Federal Lands Highway

# Road Inventory Program

Road Inventory and Condition Assessment

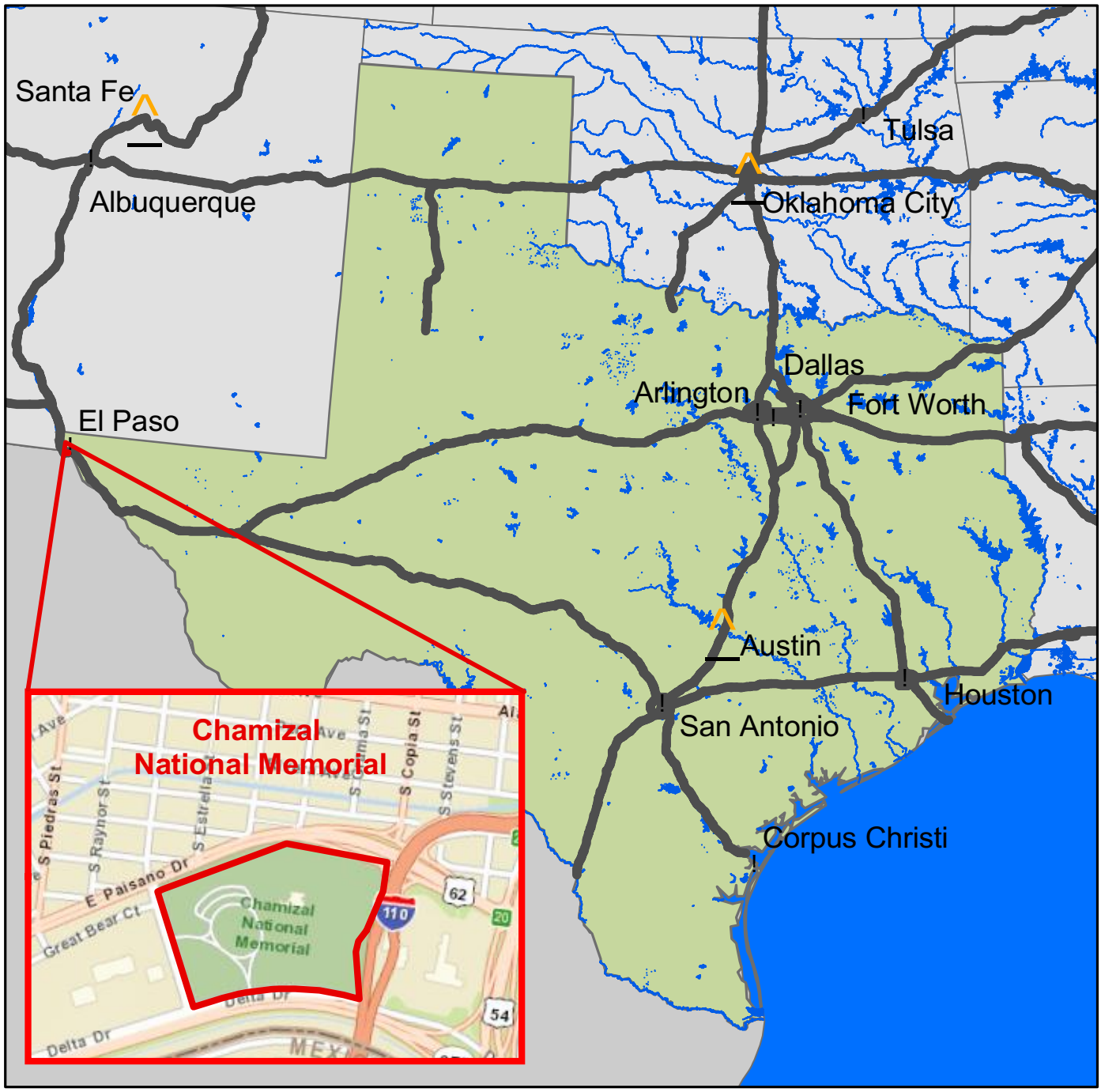

# Chamizal National Memorial

## CHAM - 7210

# Cycle 5 Report

**Prepared By: Federal Highway Administration**
**Road Inventory Program (RIP)**
**Data Collected: 03/2011**
**Report Date: 08/2012**

# Chamizal National Memorial
# in
# Texas



DCV = Data Collection Vehicle

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# Section 1
# Introduction

Chamizal National Memorial

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## INTRODUCTION

The Federal Highway Administration, (FHWA), in the mid 1970s, was charged with the task of identifying surface condition deficiencies and corrective priorities on National Park Service (NPS) roads and parkways. Additionally, FHWA was tasked with establishing an integrated maintenance features inventory, locating features such as culverts, guardrails, and signs, among others, along NPS roads and parkways. As a result, in 1976 the NPS and FHWA entered into an MOA (Memorandum Of Agreement) which established the RIP (Road Inventory Program). This MOA was terminated and revised in 1980 to establish a new MOA aiming to update RIP data and develop a long-range program to improve and maintain NPS roads to designated condition standards and establish a maintenance management program.

The FHWA completed this initial phase of the RIP in the early 1980s. As a result of this effort, each NPS site included in the study received a RIP Report known as the "Brown Book" which included the information collected during this first RIP phase.

In the 1990s, the effort was again renewed to update and maintain the RIP data. By this time the computer age was upon us and a process was employed that relied heavily on electronic data collection and computer technology. A cyclical program was developed and the RIP completed two cycles of data collection from 1994 to 2001. Cycle 1, starting in 1994, was conducted in 44 "large parks" (parks containing 10 or more paved route miles). Cycle 2 began in 1997 and comprised 79 large parks and 5 small parks totaling 4,874 paved route miles. Each of these parks received a RIP Report known as the "Blue Book". Cycle 3, from 2001 to 2004, was conducted in all parks, large and small, that contained any paved routes, including parking areas and, again, each park received a RIP Report and associated electronic files.

Cycle 4 was initiated in the spring of 2006 covering 86 large parks and several associated small parks consisting of 5,553 paved route miles and 6,232 paved parking areas. Data collection has been completed for Cycle 4 and all data has been delivered to the NPS.

In 2005, the FHWA began implementing the use of a Pavement Management System (PMS) to assist the NPS in prioritizing Pavement Maintenance and Rehabilitation activities. The PMS used by FHWA is the Highway Pavement Management Application (HPMA) and this software has the ability to store inventory and condition data from RIP and forecast future performance using prediction models. Outputs include performance and condition reports at the National, Regional, Park, or Route level. A regional prioritized list and optimization have been produced for most regions and the Federal Highway Deferred Maintenance is calculated via the HPMA.

In an effort to improve the accuracy of treatment recommendations and pavement condition descriptions, an extensive study was completed throughout 2010 that has resulted in changes to the RIP condition reporting method, specifically the distresses and indexes that comprise the Pavement Condition Rating (PCR). It was determined that a better representation of PCR could

be achieved by modifying the relative impact certain distresses would have on the overall rating. The changes that were implemented were endorsed by management at both the FHWA and NPS in October 2010. These changes will allow greater use of RIP and HPMA data for not simply condition data reporting, but also as a reliable tool for project identification and selection. Because of these changes, the PCR Condition ratings reported in Cycle 5 do not directly relate to the condition ratings reported in previous cycle RIP Reports. For more detailed information about the changes, see Section 3 and Section 10 in this RIP Report.

Cycle 5 has launched in the summer of 2010 and will again comprise all parks, large and small, that are served by paved roads and/or parking areas. For Cycle 5, the decision was made to collect condition data in large parks on Functional Class 1, 2, and 7 paved routes only, as well as any new routes that were previously not collected. In small parks, all paved routes and parking areas will be collected. As a result, this will include 81 large parks with 4,459 paved route miles and 168 small parks with 529 paved route miles and associated paved parking areas.

Since 1984, the Road Inventory Program has been funded through the Federal Lands Highway Park Roads and Parkways (PRP) Program. Currently, coordination of the RIP with FLH is under the NPS Washington Headquarters Park Facility Management Division. The FLH Washington office coordinates policy and prepares national reports and needs assessment studies for Congress.

In 1998, the Transportation Equity Act for the 21st Century (TEA-21) amended Title 23 U.S.C., and inserted Section 204(a)(6) requiring the FHWA and NPS, to develop by rule, a Pavement Management System (PMS) applied to park roads and parkways serving the National Park System.

FLH is responsible for the accuracy of all data presented in this report. Any questions or comments concerning the contents of this report should be directed to the national RIP Coordinator located in Sterling, Virginia.

Respectfully,

FHWA RIP Team

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# Section 2
# Park Route Inventory

## Chamizal National Memorial

Federal Lands Highway
Road Inventory Program

# Cycle 5 NPS/RIP Route ID Report



Shading Color Key:
Red text denotes approx. mileage

White = Paved Routes, DCV Driven
Yellow = Unpaved Routes, DCV not Driven
Blue = All Paved Parking Areas
Green = All Unpaved Parking Areas
Grey = Paved Routes, DCV not Driven
Black = State, Local or Private non-NPS Routes
= Concession Route Flag ON

*Unpaved route data was obtained from NPS and was not inventoried by the Road Inventory Program (RIP).

** DCV - Data Collection Vehicle NC - Not Collected

## CHAM

### *CHAMIZAL NATIONAL MEMORIAL*

| Rte. No. | Cycle Collected | FMSS No. | Concess Route | Route Name | Route Description From | Route Description To | Maint. District | Paved Miles | Un-Paved Miles | Total Route Length | Func. Class | Manual Rated SQ/FT | Surf. Type | Area Maps |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0010 | 5 | 73039 | | CIRCLE DRIVE | FROM END OF ROUTE 0010AAZ (SAN MARCIAL ENTRANCE ROAD) | TO ROUTE 0010AAZ (SAN MARCIAL ENTRANCE ROAD) | N/A | 0.29 | 0.00 | 0.29 | 1 | | AS | 1 |
| 0010AZZ | 5 | 102676 | | SAN MARCIAL ENTRANCE ROADS | FROM S. SAN MARCIAL STREET | TO BEGINNING OF ROUTE 0010 (CIRCLE DRIVE) | N/A | 0.11 | 0.00 | 0.11 | 1 | | AS | 1 |
| 0010BZZ | 5 | 102678 | | DELTA ENTRANCE ROADS | FROM DELTA DRIVE / CESAR E. CHAVEZ BORDER HIGHWAY | TO ROUTE 0010 (CIRCLE DRIVE) | N/A | 0.12 | 0.00 | 0.12 | 1 | | AS | 1 |
| 0900 | 5 | 73045 | | CHAMIZAL VISITOR CENTER MAIN PARKING | FROM ROUTE 0010 (CIRCLE DRIVE) AT MP 0.16 ON RIGHT | TO ROUTE 0010 (CIRCLE DRIVE) AT MP 0.25 ON RIGHT | N/A | 0.00 | 0.00 | 0.00 | | 82,891 | AS | 1 |
| 0901 | 5 | 102859 | | MAINTENANCE PARKING AREA | FROM ROUTE 0900 (CHAMIZAL VISITOR CENTER MAIN PARKING) | TO MAINTENANCE AREA | N/A | 0.00 | 0.00 | 0.00 | | 18,896 | AS | 1 |
| 0902 | 5 | 102945 | | THEATER TECH PARKING | ADJACENT TO ROUTE 0010 (CIRCLE DRIVE) AT MP 0.08 ON LEFT | | N/A | 0.00 | 0.00 | 0.00 | | 3,643 | CO | 1 |
| 0903 | NC | 73358 | | CHAMIZAL OVERFLOW PARKING | FROM ROUTE 0010BAZ (DELTA ENTRANCE ROAD) AT MP 0.01 ON LEFT | TO PARKING | N/A | 0.00 | 0.00 | 0.00 | | 232,000 | GR | |

# Cycle 5 NPS/RIP Route ID Report



Shading Color Key:
Red text denotes approx. mileage

White = Paved Routes, DCV Driven | Yellow = Unpaved Routes, DCV not Driven | Blue = All Paved Parking Areas | Green = All Unpaved Parking Areas

Grey = Paved Routes, DCV not Driven | Black = State, Local or Private non-NPS Routes | = Concession Route Flag ON

*Unpaved route data was obtained from NPS and was not inventoried by the Road Inventory Program (RIP).

** DCV - Data Collection Vehicle NC - Not Collected

## CYCLE 5 SUMMARY TOTALS FOR CHAMIZAL NATIONAL MEMORIAL

### CYCLE 5 ROUTE TOTALS

| | |
|---|---|
| DCV Driven Route Miles | 0.45 |
| Manually Rated Route Miles | 0.07 |
| TOTAL PARK ROUTE MILES COLLECTED IN CYCLE 5 | 0.51 |
| Manually Rated Routes (SQFT) | 4,452 |
| TOTAL UNPAVED PARK ROUTE MILES | 0.00 |

### CYCLE 5 CONCESSION TOTALS

| | |
|---|---|
| Concession Paved Route Miles | 0.00 |
| Concession Unpaved Route Miles | 0.00 |
| TOTAL CONCESSION ROUTE MILES | 0.00 |
| Concession Paved Parking Area SQFT | 0 |
| Concession Unpaved Parking Area SQFT | 0 |
| TOTAL CONCESSION PARKING AREA SQFT | 0 |
| Concession Manually Rated Rotes SQFT | 0 |

### * CYCLE 5 PARKING AREA TOTALS

| | |
|---|---|
| Paved Parking (SQFT) | 105,430 |
| Unpaved Parking (SQFT) | 232,000 |
| TOTAL PARKING (SQFT) | 337,430 |

### CYCLE 5 WEIGHTED AVERAGE PARK VALUES

| | |
|---|---|
| DCV Driven PCR | 85 |
| **Manually Rated Routes PCR | 73 |
| **Parking PCR | 74 |
| ***Total Equivalent Lane Miles | 2.58 |

* - The Parking Area Totals SQFT value represents **all** parking areas collected in Cycle 5, both park and concessionaire.

** - Parking and Manually Rated Routes are assigned the following PCR values based on their observed condition: Construction=-1, Excellent=97, Good=90, Fair=73, and Poor=45.

*** - Equivalent Lane Miles are calculated by route using the following equations : DCV and Manually Rated Lines Routes=(PAVE_WIDTHxPAVED_MI)/11 foot lane. Parking Areas=SQ_FEET/5280/11. Manually Rated Polygons=SQ_FEET/5280/11.

# Cycle 5 NPS/RIP Route ID Report



Shading Color Key:
Red text denotes approx. mileage

| | | | |
|---|---|---|---|
| White = Paved Routes, DCV Driven | Yellow = Unpaved Routes, DCV not Driven | Blue = All Paved Parking Areas | Green = All Unpaved Parking Areas |
| Grey = Paved Routes, DCV not Driven | Black = State, Local or Private non-NPS Routes | = Concession Route Flag ON | |

*Unpaved route data was obtained from NPS and was not inventoried by the Road Inventory Program (RIP).

** DCV - Data Collection Vehicle NC - Not Collected

## General Park Road Functional Classification Table

Class 1 Principal Park Road/Rural Parkway (Public Roads) Roads which constitute the main access route, circulatory tour, or thoroughfare for park visitors. Route Numbers 1 - 99. Note: Rural parkways (e.g. Natchez Trace) are numbered 1 - 9. State Routes Inventoried for Park. Route Numbers 5000-5999

Class 2 Connector Park Road (Public Roads) - Roads which provide access within a park to areas of scenic, scientific, recreational or cultural interest, such as overlooks, campgrounds, etc. Route Numbers 100-199.

Class 3 Special Purpose Park Road (Public Roads) - Roads which provide circulation within public areas, such as campgrounds, picnic areas, visitor center complexes, concessionaire facilities, etc. These roads generally serve low-speed traffic and are often designed for one-way circulation. Route Numbers 200-299.

Class 4 Primitive Park Roads (Public Roads) - Roads which provide circulation through remote areas and/or access to primitive campgrounds and undeveloped areas. These roads frequently have no minimum design standards and their use may be limited to specially equipped vehicles. Route Numbers 200-299.
Note: Functional Classes 3 and 4 have the same route numbers because, historically, they were numbered similarly.

Class 5 Administrative Access Road (Administrative Roads) - All public roads intended for access to administrative developments or structures such as park offices, employee quarters, or utility areas. Route Numbers 400-499.

Class 6 Restricted Road (Administrative Roads) - All roads normally closed to the public, including patrol roads, truck trails, and other similar roads. Route Numbers 400-499.
Note: Functional Classes 5 and 6 have the same route numbers because historically they were numbered similarly and often there is little distinction between these routes. For example, because utility areas and employee housing are often closed to the public, this restriction would result in classification of FC 6 rather than FC 5.

Class 7 Urban Parkway (Urban Parkways and City Streets) - These facilities serve high volumes of park and non-park related traffic and are restricted, limited-access facilities in an urban area. This category of roads primarily encompasses the major parkways which serve as gateways to our nation's capital. Other major park roads or portions thereof, however, may be included in this category. Route Numbers 1-9.

Class 8 City Streets (Urban Parkways and City Streets) - City streets are usually extensions of the adjoining street system that are owned and maintained by the National Park Service. The construction and/or reconstruction should conform with accepted local engineering practice and local conditions. Route Numbers 600-699.

**********

A park road system contains those roads within or giving access to a park or other unit of the NPS which are administered by the NPS, or by the Service in cooperation with other agencies. The assignment of a functional classification (FC) to a park road is not based on traffic volumes or design speed, but on the intended use or function of that road or route.

The historic route numbering system also included a 300 number series for interpretive roads, and a 500 series for one-way roads. There are approximately 250 roads nationwide which are designated by the 300 and 500 series. The numbers for these roads will be maintained for reporting consistency. However, since these interpretive and one-way routes are not as clearly tied to a specific functional class, the 300 and 500 series will be discontinued for future use.

5000 route numbers are assigned to Non-NPS Routes that are State, County or City owned which border, traverse, or provide access to Park Facilities or Assets. 5000 Routes

## Surface Type Abbreviations:

AS - Asphaltic Concrete Pavement
CO - Portland Cement Concrete Pavement
BR - Brick or Pavers Road Bed
CB - Cobble Stone Road Bed
GR - Gravel Road Bed
SA - Sand Road Bed
NV - Native or Dirt Material Road Bed
OT - Other Materials Road Bed

# NPS/RIP Subcomponent Details for CHAM



Shading Color Key:
Red text denotes approx. mileage

White = Paved Routes, DCV Driven | Yellow = Unpaved Routes, DCV not Driven | Blue = All Paved Parking Areas | Green = All Unpaved Parking Areas

Grey = Paved Routes, DCV not Driven | Black = State, Local or Private non-NPS Routes | = Concession Route Flag ON

*Unpaved route data was obtained from NPS and was not inventoried by the Road Inventory Program (RIP).

