National Park Service

National Park Service
U.S. Department of the Interior

Value Analysis Study
October 22 - 24, 2019

National Park Service
Everglades National Park, Florida

Tamiami Trail Modifications: Next Steps Phase 2

PMIS Number: 259050

Value Analysis Final Report

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FORWARD

This report includes recommendations for Tamiami Trail Modifications: Next Steps Phase 2. They stem from a Value Analysis (VA) workshop initiated by the National Park Service. The VA workshop was held at the HDR Office located at 15450 New Barn Road, Miami, FL 33014, October 22 - 24, 2019.

Coordination of this VA was done by Hugo Gutierrez, project manager, HDR. Stephen Kirk, a certified value specialist of Kirk Value Planners (Kirk Associates, LLC), led the team's deliberations during the workshop. The list of attendees is contained at the end of Section B.

Value Analysis Study
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SECTION A: EXECUTIVE SUMMARY

"He has the right to criticize who has the heart to help," A. Lincoln

Summary Description of Project:

The Tamiami Trail is a 264-mile roadway (U.S. Highway 41/State Road 90) that was completed in 1928 to connect the growing cities of Tampa and Miami. Within the Everglades, the roadway embankment was constructed by excavating the underlying limestone, forming what is now the L-29 borrow canal. The excavated material was placed directly on top of the existing Everglades muck soil. Over time the muck has consolidated, which has contributed to roadway instability problems. The eastern 10.7-miles of the Tamiami Trail between the L-31N and L-67 extension levees remained lower, limiting the ability to raise water levels and increase flows into Northeastern Shark River Slough.

The Tamiami Trail (U.S. Highway 41) has long been recognized as one of the primary barriers to flow of water through the ecosystem. The need to eliminate barriers to overland flow of water in the Everglades was considered one of the indisputable tenets of restoration. Much scientific information amassed in recent decades reinforced the importance of removing these barriers to water flow in order to restore natural marsh connectivity.

In November 2010, the National Park Service completed the Tamiami Trail Modifications: Next Steps Final Environmental Impact Statement; the Record of Decision was signed in early 2011. This report presented an environmental analysis of six alternatives: a no-action alternative, and five variations of additional bridging that could be constructed along the eastern roadway, while accommodating access to all of the adjacent developed areas (these include: two Miccosukee Indian camps, three commercial and one private airboat operations, and three radio/telemetry tower arrays). The environmentally preferred alternative (Alternative 6e) recommended the construction of up to 5.5-miles of additional bridging (in four potential locations), and complete reconstruction of the remaining roadway. The recommended roadway reconstruction would remove all of the unsuitable sub-base, and raise the top of the finished roadway elevation to approximately 13 feet National Geodetic Vertical Datum (NGVD), to accommodate the future Comprehensive Everglades Restoration Plan (CERP) projected design high water of 9.7 feet in the L-29 canal (see **Figures 1A and 1B**).

Figure 1A. The Modified Water Deliveries, Tamiami Trail modifications, with the 1-mile bridge (purple) and partial reconstruction of the roadway.

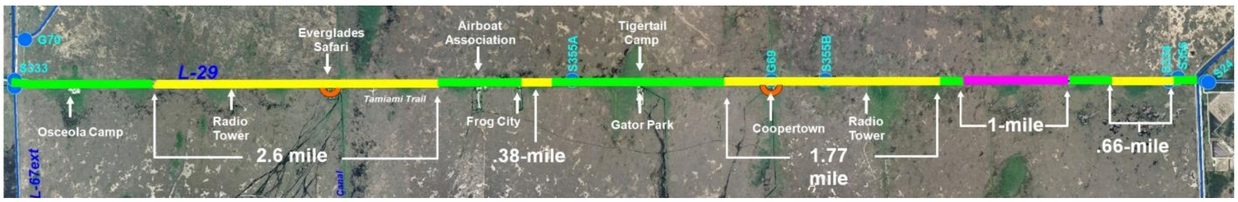

Figure 1B. Tamiami Trail Next Steps recommended plan (Alternative 6e), with up to 5.5-miles of additional bridging (yellow) and complete reconstruction of the remaining roadway.

Tamiami Trail Next Steps Phase 1

The 2009 Omnibus Appropriations Act (March 10, 2009) directed the NPS to evaluate bridging alternatives to the Tamiami Trail (US Highway 41) roadway (10.7-mile eastern section), beyond what was authorized by the 2008 Modified Water Deliveries to ENP Project: Limited Reevaluation Report (MWD/LRR), in order to "restore more natural water flow to Everglades National Park (ENP) and Florida Bay and for the purpose of restoring habitat within the Park and the ecological connectivity between the Park and the Water Conservation Areas." The 2009 Omnibus Act also directed the U. S. Army Corps of Engineers (USACE) to immediately construct the 2008 LRR plan—a 1-mile bridge and the remaining road elevated to allow stages in the L-29 Canal to be raised to as much as 8.5 feet. Passage of the 2009 Omnibus Act was an acknowledgement that construction of the LRR modifications was only the first step, albeit an important one, to restoration of flows and ecological conditions in ENP.

A Final EIS (FEIS) was completed in 2010 by ENP for the Tamiami Trail Next Steps Project. The Record of Decision (ROD) was subsequently published in the Federal Register on April 26, 2011. The preferred plan identified in the FEIS and ROD was to add 5.5 miles of bridging to the 1-mile bridge then under construction and raise the balance of the 10.7-mile highway corridor (Alternative 6e in the FEIS). The estimated total cost for construction of Alternative 6e was estimated at $279 million. This estimated total cost includes escalation, contingency, Engineering and Design (E&D), and Supervision and Administrative (S&A) costs. Alternative 6e specifies construction of 5.5-miles of bridging and raising the remaining roadway in the 10.7-mile corridor of the Tamiami Trail to allow for a water stage up to a 9.7-feet NGVD designed high water (DHW) in the adjacent L-29 Canal, consistent with Florida Department of Transportation specifications that essentially allow for unconstrained flows to the Expansion Area (Northeast Shark River Slough) of

Everglades National Park. Importantly, this level of road elevation precludes the need for any future modifications to the highway corridor when full restoration of the Everglades is achieved through the addition of projects supplying sufficient flow of clean water.

On December 23, 2011, Congress passed the Consolidated Appropriations Act of 2012 (Public Law 112-74) which authorized construction of Alternative 6e of the Next Steps Project. In October 2012, NPS Director Jonathan Jarvis directed the staff of the Denver Service Center (DSC) and ENP to focus on the western 2.6 mile bridge as the first increment (Phase 1) towards implementation of Alternative 6e. In early 2013 the NPS developed a conceptual design and initial cost estimate of $180 million for Phase 1, to construct 2.6- miles of bridging and roadway improvements. Prioritization of alternatives was based on maximizing early benefits to the park, reducing costs, and ensuring compatibility with other projects in the Everglades. All Phases of the project intend to provide restoration benefits to EVER, minimize costs while maintaining an acceptable level of ecosystem performance, and are compatible with the features considered in the Central Everglades Planning Process (CEPP) Tentatively Selected Plan. In late 2013, Florida Governor Rick Scott pledged up to $90 million of Florida Department of Transportation (FDOT) funding for Phase 1, and the NPS and Federal Highway Administration (FHWA) committed to matching that funding up to $90M for Phase 1.

The TT: NS Phase 1 eastern bridge (0.88-miles of decking) was completed in April 2018, and the western bridge (1.43-miles of decking) was substantially completed in October 2018. The adjacent approaches and transitions (totaling 0.7-miles) have been raised from approximately 10.0 feet to 13.1 feet based on the NGVD of 1929, to accommodate the future CERP design high water (DHW) requirement of 9.7 feet NGVD in the adjacent L-29 Canal. Removal of the original (abandoned) Tamiami Trail roadway at the eastern bridge began in October 2018. All of the remaining Phase 1 work is currently being closed out by the FDOT and their contractor.

Tamiami Trail Next Steps Phase 2

This second phase of the Tamiami Trail Modifications was originally provided for as included in the first phase of design but has since beneficially changed. An NPS-sponsored VA Workshop was held in July 2018 to reassess the project to determine the most environmentally responsible and cost effective Phase 2 plan to achieve the purpose, need, and objectives. The Phase 2 Recommended Plan from the July 2018 VA proposed to implement modest conveyance improvements (i.e. 72-foot wide pre-cast concrete culverts) to enhance water flow at six existing culvert locations instead of constructing the previously approved 2.8 miles of Phase 2 bridging. Remaining segments of roadway would be raised, the remaining culverts will be replaced in-kind, and swales would be added to enhance water quality. The changes to the original plan were anticipated to result in significant cost savings to the project while being confirmed by a multidisciplinary team to meet the purpose and need of the Tamiami Trail Modifications.

Following the July 2018 VA Workshop, the proposed Tamiami Trail Modifications Phase 2 modifications were identified as follows:

1. Integrate proposed construction with approximately 4.2 miles of bridge and roadway improvements constructed under Phase 1;
2. Integrate proposed construction with existing sites and facilities requiring access to the roadway;
3. Include functional replacement of current means of access and provide for acceleration and deceleration per FDOT standards;
4. Include functional replacement of parking facilities for Osceola and Tiger Tail camps;
5. Include provisions to accommodate each site's proposed changes per cure plans;
6. Reconstruct approximately 6.5 miles of roadway;
7. Raise the roadway prism to accommodate the CERP design high water requirement of 9.7 feet NGVD of 1929;
8. Replace 6 larger existing culvert structures with 72-foot wide pre-cast concrete culvert assemblies, bridges, etc.;
9. Replace 12 smaller existing culvert structures with culverts, bridges, etc.; and
10. Construct permanent stormwater quality treatment facilities, as required.

This value analysis study helped identify alternatives and developed recommendations for the programmatic needs for the Tamiami Phase II. The VA focused specifically on the options to reconstruct the 6.5 miles of Tamiami Trail and water conveyance options.

Project Budget

The net construction budget for the project has not yet been established.

Value Analysis Objectives

This VA workshop focused on:

- Selecting preferred alternatives using Choosing By Advantages (CBA) and Life Cycle Costing (LCC)
- Brainstorming ideas to add value to the project
- Identification of impacts to users of road
- Maintainability of structures
- Safety of operation
- Impact and accessibility to neighbors
- Reducing impacts to Tamiami Trail (as a cultural resource)
- Compatibility with regional water management operation
- Timely project schedule
- Meeting FDOT standards
- Environmental sensitivity during construction
- Maintenance of traffic (MOT) for visitors, community, tribes, private businesses

Alternatives Considered - Structural Type Selection

The value analysis included a diverse range of possible alternatives. During the workshop, HDR presented five structural type alternatives.

During the brainstorming session many ideas were listed. During the reconsideration phase, further improvements were identified. Following is a summary:

Alternative:	Description:	Status:	Initial Costs:	Life Cycle Costs:
Alternative 1	Precast Multi-span Box Culvert	Evaluated in CBA & LCC	$791,107	$1,064,407
Alternative 2	Flat Slab Bridge	Evaluated in CBA & LCC	$992,431	$1,402,331
Alternative 3	Inverted T Beam Bridge	Evaluated in CBA & LCC	$890,531	$1,437,031
Alternative 4 **Preferred Alternative**	Florida Slab Beam Bridge	Evaluated in CBA & LCC	$982,208	$1,392,108
Alternative 5	Span Arch 3-Sided Box Culvert	Evaluated in CBA & LCC	$1,200,241	$1,473,541

Preferred Alternative for Structural Type Selection (via CBA)

Alternative 4 was identified as the preferred alternative based on Choosing By Advantages (CBA) decision making approach. The advantages identified by CBA over the other Alternatives include the following:

- BETTER at maintaining habitat for wildlife crossing under the highway due to natural bottom and sloped sides
- SLIGHTLY BETTER because of less of a footprint of impact
- BETTER due to moderate maintenance and repair
- SIGNIFICANTLY BETTER constructability due to no de-watering, concrete foundation, minimal formwork required
- Third lowest initial cost
- Third lowest maintenance cost
- Second lowest life cycle cost

In addition to identifying advantages, the CBA process also included preparation of graphs to compare the importance of the advantages and costs. See **Figure 2**, which compares the "Importance to Initial Cost." It illustrates Alternative 4 has the highest importance of advantages (benefits) to initial cost compared to the other alternatives.

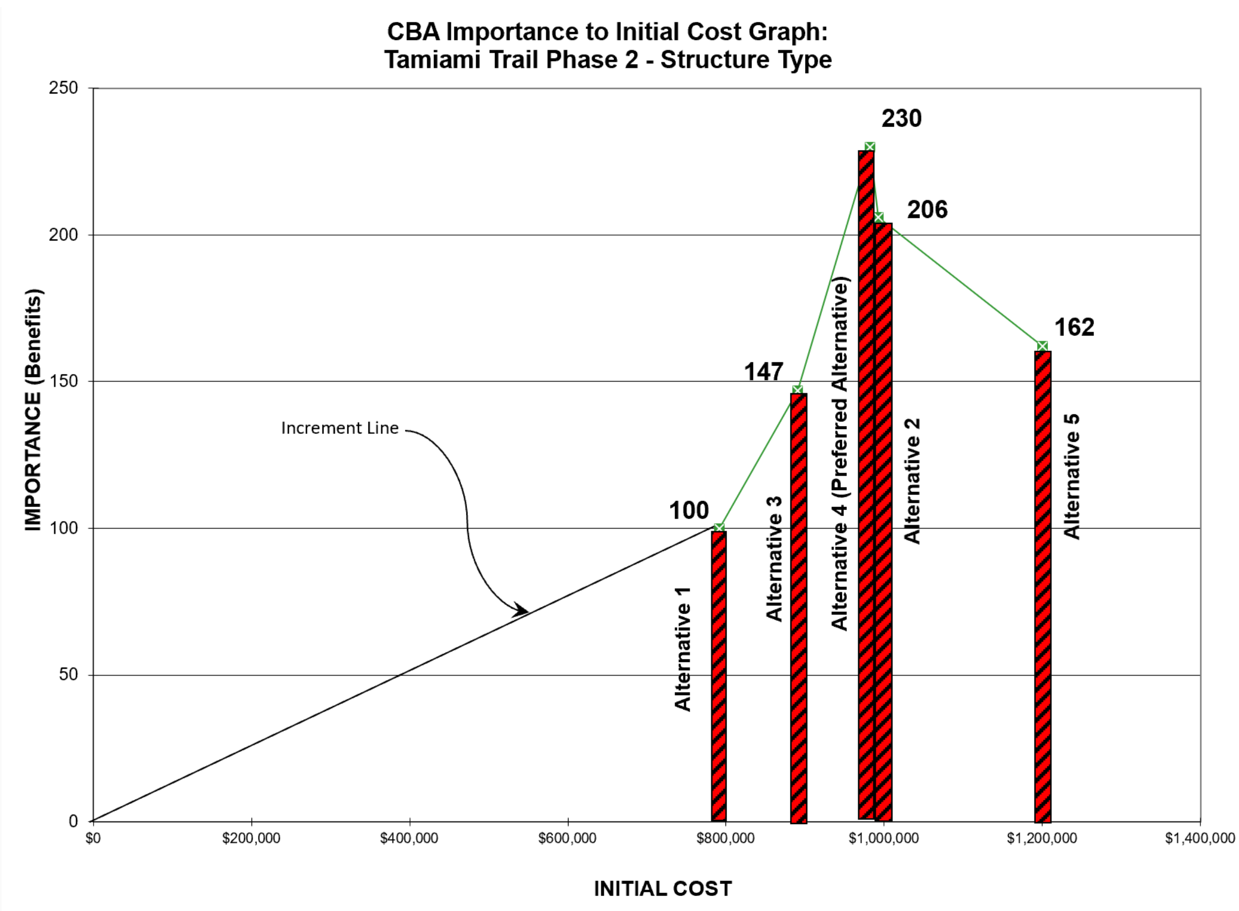

Figure 2: Importance to Initial Cost Graph – Structural Type Alternatives

Refer also to **Figure 3**, which compares the Importance to Life Cycle Cost. This graph also confirms Alternative 4 has the highest importance of advantages (benefits) to life cycle cost.

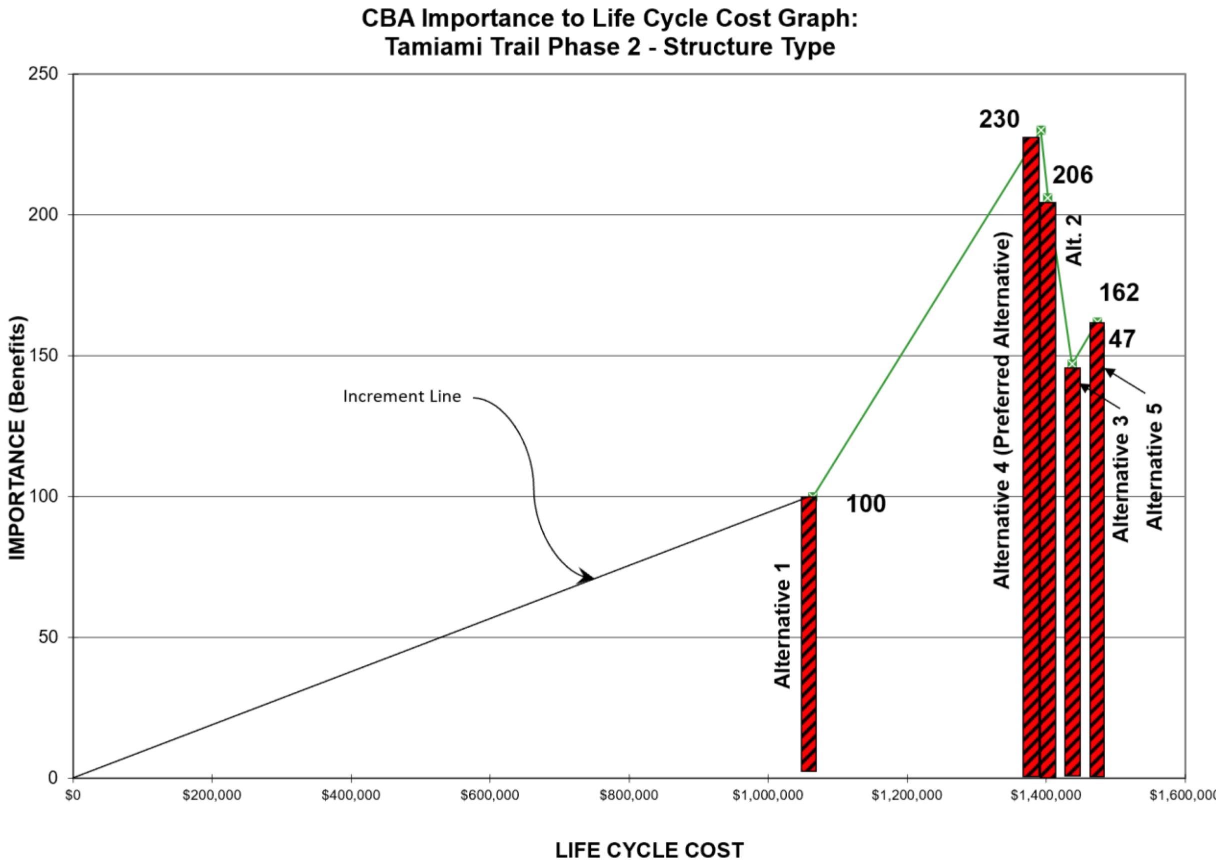

Figure 3: Importance to Life Cycle Cost Graph – Structural Type Alternatives

Reconsideration: (Alternative 4)

Discussion followed the CBA evaluation of the alternatives. Although Alternative 4, use of Florida slab beam bridge design, scored the best, ideas from the other alternatives and ideas from the creative phase were also of interest. See idea listing in **Section B** of this report.

Preferred Alternative

Alternative 4, Florida slab beam bridge design, received consensus from the VA team as the preferred structural type alternative.

<u>Alternatives Considered – Criteria & Access at Businesses & Driveways</u>

The VA team reviewed and confirmed the following bridge and culvert criteria:

BRIDGE CRITERIA FOR RFP
Per following criteria:

1. Minimum single span: 60 feet.
2. Provide sloped sidewalls and continuous corridor/shelf for wildlife passage under the bridge structure.
3. Provide natural bottom below bridge; de-muck and restore slough within the 100-foot temporary construction zone.
4. Provide sloped sidewalls with shelf for wildlife.
5. Provide open water flow.
6. Provide minimum clearance of 2 feet above high water.
7. Any steel bridge proposal(s) would need to meet the FDOT clearance requirement for steel bridges of 12 feet above high water.
8. Bridge locations are to be as specified and cannot be combined.

CULVERT CRITERIA FOR RFP
Replace Nine (9) "In-Kind" Culvert Locations with culverts as follows:

1. Material
    a. Existing – Concrete
    b. Replacement - Specify a minimum 75-year design life (not necessarily concrete).
2. Size/Location
    a. Existing – 10 @ 60" diameter; 5 @ 48" diameter
    b. Replacement – Maintain or increase total cross-sectional area at same locations (3 groupings) with minimum 8-foot diameter culvert(s) per Fish & Wildlife design criteria (eliminates need for Manatee grates).
        i. Exception – At Gator Park location replace the 3 @ 48" culverts w/ 2 @ 8-foot culverts approximately 100 feet to the east of current location.
3. Length
    a. Existing – 63 foot to 70 foot in length
    b. Replacement – Design to roadway typical sections
4. Ground Depth (Invert Elevation)
    a. Existing – 3 feet to 4 feet
    b. Replacement – Provide maximum 2-foot invert elevation NGVD.
5. Other criteria for Replacements:
    a. Remove muck at location; replace with clean fill both under and downstream of the culvert location.
    b. <u>No</u> head wall; tapered culvert end with rip-rap around.
6. During construction no more than 2 culvert locations can be closed at the same time.

The following criteria was developed for typical sections at each driveway.

TYPICAL SECTIONS AT EACH DRIVEWAY – CRITERIA FOR TRAFFIC LANES
Criteria for traffic lanes:

1. Use at location
2. Impact to environment
3. Use standard access connections
4. Access management requirements – DOT
5. May need access hearing (requires scheduling)

Following is a site by site recommended access design based on VA team discussions.

SITE ACCESS

1. S-334 – Maintain existing full access; no left turn –
    a. Notes: Existing right turn lane going east; best wetlands; nesting area; consider shifting road to avoid wetland on south.
2. Osceola – New left turning lane; option to add right lane
    a. Notes: Requires retaining wall to stay within easement; build one new west entrance before eliminating old access; discuss with residents turning lane if acceleration lane, then next to fence line.
3. Airboat Association – Left turn only east to west
4. Frog City (launch air boats by NPS) – Left turn only east to west
5. Gator Park – Full Access
    a. Notes: 4 lanes
6. Tiger Camp – 30-foot shift to south; right turn
    a. Notes: Correct access point to parking per DOT; diagonal parking
7. Coopertown – Full Access
    a. Notes: eliminate entry road access on west; eliminate parking on west; one access on east
8. Salem Radio Tower #2 – No modification
9. Intercom – No modification

Alternatives Considered – Stormwater Management Options Driveways

The value analysis included a diverse range of possible alternatives for stormwater management. During the workshop, HDR presented five alternatives.

