

**HARDWICK WASTEWATER
POST JULY 2023 FLOOD
TREATMENT PLANT ASSESSMENT
CALEDONIA COUNTY, VERMONT**

**NPDES PERMIT NUMBER VT0100137
STATE OF VERMONT PERMIT NUMBER 3-1143**

August 29, 2023

This report was prepared based on observations made during July 14th, 17th and 18th site visits by Heather Collins, VT DEC, WSMD, WWMP in conjunction with Army Corps of Engineers and US EPA Region 1 representatives.

REPORT LIMITATIONS

This report was prepared from visual observations and operator conversations during site visits. No testing of equipment or measuring of components was performed.

MAIN PLANT

FACILITY DESCRIPTION

The facility is an aerated lagoon system. Influent flows by gravity into the headworks through a hydraulic comminutor (Muffin Monster). If the comminutor fails, the adjacent bar racks provide primary screening. Influent then flows through a grit screen to the grit settling chamber, then to grit cyclone where grit is removed through a dewatering system, and remaining influent flows to the wet well. Influent is then pumped from the wet well into Lagoon 1, which normally contains an anaerobic cell at the head of the Lagoon; however, the system is in the middle of a capital improvements project and the anaerobic cell has been dismantled currently awaiting replacement. Influent then flows through a partially mixed aerobic cell before entering a crossover pipe where Poly-Aluminum Chloride (PAC) for phosphorous removal is injected as it flows to Lagoon 2. Lagoon 2 consists of two partially mixed aerobic cells. Treated effluent then flows to the CT chamber where sodium hypochlorite is injected prior to CT. At the end of the CT chamber sodium bisulfite is injected for dichlorination prior to discharge to the Lamoille River.

The main building houses a laboratory and a motor control center (MCC) with nearly all pump and motor starters, variable frequency drives (VFDs), and branch circuit breakers. The plant's automatic transfer switch (ATS), main control panel, Programmable Logic Controller (PLC), spare pump and motor storage, grinder hydraulic power pack, chemical feed pumps and tanks (sodium hypochlorite and sodium bisulfite), backup generator, mechanical room, and maintenance area are also located on the main level of the main plant building. The main building's basement houses the influent pumps, heating system fuel storage, and dehumidifier. A garage that houses the plant's lawn mowing equipment and portable pumps with hoses is located adjacent to the Main Building. The PAC chemical feed pumps and tanks are located in a separate building near the rear of the Lagoons at higher elevation.

OBSERVATIONS

Except the PAC chemical feed building and lagoons the entire plant was inundated with flood water and rendered inoperable as of the July 14, 2023, site visit. Flooding

appeared to be backwater type with high water marks observed at approximately 5' above the first floor of the main plant building.

The influent wet well pump station was being bypassed using a portable diesel pump and temporary float system to pump influent to Lagoon 1. The aeration system and mixers were not functional without power. Influent was flowing via gravity through Lagoon 1 to Lagoon 2. No chemical addition for nutrient control (PAC) was being added at this time as the power was still off to the facility. The system was not discharging at the time of the site visit.

As of July 17, 2023, power had been restored to partial components of the plant and the new blower that had been onsite as part of the improvements project had been installed. Lagoons were being partially aerated.

As of the July 18th site visit a temporary power circuit to the PAC feed building was installed and providing chemical injection. Used, chlorine and de-chlorination pumps were sourced from a neighboring facility and were in operation to provide disinfection and dichlorination prior to discharging.

The motor control center (MCC) including nearly all pump and motor starters, variable frequency drives (VFDs), branch circuit breakers, and electrical conduits were inundated and likely destroyed. The same is true for the plant's heating and hot water system, meters, analytical monitors, recorders, laboratory equipment and supplies, and automatic samplers. The plant's automatic transfer switch (ATS), main control panel, grinder hydraulic power pack, chemical feed pumps and tanks (sodium hypochlorite and sodium bisulfite), blowers (two original and one new), and backup generator will also require complete re-build or replacement. The facility's small chlorination building that sat atop the chlorine contact chamber was completely washed away in the flood waters. The Facility's lawn tractor, portable pumps with hosing and spare parts located in the adjacent garage were submerged in flood waters. The facility's Dodge truck and trailer mount sewer rodder parked adjacent to the facility were also submerged in flood waters.

