CITY OF PACIFIC GROVE

Sewer Pump Station Condition Assessment
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Sewer Pump Station Condition Assessment City of Pacific Grove

Background

The City of Pacific Grove (City) owns and operates a wastewater collection system that includes approximately 59 miles of gravity pipe and 7 lift stations. Most of the City's wastewater flow is conveyed by gravity or by force main to the regional wastewater treatment facility, Monterey One Water (M1W), located in Marina, CA. There are two additional lift stations within the City (LS 13 and LS 15) that are owned and operated by M1W. Only the seven lift stations owned and operated by the City are being assessed in this condition assessment. Figure 1, located on the next page, which was published originally in the City's 2014 Sewer Master Plan, depicts the locations of the seven lift stations as well as the two lift stations owned and operated by M1W.

The following lift stations were inspected for this assessment:

1. #11 – Eardley Pump Station
2. #12 – Ocean View Blvd at 9th Ave
3. #14 – Lover's Point
4. #15.5 –Crespi Pond
5. #16 – Arena
6. #17 – Beach Comber
7. #18 – Russell's Service Center

Figure 1. 2014 Map of the City of Pacific Grove Sewer Collection System.

Objective

The City requested Wallace Group to evaluate the physical condition of the seven lift stations and provide recommendations for any upgrades. The objective of this report is as follows:

- Complete a physical evaluation of each of the seven lift stations;
- Summarize the existing conditions of the seven lift stations;
- Identify any upgrades required to the each of the seven lift stations;
- Provide a recommended priority list for the upgrades; and
- Provide an engineer's opinion of probable cost to complete the recommended improvements.

It should be noted that a hydraulic capacity analysis was not part of the scope of work for this report since the City does not currently have any capacity constraints at the lift stations and there is not any significant development identified for the future. Therefore, this report will not evaluate the lift station's ability to meet current or future flow conditions.

Lift Station Evaluation

Wallace Group contracted with Fluid Resource Management, Inc. (FRM), to complete the physical evaluation of each of the seven lift stations. FRM conducted their evaluation in December 2019. FRM's field reports are provided in Appendix A. Table 1 provides a summary of the known features for each lift station. It is worth noting that the flow rates recorded in the table under-estimate the actual flowrate of the pump. This is because incoming flow was unable to be measured and isolated during the drawdown of the wet well by the pump. A definition and rank order of terms used in the field reports is provided here for clarity. In the rank order 1 is the best and 4 is the worst.

- Good condition – product/equipment installed and working correctly, may appear to be newer, not exhibiting a reason for replacement.
- Satisfactory condition – product/equipment is installed and working, no repairs needed, equipment/product is not new.
- Serviceable /operational condition – product/equipment is installed and appears to be function as designed, may appear to be showing age, has not failed but getting closer to the end of its useful life, not recommending replacement at this time but withing 5 to 10 years, or unable to adequately test.
- Poor condition -product/equipment appeared to be failing and/or near failure, testing demonstrated product/equipment to be failing or near failure. Needs replacement in the near future.

Rank	Condition Statement
1.	Good
2.	Satisfactory
3.	Serviceable/operational
4.	Poor

Table 1.Summary of lift station characteristics

		#11 - Eardley	#12 - Ocean View Blvd. at 9th Ave.	#14 - Lover's Point	#15.5 – Crespi Pond	#16 - Arena	#17 - Beach Comber	#18 – Russell's Service Center
Lift Station Type		Submersible	Submersible	Submersible	Submersible	Dry-well	Submersible	Submersible
Number of Pumps		2	2	2	2	2	2	2
Pump 1 Information								
	Manufacturer	unknown	Flygt	Flygt	Not reported	Fairbanks Morse	Flygt	Not reported
	Serial/Model #	n/a	3171.095-1120002	3085.092-9367	Not reported	Not reported	Not reported	Not reported
	Horse Power	Not reported	25	3	Not reported	20	7.4	3
	Phase	3	3	3	1	3	3	3
	Voltage	240	240	208	240	240	240	240
	Flow	159	853	144	19.5	269	128	79
	Condition	Good - Infinite megohm reading	Satisfactory - Could not megohm	Satisfactory	Poor - very low megohm readings	Moderate - Low megohm reading	Poor - Low megohm reading	Poor - very low megohm readings
Pump 2 Information								
	Manufacturer	unknown	Flygt	Flygt	Not reported	Fairbanks Morse	Flygt	Not reported
	Serial/Model #	n/a	3171.095-1120002	3085.092-9367	Not reported	Not reported	Not reported	Not reported
	Horse Power (hp)	unknown	25	3	Not reported	20	7.4	3
	Phase	3	1	3	1	3	3	3
	Voltage (v)	240	230	208	240	240	240	240
	Flow (gpm)	207	122	112	12	314	116	66.6
	Condition	Good/Infinite megohm reading	Satisfactory/Could not megohm	Moderate - Lower megohm Reading	Poor - very low megohm readings	Moderate - Low megohm reading	Low megohm Reading	Poor - very low megohm readings
Wet Well Diameter (ft)		6	9	4.5	4.5	7 x .5.5	5.8	4
Wet Well Depth (ft)		16.2	18	11.2	5.3	14.2	14	20
Wet Well Condition		Corrosion Present	Satisfactory	Satisfactory	Poor but serviceable - concrete aggregate exposed	Good	Poor	Poor
Wet Well Coating		Yes	Yes - T-lok, secondary fall protection showing heavy corrosion	Yes - in serviceable condition	No	Yes - satisfactory condition	Yes - failed coating - concrete aggregate exposed where coating has failed	No - concrete aggregate exposed - heavy corrosion
Discharge Piping Size (in)		4 est.	8	3 est.	3	6 out of pumps, 8 out of station	4	4
Discharge Piping Material		Ductile Iron	Ductile Iron - corroded in wet well - coating failure on piping	Ductile Iron - wet well piping heavily corroded, valve vault piping satisfactory	PVC	Ductile Iron - satisfactory	Ductile Iron - satisfactory	Ductile Iron - heavily corroded/ could not operate isolation valve
Signal Controls		Transducer, redundant backup float	Transducer, redundant backup float	Bubbler	Bubbler, backup float	Bubbler, backup float	Floats	Bubbler, backup float
Emergency Back Up Generator		Yes - 50kW	Yes - 50kW	Yes - 55kW	No	Yes - 60kW	No generator installed - manual transfer switch	No - 70kW rated transfer switch
Emergency Notification		Internet/Auto dialer	SCADA/Auto dialer	SCADA/Auto dialer	Auto dialer	Auto dialer	Auto dialer	SCADA/Auto dialer

