CITY OF MARATHON, FLORIDA
RESOLUTION 2018-74

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF MARATHON, FLORIDA, AUTHORIZING A "SOLE-SOURCE" PURCHASE PURSUANT TO THE CITY'S PURCHASING POLICIES AND PROCEDURES AND APPROVING THE PURCHASE OF A FLOVAC RADIO BASED, CLOUD HOSTED, REMOTE MONITORING SYSTEM FOR THE SEWAGE VACUUM COLLECTION SYSTEM, IN AN AMOUNT NOT TO EXCEED $75,600.00; AUTHORIZING THE CITY MANAGER TO ENTER INTO AGREEMENTS IN CONNECTION THEREWITH, APPROPRIATING AND EXPENDING BUDGETED FUNDS; AND PROVIDING FOR AN EFFECTIVE DATE

WHEREAS, pursuant to Resolution 2008-134, the City Council of the City of Marathon adopted purchasing policies and procedures after determining that it was fiscally prudent and in the best interests of the City's residents for the City to adopt policies and procedures for City employees and officials regarding the purchasing and acquisition of contractual services, equipment, goods, professional services and other similar types of services; and

WHEREAS, the City may waive competitive bidding in the event that "only one vendor possesses the unique and singularly available capability to meet the requirements of a particular procurement; and

WHEREAS, the City wishes to approve purchase of a Flovac radio based, cloud hosted, remote monitoring system for the sewage vacuum collection system, in an amount not to exceed $75,600.00

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF MARATHON, FLORIDA, THAT:

Section 1.   The above recitals are true and correct and incorporated herein.

Section 2.   The City's purchasing policies and procedures are hereby waived and the City Council hereby authorizes the City Manager to execute any agreements in connection, in substantially the same form and format as attached hereto as Exhibit "A" and expend budgeted funds on behalf of the City.

Section 3.   This resolution shall take effect immediately upon its adoption.

PASSED AND APPROVED BY THE CITY COUNCIL OF THE CITY OF MARATHON, FLORIDA THIS 14th DAY OF AUGUST, 2018.

THE CITY OF MARATHON, FLORIDA

Michelle Coldiron, Mayor

AYES: Bartus, Cook, Senmartin, Zieg, Coldiron
NOES: None
ABSENT: None
ABSTAIN: None

ATTEST:

Diane Clavier, City Clerk

(City Seal)

APPROVED AS TO FORM AND LEGALITY FOR THE USE AND RELIANCE OF THE CITY OF MARATHON, FLORIDA ONLY:

David Migut, City Attorney

Wireless Monitoring System Proposal

City of Marathon Utilities Department

Marathon, FL

Client: **Dan Saus – Utility Director**

Date: **April 25, 2018**

Contents

1) Executive Summary

The City of Marathon Utilities Department owns, operates, and maintains five wastewater treatment facilities and associated sewer collection systems, providing sewer service to its residential and commercial customers. The City of Marathon's sewer collection network is composed of four vacuum sewer systems and one low-pressure system. The vacuum sewer system includes several buffer tanks to handle large volume users such as hotels, schools, hospitals, marinas, apartment buildings, trailer parks, and retail complexes.

After the successful installation of FLOVAC's Wireless Monitoring System at Area 6, Dan Saus has requested a proposal to monitor the remainder of the Buffer Tanks on Areas 3, 4 and 5. According to the site survey and information provided by Mark Bombard in February 2017, there are 73 Buffer Tanks on Areas 3, 4 and 5. As requested by Dan Saus, this proposal also includes 12 additional Buffer Tanks and 2 Automatic Air Injection Systems. The chart below summarizes the quantities and type of the Buffer Tanks:

Buffer Tanks	Area 3	Area 4	Area 5	Additional	Summary
Singles	16	8	6	8	**38**
Doubles	14	16	11	4	**45**
Triples	2	0	0	0	**2**
AAIS	0	0	0	2	**2**
Totals	**32**	**24**	**17**	**14**	**87**

