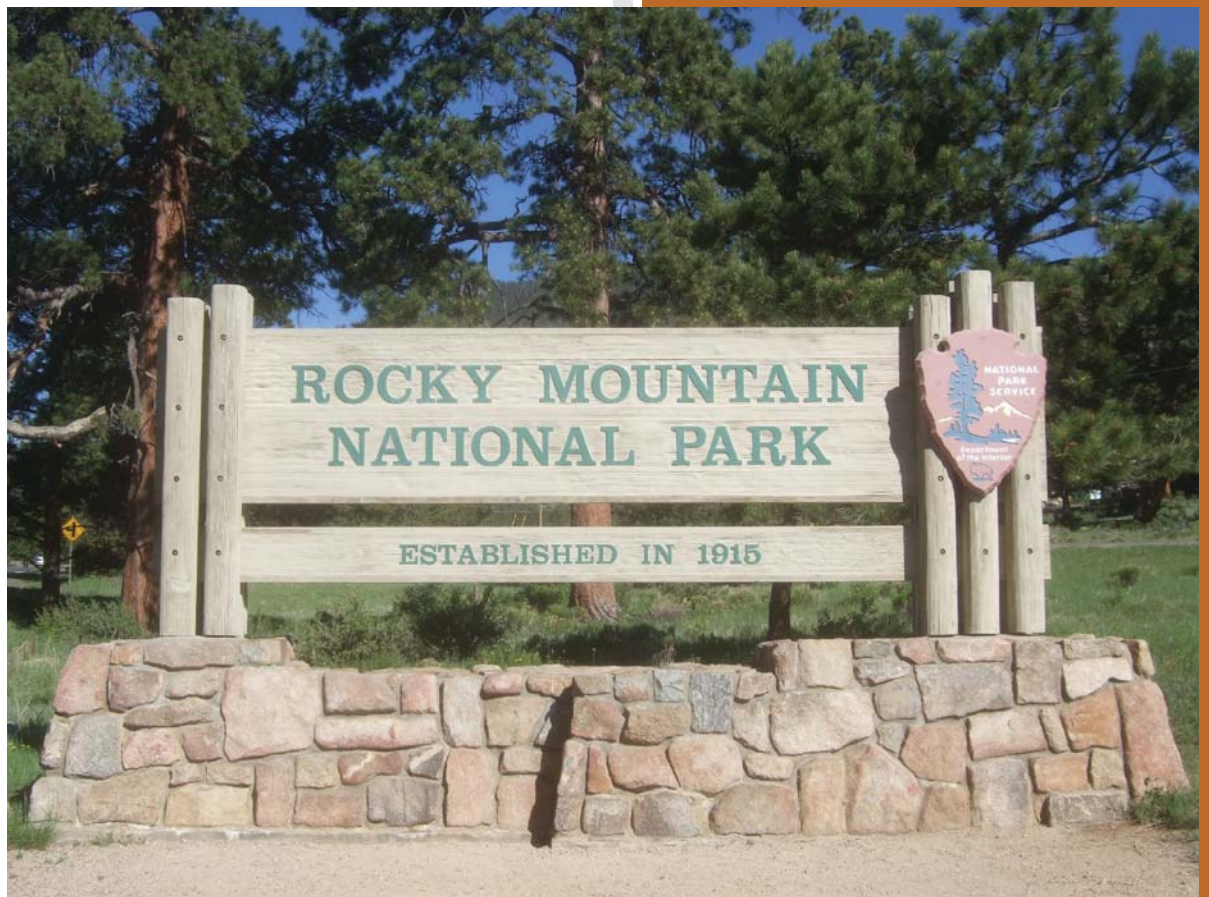


ROMO WIP Report

NPS Retaining Wall Inventory Program Rocky Mountain National Park



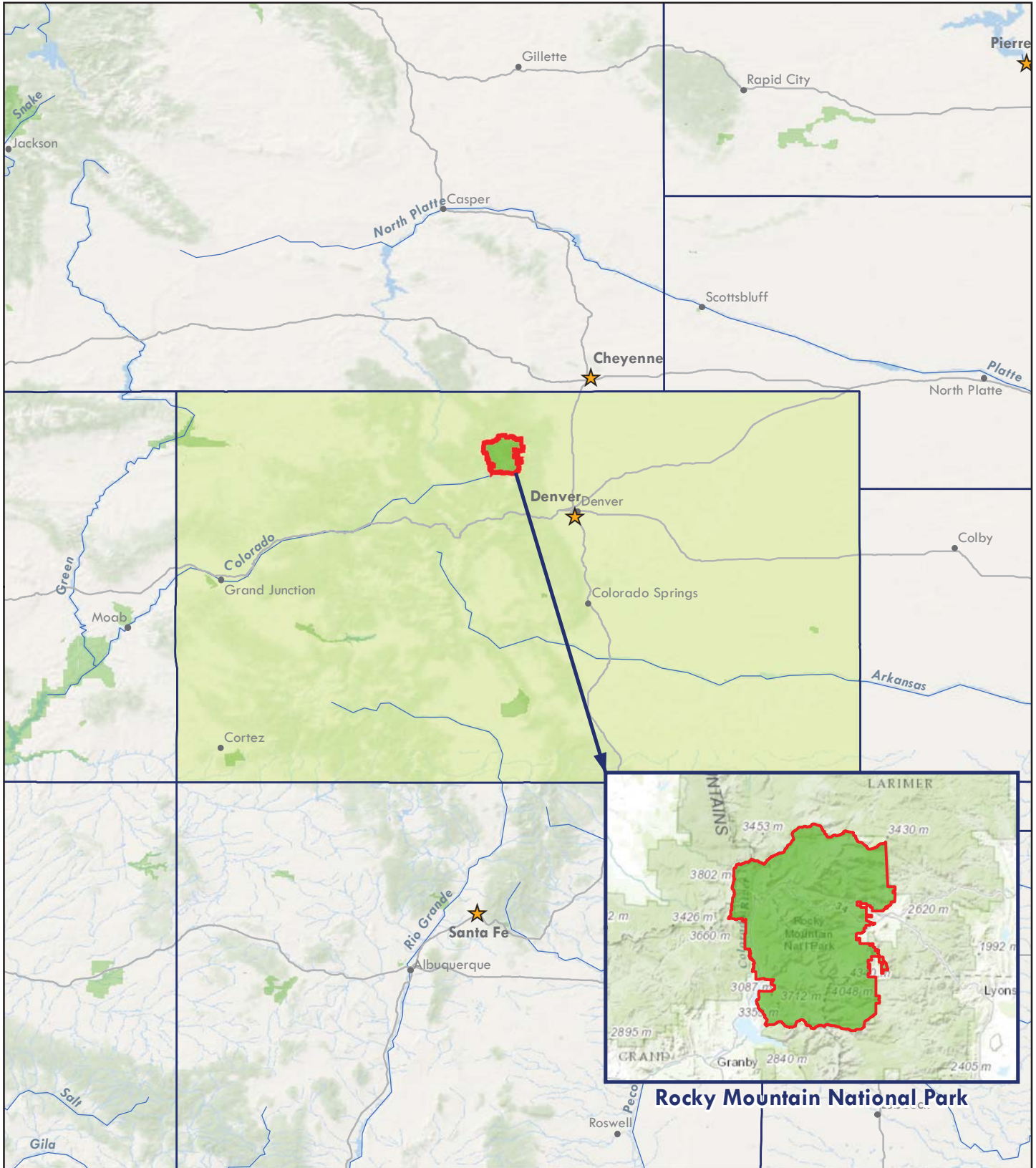
**Federal Lands Highway
Road Inventory Program**

Prepared By:

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

**Data Collection Date: September 2007
Report Date: October 2015**

Rocky Mountain National Park in Colorado



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



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Introduction



Rocky Mountain 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



Rocky Mountain National Park

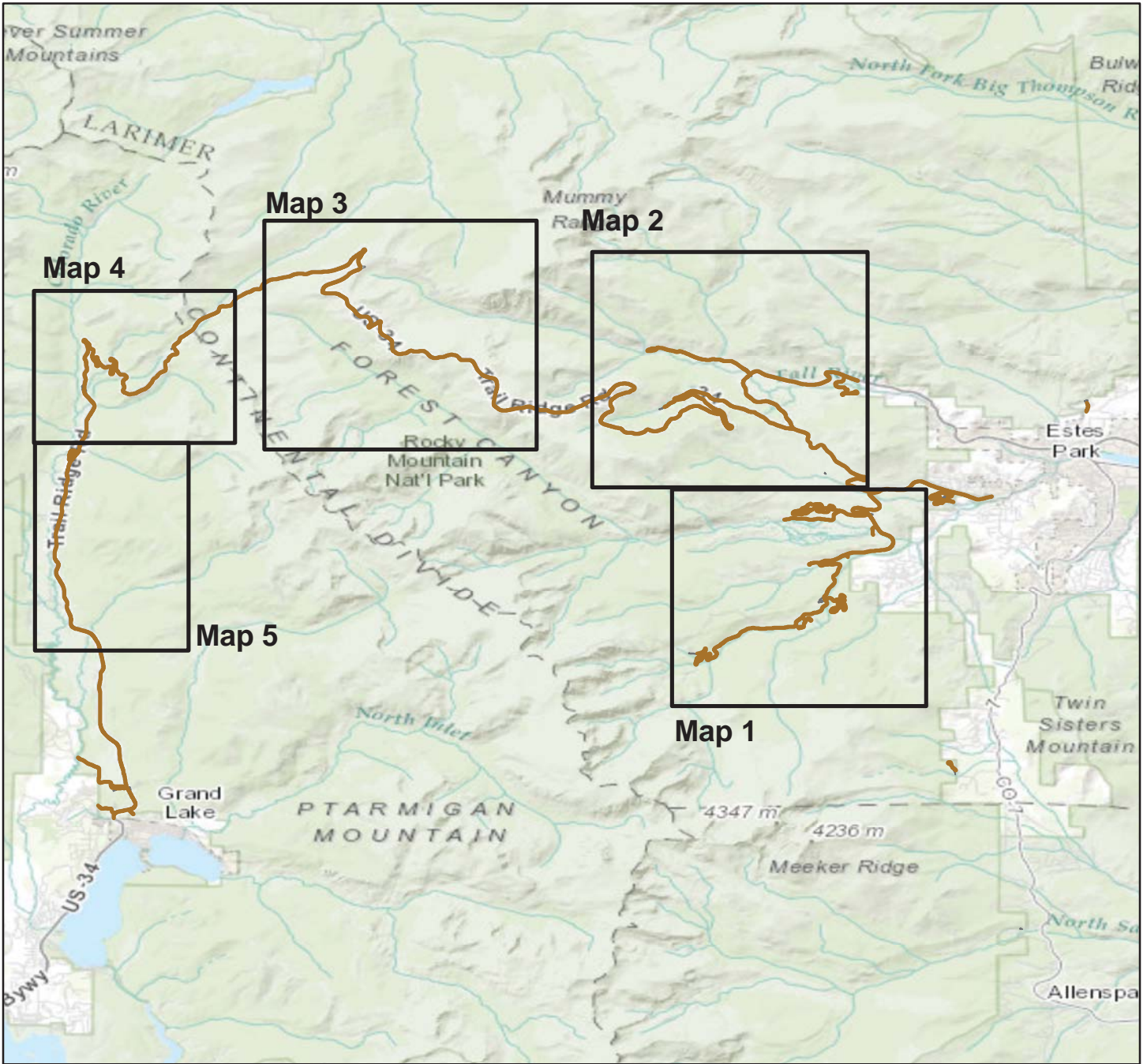


**Federal Lands Highway
Road Inventory Program**

Rocky Mountain 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

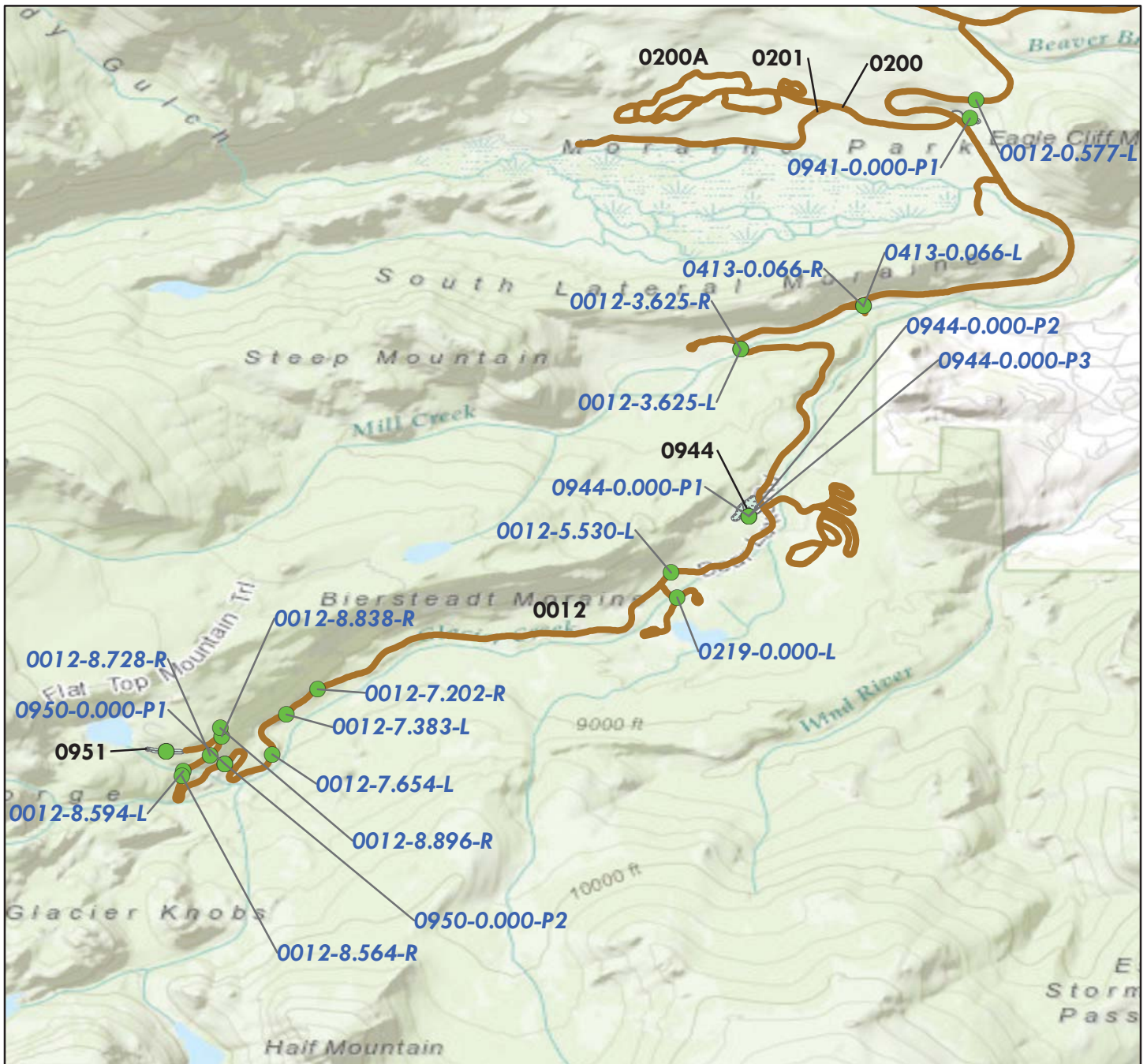
 RIP Collected Routes



Rocky Mountain 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



Rocky Mountain 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

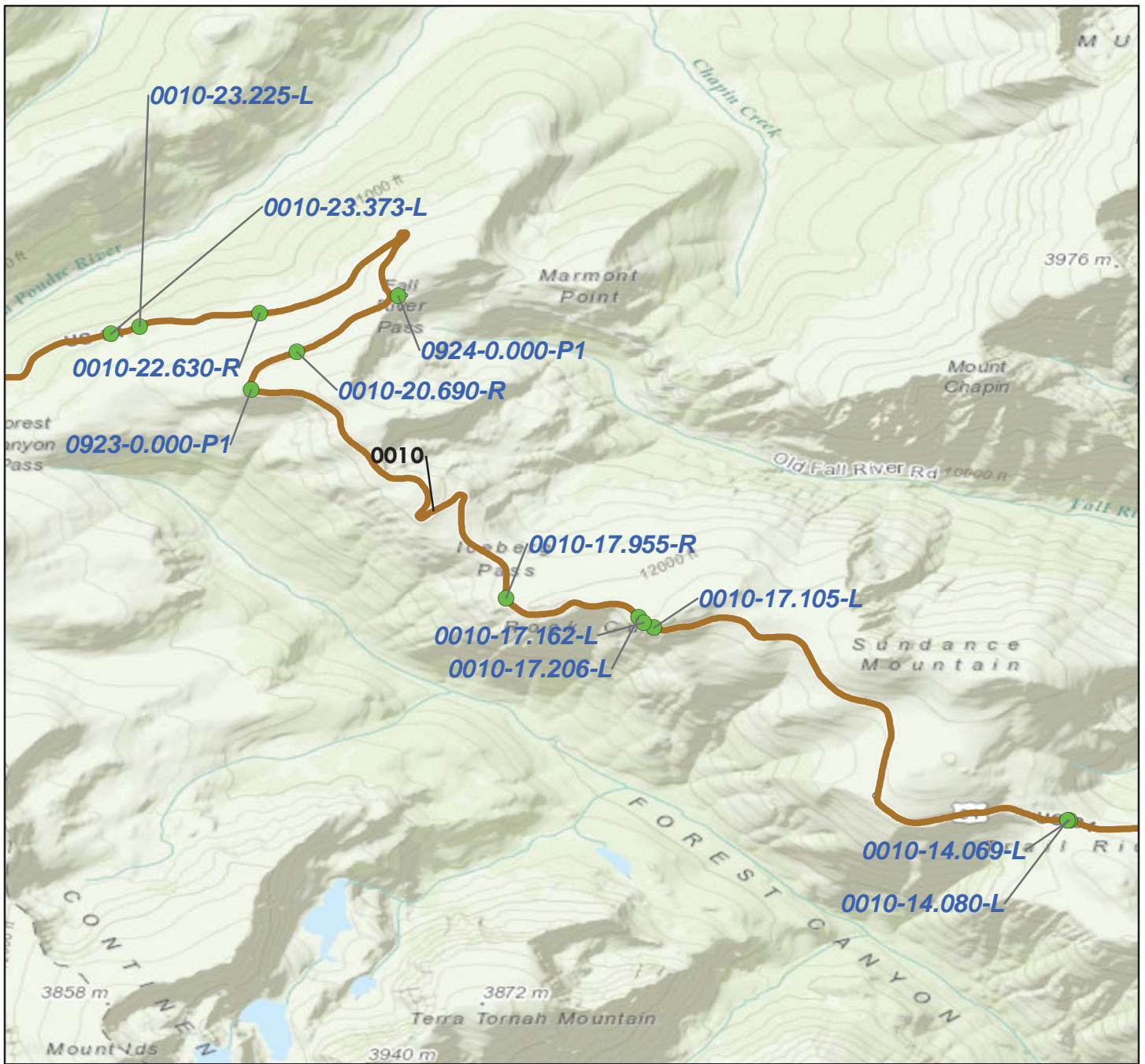
— RIP Collected Routes



Rocky Mountain National Park

WALL LOCATION MAP

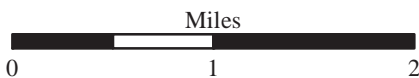
Map 3



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

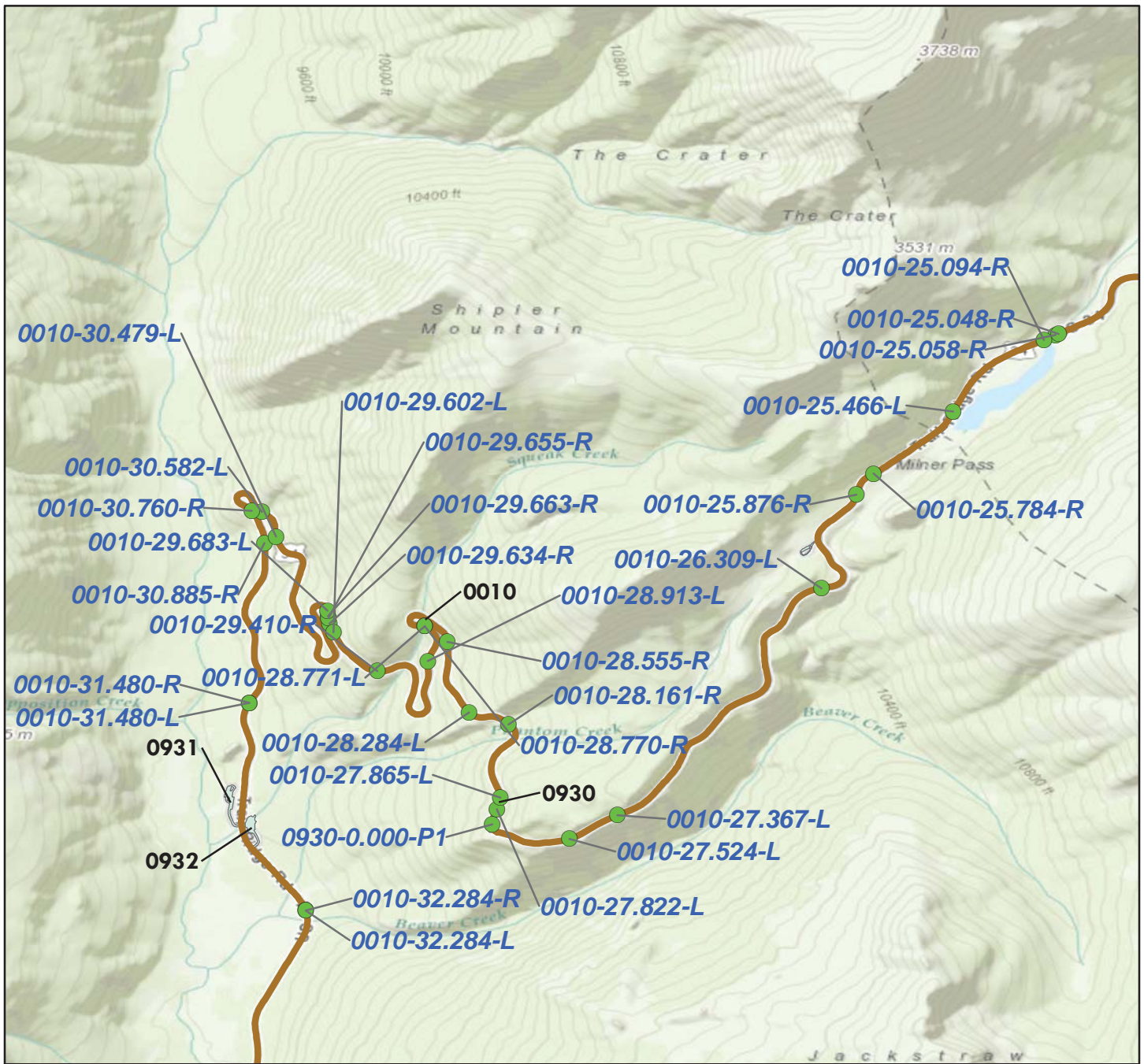
— RIP Collected Routes



Rocky Mountain National Park

WALL LOCATION MAP

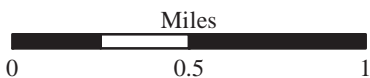
Map 4



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



Rocky Mountain 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

— RIP Collected Routes



Tier 1 Park Retaining Wall Overview



Rocky Mountain National Park



Federal Lands Highway
Road Inventory Program

Parkwide Summary: Rocky Mountain National Park

Initial retaining wall inspections were conducted at Rocky Mountain 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 Rocky Mountain 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, 118 walls were inventoried on the routes listed below.

Table 1: Number of Walls by Route

Route Number	Route Name	No. of Walls
0010	TRAIL RIDGE ROAD	53
0012	BEAR LAKE ROAD	12
0204ZZ	ASPENGLÉN CAMPGROUND ROADS	1
0219	GLACIER CREEK RIDING STABLE ROAD	1
0220	HIDDEN VALLEY ACCESS ROAD	1
0413	MILL CREEK RESIDENCE ROAD	2
0500	OLD FALL RIVER ROAD	35
0917	RAINBOW CURVE PARKING AREA	1
0923	GORE RANGE OVERLOOK PARKING	1
0924	ALPINE VISITORS CENTER PARKING	1
0930	FARVIEW CURVE OVERLOOK PARKING	1
0941	MORaine PARK VISITOR CENTER	1
0944	PARK AND RIDE PARKING	3
0950	GLACIER GORGE PARKING	2
0951	BEAR LAKE PARKING AREA	3

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
CW - Cut Wall	24
FW - Fill Wall	58
HW - Head Wall	28
SP - Slope Protection	4
SW - Switchback Wall	4

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	1
CL, Cantilever - Concrete	15
GC, Gravity - Mass Concrete	2
GD, Gravity - Dry Stone	54
GG, Gravity - Gabion	5
GM, Gravity - Mortared Stone	39
SN, Soil Nail	2

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

Recommended Action	2007 Repair Costs*	No. of Walls
No Action	\$0	100
Monitor	\$0	0
Maintenance	\$3,310	9
Repair Elements	\$87,745	5
Replace Elements	\$20,950	4
Replace Wall	\$0	0
Totals	\$112,005	118

*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

Cost Range*	No. of Walls
\$0	100
\$1 - \$25,000	17
\$25,001 - \$50,000	0
\$50,001 - \$100,000	1
\$100,001 - \$250,000	0
\$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
Total Number of Walls	118

*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 Rocky Mountain 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 Rocky Mountain 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

Wall Identification	Failure Consequence⁽¹⁾	Wall Rating⁽²⁾	Recommended Action⁽³⁾	2007 Repair Costs⁽⁴⁾
ROMO-0010-17.206-L	LOW	43	REPLACE ELEMENTS	\$20,000

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



Rocky Mountain National Park



Federal Lands Highway
Road Inventory Program

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE 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
ROMO-0010-9.508-L 6/27/2007	220	51	Gravity - Mortared Stone	Cut Wall	69	\$0.00
ROMO-0010-9.518-L 6/27/2007	220	51	Gravity - Mortared Stone	Cut Wall	69	\$0.00
ROMO-0010-11.320-R 6/27/2007	2,400	141	Gravity - Dry Stone	Fill Wall	59	\$0.00
ROMO-0010-11.923-R 6/27/2007	18,200	530	Gravity - Dry Stone	Fill Wall	69	\$500.00
ROMO-0010-14.069-L 6/27/2007	160	39	Gravity - Mass Concrete	Cut Wall	88	\$225.00

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE 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
ROMO-0010-14.080-L 6/27/2007	160	39	Gravity - Mass Concrete	Cut Wall	76	\$225.00
ROMO-0010-17.105-L 6/27/2007	7,000	164	Gravity - Dry Stone	Fill Wall	67	\$0.00
ROMO-0010-17.162-L 6/27/2007	1,100	30	Gravity - Dry Stone	Fill Wall	79	\$55.00
ROMO-0010-17.206-L 6/27/2007	1,150	460	Gravity - Mortared Stone	Fill Wall	43	\$20,000.00
ROMO-0010-17.955-R 7/25/2007	27	7	Gravity - Mortared Stone	Head Wall	84	\$0.00

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE 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

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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
ROMO-0010-20.690-R 7/25/2007	4,700	942	Gravity - Mortared Stone	Cut Wall	79	\$0.00
ROMO-0010-22.630-R 7/25/2007	27	8	Gravity - Mortared Stone	Head Wall	83	\$0.00
ROMO-0010-23.225-L 7/25/2007	1,050	301	Gravity - Mortared Stone	Cut Wall	80	\$0.00
ROMO-0010-23.373-L 7/25/2007	1,300	326	Gravity - Mortared Stone	Cut Wall	80	\$0.00
ROMO-0010-24.270-L 7/25/2007	1,800	451	Gravity - Mortared Stone	Cut Wall	80	\$0.00

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE 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

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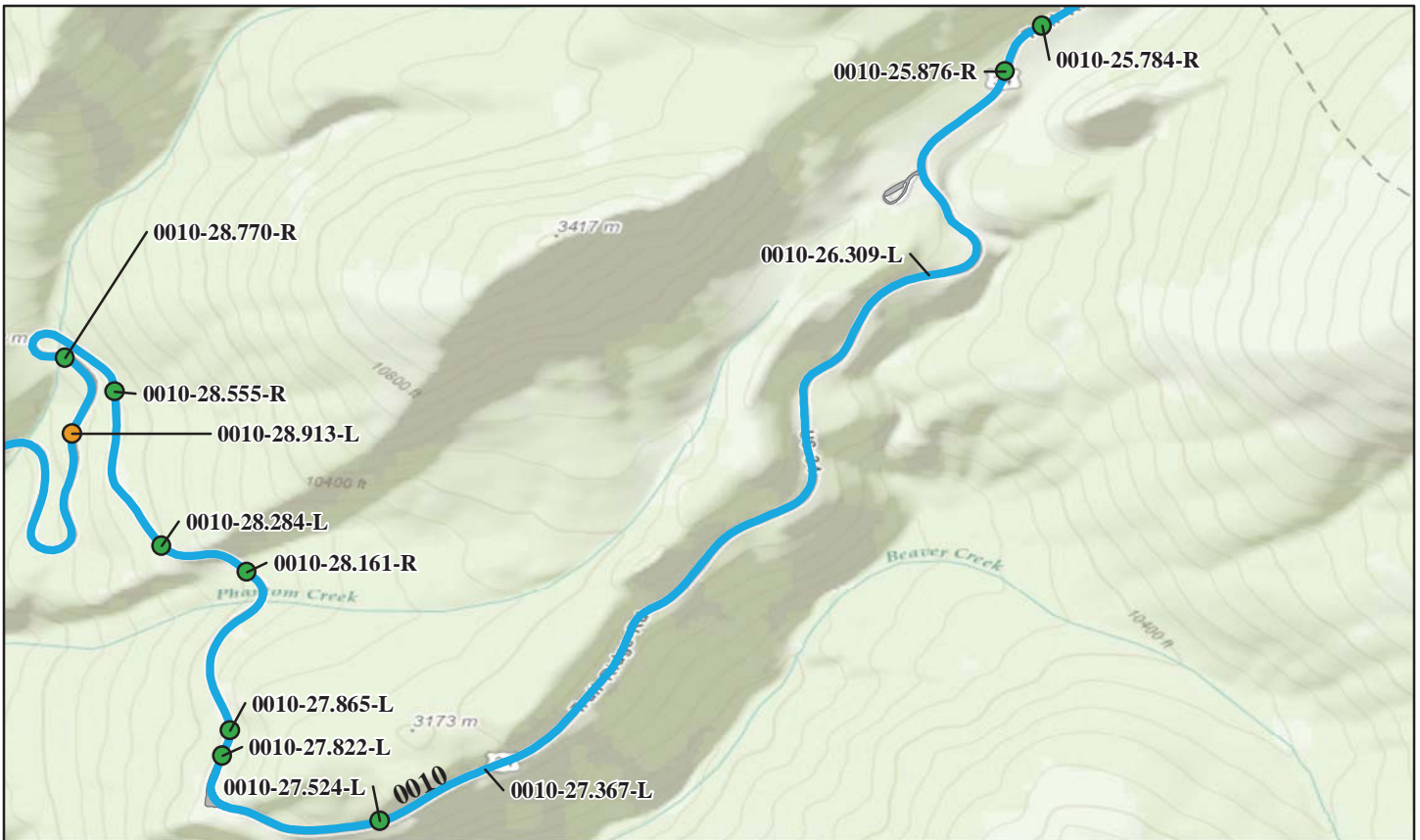
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
ROMO-0010-24.677-L 7/26/2007	25	7	Gravity - Mortared Stone	Head Wall	86	\$0.00
ROMO-0010-25.048-R 7/26/2007	18	7	Gravity - Mortared Stone	Head Wall	83	\$0.00
ROMO-0010-25.058-R 7/26/2007	20	8	Gravity - Mortared Stone	Head Wall	89	\$0.00
ROMO-0010-25.094-R 7/26/2007	56	38	Gravity - Mortared Stone	Head Wall	81	\$0.00
ROMO-0010-25.466-L 7/26/2007	5,600	560	Gravity - Mortared Stone	Fill Wall	73	\$0.00

