Revised July 30, 2021 *Via: Electronic Mail*

City of Stuart Planning Department
121 SW Flagler Avenue
Stuart, FL 34994

Re: Costco Kanner PUD – Site Plan, Revisions for 2nd Commission Hearing Drainage and Utility Statements

To Whom it May Concern:

Please find below the proposed drainage and utility statements for the above reference PUD application. This information is reflect on the preliminary engineering plans and site plan (from Lucido and Associates) that is being submitted concurrently with this letter.

DRAINAGE STATEMENT:

THE PROPOSED PROJECT WILL CONSTRUCT A MASTER STORWATER MANAGEMENT SYSTEM CONSISTING OF A SERIES OF INTERCONNECTED WET DETENTION LAKES AND DRY DETENTION / RETENTION PONDS. THE SYSTEM WILL BE DESIGNED TO SATISFY THE APPLICABLE CRITERIA OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT (SFWMD), CITY OF STUART, FLORIDA DEPARTMENT OF TRANSPORTATION (FDOT), AND MARTIN COUNTY. THE PROJECT WILL PROVIDE THE REQUIRED 0.50" OF DRY PRE-TREATMENT FOR THE COMMERCIAL USE AREAS BY UTILIZING A MIX OF DRY DETENTION / RETENTION PONDS AND UNDERGROUND EXFILTRATION TRENCH. THE PROJECT WILL BE DESIGNED TO MEET THE ALLOWABLE DISCHARGE RATE FOR THE EXISTING DRAINAGE CONNECTIONS DOWNSTREAM TO THE KANNER HIGHWAY DRAINAGE SYSTEM. THIS INCLUDE CONSTRUCTING A DRAINAGE BYPASS SYSTEM TO PROVIDE CONVEYANCE OF OFF-SITE FLOWS THAT CURRENTLY DRAIN WEST THROUGH THE PROPERTY FROM THE SURROUNDING DRAINAGE BASIN AND WILLOUGHBY BLVD TO THE EAST. THE PROPOSED SYSTEM WILL ALSO MODIFY AN EXISTING FDOT LAKE ON-SITE THAT CURRENTLY SERVES KANNER HWY. THE EXPANDED LAKE WILL CONTINUE TO SERVE KANNER HWY IN ADDITION TO THE ON-SITE DEVELOPMENT. THE DEVELOPER SHALL FILE ALL REQUIRED PERMITS AND AGREEMENTS TO CONSTRUCT OR MODIFY THE PROPOSED INFRASTRUCTURE CURRENTLY SERVING OFF-SITE AREAS. THE PROJECT WILL REQUIRE A MODIFICATION TO EXISTING SFWMD ERP CONCEPTUAL PERMIT 43-103195-P THE APPLICANT WILL SUBMIT WATER QUALITY FINDINGS ON AN ANNUAL BASIS WITH THE FIRST DATA COLLECTION PERIOD COMMENCING UPON THE DATE THE CITY ISSUES THE CERTIFICATION OF OCCUPANCY FOR THE FIRST PHASE OF CONSTRUCTION. THE FIRST ANNUAL WATER QUALITY FINDINGS SHALL BE SUBMTTED (1) YEAR FROM THE CITY'S ISSUANCE OF THE CERTIFICATION OF OCCUPANCY FOR THE FIRST PHASE OF CONSTRUCTION AND ANNUALLY THEREAFTER FOR A TIME PERIOD ENDING NO EARLIER THAN (5) YEARS AFTER YEARS AFTER THE ISSUANCE OF THE FINAL CERTIFICATE OF OCCUPANCY. THE RESULTS OF ANY ANNUAL WATER QUALITY FINDINGS SHALL NOT CONSTITUTE ACKNOWLEDGEMENT BY THE DEVELOPER OR THE CITY THAT THE PROPOSED CITY IS DEFICIENT, OR CAUSING, AND/OR CONTRIBUTING

TO A WATER QUALITY VIOLATION. RATHER, THE ANNUAL WATER QUALITY DATA FINDINGS SHALL BE PROVIDED ONLY AS INFORMATIONAL PURPOSES TO THE CITY AS IT RELATES TO PERFORMANCE OF THE PROPOSED STORMWATER BEST MANAGEMENT PRACTICES.

UTILITY STATEMENT:

WATER, SEWER, AND FIRE PROTECTION SERVICE WILL BE PROVIDED BY THE CITY OF STUART UTILITIES DEPARTMENT VIA CONNECTIONS TO EXISTING MAINS LOCATED ON THE SOUTHERN AND EASTERN PROPERTY BOUNDARIES. THE PROPOSED PROJECT WILL CONSTRUCT ON-SITE UTILITY INFRASTRUCTURE THROUGHOUT THE PUD TO SERVE THE MULTIPLE USES WITHIN THE DEVELOPMENT. ALL UTILITY DESIGN AND CONSTRUCTION WILL BE IN CONFORMANCE WITH THE LATEST STANDARDS OF THE CITY OF STUART AND THE FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECITON (FDEP). THE ON-SITE UTILITY SYSTEM FOR WATER, SEWER, AND FIRE PROTECTION WILL BE PRIVATELY OWNED, OPERATED, AND MAINTAINED BY THE DEVELOPER OR A DESIGNATED PROPERTY OWNERS ASSOCIATION UPON PROPER LEGAL ESTABLISHMENT. THE PRIVATE ON-SITE UTILITY INFRASTURCTURE WILL CONSIST OF A GRAVITY SEWER SYSTEM, SEWER AND WATER SERVICES TO THE BUILDINGS, GREASE TRAPS (WHERE REQUIRED), A PRIVATE FIRE PROTECTION MAIN, AND THE ASSOCIATED APPURTENANCES. ALL POINTS OF SERVICE FOR WATER AND SEWER SHALL BE LOCATED WITHIN AN EXISTING RIGHT-OF-WAY OR CITY OF STUART UTILITY EASEMENT. THE ONLY PUBLIC UTILITY TO BE CONSTRUCTED ON-SITE SHALL BE A NEW CITY OF STUART WASTEWATER LIFT STATION. THE LIFT STATION WILL BE DESIGNED TO SERVE THE ENTIRE PUD AND SHALL BE CONSTRUCTED ADJACENT TO THE KANNER HIGHWAY RIGHT-OF-WAY AS SHOWN ON THE SITE PLAN. THE DEVLEOPER SHALL EXTEND AN EXISTING CITY OF STUART WATER MAIN ACROSS THE PROPERTY FRONTAGE ON KANNER HIGHWAY. THE PROPOSED GRAVITY SEWER WILL COLLECT WASTEWATER FROM THE VARIOUS USES AND CONVEY IT TO THE PROPOSED CITY OF STUART LIFT STATION. THE LIFT STATION WILL DISCHARGE TO AN EXISTING CITY OF STUART FORCE MAIN LOCATED AT THE SOUTHERN PROPERTY BOUNDARY.

A PRIVATE FIRE PROTECTION MAIN SHALL BE CONSTRUCTED THROUGH THE PUD WITH CONNECTIONS TO BUILDINGS SPRINKLER SYSTEMS, HYDRANTS, AND FIRE DEPARTMENT CONNECTIONS (FDC'S). THE DEVELOPER SHALL FILE ALL REQUIRED PERMITS AND AGREEMENTS PRIOR TO CONSTRUCTING OR MODIFYING ANY PORTION OF UTILITY INFRASTRUCTURE ASSOCIATED WITH THE APPROVED SITE PLAN. THE DEVELOPMENT WILL RECIEVE ELECTRICAL AND COMMUNICATION SERVICE FROM LOCAL PROVIDER SYSTEMS THAT EXIST ON KANNER HIGHWAY AND WILLOUGHBY BOULEVARD. PRIOR TO CONSTRUCTION COMPLETION THE DEVELOPER SHALL PROVIDE EASEMENTS FOR ON-SITE PRIVATE ELECTRICAL AND COMMUNICATION UTILITIES WHERE REQUIRED.

We feel the above statement accurately reflects the intent of the proposed development design as presented on the PUD site plan.

Respectfully,
ENGINEERING DESIGN & CONSTRUCTION, INC.

David C. Baggett, P.E.
Professional Engineer

Cc: Doug Fitzwater – Lucido and Associates

Z:\EDC-2020\20-313 - Costco Stuart - Kanner Highway\ENGINEERING\Documents\Submittal Documents\Comment Response Letter\2021-07-30_CoS_2nd_Hearing_Submittal\2021-07-30_Revised_Drainage_and_Utility_Statement_Letter.docx

Revised June 16, 2021 *Via: Electronic Mail*

City of Stuart Planning Department
121 SW Flagler Avenue
Stuart, FL 34994

Re: Costco – Kanner PUD
City of Stuart LDC 5.05.02(i) Tree Replacement – Innovative Stormwater Treatment

To Whom it May Concern:

Please find below and enclosed an analysis for the above referenced PUD in accordance with City of Stuart Land Development Code (LDC). The applicant seeks approval of the proposed tree replacement fund credit based on the PUD's stormwater management system removal efficiency of nitrogen and phosphorus per Section 5.05.02(i).

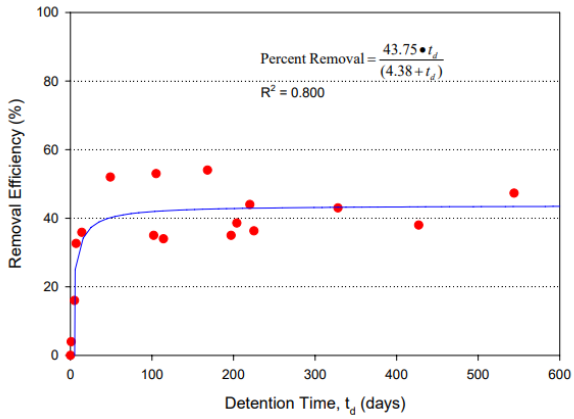
Tree Replacement Credit Criteria:
Per Land Development Code Section 5.05.02, innovative stormwater treatment design which is demonstrated to exceed water quality treatment above that required in section 6.03.00 and South Florida Water Management District best management practice and reduces post-development stormwater pollutant loading of total nitrates and phosphates by 81 or more percent may be substituted for a proportion of the tree replacement fund payment in accordance with table 2 (below) and as approved by the city development director.

Table 2: Credit for Providing Additional Nitrate and Phosphate Removal

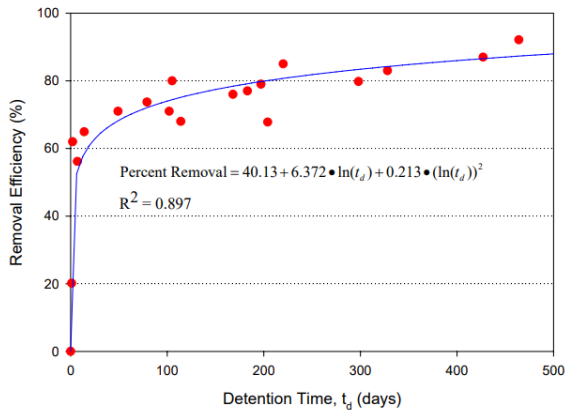
Percentage of Nitrate and Phosphate Loading Reduction from Stormwater	Maximum Pollutant Removal Factor for Construction Value of Additional Stormwater Treatment [a]
81% to 85%	1.25
86% to 89%	1.5
90%+	2.0

Stormwater Management System Design:
The proposed PUD will convert the existing property from a ruderal upland pine and wet flatwood land coverage to a mixed-use development. The most practical type of stormwater system to serve a development of this size is a wet detention lake system. Lakes provide the required treatment and attenuation per regulations set forth by the City of Stuart, SFWMD, and FDOT while also providing the developer a cost-efficient means of generating fill for their project.

Per the LDC, the City's minimum removal efficiency to qualify for tree replacement credit is 81% for both nitrogen and phosphorus. While wet detention lakes can achieve upwards of almost 90% removal of phosphorus, the maximum removal efficiency of nitrogen is approximately 45% (Evaluation of Current Stormwater Design Criteria within the State of Florida, Harper, 2007).



Nitrogen Removal Efficiency



Phosphorus Removal Efficiency

As such, the developer is proposing to integrate innovative stormwater treatment into the drainage system. In addition to the wet detention lakes the system will incorporate native planted dry retention ponds, a bio-detention shelf, littoral plantings, pervious pavement and pavers, and a nutrient upflow filtration box. These measures will allow for a higher removal efficiency of both nitrogen and phosphorus. The wet detention permanent pool volumes are based on an anoxic depth of 12' below control (not to the maximum excavation depth possible). Dry retention volumes will be provided for in the proposed native planted ponds and underground exfiltration trench. The additional littoral zone and bio-detention plantings are aquatic plant-based BMPs that remove nutrients through a variety of processes related to nutrient uptake, transformation, and microbial activities. The nutrient upflow filtration will be provided by a proprietary system approved for use in Florida known a Nutrient Removal Filtration System ("NRFS") by Oldcastle Infrastructure. The NRFS will be installed downstream of the wet detention lake in basin DA A-3. The systems removes nutrients by directing stormwater underneath a bed of Bold & Gold biosorption filter media where it then flows upward. The Bold & Gold media creates sorbent surface bonds to establish a media nutrient cycle that actively captures and consumes nutrients, while promoting denitrification. High levels of phosphorus and nitrogen can compromise ecosystem integrity and human health. Bold & Gold media is an ideal media for pretreatment prior to rainwater harvesting or post treatment following detention prior to discharge into receiving waters. The Bold & Gold media must be replaced at a minimum of 5 year increments (or as needed) to promote efficiency removal of phosphorus.

Below is the removal efficiency of Total Nitrogen and Phosphorus in the proposed stormwater management system. Please see the enclosed BMP Trains exhibits for more detailed calculations of the nutrient removal efficiency of the proposed stormwater management system. Calculations are based on preliminary engineering of the stormwater management system. The final removal efficiencies will be determined at time of final construction level plan approval.

Provided Total Nitrogen Removal = 81%
Provided Total Phosphorus Removal = 89%

Innovative Stormwater Cost Estimate:

The following is a breakdown of estimated costs associated with the proposed innovative stormwater best management practices (BMP's). Costs a based on latest estimated values per FDOT Historical Cost indices, Martin County Estimates of Probable Cost, quotes from manufacturers (for NRFS), and compiled estimate data by the design team professional engineering and landscape consultants.

Oldcastle Infrastructure Nutrient Removal Filtration System (NRFS):
NRFS Materials (including Bold & Gold Media) = $130,000
NRFS Installation Cost = $50,000
*Bold & Gold Media Replacement ($13,800/replacement, replaced on 5yr inc for 25yr) = $69,000
Total Credited Cost of NRFS = $249,000

Pervious Pavement and Pavers
Pervious Concrete (@ Costco Parking Lot): 10,092 SF = 1,121 SY x $60/SY = $67,260
Pervious Pavers (@ Roundabout): 7,600 SF = 844 SY x $53/SY = $44,732
Pervious pavement surfaces to be constructed in place of typical asphalt paving section. As such the offset cost of typical asphalt is:
1,121 SY + 844 SY = 1,965 SY x $20/SY = $39,300
Net Increase in Paving Cost: $67,260 + $44,732 - $39,300 = $72,692

Wet Detention Lake Littoral and Bio-Detention Plantings
Lump Sum Cost Estimate per Landscape Architect = $32,280

Total Cost of Innovative Stormwater BMP's = $353,972

Tree Replacement Credit Calculation:

Now that total cost of the innovative stormwater BMP's have been determined the applicable credits per LDR Sec 5.05.02 shall be applied. To account for varying treatment efficiencies in the proposed system the tree replacement credit calculations will assume an equal proportionate cost associated with the removal nitrogen and phosphorus. This proportionate share is 50/50 as follows:

Proportionate Cost of Innovative BMPs for Nitrogen Removal = $353,972 / 2 = $176,986
Proportionate Cost of Innovative BMPs for Phosphorus Removal = $353,972 / 2 = $176,986

Based on the calculated removal efficiency or the proposed system the following credit applies:
Provided Total Nitrogen Removal = 81% = 1.25 Credit per LDR 5.05.02
Provided Total Phosphorus Removal = 89% = 1.5 Credit per LDR 5.05.02

Credit for 81% Nitrogen Removal = $176,986 x 1.25 = $221,232.50
Credit for 90% Phosphorus Removal = $176,986 x 1.5 = $265,479.00
Total Credit for Tree Mitigation = $486,711.50

We feel this analysis and the enclosed calculations provide sufficient support for the above tree removal credit to offset a portion of the overall required tree replacement fund. Should you have any questions or comments do not hesitate to contact our office.

Respectfully,
ENGINEERING DESIGN & CONSTRUCTION, INC.

David C. Baggett, P.E.
Professional Engineer

Cc: Doug Fitzwater – Lucido and Associates

Enclosed: BMP Trains Net Improvement Calculations & Exhibits

Z:\EDC-2020\20-313 - Costco Stuart - Kanner Highway\ENGINEERING\Documents\Submittal Documents\Applications\2021-06-XX_CoS_Commission_Resubmittal\2021-03-12_Revised_Tree_Mitigation_Stormwater_Letter.docx

GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	6/17/2021	Blue Numbers = Input data Red Numbers = Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT: Kanner CPUD

HELP Rainfall

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

Meteorological Zone (Please use zone map):	CLICK ON CELL BELOW TO SELECT Zone 5	
Mean Annual Rainfall (Please use rainfall map):	57.00	Inches
Type of analysis:	CLICK ON CELL BELOW TO SELECT Specified removal efficiency	
Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**):	81 / 81	%

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

Model documentation and example problems.

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION

6/17/2021

CLICK ON CELL BELOW TO SELECT CONFIGURATION

J - Mixed-4 Catchment-3 Series-Parallel

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING | MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: POST DA A-2

Delay [hrs]

max delay = 15 hrs.

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Undeveloped - Ruderal/Upland Pine: TN=1.694 TP=0.162
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Multi-Family: TN=2.320 TP=0.520

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:	11.910	AC
Total post-development catchment or for BMP analysis:	11.910	AC
Pre-development Non DCIA CN:	77.00	
Pre-development DCIA percentage:	0.00	%
Post-development Non DCIA CN:	92.00	
Post-development DCIA percentage:	65.74	%
Estimated BMP Area (No loading from this area)	2.720	AC

Average annual pre runoff volume:	7.626	ac-ft/year
Average annual post runoff volume (note no BMP area):	28.460	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	15.932	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.524	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	81.430	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	18.251	kg/year

CATCHMENT NO.2 NAME: POST DA A-3

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Undeveloped - Wet Flatwoods: TN=1.213 TP=0.021
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT High-Intensity Commercial: TN=2.40 TP=0.345

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:	27.130	AC
Total post-development catchment or BMP analysis area:	27.130	AC
Pre-development Non DCIA CN:	77.00	
Pre-development DCIA percentage:	0.00	%
Post-development Non DCIA CN:	95.00	
Post-development DCIA percentage:	81.55	%
Estimated BMP Area (No loading from this area)	2.860	AC

Average annual pre runoff volume:	17.371	ac-ft/year
Average annual post runoff volume (note no BMP area):	85.491	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	25.987	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	0.450	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	253.039	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	36.374	kg/year

CATCHMENT NO.3 NAME: Post DA B-NWW-4A

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Highway: TN=1.520 TP=0.200
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Highway: TN=1.520 TP=0.200

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:	9.386	AC
Total post-development catchment or BMP analysis area:	9.386	AC
Pre-development Non DCIA CN:	92.00	
Pre-development DCIA percentage:	68.08	%
Post-development Non DCIA CN:	93.00	
Post-development DCIA percentage:	71.75	%
Estimated BMP Area (no loading from this area)	0.000	AC

Average annual pre runoff volume:	29.543	ac-ft/year
Average annual post runoff volume (note no BMP area):	30.674	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	55.380	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	7.287	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	57.501	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	7.566	kg/year

CATCHMENT NO.4 NAME: POST DA A-1

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Undeveloped - Ruderal/Upland Pine: TN=1.694 TP=0.162
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Multi-Family: TN=2.320 TP=0.520

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:	9.950	AC
Total post-development catchment or BMP analysis area:	9.950	AC
Pre-development Non DCIA CN:	77.00	
Pre-development DCIA percentage:	0.00	%
Post-development Non DCIA CN:	92.00	
Post-development DCIA percentage:	65.74	%
Estimated BMP Area (no loading from this area)	2.250	AC

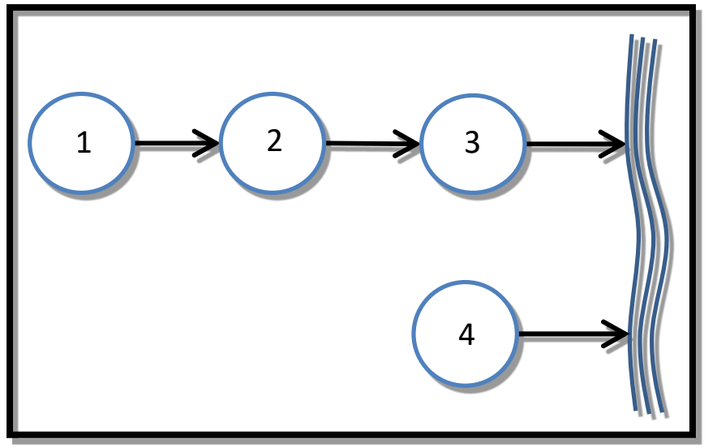
Average annual pre runoff volume:	6.371	ac-ft/year
Average annual post runoff volume (note no BMP area):	23.846	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	13.310	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.273	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	68.227	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	15.292	kg/year

STORMWATER TREATMENT ANALYSIS:	V 8.6	GO TO GENERAL SITE INFORMATION PAGE	Blue Numbers =	Input data
			Red Numbers =	Calculated

If not done, specify pre- and post-development watershed characteristics.

6/17/2021

GO TO WATERSHED CHARACTERISTICS



Total Required Treatment Efficiency:

Required Treatment Eff (**Nitrogen**):	81	%
Required Treatment Eff (**Phosphorus**):	81	%

Select one of the BMPs below to analyze efficiency or review the summary data.

RETENTION BASIN	WET DETENTION / MAP	EXFILTRATION TRENCH	RAIN GARDEN / depression storage	SWALE	USER DEFINED BMP
PERVIOUS PAVEMENT	STORMWATER HARVESTING	FILTRATION	View Media Mixes	NOTE !!!: All individual system must be sized prior to being analyzed in conjunction with other systems. Please read instructions in the CATCHMENT AND TREATMENT SUMMARY RESULTS tab for more information.	
GREENROOF	RAINWATER HARVESTING	LINED REUSE POND & UNDERDRAIN INPUT	GO TO COST ANALYSIS WORKSHEET		
VEGETATED NATURAL BUFFER	VEGETATED FILTER STRIP	TREE WELL	CATCHMENT AND TREATMENT SURFACE		

WET DETENTION / MANAGED AQUATIC PLANTS: 6/17/2021 V 8.6

Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: **Kanner CPUD**

GO TO STORMWATER TREATMENT ANALYSIS

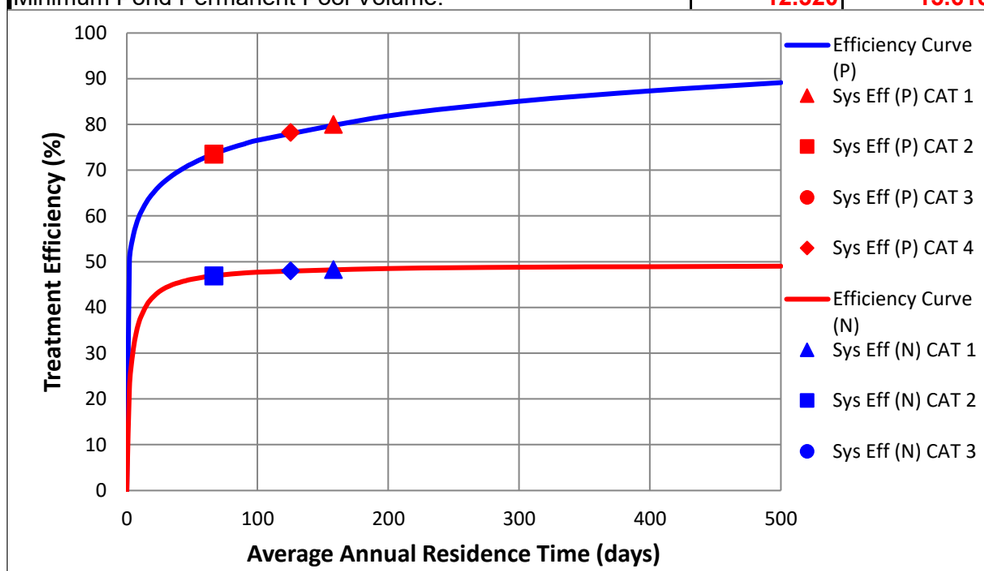
	POST DA A-2	POST DA A-3st	DA B-NWW	POST DA A-1	
Total pre-development catchment area:	11.910	27.130	9.386	9.950	ac
Total post-development catchment area:	9.190	24.270	9.386	7.700	ac
Average annual residence time (between 1 and 500 days)	158.00	66.65		125.21	days
Littoral Zone or other improvements used?*	YES	YES		YES	
Littoral Zone or other improvement efficiency credit:	10.00	10.00		10.00	%
Floating Wetland or Mats used in the design:	NO	NO		NO	
Floating Wetland or Mats credit:	0.00	0.00		0.00	%
Total **Nitrogen** removal required:	81.000	81.000	81.000	81.000	%
Total **Phosphorus** removal required:	81.000	81.000	81.000	81.000	%
Total **Nitrogen** removal efficiency:	48.313	46.947	0.000	48.044	%
Total **Phosphorous** removal efficiency:	80.063	73.580	0.000	78.288	%
Is the wet detention sufficient:	NO	NO		NO	
Average annual runoff volume:	28.460	85.491	30.674	23.846	ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

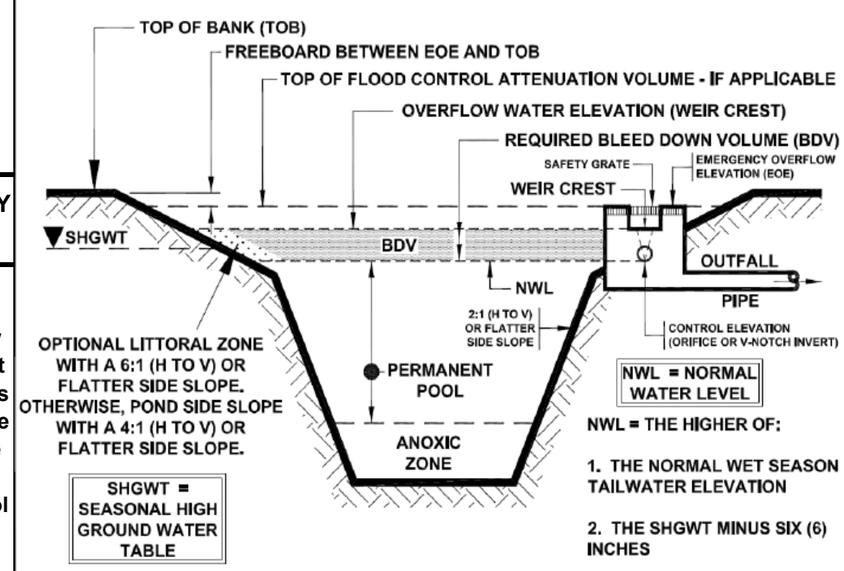
Minimum Pond Permanent Pool Volume:	12.320	15.610		8.180	ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

RETENTION BASIN: 6/17/2021 V 8.6

Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

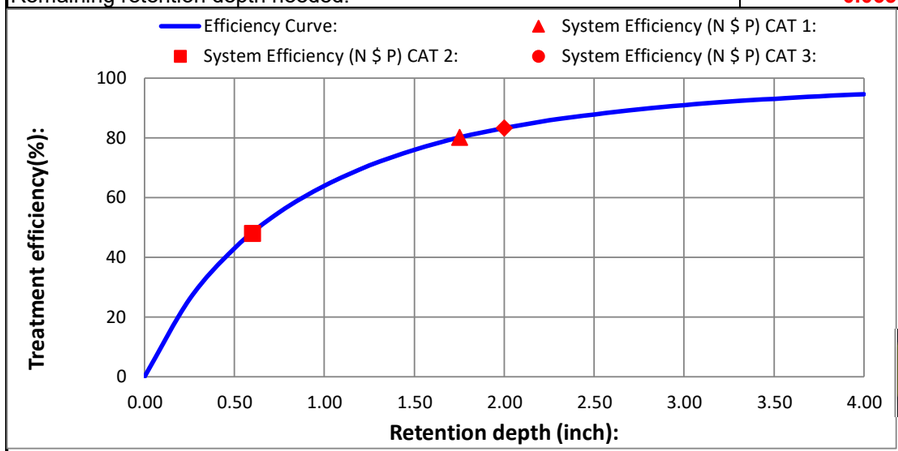
GO TO STORMWATER TREATMENT ANALYSIS

RETENTION BASIN SERVING: Kanner CPUD

Loadings from BMP area are contained by the BMP, thus no BMP area load.	POST DA A-2	POST DA A-3	ost DA B-NWW-4	POST DA A-1	
Watershed area cotributing to basin:	9.190	24.270	9.386	7.700	ac
Required Treatment Eff (**Nitrogen**):	81.000	81.000	81.000	81.000	%
Required Treatment Eff (**Phosphorus**):	81.000	81.000	81.000	81.000	%
Required retention depth over the watershed to meet required efficiency:	1.815	1.815	1.815	1.815	in
Required water quality retention volume:	1.390	3.672	1.420	1.165	ac-ft

RETENTION BASIN FOR MULTIPLE TREATMENT SYSTEMS (if there is a need for additional removal efficiencies in a series of BMPs):

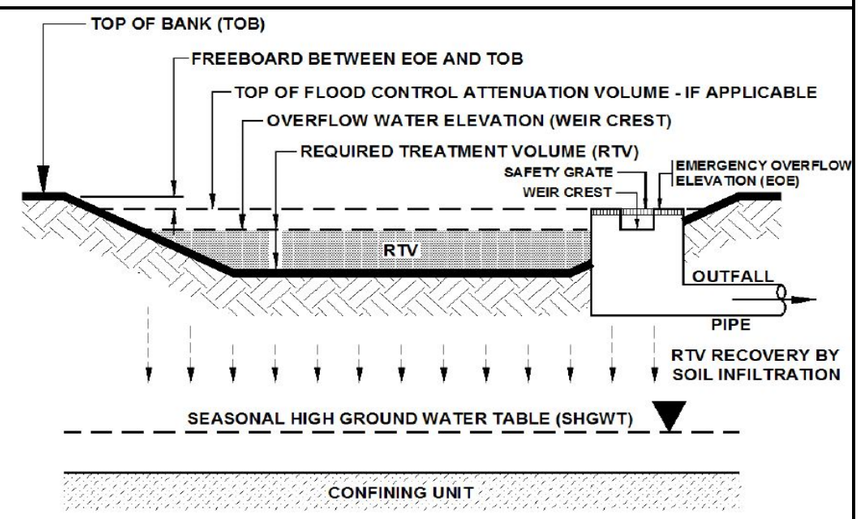
Retention volume based on retention depth and Total area - BMP area	1.340	1.214	0.000	1.283	ac-ft
Provided retention depth (0.1-3.99 inches over the watershed)	1.750	0.600		2.000	in
Provided treatment efficiency (**Nitrogen**):	80.178	48.022	0.000	83.323	%
Provided treatment efficiency (**Phosphorus**):	80.178	48.022	0.000	83.323	%
Remaining treatment efficiency (**Nitrogen**):	4.148	63.446	81.000	0.000	%
Remaining treatment efficiency (**Phosphorus**):	4.148	63.446	81.000	0.000	%
Remaining retention depth needed:	0.065	1.215	1.815	0.000	in



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of this graph is to help illustrate the treatment efficiency of the retention system as the function of retention depth **for a single BMP and in a single catchment**. The graph illustrates that there is a diminished return as the retention depth is increased. Thus evaluations of other alternatives in "treatment trains" and compensatory treatment should be considered. **NOTE:** the retention volume can not exceed 3.99 inches to be within the range of data used to determine effectiveness.

HELP - EXAMPLE PROBLEM 3



TYPICAL CROSS SECTION OF A "DRY" RETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010.

View Media Mixes

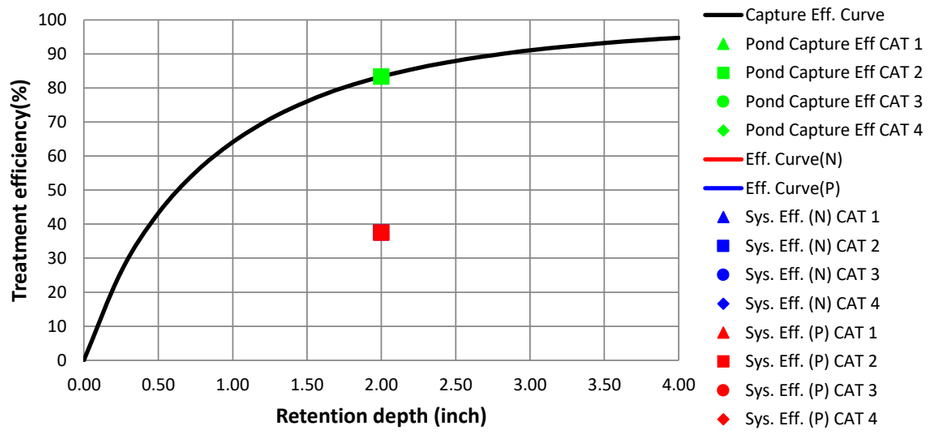
Estimate of groundwater impacts	Catchment 1	Catchment 2	Catchment 3	Catchment 4
Use only down flow media mix before water enters the ground, specify type				
Nitrogen mass reduction in groundwater discharge (%)				
Phosphorus mass reduction in groundwater discharge (%)				

FILTRATION (Underdrained Dry Basin or Upflow Filter after Wet Detention) 6/17/2021 V 8.6

FILTRATION SERVING EITHER WET POND OR DRY POND: Kanner CPUD

Notes: No loadings from this BMP area and media must match location.	POST DA A-2	POST DA A-3	st DA B-NWW-	POST DA A-1	
Contributing catchment area:	9.190	24.270	9.386	7.700	ac
Treatment depth (0.0-4.0 inches):		2.00			in
Treatment volume provided for treatment depth:	0.000	4.045	0.000	0.000	ac-ft
Provided water capture efficiency:	0.000	83.323	0.000	0.000	%
Required treatment efficiency (**Nitrogen**):		81.000			%
Required treatment efficiency (**Phosphorus**):		81.000			%
Type of media mixes: View Media Mixes		B&G ECT3			
Provided treatment efficiency (**Nitrogen**):		37.495			%
Provided treatment efficiency (**Phosphorus**):		37.495			%
Is this effluent filtration for a wet detention pond?		Yes			

ERROR MESSAGE WINDOW FOR FILTRATION INCLUDING BIOFILTRATION:



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of this graph is to help illustrate the treatment efficiency of the system as the function of retention depth. The graph illustrates that there is a point of diminished return as the retention depth is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.

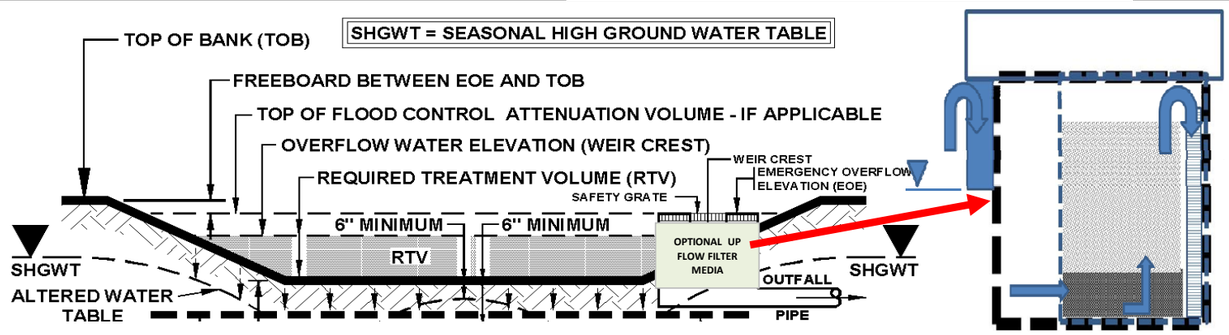
Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

GO TO STORMWATER TREATMENT ANALYSIS

FOR UNDERDRAINS GO TO LATTERAL SPACING CALCULATOR

REQUIRED REMAINING TREATMENT EFFICIENCIES.

	POST DA A-2	POST DA A-3	st DA B-NWW	POST DA A-1	
Remaining treatment efficiency needed (**Nitrogen**):		43.505			%
Remaining treatment efficiency needed (**Phosphorus**):		43.505			%



The use of a Biosorption Activated Media may be required.

Source of Graphic: Stormwater Management Academy, University of Central Florida

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

CALCULATION METHODS:

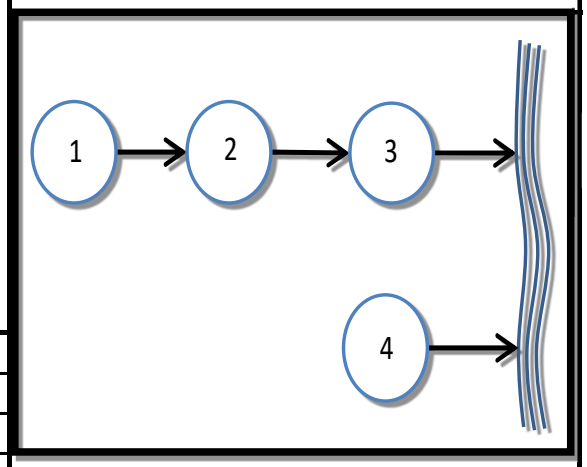
1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	Kanner CPUD	Optional Identification	Kanner CPUD	
	POST DA A-2	POST DA A-3	Post DA B-NWW-4A	POST DA A-1
BMP Name	Retention Basin	Retention Basin		Retention Basin
BMP Name	Wet Detention/ MAPs	Filtration		Wet Detention/ MAPs
BMP Name		Wet Detention/ MAPs		

REVIEW, ONE OR MORE CATCHMENT HAS BEEN SPECIFIED WITHOUT A BMP

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	J - Mixed-4 Catchment-3 Series-Parallel	Treatment Objectives or Target for TN MET TP MET	6/17/2021 BMPTRAINS MODEL
Nitrogen Pre Load (kg/yr)	110.61		
Phosphorus Pre Load (kg/yr)	10.53		
Nitrogen Post Load (kg/yr)	460.20		
Phosphorus Post Load (kg/yr)	77.48		
Target Load Reduction (N) %	81		
Target Load Reduction (P) %	81		
Target Discharge Load, N (kg/yr)	87.44		
Target Discharge Load, P (kg/yr)	14.72		
Provided Overall Efficiency, N (%):	81		
Provided Overall Efficiency, P (%):	89		
Discharged Load, N (kg/yr & lb/yr):	89.60	197.35	
Discharged Load, P (kg/yr & lb/yr):	8.37	18.44	
Load Removed, N (kg/yr & lb/yr):	370.60	816.28	
Load Removed, P (kg/yr & lb/yr):	69.11	152.23	



Oldcastle Infrastructure™
A CRH COMPANY

BOLD & GOLD®

Biosorption Activated Media (BAM)

Bold & Gold® Removal Efficiencies up to:

- **75% Nitrogen**
- **95% Phosphorous**
- **95% TSS**

**Varies based on sizing & site conditions*

Bold & Gold is a Biosorption Activated Media (BAM) used for pollution control to reduce nitrogen and phosphorus levels in stormwater. Bold and Gold creates sorbent surface bonds to establish a media nutrient cycle that actively captures and consumes nutrients, while promoting denitrification. High levels of phosphorus and nitrogen can compromise ecosystem integrity and human health. Bold & Gold Media is an ideal media for pre-treatment prior to rainwater harvesting or post treatment following detention prior to discharge into receiving waters.

Benefits:

- High Surface Area
- Biological Activity: Denitrification and Nutrient Consumption
- No Biological Toxic Effects
- Sustainable: Long Life Media Made from Recycled Material
- Economical (Lower Cost Media)
- Available in Various Blends
- Removes TN, TP, TSS and Metals
- Physical Filtration of Solids
- Sorbent Surface Bonding for Capture of Dissolved Pollutants

LEED Credit Eligible:

4.1;4.2 Materials & Resources Recycled Content

6.2 Stormwater Design / Quality Control

Suntree Technologies Inc.

Oldcastle Infrastructure™
A CRH COMPANY

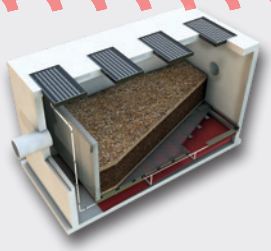
BIORETENTION / BIOFILTRATION

ADVANCED BIOSORPTION FILTRATION

Bold & Gold Combined Stormwater Treatment Technologies

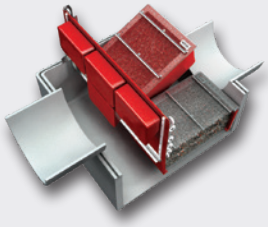
Nutrimax™

The only engineered wetland built to maximize the power of Bold & Gold Media for superior nutrient reduction. Nutrimax does not require a prefilter and averts typical clogging failures associated with other biofilters. The incorporation of Hydro-Variant Technology® allows for extensive treatment of lower flows, without compromising watershed hydrology during peak flows, affording an ideal solution for space restricted areas.



