PART 2, CHAPTER 3

ENGINEERING ANALYSIS

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ENGINEERING ANALYSIS

3.1 OVERVIEW

Pursuant to ***23 United States Code (U.S.C.) § 327*** and the implementing Memorandum of Understanding (MOU) executed on May 26, 2022, the Florida Department of Transportation (FDOT) has assumed and Federal Highway Administration (FHWA) has assigned its responsibilities under the ***National Environmental Policy Act (NEPA)*** for highway projects on the State Highway System (SHS) and Local Agency Program (LAP) projects off the SHS (***NEPA*** Assignment). In general, FDOT's assumption includes all highway projects in Florida which source of federal funding comes from FHWA or which constitute a federal action through FHWA. ***NEPA*** Assignment includes responsibility for environmental review, interagency consultation and other activities pertaining to the review or approval of ***NEPA*** actions. Consistent with law and the MOU, FDOT will be the Lead Federal Agency for highway projects with approval authority resting in the Office of Environmental Management (OEM).

3.1.1 Purpose

Engineering analysis builds upon the information developed and documented by FDOT during the Planning phase of a project. This chapter contains FDOT's procedure for engineering analyses to support development of general project location and design concepts during Project Development and Environment (PD&E) Studies. The engineering analysis defines project features essential to the assessment of project impacts on the social, cultural, natural, and physical environment while also seeking to balance the extent to which project needs are addressed to ensure project costs and environmental impacts are minimized. Further, the analysis establishes necessary design considerations to support progression of the project from concept to preliminary design and eventually to final design.

This chapter provides guidance on engineering analysis and considerations concerning evaluation of existing conditions, selection of design parameters, development of project alternatives, analysis of alternatives, selection of the preferred alternative(s), and documentation of engineering analyses.

During the identification and evaluation of the project alternatives, the Project Manager should continuously coordinate with the various offices within the District to promote collaboration between a multi-disciplinary team including engineers and environmental specialists throughout the project development process. Continual coordination is critical to the success of the project because it helps resolve and address project issues that may affect development of project alternatives. The Project Manager also has the responsibility of engaging project stakeholders and the public throughout the project development process.

3.1.2 Definitions

Air operations area (AOA)- A portion of an airport, specified in the airport security program, in which security measures specified in this part are carried out. This area includes aircraft movement areas, aircraft parking areas, loading ramps, and safety areas, for use by aircraft regulated under ***49 Code of Federal Regulations (CFR) Part 1544*** or ***Part 1546***, and any adjacent areas (such as general aviation areas) that are not separated by adequate security systems, measures, or procedures. This area does not include the secured area.

Alignment - Refers to both horizontal and vertical placement of a transportation facility. Horizontal alignment refers to the location of the transportation facility as described by curves and tangents. Vertical alignment refers to the vertical profile of the facility (i.e., below grade, at grade, or above grade).

Alternative - A potential transportation corridor, alignment, design feature, mode, or improvement under consideration that addresses the project's Purpose and Need.

Alternative Corridor Evaluation (ACE) - A study process used to identify and evaluate alternative corridors for the project with regard to transportation needs and environmental issues or concerns early in the project development process. This study links planning and the environmental review process. This process if described in ***Part 1, Chapter 4, Project Development Process***.

Bicycle Lane - A bicycle lane (bike lane) is a portion of a curbed roadway designated for the exclusive use of bicyclists.

Corridor - Any land area designated by the state, a county, or a municipality which is between two geographic points and which is used or suitable for the movement of people and goods by one or more modes of transportation.

Design Exception - Required when existing or proposed design elements do not meet the FDOT's governing criteria and the American Association of the State Highway and Transportation Officials' (AASHTO's) new construction criteria for Controlling Design Elements.

Design Variation - Required when existing or proposed design elements do not meet FDOT's criteria.

Express Lanes - A type of managed travel lane physically separated from general use lanes, or general toll lanes, within a roadway corridor. Express lanes use congestion pricing through electronic tolling in which toll amounts are set based on traffic conditions in the express lanes.

Final Design - Any design activities following preliminary design, expressly including the preparation of final construction plans and detailed specifications for the performance of construction work, final plans, final quantities, and final engineer's estimate for construction, also referred to as Plans Specifications & Estimates (PS&E).

Local Agency Program (LAP) – A program to establish consistent and uniform practices for authorizing local agencies to use federal-aid funds provided through FDOT.

Managed Lane - Highway facilities or sets of lanes within an existing highway facility where operational strategies are proactively implemented and managed in response to changing conditions with a combination of tools. These tools include access control, vehicle eligibility, variable pricing, or a combination thereof. Managed lanes can include express lanes, high occupancy vehicle (HOV) lanes, reversible lanes, truck-only toll lanes, and vehicle-restricted lanes.

No-Action (No-Build) Alternative - The option in which the proposed project activity would not take place. The No-Action (No-Build) alternative provides the baseline for establishing environmental impacts of the build alternatives.

Preferred Alternative - The preferred alternative for a federal project is the alternative that has been approved by the lead agency.

Preliminary Design - Defines the general project location and design concept. It includes but is not limited to: preliminary engineering and other activities and analyses, such as environmental assessments, topographic surveys, metes and bounds surveys, geotechnical investigations, hydrologic analysis, utility engineering, traffic studies, financial plans, revenue estimates, hazardous materials assessments, general estimates of the types and quantities of materials, and other work needed to establish parameters for the final design.

Preliminary Engineering Report (PER) - The engineering report that documents engineering analyses and decisions made during the PD&E Study. The ***PER*** contains preliminary design plans and design parameters that support advancing the project into the final Design phase.

Reasonable Alternatives [Term used in the Environmental Impact Statement (EIS) only] A reasonable range of alternatives that are technically and economically feasible, and meet the purpose and need for the proposed action.

Transportation Management Area (TMA) - All Urbanized Areas (UZAs) with population greater than 200,000 as determined by the most recent census.

Transportation Systems Management and Operations (TSM&O) – A set of strategies to manage traffic congestion and minimize other unpredictable causes of service disruption and delay to preserve the capacity and improve the security, safety, and reliability of the transportation system.

Viable Alternatives [Term used in Type 2 Categorical Exclusion (CE), Environmental Assessment (EA), and State Environmental Impact Report (SEIR) only] - Alternatives that address the purpose and need that can be designed and constructed from an engineering standpoint, if there is more than one alternative proposed.

Watershed Approach to Evaluating Regional Stormwater Solutions (WATERSS) – An approach for proactively looking for opportunities for innovative stormwater management projects with agencies and/or stakeholders. The ***WATERSS Process Guidebook*** contains the steps and documentation required to complete the WATERSS process.

3.2 PROCEDURE

This section describes the procedure for conducting engineering analysis during the PD&E phase. FDOT conducts engineering analyses consistent with the ***FDOT Design Manual (FDM), Topic No. 625-000-002***, and other manuals and procedures listed in ***Figure 3-1***. Engineering considerations for a project begin during the Planning phase where the project's purpose and need is defined, and continue throughout the PD&E process when conceptual and preliminary design plans are prepared. Engineering analysis and considerations include coordination with other FDOT offices within the Districts and Central Office, Federally Recognized Native American Tribes, agencies, the public, and the Lead Federal Agency as appropriate.

3.2.1 Level of Detail of Analysis

The level of detail for engineering analysis for a PD&E Study depends on the overall size and complexity of the project. It also depends on the Class of Action (COA) or type of Environmental Document for the project. Type 1 Categorical Exclusion (CE) and Non-Major State Action (NMSA) projects require a lesser level of analysis and do not require a PD&E Study. Type 2 CE, Environmental Assessment (EA), Environmental Impact Statement (EIS), and State Environmental Impact Report (SEIR) projects require a more detailed level of analysis and documentation. Regardless of the Environmental Document type, the engineering analyses must be performed to a level of detail that is sufficient to assess the effects of the alternative(s) on the social, economic, natural, cultural, and physical environment. In order to analyze multiple alternatives, the Project Manager must ensure that the alternatives are developed to the same level of detail.

A ***Preliminary Engineering Report (PER)*** is prepared to document the results of engineering analysis for a SEIR, Type 2 CE, EA, or EIS. See ***Section 3.2.10.2*** for an outline of the ***PER***. If the Design phase occurs concurrently with the PD&E phase, a ***PER*** may be scaled down to present the results supporting alternatives evaluation as other preliminary design information are documented in the Design Documentation for the project. See ***Part 1, Chapter 4, Project Development Process*** for guidance on completing PD&E and Design phases concurrently.

Bridge replacement PD&E Studies do not require preparation of a ***PER***, rather the preliminary engineering analysis results for these projects may be documented in the ***Bridge Development Report (BDR)*** or ***Bridge Replacement Report***.

3.2.2 Project Coordination

The PD&E Project Manager is responsible for timely coordination with other offices within the District and Central Office, as applicable, to ensure proper development and evaluation of project alternatives. A successful PD&E Study requires orderly and continuous coordination between planning, engineering, environmental, public involvement, and other staff from various offices.

If the project has federal involvement, the Project Manager must coordinate the project development efforts with OEM. Coordination with FDOT's Structures Design Office is required for special bridge structures such as moveable bridges, historic bridges, and signature bridges. Coordination with the US Coast Guard (USCG) and US Army Corps of Engineers (USACE) is also required for permitting purposes.

For projects that are in the vicinity of a public use or military airport, the Project Manager must coordinate with the Airspace and Land Use Manager in the Department Aviation Office as early as possible in the initial phases of the project.

Prior to making commitments, the Project Manager must coordinate with appropriate staff to ensure commitments are viable and are approved by the appropriate offices. ***Part 2, Chapter 22, Commitments*** and ***Procedure No. 650-000-003, Project Commitment Tracking***.

The following is a list of the various coordination efforts the Project Manager undertakes during the PD&E Study.

Planning

It is the responsibility of the Project Manager to request the existing and future traffic projections, turning movements, and traffic factors from the District Planning Office. See ***Part 1, Chapter 4, Project Development Process*** for guidance on re-using data from planning studies.

Projects involving Express Lanes or tolled lanes require coordination with the Systems Planning Office, the Traffic Engineering and Operations Office in Central Office, and the Florida Turnpike Enterprise (FTE).

The Project Manager should also coordinate with District Metropolitan Planning Organization (MPO)/Transportation Planning Organization (TPO) liaison for planning consistency requirements.

Traffic Operations

Projects involving Intelligent Transportation System (ITS) and TSM&O strategies require coordination with the Traffic Operations Office.

Roadway Design

Project alternatives must be reviewed for proper application of geometric design elements including design speed, typical section details, superelevation, horizontal and vertical alignment, constructability, and maintainability. Unconventional design alternatives and innovative design concepts should be coordinated with the District Design Engineer and the District Structures Design Engineer.

During the development and evaluation of alternatives, the viable or reasonable alternatives must be reviewed for situations that would require a Design Variation or Design Exception. If a variation or exception is needed, the Project Manager must coordinate with the District Design Engineer to receive District or Central Office approval, as required.

During the development of alternatives, the Project Manager must coordinate the typical sections with the District Design Engineer. After the public hearing is completed (if held) and the preferred alternative is approved, a ***Typical Section Package*** will be signed by a Professional Engineer (PE) and finalized in accordance with ***FDM, Part 1, Chapter 120, Topic No. 625-000-002***. The signed ***Typical Section Package*** is submitted with the final ***PER***.

Toll Road

For projects that are on or within the vicinity of a toll road, the Project Manager must coordinate with the FTE Environmental Management Office's Project Development Engineer or responsible authority for the toll road. Project alternatives must be reviewed for conformance to the ***General Tolling Requirements (GTR) Toll Siting 202 and 300 Toll Submittal Requirements***. Alternatives must be coordinated with FTE's Tolls Design. After a preferred alternative is selected, a ***Toll Siting Technical Memorandum (TSTM)*** is prepared per the ***GTR*** using FTE's ***Toll Siting Technical Memorandum Template***.

Structures

The Project Manager must coordinate with the District Structures Design Engineer for conceptual location and design recommendations for each bridge alternative including cost and any benefit-cost analyses used for selecting or recommending structure alternatives. The District Structures Design Engineer must approve the bridge analysis. In addition, the Project Manager must consult the District Structures Design Engineer if non-standard signs, lighting, signals, or other miscellaneous structures are under consideration.