#11 – Eardley

Eardley lift station is a medium size lift station for the City, both in terms of discharge flowrate and physical dimension. In general, this lift station appeared to be in good condition. The valve vault was in very good condition and appeared to be "like new" but some of the components in the wet well showed signs of corrosion. For example, the grating that comprised the secondary fall protection over the wet well and the ductile iron discharge piping showed signs of corrosion. Stainless steel components, like the pump lifting guiderails were in good condition and showed no signs of corrosion. Electrically the lift station was in good condition as well, with the control panel interior appearing "like new." To assess the quality of the electric motors powering the pumps, the pump motors were megohm tested. The megohm test determines the degree to which the electric motor windings are insulated. A new motor should demonstrate infinite resistance (infinite megohms) and as the motor is used, resistance decreases. The closer to zero resistance, the closer the motor is to failing. Please note that it is not predictable exactly how much life a pump may have left regardless of the megohm reading, but this is the best indicator of pump life expectancy.

Figure 2. Eardley lift station significant grease mat.

In addition, the presence of splicing or intermediate junctions can cause a lower or higher reading than if the pump motors were isolated from such junctions prior to the megohm test being performed. Both pumps demonstrated infinite resistance when megohm tested and junction box splicing was satisfactory. The 50kW back-up generator was tested and proved operational. There were no "seal-offs" installed on the conduits entering the control panel. Conduits penetrating the control panel with no seal-off risk conveying corrosive and/or volatile gases into the control panel. The corrosion caused by these gases can lead to mechanical failure of contactors and other electrical components as well as create risk of explosion. The presence of these gases can be exacerbated due to the formation of grease mats and accumulating settled solids as was noted in the field report. Furthermore, the field report noted the wet well was very odorous which confirms the presence of corrosive and/or volatile gases. A hand written note inside the panel showed the difference in height between the "pump on" level and "pump-off" level was about 5 ft. Depending on the average flowrate coming into the lift station, the wastewater may be sitting stagnant in the lift station long enough to allow grease/fats to separate and anaerobic (odorous) biological activity to take place. There were no structural concerns for this lift station.

Recommendations

Eardley lift station is in good condition. Based on the site evaluation conducted by FRM, the following summarizes the recommendations for this lift station:

- Install "seal-offs" on all conduits that penetrate control panel
- Mitigate grease load into lift station – grease trap upstream
- Treat grease in lift station – wet well enzyme additives to enhance breakdown of grease
- Evaluate the number of starts/stops for this lift station. If the number of start/stops is minimal, it is recommended to reduce the difference between pump-on level and pump-off level to increase the start/stops per hour, without exceeding manufacturer recommended start/stops per hour
- Coat secondary fall protection and discharge piping
- Maintain records of impeller and volute wear

#12 – Ocean View at 9th Ave.

#12 lift station is the largest of the City's lift stations and appeared in good condition. The wet well has a coating that is in satisfactory condition, but the secondary fall protection demonstrated heavy corrosion. While the check valves, isolation valves, and bypass piping were in good condition the ductile iron piping in the wet well was corroded and the coating on the piping has failed. The guide rails (stainless-steel) and access hatches were in good condition. The pump motors were not able to be megohm tested as a result of panel arrangement, so no assessment of pump motor condition is provided. Both pumps did produce approximately 850 gpm each which appears to be near maximum efficiency based on manufacturer's data. The control panel did have seal-offs installed and the electrical components inside the panel appeared in good condition. Epoxy was used to fill all splices into the control panel which adds water resistance and keeps the splices in good condition. The below grade structure that houses the electrical system and back-up generator was in good condition. A large grease mat was noted even though operations staff installed grease blocks. There were no structural concerns for this lift station.

