# The Road Inventory
# of
# Kaloko-Honokohau National Historical Park
# KAHO - 8320
## Cycle 4

# Kaloko-Honokohau National Historical Park
# in
# Hawaii

Honolulu

Kaloko-Honokohau
National Historical Park

# TABLE OF CONTENTS

# Kaloko-Honokohau National Historical Park

# Section 1
# Introduction

# INTRODUCTION

**Background:** In 1976, the National Park Service (NPS) and the Federal Highway Administration (FHWA) entered into a Memorandum of Agreement (MOA), establishing the Road Inventory Program (RIP). In 1980, the NPS and the FHWA terminated the 1976 MOA and entered into a new MOA that provided for the completion of the initial phase of the RIP. The purpose of the RIP, per the 1980 MOA was to maintain and update RIP data in order to develop long-range costs and programs to bring National Park Service (NPS) roads up to, or to maintain, designated standards, and establish a maintenance management program.

The FHWA's Federal Lands Highway (FLH) was assigned the task of identifying condition deficiencies and corrective priorities along with associated corrective costs, inventorying maintenance features (e.g., culverts, signs, guardrail, etc.), summarizing the data and findings in a report and providing a photographic record of the road system.

The FLH completed the initial phase of the RIP in the early 1980's. As a result of this effort, each park received a RIP book, also known as the "Brown Book," that included the information collected during this initial RIP phase.

In an effort to maintain and update the RIP data, a cyclical data collection and reporting process was reestablished in the 1990's. The FLH completed two cycles of RIP data collection between 1994 and 2001. Cycle 1 was collected in 44 large parks from 1994 to 1996. This data was found to be unusable for comparison to future cycles. Cycle 2 data was collected from March 1997 to January 2001 in 79 large parks and 5 small parks containing 4,874 route miles. Each park received a copy of a Cycle 2 RIP Report, also known as the "Blue Book". Cycle 3 was completed from 2001 through 2004, and included data collection in all parks that contain pavement.

Since 1984, the RIP Program has been funded through the Federal Lands Highway Program's Park Roads and Parkways (PRP) Program. Currently, the NPS Washington Headquarters' Park Facility Management Division is responsible for coordinating the RIP program with the FLH. The FLH Washington office coordinates policy and prepares national reports and needs assessment studies for congress.

In 1998, the Transportation Equity Act for the 21$^{st}$ Century (TEA-21) amended Title 23 U.S.C., and inserted Section 204(a)(6) which requires the Federal Highway Administration and the National Park Service, to develop, by rule, a Pavement Management System (PMS) for the park roads and parkways serving the National Park System. As a result of the requirements in TEA-21, the NPS and FHWA are in the process of developing a PMS. The PMS will assist the decision-makers in effectively spending limited PRP Program funds. The PMS

will provide information for planning and programming road maintenance, rehabilitation, and reconstruction activities. RIP data will provide the basic information for this system.

Key information included in the RIP is the mileage inventory and condition assessments accomplished by the RIP Program. The mileage and condition data are used in the current allocation formula of PRP Program funds.

**RIP Cycle 4:** Cycle 4 data collection was initiated in spring 2006, where 86 large parks, consisting of 5,553 route miles and 6,232 paved parking areas, were selected as a representative sample of the entire NPS paved road network. Cycle 4 is scheduled for completion in spring 2009 and will serve the PMS in further development of its pavement preservation techniques.

In the Cycle 4 Reports, a general condition rating of excellent, good, fair and poor is ascribed to each one-mile section of paved roadway, and to each paved parking area. This condition rating system provides a realistic means of assessing the general funding needs for road improvements. Along with these descriptive condition ratings, a numerical rating between 0 and 100 is ascribed to each mile of road and to each parking area. This numerical rating is called a Pavement Condition Rating (PCR). The PCR rating system is described in Section 10 of this report.

All of the fieldwork required for obtaining inventory, condition, and maintenance feature information is coordinated with each park and the regional offices to ensure that the information in the RIP reports is accurate.

The FLH is responsible for all the data presented in this report. Anyone having questions or comments regarding the contents of this report is encouraged to contact the FHWA RIP Coordinator. It is our aim to provide exceptional customer satisfaction in our delivery of the RIP program.

The FHWA RIP Team

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# Kaloko-Honokohau National Historical Park



# Section 2
# Park Summary Information

**Section 2:  Park Summary Information**

No roads were driven with the ARAN vehicle in Cycle 4.

# Kaloko-Honokohau National Historical Park



# Section 3
# Park Route Location / Condition Maps

# Kaloko-Honokohau National Historical Park
## Route Location Map
## Key Map



**Park Owned Routes**

0.2    0.1    0       0.2

Miles

N

3-1
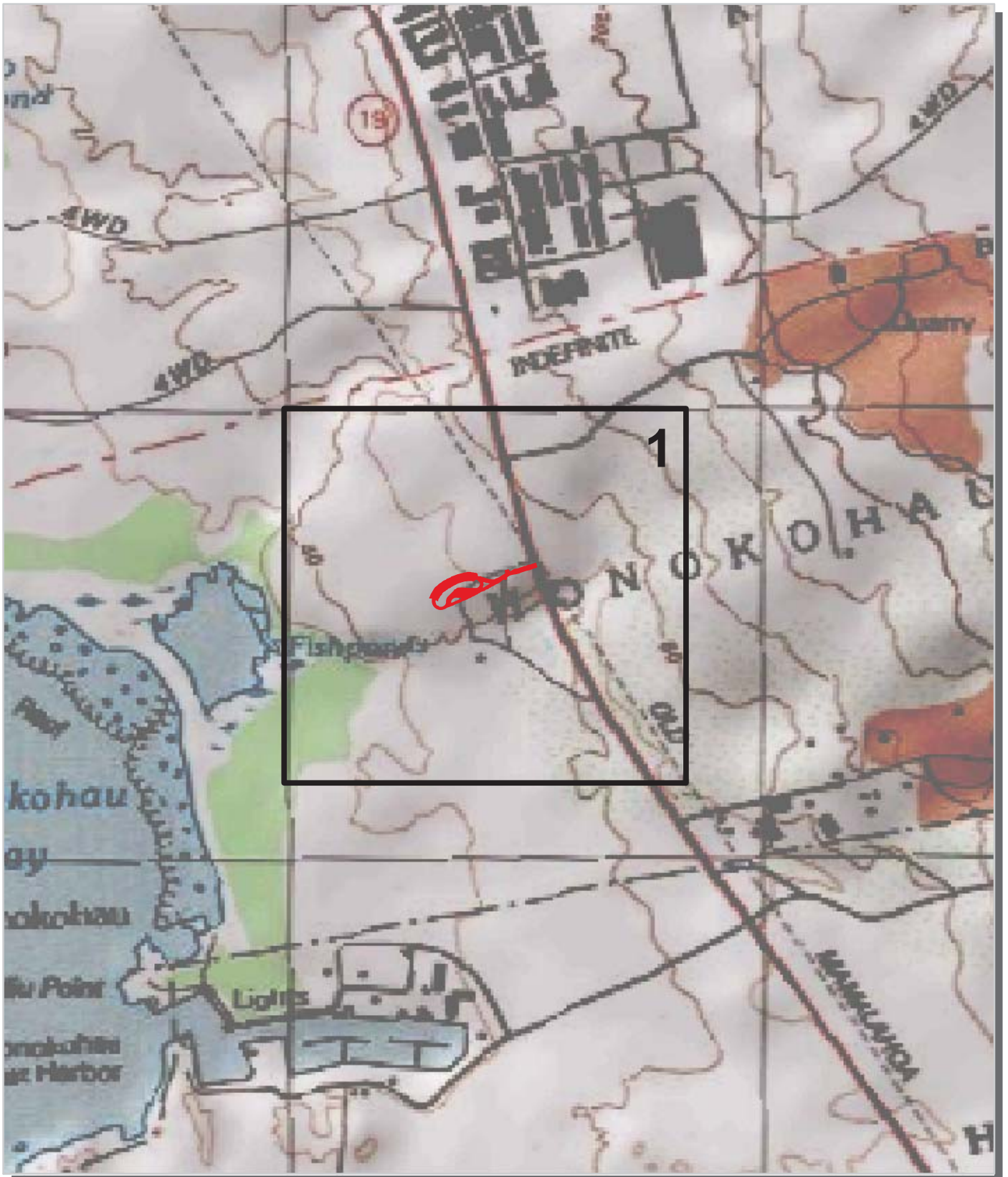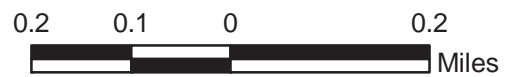
# Kaloko-Honokohau National Historical Park
## Route Location Map
## Area 1

Rte 0011

Rte 0902

Unique colors used to differentiate routes

0.1    0.05    0    0.1

Miles

N

3-2

# Kaloko-Honokohau National Historical Park



# Section 4
# Park Route Inventory

Shading Color Key:

Red text denotes approx. mileage

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

** Unpaved Routes displayed on report were obtained from FMSS database and not inventoried by Road Inventory Program (RIP)

## KAHO — KALOKO-HONOKOHAU NATIONAL HISTORICAL PARK

| Rte. No. | FMSS No. | Concess Route | Route Name | Route Description From | To | Maint. District | Paved Miles | Un-Paved Miles | Total Route Length | Func. Class | Rte. Lanes | Manual Rated SQ/FT | Surf. Type | Area Maps |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0010 | 15625 | | ALA KALOKO ROAD | FROM STATE ROUTE 19 | TO ROUTE 0900 (KALOKO FISHPOND PARKING) | N/A | 0.000 | 0.900 | 0.900 | 1 | | 0 | GR | |
| 0011 | 94792 | | VISITOR CENTER ENTRANCE ROAD | FROM STATE ROUTE 19 | TO ROUTE 0902 (VISITOR CENTER PARKING LOT) | N/A | 0.058 | 0.000 | 0.058 | 2 | | 9,653 | AS | 1 |
| 0400 | 35512 | | MAINTENANCE YARD ACCESS ROAD | FROM KEALAKEHE PARKWAY | TO ROUTE 0901 (MAINTENANCE YARD AND PARKING) | N/A | 0.000 | 0.230 | 0.230 | 5 | | 13,679 | NV | |
| 0401 | 15624 | | PIPELINE ROAD | FROM ROUTE 0011 (VISITOR CENTER ENTRANCE ROAD) | TO ROUTE 0901 (MAINTENANCE YARD AND PARKING) | N/A | 0.000 | 0.600 | 0.600 | 6 | | 0 | GR | |
| 0900 | 35513 | | KALOKO FISHPOND PARKING | FROM END OF ROUTE 0010 (ALA KALOKO ROAD) | TO PARKING | N/A | 0.000 | 0.000 | 0.000 | | | 14,530 | SA | |
| 0901 | 35514 | | MAINTENANCE YARD AND PARKING | FROM END OF ROUTE 0400 (MAINTENANCE YARD ACCESS ROAD) | TO ROUTE 0401 (PIPELINE ROAD) | N/A | 0.000 | 0.000 | 0.000 | | | 34,781 | NV | |
| 0902 | 94778 | | VISITOR CENTER PARKING LOT | FROM ROUTE 0011 (VISITOR CENTER ENTRANCE ROAD) | TO PARKING | N/A | 0.000 | 0.000 | 0.000 | | | 47,432 | AS | 1 |

## SUMMARY TOTALS FOR KALOKO-HONOKOHAU NATIONAL HISTORICAL PARK

### ROUTE TOTALS

| | |
|---|---|
| ARAN Driven Route Miles | 0.000 |
| All Paved Route Miles | 0.058 |
| All Unpaved Route Miles | 1.730 |
| TOTAL PARK ROUTE MILES | 1.788 |
| All Manually Rated Roads (SQFT) | 9,653 |

### PARKING AREA TOTALS

| | |
|---|---|
| All Paved Parking (SQFT) | 47,432 |
| All Unpaved Parking (SQFT) | 49,311 |
| TOTAL ALL PARKING (SQFT) | 96,742 |

### LANE MILE TOTALS

| | |
|---|---|
| ARAN Driven Lane Miles | 0.000 |
| Paved Parking Lane Miles | 0.817 |
| Paved MRR Lane Miles | 0.166 |
| TOTAL PAVED LANE MILES | 0.983 |

### CONCESSION TOTALS

| | |
|---|---|
| Concession Paved Route Miles | 0.000 |
| Concession Unpaved Route Miles | 0.000 |
| Concession Paved Parking Area SQFT | 0 |
| Concession Unpaved Parking Area SQFT | 0 |
| Concession Paved MRR SQFT | 0 |

### WEIGHTED AVERAGE PARK VALUES

| PCR (Rating) | SCR (Rating) | RCI (Rating) | RUT (Index) | AC (Index) | LC (Index) | TC (Index) | PATCH (Index) | PCR (Concession) |
|---|---|---|---|---|---|---|---|---|
| 97.00 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

**Shading Color Key:**

Red text denotes approx. mileage

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

** Unpaved Routes displayed on report were obtained from FMSS database and not inventoried by Road Inventory Program (RIP)