For coastal bridge replacement projects, consideration may be given to using clean demolition materials as an artificial reef under ***Title 33 U.S.C. Chapter 35***. This consideration must be part of the coordination and consultation process with the regulatory and resource agencies as well as with other stakeholders. The ***BDR*** (see ***FDM, Part 1, Chapter 121, Topic No. 625-000-002***) will include the approximate volume of debris and the estimated timeframe in which the material will be available.

Drainage

The Project Manager should meet with the District Drainage Engineer to explore watershed stormwater needs and stormwater pond sites when developing project alternatives.

If the project uses the WATERSS process, the Project Manager should meet with the WATERSS District Champion and District Drainage Engineer to discuss the project, broad stormwater needs, and review planning-level project characteristics that influence stormwater management strategies as the first step in the WATERSS process. Additional WATERSS coordination information is provided in FDOT's ***WATERSS Process Guidebook***.

The District Drainage Engineer should also review tidal projects to determine if coastal hydraulics will affect project design. If so, a Coastal Engineer should review the project in accordance with the ***Drainage Manual, Topic No. 625-040-002***. If the project is located within the Coastal Building Zone, as defined by ***Rule 62S-7.010, Florida Administrative Code (F.A.C.)***, the project will require a Sea Level Impaction Projection (SLIP) study and a Sea Level Rise Analysis, in accordance with ***Section 3.2.5.14***.

Freight/Port

The Project Manager must coordinate with the District Seaport Coordinator and/or District Freight Coordinator whenever the project involves a port, or is part of landside port transportation or access improvements, such as highways connecting Florida's ports to their markets.

Aviation

Federal regulations promulgated by the Federal Aviation Administration (FAA) exist to protect the national airspace system and must be considered and complied with when planning, designing, and constructing a FDOT project in the vicinity of a public-use or military airport. ***FDM, Part 1, Chapter 110.5.1, Topic No. 625-000-002*** provides guidance on the required action during Design.

FAA discourages placing stormwater treatment facilities within the airport's air operation area because of their potential for being hazardous wildlife attractants. The Project Manager must coordinate with the FDOT Airport Engineering Manager when stormwater treatment facilities are proposed within the vicinity of an airport. Such coordination is essential to ensure the stormwater treatment facilities incorporate the FAA design criteria of no above-ground standing water.

Scenic Highways

The Project Manager must coordinate with the District Scenic Highway Coordinator for projects affecting designated scenic highways. If the project impacts a scenic highway

and qualifies for screening, it will be identified in the Environmental Screening Tool (EST) as part of the Efficient Transportation Decision Making (ETDM) process.

Right of Way

The Project Manager should discuss Right of Way (ROW) requirements associated with the project alternatives and coordinate with the District ROW office to identify or obtain ROW cost estimates, schedules, and work effort to complete ROW activities. Issues related to open cut and fill roadway cross sections pointed in ***FDM, Part 1, Chapter 113, Topic No. 625-000-002*** should be discussed with the District ROW office.

Landscape

The Project Manager should discuss landscaping needs for the preferred alternative with the District Landscape Architect.

Lighting

The Project Manager should coordinate early with the local communities and stakeholders to identify the effects of project lighting. Considerations should include the impacts to neighborhoods, aesthetic impact, and impacts to sensitive species.

Wildlife

The Project Manager should discuss the need for potential wildlife crossings with the District Environmental Manager, District Drainage Engineer, District Permit Coordinator, and District Structures Design Engineer.

Permits

The determination of permits required for the project starts during the ETDM Programming Screen. Representatives from each of the environmental permit agencies comment on the general project (including potential permits from their agency). Early coordination with the District Permit Coordinator and regulatory agencies is necessary to support project permitting. For more information regarding the environmental permit process, see ***Part 1, Chapter 12, Environmental Permits***.

Utilities and Railroads

The Project Manager should begin early coordination with District Utility Office and the District Railroad Office to identify and document potential utility and railroad conflicts, see ***Part 2, Chapter 21, Utilities and Railroads***.

3.2.3 Preliminary Engineering Analysis

The key elements in performing engineering analysis during PD&E are:

1. Project purpose and need

2. Data collection
3. Existing conditions analysis
4. Future conditions
5. Design controls and criteria
6. Alternatives analysis

3.2.3.1 Project Purpose and Need

Purpose and need identification generally occurs during the Planning phase of the project. It is important for the Project Manager to review and understand the project's purpose and need, which drives the development of alternatives considered and evaluated during the PD&E process and documented in the Environmental Document. During the PD&E process the project's purpose and need will be further developed, however, any fundamental changes to the purpose and need must be approved by OEM. Refer to ***Part 2, Chapter 1, Project Description and Purpose and Need*** for more information.

The Project Manager must review the ***Programming Screen Summary Report*** for projects that were screened through the ETDM Process. The Project Manager should also review planning documents such as the Long Range Transportation Plan (LRTP), feasibility reports, and ***Alternative Corridor Evaluation Report (ACER)***.

3.2.3.2 Data Collection

The data collection process should consider the purpose and need for the project and the goals and objectives of the PD&E Study. Specifically, data collection should start by obtaining the data to assess and support the purpose and need for the project. When existing data is available, efforts should be made to determine any gaps in the data and approaches to fill the gaps.

3.2.3.3 Existing Conditions Analysis

The purpose of the existing conditions analysis is to document available information regarding the existing facility or corridor. Existing conditions analysis documents the inventory of roadway elements, structure elements, and environmental features of the project. It also includes review of planning issues contained in previous planning documents such as corridor feasibility studies or interchange access requests. The existing conditions analysis helps to identify or confirm design and operational deficiencies associated with the project study area, as well as to verify, refine, and support the purpose and need for the project. It also establishes the baseline conditions for which environmental impacts are evaluated.

Existing condition analysis should consider results of the evaluation of roadway and bridges that have required repair and reconstruction activities on two or more occasions due to emergency events pursuant to ***23 Code of Federal Regulations (CFR) § 667.9***.

This includes review of the Transportation Asset Management Plan (TAMP) and related evaluation reports. Additionally, coordination with the District Maintenance Office and District Pavement Engineer is essential to determine if there are reasonable alternatives to the affected portion of the roadway or bridge.

The sections below are examples of elements of existing conditions analysis. For new corridors, analysis of existing conditions requires a description of the adjacent facilities to explain how the existing transportation system is currently handling the travel demand.

3.2.3.3.1 Existing Roadway Conditions

Existing roadway conditions should be documented in the ***PER*** to reflect the following elements. Include a statement in the ***PER*** of any roadway elements that do not exist within the project limits or study area.

1. Roadway typical sections of each corridor within the project limits. Include dimensions of each cross-sectional element (e.g., ROW, lanes, shoulders, median, curb, sidewalk, roadside protection, drainage swales).

2. Roadway functional and context classifications. Include any other special classifications (e.g., hurricane evacuation route, Strategic Intermodal System (SIS) corridor)

3. Access management classification and standards

4. ROW of existing roadways within the project limits including extent and type of limited access and easements

5. Adjacent land use shown on a land use map

6. Pavement type, structural and operational conditions

7. Existing design speed and posted speed

8. Horizontal alignment components

9. Vertical alignment components

10. Multi-modal facilities:

    a. Pedestrian accommodations - Sidewalks, crosswalks, Americans with Disabilities Act (ADA) accessibility, and school routes

    b. Bicycle facilities - Location, type, width, and designation

    c. Shared use paths – Location, width, and pavement type

    d. Mass transit facilities including bus and rail services – Type, locations and number of stops, transfer centers, park-and-ride facilities, bus bays

e. Freight and intermodal logistics centers

11. Intersections - Lane configuration, intersection control type, technology, and operational conditions

12. Physical or operational restrictions such as multimodal use lanes, parking, evacuation routes, fixed objects, barriers, and clear zones

13. Traffic data - Annual Average Daily Traffic (AADT), peak hour volume, Directional Design Hour Volumes (DDHV), truck percentage, pedestrian and bicycle counts, and transit data

14. Roadway operational conditions – Level of Service (LOS) and relevant performance measures such as delay, travel time, and density

15. Managed Lanes (e.g., Express or Toll Lanes) configurations, and operations within the corridor

16. Crash data - Crash rates, severity, number (frequency), types, locations, contributing causes and patterns

17. Railroad crossings - Number of tracks, number of train crossings, speed, type of train (passenger or freight), type of warning devices, operating characteristics, railroad ROW, and Rail Master Plan

18. Drainage – Drainage map depicting basins and flow patterns, floodplains and stormwater management systems including regional facilities, size and location of cross drains and box culverts along the corridor

19. Lighting - Location, type, condition, spacing, and maintaining agency

20. Utilities - Location, Utility Agency/Owner (UAO), and contact persons

21. Soil map depicting soils and geotechnical data

22. Aesthetic features (e.g., scenic views, lighting, landscaping, vegetation, pavers)

23. Traffic signs – describe the existing guide signage and include location(s) of any overhead cantilever and span sign structures

24. Noise walls and perimeter walls – type and location

25. ITS/TSM&O – Describe operational needs and infrastructure requirements. Review and summarize Concepts of Operations (ConOps) and other systems engineering documents, if applicable.

3.2.3.3.2 Existing Bridges and Structures

FDOT's Bridge Maintenance Office maintains ***Bridge Inspection Reports (BIRs)*** for every public bridge in the State of Florida. The Project Manager must obtain the recent ***BIR*** for each bridge on the existing corridor. Additionally, geotechnical and scour reports, environmental permits, and previous studies for existing bridges can be requested from the structures and environmental permits offices. If hydraulic analysis is anticipated, bridge information for each bridge upstream and downstream of the existing crossing can also be obtained. For bridges maintained by other agencies, all relevant information regarding the existing bridge should be requested from the owner of the bridges.

Evaluation of existing bridge conditions should include identification of wildlife crossing features. See ***FDOT Wildlife Crossing Guidelines***. These features include bridges, bridges with shelves, specially identified culverts, enlarged culverts or drainage culverts, and/or exclusionary devices such as fencing, walls or other barriers, or some combination of these features. The Project Manager should confirm the location of a wildlife crossing feature based on coordination with the District Environmental Manager, District Drainage Engineer, District Permit Coordinator, and District Structures Design Engineer.

Document the following existing bridge elements in the ***PER***. Include a statement in the ***PER*** of any bridge elements that do not apply to the project.

1. Bridge number
2. Bridge Type
3. Typical Section
4. Facility crossed (waterway, roadway, or railroad)
5. Year structure was built and/or modified
6. Type of structure - Timber, concrete, or steel
7. Condition - Structural rating and suitability for widening or retrofitting
8. Load posting information
9. Horizontal and vertical clearances
10. Ship impact data
11. Span arrangement - Number and length of spans
12. Historical significance - i.e., ***National Register of Historic Places (NRHP)*** eligible or may be a potentially significant historic bridge (of 50 years of age or older). If a bridge is on the ***NRHP***, determine if the bridge is a critical landmark or a signature structure.

13. Geotechnical information from existing bridge borings, pile driving records, scour reports, and maintenance history where available

14. Channel data - Alignment, width, depth, and clearance requirements

15. On bridges with moveable spans - The average number of times the bridge opens per day, results of boat traffic and mast height surveys, include any special navigation (shipping/boating) requirements that will require accommodation during construction

16. Normal High Water and Mean High Water (for coastal bridges)

17. Bridge security issues

3.2.3.3.3 Existing Environmental Features

Existing conditions analysis must include a review of potential environmental issues in the project area that would affect development of project alternatives. This analysis requires input from environmental specialists. As such, field observations of existing environmental features must be conducted concurrently with the review of existing roadway and bridge features. Close coordination between environmental and engineering staff is essential to developing alternatives that reduce environmental impacts.

3.2.3.3.4 Existing Intelligent Transportation Systems/Transportation Systems Management and Operations

Projects that involve ITS must include review of existing ITS documents and plans to determine operational needs and infrastructure requirements. Also, if applicable, review existing ConOps and other systems engineering documents.

3.2.3.4 Future Conditions

Future conditions such as changes in land use, context classification, travel demand and other improvement plans should be considered and discussed in the ***PER***. Discuss how future demand volumes and design hour volumes were estimated. Reference the traffic report, or Interchange Access Request (IAR) analysis and traffic forecasting memo for more details, if applicable.

