State of North Carolina

North Carolina Utilities Commission
Raleigh

Docket No. W-1333, Sub 0
Docket No. W-1130, Sub 11

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

In the Matter of	)
Application by Currituck Water & Sewer, LLC,	)
4700 Homewood Court, Suite 108, Raleigh, North	)
Carolina 27609, and Sandler Utility, LLC ,	)
Virginia Beach, Virginia, for Authority	)
To Transfer the Eagle Creek Wastewater System	)
And Franchise in Currituck County, North	)
Carolina, and Approval of Rates	)

REBUTTAL TESTIMONY

OF

MICHAEL J. MYERS

SECRETARY OF CURRITUCK WATER & SEWER, LLC

March 31, 2022

Q. MUCH OF THE PUBLIC STAFF TESTIMONY ADDRESSES THE PERFORMANCE OF ENVIROLINK AS THE CONTRACT OPERATOR OF THE EAGLE CREEK WASTEWATER COLLECTION AND TREATMENT SYSTEM BEGINNING SEPTEMBER 2020. WHAT IS YOUR RESPONSE TO THE PUBLIC STAFF'S ASSESSMENT OF THE PERFORMANCE OF ENVIROLINK?

A. The fundamental issue in this case is the suitability of Currituck Water & Sewer ("CWS") to acquire the Eagle Creek wastewater collection and treatment system from Sandler Utility. Under G.S.§ 62-111 applications to transfer ownership of public utilities shall be given if justified by the public convenience and necessity. That transfer of this utility to a new owner such as CWS is in the public interest has never been clearer than in this proceeding. It has been demonstrated time after time that developer designed, built, owned and operated water and/or sewer utilities like Eagle Creek are doomed to experience service issues.

Regarding Envirolink, it is understandable, reasonable and anticipated that given the plight of the customers over the past 20 years and the catastrophic system failure of September/October of 2020, customers will be frustrated and look for answers from the only party they see on a day-to-day basis. It is understandable that customers will blame Envirolink for the system failures or for the condition of the system even if customer views are not based in accurate factual knowledge. As stated by Engineer Rigsby, in his recent independent review of the Eagle Creek system conducted by this NC DEQ approved consultant, eight independent reviews have been conducted, documenting poor operation and maintenance for at least 12 years. It is important to understand that at the time of the system failures in 2020, Envirolink had only assumed operations 20 days before the first vacuum station failure. As Mr. Rigsby, the NC DEQ reviewer noted, the Eagle Creek vacuum system was an accident waiting to happen.

Contrary to the underlying theme of the Public Staff's testimony and the tenor of its questions to the public witnesses on March 2, 2022, the primary issue that led to the system failures of 2020 and 2021 was not the suitability of the system operator at that time but the lack of investment and the undercapitalization of the Eagle Creek wastewater system. Every expert that has reviewed the Eagle Creek wastewater system agrees with Mr. Rigsby, the NC DEQ's independent reviewer, and has drawn the same conclusion: the cause of the system failures was not operations but poor maintenance and lack of prudent design redundancy. The system failures in the fall of 2020 were tragic for the residents of Eagle Creek, and while analysis of cause is prudent and necessary, the first priority should be to identify and implement solutions.

Some, including the Public Staff sponsored NC DEQ witnesses, attempt to deflect attention away from the root causes, focusing on certain reports and alleged imprudent actions. This testimony, in my view, is meant to avoid criticism and to draw attention away from the fact that NCDEQ was aware of the lack of maintenance, lack of investment and the repeated service outages for over 15 years.

Q. PLEASE DESCRIBE THE RELATIONSHIP BETWEEN ENVIROLINK AND ENVIROTECH AND BETWEEN ENVIROLIINK AND CURRITUCK WATER & SEWER.

A. Envirolink acquired Envirotech and continued to rely upon former Envirotech employees to provide service through a transition period that extended through September 7, 2020. Of critical importance is that neither Envirolink nor Envirotech is an applicant in these dockets. Neither CWS, Envirolink or Envirotech has ever held a certificate of public convenience and necessity to own the Eagle Creek system or been issued permits to operate the Eagle Creek system. Neither of these two operators or CWS has had the responsibility to provide the funding to maintain, operate or make capital improvements to the system.

Envirolink and CWS have limited commonality of ownership though completely different sources of capital, and CWS intends to continue to rely upon Envirolink and the understanding of the system that Envirolink has gained, in part at its own expense, should the application be approved.

Q. WHAT ACTIONS DID ENVIROLINK TAKE IN ANTICIPATION OF THE POSSIBILITY THAT IT MIGHT TAKE OVER OPERATION RESPONSIBILITIES FOR THE EAGLE CREEK SYSTEM?

A. Even before assuming operations, Envirolink, with the support of CWS, identified the need for investment in the Eagle Creek wastewater system and embarked on developing sustainable solutions. Prior to the system failures of 2020, beginning in the summer of 2020, Envirolink supported negotiations between CWS and Sandler Utility addressing the transfer of the wastewater facilities. It was obvious from Envirolink's first involvement that Sandler Utility lacked the willingness or desire to invest in the proper operations and maintenance of the Eagle Creek wastewater facility.

Q. RATHER THAN MAKING A RECOMMENDATION AS TO THE BEST SYSTEM TO BE EMPLOYED IN PROVIDING SERVICE WITHIN THE EAGLE CREEK, THE PUBLIC STAFF, THROUGH THE TESTIMONIES OF WITNESSES FRANKLIN, MAY AND TANKARD, APPEARS TO BE FOCUSED ON ATTACHING CAUSE TO THE CURRENT STATE OF THE EAGLE CREEK SYSTEM. PLEASE COMMENT.

A. It is troubling that after conducting extensive discovery and sending out innumerable data requests, communicating with customers, and after undertaking trips to the service area and after visiting only one partial vacuum system, the Public Staff basically has taken a pass, thrown up its hands, and makes no meaningful recommendations. The residents of Eagle Creek deserve state agencies that focus on sustainable solutions.

It is my opinion that there will be a time and place to focus on the current state of system and how it got into its current condition, but that right now the focus should be on finding and implementing a sustainable long term solution for the residents of Eagle Creek. However, if Public Staff deems it important to focus on the cause for the current state of the system, in my view, the agency should rely on the experts and the evidence, and should focus on the eight independent reviews, previous Sandler Utility rate case proceedings and six NC

DEQ inspection reports dating back to 2009. Five of the six inspection reports from 2009 to September 2020, every rate case proceeding and each of the eight independent reviews document poor maintenance, substandard service, inadequate record keeping and deficient capital planning.

Q. IF BLAME IS TO BE ATTACHED, WHERE, AND IN YOUR OPOINION SHOULD THE BLAME BE PLACED?

A. If the Public Staff is looking for an entity to blame for the fact that the Eagle Creek wastewater system has for a long period of time been deficient, it need look no further than the owner, Sandler, Envirotech (the operator for the first 25 years), DWR, and the Public Staff, upon whom the NCUC depends to investigate and monitor utilities under its jurisdiction.

Envirolink has and will bear responsibility for its limited operation under severely challenging conditions, but at least it has been a steady, constant presence for the community and has assisted CWS in looking beyond the existing crisis and in seeking a long term, cost effective solution. While the Public Staff has participated in one community meeting, the only party that has consistently and willingly met with residents of Eagle Creek is Envirolink, even though Envirolink only came onto the scene in late 2020. Some important facts to consider are that outside of one meeting that the Public Staff attended: Envirolink and CWS are the only parties that have embraced solutions and that have not avoided public scrutiny. Only Envirolink has met with the media, reporters, senators and representatives. Envirolink has conducted more than three townhall style meetings, has met with the HOA representatives on numerous occasions, and has met with residents one-on-one, while others, in my opinion, have stuck their heads in the sand.

Q. PLEASE SUMMERIZE THE CONCLUSIONS OF THE INDEPENDENT ENGINEER TO WHICH YOU MAKE REFERENCE.

A. As Mr. Rigsby, the independent engineer NC DWR insisted be hired, concluded:

- Eagle Creek has been an accident waiting to happen many years before the fall of 2020.
- The system suffers from over 12 years of poor maintenance.
- The owner was not engaged.
- The system needs to be replaced.

See Myers Rebuttal Exhibit A.

It is irresponsible, in response to public pressure, to focus attention on an operator that had been involved for less than one month before system failure. Envirolink has not avoided the public scrutiny, even though it had no responsibility for the condition of the facilities prior to September 2020, and had no ability to authorize investment. In addition, it is well documented that Envirolink has invested well beyond any compensation received by the owner in training, labor, equipment, studies, and engineering, because Envirolink has and remains focused on a sustainable solution. All of this to ensure that a sustainable solution is implemented.

Q. PLEASE ELABORATE ON THE HISTORY AND DESIGN OF THE EAGLE CREEK SYSTEM HISTORY LEADING UP TO ITS CONDITION TODAY.

A. Eagle Creek in the coastal county of Currituck is at an elevation barely above sea level and is susceptible to poor drainage and frequent rain events from hurricanes and other severe storms. The poor drainage required the installation of swales when the subdivision was developed. When Eagle Creek was developed, the decision was made to provide wastewater collection and treatment through a vacuum system. This has proven to be a poor choice because the design and construction were not suitable for this application. The developer was responsible for the design, construction, ownership and operation of the wastewater system from the very beginning.

Based on conversations with Florida DEQ, A3-USA, Quavac, Flovac, literature research and Public Staff testimony, CWS is convinced that the design and construction did not address known shortcomings and limitations of vacuum technology. As the Commission is well aware, it is very common for developers to underfund design, construction, operation and maintenance of utilities due to lack of industry knowledge and lack of focus on the long term sustainability of the utility system. For example, the following are some of the most significant design issues that should have been addressed up front:

- **Pit Volume**: The pit volume is undersized. While Airvac has stated that pit volume is determined based on the size of the lateral, this contradicts information obtained from Flovac, A3-USA, NC Regulation, Florida DEQ, CWS's review of literature and Faunhofer-Instit Fur Grenzflachen-Und Bioverfahrenstechnik IGB "Guideline: Vacuum Sewer Systems" provided by the Public Staff in its response to CWS Data Request #1.
- **Saw Tooth Profile**: The saw tooth profile constructed at Eagle Creek is not consistent with current design criteria, as documented Airvac's Technical Manual, Flovac's observation, CWS's literature research and Faunhofer-Instit Fur Grenzflachen-Und Bioverfahrenstechnik IGB "Guideline: Vacuum Sewer Systems" obtained by CWS from the Public Staff in its response to CWS Data Request #1.
- **Sewage and Vacuum Pump sizing and selection** – as recommended by Flovac and A3-USA: The pumps were minimally sized and did not include any safety factor in the design. Additionally, VFD are common on vacuum pumps and sewage pumps, which allow pumps to ramp up and down based on conditions in the vacuum mains. None was installed for Eagle Creek.
- **Inflow & Infiltration** – It is well documented by Airvac, Flovac, A3-USA, Quavac and virtually all of the literature on the subject addressing vacuum systems that inflow and infiltration are critical factors and must be eliminated. The well documented inflow and infiltration experienced with the Eagle Creek

wastewater system has been excessive by any known metric. Infiltration and inflow is a critical factor with the Eagle Creek system because of its detrimental impact on pipe hydraulics, vacuum pump life, and pit operation.

- **Monitoring system** – Recommended by Airvac, Flovac and A3-USA to address the service related issues common in vacuum systems, as documented in numerous literature resources. Monitoring systems are valuable tools for assessing and eliminating sources of inflow and infiltration, as well as help for technicians to locate service issues during interface valve malfunctions. None was initially installed for Eagle Creek.
- **Redundancy** – The system did not include many redundancy features required by other regulatory agencies with more experience than North Carolina. For example,
    - the system design should have included sufficient vacuum pump capacity, so that the system could operate normally with one vacuum pump out of service.
    - The system design should have included sufficient sewage pump capacity, so the system could operate normally with one sewage pump out of service.
    - The system design should have included sufficient receiving tank volume to dampen or cushion and vacuum loss in the collection network from service valve failures.
    - The system design should have included multiple tanks to permit maintenance on the tank without shutting the system down.
- **Spare parts** – The design should have included spare parts for every component of a vacuum system. When Envirolink took over operations, the only spare parts were service valves and controllers. There were no spare vacuum pumps, no

spare sewage pumps, or other spare parts that would be expected as part of normal on-going program.

See Myers Rebuttal Exhibits B-G.

Additional consideration should be given to Mr. Franklin's testimony where on Page 17 of his testimony he states that based on his October 21, 2020 investigation, "Numerous pits were located in low lying areas,. . ." Vacuum systems are very rarely installed, as evidenced by information obtained from NC DEQ, that less than 4% of the collection system in Eastern North Carolina are vacuum systems. If this is extended to all of North Carolina, vacuum systems make up less than 1% of sewer collection systems in North Carolina or anywhere else.

The primary reasons other sewer collection technology is favored over vacuum is that vacuum has many moving parts that require immediate attention by operators who must be well trained to operate their unique features. The pool of such operators trained in the operation of any vacuum system is exceptionally limited. These important factors are well documented in the literature.

With respect to vacuum systems, there are far more interdependencies in contrast to much more simple and widely relied upon collection systems such as gravity, which by definition depends primarily upon the pull of natural forces, not upon constant negative pressure that depends upon a constant supply of electricity and where loss of vacuum in one part of the system can cause a widespread loss of vacuum and expansive system disruption of service. The pool of operators trained in the operation of gravity systems is much larger.

Q. PLEASE ELABORATE FURTHER ON THE DESIGN OF THE EAGLE CREEK SYSTEM AND THE ROLE THE NORTH CAROLINA REGULATORS PLAYED WITH RESPECT TO THE DESIGN

A. While NC DEQ and Public Staff either knew or should have known that the Eagle Creek wastewater system was a "accident waiting to happen", the design and construction were also a significant challenge for the Eagle Creek wastewater system. The original design lacked several critical design safety features that should have been but were not incorporated into the original design. This was likely because the North Carolina Department of Environmental Quality had very little experience in regulating vacuum systems (only 14 in North Carolina), in 1987 and were not aware of limitations on the critical design for vacuum systems, such as: pit volume, buffer tanks, inflow and infiltration impacts, receiving tank size, vacuum pump redundancy, sewage pump redundancy, monitoring systems, importance of the saw tooth profile, layout of the saw tooth profile, etc.

According to information obtained from the Public Staff in response to CWS Data Request #1, in developing the Public Staff testimony, neither NC DEQ nor the Public Staff have reached out to agencies in other states with more extensive experience than North Carolina in vacuum systems design to inquire into the experiences of these state agencies with vacuum sewers and some of the key design features those state agencies require. CWS, in developing its testimony and recommendations, has contacted Florida DEQ, Flovac, Quavac, A3-USA, has reviewed extensive literature and independent expert opinions. See Myers Rebuttal Exhibits B-G. Based on these evaluation, while Envirolink , which it has received some justifiable criticisms on a few operational and communication difficulties, maintains those difficulties did not cause the service failures and have been corrected.

In addition to the foregoing, the Commission can also refer to customer testimony. The Commission has heard and is hearing testimony from an individual at the March 2, 2022 customer hearing who assisted with the original construction of the Eagle Creek, evidence from licensed engineers, vacuum technology providers, customers, Currituck County officials, North Carolina State Representatives, Health Directors, and even NC DEQ itself that document that service outages, lack of maintenance and mismanagement have been systemic at Eagle Creek dating as far back as 2012.

Q. BASED ON THESE DESIGN FAILURES, SHOULD REGULATORS HAVE PROVIDED GREEATER OVERSIGHT, AND IS THE PUBLIC STAFF'S FOCUS ON ENVIROLINK'S OPERATIONS IN 2020 JUSTIFIED?

Contrary to implications in the Public Staff testimony, the Eagle Creek vacuum system has been beset by problems from the time it was installed due in large measure to these design shortcomings. Regulators have provided only sporadic and lax oversight of the Eagle Creek system. NC DEQ only conducted six inspections over the first 24 years of operation, with five indicating a non-compliant system. The inspections noted lack of maintenance, lack of maintenance records, no capital plan and numerous limit violations. Unfortunately, the frequency of inspections and aggressive enforcement actions did not begin until public scrutiny increased because of the critical system failures of 2020. There have been four inspections since September 2020. See Myers Rebuttal Exhibit H.

It appears that DWR depends in large measure upon customer complaints, conducts only infrequent inspections, and is slow to rectify deficiencies until the operation of these systems spins out of control.

Based in part on the Public Staff testimony, CWS questions whether the DWR supervisors or the Public Staff engineer have a complete understanding of how the vacuum systems are designed and operated. In many instances, witnesses, Franklin, Tankard and May fail to provide complete and accurate information. For example, on page 7 of witnesses Tankard and May's testimony they indicate that candy canes keep the vacuum from drawing water from drain traps and toilets within the homes or from otherwise damaging pipes. Contrary to this testimony, the main purpose of the candy canes is to allow air to enter the vacuum system in order to maintain a proper air-to-water ratio, so that water can be transmitted from the home to the central vacuum station.

Q. ARE THERE EXAMPLES OF DWR AND THE PUBLIC STAFF PROVIDING AN INCOMLPETE PICTURE OF THE EAGLE CREEK SYSTEM?

A. Yes. Examples include:

- Witnesses Tankard and May failed to inform the Commission of the numerous non-compliant inspections dating back to 2012.
  Witness Franklin failed to provide the Commission photos documenting the poor condition of the facilities provided to him through discovery. See Myers Rebuttal Exhibit I.
- Neither Witnesses Franklin, May or Tankard provide any information from independent reviews conducted initially by CWS and now Sandler.
- Witnesses Franklin only provides one comparative example, without conducting further investigations into other systems or oversight by states with more experience in regulating vacuum system.

Q. PLEASE ADDRESS THE 2015 SANDLER GENERAL RATE CASE AND WHAT IT SHOWS ABOUT THE SYSTEM IN 2015 AND THE DEGREE OF REGULATORY OVERSIGHT.

A. In Sandler's 2015 general rate case the Commission identified substantial service-related issues and required Sandler to take remediation steps. The system at that time was being operated by Envirotech, not Envirolink. Envirolink did not participate in Eagle Creek until five years later. While Sandler complied with some requirements of the Commission's order, it failed to comply with others, and the Public Staff failed to follow up adequately in requiring Sandler to comply.

On page 17 of Mr. Franklin's testimony he states in reporting on his October 21, 2020 inspection of the Eagle Creek system, five years after the Commission's order, "Residential vacuum pits and candy canes were also inspected. Numerous pits were located in low lying areas, and it was evident that the actions required under Ordering Paragraph 4 of the 2015 rate case order to complete renovations to reduce rainwater intrusion had not been fully implemented." The result was that there were tell-tale signs that the system was not being adequately maintained and repaired. The conditions manifesting themselves in the events of 2020 and 2021 are evidence of prior neglect of a system ill-suited for its application and one requiring an unusual level of oversight and reliance on technician response times.

The Eagle Creek system is owned by Sandler, the real estate developer. Sandler provides the funding, holds the certificate and the permits. Sandler hires and pays for the services of the contract operators. As stated above, ownership of water and wastewater systems by developers often results in service issues because they are focused on providing service only until lots have been sold and homes constructed. This manifests itself in minimal design standards, lack of investment, lack of engagement and oversight, and it should alert regulators to pay close attention. Sadly, such apparently was not the case. This should have prompted greater and more timely regulatory oversight.

Q WHAT ABOUT DWR'S PARTICIPATION IN THE CONSENT JUDGMENT?

A. DWR's oversight of the Eagle Creek vacuum system was not adequate until conditions that could have been anticipated devolved out of control, resulting in severe service disruptions to customers and degradation of the environment. In reaction to the emergency DWR and the North Carolina Attorney General focused on short term solutions without weighing the effect of these solutions on costs, manpower to implement them and long term sustainability. The Public Staff, which should have been advertent to costs, was absent in the process. Neither CWS, Envirolink or the expert reviewers have been able to influence regulators in addressing repeated requests that they take into account costs and a long term solution. Instead, the only step addressing long term issues mandated by these environmental regulators is to require in the consent decree that should Sandler sell the system, the acquirer is bound to step into

Sandler's shoes and accept potential judicial actions for Sandler's past actions and comply with the draconian obligations to implement the short term remedies imposed upon Sandler and be subject to contempt for failure to comply. Instead, much money is being spent as stop-gap measures that may prove unneeded for implementation of the most appropriate long term solution.

Q. PLEASE DESCRIBE THE CONDITION OF THE EAGLE CREEK SYSTEM WHEN ENVIROLINK TOOK OVER AS SYSTEM OPERATOR IN SEPTEMBER 2020.

A. The Public Staff witnesses provided an inaccurate and incomplete picture of conditions of the vacuum system at the end of 2020, almost immediately after Envirolink began operations. The system was an emergency waiting to happen. One Airvac reviewer, commented during a site visit, that he did not know how anyone could keep this system operational. The system had severe service outages before due to excessive storms, basic monitoring and no spare parts, much less elevated ones on pedestals to avoid flooding or that could be locked to avoid tampering. The pits are undersized. Pits contain 40 gallons for two homes, as compared to recommendation from Faunhofer-Instit Fur Grenzflachen-Und Bioverfahrenstechnik IGB "Guideline: Vacuum Sewer Systems" obtained from the Public Staff in its response to CWS Data Request #1.,which recommends 25% of average daily flow. Assuming two-three bedroom homes per pit and using NC DEQ Design Criteria, that would require a minimum of 180 gallons [note: other sources would require more storage]. Many homes in the Eagle Creek community have 4, 5, and even 6 bedrooms, so a more extensive analysis is required to determine the appropriate pit volume. The design of the vacuum pits is poorly suited for the service area as is evidence by the excessive inflow and infiltration entering through the pits. The problems with drainage due to the low elevation had manifested themselves before.

Q. PLEASE ADDRESS THE MANNER IN WHICH THE SYSTEM HAD BEEN MAINTAINED AND REPAIRED PRIOR TO ENVIROLINK'S BECMMING THE OPERATOR.

A. As evidenced in the NC DEQ inspection reports dating back to 2012, chronic deficiencies existed with the WWTP. Based in part upon lack of adequate resources the operator (Envirotech) had engaged in the process of waiting until parts of the collection system failed before repairing them or replacing them. See Myers Rebuttal Exhibit A. CWS witness Freed will address the difficulties Envirotech encountered. The more appropriate process would have been to engage in preventive maintenance activities, so that as parts reached the end of their useful lives or displayed potential malfunction due to unanticipated obsolescence or a history of inadequate maintenance, they could have been replaced. However, as Mr. Franklin's testimony indicates, even well maintained vacuum systems experience significant failures. While CWS disagrees that five failures per month constitute "rare" failures, Mr. Franklin's testimony does support the fact that even well-maintained vacuum systems require "continuous maintenance" and are prone to failure. This is the only logical conclusion. It doesn't take an expert in rocket science to appreciate this conclusion. Among the conditions cited by, Mr. Rigsby, the Independent Engineering Evaluation required by DWR are "lack of routine and preventive maintenance" and "lack of redundancy."

The February 28, 2022 Independent Engineering Evaluation by Century Engineering concludes the obvious:

> **There have been eight independent third party technical evaluations of the system dating back to 2010 which all consistently document numerous problems with the Eagle Creek vacuum sewer collection system** including excessive infiltration and inflow, sanitary sewer overflows, vacuum leaks, vacuum pit valve and controller failures, vacuum station problems including vacuum pump failure and sewage pump failure, and the catastrophic system failure of September and October 2020

Q. YOU HAVE HAD FIRST-HAND KNOWLEDGE OF THE SYSTEM. IN RESPONSE TO THE PUBLIC STAFF FOCUS ON ENVIROLINK, PLEASE ELABORATE FURTHER ON YOUR ASSESSMENT AS TO THE

CAUSES FOR THE CONDITION OF THE EAGLE CREEK SYSTEM AND THE BEST SOLUTION FOR ITS LOONGTERM APPROPRIATE OPERATION.

A. As mentioned above, I believe resources should now be deployed to identify solutions, but if a scapegoat or an entity solely to blame for the critical condition of the Eagle Creek system it should not be Envirolink. To focus solely upon performance on the most recent operator is to ignore and misrepresent evidence, to attempt to shield many other actors with far greater responsibility for the condition of the system, including the regulators, who have thrown up their hands as to the best process to move forward, improve the condition of the system as it currently exists and provide for long term viability and provide adequate customer service.

Sandler wishes to sell. CWS wishes to acquire and replace. CWS wants to improve the system and service for the residents of Eagle Creek and has proposed a robust plan to upgrade the Eagle Creek wastewater treatment system, replace the Eagle Creek collection system with a new system and combine the Eagle Creek system with the neighboring systems of Fost and Flora in a systematic, cost effective way. This is a prudent sustainable solution that is not disputed.

Eight independent reviews have been conducted, including reports conducted by A3-USA and the recent report by NC DEQ's approved independent reviewer. These reviewers conclude that system replacement is the only viable solution. Envirolink personnel have communicated on numerous occasions to NC DEQ and the Public Staff that the only prudent solution is to keep the current permit in place so that NC DEQ can monitor operations in the interim until a permanent solution can be permitted and so that CWS can fund and construct appropriate system features. This requires transferring the Eagle Creek wastewater system to CWS, and allowing CWS to embark on system replacement.

Additional evidence supporting this solution is the meeting held in the summer of 2021 at the request of Senator Steinburg and Representative Hanig. At that meeting, Senator

Steinburg and Representative Hanig called on state officials to remove barriers allowing implementation of an expeditious solution. Yet, as we close in on one year later, NC DEQ and now the Public Staff continue to focus on temporary fixes, studies and reporting requirements.

I emphasize again that every professional, other than NC DEQ and now the Public Staff, has reached the same conclusion; system replacement is necessary. To focus on blaming someone that had been on the job for only 20 days when the system collapsed and did not have the authority to make the necessary investments, is just not logical.

Q. HAVE THERE BEEN EARLIER EFFORTS, RECOGNIZIING THE DEFICIENCIES OF THE VACUUM SYSTEM TO TAKE STEPS THAT WOULD HAVE RECIRIFIED THE SYSTEM DEFICIENCIES AND PERHAPS AVOIDED THE DISRUPTION THAT SUBSEQUENTLY TOOK PLACE?

A. Yes. Currituck County agreed to acquire the Eagle Creek wastewater system several years ago. Currituck County currently has no interest in acquiring Eagle Creek and was only willing to acquire it earlier because of the known service issues and the need to find a responsible owner. Ultimately, that transaction did not proceed because community leaders objected to the County's plan to convert the collection system

Q. THE ENVIRONMENTAL AND PUBLIC STAFF REGULATORS PLACE RESPONSIBILITY FOR THE CONDITION OF THE EAGLE CREEK SYSTEM ON ENVIROLINK AND OTHERS. BASED ON YOUR OBSERVATION, WHAT ROLE HAVE THE REGULATORS PLAYED OVER TIME WITH RESPECT TO THEIR OVERSIGHT OF THE EAGLE CREEK SYSTEM?

A. DWR's method of oversight can be best described as "out of sight, out of mind". From their testimony it appears that DWR heavily relies upon the practice of assessing the frequency and whether remedial steps are required on public scrutiny and customer complaints.

The situation of a nearby systems, serving the Kinnakeet Shores subdivision in Dare County and the Town of Robersonville in Martin County from 2012, provides striking examples. The Kinnakeet Shores system has not yet resulted in disruptions of service to residence. Nevertheless, the WWTP major treatment units are no longer functional. Both clarifiers, the tertiary filter, spray irrigation system, and back-up generator are not functional. Biosolids have not been removed from the plant for at least seven years. DWR only recently placed the WWTP on sewer moratorium with no sewer taps, sewer extensions or additional flow effective as of the date of the moratorium. The owner of that system likewise is the developer of the community and has experienced difficulties the Commission has been forced to address. Customers in Kinnakeet Shores filed in a complaint before the Commission seeking immediate assistance. Neither the Public Staff nor the Commission has taken any action, although this complaint has been pending for many weeks.

Prior to 2012, the Town of Robersonville, NC had been allowed to degrade to the point that virtually none of the equipment within the plant functioned, the bar screen had over 8 feet of grease, and there was so many solids in the plant that vegetation was growing over much of the facility. It was only after the system was allowed to degrade to this point, that NC DWR arrested the operator. However, even this action did not address the problem that led to condition of the facility. Lack of investment by the Town in the prior 10 years led to DWR's action. Clearly, the operator made a poor decision, but DWR failed to recognize that it was the lack of investment and failure of oversight that put the operator into that situation. See Myers Rebuttal Exhibit N.

Q. ALTHOUGH THE PUBLIC STAFF MAKES NO RECOMMENDATION ON THE LONG TERM SOLUTION FOR THE EAGLE CREEK SYSTEM, IT TAKES ISSUE WITH CWS'S ASSESSMENT OF THE CURRENT CONDITION OF THE SYSTEM. PLEASE RESPOND TO THE TESTIMONY OF THE PUBLIC STAFF ASSESSING THE SUITABILITY OF THE VACUUM SYSTEM CURRENTLY IN PLACE THROUGH WHICH SERVICE IS PROVIDED IN EAGLE CREEK.

A. The Public Staff takes issue with the contention of CWS, in conflict with substantial expert opinion, that many components of the Eagle Creek vacuum system have reached the end of their useful lives. The documentation addresses components of vacuum systems that have only recently been repaired. Mr. Franklin bases this conclusion on the novel theory that as Envirolink and Sandler are expending substantial amounts of time and expense in replacing many of the components of the system or installing necessary parts, that system parts have not reached the end of their useful lives. This is completely illogical and is further evidence that the Public Staff did not perform a thorough analysis.

The fact that the parts are being replaced is irrefutable evidence that the system parts have exceeded their useful lives. Mr. Franklin's unusual theory seems to be that the components had not reached the end of their useful lives because, although nonfunctional, they were on schedule to be replaced in the future. Mr. Franklin testimony further supports CWS's position that in disallowing the replacement or rebuilding in his rate base calculation, he in essence admits that the expenditures are repairs and should not add life to the system.

In spite of Mr. Franklin's assertion that the Eagle Creek vacuum system has not exceeded its useful life based in part upon replacement of worn out or obsolete components, Mr. Franklin on page 8 of his testimony quotes from the Public Staff letter dated February 26, 2021, " The letter further stated that the Public Staff is of the opinion that Sandler's continued practice of primarily replacing controllers is a temporary repair and does not adequately address ordering paragraph 4(b) of the 2015 Rate Case Order." Likewise, Mr. Franklin states on page 9 of his testimony, "pedestal mounted controllers have not been installed on all valve pits, nor would installation of the pedestal mounted controllers on all the pits prevent rainwater and run-off from flowing into the pits and adversely impacting valve pit operation." Essential parts of the existing Eagle Creek vacuum system never operated as they should have, are obsolete or are worn out altogether.

Q. CAN YOU PROVIDE ADDITIONAL EXAMPLES TO SUPPORT YOUR VIEW THAT ESSENTIAL PARTS OF THE SYSTEM HAVE EXCEEDED THE END OF THEIR USEFUL LIVES?

A. When pits in which sewerage is initially collected are sinking into the ground and allowing excessive inflow and infiltration and do not meet current standards, it defies all logic to assert that these components of the sewage collection system have not exceeded their useful lives. Otherwise, they would not need to be replaced.

Had the regulators been the least bit responsive to a sustainable solution and the plan laid out by CWS, a solution would be in place, rather than causing additional delays by attempting to levy unreasonable restrictions or before imposing requirements that substantial components be replaced without a thorough examination into whether continued reliance on the vacuum system as it currently exists is appropriate. Nevertheless, replacing worn out parts does not support Mr. Franklin's conclusion that the system has not exceeded its useful life.

Moreover, to the extent one owns an automobile with 400,000 miles on the odometer and replaces the engine, the transmission, the mirrors, the catalytic converter, one still has a used car. The Public Staff argument does not support its position but instead supports CWS's point. The regulators seem content to address the catastrophic failure of the Eagle Creek system with a Band-Aid approach. The patient is sick, but its veins are fine, so no need to worry about the heart or the bloodwork? The system needs a systematic replacement.

Q. YOU NOW HAVE THE REPORT OF CENTURY ENGINEERING ON THE STATE OF THE EAGLE CREEK SYSTEM REQUIRED BY DWR IN THE CONSENT DECREE. THROUGH DISCOVERY ANSWERS THE PUBLIC STAFF IS UNWILLING TO AGREE THAT THE CONCLUSIONS OF THIS REPORT, IN WHICH ENVIROLINK AND CWS HAD NO PART WHATSOEVER, IS NOT IN CONFLICT WITH THEIR TESTIMONY. PLEASE COMMENT.

A. The best evidence that Public Staff and DWR are in error is the report of the independent engineer, Mr. Rigsby, that DWR insisted Sandler hire to evaluate the system. It is impossible to read this report, and conclude that the Public Staff is accurate that many components of the Eagle Creek vacuum collection system have not exceeded their useful lives. The February 28, 2022 Century Engineer Report states:

> There is a wealth of published literature which describes the design, operation, and maintenance of vacuum sewer systems in general which all consistently describe numerous problems and difficulties in operating and maintaining the systems, all of which are consistent with the findings of the eight third party technical evaluations (conducted for Eagle Creek).
>
> * * *
>
> The engineer further recommends abandoning the vacuum sewer system in favor of an individual grinder pump and low pressure force main collection system which will result in a more environmentally sound, more reliable, and more cost effective long term solution.
>
> However, if the project stakeholders prefer to continue to rely upon the old and depreciated vacuum sewer collection system, then the engineer recommends splitting the current system into three separate smaller systems each with its own main vacuum tank and sewage pump station with separate force mains to the wastewater treatment plant.

Q. ALTHOUGH THE PUBLIC STAFF SPENDS SUBSTANTIAL EFFORT IN ADDRESSING THE CONDITION OF THE EAGLE CREEK SYSTEM IN ITS TESTIMONY, WHAT RECOMMENDATION DOES THE PUBLIC STAFF PROVIDE TO THE COMMISSION ADDRESSING THE LONG TERM CORRECTIONS TO THE SYSTEM?

A. In spite of taking issue with CWS's assessment of the Eagle Creek vacuum system and in contradiction of the independent engineer, and in spite of extensive discovery on the issue, the Public Staff comes forward with no recommendation to the Commission as to whether the vacuum should be replaced on should remain in place.

Q. PLEASE ADDRESS THE DISPLEASURE EXPRESSED BY THE CUSTOMERS WITHIN EAGLE CREEK IN STATEMENTS PROVIDED TO THE COMMISSION AND WITH THE PUBLIC STAFF AND OTHERS?

A. Consumers of wastewater services within the Eagle Creek subdivision understandably are distressed at the inadequate services they have received and inadequate oversight by regulatory officials for many years. Envirolink became the operator of the system at a time that generally coincided with or shortly followed the beginning of what ended up being a catastrophic failure of the system. Envirolink managers and employees, by default through the absence of the owner and state officials, have become the face to residents due to unwillingness of owners and regulators to engage with the community. Understandably, many within the community direct their displeasure and ire at Envirolink. As Mr. Miller's testimony addresses, he has had conversations with many in the community that have expressed that their actions are the only way to get state officials attention. In spite of having inherited a very difficult situation, Envirolink has been consistent in its support of what it believes is in the best interest of the community and has expended substantial time and expense in supporting the operation of a dilapidated system.

One issue of which consumers legitimately complain is communication with the consumers with respect to outages. When Envirolink took over operations, the need for communications was apparent, and the need expanded exponentially. Envirolink recognized the need for communications and transparency with the residents and began developing communication protocols. The owner and prior operator of the system had no means of communication with customers. Envirolink met with community representatives and obtained input into communication protocols. Envirolink relied heavily on the information obtained in developing communication protocols. However, for reasons satisfactory to itself, the homeowners association as addressed by Mr. Lickfeld in his March 2, 2022 testimony, determined that it could no longer provide this assistance. Consequently, Envirolink quickly was

State of North Carolina

North Carolina Utilities Commission
Raleigh

Docket No. W-1333, Sub 0
Docket No. W-1130, Sub 11

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

In the Matter of	)
Application by Currituck Water & Sewer, LLC,	)
4700 Homewood Court, Suite 108, Raleigh, North	)
Carolina 27609, and Sandler Utility, LLC ,	)
Virginia Beach, Virginia, for Authority	)
To Transfer the Eagle Creek Wastewater System	)
And Franchise in Currituck County, North	)
Carolina, and Approval of Rates	)

REBUTTAL TESTIMONY

OF

MICHAEL J. MYERS

SECRETARY OF CURRITUCK WATER & SEWER, LLC

March 31, 2022

Q. MUCH OF THE PUBLIC STAFF TESTIMONY ADDRESSES THE PERFORMANCE OF ENVIROLINK AS THE CONTRACT OPERATOR OF THE EAGLE CREEK WASTEWATER COLLECTION AND TREATMENT SYSTEM BEGINNING SEPTEMBER 2020. WHAT IS YOUR RESPONSE TO THE PUBLIC STAFF'S ASSESSMENT OF THE PERFORMANCE OF ENVIROLINK?

A. The fundamental issue in this case is the suitability of Currituck Water & Sewer ("CWS") to acquire the Eagle Creek wastewater collection and treatment system from Sandler Utility. Under G.S.§ 62-111 applications to transfer ownership of public utilities shall be given if justified by the public convenience and necessity. That transfer of this utility to a new owner such as CWS is in the public interest has never been clearer than in this proceeding. It has been demonstrated time after time that developer designed, built, owned and operated water and/or sewer utilities like Eagle Creek are doomed to experience service issues.

Regarding Envirolink, it is understandable, reasonable and anticipated that given the plight of the customers over the past 20 years and the catastrophic system failure of September/October of 2020, customers will be frustrated and look for answers from the only party they see on a day-to-day basis. It is understandable that customers will blame Envirolink for the system failures or for the condition of the system even if customer views are not based in accurate factual knowledge. As stated by Engineer Rigsby, in his recent independent review of the Eagle Creek system conducted by this NC DEQ approved consultant, eight independent reviews have been conducted, documenting poor operation and maintenance for at least 12 years. It is important to understand that at the time of the system failures in 2020, Envirolink had only assumed operations 20 days before the first vacuum station failure. As Mr. Rigsby, the NC DEQ reviewer noted, the Eagle Creek vacuum system was an accident waiting to happen.

Contrary to the underlying theme of the Public Staff's testimony and the tenor of its questions to the public witnesses on March 2, 2022, the primary issue that led to the system failures of 2020 and 2021 was not the suitability of the system operator at that time but the lack of investment and the undercapitalization of the Eagle Creek wastewater system. Every expert that has reviewed the Eagle Creek wastewater system agrees with Mr. Rigsby, the NC DEQ's independent reviewer, and has drawn the same conclusion: the cause of the system failures was not operations but poor maintenance and lack of prudent design redundancy. The system failures in the fall of 2020 were tragic for the residents of Eagle Creek, and while analysis of cause is prudent and necessary, the first priority should be to identify and implement solutions.

Some, including the Public Staff sponsored NC DEQ witnesses, attempt to deflect attention away from the root causes, focusing on certain reports and alleged imprudent actions. This testimony, in my view, is meant to avoid criticism and to draw attention away from the fact that NCDEQ was aware of the lack of maintenance, lack of investment and the repeated service outages for over 15 years.

Q. PLEASE DESCRIBE THE RELATIONSHIP BETWEEN ENVIROLINK AND ENVIROTECH AND BETWEEN ENVIROLIINK AND CURRITUCK WATER & SEWER.

A. Envirolink acquired Envirotech and continued to rely upon former Envirotech employees to provide service through a transition period that extended through September 7, 2020. Of critical importance is that neither Envirolink nor Envirotech is an applicant in these dockets. Neither CWS, Envirolink or Envirotech has ever held a certificate of public convenience and necessity to own the Eagle Creek system or been issued permits to operate the Eagle Creek system. Neither of these two operators or CWS has had the responsibility to provide the funding to maintain, operate or make capital improvements to the system.

Envirolink and CWS have limited commonality of ownership though completely different sources of capital, and CWS intends to continue to rely upon Envirolink and the understanding of the system that Envirolink has gained, in part at its own expense, should the application be approved.

Q. WHAT ACTIONS DID ENVIROLINK TAKE IN ANTICIPATION OF THE POSSIBILITY THAT IT MIGHT TAKE OVER OPERATION RESPONSIBILITIES FOR THE EAGLE CREEK SYSTEM?

A. Even before assuming operations, Envirolink, with the support of CWS, identified the need for investment in the Eagle Creek wastewater system and embarked on developing sustainable solutions. Prior to the system failures of 2020, beginning in the summer of 2020, Envirolink supported negotiations between CWS and Sandler Utility addressing the transfer of the wastewater facilities. It was obvious from Envirolink's first involvement that Sandler Utility lacked the willingness or desire to invest in the proper operations and maintenance of the Eagle Creek wastewater facility.

Q. RATHER THAN MAKING A RECOMMENDATION AS TO THE BEST SYSTEM TO BE EMPLOYED IN PROVIDING SERVICE WITHIN THE EAGLE CREEK, THE PUBLIC STAFF, THROUGH THE TESTIMONIES OF WITNESSES FRANKLIN, MAY AND TANKARD, APPEARS TO BE FOCUSED ON ATTACHING CAUSE TO THE CURRENT STATE OF THE EAGLE CREEK SYSTEM. PLEASE COMMENT.

A. It is troubling that after conducting extensive discovery and sending out innumerable data requests, communicating with customers, and after undertaking trips to the service area and after visiting only one partial vacuum system, the Public Staff basically has taken a pass, thrown up its hands, and makes no meaningful recommendations. The residents of Eagle Creek deserve state agencies that focus on sustainable solutions.

It is my opinion that there will be a time and place to focus on the current state of system and how it got into its current condition, but that right now the focus should be on finding and implementing a sustainable long term solution for the residents of Eagle Creek. However, if Public Staff deems it important to focus on the cause for the current state of the system, in my view, the agency should rely on the experts and the evidence, and should focus on the eight independent reviews, previous Sandler Utility rate case proceedings and six NC

DEQ inspection reports dating back to 2009. Five of the six inspection reports from 2009 to September 2020, every rate case proceeding and each of the eight independent reviews document poor maintenance, substandard service, inadequate record keeping and deficient capital planning.

Q. IF BLAME IS TO BE ATTACHED, WHERE, AND IN YOUR OPOINION SHOULD THE BLAME BE PLACED?

A. If the Public Staff is looking for an entity to blame for the fact that the Eagle Creek wastewater system has for a long period of time been deficient, it need look no further than the owner, Sandler, Envirotech (the operator for the first 25 years), DWR, and the Public Staff, upon whom the NCUC depends to investigate and monitor utilities under its jurisdiction.

Envirolink has and will bear responsibility for its limited operation under severely challenging conditions, but at least it has been a steady, constant presence for the community and has assisted CWS in looking beyond the existing crisis and in seeking a long term, cost effective solution. While the Public Staff has participated in one community meeting, the only party that has consistently and willingly met with residents of Eagle Creek is Envirolink, even though Envirolink only came onto the scene in late 2020. Some important facts to consider are that outside of one meeting that the Public Staff attended: Envirolink and CWS are the only parties that have embraced solutions and that have not avoided public scrutiny. Only Envirolink has met with the media, reporters, senators and representatives. Envirolink has conducted more than three townhall style meetings, has met with the HOA representatives on numerous occasions, and has met with residents one-on-one, while others, in my opinion, have stuck their heads in the sand.

Q. PLEASE SUMMERIZE THE CONCLUSIONS OF THE INDEPENDENT ENGINEER TO WHICH YOU MAKE REFERENCE.

A. As Mr. Rigsby, the independent engineer NC DWR insisted be hired, concluded:

- Eagle Creek has been an accident waiting to happen many years before the fall of 2020.
- The system suffers from over 12 years of poor maintenance.
- The owner was not engaged.
- The system needs to be replaced.

See Myers Rebuttal Exhibit A.

It is irresponsible, in response to public pressure, to focus attention on an operator that had been involved for less than one month before system failure. Envirolink has not avoided the public scrutiny, even though it had no responsibility for the condition of the facilities prior to September 2020, and had no ability to authorize investment. In addition, it is well documented that Envirolink has invested well beyond any compensation received by the owner in training, labor, equipment, studies, and engineering, because Envirolink has and remains focused on a sustainable solution. All of this to ensure that a sustainable solution is implemented.

Q. PLEASE ELABORATE ON THE HISTORY AND DESIGN OF THE EAGLE CREEK SYSTEM HISTORY LEADING UP TO ITS CONDITION TODAY.

A. Eagle Creek in the coastal county of Currituck is at an elevation barely above sea level and is susceptible to poor drainage and frequent rain events from hurricanes and other severe storms. The poor drainage required the installation of swales when the subdivision was developed. When Eagle Creek was developed, the decision was made to provide wastewater collection and treatment through a vacuum system. This has proven to be a poor choice because the design and construction were not suitable for this application. The developer was responsible for the design, construction, ownership and operation of the wastewater system from the very beginning.

Based on conversations with Florida DEQ, A3-USA, Quavac, Flovac, literature research and Public Staff testimony, CWS is convinced that the design and construction did not address known shortcomings and limitations of vacuum technology. As the Commission is well aware, it is very common for developers to underfund design, construction, operation and maintenance of utilities due to lack of industry knowledge and lack of focus on the long term sustainability of the utility system. For example, the following are some of the most significant design issues that should have been addressed up front:

- **Pit Volume:** The pit volume is undersized. While Airvac has stated that pit volume is determined based on the size of the lateral, this contradicts information obtained from Flovac, A3-USA, NC Regulation, Florida DEQ, CWS's review of literature and Faunhofer-Instit Fur Grenzflachen-Und Bioverfahrenstechnik IGB "Guideline: Vacuum Sewer Systems" provided by the Public Staff in its response to CWS Data Request #1.
- **Saw Tooth Profile:** The saw tooth profile constructed at Eagle Creek is not consistent with current design criteria, as documented Airvac's Technical Manual, Flovac's observation, CWS's literature research and Faunhofer-Instit Fur Grenzflachen-Und Bioverfahrenstechnik IGB "Guideline: Vacuum Sewer Systems" obtained by CWS from the Public Staff in its response to CWS Data Request #1.
- **Sewage and Vacuum Pump sizing and selection** – as recommended by Flovac and A3-USA: The pumps were minimally sized and did not include any safety factor in the design. Additionally, VFD are common on vacuum pumps and sewage pumps, which allow pumps to ramp up and down based on conditions in the vacuum mains. None was installed for Eagle Creek.
- **Inflow & Infiltration** – It is well documented by Airvac, Flovac, A3-USA, Quavac and virtually all of the literature on the subject addressing vacuum systems that inflow and infiltration are critical factors and must be eliminated. The well documented inflow and infiltration experienced with the Eagle Creek

wastewater system has been excessive by any known metric. Infiltration and inflow is a critical factor with the Eagle Creek system because of its detrimental impact on pipe hydraulics, vacuum pump life, and pit operation.

- **Monitoring system** – Recommended by Airvac, Flovac and A3-USA to address the service related issues common in vacuum systems, as documented in numerous literature resources. Monitoring systems are valuable tools for assessing and eliminating sources of inflow and infiltration, as well as help for technicians to locate service issues during interface valve malfunctions. None was initially installed for Eagle Creek.
- **Redundancy** – The system did not include many redundancy features required by other regulatory agencies with more experience than North Carolina. For example,
  - the system design should have included sufficient vacuum pump capacity, so that the system could operate normally with one vacuum pump out of service.
  - The system design should have included sufficient sewage pump capacity, so the system could operate normally with one sewage pump out of service.
  - The system design should have included sufficient receiving tank volume to dampen or cushion and vacuum loss in the collection network from service valve failures.
  - The system design should have included multiple tanks to permit maintenance on the tank without shutting the system down.
- **Spare parts** – The design should have included spare parts for every component of a vacuum system. When Envirolink took over operations, the only spare parts were service valves and controllers. There were no spare vacuum pumps, no

spare sewage pumps, or other spare parts that would be expected as part of normal on-going program.

See Myers Rebuttal Exhibits B-G.

Additional consideration should be given to Mr. Franklin's testimony where on Page 17 of his testimony he states that based on his October 21, 2020 investigation, "Numerous pits were located in low lying areas,. . ." Vacuum systems are very rarely installed, as evidenced by information obtained from NC DEQ, that less than 4% of the collection system in Eastern North Carolina are vacuum systems. If this is extended to all of North Carolina, vacuum systems make up less than 1% of sewer collection systems in North Carolina or anywhere else.

The primary reasons other sewer collection technology is favored over vacuum is that vacuum has many moving parts that require immediate attention by operators who must be well trained to operate their unique features. The pool of such operators trained in the operation of any vacuum system is exceptionally limited. These important factors are well documented in the literature.

With respect to vacuum systems, there are far more interdependencies in contrast to much more simple and widely relied upon collection systems such as gravity, which by definition depends primarily upon the pull of natural forces, not upon constant negative pressure that depends upon a constant supply of electricity and where loss of vacuum in one part of the system can cause a widespread loss of vacuum and expansive system disruption of service. The pool of operators trained in the operation of gravity systems is much larger.

Q. PLEASE ELABORATE FURTHER ON THE DESIGN OF THE EAGLE CREEK SYSTEM AND THE ROLE THE NORTH CAROLINA REGULATORS PLAYED WITH RESPECT TO THE DESIGN

A. While NC DEQ and Public Staff either knew or should have known that the Eagle Creek wastewater system was a "accident waiting to happen", the design and construction were also a significant challenge for the Eagle Creek wastewater system. The original design lacked several critical design safety features that should have been but were not incorporated into the original design. This was likely because the North Carolina Department of Environmental Quality had very little experience in regulating vacuum systems (only 14 in North Carolina), in 1987 and were not aware of limitations on the critical design for vacuum systems, such as: pit volume, buffer tanks, inflow and infiltration impacts, receiving tank size, vacuum pump redundancy, sewage pump redundancy, monitoring systems, importance of the saw tooth profile, layout of the saw tooth profile, etc.

According to information obtained from the Public Staff in response to CWS Data Request #1, in developing the Public Staff testimony, neither NC DEQ nor the Public Staff have reached out to agencies in other states with more extensive experience than North Carolina in vacuum systems design to inquire into the experiences of these state agencies with vacuum sewers and some of the key design features those state agencies require. CWS, in developing its testimony and recommendations, has contacted Florida DEQ, Flovac, Quavac, A3-USA, has reviewed extensive literature and independent expert opinions. See Myers Rebuttal Exhibits B-G. Based on these evaluation, while Envirolink , which it has received some justifiable criticisms on a few operational and communication difficulties, maintains those difficulties did not cause the service failures and have been corrected.

In addition to the foregoing, the Commission can also refer to customer testimony. The Commission has heard and is hearing testimony from an individual at the March 2, 2022 customer hearing who assisted with the original construction of the Eagle Creek, evidence from licensed engineers, vacuum technology providers, customers, Currituck County officials, North Carolina State Representatives, Health Directors, and even NC DEQ itself that document that service outages, lack of maintenance and mismanagement have been systemic at Eagle Creek dating as far back as 2012.

Q. BASED ON THESE DESIGN FAILURES, SHOULD REGULATORS HAVE PROVIDED GREEATER OVERSIGHT, AND IS THE PUBLIC STAFF'S FOCUS ON ENVIROLINK'S OPERATIONS IN 2020 JUSTIFIED?

Contrary to implications in the Public Staff testimony, the Eagle Creek vacuum system has been beset by problems from the time it was installed due in large measure to these design shortcomings. Regulators have provided only sporadic and lax oversight of the Eagle Creek system. NC DEQ only conducted six inspections over the first 24 years of operation, with five indicating a non-compliant system. The inspections noted lack of maintenance, lack of maintenance records, no capital plan and numerous limit violations. Unfortunately, the frequency of inspections and aggressive enforcement actions did not begin until public scrutiny increased because of the critical system failures of 2020. There have been four inspections since September 2020. See Myers Rebuttal Exhibit H.

It appears that DWR depends in large measure upon customer complaints, conducts only infrequent inspections, and is slow to rectify deficiencies until the operation of these systems spins out of control.

Based in part on the Public Staff testimony, CWS questions whether the DWR supervisors or the Public Staff engineer have a complete understanding of how the vacuum systems are designed and operated. In many instances, witnesses, Franklin, Tankard and May fail to provide complete and accurate information. For example, on page 7 of witnesses Tankard and May's testimony they indicate that candy canes keep the vacuum from drawing water from drain traps and toilets within the homes or from otherwise damaging pipes. Contrary to this testimony, the main purpose of the candy canes is to allow air to enter the vacuum system in order to maintain a proper air-to-water ratio, so that water can be transmitted from the home to the central vacuum station.

Q. ARE THERE EXAMPLES OF DWR AND THE PUBLIC STAFF PROVIDING AN INCOMLPETE PICTURE OF THE EAGLE CREEK SYSTEM?

A. Yes. Examples include:

- Witnesses Tankard and May failed to inform the Commission of the numerous non-compliant inspections dating back to 2012.
  Witness Franklin failed to provide the Commission photos documenting the poor condition of the facilities provided to him through discovery. See Myers Rebuttal Exhibit I.
- Neither Witnesses Franklin, May or Tankard provide any information from independent reviews conducted initially by CWS and now Sandler.
- Witnesses Franklin only provides one comparative example, without conducting further investigations into other systems or oversight by states with more experience in regulating vacuum system.

Q. PLEASE ADDRESS THE 2015 SANDLER GENERAL RATE CASE AND WHAT IT SHOWS ABOUT THE SYSTEM IN 2015 AND THE DEGREE OF REGULATORY OVERSIGHT.

A. In Sandler's 2015 general rate case the Commission identified substantial service-related issues and required Sandler to take remediation steps. The system at that time was being operated by Envirotech, not Envirolink. Envirolink did not participate in Eagle Creek until five years later. While Sandler complied with some requirements of the Commission's order, it failed to comply with others, and the Public Staff failed to follow up adequately in requiring Sandler to comply.

On page 17 of Mr. Franklin's testimony he states in reporting on his October 21, 2020 inspection of the Eagle Creek system, five years after the Commission's order, "Residential vacuum pits and candy canes were also inspected. Numerous pits were located in low lying areas, and it was evident that the actions required under Ordering Paragraph 4 of the 2015 rate case order to complete renovations to reduce rainwater intrusion had not been fully implemented." The result was that there were tell-tale signs that the system was not being adequately maintained and repaired. The conditions manifesting themselves in the events of 2020 and 2021 are evidence of prior neglect of a system ill-suited for its application and one requiring an unusual level of oversight and reliance on technician response times.

The Eagle Creek system is owned by Sandler, the real estate developer. Sandler provides the funding, holds the certificate and the permits. Sandler hires and pays for the services of the contract operators. As stated above, ownership of water and wastewater systems by developers often results in service issues because they are focused on providing service only until lots have been sold and homes constructed. This manifests itself in minimal design standards, lack of investment, lack of engagement and oversight, and it should alert regulators to pay close attention. Sadly, such apparently was not the case. This should have prompted greater and more timely regulatory oversight.

Q WHAT ABOUT DWR'S PARTICIPATION IN THE CONSENT JUDGMENT?

A. DWR's oversight of the Eagle Creek vacuum system was not adequate until conditions that could have been anticipated devolved out of control, resulting in severe service disruptions to customers and degradation of the environment. In reaction to the emergency DWR and the North Carolina Attorney General focused on short term solutions without weighing the effect of these solutions on costs, manpower to implement them and long term sustainability. The Public Staff, which should have been advertent to costs, was absent in the process. Neither CWS, Envirolink or the expert reviewers have been able to influence regulators in addressing repeated requests that they take into account costs and a long term solution. Instead, the only step addressing long term issues mandated by these environmental regulators is to require in the consent decree that should Sandler sell the system, the acquirer is bound to step into

Sandler's shoes and accept potential judicial actions for Sandler's past actions and comply with the draconian obligations to implement the short term remedies imposed upon Sandler and be subject to contempt for failure to comply. Instead, much money is being spent as stop-gap measures that may prove unneeded for implementation of the most appropriate long term solution.

Q. PLEASE DESCRIBE THE CONDITION OF THE EAGLE CREEK SYSTEM WHEN ENVIROLINK TOOK OVER AS SYSTEM OPERATOR IN SEPTEMBER 2020.

A. The Public Staff witnesses provided an inaccurate and incomplete picture of conditions of the vacuum system at the end of 2020, almost immediately after Envirolink began operations. The system was an emergency waiting to happen. One Airvac reviewer, commented during a site visit, that he did not know how anyone could keep this system operational. The system had severe service outages before due to excessive storms, basic monitoring and no spare parts, much less elevated ones on pedestals to avoid flooding or that could be locked to avoid tampering. The pits are undersized. Pits contain 40 gallons for two homes, as compared to recommendation from Faunhofer-Instit Fur Grenzflachen-Und Bioverfahrenstechnik IGB "Guideline: Vacuum Sewer Systems" obtained from the Public Staff in its response to CWS Data Request #1.,which recommends 25% of average daily flow. Assuming two-three bedroom homes per pit and using NC DEQ Design Criteria, that would require a minimum of 180 gallons [note: other sources would require more storage]. Many homes in the Eagle Creek community have 4, 5, and even 6 bedrooms, so a more extensive analysis is required to determine the appropriate pit volume. The design of the vacuum pits is poorly suited for the service area as is evidence by the excessive inflow and infiltration entering through the pits. The problems with drainage due to the low elevation had manifested themselves before.

Q. PLEASE ADDRESS THE MANNER IN WHICH THE SYSTEM HAD BEEN MAINTAINED AND REPAIRED PRIOR TO ENVIROLINK'S BECMMING THE OPERATOR.

