

APPENDIX J

Preliminary Stormwater Management Report

**MIAMI-DADE COUNTY
PARKS, RECREATION, AND OPEN SPACES (MDPROS)**

**LUDLAM TRAIL CORRIDOR
FROM SW 80th STREET TO 400 FEET NORTH OF NW 7th STREET
MIAMI-DADE COUNTY, FLORIDA
P&R CONTRACT NO. 43502-15-001-14470619
P&R PROJECT NO. RFQ 786B
FM NO. 444236-1-22-01
ETDM NO. 14369**

**PRELIMINARY
STORMWATER MANAGEMENT REPORT**

PREPARED BY

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1 INTRODUCTION

The Miami-Dade County Parks, Recreation and Open Spaces (MDPROS) Department is conducting a Project Development and Environment (PD&E) Study for a continuous public bicycle and pedestrian pathway along the Ludlam Trail Corridor in Miami-Dade County. The project is funded under a Local Agency Program (LAP) Agreement with the Florida Department of Transportation (FDOT) which requires compliance under the National Environmental Policy Act (NEPA). This Preliminary Stormwater Management Report documents the existing conditions, design criteria, and proposed conditions from a drainage point of view.

1.1 Purpose and Scope

The purpose of the proposed Ludlam Trail Corridor is to provide a new route/pathway in Miami-Dade County to encourage the use of alternate modes of transportation and enhance overall connectivity and accessibility to schools, parks, transit stations, and bus stops for more than 30,000 people living within two miles of the proposed project corridor. The proposed project would provide a safe, dedicated, and direct means of non-motorized transportation to and from areas of residences, work, schools, parks, and shopping centers, and would serve bicyclists, pedestrians, and other non-motorized vehicle users.

1.2 Project Description

MDPROS is proposing to develop a 5.6-mile multi-use trail within the former Florida East Coast Industries (FECI) railroad corridor (i.e., the Ludlam Trail Corridor, or proposed project). As a future component of the Shared-Use Nonmotorized (SUN) Trail Network, this proposed publicly accessible trail would serve bicyclists, pedestrians, and users of other types of non-motorized vehicles. In addition, the proposed project is expected to provide a safe, dedicated, and direct means of non-motorized transportation to and from areas of residences, work, schools, parks, and shopping centers.

The proposed project limits extend along a segment of the former FECI rail corridor from SW 80th Street to 400 feet north of NW 7th Street, between 69th and 70th Avenues (**See Appendix A**). The project occurs entirely within the former FECI right-of-way (ROW). The ROW for the proposed Ludlam Trail Corridor is approximately 100 feet wide for most of its length, although it narrows to between 75 or 80 feet in some areas. Further, at up to nine (9) roadway crossings, the ROW at the roadway crossing narrows to approximately 40 feet. These roadway crossings include the following: SW 72nd Street/Sunset Drive; SW 56th Street /Miller Drive; SW 40th Street /Bird Road; SW 24th Street/Coral Way; SW 23rd Street; SW 22nd Street; SW 21st Street; SW 8th Street/Calle Ocho; and W Flagler Street.) (**See Appendix B for project Typical Sections**). The proposed project study area extends through sections of the City of Miami, the City of South Miami, and unincorporated Miami-Dade County, and is immediately adjacent to the City of West Miami.

The proposed Ludlam Trail Corridor is located within three (3) South Florida Water management District (SFWMD) Drainage Basins:

- 1) From the Begin Project at SW 80th Street to SW 40th Street – within the C-2 Canal Basin
- 2) From SW 40th Street to SW 8th Street – within the Coral Gables Basin
- 3) From SW 8th Street to the End Project just north of NW 7th Street – within the Tamiami East Basin

This Preliminary Stormwater Management Report presents how the applicable drainage criteria will be addressed as a result of the proposed Ludlam Trail Corridor improvements.

2 DRAINAGE SYSTEM IMPROVEMENTS

There are currently no existing stormwater management systems for the Ludlam Trail Corridor. Stormwater Runoff is permitted to flow directly onto the existing adjacent green areas for storage, where it eventually infiltrates into the ground.