During the brainstorming session many ideas were listed. During the reconsideration phase, further improvements were identified. Following is a summary:

Alternative:	**Description:**	**Status:**	**Initial Costs:**	**Life Cycle Costs:**
Alternative 1A **Preferred Alternative**	Swales, with infiltration trench (every 500 feet)	Evaluated in CBA & LCC	\$1,000,000	\$1,546,500
Alternative 1B	Swales, greater depth to achieve water quantity	Evaluated in CBA & LCC	\$2,000,000	\$3,366,300
Alternative 2	Swales, with some infiltration trenches and some ponds	Evaluated in CBA & LCC	\$2,500,000	\$3,866,300
Alternative 3	Swales, with exfiltration trench (entire length), placed below swale	Evaluated in CBA & LCC	\$3,000,000	\$7,679,200
Alternative 4	No Swales, pollution control structures	Evaluated in CBA & LCC	\$4,000,000	\$7,324,100

Preferred Alternative for Stormwater Management (via CBA)

Alternative 1A was identified as the preferred alternative based on Choosing By Advantages (CBA) decision making approach. The advantages identified by CBA over the other Alternatives include the following:

- MODERATELY BETTER at improving habitat due to swales
- MUCH BETTER at improving water quality
- SIGNIFICANTLY BETTER reliability
- SIGNIFICANTLY BETTER 50-year longer life
- MUCH BETTER maintainability due to low maintenance (grass cutting) requirements and periodic trench maintenance
- MUCH BETTER; simple construction with addition of infiltration equipment
- SIGNIFICANTLY BETTER obtaining permitting approval; meets State water quality permitting requirements
- LOWEST initial cost
- LOWEST life cycle cost

In addition to identifying advantages, the CBA process also included preparation of graphs to compare the importance of the advantages and costs. See **Figure 4**, which compares the “Importance to Initial Cost.” It illustrates Alternative 1A has the highest importance of advantages (benefits) to initial cost compared to the other alternatives.

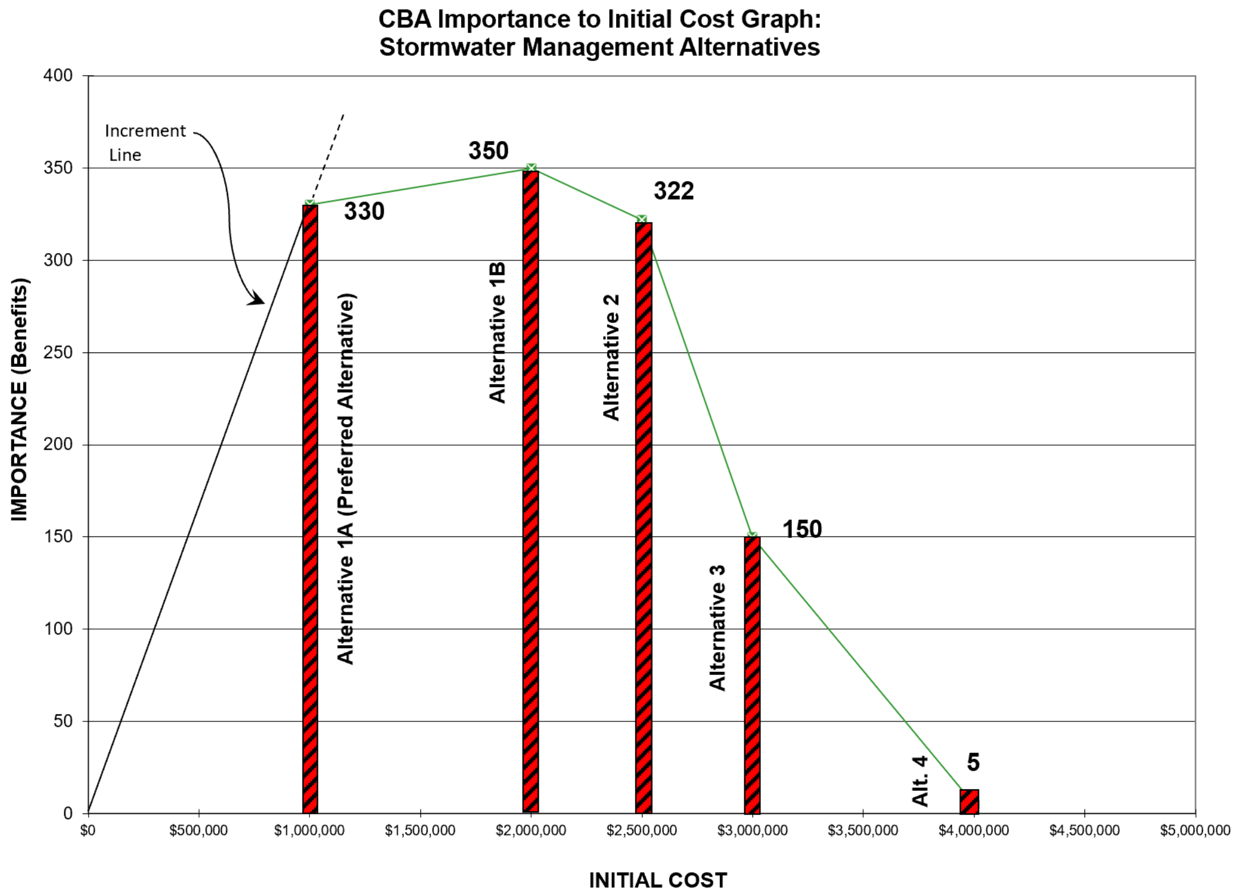

Figure 4: Importance to Initial Cost Graph – Stormwater Management Alternatives

Refer also to **Figure 5**, which compares the Importance to Life Cycle Cost. This graph also confirms Alternative 1A has the highest importance of advantages (benefits) to life cycle cost.

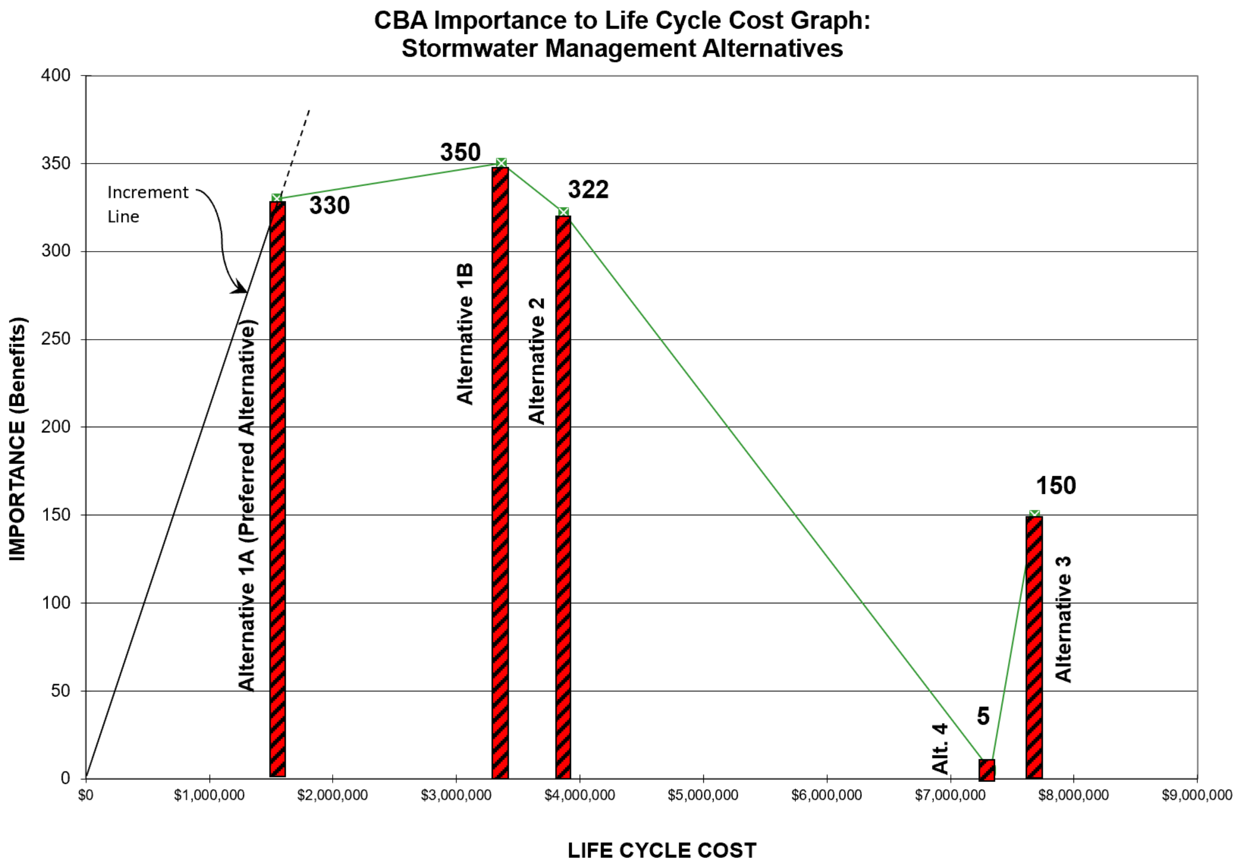

Figure 5: Importance to Life Cycle Cost Graph – Stormwater Management Alternatives

<u>Reconsideration: (Alternative 1A)</u>

Discussion followed the CBA evaluation of the alternatives. Although stormwater management Alternative 1A, Swales with infiltration trench (every 500 feet), scored the best, ideas from the other alternatives and ideas from the creative phase were also of interest. See idea listing in **Section B** of this report.

<u>Preferred Alternative</u>

Alternative 1A, Swales with infiltration trench (every 500 feet), received consensus from the VA team as the preferred stormwater management alternative.

Preferred Alternative for Typical Road Section

See **Figure 6** for the typical road section developed as part of this value analysis.

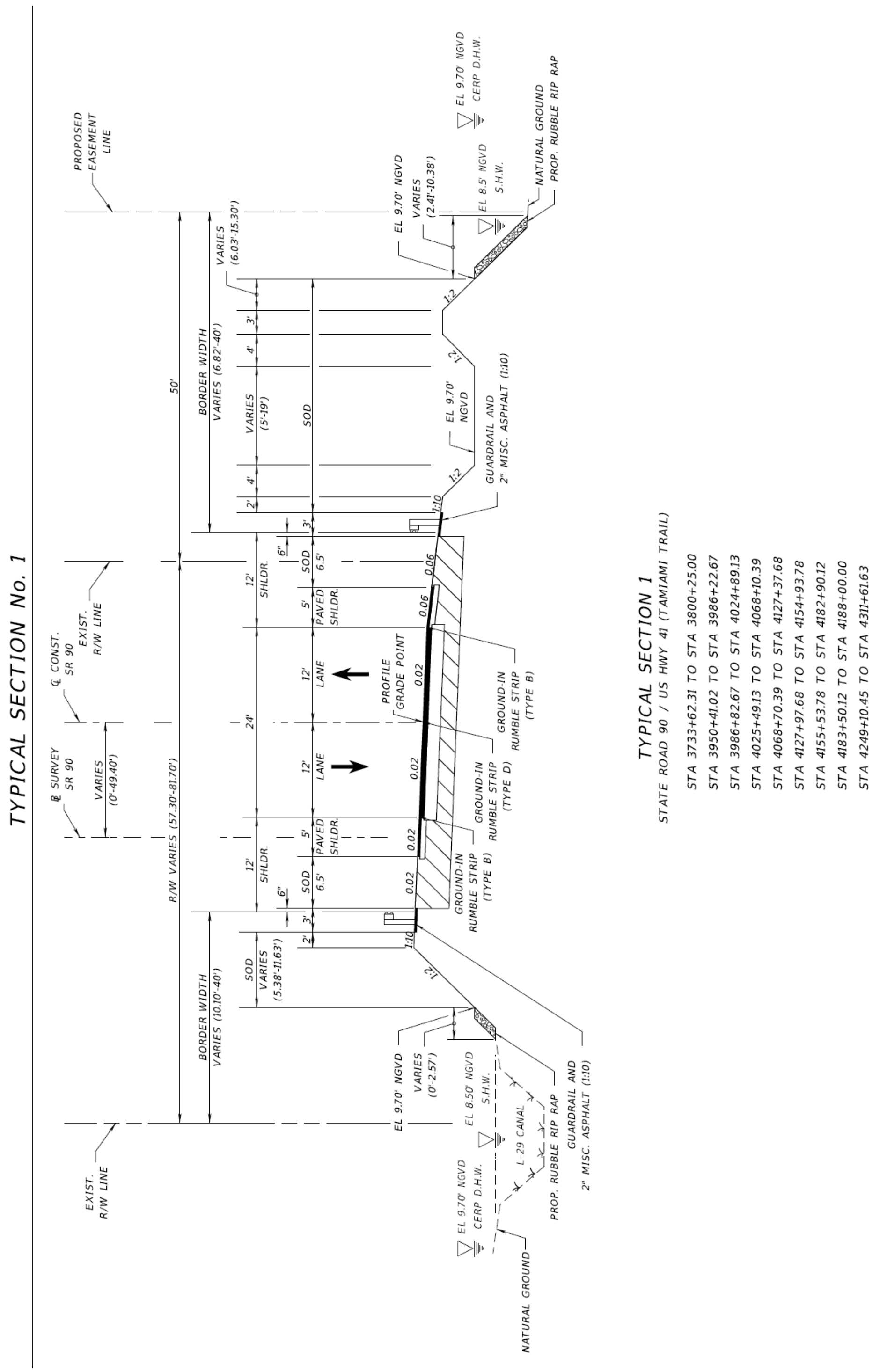

Figure 6: Typical Road Section Developed in Value Analysis

The VA study details are contained in **Section B** of this report which follows.

Value Analysis Study
Tamiami Trail Modifications: Next Steps Phase 2

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SECTION B: VALUE ANALYSIS STUDY

Phase I - Information

Study Specifics

Project Background

The 2009 Omnibus Appropriations Act (March 10, 2009) directed the National Park Service (NPS) to evaluate bridging alternatives to the Tamiami Trail (10.7-mile eastern section), beyond what was authorized by the 2008 Limited Reevaluation Report (LRR), in order to "restore more natural water flow to Everglades National Park (ENP) and Florida Bay and for the purpose of restoring habitat within the Park and the ecological connectivity between the Park and the Water Conservation Areas." In response to this Congressional directive, the NPS completed an Environmental Impact Statement (EIS) for the Tamiami Trail Modifications: Next Steps (TTM:NS) project (Notice of Availability published in the Federal Register on December 20, 2010). The Record of Decision (ROD) for this EIS was published in the Federal Register on April 26, 2011. On December 23, 2011, Congress passed the Consolidated Appropriations Act of 2012 (Public Law 112-74) which authorized construction of the EIS selected plan, Alternative 6e. The first priority of TTM:NS Alternative 6e is the 2.60-mile bridge located between the Osceola Camp and the Airboat Association.

Phase 1

The 2009 Omnibus Appropriations Act (March 10, 2009) directed the NPS to evaluate bridging alternatives to the Tamiami Trail (US Highway 41) roadway (10.7-mile eastern section), beyond what was authorized by the 2008 Modified Water Deliveries to ENP Project: Limited Reevaluation Report (MWD/LRR), in order to “restore more natural water flow to Everglades National Park (ENP) and Florida Bay and for the purpose of restoring habitat within the Park and the ecological connectivity between the Park and the Water Conservation Areas.” The 2009 Omnibus Act also directed the U. S. Army Corps of Engineers (USACE) to immediately construct the 2008 LRR plan—a 1-mile bridge and the remaining road elevated to allow stages in the L-29 Canal to be raised to as much as 8.5 feet. Passage of the 2009 Omnibus Act was an acknowledgement that construction of the LRR modifications was only the first step, albeit an important one, to restoration of flows and ecological conditions in ENP.
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The TT:NS Phase 1 eastern bridge (0.88-miles of decking) was completed in April 2018, and the western bridge (1.43-miles of decking) was substantially completed in October 2018. The adjacent approaches and transitions (totaling 0.7-miles) have been raised from approximately 10.0 feet to 13.1 feet based on the National Geodetic Vertical Datum of 1929 (NGVD), to accommodate the future Comprehensive Everglades Restoration Plan (CERP) design high water (DHW) requirement of 9.7 feet NGVD in the adjacent L-29 Canal. Removal of the original (abandoned) Tamiami Trail roadway at the eastern bridge began in October 2018. All of the remaining Phase 1 work is currently being closed out by the FDOT and their contractor.

Measurable Results

Changes to the Tamiami roadway and conveyance systems will allow for the restoration of more natural water flow to Everglades National Park and Florida Bay and allow for restoration of habitat within the Park and the ecological connectivity between the Park and the Water Conservation Area.

Reference Documents

The design team of HDR Engineering, Inc. provided the VA team with the following reference documents:

- Everglades National Park Tamiami Trail Modifications: Next Steps, Final Environmental Impact Statement (FEIS), prepared by URS, November 2010
- Value Analysis Report, Construct 2.60-Mile Tamiami Trail Bridge, prepared by Kirk Associates with HDR, January 30, 2014
- Cost Estimates of Options 1 – 3, prepared by FDOT, February 2018
- US 41/ SR 90/ Tamiami Trail Road Raising Evaluation, prepared by FDOT District 6, May 25, 2018
- Tamiami Trail MOT Sequence, prepared by FDOT District 6, May 25, 2018
- Cost estimate and life cycle cost estimate of VA Alternatives, prepared by HDR, July 27, 2018
- Value Analysis Report, Tamiami Trail Next Steps Phase 2 Roadway and Conveyance Improvements, prepared by Kirk Associates with HDR, September 28, 2018
- Structure Type Technical Memorandum, prepared by HDR, September 17, 2019

Phase II - Function Analysis

Function Logic Diagram

Function analysis is core to any value analysis study. For this project, the VA team prepared a function logic diagram (**Figure 7**) to help understand the overall purposes of the project to "restore more natural water flow" to Everglades National Park and Florida Bay and for the purpose of "restoring habitat" within the Park and "restore the ecological connectivity" between the Park and the Water Conservation Areas. Functions are described using an abridged description with an active verb and a measurable noun. Reading to the right of the diagram answers "how" the mission is to be achieved with this project. Functions include:

- Provide for visitor enjoyment
- Prevent loss, maintain, and improve the condition of the resources
- Protect public and employee health, safety and welfare
- Improve operational efficiency and sustainability
- Strengthen partnership and community relationships

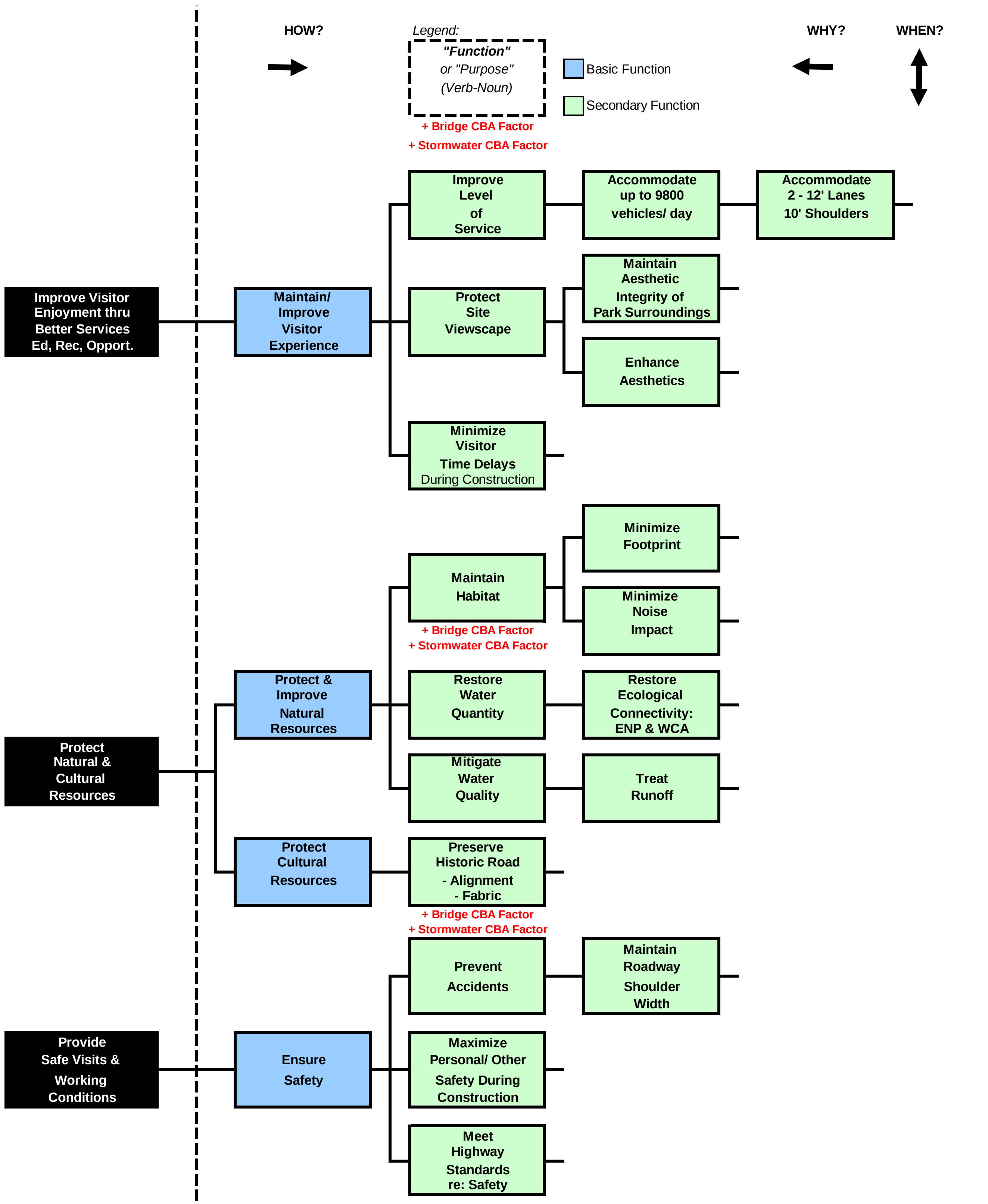
Reading even further to the right answers "how" each of these functions are to be met with this project. Reading from right to left on the diagram answers "why" the specific functions of the project are to be done.

This function logic diagram was later used by the VA team to identify factors to evaluate the alternatives using the Choosing By Advantages (CBA) decision making approach. The functions used as factors are identified on the diagram. Those functions that are equally met by each alternative (no advantages to one alternative over another) did not need to be included as evaluation factors in the CBA.