Figure 3. #12 lift station with visible corrosion on fall protection grating.

Recommendations

#12 lift station is in good condition. Based on the site evaluation conducted by FRM, the following summarizes the recommendations for this lift station.

- Re-coat secondary fall protection and replace corroded components as necessary

- Re-coat discharge piping
- Re-configure control panel to allow megohm testing
- Perform megohm test on pump motors
- Maintain records of impeller and volute wear

#14 – Lover's Point

Lover's Point lift station is a smaller lift station. Mechanically the lift station was in serviceable condition, but it also demonstrated electrical and corrosion issues. Pump 1 produced 144 gpm while pump 2 produced 112 gpm. However both pumps demonstrated only moderate megohm readings. The three leads on pump 1 averaged 570 megohms and pump 2 averaged 355 megohms. The lower megohm readings are indicative of failing motor winding insulation or poor splice condition. Because the splices were in satisfactory condition it is more likely the pump motors are beginning to wear out. According to the manufacturer's pump curve, the pumps are operating far from the point of best efficiency and a couple more feet of head on the pumps would lead to greatly reduced discharge flowrate.

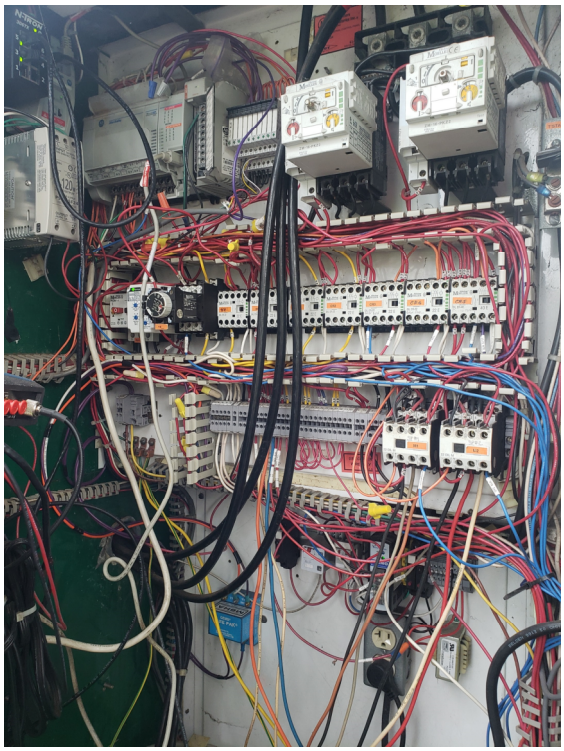

Figure 4. Disorganized Lover's Point control panel wiring.

There was heavy corrosion on the ductile iron discharge piping but the piping and aged valving in the valve vault were in satisfactory condition. No seal-offs were present on the conduits penetrating the control panel allowing for the possibility for sewer gases to enter. Control panel wiring was disorganized, messy, and potentially dangerous as no electrical schematics or reference documents were on site. A substantial grease ring was present however no matting was visible. The operations staff installed grease blocks which may be contributing to the control of grease mat formation. There was a noticeable amount of solids in the wet well. Lover's Point lift station is equipped with a 55kW generator which was tested and proved operational. Also, of note was an overflow line that exits the lift station wet well and is routed to the side of the adjacent cliff above the beach, however the line has been capped on the outlet side. It is recommended a cap be added to the inside of the lift station. There did not appear to be structural issues with the lift station, but the concrete was broken around the lid.

Recommendations

Lover's Point lift station is in satisfactory condition. Based on the site evaluation conducted by FRM, the following summarizes the recommendations for this lift station:

- Replace discharge piping
- Replace valving
- Obtain schematics and labels, and re-wire control panel
- Replace pumps with pump having operating point closer to best efficiency point
- Maintain records of impeller and volute wear
- Cap overflow pipe in wet well.

#15.5 – Crespi pond

#15.5 lift station is the smallest of the City's lift stations, and it is in the worst condition of the City's seven lift stations. Operations staff also indicated that #15.5 has disproportionately large operational and maintenance issues as compared to the other six lift stations. Both pump motors had very low megohm readings, which indicate the pumps should be replaced. Pump 1 produced 19.5 gpm and pump 2 produced 12 gpm. Both pumps were prone to air-locking until operations staff drilled and tapped the discharge piping in the wet well and placed ¼ stainless ball valves. There is no coating in the wet well and there is no valve vault. The ductile iron check valve and PVC isolation valves are located inside the wet well. Due to the deleterious condition of the piping and valves, operations staff requested that FRM not remove the pumps for inspection. Electrical conduits were not sealed off from the lift station, possibly allowing corrosive and volatile gases to be introduced. A thick mat covered the water surface in the wet well. Material composition of the mat was not only grease but also rags and solids. The sole source of wastewater for this lift station is the adjacent public restroom. The restroom is outfitted with low flow toilets and faucets as well as no flush urinals. The low demand and the low water to waste ratio at this facility partially explains the heavy matting and solids build up. There were no structural concerns for this lift station.