2) Buffer Tank Locations

Area 3 Buffer Tank Locations	Type	Pits	Valves
Seven Mile Marine Center	Single	1	1
Ocean Breeze Trailer Park West (North)	Single	1	1
Ocean Breeze Trailer Park West (South)	Single	1	1
Marathon Marina RV Park	Single	1	1
Lazy Days	Double	1	2
Marathon Marina	Double	1	2
Ocean Breeze Trailer Park East	Single	1	1
Galway Bay	Double	1	2
Burdines	Single	1	1
Golden Rule Seafood	Single	1	1
Trailerama	Double	1	2
Marathon Prop. LLC 1622 Overseas	Double	1	2
The Hammocks of Marathon	Double	1	2
Hyatt Employee Housing	Double	1	2
Coast Guard	Single	1	1
Laundromat	Double	1	2
Terra Marine Trailer Park	Single	1	1
Interselect (Sandpiper)	Single	1	1
Sisters Creek Townhomes	Double	1	2
Fishermen's Hospital	Triple	1	3
City Park & Marina	Single	1	1
Marlin Bay	Double	1	2
Keys Fisheries	Double	1	2
Old Town Village	Single	1	1
Florida Keys Lobster & Steak House	Double	1	2
Overseas Lounge	Single	1	1
Marathon Yacht Club	Double	1	2
Monroe County EOC	Double	1	2
Tranquility Bay	Triple	1	3
Turtle Hospital (Front)	Single	1	1
Turtle Hospital (Rear)	Single	1	1
Faro Blanco Condo	Single	1	1
	Totals	**32**	**50**

Area 4

Area 4 Buffer Tank Location	Type	Pits	Valves
Coral Club Condo	Double	1	2
Captains Quarters Condo	Double	1	2
Harbor Club South Condo	Double	1	2
Lemon Cove Condo	Double	1	2
Schooner Condo	Double	1	2
Tradewinds	Double	1	2
Sombrero Ridge	Double	1	2
Spanish Galleon Condo	Double	1	2
Harbor House Condo	Double	1	2
Lady Alexander Condo	Double	1	2
Cobia Point Condo	Double	1	2
Home Depot	Double	1	2
Hacket Point	Single	1	1
Gemini	Single	1	1
Winn Dixie	Double	1	2
Crane Point	Single	1	1
Panda House	Single	1	1
Sea Dell Motel	Double	1	2
47th Street Gulf	Single	1	1
Black Fin Resort Office	Single	1	1
Black Fin Resort Units	Single	1	1
Banana Bay Motel	Double	1	2
Marathon Key Beach Club	Single	1	1
Tropical Isle Apt. (Monroe Co. Housing)	Double	1	2
Totals		**24**	**40**

Area 5

Area 5 Buffer Tank Location	Type	Pits	Valves
Lucy Apartments	Double	1	2
IHOP	Double	1	2
Trailer Ranch	Double	1	2
Discovery Bay	Double	1	2
Coconut Kay	Double	1	2
King Sail	Double	1	2
The Reef	Double	1	2
Gulfside Estates	Single	1	1
Tropical Cottages	Double	1	2
Reef Apartments	Double	1	2
Aquarium Encounters	Single	1	1
Sea Watch Condo	Double	1	2
Indigo Reef Condo	Double	1	2
Laurie's Deli	Single	1	1
Centenial Bank	Single	1	1
Burger King	Single	1	1
Town Square Mall	Single	1	1
Totals		**17**	**28**

3) Wireless Monitoring System Overview

FLOVAC's Wireless Monitoring System provides a 24/7 status report of the vacuum sewer system, detecting abnormal conditions in the vacuum valves, sewer collection network and vacuum stations, allowing the operators to respond quickly to any call-outs and have a proactive approach to system maintenance.

One of the most important features of FLOVAC's System is its two-way or bi-directional radio network, allowing for seamless communication interaction between all devices in the system.

FLOVAC's System is capable of monitoring the following items:

- Valve stuck open
- Valve open/close cycles (allowing detection of unwanted storm or ground water infiltration)
- Last opening time log for potential valve not opening signal
- Vacuum pressure in vacuum lines
- Automatic air injection with remote valve control (open/closed)
- Alarms
- Alerts via SMS / e-mail (optional)
- Battery or solar operated
- Integration with existing SCADA systems

FLOVAC's System also features the following benefits:

- No need for external power supply (batteries included)
- Battery life up to 10 years
- Wireless operating range up to 4 miles (6 km)
- LoRaWan protocol allows for many different modules to operate within the same system
- Universal module for many different sensors
- Dedicated network with unlimited number of devices in a single network

FLOVAC's Wireless Monitoring System is compatible with most vacuum sewer systems provided by other major suppliers, allowing it to be integrated into existing and new systems. Since the system is battery powered and communication between all devices is made through a wireless protocol, there is no need for expensive infrastructure. The system is developed in different layers, making it easily customizable according to the client's preferences.