Figure 7

Tamiami Trail Modifications: Next Steps Phase 2

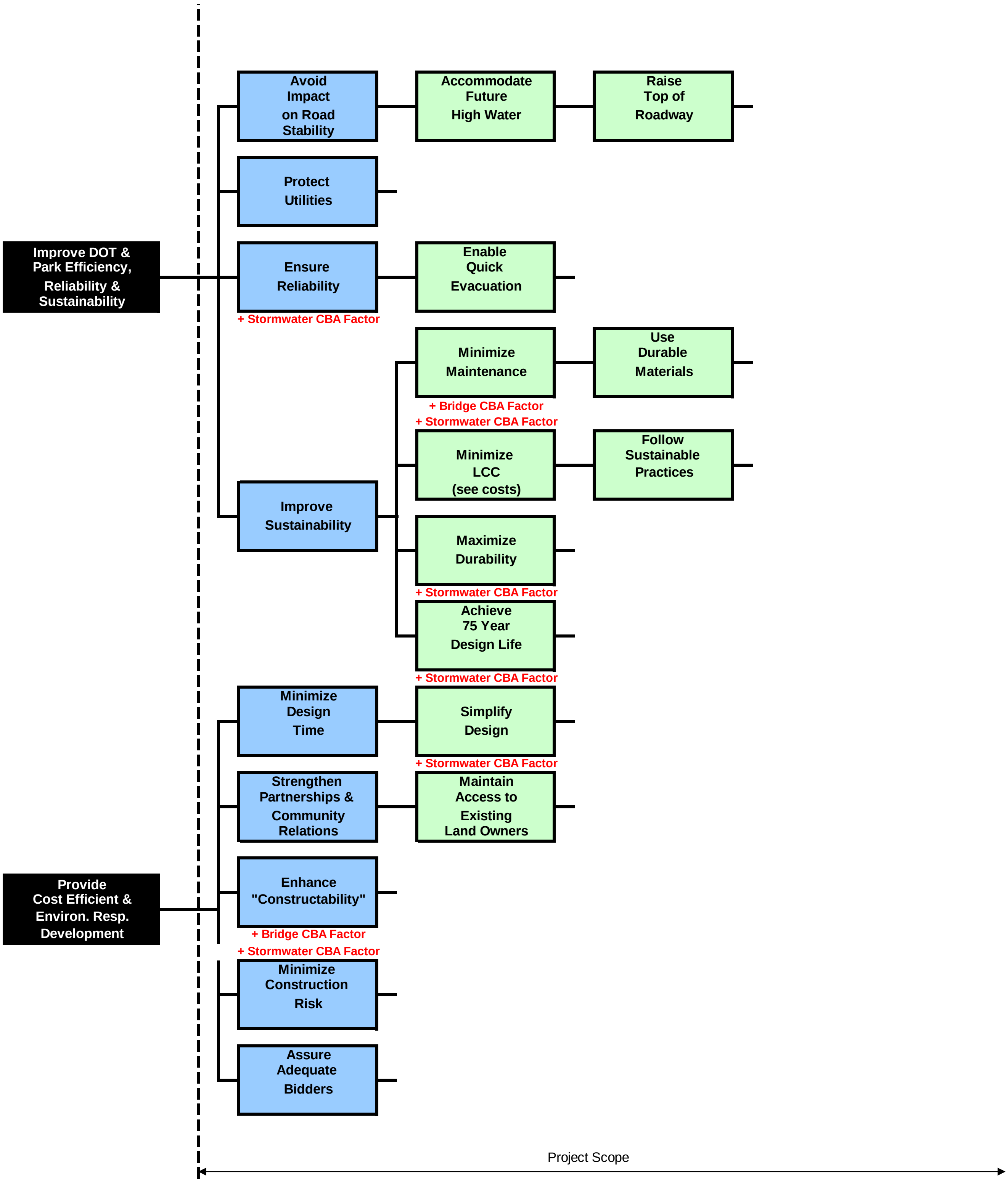
Function Logic Diagram



Tamiami Trail Modifications: Next Steps Phase 2

Figure 7

Function Logic Diagram



Phase III - Creativity

Creative Ideas

Some thirty three (33) creative ideas were generated during the “brainstorming” portion of the VA workshop. Design responses to ideas are listed in italics.

Following is a listing of ideas:

1. Options for slope 1:2 (can collapse; high maintenance). Consider other slopes. (*response: Staying with 1:2 slope*)
2. Options for overflow berm to minimize deterioration. (*response: Concrete weirs @ 1,000 feet +/-)*
3. Berm width of 2 feet may not be enough; evaluate options. (*response: Decision made to make the top of berm 3 feet wide (and not cover with rip-rap material).*
4. Assure clearance is sufficient for maintenance of swale (trench drift down swale). (*response: Minimum width is 5 feet*)
5. Use material to protect/stabilize berm, i.e. geotextile material, etc. (*response: Decision made to leave top of berm with sod/vegetation and not go with the rip-rap over the top of the berm).*
6. Show details of design of swale in design documents. (*response: Done, design to incorporate concrete weirs every 1,000 feet)*
7. Options for removal of unsuitable material under road and right of swale area. Current design removes only unsuitable material under paved shoulder and swale. *(response: following geotech report: doubling up geotextile material at the seam)*
8. Provide toe design for rubble rip-rap. *(response: plan is to tie back in towards the roadway, like a little “footer”)*
9. Consider rip-rap to continue over the top and around berm. *(response: discussed and decided not to continue rip-rap over top of berm)*
10. Question having grass on berm because of maintenance re: mowing/weed-whacking. *(response: discussed an agreed to keep grass as part of berm design)*
11. Avoid woody growth at swale/berm areas – consider geotextile or other material. *(response: decided to go with sod/grass above rip-rap on top of berm)*
12. Constraint is 50 feet easement (for final construction) plus additional 50 feet during construction. *(response: tight but staying within easement 50 feet + 30 feet = 80 feet – NPS action)*
13. Have breaks in guard rail for maintenance access to swale for maintenance. *(response: now part of the design every half-mile as needed)*
14. Other culverts – replace-in-kind or other options. *(response: discussed and decision made, see culvert design criteria in executive summary)*
15. Identify options for culvert entry last design elliptical pipe *(response: no elliptical pipe; going with round with rip-rap around perimeter of culvert entry)*
16. Coordinate project with U.S. Fish & Wildlife. *(response: HDR handling this with USFWS and FWC; will be taken care of prior to spring)*

17. Create static plans (60%) in order to process draft permit applications. *(response: got to do this. November 8th HDR submitting 60% plans)*
18. Hold pre-application meeting later November in order to submit permit early December to avoid Christmas holidays. *(response: plan is to do this.)*
19. Provide draft permit application to DEP for review. *(response: need to do this by end of November)*
20. Consider shelf for wildlife to cross under bridge(s) See bridge design Alternate 4. *(response: this is now incorporated into the design criteria)*
21. Options to avoid halo effect down from outflow – maintain enough clearance (100 feet) downstream – within construction zone. *(response: possibly remove halo; definitely want to do this)*
22. Add littoral shelf for wetland plants. *(response: this would be at water's edge; DOT wants to see this effort. To be considered; possibly include in RFP to give Contractor opportunity to propose acceptable solution.)*
23. Add 50% more volume to current design. *(response: must do. To be addressed in Alternative 2 that includes ponds.)*
    a. Gator Park
    b. Frog City
    c. Abandoned Residential Area
    d. Park land next to Airboat
    e. Water Management location – need approval (east)
24. Treat all runoff or only new runoff *(response: plan is to treat <u>all</u> of the runoff)*
25. For swales, increase height of berm and periodically lower (top of berm) and provide rip rap spillway. *(response: this idea was considered but not accepted as part of the design criteria)*
26. For selected areas use drain structure and pipe to drain to culverts. *(response: not required)*
27. Stormwater Management Alternative 1A – Infiltration trench and de-muck to have volume for swale for extra 50% @ 500-foot intervals. *(response: <u>preferred alternative</u> in CBA, received highest scoring)*
28. Stormwater Management Alternative 1B – Same as Alternative 1A but going deeper. *(response: not p<u>referred alternative</u> in CBA, received 2nd highest scoring)*
29. Stormwater Management Alternative 2 – Same as 1A plus Ponds *(response: not preferred alternative in CBA, received third highest scoring)*
30. Stormwater Management Alternative 3 – Exfiltration Trenches – Place below trench. *(response: not preferred alternative in CBA, received second lowest scoring)*
31. Stormwater Management Alternative 4 – Pollution Control Structures. *(response: not preferred alternative in CBA, received lowest scoring)*
32. FDOT to define requirements, then meet with SHPO to confirm acceptance before D-B contract. *(response: agreed this must be done)*
33. NPS is anticipated to be the lead agency with respect to Environmental Compliance with NEPA. The anticipated and desired vehicle for capturing the proposed construction is a Memorandum to File. The FDOT is anticipating adoption of the NPS's NEPA documentation *(response: agreed this to be done)*

Phase IV - Evaluation (Part 1 – Factors & Definitions)

As the first task of the evaluation phase the team developed and discussed the CBA factors which would be used to evaluate the alternatives within each decision topic (goal). The study team then defined variables and sub factors to tailor the evaluation factors to the needs for each topic. The following table, **Figure 8**, is the evaluation factors and definitions used.

CBA Topics

NPS OBJECTIVE: Provide for Visitor Enjoyment	
Factor 1: Improve Visitor Services, Educational and Recreational Opportunities	
NPS OBJECTIVE: Protect Cultural and Natural Resources	
Factor 2: Prevent Loss, Maintain & Improve Resources	
NPS OBJECTIVE: Protect Public and Employee Health, Safety & Welfare	
Factor 3: Protect Public and Employee Health, Safety & Welfare	
NPS OBJECTIVE: Improve Efficiency of Park Operations	
Factor 4: Improve Operational Efficiency, Reliability and Sustainability	
NPS OBJECTIVE: Other Considerations	
Factor 5: Provide Other Advantages to NPS	
SPECIAL FACTOR: COST	
Sub-factor	Definition/Variables
Initial Cost (Short-term)	• Capital Costs
Life Cycle Cost (Long-term)	• Maintenance Costs • Operating Costs • Staffing Costs

Figure 8: CBA Evaluation Factors

Phase IV - Evaluation (Part 2 – Choosing by Advantages)

Alternatives within each decision topic were evaluated using a process called Choosing by Advantages, where decisions are based on the importance of advantages between alternatives. The value based decision making technique has been used by the NPS for many years to help identify the preferred alternative for further design development. The evaluation involves the identification of the attributes or characteristics of each alternative relative to the evaluation criteria, a determination of the advantages for each alternative within each evaluation factor, and then the weighing of importance of each advantage.

The highest importance advantage is identified in each factor. The paramount advantage, across factors, was determined and assigned a weight determined by the team. Remaining advantages were rated on the same scale. Construction and life cycle costs were developed for each alternative, as appropriate. Recommendations are based on a balance of cost and importance.

The evaluation sheets form the basis for presenting the alternatives and design sketches and cost estimates. The evaluation tables present many types of information. Attributes of an alternative are shown above the dotted line in the CBA table. Advantages between alternatives are shown below the dotted line. An anchor statement summarizes those advantages. The advantage with the highest importance within a factor is indicated by a highlight around the advantage cell.

The study team evaluated the benefit or “importance of advantage” to be realized from the Alternatives (see CBA Matrix for each decision topic). Relative initial cost estimates for the alternatives were developed by the VA team. Results were graphed with importance or benefit on the vertical scale and initial cost on the horizontal scale, as appropriate. The positive slope of the increment reflects good value and the highest benefit to cost ratio. Similarly, when the life cycle costs are considered, certain alternatives offer the best value and the highest benefit to cost ratio to the NPS and were selected as the preferred alternative.

Upon reconsideration, the VA team suggested the design team explore ways to add additional benefits and lower initial and life cycle costs to each of the preferred alternatives.

Phase V - Development

The development phase of the VA job plan includes preparing a variety of items to verify each creative idea truly adds value to the project. The results are then used to prepare a presentation.

For each of the five decisions, the following pages contain the following, as appropriate:

A. Value Analysis Recommendation
    - Original Design Alternatives
    - Preferred Alternative
    - Discussion
    - Life Cycle Cost Analysis
B. Sketches of Alternatives Considered
C. Choosing By Advantages Matrix
D. Life Cycle Cost Analysis
E. Total Importance Allocation to Advantages Scale
F. CBA Importance to Initial Cost Graph
G. CBA Importance to Life Cycle Cost

See **Figure 9** which documents the Structural Type alternatives and the alternative selection.

See **Figure 10** which documents the Stormwater Management alternatives and the alternative selection.

Value Analysis Recommendation-Choosing By Advantages

Figure 9A

Project: **Tamiami Trail Phase 2**

Item: **Structure Type**

VA No. **CBA-1**

Alternatives Considered

The VA team reviewed the alternatives prepared by HDR. These alternatives included:

- Alternative 1: Precast Multi-span Box Culvert;
- Alternative 2: Flat Slab Bridge;
- Alternative 3: Inverted T Beam Bridge;
- Alternative 4: Florida Slab Beam Bridge;
- Alternative 5: Span Arch 3-Sided Box Culvert.

Preferred Alternative

Based on the CBA analysis, the VA team identified Alternative 4 as the preferred alternative.

Advantages of the Preferred Alternative 4:

- BETTER at maintaining habitat for wildlife crossing under the highway due to natural bottom and sloped sides
- SLIGHTLY BETTER because of less of a footprint of impact
- BETTER due to moderate maintenance and repair
- SIGNIFICANTLY BETTER constructability due to no de-watering, concrete foundation, minimal formwork required
- Third lowest initial cost
- Third lowest maintenance cost
- Second lowest life cycle cost

Reconsideration Recommendations

After initial selection of Alternative 4, the team identified a number of further improvements. See idea listing for further consideration.

Life Cycle Cost Summary

	Initial Cost	Life Cycle Cost
Preferred Alternative 4	**982,208**	**1,392,108**

Sketch Worksheet

Figure 9B

Project: **Tamiami Trail Phase 2**

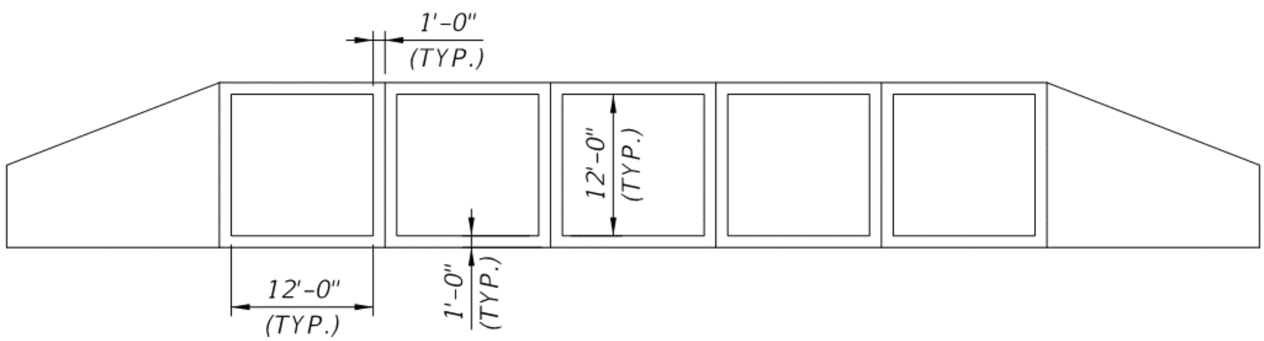
Item: **Structure Type**

VA No.

CBA-1

Alternative 1 **Precast Multi-span Box Culvert**

The first proposed structural alternative consists of 5 precast 12ft by 12ft multi-cell box culverts which will cover a total span of 70ft. A total width of 54ft was assumed. See details of culvert elevation below.



Sketch Worksheet

Figure 9B

Project: Tamiami Trail Phase 2

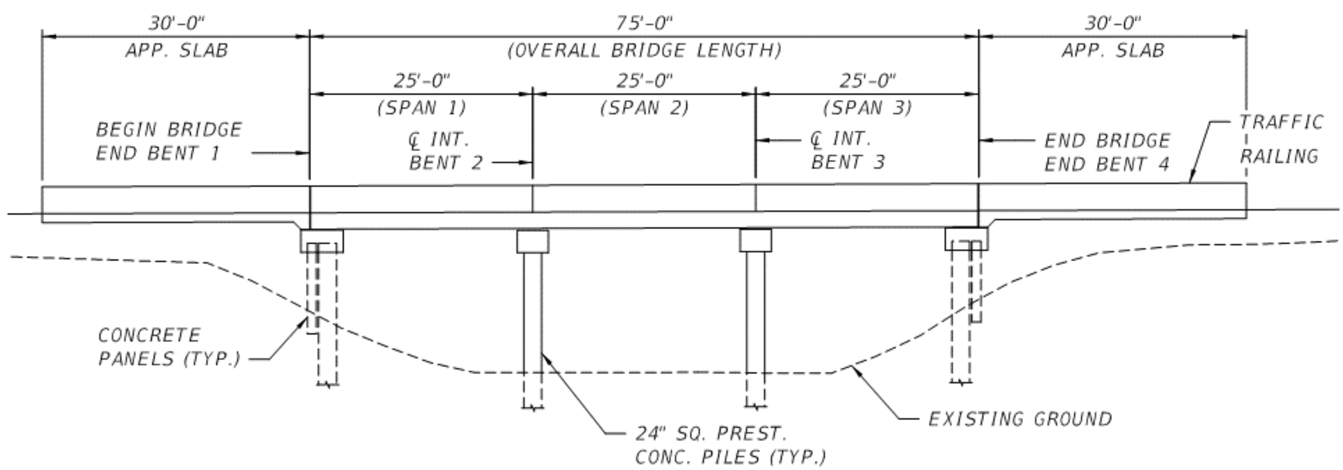
Item: Structure Type

VA No.

CBA-1

Alternative 2 **Flat Slab Bridge**

This structural alternative consists of a flat slab bridge with 3-25ft simple spans. A 1ft 8in cast in place reinforced concrete deck is the superstructure and concrete end bents and prestressed concrete piles are part of the substructure. A total bridge width of 54ft was assumed. See figure below for details of the structural elements.



Sketch Worksheet

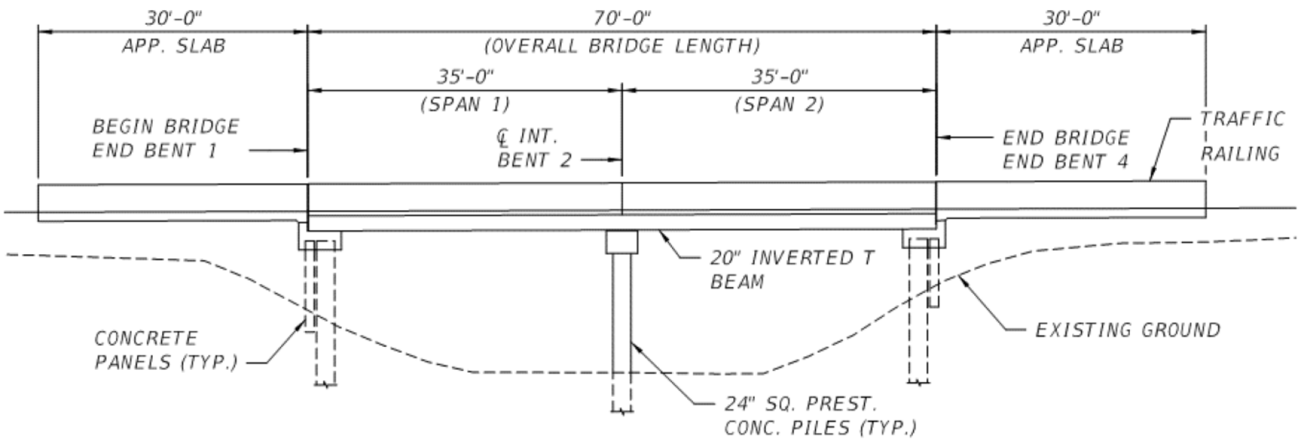
Figure 9B

Project: **Tamiami Trail Phase 2** **VA No.**

Item: **Structure Type** **CBA-1**

	Alternative 3	**Inverted T Beam Bridge**

This structural alternative is a double 35ft span inverted T beam bridge. Superstructure components include: 6" RC concrete deck, and 20" precast inverted T girders. Substructure structural elements are: intermediate and end bent caps and prestressed concrete piles. A total bridge width of 54ftwas assumed. See figure 5 for structural elements.



Sketch Worksheet

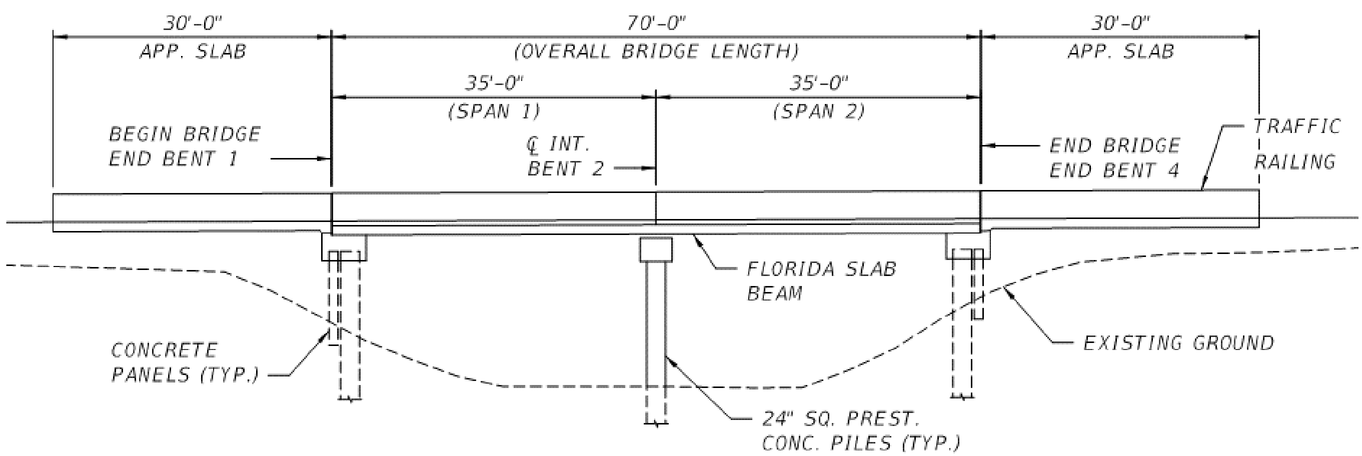
Figure 9B

Project: Tamiami Trail Phase 2 **VA No.**

Item: Structure Type **CBA-1**

	Alternative 4	**Florida Slab Beam Bridge**

This structural alternative is a two-span 35ft span Florida Slab Beam Bridge. Superstructure components include: 6” C.I.P reinforced concrete topping, and 12”x58” precast Florida Slab beams. Substructure structural elements are: intermediate and end bent caps and prestressed concrete piles. A total bridge width of 54 ft was assumed .See figure below for structural elements.