NRFS®

The NRFS uses an orifice flow control to maximize contact time with Bold & Gold media to remove nutrients and TSS prior to discharge. The optional addition of a SkimBoss MAX allows the NRFS to bolster detention time and removal potential through Hydro-Variant Technology. The NRFS is ideal for pretreatment of rainwater prior to harvesting, LID, water quality improvement or post treatment following detention.



SkimBoss® UpFlow Filter

Designed for online installation, as an option to the NSBB™, to boost nutrient and TSS removal without the associated headloss. Combining Bold & Gold media with Hydro-Variant Technology resists clogging and automatically adjusts to rising water levels during peak flows without compromising watershed hydrology.

Modeling available in BMPTRAINS Bold & Gold Media for an unbeatable treatment train!

Use Bold & Gold in BMPs for nitrogen and phosphorus reduction credits:

- ERP (Environmental Resource Permit)
- TMDL (Total Maximum Daily Load)
- MS4 (Municipal Separate Storm Sewer System)
- BMAP (Basin Management Action Plans)
- Net Improvement

Suntree Technologies Inc.

Water
www.oldcastleinfrastructure.com
800-579-8819

Pervious Concrete

When it Rains, it Drains.

Naturally...

Reduces Runoff

Cleans Stormwater

Replenishes Aquifers

Conserves Water

Protects Streams

ADA Friendly

Pervious Concrete: The Natural Choice

It's tough to balance the demand for development with the need to preserve our natural resources. However, this balance becomes easy to achieve when you construct parking lots using pervious concrete.

Pervious concrete is a mix of coarse aggregate, cement, water, and little to no sand. Also known as "no-fines" or porous concrete, this mixture creates an open-cell structure, allowing rainwater to filter through to underlying soil. By modeling natural ground cover, pervious concrete is an excellent choice for stormwater management.

Pervious Concrete: The Environmentally Sound Choice

According to the United States Environmental Protection Agency (EPA), stormwater runoff can send as much as 90% of the pollutants—such as oil and other hydrocarbon liquids found on the surface of traditional parking lots—directly into our rivers and streams. The EPA now requires state and local governments to implement measures to reduce and improve the overall quality of stormwater runoff in an effort to address this important pollution problem. Pervious concrete has been recognized by the EPA as a best management practice (BMP) to address this most vital environmental concern. The open-cell structure of pervious concrete provides a medium for aerobic bacteria that break down many of the pollutants that seep from parked cars.

Pervious concrete also contributes to enhanced air quality by lowering atmospheric heating through lighter color and lower density, decreasing the impact of heat island effects. The heat island effect occurs when tree-covered areas are replaced with dark pavement surfaces, and is characterized by up to a 12-degree average temperature increase between an urban area and its surrounding countryside. This heat island effect increases ground level ozone production by as much as 30%.

Concrete surfaces, both pervious and conventional, have a much higher albedo—a measure of reflectance—than competitive paving materials. Specifications requiring a minimum surface albedo are becoming increasingly popular. The inherently light color of concrete naturally reflects heat and light. Studies have shown as much as a 30% savings in lighting costs over other pavement types due to concrete pavement's reflectivity.

Pervious Concrete: The Smart Business Choice

Using pervious concrete pavement in your parking lot can reduce the need for large detention ponds because the pavement acts as a detention area. Lot owners will spend fewer dollars on labor, construction and maintenance of detention ponds, skimmers, pumps, drainage pipes, and other stormwater management systems. Expensive irrigation systems can also be downsized or eliminated.

A pervious concrete parking lot will help reduce demands upon sewer systems. Today, many government agencies are now implementing stormwater impact fees for all impervious areas. Pervious concrete can reduce these fees for the property owner.

Developers are using pervious concrete for parking lots to increase utilization of commercial properties. The land ordinarily devoted to costly stormwater management practices or compliance with maximum impervious area ordinances can now be developed or preserved, enhancing the bottom line.

Pervious concrete is a durable material—parking areas properly designed and constructed will last 20-40 years with little or no maintenance. Thus concrete, conventional or pervious, is widely recognized as the lowest life cycle cost option available for paving.

Benefits of Pervious Concrete

Reduces stormwater runoff

Eliminates need for detention ponds and other costly stormwater management practices

Replenishes water tables and aquifers

Allows for more efficient land development

Minimizes flash flooding and standing water

Prevents warm and polluted water from entering our streams

Mitigates surface pollutants

The best application for pervious concrete is parking lots.

When it Rains, it Drains.

Stormwater runoff occurs when rain falls. This runoff causes increased pollution in rivers and streams, flash floods, and loss of rainwater that could otherwise replenish water tables and aquifers. Pervious concrete has a 15-25% void structure and allows 3–8 gallons of water per minute to pass through each square foot—accounting for far more than is generated during most rain events. Pervious concrete puts rainwater back in the ground where it belongs.

Pervious Concrete
Frequently Asked Questions

Q: What about drainage issues in soils with high clay content?

A: Typically if a soil type has sufficient percolation to support a septic tank system it will be allowable for pervious concrete. If a soil is truly impervious, the pervious concrete system will still be useful for detention pond requirements. Soil percolation rates are most important if you must meet stormwater quality requirements. A typical parking lot design may have 5″–8″ of pervious pavement on top of a 6″–12″ sub-base of #57 stone (40% voids) on a geotextile fabric. In sandy areas pervious is placed directly above the sand.

Q: What about freeze-thaw issues?

A: Pervious concrete has been in place as far north as Raleigh, N.C., for over 12 years with no freeze thaw problems. Only a few installations exist in extreme wet freeze-thaw regions. There are many studies underway. Visit our Web site to find current information about this topic.

Q: What about clogging?

A: Clogging problems are mainly an issue of design. If a natural area with grass or exposed soil is allowed to drain stormwater across a pervious concrete pavement, fine material can be introduced into the system causing localized clogging. Vegetative matter can collect on the surface of the pervious concrete causing some clogging, but routine sweeping or vacuuming will restore porosity. Studies have been conducted that indicate pressure washing will restore most of the porosity of clogged pervious concrete to nearly new conditions.

Q: What other uses are there for pervious concrete?

A: Pervious concrete has been successfully used for low volume streets, driveways, sidewalks, golf cart paths, retaining walls, and French drains. Pervious concrete can be utilized in a variety of paving applications to provide hardscape without altering hydrology of the land.

For more information and contacts on pervious concrete go to:

www.pervious.info

Concrete Thinking for a sustainable world

Southeast Cement Association

www.secement.org

Benefits of Littoral Plants

The littoral zone of a pond or lake is the shallow, transitional area between dry land and open water. With the low depth of water, as well as plenty of light and nutrients, this zone provides the ideal conditions for plants and animals to thrive. As an essential part of the aquatic ecosystem, littoral plants can even provide added benefits to pond and lake managers.

When it comes to adding pond plants, you should always remember that there is a lot more than meets the eye. Knowing what benefits to expect from littoral zone plants and how to find the right choice for your needs can often be overwhelming. To help you get started, here's a look at everything you need to know about littoral zone planting.

Blog Posts

- Nutrient Pollution and Digestive Bacteria
- Importance of Carp Containment Barriers
- Benefits of Littoral Plants
- Solutions for Aquatic Midges
- Are Grass Carp Right For My Pond?
- Pond Aeration 101

4 Benefits to Littoral Zone Planting

- **Aesthetics**

  Aquatic plants in the littoral zone are lush and healthful, providing an enhanced appearance to any pond or lake. To achieve a beautiful look, common options often

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and enhanced depth and color. Typically, plants will offer significant visual impact when planted in clusters throughout the body of water. They should be [illegible] carefully to ensure there is no unintended spread of invasive plant species within the planting.

- **Reduced Erosion**

  Planting flora in a pond's littoral zone can also help control and prevent erosion. Plants closer to the shore typically referred to as emergent plants (those with root systems in submerged soils but which extend above the water) and shoreline plants (those with root systems along the shoreline), are often the best at providing erosion control. With their large root structures, they are able to reduce waves and stabilize the soil, effectively preventing erosion.

- **Increased Wildlife Habitat**

  Plants often provide ideal and attractive habitats for birds and other animals, often bringing the pond to life. Fish receive shade, which is the perfect spot to hide from predators. Aquatic plants are also often used as food for a variety of wildlife, including turtles, ducks, fish, insects, and wading birds. They also attract insects, which are a food source for frogs.

- **Nutrient Absorption**

  Littoral zone plants further maintain the balance of the aquatic ecosystem by enhancing water quality and absorbing excess nutrients from the environment. Waste

ponds. Thankfully, plants can absorb these contaminants, maintaining great water quality, and preventing potential problems from higher concentrations.

What Should You Plant?

Because of these benefits, littoral zone planting is common practice for Florida lakes and ponds. With a wide variety of native plants to choose from, a great place to start is by checking out our recommendations in this guide.

SHORELINE PLANTING RECOMMENDATIONS FOR PONDS AND LAKES

Pickerelweed, bulrush, duck potato, blue flags, cattails, and golden canna are all plants covered in the guide and can be beneficial to just about any water body.

Download The Guide

Keep in mind, however, that this list is far from exhaustive. *Juncus*, a genus of plant species typically referred to as rushes, are reliable and hold up well in areas where water conditions often vary. They are stylistic in appearance and offer a wide variety, as some have straight stems and others are cultivated with curly or twisting stems. And *Spartina bakeri*, also known as sand cordgrass and Baker's cordgrass, is a popular species often used in transitions from pond banks to upland landscapes.

Choosing the right species for your pond or lake is crucial to a successful and well-balanced aquatic ecosystem. At Florida Waterways, we have the foundational knowledge and skills necessary to set your pond up for success through careful planning and installation, as well

Interested in learning more? Check out these resources:

- https://edis.ifas.ufl.edu/pdffiles/EP/EP47600.pdf
- https://www.pinellascounty.org/environment/watershed/pdf/adoptapond/Lakefront_Revegetation.pdf

When you're ready to start customizing a lakefront vegetation plan, contact us to get started!

About the Author: Sheri Schwartz

Sheri Schwartz is a Marine Biologist and Marine Scientist. As a Florida native, she holds a Master of Science degree in Marine Science and Marine Biology from Nova Southeastern University, a Bachelor of Science degree in Biological Sciences from Florida State University, and she is a PADI SCUBA-certified diver, wildlife observer, and published science writer. Since completing her graduate program, she has worked in the marine and environmental sectors, including government contracts and private industry, and has developed a breadth of knowledge in the fields of biological and environmental science, water sampling, water quality testing and monitoring, benthic and pelagic habitat monitoring, and quantitative data analysis. Florida Waterways, Inc. is a State-wide environmental firm specializing in pond and lake management using solution-focused, science-based approaches. Florida Waterways has a team of environmental professionals who specialize in multiple disciplines including: aquatic biology and ecology, limnology, entomology, soils, chemistry, sampling, and landscape sciences.

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GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	6/17/2021	Blue Numbers = Input data Red Numbers = Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT: Kanner CPUD

HELP Rainfall

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

Meteorological Zone (Please use zone map):	CLICK ON CELL BELOW TO SELECT Zone 5	
Mean Annual Rainfall (Please use rainfall map):	57.00	Inches
Type of analysis:	CLICK ON CELL BELOW TO SELECT Specified removal efficiency	
Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**):	81 / 81	%

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

Model documentation and example problems.

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION

6/17/2021

CLICK ON CELL BELOW TO SELECT CONFIGURATION

J - Mixed-4 Catchment-3 Series-Parallel

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING | MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: POST DA A-2

Delay [hrs]

max delay = 15 hrs.

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Undeveloped - Ruderal/Upland Pine: TN=1.694 TP=0.162
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Multi-Family: TN=2.320 TP=0.520

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:	11.910	AC
Total post-development catchment or for BMP analysis:	11.910	AC
Pre-development Non DCIA CN:	77.00	
Pre-development DCIA percentage:	0.00	%
Post-development Non DCIA CN:	92.00	
Post-development DCIA percentage:	65.74	%
Estimated BMP Area (No loading from this area)	2.720	AC

Average annual pre runoff volume:	7.626	ac-ft/year
Average annual post runoff volume (note no BMP area):	28.460	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	15.932	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.524	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	81.430	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	18.251	kg/year

CATCHMENT NO.2 NAME: POST DA A-3

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Undeveloped - Wet Flatwoods: TN=1.213 TP=0.021
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT High-Intensity Commercial: TN=2.40 TP=0.345

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:	27.130	AC
Total post-development catchment or BMP analysis area:	27.130	AC
Pre-development Non DCIA CN:	77.00	
Pre-development DCIA percentage:	0.00	%
Post-development Non DCIA CN:	95.00	
Post-development DCIA percentage:	81.55	%
Estimated BMP Area (No loading from this area)	2.860	AC

Average annual pre runoff volume:	17.371	ac-ft/year
Average annual post runoff volume (note no BMP area):	85.491	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	25.987	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	0.450	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	253.039	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	36.374	kg/year

CATCHMENT NO.3 NAME: Post DA B-NWW-4A

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Highway: TN=1.520 TP=0.200
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Highway: TN=1.520 TP=0.200

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:	9.386	AC
Total post-development catchment or BMP analysis area:	9.386	AC
Pre-development Non DCIA CN:	92.00	
Pre-development DCIA percentage:	68.08	%
Post-development Non DCIA CN:	93.00	
Post-development DCIA percentage:	71.75	%
Estimated BMP Area (no loading from this area)	0.000	AC

Average annual pre runoff volume:	29.543	ac-ft/year
Average annual post runoff volume (note no BMP area):	30.674	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	55.380	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	7.287	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	57.501	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	7.566	kg/year

CATCHMENT NO.4 NAME: POST DA A-1

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Undeveloped - Ruderal/Upland Pine: TN=1.694 TP=0.162
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Multi-Family: TN=2.320 TP=0.520

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:	9.950	AC
Total post-development catchment or BMP analysis area:	9.950	AC
Pre-development Non DCIA CN:	77.00	
Pre-development DCIA percentage:	0.00	%
Post-development Non DCIA CN:	92.00	
Post-development DCIA percentage:	65.74	%
Estimated BMP Area (no loading from this area)	2.250	AC

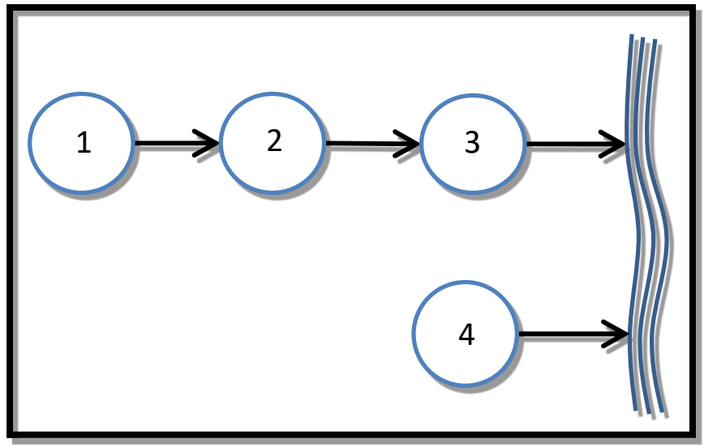
Average annual pre runoff volume:	6.371	ac-ft/year
Average annual post runoff volume (note no BMP area):	23.846	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	13.310	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.273	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	68.227	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	15.292	kg/year

STORMWATER TREATMENT ANALYSIS:	V 8.6	GO TO GENERAL SITE INFORMATION PAGE	Blue Numbers =	Input data
			Red Numbers =	Calculated

If not done, specify pre- and post-development watershed characteristics.

6/17/2021

GO TO WATERSHED CHARACTERISTICS



Total Required Treatment Efficiency:

Required Treatment Eff (**Nitrogen**):	81	%
Required Treatment Eff (**Phosphorus**):	81	%

Select one of the BMPs below to analyze efficiency or review the summary data.

RETENTION BASIN	WET DETENTION / MAP	EXFILTRATION TRENCH	RAIN GARDEN / depression storage	SWALE	USER DEFINED BMP
PERVIOUS PAVEMENT	STORMWATER HARVESTING	FILTRATION	View Media Mixes	NOTE !!!: All individual system must be sized prior to being analyzed in conjunction with other systems. Please read instructions in the CATCHMENT AND TREATMENT SUMMARY RESULTS tab for more information.	
GREENROOF	RAINWATER HARVESTING	LINED REUSE POND & UNDERDRAIN INPUT	GO TO COST ANALYSIS WORKSHEET		
VEGETATED NATURAL BUFFER	VEGETATED FILTER STRIP	TREE WELL	CATCHMENT AND TREATMENT SURFACE		

WET DETENTION / MANAGED AQUATIC PLANTS: 6/17/2021 V 8.6

Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: **Kanner CPUD**

GO TO STORMWATER TREATMENT ANALYSIS

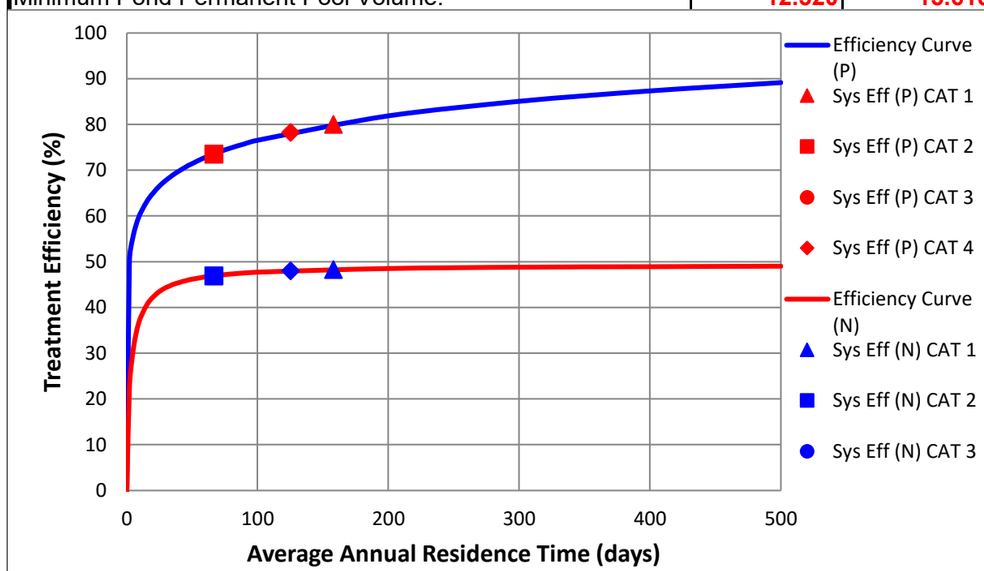
	POST DA A-2	POST DA A-3st	DA B-NWW	POST DA A-1	
Total pre-development catchment area:	11.910	27.130	9.386	9.950	ac
Total post-development catchment area:	9.190	24.270	9.386	7.700	ac
Average annual residence time (between 1 and 500 days)	158.00	66.65		125.21	days
Littoral Zone or other improvements used?*	YES	YES		YES	
Littoral Zone or other improvement efficiency credit:	10.00	10.00		10.00	%
Floating Wetland or Mats used in the design:	NO	NO		NO	
Floating Wetland or Mats credit:	0.00	0.00		0.00	%
Total **Nitrogen** removal required:	81.000	81.000	81.000	81.000	%
Total **Phosphorus** removal required:	81.000	81.000	81.000	81.000	%
Total **Nitrogen** removal efficiency:	48.313	46.947	0.000	48.044	%
Total **Phosphorous** removal efficiency:	80.063	73.580	0.000	78.288	%
Is the wet detention sufficient:	NO	NO		NO	
Average annual runoff volume:	28.460	85.491	30.674	23.846	ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

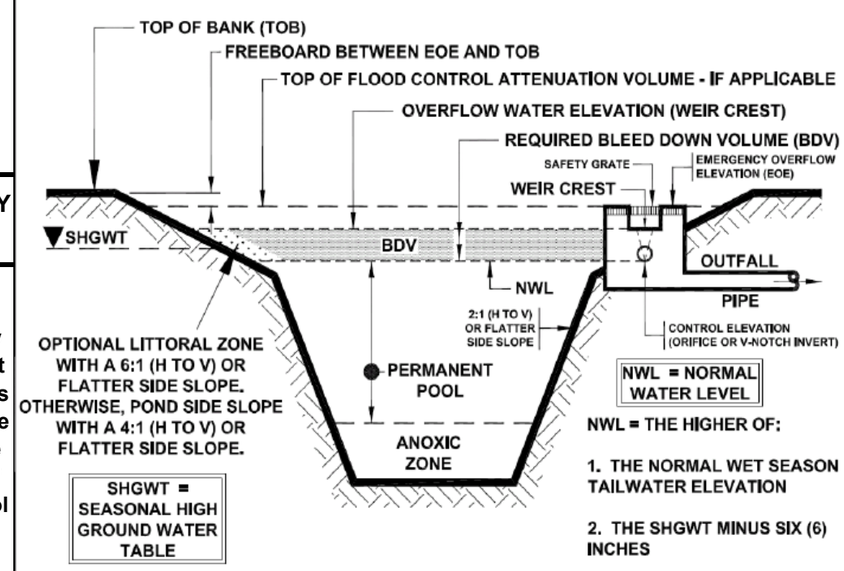
Minimum Pond Permanent Pool Volume:	12.320	15.610		8.180	ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

RETENTION BASIN: 6/17/2021 V 8.6

Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

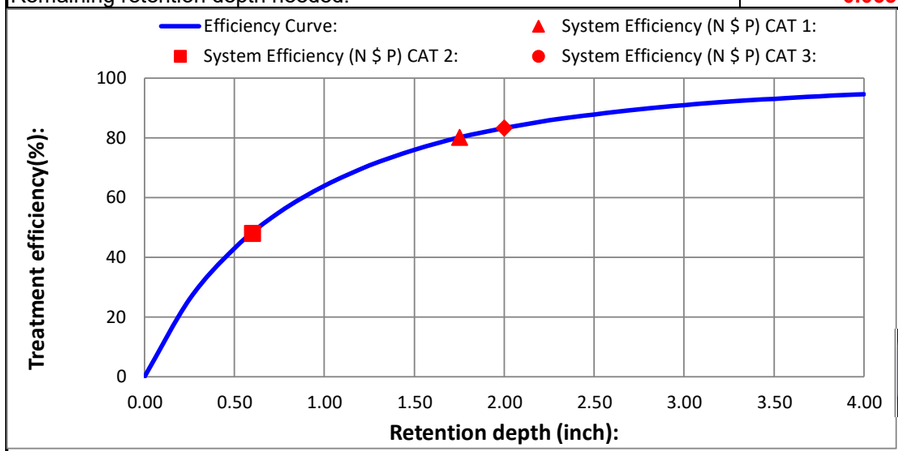
GO TO STORMWATER TREATMENT ANALYSIS

RETENTION BASIN SERVING: Kanner CPUD

Loadings from BMP area are contained by the BMP, thus no BMP area load.	POST DA A-2	POST DA A-3	ost DA B-NWW-4	POST DA A-1	
Watershed area cotributing to basin:	9.190	24.270	9.386	7.700	ac
Required Treatment Eff (**Nitrogen**):	81.000	81.000	81.000	81.000	%
Required Treatment Eff (**Phosphorus**):	81.000	81.000	81.000	81.000	%
Required retention depth over the watershed to meet required efficiency:	1.815	1.815	1.815	1.815	in
Required water quality retention volume:	1.390	3.672	1.420	1.165	ac-ft

RETENTION BASIN FOR MULTIPLE TREATMENT SYSTEMS (if there is a need for additional removal efficiencies in a series of BMPs):

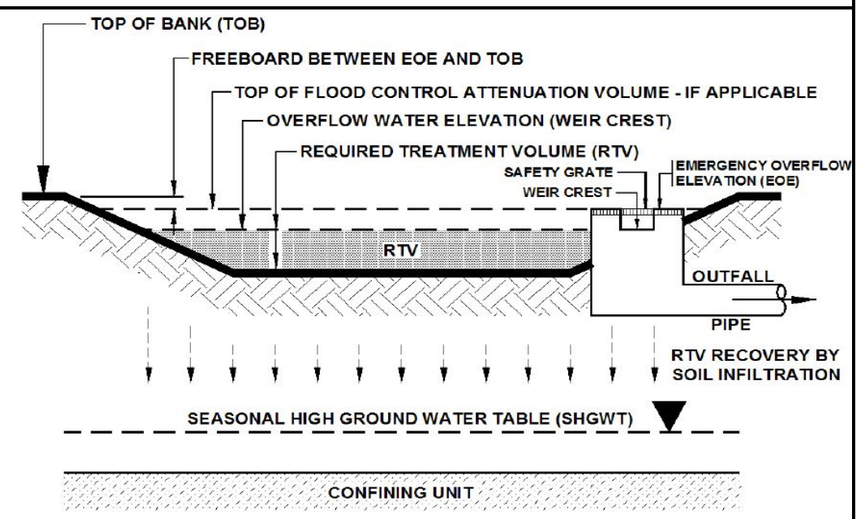
Retention volume based on retention depth and Total area - BMP area	1.340	1.214	0.000	1.283	ac-ft
Provided retention depth (0.1-3.99 inches over the watershed)	1.750	0.600		2.000	in
Provided treatment efficiency (**Nitrogen**):	80.178	48.022	0.000	83.323	%
Provided treatment efficiency (**Phosphorus**):	80.178	48.022	0.000	83.323	%
Remaining treatment efficiency (**Nitrogen**):	4.148	63.446	81.000	0.000	%
Remaining treatment efficiency (**Phosphorus**):	4.148	63.446	81.000	0.000	%
Remaining retention depth needed:	0.065	1.215	1.815	0.000	in



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of this graph is to help illustrate the treatment efficiency of the retention system as the function of retention depth **for a single BMP and in a single catchment**. The graph illustrates that there is a diminished return as the retention depth is increased. Thus evaluations of other alternatives in "treatment trains" and compensatory treatment should be considered. **NOTE:** the retention volume can not exceed 3.99 inches to be within the range of data used to determine effectiveness.

HELP - EXAMPLE PROBLEM 3



TYPICAL CROSS SECTION OF A "DRY" RETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010.

View Media Mixes

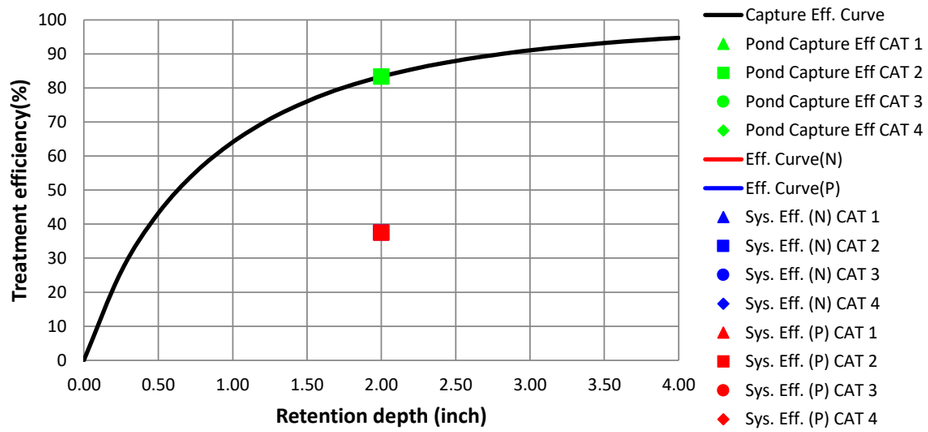
Estimate of groundwater impacts	Catchment 1	Catchment 2	Catchment 3	Catchment 4
Use only down flow media mix before water enters the ground, specify type				
Nitrogen mass reduction in groundwater discharge (%)				
Phosphorus mass reduction in groundwater discharge (%)				

FILTRATION (Underdrained Dry Basin or Upflow Filter after Wet Detention) 6/17/2021 V 8.6

FILTRATION SERVING EITHER WET POND OR DRY POND: Kanner CPUD

Notes: No loadings from this BMP area and media must match location.	POST DA A-2	POST DA A-3	st DA B-NWW-	POST DA A-1	
Contributing catchment area:	9.190	24.270	9.386	7.700	ac
Treatment depth (0.0-4.0 inches):		2.00			in
Treatment volume provided for treatment depth:	0.000	4.045	0.000	0.000	ac-ft
Provided water capture efficiency:	0.000	83.323	0.000	0.000	%
Required treatment efficiency (**Nitrogen**):		81.000			%
Required treatment efficiency (**Phosphorus**):		81.000			%
Type of media mixes: View Media Mixes		B&G ECT3			
Provided treatment efficiency (**Nitrogen**):		37.495			%
Provided treatment efficiency (**Phosphorus**):		37.495			%
Is this effluent filtration for a wet detention pond?		Yes			

ERROR MESSAGE WINDOW FOR FILTRATION INCLUDING BIOFILTRATION:



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of this graph is to help illustrate the treatment efficiency of the system as the function of retention depth. The graph illustrates that there is a point of diminished return as the retention depth is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.

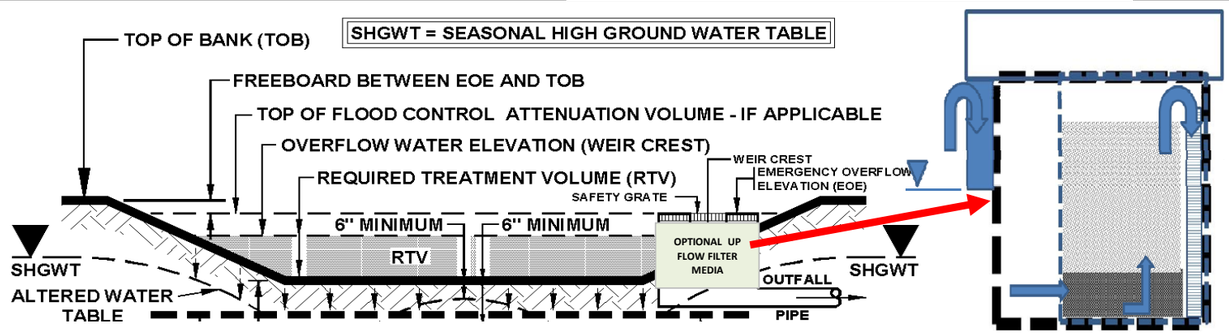
Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

GO TO STORMWATER TREATMENT ANALYSIS

FOR UNDERDRAINS GO TO LATTERAL SPACING CALCULATOR

REQUIRED REMAINING TREATMENT EFFICIENCIES.

	POST DA A-2	POST DA A-3	st DA B-NWW	POST DA A-1	
Remaining treatment efficiency needed (**Nitrogen**):		43.505			%
Remaining treatment efficiency needed (**Phosphorus**):		43.505			%



The use of a Biosorption Activated Media may be required.

Source of Graphic: Stormwater Management Academy, University of Central Florida

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

CALCULATION METHODS:

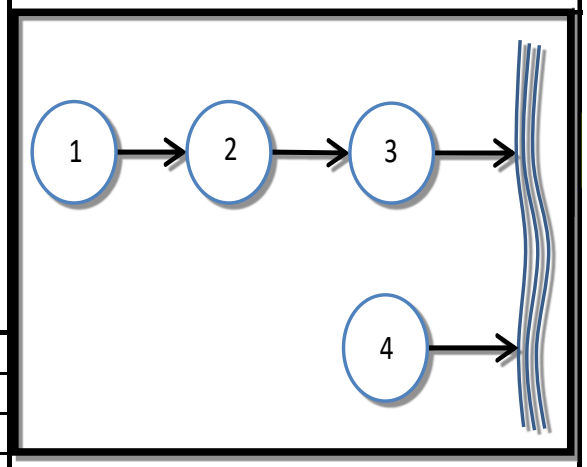
1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	Kanner CPUD	Optional Identification	Kanner CPUD	
	POST DA A-2	POST DA A-3	Post DA B-NWW-4A	POST DA A-1
BMP Name	Retention Basin	Retention Basin		Retention Basin
BMP Name	Wet Detention/ MAPs	Filtration		Wet Detention/ MAPs
BMP Name		Wet Detention/ MAPs		

REVIEW, ONE OR MORE CATCHMENT HAS BEEN SPECIFIED WITHOUT A BMP

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	J - Mixed-4 Catchment-3 Series-Parallel	Treatment Objectives or Target for TN MET TP MET	6/17/2021 BMPTRAINS MODEL
Nitrogen Pre Load (kg/yr)	110.61		
Phosphorus Pre Load (kg/yr)	10.53		
Nitrogen Post Load (kg/yr)	460.20		
Phosphorus Post Load (kg/yr)	77.48		
Target Load Reduction (N) %	81		
Target Load Reduction (P) %	81		
Target Discharge Load, N (kg/yr)	87.44		
Target Discharge Load, P (kg/yr)	14.72		
Provided Overall Efficiency, N (%):	81		
Provided Overall Efficiency, P (%):	89		
Discharged Load, N (kg/yr & lb/yr):	89.60	197.35	
Discharged Load, P (kg/yr & lb/yr):	8.37	18.44	
Load Removed, N (kg/yr & lb/yr):	370.60	816.28	
Load Removed, P (kg/yr & lb/yr):	69.11	152.23	



Oldcastle Infrastructure™
A CRH COMPANY

BOLD & GOLD®

Biosorption Activated Media (BAM)

Bold & Gold® Removal Efficiencies up to:

- **75% Nitrogen**
- **95% Phosphorous**
- **95% TSS**

**Varies based on sizing & site conditions*

Bold & Gold is a Biosorption Activated Media (BAM) used for pollution control to reduce nitrogen and phosphorus levels in stormwater. Bold and Gold creates sorbent surface bonds to establish a media nutrient cycle that actively captures and consumes nutrients, while promoting denitrification. High levels of phosphorus and nitrogen can compromise ecosystem integrity and human health. Bold & Gold Media is an ideal media for pre-treatment prior to rainwater harvesting or post treatment following detention prior to discharge into receiving waters.

Benefits:

- High Surface Area
- Biological Activity: Denitrification and Nutrient Consumption
- No Biological Toxic Effects
- Sustainable: Long Life Media Made from Recycled Material
- Economical (Lower Cost Media)
- Available in Various Blends
- Removes TN, TP, TSS and Metals
- Physical Filtration of Solids
- Sorbent Surface Bonding for Capture of Dissolved Pollutants

LEED Credit Eligible:

4.1;4.2 Materials & Resources Recycled Content

6.2 Stormwater Design / Quality Control

Suntree Technologies Inc.

Oldcastle Infrastructure™
A CRH COMPANY

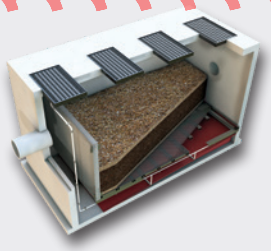
BIORETENTION / BIOFILTRATION

ADVANCED BIOSORPTION FILTRATION

Bold & Gold Combined Stormwater Treatment Technologies

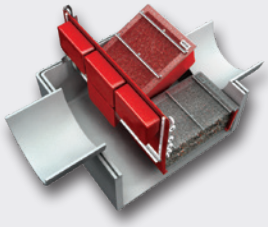
Nutrimax™

The only engineered wetland built to maximize the power of Bold & Gold Media for superior nutrient reduction. Nutrimax does not require a prefilter and averts typical clogging failures associated with other biofilters. The incorporation of Hydro-Variant Technology® allows for extensive treatment of lower flows, without compromising watershed hydrology during peak flows, affording an ideal solution for space restricted areas.



NRFS®

The NRFS uses an orifice flow control to maximize contact time with Bold & Gold media to remove nutrients and TSS prior to discharge. The optional addition of a SkimBoss MAX allows the NRFS to bolster detention time and removal potential through Hydro-Variant Technology. The NRFS is ideal for pretreatment of rainwater prior to harvesting, LID, water quality improvement or post treatment following detention.



SkimBoss® UpFlow Filter

Designed for online installation, as an option to the NSBB™, to boost nutrient and TSS removal without the associated headloss. Combining Bold & Gold media with Hydro-Variant Technology resists clogging and automatically adjusts to rising water levels during peak flows without compromising watershed hydrology.

Modeling available in BMPTRAINS Bold & Gold Media for an unbeatable treatment train!

Use Bold & Gold in BMPs for nitrogen and phosphorus reduction credits:

- ERP (Environmental Resource Permit)
- TMDL (Total Maximum Daily Load)
- MS4 (Municipal Separate Storm Sewer System)
- BMAP (Basin Management Action Plans)
- Net Improvement

Suntree Technologies Inc.

Water
www.oldcastleinfrastructure.com
800-579-8819

Pervious Concrete

When it Rains, it Drains.

Naturally...

Reduces Runoff

Cleans Stormwater

Replenishes Aquifers

Conserves Water

Protects Streams

ADA Friendly

Pervious Concrete: The Natural Choice

It's tough to balance the demand for development with the need to preserve our natural resources. However, this balance becomes easy to achieve when you construct parking lots using pervious concrete.

Pervious concrete is a mix of coarse aggregate, cement, water, and little to no sand. Also known as "no-fines" or porous concrete, this mixture creates an open-cell structure, allowing rainwater to filter through to underlying soil. By modeling natural ground cover, pervious concrete is an excellent choice for stormwater management.

Pervious Concrete: The Environmentally Sound Choice

According to the United States Environmental Protection Agency (EPA), stormwater runoff can send as much as 90% of the pollutants—such as oil and other hydrocarbon liquids found on the surface of traditional parking lots—directly into our rivers and streams. The EPA now requires state and local governments to implement measures to reduce and improve the overall quality of stormwater runoff in an effort to address this important pollution problem. Pervious concrete has been recognized by the EPA as a best management practice (BMP) to address this most vital environmental concern. The open-cell structure of pervious concrete provides a medium for aerobic bacteria that break down many of the pollutants that seep from parked cars.

Pervious concrete also contributes to enhanced air quality by lowering atmospheric heating through lighter color and lower density, decreasing the impact of heat island effects. The heat island effect occurs when tree-covered areas are replaced with dark pavement surfaces, and is characterized by up to a 12-degree average temperature increase between an urban area and its surrounding countryside. This heat island effect increases ground level ozone production by as much as 30%.

Concrete surfaces, both pervious and conventional, have a much higher albedo—a measure of reflectance—than competitive paving materials. Specifications requiring a minimum surface albedo are becoming increasingly popular. The inherently light color of concrete naturally reflects heat and light. Studies have shown as much as a 30% savings in lighting costs over other pavement types due to concrete pavement's reflectivity.

Pervious Concrete: The Smart Business Choice

Using pervious concrete pavement in your parking lot can reduce the need for large detention ponds because the pavement acts as a detention area. Lot owners will spend fewer dollars on labor, construction and maintenance of detention ponds, skimmers, pumps, drainage pipes, and other stormwater management systems. Expensive irrigation systems can also be downsized or eliminated.

A pervious concrete parking lot will help reduce demands upon sewer systems. Today, many government agencies are now implementing stormwater impact fees for all impervious areas. Pervious concrete can reduce these fees for the property owner.

Developers are using pervious concrete for parking lots to increase utilization of commercial properties. The land ordinarily devoted to costly stormwater management practices or compliance with maximum impervious area ordinances can now be developed or preserved, enhancing the bottom line.

Pervious concrete is a durable material—parking areas properly designed and constructed will last 20-40 years with little or no maintenance. Thus concrete, conventional or pervious, is widely recognized as the lowest life cycle cost option available for paving.

Benefits of Pervious Concrete

Reduces stormwater runoff

Eliminates need for detention ponds and other costly stormwater management practices

Replenishes water tables and aquifers

Allows for more efficient land development

Minimizes flash flooding and standing water

Prevents warm and polluted water from entering our streams

Mitigates surface pollutants

The best application for pervious concrete is parking lots.

When it Rains, it Drains.

Stormwater runoff occurs when rain falls. This runoff causes increased pollution in rivers and streams, flash floods, and loss of rainwater that could otherwise replenish water tables and aquifers. Pervious concrete has a 15-25% void structure and allows 3–8 gallons of water per minute to pass through each square foot—accounting for far more than is generated during most rain events. Pervious concrete puts rainwater back in the ground where it belongs.

Pervious Concrete
Frequently Asked Questions

Q: What about drainage issues in soils with high clay content?

A: Typically if a soil type has sufficient percolation to support a septic tank system it will be allowable for pervious concrete. If a soil is truly impervious, the pervious concrete system will still be useful for detention pond requirements. Soil percolation rates are most important if you must meet stormwater quality requirements. A typical parking lot design may have 5″–8″ of pervious pavement on top of a 6″–12″ sub-base of #57 stone (40% voids) on a geotextile fabric. In sandy areas pervious is placed directly above the sand.

Q: What about freeze-thaw issues?

A: Pervious concrete has been in place as far north as Raleigh, N.C., for over 12 years with no freeze thaw problems. Only a few installations exist in extreme wet freeze-thaw regions. There are many studies underway. Visit our Web site to find current information about this topic.

Q: What about clogging?

A: Clogging problems are mainly an issue of design. If a natural area with grass or exposed soil is allowed to drain stormwater across a pervious concrete pavement, fine material can be introduced into the system causing localized clogging. Vegetative matter can collect on the surface of the pervious concrete causing some clogging, but routine sweeping or vacuuming will restore porosity. Studies have been conducted that indicate pressure washing will restore most of the porosity of clogged pervious concrete to nearly new conditions.