The proposed project improvements, however, will introduce new impervious areas which will increase the stormwater runoff volume. In addition, the new impervious areas will reduce the storage of runoff available from the existing ground surface due to the configuration of the proposed trail. In order to compensate for this increase of runoff and decrease of surface storage, the proposed Ludlam Trail Corridor will include swales (**See Appendix B**) that must be designed to retain the required water quality treatment volume, retain the increase of stormwater runoff due to the increase of impervious area, and also be able to account for any lost ground surface storage of stormwater runoff.

This Preliminary Stormwater Management Report will quantify the required water quality treatment volume and the required stormwater runoff volume needed to be retained onsite due to the increase of impervious area. Due to the scope of this preliminary study phase, however, the required stormwater retention volume due to the decrease of ground surface storage cannot be determined, but must be taken into account during the final design phase of the project. This will ensure that adjacent property owners will not be adversely affected by the proposed Ludlam Trail Corridor improvements.

3 DESIGN CRITERIA AND PARAMETERS

This section outlines the South Florida Water Management District (SFWMD) and Miami-Dade County Department of Regulatory and Economic Resources (DRER) stormwater quantity and quality criteria applicable to the proposed drainage systems. The criteria and parameters outlined in this section are derived from the applicable published regulations, permit design manuals, and design standards.

3.1 Design High Water Elevation

The design high water elevation for most projects within Miami-Dade County is typically derived from the Public Works Department Design Standard W.C. 2.2, which is determined from the average October groundwater level data available from 1960 to 1975. Design Standard W.C. 2.2 shows the wet season groundwater elevation within the 3.0 ft-NGVD (1.44 ft-NAVD) elevation contour (**See Appendix D**).

3.2 Stormwater Quantity Criteria

The stormwater quantity criteria will be based on the most stringent requirement between the SFWMD and DRER criteria.

3.2.1 Design Storms

The DRER's criteria outlined in the Policy for Design of Drainage Structures in Miami-Dade County (December 1980) requires that drainage systems for those other than four lane roads in high density, high traffic areas be designed for a 5-year frequency design storm.

Miami-Dade County DRER also requires that proposed drainage systems meet the offsite discharge requirements per the SFWMD 25 year – 72 hour rainfall event.

Table 3-1: Design Storm Events

Design Storm Event
5 year - 24 hour
25 year - 72 hour

3.2.2 Spread

There are no applicable spread criteria for the subject project.

3.3 Stormwater Quality Criteria

The design high water elevation for most projects within Miami-Dade County is typically derived from the Public Works Department Design Standard W.C. 2.2, which is determined from the average October groundwater level data available from 1960 to 1975. Design Standard W.C. 2.2 shows the wet season groundwater elevation within the 3.0 ft-NGVD (1.44 ft-NAVD) elevation contour.

The SFWMD requires that all projects meet state water quality standards, as set forth in Chapter 17-302, Florida Administrative Code (FAC). To assure that these criteria are met, the Project

must meet the following volumetric retention/detention requirements, as describe in the SFWMD Permit Volume IV:

1. For wet detention systems, the first inch of runoff from the project or the total runoff from 2.5 inches times the percent impervious, whichever is greater, must be detained on-site. A wet detention system is a system that maintains the control elevation below one foot from the seasonal high groundwater elevation and does not bleed-down more than one-half inch of detention volume in 24 hours.
2. Dry detention systems must only provide 75 percent of the required wet detention volume. Dry detention systems must maintain the control elevation at least one foot above the seasonal high groundwater elevation.
3. Retention systems must only provide 50 percent of the wet detention volume.
4. For projects with more than 50 percent of imperviousness, discharge to the receiving water bodies must be made through baffles, skimmers, or other mechanisms suitable of preventing oil and grease from discharging to / or from the retention / detention areas.

DRER also requires that all projects meet the state water quality standards. To assure that this criteria is met, 100 percent of the first inch of runoff must be retained on-site. The volume is equivalent to retaining one inch of runoff from the furthest hydrologic point in the project. The methodology for estimating this volume is outlined in DRER's Policy for Design of Drainage Structures as follows:

$$V = 60 C i A T_t$$

Where:

V = Required stormwater quality volume [cubic feet]

C = Runoff coefficient [dimensionless]

i = Storm intensity [inches per hour]

A = Total tributary area [acres]

T_t = Duration of storm whose runoff is polluted and contaminated [minutes]
= T_{1"} + T_c

Where:

$$T_{1"} = \frac{2940 F^{-0.11}}{308.5 C - 60.5 (0.5895 + F^{-0.67})}$$

Where:

F = Storm frequency [years]

C = Runoff coefficient

T_c = Time of concentration [minutes]

i = Storm intensity [inches per hour]

$$i = \frac{308.5}{48.6 F^{-0.11} + T_t (0.5895 + F^{-0.67})}$$

Where:

F = Storm frequency [years]

T_t = Duration of storm whose runoff is polluted and contaminated [minutes]

For projects such as the Ludlam Trail Corridor, DRER requires that the one-inch of runoff be retained for a rainfall event with a 5-year frequency.

