

Asset Management by a Performance-Based Practical Design (PBPD) System Preservation Approach

- Why a System Preservation Approach?
- What is Asset Management by PBPD and what does it mean for the Department?
- FDM Asset Management revisions
- Summary
- Questions



What this training is:

- A high-level overview of the asset management concept.
- A discussion of FDM updates to chapters 3, 11 and 13 that support the asset management concept.



What this training is not:

- An in-depth discussion of safety analysis.
 - Safety Certification Process (SCP) training and the Interactive Highway Safety Design Model (IHSDM) Training will be offered separately.
- An in-depth discussion of the BOSCD or other documents.
- A complete discussion of all FDM updates related to Asset Management.
 - Other functional areas are in the process of developing supporting documentation where necessary.



Why a System Preservation Approach?

- Incorporating a Performance Based Practical Design approach to system preservation will allow us to be much more efficient with our transportation dollars.
- The result will be an overall improvement in system health.



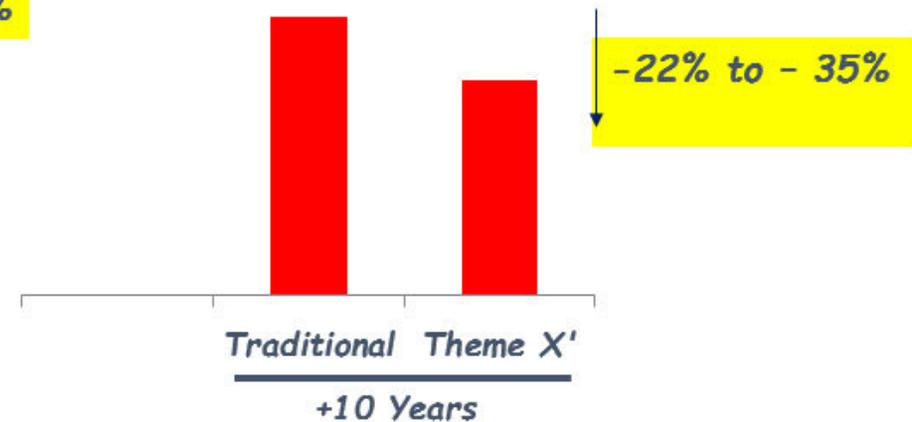
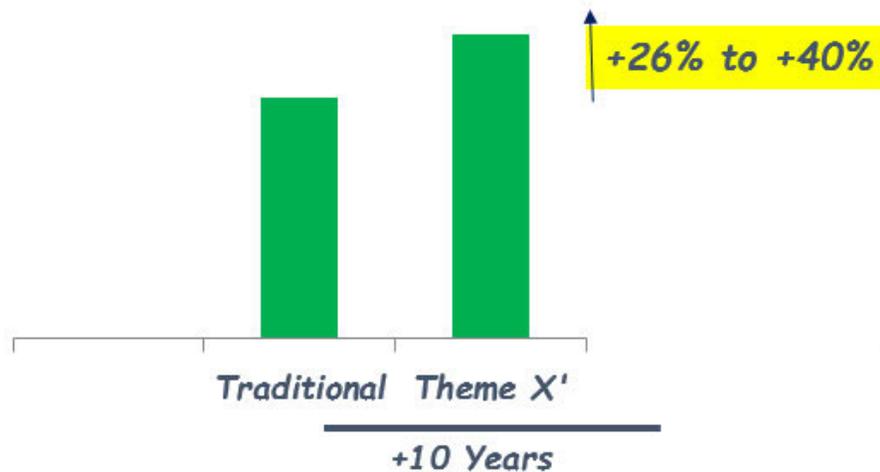
Resulting Pavement Conditions...

(Data Only for Illustrative Purposes)



Pavements "Fair And Above"

Pavements "Poor Or Worse"

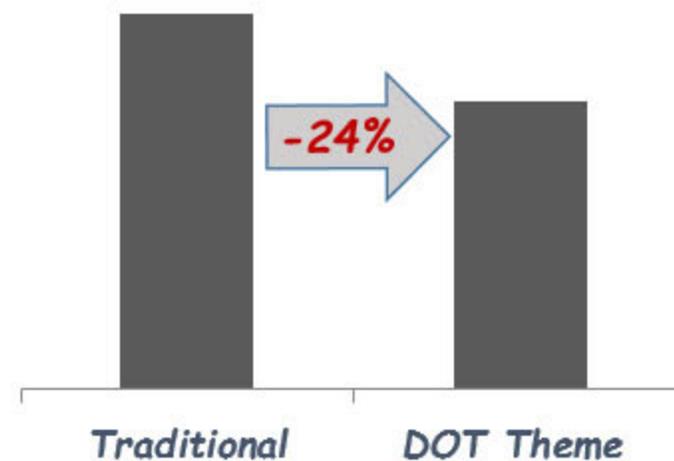
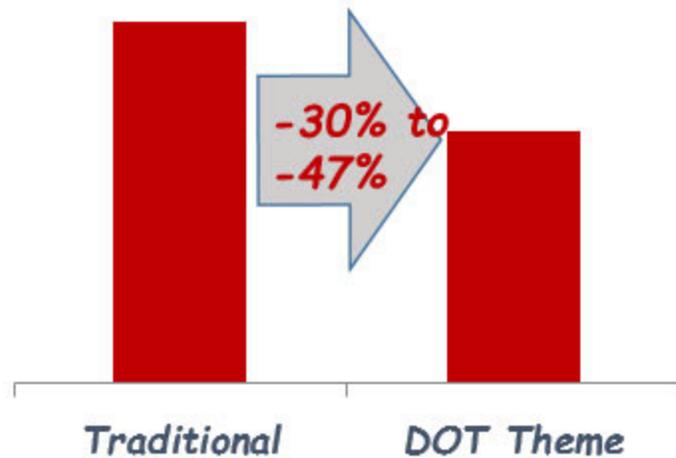


Unmet Highway Need Backlog...

(Data Only for Illustrative Purposes)

Backlog Miles In 10-years

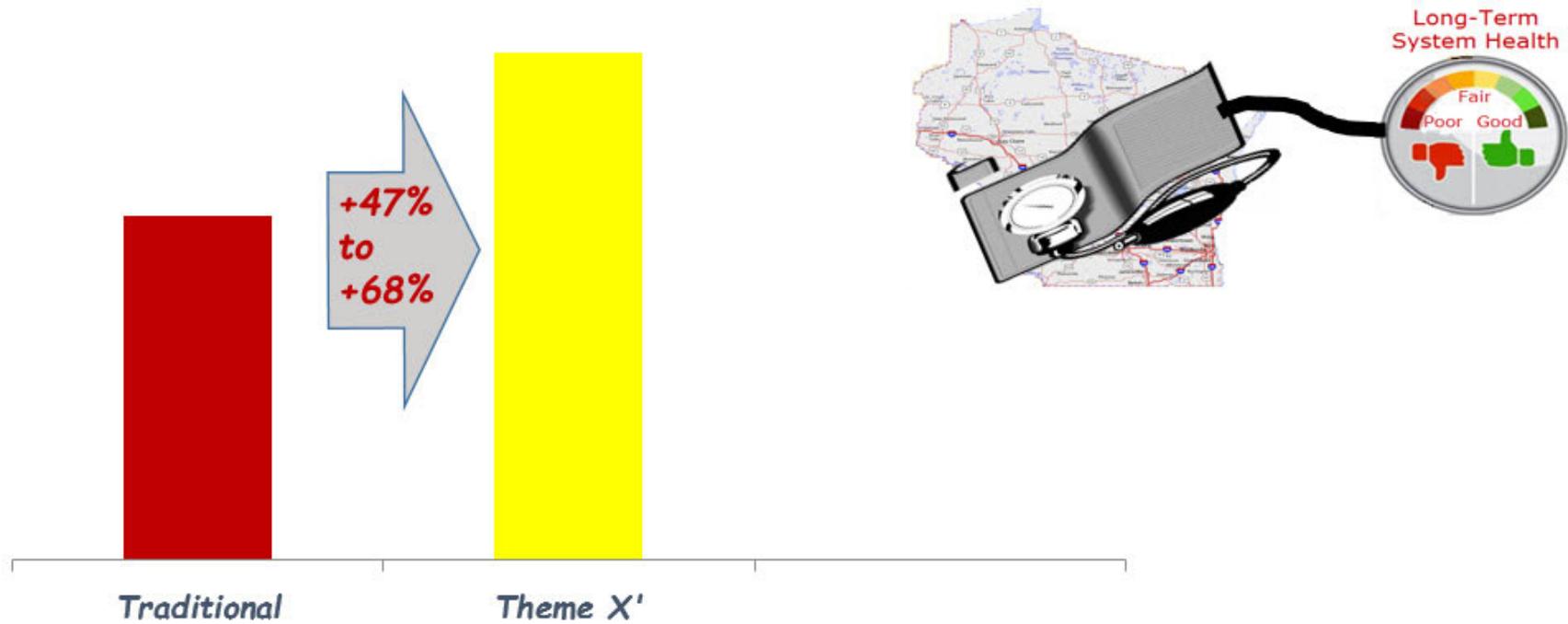
Cost To Fix Backlog



Resulting Highway Life-Years Added...