## 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 are driven for GPS, Video Log and Road Features only.

## 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**

# Kaloko-Honokohau National Historical Park



# Section 5
# Paved Route Condition Rating Sheets (CRS)

**Section 5:  Paved Route Condition Rating Sheets**

No roads were driven with the ARAN vehicle in Cycle 4

# Kaloko-Honokohau National Historical Park



# Section 6
# Manually Rated Paved Route Condition Rating Sheets (MRR)
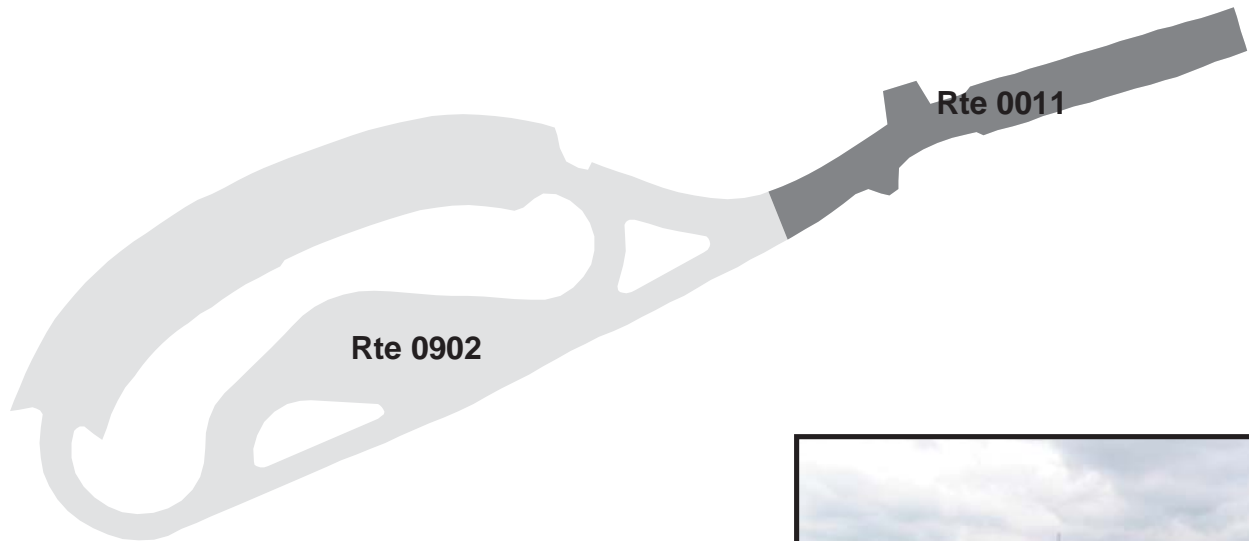
# KALOKO-HONOKOHAU NATIONAL HISTORICAL PARK
## Route 0011
### VISITOR CENTER ENTRANCE ROAD
FROM STATE ROUTE 19
TO ROUTE 0902 (VISITOR CENTER PARKING LOT)

| Route Number | Public / NonPublic | Date Visited | | Area (sq ft) | Lane Miles * | Surface Type |
|---|---|---|---|---|---|---|
| 0011 | PUBLIC | 3/6/2008 | | 9,653 | 0.17 | AS |

| Culverts | Drop Inlets | Gates | Fire Hydrants | Curb & Gutter | Curb | PCR |
|---|---|---|---|---|---|---|
| 0 | 0 | 1 | 1 | NO CURB AND GUTTER | NO CURB | EXCELLENT/97 |

* Lane miles are based on 11' lane widths

**Rte 0011**

**Rte 0902**



130    65    0    130

Feet    N    6-1

# Kaloko-Honokohau National Historical Park



# Section 7
# Parking Area Condition Rating Sheets

# KALOKO-HONOKOHAU NATIONAL HISTORICAL PARK
## Route 0902
### VISITOR CENTER PARKING LOT
### FROM ROUTE 0011 (VISITOR CENTER ENTRANCE ROAD)
### TO PARKING

| Route Number | Public / NonPublic | Date Visited | | Area (sq ft) | Lane Miles * | Surface Type |
|---|---|---|---|---|---|---|
| 0902 | PUBLIC | 3/6/2008 | | 47,432 | 0.82 | AS |

| Culverts | Drop Inlets | Gates | Fire Hydrants | Curb & Gutter | Curb | PCR |
|---|---|---|---|---|---|---|
| 0 | 2 | 1 | 1 | CONCRETE CURB AND GUTTER | CONCRETE CURB | EXCELLENT/97 |

\* Lane miles are based on 11' lane widths









Rte 0011

Rte 0902

190    95    0    190

Feet    N

7-1
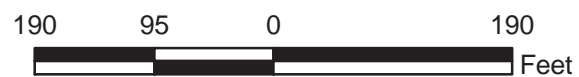
# Kaloko-Honokohau National Historical Park



# Section 8
# Parkwide / Route Maintenance
# Features Summaries

**Section 8:  Parkwide / Route Maintenance Features Summary**

No roads were driven with the ARAN vehicle in Cycle 4, therefore no maintenance features were collected

# Kaloko-Honokohau National Historical Park



# Section 9
# Park Route Maintenance Features
# Road Logs

**Section 9:  Park Route Maintenance Features Road Log**

No roads were driven with the ARAN vehicle in Cycle 4, therefore no maintenance features were collected

# Kaloko-Honokohau National Historical Park

# Section 10
# Appendix

## APPENDIX A: GLOSSARY OF TERMS AND ABBREVIATIONS

| TERM OR ABBREVIATION | DESCRIPTION OR DEFINITION |
|---|---|
| AADT | (Annual Average Daily Traffic) The estimate of typical daily traffic on a road segment for all days of the week over the period of one year. |
| CRS | Condition Rating Sheets. (Section 5) |
| Excellent | Excellent rating with an index value of 95 or greater |
| Fair | Fair rating with an index value from 61 to 84 |
| Func. Class | Funtional Classification (see Route ID, Section 4) |
| 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 |
| MRR | Manually Rated Route |
| N/A | Not Applicable |
| NC | Not Collected |
| Paved Width | Width from edge-of-pavement to edge-of-pavement |
| PCR | Pavement Condition Rating (Appendix B, Section 10) |
| Poor | Poor Rating with an index value of 60 or less |
| RCI | Roughness Condition Index |
| SADT | (Seasonal Annual Daily Traffic) The AADT adjusted to represent just the period of the year containing 80 percent of the total annual traffic. |
| SCR | Surface Condition Rating (Appendix B, Section 10) |
| Shoulder Width | Distance from fogline to hinge point, or if no fogline, from edge-of-pavement to hinge point. |

## APPENDIX B:   DESCRIPTION OF RATING SYSTEM

A numerical roadway rating system is used to describe the overall condition of the paved roadways and paved parking areas. In this system, a numerical rating between 0 and 100 is ascribed to each 0.02 miles of road. This numerical rating is called a Pavement Condition Rating (PCR). A "perfect" road, newly constructed with no surface distresses and a smooth surface, would be assigned a PCR rating of 100.  Based on the type, severity, and extent of surface distresses points are deducted from 100 to arrive at the final PCR.

Data is collected on the following distresses and conditions:

- **Alligator Cracking** - a series of interconnecting cracks resembling alligator skin or chicken wire, which can occur anywhere in the lane.

- **Longitudinal Cracking** - cracks which are parallel to the pavement centerline or asphalt lay-down direction.

- **Transverse Cracking** - cracks perpendicular to the pavement centerline.

- **Pothole (patch)** - a bowl-shaped hole in the pavement surface. May be patched or not.

- **Rutting** - surface depressions in the wheel paths.

- **Roughness** is collected as International Roughness Index (IRI) and is used in the PCR formula. Roughness is measured in inches of vertical displacement of the vehicle per mile traveled.

A Distress Rating Index value is calculated for each of the individual distresses at the 0.02 mile, or every 105.6 feet.

## Calculation of Index Values

**Note:**  Index values < 0 default 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.
All severity protocols are taken from the SHRP Distress Identification Manual.

**Condition Ranges for all Indices**
| | |
|---|---|
| Excellent | >=95 |
| Good | >=85 and <95 |
| Fair | >60 and <85 |
| Poor | <=60 |

### Alligator Crack Index

$$AC\_INDEX = 100 - 40 * [(\%LOW / 70) + (\%MED / 30) + (\%HI / 10)]$$

Where :

The values %LOW, %MED and %HI describe the percent of the total WX measured area that is affected by alligator cracking of each severity level.  These values range from $\geq 0$ to $\leq 100$.

%LOW = (Total square area WX measured low severity alligator cracking) / (Section length * WX measured lane width)

%MED = (Total square area WX measured medium severity alligator cracking) / (Section length * WX measured lane width)

%HI = (Total square area WX measured high severity alligator cracking) / (Section length * WX measured lane width)

The denominators 70, 30, and 10 are the maximum allowable extents for the numerator value in the same units.  For example, low severity alligator cracking totaling 70% of the measured section area would alone fail that section of road for this index.

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

Severity Levels:

Low severity alligator cracking describes an area of cracks with no or only a few connecting cracks; cracks are not spalled (cracked, broken, chipped, frayed along the cracks); pumping (water seepage from beneath the pavement through the cracks) is not evident.  Any sealed alligator cracks are low severity alligator cracks, as long as the sealant is still in good condition.  If the sealant has reopened, and the crack is visible and can be measured, the crack severity is assigned according to that measurement.

Medium severity alligator cracking describes an area of interconnected cracks forming a complete pattern; cracks may be slightly spalled; pumping is not evident.

High severity alligator cracking describes an area of moderately or severely spalled interconnected cracks forming a complete pattern; pieces may move when subjected to traffic; pumping may be evident.

## Longitudinal Crack Index

$$\text{LC\_INDEX} = 100 - 40 * [(\%\text{LOW} / 350) + (\%\text{MED} / 200) + (\%\text{HI} / 75)]$$

Where:

The values %LOW, %MED and %HI describe the length of longitudinal cracking of each severity as a percent of the section length.  These values are $\geq 0$ and can exceed 100.

%LOW = (Total linear feet WX measured low severity longitudinal cracking) / (Section length in linear feet)

%MED = (Total linear feet WX measured medium severity longitudinal cracking) / (Section length in linear feet)

%HI = (Total linear feet WX measured high severity longitudinal cracking) / (Section length in linear feet)

The denominators 350, 200, and 75 are the maximum allowable extents for the numerator value in the same units.  For example, medium severity longitudinal cracking with a total length that is 200% of the length of the section would alone fail that section of road for this index.

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

Severity Levels:

Low severity longitudinal cracks have a mean width $\leq \frac{1}{4}$", or are sealed cracks of indeterminate width whose sealant material is in good condition.

Medium severity longitudinal cracks have a mean width $> \frac{1}{4}$" and $\leq \frac{3}{4}$".

High severity longitudinal cracks have a mean width $> \frac{3}{4}$".

## Transverse Crack Index

$\textbf{TC\_INDEX} = 100 - \{[20 * ((LOW / 15.1) + (MED / 7.5))] + [40 * (HI / 1.9)]\}$

Where:

The values LOW, MED and HI describe a count of the total number of transverse cracks of each severity level, where one transverse crack unit is equal to the WX measured lane width. These values are $\geq 0$.

LOW = (Total linear feet WX measured low severity transverse cracking) / (WX measured lane width)
MED = (Total linear feet WX measured medium severity transverse cracking) / (WX measured lane width)
HI = (Total linear feet WX measured high severity transverse cracking) / (WX measured lane width)

The denominators 15.1, 7.5, and 1.9 are the maximum allowable extents for the numerator value in the same units. For example, high severity transverse cracking with a total length that amounts to 1.9 times the WX measured lane width would alone fail that section of road for this index.

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

Severity Levels:

Low severity transverse cracks have a mean width $\leq$ ¼", or are sealed cracks of indeterminate width whose sealant material is in good condition.

Medium severity transverse cracks have a mean width $>$ ¼" and $\leq$ ¾".

High severity transverse cracks have a mean width $>$ ¾".

## Patching Index

$\textbf{PATCH\_INDEX} = 100 - 40 * (\%PATCHING / 80)$

Where:

The value %PATCHING describes the percent of the total WX measured area that is affected by patching. This value ranges from $\geq 0$ to $\leq 100$.

%PATCHING = (Total area WX measured patching) / (Section length * WX measured lane width)

The denominator 80 is the maximum allowable extent for the numerator value in the same units. Patching totaling 80% or more of the measured section area fails a section of road for this index.

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

There are no severity levels for patching.

## Rutting Index

$\textbf{RUT\_INDEX} = 100 - 40 * [(\%LOW / 160) + (\%MED / 80) + (\%HI / 40)]$

Where:

10 ARAN rut depth measurements are taken per full .02 section for each of 2 wheel paths (left and right), resulting in a total of 20 measurements taken for both wheel paths.  The values %LOW, %MED and %HI describe the number of ARAN rut depth measurements of both wheel paths in the section whose values are of each severity level, calculated as a percentage of the total number of ARAN rut depth measurements taken for a single wheel path in the section.  These values range from $\geq 0$ to $\leq 200$.

%LOW = (Total number of ARAN measured low severity ruts in section for both wheel paths) / (Total number of ARAN rut measurements in section for a single wheel path)
%MED = (Total number of ARAN measured medium severity ruts in section for both wheel paths) / (Total number of ARAN rut measurements in section for a single wheel path)
%HI = (Total number of ARAN measured high severity ruts in section for both wheel paths) / (Total number of ARAN rut measurements in section for a single wheel path)

The denominators 160, 80, and 40 are the maximum allowable extents for the numerator value in the same units.  For example, low severity ruts recorded in 16 of the 20 total readings (or 160% of a full wheel path's worth of readings) for a full .02 section would fail that section for this index.

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

Severity Levels:

Ruts with an ARAN measured depth < 0.20" are not included in the distress calculations.

Low severity ruts have an ARAN measured depth $\geq 0.20$" and $\leq 0.49$".

Medium severity ruts have an ARAN measured depth $\geq 0.50$" and $\leq 0.99$".

High severity ruts have an ARAN measured depth $\geq 1.00$".


## Roughness Condition Index

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

**Where:**

The value AVG IRI describes the average value of the Left IRI and Right IRI measurements for the section. This value can range from approximately 40 to over 1000.

AVG IRI = (ARAN measured Left IRI + ARAN measured Right IRI) / 2

There is no applicable threshold for failure for this index.


NOTE: Collection of roughness data is dependent on the data collection vehicle traveling at a minimum speed of 12 mph. In the event that a route cannot be safely traveled at this minimum speed, and results in no roughness data, the SCR only will be calculated.


## Surface Condition Rating Index

**SCR** = 100 - [(100 - AC_INDEX) + (100 - LC_INDEX) + (100 - TC_INDEX) + (100 - PATCH_INDEX) + (100 - RUT_INDEX)]

Where:

See above for determinations of AC_INDEX, LC_INDEX, TC_INDEX, PATCH_INDEX and RUT_INDEX.

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


## Pavement Condition Rating Index Asphaltic Concrete Pavement (AS)

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

Where:

See above for determinations of SCR and RCI.

The values 0.60 and 0.40 function as weights within the formula.

If SCR equals zero (which means that the road surface condition is very poor), then the formula simply reduces to: PCR = 0.40 * RCI.

If RCI equals zero (which means that this value was not available for some reason), then the formula becomes: PCR = SCR.

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


## Pavement Condition Rating Index Portland Cement Concrete Pavement (CO)

**Concrete PCR** = -0.0012(IRI^2)+0.0499(IRI)+99.542

Where:

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


## Parking Lot and Manually Rated Road Condition Rating

**Surface Condition Distresses- Chip Seal:**
Raveling – loss of surface rock chips revealing previous surface
Bleeding – asphalt or tar is bleeding through to the surface where surface looks slick with asphalt
Rutting
Potholes/Patching


**Ratings - Chip Seal:**
Excellent – None of the surface affected by the above (recently constructed)
Good – Less than 10% of surface affected by the above
Fair – Between 10% and 40% of surface affected by the above
Poor – More than 40% of surface affected by the above


**Surface Condition - Asphalt:**
Cracking of any type
Rutting
Potholes/Patching

**Ratings - Asphalt:**

Excellent – None of the surface affected by the above (recently constructed)
Good – Less than 10% of surface affected by the above
Fair – Between 10% and 40% of surface affected by the above
Poor – More than 40% of surface affected by the above

**<u>Index Values of Visual Ratings on Parking Lots and Manually Rated Roads</u>**

Under Construction 100

Excellent 97

Good 90

Fair 73

Poor 45

# APPENDIX C: GENERAL INFORMATION ON RIP SYSTEMS

## DMI (Distance Measuring Instrument)

The DMI (Distance Measuring Instrument) obtains road length measurements that are highly accurate (to 0.001 miles). The DMI is connected to the outside of the rear wheel on the driver's side, and is wired into the antilock braking system (ABS). The number of pulses recorded for each wheel rotation by the ABS is registered by the DMI, which transmits a measurement of distance traveled to the processing computers in the ARAN. The DMI distance measurements are the foundation to which all the other subsystems are tied.

