Weston & Sampson

westonandsampson.com

98 South Main Street, Suite 2
Waterbury, VT 05676
tel: 802.244.5051

REPORT

January 2020

STATE OF VERMONT
MICHAEL ALAN SMITH
NO. 7150
CIVIL
LICENSED
PROFESSIONAL ENGINEER
3-24-2020

TOWN OF
Whitingham
VERMONT

Whitingham & Jacksonville Wastewater Treatment Facilities

20-Year Evaluation and Preliminary Engineering Report

98 South Main Street, Suite 2, Waterbury, VT 05676
Tel: 802.244.5051

March 24, 2020

Ms. Gig Zboray - Selectboard Office Administrator
Town of Whitingham
2948 VT Route 100
Jacksonville, Vermont 05342

Re: 20-Year Evaluation and Preliminary Engineering Report
Wastewater Collection and Treatment Facilities
Town of Whitingham, VT

Dear Gig:

We have prepared this final version of the Preliminary Engineering Report (PER) that was prepared in 2019 and approved by the Vermont Agency of Natural Resources (ANR) in January 2020. Also attached to this report is the approval letter from the ANR, which concurs with the findings of the PER and our subsequent conversations regarding the use of spare parts in lieu of process redundancy. This will significantly reduce construction costs while maintaining effective treatment of wastewater for the villages of Whitingham and Jacksonville. Additional managerial requirements were requested by the ANR as well, including updates to your Operations & Maintenance Emergency Response (OMER) plan and Operations & Maintenance (O&M) manual for each WWTF. These items can be addressed as we move forward with final design of the recommended alternative.

Our next step will be to engage with the Selectboard to discuss the findings of this report and determine what elements of our recommended alternative will be included in the final design of a project to be completed in 2021. We would be happy to attend a regularly scheduled Selectboard meeting or special meeting as needed in order to bring everyone up to speed and determine the best path forward.

We appreciate the assistance Town staff have provided throughout this process and look forward to the next steps in the development of your project. Please let us know when you are ready to have us meet with the Selectboard regarding a design scope.

Sincerely,

WESTON & SAMPSON ENGINEERS, INC.

Michael A. Smith, PE
Team Leader

Cc: David DiCantio – Town of Whitingham
Lynnette Claudon, PE – Vermont ANR Water Investment Division

Attachments: ANR Approval Letter
Preliminary Engineering Report (Final)

\\wse03.local\WSE\Projects\VT\Whitingham VT\20-Year Evaluation*Preliminary* Engineering Report\final report\Whitingham Final PER Trans Ltr 3-24-20.docx

VERMONT

Vermont Department of Environmental Conservation

Agency of Natural Resources
EC7 WATER INVESTMENT DIVISION
National Life Building, DAVIS 3
1 National Life Drive
Montpelier, VT 05620-3510
FAX: (802) 828-1552

Gig Zboray
Selectboard Office Administrator
Town of Whitingham
P.O Box 529
Jacksonville, VT 05342

Revised: Tuesday January 21, 2020
Effective: Monday, January 13, 2020

Re: Acceptance of Preliminary Engineering Report
Jacksonville and Whitinghtam WWTFs Refurbishment Project
Vermont/USEPA Clean Water Revolving Loan Number RF1-231

Dear Ms. Zboray:

The Water Investment Division has completed its review of the following document:

- **Preliminary Engineering Report** (PER) entitled *"Town of Whitingham Vermont Whitingham & Jacksonville Wastewater Treatment Facilities 20-Year Evaluation and Preliminary Engineering Report"*, and dated July 2019, by Weston & Sampson Engineers, Inc.

The Department will accept the selected alternative in the PER to refurbish the existing wastewater treatment facilities (WWTFs) with a single RBC shaft with the proposed spare parts provisions recommended by Weston & Sampson and managerial requirements listed below:

Redundant Equipment Required on Hand:

1. Spare RBC Drive for each WWTF
2. Spare RBC Motor for each WWTF
3. Spare Shaft for each WWTF, or documentation of availability of spare shaft to be delivered within two days
4. Spare 25% Replacement Media for each WWTF

Managerial Requirements:

1. Enter into two emergency contracts to pump wastewater from either Whitingham WWTF and transport it to a wastewater treatment facility that has agreed to accept it.
2. Obtain letters from at least two wastewater treatment facilities stating they agree to accept hauled wastewater from either Whitingham WWTF.
3. Develop a more robust OM&ER Plan that:
    a. Includes details on assuring the redundant equipment requirement is continually met;

b. Includes information on the managerial requirements (emergency pump and haul transport contractors and facilities to receive sludge); and
c. Includes maintenance and inspection activities to ensure critical infrastructure is replaced before failure.
4. Develop a more robust O&M Manual detailing required contingency plans:
   a. Contact the Waste Management Division prior to any demolition or work on RBC shafts, media, or other components that have been in contact with wastewater or contain biofilm and that takes place outside of the WWTF building.
5. Compliance with additional permit conditions and monitoring of these operational components by Wastewater Management Program.

We believe there is risk associated with the redundancy provisions described above. Redundancy is required at most Vermont Wastewater Treatment Facilities in order to ensure that it is possible to meet the water quality parameters in the discharge permit when maintenance and emergencies occur at the facility. In the event that a RBC is out of commission, there will be several days to several weeks when the fluent or effluent at this WWTF may have to be pumped and hauled to another facility at a high cost to the Town with potential for additional fines and fees from this Department.

As a result of this project and other small WWTFs that lack redundancy, the Department is considering conducting a study to examine redundancy at WWTFs with RBCs, sequencing batch reactors, and oxidation ditches with equipment and best practices. We hope that the results of this study can inform policies for future decisions for this and other facilities. As part of this future policy there may be recommendations for specialized subsidy through the CWSRF.

This is not a facilities plan approval, which is needed to qualify the Town for CWSRF design or construction funding. In order to receive Facilities Plan approval, the Town will need to submit a completed Environmental Information Document and undergo the State Environmental Review Process.

Please call Lynnette Claudon, PE at 802-490-6226 if you have any questions regarding this acceptance letter or the conditions.

Sincerely,

LW Claudon

Lynnette Claudon, PE
Chief Pollution Control Design Engineer
Water Investment Division

Electronic copies:

Michael A. Smith, PE, Weston & Sampson Engineers, Inc.
Thomas Brown, CWSRF Program Lead, VT-DEC-WID
Jeff Fehrs, PE, Supervisor, Design and Construction Engineering Section, VT-DEC-WID
Chip Gianfagna and **Katheen Parish**, Wastewater Management Program, VT-DEC
Jon Harries, PE, USDA Rural Development

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

\\wse03.local\WSE\Projects\VT\Whitingham VT\Report\whitingham - 20-yr eval + PER.docx

EXECUTIVE SUMMARY

Weston & Sampson, on behalf of the Town of Whitingham, conducted an evaluation of the Wastewater Treatment Facilities (WWTFs) in the villages of Whitingham and Jacksonville to satisfy the requirements of a 20-Year Evaluation and Preliminary Engineering Report (PER). This study was undertaken after an event in March 2018 where a piece of media from the Jacksonville Rotating Biological Contactor (RBC) broke off. The unit was repaired, but in response the State of Vermont Watershed Management Division required a comprehensive study be undertaken to ensure both facility's continued operation for the future.

Site investigations included a walk-through of both WWTFs and a selective evaluation of the collection systems. Based on this review, we found that the collection system was in generally good condition and that the treatment equipment, while aged beyond its design life, were adequate to meet the needs of the two service areas.

As part of the PER portion of this report, alternative technologies were investigated to determine what the most effective and cost-efficient approach is for treating wastewater from the two villages. A Sequencing Batch Reactor (SBR), Moving Bed Biological Reactor (MBBR), and a combination RBC/cloth filter system were considered, and preliminary sizing calculations performed. After a financial analysis considering the financed capital costs of each project as well as the long-term operations and maintenance (O&M) costs associated with each option, the RBC/cloth filter system was found to be the most cost-effective alternative. Included in the overall project are the following items

- Collection system repairs for the Jacksonville and Whitingham service areas to reduce the effects of groundwater infiltration and stormwater inflow to the WWTFs,
- Complete rehabilitation of both WWTF buildings, including the removal of mold-damaged drywall, new heating systems, additional insulation, new roofing and new plumbing systems,
- A new water supply system for the Jacksonville WWTF,
- New emergency generators at each WWTF to provide continual service in the event of a power outage,
- Replacement of the existing RBC and clarifiers with BioMax units, an integrated secondary treatment and filtering process,
- New ancillary wastewater process equipment, including pumps, ventilation systems, and improved sludge removal,
- A new consolidated control panel for each WWTF for all process equipment that includes remote viewing capabilities as well as additional alarm types (e.g. email, text message)

An Engineer's Opinion of Probable Cost was generated for the preferred alternative; the project is estimated to cost approximately three million, three hundred thousand dollars ($3,300,000). With a Clean Water State Revolving Fund ("Clean Water SRF") loan, this project would result in a sewer bill of approximately **$125 per month per Equivalent Residential Unit**. However, not all of the items included in this analysis need to be undertaken immediately. This report serves to address the immediate concerns of the State of Vermont while providing a longer term shopping list the Town can implement in the future.

The Town of Whitingham intends to begin the Final Design phase for selected work in 2019, anticipating a 2020 construction season for the project outlined above.

1.0 PROJECT PLANNING

The Town of Whitingham is located in southern Windsor County with approximately 1,400 total residents. The Town owns and operates two wastewater collection and treatment systems. **Figure 1** on the next page provides a general locus map showing the town and the location of the wastewater infrastructure. This section provides a description of each collection and treatment system and an overview of the character of the sewer service area relating to waste source types, geography, natural resources and demographics.

1.1 System Location and Description

1.1.1 Jacksonville

Jacksonville is a village within the Town of Whitingham consisting of businesses, municipal facilities and a residences concentrated at the intersection of VT Route 100, VT Route 112 and Gates Pond Road. Additional residences and small businesses line the roads entering the Village. The system has a total of 93 users, predominantly single-family homes. The single largest user is the Town of Whitingham school (56 equivalent residential units (ERUs)); there are several businesses, multi-family homes, churches and municipal facilities that also use the system. The wastewater collection system consists of approximately 13,000 feet of 8-inch PVC and Ductile Iron (DI) piping and 75 manholes. This system conveys sewage to the Jacksonville WWTF located on Route 112 approximately 1 mile south of the Village center, adjacent to the North Branch of the Deerfield River to which it discharges. The WWTF, built in 1982 is a ±1,800 square foot single-story wood frame structure with clapboard siding and asphalt shingle roof. The foundation consists of below grade cast-in-place concrete tanks that provide primary treatment and flow equalization. Unit processes for secondary treatment and final polishing are located at grade. Unit processes include the following:

- Primary settling with no screening
- Flow equalization
- Secondary treatment via Rotating Biological Contactor (RBC)
- Secondary clarification for biological solids removal
- UV disinfection

Refer to **Figure 2** for a process flow diagram of these unit processes. An office, lab, shop and garage space are provided at Jacksonville's facility. The Jacksonville WWTF was issued Discharge Permit number 3-1230 with the following limits:

Table 1: Jacksonville WWTF Permit Discharge Limitations

Effluent Characteristic	Monthly Average	Weekly Average	Maximum Day	Instantaneous Maximum
Flow (Annual Average)	0.0501 MGD	-	-	-
BOD_5	12.5 lbs/day 30 mg/L	18.8 lbs/day 45 mg/L	50 mg/L	-
Total Suspended Solids	12.5 lbs/day 30 mg/L	18.8 lbs/day 45 mg/L	50 mg/L	-
Settleable Solids	-	-	-	1.0 ml/L

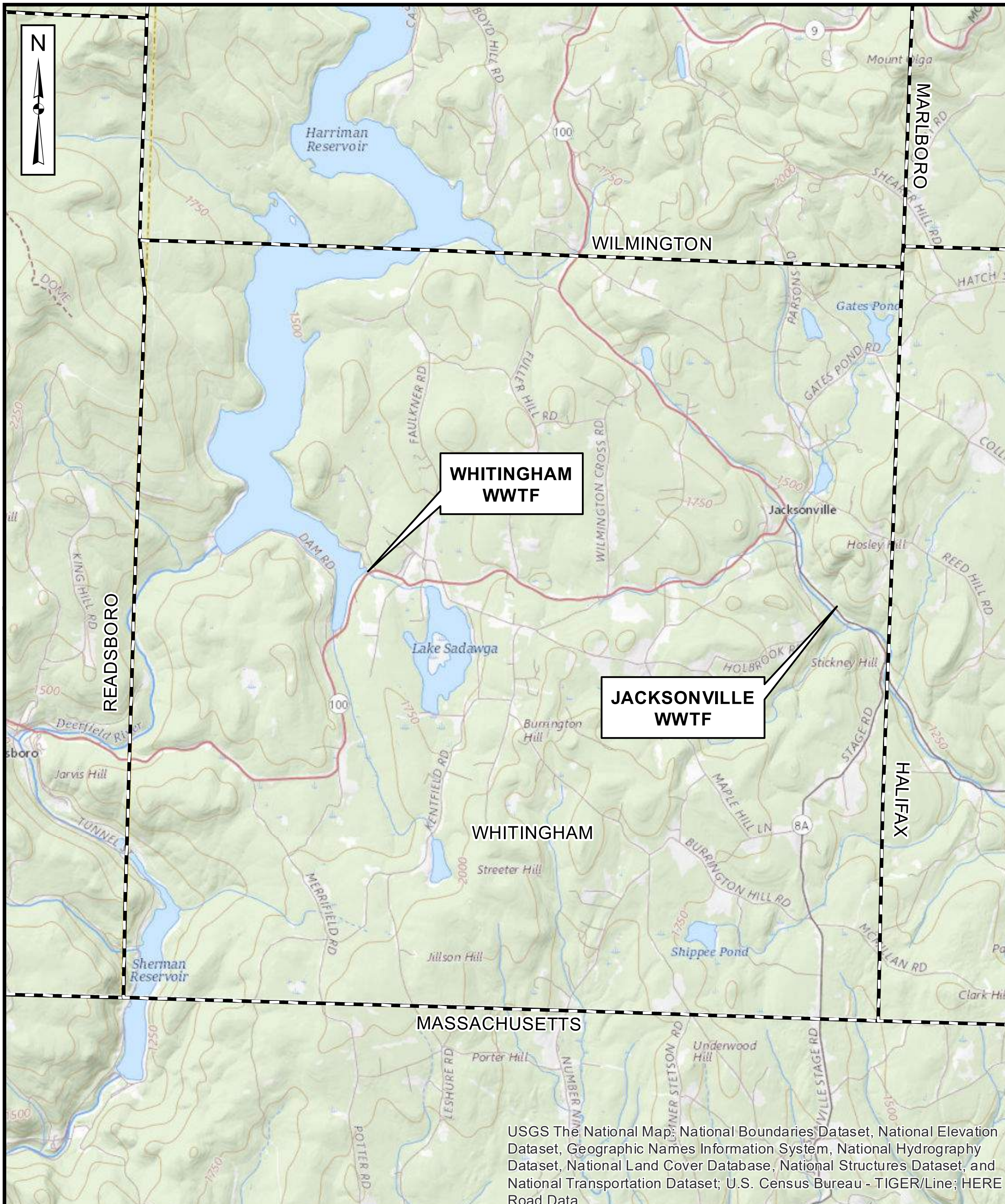


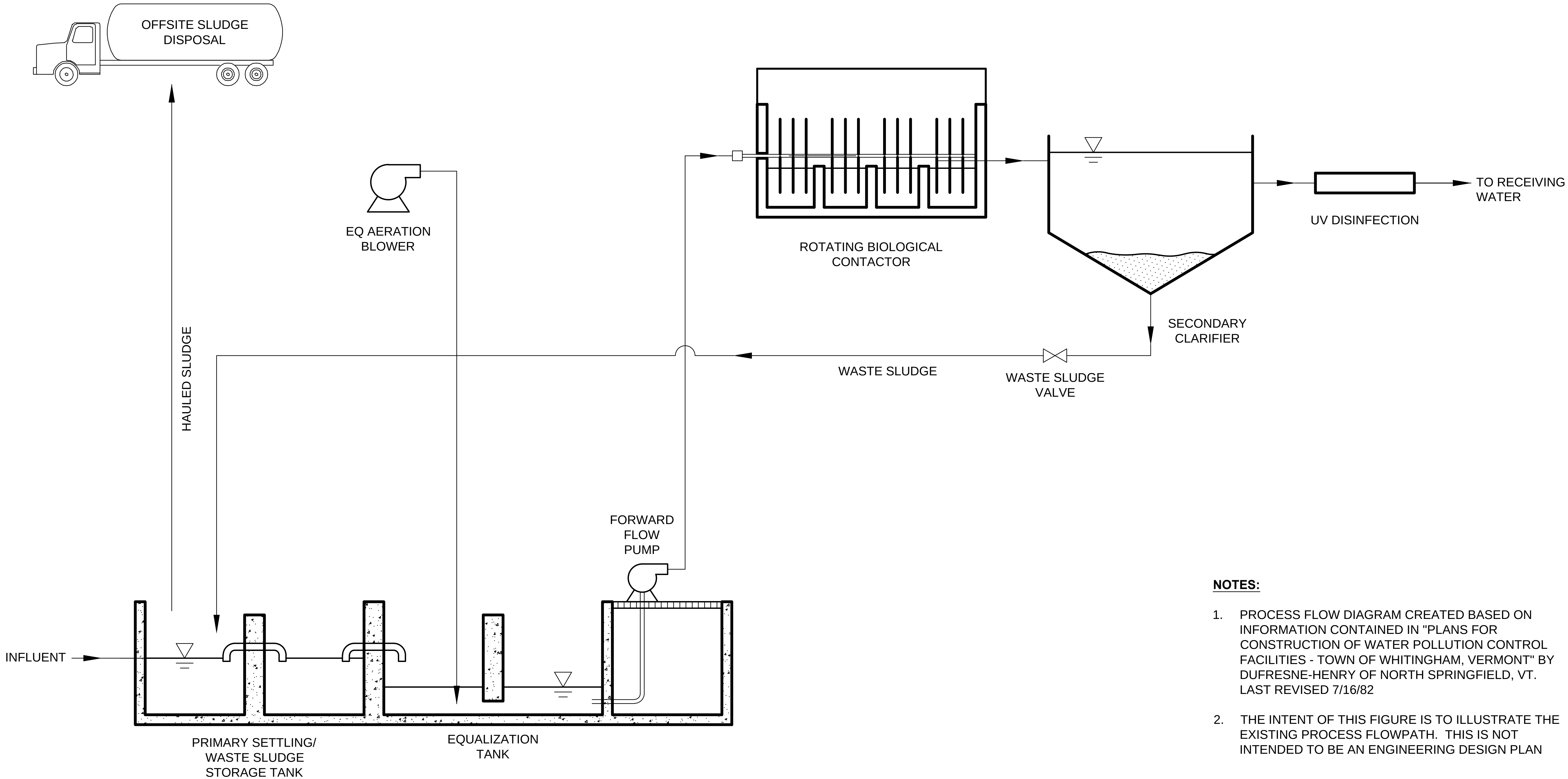
FIGURE 1
TOWN OF WHITINGHAM, VERMONT
20-YEAR EVALUATION + PRELIMINARY ENGINEERING REPORT

LOCUS MAP

Town Boundary

0 8,000 16,000 **Feet**

Weston & Sampson



NOTES:

1. PROCESS FLOW DIAGRAM CREATED BASED ON INFORMATION CONTAINED IN "PLANS FOR CONSTRUCTION OF WATER POLLUTION CONTROL FACILITIES - TOWN OF WHITINGHAM, VERMONT" BY DUFRESNE-HENRY OF NORTH SPRINGFIELD, VT. LAST REVISED 7/16/82

2. THE INTENT OF THIS FIGURE IS TO ILLUSTRATE THE EXISTING PROCESS FLOWPATH. THIS IS NOT INTENDED TO BE AN ENGINEERING DESIGN PLAN

NO	DATE	BY	DESCRIPTION
-	-	-	-

DRAWN BY: SMM | CHK'D BY: CWS | 03/08/2019

Weston & Sampson

20-YEAR EVALUATION AND PRELIMINARY ENGINEERING REPORT
WHITINGHAM, VERMONT

FIGURE 2
EXISTING FACILITIES
PROCESS FLOW DIAGRAM

\\wse03.local\WSE\Projects\VT\Whitingham VT\20-Year Evaluation\CAD\whitingham -- PFD 2018 1210.dwg

E. coli	-	-	-	77/100 mL

Figure 3 provides the overall layout of the Jacksonville sewer service area. **Figure 4** provides a site plan illustrating the WWTF, driveway, and adjacent features. **Figure 5** provides a plan illustrating the sub-floor tankage, and **Figure 6** is a floor plan of the Jacksonville WWTF illustrating the major system components.

1.1.2 Whitingham

Whitingham is an unincorporated village to the west of Jacksonville. The service area has a total of 49 sewer connections, 8 of which are multi-family residences, businesses or churches. The Whitingham wastewater collection system includes approximately 5,000 feet of 8-inch DI pipe, 33 manholes and one sewage pump station located south of the treatment facility. Users south of the WWTF discharge to the pump station, which conveys sewage to the primary settling tank. Users to the east of the WWTF discharge directly via gravity to the primary settling tank. The Whitingham WWTF is located at the corner of VT Route 100 and Brick House Road. This building is constructed in a similar manner (also in 1982) but is smaller than the Jacksonville facility (±900 square feet); the Whitingham WWTF is smaller hydraulically and does not house office space or formal laboratory space. It is located on a steep slope; the west side of the building's foundation/settling tanks are exposed while being fully sub-grade on the east side. A retaining wall is located on the south side of the building. Treatment at Whitingham is similar to Jacksonville and follows the same process flow diagram outlined in Figure 2.

The Whitingham WWTF was issued Discharge Permit number 3-1229 with the following limits:

Table 2: Whitingham WWTF Permit Discharge Limitations

Effluent Characteristic	Monthly Average	Weekly Average	Maximum Day	Instantaneous Maximum
Flow (Annual Average)	0.0123 MGD	-	-	-
BOD_5	3.1 lbs/day 30 mg/L	4.6 lbs/day 45 mg/L	50 mg/L	-
Total Suspended Solids	3.1 lbs/day 30 mg/L	4.6 lbs/day 45 mg/L	50 mg/L	-
Settleable Solids	-	-	-	1.0 ml/L
E. coli	-	-	-	77/100 mL

Figure 7 provides the overall layout of the Whitingham sewer service area. **Figure 8** provides a site plan illustrating the WWTF, driveway, and adjacent features. **Figure 9** provides a plan illustrating the sub-floor tankage, and **Figure 10** is a floor plan of the Whitingham WWTF illustrating the major system components. The NPDES permits for these facilities has been provided in **Appendix A**.

1.2 Environmental Resources Present

Figures 11 and **12** have been provided to illustrate the environmental resources that are present in and around the sewer service areas of Whitingham and Jacksonville, respectively. These figures are taken from information provided by the Agency of Natural Resources' Natural Resource Atlas. According to this information, the primary environmental resource potentially present is at the Jacksonville WWTF, where the FEMA flood hazard area appears to encroach approximately half of the building. However,

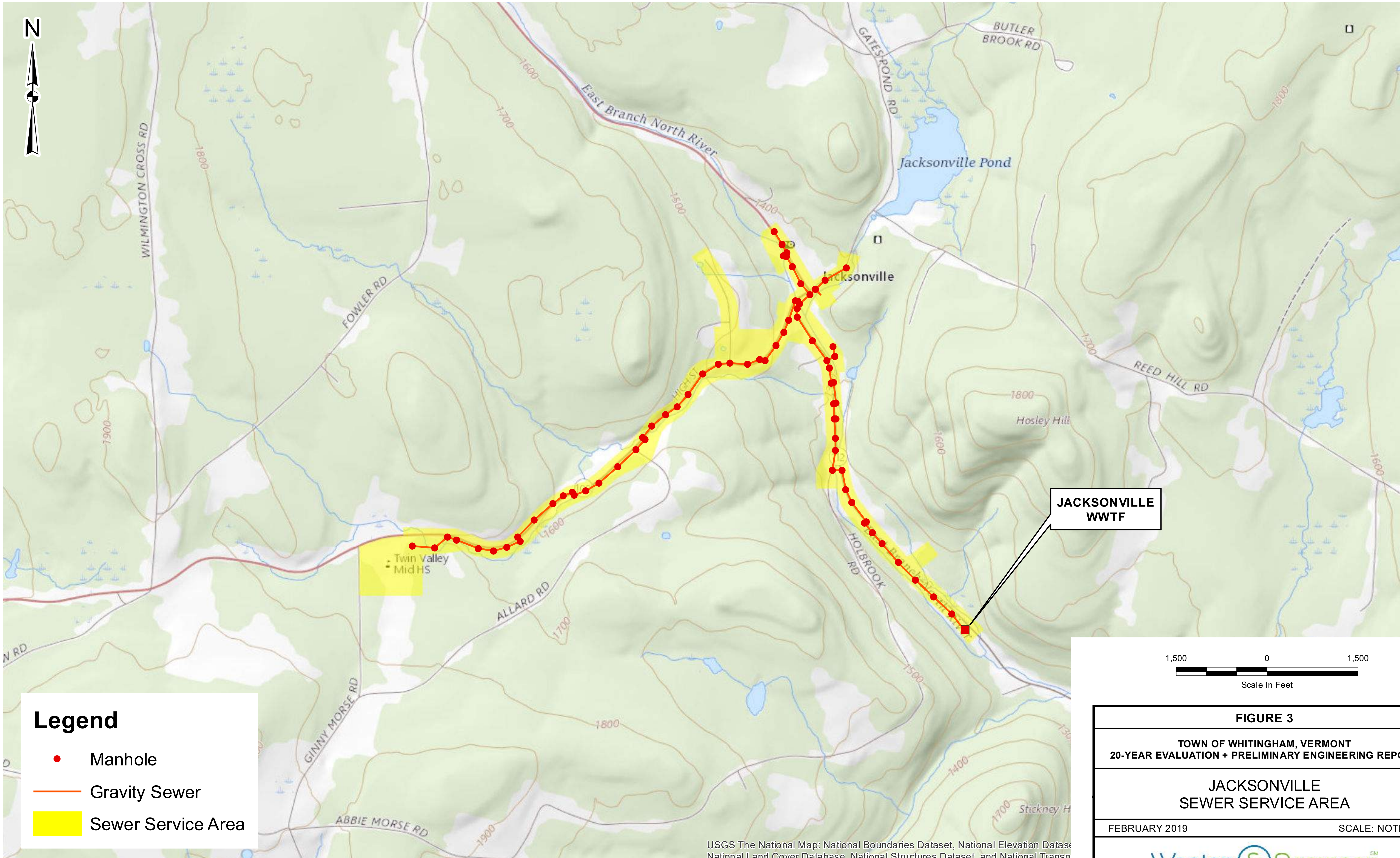


FIGURE 3

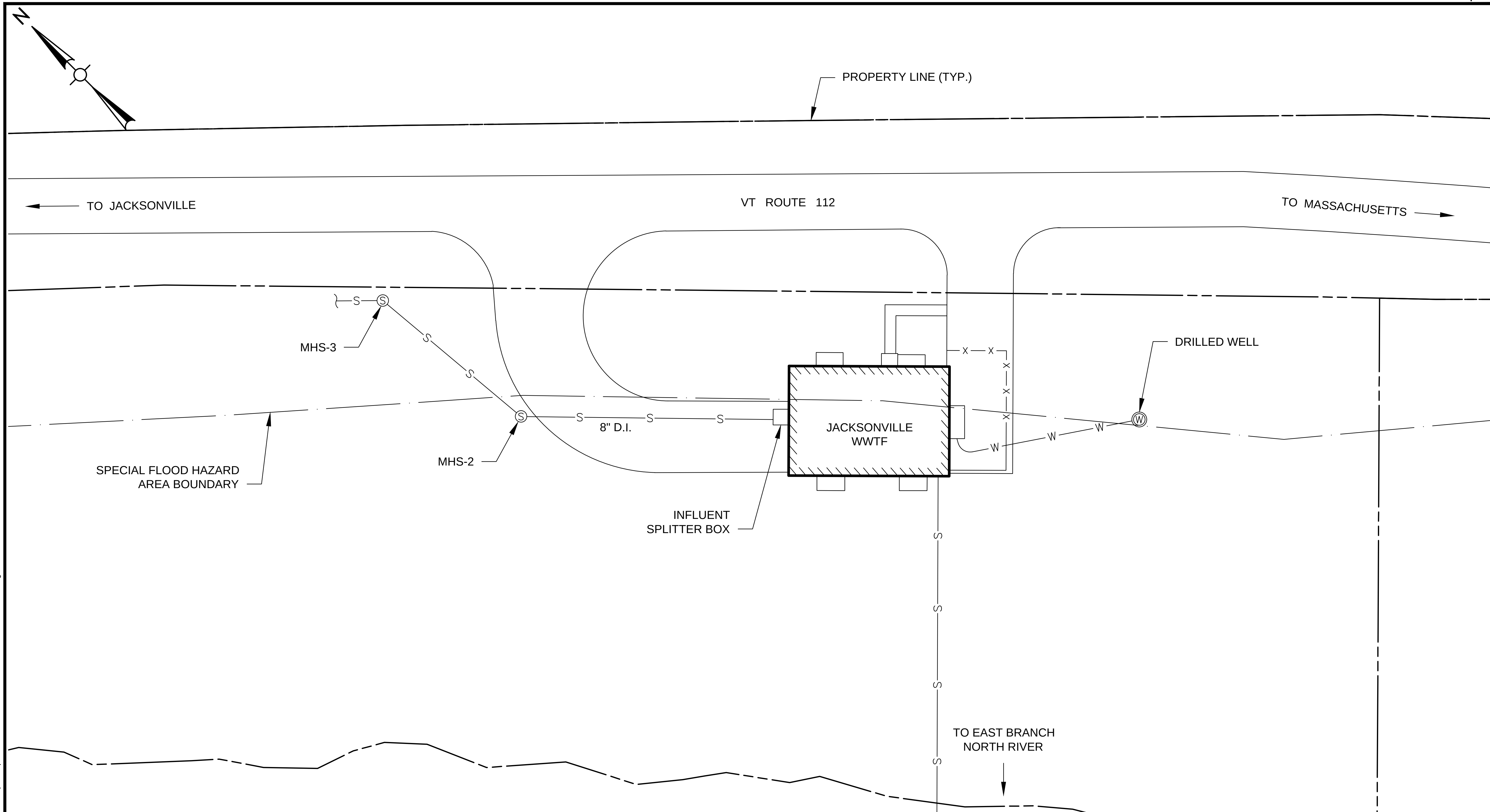
TOWN OF WHITINGHAM, VERMONT
20-YEAR EVALUATION + PRELIMINARY ENGINEERING REPORT

JACKSONVILLE
SEWER SERVICE AREA

FEBRUARY 2019 | SCALE: NOTED

Weston & Sampson

Path: Z:\Depts\GIS\data\Client\Whitingham VT\Project\Whitingham WWTP 20190227\Figure 3 - Jacksonville Sewer Service Area.mxd **User:** TerenzoniC **Saved:** 2/28/2019 11:14:03 AM **Opened:** 2/28/2019 11:14:22 AM



