CFLHD GUIDELINES FOR
SAFETY-RELATED DESIGN PROCEDURES

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Introduction

The purpose of this document is to describe how safety-related design information is gathered and addressed during the project development process in CFLHD. This document provides guidelines on the safety-related roles and responsibilities of the Project Manager, Highway Design Manager, Lead Designer, and Safety Engineer. Guidelines on basic safety-related improvements to be included in various project types are also provided.

According to the FLH Safety Philosophy, the "…overall goal is to work cooperatively to integrate safety as a basic business principle in all activities jointly undertaken by the FLH and Federal Land Management Agencies (FLMA)." Through a collaborative and cooperative effort between CFLHD and the FLMAs, CFLHD projects incorporate appropriate safety enhancements while respecting the resource impacts and the historic and cultural values of the associated facility. (Refer to the Project Development and Design Manual (PDDM) Section 8.1.1 for the entire FLH Safety Philosophy.)

FLH safety-related policies, standards, and practices are generally provided in the PDDM in Chapters 1, 4, 8, and 9. However, the PDDM does not address specific roles and responsibilities or procedures for how to perform necessary tasks. These guidelines provide additional detail on the specific methods used in CFLHD to:

- Obtain safety-related information as part of the scoping and preliminary design, including both existing available data as well as new data to perform specific safety studies.
- Perform the appropriate level and type of safety analysis for various project types and design conditions (ADT, speed).
- Determine the level of improvement of safety-related design elements or features to include in the scope of the project to address both:
    a. Nominal Safety – the conformance with design standards or design exception documentation, and
    b. Substantive Safety – actual safety performance as measured by crash data or estimated by crash prediction.

This document is intended to be a guide and is not a replacement for policy, engineering judgment, and site-specific assessment and consideration. This information does not constitute a standard or requirement.

Roles and Responsibilities

Management expects flexibility to be exercised when using the following roles and responsibilities to best use staff to deliver projects and develop skills for CFLHD's staff and for oversight of A/E consultant-delivered work. See Tables 1, 2, 3 and 4 in the Appendix for more information on responsibilities for specific tasks.

Planning and Programming

- Include safety as a component in the project selection criteria
- Request safety assessments for proposed projects as needed
- Select highway segments for Road Safety Audits
- Request crash data for all Forest Highway project proposals

Project Manager

- Project leadership and direction
- Manage and convey project risks and risk decisions
- Coordinate dispute resolution
- Meet with the Safety Engineer as each new project is identified to ensure early engagement of Safety
- Overall accountability for the safety-related decision-making process

Highway Design Manager

- Provide technical guidance to the Lead Designer
- Establish broad technical design guidelines and procedures
- Endorse any exceptions to standards or variances from safety-related FLH standard practices
- Technical quality assurance and oversight of design risk assessment

Lead Designer

- Develop project design standards using CFLHD guidelines. Design incorporates: controlling geometric criteria (design speed, lane width, shoulder width, bridge width, structural capacity, grade, stopping sight distance, cross slope, superelevation, horizontal and vertical clearances), clear zone, roadside barriers, end treatments, and curve widening for each alternative under consideration.
- Identify and document any exceptions to standards or variances from safety-related FLH standard practices
- Incorporate CFT recommendations
- Document all decisions regarding safety improvements and/or mitigation
- Assist construction in the development of any design changes that affect roadway geometry or clear zone, ensuring that the approved design standards and clear zone guidelines are still being met

Safety Engineer

- Provide safety assistance to Planning and Programming by preparing safety assessments for proposed projects as requested.
- Analyze crash data for crash types, locations, potential problems, opportunities to reduce severity and number of crashes
- Provide available crash data summary for NPS projects using the NPS STARS database as requested by Planning and Programming and the Project Manager
- Meet with the PM when each new project is identified to establish the appropriate safety-related design strategy based on analysis of available crash data and other roadway characteristics
- Provide technical assistance in the collection and interpretation of crash data
- Review the safety-related project decisions
- Recommend changes to the scope of work necessary to address key safety issues
- Provide comments during plan reviews
- Recommend safety improvements/mitigations, include supporting information and risk assessment documentation
- Evaluate the effectiveness of safety-related design processes, procedures and guidelines