(Data Only for Illustrative Purposes)

Life Mile Years Added



Why a System Preservation Approach?

- WisDOT has the obligation to operate in a financially sustainable manner to address needs on the whole system.
- DTIM uses the theme to determine the funding level for each program and region based on pavement condition, safety and operational needs.
- DTSD determines projects purpose and need based on analysis of those factors to maintain thematic compliance.



System Preservation Approach

- Better to have a greater number of “good” projects vs. a fewer number of “ideal” projects.
- Net result is more serious problem areas are treated through prioritization of safety needs.
- Will result in an overall safety improvement of the State transportation system assets.
- Other states have utilized similar processes and experienced overall safety improvement results.



Asset Management

- Definition of an asset:
“If you own it and spend public dollars to maintain it, improve it, or replace it; it’s an asset that needs to be managed”
- How each State DOT decides to manage those assets is a fundamental core responsibility.
- WisDOT will manage transportation assets based on safety evaluation and analysis.



Asset Management

- The term “Asset Management” may be new, but in practice is something the Department was already doing.
- The former WisDOT approach could most closely be called “Practical Design.”
- The difference is how those assets will be managed moving forward.
- WisDOT will use Performance-Based Practical Design (PBPD) as an asset management tool.



Performance-Based Practical Design

- Breaks from the traditional design approach by “fixing only what is broken”.
- Limits items in projects to those that address a specific purpose and need.
- Uses data to drive the decision making process.
- Relies on substantive safety instead of nominal safety when selecting proposed roadway features to improve.



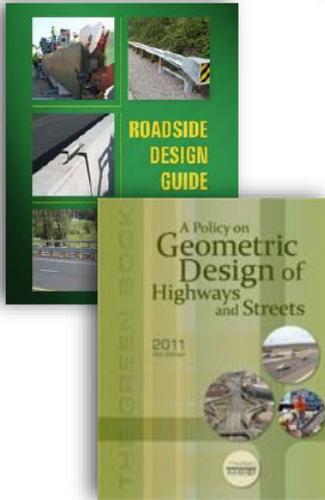
Substantive Safety vs. Nominal Safety

Approaches for Considering Safety

Nominal
Safety

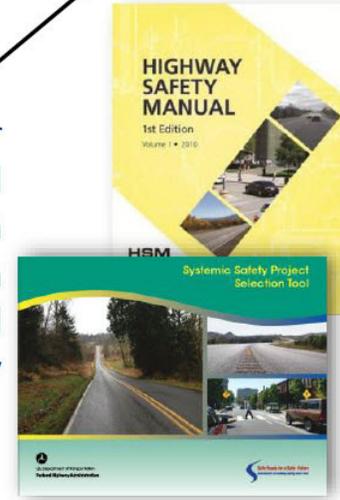
Substantive
Safety

Source: AASHTO



Examined in reference to compliance with standards, warrants, guidelines and sanctioned design procedures

Source: AASHTO



The actual or expected performance in terms of crash frequency and severity

*Adapted from Ezra Hauer, ITE Traffic Safety Toolbox Introduction, 1999

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FHWA PowerPoint (Every Day Counts) "Data-Driven Safety Analysis –Nominal vs. Substantive Safety" by John McFadden, P.E.

Substantive Safety vs. Nominal Safety

- Substantive Safety – relies on tools like Meta-Manager and the Highway Safety Manual (HSM) to perform actual and predictive crash analysis of proposed roadway features.
- Nominal Safety – Assumes if you utilize standard values published in reference resources like the “Green Book” and the Roadside Design Guide, your roadway will be “safe”.



History of Design Standards

Hwy Design Standards in the U.S.

Initially, AASHO's Committee on Standards confined itself to disseminating information on design to its members, but in 1928 it proposed that the Association adopt "standards of practice" to guide the member States in technical matters in which some uniformity from State to State was urgently needed. As a result, on March 1, 1928, AASHO approved its first four standards which read as follows:

- That wherever practicable shoulders along the edges of pavements shall have a standard width of not less than 8 feet.
- That on pavements 10 feet shall be considered as the standard width for each traffic lane.
- That the crown of a two-lane concrete pavement shall be 1 inch.
- That no part of a concrete pavement shall have a thickness of less than 6 inches, and that all unsupported edges shall be strengthened. (6)



FHWA PowerPoint (Every Day Counts) "Data-Driven Safety Analysis –Nominal vs. Substantive Safety" by John McFadden, P.E.

Standards vs. Analysis?

- WisDOT will move from a Standards based organization to an Analysis based organization.
 - We will no longer use a “cook book” approach that starts with desirable design values.
 - Solutions will be specifically designed for individual situations to focus on meeting projects specific purpose and need.



Old Methodology vs. New Methodology

- Old Methodology:
 - Application of Standards applied everywhere along the corridor, regardless of whether or not a safety or operational problem exists.
 - Results are vast overtreatment of the majority of highways at a greater cost.
- New Methodology:
 - By focusing geometric improvements at problem areas or “Sites of Promise”, dollars can be stretched to more projects, making improvement in overall safety on a systemwide basis.



Nationwide Application

The EDC Data-Driven Safety Analysis Initiative...

- Goal: Integrate **safety performance** into ALL highway investment decisions



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Nationwide Application

- Other states have implemented this methodology with positive results dating back to 2006.
- States experienced overall increased safety across their highway system.
- Enabled those States to deliver a greater number of projects and treat a greater number of roadway miles.



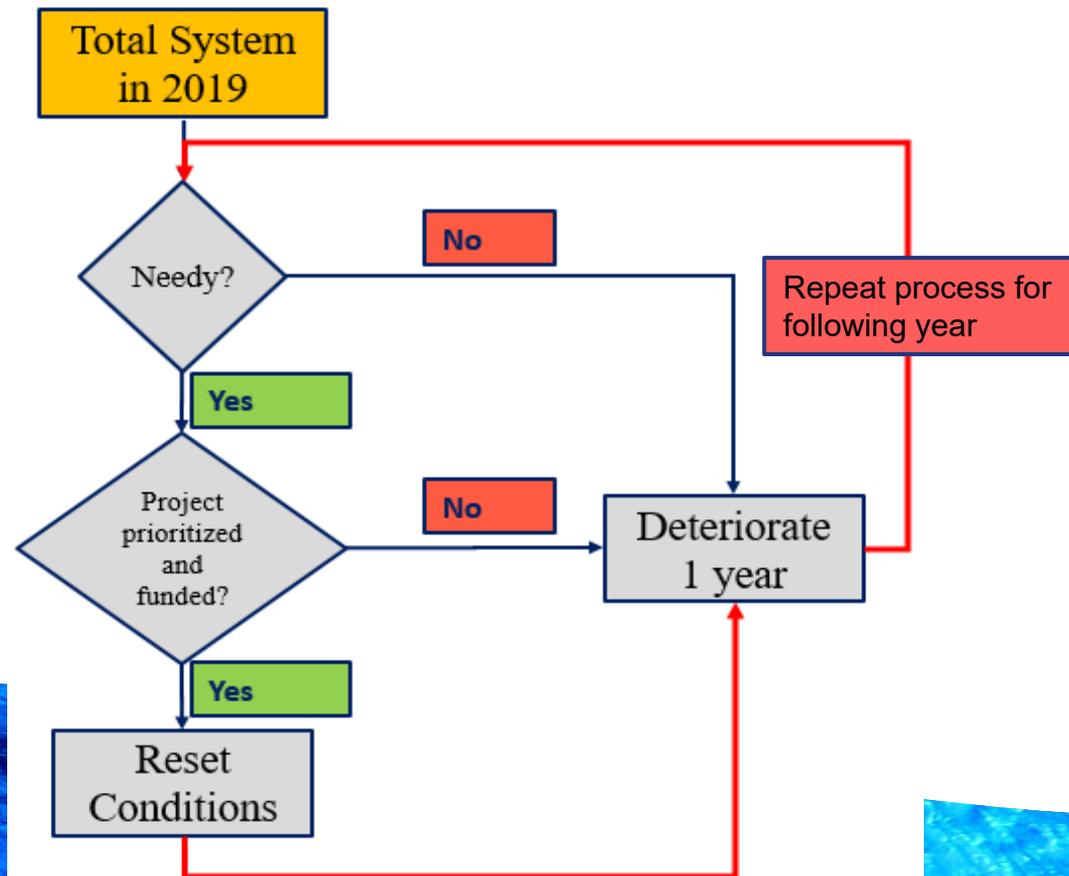
WisDOT Application

- WisDOT will rely heavily on safety as the metric to evaluate performance of the system.
- Created a new Safety Certification Process (SCP)
 - Applied to all projects in 303 subprogram.
 - Uses Meta-Manager and the Highway Safety Manual (HSM) as the primary tools in crash evaluations.
 - Produces a Safety Certification Document (SCD) that includes specific improvement recommendations during preliminary scoping.