A. As evidenced in the NC DEQ inspection reports dating back to 2012, chronic deficiencies existed with the WWTP. Based in part upon lack of adequate resources the operator (Envirotech) had engaged in the process of waiting until parts of the collection system failed before repairing them or replacing them. See Myers Rebuttal Exhibit A. CWS witness Freed will address the difficulties Envirotech encountered. The more appropriate process would have been to engage in preventive maintenance activities, so that as parts reached the end of their useful lives or displayed potential malfunction due to unanticipated obsolescence or a history of inadequate maintenance, they could have been replaced. However, as Mr. Franklin's testimony indicates, even well maintained vacuum systems experience significant failures. While CWS disagrees that five failures per month constitute "rare" failures, Mr. Franklin's testimony does support the fact that even well-maintained vacuum systems require "continuous maintenance" and are prone to failure. This is the only logical conclusion. It doesn't take an expert in rocket science to appreciate this conclusion. Among the conditions cited by, Mr. Rigsby, the Independent Engineering Evaluation required by DWR are "lack of routine and preventive maintenance" and "lack of redundancy."

The February 28, 2022 Independent Engineering Evaluation by Century Engineering concludes the obvious:

> **There have been eight independent third party technical evaluations of the system dating back to 2010 which all consistently document numerous problems with the Eagle Creek vacuum sewer collection system** including excessive infiltration and inflow, sanitary sewer overflows, vacuum leaks, vacuum pit valve and controller failures, vacuum station problems including vacuum pump failure and sewage pump failure, and the catastrophic system failure of September and October 2020

Q. YOU HAVE HAD FIRST-HAND KNOWLEDGE OF THE SYSTEM. IN RESPONSE TO THE PUBLIC STAFF FOCUS ON ENVIROLINK, PLEASE ELABORATE FURTHER ON YOUR ASSESSMENT AS TO THE

CAUSES FOR THE CONDITION OF THE EAGLE CREEK SYSTEM AND THE BEST SOLUTION FOR ITS LOONGTERM APPROPRIATE OPERATION.

A. As mentioned above, I believe resources should now be deployed to identify solutions, but if a scapegoat or an entity solely to blame for the critical condition of the Eagle Creek system it should not be Envirolink. To focus solely upon performance on the most recent operator is to ignore and misrepresent evidence, to attempt to shield many other actors with far greater responsibility for the condition of the system, including the regulators, who have thrown up their hands as to the best process to move forward, improve the condition of the system as it currently exists and provide for long term viability and provide adequate customer service.

Sandler wishes to sell. CWS wishes to acquire and replace. CWS wants to improve the system and service for the residents of Eagle Creek and has proposed a robust plan to upgrade the Eagle Creek wastewater treatment system, replace the Eagle Creek collection system with a new system and combine the Eagle Creek system with the neighboring systems of Fost and Flora in a systematic, cost effective way. This is a prudent sustainable solution that is not disputed.

Eight independent reviews have been conducted, including reports conducted by A3-USA and the recent report by NC DEQ's approved independent reviewer. These reviewers conclude that system replacement is the only viable solution. Envirolink personnel have communicated on numerous occasions to NC DEQ and the Public Staff that the only prudent solution is to keep the current permit in place so that NC DEQ can monitor operations in the interim until a permanent solution can be permitted and so that CWS can fund and construct appropriate system features. This requires transferring the Eagle Creek wastewater system to CWS, and allowing CWS to embark on system replacement.

Additional evidence supporting this solution is the meeting held in the summer of 2021 at the request of Senator Steinburg and Representative Hanig. At that meeting, Senator

Steinburg and Representative Hanig called on state officials to remove barriers allowing implementation of an expeditious solution. Yet, as we close in on one year later, NC DEQ and now the Public Staff continue to focus on temporary fixes, studies and reporting requirements.

I emphasize again that every professional, other than NC DEQ and now the Public Staff, has reached the same conclusion; system replacement is necessary. To focus on blaming someone that had been on the job for only 20 days when the system collapsed and did not have the authority to make the necessary investments, is just not logical.

Q. HAVE THERE BEEN EARLIER EFFORTS, RECOGNIZIING THE DEFICIENCIES OF THE VACUUM SYSTEM TO TAKE STEPS THAT WOULD HAVE RECIRIFIED THE SYSTEM DEFICIENCIES AND PERHAPS AVOIDED THE DISRUPTION THAT SUBSEQUENTLY TOOK PLACE?

A. Yes. Currituck County agreed to acquire the Eagle Creek wastewater system several years ago. Currituck County currently has no interest in acquiring Eagle Creek and was only willing to acquire it earlier because of the known service issues and the need to find a responsible owner. Ultimately, that transaction did not proceed because community leaders objected to the County's plan to convert the collection system

Q. THE ENVIRONMENTAL AND PUBLIC STAFF REGULATORS PLACE RESPONSIBILITY FOR THE CONDITION OF THE EAGLE CREEK SYSTEM ON ENVIROLINK AND OTHERS. BASED ON YOUR OBSERVATION, WHAT ROLE HAVE THE REGULATORS PLAYED OVER TIME WITH RESPECT TO THEIR OVERSIGHT OF THE EAGLE CREEK SYSTEM?

A. DWR's method of oversight can be best described as "out of sight, out of mind". From their testimony it appears that DWR heavily relies upon the practice of assessing the frequency and whether remedial steps are required on public scrutiny and customer complaints.

The situation of a nearby systems, serving the Kinnakeet Shores subdivision in Dare County and the Town of Robersonville in Martin County from 2012, provides striking examples. The Kinnakeet Shores system has not yet resulted in disruptions of service to residence. Nevertheless, the WWTP major treatment units are no longer functional. Both clarifiers, the tertiary filter, spray irrigation system, and back-up generator are not functional. Biosolids have not been removed from the plant for at least seven years. DWR only recently placed the WWTP on sewer moratorium with no sewer taps, sewer extensions or additional flow effective as of the date of the moratorium. The owner of that system likewise is the developer of the community and has experienced difficulties the Commission has been forced to address. Customers in Kinnakeet Shores filed in a complaint before the Commission seeking immediate assistance. Neither the Public Staff nor the Commission has taken any action, although this complaint has been pending for many weeks.

Prior to 2012, the Town of Robersonville, NC had been allowed to degrade to the point that virtually none of the equipment within the plant functioned, the bar screen had over 8 feet of grease, and there was so many solids in the plant that vegetation was growing over much of the facility. It was only after the system was allowed to degrade to this point, that NC DWR arrested the operator. However, even this action did not address the problem that led to condition of the facility. Lack of investment by the Town in the prior 10 years led to DWR's action. Clearly, the operator made a poor decision, but DWR failed to recognize that it was the lack of investment and failure of oversight that put the operator into that situation. See Myers Rebuttal Exhibit N.

Q. ALTHOUGH THE PUBLIC STAFF MAKES NO RECOMMENDATION ON THE LONG TERM SOLUTION FOR THE EAGLE CREEK SYSTEM, IT TAKES ISSUE WITH CWS'S ASSESSMENT OF THE CURRENT CONDITION OF THE SYSTEM. PLEASE RESPOND TO THE TESTIMONY OF THE PUBLIC STAFF ASSESSING THE SUITABILITY OF THE VACUUM SYSTEM CURRENTLY IN PLACE THROUGH WHICH SERVICE IS PROVIDED IN EAGLE CREEK.

A. The Public Staff takes issue with the contention of CWS, in conflict with substantial expert opinion, that many components of the Eagle Creek vacuum system have reached the end of their useful lives. The documentation addresses components of vacuum systems that have only recently been repaired. Mr. Franklin bases this conclusion on the novel theory that as Envirolink and Sandler are expending substantial amounts of time and expense in replacing many of the components of the system or installing necessary parts, that system parts have not reached the end of their useful lives. This is completely illogical and is further evidence that the Public Staff did not perform a thorough analysis.

The fact that the parts are being replaced is irrefutable evidence that the system parts have exceeded their useful lives. Mr. Franklin's unusual theory seems to be that the components had not reached the end of their useful lives because, although nonfunctional, they were on schedule to be replaced in the future. Mr. Franklin testimony further supports CWS's position that in disallowing the replacement or rebuilding in his rate base calculation, he in essence admits that the expenditures are repairs and should not add life to the system.

In spite of Mr. Franklin's assertion that the Eagle Creek vacuum system has not exceeded its useful life based in part upon replacement of worn out or obsolete components, Mr. Franklin on page 8 of his testimony quotes from the Public Staff letter dated February 26, 2021, " The letter further stated that the Public Staff is of the opinion that Sandler's continued practice of primarily replacing controllers is a temporary repair and does not adequately address ordering paragraph 4(b) of the 2015 Rate Case Order." Likewise, Mr. Franklin states on page 9 of his testimony, "pedestal mounted controllers have not been installed on all valve pits, nor would installation of the pedestal mounted controllers on all the pits prevent rainwater and run-off from flowing into the pits and adversely impacting valve pit operation." Essential parts of the existing Eagle Creek vacuum system never operated as they should have, are obsolete or are worn out altogether.

Q. CAN YOU PROVIDE ADDITIONAL EXAMPLES TO SUPPORT YOUR VIEW THAT ESSENTIAL PARTS OF THE SYSTEM HAVE EXCEEDED THE END OF THEIR USEFUL LIVES?

A. When pits in which sewerage is initially collected are sinking into the ground and allowing excessive inflow and infiltration and do not meet current standards, it defies all logic to assert that these components of the sewage collection system have not exceeded their useful lives. Otherwise, they would not need to be replaced.

Had the regulators been the least bit responsive to a sustainable solution and the plan laid out by CWS, a solution would be in place, rather than causing additional delays by attempting to levy unreasonable restrictions or before imposing requirements that substantial components be replaced without a thorough examination into whether continued reliance on the vacuum system as it currently exists is appropriate. Nevertheless, replacing worn out parts does not support Mr. Franklin's conclusion that the system has not exceeded its useful life.

Moreover, to the extent one owns an automobile with 400,000 miles on the odometer and replaces the engine, the transmission, the mirrors, the catalytic converter, one still has a used car. The Public Staff argument does not support its position but instead supports CWS's point. The regulators seem content to address the catastrophic failure of the Eagle Creek system with a Band-Aid approach. The patient is sick, but its veins are fine, so no need to worry about the heart or the bloodwork? The system needs a systematic replacement.

Q. YOU NOW HAVE THE REPORT OF CENTURY ENGINEERING ON THE STATE OF THE EAGLE CREEK SYSTEM REQUIRED BY DWR IN THE CONSENT DECREE. THROUGH DISCOVERY ANSWERS THE PUBLIC STAFF IS UNWILLING TO AGREE THAT THE CONCLUSIONS OF THIS REPORT, IN WHICH ENVIROLINK AND CWS HAD NO PART WHATSOEVER, IS NOT IN CONFLICT WITH THEIR TESTIMONY. PLEASE COMMENT.

A. The best evidence that Public Staff and DWR are in error is the report of the independent engineer, Mr. Rigsby, that DWR insisted Sandler hire to evaluate the system. It is impossible to read this report, and conclude that the Public Staff is accurate that many components of the Eagle Creek vacuum collection system have not exceeded their useful lives. The February 28, 2022 Century Engineer Report states:

> There is a wealth of published literature which describes the design, operation, and maintenance of vacuum sewer systems in general which all consistently describe numerous problems and difficulties in operating and maintaining the systems, all of which are consistent with the findings of the eight third party technical evaluations (conducted for Eagle Creek).
>
> * * *
>
> The engineer further recommends abandoning the vacuum sewer system in favor of an individual grinder pump and low pressure force main collection system which will result in a more environmentally sound, more reliable, and more cost effective long term solution.
>
> However, if the project stakeholders prefer to continue to rely upon the old and depreciated vacuum sewer collection system, then the engineer recommends splitting the current system into three separate smaller systems each with its own main vacuum tank and sewage pump station with separate force mains to the wastewater treatment plant.

Q. ALTHOUGH THE PUBLIC STAFF SPENDS SUBSTANTIAL EFFORT IN ADDRESSING THE CONDITION OF THE EAGLE CREEK SYSTEM IN ITS TESTIMONY, WHAT RECOMMENDATION DOES THE PUBLIC STAFF PROVIDE TO THE COMMISSION ADDRESSING THE LONG TERM CORRECTIONS TO THE SYSTEM?

A. In spite of taking issue with CWS's assessment of the Eagle Creek vacuum system and in contradiction of the independent engineer, and in spite of extensive discovery on the issue, the Public Staff comes forward with no recommendation to the Commission as to whether the vacuum should be replaced on should remain in place.

Q. PLEASE ADDRESS THE DISPLEASURE EXPRESSED BY THE CUSTOMERS WITHIN EAGLE CREEK IN STATEMENTS PROVIDED TO THE COMMISSION AND WITH THE PUBLIC STAFF AND OTHERS?

A. Consumers of wastewater services within the Eagle Creek subdivision understandably are distressed at the inadequate services they have received and inadequate oversight by regulatory officials for many years. Envirolink became the operator of the system at a time that generally coincided with or shortly followed the beginning of what ended up being a catastrophic failure of the system. Envirolink managers and employees, by default through the absence of the owner and state officials, have become the face to residents due to unwillingness of owners and regulators to engage with the community. Understandably, many within the community direct their displeasure and ire at Envirolink. As Mr. Miller's testimony addresses, he has had conversations with many in the community that have expressed that their actions are the only way to get state officials attention. In spite of having inherited a very difficult situation, Envirolink has been consistent in its support of what it believes is in the best interest of the community and has expended substantial time and expense in supporting the operation of a dilapidated system.

One issue of which consumers legitimately complain is communication with the consumers with respect to outages. When Envirolink took over operations, the need for communications was apparent, and the need expanded exponentially. Envirolink recognized the need for communications and transparency with the residents and began developing communication protocols. The owner and prior operator of the system had no means of communication with customers. Envirolink met with community representatives and obtained input into communication protocols. Envirolink relied heavily on the information obtained in developing communication protocols. However, for reasons satisfactory to itself, the homeowners association as addressed by Mr. Lickfeld in his March 2, 2022 testimony, determined that it could no longer provide this assistance. Consequently, Envirolink quickly was required to explore and identify alternative means of communications with customers. This resulted in a system through which Envirolink communicates with the customers through email, posting to the county website and internet messages.

Still, when the content of messages customers receive is notification of outages and requests to curtail usage, and when the customers are receiving information requesting that they change their normal habits, and the communication is being used for all practical purposes to announce a major inconvenience, customers will be dissatisfied. CWS witness Miller provides additional information on communications.

Q. PLEASE DESCRIBE OTHER METHODS THAT CWS AND ENVIROLINK HAVE USED TO PROVIDE INFORMATION TO THE CONSUMERS WITHIN EAGLE CREEK.

A. Envirolink has held meetings within the subdivision to address concerns and questions, providing slides presented to customers. See Myers Rebuttal Exhibits J-M. CWS and Envirolink requested the assistance of state legislators and initiated a meeting in Raleigh with Sandler, the Public Staff, DWR, leaders of the Homeowners Association, and developers such as the Fost developer. While many customers continue to be dissatisfied, as long as the system remains in a state of disrepair, customers cannot be expected to be happy. Understandably, the dissatisfaction initially from lack of timely messages now has become dissatisfaction with receiving too many messages.

In contrast, Sandler and NC DEQ have not participated in any community meetings. The Public Staff conducted only one community meeting.

Q. PLEASE ADDRESS THE ISSUE OF THE INSTALLATION OF THE FORCE MAIN INSTALLED TO INTERCONNECT TO FOST COLLECTION SYSTEM TO THE WASTEWATER TREATMENT PLANT IN EAGLE CREEK.

A. Customers point to efforts by CWS and Envirolink to install a force main from the Fost development through easements adjacent to the golf course property to support their view that any replacement of the existing vacuum collection system within the subdivision will result in undue disruption and displacement. First and foremost, construction is required regardless of the decision on technology. Based on the first-hand experience of Envirolink, parts of the collection system even if it remains in place as currently engineered and installed must be replaced. Pits are sinking. Pits are undersized. Pits are located on the property of the homeowners. Every two residences have one pit with 40 gallons of storage. There are hundreds of them. Nevertheless, the construction of the force main through the easements in proximity to the golf course property must be placed in proper context, and I refer to CWS rebuttal witnesses Bissell and Miller for additional information.

The owner of the golf course, in contradiction to his responsibilities with respect to receipt of effluent and paying for it under the terms of the contract, has resisted doing so. He has used opportunities to interfere with the easement rights of the owner of the sewer system as leverage to enhance his own financial interests. Alteration of a permit and obtaining a setback waiver were necessary to address issues with the infiltration pond. The owner of the golf course used his leverage in resisting the needed alteration of the permit that required his permission.

The easement providing the path in which the force main was installed unfortunately was likewise available to electric service and the golf course in the location of underground facilities. These entities, over which CWS and Envirolink had no connection, had mismarked their underground facilities. When the contractor installing the force main attempted to install the underground facilities, the contractor disrupted the service of these other entities because their lines were mismarked. There is no dispute that the lines were mismarked. Dominion Energy's locator has assumed responsibility. This resulted in disruption within the subdivision and to the golf course. The owner and operator of the golf course immediately placed the blame on Envirolink and CWS.

When the irrigation system was damaged, the owner of the golf course prevented the contractor from rectifying the situation expeditiously. It was necessary to call the Currituck County Sheriff to obtain assistance. Zach Basnight of Basnight Construction, the contractor for installing the force main, provides testimony verifying this narrative of events concerning the golf course and the installation of the force main.

Q. PLEASE ADDRESS THE ISSUE OF POTENTIAL DISRUPTION WITHIN THE EAGLE CREEK SUBDIVISION OF WHICH CONSUMERS EXPRESSED CONCERN TO THE EXTENT THAT REPLACEMENTS OF PARTS OF THE COLLECTION SYSTEM MUST BE REPLACED.

A. When construction activities are performed, disruption is to be expected. Every effort should and will be made to minimize the disruption, and CWS will work with every property owner and service provider to minimize disruptions. Moreover, if the community and the regulators conclude that they would rather continue with vacuum technology such as they have now because of the concerns of temporary disruptions, and other concerns, CWS has stated repeatedly and repeats here that it will comply with those wishes.

Q. THE PUBLIC STAFF MAKES NO RECOMMENDATION WITH RESPECT TO ITS VIEWS ON REPAIRING OR REPLACING THE VACUUM SYSTEM SERVING EAGLE CREEK. IN LIGHT OF THIS, WHAT IS THE RESPONSE OF CWS?

A. When upgrading, expanding, renovating or replacing water and sewer systems, the owner of sewer systems regulated by the state must provide the capital to install new or replacement facilities, and the responsibility for such installation and replacement rests with the entity that provides the money. The role of the regulator is to assess the reasonableness and prudency of the owner's decisions, even if they are unpopular ones. After the fact, the regulator determines which costs are recoverable from consumers. Should regulators in response to valid concerns of consumers determine to order the manner in which facilities are constructed or operated, these determinations should be borne in mind when requests for cost recovery are sought. Interestingly, after extensive investigation by the Public Staff with data requests addressing issues such as the costs of replacing the vacuum system with a gravity system, the Public Staff is silent on the issue of whether the vacuum system should be retained or replaced.

Q. WHAT IS THE RESPONSE OF CWS TO WHAT YOU UNDERSTAND TO BE THE ULTIMATE RECOMMENDATION OF THE PUBLIC STAFF IN THIS CASE?

A. The Public Staff recommends that CWS's application to acquire the Eagle Creek system be held in abeyance until Sandler has complied with the conditions imposed by the consent decree issued at the insistence of DWR and that if CWS agrees to step into the shoes of Sandler, it undertake the responsibilities imposed upon Sandler and make itself subject to contempt for failure to do so.

Q. PLEASE ADDRESS THE PUBLIC STAFF RECOMMENDATION FOR A ONE MILLION DOLLAR BOND.

A. The Public Staff recommends that the Commission impose a bond of $1,000,000 on CWS as a condition for its receipt of a certificate of public convenience and necessity to own and operate the Eagle Creek system. The Public Staff's response to CWS's discovery justifies the $1 million bond recommendation on the need for the extensive upgrades required on the Eagle Creek wastewater facility. This justification conflicts with the justification in the Public Staff testimony. The Public Staff testimony cites as a reason for a $1 million bond the fact that CWS has never owned and operated a system before. The Public Staff spends pages in its testimony criticizing Envirolink, the operator CWS intends to hire. The bond amount cannot be based on lack of experience by CWS and the alleged poor performance by the operator it intends to engage.

The response to this allegation of poor performance directed at Envirolink is a simple one and is addressed in CWS's testimony. The allegation or implication that failure to meet effluent limitations was not occurring before Envirolink took over but only began to occur thereafter or that this was an intentional failure by Envirolink is erroneous, is slanderous, and it should never be countenanced. In time and in spite of the draconian operating strictures imposed by the DWR motivated consent decree, the effluent exceedances have been corrected. The Public Staff, were it willing to make a thorough presentation, would have acknowledged this.

With respect to the suggestion that CWS provide a $1,000,000 bond, another basis relied upon by the Public Staff is that CWS has stated that it will seek authority to provide service in the Fost and Flora subdivisions. The application before the Commission to obtain a CPCN for the Fost subdivision has been pending before the Commission since June 1, 2021. As far as CWS can determine, this application has been languishing over this period of time due to Public Staff inaction. No application by CWS has been filed with respect to the Flora subdivision. Obviously, it would be premature and unreasonable to require a bond for operating the Flora and Fost systems when there has been no authorization by the Commission for CWS to serve those systems. When and if that point is reached, the time to address the bond for serving those systems would arrive. Interestingly and inconsistently, the Public Staff ignores the position of CWS that its efforts to serve Fost and Flora should reduce risks to customers in Eagle Creek. Obviously, the Public Staff wishes to have it both ways; it refuses to recognize the benefits of service in Eagle Creek in order to impose onerous conditions on CWS for its willingness to serve there.

Q. YOU HAVE RECITED THE PROVISIONS OF THE CONSENT DECREE ENTERED INTO BY DWR AND SANDLER UTILITY. WHAT ROLE , IF ANY, DID CWS OR ENVIROLINK PLAY IN NEGOTIATIONS LEADING UP TO THE TERMS OF THE CONSENT DECREE?

A. While the negotiations leading up to the consent decree were underway and it terms addressed, an Asset Purchase Agreement had been negotiated between Sandler Utility and CWS for the sale of the wastewater system. CWS had filed its application before this Commission seeking approval of the transfer. Envirolink served as contract operator for the Eagle Creek system. Neither CWS nor Envirolink were parties to the consent decree. The defendant listed in the consent decree is Sandler Utility. Neither CWS, nor Envirolink, appeared before the Superior Court judge when the consent decree was presented for approval. To the best of my knowledge, neither the Public Staff nor representatives of the Commission were formal participants in the negotiations. The North Carolina Attorney General, DWR, and Sandler Utility apprised CWS and Envirolink of the negotiations leading up to the consent decree, and representatives of CWS and Envirolink participated in informal discussions addressing the consent decree. In these informal discussions, representatives of CWS and Envirolink maintained that the provision making a transferee of the Eagle Creek wastewater system a surrogate for the obligations imposed upon Sandler Utility and making the transferee subject to contempt for failure to comply with those provisions was counterproductive, unnecessary, and not in the best interests of the consumers within Eagle Creek. Representatives of CWS and Envirolink likewise argued that in addition to addressing the current need to rectify inadequacies of the Eagle Creek system, attention should be given to a longer term solution. Neither of these arguments found their way into the consent decree. CWS was in the process of undertaking a thorough analysis of the most cost effective and reliable system with which to provide service within Eagle Creek. From the perspective of CWS, expending substantial amounts of funds and labor to provide temporary repairs to the existing vacuum system was ill-advised.

Q. HAS CWS UNDERTAKEN A STUDY TO COMPARE THE COST, ON BOTH OF INSTALLATION AND OF LONG TERM REPAIR AND MAINTENANCE OF REPLACING SUBSTANTIAL PARTS OF THE EAGLE CREEK SYSTEM WITH GRAVITY COLLECTION VERSUS LEAVING THE EXISTING VACUUM SYSTEM IN PLACE AND CONTINUING TO MAKE THE EXPENDITURES TO COMPLY WITH THE CONSENT DECREE AND TO MAINTAIN AND REPAIR THE VACUUM SYSTEM INTO THE FUTURE?

A. Yes. In summary fashion our investigation shows that over the long term the cost for replacing important components of the collection system with gravity will be cheaper and will provide more reliable service. Our calculations show as follows:

Line	Item Description	Estimate
1	Vacuum System Replacement	$2,865,000.00
2	Gravity System Replacement	
	2021 Estimate	$1,667,000.00
	2022 Estimate	$2,417,150.00

Q. WHAT ACTION DOES CWS REQUEST THE COMMISSION TO TAKE?

A. CWS urges the Commission to take greater affirmative initiative with respect to addressing the difficult circumstances in Eagle Creek than the laissez faire recommendation of the Public StafF. Just as CWS urged a comprehensive assessment and long term solution to the Eagle Creek situation in the Raleigh meeting among representatives of all the affected parties, CWS again urges that the Commission to assert itself in accomplishing a satisfactory long term solution that goes above and beyond the DWR sponsored consent decree. The Commission and the environmental regulators are supposed to be knowledgeable on utility service, and should be working in cooperation with those having the financial resources, willingness and experience in operating the Eagle Creek system, and collectively should be able to arrive at a reasonable solution.

CWS urges the Commission to endorse a solution which includes the following:

1. Direct the Public Staff to work with CWS, Sandler Utility and DWR to ensure that the existing collection system permit and Consent Judgement remain in place until the following steps can be implemented.
2. CWS receives the certificate of public convenience and necessity to own and operate the Eagle Creek wastewater collection and treatment system.
3. The Commission requires a reasonable bond based on the requirements to serve the Eagle Creek system.
4. CWS, Public Staff and DWR work to obtain a new collection system permit from DWR to construct and upgrade the collection system.
5. CWS, Public Staff and DWR work to transfer the wastewater treatment permit from Sandler Utility to CWS.
6. CWS upgrades or replaces the collection system for the residents of Eagle Creek.
7. The Commission, as part of its order to impose on CWS a requirement that upon receipt of the certificate of public convenience and necessity to replace the vacuum collection system serving the Eagle Creek community.
    a. To the extent the Commission, based on the evidence in these dockets, determines that the existing vacuum system for Eagle Creek should remain in place, CWS urges the Commission to so rule. It is unfortunate that the Commission has no recommendation from the agency charged with responsibility to investigate this issue.
    b. To the extent that the Commission, based on the evidence in these dockets, determines that it is appropriate to replace the vacuum system with another type system, CWS urges the Commission to so rule.
    c. To the extent the Commission determines that the decision to replace or repair should be left to the discretion of CWS, CWS urges the Commission to so rule.

d. To the extent that the Commission determines that CWS should compile and file periodic reports informing the Commission of progress in meeting service obligations or the expenditure of funds, CWS urges the Commission to so rule.

e. To the extent that the Commission determines that CWS should submit a budget and a timeline for making improvements to be overseen by the Commission, CWS urges the Commission to so rule.

8. CWS urges that the Commission, as part of its order, to prohibit CWS from requesting any rate increase until such time that the Eagle Creek vacuum system is replaced and the wastewater treatment plant is upgraded and expanded.

a. To the extent that the Commission determines that reasonable conditions should be imposed on CWS with respect to issues of service reliability and the expenditure of costs, CWS urges the Commission to articulate and approve such conditions.

b. To the extent that the Commission determines that reasonable limitations should be imposed upon the inclusion of expenditures in its rate base calculation related to the expenditures of funds necessary to bring the system into compliance with reasonable regulatory standards, CWS urges the Commission to so rule.

c. To the extent that the Commission determines that there should be a delay in a filing by CWS for an adjustment to rates until such time as the above conditions are met, CWS encourages the Commission to so rule.

9. Until such time in the future that the Commission takes action on either CWS's existing new franchise request for Fost or potential future contiguous extension request in the future for Flora, CWS urges that the Commission address the amount of the bond to serve those systems at that time.

. The Commission and DWR have full authority to oversee the implementation of such provisions. CWS anticipates the vacuum system replacement to take approximately 18 months (with a construction period of approximately 6 months). In the meantime, to the extent that repairs, replacements and additions to the existing vacuum system are necessary to alleviate short term issues, reliance on the provisions of a consent decree should continue.

From CWS's perspective, it would be appropriate for the Commission to consider whether or not the costs of such continued improvements should be added to Sandler's investment for which recovery is permissible. As the original agreement between Sandler and CWS contemplated, CWS maintains that the ability to increase purchase price, based on prudent NCUC approved upgrades, provides a meaningful incentive for Sandler to continue to invest until CWS can complete the required upgrades and replacements.

Myers Rebuttal Exhibit A

Century Engineering Evaluation Feb. 28, 2022

Myers Exhibit A

A

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Mar 31 2022

Eagle Creek Subdivision Vacuum Sewer Collection System
Independent Engineering Evaluation

Prepared By:

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February 28, 2022

NORTH CAROLINA
PROFESSIONAL
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ENGINEER
DAVID J. RIGBY

Eagle Creek Subdivision Vacuum Sewer Collection System
Independent Engineering Evaluation

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Eagle Creek Subdivision Vacuum Sewer Collection System
Independent Engineering Evaluation

A. Executive Summary

During his fifty-year career, the Engineer has inspected more than one hundred domestic sewer collection and treatment systems and designed upgrades thereto. Without question, the Eagle Creek vacuum sewer collection system is one of the most poorly maintained systems the Engineer has ever seen. The system suffers from absentee ownership, lack of properly trained operators, lack of routine and preventive maintenance, lack of redundancy, lack of spare parts, lack of adequate user revenues necessary to properly support the facilities and the facility operations, and lack of pride.

There have been eight independent third-party technical evaluations of the system dating back to 2010 which all consistently document numerous problems with the Eagle Creek vacuum sewer collection system including excessive infiltration and inflow, sanitary sewer overflows, vacuum leaks, vacuum pit valve and controller failures, vacuum station problems including vacuum pump failure and sewage pump failure, and the catastrophic system failure of September and October 2020.

There is a wealth of published literature which describes the design, operation, and maintenance of vacuum sewer systems in general which all consistently describe numerous problems and difficulties in operating and maintaining the systems, all of which are consistent with the findings of the eight third-party technical evaluations.

The Engineer has identified more than two-dozen near-term improvements which should be made to improve the reliability of the system while longer-term improvements are being developed and pursued.

The Engineer strongly recommends further investigations into converting the privately owned Eagle Creek Subdivision vacuum sewer collection and treatment system to a public utility by creating a local public sanitary district and applying for IIJA grant and or loan funding which has recently been allocated to the State of North Carolina by EPA.

The Engineer further recommends abandoning the vacuum sewer system in favor of an individual grinder pump and low-pressure force main collection system which will result in a more environmentally sound, more reliable, and more cost-effective long-term solution.

However, if the project stakeholders prefer to continue to rely on the old and depreciated vacuum sewer collection system, then the Engineer recommends splitting the current system into three separate smaller systems each with its own main vacuum tank and sewage pump station with separate force mains to the wastewater treatment plant.

B. Purpose and Scope

The Eagle Creek Subdivision, consisting of 420 single family homes and a public golf course, is served by the Sandler Utilities vacuum sewer collection and wastewater treatment system. The collection system consists of 4.8 miles of vacuum sewer lines and utilizes vacuum pumps to maintain a constant negative pressure within the sewer pipes. Domestic sewage from the individual homes connects to the system through containment tanks which are referred to as "pits" with each pit serving two homes. The sewage from the homes is conveyed through the sewer pipes to a central vacuum receiving station from where it is pumped to the adjacent Sandler Utilities wastewater treatment plant which is permitted for 350,000 gallons per day.

Due to persistent problems with sanitary sewer overflows (SSOs) escaping from the vacuum sewer collection system during the past two years, including a catastrophic failure of the system in September 2020 which lasted nearly a month, the North Carolina Department of Environmental Protection and Natural Resources, Division of Water Quality, took legal action against Sandler Utilities to cease and desist and to take immediate steps to prevent further SSOs from occurring including requiring an Independent Engineering Evaluation of the system, the problems and the operations.

This Independent Engineering Evaluation is being hereby provided in compliance with the AMENDED CONSENT JUDGEMENT dated December 28, 2021. The scope of this report details both near-term and long-term actions necessary to prevent future sanitary sewer overflows (SSOs) and system performance issues, including but not limited to: (1) changes in staffing, (2) operation and maintenance procedures, (3) equipment replacement, (4) acquisition of additional backup equipment, and (5) upgrades to the design and physical infrastructure of the Collection System.

C. Engagement

On December 6, 2021, Brittney Willis, P.E., of Wakefield Development contacted Century Engineering, Inc. and requested assistance to provide an evaluation of the Eagle Creek Vacuum Sewer Collection System. On December 9, 2021, William Silverman, Esq. from Wood Smith Henning & Berman LLP, Raleigh, North Carolina, the attorney representing Sandler Utilities at Mill Run, forwarded the Engineer's resume to the North Carolina Department of Environmental and Natural Resources, Division of Water Quality, for acceptance.

D. Background Information Provided

The Engineer was provided with thirty-six separate project related documents plus a copy of the Eagle Creek Phase I Sewer System construction drawings to be used as the basis of the review. The documents consist of the Permit to operate the Eagle Creek Collection System issued by the North Carolina Department of Environmental and Natural Resources, Division of Water Quality (DWQ), Notices of Violation and Notices of Intent to Enforce for the operation of the sewer collection system issued by DWQ, technical reports of field observations by Bissell Professional Group, Flovac, Inc., Airvac, Inc., and A3-USA, Inc., several compliance response letters to the DWQ from Sandler Utilities, North Carolina Utilities Commission Public Staff Data Requests, miscellaneous vacuum sewer system operation and maintenance instructions, and the AMENDED CONSENT JUDGEMENT. The list of the documents provided is included as Appendix A.

E. Field Inspections by the Engineer

The Engineer made two visits to the Eagle Creek project to observe the physical conditions of vacuum sewer system and to provide perspective and verification of the observations, comments and recommendations made in the third-party Bissell Professional Group, Airvac Inc., Flovac Inc. and A3-USA, Inc. technical reports of field investigations.

The Engineer visited the project on December 16, 2021, and met with Clayton Goris, an attorney assisting William Silverman in the matter. After being cleared by the area manager for Envirolink, Inc. (the contract Operator in Responsible Charge – ORC), the Engineer and Mr. Goris had a brief conversation with the operator and performed a cursory inspection of the vacuum sewer receiving station. The wastewater treatment plant was not inspected or observed during the visit.

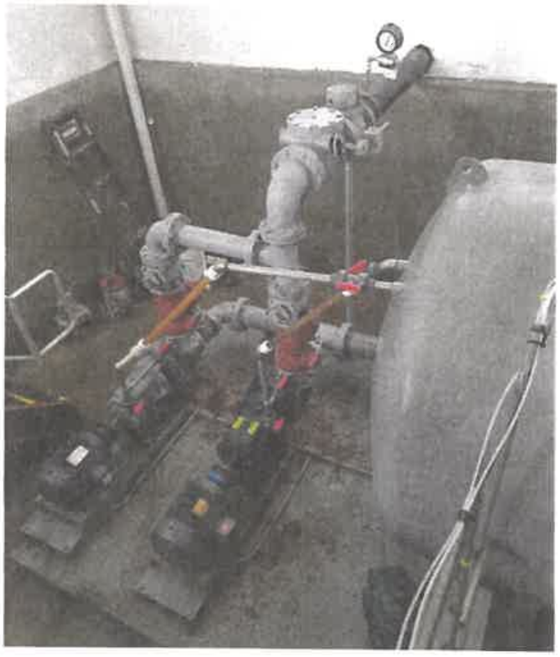
The Engineer and Mr. Goris visited the project again on February 4, 2022. During the visit, time was spent talking with the Envirolink wastewater treatment plant operator who provided a tour of the treatment plant during which the conditions of the facility were discussed and noted. The Engineer performed a more detailed inspection of the vacuum sewer receiving station including the building, the operating equipment, and supplies. The Engineer and Mr. Goris also accompanied the Flovac, Inc. field technician as he demonstrated the procedures that were being taken to remove the vacuum controllers out from the individual vacuum pits and relocate them into above ground protective pedestals. The Flovac, Inc. field technician also described the procedures for installing new battery operated, mobile phone monitored vacuum pit alarm systems. The Flovac, Inc. field technician was extremely knowledgeable in the operation and maintenance of vacuum sewer collection systems.

F. Field Observations with Photographs

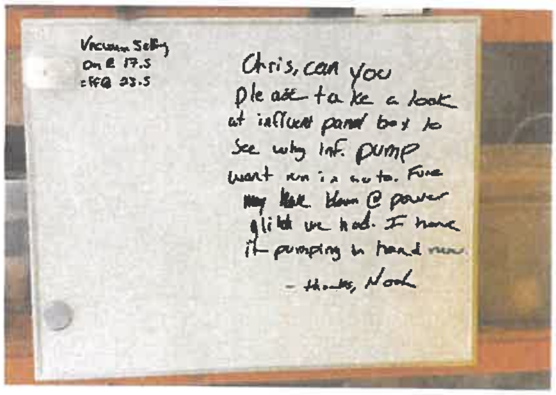
When the Engineer arrived at the vacuum sewer receiving station at 9:30 am on February 4, 2022, the one and only operator at the facility was asleep in his car. It took a few minutes of tapping on the window of the car to wake the operator.

Shortly after waking the operator, the wastewater treatment plant operator arrived. He said he was relatively new to Envirolink and to the wastewater treatment plant and that he lived two hours away. He said he had been trained on a larger plant. He was very knowledgeable about the plant and wastewater treatment in general, and he was conscientious in his work. He was however being tasked with running an old and poorly maintained facility in which the secondary effluent filters were off line.

Inside the vacuum sewer receiving station building is the main vacuum tank. There is a robust coat of gray paint on the tank exterior, however, it had been recently reported the interior is in poor condition. The Engineer was not able to verify this. What was observed was an extremely messy and cruddy vacuum tank pit with water, sewage and oil on the floor, old broken and worn-out parts, rusty pipes and pump platforms, broken ladders, and loose wires.



Mounted on wooden shelves on the main floor level of the vacuum sewer receiving station building is a white board for operator instructions, comments and communications. On the white board the lead operator left instructions to an assistant operator as follows: "Chris, can you please take a look at influent panel box to see why the influent pump won't run in auto. Fuse may have blown @ power glitch we had. I have it pumping in hand now. Thanks, Noah."

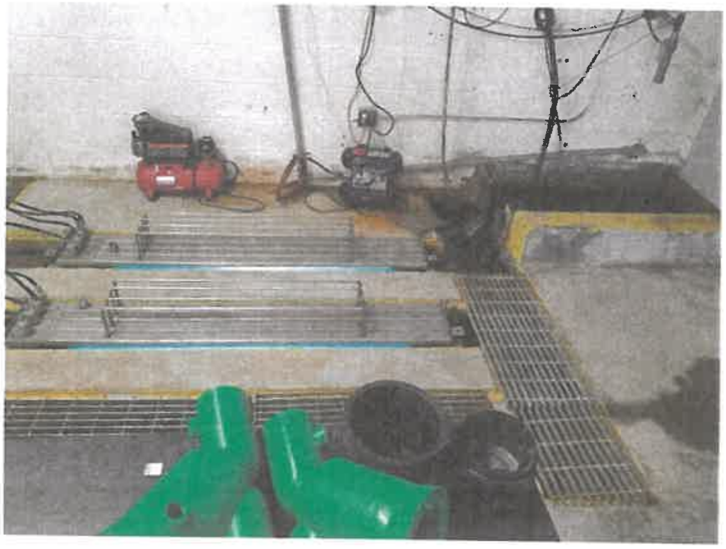


The vacuum pumps are located on the main floor of the vacuum sewer receiving building. The vacuum pumps are mismatched and one of the motors is scuffed. The pump platform is rusted, and loose and uncapped wires are strewn about. Oil and water are on the floor.

The main room in the vacuum sewer receiving station houses the electrical controls, the aeration blowers for the wastewater treatment plant, spare chemicals, vacuum sewer valve pit spare parts, the ultraviolet disinfection lights, and two cabinets for small parts. The condition of the room and equipment is trashy. There are buckets of unknown fluids lying around, there is a spare blower motor which may or may not be operable. Chemical bags are torn open and improperly stored. There is water on the floor. The spare vacuum valve pit assemblies are strewn in a heap, and it is unknown if any are operable or not.

The bathroom is as dilapidated as the vacuum sewer tank pit area and main vacuum building blower and vacuum pump operating room. There is water on the floor. The toilet doesn't work properly and there is a sign on the wall above which says, "Make sure flapper closes." Spent and broken ultraviolet light tubes are stacked in one corner. For some reason there is a disconnected dishwasher in the bathroom that has junk lying on top of it. There is a spare blower motor placed behind the dishwasher. Above the dishwasher is a shelf with junk and a fan that doesn't work and a roll of original construction drawings that is old and so washed out that it is unreadable.

Also located in the main room in the vacuum sewer receiving station are two small cabinets and the ultraviolet disinfection lamps. The cabinets have oily junk stacked on them and the cabinet doors hang open. The ultraviolet lamp area has unsecured electrical equipment and wires strewn around in the wet environment.



G. Summaries of Third-Party Inspection Reports

1. Updated Preliminary Report Eagle Creek Wastewater Treatment Plant Evaluation, April 21, 2010, Bissell Professional Group. This report was prepared by the original sewer system design engineer at the time the system had been in operation for nine years. The purpose of the report was to provide an evaluation of the then current condition of the Eagle Creek sewer system for the prospective event of a third-party investment. Problems identified with the collection system included the following:

- *48 hours after a 2" rainfall, the wastewater plant was experiencing excess flow from infiltration into the collection system.*

- *4 or 5 vacuum pits need to be repaired because infiltration is leaking in through cracks in the fiberglass pit bottoms.*
- *One of the vacuum pumps needs repair.*
- *The intake filter casings on the vacuum pumps have deteriorated and need to be replaced immediately.*

2. **Site Survey Report Eagle Creek, NC**, September 30, 2020, Airvac, Inc. This report was prepared following a significant vacuum sewer failure event on September 28, 2020. The purpose of the report was to engage the supplier of the original vacuum sewer system equipment to assess the system, to determine the causes of the failure and provide suggestions for system improvements. Problems identified with the collection system included the following:

- *The current operators have no experience with vacuum technology systems.*
- *One vacuum pump was locked up and the other could only pull 5 inches of vacuum.*
- *Only one of the two sewage pumps would run but would not pump.*
- *Vacuum from the tank was leaking through the pump seals and when the pump ran sewage leaked onto the floor.*
- *The motor windings were faulty on the other sewage pump.*
- *The conical screens on the vacuum pumps were plugged with grease.*
- *When the vacuum pump was finally started it would not produce the required vacuum pressure.*
- *No backup vacuum valves or controllers were on site.*

- *During the site visit the power to the main vacuum panel board went down and the standby generator wasn't working. The operator had removed some wiring with the power turned on and a hot wire touched the panel box, and it blew the fuse.*
- *No spare fuses were on site.*
- *In all pits inspected by the Airvac technician, there were no clamps on the vacuum control hoses and breather hoses had been disconnected.*

3. **Report of System Support**, October 7 - 9, 2020, Flovac, Inc. This report was prepared by a competitive vacuum system manufacturer in support of the initial observations and recommendations made by Airvac. Problems identified with the collection system included the following:

- *The 10" main vacuum plug valve at the vacuum station was inoperable.*
- *After working most of the day to identify leaking valves in the collection system, vacuum returned to the system only to fail again before the end of the day.*
- *A review of the vacuum station discovered that the only previously believed functioning sewage pump was actually not working due to rotating unit bearing failure.*
- *It appeared the second sewage pump that wasn't working also had failed bearings.*
- *The dedicated vacuum pump truck that was supposed to be on-site was not there and the system had to be shut down to protect the vacuum pumps from flooding from sewage.*
- *The water level probes in the vacuum tank were not functioning properly if at all.*
- *The operators claimed the internal condition of the vacuum tank was poor.*

- *The vacuum tank was cleaned and placed back in service.*
- *With the system down for so long many of the valve pits were flooded.*
- *There were almost no spare parts on hand.*

4. Site Survey Report Eagle Creek, NC, October 30, 2020, Airvac, Inc. This report was prepared as a follow-up to the previous report by Airvac, Inc. to document the improvements made to correct the earlier identified problems and to identify any remaining problems. Problems identified with the collection system included the following:

- *Workers were on site with a pump truck trying to pump out water and sewage from the upper pit chambers.*
- *After working all day to locate leaks the system was running with good vacuum.*
- *There are still a lot of hoses without clamps.*
- *At least one and as many as four water level probes in the vacuum tank were missing wires and therefore were malfunctioning.*
- *At least two of the solenoid valves were not working.*
- *Missing parts included test hoses, 6 vacuum pit valves, 20 controllers, 3 probes and 3/8" and 5/8" hose clamps.*

5. Trip Report Eagle Creek, Moyock, NC, November 20, 2020, Flovac, Inc. This report was prepared as a follow-up to the previous report by Flovac to document the improvements made to correct the earlier identified problems and to identify any remaining problems. Problems identified with the collection system included the following:

- *The starter contacts for vacuum pump number 1 were melted / welded shut and the pump would not turn off.*
- *There were insufficient spare parts to rebuild the system.*
- *The operator was so busy searching for leaking valves that he had no time to rebuild the valve pit controllers.*
- *The assistant operators lacked technical experience with vacuum sewer systems and wastewater collection systems in general.*
- *There were still multiple houses where raw sewage was overflowing from the candy cane air vents.*
- *Raw sewage was found backing up into the upper valve pit chambers in several cases.*

6. **Eagle Creek Vacuum System Review**, July 2021, A3-USA, Inc. This report was independently funded by Envirolink, Inc., the ORC. The report is properly described as an overview of the vacuum sewer collection system with recommendations for a complete overhaul. Undocumented and unspecified criticisms with the collection system include the following:

- *The poor condition of the system and the current service issues are the result of years of neglect due to inadequate maintenance and inadequate investment.*
- *The frequency of pit valve failures coupled with design limitations have resulted in the need to increase the number of operators assigned to the collection system.*
- *Often operators are too busy to acknowledge calls of problems from home owners.*
- *The vacuum tank and controls are in poor condition.*
- *The capacity of the vacuum pumps does not provide for a safety factor.*

- *The system lacks alarms to alert both operators and home owners.*

7. **Trip Report Eagle Creek, Moyock, NC**, October 5-8, 2021, Flovac, Inc. A year after the catastrophic failure of the system in October 2020, and multiple efforts and expenditures to improve the vacuum sewer collection system, Flovac, Inc. returned to the project to assess the condition of the system and identified the ongoing problems:

- *There had been extended periods of low vacuum pressure.*
- *The alarm panel was turned off.*
- *The safety high level lock out for the compressor was turned off.*
- *There were leaks in the high level lock out air line.*
- *The chart recorder was not working and was out of calibration.*
- *The vacuum pump and sewage pump run time recording was not up to date.*
- *Both vacuum pumps were leaking oil and were low on oil.*
- *The 8" main vacuum valve would not seat properly.*
- *The 10" main vacuum valve was inoperable.*
- *The main sewer pump couplings were not properly aligned, and bolts were missing from the mounting bases.*
- *One of the sewage pumps was inoperable.*
- *The pump recirculation lines were shut off.*
- *It appeared as if the water level probes were at improper levels or were dirty.*
- *The station was unkempt with oil and absorbents on the floor.*
- *There were no spare parts on site including no vacuum pump oil.*
- *Used parts were being used to rebuild controllers and valves.*

- *The was no clean space / environment in which to work or carry out operator duties.*
- *The conical screens were missing from the vacuum pumps.*
- *In every valve pit that was opened, there were incorrect valve rebuilds, missing parts and disconnected hoses.*
- *There is a general lack of direction, goals, or cohesiveness among the operators.*

8. **Monitoring Observations Eagle Creek, Moyock, NC,** December 22, 2021, Flovac, Inc. Following the installation of some monitoring and charting equipment which provided limited diagnostic information, Flovac, Inc. visited the system and identified the following problems:

- *Vacuum pump run times were excessive being 14 hours per day in lieu of the design 6 hours per day.*
- *An unidentified leak or leaks had occurred resulting in excessive run times.*
- *Confirmed waterlogging within the piping system occurs at unidentified locations throughout the system.*

H. Published Literature on Vacuum Sewer System Operations

To put the facts and observations reported herein in perspective, it is appropriate to include commercially published and manufactures' technical support information regarding the reliability of vacuum sewer systems. The publications and important operation and maintenance information are as follows:

1. **United States Environmental Protection Agency**, (1978) Pressure and Vacuum Sewer Demonstration Project – Bend Oregon. *EPA-6002-78-168,* Municipal Environmental Research Laboratory, Cincinnati, Ohio.

In 1978 EPA funded a pilot study to compare grinder pump pressure sewers to vacuum sewers in Bend, Oregon. The pilot lasted fifteen months. At the end of the testing period no problems were reported with the pressure sewer. The vacuum sewer was 1,847' long and collected sewage from 11 homes. Problems reported with the vacuum sewer system included the following:

- Problems with the operation of the sliding-vane vacuum pumps occurred repeatedly.
- An excessive amount of water condensed in the lubrication system of the pumps.
- Manometer-type condensate drains installed on the vacuum pumps required manual draining of the condensate every day which resulted in the pumps losing their oil.
- Bearing surfaces on one pump had to be rebuilt.
- Failure of the vacuum valves resulted from malfunctions in the valve controller.
- One valve failed in the open position due to a small particle of debris in the pneumatic circuit of the valve controller.
- Another valve failed because of freezing moisture in the control circuit check valve.

2. **Obradović, D., Šperac, M, & Marenjak, S.** (2019), Maintenance Issues of the Vacuum Sewer System. *Environmental Engineering - IO,* 6, No. 2.

Obradović, Šperac and Marenjak, members of the Civil Engineering Faculty at the Josip Juraj Strossmayer University of Osijek, Croatia, published a very well documented and detailed professional paper on the maintenance of vacuum sewers in Europe. The disadvantages reported included the following:

- High energy consumption.
- Additional cost for vacuum valves and vacuum stations.
- Expert design is needed.
- Needs energy to maintain vacuum
- Network length is limited.
- Skilled operators are required – training necessary.
- Number of system providers limited.
- Faults of individual valves can affect the entire system
- System components not quickly available everywhere.

Included in the paper was Table 2, Maintenance tasks and their frequencies, which is as shown below.

Table 2. Maintenance tasks and their frequencies (Mohr et al. 2016; Mäkinen 2016; Buchanan et al. 2010)

Frequency	Maintenance Tasks
Daily	General inspection at the station Visually check gauges/ charts Record all pump run times Check oil level in vacuum pump sight glass Check alarms at the control cabinet Fill out daily equipment check-up log book Check alarm dialer function
Weekly	Exercise generator (if applicable) Check vacuum system for leaks with manometer and record findings Check oil level Check for unusual noises Check vacuum pump exhaust filter gauge Visually/audibly check vacuum station operation
Monthly	Change oil and oil filters (depends on manufacturer's recommendations) Remove and clean inlet filters on vacuum pumps Test all alarm systems Check all motor couplings and adjust (if needed) Clean all sight glasses Exercise all shut off valves (vacuum station) Check appearance of station (cleanliness and accessibility) Check biofilter (humidity, odours, appearance) Check sump for proper valve cycling Check vacuum sensor (absolute pressure)
Semi-annually to annually	Conduct external leak test on all vacuum valves Check electrical connections at the station Check tank for deposits and remove them Check alarm signals of the vacuum pumps Check pump motors and couplings (wear, misalignment, deterioration, overheating)
Every year	Exercise division valves Inspect vacuum and sewage pumps for wear Visual inspection of all pits and valves Check valve timing and adjust if needed Check functionality of alarms Change oil of vacuum pump Change oil filter of vacuum pump Check state of construction of the station (e.g. corrosion, structures, etc.) Floating switch cleaning and testing
Every 3 years	Rebuild controller (buffer tank valves only)
Every 5 years	Rebuild controller (most valves)
Every 15 to 25 years	Replace a vacuum station equipment

3. **State of Florida**, (2022), Design Considerations – Vacuum Sewer Systems. *Florida Administrative Code (62-604.600(7)(a).*

The State of Florida has rigorous requirements for the design of vacuum sewer systems. The requirements include 100 separate items divided into eight sections including General, Vacuum Collection System, Vacuum Valves, Valve Pits, Buffer Tanks, Individual Gravity Laterals, Vacuum Pump Stations, and Emergency Operations for Vacuum Pump Stations. A copy of the State of Florida code is included as Appendix B. A review of these requirements provides perspective into the difficulty in properly constructing a vacuum sewer collection system and into the numerous ways a vacuum sewer collection system can under perform.

4. **Lauwo, S., Sharvelle, S. & Roesner, L.,** (2012) A review of Advanced Sewer System Designs and Technologies. *Water Environment Research Foundation.* INFR4SG09d.

Lauwo, Sharvelle and Roesner while working at Colorado State University, performed an extensive review of several advanced sewer system technologies including the vacuum sewer technology. Their reported disadvantages with a vacuum sewer system include the following:

- The system will not operate during power outages or a malfunction at the vacuum station.
- A good air to liquid ration is necessary to avoid water logging but may be difficult to maintain.
- Grease can cause problems at the collection pit.

I. Summary of the Engineer's Observations

1. Review of Records and Visual Observations

Arguably, the Eagle Creek vacuum sewer collection system is one of the most poorly maintained system the Engineer has ever seen. The system suffers from absentee ownership, lack of properly trained operators, lack of routine and preventive maintenance, lack of redundancy and spare parts, lack of adequate user revenues necessary to properly support the facilities and the facility operations, and lack of pride.

Records indicate the system was constructed in 2000 and placed into service in 2001. It is now twenty-one years old. In 2010, when the sewer collection system was only nine years old, the original design engineer, Bissell Professional Group, issued the Eagle Creek Wastewater Treatment Plant Evaluation which identified several problems with the vacuum sewer collection system including:

- Two days after a 2" rainfall the wastewater plant was experiencing excess flow from infiltration into the collection system.
- Four or five vacuum pits needed to be repaired because infiltration was leaking in through cracks in the fiberglass pit bottoms.
- One of the two vacuum pumps needed to be repaired.
- And the intake filter casings on the vacuum pumps had deteriorated and needed to be replaced immediately.

Four years later in 2015, the State of North Carolina Public Utility Commission (PUC), ordered Sandler Utilities to take immediate corrective action to inspect all vacuum pits and raise them above grade to minimize infiltration and inflow and to install main line isolation valves to prevent the collection system from losing vacuum and to repair other necessary equipment. In May 2016, Enviro-Tech, the then Operator in Responsible Charge (ORC) sent a report to the PUC documenting some of the actions taken to comply with the order. Then in September 2020 the system experienced catastrophic failure and was down for more than a month. Since then, there have been eight independent third-party investigations into the circumstances of the failure and the conditions of the vacuum sewer collection system. Those fully detailed reports are presented Section G above.

Those nine reports plus the letter from Enviro-Tech describe countless problems with the system that have been recurring for more than a decade. The numerous problems listed are consistent with the Engineer's experience with poorly maintained vacuum sewer collection systems in general and with absentee ownership vacuum sewer systems specifically. The inspections and observations offered no surprises.

The Engineer also searched the literature for professional articles relating to the reliability of and maintenance issues with vacuum sewer collection systems. Published information provided by the U. S. Environmental Protection Agency, the Water Environment Research Foundation, the State of Florida and two academic groups from the Colorado State University and from the University of Osijek, Croatia are listed in Section H above. All four documents present both actual and potential operation and maintenance issues with vacuum sewer collection systems which are consistent with the problems reported by the eight third-party reports and the Enviro-Tech letter in Section G.

In addition to published information, the Engineer made his own observations of the Eagle Creek facilities. Specific observations are reported in Section F above and include the following. The one operator in attendance on the morning of February 4, 2022, was asleep in his car at 9:30 in the morning. The vacuum tank pit was dirty, oily, and unkempt with rusty and broken parts and equipment lying around. There were loose electric wires in the building that seemed to be associated with the vacuum pumps and controls but were disconnected. One sewage pump was reported to be malfunctioning. Bags of chemicals were torn open and unsecured, there were drums of unknown liquids and materials strewn around, and there were numerous used vacuum valve parts stacked in a heap. There was no ear protection, no safety signage and the entire facility was in a very poor housekeeping condition. The building fails to fully comply with OSHA regulations and statewide building codes. There was no security for the facility or grounds and the access road was nearly unpassable.

2. Engineer's Concerns from Industry Experience

Besides the problems and issues which can be verified by published reports and actual field observations, the Engineer has additional concerns stemming from his lengthy career experience. Those concerns include the following.

- The wastewater treatment plant operator reported the average dry weather flow is approximately 50,000 gallons per day. In a 10" diameter pipe the average velocity is 0.144 feet per second. The rule of thumb velocity for design of closed piping systems is a minimum velocity of 2.0 feet per second to prevent settling and deposition of solids. The condition of the interior of the vacuum collection pipes is unknown and it would not be surprising if there is a build-up of solids and grease inside the pipes.

- Currently, work is underway to move all the vacuum valve controllers out of the below ground pits up into above grade pedestals. In addition to the valve controllers, work is underway to install battery operated sensors at each pit to monitor several operating functions and to wirelessly report any problems to a cell phone accessible, central monitoring station. This work is NOT intended to lessen the occurrence of vacuum system failures or to reduce maintenance requirements, it is intended to make it easier and quicker for an operator to identify a leaking valve and repair it to lessen the chance of a lengthy or catastrophic system failure. The concern with this approach is now hundreds of new electrical / mechanical devices have been added to the system which must be maintained, and which can themselves fail, and which now exposes the system to cyber-attack.
- In the past eighteen months alone, Sandler Utilities has spent approximately $674,000 in maintenance and repairs to the vacuum sewer collection system. Considering the system is still in very poor or unknown condition(s) it is likely that additional funds will be necessary to continue upgrading and improving the facilities. The Engineer speculates that historically, the customer user rates have been too low to produce sufficient revenue to properly provide for adequate routine and preventive maintenance of the vacuum sewer collection system.