All Water Quality calculations with adherence to the above criteria are provided in Appendix C of this report.

For the proposed drainage design, the more stringent criteria of either the SFWMD or Miami-Dade County DRER will be used.

4 FLOODPLAIN IMPACTS

In accordance with Part 2, Chapter 13 of the PD&E Manual, the project area is generally located outside of the 100-year floodplain, in flood insurance rate Zone X. However, from SW 43rd Street to SW 40th Street, the project is located within Zone AH with a Base Flood Elevation of 9.00, and from the Tamiami Canal (C-4) to the northern Project Terminus, the project is located within Zone AH with a Base Flood Elevation of 7.00 (See APPENDIX E).

The proposed drainage improvements associated with the project will perform hydraulically in a manner equal to or greater than the existing conditions (no treatment), and backwater surface elevations are not expected to increase. Thus, there will be no significant adverse impacts on natural and beneficial floodplain values. There will be no significant change in flood risk, and there will not be a significant change in the potential for interruption or termination of emergency service or emergency evacuation routes. Any localized flooding will not increase as the result of this project. Therefore, it has been determined that any encroachment upon the base floodplain is not significant.

5 DRAINAGE ANALYSIS RESULTS

The results of the drainage analysis have been summarized and presented in Appendix C of this report.

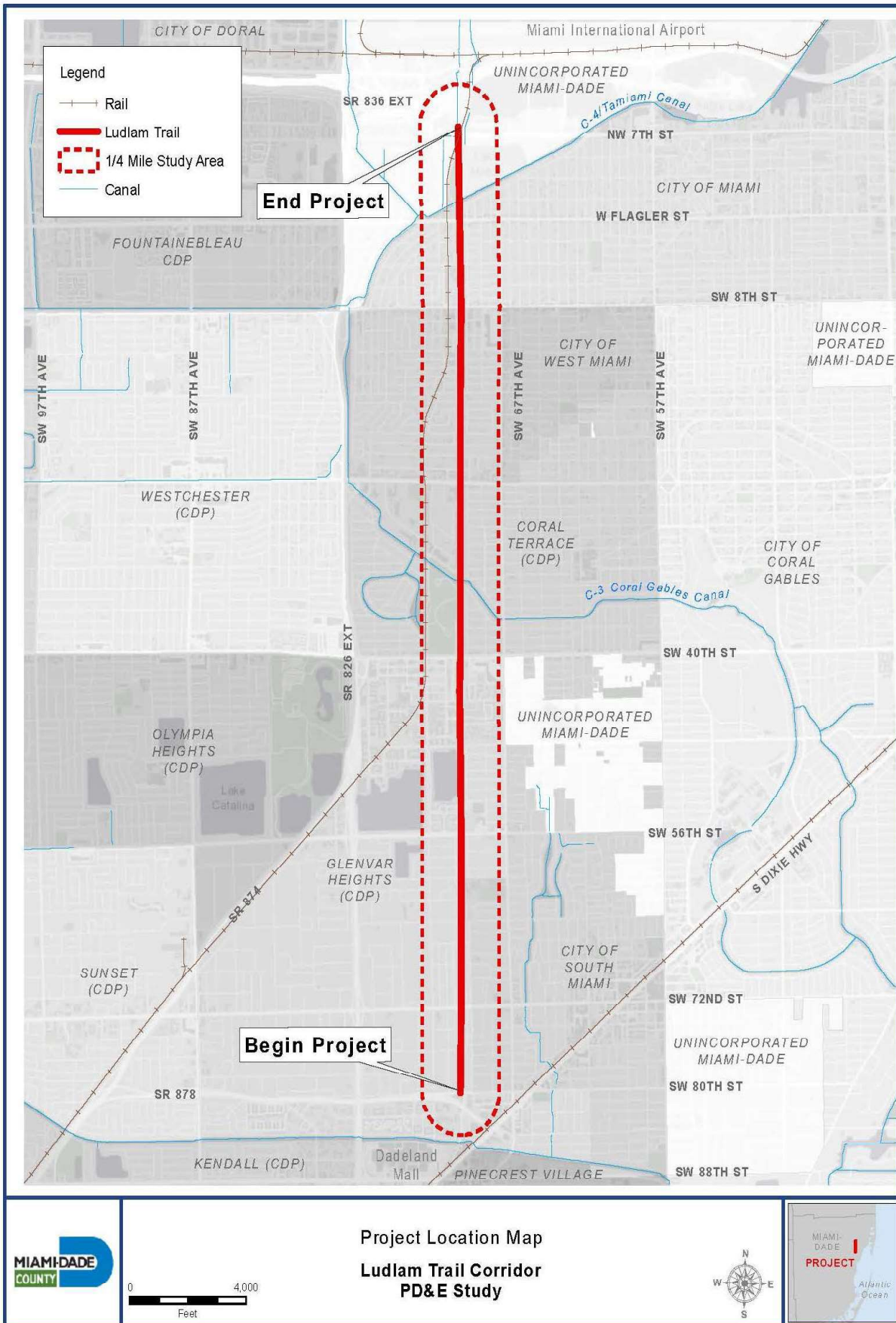
Table C-1 gives a description of the different drainage basins and their boundary limits

