Florida Keys Aqueduct Authority
Monroe County, Florida

Cudjoe Regional Wastewater Collection System
Design Build Project for Outer Islands
FKAA Project No. 4053-12

Change Order No. 3

I. General

This Change Order is hereby made a part of the Contract Documents. All requirements of the original Design Build Agreement dated January 15, 2013 shall remain in full force and effect except as modified hereinafter.

II. Scope of Work and Reason for Modification

A. Inclusion of certain **Value Engineering** Study (VES) recommendations which provide either cost savings and/or provide value-added improvements to the project. The contract called for a formalized study to review the project design criteria and planning documents. A final VES report was produced by the Contractor in April 2013.

Monroe County and FKAA worked with the Contractor to determine which of the VES recommendations to consider for approval. Concurrently, over the past several months, other VE recommendations have been discussed and have been integrated into this Change Order. The selected alternative VE items are attached as EXHIBIT A – VE Summary for the Cudjoe Regional Outer Islands Project, September 25, 2013.

B. Contract Time: For the VE item related to additional asphalt pavement work, 120 days shall be added to the final completion date of the contract. This added time shall not extend the substantial completion date of the wastewater system for operational acceptance. Thus, the ***Contract Substantial Completion remains December 30, 2015*** *and the* ***Final Completion date shall now be June 27, 2016.***

III. Summary

- Original Awarded Contract Amount	$ 79,813,000
- Amount of Change Orders 1 and 2	4,999,440
- Previous Adjusted Contract Amount	$ 84,812,440
- Amount of Change Order No. 3	**($ 586,535)**
- Newly Adjusted Contract Amount	$ 84,225,905

IV. Specific Conditions

A. The VE item for Owner Direct Purchase (ODP) shall follow the procedures provided in EXHIBIT B.

These procedures will be incorporated into the contract documents regarding responsibilities of Contractor and Owner for handling procurement and delivery of the identified items for ODP.

B. The VE item for servicing Little Palm Island is for final design, permitting and construction activities. The Contractor shall not proceed with the design or permitting until written confirmation of engagement has been received from the Owner of Palm Island (Noble House). The Contractor shall not proceed with construction activities for this portion of the project until finances for the work are in place and FKAA issues the Contractor NTP for this work. Because Little Palm Island is located within Coastal Barrier Resources System unit FL-51, issuance of a Notice to Proceed on the changes to include Little Palm Island are subject to the following conditions:

1. Changes approved by the BOCC on October 16, 2013 to Monroe County Code Section 130-122 Coastal Barrier Resources System Overlay District to eliminate the prohibition on the extension and expansion of utilities to or through lands designated as a unit of the coastal barrier resources system are approved by DEO and become effective.

2. Receipt by Little Palm Island (Noble House) of an approval from the Monroe County Board of County Commissioners to allow the extension and expansion of central wastewater utilities pursuant to the analysis and requirements of Comprehensive Plan Policy 101.12.4.

3. Approval of the Monroe County Board of County Commissioners to extend the Cudjoe Regional Wastewater system boundaries to include Little Palm Island.

4. Execution of a Consent and Acknowledgement agreement by Little Palm Island (Noble House) committing the owners to payment of the EDU assessments for wastewater service.

C. The VE item for additional pavement work is to be completed concurrently or immediately after the contracted pavement work. The allowance for additional time for final completion for this added work item shall not interfere with the Contractor's obligation to substantial complete the wastewater system by December 31, 2015.

The Florida Keys Aqueduct Authority and the Design Build Contractor, Layne Heavy Civil, Inc., agree that the Contract sum agreed to in this Change Order constitutes a full and complete settlement of the issues set forth in this Agreement. The Contractor accepts the terms of the Change Order as full compensation for all costs, whether direct or indirect, whether incurred or in the future, related to the issues set forth in this Change Order.

The undersigned have carefully read this Change Order and by affixing their signatures attest their full agreement with the provisions herein.

Owner:
Florida Keys Aqueduct Authority

Kirk C. Zuelch — Date: 10-30-13
Executive Director

Tom Walker, PE — Date: 10/29/13
Manager of Engineering

Joe Ivey — Date: 10/29/13
Construction Manager

Contractor:
Layne Heavy Civil, Inc.

Mark Accetturo — Date: 11/5/13
President

Wesley Self, PE — Date: 11-12-13
Program Manager

FKAA Board Approval Date: _____

EXHIBIT A

CHANGE ORDER 3 - VALUE ENGINEERING SELECTED OPTIONS

Cudjoe Regional Wastewater - Outer Islands Project

Change Order No. 3

Description	Add	Deduct	Comments
1. Provide Remote monitoring of residential grinder pump stations	$ 655,000.00	$ -	Includes 2278 HT units and 30 Collectors.
2. Upgrade the grinder pump panel to include emergency generator receptacle	$ 318,920.00	$ -	Based on approved pump panel shop drawings of Eone grinder and modified exterior disconnect switch, cost reduced from $288 each to $140 each.
3. FKAA Direct Purchase of Remaining Simplex Grinder Packages to include HiTide antennas, External Ball Valve & Curb Box, 1-1/4" Lateral Kit Assembly and 25' of 1-1/4" HDPE Pipe (2078 units)		$ 7,974,012.88	Quoted price plus 6% sales tax
4. Expedite the design review process		$ 12,500.00	$25,000 shared 50%/50% between Layne and FKAA
5. Niles Channel Casing Elimination Credit		$ 250,000.00	$500,000 shared 50%/50% between Layne and FKAA
6. RFQ 003R - Little Palm Island Extension	$ 453,940.03		
7. RFQ 002 - Cayman Drive Extension LSL	$ 104,382.00		
8. Paving Overlay Option B (beyond current project requirements. Full road overlay within service area)	$ 6,011,140.28		4 month time extension required for paving activities
9. Additional Service Laterals for Permited Lots	$ 106,596.00		LSL - 5ea, RR - 25ea, LTK - 17ea = 47 ea @ $2,100/ea plus 8% D/B Fee
			WASTEWATER ONLY
Total Contract Add	**$ 7,649,978.31**		$1,638,838.03
Total Contract Deduct		**$ 8,236,512.88**	-$8,236,512.88
Purchase Orders for Owner Direct Purchase	$ 7,522,518.62		$7,522,518.62
Change to the Project; including pavement =	$ 6,935,984.05		
Change to the Wastewater portion of project =			**$924,843.77**
Sales Tax Savings from ODP (Item 3 Above):		**$ 451,494.26**	

INCLUDES GENERATOR RECEPTACLE

9/17/2013
\\filesvr\Users_Files\twalker\Desktop\Change Order No 3 VE summary.

EXHIBIT B

Section 01625

OWNER DIRECT PURCHASE PROGRAM

PART 1 – GENERAL

1-1. GENERAL. This section applies for purchases greater than $10,000. Because the Owner holds a current Florida Consumer's Certificate Revenue, construction materials and equipment purchased by the Owner for and incorporated into this Project are eligible for exemption from Florida State sales tax. The Contractor shall implement the following procedures for the Owner to take advantage of its sales tax exempt status.

1-2. DEFINITIONS.

Direct-Purchase Items: Material purchased directly by the Owner through execution and delivery of a Purchase Order.

Purchase Order: The Owner's request for materials from a particular vendor or supplier and the Owner's promise to pay for the materials specified upon delivery and acceptance at the project site, and presentation of proper documentation by the Contractor to the Owner certifying payment of same.

Purchasing Requisition Request Form: A request by the Contractor to the Owner specifying items, in sufficient detail, that the Owner will directly purchase from a particular vendor or supplier.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3-1. PROCEDURES.

A. The Contractor shall include the cost of construction materials and equipment in its Bid Price for this section. The Bid Price will also include all Florida States sales taxes normally applicable to such materials and equipment directly from the supplier. In the event the Owner elects to make direct purchases, as referred to in this Section

as "Direct-Purchase Items", the responsibilities of both, the Owner and the Contractor relative to Direct-Purchase Items shall be governed by the terms and conditions of this Section. This Section shall take precedence over any conflicting conditions and terms of other Contract Documents. All clerical, administrative, management, supervisory, inspection handling, storage, and other costs necessary for the Contractor to comply with this Section are included in the Bid Price.

B. The Contractor shall select the supplier or suppliers from whom it wishes to purchase materials or equipment.

C. The Contractor shall require major Subcontractors to comply with these procedures.

D. The Contractor shall furnish Owner with a Purchasing Requisition Request Form identifying each item of material or equipment to be purchased by the Contractor for the Project. This form shall be acceptable to Owner. The Purchasing Requisition Request Form shall include:

1. The name, address, telephone number and contact person for the supplier

2. Manufacturer or brand, model or specification number of the item.

3. Quantity needed as estimated by the Contractor or its Subcontractors and Suppliers

4. The price quoted by the Supplier for the material or equipment in question.

5. Any sales tax associated with such quote.

6. Shipping, handling and insurance costs.

7. Delivery date as established by the Contractor or its Subcontractors and Suppliers.

8. Special terms and conditions which have been negotiated with the supplier relative to payment terms, discounts, rebates, warranty, credits or other terms and conditions which will revert to the Owner.

9. Statement with the submittal control number that materials have been reviewed and approved by Engineer during the Shop Drawing submittal process.