Conflict Resolution / Escalation / Endorsement

- When a safety-related issue cannot be fully resolved and endorsed by all of the above staff, or the issue involves extraordinary risk or exceptions to standards, the issue is elevated to the Management Board for further guidance or resolution.
- The Management Board is aware of and endorses safety-related design processes, project decisions, and risk assessments
- Director and Division Engineer are aware of and endorse any exceptions to the FLH safety design policies and standards

4R projects

New construction and reconstruction involves the application of established policies, standards, and criteria in the design and construction of the facility.

Data to Obtain

Refer to Table 1 in the Appendix for information on specific data to gather. See PDDM Section 4.3.2. For all projects perform a site inspection. See PDDM Section 4.3.3.

Level of Safety Analysis

Early project planning for 4R projects will always include an evaluation of the safety elements of the roadway and roadside, as well as the traffic data to determine the level of exposure. Evaluate the crash history, predominant crash types, traffic volumes and vehicle classifications, project scope, and budget to determine the extent of safety improvements needed to improve the existing safety elements or address an identified safety issue. See PDDM Section 8.4. Document the design decision process.

Assess the predicted operating speeds along the alignment to check if any locations are a safety concern. See PDDM Section 9.3.1.13.

The level of analysis for 4R projects should be scaled to the degree of potential risk, which is related to exposure (ADT) and severity (design speed and roadside hazard rating). For projects with higher ADTs (e.g. over 2,000), consider performing a safety analysis on proposed alternatives as described in the PDDM Section 8.4, including an in-depth proposed geometric features analysis.

Based on the results of the safety analysis, consider a Road Safety Audit as appropriate. See PDDM Section 8.4.6.

Basic Safety Improvements

Basic safety improvements included in 4R projects are:

1. Maintain consistency in geometric design features and speed between adjacent sections of the roadway.
2. Install pavement markings to meet current standards.
3. Install signs and posts to meet current standards. See PDDM Section 8.7.1.1.2
4. Eliminate pavement edge drop-off.
5. All roadside safety hardware installed on projects to meet current standards, including bridge railing, guardrail barriers and terminals, bridge-rail to guardrail connections, and sign support breakaway hardware within the clear zone.
6. Improve roadway geometric elements to address identified safety issues (PDDM Section 9.3).

RRR projects

The primary purpose of a RRR project is to preserve and extend the pavement service life, provide additional pavement strength, restore or improve the original roadway cross section, improve the ride of the roadway, and enhance highway safety and traffic operations.

Designing RRR programmed projects to meet all current standards is usually not intended and may not be practical. As stated in the *Green Book*, Foreword, existing roads that do not meet the guidelines for geometric design are not necessarily unsafe and do not necessarily have to be upgraded to meet the design criteria. However, all substandard elements must be identified and evaluated. Identify all substandard features and document each exception. (PDDM Section 4.4.2)

Develop RRR projects in a manner which identifies the need and incorporates appropriate safety enhancements. Use engineering judgment to determine the extent to which safety-related improvements can reasonably be made with the limited resources available. See PDDM Section 9.4.

The proposed design should not worsen an existing safety-related condition (clear zone, guardrail height, edge drop-off, drainage feature, etc.).

Data to Obtain

Refer to Table 2 in the Appendix for information on specific data to gather. See PDDM Section 4.3.2. For all projects perform a site inspection. See PDDM Section 4.3.3.

Level of Safety Analysis

A proactive safety-conscious approach is necessary to identify and correct any safety performance or condition issues and enhance safety. See PDDM Section 9.4.2.

During early project planning for RRR projects, evaluate the safety-related elements of the roadway and roadside, including deficient roadway geometrics, the clear recovery area, median widths, existing fore-slope rates, and all existing roadside safety hardware. Evaluate crash history, predominant crash types, traffic volumes and vehicle classifications, and project scope and budget to determine the extent of safety improvements needed.