Figure 5. Total mat coverage in shallow wet well lift station #15.5.

Recommendations

Lift station 15.5 is in poor condition. Based on the site evaluation conducted by FRM, the following summarizes the recommendations for this lift station:

- Replace lift station with new and/or
- Install a septic tank up stream of lift station or
- Eliminate lift station and install gravity sewer from restroom to trunk line beneath Sunset Dr (this would need to be verified to determine if feasible)

#16 – Arena

The Arena lift station is in good condition. The dry well type lift station has a two tier dry well. On the upper tier are the electrical systems. The control panel wiring and components were in good condition and the 60kW natural gas generator proved to be operational. Similarly, the soft start contactors were proved to be in satisfactory condition after being disassembled for inspection. On the lower tier of the dry well structure were the mechanical components of the lift station including the two sewage pumps, a dry well sump pump, and ventilation fan. All mechanical equipment was in good operational condition. Pump 1 produced 269 gpm while pump 2 produced 314 gpm. At the time of flow testing a significant amount of flow was coming into the wet well and as such the reported flowrates are anticipated to be much lower than the pumps actual flowrates. Both pumps did demonstrate moderately low megohm readings, indicating the pump motor winding insulation is failing. Suction and discharge piping in the dry well are coated and the coating is in good condition. Check valves, manufactured in 1994, appeared to be operating properly. FRM reported that the pumps would need to be removed in order to verify valve operation. The wet well was also in satisfactory condition with the coating reported to be in good shape. Minimal matting and minor debris were observed to be floating in the wet well. Lift station exterior was in satisfactory condition with some loss of concrete on the dry well lid. Operations staff did point out some areas where vandalism had taken place. The vandals were able to cause minor damage by penetrating the steel mesh covering some of the dry well openings, including a motorized louver vent.

Figure 6. Red-handled isolation valving in the Arena lift station.

Currently there is no recommended capital upgrades to provide for this lift station however as the lift station comes to the end of its useful life Wallace Group does recommend a wet pit type lift station over the current dry-pit type. Wet pit type lift stations reduce and can even eliminate the need for confined space entry for routine operations and maintenance and are safer for operations staff.

Recommendations

Based on the site evaluation conducted by FRM, the Arena lift station is in satisfactory condition. The following summarizes the recommendations for this lift station:

- Confirm operation of isolation valves
- Inspect impeller and volute wear on both pumps
- More robust mesh or grating should be used on all dry well openings to minimize damage caused by vandalism

#17 – Beach Comber

The Beach Comber lift station is in poor condition. The control panel is corroded through and could be allowing rainwater in. Both pumps demonstrated very low megohm readings. At the Beach Comber lift station, the low megohm readings could be a result of poor wire splicing practice or the pump motors could be failing. There are no seal offs on any of the conduits entering the control panel, which is likely contributing to corrosion of the control panel from the inside out. Additionally, there are no bollards or other protection from traffic, which is a concern as the lift station is located on the outside of a corner where vehicle traffic tends to speed. Pump 1 produced 128 gpm and pump 2 produced 116 gpm. Both pumps showed noticeable signs of wear on the impeller and volute. Coating on the wet well appears to be a urethane product and has failed. Some concrete aggregate was exposed in areas of coating failure in the wet well. Check valves and isolation valves within the valve vault were noted as old and having a corroded exterior, however the ductile iron discharge piping was in satisfactory condition. The Beach Comber lift station did not have a standby generator but did have a manual transfer switch and was connection ready. An overflow pipe located within the wet well was pointed out by operations staff, but it is unclear if the overflow pipe is plugged or where the outfall is located.

Figure 7. Reduced impeller profile and compromised impeller geometry due to wear in the Beach Comber lift station.

Recommendations

The Beach Comber lift station is in poor condition. Based on the site evaluation conducted by FRM, the following summarizes the recommendations for this lift station:

- Investigate cause for low megohm reading
- Replace pumps
- Replace control panel enclosure
- Install electrical seal offs
- Install traffic protection around control panel – eg. bollards
- Re-coat lift station wet well
- Cap overflow pipe

#18 – Russell's Service Station

The #18 lift station is generally in poor condition. Megohm testing the two pumps in this lift station yielded very low resistance. The low reading should be investigated further for cause. Megohm testing could have been compromised due to poor splice quality and/or the junction box (where the splicing is) being full of water. Alternatively, the pump motors could be failing. Because the pumps were not installed on guide rails the pumps were not pulled. Therefore, the pump wet ends could not be inspected. Pump 1 produced 79 gpm and pump 2 produced 67 gpm. The isolation and check valves in the valve vault are old with exterior corrosion and the isolation valves were inoperable. The discharge piping showed signs of heavy corrosion. Similarly, the operations staff stated concern for integrity of the force main. The concern for the force main lies primarily in the fact that it is aged ductile iron and that it passes beneath some buildings whose foundation may be compromised if the force main is leaking. The wet well has aggregate within the concrete exposed. The #18 lift station did not have a standby generator onsite but does have a 70kW rated transfer switch installed with external point of connection for a portable generator.