4) Network Layout

4.1) Network LoRaWan

LoRaWan is a new, private and spread-spectrum modulation technique which allows data transmission at extremely low data-rates to very long ranges. LoRaWan is a Low Power Wide Area Network (LPWAN) specification intended for wireless battery operated Things in a regional, national or global network. LoRaWan targets key requirements of Internet of Things such as secure bi-directional communication, mobility and localization services. The LoRaWan specification provides seamless interoperability among smart Things without the need of complex local installations and gives back the freedom to the user, developer, businesses enabling the roll out of Internet of Things.

Link Budget (common)

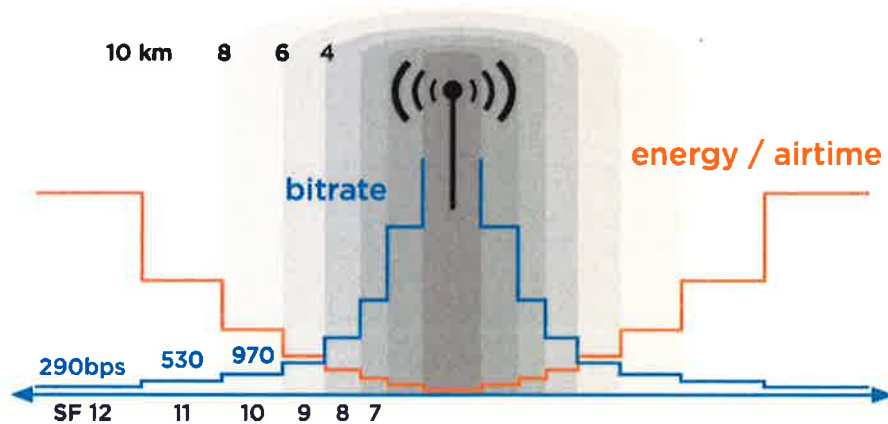**Figure 1 Sensitivity of the Flovac LoRaWan Module**