E. Promptly upon receipt of a Purchasing Requisition Request Form, the Owner shall award a Purchase Order for that material or equipment, which the Owner chooses to purchase. The Purchase Order shall require that the supplier provide the required shipping and handling insurance. The Purchase Order shall also require the delivery of the Direct-Purchase Items on the delivery dates provided by the Contractor on the Purchasing Requisition Request Form. A copy of each Purchase Order will be sent to the Contractor to verify that items ordered are in accordance with the Purchasing Requisition Request Form, the terms and delivery dates required.

F. The Contractor shall prepare and the Owner shall execute deductive Change Orders to reflect purchases made by the Owner. The amount of the deduction shall be based on the Requisition amount plus sales tax avoided. These Change Orders shall be executed before the related Purchase Order will be paid.

G. Nothing in this Section shall alter or modify the procedures for submission of Shop Drawings and other submittals by the Contractor.

H. The Contractor shall be fully responsible for all matters relating to the receipt, protection and risk of loss of Direct-Purchase Items the same as if such items were purchased by the Contractor. At a minimum, the Contractor shall verify correct quantities, verify documentation, coordinate and expedite delivery, obtain and verify warranties required by the Contract Documents, inspect and accept each item at the time of delivery, unload, handle and store the item. Direct purchase of materials by the Owner in no way relieves the Contractor of any responsibilities regarding the compliance with specification requirements, coordination, protection, scheduling or warranty.

I. As Direct-Purchase Items are delivered to the job-site, Contractor shall visually inspect all shipments, and approve the supplier's shipping documents and invoice. The Contractor shall ensure that each delivery of Direct-Purchase Items is accomplished by documentation adequate to identify the Purchase Order against which the purchase is made. The Contractor shall forward approved invoices to the Owner's Representative for payment. The Owner will process these completed invoices as they are received with their associated paperwork.

J. The Contractor shall inspect to determine that Direct-Purchase Items conform to the Purchase Requisition Request Form, and determine prior to incorporation into the Project if such materials are defective. If the Contractor discovers defective or nonconforming items it shall not utilize such items in the Project and shall promptly notify the Owner of

the defect or nonconformity and assist the Owner in obtaining repair or replacement of the item. The Contractor shall be fully responsible and liable to the Owner if it fails to perform such inspection or otherwise permits defective or non-conforming material or equipment to be incorporated into the Project. The Contractor shall not be relieved of its obligation to ensure that materials requested for purchase have been reviewed by the Engineer and are released for purchase complying with the Shop Drawing and submittal procedures.

K. The Contractor warrants Direct-Purchase Items the same as all other materials and equipment furnished by the Contractor and nothing in this Section shall alter or modify the Contractor obligations under the Contract relative to warranties.

L. The Contractor will purchase and maintain Builder's Risk insurance sufficient to protect against any loss of or damage to Direct-Purchase Items. Such insurance shall cover the full value of Direct-Purchase Items not yet incorporated into the Project starting from the moment of material delivery to the project site. The Contractor shall be solely responsible for any deductible or any loss not covered by Builder's Risk Insurance.

M. The Contractor shall be liable for any interruption or delay in connection with Direct-Purchase Items.

N. The Contractor shall on a monthly basis provide the Owner or Owner's Representative with documentation establishing the amount and nature of the material and equipment delivered by suppliers and accepted by the Contractor during that reporting period. The Contractor shall match all material and equipment to purchase orders, invoices, delivery tickets, and inspection and acceptance reports. The Contractor shall also obtain lien waivers and other releases from suppliers. Upon receipt of appropriate documentation from the Contractor, the Owner's Representative shall request payment from the Owner. Payments will be made directly by the Owner to the appropriate supplier in accordance to the terms and conditions of the Contract Documents.

O. The Contractor shall maintain records of all Owner Direct-Purchase Items incorporated into the Work. These records shall be available for inspection by the Owner upon request.

End of Section

	Quantity	Units	FKAA Removes from Layne Contract (includes 6% tax)	Extension	WRT Offer to FKAA with NO TAX	Extension
Eone Package	2078	EA	$ 3,445.00	$ 7,158,710.00	$ 3,250.00	$ 6,753,500.00
Spare Cores	45	EA	$ 1,656.78	$ 74,555.10	$ 1,563.00	$ 70,335.00
Generator Receptacle	2078	EA	$ 129.63	$ 269,362.83	$ 122.29	$ 254,121.31
HiTide - antennas in control boxes	2078	EA	$ 226.85	$ 471,384.95	$ 214.01	$ 444,712.30
			Total Project	$ 7,974,012.88		$ 7,522,668.61
					FKAA Sales Tax Savings	$ 451,344.26
				1.08	1	0.925925926
				1.06	1	0.943396226

Eone Package, spare cores, generator receptacles, telemetry (ITEMS 1,2,3,4 ABOVE)			$ 7,974,012.88	$ 5,149.30	$ 7,522,668.61
A. TAX SAVINGS FOR ITEMS 1-4		6%			$ 451,344.26
B. TAX SAVINGS ON EONE ITEMS 1-3- FIRST:	$5,000	1.50%			$ 75.00
C. TAX SAVINGS ON HI TIDE ITEM 4 -FIRST:	$ 5,000	1.50%			$ 75.00
TOTAL TAX SAVINGS					$ 451,494.26

RFQ 003R Response
Addition of Little Palm Island
& Hydraulic Modeling of Long Beach Road

July 23, 2013

Discussion: Proposal includes increase in pipe size for accomodating the addition of Little Palm Island Resort to the system. Assumed flows: Little Palm 54 gpm (peak). Certain conditions could cause Little Palm Island to see TDH of about 170' which may require high head pumps or a repump station to be paid for by Customer.

Original Pipeline Design

Item	Quantity	Unit	Unit Price	Extension
2" HDPE Forcemain	1982	LF	$ 20.00	$ 39,640.00
3" HDPE Forcemain	19111	LF	$ 25.00	$ 477,775.00
4" - HDPE Forcemain	1644	LF	$ 31.50	$ 51,786.00
6" - HDPE Forcemain	0	LF	$ 46.00	$ -
8" - PVC Forcemain	1609	LF	$ 61.00	$ 98,149.00
10" - PVC Forcemain	67	LF	$ 70.00	$ 4,690.00
	24413		Subtotal (A):	$ 672,040.00

Updated Pipeline Design

Item	Quantity	Unit	Unit Price	Extension
2" HDPE Forcemain	0	LF	$ 20.00	$ -
3" HDPE Forcemain	3994	LF	$ 25.00	$ 99,850.00
4" - HDPE Forcemain	15809	LF	$ 31.50	$ 497,983.50
6" - HDPE Forcemain	3934	LF	$ 46.00	$ 180,964.00
8" - PVC Forcemain	1609	LF	$ 61.00	$ 98,149.00
10" - PVC Forcemain	67	LF	$ 70.00	$ 4,690.00
	25413		Subtotal(B):	$ 881,636.50

Pipeline Increase (B-A)	$	209,596.50
Big Pine South Pump Station Equipment Change (Pumps, Electrical, Generator)	$	132,064.90
Ramrod Pump Station Equipment Change (Pumps, Electrical, Generator)	$	78,278.63
Re-design/Modeling	$	34,000.00
Total Cost of Change	**$**	**453,940.03**

Projected Hydraulic Changes to Pump Stations

PUMP STATION	ORIGINAL			UPDATED		
	FLOW, GPM	HEAD, FT	PUMP POWER, HP	FLOW, GPM	HEAD, FT	PUMP POWER, HP
Big Pine	859	135	65	921	166	92
Ramrod	1184	200	120	1246	202	128

Other Items:
Proposal prices good until September 1, 2013
Contract Time Extension NOT required.

Contractor Approval:

Wesley Self, P.E.

Cudjoe Regional Wastewater Outer Islands Design Build
Paving Overlay Proposal

Scope: 1" Mill and 1" Overlay (S-3), including basic striping replacement and reflector replacement where needed.		
Paving Unit Price (SY)	$12.50	Per Schedule of Values in Design Build Agreement
Misc.	15%	Used for replacement of striping, reflectors, stop bars, pothole repair, etc.
DB Fee	8%	Per Design Build Agreement

Paving Scope Description

A - Original Budgeted Paving in Layne's Design Build Price.
B - Expansion of Paving for full width overlay in the utility trenched areas for paved public roads
C - Expansion of Paving for full width overlay in the sewer service area for paved public roads.
D - Expansion of Paving for full width overlay for the entire island's paved public roads.