Tables C-2A, C-2B, and C-2C provides the required water quality treatment volumes that need to be retained by the proposed dry retention swales. The required water quality retention volumes are categorized by the areas located within each South Florida Water management District (SFWMD) Drainage Basin.

Table C-3 compares the post-development stormwater runoff volume to the pre-development stormwater runoff volume during the SFWMD's 25 year – 72 hour design storm. This is the volume of runoff that needs to be retained by the proposed dry retention swales in order to account for the increase of stormwater runoff due to the increase of impervious area.

APPENDIX A

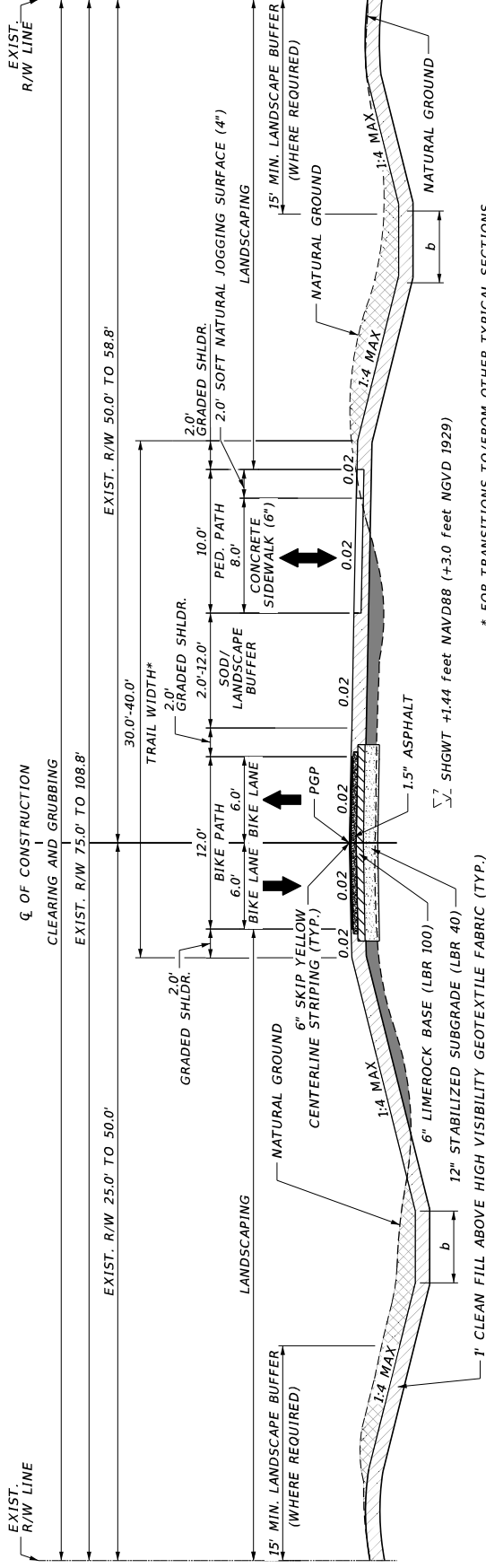
Location Map



APPENDIX B

Typical Sections

LUDLAM TRAIL BICYCLE AND PEDESTRIAN PATH (BUFFERED SEPARATION)