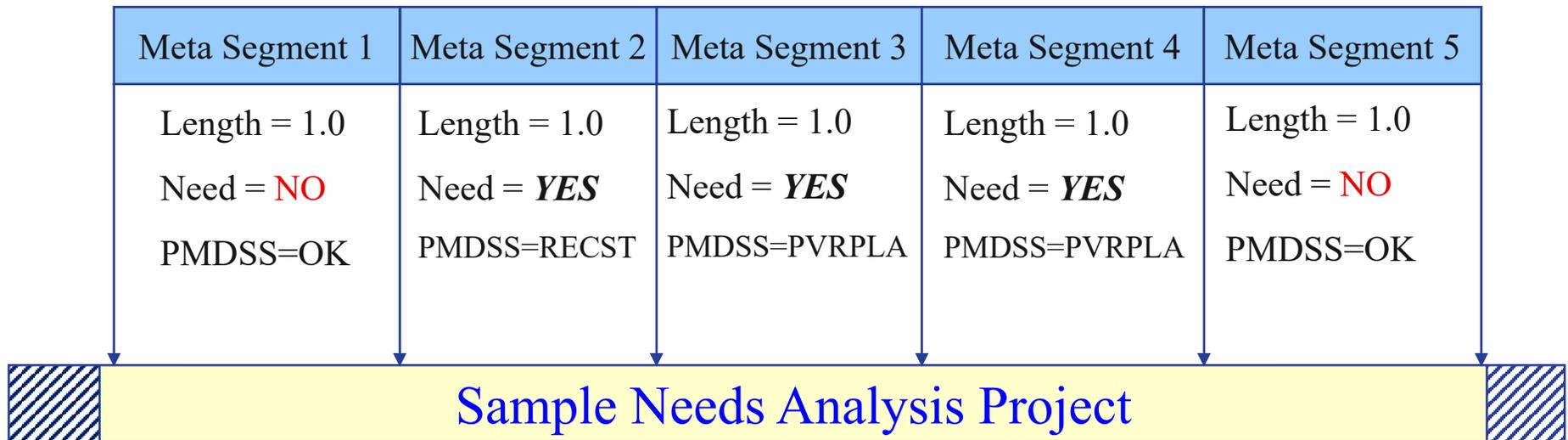


Meta-Manager Process

- Needs analysis conducted to identify projects.
 - Projects are included only when “Need” is $\geq 50\%$ for project.
 - Existing condition, age and expected future condition are evaluated.



Meta-Manager Pavement Process



- Project segment needs determined.
 - Pavement treatments are determined for segments.
 - Select lowest level treatment that undertreats no more than 30% of needs analysis project.
 - PVRPLA undertreats 20% of needs analysis project (1.0 mi/5.0 mi = 20%).



Meta-Manager Crash Process

- Split STN into segments that represent changes in pavement, project and traffic.
 - Place the crashes on the segments using the crash locations.
 - Group roadway segments using characteristics about the segments:
 - Function (Interstate, expressway, principle arterial, etc.)
 - Speed
 - Traffic
 - Number of lanes
 - Divided vs. Undivided
- Calculate rates for total crashes, KAB crashes and KAB injuries, per HMVMT, for each segment.



Meta-Manager Crash Process

- Calculate crash proportions for run off the road (ROR), Intersection and Driver related crashes. Also calculate crash rates for spots along the roadway.
- Make above calculations for each group. This is the baseline.
- Calculate upper control limit (UCL) for each Meta segment, based on group baseline and segment exposure.
- Calculate a benefit-cost ratio (B/C) for each segment based on severity and number of crashes.
 - FIIPS scheduled cost and concept data.
 - Economic cost of crashes (NSC).
 - Photo log add on tool (SSA mapping tool).



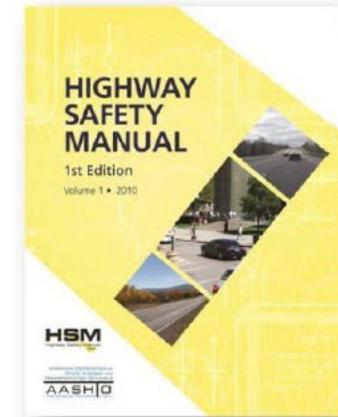
Meta-Manager Crash Process

- Compare Crash Types to corresponding UCL.
 - Overall Crash rate $>$ UCL \rightarrow Rate Flag triggered
 - KAB Crash rate $>$ UCL \rightarrow Rate Flag triggered
 - KAB injury rate $>$ UCL \rightarrow Rate Flag triggered
- If No Rate Flags triggered?
 - Project has no safety issues.
- If Rate Flag triggered?
 - If ROR Crash proportion $>$ UCL \rightarrow Flag triggered (Engineering problem)
 - If Intersection Crash proportion $>$ UCL \rightarrow Flag triggered (Engineering problem)
 - If Driver Crash proportion $>$ UCL \rightarrow Flag triggered (Speed/Alcohol problem)
 - Crash data given to State Patrol for use in MACH system.
 - If Rate Flag without a proportion Flag \rightarrow Further Eng. Review



What is the HSM?

- A tool that applies an **evidence-based** technical approach to safety
- Provides reliable **estimates** of an existing or proposed roadway's **expected safety performance**.
- Helps agencies **quantify** the **safety impacts** of transportation decisions, similar to the way agencies quantify:
 - traffic growth
 - environmental impacts
 - traffic operations
 - pavement life
 - construction costs



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Safety Certification Process

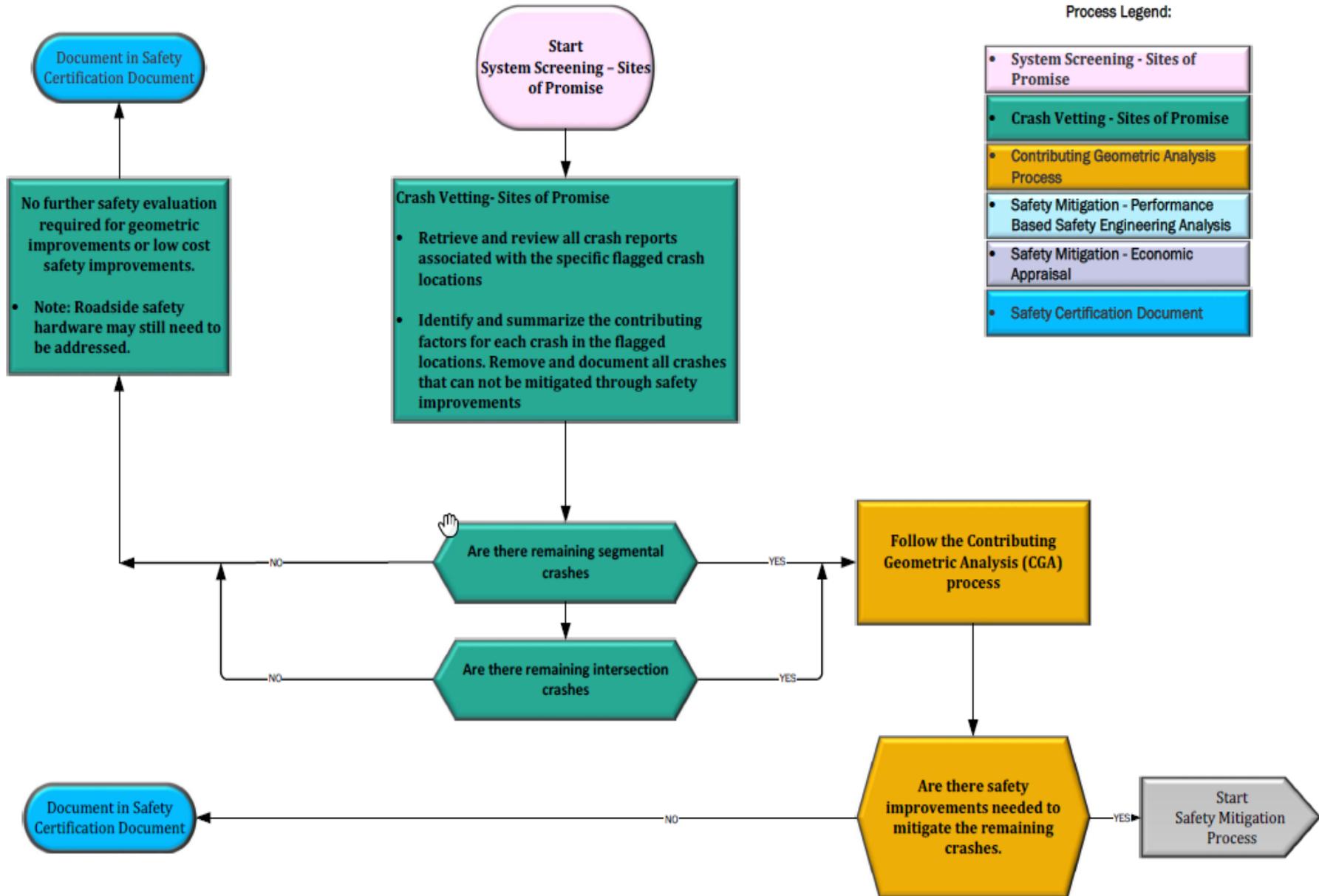
- Safety Screening Analysis (SSA) renamed to Controlling Geometric Analysis (CGA).
 - SCP Incorporates CGA.
 - SCP process → Meta-Manger + CGA + HSM
- Selects appropriate Improvement Strategies for projects (FDM 3-5).
 - Perpetuation
 - Rehabilitation
 - Modernization