J. Conclusions and Recommendations

In accordance with the AMENDED CONSENT JUDGEMENT the Engineer hereby provides both near-term and long-term actions to prevent (minimize to the extent possible) future sanitary sewer overflows (SSOs) and system performance issues.

1. Near-Term Corrective Actions

Near-term corrective actions recommended include the following:

- Inspect the vacuum collection lines where possible. The construction drawings indicate the collection lines have been installed with a sawtooth profile, which means it will be difficult to insert a camera and view a long length of line. It also means there will be pockets of sewage at various points. It is recommended that two or three inspection sites be selected for short time inspections. Once the system is opened for inspection vacuum will be lost. This procedure must be performed quickly and carefully.
- Install shut-off valves on the main collection lines at strategic points and install valved riser pipes for connection to portable vacuum sewage pumps which will allow for continuance of the collection operations while shutting down the vacuum tank station for maintenance and repairs.
- Purchase or lease a portable vacuum system pump.
- Clean and repair the vacuum tank.
- Upgrade the vacuum tank controls systems.
- Upgrade and replace the vacuum station electrical control panel.
- Purchase a spare vacuum pump and a spare main sewage pump to have on hand.

- In the vacuum station, insert all electrical and control wiring into conduits, properly mount and install avoiding tripping hazards, and discard broken and unused wires and cables.
- Inspect spare vacuum valves and discard damaged and unusable parts.
- Make the building, electrical and lighting code compliant.
- Make the building OSHA complaint.
- Secure and label all chemicals.
- Provide sound enclosures around the blowers.
- Start a daily log book.
- Provide fall and eye protection around the UV system.
- Install building heating and ventilation to code.
- Install a security fence and gate with locks and lock the building.
- Bring in sufficient gravel to properly repair the access road.
- Fix the toilet.
- Purchase any spare parts that should be on hand.
- Clean and repair the cabinets
- Discard broken and unused junk including the old UV lamps, the blower motors, the dishwasher, etc.
- Label everything as appropriate
- Obtain new copies of the plans and specifications and vacuum system operating and maintenance manuals.
- Improve overall housekeeping.

2. Long-Term Corrective Actions

This independent engineering evaluation report clearly documents the overwhelming number of problems with the Eagle Creek vacuum sewer collection system that have been going on for at least twelve years, and with vacuum sewer collection systems in general. It is beyond the scope of this report to perform a detailed life-cycle cost analysis of the variety of sewer collection systems which will provide more environmentally sound, more reliable, and more cost-effective performance over the long-term. However, from the Engineer's experience in performing similar life-cycle cost analyses when comparing the costs of installing and operating vacuum sewer systems, grinder pump and low-pressure force main systems, and conventional gravity sewer systems with central sewage pump stations in flat sandy areas with high water tables like Eagle Creek, the grinder pump with low-pressure force mains always proves to be the most cost-effective, long-term alternative. This has become especially true with the advent of trenchless, directional bore technology for the installation of the low-pressure, HDPE or PVC force main pipes.

Considering the above, the Engineer offers the following long-term recommendations.

a. Convert the vacuum sewer collection system to a grinder pump low-pressure force main system beginning at Eagleton Circle.

b. Depart from the ineffective contract maintenance program of the past by having the Eagle Creek subdivision apply for the creation of public utility district (PUD) status which could be expanded to encompass a larger territory in the future. This will place the ownership of the system in the hands of the property owners who then will control the operation, maintenance, and management of the system.

c. The U. S. Congress recently passed the Infrastructure Investment and Jobs Act (IIJA) and designated the US Environmental Protection Agency the managing agency for water and wastewater infrastructure funding. The State of North Carolina has been allocated $199,211,000 to its State Revolving Loan Fund for 2022. The IIJA has provisions for 100% grants and forgivable loans under certain circumstances. The Engineer recommends once a PUD has been established, pursuing public funding for future long-term capital improvements.

However, if the project stakeholders collectively decide that neither a grinder pump and low-pressure force main system nor a gravity sewer system with central pump stations is to be considered, and the continued reliance on an old and depreciated vacuum sewer collection system is preferred, then the Engineer offers these recommendations.

a. Perform a detailed technical hydraulic analysis of the vacuum collection system to thereby isolate the system into at least separate regions.
b. Design two new main vacuum tank and pump stations with separate force mains.
c. Replace all two-piece valve pits with single piece valve pits to significantly reduce infiltration and inflow and eliminate SSOs.
d. Replace the existing main vacuum receiving tank.
e. Clean and flush as many of the existing vacuum collection lines as possible.

Appendix A

Eagle Creek Sewer System - Documents Provided for Review

1. Flovac Operations Group, (March 2010) Preventative Maintenance Program (for Vacuum Sewer Systems), Flovac Inc., consisting of 6 pages.

2. Bissell Professional Group, (April 21, 2010) Updated Preliminary Report Eagle Creek Wastewater Treatment Plant Evaluation, consisting of 11 pages.

3. Envirolink, Inc, (January 2012) Emergency Action Plan, consisting of 38 pages.

4. North Carolina Department of Environmental and Natural Resources, Division of Water Quality, (May 2, 2103) Permit No. WQCS00290 Eagle Creek Collection System.

5. North Carolina Utilities Commission, (December 2, 2015) Proposed Order Granting Rate Increase to Sandler Utilities at Mill Run, LLC.

6. Enviro-Tech, (May 3, 2016) Letter to North Carolina Public Service Commission.

7. Airvac, (September 30, 2020) Site Survey Report Eagle Creek, NC.

8. North Carolina Department of Environmental and Natural Resources, Division of Water Quality, (October 7, 2020) Notice of Violation / Notice of Intent to Enforce.

9. Sandler Utilities at Mill Run, LLC, (October 27, 2020) Letter Response to North Carolina Department of Environmental and Natural Resources, Division of Water Quality.

10. Flovac Inc., (November 20, 2020) Inspection Report of Eagle Creek Sewer System by Michael Pringle.

11. North Carolina Department of Environmental and Natural Resources, Division of Water Quality, (November 23, 2020) Notice of Violation / Notice of Intent to Enforce.

12. North Carolina Department of Environmental Quality, (December 10, 2020) Order for Violations of Collection System Permit WQCS00290, Findings and Decisions and Assessment of civil Penalties.

13. Sandler Utilities at Mill Run, LLC, (December 15, 2020) Letter Response to North Carolina Department of Environmental and Natural Resources, Division of Water Quality.

14. North Carolina Department of Environmental and Natural Resources, Division of Water Quality, (December 16, 2020) Notice of Violation.

15. North Carolina Department of Environmental and Natural Resources, Division of Water Quality, (January 14, 2021) Notice of Violation / Notice of Intent to Enforce.

Appendix A

Eagle Creek Sewer System - Documents Provided for Review

Myers Rebuttal Exhibit B

AIRVAC PROJECT LIST

Myers Exhibit B

Airvan Project List

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)		System Owner/Client	Pop.	Vacuum Main
Mariners Cove 6CA	WA	16			2012		Water Corporation		
Port Hedland 9A-9B	WA	238			2011		Water Corporation		
Minnamurra - Retrofit	NSW	180			2011		Sydney Water		
Waterfall Gully – Retrofit	SA	30		1	2011		SA Water		
Millbridge Estate – Stages 12-15	WA	20		1	2011		Water Corporation		
Glenleigh Road - Retrofit	WA	80			2010		Water Corporation		
Bayview West	NT	15		1	2010		Power & Water Authority		
Waterside	NSW	110	400	1	2006		Stockland Trust		
Broadwater	WA	90	350	1	2006		Water Corporation		
Pacific Harbor	QLD	88	440	1	2006		QM Properties		
Vasse Newtown (Dowell Rd)	WA	70	500	1	2006		Water Corporation		
Port Kennedy	WA			1	2006		Meriton		
Calypso Bay	QLD	104	520	1	2005		Roche Group		
Carnarvon	WA	56	336	1	2005		Water Corporation		
Ashley	NSW	43	172	1	2005		Moree Council		
Port Botany Retrofit	NSW	14	14		2005		Maritime Board		
Mariners Cove (Waterlily Dr.)	WA	8	40	1	2005		Water Corporation		
Ningi Retrofit	QLD	20	80		2004		Caboolture Council		
Caltex Oil Refinery Kurnell	NSW	16	16		2004		Sydney Water		
Sanctuary Lakes Retrofit	VIC	16	64		2004		City West Water		
Ningi Extension	QLD	14	43		2004		Caboolture Council		
Exmouth Marina	WA	14	64	1	2004		Water Corporation		
Ibis Gardens	WA	13	78		2004		Water Corporation		
Machams Beach	QLD	133	532		2003		Cairns Water		
Hat Head	NSW	97	450	1	2003		Kempsey Council		
Manning Point	NSW	68	120	1	2003		MidCoast Water		
Millbridge Estate	WA	65	390	1	2003		Water Corporation		
Haywards Bay	NSW	53	212	1	2003	2004	Winten Group		
Port Geraldton	WA	21	60	1	2003	2004	Port Authority		
Port Headland Retrofit	WA	20	80		2003		Water Corporation		
Coomera Waters	QLD	123	492	1	2002	2003	Gold Coast Council		
South Geraldton	WA	116	580	1	2002		Water Corporation		
Dora Creek Retrofit	NSW	115	460		2002	2003	Hunter Water		
Port Geographe Retrofit (Ford Rd.)	WA	14	84		2002		Water Corporation		
Bundeena	NSW	112	448	1	2001		Sydney Water		
Cocos Islands	WA	99	340	2	2001		KRSP		
Noosaville	QLD	42	120	1	2001		Noosa Council		
Barrack Square Marina	WA	16	16	1	2001		Dept of Transport		
Lytton Berri Extension	QLD	1	1		2001		Australand		
Clydebank, Busselton Retrofit	WA	166	830		2000	2001	Water Corporation		
Falcon 2A	WA	60	240		2000	2003	Water Corporation		
Cloisters, Busselton	WA	12	42		2000		Water Corporation		

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)		System Owner/Client	Pop.	Vacuum Main
Harrington Waters Estate	NSW	133	552	1	1999	2002	MidCoast Water		
Bayview Haven Estate	NT	57	228	1	1999		Power & Water Authority		
Marlow Lagoon	NT	37	85	1	1999	2000/05	Power & Water Authority		
Bayswater	WA	19	160	1	1999		Water Corporation		
Picton Road, Bunbury	WA	15	75	1	1999	2000	Water Corporation		
Hemmant Extension	QLD	7	7	1	1999		Brisbane City Council		
Busselton 14A (Lyrebird Rd.)	WA	225	500	1	1997		Water Corporation		
Couran Cove Eco Resort, South Stradbroke Island	QLD	180	400	1	1997		Interpacific Resorts		
South Yunderup	WA	52	175	1	1997		Water Corporation		
Cox Bay (Olive St.)	WA	48	240	1	1997		Water Corporation		
Port Kennedy	WA	15	50	1	1997		Water Corporation		
Bonnet Bay & Sylvania Waters Stage 1 - Retrofit	NSW	434	700	3	1996		Sydney Water		
Baradine	NSW	120	300	1	1996		Coonabarabran Shire Council		
South Guildford (Wilkie St.)	WA	113	452	1	1996		Water Corp WA		
Rockingham 9A	WA	76	276	1	1996		Water Corp WA		
Kupungarri	WA	40	100	1	1996		Homeswest		
Maroochy - Scum Extraction Sewage Treatment Plant	QLD	8		1	1996		Maroochy Shire Council		
Furnissdale	WA	52	200	1	1995		Water Corp WA		
Dardanup	WA	39	73	1	1995		Water Corp WA		
Eagleview Industrial Subdiv.	QLD	10	20	1	1995		Brisbane City Council		
Kenmore	QLD	0	12	1	1995		Brisbane City Council		
West Gosford	NSW	36	45	1	1994	95/03	Gosford City Council		
North Yunderup	WA	18	75	1	1994		Water Corp WA		
Lytton Industrial Estate Stage 2	QLD	17	34	1	1994		Brisbane City Council		
Port Botany - Retrofit	NSW	6		0	1994		Maritime Services Board		
Barrenjoey	NSW	105	300	1	1992		Sydney Water		
Shay Gap - Retrofit	WA	12			1992		BHP Iron-Ore Ltd		
Davistown	NSW	420	850	1	1991		Gosford City Council		
West Byron Bay	NSW	22	64	1	1991		Byron Shire Council		
Port Mandurah	WA	225	1200	1	1990		Water Corp WA		
Riverglen Marina Murray Bridge	SA	5	61	1	1990		Copedale Pty Ltd		
Kurnell	NSW	460	1400	1	1989		Sydney Water		
Hindmarsh Island	SA	152	650	2	1989	-2005	Marina Hindmarsh		
Police Berths Sydney	NSW	6	6	1	1986		Police Department		
AUSTRALIA TOTAL		**5752**	**17904**	**60**					
West End - Bahamas -Phase 1		217	711	1	2009		Ginn Development Company		
West End - Bahamas -Phase 2		154	325	1	2009		Ginn Development Company		
BAHAMAS		**371**	**1036**	**2**					

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)	System Owner/Client	Pop.	Vacuum Main
Paranagua	Parana	38	228	1	2004	Aguas de Paranagua		
Jurere International	Santa Catarina	65	189	1	2003	Habitasul		
BRAZIL		**103**	**417**	**2**				
Beach House 2		14		1	1998	Amedeo Corporation		
Bolkiah Stage B		67	138	1	1995	Brunei Water Authority		
Bolkiah Stage A		71	147	1	1994	Brunei Water Authority		
BRUNEI TOTAL		**152**	**285**	**3**				
St. Paul de l'Ile-aux-Noix	Quebec	132	265	1	2007			
Quebec City Lac St. Charles	Quebec	72	140	1	1998			
Town of Maria	Quebec	450	1200	1	1995			
Canton de Magog	Quebec	66		1	1989			
Sherbrooke Ville de Rock Forest	Quebec	65		1	1989			
Invemere - Retrofit	British Columbia	15		1	1988			
Black Tusk Village - Retrofit	British Columbia	95	95	1	1987			
Surrey - Retrofit	British Columbia	900	900	3	1987			
CANADA TOTAL		**1795**	**2600**	**10**				
Zdar		368		1	2011			
Sokolec Extension		22			2010		1020	
Uzice Extension		15			2010		1300	
Zatcany Extension		50			2010			
Veltruby Extension	Kolin	103			2009		1650	
Zatcany Extension		25			2009		480	
Jestrebi-Provodin	Cseka Lipa	110	140	1	2008			
Jestrebi-Provodin	Cseka Lipa	110	140	1	2008			
Veltruby	Kolin	255	305	1	2008			
Veltruby	Kolin	255	305	1	2008			
Jizni Polabi	Nymburk	332	720	1	2006		1650	
Rajhradice	Brno	350	370	1	2006		1300	
Veltruby 2. Stadium	Kolin	375	403	1	2006		1020	
Velky Osek	Kolin	314	650	1	2005		2000	
Vrbova Lhota	Kolin	145	195	1	2005		480	
Dobrichov Pecky	Kolin	79	173	1	2004		400	
Sendrazice	Kolin	116	180	1	2004		1200	
Budimerice Slotava	Nymburk	188	264	1	2003		500	
Cirkvice	Kutna Hora	182	275	1	2003		1100	
Jestrebi	Cseka Lipa	109	113	1	2003		800	
Veltruby 1. Stadium	Kolin	58	59	1	2003		180	
Zvole Stage 2	Sumperk	100	124	1	2003		370	

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)	System Owner/Client	Pop.	Vacuum Main
Bystrice	Benesov	110	35	1	2002		35	
Dolni Berkovice & Vlineves	Melnik	188	360	1	2002		1200	
Klecany	Praha	28	50	1	2002		150	
Dubicko	Sumperk	29	180	1	2001		400	
Opatovice	Brno	119	299	1	2001		900	
Prisovice	Liberec	56	96	1	2001		400	
Dolni Studenky	Sumperk	202	380	1	2000		1300	
Hrncire	Praha	357	380	1	2000		1200	
Luzany u Prestic	Klatovy	59	192	1	2000		600	
Luzec nad Vltavou	Melnik	130	260	1	2000		900	
Zvole Stage 1	Sumperk	178	178	1	1999		800	
Chodouny-Lounky-Cerneves	Litomerice	101	320	1	1998		1000	
Prague Coll. Drainage C1A	Prague Center	12		1	1998		Qmax= 3 l/s	
Tuchlovice	Kladno	26	26	1	1998		100	
Svitavy Lacnov	Svitavy	103	269	1	1997		1200	
Veltrusy	Melnik	146	386	1	1997		3050	
Bohuslaice u Sumperka	Sumperk	72	137	1	1996		400	
Horatev u Podebrad	Nymburk	75	270	1	1996		700	
CZECH REPUBLIC TOTAL		**5652**	**8234**	**35**				
Peteborough	Cambridgeshire	45		1	2011	O&H Hampton Ltd		
Addlingfleet	Goole	35		1	2011	Severn Trent Water		
Stock Green	Redditch	24			2011	Severn Trent Water		
Medway Valley Park Phase 2	Kent	9			2010	Blue Circle		
Oasby	Lincolnshire	34	71	1	2008	Anglian Water		
Pickworth	Rutland	27	63	1	2008	Anglian Water		
Great Yarmouth	Norfolk	36	149	1	2005	Landfast Ltd.		
Peterborough - Area 300	Cambridgeshire	52			2005	O&H Hampton Ltd		
Upwell & Outwell Phase 4	Norfolk	107	191	1	2004	Anglian Water		
Upwell & Outwell Phase 3	Norfolk	141	397	1	2004	Anglian Water		
Upwell & Outwell Phase 1	Norfolk	99	328	1	2004	Anglian Water		
Upwell & Outwell Phase 2	Norfolk	79	240	1	2003	Anglian Water		
Peterborough - Area 200	Cambridgeshire	13		1	2002	O&H Hampton Ltd		
Parson Drove	Cambridgeshire	103	367	1	2002	Anglian Water		
Marshland St James	Norfolk	120	308	1	2002	Anglian Water		
Walpole St Andrews/St Peter	Norfolk	84	556	1	2001	Anglian Water		
Stowbridge Village	Cambridgeshire	35	96	1	2001	Anglian Water		
East Bilney	Norfolk	11	25	1	2001	Anglian Water		
Markham Moor	Nottinghamshire	77	236	1	2000	Severn Trent Water		
Central Veterinary Labs	Surrey	13		1	2000	Kier Construction		
Burton Waters Lincoln 1-5	Lincolnshire	85		1	2000 2008	Eastman Securities		
Harleford Lakes Marlow 1 & 2	Buckinghamshire	4	12	1	1999	Harleyford Estates		

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)		System Owner/Client	Pop.	Vacuum Main
Crossways 25 Phase 4	Kent	19		1	1999		Blue Circle		
Peterborough - Area 100	Cambridgeshire	33		1	1998		O&H Hampton Ltd		
Earth Center Doncaster	Doncaster	2		1	1998		Bovis Europe		
Longstowe	Cambridgeshire	39	96	1	1997		Anglian Water		
Thrupp Village	Gloucestershire	9	40	1	1997		Anglian Water		
Medway Valley Park Phase 1	Kent	30		1	1995		Blue Circle		
New Bollingbrooke	Lincolnshire	37	120	1	1995		Anglian Water		
Bunwell	Norfolk	65	200	1	1994		Anglian Water		
Eyke	Suffolk	41	140	1	1994		Anglian Water		
Henlow Hitchin Road	Bedfordshire	13	40	1	1994		Anglian Water		
Kings Lynn Willow Park	Norfolk	3		1	1994		Dosser East		
Marsh Road Gernard	Isle of Wight	12	40	1	1993		Southern Water		
Shouldham	Norfolk	78	200	1	1993		Anglian Water		
Claxby	Lincolnshire	14	100	1	1992		Anglian Water		
Shiplake Lock	Berkshire	9	30	1	1992		Thames Water		
Watermans Way	Berkshire	8	40	1	1992		Thames Water		
Wygate Park Spalding 1-8	Lincolnshire	130		1	1989	1997	Swallow Homes		
Hamm Court Runnymeade	Surrey	31	120	1	1989		Thames Water		
West End Village	Surrey	24	100	1	1989		Thames Water		
Woolram Wygate Spalding	Lincolnshire	30	30	1	1989		Martin Baker		
Thorncott & Hatch		22	66	1	1988		Anglian Water		
Bromley Green	Kent	42	110	1	1988		Southern Water		
Castle Rising	Norfolk	30	140	1	1988		Anglian Water		
Thorganby Village	Yorkshire	28	120	1	1988		Yorkshire Water		
Pagham Beach Phase 1-3	Sussex	72	250	1	1987	1991	Southern Water		
Crossways Dartford Phase 1-6	Kent	150		1	1987		Land Securities Ltd		
Earl Stonham	Suffolk	55	150	1	1987		Anglian Water		
Priory Road North Dartford	Essex	30	120	1	1987		Thames Water		
Beacons Way Skegness	Lincolnshire	30	120	1	1986		Anglian Water		
Church Lane Moor Monkton	Yorkshire	20	80	1	1986		Yorkshire Water		
Southfields Estate Orsett	Essex	36	160	1	1986		Anglian Water		
Oldbury on Severn (The Naith)	Gloucestershire	52	150	1	1986	2009	Wessex Water		
Gosport Factory	Hampshire	8		1	1985		Sweetheart Int.		
Holton St Mary	Suffolk	60	200	1	1985		Anglian Water		
High Street Spalding	Lincolnshire	14	60	1	1982		Anglian Water		
Low Fulney Estate Spalding	Lincolnshire	28	60	1	1982		Anglian Water		
Chelmsford Hospital	Essex	40		1	1980		Mid-Essex HA		
ENGLAND TOTAL		**2577**	**6121**	**56**					

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)		System Owner/Client	Pop.	Vacuum Main
Vert Le Petit (91)	Essonne	16		1	2010		Centre Etudes du Bouchet	800	
Biscarosse Bosque Nord - Gouben (40)	Landes	23		1	2008		MAIRIE	270	
Challans (85)	Vendee	49		1	2008		MAIRIE	300	
Chateauneuf Les Martigues (13)	Bouches du Rhone	31		1	2008		Marseille Provence Metropole	220	
Pont De Ce (49)	Maine-et-Loire	51		1	2008		SODEMEL	300	
Thenec 2 (17)	Charente-Maritime	14		1	2008		Syndicat des Eaux 17	363	
Amneville (57)	Moselle	21		1	2007		MAIRIE	420	
Marcoule (30)	Gard	130		1	2007		COGEMA		
Thenac 1 (17)	Charente-Maritime	13		1	2007		Syndicat des Eaux 17	819	
Ambronay (1)	Ain	21		1	2005	2006	DDAF de l'Ain	800	
Biscarosse Millas (40)	Landes	34		1	2005		MAIRIE	675	
Bonneuil (94)	Val-de-Marne	64		1	2005	2006	PORT Autonome de PARIS	3400	
Cap D'Agde -L'Ile St. Martin (34)	Herault	14		1	2005	2006	SCCV L'ILE ST MARTIN	800	
Port Medoc (33)	Gironde	20		1	2004		GUINTOLI Marine	700	
Sete (34)	Herault	41		1	2004		PROJETC Sud	1500	
CHM Montalivet (33)	Gironde	48		1	2003	2006	SOCNAT	4500	
St. Tropez Port (83)	Var	18		1	2003		OTH Mediterranee	1600	
Chamigny (77)	Seine-et-Marne	40		1	2002		B&R Ingenierie	350	
Berry au Bac		29		1	2001		DDE Laon		
Ury (77)	Seine-et-Marne	124		1	2001	2002	SAFEGE	1100	
Bury (60)	Oise	47		1	2000		DDE Clermont	400	
Holzwihr (68)	Haut-Rhin	134		1	2000	2001	DDE Colmar	1000	
Val de la Haye (76)	Seine-Maritime	56		1	2000	2001	CC agglomeration Rouen	500	
Batz Sur Mer 2 (44)	Loire-Atlantique	31		1	1999		SetPraud	720	
Belz Saint Cado (56)	Morbihan	106		1	1999	2001	Cabinet Guitton	2750	
Chize (79)	Deux Sevres	85		1	1999		DDE des Deux Sevres	1480	
Coquelles (62)	Pas-de-Calais	70		1	1999		DDE Calais	630	
La Chapelle des Marais (44)	Loire-Atlantique	62		1	1999		Sivom d'Herbignac	1080	
Marans (17)	Charente-Maritime	41		2	1999		DDAF de la Charente Maritime	400	
Souppes Sur Loing 2 (77)	Seine-et-Marne	44		1	1999	2005	DDE Nemours	150	
Biscarosse Latecoere (40)	Landes	21		1	1998		DDA 40	1800	
Dassault Aviation Merignac (33)	Gironde	21		1	1998		Dassault Aviation	800	
Riedwihr (68)	Haut-Rhin	59		1	1998	2000	DDE Colmar	816	
St. Julien de Concelles (44)	Loire-Atlantique	82		1	1998	2000	Sogreah / Praud	700	
Hopital du Vesinet (78)	Yvelines	40		1	1997		Beture	1750	
Jaux (60)	Oise	13		1	1997		Sogeti	279	
Outreau (62)	Pas-de-Calais	55		1	1997		DDE Samer Desvres	68	
Pontoise les Noyon Varesnes (60)	Oise	78		1	1997		DDA Beauvais DDE Noyon	1450	
Souppes sur Loing 1 (77)	Seine-et-Marne	43		1	1997		DDE Nemours	2030	
St. Jean aux Bois (60)	Oise	52		1	1997		Sogeti	385	
Garennes sur Eure (27)	Eure	190		1	1996	2001	DDA Evereux	1011	

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Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)		System Owner/Client	Pop.	Vacuum Main
Fort Mahon 2 (80)	Somme	18		1	1995		DDE Rue	2000	
Holtzwihr Wickerschwihr (68)	Haut-Rhin	118		1	1995		DDE Colmar	1800	
Mouy (60)	Oise	65		1	1994		DDE Clermont	3240	
Noyelles sur Mer (80)	Somme	105		1	1994		DDA Amiens	1950	
Precy sur Marne (77)	Seine-et-Marne	24		1	1994		DDE Claye Souilly	500	
Thionville (57)	Moselle	38		1	1994		Service Technique Thionville	450	
Gisy les Nobles (89)	Yonne	100		1	1993		DDA Auxerre	800	
Hourtin Piqueyrot (33)	Gironde	22		1	1993		DDE 33	1300	
Marignane (13)	Bouches du Rhone	35		1	1993	1994	Societe des Eaux de Marseille	1500	
Orconte (51)	Marne	82		1	1993		DDE Chalon s/Mame	600	
Batz sur Mer (44)	Loire-Atlantique	56		1	1992	1996	Set Praud	1000	
Port St. Louis du Rhone (13)	Bouches du Rhone	16		1	1992	1995	SI Borel	1800	
St. Ciers sur Gironde (33)	Gironde	75		1	1992	1998	Cabinet Merlin St. Andre de Cubzac	4500	
Pont Remy (80)	Somme	42		1	1991		DDA Amiens	2000	
La Teste PRL (33)	Gironde	28		1	1990	1996	DDE la Teste Cabinet Baure	3500	
St. Avit (33)	Gironde	152		1	1990	2004	DDAF de la Gironde	2500	
Allonne (60)	Oise	41		1	1989		DDA de Beauvais	1000	
Fort Mahon (80)	Somme	45		1	1989		DDE Rue (80)	1330	
Hourtin Lanchanau (33)	Gironde	56		1	1989	2005	DDE de la Gironde Arrondissement Ouest	1500	
Lagny sur Marne (77)	Seine-et-Marne	25		1	1989		DDE de Melun	400	
L'Untxin Ciboure (64)	Pyrenees Atlantique	50		1	1989	2004	DDE st. Jean de Luz	7500	
Milly sur Therain (60)	Oise	101		1	1989		DDA de Beauvais	2000	
Sissonne (2)	Aisne	90		1	1989		DDE de Laon	2400	
St. Louis de Montferrand (33)	Gironde	106		1	1989	2000	Lyonnaise des Eaux Dumez	3000	
Ingre (45)	Loiret	70		1	1988		Service Technique	1000	
St. Maixant (33)	Gironde	142		1	1988	1994	DDAF de la Gironde	1250	
Arbonne la Foret (77)	Seine-et-Marne	165		1	1987		DDA de Seine et Marne	1300	
Castres (2)	Aisne	34		1	1987		DDA de l'Aisne	240	
Hostens le Lac (33)	Gironde	8		1	1987	1988	DDAF de la Gironde	400	
Izon Ouest (33)	Gironde	77		1	1987	2005	Cabinet Socama a Merignac	1900	
Izone Centre (33)	Gironde	149		1	1987	2003	Cabinet Socama a Merignac	2600	
Sadirac (33)	Gironde	33		1	1987	1993	DDAF de la Gironde	300	
St. Macaire (33)	Gironde	140		1	1987	2003	Cabinet Socama a Merignac	2600	
St. Nicolas de Redon (44)	Loire-Atlantique	26		1	1987	1991	Services Technique	1900	
Thourotte Longueil Annel (60)	Oise	105		1	1987		DDE Ribecourt	1000	
Vayres (33)	Gironde	151		1	1987	2005	Cabinet Socama a Merignac	3000	
Vieux Moulin (60)	Oise	135		1	1987		DDA Oise DDE Compiegne	800	
Biscarrosse Ispes (40)	Landes	60		1	1986	2004	Cabinet Merlin St. Andre de Cubzac	5500	
Caudrot (33)	Gironde	117		1	1986		DDAF de la Gironde	1500	
Pineuilh (33)	Gironde	196		1	1986	2005	DDAF de la Gironde	1200	
Biscarosse Navarosse (40)	Landes	53		1	1985	2004	DDA 40	9600	

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)		System Owner/Client	Pop.	Vacuum Main
Biscarrosse Mayotte (40)	Landes	53		1	1985	2003	DDA 40	5200	
Fossoy (2)	Aisne	10		1	1985		DDE de l'Aisne	1600	
Gensac (33)	Gironde	82		1	1985	1992	DDAF de la Gironde	800	
Hourtin ZAC (33)	Gironde	70		1	1985	1993	Cabinet Duchassaing Merignac	6800	
Tracy le Mont		16		1	1985		DDE de Ribecourt	300	
Bruges Quartier du Tasta (33)	Gironde	75		1	1984	1996	CUB Cabinet Sogelerg	12000	
Hostens VVF (33)	Gironde	25		1	1984		VVF	3500	
St. Pierre d'Aurillac (33)	Gironde	86		1	1984	1988	DDE de la Gironde	650	
FRANCE TOTAL		**5699**	**0**	**91**					
Stadl/Brunn, 2.BA		20	20	1	2008				
Staning		80	80	1	2008				
Hennersdorf		40	40	1	2008				
Hilders		126	132	1	2007				
Stad/Brunn Phase 1	(with VAB Tronic)	33	60	1	2006				
Hörwalting Phase 1	(with VAB Tronic)	19	19	1	2006				
Christinedorf	(with VAB Tronic)	71	90	1	2006				
Doberlug Ost	(with VAB Tronic)	59	150	1	2006				
Scheppenbachtal Phase 1	(with VAB Tronic)	25	25	1	2006				
Mainleus	(with VAB Tronic)	13	13	1	2005				
Oberporing	(with VAB Tronic)	57	57	1	2005				
Cham Phase 3.BA	(with VAB Tronic)	61	61		2005				
Schmalensee		50			2005				
Barenklau	(with VAB Tronic)	78	78	1	2005				
Gressenwohr	(with VAB Tronic)	68	76	1	2005				
Ernsgaden		20			2005				
Jena		8			2005				
Genderkingen		6	6		2004				
Schmalensee		10	10		2004				
Bitterfeld (Retrofit)	(with VAB Tronic)	8	8		2004				
Basel				1	2004				
Athen/Flisvos	(with VAB Tronic)	7		1	2004				
Stavenhagen (Midjetstation)	(with VAB Tronic)	12	12	1	2004				
Blaibach	(with VAB Tronic)	55	55	1	2004				
Triftlfing		43	43	1	2004				
Altenwillershagen/Ahrenshagen	(with VAB Tronic)	89	420		2004	2005			
Guben Phase 2 + 3 + 4	(with VAB Tronic)	59	59		2004	2005			
Cham Phase 2	(with VAB Tronic)	60	60		2004				
Pirow/Bresch	(with VAB Tronic)	60	126	1	2003				
Schonebeck	(with VAB Tronic)	45	45	1	2003				
Guben Phase 1	(with VAB Tronic)	19	19	1	2003				
Altenwillershagen	(with VAB Tronic)	24	75	1	2003				

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Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)		System Owner/Client	Pop.	Vacuum Main
Cham Phase 1	(with VAB Tronic)	58	58	1	2003				
Berlin Spandau	(with VAB Tronic)	14	200	1	2002	2003			
Thurungen	(with VAB Tronic)	35	85	1	2002	2003			
Dasswang	(with VAB Tronic)	158	170	1	2002	2006			
Chemiepart Erweiterung									
Glauberstrasse Retrofit		17	17	1	2002	2006			
Kablow Retrofit		40	40	1	2002				
Bohlendorf	(with VAB Tronic)	8	120	1	2002	2005			
Berlin Charlottenburg Ost 1	(with VAB Tronic)	21	260	1	2001				
Berlin Charlottenburg Ost 2	(with VAB Tronic)	16	180	1	2001				
Groben		106	106	1	2001				
Grost Retrofit		38	90	1	2001				
Kablow		301	320	1	2001	2006			
Parkstetten		18	18	1	2001				
Tricat Industrial		4	1	1	2001				
Wentdorf / Cumlosen		205	225	1	2001				
Edengarten		80	220	1	2000	2006			
Berlin Charlottenburg	(with VAB Tronic)	133	2500	1	2000	2002			
Deggendorf Phase 1		103	103	1	2000				
Grost Retrofit		32	50	1	2000				
Jena Phase 1, 2,3, 4		337	337	1	1999	2002			
Karstadt		73	73	1	1999	2000			
Rudisleben Phase 1,2		185	185	1	1999	2000			
Burgheim		45	45	1	1998				
Wathlingen		45	45	1	1998				
Winkel Phase 1, 2, 3		289	289	1	1997	1999			
Campingplatz Niemtsch 1,2,3		22	190	1	1997	1999			
Schwarza Industrial	(with VAB Tronic)	64	64	1	1997	1998			
Probfeld		40	40	1	1997				
Rosa		22	22	1	1997				
Tornau		190	190	1	1997				
Schwemsal		185	235	1	1996	1997			
Goldenstedt Retrofit		8	8	1	1996				
Braunschweig		68	68	1	1995	1996			
Genshagen		60	280	1	1995	1996			
GERMANY TOTAL		**4345**	**8673**	**56**					
Flisvos Harbour	Athens	8	12	1	2004		Harbour Authority of Athens		
GREECE TOTAL		**8**	**12**	**1**					

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)		System Owner/Client	Pop.	Vacuum Main
Ujlengyel-Pusztavacs	Pest	254	1270	3	2005		Ujlengyel-Pusztavacs		16.1 km
Furta	Hajdu	161	566	1	2002	2004	Zsaka Furta	3140	11.3 km
Zsaka	Hajdu	183	741	1	2002	2004	Zsaka Furta	3140	12.9 km
Korsladany Phase 1	Bekes	144	686	1	2002	2003	Korsladany	2050	9.7 km
Berettyoujfalu Phase 2	Hajdu	179	1363		2001	2002	Berettyoujfalu	3600	11.9 km
Kondoros Phase 1	Bekes	130	698	1	2001		Kondoros	2100	9.4 km
Alsonemedi	Pest	451	1975	2	1998	1999	Alsonmedi	4800	26.7 km
Hernad	Pest	323	1250	1	1998	1999	Hernad	3500	29.8 km
Berettyoujfalu Phase 1	Hajdu	105	505	2	1997		Berettyoujfalu	1300	6.0 km
HUNGARY TOTAL		**1930**	**9054**	**12**					
Allenwood	Kildare	35	90	1	2005	UC	County Kildare		
IRELAND TOTAL		**35**	**90**	**1**					
Correzzola-Cive (PD)	Veneto	25	50	1	2003				1307m
Venice S Erasmo Island (VE)	Veneto	125		1	2003	2006			8765m
Venice SS Giovanni E Paolo Hospital (VE)	Veneto	53		1	2002	2003			1064m
Venice GB Giustinian (VE)	Veneto	22	50	1	1995	1996			911m
Saonara (PD)	Veneto	37	70	1	1993	1994			2100m
Ceneselli (RO)	Veneto	19	30	1	1992				
ITALY TOTAL		**281**	**200**	**6**					
Kazuno City Yuze	Akita	13		1	2010				.7Km
Shimonoseki City Kikugawa	Yamaguchi	477		5	2010				
Yatomi City Jyuushiyamaseibu	Aichi	60		1	2009				8.1Km
Sakura City	Tochigi	58		1	2009				
Matsushige City Nagahara	Tokushima	18		1	2009				1.2Km
Tsuruoka City Watamae	Yamagata	164		1	2007				
Kure City Hirokotsubo	Hiroshima	4		1	2007				1.0Km
Mima City Anabuki	Tokushima	63		1	2006				2.3Km
Kuwana City Nagashimahokubu	Mie	241		1	2006				13.1Km
Uken Town Uken-chuo	Kagoshima	51		1	2006				
Kouhoku Town Kamisou	Saga	27		1	2005				1.8Km
Takashima City Oota	Siga	55		1	2005				1.5Km
Kooriyama City Suimon	Fukushima	26		1	2005				0.7Km
Tsuyama City Hitori	Okayama	50		1	2005				1.5Km
Hamada City Kawaichi	Shimane	50	165	2	2005				7.8Km
Shimonoseki City Yoshiga	Yamaguchi	72	265	2	2005				10.1Km
Minamiawaji City Maruyama	Hyougo	30	323	1	2005				3.9Km
Sakata City Gunnkyou	Yamagata	83		1	2005				

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)	System Owner/Client	Pop.	Vacuum Main
Moseushi City Moseushi	Hokkaido	382		1	2005			
Maibara City Tawada	Shiga	73		1	2004			3.4Km
Tsuyama City Kume	Okayama	200		2	2004			10.8Km
Tamana City Oobiraki	Kumamoto	150	310	1	2004			8.0Km
Shyouwa Town Shimosyouwa	Fukushima	5	30	1	2004			0.6Km
Yatomi City Jyuushiyamaseibu	Aichi	200	1091	2	2004			23.3Km
Sanjyou City Honnjyouji	Niigata	140	318	1	2003			6.8Km
Maibara City Samegaikita	Shiga	36		1	2003			0.9Km
Maibara City Samegainishi	Shiga	9		1				0.3Km
Maibara City Samegaihigashi	Shiga	76		1	2003			2.9Km
Iki City Cyuuou	Nagasaki	75		1	2003			1.5Km
Kisugi Town Hinobori	Shimane	122	300	1	2003			
Iwaki Prefecture Nagai	Fukushima	69	131	1	2003			
Kawasato Town Kamiege	Saitama	47	84	1	2003			
Kohoku Town Haccho	Saga	184	190	1	2003			
Urakawa Town Ogibushi	Hokkaido	76	208	1	2003			
Shin-asahi Town Warazono	Shiga		182	1	2002			
Tamagawa Town Oura	Yamaguchi	8	23	1	2002			
Kaihu Town Kawanishi	Tokushima	228	205	1	2001			
Maibara Town Samegai	Shiga	113		1	2001			
O'mi Town Terakura	Shiga	51		1	2001			
Tobishima Village Takenogo	Aichi	55		1	2001			
Kogota Town Hirabari	Miyagi	101		1	2000			
Nango Town First District	Miyagi	250	471	1	2000			
O'ami-shirasato Town	Chiba	234		1	2000			
Uken Village Hirata	Kagoshima	43	101	1	2000			
Uken Village Taken	Kagoshima	11		1	2000			
Yatomi Town Hiroomi	Aichi			1	2000			
Yatomi Town Hokuseibu	Aichi	86		1	2000			
Yokohama City Minami-hommoku	Kanagawa	11		1	2000			
Jushiyama Village Hokubu	Aichi	184	343	1	1999			
Kikukawa Town Kamitabe	Yamaguchi	40	292	1	1999			
Kogota Town Ogizone	Miyagi	145	142	1	1999			
Kohoku Town Sarushi	Saga	315	450	1	1999			
Nakajima Town Kasashiho	Ishikawa	108	297	1	1999			
Shirako Town Third District	Chiba	556	556	1	1999			
Uken Village Ashiken	Kagoshima	90		1	1999			
Inagaki Village	Aomori	74	116	1	1998			
Isawa Town Atago	Iwate	360	368	1	1998			
Kogota Town Nakazone	Miyagi	190	165	1	1998			
Matsubushi Town	Saitama	80		1	1998			

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)	System Owner/Client	Pop.	Vacuum Main
Nagato City	Yamaguchi	60	148	1	1998			
Rokugo Town	Akita	150	1000	1	1998			
Seto Town	Okayama			1	1998			
Tamagawa Town	Yamaguchi	60	270	1	1998			
Uken Village Chuo	Kagoshima	94	320	1	1998			
Yokoshima Town Kuban	Kumamoto	150		1	1998			
Yuge Town	Ehime	211	753	1	1998			
Esashi Town	Iwate	78	157	1	1997			
Isawa Town Tsuji	Iwate	102		1	1997			
Mobara City	Chiba	520		1	1997			
Onga Town	Fukuoka	50	95	1	1997			
Onishi Town	Ehime	130	301	1	1997			
Shin'asahi Town	Shiga	130	420	1	1997			
Sobetsu Town	Hokkaido	52	140	1	1997			
Tsushima Town	Ehime	31		1	1997			
Kazuno City	Akita	60		1	1996			
Nango Town Fourth District	Miyagi	121	190	1	1996			
Nango Town Third District	Miyagi	326	567	1	1996			
Ota-ku	Tokyo	1		1	1996			
Tobishima Village	Aichi	120	204	1	1996			
Yokkaichi City	Mie	123	602	1	1996			
Isawa Town Kuyozuka	Iwate	235	336	1	1995			
Kikukawa Town Chuo	Yamaguchi	300	1007	1	1995			
Nango Town Second District	Miyagi	302	524	1	1995			
Shirako Town Second District	Chiba	806	796	1	1995			
Yokoshima Town Kurinoo	Kumamoto	244	441	1	1995			
Yokoshima Town Kyodomari	Kumamoto	163	302	1	1995			
Moseushi Town	Hokkaido	386	803	1	1994			
Okayama City	Okayama	26	119	1	1994			
Sapporo City	Hokkaido	15	16	1	1994			
Yahaba Town	Iwate	340	509	1	1994			
Miasa Town	Tottori	50		1	1993			
Yokoshima Town Yokoshima	Kumamoto	123	184	1	1993			
Hamamatsu City	Shizuoka	140	798	1	1992			
Shirako Town First District	Chiba	312	312	1	1992			
Saijo City	Ehime	78	215	1	1991			
Sanwa Village	Niigata	73	144	1	1991			
JAPAN (E) TOTAL		**12881**	**18799**	**104**				

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)	System Owner/Client	Pop.	Vacuum Main
Kogota Town	Miyagi	155		1	2003			
Yokkaichi City	Mie	8		1	2003			
Yokohama City Isesaki	Kanagawa	10		1	2003			
Yokohama City Naka-ku	Kanagawa	26		1	2003			
Yokohama City Nishi-ku Chuo	Kanagawa	16		1	2003			
Wakayama City Kusumoto	Wakayama	54		1	2003			
Noichi Town	Kouchi	59	230	1	2002			
Saya Town Chuo	Aichi	123		1	2001			
Kamitonda Town	Wakayama	239	420	1	2001			
Saya Town	Aichi	123		1	1998			
Yakake Town	Okayama	57		1	1998			
Hirata Town	Yamagata	100	216	1	1997			
Isawa Town	Iwate	200	370	1	1997			
Tsuroka City	Yamagata	36	99	1	1997			
Saya Town	Aichi	234	848	1	1996			
Shibetsu City	Hokkaido	176		1	1996			
Yahaba Town	Iwate	114	215	1	1996			
Fujishima Town	Yamagata	181	446	1	1995			
Nobeoka City	Miyazaki	100	736	1	1995			
Kikukawa Town	Yamaguchi	125	287	1	1994			
JAPAN (H) TOTAL		**2136**	**3867**	**20**				
Inashiki-Shi	Ibaraki			1	2009			
Aishin Light Metal	Toyama			1	2007			
Yokohama City (Station only)	Kanagawa			1	2006			
Hanoura-Nishi	Tokushima			1	2005			
Hachikai Vlg Hachikai-hokubu	Aichi		167	1	2003			
Hachika Vlg Hachikai-nambu	Aichi		200	1	2003			
Hachikai Vlg Hutako	Aichi	95	276	1	2003			
Kamimine Town Emukae	Saga	273	290	1	2003			
Hachikai Vlg Hachikai-chubu	Aichi	71	162	1	2002			
Yawara Village	Ibaraki		195	1	2002			
Hachikai Village / Higashikawa	Aichi	61	135	1	2001			
Nanao City	Ishikawa	44	162	1	2001			
Tako Town	Chiba	82	288	1	2001			
Hachikai Village Akame	Aichi	57	168	1	2000			
Yoshikawa Town	Niigata	83	233	1	2000			
Nagato City	Yamaguchi	61	229	1	1999			
Sanagouchi Village	Tokushima	130	168	1	1999			
Simokamakari Town	Hiroshima	88	383	1	1999			
Hachikai Village	Aichi	95	188	1	1998			

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)		System Owner/Client	Pop.	Vacuum Main
Konan Town	Saitama	134	315	1	1998				
Hirata Town	Gifu	200	335	1	1997				
Kotake Town	Fukuoka	84	230	1	1997				
Yuubetsu	Hokkaido	65	132	1	1997				
Katsuura Town	Tokusima	112	269	1	1996				
Utsunomiya City	Tochigi	14		1	1996				
Akiho Town	Yamaguchi	109	212	1	1995				
Fukui City	Fukui	94	287	1	1995				
Karuizawa Town	Nagano	42	160	1	1994				
Konan Town	Saitama	140	325	1	1994				
Nanno Town	Gifu	14	50	1	1994				
Kamimine Town	Saga	128	200	1	1993				
Kaizu Town	Gifu	6	142	1	1992				
Oshino Village	Yamanashi	190	490	1	1991				
Kawamoto Town	Saitama	3		1	1990				
JAPAN (K) TOTAL		**2475**	**6391**	**34**					
Pyeongtaek K-6 Dujung	Kyunggido	85	450	1	2010	UC	Pyeongtaek City		
Shingori Nuclear Power Plant (#3,4)	Kyungsang bukdo	16	30	1	2010	UC	Korea Hydro & Nuclear Power		
Seocheon	Chungcheong namdo	190	950	1	2009		Seocheon City		
Nuclear Low & Intermediate Level Waste Disposal	Kyungsang bukdo	6	8	1	2009		Korea Hydro & Nuclear Power		
Shinwolsung Nuclear Power Plant (#1,2)	Kyungsang bukdo	16	30	1	2008		Korea Hydro & Nuclear Power		
Hyundai Steel	Chungcheong namdo	120	150	4	2008		Hyundai Steel		
Gyeongju	Kyungsang bukdo	220	1120	2	2008		Korean Environmental Mgmt		
POSCO Extension(Finex #2)	Kyungsang bukdo	10	40	0	2007		POSCO		
Shingori Nuclear Power Plant (#1,2)	Kyungsang bukdo	13	30	1	2007	UC	Korea Hydro & Nuclear Power		
POSCO Extension (Finex)	Kyungsang bukdo	12	50	0	2006		POSCO		
Naegak	Kyunggido	36	150	1	2006		Korean Environmental Mgmt		
Shinwol	Kyunggido	55	220	1	2006		Korean Environmental Mgmt		
POSCO 2nd	Kyungsang bukdo	36	35	2	2005		POSCO		
POSCO 1st	Kyungsang bukdo	37	35	1	2005		POSCO		
HYNIX 2nd	Kyunggido	80	41	2	2004		HYNIX		
HYNIX 1st	Kyunggido	73	45	2	2004		HYNIX		
Doyang	Jeonra namdo	13	40	1	2004		Korean Environmental Mgmt		
Samsung Electronics Suwon Plant - 2 new vacuum stations	Kyunggido			2	2003		Samsung Electronics		
Kwangju	Kyunggido	72	232	1	2001		Korean Environmental Mgmt		
Samsung Electronics Suwon Plant Extension	Kyunggido	36	18	0	2001		Samsung Electronics		
Samsung Electronics Suwon Plant	Kyunggido	270	155	5	1994		Samsung Electronics		
KOREA TOTAL		**1396**	**3829**	**30**					

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)	System Owner/Client	Pop.	Vacuum Main
Palemona	Litvia	67	100	1	2000		600	
LITHUANIA TOTAL		**67**	**100**	**1**				
Indah Pulau		110	130	1	2004	JAKS		
MALAYSIA TOTAL		**110**	**130**	**1**				
Fovisste (Ciudad de la Carmen)	Campeche	23	200	1	2009	SMAPAC		
Mahahual - Phase 2	Quintana Roo	33	280	0	2008	CAPA		
Chiquila	Quintana Roo	36	18	1	2005	CAPA		
Holbox	Quintana Roo	84	880	1	2004	CAPA		
Mahahual	Quintana Roo	42	240	1	2002	CAPA		
Villas Chactemal	Quintana Roo	12	25	0	2002	Grupos Domos		
San Manuel	Campeche	26	180	1	1999	SMAPAC		
Isla Mujeres Retrofit	Quintana Roo	28	240	1	1999	Aguakan		
Progreso Zone 1	Yucatan	100	886	2	1999	SMAPAP		
Campeche	Campeche	178	887	2	1997	SMAPAC		
Chetumal Phase 1	Quintana Roo	159	1861	2	1997	CAPA		
Flamboyanes	Yucatan	138	1100	1	1982	SMAPAP		
MEXICO TOTAL		**859**	**6797**	**13**				
GW Amstelveen Extension		68			1998			
GW Gramsbergen Extension		42			1997			
GW Hardinxveld Giessendam Extension		15			1997			
GW Leiden Extension		10			1997			
GW Oirschot Extension		62			1997			
GW Amstelveen Extension		27			1996			
GW Dantumadeel Extension		32			1996			
GW Gramsbergen Extension		20			1996			
North Refinery		26		1	1995			
GW Dantumadeel		1		1	1988			
GW Huissen		16			1988			
GW Soest		1			1988			
GW Zevenaan		2		1	1988			
GW Neerynen		118		1	1986			
GW Neerynen		82			1986			
GW Soest		5		1	1986			
GW Heesch Project Wijstraat		59		1	1985			
GW Wijchen		32		1	1985			
GW Zeeland Project Graspeel		112		1	1985			
GW Zevenaar Project Babberich		115		1	1985			

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)	System Owner/Client	Pop.	Vacuum Main
GW Kollum Project Triemmen		49		1	1984			
GW Soest Project Wieksloterweg		72		1	1984			
GW Wijchen Div. Projecten		188		1	1984			
GW Zevenaar Project Uitbreiding Ooy		16		1	1984			
Heidemij Project GW Geffen		58		1	1984			
GW Hoogeveen GW Zuidwolde Project Alteveer		68		1	1983			
GW Huissen Project de Hoeve 1e Ease		48		1	1983			
GW Zevenaar Project Ooy		69		1	1983			
GW Edam-Volendam Project Oorgat		33		1	1982			
GW Haskerland Project Rohel		54			1982			
GW Haskerland Project St. Johannesga		74		1	1982			
GW Valburg Project Hervelo		114		1	1982			
NETHERLANDS TOTAL		**1688**	**0**	**20**				
Khasab		52	169	1	2001	Sultanate of Oman - Ministry of Regional Municipalities		
OMAN TOTAL		**52**	**169**	**1**				
Celestynow Phase IX		76			2011			
Celestynow Phase X		11			2011			
Gmina Rokietnica		4			2011			
Rzgow Phase 2011		14			2011			
Gmina Rokietnica		30			2010			
Rzgow Phase IId		49			2010			
Rzgow Phase IIc		104			2009			
Rzgow Phase IIb		70			2008			
Rzgow Phase IIa		41			2007			
Celestynow		96			2006			
Halinow		65			2006			
Imielin Phase 1		187		2	2006			
Rzgow Phase 1		160			2006			
Celestynow 2.stage		180		0	2003			
Celestynow B		57		0	2003			
Duszniki		31		1	2003			
Gmina Celestynow m. Glina		57		1	2003			
Gmina Rakoniewice m. Rostarzewo		50		1	2003			

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)		System Owner/Client	Pop.	Vacuum Main
Gmina Rokietnica 3.stage		15		0	2003				
Gmina Rokietnica 4.stage		136		0	2003				
Miasteczko Slaskie		240		1	2003				
Potworow 2		30		0	2003				
Tworog		112		1	2003				
Wielbark		100		1	2003				
Celestynow 1.stage		30		0	2002				
Gmina Rokietnica 2.stage		126		2	2002				
Warszawa Ursynow - Natolin Zachod		38		1	2002				
Gmina Ilowa		579		2	2001	2002			
Gmina Rokietnica 1.stage		90		1	2001				
Lesznowola		137		1	2001	2002			
Potworow 1		33		1	2001	2002			
Gmina Miescisko		193		1	2000				
Jedlnia Letnisko		55		1	2000				
Zakrzew		150		1	2000				
Gmina Ludwin m. Kaniwola		54		1	1999				
Gmina Zakrzew m. Milejowice		150		1	1998				
Miasto Olawa os. Odrzanska		144		1	1998	1999			
Miasto Skoko		104		1	1998	1999			
POLAND TOTAL		**3798**	**0**	**23**					
Almada Aroeira		32		1	2000		Silcoge SA / CM Almada	500	
PORTUGAL TOTAL		**32**	**0**	**1**					
Cantera	PR	505	1170	1	2010		Puerto Rico Water & Sewer Auth.		
Culebra	PR	230	600	1	2009		Puerto Rico Water & Sewer Auth.		
Barrio Obrero South - Phase I	PR	270	900	1	2008		Puerto Rico Highway Authority		
PUERTO RICO TOTAL		**1005**	**2670**	**3**					
Doha Block 1200 Vacuum Sewerage		54	129	1	1995		Ministry of Municipal Affairs & Agriculture Doha, Qatar		
QATAR TOTAL		**54**	**129**	**1**					
Archerfield Extension	East Louthian	10			2010		Caledonian Heritable Ltd		
Drum	Perth & Kinross	61	150	1	2006		Scottish Water		
Archerfield Golf	East Louthian	59	200	1	2005		Caledonian Heritable Ltd		
SCOTLAND TOTAL		**130**	**350**	**2**					
Vajnory 1st Stage	Bratislava (SR)	78	235	1	1998			2500	
SLOVAKIA TOTAL		**78**	**235**	**1**					

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)		System Owner/Client	Pop.	Vacuum Main
Dornava		37		1	2006				
Logatec		16		1	2004	UC			
SLOVENIA TOTAL		**53**	**0**	**2**					
Empuriabrava Phase 3	Catalunya	118		1	2010	UC	Town Hall Castello d'Empuries		
Empuriabrava Phase 4	Catalunya	83		1	2009	UC	Town Hall Castello d'Empuries		
America's Cup	Valencia	26	60	1	2005		Consorcio 2.007		
Marxuquera Phase 1	Valencia	35		1	2005		Town Hall of Gandia		
Callosa del Segura	Valencia	118	535	1	2005		Generalitat Valenciana		
IMT Tarragona	Catalunya	12	32	1	2005		International Marina Tarraco		
Marenys de Rafalcaid	Valencia	131	472	1	2005		Town Hall of Gandia		
Gandia Playas	Valencia	25	25	1	2004		Private Company		
Roses Harbor	Catalunya	7	21	1	2004		Generalitat Harbors Authority		
Vilanovia i la Geltru Harbor	Catalunya	8	15	1	2004		Generalitat Harbors Authority		
Arenys de Mar Harbor	Catalunya	7	10	1	2003		Generalitat Harbors Authority		
Barcelona Maremagnum Port 2,000	Catalunya	55	115	1	2003		Barcelona Harbor Authority		
Empuriabrava Phase 2	Catalunya	90	962	1	2003		Town Hall Castello d'Empuries		
Barcelona Commercial Harbor	Catalunya	39	49	1	2001		Barcelona Harbor Authority		
Empuriabrava Phase 1	Catalunya	72	870	1	1999		Town Hall Castello d'Empuries		
SPAIN TOTAL		**826**	**3166**	**15**					
Pen Bay Racetrack - Phase 2	Pingtung	12		0	2012		Pen Bay Co.		
Pen Bay Racetrack - Phase 1	Pingtung	22		1	2011		Pen Bay Co.		
TAIWAN TOTAL		**34**	**0**	**1**					
Muang Thong Bangna		60		1	1992		Bangkok Land Company		
THAILAND TOTAL		**60**	**0**	**1**					
Madinat Jumeirah	Dubai	7		1	2004		Madinat Jumeirah		
UNITED ARAB EMIRATES TOTAL		**7**	**0**	**1**					
Alakanuk	AK	140	130	1	95		Village of Alakanuk		
Emmonak	AK	240	240	1	86		Emmonak Water & Sewer		
Kaktovik (NSB)	AK	100	100	1	2002		North Slope Borough		
Kotlick	AK	75	84	0	98		Native Health Service		
North Slope Borough	AK	205	205	0	2000		North Slope Borough		
Point Hope (NSB)	AK	220	220	1	99		North Slope Borough		
Savoonga	AK	43	43	0	98		Native Health Service		
Selawik	AK	80	80	1	96		Village of Selawik		
Mobile / Scott Paper	AL	28	0	1	72		Turner Supply		