* FOR TRANSITIONS TO/FROM OTHER TYPICAL SECTIONS, SEE TYPICAL SECTION DETAILS (SHEET 7)

TYPICAL SECTION 1

TRAIL DESIGN SPEED	
18 MPH	FOR LONGITUDINAL GRADES \leq 4%
30 MPH	FOR DOWNHILL LONGITUDINAL GRADES $>$ 4%

DRAINAGE LEGEND	
b: Swale Bottom Width	Swale depth and width is to be determined in design.

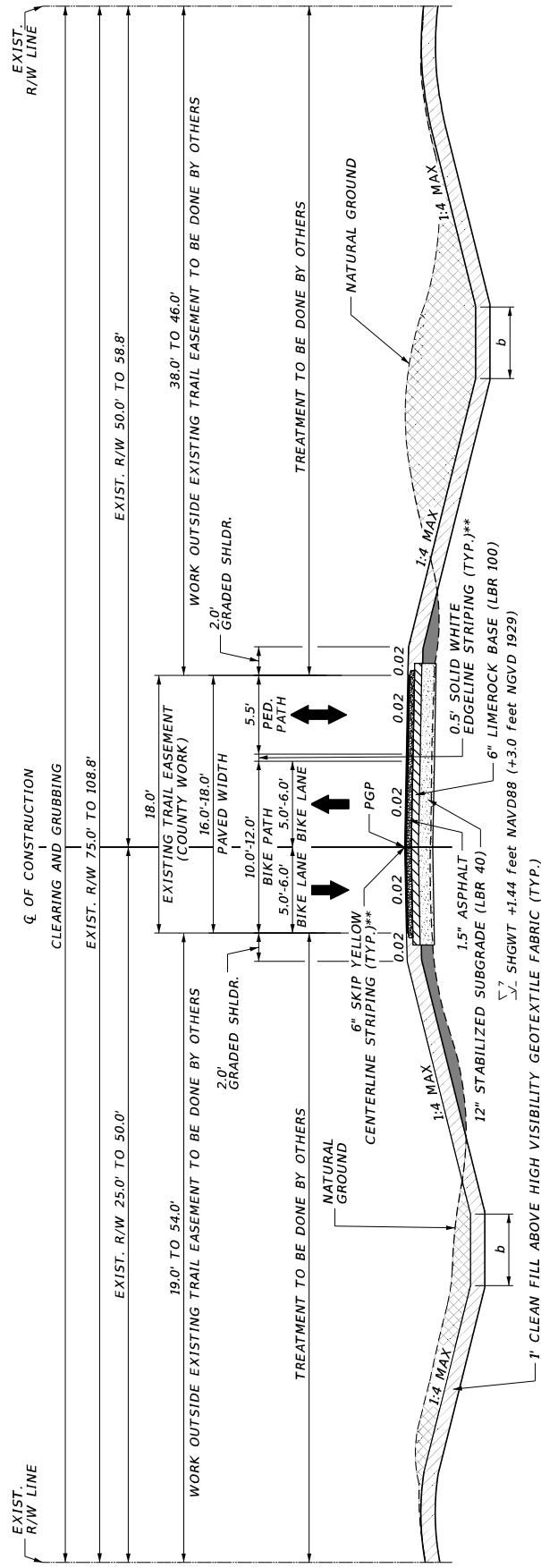
EARTHWORK LEGEND	
CUT	RELOCATED FILL
CLEAN FILL	

NOTES:

1. ESTIMATED SEASONAL HIGH GROUNDWATER TABLE (SHGWT) EACH YEAR IS IN THE AUGUST-SEPTEMBER PERIOD AT THE END OF THE WET SEASON DURING A YEAR OF AVERAGE (NORMAL) RAINFALL.
2. SHGWT BASED ON NORTH AMERICAN VERTICAL DATUM (NAVD) 1988.
3. PGP: PROFILE GRADE POINT
4. APPLICABLE DRAINAGE IS TO BE EVALUATED/DETERMINED DURING DESIGN.
5. APPLICABLE LIGHTING INCLUDING LOW-LEVEL BOLLARD LIGHTING IS TO BE EVALUATED/DETERMINED DURING DESIGN.
6. ANY EXISTING CHAIN LINK FENCE, ASPHALT PADS OR OTHER ITEMS/ENCROACHMENTS WITHIN THE TRAIL RIGHT OF WILL BE REMOVED AT THE TIME OF CLEARING AND GRUBBING