Figure 8. Corroded discharge piping in lift station #18 wet well.

Recommendations

The lift station #18 is in poor condition. Based on the site evaluation conducted by FRM, the following summarizes the recommendations for this lift station:

- Replace lift station
- Investigate feasibility of eliminating lift station and flow by gravity to nearby sewer main
- Replace and relocate force main into public right of way

Document Review

One year, 2019, of operational data was provided to Wallace Group by the City. The operational data included pump run hours and 'Code II Work Events.' Code II Work Events are best described as work performed outside of routine checks, operations, and maintenance. They include emergency call-outs as well as work performed above and beyond routine work that occurred during routine visits. The pump run hours were used in conjunction with observed flowrates recorded during the FRM field inspections to determine approximate gallons pumped per month and per year by each lift station. The Code II

Work Events were also counted at each lift station giving insight to the frequency of 'issues' at each lift station.

In 2019 lift station #12 pumped nearly 6 times more wastewater than the next highest volume lift station, whereas lift stations #15.5 and #18 pumped the least wastewater. Stations #12 and #14 had the most Code II Work Events, with 13 reported in 2019, whereas Station #18 had the fewest with only 1 Code II Work Event. While data like number of emergency call-outs, pump run hours, and gallons pumped gives quality insight into system management some statistics can be more helpful than others.

Table 2 Summary of data analysis from document review.

2019 Statistic Name	Lift Station #11	Lift Station #12	Lift Station #14	Lift Station #15.5	Lift Station #16	Lift Station #17	Lift Station #18
Average Gallons Pumped Per Month	1,116,009	6,931,052	268,128	8,726	1,175,140	37,454	13,638
Total Gallons Pumped	13,392,108	83,172,618	3,217,536	104,706	14,101,680	449,448	163,661
Number of Code II Work Events	7	13	13	8	4	2	1
Event Intensity	1.05	0.30	7.77	152.81	0.50	8.90	12.22

Looking at Code II Work Events per million gallons pumped, a statistic referred to in this report as 'event intensity', yields a potentially more meaningful measure on which to base management and operations decisions. Lift station #15.5 had an event intensity approximately twelve-and-one-half (12.5) times higher than the lift station (lift station #18) with the next highest event intensity.

Summary of Recommendations

A summary of recommendations and estimated costs are provided in Table 3. It should be noted that all projects should have a preliminary engineering study to better assess the feasibility, scope, and cost associated with the projects identified for each lift station. The estimated preliminary engineering report cost for each of the projects identified is also included in the Table 3.

Table 3. Recommended projects summary and estimated costs.

Lift Station No.	Lift Station Name	Brief Project Description											Estimated Costs				
		Replace or eliminate lift station	Replace pumps	Replace wet well piping	Replace valving	Coat wet well	Misc. coating - (eg. piping, secondary fall protection, valves)	Install seal-offs	Replace control panel enclosure	Control panel work (eg. re-wire, reconfigure)	Pumper truck bypass req'd for upgrades	Install bollards to protect control panel	Construction /Implementation Cost	Engineering, Environmental, Construction Management, Inspection, Administration (45% of Construction Cost)	Total Project Cost	O&M Recommendations	Other Notes
11	**Eardley**						X	X					$30,000	$13,500	$43,500	See footnote 1	
12	**Ocean View at 9th Ave.**						X			X			$20,000	$9,000	$29,000	See footnote 2	
14	**Lover's Point**		X	X	X					X	X		$60,000	$27,000	$87,000	See footnote 3	
15.5	**Crespi Pond**	X											$200,000	$90,000	$290,000		See footnote 4
16	**Arena**	*no projects recommended*											*no projects recommended*				
17	**Beach Comber**		X			X		X	X		X	X	$150,000	$67,500	$217,500	See footnote 5	
18	**Russell's Service Center**	X											$350,000	$157,500	$507,500		See footnote 6

1. Mitigate/prevent grease load, evaluate start/stop frequency and adjust floats to reduce water residence time in lift station
2. Maintain records of impeller wear, perform megohm test on pump motors
3. Maintain records of impeller wear
4. Investigate feasibility of eliminating lift station and use gravity sewer to convey flow to Sunset Dr./Ocean View Blvd. sewer main
5. Inspect impeller and volute wear on both pumps, confirm operation of isolation valves
6. Investigate condition of existing force main and consider new alignment that doesn't pass beneath structures, also investigate eliminating lift station and gravity flow to nearby sewer main

Lastly a prioritization matrix is provided in Table 4 below. The table provides an importance factor which is based on engineering judgement as to how the three parameters are to be weighted. The higher the importance factor of a given parameter the more it will contribute to increasing project priority for the given lift station. The three parameters*, 1. Overflow to water body of the state, 2. Community impact, and 3. Event intensity* are scored on a scale between 0 and 10 points; 10 points being the highest priority and 0 points being the lowest priority. Then the score is computed by adding the product of each parameter by its importance factor. The highest score is given the highest priority (a priority of 1) and the lowest score is given the lowest priority (a priority of 6). Because no projects are recommended for lift station #16 (Arena), it is omitted from the project prioritization matrix.