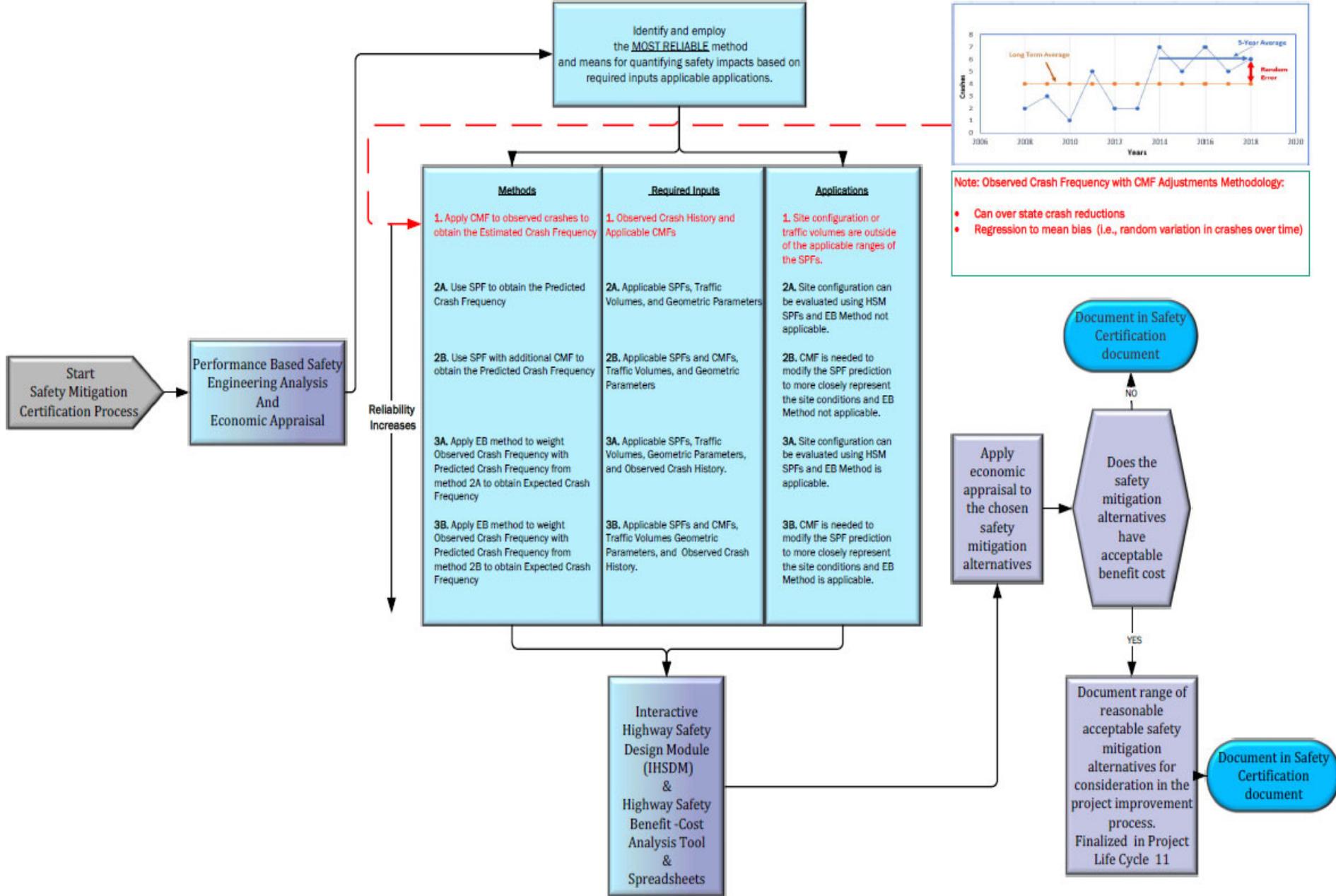
Safety Certification Process Flowchart

Process Legend:

- System Screening - Sites of Promise
- Crash Vetting - Sites of Promise
- Contributing Geometric Analysis Process
- Safety Mitigation - Performance Based Safety Engineering Analysis
- Safety Mitigation - Economic Appraisal
- Safety Certification Document



Safety Certification Process Flowchart



FDM Asset Management revisions

- Revisions in FDM Chapters 3, 11 and 13 are BPD responsibility.
- Urgency was required to complete asset management implementation changes to the FDM.
- As a result there may be some inconsistencies in the FDM but we believe that the overall process is clear.
- We are aware of some of these discrepancies and will address them in the next submittal of the FDM.
- Please report discrepancies to program controls or oversight staff and they will be evaluated and revised as necessary.



FDM 3-1 Revisions – Process Overview

- Reduced phases from 7 to 4 and renamed them.
- Renamed early milestones.
- Created Safety Certification (FDM 11-38) & Structure Certification (FDM 11-35) phase deliverables.
- Created Final Scope Certification (FSC) Approval Milestone (FDM 11-4-3).
- Reorganized which phase deliverables are associated with FIIPS Life Cycle snapshots.



FDM 3-1 Revisions – Process Overview

Facilities Development Process

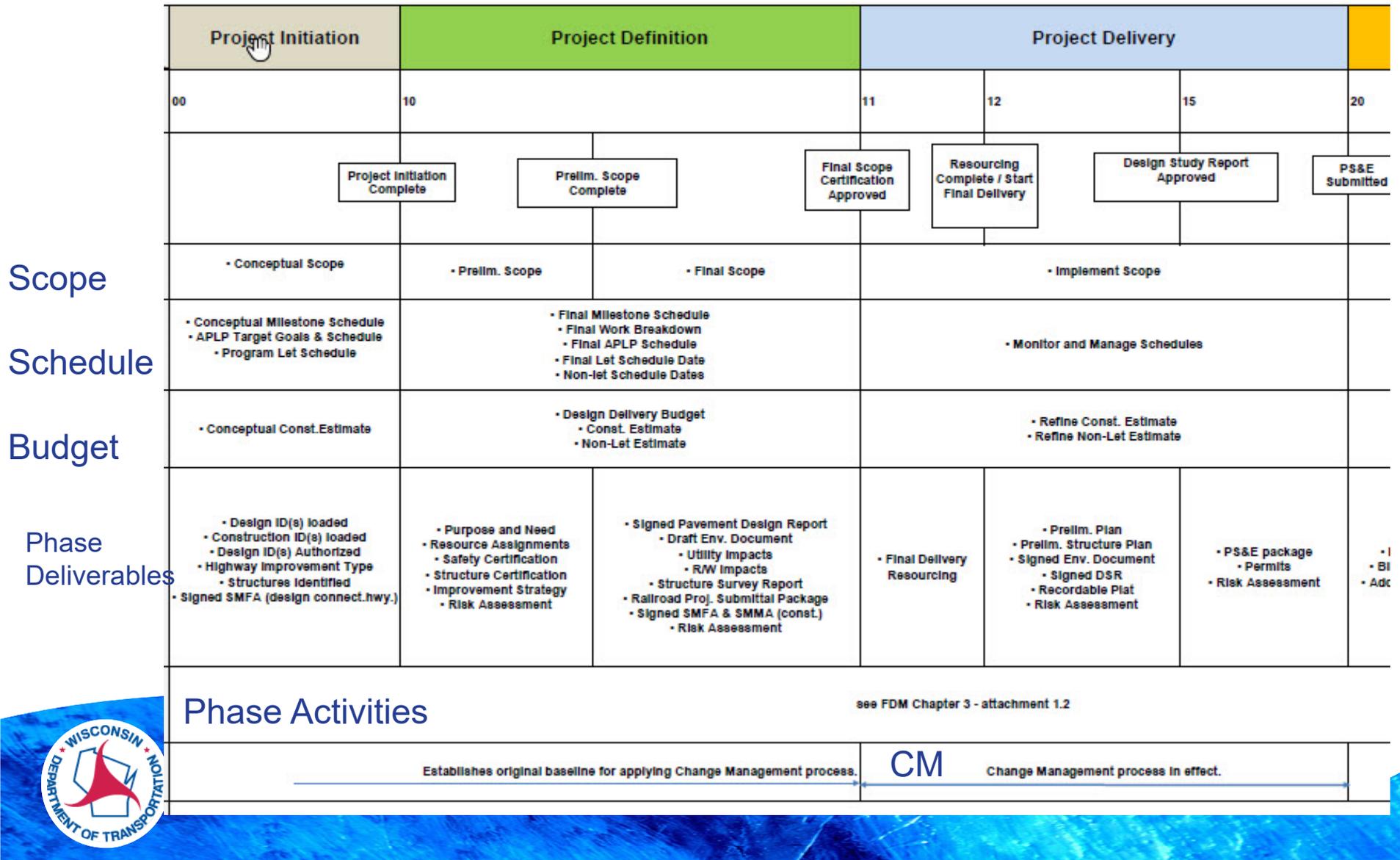
Phase Names			Project Initiation	Project Definition		Project Delivery			Project Proposal Execution		
Phase Elements			00	10		11	12	15	20	40	
Life Cycle (Construction ID)											
Milestone			Project Initiation Complete	Prelim. Scope Complete	Final Scope Certification Approved	Resourcing Complete / Start Final Delivery	Design Study Report Approved	P&E Submitted	Project LET	Project Award	
Deliverables <small>(Deliverables listed may have been started in a previous phase but must be completed prior to advancing to the next phase)</small>	Project Management Plan	Scope	• Conceptual Scope	• Prelim. Scope	• Final Scope	• Implement Scope					
		Schedule	• Conceptual Milestone Schedule • APLP Target Goals & Schedule • Program Let Schedule	• Final Milestone Schedule • Final Work Breakdown • Final APLP Schedule • Final Let Schedule Date • Non-let Schedule Dates			• Monitor and Manage Schedules				
		Budget	• Conceptual Const. Estimate	• Design Delivery Budget • Const. Estimate • Non-Let Estimate			• Refine Const. Estimate • Refine Non-Let Estimate				
	Phase Deliverables		<ul style="list-style-type: none"> • Design ID(s) loaded • Construction ID(s) loaded • Design ID(s) Authorized • Highway Improvement Type • Structures Identified • Signed SMFA (design connect.hwy.) 	<ul style="list-style-type: none"> • Purpose and Need • Resource Assignments • Safety Certification • Structure Certification • Improvement Strategy • Risk Assessment 	<ul style="list-style-type: none"> • Signed Pavement Design Report • Draft Env. Document • Utility Impacts • RW Impacts • Structure Survey Report • Railroad Proj. Submittal Package • Signed SMFA & SMMA (const.) • Risk Assessment 	• Final Delivery Resourcing	<ul style="list-style-type: none"> • Prelim. Plan • Prelim. Structure Plan • Signed Env. Document • Signed DSR • Recordable Plat • Risk Assessment 	<ul style="list-style-type: none"> • P&E package • Permits • Risk Assessment 	<ul style="list-style-type: none"> • Plan Revisions • Bid Advertisement • Addenda (if required) 	• Bid Review	<ul style="list-style-type: none"> • Design ID Closed • Design Files Archived
Phase Activities			see FDM Chapter 3 - attachment 1.2								
Change Management			Establishes original baseline for applying Change Management process.				Change Management process in effect.				
Link to Performance Measures											