If the future context classification is different than the existing, the future context classification should be used when developing project alternatives. The following are questions to consider when defining future context classifications.

- Are there any planned or new developments anticipated in the project area?

- What is the local government future land use vision as identified in the Local Government Comprehensive Plan (LGCP), corridor plan, policies or other credible sources?

- Does the adopted future land use plan include specific recommendations regarding development density, building setbacks, or urban design within the project area?

- Are there locally adopted multimodal plans or policies affecting non-motorists' trips or transit?

The FDOT procedure for identifying roadway context classification is presented in the ***FDOT Context Classification Guide***.

3.2.3.5 Design Controls and Criteria

Design controls are established parameters or physical characteristics that affect the selection of criteria and standards for geometric design of project alternatives. Refer to ***FDM, Part 2, Chapter 201***, Topic No. ***625-000-002*** for further information on design controls.

Document the following design controls in the ***PER***. If a Design Control is not applicable, include a statement to that fact in the ***PER***:

1. Roadway context classification
2. Functional classification and SIS designation
3. Access management class and applicable standards
4. Design speed and Target Speed
5. Capacity and LOS Target
6. Design vehicle
7. Pedestrian and bicycle requirements
8. Physical constraints (e.g., existing ROW, approach roads, intersecting roads, railroads, major utilities)
9. Environmental constraints (e.g., public parks, historic and cultural features, wetlands, floodplains)
10. Type of stormwater management facilities (e.g., closed or open drainage systems)
11. Navigational requirements
12. Design high water, including impacts from projections
13. Design wave heights for coastal bridges, including impacts from sea level rise projections

The design controls guide the selection of the appropriate design criteria to be used in developing project alternatives. The ***FDM, Topic No. 625-000-002*** is the principal source of values for design criteria for projects on the SHS or National Highway System. The values for design criteria contained in the ***FDM*** have been accepted by FHWA. LAP projects on the State or National Highway System or off the State or National Highway Systems with an estimated construction value of $10 million or greater will use the ***FDM***. Otherwise, LAP projects on local roads will use the design criteria from the ***Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways (Florida Greenbook), Topic No. 625-000-015***. LAP projects which include a vehicular bridge or pedestrian bridge over a roadway will use the ***Structures Manual, Topic No. 625-020-018*** for structure design and the ***Florida Greenbook*** for the roadway design. All other federally funded projects on local roads, and state and local funded projects on local roads use the ***Florida Greenbook***. See the ***Local Agency Program Manual, Chapter 19, Topic No. 525-010-300***, for more information Guidance on the design, location and installation of transit facilities can be found in the ***Accessing Transit Design Handbook***.

Include a table in the ***PER*** listing the relevant roadway, structure, and drainage design criteria to be used in developing project alternatives. Include references to the associated manuals, procedures and guidelines that defined the criteria.

Comparison of the existing conditions against the current design controls or criteria identifies roadway and structure elements that do not meet current standards. Such project deficiencies must be discussed, analyzed, and documented in the ***PER*** or for a bridge replacement, the ***BDR***. Analysis of project deficiencies is used to support the project purpose and need (see ***Part 2, Chapter 1, Project Description and Purpose and Need***).

3.2.4 Alternatives Analysis

Alternatives analysis is the process of developing, evaluating, and eliminating potential project alternatives based on the purpose and need for the project. Alternatives analysis involves evaluation of both engineering and environmental aspects of a project. Therefore, the Project Manager must engage both District engineering and environmental staff from the scope development stage through the alternative analysis process.

The process to develop and evaluate potential alternatives must also seek public and stakeholder input. See ***Part 1, Chapter 11, Public Involvement*** for guidance regarding public involvement for a project.

The alternatives analysis of a PD&E Study must consider the following alternatives:

1. No-Action Alternative, or No-Build Alternative
2. TSM&O Alternative
3. Multimodal Alternative

4. Build Alternative(s)

Innovative alternatives such as Connected and Automated Vehicle (CAV) technology, autonomous vehicles and tunneling should be given consideration when practicable, especially on Major Projects, as defined in ***Part 1, Chapter 4, Project Development Process***, or projects in highly congested urban areas. For more information on CAV please see ***Florida's Connected and Automated Vehicle (CAV) Business Plan***.

Some of the project alternatives developed, analyzed, and eliminated during the Planning phase of a project can be eliminated from further analysis consistent with the conditions in ***Title 23 U.S.C. § 168***. During the PD&E Study, it is the responsibility of the Project Manager to review planning studies previously completed for the project, and document the alternatives that have already been considered, screened, and eliminated through a planning process. The Project Manager must coordinate with the OEM in advance to verify any planning decision that can be adopted or incorporated by reference into the Environmental Document pursuant to ***23 U.S.C. § 168*** and ***23 CFR Part 450, Appendix A***. This coordination must occur during the scope development stage of the PD&E project. See ***Part 1, Chapter 4, Project Development Process*** for more guidance.

3.2.4.1 No-Action Alternative

The No-Action Alternative (or No-Build Alternative) serves as the baseline, or benchmark against which the Build Alternatives are evaluated. The No-Action Alternative is defined as the alternative in which the proposed project activity would not take place.

The engineering analysis must analyze the effects of the No-Action Alternative on the surrounding social, cultural, natural, and physical environment to the same level of detail as the build alternatives. The No-Action Alternative remains under consideration throughout the PD&E Study, including the public hearing. Both the ***PER*** and Environmental Document must include and discuss the No-Action Alternative. Discussion about impacts of the No-Action Alternative must include the impacts to surrounding areas, such as increased travel demand on the existing facility and parallel routes, impacts to multi-modal facilities, and impacts to emergency response times, amongst others. If applicable, the No-Action Alternative should include a discussion of projects already programmed in the area and if they change any of the anticipated impacts or the purpose and need of the project.

Documentation of the alternatives analysis must include advantages and disadvantages of the No-Action Alternative.

3.2.4.2 Transportation System Management and Operations Alternative

The TSM&O Alternative includes strategies with the operational objective of preserving the capacity and improving the security, safety, and reliability of the transportation system, while minimizing environmental impacts. These strategies may include upgrades or additions to the existing facility, such as ramp signals, arterial traffic management systems, traffic incident management, work zone traffic management, road weather

management, traveler information services, congestion pricing, parking management, traffic control, commercial vehicle operations, transit priority signals systems, and freight management.

Prior to evaluating build alternatives, engineering analysis must demonstrate that maximization of the existing system through various TSM&O strategies will not meet the purpose and need for the project. Documentation of the TSM&O Alternative evaluation must include a ConOps and system requirements as described in ***Florida's Statewide Systems Engineering Management Plan (SEMP)***.

While TSM&O primarily relates to projects in urbanized areas, the concept of achieving maximum utilization is also important in rural areas. The TSM&O Alternative shall be discussed in the alternatives section of the ***PER*** and Environmental Document. If the TSM&O Alternative does not meet the purpose and need for the project, the ***PER*** and Environmental Document must briefly explain why.

3.2.4.3 Multimodal Alternatives

When consistent with the purpose and need, the alternatives analysis should consider multimodal alternatives. The Project Manager should review the MPO LRTP, LGCP, and the Transit Development Plan, where applicable, for any multimodal projects that are planned along the corridor for possible inclusion into the project. The Project Manager should also coordinate with the District Transit or Modal Office when evaluating multimodal alternatives. Multimodal alternatives can include non-motorized facilities (for pedestrians and bicyclists) to meet the purpose and need for the project. These alternatives must include the types of facilities that are planned in the LGCP. Discussion of multimodal alternatives should include needs that are stated in the LRTP and/or LGCP.

3.2.4.4 Build Alternatives

The Build Alternatives are proposed to address the project's purpose and need. Build alternatives should seek to avoid or minimize impacts to the environment by considering issues, concerns, and opportunities identified during the Planning phase of the project.

To ensure meaningful evaluation of alternatives, **each** build alternative **must** have:

1. Logical termini and should be of sufficient length to address environmental matters and the purpose and need on a broad scope.

2. Independent utility, i.e., to function as designed and be a reasonable expenditure even if no additional transportation improvements in the area are made.

The Project Manager and project team may consider opportunities for developing hybrid alternatives that could incorporate TSM&O strategies and/or multimodal options with the build alternative to meet the purpose and need for the project. Incorporation of TSM&O strategies in the build alternative requires the Project Manager to obtain input from the District TSM&O Program Engineer early on during the alternative development process.

Design detail of the Build Alternatives should be commensurate with the information needed to define and evaluate environmental impacts or define ROW. Each alternative must be explored at a sufficient level of detail to support a reasoned choice. All alternatives under consideration must be developed to a comparable level of detail so that their comparative merits may be evaluated.

3.2.4.4.1 Development of Build Alternatives

The number of Build Alternatives to be analyzed during the PD&E Study affects the project schedule and budget. The initial number of Build Alternatives to be analyzed in detail during the PD&E Study must be relative to the size and complexity of the project. As such, only viable or reasonable Build Alternatives should be evaluated in detail.

When Planning phase corridor studies identified and documented operational strategies or improvement options that may address the needs, the Project Manager should coordinate with the District Environmental Office to determine if planning products or decisions can be reused or adopted according to ***23 U.S.C. § 168*** and ***23 CFR § 450.318*** and ***Appendix A*** of ***23 CFR Part 450 - Linking the Transportation Planning and NEPA Processes***. See ***Part 1, Chapter 4, Project Development Process*** for more guidance on linking planning and the environmental review process.

For complex projects, an evaluation of alternatives may start by high-level screening of a broad number of improvements, concepts, or TSM&O strategies to eliminate unreasonable or nonviable alternatives from further detailed analysis. The high-level screenings process can be used to quickly identify and evaluate the performance of various improvements and design concepts. FDOT design criteria and standards must be used when developing the alternatives compatible with context classification and other applicable design controls.

A Type 2 CE or SEIR must evaluate at least one Build Alternative and a No-Action Alternative. The actual number of alternatives evaluated depends on factors such as complexity of the project, environmental issues/resources, results of planning/corridor studies, and input from stakeholders and the public.

An EA must evaluate at least one Build Alternative and a No-Action Alternative. The ***FHWA Technical Advisory T 6640.8A*** notes the purpose of the EA is to determine if an EIS is required. The EA does not need to evaluate in detail all reasonable alternatives for the project and may be prepared for one or more viable build alternatives. The EA should also include a discussion of any alternative considered but eliminated prior to preparation of the EA that documents the reasons for eliminating the alternative.

An EIS must evaluate reasonable alternatives or a reasonable range of alternatives in addition to a No-Action Alternative.

Typically, EISs and complex EAs are developed through the Alternative Corridor Evaluation (ACE) process which refines the scope of the project and number of alternatives to be considered during PD&E. The ACE process is discussed in detail in ***Part 1, Chapter 4, Project Development Process***.

3.2.4.4.2 Alternatives Considered but Eliminated

The primary reason for eliminating an alternative from consideration is that it does not meet the project's purpose and need. Project Managers are encouraged to screen unreasonable or unviable alternatives early in the alternative development stage. The screening of alternatives determines if an individual alternative or a concept has one or more deficiencies that prevent it from being successfully implemented. The screening of alternatives is based on project purpose and need or environmental controversy based on impacts on natural, social, physical or cultural environment. Other factors that should be considered when screening the alternatives include design constraints, constructability issues, and construction costs.

Although the No-Action Alternative does not typically meet the purpose and need, it must be considered as a viable alternative throughout the study.

The ***PER*** must include a section that discusses alternatives, including associated TSM&O strategies, which were considered for the project but eliminated from detailed study (during the Planning or PD&E phase). The section should discuss descriptions of each alternative considered in the evaluation process; the methodology used for eliminating alternatives including screening criteria used; data used in evaluation; agency and public input into the evaluation process; and at what point in the process (Planning or PD&E phase) the alternatives were eliminated. The Environmental Document must briefly summarize development of alternatives and decisions made (including the reasons for eliminating alternatives from detailed analysis) during alternatives evaluation process.

3.2.5 Engineering Considerations for Build Alternatives

The following sections discuss engineering elements that are important to consider during the development of build alternatives. Include a discussion in the ***PER*** of the following engineering elements. If an engineering element does not apply, include a statement to that fact in the ***PER***.

