

HALE WIP Report

NPS Retaining Wall Inventory Program Haleakala National Park



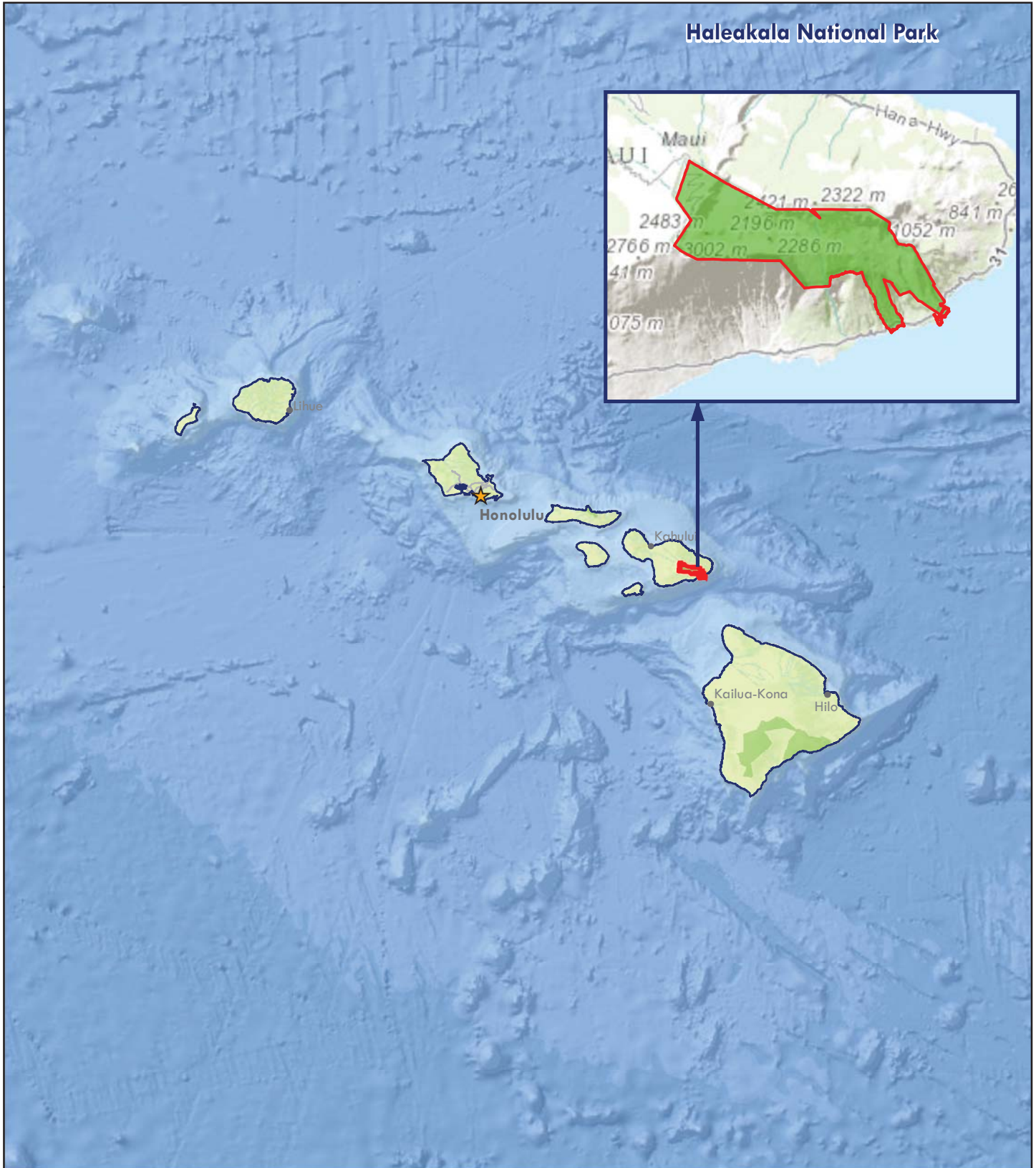
**Federal Lands Highway
Road Inventory Program**

Prepared By:

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

Data Collection Date: July 2007
Report Date: October 2015

Haleakala National Park in Hawaii



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



Table of Contents

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

Introduction



Haleakala 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



Haleakala National Park

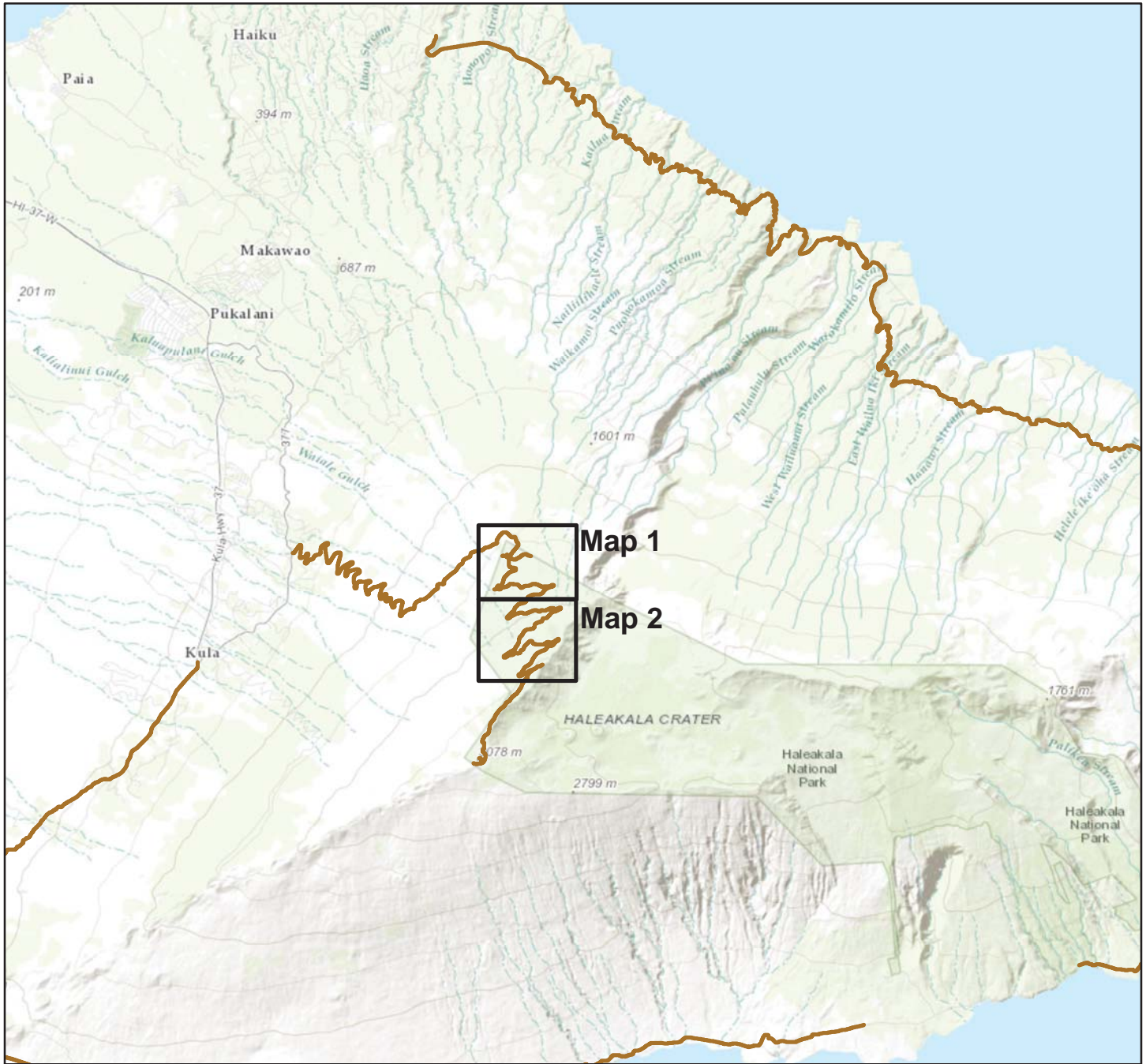


**Federal Lands Highway
Road Inventory Program**

Haleakala 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

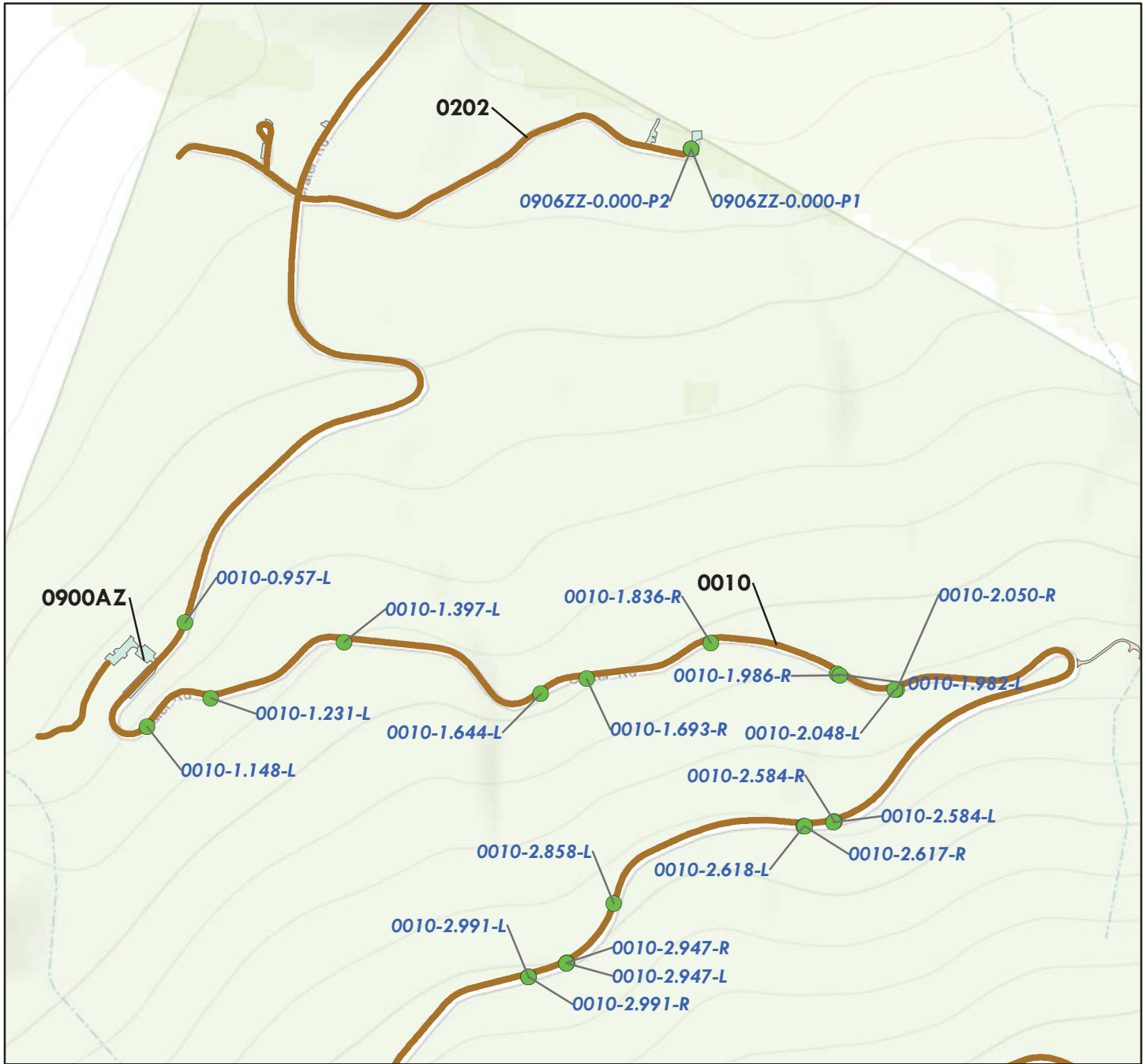
 RIP Collected Routes



Haleakala 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



Haleakala 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



Tier 1 Park Retaining Wall Overview



Haleakala National Park



Federal Lands Highway
Road Inventory Program

Parkwide Summary: Haleakala National Park

Initial retaining wall inspections were conducted at Haleakala 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.

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, 68 walls were inventoried on the routes listed below.

Table 1: Number of Walls by Route

Route Number	Route Name	No. of Walls
0010	HALEAKALA PARK ROAD	65
0902	LELEIWI OVERLOOK PARKING	1
0906ZZ	HOSMER GROVE CAMPGROUND PARKING AREAS	2

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

Table 2: Number of Walls by Wall Function

Wall Function	No. of Walls
CW - Cut Wall	3
HW - Head Wall	64
SP - Slope Protection	1

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
CL, Cantilever - Concrete	1
GC, Gravity - Mass Concrete	3
GD, Gravity - Dry Stone	3
GM, Gravity - Mortared Stone	61

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	60
Monitor	\$0	0
Maintenance	\$3,320	7
Repair Elements	\$320	1
Replace Elements	\$0	0
Replace Wall	\$0	0
Totals	\$3,640	68

*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	60
\$1 - \$25,000	8
\$25,001 - \$50,000	0
\$50,001 - \$100,000	0
\$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	68

*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 Haleakala 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 Haleakala 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.

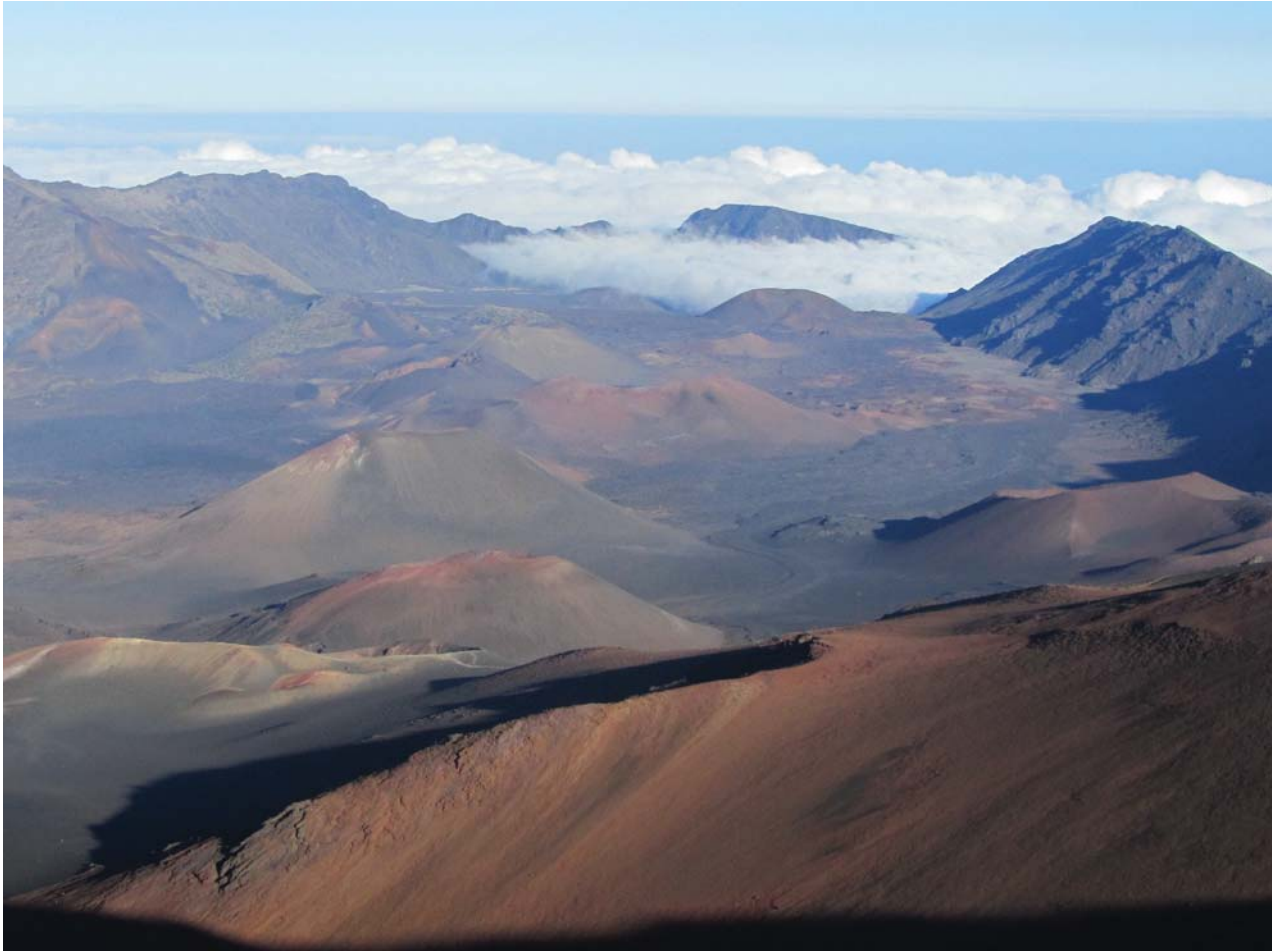
Notes: 1) Low consequence of failure and/or no recommended action may indicate repairs are not needed.