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE 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

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Good to Excellent (70 - 100)

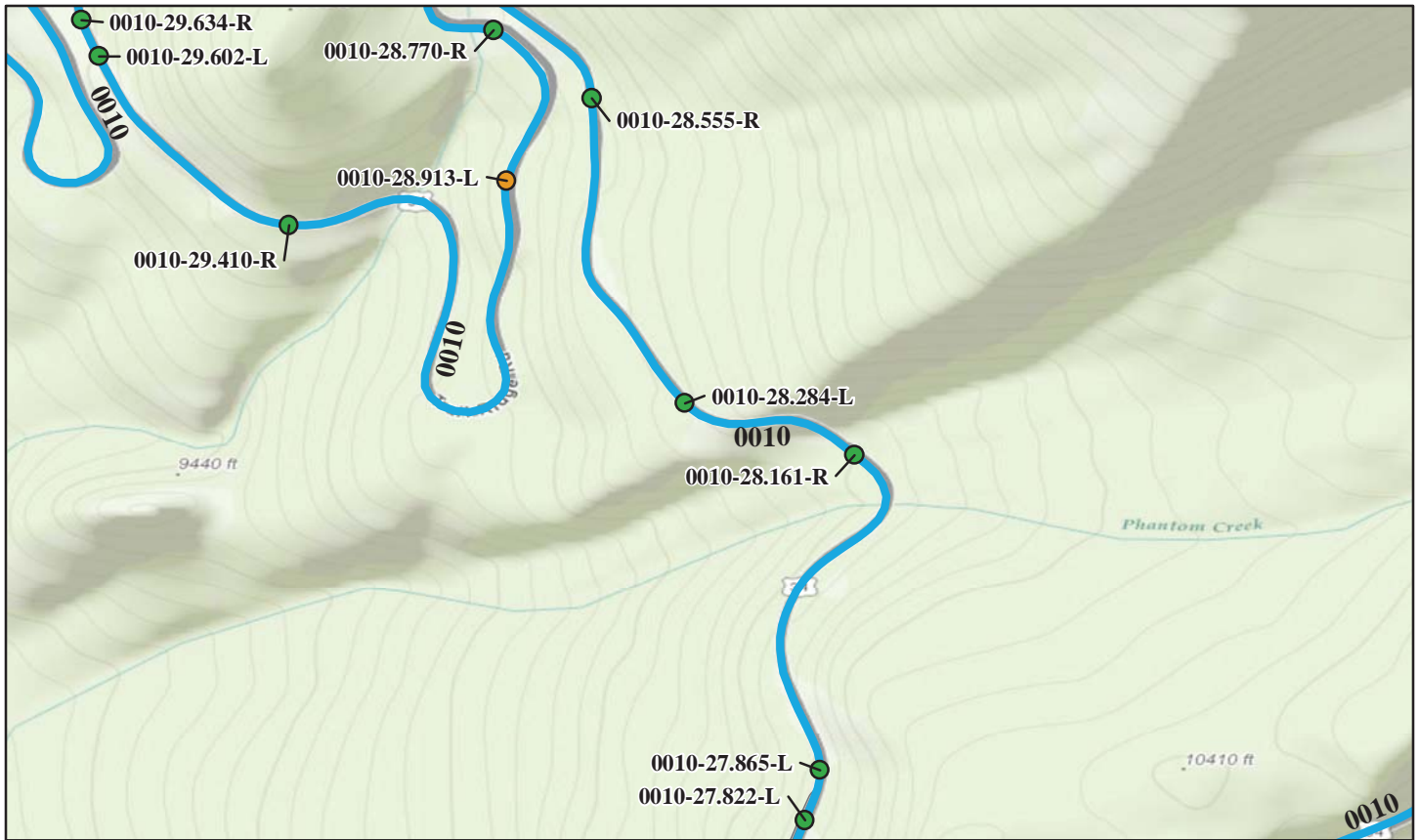
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
ROMO-0010-25.784-R 7/26/2007	25	7	Gravity - Mortared Stone	Head Wall	81	\$0.00
ROMO-0010-25.876-R 7/26/2007	30	7	Gravity - Mortared Stone	Head Wall	80	\$0.00
ROMO-0010-26.309-L 7/26/2007	2,300	115	Gravity - Dry Stone	Fill Wall	62	\$0.00
ROMO-0010-27.367-L 9/12/2007	936	72	Bin - Metal	Fill Wall	58	\$0.00
ROMO-0010-27.524-L 9/12/2007	305	27	Gravity - Dry Stone	Slope Protection	74	\$0.00

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE 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

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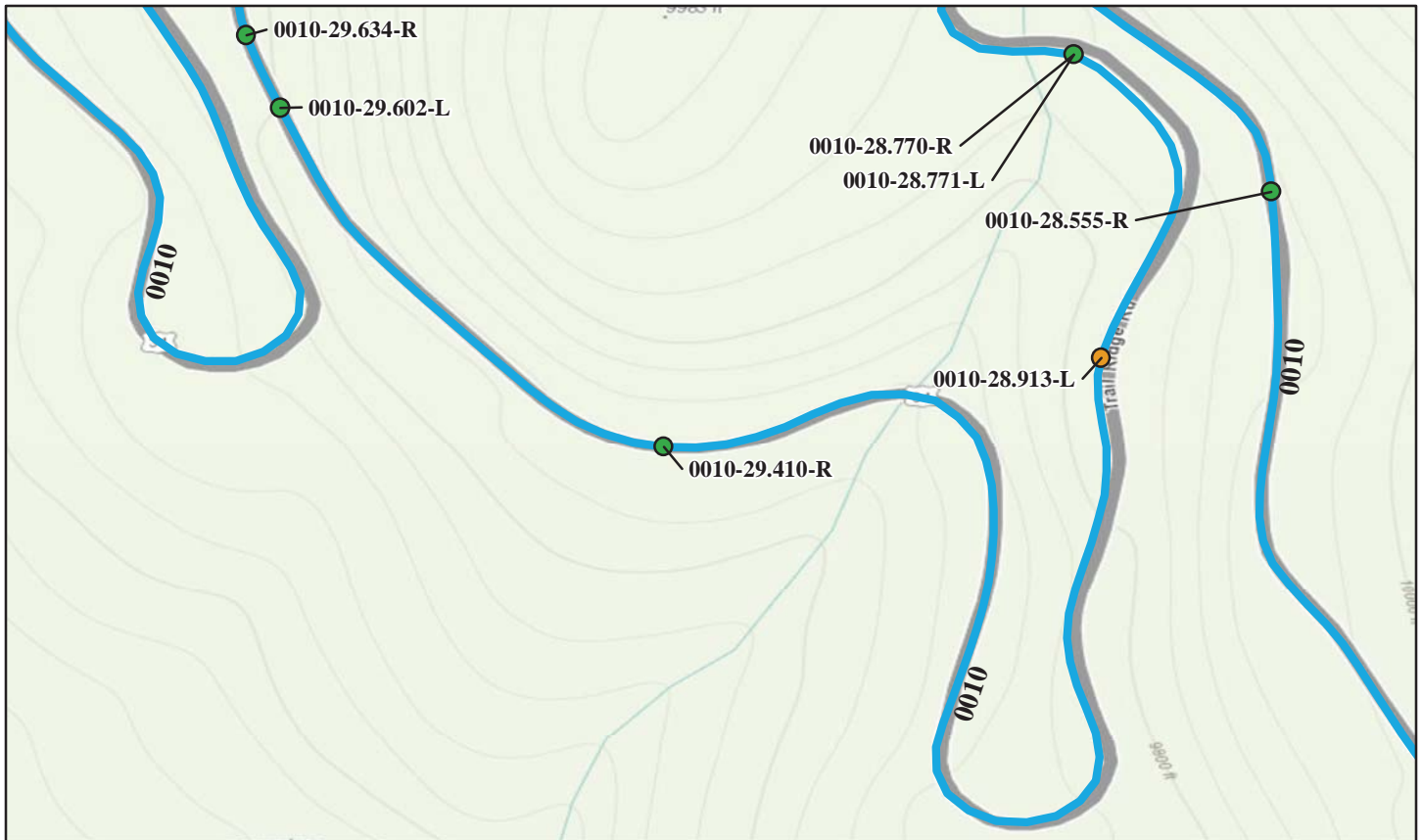
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
ROMO-0010-27.822-L 9/12/2007	90	20	Gravity - Mortared Stone	Head Wall	84	\$55.00
ROMO-0010-27.865-L 9/13/2007	1,500	120	Gravity - Dry Stone	Slope Protection	89	\$0.00
ROMO-0010-28.161-R 9/12/2007	410	82	Gravity - Mortared Stone	Cut Wall	81	\$220.00
ROMO-0010-28.284-L 9/12/2007	7,200	180	Gravity - Dry Stone	Slope Protection	81	\$805.00
ROMO-0010-28.555-R 9/12/2007	1,750	386	Gravity - Mortared Stone	Cut Wall	87	\$880.00

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE 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

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Good to Excellent (70 - 100)

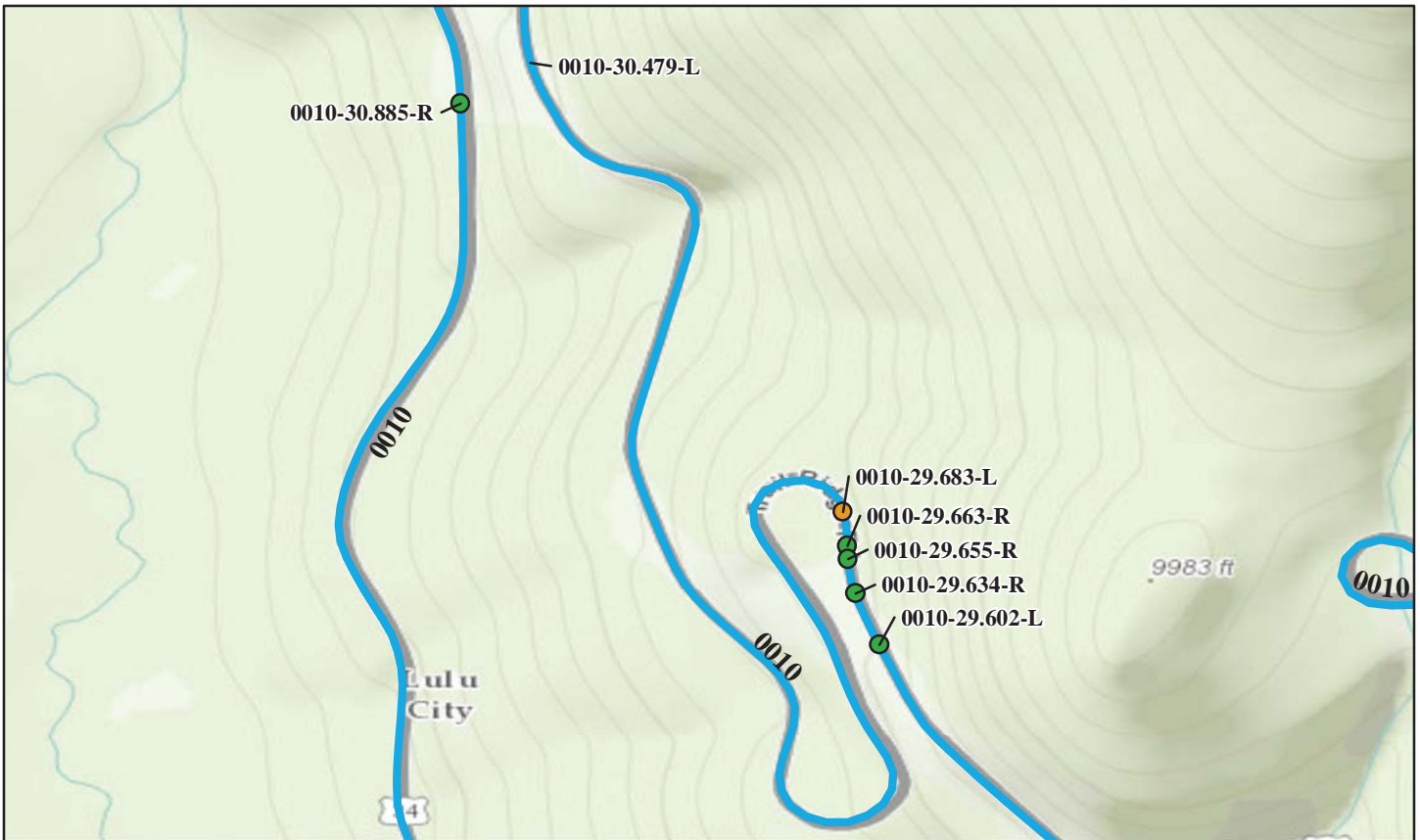
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
ROMO-0010-28.770-R 9/12/2007	100	20	Gravity - Mortared Stone	Head Wall	88	\$0.00
ROMO-0010-28.771-L 9/12/2007	100	20	Gravity - Mortared Stone	Head Wall	53	\$11,530.00
ROMO-0010-28.913-L 9/12/2007	7,524	935	Gravity - Mortared Stone	Cut Wall	64	\$59,780.00
ROMO-0010-29.410-R 9/12/2007	145	26	Gravity - Mortared Stone	Head Wall	86	\$110.00
ROMO-0010-29.602-L 9/13/2007	13,200	190	Gravity - Mortared Stone	Switchback Wall	84	\$0.00

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD



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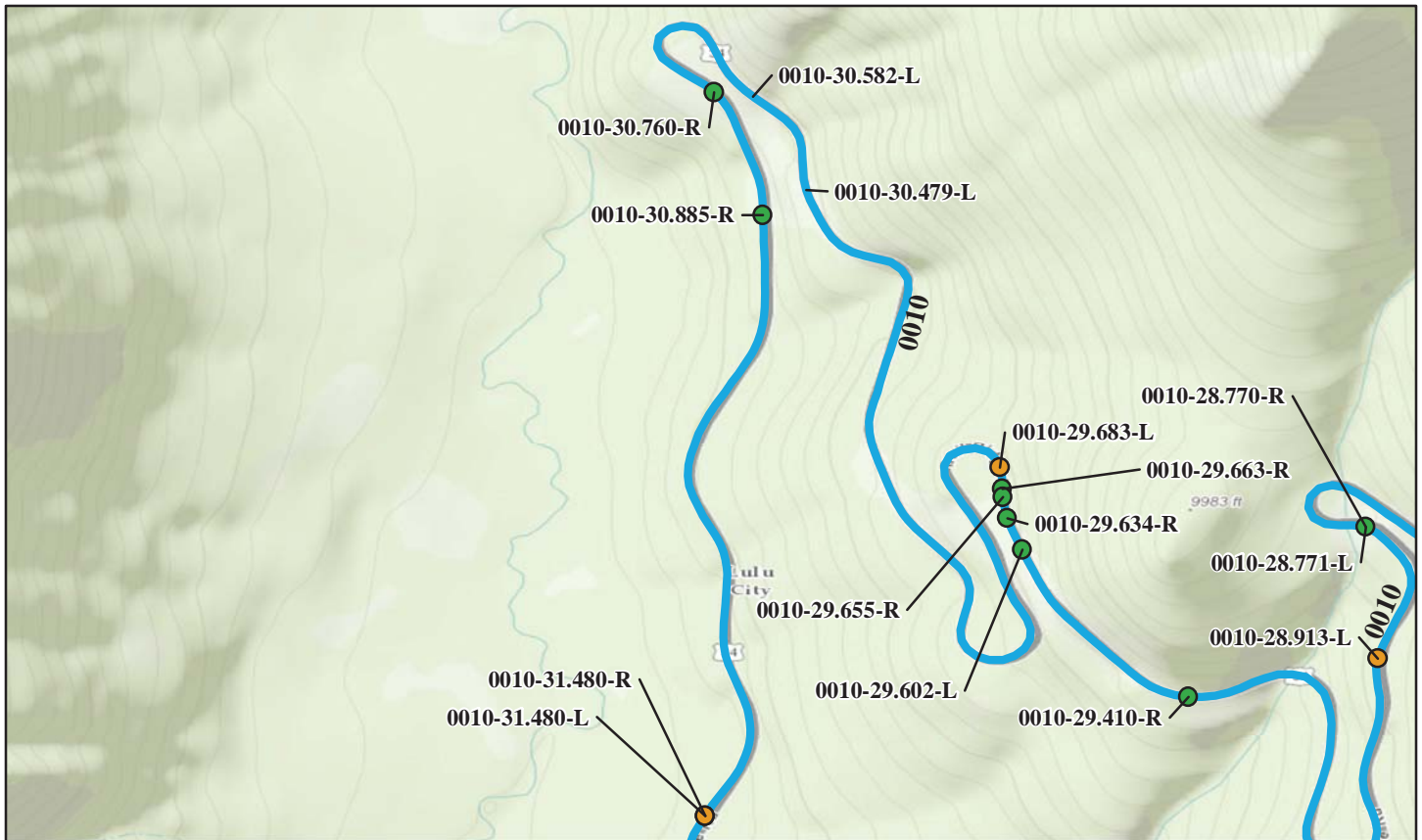
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
ROMO-0010-29.634-R 9/12/2007	500	22	Gravity - Mortared Stone	Cut Wall	85	\$0.00
ROMO-0010-29.655-R 9/12/2007	625	25	Gravity - Mortared Stone	Cut Wall	71	\$15,540.00
ROMO-0010-29.663-R 9/12/2007	550	19	Gravity - Mortared Stone	Cut Wall	82	\$0.00
ROMO-0010-29.683-L 9/12/2007	4,300	230	Gravity - Dry Stone	Fill Wall	69	\$0.00
ROMO-0010-30.479-L 9/12/2007	2,500	123	Gravity - Dry Stone	Fill Wall	60	\$0.00

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE 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

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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
ROMO-0010-30.582-L 9/12/2007	4,000	162	Gravity - Dry Stone	Fill Wall	61	\$0.00
ROMO-0010-30.760-R 9/12/2007	750	95	Gravity - Dry Stone	Fill Wall	70	\$540.00
ROMO-0010-30.885-R 9/12/2007	1,215	81	Gravity - Dry Stone	Fill Wall	76	\$0.00
ROMO-0010-31.480-L 9/12/2007	150	37	Gravity - Mortared Stone	Head Wall	68	\$270.00
ROMO-0010-31.480-R 9/12/2007	138	36	Gravity - Mortared Stone	Head Wall	72	\$0.00

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE 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
ROMO-0010-32.284-L 9/12/2007	131	36	Gravity - Mortared Stone	Head Wall	80	\$0.00
ROMO-0010-32.284-R 9/12/2007	170	36	Gravity - Mortared Stone	Head Wall	79	\$0.00
ROMO-0010-33.386-L 9/12/2007	400	45	Gravity - Mortared Stone	Head Wall	77	\$840.00
ROMO-0010-33.386-R 9/13/2007	200	34	Gravity - Mortared Stone	Head Wall	77	\$0.00
ROMO-0010-34.570-L 9/12/2007	796	177	Gravity - Mortared Stone	Cut Wall	79	\$0.00

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE 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)

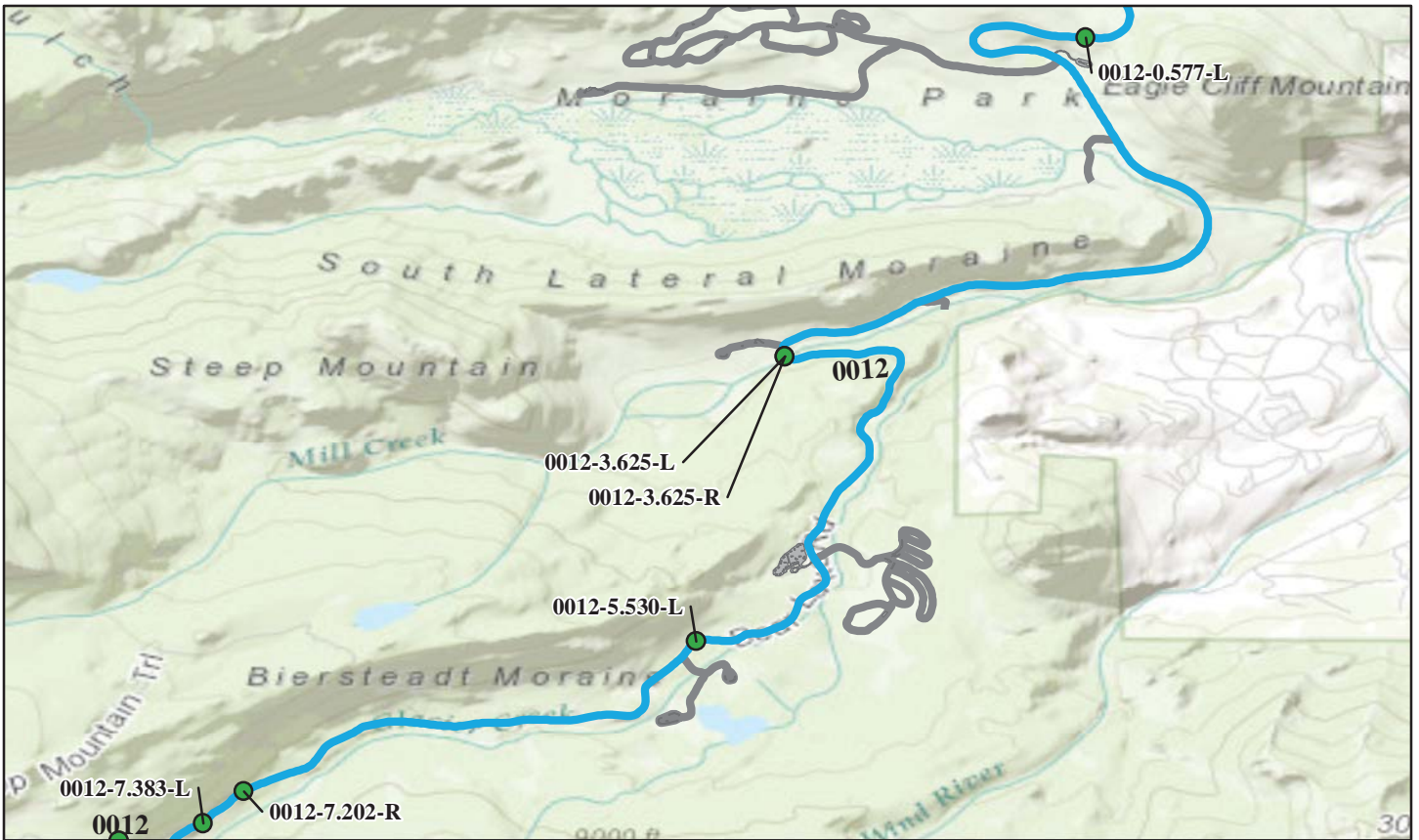
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
ROMO-0010-36.223-L 9/12/2007	390	131	Gravity - Mortared Stone	Cut Wall	75	\$0.00
ROMO-0010-38.117-L 9/12/2007	250	45	Gravity - Mortared Stone	Head Wall	73	\$0.00
ROMO-0010-38.117-R 9/12/2007	139	32	Gravity - Mortared Stone	Head Wall	56	\$375.00

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

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE 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
ROMO-0012-0.577-L 7/25/2007	40	7	Gravity - Mortared Stone	Head Wall	87	\$0.00
ROMO-0012-3.625-L 7/24/2007	100	30	Cantilever - Concrete	Head Wall	81	\$0.00
ROMO-0012-3.625-R 7/24/2007	100	30	Cantilever - Concrete	Head Wall	81	\$0.00
ROMO-0012-5.530-L 7/24/2007	15	7	Cantilever - Concrete	Head Wall	90	\$0.00
ROMO-0012-7.202-R 7/24/2007	3,600	742	Soil Nail	Cut Wall	92	\$0.00

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

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE 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)

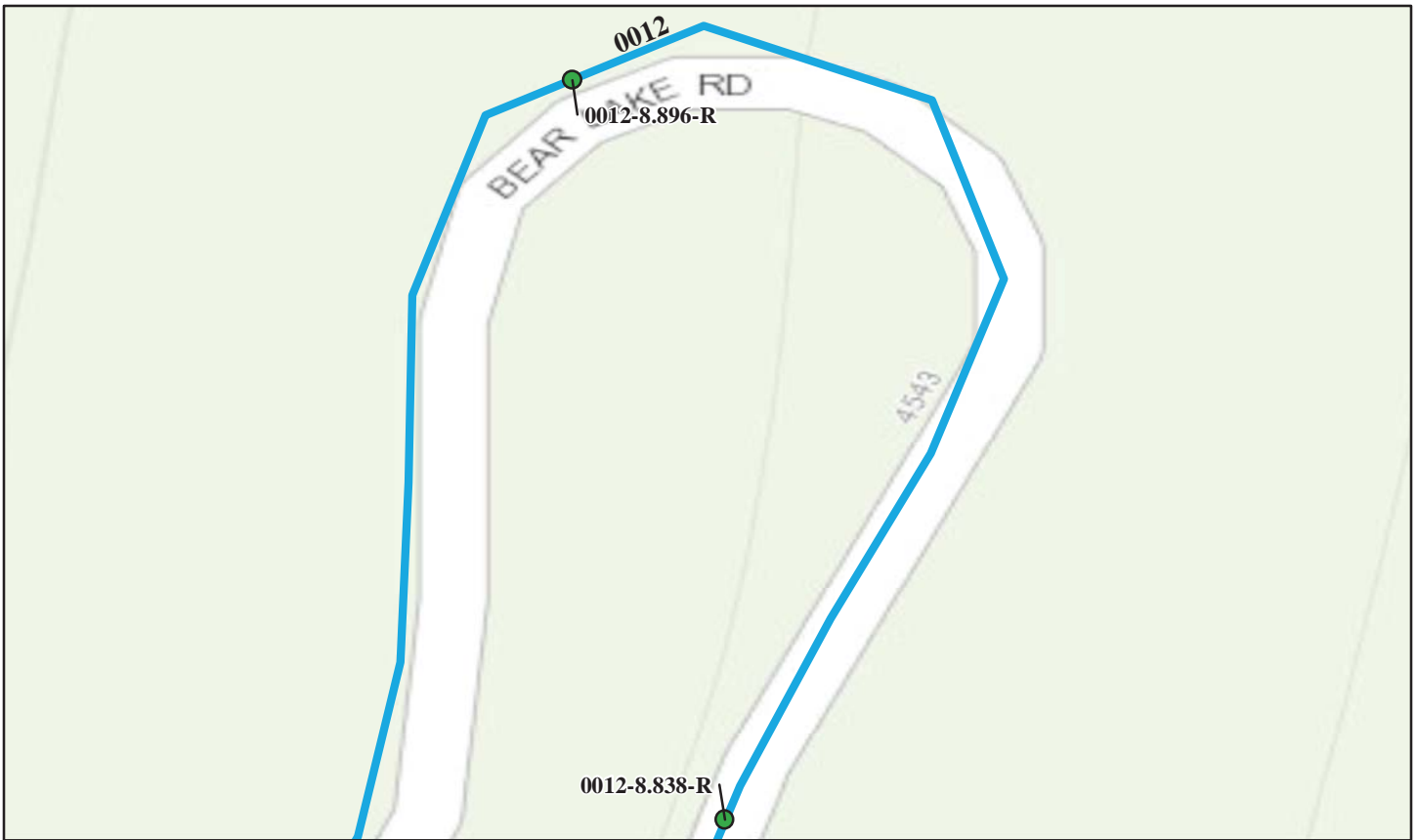
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
ROMO-0012-7.383-L 7/24/2007	7,150	687	Cantilever - Concrete	Fill Wall	95	\$0.00
ROMO-0012-7.654-L 7/24/2007	1,150	108	Cantilever - Concrete	Fill Wall	93	\$0.00
ROMO-0012-8.564-R 7/24/2007	4,330	464	Cantilever - Concrete	Fill Wall	93	\$0.00
ROMO-0012-8.594-L 7/24/2007	90	19	Cantilever - Concrete	Head Wall	94	\$0.00
ROMO-0012-8.728-R 7/24/2007	4,140	474	Cantilever - Concrete	Fill Wall	95	\$0.00

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

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE 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
ROMO-0012-8.838-R 7/24/2007	2,680	284	Cantilever - Concrete	Fill Wall	92	\$0.00
ROMO-0012-8.896-R 7/24/2007	370	89	Soil Nail	Cut Wall	90	\$0.00

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

Rocky Mountain National Park

ROUTE 0204ZZ: ASPENGLLEN CAMPGROUND ROADS



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)

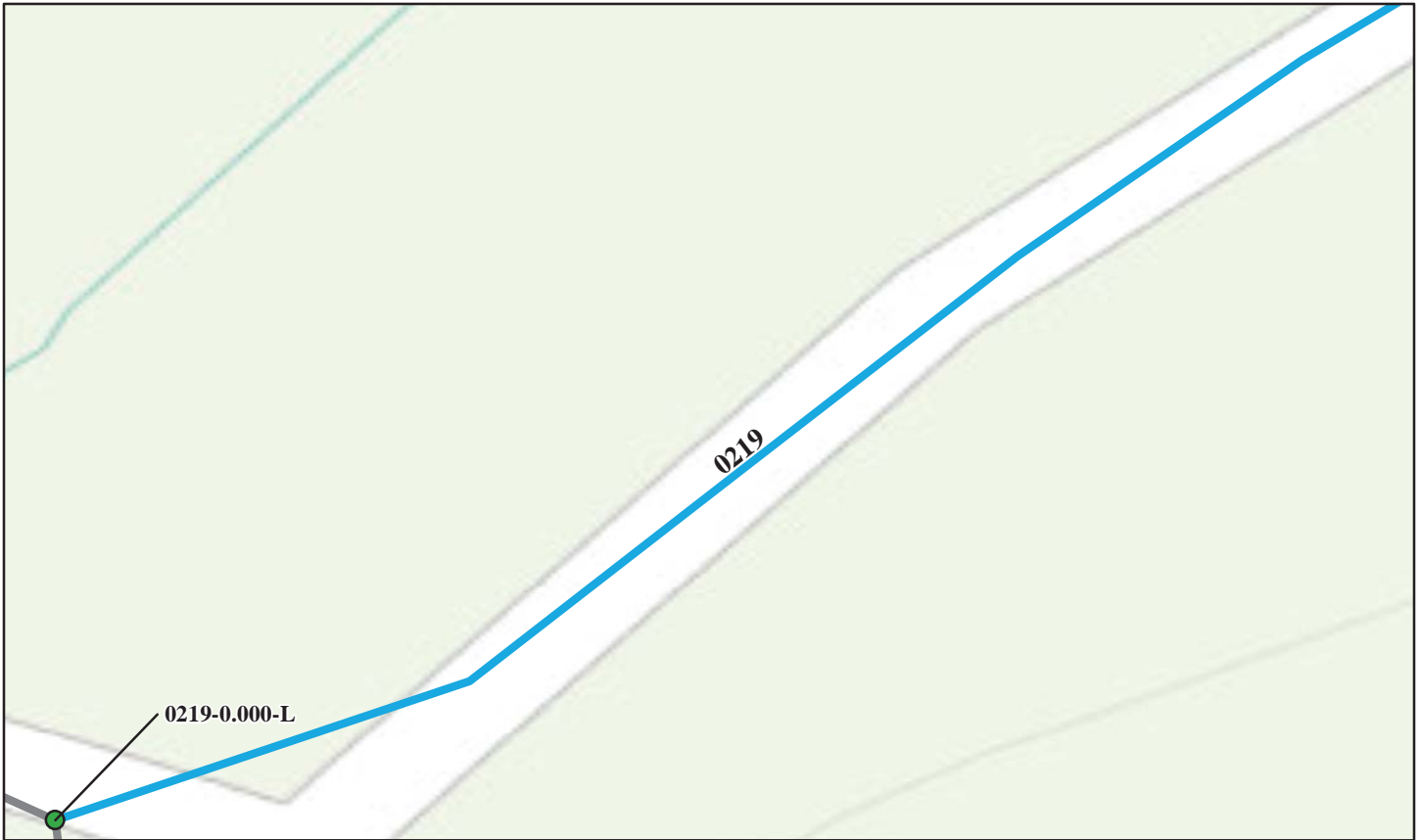
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
ROMO-0204ZZ-0.134-L 7/23/2007	324	109	Gravity - Dry Stone	Fill Wall	76	\$0.00