Ten (10) new rolls of liner for the lagoons were on-site and slated for installation as part of the capital improvement project. Several rolls were carried by flood waters several hundred yards. The extent of damage is unknown and should be elevated prior to installation.

No physical damage to structures was visually observed other than the chlorination building mentioned above. There was damage to the existing site fencing.

PUMP STATIONS

ROUTE 14 PUMP STATION

FACILITY DESCRIPTION

The facility is a submersible pump station with a cast in place concrete wet well and concrete pump pit. The control panel is mounted on grade.

OBSERVATIONS

The entire pumpstation with control panel, electrical components and remote monitoring system were submerged. There was silt and debris accumulation, and likely damaged conduits. The wet well interior appeared unimpacted. The pump station was not operable during the first two site visits. Waste was being pumped and trucked to the Buffalo Street Pump Station. By the July 18th site visit a temporary control panel had been installed to allow manual on/off operation of pumps.

BUFFALO STREET PUMP STATION

FACILITY DESCRIPTION

The facility is dry pit style wastewater pump station with a cast in place concrete wet well and steel pump pit containing two flight pumps, a dehumidifier, sump pump and phone communications. The control panel is mounted on grade inside the site fence.

OBSERVATIONS

The main components of the wastewater pump station were submerged. Damage was limited to the partially submerged control panel, electrical components, dehumidifier, phone communications, silt and debris accumulation, and likely damaged conduits. The panel had been temporarily modified to allow manual on/off operation of pumps.

COLLECTION SYSTEM

FACILITY DESCRIPTION

There are four stream crossings in the collection system; two of the stream crossings are submerged siphons and the other two are 8" crossings.

OBSERVATIONS

Overall, the collection system received large amounts of grit/silt/debris. Sections of collection system piping were exposed along Rte. 14 and Buffalo Street along Copper Brook due to scour.

RECOMMENDATIONS

IMMEDIATE

- The plant staff and on-site contractor were able to install a temporary bypass pump, used chemical feed pumps, temporary power feeds, and bring an existing blower on-line, thus completing immediate needs to bring the plant into limited operation. Temporary control panels were installed at both pump stations.

SHORT TERM

- Evaluate electrical components, wiring and conduits. All may need replacing.
- Complete replacement or professional rehabilitation of all electrical and mechanical equipment and instrumentation below the high-water mark which show evidence of water intrusion. Even equipment quickly brought back into operation may suffer shortened life due to silt and containments in flood waters.
- A significant amount of equipment was impacted, including most of the motor control center (MCC), chlorination & de-chlorination pumps, instrumentation, analytical monitors & recorders, influent pump motors & control panel, grinder hydraulic power pack and control panel, grit pump motors & control panel, blower motors & control panels, possibly complete blower assemblies, and generator Pumps which show evidence of water intrusion in bearing grease or oil should be replaced or reconditioned.
- An appreciable amount of grit and sediment from the upstream collection system and headworks inundation was likely conveyed into the plant. Subsequently, pump performance should be checked for accelerated wear and replaced or reconditioned.
- The Rte. 14 and Buffalo Street Pump Stations received appreciable amounts of grit and sediment from the upstream collection system inundation were likely conveyed into the wet wells. Subsequently, pump performance should be checked for accelerated wear. Pumps which show evidence of water intrusion in bearing grease or oil should be replaced or reconditioned. Replacement of VFD's, panel heaters, and miscellaneous associated relays & terminal strips. Extended manual operation may necessitate replacement of main breakers. Complete panel replacements may be more economical than component replacements.