30 15 0 30 60

SCALE: 1"=30'

NO	DATE	BY	DESCRIPTION
-	-	-	-

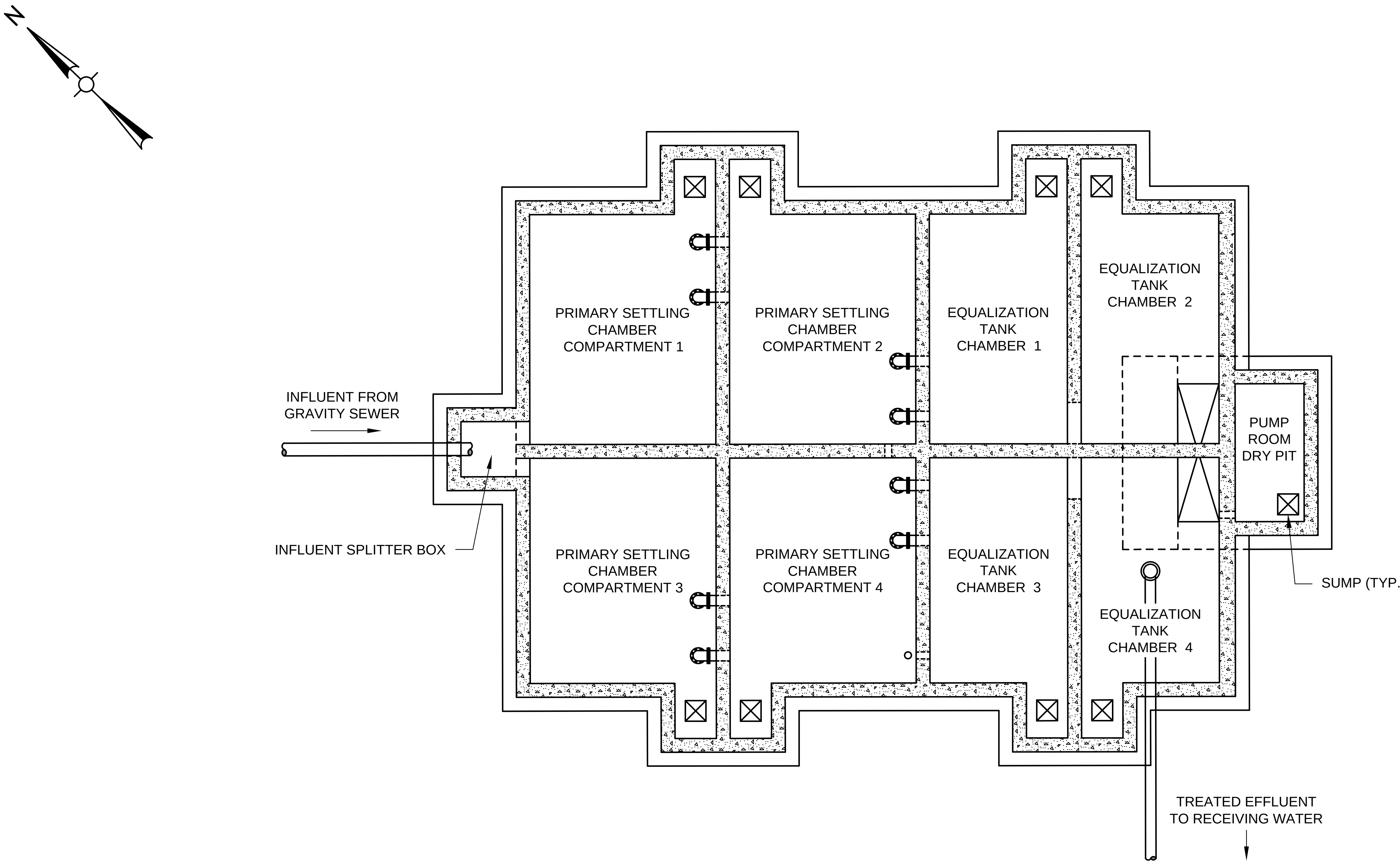
DRAWN BY: VLB | CHK'D BY: SMM | 03/08/2019

Weston & Sampson

20-YEAR EVALUATION
AND PRELIMINARY
ENGINEERING REPORT
WHITINGHAM, VERMONT

FIGURE 4
JACKSONVILLE WWTF
SITE PLAN

P:\VT\Whitingham VT\CAD\FIGURE 4 - JACKSONVILLE SITE PLAN.dwg



NO	DATE	BY	DESCRIPTION
-	-	-	-

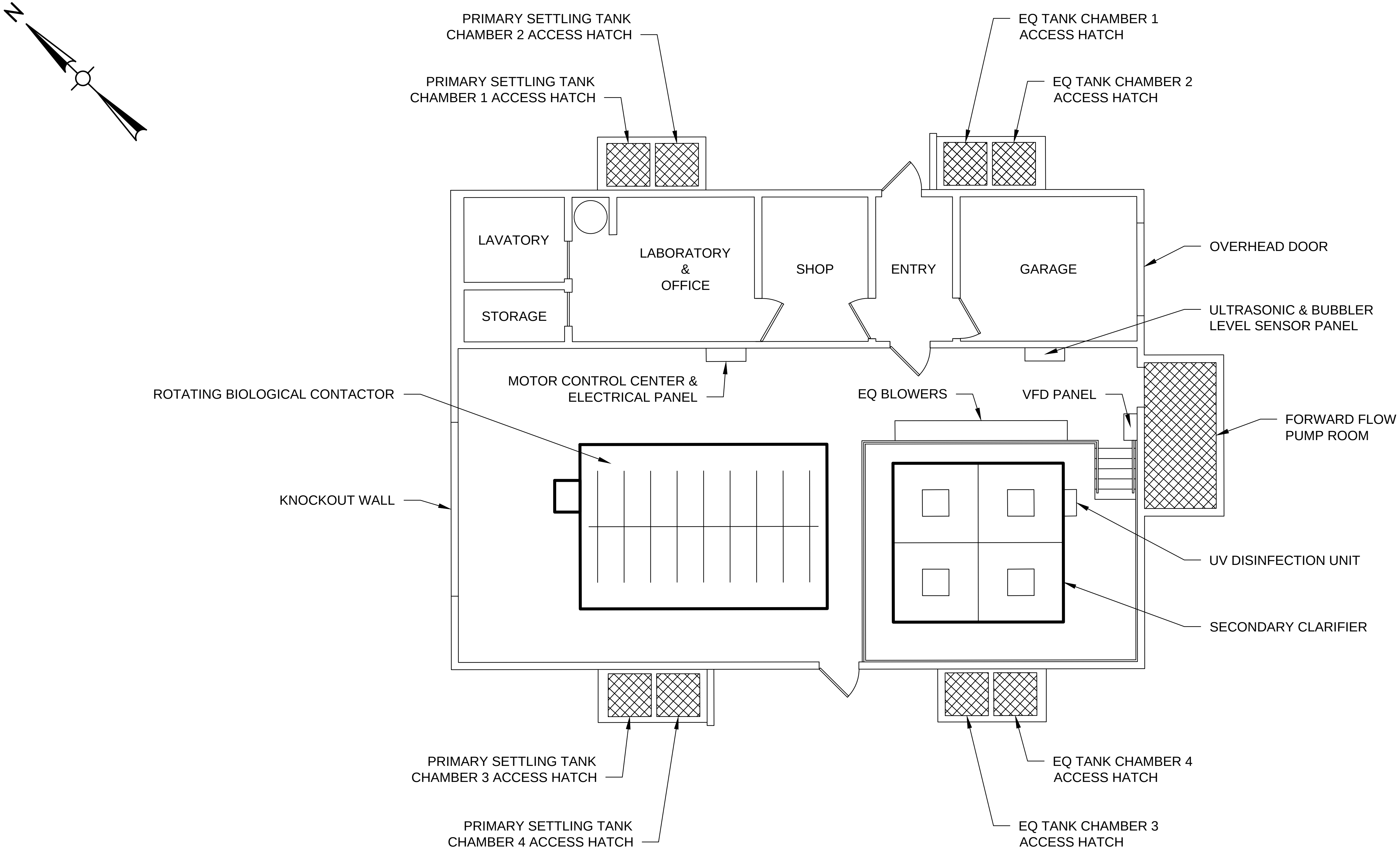
DRAWN BY: VLB | CHK'D BY: SMM | 03/08/2019

Weston & Sampson

20-YEAR EVALUATION AND PRELIMINARY ENGINEERING REPORT WHITINGHAM, VERMONT

FIGURE 5
JACKSONVILLE WWTF
TANKAGE PLAN

\\wse03.local\WSE\Projects\VT\Whitingham VT\CAD\FIGURE 5 – JACKSONVILLE TANKAGE PLAN.dwg



0 4' 8' 16'

SCALE: ⅛" = 1'–0"

NO	DATE	BY	DESCRIPTION
-	-	-	-

DRAWN BY: EMG | CHK'D BY: SMM | 12/12/2018

Weston & Sampson℠

20-YEAR EVALUATION AND PRELIMINARY ENGINEERING REPORT WHITINGHAM, VERMONT

FIGURE 6
JACKSONVILLE WWTF
FLOOR PLAN

\\wse03.local\WSE\Projects\VT\Whitingham VT\CAD\FIGURE 6 – JACKSONVILLE FLOOR PLAN.dwg

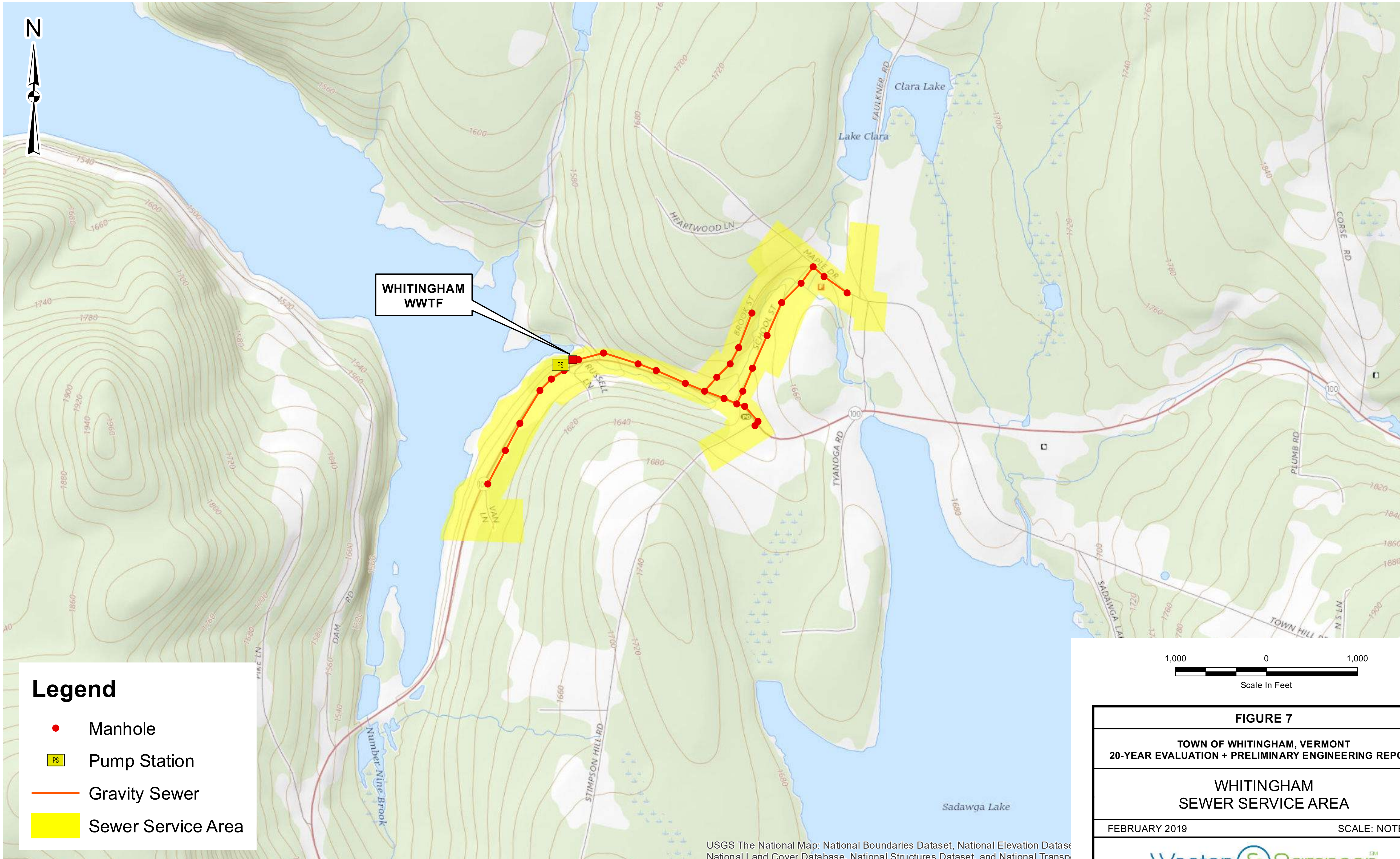


FIGURE 7

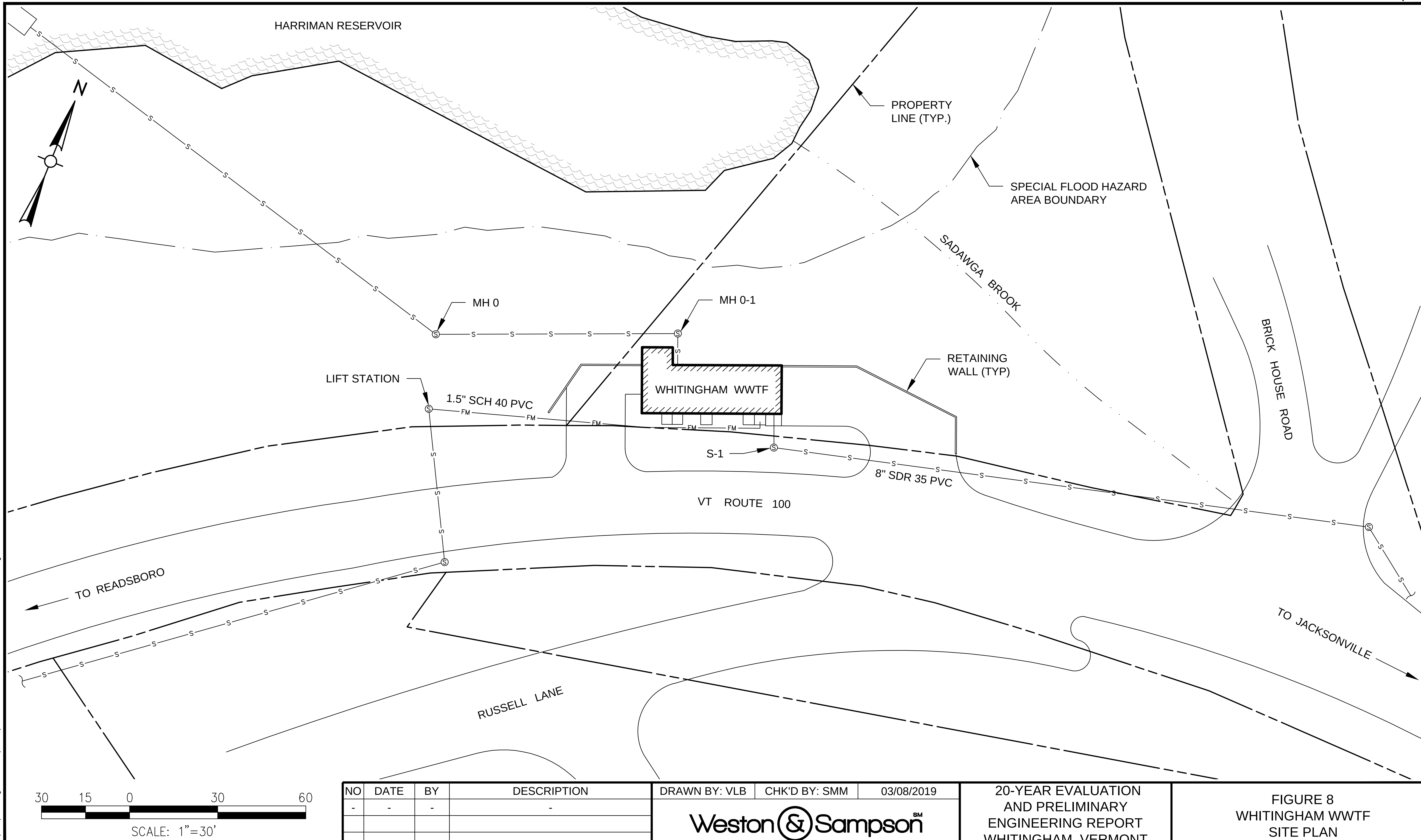
TOWN OF WHITINGHAM, VERMONT
20-YEAR EVALUATION + PRELIMINARY ENGINEERING REPORT

WHITINGHAM
SEWER SERVICE AREA

FEBRUARY 2019 | SCALE: NOTED

Weston & Sampson

Path: Z:\Depts\GIS\data\Client\Whitingham VT\Project\Whitingham WWTP 20190227\Figure 7 - Whitingham Sewer Service Area.mxd User: TerenzoniC Saved: 2/28/2019 10:58:56 AM Opened: 2/28/2019 10:59:05 AM



NO	DATE	BY	DESCRIPTION
-	-	-	-

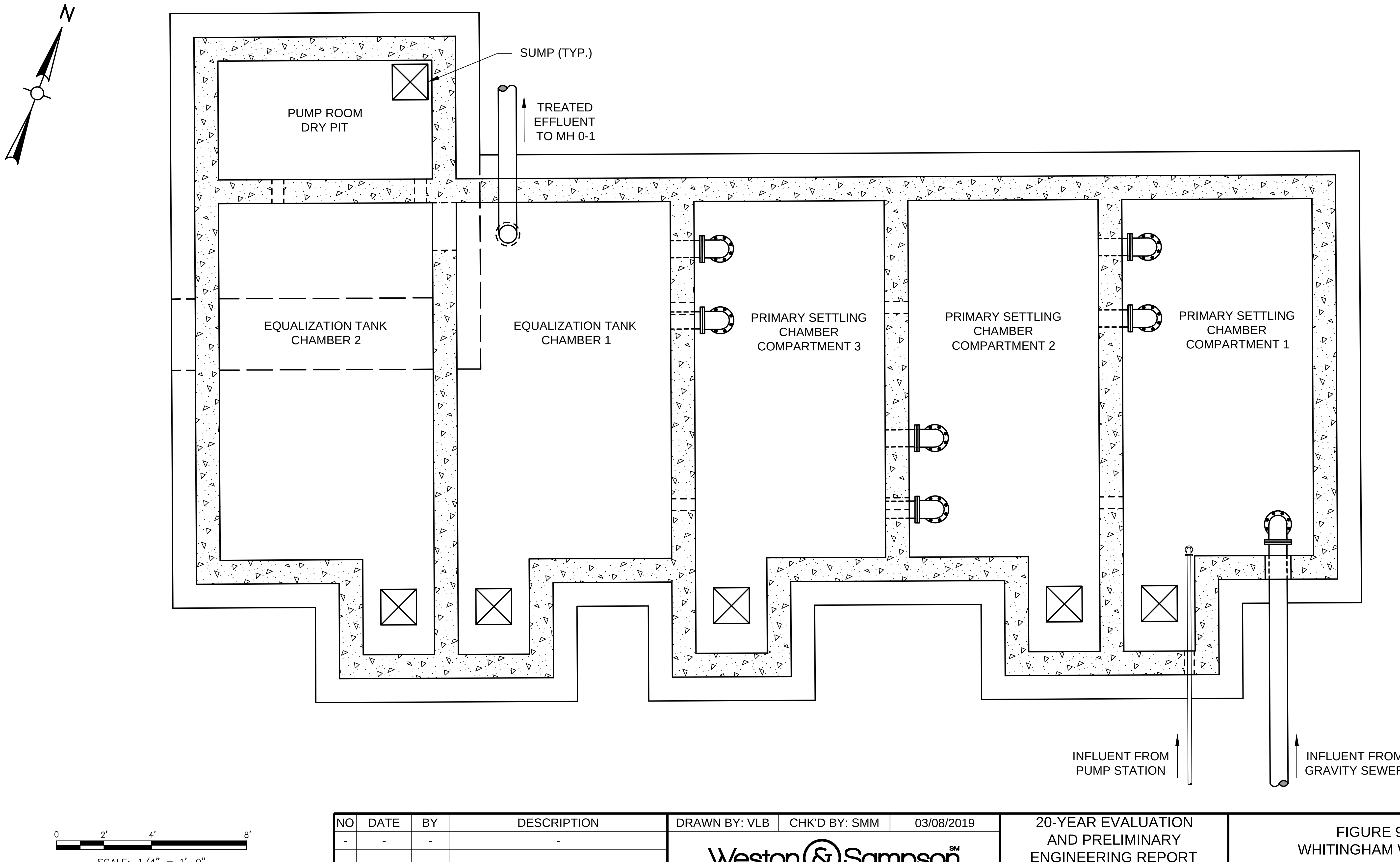
DRAWN BY: VLB | CHK'D BY: SMM | 03/08/2019

Weston & Sampson

20-YEAR EVALUATION AND PRELIMINARY ENGINEERING REPORT
WHITINGHAM, VERMONT

FIGURE 8
WHITINGHAM WWTF
SITE PLAN

P:\VT\Whitingham VT\CAD\FIGURE 8 – WHITINGHAM SITE PLAN.dwg



NO	DATE	BY	DESCRIPTION
-	-	-	-

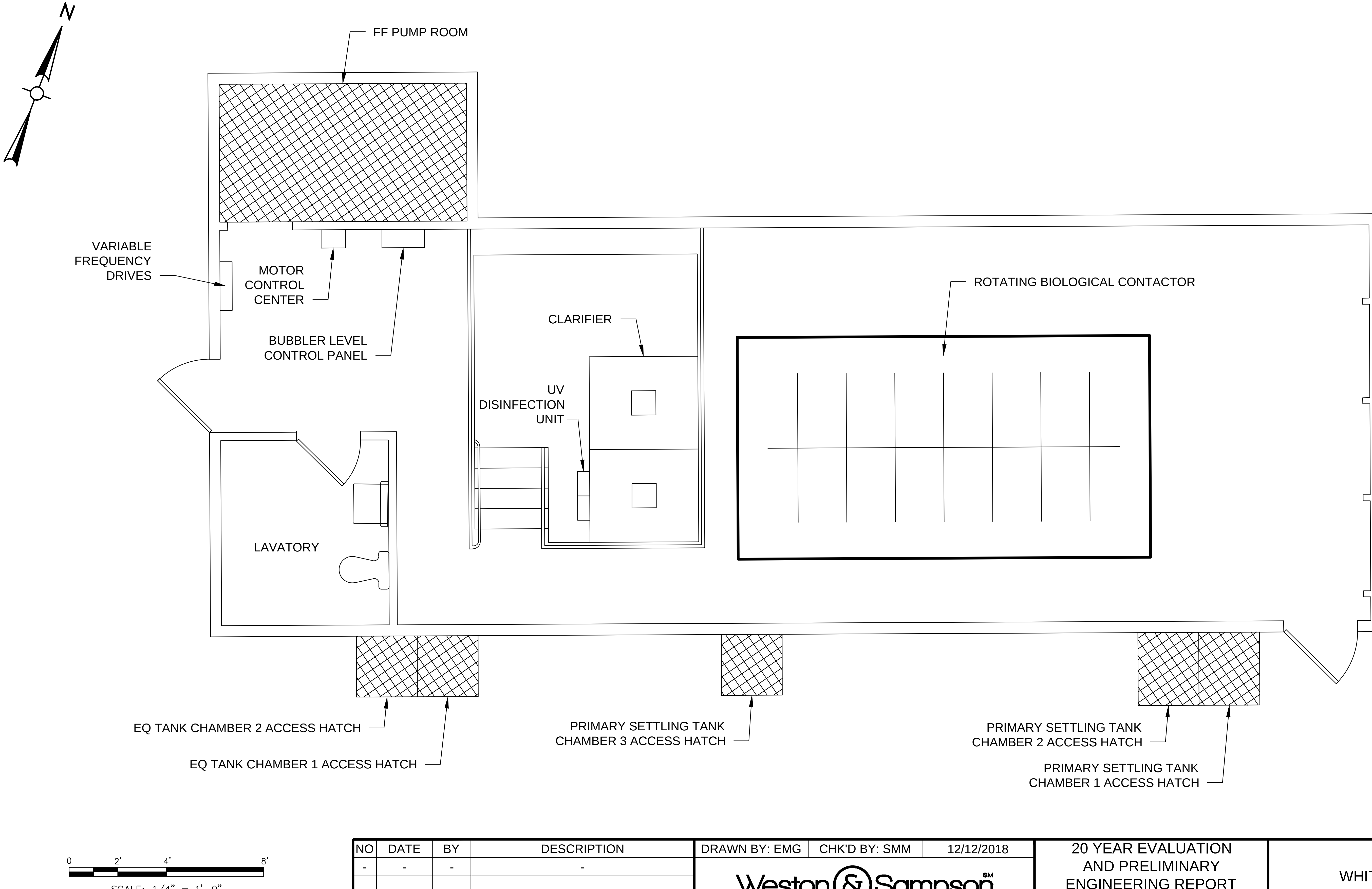
DRAWN BY: VLB | CHK'D BY: SMM | 03/08/2019

Weston & Sampson

20-YEAR EVALUATION
AND PRELIMINARY
ENGINEERING REPORT
WHITINGHAM, VERMONT

FIGURE 9
WHITINGHAM WWTF
TANKAGE PLAN

\\wse03.local\WSE\Projects\VT\Whitingham VT\CAD\FIGURE 9 - WHITINGHAM TANKAGE PLAN.dwg



NO	DATE	BY	DESCRIPTION
-	-	-	-

DRAWN BY: EMG | CHK'D BY: SMM | 12/12/2018

Weston & Sampson

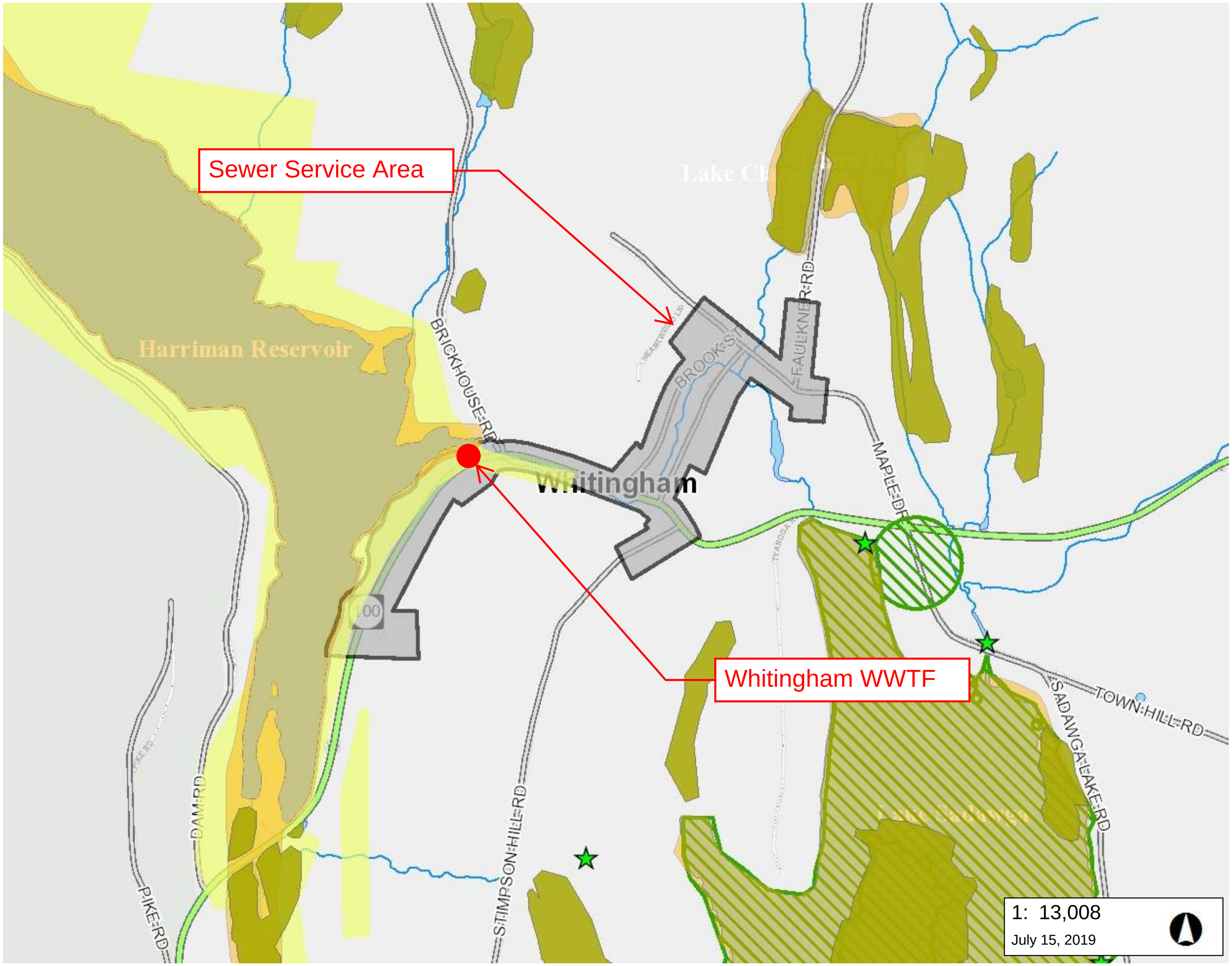
20 YEAR EVALUATION AND PRELIMINARY ENGINEERING REPORT WHITINGHAM, VERMONT

FIGURE 10
WHITINGHAM WWTF
FLOOR PLAN

Fig 11 - Whitingham Env. Resources

Vermont Agency of Natural Resources

vermont.gov



LEGEND

- Vernal Pools Confirmed – AE/\
- Wetland Projects
- Wetland - VSWI
  - Class 1 Wetland
  - Class 2 Wetland
  - Buffer
- DFIRM Floodways
- Flood Hazard Areas (Only FEM
  - AE (1-percent annual chance flood
  - A (1-percent annual chance floodpl
  - AO (1-percent annual chance zone feet)
  - 0.2-percent annual chance flood ha
- Fragile Areas Registry
  - Physical Feature
  - Biological Feature
  - Physical and Biological Features
- Conserved Lands
  - Housing and Conservation Board
  - Local Government
  - Private Organization
  - US Dept. of Defense
  - US Fish and Wildlife Service
  - US National Park Service
  - UVM and State Colleges
  - VT Dept. Buildings and General Se
  - VT Division for Historical Preservati
- Rare Threatened Endangered