	A		B		C		D	
	Quantity (SY)	Total	Quantity (SY)	Total	Quantity (SY)	Total	Quantity (SY)	Total
Lower Sugarloaf Key	99,350	$ 1,241,875.00	71,019	$ 887,737.50	6,006	$ 75,073.50	57,252	$ 715,648.50
LSK Misc.				$ 133,160.63		$ 11,261.03		$ 107,347.28
Ramrod Key	72,315	$ 903,937.50	20,077	$ 250,962.50	26,314	$ 328,927.50	2,039	$ 25,488.00
RK Misc.				$ 37,644.38		$ 49,339.13		$ 3,823.20
Little Torch Key	67,320	$ 841,500.00	45,139	$ 564,237.50	25,169	$ 314,617.50	1,654	$ 20,675.00
LTK Misc.				$ 84,635.63		$ 47,192.63		$ 3,101.25
Big Pine Key	365,000	$ 4,562,500.00	250,956	$ 3,136,950.00	98,501	$ 1,231,262.50	19,906	$ 248,825.00
BPK Misc.				$ 470,542.50		$ 184,689.38		$ 37,323.75
Subtotal	603,985	$ 7,549,812.50	387,191	$ 5,565,870.63	155,990	$ 2,242,363.15	80,851	$ 1,162,231.98
DB Fee		$ 603,985.00		$ 445,269.65		$ 179,389.05		$ 92,978.56
Total		$ 8,153,797.50		$ 6,011,140.28		$ 2,421,752.20		$ 1,255,210.53

Add to Contract for B	$ 6,011,140.28
Add to Contract for B+C	$ 8,432,892.48
Add to Contract for B+C+D	$ 9,688,103.01

Note:
Layne requires a 4 month time extension for Paving Overlay and Restoration Activities associated with this work. No time extension on utility work is requested.

"Note #2 additional information: Asphalt Key Maps dated 7/13/13 are hereby incorporated herein by reference". File Tracer = 7/29/13 DRH JW

REQUEST FOR QUOTATION

QUOTATION NO: RFQ 002 – Revised 2

TO: Layne Heavy Civil DATE: August 16, 2013

FROM: Florida Keys Aqueduct Authority

PROJECT: Cudjoe Regional Wastewater Program – Outer Islands

KEYWORD DESCRIPTION: Extend wastewater along Caymen Dr. at the end of Sugarloaf Blvd.

DATE QUOTATION REQUIRED: August 23, 2013

The following modification to the contract has been identified. Pursuant to the General Conditions, please provide a quotation for the alteration as described in Item 1. The quotation should include an itemized breakdown of contractor and subcontractor costs, including labor, materials, rentals, approved services, overhead, and profit. This request shall not be considered authorization to proceed with the work herein described.

To be completed by Initiator of Request:

1. Scope of Work: (include list of attachments):

Provide a cost change detail (+/-) to extend wastewater (2"FM) along Caymen Dr. at the end of Sugarloaf Blvd. Installation of FM shall observe the required setbacks from a proposed water main to be installed on the north side of road/edge of pavement. There are currently 6 properties with building permits that we will be able to serve upon the completion of Cudjoe Outer Islands. Wastewater service will include 6 services with grinder stations. Please refer to attached table and figure. This RFQ does not include potable water service.

2. Reason(s) for Modification: ☒ **Owner** ☐ **Unforeseen Conditions(site, weather, etc** ☐ **Other**

3. Approval of Request:

Owner: _____ Date: _____

Engineer: _____ Date: _____

To be completed by Contractor:

4. Total cost of modification (attach detailed breakdown) $ 104.382.00
5. Will a modification to the contract time be required? ☐ Yes X No

If so, trade(s) _____

No. of personnel _____

Duration _____ (calendar days)

6. Attachment identification: (list) Cost Breakdown Attached
7. Quotation is in effect until: (date) 9/15/13
8. Approval of Quotation patrick.stalker@layne.com Digitally signed by patrick.stalker@layne.com DN: cn=patrick.stalker@layne.com Date: 2013.08.16 13:56:10 -04'00'

Contractor Layne Heavy Civil, Inc. Date 08/16/13

Request for Quotation #2 - Extend wastewater along Caymen Dr.

Sewer				
2" HDPE FM	LF	1,100	21.00	23,100.00
Service Connection	EA	6	1,000.00	6,000.00
Simplex Grinder	EA	6	6,400.00	38,400.00
End Flush	EA	1	1,400.00	1,400.00
Tie-in to Existing	EA	0	2,650.00	0.00
Asphalt Mill & Overlay	SY	2,000	12.50	25,000.00
Silt Fence	LF	1,100	2.50	2,750.00
Markup			8%	7,732.00
TOTAL				104,382.00

Cudjoe Regional Wastewater Collection System Design-Build Project for Outer Islands

FINAL Value Engineering Study Report

April 2013

Design Build Team

Layne

CHEN·MOORE & ASSOCIATES

ECKLER ENGINEERING, INC.

Value Engineering Consultant

ARCADIS

Infrastructure Water Environment Buildings

ARCADIS

ARCADIS U.S., Inc.
9861 Broken Land Parkway, Suite 254
Columbia, MD 21046
Tel410-381-1990
www.arcadis-canada.com

Mr. Don Hubbs
Florida Keys Aqueduct Authority
1100 Kennedy Drive
Key West, Florida 33041

Subject: Cudjoe Regional Wastewater Collection System Design Build Project
Final Value Engineering Study Report

BUSINESS PRACTICE:
PMCM

Dear Mr. Hubbs:

The Layne Heavy Civil, Inc. Design-Build Team in association with ARCADIS U.S., Inc. is pleased to submit the subject value engineering (VE) study report documenting the events and results of the VE study conducted March 5-7, 2013 in Key West, Florida. The study identified several ways to reduce the project costs and several options for enhancing the value this project provides for Monroe County and the Florida Keys Aqueduct Authority (FKAA). Of note are alternatives to repave entire streets in lieu of only half widths; expand the regional wastewater system to include the areas to be provided with on-site treatment systems or currently being served by packaged wastewater treatment plants; add the Bay Point area to the project, and install the grinder pumps for the commercial properties. The value added is derived from eliminating multiple contracts to perform work on the same roadways, adding more customers to the regional system cost effectively because of the economies of scale, reducing overall operations and maintenance costs of inefficient systems, and installing the same equipment on all sites being served in a timely and efficient manner.

We appreciate this opportunity to work with FKAA and the County to deliver a cost-effective project that will best serve the needs of the County and result in a low maintenance operation. As you evaluate the suggestions presented, please do not hesitate to contact us if you need additional information to aid in your implementation decision-making.

Date:
April 9, 2013

Contact:
Howard Greenfield

Phone:
410-381-1990 x20

Email:
howard.greenfield@arcadis-us.com

Our ref:
WF900207.0000

Sincerely,

Layne Heavy Civil, Inc.

Joe Wright, PE
Design Manager

ARCADIS U.S., Inc.

Howard Greenfield, CVS
Associate Vice President

Copies: Wesley Self

TABLE OF CONTENTS

SECTION ONE – EXECUTIVE SUMMARY

INTRODUCTION

This value engineering (VE) study report documents the events and results of the VE study conducted by Layne Heavy Civil, Inc. in association with ARCADIS U.S., Inc. for the Florida Keys Aqueduct Authority (FKAA), the operator of the Monroe County, Florida Cudjoe Regional Wastewater System. The subject of the study was the Cudjoe Regional Wastewater Collection System Design-Build Project for Outer Islands being developed by the Design-Build Team led by Layne Heavy Civil, Inc. for construction and Chen-Moore & Associates, Inc. and Eckler Engineering, Inc. for design. The project was at the Preliminary Design Report (30% design completion) stage at the time of the VE study, March 5-7, 2013, in Key West, FL.

Comprising the VE team were representatives from FKAA's project development team and subject matter specialists from ARCADIS. Names and affiliations are provided in Section Four of this report. The team used the following six-phase VE Job Plan to guide its deliberations:

- Information Gathering Phase (including a site visit)
- Function Identification and Analysis Phase
- Creative Idea Generation Phase
- Evaluation/Judgment Phase
- Alternative Development Phase
- Presentation Phase

PROJECT DESCRIPTION

The Cudjoe Regional Wastewater Collection System Design-Build Project for Outer Islands will collect wastewater from residential and commercial properties on Lower Sugarloaf Key to the south and North and South Big Pine Key, Little Torch Key and Ramrod Key to the north, and convey it to a transmission line on the inner island Keys that flows to the new wastewater treatment plant to be constructed on Cudjoe Key.

The collection system consists of gravity sewers placed in the middle of the road, in areas where the invert of the sewers can be located from 2.5 ft. below grade to approximately 8 ft. below grade, and where the homes are spaced close together. The pipes will be a minimum 8-in.-diameter PVC pipe. 30-in.-diameter manholes will be used at the terminal points and changes in alignment and grade. The manholes will be spaced a maximum of 450 ft. and 6-in.-diameter laterals will be provided from the sewer line to the homeowner's property line. The laterals will be a minimum of 30 in. deep and will be capped with a cleanout at the property line.

Flows from the low end of the gravity sewers terminate at neighborhood lift stations where they pumped through a transmission main to the primary transmission line along Overseas Highway/U.S. Highway 1. The force main system will consist of 2-inch to 6-inch HDPE C-900 pipe. While maintaining a 2 fps scouring velocity, the system will convey the collected wastewater from the

neighborhood lift stations to the regional transmission force main or master lift station on Overseas Highway.

Lift station locations were determined by restricting the last gravity sewer manhole before the lift station to a maximum depth of 8 feet, except where due to limited right-of-way area for the proposed lift stations, pipes have a deeper cut than 8 feet. The proposed lift stations require an approximate footprint area of about 200 square feet. These lift stations consist of 5-ft.-diameter precast concrete manholes approximately 15 ft. deep with from two to four, 1 horsepower (hp), grinder pumps and require electrical service and pump control panels.