The level of analysis for RRR projects should be scaled to the degree of potential risk, which is related to exposure (ADT) and severity (design speed and roadside hazard rating). Typically, safety improvements are the most cost effective on roadways with higher traffic volumes. This should not imply that safety enhancements on lower traffic volume roadways are not to be considered. Even relatively low-cost incremental safety enhancements can significantly reduce accident frequency and/or severity.

Based on the results of the safety analysis, consider a Road Safety Audit as appropriate. See PDDM Section 8.4.6.

Basic Safety Improvements

Basic safety improvements included in RRR projects are:

1. Establish appropriate clear zone
2. Maintain consistency in geometric design features and speed between adjacent sections of the roadway.
3. Install pavement markings to meet current standards.

4. Replace all deficient signing and sign posts to meet current standards. Replace all non-breakaway sign supports within the clear zone.
5. Eliminate pavement edge drop-off.
6. Assess all existing barriers and document project decisions and actions. See PDDM Section 9.4.4.

Other considerations:

1. Within the clear zone established for the project, remediate roadside hazards and provide a recoverable foreslope (see PDDM Section 9.4.4). Document any exceptions.
2. As much as practical, improve deficient sight distances and safety-related roadway geometric elements that are not performing in a satisfactory manner (see PDDM Section 9.4.3).
3. Typically on RRR projects, consider additional targeted safety improvements, such as installing enhanced traffic control devices and guidance, (EX: rumble strips, rumble stripes, fluorescent sign sheeting), flattening roadsides so guardrail can be removed, installing guardrail at potentially hazardous locations, improving roadsides beyond the clear zone, selectively improving geometry and sight distances, and improving private and public access points.

Very Low-Volume Local Roads (ADT≤400)

The AASHTO *Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤400)* (VLVLR) may be used in lieu of the Green Book for designing local or collector roads that fit the criteria. The VLVLR is applicable for roads that are 1) primarily used by familiar drivers, and 2) design average daily traffic volume of 400 or less.

Data to Obtain

Refer to Table 3 in the Appendix for information on specific data to gather. See PDDM Section 4.3.2. For all projects perform a site inspection. See PDDM Section 4.3.3.

Level of Safety Analysis

For projects designed according to the VLVLR, changes to roadway or roadside geometrics are generally recommended only when there is a documentable site-specific safety problem. The level of safety design analysis will be more limited, addressing demonstrated critical safety issues using a risk assessment approach. Consider crash data, skid marks or roadside damage, and concerns raised by locals to assess site-specific safety problems. For projects with a changed alignment, assess the predicted operating speeds along the new alignment to check if any locations are a safety concern. See PDDM Section 9.3.1.13.

Basic Safety Improvements

Basic safety improvements included in projects designed according to VLVLR are:

1. Maintain consistency in geometric design features and speed between adjacent sections of the roadway.
2. Replace pavement markings to meet current standards.
3. Replace deficient signing to meet current standards.
4. Eliminate pavement edge drop-off.

Other considerations:

1. When determined by a risk assessment approach, improve roadway geometric elements above minimum standards to address a demonstrated safety issue (PDDM Section 9.3).
2. Improve deficient sight distances if needed to meet the VLVLR standards.
3. When determined by a risk assessment approach, improve the roadside safety conditions and/or provide roadside safety hardware to meet current standards, including bridge railing, guardrail barriers and terminals, bridge-rail to guardrail connections and sign support breakaway hardware within the clear zone. Evaluate and document any exceptions of existing barriers to current standards.

Pavement Preservation

CFL Pavement Preservation Safety Guidelines

The pavement preservation safety guidelines include five items: edge drop-off, pavement markings, rumble strips, signing, and guardrail. The guidelines for these five items vary according to the type of pavement preservation performed on the project: pavement treatments that raise the profile grade, as is the case for asphalt overlays, and those that do not change the profile grade of the road, as in the case of chips seals, slurry seals and crack-filling.

For Pavement Preservation projects raising the roadway profile less than one inch:

Edge Drop-off: Note locations where the edge drop-off is in excess of 2 inches and report to owners (park) staff.