1: 13,008

July 15, 2019

661.0 0 330.00 661.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 1084 Ft. 1cm = 130 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

NOTES

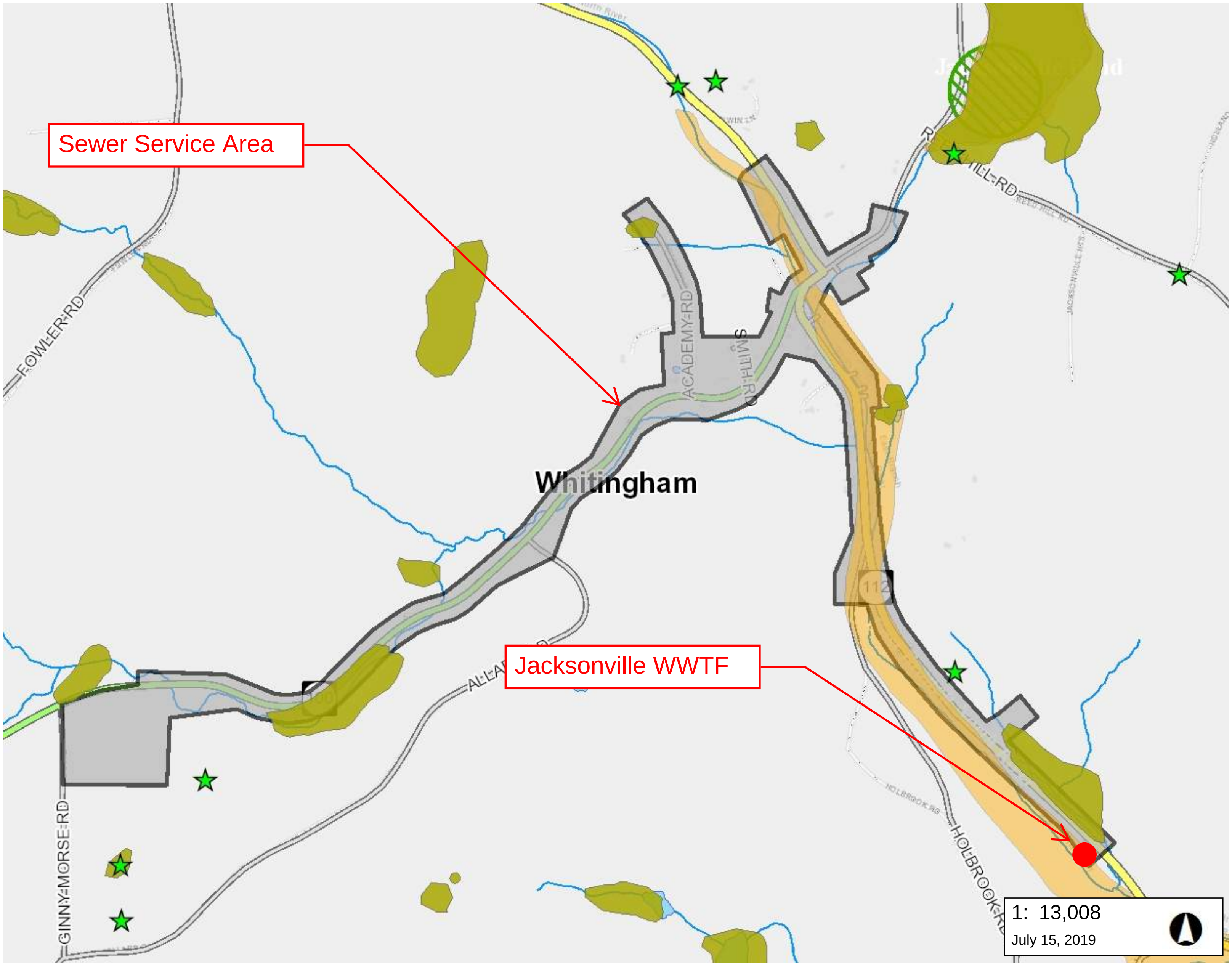
Map created using ANR's Natural Resources Atlas

Fig 12 - Jacksonville Env. Resources

Vermont Agency of Natural Resources

VERMONT

vermont.gov



LEGEND

- Vernal Pools Confirmed – AE/\
- Wetland Projects
- Wetland - VSWI
  - Class 1 Wetland
  - Class 2 Wetland
  - Buffer
- DFIRM Floodways
- Flood Hazard Areas (Only FEN
  - AE (1-percent annual chance flood
  - A (1-percent annual chance floodpl
  - AO (1-percent annual chance zone feet)
  - 0.2-percent annual chance flood ha
- Fragile Areas Registry
  - Physical Feature
  - Biological Feature
  - Physical and Biological Features
- Conserved Lands
  - Housing and Conservation Board
  - Local Government
  - Private Organization
  - US Dept. of Defense
  - US Fish and Wildlife Service
  - US National Park Service
  - UVM and State Colleges
  - VT Dept. Buildings and General Se
  - VT Division for Historical Preservati
- Rare Threatened Endangered

661.0 0 330.00 661.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 1084 Ft. 1cm = 130 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

DISCLAIMER: This map is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. ANR and the State of Vermont make no representations of any kind, including but not limited to, the warranties of merchantability, or fitness for a particular use, nor are any such warranties to be implied with respect to the data on this map.

NOTES

Map created using ANR's Natural Resources Atlas based on site visits, we believe the mapping is in error as the building is at the same general elevation as VT Route 112, which is not in the flood hazard area. As part of the overall planning and design process, further information will be gathered and submitted to FEMA to determine whether or not the building is actually in the flood hazard area or not. An Environmental Information Document that provides a more comprehensive assessment of each facility's potential impact has been prepared and is attached as Appendix B.

1.3 Population Trends

According to the document Vermont Population Projections – 2010 – 2030 (Jones and Schwarz, August 2013, see Appendix C for relevant excerpts of the report), there are two potential scenarios for population growth. Scenario A represents a healthy national economy as seen in the 1990's, which corresponds to a greater rate of net in-migration. Scenario B represents a weaker national economy as seen in the 2000's and has a lower migration rate.

The baseline population in 2010 for the entire Town of Whitingham (including people living outside the sewer service areas) was 1,357. Using Scenario A (greater in-migration), the 2020 population was projected to be 1,450, an increase of 6.9%. In 2030, the population was projected to be 1,501, an increase of 10.6%. For Scenario B (lower in-migration), the 2020 population was projected to be 1,386, an increase of 2.1% and the 2030 population was projected to be 1,380, an increase of 1.7%.

1.4 Community Engagement

As part of the process of preparing this report and future steps, the Town of Whitingham will engage the public to keep them informed on the findings of this report, review the alternatives available, and answer questions they may have on the project.

\\wse03.local\WSE\Projects\VT\Whitingham VT\Report\whitingham - 20-yr eval + PER.docx

2.0 EXISTING FACILITIES

2.1 Location Map

Schematic plans have been prepared of both collection systems. Refer to **Figure 13** for a depiction of Jacksonville's collection system, **Figure 14** for Whitingham's collection system. As shown in previous sections, **Figure 6** illustrates Jacksonville WWTF's floor plan and **Figure 10** for Whitingham WWTF's floor plan.

2.2 Current Flows and Loads

Data for 2017, the last complete year available at the time of this analysis, was used to prepare **Table 3** (for Jacksonville) and **Table 4** (for Whitingham). These illustrate the average daily loads and flows seen at each WWTF. Currently, Jacksonville is at 26% of its hydraulic capacity and 17% of its mass load capacity. Whitingham is at 35% of its hydraulic capacity and 20% of its mass load capacity. These facilities are operating well below their design capacity.

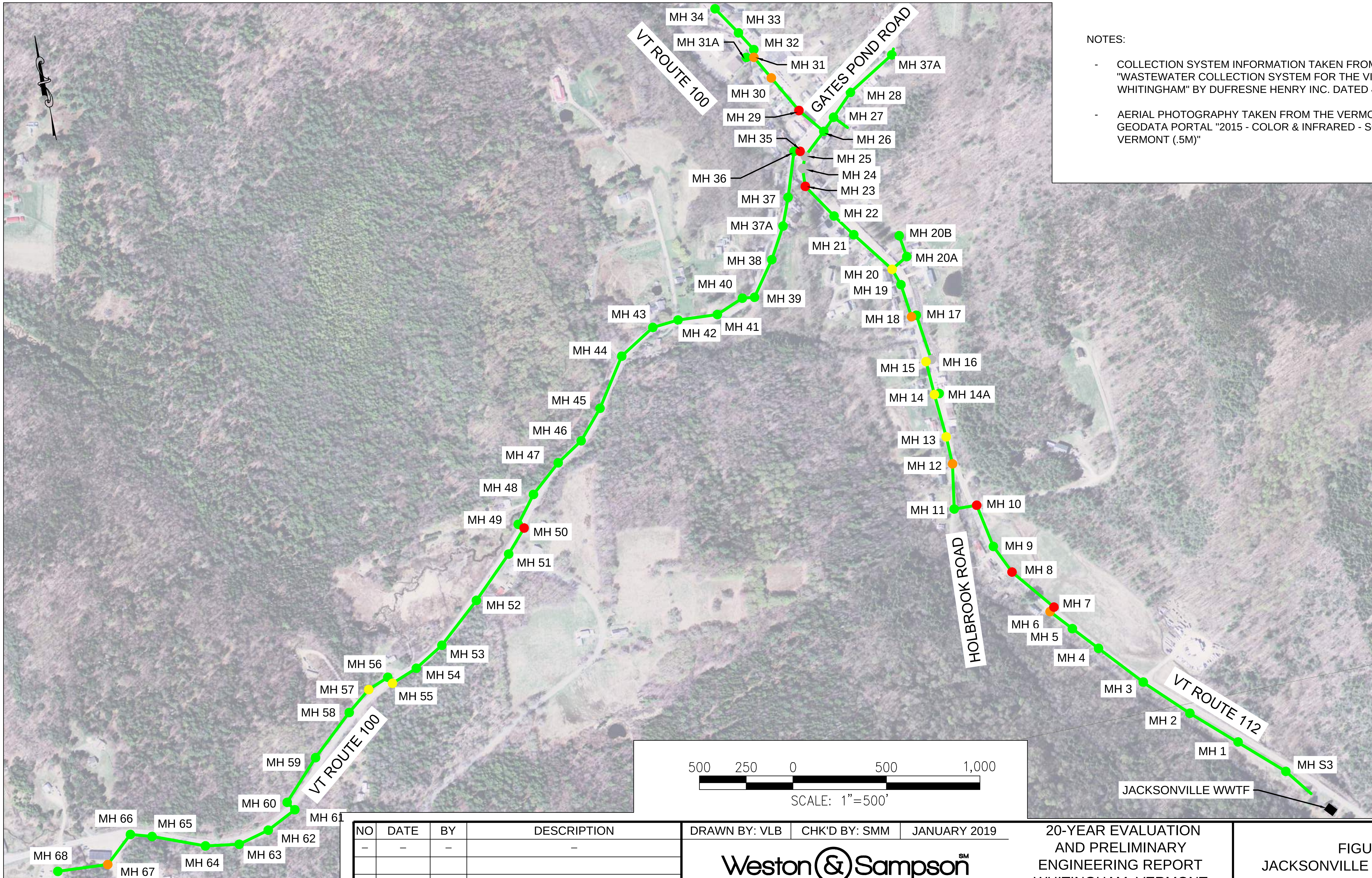
An analysis of the daily flows for each WWTF versus recorded rainfall was performed to determine if groundwater infiltration and surface water inflow (I/I)is a significant issue that is adversely affecting the plants. This information is presented on **Figure 15** (for Jacksonville) and **Figure 16** (for Whitingham). These charts demonstrate that flows at each WWTF in 2017 were well below their permitted limits. Some I/I can be seen, however, even at the extreme storm event in November, flow rates did not exceed their permitted limits.

2.3 History

A summary of the major repair work conducted in the past 20 years is provided in **Table 5** below. This information was gathered with assistance from David DiCantio, chief operator for the facilities since 2005.

Table 5: Major Repair Work on Jacksonville & Whitingham WWTF in the Past 20 years

Item	Location	Date
New Pump Station(pumps, rail, controls)	Jacksonville	June 2007
New Process Pump #1	Jacksonville	June 2008
New Process Pump #2	Jacksonville	April 2018
New VFD #2	Jacksonville	May 2016
New RBC Bearings, both ends	Jacksonville	October 2012
New UV Units, both #1 & #2	Jacksonville	July 2018
LED Lighting	Jacksonville	2015
All process pumps & drives	Jacksonville	1999
Roof	Jacksonville	May 2008
New Process Pump #1	Whitingham	June 2014
New Process Pump #2	Whitingham	July 2016
New Motor on Process Pump #2	Whitingham	September 2018
New VFD #1	Whitingham	May 2008
New RBC Bearings, both ends	Whitingham	October 2008



NOTES:

- COLLECTION SYSTEM INFORMATION TAKEN FROM "WASTEWATER COLLECTION SYSTEM FOR THE VILLAGE OF WHITINGHAM" BY DUFRESNE HENRY INC. DATED 4/12/82
- AERIAL PHOTOGRAPHY TAKEN FROM THE VERMONT OPEN GEODATA PORTAL "2015 - COLOR & INFRARED - SOUTHERN VERMONT (.5M)"

NO	DATE	BY	DESCRIPTION
–	–	–	–

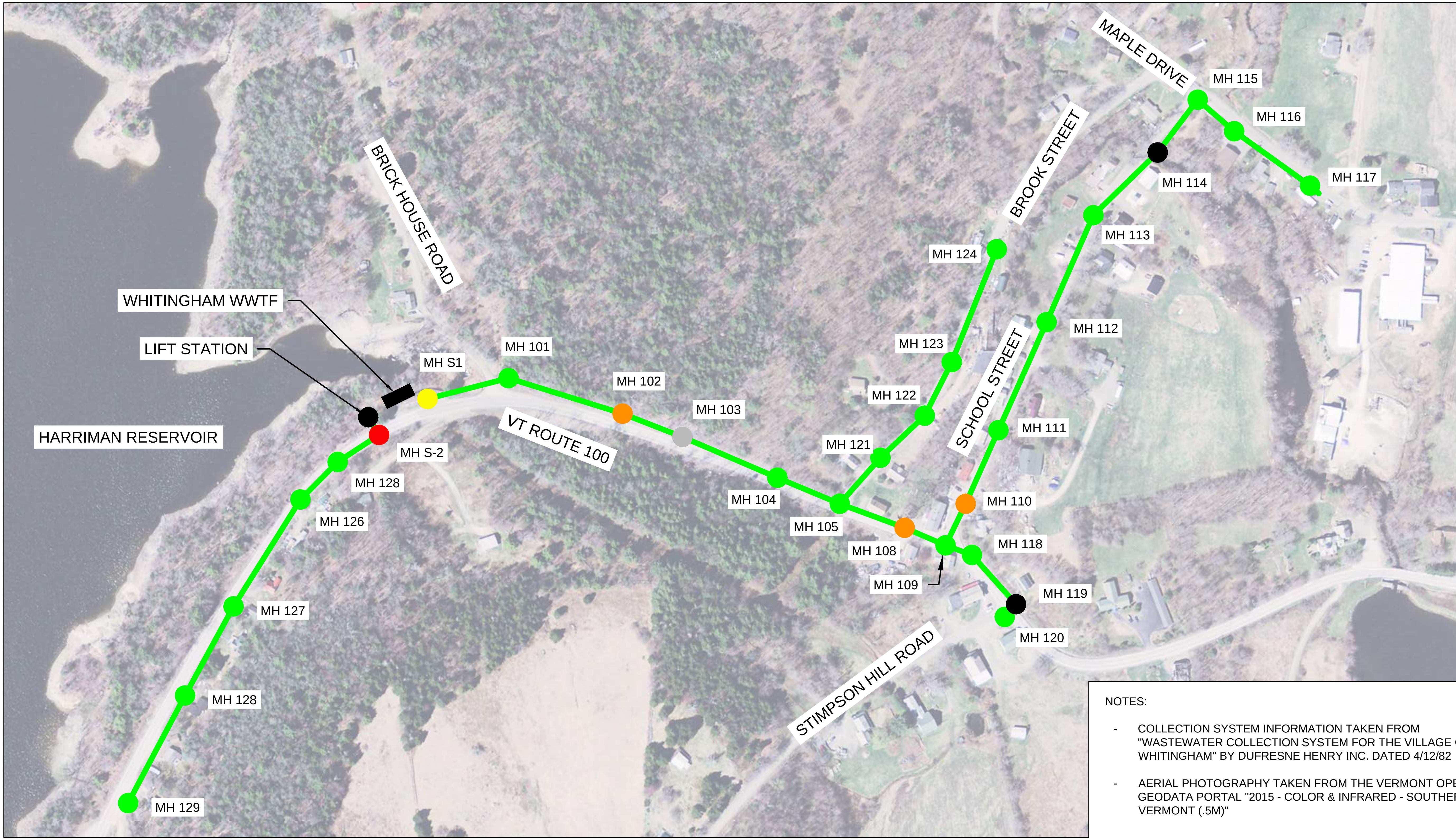
DRAWN BY: VLB | CHK'D BY: SMM | JANUARY 2019

Weston & Sampson

20-YEAR EVALUATION AND PRELIMINARY ENGINEERING REPORT
WHITINGHAM, VERMONT

FIGURE 13
JACKSONVILLE SERVICE AREA

\\wse03.local\WSE\Projects\VT\Whitingham VT\CAD\APP B MH REPORT.dwg



NOTES:

- COLLECTION SYSTEM INFORMATION TAKEN FROM "WASTEWATER COLLECTION SYSTEM FOR THE VILLAGE OF WHITINGHAM" BY DUFRESNE HENRY INC. DATED 4/12/82
- AERIAL PHOTOGRAPHY TAKEN FROM THE VERMONT OPEN GEODATA PORTAL "2015 - COLOR & INFRARED - SOUTHERN VERMONT (.5M)"

250 125 0 250 500

SCALE: 1"=250'

NO	DATE	BY	DESCRIPTION
–	–	–	–

DRAWN BY: VLB | CHK'D BY: SMM | JANUARY 2019

Weston & Sampson

20-YEAR EVALUATION AND PRELIMINARY ENGINEERING REPORT
WHITINGHAM, VERMONT

FIGURE 14
WHITINGHAM SERVICE AREA

\\wse03.local\WSE\Projects\VT\Whitingham VT\CAD\APP B MH REPORT.dwg

Table 3

Jacksonville WWTF Operation Summary - 2017

Jacksonville, Vermont

Parameter	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Average	Design	Capacity
Influent Loadings															
Organic and Solids															
Monthly BOD_5 (mg/l)	188	98	75	88	83	86	79	77	93	129	111	68	98	155	63%
Monthly BOD_5 (lbs/day)	40.1	8.2	6.9	14.7	12.4	12.4	10.8	8.5	9.5	23.3	18.5	9.6	15	84	17%
Monthly TSS (mg/l)	62	66	528	60	262	72	66	84	49	390	86	41	147	155	95%
Monthly TSS (lbs/day)	13.2	5.5	48.4	10.0	39.1	10.4	9.0	9.3	5.0	70.6	14.3	5.8	20	84	24%
Effluent Characteristics															
Hydraulic															
Average Day Flow (MGD)	0.0256	0.0100	0.0110	0.0200	0.0179	0.0173	0.0164	0.0133	0.0123	0.0217	0.0200	0.0169	0.017	0.065	26%
Maximum Day Flow (MGD)	0.0337	0.0124	0.0143	0.0270	0.2690	0.0225	0.0195	0.0178	0.0164	0.0444	0.0482	0.0200	0.045	0.065	70%
Organic															
Monthly BOD_5 (mg/l)	9	11	8	7	11	8	7	8	8	12	11	10	9	30	30%
Monthly BOD_5 (lbs/day)	1.9	0.9	0.7	1.2	1.6	1.1	1.0	0.9	0.8	2.1	1.8	1.4	1.3	16	8%
Average Monthly Removal Efficiency (%)	95.2	89.3	89.3	92.0	86.7	91.3	91.1	89.6	91.9	91.1	90.5	85.9	90.9	19%	
Solids															
Monthly TSS (mg/l)	15.3	11.0	5.4	14.3	4.7	2.0	3.5	14.0	6.0	23.0	6.0	11.0	9.7	30	32%
Monthly TSS (lbs/day)	3.3	0.9	0.5	2.4	0.7	0.3	0.5	1.6	0.6	4.2	1.0	1.6	1.5	16	9%
Average Monthly Removal Efficiency (%)	75.3	83.3	99.0	76.2	98.2	97.2	94.7	83.3	87.8	94.1	93.0	73.2	93.4		
Finishing															
Monthly Total TKN (mg/L)	5.6	1.5	9.7	8.8	1.3	1.5	2.7	2.8	0.9	1.0	1.1	3.0			
Monthly E-coli (#/100 ml)	5.00	7.00	7.00	12.00	16.00	8.00	14.00	14.00	7.00	6.00	7.00	2.00	<1	77/100 Inst. Max	
Average pH	6.4	6.5	6.3	6.5	6.4	6.6	6.4	6.7	6.5	6.6	6.6	6.6	6.5	6.5 to 8.5	

Notes: Design values taken from Design Data tables in the Whitingham/Jacksonville WWTF O&M plans
Design effluent values taken from permit 3-1229
Data taken from WR43 reports prepared by the Chief Operator

Table 4
Whitingham WWTF Operation Summary - 2017
Whitingham, Vermont

Parameter	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Average	Design	Capacity
Influent Loadings															
Organic and Solids															
Monthly BOD_5 (mg/l)	178	108	88	91	69	76	81	86	88	89	92	77	93.583	160	58%
Monthly BOD_5 (lbs/day)	5.9	2.7	7.3	7.6	0.3	2.3	3.2	3.5	3.3	4.0	7.7	3.0	4.240	21	20%
Monthly TSS (mg/l)	76	78	43	76	46	62	52	80	41	51	44	61	59.167	160	37%
Monthly TSS (lbs/day)	2.5	2.0	3.6	6.3	0.2	1.9	2.0	3.3	1.5	2.3	3.7	2.4	2.642	21	13%
Effluent Characteristics															
Hydraulic															
Average Day Flow (MGD)	0.0040	0.0030	0.0100	0.0100	0.0005	0.0037	0.0047	0.0049	0.0045	0.0054	0.0100	0.0047	0.0054	0.016	35%
Maximum Day Flow (MGD)	0.0050	0.0037	0.0069	0.0071	0.0061	0.0047	0.0066	0.0049	0.0047	0.0102	0.0095	0.0047	0.0062		
Organic															
Monthly BOD_5 (mg/l)	7	9	9	9	9	6	7	7	8	8	9	6	8	30	26%
Monthly BOD_5 (lbs/day)	0.2	0.2	0.8	0.7	0.0	0.2	0.3	0.3	0.3	0.4	0.8	0.2	0.4	37.5	1%
Average Monthly Removal Efficiency (%)	96.1	92.1	89.8	90.7	87.7	92.1	92.0	91.4	90.9	91.0	90.2	92.3	91.8		
Solids															
Monthly TSS (mg/l)	20.0	5.3	4.5	4.7	10.0	2.0	4.5	4.0	5.0	4.5	4.0	7.0	6.3	30.0	21%
Monthly TSS (lbs/day)	0.7	0.1	0.4	0.4	0.0	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.3	3.9	6%
Average Monthly Removal Efficiency (%)	73.7	93.2	89.5	93.8	78.3	96.8	91.3	95.0	87.8	91.2	90.9	88.5	89.4		
Finishing															
Monthly Total TKN (mg/L)	11.2	2.9	7.3	4.6	4.4	1.5	12.8	11.5	0.8	0.9	1.0	1.1			
Monthly E-coli (#/100 ml)	3.00	4.00	5.00	5.00	5.00	8.00	10.00	13.00	9.00	6.00	4.00	3.00	<1	77/100 Inst. Max	
Average pH	6.6	6.7	6.5	6.7	6.6	6.6	6.4	6.7	6.5	6.4	6.5	7.3	6.6	6.5 to 8.5	

Notes: Design influent values taken from Design Data tables in the Whitingham/Jacksonville WWTF O&M plans
Design effluent values taken from permit 3-1230
Data taken from WR43 reports prepared by the Chief Operator

Figure 15
Jacksonville WWTP
2017 Effluent Flow vs. Precipitation

Figure 16
Whitingham WWTP
2017 Effluent Flow vs. Precipitation

New RBC Drive-end Bearing	Whitingham	March 2018
New Media Section and Rack	Whitingham	June 2018
New UV Unit #2	Whitingham	April 2018
LED lighting	Whitingham	2015
All process pumps & drives	Whitingham	1999
Roof	Whitingham	May 2008

2.4 Site Visit & Inspection

A site visit was conducted by senior process engineers from Weston & Sampson accompanied by chief operator David DiCantio at both the Whitingham and Jacksonville WWTFs on October 25, 2018 and February 20, 2019 to inspect the facility and gain an understanding of overall condition, operations and performance issues.

At the time of our visit the facilities were operating at average daily flows of approximately 4,000 gpd (Whitingham) and 16,000 gpd (Jacksonville) and all critical systems required for proper treatment were operational. Appendix D provides a basis of design for both facilities.

2.5 Condition of Existing Facilities

The following is a summary of the general condition of the facility based on visual observations and input from the plant operator during the site visits. Included in this evaluation are the condition of the facilities, their suitability for continued use, their adequacy to address the needs of each community, and their conveyance, treatment, storage and disposal capabilities.

Both the Jacksonville and Whitingham WWTFs originally constructed in 1982 and are housed within conventional wood frame buildings with clapboard siding and drywall interior walls. The buildings are constructed over a series of below grade cast in place concrete tanks that include primary settling/sludge storage compartments, equalization tanks and a Forward Flow Pump dry pit. Hatches for each chamber are provided outside the building footprint for access to the tanks for sludge pumping and or tank draining by a tank truck when needed.

Weston & Sampson was not able to observe the condition of the process tankage below slab for the Whitingham or the Jacksonville facility. It is possible that prolonged exposure to hydrogen sulfide from sewer gases caused degradation of the concrete. Excessive degradation can lead to weakening of the main floor. If this occurs, work (e.g. removing old process equipment) could concentrate loads over a small surface area, risking structural integrity. While not part of this scope of work, final design of the selected alternative must also include a complete structural assessment of the concrete to determine if any work is required to maintain the structure's integrity.

2.5.1 Jacksonville WWTF

A summary of the condition of the primary system components of the Jacksonville WWTF is provided in Table 6. A more detailed narrative of the findings is presented in the following section.