Q: What other uses are there for pervious concrete?

A: Pervious concrete has been successfully used for low volume streets, driveways, sidewalks, golf cart paths, retaining walls, and French drains. Pervious concrete can be utilized in a variety of paving applications to provide hardscape without altering hydrology of the land.

For more information and contacts on pervious concrete go to:

www.pervious.info

Concrete Thinking for a sustainable world

Southeast Cement Association

www.secement.org

Benefits of Littoral Plants

The littoral zone of a pond or lake is the shallow, transitional area between dry land and open water. With the low depth of water, as well as plenty of light and nutrients, this zone provides the ideal conditions for plants and animals to thrive. As an essential part of the aquatic ecosystem, littoral plants can even provide added benefits to pond and lake managers.

When it comes to adding pond plants, you should always remember that there is a lot more than meets the eye. Knowing what benefits to expect from littoral zone plants and how to find the right choice for your needs can often be overwhelming. To help you get started, here's a look at everything you need to know about littoral zone planting.

Blog Posts

- Nutrient Pollution and Digestive Bacteria
- Importance of Carp Containment Barriers
- Benefits of Littoral Plants
- Solutions for Aquatic Midges
- Are Grass Carp Right For My Pond?
- Pond Aeration 101

4 Benefits to Littoral Zone Planting

- **Aesthetics**

  Aquatic plants in the littoral zone are lush and healthful, providing an enhanced appearance to any pond or lake. To achieve a beautiful look, common options often

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and enhanced depth and color. Typically, plants will offer significant visual impact when planted in clusters throughout the body of water. They should be [illegible] carefully to ensure there is no unintended spread of invasive plant species within the planting.

- **Reduced Erosion**

  Planting flora in a pond's littoral zone can also help control and prevent erosion. Plants closer to the shore typically referred to as emergent plants (those with root systems in submerged soils but which extend above the water) and shoreline plants (those with root systems along the shoreline), are often the best at providing erosion control. With their large root structures, they are able to reduce waves and stabilize the soil, effectively preventing erosion.

- **Increased Wildlife Habitat**

  Plants often provide ideal and attractive habitats for birds and other animals, often bringing the pond to life. Fish receive shade, which is the perfect spot to hide from predators. Aquatic plants are also often used as food for a variety of wildlife, including turtles, ducks, fish, insects, and wading birds. They also attract insects, which are a food source for frogs.

- **Nutrient Absorption**

  Littoral zone plants further maintain the balance of the aquatic ecosystem by enhancing water quality and absorbing excess nutrients from the environment. Waste

ponds. Thankfully, plants can absorb these contaminants, maintaining great water quality, and preventing potential problems from higher concentrations.

What Should You Plant?

Because of these benefits, littoral zone planting is common practice for Florida lakes and ponds. With a wide variety of native plants to choose from, a great place to start is by checking out our recommendations in this guide.

SHORELINE PLANTING RECOMMENDATIONS FOR PONDS AND LAKES

Pickerelweed, bulrush, duck potato, blue flags, cattails, and golden canna are all plants covered in the guide and can be beneficial to just about any water body.

Download The Guide

Keep in mind, however, that this list is far from exhaustive. *Juncus*, a genus of plant species typically referred to as rushes, are reliable and hold up well in areas where water conditions often vary. They are stylistic in appearance and offer a wide variety, as some have straight stems and others are cultivated with curly or twisting stems. And *Spartina bakeri*, also known as sand cordgrass and Baker's cordgrass, is a popular species often used in transitions from pond banks to upland landscapes.

Choosing the right species for your pond or lake is crucial to a successful and well-balanced aquatic ecosystem. At Florida Waterways, we have the foundational knowledge and skills necessary to set your pond up for success through careful planning and installation, as well

Interested in learning more? Check out these resources:

- https://edis.ifas.ufl.edu/pdffiles/EP/EP47600.pdf
- https://www.pinellascounty.org/environment/watershed/pdf/adoptapond/Lakefront_Revegetation.pdf

When you're ready to start customizing a lakefront vegetation plan, contact us to get started!

About the Author: Sheri Schwartz

Sheri Schwartz is a Marine Biologist and Marine Scientist. As a Florida native, she holds a Master of Science degree in Marine Science and Marine Biology from Nova Southeastern University, a Bachelor of Science degree in Biological Sciences from Florida State University, and she is a PADI SCUBA-certified diver, wildlife observer, and published science writer. Since completing her graduate program, she has worked in the marine and environmental sectors, including government contracts and private industry, and has developed a breadth of knowledge in the fields of biological and environmental science, water sampling, water quality testing and monitoring, benthic and pelagic habitat monitoring, and quantitative data analysis. Florida Waterways, Inc. is a State-wide environmental firm specializing in pond and lake management using solution-focused, science-based approaches. Florida Waterways has a team of environmental professionals who specialize in multiple disciplines including: aquatic biology and ecology, limnology, entomology, soils, chemistry, sampling, and landscape sciences.

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Revised June 16, 2021 *Via: Electronic Mail*

City of Stuart Planning Department
121 SW Flagler Avenue
Stuart, FL 34994

Re: Costco Kanner PUD – Site Plan, Revisions for 2nd Commission Hearing Drainage and Utility Statements

To Whom it May Concern:

Please find below the proposed drainage and utility statements for the above reference PUD application. This information is reflect on the preliminary engineering plans and site plan (from Lucido and Associates) that is being submitted concurrently with this letter.

DRAINAGE STATEMENT:

THE PROPOSED PROJECT WILL CONSTRUCT A MASTER STORWATER MANAGEMENT SYSTEM CONSISTING OF A SERIES OF INTERCONNECTED WET DETENTION LAKES AND DRY RETENTION PONDS. THE SYSTEM WILL BE DESIGNED TO SATISFY THE APPLICABLE CRITERIA OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT (SFWMD), CITY OF STUART, FLORIDA DEPARTMENT OF TRANSPORTATION (FDOT), AND MARTIN COUNTY. THE PROJECT WILL PROVIDE THE REQUIRED 0.50" OF DRY PRE-TREATMENT FOR THE COMMERCIAL USE AREAS BY UTILIZING A MIX OF DRY RETENTION PONDS AND UNDERGROUND EXFILTRATION TRENCH. THE PROJECT WILL BE DESIGNED TO MEET THE ALLOWABLE DISCHARGE RATE FOR THE EXISTING DRAINAGE CONNECTIONS DOWNSTREAM TO THE KANNER HIGHWAY DRAINAGE SYSTEM. THIS INCLUDE CONSTRUCTING A DRAINAGE BYPASS SYSTEM TO PROVIDE CONVEYANCE OF OFF-SITE FLOWS THAT CURRENTLY DRAIN WEST THROUGH THE PROPERTY FROM THE SURROUNDING DRAINAGE BASIN AND WILLOUGHBY BLVD TO THE EAST. THE PROPOSED SYSTEM WILL ALSO EXPAND AN EXISTING FDOT LAKE ON-SITE THAT CURRENTLY SERVES KANNER HWY. THE EXPANDED LAKE WILL CONTINUE TO SERVE KANNER HWY IN ADDITION TO THE ON-SITE DEVELOPMENT. THE DEVELOPER SHALL FILE ALL REQUIRED PERMITS AND AGREEMENTS TO CONSTRUCT OR MODIFY THE PROPOSED INFRASTRUCTURE CURRENTLY SERVING OFF-SITE AREAS. THE PROJECT WILL REQUIRE A MODIFICATION TO EXISTING SFWMD ERP CONEPTUAL PERMIT 43-103195-P.

UTILITY STATEMENT:

WATER, SEWER, AND FIRE PROTECTION SERVICE WILL BE PROVIDED BY THE CITY OF STUART UTILITIES DEPARTMENT VIA CONNECTIONS TO EXISTING MAINS LOCATED ON THE SOUTHERN AND EASTERN PROPERTY BOUNDARIES. THE PROPOSED PROJECT WILL CONSTRUCT ON-SITE UTILITY INFRASTRUCTURE THROUGHOUT THE PUD TO SERVE THE MULTIPLE USES WITHIN THE DEVELOPMENT. ALL UTILITY DESIGN AND CONSTRUCTION WILL BE IN CONFORMANCE WITH THE LATEST STANDARDS OF THE CITY OF STUART AND THE FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECITON (FDEP). THE ON-SITE UTILITY SYSTEM FOR WATER, SEWER, AND FIRE PROTECTION

WILL BE PRIVATELY OWNED, OPERATED, AND MAINTAINED BY THE DEVELOPER OR A DESIGNATED PROPERTY OWNERS ASSOCIATION UPON PROPER LEGAL ESTABLISHMENT. THE PRIVATE ON-SITE UTILITY INFRASTURCTURE WILL CONSIST OF A GRAVITY SEWER SYSTEM, SEWER AND WATER SERVICES TO THE BUILDINGS, GREASE TRAPS (WHERE REQUIRED), A PRIVATE FIRE PROTECTION MAIN, AND THE ASSOCIATED APPURTENANCES. ALL POINTS OF SERVICE FOR WATER AND SEWER SHALL BE LOCATED WITHIN AN EXISTING RIGHT-OF-WAY OR CITY OF STUART UTILITY EASEMENT. THE ONLY PUBLIC UTILITY TO BE CONSTRUCTED ON-SITE SHALL BE A NEW CITY OF STUART WASTEWATER LIFT STATION. THE LIFT STATION WILL BE DESIGNED TO SERVE THE ENTIRE PUD AND SHALL BE CONSTRUCTED ADJACENT TO THE KANNER HIGHWAY RIGHT-OF-WAY AS SHOWN ON THE SITE PLAN. THE DEVLEOPER SHALL EXTEND AN EXISTING CITY OF STUART WATER MAIN ACROSS THE PROPERTY FRONTAGE ON KANNER HIGHWAY. THE PROPOSED GRAVITY SEWER WILL COLLECT WASTEWATER FROM THE VARIOUS USES AND CONVEY IT TO THE PROPOSED CITY OF STUART LIFT STATION. THE LIFT STATION WILL DISCHARGE TO AN EXISTING CITY OF STUART FORCE MAIN LOCATED AT THE SOUTHERN PROPERTY BOUNDARY.
A PRIVATE FIRE PROTECTION MAIN SHALL BE CONSTRUCTED THROUGH THE PUD WITH CONNECTIONS TO BUILDINGS SPRINKLER SYSTEMS, HYDRANTS, AND FIRE DEPARTMENT CONNECTIONS (FDC'S). THE DEVELOPER SHALL FILE ALL REQUIRED PERMITS AND AGREEMENTS PRIOR TO CONSTRUCTING OR MODIFYING ANY PORTION OF UTILITY INFRASTRUCTURE ASSOCIATED WITH THE APPROVED SITE PLAN. THE DEVELOPMENT WILL RECIEVE ELECTRICAL AND COMMUNICATION SERVICE FROM LOCAL PROVIDER SYSTEMS THAT EXIST ON KANNER HIGHWAY AND WILLOUGHBY BOULEVARD. PRIOR TO CONSTRUCTION COMPLETION THE DEVELOPER SHALL PROVIDE EASEMENTS FOR ON-SITE PRIVATE ELECTRICAL AND COMMUNICATION UTILITIES WHERE REQUIRED.

We feel the above statement accurately reflects the intent of the proposed development design as presented on the PUD site plan.

Respectfully,
ENGINEERING DESIGN & CONSTRUCTION, INC.

David C. Baggett, P.E.
Professional Engineer

Cc: Doug Fitzwater – Lucido and Associates

Z:\EDC-2020\20-313 - Costco Stuart - Kanner Highway\ENGINEERING\Documents\Submittal Documents\Applications\2021-06-XX_CoS_Commission_Resubmittal\2021-06-16_Revised_Drainage_and_Utility_Statement_Letter.docx

O'ROURKE
ENGINEERING & PLANNING

TRAFFIC ANALYSIS

FOR

KANNER CPUD

Prepared for:

Mr. Joe Marino
M & M Retail Partners, LLC.
Lodi, NJ 07644
973-779-7466

Prepared by

O'Rourke Engineering & Planning
22 SE Seminole Street
Stuart, Florida 34994
772-781-7918

December 16, 2020
Revised March 16, 2021
Revised April 21, 2021
Revised June 25, 2021

MR18031.0

Prepared by: O'Rourke Engineering & Planning Certificate of Authorization: #26869 22 SE Seminole Street Stuart, Florida 34994 (772) 781-7918	Professional Engineer Susan E. O'Rourke, P.E. Date signed and sealed: 6/25/2021 License #: 42684

O'ROURKE
ENGINEERING & PLANNING

December 16, 2020

Mr. Joe Marino
M & M Retail Partners, LLC.
Lodi, NJ 07644

Re: Kanner CPUD

Dear Mr. Marino:

O'Rourke Engineering & Planning has completed the traffic analysis for the proposed development including 157,531 square feet of Discount Club, 16,750 square feet of Shopping Center, 16,240 square feet of restaurant, 2,500 square feet of fast food with drive thru, and 378 units of Multifamily Housing (Mid-Rise) to be located east of Kanner Highway and approximately 2,000 feet north of Indian Street in Stuart, FL. The steps in the analysis and the ensuing results are presented herein.

It has been a pleasure working with you. If you have any questions or comments, please give me a call.

Respectfully submitted,
O'ROURKE ENGINEERING & PLANNING

Susan E. O'Rourke

Susan E. O'Rourke, P.E.
Registered Civil Engineer - Traffic

Traffic Analysis Report – M&M Retail – 6.25.21

22 SE Seminole Street | Stuart, FL 34994 | 772-781-7918 | SEORourke@comcast.net

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APPENDICES

APPENDIX A: Site Plan
APPENDIX B: Non-Motorized Features
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APPENDIX D: Martin County 2019 Roadway Level of Service Inventory Report
APPENDIX E: Driveway Data and Analyses

INTRODUCTION

O'Rourke Engineering & Planning was retained to prepare a traffic analysis for the proposed development including 157,531 square feet of Discount Club, 16,750 square feet of Shopping Center, 16,240 square feet of restaurant, 2,500 square feet of fast food with drive thru, and 378 units of Multifamily Housing (Mid-Rise) to be located east of Kanner Highway and approximately 2,000 feet north on Indian Street in Stuart, Florida. The purpose of this analysis is to determine the impact of the development on the roadway.

PROJECT DESCRIPTION

The approximately 48.97-acre parcel is proposed to be developed with 157,531 square feet of Discount Club, 16,750 square feet of Shopping Center, 16,240 square feet of restaurant, 2,500 square feet of fast food with drive thru, and 378 units of Multifamily Housing (Mid-Rise). **Figure 1** shows the project location. The project site plan is included in **Appendix A**.

EXISTING CONDITIONS

The study area is defined as the roadways upon which the project has an impact of 5% of the level of service capacity of the roadway. Once the project traffic was assigned, the study area was refined based on the impact percentages.

The study area roadways were defined in terms of existing lane geometrics and existing traffic volumes. The non-motorized transportation components are included in **Appendix B**.

Existing Lane Geometrics

The study area was reviewed to determine the existing number and type of lanes and the traffic control along the roadway. Each roadway is described below.

Kanner Highway is a six-lane divided arterial with a north/south alignment.

Willoughby Boulevard is a four-lane divided arterial with a north/south alignment.

Indian Street is a four-lane divided collector with an east/west alignment.

Monterey Road is a four-lane divided arterial with an east/west alignment.

PROJECT TRAFFIC

To estimate traffic generated by the land uses defined in the scope of this project, the ITE Trip Generation, 10th Edition trip rates for land use codes 221-Multifamily Housing (Mid-Rise), 820-Retail Shopping Center, 932-High-Turnover (Sit-Down) Restaurant, 934 Fast Food (w/ Drive-Thru), and 857-Discount Club were applied. These calculations provide an estimate of the typical generation for the proposed use. Trip generation for the project in the Daily, AM and PM Peak Hours is shown in **Table 1.** The details of the internal capture and pass-by are included in **Appendix C**.

As shown, the project will generate 7,325 daily trips, 336 in the AM peak hour, and 664 in the PM peak hour.

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22 SE Seminole St
Stuart, Fl, 34994

Job Number: MR18031.0 | Date: 5/21/18

Legend

●	=	Signalized Intersection
▭	=	Project Location
4LD	=	Roadway Laneage

Figure 1
Project Location
M&M Retail

Figure 1 & 2 - location and assignment (1)

Table 1 - Trip Generation

Table 1a: Daily

Land Use	ITE Code	Intensity	Units	Trip Generation Rate	Directional Split		Gross Trips			Internalization Trips				Net External Trips			Pass-by Trips				Net New Trips		
					In	Out	In	Out	Total	In	Out	Total	%	In	Out	Total	In	Out	Total	%	In	Out	Total
Multifamily Housing (Mid-Rise)	221	378	DU	T = 5.45(X) - 1.75	50%	50%	1,029	1,029	2,058	72	216	288	14.0%	957	813	1,770	-	-	-	0.0%	957	813	1,770
Shopping Center	820	16,750	Sft	Ln(T) = 0.68Ln(X) + 5.57	50%	50%	892	892	1,784	47	120	167	9.4%	845	772	1,617	388	388	776	48.0%	457	384	841
Discount Club	857	157,531	Sft	T = 41.80(X)	50%	50%	3,293	3,292	6,585	173	445	618	9.4%	3,120	2,847	5,967	1,164	1,163	2,327	39.0%	1,956	1,684	3,640
Fast Food (w/ Drive Thru)	934	2,500	Sft	T = 470.95(X)	50%	50%	589	588	1,177	294	102	396	33.6%	295	486	781	192	191	383	49.0%	103	295	398
High-Turnover (Sit-Down) Restaurant	932	16,240	Sft	T = 112.18(X)	50%	50%	911	911	1,822	456	159	615	33.8%	455	752	1,207	266	265	531	44.0%	189	487	676
Retail Sub Total							**5,685**	**5,683**	**11,368**	**970**	**826**	**1,796**	**15.8%**	**4,715**	**4,857**	**9,572**	**2,010**	**2,007**	**4,017**	**42.0%**	**2,705**	**2,850**	**5,555**
TOTALS		**193,021**					**6,714**	**6,712**	**13,426**	**1,042**	**1,042**	**2,084**	**15.5%**	**5,672**	**5,670**	**11,342**	**2,010**	**2,007**	**4,017**	**35.4%**	**3,662**	**3,663**	**7,325**

Source: ITE 10th Edition Trip Generation Rates
Total 162,020 w/ OutdoorVestibule 4,489

Table 1b: AM Peak Hour

Land Use	ITE Code	Intensity	Units	Trip Generation Rate	Directional Split		Gross Trips			Internalization Trips				Net External Trips			Pass-by Trips				Net New Trips		
					In	Out	In	Out	Total	In	Out	Total	%	In	Out	Total	In	Out	Total	%	In	Out	Total
Multifamily Housing (Mid-Rise)	221	378	DU	Ln(T) = 0.98Ln(X) - 0.98	26%	74%	33	93	126	3	20	23	18.3%	30	73	103	-	-	-	0.0%	30	73	103
Shopping Center	820	16,750	Sft	T = 0.50(X) + 151.78	62%	38%	99	61	160	9	8	17	10.6%	90	53	143	35	34	69	48.0%	55	19	74
Discount Club	857	157,531	Sft	T = 0.49(X)	70%	30%	54	23	77	4	4	8	10.4%	50	19	69	14	13	27	39.0%	36	6	42
Fast Food (w/ Drive Thru)	934	2,500	Sft	T = 40.19(X)	51%	49%	51	49	100	11	5	16	16.0%	40	44	84	21	20	41	49.0%	19	24	43
High-Turnover (Sit-Down) Restaurant	932	16,240	Sft	T = 9.94(X)	55%	45%	89	72	161	19	9	28	17.4%	70	63	133	30	29	59	44.0%	40	34	74
Retail Sub Total							**293**	**205**	**498**	**43**	**26**	**69**	**13.9%**	**250**	**179**	**429**	**100**	**96**	**196**	**45.7%**	**150**	**83**	**233**
TOTALS		**193,021**					**326**	**298**	**624**	**46**	**46**	**92**	**14.7%**	**280**	**252**	**532**	**100**	**96**	**196**	**36.8%**	**180**	**156**	**336**

Source: ITE 10th Edition Trip Generation Rates

Table 1c: PM Peak Hour

Land Use	ITE Code	Intensity	Units	Trip Generation Rate	Directional Split		Gross Trips			Internalization Trips (1)				Net External Trips			Pass-by Trips				Net New Trips		
					In	Out	In	Out	Total	In	Out	Total	%	In	Out	Total	In	Out	Total	%	In	Out	Total
Multifamily Housing (Mid-Rise)	221	378	DU	Ln(T)=0.96Ln(X)-0.63	61%	39%	97	62	159	25	18	43	27.0%	72	44	116	-	-	-	0.0%	72	44	116
Shopping Center	820	16,750	Sft	Ln(T) = 0.74Ln(X) + 2.89	48%	52%	70	75	145	4	7	11	7.6%	66	68	134	32	33	65	48.0%	34	35	69
Discount Club	857	157,531	Sft	T = 4.18(X)	50%	50%	329	329	658	18	29	47	7.1%	311	300	611	119	119	238	39.0%	192	181	373
Fast Food (w/ Drive Thru)	934	2,500	Sft	T = 32.67(X)	52%	48%	43	39	82	9	7	16	19.5%	34	32	66	16	16	32	49.0%	18	16	34
High-Turnover (Sit-Down) Restaurant	932	16,240	Sft	T = 9.77(X)	62%	38%	99	60	159	18	13	31	19.5%	81	47	128	28	28	56	44.0%	53	19	72
Retail Sub Total							**541**	**503**	**1,044**	**49**	**56**	**105**	**10.1%**	**492**	**447**	**939**	**195**	**196**	**391**	**41.6%**	**297**	**251**	**548**
TOTALS		**193,021**					**638**	**565**	**1,203**	**74**	**74**	**148**	**12.3%**	**564**	**491**	**1,055**	**195**	**196**	**391**	**37.1%**	**369**	**295**	**664**

Source: ITE 10th Edition Trip Generation Rates

PROJECT DISTRIBUTION/ ASSIGNMENT/ IMPACT

The project traffic was distributed by general geographic direction and then assigned to the roadway network. Two different traffic assignments were made for the retail use and the residential use.

Distribution/Assignment – The distributions led to an assignment of trips based on the anticipated ultimate destinations and the roadway paths used to reach those destinations. **Figure 2a and 2b** shows the project assignment for both retail and residential land uses.

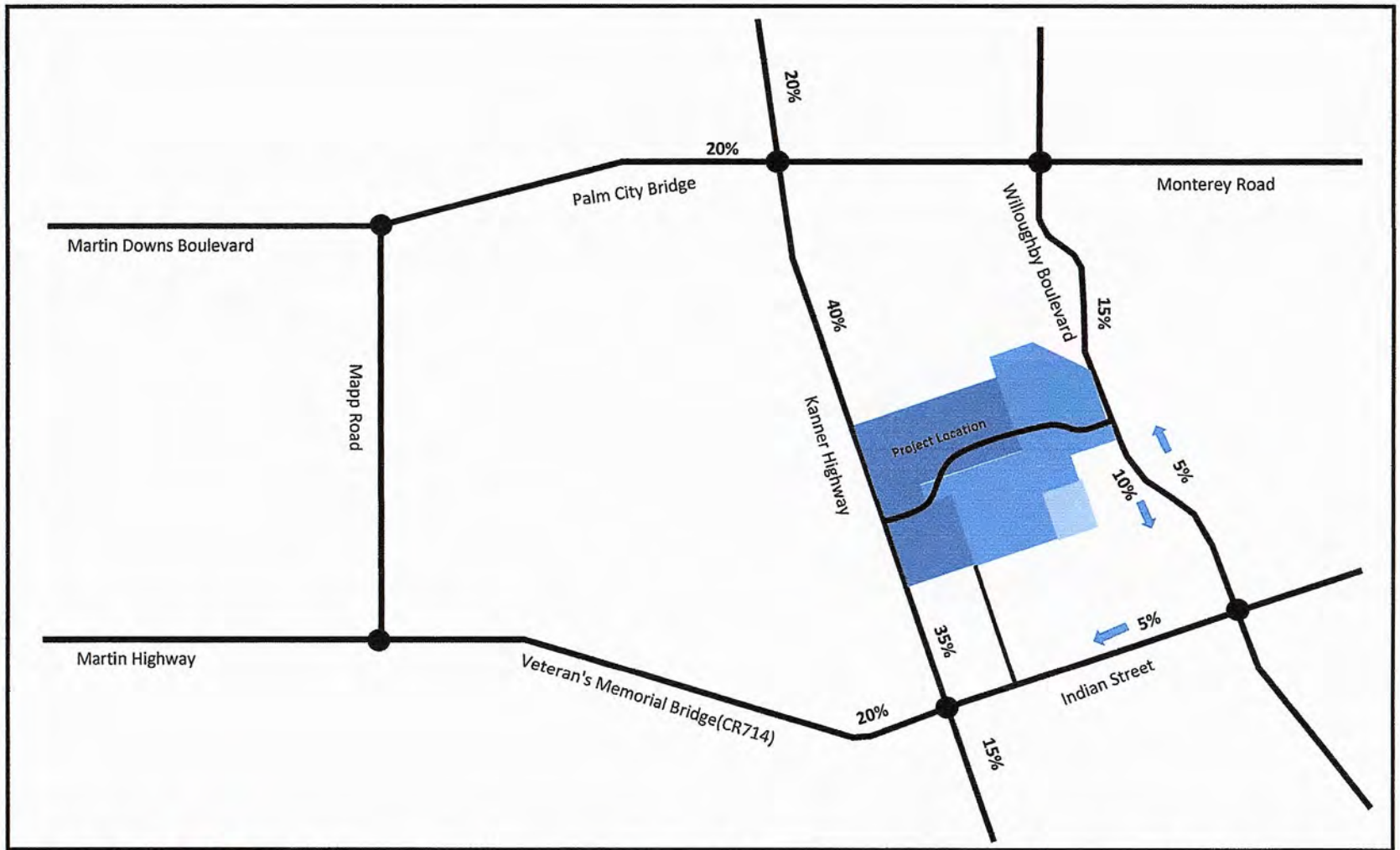
Table 2 summarizes the resultant AM and PM peak hour trips assigned to the network and the project % of capacity.

Impact – As seen in Table 2, there are no links with a 5% or greater impact. Therefore, the directly accessed links on Kanner Highway and Willoughby Boulevard were analyzed.

FUTURE TRAFFIC

Since the project traffic is not significant, the adjacent links were analyzed for future traffic volumes. **Table 3** shows that the total traffic on the adjacent links of Kanner Highway and Willoughby Boulevard will operate at acceptable levels of service at project buildout of 2024. To estimate future 2024 volumes on Kanner Highway and Willoughby Boulevard, the existing (2019) traffic volumes were increased by a growth rate found in the Martin County 2019 Roadway Level of Service Inventory Report. The growth rate was then applied for three years to estimate the 2024 peak hour directional volumes. The project traffic was then added to estimate the 2024 Total Traffic volumes with project traffic added. The total traffic volumes were then compared to the acceptable threshold.

The Martin County 2019 Roadway Level of Service Inventory Report is included in the **Appendix D**.



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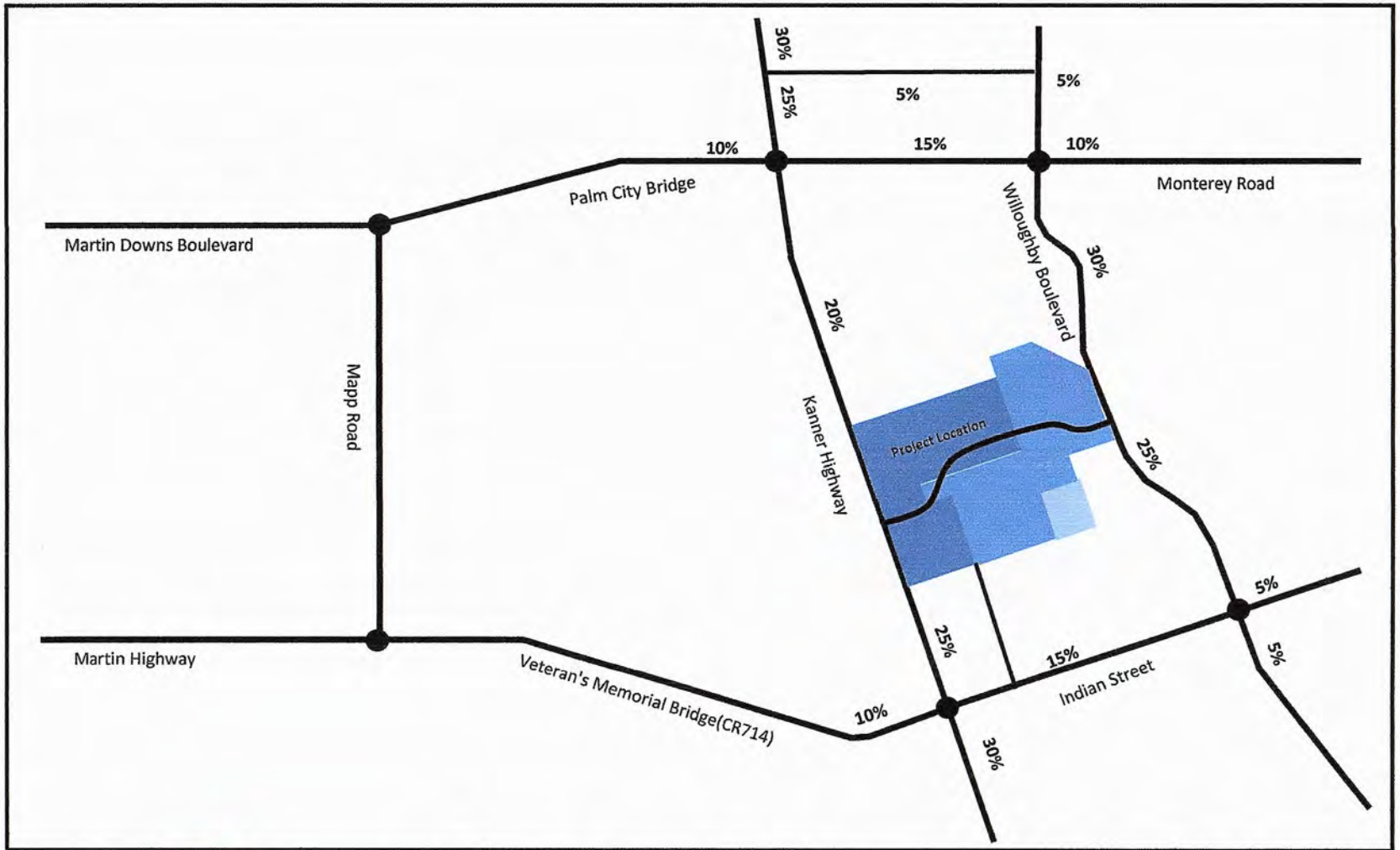
Legend

●	=	Signalized Intersection
▭	=	Project Location
XX%	=	Percent Assignment

Figure 2a
Percent Assignment - Retail
M&M Retail



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Legend

●	=	Signalized Intersection
▬	=	Project Location
XX%	=	Percent Assignment

Figure 2b

Percent Assignment - Residential

M&M Retail

Table 2a: Percent Impact - AM Peak Hour

Segment	From	To	Direction		Lanes	Is Project Traffic 5% or More of Capacity?	LOS D Directional Peak Hour	Retail: Project Percent Assignment	Retail: Directional Peak Project Volume	Residential: Project Percent Assignment	Residential: Directional Peak Project Volume	Total Project Traffic	Directional Percent Project of Capacity
Kanner Highway (SR-76)	Salerno Rd	Indian St	NB	IN	6LD	no	3,020	15%	23	30%	9	32	1.06%
	Salerno Rd	Indian St	SB	OUT	6LD	no	3,020	15%	12	30%	22	34	1.13%
	Indian St	Project Entrance	NB	IN	6LD	no	3,020	35%	53	25%	8	61	2.02%
	Indian St	Project Entrance	SB	OUT	6LD	no	3,020	35%	29	25%	18	47	1.56%
	Project Entrance	SR-714	NB	OUT	6LD	no	3,020	40%	33	20%	15	48	1.59%
	Project Entrance	SR-714	SB	IN	6LD	no	3,020	40%	60	20%	6	66	2.19%
	SR-714	SR-5	NB	OUT	6LD	no	3,020	20%	17	30%	22	39	1.29%
	SR-714	SR-5	SB	IN	6LD	no	3,020	20%	30	30%	9	39	1.29%
Willoughby Blvd	Salerno Rd	Pomeroy St	NB	IN	2L	no	880	5%	8	5%	2	10	1.14%
	Salerno Rd	Pomeroy St	SB	OUT	2L	no	880	5%	4	5%	4	8	0.91%
	Pomeroy St	Indian St	NB	IN	4LD	no	2,000	5%	8	5%	2	10	0.50%
	Pomeroy St	Indian St	SB	OUT	4LD	no	2,000	5%	4	5%	4	8	0.40%
	Indian St	Project Entrance	NB	IN	4LD	no	2,000	5%	8	25%	8	16	0.80%
	Indian St	Project Entrance	SB	OUT	4LD	no	2,000	10%	8	25%	18	26	1.30%
	Project Entrance	SR-714	NB	OUT	4LD	no	2,000	15%	12	30%	22	34	1.70%
	Project Entrance	SR-714	SB	IN	4LD	no	2,000	15%	23	30%	9	32	1.60%
SR-714 (Monterey Rd)	SR-76	Willoughby Blvd	EB	OUT	4LD	no	2,000	0%	0	10%	7	7	0.35%
	SR-76	Willoughby Blvd	WB	IN	4LD	no	2,000	0%	0	10%	3	3	0.15%
Indian St	SR-76	Willoughby Blvd	EB	OUT	4LD	no	2,000	0%	0	15%	11	11	0.55%
	SR-76	Willoughby Blvd	WB	IN	4LD	no	2,000	5%	8	15%	5	13	0.65%
CR-714 (Veteran's Memorial Bridge)	Mapp Rd	SR-76	EB	IN	4LD	no	2,000	20%	30	10%	3	33	1.65%
	Mapp Rd	SR-76	WB	OUT	4LD	no	2,000	20%	17	10%	7	24	1.20%

Source: Martin County 2019 Roadway Level of Service Inventory Report

	IN	OUT
Retail	150	83
Residential	30	73

Table 2b Percent Impact - PM Peak Hour

Segment	From	To	Direction		Lanes	Is Project Traffic 5% or More of Capacity?	LOS D Directional Peak Hour	Retail: Project Percent Assignment	Retail: Directional Peak Project Volume	Residential: Project Percent Assignment	Residential: Directional Peak Project Volume	Total Project Traffic	Directional Percent Project of Capacity
Kanner Highway (SR-76)	Salerno Rd	Indian St	NB	IN	6LD	no	3,020	15%	45	30%	22	67	2.22%
	Salerno Rd	Indian St	SB	OUT	6LD	no	3,020	15%	38	30%	13	51	1.69%
	Indian St	Project Entrance	NB	IN	6LD	no	3,020	35%	104	25%	18	122	4.04%
	Indian St	Project Entrance	SB	OUT	6LD	no	3,020	35%	88	25%	11	99	3.28%
	Project Entrance	SR-714	NB	OUT	6LD	no	3,020	40%	100	20%	9	109	3.61%
	Project Entrance	SR-714	SB	IN	6LD	no	3,020	40%	119	20%	14	133	4.40%
	SR-714	SR-5	NB	OUT	6LD	no	3,020	20%	50	30%	13	63	2.09%
	SR-714	SR-5	SB	IN	6LD	no	3,020	20%	59	30%	22	81	2.68%
Willoughby Blvd	Salerno Rd	Pomeroy St	NB	IN	2L	no	880	5%	8	5%	4	12	1.36%
	Salerno Rd	Pomeroy St	SB	OUT	2L	no	880	5%	13	5%	2	15	1.70%
	Pomeroy St	Indian St	NB	IN	4LD	no	2,000	5%	8	5%	4	12	0.60%
	Pomeroy St	Indian St	SB	OUT	4LD	no	2,000	5%	4	5%	2	6	0.30%
	Indian St	Project Entrance	NB	IN	4LD	no	2,000	5%	8	25%	18	26	1.30%
	Indian St	Project Entrance	SB	OUT	4LD	no	2,000	10%	8	25%	11	19	0.95%
	Project Entrance	SR-714	NB	OUT	4LD	no	2,000	15%	12	30%	13	25	1.25%
	Project Entrance	SR-714	SB	IN	4LD	no	2,000	15%	23	30%	22	45	2.25%
SR-714 (Monterey Rd)	SR-76	Willoughby Blvd	EB	OUT	4LD	no	2,000	0%	0	15%	7	7	0.35%
	SR-76	Willoughby Blvd	WB	IN	4LD	no	2,000	0%	0	15%	11	11	0.55%
Indian St	SR-76	Willoughby Blvd	EB	OUT	4LD	no	2,000	0%	0	15%	7	7	0.35%
	SR-76	Willoughby Blvd	WB	IN	4LD	no	2,000	5%	15	15%	11	26	1.30%
CR-714 (Veteran's Memorial Bridge)	Mapp Rd	SR-76	EB	IN	4LD	no	2,000	20%	59	10%	7	66	3.30%
	Mapp Rd	SR-76	WB	OUT	4LD	no	2,000	20%	50	10%	4	54	2.70%

Source: Martin County 2019 Roadway Level of Service Inventory Report

	IN	OUT
Retail	297	251
Residential	72	44

Table 3a: Link Analysis - AM Peak Hour

Segment	From	To	Direction		Lanes	Is Project Traffic 5% or More of Capacity?	2019 AADT	D Factor (1)	2019 Volume Peak Hour Peak Direction	Growth Rate	2024 Volume Peak Hour Directional	LOS D Directional Peak Hour	Retail: Project Percent Assignment	Retail: Directional Peak Project Volume	Residential: Project Percent Assignment	Residential: Directional Peak Project Volume	Total Project Traffic	Directional Percent Project of Capacity	Total Traffic (Peak Direction)	Does Project Meet Concurrency?
Kanner Highway (SR-76)	Indian St	Project Entrance	NB	IN	6LD	no	21,116	0.376	598	1.005	613	3020	35%	53	25%	8	61	2.02%	674	Yes
	Indian St	Project Entrance	SB	OUT	6LD	no	21,116	0.624	993	1.005	1018	3020	35%	29	25%	18	47	1.56%	1065	Yes
	Project Entrance	SR-714	NB	OUT	6LD	no	21,116	0.376	598	1.005	613	3020	40%	33	20%	15	48	1.59%	661	Yes
	Project Entrance	SR-714	SB	IN	6LD	no	21,116	0.624	993	1.005	1018	3020	40%	60	20%	6	66	2.19%	1084	Yes
Willoughby Blvd	Indian St	Project Entrance	NB	IN	4LD	no	11,100	0.376	401	1.037	481	2000	5%	8	25%	8	16	0.80%	497	Yes
	Indian St	Project Entrance	SB	OUT	4LD	no	11,100	0.624	666	1.037	799	2000	10%	12	25%	18	30	1.30%	829	Yes
	Project Entrance	SR-714	NB	OUT	4LD	no	11,100	0.376	401	1.037	481	2000	15%	12	30%	22	34	1.70%	515	Yes
	Project Entrance	SR-714	SB	IN	4LD	no	11,100	0.624	666	1.037	799	2000	15%	23	30%	9	32	1.60%	831	Yes

Source: Martin County 2019 Roadway Level of Service Inventory Report
(1) FDOT Florida Traffic Online

	IN	OUT
Retail	150	83
Residential	30	73

Years Grown: 5

Table 3b: Link Analysis - PM Peak Hour

Segment	From	To	Direction		Lanes	Is Project Traffic 5% or More of Capacity?	2019 AADT	D Factor (1)	2019 Volume Peak Hour Peak Direction	Growth Rate	2024 Volume Peak Hour Peak Direction	LOS D Directional Peak Hour	Retail: Project Percent Assignment	Retail: Directional Peak Project Volume	Residential: Project Percent Assignment	Residential: Directional Peak Project Volume	Total Project Traffic	Directional Percent Project of Capacity	Total Traffic (Peak Direction)	Does Project Meet Concurrency?
Kanner Highway (SR-76)	Indian St	Project Entrance	NB	IN	6LD	no	21,116	0.624	993	1.005	1018	3020	35%	104	25%	18	122	4.04%	1140	Yes
	Indian St	Project Entrance	SB	OUT	6LD	no	21,116	0.376	598	1.005	613	3020	35%	88	25%	11	99	3.28%	712	Yes
	Project Entrance	SR-714	NB	OUT	6LD	no	21,116	0.624	993	1.005	1018	3020	40%	100	20%	9	109	3.61%	1127	Yes
	Project Entrance	SR-714	SB	IN	6LD	no	21,116	0.376	598	1.005	613	3020	40%	119	20%	14	133	4.40%	746	Yes
Willoughby Blvd	Indian St	Project Entrance	NB	IN	4LD	no	11,100	0.624	666	1.037	799	2000	5%	8	25%	18	26	1.30%	825	Yes
	Indian St	Project Entrance	SB	OUT	4LD	no	11,100	0.376	401	1.037	481	2000	10%	8	25%	11	19	0.95%	500	Yes
	Project Entrance	SR-714	NB	OUT	4LD	no	11,100	0.624	666	1.037	799	2000	15%	12	30%	13	25	1.25%	824	Yes
	Project Entrance	SR-714	SB	IN	4LD	no	11,100	0.376	401	1.037	481	2000	15%	23	30%	22	45	2.25%	526	Yes

Source: Martin County 2019 Roadway Level of Service Inventory Report
(1) FDOT Florida Traffic Online

	IN	OUT
Retail	297	251
Residential	72	44

Years Grown: 5

INTERSECTIONS / DRIVEWAYS

The intersection analysis was limited to the intersections of the driveways with Kanner and the driveway with Willoughby. Since the project is not significant on any link, additional intersection analysis was not required.