- Lagoon sludge and sediment depths should be also checked and compared to pre-flood measurements. Excess buildup of solids should be removed.
- Jetting and camera inspection of low-lying collection system areas as the collection system received an appreciable amount of grit/silt/debris. Camera inspections should be explored to ascertain collection system damages.
- Have Reduced Pressure Zone Backflow Preventers (RPZBP) at the facility inspected and tested to ensure they are properly functioning.

LONG TERM

Long term recommendations to potentially mitigate future flooding impacts include:

- Due to the low site elevation, the treatment plant has been and will continue to be subjected to repeated flooding during severe events. Conduct a cost and life cycle analysis to determine if relocation is a better option than reconstruction. Repair/reconstruction costs could exceed \$2M or more. Elevating the MCC / control panels, blowers, and generator. This would require a significant undertaking as an additional building floor, mezzanine or new elevated building would be required.
- A structural analysis of the Main treatment plant building should be considered before performing any long term or mitigation repairs are made to ensure the building can support long term use.
- Although the low technology and inherent storage of a lagoon system provides some resiliency against flooding, the high cost of repairs warrants a life cycle cost analysis of replacing the facility with a more modern, smaller footprinted facility at a higher elevation.
- Replace main influent and grit pumps sludge pumps with immersible units.
- Install flood doors and flood barriers at windows. Inspect and replace as necessary flood proofing at all building penetrations.
- Controls for pump stations should be elevated above flood stage.
- Evaluate if crossover piping from Lagoon 1 and to Lagoon 2 is adequately sized to allow for hydraulic balancing and prevent overflows to contact chambers. Larger crossover pipes, multiple pipes and/or pumps should be considered.
- High flows may exceed the working capacity of chemical pumps. Additional pumps should be provided to deliver process and disinfection chemicals during high flows. Larger day tanks and supplies of chemicals on hand may be needed.
- Outfall pipes should have valves or duckbills to prevent river water from backing

into plant components.

- Consider portable or fixed pumps to discharge effluent if gravity flow is no longer possible.

PHOTOS



1 – Receded Flood Waters at Main Plant (photo by Chief Operator Ken LaCasse)



2- Receded Flood Waters at Main Plant, Note Two Rolls of Lagoon Liner Laid Against Stairs to the Lagoon Level, Sewer Rodder and Facility's Dodge Truck (photo by Chief Operator Ken LaCasse)