Table 6

Jacksonville WWTF Equipment List

Whitingham, Vermont 20-Year Evaluation & Preliminary Engineering Report

Equipment	Unit Process & Subsystem	Manufacturer	Model	Size	Type	Number	Capacity	Motor	Installed	Last Serviced	Condition	Design Life (Years)	Remaining Life (Years)
Primary Settling/Sludge Storage Tank	Primary Settling	-	-	16' x 14' x 5'	Concrete	4			1982		Unknown		
Equalization Tank	Flow Equalization								1982		Unknown		
Flow Equalization Pump Chamber	Flow Equalization	NA				1			1982	1982	Fair		
Inlet box with 2-90˚ V-notch weir and stop plates	Primary Settling					1			1982	1982	Fair		
Sump pump & Discharge Piping	Flow Equalization			1"					1982		Inoperable		
Forward Flow Pump Intake Piping and Valves	Flow Equalization			3"	PVC								
Forward Feed Pump 1	Flow Equalization			3"	Double Disk	1	10-58gpm 30-	3Ø / 3 HP / 208V	2008	2014	Failed		
Forward Feed Pump 2	Flow Equalization			3"	Double Disk	1	10-58gpm 30-	3Ø / 3 HP / 208V	1999	2016	Fair		
VFD 1	Flow Equalization								2008		Fair		
VFD 2	Flow Equalization								1999		Fair		
Drive motor #1	Flow Equalization							3hp 1750rpm	1999		Fair		
Drive motor #2	Flow Equalization							3hp 1750rpm	2018		Fair		
3" air intake (Blowers)	Flow Equalization			3"	Threaded Iron								
Process piping to RBC	Secondary Treatment			2.5"									
RBC Drive Unit	Secondary Treatment					1	51,000sqft, 5,5	3Ø / 3 HP / 208V	1982		Poor		
RBC shaft	Secondary Treatment					1	1.5 RPM		1982		Poor		
RBC Bearings, Drive-end	Secondary Treatment				Pillow Block	1			2008	2018	Good		
RBC Bearings, non drive-end	Secondary Treatment				Pillow Block	1			2008		Fair		
Fiberglass cover	Secondary Treatment					1			1982		Fair		
8" RBC Vent Ducting	Secondary Treatment			8"									
RBC media	Secondary Treatment								1982		Poor		
Intake Filter	Flow Equalization												
Blowers with motors	Flow Equalization					2	75 ICFM @ 17	3Ø / 5 HP / 208V	1982		non-operational		
Discharge Header	Flow Equalization												
UV disinfection unit #1, 6 lamps	Tertiary Treatment						40 GPM		1982		Failed		
UV disinfection unit #2, 1 Lamp	Tertiary Treatment						40 GPM		1982	2018	Good		
Clarifier									1982		Poor		
Scum Baffle													
Suction Cone													
3" Ball Valves				3"	Ball	11							
2" Gate Valve with union				2"	Gate								
Process piping & joints				4"	Sch 40 PVC								
Sludge Wasting Valves				4"	Motor Oporated Ball	2			1982		Poor		
Air Compressors													
Level control													
CU-1 Condensing unit					11,200 BTU								
AC-1 Air Conditioning Unit					11,200 BTU		300 CFM	1/8 HP					
EF-1 Toilet Exhaust Fan					Centrif	1	90 CFM	1/100 HP 1070RPM					
EF-4 Exhaust Fan					Vane Axial		145 CFM	1/50 HP 1750RPM					
EF-2 Exhaust Fan					Centrif	1	240 CFM	3/4 HP 4495RPM					
Supply Blower A					Supply		100 CFM						
Supply Blower B					Supply		200 CFM						
Return Blower C					Return		210 CFM						
Return Blower D					Return		2970 CFM						
Frest Air Intake E					Fresh Air Intake		90 CFM						
Horizontal unit heaters						2	5.0 kW						
Wall heater						1	2000W						
Baseboard heaters							750 W						
Motor control coils						10							
Lighting					LED					2015			
Paint											Poor		
Windows											Poor		
Door											Poor		
Drywall											Poor		
Roof										2008			

Building

The Jacksonville WWTF is the larger of the two facilities and includes a garage, bathroom, laboratory/office, storage room, and shop space as well as an area for process equipment. In the process equipment area, a large open space houses the RBC, clarifiers, equalization blowers, control panels and disinfection system, with a small room dedicated to housing the forward flow pumps.

The building is exhibiting signs of its age in many of the building subsystems. The roof, last replaced in 2008, has leaked as evidenced by water damage visible in the laboratory/office space. Exterior paint is peeling, and doors are rusting. The exterior garage door is inoperable.

Interior walls are in need of replacement. In the process equipment area, significant mold growth is visible as the RBC covers were not replaced after the media repair work. Paint bubbles at the ceiling/wall interface in the laboratory space indicate that water leakage has occurred, likely damaging the drywall.

With respect to mechanical and electrical systems, the heating system is inadequate, the operator is required to run an electric space heater in the lavatory in order to prevent the plumbing from freezing during the winter. The ventilation system has not been replaced since the construction of the building and is out of date. The facility does not have a generator and the RBC has to be manually rotated in times of power outage to maintain the media's biogrowth. The electrical systems are outdated and should be replaced with any repair work undertaken. Emergency panel needs to be installed to meet current design standards.

Primary Settling and Equalization Tanks

All sewage enters the Jacksonville WWTF through a concrete influent splitter box with manual aluminum sluice gates to direct wastewater to one of the two sets of primary settling chambers located below the building. There is no influent flow monitoring capability. Access to the splitter box is via a large, heavy aluminum hatch, which is onerous for the operator to open. In addition, this is considered a confined space if the operator needs to enter the structure for operation or maintenance.

Preliminary treatment, typically consisting of coarse screening and grit removal, is not present at this facility.

In total there are four primary settling chambers, which also act as storage chambers for clarifier sludge. Each chamber measures 14’ x 16’ and an overflow pipe is provided at a depth of 5 feet. Two 8-inch pipes connect each chamber at the normal water level, which reduces the total amount of volume required for pumping in each occurrence as the first chamber accumulates solids at a faster rate. Access hatches for each chamber cell are provided on the east and west walls of the building to allow a truck to pump out accumulated solids. The bottoms of the tanks are flat, and solids have historically accumulated in the corners of each chamber that cannot be easily accessed by truck suction hoses.

After passing through the primary settling chambers, wastewater enters a set of four aerated equalization chambers. Each cell is 10’ x 16’ and can accommodate a normal range of depth from zero to 5.5 feet. A suction pipe in the EQ tank conveys wastewater through a check and ball valve to the forward flow pumps located in the pump room. This room has a grated floor with a dry pit underneath. A sump pump was installed when the WWTF was built to drain this pit if water drained into it. This sump pump has not been in operation for many years. Actual wastewater levels can exceed 5.5 feet on occasion (e.g. wet weather flow), and it surcharges into the sump area of the main floor, where the clarifier is located, through a 1-inch hole in the floor. The original purpose for this hole was unable to be determined. The sump area is drained by a four-inch core in the wall between the clarifier sump and the pump room, discharging to the dry pit. A portable sump pump is then used to drain this wastewater back to the tankage below grade.

The equalization tanks were originally designed to be aerated to enhance the biological treatment process and minimize odors. A set of three blowers is located in main process room was originally intended to provide mixing air. These units have been inoperable since 2005. Ventilation for the primary settling and equalization compartments was formerly provided by a blower located in the garage, with an exhaust vent above the roof. The discharge fan for this ventilation system has also failed, and only passive ventilation is being provided.

While the tanks could not be accessed during the site walk to assess their condition, observation of the covered concrete at the inlet splitter box revealed only very modest exposure of aggregate above the water surface and the aluminum stop gates were in good condition. Given the lack of ventilation and the weight of the process tanks supported on the tank top slabs, it would be prudent to determine the condition of the underside of the slab and whether or not there is any exposed/compromised reinforcing steel to ensure structural adequacy and or need for repairs. Tank access hatches, while in good condition, are very heavy and could be replaced with a lighter structure that would ease the physical strain on the operator.

<u>Wastewater Process Equipment</u>

RBC Influent Pumps: There are two Penn Valley Double Disc positive displacement diaphragm pumps located in the Forward Feed Pump Room which lift influent from the Equalization Tank through suction piping and into the RBC tank where it discharges through three feed points of the four media zones. Flow is currently directed to only the first and second zones, the discharge pipe for the third zone has been disconnected. Flow control to each zone is controlled by ball valves, and does not allow the operator to accurately gauge the flow distribution to each zone.

Two forward feed pumps are provided, one active and one standby. Currently, Forward Feed Pump 1 is inoperable, Forward Feed Pump 2 is the sole operating pump for the system. Variable Frequency Drives (VFDs) are provided for each pump. The EQ tank was originally equipped with a bubbler type level sensor that was designed to control pump speed selection. This was replaced by an ultrasonic sensor, but it is no longer in service and pump speed is selected manually. As a result, increases of inflow need to be visually observed by the operator and the speed of the pumps increased. This results in the occasional surcharge of effluent from the EQ tanks into the sump area of the clarifier.

Rotating Biological Contactor: The RBC is a single shaft unit with 12-foot diameter media in a steel tank divided into 4 zones with baffles. The tank was equipped with rigid fiberglass segmented covers vented through the roof, but were removed during the media replacement in 2018 and have not been replaced.

The media in zone two is damaged due to shifting as the shaft rotates and is supported with ratchet straps for stabilization. Media in the third section was replaced in May of 2018 due to this same tearing. (Note: Zone 1 is at the influent (drive) end).

A report (copy provided in Appendix E) provided by Mountain Machine Works (MMW) who performed the prior replacement, noted that the media at the time had extremely heavy growth due excessive organic loading and/or insufficient biomass sloughing. (Note that the MMW report identifies the 4 zones as A, B, C, and D with zone D being the influent end). Excessive growth on the media can promote wear at the media mounting bolt locations as the media rotates due to the excess weight of the biomass that eventually results in media failure and is the likely cause of the failure experienced. This is not uncommon with RBC systems and is often mitigated by providing intermittent coarse bubble aeration below the media to enhance sloughing. This system is not equipped with supplemental aeration for sloughing. As noted previously, plant staff have (since the failure in early 2018) been using a hose to spray the media when needed to enhance sloughing.

The MMW report also noted that in general the support shaft, bearings and drive are aging but with some recent bearing replacement/repairs are all in serviceable condition.

The steel tank is showing fairly significant rust in some locations but appears to be structurally sound. Overall it appears the unit could be fully refurbished including media replacement, complete mechanical overhaul and sandblast and repaint the steel tank inside and out to maximize its longevity.

Secondary Clarifiers: Effluent from the RBC flows by gravity to the secondary clarifiers. There are two sections in the single steel vessel, each section having two hopper bottoms. The tank sits in a recessed floor section approximately two feet below the rest of the building floor to support gravity flow and clarifier depth. The clarifiers are passive, they do not have mechanical sludge rakes, skimmers, or other moving parts in the tanks. Sludge removal is performed by opening a sludge waste valve on the waste line from the clarifier hopper bottoms from each of the two clarifiers. These valves are motorized and operated by an analog timer arrangement that allows the open and closed frequency and duration to be set by the operator. Waste sludge flows by gravity back to the primary settling tank. This provides both sludge wasting and also acts as an internal recycle back to the RBC influent. Because plant flow is reported based on runtime of the RBC influent pumps the recycle flow must be removed from the report flow. Recycle flow is calculated based on valve open time and estimated waste flow as there is no waste sludge line flow meter. The clarifier tanks have significantly less rust than the RBC tank with most of the paint and interior bituminous coating intact. However, the operator has stated that when influent is high, the level in the EQ tank rises high enough so that wastewater enters the sump area of the clarifier through a one-inch core in the floor. This occasional influx of wastewater is reducing the serviceable life of the steel structure of the clarifier.

UV Disinfection System: This system is equipped with two in-line closed vessel UV disinfection units, one of which is non-functional. The original Basis of Design specified units rated for 15 gpm, though subsequent upgrades increased the unit sizes to 40 gpm. A hypochlorite system is currently provided for a backup. The functional UV unit was installed in 2018.

Electrical Systems

In general, as noted in prior sections the exiting electrical systems are functional. Panel interiors were not inspected but it is suspected that contacts and other metal components within the various panels in the main process room may have been adversely affected by the damp environment resulting from the open top clarifiers and the removal of the RBC covers in 2018. If the plant is to be taken off-line for repairs or upgrades, replacement of electrical wiring would be warranted. Selectboard member Greg Brown, who was present at the October site visit, noted that the electrical service to the Jacksonville facility was not installed correctly, though it still functions.

Exterior Site Elements

All critical equipment is inside the building and therefore security fencing is neither provided or required. The access drive and walkway are asphalt and in fair condition.

2.5.2 Jacksonville Collection System

For the Jacksonville service area, wastewater is collected and conveyed in a gravity network. For the purposes of preliminary investigation, a year's worth of effluent discharge data was compared against precipitation records to see if there is evidence of significant groundwater infiltration and/or surface water inflow (I/I) entering the collection system. This data is presented on Figure 13. From this data it is apparent that daily flow does not exceed permitted limits of the Jacksonville WWTF, even during storm events exceeding 4.5 inches. Generally, groundwater infiltration and stormwater inflow (I/I) does not appear to be an issue that has a deleterious impact on treatment at the WWTF.

Of the 73 total manhole structures in the collection system, Weston & Sampson selected 25 structures for a topside inspection. These structures represent areas known to the Chief Operator as problematic or were considered to be a good bellwether of the overall system condition. Field work was conducted on November 14 and 15, 2018. Overall, the condition of the collection system is fair. The most significant issues found during the inspection were infiltration from the manhole chimneys and inability to access structures due to paving. Weston & Sampson has prepared a stand-alone manhole inspection report and is included in Appendix F.

2.5.3 Whitingham WWTF

The Whitingham WWTF is of the same vintage and similar in design both in layout and process type and configuration as the Jacksonville facility, but is smaller as it is designed for a smaller flow rate. This WWTF does not have the office or lab space which is provided at Jacksonville. A summary of the condition of the primary system components of the Whitingham WWTF is provided in Table 7. A more detailed narrative of the findings is presented in the following section.

General Building Condition

The building structure appears to be sound with some minor cosmetic issues. Exterior paint is peeling in many areas and the clapboard siding near grade is showing signs of water damage. The entrance door and windows are showing their age with significant rust at the bottom of the main steel door. The asphalt shingle roof was last replaced in 2008.

Interior walls and floors are in reasonably good shape but are showing their age with various cracks and holes in the drywall. The facility consists of the main process room which houses the RBC, Secondary Clarifiers and UV system as well as supporting ancillary equipment and a small bathroom. Like Jacksonville, the process room walls and ceiling have significant mold growth due to inadequate ventilation and the lack of tank covers that creates a humid environment. This environment is also problematic for the mechanical and electrical equipment in the same space. There is no separate electrical room at the facility. Building, lighting, heating and ventilation systems, although showing signs of age, are for the most part functional. Lighting fixtures are LEDs that were recently installed, and in some cases, there are exposed wires and electrical fixture boxes.

Overall the building is generally serviceable but is in need of improvements to doors, interior and exterior wall surfaces and building electrical, lighting and HVAC systems are old and their condition, function and reliability are marginal and warrant rehabilitation or replacement for continued reliable long term occupancy.

Primary Settling and Equalization Tanks

The Whitingham Facility includes one 3 compartment primary clarification/sludge storage (septic tank), followed by one 2 compartment Septic Tank Effluent/RBC Influent Equalization tank. The tanks were designed with a PVC duct system and exhaust fan to provide headspace ventilation to draw fresh air in through the various hatches which are not entirely air tight. The exhaust fans are located in the attic space and were not readily accessible during the site walk but are reported to be functional.

The tanks could not be accessed during the site walk to assess their condition. Since there is no influent splitter box at this facility, there was no ability to assess the condition of the concrete tanks. Given the age of the tanks it would be prudent to determine the condition of the underside of the slab and whether or not there is any exposed or compromised reinforcing steel to ensure structural adequacy and or need for repairs. Tanks access hatches appear to be in good serviceable condition.

Table 7

Whitingham WWTF Equipment List

Whitingham, Vermont 20-Year Evaluation & Preliminary Engineering Report

Equipment	Unit Process & Subsystem	Manufacturer	Model	Size	Type	Number	Capacity	Motor	Installed/Last Replaced	Condition	Design Life (Years)	Remaining Life (Years)
Discharge Pump	Influent PS	HOMA	GRP Series	2"	Grinder	2		2 hp, 208V, 3Φ	2007	Fair	20	8
Primary Settling/Sludge Storage Tank	Primary Settling	-	-	8' x 15'	Concrete	3	8,100 gal	-	1982	Good	60	23
Equalization Tank	Flow Equalization	-	-	9' x 15'	Concrete	2	7,000 gal	-	1982	Good	60	23
Flow Equalization Pump Chamber	Flow Equalization	-	-	5' x 9'	Concrete	1	5,300 gal	-	1982	Good	60	23
Sump pump & Discharge Piping	Flow Equalization								1982	Failed	20	0
Equalization Tank Aeration System	Flow Equalization						60 cfm			Failed	20	0
Forward Flow Pump Intake Piping and Valves	Flow Equalization			2"	PVC				1982	Fair		0
Forward Feed Pump 1	Flow Equalization	Penn Valley		2"	Double Disc	1	3-18 gpm, 14-56 spm	Drive Motor #1	2008	Failed	20	9
Forward Feed Pump 2	Flow Equalization	Penn Valley		2"	Double Disc	1	3-18 gpm, 14-56 spm	Drive Motor #2	2018	Good	20	19
VFD 1	Flow Equalization								1999	Fair	20	0
VFD 2	Flow Equalization								2016	Fair	20	17
Drive motor #1	Flow Equalization							1 hp, 208V, 3Φ 1140 rpm	1999	Fair	20	0
Drive motor #2	Flow Equalization							1 hp, 208V, 3Φ 1140 rpm	1999	Fair	20	0
6" exhaust duct	Flow Equalization			6"								0
Bubbler control system	Flow Equalization								1982	Failed	20	0
Pump control panel	Flow Equalization								1982	Failed	20	0
Process piping to RBC	Secondary Treatment			1.5								0
RBC media	Secondary Treatment			12,000 sf		1	1.03 gpd/sf				20	0
RBC Tank	Secondary Treatment	Lyco Manufacturing			Steel	1	2,000 gal		1982		20	0
RBC shaft & bearings	Secondary Treatment						1.5rpm		2012		20	13
Gear reducer drive unit	Secondary Treatment						1.5HP 1200rpm					0
UV Disinfection control panel	Final Polishing	Ultra Dynamics	1500MF			2			1982			0
UV disinfection unit 1	Final Polishing	Ultra Dynamics				2 bulbs	15 gpm		2018			0
UV disinfection unit 2	Final Polishing	Sanitron	S50C			1 bulb	20 gpm		2018			0
Process piping & joints	Final Polishing			3"	PVC							0
Clarifier	Secondary Treatment								1982	Poor	20	0
Sludge Wasting Valves	Secondary Treatment											0
Suction Cone	Secondary Treatment											0
Building Plumbing	Building											0
Building Heating												0
Roof	Building								2008			0

Wastewater Process Equipment

RBC Influent Pumps: There are two Penn Valley Double Disc positive displacement diaphragm pumps located at grade in a small room adjacent to the main process room which lift influent from the equalization tank through suction piping in a dry pit and discharge up to and along the ceiling to the RBC tank where it discharges through one or more of three feed points one each to each of the first three of four media zones. Flow is currently directed to all three zones. The RBC feed piping arrangement in this case employs vertical (downward) mounted tees. This configuration does not provide an even distribution of water to the RBC media. Flow spilt is an important factor in controlling media zone overload.

Only one pump is normally used with the second as standby. The pumps are equipped with variable frequency drives. Pump 1 is currently offline, the pump is non-functioning, leaving Pump 2 as the only active pump in the system. The EQ tank is equipped with a bubbler type level sensor with air compressors that was designed to control pump speed selection. There is no direct flow measurement, rather flows are recorded based on pump run time and speed.

Rotating Biological Contactor: The RBC is a single shaft unit with 6-foot diameter media in a steel tank divided into three compartments in series separated by baffles. The tank was equipped with rigid fiberglass segmented covers vented through the roof however the covers have been removed to allow the media to be hosed down to support sloughing and avoid the problems encountered at Jacksonville.

The steel tank is rusting in some locations but appears to be structurally sound.

Secondary Clarifier: Effluent from the RBC flows by gravity to a single clarifier. This structure is a steel tank with dual hopper bottom for sludge collection. The tank sits in a recessed floor section approximately 2 feet below the rest of the building floor to support gravity flow and clarifier depth. The clarifiers are passive; they do not have mechanical sludge rakes or skimmers, or any other moving parts in the tanks. Sludge removal is performed by opening an electrically actuated valve on the waste line from the clarifier hopper bottoms using two analog timers to control frequency and duration of the valve open time. The operator has reported difficulty in setting waste timing and duration with the two different but linked timers, one for waste duration and one for frequency. Waste sludge flows by gravity back to the primary settling tank, providing both sludge wasting and internal recycle back to the RBC influent. Because plant flow is reported based on runtime of the RBC influent pumps the recycle flow must be removed from the report flow. Recycle flow is calculated based on valve open time and estimated waste flow as there is no waste sludge line flow meter. The current sludge wasting arrangement is less than ideal particularly if a waste valve should fail open which would result in the entire clarifier draining to the septic tank potentially causing an internal recycle loop that could eventually result in overflow of partially treated sewage to the outfall. Also access to the waste control valves is very difficult. Any upgrade should investigate alternative waste control and metering methods.

The clarifier tank is in fair condition with most of the paint and interior bituminous coating intact. These tanks remain serviceable but would benefit from new interior and exterior coatings to extend their useful life.

UV Disinfection: The system is equipped with 2 in-line closed vessel UV disinfection systems, one active and one standby. These units are alternated each month. Both these units were replaced in 2018.

Electrical Systems

In general, as noted in prior sections the exiting electrical systems are functional and in generally fair condition for their age. Panel interiors were not inspected but it is suspected that contacts and other metal components within the various panels in the main process room may have been adversely affected by the damp environment resulting from the open top clarifiers and the removal of the RBC covers in 2018. An upgrade to the electrical systems during a larger system upgrade is warranted.

Exterior Site Elements

All critical equipment is inside the building and therefore security fencing is neither provided or required. The facility sits adjacent to a steep slope at the rear with the concrete tank wall above grade on the back side and cast in place concrete "wing" retaining walls on either side with steel chain link fence along the top for fall protection. The wing retaining walls have suffered from freeze thaw damage where the steel fence posts were cast in place. This will need repair to ensure fence stability. There is also a manhole on the slope behind the building (MH-01) on the outfall pipe that appears to be leaning significantly downhill that should be repaired.

Pump Station

A pump station serves to convey sewage from the users to the south of the WWTF into the primary settling tanks. This structure is a 4-foot diameter manhole with a duplex grinder pump system controlled by floats. There are two pipe couplings and the main pump rail support bracket and hatch in the duplex submersible influent pump station that lifts flow from the southwest interceptor into the septic tanks that are in need of replacement. The wet well is a precast concrete manhole and the controls, pump rails and pumps are all in good condition.

2.5.4 Whitingham Collection System

For the Whitingham service area, wastewater is collected and conveyed in two zones, one discharging to a pump station on the south side of the WWTF, and one directly discharges via gravity to the WWTF. As with the Jacksonville WWTF, a year's worth of effluent discharge data was compared against precipitation records to see if there is evidence of significant groundwater infiltration and/or surface water inflow (I/I) entering the collection system. This data is presented on Figure 14. From this data it is apparent that daily flow does not exceed permitted limits of the WWTF, even during the intense event recorded during the study period. Generally, I/I does not appear to be an issue that has a significant negative impact on the WWTF.

Of the 33 total manhole structures, Weston & Sampson selected 8 structures for a topside inspection. These structures represent areas known to the Chief Operator as problematic or were considered to be a good bellwether of the overall system condition. Field work was conducted on November 14 and 15, 2018. Overall, the collection system is adequate. The most significant issues found during the inspection were infiltration and inflow from the chimneys and inability to access structures due to paving. Weston & Sampson has prepared a stand-alone manhole inspection report and is included in Appendix F.

2.6 Financial Status of Existing Facilities

2.6.1 Users and User Fees

The Town of Whitingham most recently adjusted its sewer usage rates in October 2018 with guidance from RCAP Solutions. Prior to this rate adjustment, users paid a fixed fee of $535.04 per year per equivalent residential unit (EU) plus a volumetric fee of $15.12 per thousand gallons discharged. As the Town does not have a water system, measurement of flows could not be accurately metered, and billing was based on averages or estimates. In order to provide a more equitable funding source, the Town elected to implement a flat user fee of $759.94 per EU.

The Village of Jacksonville has 93 user accounts, of which 29 are non-residential users (e.g. business, municipal, or multi-family connections). The Village of Whitingham has 49 user accounts, of which 8 are non-residential users.

2.6.2 Operation & Maintenance Cost

In FY 2018, $150,456 was budgeted for both service areas and $219,466.98 was expended. The additional costs were associated with the emergency repairs and additional costs associated with that work (e.g. sewage pumping/hauling). For Fiscal Year (FY) 2019, the Town of Whitingham has budgeted $182,812 to begin establishing a more robust capital account to fund the upcoming repairs and/or upgrades needed. Table 8 breaks down this figure into broad categories:

Table 8: Town of Whitingham FY2019 Budget for O&M

Item	Amount
Administration	$55,470
Operator Salaries	$59,192
Facility Consumables	$2,150
Sludge Removal	$1,500
Electricity	$15,000
Repairs	$36,000
Plant Improvements	$8,000
Contractors	$2,500
Misc	$3,000
Total	**$182,812**

As of November 2018, the total sewer fund balance was approximately $148,000. The Town of Whitingham, recognizing that significant capital improvements will be necessary in the coming years, will use some of the additional user fees collected to begin a reserve account. As part of the RCAP

Solutions report, projected budgets through Fiscal Year (FY) 2021 were presented that incorporated anticipated capital expenditures for the aging system components. However, as the final design and cost of these improvements were not known at the time, additional changes will likely be necessary.

Refer to Appendix G for a copy of the RCAP Solutions report, a comparative FY18/19 budget report, and a detailed breakdown of the O&M costs for the facilities.

2.7 Water, Energy and Waste Audits

No formal I/I study or energy audit has been conducted on both the Whitingham and Jacksonville WWTFs to date.

As discussed in previous sections, Weston & Sampson has evaluated the daily flow of each WWTF and precipitation records to prepare Figures 15 and 16. These figures illustrate the relationship between precipitation and WWTF flow. These figures show that there have been no exceedances of the permitted flow limits in 2017. Groundwater infiltration does appear to slightly impact flows at the WWTF. By and large, the stormwater inflow does not appear significantly impact flows to the plant with one notable exception; a 5 inch storm event in the fall of 2017.

\\wse03.local\WSE\Projects\VT\Whitingham VT\Report\whitingham - 20-yr eval + PER.docx

3.0 NEED FOR PROJECT

3.1 Health, Sanitation & Security

On March 22, 2018, a 1272 Order was issued to the Town of Whitingham due to the failure of one RBC media at the Jacksonville facility. While this event did not result in the discharge of untreated effluent into waters of the State, it did highlight the age of the system and the potential for future events to occur that could result in an unpermitted discharge without efforts to repair or replace aging components. The purpose of this study is to lay the foundation for work that will allow each plant to continue meeting permit limits for the next 20 years.

3.2 Aging Infrastructure

As discussed above, this facility is over 40 years old and has not undergone significant repairs or equipment replacement in its lifespan. As facilities typically have a design life of 20 years, the ANR is concerned about the future performance of both WWTFs. Equipment will need to be rehabilitated or replaced in order to continue meeting the needs of its customers while maintaining permit limits. In the instance of the March 22, 2018 1272 Order, the issue was the failure of a piece of RBC media. To date there has not been any major work performed on the critical system component, the RBC motor and drive assembly.

3.3 Reasonable Growth

As discussed in Section 1.4 above, the projected population growth for the Town of Whitingham is projected to range from approximately 2% (low growth) to 11% (robust growth) based on the report in Appendix C. However, this study was conducted several years ago and more recent statewide population surveys show a much lower population growth of 0.1% from 2010 to 2018.

Based on the figures above and the current loadings to the Whitingham and Jacksonville WWTFs, it appears that population growth will be minimal. Since both facilities are currently operating at less than 50% of their permitted flow limits and peak daily flows do no exceed daily design flow, anticipated growth over the next 20 years can be easily accommodated by the current systems if they are updated kept in good operating condition.

3.4 Additional Needs

Currently both plants do not have emergency backup power. Recently (November 2018) a power outage rendered the plant inoperable, and the Wastewater Operator hand-actuated the RBC shafts to keep the media and biofilm from drying out. This is an untenable situation and as part of this study, generators for each facility will be included in the scope.

Staff from the VT DEC have raised concerns about the lack of redundancy at each WWTF, noting that the financial impact the media failure in 2017 could have been mitigated if there were redundant units available. All of the options explored in the following sections have been prepared with provisions to keep the WWTFs operational when critical system components fail.

In a previous study commissioned by the Town of Whitingham, concerns over future nitrogen limits was raised. The ultimate discharge point for these WWTFs is Long Island Sound, a receiving water that has a nitrogen limit established by the US EPA. It is possible that stringent nitrogen limits could be established in the next 20 years, with the potential to require operational or equipment upgrades. However, due to the plant's very low loadings, it is impractical to consider that a very costly nitrogen removal upgrade would provide a meaningful benefit to Long Island Sound. Weston & Sampson believes that through careful, efficient operation of the existing facilities (aided by upgrades discussed in this report), nitrogen levels discharged by the two WWTFs will be reduced to the extent practicable.

\\wse03.local\WSE\Projects\VT\Whitingham VT\Report\whitingham - 20-yr eval + PER.docx

4.0 ALTERNATIVES CONSIDERED

Several options were explored to modernize the WWTFs as part of the alternatives analysis for the Town of Whitingham. Many of these were found to be prohibitively costly upon a preliminary review. For example, decommissioning the Whitingham WWTF and converting it to a pump station could save on long-term operational costs. However, the only feasible route for a force main to connect the Whitingham service area to the Jacksonville service area is Route 100, where ledge is clearly evident along the three mile route from the Whitingham WWTF to Twin Valley Middle High School. The cost to either directionally drill or blast through this route would easily exceed $200 per foot, a capital cost of over $3,000,000. This figure does not even consider building decommissioning, pump station reconstruction or potential up-sizing of equipment at the Jacksonville WWTF. Therefore, consolidation was not investigated further.

As mentioned in the previous section, provisions for redundancy are mandated by the VT DEC and all alternatives have included the costs associated with redundancy. For some alternatives (e.g. SBR), the dual chambers allow one unit to operate if the other unit is offline. For others (e.g. RBC), spare parts will be kept on hand in the event of failure. For the RBC process, the concept of dual units was considered but ultimately rejected as impractical. For the Whitingham location, adding a second unit would require an expensive building addition on a steep bank. At Jacksonville, construction would either need to occur within a floodplain or the existing floorplan would need to be reconfigured. The former would pose environmental permitting challenges and the latter would add considerable capital cost. By keeping the common spare parts for repair on-hand, a system shutdown would be limited to a short duration. In the interim, flow through the RBC unit would still pass through the biofilm on the media, reducing BOD to some extent.