The project has proposed four driveways.

- Driveway 1 will be a full access signalized intersection to Kanner Highway with two westbound left-turn lanes leaving the project.
- Driveway 2 will have access to Kanner Highway and will be a directional median with a left-in, right-in, right-out only.
- Driveway 3 will have full access onto Willoughby Boulevard.
- Driveway 4 will be a right-in/right-out driveway on Kanner Highway.

The project will also have a cross-access to Indian Street and other driveways on Kanner Highway. For purposes of this study, we have shown traffic at project driveways 1, 2, 3, and 4 and at the cross-access driveway on Indian Street.

Figures 3a and 3b show the driveway percent assignments for the retail and residential portions, respectively. **Figure 3c** illustrates the total of the retail and residential project volumes in the AM and PM peak hour. The proposed driveway lanes are summarized below:

<u>Driveway 1/ Kanner Highway (Full Access)</u>

Northbound
- 1 – U-turn lane
- 3 - through lanes
- 1 – right turn lane

Southbound
- 1 – left turn lane
- 2 – through lanes
- 1 – through/right lane

Eastbound
- 1 – left turn lane
- 1 – one through/right lane

Westbound
- 1 – right turn lane
- 1 – left turn lane
- 1 – through/left turn lane*

*could be two left turn lanes, and a through/right turn lane

<u>Driveway 3/ Willoughby Boulevard (Full Access)</u>

Northbound
- 1 – left turn lane
- 2 – through lanes

Southbound
- 1 – U-turn lane
- 2 – through lanes
- 1 – right turn lane

Eastbound
- 1 – left turn lane
- 1 – right turn lane

Westbound
- Future Sailfish Access

<u>Driveway 2/ Kanner Highway (Directional Access)</u>

Northbound
- 1 – U-turn lane
- 3 – through lanes
- 1 – right turn lane

Southbound
- 1 – left turn lane
- 3 – through lanes

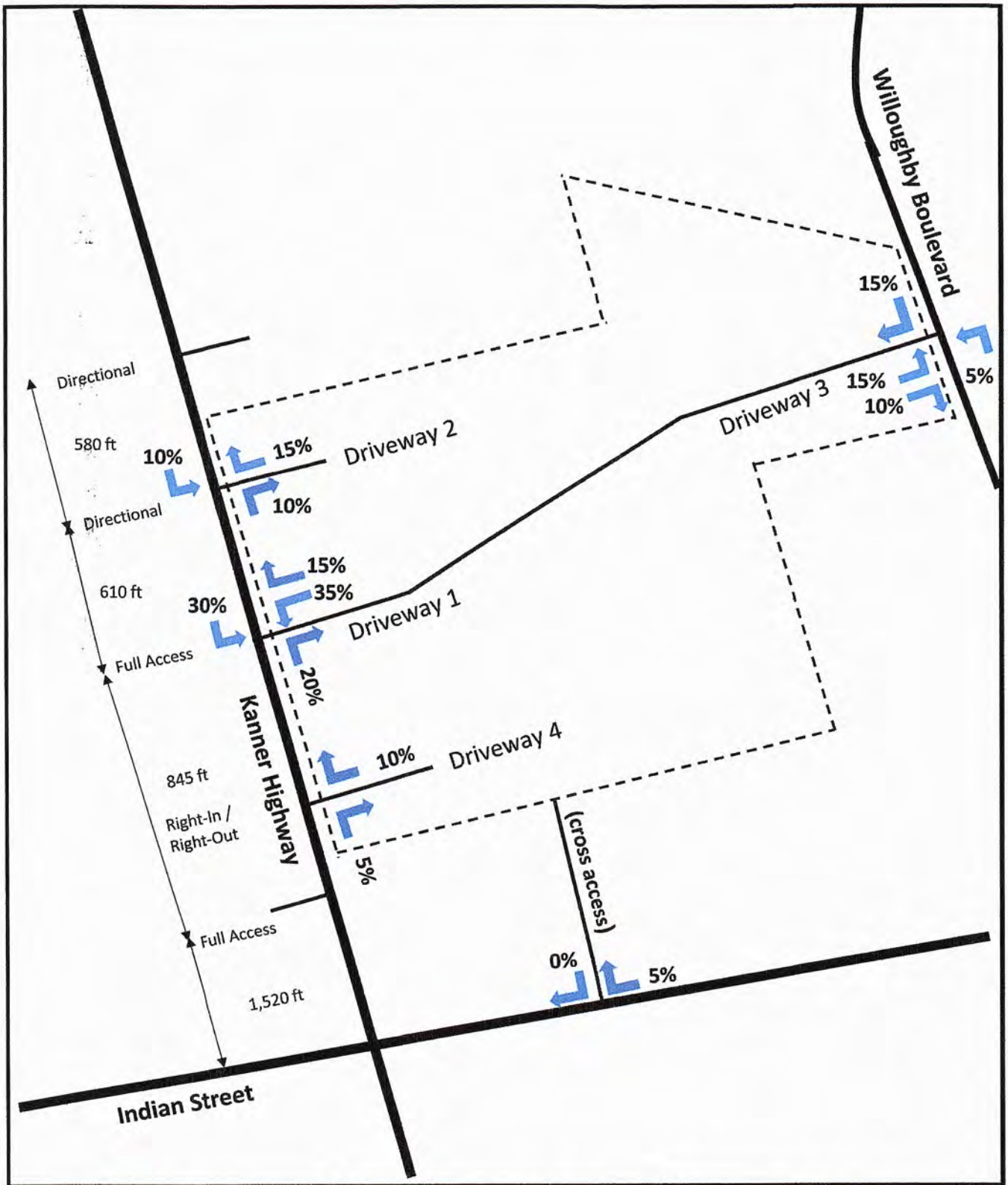
Westbound
- 1 – right turn

<u>Driveway 4/ Kanner Highway (Right-in/Right out)</u>

Northbound
- 3 – through lanes
- 1 – right turn lane

Southbound
- 3 – through lanes

Westbound
- 1 – right turn lane



NTS

O'ROURKE ENGINEERING & PLANNING

22 SE Seminole St
Stuart, Fl, 34994

Job #: MR18031.0 | 6.25.21

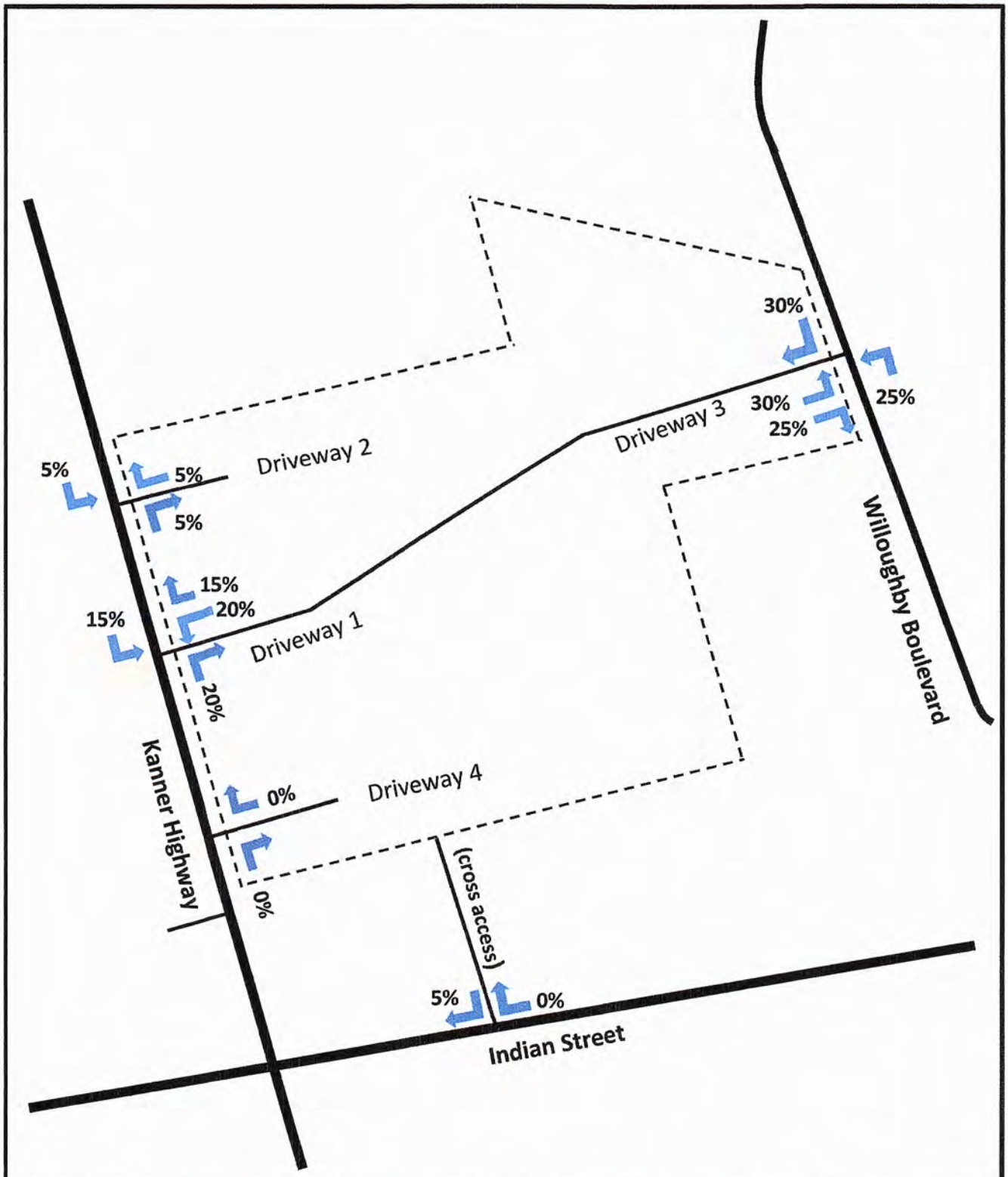
Legend

= Project Location
= Direction
15% = Percent Project Traffic
xx ft. = Driveway Spacing

Figure 3a

Driveway Assignment - Retail

M & M Retail



NTS

O'ROURKE ENGINEERING & PLANNING

22 SE Seminole St
Stuart, Fl, 34994

Job #: MR18031.0 | Date: 3/12/21

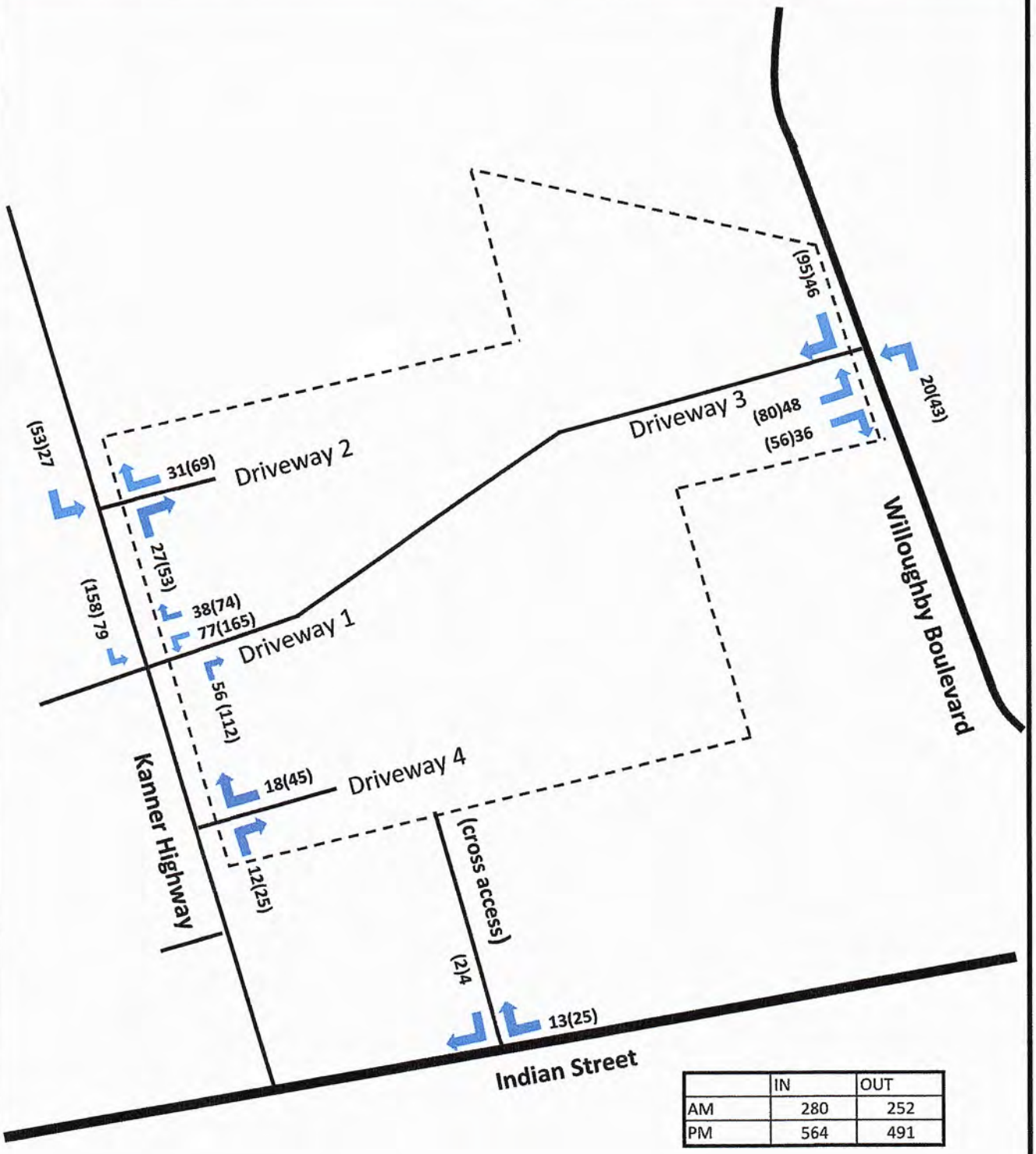
Legend

= Project Location
= Direction
15% = Percent Project Traffic

Figure 3b

Driveway Assignment - Residential

M & M Retail



	IN	OUT
AM	280	252
PM	564	491

O'ROURKE ENGINEERING & PLANNING

NTS

22 SE Seminole St
Stuart, Fl, 34994

Job #: MR18031.0 | 6.26.21

Legend

XX(XX) = AM(PM)
= Project Location
= Direction
15% = Percent Project Traffic

Figure 3c

Total Driveway Volumes

M & M Retail

As shown, ingress turn lanes are proposed for driveways 1, 2, and 3.

A turn lane analysis was conducted for driveway 4 using the FDOT Access Management Guidebook November 2019. For roadways with a posted speed limit of 45 MPH or less, the lower threshold of 80 right-turn vehicles per hour would be most used for higher volume (greater than 600 vehicles per hour, per lane in one direction on the major roadway) or two-lane roads where lateral movement is restricted. The 125 right-turn vehicles per hour upper threshold would be most appropriate on lower volume roadways, multilane highways, or driveways with a large entry radius (50 feet or greater).

Table 4: Right Turn Lane Analysis - Driveway 4

Major Road Speed Limit (MPH)	Number of Lanes (Directional)	Thru Volume (Veh/hr)	Thru Volume (Veh/hr/ln)	Right Turn Volume	Threshold Volume	Right Turn Warranted?
45	3	~~1073~~ ~~1018~~ 1266	422 ~~339~~	25	125	No

Roadway Posted Speed Limit	Number of Right Turns Per Hour(1)
45 MPH or Less	80-125
Over 45 MPH	35-55

(1) FDOT Access Management Guidebook November 2019, Table 27

As shown, an ingress right-turn lane is not warranted at driveway 4. However, a right-turn lane is proposed.

The three driveways on Kanner Highway and the driveway on Willoughby Boulevard were analyzed using HCS.

Existing through volumes on Kanner Highway were obtained from the 2019 FDOT 24-hour count on Kanner Highway and the peak hour volumes were calculated and grown to 2024 using the growth rate contained in the Martin County 2019 Roadway Level of Service Inventory Report. Project traffic was then added to obtain the total traffic at the driveways.

The existing peak hour peak direction volume for Willoughby Boulevard was taken from the Martin County 2019 Roadway Level of Service Inventory Report, the FDOT D Factor was then used to convert the existing peak hour peak direction volume into the peak hour off-peak direction volume. These volumes were then grown to 2024 using the growth rate contained in the Martin County 2019 Roadway Level of Service Inventory Report and project traffic was then added.

Table 5 summarizes the results of the driveway analysis. As shown, all driveways will operate at acceptable levels of service at project buildout. **Table 6** summarizes the turn lane lengths and the projected queue for each turn lane.

Table 5: Driveway Results Summary

Intersection	AM Peak Hour			PM Peak Hour		
	Delay	V/C	LOS	Delay	V/C	LOS
Driveway 1 & Kanner Hwy	22.0	0.32	C	34.4	0.34	C
Driveway 2 & Kanner Hwy	9.6	0.04	A	9.9	0.09	A
Driveway 3 & Willoughby Blvd	16.7	0.05	C	15.5	0.08	C
Driveway 4 & Kanner Hwy	13.9	0.04	B	15.7	0.12	C

Table 6: Turn Lane Queue Analysis

Turn Lane Direction	Turn Lane Length (3)	Queue Length
Driveway 1		
NBR	350	71.2
NBL	400	25 (1)
SBL	335	97.7
Driveway 2		
NBR	270	0
NBL	315	25 (1)
SBL	270	25 (1)
Driveway 3		
NBL	265	25 (1)
SBR	240	0
Driveway 4		
NBR	195	25 (1)

(1) Less than 1 vehicle queue, 25' used instead
(2) Based on higher of AM or PM queue
(3) Includes 50 foot taper

The driveway HCS, the retail and residential driveway volumes, and existing FDOT data are included in **Appendix E.**

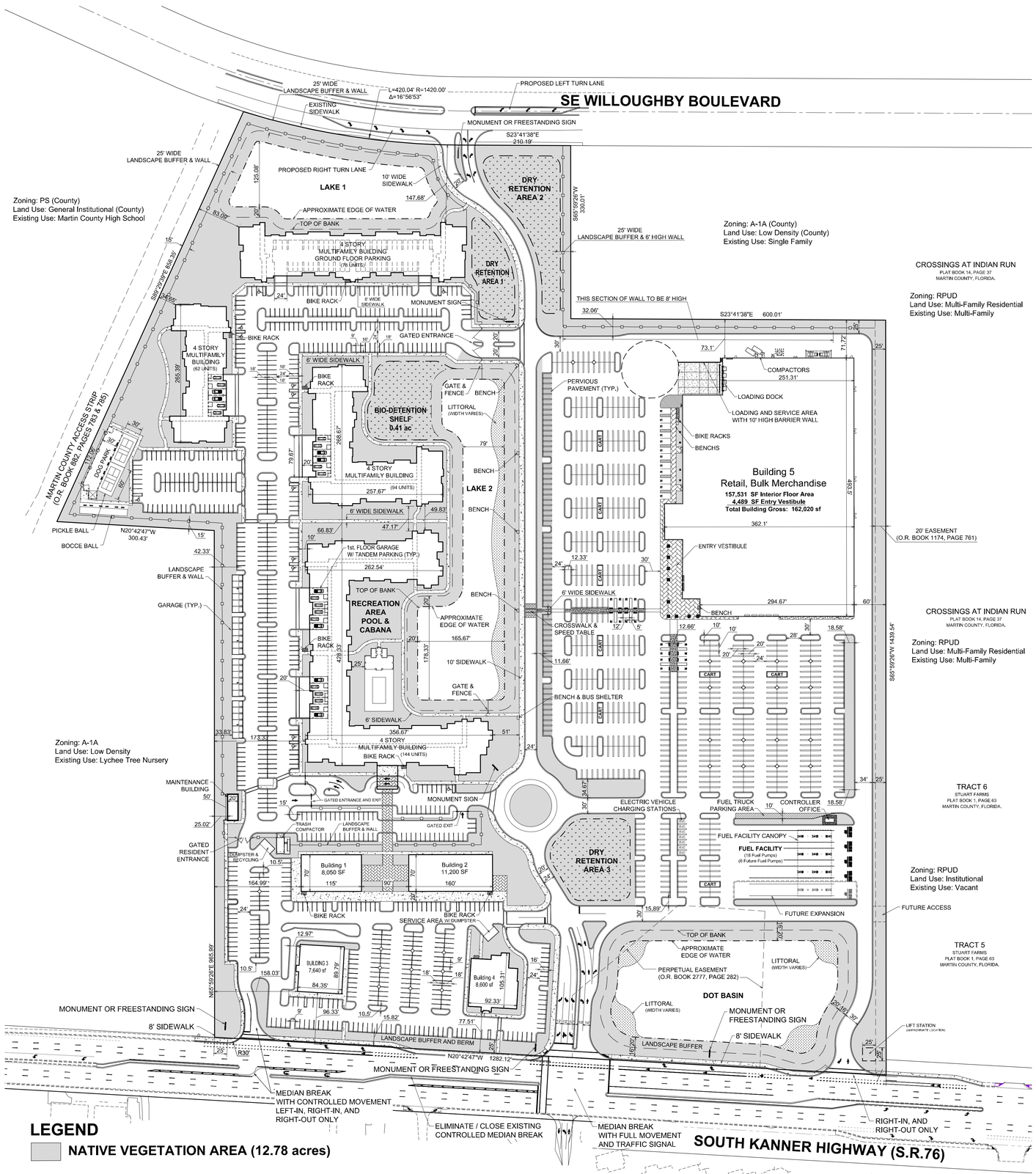
A pre-app meeting was held with FDOT to discuss the driveways. The results of the pre-app will be included in Appendix E when the FDOT finalizes their review. A signal warrant analysis will be required when the applicant applies for a construction permit. Based on the projected volumes at the full-access driveway, it is anticipated that a signal will be warranted. The full warrant analysis was provided to the FDOT under separate cover.

CONCURRENCY REVIEW/ CONCLUSION

The 157,531 square feet of Discount Club, 16,750 square feet of Shopping Center, 16,240 square feet of restaurant, 2,500 square feet of fast food with drive thru, and 398 units of apartment will have a traffic impact of 7,410 Daily trips, 341 AM peak hour trips and 668 PM peak hour trips. With the projects proposed signalization, turn lanes, and inclusion of Costco Boulevard, these project trips will be mitigated.

APPENDIX A

SITE PLAN



LEGEND

NATIVE VEGETATION AREA (12.78 acres)

Site Data

Total Site Area:	2,133,987 sf	(48.99 ac)	100%
Future Land Use Designation (Proposed):			Neighborhood Special District
Proposed Zoning:			CPUD
Building Height (max):			45'
Total Building Area:	361,572 sf	(8.30 ac)	16.9%

Pervious / Impervious Calculations

Impervious Area:	1,512,215 sf	(34.72 ac)	70.9%
Buildings:	361,572 sf	(8.30 ac)	16.9%
Pavement & Curb:	857,054 sf	(19.68 ac)	40.2%
Sidewalks, Patios & Pool:	105,309 sf	(2.42 ac)	5.0%
Lakes:	109,465 sf	(2.51 ac)	5.1%
DOT Basin:	78,815 sf	(1.81 ac)	3.7%
Pervious Area:	621,772 sf	(14.27 ac)	29.1%
Landscape:	548,757 sf	(12.59 ac)	25.7%
Dry Retention Areas:	55,155 sf	(1.27 ac)	2.6%
Bio Detention Area:	17,860 sf	(0.41 ac)	0.8%
Open Space			
Required: (25% of 48.99 ac)		(12.25 ac)	25.0%
Provided*:		(12.78 ac)	26.1%
* Includes Landscape with Native Vegetation Areas, Dry Retention Areas & Bio Detention Area, Excludes Parking Area Interior Landscape Areas.			
Interior Landscape Areas:		(1.49 ac)	3.0%

Parking Requirements

Parking Required (per Kanner CPUD):

Retail, bulk merchandise (1 space / 250 sf):	155,986 sf / 250 sf = 624 Spaces
Fuel Facility (1 space / 250 sf + 2 / bay + 1/vacuum):	20 Spaces
Retail (1 space / 250 sf):	19,250 sf / 250 sf = 77 Spaces
Building 3 (1 space per 100 sf +1 per each employee): 7,640 sf / 100 = 77 spaces + 13 employees	90 Spaces
Building 4 (1 space per 3 Seats + 1 per each employee): @ 300 seats + 18 employees:	118 Spaces
Multi-Family	692 Spaces
One Bedroom Units (128) @ 1.5 per unit: 192 Spaces	
Two Bedroom Units (240) @ 2.0 per unit: 480 Spaces	
Three Bedroom Units (10) @ 2.0 per unit: 20 Spaces	
Total Parking Required:	**1,621 Spaces**

Parking Provided:

Retail, bulk merchandise (per Kanner CPUD):	720 Spaces
Standard:	692 Spaces
Handicap:	28 Spaces
Fuel Facility:	20 Spaces
Retail:	77 Spaces
Standard:	73 Spaces
Handicap:	4 Spaces
Restaurant:	104 Spaces
Standard:	100 Spaces
Handicap:	4 Spaces
Restaurant:	104 Spaces
Standard:	100 Spaces
Handicap:	4 Spaces
Multi-Family (per Kanner CPUD 1.71 spaces / unit):	647 Spaces
Standard:	630 Spaces
Handicap:	17 Spaces
Total Parking Provided:	**1,672 Spaces**

Bicycle Parking

Retail, Bulk Merchandise		**Buildings 3 & 4**	
Required:	20 Spaces	Required:	8 Spaces
Provided:	20 Spaces	Provided:	8 Spaces
Buildings 1 & 2		**Multifamily**	
Required:	6 Spaces	Required:	20 Spaces
Provided:	6 Spaces	Provided:	20 Spaces

Neighborhood Special District

Residential Density		
Maximum UPA (Non- CRA):		15.0
Provided UPA:	7.7 UPA (378 units / 48.99 ac)	
Site Area	48.99 ac	
Residential		
Provided Area:	14.70 ac	30.0%
Non-Residential		
Provided Area:	34.29 ac	70.0%
Commercial Areas:	22.83 ac	46.6%
Stormwater Tracts:	8.95 ac	18.3%
Right of Way:	2.51 ac	5.1%
Non-Residential Floor Area Ratio		
Maximum Allowable Area:	4,267,974 sf	2.0 FAR
Provided Area:	193,146 sf	0.09 FAR

Building Data

Building Coverage:	361,572 sf
Retail, Bulk Merchandise:	157,531 sf
Fuel Facility Office:	125 sf
Retail:	19,250 sf
Restaurant:	16,240 sf
Multi-Family (Includes Garages, Cabana & Maintenanace):	168,426 sf

Native Vegetation Requirement

Total Site Area:	**48.99 acres**
Wetlands:	6.50 acres
Surface Waters:	4.10 acres
Upland Area:	38.39 acres

Required Native Vegetation Area (25.0%): 9.60 acres
Provided Native Vegetation Area (33.3%): 12.78 acres

General Notes:

- All building, parking and access areas shall document compliance with the requirements of the American Disabilities Act prior to the issuance of a building permit.
- Refer to Landscape Plan for landscape details and specifications.
- All exotic plant species shall be removed and all required landscaping shall be installed prior to the issuance of a Certificate of Occupancy.
- The applicant will request in writing, prior to any land clearing, that the City of Stuart Development Dept. Perform a field inspection to determine if barricades have been properly installed on the site.
- All signs will comply with the sign regulations at the time of permitting.
- "No Trespass" signs to be posted during construction and displayed at all entrances and exits.
- All building numbers to be no less than four (4) inches tall, illuminated, and not blocked by landscaping.
- Building numbers shall be placed at front and rear entrances.
- Sediment control measures shall be maintained in working order at all times.
- Provisions shall be made to minimize the deposit of sediment by transport vehicles onto public paved surfaces.
- Sediment basin and traps, perimeter dikes, sediment barriers and other measures intended to trap sediment shall be constructed as a first step in any land activity and shall be made functional before land disturbance takes place.
- All public sidewalks are to be a minimum of 6' in width.
- A crime watch contact shall be established on site, to include all residents and businesses.
- Any sidewalk damaged during construction shall be repaired or replaced.
- A/C Units, trash receptacles, back flow preventer, and other above ground utilities shall be screened with landscape per City of Stuart LDR.
- Knox Box key vaults shall be provided as required.
- No permanent trailers shall be permitted on site. A temporary construction trailer shall be allowed during the course construction activities.
- Detectable warning surfaces shall be provided at all sidewalk ramps and crosswalks.
- Buildings 1, 2, 3, 4 & 5 may include any use allowed in the CPUD Agreement and any additional additional parking required shall be debited against the excess parking provided.

Land Use Site Data

Total Site Area:	48.99 ac	
Right of Way:	2.51 ac	5.1%
Residential:	14.70 ac	30.0%
Commercial:	22.80 ac	46.6%
Retail, Bulk Merchandise:	17.24 ac	
Kanner Highway Parcel:	5.59 ac	
Stormwater Tracts:	8.95 ac	18.3%
Lake 1:	1.77 ac	
Lake 2:	2.85 ac	
Dry Retention Area 1:	0.32 ac	
Dry Retention Area 2:	0.78 ac	
Dry Retention Area 3:	0.48 ac	
DOT Basin:	2.75 ac	

Density & Floor Area Ratio

Residential	
Residential Units:	378
Density Overall Site:	7.7 UPA (378 units / 48.99 ac)
Commercial	
Project Site Area:	2,133,987 sf
Total Commercial Building Area:	193,146 sf
Floor Area Ratio:	0.09 FAR

lucido & associates
701 E Ocean Blvd., Stuart, Florida 34994 (772) 220-2100, Fax (772) 223-0220

Key / Location:

Project Team:

Applicant:
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Piscataway, NJ 07704
703-839-3776

Engineer:
Maser Consulting
410 Eagleview Blvd, Suite 104
Exton, PA 19341
610-254-9140

Engineer:
EDC Engineering
Rod Kennedy
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Port St Lucie, Florida, 34987

Surveyor:
EDC Engineering
Rod Kennedy
10250 SW Village Pkwy, Suite 201
Port St Lucie, Florida, 34987

Landscape Architect/Land Planner:
Lucido & Associates
701 E Ocean Blvd
Stuart, FL 34904
772-220-2100

Environmental
EW Consultants
Ed Weinberg
1000 SE Monterey Commons Blvd #208
Stuart, Florida 34996

KANNER CPUD

City of Stuart, Martin County, Florida

Master Site Plan

Date	By	Description
8.21.2020	SLS	Initial Submittal
12.18.2020	SLS	1st Resubmittal
03.16.2021	SLS	2nd Resubmittal
04.21.2021	SLS	3rd Resubmittal
05.13.2021	SLS	LPA Comments
06.16.2021	SLS	Reduced Residential Units

NORTH

SCALE: 1" = 100'

0 50' 100' 200'

REG. # 1018
Thomas P. Lucido

Designer	---
Manager	---
Project Number	---
Municipal Number	---
Computer File	19-935 - Costco Master Site Plan.dwg

Sheet **1 of 1**

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APPENDIX B

NON-MOTORIZED FEATURES

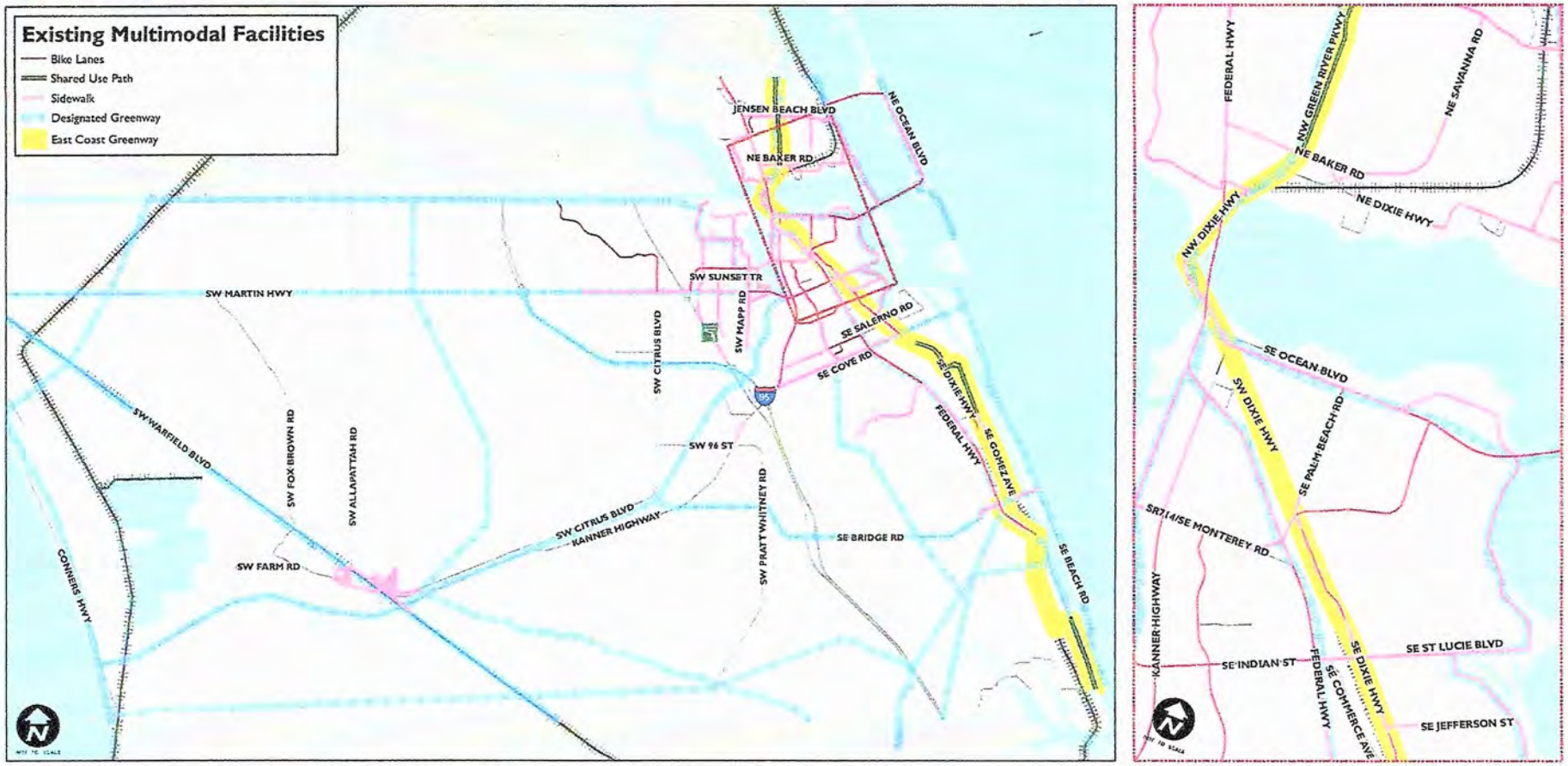


Figure 2-2. Existing Multimodal Facilities

Figure 2-2 provides an overview of existing and designated bicycle and pedestrian facilities. This includes roadways with existing bike lanes, shared use paths, and sidewalks along major roadways. As illustrated, nearly all the existing bike lanes and shared use paths are located within the eastern portion of the County and serve to connect the urbanized areas. Included in Figure 2-2 is the proposed East Coast Greenways (ECG), which are trails of regional and statewide significance and connect to Palm Beach and St. Lucie Counties. The light-green network represents the Designated Greenways – these greenways do not necessarily represent existing bike facilities, rather they identify corridors along which to provide a facility.

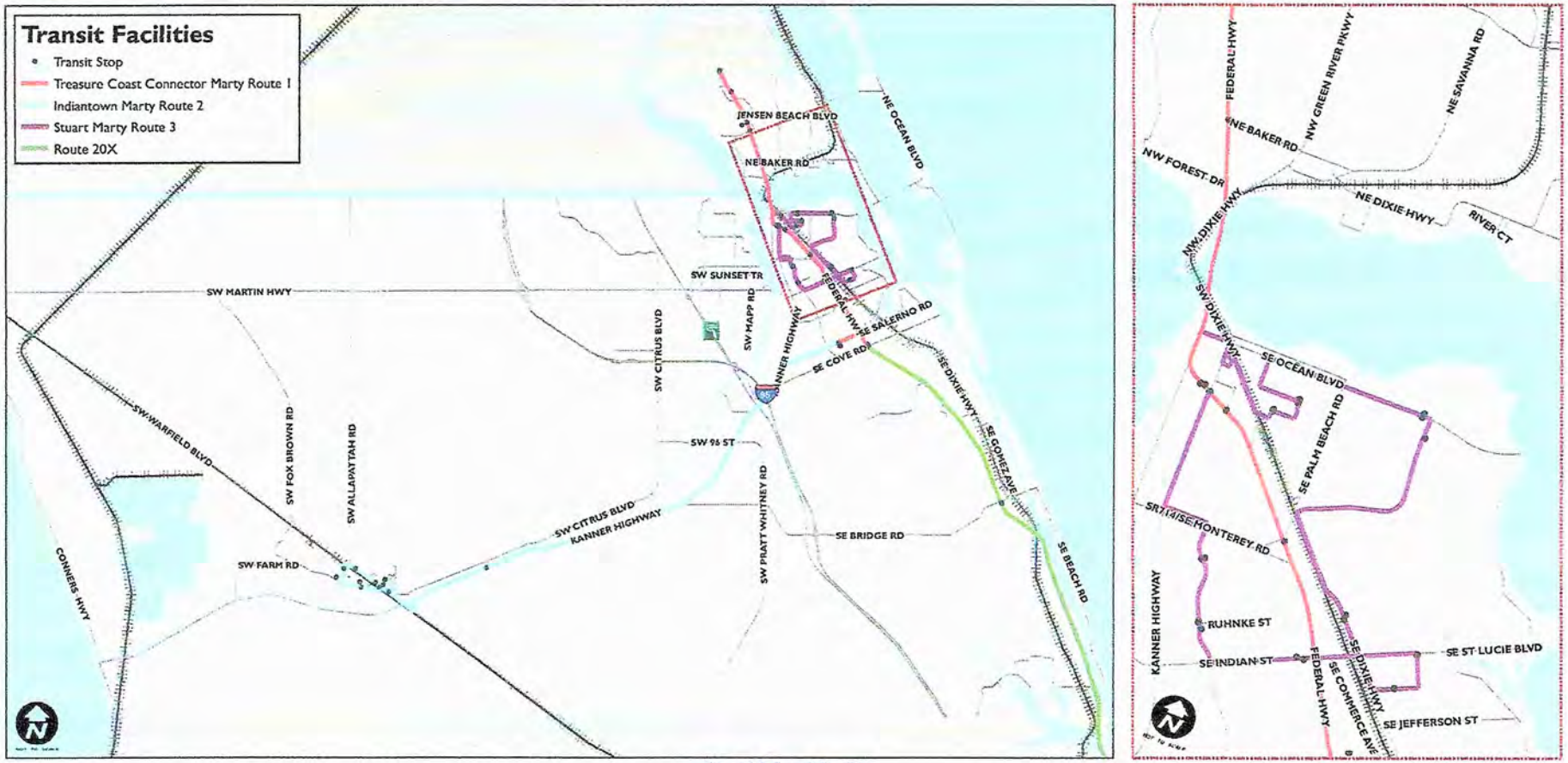


Figure 2-3. Transit Facilities

Figure 2-3 illustrates the locations of the transit routes and stops in Martin County. Four bus routes serve Martin County: Route 1/US 1 Corridor, Route 2/Indiantown, Route 3/Stuart, and Route 20X. Route 1/US 1 Corridor provides service from Port Salerno north to St. Lucie County while Route 20X provides commuter service south to Palm Beach County. Route 2/Indiantown serves as a connector between Indiantown and the urbanized east coast of Martin County while Route 3/Stuart provides a circulator service within the Stuart urbanized area.