DATE		REVISIONS		DESCRIPTION		AECOM		MIAMI-DADE COUNTY		LUDLAM TRAIL CORRIDOR P&E STUDY		LUDLAM TRAIL TYPICAL SECTIONS		SHEET NO.	
						110 EAST BROWARD BOULEVARD, SUITE 700 FORT LAUDERDALE, FL 33301						P&R CONTRACT NO. 275 NW 2nd Street Miami, FL 33128 305-755-7800			
												P&R PROJECT NO. 4350215-001-14470619			

**LUDLAM TRAIL
BICYCLE AND PEDESTRIAN PATH
(DEVELOPMENT ZONES)**






**** FOR PAVEMENT MARKING LOCATION DETAIL, SEE TYPICAL SECTION DETAILS (SHEET 7)**

TYPICAL SECTION 3

TRAIL DESIGN SPEED	
18 MPH	FOR LONGITUDINAL GRADES \leq 4%
30 MPH	FOR DOWNHILL LONGITUDINAL GRADES $>$ 4%

DRAINAGE LEGEND
<i>b: Swale Bottom Width</i> <i>Swale depth and width is to be determined in design.</i>

EARTHWORK LEGEND

	CUT
	RELOCATED FILL
	CLEAN FILL

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(PER PRELIMINARY REPORT OF SUBSURFACE EXPLORATION & GEOTECHNICAL ENGINEERING EVALUATIONS, OCTOBER 2018, PREPARED BY: GEOSOL, INC.)
2. SHGWT BASED ON NORTH AMERICAN VERTICAL DATUM (NAVD) 1988.
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6. ANY EXISTING CHAIN LINK FENCE, ASPHALT PADS OR OTHER ITEMS/ENCROACHMENTS WITHIN THE TRAIL RIGHT OF WAY MUST BE REMOVED BY OTHERS, TO COINCIDE WITH THE TIME OF CLEARING AND GRUBBING FOR THIS PROJECT




	<div style="text-align: center;">AECOM 110 EAST BROWARD BOULEVARD, SUITE 700 FORT LAUDERDALE, FL 33301</div>	<div style="text-align: right;">MIAMI-DADE COUNTY</div>	LUDLAM TRAIL CORRIDOR PD&E STUDY	<div style="text-align: center;"><i>LUDLAM TRAIL</i> <i>TYPICAL SECTIONS</i></div>	SHEET NO.
DATE	REVISIONS DESCRIPTION		Miami-Dade County Hickman Building 275 NW 2nd Street Miami, FL 33128 Open Spaces 305-755-7800 (MDFR05)	P&E CONTRACT NO. P&E PROJECT NO. 43502-15-001-14470619	
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* FOR TRANSITIONS TO/FROM OTHER TYPICAL SECTIONS,
SEE TYPICAL SECTION DETAILS (SHEET 7)

** FOR PAVEMENT MARKING LOCATION DETAIL, SEE TYPICAL SECTION DETAILS (SHEET 7)

EARTHWORK LEGEND		DRAINAGE LEGEND	
	CUT		<i>b: Swale Bottom Width Swale depth and width is to be determined in design.</i>
	RELOCATED FILL		

DRAINAGE LEGEND
<i>b: Swale Bottom Width</i> <i>Swale depth and width is to be determined in design.</i>