## Digital Image Information

All images collected in Cycle 4 are digital images in .jpg format. These images provide adequate resolution for identifying sign and feature inventories and pavement evaluations. The images can be viewed with an interactive software program called VisiData. Each park will receive a copy of the VisiData program. Cycle 4 data, as well as Cycle 3 data, can be viewed using the Visi-Data software program. This program is a data presentation and analysis tool that can be accessed either at the individual park, park region or at NPS headquarters. The data is organized in a hierarchical manner and presented in tabular and graphical formats. The user is able to perform queries and drill down through the data to find the particular information they are looking for. Associated digital right-of-way images from either the LAN, USB port, individual DVD can be presented along with GPS locations.

## Right-of-way (ROW) Video

Three digital cameras are mounted above the vehicle's windshield that point directly forward and slightly to the left and right. These cameras each collect one image every 0.002 miles (10.56 feet) in the primary-direction lane, to give a panoramic field-of-view of about 160 degrees. (Forward-facing video from the center camera only is collected in the opposite-direction lane of travel.)

If data collection speed exceeds 35-40 mph, the network and storage computers may become overwhelmed and may begin to drop individual video frames. Occasional common video quality issues include sun glare and rapid changes between sunlight and shadow. The camera system is equipped with auto risers that sometimes cannot adjust quickly enough to collect optimal video images.

| FHWA ARAN CAMERA SPECIFICATIONS Forward-Facing Cameras (ROW) | |
|---|---|
| Focal length | 10 mm |
| Chip size | 8.71mm X 6.90mm |
| Naming convention of each image | chainage.jpg |
| Image resolution | 1300 X 1030 |
| Image pixel size | depends on distance |
| Relative position of the GPS unit to each camera | 2.104 meters from front-center rutbar to camera |
| *The ARAN has a lever arm setting which tells the POS system where the center of the rutbar is with respect to the GPS antennas.* | |

## Pavement Video

Pavement video images are collected by the data collection vehicle to use in later analysis to determine extents and severities of different types of pavement distress. The pavement in the primary-direction road lane is filmed continuously by two analog cameras attached to booms extended from the rear of the ARAN on the left and right sides. Strobe lights fire synchronously with the opening of the camera shutters to eliminate shadows and motion blur. The images from the two cameras overlap, and are stitched together in real time to create a continuous strip image of the pavement in the primary direction lane. This strip has a maximum width of 3.0 meters (actual width depends on pavement camera calibration) and is sectioned for ease of file management every 0.010 miles (52.8 feet).

The cameras both have a resolution of 640 x 480, making the threshold of visible pavement cracks about 3 mm. Because the cameras are triggered by time and not distance traveled, this subsystem requires a minimum operating speed of 6 mph, otherwise images are taken on top of one another and result in checkered or black pavement video.

| FHWA ARAN CAMERA SPECIFICATIONS | |
|---|---|
| **Pavement Cameras** | |
| Image Pixel size | 3.135 mm /side |
| Image Resolution | 640 X 480 |
| Area that images cover | 1.5 m X 1.2 m |
| Full color or grayscale | grayscale |
| Vehicle speed limitations | 80km/h |
| Aperture setting | Auto-iris |
| Exposure setting | 1/50000 |

## FHWA ARAN GPS & Inertial System

GPS is collected by a NovAtel MiLLenium, 12 channel, dual frequency L1/L2, DGPS ready receiver with a MiLLennium 502 GPS antenna. An OmniStar 3000 LR provides real-time differential correction. An Applanix POS/LV is the inertial system that fills in when GPS is unavailable. The antenna is mounted in the center of the roof, slightly toward the rear of the vehicle, but a lever arm is applied to place the operational location of GPS recording at the center of the rutbar on the front bumper of the vehicle. Expected accuracy under ideal conditions is sub meter.

## GPS Collected on Manually Rated Routes

Parking areas and roads that are not fully drivable with the ARAN data collection vehicle are collected manually by field technicians. GPS is collected for these routes using GPS field data collection utilizes Trimble ProXRS or ProXH Receivers matched with Trimble TSC1 or Ranger handheld Data Loggers, connected to Trimble Hurricane Antennas giving sub meter accuracy in ideal conditions. This collection equipment has varied as technology has improved over the years of RIP data collection. Some GPS files collected as early as 1998 have been verified for accuracy and perpetuated through the current cycle of data collection.

## GPS SHAPEFILES

| Type of Route and Collection | Shape | Filename |
|---|---|---|
| Roads driven by ARAN | Line | park_road_04.dbf/.shp/.shx |
| Parking Areas | Polygon | park_pkg_04.dbf/.shp/.shx |
| Roads Manually Rated as Lines (not in every park) | Line | park_mrl_04.dbf/.shp/.shx |
| Roads Manually Rated as Polygons (not in every park) | Polygon | park_mrp_04.dbf/.shp/.shx |

• Datum for all GPS shapefiles is LL_WGS84_DD (Latitude Longitude _World Geodetic Survey 1984_Decimal Degrees)
• In filename, "park" is NPS four-letter alphabetic code.
• The source for route data required for data processing and report production is the PARK_RouteInfo.mdb.

## Condition Photos Taken of Manually Rated Roads

One or more digital photos are taken by Canon Power Shot G2 4.0 Mega Pixel digital camera for each manually rated route in a National Park.  They are stored in .jpg format named with the four-letter NPS park alphabetic code, route number, and the photo number assigned by the camera. For example, YOSE_0900_4434.jpg is the filename of the photo named 4434 by the camera that was taken of Yosemite National Park route 0900.

## Scenic Photos

Scenic photos are taken by Canon Power Shot G2 4.0 Mega Pixel digital camera throughout each park and are named with the four-letter NPS park alphabetic code and the count of the photo taken in that park. For example, GRCA003.jpg is the filename of the third scenic photo taken in Grand Canyon National Park. The number of scenic photos provided will vary between parks.

# APPENDIX D: METADATA

## FHWA – NPS Road Inventory Program Cycle 4 Metadata

The purpose of these sheets is to provide users of the Road Inventory Program's data with data accuracies and tolerances to help users define ways in which the RIP data can and cannot be used. For further information on specifics of data collection equipment, data collection procedures, equipment calibrations, or quality control/quality assurance procedures, please contact Jim Kennedy, Project Manager, Data Quality Assurance, at 720-963-3560 or jim.kennedy@fhwa.dot.gov.

All Road Inventory Program data undergoes quality control and quality assurance testing. This document represents the known data accuracies and tolerances for the data collection equipment, data collection procedures, and data processing procedures currently in use. Many additional tests conducted on the park databases during the quality assurance phase to ensure data integrity are not listed as a part of this document. Before it is delivered, a park database undergoes a large set of table design consistency, field data format consistency, data completeness, uniqueness of key fields, data reasonableness, acceptable data range, within-field data consistency, between-field data consistency, and between-table data consistency tests. Additional data sampling checks are conducted to ensure proper data upload from raw files into the park database and to quality check the pavement crack analysis. Further information is detailed in the FHWA – NPS RIP Quality Assurance Manual, available upon request.

This description of metadata includes only the known accuracies with which a data field matches its expected value. The tables that follow this page show each database field's:

- Field – field name
- Format – data type and number of characters of field
- Expected Value – meaning of value assigned to field
- Source – when in process field value obtained
- Validation – how field value obtained
- Expected Accuracy – accuracy with which contents of field match Expected Value

Verifying and continually improving the accuracy of Road Inventory Program data is an ongoing goal of the Federal Highway Administration and the National Park Service. Field testing and post-collection analysis of ARAN (Automatic Road ANalyzer) -collected data will continue in Cycle 4. Data quality is expected to improve as the FHWA – NPS Road Inventory Program continues to operate, due to the fact that future data collection cycles will consist in large part of data updates. Also, technological improvements are expected to render the data increasingly consistent with actual roadway conditions as data collection cycles progress.

## Specific Caveats

- MUTCD based on contents & colors of sign, not on size
- Database records that show a Portland Cement Concrete (CO) surface type sometimes include distress index values that seem to show a perfect roadway. Condition assessments on concrete pavements are not conducted for Alligator Cracking, Transverse or Longitudinal Cracking, Patching, or Rutting. Perfect values for concrete road sections for these indexes are default values and do not represent a condition assessment of the concrete surfaces.
- On the USB drive, in the Database folder, parks are provided with intersection lists and exceptions lists. These documents should be treated as raw files and are not accurate. Refer to the final database for accurately post-processed intersection data.
- Most roadway data is collected in the primary direction lane of a roadway. To save data storage space and to reduce data analysis efforts, the assumption was made that the paved surface condition of a route's primary lane adequately represents the surface condition of the full roadway. Therefore, in the database, opposite-direction records in the PMS_Tenth table do not include assessed values for roadway surface distresses. Values such as 0, N/A, -1, or a repeat of the primary-direction assessed value indicate that no assessment was performed. The PMS_20 and PMS_Mile tables simply exclude all opposite routes.

- Roadway Data is collected in intervals of 0.010 miles (52.8feet) constituting a "station".
- Most roadway features are collected relative to the primary direction lane of a roadway, using the primary-direction video and mileage. Signs and Mile Markers are the only features collected using the opposite-direction video with mileage location referenced to the primary direction lane of the roadway.
- Route_GPS table contains GPS positional information collected by the ARAN and post processed with Applanix POSPac Land 5.0 post-processing software. No manual adjustments have occurred on this table.
- Modifications to the Park_ROAD_04.dbf/.shp/.shx files may have been necessary for report esthetics.
- Modifications to the Park_PKG_04. dbf/.shp/.shx files may have been necessary for report esthetics.
- Cycle 4 utilizes the Microsoft Office 2003 suite of products and Crystal Reports XI for document and data file generation and reporting.
- All PDF files are in Adobe Acrobat 7.0 Professional format.
- All ArcGIS files are created using ESRI Version 9.x software.
- Thumbnail images are created at 1/10 original image size for Right-of-Way and Pavement Images.
- FHWA is investigating the rutting methodology and calculated values it currently reports. Equipment limitations and analysis methods may be over reporting, low severity rutting.

## Key to Notes in Tables

(1): Note that only one value fits in field, so even if this value varies throughout the route, only predominant value is recorded here.

(2): Shoulder width is measured at route start and every half-mile along the route in the primary direction. Width is the entire width of the drivable shoulder, regardless of the presence or absence of pavement, from the fog line to the shoulder hinge point, or if no fog line exists, from the edge of pavement to the hinge point. Identification of shoulder hinge point can be problematic using video analysis. Some paved ditches may be mistakenly recorded as shoulders where the shoulder hinge point and change in slope are not easily distinguished from the video.

(3): Mileage is measured by the ARAN (Automatic Road ANalyzer) data collection vehicle out to the 0.001 decimal place. The DMI (distance measuring instrument) is very accurate, with extremely slight variations in measurement due to air temperature, tire inflation, curves, hills, and equipment calibration.

(4): Features are measured differently depending on whether they are visible in the forward-facing video of the roadway, but every feature milepost measurement depends on the baseline measurement of the data collection vehicle's mileage. The ARAN (Automatic Road ANalyzer) data collection vehicle's mileage is measured by the DMI (distance measuring instrument) out to the 0.001 decimal place. The DMI is very accurate, with extremely slight variations in measurement due to air temperature, tire inflation, curves, hills, and equipment calibration. If a feature will not be visible in the forward-facing video, its milepost is determined by the data collectors' key press tagging the milepost when the ARAN passes the feature. Key presses are entered into the ARAN software when the vehicle travels typically between 15 and 45 miles/hour, so a delay of a single second as the vehicle passes a feature would result in an inaccuracy of 0.004 miles (22 feet) to 0.012 miles (66 feet). If a feature is visible in the video, its milepost is determined during post-processing using a video measurement software called Surveyor.

(5): Condition assessments on concrete (PCC) pavements are not conducted for Alligator Cracking, Transverse or Longitudinal Cracking, Patching, or Rutting. Perfect values for concrete road sections for these indexes are default values and do not represent a condition assessment of the concrete surfaces.

(6): Roadway cracking presence, type, severity, and extent are determined by filming the roadway in the primary lane continuously with two overlapping analog cameras of 640 x 480 resolutions. The images from both cameras are stitched together in real time to create a continuous strip image of the roadway pavement in the primary lane. Cracks 3 mm or greater in width are visible in this video. A semi-automatic process running the WiseCrax software with additional input by human operators provides the cracking quantities recorded in these database fields. Quality checks have determined that a consistent 80% or better of the visible cracks are recorded.