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

Rocky Mountain National Park

ROUTE 0219: GLACIER CREEK RIDING STABLE 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

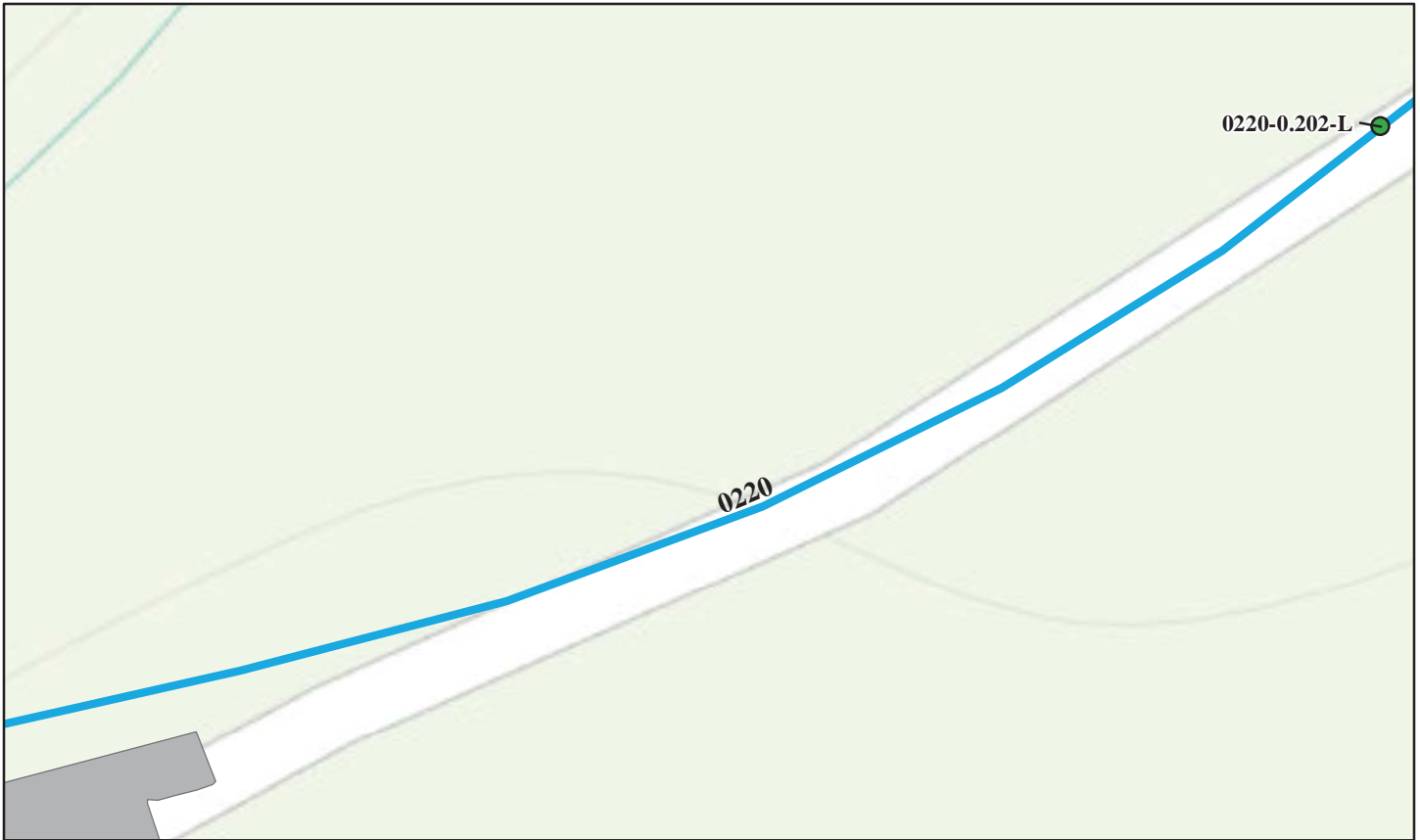
Critical / Poor (0 - 49)	Fair (50 - 69)	Good to Excellent (70 - 100)	No Data
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
ROMO-0219-0.000-L 7/24/2007	1,000	200	Cantilever - Concrete	Cut Wall	87	\$0.00

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

Rocky Mountain National Park

ROUTE 0220: HIDDEN VALLEY ACCESS 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)

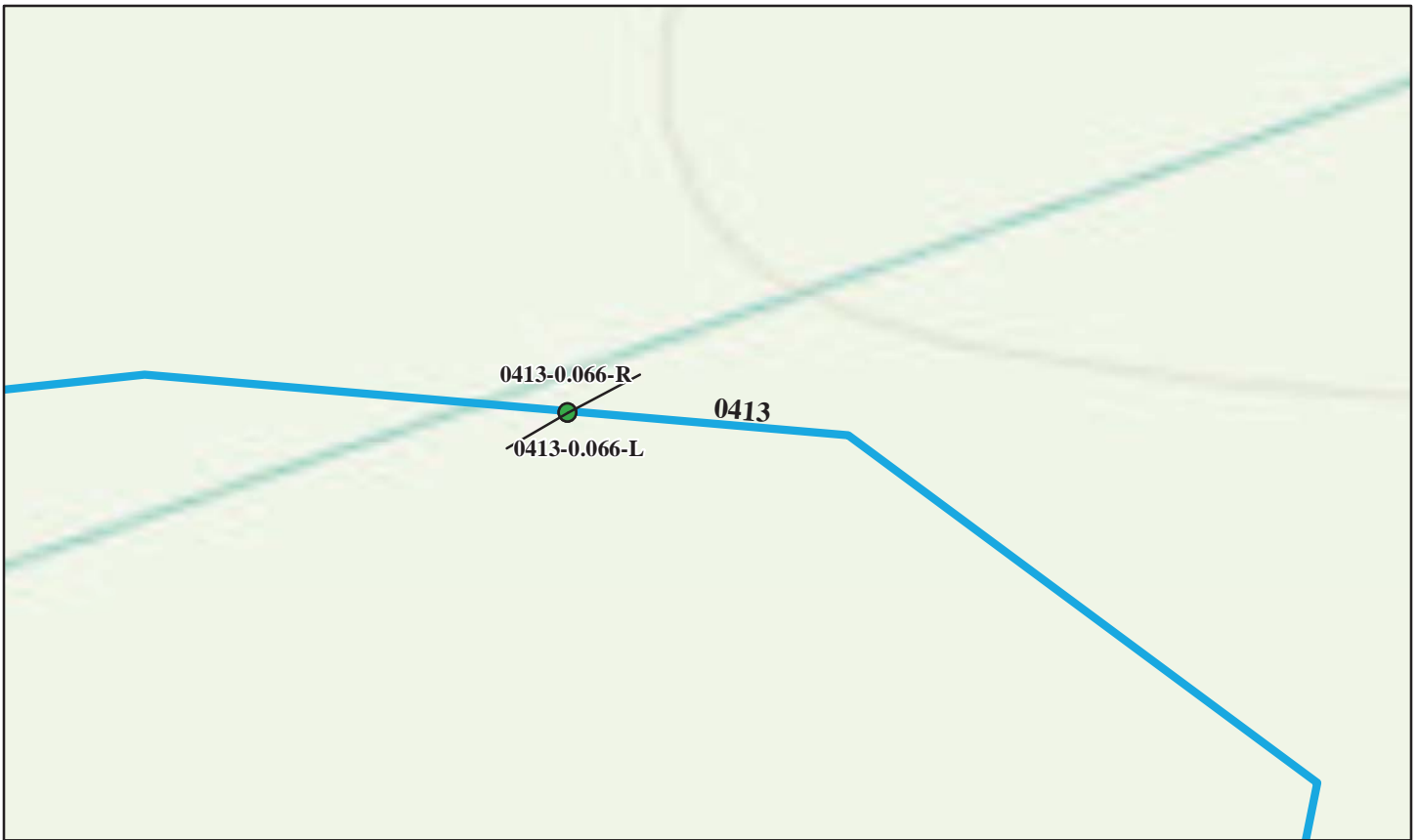
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
ROMO-0220-0.202-L 7/26/2007	1,400	205	Gravity - Dry Stone	Cut Wall	83	\$0.00

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

Rocky Mountain National Park

ROUTE 0413: MILL CREEK RESIDENCE 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
ROMO-0413-0.066-L 7/26/2007	95	30	Cantilever - Concrete	Head Wall	90	\$0.00
ROMO-0413-0.066-R 7/26/2007	95	30	Cantilever - Concrete	Head Wall	90	\$0.00

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

GPS is not available because the route is unpaved.

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
ROMO-0500-0.250-L 6/26/2007	136	34	Gravity - Dry Stone	Fill Wall	70	\$0.00
ROMO-0500-0.500-L 6/26/2007	900	84	Gravity - Dry Stone	Fill Wall	63	\$0.00
ROMO-0500-0.620-L 6/26/2007	200	41	Gravity - Dry Stone	Fill Wall	69	\$0.00
ROMO-0500-0.680-L 6/26/2007	180	37	Gravity - Dry Stone	Fill Wall	69	\$0.00
ROMO-0500-0.980-R 6/26/2007	2,900	325	Gravity - Dry Stone	Fill Wall	70	\$0.00

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

GPS is not available because the route is unpaved.

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
ROMO-0500-1.020-L 6/26/2007	380	80	Gravity - Dry Stone	Switchback Wall	70	\$0.00
ROMO-0500-1.025-L 6/26/2007	980	115	Gravity - Dry Stone	Fill Wall	70	\$0.00
ROMO-0500-1.300-L 6/26/2007	380	100	Gravity - Dry Stone	Fill Wall	63	\$0.00
ROMO-0500-1.700-L 6/26/2007	120	36	Gravity - Dry Stone	Fill Wall	69	\$0.00
ROMO-0500-1.780-L 6/26/2007	250	62	Gravity - Dry Stone	Fill Wall	70	\$0.00

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

GPS is not available because the route is unpaved.

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
ROMO-0500-2.850-L 6/26/2007	560	82	Gravity - Dry Stone	Fill Wall	69	\$0.00
ROMO-0500-3.500-R 6/26/2007	480	125	Gravity - Dry Stone	Fill Wall	66	\$0.00
ROMO-0500-3.600-L 6/26/2007	250	50	Gravity - Dry Stone	Fill Wall	69	\$0.00
ROMO-0500-3.800-R 6/26/2007	7,700	360	Gravity - Gabion	Slope Protection	65	\$0.00
ROMO-0500-4.050-R 6/26/2007	960	32	Gravity - Gabion	Switchback Wall	69	\$0.00

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

GPS is not available because the route is unpaved.

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
ROMO-0500-4.100-R 6/26/2007	1,300	79	Gravity - Gabion	Switchback Wall	72	\$0.00
ROMO-0500-4.200-L 6/26/2007	240	35	Gravity - Dry Stone	Fill Wall	60	\$0.00
ROMO-0500-4.210-L 6/26/2007	600	45	Gravity - Gabion	Fill Wall	70	\$0.00
ROMO-0500-4.250-L 6/26/2007	615	123	Gravity - Dry Stone	Fill Wall	56	\$0.00
ROMO-0500-4.251-L 6/26/2007	1,400	100	Gravity - Gabion	Fill Wall	62	\$55.00

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

GPS is not available because the route is unpaved.

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
ROMO-0500-4.400-L 6/26/2007	710	64	Gravity - Dry Stone	Fill Wall	65	\$0.00
ROMO-0500-4.450-L 6/26/2007	350	35	Gravity - Dry Stone	Fill Wall	68	\$0.00
ROMO-0500-4.550-R 6/26/2007	2,300	240	Gravity - Dry Stone	Fill Wall	80	\$0.00
ROMO-0500-4.600-L 6/26/2007	1,070	55	Gravity - Dry Stone	Fill Wall	69	\$0.00
ROMO-0500-4.750-L 6/26/2007	800	123	Gravity - Dry Stone	Fill Wall	60	\$0.00

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

GPS is not available because the route is unpaved.

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
ROMO-0500-4.800-L 6/26/2007	600	132	Gravity - Dry Stone	Fill Wall	67	\$0.00
ROMO-0500-4.900-L 6/26/2007	3,100	330	Gravity - Dry Stone	Fill Wall	65	\$0.00
ROMO-0500-4.950-L 6/27/2007	900	76	Gravity - Dry Stone	Fill Wall	72	\$0.00
ROMO-0500-5.400-L 6/27/2007	600	134	Gravity - Dry Stone	Fill Wall	69	\$0.00
ROMO-0500-5.600-L 6/27/2007	450	112	Gravity - Dry Stone	Fill Wall	63	\$0.00

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

GPS is not available because the route is unpaved.

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)

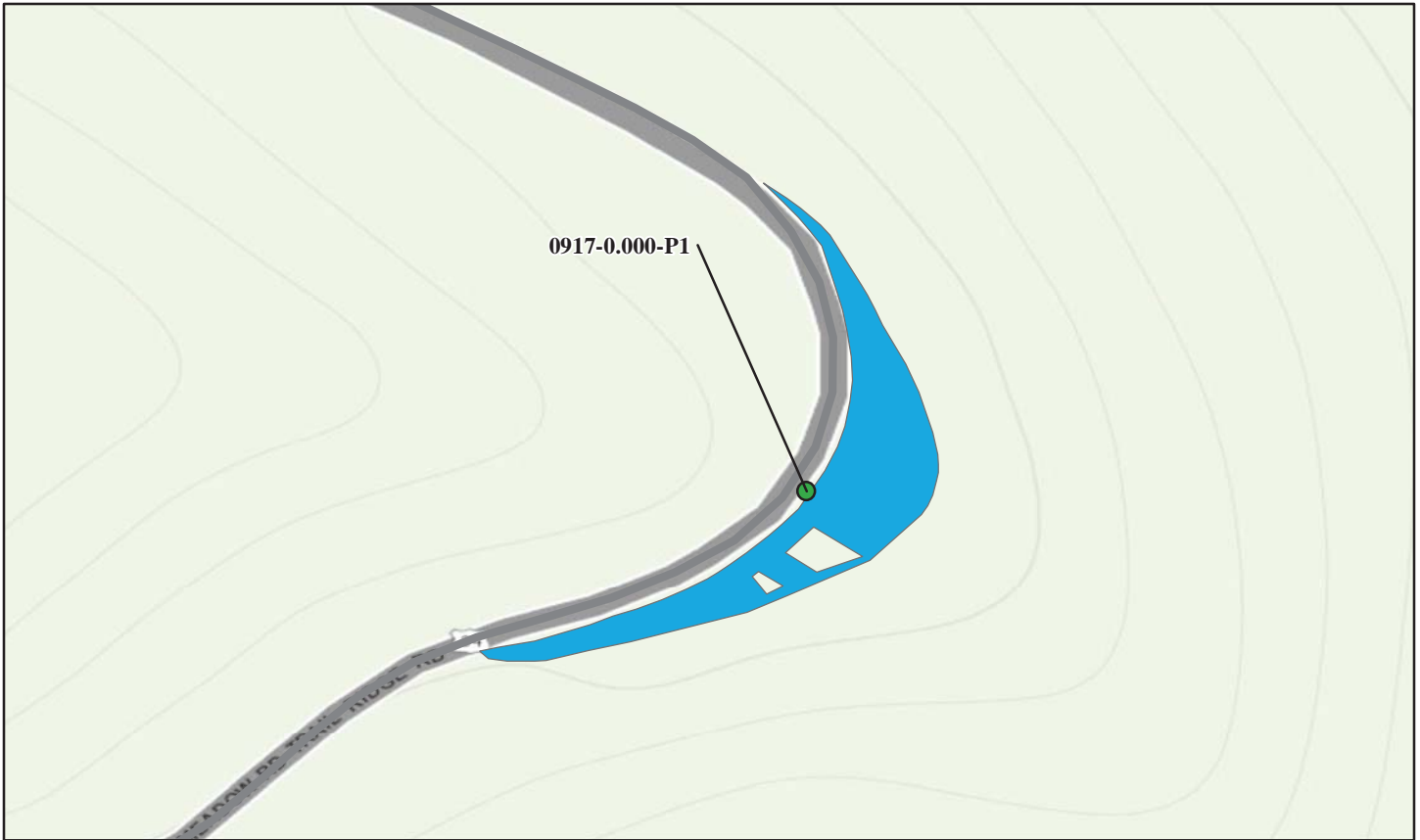
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
ROMO-0500-6.000-R 6/27/2007	820	74	Gravity - Dry Stone	Fill Wall	66	\$0.00
ROMO-0500-6.300-R 6/27/2007	150	30	Gravity - Dry Stone	Fill Wall	63	\$0.00
ROMO-0500-6.500-R 6/27/2007	430	72	Gravity - Dry Stone	Fill Wall	70	\$0.00
ROMO-0500-8.200-L 6/27/2007	470	135	Gravity - Dry Stone	Fill Wall	68	\$0.00
ROMO-0500-8.300-L 6/27/2007	480	120	Gravity - Dry Stone	Fill Wall	70	\$0.00

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

Rocky Mountain National Park

ROUTE 0917: RAINBOW CURVE PARKING AREA



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
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
ROMO-0917-0.000-P1 6/27/2007	9800	280	Gravity - Dry Stone	Fill Wall	80	\$0.00

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

Rocky Mountain National Park

ROUTE 0923: GORE RANGE OVERLOOK 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)

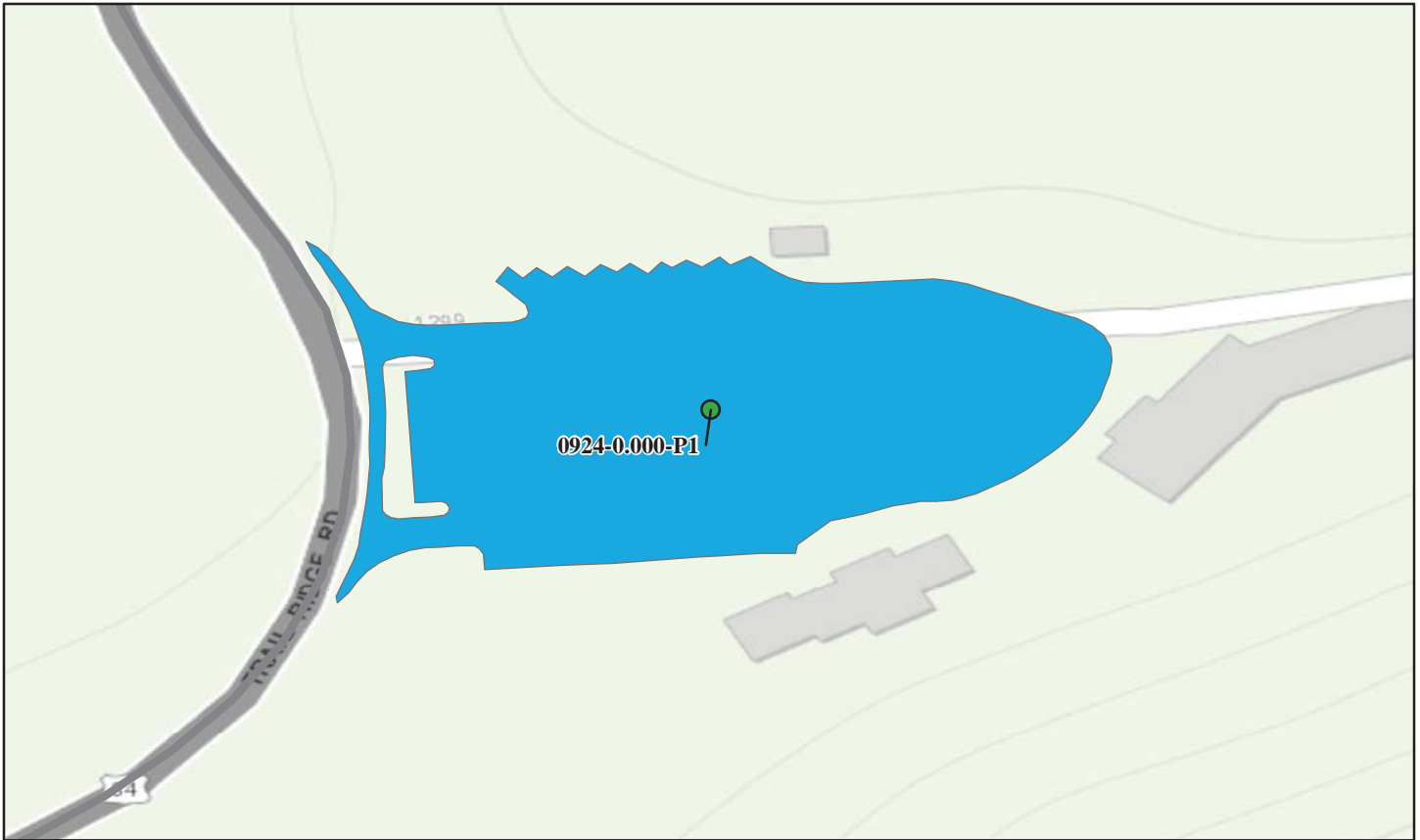
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
ROMO-0923-0.000-P1 7/25/2007	2300	290	Gravity - Dry Stone	Fill Wall	90	\$0.00

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

Rocky Mountain National Park

ROUTE 0924: ALPINE VISITORS CENTER 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

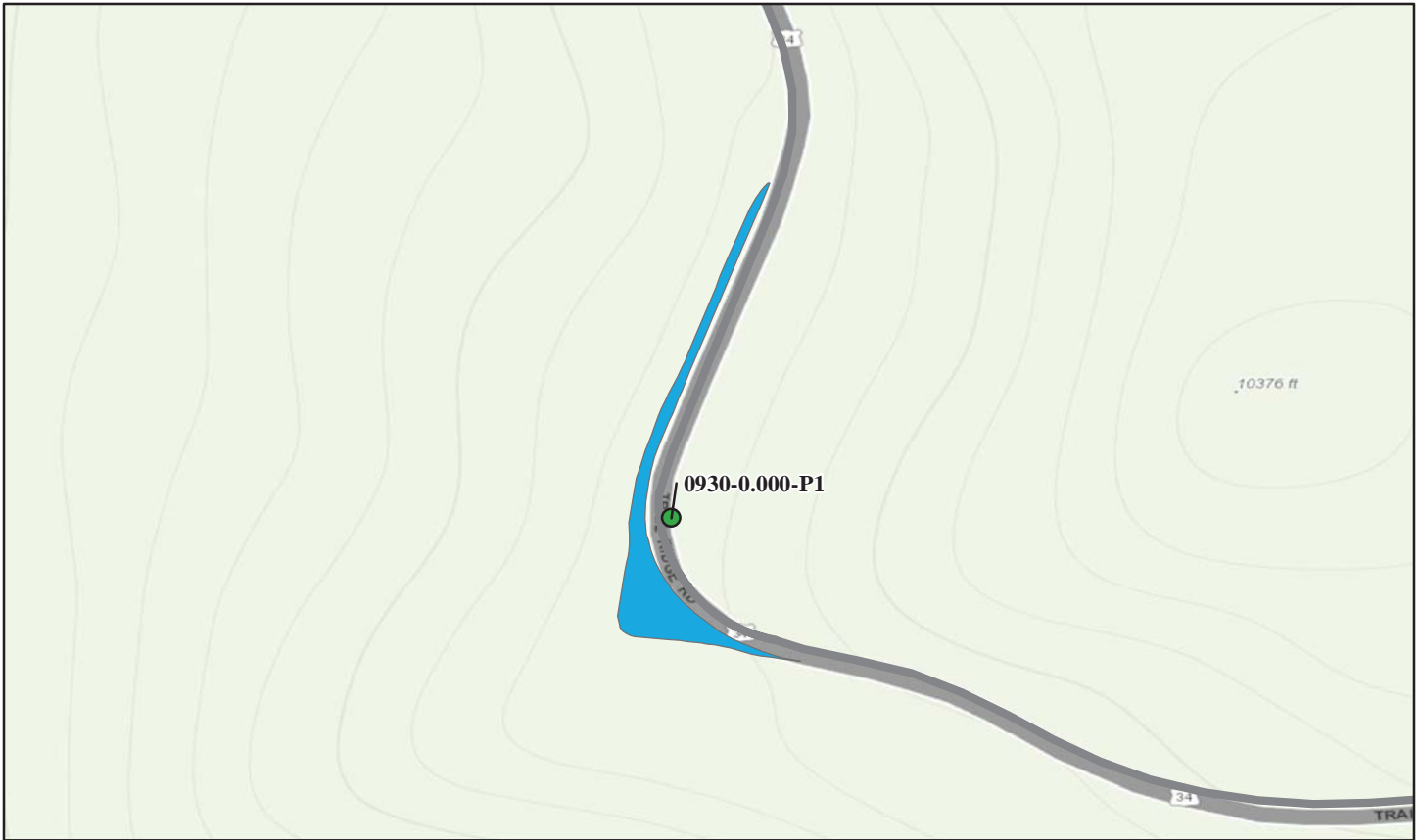
Critical / Poor (0 - 49)	Fair (50 - 69)	Good to Excellent (70 - 100)	No Data
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
ROMO-0924-0.000-P1 7/25/2007	1771	506	Cantilever - Concrete	Cut Wall	89	\$0.00

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

Rocky Mountain National Park

ROUTE 0930: FARVIEW CURVE OVERLOOK 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

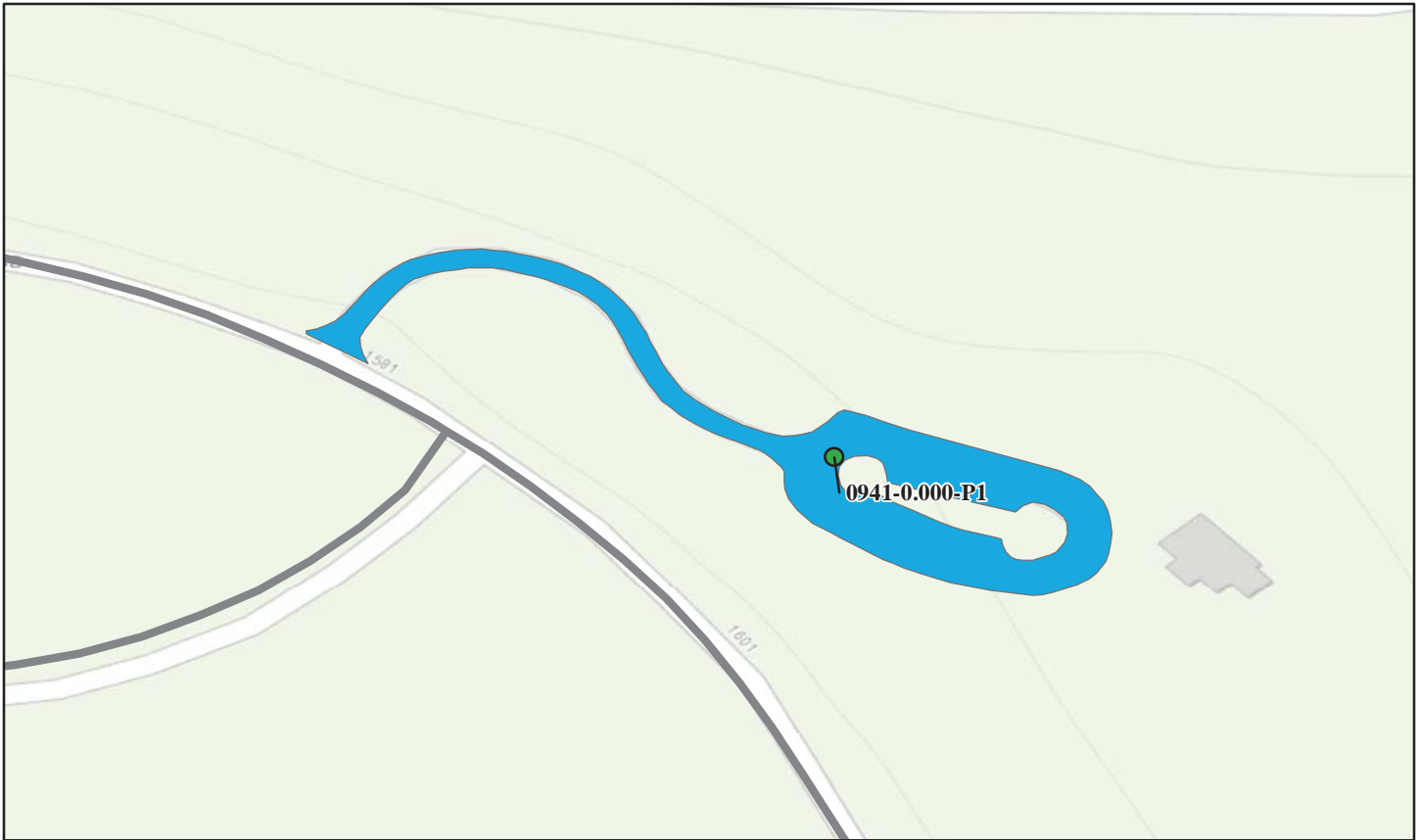
Critical / Poor (0 - 49)	Fair (50 - 69)	Good to Excellent (70 - 100)	No Data
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
ROMO-0930-0.000-P1 9/12/2007	610	122	Gravity - Dry Stone	Fill Wall	74	\$0.00

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

Rocky Mountain National Park

ROUTE 0941: MORaine PARK VISITOR CENTER



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
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
ROMO-0941-0.000-P1 7/25/2007	126	28	Gravity - Mortared Stone	Head Wall	81	\$0.00

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

Rocky Mountain National Park

ROUTE 0944: PARK AND RIDE 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)