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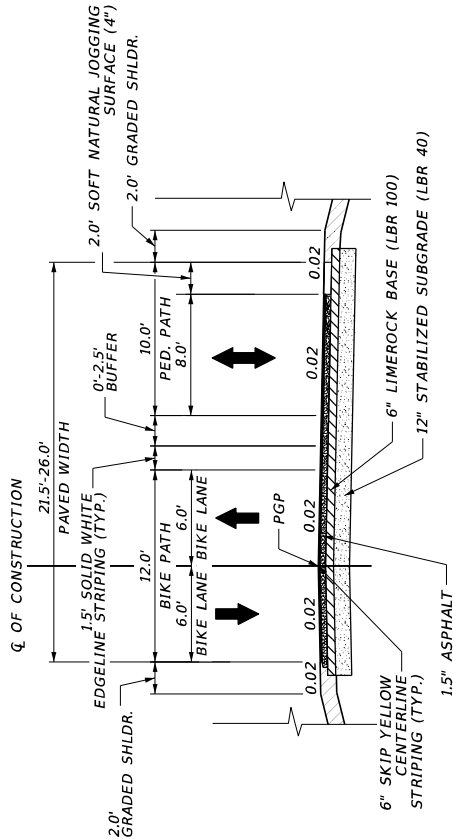
- (PER PRELIMINARY REPORT OF SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING EVALUATIONS, OCTOBER 2018, PREPARED BY: GEOSOL, INC.)
2. SHGWT BASED ON NORTH AMERICAN VERTICAL DATUM (NAVD83) 1988.
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<div>REVISIONS</div> <table><tr><th>DATE</th><th>DESCRIPTION</th></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr></table>		DATE	DESCRIPTION					<div><div><div><div>AECOM</div><div>110 EAST BROWARD BOULEVARD, SUITE 700</div><div>FORT LAUDERDALE, FL 33301</div></div><div><div>MIAMI-DADE</div><div>COUNTY</div></div></div></div>		<div>LUDLAM TRAIL CORRIDOR PD&E STUDY</div> <table><tr><td>Miami-Dade County P&E</td><td>Hickman Building 275 NW 2nd Street Miami, FL 33128</td><td>P&R CONTRACT NO. RFQ 7868</td></tr><tr><td>Open Spaces (MDPROS)</td><td>305-255-7800</td><td>P&R PROJECT NO. 4350215.001-1470619</td></tr></table>			Miami-Dade County P&E	Hickman Building 275 NW 2nd Street Miami, FL 33128	P&R CONTRACT NO. RFQ 7868	Open Spaces (MDPROS)	305-255-7800	P&R PROJECT NO. 4350215.001-1470619	<div>LUDLAM TRAIL TYPICAL SECTIONS</div>		SHEET NO.
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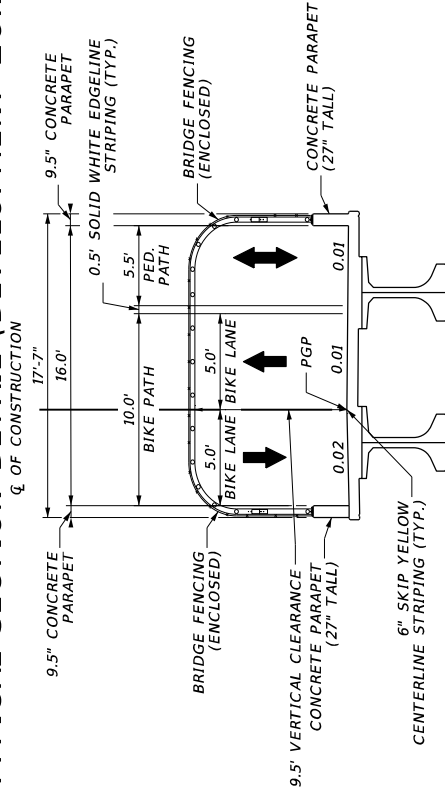
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LUDLAM TRAIL
BICYCLE AND PEDESTRIAN PATH
PAVED BUFFER TRANSITION DETAIL



LUDLAM TRAIL PEDESTRIAN BRIDGE
TYPICAL SECTION DETAIL (DEVELOPMENT ZONES)



REVISIONS

DESCRIPTION

DRAFT

AECOM
110 EAST BROWARD BOULEVARD, SUITE 700
FORT LAUDERDALE, FL 33301

MIAMI-DADE COUNTY

LUDLAM TRAIL CORRIDOR P&E STUDY
Miami-Dade County
Parks, Recreation, and
Open Spaces
(INDPROS)

Hickman Building
275 NW 2nd Street
Miami, FL 33128
305/555-7800
4350215-00014470619

P&E CONTRACT NO.
RPO 788B
RCS PROJECT NO.
4350215-00014470619

SHEET
NO.

LUDLAM TRAIL
TYPICAL SECTION DETAILS

LUDLAM TRAIL PEDESTRIAN BRIDGE
TYPICAL SECTION DETAIL

