CRLA
WIP Report

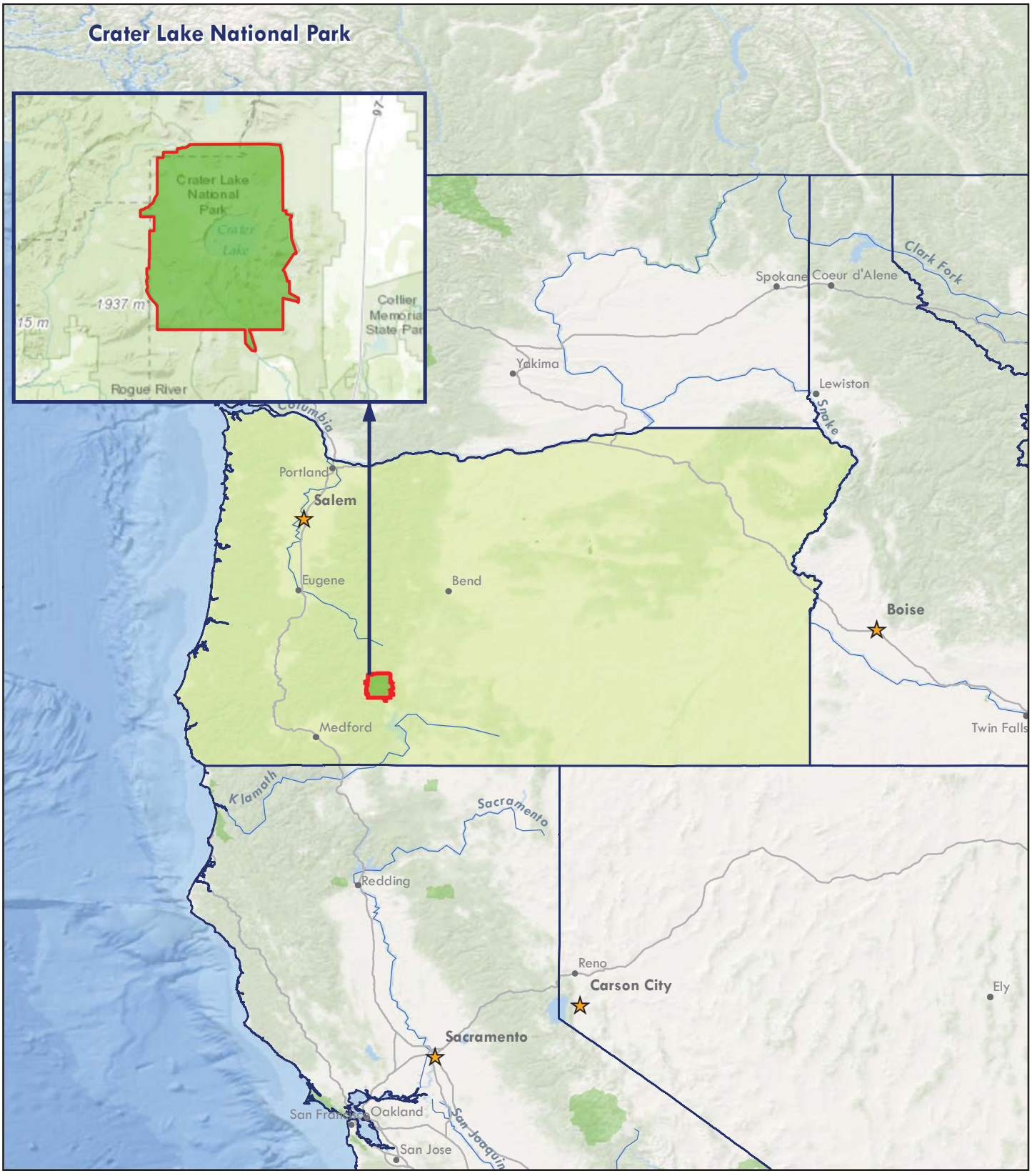
NPS Retaining Wall Inventory Program
Crater Lake National Park

Federal Lands Highway
Road Inventory Program

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

Data Collection Date: July 2007
Report Date: October 2015

Crater Lake National Park
in
Oregon



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Introduction

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Federal Lands Highway
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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

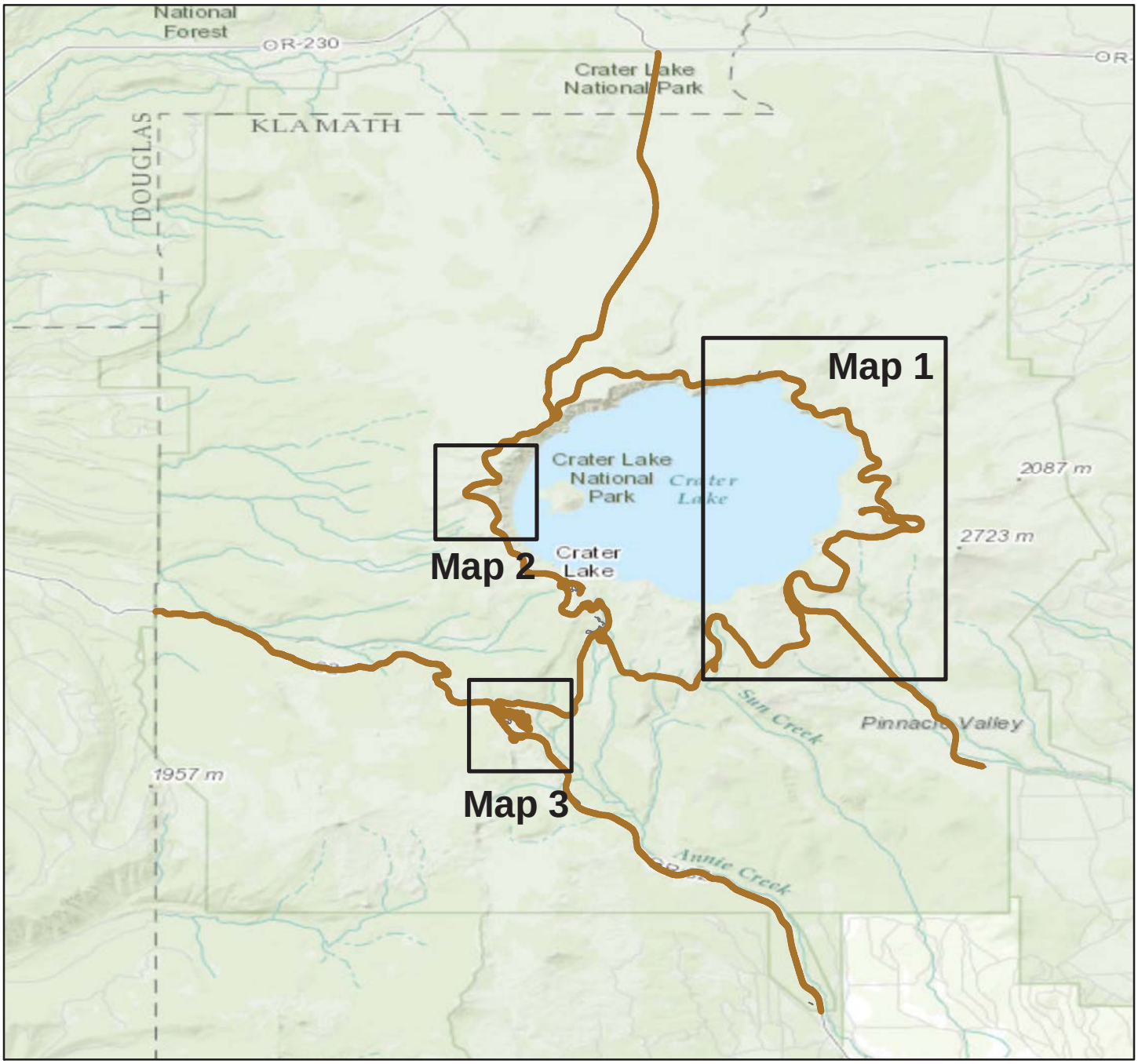
Crater Lake National Park

Federal Lands Highway
Road Inventory Program

Crater Lake 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

Miles

0 2.5 5

N

Crater Lake 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

Miles

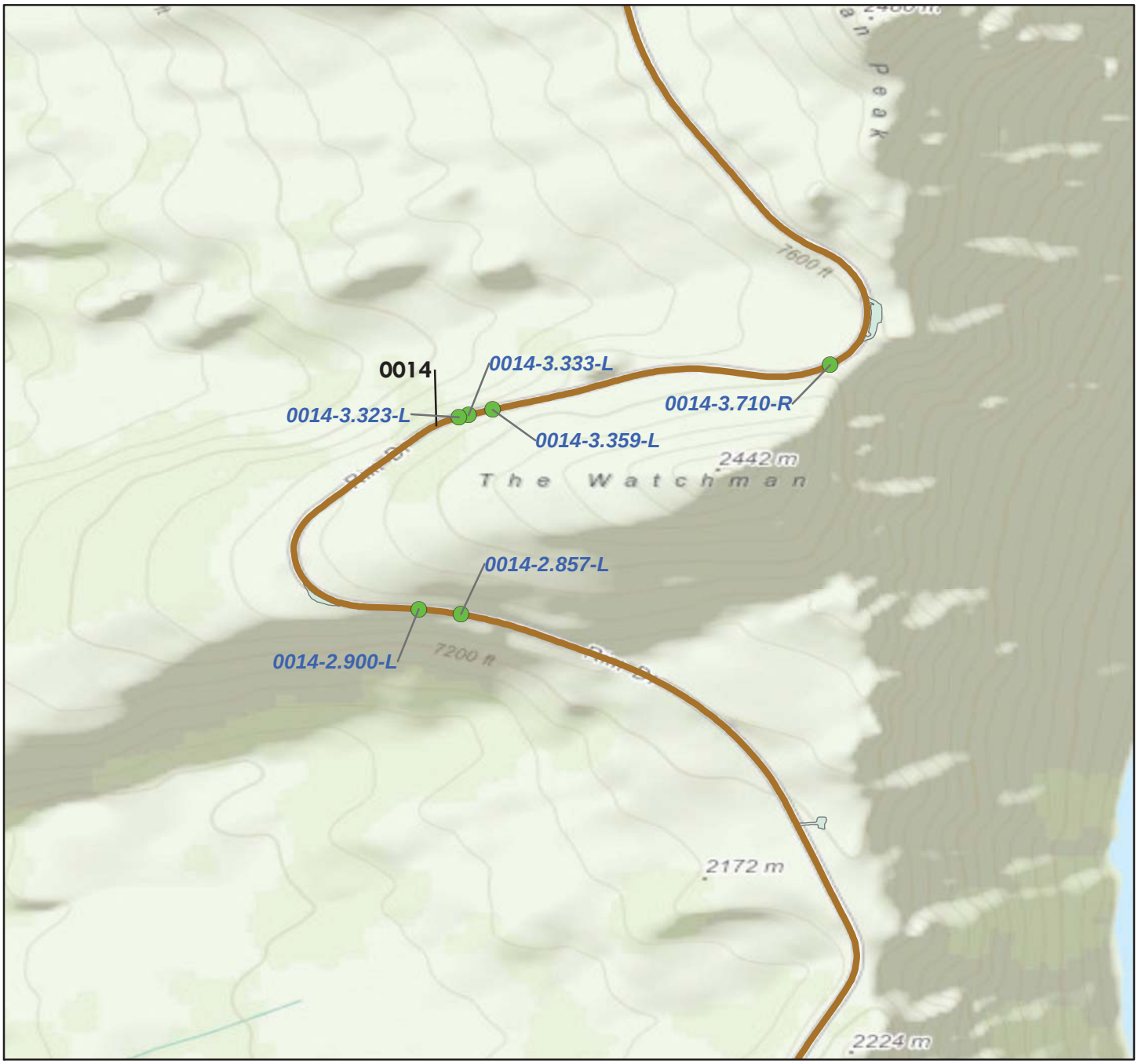
0 1.5 3

N

Crater Lake 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

Miles

0 0.3 0.6

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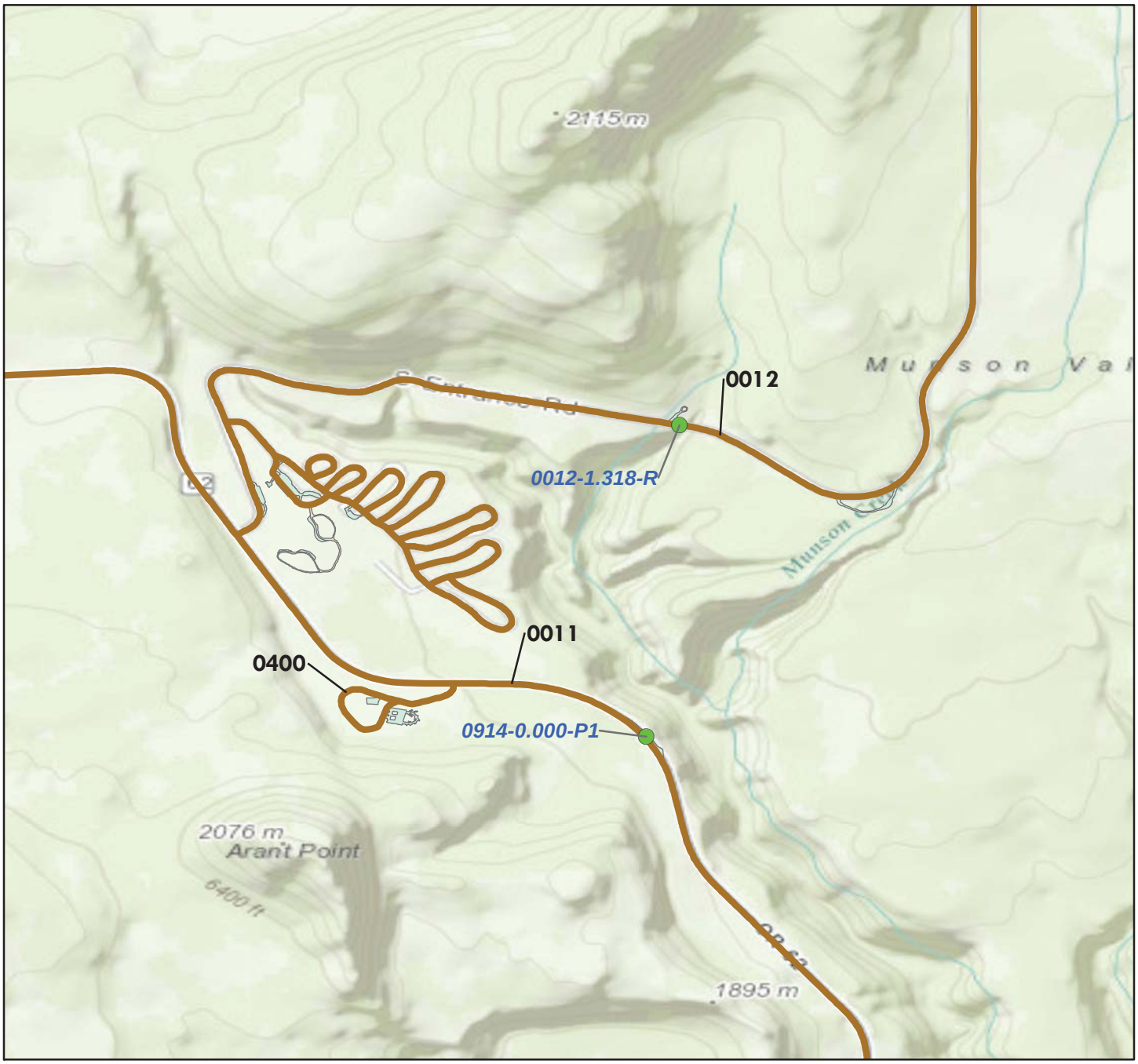
Crater Lake National Park