## Access Database Metadata

**MASTER Table Metadata**:

| | FIELD | FORMAT | EXPECTED VALUE | SOURCE | VALIDATION | EXPECTED ACCURACY |
|---|---|---|---|---|---|---|
| 1 | RIP_CYCLE | XX | 4, for data collection cycle 4 | Route ID Meeting | FHWA Determination | 100% Referenced to other tables |
| 2 | STATE | XX | State where route is located | Route ID Meeting | Park Input / FHWA Determination | 100%, Referenced to other tables (1) |
| 3 | PARK_ALPHA | XXXX | Park alpha code | Route ID Meeting | NPS References | 100%, Referenced to other tables |
| 4 | PARK_NO | XXXX | Park numeric code | Route ID Meeting | NPS References | 100%, Referenced to other tables |
| 5 | RTE_NO | 9999XXX | Route number | Route ID Meeting | Park Input / FHWA Classification | 100%, Referenced to other tables |
| 6 | RTE_NAME | (Text) | Route name | Route ID Meeting | Park Input | 100%, Referenced to other tables. 100 characters fit in field |
| 7 | FUNCT_CLASS | X | Route functional classification | Route ID Meeting | Park Input / FHWA Classification | 100%, Referenced to other tables |
| 8 | DIRECTION | XXX | Survey lane: PRI (primary) or OPP (opposite) | Route ID Meeting | Park Input / FHWA Determination | 100%, |
| 9 | BEG_MP_EST | 999.999 (miles) | Estimated starting MP | Route ID Meeting | Park Input / FHWA Determination | Estimated before data collected |
| 10 | END_MP_EST | 999.999 (miles) | Estimated ending MP | Route ID Meeting | Park Input / FHWA Determination | Estimated before data collected |
| 11 | RTE_LENGTH | 999.999 (miles) | Collected route length | ARAN Data Collection | Automatic Output | 100% |
| 12 | FROM_DESC | (Text) | Beginning terminus of route | Route ID Meeting | Park Input / FHWA Determination | 100% Referenced to other tables |
| 13 | TO_DESC | (Text) | Ending terminus of route | Route ID Meeting | Park Input / FHWA Determination | 100% Referenced to other tables |
| 14 | NO_LANES | X | Number of lanes in route | ARAN Data Collection | Survey Crew Input | Untested. (1) |
| 15 | SURF_TYPE | XX | Surface type of route | ARAN Data Collection | Survey Crew Input | 100%, Referenced to other tables (1) |
| 16 | COMP_DIR | XX | Compass direction of route's primary lane (nearest cardinal direction) | Route ID Meeting | Park Input / FHWA Determination | Untested |
| 17 | COMMENTS | (Text) | Special information, if any | Contractor Post-processing | Contractor Input | Untested |
| 18 | FILENAME | (Text) | Filename of raw data files | ARAN Data Collection | Automatic Output | 100% |
| 19 | SECTION | (Text) | Route section ID | Route ID Meeting/ARAN Data Collection | Survey Crew Input/Automatic Output | 100% |

| 20 | FKEY | 9999999 | Unique record ID | Contractor Post-processing | Database Processing | 100% |
| 21 | DATE | MM/DD/YY | Data collection date | ARAN Data Collection | Automatic Output | 100% |
| 22 | BEG_MP | 999.999 (miles) | Beginning MP collected | ARAN Data Collection | Automatic Output | 100% (3) |
| 23 | END_MP | 999.999 (miles) | Ending MP collected | ARAN Data Collection | Automatic Output | 100% (3) |

**PMS_FEATURE Table Metadata**:

| | FIELD | FORMAT | EXPECTED VALUE | SOURCE | VALIDATION | EXPECTED ACCURACY |
|---|---|---|---|---|---|---|
| 1 | RIP_CYCLE | XX | 4, for data collection cycle 4 | Route ID Meeting | FHWA Determination | 100% Referenced to other tables |
| 2 | STATE | XX | State where route is located | Route ID Meeting | Park Input / FHWA Determination | Untested (1) |
| 3 | PARK_ALPHA | XXXX | Park alpha code | Route ID Meeting | NPS References | 100% Referenced to other tables |
| 4 | PARK_NO | XXXX | Park numeric code | Route ID Meeting | NPS References | 100% Referenced to other tables |
| 5 | RTE_NO | 9999XXX | Route number | Route ID Meeting | Park Input / FHWA Classification | 100% Referenced to other tables |
| 6 | FMSS_EQUIP | XXXXXXX | Facility Management Software System Equipment number | NPS FMSS application | NPS References | Untested |
| 7 | FUNCT_CLASS | X | Route functional class | Route ID Meeting | Park Input / FHWA Classification | 100% Referenced to other tables |
| 8 | DIRECTION | XXX | Survey lane: PRI (primary) or OPP (opposite) | Route ID Meeting | Park Input / FHWA Determination | 100% |
| 9 | MP | 999.999 (miles) | Feature location along route | ARAN Data Collection/Contractor Post-processing | Video Analysis | <=0.001 mile |
| 10 | BEG_MP | 999.999 (miles) | Feature Beginning location along route | Contractor Post-processing | Video Analysis | <=0.001 mile |
| 11 | END_MP | 999.999 (miles) | Feature Ending location along route | Contractor Post-processing | Video Analysis | <=0.001 mile |
| 12 | FEATURE_LENGTH | 999.99 (Feet) | Linear Feature Length | Contractor Post-processing | Database Processing | 100% |
| 13 | EVENT | XXXX | Event category of feature | Contractor Post-processing | Video Analysis | Untested |
| 14 | EVENT_CODE | XXXX | Event sub-category of feature | Contractor Post-processing | Video Analysis | Untested |
| 15 | FEATURE_TYPE | (Text) | Feature designation: LINEAR or POINT | Contractor Post-processing | Video Analysis | Untested |
| 16 | EVENT_DESC | (Text) | Description of feature/contents of sign | Contractor Post-processing | Video Analysis | Untested |
| 17 | MUTCD | (Text) | MUTCD Code of Sign | Contractor Post-processing | Database Processing | 95% |
| 18 | CONDITION | "N/A" | Sign condition. N/A. Not to be populated | Contractor Post-processing | Video Analysis | Values inaccurate, defaulted to "N/A" |
| 19 | COMMENT | (Text) | Sign label, intersecting route, etc. | Contractor Post-processing | Database Processing | Untested |
| 20 | OFFSET | "N/A" | Offset from Road Edge. N/A. Not to be populated | Contractor Post-processing | Database Processing | Values inaccurate, defaulted to "N/A" |

| | FIELD | FORMAT | EXPECTED VALUE | SOURCE | VALIDATION | EXPECTED ACCURACY |
|---|---|---|---|---|---|---|
| 21 | SIDE | (Text) | Side of route relative to lane driven | Contractor Post-processing | Video Analysis | 95% |
| 22 | STR_NUMBER | (Text) | FHWA bridge structure number | FHWA Post-processing | Database Processing | Untested |
| 23 | BARR_MAT | (Text) | Barrier Material Type | Contractor Post-processing | Video Analysis | Untested |
| 24 | BARR_TYPE | (Text) | Barrier Type | Contractor Post-processing | Video Analysis | Untested |
| 25 | BARR_POST_MAT | (Text) | Barrier Post Materials | Contractor Post-processing | Video Analysis | Untested |
| 26 | BARR_BEG_TERM | (Text) | Barrier Approach Treatment | Contractor Post-processing | Video Analysis | Untested |
| 27 | BARR_END_TERM | (Text) | Barrier End Treatment | Contractor Post-processing | Video Analysis | Untested |
| 28 | CURB_MAT | (Text) | Curb Material Type | Contractor Post-processing | Video Analysis | Untested |
| 29 | PAVED_DITCH_MAT | (Text) | Paved Ditch Material Type | Contractor Post-processing | Video Analysis | Untested (2) |
| 30 | GATE_MAT | (Text) | Gate Material Type | Contractor Post-processing | Video Analysis | Untested |
| 31 | GATE_STYLE | (Text) | Gate Style | Contractor Post-processing | Video Analysis | Untested |
| 32 | BEG_GPS_LAT | 999.999999 | GPS Latitude Co-ordinate (decimal degrees) | Contractor Post-processing | Video Analysis | <= 3.00 feet |
| 33 | BEG_GPS_LON | -999.999999 | GPS Longitude Co-ordinate (-decimal degrees) | Contractor Post-processing | Video Analysis | <= 3.00 feet |
| 34 | BEG_GPS_ELEV | 99999.9 | GPS Elevation Feet | Contractor Post-processing | Video Analysis | Untested |
| 35 | BEG_GPS_MODE | (Text) | GPS Satellite Mode | Contractor Post-processing | Video Analysis | Untested |
| 36 | END_GPS_LAT | 999.999999 | GPS Latitude Co-ordinate (decimal degrees) | Contractor Post-processing | Video Analysis | <= 3.00 feet |
| 37 | END_GPS_LON | -999.999999 | GPS Longitude Co-ordinate (-decimal degrees) | Contractor Post-processing | Video Analysis | <= 3.00 feet |
| 38 | END_GPS_ELEV | 99999.9 | GPS Elevation Feet | Contractor Post-processing | Video Analysis | Untested |
| 39 | END_GPS_MODE | (Text) | GPS Satellite Mode | Contractor Post-processing | Video Analysis | Untested |
| 40 | DATUM | (Text) | LL_WGS84_DD | Contractor Post-processing | Database Processing | 100% |
| 41 | VIDEO | *<Park>*C04VID*<#>* | Removable USB video hard drive number | Contractor Post-processing | Database Processing | Untested |
| 42 | IMAGE | (Text) | Filename of .jpg image showing feature | Contractor Post-processing | Automatic Output | Untested |
| 43 | DATE | MM/DD/YY | Data collection date | ARAN Data Collection | Automatic Output | 100% |
| 44 | FILENAME | (Text) | Filename of raw data files | ARAN Data Collection | Automatic Output | 100% |
| 45 | SECTION | (Text) | Route section ID | Route ID Meeting/ARAN Data Collection | Survey Crew Input/Automatic Output | 100% |
| 46 | FKEY | (Numeric) | Unique record ID | Contractor Post-processing | Database Processing | 100% |
| 47 | VISI_FROM | 999999 (millimiles) | Raw MP of first video frame showing feature | Contractor Post-processing | Database Processing | Untested |
| 48 | VISI_TO | 999999 (millimiles) | Raw MP of last video frame showing feature | Contractor Post-processing | Database Processing | Untested |

| | FIELD | FORMAT | EXPECTED VALUE | SOURCE | VALIDATION | EXPECTED ACCURACY |
|---|---|---|---|---|---|---|
| 49 | IDKEY | (Text) | Unique record ID used by VisiData | Contractor Post-processing | Database Processing | Untested |
| 50 | MP_REF | (Text) | Range of mileage to play in VisiData | Contractor Post-processing | Database Processing | Untested |

| List of Roadway Features | | | | | | |
|---|---|---|---|---|---|---|
| # | EVENT | EVENT_CODE | FEATURE_TYPE | EVENT_DESC | STRUCTURE # | COLLECTED BY |
| | | | | | | |
| 1 | BRIDGE | BRDG | LINEAR | BRIDGE | ALWAYS | ARAN |
| 2 | CATTLE GUARD | CGD | POINT | CATTLE GUARD | - | VIDEO RATING |
| 3 | CONSTRUCTION | CNST | LINEAR | CONSTRUCTION WORK ZONE | - | ARAN |
| 4 | CULVERT | CUL | POINT | CULVERT | SOMETIMES | ARAN |
| 5 | CURB | CRBL | LINEAR | CURB ON LEFT | - | VIDEO RATING |
| | "" | CRBR | LINEAR | CURB ON RIGHT | - | VIDEO RATING |
| 6 | CURB-AND-GUTTER | CAGL | LINEAR | CURB-AND-GUTTER ON LEFT | - | VIDEO RATING |
| | "" | CAGR | LINEAR | CURB-AND-GUTTER ON RIGHT | - | VIDEO RATING |
| 7 | DROP INLET | DINL | POINT | DROP INLET ON LEFT | - | ARAN |
| | "" | DINR | POINT | DROP INLET ON RIGHT | - | ARAN |
| 8 | GATE | GATE | POINT | GATE | - | VIDEO RATING |
| 9 | FIRE HYDRANT | FHDL | POINT | FIRE HYDRANT ON LEFT | - | VIDEO RATING |
| | "" | FHDR | POINT | FIRE HYDRANT ON RIGHT | - | VIDEO RATING |
| 10 | GUARD/GUIDE WALL | GGWL | LINEAR | GUARD/GUIDE WALL ON LEFT | - | VIDEO RATING |
| | "" | GGWR | LINEAR | GUARD/GUIDE WALL ON RIGHT | - | VIDEO RATING |
| 11 | GUARD/GUIDE RAIL | GGRL | LINEAR | GUARD/GUIDE RAIL ON LEFT | - | VIDEO RATING |
| | "" | GGRR | LINEAR | GUARD/GUIDE RAIL ON RIGHT | - | VIDEO RATING |
| 12 | INTERSECTION | INTL | POINT | INTERSECTION ON LEFT | - | ARAN |
| | "" | INTR | POINT | INTERSECTION ON RIGHT | - | ARAN |
| | "" | INTN | POINT | INTERSECTION SIDE N/A | - | ARAN |

| | | | | | |
|---|---|---|---|---|---|
| 13 | LANE DEVIATION | LADV | LINEAR | LANE DEVIATION | - | ARAN |
| 14 | LOW WATER CROSSING | LWCR | LINEAR | LOW WATER CROSSING | SOMETIMES | VIDEO RATING |
| 15 | MILE MARKER | MML | POINT | MILE MARKER ON LEFT | - | VIDEO RATING |
| | "" | MMR | POINT | MILE MARKER ON RIGHT | - | VIDEO RATING |
| 16 | OVERPASS | OPV | POINT | OVERPASS VEHICULAR | SOMETIMES | ARAN |
| | "" | OPP | POINT | OVERPASS PEDESTRIAN | SOMETIMES | ARAN |
| | "" | OPRX | POINT | OVERPASS RAILROAD CROSSING | SOMETIMES | ARAN |
| 17 | PARK BOUNDARY | PRK | POINT | PARK BOUNDARY | - | ARAN |
| 18 | PAVED DITCH | PVDL | LINEAR | PAVED DITCH ON LEFT | - | VIDEO RATING |
| | "" | PVDR | LINEAR | PAVED DITCH ON RIGHT | - | VIDEO RATING |
| 19 | PULLOUT | PLOL | LINEAR | PULLOUT ON LEFT | - | VIDEO RATING |
| | "" | PLOR | LINEAR | PULLOUT ON RIGHT | - | VIDEO RATING |
| 20 | RAILROAD CROSSING | RRX | POINT | RAILROAD CROSSING | - | VIDEO RATING |
| 21 | RETAINING WALL | RTWL | LINEAR | RETAINING WALL ON LEFT | - | VIDEO RATING |
| | "" | RTWR | LINEAR | RETAINING WALL ON RIGHT | - | VIDEO RATING |
| 22 | ROUTE BEGIN | RBEG | POINT | ROUTE BEGIN | - | ARAN |
| 23 | ROUTE END | REND | POINT | ROUTE END | - | ARAN |
| 24 | SIGN | REGU, WARN, GUID, UNKN | POINT | DOCUMENT CONTENTS OF SIGN. (WHAT THE SIGN SAYS) FOR GRAPHICS ONLY SIGNS POPULATED WITH ("GRAPHIC SIGN, NO TEXT") FOR UNREADABLE TEXT POPULATED WITH ("UNABLE TO READ FROM VIDEO") | - | VIDEO RATING |
| 25 | STATE BOUNDARY | STB | POINT | STATE BOUNDARY | - | ARAN |
| 26 | TRAFFIC LIGHT | TRF | POINT | TRAFFIC LIGHT | - | VIDEO RATING |
| 27 | TUNNEL | TUN | LINEAR | TUNNEL | ALWAYS | ARAN |