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



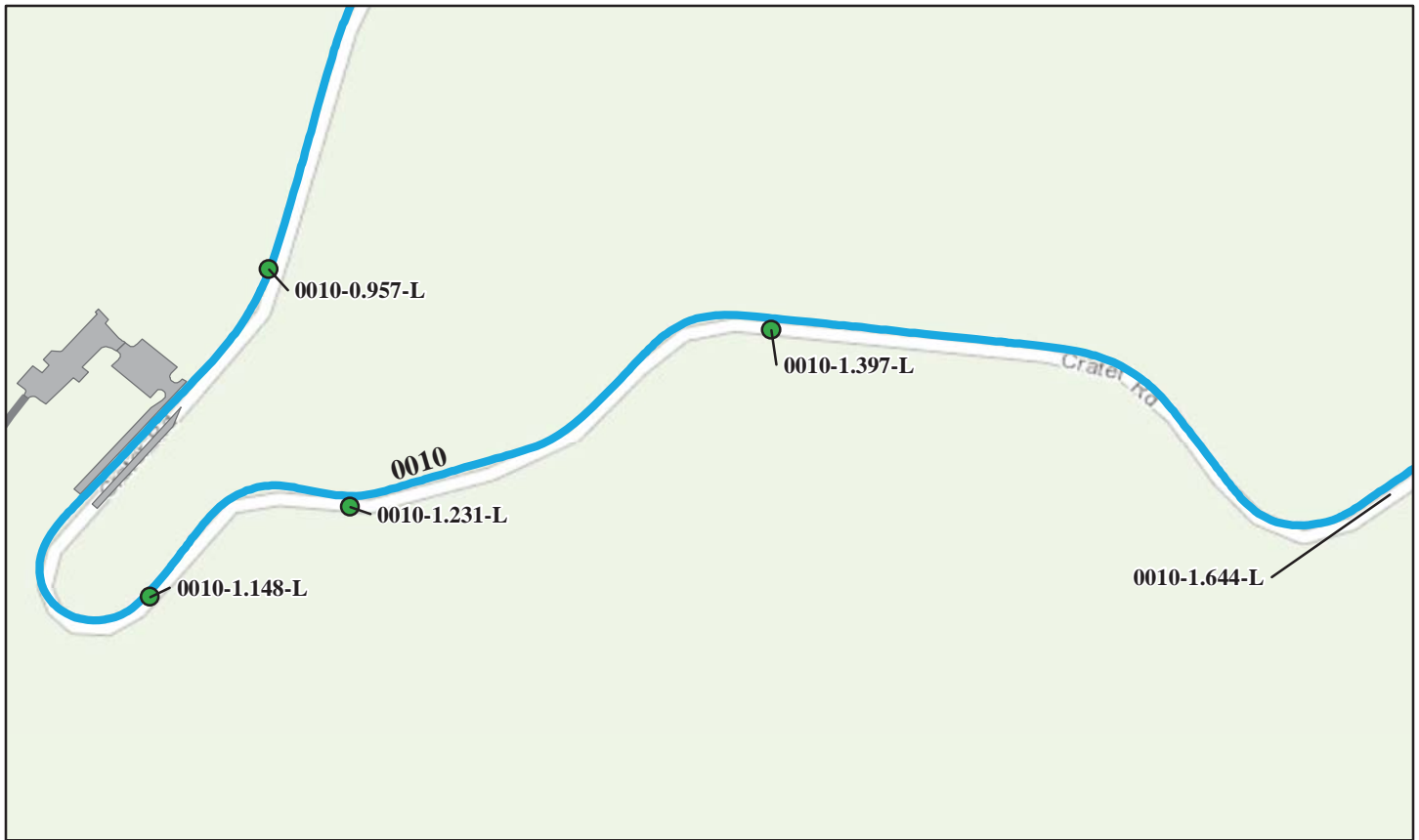
Haleakala National Park



Federal Lands Highway
Road Inventory Program

Haleakala National Park

ROUTE 0010: HALEAKALA PARK 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)

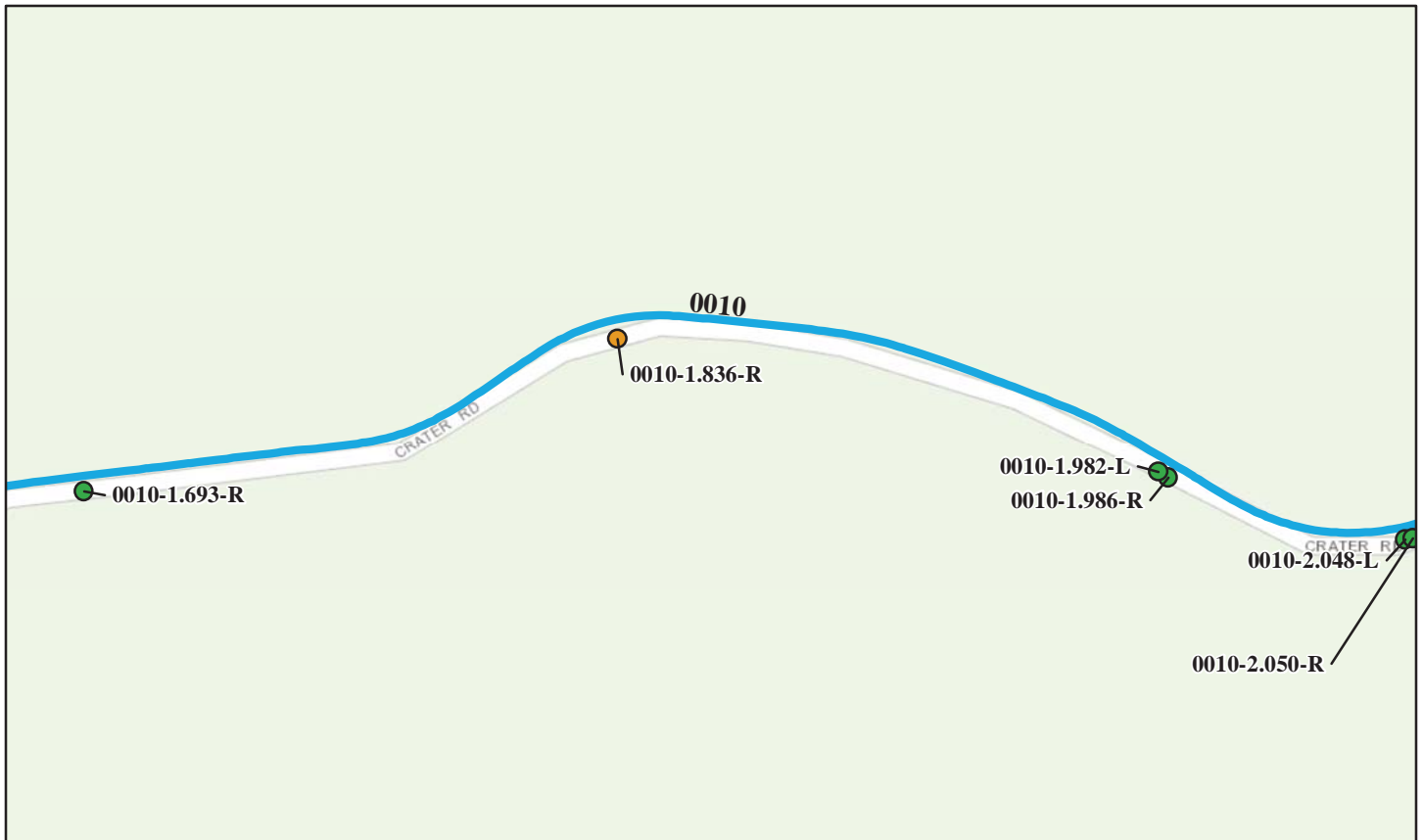
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
HALE-0010-0.957-L 7/9/2007	45	13	Gravity - Mortared Stone	Head Wall	84	\$0.00
HALE-0010-1.148-L 7/9/2007	30	12	Gravity - Mortared Stone	Head Wall	78	\$0.00
HALE-0010-1.231-L 7/9/2007	50	14	Gravity - Mortared Stone	Head Wall	78	\$0.00
HALE-0010-1.397-L 7/9/2007	40	13	Gravity - Mortared Stone	Head Wall	78	\$0.00
HALE-0010-1.644-L 7/9/2007	80	12	Gravity - Dry Stone	Head Wall	52	\$270.00

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

Haleakala National Park

ROUTE 0010: HALEAKALA PARK 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
HALE-0010-1.693-R 7/9/2007	95	17	Gravity - Mortared Stone	Head Wall	73	\$0.00
HALE-0010-1.836-R 7/9/2007	60	16	Gravity - Mortared Stone	Head Wall	68	\$0.00
HALE-0010-1.982-L 7/9/2007	220	48	Gravity - Mortared Stone	Head Wall	79	\$0.00
HALE-0010-1.986-R 7/9/2007	150	38	Gravity - Mortared Stone	Head Wall	79	\$0.00
HALE-0010-2.048-L 7/9/2007	20	8	Gravity - Mortared Stone	Head Wall	78	\$0.00

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

Haleakala National Park

ROUTE 0010: HALEAKALA PARK 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
HALE-0010-2.050-R 7/9/2007	20	10	Gravity - Mortared Stone	Head Wall	78	\$0.00
HALE-0010-2.584-L 7/9/2007	125	48	Gravity - Mortared Stone	Head Wall	79	\$0.00
HALE-0010-2.584-R 7/9/2007	130	38	Gravity - Mortared Stone	Head Wall	79	\$0.00
HALE-0010-2.617-R 7/10/2007	40	11	Gravity - Mortared Stone	Head Wall	74	\$0.00
HALE-0010-2.618-L 7/10/2007	35	10	Gravity - Mortared Stone	Head Wall	74	\$0.00

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

Haleakala National Park

ROUTE 0010: HALEAKALA PARK 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
HALE-0010-2.858-L 7/10/2007	25	8	Gravity - Mortared Stone	Head Wall	69	\$0.00
HALE-0010-2.947-L 7/10/2007	185	45	Gravity - Mortared Stone	Head Wall	79	\$0.00
HALE-0010-2.947-R 7/10/2007	160	37	Gravity - Mortared Stone	Head Wall	79	\$0.00
HALE-0010-2.991-L 7/10/2007	120	41	Gravity - Mass Concrete	Head Wall	76	\$0.00
HALE-0010-2.991-R 7/10/2007	225	45	Gravity - Mortared Stone	Head Wall	79	\$0.00

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

Haleakala National Park

ROUTE 0010: HALEAKALA PARK 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
HALE-0010-3.342-L 7/10/2007	65	14	Gravity - Mortared Stone	Head Wall	72	\$0.00
HALE-0010-3.515-R 7/10/2007	75	23	Gravity - Mortared Stone	Head Wall	70	\$0.00
HALE-0010-3.692-L 7/10/2007	30	8	Gravity - Dry Stone	Head Wall	73	\$0.00
HALE-0010-3.777-L 7/10/2007	200	48	Gravity - Mortared Stone	Head Wall	70	\$0.00
HALE-0010-3.785-R 7/10/2007	180	38	Gravity - Mortared Stone	Head Wall	72	\$0.00

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

Haleakala National Park

ROUTE 0010: HALEAKALA PARK 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)

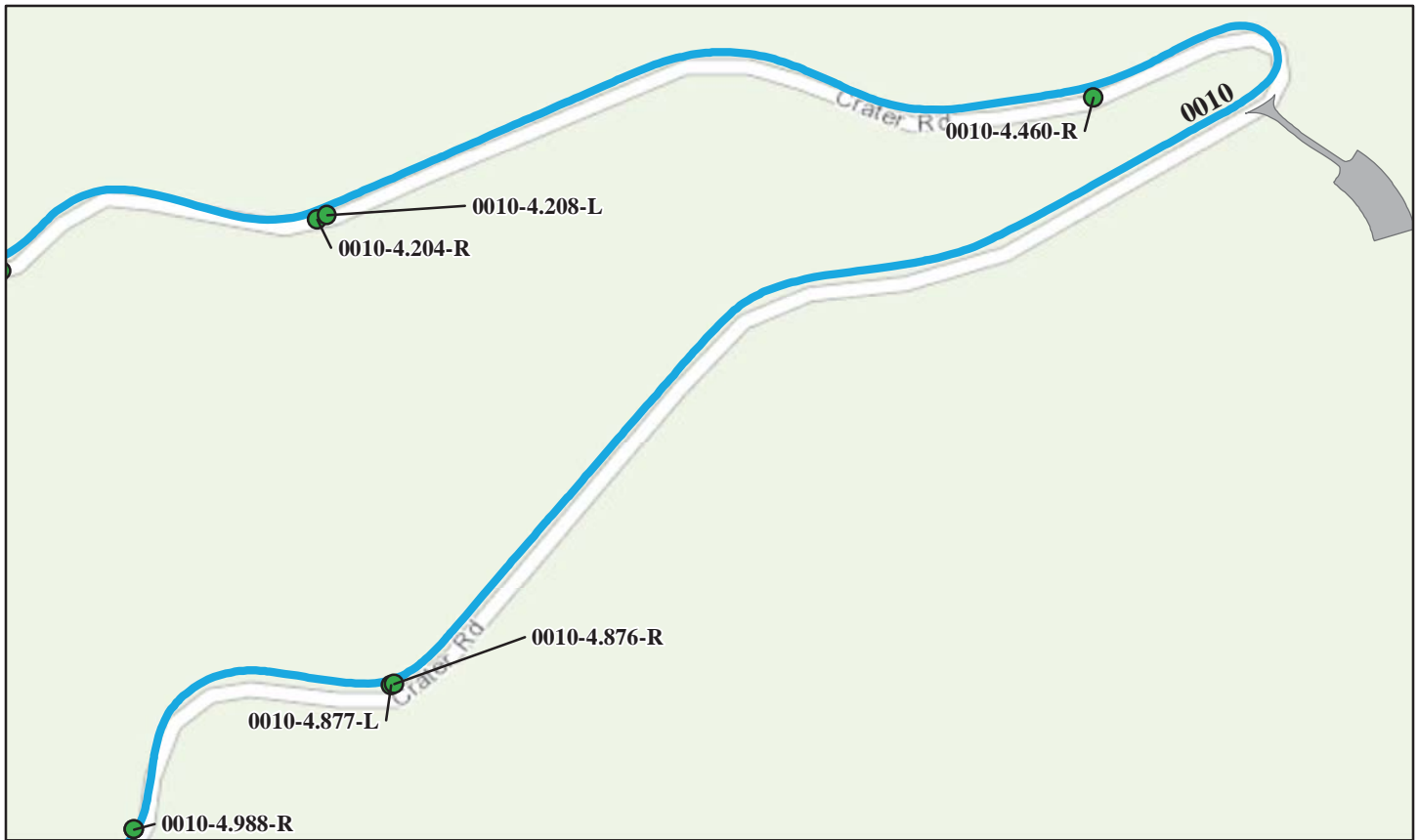
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
HALE-0010-3.858-L 7/10/2007	100	30	Gravity - Mortared Stone	Head Wall	70	\$0.00
HALE-0010-3.859-R 7/10/2007	100	23	Gravity - Mass Concrete	Head Wall	78	\$0.00
HALE-0010-4.096-R 7/10/2007	45	14	Gravity - Mortared Stone	Head Wall	70	\$0.00
HALE-0010-4.098-L 7/10/2007	35	11	Gravity - Mortared Stone	Head Wall	70	\$0.00
HALE-0010-4.204-R 7/10/2007	230	27	Gravity - Mortared Stone	Head Wall	70	\$0.00

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

Haleakala National Park

ROUTE 0010: HALEAKALA PARK 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)