WALL LOCATION MAP

Map 3



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Wall Locations

RIP Collected Routes

Miles

0 0.5 1

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Tier 1
Park Retaining Wall Overview

Crater Lake National Park

Federal Lands Highway
Road Inventory Program

Parkwide Summary: Crater Lake National Park

Initial retaining wall inspections were conducted at Crater Lake 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 Crater Lake National Park in 2010 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, 24 walls were inventoried on the routes listed below.

Table 1: Number of Walls by Route

Route Number	Route Name	No. of Walls
0012	MUNSON VALLEY ROAD	1
0013	EAST RIM DRIVE	14
0014	WEST RIM DRIVE	6
0914	FOSSIL FUMAROLES - GODFREY GLEN OVERLOOK	1
0932	SKELL HEAD OVERLOOK	1
0939	PHANTOM SHIP OVERLOOK	1

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
FW - Fill Wall	20
SP - Slope Protection	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
GD, Gravity - Dry Stone	4
GM, Gravity - Mortared Stone	20

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	12
Monitor	$0	0
Maintenance	$1,230	2
Repair Elements	$442,291	9
Replace Elements	$135,875	1
Replace Wall	$0	0
Totals	**$579,396**	**24**

*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	12
$1 - $25,000	7
$25,001 - $50,000	0
$50,001 - $100,000	2
$100,001 - $250,000	3
$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	**24**

*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 Crater Lake 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 mortor 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 Crater Lake 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)
No critically deficient walls.				

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.

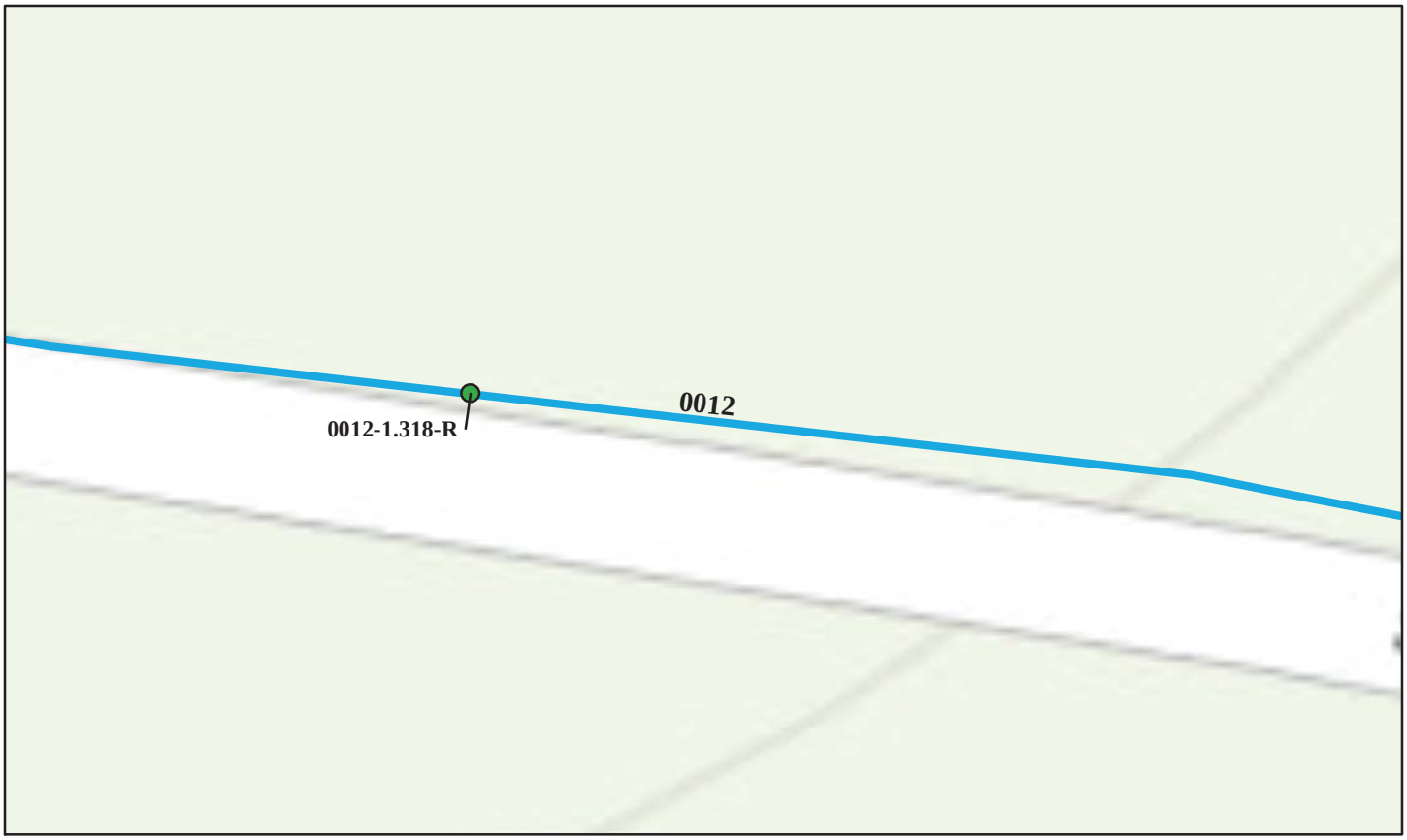
Tier 2
Route Retaining Wall Overview

Crater Lake National Park

Federal Lands Highway
Road Inventory Program

Crater Lake National Park

ROUTE 0012: MUNSON VALLEY 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
CRLA-0012-1.318-R 7/17/2007	144	36	Gravity - Mortared Stone	Fill Wall	85	$1,180.00

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

Crater Lake National Park

ROUTE 0013: EAST RIM DRIVE

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

Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)	Fair (50 - 69)	Good to Excellent (70 - 100)	No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
CRLA-0013-4.800-L 7/17/2007	414	53	Gravity - Mortared Stone	Fill Wall	82	$0.00
CRLA-0013-10.112-L 7/17/2007	974	124	Gravity - Mortared Stone	Fill Wall	92	$0.00
CRLA-0013-13.930-L 7/17/2007	2,040	218	Gravity - Mortared Stone	Fill Wall	78	$76,511.00
CRLA-0013-15.271-L 7/17/2007	5,005	139	Gravity - Dry Stone	Slope Protection	87	$0.00
CRLA-0013-15.325-L 7/17/2007	12,368	342	Gravity - Dry Stone	Slope Protection	87	$0.00

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

Crater Lake National Park

ROUTE 0013: EAST RIM DRIVE

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

Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)	Fair (50 - 69)	Good to Excellent (70 - 100)	No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
CRLA-0013-15.415-L 7/19/2007	142	21	Gravity - Mortared Stone	Fill Wall	70	$2,360.00
CRLA-0013-15.419-L 7/18/2007	2,109	157	Gravity - Dry Stone	Slope Protection	87	$0.00
CRLA-0013-15.450-L 7/18/2007	1,366	124	Gravity - Mortared Stone	Fill Wall	76	$51,225.00
CRLA-0013-15.490-L 7/18/2007	8,596	158	Gravity - Dry Stone	Slope Protection	81	$0.00
CRLA-0013-15.537-L 7/18/2007	10,551	412	Gravity - Mortared Stone	Fill Wall	78	$50.00

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

Crater Lake National Park

ROUTE 0013: EAST RIM DRIVE

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

Retaining Wall Condition Legend – Wall Condition Rating

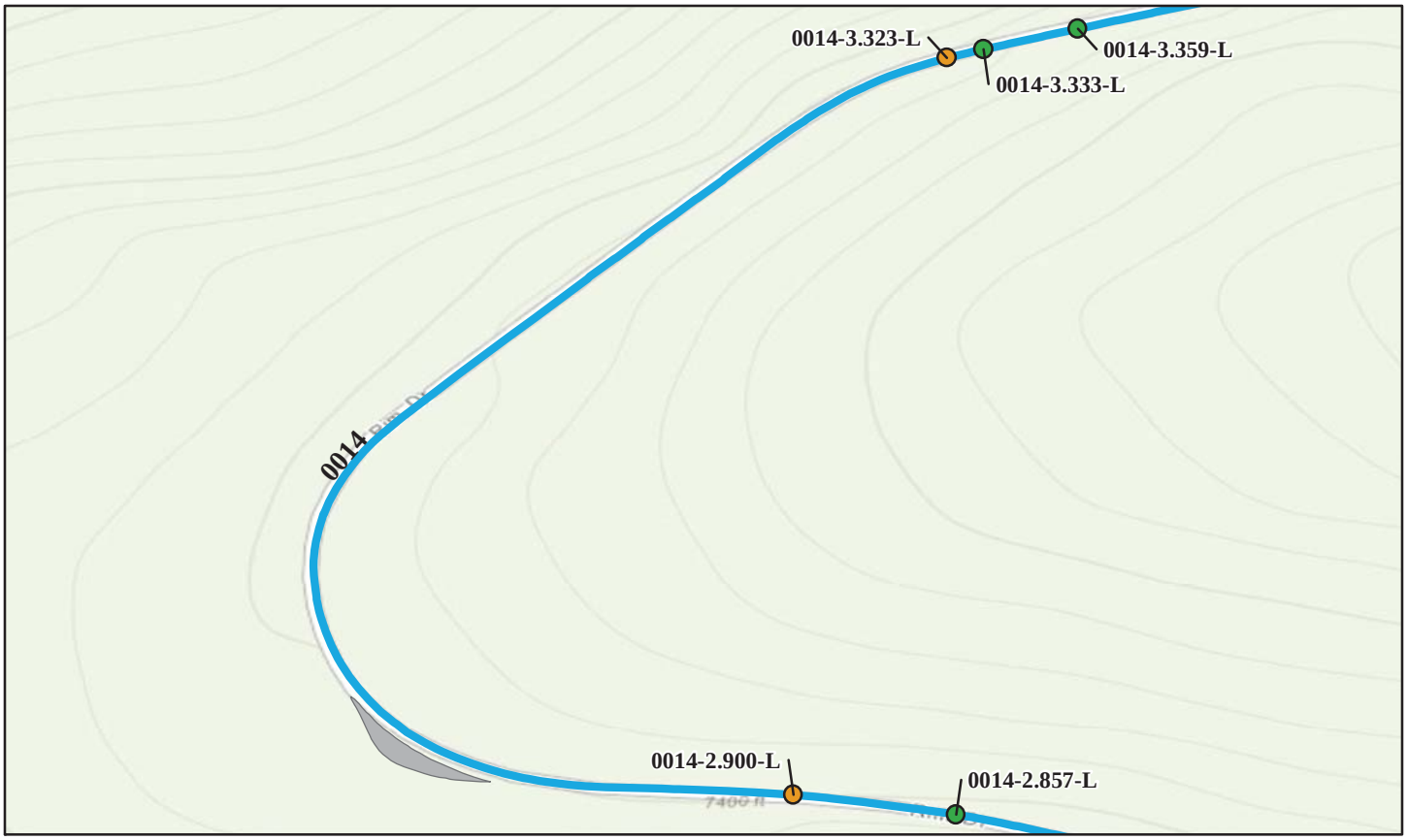
Critical / Poor (0 - 49)	Fair (50 - 69)	Good to Excellent (70 - 100)	No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
CRLA-0013-15.623-L 7/18/2007	3,570	176	Gravity - Mortared Stone	Fill Wall	78	$133,875.00
CRLA-0013-17.832-L 7/18/2007	784	148	Gravity - Mortared Stone	Fill Wall	88	$0.00
CRLA-0013-18.386-L 7/18/2007	721	175	Gravity - Mortared Stone	Fill Wall	90	$0.00
CRLA-0013-18.568-L 7/19/2007	2,539	253	Gravity - Mortared Stone	Fill Wall	62	$121,420.00

