fill protection for road. Toe is in the river.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	80	<b>Face Area (sq.):</b>	600
<b>Average Wall Height (ft.):</b>	7	<b>Face Angle (deg.):</b>	70
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>	
PERFORMANCE 8.00	High - Performing as intended	9	
WALL FOUNDATION MATERIAL 8.00	Toe of wall is in creek bed, no evidence of distress	9	
PLACED STONE 8.00	4 ft minus stone, little weathering, well interlocked	9	
LATERAL SLOPE 0.50	36% slope, coluvial material, large boulder size, well vegetated	8	
ROAD/SIDEWALK/SHOULDER 0.50	No signs of distress in roadway, shoulder has slight sloughing	8	
DOWNSLOPE 0.50	River bed, no distress noted	9	
WALL DRAINS 0.50	No evidence of distress	9	
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	HIGH		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0509: VIRGINIA CASCADE DRIVE**

**Retaining Wall Condition Photos**



**YELL\_0509\_1.133\_R\_1.jpg**

<b>Wall ID:</b>	YELL-0906G-0.000-P1		
<b>Route Name:</b>	CANYON CAMPGROUND SERVICE PARKING		
<b>Inspection Date:</b>	May 18, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	81	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Cut Wall	<b>Primary Wall Type:</b>	Cantilever - Concrete
<b>Surface Treatment:</b>	Painted	<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Cast in place concrete cantilever wall. Bottom of wall scheduled to be buried in fill during 2007 canyon rims job.		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	507	<b>Face Area (sq.):</b>	1863
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	12	<b>Vertical Offset (ft.):</b>	0
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as designed		8
WALL FOUNDATION MATERIAL 8.00	Sidewalk		9
CONCRETE 8.00	Vertical cracking of 1/8" thick at 10 foot spacing, not affecting performance		8
OTHER SECONDARY ELEMENT 1.00	Paint peeling, not affecting performance, wall scheduled to be sand blasted and stained in 2007 FHWA project		4
UPSLOPE 0.50	Moderate, forested, minor raveling		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress		9
WALL DRAINS 0.50	No distress		9
LATERAL SLOPE 1.00	Beginning has gentle forested slope and end has raveling rock slope		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0906G: CANYON CAMPGROUND SERVICE PARKING**

## **Retaining Wall Condition Photos**



**YELL\_0906G\_0.000\_P1\_1.jpg**

<b>Wall ID:</b>	YELL-0906L-0.000-P1		
<b>Route Name:</b>	INSPIRATION POINT PARKING		
<b>Inspection Date:</b>	May 18, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stacked fill wall supporting drive into parking area, historic wall, some raveling at top of wall, overgrown with trees		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	423	<b>Face Area (sq.):</b>	2558
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as designed		8
WALL FOUNDATION MATERIAL 8.00	Firm soil		9
PLACED STONE 8.00	Irregular shaped slightly weathered stones, a few small voids		7
DOWNSLOPE 0.50	Flat and heavily forested		8
LATERAL SLOPE 0.50	Flat and heavily forested		8
WALL DRAINS 0.50	No distress		9
ROAD/SIDEWALK/SHOULDER 1.00	Pavement has no distress, shoulder has some erosion		7
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			



**Yellowstone National Park**  
**ROUTE 0906L: INSPIRATION POINT PARKING**

**Retaining Wall Condition Photos**



**YELL\_0906L\_0.000\_P1\_1.jpg**

<b>Wall ID:</b>	YELL-0906L-0.000-P2		
<b>Route Name:</b>	INSPIRATION POINT PARKING		
<b>Inspection Date:</b>	May 18, 2007	<b>Approximate Year Built:</b>	Unknown
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action
<b>Wall Description</b>			
<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stacked fill wall, some raveling at top of wall, overgrown with trees		
<b>Wall Measurements</b>			
<b>Wall Length (ft.):</b>	118	<b>Face Area (sq.):</b>	479
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	50
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-1
<b>Assessed Elements</b>			
<b>Element (Weighting Factor)</b>	<b>Narrative</b>		<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as designed		8
WALL FOUNDATION MATERIAL 8.00	Firm soil		8
PLACED STONE 8.00	Irregularly shaped, slightly weathered, overgrown with trees, small voids		8
DOWNSLOPE 0.50	Flat and heavily forested		8
LATERAL SLOPE 0.50	Flat and heavily forested		8
ROAD/SIDEWALK/SHOULDER 0.50	No distress		8
WALL DRAINS 0.50	No distress		9
<b>Repair Recommendations</b>			
<b>Failure Consequence:</b>	LOW		
<b>Recommendation Narrative:</b>	None		
<b>Repair Cost:</b>	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