3.2.5.1 Complete Streets

Development of Build Alternatives must consider the FDOT policy on ***Complete Streets, Topic No. 000-625-017*** early in the alternatives development process. The ***Complete Streets Policy*** requires a context-sensitive approach to project development by accommodating all transportation users and their relationship to safety, economy, mobility, and the environment. Consideration and integration of complete streets during the PD&E Study promotes the efficient development of a multimodal transportation system. The complete streets context classification is determined based on the ***FDOT Context Classification Guide*** and coordination with the FDOT staff to help ensure that the determination of context classification is collaborated for future approvals.

Complete streets must serve the transportation needs of users of all ages and abilities, including cyclists, pedestrians, motorists, transit riders, emergency responders, and freight handlers. Incorporation of complete streets into the project development process

requires coordination with local governments, MPOs, transportation agencies, and the public.

Understanding of community context (transportation network, land use, and local priority), potential users and needs are key inputs for developing build alternatives that are complete streets oriented. The Project Manager must evaluate these key inputs during data collection, existing conditions analysis, and the alternatives development steps of the engineering analysis.

There is no single design solution for complete streets because each street and its context and travel demand are unique. For example, a complete street in an urban setting is quite different from a complete street in a rural setting; however, both streets must be designed to meet the users' needs and the transportation objectives of safety, mobility and the environment. Incorporation of complete streets may necessitate modification of design standards to allow typical sections to accommodate non-motorized traffic or allow raised medians, adequate shoulders, narrow lanes, and traffic calming features. Such modifications must follow FDOT's Design Exceptions and Design Variations process.

3.2.5.2 Pedestrians and Bicycle Accommodation

In 2010, the U.S. Department of Transportation (USDOT) issued a Policy Statement on Bicycle and Pedestrian Accommodation Regulation and Recommendations to support the development of fully integrated active transportation networks. It states:

> The DOT policy is to incorporate safe and convenient walking and bicycling facilities into transportation projects. Every transportation agency, including DOT, has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems. Because of the numerous individual and community benefits that walking and bicycling provide — including health, safety, environmental, transportation, and quality of life — transportation agencies are encouraged to go beyond minimum standards to provide safe and convenient facilities for these modes.

The USDOT policy encourages the State, local government, and public transportation agencies to:

1. Consider walking and cycling as equals with other transportation modes
2. Ensure that there are transportation choices for people of all ages and abilities
3. Go beyond minimum design standards

FHWA Bicycle and Pedestrian Planning, Program and Project Development provides additional guidance related to safety and accommodation of pedestrians and bicyclists.

FDOT's policy on ***Complete Streets, Topic No. 000-625-017*** is consistent with the 2010 USDOT ***Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations*** and further specifies that facilities be context-appropriate, based on existing or planned land use. Additionally, ***Section 335.065, Florida Statutes (F.S.)***, requires full consideration of bicycle and pedestrian ways along state roads and transportation facilities during planning and project development unless contrary to public safety, disproportionate cost or absence of need. Therefore, all Build Alternatives must consider pedestrian and bicycle accommodation.

Guidance on the design of pedestrian and bicycle facilities can be found in:

1. ***FDM, Part 2, Chapter 222 – Pedestrian Facilities and FDM, Part 2, Chapter 223 – Bicycle Facilities***

2. ***American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities***

3. ***AASHTO Guide for the Development of Pedestrian Facilities***

4. ***Florida Greenbook*** (for off-system projects)

Pedestrian sidewalks in highly developed urban areas and near schools may require additional width based on anticipated pedestrian volumes and context. When designing pedestrian facilities, the safe crossing needs of the pedestrian must be considered, such as providing median refuge, placing crosswalks perpendicular to the roadway or to match the intersection lines at skewed intersections, and minimizing pedestrian crossing length.

For interchange design, pedestrians and bicyclists accommodation on the arterial must be considered at the beginning of the planning process and during the PD&E phase. Ramp configurations, speeds, and overall complexity can create impractical and unsafe conditions for bicyclists and pedestrians if not carefully considered throughout the design process.

Where current pedestrian or bicycle facilities or indications of use are identified, the Bicycles and Pedestrians section of the Environmental Document should discuss the current and anticipated use of the facilities, the potential impacts of the affected alternatives, and proposed measures, if any, to avoid or reduce adverse impacts to the facility and its users. Where new facilities are proposed as a part of the proposed highway project, the Environmental Document should include sufficient information to explain the basis for providing the facilities (e.g., proposed bicycle facility is a link in the local plan or sidewalks will reduce project access impact to the community). Where the preferred alternative would sever an existing major route for non-motorized transportation traffic, the proposed project needs to provide a reasonable, alternative route or demonstrate that such a route exists. This needs to be described in the Environmental Document according to the ***FHWA Technical Advisory T6640.8A***.

3.2.5.3 Traffic Operations and Safety

Build alternatives should be evaluated for their impact on traffic operations. Traffic analysis for build alternatives includes both travel demand forecasting and capacity analysis to determine the number of through lanes, intersection control type, intersection configurations, need for auxiliary lanes, or access management. One of the primary objectives of traffic analysis is to determine if the Build Alternative will operate acceptably through the design year. Projects in urban areas require extensive traffic operational evaluations as compared to projects in rural areas because of recurring congestion and ROW constraints. Refer to the FDOT's ***Traffic Analysis Handbook*** and ***Part 2, Chapter 2, Traffic Analysis*** for further guidance on traffic operations evaluation.

Safety analysis for build conditions should occur after evaluation of crash data to determine any existing safety deficiencies and appropriate corrective measures. Evaluation of existing safety can also include a Road Safety Audit (RSA), which is an examination of safety conditions of a road by an independent audit team. Safety analysis for build conditions should analyze potential hazardous elements on the proposed project conditions and draw inferences based on interactions of these elements and users. Development of Build Alternatives must correct existing safety deficiencies. For existing and prescreened safety needs, review, select, and prioritize any of the overlapping safety needs or projects identified in FDOT's ***Safety Needs List Dashboard*** with coordination and approval of the appropriate manger determined by the District (i.e., the District Traffic Operations Engineer, District Safety Administrator, or other appropriate position according to the Districts' processes).

Intersection alternative(s) evaluation is governed by the ***Manual on Intersection Control Evaluation, Topic No. 750-010-003***.

3.2.5.4 Managed Lanes

It is the policy of FDOT to employ managed lanes on appropriate facilities that currently, or are expected in the future to, experience significant congestion in accordance with FDOT's ***Managed Lanes Policy, Topic No. 000-525-045***. Managed Lanes are highway facilities or sets of lanes where TSM&O strategies are proactively implemented and managed in response to changing traffic conditions to provide congestion relief. They are generally considered in congested urban areas with limited ROW and where the previous widening projects have not met travel demand. For this reason, the managed lanes alternative is evaluated for its ability to provide long-term mobility, managed capacity, travel time reliability, and travel options. Coordinate with the State Connected Vehicles, Arterials & Managed Lanes Engineer and Systems Management Administrator for guidance.

PD&E Studies can evaluate the Managed Lanes alternatives against the No-Action (No-Build) Alternative if the project is included in the MPO LRTP as a Managed Lanes project, or if previously completed planning or corridor studies had recommended Managed Lanes per ***Title 23 U.S.C. § 129***, ***Title 23 U.S.C. § 166***, and ***Title 23 U.S.C. § 301***.

Typically, development of initial congestion pricing concepts and the decision to apply congestion pricing is made during the Planning phase. The initial congestion pricing concepts may be refined during the PD&E phase as more data related to engineering, finance, and public factors are collected. Therefore, the Project Manager should coordinate with the Florida Turnpike Enterprise Toll Studies and Forecasting Office about the decision to use congestion pricing and the scope of tolling analysis, if required during the PD&E phase.

3.2.5.5 Access Management

Access management is a comprehensive approach to the management and regulation of driveways, medians, median openings, intersections, and freeway interchanges. The purpose of access management is to increase safety and efficiency of the transportation system by providing proper access from the SHS to abutting lands while limiting and separating traffic conflict points. It also ensures balance between accessibility and mobility while increasing the capacity of a roadway system. Access management analysis in the PD&E Study should evaluate and recommend appropriate locations for median openings and driveways, as applicable. The concept plans developed in the PD&E Study should show appropriate access management features. Changes in access management should be consistent with ***Procedure No. 625-010-021, Median Openings and Access Management***. The Project Manager should coordinate with the District Access Management Review Committee (AMRC) for any proposed deviations from the access management and median opening standards.

3.2.5.6 Interchanges on Interstate Highways

If the project includes a new interchange or a modification to an existing interchange, the Project Manager must coordinate with the District Interchange Review Coordinator (DIRC) throughout development of the project to ensure that the alternative which received safety, operational and engineering (SO&E) acceptability in the ***Interchange Justification Report (IJR)***, ***Interchange Modification Report (IMR), System Interchange Modification Report*** or ***Interchange Operational Analysis Report (IOAR)*** is included as one of the PD&E Study alternatives. Additionally, the Project Manager must coordinate the project schedule with DIRC such that the SO&E acceptability is obtained before the ***NEPA*** Document is sent to OEM for final approval.

To streamline project development, traffic operational analysis, safety analysis, and conceptual design analysis performed to address the requirements of the ***2017 FHWA Policy on Access to the Interstate System*** also support development and evaluation of alternatives in the PD&E Study. The Interchange Access Request (IAR) process and PD&E approval is further discussed in ***Part 1, Chapter 4, Project Development Process***. Additionally, the preliminary engineering analysis for the PD&E Study includes the following to satisfy the FHWA Policy requirements related to social, economic or environmental impacts:

- Perform traffic and safety analyses of the No-Build conditions to demonstrate the inability of the existing interchanges to adequately serve design year traffic demands or address safety needs.

- Review local roads and streets within the interchange area of influence to confirm that local road improvements will not satisfactorily address the design year traffic demands.

- Summarize all alternatives considered to address the need for the IAR proposal and describe why alternative solutions to the proposed access change do not address the need or are not feasible.

- List planned improvements on the interstate within the IAR proposal and discuss IAR consistent with local and regional land use and transportation plans.

- In corridors where the potential exists for future multiple interchange additions, describe other access changes that are planned in close proximity to the IAR proposal, and state any impacts the IAR proposal and planned access changes have within the context of a network plan. Additionally, summarize how the adjacent planned access changes were incorporated into the IAR evaluation.

- If a new or modified IAR is due to a new, expanded, or substantial change in current or planned future development or land use, describe coordination that has occurred to identify fiscal responsibilities and any commitments to constructing local improvements needed to assure adequate collection and dispersion of the traffic resulting from the development with the adjoining local street network and the interchange.

If the recommended PD&E Study alternative is different from the interchange concept that received SO&E acceptability, the ***IJR***, ***IMR***, or ***IOAR*** must be re-evaluated to demonstrate that the preferred alternative meets the requirements of the IAR analysis procedure prior to the final approval of the ***NEPA*** Document or design change re-evaluation. The need and scope for the IAR re-evaluation must be determined through consultation with the DIRC, Statewide Interchange Review Coordinator (SIRC), and FHWA, as appropriate. See the ***Interchange Access Request User's Guide*** for IAR re-evaluation guidance.

3.2.5.7 Intelligent Transportation Systems

If a project uses federal funds and involves ITS technologies or a system of technologies, the requirements specified in the ***Procedure No. 750-040-003, Florida Department of Transportation Systems Engineering and Intelligent Transportation System (ITS) Architecture Procedure*** must be followed. The guidelines ensure an ITS project's compliance with ***23 CFR § 940.11*** and FDOT's requirements. Authorization of federal funds for construction or implementation of the project cannot proceed until compliance with ***23 CFR § 940.11*** is demonstrated.