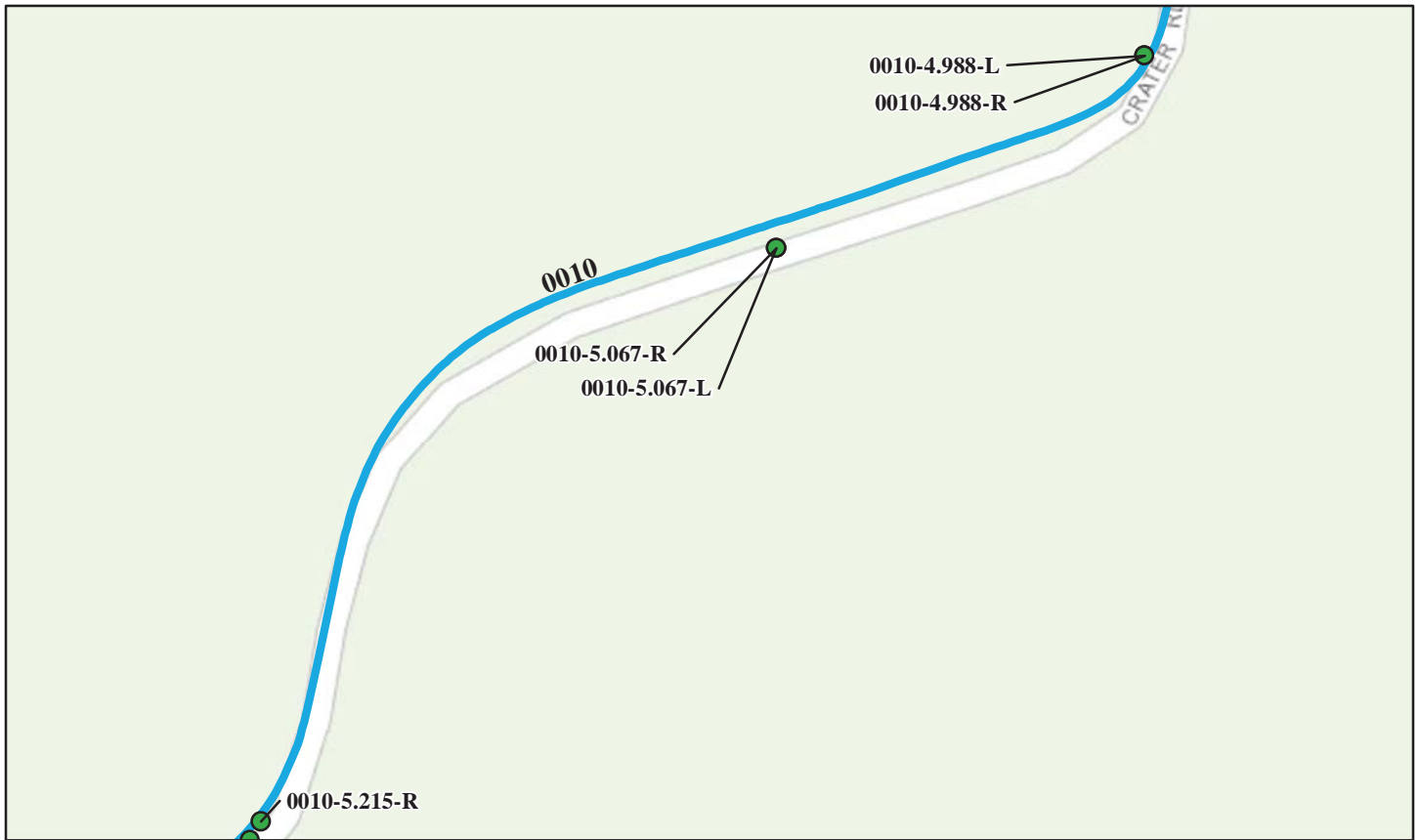
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
HALE-0010-4.208-L 7/10/2007	240	41	Gravity - Mortared Stone	Head Wall	70	\$0.00
HALE-0010-4.460-R 7/10/2007	500	130	Gravity - Mortared Stone	Cut Wall	80	\$0.00
HALE-0010-4.876-R 7/10/2007	45	12	Gravity - Mortared Stone	Head Wall	70	\$0.00
HALE-0010-4.877-L 7/10/2007	20	9	Gravity - Mortared Stone	Head Wall	70	\$0.00
HALE-0010-4.988-L 7/10/2007	40	14	Gravity - Mortared Stone	Head Wall	70	\$0.00

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

Haleakala National Park

ROUTE 0010: HALEAKALA PARK 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
HALE-0010-4.988-R 7/10/2007	45	10	Gravity - Mortared Stone	Head Wall	70	\$0.00
HALE-0010-5.067-L 7/10/2007	40	24	Gravity - Mortared Stone	Head Wall	70	\$0.00
HALE-0010-5.067-R 7/10/2007	100	19	Gravity - Mortared Stone	Head Wall	69	\$0.00
HALE-0010-5.215-R 7/10/2007	110	31	Gravity - Mortared Stone	Head Wall	70	\$0.00
HALE-0010-5.218-L 7/10/2007	90	14	Gravity - Mass Concrete	Head Wall	79	\$0.00

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

Haleakala National Park

ROUTE 0010: HALEAKALA PARK 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)

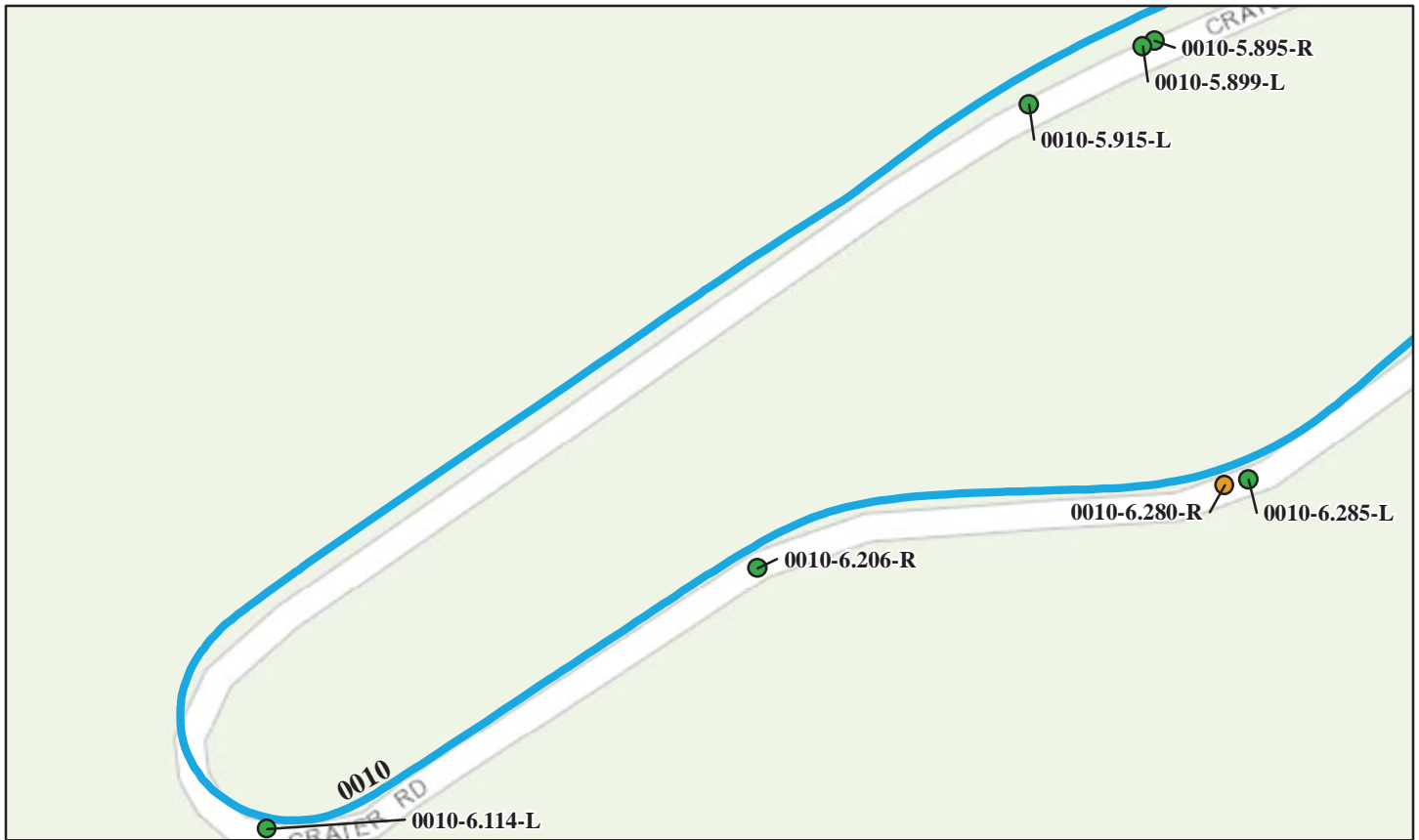
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
HALE-0010-5.727-L 7/10/2007	52	22	Gravity - Mortared Stone	Head Wall	64	\$320.00
HALE-0010-5.727-R 7/10/2007	70	22	Gravity - Mortared Stone	Head Wall	70	\$0.00
HALE-0010-5.826-L 7/10/2007	75	30	Gravity - Mortared Stone	Head Wall	68	\$0.00
HALE-0010-5.826-R 7/10/2007	100	26	Gravity - Mortared Stone	Head Wall	69	\$0.00
HALE-0010-5.895-R 7/10/2007	280	34	Gravity - Mortared Stone	Head Wall	81	\$0.00

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

Haleakala National Park

ROUTE 0010: HALEAKALA PARK 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)

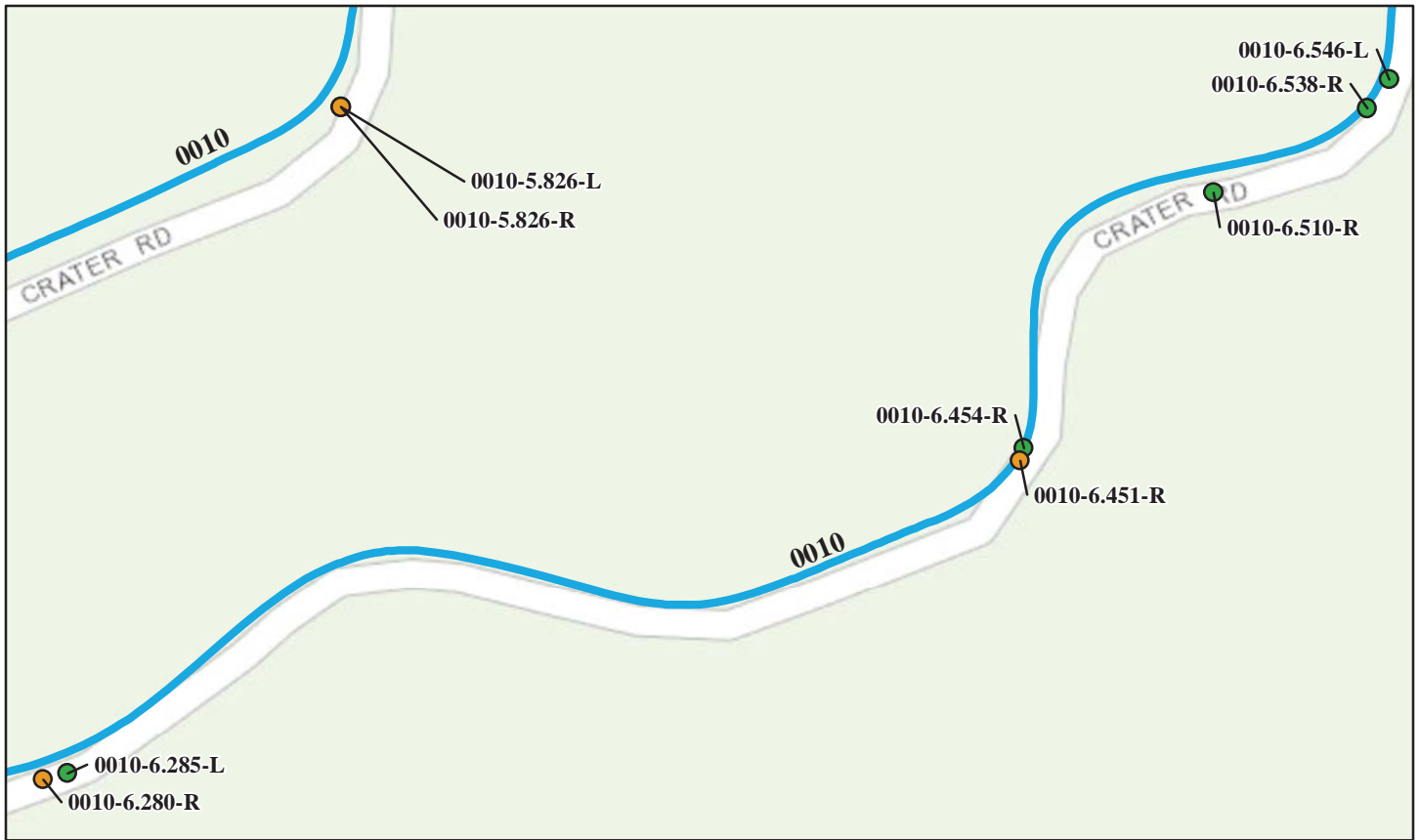
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
HALE-0010-5.899-L 7/10/2007	190	33	Cantilever - Concrete	Head Wall	90	\$0.00
HALE-0010-5.915-L 7/10/2007	30	8	Gravity - Mortared Stone	Head Wall	79	\$0.00
HALE-0010-6.114-L 7/10/2007	230	52	Gravity - Mortared Stone	Cut Wall	80	\$0.00
HALE-0010-6.206-R 7/10/2007	80	17	Gravity - Mortared Stone	Head Wall	72	\$0.00
HALE-0010-6.280-R 7/10/2007	190	43	Gravity - Mortared Stone	Head Wall	68	\$0.00

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

Haleakala National Park

ROUTE 0010: HALEAKALA PARK 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
HALE-0010-6.285-L 7/10/2007	45	15	Gravity - Mortared Stone	Head Wall	79	\$0.00
HALE-0010-6.451-R 7/10/2007	25	13	Gravity - Mortared Stone	Head Wall	67	\$110.00
HALE-0010-6.454-R 7/10/2007	25	13	Gravity - Mortared Stone	Head Wall	70	\$0.00
HALE-0010-6.510-R 7/10/2007	565	113	Gravity - Mortared Stone	Cut Wall	80	\$0.00
HALE-0010-6.538-R 7/11/2007	100	21	Gravity - Mortared Stone	Head Wall	79	\$110.00

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

Haleakala National Park

ROUTE 0010: HALEAKALA PARK 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)

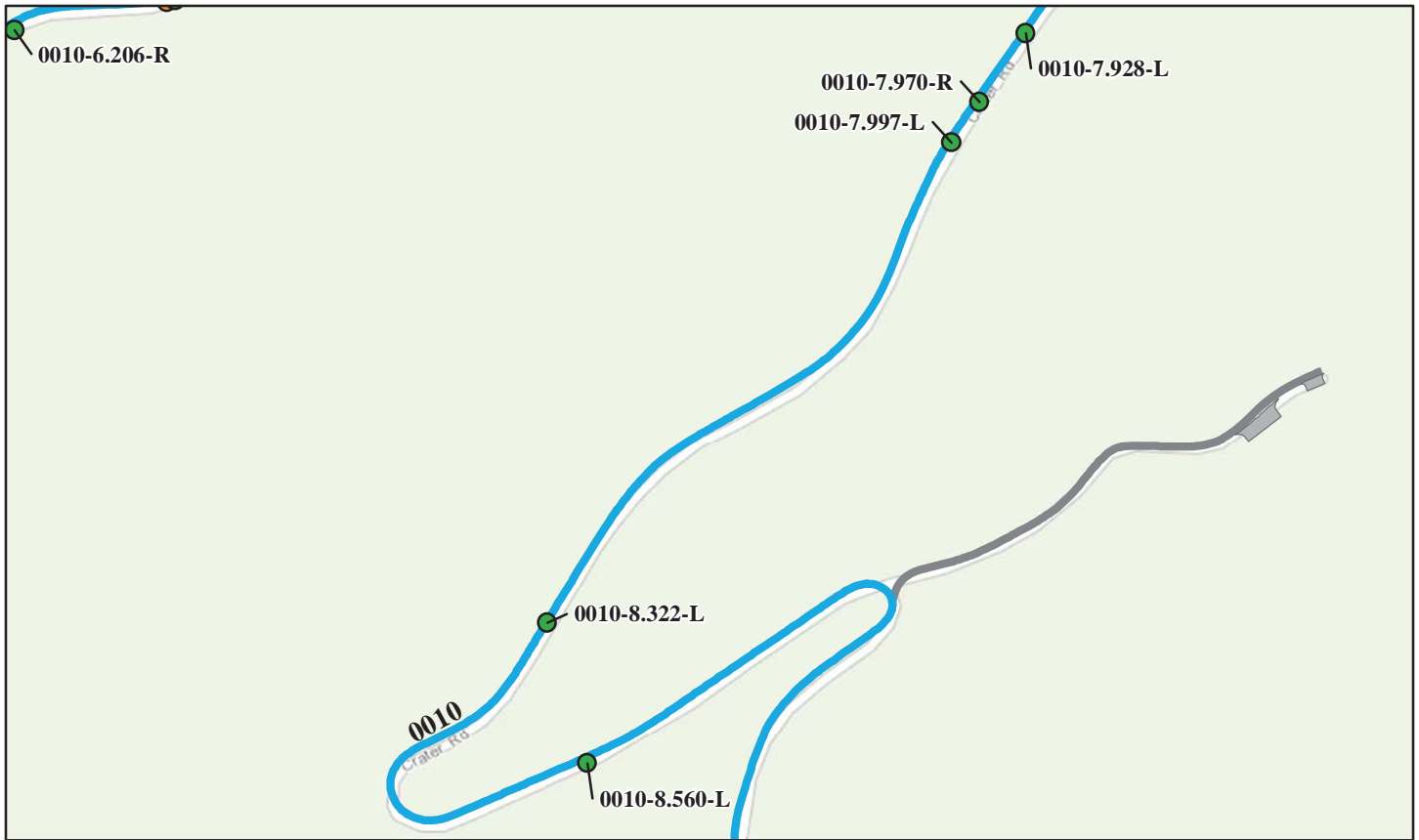
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
HALE-0010-6.546-L 7/11/2007	90	13	Gravity - Mortared Stone	Head Wall	72	\$0.00
HALE-0010-7.182-R 7/11/2007	45	14	Gravity - Mortared Stone	Head Wall	73	\$0.00
HALE-0010-7.320-R 7/11/2007	35	12	Gravity - Mortared Stone	Head Wall	59	\$320.00
HALE-0010-7.766-L 7/11/2007	30	13	Gravity - Mortared Stone	Head Wall	70	\$110.00
HALE-0010-7.819-L 7/11/2007	30	12	Gravity - Mortared Stone	Head Wall	70	\$0.00