# **Yellowstone National Park**

**ROUTE 0906L: INSPIRATION POINT PARKING**

## **Retaining Wall Condition Photos**



**YELL\_0906L\_0.000\_P2\_1.jpg**



# Appendix A

## Summary of WIP Definitions



**Yellowstone National Park**



**Federal Lands Highway  
Road Inventory Program**



## **Appendix A**

### **Summary of WIP Definitions and Assessment Categories**

## Wall Naming Convention

Unique “Wall Identification” names were assigned to the retaining walls that were inventoried. The Wall Identification includes the Park Name, the RIP Route Number (e.g., **0013**), the beginning milepoint of a wall (e.g., **0.622**) and the side of the road the wall is located on (e.g., **L.**) relative to the primary direction of travel (direction of increasing mileposts). Thus, a typical wall identified would have the following format: **YOSE-0013-0.622-L.**

For roadways not in RIP, park-supplied route numbers were used or the convention RRR#. Similarly, for parking areas not in RIP, the park-supplied parking area number or the convention PPP# was used. Also for parking areas, walls are numbered in ascending order as they are encountered when traveling counterclockwise around the parking area (most common direction of traffic flow). Parking area walls are designated P1, P2, P3, etc. as new walls are encountered.

- NPS Retaining Wall Inventory Program Field Guide (WIFG)-		
Retaining Wall Acceptance Criteria		
*All classes of paved roadways and parking areas included in the RIP Route Investigation Report and/or identified by park staff.		
*Walls must reside within the constructed roadway/parking area prism.		
*Maximum wall height, including only that portion actively retaining soil and/or rock, must be ≥ 4 ft. (>6ft for culvert headwalls).		
*Consider known/verifiable wall embedment in determining maximum retaining wall height. Include fully buried retaining structures.		
*Walls have an internal wall face angle ≥ 45° (≥ 1H:1V face slope ratio).		
*Include all walls where the intent is to support/protect the travelway, and where failure would require replacement with a retaining wall.		
Definitions		
Design Criteria	Measure of how well current design criteria are satisfied: <b>None</b> - Does not meet any known standards. <b>Non-AASHTO</b> - Does not meet AASHTO, but is consistent with other structures of its type/period with good performance. <b>AASHTO</b> - Apparently meets current AASHTO Geometric, Design, Materials, and Construction Standards.	
Consequence of Failure	<b>Low</b> - No loss of roadway, no to low public risk, no impact to traffic during wall repair/replacement <b>Moderate</b> - Hourly to short-term closure of roadway, low-to-moderate public risk, multiple alternate routes available <b>High</b> - Seasonal to long-term loss of roadway, substantial loss-of-life risk, no alternate routes available	
Action	Select from: <b>No Action, Monitor, Maintenance, Repair Elements, Replace Elements, and Replace Wall</b>	
Weighting Factor	Weighting Factor to be applied to the Condition Rating (CR). When indicated on the Condition Assessment Input Form: WF=0.5 for CR=8-10; WF=1.0 for CR=4-7; and WF=5 for CR=1-3.	
Data Reliability	Estimate of how well observed conditions represent wall performance, and if additional investigations may be warranted. <b>1-Poor</b> Conditions cannot be sufficiently observed to rate element(s), warranting additional investigations to better define element performance and/or to determine the cause(s) or poor performance. <b>2-Good</b> Observed conditions are sufficient to rate the conditions of wall element(s); however, additional investigations would be useful to better understand element performance. <b>3-Very Good</b> Observed conditions clearly describe wall performance. Additional investigations are not needed.	
Wall Function Codes		
[FW] Fill Wall	[BW] Bridge Wall	[SW] Switchback Wall
[CW] Cut Wall	[HW] Head Wall	[SP] Slope Protection [FL] Flood Wall
Wall Type Codes		
[AH] Anchor, Tieback H-Pile	[CC] Crib, Concrete	[MG] MSE, Geosynthetic Wrapped Face
[AM] Anchor, Micropile	[CM] Crib, Metal	[MP] MSE, Precast Panel
[AS] Anchor, Tieback Sheet Pile	[CT] Crib, Timber	[MS] MSE, Segmental Block
[BC] Bin, Concrete	[GB] Gravity, Concrete Block/ Brick	[MW] MSE, Welded Wire Face
[BM] Bin, Metal	[GC] Gravity, Mass Concrete	[SN] Soil Nail
[CL] Cantilever, Concrete	[GD] Gravity, Dry Stone	[TP] Tangent/ Secant Pile
[CP] Cantilever, Soldier Pile	[GG] Gravity, Gabion	[OT] Other, User Defined
[CS] Cantilever, Sheet Pile	[GM] Gravity, Mortared Stone	[NO] None
Architectural Facing Type Codes		
[BV] Brick Veneer	[PF] Planted Face	[SS] Simulated Stone
[CO] Cementitious Overlay	[SC] Sculpted Shotcrete	[SV] Stone Veneer
[FF] Fractured Fin Concrete	[SH] Shotcrete (nozzle finish)	[TI] Timber
[FL] Formlined Concrete	[SM] Steel/Metal	[OT] Other, User Defined
[PC] Plain Concrete (float finish or light texture)	[SO] Stone	[NO] None
Surface Treatment Codes		
[BG] Bush Gun (tool-textured concrete)	[PS] Preservative	[WS] Weathering Steel
[CA] Color Additive	[SE] Silane Sealer	[OT] Other, User Defined
[GL] Galvanized	[ST] Stain	[NO] None
[PA] Painted	[TR] Tar Coated	