3- High Water Mark Above Grit Chamber and Influent Wet Well



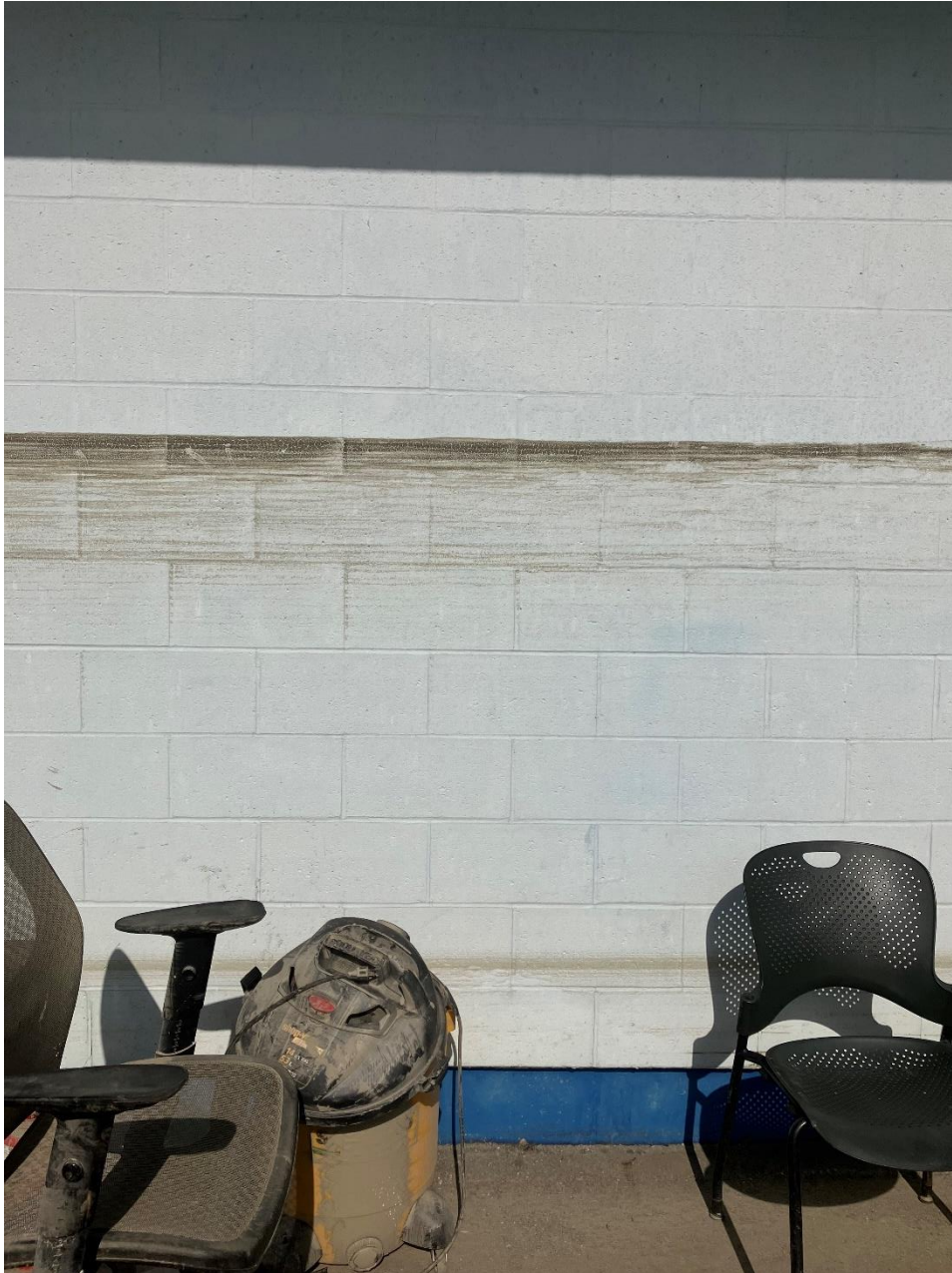
4- High Water Mark in Grit Cyclone Room



5- Portable Pump Pumping from Influent Wet Well to Lagoon 1



6 – Scour Over Berm of Lagoons and Remnants of Chlorine Injection A-Frame Building Along Site Fencing



7- High Water Mark on Exterior of Main Plant Building



8- High Water Mark with Insulation from Concrete Block Construction in Main Office Area