## CHAM

***CHAMIZAL NATIONAL MEMORIAL***

### Asset Entered in FMSS System

| Rte. No. | FMSS No. | Cycle Collected | Route Name | Route Description From | Route Description To | Concess Route | Func. Class | Paved Miles | Un-Paved Miles | Total Route Length | Manual Rated SQ/FT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0010AZZ | 102676 | 5 | SAN MARCIAL ENTRANCE ROADS | FROM S. SAN MARCIAL STREET | TO BEGINNING OF ROUTE 0010 (CIRCLE DRIVE) | | 1 | 0.11 | 0.00 | 0.11 | |
| 0010BZZ | 102678 | 5 | DELTA ENTRANCE ROADS | FROM DELTA DRIVE / CESAR E. CHAVEZ BORDER HIGHWAY | TO ROUTE 0010 (CIRCLE DRIVE) | | 1 | 0.12 | 0.00 | 0.12 | |

### Asset CHAM-0010AZZ Subcomponent Breakdown

| Rte. No. | FMSS No. | Cycle Collected | Route Name | Route Description From | Route Description To | Concess Route | Func. Class | Paved Miles | Un-Paved Miles | Total Route Length | Manual Rated SQ/FT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0010AAZ | 102676 | 5 | SAN MARCIAL ENTRANCE ROAD | FROM S. SAN MARCIAL STREET | TO BEGINNING OF ROUTE 0010 (CIRCLE DRIVE) | | 1 | 0.09 | 0.00 | 0.09 | |
| 0010ABZ | 102676 | 5 | SAN MARCIAL ENTRANCE ROAD SPUR | FROM ROUTE 0010 (CIRCLE DRIVE) | TO ROUTE 0010AAZ (SAN MARCIAL ENTRANCE ROAD) | | 1 | 0.02 | 0.00 | 0.02 | 1,309 |

### Asset CHAM-0010BZZ Subcomponent Breakdown

| Rte. No. | FMSS No. | Cycle Collected | Route Name | Route Description From | Route Description To | Concess Route | Func. Class | Paved Miles | Un-Paved Miles | Total Route Length | Manual Rated SQ/FT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0010BAZ | 102678 | 5 | DELTA ENTRANCE ROAD | FROM DELTA DRIVE / CESAR E. CHAVEZ BORDER HIGHWAY | TO ROUTE 0010 (CIRCLE DRIVE) AT MP 0.08 ON RIGHT | | 1 | 0.07 | 0.00 | 0.07 | |
| 0010BBZ | 102678 | 5 | DELTA ENTRANCE ROAD SPUR | FROM ROUTE 0010 (CIRCLE DRIVE) | TO ROUTE 0010BAZ | | 1 | 0.05 | 0.00 | 0.05 | 3,143 |

## ROUTE IDENTIFICATION CHANGES TO PAVED ROUTES FROM PREVIOUS CYCLE - CHAM

| ROUTES MODIFIED FROM PREVIOUS INVENTORY: | | | |
|---|---|---|---|
| **Route #** | **Route Name** | **Type of Modification** | **Comments** |
| 0901 | MAINTENANCE PARKING AREA | SQ FEET CHANGE | A NEW SECTION OF PARKING WAS ADDED IN CYCLE 5. THEREFORE THE SQUARE FEET AREA HAS INCREASED. |
| 0902 | THEATER TECH PARKING | SQ FEET CHANGE | A NEW SECTION OF PARKING WAS ADDED IN CYCLE 5. THEREFORE THE SQUARE FEET AREA HAS INCREASED. |
| **OTHER CHANGES FROM PREVIOUS INVENTORY:** | | | |
| **Route #** | **Route Name** | **Type of Change** | **Comments** |
| 0010AZZ | SAN MARCIAL ENTRANCE ROADS | ROUTES COMBINED | THE ROAD SPUR SECTION WAS ADDED AND COMBINED WITH THIS ROUTE. |
| 0010BZZ | DELTA ENTRANCE ROADS | ROUTES COMBINED | THE ROAD SPUR SECTION WAS ADDED AND COMBINED WITH THIS ROUTE. |

# Section 3
# Park Summary Information


Chamizal National Memorial

Federal Lands Highway
Road Inventory Program

# CHAM: PAVED ROUTE MILES AND PERCENTAGES BY FUNCTIONAL CLASS AND PCR

| F.C. | Pavement Condition Rating (PCR) | | | | | | | | TOTAL MILES |
|---|---|---|---|---|---|---|---|---|---|
| | Poor (0-60) | | Fair (61-84) | | Good (85-94) | | Excellent (95-100) | | |
| | MILES | % | MILES | % | MILES | % | MILES | % | |
| 1 | | | 0.20 | 44.44% | 0.25 | 55.56% | | | **0.45** |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| **Totals** | **0.00** | **0.00%** | **0.20** | **44.44%** | **0.25** | **55.56%** | **0.00** | **0.00%** | **0.45** |

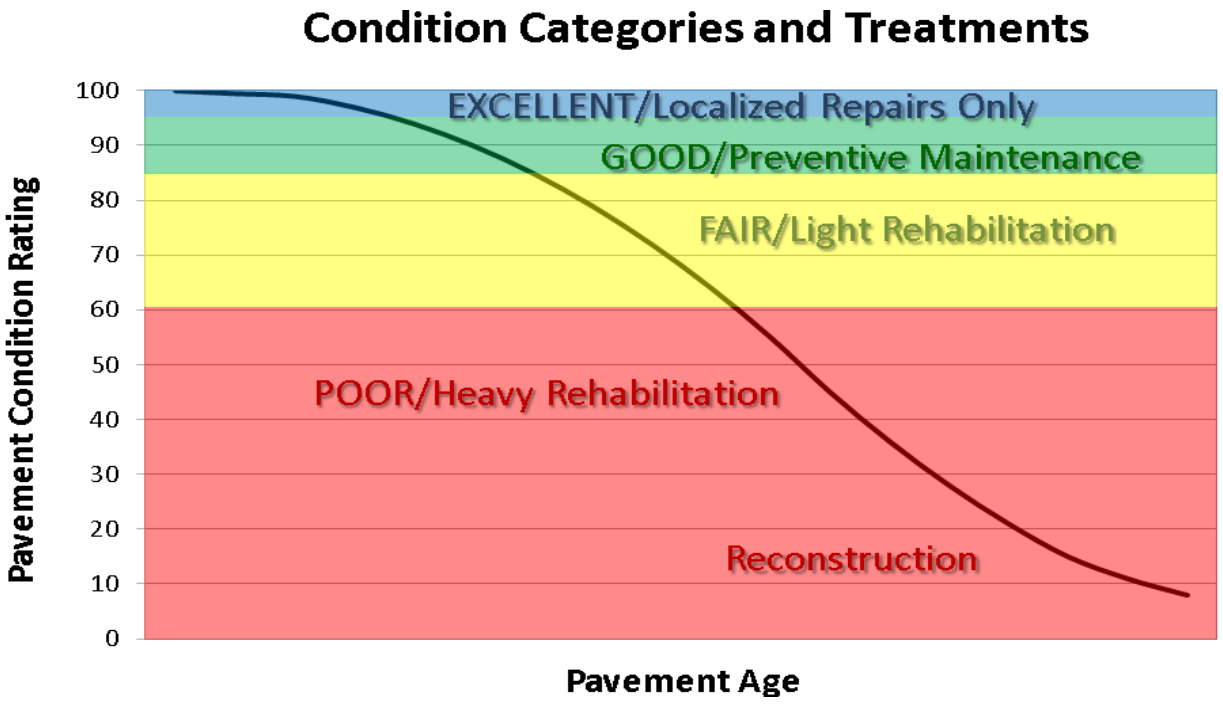
**Note:** **The information in this table is derived from the PMS_20 table in the Park database, which only contains processed data from routes collected with the Data Collection Vehicle (DCV). Information for Manually Rated Routes (MRR) and Parking Areas is not reported in this table. Only Functional Class 1, 2, & 7 routes, and any new routes not previously collected by RIP, are collected in Large Parks.**

## Explanation of the Excellent, Good, Fair and Poor Condition Descriptions

In addition to the RIP Index changes that have been implemented in Cycle 5, we will also aim to provide greater assistance in translating excellent/good/fair/poor categories into pavement needs categories. The PCR can be used to indicate the place in the Pavement Life Cycle and the types of treatments that should be considered now and into the future.

- Excellent/New: PCR of 95-100. Pavements in this range will require only spot repairs
- Good: PCR of 85-94. Pavements in this range will likely be candidates for Preventive Maintenance. Examples include Chip and Slurry Seals, Micro Surfacing and Thin Overlays.
- Fair: PCR of 61-84. Pavements in this range will likely be candidates of Light Rehabilitation (L3R). Examples include single-lift overlays up to 2.5 inches in total thickness, milling and overlays.
- Poor: PCR of 0-60. Pavements in this range will likely be candidates of Heavy Rehabilitation or Reconstruction (H3R or 4R). Examples include Pulverization, Multiple Lift Overlays, and Reconstruction.

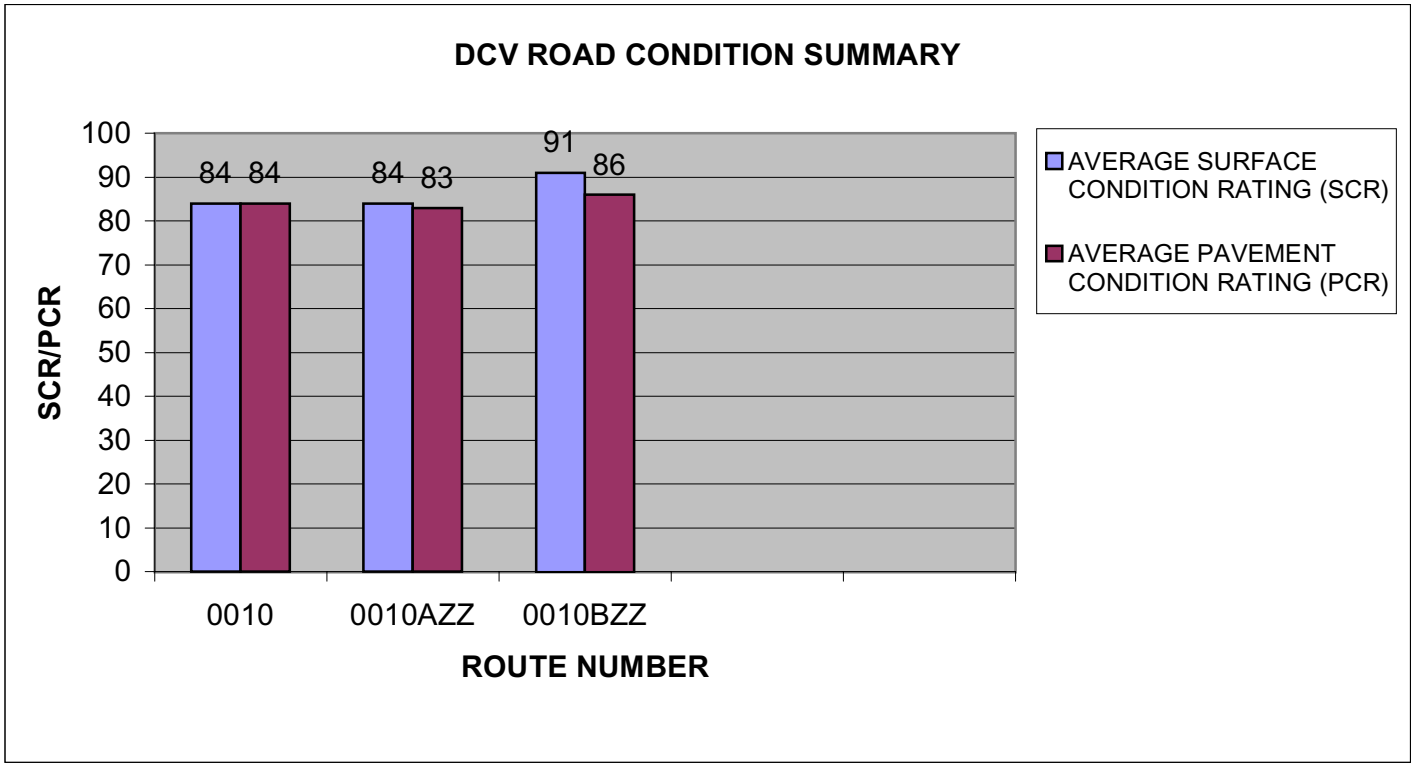
At this time, specific Maintenance and Rehabilitation activities should be evaluated and recommended at the project level. Site-specific conditions that influence treatment type should be determined based on performing a subsurface investigation and/or pavement condition survey, and not be based solely on RIP data. Additionally, RIP produces a snapshot of conditions the year in which the data was collected. For further information or to obtain additional Pavement Management System's data from our Highway Pavement Management Application (HPMA) please contact the Eastern Federal Lands pavement team.



# CHAM: DCV ROAD CONDITION SUMMARY

DCV - Data Collection Vehicle

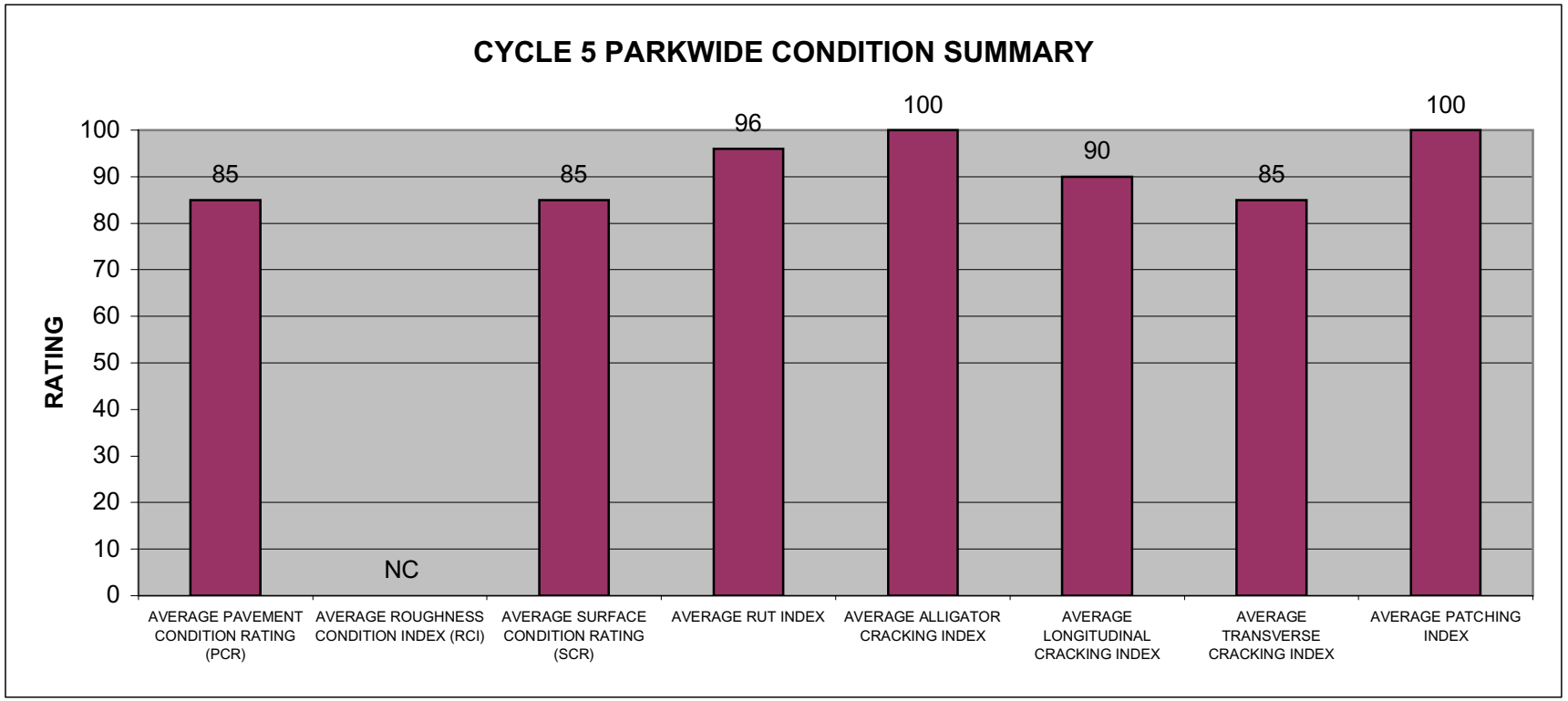
| ROUTE NUMBER | ROUTE NAME | FUNCT CLASS | ROUTE LENGTH | SURFACE TYPE | AVERAGE SURFACE CONDITION RATING (SCR) | AVERAGE PAVEMENT CONDITION RATING (PCR) |
|---|---|---|---|---|---|---|
| 0010 | CIRCLE DRIVE | 1 | 0.29 | ASPHALT | 84 | 84 |
| 0010AZZ | SAN MARCIAL ENTRANCE ROADS | 1 | 0.11 | ASPHALT | 84 | 83 |
| 0010BZZ | DELTA ENTRANCE ROADS | 1 | 0.12 | ASPHALT | 91 | 86 |



# CHAM: PARKWIDE DCV CONDITION SUMMARY

| AVERAGE PAVEMENT CONDITION RATING (PCR) | AVERAGE ROUGHNESS CONDITION INDEX (RCI) | AVERAGE SURFACE CONDITION RATING (SCR) | AVERAGE RUT INDEX | AVERAGE ALLIGATOR CRACKING INDEX | AVERAGE LONGITUDINAL CRACKING INDEX | AVERAGE TRANSVERSE CRACKING INDEX | AVERAGE PATCHING INDEX |
|---|---|---|---|---|---|---|---|
| 85 | NC | 85 | 96 | 100 | 90 | 85 | 100 |

*All Index values are based on Data Collection Vehicle (DCV) driven roads that were collected in Cycle-5.*
*Roughness data is only collected on routes with lengths greater than 0.5 miles and a posted speed limit of 25 MPH or greater.*