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)	System Owner/Client	Pop.	Vacuum Main
Calico Rock	AR	93	150	1	93	City of Calico Rock		
Oppelo	AR	159	300	2	96	City of Oppelo		
Ward	AR	84	250	1	94	Ward City Hall		
Fallen Leaf Lake S. Tahoe	CA	13	200	1	82	Lake Tahoe P.U. District		
New Haven Train Station	CT	30	30	1	95	New Haven Train Station		
Apalachicola	FL	508	1,176	1	2002	City of Apalachicola		
Bay Point	FL	161	348	1	2005	F.K.A.A.		
Carrabelle	FL	286	793	1	2002	City of Carrabelle		
Carrabelle Extension	FL	67	237	0	2003	City of Carrabelle		
Cedar Grove, CDBG	FL	25	52	1	2001	City of Cedar Grove		
Cedar Grove, North & South	FL	410	900	1	2003	City of Cedar Grove		
Dinner Key	FL	135	250	1	94	City of Miami		
Eastpoint, Ph 1-2	FL	315	541	2	75	Eastpoint Water & Sewer		
Englewood, AV4 & AV5	FL	24	75	0	2000	Englewood Water District		
Englewood, V1 Ph 1, 3-8	FL	420	2,000	1	96	Englewood Water District		
Englewood, V2 Ph 2	FL	415	1,100	1	99	Englewood Water District		
Englewood, V3	FL	482	1,300	1	2000	Englewood Water District		
Englewood, V4	FL	423	1,129	1	2000	Englewood Water District		
Englewood, V5	FL	210	539	0	2000	Englewood Water District		
Englewood, V6	FL	344	420	1	2003	Englewood Water District		
Englewood, V6 Private	FL	24	24	1	99	Englewood Water District		
Englewood, V7	FL	189	500	1	2004	Englewood Water District		
Englewood, V8	FL	133	460	0	2003	Englewood Water District		
Gulfstream Park	FL	46	524	1	2004	Gulfstream Park		
Indian River/Rockridge	FL	257	400	1	2008	Indian River County		
Key Largo Basin BCD/Lake Surprs.	FL	1,020	2,900	2	2009	KLWTD		
Key Largo TPTV	FL	201	612	1	2006	Key Largo WW Treatment Distr.		
KLWWTD Area A	FL	321	903	1	2010	KLWWTD		
KLWWTD Area D	FL	230	803	1	2010	KLWWTD		
KLWWTD Area E/F	FL	537	2,110	1	2010	KLWWTD		
KLWWTD Area G/H	FL	360	1,441	1	2010	KLWWTD		
KLWWTD Area I	FL	477	1,906	1	2010	KLWWTD		
KLWWTD Area J/K	FL	538	2,150	1	2010	KLWWTD		
Lake Forest	FL	413	965	1	2009	J.E.A.		
Lanark Village	FL	88	450	1	91	Lanark Water & Sewer		
Little Venice & Extension	FL	371	840	1	2004	F.K.A.A.		
Longwood	FL	20	39	1	96	City of Longwood		
Loxahatchee Nature Ctr	FL	1	1	1	95	City of West Palm Beach		
Marathon Area 3	FL	177	407	1	2010	City of Marathon		
Marathon Area 5	FL	454	1,240	1	2010	City of Marathon		
Marathon, Area 4	FL	317	792	1	2009	City of Marathon		
Marathon, Area 6 + Alt 4	FL	114	276	1	2009	City of Marathon		

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)	System Owner/Client	Pop.	Vacuum Main
Marathon-Marlin Bay Yacht Club	FL	37	82	1	2008			
Marathon-Sombrero Beach Road	FL	36	79	0	2007	City of Marathon		
Martin Co., Lighthouse / Seagate	FL	139	500	1	2005	Martin Co. Utilites & SWD		
Martin County (Canopy Creek)	FL	159	240	1	2010	Martin Co. Utilites & SWD		
Martin County (North River Shores) ph 1	FL	176	525	1	2010	Martin Co. Utilites & SWD		
Oakwood Villa	FL	459	1,311	1	2008	J.E.A.		
Ocean Reef	FL	175	275	1	2002	North Key Largo Utility Corp.		
Okeechobee Ousley Estates	FL	70	81	1	2002	Okeechobee Utility Authority		
Okeechobee Taylor Creek West	FL	310	1,356	1	2004	Okeechobee Utility Authority		
Pattersontown	FL	35	70	1	91	City of Milton		
Ponte Vedra Beach	FL	368	811	1	2005	J.E.A.		
Sanford, Ph 1-4	FL	400	1,250	1	90	City of Sanford		
Sarasota Area D	FL	493	1,163	1	2009	Sarasota County		
Sarasota Area N	FL	690	1,900	1	2010	Sarasota County		
Sarasota, Area C	FL	346	629	1	2008	Sarasota County		
Sarasota, Area E	FL	229	565	1	2003	Sarasota County		
Sarasota, Area F	FL	448	1,150	1	2005	Sarasota County		
Sarasota, Area K East	FL	594	1,323	1	2009	Sarasota County		
Sarasota, Area K West	FL	710	1,294	1	2009	Sarasota County		
Scott Mill	FL	293	320	1	2008	J.E.A.		
Silver Palms (RV Park) Ph 1	FL	63	230	1	2010	Okeechobee Utility Authority		
Stock Island	FL	119	1,200	1	2003	Keys Environmental		
Village of Palm Springs	FL	53	91	1	99	Village of Palm Springs		
VPS, 10th & Kirk	FL	164	350	1	2005	Village of Palm Springs		
VPS, YMCA/ Congress	FL	179	350	1	2000	Village of Palm Springs		
Waterside Pointe -Phase 1	FL	131	288	1	2008	Ryland Homes		
Sarasota, Area A	FL	383	1,150	1	2005	Sarasota County		
Ivey, Lake Tchukolako	GA	265	500	2	2003	Town of Ivey		
Peoria/Keystone Steel	IL	14	14	1	76	Keystone Steel		
Adams Lake	IN	209	389	3	92	Adams Lake Sanitary District		
Bruceville	IN	120	300	1	2009	Town of Bruceville		
Country Squire Lake (N. Vernon)	IN	500	950	7	74	Jennings NW Regional		
Foxcliff/Mapleturn (Martinsville)	IN	38	38	1	73	Mapleturn Utilities		
Gnawbone	IN	50	106	1	2000	Gnawbone Reg. Sewer Distr.		
JNRU	IN	550	1,200	8	UC	Jennings NW Regional		
Lafayette	IN	30	0	1	77	Information Confidential		
Lake Bruce	IN	132	324	2	2008	Lake Bruce Sewer District		
Lake Manitou	IN	435	775	3	88	City of Rochester		
Monterey	IN	77	122	1	2001	Town of Monterey		
Montezuma	IN	256	472	1	UC	City of Montezuma		
North Webster	IN	212	410	2	94	Town of North Webster		
Oaktown	IN	136	336	1	99	Town of Oaktown		

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)	System Owner/Client	Pop.	Vacuum Main
Pine Lake (LaPorte)	IN	77	160	1	98	Pine Lake Conservancy Dist.		
Plainville	IN	163	270	1	75	Town of Plainville		
Rome City / West Lakes RSD	IN	155	320	1	2008	West Lakes RSD		
Silver Lake	IN	192	300	2	92	Silver Lake Utilities		
Skinner Lake (Albion)	IN	70	145	1	97	Skinner Lake Reg. Sewer Dist.		
Stockwell	IN	132	197	1	2004	Lauramie Township RSD		
Tri-Lakes (Columbia City)	IN	540	1,000	4	94	Tri-Lakes Sewer District		
Tri-Lakes, Big & Loon Lakes	IN	320	700	2	2001	Tri-Lakes Sewer District		
Witmer Lake/Wolcottville	IN	115	225	1	96	Town of Wolcottville		
Wolcottville North	IN	275	500	1	99	Town of Wolcottville		
Alton	KY	210	430	4	87	Alton Water & Sewer District		
Baton Rouge/Poulene	LA	8	8	1	74	Rhone Poulene		
Barnstable, Route 28	MA	39	40	1	2002	Town of Barnstable		
Plum Island	MA	580	1,056	1	2006	City of Newburyport		
Provincetown	MA	259	2,265	1	2003	Town of Provincetown		
Bay City	MD	223	750	1	95	Queen Anne's Co. San. District		
Cedar Cove/Spyglass	MD	19	156	1	85	St. Mary's/Oxford Association		
Cloverfields	MD	336	950	1	94	Queen Anne's Co. San. District		
Crisfield	MD	157	300	1	97	Somerset Co. Sanitary District		
Fairmount/Somerset	MD	159	238	1	81	Somerset Co. Sanitary District		
Queen Anne's County	MD	1,300	3,500	12	81	Queen Anne's Co. San. District		
St. Michaels/Martingham	MD	140	175	1	72	Martingham Utilities		
Swan Point/Charles Co. (LaPlata)	MD	109	175	1	88	Charles Co. Public Utility		
Gregory	MI	63	231	1	2002	Multi-Lake Reg. Sewer District		
Patterson Lake/Kaiserville	MI	157	320	1	2002	Multi-Lake Reg. Sewer District		
Iron Mountain Lake	MO	241	368	1	2000	City of Iron Mountain Lake		
Poplar Bluff, East Butler	MO	227	443	1	2003	East Butler Sewer District		
Caswell Beach	NC	136	358	1	UC	Town of Caswell Beach		
Eagle Crk/Mill Run (Moyock)	NC	152	423	1	99	Arland Community Develop.		
Grimesland	NC	97	228	1	2003	City of Grimesland		
Holden Beach Service Area 1	NC	480	1,352	1	2006	Town of Holden Beach		
Holden Beach Service Area 2-3-4	NC	830	1,575	3	2006	Town of Holden Beach		
Locust/Brown's Hill	NC	46	108	1	98	City of Locust		
Locust/Meadow Creek Church	NC	161	322	1	2000	City of Locust		
New Bern/Haywood	NC	43	130	1	94	City of New Bern		
New Bern/Highway 55	NC	40	75	1	94	City of New Bern		
New Bern/Pembroke	NC	97	150	1	94	City of New Bern		
New Bern/Woodrow	NC	45	90	1	94	City of New Bern		
North River Club Beaufort Ph 1	NC	61	158	1	2007	Town of Beaufort		
Northwest	NC	120	238	1	2009	City of Northwest		
Oak Island Ph 1	NC	1,200	2,600	3	2009	Town of Oak Island		
Oak Island Ph 2	NC	2,400	7,200	6	2010	Town of Oak Island		

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)	System Owner/Client	Pop.	Vacuum Main
Stanfield	NC	129	190	1	2001	Town of Stanfield		
Sunset Beach	NC	597	1,085	1	UC	Brunswick County		
Trentwoods	NC	586	854	2	2004	City of New Bern		
Alloway	NJ	98	190	1	2009	Alloway Township		
Albuquerque NV Area B & F	NM	184	628	1	2000	City of Albuquerque Water Utility		
Albuquerque NV Area C	NM	36	72	0	2003	City of Albuquerque Water Utility		
Albuquerque NV Area D Ph 1	NM	215	500	1	2003	City of Albuquerque Water Utility		
Albuquerque NV Area D Ph 2	NM	347	728	0	2004	City of Albuquerque Water Utility		
Albuquerque NV Area E	NM	76	187	0	2003	City of Albuquerque Water Utility		
Albuquerque NV Area K Ph 1 & 2	NM	162	327	1	2005	City of Albuquerque Water Utility		
Albuquerque NV Paseo del Norte	NM	246	493	1	95	City of Albuquerque Water Utility		
Albuquerque SV Coors	NM	166	378	1	2006	City of Albuquerque Water Utility		
Albuquerque SV Gun Club Ph 2	NM	264	414	1	95	City of Albuquerque Water Utility		
Albuquerque SV Gun Club Ph 4-5	NM	170	364	1	98	City of Albuquerque Water Utility		
Albuquerque SV Los Padillos Ph 1-3	NM	450	980	1	95	City of Albuquerque Water Utility		
Albuquerque SV Pajarito VI-IX Ph 1	NM	91	177	1	2003	City of Albuquerque Water Utility		
Albuquerque SV Pajarito VI-IX Ph 2	NM	145	290	1	2003	City of Albuquerque Water Utility		
Albuquerque SV Polk	NM	264	600	1	2003	City of Albuquerque Water Utility		
Albuquerque SV Polk Ph 2A	NM	298	625	0	2004	City of Albuquerque Water Utility		
San Pablo	NM	62	167	1	2004	City of Las Cruces		
San Pablo Ph 2	NM	35	55	0	2005	City of Las Cruces		
Sunland Park	NM	5	120	1	2002	City of Sunland Park		
Truth or Consequences	NM	80	150	1	96	City of Truth or Consequences		
Glen Park (Watertown)	NY	97	166	1	95	Village of Glen Park		
Jimmersontown (Salamanca)	NY	98	135	1	99	Seneca Nation of Indians		
Lafargeville	NY	142	238	1	83	Lafargeville Sewer District		
Lake Chautauqua (Celeron)	NY	868	1,800	4	86	Lake Chautauqua PSD		
Morristown	NY	144	218	1	87	Village of Morristown		
Steamburg	NY	84	84	1	UC	Seneca Nation of Indians		
Theresa	NY	141	237	1	89	Village of Theresa		
Bellwood/Geauga Co.	OH	66	66	1	99	County of Geauga		
Brayton Trail (Chardon)	OH	7	13	1	94	Geauga County		
Clifton	OH	61	126	1	94	Greene Co. Sanitary Engineer		
Crystal Lake/Medway	OH	438	975	2	94	Clark Co. Utilities		
Damascus	OH	52	96	1	2002	Mahoning Co. Bd. Of Commiss.		
Damascus Extension	OH	60	110	0	2003	Mahoning Co. Bd. Of Commiss.		
Forest, Ph 1	OH	65	146	1	2002	Village of Forest		
Forest, Ph 2	OH	79	206	0	2004	Village of Forest		
McCartyville	OH	44	100	1	2007	Shelby County Sewer District		
McGuffey, Ph 1-2	OH	142	258	1	2000	Village of McGuffey		
Montpelier	OH	50	80	1	93	Village of Montpelier		
Montpelier Extension	OH	45	82	0	2002	Village of Montpelier		

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)	System Owner/Client	Pop.	Vacuum Main
Montpelier, Ph 2	OH	50	102	1	98	Village of Montpelier		
N. Lima/Mahoning Co.	OH	117	200	1	2001	Mahoning County		
Parkman	OH	83	130	1	2007	Geauga Co. Water Res.		
Randolph Co. / Portage	OH	43	156	1	2008	Portage Co. Water Res.		
Bend, Woodriver Village	OR	75	148	1	2002	City of Bend		
Miles Crossing	OR	331	340	1	2009	City of Miles Crossing		
Lanse/Kylertown/Winburne	PA	389	747	3	2002	Cooper Twp. Municipal Auth.		
Beallsville	PA	127	235	1	91	Borough of Beallsville		
Cooper Twp/Grassflats	PA	165	430	1	2002	Cooper Twp. Municipal Auth.		
Fripp Island	SC	356	733	1	2006	Fripp Island PSD		
Charlotte	TN	212	360	1	84	City of Charlotte		
Westmoreland	TN	486	700	4	79	City of Westmoreland		
White House	TN	349	698	2	87	City of White House		
Beach Road MUD (Matagorda)	TX	88	320	1	98	Beach Road MUD		
Caney Creek / Sargent	TX	273	741	1	2006	City of Sargent		
Canutillo	TX	59	128	1	2001	El Paso Water Utilities		
Daingerfield State Park	TX	32	86	1	UC	Texas Parks and Wildlife		
LaSalle Ranch Sanctuary Subdiv.	TX	287	750	1	2009	DH Development		
Orangefield - Phase 1	TX	180	270	1	2010	Orangefield Water Supply Corp.		
Orangefield - Phase 2	TX	195	270	1	2010	Orangefield Water Supply Corp.		
Port O'Connor	TX	523	1,121	2	2001	Port O'Connor MUD		
Port O'Connor Line Extension	TX	3	0	0	2010	Port O'Connor MUD		
Port O'Connor, Deerwood	TX	10	25	0	2002	Port O'Connor MUD		
Port O'Connor, Larry's Harbor	TX	27	45	0	2002	Port O'Connor MUD		
Surfside Beach	TX	11	20	1	2000	Village of Surfside		
Surfside Beach Ph 2	TX	186	250	0	2006	Village of Surfside		
Hooper	UT	640	1,280	3	2007	Hooper City		
Alanton	VA	161	305	1	2000	City of Virginia Beach		
Back Creek	VA	31	84	0	2006	County of York		
Calthrop Neck	VA	94	188	1	2000	County of York		
Cape Charles, Ph 1	VA	150	300	1	2001	City of Cape Charles		
Colony at Bay Creek	VA	98	152	1	2002	Baymark Construction Corp.		
Dandy (Grafton)	VA	89	204	1	98	County of York		
Dare (Grafton)	VA	229	473	1	99	County of York		
Dare, Ph 3 & 4	VA	119	175	0	2002	County of York		
Dozier's Bridge	VA	50	72	1	95	City of Virginia Beach		
Heron Point at Bay Creek	VA	32	50	1	2003	Baymark Construction Corp.		
High Gates Green	VA	64	80	0	96	City of Virginia Beach		
Huntersville/Suffolk	VA	12	32	1	93	City of Suffolk		
Isle of Wight/Windsor	VA	223	406	1	2000	County of Isle of Wight		
Langley Air Force Base	VA	42	92	1	2007	Langley Air Force Base		

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)	System Owner/Client	Pop.	Vacuum Main
Langley General Quarters	VA	80	176	1	2009	Langley Air Force Base		
Little Neck Creek	VA	207	356	1	2006	City of Virginia Beach		
Marlbank Farms/York Co.	VA	181	383	1	2006	County of York		
Mathews Courthouse	VA	150	225	1	74	H.R.S.D.		
Mt. Zion (Charles City)	VA	19	60	1	93	Charles City Co. Utility		
Nansemond Parkway	VA	50	200	1	97	City of Suffolk		
Nansemond Pkwy/Progresso Rd.	VA	49	67	1	98	City of Suffolk		
Northumberland	VA	283	472	1	2003	Northumberland County		
Patrick's Creek/Old Lakeside	VA	41	81	1	99	County of York		
Patrick's Creek/Piney Point	VA	100	215	0	2001	County of York		
Reedville	VA	87	103	1	96	Northumberland County		
Respass Beach/Harborview	VA	145	464	1	96	City of Suffolk		
Seaford, Ph 1	VA	108	275	1	95	County of York		
Seaford, Ph 2	VA	162	423	0	96	County of York		
Seaford/Claxton Creek	VA	107	204	0	2002	County of York		
Washington District/Westmoreland	VA	407	500	1	2006	Westmoreland County		
York Point, Ph 1	VA	49	118	1	2009	County of York		
Carnation	WA	304	657	1	2008	City of Carnation		
Grand Mound	WA	35	70	2	98	Thurston County		
Lower Elwah	WA	90	200	1	UC	Lower Elwah Klallam Tribe		
Ocean Shores - Sta 1	WA	7	53	1	94	City of Ocean Shores		
Ocean Shores - Sta 2	WA	878	1,400	1	96	City of Ocean Shores		
Ocean Shores- Sta 1 (new)	WA	509	1,200	1	99	City of Ocean Shores		
Ocean Shores- Sta 3	WA	1,265	1,600	1	99	City of Ocean Shores		
Ocean Shores- Sta 4	WA	582	1,200	1	99	City of Ocean Shores		
Ocean Shores- Sta 5	WA	717	1,200	1	99	City of Ocean Shores		
Ocean Shores- Sta 6	WA	405	1,600	1	99	City of Ocean Shores		
Ocean Shores- Sta 7	WA	1,036	3,500	1	99	City of Ocean Shores		
Salmon Beach/Tacoma	WA	83	83	1	91	City of Tacoma		
Vashon Island/Beulah Park	WA	30	60	1	2001	Vashon Island Sewer District		
Vashon Island/Bunker Trail	WA	25	50	1	2001	Vashon Island Sewer District		
Beech Bottom	WV	50	150	1	92	Brooke Co. PSD		
Big Sandy (Elkview)	WV	236	357	3	91	Big Sandy PSD		
Bradshaw	WV	73	147	1	94	Town of Bradshaw		
Bramwell	WV	184	300	2	94	Bluewell PSD		
Central Boaz (Parkersburg)	WV	171	355	1	88	Central Boaz PSD		
Claywood Park (Parkersburg)	WV	161	218	1	91	Claywood Park PSD		
Friendly/Ben's Run	WV	220	325	2	85	Friendly PSD		
Hancock Co. (Weirton)	WV	235	270	2	97	Hancock County		
New Cumberland	WV	101	202	1	90	City of New Cumberland		
Ohio Co. (Cedar Rocks)	WV	200	250	1	84	Ohio Co. PSD		
Ohio Co., Ph 2A (Peters Run)	WV	100	150	1	87	Ohio Co. PSD		

AIRVAC PROJECT LIST

Project Name	Prefecture Region	No. Valves	No. Conn	No. Stations	Year(s)	System Owner/Client	Pop.	Vacuum Main
Ohio Co., Ph 2B (SC,BZ,SH)	WV	240	350	3	88	Ohio Co. PSD		
Pine Grove	WV	184	380	1	94	Town of Pine Grove		
Red Jacket (Matewan)	WV	130	150	1	85	Red Jacket Public Service		
Washington Lands (Moundsville)	WV	108	162	1	87	Marshall Co. PSD		
Waverly/Union Williams	WV	114	140	1	92	Union Williams PSD		
Worthington	WV	232	329	2	95	Town of Worthington		
Worthington/Idamay/Carolina	WV	119	422	1	2000	Greater Marion PSD		
UNITED STATES TOTAL		**59609**	**136843**	**315**				
Big Bear Lake	CA	80	80	1	1994	San Bernardino County		
Oyster Point Marina	CA	7	7	1	1998	San Mateo County		
Ocean Pines	MD	2351	5000	15	76	Worcester Co.		
Palmetto Dunes/Broadcreek	SC	262	657	2	75	Broadcreek PSD		
Virginia Beach Sandbridge	VA	614	1000	2	2001-03	City of Virginia Beach		
UNITED STATES RETROFIT TOTAL		**3314**	**6744**	**21**				
Nash Village	Newport	24	49	1	2002	Welsh Water		
Four Crosses Sewerage	Powys	34	120	1	1987	Severn Trent		
WALES TOTAL		**58**	**169**	**2**				
Canouan Resorts Ltd		41	160	2	1995			
WEST INDIES TOTAL		**41**	**160**	**2**				
US		59,609	136,843	315				
US Retrofit		3,314	6,744	21				
International		56,540	101,587	614				
WORLD TOTAL		**119,463**	**245,174**	**950**				

Myers Rebuttal Exhibit C

QUAVAC PROJECT LIST

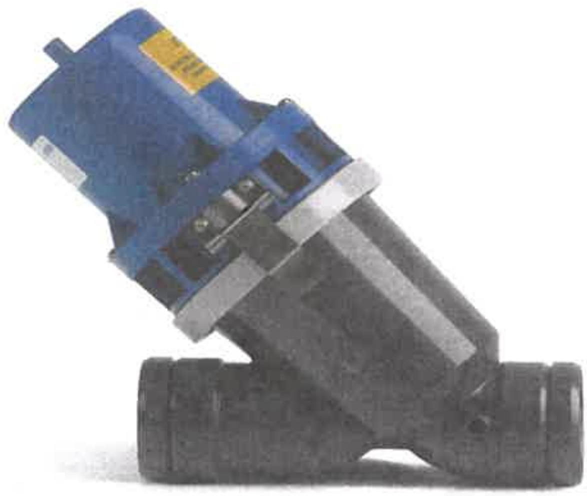
Myers Exhibit C

Quarry Project List

Qua-vac

Reference list

Updated 2021



Qua vac Reference list Australia

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Freemantle Sailing Club	500	2	1979
2	Station Pier	600	22	1973
3	South Wharf	200	2	1971
4	Victoria Dock	300	8	1974
5	St. Kilda Pier	450	2	1975
6	Summerhile Mobile Home Park	2010	47	1989
7	St. Kilda Peir Upgrade	450	2	1989
8	V-Line Carriage	520	1	1989
9	Tacoma	15200	295	1990
10	Pinkenba	-	24	1999/2005
11	Brighton Pathology Lab.	300	10	2012
12	Tacoma NSW		50	2017
13	Kurnell (rebuild Airvac)		450	2015
14	Bonnet Bay		35	2015

Qua vac   Reference list Austria

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Klagenfurt	250	9 VT / 4 GWT	1995
2	Blumenfreunde	2.500	64	1997
3	Schwendt	8.400	85	1998
4	Zirl	1.600	30	1999
5	Fritzens	1250	29	2000

Quavac Reference list Belgium

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Recr. Park Stabo Leuven	550	4	1977
2	Zilverstrand te Mol, Recreation Area	1700	24	1990
3	Community Jabbeke Domain "Flaminckapark", Ejector station underground	1900	24	2001
4	Community Namur I	800	35	2006
5	Community Namur II	1500	75	2010
6	Dinant I	1500	45	2013
7	Dinant 2	1500	65	2014
8	Chatelet	1400	44	2015
9	Dinant 3	1600	21	2014
10	Dinant 4	1700	53	2015

Qua vac Reference list Botswana

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Kasana / Kazangula	63500	400	2015
2	Kanye	51800	547	Under construction

Quavac Reference list Canada

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Southwestminster	40000	1000	1979
2	The District of Invermere	3000	120	1984
3	Black Tusk Village	2000	100	1983

Qua vac

Reference list Denmark

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Olstykke Stationavej	2700	29	1976
2	Ledφje-Smφrum.	370	7	1976
3	Aggersund	5000	48	1976
4	Skanderborg	450	6	1978
5	Purhus	650	21	1978
6	Sdr. Sejerslev.	1520	12	1978
7	Visby	2210	17	1979
8	Vesternäs	2000	33	1979
9	Gundsφ Jyllinge Nord	18000	187	1980
10	Hillerφd	395	28	1980
11	Superfos	1250	15	1980
12	Olstykke	1560	10	1980
13	Allerod	1110	22	1986
14	Rudbol	470	6	1990
15	Ebeltoft	3000	29	1991
16	Siltoftevje	900	12	1991
17	Emmerlev	3000	27	1994
18	Mariagerfjord Etape 3		59	2018
19	Ebeltoft			2018
20	Vejle		32	2019
21	Mariagerfjord Etape 4		95	2019
22	Ringkøbing - Skjem Forsyning		110	U.C.
23	Lalandia		110	U.C.
24	Hillrod		1	2020
25	Vestforsyning Spildevand Norhede		120	U.C.
26	Horsens		8	U.C.

Reference list Denmark

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Laulasma	10550	147	2019
2	Roobuka	12800	185	2020
3	Tyrisalu I		126	U.C.
4	Tyrisalu II		95	U.C.

Quavac Reference list France

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Juvigny I	1100	21	1975
2	Juvigny II	520	18	1978
3	Juvigny III	460	18	1980
4	Souppes/Loing	1800	18	1976
5	Bethisy St. Pierre	650	11	1976
6	Longueil-Annel I	850	39	1978
7	Longueil-Annel II	1300	25	1979
8	Gujan/Mestras Camping	2400	21	1980
9	Montalivet Camping	6400	43	1981
10	Cayeux Sur Mer Camping	-	-	1981
11	Hostens	2500	40	1982
12	Ile de Ré	-	-	1983
13	Le Wafou,Cote d'Ivoire	-	-	1983
14	Bruges Le Tasta Villabois	-	-	1984
15	St. Pierre d'Aurillac	-	-	1984
16	Fossoy	-	-	1985
17	Hourtin Camping	-	-	1985
18	Biscarosse Camping	-	-	1985
19	Tracy le mont Community	-	-	1985
20	Romilly Camping	-	-	1985
21	Gensac Community	4385	72	1985
22	Sadirac Community	2300	45	1985
23	Gironde sur Dropt Community	3200	38	1987
24	Sahurs Community	2600	40	1987
25	Community Touffreville	1900	30	1988
26	Community Genac	4385	72	1988/92
27	Community Gironde sur Dropt	1210	13	1988
28	Community Sainte Terre	600	20	1989
29	Community Gironde sur Dropt	3490	55	1989
30	Community Gironde sur Dropt 7th.	840	11	1990
31	Comm. Sainte Terre 4th.	900	18	1990
32	Community Clères	2000	30	1991
33	Community Saint Aubin	600	13	1991
34	Comm. Sainte Terre 5/6th.	1065	25	1991
35	Community Sainte Terre	1470	30	1992
36	Community Gironde sur Dropt 8th.	810	11	1992
37	Community Daire 1st.	1600	6	1992
38	Comm. St. Aubin les Elb.	800	25	1992
39	Community Fechain	2800	50	1993
40	Community Le Havre	900	17	1993
41	Comm. Sainte Terre 8th.	1505	21	1993
42	Art sur Meurthe	1200	20	1994
43	Community Loupian	3650	52	1994
44	Community Marthon	4100	60	1995
45	Community Vorreppe	3800	59	1995/2014/2015
46	Community Le Havre, Bld. Durand	1910	28	1997
47	Community Pont à Mousson	350	11	1997
49	Community Proville	970	20	2002
50	Community Rosoy	1980	20	2003
51	Plage de Canet/Roussilon	4600	27	2003
52	Community Ury	400	3	2003
53	Community Belz-Hameau	1315	24	2003
54	Community Verberie	4000	39	2004
55	Community Le Trait	3960	40	2005

Qua vac Reference list France

56	Community Bordes Aumont	4180	64	2006
57	Community Namur 1	780	29	2006
58	Community La Montagne	1500	25+14	2009
59	Community Namur 2	1550	75	2010
60	Community Sahurs Rouan	Retrofit	11	2010
61	Aerolia	600	27	2012
62	Comm. Le Havre	500	4	2012
63	Comm. Calais	600	5	2012
64	Erondelle	500	15	2013
65	Hamel L'Ecluse	895	56	2014
66	Liercourt	3400	12	2014
67	Buzancais	625	10	2015

Quavac Reference list French Polynesia

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Brando Resort	2.500	52	2012

Qua vac Reference list Germany

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Teupitz	4100	80	1997
2	Tornow	2100	65	1997
3	Neuendorf	1700	60	1997
4	Egsdorf	1420	55	1997
5	Schwerin	5500	85	1997
6	Schleswig (Rebuild Schluff)		344	2013
7	Bonauwörth		15	2013-U.C.
8	Gifhorn (Rebuild Schluff)		217	2015-U.C.
9	Hardebek (Rebuild Schluff)		260	2016-U.C.
10	Martk Tüsling		10	2016
11	Teupitz II		64	2017
12	Konigsmoos (rebuild Roevac)		15	2017-U.C.
13	Auwaldsee (extension)		2	2018
14	Wasserverband Wendland (extension)		3	2019

Quavac Reference list Greece

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Faliro Marina	1051	32	2004
2	Alexandria Section I	11500	240	2008
3	Alexandria Section II	8500	225	2008
4	Olympiada	-	430	2015
5	Piragadikia	-	57	2015
6	Stratoni	-	40	2015
7	Marmaras		56	2015

Quavac Reference list Hong Kong

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Shui Wai. Village	2.200	37	1996

Qua vac Reference list Hungary

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Szentendre town	1.216	59	1986
2	Dunakiliti village I	4800	115	1991
3	Dunakiliti village II	5700	163	1991
	Extension		15	2004

Quavac Reference list India

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Village Resort	250	10	2013
2	Goa Dhramapur	5670	77	2017
3	Agra		130	U.C.
4	Kochi		400	U.C.

Qua vac Reference list Indonesia

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Graha Natura	7915	145	2013

Quavac Reference list Ireland

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Tarbert	500	4	2014

Qua vac Reference list Italy

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Palau	1800	20	1983
2	Pinarolo po Comune	2700	25	1984
3	Pinarolo po Comune	4620	45	1987
4	Gabiano Comune	1935	8	1985
5	Avenza Centro Cm.	4000	42	1984
6	S,. Benedetto Comune	13200	70	1986
7	S. Benedetto Comune	13200	70	1986
8	Cgnana (SS)	800	10	1987
9	Castell. Comune	4815	31	1987
10	Belfiore (MN)	1000	40	1989
11	Roncoferraro (MN)	3200	38	1989
12	Civitavecchia (Roma)	1800	24	1989
13	Casale Monferrato Comune	17370	107	1989
14	Pescara Po	1200	12	1989
15	Verrua Po	2200	50	-
16	Genova Ist. Ital.	3000	15	1992
17	Genova Ist. Tumori	6000	50	1992
18	Portisco	9000	10	1990
19	Roversbella (MN)	2000	40	1991
20	Angiari (MN)	1800	66	1991
21	Expo '92-Genova	3000	51	1992
22	Alleghe (BL)	2200	63	1992
23	Carbonara I `	1300	19	1994
24	Carbonara II	1500	25	1995
25	Forte dei Marmi	2500	59	1995
26	Forte dei Marmi	2500	59	1995
27	Torlino Vimercati	2300	50	1997
28	Urbano Venezia, All' Isola Della Giudecca	2100	360	2000
29	Venezia	-	80	2003
30	Port of Napels	-	100	2011
31	Verrua Po2200	2200	50	2015

Qua vac Reference list Japan

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	"INAX Chita factory" - Industry area closed to ocean ,shipping center , office , restaurant and factories in Aichi prefecture	1.300	13	1989
2	"SHIKANOSHIMA public resort" - in Fukuoka prefecture	300	1	1990
3	"KONDOU BOUSEKI factory"-shipping center , factory dormitory, restaurant in Nagano prefecture	1.100	7	1991
4	"MINAMIAWAJI public resort" - pool , camping-center in Hyogo prefecture	120	3	1991
5	"SHOWA ALUMINUM HIKONE factory"- factory , restaurant in Shiga prefecture	1.500	11	1992
6	"Temporary Sewer System in Yokohama" - in Kanagawa prefecture	300	52	1992
7	"Tokyo Power Station" factory , power station in Tokyo prefecture	400	2	1993
8	"AIZU University" - university in Fukushima prefecture	1.070	16	1993
9	"Market" - in Tochigi prefecture	1.300	17	1993
10	"Area Iwauchi" - Tanabe city , in Wakayama prefecture	350	17	1993
11	"Market" - in Saitama prefecture	1.733	21	1994
12	"Area Sonohara" - Tanabe city , in Wakayama prefecture	1.852	55	1994
13	"Park West-South of Lake Biwa in Shiga prefecture	1.132	6	1994
14	"Area Kamiakitsukawahigashi" Tanabe city , in Wakayama prefecture	16.671	338	1996
15	"Area Nakahara" - Tanabe city , in Wakayama prefecture	12.016	222	1996
16	"Area Hakogawa" - Mitagawa town , in Saga prefecture	8.200	150	1996
17	"Tokyo Power Station" power station , in Tokyo prefecture	679	4	1994
18	"Factory Tokaigomu" - Komaki city , in Aichi prefecture	2.555	34	1993
19	"MIHO Museum" - in Shiga prefecture	940	2	1996
20	"Factory XEROX" - in Kanagawa prefecture	400	5	1995
21	"Nankai Train Yard" - in Wakayama prefecture	12,04	8	1996
22	"Factory Tokyoseiko" - in Ibaragi prefecture	1.547	17	1996
23	"Area Kamihaya" - Tanabe city , in Wakayama prefecture	16.219	218	1998
24	"Area Ichinose" - Kamitonda town,in Wakayama prefecture	12.070	82	1999
25	"Town Nahari" - in Kochi prefecture	2.450	133	1997
26	"Area Shimoono" - Ube city , in Yamaguchi prefecture	16.700	78	1996
27	"Village Yamaji" - in Aichi prefecture	12.038	82	2000
28	"Area Kumano" - Hanamaki city , in Iwate prefecture	18.781	486	1997
29	"Area Bou" - Bounotsu city ,in Kagoshima prefecture	6.500	422	1998
30	"Area Misuugan" - Tanabe city , in Wakayama prefecture	9.134	282	1997
31	"Area Kyowahigashi" - Village Minabegawamura, in Wakayama prefecture	7.490	240	2001
32	"Area Nishiudo" - Village Tatuta ,in Aichi prefecture	6.858	102	2001
33	"Area Komoi" - Village Tatsuta ,in Okayama prefecture	10.282	96	2004

Qua vac Reference list Japan

34	"Area Terachi""- Village Seto ,in Okayama prefecture	1.613	52	1998
35	"Area Yuge" - Village Seto ,in Okayama prefecture	2.505	90	1998
36	"Area Sakutaoka" - Village Kujukuri ,in Chiba prefecture	12.161	184	2001
37	"Area Ohama" - Village Takuma ,in Kagawa prefecture	2.220	459	2001
38	"Daiwa hause Mie factory"	1.195	5	1998
39	"CANON Ami Factory" Camera factory in Ibaragi prefecture	190	21	1997
40	"CANON Ueno Factory" - Printer factory in Mie prefecture	600	6	1997
41	"Tokyo Power Station Shinagawa" - power station , in Tokyo prefecture	935	7	1998
42	"Factory Takaoka" - factory ,in Aichi prefecture	698	19	1998
43	"Area Katamata" - Village Mutsumi ,in Yamaguchi prefecture	8.863	50	1999
44	"Factory Nihon Denkigarasu Notogawa" - factory ,in Shiga prefecture	2.462	13	1998
45	"Area Yotsue" - Village Tatsuta ,in Aichi prefecture	6.033	52	1998
46	"Area Ushiyanishibun" - Village Ariake ,in Saga prefecture	9.200	310	2001
47	"Factory Yasunaga Ueno" - factory ,in Mie prefecture	541	11	1998
49	"Seibubunri University" - university ,in Saitama prefecture	472	2	1999
50	"CANON Material Oita" - factory in Oita prefecture	1.314	16	
51	"Area Morikawa" - Village Tatsuta ,in Aichi prefecture	10.401.100,00	91	2007
52	"CI Kasei Okayama" - factory in Okayama prefecture	553	6	1999
53	"Area Yokotayasutomi" - Masuda city ,in Shimane prefecture	13.900	300	2003
54	"YKK Kurobe" - factory ,in Toyama prefecture	456	7	2000
55	"Area Kiridoshi" - Village Kamimine , in Saga prefecture	931	27	2001
56	A Part of Sakae-cho Tokoname, Aichi prefecture	2.129	136	2001
57	"Fujitsu Aizuwakamatsu" - factory in Fukushima prefecture	1.020	5	2001
58	"Area Iwata Oka" - Kamitonda town, in Wakayama prefecture	5.987	94	2003
59	"Area Takuma" - Kamitonda town, in Wakayama prefecture	5.594	115	2004
60	"Area Totsui" - Yura town, in Wakayama prefecture	652	36	2004
61	"Area Higashitoyama" - Motosu town, in Gifu prefecture	6.508	85	2004
62	A Part of Kumayama-cho in Okayama prefecture	1.544	65	2002
63	"Daiwa hause Sakai factory" - in Osaka prefecture	506	7	2001
64	"Area Takegashima" - Shishikui town, in Tokushima prefecture	960	48	2002
65	"Area Hashishita" - Kitakata town, in Saga prefecture	15.250	290	2003
66	"Area Yukiura" - Oseto town, in Nagasaki prefecture	2700	260	2003
67	"Area Nouso" - Taku city,in Saga prefecture	6.822	112	2005
68	"Sumitomokoukan Kajima factory" - in Ibaragi prefecture	1.476	11	2002

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Qua vac Reference list Japan

69	"JR Toukai Komaki Laboratory" - in Aichi prefecture	1.270	11	2002
70	"Sankeigiken Kogyo Anou factory" - in Mie prefecture	1.200	9	2002
71	"Chubu International Airport" - in Aichi prefecture	3.500	33	2005
72	"Area Uchiharahigashi" - Hidaka town,in Wakayama prefecture	3.240	115	2006
73	"Area Ta" - Yuasa town, in Wakayama prefecture	4.450	146	2005
74	"Area Udohigashihattanwari" - Village Tatsuta, in Aichi prefacture	8.425	81	2007
75	"Area Tanono" - Onohara town, in Kagawa prefecture	3.823	43	2004
76	"Area Shinjyo Maenosho" Yumesaki town, in Hyogo prefecture	9.025	162	2004
77	"Area Konokusa Maenosho" - Yumesaki town, in Hyogo prefecture	9.632	103	2004
78	"Recycle Plaza" - incineration plant in Aichi prefecture	399	10	2001
79	"Seico Epson Apartment house" - in Nagano prefecture	420	34	2002
80	"Miyata Primary School" - in Aichi prefecture	308	3	2002
81	"YKK Makino Factory" - in Toyama prefecture	1.380	20	2003
82	"CI Kasei Shiga factory" - in Shiga prefecture	1.211	27	2003
83	"Area Sugino" - Kinomoto town in Shiga prefecture	922	29	2008
84	"Area Segi" - Tokoname city in Aichi prefecture	1.810	83	2003
85	"Area El" - Ichinomiya town in Hyogo prefecture	5.380	227	2005
86	"Area Hayao " - Aisai city in Aichi prefecture	14.887	86	2006
87	"Area Sigan" - Hirata city in Shimane prefecture	10.100	142	2005
88	"Area Fukuchi-toubu" - Nishio city in Aichi prefecture	16.700	119	2007
89	"Area Narahara" - Hachioji city in Tokyo	390	15	2004
90	"Area Kamibuchi -Manba, Kaminakagiri" - Hichisou town in Gifu prefecture	2.900	72	2007
91	"Area Kamibuchi –Shimo-Youkaichi" - Hichisou town in Gifu prefecture	2.100	26	2008
92	TOSTEM Corp. Maebashi factory in Gunma prefecture	450	6	2004
93	BRIGESTONE EVER LIGHT in Mie prefecture	600	6	2004
94	"Area Tabuteura" - Nansei town in Mie prefecture	2.420	80	2007
95	"Area Tatsuta" - Aisai city in Aichi prefecture	10.600	73	2008
96	"Area Kayahara" - Taga town in Shiga prefecture	3.500	73	2007
97	"Area Nakahaya" - Tanabe city in Wakayama prefecture	1.320	72	2002
98	"Area Same" Taga town in Shiga prefecture	5.000	78	2008
99	AISIN SEIKI CO., LTD. Kise-site in Aichi prefecture	115	1	2005
100	Murata Machinery, Ltd. Inuyama-site in Aichi prefecture	2.100	34	2005
101	"Area Minamigata" Seto town in Okayama prefecture	3.000	54	2008
102	"Area Haya" - Tanabe city in Wakayama prefecture	5.400	187	2007

103	"Area Uchihara-Nishi" - Hidaka town in Wakayama prefecture	2.300	36	2007
104	Gifu Prefectural General Medical Center - in Gifu prefecture	640	13	2007
105	"Area Ichiba" - Tokoname city in Aichi prefecture	1.100	75	2007
106	"Area Imamachi" - Higashiyoga town in Saga prefecture	4.412	235	2004
107	"Area Inuimichi" - Kawazoe town in Saga prefecture	-	-	2005
108	"Area Inoue-Nanbu" - Miki town in Kagawa prefecture	-	38	2007
109	"Area Kokubu" - Hamada city in Shimane prefecture	2.708	154	2006
110	"Area Tojima" - Shinjo village in Okayama prefecture	1.110	24	2006
111	"Area miama" - Maniwa city in Okayama prefecture	510	12	2006
112	"Area Shikagawa" Edajima city in Hiroshima prefecture	1.370	26	2007
113	"Area Kirihata" - Saiki city in Oita prefecture	13100	237	2008
114	"Area Katsuyama" Maniwa city in Okayama prefecture	196	21	2007
115	"Area Nakagawacho"Maniwa cityin Okayama prefecture	196	21	2007
116	"Area Ushiya Nishibun" Shiroishi town in Saga prefecture	-	-	2009
117	"Area Iioka Kitahara" Kyotanabe cityin Kyoto prefecture	1.434	13	2009
118	"Area Shimoarai" Katsuyama cityin Hukui prefecture	700	24	2009
119	"Area Izichi Bantohshima" Katsuyama cityin Hukui prefecture	-	-	2009
120	"Area Shimobe" Minobu town in Yamanashi prefecture	2.126	87	2009
121	"Area Hukuchi Chubu" Nishio cityin Aichi prefecture	12.460	102	2010
122	"Toyota Industries corp. Kariya Factory"in Aichi prefecture	2.117	22	2009
123	"Area Amishiro" Yura town in Wakayama prefecture	1.682	25	2008
124	"Area Ohbiki Kamiya"Yura town in Wakayama prefecture	10.058	217	2009
125	"Area Kawachi" Ikata town in Ehime prefecture	2.315	36	2009
126	"Area Uryu" Izumo town in Shimane prefecture	1.967	76	2009
127	"Akizuki Ammunition Depot" Etazima cityin Hiroshima prefecture	2.963	21	2007
128	"Miyagi Jail"in Miyagi prefecture	54	12	2007
129	"Kiryu University" Midori cityin Gunma prefecture	460	3	2008
130	"YKK corp. Hurumido Factory"in Toyama prefecture	2.656	28	2008
131	"Area Oku" Setouchi city in Okayama prefecture	-	-	2009
132	"Area Ohtsu" Izumo city in Shimane prefecture	-	-	2009
133	"Area Saizu" Amakusa cityin Kumamoto prefecture	-	-	2010
134	"Area Gochoda Tadokoro" Ureshino city in Saga prefecture	-	-	2009
135	"Fuji Film Techno Products corp.Takematsu Factory"in Kanagawa prefecture	1.156	31	2009
136	"Tokyo Electric Power Company corp.Power Plant" in Niigata prefecture	448	12	2009

137	"Area Ooyabu" Tamano cityin Okayama prefecture	-	-	2010
138	"Mitsubishi Mortors corp. Okazaki Factory"in Aichi prefecture	780	6	2010

Qua vac Reference list Kingdom of Bahrain

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
	population of 15500 persons			
1	Amwaj Islands A	2500	77	2005
2	Amwaj Islands B	2200	90	2005
3	Amwaj Islands C	2100	60	2005
4	Amwaj Islands D	2150	36	2005
5	Amwaj Islands E	3400	103	2006
6	Amwaj Islands M	2500	90	2006

Quavac Reference list Korea

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Haeyang Plant I - Large flow cap. systems	3500	12	2006
2	Haeyang Plant II - Large flow cap. Systems	3500	12	2006
3	Hyunda Shipyard I - Large flow cap. Systems	4850	18	2007
4	Hyunda Shipyard II - Large flow cap. Systems	5850	20	2007
5	Samsung Factory Gumi	2574	36	2008
6	Song Gye Village	1469	40	2008
7	Chu-Pung Ryung Village	3575	63	2009
8	Ai-Ui Village	1450	42	2011
9	Cho Kang Village	1200	30	2011
10	Hyundai MIPO Dockyard	4175	24	2013

Qua vac Reference list Latvia

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Marupe	1.000	19	2016
2	Jaunolaine	2.095	48	2019
3	Balthezers (Rebuild Roevac)		11	2017-U.C.

Quavac Reference list Lithuania

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Vieksniai Village	4500	215	2011
2	Kietaviskes	2500	64	2013

Quavac Reference list Malaysia

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Vintage Height 1	5000	250	2001
2	Vintage Height 2	3000	200	2001
3	Miri University Miri	1520	24	2005
4	Miri University Miri 2nd.	850	24	2006
5	Kuching Police Station Centre	1.855	80	2007
6	Shell MIRI	2.850	180	2009
7	Miri Police Station Centre	2.855	74	2010
8	Kuching Campus	2.190	46	2011

Quavac Reference list Maldives

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Meedhoo Island	2250	55	2008
2	Nilandhoo Island	4800	95	2008
3	Manadhoo Island	4460	100	2009
4	Ungoofaru Island	4060	85	2009
5	Hithadhoo Island I	11300	251	2018
6	Hithadhoo Island II	11250	229	2019
7	fuvamulah (Rebuild Roevac)		610	U.C
8	Holiday Resort		50	U.C

Qua vac Reference list Mexico

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Holbox CAPA (Rebuild Airvac)	-	117	2017-2019
2	Chetumal CAPA (Rebuilld Airvac)	-	16	2017-2018
3	Mahahual (Rebuilld Airvac)	-	44	2019
4	Chiquila (Rebuilld Airvac)	-	54	2017-2020

Quavac Reference list Montenegro

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Porto Novi (Marina boat-vacuum toilets)	-	25	2019

Quavac Reference list Nigeria

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Melrose Estate	2.750	45	2013
2	Cowrie Creek Estate		106	2019

Quavac Reference list Oman

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Shiraija	1078	65	2010
2	Seeq	1946	54	2010
4	Buraidha (rebuild Airvac)	-	50	2013

Qua vac Reference list Poland

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Zakrzew/Milejowice	9600	144	1998
2	Kabojoszowi I	7600	100	1999
4	Jaworzno	2600	53	2020

Quavac Reference list Portugal

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Resgatados	-	116	2019
2	Bebedouro		99	2019

Quavac Reference list Qatar

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Barwa Al Khor	3225	49	2016
2	MizherHotel		15	2017
3	Ras Abo Aboud boulevard World Cup 2022	1935	20	2021

Quavac Reference list Romania

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Dragomiresti Vale II	3800	86	2014
2	Maneciu	4000	110	2016
3	Dragos Voda	24542	259	2019
5	Smeeni		300	2019
6	Cartojani	6351	335	2020

Qua vac Reference list Russia

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Forrest Village	4.500	126	2019

Quavac Reference list Saudi Arabia

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	King Abdulaziz Airport	5380	97	U.C.

Qua vac Reference list Slovenia

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Logatec	9200	245	2015
2	Borovnica	7200	133	2015
3	Bis	5420	76	2015
4	Apace	3450	80	2015
5	Crnci	3100	79	2015
6	Segovci	1450	71	2015

Qua vac Reference list Spain

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Community Marxuquera:	20.540	158	2007
2	Montesol - Ejector station	460 Inhabitants	35	2007
3	Camit Pinet	200 Inhabitants	15	2007
4	Ermitage - Vacuum tank station	195 Inhabitants	14	2007
5	Xauxa - Ejector station	275 Inhabitants	22	2009
6	Barranco Blanco - Ejector station 2 x	240 Inhabitants	18	2009
7	Mollo section I,II and III - Vacuum tank station	700 Inhabitants	54	2009
8	Puerto de Valencio			
	Vacuum system 1	4.550	40	2011
	Vacuum system 2	5230	42	2011
9	Port Barcelona	_	_	U.C.
10	Empuria Brava (Rebuild Flovac)	_	25	2017-U.C.
11	El Saler	1206	10	U.C.
12	Santa Pola (Rebuild Flovac)		25	2019-U.C.
13	Castellar	2850	33	U.C.

Qua vac Reference list Sweden

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Säljemar	4000	10	1981
2	Sjöbo	2200	30	1983
3	Simrishmn	1700	26	1984
4	Täby fase I	4600	90	1984
5	Täby fase II	2200	30	1985
6	Markaryd	1700	27	1985
7	Kôping	3200	70	1985
8	Vellinge Kommun Falster bo	2100	41	1979
9	Lockorp Malmö Kommun	1700	39	1983
10	Smygehuk Trelleborg Kommun	9500	140	1985

Qua vac Reference list Switzerland

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Wädenwil	400	6	1975
2	Bonstetten	150	4	1976
3	Yvonand	400	2	1977
4	Nierderried	1200	26	1978
5	Oberhofen	590	17	1979
6	Egnach	850	20	1979
7	Bonstetten	500	6	1979
8	Mörigen	325	10	1979
9	Steckhorn	325	1	1979
10	Schenkon	2400	26	1979
11	Unterseen	800	11	1979
12	Vinzeln	2100	27	1980
13	Dübendorf	540	2	1980
14	Rheineck	610	12	1980
15	Stäfa	480	6	1981
16	Rorschach	140	5	1981
17	Benken	700	4	1981
18	Iseltwald	140	5	1982
19	Altendorf	960	5	1980
20	Eich	860	11	1981
21	Thal	150	5	1981
22	Iseltwald	260	12	1981
23	Grenchen	2800	18	1982
24	Basel	835	13	1982
25	Celigny	1200	18	1982
26	Celigny	900	13	1982
27	Nottwil	700	8	1982
28	Nottwil	600	6	1982
29	Nottwil	480	7	1982
30	Zug	840	11	1982
31	Laupen	270	3	1982
32	Altdorf	570	8	1982
33	Gampelen	460	4	1983
34	Busskirch	630	3	1983
35	Basel	650	6	1983
36	Büren	810	8	1985
37	Perroy	750	11	1986
38	Crans	790	7	1987
39	Bellechasse	1000	6	1987
40	Winterthur	740	8	1988
41	Greng	1075	15	1988
42	Meyriez	1200	19	1988
43	Unterbach	1250	12	1989
44	Hünenberg	3120	18	1989
45	Ebikon	700	8	1990
46	Neuenstadt	800	16	1991

Qua vac Reference list The Netherlands

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Bussloo - Wilp Recreation area	9200	22	1975
2	Beekse Bergen Hilvarenbeek Recreation area	5300	15	1977
3	De Byland - Tolkamer Recreation area	1600	5	1975
4	De flaasbloem Recreation center	2800	13	1974
5	Camping Loodsmanduin,Texel Camping	3500	18	1975
6	Community Heeswijk/Dinter	3650	19	1978
7	Domein-Kessel	200	2	1980
8	Community Waspik	1250	13	1975
9	Community Reusel I	2170	9	1978
10	Community Gasselte	6200	165	1978
11	Community Rijnsburg I	750	30	1978
12	Community Nes A/D Amstel	2200	39	1978
13	Community Reusel II	2150	15	1979
14	Community Oostburg	400	2	1979
15	Community Diever	2800	26	1979
16	Community Finsterwolde	1500	20	1980
17	Community Nes/Buren I	5100	65	1980
18	Community Nes/Buren II	1750	27	1980
19	Community Nes/Buren III	1350	19	1980
20	Community Oud Alblas	3100	66	1980
21	Community Rijnsburg II	4150	60	1980
22	Community Arkel-Kedichem	1800	28	1981
23	Community Opsterland	1750	19	1981
24	Community 's-Gravenzande I	5800	62	1982
25	Community Polsbroek I	4600	85	1982
26	Community Polsbroek II	4800	70	1983
27	Community Beilen-Spier	3200	24	1982
28	Community Emmen-Klazinaveen	8400	65	1981
29	Community Stadskanaal	5850	69	1982
30	Community Emmen	5 system	225	1979-1983
31	Community Emmen	2100	13	1982
32	Community Emmen	3500	27	1982
33	Community Rotterdam I	5900	122	1982
34	Community Rotterdam II	3020	74	1983
35	Community Almkerk	3400	72	1982
36	Community Leiden	1600	17	1982
37	Community Bellingwedde	5200	68	1982
38	Community Bellingwedde	2900	38	1982
39	Community Wateringen	3570	70	1982
40	Community Akersloot	2240	31	1982
41	Community Axel -I	3100	45	1982
42	Community Axel -II	5400	54	1983
43	Gors Kruiningen, Recreation Centre	2440	37	1983
44	Community Almkerk	1850	50	1983
45	Community Hardinxveld- Giessendam	920	25	1983
46	Community Winschoten	6250	63	1983
47	Community Nieuwkoop	4110	128	1984
49	Community Het Bildt	5000	57	1984
50	Community Hardinxveld- Giessendam	750	20	1984
51	Community Brandwijk	4140	72	1984
52	Community Molenaarsgraaf	5670	106	1984
53	Community Ottoland	1730	30	1984
54	Community Benschop I	7210	87	1984
55	Community Benschop II	5520	82	1984

56	Community Benschop III	6050	81	1984
57	Community Hardinxveld- Giessendam "Buitendams I	2820	51	1984
58	Community Hardinxveld- Giessendam "Buitendams II"	3650	65	1984
59	Community Zoeterwoude	4680	88	1985
60	Community Lopik Phase I	1920	34	1985
61	Community Hardinxveld- Giessendam	3500	60	1985
62	Community Arkel-Kedichem	5260	50	1985
63	Community Bedum, House Boats	400	18	1985
64	Company Ahold BV, Supermarket	250	25	1985
65	Company Ahold BV, Supermarket	400	30	1985
66	Community Oud Alblas	5200	56	1985
67	Community Lopik Phase II	3020	34	1986
68	Community Lopik Phase III	2400	46	1986
69	Community Lopik Phase IV	5230	64	1986
70	Community 's-Gravenzande II	7500	87	1982
71	Community 's-Gravemzande III	3320	61	1983
72	Community 's-Gravenzande IV	7250	67	1985
73	Community Ottoland	980	13	1986
74	Recreation Heerderstrand	900	5	1980
75	Community Lopik-Lekdijk	7610	63	1988
76	Company Ahold BV, Supermarket	650	44	1988
77	Community Middelharnis Vacuumstation for Polluted Area	450	8 filters	1988
78	Community Strijen Vacuumstation for Polluted Area	800	12 filters	1989
79	Pelican Resort & Casino	2800	100 VT	1989
80	Community Rotterdam	2200	58	1990
81	Community Dirksland Vacuumstation for Polluted Area	500	8 filters	1993
82	Community Piershil Vacuumstation for Polluted Area	600	6 filters	1994
83	Community Dordrecht Vacuumstation for polluted Area	400	5 filters	1995
84	Community Emmen Pilot project for connection of proceswater from Agriculture	300	2	1996
85	Airport Schiphol Amsterdam Vacuumstation for Polluted Area	1000	10 filters	1996
86	Police Building Vacuum toilet system	60	3 GWT, 2 VT	1998
87	Community Lopik-Lekdijk Mini-Ejector station	800	10	1999
88	Bonaire Beach Club 10 Control Units	-	10	2006
89	Marina "De Ronde" Sewage suction unit boats	Type unit	1 AVR	2006
90	Marina Ter Apel	-	2	2006
91	Marina Volendam 400 Berths Ejector Station with 14 VT / 4 GWT	300	14+4	2007
92	Community Hoogeveen (Zuid-Wolde)	Retrofit	55	1999-2004
93	MOB COMPLEX - Lopik	500	8	2010
94	Community Lopik - Lekdijk	1200	25	2010
95	Community Lopik Subgemaal	1000	1 Vacuum station	2010
96	Community Noorderhoek		550(vacuum toilets)	2011
97	Community Gors Kruiningen		1 Ombouw station	2011
98	Community Sluiskil/Koewacht (extension)	349	2	2011
99	Community Zederik	Retrofit	10	2011
100	Community Aalburg	Retrofit	1	2011
101	Community Landerd	Retrofit	10	2011
102	Community Katwijk	-	1	2011
103	Community Stigtsevecht	Retrofit	3	2012
104	Community Midden Drenthe	Retrofit	5	2012

Qua vac Reference list The Netherlands

105	Community Hardenberg	Retrofit	4	2012
106	Community Soest	Retrofit	20	2011
107	Community Zevenaar	Retrofit	13	2012
108	Community Drechterland	Retrofit	120	2014
109	Community Almere		20	2015
110	Community Groningen	2168	250 (vacuum toilets)	2017
111	Community Zeewolde	10580	100	2017
112	Community Amsterdam (schoonschip)		120 (vacuum toilets)	2018
113	Community Almere (Duin)	2100	60	2020
114	Community Almere (Floriade 1)	2500	21	U.C.
115	Community Almere (Floriade 2)	4500	38	U.C.
116	Community Almere (Stichtse Kant)		120	U.C.
117	Community Almere (Muiderzand)			U.C.
118	Community Zevenaar (rebuild)		53	U.C.
119	VVE Oosterwold Almere	555	10	U.C.