Regardless of the option chosen, there are items that will need to be addressed to ensure each facility continues to serve the Town's residents for the next 20 years. These items are outlined below:

<u>Building Improvements</u>

Roofing

The roofs of each building are showing their age despite being installed in 2008. With the other facility work being performed, it is prudent to replace the roof at each facility to ensure leaks do not damage equipment or cause the workspaces to become an unhealthy environment.

Insulation, Doors and Windows

At Jacksonville, electric space heaters are used to prevent plumbing from freezing. In order to ensure the building is adequately climate controlled while being energy-efficient, the building will be clad with an additional layer of insulation. This insulation will be installed over the existing clapboards, with new clapboards used to finish the building. As the Whitingham facility is of a similar design, this treatment is proposed for that building as well. Windows will be replaced with modern, energy-efficient models. Doors, which show signs of rusting, will be replaced as well. The overhead door accessing the garage at Jacksonville will be replaced as it is also currently inoperable.

Heating, Ventilation and Air Conditioning (HVAC)

The existing HVAC systems have not been maintained over their life and are currently in poor condition. As discussed above, the Jacksonville building has an inadequate heating system and requires improvement. Systems are of a similar age in Whitingham and will need replacement in order for that facility to continue to operate for the next 20 years. As part of all alternatives, new HVAC systems have been included.

Electrical
All electrical wiring will be replaced as part of this project and systems brought up to current code. Motor Control Centers (MCCs) will be replaced with modern equivalents.

Emergency Power
A new diesel engine generator and transfer switch should be installed to provide emergency power. Due to the relatively small ancillary loads the generator should be sized to run the entire facility.

Primary Settling and Equalization Tanks
Ventilation
The existing below grade tank ventilation ducts and louvers could not be inspected but the exhaust blower has not been functional for some time and as such it is expected that the louvers are corroded and likely clogged with mold, insects etc. Due to the lack of access to inspect and maintain the ducts and louvers we recommend that the duct system and exhaust fan be removed in their entirety and replaced with a new exhaust system that does not include inaccessible equipment. The new system should draw from the inlet distribution box so that the most foul air is not drawn through the headspace of other tanks.

Tank Rehabilitation
Evaluate the exiting below grade tankage interior for corrosion and exposed reinforcing and repair as appropriate. Sloped bottoms will be poured to aid in sludge removal pumping. The sub-slab ventilation system will be restored to an active system by replacing the blowers and replacing deteriorated piping as needed.

Air Mixing System Replacement
The existing out of service blowers believed to be used for aerated mixing of the equalization tank at Jacksonville should be removed in their entirety and replaced with modern alternatives.

Process Equipment
Forward Flow Pumps & VFDs
At each WWTF, one of the forward flow pumps has failed and will be replaced. The VFDs that are currently in operation have reached the end of their useful life and should be replaced with modern equivalents.

Effluent Flow Metering
Currently flow is metered indirectly based on pump runtimes and estimated waste sludge return flow rates. A new direct flow measurement system will be installed to accurately record flows via magmeter. This style of flow meter can be installed on the small-diameter piping in both plants easily.

Control Panels
Currently separate panels are used for each sub-system, and there is no autoresponse system set up to inform key personnel in the event of an alarm. A consolidated and simplified control panel will help the operator optimize the process and provide additional tools to ensure each facility is attended to in a timely matter. New control panels for Whitingham and Jacksonville will house the VFDs for the forward

flow pumps, receive signals from the process equipment, provide remote alarm capability, and allow the operator to observe key parameters remotely.

Site Improvements

Whitingham Pump Station

One of the duplex grinder pumps in this structure is inoperable and will be replaced regardless of the alternative chosen. These costs have been included in each alternative.

Whitingham Retaining Wall

The backside of the Whitingham building is a steep slope leading to the Harriman Reservoir. Retaining walls are used to support the access drives on the north and south sides of the building. The wall is beginning to show evidence of settlement, cracks are appearing in places. Repair of this wall will be included in all alternatives considered.

4.1 Alternative 1: Rehabilitation of Existing System

4.1.1 Description

In addition to the common facility improvements described above, this alternative replaces the RBC in-kind with spare parts to satisfy redundancy requirements.

Rotating Biological Contactor

RBC Reactor

A new RBC reactor with the same configuration and media surface area will be installed and the exiting unit removed. The media dosing manifold piping will be replaced with a channel and weir system to equally distribute flow across the whole tank length, giving the operator a visual indicator of flow distribution and allow them to better optimize the process. We believe that replacement will provide the greatest service life for the new system over refurbishment.

Sloughing system

The RBC will be provided with a coarse bubble air diffuser sloughing system to allow periodic supplemental sloughing to avoid excessive buildup of biomass in the future.

Effluent recycle

RBC treatment typically benefits from an internal recycle. This will be considered in this application. This could be implemented with a simple controlled overflow from the RBC discharge to the influent equalization tank or through the secondary clarifier waste sludge system discussed further below.

Covers

RBC covers will be replaced to reduce the humidity load in the process room and improve environmental conditions for operators and equipment. In lieu of the hard covers that are problematic to remove to access media for repair if needed, there are various soft “tarp” style covers that could be employed. The existing ventilation for under the covers should also be reinstated to maintain a small positive pressure under the covers.

Tankage

The RBC tank shows evidence of significant rusting and will be replaced.

Secondary Clarifiers

Steel Tanks

The exiting clarifier tanks will be replaced.

Sludge Wasting

The existing timer-based control valve wasting arrangement will be replaced with an alternate more reliable and easier to operate approach that precludes tank draining upon failure. The exiting sludge intake arrangement could remain with the external piping modified to include either an air lift pump or a riser section with a telescoping riser to allow overflow flow adjustment. This system could also provide the recommended RBC recycle.

UV Disinfection System

Only one lamp is currently in operation at each facility. To provide redundancy, a second lamp will be installed at both Whitingham and Jacksonville.

4.1.2 Design Criteria

The design criteria for this alternative is based off the original parameters outlined in the Basis of Design. Refer to Appendix D for this information.

4.1.3 Map

Refer to Figures 6 and 10 for a schematic floor plan that illustrates the proposed improvements to the Jacksonville and Whitingham WWTFs, respectively.

4.1.4 Environmental Impacts

This alternative involved interior work only, and site disturbance will be minimal. As mentioned in previous sections, Jacksonville is shown as being inside a Flood Hazard Area, though this delineation does not conform to the existing topography of the area. During future phases of the project additional investigations will determine where the actual Flood Hazard Area is through the Letter of Map Amendment (LOMA) process.

4.1.5 Land Requirements

This alternative would not require any additional land in order to implement.

4.1.6 Potential Construction Problems

As the site is already developed, and the extent of this alternative is to replace equipment, there will likely be few construction issues associated with this alternative.

4.1.7 Sustainability Considerations

Potable water is only used for the operator's facilities in the two WWTFs, therefore water efficiency relating to re-use and conservation is not a significant factor for any alternative considered for this report. No exterior improvements are proposed, so stormwater mitigation measures have not been considered either. All alternatives will provide additional information and operational robustness to the operator, providing a more sustainable process. By providing effluent flow metering, the operator and Town will have a better idea of the water use of the community and can make more informed decisions. By adding a generator, both plants' continued operation during power outages will continue, protecting the receiving water from raw sewage.

4.1.8 Cost Estimate

An Engineer's Opinion of Probable Cost has been prepared for the capital costs of this alternative and is shown on Table 9 for Jacksonville and Table 10 for Whitingham. For the purposes of this analysis, O&M costs are assumed to be similar to the existing system.

4.2 Alternative 2 – Sequencing Batch Reactor

This option replaces the existing RBC and clarifier with a sequencing batch reactor. All items identified at the beginning of this section are included as well.

4.2.1 Description

The Sequencing Batch Reactor (SBR) is an activated sludge process that is operated in batch fill and draw mode rather than a flow through mode. SBRs provides secondary biological treatment and secondary clarification in a single tank. SBR systems typically use two or more identical reactors and alternate their fill and draw cycles to allow one reactor to fill while the other processes the wastewater. SBR reactors typically have larger volumes than a comparable conventional flow through design, but as clarification takes place in the same vessel, this difference is offset. Some advantages of SBRs are:

- Good load dilution and therefore accommodate shock loads well,
- ideal settling conditions with no need for conventional clarifier mechanisms, and
- Nitrogen removal can occur by adjustment of the operating conditions.

Disadvantages include the following:

- Need for equalization after the SBR to buffer the higher discharge rates from batch flow,
- larger overall tank volumes than comparable conventional flow through systems to accommodate high flow events, and
- A steeper learning curve for operators accustomed to their existing process.

In low flow applications like Jacksonville and Whitingham a single SBR reactor with equalization on influent and effluent is sometimes used. Influent equalization temporarily stores influent while the reactor is in settle and decant modes. Effluent equalization allows the discharge flow rate of the SBR to average out, reducing the size of downstream equipment and maintaining a consistent discharge to the receiving water. Both Whitingham and Jacksonville WWTFs include influent equalization with a volume of 100% of the design average flow at Whitingham and 50% of design average flow at Jacksonville. For our assessment of this alternative effluent equalization tanks were not provided, and the UV disinfection units are upsized to accommodate the higher peak flow. At Whitingham, the increased peak flow rate is not an issue as the receiving water as the Harriman Reservoir is very large with respect to the small daily flow processed by the that WWTF. The flows at Jacksonville, however, are larger and the discharge is to the North Branch of the Deerfield River, a smaller water body. To limit the potential impacts to the receiving water from high short-term flows and recognizing that the influent equalization volume is only 50% of the design average flow, two SBR reactors are proposed for Jacksonville to reduce the individual batch working volumes and lower the peak discharge flow rate. This will also serve as a redundancy measure. At Whitingham, spare parts of critical system components (e.g. blowers, aeration grids, etc) will be kept on-hand in case of a system upset.

For this alternative, the following tasks related to the process equipment will be performed:

<u>Sequencing Batch Reactor</u>

Table 9

Whitingham 20-Year Evaluation & Preliminary Engineering Report

Preliminary Opinion of Project Cost

Jacksonville Alternative 1: Replacement of Existing Equipment In-Kind

Item No.	Description	Unit	Est. Qty.	Cost/Unit	Total Cost
1	General				
	Mobilization/Demobilization	L.S.	1	$ 56,900	$ 56,900
	Bonds and Insurance (8%)	L.S.	1	$ 91,040	$ 91,000
	General Conditions (5%)	L.S.	1	$ 56,900	$ 56,900
				General	$205,000
2	Demolition				
	Roof Demolition	S.F.	2,000	$ 7	$ 13,000
	Drywall Demolition	S.F.	5,900	$ 0.50	$ 3,000
	Plumbing Demolition	L.S.	1	$ 1,500	$ 1,500
	Process Piping Demolition	L.S.	1	$ 2,500	$ 2,500
	HVAC Demo	L.S.	1	$ 5,000	$ 5,000
	Electrical Demolition	L.S.	1	$ 2,000	$ 2,000
	Demo Bubbler Level Control System	L.S.	1	$ 1,500	$ 1,500
	Demo UV control panel	L.S.	1	$ 1,000	$ 1,000
	Demo Pump control panel	L.S.	1	$ 1,500	$ 1,500
	Demo EQ tank aeration equipment	L.S.	1	$ 3,000	$ 3,000
	Disposal	L.S.	1	$ 3,000	$ 3,000
				Demolition	$37,000
3	Temporary Treatment (both plants)				
	Mobilization & Demobilization	L.S.	1	$ 20,000	$ 20,000
	Training	L.S.	1	$ 10,000	$ 10,000
	Extended Aeration Temporary Treatment System	Mo.	6	$ 16,500	$ 99,000
	Install and Remove Temporary Power	L.S.	1	$ 25,000	$ 25,000
	Crushed Stone Pad	S.F.	500	$ 75	$ 37,500
	Temporary Piping	L.S.	1	$ 7,000	$ 7,000
	Outfall Connection MH	Ea.	1	$ 5,000	$ 5,000
	Electric	kWh	9,700	$ 0.15	$ 1,500
	Installation	L.S.	1	$ 8,000	$ 8,000
	Site Restoration/Erosion Control	L.S.	1	$ 7,500	$ 7,500
		Temporary Treatment (both plants)			$221,000
3	Building Improvements				
	Insulation and New Clapboards	S.F.	1,900	$ 20	$ 38,000
	New Roof	S.F.	2,000	$ 20	$ 40,000
	Door Replacement	Ea.	1	$ 2,500	$ 2,500
	Window Replacement	Ea.	4	$ 1,000	$ 4,000
	New Interior Drywall	S.F.	5,900	$ 10	$ 59,000
	Interior Painting	S.F.	5,900	$ 3	$ 17,700
	Domestic Hot Water	L.S.	1	$ 2,000	$ 2,000
	Backflow Preventer	L.S.	1	$ 2,500	$ 2,500
	Plumbing Fixtures	L.S.	1	$ 2,500	$ 2,500
	Office Space Ventilation/AC	L.S.	1	$ 4,000	$ 4,000
	Unit Heatrs	Ea.	4	$ 1,500	$ 6,000
	Dehumidifier	L.S.	1	$ 5,000	$ 5,000
	Exhaust Fans	L.S.	1	$ 3,500	$ 3,500
	Power Distribution	L.S.	1	$ 30,000	$ 30,000
	Lighting - Reinstallation of Existing LEDs	Ea.	1	$ 250	$ 300
	Emergency Power Generator	Ea.	1	$ 50,000	$ 50,000

Table 9

Whitingham 20-Year Evaluation & Preliminary Engineering Report

Preliminary Opinion of Project Cost

Jacksonville Alternative 1: Replacement of Existing Equipment In-Kind

Item No.	Description	Unit	Est. Qty.	Cost/Unit	Total Cost
			Building Improvements		$267,000
4	Site Work				
	Replace Well Pump	L.S.	1	$ 3,000	$ 3,000
				Site Work	$3,000
5	Process Equipment				
	Sub-Slab Tankage Ventilation (Blower & Ducting)	L.S.	1	$ 35,000	$ 35,000
	Replacement EQ Blowers	L.S.	1	$ 30,000	$ 30,000
	Grout Tank Floor to Slope	CY	25	$ 150	$ 3,800
	Replace Forward Flow Pump	L.S.	1	$ 5,000	$ 5,000
	Replace VFD for Forward Flow Pump 1	Ea.	1	$ 5,000	$ 5,000
	New EQ Tank Pressure Transducer	Ea.	1	$ 1,500	$ 1,500
	New Integrated Control Panel	Ea.	1	$ 65,000	$ 65,000
	Replace RBC Unit	Ea.	1	$ 150,000	$ 150,000
	Replace Clarifier	L.S.	1	$ 119,000	$ 119,000
	New Effluent Flow Meter	Ea.	1	$ 4,000	$ 4,000
	New UV Unit	Ea.	1	$ 5,000	$ 5,000
	Equipment Installation	L.S.	1	$ 100,491	$ 100,500
	Control Wiring	L.S.	1	$ 15,000	$ 15,000
				Process Equipment	$539,000
6	Collection System				
	Collection System Improvements	L.S.	1	$ 71,000	$ 71,000
				Collection System	$71,000
				Construction Subtotal	$1,343,000
				Engineering (23%)	$309,000
				Project Contingencies (30%)	$496,000
				TOTAL OPINION OF PROJECT COST	$2,150,000

Notes:

1- *Engineering New Record (ENR) Construction Cost Index (CCI) for December 2018 is 11093.47*

2- *Subtotal amounts have been rounded to the next $1,000.*

3- *Overall anticipated project cost has been rounded to the next $10,000.*

4- *Anticipated costs have been developed based on similar recent projects, and equipment manufacturer's cost data.*

5- *Permitting costs have not been included.*

6- *Contractor's OH&P are included in the unit prices.*

7- *Start-up and Operator Training is included in the listed equipment costs.*

8- *Project costs have been developed without benefit of final design drawings. For planning level costs, a contingency of 30% should be carried.*

Table 10

Whitingham 20-Year Evaluation & Preliminary Engineering Report

Preliminary Opinion of Project Cost

Whitingham Alternative 1: Replacement of Existing Equipment In-Kind

Item No.	Description	Unit	Est. Qty.		Cost/Unit		Total Cost
1	General						
	Mobilization/Demobilization	L.S.	1	$	34,050	$	34,100
	Bonds and Insurance (8%)	L.S.	1	$	54,480	$	54,500
	General Conditions (5%)	L.S.	1	$	34,050	$	34,100
					General		$123,000
2	Demolition						
	Roof Demolition	S.F.	1,000	$	7	$	7,000
	Drywall Demolition	S.F.	2,700	$	0.50	$	1,400
	Plumbing Demolition	L.S.	1	$	1,000	$	1,000
	HVAC Demo	L.S.	1	$	10,000	$	10,000
	Electrical Demolition	L.S.	1	$	2,000	$	2,000
	Demo Bubbler Level Control System	L.S.	1	$	1,500	$	1,500
	Demo UV control panel	L.S.	1	$	1,000	$	1,000
	Demo Pump control panel	L.S.	1	$	1,500	$	1,500
	Disposal	L.S.	1	$	2,400	$	2,400
					Demolition		$28,000
3	Temporary Treatment						
	Pump/Haul to Jacksonville	Day	90	$	500	$	45,000
					Temporary Treatment		$45,000
3	Building Improvements						
	Insulation and New Clapboards	S.F.	1,500	$	20	$	30,000
	New Roof	S.F.	1,000	$	20	$	20,000
	Door Replacement	Ea.	2	$	2,500	$	5,000
	Window Replacement	Ea.	4	$	800	$	3,200
	New Interior Drywall	S.F.	2,700	$	10	$	27,000
	Domestic Hot Water	L.S.	1	$	2,000	$	2,000
	Backflow Preventer	L.S.	1	$	2,500	$	2,500
	Plumbing Fixtures	L.S.	1	$	2,500	$	2,500
	Unit Heatrs	Ea.	3	$	1,500	$	4,500
	Dehumidifier	L.S.	1	$	5,000	$	5,000
	Exhaust Fans	L.S.	1	$	1,000	$	1,000
	Interior Painting	S.F.	2,700	$	3	$	8,100
	Power Distribution	L.S.	1	$	20,000	$	20,000
	Lighting - Reinstallation of Existing LEDs	Ea.	11	$	250	$	2,800
	Emergency Power Generator	Ea.	1	$	25,000	$	25,000
					Building Improvements		$159,000
4	Site Work						
	Pump Station Pump Replacement	L.S.	1	$	5,000	$	5,000
	Effluent MH Repair	L.S.	1	$	3,000	$	3,000
	Retaining Wall Repair	L.F.	120	$	100	$	12,000
					Site Work		$20,000
5	Process Equipment						

Table 10

Whitingham 20-Year Evaluation & Preliminary Engineering Report

Preliminary Opinion of Project Cost

Whitingham Alternative 1: Replacement of Existing Equipment In-Kind

Item No.	Description	Unit	Est. Qty.	Cost/Unit	Total Cost
	Sub-Slab Tankage Ventilation (Blower & Ducting)	L.S.	1	$ 20,000	$ 20,000
	Grout Tank Floor to Slope	CY	10	$ 150	$ 1,500
	Replace Forward Flow Pump	L.S.	1	$ 3,000	$ 3,000
	Replace VFD for Forward Flow Pump 1	Ea.	1	$ 5,000	$ 5,000
	New EQ Tank Pressure Transducer	Ea.	1	$ 1,500	$ 1,500
	New Integrated Control Panel	Ea.	1	$ 65,000	$ 65,000
	Replace RBC Unit	Ea.	1	$ 150,000	$ 150,000
	Replace Clarifier	L.S.	1	$ 60,000	$ 60,000
	New Effluent Flow Meter	Ea.	1	$ 4,000	$ 4,000
	New UV Unit	Ea.	1	$ 3,000	$ 3,000
	Equipment Installation	L.S.	1	$ 74,433	$ 74,400
	Control Wiring	L.S.	1	$ 15,000	$ 15,000
				Process Equipment	$403,000
6	Collection System				
	Collection System Improvements	L.S.	1	$ 26,000	$ 26,000
				Collection System	$26,000
				Construction Subtotal	$804,000
				Engineering (23%)	$185,000
				Project Contingencies (30%)	$297,000
				TOTAL OPINION OF PROJECT COST	$1,290,000

Notes:

1- *Engineering New Record (ENR) Construction Cost Index (CCI) for December 2018 is 11093.47*
2- *Subtotal amounts have been rounded to the next $1,000.*
3- *Overall anticipated project cost has been rounded to the next $10,000.*
4- *Anticipated costs have been developed based on similar recent projects, and equipment manufacturer's cost data.*
5- *Permitting costs have not been included.*
6- *Contractor's OH&P are included in the unit prices.*
7- *Start-up and Operator Training is included in the listed equipment costs.*
8- *Project costs have been developed without benefit of final design drawings. For planning level costs, a contingency of 30% should be carried.*

Building Addition
As the space under the building is taken up by tankage, a building addition will be required to house the SBR units. The reactor tanks will be installed below grade; for this preliminary analysis circular plastic or fiberglass tankage is assumed.

SBR Reactors
At the Jacksonville WWTF, the reactors have been sized as 17-foot diameter, 14-foot deep vessels. For Whitingham, a single 12-foot diameter, 14-foot deep vessel has been sized. These vessels would contain a diffused aeration system with blowers, diffuser grid, and air supply piping. Decant mechanisms are included, and the controls would be integrated into the single panel provided as in the common system improvements described at the beginning of this section.

<u>Secondary Clarifiers</u>
These units will be demolished and removed from the facilities.

<u>UV Disinfection System</u>
The UV system will be upsized to account for the higher discharge flow rates associated with the SBR.

4.2.2 Design Criteria

Sizing of this process was performed with BioWin, a wastewater treatment process simulator that ties together biological, chemical and physical process models. Preliminary SBR sizing for this alternative is based on typical SBR design hydraulic retention time at high water level and design average day flows of approximately 20 to 24 hours and a working volume of 1/3 of the total reactor liquid volume at high water. **Table 11** provides a summary of the preliminary SBR sizing for both facilities.

Table 11: Summary of Preliminary SBR Sizing		Whitingham WWTF	Jacksonville WWTF
Parameter		Design ADF	Design ADF
Reactor Basins			
	Number of Reactors	1	2
	Reactor Diameter. Ft	12	17
	Max SWD, ft	13	13
	Reactor Freeboard @ Max Depth, ft	1	1
	Reactor Total Depth, ft	14.0	14.0
	High Water Depth, ft	13.0	13.0
	Low Water Depth, ft	9	9
	Max Decant Depth, ft	4.0	4.0
	Reactor Volume @ High Water, gal	10,998	22,072
	Reactor Volume @ Low Water, gal	7,614	15,280
	Max Decant Volume Per Reactor, gal	3,384	6,791
	High Water Retention Time, days	0.86	0.85

	Min required cycles per day at ADF per reactor	3.8	3.8
	Max Hours per cycle	6.4	6.3
	Design Cycle Time	6	6
SBR Cycle Times			
	Average Cycle Duration, hrs	6	6
	Aerated Fill/React, hrs	3.00	3.00
	Aerated React, hrs	1.00	1.00
	Min Settle, hrs	1	1
	Min Decant, hrs	1	1
	Idle (React)	0	0
	Number of Cycles per day/reactor	4.00	4.00

4.2.3 Map

Refer to Figures 17 & 18 for a plan illustrating a conceptual layout of this alternative.

4.2.4 Environmental Impacts

This alternative will involve a building addition to provide space for the new process equipment. In Jacksonville, there is a sufficient front yard to construct the space needed without further encroaching on the river or its floodplain. As mentioned in previous sections, Jacksonville is shown as being inside a Flood Hazard Area, though this delineation does not conform to the existing topography of the area. During future phases of the project additional investigations will determine where the actual Flood Hazard Area is through the Letter of Map Amendment (LOMA) process.

In Whitingham, construction will be more complicated as the site is on a steep slope. However, with good erosion control practices this site can be expanded without an undue adverse impact to the surrounding environment.

4.2.5 Land Requirements

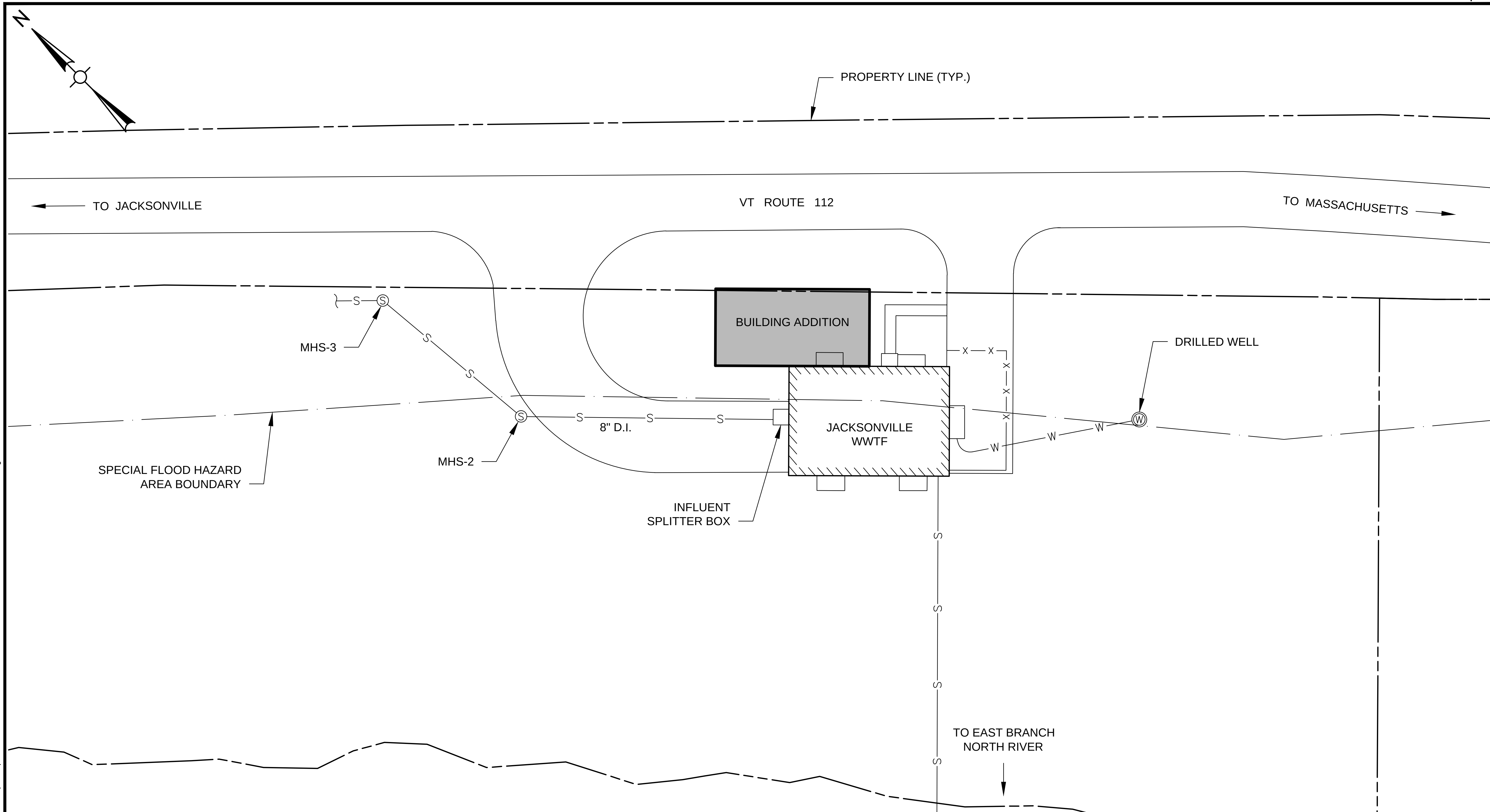
No additional land would be needed in order to implement this alternative.

4.2.6 Potential Construction Problems

Construction at Jacksonville is anticipated to be relatively straightforward if built with good practices. At Whitingham, space is constrained due to the steep slope to the west of the building and the small parcel size. The contractor will need to carefully stage their equipment and provide space for temporary storage of wastewater with access available for a pump truck to regularly drain and haul the accumulated wastewater to Jacksonville.

4.2.7 Sustainability Considerations

Implementation of this alternative would result in the use of more electricity to drive the aerated SBR system.