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

Haleakala National Park

ROUTE 0010: HALEAKALA PARK 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)

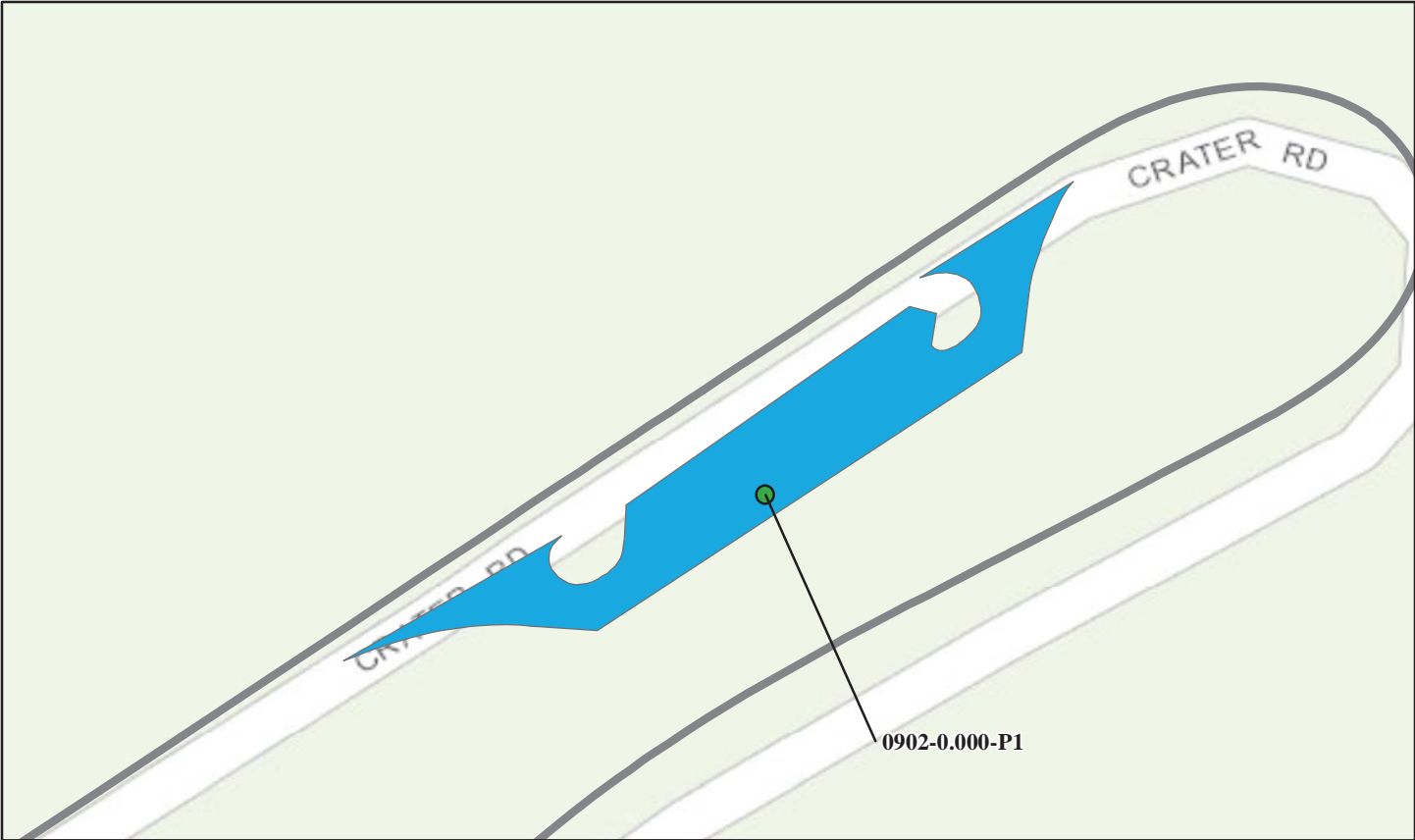
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
HALE-0010-7.928-L 7/11/2007	30	11	Gravity - Mortared Stone	Head Wall	75	\$0.00
HALE-0010-7.970-R 7/11/2007	2,100	210	Gravity - Dry Stone	Slope Protection	76	\$0.00
HALE-0010-7.997-L 7/11/2007	30	13	Gravity - Mortared Stone	Head Wall	70	\$0.00
HALE-0010-8.322-L 7/11/2007	30	13	Gravity - Mortared Stone	Head Wall	75	\$0.00
HALE-0010-8.560-L 7/11/2007	35	9	Gravity - Mortared Stone	Head Wall	75	\$0.00

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

Haleakala National Park

ROUTE 0902: LELEIWI 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

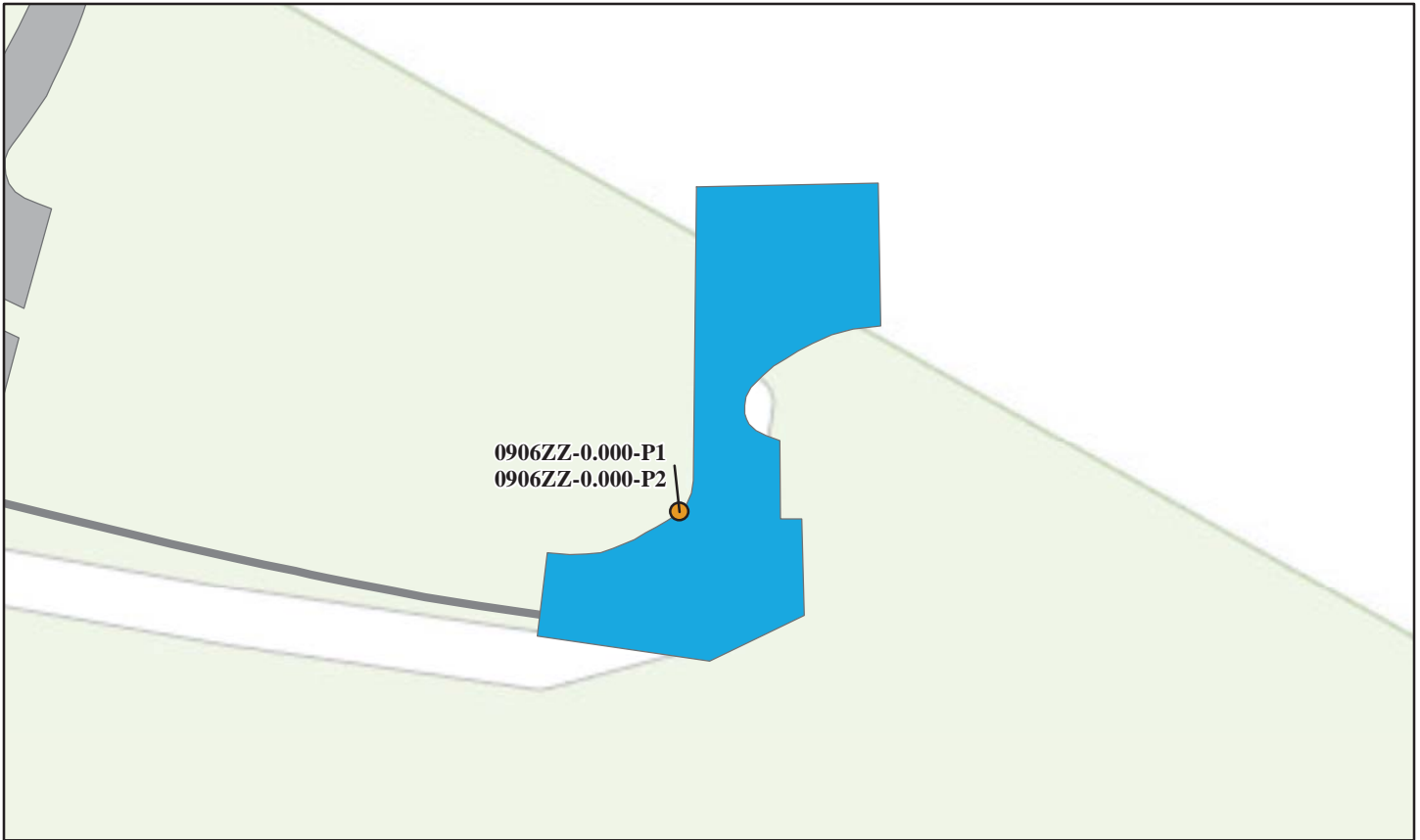
Critical / Poor (0 - 49)	Fair (50 - 69)	Good to Excellent (70 - 100)	No Data
--------------------------	----------------	------------------------------	---------

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
HALE-0902-0.000-P1 7/11/2007	1320	233	Gravity - Mortared Stone	Head Wall	77	\$0.00

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

Haleakala National Park

ROUTE 0906ZZ: HOSMER GROVE CAMPGROUND PARKING AREAS



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
HALE-0906ZZ-0.000-P1 7/11/2007	100	15	Gravity - Mortared Stone	Head Wall	66	\$320.00
HALE-0906ZZ-0.000-P2 7/11/2007	332	68	Gravity - Mortared Stone	Head Wall	57	\$2,080.00

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

Tier 3 Retaining Wall Details



Haleakala National Park



Federal Lands Highway
Road Inventory Program

Wall ID:	HALE-0010-0.957-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 09, 2007	Approximate Year Built:	1934
*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:	Mortared stone head wall in good condition.		

Wall Measurements

Wall Length (ft.):	13	Face Area (sq.):	45
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	Performing as designed, no problems.	7
WALL FOUNDATION MATERIAL 8.00	Lava rock in good condition, stable, adequate to support wall.	9
MORTAR 8.00	Good condition. No evidence of failure or cracking, sound, durable.	9
PLACED STONE 8.00	Good condition, water staining, no signs of erosion or cracking, or weathering, no missing blocks.	9
CULVERT 0.50	Good condition CMP.	8
DOWNSLOPE 0.50	Cobbles, boulders well compacted, no signs of failure.	8
LATERAL SLOPE 0.50	Stable 2:1 grassy slope, no signs of failure.	8
ROAD/SIDEWALK/SHOULDER 0.50	No cracking along roadway.	8
UPSLOPE 0.50	Cobbles, boulders well compacted, vegetated area.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_0.957_L_1.jpg



HALE_0010_0.957_L_2.jpg

Wall ID:	HALE-0010-1.148-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 09, 2007	Approximate Year Built:	1934
*Wall Rating:	78	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 a 2 foot CMP (1/2 full with fines).		

Wall Measurements

Wall Length (ft.):	12	Face Area (sq.):	30
Average Wall Height (ft.):	2	Face Angle (deg.):	90
Maximum Wall Height (ft.):	4	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	No signs of distress or settlement. Performing well.	8
WALL FOUNDATION MATERIAL 8.00	Rocky with soil matrix more than adequate to support wall. No movements apparent.	8
MORTAR 8.00	No evidence of cracking or shrinkage.	8
STONE MASONRY 8.00	Good condition. No elements missing, no signs of settlement or bulging.	8
CULVERT 1.00	CMP needs cleaning.	6
WALL DRAINS 1.00	The CMP is 2' diameter and is full with debris. Needs cleaning.	6
DOWNSLOPE 1.00	Rocky and vegetated, no signs of failure, stable condition.	7
LATERAL SLOPE 1.00	Stable, no slope failures or signs of erosion or movement.	7
UPSLOPE 1.00	Paved and no signs of failure or settlement, or cracking. Well compacted.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_1.148_L_1.jpg

Wall ID:	HALE-0010-1.231-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 09, 2007	Approximate Year Built:	1934
*Wall Rating:	78	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 in good condition.		

Wall Measurements

Wall Length (ft.):	14	Face Area (sq.):	50
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	4	Vertical Offset (ft.):	-4

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	No signs of distress or settlement. Performing well.	8
WALL FOUNDATION MATERIAL 8.00	Rocky with soil matrix more than adequate to support wall. No movements apparent.	8
MORTAR 8.00	No evidence of cracking or shrinkage.	8
STONE MASONRY 8.00	Good condition. No elements missing, no signs of settlement or bulging.	8
CULVERT 1.00	CMP needs cleaning.	6
WALL DRAINS 1.00	The CMP is 2' diameter and is full with debris. Needs cleaning.	6
DOWNSLOPE 1.00	Rocky and vegetated, no signs of failure, stable condition.	7
LATERAL SLOPE 1.00	Stable, no slope failures or signs of erosion or movement.	7
UPSLOPE 1.00	Paved and no signs of failure or settlement, or cracking. Well compacted.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_1.231_L_1.jpg

Wall ID:	HALE-0010-1.397-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 09, 2007	Approximate Year Built:	1934
*Wall Rating:	78	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 2 ft CMP, good condition.		

Wall Measurements

Wall Length (ft.):	13	Face Area (sq.):	40
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	5	Vertical Offset (ft.):	-3

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	No signs of distress or settlement. Performing well as designed.	8
WALL FOUNDATION MATERIAL 8.00	Good condition, stable. Slight erosion of the materials near the bottom of pipe.	8
MORTAR 8.00	Good condition. No evidence of failure or cracking, sound, durable.	8
STONE MASONRY 8.00	Good condition. No elements missing, no signs of settlement or bulging.	8
CULVERT 1.00	Good condition.	6
WALL DRAINS 1.00	CMP clean and excellent condition. No signs of failure.	6
DOWNSLOPE 1.00	Some erosion in the water path, stable.	7
LATERAL SLOPE 1.00	Stable, no slope failure or signs of erosion or movement.	7
ROAD/SIDEWALK/SHOULDER 1.00	Paved and no signs of failure or settlement, or 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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_1.397_L_1.jpg

Wall ID:	HALE-0010-1.644-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 09, 2007	Approximate Year Built:	1934
*Wall Rating:	52	Maintenance Action:	Maintenance

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stack headwall with 2 ft CMP.		

Wall Measurements

Wall Length (ft.):	12	Face Area (sq.):	80
Average Wall Height (ft.):	6	Face Angle (deg.):	80
Maximum Wall Height (ft.):	7	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	No signs of distress or failure, may require vegetation clearing.	3
WALL FOUNDATION MATERIAL 8.00	Rocky with soil matrix with some erosion beneath the pipe, required refilling.	6
PLACED STONE 8.00	Varying stone sizes, large gaps, no signs of movement or bulging.	6
VEGETATION 1.00	Many bushes that need clearing, may be affecting wall stability.	5
DOWNSLOPE 1.00	Boulders/cobbles with bushes. Needs clearing, some erosion.	6
LATERAL SLOPE 1.00	Highly vegetated steep slope 1.5:1.	6
UPSLOPE 1.00	Boulders, cobbles, soil well compacted, vegetated.	6
CULVERT 1.00	2' CMP in good condition.	7
WALL DRAINS 1.00	2' CMP in good condition.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Remove vegetation on wall and place fill in foundation near pipe. 4 hours of labor @ \$55.00 per hour = \$220.00 Foundation fill material - 1 cubic yard = \$50.00
Repair Cost:	\$270

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

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_1.644_L_1.jpg



HALE_0010_1.644_L_2.jpg

Wall ID:	HALE-0010-1.693-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 09, 2007	Approximate Year Built:	1934
*Wall Rating:	73	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	Gravity - Mass Concrete
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone headwall overlaid by 2 ft high concrete wall.		