Qua vac Reference list United Arab Emirates

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Jumeirah Island project 1	7000	22	2003
2	Jumeirah Island project 2	6500	25	2003
3	Jumeirah Island project 3	5800	23	2003
4	Jumeirah Islands Extention 15 + 16 Villas	250	2	2007
5	Clubhouse + Children Playground	150	2	2007
6	HQ Coastguard Abu-Dhabi	2240	31	2008
7	One & Only Hotel The Palm	12 (vacuum toilets)	2 (interface units)	2010
8	Jumeirah Height	2000	12	U.C.
9	Zayed University	3600	75	2011
10	Qseewrah Palace 1	2500	21	2010
11	Retrofit Sharjah University	-	100	2010
12	Al Badea Rulers palace	-	-	U.C.
13	Al Marjan Island Vac.sytem 1	9875	175	2010
14	Al Marjan Island Vac.sytem 2	5900	150	2011
15	Qseewrah Palace 2	2300	3	2015
16	Zayed University extension		4	2020

Qua vac Reference list United Kingdom

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Floatels (UK) Ltd.- Floatel Northwich - Hotel	250	42	1989
2	Leak Commonside. Suburb	2200	41	1991
3	Sibsey. Suburb	1160	21	1991
4	Peterborough. Suburb	3870	33	1991
5	Tydd St. Mary. Suburb	3360	61	1991
6	Stickford. Suburb	4977	72	1992
7	Woodhurst. Suburb	1870	29	1993
8	Friskney. Suburb	5200	104	1994
9	Pidley. Suburb	1600	38	1994
10	ST. John's. Building	1880	7	1996
11	Yarwell. Suburb	1725	46	1996
12	Beeston	800	25	1996
13	Theddlethorpe	1800	42	1996
14	Bicker	3550	77	1996
15	Yarwell	1460	45	1996
16	Astwood	1470	36	1999
17	Whisby	420	18	2000
18	Markham Moor	-	35	2001
19	Osgodby/Kirkby	2100	56	2002
20	Anderby	2500	42	2002
21	Louth (3 villages)	7800	115	2003
22	Fosdyke	3600	63	2003
23	Toynten St. Peter	2400	42	2004
24	Tansor / Cotterstock	3750	42	2005/2006
25	Wigsley	-	50	2005
26	South Somercotes	1450	30	2006
27	Crossways	Rebuild ISEKI	22	2008
28	Crossways	new extension	16	2008
29	Hubbert's bridge	4750	34	2009
30	Saltfleetby St. Peter	6525	100	2009
31	Crossways	Rebuild ISEKI	17	2011
32	Crossways	Rebuild ISEKI	17	2011
33	Leamington	-	1	2011
34	Tansor / Cotterstock	3750	42	2011
35	Floatels UK / Throp Arnold	Rebuild ISEKI	13	2014
36	Thames Water	Rebuild ISEKI	212	2014
37	Bromley Green	Rebuild ISEKI	40	2016
38	Bosham Hoe	Rebuild Roevac	35	2016
39	Saltford Priors			U.C.

Qua vac Reference list Venezuela

SL No	Name and type of the project	Vacuum sewers in meter	Number of valves	Start-up Year
1	Merida Village	5682	156	2011

Myers Rebuttal Exhibit D

Q. & A QUAVAC CEO

Myers Exhibit D

Q & A [illegible] / CO

Michael Myers

To: Ivar Quatfass
Subject: RE: [External] - RE: [External] - RE: [External] - RE: [External] - RE: [External] - RE: [External] - RE: [External] - RE: [External] - QUAVAC Vacuum sewer system

From: Ivar Quatfass <Ivar.quatfass@QuaVac.com>
Sent: Thursday, February 3, 2022 10:03 AM
To: Michael Myers <mmyers@envirolinkinc.com>; Tracy Miller <tmiller@envirolinkinc.com>
Cc: Charles Donnell <cdonnell@envirolinkinc.com>; mark <mark@bissellprofessionalgroup.com>; Arjan Krebs <arjan.krebs@quavac.com>; Jan Drost <jan.drost@quavac.com>
Subject: [External] - RE: [External] - RE: [External] - RE: [External] - RE: [External] - RE: [External] - RE: [External] - RE: [External] - QUAVAC Vacuum sewer system

EXTERNAL EMAIL: Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Mike,

Please find some answers. Independent source is hard to find as many issues will not be published at least not in those details. Like Eagle Creek we got the article alert, also here it is not explicit mentioned the issues like failure of controllers etc. but obvious we as vacuum supplier knew the issues.

We enclose some information as close as possible to US, in this case Mexico, with some independent article from CAPA Water body. Unfortunate in Spanish but we did a Google Translate document with it also. Project was done through our agent VIAVAC

1. Life span of the controllers Airvac, we do not have any information on this. We searched our files but it is not mentioned.
2. It is hard to find this information published. We have numerous of projects rebuild from several suppliers, and so also Airvac. In all projects done the broken controllers were spreading around the vacuum stations in parts. As such we assume that failure rate is high. We can only show our experience like enclosed CAPA document.
3. a) globally we can only provide Quavac information, as such please find enclosed reference list.
   b) Airvac dominate the US market. Airvac is also nowadays mainly only active in US and Mexico as their Parent company Aqseptence will provide in all other countries the vacuum sewer system with their brand Roevac. Enclosed an Airvac reference list unfortunate from 2012
   c) Vacuum sewer suppliers in the market are very limited as such market share vary huge from country by country, global market share is hard to mention. E.g. Quavac 100% market share Netherlands, 90% Denmark, UK -80% etc. but 0% in US
   d) Airvac/Flovac or Roevac systems in total around 25 projects has been converted in the last 10 years. Latest project was Roevac on the Maldives with more than 600 pits https://twitter.com/teamfenaka/status/1318096698015535105 Video made by the water body Fenaka Corporation Ltd
4. we market Vacuum station and prepare complete designs for it with hydraulic calculations. This is our core business for any new project. Eagle Creek is for us a Retrofit project, and from experience we see that the installed vacuum stations from other suppliers function normal. After complete change of the pits the vacuum station will even perform better is our experience without changing anything. Hope you can clarify more what is required, and we can assist you on this.

Hopefully this information is helpful but if you guide us in which direction you want to go with the testimony, we might even provide more details.

Best regards,
Ivar

Van: Michael Myers <mmyers@envirolinkinc.com>
Verzonden: donderdag 3 februari 2022 14:17
Aan: Ivar Quatfass <Ivar.quatfass@QuaVac.com>; Tracy Miller <tmiller@envirolinkinc.com>
CC: Charles Donnell <cdonnell@envirolinkinc.com>; mark <mark@bissellprofessionalgroup.com>; Arjan Krebs <arjan.krebs@quavac.com>; Jan Drost <jan.drost@quavac.com>
Onderwerp: RE: [External] - RE: [External] - RE: [External] - RE: [External] - RE: [External] - RE: [External] - RE: [External] - QUAVAC Vacuum sewer system

Thanks all for jumping on things. I am preparing testimony as we proceed through the approval process. A couple of issues have come up where we could really use some additional insight from a more independent source.

If you can just point me in the right direction on where to find the information I am trying to get, I would be very much appreciated your guidance. The issues are:

1. Information on the life of a Airvac and Flovac controller. We have information that suggest a 10-12 year life. I remember reviewing information on the life of Airvac controller and valves from one of Airvac's older design manuals but in reviewing their current design manual, I do not see information on the life of their controller and valve. We also have a Airvac presentation that claims a 10-15 year life but we are looking for a more definitive reference for the life of Airvac controllers.

2. Information on the failure rate of Airvac and Flovac controllers. We have one reference from Warsaw University that discusses failure rates of vacuum systems generally and provides some information that suggest most of the failures are related to the controllers but you made the statement that Qua Vac valve require 80% less maintenance. I assume that is largely related to the elimination of the controller in Qua Vacs valve assembly. If you could guide us to where we can find information on the controller failure rate, I would appreciate it.
3. Do you have any information on the total number of vacuum collection systems there are in the market place? It would be great if we could present information as follows:
   a. Total number of vacuum system globally
   b. Total number of vacuum systems in US
   c. Market Presence % Airvac, % Flovac,% Qua Vac
   d. How many Air Vac and Flo Vac systems have been converted to Qua Vac?
4. I know you don't market a vacuum station, but any information you could provide on the life of a vacuum station and the current best design standards would also be very helpful. The information you provided from Florida was useful but I believe that Europe is ahead of the US on design practices for vacuum, so I am looking for best design practices for vacuum stations.

Thanks and any help or if you can point me in the right direction, we can take it from there.

Best,
Mike

From: Ivar Quatfass <Ivar.quatfass@QuaVac.com>
Sent: Thursday, February 3, 2022 7:38 AM
To: Tracy Miller <tmiller@envirolinkinc.com>; Michael Myers <mmyers@envirolinkinc.com>

Cc: Charles Donnell <cdonnell@envirolinkinc.com>; mark <mark@bissellprofessionalgroup.com>; Arjan Krebs <arjan.krebs@quavac.com>; Jan Drost <jan.drost@quavac.com>
Subject: [External] - RE: [External] - RE: [External] - RE: [External] - RE: [External] - RE: [External] - RE: [External] - QUAVAC Vacuum sewer system

EXTERNAL EMAIL: Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Goodmorning Tracy,

Thank you very much for your email.

The attachment you have send shows the present Airvac pits installed in Eagle Creek, thank you for this.

As agreed Quavac will send one Demo pit, to send the proper pit (easy to exchange for your team) we assume the Model VP3042H – 6'deep (±1.83 meter height) is the most common installed in the project. Our previous drawing send was a 2 meter height (± 6'6") pit so would perfectly match

Following we need, hopefully you can provide to prepare the demo pit:
1. Identify in the Eagle Creek project an Airvac pit (model type VP3042H) to be exchanged by a Quavac pit
2. Send us the layout drawing of the project (or google earth picture) showing the location of this pit
3. Vacuum outlet 3" service connection to vacuum mainline. Please inform about material of the vacuum sewer main PVC or PE ?
4. Gravity stub-out 4"or 6", we will provide a single pit made from HDPE 20mm wall thickness, we assume you will cut and weld a 4"or 6"gravity stub-out to our pit at the correct location ? If not than we need the as built drawing of the identified pit showing the gravity stub-out location(s) and size. But we assume the first option is also the preferable option as many contractors do.

For your information:
The Demo pit will arrive as a single pit from HDPE with all the equipment pre-assembled. (vacuum valve, controller, piping, ball valves, hoses)
When the identified Airvac pit has been removed the Quavac pit can be installed and connected to the gravity and vacuum line and ready to receive the sewage. We anticipate that it will be done in ± 2-3 hours for this first demo pit.

Thank you sending the information so we can prepare the demo pit asap,

Best regards,

Ivar Quatfass

Van: Tracy Miller <tmiller@envirolinkinc.com>
Verzonden: donderdag 3 februari 2022 00:55
Aan: Ivar Quatfass <Ivar.quatfass@QuaVac.com>; Michael Myers <mmyers@envirolinkinc.com>
CC: Charles Donnell <cdonnell@envirolinkinc.com>; mark <mark@bissellprofessionalgroup.com>; Arjan Krebs <arjan.krebs@quavac.com>; Jan Drost <jan.drost@quavac.com>
Onderwerp: RE: [External] - RE: [External] - RE: [External] - RE: [External] - RE: [External] - RE: [External] - QUAVAC Vacuum sewer system

Ivar,

Please see the attached specs for the current pits utilized in this system. If you need anything please let me know and I will do what I can to help you.

Thanks,

TRACY MILLER
REGIONAL MANAGER
ENVIROLINK INC.
4700 HOMEWOOD COURT
SUITE 108
RALEIGH, NC 27609
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Care, Character, Excellence, Professionalism

ENVIROLINK

"We are what we repeatedly do. Excellence, then, is not an act, but a habit."

Myers Rebuttal Exhibit E

CAPA REPORT

Supports Quavac CEO regarding failed Airvac Systems

Myers Exhibit F E

Gobierno del Estado de Quintana Roo

Resultados
CON BENEFICIOS PARA TODOS

CAPA
Comisión de Agua Potable y Alcantarillado

GOVERNMENT OF THE STATE OF QUINTANA ROO
DRINKING WATER AND SEWAGE COMMISSION
LAZARO CARDENAS OPERATING ORGANISM

INFORMATION CARD

VIAVAC/Vacuflow HOLBOX COLLECTION TANK

INSTALLATION AND OPERATION REPORT

BACKGROUND:

The Holbox Island Sanitary Drainage System was built in 2004; Given the topographic conditions of the island, the High Vacuum System was chosen, with a patent from the company Airvac, which at that time was a leader in the development of this process.

In 2005, during its first year in operation, the island was hit by the passage of Hurricane Wilma, which caused a lot of damage to the infrastructure and in turn showed many technical construction aspects that were not taken into account at the time of its construction. One of them, basic in the system, is the correct collection of wastewater in the collection tanks and its subsequent channeling to the Vacuum Plant.

Among the main anomalies that have been observed in 11 years of operation, we can mention the following:

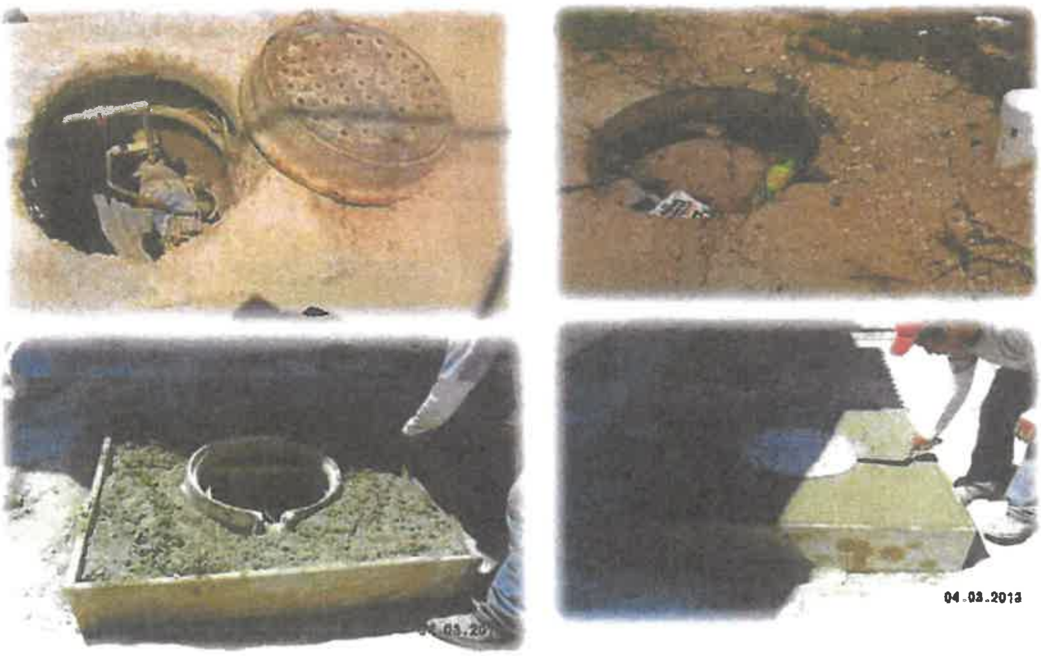
ÿ The Airvac Valve System and its sensors DO NOT work under water, as the company offered at the time. The high presence of humidity during the rainy season enters the sensors, blocking their operation and the operation of the vacuum valve. in turn affecting the

View of a new Airvac Collection Tank during the construction of the System, optimal state of the upper chamber.

View of an Airvac Collector Tank in operation, general condition of the upper chambers.

ÿ The collecting tanks, their rims and covers presented structural damage from the beginning, by not considering the damage caused by the high salinity in the environment and soil.

As mentioned at the beginning, the topographical characteristics of the island defined the system to be used, but in this case it is also a point against; since it presents many movements (settlements) and that normally the water table is barely 60
cm.



65 of the 85 collector tanks presented failures in the 12 years of operation, most of them have already been repaired with their own resources, it was started by the most critical ones such as those observed.

CURRENT SITUATION:

ÿ The cost of operation and maintenance of Airvac valves and vacuum sensors is very high. Currently there are 20 collecting tanks working manually, there are no spare parts necessary for automation. They must be activated 2 to 5 times a day, a number that increases in vacation or rainy seasons.

This number of Collecting Tanks that are losing automation due to lack of spare parts is increasing annually, in 2013 there were 10 tanks, in 2014 it increased to 14 of them, this 2015 as indicated before it rose to 20. This also increases operating expenses and number of incidents with service users.

In addition to this lack of spare parts, we must consider the two complementary elements that make these tanks work properly, which are the vents of the Airvac valves and the gravity lines that frequently suffer damage that affects their correct operation.

In February of this year, a collection tank from the company **Viatek was received as a test donation,** which was installed to replace an Airvac fiberglass tank that had critical damage to its structure, as it had large cracks that allowed the passage of sewage to the top and were already contaminating the water table.

Airvac collector tank in poor condition, with serious leaks of sewage into the subsoil and water table.

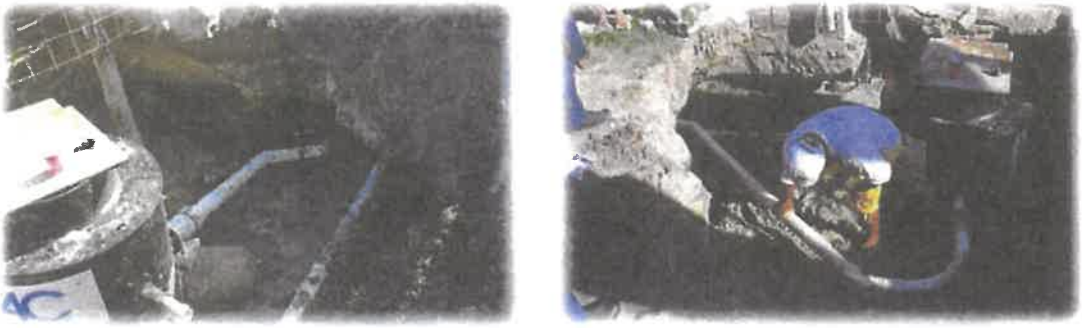
VIAVAC/ Vacuflow collection tank supplied; its characteristics and operation were explained to the operating personnel. Immediately highlighting that they work without a vacuum sensor and external vents.

The replacement process was long, 9 hours of continuous work, for which the following technical resources were used:

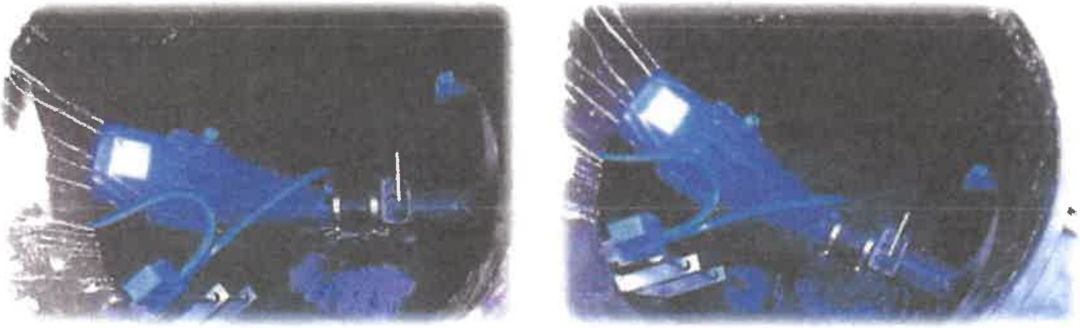
• 8 Workers.
• 1 Backhoe.
• 1 Vactor-type truck.
• 1 pick-up truck. • Minor tool.
• Special pieces of sanitary and hydraulic PVC.

Excavation process, *to reach the adequate depth of connection of the gravity lines, it was necessary to open a circumference of approximately 4.00 mt due to the landslides of the sand.*

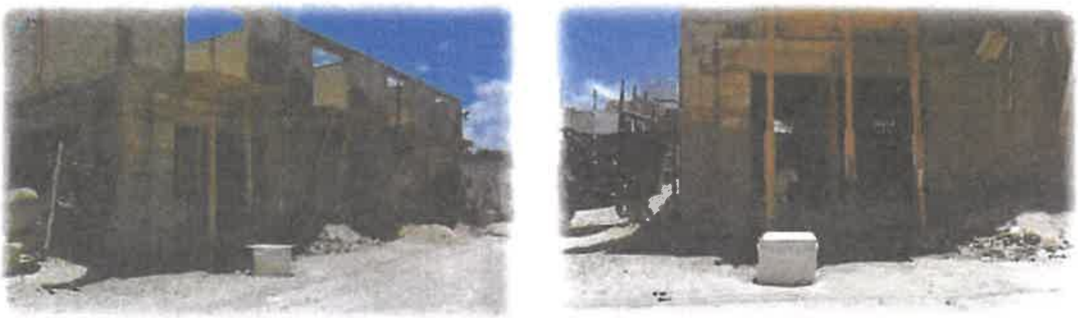
Installation and interconnection process, *due to the water table it was difficult to leave the tank in place, it was necessary to use sacks with gravel.*



Interconnection process, *of gravity and vacuum lines.*



First activation, *the VIAVAC/ Vacuflow system worked satisfactorily immediately after installation. It was observed to work on three occasions, raising and lowering the float without any problem.*



The Viatek company, *in turn, supplied the PAD cover for the collecting tank, a 24" PVC coupling to raise the curb level to the desired height above street level, and paid for the construction of the corresponding curb; This curb has not been developed because a self-service store is under construction on the adjoining land and whose main access is just in front of the location of the collection tank, where a sidewalk will be built; The legal representation of that company requested a permit from SEMARNAT to fill the street with sand and raise its level, since it floods to a great extent during the rainy season. The authorization and the final levels have already been obtained, and this week the aforementioned curbstone must be built.*

Gobierno del Estado de Quintana Roo

Resultados CON BENEFICIOS PARA TODOS

CAPA Comisión de Agua Potable y Alcantarillado

CONCLUSIONS:

Below is a comparison between these two vacuum systems, based on the years of operation of the Airvac System and the 4-month trial period of the VIAVAC/Vacuflow System.

AIRVAC:

ÿ Airvac, the system of valves and vacuum sensors have been very expensive economically and operationally they present many faults with the passage of time or in the presence of humidity.

ÿ The collecting tanks were originally at ground level, so even with good concrete curbs they have infiltration of rainwater through the joints in the rainy season, cracks in their walls are not ruled out as well, since they are always observed with water inside, even in dry season

ÿ The vents of the vacuum valves and the gravity lines present constant breaks that affect its proper functioning, in addition to the costs of its repair.

VIAVAC/Vacuflow:

ÿ We do not have information on the cost of the product, but operationally it has worked correctly since its installation; Starter reduces risk points by not requiring a breather or vacuum sensor to operate.

ÿ The collecting tank has a large storage capacity in case of momentary loss of empty.

ÿ Having the vacuum outlets and discharges integrated (thermofused) to the body of the collecting tank guarantees its total hermeticity and the filtration of water towards the interior or exterior of the tank is ruled out.

ÿ Since its installation there has been no problem at this collection point.

In talks with the operators of the sanitary drainage system, they inform us that they are comfortable with this new method and have not observed any failure in the 4 months that it has been in operation.

For extensions of the sanitary drainage network, this VIAVAC system is suitable. But the difficulty of changing an existing collection tank for this other is very complex, due to possible structural damage to the surrounding buildings at the time of excavation.

It would be appropriate if float and valve system could be adapted to the tanks this existing collectors.

ELABORATED

ARCH. ABEL DARIO OXTE MEDINA
TECHNICAL DEPUTY MANAGER

Myers Rebuttal Exhibit F

News Article, Town of Forest
Supports Q&A with Quavac CEO regarding failed Airvac Systems

Myers Exhibit O

NEWS

VAC SEWER ISSUES CONTINUE IN FOREST

WRITTEN BY ON FEBRUARY 21, 2022

The Village of Forest is still experiencing vacuum sewer issues in the area from South Gormley to Mad River Streets and South Patterson to Daisy Streets.

The crew was out all weekend working to get the problem addressed and repaired.

They will also be out today with the vac truck working at each pit to prevent overflow.

Village officials realize this is an inconvenience to Forest residents, but the crew is working to resolve the issue.

They ask residents in that area of town to continue to use the system sparingly.

AUTHOR

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Myers Rebuttal Exhibit G

A3-USA Evaluation

Myers Exhibit E F 6

A3 - UCA Evaluation

Summary of Key Findings and Recommendations.

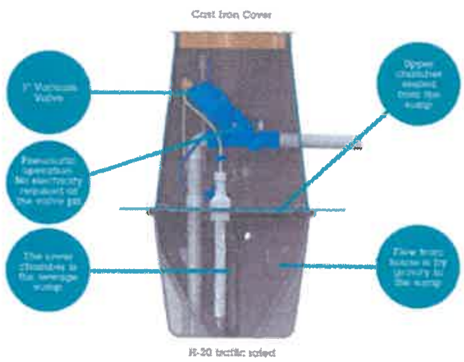
1. Absent a major investment into redesign and rebuild of the existing vacuum system, service levels of the existing system will not significantly improve.
2. Labor is not the solution. Regardless of the labor resources, service levels will not significantly improve. Additional drawbacks include the cost of labor and masks the root issue.
3. Service levels are impacted by:
    a. Design limitations
    b. Maintenance history
    c. Investment history
    d. History of owner engagement
4. Education of regulatory officials and lawmakers on vacuum system technology is needed.
5. Immediate recommended actions:
    a. Recommendation (Immediate): Install air admittance at four locations;
    b. Recommendation (Immediate): Provide 24/7/365 on-site system monitoring;
    c. Recommendation (Immediate): Move controller outside of pits for the most problematic services;
6. Long Term Recommendation Actions:
    a. Recommendation (Long Term): replacement of vacuum station, including:
        i. Install sufficient vacuum capacity. Higher capacity vacuum pumps.
        ii. Install variable frequency drives on all vacuum pumps.
        iii. Install VFDs on sewage pumps to permit ramping up and down.
        iv. Improved instrumentation to include air flow, vacuum sensor, pressure sensor, and level sensors.
        v. Oil-sealed rotary screw vacuum pumps.
        vi. New stainless steel vacuum station tank including new instrumentation.
        vii. Install three (3) vacuum pumps.
        viii.
    b. Recommendation (Long Term): Pit Replacement.
        i. Monolithic construction
        ii. Spring-operated valve versus diaphragm-operated valves;
        iii. Move controllers outside of pit. Use of water resistant controllers;
        iv. Installation of alarm light;
        v. Increase storage volume;
        vi. Secure pits;
    c. Recommendation (Long Term): Install monitoring system to include:
        i. Pit instrumentation & alarms
        ii. Vacuum station instrumentations & alarms
        iii. Alarm & paging system
    d. Recommendation (Long Term): Maintain 24/7/365 on-site monitoring.

Background

The Eagle Creek Community is located in Currituck County, North Carolina, the most northeastern county in State of North Carolina and in close proximity to the Norfolk/Virginia Beach metro area, approximately 20 miles south of Chesapeake, Virginia. Currituck County includes the commonly known Outerbanks and mainland areas and is separated by the Currituck Sound. There are four wastewater treatment facilities located in the Moyock area: Carolina Village MHP (60,000 gpd), Eagle Creek (350,000 gpd), Moyock Commons (40,000 gpd) and the Moyock Regional facility (100,000 gpd). Carolina Village, Eagle Creek and Moyock Regional are non-compliant with state regulations with Eagle Creek and Carolina Village being in poor physical condition.

The Eagle Creek wastewater system includes the Eagle Creek community [440 single family homes], a golf course and the Moyock Middle School. The wastewater system has come under scrutiny due to poor service from the vacuum collection system. The vacuum sewer collection system is the focus of the service issues and the purpose of this review.

Figure 1. Typical Airvac Pit [from Airvac website].



The current owner is Sandler Utility at Mill Run (Seller), who has entered into a Asset Purchase Agreement with Currituck Water and Sewer (Buyer) for the purchase of the sewer system. The sewer system includes a 175,000 gpd wastewater treatment facility, high rate infiltration pond, spray irrigation and the aforementioned vacuum sewer.

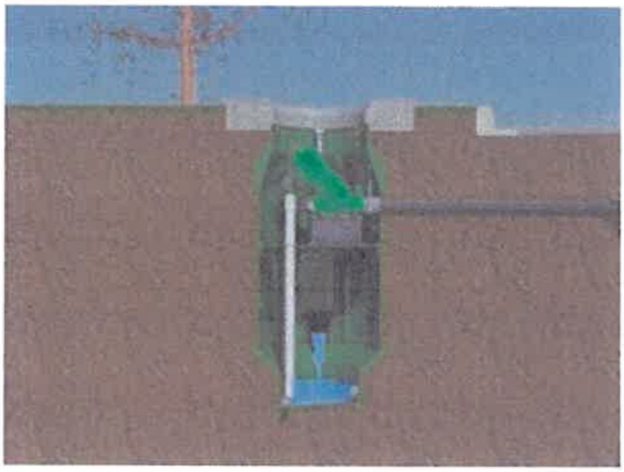
Sandler Utility's ownership and responsibility starts at the service valves ("pits") located at the edge of the right of way and includes the vacuum mains and vacuum station. Photos of each service pit are provided as Appendix A and typical Airvac Pit is shown in Figure 1 below. The pit includes a top and bottom sump, an actuated vacuum valve, and controller. Pits are installed in the ground between the vacuum main and the home. As homes are constructed, each homeowner installs a vent between the home and the pit [Figure 2. Typical Vent]. This vent is referenced as a 'candy cane'.

Figure 2. Typical Homeowner Vent.

Water from the home enters the pit in the lower sump causing the valve to open. The vacuum main is kept under 16 – 20 of negative pressure conveying the water from the home to the vacuum station located near the wastewater treatment facility. Major components of the vacuum station include the tank, vacuum pumps and sewage pumps. The vacuum pumps function to apply a vacuum (negative pressure) to the tank, with the sewage pumps functioning to convey water from the tank to the wastewater treatment plant. Thus, the sewage pumps are critical to maintaining a proper level in the tank.

Chamber "Pit" Design

I. Chamber - The Airvac and FloVac Chamber design both include lower chamber (sump) and upper chamber with a seam approximately midway up the tank [see diagram below from Flovac webpage and above Airvax webpage]. The pit has pipe penetrations between the lower and upper sumps that include a sensor pipe and a 3" vacuum line. Both vacuum lines include rubber grommets designed to make each sump water tight.



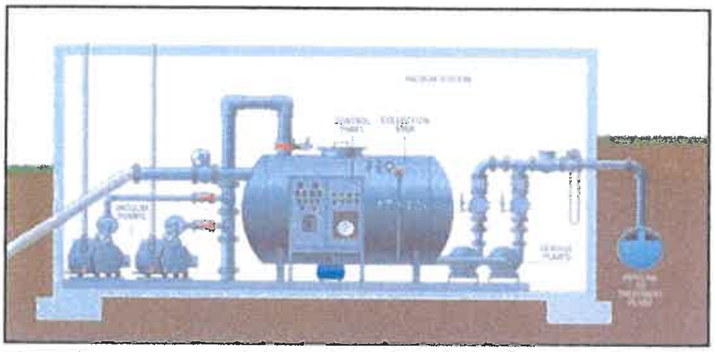
Simplified Pit Operation Description

Water from the customers flows from the home through a service line into the sump. As water fills the sump, pressure in the sensor pipe increases opening the diaphragm in the controller causing the controller to initiate the opening of the valve.

As the lower chamber is emptied atmospheric air enters the controller which removes the vacuum from the valve. The heavy valve spring then causing the valve to close.

Figure 3. Typical Vacuum Station.

Typical Vacuum Station Diagram



Pit failures include:

1. Valve failing to close
2. Valve failing to open
3. Valve chattering very roughly at low vacuum
4. While uncommon other potential pit failures include:
    a. Mechanical failure in valve
    b. Failure of valve fittings
    c. Clogging of breather tubes

The most common reasons for pit failures are:

i. Controllers
ii. Valves
iii. Other issues

While the systems are designed to be able to operate underwater, the membrane within the controller is very sensitive to moisture and if moisture comes in contact with the membrane, the controller will not operate the valve.

Typically, the valve will open but fail to close. The consequence of pit failure include:

1. Valve failing to close – Commonly known as a "leak". This will cause the main to lose vacuum creating an alarm condition. Both the repair of the "leak" and failure to repair the "leak" affect service to other customers. If not repaired, the "leak" will cause the entire system to lose vacuum impacting the entire community. Repairs require isolation of the leak (e.g. shutting of portions of the vacuum mains) to allow repair activities to proceed. Pit design does play a critical role in the ability to isolate "leaks".

2. Valve failing to open – The limited storage in the lower pit means that in the event of a valve failing to open, there is very little capacity for water use prior to a sewer backup in the home. For comparison, a typical low pressure system includes sufficient tankage to permit normal water using for 12-24 hours [120 gallons for 1 home]. Conversely, the Eagle Creek pit design provides approximately 40-50 gallon for every two (2) homes or 20-25 gallons per home. The only way for technicians to identify valve issues when a valve fails to open is from a customer notification of a sewer backup.

Candy Cane (Vent) Operations
While the vent or candy cane is owned by the home owner it does play a role in the issues at Eagle Creek. During normal operation or a "leak" situation, the vent (candy cane) permits air to enter the pit allowing water movement through the main. In addition, when a "leak" occurs the vent (candy cane) will make noise similar to a whistle.

When a valve fails to open, the candy cane may discharge water resulting in the customer having a sanitary sewer overflow. Note, however, this is typically very site specific as the vent would not protect homes if the vent is higher than the basements or slab.

Improperly installed candy canes could impact the service and the performance of the pit, causing:

a. Valve closing issues (if not properly vented)
b. Dewatering of toilets
c. Inflow and Infiltration
d. Customer sanitary sewer overflow

Sanitary Sewer Overflows
" The owner or operator of any wastewater collection or treatment works for which a permit is issued under this Part shall report a discharge of 1,000 gallons or more of untreated wastewater to the surface waters of the State to the Department as soon as practicable, but no later than 24 hours after the owner or operator has determined that the discharge has reached the surface waters of the State. This reporting requirement shall be in addition to any other reporting requirements applicable to the owner or operator of the wastewater collection or treatment works." [underlined for emphasis]

While the cleanouts and candy cane SSO are not subject to NC DEQ reporting requirements, SSOs generated from pits do require reporting according to the criteria listed both in regulation and the system-wide collection system permit.

Goals
The vacuum system at Eagle Creek has had two vacuum station failures and a long history of routine service valve failures dating back to 2002. Service related issues were most severe in October 2020 with a catastrophic failure of the vacuum station, including vacuum and sewage pumps within a 1 week period. On February 2,2021, at the request and funding of Envirolink, a review of the vacuum system at Eagle Creek was initiated. Envirolink established the following goals as the basis for our review:

1. Assess the existing vacuum station;
2. Assess the existing service valves;
3. Assess the service response and restoration procedures;
4. Offer opinion and cost for upgrades to improve the reliability of the vacuum station;
5. Offer opinion and cost for upgrades to improve the reliability of the service valves with a performance standard of one pit failure for every 6,000,000,000 valve opening operations. In essence, zero failure over the life of the valve;
6. Offer opinion and cost of upgrades to service valves and/or vacuum station that would permit continued operation of the vacuum system in the event of a service valve failures;
7. Offer opinion and cost of upgrades to the vacuum system that would improve the service restoration in the event of a service valve failure;

Reviewers

Mr. Jens Sonntag, President of A3-USA, along with Jim Docherty, A3-USA and Michael Myers, Envirolink, conducted a multi-day review of the system and conducted on site visits. Mr. Sonntag has over 15 years experience in vacuum sewer collection in both Germany and the United States as an engineer for Airvac. He currently oversees operations of A3-USA, a technology provider, specializing in water and wastewater treatment technology. Mr. Jim Docherty, offers over 25 years of experience with vacuum sewer collection in the United States having worked for Air Vac and other vacuum sewer system technology providers.

Site visit took place during a heavy rainfall, allowing a review of service response procedures. Site visits included inspection of the vacuum system and interviews with several homes owners to discuss service related issues. Emphasis was place of interviewing home owners in the Eagleton Circle and Green View Road area. This area is the lowest area of the community and is prone to flooding. As seen in the photos, several of the pits are located next to drainage channels or ditches that are prone to flooding.

Vacuum Station Operation and Maintenance Procedures
As part of the review, operators, maintenance technicians, and supervisors responsible for the day-to-day operation of the system were interviewed. Staff were helpful and knowledgeable of vacuum system operation and maintenance procedures, vacuum station and service valve operation. Supervisors were more knowledgeable of the range of technology available in the marketplace than the on-site technicians. It is very clear, staff are extremely stressed because of the operation of the vacuum system and the negative customer relations that persist as a result of the condition and performance of the vacuum system.

As part of the review, vacuum station operation and maintenance procedures, service valve and controller rebuilding procedures, emergency response procedures, service valve operation, troubleshooting procedures, and service restoration procedures were evaluated. Staff were knowledgeable on the operational and maintenance procedures for the Eagle Creek vacuum system.

As part of the report, the team was asked to provide an opinion on appropriate staffing levels. As part of this assessment, the team reviewed the size, complexity and condition of the Eagle Creek vacuum system to other vacuum systems. As such, two other vacuum systems were reviewed for comparison purposes.

Eagle Creek Assets and Resources
Eagle Creek Assets

- One (1) vacuum station
- 220 valves

The resources both dedicated and available to Eagle Creek. The team consist of:

- Three (3) technicians that are on-site daily;
- Five (5) local (within 45 minute drive) technicians;
- Local supervisor;
- Ten (10) trained personnel that provide support during emergency situations;

New staff members are teamed with an experienced staff member as they integrate into the operations of the Eagle Creek system.

York County, VA Assets and Resources
Comparison: York County, VA

- Eight (8) vacuum stations
- 5000 valves

York County employs Five (5) FTEs that are available for the operation of the vacuum system.

For context, a Eagle Creek sized vacuum system would typically require the support of one (1) part time operations technician with maintenance support for performing preventive maintenance activities as required. In addition, a typical vacuum system would not require additional dedicated resources during rainfall events in order to maintain proper operation of the vacuum system.

The poor condition of the Eagle Creek system from years of inadequate maintenance, years of inadequate investment, and years of inadequate owner engagement (up until recently) have resulted in the current service issues.

Decisions to allocate such a significant level of resources to Eagle Creek were necessary because of the condition of the Eagle Creek assets, coupled with perceptions and lack of vacuum system expertise by from regulatory officials. The main questions raised as part of this evaluation were:

1. Prudency
2. Funding

There is a concern regarding the prudency of allocating such a high level of resources. Certainly, if there had been a more robust maintenance program and investment, the condition of the system would be significantly better than what was witnessed. Additional capital investment would lessen the strain on human resources and were perplexed by the unwillingness to make these investments. For clarity, the team does not think a band-aid approach adds any value and that any investment into the collection system at Eagle Creek should be a complete overhaul and upgrade. There is no value a investment that does not result in a complete overhaul of the collection system. Any investment that does not completely upgrade the collection system will not produce the desired outcome. Further delays in moving to a long term solution will result in continued service issues and waste of human resources. In the opinion of the team, given the current condition of the vacuum system, there is no level of man power that will guarantee uninterrupted service for the Eagle Creek vacuum system.

Again for context, over the last 90 days, there have been in excess of 1800 field hours dedicated to the Eagle Creek system operation. This does not include efforts from management and customer service. The effort from field operations during this period, averages of 21 hours of coverage per day, with ramping up to 14 people on site in some instances with a minimum of three people on-site during the day.

Funding for these activities, the owner reports that they do not have the funds to support such a robust operation plan, so funding for these efforts has been provided by Envirolink.

While it is understandable that regulators and the community are frustrated, it is clear, that the staff and management are committed to providing exceeding typical response times and allocation of resources to meet the demands of the community but feel that system limitations, coupled with the overall age and condition of the system are impacting their ability to achieve the desired results and is the reason for customer perceptions and complaints.

Comparing response times for Eagle Creek to other types of systems, the service response model for Eagle Creek was found to be very responsive. In the event of a 'low vacuum' alarm, the on-site or on-call technician responds within 15-30 minutes when techs are on duty and 1 hour when tech are not on-duty (industry guidelines are 1.5 hours during business hours and 2 hours during non-business hours.

While there are perception issues and customer frustration, another source of frustration for customers is procedures for repairing "leaks". In this context, repairing a "leak" on a vacuum system is more analogous to a water distribution system than a sewer collection system. When responding to a "leak", priority is given to isolating and identifying the "leak" creating the alarm condition. Similar to water distribution system, section of the vacuum system must be taken out of service in order to isolate the "leak", so it can be located and repaired. Once the "leak" is located, vacuum mains remain shut down until the repair is completed. Upon completion of the repair, service to the vacuum mains that had been shut down is restored. It is our opinion that reports related to the "system being down" are due to the isolation activities during a service response procedure.

The big difference between a vacuum system and other sewer collection technology is the fact that one service leak impacts service for other customers. As described about the efforts to repair one service, impact other customers. This complicates restoration efforts and leads to additional service issues during restoration procedures. Once the initial "leak" is repaired, technicians begin opening valves and restoring vacuum. As vacuum is restored, full pits that could not actuate during restoration efforts begin to 'fire' creating additional "leaks". As such restoration efforts are an iterative process of search, identify, repair, restore. A typical restoration effort occurs according the following model:

1. Isolate system
2. Search and identify leak
3. Repair customer leak
4. Restore vacuum pressure
5. Isolate system
6. Search and identify leak
7. Repair customer leak
8. Restore vacuum pressure
9. Repeat steps 1 through 5 until all leaks have been restored

These efforts begin on the vacuum mains closest to the plant and continue through to the end of the line. As such customers on the end of the line have the longest periods of service interruption and are the most impacted by a customer leak.

Potential complications during restoration efforts include:

1. Customer leak on a previously restored section of line. This results in technicians "retreating" to restore the customer leak and then working to regain the lost progress.
2. Use of water – the limited storage in the customer pits. Heavy usage of water complicates restoration efforts as water backs up into controllers resulting in additional customer leaks.

It was noted that customers get frustrated during restoration efforts as technicians are focused on finding and isolating leaks and often fail to acknowledge receipt of the customer call. While the response model used is effective, we do recommend an acknowledgement or notification prior to isolating parts of the system.

Recommendation: The technicians acknowledge receipt of the service orders by communicating to the customers that they have received the service request and informing the customer that they will respond once the service leak is isolated and repaired.

It was also noted that a reverse 411 system is utilized to communicate service interruptions to the community. This system is effective in normal water and sewer utility operation in communicating service status information to customers. However, there are timing issues related with customer notifications. During service restoration efforts, customer notifications often lag real time conditions. While the timing between obtaining field information and initiating notification is typically 30 minutes. On the ground conditions change very rapidly so even a 30 minute difference between obtaining field date and issuance of customer notification creates situation where the customer notification represents 'old' information. As such, customer notifications should include a time stamp, in a attempt to get customers to understand the time the information was collected.

Recommendation: Simplify customer notifications. Note, Envirolink has worked with the HOA to develop communication protocols and those protocols are being followed.

In addition to reviewing the service response plan, an evaluation of the vacuum station and pit design was conducted.

Vacuum Station Evaluation

The vacuum station capacity is a critical issue and places a significant strain on the system. A more robust design of the vacuum station is necessary to maintain vacuum during service leaks and reduce the strain on response times.

Prior to summarizing specific observations, a fundamental understanding of vacuum technically and the Eagle Creek system is required. Key points are:

1. **Vacuum station design coupled with the age and condition of the pits, magnify the service limitations of vacuum technology.** In the event of a service leak or low vacuum alarm, technicians have minutes to find, isolate, repair and restore the service. There will always be the risk of additional pit failures regardless of speed for repair. In the case of Eagle Creek, time for repair of a service is critical because every minute it takes to identify and isolate a pit failure increases the risk that another pit will fail while responding. Additional labor resources will not solve this issue.
2. **There is not a solution for stuck closed valves.** There is no way for technicians to identify a stuck closed pit failure prior to backup. No level of manpower will solve this issue. Valves that stick closed will not result in a low vacuum alarm, so the only mechanism for identifying a stuck closed valve is through customer notification.

Key observations:

1. Significant investment in the vacuum and sewage pumps were made in Fall of 2020 as an emergency corrective maintenance action. There remains major components of the vacuum station that remain in a deteriorated state. In particular, the condition of the tank and controls are considered poor.
2. The vacuum pumps are being operated between 16 and 20 pounds of vacuum. The capacity of the vacuum pumps does not include a safety factor.

3. Restoring service after repairing a valve is complicated because of a lack of air admittance. The air admittance stations introduce additional air to move the water towards the vacuum station, allowing the vacuum to recover, greatly improving system performance.
4. Higher capacity vacuum pumps would provide a safety factor and enhance service levels.
5. The current vacuum pumps were not sized to account for inflow and infiltration without significant operator intervention. The addition of air admittance valves and higher vacuum pump capacity will allow the system to handle significantly more flow associated with I&I. The vacuum capacity is a critical issue.
6. The existing rotary vane pumps operate at a single speed with stop/start controls not variable frequency drives. Rotary screw, with variable frequency drives will be required.
7. The existing system does not provide alarms to alert homeowners and technicians of valve pit issues.
8. The existing sewage pumps are not continuous duty and include start/stop controls. Installation of variable frequency drives with the use of continuous duty sewage pumps are required.
9. The existing system includes two vacuum pumps. Additional redundancy is required.
10. The existing vacuum pumps are not recommended for vacuum systems. Oil-sealed rotary screw vacuum pumps are the current standard for use in vacuum systems.

Inflow and Infiltration - I&I is a consideration in high groundwater table areas. Installation of cycle counters at each pit allows the identification and quantity of infiltration at each pit. Sources of infiltration include:

1. Leaking through the top (the top of the pit if full of water) and then slow leaking through the pipe penetrations (around the grommets) in the membrane that separates the upper part of the pit from the sump.
2. Aging of grommets that attempt to seal the homeowners' gravity lines at the penetration to the sump – These should be replaced every 10 years and have never been replaced. This is a significant source of I&I.
3. The homeowner's gravity lines are leaking. This is difficult and costly to find without counters and monitoring.

Findings & Recommendations

Immediate Actions

1. Install air admittance – install air admittance at dead ends. There are four dead ends on the Eagle Creek system at
    a. Eagleton Circle (2)
    b. Eagle Creek Drive (1)
    c. St. Andrews (1)
2. Continuous on-site system monitoring. For stated reasons, repairs must be identified and repaired within minutes. Vacuum system technology is unique as industry standard response times are not adequate. This is evident by vacuum system manufacturers promotion of pit monitoring systems. Vacuum technology manufacturers recognized the inherent nature of vacuum systems and the strain this placed on response times. The vacuum industry responded by developing pit monitoring, which is meant to shorten the time required to identify pit issues. This is magnified at Eagle Creek because of design short comings, maintenance history, and lack of historical investment.

3. Move controllers on most problematic pits. **Anything short of a complete redesign and rebuild of the vacuum system will only marginally improve service and is not a prudent expenditure of funds.** However, moving the controllers outside of the pit for the most troublesome services will help those customers experiencing the majority of the issues.

Long Term Initiatives (assumes continuing with vacuum sewer collection)

1. *Recommendation (Long Term)*: Replace Pits. The pits on the Eagle Creek vacuum system are not recommended for this application and beyond their expected life. The increased issues in recent months is attributed to the age the pits. Pit failures have become part of daily maintenance activities.
    a. Monolithic construction – This solution eliminates the seam by using monolithic manufacturing techniques. Requires specialty molds. Not effective against water entry through the top of the vessel.
2. *Recommendation (Long Term)*: Redesign and Replacement of Vacuum Station
    a. Install variable Frequency Drives on vacuum pumps. The installation of VFDs will smooth out the performance curves and improve energy efficiency. [e.g. distribution curve versus a step function].
    b. Higher capacity vacuum pumps – The system was designed without consideration of inflow and infiltration. Pits and pit components have a design life of 10 years. As pits age, components within the pit deteriorate and become sources of inflow and infiltration. The Eagle Creek is additionally impacted by sea level rise and experiences significant sources of inflow and infiltration. The capacity of the existing vacuum pumps do not include a safety factor for inflow and infiltration, thus vacuum pumps need to be sized to permit one vacuum pump to carry the system with an appropriate safety factor.
    c.
    d. Install VFDs on sewage pumps to permit ramping up and down.
    e. Instrumentation to include air flow, vacuum sensor, pressure sensor, and level sensors.
    f. Oil-sealed rotary screw vacuum pumps. The existing rotary vane vacuum pumps are not recommended for vacuum systems due their sensitivity to moisture. The current best available technology for vacuum pumps are rotary screw vacuum pumps with variable frequency speed controls. The 'vanes' deteriorate when in contact with water. This increases the risk of failure. Water penetrating the vacuum pumps will cause a vacuum pump failure. The use of oil-sealed screw vacuums will both increase energy efficiency and provide for lower risk of failure.
    g. New stainless steel vacuum station tank outfitted with upgraded instrumentation, including level transmitters, pressure (vacuum) transmitter.
3. *Recommendation (Long Term)*: Change and move controllers. Until controllers are developed that do not fail upon contact with moisture, the controllers should be located above flood levels and outside of pits.
    a. Move controllers outside of pits
    b. Use of water resistant controllers
4. Recommendation (Long Term): Maintain 24/7/365 on-site monitoring. Until pit valve design addresses limited storage volume and the potential to impact overall system performance, response times will remain vital to maintaining service. While monitoring is effective in reducing the time to identify pit problems, it does not solve the underlying problem. Until vacuum technology addresses the underlying problem, the time to identify and repair a pit issue will remain critical.

Myers Rebuttal Exhibit H

DEQ Inspection Reports

Myers Exhibit G

1141

6

ATTACHMENT 1

Compliance Inspection Report

Permit: WQ0014306 **Effective:** 11/13/09 **Expiration:** 09/30/15 **Owner :** Sandler Utilities at Mill Run L L C
SOC: **Effective:** **Expiration:** **Facility:** Eagle Creek WWTP
287 Saint Andrews Rd

County: Currituck
Region: Washington

Moyock NC 27958

Contact Person: Raymond Gottlieb **Title:** **Phone:** 757-463-5000 Ext.388

Directions to Facility:

Beginning at the intersection of Hwy 168 and NCSR 1215 (Survey Rd) 2 miles south of the Moyock on the Currituck County Mainland, proceed to the terminus of 1215 (1215 will change to Eagle Creek Rd). At the terminus, turn left onto Greenview Rd. At the t

System Classifications: SI, WW2,

Primary ORC: William Galen Freed **Certification:** 14856 **Phone:** 252-491-5277

Secondary ORC(s):

On-Site Representative(s):

Related Permits:

Inspection Date: 09/25/2012 **Entry Time** 10:30AM **Exit Time:** 12:00PM

Primary Inspector: Robert B Tankard **Phone:** 252-946-6481 Ext.233

Secondary Inspector(s):

David L May Phone :252-946-6481 Ext.35

Reason for Inspection: Routine **Inspection Type:** Compliance Evaluation

Permit Inspection Type: Reclaimed Water

Facility Status: ☐ Compliant ■ Not Compliant

Question Areas:

■ Treatment Flow Measurement-Effluent
■ Treatment Flow Measurement-Water Use Records
■ Record Keeping
■ Treatment Disinfection
■ Treatment Return pumps
■ Treatment Flow Measurement-Influent
■ Treatment Barscreen
■ Treatment Activated Sludge
■ End Use-Infiltration
■ End Use-Reuse
■ Miscellaneous Questions
■ Treatment Filters
■ Treatment Clarifiers
■ Treatment Flow Measurement
■ Standby Power

(See attachment summary)

Inspection Summary:

The effluent at the wwtp appears to meet the effluent limits during the time of the inspection. Areas of concern with the wwtp are as follows:

*Algae is growing on the weirs of the clarifier.
*Solids and plant growth is stored in the digestor. The digestor needs to be cleaned (solids and plants need to be removed).
*Only one bank of UV bulbs are operational. ORC has stated that he had to rewire the ones in use. The second bank is non-operational.
*Woody vegetation is growing on the dikes of the infiltration basin.
*The golf course is no longer operational. The ORC has stated that the property is for sale.

These concerns need to be addressed and a follow-up inspection will take place in the future to verify compliance. The facility is non-compliant at this time.

Type

	Yes
Lagoon Spray, LR	
Infiltration System	
Single Family Spray, LR	
Activated Sludge Spray, LR	
Activated Sludge Drip, LR	
Activated Sludge Spray, HR	
Single Family Drip	
Recycle/Reuse	
Reuse (Quality)	X

Treatment Flow Measurement-Influent

	Yes	No	NA	NE
Is flowmeter calibrated annually?			X	
Is flowmeter operating properly?			X	
Does flowmeter monitor continuously?			X	
Does flowmeter record flow?			X	
Does flowmeter appear to monitor accurately?			X	

Comment:

Treatment Flow Measurement-Water Use Records

	Yes	No	NA	NE
Is water use metered?			X	
Are the daily average values properly calculated?			X	

Comment:

Treatment Flow Measurement-Effluent

	Yes	No	NA	NE
Is flowmeter calibrated annually?	X			
Is flowmeter operating properly?	X			
Does flowmeter monitor continuously?	X			
Does flowmeter record flow?	X			
Does flowmeter appear to monitor accurately?	X			

Comment:

Standby Power

	Yes	No	NA	NE
Is automatically activated standby power available?	X			
Is generator tested weekly by interrupting primary power source?	X			
Is generator operable?	X			
Does generator have adequate fuel?	X			

Comment:

Treatment Barscreen

	Yes	No	NA	NE
Is it free of excessive debris?	■	□	□	□
Is disposal of screenings in compliance?	■	□	□	□
Are the bars spaced properly?	■	□	□	□
Is the unit in good condition?	■	□	□	□

Comment:

Treatment Activated Sludge

	Yes	No	NA	NE
Is the aeration mechanism operable?	■	□	□	□
Is the aeration basin thoroughly mixed?	■	□	□	□
Is the aeration equipment easily accessed?	■	□	□	□
Is Dissolved Oxygen adequate?	□	□	□	■
Are Settleometer results acceptable?	□	□	□	■
Is activated sludge an acceptable color?	■	□	□	□

Comment: Operator is using large aeration basin as digestor. The digestor for the system being used is full of solids and plants. This digestor should be pumped and cleaned out.

Treatment Clarifiers

	Yes	No	NA	NE
Are the weirs level?	■	□	□	□
Are the weirs free of solids and algae?	□	■	□	□
Is the scum removal system operational?	■	□	□	□
Is the scum removal system accessible?	■	□	□	□
Is the sludge blanket at an acceptable level?	□	□	□	■
Is the effluent from the clarifier free of excessive solids?	■	□	□	□

Comment: The clarifier weirs are full of algae.

Treatment Return pumps

	Yes	No	NA	NE
Are they in place?	■	□	□	□
Are they operational?	■	□	□	□

Comment:

Treatment Filters

	Yes	No	NA	NE
Is the filter media present?	■	□	□	□
Is the filter media the correct size and type?	■	□	□	□
Is the air scour operational?	■	□	□	□
Is the scouring acceptable?	■	□	□	□
Is the clear well free of excessive solids?	■	□	□	□
Is the mud well free of excessive solids and filter media?	■	□	□	□
Does backwashing frequency appear adequate?	■	□	□	□

Comment:

Treatment Disinfection

	Yes	No	NA	NE
Is the system working?	X			
Do the fecal coliform results indicate proper disinfection?				
Is there adequate detention time (>=30 minutes)?	X			
Is the system properly maintained?		X		
If gas, does the cylinder storage appear safe?			X	
Is the fan in the chlorine feed room and storage area operable?			X	
Is the chlorinator accessible?			X	
If tablets, are tablets present?			X	
Are the tablets the proper size and type?			X	
Is contact chamber free of sludge, solids, and growth?			X	
If UV, are extra UV bulbs available?	X			
If UV, is the UV intensity adequate?	X			
# Is it a dual feed system?			X	
Does the Stationary Source have more than 2500 lbs of Chlorine (CAS No. 7782-50-5)?			X	
If yes, then is there a Risk Management Plan on site?			X	

If yes, then what is the EPA twelve digit ID Number? (1000-____-____)

If yes, then when was the RMP last updated?