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

Crater Lake National Park

ROUTE 0014: WEST RIM DRIVE



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

Retaining Wall Condition Legend – Wall Condition Rating

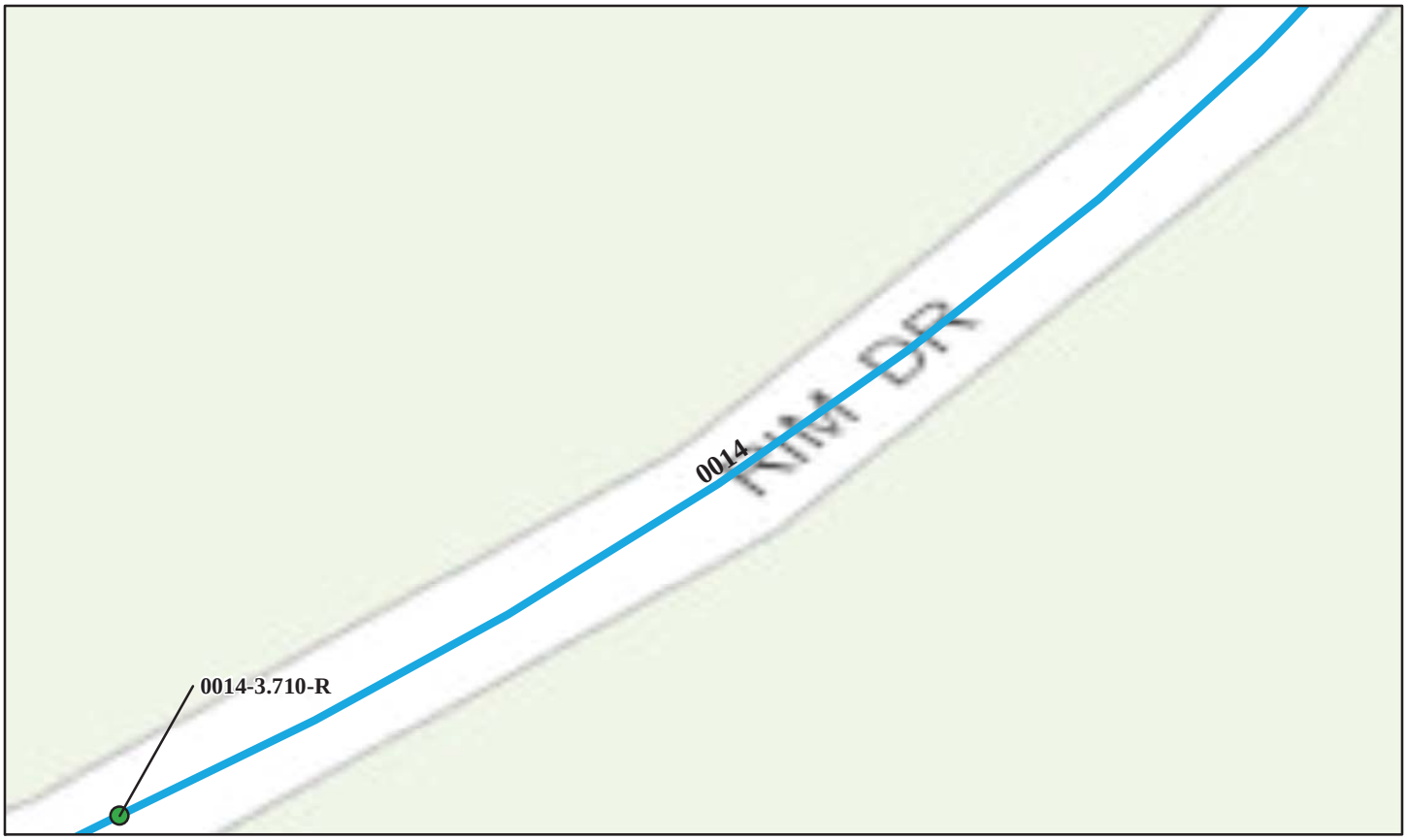
Critical / Poor (0 - 49)	Fair (50 - 69)	Good to Excellent (70 - 100)	No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
CRLA-0014-2.857-L 7/16/2007	930	120	Gravity - Mortared Stone	Fill Wall	83	$16,620.00
CRLA-0014-2.900-L 7/17/2007	2,642	328	Gravity - Mortared Stone	Fill Wall	63	$135,875.00
CRLA-0014-3.323-L 7/17/2007	178	48	Gravity - Mortared Stone	Fill Wall	65	$12,000.00
CRLA-0014-3.333-L 7/17/2007	110	21	Gravity - Mortared Stone	Fill Wall	88	$0.00
CRLA-0014-3.359-L 7/17/2007	96	27	Gravity - Mortared Stone	Fill Wall	86	$0.00

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

Crater Lake National Park

ROUTE 0014: WEST RIM DRIVE



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

Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)	Fair (50 - 69)	Good to Excellent (70 - 100)	No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
CRLA-0014-3.710-R 7/17/2007	1,410	154	Gravity - Mortared Stone	Fill Wall	78	$0.00

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

Crater Lake National Park

ROUTE 0914: FOSSIL FUMAROLES - GODFREY GLEN OVERLOOK

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
CRLA-0914-0.000-P1 7/17/2007	212	67	Gravity - Mortared Stone	Fill Wall	68	$15,780.00

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

Crater Lake National Park

ROUTE 0932: SKELL HEAD OVERLOOK

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

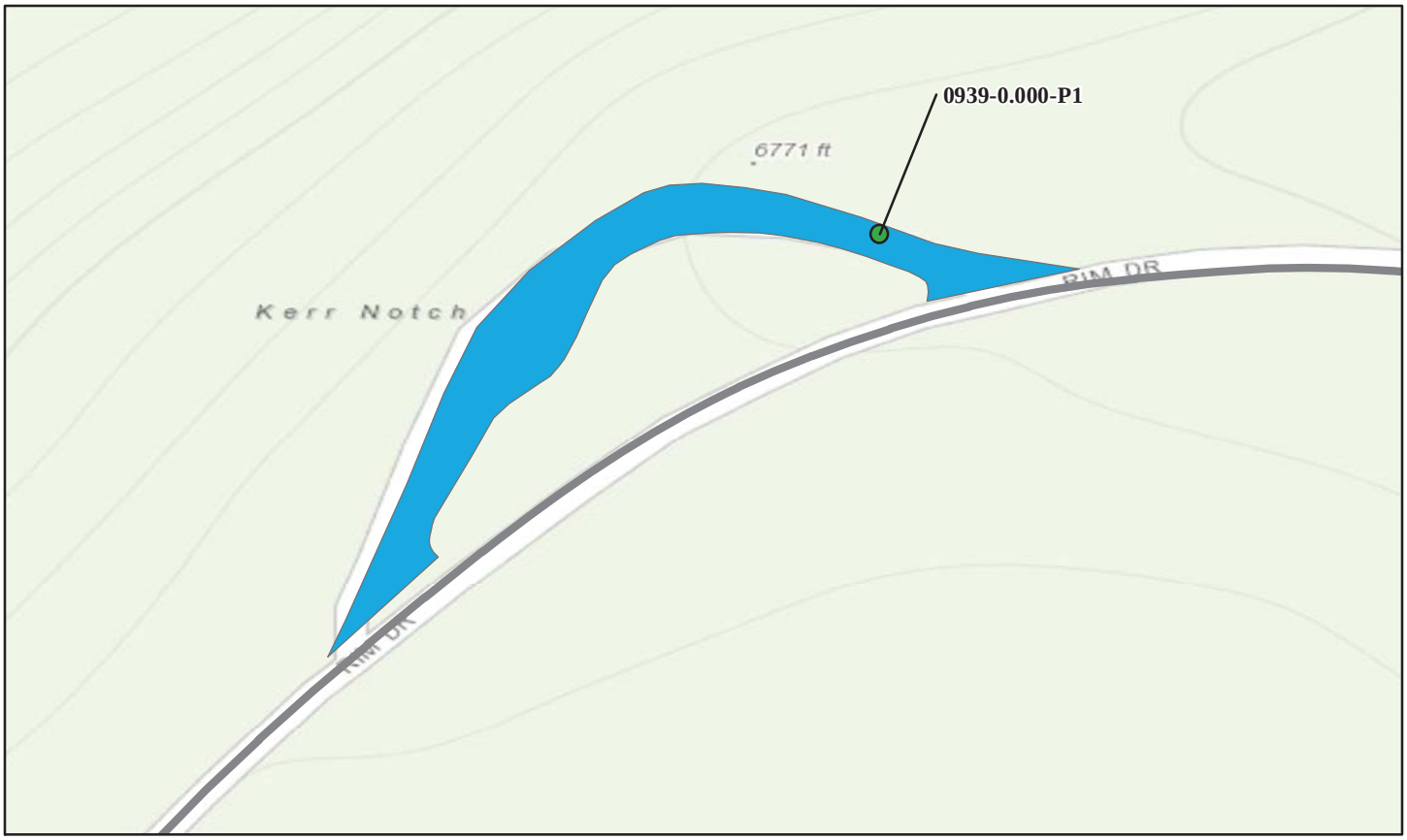
Critical / Poor (0 - 49)	Fair (50 - 69)	Good to Excellent (70 - 100)	No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
CRLA-0932-0.000-P1 7/17/2007	586	92	Gravity - Mortared Stone	Fill Wall	61	$12,500.00

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

Crater Lake National Park

ROUTE 0939: PHANTOM SHIP OVERLOOK



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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
CRLA-0939-0.000-P1 7/17/2007	192	49	Gravity - Mortared Stone	Fill Wall	85	$0.00

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

Tier 3
Retaining Wall Details

Crater Lake National Park

Federal Lands Highway
Road Inventory Program

Wall ID:	**CRLA-0012-1.318-R**		
Route Name:	MUNSON VALLEY ROAD		
Inspection Date:	July 17, 2007	**Approximate Year Built:**	1959
***Wall Rating:**	85	**Maintenance Action:**	Maintenance

Wall Description

Wall Function:	Fill Wall	**Primary Wall Type:**	Gravity - Mortared Stone
Surface Treatment:		**Secondary Wall Type:**	
Secondary Surface Treatment:		**Architectural Facing:**	
General Description:	Fill wall just before bridge		

Wall Measurements

Wall Length (ft.):	36	**Face Area (sq.):**	144
Average Wall Height (ft.):	4	**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	Wall is performing as constructed however to stop slope erosion under down drain, repair is recommended.	8
WALL FOUNDATION MATERIAL 8.00	4 foot flat soil bench/ road fill	9
MORTAR 8.00	Evidence of debonding and spalling over 10% of the wall area. Average depth is 2 inches and width of 0.5 to 1 inch. There is one vertical crack mostly in the mortar, at 18.5 feet from start , 1/8 inch wide with one stone cracked. Not effecting the pe	8
STONE MASONRY 8.00	Strong stones that do not show any distress	9
DOWNSLOPE 0.50	35 degree soil slope with a few trees. Evidence of surface depth erosion	8
LATERAL SLOPE 0.50	Soil; some vegetation on the start end. At end of wall is a concrete bridge abutment	9
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress.	9
WALL DRAINS 0.50	No obvious drains, no distress	9
CURB/BERM/DITCH 1.00	Surface drainage at 32 feet from start of wall. 1/2 round CMP down drain below surface drain outlet that has shifted towards the end of the wall 1.5 feet O.C. It is missing one anchor on top	6

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Re-establish correct position for down drain and remove and replace 4 anchors at top. 16 man hrs. * $55m = 880. 4 anchors * $75 = 300. 300+880=1180
Repair Cost:	$1,180

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

Crater Lake National Park

ROUTE 0012: MUNSON VALLEY ROAD

Retaining Wall Condition Photos

CRLA_0012_1.318_R_1.jpg

CRLA_0012_1.318_R_2.jpg

Wall ID:	**CRLA-0013-4.800-L**		
Route Name:	EAST RIM DRIVE		
Inspection Date:	July 17, 2007	**Approximate Year Built:**	1934
***Wall Rating:**	82	**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:	N/A		

Wall Measurements

Wall Length (ft.):	53	**Face Area (sq.):**	414
Average Wall Height (ft.):	8	**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	Foundation repaired	8
WALL FOUNDATION MATERIAL 8.00	Floater stones placed, rock & colluvium	8
MORTAR 8.00	Minor mortar cracking/debonding with an average depth of 2 inches and 1 inch wide over 10% of the wall surface.	8
STONE MASONRY 8.00	No distress	9
DOWNSLOPE 0.50	Steep colluvium, stable	8
CURB/BERM/DITCH 0.50	No wall related distress.	9
LATERAL SLOPE 0.50	Steep colluvium, stable	9
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress.	10
UPSLOPE 0.50	Red cliffs, stable	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.

Crater Lake National Park

ROUTE 0013: EAST RIM DRIVE

Retaining Wall Condition Photos

CRLA_0013_4.800_L_1.jpg

Wall ID:	**CRLA-0013-10.112-L**		
Route Name:	EAST RIM DRIVE		
Inspection Date:	July 17, 2007	**Approximate Year Built:**	1936
***Wall Rating:**	92	**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:	Fill wall between small pullouts 20 ft rock cut opposite.		