23 CFR § 940.11 requires that all ITS projects funded with highway trust funds be based on systems engineering analysis and have a project level ITS architecture that is coordinated with the development of the regional ITS architecture before advancing to final design. The Project Manager must prepare a high-level project ConOps and a ***Preliminary System Engineering Management Plan (PSEMP)*** to document the results of the system engineering analysis. The ***PSEMP*** is a technical document that defines the project's system engineering process for ITS deployments from concept to system operations in Florida consistent with ***23 CFR Part 940***. ***PSEMP*** specifies systems engineering activities and what must be built to satisfy stakeholder needs. The Project Manager should coordinate with the District TSM&O Engineer or program manager and the County Engineer when developing the ***PSEMP***. Example of project alternatives that may require a ***PSEMP*** are Managed Lanes alternatives, transit alternatives, and any alternative with TSM&O strategies, because they involve ITS technologies and may be funded by federal funds.

3.2.5.8 Lane Repurposing

Lane repurposing alternatives are intended to reconfigure the existing cross section of the roadway to accommodate other uses and travel modes. The recovered travel lanes can be repurposed as bicycle lanes, sidewalks, landscaping, on-street parking, channelization, or bus lanes. Since a lane repurposing alternative may redistribute traffic to other adjacent roadways, a networkwide or system impact analysis should be performed. Projects considering lane repurposing as an alternative must follow the procedures in ***FDM, Part 1, Chapter 126, Topic No. 625-000-002***, for review and approval by the Chief Engineer, prior to the selection of a preferred alternative.

3.2.5.9 Landscape

Discuss any landscaping accommodations included in the build alternatives. Refer to ***FDM, Part 2, Chapter 270*** for more information on planting designs.

3.2.5.10 Lighting

Discuss lighting accommodations included in the build alternatives. Considerations should include the impacts to neighborhoods, aesthetic impact, and impacts to sensitive species.

3.2.5.11 Wildlife Crossings

Discuss potential wildlife crossings associated with the build alternatives.

3.2.5.12 Permits

Summarize the anticipated permitting needs of the build alternatives.

3.2.5.13 Stormwater Management

A PD&E Study must consider how management of stormwater from the project area will meet water quality, rate, and quantity requirements of FDOT, Water Management Districts (WMDs) and the Florida Department of Environmental Protection (FDEP). The ***Drainage Manual, Topic No. 625-040-002*** contains the drainage design standards for FDOT projects.

If the project uses the WATERSS process, the Project Manager should coordinate with the WATERSS District Champion and the District Drainage Engineer to discuss watershed needs, innovative stormwater management and follow the WATERSS process. The ***WATERSS Process Guidebook*** contains the steps and documentation required to complete the WATERSS process. Stormwater management solutions developed through this process are documented in the project ***Stormwater Management Alternatives Report (SMARt)***, summarized in the ***PER***, and may be modified in future phases of the project.

For projects not using the WATERSS process, drainage decisions are documented in the ***PER*** and ***Pond Siting Report (PSR)*** or ***Conceptual Drainage Design Report***. For projects using ponds for stormwater management, a ***PSR*** is prepared, identifying potential pond sites. If the stormwater facilities are other than ponds, a ***Conceptual Drainage Design Report*** is prepared (see ***Part 2, Chapter 11, Water Resources*** and the ***Drainage Manual, Chapter 5, Topic No. 625-040-002***).

3.2.5.13.1 Drainage and Landscaping

The Project Manager should meet with the District Drainage Engineer and Landscape Architect to explore opportunities for integrating pond features with existing and proposed landscaping.

3.2.5.14 Sea Level Impact Projection (SLIP) Studies

Resiliency includes the ability of the transportation system to adapt to changing conditions and prepare for, withstand, and recover from disruption. FDOT's policy on ***Resiliency of State Transportation Infrastructure, Topic No. 000-525-053*** identifies sea level rise as a key source of risk and states that FDOT will employ strategies to avoid, mitigate, or eliminate impacts. In addition, ***Senate Bill 178*** was passed by the 2020 Florida Legislature to create ***Section 161.551, F.S.***, adding requirements for analyzing resiliency against sea level rise within the Coastal Building Zone. The regulatory requirements of this legislation were codified by FDEP into ***Chapter 62S-7, F.A.C.*** The SLIP regulation is effective July 1, 2022, wherein a state-financed constructor which is a public entity that commissions or manages a construction project that uses funds appropriated from the state on a new coastal construction structure must conduct a SLIP study and submit it to FDEP who will publish notice of the SLIP on its website for 30 days prior to construction.

3.2.5.14.1 Identifying Applicable Coastal Projects

Per ***Chapter 62S-7, F.A.C.***, FDOT must perform a SLIP study for construction of a "new coastal structure" within the Coastal Building Zone, for projects that begin construction on July 1, 2022 or after.

A "new coastal structure" is defined as a major or non-habitable major structure for which construction has not yet commenced beginning July 1, 2022. Major Structures and Non-habitable Major Structures are defined in ***Section 161.54(6), F.S.*** Projects that are for the rehabilitation or maintenance of existing structures, resurfacing and related minor improvements, such as adding a turn lane, improved lighting, upgrading traffic signals, are not considered a new coastal structure. All projects requiring a PD&E Study are required to complete a SLIP study on each alternative.

The Coastal Building Zone is defined in ***Rule 62S-7.010, F.A.C.***, as the following:

1. The land area from the seasonal high-water line landward to a line 1,500 feet landward from the coastal construction control line as established pursuant to ***Section 161.053, F.S.***, and for those coastal areas fronting on the Gulf of Mexico, Atlantic Ocean, Florida Bay, or Straits of Florida and not included under ***Section 161.053, F.S.***, the land area seaward of the most landward velocity zone line as established by the Federal Emergency Management Agency (FEMA) and shown on ***Flood Insurance Rate Maps (FIRM)***.

2. On coastal barrier islands, it shall be the land area from the seasonal high-water line to a line 5,000 feet landward from the coastal construction control line established pursuant to ***Section 161.053, F.S.***, or the entire island, whichever is less.

3. All land area in the Florida Keys located within Monroe County shall be included in the Coastal Building Zone.

3.2.5.14.2 Submitting a SLIP Study

FDEP has developed a web-based tool for performing and submitting a SLIP study. The results developed with the tool fulfills the requirements of ***Section 161.551, F.S.*** The FDEP SLIP Tool must be accessed by an approved, registered user account. Coordinate with the Project Manager for the registration account specific to each FDOT District.

The input parameters to the SLIP Tool are provided on the ***FDEP Slip Studies website*** and should be documented within the ***PER*** as part of the PD&E Study. The SLIP Tool generates a ***SLIP Study Report***, which is published on the ***FDEP Slip Studies website***. If there are changes to the preferred alternative in Design, the SLIP study will be modified and resubmitted.

Per ***Rule 62S-7 F.A.C.***, FDOT may not commence construction until notified by the FDEP that:

- The ***SLIP Study Report*** was approved as meeting the requirements of ***Section 161.551, F.S.***, and

- The FDEP 30-day publication period has finished.

3.2.5.14.3 Sea Level Rise Analysis

An analysis to determine risk related to sea level rise is conducted for projects within the Coastal Building Zone. This will identify risks related to sea level rise, flooding, and storms; assess potential impacts; and employ strategies to avoid, mitigate, or eliminate impacts.

Risk Assessment: Using the results of the SLIP study, assess performance and vulnerability of existing or proposed infrastructure relating to sea-level rise, flooding (including the average annual chance of major flood damage), inundation, storm increases, and wave damage over the life of the infrastructure (or out to a future period of 50 years, whichever is less).

Resiliency Measures: Based on the results of the risk assessment, determine if there are cost prudent, practical resiliency measures that can be considered. Include a discussion on feasibility and how these measures will affect construction and maintenance costs as well as the level of infrastructure performance.

Coordination Considerations: For projects impacted by sea level rise, the Project Manager coordinates with District's Roadway and Drainage Design Engineers when performing the SLIP study, Sea Level Rise Analysis, and developing a sea level rise design strategy that is cost-prudent and practical. The results of this analysis are documented in the ***PER***.

Design efforts to increase a project's resiliency should be discussed with regional climate resilience collaboratives, MPOs, TPOs, and local agencies to identify local initiatives and plans regarding sea level rise.

Refer to the ***Drainage Manual, Topic No. 625-040-002*** for further guidance on resiliency and sea level rise considerations.

3.2.5.15 Water Quality

A ***Water Quality Impact Evaluation (WQIE) Checklist, Form No. 650-050-37*** must be prepared for each Type 2 CE, EA, EIS or SEIR project. The WQIE focuses on surface water and ground water. The surface water evaluation should identify and document water quality issues to produce designs that are complying with the goals of the ***Clean Water Act (CWA)***, as amended. The objective of the ***CWA*** is to provide guidance for developing comprehensive solutions to prevent, reduce, and eliminate pollution of waters of the United States. The ground water evaluation, in coordination with the Environmental Protection Agency (EPA) and other regulatory agencies, should be consistent with the ***Safe Drinking Water Act (SDWA)***, as amended. The ***SDWA*** requires ground water

quality to be maintained to protect human health, the environment, and ground water resources. WQIE requirements are discussed in detail in ***Part 2, Chapter 11, Water Resources***.

3.2.5.16 Hydrology and Floodplains

Analysis of project alternatives includes hydrology and hydraulic evaluation to determine preliminary location, type, and size of major drainage crossings that may impact floodplains and floodways. Protection of floodplains and floodways is required by ***Executive Order (EO) 11988, Floodplain Management***, ***USDOT Order 5650.2***, ***Floodplain Management and Protection*** and ***23 CFR Part 650A***. The intent of these directives is to avoid or minimize highway encroachments within the 100-year (base) floodplains, where practicable, and to avoid supporting land use development which is incompatible with floodplain values.

Hydraulics evaluation involves field observations to determine or confirm needed improvements, analysis of existing and proposed drainage basins, design of cross drains and culverts, design of outfall structures, determination of special erosion control and flood control features, among other things. Hydraulics evaluation also determines and corrects roadway design profile issues that may cause roadway flooding or overtopping.

The results of hydrology and hydraulic evaluation are summarized in the ***PER*** and the Environmental Document and detailed in the ***Location Hydraulics Report (LHR)***. See ***Part 2, Chapter 13, Floodplains*** for guidance on how to prepare an ***LHR***.

3.2.5.17 Utilities and Railroads

The Project Manager should coordinate with the District Utility Engineer and District Railroad Coordinator whenever a project involves utilities and/or rail systems on the project. The goal is to identify potential existing or future conflicts with the project. Coordination requirements for potential utilities and railroad conflicts are outlined in ***Part 2, Chapter 21, Utilities and Railroads***.

3.2.5.18 Survey and Mapping

Development of the horizontal and vertical alignment of the build alternative requires topographic survey data. The Project Manager should obtain existing information on survey control points, benchmarks, and control data (e.g., vertical and horizontal datum, coordinate system). The scale of surveying and mapping required for a PD&E Study depends on the project context, project complexity, and adjacent land use intensity. The scale of surveying and mapping also depends on the scope of the preliminary engineering. Engineering analysis for build alternatives may require the following:

1. Existing aerial photographs and imagery
2. LiDAR technology
3. Previous topographic surveys and reports

4. Previous roadway corridor mapping
5. U.S. Geological Survey (USGS) topographic maps
6. ROW maps, including supporting survey and title work
7. County maps showing adjacent parcels, plats, and side streets
8. Utility locates
9. Additional topographic surveys, Digital Terrain Models (DTM) and reports

Refer to the ***Surveying and Mapping Procedure, Topic No. 550-030-101***, and ***Surveying and Mapping Handbook*** for standards and guidance for conducting surveying and mapping.

3.2.5.19 Geotechnical Investigation

Soil exploration during the PD&E phase is part of the analysis that supports location and design of project alternatives. A subsurface investigation is required at the site of new structures, roadway construction, widening, trails, and rehabilitation locations as directed by the District Geotechnical Engineer or project scope. The scale of geotechnical investigation depends on the level of design analysis for the PD&E project and the type of soils involved. Geotechnical and subsurface investigation during PD&E involves:

1. Reviewing project requirements such as project location, alignment, structure location, structure loads, pier locations, and cut/fill area locations
2. Performing field reconnaissance of the site and existing structures to determine conditions that may affect development and construction of the project
3. Reviewing or obtaining ground survey data, aerial photography, geological information, U.S. Department of Agriculture (USDA) soil data, USGS topo maps, U.S Coast and Geodetic Survey (USCGS) maps
4. Planning and conducting field investigation and laboratory testing
5. Preparing a preliminary geotechnical report summarizing available data and providing recommendation
6. Identifying potential needs for the design investigation to address construction requirements and anticipate problems

Geotechnical and subsurface investigations must be conducted by a geotechnical engineer and the report must be signed by the engineer, in accordance with geotechnical standards, policies, and procedures (refer to the ***Soils and Foundations Handbook***).