**PMS_20, PMS_MILE, & PMS_TENTH Tables Metadata**:

| | FIELD | FORMAT | EXPECTED VALUE | SOURCE | VALIDATION | EXPECTED ACCURACY |
|---|---|---|---|---|---|---|
| 1 | RIP_CYCLE | XX | 4, for RIP data collection Cycle 4 | Route ID Meeting | FHWA Determination | 100% Referenced to other tables |
| 2 | STATE | XX | State where route is located | Route ID Meeting | Park Input/FHWA Determination | Untested. (1) |
| 3 | PARK_ALPHA | XXXX | Park alpha code | Route ID Meeting | NPS References | 100% Referenced to other tables |
| 4 | PARK_NO | XXXX | Park numeric code | Route ID Meeting | NPS References | 100% Referenced to other tables |
| 5 | RTE_NO | 9999XXX | Route number | Route ID Meeting | Park Input/FHWA Classification | 100% Referenced to other tables |
| 6 | FUNCT_CLASS | X | Route functional class | Route ID Meeting | Park Input/FHWA Classification | 100% Referenced to other tables |
| 7 | DIRECTION | XXX | Survey lane: PRI (primary) or OPP (opposite) | Route ID Meeting | Park Input/FHWA Determination | 100% |
| 8 | BEG_MP | 999.999 (miles) | MP at start of road interval described by database record | Contractor Post-processing | Database Processing | 100% (3) |
| 9 | END_MP | 999.999 (miles) | MP at end of road interval described by database record | Contractor Post-processing | Database Processing | 100% (3) |
| 10 | INT_LENGTH | 999.9 (ft) | Length of road interval as aggregated for data table | Contractor Post-processing | Database Processing | 100% |
| 11 | RTE_LENGTH | 999.999 (miles) | Collected route length | ARAN Data Collection | Automatic Output | 100% (3) |
| 12 | NO_LANES | 99 | Number of lanes in route | ARAN Data Collection | Survey Crew Input | Untested. (1) |
| 13 | LANE_NO | 99 | Data collection lane | Contractor Post-processing | Database Processing | Untested |
| 14 | D_LANE_WIDTH | 99.999 (ft) | WiseCrax (crack detection software) analysis width | Contractor Post-processing | Automatic Output | Untested |
| 15 | LANE_WIDTH | 99.9 (ft) | Width of lane | Contractor Post-processing | Video Analysis | 95%, <=1.0 foot |
| 16 | PAVE_WIDTH | 99.9 (ft) | Full pavement width | Contractor Post-processing | Video Analysis | 95%, <=1.0 foot |
| 17 | SHLD_WIDTH_L | 99.9 (ft) | Left shoulder width | Contractor Post-processing | Video Analysis | 95%, <=1.0 foot (2) |
| 18 | SHLD_WIDTH_R | 99.9 (ft) | Right shoulder width | Contractor Post-processing | Video Analysis | 95%, <=1.0 foot (2) |
| 19 | SHLD_COND_L | N/A | N/A. Intended to be Left shoulder condition | ARAN Data Collection | Survey Crew Input | Values inaccurate, defaulted to "N/A" |
| 20 | SHLD_COND_R | N/A | N/A. Intended to be Right shoulder condition | ARAN Data Collection | Survey Crew Input | Values inaccurate, defaulted to "N/A" |
| 21 | DRAIN_COND_L | N/A | N/A. Intended to be Left drainage condition | ARAN Data Collection | Survey Crew Input | Values inaccurate, defaulted to "N/A" |
| 22 | DRAIN_COND_R | N/A | N/A. Intended to be Right drainage condition | ARAN Data Collection | Survey Crew Input | Values inaccurate, defaulted to "N/A" |

| | FIELD | FORMAT | EXPECTED VALUE | SOURCE | VALIDATION | EXPECTED ACCURACY |
|---|---|---|---|---|---|---|
| 23 | SURF_TYPE | XX | Surface type of route | ARAN Data Collection | Survey Crew Input | Untested. (1) |
| 24 | PCR | 999 | Pavement Condition Rating | Contractor Post-processing | Database Processing | 100% for calculation (6) |
| 25 | RCI | 999 | Roughness Condition Index; -1 if invalid IRI | Contractor Post-processing | Database Processing | 100% for calculation |
| 26 | SCR | 999 | Surface Condition Rating | Contractor Post-processing | Database Processing | 100% for calculation (5) (6) |
| 27 | IRI_AVG | 999.9 (inches/mile) | Average IRI | Contractor Post-processing | Database Processing | Untested |
| 28 | IRI_SD | 999.9 (inches/mile) | IRI standard deviation | Contractor Post-processing | Database Processing | Untested |
| 29 | IRI_L | 999.9 (inches/mile) | Left wheel path IRI | ARAN Data Collection | Automatic Output | Untested |
| 30 | IRI_R | 999.9 (inches/mile) | Right wheel path IRI | ARAN Data Collection | Automatic Output | Untested |
| 31 | IRI_FLAG | 0 or -1 | -1 if invalid IRI data | Contractor Post-processing | Database Processing | Untested |
| 32 | RUT_INDEX | 999 | Rut index | Contractor Post-processing | Database Processing | 100% for calculation (5) |
| 33 | RUT_AVG | 99.99 (inches) | Average rut depth of both wheelpaths | Contractor Post-processing | Database Processing | Untested (5) |
| 34 | RUT_MAX | 99.99 (inches) | Maximum rut depth of both wheelpaths | Contractor Post-processing | Database Processing | Untested (5) |
| 35 | RUT_SD | 9.9 | Rut depth standard deviation | Contractor Post-processing | Database Processing | Untested (5) |
| 36 | RUT_LOW | 999 (%) | Percent of low severity ruts (on a 0-200% scale) in both wheelpaths | Contractor Post-processing | Database Processing | Untested (5) |
| 37 | RUT_MED | 999 (%) | Percent of medium severity ruts (on a 0-200% scale) in both wheelpaths | Contractor Post-processing | Database Processing | Untested (5) |
| 38 | RUT_HI | 999 (%) | Percent of high severity ruts (on a 0-200% scale) in both wheelpaths | Contractor Post-processing | Database Processing | Untested (5) |
| 39 | XFALL | 999.9 (% slope) | Cross fall at start of road interval | ARAN Data Collection | Automatic Output | Untested |
| 40 | GRADE | 999.9 (% slope) | Grade at start of road interval | ARAN Data Collection | Automatic Output | Untested |
| 41 | AC_INDEX | 999 | Alligator cracking index | Contractor Post-processing | Database Processing | 100% for calculation (5) (6) |
| 42 | AC_LOW | 999.9999 (%) | Percent of WiseCrax measured lane area with low-severity alligator cracking | Contractor Post-processing | Pavement Video Analysis | As a Computed 95% Confidence Level (5) (6) |
| 43 | AC_MED | 999.9999 (%) | Percent of WiseCrax measured lane area with medium-severity alligator cracking | Contractor Post-processing | Pavement Video Analysis | As a Computed 95% Confidence Level (5) (6) |
| 44 | AC_HI | 999.9999 (%) | Percent of WiseCrax measured lane area with high-severity alligator | Contractor Post-processing | Pavement Video Analysis | As a Computed 95% Confidence Level (5) (6) |

| | FIELD | FORMAT | EXPECTED VALUE | SOURCE | VALIDATION | EXPECTED ACCURACY |
|---|---|---|---|---|---|---|
| | | | cracking | | | |
| 45 | LC_INDEX | 999 | Longitudinal cracking index | Contractor Post-processing | Database Processing | 100% for calculation (5) (6) |
| 46 | LC_LOW | 999.99 (%) | Low-severity longitudinal cracking in lane as a percentage of road interval length | Contractor Post-processing | Pavement Video Analysis | As a Computed 95% Confidence Level (5) (6) |
| 47 | LC_MED | 999.99 (%) | Medium-severity longitudinal cracking in lane as a percentage of road interval length | Contractor Post-processing | Pavement Video Analysis | As a Computed 95% Confidence Level (5) (6) |
| 48 | LC_HI | 999.99 (%) | High-severity longitudinal cracking in lane as a percentage of road interval length | Contractor Post-processing | Pavement Video Analysis | As a Computed 95% Confidence Level (5) (6) |
| 49 | TC_INDEX | 999 | Transverse cracking index | Contractor Post-processing | Database Processing | 100% for calculation (5) (6) |
| 50 | TC_LOW | 999.99 (cracks) | Count of low-severity transverse cracks, where one crack unit equals the WiseCrax measured lane width | Contractor Post-processing | Pavement Video Analysis | As a Computed 95% Confidence Level (5) (6) |
| 51 | TC_MED | 999.99 (cracks) | Count of medium-severity transverse cracks, where one crack unit equals the WiseCrax measured lane width | Contractor Post-processing | Pavement Video Analysis | As a Computed 95% Confidence Level (5) (6) |
| 52 | TC_HI | 999.99 (cracks) | Count of high-severity transverse cracks, where one crack unit equals the WiseCrax measured lane width | Contractor Post-processing | Pavement Video Analysis | As a Computed 95% Confidence Level (5) (6) |
| 53 | PATCH_INDEX | 999 | Patching index | Contractor Post-processing | Database Processing | 100% for calculation (5) (6) |
| 54 | PATCHING | 999.9999 (%) | Percent of WiseCrax measured lane area affected by patching | Contractor Post-processing | Pavement Video Analysis | As a Computed 95% Confidence Level (5) (6) |
| 55 | GPS_LAT | 999.999999 | Latitude coordinate | ARAN Data Collection | Automatic Output | <= 3.00 feet |
| 56 | GPS_LON | -999.999999 | Longitude coordinate | ARAN Data Collection | Automatic Output | <= 3.00 feet |
| 57 | GPS_ELEV | 99999.9 | Elevation | ARAN Data Collection | Automatic Output | Untested |
| 58 | GPS_MODE | XXX | GPS Satellite Mode during collection | ARAN Data Collection | Automatic Output | Untested |
| 59 | DATUM | (Text) | LL_WGS84_DD | ARAN Data Collection | Database Processing | 100% |
| 60 | VIDEO | *<Park>*C04VID*<#>* | Removable USB video hard | Contractor Post-processing | Database Processing | Untested |

| | FIELD | FORMAT | EXPECTED VALUE | SOURCE | VALIDATION | EXPECTED ACCURACY |
|---|---|---|---|---|---|---|
| | | | drive number | | | |
| 61 | IMAGE | (Text) | Filename of .jpg image showing road interval | Contractor Post-processing | Automatic Output | Untested |
| 62 | SPEED | 999 (miles/hour) | Average ARAN speed during data collection | ARAN Data Collection | Automatic Output | Untested |
| 63 | BRIDGE_FLAG | 0 or 1 | Flag indicating presence of bridge in interval | ARAN Data Collection | Survey Crew Input | Untested |
| 64 | CONSTR_FLAG | 0 or 1 | Flag indicating construction in interval | ARAN Data Collection | Survey Crew Input | Untested |
| 65 | LANEDEV_FLAG | 0 or 1 | Flag indicating lane deviation in interval | ARAN Data Collection | Survey Crew Input | Untested |
| 66 | DATE | MM/DD/YY | Data collection date | ARAN Data Collection | Automatic Output | 100% |
| 67 | NODISTRESS | 0 OR 1 | Flag indicating absence of pavement distress | Contractor Post-processing | Database Processing | 100% |
| 68 | FILENAME | (Text) | Filename of raw data files | ARAN Data Collection | Automatic Output | 100% |
| 69 | SECTION | (Text) | Route section ID | Route ID Meeting/ARAN Data Collection | Survey Crew Input/Automatic Output | 100% |
| 70 | FKEY | (Numeric) | Unique record ID | Contractor Post-processing | Database Processing | 100% |
| 71 | CONTRACTOR1 | (Numeric) | Raw MP of first video frame in section | Contractor Post-processing | Database Processing | Untested |
| 72 | CONTRACTOR2 | (Numeric) | Raw MP of last video frame in section | Contractor Post-processing | Database Processing | Untested |
| 73 | CONTRACTOR3 | (Text) | Unique record ID used by VisiData | Contractor Post-processing | Database Processing | Untested |
| 74 | CONTRACTOR4 | (Text) | Range of mileage to play in VisiData | Contractor Post-processing | Database Processing | Untested |

**ROUTE_GPS table metadata:**

| | FIELD | FORMAT | EXPECTED VALUE | SOURCE | VALIDATION | EXPECTED ACCURACY |
|---|---|---|---|---|---|---|
| 1 | RIP_CYCLE | XX | 4, for RIP data collection Cycle 4 | Route ID Meeting | FHWA Determination | 100% referenced to other tables |
| 2 | STATE | XX | State where route is located | Route ID Meeting | Park Input/FHWA Determination | Untested |
| 3 | PARK_ALPHA | XXXX | Park alpha code | Route ID Meeting | NPS References | 100% Referenced to other tables |
| 4 | PARK_NO | XXXX | Park numeric code | Route ID Meeting | NPS References | 100% Referenced to other tables |
| 5 | RTE_NO | 9999XXX | Route number | Route ID Meeting | Park Input/FHWA Classification | 100% Referenced to other tables |
| 6 | FUNCT_CLASS | X | Route functional classification | Route ID Meeting | Park Input/FHWA Classification | 100% Referenced to other tables |
| 7 | RTE_NAME | (Text) | Route name | Route ID Meeting | Park Input | 100% Referenced to other tables . 100 characters fit in field |
| 8 | LANE_NUMBER | 99 | Data collection lane | Contractor Post-processing | Database Processing | Untested |
| 9 | DIRECTION | XXX | Survey lane: PRI (primary) or OPP (opposite) | Route ID Meeting | Park Input/FHWA Determination | Untested |
| 10 | MP | 999.999 | Mile Post (at 0.01 record) | ARAN Data Collection, Contractor Post-processing | Survey Crew Input/GPS Processing | Untested (3) |
| 11 | GPS_LAT | 999.999999 | GPS Latitude Co-ordinate (decimal degrees) | ARAN Data Collection, Contractor Post-processing | Automatic Output | <= 3.00 feet |
| 12 | GPS_LON | -999.999999 | GPS Longitude Co-ordinate (-decimal degrees) | ARAN Data Collection, Contractor Post-processing | Automatic Output | <= 3.00 feet |
| 13 | GPS_ELEV | 99999.9 | Elevation | ARAN Data Collection, Contractor Post-processing | Automatic Output | Untested |
| 14 | GPS_MODE | XXX | GPS Satellite Mode during collection | ARAN Data Collection, Contractor Post-processing | Automatic Output | Untested |
| 15 | XFALL | 999.9 | Cross Fall: % Slope at GPS Location (Caution, Data not Validated) | ARAN Data Collection, Contractor Post-processing | Automatic Output | Untested |
| 16 | GRADE | 999.9 | Grade: % Slope at GPS Location (Caution, Data not Validated) | ARAN Data Collection, Contractor Post-processing | Automatic Output | Untested |
| 17 | HEADING | 999.9 | Heading Relative to True North | ARAN Data Collection | Automatic Output | Untested |
| 18 | DATUM | (Text) | LL_WGS84_DD | ARAN Data Collection | Database Processing | Untested |
| 19 | FILENAME | (Text) | Filename of raw data files | ARAN Data Collection | Automatic Output | Untested |
| 20 | FKEY | 9999999 | Unique record ID | Contractor Post-processing | Database Processing | Untested |

| 21 | DATE | MM/DD/YY | ARAN Data Collection Date | ARAN Data Collection | Automatic Output | Untested |
|----|------|----------|---------------------------|----------------------|------------------|----------|
| 22 | COMMENT | (Text) | Source of Any Digitized Data | ARAN Data Collection | Database Processing | Untested |
| 23 | CONTRACTOR1 | (Numeric) | Visi_from | Contractor Post-processing | Database Processing | Untested |
| 24 | CONTRACTOR2 | (Numeric) | Visi_to | Contractor Post-processing | Database Processing | Untested |
| 25 | CONTRACTOR3 | (Text) | Visi_dir (ipdated to chapter 1) | Contractor Post-processing | Database Processing | Untested |
| 26 | CONTRACTOR4 | (Text) | Comments/exceptions | Contractor Post-processing | Database Processing | Untested |