Wall Measurements

Wall Length (ft.):	124	**Face Area (sq.):**	974
Average Wall Height (ft.):	8	**Face Angle (deg.):**	87
Maximum Wall Height (ft.):	16	**Vertical Offset (ft.):**	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Performing as intended	10
WALL FOUNDATION MATERIAL 8.00	On rock	10
MORTAR 8.00	Repointed on upper wall and guardwall, in 2006-2007 season. Lower wall - cracking 1/8" to 1/4" ~ 15%. 1 to 2 inch voids infrequent. Lower wall end was repointed earlier	8
STONE MASONRY 8.00	No distress	9
CURB/BERM/DITCH 0.50	No wall related distress.	10
DOWNSLOPE 0.50	Rock slope	10
LATERAL SLOPE 0.50	Steep and rocky	10
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress.	10
UPSLOPE 0.50	Rock slope	10

Repair Recommendations

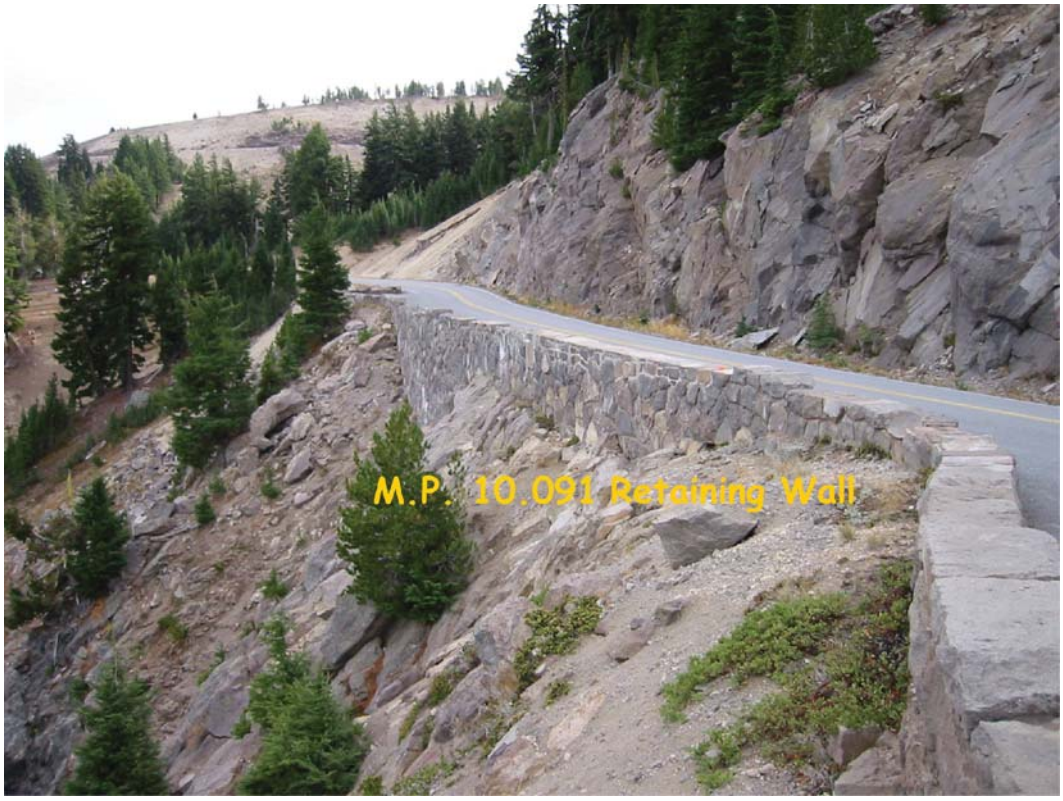
Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	$0

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

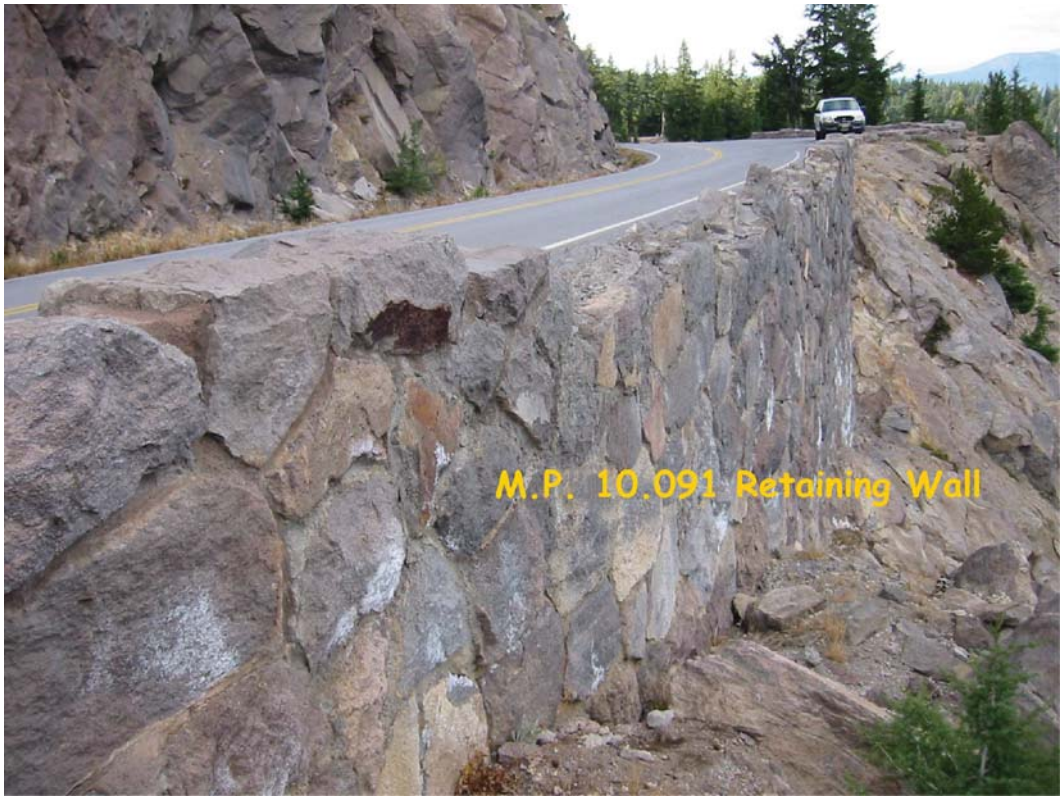
Crater Lake National Park

ROUTE 0013: EAST RIM DRIVE

Retaining Wall Condition Photos



CRLA_0013_10.112_L_1.jpg



CRLA_0013_10.112_L_2.jpg

Wall ID:	**CRLA-0013-13.930-L**		
Route Name:	EAST RIM DRIVE		
Inspection Date:	July 17, 2007	**Approximate Year Built:**	1936
***Wall Rating:**	78	**Maintenance Action:**	Repair Elements

Wall Description

Wall Function:	Fill Wall	**Primary Wall Type:**	Gravity - Mortared Stone
Surface Treatment:		**Secondary Wall Type:**	
Secondary Surface Treatment:		**Architectural Facing:**	
General Description:	30 ft rock cut opposite		

Wall Measurements

Wall Length (ft.):	218	**Face Area (sq.):**	2040
Average Wall Height (ft.):	9	**Face Angle (deg.):**	87
Maximum Wall Height (ft.):	13	**Vertical Offset (ft.):**	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Mortar distress problem long term.	7
WALL FOUNDATION MATERIAL 8.00	No bedrock, no undermining; probable repair at base, but could be original construction	9
MORTAR 8.00	First 45 feet of wall shows considerable spalling over 60% - voids to 4" deep and 2" wide. From 45-160 ft debonding over 15%, remaining wall debonding over about 35%.	6
STONE MASONRY 8.00	No distress.	9
DOWNSLOPE 0.50	Steep colluvium that can ravel. Appears to be stable.	8
LATERAL SLOPE 0.50	Steep colluvium	9
WALL DRAINS 0.50	At least two weep holes present	9
CURB/BERM/DITCH 0.50	No wall related distress.	10
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress.	10

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Repointing of 50% of wall face: Wall area = 2040.3 x 0.5 = 963.275 Repointing 1020.15sf * $75/sf = $76511
Repair Cost:	$76,511

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

Crater Lake National Park

ROUTE 0013: EAST RIM DRIVE

Retaining Wall Condition Photos

CRLA_0013_13.930_L_1.jpg

Wall ID:	**CRLA-0013-15.271-L**		
Route Name:	EAST RIM DRIVE		
Inspection Date:	July 17, 2007	**Approximate Year Built:**	1934
***Wall Rating:**	87	**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:	Dutton Cliffs area. Pinnacles Road 400 ft below.		

Wall Measurements

Wall Length (ft.):	139	**Face Area (sq.):**	5005
Average Wall Height (ft.):	36	**Face Angle (deg.):**	48
Maximum Wall Height (ft.):	50	**Vertical Offset (ft.):**	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Performing as intended	9
WALL FOUNDATION MATERIAL 8.00	Steep colluvium, no bench, stable	8
PLACED STONE 8.00	Minimal voids, slight surface irregularities, stones tight (good interlock).	9
ROAD/SIDEWALK/SHOULDER 0.50	Pavement cracking at base of parapet, parapet related	8
DOWNSLOPE 0.50	Colluvial, ravelly but stable	9
LATERAL SLOPE 0.50	Rock outcrop at end, stable colluvium at start	9
WALL DRAINS 0.50	Self draining face, no distress	9

Repair Recommendations

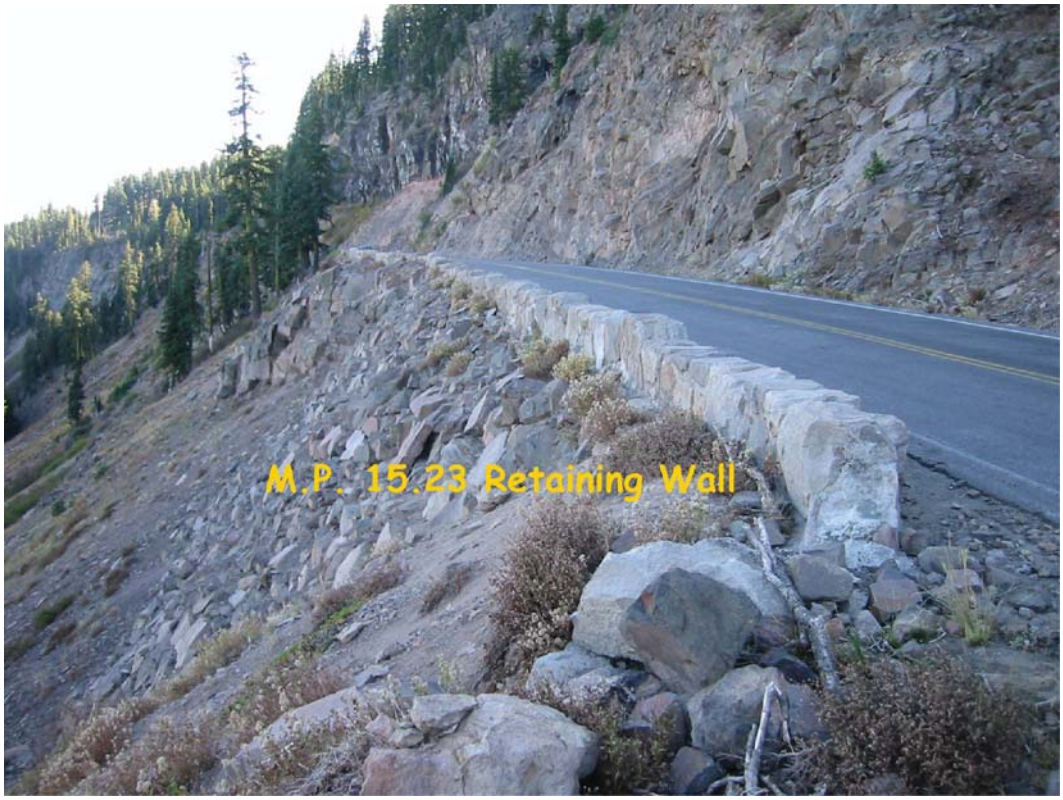
Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	$0

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

Crater Lake National Park

ROUTE 0013: EAST RIM DRIVE

Retaining Wall Condition Photos



CRLA_0013_15.271_L_1.jpg

Wall ID:	**CRLA-0013-15.325-L**		
Route Name:	EAST RIM DRIVE		
Inspection Date:	July 17, 2007	**Approximate Year Built:**	1937
***Wall Rating:**	87	**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:	Dutton Cliffs area. Pinnacles road 400 ft below.		

Wall Measurements

Wall Length (ft.):	342	**Face Area (sq.):**	12368
Average Wall Height (ft.):	36	**Face Angle (deg.):**	47
Maximum Wall Height (ft.):	76	**Vertical Offset (ft.):**	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Performing as intended	9
WALL FOUNDATION MATERIAL 8.00	Soil/talus, no bench, steep (40 degrees)	8
PLACED STONE 8.00	8ft minus stones, slightly oversteepened at beginning of top, irregular face (non-planar - ok), voids 1-2ft, tight stone contact/interlock	9
STONE MASONRY 8.00	Compound constructed slope at upper section of wall - minor wall element	9
DOWNSLOPE 0.50	Talus/soil colluvium ~38-40degrees. Ravelly but stable	8
ROAD/SIDEWALK/SHOULDER 0.50	Minor cracking	8
LATERAL SLOPE 0.50	Steep soil/talus, no distress	9
WALL DRAINS 0.50	Self draining face, no 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.

Crater Lake National Park

ROUTE 0013: EAST RIM DRIVE

Retaining Wall Condition Photos

Condition photos are not available for CRLA-0013-15.325-L.

Wall ID:	**CRLA-0013-15.415-L**		
Route Name:	EAST RIM DRIVE		
Inspection Date:	July 19, 2007	**Approximate Year Built:**	Unknown
***Wall Rating:**	70	**Maintenance Action:**	Repair Elements

Wall Description

Wall Function:	Fill Wall	**Primary Wall Type:**	Gravity - Mortared Stone
Surface Treatment:		**Secondary Wall Type:**	
Secondary Surface Treatment:		**Architectural Facing:**	
General Description:	Wall begins in pullout near end. Wall ends at beginning of SP wall. Dutton Cliffs area.		