9-Main Building MCC Showing High Water Mark



10- Instrumentation and PLC Panel High Water Mark



11- High Water Mark in Laboratory Area



12- New Switches for Upgrade that were Submerged



13- Boiler Room with High Water Mark



14- Plant Generator High Water Mark



15- Maintenance Room



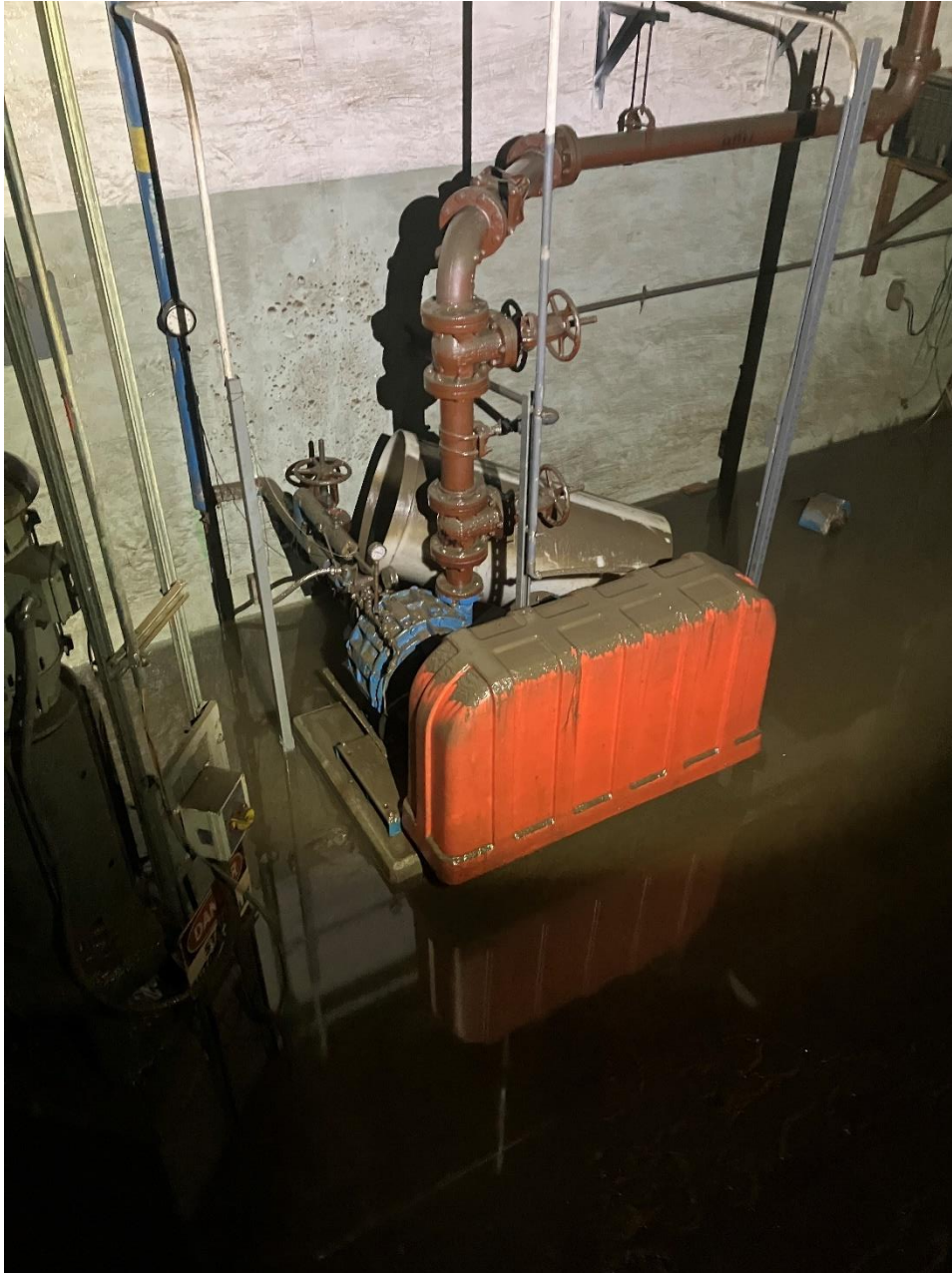
16- Maintenance Room Showing Portable Pump Pumping Out Basement Level



17- Plant Autosampler



18- Influent Pumps Located in Basement Level



19- Grit Pump Located in Basement Level



20- Dehumidifier Located in Basement Level



21- Basement Stairs



22- Blower Room



23- New Blower Installed for Improvements Project High Water Mark



24- Chemical Feed Room with Tanks and Feed Lines



25- Plant Chlorine Contact Chamber with Approximate Location of Where A-Frame Structure Used to Sit



26- Garage Where Lawn Mowing Equipment, Portable Pumps and Hoses, and Spare Parts Were Stored



27- Exterior and Interior of Sewer Rodder



28- Site Fencing



29- Rte. 14 Pump Station After Flood Waters Receded, Note High Water Mark on Adjacent Building (photo by Chief Operator Ken LaCasse)



30- Buffalo Street Pump Station Control Panel High Water Mark



31- Ten (10) Rolls of Lagoon Liner Awaiting Installation for Improvements Project. All Ten Rolls Were Submerged, Several Rolls Were Carried Away by Flood Waters and Retrieved After Flood Waters Receded.