Wall Measurements

Wall Length (ft.):	17	Face Area (sq.):	95
Average Wall Height (ft.):	5	Face Angle (deg.):	90
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	No signs of distress or settlement. Performing well as designed.	7
WALL FOUNDATION MATERIAL 8.00	Wall elements are fully bearing against foundation, no significant settlement or distress. Soil more than adequate to support wall.	8
CONCRETE 8.00	Excellent condition, no signs of cracking or shrinkage (installed at a later date over mortared stone wall)	7
MORTAR 8.00	No evidence of cracking or shrinkage. Durable, no spalling.	7
STONE MASONRY 8.00	Good condition. No elements missing, no signs of settlement or bulging.	8
LATERAL SLOPE 1.00	Very steep 1:1 slope, heavily vegetated, stable.	6
VEGETATION 1.00	Heavy vegetation, not affecting wall stability.	6
CULVERT 1.00	2' CMP in good condition.	7
DOWNSLOPE 1.00	Boulder/cobbles/soil stable; no signs of 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.

Haleakala National Park

ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_1.693_R_1.jpg



HALE_0010_1.693_R_2.jpg

Wall ID:	HALE-0010-1.836-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 09, 2007	Approximate Year Built:	1934
*Wall Rating:	68	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 2 ft CMP.		

Wall Measurements

Wall Length (ft.):	16	Face Area (sq.):	60
Average Wall Height (ft.):	3	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	No signs of distress or settlement. Performing well as designed.	7
WALL FOUNDATION MATERIAL 8.00	Sufficient to support wall, some erosion beneath the culvert pipe.	6
MORTAR 8.00	No evidence of cracking or shrinkage.	7
STONE MASONRY 8.00	All stones intact except for a 2' long area at wall start, some bulging.	7
CULVERT 0.50	2' CMP in good condition.	8
VEGETATION 1.00	Bushes and tall grass, no major effect on wall stability.	6
DOWNSLOPE 1.00	Some erosion near pipe inlet, no major effect on wall stability.	7
LATERAL SLOPE 1.00	Some erosion at toe of slope, no major effect on wall stability.	7
UPSLOPE 1.00	Compacted gravel and soil, no settlement 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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_1.836_R_1.jpg

Wall ID:	HALE-0010-1.982-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 09, 2007	Approximate Year Built:	1934
*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, 8 ft x 8 ft box culvert.		

Wall Measurements

Wall Length (ft.):	48	Face Area (sq.):	220
Average Wall Height (ft.):	4	Face Angle (deg.):	90
Maximum Wall Height (ft.):	11	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	No signs of distress or settlement. Performing well as designed.	8
WALL FOUNDATION MATERIAL 8.00	Rocks and boulders sufficient to support wall, no signs of erosion.	8
MORTAR 8.00	No evidence of cracking or shrinkage.	8
STONE MASONRY 8.00	Good condition. No elements missing, no signs of settlement or bulging.	8
CULVERT 1.00	Concrete box culvert is sound, no cracks, good condition.	7
DOWNSLOPE 1.00	Rocks, no signs of erosion, stable condition.	7
LATERAL SLOPE 1.00	1.5:1 slope with rock and vegetation. Stable, no signs of erosion.	7
UPSLOPE 1.00	Stable, no slope failure or signs of erosion or movement.	7
WALL DRAINS 1.00	No drainage related distress.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_1.982_L_1.jpg



HALE_0010_1.982_L_2.jpg

Wall ID:	HALE-0010-1.986-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 09, 2007	Approximate Year Built:	1934
*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, box concrete culvert 8 ft x 8 ft.		

Wall Measurements

Wall Length (ft.):	38	Face Area (sq.):	150
Average Wall Height (ft.):	3	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	No signs of distress or settlement. Performing well as designed.	8
WALL FOUNDATION MATERIAL 8.00	Rocks and boulders sufficient to support wall, no signs of erosion.	8
MORTAR 8.00	No evidence of cracking or shrinkage.	8
STONE MASONRY 8.00	Good condition. No elements missing, no signs of settlement or bulging.	8
CULVERT 1.00	Concrete box culvert is sound, no cracks, good condition.	7
DOWNSLOPE 1.00	Rocks, no signs of erosion, stable condition.	7
LATERAL SLOPE 1.00	1.5:1 slope with rock and vegetation. Stable, no signs of erosion.	7
UPSLOPE 1.00	Stable, no slope failure or signs of erosion or movement.	7
WALL DRAINS 1.00	No drainage related distress.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_1.986_R_1.jpg



HALE_0010_1.986_R_2.jpg

Wall ID:	HALE-0010-2.048-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 09, 2007	Approximate Year Built:	1934
*Wall Rating:	78	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 1.5 ft concrete pipe in good condition.		

Wall Measurements

Wall Length (ft.):	8	Face Area (sq.):	20
Average Wall Height (ft.):	2	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	No signs of distress or settlement. Performing well.	8
WALL FOUNDATION MATERIAL 8.00	Rocky with soil matrix more than adequate to support wall. No movements apparent.	8
MORTAR 8.00	No evidence of cracking or shrinkage.	8
STONE MASONRY 8.00	Good condition. No elements missing, no signs of settlement or bulging.	8
CULVERT 1.00	1.5' CMP in good condition.	6
WALL DRAINS 1.00	No drainage related distress.	6
DOWNSLOPE 1.00	Rocky and vegetated, no signs of failure, stable condition.	7
LATERAL SLOPE 1.00	Stable, no slope failures or signs of erosion or movement.	7
UPSLOPE 1.00	Paved and no signs of failure or settlement, or cracking. Well compacted.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_2.048_L_1.jpg

Wall ID:	HALE-0010-2.050-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 09, 2007	Approximate Year Built:	1934
*Wall Rating:	78	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 in good condition.		

Wall Measurements

Wall Length (ft.):	10	Face Area (sq.):	20
Average Wall Height (ft.):	2	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	No signs of distress or settlement. Performing well.	8
WALL FOUNDATION MATERIAL 8.00	Rocky with soil matrix more than adequate to support wall. No movements apparent.	8
MORTAR 8.00	No evidence of cracking or shrinkage.	8
STONE MASONRY 8.00	Good condition. No elements missing, no signs of settlement or bulging.	8
CULVERT 1.00	2' CMP in good condition.	6
WALL DRAINS 1.00	No drainage related distress.	6
DOWNSLOPE 1.00	Rocky and vegetated, no signs of failure, stable condition.	7
LATERAL SLOPE 1.00	Stable, no slope failures or signs of erosion or movement.	7
UPSLOPE 1.00	Paved and no signs of failure or settlement, or cracking. Well compacted.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_2.050_R_1.jpg

Wall ID:	HALE-0010-2.584-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 09, 2007	Approximate Year Built:	1934
*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 for 6 ft w x 7 ft h box culvert.		

Wall Measurements

Wall Length (ft.):	48	Face Area (sq.):	125
Average Wall Height (ft.):	2	Face Angle (deg.):	90
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	-5

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Performing well and good overall stability.	8
WALL FOUNDATION MATERIAL 8.00	Rocks and boulders sufficient to support wall, no signs of erosion.	8
MORTAR 8.00	Some occasional shrinkage.	8
STONE MASONRY 8.00	Good condition. No elements missing, no signs of settlement or bulging.	8
CULVERT 1.00	Box culvert constructed of concrete, sound and no cracking, good condition.	7
DOWNSLOPE 1.00	Loose gravel with cobble, no vegetation.	7
LATERAL SLOPE 1.00	1.5:1 slope with rock and vegetation, very stable, no erosion.	7
UPSLOPE 1.00	Rocky and vegetated, no signs of failure, stable condition.	7
WALL DRAINS 1.00	No drainage related distress.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_2.584_L_1.jpg

Wall ID:	HALE-0010-2.584-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 09, 2007	Approximate Year Built:	1934
*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 for 6 ft w x 7 ft h box culvert.		

Wall Measurements

Wall Length (ft.):	38	Face Area (sq.):	130
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	-12

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Performing well and good overall stability.	8
WALL FOUNDATION MATERIAL 8.00	Rocks and boulders sufficient to support wall, no signs of erosion.	8
MORTAR 8.00	Good condition. No evidence of failure or cracking, sound, durable.	8
STONE MASONRY 8.00	Good condition. No elements missing, no signs of settlement or bulging.	8
CULVERT 1.00	Box culvert constructed of concrete, sound and no cracking, good condition.	7
DOWNSLOPE 1.00	Rocks and boulders, sound, no sign of erosion or settlement.	7
LATERAL SLOPE 1.00	Rocky, very steep with bushes, stable.	7
UPSLOPE 1.00	Boulders/cobbles/soil highly vegetated.	7
WALL DRAINS 1.00	No drainage related distress.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_2.584_R_1.jpg



HALE_0010_2.584_R_2.jpg

Wall ID:	HALE-0010-2.617-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	74	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 3 ft CMP.		

Wall Measurements

Wall Length (ft.):	11	Face Area (sq.):	40
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	-5

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Performing well and good overall stability.	8
WALL FOUNDATION MATERIAL 8.00	Bedrock sufficient to support wall, no signs of settlement.	8
MORTAR 8.00	Minor cracking, separation, shrinkage.	7
STONE MASONRY 8.00	Good condition. No elements missing, no signs of settlement or bulging.	7
CULVERT 1.00	3' CMP in good working condition.	7
DOWNSLOPE 1.00	Bedrock, no signs of erosion, good condition.	7
LATERAL SLOPE 1.00	Rock slope inlay for slope protection on the uspside; boulders with heavy bush vegetation.	7
UPSLOPE 1.00	Well compacted gravel, 1.5:1 slope, well vegetated with tall grass, stable.	7
VEGETATION 1.00	No major effect on wall stability from vegetation.	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.

Haleakala National Park

ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_2.617_R_1.jpg



HALE_0010_2.617_R_2.jpg

Wall ID:	HALE-0010-2.618-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	74	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 3 ft CMP.		

Wall Measurements

Wall Length (ft.):	10	Face Area (sq.):	35
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 well and good overall stability.	8
WALL FOUNDATION MATERIAL 8.00	Bedrock sufficient to support wall, no signs of settlement.	8
MORTAR 8.00	Minor shrinkage, intact.	7
STONE MASONRY 8.00	Good condition. No elements missing, no signs of settlement or bulging.	7
CULVERT 1.00	3' CMP in good working condition.	7
DOWNSLOPE 1.00	Bedrock, no signs of erosion, good condition.	7
LATERAL SLOPE 1.00	Rock slope inlay for slope protection; boulders, heavy vegetation.	7
UPSLOPE 1.00	Well compacted gravel, 1.5:1 slope, well vegetated with tall grass, stable.	7
VEGETATION 1.00	Vegetation has no major effect on wall stability.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_2.618_L_1.jpg



HALE_0010_2.618_L_2.jpg

Wall ID:	HALE-0010-2.858-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	69	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 2 ft CMP.		

Wall Measurements

Wall Length (ft.):	8	Face Area (sq.):	25
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	5	Vertical Offset (ft.):	-3

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Performing well and good overall stability.	7
WALL FOUNDATION MATERIAL 8.00	Soil and rock sufficient to support wall, no signs of settlement.	7
MORTAR 8.00	Minor shrinkage, good condition in general.	7
STONE MASONRY 8.00	Good condition. No elements missing, no signs of settlement or bulging.	7
CULVERT 1.00	2' CMP in good condition.	6
DOWNSLOPE 1.00	Very heavy vegetation with bushes; soil/rock, minor scour/erosion.	6
LATERAL SLOPE 1.00	Steep 2:1 slope with heavy vegetation. Rock/soil stable.	6
UPSLOPE 1.00	Well compacted gravel, 1.5:1 slope, well vegetated with tall grass, stable.	6
VEGETATION 1.00	Heavily vegetated with small bushes. No impact on wall.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_2.858_L_1.jpg

Wall ID:	HALE-0010-2.947-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	79	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:	Mortared stone headwall for 8 ft x 8 ft concrete box culvert. A secondary 6 ft dry stack wall on top of headwall for slope protection.		

Wall Measurements

Wall Length (ft.):	45	Face Area (sq.):	185
Average Wall Height (ft.):	4	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	Performing well and good overall stability.	8
WALL FOUNDATION MATERIAL 8.00	Bedrock sufficient to support wall, no signs of settlement.	8
MORTAR 8.00	Good condition. No evidence of failure or cracking, sound, durable.	8
STONE MASONRY 8.00	Good condition. No elements missing, no signs of settlement or bulging.	8
CULVERT 1.00	2' CMP in good condition.	7
DOWNSLOPE 1.00	Heavily vegetated; minor scour/erosion.	7
LATERAL SLOPE 1.00	Very steep 1:1, well vegetated with bushes.	7
UPSLOPE 1.00	Slope protection riprap placed for 1:1 slope; good condition.	7
WALL DRAINS 1.00	No drainage related distress.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_2.947_L_1.jpg



HALE_0010_2.947_L_2.jpg

Wall ID:	HALE-0010-2.947-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	79	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:	Mortared stone headwall for 8 ft x 8 ft CIP concrete box culvert with secondary 12 ft high dry stack wall above for slope protection.		

Wall Measurements

Wall Length (ft.):	37	Face Area (sq.):	160
Average Wall Height (ft.):	4	Face Angle (deg.):	90
Maximum Wall Height (ft.):	12	Vertical Offset (ft.):	-9

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Performing well and good overall stability.	8
WALL FOUNDATION MATERIAL 8.00	Rocks and soil sufficient to support wall, no signs of settlement.	8
MORTAR 8.00	Minor cracking and shrinkage in the upper layers.	8
STONE MASONRY 8.00	Good condition. No elements missing, no signs of settlement or bulging.	8
CULVERT 1.00	2' CMP in good condition.	7
DOWNSLOPE 1.00	Heavily vegetated; minor scour/erosion.	7
LATERAL SLOPE 1.00	Very steep 1:1, well vegetated with bushes.	7
UPSLOPE 1.00	Slope protection riprap placed for 1:1 slope; good condition.	7
WALL DRAINS 1.00	No drainage related distress.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_2.947_R_1.jpg



HALE_0010_2.947_R_2.jpg

Wall ID:	HALE-0010-2.991-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	76	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mass Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mass concrete headwall with wingwalls for a 10 ft x 10 ft CIP box culvert. Appears to overlay older mortared stone wall.		

Wall Measurements

Wall Length (ft.):	41	Face Area (sq.):	120
Average Wall Height (ft.):	2	Face Angle (deg.):	90
Maximum Wall Height (ft.):	13	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Newly installed wall, no settlement, good overall stability.	8
WALL FOUNDATION MATERIAL 8.00	Bedrock sufficient to support wall.	8
CONCRETE 8.00	Concrete is sound and durable; minor cracking and fatigue. No spalling, no water seepage.	7
DOWNSLOPE 0.50	Bedrock, stable, no signs of erosion.	8
UPSLOPE 0.50	Stable soil/gravel fill with boulders.	8
CULVERT 1.00	10' x 10' CIP culvert in good condition.	7
LATERAL SLOPE 1.00	Compacted, stable soil, no signs of erosion, a few bushes.	7
VEGETATION 1.00	No vegetation impacts on the wall.	7
WALL DRAINS 1.00	No drainage related distress.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_2.991_L_1.jpg



HALE_0010_2.991_L_2.jpg

Wall ID:	HALE-0010-2.991-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	79	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:	Mortared stone headwall for a 10 ft x 10 ft CIP box culvert with a secondary 12 ft dry stack stone wall above headwall.		

Wall Measurements

Wall Length (ft.):	45	Face Area (sq.):	225
Average Wall Height (ft.):	5	Face Angle (deg.):	90
Maximum Wall Height (ft.):	12	Vertical Offset (ft.):	-10

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Performing well and good overall stability.	8
WALL FOUNDATION MATERIAL 8.00	Rocks and soil sufficient to support wall, no signs of settlement.	8
MORTAR 8.00	New mortar recently added.	8
STONE MASONRY 8.00	Good condition. No elements missing, no signs of settlement or bulging.	8
CULVERT 1.00	2' CMP in good condition.	7
DOWNSLOPE 1.00	Heavily vegetated; minor scour/erosion.	7
LATERAL SLOPE 1.00	Very steep 1:1, well vegetated with bushes.	7
UPSLOPE 1.00	Slope protection riprap placed for 1:1 slope; good condition.	7
WALL DRAINS 1.00	No drainage related distress.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_2.991_R_1.jpg



HALE_0010_2.991_R_2.jpg

Wall ID:	HALE-0010-3.342-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*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:	Mortared stone headwall with 2 ft CMP.		