Comment: The UV system is having problems. There has been several occasions that the UV system has failed to give an adequate kill of the fecal. Also, the second UV system is non operational (power cords are gone to the lamp fixtures). ORC has stated that the manyfacturer has gone out of business and finding parts for these units are scarce. The Owner needs to actively look for a replacement system for disinfection.

Record Keeping

	Yes	No	NA	NE
Is a copy of current permit available?	X			
Are monitoring reports present: NDMR?	X			
NDAR?	X			
Are flow rates less than of permitted flow?	X			
Are flow rates less than of permitted flow?	X			
Are application rates adhered to?	X			
Is GW monitoring being conducted, if required (GW-59s submitted)?	X			
Are all samples analyzed for all required parameters?	X			
Are there any 2L GW quality violations?	X			
Is GW-59A certification form completed for facility?	X			
Is effluent sampled for same parameters as GW?	X			
Do effluent concentrations exceed GW standards?	X			
Are annual soil reports available?				X

# Are PAN records required?	□	□	□	■
# Did last soil report indicate a need for lime?	□	□	□	■
If so, has it been applied?	□	□	□	■
Are operational logs present?	■	□	□	□
Are lab sheets available for review?	■	□	□	□
Do lab sheets support data reported on NDMR?	■	□	□	□
Do lab sheets support data reported on GW-59s?	■	□	□	□
Are Operational and Maintenance records present?	■	□	□	□
Were Operational and Maintenance records complete?	■	□	□	□
Has permittee been free of public complaints in last 12 months?	■	□	□	□
Is a copy of the SOC readily available?	□	□	■	□
No treatment units bypassed since last inspection?	■	□	□	□

Comment:

End Use-Infiltration

	Yes	No	NA	NE
# Is the application High Rate or Low Rate?	High Rate			
Are buffers maintained?	■	□	□	□
Are any supply wells within the CB?	□	□	□	■
Are any supply wells within 250' of the CB?	□	□	□	■
Is municipal water available in the area?	■	□	□	□
Are GW monitoring wells required?	■	□	□	□
Are GW monitoring wells located properly w/ respect to RB and CB?	■	□	□	□
Are GW monitoring wells properly constructed, including screened interval?	■	□	□	□
Is a usable green area maintained?	■	□	□	□
Is the disposal site acceptable?	■	□	□	□
Is the distribution equipment acceptable?	■	□	□	□
Is the disposal site free of ponding?	■	□	□	□
Is the disposal site free of breakout?	■	□	□	□
Are the disposal sites free of solids, algae, etc.?	■	□	□	□
Do the records show that the fields are properly maintained?	■	□	□	□
Are the disposal sites free of vegetation?	■	□	□	□
Do any surface water features appear to be adversely impacted by GW discharge?	□	■	□	□
No chemicals or rototiller used to eliminate vegetation, solids, algae, etc.?	□	■	□	□

Comment: The only issue with the infiltration pond is that woody vegetation is growing on inside and outside of the dike walls. The dikes were mowed approximately two years ago. The infiltration system appeared to not function as well as pre mowing. This is due to the mulch and solids washing into the pond and clogging the bottom of the pond. The owner needs to remove the vegetation from the dikes without causing future problems with the infiltration of the pond.

End Use-Reuse

	Yes	No	NA	NE
Is the acreage in the permit being utilized?	□	■	□	□
Does the acreage specified in the permit correspond to the measured acreage at the site?	□	■	□	□
Are all essential units provided in duplicate?	■	□	□	□
Is an automatically activated standby power source available?	■	□	□	□
Is the equalization capacity adequate?	■	□	□	□
Is aerated flow equalization present?	■	□	□	□
Has the turbidity meter been calibrated in the last 12 months?	□	■	□	□
Does the turbidity meter have recording capabilities?	■	□	□	□
Is all flow diverted at the appropriate times?	■	□	□	□
Is all upset wastewater diverted from reuse storage unit?	■	□	□	□
Is all upset wastewater treated, retreated, or disposed of acceptably?	■	□	□	□
Is upset wastewater treated prior to discharge to irrigation storage?	■	□	□	□
Is public access restricted from irrigation area during active site use?	■	□	□	□
If golf course, is a sign posted in plain sight on the club house?	□	□	□	■
Is the cover crop acceptable?	■	□	□	□
Are buffers adequate?	■	□	□	□
Is the site free of ponding/runoff?	■	□	□	□
Is the acreage in the permit being utilized?	□	■	□	□
Is the application equipment acceptable?	■	□	□	□
Is the application area free of limiting slopes?	■	□	□	□
How close is the closest water supply well?	□	□	□	■
Are any supply wells within the CB?	□	■	□	□
Are any supply wells within 250' of the CB?	□	■	□	□
Is municipal water available in the area?	■	□	□	□
Are GW monitoring wells required?	□	■	□	□
Are GW monitoring wells located properly w/ respect to RB and CB?	□	□	■	□
Are GW monitoring wells properly constructed, including screened interval?	□	□	■	□

Comment: The golf couse is no longer operating and is up for Sale. Therefore, no irrigation is taking place on the golf course.

Compliance Inspection Report

Permit: WQ0014306 **Effective:** 11/13/09 **Expiration:** 09/30/15 **Owner :** Sandler Utilities at Mill Run L L C
SOC: **Effective:** **Expiration:** **Facility:** Eagle Creek WWTP
287 Saint Andrews Rd

County: Currituck
Region: Washington

Moyock NC 27958

Contact Person: Raymond Gottlieb **Title:** **Phone:** 757-463-5000 Ext.388

Directions to Facility:

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System Classifications: SI, WW2,

Primary ORC: William Galen Freed **Certification:** 14856 **Phone:** 252-491-5277

Secondary ORC(s):

On-Site Representative(s):

Related Permits:

Inspection Date: 11/20/2013 **Entry Time** 11:00AM **Exit Time:** 12:30PM

Primary Inspector: Robert B Tankard **Phone:** 252-946-6481 Ext.233

Secondary Inspector(s):

Ronnie T Smith

Reason for Inspection: Routine **Inspection Type:** Compliance Evaluation

Permit Inspection Type: Reclaimed Water

Facility Status: ■ Compliant ☐ Not Compliant

Question Areas:

- ■ Treatment Flow Measurement-Effluent
- ■ Treatment Flow Measurement-Water Use Records
- ■ Record Keeping
- ■ Treatment Clarifiers
- ■ Treatment Flow Measurement
- ■ Standby Power
- ■ Treatment Flow Measurement-Influent
- ■ Treatment Barscreen
- ■ Treatment Activated Sludge
- ■ Treatment Disinfection
- ■ Treatment Return pumps
- ■ Miscellaneous Questions
- ■ Treatment Filters
- ■ Treatment Sludge Storage/Treatment
- ■ End Use-Infiltration
- ■ End Use-Reuse

(See attachment summary)

Inspection Summary:

The facility was found to be in compliance. Thanks to Mr. Bill Free with his help in the inspection.

Type

Type	Yes	No	NA	NE
Lagoon Spray, LR	☐			
Infiltration System	☐			
Activated Sludge Spray, HR	☐			
Activated Sludge Spray, LR	☐			
Single Family Spray, LR	☐			
Activated Sludge Drip, LR	☐			
Single Family Drip	☐			
Recycle/Reuse	☐			
Reuse (Quality)	■			

Treatment Flow Measurement-Influent

	Yes	No	NA	NE
Is flowmeter calibrated annually?	☐	☐	■	☐
Is flowmeter operating properly?	☐	☐	■	☐
Does flowmeter monitor continuously?	☐	☐	■	☐
Does flowmeter record flow?	☐	☐	■	☐
Does flowmeter appear to monitor accurately?	☐	☐	■	☐

Comment:

Treatment Flow Measurement-Water Use Records

	Yes	No	NA	NE
Is water use metered?	☐	☐	■	☐
Are the daily average values properly calculated?	☐	☐	■	☐

Comment:

Treatment Flow Measurement-Effluent

	Yes	No	NA	NE
Is flowmeter calibrated annually?	■	☐	☐	☐
Is flowmeter operating properly?	■	☐	☐	☐
Does flowmeter monitor continuously?	■	☐	☐	☐
Does flowmeter record flow?	■	☐	☐	☐
Does flowmeter appear to monitor accurately?	■	☐	☐	☐

Comment:

Standby Power

	Yes	No	NA	NE
Is automatically activated standby power available?	■	☐	☐	☐
Is generator tested weekly by interrupting primary power source?	■	☐	☐	☐
Is generator operable?	■	☐	☐	☐
Does generator have adequate fuel?	■	☐	☐	☐

Comment: Generator was started while on-site while assimulating a power loss.

Treatment Barscreen

	Yes	No	NA	NE
Is it free of excessive debris?	X			
Is disposal of screenings in compliance?	X			
Are the bars spaced properly?	X			
Is the unit in good condition?	X			

Comment:

Treatment Activated Sludge

	Yes	No	NA	NE
Is the aeration mechanism operable?	X			
Is the aeration basin thoroughly mixed?	X			
Is the aeration equipment easily accessed?	X			
Is Dissolved Oxygen adequate?				X
Are Settleometer results acceptable?				X
Is activated sludge an acceptable color?	X			

Comment:

Treatment Clarifiers

	Yes	No	NA	NE
Are the weirs level?	X			
Are the weirs free of solids and algae?	X			
Is the scum removal system operational?	X			
Is the scum removal system accessible?	X			
Is the sludge blanket at an acceptable level?	X			
Is the effluent from the clarifier free of excessive solids?	X			

Comment:

Treatment Return pumps

	Yes	No	NA	NE
Are they in place?	X			
Are they operational?	X			

Comment:

Treatment Filters

	Yes	No	NA	NE
Is the filter media present?	X			
Is the filter media the correct size and type?	X			
Is the air scour operational?	X			
Is the scouring acceptable?	X			
Is the clear well free of excessive solids?	X			
Is the mud well free of excessive solids and filter media?	X			
Does backwashing frequency appear adequate?				X

Comment:

Treatment Sludge Storage/Treatment

	Yes	No	NA	NE
Is the aeration operational?	■	□	□	□
Is the aeration pattern even?	□	□	□	■
If required, are Sanitary "Ts" present in tankage?	□	□	■	□

Comment:

Treatment Disinfection

	Yes	No	NA	NE
Is the system working?	■	□	□	□
Do the fecal coliform results indicate proper disinfection?	■	□	□	□
Is there adequate detention time (>=30 minutes)?	□	□	■	□
Is the system properly maintained?	■	□	□	□
If gas, does the cylinder storage appear safe?	□	□	■	□
Is the fan in the chlorine feed room and storage area operable?	□	□	■	□
Is the chlorinator accessible?	□	□	■	□
If tablets, are tablets present?	□	□	■	□
Are the tablets the proper size and type?	□	□	■	□
Is contact chamber free of sludge, solids, and growth?	□	□	■	□
If UV, are extra UV bulbs available?	■	□	□	□
If UV, is the UV intensity adequate?	■	□	□	□
# Is it a dual feed system?	□	□	■	□
Does the Stationary Source have more than 2500 lbs of Chlorine (CAS No. 7782-50-5)?	□	□	■	□
If yes, then is there a Risk Management Plan on site?	□	□	■	□
If yes, then what is the EPA twelve digit ID Number? (1000-____-____)				
If yes, then when was the RMP last updated?				

Comment:

Record Keeping

	Yes	No	NA	NE
Is a copy of current permit available?	■	□	□	□
Are monitoring reports present: NDMR?	■	□	□	□
NDAR?	■	□	□	□
Are flow rates less than of permitted flow?	■	□	□	□
Are flow rates less than of permitted flow?	■	□	□	□
Are application rates adhered to?	■	□	□	□
Is GW monitoring being conducted, if required (GW-59s submitted)?	■	□	□	□
Are all samples analyzed for all required parameters?	■	□	□	□
Are there any 2L GW quality violations?	□	■	□	□
Is GW-59A certification form completed for facility?	■	□	□	□
Is effluent sampled for same parameters as GW?	■	□	□	□

	Yes	No	NA	NE
Do effluent concentrations exceed GW standards?		■		
Are annual soil reports available?			■	
# Are PAN records required?			■	
# Did last soil report indicate a need for lime?			■	
If so, has it been applied?			■	
Are operational logs present?	■			
Are lab sheets available for review?	■			
Do lab sheets support data reported on NDMR?	■			
Do lab sheets support data reported on GW-59s?	■			
Are Operational and Maintenance records present?	■			
Were Operational and Maintenance records complete?	■			
Has permittee been free of public complaints in last 12 months?	■			
Is a copy of the SOC readily available?			■	
No treatment units bypassed since last inspection?	■			

Comment: Please be aware that a groundwater standard for ammonia nitrogen of 1.5 micrograms/liter is now applicable.

End Use-Infiltration

	Yes	No	NA	NE
# Is the application High Rate or Low Rate?				
Are buffers maintained?	■			
Are any supply wells within the CB?		■		
Are any supply wells within 250' of the CB?		■		
Is municipal water available in the area?	■			
Are GW monitoring wells required?	■			
Are GW monitoring wells located properly w/ respect to RB and CB?	■			
Are GW monitoring wells properly constructed, including screened interval?	■			
Is a usable green area maintained?	■			
Is the disposal site acceptable?	■			
Is the distribution equipment acceptable?	■			
Is the disposal site free of ponding?			■	
Is the disposal site free of breakout?			■	
Are the disposal sites free of solids, algae, etc.?	■			
Do the records show that the fields are properly maintained?				
Are the disposal sites free of vegetation?				
Do any surface water features appear to be adversely impacted by GW discharge?				
No chemicals or rototiller used to eliminate vegetation, solids, algae, etc.?				

Comment: Please be aware that a groundwater standard for Ammonia Nitrogen of 1.5 microgram/liter is now applicable.

Permit: WQ0014306 Owner - Facility: Sandler Utilities at Mill Run L L C

Inspection Date: 11/20/2013 Inspection Type : Compliance Evaluation Reason for Visit: Routine

End Use-Reuse

	Yes	No	NA	NE
Is the acreage in the permit being utilized?	■	□	□	□
Does the acreage specified in the permit correspond to the measured acreage at the site?	■	□	□	□
Are all essential units provided in duplicate?	■	□	□	□
Is an automatically activated standby power source available?	■	□	□	□
Is the equalization capacity adequate?	■	□	□	□
Is aerated flow equalization present?	■	□	□	□
Has the turbidity meter been calibrated in the last 12 months?	■	□	□	□
Does the turbidity meter have recording capabilities?	■	□	□	□
Is all flow diverted at the appropriate times?	■	□	□	□
Is all upset wastewater diverted from reuse storage unit?	■	□	□	□
Is all upset wastewater treated, retreated, or disposed of acceptably?	■	□	□	□
Is upset wastewater treated prior to discharge to irrigation storage?	■	□	□	□
Is public access restricted from irrigation area during active site use?	■	□	□	□
If golf course, is a sign posted in plain sight on the club house?	■	□	□	□
Is the cover crop acceptable?	■	□	□	□
Are buffers adequate?	■	□	□	□
Is the site free of ponding/runoff?	■	□	□	□
Is the acreage in the permit being utilized?	■	□	□	□
Is the application equipment acceptable?	■	□	□	□
Is the application area free of limiting slopes?	■	□	□	□
How close is the closest water supply well?	□	□	□	■
Are any supply wells within the CB?	□	□	■	□
Are any supply wells within 250' of the CB?	□	□	■	□
Is municipal water available in the area?	■	□	□	□
Are GW monitoring wells required?	■	□	□	□
Are GW monitoring wells located properly w/ respect to RB and CB?	■	□	□	□
Are GW monitoring wells properly constructed, including screened interval?	■	□	□	□

Comment:

Compliance Inspection Report

Permit: WQ0014306 **Effective:** 11/13/09 **Expiration:** 09/30/15 **Owner :** Sandler Utilities at Mill Run L L C
SOC: **Effective:** **Expiration:** **Facility:** Eagle Creek WWTP
287 Saint Andrews Rd

County: Currituck
Region: Washington

Moyock NC 27958

Contact Person: Raymond Gottlieb **Title:** **Phone:** 757-463-5000 Ext.388

Directions to Facility:

Beginning at the intersection of Hwy 168 and NCSR 1215 (Survey Rd) 2 miles south of the Moyock on the Currituck County Mainland, proceed to the terminus of 1215 (1215 will change to Eagle Creek Rd). At the terminus, turn left onto Greenview Rd. At the t

System Classifications: SI, WW2,

Primary ORC: **Certification:** **Phone:**

Secondary ORC(s):

On-Site Representative(s):

Related Permits:

Inspection Date: 04/22/2015 **Entry Time** 09:45AM **Exit Time:** 12:00PM

Primary Inspector: Scott A Vinson **Phone:** 919-791-4252

Secondary Inspector(s):

Reason for Inspection: Routine **Inspection Type:** Compliance Evaluation

Permit Inspection Type: Reclaimed Water

Facility Status: ☐ Compliant ■ Not Compliant

Question Areas:

■ Treatment Flow Measurement-Effluent
■ Treatment Flow Measurement-Water Use Records
■ Treatment Filters
■ Treatment Sludge Storage/Treatment
■ Treatment Disinfection
■ Treatment Return pumps
■ Treatment Flow Measurement-Influent
■ Treatment
■ Record Keeping
■ End Use-Irrigation
■ End Use-Infiltration
■ End Use-Reuse
■ Miscellaneous Questions
■ Treatment Barscreen
■ Treatment Activated Sludge
■ Treatment Clarifiers
■ Treatment Flow Measurement
■ Standby Power

(See attachment summary)

Inspection Summary:

Overall the site looked clean and maintained.

Please complete the required maintenance on the inoperable second bank of UV bulbs as soon as possible and please let me know when it is complete.

There have been multiple fecal, total suspended solids and ammonia limit violations from January through March of 2015 tha need to be addressed and kept from reoccurring.

The GW-59 forms for March, July & November of 2014 have not been submitted to the Divison. Please determine if these well samples were taken and analyzed and let Scott Vinson with the Divison know if they were not taken. If they have been taken, let Scott know and submit the appropriate forms to Raleigh as required by the permit.

I spot checked NDMRs and for March 2014 and November 2014 analysis matched lab result sheets and discovered that the missing tri-annuals (Total Organic Carbon, TDS & Chloride) were actually taken but merely missed being recorded on the submitted NDMR forms. Please review forms for March, July & November of 2014 and March 2015 and revise as needed to include the missing data and re-submit revised forms to the Division's central office for processing. Please also send a copy of these revised forms to my attention at the address below:

NCDENR - DWR
c/o Scott Vinson
943 Washington Square Mall
Washington, NC 27889

Type

	Yes	No	NA	NE
Infiltration System	□			
Single Family Spray, LR	□			
Lagoon Spray, LR	□			
Activated Sludge Spray, HR	□			
Activated Sludge Spray, LR	□			
Recycle/Reuse	□			
Activated Sludge Drip, LR	□			
Single Family Drip	□			
Reuse (Quality)	■			

Treatment

	Yes	No	NA	NE
Are Treatment facilities consistent with those outlined in the current permit?	■	□	□	□
Do all treatment units appear to be operational? (if no, note below.)	■	□	□	□

Comment:

Treatment Flow Measurement-Influent

	Yes	No	NA	NE
Is flowmeter calibrated annually?	□	□	■	□
Is flowmeter operating properly?	□	□	■	□
Does flowmeter monitor continuously?	□	□	■	□
Does flowmeter record flow?	□	□	■	□
Does flowmeter appear to monitor accurately?	□	□	■	□

Comment:

Treatment Flow Measurement-Water Use Records

	Yes	No	NA	NE
Is water use metered?	□	□	■	□
Are the daily average values properly calculated?	□	□	■	□

Comment:

Treatment Flow Measurement-Effluent

	Yes	No	NA	NE
Is flowmeter calibrated annually?	■	□	□	□
Is flowmeter operating properly?	■	□	□	□
Does flowmeter monitor continuously?	■	□	□	□
Does flowmeter record flow?	■	□	□	□
Does flowmeter appear to monitor accurately?	■	□	□	□

Comment: Flow meter calibrated May 2014 and has scheduled next calibration to be performed on May 27, 2015.
Turbidity meter was newly installed this past year (2014) and is planned to be calibrated also on May 27, 2015.

Standby Power

	Yes	No	NA	NE
Is automatically activated standby power available?	■	□	□	□
Is generator tested weekly by interrupting primary power source?	■	□	□	□
Is generator operable?	■	□	□	□
Does generator have adequate fuel?	■	□	□	□

Comment: The generator was started while on-site while assimulating a power loss.

Treatment Barscreen

	Yes	No	NA	NE
Is it free of excessive debris?	■	□	□	□
Is disposal of screenings in compliance?	■	□	□	□
Are the bars spaced properly?	■	□	□	□
Is the unit in good condition?	■	□	□	□

Comment:

Treatment Activated Sludge

	Yes	No	NA	NE
Is the aeration mechanism operable?	■	□	□	□
Is the aeration basin thoroughly mixed?	■	□	□	□
Is the aeration equipment easily accessed?	■	□	□	□
Is Dissolved Oxygen adequate?	□	□	□	■
Are Settleometer results acceptable?	□	□	□	■
Is activated sludge an acceptable color?	■	□	□	□

Comment:

Treatment Clarifiers

	Yes	No	NA	NE
Are the weirs level?	■	□	□	□
Are the weirs free of solids and algae?	■	□	□	□
Is the scum removal system operational?	■	□	□	□
Is the scum removal system accessible?	■	□	□	□
Is the sludge blanket at an acceptable level?	■	□	□	□
Is the effluent from the clarifier free of excessive solids?	■	□	□	□

Comment:

Treatment Return pumps

	Yes	No	NA	NE
Are they in place?	■	□	□	□
Are they operational?	■	□	□	□

Comment:

Treatment Filters

	Yes	No	NA	NE
Is the filter media present?	■	□	□	□
Is the filter media the correct size and type?	■	□	□	□

	Yes	No	NA	NE
Is the air scour operational?	X			
Is the scouring acceptable?	X			
Is the clear well free of excessive solids?	X			
Is the mud well free of excessive solids and filter media?	X			
Does backwashing frequency appear adequate?				X

Comment:

Treatment Sludge Storage/Treatment

	Yes	No	NA	NE
Is the aeration operational?	X			
Is the aeration pattern even?				X
If required, are Sanitary "Ts" present in tankage?			X	

Comment: Need to remove small amount of weeds/woody vegetation off top of sludge holding tank and to continue to remove sludge as needed.

Treatment Disinfection

	Yes	No	NA	NE
Is the system working?	X			
Do the fecal coliform results indicate proper disinfection?		X		
Is there adequate detention time (>=30 minutes)?			X	
Is the system properly maintained?		X		
If gas, does the cylinder storage appear safe?			X	
Is the fan in the chlorine feed room and storage area operable?			X	
Is the chlorinator accessible?			X	
If tablets, are tablets present?			X	
Are the tablets the proper size and type?			X	
Is contact chamber free of sludge, solids, and growth?			X	
If UV, are extra UV bulbs available?	X			
If UV, is the UV intensity adequate?	X			
# Is it a dual feed system?	X			
Does the Stationary Source have more than 2500 lbs of Chlorine (CAS No. 7782-50-5)?			X	
If yes, then is there a Risk Management Plan on site?			X	

If yes, then what is the EPA twelve digit ID Number? (1000-____-____)

If yes, then when was the RMP last updated?

Comment: There have been excessive fecal limit violations in February and March of 2015 reported on the NDMRs.

There are twin sets/banks of UV bulbs, with one set currently down and needing to be maintained. Please repair as soon as possible.

Record Keeping

	Yes	No	NA	NE
Is a copy of current permit available?	X			

	Yes	No	NA	NE
Are monitoring reports present: NDMR?	■	□	□	□
NDAR?	■	□	□	□
Are flow rates less than of permitted flow?	■	□	□	□
Are flow rates less than of permitted flow?	■	□	□	□
Are application rates adhered to?	■	□	□	□
Is GW monitoring being conducted, if required (GW-59s submitted)?	□	■	□	□
Are all samples analyzed for all required parameters?	■	□	□	□
Are there any 2L GW quality violations?	□	□	□	■
Is GW-59A certification form completed for facility?	■	□	□	□
Is effluent sampled for same parameters as GW?	■	□	□	□
Do effluent concentrations exceed GW standards?	□	□	□	■
Are annual soil reports available?	□	□	■	□
# Are PAN records required?	□	□	■	□
# Did last soil report indicate a need for lime?	□	□	■	□
If so, has it been applied?	□	□	■	□
Are operational logs present?	■	□	□	□
Are lab sheets available for review?	■	□	□	□
Do lab sheets support data reported on NDMR?	■	□	□	□
Do lab sheets support data reported on GW-59s?	□	□	□	■
Are Operational and Maintenance records present?	■	□	□	□
Were Operational and Maintenance records complete?	■	□	□	□
Has permittee been free of public complaints in last 12 months?	■	□	□	□
Is a copy of the SOC readily available?	□	□	■	□
No treatment units bypassed since last inspection?	■	□	□	□

Comment: GW-59 forms for March, July and November of 2014 have not been submitted to the Division.

End Use-Irrigation

	Yes	No	NA	NE
Are buffers adequate?	■	□	□	□
Is the cover crop type specified in permit?	■	□	□	□
Is the crop cover acceptable?	■	□	□	□
Is the site condition adequate?	■	□	□	□
Is the site free of runoff / ponding?	■	□	□	□
Is the acreage specified in the permit being utilized?	■	□	□	□
Is the application equipment present?	■	□	□	□
Is the application equipment operational?	■	□	□	□
Is the disposal field free of limiting slopes?	■	□	□	□
Is access restricted and/or signs posted during active site use?	□	■	□	□

	Yes	No	NA	NE
Are any supply wells within the CB?	□	■	□	□
Are any supply wells within 250' of the CB?	□	■	□	□
How close is the closest water supply well?	□	□	□	■
Is municipal water available in the area?	■	□	□	□
# Info only: Does the permit call for monitoring wells?	■	□	□	□
Are GW monitoring wells located properly w/ respect to RB and CB?	□	□	□	■
Are GW monitoring wells properly constructed, including screened interval?	□	□	□	■
Are monitoring wells damaged?	□	□	□	■

Comment: A reuse spray irrigation sign was not present at the golf club house. The club house manager believes the previous sign may have been removed along with multiple older posts on the bulletin board and mentioned that he would post a new sign once the ORC creates and gives it to him. He will place signage behind locked glass door on bulletin board so that it can not be accidently removed again.

End Use-Infiltration

	Yes	No	NA	NE
# Is the application High Rate or Low Rate?				
Are buffers maintained?	■	□	□	□
Are any supply wells within the CB?	□	■	□	□
Are any supply wells within 250' of the CB?	□	■	□	□
Is municipal water available in the area?	■	□	□	□
Are GW monitoring wells required?	■	□	□	□
Are GW monitoring wells located properly w/ respect to RB and CB?	□	□	□	■
Are GW monitoring wells properly constructed, including screened interval?	□	□	□	■
Is a usable green area maintained?	■	□	□	□
Is the disposal site acceptable?	■	□	□	□
Is the distribution equipment acceptable?	■	□	□	□
Is the disposal site free of ponding?	□	□	■	□
Is the disposal site free of breakout?	□	□	■	□
Are the disposal sites free of solids, algae, etc.?	■	□	□	□
Do the records show that the fields are properly maintained?	□	□	■	□
Are the disposal sites free of vegetation?	□	□	■	□
Do any surface water features appear to be adversely impacted by GW discharge?	□	□	■	□
No chemicals or rototiller used to eliminate vegetation, solids, algae, etc.?	□	□	■	□

Comment: Please be aware that a groundwater standard for Ammonia Nitrogen of 1.5 microgram/liter is now applcable.

End Use-Reuse

	Yes	No	NA	NE
Is the acreage in the permit being utilized?	■	□	□	□
Does the acreage specified in the permit correspond to the measured acreage at the site?	■	□	□	□
Are all essential units provided in duplicate?	■	□	□	□

Is an automatically activated standby power source available?	■	□	□	□
Is the equalization capacity adequate?	■	□	□	□
Is aerated flow equalization present?	■	□	□	□
Has the turbidity meter been calibrated in the last 12 months?	■	□	□	□
Does the turbidity meter have recording capabilities?	■	□	□	□
Is all flow diverted at the appropriate times?	■	□	□	□
Is all upset wastewater diverted from reuse storage unit?	■	□	□	□
Is all upset wastewater treated, retreated, or disposed of acceptably?	■	□	□	□
Is upset wastewater treated prior to discharge to irrigation storage?	■	□	□	□
Is public access restricted from irrigation area during active site use?	■	□	□	□
If golf course, is a sign posted in plain sight on the club house?	□	■	□	□
Is the cover crop acceptable?	■	□	□	□
Are buffers adequate?	■	□	□	□
Is the site free of ponding/runoff?	■	□	□	□
Is the acreage in the permit being utilized?	■	□	□	□
Is the application equipment acceptable?	■	□	□	□
Is the application area free of limiting slopes?	■	□	□	□
How close is the closest water supply well?	□	□	□	■
Are any supply wells within the CB?	□	□	■	□
Are any supply wells within 250' of the CB?	□	□	■	□
Is municipal water available in the area?	■	□	□	□
Are GW monitoring wells required?	■	□	□	□
Are GW monitoring wells located properly w/ respect to RB and CB?	■	□	□	□
Are GW monitoring wells properly constructed, including screened interval?	■	□	□	□

Comment: A reuse spray irrigation sign was not present at the golf club house. The club house manager believes the previous sign may have been removed along with multiple older posts on the bulletin board and mentioned that he would post a new sign once the ORC creates and gives it to him. He will place signage behind locked glass door on bulletin board so that it can not be accidently removed again.

Compliance Inspection Report

Permit: WQ0014306 **Effective:** 10/08/15 **Expiration:** 09/30/20 **Owner :** Sandler Utilities at Mill Run L L C
SOC: **Effective:** **Expiration:** **Facility:** Eagle Creek WWTP
287 Saint Andrews Rd

County: Currituck
Region: Washington

Moyock NC 27958

Contact Person: Raymond Gottlieb **Title:** **Phone:** 757-463-5000 Ext.388

Directions to Facility:

Beginning at the intersection of Hwy 168 and NCSR 1215 (Survey Rd) 2 miles south of the Moyock on the Currituck County Mainland, proceed to the terminus of 1215 (1215 will change to Eagle Creek Rd). At the terminus, turn left onto Greenview Rd. At the t

System Classifications: SI, WW2,

Primary ORC: **Certification:** **Phone:**
Secondary ORC(s):

On-Site Representative(s):

Related Permits:

Inspection Date: 01/31/2018 **Entry Time** 10:35AM **Exit Time:** 01:15PM
Primary Inspector: Scott A Vinson **Phone:** 919-791-4252

Secondary Inspector(s):

Reason for Inspection: Routine **Inspection Type:** Compliance Sampling
Permit Inspection Type: Reclaimed Water

Facility Status: ☐ Compliant ■ Not Compliant

Question Areas:

■ Treatment Flow Measurement-Effluent
■ Treatment Flow Measurement-Water Use Records
■ Treatment Filters
■ Treatment Sludge Storage/Treatment
■ Treatment Disinfection
■ Treatment Return pumps
■ Wells
■ Treatment Flow Measurement-Influent
■ Treatment
■ Record Keeping
■ End Use-Irrigation
■ End Use-Infiltration
■ End Use-Reuse
■ Miscellaneous Questions
■ Treatment Barscreen
■ Treatment Activated Sludge
■ Treatment Clarifiers
■ Treatment Flow Measurement
■ Standby Power

(See attachment summary)

Inspection Summary:

On January 31, 2018, Washington Regional Office Staff members Scott Vinson and Randy Sipe visited the Eagle Creek Wastewater Treatment Plant to conduct a Compliance Sampling Evaluation. This inspection was conducted to both spot check and review records as well as to sample the effluent and the two ground water monitoring wells. The facility was found to be Non-Compliant with the permit for the reasons listed below (marked with asteriks).

I reviewed records for NDMRs for Januray 2016, October 2016, June 2017 and October 2017 and the reported analysis matched lab result sheets.

The facility had Delta Systems Environmental calibrate their turbidity and flow meters on June 6, 2017, and had their thermometer last calibrated on April 10, 2017 and had a new meter bought in Janauary 2018.

The facility contracts with Atlantic Sewage for their sludge/solids removal. They remove solids approximately every month as needed.

The required maintenance on the inoperable second bank of UV bulbs has been completed and is operable.
The missing GW-59s from 2014 were submitted in June of 2015. The ground water monitoring results show signs of high Total Ammonia Nitrogen in both monitoring wells.

The facility's bench sheets need to have a place where the ORC/Backup ORC can sign daily as the calibrations and analyzed data points are taken and recorded.

**The reclaim wastewater reuse sign was not properly posted at the Golf Club House and DWR staff had to request that the Club Manager repost the sign and was put on notice that they are required to leave the sign posted at all times. The sign was reposted prior to staff leaving the club house.

***The excessive cold weather that occurred this winter (first week in January 2018) had caused the clarifier water to flip which caused excessive solids to drain down and partially clog the filters. After discussing with the operator, the sand media needs to be replaced as needed to continue proper filtering as soon as possible.

***There is again an excessive amount of woody vegetation growing around the high rate infiltration pond that needs to be removed as soon as possible. The removal should not be by grinding the tree trunks in place which could allow for solids to enter the infiltration basin as did last time. The removal should be such that no solids should fall or enter in the basin, nor should there be any excessive erosion of the side walls allowed to occur during and after the removal process. Grassed revegetation of the side walls should be established around the entire basin after all the woody vegetation is properly removed from the site. This grassed vegetation should be mowed regularly to remain healthy and to keep woody vegetation from re-establishing.

***The two groundwater monitoring wells located adjacent to the high rate infiltration pond have been exceeding their Total Ammonia Nitrogen limits (1.5 mg/L) with MW-1 having approximately 6.3mg/L and MW-2 having approximately 10.8 mg/L regularly. It is noted that the wastewater effluent leaving the plant for the past 10-15 years has regularly been reported as being below allowable limits (4mg/L) for what was discharged into the infiltration pond with very few exceptions(see January-March of 2015).
It is important that the source of the high levels of ammonia in the groundwater are determined and eliminated if possible.

Sampling Results

	Effluent	MW-1	MW-2	
BOD, 5-Day	2.0 mg/L			
Fecal Coliform	1 CFU/100ml (Q1)			
Turbidity	5.3			
Suspended Solids	12 mg/L			
NH3 as N	0.13 mg/L	5.7 mg/L	9.8 mg/L	***
NO2+NO3 as N	17 mg/L	0.02 mg/L	0.02 mg/L	
TKN as N	1.8 mg/L	6.4 mg/L	10 mg/L	
TP	3.6 mg/L	1.4 mg/L	2.0 mg/L	

If you have any questions please call or write, Scott.Vinson@ncdenr.gov or (252)948-3844.

Please provide a written response to these permit and limit condition violations listed above to:

NCDEQ-DWR, WQROS
c/o Scott Vinson
943 Washington Square Mall
Washington, NC 27889

Type

	Yes	No	NA	NE
Activated Sludge Spray, HR	☐			
Activated Sludge Drip, LR	☐			
Recycle/Reuse	☐			
Single Family Drip	☐			
Lagoon Spray, LR	☐			
Single Family Spray, LR	☐			
Activated Sludge Spray, LR	☐			
Infiltration System	■			
Reuse (Quality)	■			

Treatment

	Yes	No	NA	NE
Are Treatment facilities consistent with those outlined in the current permit?	■	☐	☐	☐
Do all treatment units appear to be operational? (if no, note below.)	■	☐	☐	☐

Comment:

Treatment Flow Measurement-Influent

	Yes	No	NA	NE
Is flowmeter calibrated annually?	☐	☐	■	☐
Is flowmeter operating properly?	☐	☐	■	☐
Does flowmeter monitor continuously?	☐	☐	■	☐
Does flowmeter record flow?	☐	☐	■	☐
Does flowmeter appear to monitor accurately?	☐	☐	■	☐

Comment:

Treatment Flow Measurement-Water Use Records

	Yes	No	NA	NE
Is water use metered?	☐	☐	■	☐
Are the daily average values properly calculated?	☐	☐	■	☐

Comment:

Treatment Flow Measurement-Effluent

	Yes	No	NA	NE
Is flowmeter calibrated annually?	■	☐	☐	☐
Is flowmeter operating properly?	■	☐	☐	☐
Does flowmeter monitor continuously?	■	☐	☐	☐
Does flowmeter record flow?	■	☐	☐	☐
Does flowmeter appear to monitor accurately?	■	☐	☐	☐

Comment: Flow meter calibrated on 6/6/2017 by Delta Systems Environmental

Standby Power

	Yes	No	NA	NE
Is automatically activated standby power available?	■	☐	☐	☐

	Yes	No	NA	NE
Is generator tested weekly by interrupting primary power source?	■	□	□	□
Is generator operable?	■	□	□	□
Does generator have adequate fuel?	■	□	□	□

Comment:

Treatment Barscreen

	Yes	No	NA	NE
Is it free of excessive debris?	■	□	□	□
Is disposal of screenings in compliance?	■	□	□	□
Are the bars spaced properly?	■	□	□	□
Is the unit in good condition?	■	□	□	□

Comment:

Treatment Activated Sludge

	Yes	No	NA	NE
Is the aeration mechanism operable?	■	□	□	□
Is the aeration basin thoroughly mixed?	■	□	□	□
Is the aeration equipment easily accessed?	■	□	□	□
Is Dissolved Oxygen adequate?	□	□	□	■
Are Settleometer results acceptable?	□	□	□	■
Is activated sludge an acceptable color?	■	□	□	□

Comment:

Treatment Clarifiers

	Yes	No	NA	NE
Are the weirs level?	■	□	□	□
Are the weirs free of solids and algae?	■	□	□	□
Is the scum removal system operational?	■	□	□	□
Is the scum removal system accessible?	■	□	□	□
Is the sludge blanket at an acceptable level?	■	□	□	□
Is the effluent from the clarifier free of excessive solids?	■	□	□	□

Comment:

Treatment Return pumps

	Yes	No	NA	NE
Are they in place?	■	□	□	□
Are they operational?	■	□	□	□

Comment:

Treatment Filters

	Yes	No	NA	NE
Is the filter media present?	■	□	□	□
Is the filter media the correct size and type?	■	□	□	□
Is the air scour operational?	■	□	□	□
Is the scouring acceptable?	■	□	□	□

	Yes	No	NA	NE
Is the clear well free of excessive solids?		X		
Is the mud well free of excessive solids and filter media?		X		
Does backwashing frequency appear adequate?		X		

Comment: The excessive cold weather that occurred this winter (first week in January 2018) had caused the clarifier water to flip which caused excessive solids to drain down and partially clog the filters. The sand media needs to be evaluated and replaced as needed to continue proper filtering.

Treatment Sludge Storage/Treatment

	Yes	No	NA	NE
Is the aeration operational?	X			
Is the aeration pattern even?				X
If required, are Sanitary "Ts" present in tankage?			X	

Comment:

Treatment Disinfection

	Yes	No	NA	NE
Is the system working?	X			
Do the fecal coliform results indicate proper disinfection?	X			
Is there adequate detention time (>=30 minutes)?			X	
Is the system properly maintained?	X			
If gas, does the cylinder storage appear safe?			X	
Is the fan in the chlorine feed room and storage area operable?			X	
Is the chlorinator accessible?			X	
If tablets, are tablets present?			X	
Are the tablets the proper size and type?			X	
Is contact chamber free of sludge, solids, and growth?			X	
If UV, are extra UV bulbs available?	X			
If UV, is the UV intensity adequate?	X			
# Is it a dual feed system?	X			
Does the Stationary Source have more than 2500 lbs of Chlorine (CAS No. 7782-50-5)?			X	
If yes, then is there a Risk Management Plan on site?			X	

If yes, then what is the EPA twelve digit ID Number? (1000-____-____)

If yes, then when was the RMP last updated?

Comment: The UV system has been repaired since last inspection and now both UV banks are fully operational.

Record Keeping

	Yes	No	NA	NE
Is a copy of current permit available?	X			
Are monitoring reports present: NDMR?	X			
NDAR?	X			
Are flow rates less than of permitted flow?	X			

Are flow rates less than of permitted flow?	■	□	□	□
Are application rates adhered to?	■	□	□	□
Is GW monitoring being conducted, if required (GW-59s submitted)?	■	□	□	□
Are all samples analyzed for all required parameters?	■	□	□	□
Are there any 2L GW quality violations?	■	□	□	□
Is GW-59A certification form completed for facility?	□	■	□	□
Is effluent sampled for same parameters as GW?	■	□	□	□
Do effluent concentrations exceed GW standards?	□	■	□	□
Are annual soil reports available?	□	□	■	□
# Are PAN records required?	□	□	■	□
# Did last soil report indicate a need for lime?	□	□	■	□
If so, has it been applied?	□	□	■	□
Are operational logs present?	■	□	□	□
Are lab sheets available for review?	■	□	□	□
Do lab sheets support data reported on NDMR?	■	□	□	□
Do lab sheets support data reported on GW-59s?	■	□	□	□
Are Operational and Maintenance records present?	□	■	□	□
Were Operational and Maintenance records complete?	□	□	□	■
Has permittee been free of public complaints in last 12 months?	■	□	□	□
Is a copy of the SOC readily available?	□	□	■	□
No treatment units bypassed since last inspection?	■	□	□	□

Comment: The two groundwater monitoring wells located adjacent to the high rate infiltration pond have been exceeding their Total Ammonia Nitrogen limits (1.5 mg/L) with MW-1 having approximately 6.3mg/L and MW-2 having approximately 10.8 mg/L regularly, while the wastewater effluent leaving the plant has regularly been below the 4mg/L limit being discharged into the infiltration pond.

The GW-59A certification form needs to be completed and submitted regularly along with the Groundwater Monitoring GW-59 orms.

The ORC keeps Operation and Maintenance records with him and are not regularly left at the plant. The records were accidentaly left at home the day of this inspection. These records need to be provided during future inspections.

End Use-Irrigation

	Yes	No	NA	NE
Are buffers adequate?	■	□	□	□
Is the cover crop type specified in permit?	■	□	□	□
Is the crop cover acceptable?	■	□	□	□
Is the site condition adequate?	■	□	□	□
Is the site free of runoff / ponding?	■	□	□	□
Is the acreage specified in the permit being utilized?	■	□	□	□

Is the application equipment present?	■	□	□	□
Is the application equipment operational?	■	□	□	□
Is the disposal field free of limiting slopes?	■	□	□	□
Is access restricted and/or signs posted during active site use?	□	■	□	□
Are any supply wells within the CB?	□	■	□	□
Are any supply wells within 250' of the CB?	□	■	□	□
How close is the closest water supply well?	□	□	□	■
Is municipal water available in the area?	■	□	□	□
# Info only: Does the permit call for monitoring wells?	■	□	□	□
Are GW monitoring wells located properly w/ respect to RB and CB?	■	□	□	□
Are GW monitoring wells properly constructed, including screened interval?	□	□	□	■
Are monitoring wells damaged?	□	■	□	□

Comment: The reclaim wastewater reuse sign was not properly posted at the Golf Club House and DWR staff had to request that the Club Manager repost the sign and was put on notice that it is required to leave the sign posted at all times. The sign was reposted prior to staff leaving the club house.

End Use-Infiltration

	Yes	No	NA	NE
# Is the application High Rate or Low Rate?	High Rate			
Are buffers maintained?	■	□	□	□
Are any supply wells within the CB?	□	■	□	□
Are any supply wells within 250' of the CB?	□	■	□	□
Is municipal water available in the area?	■	□	□	□
Are GW monitoring wells required?	■	□	□	□
Are GW monitoring wells located properly w/ respect to RB and CB?	■	□	□	□
Are GW monitoring wells properly constructed, including screened interval?	□	□	□	■
Is a usable green area maintained?	■	□	□	□
Is the disposal site acceptable?	■	□	□	□
Is the distribution equipment acceptable?	■	□	□	□
Is the disposal site free of ponding?	□	□	■	□
Is the disposal site free of breakout?	□	□	■	□
Are the disposal sites free of solids, algae, etc.?	■	□	□	□
Do the records show that the fields are properly maintained?	□	□	■	□
Are the disposal sites free of vegetation?	□	■	□	□
Do any surface water features appear to be adversely impacted by GW discharge?	□	□	□	□
No chemicals or rototiller used to eliminate vegetation, solids, algae, etc.?	□	□	■	□

Comment: There is again an excessive amount of woody vegetation growing around the high rate infiltration pond that needs to be removed as soon as possible. The removal should not be by grinding the tree trunks in place which allows for solids to enter the infiltration basin. The removal should be such that no solids should fall or enter in the basin, nor should there be any excessive erosion of the side walls allowed to occur during and after the removal process. Grassed revegetation of the side walls should be implemented as needed around the entire basin after all the woody vegetation is properly removed from the site.

End Use-Reuse

	Yes	No	NA	NE
Is the acreage in the permit being utilized?	■	□	□	□
Does the acreage specified in the permit correspond to the measured acreage at the site?	■	□	□	□
Are all essential units provided in duplicate?	■	□	□	□
Is an automatically activated standby power source available?	■	□	□	□
Is the equalization capacity adequate?	■	□	□	□
Is aerated flow equalization present?	■	□	□	□
Has the turbidity meter been calibrated in the last 12 months?	■	□	□	□
Does the turbidity meter have recording capabilities?	■	□	□	□
Is all flow diverted at the appropriate times?	■	□	□	□
Is all upset wastewater diverted from reuse storage unit?	■	□	□	□
Is all upset wastewater treated, retreated, or disposed of acceptably?	■	□	□	□
Is upset wastewater treated prior to discharge to irrigation storage?	■	□	□	□
Is public access restricted from irrigation area during active site use?	■	□	□	□
If golf course, is a sign posted in plain sight on the club house?	□	■	□	□
Is the cover crop acceptable?	■	□	□	□
Are buffers adequate?	■	□	□	□
Is the site free of ponding/runoff?	■	□	□	□
Is the acreage in the permit being utilized?	■	□	□	□
Is the application equipment acceptable?	■	□	□	□
Is the application area free of limiting slopes?	■	□	□	□
How close is the closest water supply well?	□	□	□	■
Are any supply wells within the CB?	□	□	■	□
Are any supply wells within 250' of the CB?	□	□	■	□
Is municipal water available in the area?	■	□	□	□
Are GW monitoring wells required?	■	□	□	□
Are GW monitoring wells located properly w/ respect to RB and CB?	■	□	□	□
Are GW monitoring wells properly constructed, including screened interval?	□	□	□	■

Comment: The reclaim wastewater reuse sign was not properly posted at the Golf Club House and DWR staff had to request that the Club Manager repost the sign and was put on notice that it is required to leave the sign posted at all times. The sign was reposted prior to staff leaving the club house.

Compliance Inspection Report

Permit: WQ0014306 **Effective:** 10/08/15 **Expiration:** 09/30/20 **Owner :** Sandler Utilities at Mill Run L L C
SOC: **Effective:** **Expiration:** **Facility:** Eagle Creek WWTP
287 Saint Andrews Rd

County: Currituck
Region: Washington

Moyock NC 27958

Contact Person: Raymond Gottlieb **Title:** **Phone:** 757-463-5000 Ext.388

Directions to Facility:

Beginning at the intersection of Hwy 168 and NCSR 1215 (Survey Rd) 2 miles south of the Moyock on the Currituck County Mainland, proceed to the terminus of 1215 (1215 will change to Eagle Creek Rd). At the terminus, turn left onto Greenview Rd. At the t

System Classifications: SI, WW2,

Primary ORC: **Certification:** **Phone:**

Secondary ORC(s):

On-Site Representative(s):

Related Permits:

Inspection Date: 04/18/2018 **Entry Time** 11:10AM **Exit Time:** 12:30PM

Primary Inspector: Scott A Vinson **Phone:** 919-791-4252

Secondary Inspector(s):

Reason for Inspection: Complaint **Inspection Type:** Compliance Evaluation

Permit Inspection Type: Reclaimed Water

Facility Status: ☐ Compliant ■ Not Compliant

Question Areas:

■ Miscellaneous Questions ■ Treatment

(See attachment summary)

Inspection Summary:

On April 18, 2018, Washington Regional Office staff member Scott Vinson, met onsite with HOA representatives, and ORC Randall Mars in reponse to a complaint regarding the no longer functioning 6,000 GPM stormwater pump that helps the movement of groundwater off site from the golf course. It was noted that the stormwater pump was no longer working and it was noted during the discussion that it had been inoperable for several months at the time of inspection. Please note that this is a violation of permit WQ0014306 condition III. Operation and Maintenance Requirments, no. 27. which states "The Permittee shall be responsible for the operation and maintenance of teh 6,000 GPM stormwater pump to allow the movement of groundwater off site from the golf course. Until such time that the County has established a drainage district, the Permittee shall be responsible for maintaining the canals for positive drainage. [15A NCAC 02T .0180(b)(1)]". This pump shall be repaired as soon as possible.

There is an excessive amount of woody vegetation growing around the high rate infiltration pond that needs to be removed as soon as possible. Please note that this is a violation of permit WQ0014306 condition III. Operation and Maintenance Requirments, no. 18. which states "A protective vegetative cover shall be established and maintained on all earthen embankments (i.e. outside toe of embankment to maximum allowable temporary storage elevation on the inside of the embankment), berms, pipe runs, erosion control areas, and surfce water divrsions. Trees, shrubs, and other woody vegetation shall not be allowed to grow on the earthen dikes or embankments. Earthen embankment areas shall be kept mowed or otherwise controlled and accessible. [15A NCAC 02T .0108(b)(1)]
The removal should not be by grinding the tree trunks in place which would allow for solids to enter the infiltration basin as was done the last time these trees were improperly removed several years ago. The removal should be such that no solids should fall or enter in the basin, nor should there be any excessive erosion of the side walls allowed to occur during and after the removal process. Grassed revegetation of the side walls should be established around the entire basin after all the woody vegetation is properly removed from the site. This grassed vegetation should be mowed regularly to remain healthy and to keep woody vegetation from re-establishing.

Please properly remove the woody vegetation around the perimeter of the high rate infiltration pond and repair this stormwater pump as soon as possible. Provide this Office with a written plan of action with proposed dates, schedules, timelines, etc. which address these items of repair work.

Please provide a written response to the permit condition violations listed above to:
NCDEQ-DWR, WQROS
c/o Scott Vinson
943 Washington Square Mall
Washington, NC 27889

It was noted during this visit that the reclaim wastewater use sign was properly posted at the Golf Club House as directed to do during the last site visit. Please remember to keep this sign posted here at all times.

Type

	Yes	No	NA	NE
Single Family Spray, LR	☐			
Lagoon Spray, LR	☐			
Activated Sludge Spray, LR	☐			
Activated Sludge Spray, HR	☐			
Recycle/Reuse	☐			
Activated Sludge Drip, LR	☐			
Single Family Drip	☐			
Reuse (Quality)	■			
Infiltration System	■			

Treatment

	Yes	No	NA	NE
Are Treatment facilities consistent with those outlined in the current permit?	■	☐	☐	☐
Do all treatment units appear to be operational? (if no, note below.)	☐	■	☐	☐

Comment: The permitted 6,000 GPM stormwater pump that allows the movement of groundwater off site from the golf course is no longer operational.
There is an excessive amount of woody vegetation growing around the high rate infiltration pond that needs to be removed as soon as possible.

Compliance Inspection Report

Permit: WQ0014306 **Effective:** 10/08/15 **Expiration:** 09/30/20 **Owner :** Sandler Utilities at Mill Run L L C
SOC: **Effective:** **Expiration:** **Facility:** Eagle Creek WWTP
287 Saint Andrews Rd

Moyock NC 27958

County: Currituck
Region: Washington

Contact Person: Raymond Gottlieb **Title:** **Phone:** 757-463-5000 Ext.388

Directions to Facility:

Beginning at the intersection of Hwy 168 and NCSR 1215 (Survey Rd) 2 miles south of the Moyock on the Currituck County Mainland, proceed to the terminus of 1215 (1215 will change to Eagle Creek Rd). At the terminus, turn left onto Greenview Rd. At the t

System Classifications: SI, WW2,

Primary ORC: **Certification:** **Phone:**
Secondary ORC(s):

On-Site Representative(s):

Related Permits:

Inspection Date: 08/19/2020 **Entry Time** 11:00AM **Exit Time:** 01:00PM
Primary Inspector: Paul M Mays **Phone:** 252-948-3940
Secondary Inspector(s):

Reason for Inspection: Routine **Inspection Type:** Compliance Evaluation
Permit Inspection Type: Reclaimed Water
Facility Status: ☐ Compliant ■ Not Compliant

Question Areas:

■ Treatment Flow Measurement-Effluent
■ Treatment Flow Measurement-Water Use Records
■ Treatment Filters
■ Treatment Sludge Storage/Treatment
■ Treatment Disinfection
■ Treatment Return pumps
■ Wells
■ Treatment Flow Measurement-Influent
■ Treatment
■ Record Keeping
■ End Use-Irrigation
■ End Use-Infiltration
■ End Use-Reuse
■ Miscellaneous Questions
■ Treatment Barscreen
■ Treatment Activated Sludge
■ Treatment Clarifiers
■ Treatment Flow Measurement
■ Standby Power

(See attachment summary)

Inspection Summary:

On 8/19/2020 from 11:00 am to 1:00 pm an inspection of Eagle Creek WWTP permitted under permit #WQ0014306 was completed by Paul Mays and Randy Sipe from WARO. The facility was found to be non-compliant with permit #WQ0014306. Below are the findings during the inspection.

Tertiary filter has been down and bypassed for 2 years according to staff during inspection. The unit was not operational during the inspection and must be fixed as soon as possible. This a violation of permit conditions II.1, III.1, III.15 and IV.13.

Effluent flow meter calibrated on 5/21/2020 by Delta Systems Environmental.

Turbidity meter calibrated on 5/21/2020 by Delta Systems Environmental

The generator was operational and halfway full during inspection.

One of the two 225,000-gallon aeration basins was closed and had vegetation growth in it. Please reference condition III.1. The facility is supposed to be properly maintained and operated at all times. The vegetation should be removed as soon as possible in a safe manner. The other aeration basin in operation looked acceptable.

The 148,250-gallon clarifier was fully operational, and the 28,220-gallon clarifier was not in operation at the time of inspection.

Operational logs were requested and were not present during inspection. It was requested from this inspection forward that they be present during future inspections. This is a violation of permit condition IV.10.

Spot checked 07/2020 GW-59 report with corresponding lab data and found no discrepancies.

Spot checked 09/2020 NDMR report with corresponding lab data and found no discrepancies.

There is an excessive amount of woody vegetation growing around the high rate infiltration pond that must be removed as soon as possible. It should be noted that much of this wooded vegetation has grown over 10ft. The removal of vegetation should not be done by grinding the tree trunks in place which allows solids to enter the infiltration basin. The removal should occur such that no solids should enter the basin, nor should there be any excessive erosion of the side walls be allowed to occur during and after removal. Grassed revegetation of the side walls should be implemented as needed around the entire basin after all the woody vegetation is properly removed from the site. This is a violation of permit condition II.1, III.1 and III.18.

Both monitoring wells for the facility were unlocked and should always be locked except for sampling.

Overall, the fields at the golf course where the "reuse" waster is being utilized looked good. The primary concern is that the fields are being irrigated with water that bypassed the tertiary filter for over two years. As this water has been pumped to the reuse pond and irrigated.

Type

	Yes	No	NA	NE
Activated Sludge Drip, LR	□			
Single Family Spray, LR	□			
Lagoon Spray, LR	□			
Activated Sludge Spray, LR	□			
Recycle/Reuse	□			
Single Family Drip	□			
Activated Sludge Spray, HR	□			
Infiltration System	■			
Reuse (Quality)	■			

Treatment

	Yes	No	NA	NE
Are Treatment facilities consistent with those outlined in the current permit?	■	□	□	□
Do all treatment units appear to be operational? (if no, note below.)	□	■	□	□

Comment: The tertiary filter has been down and bypassed for 2 years according to staff during inspection. The unit was not operational during the inspection and must be fixed as soon as possible. This a violation of permit conditions II.1, III.1, III.15 and IV.13.

Treatment Flow Measurement-Influent

	Yes	No	NA	NE
Is flowmeter calibrated annually?	□	□	■	□
Is flowmeter operating properly?	□	□	■	□
Does flowmeter monitor continuously?	□	□	■	□
Does flowmeter record flow?	□	□	■	□
Does flowmeter appear to monitor accurately?	□	□	■	□

Comment:

Treatment Flow Measurement-Water Use Records

	Yes	No	NA	NE
Is water use metered?	□	□	■	□
Are the daily average values properly calculated?	□	□	■	□

Comment:

Treatment Flow Measurement-Effluent

	Yes	No	NA	NE
Is flowmeter calibrated annually?	■	□	□	□
Is flowmeter operating properly?	■	□	□	□
Does flowmeter monitor continuously?	■	□	□	□
Does flowmeter record flow?	■	□	□	□
Does flowmeter appear to monitor accurately?	■	□	□	□

Comment: Effluent flow meter calibrated on 5/21/2020 by Delta Systems Environmental.