Wall Measurements

Wall Length (ft.):	21	**Face Area (sq.):**	142
Average Wall Height (ft.):	6	**Face Angle (deg.):**	69
Maximum Wall Height (ft.):	8	**Vertical Offset (ft.):**	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	No threat short term, foundation/drainage outlet distress long term threat to performance.	7
WALL FOUNDATION MATERIAL 8.00	Steep talus and soil (43 degrees) - no bench. Undermined 2.5' deep x4'x1' at culvert outlet.	5
MORTAR 8.00	Lt. cracking (>1/8", 15% of wall). Large 2-3" grout joints (a little sloppy).	8
STONE MASONRY 8.00	Irregular face, constructed that way, good interlock. Stones sound.	8
DOWNSLOPE 0.50	43 degrees talus and soil drainage channel from culvert.	8
LATERAL SLOPE 0.50	Embankment 40degrees start, SP wall at end - no distress	9
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress.	9
WALL DRAINS 0.50	None visible - no distress	9
CULVERT 1.00	18" cmp through wall - dented at end but functional. Eroded outlet 4 ft deep	5

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Underpin foundation void at culvert: 4'x3'x2' (includes 1'subexc) = 24cf Use 1cy. Use on-site materials. 2 crewx16hrsx$55/hr = $1760. Erosion Repair at outlet: 5cy class 6 riprap. 5cy x $120/cy = $600
Repair Cost:	$2,360

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

Crater Lake National Park

ROUTE 0013: EAST RIM DRIVE

Retaining Wall Condition Photos

CRLA_0013_15.415_L_1.jpg

Wall ID:	**CRLA-0013-15.419-L**		
Route Name:	EAST RIM DRIVE		
Inspection Date:	July 18, 2007	**Approximate Year Built:**	Unknown
***Wall Rating:**	87	**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:	Dutton Cliffs area. Overlaps GM wall at end		

Wall Measurements

Wall Length (ft.):	157	**Face Area (sq.):**	2109
Average Wall Height (ft.):	13	**Face Angle (deg.):**	47
Maximum Wall Height (ft.):	20	**Vertical Offset (ft.):**	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Performing as intended	9
WALL FOUNDATION MATERIAL 8.00	Deep talus, 37 degrees, stable, no bench.	8
PLACED STONE 8.00	7' minus angular stones, irregular face, voids to 1ft. Stones well interlocked.	9
DOWNSLOPE 0.50	Stable talus, 37 degrees, no distress	8
LATERAL SLOPE 0.50	GM wall, no distress	9
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress.	9
WALL DRAINS 0.50	Self draining face, no 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.

Crater Lake National Park

ROUTE 0013: EAST RIM DRIVE

Retaining Wall Condition Photos

Condition photos are not available for CRLA-0013-15.419-L.

Wall ID:	**CRLA-0013-15.450-L**		
Route Name:	EAST RIM DRIVE		
Inspection Date:	July 18, 2007	**Approximate Year Built:**	1931
***Wall Rating:**	76	**Maintenance Action:**	Repair Elements

Wall Description

Wall Function:	Fill Wall	**Primary Wall Type:**	Gravity - Mortared Stone
Surface Treatment:		**Secondary Wall Type:**	
Secondary Surface Treatment:		**Architectural Facing:**	
General Description:	Overlaps SP wall at start, approx 10 ft. Dutton Cliffs area.		

Wall Measurements

Wall Length (ft.):	124	**Face Area (sq.):**	1366
Average Wall Height (ft.):	11	**Face Angle (deg.):**	84
Maximum Wall Height (ft.):	14	**Vertical Offset (ft.):**	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Mortar distress may threaten long term performance. No short term issue.	7
WALL FOUNDATION MATERIAL 8.00	Steep soil/talus, 37 degrees. No bench	8
MORTAR 8.00	Weathered with grout loss and voids 1/2-1.5" over 20-305 of mortar. Cracking/debonding over additional 10-20%. Existing mortar sound.	6
STONE MASONRY 8.00	No distress, plumb.	9
DOWNSLOPE 0.50	Steep soil/talus 37 degrees, poorly vegetated	8
LATERAL SLOPE 0.50	SP wall at start, rock outcrop at end	9
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress.	9
WALL DRAINS 0.50	None seen, no distress	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Repoint mortar over 50% of wall face area: 1365.5sf x 0.5 = 683sf, 683sf x $75/sf = $51,225
Repair Cost:	$51,225

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

Crater Lake National Park

ROUTE 0013: EAST RIM DRIVE

Retaining Wall Condition Photos

Condition photos are not available for CRLA-0013-15.450-L.

Wall ID:	**CRLA-0013-15.490-L**		
Route Name:	EAST RIM DRIVE		
Inspection Date:	July 18, 2007	**Approximate Year Built:**	Unknown
***Wall Rating:**	81	**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:	SP extends below outcrop at wall start - wall below outcrop not included in area. Upper wall steeper near end. Dutton Cliffs area. WALL AREA IS VERTICAL PROJECTION.		

Wall Measurements

Wall Length (ft.):	158	**Face Area (sq.):**	8596
Average Wall Height (ft.):	54	**Face Angle (deg.):**	49
Maximum Wall Height (ft.):	82	**Vertical Offset (ft.):**	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Performing as constructed. Last 5 feet has 3 ft stones missing.	8
WALL FOUNDATION MATERIAL 8.00	40 degree soil and talus with no bench	8
PLACED STONE 8.00	Stones 8ft minus, angular. Irregular face. Up to 2' voids. Good interlock. Last 5 feet of wall is missing lower wall stones.	8
DOWNSLOPE 0.50	Soil and talus slope, 40 degrees, 30% vegetated. Pinnacles road at bottom of slope.	8
UPSLOPE 0.50	Cliff and rock slopes source of boulders hitting guardwall - damage to upper wall	8
LATERAL SLOPE 0.50	Rock outcrop at start, shallow soil over bedrock at end	9
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress.	9
WALL DRAINS 0.50	Self draining face, no 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.

Crater Lake National Park

ROUTE 0013: EAST RIM DRIVE

Retaining Wall Condition Photos

Condition photos are not available for CRLA-0013-15.490-L.

Wall ID:	**CRLA-0013-15.537-L**		
Route Name:	EAST RIM DRIVE		
Inspection Date:	July 18, 2007	**Approximate Year Built:**	1931
***Wall Rating:**	78	**Maintenance Action:**	Maintenance

Wall Description

Wall Function:	Fill Wall	**Primary Wall Type:**	Gravity - Mortared Stone
Surface Treatment:		**Secondary Wall Type:**	
Secondary Surface Treatment:		**Architectural Facing:**	
General Description:	Dutton Cliffs area. Guardwall missing 0-107 and 225-330, probably due to rockfall impact. Highest GM wall I have ever seen. Could not access face or toe without ropes. Could not rope up with 2 person crew.		

Wall Measurements

Wall Length (ft.):	412	**Face Area (sq.):**	10551
Average Wall Height (ft.):	25	**Face Angle (deg.):**	84
Maximum Wall Height (ft.):	46	**Vertical Offset (ft.):**	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Appears to be performing as intended	8
WALL FOUNDATION MATERIAL 8.00	Steep grassy soil and bedrock outcrops	8
MORTAR 8.00	Face not accessible. Can't rate. Other walls of same age in area need repointing. IF mortar distress is present, it is not effecting overall wall performance in the short term.	7
STONE MASONRY 8.00	Plumb - no distortion, deflection, displacement. Could not see individual stones up close.	8
CURB/BERM/DITCH 0.50	Asphalt "ditch" 6" deep x 2' between pavement and guardwall base. Little apparent seepage behind wall. Water spilling onto wall face at missing GW at 225' onto rock outcrop.	8
DOWNSLOPE 0.50	Steep grassy slope and outcrops. Stable.	8
WALL DRAINS 0.50	Culvert through wall at 98 ft from start 4 ft below wall top. Flowing and vegetation on wall below outlet. No distress evident.	8
LATERAL SLOPE 0.50	Outcrops both ends	9
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress.	9

Repair Recommendations

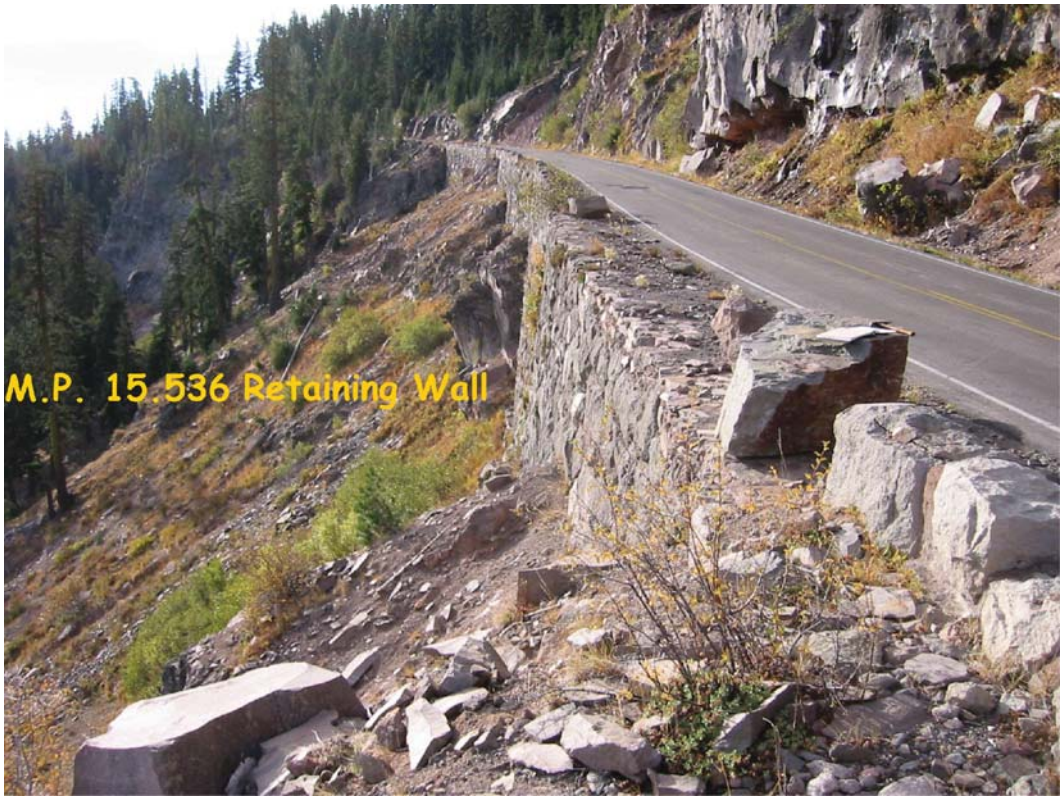
Failure Consequence:	MODERATE
Recommendation Narrative:	Further inspection required. 3 person crew minimum- rope up. Use vehicle as anchor. Will block one lane. Need traffic control.
Repair Cost:	$50

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

Crater Lake National Park

ROUTE 0013: EAST RIM DRIVE

Retaining Wall Condition Photos



CRLA_0013_15.537_L_1.jpg

Wall ID:	**CRLA-0013-15.623-L**		
Route Name:	EAST RIM DRIVE		
Inspection Date:	July 18, 2007	**Approximate Year Built:**	1937
***Wall Rating:**	78	**Maintenance Action:**	Repair Elements

Wall Description

Wall Function:	Fill Wall	**Primary Wall Type:**	Gravity - Mortared Stone
Surface Treatment:		**Secondary Wall Type:**	
Secondary Surface Treatment:		**Architectural Facing:**	
General Description:	Dutton Cliffs area. Wall ends just before pullout left.		

Wall Measurements

Wall Length (ft.):	176	**Face Area (sq.):**	3570
Average Wall Height (ft.):	20	**Face Angle (deg.):**	85
Maximum Wall Height (ft.):	27	**Vertical Offset (ft.):**	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Mortar distress poses long term threat to performance	7
WALL FOUNDATION MATERIAL 8.00	1' bench for part of wall, no undermining, soil/talus material	9
MORTAR 8.00	Lots of debonding, several void areas with gaps as wide as 4", about 50% of grout	6
STONE MASONRY 8.00	Plumb, no distress	9
CURB/BERM/DITCH 0.50	Paved waterway 3 ft wide between pavement and guardwall. Slight cracking, infiltration and settlement.	8
DOWNSLOPE 0.50	Steep, 38-40 degrees, soil/talus, stable	9
LATERAL SLOPE 0.50	Outcrop start, steep soil/talus end.	9
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress.	9
WALL DRAINS 0.50	12" cmp in wall, no distress	9

Repair Recommendations

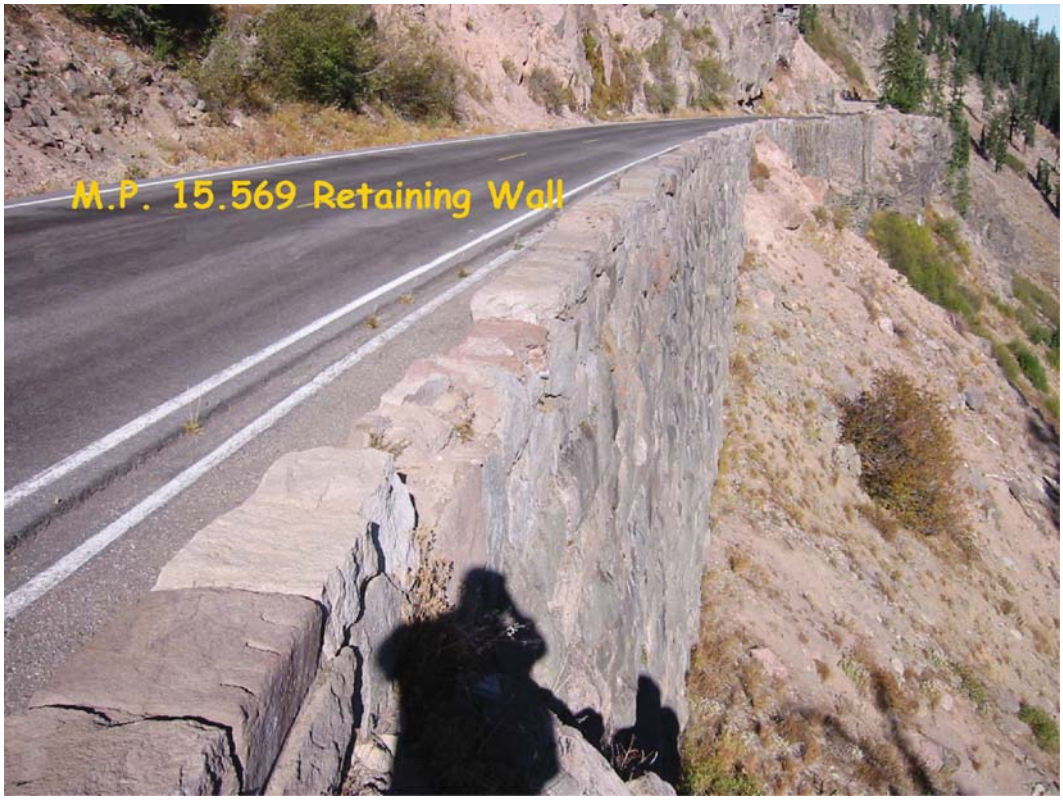
Failure Consequence:	MODERATE
Recommendation Narrative:	50% of wall needs repointing wall area = 3570 sf, 1/2 = 1785 sf. Repointing repair: 1785sf * $75/sf = $133875
Repair Cost:	$133,875

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

Crater Lake National Park

ROUTE 0013: EAST RIM DRIVE

Retaining Wall Condition Photos



CRLA_0013_15.623_L_1.jpg

Wall ID:	**CRLA-0013-17.832-L**		
Route Name:	EAST RIM DRIVE		
Inspection Date:	July 18, 2007	**Approximate Year Built:**	Unknown
***Wall Rating:**	88	**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:	Small length of guardwall on top of large boulder included in wall length. Not included in walll area. 15 ftrock cut opposite.		