Areas not served by gravity sewers will be serviced by a low pressure sewer collection system. At each home, a 30-in.-diameter, 5-ft.-deep fiberglass manhole with a 1 hp grinder pump will be installed approximately 4 ft. from the home owner's electric meter. The homeowner will be responsible for connecting the pump to the home's electrical service and wastewater discharge line that currently goes to the septic system. The wastewater collected from individual properties will feed into a network of small-diameter force mains (2-inch or 4-inch) to transmit it to the regional force main system.

The main transmission line along Overseas Highway is a combination of 10-in. to 14-in. diameter buried PVC pipe and 6-in. to 10-in. ductile iron pipe for bridge crossings. Three pump stations are used to move flow along the pipeline, Big Pine Pump Station #1 and #2 to the north, and Lower Sugar Loaf Pump Station to the south.

In addition, residences in remote areas will be provided with on-site wastewater treatment systems.

The cost of the design-build project is $81.3 million and the work is to be accomplished by December 31, 2015.

CONCERNS AND OBJECTIVES

Monroe County's goals in completing the project are to:

- Develop a reliable wastewater collection system that is easy to maintain
- Develop a cost effective wastewater collection system
- Serve as many customers as possible at a capital service cost of $22,000 or less
- Construct the project with minimal disruption to the community
- Complete the project on or ahead of schedule

As the agency responsible for constructing and operating the system, FKAA engaged this VE study to assist it and the Design-Build Team to develop a cost effective project that accommodates the County's goals. The objective of the study was to identify specific changes that could be implemented to enhance constructability, performance and cost effectiveness over the projected life of the facility.

STUDY RESULTS

The VE team brainstormed numerous ideas for achieving the study objectives. After careful screening, and research and development, three alternatives with identified capital cost savings potential; six alternatives that will increase reliability and maintainability, increase the areas serviced or enhance value for Monroe County but add to the project's total cost; and six design suggestions that will provide additional value for Monroe County, facilitate construction or produce non-quantified cost savings. Each of these alternatives and design suggestions were developed for review by FKAA and Monroe County. Each alternative is identified with an alternative number (Alt. No.) indicating the order it was generated during the creative phase, for tracking purposes. All of the alternatives are summarized on the following Summary of Value Engineering Alternatives table and detailed in Section Two of the report. The narrative below discusses the alternatives that will have the greatest impact on the project.

There is a potential to eliminate the Big Pine Key #2 Master Pump Station by using the Big Pine Key's pumps and force mains to deliver flows directly to the Big Pine Key #1 Master Pump Station. This saves capital cost, maintenance costs and pumping costs, as well as eliminates a pump station in a neighborhood as explained in Alt. No. 11.

Using horizontal directional drilling to install the transmission line across all the water bodies in lieu of suspending ductile iron pipe on bridge structures will add to the capital cost of the project. However, this increase in capital cost will result in significantly less long-term maintenance, eliminate the need to replace the pipe when a bridge is reconstructed, and eliminate the risk of an environmental pollution event, should the pipe break for any reason. This concept is illustrated in Alt. No. 3.

Two value adding concepts for Monroe County are presented in Alt. Nos. 9 and 17. In the former, the VE team suggests performing full-width asphalt paving on streets disturbed by the installation of gravity sewer lines. Under the current program, only ½ the width of the street will be repaved, which necessitates the County issuing another contract to repave the remaining part of the street, and causes the community to be disrupted twice. Overall it will be more cost effective to perform the operation only once.

In the latter (Alt. No. 17), it is suggested that the commercial properties be hooked up to the wastewater collection system as part of this project, in lieu of making the property owner responsible for the hook-up. This is more cost effective because all the work could be performed under one permit, the crew increases efficiency in performing the work will be highly efficient due to the repetition of installing over 1,000 to 2,000 similar systems for residential customers, and it standardizes the equipment used. This approach also ensures that the property owners are connected to the system in a timely manner.

Upgrading the residential grinder pump panel to include a receptacle for an emergency generator hook-up, Alt. No. 18.2, and telemetry for remote monitoring, Alt. No. 18.1, will result in better long-term performance and allow FKAA to more cost-effectively maintain the system for the County.

SUMMARY OF VALUE ENGINEERING ALTERNATIVES

ARCADIS

PROJECT: **CUDJOE REGIONAL WASTEWATER COLLECTION SYSTEM DESIGN-BUILD PROJECT FOR OUTER ISLANDS**

PRESENT WORTH OF COST SAVINGS

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
2	Add the Bay Point area to the collection system	DESIGN SUGGESTION				
3	Use horizontal directional drilling (HDD) at bridge crossings in lieu of hanging pipe on highway bridges	$2,000,000	$4,431,000	($2,431,000)	$2,913,000	$482,000
4	Reevaluate additive service areas not included in Change Order No. 1	DESIGN SUGGESTION				
5	Use stainless steel in lieu of ductile iron pipe for above grade bridge crossings	$2,000,000	$2,961,000	($961,000)	$398,000	($563,000)
9	Perform full street asphalt resurfacing in lieu of one-half the full width	$7,550,000	$12,825,000	($5,275,000)		($5,275,000)
10	Include drainage improvements to streets impacted by wastewater collection construction	DESIGN SUGGESTION				
11	Eliminate the Big Pine Key #2 master pump station	$1,411,000	$561,000	$850,000	$294,000	$1,144,000
12	Use fiberglass wetwells for neighborhood lift stations in lieu of precast concrete with HDPE liners	$716,000	$670,000	$46,000		$46,000
13/14	Re-evaluate the equivalent dwelling unit flows and reduce the size of the pumps used in the master pump stations	DESIGN SUGGESTION				
16	Use a packaged booster pump station in lieu of a custom re-pump station for Ramrod	$1,240,000	$850,000	$390,000	$204,000	$594,000
17	Connect the commercial properties into the system under a single permit modification	$0	$3,200,000	($3,200,000)		($3,200,000)
18.1	Provide remote monitoring of residential grinder pump stations	$0	$655,000	($655,000)	$2,636,000	$1,981,000
18.2	Upgrade the grinder pump panel to include an emergency generator receptacle	$0	$656,000	($656,000)		($656,000)
23	Expedite the design review process	$25,000	$0	$25,000		$25,000
24	Extend the service area from Big Pine Key to Bahia-Honda State Park	DESIGN SUGGESTION				

SECTION TWO – STUDY RESULTS

GENERAL

The ultimate results of this value engineering study conducted on the Cudjoe Regional Wastewater Collection System Design-Build Project for Outer Islands are projected to be the benefits that can be realized by the owner, Monroe County, the Florida Keys Aqueduct Authority, the system operator, the community and the Design-Build Team, comprised of Layne Heavy Civil, Inc. (construction) and Chen-Moore & Associates, Inc. and Eckler Engineering, Inc. (design). The results will directly affect the project's design and construction and will require coordination between the owner, the operator and the Design-Build Team to determine the disposition of each alternative.

During the study, many ideas for potential value enhancements were conceived and evaluated by the team for technical merit, applicability to the project, implementability (considering the project's status), and the ability to meet Monroe County's project value objectives. Research performed on those ideas considered to potentially enhance the value of the project, resulted in the development of individual alternatives identifying specific changes to the project as a whole, or individual elements that comprise the project. These are in the form of VE alternatives (accompanied by cost estimates) or design suggestions (typically without cost estimates). For each alternative developed, the following information is provided:

- A summary of the original design;
- A description of the proposed change to the project;
- Sketches and design calculations, if appropriate;
- A capital cost comparison and life cycle discounted present worth cost comparison of the alternative and original design (where appropriate);
- A descriptive evaluation of the advantages and disadvantages of selecting the alternative; and
- A brief narrative to compare the original design and the proposed change, and provide a rationale for implementing the change into the project.

The capital cost comparisons used unit quantities contained in the project cost estimate prepared by the designers, whenever possible. If unit quantities were not available, published databases, such as the one produced by the RS Means Company, or team member or owner databases were consulted. Direct quotes from vendors for equipment items were also obtained.

Each design suggestion contains the same information as the VE alternatives, except that no cost information is usually included. Design suggestions are presented to bring attention to areas of the design that, in the opinion of the VE team, should be changed for reasons other than cost. Examples of these include: improved facility operation, ease of maintenance, ease of construction, safer working conditions, reduction in project risk, reduction in schedule time, etc. In addition, some ideas cannot be quantified in terms of cost with the design information provided; these are also presented as design suggestions and are intended to improve the quality of the project.

Each alternative or design suggestion developed is identified with an alternative number (Alt. No.) to track it through the value analysis process and thus facilitate referencing among the Creative Idea Listing and Evaluation worksheets, the alternatives, and the Summary of Value Engineering Alternatives table (used in the Section One – Executive Summary).

KEY ISSUES

Monroe County's goals in completing the project are to:

- Develop a reliable wastewater collection system that is easy to maintain
- Develop a cost effective wastewater collection system
- Serve as many customers as possible at a capital service cost of $22,000 or less
- Construct the project with minimal disruption to the community
- Complete the project on or ahead of schedule

STUDY OBJECTIVES

As the agency responsible for constructing and operating the system, FKAA engaged this VE study to assist it and the Design-Build Team to develop a cost effective project that accommodates the County's goals. The objective of the study was to identify specific changes that could be implemented to enhance constructability, performance and cost effectiveness over the projected life of the facility.