Figure 2 Distance vs Energy vs Bitrate

FLOVAC's LoRaWan supports different frequencies for each country where the system is to be installed. Modules automatically connect to the closest gateway, which can cover an area of up to 4 miles (6 km). In larger areas, multiple gateways could be installed to increase the coverage area. The gateway is connected to the WAN by default, through a GPRS/GSM connection or a local ethernet connection. The gateway only communicates through a secure server, which collects and sorts all data collected from the modules into databases.
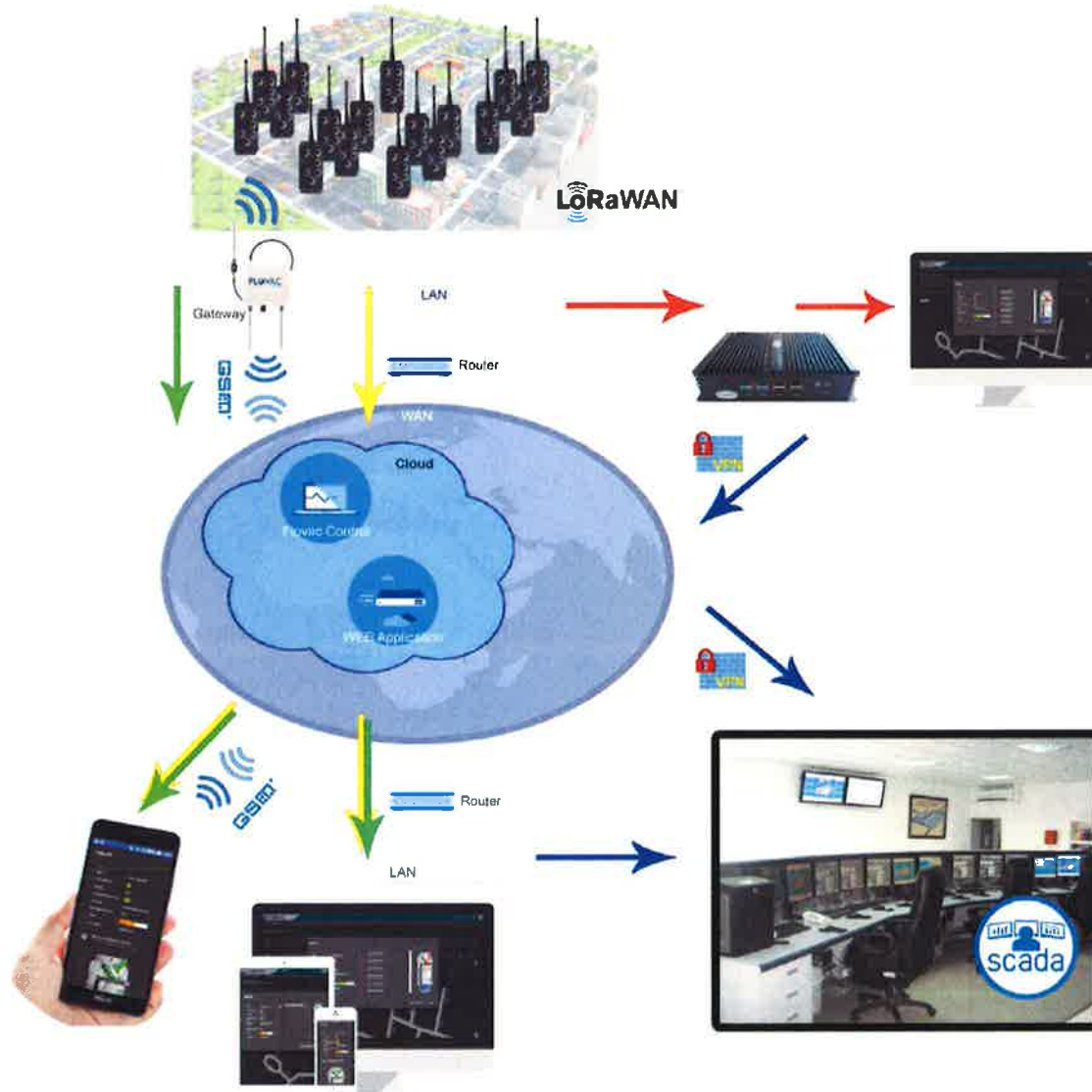
4.2) WAN / LAN Network Connections

Figure 3 Network Examples

Green Routing: Most flexible. Gateway only needs power and can be placed anywhere in the area, with the best LoRaWan network performance.

Yellow Routing: Less flexibility. Gateway needs power and wired ethernet connection to internet for cloud hosting. Placement of the gateway at the best spot could be impacted by power and wired internet connection requirements, sometimes requiring the installation of a second gateway to cover the entire monitoring area.

Red Routing: Less flexibility. Gateway requirements are the same as the Yellow Routing. Cloud hosting will not be used, requiring an IPC computer and screen to be installed at the same location as the gateway to host the monitoring software and data on a local network.

Blue Routing: Optional. Custom made depending on the local network condition.

4.3) Gateway

The FLOVAC gateway communicates wirelessly with the monitoring modules in the field. All information received from the modules is transferred to the FLOVAC control server through GPRS/GSM or by wired LAN (figure 3). The best spot to install a gateway is in the center of the coverage area. The gateway needs power 100-240VAC-1A and ethernet connection when the GSM function is not utilized. Large coverage areas may require multiple gateways.