Sketch Worksheet

Figure 9B

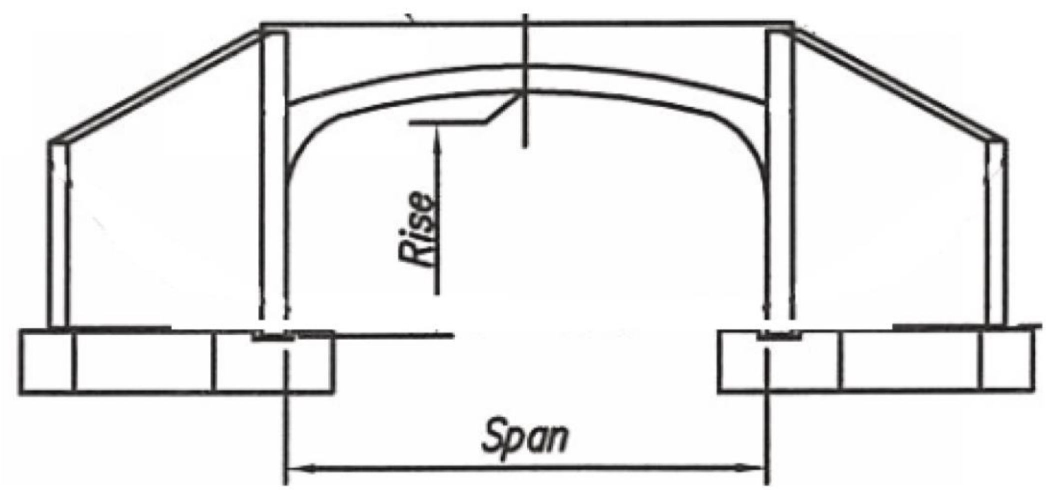
Project: **Tamiami Trail Phase 2**

Item: **Structure Type**

VA No.
CBA-1

■	**Alternative 5**	**Span Arch 3-Sided Box Culvert**

This structural alternative is a single span ConSpan arch shape 1272T. The span length will be 72 ft and a rise of 15ft - 8 3/8 inches. A total bridge width of 55ft was assumed. See figure below for details of a ConSpan arch cross section.



Choosing By Advantages Matrix

Figure 9C

Project: Tamiami Trail Phase 2 — VA No.

Item: Structure Type — CBA-1

Factors:	Alternative 1 Precast Multi-span Box Culvert		Alternative 2 Flat Slab Bridge		Alternative 3 Inverted T Beam Bridge		Alternative 4 Florida Slab Beam Bridge		Alternative 5 Span Arch 3-Sided Box Culvert	
Provide Safe Visits and Working Conditions										
Sub Factor: Visitor Safety (No Differences)										
Protect Natural and Cultural Resources										
Sub Factor: Maintain Habitat										
Attributes:	Has concrete floor surface; vertical concrete sides (which limits certain wildlife mobility); 12'x12' standard size		existing ground surface; 24" square concrete piles; concrete flat slab bridge sections; 25-foot maximum span		existing ground surface; 24" square concrete piles; concrete inverted T bridge sections w/ concrete topping; 35-foot maximum span		existing ground surface; 24" square concrete piles; concrete Florida Slab Beam w concrete topping; 35-foot maximum span		Proprietary System with concrete precast sections; concrete foundation systems (i.e. concrete footings); 70-foot maximum span	
Advantages:	**NO ADVANTAGE**	**0.0**	**BETTER** at maintaining habitat for wildlife crossing under the highway due to natural bottom and sloped sides	**95.0**	BETTER at maintaining habitat for wildlife crossing under the highway due to natural bottom and sloped sides	**95.0**	BETTER at maintaining habitat for wildlife crossing under the highway due to natural bottom and sloped sides	**95.0**	**MODERATELY BETTER** maintaining habitat for wildlife crossing under the highway due to natural bottom and sloped sides	**62.0**
Sub Factor: Restore Water Quality										
Attributes:	Requires Sheetpiles (which results in poor water quality during construction)		No sheetpiles required during construction; requires concrete piles for bridge supports		No sheetpiles required during construction; requires concrete piles for bridge supports		No sheetpiles required during construction; requires concrete piles for bridge supports		Requires Sheetpiles (which results in poor water quality during construction)	
Advantages:	**NO ADVANTAGE**	**0.0**	**SLIGHTLY BETTER** because of less of a footprint of impact	**20.0**	**SLIGHTLY BETTER** because of less of a footprint of impact	**20.0**	**SLIGHTLY BETTER** because of less of a footprint of impact	**20.0**	**NO ADVANTAGE**	**0.0**
Improve Visitor Enjoyment Through Better Services, Educational & Recreational Opportunities (No Differences)										
Sub Factor: Visitor Experience (No Differences)										
Improve Efficiency, Reliability and Sustainability of Park Operations										
Sub Factor: Maintainability										
Attributes: (Inspection and Repair)	Does not require any freeboard;		Concrete pile-supported; requires a minimum of 2 feet above design high water		Concrete pile-supported; Deep T-Beam; requires a minimum of 2 feet above design high water		Concrete pile-supported; requires a minimum of 2 feet above design high water		Concrete pile-supported; requires a minimum of 2 feet above design high water	
Attributes: (Removal of Debris)	12-foot span; debris accumulates on walls between culvert sections		25-foot span; debris accumulates on concrete piles		35-foot span; debris accumulates on concrete piles		35 foot span; debris accumulates on concrete piles		70-foot span; arch design with total clear span capability	
Advantages:	**MUCH BETTER** maintainability due to minimal routine maintenance and repair	**100.0**	**BETTER** due to moderate maintenance and repair	**75.0**	**NO ADVANTAGE**	**0.0**	**BETTER** due to moderate maintenance and repair	**75.0**	**MUCH BETTER** maintainability due to minimal maintenance and repair; minimal debris accumulation	**100.0**

Choosing By Advantages Matrix Figure 9C

Project: **Tamiami Trail Phase 2** VA No.

Item: **Structure Type** CBA-1

Factors:	Alternative 1 Precast Multi-span Box Culvert		Alternative 2 Flat Slab Bridge		Alternative 3 Inverted T Beam Bridge		Alternative 4 Florida Slab Beam Bridge		Alternative 5 Span Arch 3-Sided Box Culvert	
Provide Cost Effective, Environmental Responsible & Beneficial Development (No Differences)										
Sub Factor: Constructability										
Attributes:	Moderately complex construction due to sheet piling requirement for de-watering and de-mucking to prepare and install		Moderately complex construction due to extensive formwork (that needs to be removed) and pile-driving; no need for sheet piling (no de-watering required)		Moderately simple construction due to no need for sheet piling (no de-watering required)		Simple construction due to no sheet piling (no de-watering required)		Complex construction due to requirement for sheet piling (de-watering required) and complex foundation system (concrete piles with concrete cap)	
Advantages:	**NO ADVANTAGE**		**MODERATELY BETTER** due to no de-watering required	**16.0**	**MUCH BETTER** due to no de-watering, concrete foundation required	**32.0**	**SIGNIFICANTLY BETTER** constructability due to no de-watering, concrete foundation, minimal formwork required	**40.0**	**NO ADVANTAGE**	**0.0**
Sub Factor: Minimize Risks (No Differences)										
Total Importance of Advantages (Benefits)		**100.0**		**206.0**		**147.0**		**230.0**		**162.0**
Initial Cost	791,107		$992,431		$890,531		$982,208		$1,200,241	
Life Cycle Cost	1,064,407		$1,402,331		$1,437,031		$1,392,108		$1,473,541	

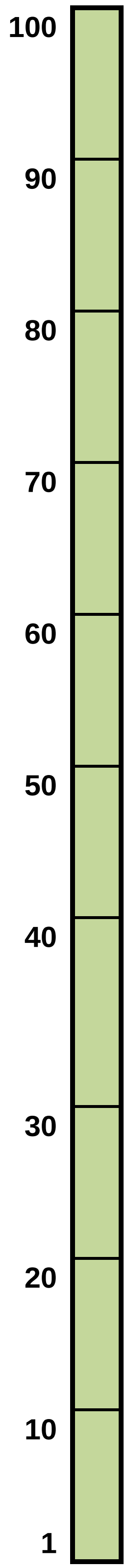
Choosing By Advantages

Figure 9D

Tamiami Trail Phase 2

Structure Type

Importance Allocation to Advantages Scale



<u>Paramount Advantage</u>

100 MUCH BETTER maintainability due to minimal routine maintenance and repair

95 BETTER at maintaining habitat for wildlife crossing under the highway due to natural bottom and sloped sides

40 SIGNIFICANTLY BETTER constructability due to no de-watering, concrete foundation, minimal formwork required

20 SLIGHTLY BETTER because of less of a footprint of impact

LIFE CYCLE COST ANALYSIS (LCCA)

Figure 7E

Project: **Tamiami Trail Phase 2**

Subject: **Structure Type**

						Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5	
						Precast Multi-span Box Culvert		Flat Slab Bridge		Inverted T Beam Bridge		Florida Slab Beam Bridge		Span Arch 3-Sided Box Culvert	
Project Life Cycle :		75	Years												
Discount Rate :		0.5%													
INITIAL COSTS		**Quantity**	**UM**		**Cost**	**Est.**	**PW**	**Est.**	**PW**	**Est.**	**PW**	**Est.**	**PW**	**Est.**	**PW**
Alternative 1	Precast Multi-span Box Culvert	3,780	SF		$209.29	791,107	791,107								
Alternative 2	Flat Slab Bridge	3,780	SF		$262.55			992,431	992,431	0	0	0	0		
Alternative 3	Inverted T Beam Bridge	3,780	SF		$235.59			0	0	890,531	890,531	0	0		
Alternative 4	Florida Slab Beam Bridge	3,780	SF		$259.84			0	0	0	0	982,208	982,208		
Alternative 5	Span Arch 3-Sided Box Culvert	3,780	SF		$317.52									1,200,241	1,200,241
Total Initial Cost							**791,107**		**992,431**		**890,531**		**982,208**		**1,200,241**
REPLACEMENT COST/ SALVAGE VALUE															
Description				**Year**	**PW Factor**										
Alternative 1				0	1.0000	0	0	0	0	0	0	0	0	0	0
Alternative 2				0	1.0000	0	0	0	0	0	0	0	0	0	0
Alternative 3				0	1.0000	0	0	0	0	0	0	0	0	0	0
Alternative 4				0	1.0000	0	0	0	0	0	0	0	0	0	0
Alternative 5				0	1.0000	0	0	0	0	0	0	0	0	0	0
Total Replacement/Salvage Costs							**0**		**0**		**0**		**0**		**0**
ANNUAL COSTS				**Diff.**											
Description			**Cost**												
		Hours	**Rate/ hr**	**Escl. %**	**PWA**										
Alternative 1	Cleaning, In:	40	$75.00	1.00%	91.089	3,000	273,268	0	0	0	0	0	0	0	0
Alternative 2	Cleaning, In:	60	$75.00	1.00%	91.089	0	0	4,500	409,901	0	0	0	0	0	0
Alternative 3	Cleaning, In:	80	$75.00	1.00%	91.089	0	0	0	0	6,000	546,535	0	0	0	0
Alternative 4	Cleaning, In:	60	$75.00	1.00%	91.089	0	0	0	0	0	0	4,500	409,901	0	0
Alternative 5	Cleaning, In:	40	$75.00	1.00%	91.089	0	0	0	0	0	0	0	0	3,000	273,268
Total Annual Costs (Present Worth)						**3,000**	**273,300**	**4,500**	**409,900**	**6,000**	**546,500**	**0**	**409,900**	**0**	**273,300**
Total Life Cycle Costs (Present Worth)							**1,064,407**		**1,402,331**		**1,437,031**		**1,392,108**		**1,473,541**
Total Life Cycle Costs (Annualized)				**PP Factor**	**0.0160**	**17,054**	**Per Year**	**22,468**	**Per Year**	**23,024**	**Per Year**	**22,305**	**Per Year**	**23,609**	**Per Year**

PW = Present Worth, PWA = Present Worth of Annuity, PP = Periodic Payment

LIFE CYCLE COST ANALYSIS (LCCA)

Figure 7E

Project: **Tamiami Trail Phase 2**

Subject: **Structure Type**

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
	Precast Multi-span Box Culvert	Flat Slab Bridge	Inverted T Beam Bridge	Florida Slab Beam Bridge	Span Arch 3-Sided Box Culvert

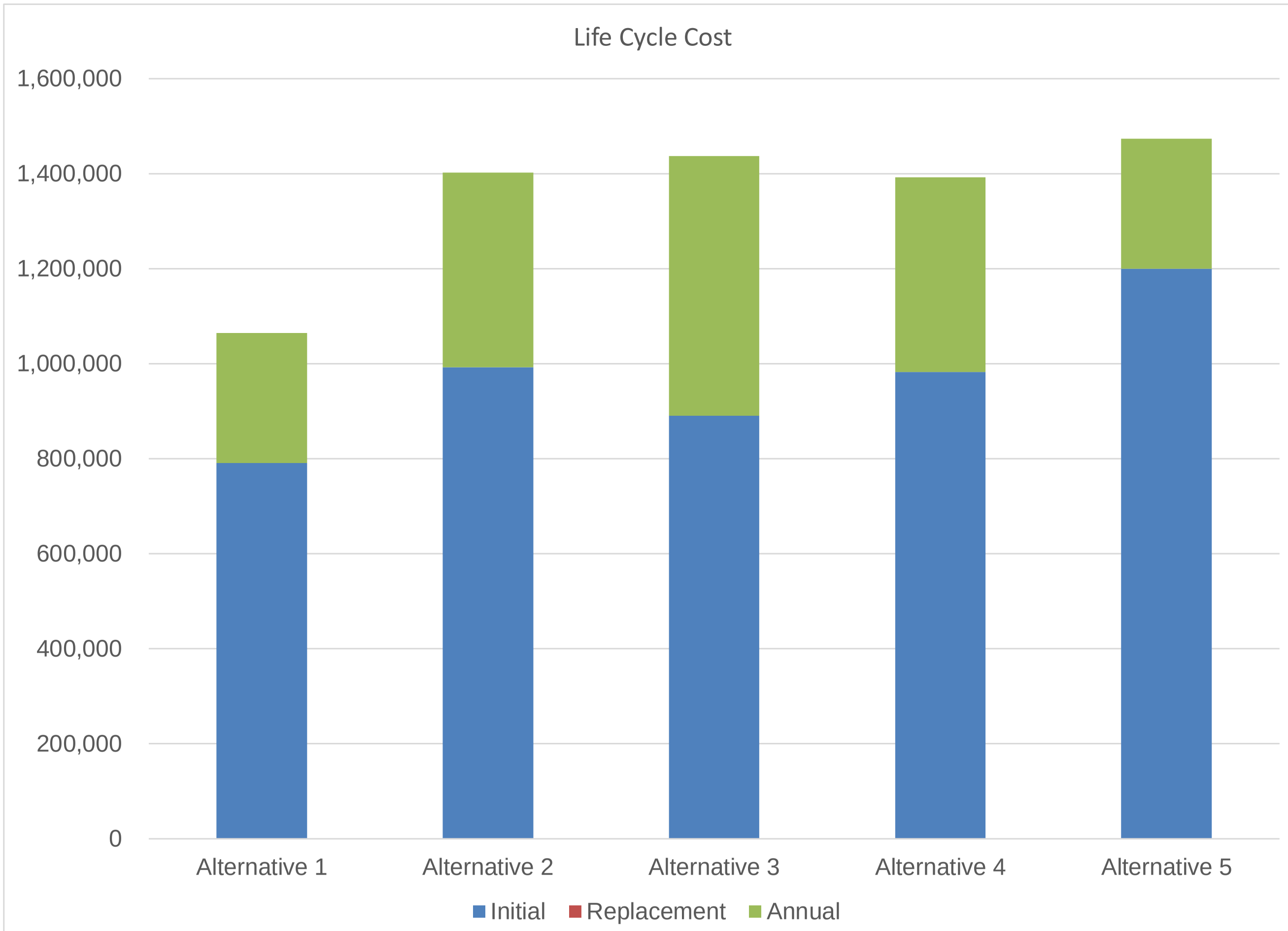
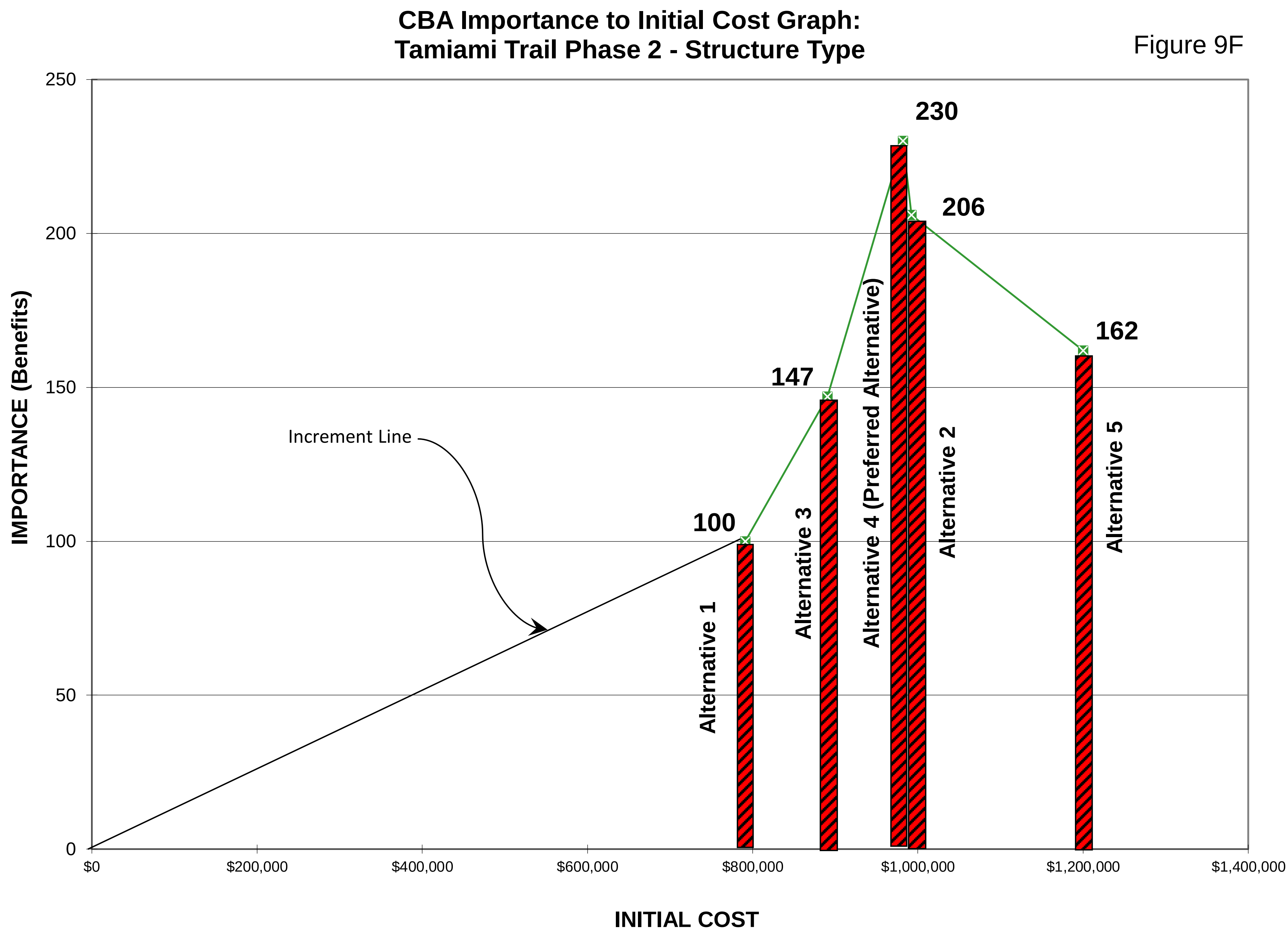


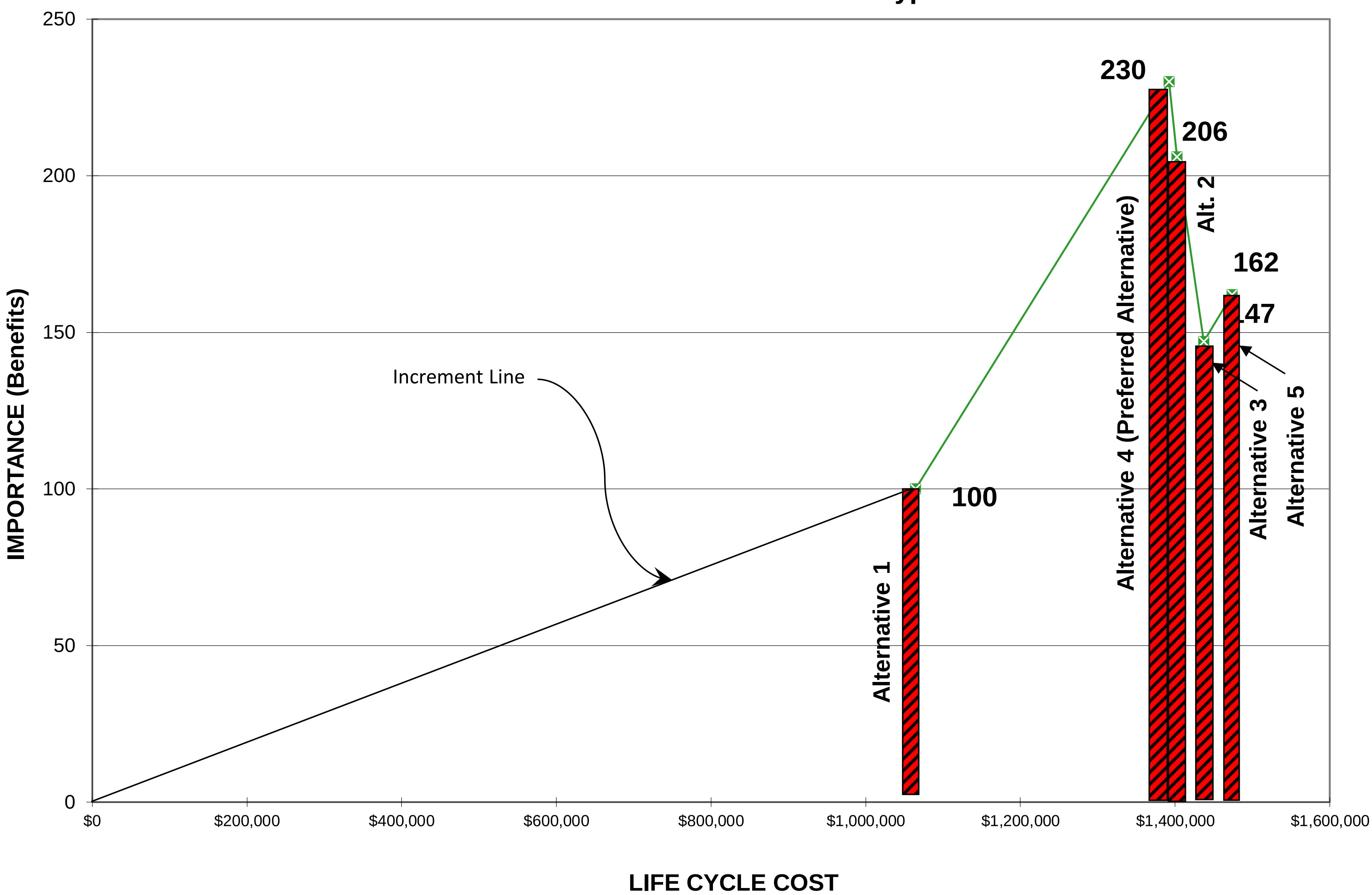
Figure 9F



CBA Importance to Initial Cost Graph:
Tamiami Trail Phase 2 - Structure Type
IMPORTANCE (Benefits)
250
200
150
100
50
0
$0
$200,000
$400,000
$600,000
$800,000
$1,000,000
$1,200,000
$1,400,000
INITIAL COST
Increment Line
100
147
230
206
162
Alternative 1
Alternative 3
Alternative 4 (Preferred Alternative)
Alternative 2
Alternative 5

Figure 9G

CBA Importance to Life Cycle Cost Graph: Tamiami Trail Phase 2 - Structure Type



Value Analysis Recommendation-Choosing By Advantages

Figure 10A

Project: Tamiami Trail Phase 2, EVER — **VA No.**

Item: Stormwater Management — **CBA-2**

Alternatives Considered

The VA team reviewed the schemes prepared by the EDX design team. These alternatives included:

- Alternative 1A: Swales, with infiltration trench (every 500 feet);
- Alternative 1B: Swales, greater depth to achieve water quantity;
- Alternative 2: Swales, with some infiltration trenches and some ponds;
- Alternative 3: Swales, with exfiltration trench (entire length), placed below swale;
- Alternative 4: No Swales, pollution control structures.