Wall Measurements

Wall Length (ft.):	148	**Face Area (sq.):**	784
Average Wall Height (ft.):	5	**Face Angle (deg.):**	86
Maximum Wall Height (ft.):	8	**Vertical Offset (ft.):**	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Performing as intended	9
WALL FOUNDATION MATERIAL 8.00	Soil/talus material, 2' bench. No distress.	9
MORTAR 8.00	Lt. cracking and grout loss (cracks<1/8", voids to 1") over ~10% of wall. Mortar sound.	8
STONE MASONRY 8.00	No distress	9
DOWNSLOPE 0.50	Soil/talus, ~35 degrees, some vegetation, no distress	9
LATERAL SLOPE 0.50	Guardwall both ends, soil/talus slopes below. No distress.	9
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress.	9
WALL DRAINS 0.50	None seen. No 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.

Crater Lake National Park

ROUTE 0013: EAST RIM DRIVE

Retaining Wall Condition Photos

CRLA_0013_17.832_L_1.jpg

Wall ID:	**CRLA-0013-18.386-L**		
Route Name:	EAST RIM DRIVE		
Inspection Date:	July 18, 2007	**Approximate Year Built:**	Unknown
***Wall Rating:**	90	**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:	Short wall in the middle of a long run of guardwall. Wall starts in narrow pullout, left.		

Wall Measurements

Wall Length (ft.):	175	**Face Area (sq.):**	721
Average Wall Height (ft.):	4	**Face Angle (deg.):**	84
Maximum Wall Height (ft.):	5	**Vertical Offset (ft.):**	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Performing as intended	9
WALL FOUNDATION MATERIAL 8.00	Soil/talus w/1' bench. Short sections (2) of concrete footer visible. No distress	9
MORTAR 8.00	No distress	9
STONE MASONRY 8.00	No distress	9
DOWNSLOPE 0.50	Steep (~37 degrees), soil/talus. Stable	8
LATERAL SLOPE 0.50	Guardwall both sides, steep soil/talus below. No distress.	9
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress.	9
WALL DRAINS 0.50	4" pvc toe drains. No distress	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.

Crater Lake National Park

ROUTE 0013: EAST RIM DRIVE

Retaining Wall Condition Photos

Condition photos are not available for CRLA-0013-18.386-L.

Wall ID:	**CRLA-0013-18.568-L**		
Route Name:	EAST RIM DRIVE		
Inspection Date:	July 19, 2007	**Approximate Year Built:**	Unknown
***Wall Rating:**	62	**Maintenance Action:**	Repair 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:	Combination GM/GD and FW/SP wall below raveling 50 high cut with rock out crop. GD/SP below GM 48 ft fron start to 134 from start and from 202 from start through to the end of wall.		

Wall Measurements

Wall Length (ft.):	253	**Face Area (sq.):**	2539
Average Wall Height (ft.):	10	**Face Angle (deg.):**	87
Maximum Wall Height (ft.):	33	**Vertical Offset (ft.):**	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Performance of the foundation is threatening the entire GM wall. Evidence of rotational and translational movement. There is various types of mortar suggesting of several attempts to stabilize the wall.	5
WALL FOUNDATION MATERIAL 8.00	GM wall - Foundation shows evidence of being undermined / rotated with the stones having a void 1 foot in height and max depth of 1 foot through out the GM wall. Soil / talus foundation material is 80% of the wall's foundation base. GD Wall - foundatio	5
MORTAR 8.00	Mortar overall shows signs of debonding and spalling over 50% of the GM wall. Areas of spalling up to 0.75 feet by 0.75 feet by 0.5 feet deep. Mortar that is bonded shows slight weathering and no soft areas.	6
STONE MASONRY 8.00	The general stone size for the GM wall consists of 3 foot minus with 90% of the stones are well interlocking and angular flat faced stones. 10% of the stones are not interlocking . Less than 5% of the stones are missing with the largest one 3 feet by 3	7
PLACED STONE 8.00	The general stone size for the GD consists of 8 foot minus with 75% being well interlocking stones and 25% not well interlocking stones. Void spaces between the stones are a max. 1 foot by 1foot by 5 feet deep.	8
DOWNSLOPE 0.50	35 to 37 degrees soil and talus slope with bed rock outcrops.	8
LATERAL SLOPE 0.50	At the start end of the wall the lateral slope is the GM guard wall. The end of the wall is GM guardwall and soil slope at 35 to 37 degrees that shows signs of erosion surface deep channel (6" deep and 1 foot across) along the entire length of the lateral	8
ROAD/SIDEWALK/SHOULDER 1.00	Road shows no sign of distress in pavement. However the wall is separated from the paved shoulder. Between 16 feet and 54 feet the shoulder the pavement has a crack 3" wide and 1 foot long but the wall looks like it shifted from the pavement ~ 1 foot. (	4
WALL DRAINS 1.00	NO evidence of wall drains. However there is areas of evidence drainage that is causing some erosion between the mortared stone and dry placed stone. 152 feet from the start of the wall vegetation is lush at the base of the GD foundation.	6

Wall ID:	**CRLA-0013-18.568-L**		
Route Name:	EAST RIM DRIVE		
Inspection Date:	July 19, 2007	**Approximate Year Built:**	Unknown
***Wall Rating:**	62	**Maintenance Action:**	Repair Elements

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Deepen foundation on the GM wall/ INVESTIGATION is REQUIRED. Under pin the length of wall that is not founded on bedrock. Underpinning however no cost so price out stone wall below grade. Assume investigation determined that stable ground is at 2 feet
Repair Cost:	$121,420

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

Crater Lake National Park

ROUTE 0013: EAST RIM DRIVE

Retaining Wall Condition Photos

Condition photos are not available for CRLA-0013-18.568-L.

Wall ID:	**CRLA-0014-2.857-L**		
Route Name:	WEST RIM DRIVE		
Inspection Date:	July 16, 2007	**Approximate Year Built:**	Unknown
***Wall Rating:**	83	**Maintenance Action:**	Repair Elements

Wall Description

Wall Function:	Fill Wall	**Primary Wall Type:**	Gravity - Mortared Stone
Surface Treatment:		**Secondary Wall Type:**	
Secondary Surface Treatment:		**Architectural Facing:**	
General Description:	Fill wall w/guardwall full length. Rock cut opposite fill.		

Wall Measurements

Wall Length (ft.):	120	**Face Area (sq.):**	930
Average Wall Height (ft.):	8	**Face Angle (deg.):**	87
Maximum Wall Height (ft.):	9	**Vertical Offset (ft.):**	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Missing 8 feet of wall at start degrading overall performance slightly	8
WALL FOUNDATION MATERIAL 8.00	Founded on exposed bedrock - No distress	10
MORTAR 8.00	Slight debonding and weathering - loss of grout 1-1.5" deep over 30% of wall face. Small voids to 1"	7
STONE MASONRY 8.00	First *8' of wall destroyed by impact, otherwise no distress	8
DOWNSLOPE 0.50	Bedrock - no distress	9
LATERAL SLOPE 0.50	Bedrock and wall end, talus at wall end - no distress	9
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress.	9
UPSLOPE 0.50	Steep but sound	9
WALL DRAINS 0.50	3 toe drains - no distress	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	56 sq ft masonry stone wall. 8' stone masonry guardwall. Wall repair: 56 * 160 = $8960. 8 * 645 = $5160. Incidental labor and materials (access, patching, etc) - $2500
Repair Cost:	$16,620

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

Crater Lake National Park

ROUTE 0014: WEST RIM DRIVE

Retaining Wall Condition Photos

CRLA_0014_2.857_L_1.jpg

Wall ID:	**CRLA-0014-2.900-L**		
Route Name:	WEST RIM DRIVE		
Inspection Date:	July 17, 2007	**Approximate Year Built:**	1931
***Wall Rating:**	63	**Maintenance Action:**	Replace Elements

Wall Description

Wall Function:	Fill Wall	**Primary Wall Type:**	Gravity - Mortared Stone
Surface Treatment:		**Secondary Wall Type:**	
Secondary Surface Treatment:		**Architectural Facing:**	
General Description:	Rock cut upslope, guardwall full length		

Wall Measurements

Wall Length (ft.):	328	**Face Area (sq.):**	2642
Average Wall Height (ft.):	8	**Face Angle (deg.):**	87
Maximum Wall Height (ft.):	10	**Vertical Offset (ft.):**	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Surface drainage and mortar distress threatening short term wall performance	6
WALL FOUNDATION MATERIAL 8.00	Exposed bed rock about 35% and last 65% of the wall is on talus material, no bench, 37-38 degrees.	8
MORTAR 8.00	50% of the mortar has debonding and spalling with an average of 2 inches deep and 0.5 inch wide for the first 75 feet. The last 300 feet of the wall shows 20% debonding and spalling	5
STONE MASONRY 8.00	Weathering and sloughing (exfoliating) of stones over about 10% of wall face. First 75 feet of wall tripped out of vertical from 95 degrees 90 degrees.	6
DOWNSLOPE 0.50	37 to 38 degrees talus slope and bedrock material	8
ROAD/SIDEWALK/SHOULDER 0.50	No distress in the pavement structure	9
WALL DRAINS 0.50	Evidence of wall drains	9
LATERAL SLOPE 1.00	Lost of bearing in the slope at the beginning of the wall (wall end exposed). Guardwall at wall end - no distress	5
CURB/BERM/DITCH 1.00	The road surface is sloping into the retaining/guard wall causing water to run along the base guardwall/top of wall for 75 feet. The ditch is 6 inches deep max. and 1 foot wide. Water is infiltrating behind the wall.	6

Repair Recommendations

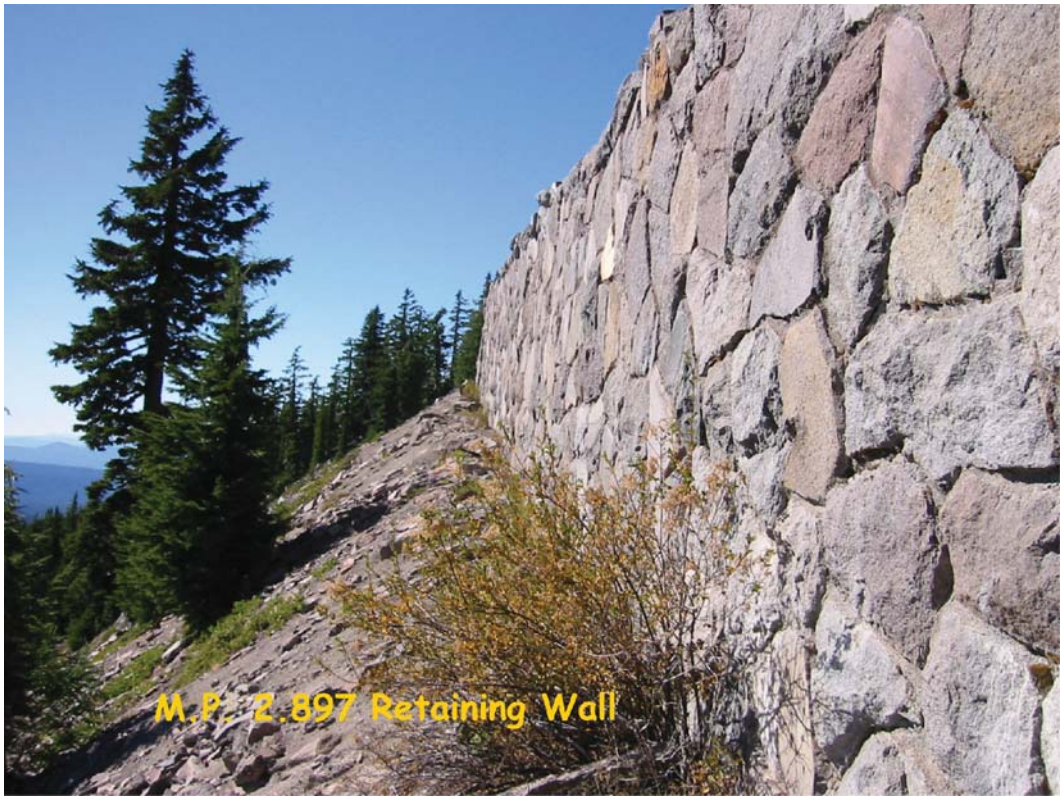
Failure Consequence:	MODERATE
Recommendation Narrative:	Rebuild first 75' of wall + guardwall - Salvage existing material: Wall rebuild: 450sf x $160/sf = $72,000. Guardwall replacement: 75' * $645/lf = $48375. Drainage repair: Construct a lined, mortared stone ditch and down drain for first 75 ft of wall.
Repair Cost:	$135,875