Type

	Yes
Activated Sludge Drip, LR	□
Single Family Spray, LR	□
Lagoon Spray, LR	□
Activated Sludge Spray, LR	□
Recycle/Reuse	□
Single Family Drip	□
Activated Sludge Spray, HR	□
Infiltration System	■
Reuse (Quality)	■

Treatment

	Yes	No	NA	NE
Are Treatment facilities consistent with those outlined in the current permit?	■	□	□	□
Do all treatment units appear to be operational? (if no, note below.)	□	■	□	□

Comment: The tertiary filter has been down and bypassed for 2 years according to staff during inspection. The unit was not operational during the inspection and must be fixed as soon as possible. This a violation of permit conditions II.1, III.1, III.15 and IV.13.

Treatment Flow Measurement-Influent

	Yes	No	NA	NE
Is flowmeter calibrated annually?	□	□	■	□
Is flowmeter operating properly?	□	□	■	□
Does flowmeter monitor continuously?	□	□	■	□
Does flowmeter record flow?	□	□	■	□
Does flowmeter appear to monitor accurately?	□	□	■	□

Comment:

Treatment Flow Measurement-Water Use Records

	Yes	No	NA	NE
Is water use metered?	□	□	■	□
Are the daily average values properly calculated?	□	□	■	□

Comment:

Treatment Flow Measurement-Effluent

	Yes	No	NA	NE
Is flowmeter calibrated annually?	■	□	□	□
Is flowmeter operating properly?	■	□	□	□
Does flowmeter monitor continuously?	■	□	□	□
Does flowmeter record flow?	■	□	□	□
Does flowmeter appear to monitor accurately?	■	□	□	□

Comment: Effluent flow meter calibrated on 5/21/2020 by Delta Systems Environmental.

Standby Power

	Yes	No	NA	NE
Is automatically activated standby power available?	■	□	□	□
Is generator tested weekly by interrupting primary power source?	■	□	□	□
Is generator operable?	■	□	□	□
Does generator have adequate fuel?	■	□	□	□

Comment: The generator was operational and halfway full during inspection.

Treatment Barscreen

	Yes	No	NA	NE
Is it free of excessive debris?	■	□	□	□
Is disposal of screenings in compliance?	■	□	□	□
Are the bars spaced properly?	■	□	□	□
Is the unit in good condition?	■	□	□	□

Comment:

Treatment Activated Sludge

	Yes	No	NA	NE
Is the aeration mechanism operable?	■	□	□	□
Is the aeration basin thoroughly mixed?	■	□	□	□
Is the aeration equipment easily accessed?	■	□	□	□
Is Dissolved Oxygen adequate?	□	□	□	■
Are Settleometer results acceptable?	□	□	□	■
Is activated sludge an acceptable color?	■	□	□	□

Comment: One of the two 225,000-gallon aeration basins was closed and had vegetation growth in it. Please reference condition III.1. The facility should be properly maintained and operated at all times. The vegetation should be removed as soon as possible in a safe manner. The other aeration basin in operation looked acceptable at the time of inspection.

Treatment Clarifiers

	Yes	No	NA	NE
Are the weirs level?	■	□	□	□
Are the weirs free of solids and algae?	■	□	□	□
Is the scum removal system operational?	■	□	□	□
Is the scum removal system accessible?	■	□	□	□
Is the sludge blanket at an acceptable level?	■	□	□	□
Is the effluent from the clarifier free of excessive solids?	■	□	□	□

Comment: The 148,250-gallon clarifier was fully operational and the 28,220-gallon clarifier was not in operation at the time of inspection.

Treatment Return pumps

	Yes	No	NA	NE
Are they in place?	■	□	□	□
Are they operational?	■	□	□	□

Comment:

Treatment Filters

	Yes	No	NA	NE
Is the filter media present?				X
Is the filter media the correct size and type?				X
Is the air scour operational?		X		
Is the scouring acceptable?		X		
Is the clear well free of excessive solids?				X
Is the mud well free of excessive solids and filter media?				X
Does backwashing frequency appear adequate?		X		

Comment: The tertiary filter has been down and bypassed for 2 years according to staff during inspection. The unit was not operational during the inspection and must be fixed as soon as possible. This a violation of permit conditions II.1, III.1, III.15 and IV.13.

Treatment Sludge Storage/Treatment

	Yes	No	NA	NE
Is the aeration operational?	X			
Is the aeration pattern even?	X			
If required, are Sanitary "Ts" present in tankage?			X	

Comment: There was growth of vegation in sludge storage. Please reference condition III.1. The facility is supposed to be properly maintained and operated at all times. The vegetation should be removed as soon as possible in a safe manner.

Treatment Disinfection

	Yes	No	NA	NE
Is the system working?	X			
Do the fecal coliform results indicate proper disinfection?	X			
Is there adequate detention time (>=30 minutes)?			X	
Is the system properly maintained?	X			
If gas, does the cylinder storage appear safe?			X	
Is the fan in the chlorine feed room and storage area operable?			X	
Is the chlorinator accessible?			X	
If tablets, are tablets present?			X	
Are the tablets the proper size and type?			X	
Is contact chamber free of sludge, solids, and growth?			X	
If UV, are extra UV bulbs available?	X			
If UV, is the UV intensity adequate?	X			
# Is it a dual feed system?	X			
Does the Stationary Source have more than 2500 lbs of Chlorine (CAS No. 7782-50-5)?			X	
If yes, then is there a Risk Management Plan on site?			X	

If yes, then what is the EPA twelve digit ID Number? (1000-____-____)

If yes, then when was the RMP last updated?

Comment: Turbidity meter calibrated on 5/21/2020 by delta environmental.

Record Keeping

	Yes	No	NA	NE
Is a copy of current permit available?	■	□	□	□
Are monitoring reports present: NDMR?	■	□	□	□
NDAR?	■	□	□	□
Are flow rates less than of permitted flow?	■	□	□	□
Are flow rates less than of permitted flow?	■	□	□	□
Are application rates adhered to?	■	□	□	□
Is GW monitoring being conducted, if required (GW-59s submitted)?	■	□	□	□
Are all samples analyzed for all required parameters?	■	□	□	□
Are there any 2L GW quality violations?	■	□	□	□
Is GW-59A certification form completed for facility?	■	□	□	□
Is effluent sampled for same parameters as GW?	■	□	□	□
Do effluent concentrations exceed GW standards?	□	■	□	□
Are annual soil reports available?	□	□	■	□
# Are PAN records required?	□	□	■	□
# Did last soil report indicate a need for lime?	□	□	■	□
If so, has it been applied?	□	□	■	□
Are operational logs present?	□	■	□	□
Are lab sheets available for review?	■	□	□	□
Do lab sheets support data reported on NDMR?	■	□	□	□
Do lab sheets support data reported on GW-59s?	■	□	□	□
Are Operational and Maintenance records present?	□	■	□	□
Were Operational and Maintenance records complete?	■	□	□	□
Has permittee been free of public complaints in last 12 months?	■	□	□	□
Is a copy of the SOC readily available?	□	□	■	□
No treatment units bypassed since last inspection?	□	■	□	□

Comment: Operational logs were requested and were not present during inspection. It was requested from this inspection forward that they be present during future inspections. This is a violation of permit condition IV.10.

Spot checked 07/2020 GW-59 (MW-2) with corresponding lab data and found no discrepancies.

Spot checked 09/2020 NDMR (3rd and 12th) with corresponding lab data and found no discrepancies.

End Use-Irrigation

	Yes	No	NA	NE
Are buffers adequate?	□	□	■	□
Is the cover crop type specified in permit?	□	□	■	□
Is the crop cover acceptable?	□	□	■	□

	Yes	No	NA	NE
Is the site condition adequate?			X	
Is the site free of runoff / ponding?			X	
Is the acreage specified in the permit being utilized?			X	
Is the application equipment present?			X	
Is the application equipment operational?			X	
Is the disposal field free of limiting slopes?			X	
Is access restricted and/or signs posted during active site use?			X	
Are any supply wells within the CB?			X	
Are any supply wells within 250' of the CB?			X	
How close is the closest water supply well?			X	
Is municipal water available in the area?			X	
# Info only: Does the permit call for monitoring wells?			X	
Are GW monitoring wells located properly w/ respect to RB and CB?			X	
Are GW monitoring wells properly constructed, including screened interval?			X	
Are monitoring wells damaged?			X	

Comment:

End Use-Infiltration

	Yes	No	NA	NE
# Is the application High Rate or Low Rate?				
Are buffers maintained?	X			
Are any supply wells within the CB?		X		
Are any supply wells within 250' of the CB?		X		
Is municipal water available in the area?	X			
Are GW monitoring wells required?	X			
Are GW monitoring wells located properly w/ respect to RB and CB?	X			
Are GW monitoring wells properly constructed, including screened interval?				X
Is a usable green area maintained?			X	
Is the disposal site acceptable?		X		
Is the distribution equipment acceptable?			X	
Is the disposal site free of ponding?			X	
Is the disposal site free of breakout?	X			
Are the disposal sites free of solids, algae, etc.?	X			
Do the records show that the fields are properly maintained?			X	
Are the disposal sites free of vegetation?		X		
Do any surface water features appear to be adversely impacted by GW discharge?				X
No chemicals or rototiller used to eliminate vegetation, solids, algae, etc.?			X	

Comment: There is an excessive amount of woody vegetation growing around the high rate infiltration pond that must be removed as soon as possible. It should be noted that much of this wooded vegetation has grown well over 10ft.The removal of vegetation should not be done by grinding the tree trunks in place which allows solids to enter the infiltration basin. The removal should occur such that no solids should enter the basin, nor should there be any excessive erosion of the side walls be allowed to occur during and after removal. Grassed revegetation of the side walls should be implemented as needed around the entire basin after all the woody vegetation is properly removed from the site. This is a violation of permit condition II.1, III.1 and III.18.

Both monitoring wells for the facility were unlocked and should always be locked except for sampling.

End Use-Reuse

	Yes	No	NA	NE
Is the acreage in the permit being utilized?	■	□	□	□
Does the acreage specified in the permit correspond to the measured acreage at the site?	■	□	□	□
Are all essential units provided in duplicate?	■	□	□	□
Is an automatically activated standby power source available?	■	□	□	□
Is the equalization capacity adequate?	□	□	■	□
Is aerated flow equalization present?	□	□	■	□
Has the turbidity meter been calibrated in the last 12 months?	■	□	□	□
Does the turbidity meter have recording capabilities?	■	□	□	□
Is all flow diverted at the appropriate times?	■	□	□	□
Is all upset wastewater diverted from reuse storage unit?	□	□	□	■
Is all upset wastewater treated, retreated, or disposed of acceptably?	□	■	□	□
Is upset wastewater treated prior to discharge to irrigation storage?	□	□	□	■
Is public access restricted from irrigation area during active site use?	■	□	□	□
If golf course, is a sign posted in plain sight on the club house?	■	□	□	□
Is the cover crop acceptable?	■	□	□	□
Are buffers adequate?	■	□	□	□
Is the site free of ponding/runoff?	■	□	□	□
Is the acreage in the permit being utilized?	■	□	□	□
Is the application equipment acceptable?	■	□	□	□
Is the application area free of limiting slopes?	■	□	□	□
How close is the closest water supply well?	□	□	□	■
Are any supply wells within the CB?	□	■	□	□
Are any supply wells within 250' of the CB?	□	■	□	□
Is municipal water available in the area?	■	□	□	□
Are GW monitoring wells required?	■	□	□	□
Are GW monitoring wells located properly w/ respect to RB and CB?	■	□	□	□
Are GW monitoring wells properly constructed, including screened interval?	□	□	□	■

Comment: Overall, the fields at the golf course where the "reuse" waster is being utilized looked good. The primary concern is that the fields are being irrigated with water that bypassed the tertiary filter for over two years. As this water has been pumped to the reuse pond and irrigated.

Compliance Inspection Report

Permit: WQ0014306 **Effective:** 10/08/15 **Expiration:** 09/30/20 **Owner :** Sandler Utilities at Mill Run L L C
SOC: **Effective:** **Expiration:** **Facility:** Eagle Creek WWTP
287 Saint Andrews Rd
County: Currituck
Region: Washington
Moyock NC 27958

Contact Person: Raymond Gottlieb **Title:** **Phone:** 757-463-5000 Ext.388

Directions to Facility:

Beginning at the intersection of Hwy 168 and NCSR 1215 (Survey Rd) 2 miles south of the Moyock on the Currituck County Mainland, proceed to the terminus of 1215 (1215 will change to Eagle Creek Rd). At the terminus, turn left onto Greenview Rd. At the t

System Classifications: SI, WW2,

Primary ORC: **Certification:** **Phone:**

Secondary ORC(s):

On-Site Representative(s):

Related Permits:

Inspection Date: 10/21/2020 **Entry Time** 10:00AM **Exit Time:** 11:45AM

Primary Inspector: Paul M Mays **Phone:** 252-948-3940

Secondary Inspector(s):

Reason for Inspection: Follow-up **Inspection Type:** Compliance Evaluation

Permit Inspection Type: Reclaimed Water

Facility Status: ■ Compliant ☐ Not Compliant

Question Areas:

■ Treatment Flow Measurement-Effluent
■ Treatment Flow Measurement-Water Use Records
■ Treatment Filters
■ Treatment Clarifiers
■ Treatment Flow Measurement
■ Standby Power
■ Treatment Flow Measurement-Influent
■ Treatment
■ Record Keeping
■ Treatment Disinfection
■ Treatment Return pumps
■ Wells
■ Miscellaneous Questions
■ Treatment Barscreen
■ Treatment Activated Sludge
■ End Use-Infiltration
■ End Use-Reuse

(See attachment summary)

Inspection Summary:

On 10/21/2020 at 10:00 am Randy Sipe and Paul Mays from the Division of Water Resources from the Washington Regional Office conducted a compliance evaluation of Eagle Creek WWTP. The Facility was found to be compliant with permit WQ0014306. Below are the findings of the compliance evaluation:

The 148,250-gallon clarifier was fully operational at the time of inspection and the 28,200-gallon clarifier was not in operation at the time of inspection.

01/2020 NDMR and 03/2020 GW-59 was spot checked with lab data. No discrepancies were found between the lab data and the monitoring reports. All other required records were available and ready for review. Operational logs were started as requested on last inspection and were present.

Facility was not free from complaints in the last 12 months at the time of inspection. A complete failure of the collection system in days prior to the inspection was the source of a multitude of complaints against the facility.

Excessive woody vegetation is still present around the high rate infiltration basin and the staff gauge for the high rate infiltration basin has been damaged. The facility is taking steps to remove the vegetation and repair or replace the staff gauge.

On 07/2020 DMR the facility did not reroute upset wastewater from the reuse pond to the high rate infiltration pond for 6 days. A Notice of Violation with Intent to Enforce was sent to address this and enforcement may be pursued.

Type

	Yes	No	NA	NE
Activated Sludge Spray, LR	□			
Single Family Spray, LR	□			
Activated Sludge Drip, LR	□			
Activated Sludge Spray, HR	□			
Lagoon Spray, LR	□			
Single Family Drip	□			
Recycle/Reuse	□			
Infiltration System	■			
Reuse (Quality)	■			

Treatment

	Yes	No	NA	NE
Are Treatment facilities consistent with those outlined in the current permit?	■	□	□	□
Do all treatment units appear to be operational? (if no, note below.)	■	□	□	□

Comment:

Treatment Flow Measurement-Influent

	Yes	No	NA	NE
Is flowmeter calibrated annually?	□	□	■	□
Is flowmeter operating properly?	□	□	■	□
Does flowmeter monitor continuously?	□	□	■	□
Does flowmeter record flow?	□	□	■	□
Does flowmeter appear to monitor accurately?	□	□	■	□

Comment:

Treatment Flow Measurement-Water Use Records

	Yes	No	NA	NE
Is water use metered?	□	□	■	□
Are the daily average values properly calculated?	□	□	■	□

Comment:

Treatment Flow Measurement-Effluent

	Yes	No	NA	NE
Is flowmeter calibrated annually?	■	□	□	□
Is flowmeter operating properly?	■	□	□	□
Does flowmeter monitor continuously?	■	□	□	□
Does flowmeter record flow?	■	□	□	□
Does flowmeter appear to monitor accurately?	■	□	□	□

Comment: Effluent Meter calibrated on 5/21/2020 by Delta Systems Environmental and appears to be fully functioning.

Turbidity Meter calibrated on 5/21/2020 by Delta Systems Environmental and appears to be fully functioning. During inspection it read 5.75 NTU.

Standby Power

	Yes	No	NA	NE
Is automatically activated standby power available?	■	□	□	□
Is generator tested weekly by interrupting primary power source?	■	□	□	□
Is generator operable?	■	□	□	□
Does generator have adequate fuel?	■	□	□	□

Comment: The generator was fully operational and ORC said it was roughly 3/4 full during inspection.

Treatment Barscreen

	Yes	No	NA	NE
Is it free of excessive debris?	■	□	□	□
Is disposal of screenings in compliance?	■	□	□	□
Are the bars spaced properly?	■	□	□	□
Is the unit in good condition?	■	□	□	□

Comment:

Treatment Activated Sludge

	Yes	No	NA	NE
Is the aeration mechanism operable?	■	□	□	□
Is the aeration basin thoroughly mixed?	■	□	□	□
Is the aeration equipment easily accessed?	■	□	□	□
Is Dissolved Oxygen adequate?	□	□	□	■
Are Settleometer results acceptable?	□	□	□	■
Is activated sludge an acceptable color?	■	□	□	□

Comment: Both aeration basins appeared to be in good shape this inspection. No excessive vegetation was present or growing in the basin.

Treatment Clarifiers

	Yes	No	NA	NE
Are the weirs level?	■	□	□	□
Are the weirs free of solids and algae?	■	□	□	□
Is the scum removal system operational?	■	□	□	□
Is the scum removal system accessible?	■	□	□	□
Is the sludge blanket at an acceptable level?	■	□	□	□
Is the effluent from the clarifier free of excessive solids?	■	□	□	□

Comment: The 148,250-gallon clarifier was fully operational at the time of inspection and the 28,200-gallon clarifier was not in operation at the time of inspection.

Treatment Return pumps

	Yes	No	NA	NE
Are they in place?	■	□	□	□

	Yes	No	NA	NE
Are they operational?	■	□	□	□

Comment:

Treatment Filters

	Yes	No	NA	NE
Is the filter media present?	□	□	□	■
Is the filter media the correct size and type?	□	□	□	■
Is the air scour operational?	■	□	□	□
Is the scouring acceptable?	■	□	□	□
Is the clear well free of excessive solids?	■	□	□	□
Is the mud well free of excessive solids and filter media?	■	□	□	□
Does backwashing frequency appear adequate?	■	□	□	□

Comment: The tertiary filter appeared completely operational at the time of the inspection.

Treatment Disinfection

	Yes	No	NA	NE
Is the system working?	■	□	□	□
Do the fecal coliform results indicate proper disinfection?	□	■	□	□
Is there adequate detention time (>=30 minutes)?	□	□	■	□
Is the system properly maintained?	■	□	□	□
If gas, does the cylinder storage appear safe?	□	□	■	□
Is the fan in the chlorine feed room and storage area operable?	□	□	■	□
Is the chlorinator accessible?	□	□	■	□
If tablets, are tablets present?	□	□	■	□
Are the tablets the proper size and type?	□	□	■	□
Is contact chamber free of sludge, solids, and growth?	□	□	■	□
If UV, are extra UV bulbs available?	■	□	□	□
If UV, is the UV intensity adequate?	■	□	□	□
# Is it a dual feed system?	■	□	□	□
Does the Stationary Source have more than 2500 lbs of Chlorine (CAS No. 7782-50-5)?	□	□	■	□
If yes, then is there a Risk Management Plan on site?	□	□	■	□

If yes, then what is the EPA twelve digit ID Number? (1000-____-____)

If yes, then when was the RMP last updated?

Comment: On 07/2020 NDMR there was a fecal violation and effluent was not diverted to the high rate infiltration pond as required by the permit for 6 days. A Notice of Violation with Intent to enforce has been issued for the fecal violation and permit violation. This was discussed with ORC and staff onsite during the inspection.

Record Keeping

	Yes	No	NA	NE
Is a copy of current permit available?	■	□	□	□
Are monitoring reports present: NDMR?	■	□	□	□

	Yes	No	NA	NE
NDAR?	■	☐	☐	☐
Are flow rates less than of permitted flow?	■	☐	☐	☐
Are flow rates less than of permitted flow?	■	☐	☐	☐
Are application rates adhered to?	■	☐	☐	☐
Is GW monitoring being conducted, if required (GW-59s submitted)?	■	☐	☐	☐
Are all samples analyzed for all required parameters?	■	☐	☐	☐
Are there any 2L GW quality violations?	■	☐	☐	☐
Is GW-59A certification form completed for facility?	■	☐	☐	☐
Is effluent sampled for same parameters as GW?	■	☐	☐	☐
Do effluent concentrations exceed GW standards?	☐	■	☐	☐
Are annual soil reports available?	■	☐	☐	☐
# Are PAN records required?	☐	☐	☐	■
# Did last soil report indicate a need for lime?	■	☐	☐	☐
If so, has it been applied?	■	☐	☐	☐
Are operational logs present?	■	☐	☐	☐
Are lab sheets available for review?	■	☐	☐	☐
Do lab sheets support data reported on NDMR?	■	☐	☐	☐
Do lab sheets support data reported on GW-59s?	■	☐	☐	☐
Are Operational and Maintenance records present?	■	☐	☐	☐
Were Operational and Maintenance records complete?	■	☐	☐	☐
Has permittee been free of public complaints in last 12 months?	☐	■	☐	☐
Is a copy of the SOC readily available?	☐	☐	■	☐
No treatment units bypassed since last inspection?	■	☐	☐	☐

Comment: 01/2020 NDMR and 03/2020 GW-59 was spot checked with lab data. No discrepancies were found between the lab data and the monitoring reports. All other required records were available and ready for review. Operational logs were started as requested on last inspection and were present.

Facility was not free from complaints in the last 12 months at the time of inspection. A complete failure of the collection system in days prior to the inspection was the source of a multitude of complaints against the facility.

End Use-Infiltration

	Yes	No	NA	NE
# Is the application High Rate or Low Rate?				
Are buffers maintained?	■	☐	☐	☐
Are any supply wells within the CB?	■	☐	☐	☐
Are any supply wells within 250' of the CB?	■	☐	☐	☐
Is municipal water available in the area?	■	☐	☐	☐
Are GW monitoring wells required?	■	☐	☐	☐

Are GW monitoring wells located properly w/ respect to RB and CB?	■	□	□	□
Are GW monitoring wells properly constructed, including screened interval?	□	□	□	■
Is a usable green area maintained?	□	□	■	□
Is the disposal site acceptable?	□	■	□	□
Is the distribution equipment acceptable?	□	□	■	□
Is the disposal site free of ponding?	□	□	■	□
Is the disposal site free of breakout?	■	□	□	□
Are the disposal sites free of solids, algae, etc.?	■	□	□	□
Do the records show that the fields are properly maintained?	□	□	■	□
Are the disposal sites free of vegetation?	□	■	□	□
Do any surface water features appear to be adversely impacted by GW discharge?	□	□	□	■
No chemicals or rototiller used to eliminate vegetation, solids, algae, etc.?	□	□	■	□

Comment: Excessive woody vegetation is still present around the high rate infiltration basin and the staff gauge for the high rate infiltration basin has been damaged. The facility is taking steps to remove the vegetation and repair or replace the staff gauge.

End Use-Reuse

	Yes	No	NA	NE
Is the acreage in the permit being utilized?	■	□	□	□
Does the acreage specified in the permit correspond to the measured acreage at the site?	■	□	□	□
Are all essential units provided in duplicate?	■	□	□	□
Is an automatically activated standby power source available?	■	□	□	□
Is the equalization capacity adequate?	□	□	■	□
Is aerated flow equalization present?	□	□	■	□
Has the turbidity meter been calibrated in the last 12 months?	■	□	□	□
Does the turbidity meter have recording capabilities?	■	□	□	□
Is all flow diverted at the appropriate times?	□	■	□	□
Is all upset wastewater diverted from reuse storage unit?	□	■	□	□
Is all upset wastewater treated, retreated, or disposed of acceptably?	□	■	□	□
Is upset wastewater treated prior to discharge to irrigation storage?	□	□	□	■
Is public access restricted from irrigation area during active site use?	■	□	□	□
If golf course, is a sign posted in plain sight on the club house?	■	□	□	□
Is the cover crop acceptable?	■	□	□	□
Are buffers adequate?	■	□	□	□
Is the site free of ponding/runoff?	■	□	□	□
Is the acreage in the permit being utilized?	■	□	□	□
Is the application equipment acceptable?	■	□	□	□
Is the application area free of limiting slopes?	■	□	□	□
How close is the closest water supply well?	■	□	□	□

Are any supply wells within the CB?	■	□	□	□
Are any supply wells within 250' of the CB?	■	□	□	□
Is municipal water available in the area?	■	□	□	□
Are GW monitoring wells required?	■	□	□	□
Are GW monitoring wells located properly w/respect to RB and CB?	■	□	□	□
Are GW monitoring wells properly constructed including screen interval?	□	□	□	■

Comment: On 07/2020 DMR the facility did not reroute upset wastewater from the reuse pond to the high rate infiltration pond for 6 days. A Notice of Violation with Intent to Enforce was sent to address this and enforcement may be pursued.

Compliance Inspection Report

Permit: WQ0014306 **Effective:** 08/04/21 **Expiration:** 06/30/27 **Owner :** Sandler Utilities at Mill Run L L C
SOC: **Effective:** **Expiration:** **Facility:** Eagle Creek WWTP
287 Saint Andrews Rd
County: Currituck
Region: Washington
Moyock NC 27958

Contact Person: Debbie A Dietz **Title:** **Phone:** 757-463-5000

Directions to Facility:

Beginning at the intersection of Hwy 168 and NCSR 1215 (Survey Rd) 2 miles south of the Moyock on the Currituck County Mainland, proceed to the terminus of 1215 (1215 will change to Eagle Creek Rd). At the terminus, turn left onto Greenview Rd. At the t

System Classifications: SI, WW2,

Primary ORC: **Certification:** **Phone:**

Secondary ORC(s):

On-Site Representative(s):

Related Permits:

Inspection Date: 10/04/2021 **Entry Time** 03:00PM **Exit Time:** 04:30PM

Primary Inspector: Paul M Mays **Phone:** 252-948-3940

Secondary Inspector(s):

Fred W Oelrich

Reason for Inspection: Follow-up **Inspection Type:** Reconnaissance

Permit Inspection Type: Reclaimed Water

Facility Status: ☐ Compliant ☐ Not Compliant

Question Areas:

■ Miscellaneous Questions

(See attachment summary)

Inspection Summary:

On 10/04/2021 Paul Mays and Fred Oelrich with the Division of Water Resources from the Washington Regional Office visited Eagle Creek WWTP to respond to complaints. The collection system for the facility went down on 10/2/2021. Residents at the time of the visit were still advised to conserve water and pits were pumped out via vacuum truck as needed. Staff at the facility were working at the time to repair the collection system to a fully functional state for all residents served by Eagle Creek WWTP.

Compliance Inspection Report

Permit: WQ0014306 **Effective:** 08/04/21 **Expiration:** 06/30/27 **Owner :** Sandler Utilities at Mill Run L L C
SOC: **Effective:** **Expiration:** **Facility:** Eagle Creek WWTP
287 Saint Andrews Rd

County: Currituck
Region: Washington

Moyock NC 27958

Contact Person: Debbie A Dietz **Title:** **Phone:** 757-463-5000

Directions to Facility:

Beginning at the intersection of Hwy 168 and NCSR 1215 (Survey Rd) 2 miles south of the Moyock on the Currituck County Mainland, proceed to the terminus of 1215 (1215 will change to Eagle Creek Rd). At the terminus, turn left onto Greenview Rd. At the t

System Classifications: SI, WW2,

Primary ORC: **Certification:** **Phone:**

Secondary ORC(s):

On-Site Representative(s):

Related Permits:

Inspection Date: 11/29/2021 **Entry Time** 12:00PM **Exit Time:** 01:30PM

Primary Inspector: Paul M Mays **Phone:** 252-948-3940

Secondary Inspector(s):

Dwight R Sipe Phone :

Reason for Inspection: Follow-up **Inspection Type:** Reconnaissance

Permit Inspection Type: Reclaimed Water

Facility Status: ☐ Compliant ☐ Not Compliant

Question Areas:

■ Miscellaneous Questions

(See attachment summary)

Inspection Summary:

On 11/29/2021 Paul Mays and Randy Sipe with the Division of Water Resources visited Eagle Creek WWTP. The initial purpose of the visit was to review the staked locations where new monitoring wells were to be installed at the facility. However, during the visit the area around the plant was found to be saturated with water. Upon investigation of this issue, it was found that water was bypassing the Tertiary filter via the mud well. When Paul Mays walked towards the area of the unauthorized bypass the ground was so saturated that quicksand like conditions prevented any closer investigation from the back of the plant. A small pond-like body of water was also observed in the back of the plant and seemed to have been fed by the bypass. The new ORC Noah Deckard later followed up and informed WARO that he estimated the bypass was 800 gallons and occurred from 08:00am to 01:00pm that day. The incident was observed at 01:00pm and was still ongoing when WARO staff left the area at 01:30pm.

It was also noted by ORC Noah Deckard that the Tertiary Filter has not been functioning correctly.

Type

	Yes No NA NE
Reuse (Quality)	☐
Lagoon Spray, LR	☐
Infiltration System	☐
Single Family Spray, LR	☐
Activated Sludge Spray, HR	☐
Activated Sludge Spray, LR	☐
Activated Sludge Drip, LR	☐
Recycle/Reuse	☐
Single Family Drip	☐

Compliance Inspection Report

Permit: WQ0014306 **Effective:** 08/04/21 **Expiration:** 06/30/27 **Owner :** Sandler Utilities at Mill Run L L C
SOC: **Effective:** **Expiration:** **Facility:** Eagle Creek WWTP
287 Saint Andrews Rd
County: Currituck
Region: Washington
Moyock NC 27958

Contact Person: Debbie A Dietz **Title:** **Phone:** 757-463-5000

Directions to Facility:

Beginning at the intersection of Hwy 168 and NCSR 1215 (Survey Rd) 2 miles south of the Moyock on the Currituck County Mainland, proceed to the terminus of 1215 (1215 will change to Eagle Creek Rd). At the terminus, turn left onto Greenview Rd. At the t

System Classifications: SI, WW2,

Primary ORC: **Certification:** **Phone:**
Secondary ORC(s):

On-Site Representative(s):

Related Permits:

Inspection Date: 12/10/2021 **Entry Time** 11:45AM **Exit Time:** 12:30PM
Primary Inspector: Paul M Mays **Phone:** 252-948-3940
Secondary Inspector(s):

Dwight R Sipe Phone :

Reason for Inspection: Routine **Inspection Type:** Reconnaissance
Permit Inspection Type: Reclaimed Water
Facility Status: ☐ Compliant ☐ Not Compliant

Question Areas:

■ Miscellaneous Questions

(See attachment summary)

Inspection Summary:

On 12/10/2021 Paul Mays and Randy Sipe with the Division of Water Resources visited Eagle Creek WWTP in response to complaints regarding the collection system. After responding to the compliant a visit to the wastewater system itself revealed the plant was still saturated with water. Upon investigation of this issue, it was found that water was bypassing the Tertiary filter again via the mud well. The area of the nearby the unauthorized bypass the ground still was so saturated that quicksand like conditions prevented any closer investigation from the back of the plant. A small pond-like body of water was also observed again in the back of the plant and seemed to have been fed by the bypass. The new ORC Noah Deckard later followed up and informed WARO that he estimated the bypass was 500 gallons and the bypass occurred for 3 hours.

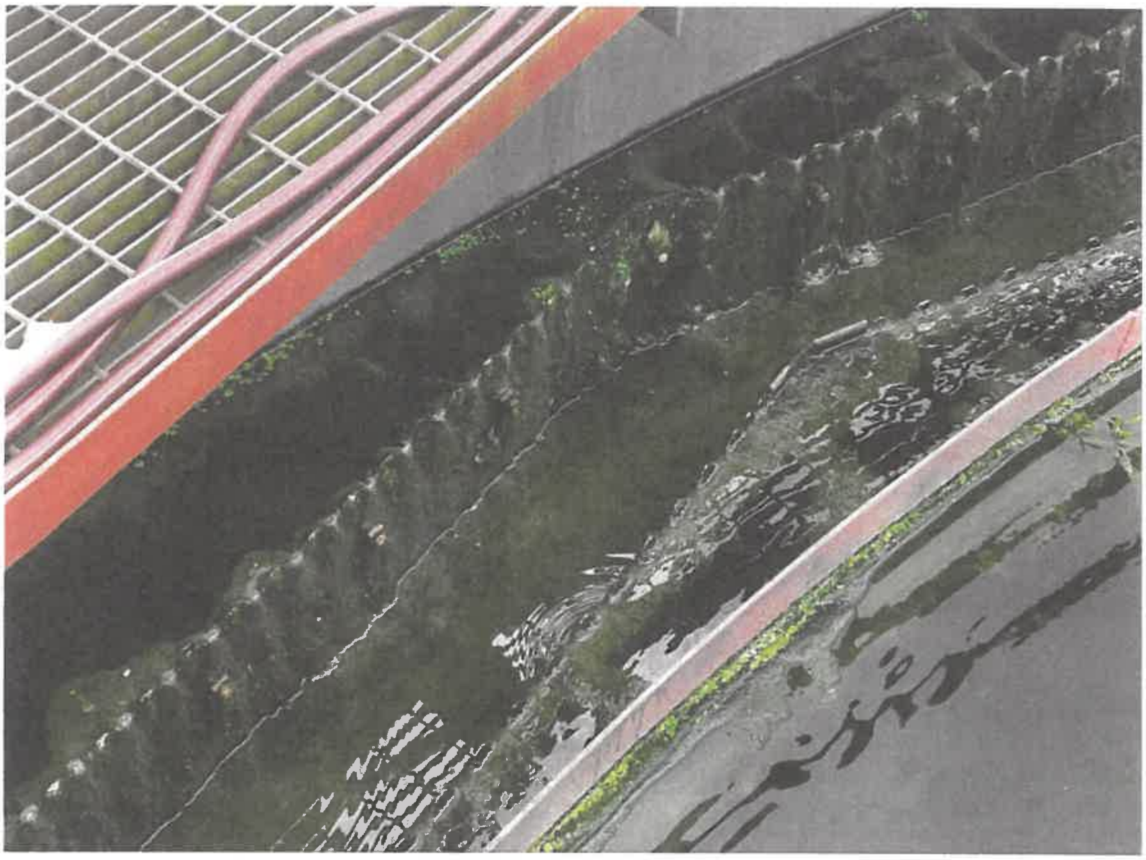
It was also noted by ORC Noah Deckard that the Tertiary Filter has not been functioning correctly.

Myers Rebuttal Exhibit I

August 4, 2020 Photos Eagle Creek WWTP

Myers Exhibit H I

Photos: from August 4, 2020— Eagle Creek WWTP



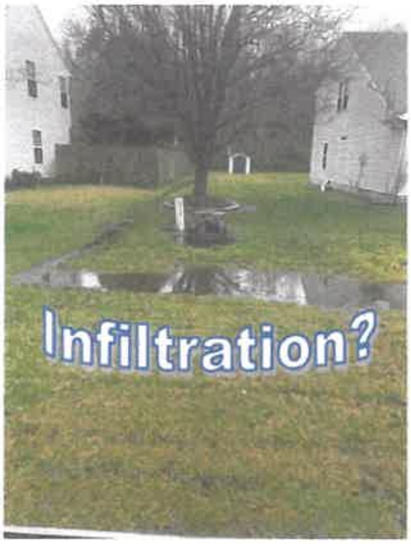
Photos: from August 4, 2020— Eagle Creek WWTP

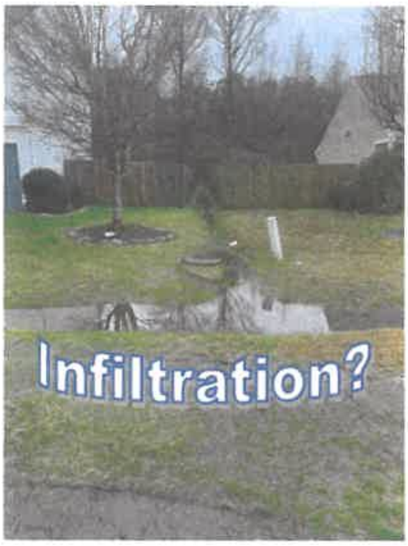
Photos: from August 4, 2020— Eagle Creek WWTP

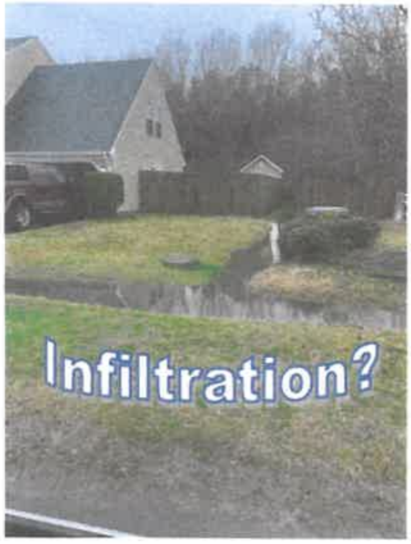
Photos: from August 4, 2020— Eagle Creek WWTP

Photos: from August 4, 2020— Eagle Creek WWTP

Photos: from August 4, 2020— Eagle Creek WWTP

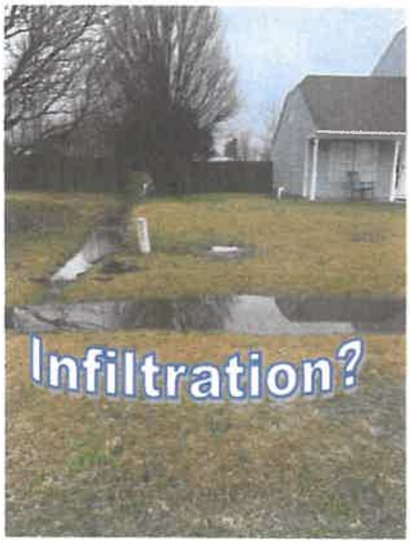

Infiltration?

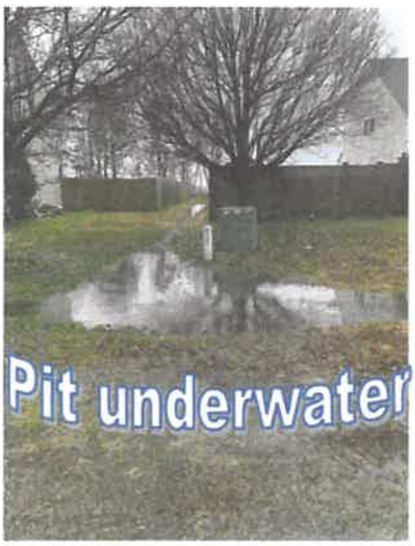

Infiltration?

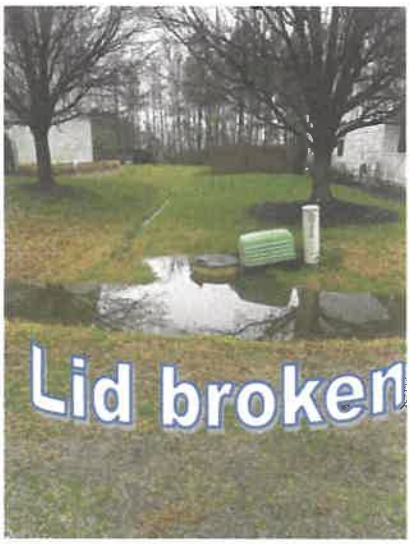

Infiltration?

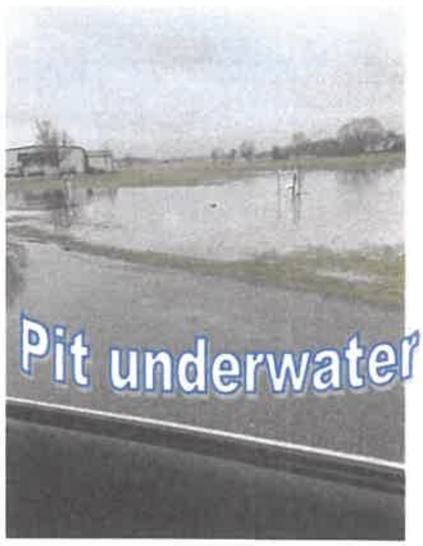

Infiltration?


Ground subsided


Infiltration?


Pit underwater


Lid broken

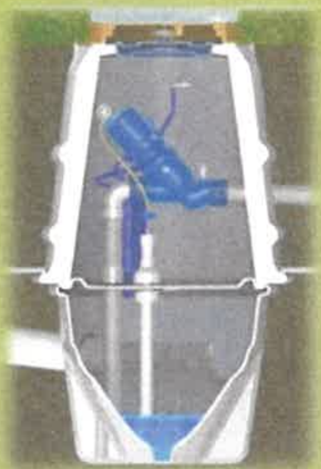

Pit underwater

Myers Rebuttal Exhibit J

Vacuum System Brochure

Service Valve Operation

It is important that you know how your home sewer system operates and that you notify Envirolink's emergency dispatcher if a problem occurs. The utility system, including the service valve ("pit") unit service your home, is owned by Sandler Utility and operated by Envirolink, Inc. Please take a few moments to read the following information to insure the proper functioning of your valve.



A few more important notes:

* If there is a valve failure at a home within the community, technicians must shut down the pipes in the street in order to locate and repair the pit with a valve failure. This will impact service to your home while technicians work to find and repair the problem. Once technicians identify the pit experiencing a failure, they will repair the pit and restore service to your area.
* The vacuum line is buried under the ground between the home and the pit. Before digging in the area, call 811 to have a technician locate the lines.
* The pit has a breather vent located adjacent to your home, It is important to keep this vent open and free of debris.
* In the event Sandler has to complete the repair due to lot owner tampering, Sandler will not be responsible for any damage to landscaping or items placed adjacent to the pit while performing any maintenance function.
* If you are going to be away from home for more than thirty (30) days, please contact Envirolink for some tips on how to manage your pit's operation while you are away and upon your return.
* Never connect enter the pit or tamper with the pit. It jeapdizes the operation of the entire sewer system and is a violation of state and federal law.
* Non-emergency contact number:
  888-754-9878; 8:00 am – 5:00 pm
* Non-emergencies include situations similar to damage to vents or general questions.

ENVIROLINK

Envirolink, Inc.

4700 Homewood Ct., Suite 108
Raleigh, North Carolina 27609

Phone: 888.754.9878
Fax: 252-235-1632
Email: customerservice@envirolinkinc.com

Homeowners Guide to

Vacuum Sewer Service Valves

Emergency Phone: 888-754-9878

What are some special situations that may arise?

If the vent (candy cane) sounds:

A whistling sound indicates the valve is open. The whistling should stop within 5—20 seconds when operating normally. If the whistling does not stop after 1 minute, this could indicate a "leak" or valve that has not closed. There are many reason this could happen but one of the more frequent reasons is a faulty controller. Other reasons include debri getting lodged in the valve seat or the valve experiencing mechanical failure. This "leak" will cause the pipes in the street to loose vacuum. You should:

⇒ Discontinue water use until the pit is safe for use.

⇒ If the whistle continues for longer than 1 minute, call our 24-hour emergency dispatcher at 888.754.9878. Inform the representative that you are in the Eagle Creek Community.

⇒ Never attempt to open the tank cover or disconnect any portion of the valve.

⇒ There is no trip charge. Envirolink, Inc. will assess the valve and inform the lot owner of situation.

⇒ If there is evidence that a lot owner has tampered with the valve, a tampering fee will be assessed.

If the candy cane overflows or there is a sewage backup in your home:

There are many reasons this could happen but it may indicate that the valve has failed to open.

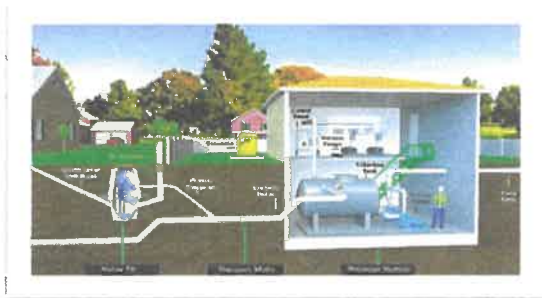
⇒ Discontinue water use until the pit is safe for use.

⇒ Call our 24-hour emergency dispatcher at 888.754.9878. Inform the representative that you are in the Eagle Creek Community.

⇒ In the event a valve fails to open, installation of a backflow device on the pipe between the candy cane and the home will prevent sewage from backing up into your home.

What is a service valve or pit and why do I have one?

The pit serving your home is an important part of the larger community sewer collection system. The pit not only serves your home but your neighbors home and can have a dramatic impact on the performance of the entire sewer system. The pit stores a small amount of in the bottom chamber and the valve opens and shuts allowing sewage to be sucked through small plastic pipes to the larger pipes in the street. A vacuum system is an alternative sewer collection technology that is sometimes used in the transport of sewage to a treatment plant.



A small holding tank has been installed underground on your property and a valve is housed in the upper chamber of the tank. The tank cover is round and is the only part that shows above the ground. All of the wastewater from your home flows into the buried tank. When the tank fills to a certain level, the valve opens automatically. The valve is normally open for 5—20 seconds and will automatically close when the tank has been emptied. The valve is programmed to operate in cycles, rather than continuously. Cycles are determined by the amount of water in the tank. During a usual day, the valve will open and shut about 8 or 10 times. While the valve is open you may hear a high pitched whistling noise. Excessive noise or noise lasting longer than 1 minute may indicate a problem and you should call the emergency number listed.

How can I help to maintain my pit?

The pit can handle any wastewater that is normally discharged to the sewer from the kitchen, bathroom, or laundry. Some chemicals and materials may cause operating problems or safety hazards.

Never put any of the following materials into sinks, toilets or drains:

- Non-biodegradable paper products (Baby Wipes)
- Cooking fat (lard, oil, grease)
- Glass, metal, wood, seafood shells
- Diapers, socks, rags or cloth of any kind
- Plastic objects (toys, eating utensils, etc.)
- Any strong chemical, toxic, caustic, or poisonous substance
- Degreasing solvents
- Any explosive or flammable material
- Gasoline, kerosene, fuel oil, paint thinner, antifreeze
- Lubricating oil or grease
- Hair clippings or kitty litter

These materials are harmful to the pits and could cause backup in your home or create unsafe conditions in your lines and tank!

Note: Sandler is not responsible for any expenses incurred due to negligence by the lot owner in maintaining the pit.

What other maintenance is suggested for the pit?

The lot owner is responsible for maintenance of the vent or "candy cane". We recommend frequent inspection of each candy cane. Specifically, listen for a prolonged whistling from the candy cane. In the event, the whistling noise does not cease within 1 minute, please contact our emergency service number.

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Myers Rebuttal Exhibit K

News Letter

Myers Exhibit K

Envirolink, Inc.

October 8, 2021
Volume 1, Issue 1

The Link

ENVIROLINK

Acquisition of Eagle Creek Sewer

Since the announcement last Spring of Sandler Utility's sale of the sewer system to Currituck Water & Sewer there has been a lot of activity. We have been working with the North Carolina Department of Environmental Quality and officials of the North Carolina Utilities Commission to obtain the required permits and approvals needed to complete the sale and upgrade the Eagle Creek sewer system. Here we update you on the status of this sale, important issues, and the process moving forward.

In the Spring of 2021, Sandler Utility and Currituck Water & Sewer entered into an agreement related to the sale and transfer of the Eagle Creek wastewater system. Currituck Water & Sewer and Sandler Utility filed a joint application to the North Carolina Utilities Commission requesting approval to transfer the system. About that same time, the North Carolina Department of Environmental Quality filed a petition for injunctive relief against Sandler Utility related to the on-going sewer service issues within the Eagle Creek community.

While the lawsuit added complications and delayed the approval, there has been recent progress that is discussed in this Newsletter, along with the current status in obtaining approval. Inside you will also find information on what to expect in the coming months.

October 18th, is an important date, as officials from the North Carolina Utilities Commission will be conducting a Town hall style meeting to explain their process and answer questions.

Currituck Water & Sewer reveals plan for Eagle Creek Sewer Improvements

In the spring of 2021, Sandler Utility (Sandler) entered into an agreement to sell the Eagle Creek sewer system to Currituck Water & Sewer (CWS). Sandler and CWS filed a joint application to the North Carolina Utilities Commission requesting approval to transfer ownership of the Eagle Creek sewer system.

In the application, CWS presented a sewer system improvement plan that included over $9 million dollars of upgrades to the Eagle Creek wastewater system.

It the application, CWS made public its plan for improvements. The plan included conversion of the vacuum system to a gravity sewer system, upgrades to the irrigation system, upgrades to the treatment plant and extension of service to neighboring communities.

Inside this issue

Special points of interest

- Gravity Sewer Reliability
- Sewer Rate Increases?
- State Approval Requirements
- Water Conservation—What does that mean?

Vacuum Upgrades [Yes or No?]

The Townhall style meeting is an important step in the process of making the sewer improvements a reality.

While residents will learn a lot about the process during the meeting, they will also get to voice their opinion on Currituck Water & Sewer's (CWS) plan to upgrade the Eagle Creek Sewer System.

Residents will have an opportunity to voice their opinion on whether they would prefer an upgrade of the existing vacuum system or conversion to gravity sewer collection.

In deciding to recommend, conversion to gravity, CWS prepared and evaluated both options.

CWS interviewed two vacuum system manufacturers and concluded that there is no "guarantee" that improvements to the vacuum system would improve the reliability of sewer service. CWS did evaluate vacuum system improvements required to provide the most reliable, long term service possible with vacuum technology. The vacuum system requires the following improvements:

- Improvements to the vacuum mains including, looping of dead end lines, additional valving and air admittance.
- Replacement of the central vacuum plant, including replacement & upgrade to vacuum pumps, sewage pumps, vacuum tank and controls
- Replacement of the pits, including additional tank storage, isolation valves, and monitoring system.

"Imagine operating a car with 400,000 miles that has never had the oil changed and then wondering why is it breaking down all the time. Do you replace the car or install a sensor?"

Gravity Sewer [Yes or No?]

Gravity Sewer Reliability

Water flows from the home to pipes located in streets or easements.

As water is received by the pump stations, water is pumped under pressure to the treatment plant.

Key points:

- Homeowners maintain the line from the home to the cleanout located close the edge of the street right of way.
- No mechanical equipment
- Each home has its own service [service is not tied into neighbor's service].
- Issues with a service are automatically isolated to only the home experiencing an issue.
- Service reliability is the highest in the industry (> 99.9%). Most homeowners will never experience a service issue.

Residents will be able to provide their comments on CWS's plan to convert the existing sewer system to gravity.

Gravity is the most common type of sewer collection technology utilized in sewer collection today and has been around for over 100 years because of its service, reliability and cost of operations. While any sewer can experience service issues, gravity sewer service provides the highest level of reliability in the industry [See insert for more information].

Concerns expressed by residents to CWS include impact on sewer rates, cost of providing service, and disruption during construction. Here we discuss the impact on sewer rates for conversion to gravity.

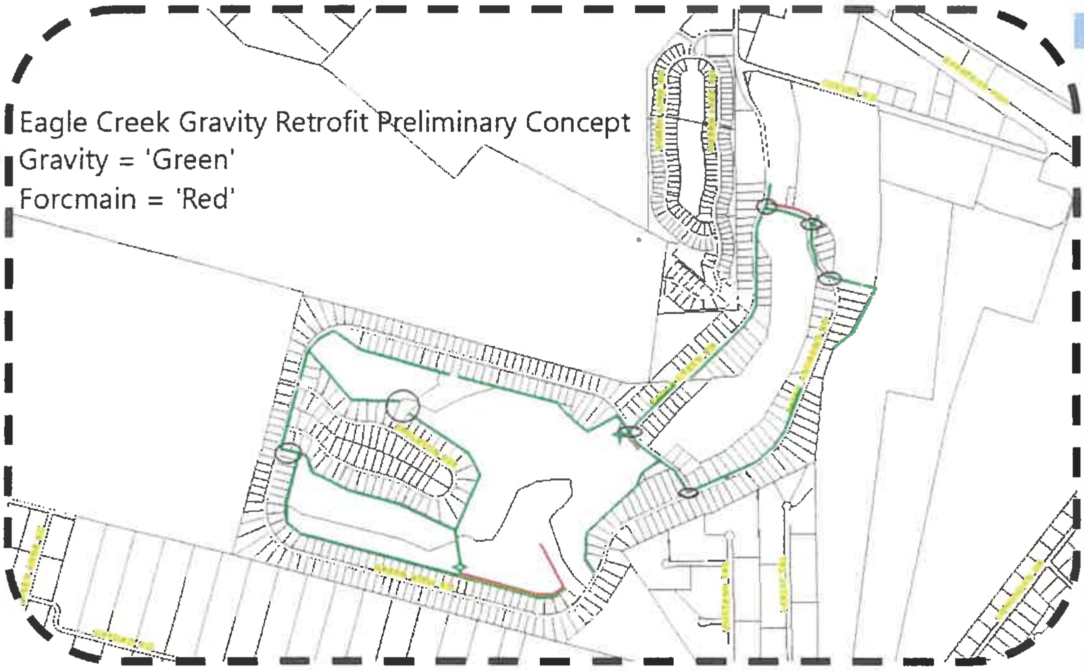
The current sewer rate for Eagle Creek residents is $52.60 per month. Currituck Water & Sewer estimates that rates may increase by less than $25.00 per month. For comparison, the neighboring Lakeside community customers pay Currituck County around $97.24 per month [Based on $40 per month + $14.31 for every 1,000 gallons consumed with a typical home using around 4,000 gallons per month].

Currituck Water & Sewer began construction of the force main needed to transmit water from the Fost community to the treatment plant. This community will bring 479 new customers. The force main is connected directly to the treatment plant without connection to the existing Eagle Creek vacuum system. This work will benefit Eagle Creek customers in a few ways.

•The Fost community will add 479 customers to Eagle Creek's existing 444 customers. These additional customers coupled with an additional 277 customers from the planned Flora development will increase the customer base and lessen individual rate impacts now and in the future.

•The force main will reduce cost for converting to gravity. The plan to convert to gravity will utilize this force main to reduce the amount of new pipe required to convert.

•Gravity sewer has a significantly lower cost of operation than vacuum sewer. Most of the savings comes from reduced labor and maintenance cost.



Conceptual Plan for Conversion to Gravity

Cost Comparison of Gravity vs Vacuum

"Expert" opinions differ on the extent of upgrades required for the Eagle Creek vacuum system. Currituck Water & Sewer has incorporated the recommendations from Airvac and Flovac, other expert opinions and our own service requirements to develop the necessary vacuum system upgrades required for the Eagle Creek vacuum system.

Major considerations when evaluating the vacuum system were:

1. Residents at the end of lines are the most impacted by service issues. Eagleton Circle residents are the first to experience service issues and the last restored. This is because of the existing system design that results because Eagleton Circle resident's service is interrupted whenever there are service issues at other locations within the community.
2. The central vacuum station is outdated and lacks several design features that are prudent when designing a vacuum system.
3. The service valves or pits do not meet state regulation and require replacement. To meet state standards, 720 gallons per service pit is required versus the existing 40 gallons.
4. There is no ability to monitor the existing pits in the event of a failure. Technicians must go home to home and inspect each home in order to determine where the problem is located.
5. One pit connects two homes and can impacts service to the entire community.
6. Inflow from groundwater

To address these concerns, several upgrades are required. These include:

- Replacement of pits to include a monitoring system, 720 gallons of storage, new valves, leak detection, isolation valves, monolithic tank construction.
- Looping of dead end lines at Eagleton Circle and Eagle Creek/St Andrews and the installation of air admittance stations.
- Replacement of the central vacuum station to include variable frequency drive pumps, stainless steel construction, new controls, new tank, upgraded vacuum pumps, and upgraded sewage pumps.

The total estimate for vacuum system upgrades is $3.65 million.

Higher Rate Increases?

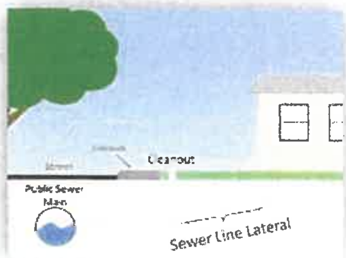
Some residents have expressed concerns over 300-400% rate increases related to the conversion to gravity. **This is simply not accurate information.**

How did this information get conveyed?

Social media is a powerful communication tool for quickly distributing information. However, sometimes this information gets distributed before it can be fully verified or validated. It is unfortunate, but information related to 300-400% increases was conveyed without being validated and failed to consider several important factors.

There are three main factors that dramatically affect the rate impact.

1. The additional customers from the planned developments increases the customer base from 444 to over 1200.
2. Most of the other cost associated with the irrigation system and treatment plant are being deferred to customers from the planned Fost and Flora projects.
3. When comparing the cost of the two options, many of the required upgrades to the vacuum system were not included factored into the rate comparison. Specifically, an important factor not considered was cost to upgrade the vacuum system is greater than the cost to convert to gravity..



Outstanding State approvals

1. North Carolina Utilities commission approval
2. North Carolina Department of Environmental Quality permit transfer [after NCUC approval].
3. North Carolina Department of Environmental Quality Construction Permit [prior to construction].
4. North Carolina Department of Environmental Quality Sedimentation and Erosion Permit
5. North Carolina Department of Transportation Encroachment Agreement
6. North Caroline Department of Environmental Quality Approval to Operate [after construction]

Water Conservation

There are 220 valves on the Eagle Creek vacuum system. Each is considered a weakness with the Eagle Creek vacuum system. In the event of a "leak", a water conservation notice may be required.