Preferred Alternative

Based on the CBA analysis, the VA team identified Alternative 1A as the preferred alternative.

Advantages of the Preferred Alternative 1A:

- MODERATELY BETTER at improving habitat due to swales
- MUCH BETTER at improving water quality
- SIGNIFICANTLY BETTER reliability
- SIGNIFICANTLY BETTER 50-year longer life
- MUCH BETTER maintainability due to low maintenance (grass cutting) requirements and periodic trench maintenance
- MUCH BETTER; simple construction with addition of infiltration equipment
- SIGNIFICANTLY BETTER obtaining permitting approval; meets State water quality permitting requirements
- Lowest initial cost
- Lowest life cycle cost

Reconsideration Recommendations

After initial selection of Alternative 1, the team identified a number of further improvements. See idea listing for further consideration.

Life Cycle Cost Summary

	Initial Cost	Life Cycle Cost
Preferred Alternative 1A	**1,000,000**	**1,546,500**

Sketch Worksheet

Figure 10B

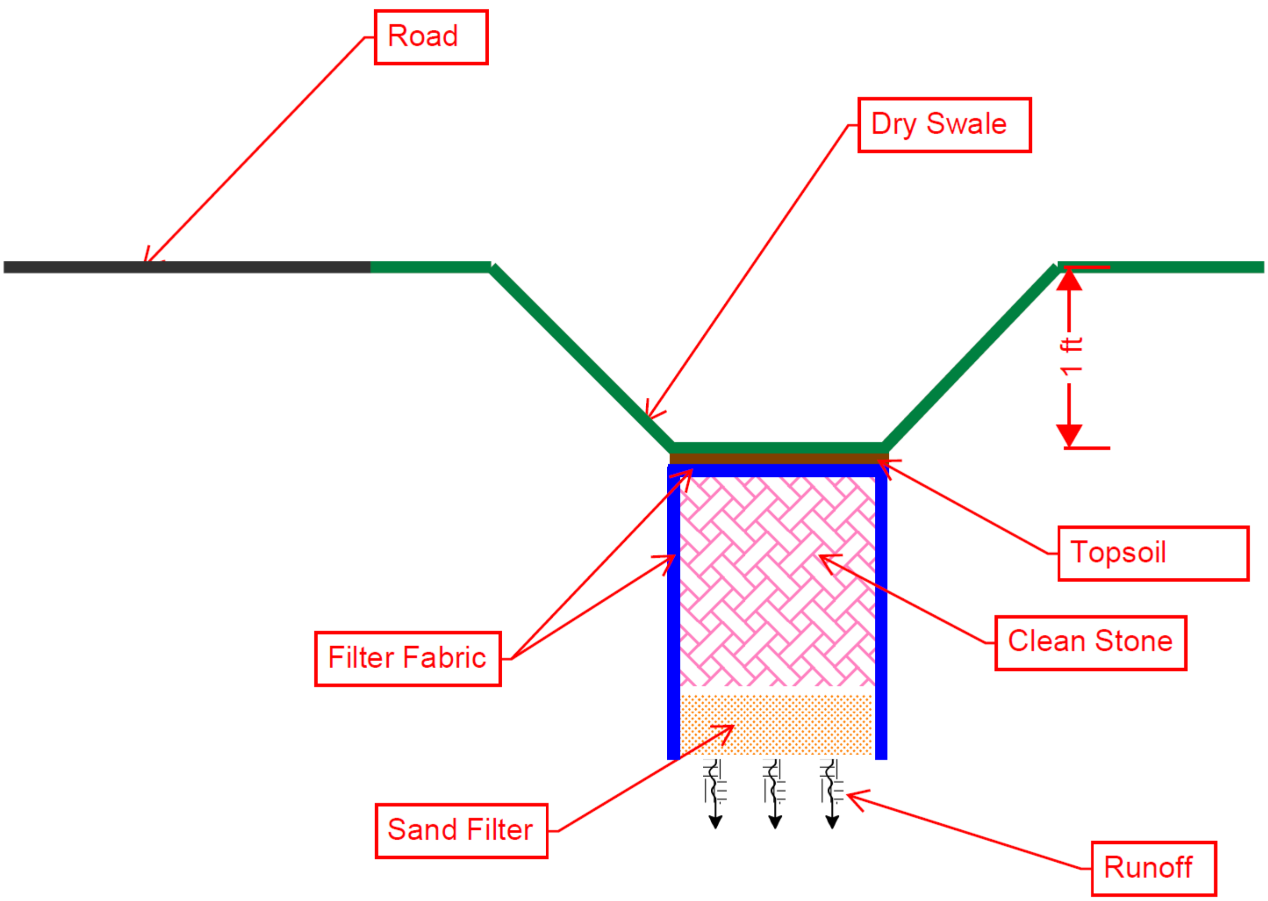
Project: **Tamiami Trail Phase 2, EVER**

Item: **Stormwater Management**

VA No.

CBA-2

Alternative 1A: **Swales, with infiltration trench (every 500 feet)**



Section

Sketch Worksheet

Figure 10B

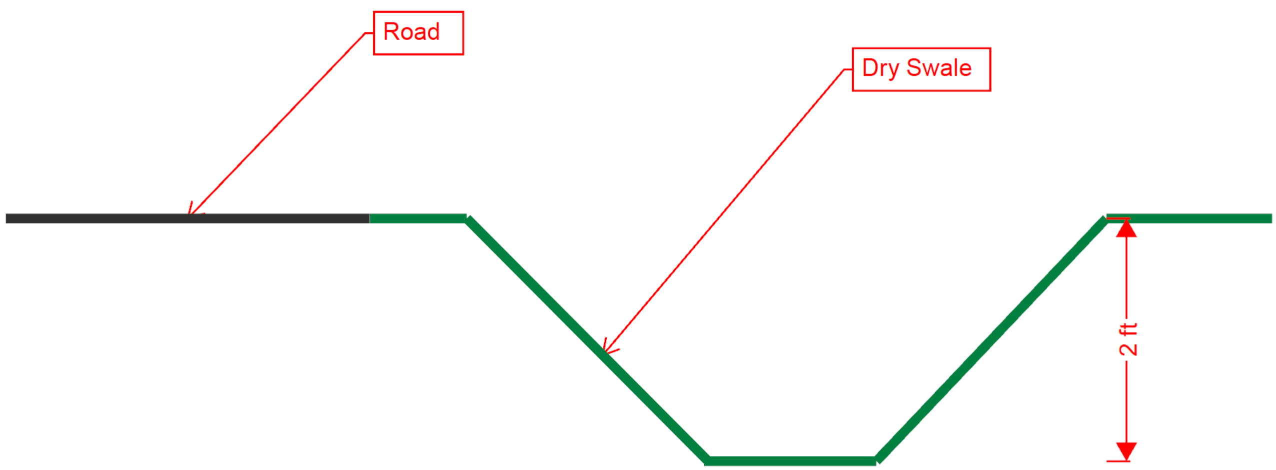
Project: **Tamiami Trail Phase 2, EVER**

Item: **Stormwater Management**

VA No.

CBA-2

Alternative 1B: Swales, greater depth to achieve water quantity



Section

Sketch Worksheet

Figure 10B

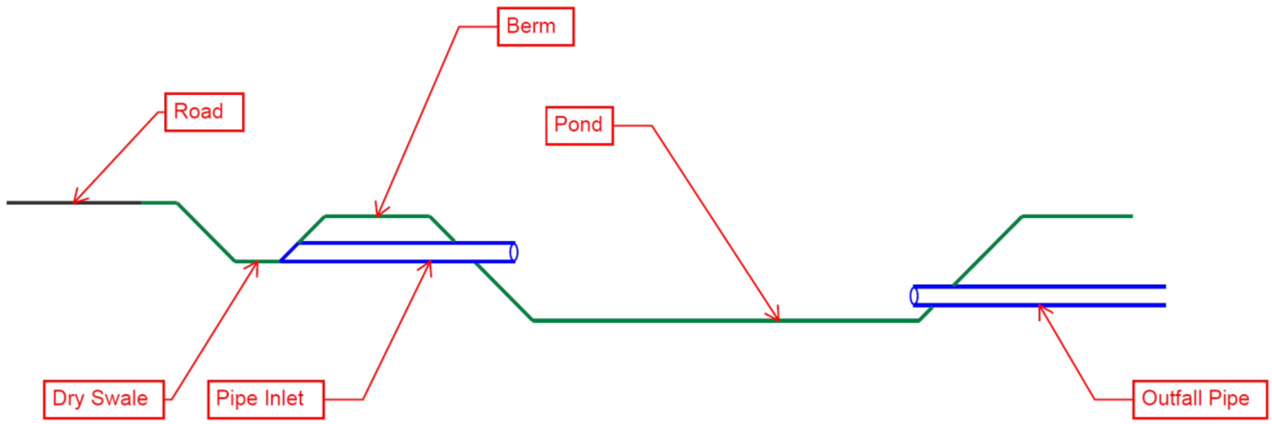
Project: **Tamiami Trail Phase 2, EVER**

Item: **Stormwater Management**

VA No.

CBA-2

Alternative 2: **Swales, with some infiltration trenches and some ponds**



Section

Sketch Worksheet

Figure 10B

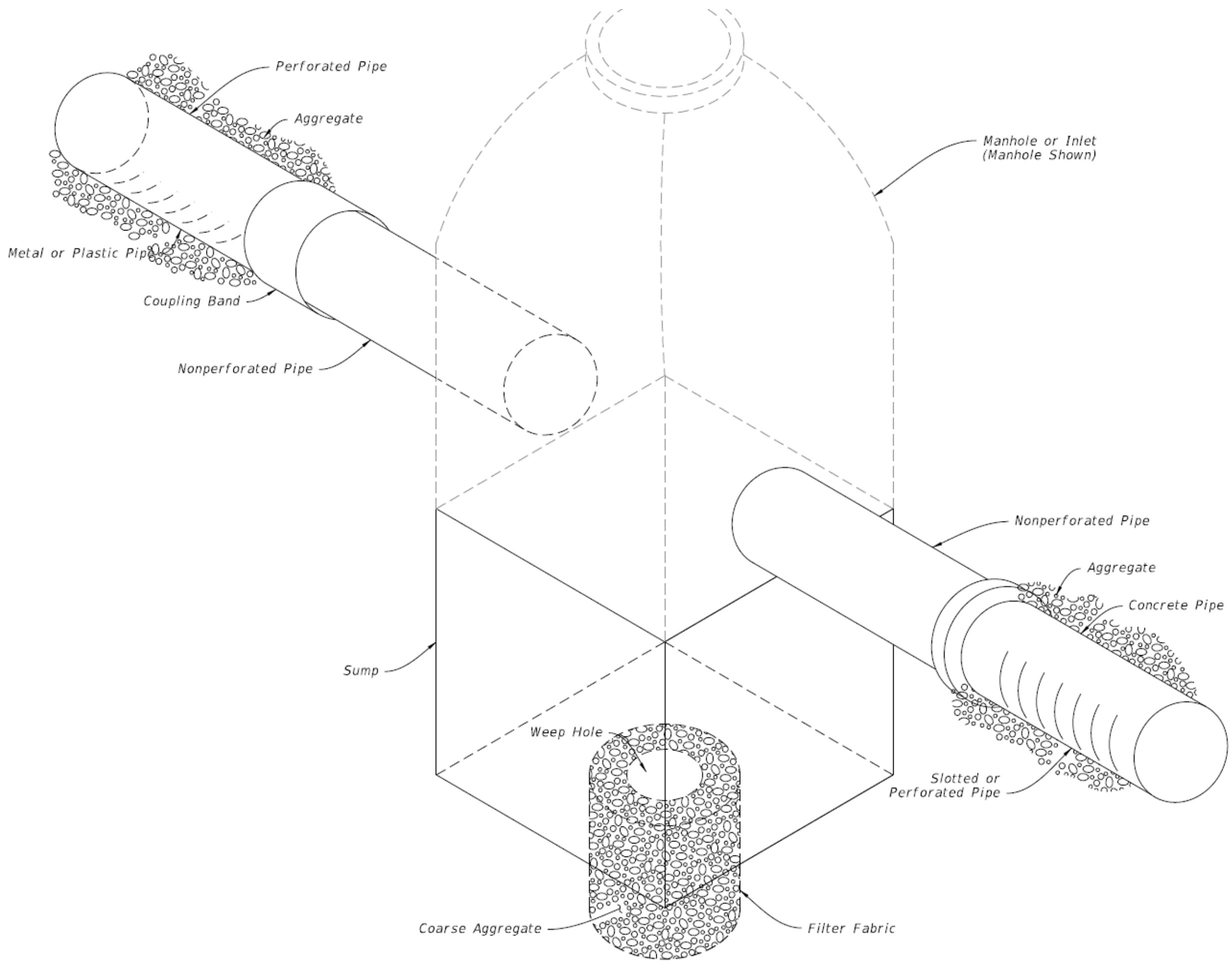
Project: **Tamiami Trail Phase 2, EVER**

Item: **Stormwater Management**

VA No.

CBA-2

Alternative 3: Swales, with exfiltration trench (entire length), placed below swale



Isometric

Sketch Worksheet

Figure 10B

Project: **Tamiami Trail Phase 2, EVER**

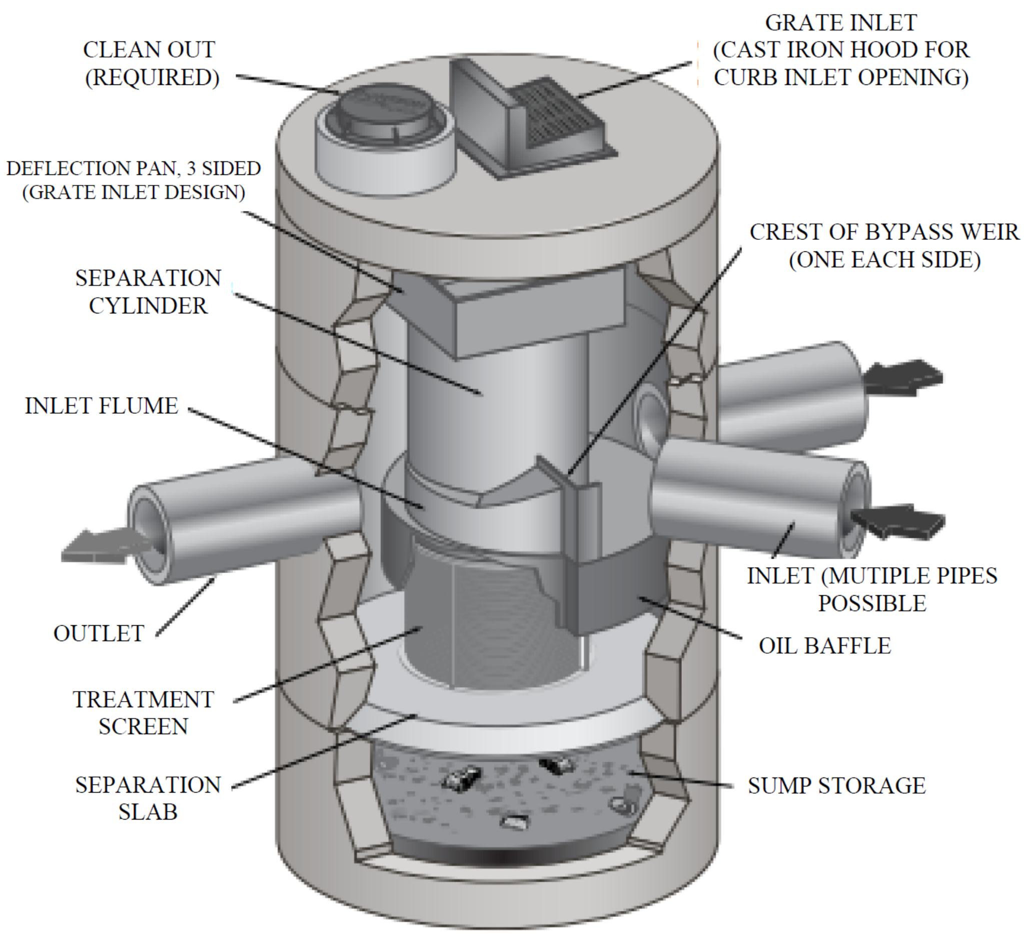
Item: **Stormwater Management**

VA No.

CBA-2

Alternative 4: **No Swales, pollution control structures**

Continuous Deflective Separation Pollutant Control Structure



Choosing By Advantages Matrix Figure 10C

Project: **Tamiami Trail Phase 2, EVER** VA No.

Item: **Stormwater Management** CBA-2

Factors:	Alternative 1A: Swales, with infiltration trench (every 500 feet)		Alternative 1B: Swales, greater depth to achieve water quantity		Alternative 2: Swales, with some infiltration trenches and some ponds		Alternative 3: Swales, with exfiltration trench (entire length), placed below swale		Alternative 4: No Swales, pollution control structures	
Provide Safe Visits and Working Conditions (No Differences)										
Protect Natural and Cultural Resources										
Sub Factor: Maintain Habitat										
Attributes:	No impact to habitat		No impact to habitat		Improved habitat due to addition of ponds; some upland loss due to ponds		No impact to habitat, except during maintenance		No impact to habitat, except during maintenance; minimal impact during construction	
Advantages:	**MODERATELY BETTER** at improving habitat due to swales	10.0	**MODERATELY BETTER** at improving habitat due to swales	10.0	**MODERATELY BETTER** at improving habitat opportunities due to addition of ponds; however, loss of upland area	10.0	**NO ADVANTAGE**	0.0	**SLIGHTLY BETTER** due to construction impact and reduced footprint	5.0
Sub Factor: Mitigate Water Quality										
Attributes:	Good mitigation		Good mitigation		Good mitigation		Fair water quality mitigation		Very poor water quality mitigation, no attenuation, no nutrient treatment	
Advantages:	**MUCH BETTER** at improving water quality	100.0	**MUCH BETTER** at improving water quality	100.0	**MUCH BETTER** at improving water quality	100.0	**MODERATELY BETTER** improving water quality	50.0	**NO ADVANTAGE**	0.0
Improve Visitor Enjoyment Through Better Services, Educational & Recreational Opportunities (No Differences)										
Improve Efficiency, Reliability and Sustainability of Park Operations										
Sub Factor: Improved Reliability										
Attributes:	Good reliability		Good reliability		Good reliability		Fair reliability due to exfiltration trench requiring periodic maintenance		Poor reliability due to pollution control structure requiring frequent maintenance and no attenuation	
Advantages:	**SIGNIFICANTLY BETTER** reliability	70.0	**SIGNIFICANTLY BETTER** reliability	70.0	**SIGNIFICANTLY BETTER** reliability	70.0	**BETTER** reliability	42.0	**NO ADVANTAGE**	0.0
Sub Factor: Extended Life/Durability										
Attributes:	75 year life		75 year life		75 year life		25 year life		25 year life	
Advantages:	**SIGNIFICANTLY BETTER** 50-year longer life	40.0	**SIGNIFICANTLY BETTER** 50-year longer life	40.0	**SIGNIFICANTLY BETTER** 50-year longer life	40.0	**NO ADVANTAGE**	0.0	**NO ADVANTAGE**	0.0

Choosing By Advantages Matrix

Figure 10C

Project: Tamiami Trail Phase 2, EVER

VA No.