NO	DATE	BY	DESCRIPTION
-	-	-	-

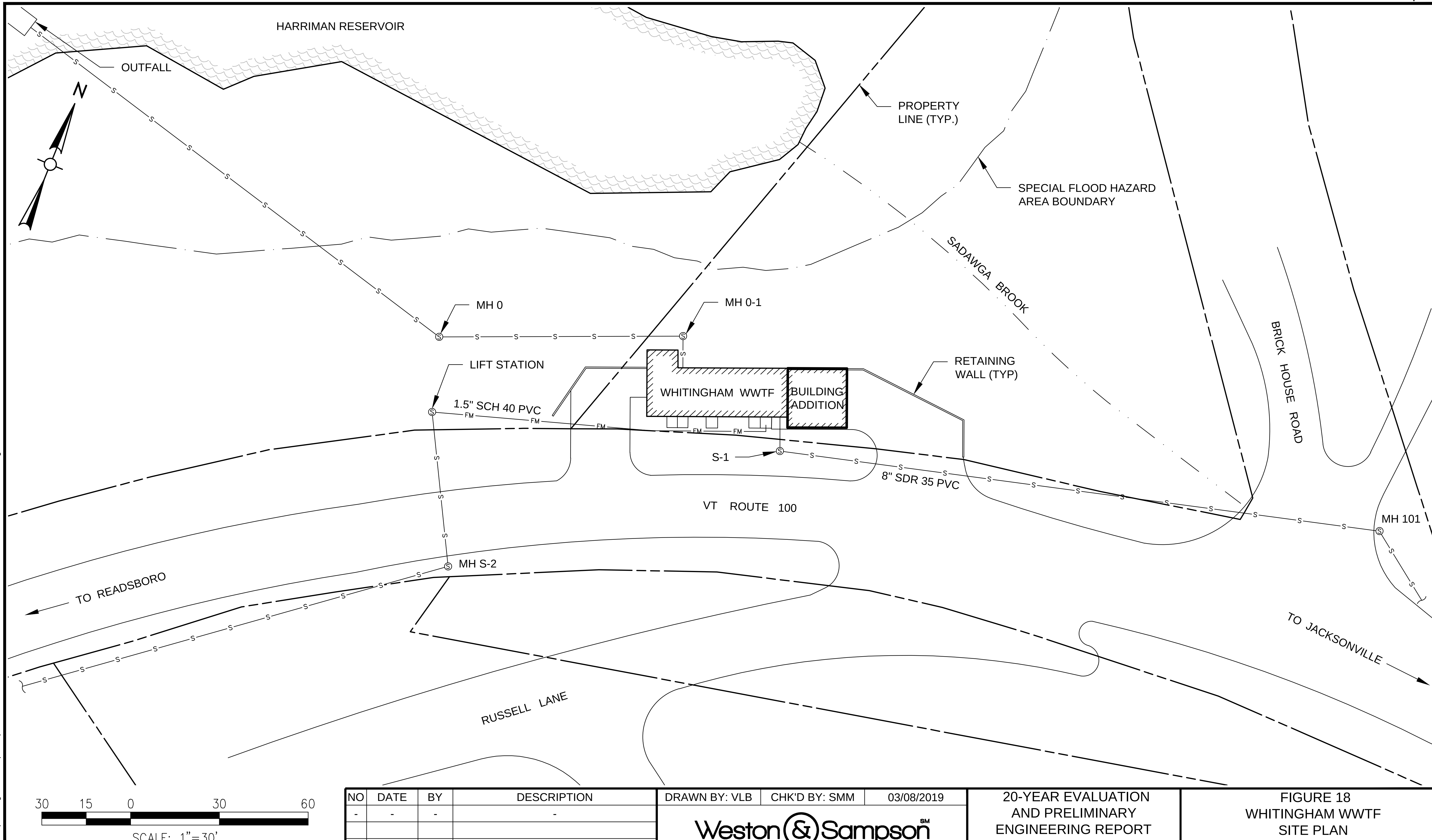
DRAWN BY: VLB | CHK'D BY: SMM | 03/08/2019

Weston & Sampson

20-YEAR EVALUATION AND PRELIMINARY ENGINEERING REPORT WHITINGHAM, VERMONT

FIGURE 17
JACKSONVILLE WWTF
SITE PLAN
ALTERNATIVES 2 & 3

P:\VT\Whitingham VT\CAD\FIGURE X - JACKSONVILLE SITE PLAN - ALTERNATIVES 2 & 3.dwg



NO	DATE	BY	DESCRIPTION
-	-	-	-

DRAWN BY: VLB | CHK'D BY: SMM | 03/08/2019

Weston & Sampson

20-YEAR EVALUATION AND PRELIMINARY ENGINEERING REPORT WHITINGHAM, VERMONT

FIGURE 18
WHITINGHAM WWTF
SITE PLAN
ALTERNATIVES 2 & 3

P:\VT\Whitingham VT\CAD\FIGURE X – WHITINGHAM SITE PLAN – ALTERNATIVES 2 & 3.dwg

4.2.8 Cost Estimate

An Engineer's Opinion of Probable Cost has been prepared for the capital costs of this alternative and is shown on Table 12 for Jacksonville and Table 13 for Whitingham. For the purposes of this analysis, O&M costs (except for electricity) are assumed to be similar to the existing system. Electricity costs are based on blower size and their continuous operation.

4.3 Alternative 3 – Moving Bed Biological Reactor

This option replaces the existing RBC and clarifier with a moving bed biological reactor. All items identified at the beginning of this section are included as well.

4.3.1 Description

MBBRs are a form of fixed film or "attached growth" process and will produce reactor effluent solids that are similar in character and quantity to that produced by the RBCs. Because neither the flows or solids loads are expected to be significantly different than the RBCs and the existing clarifiers have performed adequately for many years, a new clarifier (similar to Alternative 1) will be provided.

A Moving Bed Biological Reactor (MBBR) employs plastic media to provide surface area to provide a substrate for biological growth. The critical process design characteristics are the surface area of the media (surface area of media per unit volume) and the available volume of the reactor as a percent of total reactor volume. Typical volumes range from 30 to 65%. The process is aerobic and aeration is typically provided by diffused air. Systems using floating media also require good screening of influent to remove stringy materials that can entwine with the media creating large "clusters" reducing the effectiveness and ultimately requiring replacement of media. These systems also require screens on the effluent of the reactor to retain the media so that it does not escape the reactor to the clarifier. Some advantages of MBBRs are:

- No need for sludge return from the clarifier as in a conventional suspended growth process,
- No risk of biomass loss due to poor solids settling characteristics,
- Good shock load recovery, and
- Provides mechanical media sloughing through scrubbing action of moving media not provided in an RBC.

Disadvantages include the following:

- Requires screening of influent in excess of the other alternatives,
- Requires sufficient tank depth for efficient diffused aeration oxygen transfer, typically 10 to 12 feet.

For this alternative, the following tasks related to the process equipment will be performed:

<u>Moving Bed Biological Reactor</u>
Building Addition
As the space under the building is taken up by tankage, a building addition will be required to house the MBBR units. The reactor tanks will be installed below grade; for this preliminary analysis circular plastic or fiberglass tankage is assumed.

Table 12

Whitingham 20-Year Evaluation & Preliminary Engineering Report

Preliminary Opinion of Project Cost

Jacksonville Alternative 2: Sequencing Batch Reactor

Item No.	Description	Unit	Est. Qty.	Cost/Unit	Total Cost
1	General				
	Mobilization/Demobilization	L.S.	1	$ 73,650	$ 73,700
	Bonds and Insurance (8%)	L.S.	1	$ 117,840	$ 117,800
	General Conditions (5%)	L.S.	1	$ 73,650	$ 73,700
				General	$266,000
2	Demolition				
	Roof Demolition	S.F.	2,000	$ 7	$ 13,000
	Drywall Demolition	S.F.	5,900	$ 0.50	$ 3,000
	Plumbing Demolition	L.S.	1	$ 1,500	$ 1,500
	Process Piping Demolition	L.S.	1	$ 2,500	$ 2,500
	HVAC Demo	L.S.	1	$ 5,000	$ 5,000
	Electrical Demolition	L.S.	1	$ 2,000	$ 2,000
	Demo Bubbler Level Control System	L.S.	1	$ 1,500	$ 1,500
	Demo UV control panel	L.S.	1	$ 1,000	$ 1,000
	Demo Pump control panel	L.S.	1	$ 1,500	$ 1,500
	Demo EQ tank aeration equipment	L.S.	1	$ 3,000	$ 3,000
	Disposal	L.S.	1	$ 3,000	$ 3,000
				Demolition	$37,000
3	Temporary Treatment (both plants)				
	Mobilization & Demobilization	L.S.	1	$ 20,000	$ 20,000
	Training	L.S.	1	$ 10,000	$ 10,000
	Extended Aeration Temporary Treatment System	Mo.	6	$ 16,500	$ 99,000
	Install and Remove Temporary Power	L.S.	1	$ 25,000	$ 25,000
	Crushed Stone Pad	S.F.	500	$ 75	$ 37,500
	Temporary Piping	L.S.	1	$ 7,000	$ 7,000
	Outfall Connection MH	Ea.	1	$ 5,000	$ 5,000
	Electric	kWh	9,700	$ 0.15	$ 1,500
	Installation	L.S.	1	$ 8,000	$ 8,000
	Site Restoration/Erosion Control	L.S.	1	$ 7,500	$ 7,500
		Temporary Treatment (both plants)			$221,000
3	Building Improvements				
	Building Addition	S.F.	1,250	$ 260	$ 325,000
	Building Excavation	C.Y.	326	$ 16	$ 5,200
	Backfill & Compaction	C.Y.	93	$ 50	$ 4,700
	Base Slab	C.Y.	32	$ 375	$ 12,000
	Tank Walls	C.Y.	31	$ 375	$ 11,600
	Insulation and New Clapboards	S.F.	1,900	$ 20	$ 38,000
	New Roof	S.F.	2,000	$ 20	$ 40,000
	Door Replacement	Ea.	1	$ 2,500	$ 2,500
	Window Replacement	Ea.	4	$ 1,000	$ 4,000
	New Interior Drywall	S.F.	5,900	$ 10	$ 59,000
	Interior Painting	S.F.	5,900	$ 3	$ 17,700
	Domestic Hot Water	L.S.	1	$ 2,000	$ 2,000
	Backflow Preventer	L.S.	1	$ 2,500	$ 2,500
	Plumbing Fixtures	L.S.	1	$ 2,500	$ 2,500
	Office Space Ventilation/AC	L.S.	1	$ 4,000	$ 4,000
	Unit Heatrs	Ea.	4	$ 1,500	$ 6,000

Table 12

Whitingham 20-Year Evaluation & Preliminary Engineering Report

Preliminary Opinion of Project Cost

Jacksonville Alternative 2: Sequencing Batch Reactor

Item No.	Description	Unit	Est. Qty.		Cost/Unit		Total Cost
	Dehumidifier	L.S.	1	$	5,000	$	5,000
	Exhaust Fans	L.S.	1	$	3,500	$	3,500
	Power Distribution	L.S.	1	$	30,000	$	30,000
	Lighting - Reinstallation of Existing LEDs	Ea.	1	$	250	$	300
	Emergency Power Generator	Ea.	1	$	50,000	$	50,000
					Building Improvements		$626,000
4	Site Work						
	Replace Well Pump	L.S.	1	$	3,000	$	3,000
					Site Work		$3,000
5	Process Equipment						
	Sub-Slab Tankage Ventilation (Blower & Ducting)	L.S.	1	$	35,000	$	35,000
	Replacement EQ Blowers	L.S.	1	$	30,000	$	30,000
	Grout Tank Floor to Slope	CY	25	$	150	$	3,800
	Replace Forward Flow Pump	L.S.	1	$	5,000	$	5,000
	Replace VFD for Forward Flow Pump 1	Ea.	1	$	5,000	$	5,000
	New EQ Tank Pressure Transducer	Ea.	1	$	1,500	$	1,500
	New Integrated Control Panel	Ea.	1	$	65,000	$	65,000
	SBR Package	Ea.	1	$	250,000	$	250,000
	New Effluent Flow Meter	Ea.	1	$	4,000	$	4,000
	New UV Unit	Ea.	1	$	5,000	$	5,000
	Equipment Installation	L.S.	1	$	95,589	$	95,600
	Control Wiring	L.S.	1	$	15,000	$	15,000
					Process Equipment		$515,000
6	Collection System						
	Collection System Improvements	L.S.	1	$	71,000	$	71,000
					Collection System		$71,000
					Construction Subtotal		$1,739,000
					Engineering (23%)		$400,000
					Project Contingencies (30%)		$642,000
					TOTAL OPINION OF PROJECT COST		$2,790,000

Notes:

1- *Engineering New Record (ENR) Construction Cost Index (CCI) for December 2018 is 11093.47*

2- *Subtotal amounts have been rounded to the next $1,000.*

3- *Overall anticipated project cost has been rounded to the next $10,000.*

4- *Anticipated costs have been developed based on similar recent projects, and equipment manufacturer's cost data.*

5- *Permitting costs have not been included.*

6- *Contractor's OH&P are included in the unit prices.*

7- *Start-up and Operator Training is included in the listed equipment costs.*

8- *Project costs have been developed without benefit of final design drawings. For planning level costs, a contingency of 30% should be carried.*

Table 13

Whitingham 20-Year Evaluation & Preliminary Engineering Report

Preliminary Opinion of Project Cost

Whitingham Alternative 2: Sequencing Batch Reactor

Item No.	Description	Unit	Est. Qty.	Cost/Unit	Total Cost
1	General				
	Mobilization/Demobilization	L.S.	1	$ 44,200	$ 44,200
	Bonds and Insurance (8%)	L.S.	1	$ 70,720	$ 70,700
	General Conditions (5%)	L.S.	1	$ 44,200	$ 44,200
				General	$160,000
2	Demolition				
	Roof Demolition	S.F.	1,000	$ 7	$ 7,000
	Drywall Demolition	S.F.	2,700	$ 0.50	$ 1,400
	Plumbing Demolition	L.S.	1	$ 1,000	$ 1,000
	HVAC Demo	L.S.	1	$ 10,000	$ 10,000
	Electrical Demolition	L.S.	1	$ 2,000	$ 2,000
	Demo Bubbler Level Control System	L.S.	1	$ 1,500	$ 1,500
	Demo UV control panel	L.S.	1	$ 1,000	$ 1,000
	Demo Pump control panel	L.S.	1	$ 1,500	$ 1,500
	Disposal	L.S.	1	$ 2,400	$ 2,400
				Demolition	$28,000
3	Temporary Treatment				
	Pump/Haul to Jacksonville	Day	90	$ 500	$ 45,000
				Temporary Treatment	$45,000
3	Building Improvements				
	Building Addition	S.F.	450	$ 260	$ 117,000
	Building Excavation	C.Y.	110	$ 16	$ 1,800
	Backfill & Compaction	C.Y.	34	$ 50	$ 1,700
	Base Slab	C.Y.	12	$ 375	$ 4,500
	Tank Walls	C.Y.	13	$ 375	$ 4,900
	Insulation and New Clapboards	S.F.	1,900	$ 20	$ 38,000
	Insulation and New Clapboards	S.F.	1,500	$ 20	$ 30,000
	New Roof	S.F.	1,000	$ 20	$ 20,000
	Door Replacement	Ea.	2	$ 2,500	$ 5,000
	Window Replacement	Ea.	4	$ 800	$ 3,200
	New Interior Drywall	S.F.	2,700	$ 10	$ 27,000
	Domestic Hot Water	L.S.	1	$ 2,000	$ 2,000
	Backflow Preventer	L.S.	1	$ 2,500	$ 2,500
	Plumbing Fixtures	L.S.	1	$ 2,500	$ 2,500
	Unit Heatrs	Ea.	3	$ 1,500	$ 4,500
	Dehumidifier	L.S.	1	$ 5,000	$ 5,000
	Exhaust Fans	L.S.	1	$ 1,000	$ 1,000
	Interior Painting	S.F.	2,700	$ 3	$ 8,100
	Power Distribution	L.S.	1	$ 20,000	$ 20,000
	Lighting - Reinstallation of Existing LEDs	Ea.	11	$ 250	$ 2,800
	Emergency Power Generator	Ea.	1	$ 25,000	$ 25,000
				Building Improvements	$327,000
4	Site Work				
	Pump Station Pump Replacement	L.S.	1	$ 5,000	$ 5,000

Table 13

Whitingham 20-Year Evaluation & Preliminary Engineering Report

Preliminary Opinion of Project Cost

Whitingham Alternative 2: Sequencing Batch Reactor

Item No.	Description	Unit	Est. Qty.	Cost/Unit	Total Cost
	Effluent MH Repair	L.S.	1	$ 3,000	$ 3,000
	Retaining Wall Repair	L.F.	120	$ 100	$ 12,000
				Site Work	$20,000
5	Process Equipment				
	Sub-Slab Tankage Ventilation (Blower & Ducting)	L.S.	1	$ 20,000	$ 20,000
	Grout Tank Floor to Slope	CY	10	$ 150	$ 1,500
	Replace Forward Flow Pump	L.S.	1	$ 3,000	$ 3,000
	Replace VFD for Forward Flow Pump 1	Ea.	1	$ 5,000	$ 5,000
	New EQ Tank Pressure Transducer	Ea.	1	$ 1,500	$ 1,500
	New Integrated Control Panel	Ea.	1	$ 65,000	$ 65,000
	SBR Package	Ea.	1	$ 238,000	$ 238,000
	New Effluent Flow Meter	Ea.	1	$ 4,000	$ 4,000
	New UV Unit	Ea.	1	$ 3,000	$ 3,000
	Equipment Installation	L.S.	1	$ 81,657	$ 81,700
	Control Wiring	L.S.	1	$ 15,000	$ 15,000
				Process Equipment	$438,000
6	Collection System				
	Collection System Improvements	L.S.	1	$ 26,000	$ 26,000
				Collection System	$26,000
				Construction Subtotal	$1,044,000
				Engineering (23%)	$240,000
				Project Contingencies (30%)	$385,000
				TOTAL OPINION OF PROJECT COST	$1,670,000

Notes:

1- *Engineering New Record (ENR) Construction Cost Index (CCI) for December 2018 is 11093.47*

2- *Subtotal amounts have been rounded to the next $1,000.*

3- *Overall anticipated project cost has been rounded to the next $10,000.*

4- *Anticipated costs have been developed based on similar recent projects, and equipment manufacturer's cost data.*

5- *Permitting costs have not been included.*

6- *Contractor's OH&P are included in the unit prices.*

7- *Start-up and Operator Training is included in the listed equipment costs.*

8- *Project costs have been developed without benefit of final design drawings. For planning level costs, a contingency of 30% should be carried.*

MBBR Reactors

At the Jacksonville WWTF, the reactors have been sized as 14.5-foot diameter, 12-foot deep vessels. For Whitingham, a single 10.5-foot diameter, 12-foot deep vessel has been sized. These vessels would contain a diffused aeration system with blowers, diffuser grid, and air supply piping. Media for fixed growth will be provided and effluent retention screens as well. The controls would be integrated into the single panel provided as in the common system improvements described at the beginning of this section.

Secondary Clarifiers

New clarifiers will be provided at each facility, similar in size to the existing process.

UV Disinfection System

Only one lamp is currently in operation at each facility. To provide redundancy, a second lamp will be installed at both Whitingham and Jacksonville.

4.3.2 Design Criteria

The preliminary MBBR sizing for this alternative is based on using media with a specific surface area of 150 sq.ft./cu.ft. (Typical for Kaldnes K1 media) and a media fill volume of 50% of the reactor. Table 14 provides a summary of the preliminary MBBR sizing for both facilities based on BioWin modeling.

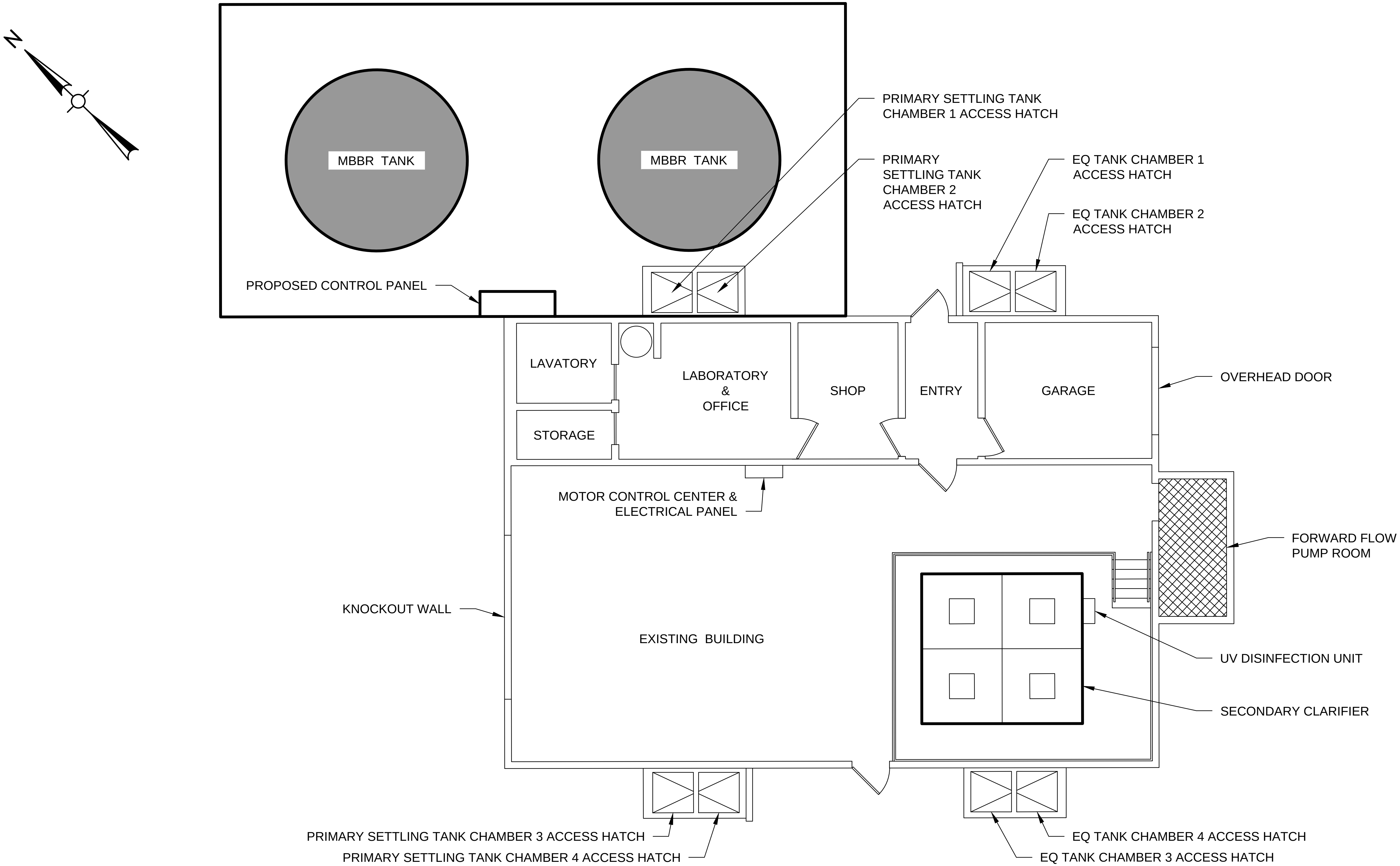
Table 14: Summary of Preliminary MBBR Sizing		
No. of Units	1	2
Diameter, ft	10.4	14.5
SWD, ft	11	11
Freeboard, ft	1	1
Volume each tank, gal	6,990	13,587
Total Reactor Volume. Gal	6,990	27,174
% Media Fill	50	50
Media Specifc Surface Area, ft2/ft3	150	150
Total Media Surface Area, sq ft	70,083	272,464
Reactor HRT, hrs	12	12
Media Organic Loading, lbsBOD/d/sq.ft.	0.21	0.22

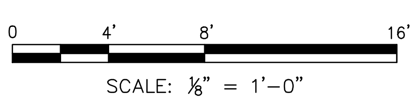
4.3.3 Map

Refer to Figures 19 & 20 for a plan illustrating a conceptual layout of this alternative.

4.3.4 Environmental Impacts

This alternative will involve a building addition to provide space for the new process equipment. In Jacksonville, there is a sufficient front yard to construct the space needed without further encroaching on the river or its floodplain. As mentioned in previous sections, Jacksonville is shown as being inside a Flood Hazard Area, though this delineation does not conform to the existing topography of the area. During future phases of the project additional investigations will determine where the actual Flood Hazard Area is through the Letter of Map Amendment (LOMA) process.





NO	DATE	BY	DESCRIPTION
-	-	-	-

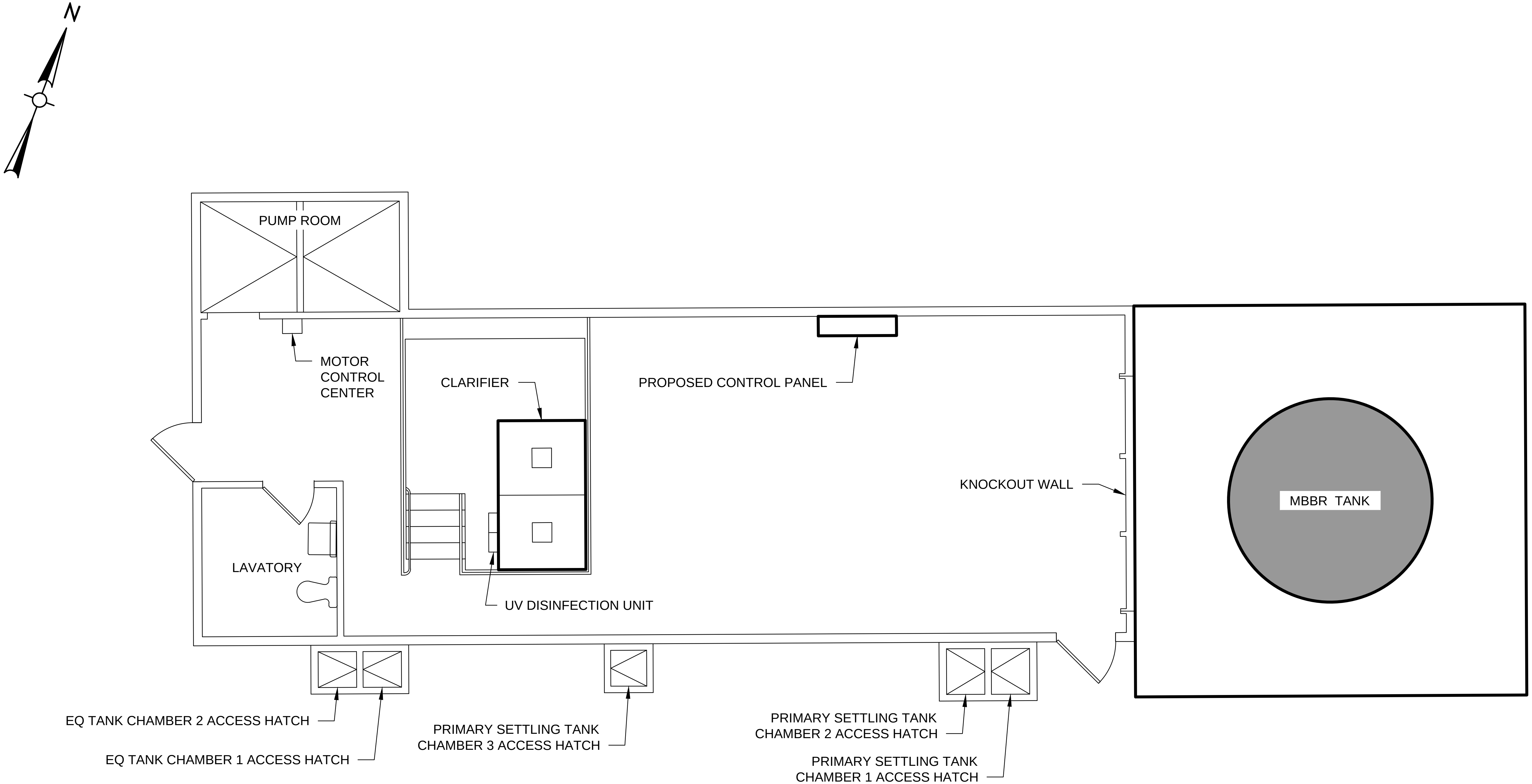
DRAWN BY: EMG | CHK'D BY: SMM | 03/08/2019

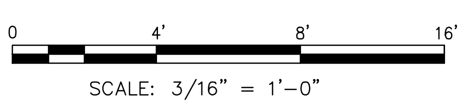
Weston & Sampson

20-YEAR EVALUATION
AND PRELIMINARY
ENGINEERING REPORT
WHITINGHAM, VERMONT

FIGURE 19
JACKSONVILLE WWTF
FLOOR PLAN
ALTERNATIVE 3: MBBR

P:\VT\Whitingham VT\CAD\FIGURE XX - JACKSONVILLE FLOOR PLAN - ALTERNATIVE 3.dwg





NO	DATE	BY	DESCRIPTION
-	-	-	-

DRAWN BY: EMG | CHK'D BY: SMM | 03/08/2019

Weston & Sampson

20-YEAR EVALUATION
AND PRELIMINARY
ENGINEERING REPORT
WHITINGHAM, VERMONT

FIGURE 20
WHITINGHAM WWTF
FLOOR PLAN
ALTERNATIVE 3: MBBR

P:\VT\Whitingham VT\CAD\FIGURE XX – WHITINGHAM FLOOR PLAN – ALTERNATIVE 3.dwg

In Whitingham, construction will be more complicated as the site is on a steep slope. However, with good erosion control practices this site can be expanded without an undue adverse impact to the surrounding environment.

4.3.5 Land Requirements

No additional land would be needed in order to implement this alternative.

4.3.6 Potential Construction Problems

Construction at Jacksonville is anticipated to be relatively straightforward if built with good practices. At Whitingham, space is constrained due to the steep slope to the west of the building and the small parcel size. The contractor will need to carefully stage their equipment and provide space for temporary storage of wastewater with access available for a pump truck to regularly drain and haul the accumulated wastewater to Jacksonville.

4.3.7 Sustainability Considerations

Implementation of this alternative would result in the use of more electricity to drive the aerated MBBR system.

4.3.8 Cost Estimate

An Engineer's Opinion of Probable Cost has been prepared for the capital costs of this alternative and is shown on Table 15 for Jacksonville and Table 16 for Whitingham. For the purposes of this analysis, O&M costs (except electricity) are assumed to be similar to the existing system. Electricity costs are based on blower size and their continuous operation.

4.4 Alternative 4: BioMax Treatment System

This option replaces the RBCs with the Aqua BioMax treatment system.

4.4.1 Description

This process is a combination of RBC and cloth media filtration. The media filtration portion of this system eliminates the need for a clarifier, and the discharge from this unit can be disinfected and discharged to the receiving water. This product is best suited for applications where flow is under 100,000 gpd.

Aqua BioMax

The existing RBC will be removed and replaced with the Aqua BioMax unit. Minor changes to influent and effluent piping will be required to connect this unit to the existing treatment train. Controls will be integrated into the panel described at the beginning of this section.

Secondary Clarifiers

The clarifiers will be demolished as part of this alternative.