Pavement Markings. Replace existing pavement markings in conformance with the MUTCD. Pavement markings may be modified provided the improvements comply with the requirements of the MUTCD.

Modifications may include changes in marking materials such as epoxy or addition of stop bars, or other approved markings.

Shoulder and Centerline Rumble Strips. Replace all shoulder and centerline rumble strips after completion of resurfacing if impacted by the project.

Signing. When the owner does not have an on-going sign replacement program, or specifically requests it, replace all existing standard regulatory and warning sign panels. Upgrade sign panel legends to meet current MUTCD standards.

Guardrail. Note sections of deficient guardrail and report to owner's staff. Deficiencies include top of rail in excess of 3 inches below design height and damage caused by impacts.

For Pavement Preservation projects that raise the roadway profile one inch or greater:

Edge Drop-off. Eliminate all edge drop offs by applying shoulder material.

Pavement Markings. Replace existing pavement markings in conformance with the MUTCD. Pavement markings may be modified provided the improvements comply with the requirements of the MUTCD.

Modifications may include changes in marking materials such as epoxy or addition of stop bars, or other approved markings.

Shoulder and Centerline Rumble Strips. Replace all existing shoulder and centerline rumble strips.

Signing. When the owner does not have an on-going sign replacement program, or specifically requests it, replace all existing standard regulatory and warning sign panels. Upgrade sign panel legends to meet current MUTCD standards.

Existing signs are tabulated in the RIP data for each park and this list may be included in the scoping visit to verify and tabulate sign panel replacement.

Guardrail. Measure the final height of all existing w-beam guardrail. Guardrail that is below the standard design height may be adjusted to bring the appurtenance into conformance using the following recommended actions:

- Raise crashworthy guardrail to the design height when the resurfacing will result in a final height in excess of three inches below the design height.

- When height adjustment is required, replace non-crashworthy end terminals with crashworthy end terminals and correct deficiencies that compromise the function of the guardrail.

- When the existing guardrail is not crashworthy (pre-w-beam designs) and requires adjustment, replace with a crashworthy guardrail and end terminals.

ERFO projects

The ERFO Program is intended to help pay the unusually heavy expenses associated with the repair and reconstruction of Federal roads and bridges seriously damaged by a natural disaster over a wide area or catastrophic failure. Restoration in-kind to pre-disaster conditions is expected to be the predominate type of repair. (ERFO Manual Chapter 1)

Data to Obtain

Refer to Table 4 in the Appendix for information on specific data to gather.

Level of Safety Analysis

Analyze crash data as appropriate. Review any specific areas involving high accident frequencies and recommend corrective measures where appropriate.

Basic Safety Improvements

Basic safety improvements included in ERFO projects are:

1. Maintain consistency in geometric design features and speed between adjacent sections of the roadway.

Typically only damaged features are recommended to be repaired as follows:

- Damaged signs or non-crashworthy sign posts within the clear zone should be replaced according to the MUTCD.
- Damaged traffic barriers should be replaced according to the RDG or the FLH Barrier Guide as applicable.

Appendix

[Tables]

Table 1: 4R Project Data

Information	How to Obtain Information	Responsible Party / Comments
Determine Existing Geometric Conditions		
Lane, shoulder, foreslope, ditch widths	• Use digital aerial photos or RIP data to get rough estimates • As-built plans • Field measurements (LaserAce®, measuring tape, wheel, etc) • Survey data	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements • Coordinates with PM and CFT to determine appropriate level of survey
Curve radii, curve lengths, tangent lengths	• Use digital aerial photos or RIP data to get rough estimates • As-built plans • Field measurements (LaserAce®, measuring tape, etc) • Survey data	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements • Coordinates with PM and CFT to determine appropriate level of survey
Superelevation rates, transition lengths	• Field measurements (LaserAce®, measuring tape, etc) • As-built plans • Survey data	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements • Coordinates with PM and CFT to determine appropriate level of survey
Vertical curve rates, lengths, grades	• As-built plans • Field measurements (LaserAce®, measuring tape, etc) • Survey data	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements • Coordinates with PM and CFT to determine appropriate level of survey