Item: Stormwater Management

CBA-2

Factors:	Alternative 1A		Alternative 1B		Alternative 2		Alternative 3		Alternative 4	
	Swales, with infiltration trench (every 500 feet)		**Swales, greater depth to achieve water quantity**		**Swales, with some infiltration trenches and some ponds**		**Swales, with exfiltration trench (entire length), placed below swale**		**No Swales, pollution control structures**	
Sub Factor: Maintainability										
Attributes:	Low maintenance		Very low maintenance		Moderate maintenance due to addition of ponds		High maintenance due to exfiltration trench French drain; requires closing of road shoulder during maintenance		Very high maintenance due to complex pollution control equipment; requires closing of road shoulder during maintenance	
Advantages:	**MUCH BETTER** maintainability due to low maintenance (grass cutting) requirements and periodic trench maintenance	**48.0**	**SIGNIFICANTLY BETTER** maintainability due to low maint. (grass cutting) requirements	**60.0**	**MUCH BETTER** maintainability due to addition of ponds	**48.0**	**SLIGHTLY BETTER** maintainability due to upkeep of French drain	**12.0**	**NO ADVANTAGE**	**0.0**
Provide Cost Effective, Environmental Responsible & Beneficial Development (No Differences)										
Sub Factor: Constructability										
Attributes:	Standard typical section with infiltration trench every 500 feet		Standard typical section with A3 granular material		Standard typical section with addition of infiltration trenches every 500 feet and construction of ponds		Standard typical section with addition of exfiltration trench entire length with a lot of piping, etc.		Sophisticated pollution control structures every 600 feet	
Advantages:	**MUCH BETTER;** simple construction with addition of infiltration equipment	**32.0**	**SIGNIFICANTLY BETTER** constructability**;** simple construction with gravel	**40.0**	**BETTER**; simple construction with addition of infiltration trenches and construction of ponds	**24.0**	**MODERATELY BETTER** construction	**16.0**	**NO ADVANTAGE**	**0.0**
Sub Factor: Permitting Approval										
Attributes:	Permit can be issued; satisfies State Water Quality requirements		Permit can be issued; satisfies State Water Quality requirements		Permit can be issued; satisfies State Water Quality requirements		Permit can be issued; satisfies State Water Quality requirements		Permit cannot issued; alone it doesn't satisfy State Water Quality requirements	
Advantages:	**SIGNIFICANTLY BETTER** obtaining permitting approval; meets State water quality permitting requirements	**30.0**	**SIGNIFICANTLY BETTER** obtaining permitting approval; meets State water quality permitting requirements	**30.0**	**SIGNIFICANTLY BETTER** obtaining permitting approval; meets State water quality permitting requirements	**30.0**	**SIGNIFICANTLY BETTER** obtaining permitting approval; meets State water quality permitting requirements	**30.0**	**NO ADVANTAGE**	**0.0**
Total Importance of Advantages (Benefits)		**330.0**		**350.0**		**322.0**		**150.0**		**5.0**
Initial Cost	1,000,000		$2,000,000		$2,500,000		$3,000,000		$4,000,000	
Life Cycle Cost	1,546,500		$3,366,300		$3,866,300		$7,679,200		$7,324,100	

Choosing By Advantages Figure 10D

Tamiami Trail Phase 2, EVER

Stormwater Management

Importance Allocation to Advantages Scale

Paramount Advantage

100	100	MUCH BETTER at improving water quality
90		
80		
70	70	SIGNIFICANTLY BETTER reliability
60	60	SIGNIFICANTLY BETTER maintainability due to low maint. (grass cutting) requirements
50		
	40	SIGNIFICANTLY BETTER 50-year longer life
40	40	SIGNIFICANTLY BETTER constructability; simple construction with gravel
30	30	SIGNIFICANTLY BETTER obtaining permitting approval; meets State water quality permitting requirements
20		
10	10	MODERATELY BETTER at improving habitat due to swales
1		

LIFE CYCLE COST ANALYSIS (LCCA)

Figure 10E

Project: **Tamiami Trail Phase 2, EVER**

Subject: **Stormwater Management**

						Alternative 1A		Alternative 1B		Alternative 2		Alternative 3		Alternative 4	
						Swales, with infiltration trench (every 500 feet)		Swales, greater depth to achieve water quantity		Swales, with some infiltration trenches and some ponds		Swales, with exfiltration trench (entire length), placed below swale		No Swales, pollution control structures	
Project Life Cycle	75 Years														
Discount Rate	0.5%														
INITIAL COSTS		**Quantity**	**UM**		**Cost**	**Est.**	**PW**	**Est.**	**PW**	**Est.**	**PW**	**Est.**	**PW**	**Est.**	**PW**
Alternative 1A	Swales, with infiltration trench (every 500 feet)	1	LS		$1,000,000	1,000,000	1,000,000								
Alternative 1B	Swales, greater depth to achieve water quantity	1	LS		$2,000,000			2,000,000	2,000,000	0	0	0	0		
Alternative 2	Swales, with some infiltration trenches and some ponds	1	LS		$2,500,000			0	0	2,500,000	2,500,000	0	0		
Alternative 3	Swales, with exfiltration trench (entire length), placed below swale	1	LS		$3,000,000			0	0	0	0	3,000,000	3,000,000		
Alternative 4	No Swales, pollution control structures	1	LS		$4,000,000			0	0	0	0	0	0	4,000,000	4,000,000
Total Initial Cost							**1,000,000**		**2,000,000**		**2,500,000**		**3,000,000**		**4,000,000**
REPLACEMENT COST/ SALVAGE VALUE															
Description		**% Replace**	**Year**		**PW Factor**										
Alternative 4	Replace exfiltration syst.	50%	25		0.8828	0	0	0	0	0	0	1,500,000	1,324,158	0	0
Alternative 5	Replace pollution control struct.	50%	25		0.8828	0	0	0	0	0	0	0	0	2,000,000	1,765,544
Alternative 4	Replace exfiltration syst.	50%	50		0.7793	0	0	0	0	0	0	1,500,000	1,168,929	0	0
Alternative 5	Replace pollution control struct.	50%	50		0.7793	0	0	0	0	0	0	0	0	2,000,000	1,558,572
					1.0000	0	0	0	0	0	0	0	0	0	0
Total Replacement/Salvage Costs							**0**		**0**		**0**		**2,493,100**		**3,324,100**
ANNUAL COSTS															
Description		**Hours**	**Cost Rate/ hr**	**Diff. Escl. %**	**PWA**										
Alternative 1A	Cleaning	80	$75.00	1.00%	91.089	6,000	546,535	0	0	0	0	0	0	0	0
Alternative 1B	Cleaning	200	$75.00	1.00%	91.089	0	0	15,000	1,366,338	0	0	0	0	0	0
Alternative 2	Cleaning	200	$75.00	1.00%	91.089	0	0	0	0	15,000	1,366,338	0	0	0	0
Alternative 3	Cleaning	320	$75.00	1.00%	91.089	0	0	0	0	0	0	24,000	2,186,140	0	0
Alternative 4	Cleaning	320	$75.00	1.00%	91.089	0	0	0	0	0	0	0	0	24,000	2,186,140
Total Annual Costs (Present Worth)						**6,000**	**546,500**	**15,000**	**1,366,300**	**15,000**	**1,366,300**	**0**	**2,186,100**	**0**	**0**
Total Life Cycle Costs (Present Worth)							**1,546,500**		**3,366,300**		**3,866,300**		**7,679,200**		**7,324,100**
Total Life Cycle Costs (Annualized)				**PP Factor**	**0.0160**	**24,778**	**Per Year**	**53,935**	**Per Year**	**61,946**	**Per Year**	**123,037**	**Per Year**	**117,348**	**Per Year**

PW = Present Worth, PWA = Present Worth of Annuity, PP = Periodic Payment

LIFE CYCLE COST ANALYSIS (LCCA)

Figure 10E

Project: **Tamiami Trail Phase 2, EVER**

Subject: **Stormwater Management**

	Alternative 1A	Alternative 1B	Alternative 2	Alternative 3	Alternative 4
	Swales, with infiltration trench (every 500 feet)	Swales, greater depth to achieve water quantity	Swales, with some infiltration trenches and some ponds	Swales, with exfiltration trench (entire length), placed below swale	No Swales, pollution control structures

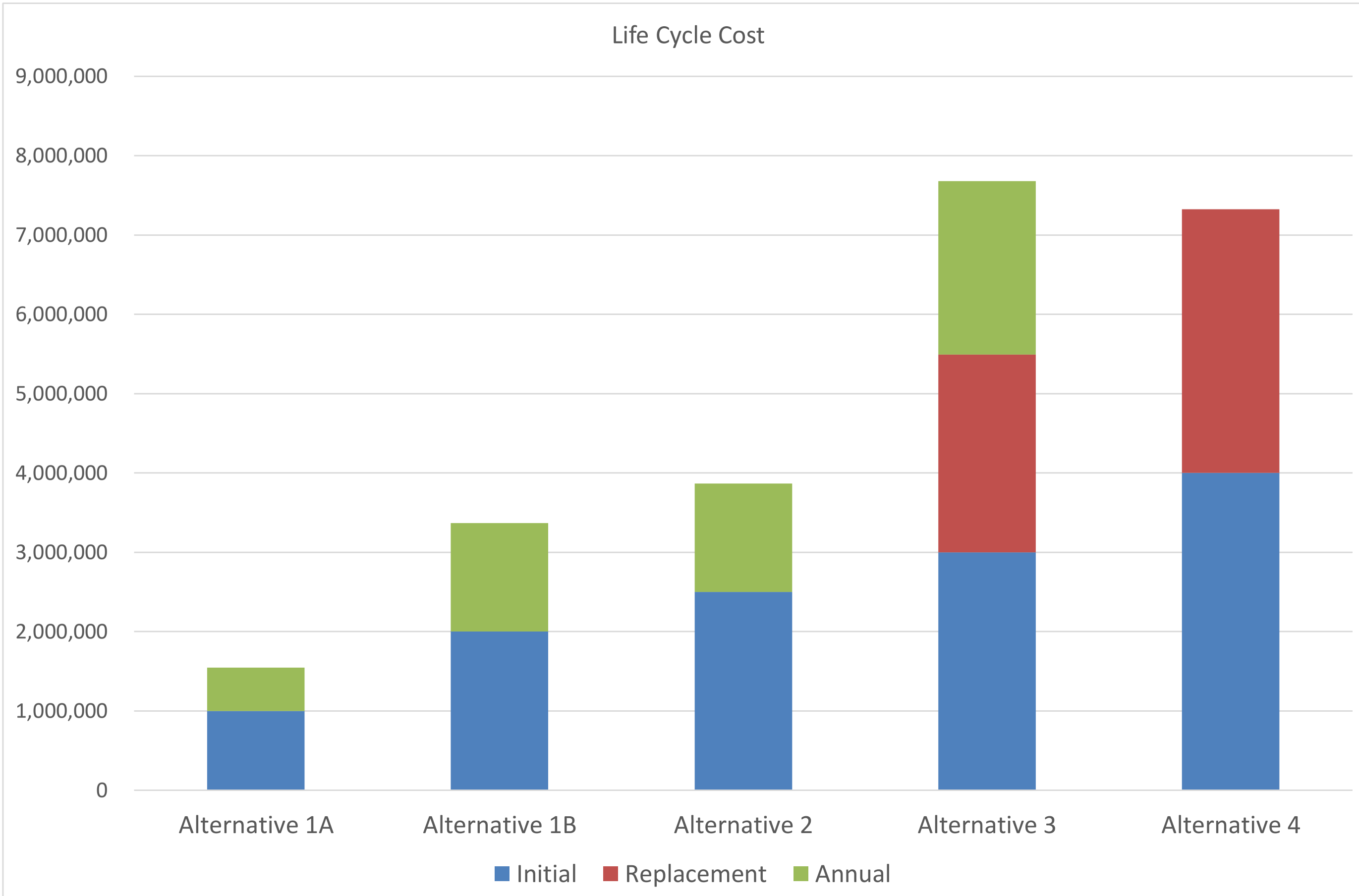


Figure 10F

CBA Importance to Initial Cost Graph: Stormwater Management Alternatives

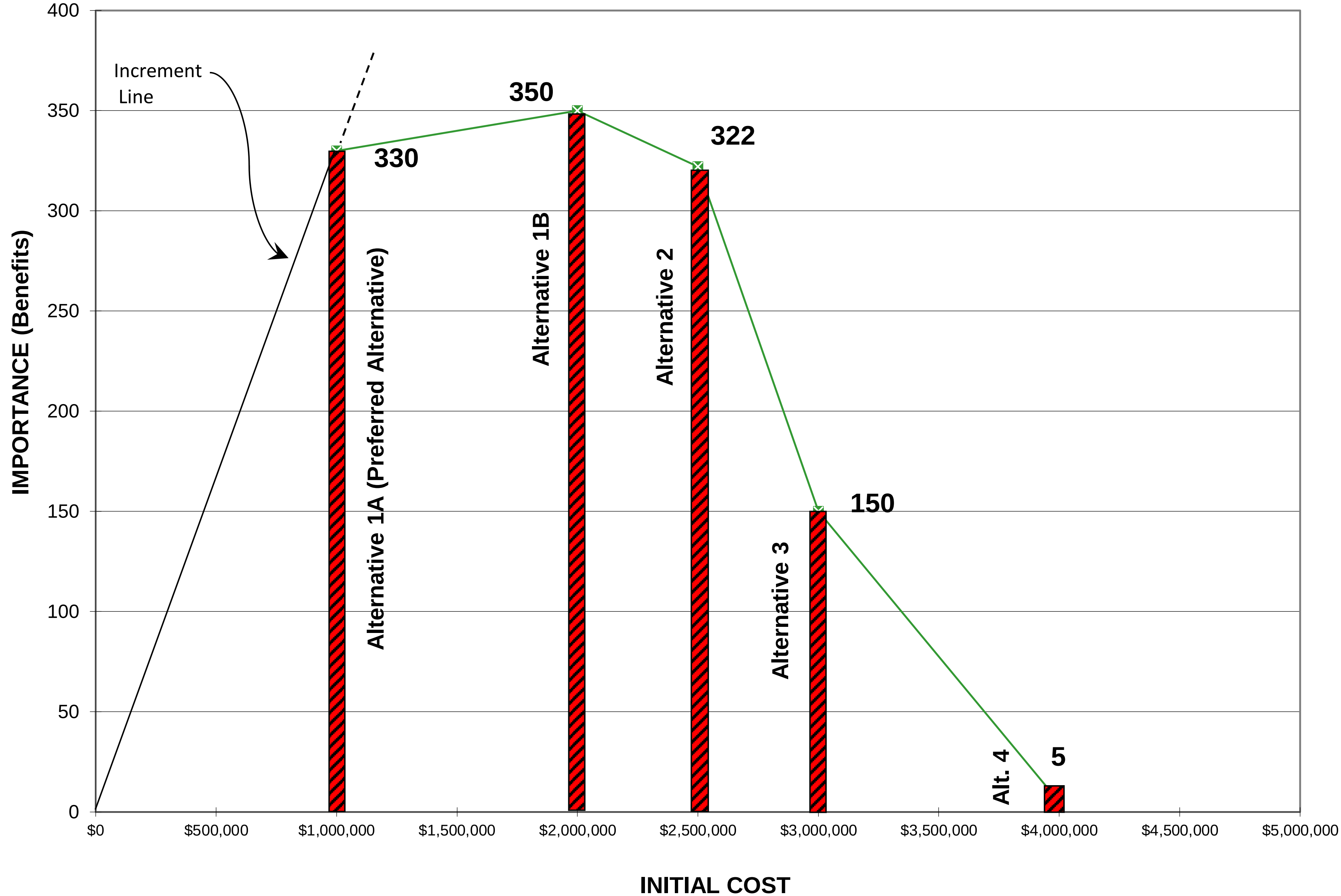
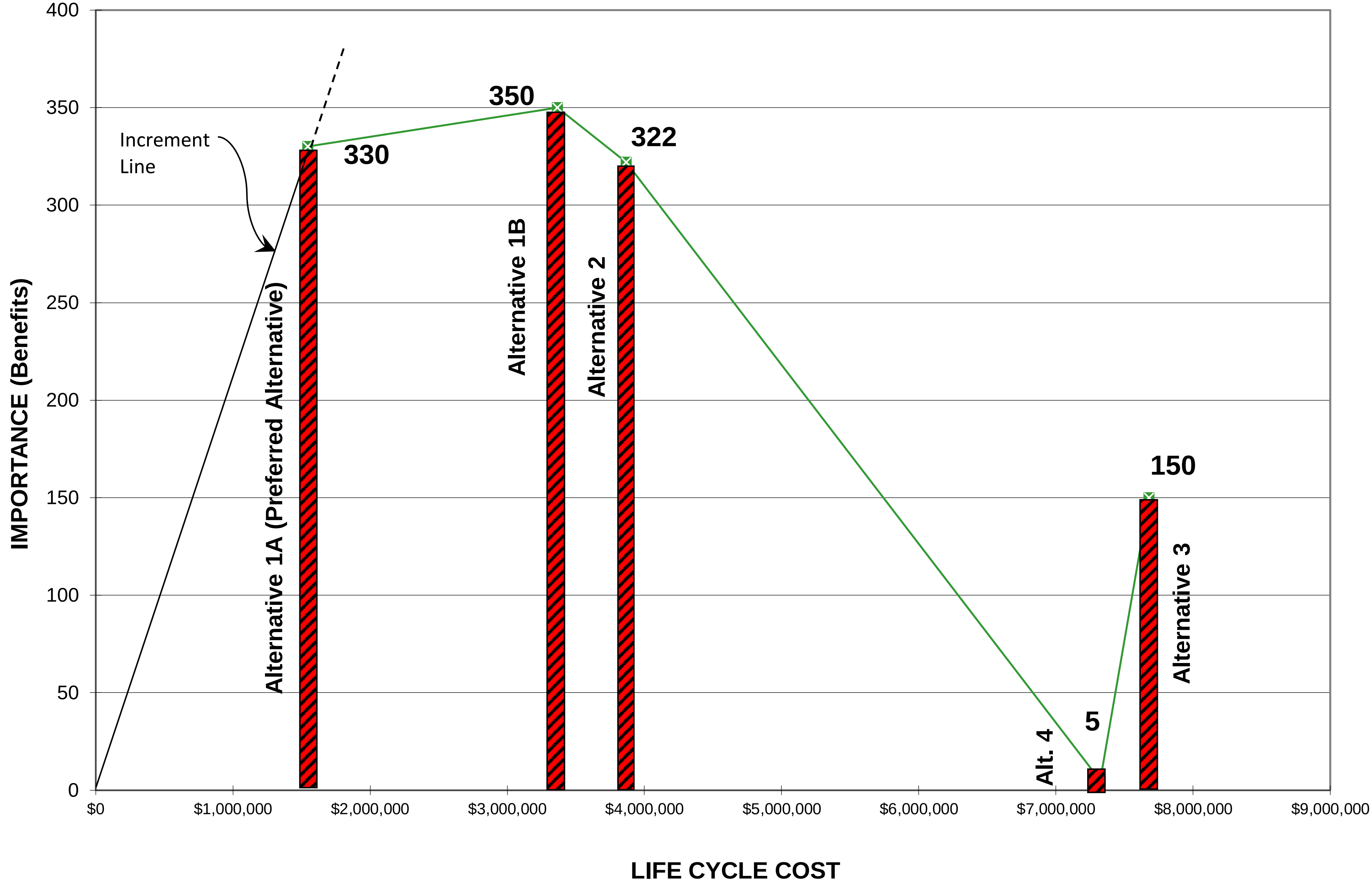


Figure 10G

CBA Importance to Life Cycle Cost Graph: Stormwater Management Alternatives



Phase VI - Recommendation

The final day of the VA workshop, the VA team summarized the workshop and the decisions reached. Following are next steps:

Next Steps:

1. VA Draft Report – 3 weeks (Steve Kirk)
2. 60% Design Submittal – 11/8/2019 – (Hugo Gutierrez)
3. Draft RFP – 11/13/2019 – (William Leidy)
4. Draft Permit Application – 11/28/2019 – (Chip Messenkopf)
5. Pre-App Meeting – 12/02/2019
6. Coordination w/ SHPO/USFWS/FWC – 12/15/2019
7. NPS Comprehensive Memo (easement/environmental) 12/2019
8. Federal Highways NEPA Re-Evaluation Draft Report (first, confirm if needs to be done) – 12/15/2019 (FDOT)
9. FHWA NEPA Re-Evaluation Final Report (if required) – 04/2020 (FDOT)

VA Team

The study team was composed of a mix of professional disciplines and varied design, construction, and maintenance experience. Members of the park staff, FDOT, the Florida DEP and HDR grounded the team with knowledge of the intricacies of managing and working on this site.

Stephen Kirk, certified value specialist of Kirk Associates, led the team's deliberations during the workshop. A list of VA team participants is contained on **Figure 11** that follows.

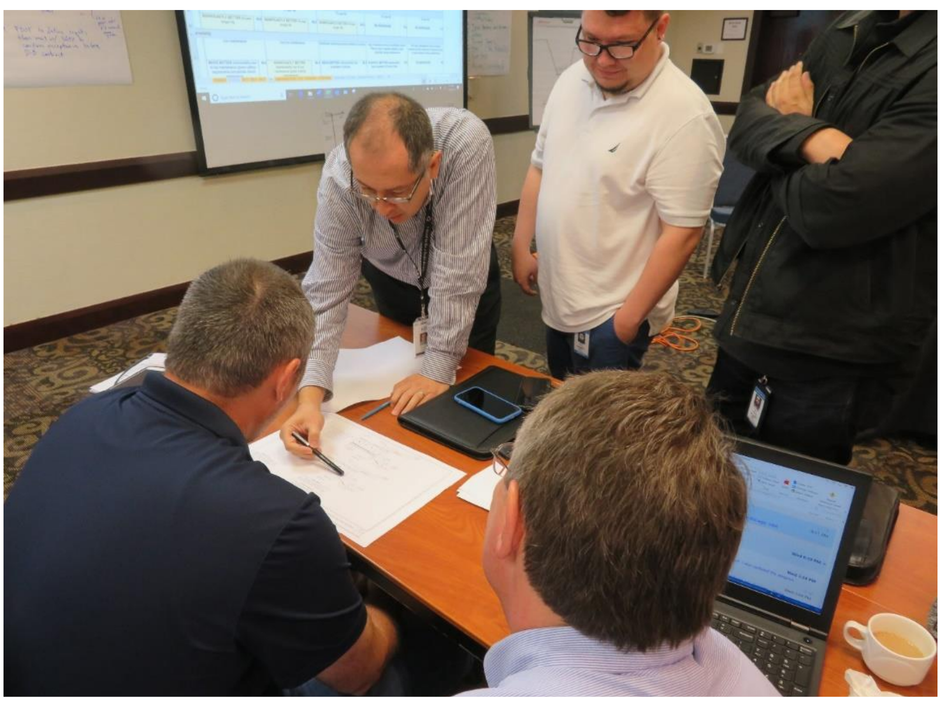
Attendance

Figure 11

Tamiami Trail Phase 2
Value Analysis

Name:	Organization	22-Oct	23-Oct	24-Oct	**Email**
Lydia Fabian	NPS	✓	✓	✓	lydia_fabian@nps.gov
Amy Renshaw	NPS	✓	✓	✓	amy.renshaw@nps.gov
Bob Johnson	NPS	✓	✓		robert_johnson@nps.gov
Jesse DeCoteau	NPS	✓	✓	✓	jesse_decoteau@nps.gov
Xavier De La Torre	FDOT	✓			
Barbara Russell	FDOT	✓			barbara.russell@dot.state.fl.us
Felix Hernandez	FDOT	✓	✓	✓	felix.hernandez@dot.state.fl.us
Miguel Villon	FDOT	✓		✓	miguel.villon@dot.state.fl.us
Jonathan Fundora	FDOT	✓	✓		jonathan.fundora@dot.state.fl.us
Chris Tauella	FDOT	✓	✓		
Leonard Salazar	FDOT	✓			
Mario Dominguez	FDOT	✓			
Nathan V. Pulido	FDOT	✓	✓		nathan.pulido@dot.state.fl.us
Steven Craig James	FDOT	✓	✓	✓	steven.james@dot.state.fl.us
Andrew Jungman	FDOT	✓	✓	✓	andrew.jungman@dot.state.fl.us
Marceau Michel	FDOT	✓	✓	✓	marceau.michel@dot.state.fl.us
Mario Perez	FDOT	✓			
Jacqueline Sequeira	FDOT	✓	✓	✓	jacqueline.sequeira@dot.state.fl.us
Gary Contron eo	FDOT		✓		gary.contron eo@dot.state.fl.us
Ben Vajta	FDOT		✓	✓	beneze.vajta@dot.state.fl.us
Alex Casals	FDOT			✓	alejandro.casals@dot.state.fl.us
Inger Hansen	FDEP	✓	✓		inger.hansen@floridadep.gov
Cortney Deal	FDEP	✓	✓	✓	cortney.deal@floridadep.gov
John Danielsen	HDR	✓	✓	✓	john.danielsen@hdrinc.com
Jon Holbrook	HDR	✓	✓	✓	jon.holbrook@hdrinc.com
Francisco Avelar	HDR	✓	✓	✓	francisco.avelarsanchez@hdrinc.com
Chip Messenkopf	HDR	✓	✓	✓	chip.messenkopf@hdrinc.com
Joe Borello	HDR	✓	✓	✓	joseph.borello@hdrinc.com
William Leidy	HDR	✓	✓	✓	william.leidy@hdrinc.com
Hugo Gutierrez	HDR	✓	✓	✓	hugo.gutierrez@hdrinc.com
Mohammad Pervez	HDR	✓	✓	✓	mohammad.pervez@hdrinc.com
Rohan Hameed	HDR	✓	✓	✓	rohan.hameed@hdrinc.com
Steve Kirk	KIRK	✓	✓	✓	kirkassociates@aol.com

VA Team Photos



Acknowledgements

It would be a serious oversight in documenting this study without acknowledging the significant contributions made by the well-informed, spirited and cooperative staff of the VA team members. Their hard work and input from their specific expertise made this VA Study a success.