UV Disinfection System

Only one lamp is currently in operation at each facility. To provide redundancy, a second lamp will be installed at both Whitingham and Jacksonville.

Table 15

Whitingham 20-Year Evaluation & Preliminary Engineering Report

Preliminary Opinion of Project Cost

Jacksonville Alternative 3: Moving Bed Biological Reactor

Item No.	Description	Unit	Est. Qty.	Cost/Unit	Total Cost
1	General				
	Mobilization/Demobilization	L.S.	1	$ 70,350	$ 70,400
	Bonds and Insurance (8%)	L.S.	1	$ 112,560	$ 112,600
	General Conditions (5%)	L.S.	1	$ 70,350	$ 70,400
				General	$254,000
2	Demolition				
	Roof Demolition	S.F.	2,000	$ 7	$ 13,000
	Drywall Demolition	S.F.	5,900	$ 0.50	$ 3,000
	Plumbing Demolition	L.S.	1	$ 1,500	$ 1,500
	Process Piping Demolition	L.S.	1	$ 2,500	$ 2,500
	HVAC Demo	L.S.	1	$ 5,000	$ 5,000
	Electrical Demolition	L.S.	1	$ 2,000	$ 2,000
	Demo Bubbler Level Control System	L.S.	1	$ 1,500	$ 1,500
	Demo UV control panel	L.S.	1	$ 1,000	$ 1,000
	Demo Pump control panel	L.S.	1	$ 1,500	$ 1,500
	Demo EQ tank aeration equipment	L.S.	1	$ 3,000	$ 3,000
	Disposal	L.S.	1	$ 3,000	$ 3,000
				Demolition	$37,000
3	Temporary Treatment (both plants)				
	Mobilization & Demobilization	L.S.	1	$ 20,000	$ 20,000
	Training	L.S.	1	$ 10,000	$ 10,000
	Extended Aeration Temporary Treatment System	Mo.	6	$ 16,500	$ 99,000
	Install and Remove Temporary Power	L.S.	1	$ 25,000	$ 25,000
	Crushed Stone Pad	S.F.	500	$ 75	$ 37,500
	Temporary Piping	L.S.	1	$ 7,000	$ 7,000
	Outfall Connection MH	Ea.	1	$ 5,000	$ 5,000
	Electric	kWh	9,700	$ 0.15	$ 1,500
	Installation	L.S.	1	$ 8,000	$ 8,000
	Site Restoration/Erosion Control	L.S.	1	$ 7,500	$ 7,500
		Temporary Treatment (both plants)			$221,000
3	Building Improvements				
	Building Addition	S.F.	1,250	$ 260	$ 325,000
	Building Excavation	C.Y.	326	$ 16	$ 5,200
	Backfill & Compaction	C.Y.	93	$ 50	$ 4,700
	Base Slab	C.Y.	32	$ 375	$ 12,000
	Tank Walls	C.Y.	31	$ 375	$ 11,600
	Insulation and New Clapboards	S.F.	1,900	$ 20	$ 38,000
	New Roof	S.F.	2,000	$ 20	$ 40,000
	Door Replacement	Ea.	1	$ 2,500	$ 2,500
	Window Replacement	Ea.	4	$ 1,000	$ 4,000
	New Interior Drywall	S.F.	5,900	$ 10	$ 59,000
	Interior Painting	S.F.	5,900	$ 3	$ 17,700
	Domestic Hot Water	L.S.	1	$ 2,000	$ 2,000
	Backflow Preventer	L.S.	1	$ 2,500	$ 2,500
	Plumbing Fixtures	L.S.	1	$ 2,500	$ 2,500
	Office Space Ventilation/AC	L.S.	1	$ 4,000	$ 4,000
	Unit Heatrs	Ea.	4	$ 1,500	$ 6,000

Table 15

Whitingham 20-Year Evaluation & Preliminary Engineering Report

Preliminary Opinion of Project Cost

Jacksonville Alternative 3: Moving Bed Biological Reactor

Item No.	Description	Unit	Est. Qty.	Cost/Unit	Total Cost
	Dehumidifier	L.S.	1	$ 5,000	$ 5,000
	Exhaust Fans	L.S.	1	$ 3,500	$ 3,500
	Power Distribution	L.S.	1	$ 30,000	$ 30,000
	Lighting - Reinstallation of Existing LEDs	Ea.	1	$ 250	$ 300
	Emergency Power Generator	Ea.	1	$ 50,000	$ 50,000
				Building Improvements	$626,000
4	Site Work				
	Replace Well Pump	L.S.	1	$ 3,000	$ 3,000
				Site Work	$3,000
5	Process Equipment				
	Sub-Slab Tankage Ventilation (Blower & Ducting)	L.S.	1	$ 35,000	$ 35,000
	Replacement EQ Blowers	L.S.	1	$ 30,000	$ 30,000
	Grout Tank Floor to Slope	CY	25	$ 150	$ 3,800
	Replace Forward Flow Pump	L.S.	1	$ 5,000	$ 5,000
	Replace VFD for Forward Flow Pump 1	Ea.	1	$ 5,000	$ 5,000
	New EQ Tank Pressure Transducer	Ea.	1	$ 1,500	$ 1,500
	New Integrated Control Panel	Ea.	1	$ 65,000	$ 65,000
	MBBR Package	Ea.	1	$ 78,000	$ 78,000
	Replace Clarifier	L.S.	1	$ 119,000	$ 119,000
	New Effluent Flow Meter	Ea.	1	$ 4,000	$ 4,000
	New UV Unit	Ea.	1	$ 5,000	$ 5,000
	Equipment Installation	L.S.	1	$ 81,915	$ 81,900
	Control Wiring	L.S.	1	$ 15,000	$ 15,000
				Process Equipment	$449,000
6	Collection System				
	Collection System Improvements	L.S.	1	$ 71,000	$ 71,000
				Collection System	$71,000
				Construction Subtotal	$1,661,000
				Engineering (23%)	$382,000
				Project Contingencies (30%)	$613,000
				TOTAL OPINION OF PROJECT COST	$2,660,000

Notes:

1- *Engineering New Record (ENR) Construction Cost Index (CCI) for December 2018 is 11093.47*

2- *Subtotal amounts have been rounded to the next $1,000.*

3- *Overall anticipated project cost has been rounded to the next $10,000.*

4- *Anticipated costs have been developed based on similar recent projects, and equipment manufacturer's cost data.*

5- *Permitting costs have not been included.*

6- *Contractor's OH&P are included in the unit prices.*

7- *Start-up and Operator Training is included in the listed equipment costs.*

8- *Project costs have been developed without benefit of final design drawings. For planning level costs, a contingency of 30% should be carried.*

Table 16

Whitingham 20-Year Evaluation & Preliminary Engineering Report

Preliminary Opinion of Project Cost

Whitingham Alternative 3: Moving Bed Biological Reactor

Item No.	Description	Unit	Est. Qty.		Cost/Unit		Total Cost
1	General						
	Mobilization/Demobilization	L.S.	1	$	37,300	$	37,300
	Bonds and Insurance (8%)	L.S.	1	$	59,680	$	59,700
	General Conditions (5%)	L.S.	1	$	37,300	$	37,300
					General		$135,000
2	Demolition						
	Roof Demolition	S.F.	1,000	$	7	$	7,000
	Drywall Demolition	S.F.	2,700	$	0.50	$	1,400
	Plumbing Demolition	L.S.	1	$	1,000	$	1,000
	HVAC Demo	L.S.	1	$	10,000	$	10,000
	Electrical Demolition	L.S.	1	$	2,000	$	2,000
	Demo Bubbler Level Control System	L.S.	1	$	1,500	$	1,500
	Demo UV control panel	L.S.	1	$	1,000	$	1,000
	Demo Pump control panel	L.S.	1	$	1,500	$	1,500
	Disposal	L.S.	1	$	2,400	$	2,400
					Demolition		$28,000
3	Temporary Treatment						
	Pump/Haul to Jacksonville	Day	90	$	500	$	45,000
					Temporary Treatment		$45,000
3	Building Improvements						
	Building Addition	S.F.	450	$	260	$	117,000
	Building Excavation	C.Y.	110	$	16	$	1,800
	Backfill & Compaction	C.Y.	34	$	50	$	1,700
	Base Slab	C.Y.	12	$	375	$	4,500
	Tank Walls	C.Y.	13	$	375	$	4,900
	Insulation and New Clapboards	S.F.	1,900	$	20	$	38,000
	Insulation and New Clapboards	S.F.	1,500	$	20	$	30,000
	New Roof	S.F.	1,000	$	20	$	20,000
	Door Replacement	Ea.	2	$	2,500	$	5,000
	Window Replacement	Ea.	4	$	800	$	3,200
	New Interior Drywall	S.F.	2,700	$	10	$	27,000
	Domestic Hot Water	L.S.	1	$	2,000	$	2,000
	Backflow Preventer	L.S.	1	$	2,500	$	2,500
	Plumbing Fixtures	L.S.	1	$	2,500	$	2,500
	Unit Heatrs	Ea.	3	$	1,500	$	4,500
	Dehumidifier	L.S.	1	$	5,000	$	5,000
	Exhaust Fans	L.S.	1	$	1,000	$	1,000
	Interior Painting	S.F.	2,700	$	3	$	8,100
	Power Distribution	L.S.	1	$	20,000	$	20,000
	Lighting - Reinstallation of Existing LEDs	Ea.	11	$	250	$	2,800
	Emergency Power Generator	Ea.	1	$	25,000	$	25,000
					Building Improvements		$327,000
4	Site Work						
	Pump Station Pump Replacement	L.S.	1	$	5,000	$	5,000

Table 16

Whitingham 20-Year Evaluation & Preliminary Engineering Report

Preliminary Opinion of Project Cost

Whitingham Alternative 3: Moving Bed Biological Reactor

Item No.	Description	Unit	Est. Qty.	Cost/Unit	Total Cost
	Effluent MH Repair	L.S.	1	$ 3,000	$ 3,000
	Retaining Wall Repair	L.F.	120	$ 100	$ 12,000
				Site Work	$20,000
5	Process Equipment				
	Sub-Slab Tankage Ventilation (Blower & Ducting)	L.S.	1	$ 20,000	$ 20,000
	Grout Tank Floor to Slope	CY	10	$ 150	$ 1,500
	Replace Forward Flow Pump	L.S.	1	$ 3,000	$ 3,000
	Replace VFD for Forward Flow Pump 1	Ea.	1	$ 5,000	$ 5,000
	New EQ Tank Pressure Transducer	Ea.	1	$ 1,500	$ 1,500
	New Integrated Control Panel	Ea.	1	$ 65,000	$ 65,000
	MBBR Package	Ea.	1	$ 68,000	$ 68,000
	Replace Clarifier	L.S.	1	$ 60,000	$ 60,000
	New Effluent Flow Meter	Ea.	1	$ 4,000	$ 4,000
	New UV Unit	Ea.	1	$ 3,000	$ 3,000
	Equipment Installation	L.S.	1	$ 53,277	$ 53,300
	Control Wiring	L.S.	1	$ 15,000	$ 15,000
				Process Equipment	$300,000
6	Collection System				
	Collection System Improvements	L.S.	1	$ 26,000	$ 26,000
				Collection System	$26,000
				Construction Subtotal	$881,000
				Engineering (23%)	$203,000
				Project Contingencies (30%)	$325,000
				TOTAL OPINION OF PROJECT COST	$1,410,000

Notes:

1- *Engineering New Record (ENR) Construction Cost Index (CCI) for December 2018 is 11093.47*

2- *Subtotal amounts have been rounded to the next $1,000.*

3- *Overall anticipated project cost has been rounded to the next $10,000.*

4- *Anticipated costs have been developed based on similar recent projects, and equipment manufacturer's cost data.*

5- *Permitting costs have not been included.*

6- *Contractor's OH&P are included in the unit prices.*

7- *Start-up and Operator Training is included in the listed equipment costs.*

8- *Project costs have been developed without benefit of final design drawings. For planning level costs, a contingency of 30% should be carried.*

4.4.2 Design Criteria

Refer to Appendix H for a design summary from the equipment manufacturer for each location.

4.4.3 Map

Refer to Figures 21 and 22 for a schematic floor plan that illustrates the proposed improvements to the Jacksonville and Whitingham WWTFs, respectively.

4.4.4 Environmental Impacts

This alternative involved interior work only, and site disturbance will be minimal. As mentioned in previous sections, Jacksonville is shown as being inside a Flood Hazard Area, though this delineation does not conform to the existing topography of the area. During future phases of the project additional investigations will determine where the actual Flood Hazard Area is through the Letter of Map Amendment (LOMA) process.

4.4.5 Land Requirements

This alternative would not require any additional land in order to implement.

4.4.6 Potential Construction Problems

As the site is already developed, and the extent of this alternative will be limited to indoors only, there will likely be few construction issues associated with this alternative.

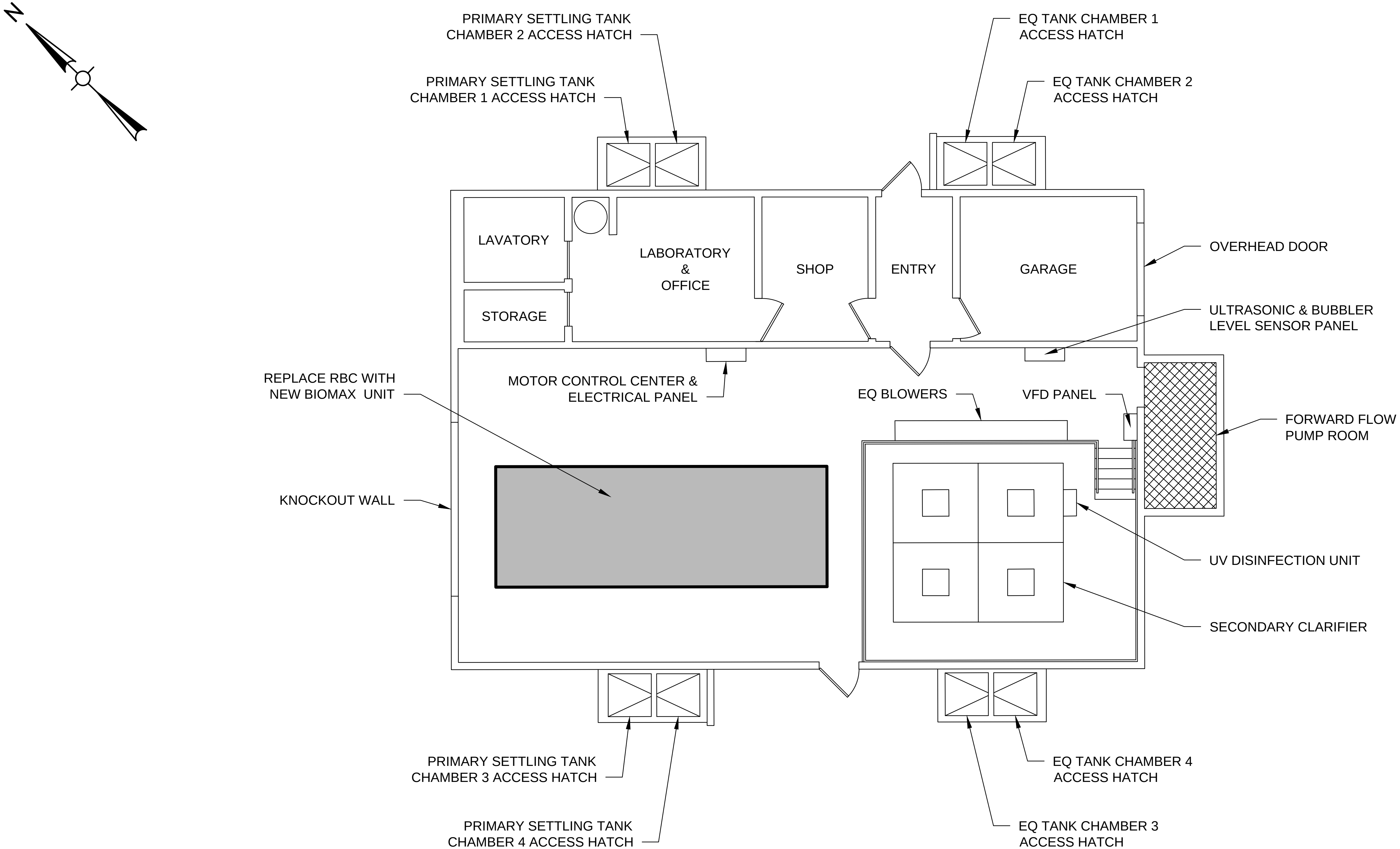
4.4.7 Sustainability Considerations

Potable water is only used for the operator's facilities in the two WWTFs, therefore water efficiency relating to re-use and conservation is not a significant factor for any alternative considered for this report. No exterior improvements are proposed, so stormwater mitigation measures have not been considered either. All alternatives will provide additional information and operational robustness to the operator, providing a more sustainable process. By providing effluent flow metering, the operator and Town will have a better idea of the water use of the community and can make more informed decisions. By adding a generator, both plants' continued operation during power outages will continue, protecting the receiving water from raw sewage.

4.4.8 Cost Estimate

An Engineer's Opinion of Probable Cost has been prepared for the capital costs of this alternative and is shown on Table 17 for Jacksonville and Table 18 for Whitingham. For the purposes of this analysis, O&M costs are assumed to be similar to the existing system.

\\wse03.local\WSE\Projects\VT\Whitingham VT\Report\whitingham - 20-yr eval + PER.docx



0 4' 8' 16'

SCALE: ⅛" = 1'–0"

NO	DATE	BY	DESCRIPTION
-	-	-	-

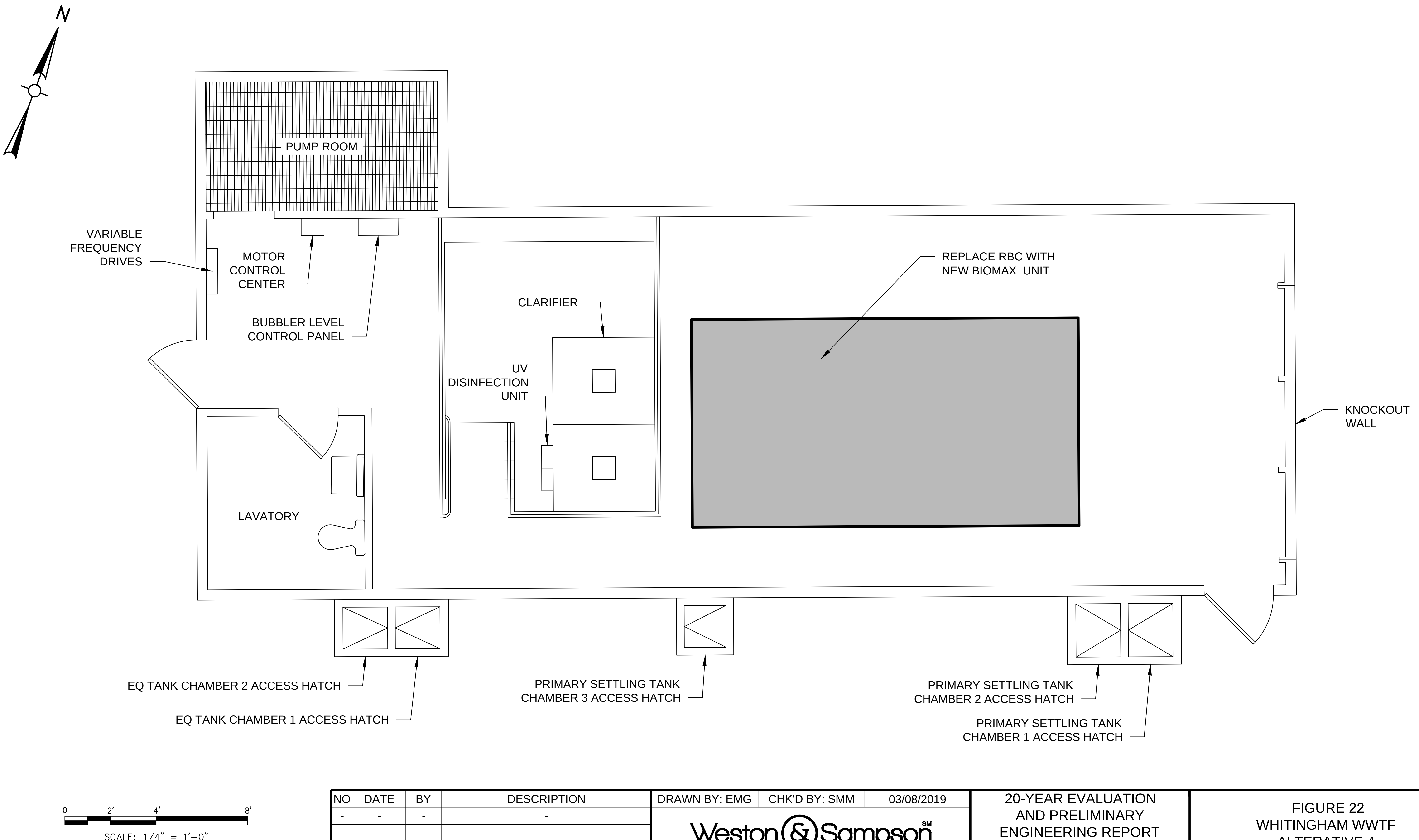
DRAWN BY: EMG | CHK'D BY: SMM | 03/08/2019

Weston & Sampson SM

20-YEAR EVALUATION AND PRELIMINARY ENGINEERING REPORT WHITINGHAM, VERMONT

FIGURE 21
JACKSONVILLE WWTF
ALTERNATIVE 4

P:\VT\Whitingham VT\CAD\FIGURE X – JACKSONVILLE FLOOR PLAN – ALTERNATIVE 4.dwg



NO	DATE	BY	DESCRIPTION
-	-	-	-

DRAWN BY: EMG | CHK'D BY: SMM | 03/08/2019

Weston & Sampson

20-YEAR EVALUATION AND PRELIMINARY ENGINEERING REPORT
WHITINGHAM, VERMONT

FIGURE 22
WHITINGHAM WWTF
ALTERATIVE 4

P:\VT\Whitingham VT\CAD\FIGURE X – WHITINGHAM SITE PLAN – ALTERNATIVE 4.dwg

Table 17

Whitingham 20-Year Evaluation & Preliminary Engineering Report

Preliminary Opinion of Project Cost

Jacksonville Alternative 4: BioMax System

Item No.	Description	Unit	Est. Qty.	Cost/Unit	Total Cost
1	General				
	Mobilization/Demobilization	L.S.	1	$ 54,750	$ 54,800
	Bonds and Insurance (8%)	L.S.	1	$ 87,600	$ 87,600
	General Conditions (5%)	L.S.	1	$ 54,750	$ 54,800
				General	$198,000
2	Demolition				
	Roof Demolition	S.F.	2,000	$ 7	$ 13,000
	Drywall Demolition	S.F.	5,900	$ 0.50	$ 3,000
	Plumbing Demolition	L.S.	1	$ 1,500	$ 1,500
	Process Piping Demolition	L.S.	1	$ 2,500	$ 2,500
	HVAC Demo	L.S.	1	$ 5,000	$ 5,000
	Electrical Demolition	L.S.	1	$ 2,000	$ 2,000
	Demo Bubbler Level Control System	L.S.	1	$ 1,500	$ 1,500
	Demo UV control panel	L.S.	1	$ 1,000	$ 1,000
	Demo Pump control panel	L.S.	1	$ 1,500	$ 1,500
	Demo EQ tank aeration equipment	L.S.	1	$ 3,000	$ 3,000
	Disposal	L.S.	1	$ 3,000	$ 3,000
				Demolition	$37,000
3	Temporary Treatment (both plants)				
	Mobilization & Demobilization	L.S.	1	$ 20,000	$ 20,000
	Training	L.S.	1	$ 10,000	$ 10,000
	Extended Aeration Temporary Treatment System	Mo.	6	$ 16,500	$ 99,000
	Install and Remove Temporary Power	L.S.	1	$ 25,000	$ 25,000
	Crushed Stone Pad	S.F.	500	$ 75	$ 37,500
	Temporary Piping	L.S.	1	$ 7,000	$ 7,000
	Outfall Connection MH	Ea.	1	$ 5,000	$ 5,000
	Electric	kWh	9,700	$ 0.15	$ 1,500
	Installation	L.S.	1	$ 8,000	$ 8,000
	Site Restoration/Erosion Control	L.S.	1	$ 7,500	$ 7,500
		Temporary Treatment (both plants)			$221,000
3	Building Improvements				
	Insulation and New Clapboards	S.F.	1,900	$ 20	$ 38,000
	New Roof	S.F.	2,000	$ 20	$ 40,000
	Door Replacement	Ea.	1	$ 2,500	$ 2,500
	Window Replacement	Ea.	4	$ 1,000	$ 4,000
	New Interior Drywall	S.F.	5,900	$ 10	$ 59,000
	Interior Painting	S.F.	5,900	$ 3	$ 17,700
	Domestic Hot Water	L.S.	1	$ 2,000	$ 2,000
	Backflow Preventer	L.S.	1	$ 2,500	$ 2,500
	Plumbing Fixtures	L.S.	1	$ 2,500	$ 2,500
	Office Space Ventilation/AC	L.S.	1	$ 4,000	$ 4,000
	Unit Heatrs	Ea.	4	$ 1,500	$ 6,000
	Dehumidifier	L.S.	1	$ 5,000	$ 5,000
	Exhaust Fans	L.S.	1	$ 3,500	$ 3,500
	Power Distribution	L.S.	1	$ 30,000	$ 30,000
	Lighting - Reinstallation of Existing LEDs	Ea.	1	$ 250	$ 300
	Emergency Power Generator	Ea.	1	$ 50,000	$ 50,000

Table 17

Whitingham 20-Year Evaluation & Preliminary Engineering Report

Preliminary Opinion of Project Cost

Jacksonville Alternative 4: BioMax System

Item No.	Description	Unit	Est. Qty.	Cost/Unit	Total Cost
				Building Improvements	$267,000
4	Site Work				
	Replace Well Pump	L.S.	1	$ 3,000	$ 3,000
				Site Work	$3,000
5	Process Equipment				
	Sub-Slab Tankage Ventilation (Blower & Ducting)	L.S.	1	$ 35,000	$ 35,000
	Replacement EQ Blowers	L.S.	1	$ 30,000	$ 30,000
	Grout Tank Floor to Slope	CY	25	$ 150	$ 3,800
	Replace Forward Flow Pump	L.S.	1	$ 5,000	$ 5,000
	Replace VFD for Forward Flow Pump 1	Ea.	1	$ 5,000	$ 5,000
	New EQ Tank Pressure Transducer	Ea.	1	$ 1,500	$ 1,500
	New Integrated Control Panel	Ea.	1	$ 65,000	$ 65,000
	BioMax Unit	Ea.	1	$ 235,000	$ 235,000
	New Effluent Flow Meter	Ea.	1	$ 4,000	$ 4,000
	New UV Unit	Ea.	1	$ 5,000	$ 5,000
	Equipment Installation	L.S.	1	$ 91,719	$ 91,700
	Control Wiring	L.S.	1	$ 15,000	$ 15,000
				Process Equipment	$496,000
6	Collection System				
	Collection System Improvements	L.S.	1	$ 71,000	$ 71,000
				Collection System	$71,000
				Construction Subtotal	$1,293,000
				Engineering (23%)	$297,000
				Project Contingencies (30%)	$477,000
				TOTAL OPINION OF PROJECT COST	$2,070,000

Notes:

1- *Engineering New Record (ENR) Construction Cost Index (CCI) for December 2018 is 11093.47*

2- *Subtotal amounts have been rounded to the next $1,000.*

3- *Overall anticipated project cost has been rounded to the next $10,000.*

4- *Anticipated costs have been developed based on similar recent projects, and equipment manufacturer's cost data.*

5- *Permitting costs have not been included.*

6- *Contractor's OH&P are included in the unit prices.*

7- *Start-up and Operator Training is included in the listed equipment costs.*

8- *Project costs have been developed without benefit of final design drawings. For planning level costs, a contingency of 30% should be carried.*

Preliminary Opinion of Project Cost

Whitingham 20-Year Evaluation & Preliminary Engineering Report

Preliminary Opinion of Project Cost

Whitingham Alternative 4: BioMax System

Item No.	Description	Unit	Est. Qty.	Cost/Unit	Total Cost
1	General				
	Mobilization/Demobilization	L.S.	1	$ 32,800	$ 32,800
	Bonds and Insurance (8%)	L.S.	1	$ 52,480	$ 52,500
	General Conditions (5%)	L.S.	1	$ 32,800	$ 32,800
				General	$119,000
2	Demolition				
	Roof Demolition	S.F.	1,000	$ 7	$ 7,000
	Drywall Demolition	S.F.	2,700	$ 0.50	$ 1,400
	Plumbing Demolition	L.S.	1	$ 1,000	$ 1,000
	HVAC Demo	L.S.	1	$ 10,000	$ 10,000
	Electrical Demolition	L.S.	1	$ 2,000	$ 2,000
	Demo Bubbler Level Control System	L.S.	1	$ 1,500	$ 1,500
	Demo UV control panel	L.S.	1	$ 1,000	$ 1,000
	Demo Pump control panel	L.S.	1	$ 1,500	$ 1,500
	Disposal	L.S.	1	$ 2,400	$ 2,400
				Demolition	$28,000
3	Temporary Treatment				
	Pump/Haul to Jacksonville	Day	90	$ 500	$ 45,000
				Temporary Treatment	$45,000
3	Building Improvements				
	Insulation and New Clapboards	S.F.	1,500	$ 20	$ 30,000
	New Roof	S.F.	1,000	$ 20	$ 20,000
	Door Replacement	Ea.	2	$ 2,500	$ 5,000
	Window Replacement	Ea.	4	$ 800	$ 3,200
	New Interior Drywall	S.F.	2,700	$ 10	$ 27,000
	Domestic Hot Water	L.S.	1	$ 2,000	$ 2,000
	Backflow Preventer	L.S.	1	$ 2,500	$ 2,500
	Plumbing Fixtures	L.S.	1	$ 2,500	$ 2,500
	Unit Heatrs	Ea.	3	$ 1,500	$ 4,500
	Dehumidifier	L.S.	1	$ 5,000	$ 5,000
	Exhaust Fans	L.S.	1	$ 1,000	$ 1,000
	Interior Painting	S.F.	2,700	$ 3	$ 8,100
	Power Distribution	L.S.	1	$ 20,000	$ 20,000
	Lighting - Reinstallation of Existing LEDs	Ea.	11	$ 250	$ 2,800
	Emergency Power Generator	Ea.	1	$ 25,000	$ 25,000
				Building Improvements	$159,000
4	Site Work				
	Pump Station Pump Replacement	L.S.	1	$ 5,000	$ 5,000
	Effluent MH Repair	L.S.	1	$ 3,000	$ 3,000
	Retaining Wall Repair	L.F.	120	$ 100	$ 12,000
				Site Work	$20,000
5	Process Equipment				

Preliminary Opinion of Project Cost

Whitingham Alternative 4: BioMax System

Item No.	Description	Unit	Est. Qty.	Cost/Unit	Total Cost
	Sub-Slab Tankage Ventilation (Blower & Ducting)	L.S.	1	$ 20,000	$ 20,000
	Grout Tank Floor to Slope	CY	10	$ 150	$ 1,500
	Replace Forward Flow Pump	L.S.	1	$ 3,000	$ 3,000
	Replace VFD for Forward Flow Pump 1	Ea.	1	$ 5,000	$ 5,000
	New EQ Tank Pressure Transducer	Ea.	1	$ 1,500	$ 1,500
	New Integrated Control Panel	Ea.	1	$ 65,000	$ 65,000
	BioMax Unit	Ea.	1	$ 130,000	$ 130,000
	Replace Clarifier	L.S.	1	$ 60,000	$ 60,000
	New Effluent Flow Meter	Ea.	1	$ 4,000	$ 4,000
	New UV Unit	Ea.	1	$ 3,000	$ 3,000
	Equipment Installation	L.S.	1	$ 69,273	$ 69,300
	Control Wiring	L.S.	1	$ 15,000	$ 15,000
				Process Equipment	$378,000
6	Collection System				
	Collection System Improvements	L.S.	1	$ 26,000	$ 26,000
				Collection System	$26,000
				Construction Subtotal	$775,000
				Engineering (23%)	$178,000
				Project Contingencies (30%)	$286,000
				TOTAL OPINION OF PROJECT COST	$1,240,000

Notes:

1- *Engineering New Record (ENR) Construction Cost Index (CCI) for December 2018 is 11093.47*
2- *Subtotal amounts have been rounded to the next $1,000.*
3- *Overall anticipated project cost has been rounded to the next $10,000.*
4- *Anticipated costs have been developed based on similar recent projects, and equipment manufacturer's cost data.*
5- *Permitting costs have not been included.*
6- *Contractor's OH&P are included in the unit prices.*
7- *Start-up and Operator Training is included in the listed equipment costs.*
8- *Project costs have been developed without benefit of final design drawings. For planning level costs, a contingency of 30% should be carried.*

5.0 SELECTION OF AN ALTERNATIVE

5.1 Lifecycle Cost Analysis

Based on the capital and O&M costs presented in Section 4, a comparative analysis is presented in this section to determine the most economical alternative. Using the guidance document provided by the Vermont Department of Environmental Conservation (VT DEC) Facilities Engineering Division (FED), this analysis provides a Net Present Value (NPV) of each alternative consisting of the following factors:

C:	Capital Cost of the Selected Alternative
USPW:	Uniform Series Present Worth of annual O&M costs for a 20-year service life
SPPW:	Single Payment Present Worth of the salvage value of the project at the end of the 20-year cycle

Therefore, the formula used to calculate the NPV is:

$$NPV = C + USPW + SPPW$$

Capital costs of the alternatives are taken from Tables 9, 10, 12, 13, 15, 16, 17 & 18 in previous sections of this report. O&M costs are based on the FY2019 budget. Salvage value of the project was assumed to be zero at the end of its service life. Interest rates are assumed as 2%, the current rate for SRF Clean Water projects. Tables 19, 20, 21 & 22 on the following pages provide the NPV for Alternatives 1, 2, 3, and 4 respectively.