RESULTS OF THE STUDY

Research of the ideas identified as having potential for enhancing the value of the project resulted in the development of nine alternatives and six design suggestions detailed in this section of the report for consideration by the County and FKAA. These alternatives and design suggestions address the key issues described above as highlighted by the following alternatives.

There is a potential to eliminate the Big Pine Key #2 Master Pump Station by using the Big Pine Key's pumps and force mains to deliver flows directly to the Big Pine Key #1 Master Pump Station. This saves capital cost, maintenance costs and pumping costs, as well as eliminates a pump station in a neighborhood as explained in Alt. No. 11.

Using horizontal directional drilling to install the transmission line across all the water bodies in lieu of suspending ductile iron pipe on bridge structures will add to the capital cost of the project. However, this increase in capital cost will result in significantly less long-term maintenance, eliminate the need to replace the pipe when a bridge is reconstructed, and eliminate the risk of an environmental pollution event, should the pipe break for any reason. This concept is illustrated in Alt. No. 3.

Two value adding concepts for Monroe County are presented in Alt. Nos. 9 and 17. In the former, the VE team suggests performing full-width asphalt paving on streets disturbed by the installation of

gravity sewer lines. Under the current program, only ½ the width of the street will be repaved, which necessitates the County issuing another contract to repave the remaining part of the street, and causes the community to be disrupted twice. Overall it will be more cost effective to perform the operation only once.

In the latter (Alt. No. 17), it is suggested that the commercial properties be hooked up to the wastewater collection system as part of this project, in lieu of making the property owner responsible for the hook-up. This is more cost effective because all the work could be performed under one permit, the crew increases efficiency in performing the work, due to the repetition of installing over 1,000 to 2,000 similar systems for residential customers, and it standardizes the equipment used. This approach also ensures that the property owners are connected to the system in a timely manner.

Upgrading the residential grinder pump panel to include a receptacle for an emergency generator hook-up, Alt. No. 18.2, and telemetry for remote monitoring, Alt. No. 18.1, will result in better long-term performance and allow FKAA to more cost-effectively maintain the system for the County.

EVALUATION OF ALTERNATIVES AND DESIGN SUGGESTIONS

When reviewing the study results, the reader should consider each part of an alternative or design suggestion on its own merit. Each area within an alternative or design suggestion that is acceptable should be considered for use in the final design, even if the entire alternative or design suggestion is not implemented. Variations of these alternatives and design suggestions by the County and FKAA are encouraged.

All alternatives and design suggestions were developed independently to provide a broad range of options to consider for implementation. Therefore, some of them are mutually exclusive, so acceptance of one may preclude the acceptance of another. In addition, some of the alternatives may be interrelated, so acceptance of one or more may not yield the total of the cost savings shown for each alternative. Design suggestions could also be interrelated thus precluding a part of one or more suggestions from being implemented if another design suggestion is also implemented.

The reader should evaluate all alternatives carefully in order to select the combination of ideas with the greatest beneficial impact on the project. Once this has been accomplished, the total cost savings resulting from the VE study can be calculated based on implementing a revised, all-inclusive design solution.

VALUE ENGINEERING ALTERNATIVE

ARCADIS

PROJECT: **CUDJOE REGIONAL WASTEWATER COLLECTION SYSTEM DESIGN-BUILD PROJECT FOR OUTER ISLANDS**
Florida Keys Aqueduct Authority

ALTERNATIVE NO.: **2**

DESCRIPTION: **ADD THE BAY POINT AREA TO THE COLLECTION SYSTEM**

SHEET NO.: **1 of 1**

ORIGINAL DESIGN:

The Bay Point area development is located approximately 3 miles southwest of Lower Sugarloaf Key. The development is currently served with a wastewater collection system and a package type wastewater treatment plant located near US Highway 1 (Overseas Highway). Average Daily Flow (ADF) from Bay Point is approximately 35,000 Gallons Per Day (GPD). The wastewater system at Bay Point is currently outside of the Cudjoe Regional System and the wastewater flows from the development are not included in the transmission system design for Lower Sugarloaf Key.

ALTERNATIVE:

Add the Bay Point development in the Cudjoe Regional Wastewater Collection System by furnishing a lift station at the site of the existing Bay Point Wastewater Treatment Plant to eliminate the plant and transport the Bay Point wastewater flow to the Lower Sugarloaf Transmission System and then to the Cudjoe Wastewater Plant.

ADVANTAGES:

- Increases the consolidation of wastewater treatment in the Keys
- Eliminates a package wastewater treatment plant along Overseas Highway.
- Adds customers to the Cudjoe Regional system

DISADVANTAGES:

- Increases capital and design costs of the Design-Build project
- There is uncertainty about the condition of the Bay Point collection system related to infiltration and inflow

DISCUSSION:

To implement the suggested change, Layne's team will design and construct the pump station at the site of the existing Bay Point Wastewater Treatment Plant and the force main from the pump station to the Lower Sugarloaf Transmission System. Layne will also modify the Lower Sugarloaf Master Pump Station and Transmission Force Main to accommodate the increased flow.

Layne can include a condition assessment of the collection system to determine the extent of infiltration and inflow, and recommend rehabilitation measures to quantify the extent of the collection deficiencies, if any.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	DESIGN SUGGESTION		
SAVINGS (Original minus Alternative)			

SECTION FOUR – VALUE ANALYSIS AND CONCLUSIONS

GENERAL

This section describes the value analysis (VA) procedure used during the VE study conducted for the Monroe County, Florida and the FKAA by the Layne Heavy Civil, Inc. Design-Build Team in association with ARCADIS U.S., Inc. on the Cudjoe Regional Wastewater Collection System Design-Build Project for Outer Islands project. The workshop was performed March 5-7, 2013, at the Preliminary Design Report (30% Design Submittal) completion stage. Layne Heavy Civil, Inc., Chen-Moore & Associates, and Eckler Engineering, Inc. have been selected by the FKAA to assist with the development of the project and have provided information for the VE team to use as the basis of the study.

A systematic approach was used in the VE study, which was divided into three parts: (1) Preparation Effort, (2) Workshop Effort, and (3) Post-Workshop Effort. A task flow diagram outlining each of the procedures included in the VE study is attached for reference.

Following this description of the VA procedure, separate narratives and supporting documentation identify the following:

- VE workshop participants
- Economic data
- Cost model
- Function analysis
- Creative ideas and evaluations

PREPARATION EFFORT

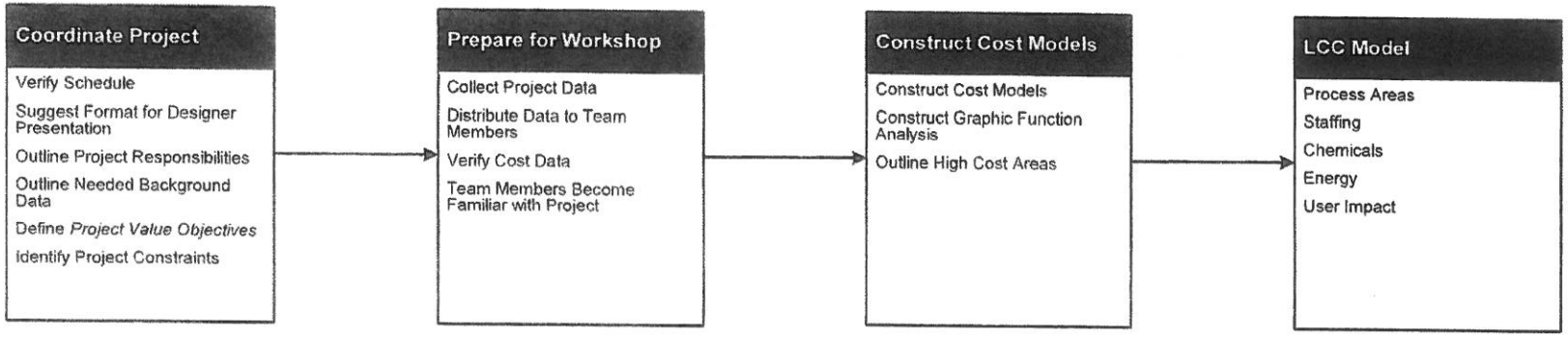
Preparation for the workshop consisted of scheduling workshop participants and tasks and gathering necessary project documents for team members to review before attending the workshop. The following documents were used as the basis for generating VE alternatives and for determining the cost implications of the selected VE alternatives:

- Preliminary Design Report, prepared by Chen & Associates, dated June 2010
- Volume III, Part 1 Ramrod Key Sample Drawings for Florida Keys Aqueduct Authority and Monroe County, prepared by Layne Heavy Civil, Inc., dated November 30, 2012
- Volume III, Part 2 Lower Sugarloaf Key Sample Drawings for Florida Keys Aqueduct Authority and Monroe County, prepared by Layne Heavy Civil, Inc., dated November 30, 2012
- Volume III, Part 3 Big Pine Key Sample Drawings for Florida Keys Aqueduct Authority and Monroe County, prepared by Layne Heavy Civil, Inc., dated November 30, 2012
- Volume III, Part 4 Little Torch Key Sample Drawings for Florida Keys Aqueduct Authority and Monroe County, prepared by Layne Heavy Civil, Inc., dated November 30, 2012