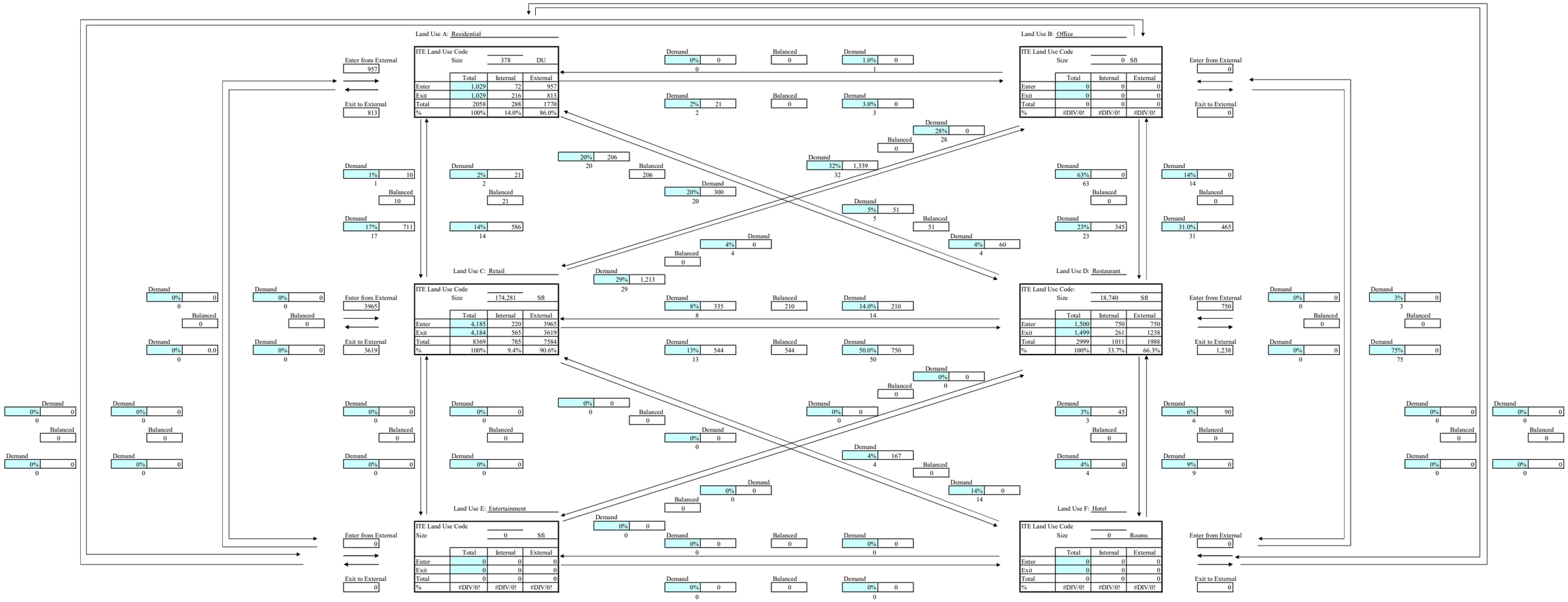
APPENDIX C

INTERNAL CAPTURE

TABLE 1: Daily Internal Traffic

PROJECT
TRIP INTERNALIZATION - Daily

Analyst _____ Name of Devlpt PROJECT
Date _____ Time Period Daily



Net External Trips for Multi-Use Development

	Land Use A	Land Use B	Land Use C	Land Use D	Land Use E	Land Use F	Total	
Enter	957	0	3965	750	0	0	5672	
Exit	813	0	3619	1238	0	0	5670	Internal
Total	1770	0	7584	1988	0	0	11342	Capture
Single-Use Trip Gen Estimate	2058	0	8369	2999	0	0	13426	15.5%

Source: based on procedures from the ITE Trip Generation Handbook, Chapter 7, March 2001

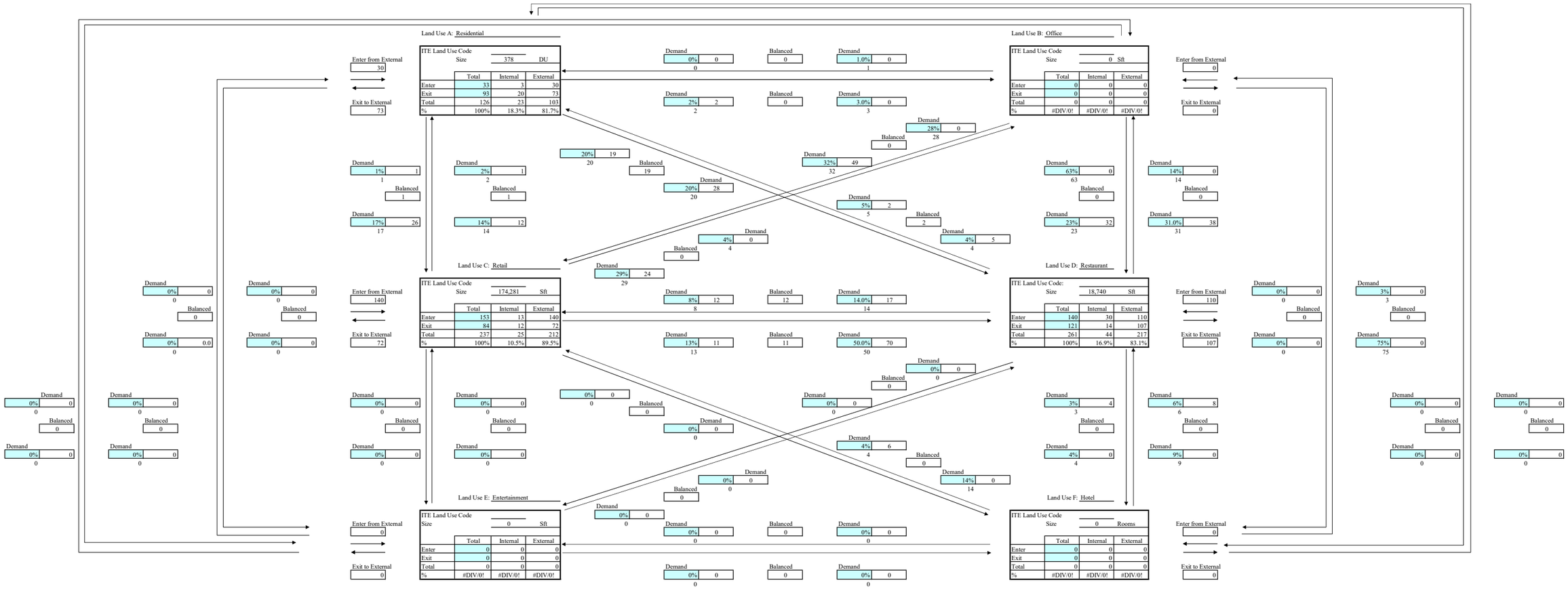
Note: Numbers outside of the Box are the ITE Pairing Values. Numbers inside the Box are Actual Values used.

TABLE 1: AM Internal Traffic - Phase 1

PROJECT
TRIP INTERNALIZATION - AM

Analyst
Date

Name of Devlpt: PROJECT
Time Period: AM Peak Hour



Net External Trips for Multi-Use Development

	Land Use A	Land Use B	Land Use C	Land Use D	Land Use E	Land Use F	Total	
Enter	30	0	140	110	0	0	280	
Exit	73	0	72	107	0	0	252	Internal
Total	103	0	212	217	0	0	532	Capture
Single-Use Trip Gen Estimate	126	0	237	261	0	0	624	14.7%

Source: based on procedures from the ITE Trip Generation Handbook, Chapter 7, March 2001

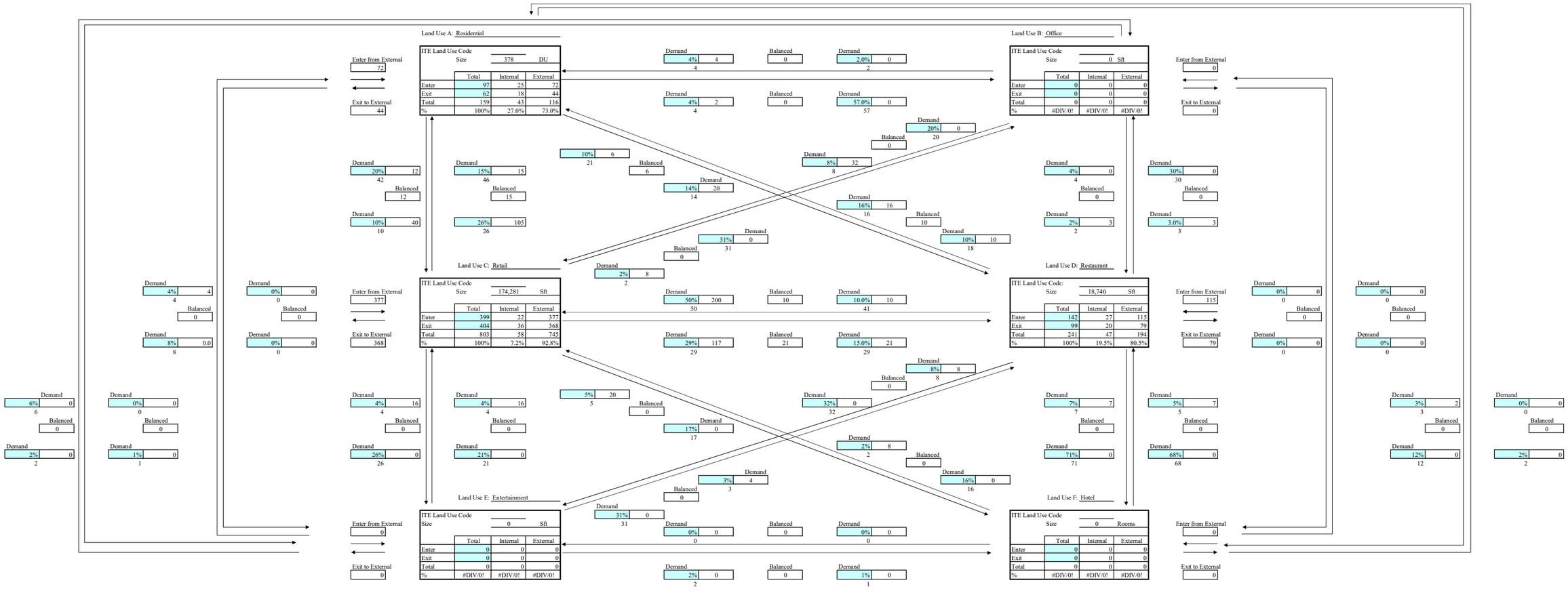
Note: Numbers outside of the Box are the ITE Pairing Values. Numbers inside the Box are Actual Values used.

TABLE 1: PM Internal Traffic

PROJECT
TRIP INTERNALIZATION - PM

Analyst
Date

Name of Devlpt: PROJECT
Time Period: PM Peak Hour



Net External Trips for Multi-Use Development

	Land Use A	Land Use B	Land Use C	Land Use D	Land Use E	Land Use F	Total	
Enter	72	0	377	115	0	0	564	
Exit	44	0	368	79	0	0	491	Internal
Total	116	0	745	194	0	0	1055	Capture
Single-Use Trip Gen Estimate	159	0	803	241	0	0	1203	12.3%

Source: based on procedures from the ITE Trip Generation Handbook, Chapter 7, March 2001

Note: Numbers outside of the Box are the ITE Pairing Values. Numbers inside the Box are Actual Values used.

Table 13 – Road Improvement Needs by Land Use Type

Land Use	Unit	Trips	Trip Length	% New	Adj %	VMT	New Rds (Ln Ft)
Residential:							
800 FT² & Under	Dwelling	5.34	5.63	100%	35%	10.66	6.13
801 to 1,100	Dwelling	5.40	5.63	100%	35%	10.78	6.19
1,101 to 2,300	Dwelling	6.63	5.63	100%	35%	13.23	7.60
2,301 & Over	Dwelling	9.57	5.63	100%	35%	19.10	10.98
Non-Residential:							
Hotel/Motel	Room	8.17	5.57	90%	35%	14.52	8.34
RV Park	Per Lot	4.00	5.57	90%	35%	7.11	4.09
Nursing Home	1000 s.f.	7.58	3.46	100%	35%	9.30	5.34
ACLF	1000 s.f.	2.66	3.46	100%	35%	3.26	1.88
Medical Office	1000 s.f.	36.13	3.46	90%	35%	39.88	22.92
Bank Walk In	1000 s.f.	69.60	3.46	53%	35%	45.25	26.00
Bank w/Drive In	1000 s.f.	148.15	3.46	53%	35%	96.31	55.35
Office Under 100,000 FT²	1000 s.f.	13.34	5.63	90%	35%	23.96	13.77
Office 100,000 to 199,999 FT²	1000 s.f.	11.38	5.63	90%	35%	20.44	11.75
Office 200,000 to 399,999 FT²	1000 s.f.	11.44	5.63	90%	35%	20.55	11.81
Office 400,000 TO 599,999 FT²	1000 s.f.	11.10	5.63	90%	35%	19.94	11.46
Office 600,000 TO 799,999 FT²	1000 s.f.	10.93	5.63	90%	35%	19.63	11.28
Office 800,000 TO 999,999 FT²	1000 s.f.	10.83	5.63	90%	35%	19.45	11.18
Office 1,000,000 Ft² or Larger	1000 s.f.	10.75	5.63	90%	35%	19.31	11.10
Manufacturing	1000 s.f.	3.82	5.63	90%	35%	6.86	3.94
Warehouse	1000 s.f.	3.56	5.63	90%	35%	6.40	3.68
Mini-Warehouse	1000 s.f.	2.50	5.63	90%	35%	4.49	2.58
Gen. Industrial	1000 s.f.	6.97	5.63	90%	35%	12.52	7.20
Retail Under 50,000 FT²	1000 s.f.	84.76	1.50	52%	35%	23.44	13.47
Retail 50,000 to 99,999 FT²	1000 s.f.	67.92	2.50	52%	35%	31.30	17.99
Retail 100,000 to 199,999 FT²	1000 s.f.	53.28	3.00	61%	35%	34.57	19.87
Retail 200,000 to 399,999 FT²	1000 s.f.	41.80	4.00	74%	35%	43.86	25.21
Retail 400,000 TO 599,999 FT²	1000 s.f.	36.27	5.73	77%	35%	56.73	32.60
Retail 600,000 TO 799,999 FT²	1000 s.f.	32.80	6.87	79%	35%	63.11	36.27
Retail 800,000 TO 999,999 FT²	1000 s.f.	30.33	8.00	80%	35%	68.81	39.55
Retail 1,000,000 Ft² or Larger	1000 s.f.	28.06	8.00	81%	35%	64.46	37.05
Gasoline/Service Station	Fuel Pstn	168.56	1.50	50%	35%	44.82	25.76
Auto Sales & Repair	1000 s.f.	33.34	3.46	85%	35%	34.76	19.98
Restaurant	1000 s.f.	89.95	3.29	56%	35%	58.75	33.76
Fast Food Restaurant	1000 s.f.	496.12	1.50	51%	35%	134.54	77.33
Car Wash	1000 s.f.	108.00	3.46	100%	35%	132.47	76.13
Convenience Store w/o Gas	1000 s.f.	737.99	1.50	39%	35%	153.05	87.96
Convenience Store w/Gas	1000 s.f.	845.60	1.50	39%	35%	175.36	100.79
Pharmacy w/Drive Thru	1000 s.f.	88.16	3.46	50%	35%	54.07	31.07
Golf Course	Hole	35.74	3.21	95%	35%	38.64	22.21
Racquet Club	1000 s.f.	14.03	3.21	95%	35%	15.17	8.72
Parks	Acre	2.28	3.21	95%	35%	2.47	1.42
Tennis Court	Court	31.04	3.21	95%	35%	33.56	19.29
Marina	Slip	2.96	3.37	95%	35%	3.36	1.93
Boat Storage	Slip	2.96	3.37	95%	35%	3.36	1.93
Post Office	1000 s.f.	108.19	3.21	90%	35%	110.80	63.68
Library	1000 s.f.	56.24	5.63	90%	35%	101.02	58.06
Day Care Center	1000 s.f.	79.26	3.46	50%	35%	48.61	27.94
Hospital	1000 s.f.	16.50	5.63	90%	35%	29.64	17.03
House of Worship	1000 s.f.	9.11	5.36	95%	35%	16.45	9.45
Movie Theatre	1000 s.f.	78.06	3.21	95%	35%	84.39	48.50
Elem School	1000 s.f.	15.43	5.36	100%	35%	29.32	16.85
Middle School	1000 s.f.	13.78	5.36	100%	35%	26.18	15.05
High School	1000 s.f.	12.89	5.36	100%	35%	24.49	14.08
Fitness Center	1000 s.f.	32.93	3.46	95%	35%	38.37	22.05

Source: Institute of Transporation Engineers Trip Generation - 8th Edition
Palm Beach County Trip Generation Rates - September 1, 2011
Walter H. Keller, Inc.

Allowable Pass-By Calculation

Segment	From	To	Existing 2019 AADT	Existing 2019 2-Way Peak Hour Trips	Growth Rate	2024 Daily Trips	Daily Pass-By Allowed	2024 2-Way Peak Hour Trips	Peak Hour Pass-By Allowed
Kanner Hwy	Indian St	Monterey Rd	21116	1631	1.005	21649	2164.9	1672	167.2
Willoughby Blvd	Indian St	Monterey Rd	11100	1280	1.037	13311	1331.1	1535	153.5
Indian St	Kanner Hwy	Willoughby Blvd	29306	2771	1.047	36871	3687.1	3486	348.6
						Total:	7183		669

APPENDIX D

MARTIN COUNTY 2019 ROADWAY LEVEL OF SERVICE INVENTORY REPORT

Martin County 2019 Roadway Level of Service Inventory Report

Road Name	From	To	Type	Generalized Service Capacity	2019 Average Annual Daily Traffic	2019 Peak Hour Directional Volume	2019 Generalized LOS	Avg. Annual Growth Rate
CR-714 (Veteran's Memorial Bridge)	Mapp Rd	SR-76	Class I: 4-Ln Divided	2000	23,957	1,622	C	6.1%
CR-723 (Savanna Rd)	CR-707	NE 24th St	Class I: 2-Ln Undivided	880	9,135	384	C	0.5%
CR-723 (Savanna Rd)	NE 24th St	CR-707A (Jensen Beach Blvd.)	Class I: 2-Ln Undivided	880	9,631	471	C	1.0%
CR-726 (Citrus Blvd)	SR-710	Greenridge Ln	Uninterrupted Rural Hwy: 2-Ln Undivided	740	2,783	126	A/B	0.5%
CR-726 (Citrus Blvd)	Greenridge Ln	CR-76A	Uninterrupted Rural Hwy: 2-Ln Undivided	740	2,488	137	A/B	0.5%
CR-76A (Citrus Blvd.)	CR-726	SR-714	Transitional 2-Ln Uninter /Undivided Flow	1200	4,269	283	A/B	8.0%
CR-76A (SW 96th St)	CR-726	Pennsylvania Ave	Transitional 2-Ln Uninter /Undivided Flow	1200	3,845	195	A/B	8.0%
CR-76A (SW 96th St)	Pennsylvania Ave	SR-76	Class I: Transitional 2-Ln Undivided	800	8,086	492	C	2.5%
CR-A1A (Dixie Hwy)	SR-5	CR-708	Class II: 2-Ln Undivided	750	3,416	192	C	4.7%
CR-A1A (Dixie Hwy)	CR-708	Osprey St	Class I: 2-Ln Undivided	880	7,552	477	C	3.7%
CR-A1A (Dixie Hwy)	Osprey St	Heritage Blvd	2-Ln Uninter /Undivided Flow	1190	6,595	393	A/B	3.1%
CR-A1A (Dixie Hwy)	Heritage Blvd	Cove Rd	2-Ln Uninter /Undivided Flow	1190	7,147	346	A/B	2.9%
CR-A1A (Dixie Hwy)	Cove Rd	Salerno Rd	Class II: 2-Ln Divided	790	12,131	617	D	3.1%
CR-A1A (Dixie Hwy)	Salerno Rd	St. Lucie Blvd	Class II: 2-Ln Undivided	750	17,261	835	F	3.3%
CR-A1A (Dixie Hwy)	St Lucie Blvd	Jefferson St	Class II: 2-Ln Undivided	750	14,108	748	D	2.9%
CR-A1A (Dixie Hwy)	Jefferson St	Indian St	Class II: 4-Ln Divided	1630	18,389	848	D	2.2%
CR-A1A (Dixie Hwy)	Indian St	SR-714	Class I: 4-Ln Divided	2000	17,161	824	C	3.1%
CR-A1A (Dixie Hwy)	SR-714	SE Fifth St	2-Ln Undivided Non-State	675	6,710	346	D	1.6%
Farm Rd	Dr Martin Luther King Jr Dr	Palm Wy	Class II: 2-Ln Undivided	750	2,817	124	C	3.2%
Fox Brown Rd	SR-710	CR-714	Uninterrupted Rural Hwy: 2-Ln Undivided	740	347	16	A/B	0.0%
Goldenrod Rd	Britt Rd	SR-732	Class II: 4-Ln Divided	1630	4,810	278	A/B	0.5%

Segments with shaded LOS require additional analysis.
The peaks are: CR-A1A (PM/SB) and Murphy Rd (PM/NB).

Martin County 2019 Roadway Level of Service Inventory Report

Road Name	From	To	Type	Generalized Service Capacity	2019 Average Annual Daily Traffic	2019 Peak Hour Directional Volume	2019 Generalized LOS	Avg. Annual Growth Rate
Goldenrod Rd	SR-732	SR-5	Class II: 2-Ln Undivided	750	6,877	402	D	1.9%
Goldenrod Rd	SR-5	Westmoreland Blvd	Class II: 2-Ln Undivided	750	4,635	295	C	3.0%
Gomez Ave	CR-708	Crossrip St	Class II: 2-Ln Undivided	750	3,732	199	C	1.4%
Gomez Ave	Crossrip St	Osprey St	Class II: 2-Ln Undivided	750	1,065	61	C	0.5%
Green River Parkway	Dixie Hwy	Baker Rd	Class II: 2-Ln Undivided	750	6,833	351	C	3.1%
Green River Parkway	Baker Rd	SR-732	Class I: 2-Ln Undivided	880	8,341	596	C	4.3%
Green River Parkway	SR-732	St. Lucie County	2-Ln Uninter /Undivided Flow	1190	8,667	576	C	1.8%
Horseshoe Point Rd	CR-A1A	Kubin Ave	2-Ln Undivided Non-State	675	5,647	285	C	0.5%
Indian St	SR-76	Willoughby Blvd	Class I: 4-Ln Divided	2000	29,306	1,729	C	4.7%
Indian St	Willoughby Blvd	SR-5	Class I: 4-Ln Divided	2000	27,852	1,236	C	2.8%
Indian St	SR-5	Commerce Ave	Class I: 4-Ln Divided	2000	22,368	995	C	0.5%
Indian St	Commerce Ave	CR-A1A	Class I: 4-Ln Divided	2000	25,515	1,199	C	2.5%
Indian St	CR-A1A	St Lucie Blvd	2-Ln Undivided Non-State	675	7,051	346	D	1.1%
Indian River Dr	Palmer St	CR-707	Class II: 2-Ln Undivided	750	7,509	374	D	3.7%
Island Way	Palm Beach County	Jupiter Road	Transitional 2-Ln Uninter /Undivided Flow	1200	4,493	302	A/B	3.4%
Island Way	Jupiter Road	Country Club Dr	Class II: 2-Ln Undivided	750	4,855	213	C	0.5%
Jack James Rd	SR-76	Blue Water Wy	Class II: 2-Ln Undivided	750	3,132	294	C	0.5%
Lares St	CR-708	CR-A1A	2-Ln Undivided Non-State	675	3,349	235	C	0.6%
Little Club Wy	Country Club Dr	Wooden Bridge Wy	2-Ln Undivided Non-State	675	2,273	103	C	0.5%
Locks Rd	Canal St	SR-76	2-Ln Undivided Non-State	675	3,667	232	C	2.0%
MacArthur Blvd	Sailfish Point	SR-A1A	2-Ln Undivided Non-State	675	5,989	368	D	6.8%

Segments with shaded LOS require additional analysis.
The peaks are: CR-A1A (PM/SB) and Murphy Rd (PM/NB).

Martin County 2019 Roadway Level of Service Inventory Report

Road Name	From	To	Type	Generalized Service Capacity	2019 Average Annual Daily Traffic	2019 Peak Hour Directional Volume	2019 Generalized LOS	Avg. Annual Growth Rate
SR-5 (US-1)	Britt Rd	SR-732	Class I: 7-Ln Divided	3530	55,878	2,898	C	0.8%
SR-5 (US-1)	SR-732	Westmoreland Blvd	Class I: 8-Ln Divided	4040	64,147	3,522	C	0.5%
SR-5 (US-1)	Westmoreland Blvd	St Lucie County	Class I: 8-Ln Divided	4040	60,343	2,721	C	0.5%
SR-710 (Warfield Blvd)	Okeechobee County	Fox Brown Rd	Uninterrupted Rural Hwy: 2-Ln Undivided	670	6,348	257	C	4.8%
SR-710 (Warfield Blvd)	Fox Brown Rd	CR-609 (Allapattah)	2-Ln Uninter /Undivided Flow	840	7,419	310	A/B	3.0%
SR-710 (Warfield Blvd)	CR-609 (Allapattah)	Van Buren	Class I: 2-Ln Undivided	870	12,335	694	C	4.0%
SR-710 (Warfield Blvd)	Van Buren	CR-726 (Citrus)	Class II: 4-Ln Divided	1710	12,335	694	A/B	4.0%
SR-710 (Warfield Blvd)	CR-726	SR-76 (Kanner)	Transitional 4-Ln Uninter /Divided Flow	2450	11,001	431	A/B	3.4%
SR-710 (Warfield Blvd)	SR-76	Palm Beach County	Transitional 4-Ln Uninter /Divided Flow	2450	6,959	258	A/B	1.4%
SR-714 (Martin Hwy)	I-95	CR-76A (Citrus)	Transitional 2-Ln Uninter /Undivided Flow	1200	13,786	735	C	5.1%
SR-714 (Martin Hwy)	CR-76A (Citrus)	Florida's Turnpike	Class I: 4-Ln Divided	2000	21,291	1,136	C	4.9%
SR-714 (Martin Downs Blvd)	Florida's Turnpike	CR-713	Class I: 4-Ln Divided	2000	20,695	1,038	C	1.7%
SR-714 (Martin Downs Blvd)	CR-713	Matheson Ave	Class I: 4-Ln Divided	2000	27,291	1,267	C	0.5%
SR-714 (Martin Downs Blvd)	Matheson Ave	Mapp Rd	Class I: 4-Ln Divided	2000	32,789	1,738	C	0.5%
SR-714 (Palm City Bridge)	Mapp Rd	SR-76	Class I: 4-Ln Divided	2000	34,751	1,989	D	0.5%
SR-714 (Monterey Rd)	SR-76	Willoughby Blvd	Class I: 4-Ln Divided	2000	22,465	1,274	C	0.5%
SR-714 (Monterey Rd)	Willoughby Blvd	Monterey Extension	Class I: 4-Ln Divided	2000	24,716	1,186	C	0.6%
SR-714 (Monterey Rd)	Monterey Extension	SR-5	Class I: 4-Ln Divided	2000	18,136	926	C	0.8%
SR-714 (Monterey Rd)	SR-5	CR-A1A	Class II: 4-Ln Divided	1630	21,333	1,099	D	0.5%
SR-714 (Monterey Rd)	CR-A1A	SR-A1A	Class I: 4-Ln Divided	1910	19,430	1,031	C	1.1%
SR-732 (Causeway Blvd)	CR-707	SR-A1A	2-Ln Uninter /Undivided Flow	1190	12,645	786	C	0.5%

Segments with shaded LOS require additional analysis.
The peaks are: CR-A1A (PM/SB) and Murphy Rd (PM/NB).

Martin County 2019 Roadway Level of Service Inventory Report

Road Name	From	To	Type	Generalized Service Capacity	2019 Average Annual Daily Traffic	2019 Peak Hour Directional Volume	2019 Generalized LOS	Avg. Annual Growth Rate
SR-732 (Jensen Beach Blvd)	SR-5	Green River Pkwy	Class I: 4-Ln Divided	2000	25,949	1,349	C	0.5%
SR-732 (Jensen Beach Blvd)	Green River Pkwy	CR-723	Class I: 4-Ln Divided	2000	23,804	1,154	C	0.5%
SR-76 (Kanner Hwy)	SR-15	SR-710	Uninterrupted Rural Hwy: 2-Ln Undivided	740	2,134	111	A/B	6.1%
SR-76 (Kanner Hwy)	SR-710	CR-708	Uninterrupted Rural Hwy: 2-Ln Undivided	740	3,412	151	A/B	0.9%
SR-76 (Kanner Hwy)	CR-708	CR-711/CR-76A	Transitional 2-Ln Uninter /Undivided Flow	1200	2,889	168	A/B	0.5%
SR-76 (Kanner Hwy)	CR-711/CR76A	Locks Rd	Class I: 4-Ln Divided	2000	13,401	831	C	1.7%
SR-76 (Kanner Hwy)	Locks Rd	Jack James	Class I: 4-Ln Divided	2000	19,231	920	C	0.5%
SR-76 (Kanner Hwy)	Jack James	Cove Rd	Class I: 6-Ln Divided	3020	43,880	2,372	C	0.6%
SR-76 (Kanner Hwy)	Cove Rd	Salerno Rd	Class I: 6-Ln Divided	3020	34,493	1,495	C	1.0%
SR-76 (Kanner Hwy)	Salerno Rd	Indian St	Class I: 6-Ln Divided	3020	30,912	1,293	C	2.6%
SR-76 (Kanner Hwy)	Indian St	SR-714	Class I: 6-Ln Divided	3020	21,116	993	C	0.5%
SR-76 (Kanner Hwy)	SR-714	SR-5	Class I: 6-Ln Divided	3020	25,158	1,006	C	0.5%
SR-A1A (Ocean Blvd)	SR-714	St Lucie Blvd	Class II: 4-Ln Divided	1630	19,437	1,081	D	0.6%
SR-A1A (Ocean Blvd)	St Lucie Blvd	Sewalls Point Rd	Class I: 4-Ln Divided	2000	23,060	1,127	C	1.0%
SR-A1A (Ocean Blvd)	Sewalls Point Rd	Macarthur Blvd	Class I: 2-Ln Divided	925	13,597	845	C	0.5%
SR-A1A (Ocean Blvd)	MacArthur Blvd	SR-732	2-Ln Uninter /Undivided Flow	1190	8,532	407	A/B	3.1%
SR-A1A (Ocean Blvd)	SR-732	St Lucie County	2-Ln Uninter /Undivided Flow	1190	14,752	870	D	1.8%
St Lucie Blvd	CR-A1A	Indian St	2-Ln Undivided Non-State	675	3,305	172	C	0.5%
St Lucie Blvd	Indian St	SR-A1A	2-Ln Undivided Non-State	675	7,524	429	D	3.3%
Westmoreland Blvd	St Lucie County	SR-5	Class II: 2-Ln Divided	790	12,271	601	D	1.0%
Willoughby Blvd	Cove Rd	Salerno Rd	Class I: 2-Ln Undivided	880	4,332	214	C	8.0%

Segments with shaded LOS require additional analysis.
The peaks are: CR-A1A (PM/SB) and Murphy Rd (PM/NB).

Martin County 2019 Roadway Level of Service Inventory Report

Road Name	From	To	Type	Generalized Service Capacity	2019 Average Annual Daily Traffic	2019 Peak Hour Directional Volume	2019 Generalized LOS	Avg. Annual Growth Rate
Willoughby Blvd	Salerno Rd	Pomeroy St	Class I: 2-Ln Undivided	880	9,007	544	C	5.4%
Willoughby Blvd	Pomeroy St	Indian St	Class I: 4-Ln Divided	2000	11,709	597	C	8.0%
Willoughby Blvd	Indian St	SR-714	Class I: 4-Ln Divided	2000	11,100	666	C	3.7%
Wright Blvd	SR-5	Dixie Highway	Class II: 2-Ln Undivided	750	10,460	555	D	4.3%

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Segments with shaded LOS require additional analysis.
The peaks are: CR-A1A (PM/SB) and Murphy Rd (PM/NB).

FLORIDA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION STATISTICS OFFICE
2019 HISTORICAL AADT REPORT

COUNTY: 89 - MARTIN

SITE: 0114 - SR 76/COLORADO AVE - SW OF MONTEREY RD(COUNTY LINK: 132)

YEAR	AADT	DIRECTION 1	DIRECTION 2	*K FACTOR	D FACTOR	T FACTOR
2019	26000 C	N 13500	S 12500	9.00	62.40	5.50
2018	27500 C	N 13500	S 14000	9.00	61.40	5.50
2017	25500 C	N 13000	S 12500	9.00	61.80	5.50
2016	26000 C	N 13000	S 13000	9.00	62.10	4.90
2015	26000 C	N 13000	S 13000	9.00	62.30	4.90
2014	23000 C	N 12000	S 11000	9.00	62.60	5.30
2013	26500 C	N 13500	S 13000	9.00	62.40	5.90
2012	25000 C	N 12500	S 12500	9.00	60.30	5.90
2011	27500 C	N 14000	S 13500	9.00	59.50	3.40
2010	27500 C	N 14000	S 13500	9.38	58.28	3.40
2009	28000 C	N 15000	S 13000	9.15	62.05	3.40
2007	28000 C	N 14000	S 14000	9.15	59.55	4.90
2006	27000 C	N 14000	S 13000	9.10	57.64	8.50
2005	26000 C	N 13500	S 12500	9.00	59.00	6.10
2004	28000 C	N 14500	S 13500	8.90	61.20	6.10

AADT FLAGS: C = COMPUTED; E = MANUAL ESTIMATE; F = FIRST YEAR ESTIMATE
S = SECOND YEAR ESTIMATE; T = THIRD YEAR ESTIMATE; R = FOURTH YEAR ESTIMATE
V = FIFTH YEAR ESTIMATE; 6 = SIXTH YEAR ESTIMATE; X = UNKNOWN
*K FACTOR: STARTING WITH YEAR 2011 IS STANDARDK, PRIOR YEARS ARE K30 VALUES

FLORIDA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION STATISTICS OFFICE
2019 HISTORICAL AADT REPORT

COUNTY: 89 - MARTIN

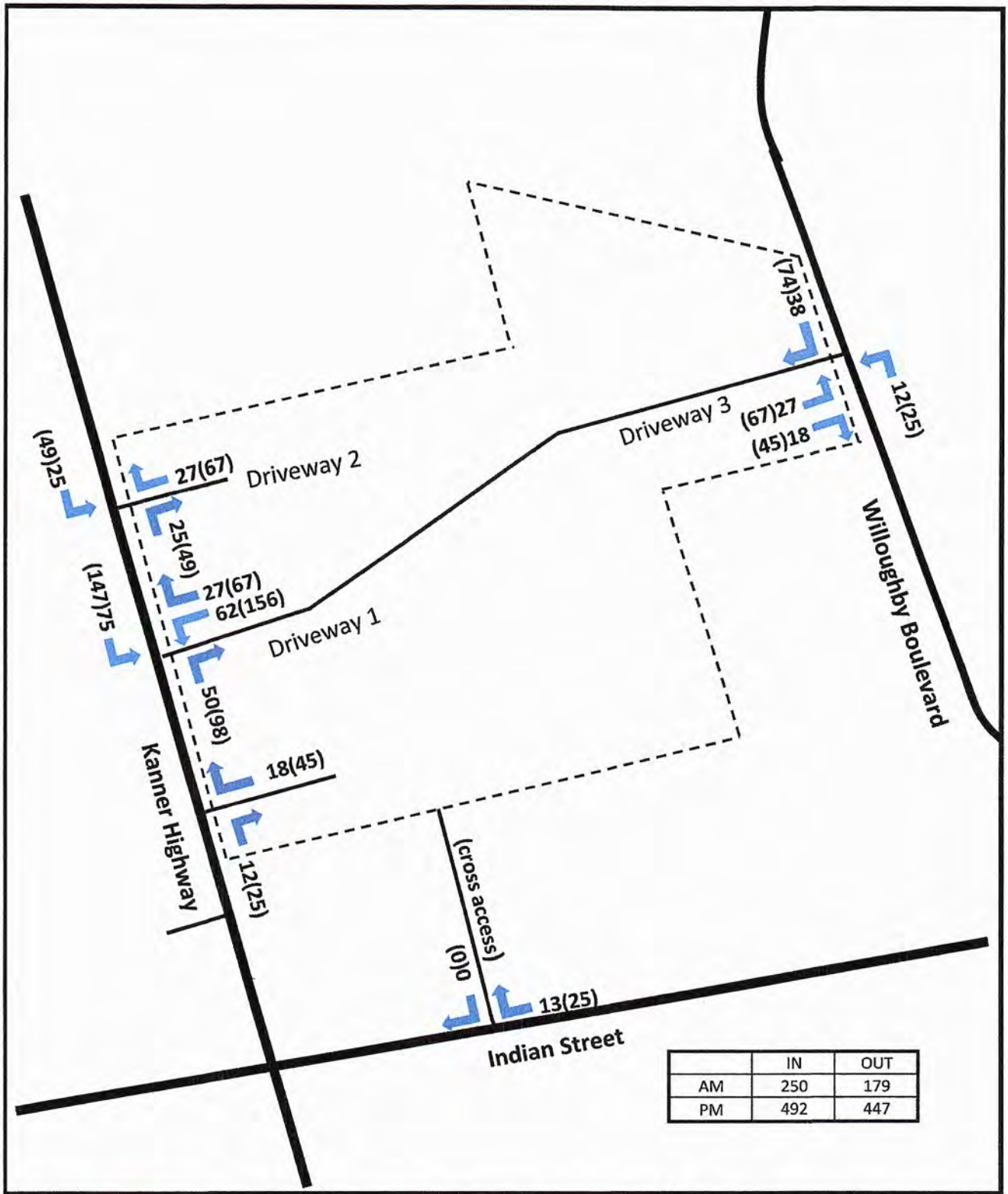
SITE: 0063 - SE WILLOUGHBY BLVD SOUTN FO INDIAN ST(COUNTY LINK: 160)

YEAR	AADT	DIRECTION 1	DIRECTION 2	*K FACTOR	D FACTOR	T FACTOR
2019	14900 F	N 7400	S 7500	9.00	62.40	13.80
2018	14700 C	N 7300	S 7400	9.00	61.40	6.10
2017	9900 V	N 4900	S 5000	9.00	61.80	3.90
2016	9700 R	N 4800	S 4900	9.00	62.10	3.80
2015	9300 T	N 4600	S 4700	9.00	62.30	6.50
2014	9100 S	N 4500	S 4600	9.00	62.60	10.10
2013	8900 F	N 4400	S 4500	9.00	62.40	11.00
2012	8700 C	N 4300	S 4400	9.00	60.30	10.50

AADT FLAGS: C = COMPUTED; E = MANUAL ESTIMATE; F = FIRST YEAR ESTIMATE
S = SECOND YEAR ESTIMATE; T = THIRD YEAR ESTIMATE; R = FOURTH YEAR ESTIMATE
V = FIFTH YEAR ESTIMATE; 6 = SIXTH YEAR ESTIMATE; X = UNKNOWN
*K FACTOR: STARTING WITH YEAR 2011 IS STANDARDK, PRIOR YEARS ARE K30 VALUES

APPENDIX E

DRIVEWAY DATA AND ANALYSES



	IN	OUT
AM	250	179
PM	492	447

O'ROURKE ENGINEERING & PLANNING

NTS

22 SE Seminole St
Stuart, Fl, 34994

Job #: MR18031.0 | Date: 6/25/20

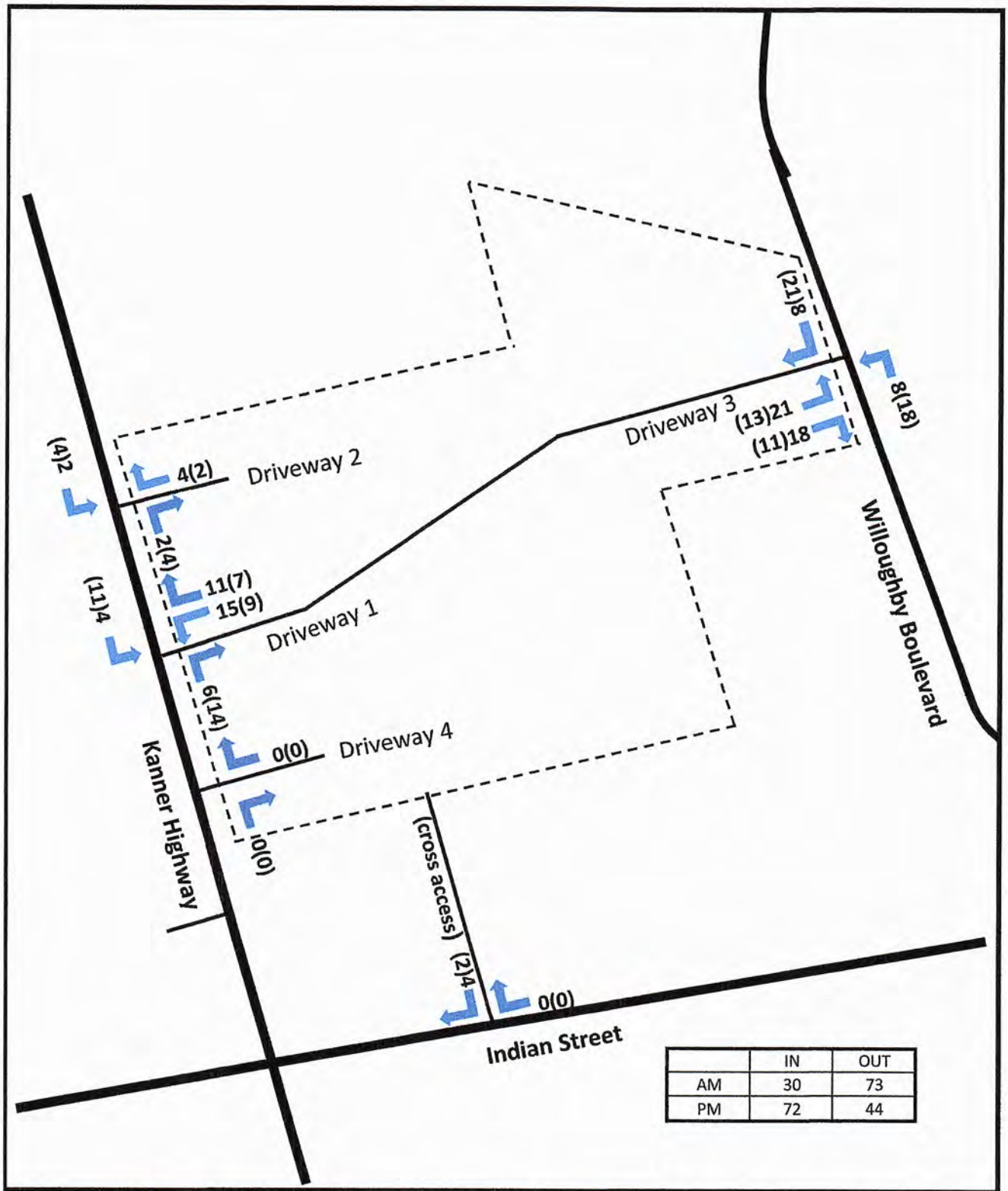
Legend

XX(XX) = AM(PM)
= Project Location
= Direction

Appendix E

Retail Driveway Volumes

M & M Retail



	IN	OUT
AM	30	73
PM	72	44

O'ROURKE ENGINEERING & PLANNING

NTS

22 SE Seminole St
Stuart, Fl, 34994

Job #: MR18031.0 | Date: 6/25/20

Legend

XX(XX) = AM(PM)
= Project Location
= Direction

Appendix E

Residential Driveway Volumes

M & M Retail

COUNTY: 89
STATION: 0114
DESCRIPTION: SR 76/COLORADO AVE - SW OF MONTEREY RD(COUNTY LINK
START DATE: 03/20/2019
START TIME: 0000