**FHWA "Route ID Program" Database**
**Database Name: ROUTEINFO.mdb**
**Table Name: ROUTE_ID**

| | FIELD | FORMAT | EXPECTED VALUE | SOURCE | VALIDATION | EXPECTED ACCURACY |
|---|---|---|---|---|---|---|
| 1 | ROUTE_IDENT | XXXX-9999XXX | The Park's Alpha Code + "-" + RTE_NO (below). | Route ID Meeting | Automatic Output | 100%, Reference source for all tables |
| 2 | RIP_CYCLE | 99 | 4, for RIP data collection Cycle 4 | Route ID Meeting | FHWA Determination | 100%, Reference source for all tables |
| 3 | PARK_ALPHA | XXXX | Park Alpha Code | Route ID Meeting | NPS References | 100%, Reference source for all tables |
| 4 | GROUP_ALPHA | XXXX | Group Alpha Code | Route ID Meeting | NPS References | 100%, Reference source for all tables |
| 5 | PARK_NO | 9999 | Park Numeric Code | Route ID Meeting | NPS References | 100%, Reference source for all tables |
| 6 | PARK_NAME | (text) | NPS Name of Park | Route ID Meeting | NPS References | 100%, Reference source for all tables |
| 7 | RTE_NO | 9999XXX | Route Number | Route ID Meeting | Park Input | 100%, Reference source for all tables |
| 8 | RTE_NAME | (Text) | Route Name | Route ID Meeting | Park Input | 100%, Reference source for all tables |
| 9 | FROM_DESC | (Text) | Beginning terminus of route | Route ID Meeting | Park Input/FHWA Determination | 100%, Reference source for all tables |
| 10 | TO_DESC | (Text) | Ending terminus of route | Route ID Meeting | Park Input/FHWA Determination | 100%, Reference source for all tables |
| 11 | INSP_DATE | MM/DD/YYYY | Collection Date | ARAN Data Collection | FHWA Determination | 100%, Reference source for all tables |
| 12 | FUNCT_CLASS | XX | Functional Class | Route ID Meeting | Park Input/FHWA Determination | 100%, Reference source for all tables |
| 13 | STATE | XX | State where route is located | Route ID Meeting | Park Input/FHWA Determination | Untested (1) |
| 14 | STATE2 | XX | Additional State Park Route traverses | Route ID Meeting | Park Input/FHWA Determination | Untested (1) |
| 15 | FMSS_NO | (Text) | NPS's Facility Management Software System (FMSS) Asset number | Route ID Meeting | Park Input | 100%, Reference source for all tables |
| 16 | FMSS_SUR_EQP | (Text) | FMSS Surface Equipment Number | Route ID Meeting | Park Input | Untested |
| 17 | M_DISTRICT | (Text) | Park Maintenance District Route resides in | Route ID Meeting | Park Input | 100%, Reference source for all tables (1) |
| 18 | TOPOGRAPHY | (Text) | Predominate Terrain condition for | Route ID Meeting | FHWA Determination | 100%, Reference source for all |

| | FIELD | FORMAT | EXPECTED VALUE | SOURCE | VALIDATION | EXPECTED ACCURACY |
|---|---|---|---|---|---|---|
| | | | Route. (FLAT, ROLLING, MOUNTAINOUS, or URBAN) | | | tables (1) |
| 19 | POSTED_SPEED | 99 | Posted Speed Limit for Route (Value is Predominate Speed Limit along Route) | Route ID Meeting | Park Input/FHWA Determination | Untested (1) |
| 20 | ARAN_ROUTE | XXX | Yes/No | Route ID Meeting | Park Input/FHWA Determination | 100%, Reference source for all tables |
| 21 | PARKING_AREA | XXX | Yes/No | Route ID Meeting | Park Input/FHWA Determination | 100%, Reference source for all tables |
| 22 | CONCESSION | XXX | Yes/No | Route ID Meeting | Park Input | 100%, Reference source for all tables |
| 23 | PAVED_MI | 999.999 | Paved mileage (to the nearest 0.001) | ARAN Data Collection | Automatic Output | 100%, Reference source for all tables |
| 24 | UNPAVED_MI | 999.999 | Unpaved mileage (to the nearest 0.001) | Route ID Meeting | Automatic Output | 100%, Reference source for all tables |
| 25 | RTE_LENGTH | 999.999 | Official Route Length | Contractor Post-processing | Automatic Output | 100%, Reference source for all tables |
| 26 | SURF_TYPE | XX | Surface type (PAVED: AS (asphalt, includes composite), CO (concrete), BR (brick/pavers), CB (cobblestone), OT (other)) | Route ID Meeting | Survey Crew Input | 100%, Reference source for all tables (1) |
| 27 | UNPAVED | XXXX | Unpaved Route (Yes/No/Both) | Route ID Meeting | Automatic Output | 100%, Reference source for all tables |
| 28 | UNPAVED_CAT | XXX | Unpaved Road Category | Route ID Meeting | Automatic Output | Untested |
| 29 | CURB | (Text) | Parking Area with Curb around perimeter. | Route ID Meeting | Park Input/FHWA Determination | Untested |
| 30 | CURB_GUTTER | (Text) | Parking Area with Curb and Gutter around perimeter. | Route ID Meeting | Park Input/FHWA Determination | Untested |
| 31 | ADJ_ROUTE | 9999XXX | Route number | Route ID Meeting | Automatic Output | 100%, Reference source for all tables |
| 32 | USER_ACCESS | (Text) | Access Designation for Parking | Route ID Meeting | Park Input/FHWA Determination | 100%, Reference source for all tables |
| 33 | PHOTO_NO | (Text) | Photo or Image | Route ID Meeting | Survey Crew Input | 100%, Reference source for all tables |
| 34 | PLOT_SIZE | (Text) | Unpaved Parking Area Size | Route ID Meeting | Automatic Output | 100%, Reference source for all tables |
| 35 | SQ_FEET | 999.999 | Route Square Footage | Contractor Post-processing | Automatic Output | 100%, Reference source for all tables |
| 36 | M_RATING | (Text) | Manual Rating | Route ID Meeting | Automatic Output | 100%, Reference source for all tables |

| | FIELD | FORMAT | EXPECTED VALUE | SOURCE | VALIDATION | EXPECTED ACCURACY |
|---|---|---|---|---|---|---|
| 37 | SQ_YARDS | 999.999 | Route Square Yardage | Contractor Post-processing | Automatic Output | 100%, Reference source for all tables |
| 38 | LANES | XX | Route travel lanes | Route ID Meeting | Automatic Output | Untested (1) |
| 39 | PAVE_WIDTH | 999.99 | Pavement Width (Weighted average) | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 40 | LANE_MILES | 999.999 | Route Equivalent Lane Miles | RIP Post-processing | Automatic Output | 100%, Reference source for all tables |
| 41 | AREA_MAP | (Text) | 1 or 2-digit number | Contractor Post-processing | FHWA/Contractor Input | 100%, Reference source for all tables |
| 42 | REMARKS | (Memo) | General remarks on Park route and data collection operations. | Contractor Post-processing | FHWA/Contractor Input | Untested |
| 43 | SUMMARY_REC | XXXX-9999XXX | ROUTE_IDENT of summary Park Asset | Route ID Meeting | Park Input/FHWA Determination | 100%, Reference source for all tables |
| 44 | NPS_REGION | (Text) | Park Region | Route ID Meeting | Park Input/FHWA Determination | 100%, Reference source for all tables |
| 45 | DIVISION | (Text) | FHWA Division | Route ID Meeting | Park Input/FHWA Determination | 100%, Reference source for all tables |
| 46 | PCR | 999.99 | Route Weighted Average PCR value | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 47 | SCR | 999.99 | Route Weighted Average SCR value | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 48 | AADT | 999 | Average Adjusted Daily Traffic | RIP | Automatic Output | Untested |
| 49 | SADT | 999 | Seasonal Adjusted Daily Traffic | RIP | Automatic Output | Untested |
| 50 | ADT_DATE | MM/DD/YYYY | Traffic Date of Collection | RIP | Automatic Output | Untested |
| 51 | BEG_LAT | 999.999999 | Route Begin GPS Latitude Co-ordinate (decimal degrees) | ARAN Data Collection | Automatic Output | <= 3.00 feet, Referenced from other tables |
| 52 | BEG_LON | -999.999999 | Route Begin GPS Longitude Co-ordinate (-decimal degrees) | ARAN Data Collection | Automatic Output | <= 3.00 feet, Referenced from other tables |
| 53 | BEG_ELEV | 99999.9 | Route Begin Elevation | ARAN Data Collection | Automatic Output | 100% Referenced to other tables |
| 54 | BEG_MODE | XXX | Route Begin GPS Satellite Mode during collection | ARAN Data Collection | Automatic Output | 100% Referenced to other tables |
| 55 | END_LAT | 999.999999 | Route End GPS Latitude Co-ordinate (decimal degrees) | ARAN Data Collection | Automatic Output | <= 3.00 feet, Referenced from other tables |

| | FIELD | FORMAT | EXPECTED VALUE | SOURCE | VALIDATION | EXPECTED ACCURACY |
|---|---|---|---|---|---|---|
| 56 | END_LON | -999.999999 | Route End GPS Longitude Co-ordinate (-decimal degrees) | ARAN Data Collection | Automatic Output | <= 3.00 feet, Referenced from other tables |
| 57 | END_ELEV | 99999.9 | Route End Elevation | ARAN Data Collection | Automatic Output | 100% Referenced to other tables |
| 58 | END_MODE | XXX | Route End GPS Satellite Mode during collection | ARAN Data Collection | Automatic Output | 100% Referenced to other tables |
| 59 | DATUM | (Text) | LL_WGS84_DD | ARAN Data Collection | Automatic Output | 100% Referenced to other tables |
| 60 | CHILD_ROUTE | XXX | Yes/No | Route ID Meeting | Automatic Output | 100% Reference source for all tables |
| 61 | CULVERT_CNT | 999 | Route Culvert Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 62 | DROP_INLET_CNT | 999 | Route Drop Inlet Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 63 | GATE_CNT | 999 | Route Gate Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 64 | TRAFLIGHT_CNT | 999 | Route Traffic Light Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 65 | SIGN_CNT | 999 | Route Sign Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 66 | LWCROSS_CNT | 999 | Route Low Water Crossing Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 67 | BRIDGE_CNT | 999 | Route Bridge Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 68 | TUNNEL_CNT | 999 | Route Tunnel Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 69 | PULLOUT_CNT | 999 | Route Pullout Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 70 | INTERSEC_CNT | 999 | Route Intersection Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 71 | ST_BNDRY_CNT | 999 | Route State Boundary Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 72 | PRK_BNDRY_CNT | 999 | Route Park Boundary Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 73 | RETWALL_CNT | 999 | Route Retaining Wall Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 74 | RR_CROSS_CNT | 999 | Route RR Crossing Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 75 | CATTLE_CNT | 999 | Route Cattle Guard Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 76 | OVHDSIGN_CNT | 999 | Route Overhead Sign Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 77 | MILEMARK_CNT | 999 | Route Mile Marker Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 78 | FHYD_CNT | 999 | Route Fire Hydrant Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 79 | OVERPASS_CNT | 999 | Route Overpass Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 80 | CABLE_TLNG | 9999.999 (ft) | Route Total Length Cable Barriers | RIP Post-processing | Automatic Output | 100% Referenced to other tables |

| | FIELD | FORMAT | EXPECTED VALUE | SOURCE | VALIDATION | EXPECTED ACCURACY |
|---|---|---|---|---|---|---|
| 81 | GDRAIL_TLNG | 9999.999 (ft) | Route Total Length Guard/Guide Rail Barriers | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 82 | GDWALL_TLNG | 9999.999 (ft) | Route Total Length Guard/Guide Wall Barriers | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 83 | TEMP_BARR_TLNG | 9999.999 (ft) | Route Total Length Temporary Barriers | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 84 | BOLLARD_TLNG | 9999.999 (ft) | Route Total Length Bollard Barriers | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 85 | BARRIER_TLNG | 9999.999 (ft) | Route Total Length All Barriers | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 86 | CURB_TLNG | 9999.999 (ft) | Route Total Length Curbing (excludes Parking Areas) | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 87 | LWCROSS_TLNG | 9999.999 (ft) | Route Total Length Low Water Crossings | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 88 | PAVDITCH_TLNG | 9999.999 (ft) | Route Total Length Paved Ditch | RIP Post-processing | Automatic Output | 100% Referenced to other tables (2) |
| 89 | TURNOUT_TLNG | 9999.999 (ft) | Route Total Length Turnouts | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 90 | LANE_NUMBER | 99 | Number of Lane Tested | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 91 | LOCAL_FACTOR | 9.9999 | Park Location Factor | NPS Partner | Automatic Output | 100% Reference source for all tables |
| 92 | E_ZONE | XXX | Route Environmental Zone | FHWA HPMA | Automatic Output | 100% Reference source for all tables |
| 93 | PAVEMENT_DM | $99,999,999.99 | Pavement Deferred Maintenance | FHWA HPMA | Automatic Output | 100% Reference source for all tables |
| 94 | CRV | $99,999,999.99 | Current Replacement Value | RIP Post-processing | Automatic Output | 100% Reference source for all tables |