# Section 4
# Park Route Location Maps


Chamizal National Memorial

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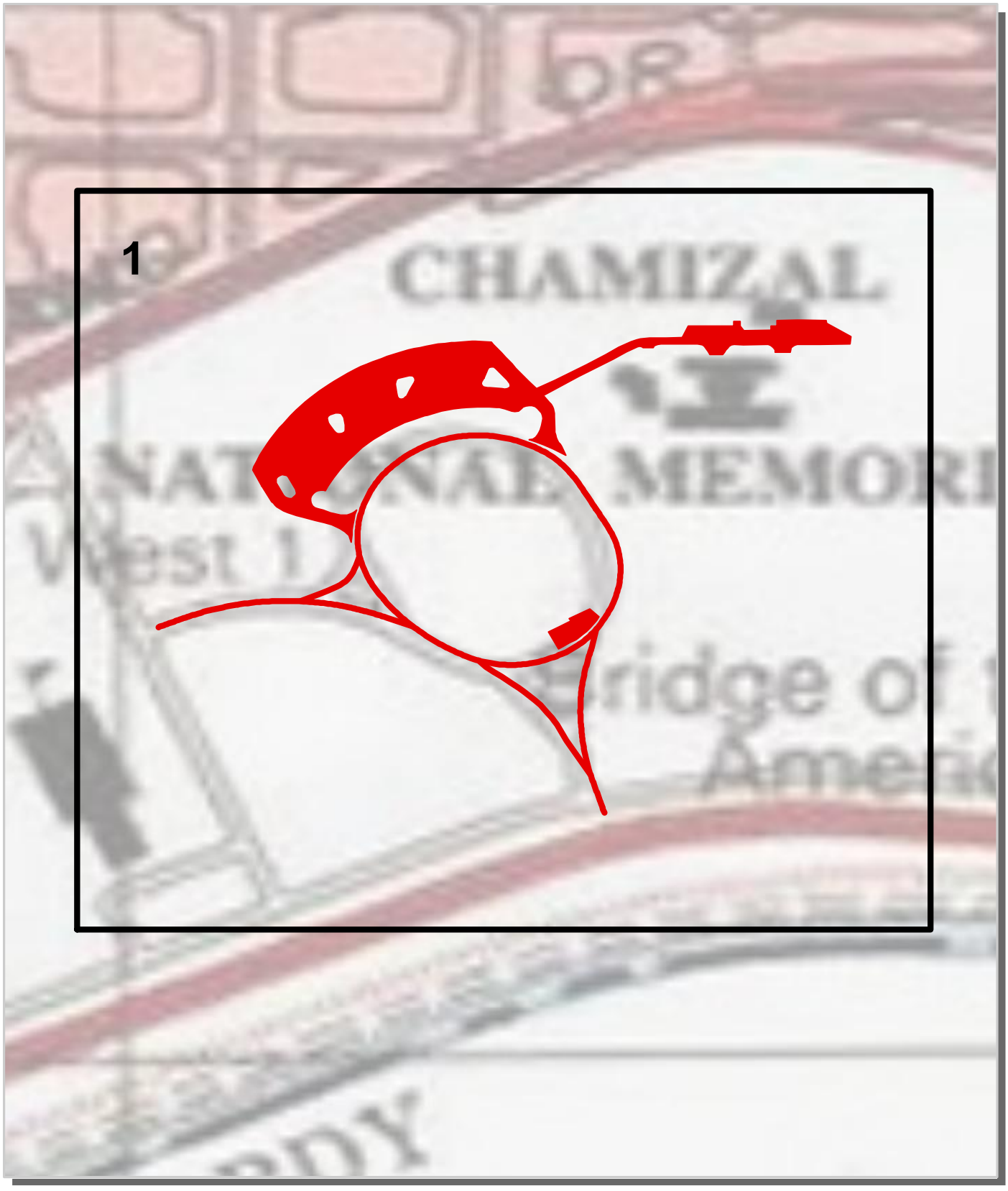
Road Inventory Program

**Chamizal National Memorial**
**Route Location Map**
**Key Map**



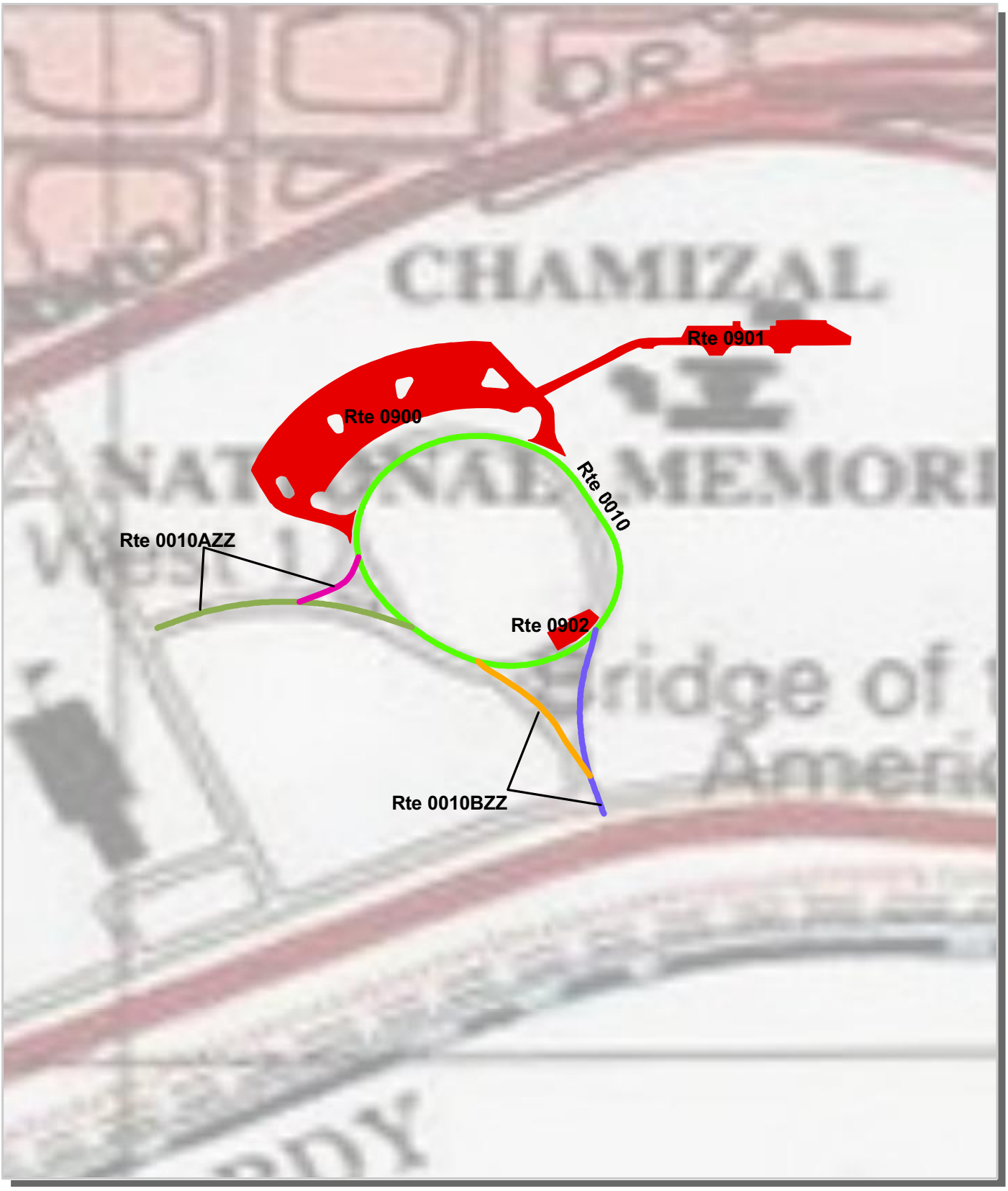

Cycle 5 Collected Routes

0

0.1 0.05 0 0.1

Miles

# Chamizal National Memorial
# Route Location Map
# Area 1



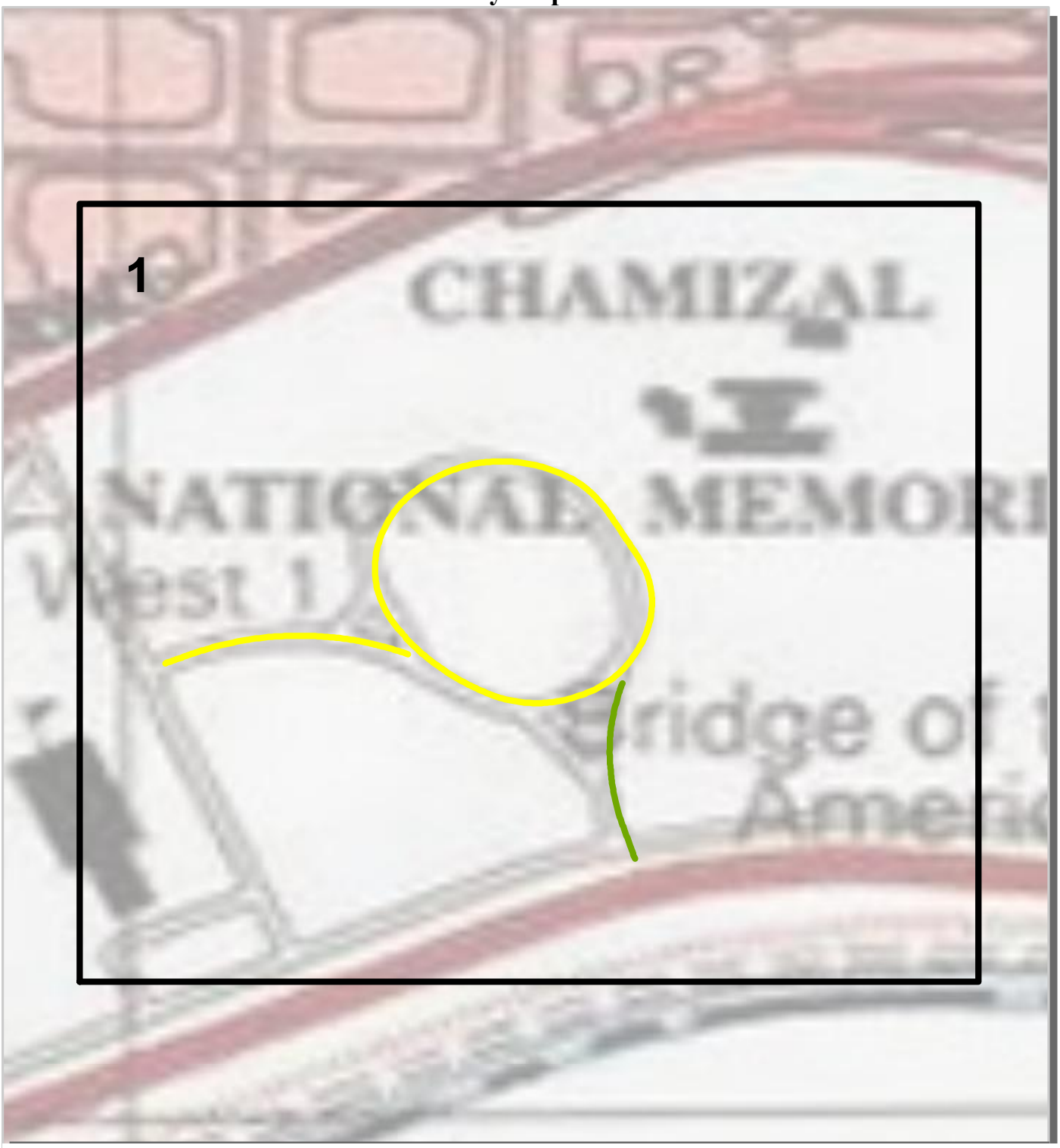

Unique colors used to differentiate routes

0

0.1 0.05 0 0.1

Miles

# Chamizal National Memorial
## Route Condition Map
## PCR - Mile by Mile
## Key Map




PCR Poor (0 - 60) Fair (61 - 84) Good (85 - 94) Excellent (95 - 100) No Data

* If the PCR rating is not available for a section, the SCR rating will be displayed. See appendix for definitions and formulas.

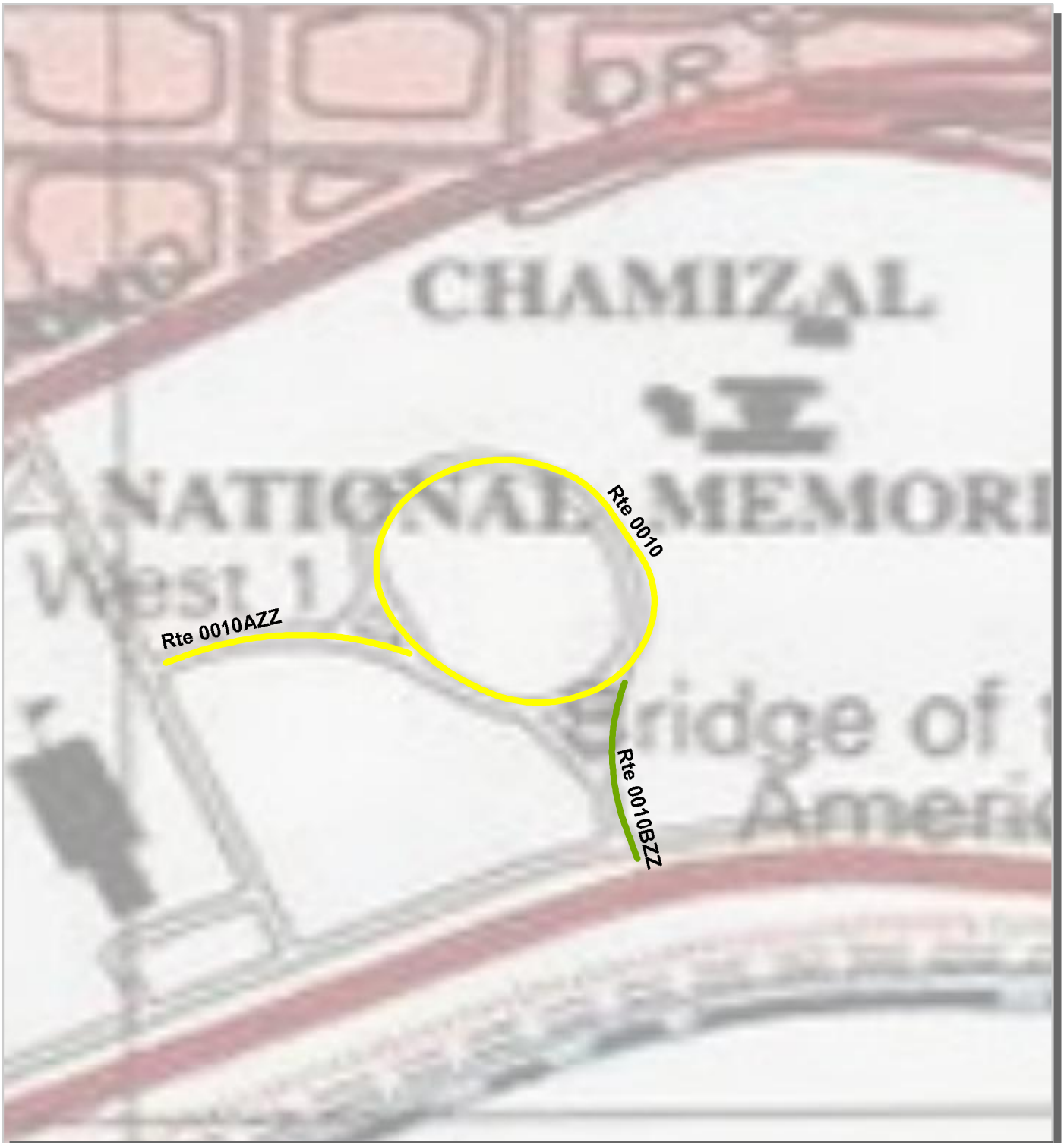
Note: Only routes collected by the DCV in Cycle-5 are displayed.

0

0.1 0.05 0 0.1

Miles

# Chamizal National Memorial
# Route Condition Map
# PCR - Mile by Mile
# Area 1




| PCR | Poor | Fair | Good | Excellent | No Data |
|---|---|---|---|---|---|
| | (0 - 60) | (61 - 84) | (85 - 94) | (95 - 100) | |

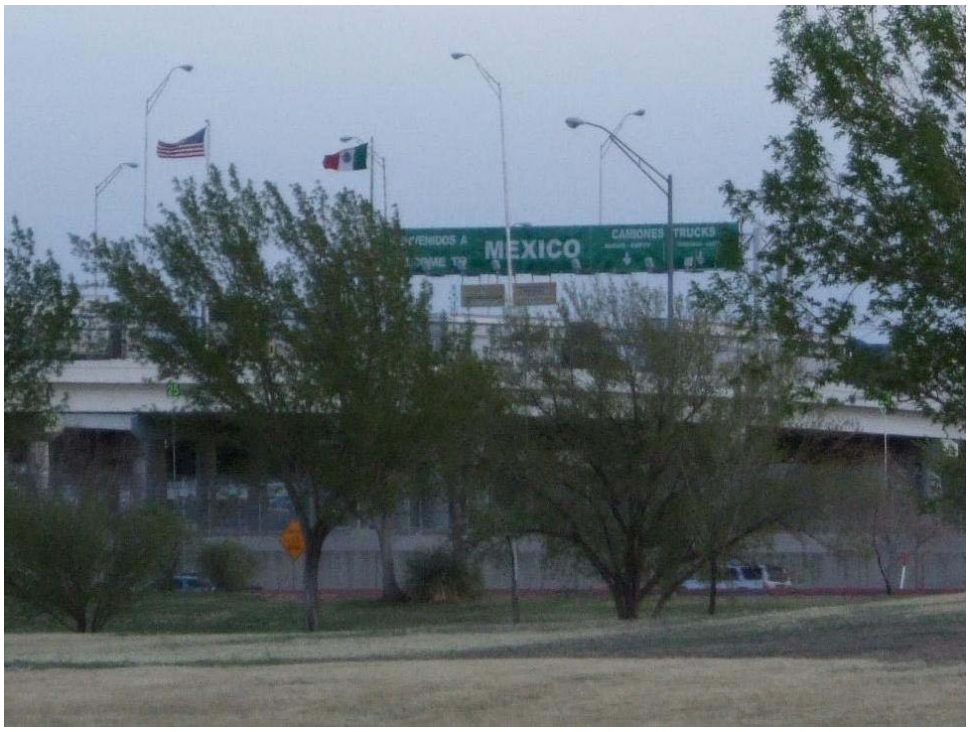
* If the PCR rating is not available for a section, the SCR rating will be displayed. See appendix for definitions and formulas.