	DIRECTION: N					DIRECTION: S					COMBINED
TIME	1ST	2ND	3RD	4TH	TOTAL	1ST	2ND	3RD	4TH	TOTAL	TOTAL
0000	36	36	28	16	116	19	12	20	19	70	186
0100	28	20	19	20	87	7	11	7	11	36	123
0200	14	11	4	7	36	19	16	4	11	50	86
0300	6	10	17	16	49	14	19	19	31	83	132
0400	17	20	25	25	87	30	37	43	50	160	247
0500	23	38	37	74	172	74	98	85	139	396	568
0600	72	95	148	134	449	150	172	175	206	703	1152
0700	163	230	254	298	945	277	296	253	269	1095	2040
0800	284	329	256	218	1087	265	186	240	198	889	1976
0900	230	218	224	229	901	172	188	184	212	756	1657
1000	245	224	214	224	907	215	197	224	191	827	1734
1100	241	234	229	284	988	210	203	229	218	860	1848
1200	245	270	259	275	1049	212	203	194	188	797	1846
1300	209	202	238	217	866	203	234	198	179	814	1680
1400	256	287	228	241	1012	187	248	218	202	855	1867
1500	270	250	254	276	1050	208	239	206	222	875	1925
1600	317	281	287	240	1125	226	203	212	244	885	2010
1700	275	260	271	292	1098	251	215	222	215	903	2001
1800	260	234	208	184	886	168	157	160	145	630	1516
1900	198	175	160	124	657	176	142	120	125	563	1220
2000	156	134	110	88	488	106	115	131	94	446	934
2100	79	85	82	70	316	108	101	85	77	371	687
2200	72	68	54	54	248	62	52	41	46	201	449
2300	22	52	59	52	185	32	37	23	20	112	297
24-HOUR TOTALS:					14804					13377	28181

PEAK VOLUME INFORMATION

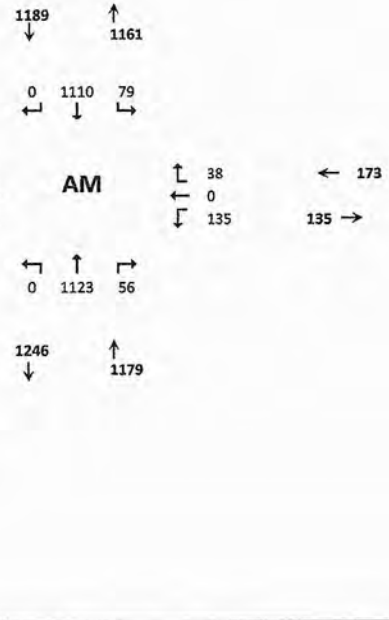
	DIRECTION: N		DIRECTION: S		COMBINED DIRECTIONS	
	HOUR	VOLUME	HOUR	VOLUME	HOUR	VOLUME
A.M.	745	1167	700	1095	715	2149
P.M.	1545	1161	1645	932	1545	2024
DAILY	745	1167	700	1095	715	2149

GENERATED BY SPS 5.0.53P

TURNING MOVEMENT VOLUME COUNTS

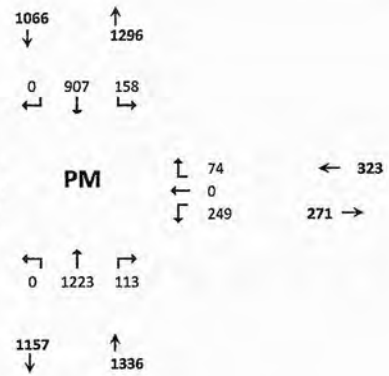
N/S STREET: Kanner Hwy
E/W STREET: Driveway 1
CONTROL:
FILENAME:
COUNT DATE: 3/20/2019
DAY: Wednesday
CITY: Stuart
INTERSECTION:
REPORT DATE: 12/16/2020
ANALYSIS YEAR: 2024

15 Min Period	Northbound NBL	NBT	NBR	Southbound SBL	SBT	SBR	Eastbound EBL	EBT	EBR	Westbound WBL	WBT	WBR	TOTAL	ONE HOUR SUM
7:00-7:15	0	163	0	0	277	0	0	0	0	0	0	0	440	2040
7:15-7:30	0	230	0	0	296	0	0	0	0	0	0	0	526	2149
7:30-7:45	0	254	0	0	253	0	0	0	0	0	0	0	507	2138
7:45-8:00	0	298	0	0	269	0	0	0	0	0	0	0	567	2127
8:00-8:15	0	284	0	0	265	0	0	0	0	0	0	0	549	1976
8:15-8:30	0	329	0	0	186	0	0	0	0	0	0	0	515	
8:30-8:45	0	256	0	0	240	0	0	0	0	0	0	0	496	
8:45-9:00	0	218	0	0	198	0	0	0	0	0	0	0	416	
AM PEAK HOUR IS FROM:			7:15AM TO 8:15AM											
Volumes	0	1066	0	0	1083	0	0	0	0	0	0	0	2149	
Season Factor	0	1066	0	0	1083	0	0	0	0	0	0	0	2149	
Growth	0	1093	0	0	1110	0	0	0	0	0	0	0	2203	
In/Out	-	IN/OUT	IN	IN	-	-	-	-	-	OUT	-	OUT	-	
Res Percentage	0%	0%	20%	15%	0%	0%	0%	0%	0%	20%	0%	15%	0%	
Retail Percentage	0%	5%/10%	20%	30%	0%	0%	0%	0%	0%	35%	0%	15%	0%	
PROJECT	0	30	56	79	0	0	0	0	0	77	0	38	0	
MMHS										7				
Kanner ALF										51				
Total	0	1123	56	79	1110	0	0	0	0	135	0	38	2542	



Seasonal Factor:	1	
	Retail	Residential
Trips In	250	30
Trips Out	179	73
Growth Rate:	1.005	
Years Grown:	5	

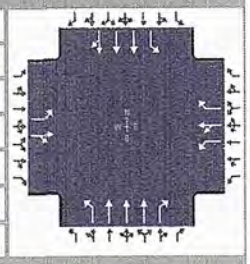
15 Min Period lanes	Northbound NBL	NBT	NBR	Southbound SBL	SBT	SBR	Eastbound EBL	EBT	EBR	Westbound WBL	WBT	WBR	TOTAL	ONE HOUR SUM
4:00-4:15	0	317	0	0	226	0	0	0	0	0	0	0	543	2010
4:15-4:30	0	281	0	0	203	0	0	0	0	0	0	0	484	1993
4:30-4:45	0	287	0	0	212	0	0	0	0	0	0	0	499	1984
4:45-5:00	0	240	0	0	244	0	0	0	0	0	0	0	484	1978
5:00-5:15	0	275	0	0	251	0	0	0	0	0	0	0	526	2001
5:15-5:30	0	260	0	0	215	0	0	0	0	0	0	0	475	
5:30-5:45	0	271	0	0	222	0	0	0	0	0	0	0	493	
5:45-6:00	0	292	0	0	215	0	0	0	0	0	0	0	507	
PM PEAK HOUR IS FROM:			4:00PM TO 5:00PM											
Volumes	0	1125	0	0	885	0	0	0	0	0	0	0	2010	
Season Factor	0	1125	0	0	885	0	0	0	0	0	0	0	2010	
Growth	0	1153	0	0	907	0	0	0	0	0	0	0	2061	
In/Out	-	IN/OUT	IN	IN	-	-	-	-	-	OUT	-	OUT	-	
Res Percentage	0%	0%	20%	15%	0%	0%	0%	0%	0%	20%	0%	15%	0%	
Retail Percentage	0%	5%/10%	20%	30%	0%	0%	0%	0%	0%	35%	0%	15%	0%	
Project	0	69	113	158	0	0	0	0	0	165	0	74		
MMHS										38				
Kanner ALF										46				
Total	0	1223	113	158	907	0	0	0	0	249	0	74	2724	



Seasonal Factor:	1	
	Retail	Residential
Trips In:	492	72
Trips Out:	447	44
Growth Rate:	1.005	
Years Grown:	5	

HCS7 Signalized Intersection Results Summary

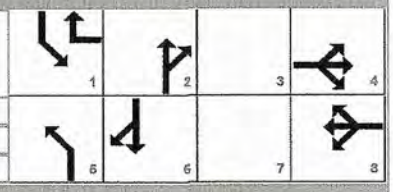
General Information				Intersection Information	
Agency	O'Rourke Engineering & Planning			Duration, h	0.250
Analyst	Nolan Comm	Analysis Date	Jun 25, 2021	Area Type	Other
Jurisdiction	Martin County	Time Period	AM	PHF	0.95
Urban Street	Kanner Highway	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Kanner & Driveway 1	File Name	Kanner and Driveway 1 - AM - Costco - 4.21.21.xus		
Project Description	Costco				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	0	0	0	135	0	38	0	1123	56	79	1110	0

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	34.0	42.0	26.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		9.0	2.0	3.0	2.0	4.0
Phase Duration, s		0.0		32.0	0.0	48.0	40.0	88.0
Change Period, ($Y+R_c$), s		6.0		6.0	6.0	6.0	6.0	6.0
Max Allow Headway (MAH), s		0.0		3.2	0.0	0.0	3.0	0.0
Queue Clearance Time (g_s), s				6.1			6.1	
Green Extension Time (g_e), s		0.0		0.3	0.0	0.0	0.1	0.0
Phase Call Probability				1.00			1.00	
Max Out Probability				0.00			0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h	0	0		71	0	111	0	1182	59	83	1168	0
Adjusted Saturation Flow Rate (s), veh/h/ln	1810	0		1810	1900	1738	1810	1725	1610	1810	1900	0
Queue Service Time (g_s), s	0.0	0.0		3.8	0.0	4.1	0.0	23.1	3.0	4.1	9.8	0.0
Cycle Queue Clearance Time (g_c), s	0.0	0.0		3.8	0.0	4.1	0.0	23.1	3.0	4.1	9.8	0.0
Green Ratio (g/C)				0.22	0.22	0.50		0.35	0.35	0.28	0.68	
Capacity (c), veh/h	2			392	411	833	2	1809	563	514	3895	
Volume-to-Capacity Ratio (X)	0.000	0.000		0.181	0.000	0.133	0.000	0.653	0.105	0.162	0.300	0.000
Back of Queue (Q), ft/ln (95 th percentile)	0	0		75.4	0	70.1	0	365.8	52.4	80	157.1	0
Back of Queue (Q), veh/ln (95 th percentile)	0.0	0.0		3.0	0.0	2.8	0.0	14.6	2.1	3.2	6.3	0.0
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	0.0			38.3	0.0	16.0	0.0	32.9	26.4	32.3	7.6	
Incremental Delay (d_2), s/veh	0.0	0.0		0.1	0.0	0.0	0.0	1.9	0.4	0.1	0.2	0.0
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0			38.4	0.0	16.0	0.0	34.8	26.7	32.3	7.8	
Level of Service (LOS)				D		B		C	C	C	A	
Approach Delay, s/veh / LOS	0.0			24.8		C	34.4		C	9.4		A
Intersection Delay, s/veh / LOS	22.0						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.73	C	2.62	C	2.12	B	1.87	B
Bicycle LOS Score / LOS	0.49	A	0.79	A	1.17	A	1.18	A

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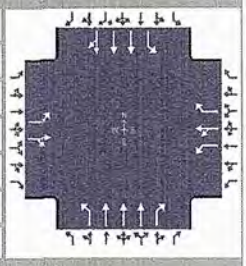
HCS7 Signalized Intersection Results Summary

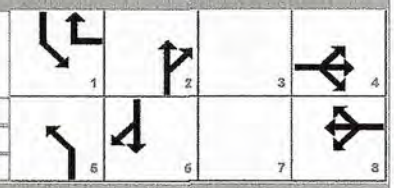
General Information				Intersection Information	
Agency	O'Rourke Engineering & Planning			Duration, h	0.250
Analyst	Nolan Comm	Analysis Date	Jun 25, 2021	Area Type	Other
Jurisdiction	Martin County	Time Period	PM	PHF	0.95
Urban Street	Kanner Highway	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Kanner & Driveway 1	File Name	Kanner and Driveway 1 - PM - Costco - 4.21.21.xus		
Project Description	Costco				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	0	0	0	249	0	74	0	1223	113	158	907	0

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	50.0	30.0	22.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		9.0	2.0	3.0	2.0	4.0
Phase Duration, s		0.0		28.0	0.0	36.0	56.0	92.0
Change Period, ($Y+R_c$), s		6.0		6.0	6.0	6.0	6.0	6.0
Max Allow Headway (MAH), s		0.0		3.2	0.0	0.0	3.0	0.0
Queue Clearance Time (g_s), s				9.7			7.6	
Green Extension Time (g_e), s		0.0		0.5	0.0	0.0	0.3	0.0
Phase Call Probability				1.00			1.00	
Max Out Probability				0.00			0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h	0	0		131	0	209	0	1287	66	166	955	0
Adjusted Saturation Flow Rate (s), veh/h/ln	1810	0		1810	1900	1735	1810	1725	1610	1810	1900	0
Queue Service Time (g_s), s	0.0	0.0		7.7	0.0	6.6	0.0	29.8	3.9	5.6	1.1	0.0
Cycle Queue Clearance Time (g_c), s	0.0	0.0		7.7	0.0	6.6	0.0	29.8	3.9	5.6	1.1	0.0
Green Ratio (g/C)				0.18	0.18	0.60		0.25	0.25	0.42	0.72	
Capacity (c), veh/h	2			332	348	990	2	1292	402	755	4085	
Volume-to-Capacity Ratio (X)	0.000	0.000		0.395	0.000	0.211	0.000	0.997	0.165	0.220	0.234	0.000
Back of Queue (Q), ft/ln (95 th percentile)	0	0		151.6	0	104.7	0	507.1	71.2	97.7	15.7	0
Back of Queue (Q), veh/ln (95 th percentile)	0.0	0.0		6.1	0.0	4.2	0.0	20.3	2.8	3.9	0.6	0.0
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	0.0			43.1	0.0	10.9	0.0	40.0	35.2	16.8	0.8	
Incremental Delay (d_2), s/veh	0.0	0.0		0.3	0.0	0.0	0.0	24.2	0.9	0.1	0.1	0.0
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0			43.4	0.0	10.9	0.0	64.2	36.1	16.8	0.9	
Level of Service (LOS)				D		B		E	D	B	A	
Approach Delay, s/veh / LOS	0.0			23.5		C	62.8		E	3.3		A
Intersection Delay, s/veh / LOS	34.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.80	C	2.62	C	2.13	B	1.86	B
Bicycle LOS Score / LOS	0.49	A	1.05	A	1.23	A	1.10	A

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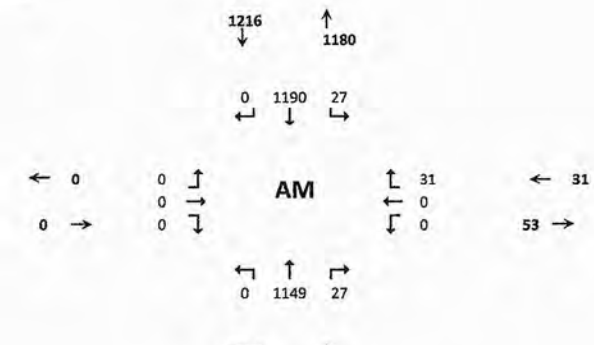
TURNING MOVEMENT VOLUME COUNTS

N/S STREET: Kanner Hwy
E/W STREET: Driveway 2
CONTROL:
FILENAME:
COUNT DATE: 4/27/2017 **DAY:** Thursday **CITY:** Stuart **INTERSECTION:**
REPORT DATE: 5/2/2017 **ANALYSIS YEAR:** 2024

15 Min Period	Northbound NBL	NBT	NBR	Southbound SBL	SBT	SBR	Eastbound EBL	EBT	EBR	Westbound WBL	WBT	WBR	TOTAL	ONE HOUR SUM
7:00-7:15	0	163	0	0	277	0	0	0	0	0	0	0	440	2040
7:15-7:30	0	230	0	0	296	0	0	0	0	0	0	0	526	2149
7:30-7:45	0	254	0	0	253	0	0	0	0	0	0	0	507	2138
7:45-8:00	0	298	0	0	269	0	0	0	0	0	0	0	567	2127
8:00-8:15	0	284	0	0	265	0	0	0	0	0	0	0	549	1976
8:15-8:30	0	329	0	0	186	0	0	0	0	0	0	0	515	
8:30-8:45	0	256	0	0	240	0	0	0	0	0	0	0	496	
8:45-9:00	0	218	0	0	198	0	0	0	0	0	0	0	416	
AM PEAK HOUR IS FROM:			7:15AM TO 8:15AM											
Volumes	0	1066	0	0	1083	0	0	0	0	0	0	0	2149	
Season Factor	0	1066	0	0	1083	0	0	0	0	0	0	0	2149	
Growth	0	1093	0	0	1110	0	0	0	0	0	0	0	2203	
In/Out	-	OUT	IN	IN	IN	-	-	-	-	-	-	OUT	-	
Res Percentage	0%	15%	5%	5%	15%	0%	0%	0%	0%	0%	0%	5%	0%	
Retail Percentage	0%	25%	10%	10%	30%	0%	0%	0%	0%	0%	0%	15%	0%	
PROJECT	0	56	27	27	80	0	0	0	0	0	0	31	0	
Total	0	1149	27	27	1190	0	0	0	0	0	0	31	2422	

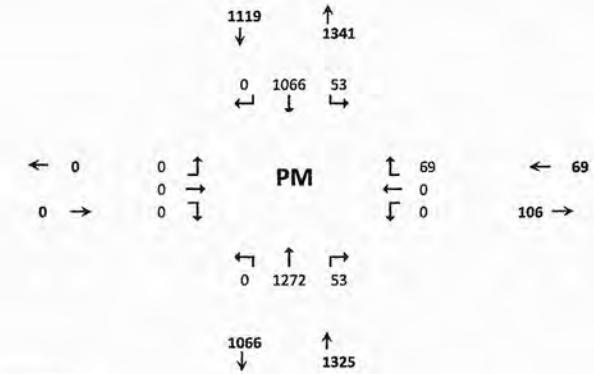


Seasonal Factor: 1

	Retail	Residential
Trips In	250	30
Trips Out	179	73

Growth Rate: 1.005
Years Grown: 5

15 Min Period lanes	Northbound NBL	NBT	NBR	Southbound SBL	SBT	SBR	Eastbound EBL	EBT	EBR	Westbound WBL	WBT	WBR	TOTAL	ONE HOUR SUM
4:00-4:15	0	317	0	0	226	0	0	0	0	0	0	0	543	2010
4:15-4:30	0	281	0	0	203	0	0	0	0	0	0	0	484	1993
4:30-4:45	0	287	0	0	212	0	0	0	0	0	0	0	499	1984
4:45-5:00	0	240	0	0	244	0	0	0	0	0	0	0	484	1978
5:00-5:15	0	275	0	0	251	0	0	0	0	0	0	0	526	2001
5:15-5:30	0	260	0	0	215	0	0	0	0	0	0	0	475	
5:30-5:45	0	271	0	0	222	0	0	0	0	0	0	0	493	
5:45-6:00	0	292	0	0	215	0	0	0	0	0	0	0	507	
PM PEAK HOUR IS FROM:			4:00PM TO 5:00PM											
Volumes	0	1125	0	0	885	0	0	0	0	0	0	0	2010	
Season Factor	0	1125	0	0	885	0	0	0	0	0	0	0	2010	
Growth	0	1153	0	0	907	0	0	0	0	0	0	0	2061	
In/Out	-	OUT	IN	IN	IN	-	-	-	-	-	-	OUT	-	
Res Percentage	0%	15%	5%	5%	15%	0%	0%	0%	0%	0%	0%	5%	0%	
Retail Percentage	0%	25%	10%	10%	30%	0%	0%	0%	0%	0%	0%	15%	0%	
Project	0	118	53	53	158	0	0	0	0	0	0	69		
Total	0	1272	53	53	1066	0	0	0	0	0	0	69	2512	



Seasonal Factor: 1

	Retail	Residential
Trips In:	492	72
Trips Out:	447	44

Growth Rate: 1.005
Years Grown: 5

HCS7 Two-Way Stop-Control Report

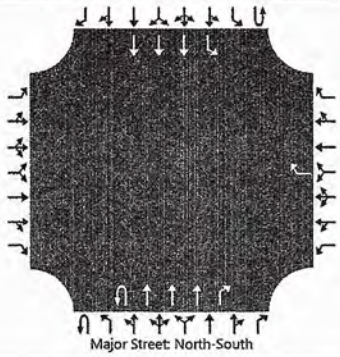
General Information

Analyst	James Kemp
Agency/Co.	O'Rourke Engineering
Date Performed	4/21/2021 6/25/21
Analysis Year	2024
Time Analyzed	AM
Intersection Orientation	North-South
Project Description	Costco

Site Information

Intersection	Kanner Hwy & Driveway 2
Jurisdiction	Martin County
East/West Street	Driveway 2
North/South Street	Kanner Hwy
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	1	1	0	3	1	0	1	3	0
Configuration								R	U		T	R		L	T	
Volume (veh/h)								31	0		1149	27	0	27	1190	
Percent Heavy Vehicles (%)								3	3				3	3		
Proportion Time Blocked								0.250						0.250		
Percent Grade (%)					0											
Right Turn Channelized					Yes				No							
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)								7.1	5.6					5.3		
Critical Headway (sec)								7.16	5.66					5.36		
Base Follow-Up Headway (sec)								3.3	2.3					3.1		
Follow-Up Headway (sec)								3.33	2.33					3.13		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)								33	0					28		
Capacity, c (veh/h)								811	486					736		
v/c Ratio								0.04	0.00					0.04		
95% Queue Length, Q_{95} (veh)								0.1	0.0					0.1		
Control Delay (s/veh)								9.6	12.4					10.1		
Level of Service (LOS)								A	B					B		
Approach Delay (s/veh)					9.6				0.0				0.2			
Approach LOS					A											

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HCS7 Two-Way Stop-Control Report

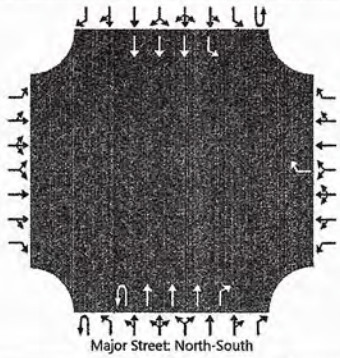
General Information

Analyst	James Kemp
Agency/Co.	O'Rourke Engineering
Date Performed	3/16/2021 6/25/21
Analysis Year	2024
Time Analyzed	PM
Intersection Orientation	North-South
Project Description	Costco

Site Information

Intersection	Kanner Hwy & Driveway 2
Jurisdiction	Martin County
East/West Street	Driveway 2
North/South Street	Kanner Hwy
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	1	1	0	3	1	0	1	3	0
Configuration								R	U		T	R		L	T	
Volume (veh/h)								69	0		1272	53	0	53	1066	
Percent Heavy Vehicles (%)								3	3				3	3		
Proportion Time Blocked								0.250						0.250		
Percent Grade (%)					0											
Right Turn Channelized					No				No							
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)								7.1	5.6					5.3		
Critical Headway (sec)								7.16	5.66					5.36		
Base Follow-Up Headway (sec)								3.3	2.3					3.1		
Follow-Up Headway (sec)								3.33	2.33					3.13		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)								73	0					56		
Capacity, c (veh/h)								811	549					588		
v/c Ratio								0.09	0.00					0.09		
95% Queue Length, Q_{95} (veh)								0.3	0.0					0.3		
Control Delay (s/veh)								9.9	11.6					11.8		
Level of Service (LOS)								A	B					B		
Approach Delay (s/veh)					9.9				0.0				0.6			
Approach LOS					A											

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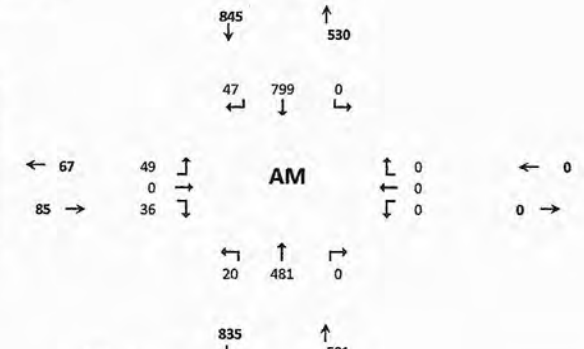
TURNING MOVEMENT VOLUME COUNTS

N/S STREET: Willoughby Blvd **E/W STREET:** Driveway 3 **CONTROL:** TWSC
FILENAME:
COUNT DATE: 2019 **DAY:** Thursday **CITY:** Stuart **INTERSECTION:**
REPORT DATE: 1/15/2020 **ANALYSIS YEAR:** 2024

15 Min Period	Northbound NBL	NBT	NBR	Southbound SBL	SBT	SBR	Eastbound EBL	EBT	EBR	Westbound WBL	WBT	WBR	TOTAL	ONE HOUR SUM
7:00-7:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15-7:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30-7:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45-8:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00-8:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15-8:30	0	0	0	0	0	0	0	0	0	0	0	0	0	
8:30-8:45	0	0	0	0	0	0	0	0	0	0	0	0	0	
8:45-9:00	0	0	0	0	0	0	0	0	0	0	0	0	0	

AM PEAK HOUR IS FROM: 7:00AM TO 8:00AM

	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	TOTAL
Volumes	0	401	0	0	666	0	0	0	0	0	0	0	0
Season Factor	0	401	0	0	666	0	0	0	0	0	0	0	1067
Growth	0	481	0	0	799	0	0	0	0	0	0	0	1280
In/Out	IN	-	-	-	-	IN	OUT	-	OUT	-	-	-	-
Retail Percent	5%	0%	0%	0%	0%	15%	15%	0%	10%	0%	0%	0%	0%
Res. Percent	25%	0%	0%	0%	0%	30%	30%	0%	25%	0%	0%	0%	0%
Retail Trips	13	0	0	0	0	38	27	0	18	0	0	0	0
Res. Trips	8	0	0	0	0	9	22	0	18	0	0	0	0
Total	20	481	0	0	799	47	49	0	36	0	0	0	1431



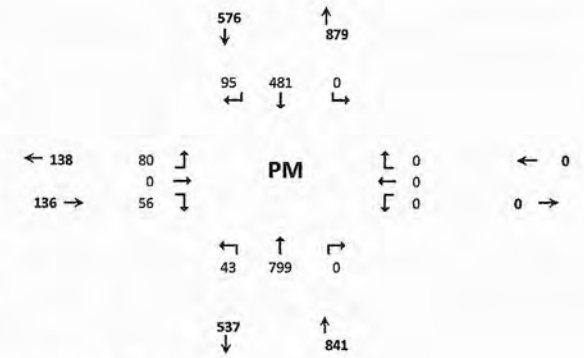
	Retail	Res.
Trips In	250	30
Trips Out	179	73

Seasonal Factor: 1
Growth Rate: 1.037
Years Grown: 5

15 Min Period lanes	Northbound NBL	NBT	NBR	Southbound SBL	SBT	SBR	Eastbound EBL	EBT	EBR	Westbound WBL	WBT	WBR	TOTAL	ONE HOUR SUM
4:00-4:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15-4:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30-4:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45-5:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00-5:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15-5:30	0	0	0	0	0	0	0	0	0	0	0	0	0	
5:30-5:45	0	0	0	0	0	0	0	0	0	0	0	0	0	
5:45-6:00	0	0	0	0	0	0	0	0	0	0	0	0	0	

PM PEAK HOUR IS FROM: 4:00PM TO 5:00PM

	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	TOTAL
Volumes	0	666	0	0	401	0	0	0	0	0	0	0	0
Season Factor	0	666	0	0	401	0	0	0	0	0	0	0	1067
Growth	0	799	0	0	481	0	0	0	0	0	0	0	1280
In/Out	IN	-	-	-	-	IN	OUT	-	OUT	-	-	-	-
Retail Percent	5%	0%	0%	0%	0%	15%	15%	0%	10%	0%	0%	0%	0%
Res. Percent	25%	0%	0%	0%	0%	30%	30%	0%	25%	0%	0%	0%	0%
Retail Trips	25	0	0	0	0	74	67	0	45	0	0	0	0
Res. Trips	18	0	0	0	0	22	13	0	11	0	0	0	0
Total	43	799	0	0	481	95	80	0	56	0	0	0	1554



	Retail	Res.
Trips In:	492	72
Trips Out:	447	44

Seasonal Factor: 1
Growth Rate: 1.037
Years Grown: 5

HCS7 Two-Way Stop-Control Report

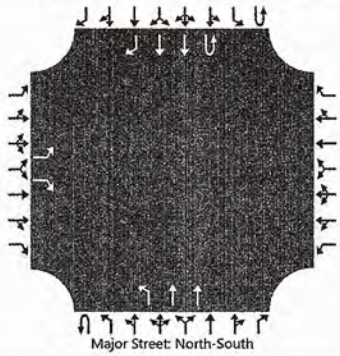
General Information

Analyst	James Kemp
Agency/Co.	O'Rourke Engineering
Date Performed	4/21/2021 6/25/21
Analysis Year	2024
Time Analyzed	AM Peak Hour
Intersection Orientation	North-South
Project Description	Costco

Site Information

Intersection	Driveway 3 & Willoughby
Jurisdiction	Martin County
East/West Street	Driveway 3
North/South Street	Willoughby Blvd
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	0	1		0	0	0	0	1	2	0	1	0	2	1
Configuration		L		R						L	T		U		T	R
Volume (veh/h)		49		36					0	20	481		0		799	47
Percent Heavy Vehicles (%)		3		3					3	3			3			
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized		No												No		
Median Type | Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1			6.4			
Critical Headway (sec)		6.86		6.96						4.16			6.46			
Base Follow-Up Headway (sec)		3.5		3.3						2.2			2.5			
Follow-Up Headway (sec)		3.53		3.33						2.23			2.53			

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		53		39						22			0			
Capacity, c (veh/h)		290		567						732			665			
v/c Ratio		0.18		0.07						0.03			0.00			
95% Queue Length, Q_{95} (veh)		0.7		0.2						0.1			0.0			
Control Delay (s/veh)		20.2		11.8						10.1			10.4			
Level of Service (LOS)		C		B						B			B			
Approach Delay (s/veh)		16.7								0.4				0.0		
Approach LOS		C														

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HCS7 Two-Way Stop-Control Report

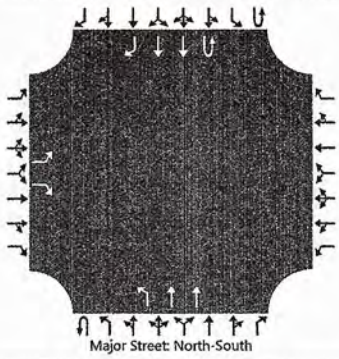
General Information

Analyst	James Kemp
Agency/Co.	O'Rourke Engineering
Date Performed	3/16/2021 6/25/21
Analysis Year	2024
Time Analyzed	PM Peak Hour
Intersection Orientation	North-South
Project Description	Costco

Site Information

Intersection	Driveway 3 & Willoughby
Jurisdiction	Martin County
East/West Street	Driveway 3
North/South Street	Willoughby Blvd
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	0	1		0	0	0	0	1	2	0	1	0	2	1
Configuration		L		R						L	T		U		T	R
Volume (veh/h)		80		56					0	43	799		0		481	95
Percent Heavy Vehicles (%)		3		3					3	3			3			
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No												No			
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1			6.4			
Critical Headway (sec)		6.86		6.96						4.16			6.46			
Base Follow-Up Headway (sec)		3.5		3.3						2.2			2.5			
Follow-Up Headway (sec)		3.53		3.33						2.23			2.53			

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		87		61						47			0			
Capacity, c (veh/h)		342		734						945			400			
v/c Ratio		0.25		0.08						0.05			0.00			
95% Queue Length, Q_{95} (veh)		1.0		0.3						0.2			0.0			
Control Delay (s/veh)		19.1		10.3						9.0			14.0			
Level of Service (LOS)		C		B						A			B			
Approach Delay (s/veh)	15.5								0.5				0.0			
Approach LOS	C															

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TURNING MOVEMENT VOLUME COUNTS

N/S STREET: Kanner Hwy **E/W STREET:** Driveway 4 **CONTROL:**

FILENAME:

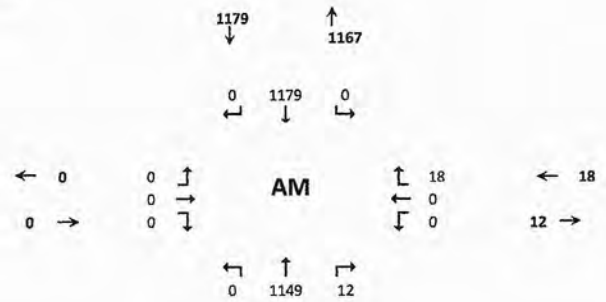
COUNT DATE: 3/20/2019 **DAY:** Wednesday **CITY:** Stuart **INTERSECTION:**

REPORT DATE: 12/16/2020 **ANALYSIS YEAR:** 2024

15 Min Period	Northbound NBL	NBT	NBR	Southbound SBL	SBT	SBR	Eastbound EBL	EBT	EBR	Westbound WBL	WBT	WBR	TOTAL	ONE HOUR SUM
7:00-7:15	0	163	0	0	277	0	0	0	0	0	0	0	440	2040
7:15-7:30	0	230	0	0	296	0	0	0	0	0	0	0	526	2149
7:30-7:45	0	254	0	0	253	0	0	0	0	0	0	0	507	2138
7:45-8:00	0	298	0	0	269	0	0	0	0	0	0	0	567	2127
8:00-8:15	0	284	0	0	265	0	0	0	0	0	0	0	549	1976
8:15-8:30	0	329	0	0	186	0	0	0	0	0	0	0	515	
8:30-8:45	0	256	0	0	240	0	0	0	0	0	0	0	496	
8:45-9:00	0	218	0	0	198	0	0	0	0	0	0	0	416	

AM PEAK HOUR IS FROM: 7:15AM TO 8:15AM

	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	TOTAL
Volumes	0	1066	0	0	1083	0	0	0	0	0	0	0	2149
Season Factor	0	1066	0	0	1083	0	0	0	0	0	0	0	2149
Growth	0	1093	0	0	1110	0	0	0	0	0	0	0	2203
In/Out	-	IN	IN	-	OUT	-	-	-	-	-	-	OUT	-
Retail Percent	0%	20%	5%	0%	30%	0%	0%	0%	0%	0%	0%	10%	0%
Res. Percent	0%	20%	0%	0%	20%	0%	0%	0%	0%	0%	0%	0%	0%
Retail Trips	0	50	12	0	54	0	0	0	0	0	0	18	0
Res. Trips	0	6	0	0	15	0	0	0	0	0	0	0	0
Total	0	1149	12	0	1179	0	0	0	0	0	0	18	2358



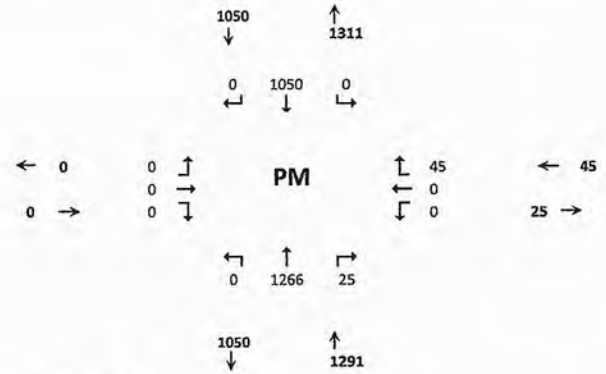
	Retail	Res.
Trips In	250	30
Trips Out	179	73

Seasonal Factor: 1
Growth Rate: 1.005
Years Grown: 5

15 Min Period lanes	Northbound NBL	NBT	NBR	Southbound SBL	SBT	SBR	Eastbound EBL	EBT	EBR	Westbound WBL	WBT	WBR	TOTAL	ONE HOUR SUM
4:00-4:15	0	317	0	0	226	0	0	0	0	0	0	0	543	2010
4:15-4:30	0	281	0	0	203	0	0	0	0	0	0	0	484	1993
4:30-4:45	0	287	0	0	212	0	0	0	0	0	0	0	499	1984
4:45-5:00	0	240	0	0	244	0	0	0	0	0	0	0	484	1978
5:00-5:15	0	275	0	0	251	0	0	0	0	0	0	0	526	2001
5:15-5:30	0	260	0	0	215	0	0	0	0	0	0	0	475	
5:30-5:45	0	271	0	0	222	0	0	0	0	0	0	0	493	
5:45-6:00	0	292	0	0	215	0	0	0	0	0	0	0	507	

PM PEAK HOUR IS FROM: 4:00PM TO 5:00PM

	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	TOTAL
Volumes	0	1125	0	0	885	0	0	0	0	0	0	0	2010
Season Factor	0	1125	0	0	885	0	0	0	0	0	0	0	2010
Growth	0	1153	0	0	907	0	0	0	0	0	0	0	2061
In/Out	-	IN	IN	-	OUT	-	-	-	-	-	-	OUT	-
Retail Percent	0%	20%	5%	0%	30%	0%	0%	0%	0%	0%	0%	10%	0%
Res. Percent	0%	20%	0%	0%	20%	0%	0%	0%	0%	0%	0%	0%	0%
Retail Trips	0	98	25	0	134	0	0	0	0	0	0	45	0
Res. Trips	0	14	0	0	9	0	0	0	0	0	0	0	0
Total	0	1266	25	0	1050	0	0	0	0	0	0	45	2386



	Retail	Res.
Trips In:	492	72
Trips Out:	447	44

Seasonal Factor: 1
Growth Rate: 1.005
Years Grown: 5

HCS7 Two-Way Stop-Control Report

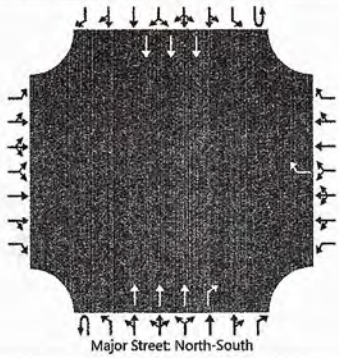
General Information

Analyst	James Kemp
Agency/Co.	O'Rourke Engineering
Date Performed	6/25/21
Analysis Year	2024
Time Analyzed	AM
Intersection Orientation	North-South
Project Description	M&M Retail

Site Information

Intersection	Kanner Hwy & Driveway 4
Jurisdiction	Martin County
East/West Street	Driveway 4
North/South Street	Kanner Hwy
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	1	0	0	3	1	0	0	3	0
Configuration								R			T	R			T	
Volume (veh/h)								18			1149	12			1179	
Percent Heavy Vehicles (%)								3								
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized					Yes				No							
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)								7.1								
Critical Headway (sec)								7.16								
Base Follow-Up Headway (sec)								3.3								
Follow-Up Headway (sec)								3.33								

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)								19								
Capacity, c (veh/h)								424								
v/c Ratio								0.04								
95% Queue Length, Q_{95} (veh)								0.1								
Control Delay (s/veh)								13.9								
Level of Service (LOS)								B								
Approach Delay (s/veh)					13.9											
Approach LOS					B											

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HCS7 Two-Way Stop-Control Report

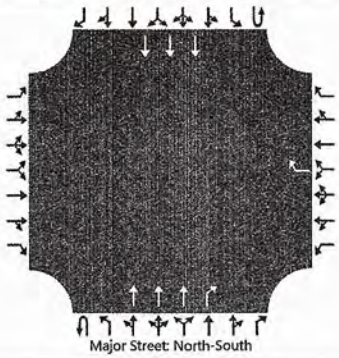
General Information

Analyst	James Kemp
Agency/Co.	O'Rourke Engineering
Date Performed	6/25/21
Analysis Year	2024
Time Analyzed	PM
Intersection Orientation	North-South
Project Description	M&M Retail

Site Information

Intersection	Kanner Hwy & Driveway 4
Jurisdiction	Martin County
East/West Street	Driveway 4
North/South Street	Kanner Hwy
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	1	0	0	3	1	0	0	3	0
Configuration								R			T	R			T	
Volume (veh/h)								45			1266	25			1050	
Percent Heavy Vehicles (%)								3								
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized					No				No							
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)								7.1								
Critical Headway (sec)								7.16								
Base Follow-Up Headway (sec)								3.3								
Follow-Up Headway (sec)								3.33								

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)								47								
Capacity, c (veh/h)								385								
v/c Ratio								0.12								
95% Queue Length, Q_{95} (veh)								0.4								
Control Delay (s/veh)								15.7								
Level of Service (LOS)								C								
Approach Delay (s/veh)					15.7											
Approach LOS					C											

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O'ROURKE
ENGINEERING & PLANNING

SIGNAL WARRANT ANALYSIS

FOR

KANNER CPUD
Kanner Highway and Proposed Signalized Driveway

Prepared for:

Mr. Joe Marino
M & M Retail Partners, LLC.
Lodi, NJ 07644
973-779-7466

Prepared by:
O'Rourke Engineering & Planning
22 SE Seminole Street
Stuart, Florida 34994
(772) 781-7918

June 26, 2020
Revised February 18, 2021
Revised March 16, 2021
Revised April 22, 2021
Revised June 25, 2021

MR18031.0

Prepared by: O'Rourke Engineering & Planning Certificate of Authorization: #26869 22 SE Seminole Street Stuart, Florida 34994 772-781-7918	Professional Engineer Susan E. O'Rourke Susan E. O'Rourke, P.E. Date signed and sealed: 6/25/2021 License #: 42684

Introduction

O'Rourke Engineering & Planning prepared the signal warrant analysis of the proposed full access driveway (Driveway 1) to be referred to as Costco Boulevard, located approximately 2,400 feet north of Indian Street on Kanner Highway. **Figure 1** shows the general project location and the relative location of the proposed full access driveway which is the subject of this analysis.