**Database Name: ROUTEINFO.mdb**
**Table Name: PARK_TOTALS**

| | FIELD | FORMAT | EXPECTED VALUE | SOURCE | VALIDATION | EXPECTED ACCURACY |
|---|---|---|---|---|---|---|
| 1 | RIP_CYCLE | 99 | 4, for RIP data collection Cycle 4 | Route ID Meeting | FHWA Determination | 100% Referenced to other tables |
| 2 | PARK_ALPHA | XXXX | Park Alpha Code | Route ID Meeting | FHWA Determination | 100% Referenced to other tables |
| 3 | GROUP_ALPHA | XXXX | Group Alpha Code | Route ID Meeting | NPS References | 100% Referenced to other tables |
| 4 | PARK_NO | 9999 | Park Numeric Code | Route ID Meeting | NPS References | 100% Referenced to other tables |
| 5 | PARK_NAME | XXXX | NPS Name of Park | Route ID Meeting | NPS References | 100% Referenced to other tables |
| 6 | INSP_DATE | MM/DD/YYYY | Date that data was collected in the park (completion date). | Route ID Meeting and ARAN Data Collection | FHWA Determination | 100% Referenced to other tables |
| 7 | NPS_REGION | XXXX | Park Region | Route ID Meeting | Park Input | 100% Referenced to other tables |
| 8 | DIVISION | XXXX | FHWA Division | Route ID Meeting | FHWA Determination | 100% Referenced to other tables |
| 9 | T_PAVED_MI | 999.999 | Total Park Paved Miles | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 10 | T_UNPAVED_MI | 999.999 | Total Park Unpaved Miles | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 11 | T_ROUTE_MILES | 999.999 | Total Park Route Miles | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 12 | T_ARAN_DRIVEN | 999.999 | Total Park ARAN Driven Miles | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 13 | T_ARAN_LMILES | 999.999 | Total Park ARAN Lane Miles | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 14 | T_CONCESS_PAVED | 999.999 | Total Park Concession Paved Miles | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 15 | T_CONCESS_UNPAVED | 999.999 | Total Park Concession Unpaved Miles | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 16 | T_PRK_PAVEDSQFT | 999.999 | Total Park Parking Paved Square Feet | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 17 | T_PRK_UNPAVEDSQFT | 999.999 | Total Park Parking Unpaved Square Feet | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 18 | T_CPRK_PAVEDSQFT | 999.999 | Total Park Concession Parking Paved Square Feet | RIP Post-processing | Automatic Output | 100% Referenced to other tables |

| | FIELD | FORMAT | EXPECTED VALUE | SOURCE | VALIDATION | EXPECTED ACCURACY |
|---|---|---|---|---|---|---|
| 19 | T_CPRK_UNPAVEDSQFT | 999.999 | Total Park Concession Parking Unpaved Square Feet | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 20 | T_PARKING_SQFT | 999.999 | Total Park Parking Square Feet | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 21 | T_PARKING_LMILES | 999.999 | Total Park Parking Equivalent Lane Miles | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 22 | T_MRR_SQFT | 999.999 | Total Park Manually Rated Road Square Feet | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 23 | T_CMRR_SQFT | 999.999 | Total Park Concession Manually Rated Road Square Feet | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 24 | T_MRR_LMILES | 999.999 | Total Park Manually Rated Road Equivalent Lane Miles | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 25 | T_LMILES | 999.999 | Total Park Lane Miles | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 26 | T_CULVERT_CNT | 999 | Total Park Culvert Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 27 | T_DROP_INLET_CNT | 999 | Total Park Drop Inlet Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 28 | T_GATE_CNT | 999 | Total Park Gate Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 29 | T_TRAFLIGHT_CNT | 999 | Total Park Traffic light Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 30 | T_SIGN_CNT | 999 | Total Park Sign Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 31 | T_LWCROSS_CNT | 999 | Total Park Low Water Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 32 | T_BRIDGE_CNT | 999 | Total Park Bridge Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 33 | T_TUNNEL_CNT | 999 | Total Park Tunnel Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 34 | T_PULLOUT_CNT | 999 | Total Park Pullout Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 35 | T_INTERSEC_CNT | 999 | Total Park Intersections Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 36 | T_ST_BNDRY_CNT | 999 | Total Park State Boundaries Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 37 | T_PRK_BNDRY_CNT | 999 | Total Park Boundaries Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 38 | T_RETWALL_CNT | 999 | Total Park Retaining Wall Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 39 | T_RR_CROSS_CNT | 999 | Total Park RR Crossing Count | RIP Post-processing | Automatic Output | 100% Referenced to other |

| | FIELD | FORMAT | EXPECTED VALUE | SOURCE | VALIDATION | EXPECTED ACCURACY |
|---|---|---|---|---|---|---|
| | | | | | | tables |
| 40 | T_CATTLE_CNT | 999 | Total Park Cattle Guard Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 41 | T_OVHDSIGN_CNT | 999 | Total Park Overhead Sign Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 42 | T_MILEMARK_CNT | 999 | Total Park Mile Marker Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 43 | T_FHYD_CNT | 999 | Total Park Fire Hydrant Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 44 | T_OVERPASS_CNT | 999 | Total Park Overpass Count | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 45 | T_CABLE_TLNG | 9999.999 (ft) | Total Length Park Cable Barriers | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 46 | T_GDRAIL_TLNG | 9999.999 (ft) | Total Length Park Guard/Guide Rail Barriers | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 47 | T_GDWALL_TLNG | 9999.999 (ft) | Total Length Park Guard/Guide Wall Barriers | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 48 | T_TEMP_BARR_TLNG | 9999.999 (ft) | Total Length Park Temporary Barriers | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 49 | T_BOLLARD_TLNG | 9999.999 (ft) | Total Length Park Bollard Barriers | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 50 | T_BARRIER_TLNG | 9999.999 (ft) | Total Length All Park Barriers | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 51 | T_CURB_TLNG | 9999.999 (ft) | Total Length Park Curbing | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 52 | T_LWCROSS_TLNG | 9999.999 (ft) | Total Length Park Low Water Crossings | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 53 | T_PAVDITCH_TLNG | 9999.999 (ft) | Total Length Park Paved Ditches | RIP Post-processing | Automatic Output | 100% Referenced to other tables (2) |
| 54 | T_TURNOUT_TLNG | 9999.999 (ft) | Total Length Park Turnouts | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 55 | PARK_PCR | 99.99 | Overall Park PCR Rating | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 56 | PARK_RCI | 99.99 | Overall Park RCI Rating | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 57 | PARK_SCR | 99.99 | Overall Park SCR Rating | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 58 | PARK_RUT_INDEX | 99.99 | Overall Park Rutting Index Rating | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 59 | PARK_AC_INDEX | 99.99 | Overall Park Alligator Cracking Index Rating | RIP Post-processing | Automatic Output | 100% Referenced to other tables |

| | FIELD | FORMAT | EXPECTED VALUE | SOURCE | VALIDATION | EXPECTED ACCURACY |
|----|-------|--------|----------------|--------|------------|-------------------|
| 60 | PARK_LC_INDEX | 99.99 | Overall Park Longitudinal Cracking Index Rating | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 61 | PARK_TC_INDEX | 99.99 | Overall Park Transverse Cracking Index Rating | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 62 | PARK_PATCH_INDEX | 99.99 | Overall Park Patching Index Rating | RIP Post-processing | Automatic Output | 100% Referenced to other tables |
| 63 | PARK_CONC_PCR | 99.99 | Overall Park Concession PCR Rating | RIP Post-processing | Automatic Output | 100% Referenced to other tables |

# Business Practices for Route Numbering and Roadway Asset Identification

**Introduction and Background:**
Beginning in November 2006, inventory and condition information gathered by the Federal Highway Administration (FHWA) has been stored in FMSS to enable NPS to report Deferred Maintenance (DM) and Current Replacement Value (CRV) for NPS paved roads, paved parking areas, bridges, and tunnels. The NPS Roads Working Group (RWG) has been tasked with developing and implementing the procedures necessary to transfer DM and CRV from FHWA's databases to NPS' Facility Management Software System (FMSS).

Current business practices for roadway definition in national parks involve face-to-face meetings between FHWA personnel and individual park staff known as "Route ID" meetings. These meetings have been ongoing for several years and have been performed within the context of the Road Inventory Program (RIP) executed mainly by FHWA. The primary focus of these meetings has been on defining roadway static information such as route names, numbers, functional class, etc. The FHWA personnel are the primary individuals responsible for implementing the RIP and the route ID meetings are an integral and fundamental part of that process. The RIP process provides route numbers for each individual road and parking area in each park. After the route ID meetings establish a given park's roadway asset base, various types of condition and inventory data are collected either manually or with a data collection van that drives each individual road with an individual route number.

The FMSS requires asset numbers as unique identifiers for all asset types including roadways. **The current practice is that all roadways that are assigned a route number at route ID, also are defined as assets and therefore also receive an FMSS asset number** (Route names and functional classes are also collaboratively assigned during the face-to-face route ID meetings). This practice began midway through the third RIP data collection cycle (ending in 2003) and was further reinforced during an asset alignment process conducted in the summer of 2006. The alignment process ensured that each route number in RIP and each asset number in FMSS were matched to the correct road and parking area.

**Issue Statement:**
As a result of various pre-existing business practices associated with the RIP, which predates FMSS by several years, route numbers are assigned for routes that are often very small. In tandem with the current business practice that all routes with route numbers are considered assets, this has caused a proliferation of asset numbers within FMSS. Over the past year, the RWG has learned that this business practice has significantly increased time and resources that parks must dedicate to administering FMSS data entry and management. This additional work effort is due to the fact that tying FMSS asset records to the more detailed, granular RIP route numbers has generated numerous new assets that require additional database and work order management. This has led to a situation where assets are not being defined the way they are managed.

The following proposed practices seek to create an asset definition process that is dictated by to how road assets are managed at the park level, not according to the pre-existing practices used in RIP for collecting detailed road information. RIP practices assign route numbers mainly based on how data are collected and driven with a data collection device. These procedures will disassociate the driving of roads with the data collection van from the process of assigning them asset status. **The end goal is to only assign asset numbers based on how parks manage their facilities within guidelines set up within FMSS and herein.** Driving the road with the data collection van allows for the collection of higher quality data as well as the ability to view road segments with video viewing software (Visidata). By de-linking driving the roads with the assignment of "asset status", we are able to get the best quality data without the proliferation of assets that has serious negative ramifications for managing roadways in parks using asset management tools.

**Proposed Actions:**

1. Make a distinction within the route number field in the RIP database between those route numbers that represent assets, those that are subcomponents of assets and those that are groups of sub-components. The route number field in the RIP database will be expanded from 6 to 7 characters. The additional character will denote the asset status of the route in question. Combined routes will be designated with a double "zz", while subcomponents will be designated with one "z". Whenever possible, a combined route should use the lowest route number to be combined as the combined route number.

2. Only show assets, whether a group of subcomponents or a single component, on the Route ID report. Assets that are composed of subcomponents will have "zz" in the route number. Individual routes will have no additional characters in the route number. Subcomponents (designated in RIP with a "z") will not be listed on the route ID report. Only assign asset numbers to those routes listed on the route ID report.

3. Provide a separate reporting function (other than the Route ID report) to identify and display information for route numbers not representing assets. Specific reporting requirements and format TBD.

4. Add a new field to the RIP database to indicate the "asset status" of a route number. The flag will have three possible values:
   a. Asset with no subcomponents.
   b. Asset with subcomponents.
   c. Non-asset (i.e. subcomponent).

   Both a change in the route number and a new "asset ID" field in the RIP database are recommended. It is easier to perform queries and other database manipulations using a separate field instead of a character within the route number field. The character in the route number field allows for rapid identification of the asset status of a road without having to access the database as a whole. Even thought non-asset routes will not be included in the route ID report (the primary location for parks to view road information in RIP), there are many other reports as well as the Visidata application where the route number is

displayed. In these cases, the character in the route number will clearly identify the asset status of the roadway.

5. Focus asset definition practices on NPS asset management needs. Create roadway assets based on how parks manage these assets within the following guidelines:

   a. Individual road segments (asset subcomponents) may be combined into a single asset. **Note that all the attributes of individual subcomponents (paved area, equipment, work orders, etc) will be included in the combined asset.**

   b. In general, combination should be used in complex circulatory environments such as campground areas, housing and other administrative areas, maintenance areas, etc.

   c. Public and non-public segments may not be combined.

   d. Segments with differing functional classes may not be combined.

   e. Discrete parking areas may be combined into a single asset where they service the same facility or resource and are within walking distance of each other.

   f. Parking areas and roads may not be combined. This includes short road segments that may be near or adjacent to parking areas. See 5h below for exceptions to this.

   g. Where the primary purpose of a road is to provide access to a parking area, and that road segment is approximately 0.25 miles in length or shorter, the access road should be considered part of the parking area (Note that this is an existing RIP business practice).

   h. Particularly long routes may be divided into multiple assets based on how a park manages the roadway network. This should not be confused with the use of sub-components listed in 5a.

   i. Roads that are actively managed by concession operations may not be combined with those managed by the NPS.

**Discussion:**

The first four items listed above are actions required by FHWA RIP to allow for the adoption of the practices shown in 5a-i. The following will provide additional direction and examples for guidelines listed.

Individual road segments (asset subcomponents) may be combined into a single asset. Where previous route ID practices have generated more assets (routes) than are practical from an asset management standpoint, small, discrete road lengths may be designated as asset subcomponents and then combined into a larger single asset. A subcomponent is NOT an FMSS term. Subcomponents will be used in RIP to indicate which routes are small, drivable individual road segments and which routes may include these segments. Once a piece of road is designated a subcomponent of another route, it will no longer have any individual identity in FMSS. Only those routes listed on the RIP Route ID report will have asset numbers in FMSS. As stated in business rule 2 above, subcomponents will not be listed on the route ID. The quantity information (length, area) will be included into the larger route of which they are a part. See Figures 1 and 2 for an example of how existing assets may be combined using subcomponents. Note that

subcomponents will have an identity in the RIP database and, if driven by RIP team, may be referenced in RIP reports, Visidata, or other RIP documentation.
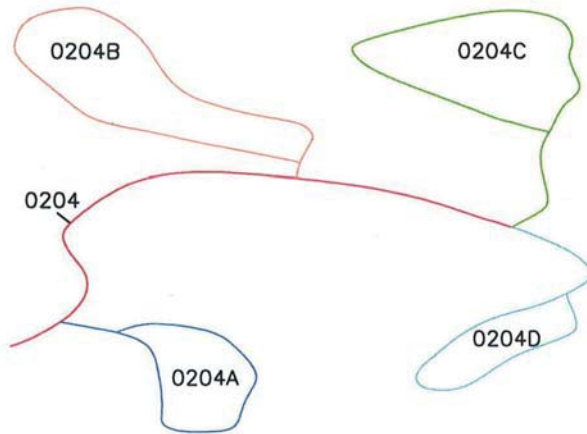


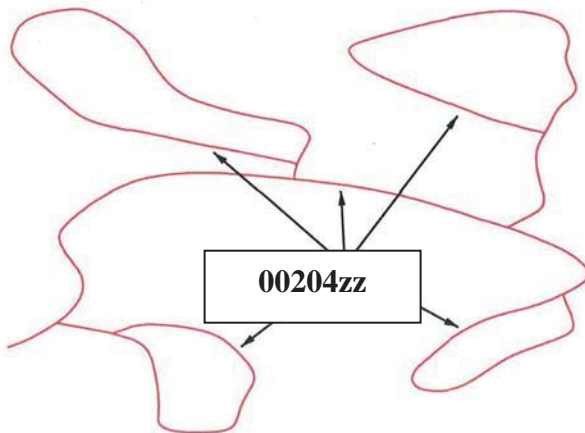**Figure 1: Campground with five routes and five assets**



**Figure 2: Campground with all loops combined into one route and one asset. This has eliminated four assets.**

In general, combination should occur in complex circulatory environments such as campground areas, housing and other administrative areas, maintenance areas, etc.