4.4) Smart Modules

FLOVAC has developed a smart LoRaWan module specifically for vacuum sewage monitoring. Our module is powered by 3.6 volt batteries and can be custom programmed to handle many different I/O's. The module is IP68 weatherproof rated and can be installed outside or inside the valve pit (installation inside the valve pit may require a shorter distance between the module and the gateway).
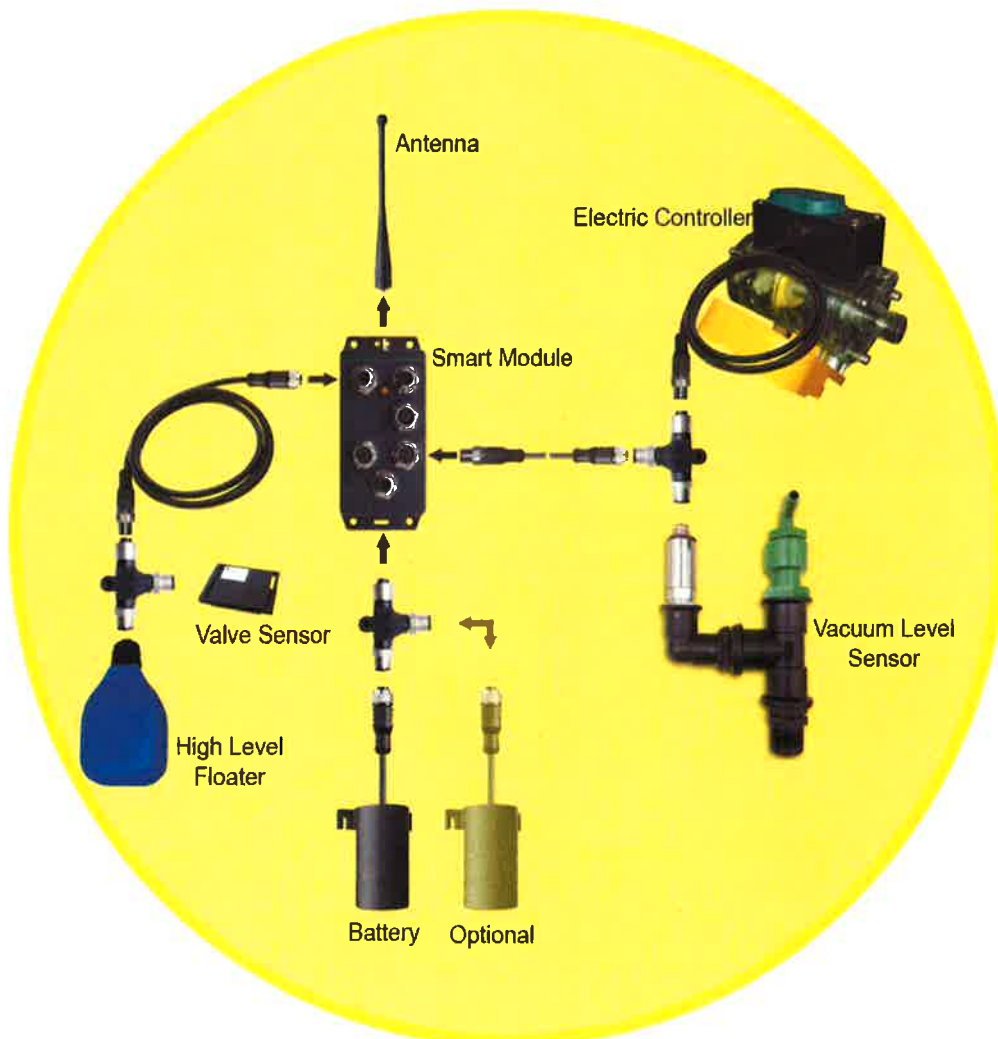
Flovac Valve Module Configuration Table

Configuration Parameter	Default value	Description
Heartbeat Time	3600 seconds	Time the module will send a message with current openings, average opening time.
Vacuum Time	900 seconds	Time the module will measure the vacuum.
Vacuum Setpoint	30	If vacuum is below setpoint, module will enable low vacuum alarm.
Vacuum Delay	180 seconds	Delay before module will enable low vacuum alarm.
Floater Delay	10 seconds	Delay before module will enable high level alarm
Valve Alarm Delay	60 seconds	Delay before module will enable valve error alarm.
Maximum Open Time	15 seconds	If the valve opens longer then this value, the module will send an alert.
Minimum Open Time	3 seconds	If the valve opens less then this value, the module will send an alert.
Transfer Retries	5 times	Times the module will retry a transfer when no acknowledge was received from gateway.
Join Retries	5 times	Times the module will retry to join a gateway.