updated 7/22/2018



FDM 3-1 Revisions – Process Overview

Facilities Development Process



FDM 3-1 Revisions – Process Overview

Facilities Development Process

Phase Names		Project Initiation	Project Definition			Project Delivery			Project Proposal Excution	
Phase Elements		00	10	11	12	15	20	40		
Life Cycle (Construction ID)		00	10	11	12	15	20	40		
Milestone			Project Initiation Complete	Prelim. Scope Complete	Final Scope Certification Approved	Resourcing Complete/ Start Final Delivery	Design Study Report Approved	PS&E Submitted	Project LET	Project Award
Program Year		7-8	6	4					0	
Performance Measures	Based on Program Year snapshot	Program Loaded On-Time (PLOT)			Delivery Risk (LC11 - LC15)					
	Based on comparison of Program Year cost estimates	Program On-Budget at Scoping (POBS)								
	Based on Program Year snapshot	Program Scoped On-Time at Scoping (PSOT)								
	Based on comparison of Life Cycle cost estimates				Program On-Budget at Let (POBL)					
	Based on comparison of Life Cycle Let schedule dates				Delivery On-Time (DOT) Delivery On-Budget (DOB)					
	Based on snapshot at quarterly PS&E date							★ Achieving TSS Milestones Ad w/ Holds		
	Based on comparison of Life Cycle cost estimate to contractor bid							★ Engineering Estimate Accuracy		
	Based on monthly snapshot									
	Based on annual snapshot								★ Engineering Delivery Cost Index (EDCI)	



FDM 3-5 Revisions – Improvement Concepts

- Discuss requirements for projects incorporated into improvement strategies, application of standards, and included in specific sections of FDM.
- Streamlined FDM section 3-5-5 - Federally Funded Preventive Maintenance Projects.
 - WisDOT/FHWA Agreement remains unchanged.



FDM 3-5 Revisions – Improvement Concepts

- Improvement Strategies:
 - Added to categorize “like” Improvement Concept Codes defined in PMM 5-10-5.
 - Use Improvement Strategies names to streamline FDM documentation.
 - Allows for modification (add new or delete existing) Improvement Concept Codes without need to update FDM documentation.



FDM 3-5 Revisions – Improvement Concepts

- Improvement Strategies:
 - Perpetuation projects
 - Preserve the existing assets and utilize the existing facilities, staying within the existing subgrade shoulder points or curb and gutter.
 - Rehabilitation projects
 - Preserve the existing assets and utilize as much of the geometry of existing facilities as practical. Minimal work outside the exiting horizontal or vertical footprint may be necessary based on safety issues.
 - Modernization projects
 - Construction could be on a new horizontal alignment, vertical alignment or where roadway through travel lane(s) did not previously exist, or replacing or constructing a new bridge.



FDM 11-1 Revisions – General

- Reorganized to define source of WisDOT standards.
 - Source of standards unchanged (minor edits).
- Discuss Asset Management by Practical Design System Preservation Approach.
 - PBPD updated to include WisDOT Asset Management philosophy.
- Defines Application of Standards.
- Created FDM Attachment 11-1-10.1.



FDM 11-1 Revisions – General

FDM Attachment 11-1-10.1

Improvement Strategies	Improvement Type	Improvement Concept Code	Improvement Concept Definition	From PMM 5-10-5				Geometrics			Roadside		
				Safety Certification Documentation Required?	Standard Application	Alignments (Horizontal and Vertical)	Cross Section Revisions (e.g. outside of existing shoulder subgrade points)? [6]	Evaluate bike & ped (outside of ADA curb ramps)? [1]	Improve Curb Ramps? [1]	Potential for R/W Acquisition (other than ADA needs)	Encroachment Report Required?	Apply Safety Improvements? (FDM 11-38, Attachment 4.2)	
Perpetuation	Preservation / Restoration	PSRS10 PSRS20 PSRS30 PSRS40	PRESERVATION / RESTORATION - preservation/restoration treatments may address cracks, joints and surface imperfections, seal and protect the road surface, improve friction and/or remove and apply a minimal riding surface (code varies by treatment type)	No (based on service life)	S-1	Existing	No	No	Based on improvement concept defined as alteration [4]	No	No	No	
Perpetuation	Resurfacing	RSRF10 RSRF20 RSRF30 COLD10 COLD20	RESURFACING - placing a new surface on an existing roadway to provide a better all-weather surface, a better riding surface, and to extend or renew the pavement life (code varies by thickness of resurface.) Cold-in-place recycling when applicable.	Yes	S-1	Existing	No	No	Yes	No	No	Yes	
Perpetuation	Bridge Rehabilitation	BRRHB	BRIDGE REHABILITATION - the preservation or restoration of the structural integrity of an existing bridge as well as work to correct safety defects.	Yes	S-1	Existing	No	No	Yes	No	No	Yes	
Rehabilitation	Reconditioning	RCND10 RCND20	RECONDITIONING - work in addition to resurfacing. Minor reconditioning (10) includes intersection work, pavement widening and/or shoulder paving. Major reconditioning (20) includes improvement of an isolated grade, curve, intersection or sight distance problem to improve safety.	Yes	S-1/S-2[7]	Existing with minor realignment or improvements based on safety certification document	Yes, S-2 areas only	See FDM 11-46	Yes	Yes [3]	Yes [5]	Yes	
Rehabilitation	Pavement Replacement	PVRPLA PVRP_O COLD30	PAVEMENT REPLACEMENT - structural improvement of the pavement structure or removal of the total thickness of all paving layers from an existing roadway and providing a new paved surface without changing the subgrade. PVRP_O includes operational improvements. Full depth Cold-in-place recycling where applicable	Yes	S-1/S-2[7]	Existing with minor improvements based on safety certification document	Yes, S-2 areas only	See FDM 11-46	Yes	Yes [3]	Yes [5]	Yes	
Rehabilitation	Bridge Replacement	BRELIM BRRPLE BRRPL	BRIDGE ELIMINATION, BRIDGE REPLACEMENT EXPANSION & BRIDGE REPLACEMENT PRESERVATION - the building of a new bridge to replace an existing bridge.	Yes	S-1/S-2[7]	Existing with minor improvements based on safety certification document	Yes, S-2 areas only	See FDM 11-46	Yes	No	Yes [5]	Yes	
Modernization	Reconstruction	RECST BRNEW	RECONSTRUCTION EXPANSION & NEW BRIDGE - total rebuilding of an existing highway to improve maintainability, safety, geometrics and traffic service.	Yes	S-2	Realignment generally necessary. Utilize as much of existing alignments as practical. Make improvements based on safety certification document.	Yes	Yes [2]	Yes	Yes	Yes	Yes	
Modernization	Expansion	RECSTE BRNEW	RECONSTRUCTION EXPANSION & NEW BRIDGE - includes the same types of work associated with reconstruction, but also involves the construction of additional through travel lanes or new structures.	S-3 Application - see appropriate FDM chapters and other resources									