0

0.1 0.05 0 0.1

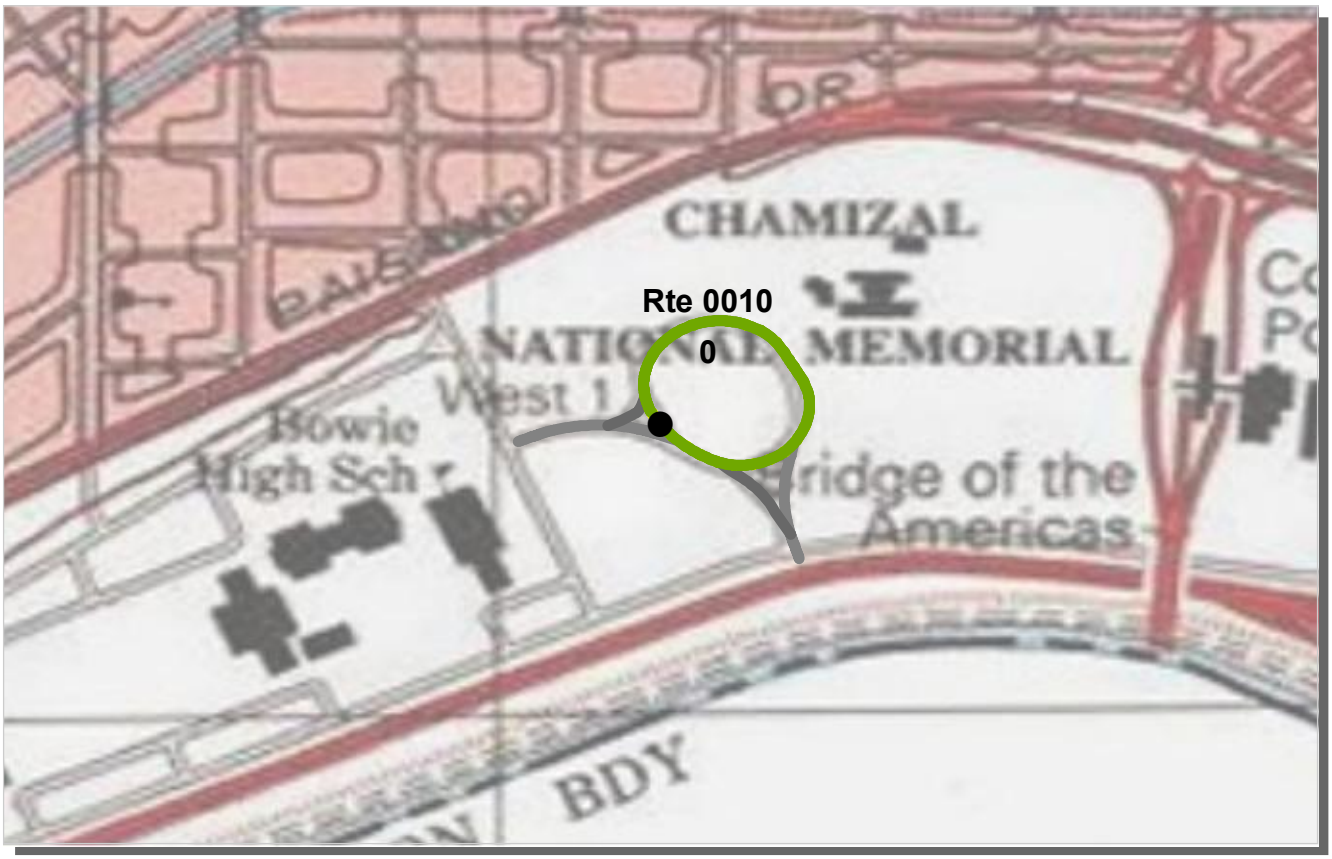
Miles

# Section 5
# Paved Route
# Condition Rating Sheets




Chamizal National Memorial

Federal Lands Highway
Road Inventory Program




PCR Poor (0 - 60) Fair (61 - 84) Good (85 - 94) Excellent (95 - 100) No Data

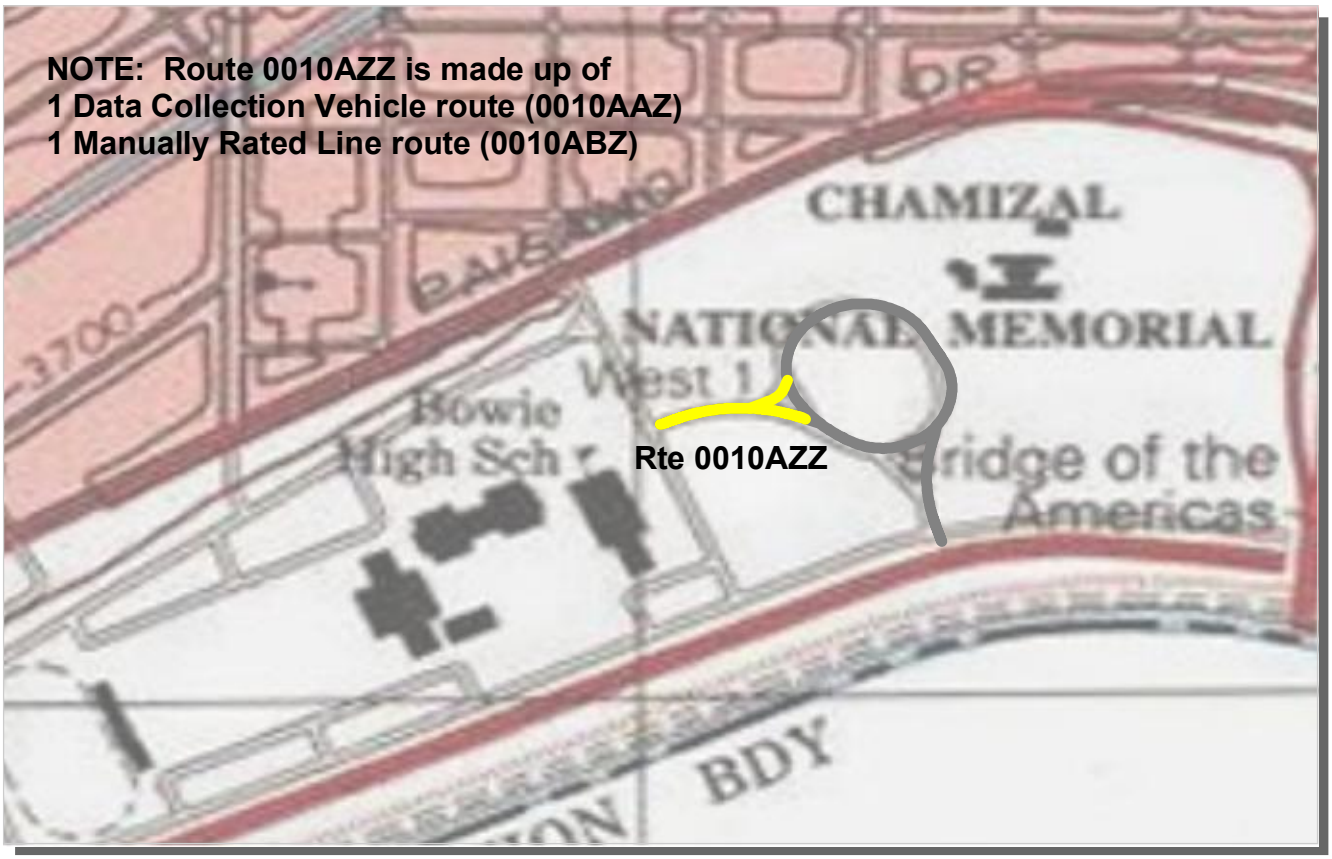
* If the PCR rating is not available for a section, the SCR rating will be displayed. See appendix for definitions and formulas.

**ROUTE: 0010 CIRCLE DRIVE**
**CHAM : CHAMIZAL NATIONAL MEMORIAL**

**COLLECTED: 3/24/2011**
**INTERMOUNTAIN REGION** **TOTAL LENGTH: 0.29 Miles**

| | | | | | |
|---|---|---|---|---|---|
| ***Section Number*** | 0 | | | | |
| ***Section Length (mi)*** | 0.29 | | | | |
| ***Cross Section Information*** | | | | | |
| Number of Lanes | 1 | | | | |
| Paved Width (ft) | 14 | | | | |
| Lane Width (ft) | 12 | | | | |
| ***Roadway Condition Information*** | | | | | |
| SCR (Surface Condition Rating) | 84 | | | | |
| PCR (Pavement Condition Rating) | 84 | | | | |
| ***Distress Index Values*** | | | | | |
| Structural Crack Index | 90 | | | | |
| Transverse Cracking Index | 84 | | | | |
| Patching Index | 100 | | | | |
| Rutting Index | 96 | | | | |
| Roughness Condition Index (RCI) | NC | | | | |

NOTES:
Structural Crack Index is a combination of the Longitudinal Cracking Index and Alligator Cracking Index.
See Section 10 for explanation of SCR, PCR, & all Distress Index Values.
NC - Not Collected N/A - Not Applicable




| PCR | Poor | Fair | Good | Excellent | No Data |
|---|---|---|---|---|---|
| | (0 - 60) | (61 - 84) | (85 - 94) | (95 - 100) | |

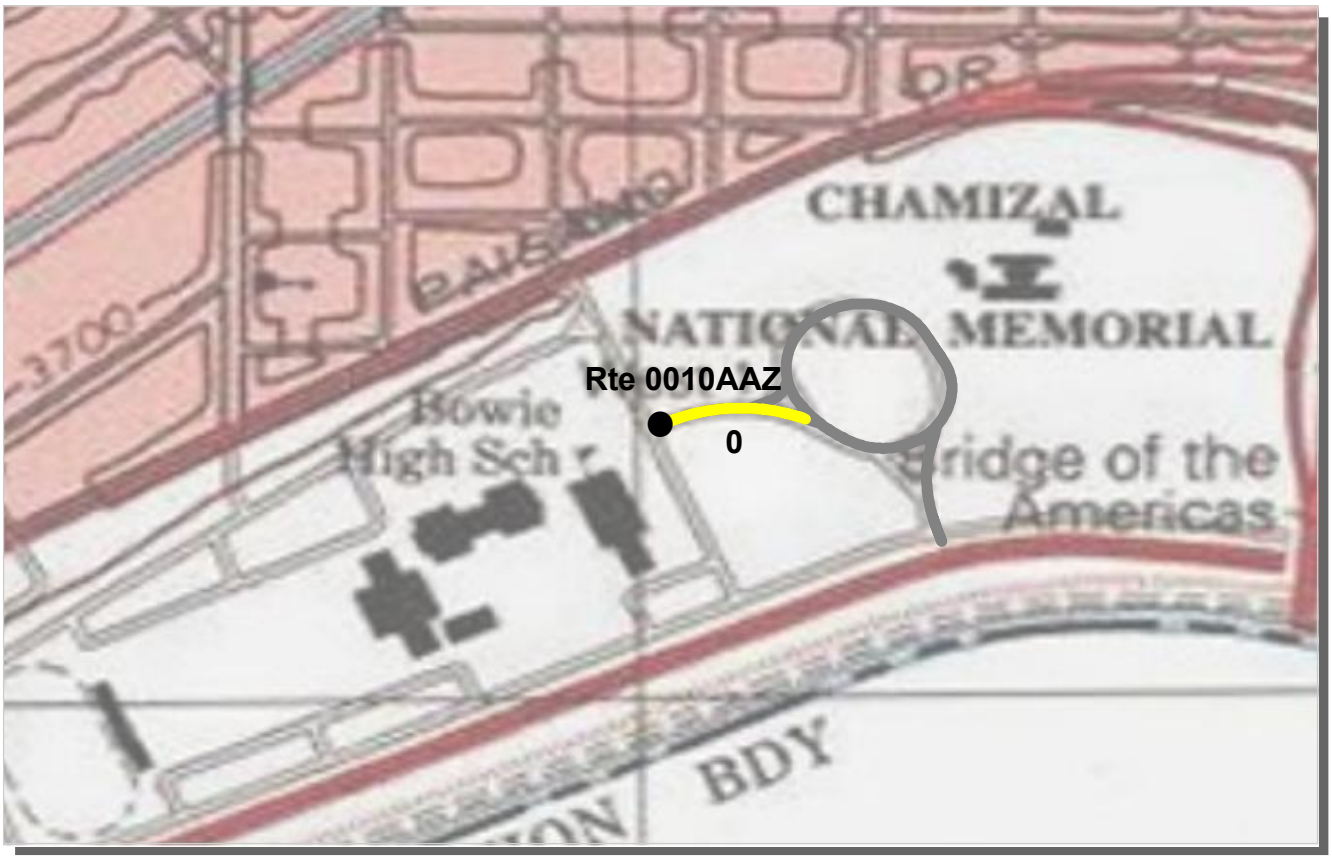
* If the PCR rating is not available for a section, the SCR rating will be displayed. See appendix for definitions and formulas.

**ROUTE: 0010AZZ SAN MARCIAL ENTRANCE ROADS**
**CHAM : CHAMIZAL NATIONAL MEMORIAL**

**Summary Record** **COLLECTED: 3/24/2011**
**INTERMOUNTAIN REGION** **TOTAL LENGTH: 0.11 Miles**

| | | | | | |
|---|---|---|---|---|---|
| ***Section Number*** | | | | | |
| ***Section Length (mi)*** | | | | | |
| ***Cross Section Information*** | | | | | |
| Number of Lanes | N/A | | | | |
| Paved Width (ft) | N/A | | | | |
| Lane Width (ft) | N/A | | | | |
| ***Roadway Condition Information*** | | | | | |
| SCR (Surface Condition Rating) | 84 | | | | |
| PCR (Pavement Condition Rating) | 83 | | | | |
| ***Distress Index Values*** | | | | | |
| Structural Crack Index | N/A | | | | |
| Transverse Cracking Index | N/A | | | | |
| Patching Index | N/A | | | | |
| Rutting Index | N/A | | | | |
| Roughness Condition Index (RCI) | N/A | | | | |

NOTES:
Structural Crack Index is a combination of the Longitudinal Cracking Index and Alligator Cracking Index.
See Section 10 for explanation of SCR, PCR, & all Distress Index Values.
NC - Not Collected N/A - Not Applicable




PCR Poor (0 - 60) Fair (61 - 84) Good (85 - 94) Excellent (95 - 100) No Data

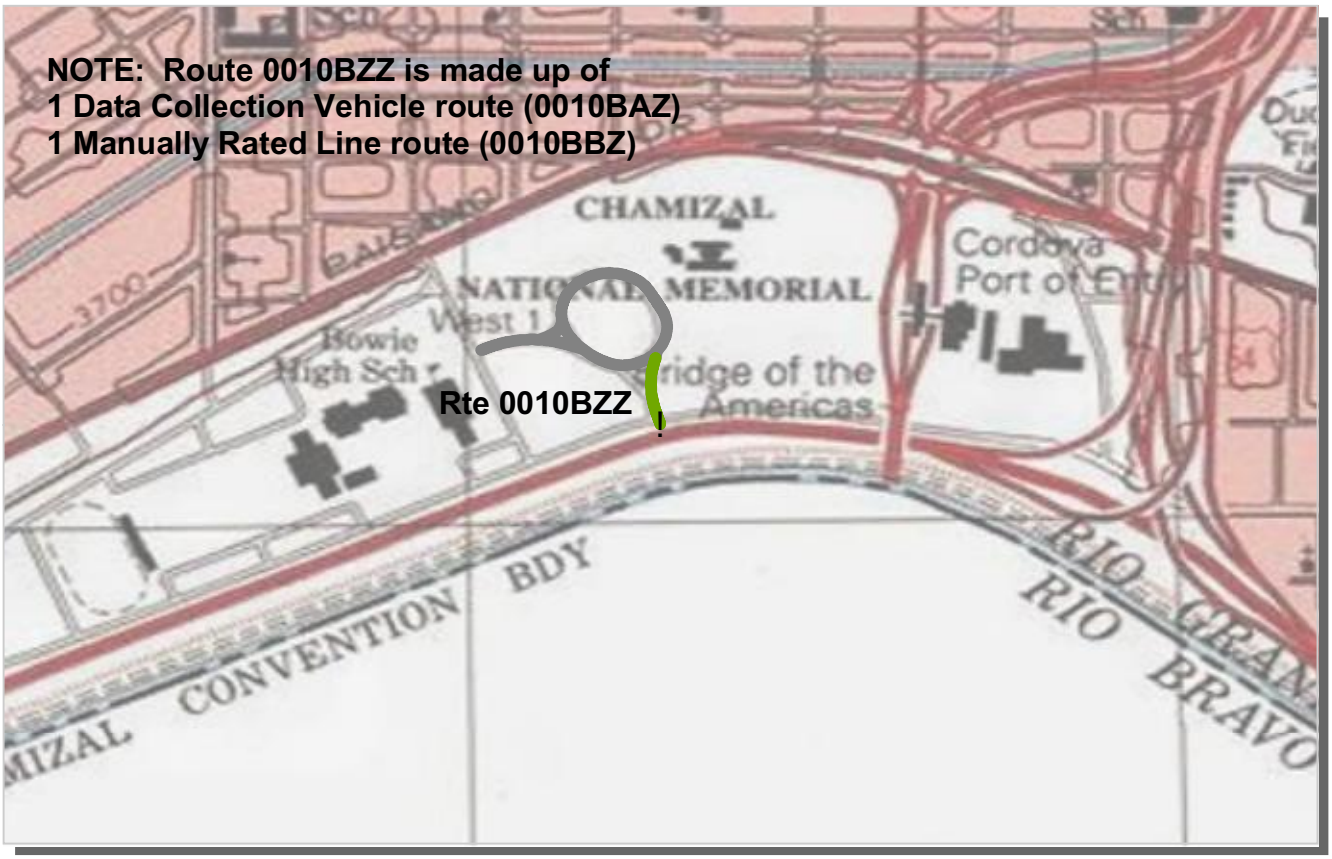
* If the PCR rating is not available for a section, the SCR rating will be displayed. See appendix for definitions and formulas.