Valve Module Message Table

Message Name	Format
Heartbeat	0,(Current Counter),(Average Open Time)
Vacuum Level	1,(Vacuum Level)
Alarm	2,(Alarm Type), (Enabled/Disabled)
Alert	3,(Alert Type),(Value 1)

Valve Module Alarm Types

Alarm Name	Alarm Description
Low Vacuum Alarm	When vacuum is below setpoint for x time.
High Level Alarm	When floater is high for x time.
Valve not closing Alarm	Valve is not closing for x time.

Valve Module Alert Types

Alert Name	Alert Description
Openings time to long	Opening time exceeded the configurated maximum open time.
Openings time to short	Opening time exceeded the configurated minimum open time.
Failed Transfers	Times the module failed to transfer a message when first message was successful.

FLOVAC Smart Module

5) Components/Sensors

5.1) Battery

Every module is powered by battery by default. The battery life depends on the transmit rate, and in a default configuration the battery can power the module for up to 10 years. When additional sensors are installed such as vacuum sensors or electrical controllers requiring greater power consumption, the use of additional battery packages is recommended. Battery is completely sealed and IP68 weatherproof rated.

5.2) Valve Sensor

The valve sensor is mounted on the vacuum valve inside the collection pit. Every change of state of the valve (open/close) will awake the module to start monitoring the status of the valve.

5.3) High Level Sensor

The high level sensor floating switch generates an early warning alarm every time that the sewer level in the collection pit exceeds a preset condition, so the operators can take the appropriate action.
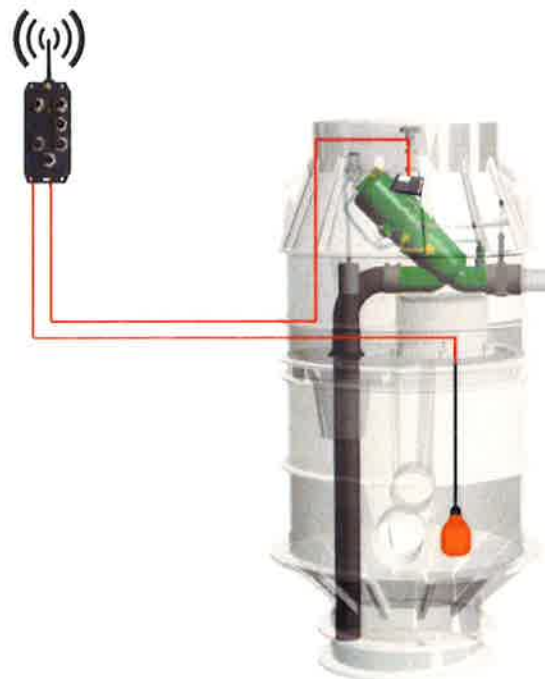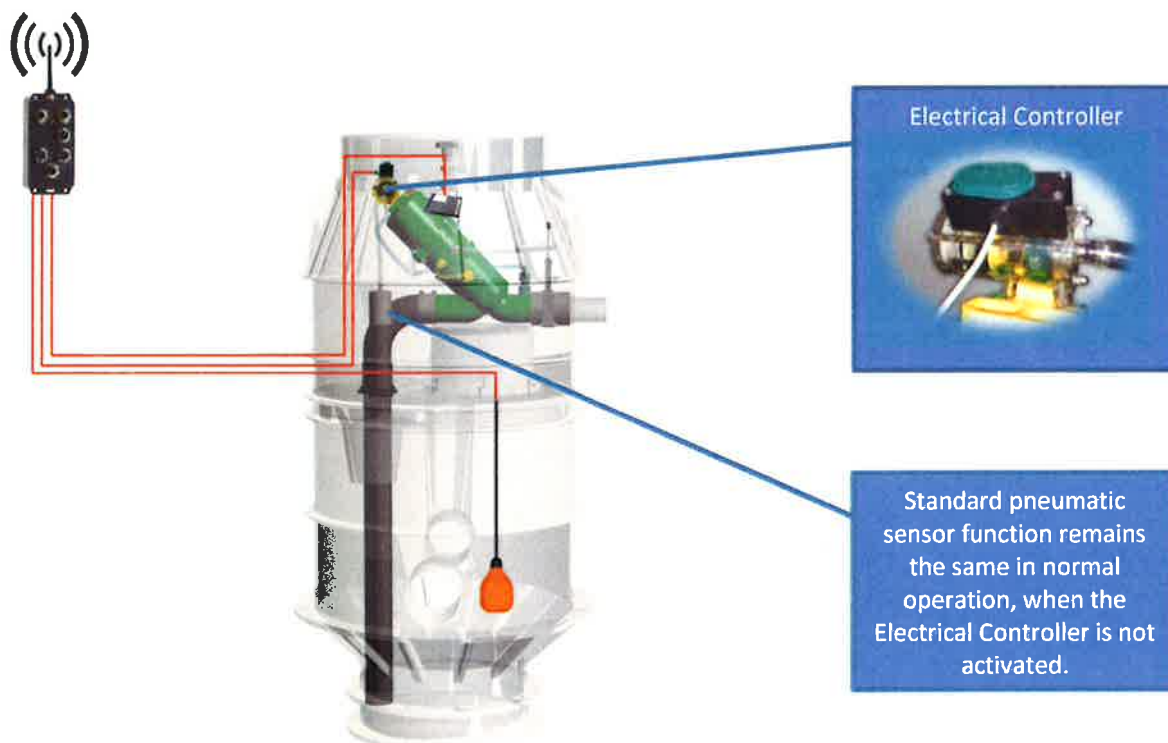
5.4) Vacuum Level Sensor