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

Crater Lake National Park

ROUTE 0014: WEST RIM DRIVE

Retaining Wall Condition Photos



CRLA_0014_2.900_L_1.jpg

CRLA_0014_2.900_L_2.jpg

Wall ID:	**CRLA-0014-3.323-L**		
Route Name:	WEST RIM DRIVE		
Inspection Date:	July 17, 2007	**Approximate Year Built:**	1931
***Wall Rating:**	65	**Maintenance Action:**	Repair Elements

Wall Description

Wall Function:	Fill Wall	**Primary Wall Type:**	Gravity - Mortared Stone
Surface Treatment:		**Secondary Wall Type:**	
Secondary Surface Treatment:		**Architectural Facing:**	
General Description:	Guardwall both ends		

Wall Measurements

Wall Length (ft.):	48	**Face Area (sq.):**	178
Average Wall Height (ft.):	5	**Face Angle (deg.):**	87
Maximum Wall Height (ft.):	6	**Vertical Offset (ft.):**	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Prior repairs evident. Foundation undermine threatens long term performance	7
WALL FOUNDATION MATERIAL 8.00	~30' on bedrock, fine, ~20 ft on colluvium, undermined 3"x1'. Repaired w/mortared stones. Bedrock below colluvium.	6
MORTAR 8.00	Some debonding, repairs done on upper end (2000), lt cracking/debonding and weathering in older mortar (~1/16", 30%).	6
STONE MASONRY 8.00	Some debonding, End 10' repaired w/ rebar and mortar. Tipped out slightly. Batter good.	6
CURB/BERM/DITCH 0.50	No wall related distress.	9
WALL DRAINS 0.50	None visible, no distress	9
DOWNSLOPE 0.50	Rock, very steep (~70 degrees)	10
LATERAL SLOPE 0.50	Rock, very steep	10
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress.	10

Repair Recommendations

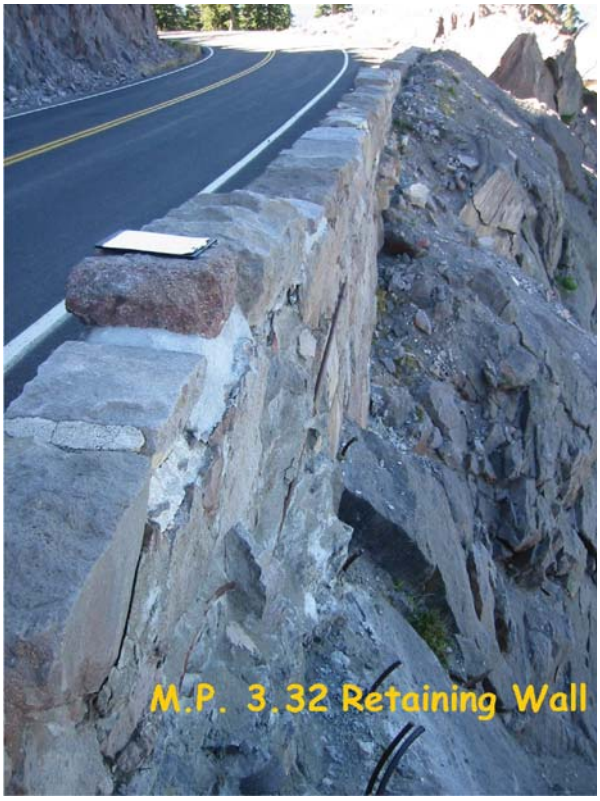
Failure Consequence:	MODERATE
Recommendation Narrative:	Underpin and deepen foundation to bedrock - GM wall underpinning and subexc: Subexc 2' minimum: Masonry underpin - 20'x3'high = 60sf. 60sf x $160/sf = $9600. Add 25% for subexc - $9600x1.25 = $12000
Repair Cost:	$12,000

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

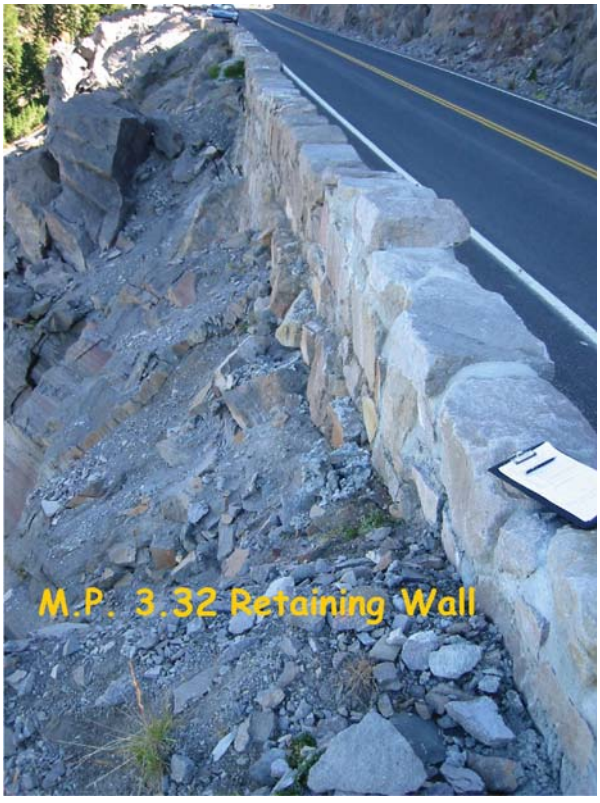
Crater Lake National Park

ROUTE 0014: WEST RIM DRIVE

Retaining Wall Condition Photos



CRLA_0014_3.323_L_1.jpg



CRLA_0014_3.323_L_2.jpg

Wall ID:	**CRLA-0014-3.333-L**		
Route Name:	WEST RIM DRIVE		
Inspection Date:	July 17, 2007	**Approximate Year Built:**	1931
***Wall Rating:**	88	**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:	Fill wall with guard wall at both ends. 50 ft rock cut opposite side of road.		

Wall Measurements

Wall Length (ft.):	21	**Face Area (sq.):**	110
Average Wall Height (ft.):	5	**Face Angle (deg.):**	90
Maximum Wall Height (ft.):	7	**Vertical Offset (ft.):**	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Performing as intended	9
WALL FOUNDATION MATERIAL 8.00	On bedrock - No distress	9
MORTAR 8.00	Upper wall / guardwall repointed. Older mortar light weathering (~1/2" grout loss, max.)	8
STONE MASONRY 8.00	No wall related distress.	9
DOWNSLOPE 0.50	Cliff, source of impact, no wall stability problems	9
LATERAL SLOPE 0.50	Bedrock outcrop on both sides of guardwall. Cliff, source of impact, no wall stability problems	9
UPSLOPE 0.50	No wall related distress.	9
WALL DRAINS 0.50	None visible - no distress	9
CURB/BERM/DITCH 0.50	No wall related distress.	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.

Crater Lake National Park

ROUTE 0014: WEST RIM DRIVE

Retaining Wall Condition Photos

CRLA_0014_3.333_L_1.jpg

Wall ID:	**CRLA-0014-3.359-L**		
Route Name:	WEST RIM DRIVE		
Inspection Date:	July 17, 2007	**Approximate Year Built:**	1931
***Wall Rating:**	86	**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:	Fill wall with guardwall both sides 50 ft rock cut opposite side of road		

Wall Measurements

Wall Length (ft.):	27	**Face Area (sq.):**	96
Average Wall Height (ft.):	3	**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	Performing as intended	9
WALL FOUNDATION MATERIAL 8.00	Rock jointed, mostly rock, bedrock, no distress	9
MORTAR 8.00	Light weathering (less than 1/2" grout loss)	8
STONE MASONRY 8.00	No wall related distress.	9
DOWNSLOPE 0.50	Bedrock, steep	9
LATERAL SLOPE 0.50	Guardwall, rock outcrops, steep	9
UPSLOPE 0.50	Cliff, source of impact	9
WALL DRAINS 0.50	None visible, no distress	9
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress.	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.

Crater Lake National Park

ROUTE 0014: WEST RIM DRIVE

Retaining Wall Condition Photos

CRLA_0014_3.359_L_1.jpg

Wall ID:	**CRLA-0014-3.710-R**		
Route Name:	WEST RIM DRIVE		
Inspection Date:	July 17, 2007	**Approximate Year Built:**	1931
***Wall Rating:**	78	**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:	Adjacent to Route 904, The Corrals Parking area		

Wall Measurements

Wall Length (ft.):	154	**Face Area (sq.):**	1410
Average Wall Height (ft.):	9	**Face Angle (deg.):**	80
Maximum Wall Height (ft.):	14	**Vertical Offset (ft.):**	1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Repairs evident at foundation. Mortar distress threat in long term	8
WALL FOUNDATION MATERIAL 8.00	No undermining, good 2-3' bench, work done to fill voids - Soil/talus material.	8
MORTAR 8.00	Minor cracking in mortar, some voids, some debonding	8
STONE MASONRY 8.00	Slight bulging in face	8
CURB/BERM/DITCH 0.50	No wall related distress.	9
DOWNSLOPE 0.50	Steep colluvium, stable slope	9
LATERAL SLOPE 0.50	Steep colluvium, stable slope	9
ROAD/SIDEWALK/SHOULDER 0.50	Sidewalk, no distress	9
WALL DRAINS 0.50	None visible	9

Repair Recommendations

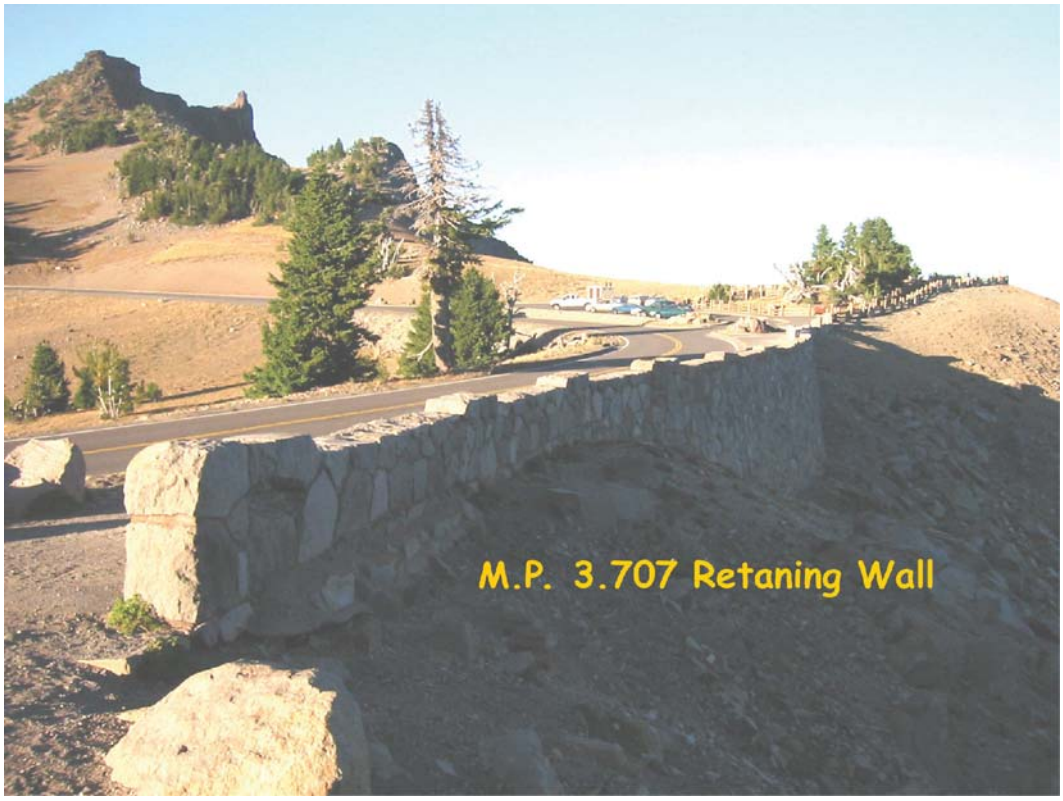
Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	$0

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

Crater Lake National Park

ROUTE 0014: WEST RIM DRIVE

Retaining Wall Condition Photos



CRLA_0014_3.710_R_1.jpg

Wall ID:	**CRLA-0914-0.000-P1**		
Route Name:	FOSSIL FUMAROLES - GODFREY GLEN OVERLOOK		
Inspection Date:	July 17, 2007	**Approximate Year Built:**	1958
***Wall Rating:**	68	**Maintenance Action:**	Repair Elements

Wall Description

Wall Function:	Fill Wall	**Primary Wall Type:**	Gravity - Mortared Stone
Surface Treatment:		**Secondary Wall Type:**	
Secondary Surface Treatment:		**Architectural Facing:**	
General Description:	Fill wall in Fossil Fumarolis overlook pullout. Wall length includes short length of guardwall (underheight wall) on both ends. Wall start on Route 11 at MP 8.802.		