Geotechnical and subsurface investigations may reveal evidence of contamination or solid waste/land-filling activities. This information is useful to the environmental analyst

tasked to perform contamination assessment work on the same project. When these investigations reveal contamination issues, the project geotechnical engineer should inform the Project Manager and the District Contamination Impacts Coordinator (DCIC).

3.2.5.20 Structures and Bridges

The Project Manager should include structures engineers when developing project alternatives that may require bridges, retaining walls, tunnels, culverts, or other structural elements.

3.2.5.20.1 Development of Bridge Alternatives

When the project involves a bridge or box culvert, several important factors guide the development of bridge alternatives. For existing bridges, the age, sufficiency rating, typical section, repair costs, vertical and horizontal clearance, historic significance, stormwater management, maintenance of traffic plan, and availability of a detour route determine if the bridge needs to be repaired or replaced.

For new bridges, the proposed typical section, navigation requirements, vertical and horizontal clearance requirements, location hydraulic evaluation and scour analysis, geotechnical data, ship/barge traffic, security requirements, aesthetics requirements, and bridge deck drainage considerations will guide the selection of the superstructure, substructure, and foundations.

For projects involving replacement of a bridge that is considered historic, or has substantial community value, the study must include a rehabilitation or repair alternative.

If the bridge has an existing or proposed wildlife crossing feature, coordination with the District Environmental Manager and the resource agencies is required to ensure appropriate bridge design alternatives are considered.

The purpose of the bridge analysis is to determine the general attributes for the bridge alternative(s). The bridge analysis must provide conceptual guidance for the bridge designer who will develop specific attributes of the bridge (such as bridge design and structure type) in the ***BDR***. The scope of services for the PD&E Study must specify the level of structural analysis and development for each anticipated bridge structure in the study. The District Structures Design Engineer must concur with the findings of the bridge analysis by signing the ***Typical Section Package***. See ***FDM, Part 2, Chapter 260, Topic No. 625-000-002*** for the contents of the bridge analysis and ***BDR***. Bridge replacement PD&E studies do not require preparation of a ***PER***, rather the preliminary engineering analysis results for these projects may be documented in the ***BDR*** or ***Bridge Replacement Report***.

3.2.5.20.2 Braided Underpass Structures

Design of interchange concepts and ramp configurations must consider the three-dimensional relationship of roadway and bridge components. Such components can include the mainline, auxiliary lanes, ramps, Collector-Distributor (C-D) roads, braided

(grade-separated) ramps, ramp terminal intersections, and ramp junctions. When an interchange concept involves braided underpass structures, the Project Manager must coordinate with the District Structures Design Engineer to ensure vertical and horizontal geometry of the bridges can be structurally designed. Braided underpass structures usually carry primary roadway traffic (e.g., mainline or C-D road traffic) over secondary roadway traffic (e.g., ramp traffic). They typically consist of single-span bridges where the beams or flat slab superstructure component is not oriented parallel to traffic of the overlying roadway and a portion of the superstructure and substructure extends beyond the limits of the traffic barriers (refer to the ***Structures Manual, Topic No. 625-020-018*** for details).

3.2.5.20.3 Bridge Hydraulics

The drainage engineer must prepare a ***LHR*** for bridges over water in accordance with the procedures outlined in the ***Drainage Manual, Topic No. 625-040-002***. Depending on the level of engineering analysis during the PD&E phase, a ***Bridge Hydraulic Report (BHR)*** may be prepared to determine the hydraulic length of the bridge.

The District Drainage Engineer should review tidal projects, including impacts from sea level rise projections, to determine if coastal hydraulics is a meaningful consideration in a roadway or bridge project's design. When coastal hydraulics is essential to the project, a coastal engineer must assist in determining the level of bridge analysis effort during scoping of the PD&E phase. Conditions that typically require attention by a coastal engineer during the final Design phase are as follows:

1. Hydraulic analysis of interconnected inlet systems
2. Analysis of inlet or channel instability, either vertically or horizontally
3. Determination of design wave parameters
4. Prediction of over wash and channel cutting
5. Design of countermeasures for inlet instability, wave attack or channel cutting
6. Prediction of sediment transport or design of countermeasures to control sediment transport
7. Assessment of wave loading on bridges and other structures

3.2.5.20.4 Perimeter Walls

The request for consideration of a perimeter wall must come from the local municipality in which the project is located or from a group of directly affected residences/property owners adjacent to the project. These requests should be documented in the project file as early in the project's life as possible (i.e., during the PD&E phase of the project). If a request for perimeter wall consideration has been made, it is the responsibility of the

Environmental Office Project Manager to forward the request to the appropriate design staff/project manager to ensure complete follow through on the request.

Perimeter walls are not intended to provide any noise reduction, nor are they intended to serve as a substitute for noise barriers at locations where a noise analysis has determined that the construction of noise barriers is not feasible and cost reasonable. Perimeter walls are also not intended to be used as mitigation for environmental impacts. Perimeter walls will not be considered as a retrofit for existing conditions, and shall only be given consideration when a minimum of one of the following conditions are met:

1. Expanding the capacity of an existing highway by adding lanes to the outside of the existing travel lanes;

2. The significant alteration of the vertical or horizontal alignment of an existing highway;

3. A new highway on a new alignment;

4. The removal of existing extensive vegetation or visual barrier within the FDOT ROW;

5. Exceptions to any of the items listed above will be considered on a case by case basis by the Assistant Secretary of Engineering and Operations.

If at least one of the above conditions is met, further consideration for the construction of a perimeter wall can proceed. The following requirements must also be met:

1. Building permits for the structures on the adjacent land that would realize a benefit from the perimeter wall must be issued prior to the approval of the Environmental Document.

2. Traffic on the project roadway must be visible from the adjacent property.

3. All structures for which the perimeter wall is being considered must be immediately adjacent to the FDOT's ROW and within 150 feet of the edge of the nearest travel lane. Additionally, the perimeter wall must be constructible within the FDOT's ROW or an easement must be granted to facilitate construction, if necessary.

4. The perimeter wall must be continuous, with no openings to accommodate driveways or other access requirements.

5. The cost of the perimeter wall shall not exceed $25,000 per adjacent land owner. A unit cost equal to 2/3 that of a noise wall (currently $30/ft^2) shall be used for estimating and programming purposes.

6. The height of a perimeter wall is limited to eight feet.

7. A simple majority of the adjacent property owners must support the construction of the perimeter wall.

FDM, Part 2, Chapter 264 provides additional details on the requirements for consideration of perimeter walls.

3.2.5.21 Transportation Management Plan

A Conceptual Transportation Management Plan (TMP) should be prepared during PD&E and will evolve as the project progresses toward final design and construction. Conceptual TMP must include traffic control strategies, and may also include additional work zone management strategies based upon the expected work zone impacts of a project. For additional guidance related to the TMP development process, see ***FDM, Part 2, Chapter 240, Topic No. 650-000-002***.

3.2.5.22 Constructability

The evaluation of build alternatives requires review of constructability and ability to maintain traffic during construction to uncover issues that may prevent implementation. The Project Manager must include Roadway Design Office, Structures Office, and Construction Office in the reviews of concept plans prepared for the Build Alternatives.

3.2.5.23 Construction Impacts

Impacts resulting from the actual construction of the proposed project should be discussed. A listing of general areas that may be discussed is provided below. This list is not intended to be all inclusive, as some impacts may be unknown and other activities are governed by specifications and law.

1. Air quality impacts related to open burning and dust control, see ***Part 2, Chapter 19, Air Quality***
2. Noise and vibration impacts related to construction activities, see ***Part 2, Chapter 18, Highway Traffic Noise***
3. Water quality protection related to erosion control, sedimentation, and turbidity reduction, see ***Part 2, Chapter 11, Water Resources***
4. Species and habitat protection related to construction activities, see ***Part 2, Chapter 16, Protected Species and Habitat***
5. Maintenance of traffic and detour routing for vehicular and multimodal traffic
6. Maintenance of access to businesses and residences for vehicular and multimodal traffic
7. Safety considerations

8. Public involvement and community interaction to ease disruptive effects
9. Disposal of construction materials
10. Stockpiling of construction materials and fill
11. Use of borrow areas
12. Mitigation measures proposed to reduce dredge and fill-related impacts

The ***PER*** and Environmental Document must contain a section that discusses construction impacts of the project. The discussion must include impacts which may occur, whether they are disruptive or beneficial, and measures, where feasible, to reduce the amount disruption which could result. Generally, FDOT has standard construction practices which take into consideration many of the direct impacts of construction, and provides for measures to reduce or eliminate their effects. Many of these measures are found in the ***Standard Specifications for Road and Bridge Construction***.

There are occasions where FDOT may commit to implement specific measures, features, or activities. Such measures will become commitments by FDOT and, as such, must be incorporated in the Commitments section of the ***PER*** and Environmental Document consistent with ***Part 2, Chapter 22, Commitments*** and ***Procedure No. 650-000-003, Project Commitment Tracking***.

3.2.6 Environmental Considerations for Build Alternatives

Development of Build Alternatives must consider the environment within which the project will be built and reflect the environmental constraints identified in the project area. Therefore, the development of the Build Alternatives should begin with overlaying environmental data collected during field review on the base map. Additional information is contained in the ***Programming Screen Summary Report*** that is completed for projects qualified for ETDM screening. FDOT environmental specialists and subject matter experts are involved throughout the project development process to evaluate potential impacts and recommend impact avoidance, minimization, mitigation, or enhancement measures. For environmental considerations refer to ***Part 2*** of this ***PD&E Manual***.

3.2.7 Value Engineering

In accordance with the ***Value Engineering Program, Topic No. 625-030-002***, all projects with an estimated cost of $25,000,000 or more (including all phases of the project), shall have a minimum of one ***Value Engineering (VE) Study***, performed during the development of the project prior to the completion of final design. Projects that have a potential for value improvements and do not meet the $25,000,000 criteria may also be studied.

The Director of Transportation Development may waive the requirement for VE Studies, See ***Value Engineering Program, Topic No. 625-030-002***. Projects delivered with the

Design Build (DB) method of construction are not required by federal regulation to have a VE Study; therefore, the requirement may be waived regardless of the dollar amount.

A VE Study can be conducted either during PD&E or during Preliminary Engineering Design. If the VE Study is conducted during the PD&E phase, it must occur after alternatives analysis is complete and before the public hearing (if held). In addition, all VE issues/recommendations should be resolved before scheduling a public hearing. The Project Manager should coordinate scheduling of the VE Study with the District Value Engineer and make sure that the draft Environmental Document, ***PER***, Summary of Public Involvement, and other technical documents are available for review by the VE team. Recommendations from the VE Study must be incorporated in the comparative alternatives evaluation and documented in the ***PER*** and the Environmental Document.

3.2.8 Comparative Alternatives Evaluation

Each project presents a unique set of challenges and the Project Manager must carefully provide a balance between the environmental impacts, the engineering considerations and the project costs, along with public input when selecting a preferred alternative. Analysis requires a comparative evaluation to objectively assess project alternatives (including the No-Action Alternative) at the same level of detail in a matrix format. The objective of an alternatives evaluation matrix is to compare the performance of each viable alternative in meeting the evaluation criteria, and to quantify its impacts to the natural, social, cultural, and physical environment. The comparative alternative evaluation must include the No-Action Alternative (No-Build Alternative).

Alternative evaluation measures should be presented in a manner to help the public, elected officials and agencies understand the advantages and disadvantages associated with each alternative.

The following is a list of suggested items to be compared in a matrix format. The list is not meant to be comprehensive, and it should be tailored to each project.