The vacuum level sensor measures the vacuum pressure at the collection pit at pre-determined intervals (intervals could be configured according to client's requirements). In addition to showing the vacuum level on the visualization screen, the system could also be configured to generate an alram when the vacuum level drops below a pre-determined setpoint. The vacuum level sensor is required for the Automatic Air Injection System (AAIS).



5.5) Electrical Controller

The electrical controller allows the vacuum valve to be opened by a remote command. The valve open command can be send manually or automatically by the FLOVAC control system. The electrical controller is required for the Automatic Air Injection System (AAIS), which generates an automatic valve open command through the AAIS algorithm.

Electrical Controller

Standard pneumatic sensor function remains the same in normal operation, when the Electrical Controller is not activated.

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6) Automatic Air Injection System (AAIS)

In some areas of the vacuum sewer network, vacuum levels can drop below their optimal operation condition, adversely affecting the proper function of the valves.

Low vacuum levels can be caused by a variety of factors, including wrong valve time settings, excessive external infiltration into the system, extensive line stretches without any connections, design and construction flaws, etc.
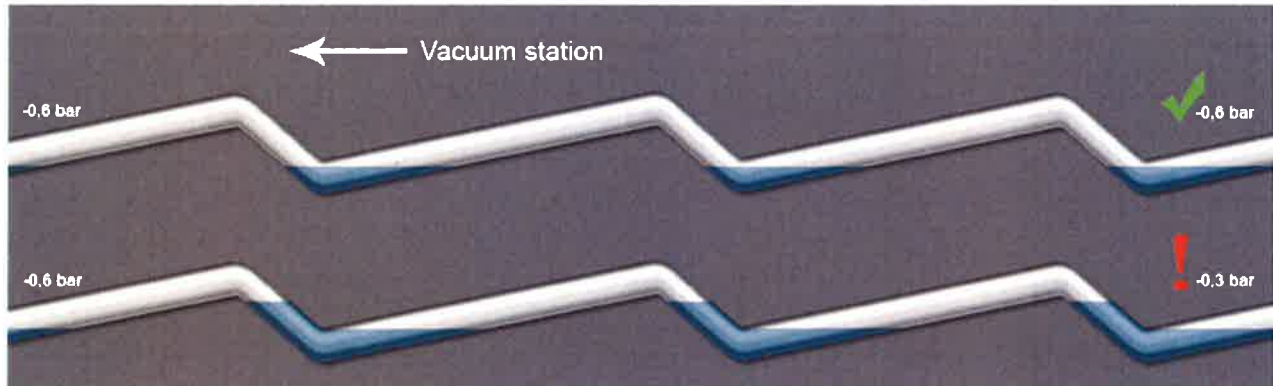
Vacuum valves need a minimum of -5 inHg to open, however this minimum pressure might not be enough to allow sufficient air to enter the system to avoid water logging.