FDM 11-1 Revisions – General

From PMM 5-10-5			
Improvement Strategies	Improvement Type	Improvement Concept Code	Improvement Concept Definition
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Perpetuation

Rehabilitation

Modernization

Geometrics				Roadside				
Safety Certification Documentation Required?	Standard Application	Alignments (Horizontal and Vertical)	Cross Section Revisions (e.g. outside of existing shoulder subgrade points)? [6]	Evaluate bike & ped (outside of ADA curb ramps)? [1]	Improve Curb Ramps? [1]	Potential for R/W Acquisition (other than ADA needs)	Encroachment Report Required?	Apply Safety Improvements? (FDM 11-38, Attachment 4.2)
No (based on service life)	S-1	Existing	No	No	Based on improvement concept defined as alteration [4]	No	No	No
Yes	S-1	Existing	No	No	Yes	No	No	Yes
Yes	S-1	Existing	No	No	Yes	No	No	Yes
Yes	S-1/S-2[7]	Existing with minor realignment or improvements based on safety certification document	Yes, S-2 areas only	See FDM 11-46	Yes	Yes [3]	Yes [5]	Yes
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Yes	S-1/S-2[7]	Existing with minor improvements based on safety certification document	Yes, S-2 areas only	See FDM 11-46	Yes	No	Yes [5]	Yes
Yes	S-2	Realignment generally necessary. Utilize as much of existing alignments as practical. Make improvements based on safety certification document.	Yes	Yes [2]	Yes	Yes	Yes	Yes
S-3 Application - see appropriate FDM chapters and other resources								



FDM 11-1 Revisions – General

- Application of Standards broken into 3 levels based on results of SCP and Purpose and Need:
 - S-1: If no discernable safety issues are present, restore existing highway features to satisfy Purpose and Need (Perpetuation).
 - S-2: Design portions of the project that do not have discernable safety issues to use S-1 application. As a starting point, use lower end of the design standard ranges for the features contributing to safety issues (Rehabilitation, Modernization-Reconstruction).
 - S-3: Use upper end of the design standard ranges as a starting point. Apply performance-based practical design principles to pick design features that satisfy the projects Purpose and Need (Modernization-Expansion).





Break Time



FDM 11-3 Revisions - Community Sensitive Design

- Incorporated Asset Management Principles and Aesthetic Funding law changes.
 - All projects should apply a CSD approach.
 - Public Involvement approach may vary based on improvement type (Perpetuation vs. Rehabilitation vs. Modernization).
 - Design Criteria flexibility and its safety performance is evaluated in Safety Certification and Scoping phases.
 - Evaluate add-on work (i.e. Utilities) and/or aesthetic treatments if requested by Locals/Public based on improvement type and project scope.
 - Add-on work and aesthetics outside of project scope may need to wait for future projects and/or be funded by Locals.



FDM 11-3 Revisions - Community Sensitive Design

- Design Criteria flexibility is not only available to soften Environmental impacts, but also to control project costs based on project improvement type and safety performance.
- Aesthetic treatments may be discussed with the Locals/Public with the level of implementation evaluated based on:
 - Project improvement type scope.
 - Funding by Locals, outside of those determined to be mitigation as part of the Environmental Process.



FDM 11-3 Revisions - Community Sensitive Design

- Financial Analysis spreadsheets are to be developed to account for Local Add-on and Aesthetic costs.
- 11-3-5 Decision Making Steps – revised to incorporate Asset Management Safety Certification/Scoping Process Tools.



FDM 11-4 Revisions - Design Reports

- Section 11-4-3 added on Final Scope Certification.
- 11-4-10 Design Study Report (DSR) content changes:
 - Revised concurrence process for Local Program projects and FHWA Oversight project Exceptions to Standards approvals.
 - New DSR formats created for Asset Management Projects (Perpetuation, Rehabilitation & Modernization).
 - Existing DSR formats (PM, Abbreviated, 3R & New Construction) remain for projects scoped prior to application of Asset Management.
 - Asset Management DSR formats build off of SCD and FSCD documentation to reduce duplication of information.
 - Added guidance on the use of New DSR formats.
 - Exception to Standards section/reports (ESR) removed and replaced with DSR Design Justifications (DJs).



FDM 11-4 Revisions - Design Justifications

- Replaces Exceptions to Standards Reports (ESRs)
- DJ section added to DSR with two Sub-sections:
 - Controlling Criteria (Formerly stand-alone ESR).
 - Non-Controlling Criteria (Formerly justified in DSR).
- DJs approved based on Improvement Type:
 - Perpetuation (S-1) DSR – Region approves, BPD Engineer concurs.
 - DJ not required, no crash problems.
 - DSR section for describing Safety Mitigation Measures.



FDM 11-4 Revisions - Design Justifications

- Rehabilitation (S-2) DSR – Region approves, BPD Chief concurs.
 - DJ required where crash problems exist and S-2 criteria cannot be justified because of unacceptable benefit/cost and/or impacts.
- Modernization DSR – Region approves, BPD Chief concurs.
 - Reconstruction (S-2) – DJ required for same reasons as Rehabilitation (S-2).
 - Reconstruction-Expansion (S-3) (New Construction) – DJ required when use of Modernization Criteria cannot be justified because of unacceptable benefit/cost and/or impacts.



FDM 11-10 Revisions - Design Controls

- Revised Design Criteria guidance and tables to be compatible with the Asset Management Process.
- Added guidance on selection of design criteria values.
 - Includes use of information from the Safety Certification Document (SCD) and Final Scoping Document (FSD).
- Added guidance as to what values, or where within a range of values, to select design criteria based on project improvement type:
 - Perpetuation (S-1 application)
 - Rehabilitation (S-1 & S-2 application)
 - Modernization (S-2 & S-3 application)
- Revised design criteria tables to be compatible with this selection process including labelling of upper/lower values and/or ranges.



FDM 11-10 Revisions - Design Controls

Maximum Super-elevation Table Revisions Example for Perpetuation, Rehabilitation and Modernization

Areas of Application		e _{max}		
Highway Type	Work Type	Existing ^A	Design Upper ^B	Design Lower ^B
Interstate freeways	Modernization and bridge replacements (including approaches)	any	6%	6%
	Rehabilitation ^C	>8%	8%	6%
Non-interstate freeways	Rehabilitation ^C	<=8%	6%	6%
	Perpetuation ^F	any	Existing	Existing
Expressways				
Rural two-lane highways				
High-speed urban highways	Modernization and bridge replacements (including approaches) ^D	any	6%	4%
	Rehabilitation ^{C, D}	>6%	6%	4%
	Rehabilitation ^{C, D}	<=6%	4%	4%
	Perpetuation ^F	any	existing	existing
Transition highways	Modernization and bridge replacements (including approaches)	any	4%	4%
	Rehabilitation ^C	any	4%	2%
	Perpetuation ^F	any	existing	existing
Low-speed urban streets	Modernization and bridge replacements (including approaches) ^E	Any	4%	4%
	Rehabilitation ^{C, E}	any	4%	2%
	Perpetuation ^F	any	existing	existing



FDM 11-15 Revisions - Rural Modernization

- Only contains Design Criteria and Guidance for Rural Modernization Projects (Reconstruction & New Construction).
- Rural Perpetuation and Rehabilitation Design Criteria and Guidance moved to FDM 11-40.
- Interstate Modernization Design Criteria and Guidance moved from FDM 11-44 to FDM 11-15.
- Guidance provided on the selection of Design Criteria Values for Reconstruction (S-2) and New Construction (S-3) Projects and use of SCD/FSC results and DJs.
- Guidance and Tables revised to reflect ranges of values and where within the ranges to select values for Reconstruction versus New Construction Projects.