**ROUTE: 0010AAZ SAN MARCIAL ENTRANCE ROAD**
**CHAM : CHAMIZAL NATIONAL MEMORIAL**

**Subcomponent Record** **COLLECTED: 3/24/2011**
**INTERMOUNTAIN REGION** **TOTAL LENGTH: 0.09 Miles**

| | | | | | |
|---|---|---|---|---|---|
| ***Section Number*** | 0 | | | | |
| ***Section Length (mi)*** | 0.09 | | | | |
| ***Cross Section Information*** | | | | | |
| Number of Lanes | 2 | | | | |
| Paved Width (ft) | 25 | | | | |
| Lane Width (ft) | 13 | | | | |
| ***Roadway Condition Information*** | | | | | |
| SCR (Surface Condition Rating) | 84 | | | | |
| PCR (Pavement Condition Rating) | 84 | | | | |
| ***Distress Index Values*** | | | | | |
| Structural Crack Index | 87 | | | | |
| Transverse Cracking Index | 84 | | | | |
| Patching Index | 100 | | | | |
| Rutting Index | 98 | | | | |
| Roughness Condition Index (RCI) | NC | | | | |

NOTES:
Structural Crack Index is a combination of the Longitudinal Cracking Index and Alligator Cracking Index.
See Section 10 for explanation of SCR, PCR, & all Distress Index Values.
NC - Not Collected N/A - Not Applicable




0

PCR Poor (0 - 60) Fair (61 - 84) Good (85 - 94) Excellent (95 - 100) No Data

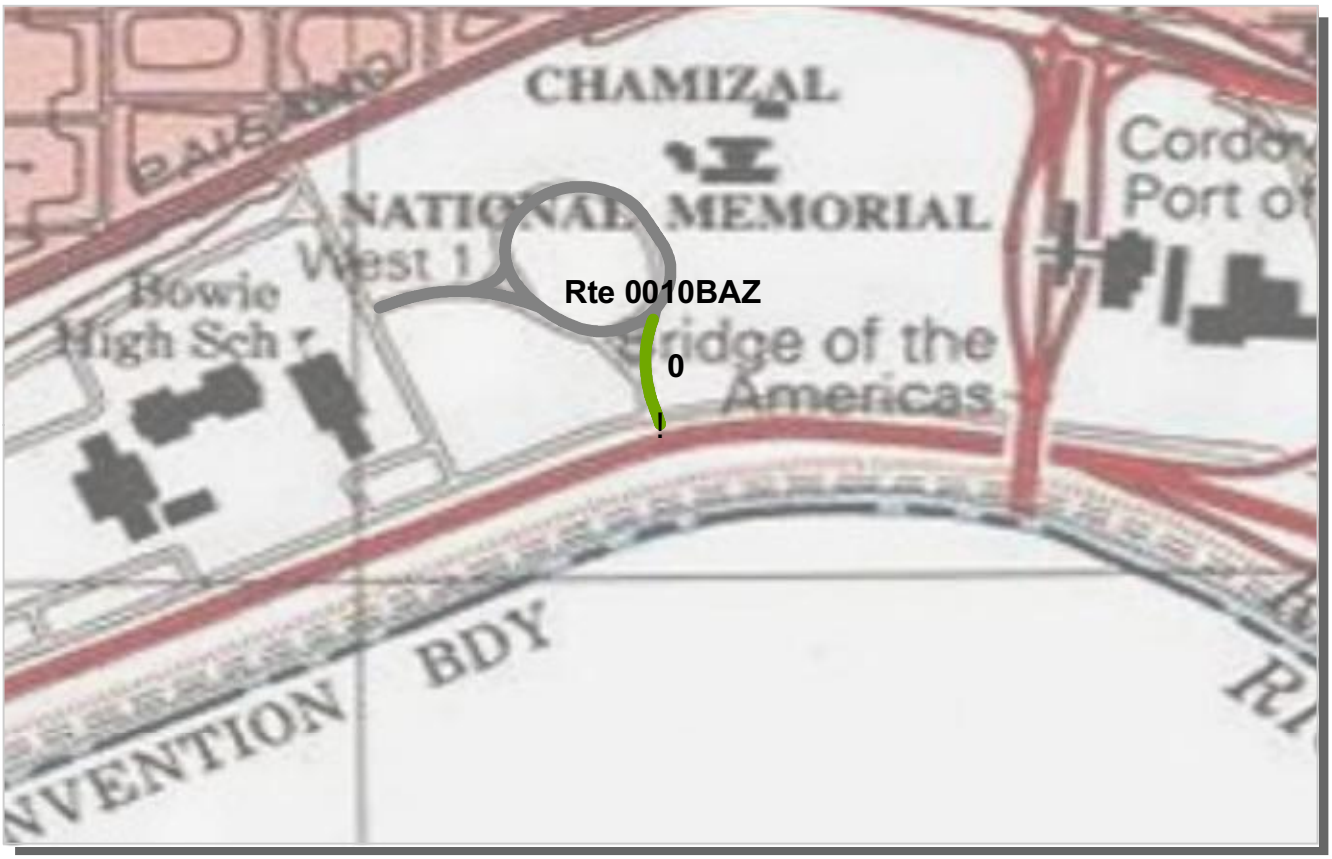
* If the PCR rating is not available for a section, the SCR rating will be displayed. See appendix for definitions and formulas.

**ROUTE: 0010BZZ DELTA ENTRANCE ROADS**
**CHAM : CHAMIZAL NATIONAL MEMORIAL**

**Summary Record** **COLLECTED: 3/24/2011**
**INTERMOUNTAIN REGION** **TOTAL LENGTH: 0.12 Miles**

| | | | | | |
|---|---|---|---|---|---|
| ***Section Number*** | | | | | |
| ***Section Length (mi)*** | | | | | |
| ***Cross Section Information*** | | | | | |
| Number of Lanes | N/A | | | | |
| Paved Width (ft) | N/A | | | | |
| Lane Width (ft) | N/A | | | | |
| ***Roadway Condition Information*** | | | | | |
| SCR (Surface Condition Rating) | 91 | | | | |
| PCR (Pavement Condition Rating) | 86 | | | | |
| ***Distress Index Values*** | | | | | |
| Structural Crack Index | N/A | | | | |
| Transverse Cracking Index | N/A | | | | |
| Patching Index | N/A | | | | |
| Rutting Index | N/A | | | | |
| Roughness Condition Index (RCI) | N/A | | | | |

NOTES:
Structural Crack Index is a combination of the Longitudinal Cracking Index and Alligator Cracking Index.
See Section 10 for explanation of SCR, PCR, & all Distress Index Values.
NC - Not Collected N/A - Not Applicable




0

PCR Poor (0 - 60) Fair (61 - 84) Good (85 - 94) Excellent (95 - 100) No Data

* If the PCR rating is not available for a section, the SCR rating will be displayed. See appendix for definitions and formulas.

**ROUTE: 0010BAZ DELTA ENTRANCE ROAD**
**CHAM : CHAMIZAL NATIONAL MEMORIAL**

**Subcomponent Record** **COLLECTED: 3/24/2011**

**INTERMOUNTAIN REGION** **TOTAL LENGTH: 0.07 Miles**

| | | | | | |
|---|---|---|---|---|---|
| ***Section Number*** | 0 | | | | |
| ***Section Length (mi)*** | 0.07 | | | | |
| ***Cross Section Information*** | | | | | |
| Number of Lanes | 2 | | | | |
| Paved Width (ft) | 20 | | | | |
| Lane Width (ft) | 13 | | | | |
| ***Roadway Condition Information*** | | | | | |
| SCR (Surface Condition Rating) | 91 | | | | |
| PCR (Pavement Condition Rating) | 91 | | | | |
| ***Distress Index Values*** | | | | | |
| Structural Crack Index | 94 | | | | |
| Transverse Cracking Index | 91 | | | | |
| Patching Index | 99 | | | | |
| Rutting Index | 93 | | | | |
| Roughness Condition Index (RCI) | NC | | | | |

NOTES:

Structural Crack Index is a combination of the Longitudinal Cracking Index and Alligator Cracking Index.

See Section 10 for explanation of SCR, PCR, & all Distress Index Values.

NC - Not Collected N/A - Not Applicable

# Section 6
# Manually Rated Paved Route Condition Rating Sheets


Chamizal National Memorial

Federal Lands Highway
Road Inventory Program

# CHAMIZAL NATIONAL MEMORIAL
## Route 0010AZZ

SAN MARCIAL ENTRANCE ROADS

FROM S. SAN MARCIAL STREET

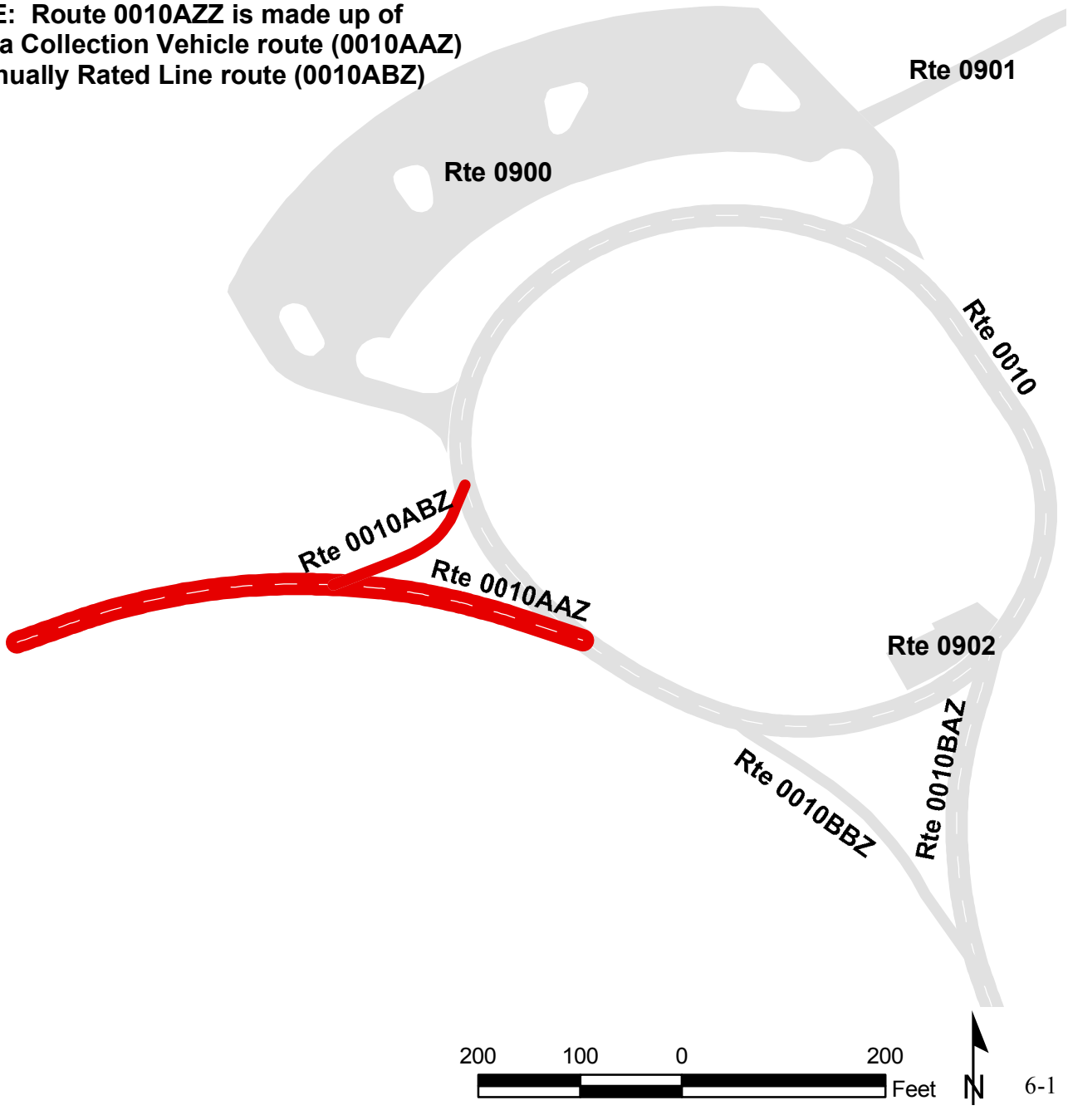
TO BEGINNING OF ROUTE 0010 (CIRCLE DRIVE)

Summary Record

| Route Number | Public / NonPublic | Date Visited | Area (sq ft) | Lane Miles * | Paved Length (mi) | Paved Width (ft) |
|---|---|---|---|---|---|---|
| 0010AZZ | PUBLIC | 3/24/2011 | -1 | 0.21 | 0.11 | 22.3 |
| **Culverts** | **Drop Inlets** | **Gates** | **Curb & Gutter** | **Curb** | **PCR** | **Surface Type** |
| 0 | 1 | 1 | N/A | N/A | SUMMARY/83 | AS |

* Lane miles are based on 11' lane widths

**NOTE: Route 0010AZZ is made up of**
**1 Data Collection Vehicle route (0010AAZ)**
**1 Manually Rated Line route (0010ABZ)**



# CHAMIZAL NATIONAL MEMORIAL
## Route 0010ABZ

SAN MARCIAL ENTRANCE ROAD SPUR

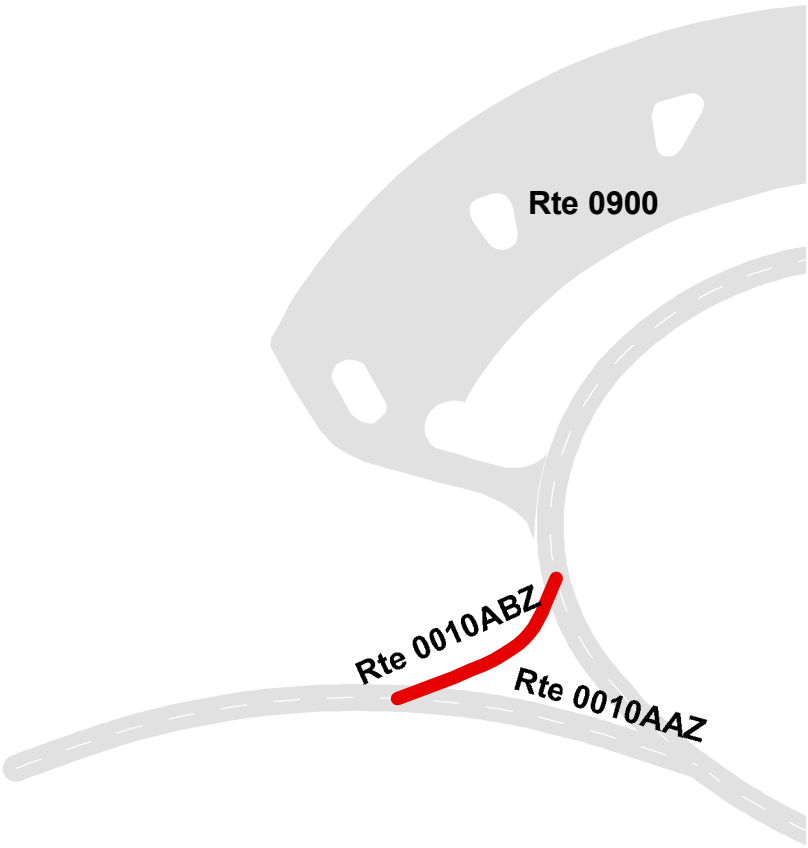
FROM ROUTE 0010 (CIRCLE DRIVE)

TO ROUTE 0010AAZ (SAN MARCIAL ENTRANCE ROAD)

Subcomponent Record

| Route Number | Public / NonPublic | Date Visited | Area (sq ft) | Lane Miles * | Paved Length (mi) | Paved Width (ft) |
|---|---|---|---|---|---|---|
| 0010ABZ | PUBLIC | 3/24/2011 | 1,309 | 0.02 | 0.02 | 12.4 |
| **Culverts** | **Drop Inlets** | **Gates** | **Curb & Gutter** | **Curb** | **PCR** | **Surface Type** |
| 0 | 0 | 0 | CURB AND GUTTER | N/A | FAIR/73 | AS |

* Lane miles are based on 11' lane widths




200 100 0 200 Feet

# CHAMIZAL NATIONAL MEMORIAL
## Route 0010BZZ

DELTA ENTRANCE ROADS

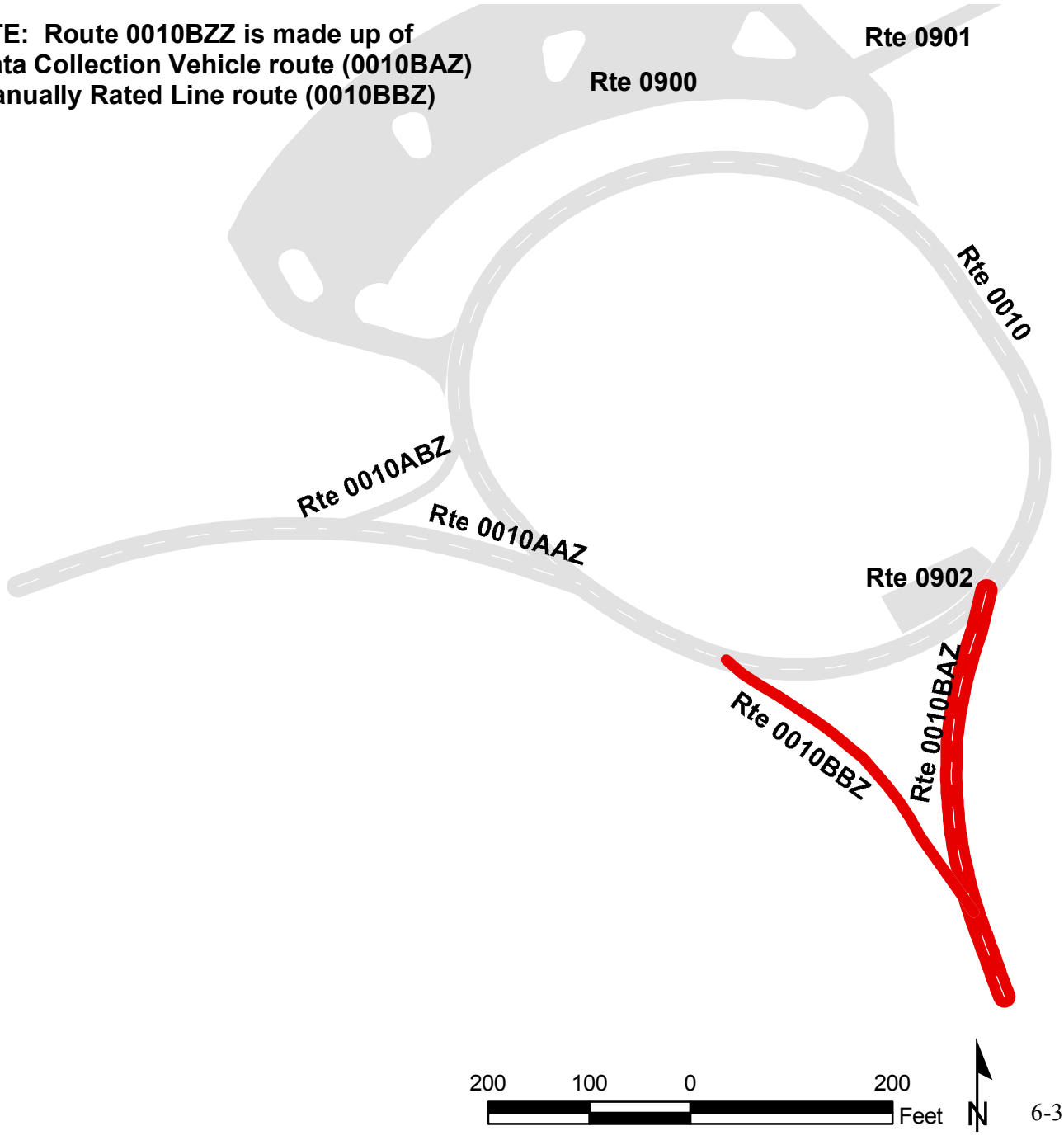
FROM DELTA DRIVE / CESAR E. CHAVEZ BORDER HIGHWAY
TO ROUTE 0010 (CIRCLE DRIVE)

Summary Record

| Route Number | Public / NonPublic | Date Visited | Area (sq ft) | Lane Miles * | Paved Length (mi) | Paved Width (ft) |
|---|---|---|---|---|---|---|
| 0010BZZ | PUBLIC | 3/24/2011 | -1 | 0.18 | 0.12 | 16.9 |
| **Culverts** | **Drop Inlets** | **Gates** | **Curb & Gutter** | **Curb** | **PCR** | **Surface Type** |
| 0 | 1 | 1 | N/A | N/A | SUMMARY/86 | AS |

* Lane miles are based on 11' lane widths

**NOTE: Route 0010BZZ is made up of**
**1 Data Collection Vehicle route (0010BAZ)**
**1 Manually Rated Line route (0010BBZ)**