Condition Ratings		
Condition Ratings apply to all Primary and Secondary Wall Elements, and are intended to assist in consistently defining element <b>severity</b> , <b>extent</b> , and <b>repair/replace urgency</b> of wall element distresses.		
9-10 (Excellent)	-Any defects are minor and are within normal range for <i>newly constructed or fabricated</i> elements. -Defects may include those typically caused from fabrication or construction.	
7-8 (Good)	-Low-to-moderate extent of low severity distress. -Distress present does not significantly compromise the element function, nor is there significantly severe distress to major structural components of an element.	
5-6 (Fair)	-High extent of low severity distress and/or low-to-medium extent of medium to high severity distress. -Distress present does not compromise element function, but lack of treatment may lead to impaired function/elevated risk of element failure in the near term.	
3-4 (Poor)	-Medium-to-high extent of medium-to-high severity distress. -Distress present threatens element function, and strength is obviously compromised and/or structural analysis is warranted. -The element condition does not pose an immediate threat to wall stability and road closure is not necessary.	
1-2 (Critical)	-Medium-to-high extent of high severity distress. -Element is no longer serving intended function. Element performance threatening overall stability of the wall at the time of inspection.	
Wall Performance Condition Ratings		
Performance	Evaluation of overall wall performance as indicated by observations not necessarily captured by observed distresses for specific elements, including global wall distresses (rotation, settlement, translation, displacement, etc.) and/or evidence of prior repairs that may further indicate component problems.	<b>Good to Excellent</b> - No observation of distresses not already captured by individual element condition assessment. No combination of element distresses indicating unseen problems or creating significant performance problems. No history of remediation or repair to wall or adjacent elements.
		<b>Fair</b> - Some observed global distress is not associated with specific elements. Some observation of element distress combinations that indicate wall component problems. Minor work on primary elements or major work on secondary elements has occurred improving overall wall function.
		<b>Poor to Critical</b> - Global wall rotation, settlement, and/or overturning is readily apparent. Combined element distresses clearly indicate serious stability problems with components or global wall stability. Major repairs have occurred to wall structural elements, though functionality has not improved significantly.