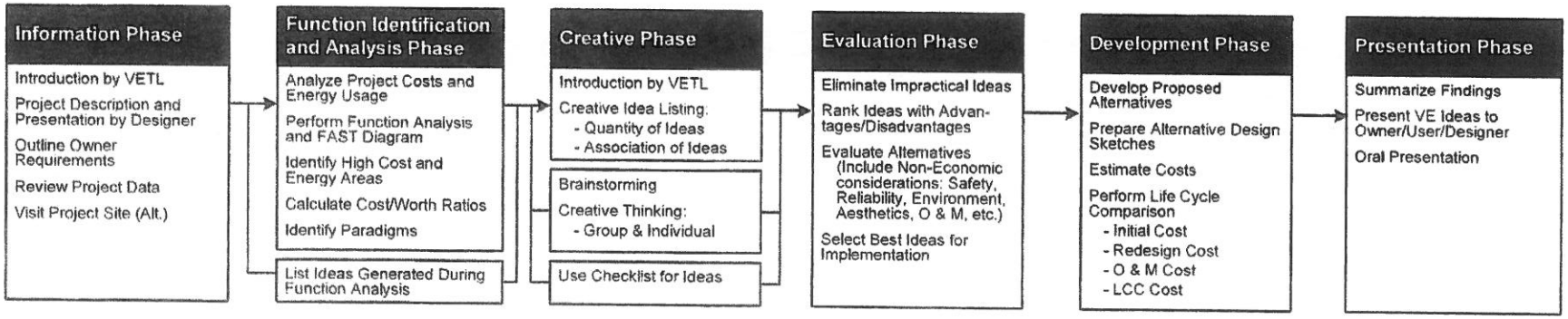
ARCADIS

Value Engineering Study Task Flow Diagram

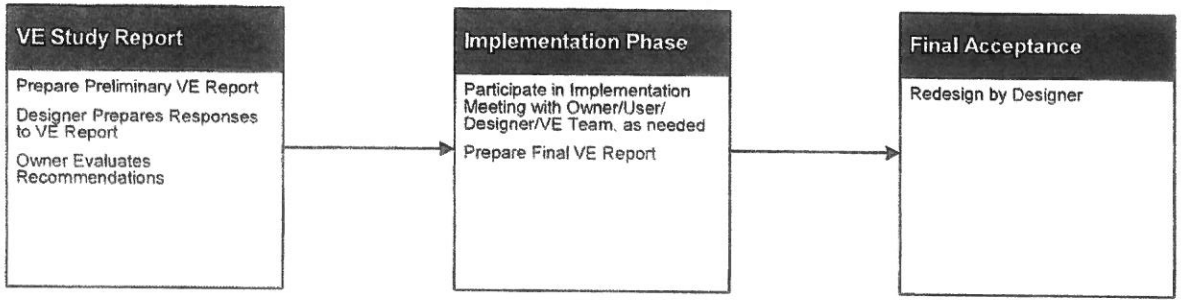
Preparation Effort



Workshop Effort



Post-Workshop Effort



- Volume III, Part 5 US Highway 1 and Key Deer Boulevard Sample Drawings for Florida Keys Aqueduct Authority and Monroe County, prepared by Layne Heavy Civil, Inc., dated November 30, 2012
- Schedule of Values, prepared by Layne Heavy Civil, Inc.

Information relating to the project's purpose and need, owner concerns, project stakeholder concerns, design criteria, project constraints, funding sources and availability, regulatory agency approval requirements, and the project's schedule and costs is very important as it provides the VE team with insight about how the project has progressed to its current state.

Project cost information, provided by the designers, is used by the VE team as the basis for a comparative analysis with similar projects. To prepare for this exercise, the VE team leader used the cost estimate prepared by Layne Heavy Civil, Inc. to develop a cost model for the project. The model was used to distribute the total project cost among the various elements or functions of the project. The VE team used this model to identify the high-cost elements or functions that drive the project, and the elements or functions providing little or no value, so that the team could focus on reducing or eliminating their impact.

VALUE ENGINEERING WORKSHOP EFFORT

The VE workshop was a three-day effort beginning with an orientation/kickoff meeting on Tuesday, March 5, 2013, and concluding with the final VE Presentation on Thursday, March 7, 2013. During the workshop, the VE Job Plan was followed in compliance with SAVE International and U.S. EPA guidelines for conducting a VE study. The Job Plan guided the search for alternatives to mitigate or eliminate high-cost drivers, secondary functions providing little or no value, and potential project risks. Alternatives to specifically address the owner's project concerns and enhance value by improving operations, reducing maintenance requirements, enhancing constructability, and providing missing functions were also considered. The Job Plan includes six phases:

- Information Phase (the ARCADIS VE team members visited the project site the day before the workshop to obtain first-hand information on existing site conditions)
- Function Identification and Analysis Phase
- Creative/Speculation Phase
- Evaluation/Judgment Phase
- Alternative Development Phase
- Presentation of Study Results Phase

Information Phase

At the beginning of the study, the decisions that have influenced the project's design and proposed construction methods have to be reviewed and understood. For this reason, the workshop began with a presentation of the project by the Chen Moore & Associates, Inc. and Eckler Engineering, Inc. design team staff to the VE team. The presentation highlighted the information provided in the documentation reviewed by the VE team before the workshop and expanded on it to include a history of the project's development and any underlying influences that caused the design to develop to its current state.

During this presentation, VE team members were given the opportunity to ask questions and obtain clarification about the information provided.

Function Identification and Analysis Phase

Having gained some information on the project, the VE team proceeded to define the functions provided by the project, identifying the costs to provide these functions, and determining whether the value provided by the functions has been optimized. Function analysis is a means of evaluating a project to see if the expenditures actually perform the requirements of the project or if there are disproportionate amounts of money spent on support functions. Elements performing support functions add cost to the project but have a relatively low worth to the basic function.

Function is defined as the intended use of a physical or process element. The team attempted to identify functions in the simplest manner using measurable noun/verb word combinations. To accomplish this, the team first looked at the project in its entirety and randomly listed its functions, which were recorded on Random Function Analysis Worksheets (provided in the Function Identification and Analysis section). Then the individual function(s) of the major components of the project depicted on the cost model were identified.

After identifying the functions, the team classified the functions according to the following:

Abbreviation	Type of Function	Definition
HO	Higher Order	The primary reason the project is being considered or project goal.
B	Basic	A function that must occur for the project to meet its higher order functions.
S	Secondary	A function that occurs because of the concept or process selected and may or may not be necessary.
R/S	Required Secondary	A secondary function that may not be necessary to perform the basic function but must be included to satisfy other requirements or the project cannot proceed.
G	Goal	Secondary goal of the project.
O	Objective	Criteria to be met.
LO	Lower Order	A function that serves as a project input.

Higher order and basic functions provide value, while secondary functions tend to reduce value. The goal of the next job phase is to reduce the impact of secondary functions and thereby enhance project value.

To further clarify the impact of the various functions, the team assigned costs to provide the functions, or group of functions, indicated by a specific project element using the cost estimate and cost model(s). Where possible, they seek to find the lowest cost, or worth, to perform the function. This is accomplished, using published data from other sources or team knowledge obtained from working on other similar projects, to establish cost goals and then comparing them to the current costs. By identifying the cost and worth of a function or group of functions, cost/worth ratios were calculated. Cost/worth ratios greater than one indicated that less than optimum value was being provided. Those project functions or elements with high cost/worth ratios became prime targets for value improvement.

As well as looking at areas with high cost/worth ratios, the team used the cost model(s) previously prepared to seek out the areas where most of the project funds are being applied. Because of the absolute magnitude of these high-cost elements or functions, they also became initial targets for value enhancement.

Overall, these exercises stimulated the VE team members to focus on apparently low value areas and initially channel their creative idea development in these places.

Creative/Speculation Phase

This VE study phase involved the creation and listing of ideas. Starting with the functions or project elements with high cost/worth ratios, a high absolute cost compared to other elements in the project, and secondary functions providing little or no value and using the classic brainstorming technique, the VE team began to generate as many ideas as possible to provide the necessary functions at a lower total life cycle cost, or to improve the quality of the project. Ideas for improving operation and maintenance, reducing project risk, and simplifying constructability were also encouraged. At this stage of the process, the VE team was looking for a large quantity of ideas and free association of ideas. A Creative Idea Listing worksheet was generated and organized by the function or project element being addressed.

The County and FKAA may wish to review these creative lists since they may contain ideas that were not pursued by the VE team but can be further evaluated for potential use in the design.

Evaluation Phase

Since the goal of the Creative/Speculation Phase was to conceive as many ideas as possible without regard for technical merit or applicability to the project goals, the Evaluation Phase focused on identifying those ideas that do respond to the project value objectives and are worthy of additional research and development before being presented to the owner. The selection process consisted of the VE team evaluating the ideas originated during the Creative/Speculation Phase, based on the County's and FKAA's value objectives identified through prior meetings and conversations at the opening presentation. Based on the team's understanding of the County's and FKAA's value objectives, each idea was compared with the present design concept, and the advantages and disadvantages of each idea were discussed.

Based on the team's understanding of the owner's value objectives, each idea was compared with the present design concepts, and the advantages and disadvantages of each idea were discussed. How well an idea met the design criteria was also reviewed. Based on the results of these reviews, the VE team rated each idea by consensus by indicating "Y – Yes" this idea is worthy of further study and potential implementation, "N – No" there are too many negative factors and the idea should be dropped from further consideration or "ABD – Already Being Done". The ratings assigned by the team to each idea are recorded in the Creative Idea Listing and included in the Study Results section of this report.