Project Cost - The project cost should include costs associated with:

1. Design Phase
2. ROW Acquisition (cost of acquiring ROW, relocation cost and business damages, if any)
3. Construction (roadway and bridge) - including TMP
4. Construction Engineering and Inspection (CEI)
5. Wetland, Habitat and Species Costs
6. Cultural Resources Costs
7. Utility Relocation Cost

8. Operations and Maintenance Cost (for transit projects)

Purpose and Need

1. Ability to meet Purpose and Need

Social and Economic Environment

1. Number of parcels (business and residential)
2. Number of relocations (business and residential)
3. Churches, Synagogues, Mosques, Worship centers
4. Cemeteries
5. Schools
6. Hospitals, Medical Centers
7. Farmland

Cultural Environment

1. ***Section 4(f)*** Resources
2. Historic Sites and Districts
3. Archaeological Sites
4. Parks, Recreational Areas, Wildlife/Waterfowl Refuges, and Protected Lands

Natural Environment

1. Wetlands and Other Surface Waters
2. Protected Species and Habitat
3. Floodplains
4. Water Resources

Physical Environment

1. Contamination/Hazardous Waste Sites
2. Noise Receptors
3. Navigation

4. Air Quality
5. Utilities
6. Bicycles and Pedestrians

Traffic Operations and Safety

1. LOS
2. Throughput
3. Delay
4. Travel Time
5. Safety
6. Vehicles Hours Traveled/Vehicle Miles Traveled (VMT)
7. Travel Time Reliability

An evaluation matrix for multimodal projects should include multimodal measures such as increased ridership, connectivity and accessibility, reduction of modal conflicts, and change in VMT.

For freight-focused projects, the comparative evaluation matrix should include freight-related performance measures. Such measures can include diversion estimates from through town, estimated travel-time savings between port and warehouse locations, travel time improvements for port access, travel-time differentials, and reduction in the number of truck trips.

3.2.9 Preferred Alternative

The identification of the preferred alternative is based on the results of the alternatives evaluation. The District should identify the preferred alternative in the appropriate sections of the ***PER*** and the Environmental Document. Both ***PER*** and Environmental Document should include supporting reasons for identifying the preferred alternative. The Environmental Document should briefly discuss proposed design features of the preferred alternative (see ***Section 3.2.10***). The ***PER*** should discuss in detail the preliminary design features of the preferred alternative. When the design features of the preferred alternative do not meet the designated design criteria, design exceptions or design variations must be prepared and approved per ***FDM, Part 1, Chapter 122, Topic No. 625-000-002***. Detail design of these features is performed during the Final Design phase, in accordance with the ***FDM, Topic No. 625-000-002***.

The preferred alternative (or portion thereof) for a project, after being identified in the Draft Environmental Impact Statement (DEIS), may be developed to a higher level of detail

than other alternatives in order to facilitate the development of mitigation measures or compliance with requirements for permitting. The development of such higher level of detail must not prevent FDOT from making an impartial decision as to whether to accept another alternative that is being considered in the environmental review process. The District must coordinate with the State Environmental Development Engineer prior to developing the preferred alternative to a higher level of detail than other alternatives.

If a preferred alternative is identified prior to the public hearing, it must be presented as such at the public hearing and in the Environmental Document available during the public comment period. It is normally expected that a preferred alternative is chosen prior to the public hearing. If in unusual circumstances a preferred alternative cannot be selected before the public hearing the District should coordinate with OEM. For these situations, additional public involvement after the hearing would be expected and could range from another public hearing to a meeting, or a flyer/mailer.

Once the public hearing is held and public and agency comments are considered, appropriate sections of the Environmental Document are updated to include information received from the public hearing process. Additionally, the ***PER*** is updated to include preliminary design details associated with the preferred alternative based on comments received.

The following are elements of the preferred alternative that require detailed discussion in the ***PER***. If an element does not exist or does apply to the project, include a statement to that fact in the ***PER***.

Typical Section(s)

Discuss the proposed typical sections and include a ***Typical Section Package*** signed by a PE, and finalized in accordance with ***FDM, Part 1, Chapter 120, Topic No. 625-000-002***. The District Design Engineer, the District Traffic Operations Engineer, the District Structure Engineer (as applicable) and the District Intermodal Systems Development Manager must concur and sign the ***Typical Section Package***. Include a copy of the approved ***Typical Section Package*** in the ***PER*** for Type 2 CEs, EAs with Finding of No Significant Impact (FONSI), EISs, and SEIRs.

Access Management

Discuss the existing access management classification(s) and any change(s) to that classification proposed by the preferred alternative. Discuss other access point changes such as medians and driveways and show the proposed changes on the concept plans. Prepare a conceptual access management plan to document access management issues and preliminary design decisions and actions reached during the PD&E phase. If a public hearing is required based on changes in access management, this hearing can be conducted concurrently with the PD&E public hearing.

Right of Way

Discuss the number of parcels, the number of relocations and the total cost estimate for the acquisition of those parcels. If a ***Conceptual Stage Relocation Plan (CSRP)*** has been developed for the project, include a reference to the plan and its conclusions. Details regarding costs for individual parcels must not be included in this discussion or elsewhere in the report. Include considerations of future land use changes around the proposed ROW.

Horizontal and Vertical Geometry

Include preliminary concept plans showing the horizontal and vertical geometry of the project.

Design Variations and Design Exceptions

Discuss any design controls and criteria that will need a design variation or design exception. Include any design variations or design exceptions which have received approval.

Multimodal Accommodations

Discuss multimodal accommodations (bicycles, pedestrians, transit), complete streets and context sensitive design solutions, such as lane repurposing, applied to the alternative.

Intersection/Interchange Concepts and Signal Analysis

Include concepts plans showing proposed intersections and/or interchange configurations. Refer to either the ***Project Traffic Analysis Report (PTAR)*** for signal timing analysis or include signal analysis in the Appendix.

Tolled Projects

Discuss the results of the ***TSTM***, if applicable.

ITS and TSM&O Strategies

Discuss ITS facilities based on the systems engineering analysis and TSM&O strategies or technologies that will be added in the preferred alternative. Confirm applicability of TSM&O strategies or technologies with the District TSM&O Program Engineer.

Landscape

Discuss landscaping accommodations for the preferred alternative as coordinated with the District Landscape Architect.

Lighting

Identify project lighting needs and design. Discuss the impacts to neighborhoods, aesthetic impact, and impacts to sensitive species.

Wildlife Crossings

Discuss wildlife crossings and coordination with appropriate District personnel and regulatory agencies.

Permits

Summarize the preferred alternative permitting needs and coordination with the District and permitting agencies.

Drainage and Stormwater Management Facilities

Discuss the type of drainage system(s) to be used for the preferred alternative. A discussion of the number and type of stormwater management systems should also be included.

Floodplain Analysis

Discuss impacts that occur to floodplains. This discussion should include whether the impacts will be parallel or perpendicular to the floodplain.

Bridge and Structure Analysis

Include a proposed typical section and bridge concept for all bridges on the project. Include the proposed superstructure and substructure for each bridge and the breakdown of cost.

Transportation Management Plan

Discuss or detail preliminary TMP that will handle all phases of construction for the preferred alternative.

Constructability

Describe construction phasing of the preferred alternative and identify any challenges with implementation of the proposed project.

Construction Impacts

Discuss all direct impacts resulting from the actual construction of the proposed project.

Special Features

Discuss any features that are not commonly associated with a transportation project. Examples could include any features included to protect or minimize impacts to the environment.

Utilities

Include a list of all the UAOs together with the contact information for each within the preferred alternative. Include a cost estimate for utility relocations.

Cost Estimates

Include a table summarizing project costs consistent with the Long Range Estimate (LRE). Use FDOT's LRE System for construction costs, and ROW estimates for ROW costs. Design and CEI costs may be developed based on a fixed percentage of construction cost. For a project with wetland impacts, include the cost of wetland mitigation. For a project with utility impacts, include the costs of utility relocation both directly and indirectly to FDOT.

3.2.10 Alternatives Analysis Documentation

This section provides guidance on documenting alternatives analysis in the Environmental Document and ***PER***. A Florida registered PE must sign and seal the engineering analysis performed to support PD&E Studies in accordance with ***Chapter 471, F.S.***

3.2.10.1 Environmental Document

The Environmental Document must discuss impacts on the environment from the preferred alternative and other alternatives in a comparative form. The comparative alternatives evaluation must provide a clear basis for the decision to select the preferred alternative. The alternatives section of the Environmental Document must address the following:

1. Evaluate reasonable alternatives to the proposed action (for EISs), and, for alternatives that the agency eliminated from detailed study, briefly discuss the reasons for their elimination.

2. Discuss each alternative considered in detail, including the proposed action so that reviewers may evaluate their comparative merits.

3. Include the No-Action Alternative.

4. Identify the agency's preferred alternative or alternatives, if one or more exists, in the draft document and identify such alternative in the final document unless another law prohibits the expression of such a preference.

5. Include appropriate mitigation opportunities and measures not already included as a part of the proposed action or alternatives.

6. Limit their consideration to a reasonable number of alternatives.

These items are required for EISs by ***40 CFR § 1502.14***.

The location of alternatives documentation differs depending on the type of Environmental Document:

1. **Type 2 CE** - Alternatives information is included in the ***PER***.

2. **EA** - Alternatives information is included in the section titled Alternatives.

3. **EIS** - Alternatives information is included in the section titled Alternatives.

4. **SEIR** - Alternatives information is included in the ***PER***.

The Alternatives section for EAs and EISs should be divided into the following sub-sections, as applicable:

1. Alternatives Development

2. Alternatives Considered but Eliminated

3. Alternatives Considered for Additional Study

4. Comparative Alternatives Evaluation

5. Preferred Alternative

Alternatives Development - Summarize any Planning phase alternative corridor reports, screening reports, and results of the ACE process as applicable. Provide a brief description of the original alternatives that were considered and the methodology used for evaluation, while referencing technical documents such as the ***PER***, ***PTAR***, and ***ACER*** for detailed information. Discuss public involvement activity as related to alternatives development.

Alternatives Considered but Eliminated - Discuss alternatives considered but eliminated from detailed analysis (include alternatives considered and eliminated during planning). Clarify why the alternatives were eliminated, what criteria were used to eliminate them, who was involved in establishing the criteria and at what point in the process the alternatives were removed.

Alternatives Considered for Additional Study - Identify the alternatives studied in detail during the PD&E Study and include a concise discussion of how and why they were selected. Describe each alternative in sufficient detail to support decision-making. Provide a clear understanding of each alternative's termini, location, costs, and major design features (i.e., number of lanes, ROW requirements, median widths, access control). See

Section 3.2.5 for information to consider for each Build Alternative. Present a summary of the environmental impacts of each alternative based on the information and analysis presented in the Environmental Analysis section of the Environmental Document. The information should provide a clear basis for decision-making.

Comparative Alternative Evaluation - Describe the alternatives evaluation methodology used to objectively compare all alternatives. Present comparative evaluation results (qualitative and quantitative) in a matrix form. Information in the matrix must be consistent with the Environmental Document and applicable technical reports. Describe the rationale and the factors used in the ranking of the alternatives.

Preferred Alternative - Describe the alternative which the District is recommending to OEM for Location and Design Concept Approval (LDCA). The selection of the preferred alternative should be described in sufficient detail so the reader can understand the decision.

Below is an example of the discussion generally found in this section.

> As a result of scoping, environmental analysis, the public hearing, and interagency coordination, the alternative identified for LDCA is (alternative name), which is (alternative description) (provide location of alternative specific details and typical sections).

The Final Environmental Impact Statement (FEIS) must identify the preferred alternative and should discuss the basis for its selection [See ***23 CFR § 771.125(a)(1)***]. The FEIS must also discuss substantive comments received on the DEIS and responses thereto, summarize public involvement, and describe the mitigation measures that are to be incorporated into the proposed action.

3.2.10.2 Preliminary Engineering Report

The ***PER*** is the documentation of the engineering analysis of a PD&E Study (for bridge projects, a ***PER*** can be substituted with a ***BDR***). The ***FDOT Preliminary Engineering Report Outline and Guidance*** provides guidance for the preparation of the ***PER***. At a minimum, the ***PER*** should contain the following:

1. Cover Page

    a. The ***PER*** must use the ***Technical Report Cover Page, Form No. 650-050-38*** as the cover sheet of the report. A sample ***PER*** cover page is provided in ***Figure 3-2***. The cover page of the ***PER*** prepared under the authority granted by the ***NEPA*** Assignment MOU and transmittal letters associated with information packages should include the following statement:

    The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by the Florida Department of

Transportation (FDOT) pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated May 26, 2022, and executed by the Federal Highway Administration and FDOT.