Attachment A includes the project site plan.

This signal warrant analysis uses existing hourly count data on Kanner Highway and estimated hourly volumes on the minor approach, Costco Boulevard. Each component of the analysis is discussed below.

Trip Generation

Three major developments will have access to Costco Boulevard; the subject property, M&M Retail, Certus ALF and out parcel, and Cleveland Clinic Medical Office. M&M Retail will consist of 157,531 square feet of Discount Warehouse, 16,750 square feet of Shopping Center, 2,500 square feet of fast-food w/ drive-thru, 16,240 square feet of restaurant and 378 apartment units.

The minor street traffic was estimated from the future developments: M&M Retail and Cleveland Clinic Medical Office. The traffic from the Certus ALF and outparcel were not included in the analysis, as the construction of this development could occur after the development of M&M Retail. The volumes were then used to evaluate the signal warrants. Each step is discussed below.

Table 1 includes the daily trip generation for each development referenced above.

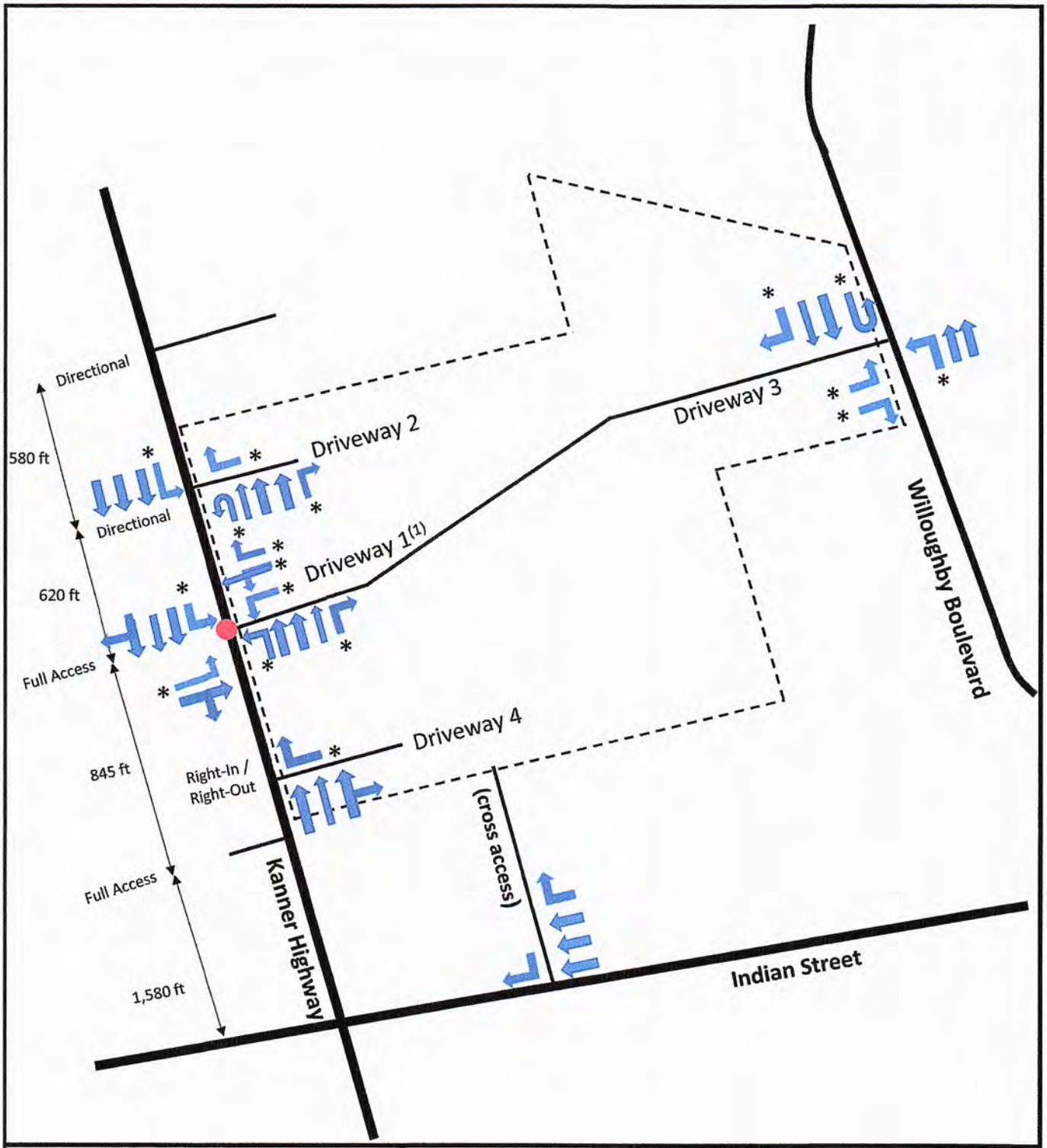
Major Street Traffic

Hourly directional traffic volumes were obtained from the FDOT website for the "Major Street": SR-76 (Kanner Highway). **Table 2** summarizes the existing hourly traffic volumes (2019) on Kanner Highway directly from the FDOT Peak Season 2019 count. The Kanner Highway volumes were compared to the Major Street thresholds. The existing major street volumes far exceed the maximum volume for several hours of the day. Given that the major street traffic is already so high before growth and before other project traffic was added, the existing traffic was used for the major street traffic.

Minor Street Traffic

The estimated movements from Costco Boulevard (minor approach) were developed based on the project traffic assigned to Costco Boulevard. **Attachment B** includes the percent assignment for each development included in the signal warrant.

The development traffic assigned to Costco Boulevard was distributed over the hours in the day based on ITE hourly distribution percentages. The percentages reflect the project traffic during that hour as it relates to daily traffic. The daily trips calculated above were applied to the hourly distribution. **Table 3** summarizes the hourly minor approach volumes. These distribution values are also included in Attachment B.



NTS

O'ROURKE ENGINEERING & PLANNING

22 SE Seminole Street
Stuart, Fl, 34994

Job #: MR18031.0 | Date: 6/25/21

Legend

= Existing Lane
* = Proposed Lane
= Driveway Spacing
= Proposed Signal

(1) Lane Call Out Subject to FDOT Permitting

Figure 1

Lane Geometrics

M & M Retail

Table 1: Daily Trip Generation

Land Use	ITE Code	Intensity	Units	Trip Generation Rate	Directional Split		Gross Trips			Internalization Trips				Net External Trips		
					In	Out	In	Out	Total	In	Out	Total	%	In	Out	Total
Medical Office (Cleveland Clinic)	**720**	**155,080**	**Sft**	**T = 38.42(X) - 87.62**	**50%**	**50%**	**2,936**	**2,935**	**5,871**	**0**	**0**	**0**	**0.0%**	**2,936**	**2,935**	**5,871**
M&M Retail - Residential Land Use	**221**	**398**	**DU**	**T = 5.45(X) - 1.75**	**50%**	**50%**	**1,084**	**1,083**	**2,167**	**72**	**216**	**288**	**14.0%**	**957**	**813**	**1,770**
M&M Retail - Total Retail Land Use		**193,021**	**Sft**		**50%**	**50%**	**5,685**	**5,683**	**11,368**	**970**	**826**	**1,796**	**15.8%**	**4,715**	**4,857**	**9,572**
Shopping Center	820	16,750	Sft	Ln(T) = 0.68Ln(X) + 5.57	50%	50%	892	892	1,784	47	120	167	9.4%	845	772	1,617
Discount Club	850	157,531	Sft	T = 41.80(X)	50%	50%	3,293	3,292	6,585	173	445	618	9.4%	3,120	2,847	5,967
Fast Food (w/ Drive Thru)	857	2,500	Sft	T = 470.95(X)	50%	50%	589	588	1,177	294	102	396	33.6%	295	486	781
High-Turnover (Sit-Down) Restaurant	934	16,240	Sft	T = 112.18(X)	50%	50%	911	911	1,822	456	159	615	33.8%	455	752	1,207
TOTALS							**9,705**	**9,701**	**19,406**	**1,042**	**1,042**	**2,084**		**8,608**	**8,605**	**17,213**

Source: ITE 10th Edition Trip Generation Rates

COUNTY: 89
STATION: 0114
DESCRIPTION: SR 76/COLORADO AVE - SW OF MONTEREY RD(COUNTY LINK
START DATE: 03/20/2019
START TIME: 0000

	DIRECTION: N					DIRECTION: S					COMBINED
TIME	1ST	2ND	3RD	4TH	TOTAL	1ST	2ND	3RD	4TH	TOTAL	TOTAL
0000	36	36	28	16	116	19	12	20	19	70	186
0100	28	20	19	20	87	7	11	7	11	36	123
0200	14	11	4	7	36	19	16	4	11	50	86
0300	6	10	17	16	49	14	19	19	31	83	132
0400	17	20	25	25	87	30	37	43	50	160	247
0500	23	38	37	74	172	74	98	85	139	396	568
0600	72	95	148	134	449	150	172	175	206	703	1152
0700	163	230	254	298	945	277	296	253	269	1095	2040
0800	284	329	256	218	1087	265	186	240	198	889	1976
0900	230	218	224	229	901	172	188	184	212	756	1657
1000	245	224	214	224	907	215	197	224	191	827	1734
1100	241	234	229	284	988	210	203	229	218	860	1848
1200	245	270	259	275	1049	212	203	194	188	797	1846
1300	209	202	238	217	866	203	234	198	179	814	1680
1400	256	287	228	241	1012	187	248	218	202	855	1867
1500	270	250	254	276	1050	208	239	206	222	875	1925
1600	317	281	287	240	1125	226	203	212	244	885	2010
1700	275	260	271	292	1098	251	215	222	215	903	2001
1800	260	234	208	184	886	168	157	160	145	630	1516
1900	198	175	160	124	657	176	142	120	125	563	1220
2000	156	134	110	88	488	106	115	131	94	446	934
2100	79	85	82	70	316	108	101	85	77	371	687
2200	72	68	54	54	248	62	52	41	46	201	449
2300	22	52	59	52	185	32	37	23	20	112	297
24-HOUR TOTALS:					14804					13377	28181

PEAK VOLUME INFORMATION

	DIRECTION: N		DIRECTION: S		COMBINED DIRECTIONS	
	HOUR	VOLUME	HOUR	VOLUME	HOUR	VOLUME
A.M.	745	1167	700	1095	715	2149
P.M.	1545	1161	1645	932	1545	2024
DAILY	745	1167	700	1095	715	2149

GENERATED BY SPS 5.0.53P

Table 2: Major Street Traffic

Table 3: Minor Approach Volumes

Hourly	Hourly Distribution			External Volumes			Percent Assignment to Costco Blvd						Minor Approach Volume
	M&M		Cleveland Clinic	M&M		Cleveland Clinic	M&M Lefts		M&M Rights		Cleveland Clinic Lefts	Cleveland Clinic Rights	
				4,857	813	2,935							
	Retail	Residential	Medical Office	Retail	Residential	Medical Office	Retail	Residential	Retail	Residential			
							35%	20%	15.0%	15.0%	15%	0%	
6-7 AM	0.2%	4.0%	1.4%	10	33	41	4	7	2	5	6	0	21
7-8 AM	1.1%	7.5%	5.4%	53	61	158	19	12	8	9	24	0	64
8-9 AM	2.0%	6.2%	8.9%	97	50	261	34	10	15	8	39	0	95
9-10 AM	3.6%	4.3%	10.4%	175	35	305	61	7	26	5	46	0	130
10-11 AM	5.6%	3.7%	10.1%	272	30	296	95	6	41	5	44	0	168
11-12 PM	8.3%	4.5%	9.1%	403	37	267	141	7	60	6	40	0	221
12-1 PM	10.0%	4.7%	7.9%	486	38	232	170	8	73	6	35	0	253
1-2 PM	9.3%	4.4%	8.8%	452	36	258	158	7	68	5	39	0	241
2-3 PM	9.0%	5.4%	9.1%	437	44	267	153	9	66	7	40	0	239
3-4 PM	8.8%	5.8%	9.2%	427	47	270	149	9	64	7	41	0	235
4-5 PM	9.2%	8.3%	7.8%	447	67	229	156	13	67	10	34	0	242
5-6 PM	9.3%	10.1%	5.6%	452	82	164	158	16	68	12	25	0	239
6-7 PM	8.0%	7.9%	2.2%	389	64	65	136	13	58	10	10	0	193
7-8 PM	6.1%	6.3%	1.3%	296	51	38	104	10	44	8	6	0	146
8-9 PM	4.4%	5.1%	0.7%	214	41	21	75	8	32	6	3	0	105
9-10 PM	2.9%	3.9%	0.3%	141	32	9	49	6	21	5	1	0	69

Signal Warrants

Using the resultant volumes shown in Tables 2 and 3, the warrants with the exception of the pedestrian, accident, and school warrants were analyzed. The minor approach of the full access driveway is the westbound approach. The left-turn volumes and 50% of the right-turn volumes will be considered for triggering the need for the signal. There will be two left-turn lanes and one right-turn lane. The speed limit on Kanner Highway is 45 MPH. The thresholds will be based on two or more lanes for the major street and two or more lanes for the minor street.

Attachment C provides the Traffic signal warrant summary of the Costco Boulevard/Kanner Highway intersection at buildout of the development.

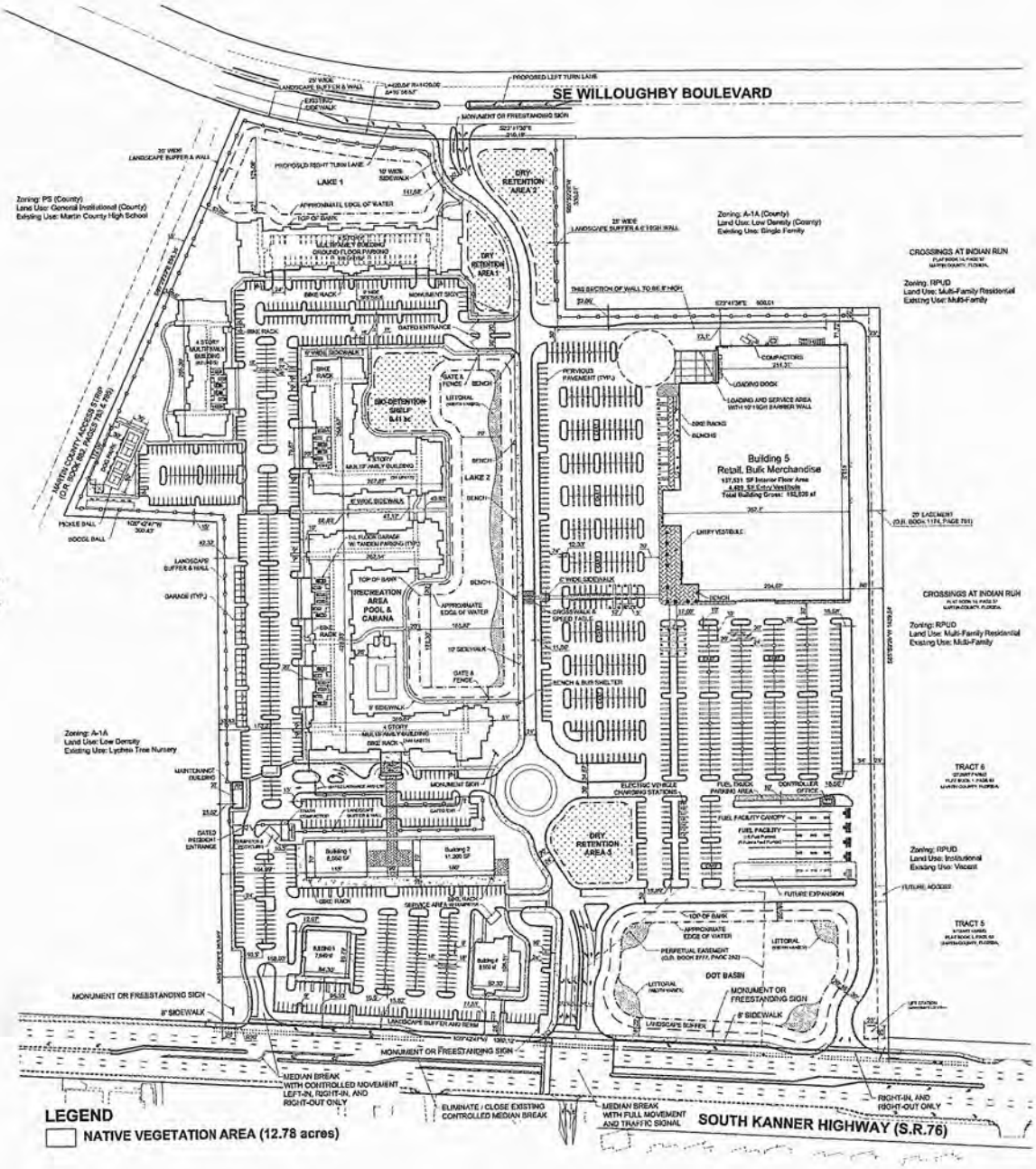
As shown, all warrants will be satisfied at 100% thresholds by completion of M&M Retail.

Conclusion

The M&M Retail development will be commencing construction once approvals are in hand. The Kanner Highway and full access driveway intersection will be constructed as part of the Discount Club site plan construction. Due to the high volumes already on Kanner, the high speed of travel and the concentration of the development in the southbound left turn lane, a signal will meet monitored warrants within days of the intersection being operational. Therefore, we request that the signal be permitted for installation during the initial construction of the Kanner Highway and full access driveway intersection improvements.

ATTACHMENT A

Site Plan



A-1

Site Data

Total Site Area:	2,133,987 sf	(48.99 ac)	100%
Future Land Use Designation (Proposed):	Neighborhood Special District		
Proposed Zoning:			CPUD
Building Height (max):			45'
Total Building Area:	361,572 sf	(8.30 ac)	16.9%

Pervious / Impervious Calculations

Impervious Area:	1,512,215 sf	(34.72 ac)	70.9%
Buildings:	361,572 sf	(8.30 ac)	16.9%
Pavement & Curb:	857,054 sf	(19.68 ac)	40.2%
Sidewalks, Patios & Pools:	105,309 sf	(2.42 ac)	5.0%
Lakes:	109,465 sf	(2.51 ac)	5.1%
DOT Basin:	78,815 sf	(1.81 ac)	3.7%
Pervious Area:	621,772 sf	(14.27 ac)	29.1%
Landscape:	545,757 sf	(12.53 ac)	25.7%
Dry Retention Areas:	55,155 sf	(1.27 ac)	2.6%
Bio Detention Area:	17,860 sf	(0.41 ac)	0.8%
Open Space			
Required (25% of 48.99 ac)		(12.25 ac)	25.0%
Provided*		(12.78 ac)	26.1%
* Includes Landscape with Native Vegetation Areas, Dry Retention Areas & Bio Detention Area. Excludes Parking Area Interior Landscape Areas.			
Interior Landscape Areas:		(1.49 ac)	3.0%

Parking Requirements

Parking Required (per Kanner CPUD):

Retail, bulk merchandise: (1 space / 250 sf): 155,960 sf / 250 sf = 624 Spaces	
Fuel Facility (1 space / 250 sf + 2 / bay + 1/vacuum):	20 Spaces
Retail (1 space / 250 sf): 19,250 sf / 250 sf = 77 Spaces	
Building 3 (1 space per 100 sf + 1 per each employee): 7,640 sf / 100 = 77 spaces + 13 employees	90 Spaces
Building 4 (1 space per 3 Seats + 1 per each employee): @ 300 seats + 18 employees:	118 Spaces
Multi-Family	692 Spaces
One Bedroom Units (128) @ 1.5 per unit:	192 Spaces
Two Bedroom Units (240) @ 2.0 per unit:	480 Spaces
Three Bedroom Units (40) @ 2.0 per unit:	80 Spaces
Total Parking Required:	**1,621 Spaces**

Parking Provided:

Retail, bulk merchandise (per Kanner CPUD):	720 Spaces
Standard:	632 Spaces
Handicap:	28 Spaces
Fuel Facility:	20 Spaces
Retail:	77 Spaces
Standard:	73 Spaces
Handicap:	4 Spaces
Restaurant:	104 Spaces
Standard:	100 Spaces
Handicap:	4 Spaces
Restaurant:	104 Spaces
Standard:	100 Spaces
Handicap:	4 Spaces
Multi-Family (per Kanner CPUD 1.71 spaces / unit):	647 Spaces
Standard:	630 Spaces
Handicap:	17 Spaces
Total Parking Provided:	**1,672 Spaces**

Bicycle Parking

Retail, Bulk Merchandise		Buildings 5 & 4	
Required:	20 Spaces	Required:	8 Spaces
Provided:	20 Spaces	Provided:	8 Spaces
Buildings 1 & 2		Multifamily	
Required:	6 Spaces	Required:	20 Spaces
Provided:	6 Spaces	Provided:	20 Spaces

Neighborhood Special District

Residential Density		
Maximum UPA (Non- CRA):		15.0
Provided UPA:	7.7 UPA (379 units / 49.99 ac)	
Site Area	48.99 ac	
Residential		
Provided Area:	14.70 ac	30.0%
Non-Residential		
Provided Area:	34.29 ac	70.0%
Commercial Area:	22.83 ac	46.6%
Stormwater Tracts:	8.95 ac	18.3%
Right of Way:	2.51 ac	5.1%
Non-Residential Floor Area Ratio		
Maximum Allowable Area:	4,267,974 sf	2.0 FAR
Provided Area:	193,140 sf	0.09 FAR

Building Data

Building Coverage:	361,572 sf
Retail, Bulk Merchandise:	157,231 sf
Fuel Facility Office:	123 sf
Retail:	19,250 sf
Restaurant:	16,249 sf
Multi-Family (Includes Garages, Cabana & Maintenance):	168,426 sf

Native Vegetation Requirement

Total Site Area:	**48.99 acres**
Wetlands:	6.50 acres
Surface Waters:	4.10 acres
Upland Area:	38.39 acres

Required Native Vegetation Area (25.0%): 9.60 acres
Provided Native Vegetation Area (33.3%): 12.78 acres

General Notes:

- All building, parking and access areas shall document compliance with the requirements of the American Disabilities Act prior to the issuance of a building permit.
- Refer to Landscape Plan for landscape details and specifications.
- All exotic plant species shall be removed and all required landscaping shall be installed prior to the issuance of a Certificate of Occupancy.
- The applicant will request in writing, prior to any land clearing, that the City of Stuart Development Dept. Perform a field inspection to determine if barricades have been properly installed on the site.
- All signs will comply with the sign regulations at the time of permitting.
- "No Trespass" signs to be posted during construction and displayed at all entrances and exits.
- All building numbers to be no less than four (4) inches tall, illuminated, and not blocked by landscaping.
- Building numbers shall be placed at front and rear entrances.
- Sediment control measures shall be maintained in working order at all times.
- Provisions shall be made to minimize the deposit of sediment by transport vehicles onto public paved surfaces.
- Sediment basin and traps, perimeter dikes, sediment barriers and other measures intended to trap sediment shall be constructed as a first step in any land activity and shall be made functional before land disturbance takes place.
- All public sidewalks are to be a minimum of 6' in width.
- A crime watch contact shall be established on site, to include all residents and businesses.
- Any sidewalk damaged during construction shall be repaired or replaced.
- NC Units, fresh receptacles, back flow preventor, and other above ground utilities shall be screened with landscape per City of Stuart LDR.
- Knox Box key vaults shall be provided as required.
- No permanent trailers shall be permitted on site. A temporary construction trailer shall be allowed during the course construction activities.
- Detectable warning surfaces shall be provided at all sidewalk ramps and crosswalks.
- Buildings 1, 2, 3, 4 & 5 may include any use allowed in the CPUD Agreement and any additional additional parking required shall be debited against the excess parking provided.

Land Use Site Data

Total Site Area:	48.99 ac	
Right of Way:	2.51 ac	5.1%
Residential:	14.70 ac	30.0%
Commercial:	22.80 ac	46.6%
Retail, Bulk Merchandise:	17.24 ac	
Kanner Highway Hotel:	5.59 ac	
Stormwater Tracts:	8.95 ac	18.3%
Lake 1:	1.77 ac	
Lake 2:	2.85 ac	
Dry Retention Area 1:	0.32 ac	
Dry Retention Area 2:	0.78 ac	
Dry Retention Area 3:	0.48 ac	
DOT Basin:	2.75 ac	

Density & Floor Area Ratio

Residential	
Residential Units:	379
Density Overall Site:	7.7 UPA (379 units / 49.99 ac)
Commercial	
Project Site Area:	2,133,987 sf
Total Commercial Building Area:	193,140 sf
Floor Area Ratio:	0.09 FAR

lucido & associates

Key / Location:

Project Team:

Applicant:
MAM Realty Partners
1300 Welton Rd
Paramus, NJ 07724
973-833-0776

Engineer:
Maser Consulting
410 Eagleview Blvd, Suite 104
Exton, PA 19341
610-254-9140

Engineer:
EDC Engineering
Rod Kennedy
10250 SW Village Pkwy, Suite 201
Port St Lucie, Florida, 34987

Surveyor
EDC Engineering
Rod Kennedy
10250 SW Village Pkwy, Suite 201
Port St Lucie, Florida, 34987

Landscape Architect and Planner
Lucido & Associates
701 E Ocean Blvd
Stuart, FL 34994
772-220-2100

Environmental
EW Consultants
Ed Weisberg
1900 SE Monterey Commons Blvd #206
Stuart, Florida 34996

KANNER CPUD

City of Stuart, Martin County, Florida

Master Site Plan

Date	By	Description
8.21.2020	SLS	Initial Submittal
12.18.2020	SLS	1st Resubmittal
03.16.2021	SLS	2nd Resubmittal
04.21.2021	SLS	3rd Resubmittal
05.13.2021	SLS	LPA Comments
06.16.2021	SLS	Reduced Residential Units

NORTH

SCALE: 1" = 100'

0 50' 100' 200'

REG. # 1018
Thomas P. Lucido

Designer	—	Sheet
Manager	—	1 of 1
Project Number	—	
Municipal Number	—	
Computer File	19-933 - Costco Master Site Plan.dwg	

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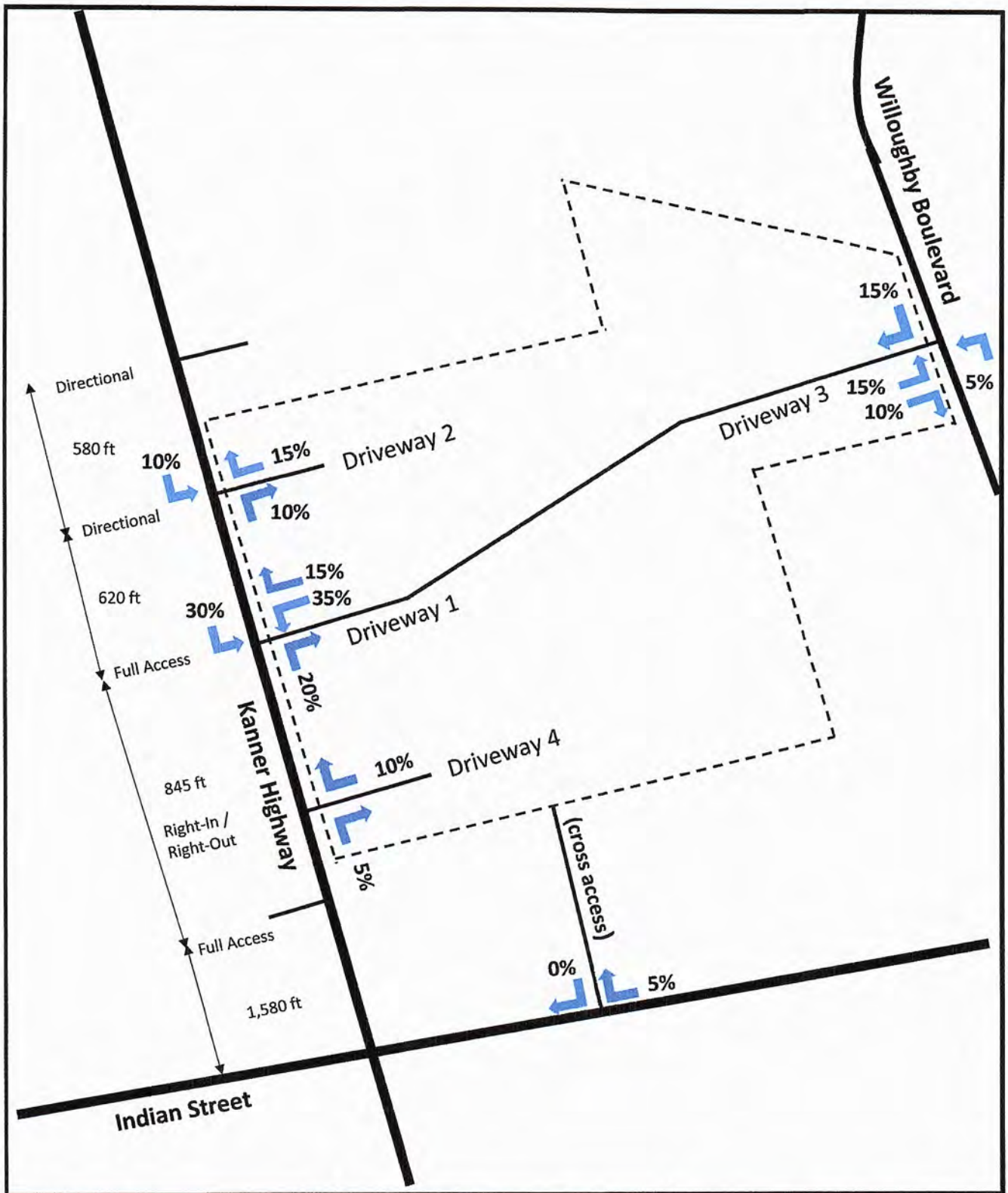
ATTACHMENT B

Percent Assignment
and
Distribution Percentage



NTS

22 SE Seminole St
Stuart, Fl, 34994

Job #: MR18031.0 | 6.25.21

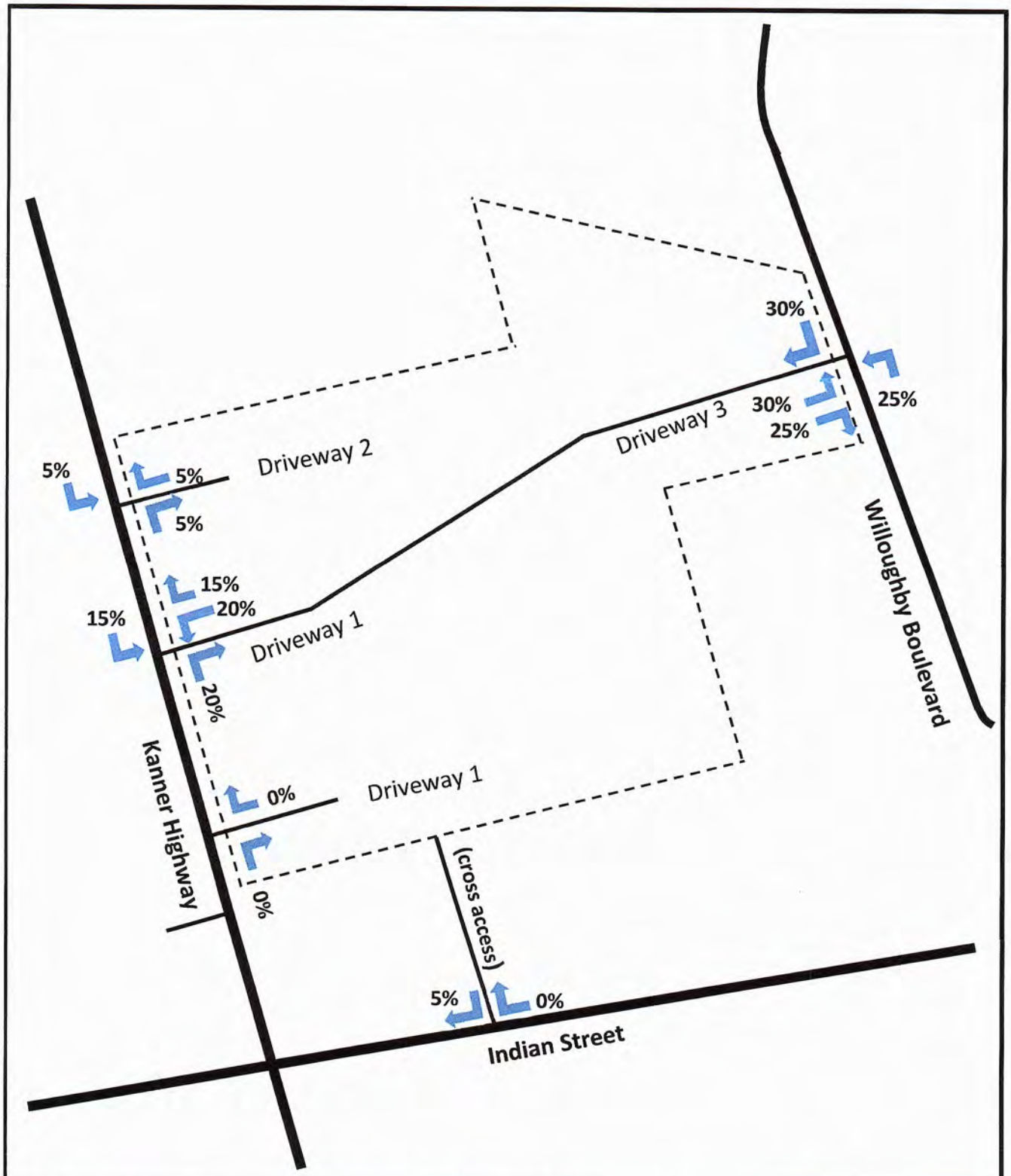
Legend

= Project Location
= Direction
15% = Percent Project Traffic
xx ft. = Driveway Spacing

Figure 2a

Driveway Assignment - Retail

M & M Retail



NTS

22 SE Seminole St
Stuart, Fl, 34994

Job #: MR18031.0 | Date: 8/31/18

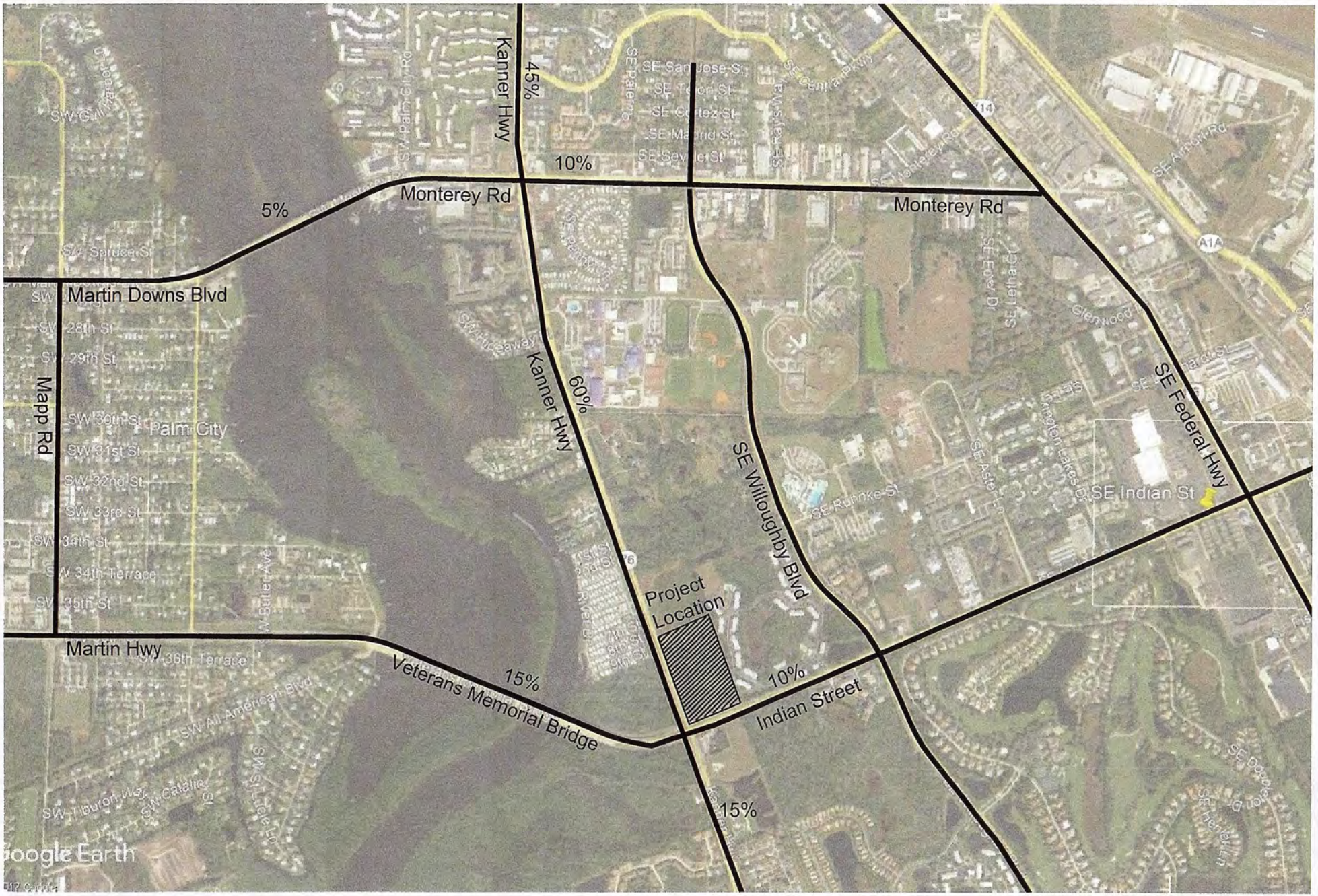
Legend

= Project Location
= Direction
15% = Percent Project Traffic
xx ft. = Driveway Spacing