Wall Measurements

Wall Length (ft.):	14	Face Area (sq.):	65
Average Wall Height (ft.):	4	Face Angle (deg.):	90
Maximum Wall Height (ft.):	7	Vertical Offset (ft.):	-8

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Performing as designed, no signs of distress, good global stability.	7
WALL FOUNDATION MATERIAL 8.00	Bedrock with boulders, sufficient to support wall.	8
MORTAR 8.00	Good condition, intact, no shrinkage or cracking.	7
STONE MASONRY 8.00	Good condition, strong, no weathering or cracking; no movement or bulging.	7
WALL DRAINS 0.50	No drainage related distress.	8
CULVERT 1.00	2' CMP in good condition.	7
DOWNSLOPE 1.00	Bedrock, strong and competent.	7
LATERAL SLOPE 1.00	Bedrock/soil with heavy vegetation.	7
UPSLOPE 1.00	Boulders imbedded in 1.5:1 slope; no signs of movement or failure.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_3.342_L_1.jpg

Wall ID:	HALE-0010-3.515-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	70	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 in good condition.		

Wall Measurements

Wall Length (ft.):	23	Face Area (sq.):	75
Average Wall Height (ft.):	3	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	Good overall performance with no signs of settlement or rotation. No evidence of prior repairs.	7
WALL FOUNDATION MATERIAL 8.00	Rock, boulders, and competent soil sufficient to support wall. No signs of scour.	7
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no water seepage; no missing mortar. Good condition.	7
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	7
CULVERT 1.00	2' CMP in good condition. Culvert clear with no debris.	7
DOWNSLOPE 1.00	Rock/soil compacted; no signs of erosion or scour.	7
LATERAL SLOPE 1.00	Stable slope with boulders, brush, and gravel. No signs of erosion or scour.	7
UPSLOPE 1.00	Rock/soil compacted; some vegetation. No concerns.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_3.515_R_1.jpg

Wall ID:	HALE-0010-3.692-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	73	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stack stone headwall in good condition.		

Wall Measurements

Wall Length (ft.):	8	Face Area (sq.):	30
Average Wall Height (ft.):	3	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	Poorly constructed wall, but is stable and shows no signs of global distress.	7
WALL FOUNDATION MATERIAL 8.00	Soil and rocks.	8
PLACED STONE 8.00	Poorly stacked stones with some gaps. Stones are strong, durable.	7
ROAD/SIDEWALK/SHOULDER 0.50	No signs of wall-related distress to roadway.	8
WALL DRAINS 0.50	Free draining wall, no drainage related distress.	8
DOWNSLOPE 1.00	Channel erosion evident, but not affecting toe of wall.	7
LATERAL SLOPE 1.00	No significant erosion on minor slope.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_3.692_L_1.jpg



HALE_0010_3.692_L_2.jpg

Wall ID:	HALE-0010-3.777-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	70	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 10 ft x 12 ft box culvert in good condition.		

Wall Measurements

Wall Length (ft.):	48	Face Area (sq.):	200
Average Wall Height (ft.):	4	Face Angle (deg.):	90
Maximum Wall Height (ft.):	13	Vertical Offset (ft.):	-13

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall performance with no signs of settlement or rotation. No evidence of prior repairs.	7
WALL FOUNDATION MATERIAL 8.00	Rock, boulders, and competent soil sufficient to support wall. No signs of scour.	7
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no water seepage; no missing mortar. Good condition.	7
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	7
CULVERT 1.00	2' CMP in good condition. Culvert clear with no debris.	7
DOWNSLOPE 1.00	Rock/soil compacted; no signs of erosion or scour.	7
LATERAL SLOPE 1.00	Stable slope with boulders, brush, and gravel. No signs of erosion or scour.	7
UPSLOPE 1.00	Rock/soil compacted; some vegetation. No concerns.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_3.777_L_1.jpg



HALE_0010_3.777_L_2.jpg

Wall ID:	HALE-0010-3.785-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*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:	Mortared stone headwall with 10 ft x 12 ft box culvert in good condition.		

Wall Measurements

Wall Length (ft.):	38	Face Area (sq.):	180
Average Wall Height (ft.):	4	Face Angle (deg.):	88
Maximum Wall Height (ft.):	12	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall performance with no signs of settlement or rotation. No evidence of prior repairs.	7
WALL FOUNDATION MATERIAL 8.00	Rock, boulders, and competent soil sufficient to support wall. No signs of scour.	7
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	7
MORTAR 8.00	Some mortar has been added recently.	8
CULVERT 1.00	2' CMP in good condition. Culvert clear with no debris.	7
DOWNSLOPE 1.00	Rock/soil compacted; no signs of erosion or scour.	7
LATERAL SLOPE 1.00	Stable slope with boulders, brush, and gravel. No signs of erosion or scour.	7
UPSLOPE 1.00	Rock/soil compacted; some vegetation. No concerns.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_3.785_R_1.jpg



HALE_0010_3.785_R_2.jpg

Wall ID:	HALE-0010-3.858-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	70	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 a 6 ft x6 ft box culvert in good condition.		

Wall Measurements

Wall Length (ft.):	30	Face Area (sq.):	100
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	-10

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall performance with no signs of settlement or rotation. No evidence of prior repairs.	7
WALL FOUNDATION MATERIAL 8.00	Rock, boulders, and competent soil sufficient to support wall. No signs of scour.	7
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no water seepage; no missing mortar. Good condition.	7
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	7
CULVERT 1.00	2' CMP in good condition. Culvert clear with no debris.	7
DOWNSLOPE 1.00	Rock/soil compacted; no signs of erosion or scour.	7
LATERAL SLOPE 1.00	Stable slope with boulders, brush, and gravel. No signs of erosion or scour.	7
UPSLOPE 1.00	Rock/soil compacted; some vegetation. No concerns.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	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.

Haleakala National Park

ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_3.858_L_1.jpg

Wall ID:	HALE-0010-3.859-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	78	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mass Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mass concrete headwall with wingwalls for a 6 ft x6 ft CIP box culvert. Appears to overlay older mortared stone wall.		

Wall Measurements

Wall Length (ft.):	23	Face Area (sq.):	100
Average Wall Height (ft.):	4	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	Performing well and good overall stability.	8
WALL FOUNDATION MATERIAL 8.00	Concrete over bedrock.	8
CONCRETE 8.00	Good condition, no signs of cracking.	8
CULVERT 1.00	6'x6' box culvert in excellent condition.	7
DOWNSLOPE 1.00	Heavily vegetated; minor scour/erosion.	7
LATERAL SLOPE 1.00	Very steep 1:1, well vegetated with bushes.	7
UPSLOPE 1.00	Slope protection riprap placed for 1:1 slope; good condition.	7
WALL DRAINS 1.00	No drainage related distress.	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.

Haleakala National Park

ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_3.859_R_1.jpg



HALE_0010_3.859_R_2.jpg

Wall ID:	HALE-0010-4.096-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	70	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 3 ft CMP in good condition.		

Wall Measurements

Wall Length (ft.):	14	Face Area (sq.):	45
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	-5

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall performance with no signs of settlement or rotation. No evidence of prior repairs.	7
WALL FOUNDATION MATERIAL 8.00	Rock, boulders, and competent soil sufficient to support wall. No signs of scour.	7
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no water seepage; no missing mortar. Good condition.	7
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	7
CULVERT 1.00	3' CMP in good condition. Culvert clear with no debris.	7
DOWNSLOPE 1.00	Rock/soil compacted; no signs of erosion or scour.	7
LATERAL SLOPE 1.00	Stable slope with boulders, brush, and gravel. No signs of erosion or scour.	7
UPSLOPE 1.00	Rock/soil compacted; some vegetation. No concerns.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_4.096_R_1.jpg

Wall ID:	HALE-0010-4.098-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	70	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 3 ft CMP in good condition.		

Wall Measurements

Wall Length (ft.):	11	Face Area (sq.):	35
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	4	Vertical Offset (ft.):	-11

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall performance with no signs of settlement or rotation. No evidence of prior repairs.	7
WALL FOUNDATION MATERIAL 8.00	Rock, boulders, and competent soil sufficient to support wall. No signs of scour.	7
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no water seepage; no missing mortar. Good condition.	7
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	7
CULVERT 1.00	3' CMP in good condition. Culvert clear with no debris.	7
DOWNSLOPE 1.00	Rock/soil compacted; no signs of erosion or scour.	7
LATERAL SLOPE 1.00	Stable slope with boulders, brush, and gravel. No signs of erosion or scour.	7
UPSLOPE 1.00	Rock/soil compacted; some vegetation. No concerns.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_4.098_L_1.jpg



HALE_0010_4.098_L_2.jpg

Wall ID:	HALE-0010-4.204-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	70	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, 3 ft CMP, in good condition.		

Wall Measurements

Wall Length (ft.):	27	Face Area (sq.):	230
Average Wall Height (ft.):	8	Face Angle (deg.):	90
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	-3

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall performance with no signs of settlement or rotation. No evidence of prior repairs.	7
WALL FOUNDATION MATERIAL 8.00	Rock, boulders, and competent soil sufficient to support wall. No signs of scour.	7
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no water seepage; no missing mortar. Good condition.	7
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	7
CULVERT 1.00	3' CMP in good condition. Culvert clear with no debris.	7
DOWNSLOPE 1.00	Rock/soil compacted; no signs of erosion or scour.	7
LATERAL SLOPE 1.00	Loose fill with boulders on one side and bedrock on other side.	7
UPSLOPE 1.00	Rock/soil compacted; some vegetation. No concerns.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_4.204_R_1.jpg



HALE_0010_4.204_R_2.jpg

Wall ID:	HALE-0010-4.208-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	70	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 a wingwall on one side, 3 ft CMP, in good condition.		

Wall Measurements

Wall Length (ft.):	41	Face Area (sq.):	240
Average Wall Height (ft.):	5	Face Angle (deg.):	90
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	-15

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall performance with no signs of settlement or rotation. No evidence of prior repairs.	7
WALL FOUNDATION MATERIAL 8.00	Rock, boulders, and competent soil sufficient to support wall. No signs of scour.	7
MORTAR 8.00	Minor cracking and shrinking.	7
STONE MASONRY 8.00	Wingwall missing a few stones.	7
DOWNSLOPE 0.50	Stable bedrock.	8
CULVERT 1.00	3' CMP in good condition. Culvert clear with no debris.	7
LATERAL SLOPE 1.00	Loose fill with boulders on one side and bedrock on other side.	7
UPSLOPE 1.00	Loose gravel and boulders with some moderate vegetation.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_4.208_L_1.jpg



HALE_0010_4.208_L_2.jpg

Wall ID:	HALE-0010-4.460-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	2002
*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:	Cut wall in parallel pull out, recently built.		

Wall Measurements

Wall Length (ft.):	130	Face Area (sq.):	500
Average Wall Height (ft.):	3	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	Excellent, performing as designed.	8
WALL FOUNDATION MATERIAL 8.00	Paved with curb, stable, sufficient to support wall.	8
MORTAR 8.00	Excellent condition.	8
STONE MASONRY 8.00	Strong, competent fairly new stones.	8
DOWNSLOPE 0.50	Paved pullout.	8
LATERAL SLOPE 0.50	Bedrock with soil and moderate vegetation.	8
UPSLOPE 0.50	Bedrock and soil, moderate vegetation, stable 1:1 slope.	8
VEGETATION 0.50	No vegetation related distress.	8
WALL DRAINS 0.50	Small 1" pipes, functioning well.	8

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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos

Condition photos are not available for HALE-0010-4.460-R.

Wall ID:	HALE-0010-4.876-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	70	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 3 ft CMP in good condition.		

Wall Measurements

Wall Length (ft.):	12	Face Area (sq.):	45
Average Wall Height (ft.):	3	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 overall performance with no signs of settlement or rotation. No evidence of prior repairs.	7
WALL FOUNDATION MATERIAL 8.00	Rock, boulders, and competent soil sufficient to support wall. No signs of scour.	7
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no water seepage; no missing mortar. Good condition.	7
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	7
CULVERT 1.00	3' CMP in good condition. Culvert clear with no debris.	7
DOWNSLOPE 1.00	Rock/soil compacted; no signs of erosion or scour.	7
LATERAL SLOPE 1.00	Stable slope with boulders, brush, and gravel. No signs of erosion or scour.	7
UPSLOPE 1.00	Rock/soil compacted; some vegetation. No concerns.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_4.876_R_1.jpg

Wall ID:	HALE-0010-4.877-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	70	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 3 ft CMP in good condition.		

Wall Measurements

Wall Length (ft.):	9	Face Area (sq.):	20
Average Wall Height (ft.):	2	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 overall performance with no signs of settlement or rotation. No evidence of prior repairs.	7
WALL FOUNDATION MATERIAL 8.00	Solid, stable rock, sufficient for wall stability.	7
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no water seepage; no missing mortar. Good condition.	7
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	7
CULVERT 1.00	3' CMP in good condition. Culvert clear with no debris.	7
DOWNSLOPE 1.00	Rock/soil compacted; no signs of erosion or scour.	7
LATERAL SLOPE 1.00	Stable rocky slope with moderate vegetation.	7
UPSLOPE 1.00	Rock/soil compacted; some vegetation. No concerns.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_4.877_L_1.jpg

Wall ID:	HALE-0010-4.988-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	70	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 2 ft CMP in good condition.		

Wall Measurements

Wall Length (ft.):	14	Face Area (sq.):	40
Average Wall Height (ft.):	2	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 overall performance with no signs of settlement or rotation. No evidence of prior repairs.	7
WALL FOUNDATION MATERIAL 8.00	Rock, boulders, and competent soil sufficient to support wall. No signs of scour.	7
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no water seepage; no missing mortar. Good condition.	7
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	7
CULVERT 1.00	2' CMP in good condition. Culvert clear with no debris.	7
DOWNSLOPE 1.00	Rock/soil compacted; no signs of erosion or scour.	7
LATERAL SLOPE 1.00	Stable slope with boulders, brush, and gravel. No signs of erosion or scour.	7
UPSLOPE 1.00	Rock/soil compacted; some vegetation. No concerns.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_4.988_L_1.jpg

Wall ID:	HALE-0010-4.988-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	70	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 2 ft CMP in good condition.		

Wall Measurements

Wall Length (ft.):	10	Face Area (sq.):	45
Average Wall Height (ft.):	4	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 overall performance with no signs of settlement or rotation. No evidence of prior repairs.	7
WALL FOUNDATION MATERIAL 8.00	Soil and boulders, sufficient to support wall.	7
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no water seepage; no missing mortar. Good condition.	7
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	7
CULVERT 1.00	2' CMP in good condition. Culvert clear with no debris.	7
DOWNSLOPE 1.00	Rock/soil compacted; no signs of erosion or scour.	7
LATERAL SLOPE 1.00	One side has dry stack boulders 2' high.	7
UPSLOPE 1.00	Loose fill, no vegetation.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_4.988_R_1.jpg

Wall ID:	HALE-0010-5.067-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	70	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, 6 ft x 6 ft box culvert, in good condition.		

Wall Measurements

Wall Length (ft.):	24	Face Area (sq.):	40
Average Wall Height (ft.):	1	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 performance with no signs of settlement or rotation. No evidence of prior repairs.	7
WALL FOUNDATION MATERIAL 8.00	Stable bedrock.	8
MORTAR 8.00	Minor cracking and shrinkage, very small section of mortar is missing.	6
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	7
CULVERT 0.50	6'x6' concrete culvert in excellent condition.	8
LATERAL SLOPE 0.50	Bedrock with grouted riprap on one side.	8
VEGETATION 1.00	One bush needs to be removed from wall face.	6
DOWNSLOPE 1.00	Rock/soil compacted; no signs of erosion or scour.	7
UPSLOPE 1.00	Rock/soil compacted; some vegetation. No concerns.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_5.067_L_1.jpg



HALE_0010_5.067_L_2.jpg

Wall ID:	HALE-0010-5.067-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	69	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, 6 ft x 6 ft CIP box culvert, in good condition.		