Value Analysis Study
Tamiami Trail Modifications: Next Steps Phase 2

Everglades National Park
Florida

October 22 - 24, 2019

SECTION C: APPENDIX

VALUE ANALYSIS PROCESS

INTRODUCTION

Value Analysis (VA) is an organized, creative process, which focuses attention on the requirements of a project for the purpose of achieving essential functions and attendant benefits at the lowest, total costs for materials, equipment, staffing, energy usage, facilities, professional services, maintenance, etc. over the life of the project. In other words, value engineering is a systematic approach to obtain optimum ***value*** for each dollar spent. As a result of thorough investigation, using experienced, multi-disciplined teams, value and economy are improved by the study of alternate systems, concepts, materials, methods and procedures.

A Certified Value Specialist (CVS) guides a Value Analysis Study. Experience has shown that project studies performed by a person or team with little or no value engineering leadership will tend to steer in the direction of a superficial review and concentrate on errors made by others. A Value Analysis Study, on the other hand, focuses on both reducing the total cost of ownership and improving overall performance. Application of the VA methodology and coordination of the activities before and after the study also significantly increase the probability the recommendations will be implemented.

This approach has been successfully applied to projects of all types and magnitudes and allows value analysis teams to be responsive to clients by producing practical results. The VA approach also encourages participation of the clients in the study in order to take advantage of their experience and knowledge. Multi-disciplined teams, using a value analysis job plan, analyze the functions of the buildings, products or processes under study, identify high cost areas, ascertain the benefits sought and propose alternatives to those planned or currently being used.

A value analysis job plan is organized into three distinct parts: (1) Pre-Study Preparation, (2) Study Workshop, and (3) Post-Study Implementation.

PRE-STUDY PREPARATION

The success of a Value Analysis Study is largely dependent on proper preparation and coordination. Information and documents are furnished by the client and distributed to the team to enable them to prepare for their role in the study. All participants are briefed on the project and their responsibility prior to the study. The pre-study activities include the following tasks:

- Identification of context of the Value Analysis Study.
- Review of project documentation and distribution of information to team members. The VA team relies on the client for the completeness and organization of the material to be used.
- Finalization of team and team assignments.
- Preparation of analytic models, as appropriate.
- Finalization of arrangements for workshop.

Each VA study is designed in response to the goals of the client. The analytic models developed prior to the workshop are consistent with these goals and are based on the information provided to the study team. While not every model is used for every study, it is important the team have sufficient data to develop at least a few of the analytic models to ensure a measure of thoroughness and perspective.

STUDY WORKSHOP

During the workshop portion of a Value Analysis Study, a Study Plan is followed which usually includes specific phases to ensure a thoughtful, professional analysis.

Phase I - Information Phase

At the beginning of a Value Analysis Study, it is important to understand the background and decisions that have influenced the development of the client's goals. For this reason, the client normally describes the history and scope of the project.

Phase II - Function Phase

The functions of the project are the controlling elements in the overall value engineering approach. Explicitly identifying the functions that drive the project is essential to the team because it forces the participants to think in terms of the purposes for the project and the desired results and costs associated with those functions.

Phase III - Creativity Phase

This step in a Value Analysis Study involves the listing of creative ideas. During this portion of a workshop, the value analysis team thinks of as many ways as possible to provide the necessary functions, keeping in mind the benefits important to the client and, at the same time, the need to reduce costs in a responsible manner. During this creative session, judgement about the ideas is not permitted.

Phase IV - Evaluation Phase

All of the information created up to this point must undergo careful consideration. The value analysis team assesses the ideas stemming from the creativity session to test, first, whether the creativity session addressed the problem areas, opportunities and functions identified earlier and, second, whether the specific strategies generated during the creativity session can be, at least in a preliminary fashion, linked with them. The value based decision-making technique of Choosing by Advantages is used to help select the preferred alternative(s). Other techniques such as life cycle costing are also used as appropriate to help the VA team discuss and evaluate alternatives.

Phase V - Development Phase

The development phase includes preparing sketches, engineering calculations, cost estimates and life cycle cost analyses to verify the idea adds value to the project. The results of this effort are then used to prepare a presentation.

Phase VI - Recommendation Phase

The last phase of the Value Analysis Study involves the presentation of recommendations. The team carefully reviews the recommendations before they are formally presented, generally on the last day of the workshop. The recommendations, the rationale that went into the development of each proposal and a summary of the cost savings are presented at this time so that the client can begin an evaluation of the value analysis recommendations prior to the receipt of the report itself.

POST-STUDY PROCEDURES

The post-study portion of a Value Analysis Study includes the preparation of a report describing the activities undertaken during the study and incorporating the recommendations stemming from the workshop. This post-study effort may require follow-up to resolve questions remaining from the study. Either the value analysis team leader or an appropriate team member may work directly with the client to further implementation strategies.

TAMIAMI TRAIL PHASE 2

Everglades National Park, Florida

VALUE ANALYSIS (VA) WORKSHOP
October 22 - 24, 2019

THREE DAY AGENDA

<u>Day 1:</u>

8:30 a.m. **INTRODUCTION TO WORKSHOP/ INFORMATION PHASE**

Welcome & Opening Remarks
Team Member Introductions
Objectives of Workshop
Workshop Organization & Agenda

8:45 **VALUE ANALYSIS BRIEFING**

9:00 **PROJECT DESIGN PRESENTATION** (By Design Team)

Status (Current Stage of Design Process)
Project Goals (by Park/ Region, as desired)

9:30 Alternatives Considered (Subject Areas)

<u>Structural Type Selection – Five Alternatives (six existing bridges)</u>

1. Precast Multi-span Box Culvert
2. Flat Slab Bridge
3. Inverted T Beam Bridge
4. Florida Slab Beam Bridge
5. Con/Span Arch

<u>Typical Sections at Businesses & Driveways – Two Alternatives</u>

<u>Stormwater Mgt. Options Driveways – Two Alternatives</u>

Project Budget & Schedule
VA Team Questions

10:15 **FUNCTION & VALUE MODELS**

Stakeholders/ Interests
Function Logic Diagram (Function Analysis)

11:00 **CREATIVITY, EVALUATION, DEVELOPMENT PHASE (Structural Type)**

Alternatives Considered/ Brainstorm Additional Alternatives
(Identify Opportunities to Achieve Best Balance of Life Cycle Cost, Performance, Sustainability, and Durability, while meeting Required Functions)
Choosing by Advantages* as appropriate
Cost Estimate of Alternatives
Estimates of Maintenance, Energy, Replacements
Life Cycle Cost Calculations
Preferred Alternative/ Written Proposal (Present, Proposed, Discussion)

11:00 **LUNCH**

1:00 p.m. **CREATIVITY, EVALUATION, DEVELOPMENT PHASE (Structure, Cont'd)**

5:00 **ADJOURN**

Day 2:

8:30 a.m. **CREATIVITY, EVALUATION, DEVELOPMENT PHASE (Structure, Cont'd)**

10:00 **CREATIVITY, EVALUATION, DEVELOPM'T PHASE (Driveway Sections)**

12:00 **LUNCH**

1:00 p.m. **CREATIVITY, EVALUATION, DEVELOPM'T PHASE (Driveway Sections)**

5:00 **ADJOURN**

Day 3:

8:30 a.m. **CREATIVITY, EVALUATION, DEVELOPMENT PHASE (Stormwater Mgt.)**

12:00 **LUNCH**

1:00 p.m. **CREATIVITY, EVALUATION, DEVELOPMENT PHASE (Stormwater Mgt.)**

3:00 **PRESENTATION**

VA Preferred Alternatives & Advantages
Next Steps (VA Implementation Plan)

5:00 **ADJOURN/ CELEBRATION!**

* CHOOSING BY ADVANTAGES (CBA)

Alternatives & Importance
Define CBA Alternatives (including sketches)
Define Evaluation Factors
Identify Attributes & Advantages
Score Importance of Advantages
Determine Total Importance of Each Alternative

Life Cycle Cost Analysis
Estimate Construction Costs
Estimate O & M Costs & Revenue Potential
Determine Life Cycle Cost of Each Alternative

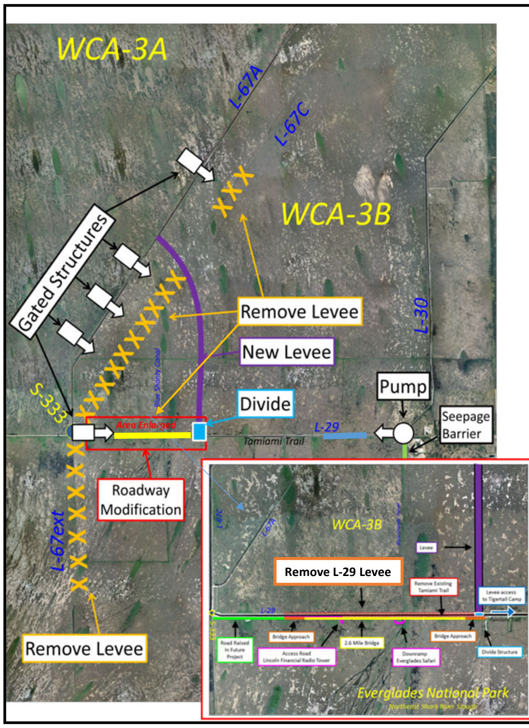
Importance to LCC Graphs/ Reconsideration
Importance to Cost Graphs
Reconsideration, Other Alternatives
CBA/ LCC/ Importance to Cost Graph Updates
Consensus of Preferred Alternative

Value Analysis Study
Tamiami Trail Modifications: Next Steps Phase 2

Everglades National Park
Florida

October 22 - 24, 2019

Tamiami Trail Next Steps Phase 2 Background Presentation

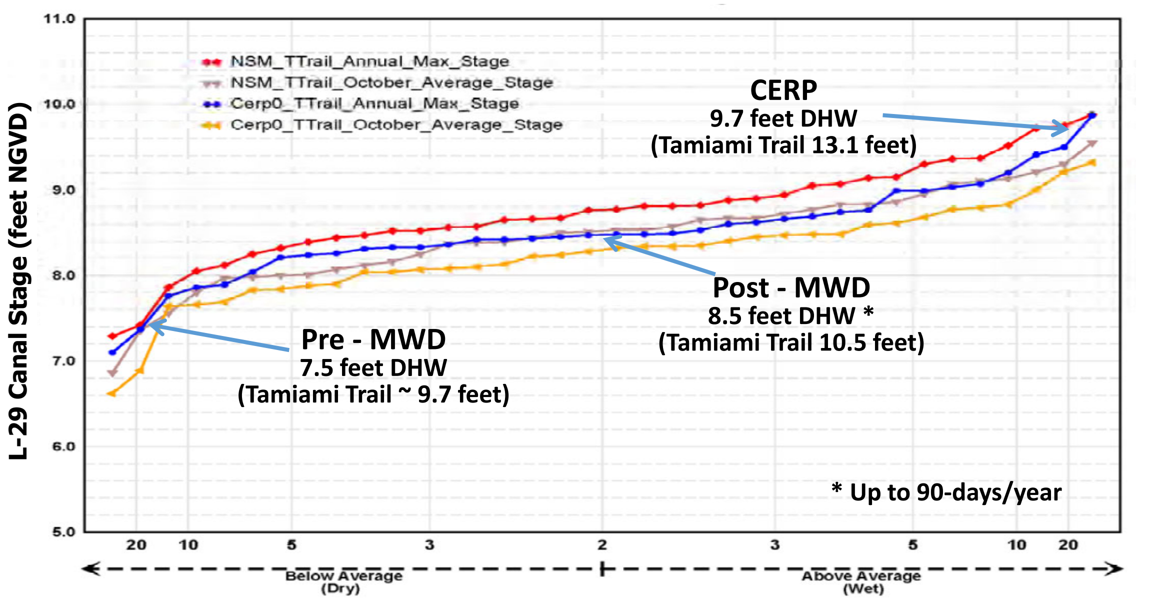


Tamiami Trail Next Steps and the Central Everglades Project

- **Goal: Sending more water south to reduce harmful discharges to the northern estuaries, and restore flows to the central/southern Everglades, requires increased outflow capacity from WCA-3A.**
- **Central Everglades Planning Project (CEPP) will redirect the majority of the new water eastward into Northeast Shark River Slough (the historic flow path).**
- **Requires reconstructing the eastern Tamiami Trail roadway, to accommodate the CEPP flows & design high water of 9.7 feet (NGVD) in the L-29 canal.**
- **The Tamiami Trail Next Steps phase 1 project constructed 2.3-miles of bridging in early 2019. These bridges are aligned with the new CEPP flow path.**
- **The Tamiami Trail Next Steps phase 2 project will reconstruct/raise the remaining 6.5 miles of roadway, to protect the roadway from adverse high water impacts.**

1

Predicted Frequency of L-29 Canal Peak Stages

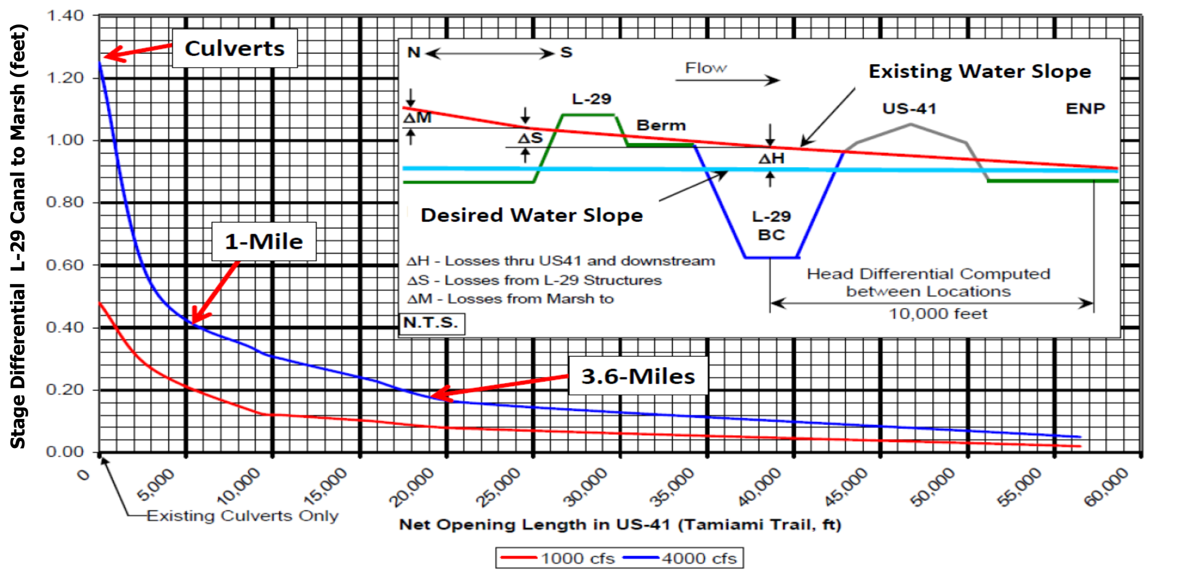


Return Period (Years)

Source: NPS, 2010 TT:NS FEIS

2

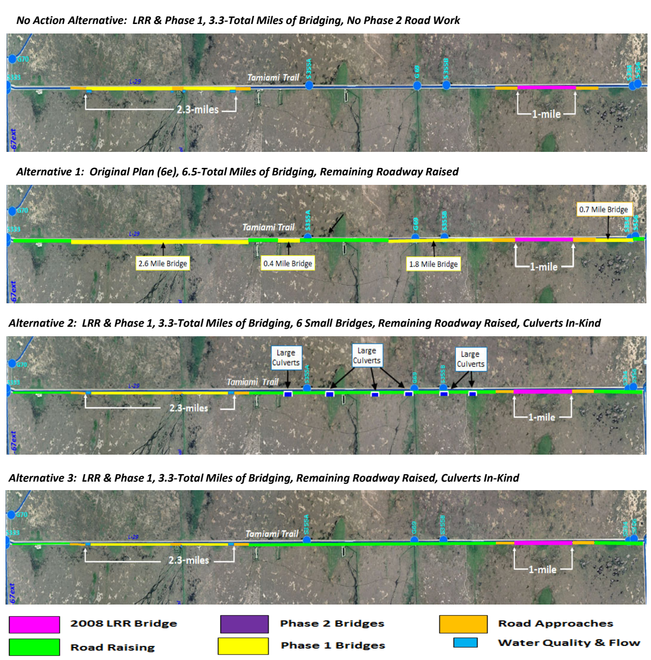
Determining the Benefits of Additional Tamiami Trail Bridging



Additional Bridges Can Pass Higher Flows at Lower Canal Stages, Reducing the Flooding Risks in Adjacent Areas.

Source: NPS, 2010 TT:NS FEIS

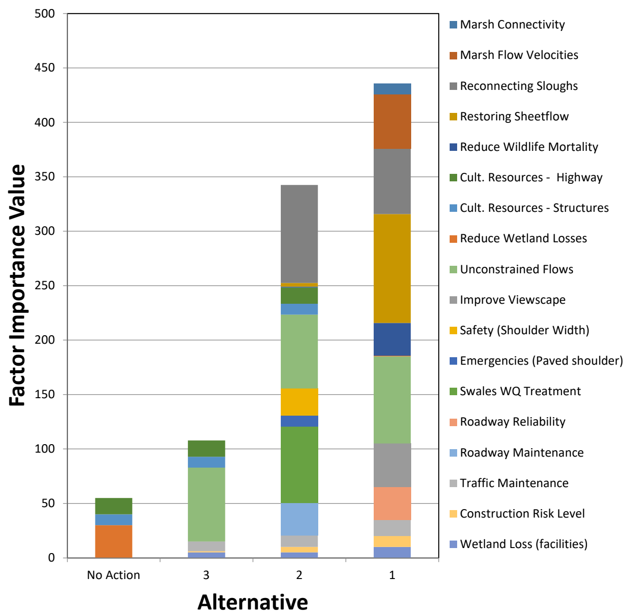
3



Four Alternatives Evaluated in July 2018 Value Analysis Workshop

- **Project Objective 1: Bridging and raising Tamiami Trail to achieve unconstrained flows into Northeast Shark River Slough and Florida Bay.**
- **Project Objective 2: Improve ecological connectivity by removing obstructions to sheetflow.**
- **Project Objective 3: Enhance the unobstructed movement of animals between the north and south of Tamiami Trail (reduce wildlife mortality).**
- **Project Objective 4: Restore slough vegetation and the deep water sloughs within ENP.**
- **Project Objective 5: Restore processes that produce and maintain ridge and slough communities in ENP east of the L-67 Extension.**
- **Project Objective 6: Improving Visitor Services, Viewscape and Construction Durations.**
- **Project Objective 7: Protect Public Health, Safety, and Welfare.**
- **Project Objective 8: Increase Roadway Reliability, and Minimize Maintenance.**
- **Project Objective 9: Cost Effective, Environmentally Responsible, and Beneficial Construction.**

4

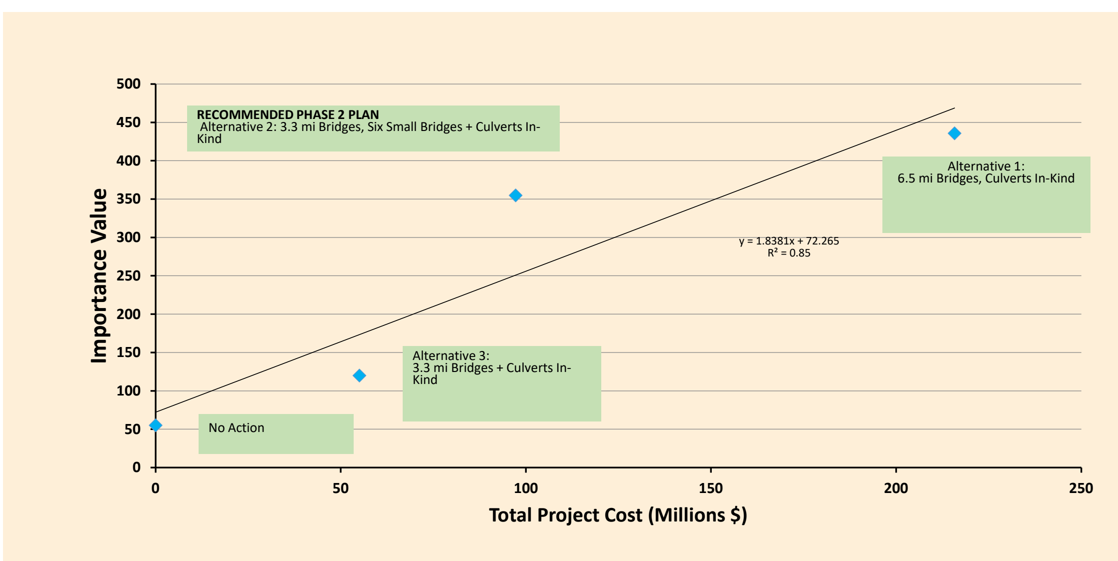


Factor Importance Values for the No-Action and three Value Analysis Workshop Alternatives

- Choosing By Advantages Approach.
- Factors 1-9 match the original project objectives, from the NPS 2010 Final EIS.
- Factors 10-18 match the Phase 2 expanded roadway improvement objectives identified in the VA Workshop.