2. Project Summary

    a. Project Description - Include a brief description of the project including name of the facility, location (City and County), project length, number of interchanges and bridges and/or major features, as applicable. Must be consistent with the Project Description in the Environmental Document.

    b. Purpose and Need - Include the purpose and need for the project. Must be consistent with purpose and need described in the Environmental Document.

    c. Commitments - Include a list of all commitments that will be included in the Environmental Document.

    d. Alternatives Analysis Summary – Provide a summary of the alternatives analysis.

    e. Description of the Preferred Alternative - Include a brief description of the preferred alternative and include any design exceptions or variations.

    f. List of Technical Documents – include a list of all technical documents prepared for the study.

3. Existing Conditions - Briefly discuss previous planning studies, existing roadway conditions, existing bridge conditions (if applicable) and existing environmental features as listed in ***Section 3.2.3.3.***

4. Future Conditions – List any future conditions that were considered in the development of alternatives per ***Section 3.2.3.3.***

5. Design Controls and Criteria - List design controls and criteria used to develop alternatives as listed in ***Section 3.2.3.5*** Include sources of the applicable criteria.

6. Alternatives Analysis

    a. Include the No-Action (No-Build) Alternative, TSM&O Alternative, Multimodal Alternative, and Build Alternative(s) per ***Section 3.2.4***.

    b. Discuss the engineering considerations in the development of Build Alternative(s) per ***Section 3.2.5***. Include discussion of alternatives that have been considered but eliminated per ***Section 3.2.4.4.2***.

    c. Summarize potential environmental impacts for each alternative, incorporate by reference the results of the environmental technical analyses to reduce repetition per ***Section 3.2.6***

d. Summarize the recommendations from the VE Study per ***Section 3.2.8*** in the comparative alternatives evaluation, if applicable. State if the VE Study will be performed in later project phases if not completed in PD&E.

e. Summarize the criteria used to assess the performance of the various alternatives. Include a comparative alternatives evaluation with assumptions made during the development of the evaluation matrix per ***Section 3.2.8***

7. Agency Coordination and Public Involvement – Summarize the agency coordination and public involvement including dates for meetings and hearing(s) held for the project. Include a reference to the project's comment and coordination documentation. Refer to ***Section 3.2.2*** for more information on project coordination. Refer to ***Part 1, Chapter 11, Public Involvement*** for public involvement requirements.

8. Preferred Alternative - Discuss the engineering details and environmental impacts of the preferred alternative as outlined in ***Section 3.2.9***.

3.3 REFERENCES

AASHTO, August, 2007. Practitioner's Handbook. Defining the Purpose and Need and Determining the Range of Alternatives for Transportation Projects

Chapter 62S-7, F.A.C. Public Financing of Coastal Construction "Slip Study Rule" https://www.flrules.org/gateway/ChapterHome.asp?Chapter=62S-7

Executive Order (EO) 11988, Floodplain Management

FAA. 2005. Wildlife Hazard Management at Airports

FHWA, 1987. FHWA Technical Advisory. T6640.8A, Guidance for Preparing and Processing Environmental and Section 4(f) Documents. https://www.environment.fhwa.dot.gov/projdev/impta6640.asp

FHWA, 2010. FHWA Order 6640.1A. FHWA Policy on Permissible Project Related Activities during the NEPA Process. https://www.fhwa.dot.gov/legsregs/directives/orders/66401a.cfm

FHWA, 2010. Integrating Freight into NEPA Analysis. https://ops.fhwa.dot.gov/publications/fhwahop10033/nepa.pdf

FHWA, 2017. Policy on Access to the Interstate System. https://www.fhwa.dot.gov/design/interstate/170522.cfm

FHWA, 2019. FHWA Bicycle and Pedestrian Planning, Program and Project Development. https://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/guidance_2019.cfm

FHWA, NEPA and Transportation Decision Making, Development and Evaluation of Alternatives. https://www.environment.fhwa.dot.gov/projdev/tdmalts.asp

First Renewal of the Memorandum of Understanding Between FHWA and FDOT Concerning the State of Florida's Participation in the Surface Transportation Project Delivery Program Pursuant to 23 U.S.C. § 327, May 26, 2022. https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/environment/pubs/nepa_assign/fdot-327-first-renewal-mou-for-comment.pdf?sfvrsn=202c70b4_2

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FDOT. 2021. WATERSS Process Guidebook. http://www.fdot.gov/environment/publications.shtm

FDOT. FDOT Wildlife Crossing Guidelines. https://www.fdot.gov/environment/protected-species-and-habitat

FDOT. FTE Toll Siting Technical Memorandum (TSTM) Template https://floridasturnpike.com/business-opportunities/design/tolls-design/

FDOT. Local Agency Program Manual, Topic No. 525-010-300. https://www.fdot.gov/programmanagement/LAP/LAP-TOC.shtm

FDOT. Procedure No. 650-000-003, Project Commitment Tracking. https://pdl.fdot.gov/

FDOT. Resiliency of State Transportation Infrastructure, Topic No. 000-525-053. resiliency_policy_000-525-053.pdf (windows.net)

FDOT. Value Engineering Program, Topic No. 625-030-002. https://pdl.fdot.gov/

Section 161.053, F.S., Coastal construction and excavation; regulation on county basis. https://www.flsenate.gov/Laws/Statutes/2021/0161.053

Section 161.54(6) F.S., Definitions. https://m.flsenate.gov/Statutes/161.54

Section 161.551, F.S. Public financing of construction projects within the coastal building zone. https://www.flsenate.gov/Laws/Statutes/2021/0161.551

Section 335.065, F.S., Bicycle and pedestrian ways along state roads and transportation facilities. https://m.flsenate.gov/statutes/335.065

Title 23 CFR § 667.9. Consideration of evaluations. https://www.ecfr.gov/current/title-23/chapter-I/subchapter-G/part-667?toc=1

Title 23 CFR Part 450. Planning Assistance and Standards. https://www.ecfr.gov/cgi-bin/text-idx?SID=41629bc4699d654b4164d357da2329e0&mc=true&node=pt23.1.450&rgn=div5

Title 23 CFR Part 650A. Location and Hydraulic Design of Encroachments on Flood Plains. https://www.ecfr.gov/current/title-23/chapter-I/subchapter-G/part-650

Title 23 CFR Part 771. Environmental Impact and Related Procedures. https://www.ecfr.gov/cgi-bin/text-idx?SID=41629bc4699d654b4164d357da2329e0&mc=true&node=pt23.1.771&rgn=div5

Title 23 CFR Part 940. Intelligent Transportation System Architecture and Standards. https://www.ecfr.gov/current/title-23/chapter-I/subchapter-K/part-940

Title 40 CFR Part 230. Guidelines for Specification of Disposal Sites for Dredged or Fill Material. https://www.ecfr.gov/cgi-bin/text-idx?SID=41629bc4699d654b4164d357da2329e0&mc=true&node=pt40.27.230&rgn=div5

Title 40 CFR §§1500-1508. Council on Environmental Quality. https://www.ecfr.gov/cgi-bin/text-idx?SID=41629bc4699d654b4164d357da2329e0&mc=true&tpl=/ecfrbrowse/Title40/40chapterV.tpl

Title 23 U.S.C. § 129. Toll roads, bridges, tunnels, and ferries 23 USC 129: Toll roads, bridges, tunnels, and ferries (house.gov)

Title 23 U.S.C § 166. HOV Facilities. https://www.gpo.gov/fdsys/pkg/USCODE-2010-title23/pdf/USCODE-2010-title23-chap1-sec166.pdf

Title 23 U.S.C. § 168. Integration of planning and environmental review

Title 23 U.S.C. § 301. Freedom from Tolls

Title 33 U.S.C. Chapter 35. Artificial Reefs

USDOT Order 5650.2, Floodplain Management and Protection

USDOT, 2010. United States Department of Transportation Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations. https://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/policy_accom.cfm

3.4 FORMS

Technical Report Cover Page, Form No. 650-050-38

Water Quality Impact Evaluation Checklist, Form No. 650-050-37

FDOT forms are found in the Procedural Document Library.

3.5 HISTORY

1/12/2000, 10/16/2013, 8/25/2016, 6/14/2017: NEPA Assignment and re-numbered from Part 2, Chapter 6, 1/14/2019, 7/1/2020

Engineering analyses, design concepts, and accompanying reports should be prepared consistently with the latest edition of the following documents:

1. FDOT Design Manual (FDM), Topic No. 625-000-002
2. Manual of Uniform Minimum Standards for Design, Construction, and Maintenance for Streets and Highways (Florida Greenbook), Topic No. 625-000-015
3. Structures Manual, Topic No. 625-020-018
4. Approval of New or Modified Access to Limited Access Highways on the State Highway System (SHS), Topic No. 000-525-015
5. Level of Service Targets for the SHS, Topic No. 000-525-006
6. Median Openings and Access Management, Procedure No. 625-010-021
7. Manual on Uniform Traffic Studies (MUTS), Topic No. 750-020-007
8. Drainage Manual, Topic No. 625-040-002
9. FDOT Drainage Design Guide
10. Utility Accommodation Manual, Rule 14-46.001, F.A.C.
11. CADD Manual, Topic No. 625-050-001
12. Standard Plans for Road and Bridge Construction, Topic No. 625-010-003
13. Complete Streets, Topic No. 000-625-017
14. Americans with Disabilities (ADA) Requirements for Access to Department Facilities, Topic No. 625-020-15
15. Transit Corridor Program, Topic No. 725-030-003
16. FDOT Right of Way Procedures Manual, Topic No. 575-000-000
17. FDOT Standard Specifications for Road and Bridge Construction
18. Project Traffic Forecasting, Procedure No. 525-030-120
19. FDOT Quality/Level of Service Handbook
20. FDOT policy on Landscape, Topic No. 000-650-011
21. FDOT Traffic Engineering Manual (TEM), Topic No. 750-000-005

Figure 3-1 Manuals, Procedures, and Design Guides, and to Establish Project Development Design Controls and Criteria

22. 2023 Managed Lanes Guidebook
23. FDOT Context Classification Guide
24. Surveying and Mapping Procedure, Topic No. 550-030-101
25. FDOT Surveying and Mapping Handbook
26. FDOT Soils and Foundations Handbook
27. FDOT Interchange Access Request User's Guide
28. FDOT Traffic Analysis Handbook
29. Manual on Intersection Control Evaluation, Topic No. 750-010-003
30. FDOT Preliminary Engineering Report Outline and Guidance - August 2019
31. FDOT Managed Lanes Policy, Topic No. 000-525-045
32. Florida Department of Transportation Systems Engineering and Intelligent Transportation System (ITS) Architecture Procedure, Procedure No. 750-040-003
33. General Tolling Requirements (GTR) Florida's Turnpike
34. WATERSS Process Guidebook

The engineering analysis may also use national publications such as:

1. Highway Capacity Manual (HCM)
2. American Association of the State Highway and Transportation Officials (AASHTO) A Policy on Highway Geometric Design (AASHTO Green book)
3. AASHTO Highway Safety Manual (HSM)
4. NCHRP Report 672, Roundabouts: An Informational Guide
5. AASHTO Guide for the Development of Bicycle Facilities
6. AASHTO Guide for the Development of Pedestrian Facilities
7. Manual on Uniform Traffic Control Devices (MUTCD)

Figure 3-1 Manuals, Procedures, and Design Guides, and to Establish Project Development Design Controls and Criteria (Page 2 of 2)

PRELIMINARY ENGINEERING REPORT

Florida Department of Transportation

District X

Project Title

Limits of Project

County, Florida

Financial Management Number: XXXXX-X

ETDM Number: XXXXXX

Date

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by the Florida Department of Transportation (FDOT) pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated May 26, 2022, and executed by the Federal Highway Administration and FDOT.

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY

Lan B. Solo
2018.10.14 16:42:26 -4'00'

ON THE DATE ADJACENT TO THE SEAL

PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

ROADWAY ENGINEERS, INC.
123 MAIN STREET
TALLAHASSEE, FL 32301
LAN B. SOLO, P.E. NO. 99994

Figure 3-2 Preliminary Engineering Report Sample Cover Page