Information	How to Obtain Information	Responsible Party / Comments
Intersection geometry, turn lanes, tapers	• Use digital aerial photos or RIP data to get rough estimates • Field measurements (LaserAce®, measuring tape, wheel, etc) • As-built plans • Survey data	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements • Coordinates with PM and CFT to determine appropriate level of survey
Approach roads, spacing, grades, widths	• Use digital aerial photos or RIP data to get rough estimates • Field measurements (LaserAce®, measuring tape, wheel, etc) • As-built plans • Survey data	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements • Coordinates with PM and CFT to determine appropriate level of survey
Determine Existing Safety Conditions		
Crash data and documented safety issues	• Research existing databases (such as NPS or county data) • During field reconnaissance, look for skid marks, evidence of run-off road incidents, roadside shrines, tree scars	Safety Engineer • Provides available crash summary for NPS projects and provides analysis for all appropriate projects Lead Designer • Look for any indications of undocumented crashes
Side slope ratios, recoverable/clear widths	• Use digital aerial photos or RIP data to get rough estimates • Field measurements (LaserAce®, measuring tape, etc) • As-built plans • Survey data	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements • Coordinates with PM and CFT to determine appropriate level of survey
Roadway and intersection sight distances	• Use digital aerial photos or RIP data to get rough estimates • Field reconnaissance	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements • Coordinates with PM and CFT to determine appropriate level of survey

Information	How to Obtain Information	Responsible Party / Comments
Roadside obstacles, culverts ends, non-breakaway devices, hazard trees	• Field reconnaissance	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements • Coordinates with PM and Safety on identifying existing safety issues
Barrier and Bridge rails, terminals, transitions	• Use digital aerial photos or RIP data to get rough estimates • Field reconnaissance	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements • Coordinates with PM and Safety on identifying existing safety issues
Existing signs and pavement markings	• Use digital aerial photos or RIP data to get rough estimates • Field reconnaissance	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements • Coordinates with PM and CFT to determine appropriate level of survey • Coordinates with PM and Safety on identifying existing safety issues
Determine Existing Operational Conditions		
Design level traffic data	• TBD*	TBD*
Posted speeds, operating speeds and changes	• Field reconnaissance	Lead Designer • Documents field measurements
Bicycles and pedestrians, path crossings	• Field reconnaissance	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements

Information	How to Obtain Information	Responsible Party / Comments
Design inconsistencies, unexpected features	• Use digital aerial photos or RIP data to get rough estimates • Field reconnaissance	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements • Coordinates with PM and Safety on identifying existing safety issues
Other items, including conflicts, access turn movements, congestion	• Use digital aerial photos or RIP data to get rough estimates • Field reconnaissance	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements • Coordinates with PM and Safety on identifying existing safety issues

* There is no specific CFL procedure for the collection of traffic data at this time.

Table 2: RRR Project Data

For some RRR projects, new survey/mapping data may not be needed, especially projects with limited scope or need for template control. The PM, in coordination with the CFT, decides on level of survey to acquire for RRR projects.

For RRR projects with survey information available, the collection of data during scoping and preliminary design is similar to a 4R project. The table below assumes no survey/mapping information is available for the project.

Information	How to Obtain Information	Responsible Party / Comments
Determine Existing Geometric Conditions		
Lane, shoulder, foreslope, ditch widths	• Use digital aerial photos or RIP data to get rough estimates • As-built plans • Field measurements (LaserAce®, measuring tape, wheel, etc)	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements
Curve radii, curve lengths, tangent lengths	• Use digital aerial photos or RIP data to get rough estimates • As-built plans • Field measurements (GPS, etc)	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements
Superelevation rates, transition lengths	Basic information: • Observe the comfort level of the existing curves as they are driven at the posted speeds • Discuss and review any problem areas with local maintenance representatives For identified problem areas: • Determine existing superelevation in the field (LaserAce®, survey data, etc)	Lead Designer • Documents field observations and discussions
Vertical curve rates, lengths, grades	• Use digital aerial photos or RIP data to get rough estimates • As-built plans	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans)