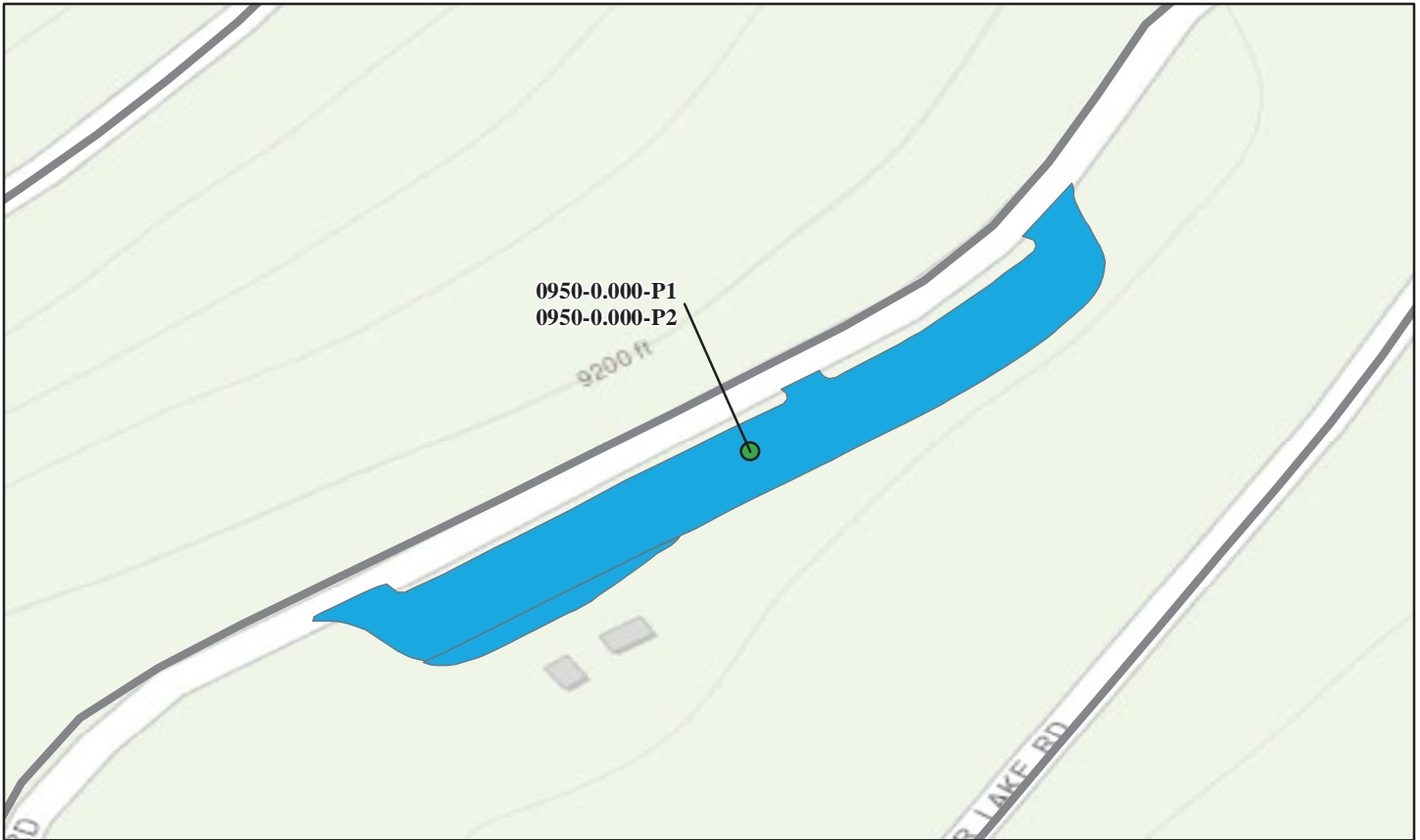
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
ROMO-0944-0.000-P1 7/25/2007	501	104	Gravity - Dry Stone	Cut Wall	81	\$0.00
ROMO-0944-0.000-P2 7/25/2007	297	81	Gravity - Dry Stone	Fill Wall	87	\$0.00
ROMO-0944-0.000-P3 7/25/2007	3860	715	Gravity - Dry Stone	Cut Wall	90	\$0.00

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

Rocky Mountain National Park

ROUTE 0950: GLACIER GORGE 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)

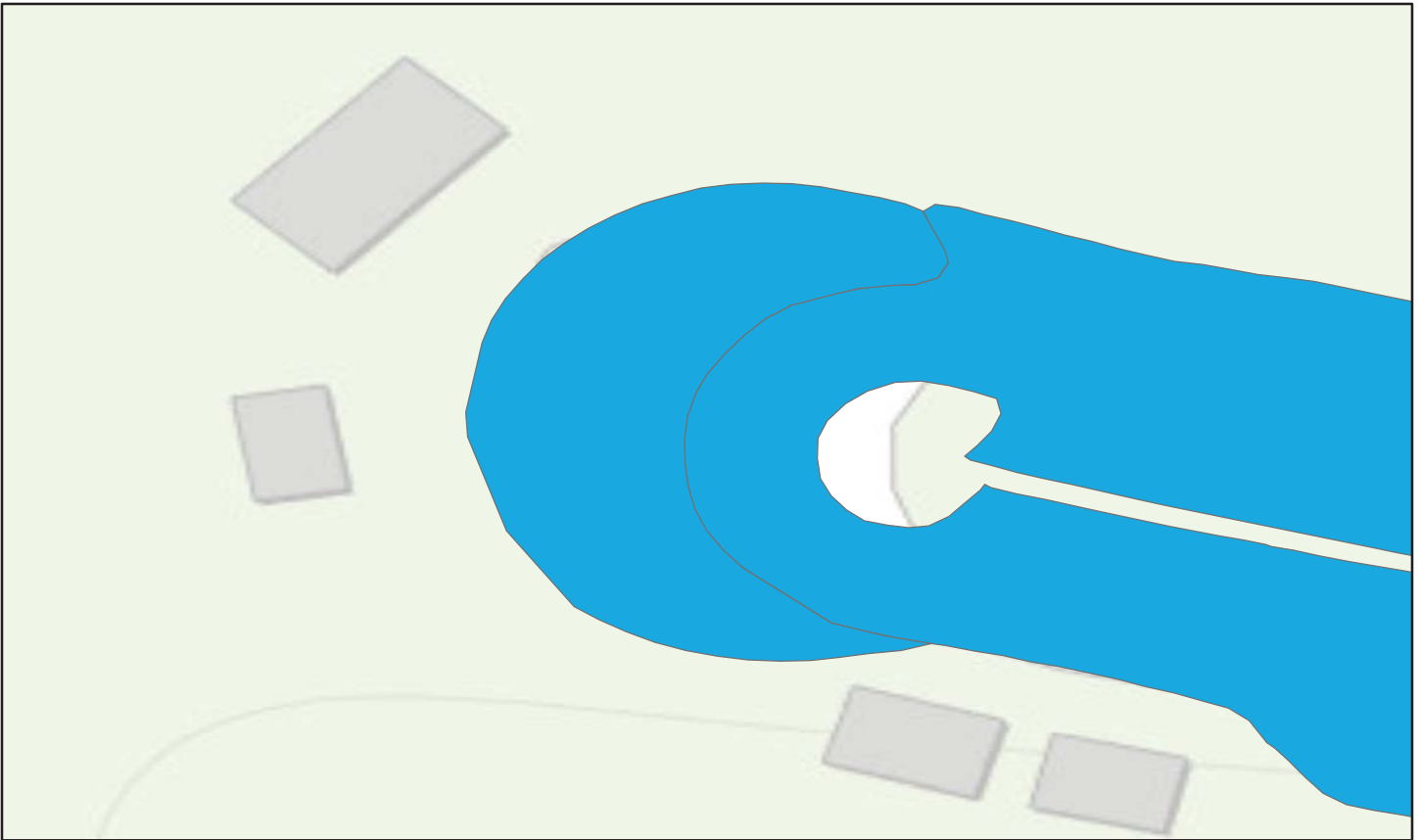
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
ROMO-0950-0.000-P1 7/24/2007	840	70	Gravity - Dry Stone	Fill Wall	77	\$0.00
ROMO-0950-0.000-P2 7/24/2007	750	75	Gravity - Dry Stone	Fill Wall	77	\$0.00

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

Rocky Mountain National Park

ROUTE 0951: BEAR LAKE PARKING AREA



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
ROMO-0951-0.000-P1 7/24/2007	464	90	Cantilever - Concrete	Cut Wall	93	\$0.00
ROMO-0951-0.000-P2 7/24/2007	562	125	Gravity - Dry Stone	Fill Wall	72	\$0.00
ROMO-0951-0.000-P3 7/24/2007	752	87	Cantilever - Concrete	Fill Wall	90	\$0.00

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

Tier 3 Retaining Wall Details



Rocky Mountain National Park



Federal Lands Highway
Road Inventory Program

Wall ID:	ROMO-0010-9.508-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	June 27, 2007	Approximate Year Built:	2000
*Wall Rating:	69	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	Gravity - Gabion
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone mortared cut wall at slump area.		

Wall Measurements

Wall Length (ft.):	51	Face Area (sq.):	220
Average Wall Height (ft.):	4	Face Angle (deg.):	90
Maximum Wall Height (ft.):	4	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	8
WALL FOUNDATION MATERIAL 8.00	No sign of settlement.	8
WIRE/GEOSYNTHETIC FACING 8.00	Gabion, no corrosion, some sagging.	6
MORTAR 8.00	Good, no spalling, very minor cracking, a few 1/8" gaps.	7
STONE MASONRY 8.00	Hard durable sandstone, recently constructed.	8
LATERAL SLOPE 0.50	Ties into soil at wall start, bedrock at wall end. No erosion.	8
WALL DRAINS 0.50	None present; no signs of drainage related distress.	8
UPSLOPE 5.00	Slump, unstable, some erosion material placed.	3

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_9.508_L_1.jpg

Wall ID:	ROMO-0010-9.518-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	June 27, 2007	Approximate Year Built:	2000
*Wall Rating:	69	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	Gravity - Gabion
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone mortared cut wall at slump area.		

Wall Measurements

Wall Length (ft.):	51	Face Area (sq.):	220
Average Wall Height (ft.):	4	Face Angle (deg.):	90
Maximum Wall Height (ft.):	4	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	8
WALL FOUNDATION MATERIAL 8.00	On footing, no sign of settlement.	8
WIRE/GEOSYNTHETIC FACING 8.00	Gabion baskets show no sign of corrosion, some sagging.	6
MORTAR 8.00	Good, no spalling, very minor cracking, few 1/8" gaps.	7
STONE MASONRY 8.00	Hard, durable "sandstone", recently constructed	8
LATERAL SLOPE 0.50	Unstable soil at wall start, bedrock at wall end, no erosion.	8
WALL DRAINS 0.50	None observed. No water related problems.	8
UPSLOPE 5.00	Slump, unstable, erosion mat placed during repair.	3

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos

Condition photos are not available for ROMO-0010-9.518-L.

Wall ID:	ROMO-0010-11.320-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	June 27, 2007	Approximate Year Built:	Unknown
*Wall Rating:	59	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stack fill wall		

Wall Measurements

Wall Length (ft.):	141	Face Area (sq.):	2400
Average Wall Height (ft.):	17	Face Angle (deg.):	50
Maximum Wall Height (ft.):	30	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Founded on soil, no sign of settlement.	7
PLACED STONE 8.00	Small to large boulders, durable, some loose.	7
LATERAL SLOPE 0.50	Well vegetated, no sign of erosion.	8
DOWNSLOPE 1.00	Well vegetated, no sign of erosion.	7
WALL DRAINS 1.00	None observed. No water related problems.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_11.320_R_1.jpg

Wall ID:	ROMO-0010-11.923-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	June 27, 2007	Approximate Year Built:	Unknown
*Wall Rating:	69	Maintenance Action:	Replace Elements

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall		

Wall Measurements

Wall Length (ft.):	530	Face Area (sq.):	18200
Average Wall Height (ft.):	34	Face Angle (deg.):	48
Maximum Wall Height (ft.):	53	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Soil and boulders, no sign of erosion.	7
PLACED STONE 8.00	Large durable rock, slightly weathered.	7
TRAFFIC BARRIER/FENCE 1.00	Missing 4.5 ft. of guardwall caprock, several loose pieces.	5
DOWNSLOPE 1.00	Large boulders and large trees. No sign of erosion.	7
LATERAL SLOPE 1.00	Ties into soil/boulder mix at each end. No erosion.	7
WALL DRAINS 1.00	None visible. No water related problems.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Replace 5 square feet of caprock: 5 sq. ft @ \$100 s.f. = \$500
Repair Cost:	\$500

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_11.923_R_1.jpg

Wall ID:	ROMO-0010-14.069-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	June 27, 2007	Approximate Year Built:	Unknown
*Wall Rating:	88	Maintenance Action:	Replace Elements

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Mass Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone veneer concrete cut wall		

Wall Measurements

Wall Length (ft.):	39	Face Area (sq.):	160
Average Wall Height (ft.):	4	Face Angle (deg.):	90
Maximum Wall Height (ft.):	4	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good - wall performing as intended	9
WALL FOUNDATION MATERIAL 8.00	Bedrock	10
CONCRETE 8.00	Cast in place concrete in good condition.	8
SHOTCRETE 8.00	No distress	8
CULVERT 0.50	3' inlet, shotcreted	8
UPSLOPE 0.50	Embankment	9
DOWNSLOPE 0.50	Waterfall on bedrock	10
LATERAL SLOPE 0.50	Bedrock	10
WALL DRAINS 0.50	5 drains, all functional	10

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	Replace 3 sq. ft. of stone veneer and mortar: 3 sq. ft. @ \$75 s.f. = \$225
Repair Cost:	\$225

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_14.069_L_1.jpg

Wall ID:	ROMO-0010-14.080-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	June 27, 2007	Approximate Year Built:	Unknown
*Wall Rating:	76	Maintenance Action:	Replace Elements

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Mass Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone veneer concrete cut wall		

Wall Measurements

Wall Length (ft.):	39	Face Area (sq.):	160
Average Wall Height (ft.):	4	Face Angle (deg.):	90
Maximum Wall Height (ft.):	4	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	8
WALL FOUNDATION MATERIAL 8.00	On footing, no sign of settlement.	8
CONCRETE 8.00	Rebar exposed at wall start.	7
STONE MASONRY 8.00	Missing stone veneer at wall start.	7
MORTAR 8.00	Recently built, no spalling, very minor cracks.	8
LATERAL SLOPE 0.50	Ties into soil/rock mix, 1.5:1 no sign of erosion.	8
UPSLOPE 0.50	Gentle, well vegetated, no sign of erosion.	8
WALL DRAINS 0.50	None observed. No water related problems.	8

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	Replace 3 sq. ft. of stone veneer and mortar:: 3 sq. ft. @ \$75 s.f. = \$225
Repair Cost:	\$225

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_14.080_L_1.jpg

Wall ID:	ROMO-0010-17.105-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	June 27, 2007	Approximate Year Built:	Unknown
*Wall Rating:	67	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall		

Wall Measurements

Wall Length (ft.):	164	Face Area (sq.):	7000
Average Wall Height (ft.):	42	Face Angle (deg.):	45
Maximum Wall Height (ft.):	43	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Founded on boulder, native soil and grass, no sign of settlement.	7
PLACED STONE 8.00	Small to large durable rock, slightly weathered, voids filled with soil, some loose pieces.	6
LATERAL SLOPE 0.50	Ties into bedrock at wall start and end, no sign of erosion.	8
DOWNSLOPE 1.00	Small to large boulders, moderately steep slope.	6
WALL DRAINS 1.00	None observed. No water related problems.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos

Condition photos are not available for ROMO-0010-17.105-L.

Wall ID:	ROMO-0010-17.162-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	June 27, 2007	Approximate Year Built:	Unknown
*Wall Rating:	79	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall		

Wall Measurements

Wall Length (ft.):	30	Face Area (sq.):	1100
Average Wall Height (ft.):	36	Face Angle (deg.):	57
Maximum Wall Height (ft.):	38	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	8
WALL FOUNDATION MATERIAL 8.00	Founded on bedrock, no sign of settlement.	8
PLACED STONE 8.00	Moderately weathered, well placed rock.	8
LATERAL SLOPE 0.50	Ties into bedrock, no sign of erosion.	8
WALL DRAINS 0.50	Drain at wall end below guardwall. No water related problems.	8
TRAFFIC BARRIER/FENCE 1.00	Guardwall has loose stone at wall start.	5
DOWNSLOPE 1.00	Very steep, shallow bedrock, no sign of erosion.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Repair loose guardwall stone.: 1 hr. labor @ \$55 = \$55
Repair Cost:	\$55

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_17.162_L_1.jpg

Wall ID:	ROMO-0010-17.206-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	June 27, 2007	Approximate Year Built:	Unknown
*Wall Rating:	43	Maintenance Action:	Replace Elements

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	Gravity - Dry Stone
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone mortared fill wall		

Wall Measurements

Wall Length (ft.):	460	Face Area (sq.):	1150
Average Wall Height (ft.):	2	Face Angle (deg.):	68
Maximum Wall Height (ft.):	4	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Poor, severe undermining of foundation, parking lot and guardwall still intact.	4
WALL FOUNDATION MATERIAL 8.00	Rock and erodible soil mix, undermined in places.	2
MORTAR 8.00	Cracking, separation, failing at several locations.	4
STONE MASONRY 8.00	Several pieces have broke off.	5
PLACED STONE 8.00	Durable rock, slightly weathered.	6
DOWNSLOPE 1.00	Loose erodible soil and boulders, 1.5:1 slope, undermined in many locations.	4
LATERAL SLOPE 1.00	Ties into soil and rock fragments, some erosion.	6
WALL DRAINS 1.00	None visible.	6

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	TBD - Wall repairs are being planned under a current construction project.
Repair Cost:	\$20,000

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_17.206_L_1.jpg



ROMO_0010_17.206_L_2.jpg

Wall ID:	ROMO-0010-17.955-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	July 25, 2007	Approximate Year Built:	Unknown
*Wall Rating:	84	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone veneer (granite) headwall with dry stacked stones on lateral slopes (structure no. 215-00)		

Wall Measurements

Wall Length (ft.):	7	Face Area (sq.):	27
Average Wall Height (ft.):	3	Face Angle (deg.):	88
Maximum Wall Height (ft.):	4	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good condition, minor lateral slope erosion and minor oxidation in culvert, wall performing as intended.	9
WALL FOUNDATION MATERIAL 8.00	Sand and gravel, no signs of displacement, minor to moderate erosion at culvert with possible minor undermining.	8
STONE MASONRY 8.00	Granite stones, moderate weathering, one stone missing.	8
MORTAR 8.00	Minor cracking, good condition.	9
CULVERT 0.50	24-inch CMP culvert, minor oxidation, functioning as intended.	8
LATERAL SLOPE 0.50	About 1H:2V slope, minor surface erosion, not impacting wall.	8
UPSLOPE 0.50	Relatively flat slope at about 1H:3V with grass vegetation.	9
ROAD/SIDEWALK/SHOULDER 0.50	Roadway no signs of distress, not impacting wall. Shoulder no signs of distress, not impacting wall.	10
WALL DRAINS 0.50	None observed, drainage issues not impacting wall.	10

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_17.955_R_1.jpg

Wall ID:	ROMO-0010-20.690-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	July 25, 2007	Approximate Year Built:	2000
*Wall Rating:	79	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone mortared cutwall		

Wall Measurements

Wall Length (ft.):	942	Face Area (sq.):	4700
Average Wall Height (ft.):	4	Face Angle (deg.):	80
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good condition, wall performing as intended.	8
WALL FOUNDATION MATERIAL 8.00	Founded on road, no signs of distress or settlement.	8
MORTAR 8.00	Some cracking and spalling, up to 1/4-inch gaps.	7
CONCRETE 8.00	Not visible, no signs of distress.	8
STONE MASONRY 8.00	Hard curable rock, minor weathering.	9
WALL DRAINS 0.50	None observed, no water-related problems with wall.	8
LATERAL SLOPE 1.00	1.5H:1V slope with minor surface erosion, not impacting wall performance.	6
UPSLOPE 1.00	Minor sloughing, some voids behind wall that are backfilled with boulders.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_20.690_R_1.jpg



ROMO_0010_20.690_R_2.jpg

Wall ID:	ROMO-0010-22.630-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	July 25, 2007	Approximate Year Built:	Unknown
*Wall Rating:	83	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone mortared culvert headwall (downstream/outlet side)		

Wall Measurements

Wall Length (ft.):	8	Face Area (sq.):	27
Average Wall Height (ft.):	3	Face Angle (deg.):	87
Maximum Wall Height (ft.):	5	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good condition, functioning as intended.	8
WALL FOUNDATION MATERIAL 8.00	Solid granular material, no signs of settlement or rotation.	9
MORTAR 8.00	Minor cracking and spalling, minor distress.	8
STONE MASONRY 8.00	Granite boulders, hard, durable, minor surface weathering.	8
LATERAL SLOPE 0.50	Minor riprap slope protection at start of wall, heavy vegetation, not impacting wall.	8
DOWNSLOPE 0.50	Active stream channel, outlet for culvert downstream, slope about 1.5H:1V, not impacting the wall.	9
ROAD/SIDEWALK/SHOULDER 0.50	Road has minor cracking, not impacting wall.	10
WALL DRAINS 0.50	None observed, no signs of distress impacting the wall concerning water-related issues.	10
CULVERT 1.00	12-inch diameter CMP with minor to moderate oxidation, partially plugged at outlet with sediments about 2-inches deep, but functioning as intended.	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_22.630_R_1.jpg

Wall ID:	ROMO-0010-23.225-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	July 25, 2007	Approximate Year Built:	Unknown
*Wall Rating:	80	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone mortared cut wall		

Wall Measurements

Wall Length (ft.):	301	Face Area (sq.):	1050
Average Wall Height (ft.):	3	Face Angle (deg.):	82
Maximum Wall Height (ft.):	4	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good condition, performing as intended.	8
WALL FOUNDATION MATERIAL 8.00	Founded on ditch, no signs of settlement.	8
MORTAR 8.00	Minor cracks (1/8"), minor spalling.	8
STONE MASONRY 8.00	Hard, durable granite, slight weathering.	8
UPSLOPE 0.50	Gentle slope, some voids on back of wall, not affecting wall performance.	8
VEGETATION 0.50	Minor grass, small pines, not affecting wall performance.	8
WALL DRAINS 0.50	Steel weepholes, no water-related issues impacting the wall.	8
LATERAL SLOPE 1.00	Gentle slope at start, some rock placed at the wall end as slope protection.	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_23.225_L_1.jpg

Wall ID:	ROMO-0010-23.373-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	July 25, 2007	Approximate Year Built:	Unknown
*Wall Rating:	80	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone mortared cut wall		

Wall Measurements

Wall Length (ft.):	326	Face Area (sq.):	1300
Average Wall Height (ft.):	3	Face Angle (deg.):	82
Maximum Wall Height (ft.):	5	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good condition, performing as intended.	8
WALL FOUNDATION MATERIAL 8.00	Asphalt ditch, no settlement observed.	8
MORTAR 8.00	Minor cracking and spalling.	8
PLACED STONE 8.00	Minor cracking, overall good condition.	8
LATERAL SLOPE 0.50	About 2H:1V slope, minor erosion at the begin and end of wall.	8
ROAD/SIDEWALK/SHOULDER 0.50	Road has no cracking, good condition.	8
WALL DRAINS 0.50	Steel weepholes, no water-related issues associated with the wall.	8
UPSLOPE 1.00	About 2H:1V slope, old rotational slump at the end of the wall repaired with placed rock, some 1.5" voids on back of wall, not affecting wall performance.	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_23.373_L_1.jpg



ROMO_0010_23.373_L_2.jpg

Wall ID:	ROMO-0010-24.270-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	July 25, 2007	Approximate Year Built:	Unknown
*Wall Rating:	80	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone mortared cut wall		

Wall Measurements

Wall Length (ft.):	451	Face Area (sq.):	1800
Average Wall Height (ft.):	3	Face Angle (deg.):	80
Maximum Wall Height (ft.):	5	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good condition, performing as intended.	8
WALL FOUNDATION MATERIAL 8.00	Founded on granite outcrop, no signs of settlement or deformation.	8
MORTAR 8.00	Minor cracks (1/8-1/4"), minor spalling.	8
STONE MASONRY 8.00	Hard, durable granite, minor surface weathering, minor voids on upslope back of wall.	8
LATERAL SLOPE 0.50	Tapers at wall end to gentle slope about 2H:1V to 1.5H:1V with minor surface erosion.	8
ROAD/SIDEWALK/SHOULDER 0.50	Road has minor cracking, relatively new overlay.	8
UPSLOPE 0.50	About 2-ft wide flat bench with about 2H:1V above, not impacting wall, minor voids behind wall.	8
VEGETATION 0.50	Minor grass, not impacting wall performance.	8
WALL DRAINS 0.50	Steel weepholes, no water-related issues impacting the wall.	8

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_24.270_L_1.jpg

Wall ID:	ROMO-0010-24.677-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	July 26, 2007	Approximate Year Built:	Unknown
*Wall Rating:	86	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Granite mortared stone (1 ft x 1.5 ft boulders) headwall (downstream/outlet side)		

Wall Measurements

Wall Length (ft.):	7	Face Area (sq.):	25
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	4	Vertical Offset (ft.):	1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good performance, minor surface erosion on lateral slopes.	9
WALL FOUNDATION MATERIAL 8.00	Alluvial sand and gravel, good condition, good performance.	9
MORTAR 8.00	Minor cracking, minor patching, occasional spalling.	8
STONE MASONRY 8.00	Hard granite, minor surface weathering, overall good condition.	9
CULVERT 0.50	24-inch CMP culvert, moderate corrosion, but performing as intended.	8
LATERAL SLOPE 0.50	Minor surface erosion, about 2H:1V slope, minor boulder riprap slope protection.	8
DOWNSLOPE 0.50	Active stream channel, about 2H:1V slope, with vegetation and boulders, not impacting wall.	9
ROAD/SIDEWALK/SHOULDER 0.50	Road has new overlay with no signs of distress. Shoulder has minor surface erosion.	9
WALL DRAINS 0.50	None observed, no water-related issues impacting wall.	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_24.677_L_1.jpg

Wall ID:	ROMO-0010-25.048-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	July 26, 2007	Approximate Year Built:	Unknown
*Wall Rating:	83	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Granite mortared stone culvert headwall at Poudre River Crosscountry Trailhead		

Wall Measurements

Wall Length (ft.):	7	Face Area (sq.):	18
Average Wall Height (ft.):	2	Face Angle (deg.):	90
Maximum Wall Height (ft.):	5	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good condition, performing as intended.	8
WALL FOUNDATION MATERIAL 8.00	Sand and gravel, good base material, no signs of settlement, moderate amount of voids, stream undermining at the base, but the wall is performing as intended.	7
MORTAR 8.00	Minor cracks and spalling, moss covered.	9
PLACED STONE 8.00	Minor stone cracking, performing as intended.	9
LATERAL SLOPE 0.50	Minor surface erosion, not impacting the wall.	8
CULVERT 0.50	24-inch CMP, minor to moderate oxidation.	9
DOWNSLOPE 0.50	Active stream channel, good condition, not impacting wall.	9
ROAD/SIDEWALK/SHOULDER 0.50	Road has no observed cracking, not impacting wall. Shoulder has slight raveling, but not impacting wall.	9
WALL DRAINS 0.50	None observed, no water-related issues impacting wall.	10

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_25.048_R_1.jpg

Wall ID:	ROMO-0010-25.058-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	July 26, 2007	Approximate Year Built:	Unknown
*Wall Rating:	89	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Granite stone mortared (1-1.5 ft boulders) headwall		

Wall Measurements

Wall Length (ft.):	8	Face Area (sq.):	20
Average Wall Height (ft.):	2	Face Angle (deg.):	90
Maximum Wall Height (ft.):	5	Vertical Offset (ft.):	4

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good condition, minor surface erosion on lateral slopes.	9
WALL FOUNDATION MATERIAL 8.00	Gravel and sand, boulder in front of wall, not impacting wall.	9
MORTAR 8.00	Minor cracks and spalling, not impacting wall performance.	9
STONE MASONRY 8.00	Minor cracking and minor weathering, not impacting performance.	9
ROAD/SIDEWALK/SHOULDER 0.50	Road has no signs of distress. Shoulder has minor ravelling, low impact to wall.	8
DOWNSLOPE 0.50	Active stream channel, sloped about 4H:1V, not impacting wall.	9
LATERAL SLOPE 0.50	Minor surface erosion, vegetated with grasses, about 1.5H:1V slope, not impacting wall.	9
VEGETATION 0.50	Minor grasses in wall, not impacting performance.	9
WALL DRAINS 0.50	None observed, no water-related issues impacting wall.	10

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_25.058_R_1.jpg

Wall ID:	ROMO-0010-25.094-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	July 26, 2007	Approximate Year Built:	Unknown
*Wall Rating:	81	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Concrete box culvert with granite mortared headwall at Poudre Lake outlet		

Wall Measurements

Wall Length (ft.):	38	Face Area (sq.):	56
Average Wall Height (ft.):	2	Face Angle (deg.):	90
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good condition, performing as intended.	8
WALL FOUNDATION MATERIAL 8.00	Active stream channel, slightly swampy with fines, performing as intended.	8
MORTAR 8.00	Minor to moderate cracking, minor spalling, with moss, occasional voids.	8
PLACED STONE 8.00	Hard competent granite and schist, minor surface erosion, possibly replaced a couple stones at the top of the wall.	8
LATERAL SLOPE 0.50	Stacked rock at 1.5H:1V slope, not impacting wall.	8
VEGETATION 0.50	Minor grass and brush at the top of the wall, not impacting performance.	8
DOWNSLOPE 0.50	Active stream channel, relatively flat, not impacting wall.	9
ROAD/SIDEWALK/SHOULDER 0.50	Road has no cracking.	9
WALL DRAINS 0.50	None observed, no water-related issues impacting wall.	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_25.094_R_1.jpg

Wall ID:	ROMO-0010-25.466-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	July 26, 2007	Approximate Year Built:	Unknown
*Wall Rating:	73	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Granite mortared gravity wall		

Wall Measurements

Wall Length (ft.):	560	Face Area (sq.):	5600
Average Wall Height (ft.):	10	Face Angle (deg.):	77
Maximum Wall Height (ft.):	18	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Fair to good condition, minor cracking and spalling of mortar and stone, water ponding on roadway above wall.	7
WALL FOUNDATION MATERIAL 8.00	About 2H:1V slope, minor vegetation, no signs of settlement.	8
MORTAR 8.00	Moderate cracking and spalling, water weeping at isolated location of wall, couple generations of patched mortar is evident, wall performing as intended.	7
STONE MASONRY 8.00	Minor cracking, moderate oxidation, hard granite, schist, and gneiss boulders.	7
DOWNSLOPE 0.50	Adjacent to lake (about 8-15' away) with 1.5H:1V to 2H:1V slope, with moderate vegetation, not impacting wall.	8
LATERAL SLOPE 0.50	Minor surface erosion on about 1.5H:1V (begin) to 3H:1V slope (end), not impacting wall.	8
TRAFFIC BARRIER/FENCE 0.50	Stone masonry gaurdwall with minor cracking and spalling, performing as intended.	8
WALL DRAINS 0.50	6" diameter steel outlet pipe under wall, open weepholes, performing as intended.	8
CULVERT 0.50	24" CMP through wall (gunshot), oval shaped, minor surface erosion, performing as intended.	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