To solve this problem FLOVAC has developed an Automatic Air Injection System (AAIS). The AAIS can prevent vacuum levels dropping below the minimum -5 inHg, as it will let in air automatically when vacuum level drops below -8 inHg or any other pressure level setup by operations.

In a conventional standalone system, the vacuum level is checked only at a specific point in the sewer collection network and does not consider the vacuum level at the vacuum station. The disadvantage of ignoring the vacuum level at the vacuum station is the possibility to inject air into the system even when there is not enough vacuum level at the vacuum station, which will further deplete the vacuum level in the system.

FLOVAC's AAIS was developed to, in addition to the vacuum level at a specific point in the sewer collection network, consider the vacuum level at the vacuum station, taking advantage of its two-way or bi-directional communication capability to evaluate all available parameters and fine tune the amount of air required for optimal operation of the system. Furthermore, the AAIS is installed by simply replacing the valve controller with FLOVAC's electrical controller, thus not requiring any additional valves and/or valve pits.

![FLOVAC AMERICAS logo]

7) Wireless Monitoring System Proposal

7.1) Proposed System Description and Features

This proposal includes the supply and installation of FLOVAC monitoring devices (gateway, smart modules, battery packs, valve sensors, high-level sensors) for 85 Buffer Tanks (38 Singles + 45 Doubles + 2 Triples) within the Marathon vacuum sewer network. Those monitoring devices will be connected to FLOVAC's LoRaWan through a gateway installed at the vacuum pump station. Also included is an Air Injection System (AAIS) in 2 strategic locations of the vacuum sewer network, including the required vacuum level sensors and electrical controllers. The FLOVAC software and system database will be hosted on FLOVAC's secure cloud, which allows for remote support and software updates, in addition to remote access by authorized operations personnel on mobile smartphones and tablets.

7.2) Price

FLOVAC's price for the implementation of the Wireless Monitoring System is $ 75,600.00 (seventy five thousand and six hundred dollars), which includes the supply and installation of all wireless monitoring equipment described above, testing, training and commissioning of the system.

FLOVAC's monthly fee for the Cloud Hosting is $ 350.00 (three hundred and fifty dollars), which includes the features described above. As per previous agreement with Dan Saus when the installation of the wireless monitoring system at Area 6, the Cloud Hosting fee will be waived until March of 2019.

7.3) Payment Terms

- 30% at Proposal Acceptance
- 30% at Equipment Delivery
- 30% at Installation Completion
- 10% at Commissioning and System Acceptance

7.4) Special Conditions

City of Marathon Utilities Department (CMUD) preparatory scope of work:

- Appropriate pole and power supply will be provided by CMUD at SA3 WWTP for the installation of the Gateway

- Appropriate pedestals will be provided by CMUD for the installation of the Modules at every Buffer Tank

- CMUD will provide all assistance and field support reasonably required by FLOVAC during the installation of the system, including access to SA3 WWTP, access to Buffer Tanks, equipment mounting and electrical connections, etc.

- CMUD will be responsible for any modifications to Buffer Tanks that may be deemed necessary for the installation of the wireless monitoring devices

- CMUD will be responsible for the replacement of magnets that maybe damaged or rusted in the existing Vacuum Valves

- The installation of the Wireless Monitoring System for the Buffer Tanks at Areas 3, 4 and 5 includes one Gateway at SA3 WWTP, in addition to the one currently installed at SA5 WWTP covering Area 6. As per our experience with the installation of Area 6, we have assumed that only one additional Gateway will be necessary, however if field conditions will prevent adequate signal strength to some of the Buffer Tanks, an additional Gateway may be required. If necessary, the cost of an additional Gateway would be $4,600.00.

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We at FLOVAC are very pleased to have the opportunity to assist the City of Marathon Utilities Department in the pursuit of continuously improving the operation and reliability of its sewerage collection system. We are confident that the proposed expansion of FLOVAC's Wireless Monitoring System to the remainder of the Buffer Tanks will allow CMUD's managers, supervisors and operators to have real time information from each Buffer Tank and associated Vacuum Valves being monitored (including the Automatic Air Inlet System), allowing for immediate identification of any faults, abnormalities and alarms, indicating the precise location where preventive and/or corrective measures must be taken.

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CEO
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