FDM 11-15 Revisions - Rural Modernization

Revised FDM 11-15 Rural Modernization Design Criteria Table

Traffic Volume			Roadway Width Dimensions ^{1,6}					Bridges ^{3,4}		
Design Class	Current ADT	Design ADT	Design Speed (mph) ²	Traveled Way Width Based On Design Speed (feet)		Shoulder Width (feet)	Roadway Width ³ Based On Design Speed (feet)		Min. Design Loading	Clear Roadway Width of Bridges
				50 mph or less	55 mph or greater		50 mph or less	55 mph or greater		
C1	0 - 400		40-60	20-24	22-24	2-4	24-32	26-32	⁵	26-30
C2	401 - 750	Under 1500	50-60	22-24	22-24	5-6	32-36	32-36	⁵	28-30
C3		1500-2000	50-60	22-24	24	6	34-36	36	⁵	32-34
		2000-3500	60		24	6		36	⁵	36
C4		Over 3500	60		24	8		40	⁵	40

Previous FDM 11-15 Rural Design Criteria Table

Traffic Volume			Roadway Width Dimensions ^{1,6}					Bridges ^{3,4}		
Design Class	Current ADT	Design ADT	Design Speed (mph) ²	Traveled Way Width Based On Design Speed (feet)		Shoulder Width (feet)	Roadway Width ³ Based On Design Speed (feet)		Min. Design Loading	Clear Roadway Width of Bridges
				50 mph or less	55 mph or greater		50 mph or less	55 mph or greater		
C1	0 - 400		60	22-24	22-24	2-4	26-32	26-32	⁵	26-30
			(40)	(20)	(24)					
C2	401 - 750	Under 1500	60	22-24	22-24	6	34-36	34-36	⁵	28-30
			(50)	(5)	(32)		(32)			
C3		1500-2000	60	24	24	6	36	36	⁵	32-34
		2000-3500	60	(22)	(34)					
C4		Over 3500	60		24	8		40	⁵	40



FDM 11-15 Revisions - Rural Modernization

New FDM 11-15 Interstate Modernization Design Criteria Table

INTERSTATE MODERNIZATION DESIGN CRITERIA

Number of Travel Lanes (Total Both Directions)		4-Lane	6-Lane or More
Sideslopes		4:1 or flatter (Recoverable) or 3:1 maximum (Traversable) with Recovery Area meeting FDM 11-15 Attachment 1.9	
Traffic Lanes	Widths	12 feet	12 feet
	Cross Slope	2%	2%
	Superelevation	6%maximum	6% maximum
Shoulders	Widths	10 feet Right ⁴ /4 feet Left	10 feet Right & Left ⁵
	Cross Slope	4%	4%
New and Replacement Bridges	Vertical Clearance	16 feet minimum. See FDM 11-35 Attachment 1.8	
	Roadway Width ¹	Full Approach Roadway Width except Major Long Span Structures shall provide 4-foot minimum from edge of traffic lanes to parapets ¹	
	Design Loading Structural Capacity ³	HL-93 (HS-20) minimum ³	HL-93 (HS-20) minimum ³
Bridges to Remain in Place	Lane Widths (Feet)	12 feet	12 feet
	Shoulder Widths (Feet)	10 feet Right/3.5 feet Left minimum except 3.5 feet Left & Right minimum for Major Long Span Structures	10 feet Right & Left minimum except 3.5 feet Left & Right minimum for Major Long Span Structures
Lateral Clearance ²		See FDM 11-15 Table 1.2 ²	
Roadside Design	Curb or Curb and Gutter	Barrier curbs shall not be used. Mountable curbs, when used, should be located at the outer edge of the shoulder. Also, where guardrail is used, the face of the curb should be flush with the face of guardrail or behind it.	
	Clear Zone Widths and Fixed Objects	FDM 11-15 Attachment 1.9 and the AASHTO Roadside Design Guide should be used for guidance regarding warranted clear zone widths. Fixed Objects within the clear zone should be removed, made breakaway or made safe through shielding by a roadside barrier and/or crash cushion.	
	Median Inlets and Ditch Checks	Median inlets should have 6:1 or flatter traversable grates and 10:1 or flatter ditch checks.	
	Median and Maintenance Crossovers	Median/Maintenance Crossovers should be eliminated whenever possible, or constructed to have 10:1 or flatter side slopes.	
	Construction Crossovers	Removed after project completion unless they are planned to be used for future maintenance or other traffic control operations. Construction crossovers left-in-place should 10:1 or flatter side slopes and appropriate safety devices installed along their length to minimize the potential for median-crossing crashes and unauthorized U-turns.	
Traffic Control Devices/Signing		Shall be in conformance with the current Manual on Uniform Traffic Control Devices (MUTCD) and the Wisconsin Manual on Uniform Traffic Control Devices (WMUTCD).	
Access Control		Right-of-way fencing or other appropriate measures shall be incorporated into all Interstate projects to address any access control issues within the proposed project limits.	



FDM 11-20 Revisions - Urban Modernization

- Only contains Design Criteria and Guidance for Urban Modernization Projects (Reconstruction & New Construction).
- Urban Perpetuation and Rehabilitation Design Criteria and Guidance moved to FDM 11-40.
- Pedestrian and Bicycle Design Criteria moved solely to FDM 11-46 with only references to 11-46 in 11-20.
- Guidance provided on the selection of Design Criteria Values for Reconstruction (S-2) and New Construction (S-3) Projects and use of SCD/FSC results and DJs.
- Design Criteria Guidance and Tables revised to reflect ranges of values and where within the ranges to select values for Reconstruction versus New Construction Projects.



FDM 11-20 Revisions - Urban Modernization

FDM 11-20 Revised Urban Modernization Design Criteria Table

Functional Class	Design Year ADT Thresholds at Levels of Service C, D & E ¹				Design Basis	Roadway Criteria ⁹							
	Scenarios	C ² LOS 4.0 ADTs (DHVs)	D LOS 5.0 ADTs (DHVs)	Middle E LOS 5.5 ADTs (DHVs)		Urban Design Class [Design Speed] (mph) ³	Travel Lanes		Median Widths (feet)	Roadway (Face of Curb to Face of Curb) Width (feet) ⁴			
							No.	Lane Widths (feet) ⁵		No Parking ^{6,7}		Parking ^{6,7}	
										Range of Normal Widths ⁸	Range of Widths including Bike Accommodations/La nes	Range of Normal Widths ⁸	Range of Widths including Bike Accommodations/La nes
Locals	N/A	Low Volume Residential (0-250 ADT)			1a [20-25]	1	12	No	N/A	N/A	28	N/A	
		Volume not a consideration			1b [25-30(20)]	2	10-12 (9)	No	24-28 (22)	32-36 (30)	36-40 (32)	46-56 (44)	
Arterials and Collectors	N/A	≤ 4,500 ADT (660 DHV)			2a [30-45]	2	11-12 (10)	No	34-36 (24)	34-36 (32)	46-48 (34)	48-56 (46)	
	Worst Best	6,500(1086) 20,000 (2260)	7,500 (1170) 22,500 (2475)	8,000 (1216) 25,000 (2700)	2b [30-45]	2	11-12 (10)	No	34-36 (24)	34-36 (32)	46-48 (34)	48-56 (46)	
	Worst Best	16,000(1888) 41,000 (4100)	17,500 (2048) 47,000 (4610)	18,000 (2088) 50,500 (4900)	3 [30-45]	4	11-12 (10)	No	48-60 (44)	56-60 (52)	68-72 (54)	70-80 (66)	
	Worst Best	22,000 (2440) 41,500 (4110)	22,750 (2500) 47,000 (4610)	23,000 (2530) 51,000 (4950)	4 [30-45]	4	11-12 (10)	14-30 (6)	2 @ 26-28 (2 @ 24)	2 @ 30-32 (2 @ 28)	2 @ 36-38 (2 @ 29)	2 @ 37-42 (2 @ 35)	
Arterials	Worst Best	35,500 (3660) 68,000 (6390)	37,500 (3790) 76,000 (7070)	38,500 (3850) 81,500 (7580)	5 [30-45]	6	11-12 (10)	14-30 (6)	2 @ 36-40 (2 @34)	2 @ 41-44 (2 @ 38)	2 @ 47-50 (2 @ 39)	2 @ 48-54 (2 @ 45)	



FDM 11-25 Revisions – Intersections at Grade

- Added new subsection FDM 11-25-1.4.2 – OSOW for Perpetuation and Rehabilitation projects.
 - Projects with a pavement treatment service life ≥ 18 years will improve the roadway to accommodate OSOW vehicles on OSOW truck routes and wind-tower corridors.
 - Improvements to accommodate OSOW vehicles will not be required where S-1 standards are applied with a pavement treatment service life < 18 years.
 - Next project will address OSOW needs regardless of improvement project type or service life.
 - Goal is to prevent successive projects with pavement service treatment lives < 18 years not addressing OSOW needs on OSOW routes.



FDM 11-25 Revisions – Intersections at Grade

- OSOW improvement will be required at spot improvement locations on Rehabilitation projects where S-2 standards are applied regardless of the pavement treatment service life.
- Low-cost countermeasures are encouraged on the OSOW truck route for Perpetuation and Rehabilitation projects.
- For roadways where it is not practicable to accommodate OSOW trucks due to high cost or impacts, documentation in the DSR demonstrating the non-feasibility of this decision is required.
- Projects with a signed DSR dated prior to Jan 1, 2019 with OSOW accommodations will retain OSOW items as designed.