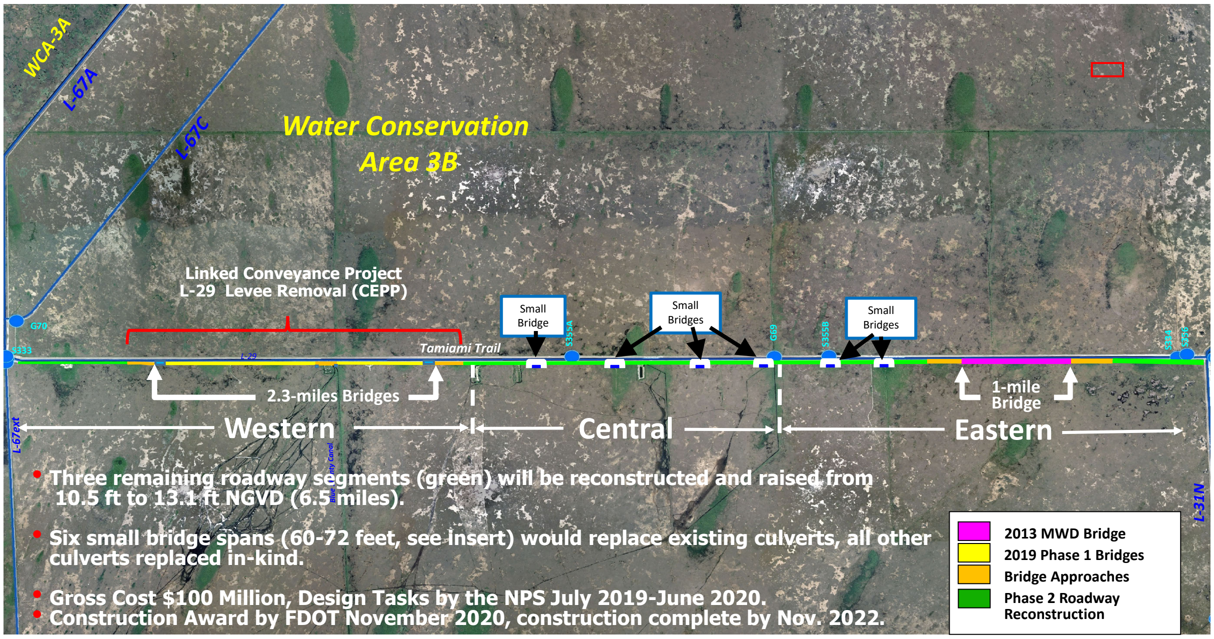
5

Factor Importance Values vs Total Project Cost for the No-Action and three VA Alternatives



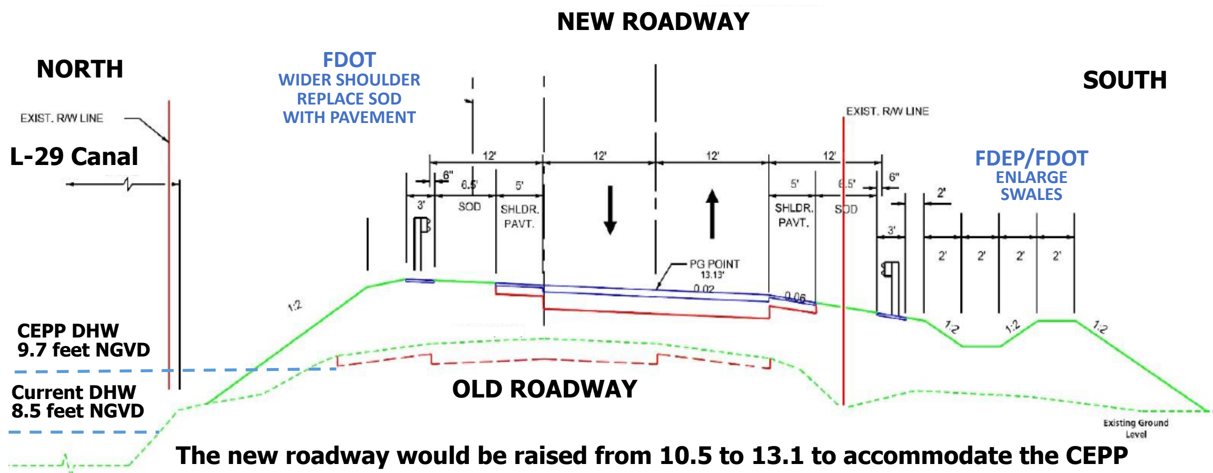
6

Tamiami Trail Next Steps Phase 2 Recommended Plan



7

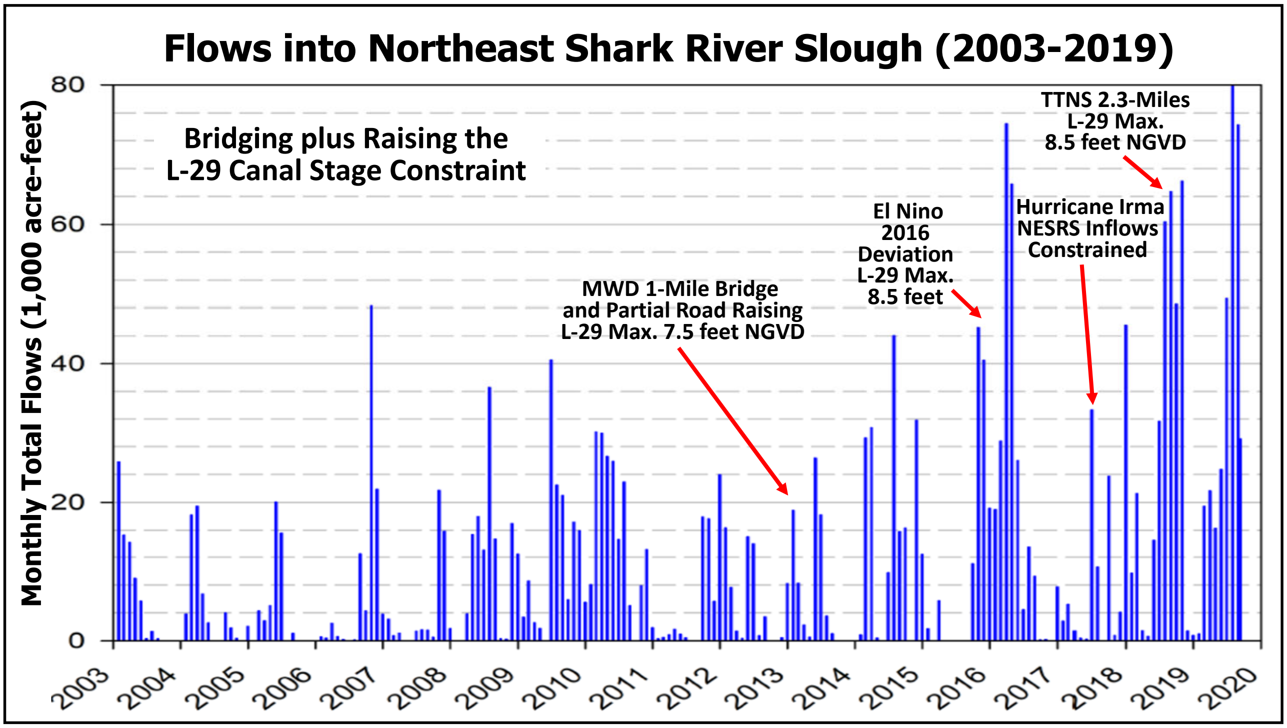
Tamiami Trail Next Steps Phase 2 Initial Typical Section



The new roadway would be raised from 10.5 to 13.1 to accommodate the CEPP design high water, and shifted southward by approximately 30 feet to accommodate the wider subbase and improved water quality treatment.

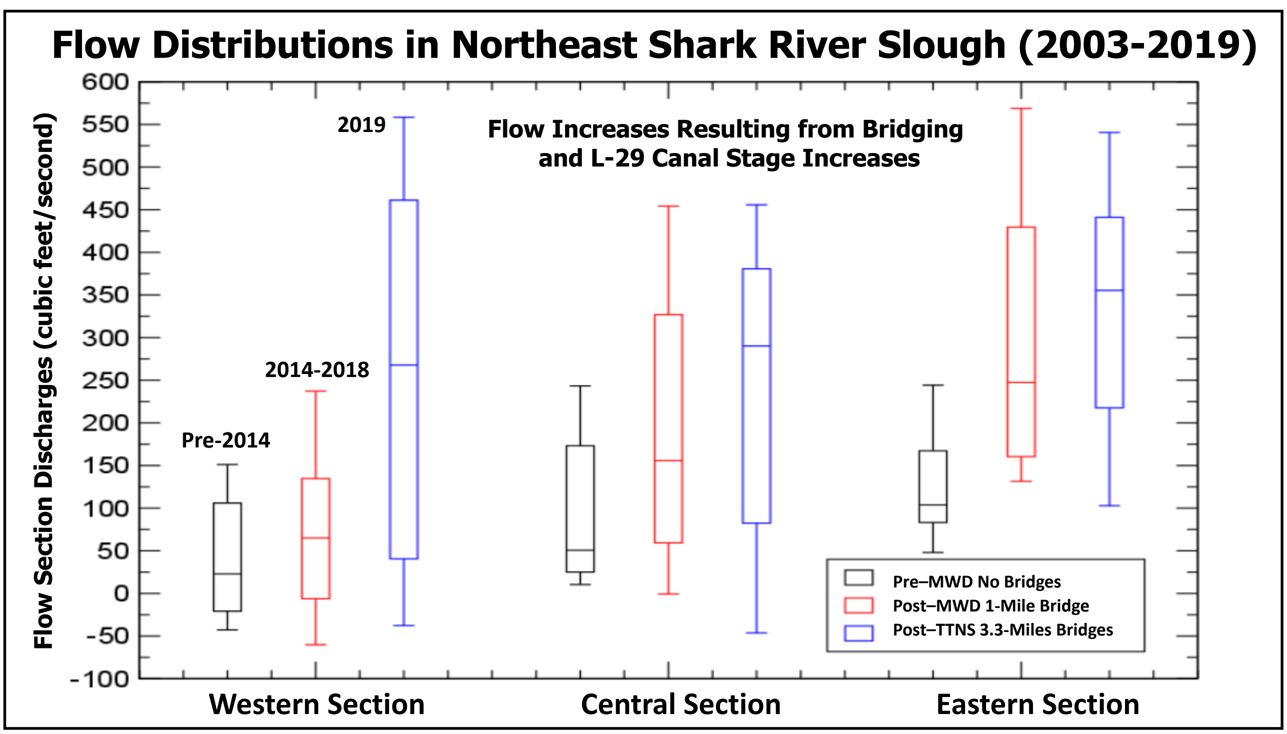
Source: NPS, 2018 TT:NS VA Wksp.

8



Flows into Northeast Shark River Slough (2003-2019)
Monthly Total Flows (1,000 acre-feet)
Bridging plus Raising the
L-29 Canal Stage Constraint
MWD 1-Mile Bridge
and Partial Road Raising
L-29 Max. 7.5 feet NGVD
El Nino
2016
Deviation
L-29 Max.
8.5 feet
Hurricane Irma
NESRS Inflows
Constrained
TTNS 2.3-Miles
L-29 Max.
8.5 feet NGVD
0
20
40
60
80
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020

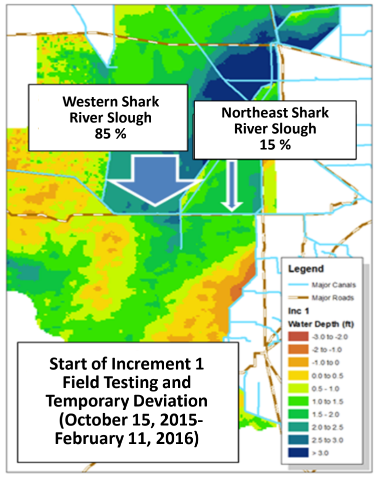
9

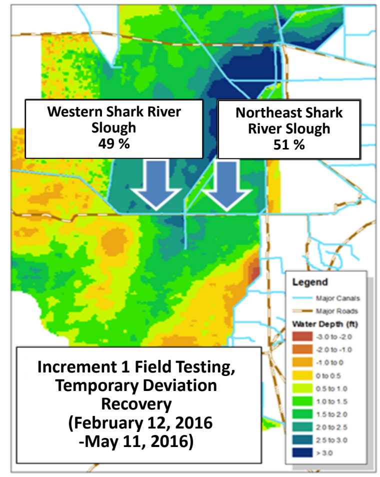


Flow Distributions in Northeast Shark River Slough (2003-2019)
Flow Section Discharges (cubic feet/second)
Flow Increases Resulting from Bridging
and L-29 Canal Stage Increases
Pre-2014
2014-2018
2019
-100
-50
0
50
100
150
200
250
300
350
400
450
500
550
600
Pre–MWD No Bridges
Post–MWD 1-Mile Bridge
Post–TTNS 3.3-Miles Bridges
Western Section
Central Section
Eastern Section

10

Tamiami Trail Flow Distributions Western versus Northeast Shark River Slough Start of Incremental Field Testing



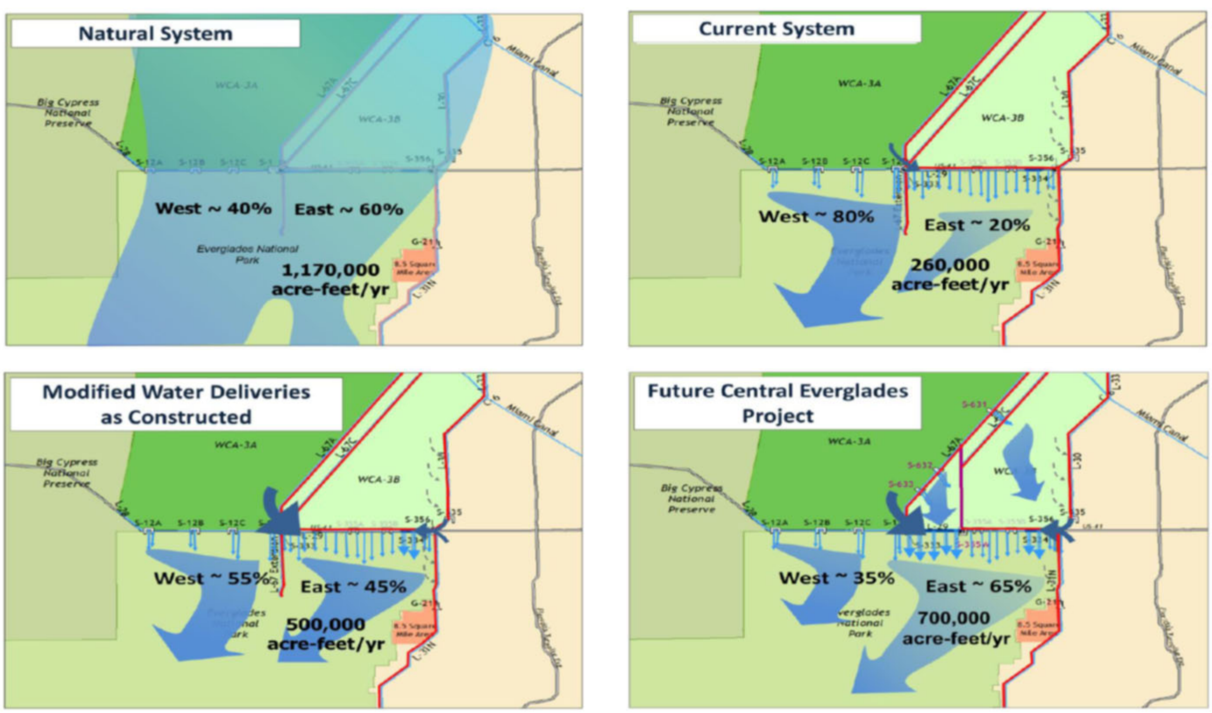


Wet Periods – Western Flows Dominate

Drier Periods – More Balanced Flow Distributions

Downstream Topographic Elevations are a Key Driver

11



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Value Analysis Study
Tamiami Trail Modifications: Next Steps Phase 2

Everglades National Park
Florida

October 22 - 24, 2019

Structural Type Alternatives Presentation

Tamiami Trail Phase II

SR 90 (US 41)
From Structure S-333 to Structure S-334

1

- Typical Section Package
- Flexible Pavement Design Package
- Preliminary Roadway Plans
- Preliminary Temporary Traffic Control Plans
- Preliminary Signing and Pavement Markings Plans
- Border Width Variation
- Shoulder Cross Slope Variation
- Billboard/Sign Inventory

Status – Roadway, Utilities, Signing & Pavement Markings

By: Rohan Hameed

2

- Preliminary Drainage Evaluation
- Preliminary Drainage Calculations
- Preliminary Drainage Report

Status – Drainage
By: Mohammad Pervez

3

- Wetland Delineations
- UMAM Analysis
- FDEP Field Reviews
- Draft Permit Applications
- Pre-Application Meetings
  - FDEP Teleconference
  - USACE Meeting and Teleconference

Status – Environmental/Permits
By: Chip Messenkopf

4

- Structure Type Technical Memo
  - Precast Multi-span Box Culvert
  - Flat Slab Bridge
  - Inverted T Beam Bridge
  - Florida Slab Beam Bridge
  - Con/Span Arch

Status – Structures
By: John Danielsen

5

Project Schedule

▪ Preliminary Plans	10/18/19
▪ Value Analysis	10/22/19 – 10/24/19
▪ 60% Plans Submittal	11/08/19
▪ RFP 1st Draft Submittal	11/13/19
▪ 60% Plans Review Meeting	11/22/19
▪ Utility Coordination Meting	12/13/19
▪ RFP 2nd Draft Submittal	01/08/20
▪ RFP Submittal to Central Office	02/12/20
▪ Planned Advertisement	02/12/20
▪ ROW Certified	03/13/20
▪ Final RFP Sent to FHWA for Approval	03/20/20
▪ Official Advertisement	04/15/20

Project Budget (Per SOS August 2019) : $92,000,000

6

Alternatives Considered

- Structural Type Selection
- Typical Sections at Businesses and Driveways
- Stormwater Management Options

7

Structural Type Selection – Five Alternatives

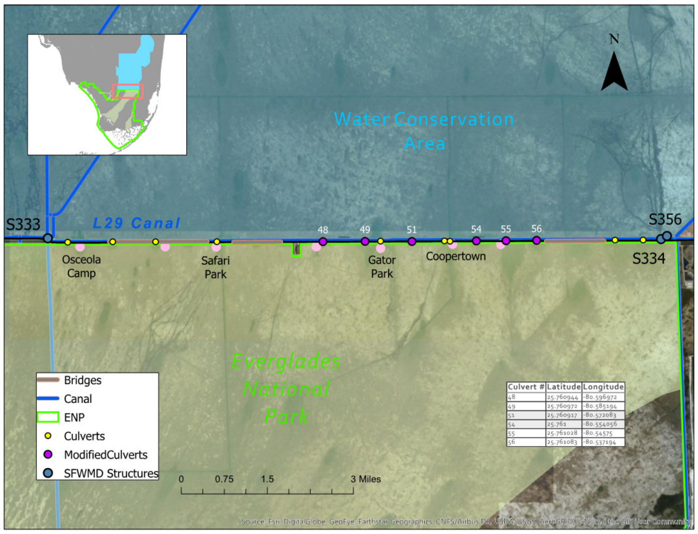
By: John Danielsen

- Alternative 1 - Precast Multi-span Box Culvert
- Alternative 2 - Flat Slab Bridge
- Alternative 3 - Inverted T Beam Bridge
- Alternative 4 - Florida Slab Beam Bridge
- Alternative 5 - Con/Span Arch

8

Structural Type Selection – Five Alternatives

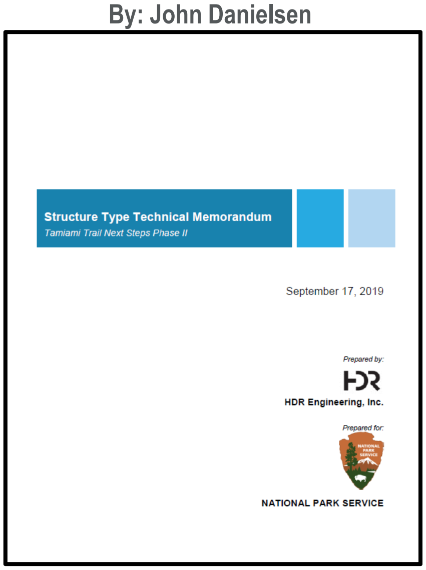
By: John Danielsen



9

Structural Type Selection – Five Alternatives

By: John Danielsen


Structure Type Technical Memorandum

Tamiami Trail Next Steps Phase II

September 17, 2019

Prepared by:

FDS

HDR Engineering, Inc.

Prepared for:

NATIONAL PARK SERVICE

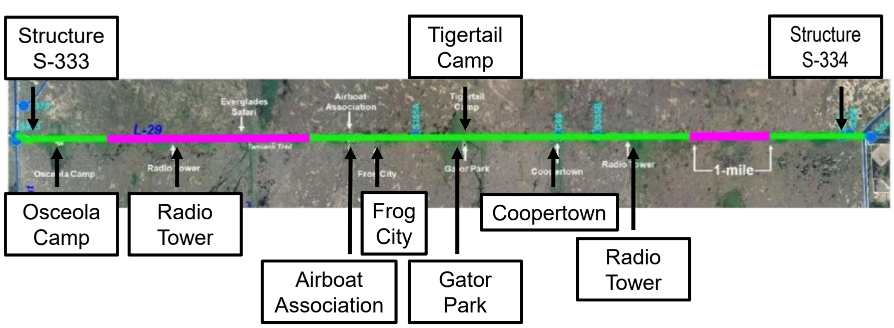
10

Typical Section at Business & Driveways
By: Rohan Hameed

- Alternative 1 - Full Shoulder with 7.7-foot Swale Bottom
- Alternative 2 - 10-foot Shoulders with Shoulder Concrete Barrier

11

Typical Section at Business & Driveways
By: Rohan Hameed



12

Stormwater Management Options

By: Mohammad Pervez

- Decision at 2018 VA – Proposed Swales as Preferred Alternative

- Stormwater Treatment Options
  - Alternative 1 - Swales
  - Alternative 2 - Ponds
  - Alternative 3 - Exfiltration Trenches
  - Alternative 4 - Pollution Control Structures

13

Questions?

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