Here we answer two questions: What to do when a conservation notice is issued and would this happen with gravity sewer. .

Would a gravity sewer result in water conservation? In a word, No. Gravity sewer works differently than vacuum and would not require water conservation.

What to do when a conservation notice is issued.:

- Restrict washing dishes and doing laundry until the conservation is lifted.
- Shorten showers and do not take baths until the restrictions are lifted

What are permitted uses of water?:

- Continue use of water for cooking, lavatory and other essentials uses but we do ask that you think before you use.
- Use of water for irrigation is also permitted.

Please call customer service and request pumping of the tank. Techs will periodically inspect & pump your tank.

What's next

While the October 18th meeting is an important step forward, there are other major challenges that must be completed before construction can begin.

At the conclusion of the meeting, State officials will evaluate the desire of the community in determining their opinion prior to scheduling the public hearing. This hearing will be located in Currituck County .

After the public hearing, each issue presented during the hearing will require investigation by the state officials and Currituck Water & Sewer. Upon completion of the investigation and submittal of additional information, the final order will be issued.

The time require for these additional investigations depends on the number and complexity of each issue presented during the hearing.

The NCUC order is a key requirement before CWS can complete the acquisition of the sewer system and submit application for construction permits to convert to gravity.

Once NC DEQ approves construction plans, Currituck Water & Sewer's contractors can begin construction.

Typical excavation on golf course

Currituck Water & Sewer's Commitment

Currituck Water & Sewer's commitment is to provide solutions that resolve problems for the long term, has beneficial impact on the environment and results in sustainable infrastructure that represent the most prudent use of our customers' monthly service fee.

Many of the recommendations, presented by others, only consider a small portion of the upgrades required on the vacuum system. Currituck Water & Sewer considered and incorporated this information in determining the extent of the upgrades required on the vacuum system. CWS concluded that upgrading of the vacuum system did not meet our reliability or service criteria and is not a prudent investment or use of resources. Specifically, the major concerns with this approach are the following:

- Vendors are unwilling to warrant & guarantee reliable service levels to all Eagle Creek residents beyond standard 1 year equipment warranties.
- Vendors are unwilling to warrant and guarantee the upgrades would maintain acceptable service reliability to all Eagle Creek residents for the next 30 years.
- Vendors are unwilling to provide assurances that in the event of service issues, that the impacts to service could be minimized and localized to only areas experiencing issues

Currituck Water & Sewer fully agrees that the recommendations provided by vendors are warranted but that they represent only a portion of the required improvements and fail to address CWS's concerns ~~or~~ provide the assurances demanded by Eagle Creek residents. CWS's criteria for these improvements is that upon completion the upgrades will proved the most reliable, cost efficient, least disruptive solution and resolve the service issues at Eagle Creek for the next 50 years.

In CWS's opinion, any plan that does not fully address both response time and the material weakness of Eagle Creek vacuum system represents a short sighted approach that will risk future service issues in the community. For information on required vacuum system upgrades, see the Vacuum System Upgrades [Yes or No?} section.

Currituck Water & Sewer's commitment to fully resolve the service issues at Eagle Creek ultimately resulted in the recommendation to convert to gravity.

Currituck County

Currituck County does not have any oversight for sewer service within the Eagle Creek community. However, their assistance and support is critical to helping to keep the required improvements affordable.

A significant factor in CWS's plan to make the required improvements affordable is based on the inclusion of the planned Fost and Flora developments, as approved by the County Commissioners. Currituck County staff play a critical role in removing barriers and assisting the adjacent communities.

The County Commissions support the adjacent developments and are working diligently to ensure that barriers are removed so that the developments proceed in accordance with County leader's vision. Commissioners have worked very diligently to improve the situation by:

- Approving the Special Use Permit for a Major Utility to include additional developments in the service area.
- Approved amendments to the Fost Master Plan and preliminary play/special use permit to allow connection to Eagle Creek treatment plant.
- Approved the Master Plan for the Flora development that will allow Flora to connect to the Eagle Creek treatment plant.
- Allowed the first phase of the Fost development to be reviewed for final approval while the force main is under construction.

"Anything short of a complete replacement of the Eagle Creek vacuum system is a not a prudent use of resources."

How long would it take and how will you be impacted during construction

In order to minimize disruption during construction, Currituck Water & Sewer revised its plan and now intends to construct the sewer pipes along the golf course. This will reduce disruption in the streets. This also allows the vacuum system to remain in operation without concern of severing the vacuum lines.

After consulting with NC DEQ, the plan is construct sections of pipe and obtain NCDEQ approval prior to activating the line. Once activated, the service can be switched to the gravity system.

This approach allows service conversion to occur as construction progresses resulting in homes being converted while construction is on-going.

The actual switchover of your service to the gravity system is anticipated to take less than 4 hours. You will be notified 1-2 days prior to the switch over, so you can make arrangements not to use water during this time.

How long to complete construction?

CWS cannot start construction until we obtain state approval. While we wait, we have been proceeding with design, obtaining contractor bids, and material pricing .

The force main currently under construction is an important component of the project. Two of the planned lift stations will tie into this pipe reducing the time required to complete construction.

Completion could take as long as a six to nine months.

We are evaluating options that could shorten this time frame but the labor shortage and long lead times for could impact the schedule.

One question we have received is how the time to complete construction compares to the time required if we upgraded the vacuum system?

Upgrades to the vacuum system also require state permits. While gravity sewer permits typically take 2-3 weeks versus vacuum permitting is expected to take several months.

The time to completion for either option is practically the same.

Envirolink, Inc

ENVIROLINK

Representative Hanig and Senator Steinburg lend assistance to Eagle Creek residents

Currituck Water & Sewer thank Representative Hanig and Senator Steinburg for their assistance and leadership in helping to navigate through the approval process with regulatory officials.

Recognizing the urgency and challenges of obtaining state approvals and permits, Representative Hanig and Senator Steinburg graciously responded and organized a multi-agency meeting between Sandler Utility, Currituck Water and Sewer/Envirolink, Currituck County, NC DEQ, and NCUC officials.

The meeting was a productive meeting and helped to focus the agencies and remove log jams that were delaying progress.

We are greatly appreciative of their assistance.

"Replacing the existing vacuum sewer with gravity sewer is the most reliable, cost efficient, least disruptive solution, making it a clear choice for resolving the sewer issues for Eagle Creek residents."

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PLEASE
PLACE
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ENVIROLINK

Myers Rebuttal Exhibit L

Envirolink FAQ

To: Eagle Creek Residents,

Thank you to all the residents that provided feedback on the newsletter! The comments were insightful and productive. We were able to make a few key observations:

1. The community is unified in their desire to resolve the sewer issues. Everyone at Envirolink has the same desire and motives.
2. The community has three perspectives on sewer:
   a. Convert to gravity sewer
   b. Repair the vacuum system
   c. Need more information
3. There is some inaccurate information being conveyed that is confusing some residents.

Our suggestion is to gather information from credible sources & verify its accuracy (that includes information provided by Envirolink or Currituck Water & Sewer. While the community is fortunate to have a couple of experts who earn a living in the water industry and can be valuable resources for you, please ensure they are experienced in water and sewer matters specifically. Other reliable resources available to you include the: **North Carolina Department of Environmental Quality, North Carolina Public Staff, North Carolina Rural Water, American Water Works Association, Water Environment Federation, National Association of Regulated Utility Companies,** and local civil engineers experienced in water & sewer.

We appreciate the questions and comments that were received. We thought the answers to those questions would benefit the entire community. The following are some of the prevalent questions and additional information to help keep you informed on your sewer service.

1. **What happened with the power interruption and what is being done to avoid additional issues?**

   Like you, we are very concerned about this as it not only represents a major inconvenience, but it also presents a significant safety hazard to our crews.

   As background information, the NC 811 organization exists to notify facility owners of proposed excavation and send positive response information. They provide and easy communication link between excavators and utility owners. NC General statute requires notification to NC 811 at least three full days prior to excavation.

   NC 811 will notify utilities in the area, and it is the utility's responsibility to properly "locate" or mark their line(s).E.g. Dominion Power is responsible for locating power; Currituck County is responsible for locating water; Sandler Utility is responsible for locating the vacuum lines; etc. This is because the owner of the lines is the only entity that has the records on the location of underground lines and pipes.

   Prior to construction, each utility owner was requested to mark the location of their utility lines (locates). Once the locates were completed, our contractor started the work to install the line.

Unfortunately, the marked locations provided by the electrical owner's did not accurately identify the location of the lines and power lines were impacted.

A meeting was held Tuesday afternoon with Dominion Power's locator to determine what happened and provide us assurances that the remaining locations are accurate and can be relied upon. Proper locating of these lines is very important so we, or other utility crews, know where it is safe to dig, or conversely where hazards exist.

Dominion Power has accepted responsibility for the incident yesterday.

As a further precaution, we have asked that the electric company have technicians on-site while crews are working.

2. **Why not just fix the vacuum system?**

   Fixing the vacuum system **may** work, but it is not guaranteed to resolve the service issues.

3. **What happens if upgrades to the vacuum system do not resolve the issue(s) and the system continues to break?**

   In our opinion, this is one of the most important factors to consider when forming your position. There are a few things to consider.

   a. Every expert agrees that gravity system will resolve the service issues.
   b. Everyone is NOT in agreement that upgrades to the vacuum system will solve the problem. However, **no recommending repairs to the vacuum system is willing to stand behind their recommendation with any sort of guarantee or warranty beyond equipment warranties.**
   c. One of the questions that needs to be answered is: **What are the options if upgrades to the vacuum do not work?**

4. **How are we intending to connect to the existing services at the homes?**
   a. **Are you connecting at the pits or the candy canes?**

   The typical service line comes from the home to a point just outside of the service valve pit. Our plan is to tie into the line just outside of the pit and extend the service line to a manhole. Once the service is connected into the manhole, the pit can either be removed or cut below ground surface and filled with sand.

   Using this method of connecting the vacuum system there will not be excavations within your yards and we will not be connecting to the candy cane.

5. **How can gravity work in Eagle Creek?**
   a. **Eagle Creek is flat.**
   b. **How will water get to the plant from low lying areas.**
   c. **How many and where are the lift stations going?**

It is true that the Eagle Creek Community has little slope or grade to it. It is very similar to both the neighboring Lakeside Community and to the planned Fost Community. Both of those communities are served by gravity sewer systems.

Prior to making the decision to install a vacuum sewer, the Eagle Creek community was originally designed for a gravity sewer system, but the decision was made by Sandler Utility to move forward with the current vacuum system.

Our plan does not include pumps at each home, rather the plan is to install three (3) lift stations at various locations within the community and have the gravity mains flow to these lift stations. The lift stations will be used to pump the water to the treatment plant.

6. **What are the real cost figures for the different options?**
Prior to answering this question, there are a few things that are important to understand regardless of your perspective or opinion.

a) Permits are required for both options.
b) Construction is required both options.

Permits: The state has an expedited permitting program for gravity sewer, but there is not an expedited permitting program for vacuum system upgrades. Permitting vacuum will take longer than gravity. Given the high degree of visibility and frustration expressed by the community related to this vacuum system, the state is likely to scrutinize any application for vacuum system upgrades thoroughly.

Construction: In order to meet regulatory standards and provide a vacuum solution with the greatest opportunity for success, the following improvements were included in our estimate:

A. The valve and pits need to be replaced and upgraded to include additional storage.
B. The central vacuum station needs replaced and upgraded.
    a. Upgrades include:
        i. Higher capacity vacuum pumps with VFD to increase the safety factor on the current design.
        ii. Higher capacity sewage pumps with VFD to increase the safety factor on the current design
        iii. More robust instrumentation and controls system to permit predictive analysis.
        iv. Larger capacity sewage tank
        v. Minimum three vacuum pumps
        vi. Minimum three sewage pumps
C. Service Pit monitoring system to include provisions to identify and page technicians when a valve fails to include an analytics package that permits predictive analysis.

Currituck Water & Sewer (CWS)estimates for both vacuum upgrades and conversion to gravity are provided below. We have also provided our original estimate for your review. Our estimate for the Gravity conversion increased by less than 6%, while our estimate for Vacuum system upgrades decreased by greater than 32%.

	Vacuum Upgrades	Conversion to gravity
CWS Initial Estimate	$5.4 MM	$1.76 MM
CWS Current Estimate	$3.65 MM	$1.77 MM

7. **How does CWS make money?**

   CWS's rates are subject to North Carolina Utilities Commission regulation and approval. CWS does intend to request rate base treatment, which permits CWS to earn a rate of return on its investment. It is not accurate that larger investments generate greater returns. The return is the same regardless of the size of the investment. What is accurate is that a larger investment generates larger amount of money generated from the return. However, it is important to understand that the North Carolina Utilities Commission audits our investments to make sure they are prudent and useful. As you can deduce form the table above, if Currituck Water & Sewer's motives were to generate a larger amount of return, it would be in our best interest to recommend repairs to the vacuum system, since our estimates are that it cost more to repair and upgrade the vacuum system than to switch to gravity.

   All the experts agrees that gravity sewer **will** resolve the service issues, including the vacuum sewer technology providers. We believe the most cost effective solution is to invest in conversion to a gravity system, and therefore, is our recommendation.

   Our perspective is different from other stakeholders in that if a vacuum system upgrade is the selected solution, then our expectation is that a complete upgrade to bring this system into compliance with NC DEQ current standards is prudent and the system requires additional upgrades to the vacuum station and vacuum lines to minimize disruption during service issues.

8. **Who owns Currituck Water & Sewer?**
   Currituck Water & Sewer is owned by three private investments entities that invest in infrastructure across the United States. The investors include US based pensions, unions, and medical associations who prefer long term, lower yield investments.

   Envirolink Inc. is owned by private investment entities that include large construction contractors, and engineering consultants.

   The leadership team of Envirolink and Currituck Water & Sewer do include individuals that support both entities but Currituck Water & Sewer and Envirolink have different owners.

9. **What has Envirolink done to improve communications?**
   We understand that the Eagle Creek community has demanded a higher level of communication. During the past year, since we have been working in the community, Envirolink has worked with the community leaders to modify and develop communications protocols that support the desires of the community. Our current protocols have streamlined communication messages and methods of delivery. The newsletter is another recommendation we have received from the community and we intend to continue sending the newsletter while

construction activities continue and look forward to continue feedback on how we can meet the communities needs for information.

Myers Rebuttal Exhibit M

Eagle Creek Virtual Town Hall

Myers Exhibit M

ENVIROLINK

Eagle Creek | Virtual Townhall

January TBD, 2022

Operations Update | System Options Review | NC Regulatory Hearings

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Eagle Creek | Operations Update

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Eagle Creek | Problems from the Outset

- System installed when community was built in 1997.
  - Sandler was the property developer and still owns the system.
- Problems started with the system from the outset.
- No records of system maintenance from 1997 until 2020.
  - No documented maintenance records.
  - Rate increase granted to address increased maintenance requirements, but no evidence to indicate the rate increase was channeled to maintenance needs.
- Envirolink takes over operations in late summer 2020
  - Began researching maintenance records and evaluating condition of system;
  - Significant, systemic problems identified with the system;
  - Better maintenance and better records, but significant problems continue
  - Major vacuum station failure, Fall 2020 result of lack of maintenance
    - Duration of outage compounded by:
      - Lack of redundancy, spare parts and supply chain issues;
      - Lack of experience on Eagle Creek's vacuum system;
- March 2021 – technicians on-site 20 hours per day
- July 2021 – technicians on site 24/7/364
- December 2021 – system upgrades installed.
  - Detailed on next page.

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Operations | System Short-Term Band-Aids

- Envirolink has personnel onsite 24/7
- Envirolink requested and Sandler authorized significant short-term fixes for the failing system since the December townhall meeting:
  - New monitoring system fully online;
  - Pedestal mounted controllers installed (110 installed);
  - Additional upgrades ongoing:
    - More pedestal mounted controllers;
    - Expand the monitoring system capabilities;

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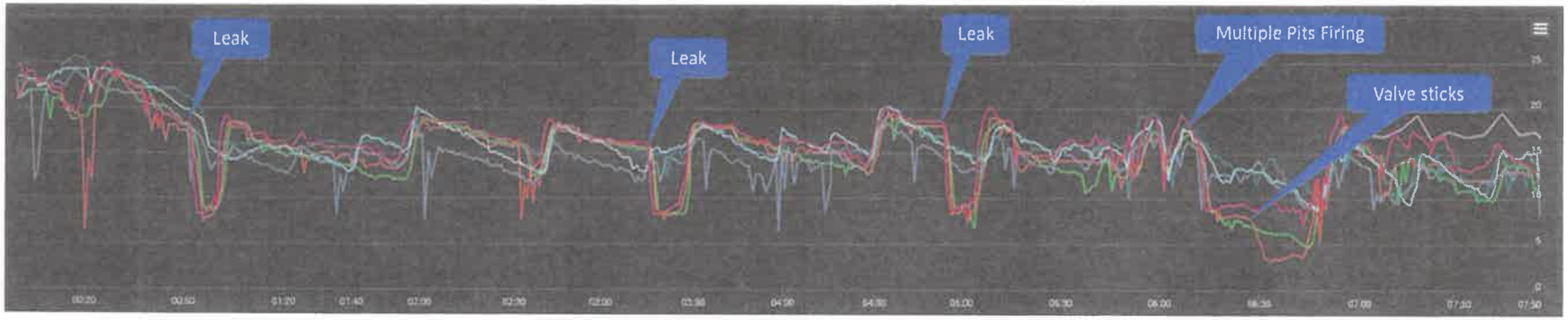
Operations | How is this helping?

- It's not perfect, but we are catching the majority of problems before they impact a household.
- Due to age and long-term lack of maintenance, there are valve failures 1-3 leaks per shift. The graphic below illustrates how quickly a leak can diminish the pressure and emphasizes the need to respond in minutes not industry standard 2 hours.

- Time elapsed: 2 minutes
- Vacuum loss: 56.8%

- Time elapsed: 2 minutes
- Vacuum loss: 50%

- Time elapsed: 3 minutes
- Vacuum loss: 52.7%



- Time elapsed: 4 minutes
- Vacuum loss: 52.2%
- Stage 2
    - Time Elapse: 20 min
    - Vacuum Loss: 81.5%

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Operations | How is this helping?

- We have already had two major weather events this year.
  - The monitoring system and on-site personnel resulted in
    - Identifying the issues faster
    - Responding faster
    - Restoring service faster
- Because we were able to now see the status of the lines we are able to respond before most customer notice a issue. These weather events would have been disasters without the monitoring systems.
- But…there were still problems. And Eagle Creek deserves better.

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Operations | What's the Long-Term Fix?

- Operations of the current system is comparable to playing whack-a-mole at the county fair; except no one wins.
- A system with a failure rate of 1-3 times per shift is not acceptable. With that many failures, some are guaranteed to be a problem for households.
- The entire system is beyond its shelf life.
- Eagle Creek needs a new system. There is no fixing the current system where you will not be in the same position in 2-3 years.
- Currituck Water & Sewer with the help of Envirolink, wants to put a new system in place.

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Eagle Creek | System Options Review

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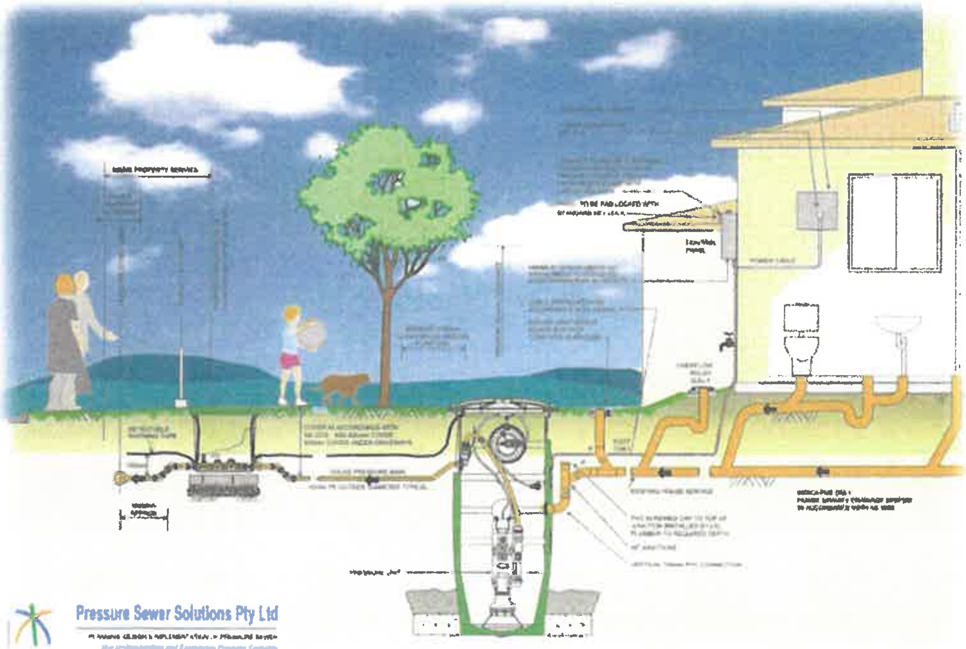
What is a Sewer Collection System (SCS)?

- The SCS transports used water from your home to a water treatment facility.



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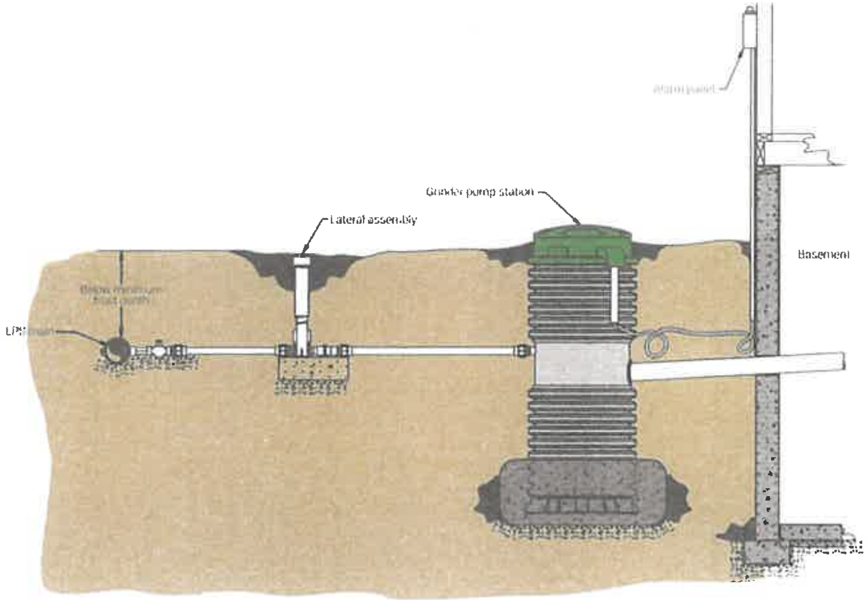
Sewer Collection System Options

- SCS Technology Options (alphabetical order):
  - Gravity
  - Low-Pressure
  - STEP
  - Vacuum



SCS Options | Low-Pressure/STEP

- Reliability comparable to vacuum system.
- Requirements:
  - installation of a tank and pump in proximity to home foundation;
  - installation of one tank and pump per home [e.g. 440 units];
  - each homeowner must grant an easement for installation, operation, and maintenance;
  - installation of low-pressure line from tank to property line;
  - installation of low-pressure mains to WWTP.
- Life of System = 10-15 years
- Regulatory agencies possess knowledge and experience to regulate and have long standing design standards.
  - Minimum storage requirements (one day storage)

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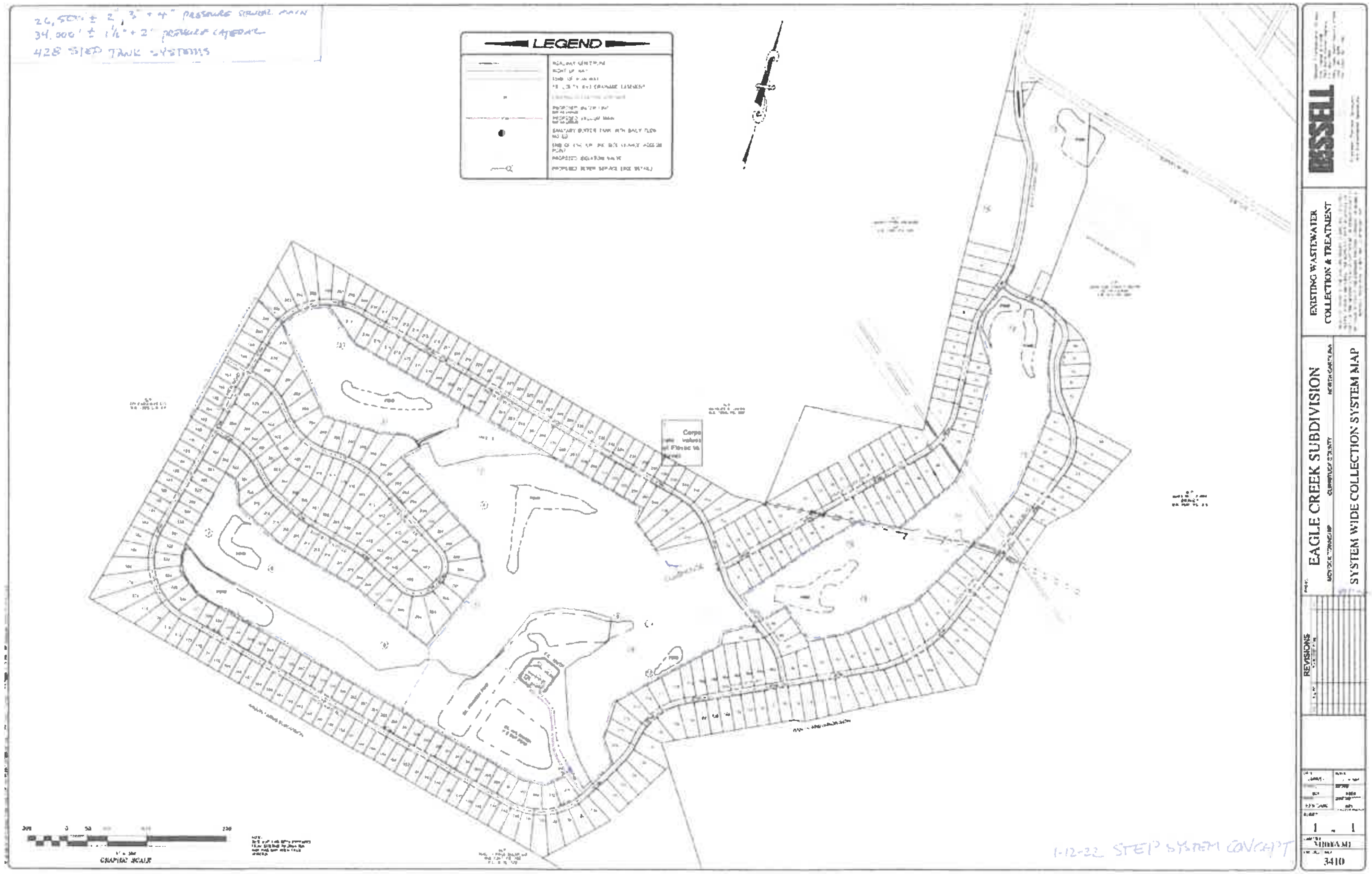
Low Pressure/STEP Impacts

Image courtesy of Environment One Corporation. Used with permission.

Low-Pressure/STEP System Conceptual Layout



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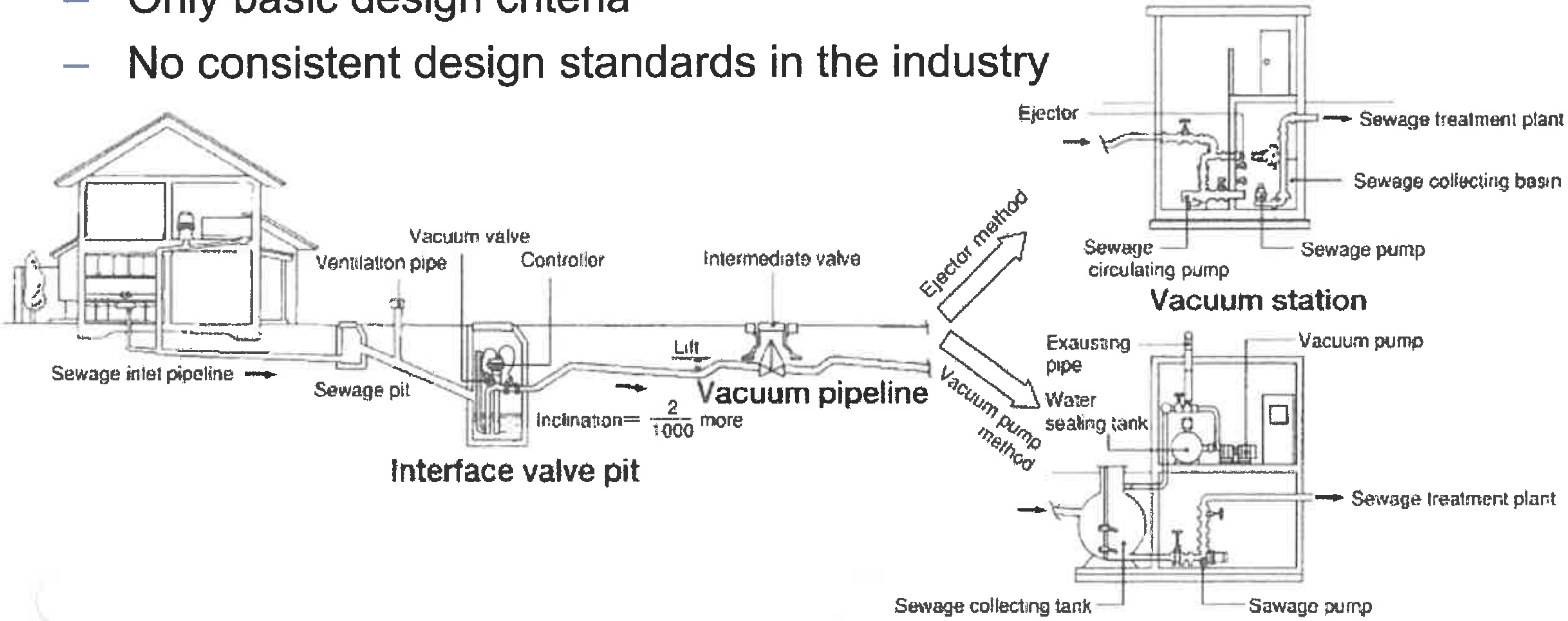
SCS Options | Vacuum System

- Operates via negative pressure
- Components:
  - Collection Chamber
  - Conduits (saw-toothed profile)
  - Vacuum Station
- Life of system = 10-12 years
- Regulatory agencies lack experience and are still learning how vacuum systems operate
  - Only basic design criteria
  - No consistent design standards in the industry



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Vacuum System | Positives & Negatives

- Positives:
  - Lower initial construction cost (good for developers' budgets building new communities).
  - Promotes water conservation;
  - Minimizes risk of sanitary sewer overflows;
- Negatives:
  - Higher costs to maintain in good working order due to more precision machine parts required for operations;
  - TBD
  - Bigger impact on personal property due to requirement to remove and replace existing pits.

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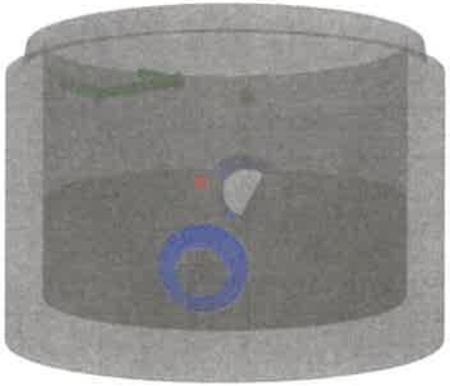
Vacuum System | Pit Replacement Impacts

200 gallons



4'x3' Base
(Shown with Precast Invert)

4' x 7' precast manhole

Valve Pit

The Valve Pit

- Pit /Sump & Cone
- Vacuum Valve
- Sump Breather Unit
- Anti-flotation Collar

700 gallons

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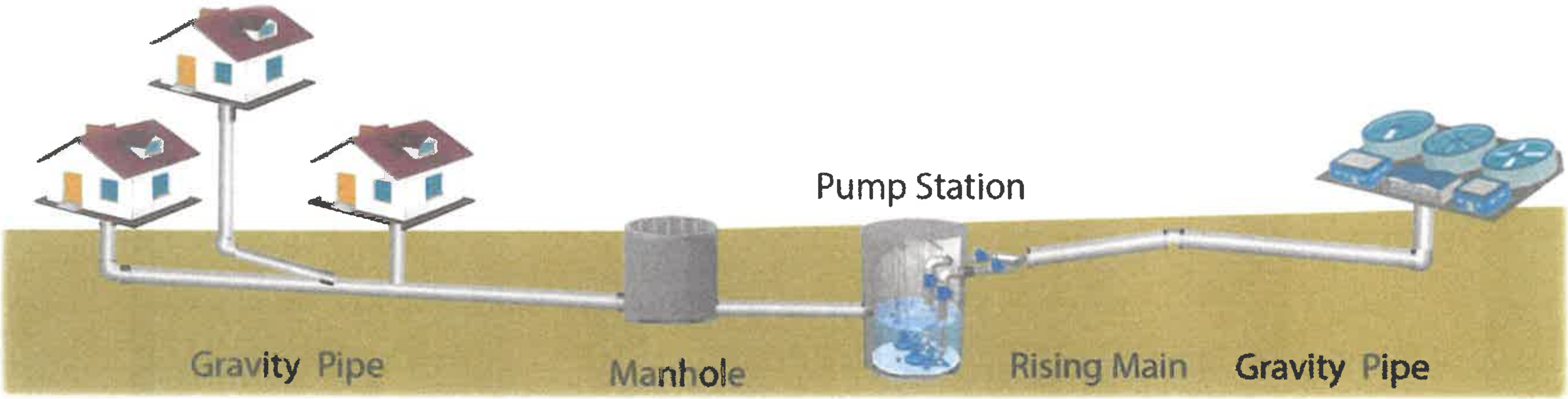
SCS Options | Gravity System

From the beginning of civilization, the most common type of sewerage collection systems are gravity and pressure systems. (Read 2004a)

- Lift Station (6)
  - Inspect 52/year
  - Clean 2/year
  - Pumps two per station
    - Two spare pumps in inventory
    - Replace pumps 1/10 year
- Manholes - inspect 1/year
- Lines - clean 1/10 years (10%/year)
- Labor – 200 hr/year



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Gravity System | Positives & Negatives

- **Positives:**
  - It uses gravity. There's no shortage of gravity.
  - Reliability - 1 call/30 years
  - Standards are well established
  - Less precision mechanical parts to break down.
  - Lower cost of operation
  - Longer life expectancy of 40-50 years
- **Negatives:**
  - Lift stations necessary (NEED TO EXPLAIN MORE)
  - Odor potential (HOW BAD)
  - Sanitary Sewer Overflow Potential
  - Potential for deeper excavations (15 feet) on portions of the golf course.

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Gravity System | Replacement Impacts/Requirements

- 1 manhole for approximately every 4-5 homes (105 manholes)
- Installation of cleanout to each home

- Installation of gravity lines to carry water to lift station.
- Installation of lift station (not on personal property)
  - Seven (7) lift stations, if depth less than 15 feet
  - Three (3) lift stations if depth increased to 20 feet.

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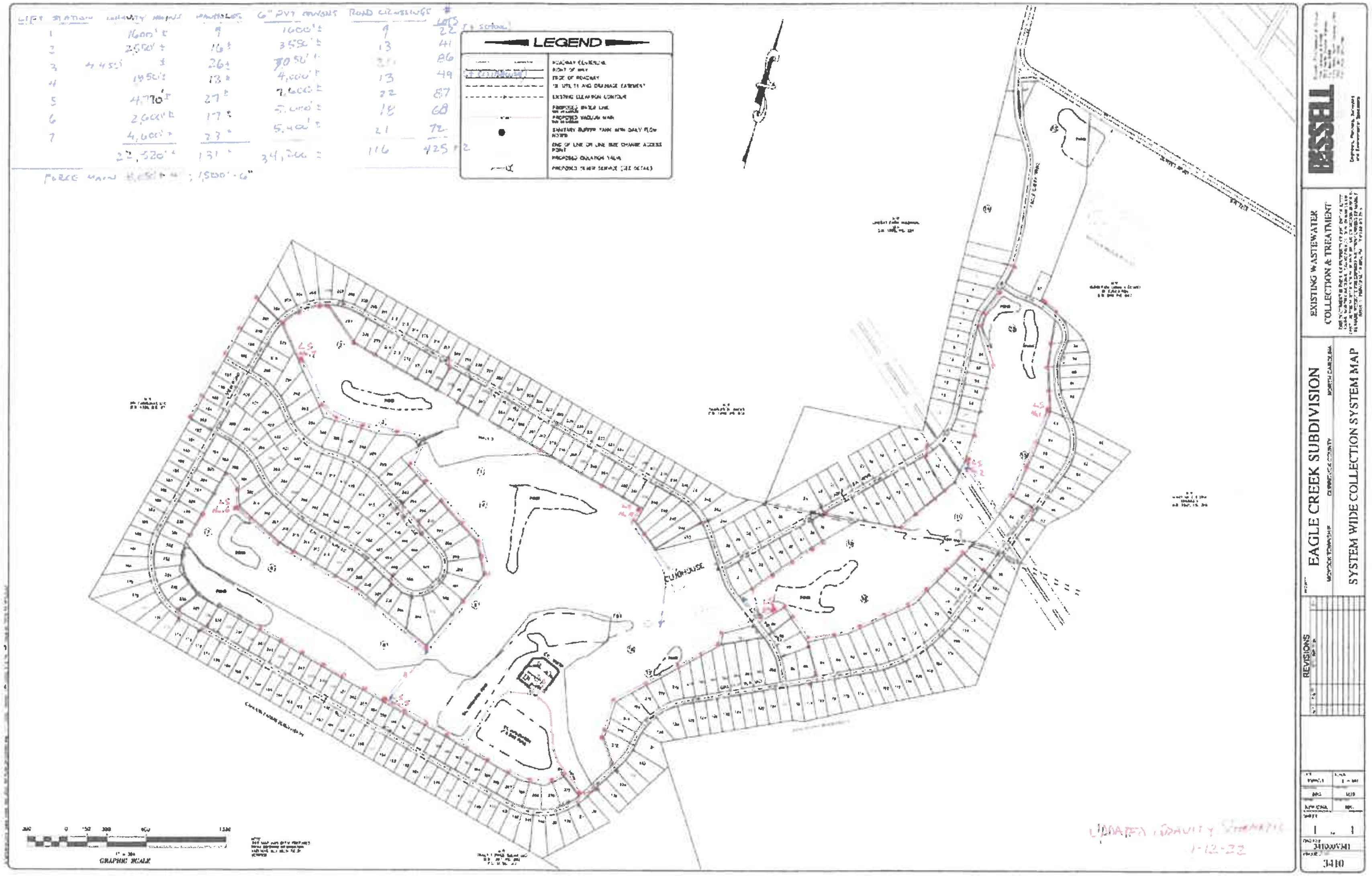
Gravity System Conceptual Layout



Sewer Collection Systems | Failure Causes

[international industry literature review]

- Low Pressure/STEP
  - 90% of failure is from grinder pump
    - 67% of pump failures is from control unit (electrical).
  - 70% of failures due to improper use of sewer system by customers.
- Gravity
  - 95% of failures from clogged pipes due to roots; fats/oils/grease; or equipment defects.
- Vacuum Systems
  - 80% of failures is from valve pits
  - 14% of failures from vacuum station

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Sewer Collection Systems | Failure Rates Comparison

[international industry literature review]

Failures (per household per year)

Low Pressure	100/208 HHs (48% failure rate)
Vacuum	100/162 HHs (62% failure rate)
Gravity	100/380,800 HHs (0.02% failure rate)

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SCS Replacement Option Common Factors

- Every effort will be made to minimize disruption to the Eagle Creek Community. But, trying to be as transparent as we can, no matter which SCS replacement option is selected, the following factors will apply:
  - Some disruption during construction;
  - Dewatering during construction;
  - Some trenching required;
  - Installation of state-of-the-art monitoring system.

SCS Impact Comparison | Vacuum vs. Gravity

Vacuum

- Installation of TBD gallon pit (1 pit per 2 homes)
- Replace vacuum station
- Remove & replace existing pit at each home (in basically same location)
- Tank size = 360-720 gallons

Gravity

- Installation of a manhole (1 manhole per 4 homes)
- Install lift stations
- Manhole installed in basically same location as existing pit
- Manhole size = 4 feet diameter and 7 feet deep

SCS Impact Comparison | Vacuum vs. Low-Pressure

Vacuum

- Installation of TBD gallon pit (1 pit per 2 homes)
- Replace vacuum station
- Remove & replace existing pit at each home (in basically same location)
- Tank size = 360-720 gallons

Low-Pressure

- Installation of a 360-gallon grinder pump station (1 per home)
- No lift OR vacuum station
- Pump installed within 5-10 feet of home foundation
- Tank size = 360 gallons
  - Note: STEP would require 1 tank with 2 completely isolated compartments = 720-gallon total tank size

SCS Impact Comparison | Gravity vs. Low-Pressure

Gravity

- Installation of a manhole (1 manhole per 4 homes)
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- No lift OR vacuum station
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- Tank size = 360 gallons
  - Note: STEP would require 1 tank with 2 completely isolated compartments = 720-gallon total tank size

Currituck Water & Sewer Design Goals for a Better Eagle Creek Future

Once CW&S obtains ownership of the Eagle Creek Sewer Collection System, we will replace the existing system with a brand-new system. This new construction will impact your community. Our goals in this effort are to give you a better future:

- No service interruption more than 4 hours during switch over;
- Replace all components that have exhausted expected life or are within 3 years of expected life;
- Upgrade system to meet modern design standards;
  - NC DEQ
  - Currituck Water & Sewer
- Minimize excavation < 15 feet
- Minimize disruption during construction
- Minimize construction in roads
- Minimize construction on residents' property
- No construction outside of 10 feet from property line
- Minimize open trench excavations on residents' property
- Contingency plan for potential issues:
  - **Electric** – Standby Crew
  - **Water** – Contractor equipped with repair parts
  - **Telecommunications** – Supply critical residents with redundant wifi during construction
  - **Sewer** – Contractor equipped with repair parts

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Currituck Water & Sewer Design Goals for a Better Eagle Creek Future

But this is a construction project. We all know that plans never work out perfectly. When things don't go perfect, we are going to strive to have contingencies in place.

- **Electric** – Standby Crew
- **Water** – Contractor equipped with repair parts
- **Telecommunications** – For any work from home customers, supply customer with redundant wifi during construction.
- **Sewer** – Contractor equipped with repair parts
- **Landscaping** – Contractor will come in after construction to restore private properties to pre-construction condition.
  - Engineers have videoed and photographed each lot.

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Questions

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SCS Design Criteria | Vacuum System

- Sufficient vacuum capacity to provide a minimum safety factor 30%.
- Variable Frequency Drives (VFDs) on all vacuum pumps.
- VFDs on sewage pumps to permit ramping up and down.
- Instrumentation to permit sewage and vacuum pump runtimes, start/stops, rainfall, water flow, amp draw, power, sewage pump discharge pressure, air flow, vacuum sensor, pressure sensor, and level sensors.
- Oil-sealed rotary screw vacuum pumps.
- Stainless steel vacuum station tank(s) minimum two (as per European recommendations)
- Three (3) vacuum pumps with one in inventory
- Two sewage pumps with one complete in inventory
- Monolithic pit design
- Minimum storage to meet NC DEQ regulation
- Spring operated valve
- Pit alarm light (level and open valve)
- Sealed & Locking pit lid
- Pit monitoring (level, vacuum, operating cycle time)
- Isolation valve actuated through monitoring system

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Recommended Phase 1 - Vacuum System Upgrades

- Upgrade and replace central vacuum station
  - Estimated Budget = $600,000
- Install monitoring system-all valve pits
  - Estimated Budget = $430,000
- Replace all valve bodies
  - Estimated budget =$450,000
- Install 500 gallon tank between pit and home
  - 4x4x5 concrete or polymer
  - Modify and move candy cane to between pit and tank
    - Discharge from candy cane into tank
  - Home owner owns
  - Amend restrictive convenient to require cleaning (pumping) 1/3 years
  - Estimated budget = $3,000 - $5,000 per tank (installed)
    - 221 pits x $4,000 = $844,000
- **Total Phase 1 budget = $2.365 MI**

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Recommended Phase 2 - Vacuum System Upgrades

- After Year 1 identify pits subject to inflow and infiltration
  - Replace pits subject to inflow and infiltration
  - Required features
    - Monolithic construction
    - Additional storage capacity [minimum 300 gallons]
    - Home owner and utility valve failure notification
    - Anti-floatation measures
  - Estimated Budget = $7,550 per pit
    - 220 pits x 30% x $6,000 = $0.5 MM
- **Estimated Phase 2 Budget = $0.5 MM**
- **Total Estimated Budget = $2.865 MM [Ph 1 & 2]**

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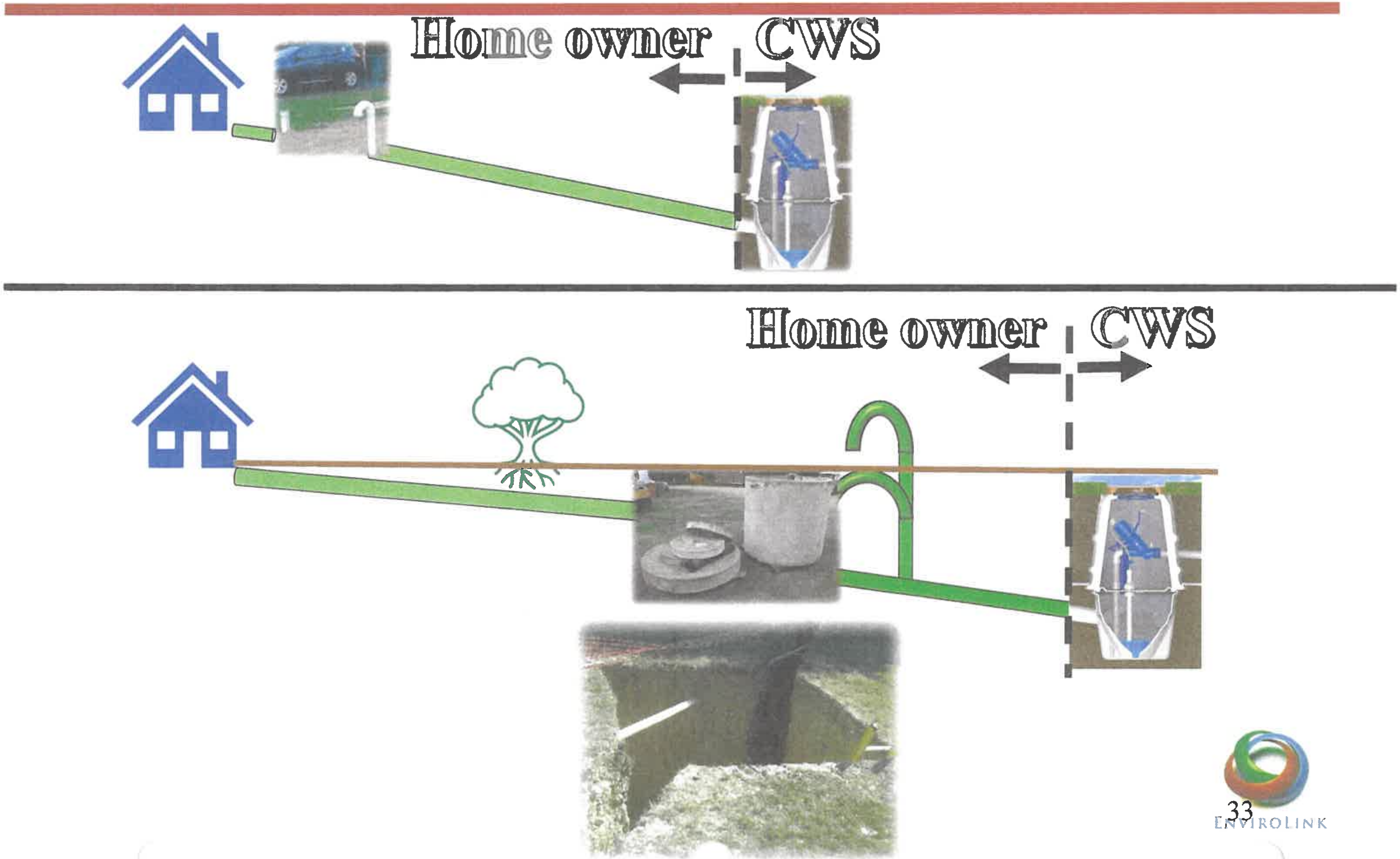
Vacuum Service Modification



Gravity System Design Criteria

- Manholes = 40 years
- Mains = 40 years
- Pumps = 10 years
- Controls = 10 years
- Maximum Depth
  - For along property lines: 6’ – 8’
  - For gravity mains on golf course: 15’
- Install manhole on short side
- Install cleanout and 6” main on long side

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Gravity System Design

- Six lift stations
  - Dual pumps with multiple spares (Required per NC DEQ)
  - Diesel backup pump
  - Storage above normal operating level (24 hour)
  - Audio-Visual alarms
  - SCADA with paging capability
- Manhole installation
  - ____ On property lines to homeowner
  - ____ On golf course
- Linear footage of mains
  - ____ On golf course
  - ____ Along property lines (directional drill)

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Vacuum System Failures [From literature review]

- Vacuum Systems
  - 80% of failures is from valve pits
    - 92% of pit failures are valve not opening, valve not closing, defective valve closing mechanism, and flooding of controller
      - 40% valve not closing (leak)
      - 20% valve not opening (backup)
      - 7.5% damage to valve closing mechanism
      - 7.5% clogging of suction pipe conduit
      - 3% wrong proportion of air/water
      - 3% closing of vent pipes
    - 25% due to improper use of sewer system by customers
  - 14% of failures from vacuum station
    - Most common cause – prolonged operation of vacuum pumps resulting from leakages in the system

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Low Pressure Evaluation

- First pressure systems installed in 1800s.
- Requires installation of a tank and pump in proximity to home foundation
- Reliability comparable to vacuum sewer
- Requires installation of one tank and pump per home [e.g. 440 units]
  - Cost estimate for tank and pump installation only:
    - $5,000 x 440 units = $2.2 MM
      - Does not include cost of main to property line
      - Does not include cost of main from property line to WWTP
- Require CWS obtain easements from each home owner for installation, operation and maintenance
- Requires installation of low pressure line from tank to property line
- Requires installation of low pressure mains to WWTP
- No further evaluation warranted.
  - Option found to be both economically and technically unfeasible

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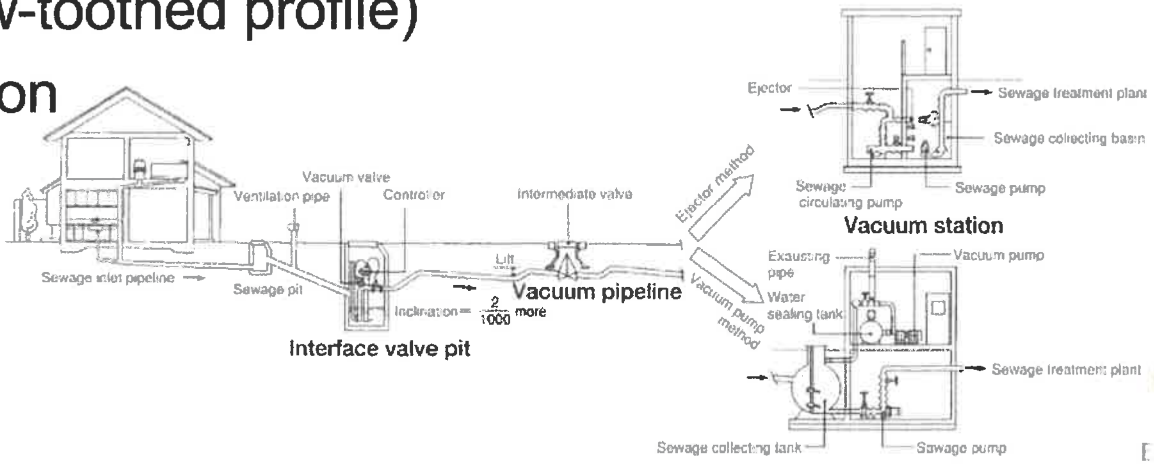
Vacuum Sewer Overview

- 1960 – Earliest commercial application of vacuum sewer
  - Note: Several publications were reviewed and their does not appear to be a consistent date established for the first application of vacuum sewer.
- 1990 - Earliest functioning vacuum system installed
  - 1997 – Eagle Creek vacuum system installed
- Operates under negative pressure
- Components
  - Collection Chamber
  - Conduits (saw-toothed profile)
  - Vacuum Station



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Vacuum System Overview [per US EPA Fact Sheet]

- Approximately 50 vacuum systems in across US
- Applicable:
  - Cost effective where construction cost high
  - Population density low
  - Topography flat
- Advantages
  - Promotes water conservation
  - Minimizes risk of sanitary sewer overflows
  - Lower Construction Cost
- Disadvantages
  - No universally adopted design standards
  - Requires responsive operation and maintenance
  - Higher energy cost
  - Reliability – Historically poor reliability but recent advances have improved reliability
  - High operational cost
  - High life cycle cost
  - High probably of service calls - One service call every 6.9 years [14.5% probability of service issue]

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Vacuum Sewer Operation & Maintenance [from Airvac Vacuum Sewage 1990 Design Manual]

- Vacuum pump – Recommend replacement every 7.5 years per manufacturer and US EPA.
  - Recommended maintenance per US EPA and Air Vac Sewage Design Manual
    - Controller (221)– Replace 1/5years
    - Valve (221) – Replace 1/10 year
    - Sewage Pumps (2)- Replace 1/10 year
    - Vacuum Pumps (2) – Replace 1/15 years
  - Other Maintenance
    - Vacuum Station – Inspect daily [360/year]
    - Vacuum pumps – Oil change monthly [12/year]
    - Vacuum filters – Change once every two years [1/2 year]
    - Sewage Pumps – Change seals twice every 10 years
    - Valves – Check timing once per year
  - Reliability
    - One service call every 6.9 years [from US EPA telephone survey]
  - Labor = 11,400 hr/year

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Vacuum System North Carolina Regulation

- **"Vacuum sewer system"** means a mechanized system of wastewater collection using differential air pressure to move the wastewater. Centralized stations provide the vacuum with valve pits providing the collection point from the source and also the inlet air required to move the wastewater. In conjunction with the vacuum pumps, a standard non-vacuum pump station and force main is used to transport the wastewater from the vacuum tanks to a gravity sewer or ultimate point of treatment and disposal. [15A NCAC 2T .302]
- (c) For pressure sewers, **vacuum sewers**, STEP systems, and other alternative sewer systems discharging into a sewer system, **the Permittee**, by certifying the permit application and receiving an issued permit, **shall maintain in operable condition all pumps, tanks, service laterals, and main lines as permitted**, **excluding the line from a building to the septic or pump tank**. [15A NCAC 2T .304]

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Vacuum Station NC DEQ Design Criteria

- 15A NCAC 2T .305…
  - (h) The following criteria shall be met for all pumping stations and force mains:
  - (1) Pump Station Reliability:
    - (A) Pump **stations shall be designed with multiple pumps** such that peak flow can be pumped with the largest pump out of service. …
    - (B) A standby power source or pump shall be required at all pump stations…
    - (C) As an alternative to Part (B) …
    - (D) Simplex pump or **vacuum stations** connecting a single building to a sewer system **shall provide 24-hours worth of wastewater storage** or shall provide storage in excess of that needed during the greatest power outage over the last three years or the documented response time to replace a failed pump, whichever is greater. Documentation of wastewater storage shall be provided with the permit application. **In no case shall less than 6 hours worth of wastewater storage be provided above the pump-on level**.
    - (E) All pump stations designed for two pumps or more shall have a telemetry system to provide remote notification of a problem condition…
    - (F) All pump stations shall have a high water audio and visual alarm.

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Vacuum System Design Considerations

- Literature [International Journal of System Assurance Management, 2017]
  - One or more vacuum vessels (recommend two)
  - Several vacuum pumps
  - Several non-clog sewage pumps
  - Standby generator
  - Vacuum reservoir tank, spare
  - Rotary vane vacuum pumps
  - Separate flows greater than 15 gpm (e.g. schools)
  - Buffer tank sized to control at least 25% of design flow
    - 120 gpd per bedroom x 25% = 30 gallons per bedroom [See table next slide]

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North Carolina Regulatory Design Standards

- Current NC Minimum Design Standards
  - 15A NCAC 2T rules
    - Design flow based on # of bedrooms
      - [120 gallons per bedroom per day] [15A NCAC 2T
    - Eagle Creek community 421 homes range from three to six bedroom
    - Vacuum classified as 'alternative' means anything other than gravity.

Bedrooms	Gallons per day	6 hr(25%) storage	% Homes
3	360	90	21.1% [89]
4	480	120	49.2% [207]
5	600	150	15.4% [65]
6	720	180	14.3% [60]

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Currituck Water & Sewer Design Goals

- Replace all components that have exhausted expected life
- Replace all components that are within 3 years of expected life
- Upgrade system to meet current design standards
  - NC DEQ
  - Flovac & A3-USA
  - Envirolink operational criteria
    - Safety factor for vacuum pump design
    - Safety factor for sewage pump design
    - Redundancy at vacuum station
    - Impact of individual service on system operation
    - Monitoring of station and services

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Myers Rebuttal Exhibit N

Robersonville Photos

Town of Robersonville [2012]

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Robersonville Lift Stations [2012]

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Town of Robersonville Asset Value