FDM 11-35 Revisions - Structures

- Structure Certification is REQUIRED before a project can move to LC11 and into the Project Delivery phase.
- Structure Certification includes:
 - Assigning a structures liaison.
 - Confirming primary structure improvement work concept.
 - Developing secondary structure improvement work.
 - Developing cost estimate for structures work.
 - Determining structure design resources (BOS or consultant).
- See Bridge Manual for more information.



FDM 11-38 – Safety Certification Process

- New FDM section containing Safety Certification Process (SCP) guidance and examples.
- First draft of SCP guidance has been developed and submitted to FHWA for review.
- Chapter contains guidance on:
 - Analysis of *Sites of Promise*
 - Crash vetting for the *Sites of Promise*
 - Contributing Geometric Analysis process (CGA)
 - The Safety Mitigation Certification process
 - The Safety Certification Document (SCD)
- Training for FDM 11-38 will be developed and offered on Oct. 29-30 in Madison and on Nov. 7-8 in Wis. Rapids.



FDM 11-40 Revisions – Perpetuation and Rehabilitation Projects for Highways

- Reorganized and renamed chapter.
 - General requirements
 - Perpetuation project design criteria
 - Rehabilitation project design criteria
 - Attachment 7.1 contains S-2 application design criteria
- 3R Interstate design criteria from FDM 11-44 moved to 11-40.
- 3R Cross-section elements for Rural Highways and Freeways moved from FDM 11-15 to 11-40.
- 3R Cross-section elements for Urban Highways moved from FDM 11-20 to 11-40.
- Chapter now contains perpetuation and rehabilitation project guidance for Interstate highways.



FDM 11-45 Revisions – Roadside Design

- Added new subsection FDM 11-45-4 – “Roadside Design Application for Perpetuation and Rehabilitation Improvements”.
 - Addresses existing guardrail hardware and Roadside Hazards Analysis on Perpetuation and Rehabilitation improvement projects.
 - Guidance only applies to existing guardrail condition, terminal ends and transitional connections to rigid barriers.
 - Does not apply to cable guard, curved beam guard, bullnoses, concrete barriers, crash cushions or sand barrel arrays.
 - Follows Asset Management methodology while applying existing FDM 11-45 guidance.
- Modernization improvements will follow existing guidance in FDM 11-45.



FDM 11-45 Revisions – Roadside Design

- Roadside Hazard Analysis (RHA) Requirements:
 - No RHA required for improvement projects with <18-year pavement treatment service life. Will re-evaluate with next improvement project.
 - Exceptions for 7 to 18-year pavement service life:
 - Regions may perform RHA at their discretion for projects using S-1 application.
 - Regions may perform RHA for isolated segments using S-2 application.
 - Perform RHA for pavement service life >18-years.
 - Refer to FDM 11-45-3 for additional RHA guidance.
 - Document decisions/justifications in DSR.



FDM 11-45 Revisions – Roadside Design

- Guardrail Hardware Treatment:
 - <18-year pavement service life:
 - Along S-1 application locations:
 - Replace/restore existing guardrail systems and/or hardware where deemed deficient by evaluation.
 - Replace existing non-EAT end treatments with EATs.
 - Replace unconnected or non-compliant beam guard transitions.
 - Follow end treatment grading process.
 - Along S-2 application locations:
 - Provide/replace beam guard where hardware life does not exceed pavement treatment life.
 - Replace existing non-EATs with EATs.
 - Replace unconnected or non-compliant beam guard transitions.
 - Incorporate full EAT grading where possible. Consider alternatives to reduce grading when necessary (length adjustment, b/c, etc.).



FDM 11-45 Revisions – Roadside Design

- 18-years or longer pavement service life:
 - Along S-1 and S-2 application locations:
 - Follow steps with aforementioned S-2 application for <18-year pavement service life.
 - Document decisions in DSR.
- Added new “Decision Tree” Attachment 4.1.
 - Flowchart used for existing beam guard, terminal ends and transitional connections to rigid barriers.



FDM 11-46 Revisions - Bicycle and Pedestrian Accommodations

- Added new subsection FDM 11-46-1.1.4 addressing asset management and curb ramp compliance.
 - Curb ramps required to be installed or updated on all 'Alteration' projects.
- Added new subsection FDM 11-46-1.1.5 addressing curb ramp compliance and R/W requirements.
 - Environmental document signed on or before Jan. 1, 2019.
 - R/W does not need to be acquired (FEE, TLE).
 - Curb Ramps upgraded to max. extent feasible within existing R/W.
 - Existing sidewalk to remain in-place.
 - Existing curb & gutter to remain in-place.



FDM 11-46 Revisions - Bicycle and Pedestrian Accommodations

- Environmental document signed after Jan. 1, 2019.
 - R/W needs to be acquired (FEE, TLE).
 - Curb Ramps upgraded to full compliance except where not feasible. Only extreme situations will allow non-compliance.
- Added new subsection FDM 11-46-1.1.6 addressing bikeways.
 - Bikeways will be repaired or resurfaced on projects where they are contiguous as part of the roadway.
 - Applies to Perpetuation, Rehabilitation and Modernization projects.
 - Multi-use trails will be handled via separate projects.



FDM 11-46 Revisions - Bicycle and Pedestrian Accommodations

- Added new subsection FDM 11-46-1.1.7 addressing sidewalks.
 - Pavement service life <18 years:
 - Perpetuation Projects:
 - Sidewalk improvements typically not part of perpetuation projects. Sidewalk will remain in-place.
 - Re-evaluate sidewalk treatment(s) with the next improvement project.
 - Rehabilitation Projects:
 - S-1 application locations will retain existing sidewalk.
 - S-2 application locations will have sidewalk improvements evaluated taking into consideration project scope, context and route continuity.



FDM 11-46 Revisions - Bicycle and Pedestrian Accommodations

- Pavement service life >18-years:
 - Rehabilitation Projects:
 - If necessary, existing sidewalk may be repaired or replaced.
 - If service life of sidewalk exceeds service life of pavement treatment, then retain existing sidewalk.
- Curb & Gutter improvements:
 - Pavement service life <18-years:
 - Existing curb & gutter to remain in-place.
 - Pavement service life >18-years:
 - If necessary, existing curb & gutter may be repaired or replaced.
 - If service life of curb & gutter exceeds service life of pavement treatment, then retain existing curb & gutter.



FDM 13 Revisions – Drainage

- Added New Subchapter in 13-1-30
“Culvert Replacement and Analysis for Perpetuation and Rehabilitation Projects”
 - Describes procedures for evaluating culverts for potential replacement during Perpetuation and Rehabilitation projects.
 - Emphasis is on replacing culverts only when the life of the culvert is less than the life of the proposed pavement treatment or if the structure has a known history of hydraulic issues.
 - Provides examples of observations that may indicate a culvert is hydraulically undersized.
 - Describes required pipe materials for Perpetuation and Rehabilitation project culverts.
 - Provides charts to confirm appropriate in place culvert size.



FDM 13 Revisions – Drainage

- Provides a procedure for replacing small culverts (< 48 inches) with the same sized culvert without significant hydrology or hydraulic analysis under strict conditions. Some of the conditions include:
 - Not a flowing waterway and/or floodplain.
 - Not in urban areas or areas with rolling terrain.
 - Not allowed for storm sewer.
 - Restriction on proximity to adjacent structures.
 - Restriction on proximity to valuable or unique resources
 - Culvert \geq existing, extensions \leq 10% of existing length.
 - ADT \leq 7,000.
 - Limits fill height to \leq 15 feet.



FDM 13 Revisions - Drainage

- Added new chapter 13-45 – “Culvert and Storm Sewer Rehabilitation and Replacement”.
 - Discusses methods for inspecting, repairing, rehabilitating and replacing culverts and storm sewer using various trenchless techniques.
 - Provides guidance on evaluation of pipe, cause of observed issues.
 - Discusses general trenchless design considerations and methods.
 - Discusses rehabilitation of pipes by slip-lining including:
 - Liner Hydraulics – Includes sample calculations
 - Physical and environmental constraints
 - Grouting, grout materials and prevention of flotation
 - Special lining applications such as box culverts or arches



FDM 13 Revisions - Drainage

- Provides an introduction to other trenchless methods inclusive of design guidance and restrictions.
- Methods include:
 - Invert paving
 - Cured in Place Pipe (CIPP)
 - Spray liners and centrifugally cast liners
 - Pipe Jacking, Pipe Ramming
 - Micro-tunneling
 - Pipe Swallowing/Pipe Crushing
 - Horizontal Direction Drilling



Summary

- Efficiency and System Health
- Safety Certification Process is added
- ESR is now Design Justification
- Process Chronology
- Resourcing



Questions