Information	How to Obtain Information	Responsible Party / Comments
Intersection geometry, turn lanes, tapers	• Use digital aerial photos or RIP data to get rough estimates • Field measurements (LaserAce®, measuring tape, wheel, etc) • As-built plans	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements
Approach roads, spacing, grades, widths	• Use digital aerial photos or RIP data to get rough estimates • Field measurements (LaserAce®, measuring tape, wheel, etc) • As-built plans	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements
Determine Existing Safety Conditions		
Crash data and documented safety issues	• Research existing databases (such as NPS or county data) • During field reconnaissance, look for skid marks, evidence of run-off road incidents, roadside shrines, tree scars	• Crash data: Safety Engineer • Provides available crash summary for NPS projects and provides analysis for all appropriate projects • • Indications of undocumented crashes: Lead Designer in coordination with CFT
Side slope ratios, recoverable/clear widths	• Use digital aerial photos or RIP data to get rough estimates • Visual assessment • Field measurements (LaserAce®, measuring tape, etc) for identified problem areas • As-built plans	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements
Roadway and intersection sight distances	• Use digital aerial photos or RIP data to get rough estimates • Field measurements (LaserAce®, etc)	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements
Roadside obstacles, culverts ends, non-breakaway devices, hazard trees	• Field reconnaissance	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans)

Information	How to Obtain Information	Responsible Party / Comments
		• Documents field measurements • Coordinates with PM and Safety on identifying existing safety issues
Barrier and Bridge rails, terminals, transitions	• Use digital aerial photos or RIP data to get rough estimates • Field reconnaissance	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements • Coordinates with PM and Safety on identifying existing safety issues
Existing signs and pavement markings	• Use digital aerial photos or RIP data to get rough estimates • Field reconnaissance	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements • Coordinates with PM and CFT to determine appropriate level of survey • Coordinates with PM and Safety on identifying existing safety issues
Determine Existing Operational Conditions		
Design level traffic data	• TBD*	TBD*
Posted speeds, operating speeds and changes	• Field reconnaissance	Lead Designer • Documents field measurements
Bicycles and pedestrians, path crossings	• Field reconnaissance	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements
Design inconsistencies, unexpected features	• Use digital aerial photos or RIP data to get rough estimates • Field reconnaissance	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements • Coordinates with PM and Safety on identifying existing safety issues

Information	How to Obtain Information	Responsible Party / Comments
Other items, including conflicts, access turn movements, congestion	• Use digital aerial photos or RIP data to get rough estimates • Field reconnaissance	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements • Coordinates with PM and Safety on identifying existing safety issues

* There is no specific CFL procedure for the collection of traffic data at this time.

Table 3: Very-Low Volume Local Road Project Data

Information	How to Obtain Information	Responsible Party
Determine Existing Geometric Conditions		
Lane, shoulder, foreslope, ditch widths	• If the project using the VLVLR is a 4R project, follow the guidelines in Table 1 • If the project using the VLVLR is a 3R project, follow the guidelines in Table 2	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements • Coordinates with PM and CFT to determine appropriate level of survey
Curve radii, curve lengths, tangent lengths		
Superelevation rates, transition lengths		
Vertical curve rates, lengths, grades		
Intersection geometry, turn lanes, tapers		
Approach roads, spacing, grades, widths		
Determine Existing Safety Conditions		
Crash data and documented safety issues	• Research existing databases (such as NPS or county data) • During field reconnaissance, look for skid marks, evidence of run-off road incidents, roadside shrines, tree scars	Safety Engineer Crash data: Provides available crash summary for NPS projects and provides analysis for all appropriate projects • Indications of undocumented crashes: Lead Designer in coordination with CFT
Side slope ratios, recoverable/clear widths	• If the project using the VLVLR is a 4R project, follow the guidelines in Table 1 • If the project using the VLVLR is a 3R project, follow the guidelines in Table 2	Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements • Coordinates with PM and CFT to determine appropriate level of survey • Coordinates with PM and Safety on identifying existing safety issues
Roadway and intersection sight distances		
Roadside obstacles, culverts ends, non-breakaway devices, hazard trees		
Barrier and Bridge rails, terminals, transitions		Lead Designer • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Documents field measurements
Existing signs and pavement markings		