Wall Measurements

Wall Length (ft.):	19	Face Area (sq.):	100
Average Wall Height (ft.):	5	Face Angle (deg.):	90
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall performance with no signs of settlement or rotation. No evidence of prior repairs.	7
WALL FOUNDATION MATERIAL 8.00	Solid, stable rock, sufficient for wall stability.	7
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no water seepage; no missing mortar. Good condition.	7
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	7
DOWNSLOPE 1.00	Loose gravel, no vegetation.	6
LATERAL SLOPE 1.00	Loose gravel with boulders.	6
CULVERT 1.00	6'x6' concrete culvert in excellent condition.	7
UPSLOPE 1.00	Rock/soil compacted; some vegetation. No concerns.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_5.067_R_1.jpg

Wall ID:	HALE-0010-5.215-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	70	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, 6 ft x 6 ft box culvert, in good condition.		

Wall Measurements

Wall Length (ft.):	31	Face Area (sq.):	110
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	-9

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall performance with no signs of settlement or rotation. No evidence of prior repairs.	7
WALL FOUNDATION MATERIAL 8.00	Rock and soil with some erosion evident.	7
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no water seepage; no missing mortar. Good condition.	7
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	7
LATERAL SLOPE 1.00	Steep bedrock on one side and loose gravel on other side. Slope is 1.5:1.	6
CULVERT 1.00	3' CMP in good condition. Culvert clear with no debris.	7
DOWNSLOPE 1.00	Rock/soil compacted; no signs of erosion or scour.	7
UPSLOPE 1.00	Rock/soil compacted; some vegetation. No concerns.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_5.215_R_1.jpg



HALE_0010_5.215_R_2.jpg

Wall ID:	HALE-0010-5.218-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	79	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mass Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mass concrete head wall with wingwall. CIP 6 ft x 6 ft box culvert in good condition.		

Wall Measurements

Wall Length (ft.):	14	Face Area (sq.):	90
Average Wall Height (ft.):	6	Face Angle (deg.):	90
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	-7

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall stability, no signs of settlement.	8
WALL FOUNDATION MATERIAL 8.00	Stable bedrock.	8
CONCRETE 8.00	Excellent condition, no cracks or water seepage.	8
CULVERT 0.50	Excellent condition.	8
DOWNSLOPE 0.50	Stable bedrock	8
LATERAL SLOPE 0.50	Stable bedrock with moderate vegetation.	8
WALL DRAINS 0.50	None, no drainage related distress.	8
UPSLOPE 1.00	Loose gravel with cobbles, stable, no vegetation.	6

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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_5.218_L_1.jpg



HALE_0010_5.218_L_2.jpg

Wall ID:	HALE-0010-5.727-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	64	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 headwall, 6 ft x 6 ft CIP box culvert, in good condition.		

Wall Measurements

Wall Length (ft.):	22	Face Area (sq.):	52
Average Wall Height (ft.):	2	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 performance with no signs of settlement or rotation.	8
WALL FOUNDATION MATERIAL 8.00	Stable bedrock.	7
MORTAR 8.00	Mortar is missing around several stones. Cracking and shrinkage in some areas.	5
STONE MASONRY 8.00	Some stones near wall edge have moved and will be lost unless re-grouted.	5
CULVERT 0.50	6'x6' culvert in excellent condition.	8
DOWNSLOPE 0.50	Stable bedrock.	8
LATERAL SLOPE 0.50	Bedrock. No signs of erosion.	8
UPSLOPE 0.50	Paved 1' from edge of road.	8
WALL DRAINS 1.00	No wall drains visible; no drainage related distress.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	RegROUT several loose stones at the edge of the wall: 4 hrs of labor @ \$55.00 per hour = \$220.00 Mortar = \$100.00
Repair Cost:	\$320

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

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_5.727_L_1.jpg



HALE_0010_5.727_L_2.jpg

Wall ID:	HALE-0010-5.727-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	70	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, 6 ft x 6 ft box culvert in good condition.		

Wall Measurements

Wall Length (ft.):	22	Face Area (sq.):	70
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	-4

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall performance with no signs of settlement or rotation. No evidence of prior repairs.	7
WALL FOUNDATION MATERIAL 8.00	Solid, stable rock, sufficient for wall stability.	7
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no water seepage; no missing mortar. Good condition.	7
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	7
CULVERT 1.00	Box culvert in good condition and clear of debris.	7
DOWNSLOPE 1.00	Rock/soil compacted; no signs of erosion or scour.	7
LATERAL SLOPE 1.00	Grouted riprap on one side, some loose gravel on other side.	7
UPSLOPE 1.00	Rock/soil compacted; some vegetation. No concerns.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_5.727_R_1.jpg

Wall ID:	HALE-0010-5.826-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	68	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, 6 ft x 6 ft CIP box culvert, in good condition.		

Wall Measurements

Wall Length (ft.):	30	Face Area (sq.):	75
Average Wall Height (ft.):	2	Face Angle (deg.):	90
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall performance with no signs of settlement or rotation. No evidence of prior repairs.	7
WALL FOUNDATION MATERIAL 8.00	Stable bedrock.	7
MORTAR 8.00	Minor cracking and shrinkage.	6
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	7
UPSLOPE 1.00	Loose gravel, no vegetation.	6
CULVERT 1.00	Culvert in good condition, clear of debris.	7
DOWNSLOPE 1.00	Stable bedrock.	7
LATERAL SLOPE 1.00	Loose gravel with boulders, no erosion.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_5.826_L_1.jpg



HALE_0010_5.826_L_2.jpg

Wall ID:	HALE-0010-5.826-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	69	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:	Mortared stone headwall, 6 ft x 6 ft box culvert, in good condition.		

Wall Measurements

Wall Length (ft.):	26	Face Area (sq.):	100
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	-11

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall performance with no signs of settlement or rotation. No evidence of prior repairs.	7
WALL FOUNDATION MATERIAL 8.00	Bedrock and soil, sufficient to support wall.	7
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no water seepage; no missing mortar. Good condition.	7
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	7
DOWNSLOPE 1.00	Some erosion evident.	6
UPSLOPE 1.00	Dry stack riprap wall exists above headwall; some brush.	6
VEGETATION 1.00	Heavy vegetation, small trees, near wall.	6
CURB/BERM/DITCH 1.00	Culvert is in good condition; free of debris.	7
LATERAL SLOPE 1.00	Stable slope, no signs of distress.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_5.826_R_1.jpg



HALE_0010_5.826_R_2.jpg

Wall ID:	HALE-0010-5.895-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	81	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	Gravity - Mortared Stone
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone headwall overlaid by 2 foot high concrete foundation for another, newly installed mortared rock wall, a 6 ft x 6 ft box culvert.		

Wall Measurements

Wall Length (ft.):	34	Face Area (sq.):	280
Average Wall Height (ft.):	8	Face Angle (deg.):	90
Maximum Wall Height (ft.):	13	Vertical Offset (ft.):	-10

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall performance with no signs of settlement or rotation; no signs of global distress.	8
WALL FOUNDATION MATERIAL 8.00	Bedrock. No signs of settlement or erosion at base of wall.	9
MORTAR 8.00	Minor shrinkage.	7
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	8
CONCRETE 8.00	Concrete foundation for upper wall shows no distortion.	9
CULVERT 0.50	6' x 6' box culvert in good condition	8
DOWNSLOPE 0.50	Bedrock with boulders.	8
WALL DRAINS 0.50	No wall drains visible; no drainage related distress.	8
LATERAL SLOPE 1.00	Loose gravel with boulders; no vegetation.	6

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.

Haleakala National Park

ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_5.895_R_1.jpg



HALE_0010_5.895_R_2.jpg

Wall ID:	HALE-0010-5.899-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	90	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Cantilever - Concrete
Surface Treatment:		Secondary Wall Type:	Gravity - Mortared Stone
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Concrete cantilever headwall with wingwalls by newly constructed mortared stone wall. 6 ft x 6 ft box culvert.		

Wall Measurements

Wall Length (ft.):	33	Face Area (sq.):	190
Average Wall Height (ft.):	5	Face Angle (deg.):	90
Maximum Wall Height (ft.):	11	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Recently built wall in excellent condition.	9
WALL FOUNDATION MATERIAL 8.00	Bedrock to granular stable aggregate. No signs of settlement or erosion.	9
CONCRETE 8.00	Excellent condition.	9
MORTAR 8.00	Newly installed, no issues.	9
STONE MASONRY 8.00	Newly installed, no issues.	9
LATERAL SLOPE 0.50	Mortared riprap wall exists on one side; no signs of distress.	8
UPSLOPE 0.50	Gravel and cobbles. Lightly vegetated. No signs of slumping or erosion.	8
VEGETATION 0.50	No vegetation related distress on wall.	8
WALL DRAINS 0.50	None; no drainage related distress.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_5.899_L_1.jpg



HALE_0010_5.899_L_2.jpg

Wall ID:	HALE-0010-5.915-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*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 in good condition.		

Wall Measurements

Wall Length (ft.):	8	Face Area (sq.):	30
Average Wall Height (ft.):	3	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 overall performance with no signs of settlement or rotation.	8
WALL FOUNDATION MATERIAL 8.00	Solid, stable rock, sufficient for wall stability.	8
MORTAR 8.00	Minor distress with some cracking near top of wall.	8
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	8
LATERAL SLOPE 0.50	Bedrock and grouted riprap on one side, dry stack riprap on other side.	8
VEGETATION 0.50	No vegetation related impacts to wall stability.	8
WALL DRAINS 0.50	No wall drains visible; no drainage related distress.	8
UPSLOPE 1.00	Loose gravel with vegetation.	6
DOWNSLOPE 1.00	Rock/soil compacted; no signs of erosion or scour.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_5.915_L_1.jpg

Wall ID:	HALE-0010-6.114-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*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:	Mortared stone masonry cutwall in good condition.		

Wall Measurements

Wall Length (ft.):	52	Face Area (sq.):	230
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 overall performance with no signs of movement or global instability.	8
WALL FOUNDATION MATERIAL 8.00	Pavement; no signs of settlement, cracking or in roadway.	9
MORTAR 8.00	Minor shrinkage and cracking.	7
STONE MASONRY 8.00	No signs of cracking or weathering.	8
UPSLOPE 0.50	Steep bedrock with loose lava rocks.	8
VEGETATION 0.50	No vegetation related impacts to wall stability.	8
WALL DRAINS 0.50	PVC pipe appears to be draining the wall very well.	8
DOWNSLOPE 0.50	Pavement, no signs of failure, erosion, or other distress.	9
LATERAL SLOPE 0.50	Bedrock, no signs of failure, erosion, or other 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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_6.114_L_1.jpg



HALE_0010_6.114_L_2.jpg

Wall ID:	HALE-0010-6.206-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*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:	Mortared stone headwall in good condition.		

Wall Measurements

Wall Length (ft.):	17	Face Area (sq.):	80
Average Wall Height (ft.):	4	Face Angle (deg.):	90
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	-6

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall performance with no signs of movement or global instability.	8
WALL FOUNDATION MATERIAL 8.00	Solid, stable bedrock, sufficient for wall stability.	7
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no water seepage; no missing mortar. Good condition.	7
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	7
UPSLOPE 1.00	Loose gravel fill with boulders and cobbles; no vegetation.	6
CULVERT 1.00	2' CMP in good condition.	7
DOWNSLOPE 1.00	Bedrock, no signs of slope failure.	7
LATERAL SLOPE 1.00	Loose gravel on one side and bedrock on downhill side. No signs of failure.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_6.206_R_1.jpg

Wall ID:	HALE-0010-6.280-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	68	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, wingwall on one side, in good condition.		

Wall Measurements

Wall Length (ft.):	43	Face Area (sq.):	190
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 overall performance with no signs of settlement or global instability.	7
WALL FOUNDATION MATERIAL 8.00	Bedrock at foundation with some undercutting, but no effect on wall stability.	7
MORTAR 8.00	Moderate shrinkage and cracking.	6
STONE MASONRY 8.00	Durable stones, no signs of weathering, erosion, or cracking.	7
CULVERT 0.50	3' CMP in good condition.	8
DOWNSLOPE 0.50	Bedrock, no signs of slope failure, erosion, or other distress.	8
LATERAL SLOPE 0.50	Bedrock, 6:1 slope on one side, steeper 1:1 slope on other side.	8
UPSLOPE 1.00	Loose gravel, no vegetation.	6
WALL DRAINS 1.00	No wall drains visible; no drainage related distress.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_6.280_R_1.jpg



HALE_0010_6.280_R_2.jpg

Wall ID:	HALE-0010-6.285-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*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 in good condition, with 2 ft CMP.		

Wall Measurements

Wall Length (ft.):	15	Face Area (sq.):	45
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	4	Vertical Offset (ft.):	-11

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall performance with no signs of movement or global instability.	8
WALL FOUNDATION MATERIAL 8.00	Solid, stable rock, sufficient for wall stability.	8
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no water seepage; no missing mortar. Good condition.	8
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	8
CULVERT 0.50	2' CMP in good condition; free of debris.	8
DOWNSLOPE 0.50	Rock/soil compacted; some vegetation. No concerns.	8
LATERAL SLOPE 0.50	Rock/soil compacted; no signs of erosion or scour.	8
WALL DRAINS 0.50	No wall drains visible; no drainage related distress.	8
UPSLOPE 1.00	Loose gravel and cobbles.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_6.285_L_1.jpg



HALE_0010_6.285_L_2.jpg

Wall ID:	HALE-0010-6.451-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	67	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 headwall in good condition with 3 ft CMP.		

Wall Measurements

Wall Length (ft.):	13	Face Area (sq.):	25
Average Wall Height (ft.):	1	Face Angle (deg.):	90
Maximum Wall Height (ft.):	4	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall performance with no signs of movement or global instability.	7
WALL FOUNDATION MATERIAL 8.00	Foundation is sufficient to support the wall, but tree roots may affect the foundation at some time.	6
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no missing mortar. Good condition.	7
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking.	7
VEGETATION 1.00	Large tree in front of the culvert poses a problem. Need removal.	5
UPSLOPE 1.00	Loose gravel, no vegetation.	6
CULVERT 1.00	3' CMP in good condition.	7
DOWNSLOPE 1.00	Rock/soil compacted. No concerns.	7
LATERAL SLOPE 1.00	Rock and compacted soil. No signs of failure, no issues.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Remove large tree from culvert inlet: 2 hours of labor @ \$55.00 per hour = \$110.00
Repair Cost:	\$110

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

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_6.451_R_1.jpg

Wall ID:	HALE-0010-6.454-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*Wall Rating:	70	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 in good condition with 3 ft CMP.		

Wall Measurements

Wall Length (ft.):	13	Face Area (sq.):	25
Average Wall Height (ft.):	1	Face Angle (deg.):	90
Maximum Wall Height (ft.):	5	Vertical Offset (ft.):	-9

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall performance with no signs of movement or global instability.	7
WALL FOUNDATION MATERIAL 8.00	Solid, stable rock, sufficient for wall stability.	7
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no missing mortar. Good condition.	7
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	7
CULVERT 1.00	3' CMP in good condition.	7
DOWNSLOPE 1.00	Rock/soil compacted; no signs of erosion or scour.	7
LATERAL SLOPE 1.00	Compacted soil, stable, no concerns.	7
UPSLOPE 1.00	Rock/soil compacted, stable, no concerns.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_6.454_R_1.jpg



HALE_0010_6.454_R_2.jpg

Wall ID:	HALE-0010-6.510-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 10, 2007	Approximate Year Built:	1934
*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:	Mortared stone cut wall for slope protection, good condition.		

Wall Measurements

Wall Length (ft.):	113	Face Area (sq.):	565
Average Wall Height (ft.):	5	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 overall performance with no signs of movement or global instability.	8
WALL FOUNDATION MATERIAL 8.00	Wall is set on pavement, no signs of settlement in roadway.	9
MORTAR 8.00	Minor shrinkage and cracking.	7
STONE MASONRY 8.00	All stones are intact, no signs of weathering or cracking. No signs of bulging or settlement.	8
UPSLOPE 0.50	Compacted soil with boulders and vegetation, no issues.	8
VEGETATION 0.50	No vegetation related impacts to wall stability.	8
WALL DRAINS 0.50	PVC pipe is draining the wall well.	8
DOWNSLOPE 0.50	Pavement, no wall related distress.	9
LATERAL SLOPE 0.50	Compacted soil with boulders, vegetation, no signs of failure or erosion.	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.

Haleakala National Park

ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_6.510_R_1.jpg



HALE_0010_6.510_R_2.jpg

Wall ID:	HALE-0010-6.538-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 11, 2007	Approximate Year Built:	1934
*Wall Rating:	79	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 headwall in good condition with 3 ft CMP.		