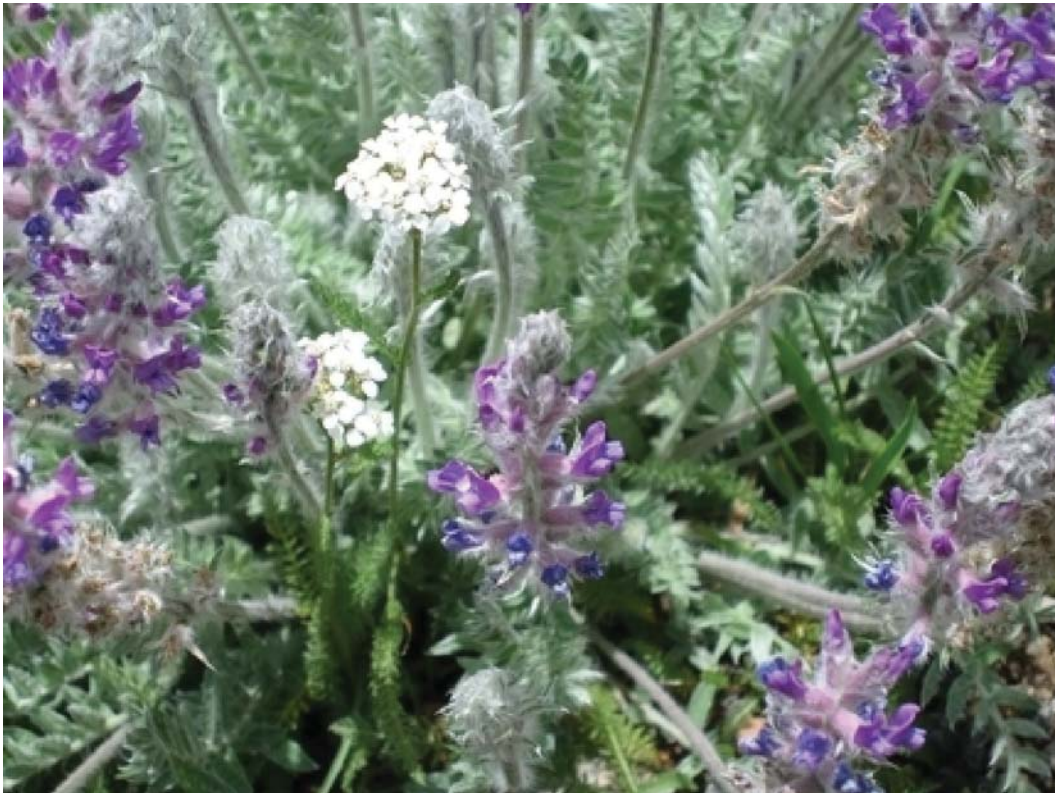
Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_25.466_L_1.jpg



ROMO_0010_25.466_L_2.jpg

Wall ID:	ROMO-0010-25.784-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	July 26, 2007	Approximate Year Built:	Unknown
*Wall Rating:	81	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared granite stone headwall		

Wall Measurements

Wall Length (ft.):	7	Face Area (sq.):	25
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	5	Vertical Offset (ft.):	4

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good performance, with lateral and shoulder minor surface erosion, culvert heavy corrosion.	8
WALL FOUNDATION MATERIAL 8.00	Sand and gravel, no signs of settlement.	9
MORTAR 8.00	Minor cracking and spalling, not impacting wall.	8
STONE MASONRY 8.00	Slightly weathered, not impacting wall.	8
CULVERT 1.00	24" CMP, heavy corrosion, not impacting wall yet.	4
ROAD/SIDEWALK/SHOULDER 0.50	Road has no signs of settlement, minor ravelling in the shoulder.	8
WALL DRAINS 0.50	None observed, no water-related issues impacting wall.	10
LATERAL SLOPE 1.00	Minor surface erosion at wall beginning and minor ravelling. No surface erosion at wall end.	7
UPSLOPE 1.00	About 2H:1V, well vegetated.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_25.784_R_1.jpg

Wall ID:	ROMO-0010-25.876-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	July 26, 2007	Approximate Year Built:	Unknown
*Wall Rating:	80	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Gravity mortared culvert headwall		

Wall Measurements

Wall Length (ft.):	7	Face Area (sq.):	30
Average Wall Height (ft.):	4	Face Angle (deg.):	90
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good condition, functioning as intended.	8
WALL FOUNDATION MATERIAL 8.00	Sand and gravel, good condition, vegetation obstructs view, some standing water.	8
MORTAR 8.00	Minor cracking, minor moss cover, functioning as intended.	8
PLACED STONE 8.00	Minor cracking, minor spalling, functioning as intended.	8
LATERAL SLOPE 0.50	About 1.5H:1V slope with minor to moderate erosional features.	8
ROAD/SIDEWALK/SHOULDER 0.50	No cracks observed in road due to new overlay.	9
UPSLOPE 0.50	Active stream channel with sand and gravel, not impacting wall.	9
WALL DRAINS 0.50	None observed, no water-related issues impacting wall.	9
CULVERT 1.00	30" culvert, heavy corrosion.	6

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_25.876_R_1.jpg

Wall ID:	ROMO-0010-26.309-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	July 26, 2007	Approximate Year Built:	Unknown
*Wall Rating:	62	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	Gravity - Mortared Stone
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall with stone masonry guardwall on top		

Wall Measurements

Wall Length (ft.):	115	Face Area (sq.):	2300
Average Wall Height (ft.):	20	Face Angle (deg.):	48
Maximum Wall Height (ft.):	32	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Fair condition, wall performing as intended, guardwall being repaired.	7
WALL FOUNDATION MATERIAL 8.00	No signs of settlement, rotation of guardwall.	6
MORTAR 8.00	Moderate cracks and spalling.	7
PLACED STONE 8.00	Hard durable rock, some loose pieces.	7
STONE MASONRY 8.00	Hard durable rock, under construction.	7
WALL DRAINS 0.50	None observed, no water-related issues impacting wall.	9
TRAFFIC BARRIER/FENCE 5.00	Barrier rotated out, under construction.	1
DOWNSLOPE 1.00	About 40-dgrees, oversteepened soil slope.	6
LATERAL SLOPE 1.00	About 3H:1V at start with no erosion, about 2H:1V at end with minor ravelling.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_26.309_L_1.jpg



ROMO_0010_26.309_L_2.jpg

Wall ID:	ROMO-0010-27.367-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	58	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Bin - Metal
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Metal bin fill wall in poor condition. Recommend monitoring wall frequently to assess likelihood of imminent failure.		

Wall Measurements

Wall Length (ft.):	72	Face Area (sq.):	936
Average Wall Height (ft.):	13	Face Angle (deg.):	79
Maximum Wall Height (ft.):	16	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Poor to Fair, signs of bulging and roadway settlement. Although wall is still performing as intended at this time, strongly recommend frequent monitoring of this wall.	5
WALL FOUNDATION MATERIAL 8.00	Loose colluvium, apparent settlement.	6
BIN OR CRIB 8.00	One segment shows bulging. Minor oxidation evident in several places.	6
DOWNSLOPE 1.00	Visible rills, moderate erosion.	6
LATERAL SLOPE 1.00	1.25:1 slope, ties into loose soil.	6
ROAD/SIDEWALK/SHOULDER 1.00	Half-moon cracks at center of left lane plus or minus 1" vertical displacement.	6
WALL DRAINS 1.00	None present, no water related stress.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_27.367_L_1.jpg

Wall ID:	ROMO-0010-27.524-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	74	Maintenance Action:	No Action

Wall Description

Wall Function:	Slope Protection	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Rough cut, dry laid granite stone slope protection wall. Approximately 1:1 slope.		

Wall Measurements

Wall Length (ft.):	27	Face Area (sq.):	305
Average Wall Height (ft.):	11	Face Angle (deg.):	45
Maximum Wall Height (ft.):	18	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good performing wall, minor bulging, but may have been constructed that way. No global distress evident.	8
WALL FOUNDATION MATERIAL 8.00	Rock fill w/minor vegetation. No signs of sloughing or deformation. Minor erosion.	7
PLACED STONE 8.00	Weathered granite blocks showing rounding, but intact and sufficiently durable. No missing blocks.	7
DOWNSLOPE 0.50	Stable granular fill and rock embankment.	8
VEGETATION 0.50	Minor ground cover. No impact to the wall.	8
WALL DRAINS 0.50	None visible. No signs of water-related distress.	8
ROAD/SIDEWALK/SHOULDER 0.50	No cracking, settlement or patching. Excellent condition.	9
LATERAL SLOPE 1.00	Minor granular fill erosion. No impacts to wall.	7
TRAFFIC BARRIER/FENCE 1.00	Entire guardwall shows some minor outward rotation along the road. The mortared stone masonry guardwall shows no signs of wall-related distress. Blocks and mortar intact, strong, no cracking.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_27.524_L_1.jpg



ROMO_0010_27.524_L_2.jpg

Wall ID:	ROMO-0010-27.822-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	84	Maintenance Action:	Maintenance

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone masonry headwall.		

Wall Measurements

Wall Length (ft.):	20	Face Area (sq.):	90
Average Wall Height (ft.):	4	Face Angle (deg.):	85
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	-20

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	No signs of global distress. Minor vegetation to be removed.	9
WALL FOUNDATION MATERIAL 8.00	No signs of settlement or scour at inlet. Rockfill.	9
MORTAR 8.00	Sound durable mortar with minor cracking in top course at crown.	7
STONE MASONRY 8.00	Hard, durable, intact granite with minor weathering. No missing blocks.	9
VEGETATION 1.00	One small pine tree will impact headwall if not removed.	4
WALL DRAINS 0.50	No wall drains. No signs of seepage or water related distress.	8
CULVERT 0.50	Functioning as intended. No distress.	9
DOWNSLOPE 0.50	Stable drainage channel.	9
LATERAL SLOPE 0.50	Well vegetated, rockfill, drains from roadway. No signs of distress.	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Remove small tree from top of wall: 1 hour of labor @ \$55.00 per hour = \$55.00.
Repair Cost:	\$55

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_27.822_L_1.jpg

Wall ID:	ROMO-0010-27.865-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 13, 2007	Approximate Year Built:	Unknown
*Wall Rating:	89	Maintenance Action:	No Action

Wall Description

Wall Function:	Slope Protection	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Rough masoned rock inlay wall, approximately 1:1 slope.		

Wall Measurements

Wall Length (ft.):	120	Face Area (sq.):	1500
Average Wall Height (ft.):	12	Face Angle (deg.):	45
Maximum Wall Height (ft.):	18	Vertical Offset (ft.):	-15

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	No signs of global distress. Well built and functioning as intended.	9
WALL FOUNDATION MATERIAL 8.00	No evidence of erosion or settlement.	9
STONE MASONRY 8.00	Rough cut / split stone. Hard, durable, very little weathering, no missing blocks. Well built, angular blocks.	9
CULVERT 0.50	Small diameter CMP at base of wall. Functioning as intended. Significant channel downcutting, not impacting wall.	8
DOWNSLOPE 0.50	Steep side slope (1.5:1), sparsely vegetated, large trees. Very stable with minor surficial erosion.	8
LATERAL SLOPE 0.50	Stable, steep lateral slopes with minor erosion.	8
UPSLOPE 0.50	Steep (1.5:1 to 1:1) slope with minor erosion. Sparsely vegetated with few trees.	8
WALL DRAINS 0.50	No visible drains. Does not appear to have any drainage issues. No seepage observed.	8
ROAD/SIDEWALK/SHOULDER 0.50	No evidence of wall related distress.	9

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_27.865_L_1.jpg

Wall ID:	ROMO-0010-28.161-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	81	Maintenance Action:	Maintenance

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Large block mortared stone masonry wall.		

Wall Measurements

Wall Length (ft.):	82	Face Area (sq.):	410
Average Wall Height (ft.):	5	Face Angle (deg.):	85
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	No signs of global distress, but may have top course impacted by small trees.	8
WALL FOUNDATION MATERIAL 8.00	Stable fill. No signs of settlement or displacement.	9
MORTAR 8.00	Good	8
STONE MASONRY 8.00	Generally strong, durable and intact. Minor cracking in some top blocks.	8
PLACED STONE 8.00	Hard, unfractured, unweathered granite. No missing blocks.	9
VEGETATION 1.00	Small trees growing along top of wall will soon become heavy on top blocks.	4
ROAD/SIDEWALK/SHOULDER 0.50	No roadway distress of any kind.	9
UPSLOPE 1.00	Highly eroded colluvial slope with minor vegetation and small trees just above wall.	5
LATERAL SLOPE 1.00	Eroding downstation slope is encroaching on wall start. No distress to wall.	6

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Remove small trees from within 5 feet of top of wall: 4 hours labor @ \$55.00 per hour = \$220.00
Repair Cost:	\$220

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_28.161_R_1.jpg

Wall ID:	ROMO-0010-28.284-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	81	Maintenance Action:	Maintenance

Wall Description

Wall Function:	Slope Protection	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Long, tall 1:1 slope dry laid, large block slope protection wall. Well constructed.		

Wall Measurements

Wall Length (ft.):	180	Face Area (sq.):	7200
Average Wall Height (ft.):	40	Face Angle (deg.):	50
Maximum Wall Height (ft.):	45	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	No signs of global instability, missing elements or localized wall deformation. Very good construction.	8
WALL FOUNDATION MATERIAL 8.00	Rock fill showing no signs of settlement or lost material.	9
PLACED STONE 8.00	Strong durable, intact stones showing only minor weathering.	8
CULVERT 0.50	24" opening culvert on inbound side is not obvious on outlet. Located at downstation end of wall - functioning as intended.	8
DOWNSLOPE 0.50	Stable drainage slope showing no slumping or significant erosion below wall.	8
WALL DRAINS 0.50	No drains evident. No signs of significant seepage or water staining. No obvious drain locations in wall face.	8
VEGETATION 0.50	No vegetation impacts.	9
ROAD/SIDEWALK/SHOULDER 1.00	Settlement cracking immediately behind guardwall on upper third of wall. Water inlet location.	5
LATERAL SLOPE 1.00	Minor slope erosion at both ends of wall. No impact to wall performance.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Seal approximately 75' of settlement cracks along guard wall: Crack seal - 75' @ \$5/ft = \$375.00. Cold patch - \$100.00. Labor - 6 hrs @ \$55.00 hr = \$330.00. Total = \$805.00
Repair Cost:	\$805

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

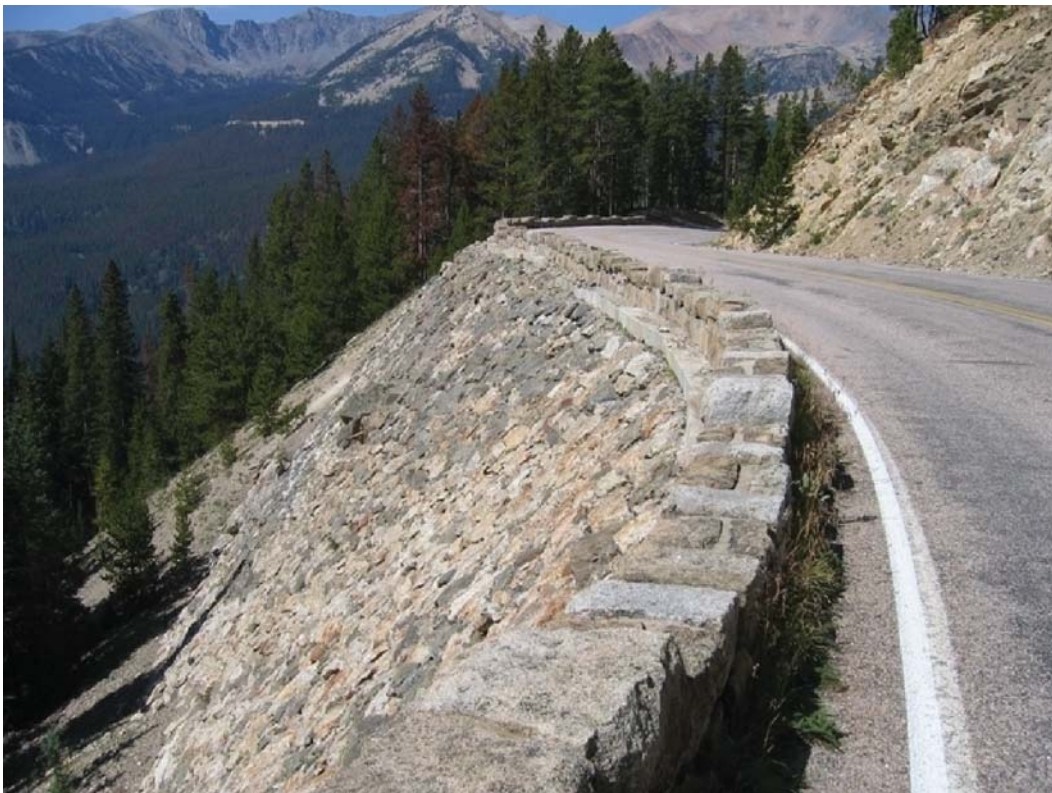
Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_28.284_L_1.jpg



ROMO_0010_28.284_L_2.jpg

Wall ID:	ROMO-0010-28.555-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	87	Maintenance Action:	Maintenance

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Long, large block mortared stone masonry wall.		

Wall Measurements

Wall Length (ft.):	386	Face Area (sq.):	1750
Average Wall Height (ft.):	4	Face Angle (deg.):	85
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Wall shows no signs of global instability. Well-built and functioning as constructed.	9
WALL FOUNDATION MATERIAL 8.00	No signs of settlement or ditch line erosional distress.	9
MORTAR 8.00	Generally intact, durable, unweathered. Top course shows occasional cracking.	8
STONE MASONRY 8.00	Hard durable, strong granite with very little cracking or weathering.	9
ROAD/SIDEWALK/SHOULDER 0.50	No signs of roadway or ditch line (paved ditch) distress.	8
CULVERT 0.50	Inlet culvert at toe of wall, not impacting wall performance.	9
LATERAL SLOPE 0.50	Stable side slopes. No signs of erosion or distress.	9
UPSLOPE 0.50	Gentle, well vegetated stable slope. No signs of slumping or erosion.	9
VEGETATION 1.00	Small trees along top of wall are not impacting wall yet, but will in the future.	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	Remove small trees within 5' of wall face and locate and clear wall drains. Labor approximately 16 hours @ \$55.00 per hour = \$880.00.
Repair Cost:	\$880

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_28.555_R_1.jpg

Wall ID:	ROMO-0010-28.770-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	88	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone masonry headwall. 5.5 ft x5 ft opening.		

Wall Measurements

Wall Length (ft.):	20	Face Area (sq.):	100
Average Wall Height (ft.):	5	Face Angle (deg.):	90
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	-10

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Well built headwall showing no signs of global distress. Functioning as intended.	9
WALL FOUNDATION MATERIAL 8.00	No signs of settlement or scour at culvert inlet.	8
MORTAR 8.00	Sound, durable w/no shrinking or cracking evident.	9
STONE MASONRY 8.00	Sound, durable hard, intact blocks. No missing elements.	9
UPSLOPE 0.50	Well vegetated 1.5:1 slope with no signs of distress.	8
WALL DRAINS 0.50	No drains evident. No signs of drainage distress.	8
DOWNSLOPE 0.50	Drainage inlet. No scour, stable channel and slope.	9
LATERAL SLOPE 0.50	Well vegetated stable slopes. No signs of distress. Fill rock placed on downstation drainage.	9
ROAD/SIDEWALK/SHOULDER 0.50	No signs of wall related distress.	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_28.770_R_1.jpg

Wall ID:	ROMO-0010-28.771-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	53	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone masonry outlet headwall with a 5.5 ft x5 ft opening.		

Wall Measurements

Wall Length (ft.):	20	Face Area (sq.):	100
Average Wall Height (ft.):	5	Face Angle (deg.):	85
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	-20

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Headwall is 1 disrepair with missing blocks and mortar.	4
WALL FOUNDATION MATERIAL 8.00	No signs of settlement or scour.	8
MORTAR 8.00	Missing, cracked, weathered mortar. No mortar behind lower bricks on left side.	4
STONE MASONRY 8.00	Hard, durable stone, though several are missing.	4
CULVERT 0.50	Culvert is functioning as intended. No distress other than headwall.	8
LATERAL SLOPE 0.50	Sparsely vegetated. No wall related distress.	8
DOWNSLOPE 0.50	Stable, rockfill creek channel.	9
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress.	9
UPSLOPE 0.50	Sparsely vegetated slope. No signs of distress.	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Replace missing stones, repoint masonry, remove tree: Replace 5 sq.ft. of missing stones @ \$620 sq.ft. = \$3100.00. Repoint entire 100 sq.ft. wall area @ \$75 sq.ft. = \$7500.00. Remove tree @ 1 hour labor @ \$55 per hr. = \$55.00. Misc. labor support 16 hours
Repair Cost:	\$11,530

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_28.771_L_1.jpg

Wall ID:	ROMO-0010-28.913-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	64	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	Gravity - Gabion
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone masonry wall overlain by 5-tier gabion wall, overlain by 3-tier metal bin wall. Stone masonry wall is currently being repaired at MilePoint 28.948. Only the GM and GG walls included in this inventory measurements. CM wall is nonfunctional.		

Wall Measurements

Wall Length (ft.):	935	Face Area (sq.):	7524
Average Wall Height (ft.):	8	Face Angle (deg.):	85
Maximum Wall Height (ft.):	19	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	GM wall is in need of localized repair. GG wall is functioning as intended. GM wall is failing, but not impacting the road yet. Upper slope has global issues, but not with GG or GM walls.	6
WALL FOUNDATION MATERIAL 8.00	No signs of settlement or erosion distress.	8
MORTAR 8.00	Localized cracking and shrinkage. Generally intact and strong. Failing at MP 28.948 and MP 28.986 due to water issues.	5
PLACED STONE 8.00	Missing few stones. Recommend replacing missing blocks on left side of wall.	5
STONE MASONRY 8.00	Hard, durable, intact granite. Failed blocks (under repair) at MP 28.948. Bulging, failing section at MP 28.986 needs repair.	5
WIRE/GEOSYNTHETIC FACING 8.00	Gabion baskets show minor bulging. Overall functioning as intended. No broken or corroded elements.	7
CULVERT 0.50	Mortared stone inlet mid-wall. In good shape. No distress.	8
LATERAL SLOPE 0.50	Well vegetated, stable lateral slopes.	8
ROAD/SIDEWALK/SHOULDER 0.50	Very minor inbound lane distress. Unclear if wet area at MP 28.986 has been patched.	8

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Remove small trees along top of wall; repair/repoint bulgins wall section and investigate global slope stability of tiered wall section. Remove small trees within 5' of wall face along entire wall length: 16 hours Labor @ \$55/hr = \$880.00.
Repair Cost:	\$59,780

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_28.913_L_1.jpg



ROMO_0010_28.913_L_10.jpg

Wall ID:	ROMO-0010-29.410-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	86	Maintenance Action:	Maintenance

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone masonry head wall, inlet side. 5 ft x5 ft opening.		

Wall Measurements

Wall Length (ft.):	26	Face Area (sq.):	145
Average Wall Height (ft.):	5	Face Angle (deg.):	90
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	-15

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	No global stability issues. Wall is performing very well. Needs small tree removal.	9
WALL FOUNDATION MATERIAL 8.00	Stable rock fill. No signs of settlement or scour.	9
MORTAR 8.00	Intact with little or no shrinkage or cracking. Sound and durable.	8
STONE MASONRY 8.00	Hard, durable, unweathered granite showing no cracking or spalling. No missing blocks.	9
CULVERT 0.50	Functioning as intended. NO significant distress.	8
DOWNSLOPE 0.50	Stable drainage channel.	8
LATERAL SLOPE 0.50	Well vegetated stable surface drainage paths. No distress.	8
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress evident.	8
UPSLOPE 0.50	Well vegetated 1.5:1 stable fill slope.	8

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Remove small trees from top of headwall: 2 hours labor @ \$55 per hour = \$110.00
Repair Cost:	\$110

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_29.410_R_1.jpg

Wall ID:	ROMO-0010-29.602-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 13, 2007	Approximate Year Built:	Unknown
*Wall Rating:	84	Maintenance Action:	No Action

Wall Description

Wall Function:	Switchback Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	Gravity - Dry Stone
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Rock inlay slope protection wall (2-tiered) overlaying a 6 ft tall mortared stone masonry wall at the toe of the slope. Wall system is within a switchback.		

Wall Measurements

Wall Length (ft.):	190	Face Area (sq.):	13200
Average Wall Height (ft.):	69	Face Angle (deg.):	50
Maximum Wall Height (ft.):	80	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	GM wall / GD wall show no signs of global instability. Well constructed walls. Minor bulging in lower tier slope protection, but may have been constructed.	8
WALL FOUNDATION MATERIAL 8.00	Wall is founded at lower road. No signs of settlement.	10
MORTAR 8.00	Mortar is in good condition, no cracking, no voids.	8
STONE MASONRY 8.00	Rough cut split stone is hard, durable, sandstone with minor weathering. No missing blocks/sections. Well built wall.	8
LATERAL SLOPE 0.50	Bedrock or well vegetated steep slope. Stable with no signs of erosion.	8
VEGETATION 0.50	Large trees growing out of bench. No impact to wall.	8
WALL DRAINS 0.50	No wall drains evident. No water drainage issues noted on the slope.	8
DOWNSLOPE 0.50	Roadway below wall shows no wall-related distress.	9
ROAD/SIDEWALK/SHOULDER 1.00	Recently patched section of outbound lane at top of wall. Possible wall/roadway fill settlement. No wall distress below patch.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_29.602_L_1.jpg



ROMO_0010_29.602_L_2.jpg

Wall ID:	ROMO-0010-29.634-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	85	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	Gravity - Dry Stone
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone masonry cut wall, overlain by roughly placed, dry laid wall, for slope protection.		

Wall Measurements

Wall Length (ft.):	22	Face Area (sq.):	500
Average Wall Height (ft.):	22	Face Angle (deg.):	85
Maximum Wall Height (ft.):	30	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	No signs of global distress. GM and GD walls are performing as constructed.	9
WALL FOUNDATION MATERIAL 8.00	No signs of settlement. Likely on bedrock.	10
MORTAR 8.00	Minor cracking and shrinkage, minor missing pieces. Still functioning okay. Most of the wall is intact and durable.	7
STONE MASONRY 8.00	Hard, fresh, strong granite with no missing pieces. Overlaying masoned stones poorly placed. Angular set holding in place.	8
UPSLOPE 0.50	Steeply dipping bedrock framing wall and slope protection. Stable and intact.	8
WALL DRAINS 0.50	One wall drain is open and appears functional. No signs of seepage.	8
ROAD/SIDEWALK/SHOULDER 0.50	No signs of wall related distress.	9
LATERAL SLOPE 0.50	Bedrock, very stable.	10
VEGETATION 0.50	No vegetation impacts to the wall	10

Repair Recommendations

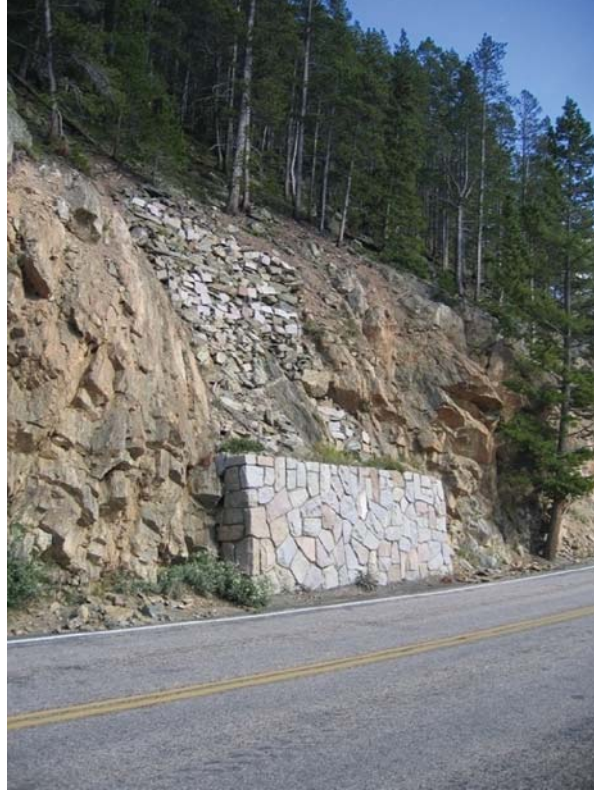
Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_29.634_R_1.jpg

Wall ID:	ROMO-0010-29.655-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	71	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	Gravity - Dry Stone
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone masonry cutwall overlain by roughly placed dry laid stones for slope protection.		

Wall Measurements

Wall Length (ft.):	25	Face Area (sq.):	625
Average Wall Height (ft.):	25	Face Angle (deg.):	85
Maximum Wall Height (ft.):	38	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Missing blocks, cracked mortar, no global issues in the GM wall. Slope protection is unstable near top of wall.	6
WALL FOUNDATION MATERIAL 8.00	No signs of distress. Likely bedrock.	10
MORTAR 8.00	Cracking and shrinking and missing mortar along top course. Missing black and mortar in upper left corner.	6
STONE MASONRY 8.00	Hard, fresh, strong, durable granite. 1-2 missing blocks. Overlaying placed rock is poorly stacked and appears to be a rock fall hazard.	6
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress.	9
LATERAL SLOPE 0.50	Bedrock. Very stable.	10
UPSLOPE 1.00	Steep colluvial fill between bedrock. Poorly supported by slope protection. Appears to be eroding.	5
VEGETATION 0.50	No vegetation impacts.	10
WALL DRAINS 1.00	One drain mid-wall is partially covered. No drainage issues evident.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Repair mortared stone masonry wall and stabilize topslope: Replace 3 sq.ft. of blocks and mortar-in-place @ \$620 sq.ft. = \$1860.00. Repoint 10 sq.ft. of the top course @ \$75 sq. ft. = \$750.00. Misc. Labor: 6 hours @ \$55.00 hr. = \$330.00. Scale upper slope
Repair Cost:	\$15,540

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

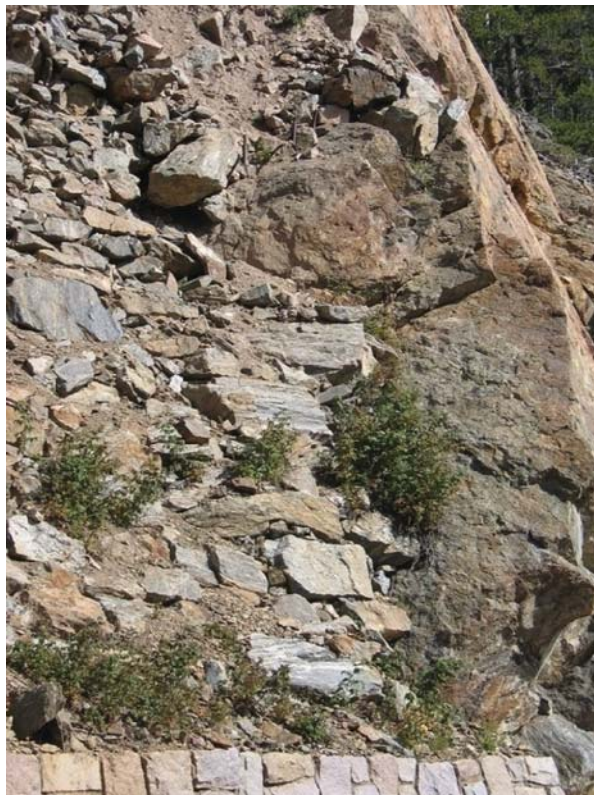
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ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_29.655_R_1.jpg



ROMO_0010_29.655_R_2.jpg

Wall ID:	ROMO-0010-29.663-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	82	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	Gravity - Dry Stone
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone masonry cutwall overlain by roughly placed, dry laid stone, for slope protection.		

Wall Measurements

Wall Length (ft.):	19	Face Area (sq.):	550
Average Wall Height (ft.):	28	Face Angle (deg.):	85
Maximum Wall Height (ft.):	28	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	The GM wall is performing as constructed with no global distress evident. The GD wall is precariously placed.	7
WALL FOUNDATION MATERIAL 8.00	No signs of settlement. Likely on bedrock.	10
MORTAR 8.00	Minor cracking and spalling in upper-course, otherwise durable.	7
PLACED STONE 8.00	Poorly placed, hard durable granite boulders.	7
STONE MASONRY 8.00	Hard, fresh durable granite.	10
LATERAL SLOPE 0.50	Stable bedrock.	9
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress.	9
WALL DRAINS 0.50	One drain appears open and functioning. No water related distress evident.	9
UPSLOPE 1.00	Raveling rock cut. Very unstable.	5

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_29.663_R_1.jpg



ROMO_0010_29.663_R_2.jpg

Wall ID:	ROMO-0010-29.683-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	69	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Very large dry stack rockery fill wall with a guardwall parapet, at a switchback. In good condition. Small CMP culvert at base of wall, outlet side. Large variation in wall height.		