# CHAMIZAL NATIONAL MEMORIAL
## Route 0010BBZ
DELTA ENTRANCE ROAD SPUR
FROM ROUTE 0010 (CIRCLE DRIVE)
TO ROUTE 0010BAZ

Subcomponent Record

| Route Number | Public / NonPublic | Date Visited | Area (sq ft) | Lane Miles * | Paved Length (mi) | Paved Width (ft) |
|---|---|---|---|---|---|---|
| 0010BBZ | PUBLIC | 3/24/2011 | 3,143 | 0.05 | 0.05 | 12.4 |
| **Culverts** | **Drop Inlets** | **Gates** | **Curb & Gutter** | **Curb** | **PCR** | **Surface Type** |
| 0 | 0 | 0 | CURB AND GUTTER | N/A | FAIR/73 | AS |

* Lane miles are based on 11' lane widths

# Section 7
# Parking Area
# Condition Rating Sheets

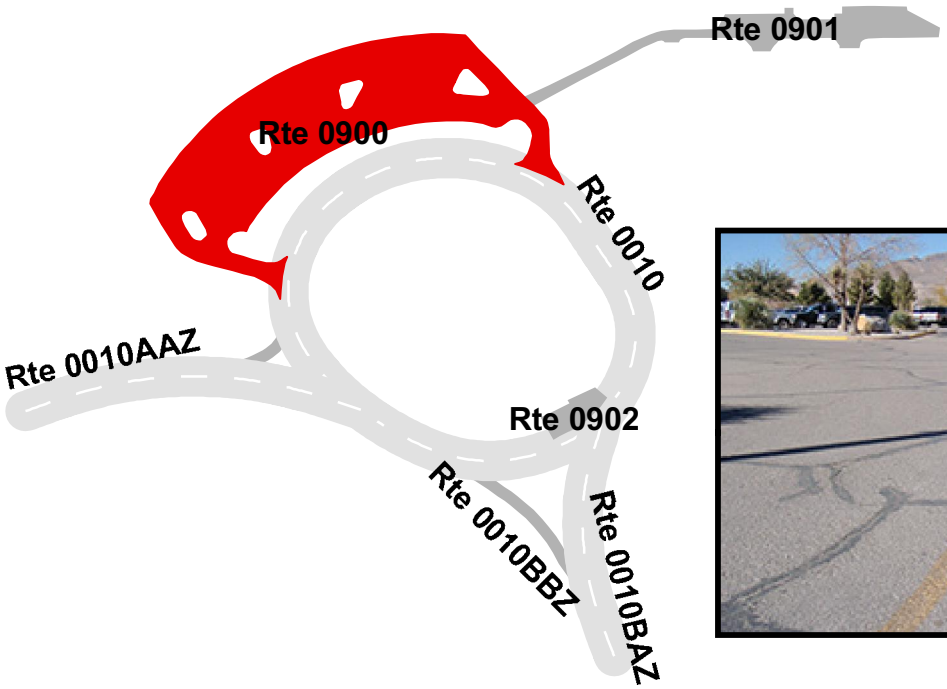
Chamizal National Memorial

Federal Lands Highway
Road Inventory Program

# CHAMIZAL NATIONAL MEMORIAL
## Route 0900
CHAMIZAL VISITOR CENTER MAIN PARKING
FROM ROUTE 0010 (CIRCLE DRIVE) AT MP 0.16 ON RIGHT
TO ROUTE 0010 (CIRCLE DRIVE) AT MP 0.25 ON RIGHT

| Route Number | Public / NonPublic | Date Visited | Area (sq ft) | Lane Miles * | Surface Type |
|---|---|---|---|---|---|
| 0900 | PUBLIC | 12/2/2010 | 82,891 | 1.43 | AS |
| **Culverts** | **Drop Inlets** | **Gates** | **Curb & Gutter** | **Curb** | **PCR** |
| 0 | 2 | 0 | CONCRETE CURB AND GUTTER | NO CURB | FAIR/73 |

* Lane miles are based on 11' lane widths

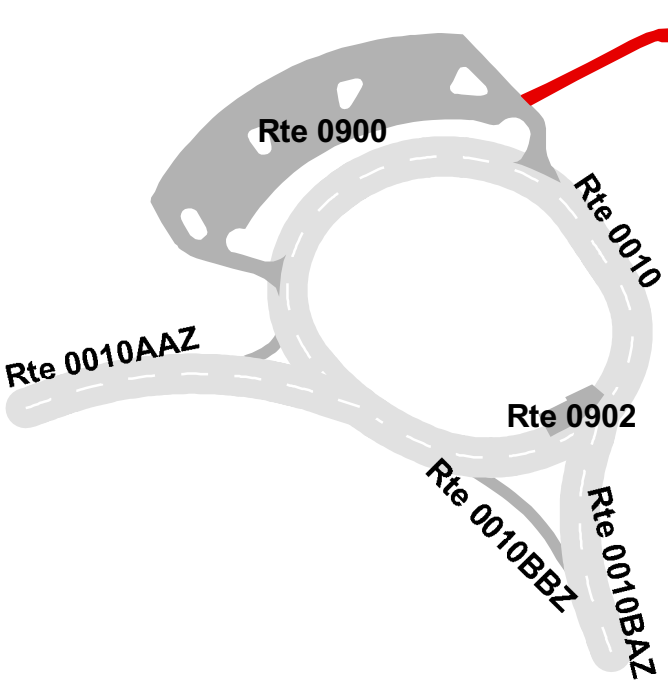



400 200 0 400
Feet

# CHAMIZAL NATIONAL MEMORIAL
## Route 0901
MAINTENANCE PARKING AREA
FROM ROUTE 0900 (CHAMIZAL VISITOR CENTER MAIN PARKING)
TO MAINTENANCE AREA

| Route Number | Public / NonPublic | Date Visited | Area (sq ft) | Lane Miles * | Surface Type |
|---|---|---|---|---|---|
| 0901 | PUBLIC | 12/2/2010 | 18,896 | 0.33 | AS |
| **Culverts** | **Drop Inlets** | **Gates** | **Curb & Gutter** | **Curb** | **PCR** |
| 1 | 0 | 0 | CONCRETE CURB AND GUTTER | NO CURB | FAIR/73 |

* Lane miles are based on 11' lane widths

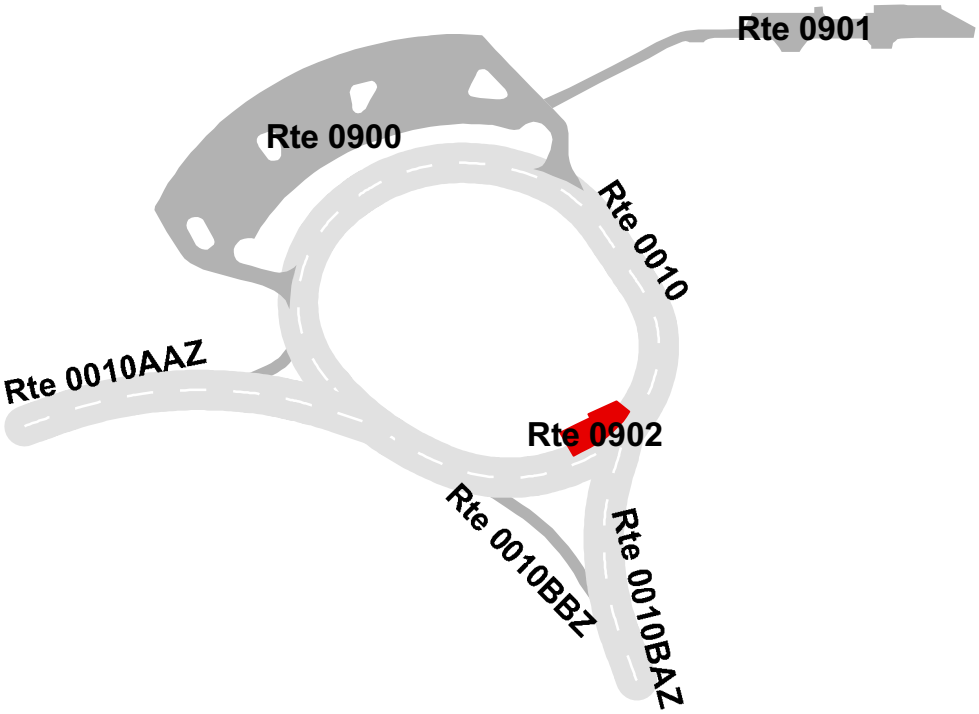



460 230 0 460
Feet

# CHAMIZAL NATIONAL MEMORIAL
## Route 0902
THEATER TECH PARKING
ADJACENT TO ROUTE 0010 (CIRCLE DRIVE) AT MP 0.08 ON LEFT

| Route Number | Public / NonPublic | Date Visited | Area (sq ft) | Lane Miles * | Surface Type |
|---|---|---|---|---|---|
| 0902 | PUBLIC | 12/2/2010 | 3,643 | 0.06 | CO |
| **Culverts** | **Drop Inlets** | **Gates** | **Curb & Gutter** | **Curb** | **PCR** |
| 0 | 0 | 0 | NO CURB AND GUTTER | CONCRETE CURB | EXCELLENT/97 |

* Lane miles are based on 11' lane widths



# Section 8
# Parkwide/Route
# Maintenance Features Summaries

Chamizal National Memorial

Federal Lands Highway
Road Inventory Program

# CHAM: PARKWIDE MAINTENANCE FEATURES SUMMARY
## Includes DCV, MRL, MRP & PKG routes collected in Cycle-5

Notice: Culverts and drop inlets were marked by NPS and inventoried by RIP in Cycle 5 on all DCV driven routes. Culverts, drop inlets, and gates were also collected on all Manually Rated Routes and Paved Parking areas. Those totals are reflected below.

| FEATURE | LINEAR FEET | COUNT |
|---|---|---|
| BRIDGE | -- | 0 |
| CATTLE GUARD | -- | 0 |
| CULVERT | -- | 1 |
| CURB | 4,341 | -- |
| DROP INLET | -- | 5 |
| GATE | -- | 2 |
| GUARD/GUIDE RAIL | 0 | -- |
| CABLE | 0 | -- |
| NON-CABLE | 0 | -- |
| GUARD/GUIDE WALL | 0 | -- |
| BOLLARD | 0 | -- |
| TEMPORARY BARRIER | 0 | -- |
| NON TEMP/BOLLARD | 0 | -- |
| INTERSECTION | -- | 21 |
| LOW WATER CROSSING | 0 | 0 |
| MILE MARKER | -- | 0 |
| OVERPASS | -- | 0 |
| PARK BOUNDARY | -- | 0 |
| PAVED DITCH | 0 | -- |
| PULLOUT | 106 | 1 |
| RAILROAD CROSSING | -- | 0 |
| RETAINING WALL | 0 | 0 |
| SIGN | -- | 26 |
| STATE BOUNDARY | -- | 0 |
| TRAFFIC LIGHT | -- | 0 |
| TUNNEL | 0 | 0 |

# CHAM: DCV ROUTE MAINTENANCE FEATURES SUMMARY

Notice: Culverts and drop inlets were marked by NPS and inventoried by RIP in Cycle 5 on all DCV driven routes. Culverts, drop inlets, and gates were also collected on all Manually Rated Routes and Paved Parking areas. Those totals are reflected below.

| FEATURE | ROUTE 0010 CIRCLE DRIVE | ROUTE 0010AZZ SAN MARCIAL ENTRANCE ROADS | ROUTE 0010BZZ DELTA ENTRANCE ROADS | | | UNIT |
|---|---|---|---|---|---|---|
| BRIDGE | 0 | 0 | 0 | | | EACH |
| CATTLE GUARD | 0 | 0 | 0 | | | EACH |
| CULVERT | 0 | 0 | 0 | | | EACH |
| CURB | 2,836 | 787 | 718 | | | LINEAR FEET |
| DROP INLET | 1 | 1 | 1 | | | EACH |
| GATE | 0 | 1 | 1 | | | EACH |
| GUARD/GUIDE RAIL | 0 | 0 | 0 | | | LINEAR FEET |
| CABLE | 0 | 0 | 0 | | | LINEAR FEET |
| NON-CABLE | 0 | 0 | 0 | | | LINEAR FEET |
| GUARD/GUIDE WALL | 0 | 0 | 0 | | | LINEAR FEET |
| BOLLARD | 0 | 0 | 0 | | | LINEAR FEET |
| TEMPORARY BARRIER | 0 | 0 | 0 | | | LINEAR FEET |
| NON TEMP/BOLLARD | 0 | 0 | 0 | | | LINEAR FEET |
| INTERSECTION | 10 | 5 | 6 | | | EACH |
| LOW WATER CROSSING | 0 | 0 | 0 | | | EACH |
| LOW WATER CROSSING | 0 | 0 | 0 | | | LINEAR FEET |
| MILE MARKER | 0 | 0 | 0 | | | EACH |
| OVERPASS | 0 | 0 | 0 | | | EACH |
| PARK BOUNDARY | 0 | 0 | 0 | | | EACH |
| PAVED DITCH | 0 | 0 | 0 | | | LINEAR FEET |
| PULLOUT | 0 | 0 | 1 | | | EACH |
| PULLOUT | 0 | 0 | 106 | | | LINEAR FEET |
| RAILROAD CROSSING | 0 | 0 | 0 | | | EACH |
| RETAINING WALL | 0 | 0 | 0 | | | EACH |
| RETAINING WALL | 0 | 0 | 0 | | | LINEAR FEET |
| SIGN | 9 | 6 | 11 | | | EACH |
| STATE BOUNDARY | 0 | 0 | 0 | | | EACH |
| TRAFFIC LIGHT | 0 | 0 | 0 | | | EACH |
| TUNNEL | 0 | 0 | 0 | | | EACH |
| TUNNEL | 0 | 0 | 0 | | | LINEAR FEET |

# STRUCTURE LIST

No data available for this section.

# Section 9
# Route Maintenance Features
# Road Logs

Chamizal National Memorial

Federal Lands Highway
Road Inventory Program

# CHAM: ROUTE MAINTENANCE FEATURES ROAD LOG

## ROUTE 0010: CIRCLE DRIVE

**Notice:** Culverts and drop inlets were marked by NPS and inventoried by RIP in Cycle 5 on all DCV driven routes. Culverts, drop inlets, and gates were also collected on all Manually Rated Routes and Paved Parking areas. Those totals are reflected below.

| FROM MILEPOST | TO MILEPOST | FEATURE | SIDE | COMMENT |
|---|---|---|---|---|
| 0.000 | 0.000 | ROUTE BEGIN | N/A | FROM END OF ROUTE 0010AAZ (SAN MARCIAL ENTRANCE ROAD) |
| 0.000 | 0.000 | INTERSECTION | RIGHT | ROUTE 0010AAZ (SAN MARCIAL ENTRANCE ROAD) |
| 0.000 | 0.046 | CURB-AND-GUTTER | RIGHT | N/A |
| 0.000 | 0.081 | CURB-AND-GUTTER | LEFT | N/A |
| 0.000 | 0.289 | ONE-WAY | N/A | N/A |
| 0.000 | 0.000 | INTERSECTION | N/A | ROUTE 0010 (CIRCLE DRIVE) |
| 0.046 | 0.046 | INTERSECTION | RIGHT | ROUTE 0010BBZ (DELTA ENTRANCE ROAD SPUR) |
| 0.049 | 0.080 | CURB-AND-GUTTER | RIGHT | N/A |
| 0.051 | 0.051 | SIGN | RIGHT | GUIDE, UNABLE TO READ FROM VIDEO |
| 0.065 | 0.065 | SIGN | RIGHT | REGULATORY, SPEED LIMIT 15 |
| 0.082 | 0.082 | INTERSECTION | LEFT | ROUTE 0902 (THEATER TECH PARKING) |
| 0.085 | 0.085 | INTERSECTION | RIGHT | ROUTE 0010BAZ (DELTA ENTRANCE ROAD) |
| 0.085 | 0.145 | CURB-AND-GUTTER | RIGHT | N/A |
| 0.085 | 0.289 | CURB-AND-GUTTER | LEFT | N/A |
| 0.088 | 0.088 | SIGN | RIGHT | REGULATORY, NO PARKING |
| 0.091 | 0.091 | SIGN | RIGHT | REGULATORY, NO PARKING STOPPING STANDING ANY TIME |
| 0.095 | 0.095 | DROP INLET | LEFT | N/A |
| 0.102 | 0.102 | SIGN | RIGHT | REGULATORY, NO PARKING STOPPING STANDING ANY TIME |
| 0.107 | 0.107 | SIGN | RIGHT | GUIDE, UNABLE TO READ FROM VIDEO |
| 0.112 | 0.112 | SIGN | RIGHT | GUIDE, UNABLE TO READ FROM VIDEO |
| 0.148 | 0.166 | CURB-AND-GUTTER | RIGHT | N/A |
| 0.159 | 0.159 | SIGN | LEFT | REGULATORY, DO NOT ENTER |
| 0.167 | 0.167 | INTERSECTION | RIGHT | ROUTE 0900 (CHAMIZAL VISITOR CENTER MAIN PARKING) |
| 0.174 | 0.248 | CURB-AND-GUTTER | RIGHT | N/A |
| 0.257 | 0.257 | INTERSECTION | RIGHT | ROUTE 0900 (CHAMIZAL VISITOR CENTER MAIN PARKING) |
| 0.259 | 0.267 | CURB-AND-GUTTER | RIGHT | N/A |
| 0.265 | 0.265 | SIGN | RIGHT | REGULATORY, EXIT |
| 0.267 | 0.267 | INTERSECTION | RIGHT | ROUTE 0010ABZ (SAN MARCIAL ENTRANCE ROAD SPUR) |
| 0.274 | 0.289 | CURB-AND-GUTTER | RIGHT | N/A |

# CHAM: ROUTE MAINTENANCE FEATURES ROAD LOG

## ROUTE 0010: CIRCLE DRIVE

**Notice:** Culverts and drop inlets were marked by NPS and inventoried by RIP in Cycle 5 on all DCV driven routes. Culverts, drop inlets, and gates were also collected on all Manually Rated Routes and Paved Parking areas. Those totals are reflected below.

| FROM MILEPOST | TO MILEPOST | FEATURE | SIDE | COMMENT |
|---|---|---|---|---|
| 0.289 | 0.289 | INTERSECTION | N/A | ROUTE 0010 (CIRCLE DRIVE) |
| 0.289 | 0.289 | INTERSECTION | RIGHT | ROUTE 0010AAZ (SAN MARCIAL ENTRANCE ROAD) |
| 0.289 | 0.289 | ROUTE END | N/A | TO ROUTE 0010AAZ (SAN MARCIAL ENTRANCE ROAD) |

# CHAM: ROUTE MAINTENANCE FEATURES ROAD LOG

## ROUTE 0010AAZ: SAN MARCIAL ENTRANCE ROAD

**Notice:** Culverts and drop inlets were marked by NPS and inventoried by RIP in Cycle 5 on all DCV driven routes. Culverts, drop inlets, and gates were also collected on all Manually Rated Routes and Paved Parking areas. Those totals are reflected below.