Wall Measurements

Wall Length (ft.):	67	**Face Area (sq.):**	212
Average Wall Height (ft.):	3	**Face Angle (deg.):**	88
Maximum Wall Height (ft.):	6	**Vertical Offset (ft.):**	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Drainage and foundation is threatening near term wall performance	6
WALL FOUNDATION MATERIAL 8.00	20 feet of wall undermined. 1 foot max deep, 1.5 max height. Founded on erodable soil	5
MORTAR 8.00	Cracks (less than 1/8") and debonding over approx. 40% of wall. Approx 10% of the wall has voids that are 1/2-2".	7
STONE MASONRY 8.00	No distress	9
LATERAL SLOPE 0.50	30 degree, well vegetated with trees. No visible erosion channels	8
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress.	9
WALL DRAINS 0.50	None visible, no distress	9
CURB/BERM/DITCH 1.00	3 skupper at base of guardwall. Two are causing erosion channels at the wall base. Significant at west skupper, (see foundation rating). Outlets causing undermining of wall.	6
DOWNSLOPE 1.00	~30 degrees, erosion prone soil, erosion channel visible -average 1.5 feet deep and 3 foot across	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Underpin wall foundation w/mortared stone: Subexc 1 ft minimum. 20'x2' high(avg) stone masonry - 40sf x $160/sf = $6400. Add 20% for subexc - 1.2x$6400 = $7680. Erosion repair - construct non-mortared stone lined ditches (2): 3'x25'x2 = 150 sq ft * $50/sf
Repair Cost:	$15,780

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

Crater Lake National Park

ROUTE 0914: FOSSIL FUMAROLES - GODFREY GLEN OVERLOOK

Retaining Wall Condition Photos

CRLA_0914_0.000_P1_1.jpg

CRLA_0914_0.000_P1_2.jpg

Wall ID:	**CRLA-0932-0.000-P1**		
Route Name:	SKELL HEAD OVERLOOK		
Inspection Date:	July 17, 2007	**Approximate Year Built:**	1934
***Wall Rating:**	61	**Maintenance Action:**	Repair Elements

Wall Description

Wall Function:	Fill Wall	**Primary Wall Type:**	Gravity - Mortared Stone
Surface Treatment:		**Secondary Wall Type:**	
Secondary Surface Treatment:		**Architectural Facing:**	
General Description:	Recommended repairs are short term. Further investigation req. for long-term solution. It is MP 5.904 along route 13.		

Wall Measurements

Wall Length (ft.):	92	**Face Area (sq.):**	586
Average Wall Height (ft.):	6	**Face Angle (deg.):**	87
Maximum Wall Height (ft.):	8	**Vertical Offset (ft.):**	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Multiple repairs over time, chronic foundation ravel	5
WALL FOUNDATION MATERIAL 8.00	Moderate to severe undermining over 25' in length, vertical gaps up to 1' high, wall footing has been repaired several times in past, past settlement has occurred due to undermining	5
MORTAR 8.00	Weathered throughout - voids 1 to 3" and grout loss - Mortar cracked and debonded ~ 50% of face ~ 1/8" - 1/4".	7
STONE MASONRY 8.00	Loss of masonry or backfill up to 1' behind face	7
CURB/BERM/DITCH 0.50	No wall related distress.	9
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress.	9
WALL DRAINS 0.50	At least two weep holes are present in masonry, no distress.	9
DOWNSLOPE 1.00	Most of slope is at angle of repose (~34 deg), ravel susceptible. A lot of gravel material.	6
LATERAL SLOPE 1.00	Most of slope is at angle of repose (~34 deg), ravel susceptible	6

Repair Recommendations

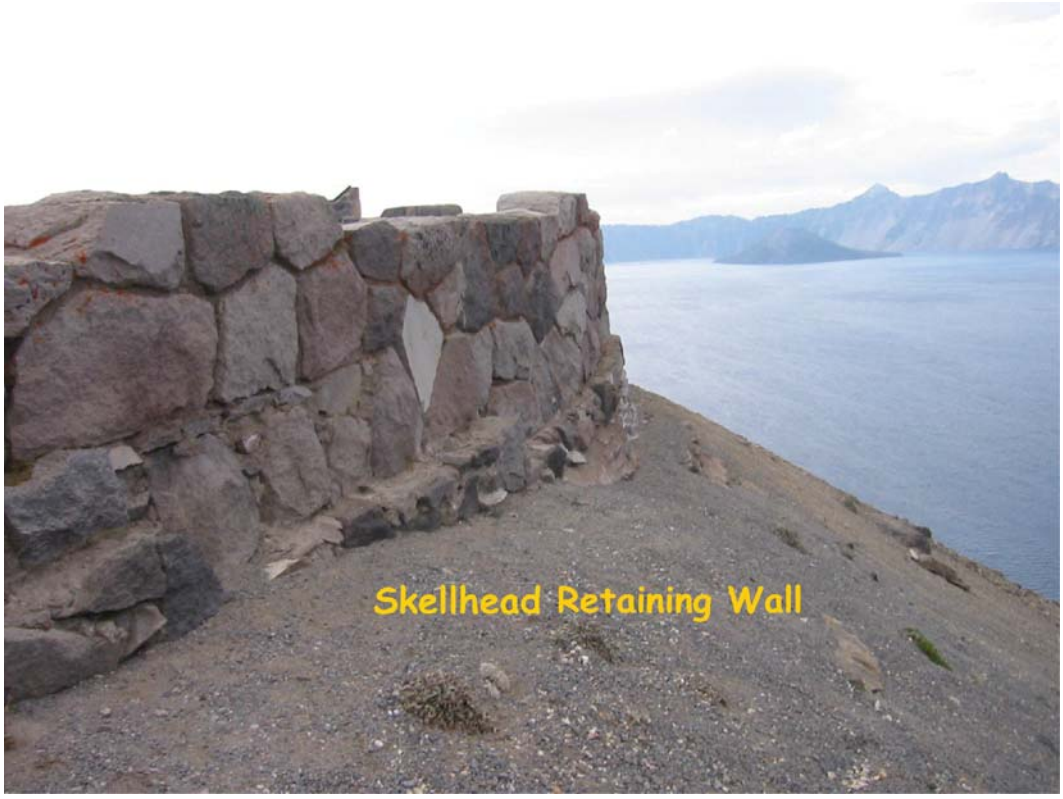
Failure Consequence:	MODERATE
Recommendation Narrative:	Foundation repair: 50 sq ft of mortar stone underpinning * $160/sf = $8000. Repointing: 60 sq ft * $75/sf = $4500
Repair Cost:	$12,500

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

Crater Lake National Park

ROUTE 0932: SKELL HEAD OVERLOOK

Retaining Wall Condition Photos



CRLA_0932_0.000_P1_1.jpg

CRLA_0932_0.000_P1_2.jpg

Wall ID:	**CRLA-0939-0.000-P1**		
Route Name:	PHANTOM SHIP OVERLOOK		
Inspection Date:	July 17, 2007	**Approximate Year Built:**	1936
***Wall Rating:**	85	**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:	Wall in Phantom Ship PA. PA at about MP 14.47 along Route 13		

Wall Measurements

Wall Length (ft.):	49	**Face Area (sq.):**	192
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	Performing as intended	9
WALL FOUNDATION MATERIAL 8.00	No distress	9
MORTAR 8.00	Slight cracking (1/8" or less) over ~10% of wall. One large mortar crack midwall	8
STONE MASONRY 8.00	One cracked face stone	8
DOWNSLOPE 0.50	Steep but stable, trees	9
LATERAL SLOPE 0.50	Steep but stable, trees	9
ROAD/SIDEWALK/SHOULDER 0.50	No wall related distress.	9
WALL DRAINS 0.50	Weep holes present, no distress	9

Repair Recommendations

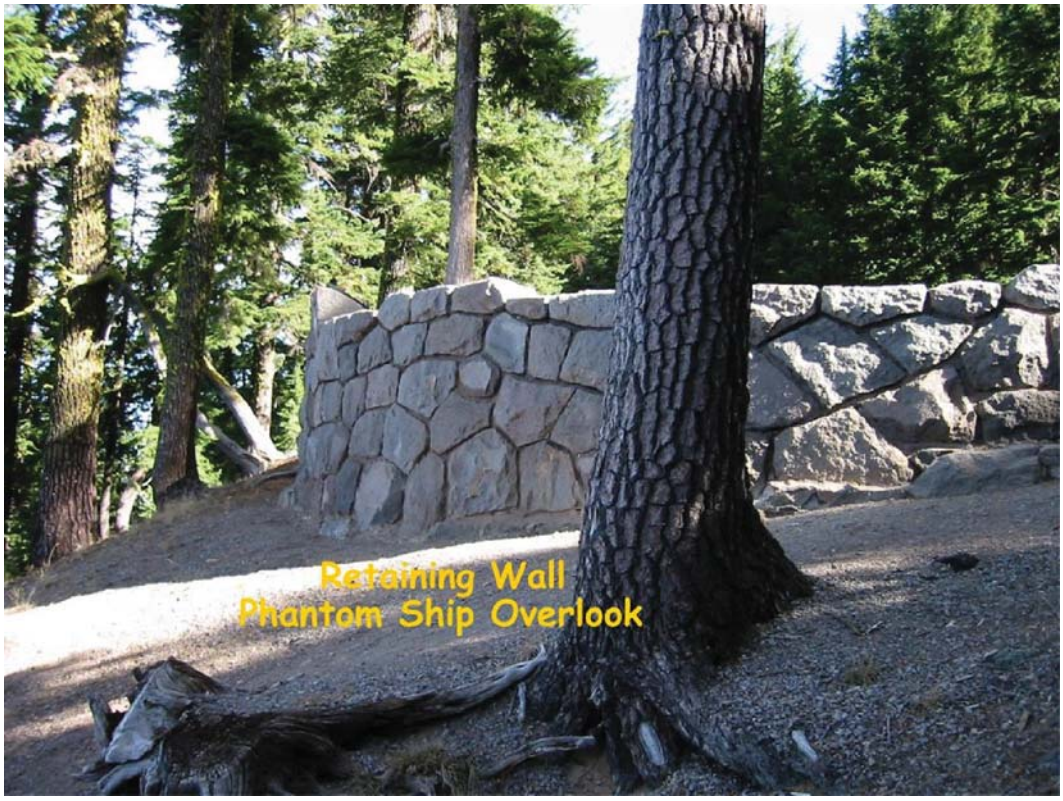
Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	$0

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

Crater Lake National Park

ROUTE 0939: PHANTOM SHIP OVERLOOK

Retaining Wall Condition Photos



CRLA_0939_0.000_P1_1.jpg

Appendix A
Summary of WIP Definitions

Crater Lake National Park

Federal Lands Highway
Road Inventory Program

Appendix A

Summary of WIP Definitions and Assessment Categories

Wall Naming Convention

Unique "Wall Identification" names were assigned to the retaining walls that were inventoried. The Wall Identification includes the Park Name, the RIP Route Number (e.g., **0013**), the beginning milepoint of a wall (e.g., **0.622**) and the side of the road the wall is located on (e.g., **L**.) relative to the primary direction of travel (direction of increasing mileposts). Thus, a typical wall identified would have the following format: **YOSE-0013-0.622-L.**

For roadways not in RIP, park-supplied route numbers were used or the convention RRR#. Similarly, for parking areas not in RIP, the park-supplied parking area number or the convention PPP# was used. Also for parking areas, walls are numbered in ascending order as they are encountered when traveling counterclockwise around the parking area (most common direction of traffic flow). Parking area walls are designated P1, P2, P3, etc. as new walls are encountered.

- NPS Retaining Wall Inventory Program Field Guide (WIFG)-

Retaining Wall Acceptance Criteria

*All classes of paved roadways and parking areas included in the RIP Route Investigation Report and/or identified by park staff.
*Walls must reside within the constructed roadway/parking area prism.
*Maximum wall height, including only that portion actively retaining soil and/or rock, must be ≥ 4 ft. (>6ft for culvert headwalls).
*Consider known/verifiable wall embedment in determining maximum retaining wall height. Include fully buried retaining structures.
*Walls have an internal wall face angle ≥ 45˚ (≥ 1H:1V face slope ratio).
*Include all walls where the intent is to support/protect the travelway, and where failure would require replacement with a retaining wall.

Definitions

Design Criteria	Measure of how well current design criteria are satisfied: **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

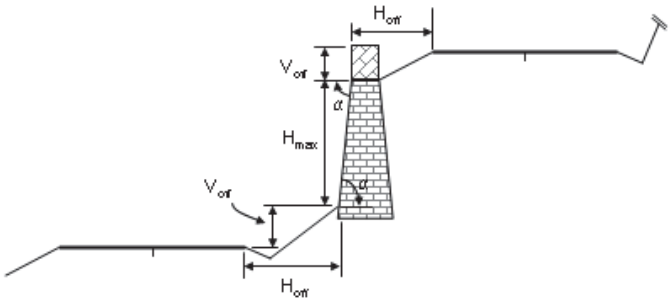
[**BV**] Brick Veneer	[**PF**] Planted Face	[**SS**] Simulated Stone
[**CO**] Cementitious Overlay	[**SC**] Sculpted Shotcrete	[**SV**] Stone Veneer
[**FF**] Fractured Fin Concrete	[**SH**] Shotcrete (nozzle finish)	[**TI**] Timber
[**FL**] Formlined Concrete	[**SM**] Steel/Metal	[**OT**] Other, User 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 *newly constructed or fabricated* 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.	**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.
		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.
		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.



H_{max}	Maximum exposed wall height, ft
V_{off}	Average vertical distance from pavement to cut wall toe or groundline at top of fill wall (+ above/ - below roadway), ft
H_{off}	Horizontal distance to wall face from edge of roadway, ft
α	Wall face angle measured from the horizontal, degrees
L	Maximum earth retaining length of the wall (excluding guardwalls). Wall length is the actual length of the structure, not simply the projected length along the roadway, ft