Wall Measurements

Wall Length (ft.):	230	Face Area (sq.):	4300
Average Wall Height (ft.):	18	Face Angle (deg.):	47
Maximum Wall Height (ft.):	44	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Soil/rock mix, no signs of settlement.	7
PLACED STONE 8.00	Moderately weathered schist and gneiss stones, well placed.	7
LATERAL SLOPE 1.00	Ties into rock fragments and into shallow bedrock at wall start. Ties into loose soil, rock fill at wall end, but no signs of distress.	5
DOWNSLOPE 1.00	Gentle slope, soil / rock mix, no signs of erosion.	7
WALL DRAINS 1.00	None present, no water related stress.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_29.683_L_1.jpg



ROMO_0010_29.683_L_2.jpg

Wall ID:	ROMO-0010-30.479-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	60	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stack rockery wall at a switchback, in good condition. Wall shows signs of distress, but a work order is already underway for this wall.		

Wall Measurements

Wall Length (ft.):	123	Face Area (sq.):	2500
Average Wall Height (ft.):	20	Face Angle (deg.):	47
Maximum Wall Height (ft.):	28	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Fair, some distress to the wall is evident.	6
WALL FOUNDATION MATERIAL 8.00	Loose soil and rock mix, signs of moderate settlement.	5
PLACED STONE 8.00	Moderately weathered schist and gneiss stones.	7
ROAD/SIDEWALK/SHOULDER 1.00	Recent patches to the roadway, assume distress caused by wall settlement.	4
LATERAL SLOPE 1.00	Ties into loose soil/rock mix, no signs of erosion.	6
DOWNSLOPE 1.00	2:1 slope, well vegetated, no signs of erosion.	7
WALL DRAINS 1.00	None present, no water related stress.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_30.479_L_1.jpg



ROMO_0010_30.479_L_2.jpg

Wall ID:	ROMO-0010-30.582-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	61	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stack rockery fill wall, recently grouted, some mortar placed recently.		

Wall Measurements

Wall Length (ft.):	162	Face Area (sq.):	4000
Average Wall Height (ft.):	24	Face Angle (deg.):	47
Maximum Wall Height (ft.):	40	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Fair, recently grouted.	6
WALL FOUNDATION MATERIAL 8.00	Loose to moderately compacted soil/rock mix, moderate settlement.	5
PLACED STONE 8.00	Moderately weathered schist and gneiss stones, some loose pieces, recently grouted.	7
LATERAL SLOPE 0.50	Ties into bedrock at wall start and wall end.	8
ROAD/SIDEWALK/SHOULDER 1.00	Under construction, previously showed settlement and distress in outside lane.	5
DOWNSLOPE 1.00	Loose soil/rock mix, no signs of erosion.	7
WALL DRAINS 1.00	None present, no water related stress.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_30.582_L_1.jpg



ROMO_0010_30.582_L_2.jpg

Wall ID:	ROMO-0010-30.760-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	70	Maintenance Action:	Maintenance

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stack stone wall below rock guardwall parapet.		

Wall Measurements

Wall Length (ft.):	95	Face Area (sq.):	750
Average Wall Height (ft.):	7	Face Angle (deg.):	47
Maximum Wall Height (ft.):	18	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Soil and rock mix, no settlement.	7
PLACED STONE 8.00	Moderately weathered gneiss and schist stones with some voids.	7
DOWNSLOPE 1.00	Loose talus, minor erosion.	7
LATERAL SLOPE 1.00	Ties into loose soil, then into bedrock at wall end.	7
TRAFFIC BARRIER/FENCE 1.00	4'-5' length of undermining of guardwall footing, but not affecting wall performance.	7
WALL DRAINS 1.00	None present, no water related stress.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Place concrete below guardwall footing as localized patch: 8 hours labor @ \$55.00 per hour = \$440.00. 1 cubic yard of concrete = \$100.00. Total = \$540.00
Repair Cost:	\$540

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_30.760_R_1.jpg



ROMO_0010_30.760_R_2.jpg

Wall ID:	ROMO-0010-30.885-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	76	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked rockery wall in good condition.		

Wall Measurements

Wall Length (ft.):	81	Face Area (sq.):	1215
Average Wall Height (ft.):	15	Face Angle (deg.):	46
Maximum Wall Height (ft.):	25	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	8
WALL FOUNDATION MATERIAL 8.00	On loose rock, shallow bedrock, no signs of settlement.	7
PLACED STONE 8.00	Moderately weathered, well placed stones.	8
DOWNSLOPE 1.00	2:1 slope, loose talus, minor erosion.	7
LATERAL SLOPE 1.00	1.5:2 slope, loose talus, sparse vegetation.	7
WALL DRAINS 1.00	None present, no water related stress.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_30.885_R_1.jpg

Wall ID:	ROMO-0010-31.480-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	68	Maintenance Action:	Maintenance

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Arched mortared stone head wall, with wing walls, in good condition, outlet side.		

Wall Measurements

Wall Length (ft.):	37	Face Area (sq.):	150
Average Wall Height (ft.):	4	Face Angle (deg.):	90
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Overall good, but some maintenance work is needed.	7
WALL FOUNDATION MATERIAL 8.00	Stable streambed, no settlement.	7
MORTAR 8.00	Fair condition, several gaps, needs remortaring in the areas of cracking and spalling.	5
STONE MASONRY 8.00	Good hard durable granite and gneiss stones, slightly weathered.	8
LATERAL SLOPE 0.50	2:1 slope, well vegetated, no erosion.	8
CULVERT 1.00	Top of stone opening has some spalling.	5
WALL DRAINS 1.00	None present, no water related stress.	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	Repair mortar on several stones some of which are near the top of the culvert opening: 4 hours of labor @ \$55.00 per hour = \$220.00. Mortar = \$50.00. Total = \$270.00
Repair Cost:	\$270

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_31.480_L_1.jpg

Wall ID:	ROMO-0010-31.480-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	72	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Arched mortared stone head wall, in good condition, inlet side.		

Wall Measurements

Wall Length (ft.):	36	Face Area (sq.):	138
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall, functioning well as intended.	8
WALL FOUNDATION MATERIAL 8.00	Stable streambed, no settlement.	7
MORTAR 8.00	Good with only minor spalling and cracking.	7
STONE MASONRY 8.00	Good hard durable granite and gneiss stones, moderately weathered.	7
LATERAL SLOPE 1.00	2:1 slope, moderately vegetated, no erosion.	7
WALL DRAINS 1.00	None present, no water related stress.	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_31.480_R_1.jpg

Wall ID:	ROMO-0010-32.284-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	80	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone headwall with wingwalls, outlet side of Beaver Creek, in good condition.		

Wall Measurements

Wall Length (ft.):	36	Face Area (sq.):	131
Average Wall Height (ft.):	3	Face Angle (deg.):	86
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	8
WALL FOUNDATION MATERIAL 8.00	Stable streambed, no signs of settlement.	7
STONE MASONRY 8.00	Good hard durable granite, slightly weathered.	8
MORTAR 8.00	Good, no cracking.	9
LATERAL SLOPE 0.50	Gentle slope, well vegetated, no signs of erosion.	8
WALL DRAINS 1.00	None present, no water related stress.	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_32.284_L_1.jpg

Wall ID:	ROMO-0010-32.284-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	79	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone headwall with 60 in CMP culvert, inlet side of Beaver Creek. Good condition.		

Wall Measurements

Wall Length (ft.):	36	Face Area (sq.):	170
Average Wall Height (ft.):	4	Face Angle (deg.):	85
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	8
WALL FOUNDATION MATERIAL 8.00	Footing exposed due to moderate scouring, but no signs of settlement.	7
STONE MASONRY 8.00	Good hard durable granite, slightly weathered.	8
MORTAR 8.00	Good condition, no cracking.	9
LATERAL SLOPE 0.50	Gentle, grassy slope, no erosion, some riprap at wall start and wall end.	8
CULVERT 1.00	60" CMP with minor corrosion, but no affect on wall performance.	7
WALL DRAINS 1.00	None present, no water related stress.	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_32.284_R_1.jpg



ROMO_0010_32.284_R_2.jpg

Wall ID:	ROMO-0010-33.386-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	77	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Arched mortared stone head wall on outlet side of Timber Creek. Some rotation at one wall end.		

Wall Measurements

Wall Length (ft.):	45	Face Area (sq.):	400
Average Wall Height (ft.):	8	Face Angle (deg.):	89
Maximum Wall Height (ft.):	16	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Wall end needs mortar repair due to wall rotation.	7
WALL FOUNDATION MATERIAL 8.00	Founded on stable stream bed, no signs of settlement.	8
MORTAR 8.00	Good, very minor cracking.	8
STONE MASONRY 8.00	Good hard durable granite, slightly weathered.	8
LATERAL SLOPE 1.00	Slope ties into drainage area. 2:1 slope, moderate vegetation.	7
WALL DRAINS 1.00	None present, no water related stress.	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	Repair wall end where rotation has occurred: 8 hours labor @ \$55.00 per hr = \$440.00. 3 hours backhoe @ \$100.00 per hr = \$300.00. Mortar @ \$100.00. Total = \$840.00
Repair Cost:	\$840

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_33.386_L_1.jpg



ROMO_0010_33.386_L_2.jpg

Wall ID:	ROMO-0010-33.386-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 13, 2007	Approximate Year Built:	Unknown
*Wall Rating:	77	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Arched mortared stone head wall with wing walls, inlet side of Timber Creek.		

Wall Measurements

Wall Length (ft.):	34	Face Area (sq.):	200
Average Wall Height (ft.):	5	Face Angle (deg.):	87
Maximum Wall Height (ft.):	12	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good performing head wall.	8
WALL FOUNDATION MATERIAL 8.00	Stable creek bed, no signs of settling.	8
MORTAR 8.00	Good condition, a few small gaps; some recent repairs were made.	7
STONE MASONRY 8.00	Good hard durable granite, slightly weathered.	8
LATERAL SLOPE 0.50	Stable vegetated slope, no erosion.	8
CULVERT 1.00	72" CMP, moderate corrosion at pipe bottom, but not affecting wall.	7
WALL DRAINS 1.00	None present, no water related stress.	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_33.386_R_1.jpg

Wall ID:	ROMO-0010-34.570-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	79	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone cut wall in good condition.		

Wall Measurements

Wall Length (ft.):	177	Face Area (sq.):	796
Average Wall Height (ft.):	4	Face Angle (deg.):	77
Maximum Wall Height (ft.):	5	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Excellent, performing as intended.	8
WALL FOUNDATION MATERIAL 8.00	Compacted soils, no signs of settlement.	8
MORTAR 8.00	Good condition.	8
STONE MASONRY 8.00	Good hard durable granite.	8
WALL DRAINS 0.50	Several weep holes, appearing to drain well, no distress.	8
LATERAL SLOPE 1.00	1.5:1 slope, minor erosion. Not affecting wall.	7
UPSLOPE 1.00	Average 1.5:1 slope. Some sloughing, heavily vegetated with trees.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_34.570_L_1.jpg

Wall ID:	ROMO-0010-36.223-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	75	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone cut wall in good condition.		

Wall Measurements

Wall Length (ft.):	131	Face Area (sq.):	390
Average Wall Height (ft.):	2	Face Angle (deg.):	83
Maximum Wall Height (ft.):	4	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Stable soil, no signs of settlement.	8
MORTAR 8.00	Patching in some areas, some areas have eroded.	7
STONE MASONRY 8.00	Good hard durable granite, slightly weathered.	8
WALL DRAINS 0.50	Two 2" weep holes, no related stress.	8
LATERAL SLOPE 1.00	Gentle slope on north side, steeper on south side, but stable vegetated soil.	7
UPSLOPE 1.00	Overall slope is 1.75:1. Heavily vegetated with trees, minor erosion.	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_36.223_L_1.jpg



ROMO_0010_36.223_L_2.jpg

Wall ID:	ROMO-0010-38.117-L		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	73	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone head wall on inlet side of Onahu creek.		

Wall Measurements

Wall Length (ft.):	45	Face Area (sq.):	250
Average Wall Height (ft.):	5	Face Angle (deg.):	88
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Founded on bottom of stream bed, no signs of settlement.	8
MORTAR 8.00	A few 3/8" cracks, minor spalling, some recent repairs.	6
STONE MASONRY 8.00	Hard durable granite, slightly weathered.	8
LATERAL SLOPE 0.50	Gentle slope at both ends, grass, trees, willows. Well vegetated, no erosion.	8
WALL DRAINS 1.00	None present, not water related stress.	7

Repair Recommendations

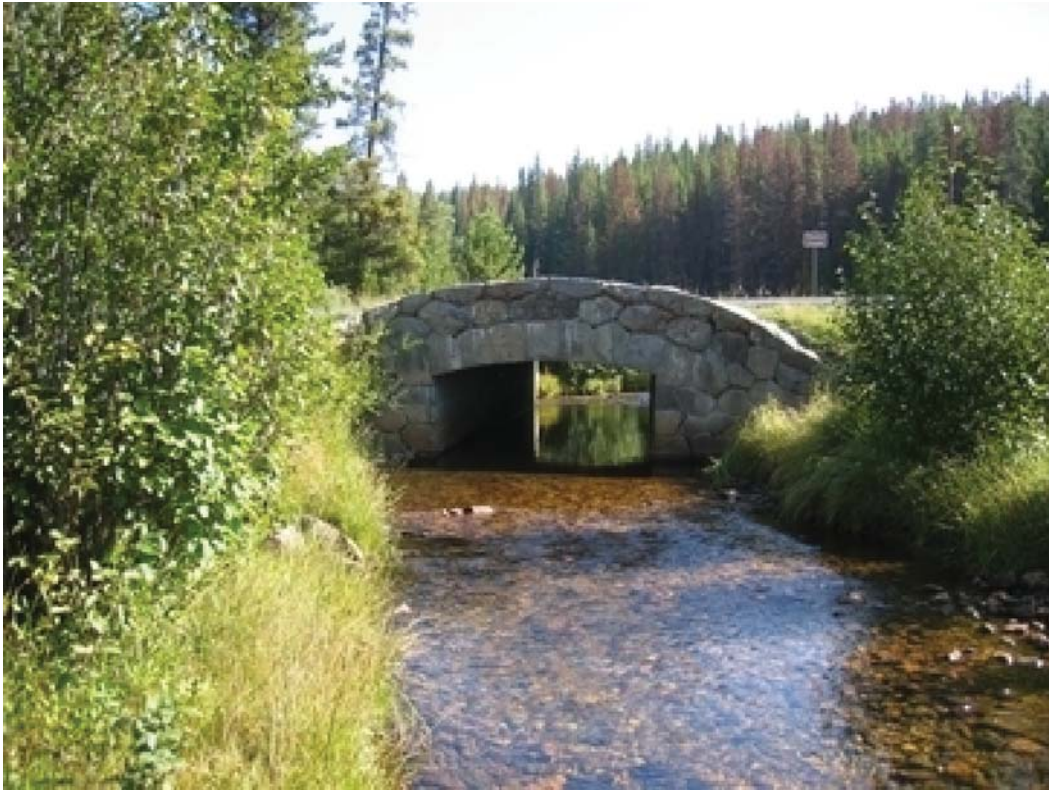
Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_38.117_L_1.jpg

Wall ID:	ROMO-0010-38.117-R		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	56	Maintenance Action:	Maintenance

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone head wall outlet side of Onahu Creek.		

Wall Measurements

Wall Length (ft.):	32	Face Area (sq.):	139
Average Wall Height (ft.):	4	Face Angle (deg.):	88
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Fair, needs some maintenance.	6
WALL FOUNDATION MATERIAL 8.00	Evidence of settlement.	5
MORTAR 8.00	Many gaps, some 3.5" wide.	3
STONE MASONRY 8.00	Good hard durable granite, slightly weathered.	8
WALL DRAINS 0.50	None present, not water related stress.	8
LATERAL SLOPE 1.00	Gentle slope, stable soil, well vegetated, minor erosion.	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	Repair mortar missing at several locations: Replace mortar = \$100.00. Labor 5 hours @ \$55.00 per hour = \$275.00. Total = \$375.00
Repair Cost:	\$375

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Retaining Wall Condition Photos



ROMO_0010_38.117_R_1.jpg

Wall ID:	ROMO-0012-0.577-L		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	July 25, 2007	Approximate Year Built:	Unknown
*Wall Rating:	87	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	Gravity - Dry Stone
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Headwall and drop inlet (18 in CMP and 18 in drop inlet height)		

Wall Measurements

Wall Length (ft.):	7	Face Area (sq.):	40
Average Wall Height (ft.):	5	Face Angle (deg.):	90
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	-4

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good performance with a minor void in the dry stack (2nd wall) and minor lateral surface erosion. Functioning as intended.	9
WALL FOUNDATION MATERIAL 8.00	Good sand and gravel material. No sign of settlement.	9
PLACED STONE 8.00	No signs of distress on 2nd wall, minor void not impacting wall performance.	8
MORTAR 8.00	Minor cracking and good performance.	9
STONE MASONRY 8.00	Granite stone. No cracks and performing as intended	9
LATERAL SLOPE 0.50	Minor surface erosion.	8
ROAD/SIDEWALK/SHOULDER 0.50	Roadway has minor transverse cracking. Shoulder has minor transverse cracking and 50 degree slope with vegetation.	8
CULVERT 0.50	18 inch CMP culvert. Open, functioning and good condition.	9
DOWNSLOPE 0.50	Relatively flat slope with no sign of erosion.	9

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE ROAD

Retaining Wall Condition Photos



ROMO_0012_0.577_L_1.jpg



ROMO_0012_0.577_L_2.jpg

Wall ID:	ROMO-0012-3.625-L		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	July 24, 2007	Approximate Year Built:	Unknown
*Wall Rating:	81	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Cantilever - Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	Stone Veneer
General Description:	Upstream wingwall. 10 ft x 8 ft box culvert with granite mortar facing.		

Wall Measurements

Wall Length (ft.):	30	Face Area (sq.):	100
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	-6

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good condition and performing as intended.	9
WALL FOUNDATION MATERIAL 8.00	No sign of settlement or distress. Alluvium stream channel bed.	8
CONCRETE 8.00	No sign of distress	8
CULVERT 0.50	10 ft x 8 ft concrete box culvert with continuous water flow. Minor oxidation and patching. Culvert is performing as intended.	8
ARCHITECTURAL FACING 0.50	Minor cracking (less than 1/8 inch) and minor spalling (less than 1/4"). Minor oxidation, no erosion, or cracking in granite stone.	9
UPSLOPE 0.50	1V:2H slope with minor vegetation and one tree. No sign of distress.	9
WALL DRAINS 0.50	None observed.	9
LATERAL SLOPE 1.00	Minor surface erosion and not impacting the structure.	7
ROAD/SIDEWALK/SHOULDER 1.00	Roadway has minor transverse cracking above culvert and reflected in roadway. Shoulder has minor surface erosion.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE ROAD

Retaining Wall Condition Photos



ROMO_0012_3.625_L_1.jpg

Wall ID:	ROMO-0012-3.625-R		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	July 24, 2007	Approximate Year Built:	Unknown
*Wall Rating:	81	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Cantilever - Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	Stone Veneer
General Description:	Downstream wingwall/Headwall with granite mortar facing 10 ft X 8 ft Box culvert.		

Wall Measurements

Wall Length (ft.):	30	Face Area (sq.):	100
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	-8

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good condition and performing as intended.	9
WALL FOUNDATION MATERIAL 8.00	No sign of settlement or distress. Alluvium stream channel bed.	8
CONCRETE 8.00	No distress observed.	8
CULVERT 0.50	10 ft x 8 ft concrete box culvert with continuous water flow. Minor oxidation and patching but performing as intended.	8
UPSLOPE 0.50	1V:1.5H slope the minor vegetation and one tree. No sign of distress and not impacting wall.	8
ARCHITECTURAL FACING 0.50	Minor cracking (less than 1/8") and spalling (less than 1/4") in the mortar. Minor oxidation, no erosion or cracking in granite stones. Good condition and functioning as intended.	9
WALL DRAINS 0.50	None observed	9
LATERAL SLOPE 1.00	Minor surface erosion and not impacting structure.	7
ROAD/SIDEWALK/SHOULDER 1.00	Roadway has minor transverse cracking above culvert reflected in roadway. Shoulder has minor surface erosion in shoulder.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE ROAD

Retaining Wall Condition Photos



ROMO_0012_3.625_R_1.jpg

Wall ID:	ROMO-0012-5.530-L		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	July 24, 2007	Approximate Year Built:	2004
*Wall Rating:	90	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Cantilever - Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	Stone Veneer
General Description:	Concrete wingwall and headwall with stone masonry facing. 2.5 ft CMP culvert.		

Wall Measurements

Wall Length (ft.):	7	Face Area (sq.):	15
Average Wall Height (ft.):	2	Face Angle (deg.):	90
Maximum Wall Height (ft.):	4	Vertical Offset (ft.):	-3

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good to excellent condition. Performing as intended but minor surface erosion on lateral slope.	10
WALL FOUNDATION MATERIAL 8.00	Riprap apron and no sign of distress.	9
CONCRETE 8.00	No distress observed. Good to excellent condition.	9
ARCHITECTURAL FACING 0.50	No cracking or spalling in mortar. Minor oxidation and no cracks in stone masonry.	9
CULVERT 0.50	2.5 ft CMP culvert and performing as intended.	9
WALL DRAINS 0.50	None observed.	9
ROAD/SIDEWALK/SHOULDER 0.50	Roadway has no sign of distress. Shoulder has no sign of distress.	10
LATERAL SLOPE 1.00	1V:1.5H slope with moderate surface erosion with rills.	7
UPSLOPE 1.00	1V:2H slope with minor erosion and minor vegetation.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE ROAD

Retaining Wall Condition Photos



ROMO_0012_5.530_L_1.jpg

Wall ID:	ROMO-0012-7.202-R		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	July 24, 2007	Approximate Year Built:	2004
*Wall Rating:	92	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Soil Nail
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	Stone Veneer
General Description:	Soil nail wall with stone veneer.		

Wall Measurements

Wall Length (ft.):	742	Face Area (sq.):	3600
Average Wall Height (ft.):	4	Face Angle (deg.):	72
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good to excellent performance with minor erosion on the end lateral slope.	10
WALL FOUNDATION MATERIAL 8.00	Curb in front of wall. No indication of foundation distress.	9
SHOTCRETE 8.00	No sign of distress observed on the face. Shotcrete covered by stone veneer. Good performance.	9
CURB/BERM/DITCH 0.50	Minor cracking and performing as intended.	9
LATERAL SLOPE 0.50	Begin slope has no erosion and well vegetated. End slope has minor erosion.	9
ARCHITECTURAL FACING 0.50	Minor cracking in the mortar. Minor oxidation in the stone veneer. Both performing as intended.	10
ROAD/SIDEWALK/SHOULDER 0.50	Roadway has no cracking. Shoulder has no cracking.	10
UPSLOPE 0.50	1V:1.5H to 1V:2H slope with well vegetated and stable.	10
WALL DRAINS 0.50	Underdrain under the wall per constructed. No visible weep holes.	10

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE ROAD

Retaining Wall Condition Photos



ROMO_0012_7.202_R_1.jpg



ROMO_0012_7.202_R_2.jpg

Wall ID:	ROMO-0012-7.383-L		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	July 24, 2007	Approximate Year Built:	2004
*Wall Rating:	95	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Cantilever - Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	Stone Veneer
General Description:	Reinforced concrete cast in place retaining wall with stone veneer.		

Wall Measurements

Wall Length (ft.):	687	Face Area (sq.):	7150
Average Wall Height (ft.):	10	Face Angle (deg.):	90
Maximum Wall Height (ft.):	15	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good to excellent performance except with minor surface erosion at the end of wall (lateral slope).	10
WALL FOUNDATION MATERIAL 8.00	Gravel and sand backfill with moderate vegetation. 4 ft wide bench with relative flat slope. No sign of distress, settlement, or erosion.	10
CONCRETE 8.00	No sign of distress observed. Concrete covered with stone veneer.	10
CURB/BERM/DITCH 0.50	Curb in good condition with minor cracking and one major crack and spalling at a wall joint on curb back face.	8
LATERAL SLOPE 0.50	Minor surface erosion with 1V:1.5H slope (end of walls)	8
DOWNSLOPE 0.50	Heavy vegetation and relatively flat (1V:2H) slope. No sign of instability	9
ARCHITECTURAL FACING 0.50	Mortar has minor cracking but good condition. Stone has minor oxidation but good condition.	10
TRAFFIC BARRIER/FENCE 0.50	No sign of distress. Two tube steel backed timber rail and in good condition.	10
WALL DRAINS 0.50	Underdrain and weepholes performing as intended.	10

Repair Recommendations

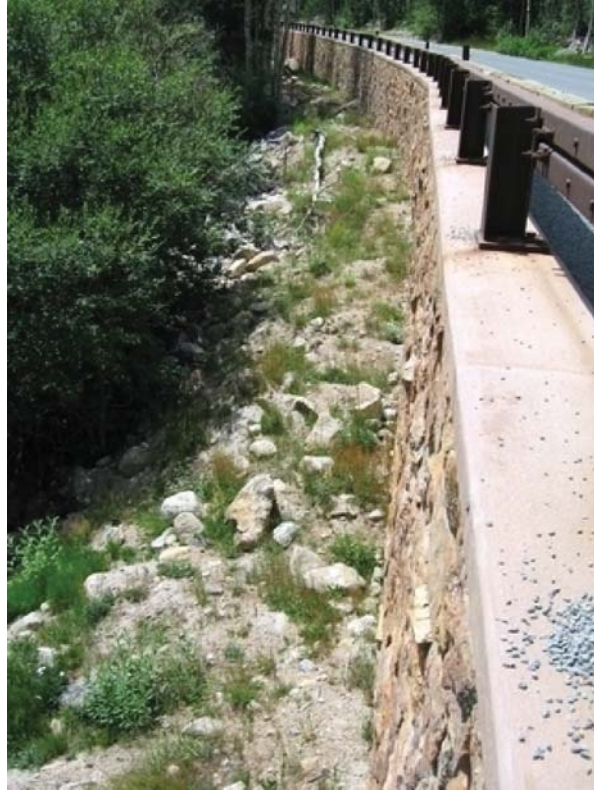
Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE ROAD

Retaining Wall Condition Photos



ROMO_0012_7.383_L_1.jpg



ROMO_0012_7.383_L_2.jpg

Wall ID:	ROMO-0012-7.654-L		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	July 24, 2007	Approximate Year Built:	2004
*Wall Rating:	93	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Cantilever - Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	Stone Veneer
General Description:	Reinforced concrete cast in place retaining wall with stone veneer.		

Wall Measurements

Wall Length (ft.):	108	Face Area (sq.):	1150
Average Wall Height (ft.):	10	Face Angle (deg.):	90
Maximum Wall Height (ft.):	14	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good to excellent with minor lateral slope erosion.	10
WALL FOUNDATION MATERIAL 8.00	Good foundation material that consists of sand and gravel. Cover maintained on wall toe.	9
CONCRETE 8.00	No distress observed. Concrete covered by stone veneer.	10
LATERAL SLOPE 0.50	Steep slope (1.5H:1V) with minor erosion and not impacting wall performance.	8
DOWNSLOPE 0.50	Minor (2 ft to 3 ft wide) bench and long 1V:2H slope to below streambed.	9
ARCHITECTURAL FACING 0.50	Minor cracking in the mortar. Minor oxidation in the stone. Good condition and functioning as intended.	10
CURB/BERM/DITCH 0.50	Curb has minor cracking but no sign of distress.	10
TRAFFIC BARRIER/FENCE 0.50	Two tube steel backed timber rail in good condition. No distress from wall displacement.	10
WALL DRAINS 0.50	Underdrains and weepholes were open and functioning as intended.	10

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE ROAD

Retaining Wall Condition Photos



ROMO_0012_7.654_L_1.jpg



ROMO_0012_7.654_L_2.jpg

Wall ID:	ROMO-0012-8.564-R		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	July 24, 2007	Approximate Year Built:	2004
*Wall Rating:	93	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Cantilever - Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	Stone Veneer
General Description:	Reinforced concrete cast in place retaining wall with stone veneer.		

Wall Measurements

Wall Length (ft.):	464	Face Area (sq.):	4330
Average Wall Height (ft.):	9	Face Angle (deg.):	90
Maximum Wall Height (ft.):	12	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good to excellent condition with minor surface erosion on lateral slopes.	10
WALL FOUNDATION MATERIAL 8.00	Sand and gravel material. 1.5H:1V slope with 3 to 4 ft bench with good foundation material. Cover maintained on toe of wall.	9
CONCRETE 8.00	No distress observed. Concrete covered by stone veneer.	10
CULVERT 0.50	Three 24 inch CMP culvert. One culvert has minor undermining around it.	8
LATERAL SLOPE 0.50	1.5H:1V slope with minor surface erosion on both ends.	8
DOWNSLOPE 0.50	2H:1V slope and bench. Not impacting wall performance.	9
ARCHITECTURAL FACING 0.50	Minor cracking in mortar and minor oxidation on the stone. Good performance and functioning at intended.	10
CURB/BERM/DITCH 0.50	Minor cracking in curb. Overall, good condition.	10
TRAFFIC BARRIER/FENCE 0.50	Two tube steel backed timber guardrail in good condition. No signs of distress or displacement.	10

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE ROAD

Retaining Wall Condition Photos



ROMO_0012_8.564_R_1.jpg

Wall ID:	ROMO-0012-8.594-L		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	July 24, 2007	Approximate Year Built:	2004
*Wall Rating:	94	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Cantilever - Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	Stone Veneer
General Description:	Upstream concrete cast in place headwall with stone veneer for double culvert.		

Wall Measurements

Wall Length (ft.):	19	Face Area (sq.):	90
Average Wall Height (ft.):	4	Face Angle (deg.):	90
Maximum Wall Height (ft.):	5	Vertical Offset (ft.):	1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good to excellent condition and performing as intended.	10
WALL FOUNDATION MATERIAL 8.00	Alluvial stream channel material. No signs of settlement or distress.	10
CONCRETE 8.00	No signs of distress observed. Concrete covered by stone veneer.	9
LATERAL SLOPE 0.50	Minor surface erosion but no sign of distress. Not impacting wall.	9
UPSLOPE 0.50	Stream channel with boulders. Not impacting wall.	9
ARCHITECTURAL FACING 0.50	Minor cracking in mortar and minor oxidation/staining on stone. Functioning as intended.	10
ROAD/SIDEWALK/SHOULDER 0.50	No crack or distress in roadway.	10
WALL DRAINS 0.50	Two 30 inch CMP culvert at base of stream and side drainage. Functioning as intended.	10
CULVERT 0.50	Two 30 inch CMP culvert at base. Functioning as intended.	10

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE ROAD

Retaining Wall Condition Photos



ROMO_0012_8.594_L_1.jpg

Wall ID:	ROMO-0012-8.728-R		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	July 24, 2007	Approximate Year Built:	2004
*Wall Rating:	95	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Cantilever - Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	Stone Veneer
General Description:	Reinforced concrete cast in place retaining wall with stone veneer.		