| FROM MILEPOST | TO MILEPOST | FEATURE | SIDE | COMMENT |
|---|---|---|---|---|
| 0.000 | 0.000 | ROUTE BEGIN | N/A | FROM S. SAN MARCIAL STREET |
| 0.000 | 0.000 | INTERSECTION | LEFT | PAVED ROUTE (S. SAN MARCIAL STREET) |
| 0.000 | 0.000 | INTERSECTION | RIGHT | PAVED ROUTE (S. SAN MARCIAL STREET) |
| 0.004 | 0.054 | CURB-AND-GUTTER | LEFT | N/A |
| 0.004 | 0.082 | CURB-AND-GUTTER | RIGHT | N/A |
| 0.008 | 0.008 | SIGN | LEFT | REGULATORY, STOP |
| 0.010 | 0.010 | GATE | N/A | N/A |
| 0.011 | 0.011 | DROP INLET | N/A | N/A |
| 0.021 | 0.021 | SIGN | RIGHT | REGULATORY, SPEED LIMIT 15 |
| 0.053 | 0.053 | SIGN | RIGHT | GUIDE, GROUNDS OPEN DAILY 5:00 A-M. TO 10:00 P.M. VISITOR CENTER OPEN TUESDAY THROUGH SATURDAY 10:00 A.M. |
| 0.058 | 0.058 | INTERSECTION | LEFT | ROUTE 0010ABZ (SAN MARCIAL ENTRANCE ROAD SPUR) |
| 0.058 | 0.085 | ONE-WAY | N/A | N/A |
| 0.061 | 0.061 | SIGN | LEFT | REGULATORY, DO NOT ENTER |
| 0.061 | 0.082 | CURB-AND-GUTTER | LEFT | N/A |
| 0.064 | 0.064 | SIGN | LEFT | REGULATORY, GRAPHIC SIGN NO TEXT |
| 0.081 | 0.081 | SIGN | LEFT | REGULATORY, ONE WAY |
| 0.085 | 0.085 | INTERSECTION | LEFT | ROUTE 0010 (CIRCLE DRIVE) |
| 0.085 | 0.085 | INTERSECTION | N/A | ROUTE 0010 (CIRCLE DRIVE) |
| 0.085 | 0.085 | ROUTE END | N/A | TO BEGINNING OF ROUTE 0010 (CIRCLE DRIVE) |

# CHAM: ROUTE MAINTENANCE FEATURES ROAD LOG

## ROUTE 0010BAZ: DELTA ENTRANCE ROAD

**Notice:** Culverts and drop inlets were marked by NPS and inventoried by RIP in Cycle 5 on all DCV driven routes. Culverts, drop inlets, and gates were also collected on all Manually Rated Routes and Paved Parking areas. Those totals are reflected below.

| FROM MILEPOST | TO MILEPOST | FEATURE | SIDE | COMMENT |
|---|---|---|---|---|
| 0.000 | 0.000 | ROUTE BEGIN | N/A | FROM DELTA DRIVE / CESAR E. CHAVEZ BORDER HIGHWAY |
| 0.000 | 0.000 | INTERSECTION | LEFT | PAVED ROUTE (DELTA DRIVE / CESAR E. CHAVEZ BORDER HIGHWAY) |
| 0.000 | 0.000 | INTERSECTION | RIGHT | PAVED ROUTE (DELTA DRIVE / CESAR E. CHAVEZ BORDER HIGHWAY) |
| 0.000 | 0.015 | CURB-AND-GUTTER | LEFT | N/A |
| 0.000 | 0.071 | CURB-AND-GUTTER | RIGHT | N/A |
| 0.002 | 0.002 | SIGN | LEFT | REGULATORY, UNABLE TO READ FROM VIDEO |
| 0.002 | 0.002 | SIGN | LEFT | GUIDE, UNABLE TO READ FROM VIDEO |
| 0.002 | 0.002 | GATE | N/A | N/A |
| 0.004 | 0.004 | SIGN | RIGHT | GUIDE, NATIONAL PARK SERVICE |
| 0.011 | 0.011 | DROP INLET | N/A | N/A |
| 0.016 | 0.016 | INTERSECTION | LEFT | ROUTE 0903 (CHAMIZAL OVERFLOW PARKING) |
| 0.019 | 0.026 | CURB-AND-GUTTER | LEFT | N/A |
| 0.024 | 0.071 | ONE-WAY | N/A | N/A |
| 0.026 | 0.026 | INTERSECTION | LEFT | ROUTE 0010BBZ (DELTA ENTRANCE ROAD SPUR) |
| 0.027 | 0.070 | CURB-AND-GUTTER | LEFT | N/A |
| 0.029 | 0.029 | SIGN | LEFT | REGULATORY, PARKING |
| 0.029 | 0.029 | SIGN | LEFT | REGULATORY, GRAPHIC SIGN NO TEXT |
| 0.034 | 0.034 | SIGN | RIGHT | REGULATORY, NO PARKING |
| 0.034 | 0.034 | SIGN | LEFT | REGULATORY, DO NOT ENTER |
| 0.034 | 0.034 | SIGN | LEFT | REGULATORY, SPEED LIMIT 15 |
| 0.035 | 0.055 | PULLOUT | RIGHT | N/A |
| 0.052 | 0.052 | SIGN | RIGHT | GUIDE, UNABLE TO READ FROM VIDEO |
| 0.060 | 0.060 | SIGN | RIGHT | GUIDE, UNABLE TO READ FROM VIDEO |
| 0.068 | 0.068 | SIGN | LEFT | REGULATORY, ONE WAY |
| 0.071 | 0.071 | INTERSECTION | LEFT | ROUTE 0010 (CIRCLE DRIVE) |
| 0.071 | 0.071 | INTERSECTION | N/A | ROUTE 0010 (CIRCLE DRIVE) |
| 0.071 | 0.071 | ROUTE END | N/A | TO ROUTE 0010 (CIRCLE DRIVE) AT MP 0.08 ON RIGHT |

# Section 10
# Appendix

Chamizal National Memorial

Federal Lands Highway
Road Inventory Program

# Explanation of Changes to the RIP Index Equations and Determination of PCR

In 2005, the FHWA began implementing the use of a Pavement Management System to assist the National Park Service in prioritizing Pavement Maintenance and Rehabilitation activities. The PMS used by FHWA is the Highway Pavement Management Application (HPMA) and this software has the ability to store inventory and condition data from RIP and forecast future performance using prediction models. Outputs include performance and condition reports at the National, Region, Park, or Route level. A regional prioritized list and optimization have been produced for most regions and the Federal Highway Deferred Maintenance is calculated via the HPMA as well.

In an effort to improve the accuracy of treatment recommendations and pavement condition descriptions vis a vis the distresses and indexes that comprise the Pavement Condition Rating (PCR), an extensive study was completed throughout 2010 that has resulted in changes to the Road Inventory Program condition reporting method and specifically, the calculation of PCR. It was determined that a better representation of PCR could be achieved by modifying the relative impact certain distresses would have on the overall rating.

Through the use of HPMA data, it was noted that false failure indicators existed with the existing PCR model, and that it would be necessary to reduce their impact. The distresses affected in this way were Rutting and Roughness. Conversely, experience showed that roadways with extensive cracking present were often shown to have a high PCR. Therefore, the crack index models were adjusted to be more sensitive to changes in crack severity or quantity. It was also determined that these issues were not due to a problem with data acquisition (i.e. the RIP "van"), but with the way the collected data was processed. The final change was to provide guidance on when to use the Roughness Condition Index (RCI) in the PCR calculation. Roughness data is of little value to determining overall condition on routes that, due to their length or geometrics, have lower vehicle operating speeds. Therefore, in Cycle 5, only routes that have lengths of one half mile or greater and posted speed limits of 25 mph or greater will have RCI reported and included in the PCR calculations.

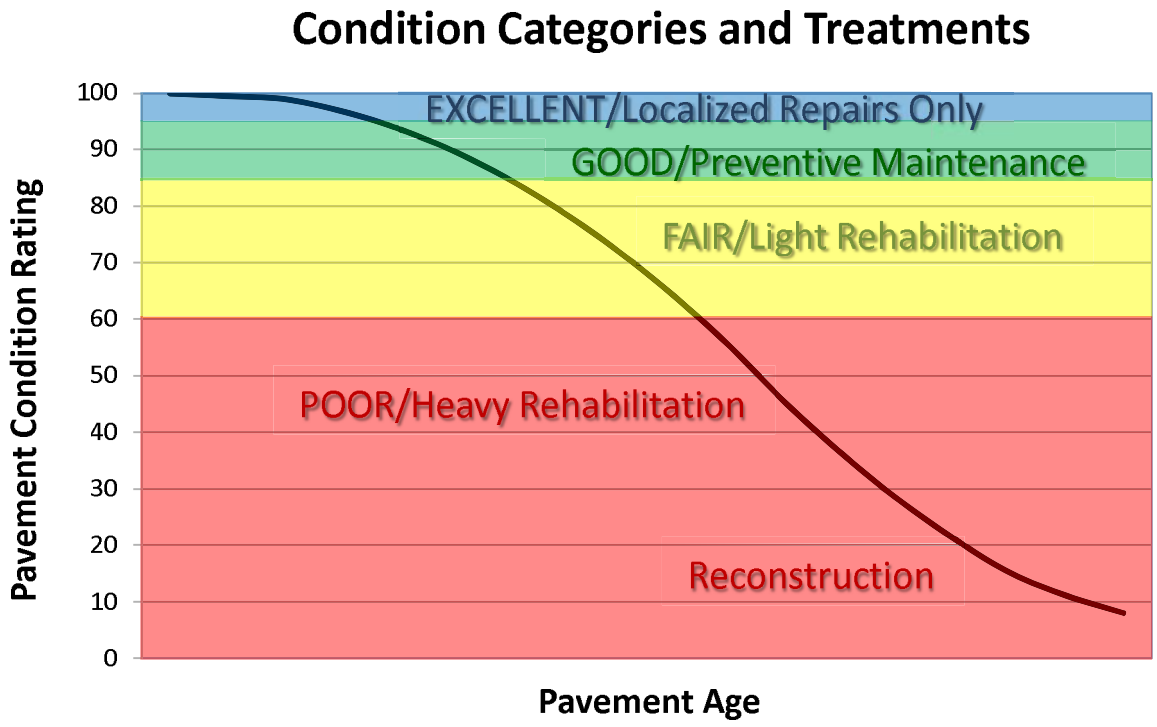
The changes that were implemented were endorsed by management at both the FHWA and NPS. In order to show the effectiveness of these changes, several sites were ground truth tested to ensure that an improvement was achieved between the relationship of PCR and the actual Maintenance and Rehabilitation needs that were represented. The changes will allow greater use of RIP and HPMA data for not simply condition data reporting, but also as a reliable tool for project identification and selection.

# Explanation of the Excellent, Good, Fair and Poor Condition Descriptions

In addition to the RIP Index changes that will be implemented in Cycle 5, we will also aim to provide greater assistance in translating good/fair/poor categories into pavement needs categories. The PCR can be used to indicate the place in the Pavement Life Cycle and the types of treatments that should be considered now and into the future.

- Excellent/New: PCR of 95-100. Pavements in this range will require only spot repairs
- Good: PCR of 85-94. Pavements in this range will likely be candidates for Preventive Maintenance. Examples include Chip and Slurry Seals, Micro Surfacing and Thin Overlays.
- Fair: PCR of 61-84. Pavements in this range will likely be candidates of Light Rehabilitation (L3R). Examples include single-lift overlays up to 2.5 inches in total thickness, milling and overlays.
- Poor: PCR of 60 or below. Pavements in this range will likely be candidates of Heavy Rehabilitation or Reconstruction (H3R or 4R). Examples include Pulverization, Multiple Lift Overlays, and Reconstruction.

At this time, specific Maintenance and Rehabilitation activities should be evaluated and recommended at the project level. Site-specific conditions that influence treatment type should be determined based on performing a subsurface investigation and/or pavement condition survey, and not be based solely on RIP data. Additionally, RIP produces a snapshot of conditions the year in which the data was collected. For further information or to obtain additional Pavement Management System's data from our Highway Pavement Management Application (HPMA) please contact the Eastern Federal Lands pavement team.



# DESCRIPTION OF RATING SYSTEM

The Federal Highway Administration (FHWA), Road Inventory Program (RIP) for the National Park Service (NPS), collects roadway condition data on paved surfaces (asphalt, concrete, brick, and cobblestone) on roads, parkways, and parking areas in national parks nationwide. The road surface condition data is collected using an automated Data Collection Vehicle (DCV). Roads having brick or cobblestone surfacing are not normally surveyed with the DCV, but are manually rated for condition rating.

The FHWA RIP is implemented based on the premise that an accurate pavement surface condition assessment can be accomplished using automated crack detection technology as applied to digital images. Various methods of pavement condition assessment have been developed over the years with varying degrees of accuracy and acceptance. The use of digital photography to record pavement images and subsequent crack detection and classification has undergone continuous improvements over the past decade. Digital cameras with increasingly superior resolution and high definition have become more affordable, and the proprietary programming code and algorithms have been improved in crack detection software.

With the use of quality digital photography and automated crack detection software, FHWA RIP is tasked with executing a pavement condition assessment on about 5000 miles of National Park Service roads and parkways. Foremost in setting up the basis of pavement distress identification is employing the distress identification protocols used by FHWA. There is no single distress identification system that is universal among entities conducting a program of distress identification. For the purpose of the NPS RIP, FHWA employs distress identification protocols that are specific to this program.

FHWA has referenced the *"Distress Identification Manual for the Long-Term Pavement Performance Program", Publication No. FHWA-RD 03-031, June 2003,* as the point-of-reference for distress types on NPS pavement. In truth, the FHWA RIP distress types are similar to those described in the LTPP manual with some modifications. This document, *"Distress Identification Manual for the NPS Road Inventory Program, Cycle 5, 2010-2013"* was developed using the *"Distress Identification Manual for the Long-Term Pavement Performance Program"* as a guideline. Definitions of severity levels based on crack width contained in this document adhere to the LTPP Distress ID Manual. Modifications have been made to the definition of Alligator and Longitudinal Cracking and determination of Alligator Cracking severity. This manual also addresses Rutting and Roughness and its application to RIP.

In 2010, FHWA RIP began the fifth cycle of data collection in national parks. For Cycle 5, data will be collected in approximately 81 large parks (10 or more paved route miles) on Functional Class 1, 2, and 7 routes plus any new routes or parking areas previously not collected, totaling an estimated 4,459 paved route miles. Additionally, 168 small parks will be collected comprising approximately 529 paved route miles and associated paved parking areas. The data is used to support the National Park Service road maintenance program and Pavement Management System (PMS) developed and maintained by FHWA.

This **"*Distress Identification Manual for the NPS Road Inventory Program, Cycle 5, 2010-2013*"** will be used as a reference resource in crack detection and classification, determination of distress severity and extent, and in the calculation of distress index values for the FHWA RIP Cycle 5.

# SURFACE DISTRESSES

## Surface Condition Rating - SCR

Surface distresses are measured in the primary lane only. In the classification and measurement of all paved surface condition data, results will be reported in the database in record intervals of 0.02 miles (105.6 feet) (smallest granularity) along the route.

### Surface distresses determined from digital images

- Transverse Cracks
- Longitudinal Cracks
- Alligator Cracks
- Patching/Potholes

### Surface distress measured by DCV (Data Collection Vehicle) LRMS (Laser Rut Measuring System)

- Rutting

### Each of the five surface distresses is assigned a computed surface distress index

- Transverse Crack Index
- Longitudinal Crack Index
- Alligator Crack Index
- Patching/Pothole Index
- Rutting Index

Surface distress data are classified as listed above, measured for severity, and quantified for extent. Classification, severity, and extent of these five surface distresses comprise the three main elements for calculation of SCR (Surface Condition Rating).

In addition to the five surface distresses, a **Structural Crack Index** is computed, which is a combination of the Longitudinal Crack Index and the Alligator Crack Index. The Structural Crack Index is then used in lieu of the LC and AC indices to compute SCR.

## Roughness Condition Index - RCI

### Additional condition data measured by DCV (lasers and accelerometers)

- Roughness (IRI)

Roughness is measured by FHWA's DCV and reported as International Roughness Index (IRI) in inches/mile. Using IRI, the Roughness Condition Index (RCI) is computed.

## Pavement Condition Rating - PCR

Using the SCR (computed from the five surface distresses) and the RCI, an overall Pavement Condition Rating (PCR) is computed. The formula for PCR is:

**Asphalt PCR** = (0.60 * SCR) + (0.40 * RCI)
**Concrete PCR** = RCI

A detailed description of each distress index formula, roughness index formula, SCR and PCR is provided in this document beginning on page 23.

Each classified surface distress will fall into one or more s*everity*…LOW, MEDIUM, or HIGH based on criteria listed. For each severity, an e*xtent* is established based on the measured quantity of the distress within that severity. Within each *severity* individual distresses are assigned a *Maximum Allowable Extent* (MAE). For example, LOW severity transverse cracking may be allowed up to 21.1 cracks within a 0.02 interval before it reaches MAE and fails.

The index formulas are based on a scale of 0-100. A PCR index value of 100 would indicate a "new" road with no measurable distresses or rough ride. A PCR value of 60 is determined to be *terminable serviceability* and the road is considered failed. The range of index values with condition descriptors is:

POOR (<=60), FAIR (61 - 84), GOOD (85 - 94), EXCELLENT (95 - 100)

Index values are generally computed based on cumulative deducts of the measured severities. As shown in the index formulas below, as any single severity reaches or exceeds MAE, the index computes to a value of 60 or less, and the road fails for that 0.02 interval.

> **Note:** As a result of a unique combination of measured surface distresses and IRI, index values occasionally compute to less than 0 or greater than 100. In this instance, an index value < 0 defaults to 0. Index values > 100 default to 100. For all indices, a higher value indicates a better road condition, and a lower value indicates a poorer road condition.

On the following page, Table 1 summarizes the different types of distresses measured.

**TABLE 1: Distress Summary**

| ASPHALT-SURFACED PAVEMENT DISTRESS TYPES with RUTTING and ROUGHNESS | | | | |
|---|---|---|---|---|
| **DISTRESS TYPE** | **UNIT OF MEASURE…** | **…CONVERTED TO** | **DEFINED SEVERITY LEVELS?** | **MEASURED BY** |
| **Alligator Cracking** | **Square Feet** | **Percent of Lane Per 0.02 Mile** | **Yes** | **Digital Image Crack Detection Software** |
| **Transverse Cracking** | **Linear Feet** | **Number of Cracks Per 0.02 Mile** | **Yes** | **Digital Image Crack Detection Software** |
| **Longitudinal Cracking** | **Linear feet** | **Percent of Lane Length Per 0.02 Mile** | **Yes** | **Digital Image Crack Detection Software** |
| **Patching/Potholes** | **Square Feet** | **Percent of Lane Per 0.02 Mile** | **No** | **Digital Image Crack Detection Software** |
| **Rutting** | **Inches** | **Rut Depth Per 0.02 Mile** | **Yes** | **DCV – Laser Rut Measuring System (LRMS)** |
| **Roughness** | **IRI** | ***RCI Per 0.02 Mile** | **No** | **DCV – Lasers /Accelerometers** |

***Note: Roughness is measured on concrete roadways, but surface distresses and rutting are not measured. For concrete, PCR = RCI**

# ALLIGATOR CRACKING

## Description

Alligator cracking is considered a combination of fatigue and block cracking. It is a series of interconnected cracks in various stages of development. Alligator cracking develops into a many-sided pattern that resembles chicken wire or alligator skin. It can occur anywhere in the road lane. Alligator cracking must have a quantifiable area.