Information	How to Obtain Information	Responsible Party
Determine Existing Operational Conditions		
Design level traffic data	• TBD*	• TBD*
Posted speeds, operating speeds and changes	• If the project using the VLVLR is a 4R project, follow the guidelines in Table 1 • If the project using the VLVLR is a 3R project, follow the guidelines in Table 2	Lead Designer • Documents field measurements • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Coordinates with PM and Safety on identifying existing safety issues
Bicycles and pedestrians, path crossings		
Design inconsistencies, unexpected features		
Other items, including conflicts, access turn movements, congestion		

* There is no specific CFL procedure for the collection of traffic data at this time.

Table 4: ERFO Project Data

Information	How to Obtain Information	Responsible Party / Comments
Determine Existing Geometric Conditions		
Lane, shoulder, foreslope, ditch widths Curve radii, curve lengths, tangent lengths Superelevation rates, transition lengths Vertical curve rates, lengths, grades Other items as applicable: Intersection geometry, turn lanes, tapers, Approach roads, spacing, grades, widths	• Use digital aerial photos or RIP data to get rough estimates • Visual assessment • Field measurements (LaserAce®, measuring tape, etc) for identified problem areas • As-built plans	Lead Designer • Documents field measurements and observations • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Coordinates with PM and Safety on identifying existing safety issues
Determine Existing Safety Conditions		
Crash data and documented safety issues	• Research existing databases (such as NPS or county data)	• Safety Engineer Provides available crash summary for NPS projects and provides analysis for all appropriate projects • Provides data to CFT
Side slope ratios, recoverable/clear widths Roadway and intersection sight distances Roadside obstacles, culverts ends, non-breakaway devices, hazard trees Barrier and Bridge rails, terminals, transitions Existing signs and pavement markings	• Use digital aerial photos or RIP data to get rough estimates • Visual assessment • Field measurements (LaserAce®, measuring tape, etc) for identified problem areas • As-built plans	Lead Designer • Documents field measurements and observations • Gathers data from available information (e.g. photos, RIP data, as-built plans) • Coordinates with PM and Safety on identifying existing safety issues
Determine Existing Operational Conditions		
Design level traffic data	• TBD*	TBD*
Posted speeds, operating speeds and changes	• Field reconnaissance	Lead Designer • Documents field observations

* There is no specific CFL procedure for the collection of traffic data at this time.

Table 5: Basic Safety Improvements by Project Type

	Meet Full Standards (Document Exceptions) *(See note 2)*	Replace Pavement Markings	Replace Deficient Signing	Eliminate Pavement Edge Drop-off	Upgrade Guardrail and Bridge Rail to Current Standards	Improve Roadside	Improve sight distance	Other types of safety enhancements, such as rumble strips, minor realignments, superelevation correction, etc	Maintain consistency in geometric design features and speed between adjacent sections of roadway	Re-establish pre-disaster conditions
4R	x	x	x	x	x	x	x	As needed by site-specific analysis	x	
RRR		x	x	x	*(See note 2)*	As much as practical		As needed by site-specific analysis	x	
Very Low-Volume Local Roads (ADT ≤400)	*(See note 4)*	x	x	x	*(See Notes 2 and 3)*	*(See note 3)*	*(See note 4)*	As needed by site-specific analysis	x	
ERFO			*(See Note 5)*		*(See Note 5)*				x	x

Note:

(1) For all projects, provide targeted, cost-effective safety improvements that respect the context of the roadway.
(2) Assess existing barrier any document project decisions and actions.
(3) Use a risk-assessment approach. See VLVLR.
(4) Meet VLVLR standards.
(5) Replace according to current standards if damaged during disaster.