Wall Measurements

Wall Length (ft.):	474	Face Area (sq.):	4140
Average Wall Height (ft.):	8	Face Angle (deg.):	90
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good to excellent wall performance with minor surfaced erosion on lateral slope.	10
WALL FOUNDATION MATERIAL 8.00	Good foundation material that consist of sand and gravel with 3 ft to 4 ft bench. No exposed wall toe and not impacting wall.	10
CONCRETE 8.00	No sign of distress observed. Concrete covered by stone veneer.	10
ARCHITECTURAL FACING 0.50	Minor cracking in the mortar. Minor oxidation in the stone. Good condition and functioning as intended.	9
LATERAL SLOPE 0.50	1.5H:1V stable slope with minor surface erosion and not impacting wall.	9
CULVERT 0.50	One 24 inch CMP culvert. Culvert has good cover and good performance.	10
CURB/BERM/DITCH 0.50	Curb has minor cracking and no sign of distress.	10
DOWNSLOPE 0.50	1.5H:1V stable slope with trees and vegetation.	10
TRAFFIC BARRIER/FENCE 0.50	Two tube steel backed timber rail in good condition. No distress from wall displacement.	10

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE ROAD

Retaining Wall Condition Photos



ROMO_0012_8.728_R_1.jpg



ROMO_0012_8.728_R_2.jpg

Wall ID:	ROMO-0012-8.838-R		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	July 24, 2007	Approximate Year Built:	2004
*Wall Rating:	92	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Cantilever - Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	Stone Veneer
General Description:	Reinforced concrete cast in-place retaining wall with stone veneer.		

Wall Measurements

Wall Length (ft.):	284	Face Area (sq.):	2680
Average Wall Height (ft.):	9	Face Angle (deg.):	90
Maximum Wall Height (ft.):	15	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good to excellent condition. Minor wall cracking perhaps related to surface water drainage issues.	9
WALL FOUNDATION MATERIAL 8.00	Sand, gravel and alluvial materials. Good foundation and no indication of settlement or displacement. Wall toe exposed at step about 2 to 3 inches and sign of corrosion.	10
CONCRETE 8.00	Minor hairline cracking at facing veneer and may indicate minor wall movement beneath. Movement is not visible due to facing.	9
CURB/BERM/DITCH 0.50	Curb has a moderate crack (1/4 inch) at edge of traffic lane. May be possible surface water issue.	8
ARCHITECTURAL FACING 0.50	Minor vertical cracking in line with curb joint.	9
CULVERT 0.50	One 24 inch CMP culvert and functioning as intended.	9
LATERAL SLOPE 0.50	Begin wall has minor surface erosion at roadway edge and end wall has gradual slope (3H:1V). No impact on wall performance.	9
TRAFFIC BARRIER/FENCE 0.50	Two tube steel backed timber guardrail. Occasion bulge not related to wall performance.	10
WALL DRAINS 0.50	Weepholes and underdrain constructed. No sign of distress due to drainage.	10

Repair Recommendations

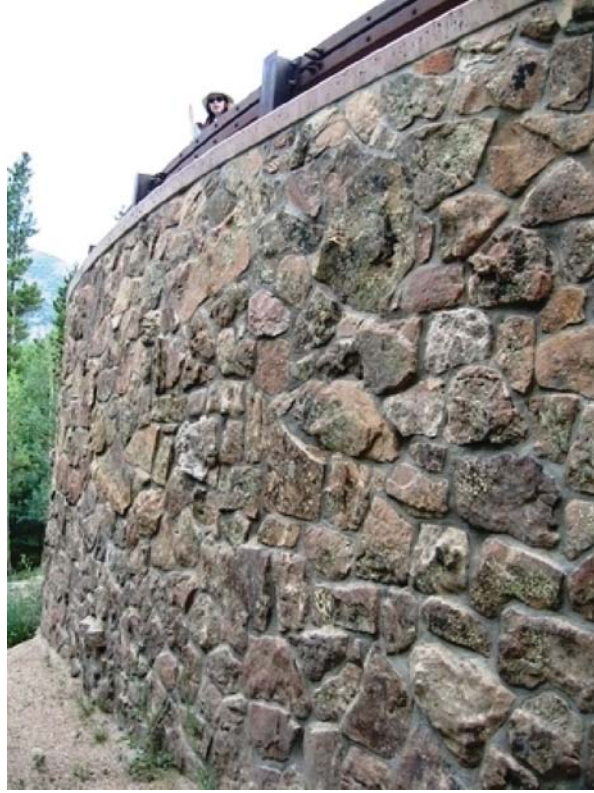
Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE ROAD

Retaining Wall Condition Photos



ROMO_0012_8.838_R_1.jpg



ROMO_0012_8.838_R_2.jpg

Wall ID:	ROMO-0012-8.896-R		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	July 24, 2007	Approximate Year Built:	2004
*Wall Rating:	90	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Soil Nail
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	Stone Veneer
General Description:	Soil nail wall with stone veneer.		

Wall Measurements

Wall Length (ft.):	89	Face Area (sq.):	370
Average Wall Height (ft.):	4	Face Angle (deg.):	72
Maximum Wall Height (ft.):	7	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good to excellent condition with minor surface erosion on lateral surface.	9
WALL FOUNDATION MATERIAL 8.00	Covered with roadway and curb. No indication of distress.	9
SHOTCRETE 8.00	No indication of distress. Covered with stone veneer.	9
LATERAL SLOPE 0.50	Minor surface erosion and impacting wall performance.	8
CURB/BERM/DITCH 0.50	Curb has minor cracking and staining.	9
UPSLOPE 0.50	Stable (1.5H:1V) slope with trees and shrubs.	9
WALL DRAINS 0.50	No weep holes, horizontal drains, and underdrains outlet below wall observed. No signs of distress from drainage.	9
ARCHITECTURAL FACING 0.50	Minor cracking in mortar and iron staining. Performing as designed.	10
ROAD/SIDEWALK/SHOULDER 0.50	Roadway has no sign of distress or cracking.	10

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE ROAD

Retaining Wall Condition Photos



ROMO_0012_8.896_R_1.jpg

Wall ID:	ROMO-0204ZZ-0.134-L		
Route Name:	ASPENGLLEN CAMPGROUND ROADS		
Inspection Date:	July 23, 2007	Approximate Year Built:	Unknown
*Wall Rating:	76	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked granite boulder fill wall		

Wall Measurements

Wall Length (ft.):	109	Face Area (sq.):	324
Average Wall Height (ft.):	3	Face Angle (deg.):	70
Maximum Wall Height (ft.):	4	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall, minor surface drainage issues with minor erosion or upstation lateral slope and top of shoulder.	8
WALL FOUNDATION MATERIAL 8.00	Sandy material at relatively low slope of about 5H:1V, no signs of settlement.	8
PLACED STONE 8.00	Granite boulders, low iron staining due to minor erosion, good condition.	7
VEGETATION 0.50	Minor brush at top of wall and grass throughout, but not impacting wall stability.	8
WALL DRAINS 0.50	None observed, no water-related issued impacting wall.	8
DOWNSLOPE 0.50	Minor slope, relatively flat, minor surface erosion.	9
LATERAL SLOPE 1.00	Wall start slope has minor surface erosion due to surface water drainage from road.	6
ROAD/SIDEWALK/SHOULDER 1.00	No distress in road. Minor ravelling in the shoulder due to surface drainage.	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park
ROUTE 0204ZZ: ASPENGLLEN CAMPGROUND ROADS

Retaining Wall Condition Photos



ROMO_0204ZZ_0.134_L_1.jpg

Wall ID:	ROMO-0219-0.000-L		
Route Name:	GLACIER CREEK RIDING STABLE ROAD		
Inspection Date:	July 24, 2007	Approximate Year Built:	Unknown
*Wall Rating:	87	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Cantilever - Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	Stone Veneer
General Description:	Cut wall concrete cantilever with stone facing.		

Wall Measurements

Wall Length (ft.):	200	Face Area (sq.):	1000
Average Wall Height (ft.):	5	Face Angle (deg.):	90
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good performance and performing as intended.	9
WALL FOUNDATION MATERIAL 8.00	Moderate vegetated flat ditch with minor undermining. No sign of distress.	8
CONCRETE 8.00	No sign of distress observed. Concrete covered by stone facing.	9
ARCHITECTURAL FACING 0.50	Minor cracking in mortar and minor spalling (isolated area) in the stone.	9
LATERAL SLOPE 0.50	Minor surface erosion and in overall good condition.	9
UPSLOPE 0.50	5H:1V stable slope with vegetation.	9
WALL DRAINS 0.50	No observed drains. No sign of drainage distress.	9
ROAD/SIDEWALK/SHOULDER 0.50	Roadway has no cracking and in good condition. Shoulder has no sign of distress and in good condition.	10

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0219: GLACIER CREEK RIDING STABLE ROAD

Retaining Wall Condition Photos



ROMO_0219_0.000_L_1.jpg

Wall ID:	ROMO-0220-0.202-L		
Route Name:	HIDDEN VALLEY ACCESS ROAD		
Inspection Date:	July 26, 2007	Approximate Year Built:	2004
*Wall Rating:	83	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Rockery cut wall		

Wall Measurements

Wall Length (ft.):	205	Face Area (sq.):	1400
Average Wall Height (ft.):	6	Face Angle (deg.):	58
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good condition, performing as intended.	8
WALL FOUNDATION MATERIAL 8.00	Founded on soil, no signs of settlement.	8
PLACED STONE 8.00	Large blocky granite, slightly weathered.	9
UPSLOPE 0.50	Very gentle, well vegetated, no signs of erosion.	8
VEGETATION 0.50	Some grass and wildflowers, not impacting wall performance.	8
WALL DRAINS 0.50	None observed, no water-related issues impacting wall.	8
LATERAL SLOPE 1.00	About 3H:1V at wall start with very minor sloughing. About 2.5H:1V at wall end, no erosion.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0220: HIDDEN VALLEY ACCESS ROAD

Retaining Wall Condition Photos



ROMO_0220_0.202_L_1.jpg

Wall ID:	ROMO-0413-0.066-L		
Route Name:	MILL CREEK RESIDENCE ROAD		
Inspection Date:	July 26, 2007	Approximate Year Built:	Unknown
*Wall Rating:	90	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Cantilever - Concrete
Surface Treatment:	Stain	Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	Formlined Concrete
General Description:	Box culvert with formliner (stone) facing.		

Wall Measurements

Wall Length (ft.):	30	Face Area (sq.):	95
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good performance and performing as intended.	9
WALL FOUNDATION MATERIAL 8.00	Boulder and granular material. Good foundation with free flowing river above it.	9
CONCRETE 8.00	No sign of distress observed. Minor cracking on formliner face.	9
ROAD/SIDEWALK/SHOULDER 0.50	Shoulder has minor depression behind wall but no impacting wall.	8
ARCHITECTURAL FACING 0.50	Formliner (Rock pattern with brown stain). Good condition with minor spalling.	9
CULVERT 0.50	Arch CMP 16 ft W x 4 ft H in 50 ft in length. Minor oxidation but performing as intended.	9
DOWNSLOPE 0.50	Stream channel with boulders. Moderate slope with moderate vegetation. No sign of surface erosion.	9
LATERAL SLOPE 0.50	Boulder riprap and relatively flat slope. Not impacting wall.	9
WALL DRAINS 0.50	None needed. No water issues.	9

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0413: MILL CREEK RESIDENCE ROAD

Retaining Wall Condition Photos



ROMO_0413_0.066_L_1.jpg

Wall ID:	ROMO-0413-0.066-R		
Route Name:	MILL CREEK RESIDENCE ROAD		
Inspection Date:	July 26, 2007	Approximate Year Built:	Unknown
*Wall Rating:	90	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Cantilever - Concrete
Surface Treatment:	Stain	Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	Formlined Concrete
General Description:	Box culvert with formliner (stone) facing.		

Wall Measurements

Wall Length (ft.):	30	Face Area (sq.):	95
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good performance and performing as intended.	9
WALL FOUNDATION MATERIAL 8.00	Good granular material with a free flowing river. Natural stream bed.	9
CONCRETE 8.00	Minor cracking in formliner facing. Minor spalling on top of wall. No signs of distress observed.	9
ROAD/SIDEWALK/SHOULDER 0.50	Roadway has minor longitudinal cracking above culvert. Shoulder has minor settlement. Not impacting wall.	8
ARCHITECTURAL FACING 0.50	Formliner (rock pattern) with brow stain. Good condition with minor spalling.	9
CULVERT 0.50	Arch CMP 16 ft wide x 4 ft high and 50 ft long. Culvert has minor oxidation but performing as intended.	9
DOWNSLOPE 0.50	Stream channel and boulders. Moderate slope with moderate vegetation. No signs of surface erosion.	9
LATERAL SLOPE 0.50	Boulder riprap and relatively flat. Not impacting wall.	9
WALL DRAINS 0.50	None observed and none required. No drainage issues.	9

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park
ROUTE 0413: MILL CREEK RESIDENCE ROAD

Retaining Wall Condition Photos



ROMO_0413_0.066_R_1.jpg

Wall ID:	ROMO-0500-0.250-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	1925
*Wall Rating:	70	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall at informal pull-out.		

Wall Measurements

Wall Length (ft.):	34	Face Area (sq.):	136
Average Wall Height (ft.):	4	Face Angle (deg.):	67
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, wall performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Good, founded on large boulders, no sign of settlement.	7
PLACED STONE 8.00	Slightly weathered durable rock from existing cut. Some burrows but not affecting wall performance.	7
DOWNSLOPE 1.00	Loose colluvium, small boulders mixed with sand, 1.5:1 average.	6
LATERAL SLOPE 1.00	Start of wall ties into colluvium, 1.5:1. End wall ties into bedrock.	7
WALL DRAINS 1.00	None observed. No signs of water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_0.250_L_1.jpg

Wall ID:	ROMO-0500-0.500-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	1925
*Wall Rating:	63	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall		

Wall Measurements

Wall Length (ft.):	84	Face Area (sq.):	900
Average Wall Height (ft.):	10	Face Angle (deg.):	58
Maximum Wall Height (ft.):	14	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Fair to good, performing as intended.	6
WALL FOUNDATION MATERIAL 8.00	Founded on boulders and sand. No signs of settlement.	7
PLACED STONE 8.00	Good, hard, durable moderately weathered rock. Some loose stone, crudely built.	6
ROAD/SIDEWALK/SHOULDER 1.00	Two locations with slight shoulder erosion.	5
DOWNSLOPE 1.00	Loose large boulders.	6
LATERAL SLOPE 1.00	Good at start and end. Ties into colluvium, 1.5:1.	7
WALL DRAINS 1.00	None observed. No signs of water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_0.500_L_1.jpg

Wall ID:	ROMO-0500-0.620-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	1925
*Wall Rating:	69	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall.		

Wall Measurements

Wall Length (ft.):	41	Face Area (sq.):	200
Average Wall Height (ft.):	5	Face Angle (deg.):	68
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Good, majority of wall founded on bedrock. No signs of settlement.	7
PLACED STONE 8.00	Good, hard, durable slightly weathered rock.	7
DOWNSLOPE 1.00	Some loose boulders mixed with sand.	6
ROAD/SIDEWALK/SHOULDER 1.00	Some signs of shoulder erosion.	6
LATERAL SLOPE 1.00	Ties into colluvium, 1.5:1 slope, no signs of erosion.	7
WALL DRAINS 1.00	None observed. No signs of water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_0.620_L_1.jpg

Wall ID:	ROMO-0500-0.680-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	1925
*Wall Rating:	69	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall.		

Wall Measurements

Wall Length (ft.):	37	Face Area (sq.):	180
Average Wall Height (ft.):	4	Face Angle (deg.):	58
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Good, founded on large boulders. No signs of settlement.	7
PLACED STONE 8.00	Hard, durable rock, moderately weathered. Some loose stone at wall start. Good at 2nd half of wall.	7
CULVERT 1.00	18" CMP, some minor corrosion on pipe bottom.	6
LATERAL SLOPE 1.00	Very minor erosion, 1.5:1 soil/boulder mix.	6
ROAD/SIDEWALK/SHOULDER 1.00	Shoulder loose and minor sloughing.	6
DOWNSLOPE 1.00	Loose large boulders, no erosion problems.	7
WALL DRAINS 1.00	None observed. No signs of water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_0.680_L_1.jpg

Wall ID:	ROMO-0500-0.980-R		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	1925
*Wall Rating:	70	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall.		

Wall Measurements

Wall Length (ft.):	325	Face Area (sq.):	2900
Average Wall Height (ft.):	8	Face Angle (deg.):	68
Maximum Wall Height (ft.):	11	Vertical Offset (ft.):	1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Good, founded on soil/boulders mix and bedrock. No signs of settlement.	7
PLACED STONE 8.00	Good, hard, durable slightly weathered rock.	7
DOWNSLOPE 1.00	Loose soil/rock mix and bedrock. No signs of erosion.	7
LATERAL SLOPE 1.00	1.5:1 soil slope at wall start. Bedrock at wall end. No signs of erosion.	7
WALL DRAINS 1.00	None observed. No signs of water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_0.980_R_1.jpg



ROMO_0500_0.980_R_2.jpg

Wall ID:	ROMO-0500-1.020-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	1925
*Wall Rating:	70	Maintenance Action:	No Action

Wall Description

Wall Function:	Switchback Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked rock wall at switchback.		

Wall Measurements

Wall Length (ft.):	80	Face Area (sq.):	380
Average Wall Height (ft.):	4	Face Angle (deg.):	50
Maximum Wall Height (ft.):	7	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Founded mostly on bedrock, no signs of settlement.	8
PLACED STONE 8.00	Moderately weathered rock. Some loose rock and some burrows.	6
LATERAL SLOPE 0.50	Ties into rock fragments at wall start and bedrock at wall end.	8
DOWNSLOPE 1.00	Mostly bedrock, some large boulders mixed with soil, no signs of erosion.	7
WALL DRAINS 1.00	None observed. No signs of water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_1.020_L_1.jpg

Wall ID:	ROMO-0500-1.025-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	1925
*Wall Rating:	70	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall.		

Wall Measurements

Wall Length (ft.):	115	Face Area (sq.):	980
Average Wall Height (ft.):	8	Face Angle (deg.):	59
Maximum Wall Height (ft.):	14	Vertical Offset (ft.):	1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Large boulders mixed with soil, no signs of settlement.	7
PLACED STONE 8.00	Moderately weathered rock. Some loose stone at wall start, good at wall end, crudely built.	7
LATERAL SLOPE 0.50	Bedrock at both wall start and wall end. No signs of erosion.	8
DOWNSLOPE 1.00	Boulders and sand and bedrock, some loose boulders, minor erosion.	6
WALL DRAINS 1.00	None observed. No signs of water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_1.025_L_1.jpg

Wall ID:	ROMO-0500-1.300-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	1925
*Wall Rating:	63	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall.		

Wall Measurements

Wall Length (ft.):	100	Face Area (sq.):	380
Average Wall Height (ft.):	3	Face Angle (deg.):	67
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Good, founded on soil/boulders mix and bedrock. Minor settlement.	6
PLACED STONE 8.00	Moderately weathered rock. Some loose stone.	6
ROAD/SIDEWALK/SHOULDER 1.00	Loose and raveling shoulder, erosion in several locations.	4
CULVERT 1.00	18" CMP, some minor corrosion and sediment accumulation.	6
DOWNSLOPE 1.00	Loose soil, large boulders, minor erosion.	6
LATERAL SLOPE 1.00	Loose soil, minor erosion at wall start. Ties into bedrock at wall end.	6
VEGETATION 1.00	Some grass and a tree. Not affecting wall performance.	7
WALL DRAINS 1.00	None observed. No signs of water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_1.300_L_1.jpg

Wall ID:	ROMO-0500-1.700-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	1925
*Wall Rating:	69	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall.		

Wall Measurements

Wall Length (ft.):	36	Face Area (sq.):	120
Average Wall Height (ft.):	3	Face Angle (deg.):	72
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Founded soil and loose boulders. No signs of settlement.	7
PLACED STONE 8.00	Slightly weathered rock. Overall hard durable rock.	7
ROAD/SIDEWALK/SHOULDER 1.00	Two small areas with shoulder erosion and sloughing.	5
LATERAL SLOPE 1.00	Ties into soil at wall start with minor erosion. Loose soil/rock mix at wall end with no observed erosion.	6
DOWNSLOPE 1.00	Large boulders. No signs of erosion.	7
WALL DRAINS 1.00	None observed. No signs of water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_1.700_L_1.jpg

Wall ID:	ROMO-0500-1.780-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	1925
*Wall Rating:	70	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall.		

Wall Measurements

Wall Length (ft.):	62	Face Area (sq.):	250
Average Wall Height (ft.):	4	Face Angle (deg.):	60
Maximum Wall Height (ft.):	5	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Founded on soil/rock mix. No signs of settlement.	7
PLACED STONE 8.00	Moderately weathered rock. Some very large blocks. Some loose rock.	7
LATERAL SLOPE 1.00	Ties into bedrock at wall start and soil bedrock at wall end. Minor erosion.	6
DOWNSLOPE 1.00	Large boulders, shallow bedrock, no signs of erosion.	7
WALL DRAINS 1.00	None observed. No signs of water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_1.780_L_1.jpg

Wall ID:	ROMO-0500-2.850-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	1925
*Wall Rating:	69	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall.		

Wall Measurements

Wall Length (ft.):	82	Face Area (sq.):	560
Average Wall Height (ft.):	6	Face Angle (deg.):	64
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Founded on soil/rock mix. No signs of settlement.	7
PLACED STONE 8.00	Moderately weathered rock. Some loose pieces.	7
ROAD/SIDEWALK/SHOULDER 1.00	Some shoulder raveling, some erosion.	5
DOWNSLOPE 1.00	Soil/rock mix, minor erosion.	6
LATERAL SLOPE 1.00	Loose soil/rock mix. Very minor erosion.	6
VEGETATION 1.00	Some currant, grass and small pines. Not affecting wall performance.	7
WALL DRAINS 1.00	None observed. No signs of water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_2.850_L_1.jpg

Wall ID:	ROMO-0500-3.500-R		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	1925
*Wall Rating:	66	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall.		

Wall Measurements

Wall Length (ft.):	125	Face Area (sq.):	480
Average Wall Height (ft.):	3	Face Angle (deg.):	68
Maximum Wall Height (ft.):	5	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	6
WALL FOUNDATION MATERIAL 8.00	Founded on soil/rock mix. No signs of settlement.	7
PLACED STONE 8.00	Moderately weathered rock. Some loose pieces.	7
DOWNSLOPE 1.00	Soil/rock mix. Minor erosion.	6
LATERAL SLOPE 1.00	Soil/rock mix. Minor erosion.	6
ROAD/SIDEWALK/SHOULDER 1.00	Some shoulder raveling.	6
CULVERT 1.00	18" CMP, partially plugged, not affecting wall performance.	7
VEGETATION 1.00	Some shrubs. Not affecting wall performance.	7
WALL DRAINS 1.00	None observed. No signs of water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_3.500_R_1.jpg

Wall ID:	ROMO-0500-3.600-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	1925
*Wall Rating:	69	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall.		

Wall Measurements

Wall Length (ft.):	50	Face Area (sq.):	250
Average Wall Height (ft.):	5	Face Angle (deg.):	66
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Founded on soil/rock mix and bedrock. No signs of settlement.	7
PLACED STONE 8.00	Moderately weathered rock. Some loose pieces.	7
ROAD/SIDEWALK/SHOULDER 1.00	Soft shoulder, minor sloughing and erosion.	5
LATERAL SLOPE 1.00	Soil/rock mix, soft, very minor erosion.	6
DOWNSLOPE 1.00	2:1 soil/rock mix, very minor to no erosion.	7
VEGETATION 1.00	Currants, not affecting wall performance.	7
WALL DRAINS 1.00	None observed. No signs of water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_3.600_L_1.jpg

Wall ID:	ROMO-0500-3.800-R		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	Unknown
*Wall Rating:	65	Maintenance Action:	No Action

Wall Description

Wall Function:	Slope Protection	Primary Wall Type:	Gravity - Gabion
Surface Treatment:		Secondary Wall Type:	Gravity - Dry Stone
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Gabion and dry stacked (top) wall for unstable slope repair.		

Wall Measurements

Wall Length (ft.):	360	Face Area (sq.):	7700
Average Wall Height (ft.):	21	Face Angle (deg.):	76
Maximum Wall Height (ft.):	50	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Fair, wall performing as intended, some sagging of baskets.	6
WALL FOUNDATION MATERIAL 8.00	Founded on road, no sign of settlement.	7
WIRE/GEOSYNTHETIC FACING 8.00	gabion basket shows some sagging, no corrosion.	6
PLACED STONE 8.00	Moderately weathered, some loose pieces.	7
LATERAL SLOPE 1.00	Loose soil/rock mix at wall start, some erosion but not affecting wall performance. Loose rock at wall end, very minor erosion.	6
VEGETATION 1.00	Some brush not affecting wall performance.	7
WALL DRAINS 1.00	None present. No sign of water related problems.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_3.800_R_1.jpg



ROMO_0500_3.800_R_2.jpg

Wall ID:	ROMO-0500-4.050-R		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	Unknown
*Wall Rating:	69	Maintenance Action:	No Action

Wall Description

Wall Function:	Switchback Wall	Primary Wall Type:	Gravity - Gabion
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Gabion wall at switchback.		

Wall Measurements

Wall Length (ft.):	32	Face Area (sq.):	960
Average Wall Height (ft.):	30	Face Angle (deg.):	49
Maximum Wall Height (ft.):	30	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Fair to good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Founded on road, no sign of settlement.	7
WIRE/GEOSYNTHETIC FACING 8.00	gabion basket shows no corrosion, minor sloughing.	7
LATERAL SLOPE 1.00	Loose soil/rock mix at wall start, minor erosion.	5
ROAD/SIDEWALK/SHOULDER 1.00	Loose shoulder, minor erosion.	5
WALL DRAINS 1.00	None present. No sign of water related problems.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_4.050_R_1.jpg

Wall ID:	ROMO-0500-4.100-R		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	Unknown
*Wall Rating:	72	Maintenance Action:	No Action

Wall Description

Wall Function:	Switchback Wall	Primary Wall Type:	Gravity - Gabion
Surface Treatment:		Secondary Wall Type:	Gravity - Dry Stone
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Gabion wall at switchback.		

Wall Measurements

Wall Length (ft.):	79	Face Area (sq.):	1300
Average Wall Height (ft.):	16	Face Angle (deg.):	52
Maximum Wall Height (ft.):	23	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, wall performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Founded on road, no sign of settlement.	8
PLACED STONE 8.00	Moderately weathered, no loose or missing rock.	7
WIRE/GEOSYNTHETIC FACING 8.00	gabion baskets, no corrosion, minor sagging.	7
LATERAL SLOPE 1.00	Loose soil/rock mix, minor erosion.	6
VEGETATION 1.00	Some brush not affecting wall performance.	7
WALL DRAINS 1.00	None present. No sign of water related problems.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_4.100_R_1.jpg

Wall ID:	ROMO-0500-4.200-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	Unknown
*Wall Rating:	60	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall		

Wall Measurements

Wall Length (ft.):	35	Face Area (sq.):	240
Average Wall Height (ft.):	7	Face Angle (deg.):	60
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Fair, wall performing as intended.	6
WALL FOUNDATION MATERIAL 8.00	Founded on loose soil/rock mix, minor settlement.	6
PLACED STONE 8.00	Moderately weathered, loose rock.	7
DOWNSLOPE 1.00	Loose soil/rock mix, some erosion.	5
LATERAL SLOPE 1.00	Loose soil/rock mix, some erosion.	5
ROAD/SIDEWALK/SHOULDER 1.00	Soft shoulder, some erosion.	5
VEGETATION 1.00	Some brush not affecting wall performance.	7
WALL DRAINS 1.00	None present. No sign of water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_4.200_L_1.jpg

Wall ID:	ROMO-0500-4.210-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	1930
*Wall Rating:	70	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Gabion
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Gabion fill wall		

Wall Measurements

Wall Length (ft.):	45	Face Area (sq.):	600
Average Wall Height (ft.):	13	Face Angle (deg.):	45
Maximum Wall Height (ft.):	25	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, wall performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Founded on loose soil/rock mix, minor settlement.	6
PLACED STONE 8.00	Moderately weathered, loose rock.	7
WIRE/GEOSYNTHETIC FACING 8.00	Gabion basket shows minor sagging, no corrosion.	7
DOWNSLOPE 1.00	Soil/mix, minor erosion.	7
LATERAL SLOPE 1.00	Soil/rock mix, minor erosion.	7
VEGETATION 1.00	Some brush not affecting wall performance.	7
WALL DRAINS 1.00	None present. No sign of water related problems.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_4.210_L_1.jpg

Wall ID:	ROMO-0500-4.250-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	1926
*Wall Rating:	56	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	Gravity - Gabion
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall with 2 gabion baskets at wall start.		

Wall Measurements

Wall Length (ft.):	123	Face Area (sq.):	615
Average Wall Height (ft.):	5	Face Angle (deg.):	57
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Fair, rotation of recently added gabions.	5
WALL FOUNDATION MATERIAL 8.00	Loose soil/rock mix, some rotation.	4
WIRE/GEOSYNTHETIC FACING 8.00	Gabion baskets, no corrosion, some sagging.	6
PLACED STONE 8.00	Moderately weathered, minor loose rock.	7
DOWNSLOPE 1.00	Loose soil/rock mix, minor erosion.	6
LATERAL SLOPE 1.00	Loose soil/rock mix, minor erosion.	6
WALL DRAINS 1.00	None present. No sign of water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_4.250_L_1.jpg

Wall ID:	ROMO-0500-4.251-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	Unknown
*Wall Rating:	62	Maintenance Action:	Maintenance

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Gabion
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Gabion fill wall.		

Wall Measurements

Wall Length (ft.):	100	Face Area (sq.):	1400
Average Wall Height (ft.):	14	Face Angle (deg.):	50
Maximum Wall Height (ft.):	14	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Fair, wall performing as intended.	6
WALL FOUNDATION MATERIAL 8.00	Founded on loose soil/boulder mix, no noticeable settlement.	6
WIRE/GEOSYNTHETIC FACING 8.00	Gabion basket shows no corrosion, no sagging, one ripped out wire basket on top.	6
PLACED STONE 8.00	Moderately weathered, some loose rock.	7
DOWNSLOPE 1.00	Loose soil/rock mix, minor erosion.	6
LATERAL SLOPE 1.00	Loose soil/rock mix, minor erosion.	6
WALL DRAINS 1.00	None present. No sign of water related problems.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Repair rip to wing basket: 1 hour labor @ \$55.00 per hour = \$55.00
Repair Cost:	\$55

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos

Condition photos are not available for ROMO-0500-4.251-L.

Wall ID:	ROMO-0500-4.400-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	1925
*Wall Rating:	65	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	Gravity - Gabion
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall with recent gabion addition at wall start.		