Table 4. Project Prioritization Matrix.

Importance Factor		**4**	**3**	**5**		
		Overflow to Marine Protected Area (yes or no)	**Community Impact (gallons pumped per month)**	**Event Intensity (code II events per million gallons pumped)**		
Lift Station No.	**Lift Station Name**	Yes - 10 No - 0	500,000 to 1,000,000 - 10 100,000 to 500,000 - 5 0 to 100,000 - 0	> 10 - 10 5 to 10 - 5 < 5 - 0	**Score**	**Priority**
					Importance Factor X Points	
11	Eardley	0	10	25	35	4
12	Ocean View Blvd. at 9th Ave.	10	10	0	20	6
14	Lover's Point	10	5	25	40	3
15.5	Crespi	0	5	50	55	1
17	Beach Comber	0	0	25	25	5
18	Russell's Service Center	0	0	50	50	2

Appendix A : Field Reports

Date- 12/3/19

Lift Station 11

Pump 1
Make/Model- Tags missing
Voltage- 240 three phase
Megohm reading- Infinite at 1000v
Amperage reading L1 10.1 **L2** 9.8 **L3** 10.3
Flow- 159
***Flow is the combination of draw down for a minute plus influent for a minute**

Pump 2
Make/Model- Tags missing
Voltage- 240v three phase
Megohm reading- Infinite at 1000v
Amperage reading L1 8.6 **L2** 7.7 **L3** 7.9
Flow- 207
***Flow is the combination of draw down for a minute plus influent for a minute**

Wet Well
Dimensions- Round 72" Diameter x 16'2" deep
Existing coatings- Yes, unknown manufacturer appears to be in serviceable condition
Corrosion- Corrosion present on secondary fall protection (grating)
Structural concerns- None
Grease and grit accumulation- 100% grease mat on the surface of the station, very thick and odorous
Invert size and depth- (1) 10" drop inlet 9' down, 10" overflow line (to aquarium holding tank)

Discharge Piping
Estimated pipe size- 4"
Check valve vault- Yes, very good condition
Condition of valves- Good
Piping material- Ductile iron
Corrosion- Piping in wet well is starting to corrode
Guide rail system- Yes, stainless steel construction
Recirculation from guide rail system- None

Electrical
Junction box- Yes, splices are satisfactory
Backup generator- 50kw generator. Unit was tested and is operational.

Motor Control Center
Type of automation-Transducer, redundant float backup
Alarm system type- Internet/Auto dialer
EYS seal offs installed- No
Schematics for panel onsite-Yes

Spare parts onsite- Staff depicted minor parts are on hand

Notes- Station is in good condition, mitigation of incoming grease.

Date- 12/3/19

Lift Station 12

Pump 1
Make/Model- Flyght 3171.095-1120002
Voltage- 240v three phase
Megohm reading- Could not perform due to panel arrangement
Amperage reading- 57 amp average from VFD
Flow- 853
***Flow is the combination of draw down for a minute plus influent for a minute**

Pump 2
Make/Model- 3171.095-1120002
Voltage- 240v three phase
Megohm reading- Could not perform due to panel arrangement
Amperage reading- 58 amp average from VFD
Flow- 853 GPM
***Flow is the combination of draw down for a minute plus influent for a minute**

Pump 3
Make/Model- Barnes SE411
Voltage- 120v
Megohm reading- Could not perform due to panel arrangement
Amperage reading- 58 amp average from VFD
Flow- Estimated 40 GPM
***Flow is the combination of draw down for a minute plus influent for a minute**

Wet Well
Dimensions- 9'x 18'
Existing coatings- Yes, T-lok in satisfactory condition
Corrosion- Secondary fall protection showing heavy corrosion
Structural concerns- None
Grease and grit accumulation- Large grease shelf, grease blocks installed
Invert size and depth- (1) 16" inlet at 10' depth (as viewed from the top)

Discharge Piping
Estimated pipe size- 8”
Check valve vault- Yes, check valves and isolation valves with bypass piping
Condition of valves- Good
Piping material- Ductile iron
Corrosion- Piping in wet well is corroded, coatings failure on piping
Guide rail system- Yes, stainless steel construction
Recirculation from guide rail system- None

Electrical
Junction box- Yes, splices are epoxy filled for water resistance
Backup generator- 50kw generator. Unit was tested and is operational.
Note- Electrical system and generator are mounted in a below grade concrete structure

Motor Control Center
Type of automation- Transducer with backup float
Alarm system type- SCADA/Auto dialer
EYS seal offs installed- Yes
Schematics for panel onsite-Yes

Spare parts onsite- Misc generator parts, spare float

Notes- Breakers mounted on a bracket in front of the VFD’s makes it impossible to remove the VFD cover in place. To test and/or work on the VFD you have to remove the breaker and bracket. This installation does not allow megging the motors