Typically these complex situations are where too many assets have been used to define roadways. Combining simple "point A to point B" roads that are clearly defined and provide access to different facilities or locations may not be done.

Public and non-public segments may not be combined. Roads that are posted as closed to the public or are intended as administrative access only (maintenance areas, housing areas, fire roads, etc) can not be combined with roads open to the public.

Segments with differing functional classes may not be combined. The roadway functional class is found on the Route ID report. Functional class indicates the type of circulatory function a given road provides. Functional class is used in a variety of applications (engineering, safety, funding) so it is important to maintain the correct functional class attributes of individual roads/assets. There are some cases where functional class was erroneously assigned in prior Route ID meetings such as where campground loops have a different functional class than the campground road. Functional classes of individual roads may be modified to correct discrepancies. The functional class definitions may not be modified.

Discrete parking areas may be combined into a single asset where they service the same facility or resource and are within walking distance of each other. These combined areas should be maintained as one asset. There are many instances where small (5-10 space), discrete parking areas have been separated into individual assets even though they provide parking for the same area or facility. These may be combined into a single asset. Figures 3 and 4 shows examples of combining parking areas.
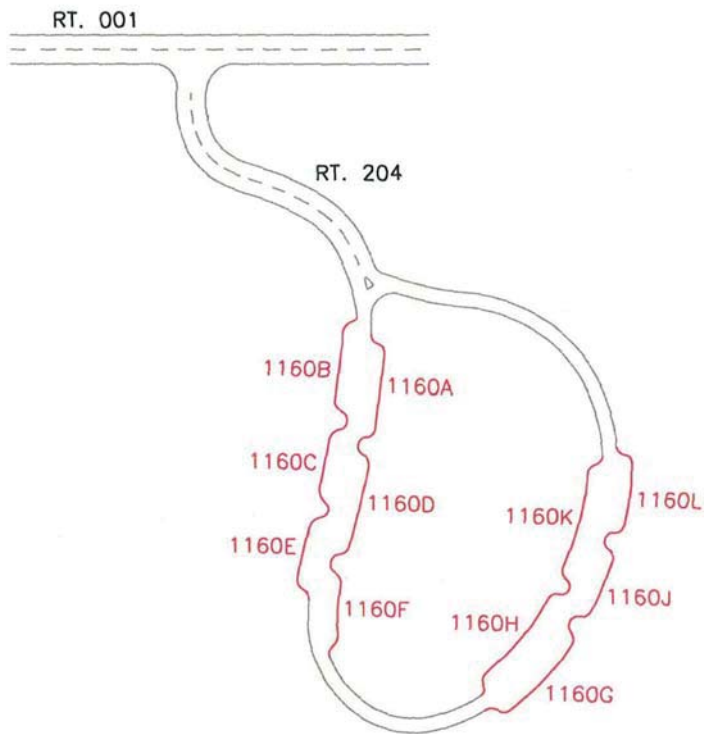
**Figure 3: Parking with access route 204 and multiple parking areas (1160 A-L). Currently, this parking area is 12 routes and 12 assets ( one 1100 asset and 11 1300 assets).**
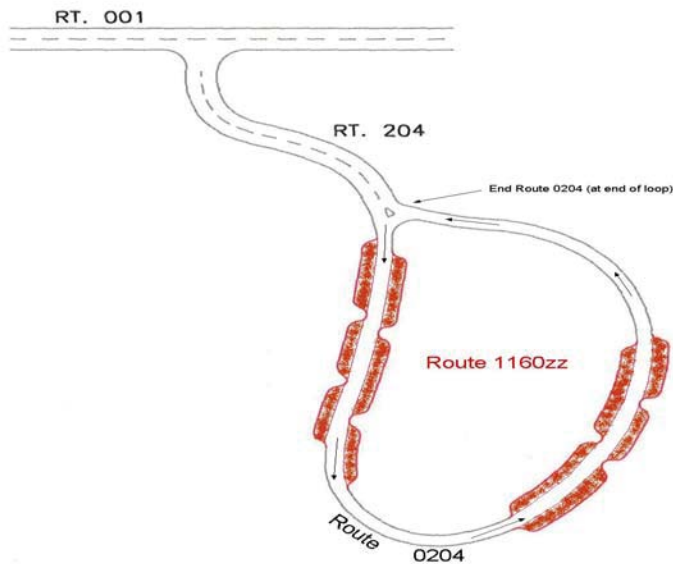


**Figure 4: Parking with access route 204 and one parking area 1160zz. Route 204 is assumed longer than 0.25 miles. There are now 2 assets (one 1100 asset, one 1300 asset) instead of 12.**

Parking areas and roads may not be combined.  Parking areas and roads are tracked as separate asset types (1300 vs. 1100) in FMSS and as such should not be combined except in situations described by 5g.  In Figure 5, Route 207 is a spur road from the main route running through parking area 1102.  Since the spur road continues through and beyond the parking area, it will remain a separate route.
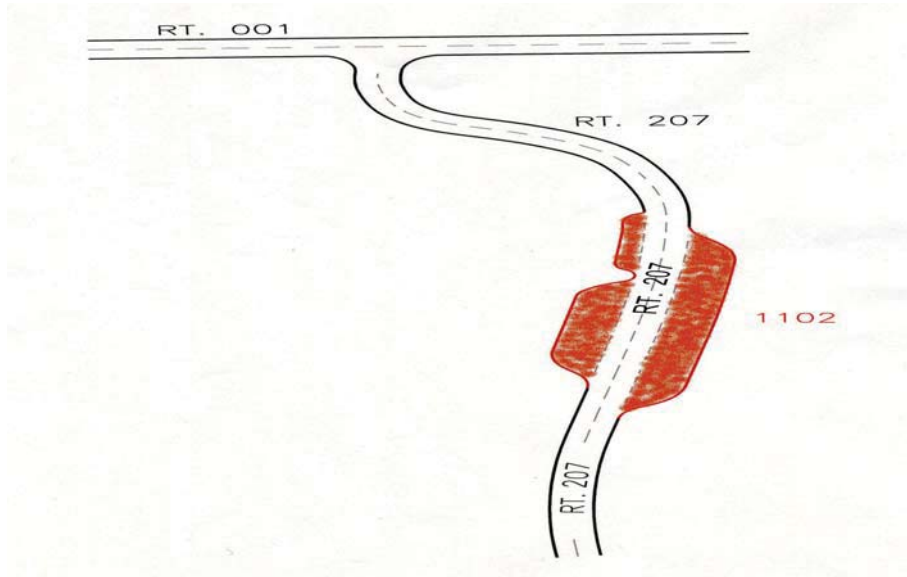


**Figure 5: Parking with access route 207 running through and continuing beyond parking 1102.  This access route cannot be considered a part of the parking area and two routes and two assets continue to exist.**

Where the primary purpose of a road is to provide access to a parking area, and that road segment is less than 0.25 miles in length, the access road should be considered part of the parking area.  See Figures 8.  Where a road continues on past a parking area to another facility or destination, even if it is less than 0.25 miles to the initial parking area, the road and parking area may not be combined.
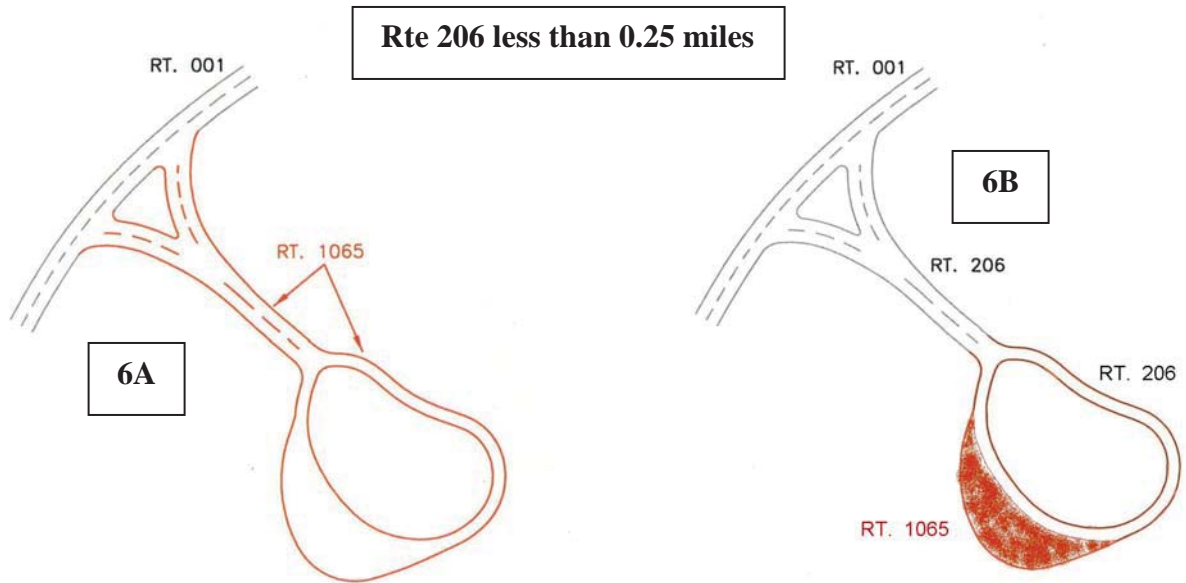
**Rte 206 less than 0.25 miles**

**Figure 6: Since the access route is less than .25 miles in length and the only use of the access is to the parking, one route for both the access and the parking area can be established.**

Particularly long routes may be divided into multiple assets based on how a park manages the roadway network.  This should not be confused with the use of sub-components listed in 5a.  Routes like the Blue Ridge Parkway or the Yellowstone Grand Loop may not lend themselves to management as a single asset by virtue of their length.  Often management districts are created for sections of these routes and maintenance activities occur primarily within these districts.  Parks may break routes up into separate assets during the Route ID process if the road is managed as discrete sections.  This should only be done for very long roads.

The following example illustrates a complex road system and how the proposed business practice and several of the guidelines could be applied to create fewer assets that are consistent with local management.
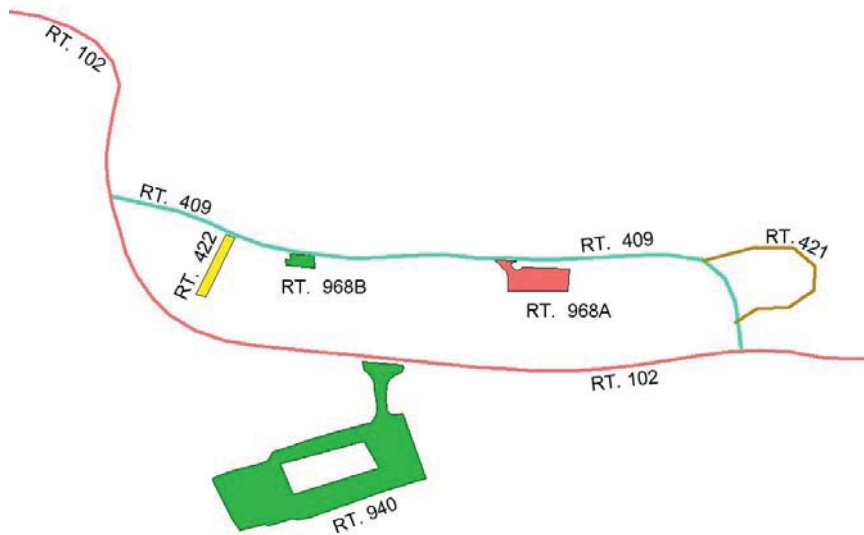
**Figure 7 – Current Housing area access configuration. Route 409 is less than 0.25 miles long.**

The area serviced by Routes 409, 421, 422, 968A, and 968B is all employee housing. Route 940 provides access to visitor services and not to the housing area. Routes may be combined to create assets that reflect local management. Routes 409, 421, and 422 are all the same functional class, provide access to one type of activity (housing) and are all posted as non-public. These routes may be combined. They should not be combined with any parking areas even though they are all less than 0.25 miles long. This is because their main function is not to provide access to parking. Routes 968A and B provide parking for access to the same facility (housing). Even though these discrete areas may provide parking to different housing units, it's reasonable to manage them as a single asset. They may also be combined.
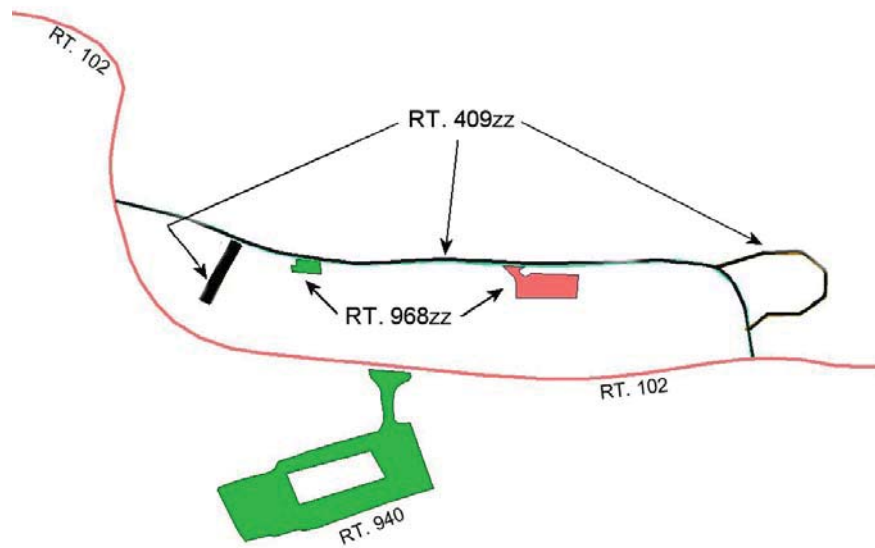


**Figure 8 – Combined housing area access configuration – Parking and road assets combined to eliminate 3 assets.**