Wall Measurements

Wall Length (ft.):	64	Face Area (sq.):	710
Average Wall Height (ft.):	11	Face Angle (deg.):	61
Maximum Wall Height (ft.):	11	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Fair to good, wall performing as intended.	6
WALL FOUNDATION MATERIAL 8.00	Shallow bedrock, no sign of settlement.	7
WIRE/GEOSYNTHETIC FACING 8.00	gabion basket shows some sagging, no corrosion.	6
PLACED STONE 8.00	Moderately weathered, loose rock.	7
LATERAL SLOPE 1.00	Loose soil/rock mix, some erosion.	5
DOWNSLOPE 1.00	Loose soil/rock mix and bedrock, very minor erosion.	6
WALL DRAINS 1.00	None present. No sign of water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_4.400_L_1.jpg

Wall ID:	ROMO-0500-4.450-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	1925
*Wall Rating:	68	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall		

Wall Measurements

Wall Length (ft.):	35	Face Area (sq.):	350
Average Wall Height (ft.):	10	Face Angle (deg.):	61
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, wall performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Founded on gravelly soil, no settlement.	7
PLACED STONE 8.00	Slightly weathered, some loose rock.	7
CULVERT 1.00	24" CMP moderate corrosion, partially plugged but not affecting wall performance.	5
ROAD/SIDEWALK/SHOULDER 1.00	Shoulder has some erosion present.	5
LATERAL SLOPE 1.00	Loose soil/rock mix, some erosion.	6
VEGETATION 1.00	Some grass but not affecting wall performance.	7
WALL DRAINS 1.00	None present. No sign of water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_4.450_L_1.jpg

Wall ID:	ROMO-0500-4.550-R		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	1925
*Wall Rating:	80	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall		

Wall Measurements

Wall Length (ft.):	240	Face Area (sq.):	2300
Average Wall Height (ft.):	9	Face Angle (deg.):	66
Maximum Wall Height (ft.):	18	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, wall performing as intended.	8
WALL FOUNDATION MATERIAL 8.00	Founded on bedrock and soil, no settlement.	8
PLACED STONE 8.00	Hard durable boulders, large to medium size.	8
DOWNSLOPE 0.50	Vegetated soil slope with large boulders.	8
LATERAL SLOPE 0.50	Bedrock at start and end.	8
WALL DRAINS 0.50	None present. No sign of water related problems.	8

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_4.550_R_1.jpg

Wall ID:	ROMO-0500-4.600-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	Unknown
*Wall Rating:	69	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	Gravity - Gabion
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall with added gabion basket at midwall		

Wall Measurements

Wall Length (ft.):	55	Face Area (sq.):	1070
Average Wall Height (ft.):	19	Face Angle (deg.):	53
Maximum Wall Height (ft.):	20	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Fair to good , wall performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Soil/rock mix, no sign of settlement.	7
PLACED STONE 8.00	Moderately weathered, loose rock.	7
WIRE/GEOSYNTHETIC FACING 8.00	gabion basket shows some sagging, no corrosion.	7
DOWNSLOPE 1.00	Loose soil/rock, some erosion, very steep.	5
LATERAL SLOPE 1.00	Loose soil/rock, some erosion.	5
WALL DRAINS 1.00	None present. No sign of water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_4.600_L_1.jpg

Wall ID:	ROMO-0500-4.750-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	1925
*Wall Rating:	60	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall		

Wall Measurements

Wall Length (ft.):	123	Face Area (sq.):	800
Average Wall Height (ft.):	6	Face Angle (deg.):	56
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Fair, performing as intended.	6
WALL FOUNDATION MATERIAL 8.00	Founded on soil/rock mix, no sign of settlement.	7
PLACED STONE 8.00	Moderately weathered, many loose and missing pieces.	5
ROAD/SIDEWALK/SHOULDER 1.00	Shoulder loose, sloughing, some erosion.	5
LATERAL SLOPE 1.00	Loose soil/rock mix, minor erosion at wall start. Ties into bedrock at wall end.	6
DOWNSLOPE 1.00	Gentle, 3:1 slope, no sign of erosion.	7
WALL DRAINS 1.00	None observed. No water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_4.750_L_1.jpg

Wall ID:	ROMO-0500-4.800-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	1925
*Wall Rating:	67	Maintenance Action:	No Action
Wall Description			
Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall		
Wall Measurements			
Wall Length (ft.):	132	Face Area (sq.):	600
Average Wall Height (ft.):	4	Face Angle (deg.):	77
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0
Assessed Elements			
Element (Weighting Factor)	Narrative		Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.		7
WALL FOUNDATION MATERIAL 8.00	Founded on bedrock and soil, no sign of settlement.		7
PLACED STONE 8.00	Slightly weathered, medium to large boulders, some loose pieces.		6
ROAD/SIDEWALK/SHOULDER 1.00	Shoulder has minor erosion.		6
DOWNSLOPE 1.00	Soil and bedrock with trees and vegetation. No signs of erosion.		7
LATERAL SLOPE 1.00	Soil and bedrock. No signs of erosion.		7
WALL DRAINS 1.00	None observed. No water related problems.		7
Repair Recommendations			
Failure Consequence:	MODERATE		
Recommendation Narrative:	None		
Repair Cost:	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_4.800_L_1.jpg

Wall ID:	ROMO-0500-4.900-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 26, 2007	Approximate Year Built:	1925
*Wall Rating:	65	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall		

Wall Measurements

Wall Length (ft.):	330	Face Area (sq.):	3100
Average Wall Height (ft.):	9	Face Angle (deg.):	70
Maximum Wall Height (ft.):	18	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Fair to good, performing as intended.	6
WALL FOUNDATION MATERIAL 8.00	Founded on soil/rock mix and shallow bedrock no sign of settlement.	7
PLACED STONE 8.00	Moderately weathered, loose pieces.	7
DOWNSLOPE 1.00	Steep in places, minor erosion.	5
ROAD/SIDEWALK/SHOULDER 1.00	Shoulder loose and raveling.	5
LATERAL SLOPE 1.00	Loose soil/rock mix, minor erosion.	6
WALL DRAINS 1.00	None observed. No water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_4.900_L_1.jpg

Wall ID:	ROMO-0500-4.950-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 27, 2007	Approximate Year Built:	Unknown
*Wall Rating:	72	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall above creek		

Wall Measurements

Wall Length (ft.):	76	Face Area (sq.):	900
Average Wall Height (ft.):	11	Face Angle (deg.):	62
Maximum Wall Height (ft.):	16	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Founded on shallow bedrock, no sign of settlement.	8
PLACED STONE 8.00	Hard durable rock, slightly weathered, some loose pieces.	7
ROAD/SIDEWALK/SHOULDER 1.00	Shoulder soft, raveling, minor erosion.	5
DOWNSLOPE 1.00	Shallow bedrock, creek below not affecting wall performance.	7
LATERAL SLOPE 1.00	Ties into soil over shallow bedrock at wall start. Ties into bedrock at wall end. No sign of erosion.	7
WALL DRAINS 1.00	None observed. No water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_4.950_L_1.jpg

Wall ID:	ROMO-0500-5.400-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 27, 2007	Approximate Year Built:	Unknown
*Wall Rating:	69	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall		

Wall Measurements

Wall Length (ft.):	134	Face Area (sq.):	600
Average Wall Height (ft.):	4	Face Angle (deg.):	61
Maximum Wall Height (ft.):	5	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Founded on soil/rock mix, no sign of settlement.	7
PLACED STONE 8.00	Slightly weathered, few loose pieces.	7
LATERAL SLOPE 1.00	Ties into soil at wall start. Ties into soil/rock mix. Moderate erosion.	5
CULVERT 1.00	18" CMP, minor corrosion, not affecting wall performance.	7
DOWNSLOPE 1.00	Well vegetated, grass, trees. No sign of erosion.	7
WALL DRAINS 1.00	None observed. No water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_5.400_L_1.jpg

Wall ID:	ROMO-0500-5.600-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 27, 2007	Approximate Year Built:	1925
*Wall Rating:	63	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall		

Wall Measurements

Wall Length (ft.):	112	Face Area (sq.):	450
Average Wall Height (ft.):	4	Face Angle (deg.):	61
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Fair to good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Founded on soil, no sign of settlement.	7
PLACED STONE 8.00	Moderately weathered, many loose pieces, crudely built.	5
ROAD/SIDEWALK/SHOULDER 1.00	Shoulder some raveling, some erosion.	5
LATERAL SLOPE 1.00	Ties into soil, minor erosion..	6
CULVERT 1.00	18" CMP, partially plugged, not affecting wall performance.	7
DOWNSLOPE 1.00	Gentle, well vegetated, no sign of erosion.	7
WALL DRAINS 1.00	None observed. No water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_5.600_L_1.jpg

Wall ID:	ROMO-0500-6.000-R		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 27, 2007	Approximate Year Built:	Unknown
*Wall Rating:	66	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall		

Wall Measurements

Wall Length (ft.):	74	Face Area (sq.):	820
Average Wall Height (ft.):	11	Face Angle (deg.):	56
Maximum Wall Height (ft.):	14	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Fair to good, performing as intended.	6
WALL FOUNDATION MATERIAL 8.00	Founded on soil. No sign of settlement.	7
PLACED STONE 8.00	Moderately weathered, loose pieces.	7
ROAD/SIDEWALK/SHOULDER 1.00	Shoulder moderate erosion.	5
CULVERT 1.00	Two 18" CMP. One abandoned. Partially plugged, minor corrosion, not affecting wall performance.	6
DOWNSLOPE 1.00	Moderate slope, grass, trees, minor erosion.	6
LATERAL SLOPE 1.00	Soil/rock mix, minor erosion.	6
WALL DRAINS 1.00	None observed. No water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_6.000_R_1.jpg

Wall ID:	ROMO-0500-6.300-R		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 27, 2007	Approximate Year Built:	Unknown
*Wall Rating:	63	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall		

Wall Measurements

Wall Length (ft.):	30	Face Area (sq.):	150
Average Wall Height (ft.):	5	Face Angle (deg.):	68
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Fair to good, performing as intended.	6
WALL FOUNDATION MATERIAL 8.00	Founded on rock fill, no sign of settlement.	7
PLACED STONE 8.00	Moderately weathered, loose pieces.	6
ROAD/SIDEWALK/SHOULDER 1.00	Soft shoulder, raveling, some erosion.	4
LATERAL SLOPE 1.00	Ties into rock fill at both ends, very minor erosion.	6
DOWNSLOPE 1.00	Boulders, no sign of erosion.	7
WALL DRAINS 1.00	None observed. No water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_6.300_R_1.jpg

Wall ID:	ROMO-0500-6.500-R		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 27, 2007	Approximate Year Built:	1925
*Wall Rating:	70	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall		

Wall Measurements

Wall Length (ft.):	72	Face Area (sq.):	430
Average Wall Height (ft.):	5	Face Angle (deg.):	62
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Founded on soil/rock mix, no sign of settlement.	7
PLACED STONE 8.00	Moderately weathered, large and durable loose placed rock.	7
ROAD/SIDEWALK/SHOULDER 1.00	Some shoulder erosion at wall start.	6
CULVERT 1.00	18" CMP, minor corrosion, not affecting wall performance.	7
DOWNSLOPE 1.00	Soil/rock mix, no sign of erosion.	7
LATERAL SLOPE 1.00	Soil/rock mix at start and end, minor erosion at wall start.	7
WALL DRAINS 1.00	None observed. No water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_6.500_R_1.jpg

Wall ID:	ROMO-0500-8.200-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 27, 2007	Approximate Year Built:	Unknown
*Wall Rating:	68	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall constructed with large boulders		

Wall Measurements

Wall Length (ft.):	135	Face Area (sq.):	470
Average Wall Height (ft.):	3	Face Angle (deg.):	78
Maximum Wall Height (ft.):	5	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Founded on wetland soils but showing no sign of settlement.	6
PLACED STONE 8.00	Large hard durable boulders.	8
DOWNSLOPE 1.00	Meadow area, topsoil and wetlands.	4
ROAD/SIDEWALK/SHOULDER 1.00	Soft shoulder, raveling, recent asphalt milling placed on road and shoulder.	5
LATERAL SLOPE 1.00	ties into soil, gentle 2:1 to 3:1, no sign of erosion.	6
WALL DRAINS 1.00	None observed. No water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_8.200_L_1.jpg

Wall ID:	ROMO-0500-8.300-L		
Route Name:	OLD FALL RIVER ROAD		
Inspection Date:	June 27, 2007	Approximate Year Built:	Unknown
*Wall Rating:	70	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall		

Wall Measurements

Wall Length (ft.):	120	Face Area (sq.):	480
Average Wall Height (ft.):	4	Face Angle (deg.):	45
Maximum Wall Height (ft.):	4	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	7
WALL FOUNDATION MATERIAL 8.00	Founded on soil, no sign of settlement.	7
PLACED STONE 8.00	Large hard durable rock, slightly weathered, some loose pieces.	7
DOWNSLOPE 1.00	Soil and good vegetation.	7
LATERAL SLOPE 1.00	Ties into native soil, no sign of erosion.	7
WALL DRAINS 1.00	None observed. No water related problems.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0500: OLD FALL RIVER ROAD

Retaining Wall Condition Photos



ROMO_0500_8.300_L_1.jpg

Wall ID:	ROMO-0917-0.000-P1		
Route Name:	RAINBOW CURVE PARKING AREA		
Inspection Date:	June 27, 2007	Approximate Year Built:	Unknown
*Wall Rating:	80	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall		

Wall Measurements

Wall Length (ft.):	280	Face Area (sq.):	9800
Average Wall Height (ft.):	35	Face Angle (deg.):	50
Maximum Wall Height (ft.):	49	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good, performing as intended.	8
WALL FOUNDATION MATERIAL 8.00	Founded on boulders over shallow bedrock, no sign of settlement.	8
PLACED STONE 8.00	Hard durable rock, slightly weathered.	8
DOWNSLOPE 0.50	Cobble to boulder size rock fragments, 2:1 slope, no sign of erosion.	8
LATERAL SLOPE 0.50	Ties into soil/rock mix, no erosion at wall start. Ties into bedrock at wall end.	8
WALL DRAINS 0.50	None observed. No water related problems.	8

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park
ROUTE 0917: RAINBOW CURVE PARKING AREA

Retaining Wall Condition Photos



ROMO_0917_0.000_P1_1.jpg

Wall ID:	ROMO-0923-0.000-P1		
Route Name:	GORE RANGE OVERLOOK PARKING		
Inspection Date:	July 25, 2007	Approximate Year Built:	Unknown
*Wall Rating:	90	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked granite rockery wall		

Wall Measurements

Wall Length (ft.):	290	Face Area (sq.):	2300
Average Wall Height (ft.):	7	Face Angle (deg.):	46
Maximum Wall Height (ft.):	12	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good condition, performing as intended.	9
WALL FOUNDATION MATERIAL 8.00	Sand and gravel, good material, no signs of settlement or erosion.	9
PLACED STONE 8.00	2-ft flat granite and gneiss boulders with minor oxidation, functioning as intended.	9
LATERAL SLOPE 0.50	Minor surface erosion, not impacting wall.	8
ROAD/SIDEWALK/SHOULDER 0.50	Parking lot asphalt above wall, no impact to wall, no signs of settlement.	9
DOWNSLOPE 0.50	Flat to 3H:1V with minor grass, not impacting wall.	10
VEGETATION 0.50	Minor grass and vegetation, stabilizing backfill material.	10
WALL DRAINS 0.50	None observed, no water-related issues impacting wall.	10

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park
ROUTE 0923: GORE RANGE OVERLOOK PARKING

Retaining Wall Condition Photos



ROMO_0923_0.000_P1_1.jpg

Wall ID:	ROMO-0924-0.000-P1		
Route Name:	ALPINE VISITORS CENTER PARKING		
Inspection Date:	July 25, 2007	Approximate Year Built:	Unknown
*Wall Rating:	89	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Cantilever - Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	Stone Veneer
General Description:	Two generation wall: new wall construction about 125 ft long connected to old wall granite concrete wall		

Wall Measurements

Wall Length (ft.):	506	Face Area (sq.):	1771
Average Wall Height (ft.):	3	Face Angle (deg.):	88
Maximum Wall Height (ft.):	5	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good to very good condition, performing as intended.	9
WALL FOUNDATION MATERIAL 8.00	Buried under sidewalk, no impact on wall performance, minor void at front face.	9
CONCRETE 8.00	No signs of distress observed, covered with stone facing.	9
ARCHITECTURAL FACING 0.50	Mortar has minor cracking and spalling with minor voids. Stone veneer has minor cracking and occasional spalling.	9
LATERAL SLOPE 0.50	Beginning slope attached to restroom structure, end of wall about 2H:1V slope with minor surface erosion.	9
ROAD/SIDEWALK/SHOULDER 0.50	Sidewalk has no signs of distress, minor cracking not associated with wall.	9
WALL DRAINS 0.50	Probably an underdrain and weepholes, but can't be seen, water-related issues not impacting wall.	9
UPSLOPE 0.50	Relatively flat and gravel drainage behind top of wall.	10

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park
ROUTE 0924: ALPINE VISITORS CENTER PARKING

Retaining Wall Condition Photos



ROMO_0924_0.000_P1_1.jpg

Wall ID:	ROMO-0930-0.000-P1		
Route Name:	FARVIEW CURVE OVERLOOK PARKING		
Inspection Date:	September 12, 2007	Approximate Year Built:	Unknown
*Wall Rating:	74	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Poorly constructed dry laid stone wall. Angular material is locked together, but no consistent construction sequence.		

Wall Measurements

Wall Length (ft.):	122	Face Area (sq.):	610
Average Wall Height (ft.):	5	Face Angle (deg.):	80
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	-3

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Poorly constructed, weathering rock blocks, some missing blocks, no signs of global instability.	7
WALL FOUNDATION MATERIAL 8.00	Table granular material. No signs of settlement.	8
PLACED STONE 8.00	Angular, weathered gneiss with cracked blocks. Some small blocks totally weathered. Occasional missing blocks. Poorly laid.	7
DOWNSLOPE 0.50	Stable shallow soils over bedrock. Moderate slope angle with good vegetation.	8
LATERAL SLOPE 0.50	Stable slopes, no signs of distress.	8
UPSLOPE 0.50	Stable granular fill slope @ 2:1. Minor vegetation. No distress evident.	8
TRAFFIC BARRIER/FENCE 0.50	Mortared stone masonry guardwall over concrete gravity footer. Like new. No signs of distress.	9
VEGETATION 0.50	No significant vegetation near the wall.	9
WALL DRAINS 1.00	Open face. Free draining. No installed drains.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park
ROUTE 0930: FARVIEW CURVE OVERLOOK PARKING

Retaining Wall Condition Photos



ROMO_0930_0.000_P1_1.jpg



ROMO_0930_0.000_P1_2.jpg

Wall ID:	ROMO-0941-0.000-P1		
Route Name:	MORAINES PARK VISITOR CENTER		
Inspection Date:	July 25, 2007	Approximate Year Built:	Unknown
*Wall Rating:	81	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Granite mortared stone headwall and drop inlet with 24 in CMP culvert.		

Wall Measurements

Wall Length (ft.):	28	Face Area (sq.):	126
Average Wall Height (ft.):	4	Face Angle (deg.):	90
Maximum Wall Height (ft.):	5	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good condition except for missing top stone on drop inlet due to surface water flow.	8
WALL FOUNDATION MATERIAL 8.00	Granular material. No signs of displacement or settlement.	9
STONE MASONRY 8.00	Minor cracking and oxidation of the stone. 1.5 ft x1.5 ft section missing at top of inlet side.	7
MORTAR 8.00	Minor cracking and spalling in the mortar. Not impacting wall.	8
LATERAL SLOPE 0.50	Relatively flat slope with vegetation. Surface water impacting drop inlet at missing stone location.	8
CULVERT 0.50	One 24 inch culvert with minor oxidation and sediment. Performing as intended.	9
ROAD/SIDEWALK/SHOULDER 0.50	Minor transverse cracking in the roadway. Not impacting wall.	9
UPSLOPE 0.50	Relatively flat slope with moderate vegetation. Not impacting wall.	9
WALL DRAINS 0.50	None observed and no drainage issues.	9

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park
ROUTE 0941: MORaine PARK VISITOR CENTER

Retaining Wall Condition Photos



ROMO_0941_0.000_P1_1.jpg

Wall ID:	ROMO-0944-0.000-P1		
Route Name:	PARK AND RIDE PARKING		
Inspection Date:	July 25, 2007	Approximate Year Built:	Unknown
*Wall Rating:	81	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Granite dry stack rockery wall.		

Wall Measurements

Wall Length (ft.):	104	Face Area (sq.):	501
Average Wall Height (ft.):	4	Face Angle (deg.):	64
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good condition performing as intended with occasion voids and loose stones.	8
WALL FOUNDATION MATERIAL 8.00	Slight (2H:1V) slope for 2 ft wide bench with sand and gravel materials. Foundation is in good condition.	8
PLACED STONE 8.00	1 to 2 ft diameter granite and gneiss boulders with minor oxidation staining, missing/displaced stones, minor sand backfill erosion.	8
LATERAL SLOPE 0.50	2H:1V slope with minor surface erosion and tapers to base at start of wall.	8
UPSLOPE 0.50	2H:1V slope at top with trees. Slope has minor surface erosion.	8
VEGETATION 0.50	Minor grass and a small tree at top. Not impacting wall performance.	8
WALL DRAINS 0.50	None observed and not impacting wall.	9
ROAD/SIDEWALK/SHOULDER 0.50	No cracking in sidewalk/shoulder.	10

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0944: PARK AND RIDE PARKING

Retaining Wall Condition Photos



ROMO_0944_0.000_P1_1.jpg

Wall ID:	ROMO-0944-0.000-P2		
Route Name:	PARK AND RIDE PARKING		
Inspection Date:	July 25, 2007	Approximate Year Built:	2005
*Wall Rating:	87	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Granite dry stack wall.		

Wall Measurements

Wall Length (ft.):	81	Face Area (sq.):	297
Average Wall Height (ft.):	3	Face Angle (deg.):	73
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good condition and functioning as intended.	9
WALL FOUNDATION MATERIAL 8.00	Sand foundation in good condition. No settlement or minor erosion. Slight slope with 2H:1V slope below and 2 ft wide minor bench.	8
PLACED STONE 8.00	Granite and gneiss boulders up to 2-4 ft diameter with minor surface erosion. Minor voids and loose rock but performing as intended.	9
LATERAL SLOPE 0.50	1.5H:1V to 2H:1V slope with minor surface erosion and not impacting wall.	8
DOWNSLOPE 0.50	Stable 2H:1V slope with trees and not impacting wall.	9
ROAD/SIDEWALK/SHOULDER 0.50	Parking lot above wall with minor cracking and not impacting the wall. Shoulder with 1H:1V slope for 1 ft at toe wall with minor surface erosion.	9
TRAFFIC BARRIER/FENCE 0.50	Two tube steel backed timber rail with no signs of distress.	9
WALL DRAINS 0.50	None observed and not impacting wall.	9

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0944: PARK AND RIDE PARKING

Retaining Wall Condition Photos



ROMO_0944_0.000_P2_1.jpg

Wall ID:	ROMO-0944-0.000-P3		
Route Name:	PARK AND RIDE PARKING		
Inspection Date:	July 25, 2007	Approximate Year Built:	2005
*Wall Rating:	90	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Granite dry stack wall.		

Wall Measurements

Wall Length (ft.):	715	Face Area (sq.):	3860
Average Wall Height (ft.):	5	Face Angle (deg.):	68
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good condition with minor erosion and performing as intended.	9
WALL FOUNDATION MATERIAL 8.00	Embedded at least 1 ft or more. Sand and gravel material in good condition. No settlement or bulging signs.	9
PLACED STONE 8.00	Granite and gneiss boulders up to 2-4 ft diameter with minor iron staining. Minor voids and loose rock but performing as intended.	9
CURB/BERM/DITCH 0.50	Ditch in front of wall with minor grass and sand. Performing as intended.	8
LATERAL SLOPE 0.50	Minor surface erosion at beginning of wall.	8
ROAD/SIDEWALK/SHOULDER 0.50	Roadway with minor cracks and not impacting wall.	9
UPSLOPE 0.50	Minor surface erosion and 4H:1V relatively flat slope.	9
WALL DRAINS 0.50	None observed and not impacting wall.	9

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0944: PARK AND RIDE PARKING

Retaining Wall Condition Photos



ROMO_0944_0.000_P3_1.jpg

Wall ID:	ROMO-0950-0.000-P1		
Route Name:	GLACIER GORGE PARKING		
Inspection Date:	July 24, 2007	Approximate Year Built:	Unknown
*Wall Rating:	77	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Large boulder rockery wall		

Wall Measurements

Wall Length (ft.):	70	Face Area (sq.):	840
Average Wall Height (ft.):	12	Face Angle (deg.):	70
Maximum Wall Height (ft.):	13	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Fair to good performance with minor missing elements but wall functioning as intended.	8
WALL FOUNDATION MATERIAL 8.00	Sand, gravel, boulder foundation material. Good base with no distress with relatively low slope and minor voids at foundations.	8
PLACED STONE 8.00	Granite and gneiss boulders up to 6 ft diameter. Hard but displaced with voids in places. Wall backfill is sand material with minor to moderate erosion.	7
DOWNSLOPE 0.50	Relatively flat and no adverse affect on wall.	8
LATERAL SLOPE 0.50	Minor to moderate erosion with steep (1.5H:1V) slope on both ends. Not impacting wall.	8
TRAFFIC BARRIER/FENCE 0.50	Two tube steel backed timber rail with no signs of distress.	9
ROAD/SIDEWALK/SHOULDER 0.50	Sidewalk is relatively new and no visible cracking or sign of distress.	10
WALL DRAINS 1.00	None observed and surface drainage eroding material.	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0950: GLACIER GORGE PARKING

Retaining Wall Condition Photos



ROMO_0950_0.000_P1_1.jpg

Wall ID:	ROMO-0950-0.000-P2		
Route Name:	GLACIER GORGE PARKING		
Inspection Date:	July 24, 2007	Approximate Year Built:	Unknown
*Wall Rating:	77	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Large boulder rockery wall.		

Wall Measurements

Wall Length (ft.):	75	Face Area (sq.):	750
Average Wall Height (ft.):	10	Face Angle (deg.):	73
Maximum Wall Height (ft.):	12	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Fair to good condition and performing as intended.	8
WALL FOUNDATION MATERIAL 8.00	1.5H:1V slope with no bench. Gravel, sand and boulders foundation material. No displacement or bulging in wall.	8
PLACED STONE 8.00	Granite and gneiss boulders up to 6 ft diameter. Hard but displaced with voids in places. Wall backfill is sand material with minor to moderate erosion.	7
DOWNSLOPE 0.50	1.5H:1V slope with no bench and no stability issue.	8
LATERAL SLOPE 0.50	Low to moderate surface erosion with small gully.	8
TRAFFIC BARRIER/FENCE 0.50	Two tube steel backed timber rail with no signs of distress.	9
ROAD/SIDEWALK/SHOULDER 0.50	Sidewalk is relatively new with no cracking or distress.	10
WALL DRAINS 1.00	None observed but surface drainage eroding material.	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0950: GLACIER GORGE PARKING

Retaining Wall Condition Photos



ROMO_0950_0.000_P2_1.jpg

Wall ID:	ROMO-0951-0.000-P1		
Route Name:	BEAR LAKE PARKING AREA		
Inspection Date:	July 24, 2007	Approximate Year Built:	2004
*Wall Rating:	93	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Cantilever - Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	Stone Veneer
General Description:	Reinforced concrete cast in-place retaining wall with stone veneer at Bear Lake Trailhead Parking Lot		

Wall Measurements

Wall Length (ft.):	90	Face Area (sq.):	464
Average Wall Height (ft.):	5	Face Angle (deg.):	90
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good to excellent condition, minor lateral slope erosion.	10
WALL FOUNDATION MATERIAL 8.00	Concrete sidewalk at toe of wall, buried, no signs of distress observed.	9
CONCRETE 8.00	No signs of distress, stone veneer covers concrete.	10
LATERAL SLOPE 0.50	Tapers to low slope, minor surface erosion, not impacting wall.	8
ROAD/SIDEWALK/SHOULDER 0.50	Sidewalk minor cracking parallel to wall, not impacting wall performance.	9
UPSLOPE 0.50	Flat to minor slope, so signs of erosion, no impact to wall.	9
ARCHITECTURAL FACING 0.50	Stone and mortar, minor cracking, good condition.	10
CURB/BERM/DITCH 0.50	Minor curb in front of wall for about 1/2 wall length, no cracking, no signs of distress.	10
WALL DRAINS 0.50	Underdrain, weepholes open, performing as intended.	10

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0951: BEAR LAKE PARKING AREA

Retaining Wall Condition Photos



ROMO_0951_0.000_P1_1.jpg

Wall ID:	ROMO-0951-0.000-P2		
Route Name:	BEAR LAKE PARKING AREA		
Inspection Date:	July 24, 2007	Approximate Year Built:	Unknown
*Wall Rating:	72	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked gravity wall		

Wall Measurements

Wall Length (ft.):	125	Face Area (sq.):	562
Average Wall Height (ft.):	4	Face Angle (deg.):	80
Maximum Wall Height (ft.):	5	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good to fair condition, some missing boulders and minor surface erosion.	7
WALL FOUNDATION MATERIAL 8.00	Sand and gravel, fair condition with minor erosion at the toe.	7
PLACED STONE 8.00	Granite boulders, missing in isolated locations, loosely placed.	7
DOWNSLOPE 0.50	Minor erosion, gentle slope about 2H:1V.	8
LATERAL SLOPE 0.50	Minor surface erosion, not impacting wall performance.	8
VEGETATION 0.50	Minor vegetation with grasses and shrubs in wall, not impacting wall performance.	9
ROAD/SIDEWALK/SHOULDER 0.50	Sidewalk no signs of distress related to the wall, not impacting the wall.	10
TRAFFIC BARRIER/FENCE 0.50	Timber fence by the sidewalk, good condition.	10
WALL DRAINS 1.00	None observed, surface water and parking lot drains to top of the wall near the middle.	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0951: BEAR LAKE PARKING AREA

Retaining Wall Condition Photos



ROMO_0951_0.000_P2_1.jpg

Wall ID:	ROMO-0951-0.000-P3		
Route Name:	BEAR LAKE PARKING AREA		
Inspection Date:	July 24, 2007	Approximate Year Built:	2004
*Wall Rating:	90	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Cantilever - Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	Stone Veneer
General Description:	Reinforced concrete cast in-place retaining wall with stone veneer		

Wall Measurements

Wall Length (ft.):	87	Face Area (sq.):	752
Average Wall Height (ft.):	8	Face Angle (deg.):	90
Maximum Wall Height (ft.):	12	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good to excellent condition, minor surface erosion downslope and at the lateral slope, wall performing as intended.	10
WALL FOUNDATION MATERIAL 8.00	Toe exposed at isolated location, minor surface erosion.	8
CONCRETE 8.00	No signs of distress, covered with stone veneer.	10
ARCHITECTURAL FACING 0.50	Stone veneer for about 25feet, minor cracking, minor staining (white), good condition. Concrete for 62feet, minor staining (white), good condition.	9
DOWNSLOPE 0.50	About 2H:1V with 2-6 foot wide bench in front, minor erosion, good condition.	9
LATERAL SLOPE 0.50	Stone gravity at the begin of wall, minor surface erosion, with 2H:1V at end of wall, slopes not impacting wall performance.	9
CURB/BERM/DITCH 0.50	Curb in good condition, minor cracking.	10
ROAD/SIDEWALK/SHOULDER 0.50	Sidewalk in good condition, no distress observed.	10
TRAFFIC BARRIER/FENCE 0.50	Timer railing, good condition.	10

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Rocky Mountain National Park

ROUTE 0951: BEAR LAKE PARKING AREA

Retaining Wall Condition Photos



ROMO_0951_0.000_P3_1.jpg



ROMO_0951_0.000_P3_2.jpg

Appendix A

Summary of WIP Definitions



Rocky Mountain 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 $\geq 45^\circ$ ($\geq 1H:1V$ 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: None - Does not meet any known standards. Non-AASHTO - Does not meet AASHTO, but is consistent with other structures of its type/period with good performance. AASHTO - Apparently meets current AASHTO Geometric, Design, Materials, and Construction Standards.
Consequence of Failure	Low - No loss of roadway, no to low public risk, no impact to traffic during wall repair/replacement Moderate - Hourly to short-term closure of roadway, low-to-moderate public risk, multiple alternate routes available High - Seasonal to long-term loss of roadway, substantial loss-of-life risk, no alternate routes available
Action	Select from: No Action, Monitor, Maintenance, Repair Elements, Replace Elements, and Replace Wall
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. 1-Poor 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. 2-Good Observed conditions are sufficient to rate the conditions of wall element(s); however, additional investigations would be useful to better understand element performance. 3-Very Good 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 **severity**, **extent**, and **repair/replace urgency** 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.	<p>Good to Excellent - 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.</p> <p>Fair - 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.</p> <p>Poor to Critical - 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.</p>
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