Wall Measurements

Wall Length (ft.):	21	Face Area (sq.):	100
Average Wall Height (ft.):	4	Face Angle (deg.):	90
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	-6

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall performance with no signs of movement or global instability.	8
WALL FOUNDATION MATERIAL 8.00	Solid, stable bedrock, sufficient for wall stability.	8
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no missing mortar. Good condition.	8
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	8
CULVERT 0.50	3' CMP in good condition.	8
DOWNSLOPE 0.50	Bedrock, no signs of slope failure or distress.	8
LATERAL SLOPE 0.50	Bedrock on both sides, no signs of slope failure or distress.	8
VEGETATION 0.50	No vegetation related impacts to wall stability.	8
WALL DRAINS 0.50	No wall drains visible; no drainage related distress.	8

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Remove dead tree from upslope: 2 hours of labor @ \$55.00 per hour = \$110.00
Repair Cost:	\$110

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

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_6.538_R_1.jpg



HALE_0010_6.538_R_2.jpg

Wall ID:	HALE-0010-6.546-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 11, 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:	Gravity - Dry Stone
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone headwall with 5 ft of slope protection provided by a dry stack rockwall built above. Culvert is a 3 ft CMP.		

Wall Measurements

Wall Length (ft.):	13	Face Area (sq.):	90
Average Wall Height (ft.):	6	Face Angle (deg.):	90
Maximum Wall Height (ft.):	11	Vertical Offset (ft.):	-15

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall performance with no signs of movement or global instability.	7
WALL FOUNDATION MATERIAL 8.00	Solid, stable rock, sufficient for wall stability. No signs of settlement.	7
MORTAR 8.00	Durable but with some minor shrinkage and cracking.	7
STONE MASONRY 8.00	Durable stones are intact, no signs of weathering. No signs of bulging or settlement.	8
UPSLOPE 0.50	Loose gravel with cobbles/boulders. No slumping or erosion.	8
CULVERT 1.00	3' CMP in good condition.	7
DOWNSLOPE 1.00	Loose gravel with cobbles/boulders. Minor erosion below CMP.	7
LATERAL SLOPE 1.00	Riprap on both sides with loose rock and gravel. No signs of distress.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_6.546_L_1.jpg



HALE_0010_6.546_L_2.jpg

Wall ID:	HALE-0010-7.182-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 11, 2007	Approximate Year Built:	1934
*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 headwall in good condition with 3 ft CMP.		

Wall Measurements

Wall Length (ft.):	14	Face Area (sq.):	45
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	Good overall performance with no signs of movement or global instability.	8
WALL FOUNDATION MATERIAL 8.00	Solid, stable rock, sufficient for wall stability.	7
MORTAR 8.00	Good condition with minor shrinkage.	7
STONE MASONRY 8.00	Generally good condition, but some loose stones on the upside corner.	7
CULVERT 0.50	3' CMP in good condition.	8
DOWNSLOPE 0.50	Bedrock, weathered fill material, no issues.	8
LATERAL SLOPE 0.50	Riprap with very little vegetation, but stable, no issues.	8
UPSLOPE 0.50	Pavement, no vegetation.	8
VEGETATION 0.50	No vegetation related impacts to wall stability.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_7.182_R_1.jpg

Wall ID:	HALE-0010-7.320-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 11, 2007	Approximate Year Built:	1934
*Wall Rating:	59	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 headwall in good condition with 2 ft CMP.		

Wall Measurements

Wall Length (ft.):	12	Face Area (sq.):	35
Average Wall Height (ft.):	2	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	Overall, the wall is stable, but is in need of having several stones reset into the wall.	6
WALL FOUNDATION MATERIAL 8.00	Soil on bedrock sufficient to support wall.	7
MORTAR 8.00	Some shrinkage and areas of loose mortar.	5
STONE MASONRY 8.00	Several missing stones need to be reset into the wall.	5
CULVERT 1.00	3' CMP is in good condition.	7
DOWNSLOPE 1.00	Gravel and boulders on bedrock, no issues.	7
LATERAL SLOPE 1.00	Stable slope with boulders, no signs of failure.	7
UPSLOPE 1.00	Loose gravel, no vegetation, but stable and no concerns.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	RegROUT stones at both ends of the wall: 4 hours of labor @ \$55.00 per hour = \$220.00 Mortar for resetting stones = \$100.00
Repair Cost:	\$320

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

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_7.320_R_1.jpg

Wall ID:	HALE-0010-7.766-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 11, 2007	Approximate Year Built:	1934
*Wall Rating:	70	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 headwall in good condition with 2 ft CMP.		

Wall Measurements

Wall Length (ft.):	13	Face Area (sq.):	30
Average Wall Height (ft.):	2	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 overall performance with no signs of movement or global instability.	7
WALL FOUNDATION MATERIAL 8.00	Solid, stable rock, sufficient for wall stability.	7
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no missing mortar. Good condition.	7
STONE MASONRY 8.00	Durable stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	7
DOWNSLOPE 0.50	Bedrock, stable slope, no issues.	8
LATERAL SLOPE 0.50	Bedrock, stable slope, no issues.	8
VEGETATION 1.00	Two large bushes will eventually impact the wall foundation; need removal.	6
CULVERT 1.00	3' CMP in good condition.	7
UPSLOPE 1.00	Paved, no vegetation, no issues.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Remove 2 bushes from wall foundation area: 2 hours of labor @ \$55.00 per hour = \$110.00
Repair Cost:	\$110

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

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_7.766_L_1.jpg

Wall ID:	HALE-0010-7.819-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 11, 2007	Approximate Year Built:	1934
*Wall Rating:	70	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 in good condition with 2 ft CMP.		

Wall Measurements

Wall Length (ft.):	12	Face Area (sq.):	30
Average Wall Height (ft.):	2	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 overall performance with no signs of movement or global instability.	7
WALL FOUNDATION MATERIAL 8.00	Solid, stable rock, sufficient for wall stability.	7
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no missing mortar. Good condition.	7
STONE MASONRY 8.00	All stones are intact, no signs of weathering, erosion, or cracking. No signs of bulging or settlement.	7
CULVERT 1.00	2' CMP is in good condition.	7
DOWNSLOPE 1.00	Rock/soil compacted; no signs of erosion or scour.	7
LATERAL SLOPE 1.00	Compacted soil, no signs of erosion or scour.	7
UPSLOPE 1.00	Rock/soil compacted; some vegetation. No concerns.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_7.819_L_1.jpg

Wall ID:	HALE-0010-7.928-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 11, 2007	Approximate Year Built:	1934
*Wall Rating:	75	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 in good condition with 2 ft CMP.		

Wall Measurements

Wall Length (ft.):	11	Face Area (sq.):	30
Average Wall Height (ft.):	2	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 overall performance with no signs of movement or global instability.	7
WALL FOUNDATION MATERIAL 8.00	Solid, stable bedrock, sufficient for wall stability.	7
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no missing mortar. Good condition.	8
STONE MASONRY 8.00	Durable stones are intact, no signs of weathering, erosion, or cracking.	8
CULVERT 0.50	2' CMP in good condition.	8
DOWNSLOPE 0.50	Bedrock with gravel, stable, no issues.	8
UPSLOPE 0.50	Flat, paved, no vegetation. No issues.	8
VEGETATION 0.50	No vegetation related impacts to wall stability.	8
WALL DRAINS 0.50	No wall drains visible; no drainage related distress.	8

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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_7.928_L_1.jpg

Wall ID:	HALE-0010-7.970-R		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 11, 2007	Approximate Year Built:	Unknown
*Wall Rating:	76	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:	Dry stack stone wall laid at 1:1 for slope protection with a 2 ft CMP at bottom of wall.		

Wall Measurements

Wall Length (ft.):	210	Face Area (sq.):	2100
Average Wall Height (ft.):	10	Face Angle (deg.):	45
Maximum Wall Height (ft.):	14	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good performance and stability; no signs of bulging, settlement, or movement.	7
WALL FOUNDATION MATERIAL 8.00	Bedrock with boulders sufficient to support wall. No signs of scour or failure.	8
PLACED STONE 8.00	Strong lava stones, no signs of distress or degradation.	8
CULVERT 0.50	2' CMP at wall bottom is in good condition	8
DOWNSLOPE 0.50	Stable rock fill, no issues.	8
LATERAL SLOPE 0.50	Bedrock and loose weathered rocks, little to no vegetation, no concerns.	8
VEGETATION 1.00	Several bushes growing in wall, no significant impact on stability.	6
UPSLOPE 1.00	Loose gravel with no vegetation, no issues.	7
WALL DRAINS 1.00	No wall drains visible; no drainage related distress.	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.

Haleakala National Park

ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_7.970_R_1.jpg



HALE_0010_7.970_R_2.jpg

Wall ID:	HALE-0010-7.997-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 11, 2007	Approximate Year Built:	1934
*Wall Rating:	70	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 in good condition with 2 ft CMP.		

Wall Measurements

Wall Length (ft.):	13	Face Area (sq.):	30
Average Wall Height (ft.):	2	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 overall performance with no signs of movement or global instability.	7
WALL FOUNDATION MATERIAL 8.00	Solid, stable rock, sufficient for wall stability.	7
MORTAR 8.00	Minor shrinkage, overall good condition.	7
STONE MASONRY 8.00	Strong durable stones, none missing, no issues.	7
CULVERT 0.50	2' CMP in good condition.	8
LATERAL SLOPE 0.50	One side paved ditch leading to inlet with stone and mortar; other side gravel with cobbles.	8
VEGETATION 0.50	No vegetation related impacts to wall stability.	8
DOWNSLOPE 1.00	Bedrock, no signs of failure or distress.	7
UPSLOPE 1.00	Paved, no vegetation, no concerns.	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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_7.997_L_1.jpg

Wall ID:	HALE-0010-8.322-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 11, 2007	Approximate Year Built:	1934
*Wall Rating:	75	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 in good condition with 2 ft CMP.		

Wall Measurements

Wall Length (ft.):	13	Face Area (sq.):	30
Average Wall Height (ft.):	2	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 overall performance with no signs of movement or global instability.	7
WALL FOUNDATION MATERIAL 8.00	Solid, stable bedrock, sufficient for wall stability.	7
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no missing mortar. Good condition.	8
STONE MASONRY 8.00	Durable stones are intact, no signs of weathering, erosion, or cracking.	8
CULVERT 0.50	2' CMP in good condition.	8
DOWNSLOPE 0.50	Bedrock with gravel, stable, no issues.	8
UPSLOPE 0.50	Flat, paved, no vegetation. No issues.	8
VEGETATION 0.50	No vegetation related impacts to wall stability.	8
WALL DRAINS 0.50	No wall drains visible; no drainage related distress.	8

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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_8.322_L_1.jpg

Wall ID:	HALE-0010-8.560-L		
Route Name:	HALEAKALA PARK ROAD		
Inspection Date:	July 11, 2007	Approximate Year Built:	1934
*Wall Rating:	75	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 in good condition with 2 ft CMP.		

Wall Measurements

Wall Length (ft.):	9	Face Area (sq.):	35
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 overall performance with no signs of movement or global instability.	7
WALL FOUNDATION MATERIAL 8.00	Solid, stable bedrock, sufficient for wall stability.	7
MORTAR 8.00	Durable and sound, no signs of shrinkage or cracking; no missing mortar. Good condition.	8
STONE MASONRY 8.00	Durable stones are intact, no signs of weathering, erosion, or cracking.	8
CULVERT 0.50	2' CMP in good condition.	8
DOWNSLOPE 0.50	Bedrock with gravel, stable, no issues.	8
UPSLOPE 0.50	Flat, paved, no vegetation. No issues.	8
VEGETATION 0.50	No vegetation related impacts to wall stability.	8
WALL DRAINS 0.50	No wall drains visible; no drainage related distress.	8

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.

Haleakala National Park
ROUTE 0010: HALEAKALA PARK ROAD

Retaining Wall Condition Photos



HALE_0010_8.560_L_1.jpg

Wall ID:	HALE-0902-0.000-P1		
Route Name:	LELEIWI OVERLOOK PARKING		
Inspection Date:	July 11, 2007	Approximate Year Built:	1934
*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:	Mortared stone cut wall in good condition.		

Wall Measurements

Wall Length (ft.):	233	Face Area (sq.):	1320
Average Wall Height (ft.):	5	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 overall performance with no signs of movement or global instability.	8
WALL FOUNDATION MATERIAL 8.00	Pavement is up to the wall base; sufficient to support the wall.	8
MORTAR 8.00	Minor shrinkage in several areas. No significant impact to wall stability.	7
STONE MASONRY 8.00	Good condition strong, rough cut masoned stones, no signs of weathering or fracturing.	8
DOWNSLOPE 0.50	Pavement, no issues.	8
LATERAL SLOPE 0.50	Loose gravel with boulders and little vegetation, 2:1 slope. No issues.	8
UPSLOPE 0.50	Loose gravel with boulders and little vegetation, 2:1 slope. No issues.	8
VEGETATION 0.50	Very minor vegetation, not impacting wall stability.	8
WALL DRAINS 0.50	PVC drains are at the bottom of the wall about 15 feet apart. Some are filled with fines, but generally the drains are functioning as intended.	8

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.

Haleakala National Park
ROUTE 0902: LELEIWI OVERLOOK PARKING

Retaining Wall Condition Photos



HALE_0902_0.000_P1_1.jpg



HALE_0902_0.000_P1_2.jpg

Wall ID:	HALE-0906ZZ-0.000-P1		
Route Name:	HOSMER GROVE CAMPGROUND PARKING AREAS		
Inspection Date:	July 11, 2007	Approximate Year Built:	1934
*Wall Rating:	66	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 headwall in good condition with a 1.5 ft concrete pipe.		

Wall Measurements

Wall Length (ft.):	15	Face Area (sq.):	100
Average Wall Height (ft.):	6	Face Angle (deg.):	45
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Good overall performance with no signs of movement or global instability.	8
WALL FOUNDATION MATERIAL 8.00	Solid, stable rock, sufficient for wall stability.	7
MORTAR 8.00	Shrinkage and some lost mortar.	4
STONE MASONRY 8.00	Strong, durable stones in good condition.	7
DOWNSLOPE 0.50	Bedrock, no issues.	8
LATERAL SLOPE 0.50	Paved on one side and compacted fill on the other side with large brush.	8
UPSLOPE 1.00	Compacted fill, some vegetation. No concerns.	7
VEGETATION 1.00	No vegetation related impacts to wall stability.	7
WALL DRAINS 1.00	No wall drains visible; no drainage related distress.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Fill gaps between stones with mortar where mortar is missing or loose: 4 hours of labor @ \$55.00 per hour = \$220.00 Mortar at \$100.00
Repair Cost:	\$320

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

Haleakala National Park

ROUTE 0906ZZ: HOSMER GROVE CAMPGROUND PARKING AREAS

Retaining Wall Condition Photos



HALE_0906ZZ_0.000_P1_1.jpg



HALE_0906ZZ_0.000_P1_2.jpg

Wall ID:	HALE-0906ZZ-0.000-P2		
Route Name:	HOSMER GROVE CAMPGROUND PARKING AREAS		
Inspection Date:	July 11, 2007	Approximate Year Built:	1934
*Wall Rating:	57	Maintenance Action:	Maintenance

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:	The mortared stone headwall has a 9 ft high dry stack rock wall built above it. The headwall has a 1.5 ft concrete culvert. Walls are in good condition.		

Wall Measurements

Wall Length (ft.):	68	Face Area (sq.):	332
Average Wall Height (ft.):	4	Face Angle (deg.):	80
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	The upper dry stack rock wall has rotated and needs to be reset. The headwall is performing well as intended.	5
WALL FOUNDATION MATERIAL 8.00	Solid, stable rock, sufficient for wall stability.	7
STONE MASONRY 8.00	Strong, large stone blocks in good condition, no signs of cracking, but there are signs of movement.	4
MORTAR 8.00	Overall good condition with only some minor shrinkage.	6
CULVERT 0.50	1.5' concrete culvert is in good condition.	8
VEGETATION 0.50	No vegetation related impacts to wall stability.	8
LATERAL SLOPE 1.00	Compacted soil, heavy vegetation.	6
DOWNSLOPE 1.00	Bedrock, no issues.	7
WALL DRAINS 1.00	No wall drains visible; no drainage related distress.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Reset displaced rock in dry stack section: 16 hours of labor @ \$55.00 per hour = \$880.00 Equipment (Backhoe) 8 hours @ \$150.00 per hour = \$1,200.00
Repair Cost:	\$2,080

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

Haleakala National Park

ROUTE 0906ZZ: HOSMER GROVE CAMPGROUND PARKING AREAS

Retaining Wall Condition Photos



HALE_0906ZZ_0.000_P2_1.jpg



HALE_0906ZZ_0.000_P2_2.jpg

Appendix A

Summary of WIP Definitions



Haleakala 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>
--------------------	--	---