Date- 12/3/19

Lift Station 14

Pump 1
Make/Model- Flyght 3085.092-9367
Voltage- 208v three phase
Megohm reading- L1 554 @ 1000v **L2** 580 @ 1000v **L3** 579 @ 1000v
Amperage reading L1 7.2 **L2** 7.3 **L3** 6.7
Flow- 144 GPM
Impeller Diameter- 75mm
***Flow is the combination of draw down for a minute plus influent for a minute**

Pump 2
Make/Model- Flyght 3085.092-9367
Voltage- 208v three phase
Megohm reading- L1 330 @ 1000v **L2** 391 @ 1000v **L3** 345 @ 1000v
Amperage reading L1 7.1 **L2** 7.3 **L3** 6.5
Flow- 112 GPM
Impeller Diameter- 75mm
***Flow is the combination of draw down for a minute plus influent for a minute**

Wet Well
Dimensions- Round 54" Diameter x 134" deep
Existing coatings- Yes, unknown manufacturer appears to be in serviceable condition
Corrosion- None
Structural concerns- None in wet well, broken concrete around lid
Grease and grit accumulation- Large grease ring, grease blocks installed and noticeable solids in wet well
Invert size and depth- (2) 6" inlets, 4' and 6.5'

Discharge Piping
Estimated pipe size- 3"
Check valve vault- Yes
Condition of valves- Check valves are old, isolation valves are gate valves
Piping material- Ductile iron
Corrosion- Piping in wet well is heavily corroded, check valve vault piping is satisfactory
Guide rail system- Yes, older but functional
Recirculation from guide rail system- None

Electrical
Junction box- Yes, splices are satisfactory
Backup generator- 55kw generator. Unit was tested and is operational.

Motor Control Center
Type of automation- Bubbler
Alarm system type- SCADA/Auto dialer
EYS seal offs installed- no
Schematics for panel onsite-no

Spare parts onsite- None

Notes- Electrical panel has messy wiring, likely from years of service. Overflow line leaving lift station runs to the side of cliff sitting above a beach, line has been capped. Lid to lift station appears to be lower than a storm drain inlet- both are mounted in a depression in the surrounding area.

Date- 12/3/19

Lift Station 15

Pump 1
Make/Model- Reliance motor 1.5HP (per handwritten note in panel)
Voltage- 240 single phase
Megohm reading-L1 .45 @ 1000v **L2** .55 @ 1000v
Amperage reading L1 11.7 **L2** 11
Flow- 19.5 GPM
***Flow is the combination of draw down for a minute plus influent for a minute**

Pump 2
Make/Model- Reliance motor 1.5HP (per handwritten note in panel)
Voltage- 240v single phase
Megohm reading- L1 .19 @ 1000v **L2** .13 @ 1000v
Amperage reading L1 12.5 **L2** 12
Flow- 12 GPM
***Flow is the combination of draw down for a minute plus influent for a minute**

Wet Well
Dimensions- Round 53.5" Diameter x 63.5" deep
Existing coatings- No
Corrosion- Corrosion present, aggregate exposed
Structural concerns- None
Grease and grit accumulation- 100% grease met on the surface of the station, very thick and full of rags
Invert size and depth- (2) 4" 2.5' down,

Discharge Piping
Estimated pipe size- 3"
Check valve vault- No, isolation and check valves in wet well
Condition of valves- Check valves are corroded, isolation valves are PVC and appear fairly new
Piping material- Ductile iron/ PVC schedule 80
Corrosion- Piping in wet well is heavily corroded
Guide rail system- None
Recirculation from guide rail system- None

Electrical
Junction box- Yes, splices are satisfactory
Backup generator- None

Motor Control Center
Type of automation-Bubbler with back up float
Alarm system type- Auto dialer
EYS seal offs installed- No
Schematics for panel onsite-No

Spare parts onsite- None

Notes- Staff did not allow removal of the pumps due to piping and valve issues. Wet well needs to be coated prior to structural loss. Piping needs to be replaced and I would recommend replacing PVC valves as they are not municipally robust. Both pumps are exhibiting very low megohm readings. I would also recommend that a guide rail system is installed to allow safer maintenance and repair.

Date- 12/2/19

Lift Station 16

Pump 1
Make/Model- Fairbanks Morse 20hp, no pump nameplate
Voltage- 240v three phase
Megohm reading L1 17.4 @1000v **L2** 17.7 @ 1000v **L3** 17.5 @ 1000v
Amperage reading L1 35.5 **L2** 35.8 **L3** 34.9
Flow- 269 GPM
***Flow is the combination of draw down for a minute plus influent for a minute**

Pump 2
Make/Model- Fairbanks Morse 20hp, no pump nameplate
Voltage- 240v three phase
Megohm reading L1 19.5 @ 1000v **L2** 19.9 @ 1000v **L3** 19.5 @ 1000v
Amperage reading L1 40.8 **L2** 39.8 **L3** 40.1
Flow- 314 GPM
***Flow is the combination of draw down for a minute plus influent for a minute**