## Severity Levels

**LOW**
An area of cracks with no or very few interconnecting cracks and the cracks are not spalled. Cracks are <= 0.25 in (6mm) in mean width. Cracks in the pattern are no further apart than 1 foot (0.328 m). May be sealed cracks with sealant in good condition and a crack width that cannot be determined.

**MEDIUM**
An area of interconnected cracks that form a complete pattern. Cracks may be slightly spalled. Cracks are >0.25 in. (6 mm) and <= 0.75 in. (19 mm) or any crack with a mean width <= 19 mm and adjacent low severity cracking. Cracks in the pattern are no further apart than 6 in. (150 mm).

**HIGH**
An area of interconnected cracks forming a complete pattern. Cracks are moderately or severely spalled. Cracks are >0.75 in (19mm) or any crack with a mean width <= 0.75 in (19mm) and adjacent medium to high severity random cracking.

A combination of observed crack width and crack pattern is used to determine overall severity of alligator cracking. Based on above description of each severity, the highest level of crack width and crack pattern determines overall severity. Table 2 illustrates this.

**TABLE 2: Alligator Crack Severity Levels**

| ALLIGATOR CRACKING SEVERITY LEVELS | | Crack Pattern | | |
|---|---|---|---|---|
| | | **LOW** | **MED** | **HIGH** |
| **Crack Width** | **LOW** | L | M | H |
| | **MED** | M | M | H |
| | **HI** | H | H | H |

## LONGITUDINAL CRACKING

### Description

Longitudinal cracking occurs predominantly parallel to the pavement centerline. It can occur anywhere within the lane. Longitudinal cracks occurring in the wheelpath may be noteworthy.

### Severity Levels

**LOW**
Cracks with a mean width of < 0.25 in. (6 mm). Sealed cracks with sealant in good condition and a width that cannot be determined.

**MED**
Cracks with a mean width > 0.25 in. (6 mm) and <= 0.75 in. (19 mm). Also, any crack with a mean width < 0.75 in. (19 mm) and adjacent random low severity cracking.

**HIGH**
Cracks with a mean width > 0.75 in. (19 mm). Also, any crack with a mean width < 0.75 in. (19 mm) and adjacent random medium to high severity cracking.

## TRANSVERSE CRACKING

### Description

Transverse cracking occurs predominantly perpendicular to the pavement centerline. It can occur anywhere within the lane.

### Severity Levels

**LOW**
Cracks with a mean width of < 0.25 in. (6 mm). Sealed cracks with sealant in good condition and a width that cannot be determined.

**MED**
Cracks with a mean width > 0.25 in. (6 mm) and <= 0.75 in. (19 mm). Also, any crack with a mean width < 0.75 in. (19 mm) and adjacent random low severity cracking.

**HIGH**
Cracks with a mean width > 0.75 in. (19 mm). Also, any crack with a mean width < 0.75 in. (19 mm) and adjacent random medium to high severity cracking.

## PATCHING AND POTHOLES

### Description

Patching is an area of pavement surface that has been removed and replaced with patching material or an area of pavement surface that has had additional patching material applied. Patching may encompass partial lane or full lane width On full lane width patching; the total, contiguous length of patch may not exceed 0.30 mi. (0.48 km). (Any full-lane patch exceeding 0.30 mi. in length is considered a pavement change). Patching must have a quantifiable area.

Potholes are bowl-shaped holes of various sizes occurring in the pavement surface.

### Severity Levels

There are no stratified severities for Patching/Potholes. They either are present or they are not.

## RUTTING

### Description

Rutting is a longitudinal surface depression in the wheelpath.

### Severity Levels

**LOW**
Ruts with a measured depth $\geq 0.20$" and $\leq 0.49$"

**MED**
Ruts with a measured depth $\geq 0.50$" and $\leq 0.99$"

**HIGH**
Ruts with a measured depth $\geq 1.00$"

Ruts < 0.20" are not included in the distress calculations.

# ROUGHNESS

## Description

Roughness is the measurement of the unevenness of the pavement in the direction of travel. It is measured in units of IRI (International Roughness Index), inches per mile, and is indicative of ride comfort.

## Severity Levels

There are no stratified severity levels for roughness. The roughness (or smoothness) of a road surface can be defined by IRI in the following table.

**TABLE 3: IRI**

| **IRI Descriptions** | |
|---|---|
| **Type of Road** | **Typical IRI ( in/mile )** |
| New Road, no noticeable roughness | <90 |
| Small level of roughness | 90 – 126 |
| Road of average roughness | 126 – 190 |
| Road with above average roughness | 190 – 253 |
| Road with severe roughness | 253 – 380 |
| Nearly impassable | >380 |

# INDEX FORMULAS

Note**:** All index formulas listed below contain MAE applicable to 0.02 mile (105.6 feet) interval.

## Alligator Crack Index

**AC_INDEX** = 100 – 40 * [(%LOW / 35) + (%MED / 15) + (%HI / 5)]

Where:

The values *%LOW*, *%MED* and *%HI* report the percentage of the observed pavement (0.02 mile, primary lane) that contains alligator cracking within the respective severities. These values range from 0 to 100.

%LOW = Percent of total area (primary lane, 0.02 in length), low severity
%MED = Percent of total area (primary lane, 0.02 in length), medium severity
%HI = Percent of total area (primary lane, 0.02 in length), high severity

Percent of total area is computed as:

$$\frac{\text{square foot area of alligator crack severity}}{\text{0.02 mile * lane width}}$$

In AC_INDEX, the denominators 35, 15, and 5 are the Maximum Allowable Extents (MAE) for each severity. In other words, we will allow up to 35% of low severity alligator cracking for a 0.02 interval before failure, 15% for medium severity, and so on. As you can see, if any single severity reaches MAE the resulting index value is 60, or failure.

## Longitudinal Crack Index

**LC_INDEX** = 100 – 40 * [(%LOW / 175) + (%MED / 75) + (%HI / 25)]

Where:

The values *%LOW*, *%MED*, and *%HI* report the length of longitudinal cracking within each severity as a percent of the section length (0.02 mile, primary lane).
These values are $\geq 0$ and can exceed 100.

%LOW = Percent of interval length (primary lane, 0.02 in length), low severity
%MED = Percent of interval length (primary lane, 0.02 in length), medium severity
%HI = Percent of interval length (primary lane, 0.02 in length), high severity

Percent of interval length is computed as:

$$\frac{\text{length of respective longitudinal cracking}}{\text{0.02 mile (105.6 feet)}}$$

In LC_INDEX, the denominators 175, 75, and 25 are the Maximum Allowable Extents (MAE) for each severity. In other words, we will allow up to 175% of low severity alligator cracking for a 0.02 interval before failure, 75% for medium severity, and so on. As you can see, if any single severity reaches MAE the resulting index value is 60, or failure.

## Structural Crack Index

**SC_INDEX** = [100 - ((100 - AC_INDEX) + (100 - LC_INDEX))]

**Structural Crack Index** is a combination of Alligator Cracking and Longitudinal Cracking, and is used in the SCR formula in lieu of AC and LC separately.

## Transverse Crack Index

**TC_INDEX** = 100 – 40 * [(LOW / 21.1) + (MED / 4.4) + (HI / 2.6)]

Where:

The values *LOW*, *MED* and *HI* report a count of the total number of transverse cracks (reported to three decimals) within each severity level, where one transverse crack is equal to the lane width. These values are $\geq 0$.

LOW = Number of cracks in interval (primary lane, 0.02 in length), low severity
MED = Number of cracks in interval (primary lane, 0.02 in length), medium severity
HI = Number of cracks in interval (primary lane, 0.02 in length), high severity

Number of cracks is computed as:

$$\frac{\text{Total length of transverse cracks}}{\text{Lane width}}$$

In TC_INDEX, the denominators 21.1, 4.4, and 2.6 are the Maximum Allowable Extents (MAE) for each severity. In other words, we will allow up to 21.1 low severity transverse cracks for a 0.02 interval before failure, 4.4 cracks for medium severity, and so on. As you can see, if any single severity reaches MAE the resulting index value is 60, or failure.

## Patching Index

**PATCH_INDEX** = 100 – 40 * (%PATCHING / 80)

Where:

The value *%PATCHING* reports the percentage of the observed pavement (0.02 mile, primary lane) that contains patching/potholes. This value ranges from 0 to 100.

%PATCHING = Percent of total area (primary lane, 0.02 in length)

Percent of total area is computed as:

$$\frac{\text{square foot area of patching/potholes}}{\text{0.02 mile * lane width}}$$

There are no severity levels for patching. It either exists or does not.

In PATCH_INDEX, the denominator 80 is the Maximum Allowable Extent (MAE) for each severity. In other words, we will allow up to 80% patching for a 0.02 interval before failure. As you can see, if patching/potholes reaches MAE the resulting index value is 60, or failure.

## Rutting Index

**RUT_INDEX** = 100 – 40 * [(%LOW / 535) + (%MED / 205) + (%HI / 40)]

Where:

20 rut depth measurements are taken per 0.02 interval for each of 2 wheel paths (left and right), resulting in a total of 40 measurements taken for both wheel paths. *Each wheelpath is analyzed independently for rut severities.* The values *%LOW*, *%MED* and *%HI* are a *total percentage* of left wheelpath percentage and right wheelpath percentage added together for the respective severity. These values range from 0 to 200.

%LOW = Percent of LOW ruts in left wheelpath based on 20 ruts, plus percent of LOW ruts in right wheelpath based on 20 ruts.
%MED = Percent of MED ruts in left wheelpath based on 20 ruts, plus percent of MED ruts in right wheelpath based on 20 ruts.
%HI = Percent of HI ruts in left wheelpath based on 20 ruts, plus percent of HI ruts in right wheelpath based on 20 ruts.

Percent of rut measurements within each severity can also be computed as:

$$\frac{\text{total number of ruts within each severity in both wheelpaths}}{20} * 100$$

In RUT_INDEX, the denominators 535, 205, and 40 are the Maximum Allowable Extents for each severity. In other words, the formula allows up to 535% low severity

ruts for a 0.02 interval before. However, since 200 is the highest measurable percentage allowed, 535% is unattainable and therefore, no amount of LOW severity rutting will cause the RUT_INDEX to fail a road. Similarly, since the MAE for MED severity rutting is 205, no amount of MED severity rutting will cause the RUT_INDEX to reach 60 and fail the road. As you can see, LOW severity rutting reaches MAE the resulting index value is 60, or failure. This formula was intentionally designed to minimize the impact of LOW and MED severity rutting on RUT_INDEX.

## Roughness Condition Index (Asphalt)

**RCI** = 32 * [5 * (2.718282 ^ (-0.0041 * AVG IRI))]

Where:

The value *AVG IRI* reports the average value of the Left IRI and Right IRI measurements for the interval (0.02 mile, primary lane). This value can range from approximately 40 to 999.0.

Average IRI is computed as:

$$\frac{\text{Left wheelpath IRI + Right wheelpath IRI}}{2}$$

There is no applicable threshold for failure for this index.

## Roughness Condition Index (Concrete)

**RCI** = $-0.0012(IRI^2) + 0.0499(IRI) + 99.542$

For concrete, PCR = RCI

## Surface Condition Rating Index

**SCR** = *Lowest* Index Value Of: [SC_INDEX, TC_INDEX, PATCH_INDEX, RUT_INDEX]

***Note:*** *The modified SCR equation above combines AC_INDEX and LC_INDEX, and considers that a single AC/LC index value of the Structural Crack Index (SC_INDEX). The lowest of the four computed index values (SC_INDEX, TC_INDEX, PATCH_INDEX, or RUT_INDEX) becomes the SCR.*

Where:

See above for determinations of SC_INDEX, TC_INDEX, PATCH_INDEX and RUT_INDEX.

The threshold for failure for this index is SCR = 60.

# Data Collection Vehicle Subsystems

Data on paved roads in Cycle 5 is collected by FHWA using a Pathway Services Inc. Data Collection Vehicle (DCV), called PathRunner. The DCV is driven in the primary-direction lane at posted speed limits and less.

## CAMERAS

Forward-facing and rear-facing video is collected as .jpg digital imagery at a frequency of 26.4 feet.

Two forward-facing cameras are mounted above the vehicle cab, one pointed straight ahead and the other to the right shoulder providing seamless 120 degree viewing.

| **CAMERA SPECIFICATIONS**<br>**Two Forward/ One Rear Facing** | |
|---|---|
| Camera lens/type | FUJINON CCTV LENS H16x10B-Y41 |
| Focal length | 10 mm – 160 mm |
| Image size | 8.8 mm x 6.6mm |
| Image format | *.jpg |
| Image resolution | HD 2000 X 1200 |
| Image pixel size | depends on distance |
| Zoom ratio | 16x |
| Max Relative Aperture | 1:2.5 |
| Iris range | F25-T800 (Equivalent to F800) |

Pavement images are created using a Laser Scan Imaging System. This system is composed of a single high resolution line-scan camera and two lasers configured to image an approximate 11-foot wide lane with 1 mm resolution.

| **CAMERA SPECIFICATIONS**<br>**Pavement Line Scan** | |
|---|---|
| Image size | 4280 pixels/line |
| Image width | 4 meters (3950 mm nominal) |
| Laser class | 3B |
| Power | 250W |
| Vehicle speed limitations | 62 mph |
| Environment | Dry pavement, day or night |
| Sensor size (approx) | 300 mm(H) x 375 mm(L) x 200 mm(D) |
| Image frame length | 26.4 feet |

## DMI (Distance Measuring Instrument)

The DMI (Distance Measuring Instrument) obtains road length measurements that are accurate to 0.1% for speeds up to 60 mph. The DMI is connected to the hub of the rear wheel on the driver's side, and is calibrated to the revolutions of the rear vehicle axle on a regular basis.

## ROUGHNESS (IRI)

The collection system includes a South Dakota type laser profiler manufactured based on active Class 1 ASTM E950 standards. The dynamic profile of the pavement surface is collected from which the IRI roughness data is computed. The sensors include one accelerometer on each wheelpath, one height sensor (laser) on each wheelpath, and a distance transducer.

| **IRI SPECIFICATIONS** | |
|---|---|
| Reported IRI units | Inches/mile |
| Vehicle speed limitations | 12-62 mph |
| IRI equipment certification | Texas Transportation Institute (TTI) |
| Wavelengths accommodated | 6 in. – 300 feet |
| IRI computed & reported | World Bank Technical Paper Number 46 |
| Environment | Dry pavement, day or night, above 32 degrees F |
| Adherence to specifications | ASTM E950-98 (2004), ASTM E 1926-08, AASHTO MP 11-08, AASHTO PP 49-08 |

## RUTTING

Rutting depths are measured using an INO Laser Rut Measurement System (LRMS). This system is a transverse profiling device that detects and characterizes pavement rutting. The LRMS can acquire full 4 meter width profiles of a pavement lane at normal traffic speeds and uses two laser profilers that digitize transverse sections of the pavement.

| **RUTTING SPECIFICATIONS** | |
|---|---|
| Reported rut depth units | Inches |
| Vehicle speed limitations | Up to 62 mph |
| Sampling rate | 30-150 profiles/second |
| Transverse resolution | 1280 points/profile |
| Transverse field-of-view | 4 m |
| Depth accuracy (nominal) | +/- 1 mm |
| Environment | Dry pavement, day or night, above 32 degrees F |
| Adherence to specifications | ASTM E1703M-95 (reapproved 2005) |

## GPS & INERTIAL SYSTEMS

GPS is collected by an onboard system employing Omnistar real time correction and a gyroscope Inertial Measuring Unit (IMU) to provide accurate positioning data in instances of satellite obstruction. All GPS coordinates are tied to image and linear distance measurements.

| GPS SPECIFICATIONS | |
|---|---|
| Static accuracy | Sub-meter |
| Dynamic accuracy | 2-3 meters |
| Receiver | 12 satellite tracking |
| Coordinate system | Lat Lon WGS 84 |
| Environment | Day or night |
| Cross-slope | +- 0.1 degrees |
| Grade | +- 0.1 degrees |

GPS on Manually Rated Roads (MRR)

Parking areas, some roads, and other paved areas that are not fully drivable with the DCV are collected manually by field technicians. GPS is collected for these routes using portable Trimble GPS backpack units.

# Geodatabase – Background and Metadata

In addition to this park report, a ***geodatabase*** containing both tabular and spatial data specific to this park has been provided. All data disseminated in the preceding report has been obtained from the tables and fields within said geodatabase. The geodatabase can be referenced for tabular data via Microsoft Access or for both tabular and spatial data via ESRI's ArcGIS Suite of software which consists of; ArcMap, ArcCatalog and ArcExplorer. Consolidating the RIP data into one database creates a seamless relationship of tables and geographic data. It will allow RIP to facilitate easier updates and enhancements in the future.

A geodatabase can be thought of as simply a database containing spatial data. Many different tables are contained with the park's geodatabase. A complete and thorough description of the tables and fields contained within this geodatabase can be found in the ***metadata***. The metadata is attached directly within the geodatabase and can be accessed via ESRI's ArcCatalog.

## GLOSSARY OF TERMS AND ABBREVIATIONS

| TERM OR ABBREVIATION | DESCRIPTION OR DEFINITION |
|---|---|
| AC | Alligator Cracking |
| CRS | Condition Rating Sheets (Section 5) |
| DCV | Data Collection Vehicle |
| Excellent | Excellent rating with an index value of 95 to 100 |
| Fair | Fair rating with an index value from 61 to 84 |
| FUNCT_CLASS | Functional Classification (see Route ID, Section 2) |
| Good | Good rating with an index value from 85 to 94 |
| IRI | International Roughness Index |
| Lane Width | Width from road centerline to fogline, or from centerline to edge-of-pavement when no fogline exists |
| LC | Longitudinal Cracking |
| MRR | Manually Rated Route |
| MRL | Manually Rated Line |
| MRP | Manually Rated Polygon |
| N/A | Not Applicable |
| NC | Not Collected |
| PATCH | Patching and Potholes |
| Paved Width | Width from edge-of-pavement to edge-of-pavement |
| PCR | Pavement Condition Rating |
| PKG | Parking Area |
| Poor | Poor rating with an index value of 0 to 60 |
| RCI | Roughness Condition Index |
| SC | Structural Cracking |
| SCR | Surface Condition Rating |
| TC | Transverse Cracking |