The team also used the designation DS to indicate a design suggestion, which is an idea that may not have specific quantifiable cost savings but may improve functionality by reducing project risk, improving constructability, helping to minimize change requests, enhance operability, ease

maintenance, reduce schedule time, or enhance project value in other ways. Design suggestions could also increase a project's cost but provide value in areas not currently addressed. These are also developed in the next phase of the VE process.

Development Phase

In this phase, each highly rated idea was expanded into a workable solution designated as a VE alternative. The development consisted of describing the current design and the alternative solution, preparing a life cycle cost comparison where applicable, describing the advantages and disadvantages of the proposed alternative solution, and writing a brief narrative to compare the original design to the proposed change and provide a rationale for implementing the idea into the design. Sketches and design calculations, where appropriate, were also prepared in this part of the study. The VE alternatives and design suggestions are included in the Section Two – Study Results section of this report.

Presentation Phase

The goals of the last phase of the workshop were to summarize the results of the study, to prepare draft Summary of Value Engineering Alternatives worksheets to hand out at the presentation, and to present the key VE alternatives and design suggestions to the County and FKAA. The presentation was held on Thursday, March 7, 2013, in Key West, Florida. The purpose of the meeting was to provide the attendees with an overview of the suggestions for value enhancement resulting from the VE study and afford them the opportunity to ask questions to clarify specific aspects of the alternatives presented. Procedures for implementing the results of the study were discussed, and arrangements were made for the reviewers of the VE report to contact the VE team in order to obtain further clarifications, if necessary. Draft copies of the Summary of Value Engineering Alternatives worksheets were given to the Design-Build Team to facilitate a timely review and speedy implementation of the selected ideas.

POST-WORKSHOP EFFORT

The post-workshop portion of the VE study consisted of the preparation of this VE Study Report. Personnel from the County and FKAA and the Design-Build Team will analyze each alternative and prepare a short response, recommending incorporation of the alternative into the project, offering modifications before implementation, or presenting reasons for rejection. The VE team is available, at your convenience, as you review the alternatives. Please do not hesitate to call on us for clarification or further information as you consider an implementation approach.

Upon completing their reviews, the County, FKAA and the Design-Build Team will meet and, by consensus, select VE alternatives and design suggestions to incorporate into the project.

VALUE ENGINEERING ALTERNATIVE

ARCADIS

PROJECT: **CUDJOE REGIONAL WASTEWATER COLLECTION SYSTEM DESIGN-BUILD PROJECT FOR OUTER ISLANDS**
Florida Keys Aqueduct Authority

ALTERNATIVE NO.: **9**

DESCRIPTION: **PERFORM FULL STREET ASPHALT RESURFACING IN LIEU OF ONE-HALF THE WIDTH**

SHEET NO.: **1 of 3**

ORIGINAL DESIGN:

Restoration of pavement impacted by pipeline construction in the Layne Heavy Civil, Inc. proposal is based upon Monroe County requirement to overlay a full lane for work performed in a lane (e.g. if all work is within a single lane only that lane will need to be repaved; if work is performed in both lanes of a 2-lane road, the full road width will be repaved). In the case where a pipe is installed entirely in one lane of a two-lane road and only the house services cross the other lane, it is necessary to repave only the lane with the main and to patch the trenches for the house services as shown in FKAA Wastewater Standard Detail WW24 or WW25 (included in Attachment 6 of Addendum No. 1). (Addendum 4, question 28)

ALTERNATIVE:

Provide full length and full-width asphalt resurfacing for all roads impacted by pipeline construction for the entire Cudjoe Regional Wastewater Collection System for Outer Islands Project area.

ADVANTAGES:

- Less costly than resurfacing the remaining lane under a separate contract considering the economy of scale of the Design-Build contract
- Eliminates additional mobilization into neighborhoods to resurface the remaining area
- Minimizes neighborhood disruption
- Ideal for asset management. Uniform product for the entire street vs. partial pavement.
- Takes advantage of lower unit prices (asphalt price is volatile)
- Aesthetically more acceptable by the community
- Minimizes differential settlement
- Addresses existing asphalt problems
- Optimizes County staff required to implement a separate contract for roadway improvements
- Reduces Construction Engineering and Inspection services on the future overlay projects

DISADVANTAGES:

- Paving cost will not be postponed

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 7,550,000	—	$ 7,550,000
ALTERNATIVE	$ 12,825,000	—	$ 12,825,000
SAVINGS (Original minus Alternative)	$ (5,275,000)	—	$ (5,275,000)

VALUE ENGINEERING ALTERNATIVE ARCADIS

PROJECT:	**CUDJOE REGIONAL WASTEWATER COLLECTION SYSTEM DESIGN-BUILD PROJECT FOR OUTER ISLANDS** *Florida Keys Aqueduct Authority*	ALTERNATIVE NO.: **9**
DESCRIPTION:	**PERFORM FULL STREET ASPHALT RESURFACING IN LIEU OF ONE-HALF THE WIDTH**	SHEET NO.: **2 of 3**

DISCUSSION:

Layne will negotiate a lump sum price change order to implement the technical recommendations from the Asphalt Pavement Evaluation and Management Project, currently underway by Monroe County. The Design-Build Contract includes a unit price of $12.50/SY for 1 in. mill and 1 in. asphalt overlay.

COST WORKSHEET

ARCADIS

PROJECT: **CUDJOE REGIONAL WW COLLECTION SYSTEM DESIGN-BUILD PROJECT FOR OUTER ISLANDS**

Florida Keys Aqueduct Authority

ALTERNATIVE NO.: **9**

SHEET NO.: **3 of 3**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Big Pine Key - 1" Mill & 1" Asphalt	SY	365,000	12.50	4,562,500	641,636	12.50	8,020,444
Ramrod - Asphalt	SY	72,315	12.50	903,938	123,812	12.50	1,547,645
Little Torch - Asphalt	SY	67,320	12.50	841,500	132,935	12.50	1,661,688
L Sugarloaf - Asphalt	SY	99,350	12.50	1,241,875	127,639	12.50	1,595,481
Subtotal				7,549,813			12,825,258
Markup (%) at							
TOTAL				7,549,813			12,825,258
TOTAL (ROUNDED)				7,550,000			12,825,000

VALUE ENGINEERING ALTERNATIVE

ARCADIS

PROJECT: **CUDJOE REGIONAL WASTEWATER COLLECTION SYSTEM DESIGN-BUILD PROJECT FOR OUTER ISLANDS**
Florida Keys Aqueduct Authority

ALTERNATIVE NO.: **18.1**

DESCRIPTION: **PROVIDE REMOTE MONITORING OF RESIDENTIAL GRINDER PUMP STATIONS**

ORIGINAL DESIGN:

The grinder pumps for each residential site are supplied with an Environment One Sentry Panel. These panels provide the pump operating control, a service rated disconnect, and an audio/visual alarm.

ALTERNATIVE:

Provide a HighTide Grinder Pump Guardian (GPG) radio for each Sentry Panel. These radios wirelessly communicate alarm conditions and pump start and stop times to neighborhood collectors which upload the information to a secure server. GPGs will be installed in the Sentry Panel prior to delivery to the site, avoiding field installation in the future. Alarm condition notifications are automatically dispatched to a pager, cell phone or land line. The status of every pump can be monitored by utility personnel from any internet connected computer.

ADVANTAGES:

- Removes the property owner from the pump service process
- Reduces service technician overtime.
- Reduces inflow and infiltration
- Extends pump effective life
- Collectors can be used to monitor Neighborhood Lift Stations

DISADVANTAGES:

- Collector coverage is site specific. The number of required collectors is estimated.
- Some individual pump locations may require repeaters to maintain communication
- Adds a minor cost to the project

DISCUSSION:

Alarm notifications are automatic and eliminate the need for homeowner to notify the utility when a station is in an alarm condition. Since the notifications are concurrent, the technician labor force can be managed more efficiently – reducing overtime. Excessive starts/stops or runtimes alert the operators of potential inflow and infiltration or early indications of a preventable failure.

In densely populated areas, there is generally one collector for each 150 GPG units. A preliminary estimate of collectors for the Outer Islands is 30 HTT1100 models. These are typically installed at municipal or public buildings (unidentified). Additional collectors (not included) could be used to monitor additional parameters of the Neighborhood Lift Stations. Communication fees, website construction and maintenance are covered by a low annual service fee per GPG eliminating the need for additional dedicated personnel to manage the monitoring system.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 0	$ 7,290,000	$ 7,290,000
ALTERNATIVE	$ 655,000	$ 4,654,000	$ 5,309,000
SAVINGS (Original minus Alternative)	$ (655,000)	$ 2,636,000	$ 1,981,000

VALUE ENGINEERING ALTERNATIVE

ARCADIS

PROJECT:	**CUDJOE REGIONAL WASTEWATER COLLECTION SYSTEM DESIGN-BUILD PROJECT FOR OUTER ISLANDS** *Florida Keys Aqueduct Authority*	ALTERNATIVE NO.: **18.1**
DESCRIPTION:	**PROVIDE REMOTE MONITORING OF RESIDENTIAL GRINDER PUMP STATIONS**	SHEET NO.: **2 of 4**

COST SAVINGS DISCUSSION:

- Advantage – *Removes the property owner from the pump service process*
  Type – Soft

  The direct notification of service technicians of alarm or power outage conditions allows the operators to minimize response and repair times, in many cases before the homeowner is aware of the issue.