Figure 2b

Driveway Assignment - Residential

M & M Retail



N
NTS

O'ROURKE ENGINEERING & PLANNING

JOB#: MR17034.0 | FILE: C4.SB10_Figure 2_12.08.17 | DATE: December 8, 2017

LEGEND

% = Project Percent Assignment

FIGURE - 2

Project Percent Assignment

MMHS - SB 10

Percent of Daily Traffic During the 60-Minute Period Beginning at Displayed Time

Land Use	221 Multifamily Housing (Mid-Rise)						222 Multifamily Housing (High-Rise)											
Setting	General Urban/ Suburban		Dense Multi-Use Urban		Center City Core		Dense Multi-Use Urban						Center City Core					
Time Period	Weekday		Weekday		Weekday		Weekday		Saturday		Sunday		Weekday		Saturday		Sunday	
Trip Type	Vehicle		Vehicle		Vehicle		Person		Person		Person		Person		Person		Person	
# Data Sites	8		4		3		8		8		8		6		6		5	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
12:00	0.5	4.7	0.5	5.0	1.3	3.5	1.6	4.2	3.1	6.2	2.4	6.4	0.8	6.1	1.9	7.6	2.4	6.8
12:15	0.4	4.6	0.7	5.0	1.3	4.4	1.3	4.4	2.8	6.0	2.1	6.1	0.8	5.8	1.8	7.5	2.0	6.6
12:30	0.3	4.3	0.5	5.3	0.7	4.6	1.1	4.3	2.5	5.9	1.9	6.0	0.7	5.9	1.3	7.2	1.8	6.6
12:45	0.3	4.5	0.7	4.8	0.4	4.4	0.8	4.5	2.2	5.9	1.6	5.9	0.4	5.4	1.1	7.4	1.6	6.8
1:00	0.3	4.4	0.7	4.5	0.2	5.3	0.7	4.7	1.8	5.8	1.4	6.1	0.3	5.3	1.0	6.6	1.5	6.6
1:15	0.3	4.5	0.5	4.4	0.2	4.6	0.5	4.5	1.4	6.1	1.4	6.3	0.2	5.3	0.9	6.3	1.3	7.1
1:30	0.3	5.0	0.7	3.8	0.7	4.6	0.4	4.9	1.2	6.1	1.3	6.8	0.2	5.3	0.8	6.2	1.0	7.0
1:45	0.3	5.2	0.5	4.7	0.7	4.2	0.4	5.2	1.0	6.3	1.2	7.2	0.2	5.3	0.7	6.2	0.9	6.9
2:00	0.2	5.4	0.6	4.6	0.9	4.4	0.3	5.4	0.9	6.3	1.2	7.0	0.2	4.7	0.9	6.2	0.8	6.8
2:15	0.2	5.4	0.7	4.4	0.9	4.9	0.4	5.7	0.9	6.0	0.9	6.9	0.1	4.7	0.9	6.1	0.6	6.7
2:30	0.2	5.3	0.7	5.2	0.7	4.6	0.4	5.9	0.7	6.3	0.7	6.4	0.2	5.2	0.8	6.1	0.7	6.7
2:45	0.3	5.2	0.6	5.2	0.4	5.3	0.4	5.8	0.8	6.5	0.8	6.3	0.3	5.5	0.8	6.1	0.5	6.7
3:00	0.3	5.8	0.5	5.3	0.2	5.1	0.3	5.6	0.7	6.6	0.6	6.4	0.3	6.1	0.6	6.5	0.4	6.6
3:15	0.4	6.5	0.2	5.8	0.2	4.6	0.3	6.1	0.7	6.5	0.6	6.4	0.3	6.3	0.4	6.8	0.5	6.4
3:30	0.4	7.1	0.2	6.0	0.2	5.7	0.3	5.9	0.7	6.4	0.6	6.6	0.4	6.1	0.4	6.8	0.4	6.4
3:45	0.5	7.9	0.3	7.2	1.1	4.9	0.4	6.0	0.7	6.4	0.5	6.4	0.3	6.0	0.4	6.8	0.4	6.0
4:00	0.5	8.3	0.3	7.4	1.1	5.3	0.6	6.5	0.7	6.5	0.6	7.0	0.4	5.8	0.5	7.0	0.4	6.0
4:15	0.8	9.4	0.5	8.2	1.3	6.8	0.7	6.1	0.6	7.0	0.5	7.4	0.5	5.7	0.4	6.7	0.3	6.1
4:30	1.1	9.8	1.1	8.0	1.5	6.6	0.9	6.6	0.6	7.4	0.5	7.8	0.6	6.0	0.4	7.0	0.3	6.5
4:45	1.5	10.1	1.4	7.0	1.3	7.3	1.0	7.0	0.5	7.3	0.5	8.1	0.8	6.4	0.4	6.6	0.2	7.0
5:00	1.7	10.1	1.9	6.5	1.8	7.9	1.2	7.0	0.6	7.6	0.6	7.7	0.9	6.6	0.4	6.9	0.3	7.3
5:15	1.8	9.5	2.2	6.3	2.0	6.0	1.4	7.5	0.6	7.3	0.7	7.6	1.0	7.2	0.5	7.1	0.3	7.3
5:30	2.3	9.0	2.8	6.5	2.2	6.2	1.7	8.1	0.7	7.1	0.8	7.3	1.2	7.2	0.6	6.5	0.4	6.5
5:45	3.0	8.5	3.4	6.3	2.6	7.5	2.0	7.9	0.8	7.1	0.9	6.8	1.5	7.5	0.6	6.5	0.6	7.2
6:00	4.0	7.9	4.1	7.7	4.9	6.4	2.6	7.9	1.0	6.8	1.0	7.0	2.0	7.9	0.7	6.1	0.7	7.3
6:15	5.1	7.2	5.2	7.1	6.8	7.1	3.5	7.7	1.2	6.6	1.0	6.5	2.7	7.8	1.1	6.1	1.0	7.1
6:30	6.0	6.7	6.0	7.0	7.7	7.1	4.2	7.2	1.5	6.5	1.0	7.0	3.4	7.7	1.3	6.6	1.2	7.6
6:45	6.8	6.3	9.2	6.5	9.3	5.5	5.5	6.9	1.8	6.3	1.2	7.3	4.2	7.8	1.6	6.8	1.4	6.9
7:00	7.5	6.3	10.9	5.5	8.6	6.2	6.8	6.7	2.1	6.0	1.3	7.0	4.7	7.6	2.1	6.6	1.7	6.6
7:15	7.5	6.1	12.0	5.3	7.5	6.4	7.8	6.5	2.5	5.8	1.6	6.8	5.8	7.1	2.1	6.6	2.1	6.6
7:30	7.5	6.1	11.8	5.0	7.9	5.7	8.8	6.2	2.7	5.6	2.0	6.2	7.1	6.7	2.7	6.1	2.4	6.4
7:45	6.9	5.9	9.0	5.1	7.7	5.3	8.5	6.0	3.1	5.5	2.4	5.7	7.8	5.9	3.1	5.6	2.8	6.2
8:00	6.2	5.1	7.2	4.7	7.5	4.6	8.0	5.7	3.6	5.5	2.8	5.6	8.1	5.9	3.3	5.4	3.2	6.0
8:15	5.7	4.7	5.8	4.2	7.1	4.9	6.8	5.5	4.1	5.5	3.3	5.5	7.8	5.5	3.9	4.7	3.7	5.6
8:30	4.9	4.4	4.7	4.3	6.4	4.9	6.1	5.1	4.5	5.3	3.7	5.0	7.2	5.3	4.1	4.4	4.1	5.1
8:45	4.6	4.1	4.8	4.0	5.7	5.7	5.8	4.7	4.9	5.1	3.7	4.8	7.0	5.3	5.1	4.4	4.7	5.0
9:00	4.3	3.9	4.0	3.8	5.3	5.1	5.1	4.4	5.0	4.9	4.1	4.5	6.7	4.7	5.6	4.1	5.0	4.7
9:15	4.1	3.6	3.9	4.1	4.9	4.4	5.1	3.8	4.7	4.8	4.5	4.8	6.1	4.5	5.9	4.4	5.2	4.4
9:30	4.0	3.3	3.7	3.7	5.1	5.3	4.7	3.5	4.6	4.5	4.8	4.9	5.4	4.4	6.3	4.3	5.3	4.1
9:45	3.8	2.8	3.6	3.7	4.2	4.9	4.3	3.4	4.6	4.3	5.3	5.3	4.9	3.8	6.1	4.1	5.7	3.5
10:00	3.7	2.7	4.1	3.6	3.5	5.1	4.3	3.1	4.8	4.2	5.6	5.1	4.6	3.5	6.4	4.1	6.2	3.3
10:15	3.8	2.5	4.3	3.4	3.3	4.6	4.4	3.4	5.2	4.1	5.6	4.6	4.2	3.3	6.4	3.4	6.8	3.1
10:30	4.0	2.2	4.2	3.0	2.4	3.3	4.3	3.1	5.8	4.0	5.5	4.1	4.4	2.7	6.3	3.4	7.5	2.5
10:45	4.3	1.9	3.8	2.5	2.9	2.4	4.2	2.9	5.7	3.9	5.6	3.4	4.6	2.4	6.6	3.3	7.5	2.3
11:00	4.5	1.5	4.4	2.3	3.3	2.4	4.5	2.8	5.6	3.6	5.8	3.0	4.9	2.1	6.6	2.9	7.5	2.0
11:15	4.7	1.2	4.3	1.6	4.0	1.8	4.4	2.3	6.0	3.5	6.2	2.8	5.5	1.6	7.2	2.6	7.1	2.2
11:30	4.9	0.9	4.6	1.2	4.0	1.8	4.4	2.1	5.8	3.4	6.3	2.5	5.4	1.2	7.7	2.5	6.9	2.5
11:45	4.6	0.6	4.8	0.9	4.4	1.8	4.3	1.9	6.0	3.2	6.5	2.5	5.8	1.1	7.3	2.2	6.9	2.5

Percent of Daily Traffic During the 60-Minute Period Beginning at Displayed Time

Land Use	820 Shopping Center		840 Automobile Sales (New)		841 Automobile Sales (Used)		842 Recreational Vehicle Sales		843 Automobile Parts Sales		848 Tire Store	
Setting	General Urban/ Suburban		General Urban/ Suburban		General Urban/ Suburban		General Urban/ Suburban		General Urban/ Suburban		General Urban/ Suburban	
Time Period	Weekday		Weekday		Weekday		Weekday		Weekday		Weekday	
Trip Type	Vehicle		Vehicle		Vehicle		Vehicle		Vehicle		Vehicle	
# Data Sites	10		6		14		5		7		6	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
12:00	0.2	10.0	0.0	9.4	0.0	9.1	0.0	10.9	0.0	8.6	0.0	7.4
12:15	0.1	10.1	0.0	8.7	0.0	9.9	0.0	10.5	0.0	8.9	0.0	8.7
12:30	0.2	9.8	0.0	9.0	0.0	9.9	0.0	10.7	0.0	9.2	0.0	9.4
12:45	0.1	9.6	0.0	8.9	0.0	9.4	0.0	8.7	0.0	9.8	0.0	11.3
1:00	0.1	9.3	0.0	9.5	0.0	8.3	0.0	8.3	0.0	8.6	0.0	11.8
1:15	0.1	9.2	0.0	9.8	0.0	7.5	0.0	8.5	0.0	7.8	0.0	11.9
1:30	0.0	9.2	0.0	10.2	0.0	7.1	0.0	7.7	0.0	7.4	0.0	12.9
1:45	0.0	9.2	0.0	10.2	0.0	6.3	0.0	8.2	0.0	6.7	0.0	11.0
2:00	0.0	9.0	0.0	10.0	0.0	7.7	0.0	8.2	0.0	7.0	0.0	10.4
2:15	0.0	8.8	0.0	9.8	0.0	8.5	0.0	9.0	0.0	7.8	0.0	9.1
2:30	0.0	8.8	0.0	9.1	0.0	8.5	0.0	8.0	0.0	8.4	0.0	8.3
2:45	0.0	8.8	0.0	8.9	0.0	8.6	0.0	7.8	0.0	9.0	0.0	9.3
3:00	0.0	8.8	0.0	8.3	0.0	8.4	0.0	7.8	0.0	8.7	0.0	10.1
3:15	0.0	8.9	0.0	8.1	0.0	8.9	0.0	7.0	0.0	8.7	0.0	10.0
3:30	0.0	9.0	0.0	8.1	0.0	9.8	0.0	9.2	0.0	8.4	0.0	9.4
3:45	0.0	9.0	0.0	7.7	0.0	10.9	0.0	9.0	0.0	8.2	0.0	9.5
4:00	0.0	9.2	0.0	7.4	0.0	11.0	0.0	10.0	0.0	8.8	0.0	9.4
4:15	0.0	9.2	0.0	7.5	0.0	11.1	0.0	9.3	0.0	8.5	0.0	9.1
4:30	0.1	9.3	0.0	8.0	0.0	11.4	0.0	8.0	0.0	8.2	0.2	8.4
4:45	0.1	9.4	0.0	8.1	0.0	10.8	0.0	8.8	0.0	7.6	0.2	8.3
5:00	0.1	9.3	0.0	8.2	0.0	10.2	0.0	6.7	0.0	7.5	0.4	6.9
5:15	0.1	9.1	0.0	8.1	0.0	9.6	0.0	5.8	0.0	7.3	0.5	6.1
5:30	0.2	8.7	0.1	6.8	0.0	7.7	0.0	4.3	0.0	7.0	0.5	5.4
5:45	0.2	8.3	0.2	5.9	0.0	6.3	0.0	2.0	0.1	6.7	0.5	3.8
6:00	0.2	8.0	0.7	5.0	0.0	4.5	0.0	1.3	0.3	6.6	0.4	3.0
6:15	0.4	7.6	1.7	4.1	0.0	3.2	0.3	0.8	0.8	5.5	0.7	2.3
6:30	0.6	7.1	2.9	3.6	0.2	2.4	0.3	0.7	1.0	5.3	1.0	1.9
6:45	0.8	6.7	4.3	3.0	0.7	1.8	2.3	0.5	1.5	5.5	1.8	1.4
7:00	1.1	6.1	5.7	2.9	1.9	1.9	5.5	0.2	2.1	5.0	2.9	1.2
7:15	1.4	5.8	6.6	1.7	3.7	1.7	6.5	0.0	2.5	5.4	3.4	0.7
7:30	1.6	5.5	7.8	1.2	4.3	1.6	8.5	0.0	4.3	5.5	4.9	0.3
7:45	1.8	4.9	8.2	0.7	4.9	1.6	7.0	0.0	4.8	5.2	6.6	0.5
8:00	2.0	4.4	8.3	0.0	5.0	1.1	6.3	0.0	5.5	4.3	7.2	0.5
8:15	2.3	4.2	8.4	0.0	7.2	0.4	9.3	0.0	6.6	3.5	7.7	0.3
8:30	2.6	3.8	7.9	0.0	7.7	0.2	9.5	0.0	6.7	2.7	7.8	0.3
8:45	3.1	3.4	8.2	0.0	9.0	0.0	12.5	0.0	7.6	1.9	8.3	0.0
9:00	3.6	2.9	7.5	0.0	11.0	0.0	14.0	0.0	8.2	1.7	9.4	0.0
9:15	4.1	2.3	7.8	0.0	9.7	0.0	12.2	0.0	8.1	1.3	10.9	0.0
9:30	4.7	1.7	7.6	0.0	10.4	0.0	12.7	0.0	7.8	0.8	11.3	0.0
9:45	5.1	1.4	7.8	0.0	11.0	0.0	12.4	0.0	8.0	0.5	10.9	0.0
10:00	5.6	1.1	8.2	0.0	10.2	0.0	12.4	0.0	8.4	0.1	10.7	0.0
10:15	6.3	0.8	8.4	0.0	9.7	0.0	12.5	0.0	8.0	0.0	9.9	0.0
10:30	6.9	0.7	8.7	0.0	10.4	0.0	11.2	0.0	8.5	0.0	9.2	0.0
10:45	7.6	0.5	8.5	0.0	9.7	0.0	11.7	0.0	8.5	0.0	8.9	0.0
11:00	8.3	0.5	8.8	0.0	9.8	0.0	8.3	0.0	8.6	0.0	8.3	0.0
11:15	8.9	0.4	9.4	0.0	9.0	0.0	8.0	0.0	9.3	0.0	8.5	0.0
11:30	9.5	0.3	9.1	0.0	8.5	0.0	9.2	0.0	8.8	0.0	8.6	0.0
11:45	9.8	0.3	9.4	0.0	9.0	0.0	9.0	0.0	8.4	0.0	7.7	0.0

Percent of Daily Traffic During the 60-Minute Period Beginning at Displayed Time

Land Use	720 Medical-Dental Office Building						730 Government Office Building		731 State Motor Vehicles Department	
Setting	General Urban/Suburban						General Urban/Suburban		General Urban/Suburban	
Time Period	Weekday		Saturday		Sunday		Weekday		Weekday	
Trip Type	Vehicle		Vehicle		Vehicle		Vehicle		Vehicle	
# Data Sites	19		1		1		7		1	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
12:00	0.1	7.9	0.0	17.9	0.0	20.0	0.0	9.8	0.0	8.9
12:15	0.1	7.9	0.0	21.6	0.0	20.0	0.0	9.3	0.0	12.1
12:30	0.1	8.0	0.0	18.7	0.0	10.0	0.0	9.5	0.0	13.1
12:45	0.1	8.4	0.0	14.9	0.0	0.0	0.0	9.3	0.0	11.9
1:00	0.1	8.8	0.0	10.4	0.0	0.0	0.0	8.8	0.0	10.8
1:15	0.1	8.9	0.0	0.0	0.0	0.0	0.0	9.2	0.4	8.5
1:30	0.0	9.3	0.0	0.0	0.0	0.0	0.0	8.8	0.4	7.5
1:45	0.1	9.2	0.0	0.0	0.0	0.0	0.0	9.5	0.4	8.3
2:00	0.1	9.1	0.0	0.0	0.0	20.0	0.0	9.8	0.4	8.7
2:15	0.1	9.3	0.0	0.0	0.0	20.0	0.0	8.5	0.0	8.3
2:30	0.1	9.2	0.0	0.0	0.0	20.0	0.0	9.3	0.0	7.9
2:45	0.0	9.3	0.0	0.0	0.0	20.0	0.0	8.8	0.0	7.9
3:00	0.1	9.2	0.0	0.0	0.0	0.0	0.0	8.2	0.0	7.9
3:15	0.2	8.7	0.0	0.0	0.0	0.0	0.0	8.8	0.4	6.0
3:30	0.4	8.6	0.0	0.0	0.0	0.0	0.0	7.3	0.4	5.0
3:45	0.5	8.1	0.0	0.0	0.0	0.0	0.0	6.3	0.8	9.4
4:00	0.6	7.8	0.0	0.0	0.0	0.0	0.0	6.3	1.2	8.7
4:15	0.6	8.3	0.0	0.0	0.0	0.0	0.0	8.9	0.8	10.2
4:30	0.5	7.4	0.0	0.0	0.0	0.0	0.0	8.2	0.8	10.0
4:45	0.4	6.7	0.0	0.0	0.0	0.0	0.0	6.9	0.4	5.6
5:00	0.4	5.6	0.0	0.0	0.0	0.0	0.0	5.5	0.0	5.2
5:15	0.5	4.2	0.0	0.0	0.0	0.0	0.0	1.1	0.0	4.6
5:30	0.7	3.5	0.0	0.0	20.0	0.0	0.0	0.4	0.0	5.8
5:45	0.9	2.7	0.0	0.0	20.0	0.0	0.0	0.3	0.0	5.8
6:00	1.4	2.2	3.7	0.0	30.0	0.0	0.2	0.0	0.8	8.9
6:15	2.0	1.7	4.5	0.0	30.0	0.0	1.3	0.0	1.2	7.5
6:30	2.8	1.5	4.5	0.0	10.0	0.0	1.8	0.0	1.2	6.2
6:45	4.0	1.4	4.5	0.0	10.0	0.0	3.3	0.0	2.7	5.6
7:00	5.4	1.3	3.0	0.0	0.0	0.0	7.1	0.0	5.2	2.5
7:15	6.7	1.1	5.2	0.0	0.0	0.0	9.3	0.0	8.1	3.3
7:30	7.6	1.1	6.7	0.0	0.0	0.0	12.0	0.0	10.0	3.7
7:45	8.2	1.0	8.2	0.0	0.0	0.0	13.8	0.0	9.8	2.9
8:00	8.9	0.7	9.0	0.0	0.0	0.0	12.4	0.0	8.7	2.5
8:15	9.3	0.6	9.7	0.0	0.0	0.0	11.8	0.0	7.3	1.7
8:30	9.7	0.5	11.2	0.0	0.0	0.0	10.7	0.0	7.3	0.4
8:45	10.3	0.4	11.9	0.0	0.0	0.0	9.5	0.0	8.9	0.0
9:00	10.4	0.3	11.2	0.0	10.0	0.0	8.5	0.0	7.5	0.0
9:15	10.7	0.2	12.7	0.0	10.0	0.0	8.5	0.0	7.1	0.0
9:30	10.7	0.2	17.9	0.0	20.0	0.0	8.1	0.0	6.7	0.0
9:45	10.5	0.2	21.6	0.0	30.0	0.0	8.8	0.0	5.0	0.0
10:00	10.1	0.2	25.4	0.0	20.0	0.0	10.1	0.0	5.4	0.0
10:15	9.9	0.1	23.9	0.0	20.0	0.0	10.2	0.0	5.2	0.0
10:30	9.7	0.1	21.6	0.0	10.0	0.0	12.5	0.0	4.8	0.0
10:45	9.5	0.2	20.1	0.0	0.0	0.0	12.9	0.0	6.2	0.0
11:00	9.1	0.1	19.4	0.0	0.0	0.0	13.4	0.0	6.4	0.0
11:15	8.8	0.2	22.4	0.0	0.0	0.0	13.2	0.0	7.3	0.0
11:30	8.3	0.1	19.4	0.0	10.0	0.0	11.4	0.0	8.7	0.0
11:45	8.0	0.0	18.7	0.0	20.0	0.0	10.6	0.0	8.3	0.0

ATTACHMENT C

Traffic Signal Warrant Summary

State of Florida Department of Transportation

TRAFFIC SIGNAL WARRANT SUMMARY

City:	Stuart	Engineer:	James Kemp
County:	89 – Martin	Date:	June 25, 2021
District:	Four		

Major Street:	Kanner Highway	Lanes:	3	Major Approach Speed:	45
Minor Street:	M&M Full Access Dwy (Costco Blvd)	Lanes:	3	Minor Approach Speed:	35

MUTCD Electronic Reference to Chapter 4: http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/part4.pdf

Volume Level Criteria

1. Is the posted speed or 85th-percentile of major street > 40 mph (70 km/h)? ☑ Yes ☐ No
2. Is the intersection in a built-up area of an isolated community with a population < 10,000? ☐ Yes ☑ No

"70%" volume level **may** be used if Question 1 **or** 2 above is answered "Yes" ☑ 70% ☑ 100%

WARRANT 1 - EIGHT-HOUR VEHICULAR VOLUME

Warrant 1 is satisfied if Condition A or Condition B is "100%" satisfied for eight hours. ☑ Yes ☐ No

Warrant 1 is also satisfied if both Condition A and Condition B are "80%" satisfied (should only be applied after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems). ☑ Yes ☐ No

Condition A - Minimum Vehicular Volume

Condition A is intended for application at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal.

100% Satisfied:	☐ Yes	☑ No
80% Satisfied:	☑ Yes	☐ No
70% Satisfied:	☑ Yes	☐ No

Number of Lanes for moving traffic on each approach		Vehicles per hour on major-street (total of both approaches)			Vehicles per hour on minor-street (one direction only)		
Major	Minor	100%[a]	80%[b]	70%[c]	100%[a]	80%[b]	70%[c]
1	1	500	400	350	150	120	105
2 or more	1	600	480	420	150	120	105
2 or more	2 or more	600	480	420	200	160	140
1	2 or more	500	400	350	200	160	140

[a] Basic Minimum hourly volume
[b] Used for combination of Conditions A and B after adequate trial of other remedial measures
[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Record 8 highest hours and the corresponding major-street and minor-street volumes in the Instructions Sheet.

Street	Eight Highest Hours							
	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
Major	1,848	1,846	1,680	1,867	1,925	2,010	2,001	1,516
Minor	221	253	241	239	235	242	239	193

Existing Volumes

State of Florida Department of Transportation

TRAFFIC SIGNAL WARRANT SUMMARY

Condition B - Interruption of Continuous Traffic

Condition B is intended for application where Condition A is not satisfied and the traffic volume on a major street is so heavy that traffic on the minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.

Applicable:	☑ Yes	☐ No
100% Satisfied:	☑ Yes	☐ No
80% Satisfied:	☑ Yes	☐ No
70% Satisfied:	☑ Yes	☐ No

Number of Lanes for moving traffic on each approach		Vehicles per hour on major-street (total of both approaches)			Vehicles per hour on minor-street (one direction only)		
Major	Minor	100%[a]	80%[b]	70%[c]	100%[a]	80%[b]	70%[c]
1	1	750	600	525	75	60	53
2 or more	1	900	720	630	75	60	53
2 or more	2 or more	900	720	630	100	80	70
1	2 or more	750	600	525	100	80	70

[a] Basic Minimum hourly volume

[b] Used for combination of Conditions A and B after adequate trial of other remedial measures

[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Record 8 highest hours and the corresponding major-street and minor-street volumes in the Instructions Sheet.

Eight Highest Hours								
Street	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
Major	1,848	1,846	1,680	1,867	1,925	2,010	2,001	1,516
Minor	221	253	241	239	235	242	239	193

Existing Volumes

Form 750-020-01
TRAFFIC ENGINEERING
10/15

State of Florida Department of Transportation

TRAFFIC SIGNAL WARRANT SUMMARY

City:	Stuart	Engineer:	James Kemp
County:	89 – Martin	Date:	June 25, 2021
District:	Four		

Major Street:	Kanner Highway	Lanes:	3	Major Approach Speed:	45
Minor Street:	M&M Full Access Dwy (Costco Blvd)	Lanes:	3	Minor Approach Speed:	35

MUTCD Electronic Reference to Chapter 4: http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/part4.pdf

Volume Level Criteria

1. Is the posted speed or 85th-percentile of major street > 40 mph (70 km/h)? ☑ Yes ☐ No
2. Is the intersection in a built-up area of an isolated community with a population < 10,000? ☐ Yes ☑ No

"70%" volume level **may** be used if Question 1 **or** 2 above is answered "Yes" ☑ Yes ☐ No

WARRANT 2 - FOUR-HOUR VEHICULAR VOLUME

If all four points lie above the appropriate line, then the warrant is satisfied.

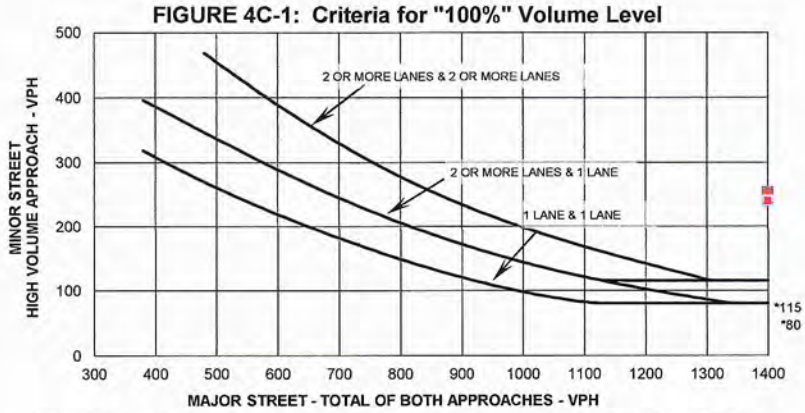
Applicable: ☑ Yes ☐ No
Satisfied: ☑ Yes ☐ No

Plot four volume combinations on the applicable figure below.

100% Volume Level

Four Highest Hours	Volumes	
	Major Street	Minor Street
12:00 PM	1846	253
1:00 PM	1680	241
4:00 PM	2010	242
5:00 PM	2001	239

FIGURE 4C-1: Criteria for "100%" Volume Level



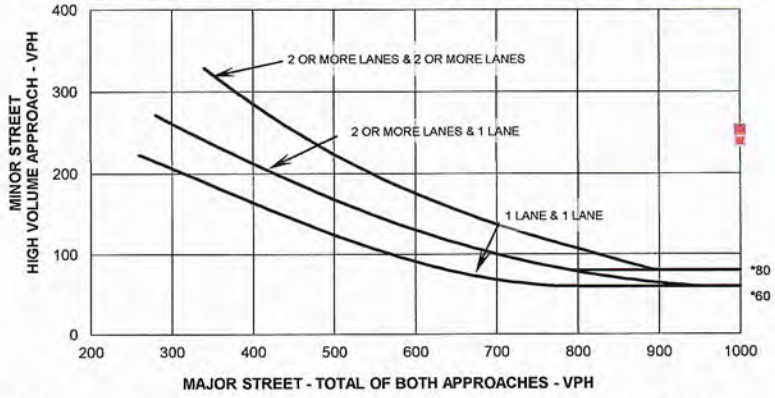
** Note: 115 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 80 vph applies as the lower threshold volume threshold for a minor street approach with one lane.*

70% Volume Level

Four Highest Hours	Volumes	
	Major Street	Minor Street
12:00 PM	1846	253
1:00 PM	1680	241
4:00 PM	2010	242
5:00 PM	2001	239

FIGURE 4C-2: Criteria for "70%" Volume Level

(Community Less than 10,000 population or above 70 km/hr (40 mph) on Major Street)



** Note: 80 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 60 vph applies as the lower threshold volume threshold for a minor street approach with one lane.*

Form 750-020-01
TRAFFIC ENGINEERING
10/15

State of Florida Department of Transportation

TRAFFIC SIGNAL WARRANT SUMMARY

City:	Stuart	Engineer:	James Kemp
County:	89 – Martin	Date:	June 25, 2021
District:	Four		

Major Street:	Kanner Highway	Lanes:	3	Major Approach Speed:	45
Minor Street:	M&M Full Access Dwy (Costco Blvd)	Lanes:	3	Minor Approach Speed:	35

MUTCD Electronic Reference to Chapter 4: http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/part4.pdf

Volume Level Criteria

1. Is the posted speed or 85th-percentile of major street > 40 mph (70 km/h)? ☑ Yes ☐ No
2. Is the intersection in a built-up area of an isolated community with a population < 10,000? ☐ Yes ☑ No

"70%" volume level **may** be used if Question 1 **or** 2 above is answered "Yes" ☑ 70% ☑ 100%

WARRANT 3 - PEAK HOUR

*If all three criteria are fulfilled **or** the plotted point lies above the appropriate line, then the warrant is satisfied.*

Applicable: ☑ Yes ☐ No
Satisfied: ☑ Yes ☐ No

Unusual condition justifying use of warrant:

Record hour when criteria are fulfilled and the corresponding delay or volume in boxes provided.

Peak Hour 100% Volume		
Time	Major Vol.	Minor Vol.
12:00 PM	1846	253

Peak Hour 70% Volume		
Time	Major Vol.	Minor Vol.
12:00 PM	1846	253

Criteria

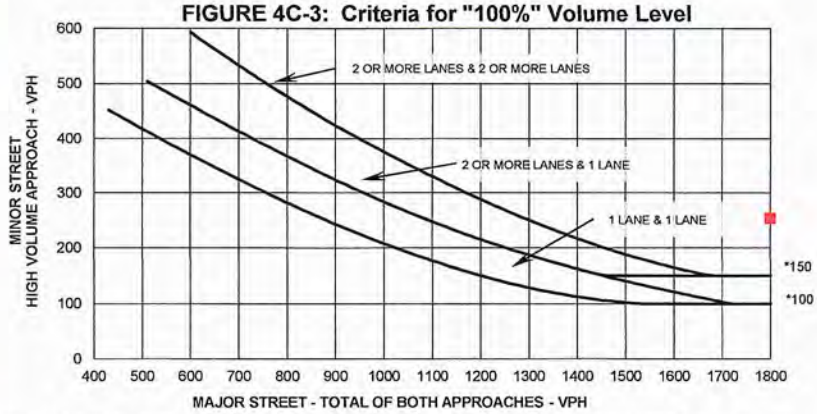
1. Delay on Minor Approach *(vehicle-hours)		
Approach Lanes	1	2
Delay Criteria*	4.0	5.0
Delay*		84.4
Fulfilled?:	☑ Yes	☐ No

2. Volume on Minor Approach One-Direction *(vehicles per hour)		
Approach Lanes	1	2
Volume Criteria*	100	150
Volume*		253
Fulfilled?:	☑ Yes	☐ No

3. Total Intersection Entering Volume *(vehicles per hour)		
No. of Approaches	3	4
Volume Criteria*	650	800
Volume*	2,099	
Fulfilled?:	☑ Yes	☐ No

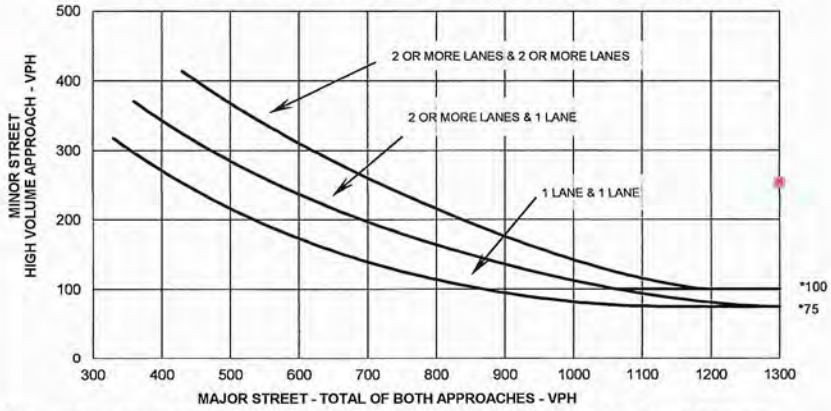
Plot volume combination on the applicable figure below.

FIGURE 4C-3: Criteria for "100%" Volume Level



** Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 100 vph applies as the lower threshold volume threshold for a minor street approach with one lane.*

FIGURE 4C-4: Criteria for "70%" Volume Level
(Community Less than 10,000 population or above 70 km/hr (40 mph) on Major Street)



** Note: 100 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 75 vph applies as the lower threshold volume threshold for a minor street approach with one lane.*

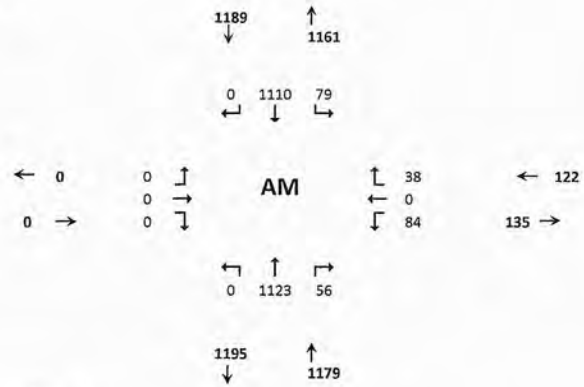
TURNING MOVEMENT VOLUME COUNTS

N/S STREET: Kanner Hwy
E/W STREET: Driveway 1
CONTROL:
FILENAME:
COUNT DATE: 3/20/2019
DAY: Wednesday
CITY: Stuart
INTERSECTION:
REPORT DATE: 12/16/2020
ANALYSIS YEAR: 2024

15 Min Period	Northbound NBL	NBT	NBR	Southbound SBL	SBT	SBR	Eastbound EBL	EBT	EBR	Westbound WBL	WBT	WBR	TOTAL	ONE HOUR SUM
7:00-7:15	0	163	0	0	277	0	0	0	0	0	0	0	440	2040
7:15-7:30	0	230	0	0	296	0	0	0	0	0	0	0	526	2149
7:30-7:45	0	254	0	0	253	0	0	0	0	0	0	0	507	2138
7:45-8:00	0	298	0	0	269	0	0	0	0	0	0	0	567	2127
8:00-8:15	0	284	0	0	265	0	0	0	0	0	0	0	549	1976
8:15-8:30	0	329	0	0	186	0	0	0	0	0	0	0	515	
8:30-8:45	0	256	0	0	240	0	0	0	0	0	0	0	496	
8:45-9:00	0	218	0	0	198	0	0	0	0	0	0	0	416	

AM PEAK HOUR IS FROM: 7:15AM TO 8:15AM

	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	TOTAL
Volumes	0	1066	0	0	1083	0	0	0	0	0	0	0	2149
Season Factor	0	1066	0	0	1083	0	0	0	0	0	0	0	2149
Growth	0	1093	0	0	1110	0	0	0	0	0	0	0	2203
In/Out	-	IN/OUT	IN	IN	-	-	-	-	-	OUT	-	OUT	-
Res Percentage	0%	0%	20%	15%	0%	0%	0%	0%	0%	20%	0%	15%	0%
Retail Percentage	0%	5%/10%	20%	30%	0%	0%	0%	0%	0%	35%	0%	15%	0%
PROJECT	0	30	56	79	0	0	0	0	0	77	0	38	0
MMHS										7			
Total	0	1123	56	79	1110	0	0	0	0	84	0	38	2490



Seasonal Factor: 1

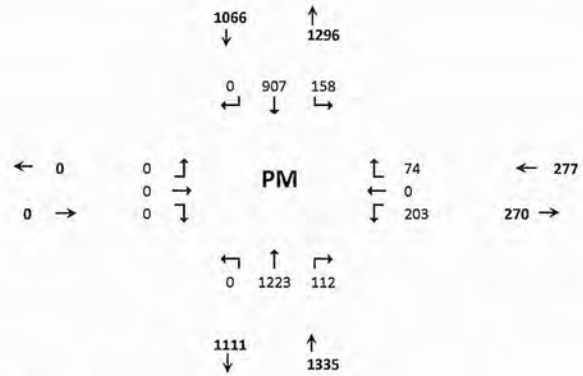
	Retail	Residential
Trips In	250	30
Trips Out	179	73

Growth Rate: 1.005
Years Grown: 5

15 Min Period lanes	Northbound NBL	NBT	NBR	Southbound SBL	SBT	SBR	Eastbound EBL	EBT	EBR	Westbound WBL	WBT	WBR	TOTAL	ONE HOUR SUM
4:00-4:15	0	317	0	0	226	0	0	0	0	0	0	0	543	2010
4:15-4:30	0	281	0	0	203	0	0	0	0	0	0	0	484	1993
4:30-4:45	0	287	0	0	212	0	0	0	0	0	0	0	499	1984
4:45-5:00	0	240	0	0	244	0	0	0	0	0	0	0	484	1978
5:00-5:15	0	275	0	0	251	0	0	0	0	0	0	0	526	2001
5:15-5:30	0	260	0	0	215	0	0	0	0	0	0	0	475	
5:30-5:45	0	271	0	0	222	0	0	0	0	0	0	0	493	
5:45-6:00	0	292	0	0	215	0	0	0	0	0	0	0	507	

PM PEAK HOUR IS FROM: 4:00PM TO 5:00PM

	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	TOTAL
Volumes	0	1125	0	0	885	0	0	0	0	0	0	0	2010
Season Factor	0	1125	0	0	885	0	0	0	0	0	0	0	2010
Growth	0	1153	0	0	907	0	0	0	0	0	0	0	2061
In/Out	-	IN/OUT	IN	IN	-	-	-	-	-	OUT	-	OUT	-
Res Percentage	0%	0%	20%	15%	0%	0%	0%	0%	0%	20%	0%	15%	0%
Retail Percentage	0%	5%/10%	20%	30%	0%	0%	0%	0%	0%	35%	0%	15%	0%
Project	0	69	112	158	0	0	0	0	0	165	0	74	
MMHS										38			
Total	0	1223	112	158	907	0	0	0	0	203	0	74	2677



Seasonal Factor: 1

	Retail	Residential
Trips In:	492	72
Trips Out:	447	44

Growth Rate: 1.005
Years Grown: 5

HCS7 Two-Way Stop-Control Report

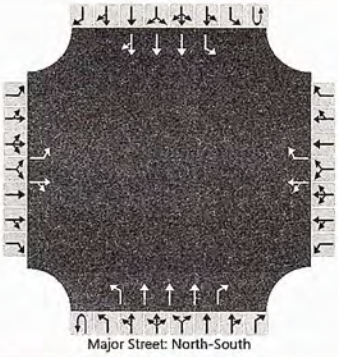
General Information

Analyst	James Kemp
Agency/Co.	O'Rourke Engineering
Date Performed	6/25/2021
Analysis Year	2024
Time Analyzed	PM Peak Hour
Intersection Orientation	North-South
Project Description	M & M Retail

Site Information

Intersection	Kanner Hwy and Driveway 1
Jurisdiction	City of Stuart
East/West Street	Driveway 1
North/South Street	Kanner Hwy
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	1	0		0	1	1	0	1	3	1	0	1	3	0
Configuration		L		TR		LT		R		L	T	R		L	T	TR
Volume (veh/h)		2	1	2		203	1	74	0	1	1223	112	0	158	907	1
Percent Heavy Vehicles (%)		3	3	3		0	3	0	3	3			3	3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized					No				No							
Median Type | Storage	Left + Thru								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		6.4	6.5	7.1		6.4	6.5	7.1		5.3				5.3		
Critical Headway (sec)		6.46	6.56	7.16		6.40	6.56	7.10		5.36				5.36		
Base Follow-Up Headway (sec)		3.8	4.0	3.9		3.8	4.0	3.9		3.1				3.1		
Follow-Up Headway (sec)		3.83	4.03	3.93		3.80	4.03	3.90		3.13				3.13		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		2		3		222		80		1				172		
Capacity, c (veh/h)		28		42		56		349		394				233		
v/c Ratio		0.08		0.08		3.97		0.23		0.00				0.74		
95% Queue Length, Q_{95} (veh)		0.2		0.2		24.2		0.9		0.0				5.1		
Control Delay (s/veh)		146.4		98.3		1488.8		18.4		14.2				54.0		
Level of Service (LOS)		F		F		F		C		B				F		
Approach Delay (s/veh)	117.5				1097.4				0.0				8.0			
Approach LOS	F				F											

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