Wet Well
Dimensions Rectangle- 7' x 5.5' x 14'2" deep
Existing coatings- Yes, coatings in satisfactory condition
Corrosion- None
Structural concerns- None
Grease and grit accumulation- No grease mat, noted small floating trash
Invert size and depth- 12"

Discharge Piping
Estimated pipe size- 6" from pumps transitions to 8" leaving station
Check valve vault- No, this is a dry well
Condition of valves- check valves appear to be working (manufactured in 1994) isolation valves are tight- cannot verify operation without removing pumps.
Piping material- Ductile iron
Corrosion- Piping in satisfactory condition, appears repairs have been made recently
Guide rail system- No
Recirculation from guide rail system- N/A

Electrical
Junction box- No
Back up generator- 60kw natural gas generator. Unit was tested and is operational.

Motor Control Center
Type of automation- Bubbler with float backup
Alarm system type- Auto dialer
EYS seal offs installed- N/A
Schematics for panel onsite-Yes
Contactors- Pumps operate off soft starts with bypass contactors. Contactors disassembled and are in satisfactory condition.

Spare parts onsite- None

Notes- Station is mechanically sound.

Date- 12/2/19

Lift Station 17

Pump 1
Make/Model- No pump nameplate
Voltage- 240v three phase
Megohm reading L1 .142 @ 165v **L2** .147 @ 165v **L3** .167 @ 165v
Amperage reading L1 13.2 **L2** 13.3 **L3** 12.6
Flow- 128 GPM
*Flow is the combination of draw down for a minute plus influent for a minute

Pump 2
Make/Model- No pump nameplate
Voltage- 240v three phase
Megohm reading L1 1.27 @ 1000v **L2** 1.22 @ 1000v **L3** 1.241 @ 1000v
Amperage reading L1 12.9 **L2** 13.9 **L3** 13.6
Flow- 116 GPM
***Flow is the combination of draw down for a minute plus influent for a minute**

Wet Well
Dimensions Round- 70" Diameter x 14'
Existing coatings- Current failed coating believed to be a urethane product
Corrosion- Aggregate exposed on concrete in areas the coating has failed.
Structural concerns- N/A
Grease and grit accumulation- Minimal grit, 6 grease blocks installed in wet well
Invert size and depth- (2) 6"

Discharge Piping
Estimated pipe size- 4"
Check valve vault- Yes, check valves and plug valves
Condition of valves- Old, corroded exterior
Piping material- Ductile iron
Corrosion- Piping in satisfactory condition
Guide rail system- Yes
Recirculation from guide rail system- No

Electrical
Junction box- No
Back up generator- Manual transfer switch is installed; no generator.

Motor Control Center
Type of automation- Floats
Alarm system type- Auto dialer
EYS seal offs installed- No
Schematics for panel onsite-Yes

Spare parts onsite- Warrick controller

Notes- Megohm readings are very low and should be investigated for cause- failing motor or conduits/junction box full of water. Concrete needs coating. Noticeable wear on the pumps impellers and volutes.

Date- 12/2/19

Lift Station 18

Pump 1
Make/Model- Reliance Motor 3hp (no pump nameplate)
Voltage- 240v three phase
Megohm reading L1 .135 @ 160v **L2** .137 @ 160v **L3** .144 @ 160v
Amperage reading L1 7.1 **L2** 7.1 **L3** 7.0
Flow- 79 GPM
*Flow is the combination of draw down for a minute plus influent for a minute

Pump 2
Make/Model- Reliance Motor 3hp (no pump nameplate)
Voltage- 240v three phase
Megohm reading L1 .339 @ 410v **L2** .354 @ 410v **L3** .370v @ 410v
Amperage reading L1 7.1 **L2** 7.1 **L3** 7.0
Flow- 66.6 GPM
***Flow is the combination of draw down for a minute plus influent for a minute**

Wet Well
Dimensions Round- 4’ dia x 20’ deep
Existing coatings- N/A
Corrosion- aggregate exposed on concrete. Should be evaluated for coatings.
Structural concerns- N/A
Grease and grit accumulation- N/A
Invert size and depth- (1) 6”, (3) 4”

Discharge Piping
Estimated pipe size- 4”
Check valve vault- yes, check valves and plug valves
Condition of valves- old, corroded exterior, isolation valve cannot be operated
Piping material- Ductile iron
Corrosion- Heavy corrosion in wet well
Guide rail system- N/A

Electrical
Junction box- Yes
Back up generator- 70KW rated transfer switch is installed; no generator.

Motor Control Center
Type of automation- Bubbler with backup float
Alarm system type- SCADA and autodialer- tested good
EYS seal offs installed- yes
Schematics for panel onsite- no

Spare parts onsite- Spare fuses

Notes- Megohm readings are very low and should be investigated for cause- failing motor or conduits/junction box full of water. Pumps not on guide rail system and could not be removed from service. Discharge piping needs to be replaced- would be a great time to install guide rails. Concrete needs coating. Isolation valves need to be replaced.