- Advantage – *Reduces service technician overtime*
  Type – Life Cycle Cost reduction

  More and more service calls are falling within hours traditionally treated as overtime hours. A similarly sized system in Brentwood Tennessee (3,000 units) typically gets 3 service calls between 3pm and 5pm. It is believed that these calls correlate with the homeowner returning home after school or work. Two of those calls are typically handled by the service crew working overtime. Therefore it is assumed that concurrent notification of a failure would reduce the number of overtime calls by more than 500 calls per year. Brentwood has a standard burdened labor rate of $45.00 per hour and an overtime rate of $62.50. Each call is responded to with 2 technicians and has an average duration of 2 hours. We assume that 2 overtime calls can be eliminated when the telemetry system is implemented.

- Advantage – *Reduces inflow and infiltration*
  Type – Life Cycle Cost reduction

  Ongoing efforts to reduce I&I has gradually gravitated to an awareness of problems originating on private property. Illegal connections of sump pumps, downspouts, sump pumps and even landscape drains add significant flows to the wastewater treatment stream increasing transportation and treatment costs. With the HighTide telemetry system, individual properties can be monitored for excessive starts/stops and runtime indicating a potential I&I problem. The preventing 5% of I&I for 2,278 units at 135 gpd reduces annual flows by over 5.5 million gallons per year. At a cost of $3.50 per 1,000 gals this saves $19,250 annually.

- Advantage – *Extends pump effective life*
  Type – Life Cycle Cost reduction

  Expedient repair of pumps in alarm can prevent excessive damage to pump systems. Additionally, excessive pump run times due to preventable I&I will accelerate wear on rotating elements and require more extensive and expensive repair. Assuming a 5% extension of life of a core ($1,850) with a 25-year design life is a present value of $92.50 for each of the 2,278 cores.

- Advantage – *Collectors can be used to monitor Neighborhood Lift Stations*
  Type – Life Cycle Cost reduction

  In addition to collecting and transmitting data from the GPGs, the collectors that are located at the Neighborhood Lift Stations (NLS) could provide basic monitoring of those stations that have no SCADA capability. Since the placement of the collectors is site specific, at this time there is no estimate of how many NLS could be so monitored.

COST WORKSHEET

ARCADIS

PROJECT: **CUDJOE REGIONAL WW COLLECTION SYSTEM DESIGN-BUILD PROJECT FOR OUTER ISLANDS**
Florida Keys Aqueduct Authority

ALTERNATIVE NO.: **18.1**

SHEET NO.: **3 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Telemetry Upgrade to Panel							
GPG Radios	EA				2,278	245.00	558,110
HTT1100 Collectors	EA				30	3,215.00	96,450
Subtotal							654,560
Markup (%) at							
TOTAL							654,560
TOTAL (ROUNDED)							655,000

LIFE CYCLE COST WORKSHEET ARCADIS

PROJECT: **CUDJOE REGIONAL WASTEWATER COLLECTION SYSTEM DESIGN BUILD PROJECT OUTER ISLANDS**

ALTERNATIVE NO.: **18.1**

SHEET NO. **4 of 4**

LIFE CYCLE PERIOD: 30 **years**

INTEREST RATE: 5.00% **ESCALATION RATE:** 3.00%

		ORIGINAL	ALTERNATIVE
A.	**INITIAL COST**	-	655,000
	Useful Life (Years)		
	INITIAL COST SAVINGS		(655,000)
B.	**RECURRENT COSTS (Annual Expenditures)**		
1.	2 Technicians @ 62.50 for 2 hours three times daily =	136,875	
2.	2 Technicians @ $62.50 for 2 hours once daily =		45,625
3.	5.5 MG per year @ 3.50/1,000 GAL	17,500	
4.	Pump core replacement @ 25-year life = 1,850/25 x 2,278	168,500	
5.	Pump Core replacement @ 26.25-year life = 1,850/26.25 x 2,278		160,500
6.			
	Total Annual Costs	322,875	206,125
	Present Worth Factor	22.5769	22.5769
	Present Worth of RECURRENT COSTS	7,289,513	4,653,661

C.	**SINGLE EXPENDITURES**	**Year**	**Amount**	**PW factor**	**Present Worth**	**Present Worth**
ORIG	PROP	< Put "x" in appropriate box (original design or proposed design)				
	1.			1.0000	-	-
	2.			1.0000	-	-
	3.			1.0000	-	-
	4.			1.0000	-	-
	5.			1.0000	-	-
	6.			1.0000	-	-
	7.			1.0000	-	-
	8.			1.0000	-	-

D.	**SALVAGE VALUE**	**Year**	**Amount**	**PW factor**	**Present Worth**	**Present Worth**
	1.			1.0000	-	-
	2.			1.0000	-	-
	Present Worth of SINGLE EXPENDITURES				-	-
E.	**Total Recurrent Costs & Single Expenditures (B + C + D)**				7,289,513	4,653,661
	RECURRENT COSTS & SINGLE EXPENDITURES SAVINGS					2,635,852
	TOTAL PRESENT WORTH COST (A + E)				7,289,513	5,308,661
	TOTAL LIFE CYCLE SAVINGS					**1,980,852**

VALUE ENGINEERING ALTERNATIVE

ARCADIS

PROJECT: **CUDJOE REGIONAL WASTEWATER COLLECTION SYSTEM DESIGN-BUILD PROJECT FOR OUTER ISLANDS**
Florida Keys Aqueduct Authority

ALTERNATIVE NO.: **18.2**

DESCRIPTION: **UPGRADE THE GRINDER PUMP PANEL TO INCLUDE AN EMERGENCY GENERATOR RECEPTACLE**

SHEET NO.: **1 of 2**

ORIGINAL DESIGN:

The grinder pumps are supplied with an Environment One Sentry Panel. These panels provide the minimal operating controls required for the EOne grinder pump, a Service Rated Disconnect and audio/visual alarm capabilities.

ALTERNATIVE:

At the owner's request, a generator receptacle with an auto-transfer switch has been proposed as an addition to the standard Sentry panel.

ADVANTAGES:

- Provides a uniform generator hook-up for all residential grinder pump stations
- The auto transfer switch automatically isolates the station load from the line for safety
- Provides a means to quickly pump down stations during extended power outages
- Manufactured as an integral component of the Sentry Control Panel. No ancillary boxes are required.

DISADVANTAGES:

- Adds minor cost to the project

DISCUSSION:

This alternative provides a homeowner accessible generator receptacle with auto-transfer switch built into the lockable panel. When the generator feed is hooked up to the external receptacle, the auto-transfer switch isolates the load from the power company line, protecting workmen. The auto-transfer switch provides the homeowner access to the generator receptacle WITHOUT access to the inside of the Sentry control panel.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 0	—	$ 0
ALTERNATIVE	$ 656,000	—	$ 656,000
SAVINGS (Original minus Alternative)	$ (656,000)	—	$ (656,000)

COST WORKSHEET

ARCADIS

PROJECT: **CUDJOE REGIONAL WW COLLECTION SYSTEM DESIGN-BUILD PROJECT FOR OUTER ISLANDS**
Florida Keys Aqueduct Authority

ALTERNATIVE NO.: **18.2**

SHEET NO.: **2 of 2**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Add Generator Receptacle							
Generator Receptacle	EA				2,278	288.00	656,064
Subtotal							656,064
Markup (%) at							
TOTAL							656,064
TOTAL (ROUNDED)							656,000

VALUE ENGINEERING ALTERNATIVE

ARCADIS

PROJECT: **CUDJOE REGIONAL WASTEWATER COLLECTION SYSTEM DESIGN BUILD PROJECT FOR OUTER ISLANDS**
Florida Keys Aqueduct Authority

ALTERNATIVE NO.: **23**

DESCRIPTION: **EXPEDITE THE DESIGN REVIEW PROCESS**

SHEET NO.: **1 of 1**

ORIGINAL DESIGN:

The original design review process included FKAA reviews of each construction package at 60% and 90% design completion levels. The Design Team incorporates accepted Value Engineering Change Proposals submits them as part of the 60% submittal.

ALTERNATIVE:

The collection and transmission system designs included by FKAA with the Design-Build RFP are considered 30% design level documents. Expedite the design review process by having the Design Team incorporate accepted Value Engineering Change Proposals into 80% design level documents which are used for construction after incorporating FKAA review comments and changes required by permitting. Construction changes are included in the submission of "Record Drawings."

ADVANTAGES:

- Optimizes the project schedule
- Accelerates commencement of construction
- Accelerates connection of customers and generates system revenues quicker helping to retire debt
- Reduces design cost by $25,000

DISADVANTAGES:

- None apparent

DISCUSSION:

This change in the design review process recognizes the level of effort expended to develop the Design Criteria Package and the 30% design documents plus the effort of the VE Team to increase the value of the project to Monroe County, FKAA, and the customers of the Cudjoe Regional Wastewater System. It also increases the ability of the Design-Build Team to meet or exceed the December 31, 2015 deadline for completing the project.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 25,000	—	$ 25,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 25,000	—	$ 25,000