Also shown in these tables is the Equivalent Uniform Annual Cost (EUAC) for each alternative. The EUAC is a figure that is derived from the same general equation as the USPW, however in this case the capital costs are distributed over the 20-year analysis period instead of having the annual O&M costs combined into one present-day value. With this method an intuitive measure of the annual overall cost of the project can be seen as opposed to the somewhat esoteric large sum of money represented by the NPV. The components used to calculate the EUAC are:

P:	Present Worth of the Capital Cost for the Selected Alternative
n:	Duration of Payments (years)
i:	Interest Rate
A:	Equivalent Uniform Annual Cost

These factors are combined into a uniform series capital recovery factor which is denoted as

$$A/P,i,n$$

Economic textbooks provide tables of capital recovery factors at given interest rates for a set of years, so the EUAC can be determined by multiplying the initial capital cost of the alternative this factor. Annual O&M costs are added to the EUAC and the resulting figure represents the annual payment the Town would need to make in order to fund the selected alternative.

Table 23: Financial Analysis Summary		
	Net Present Value	Equivalent Uniform Annual Cost
Alternative 1	$6,000,000	$368,000
Alternative 2	$7,000,000	$427,000
Alternative 3	$6,800,000	$419,000
Alternative 4	$5,800,000	$357,000

\\wse03.local\WSE\Projects\VT\Whitingham VT\Report\whitingham - 20-yr eval + PER.docx

Table 19

Whitingham 20-Year Evaluation & Preliminary Engineering Report

Uniform Series Present Worth Calculation

Alternative 1: Replacement of Existing Equipment In-Kind

Annual O&M Cost	$	158,000	
Interest Rate		2%	per ANR
Payment Period		20	
USPW of O&M Costs	$	2,583,526	
Capital Cost	$	3,440,000	
Salvage Cost	$	-	assume 0% of cap cost
Salvage Value	$	172,000	straight line depreciation
Net Present Value	$	6,023,526	
Equivalent Uniform Annual Cost	$	368,379	

Table 20

Whitingham 20-Year Evaluation & Preliminary Engineering Report

Uniform Series Present Worth Calculation

Alternative 2: Sequencing Batch Reactor

Annual O&M Cost	$	154,000	
Interest Rate		2%	per ANR
Payment Period		20	
USPW of O&M Costs	$	2,518,121	
Capital Cost	$	4,460,000	
Salvage Cost	$	-	assume 0% of cap cost
Salvage Value	$	223,000	straight line depreciation
Net Present Value	$	6,978,121	
Equivalent Uniform Annual Cost	$	426,759	

Table 21

Whitingham 20-Year Evaluation & Preliminary Engineering Report

Uniform Series Present Worth Calculation

Alternative 3: Moving Bed Biological Reactor

Annual O&M Cost	$	170,000	
Interest Rate		2%	per ANR
Payment Period		20	
USPW of O&M Costs	$	2,779,744	
Capital Cost	$	4,070,000	
Salvage Cost	$	-	assume 0% of cap cost
Salvage Value	$	203,500	straight line depreciation
Net Present Value	$	6,849,744	
Equivalent Uniform Annual Cost	$	418,908	

Table 22

Whitingham 20-Year Evaluation & Preliminary Engineering Report

Uniform Series Present Worth Calculation

Alternative 4: BioMax Unit

Annual O&M Cost	$	155,000	
Interest Rate		2%	per ANR
Payment Period		20	
USPW of O&M Costs	$	2,534,472	
Capital Cost	$	3,310,000	
Salvage Cost	$	-	assume 0% of cap cost
Salvage Value	$	165,500	straight line depreciation
Net Present Value	$	5,844,472	
Equivalent Uniform Annual Cost	$	357,429	
Annual Payments for Capital Cost	$	202,429	

6.0 PROPOSED PROJECT

Based on the financial analysis conducted in Section 5 above, Alternative 4 is the most economical option and has been selected for further discussion in this section.

6.1 Preliminary Project Design

Refer to Section 4.4 for a description of the extent of work associated with this alternative.

6.2 Project Schedule

We anticipate the following timetable from the submission of this report to the commencement of construction as shown in **Table 24** below:

Table 24: Project Schedule	
PER Approval	Summer 2019
Begin Final Design	Summer 2019
Survey/LOMA Permitting	Fall 2019
30% Design Progress Meeting	Mid-Fall 2019
60% Design Progress Meeting	Early Winter 2019
90% Design Progress Meeting	Mid-Winter 2020
Submit Permit Applications	Mid-Winter 2020
Town Bond Vote	March 2020
100% Design/Advertise Bids	Late March 2020
Award Bid	Early May 2020
Construction Start	June 2020

6.3 Permit Requirements

As this project primarily involves work inside the existing WWTFs and repairs to existing manholes in the collection systems, no additional land is required. The permitting requirements for the project are limited as well. An Engineering Information Document will be sent to the State of Vermont shortly after this report with further detail on the permit requirements. However, we anticipate the following permits being required for this project:

FEMA Letter of Map Amendment (LOMA)

As the existing mapping shows the Jacksonville WWTF inside the Special Flood Hazard Area (SFHA), additional investigation is required. Based on our site visits, we suspect that the boundary shown on the maps is inaccurate; the WWTF building is at or near the same elevation as the adjacent road, and the road itself is not in the SFHA. A limited topographical survey will be conducted to determine the elevation of the building and the information sent to FEMA to determine whether the structure is above the SFHA. If it is, a LOMA can be filed and no further action is needed. If the building is inside the SFHA, additional floodproofing or mitigation measures will need to be built into the final design of the project.

Construction Permit

This permit from the Division of Fire Safety is required for the building reconstruction work. Once final plans are completed, this application can be filed for approval.

Other Permits

Shortly after this report is completed, a Project Review Sheet will be obtained to conclude what other permits are necessary. However, we do not anticipate many of these to be applicable as the project's exterior work is limited to repairs of existing structures. Act 250 will likely not be applicable either as the project is municipal in nature and the parcels of both WWTFs are less than 10 acres.

6.4 Sustainability Considerations

Building insulation will allow the operator to cease use of the existing electric resistance heat in the Jacksonville building, reducing energy load. The selected technology uses low-horsepower motors to meet permit requirements, keeping the energy costs as low as practicable. As the project does not involve building addition, green infrastructure features were not included.

Redundancy Considerations

Process redundancy is typically designed into facilities by providing equipment configurations which will allow 100% of unit process function with any single unit out of service. This is why three pumps or blowers are commonly seen, when two will handle the maximum design condition.

In the case of the RBC replacements in the Whitingham and Jacksonville WWTGs, the entire biological treatment process is handled by a single piece of process equipment. Full redundancy for an RBC at both of these facilities is not practical for the following reasons:

- You are not able to start up an RBC in less than 3 weeks, due to the need to establish sufficient biomass or the media for effective treatment;
- You cannot keep a redundant unit in full-time parallel operation due to lack of sufficient BDD load to keep effective biomass in both units; and
- Adding full process redundancy would be cost prohibitive.

Instead of full process redundancy, it is common for small RBC installations to identify potential process failure points and to maintain spare parts on site for these. Typical failure points for an RBC are:

- Motor
- Bearings (shaft)
- Gear box

As evidenced by the existing units, media failure is not likely until the units have exceeded 2x their design life.

Since biomass can be maintained during short-term repairs, we recommend providing process redundancy by maintaining a stock of spare parts for critical equipment.

6.5 Engineer's Opinion of Probable Cost

Refer to Table 17 & 18 for an itemized opinion of the total project cost. This was developed outshout benefit of final design drawings and therefore carries a 30% contingency for financial planning purposes.

6.6 Annual Operating Budget

Income

As discussed in Section 2.6, sewer users currently pay a flat fee of $759.94 per EU. In total there are 142 user accounts and 243.65 EUs, equating to an annual income of $185,159.38.

Annual O&M Costs

O&M costs for equipment have been estimated at 2% of their capital costs. Electricity costs for the process equipment have been estimated based on the rated horsepower of the existing RBC systems versus the rated horsepower of the proposed BioMax system. Electrical demand of other equipment (e.g. lab/office space, process pumps, ventilation systems, etc.) was assumed to be included in the existing electrical budget. Other operational costs associated with the sewer system have been based on the FY2019 budget discussed in Section 2.6. **Table 25** below provides the annual O&M costs for the selected alternative.

Table 25: Annual O&M Costs

Description	Alternative #4
Labor	$60,000
Operations/Maintenance	$17,480
Energy	$13,367
Other	$64,620
Total	$155,000

Debt Repayments

In FY2019, an $8,000 reserve was set aside to fund future plant improvements. Assuming all tasks identified in the selected alternative are chosen, approximately $3.3 million is required to be financed through the Vermont Clean Water State Revolving Loan Fund program. Current terms for financing are 2% over a 20-year period. This equates to an annual payment of $202,429.

Reserves

As of November 19, 2018, the total sewer fund balance was $147,998.28.

\\wse03.local\WSE\Projects\VT\Whitingham VT\Report\whitingham - 20-yr eval + PER.docx

7.0 CONCLUSIONS & RECOMMENDATIONS

After the financial analysis between the four potential options to rehabilitate the Jacksonville and Whitingham WWTFs and collection systems, the most economical alternative was found to be the BioMax system, a combination RBC and filter that eliminates the need for a clarifier. The total project cost included a complete rehabilitation of both facility buildings, installation of the new process equipment, bringing all mechanical and electrical systems up to code, and the installation of a single control panel with touchscreen display and remote read/alarm capabilities. Generators for each facility have been included as well to ensure the continuous operation of the facilities in the event of power outages. The collection system is in need of rehabilitation, and the cost to repair these structures were included as well. Temporary wastewater treatment via an extended aeration system will be provided throughout the construction period to ensure sewage continues to be treated and the Town stays in compliance with its discharge permit. The selected alternative will provide the Town of Whitingham's sewer users with a reliable asset for the next 20 years.

A planning-level opinion of cost has been developed for this alternative, this cost can be financed through the SRF Clean Water program. In addition to the low interest rates (2% over 20 years), additional assistance is available. This report, Step 1 of the three-step process, was funded through a Planning Loan, which is eligible for 50% forgiveness up to $200,000. The engineering fees for Step 2, Final Design, are also eligible for loan forgiveness. As the ultimate project will be determined through discussions with Town staff and the Selectboard, the fees for Step 2 have not been determined yet. Additional funding may be obtained through Pollution Control Grants. These grants are competitive, and recipients are selected based on an application form that scores projects based on need, financial status of the municipality, and environmental benefit. The total amount of money available for Pollution Control Grants is determined each year by the Vermont Legislature and varies from year to year. Due to the uncertainty of funding and how this project would rank compared against other applicants, the financial analysis did not include Pollution Control Grants. However, if this project does rank high enough and funds are available, it will reduce the payments needed to finance the project. Another potential source of assistance is the Water Infrastructure Sponsorship Program (WISPr). This program is intended to fund natural resource projects that are not directly related to wastewater facility improvements. Example projects could include streambank restoration, stormwater mitigation and other projects that improve water quality. While not a direct financial benefit for this project, participation in the WISPr program will improve the score of projects that apply for Pollution Control Grants, which do have a direct impact on project cost. If the Town or non-profit groups have considered these types of projects in the past but elected not to pursue them due to funding issues, this program may be worth investigating further.

Total project costs were projected at $3,310,000, which equate to an annual cost of $202,429. Replacing the "Plant Improvements" and "Repairs" line items with the projected O&M costs discussed in Section 6.6, a revised sewer budget is provided in **Table 26** below:

Table 26: Revised Sewer Budget

Item	Proposed Budget Amount
Capital Cost Financing	$203,000
Labor	$60,000
Operations/Maintenance	$18,000
Energy	$15,000

Other	$65,000
Total	**$361,000**

Dividing this annual cost amongst the 243.65 EUs in both collection systems provides the estimated annual sewer cost to a single-family residence of $1,481.63 per year, or $123.46 per month. This is an increase of 94% from the current rate of $759.94.

While this report provides a comprehensive analysis of the needs of the Whitingham and Jacksonville facilities, not all of the work is required to be immediately undertaken. For example, collection system work does not need to occur in the 2020 construction season, the WWTFs have the capacity to treat all wastewater entering the plant without exceeding its permitted discharge rate. The cost tables provided in this report provide a line-by-line breakdown of all the components of the selected alternative. Certain items, though, must be undertaken in response to the State of Vermont's 1272 order (e.g. replacement of the aging RBC units). The findings of this report will be presented to Town staff and Selectboard members, and will serve as a starting point in the conversation to determine what the ultimate project to be constructed in 2020 will be. This comprehensive analysis was performed to ensure the Town, if they elected to pursue any of these items in the future, would be eligible for the financing rates available through the Clean Water SRF program.

We thank the Town for the opportunity to be of service with this project. In particular, Gig Zboray and David DiCantio have been extremely helpful as questions arose and thank them for their time and effort assisting us. We look forward to presenting our findings and further aiding the town to establish a long-term solution to their wastewater treatment systems.

8.0 REFERENCES

Plans for Construction of Water Pollution Control Facilities, Town of Whitingham, Vermont – Wastewater Treatment Facilities for the Villages of Whitingham and Jacksonville. Dufresne Henry Inc., last revised 7/16/1982

Plans for Construction of Water Pollution Control Facilities, Town of Whitingham, Vermont – Wastewater Collection System for the Village of Jacksonville. Dufresne Henry, Inc., last revised September 1983.

Plans for Construction of Water Pollution Control Facilities, Town of Whitingham, Vermont – Wastewater Collection System for the Village of Whitingham. Dufresne Henry, Inc., last revised 4/12/82.

\\wse03.local\WSE\Projects\VT\Whitingham VT\Report\whitingham - 20-yr eval + PER.docx

APPENDIX A

NPDES Permits

VERMONT

State of Vermont
Department of Environmental Conservation
Watershed Management Division
One National Life Drive – Building Main 2
Montpelier VT 05620-3522
http://www.watershedmanagement.vt.gov/

Agency of Natural Resources

March 4, 2016

Ms. Bonnie Jo Radasch
Town of Whitingham
PO Box 529
Jacksonville VT 05342-0529

SUBJECT: NPDES Discharge Permit 3-1229, Whitingham WWTF Corrected Pages
NPDES Discharge Permit 3-1230, Jacksonville WWTF Corrected Page

Dear Ms. Radasch:

For discharge permit 3-1229, enclosed are corrected Pages 4 and 5. Condition C.3., has been revised to update the formulas used to properly calculate Total Nitrogen pounds and Total Nitrogen pounds per day, annual average.

For discharge permit 3-1225, enclosed is a corrected Page 4. Condition C.3., has also been revised to update the same Total Nitrogen formulas noted above.

Please replace the enclosed corrected pages with the pages you have on file. Thank you. If you have any questions regarding this correction, please contact Julia Butzler via e-mail at julia.butzler@vermont.gov or call 802-490-6182.

Respectfully,

Carole Fowler

Carole Fowler
Business Operations Support Services Section

Enclosure: 3-1229, Page 4 & 5
3-1230, Page 4

Cc: David DiCantio, Chief Operator, Town of Whitingham WWTF & Jacksonville WWTF

VERMONT

Vermont Department of Environmental Conservation
Watershed Management Division
1 National Life Drive, Main-2
Montpelier VT 05620-3522

Agency of Natural Resources

[phone] 802-828-1535
[fax] 802-828-1544

May 12, 2014

Town of Whitingham
Attn: Keith Bronson
PO Box 529
Jacksonville, VT 05342

SUBJECT: CORRECTED PAGE, Discharge Permit No. 3-1229, Whitingham WWTF

Dear Mr. Bronson:

Enclosed is a corrected page 6 of your discharge permit. This page was corrected to address the typographical error in the Reapplication Date. Reapplication should occur 180 prior to permit expiration. Since your permit expires on September 30, 2018; the reapplication date was adjusted to be March 31, 2018, not March 31, 2017. No other changes to the permit have been made.

Please replace the duplexed pages you have on file (pages 5/6) with the enclosed pages.

If you have questions, please contact Randy Bean at (802) 490-6181.

Respectfully,

Carroll Fowler

for Randy Bean
Environmental Analyst V
Wastewater Management Program

Enclosures (2)
cc: David DiCantio, Town of Whitinghams
David DiDomenico, Wastewater Management Program VT DEC

VERMONT

Vermont Department of Environmental Conservation
Watershed Management Division
1 National Life Drive, Main-2
Montpelier VT 05620-3522

Agency of Natural Resources

[phone] 802-828-1535
[fax] 802-828-1544

December 26, 2013

Town of Whitingham
Attn: Keith Bronson
PO Box 529
Jacksonville, VT 05342

RE: Discharge Permit No. 3-1229: Whitingham Wastewater Treatment Facility

Dear Mr. Bronson,

Enclosed is your copy of Discharge Permits No. 3-1229 which has been signed on behalf of the Commissioner of the Department of Environmental Conservation. This permit authorizes the discharge of treated and disinfected wastewater from the Whitingham Wastewater Treatment Facility to the Harriman Reservoir.

Please review the permit carefully and make note of the effluent limitations, monitoring requirements, and other special conditions. As proposed in the draft permit which was provide for comment, this permit contains several changes from the permit that currently authorizes your discharge. Specifically, the requirements of EPA's Long Island Sound Nitrogen TMDL are included in the permit (See Condition I.A.C). The TMDL requires the Town to monitor for Total Nitrogen, develop and implement a Nitrogen Optimization Plan, assess the adequacy of the Plan, and annually report the Total Nitrogen discharged from your facility. Also the permit includes a requirement to conduct a Whole Effluent Toxicity test to confirm that this discharge does not have toxic impact and to sample the discharge for Total Phosphorus to assess its potential to contribute to eutrophication in the Harriman Reservoir.

Since we did not receive any comments on this draft permit during the public notice period, the final permit is unchanged from the draft that was placed on public notice for comment.

If there are any questions regarding this permit please contact Randy Bean at our office.

Sincerely,

Ernest F. Kelley, Manager
Wastewater Management Program

attachments
cc
David DiCantio, Town of Whitingham WWTF
David DiDomenico, VT DEC WSMD

AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATERSHED MANAGEMENT DIVISION
ONE NATIONAL LIFE DRIVE, MAIN BUILDING, 2nd FLOOR
MONTPELIER, VT 05620-3522

Permit No.: 3-1229
PIN: NS98-0214
File 13-20
NPDES No.: VT0101109

Name of Applicant: Town of Whitingham
PO Box 529
Whitingham, VT 05342

Expiration Date: September 30, 2018

DISCHARGE PERMIT

In compliance with the provisions of the Vermont Water Pollution Control Act as amended (10 V.S.A. Chapter 47 §1251 et seq), the Vermont Water Pollution Control Permit Regulations, and the Federal Clean Water Act, as amended (33 U.S.C. §1251 et seq), the Town of Whitingham, Vermont (hereinafter referred to as the "permittee") is authorized by the Secretary, Agency of Natural Resources, to discharge from the Whitingham Wastewater Treatment Facility to the Harriman Reservoir in accordance with the following general and special conditions.

This permit shall become effective on the date of signing.

State of Vermont
Agency of Natural Resources

David K. Mears, Commissioner
Department of Environmental Conservation

BY:

Digitally signed by Peter LaFlamme
DN: cn=Peter LaFlamme, o=VTDEC, ou=Watershed Management Division, email=pete.laflamme@state.vt.us, c=US
Date: 2013.12.24 08:53:28 -05'00'

Peter LaFlamme, Director
Watershed Management Division

I. SPECIAL CONDITIONS

A. EFFLUENT LIMITS

1. From the date of signing through September 30, 2018 the permittee is authorized to discharge from S/N 001 - outfall, Whitingham Wastewater Treatment Facility, to the Harriman Reservoir, an effluent whose characteristics shall not exceed the values listed below:

DISCHARGE LIMITATIONS							
Effluent Characteristic	**Monthly Average**	**Weekly Average**	**Maximum Day**	**Monthly Average**	**Weekly Average**	**Maximum Day**	**Instantaneous Maximum**
	....	(lbs / day)	....	....	(Concentration)		....
Flow (Annual Avg)				0.0123 MGD			
Biochemical Oxygen Demand, 5-day, 20° C	3.1	4.6		30 mg/l	45 mg/l	50 mg/l	
Total Suspended Solids	3.1	4.6		30 mg/l	45 mg/l	50 mg/l	
Total Phosphorus						monitor only mg/l	
Total Nitrogen	See Condition I.C. below			monitor only mg/l			
Settleable Solids							1.0 ml/l
Escherichia coli Bacteria							77/100 ml
pH(1)				Between 6.0 and 8.5 Standard Units			

(1) In accordance with Section 2-04 of the Vermont Water Quality Standards, effective January 1, 2008, this permit establishes a mixing zone in Harriman Reservoir for pH not to exceed a 50 foot radius from the outfall. Within this mixing zone Section 3-01 B.9.of the Water Quality Standards is waived in accordance with Section 2-04

2. The effluent shall not have concentrations or combinations of contaminants including oil, grease, scum, foam, or floating solids which would cause a violation of the water quality standards of the receiving waters.

3. The discharge shall not cause visible discoloration of the receiving waters.

4. The monthly average concentrations of BOD5 and total suspended solids in the discharge shall not exceed 15 percent of the monthly average concentrations of BOD5 and total suspended solids in the influent into the permittee's wastewater treatment facilities. For the purposes of determining whether the permittee is in compliance with this condition, samples from the discharge and the influent shall be taken with appropriate allowance for detention times. See Part I, Special Conditions, Paragraph E.2., Effluent Monitoring.

5. When the effluent discharged for a period of 90 consecutive days exceeds 80 percent of the permitted flow limitation, the permittee shall submit to the permitting authority projected loadings and a program for maintaining satisfactory treatment levels consistent with approved water quality management plans.

6. Any action on the part of the Agency of Natural Resources in reviewing, commenting upon or approving plans and specifications for the construction of wastewater treatment facilities shall not relieve the permittee from the responsibility to achieve effluent limitations set forth in this permit and shall not constitute a waiver of, or act of estoppel against any remedy available to the Agency, the State of Vermont or the federal government for failure to meet any requirement set forth in this permit or imposed by state or federal law.

7. At a minimum of once annually or more frequently if warranted by sludge depth measurements or degrading effluent quality, the three septic tanks and equalization tanks shall be cleaned of accumulated sludge and scum. **The dates of such cleanings shall be reported on the applicable discharge monitoring report form (WR-43).**

8. The permittee shall clean the quartz sleeves of the ultraviolet light disinfection system at a frequency which assures that effective disinfection is maintained and shall replace the ultraviolet light disinfection system lamps <u>as necessary to maintain compliance with the *E. coli* bacteria limitation.</u> **The dates and a description of the ultraviolet light disinfection system maintenance activities shall be included on the applicable discharge monitoring report form (WR-43).**

B. WASTE MANAGEMENT ZONE

In accordance with 10 V.S.A. Section 1252, this permit hereby establishes a waste management zone that extends for a 75 foot radius from the outfall of the Whitingham Wastewater Treatment Facility in the Harriman Reservoir.

C. TOTAL NITROGEN

1. Optimization Plan

By March 31, 2014, the permittee shall develop and submit to the Department for review and approval a Nitrogen Removal Optimization Evaluation Plan (the Plan) for the evaluation of alternative methods of operating the existing wastewater treatment facility to optimize the removal of nitrogen. The methods to be evaluated include, but are not limited to: operational, process, or equipment changes designed to enhance nitrification and denitrification (seasonal and year-round); incorporation of anoxic zones; septage receiving policies and procedures; and side stream management. The permittee shall implement these recommended operational changes in order to maintain the existing mass discharge loading of total nitrogen. The baseline annual average daily total nitrogen load discharge from this facility is estimated to be **approximately 2 lbs/day**.

This Plan shall be developed by a qualified professional with experience in the operation and/or design of municipal wastewater treatment facilities in conjunction with the Chief Operator of the facility.

This Plan shall be provided to the Agency for review and approval prior to implementation and shall be revised upon the Agency's request or by the Permittee to address equipment or operational changes.

Implementation of the Plan shall commence within 30 days of its approval by the Agency.

2. Plan Evaluation

Within one year following the implementation of the Plan, the permitee shall evaluate the effectiveness of the Plan. The evaluation shall be conducted by a qualified professional with experience in the operation and/or design of municipal wastewater treatment facilities in conjunction with the Chief Operator of the facility. The results of the Evaluation shall be submitted to the Agency for review and approval within 60 days of its completion and shall be revised at the Agency's request. Actions to implement the approved nitrogen removal optimization practices, if any, shall be initiated within 90 days of the Department's approval.

3. Reporting

Annually, beginning in January 2015, the permittee shall submit, a report to the Agency, as an attachment to the December Discharge Monitoring Report form (WR-43), that documents the annual average daily Total Nitrogen discharged (in pounds per day) from the facility, summarizes nitrogen removal optimization and efficiencies, and tracks trends relative to the previous year.

Total Nitrogen (TN) = Total Kjeldahl Nitrogen (TKN) + Nitrite/Nitrate (NO_x).

TN pounds per day, annual average, shall be calculated as follows:

1. Calculate the pounds of TN discharged on each sample date:

TN (lbs) = TN (mg/L) × volume discharged (million gallons) on day of sample × 8.34

2. Calculate the TN, pounds per day, annual average:

TN (lbs/day, annual average) = (Sum of all TN [lbs])/(count of TN samples)

4. Wasteload Allocation

This permit does not establish a formal Waste Load Allocation for the facility nor does it convey any right to ownership of the facility's estimated baseline annual average total nitrogen load.

The Agency reserves the right to reopen and amend this permit to include an alternate Total Nitrogen limitation and/or additional monitoring requirements based on the monitoring data, the results of nitrogen optimization activities, or a formal Waste Load Allocation promulgated under Vermont's Waste Load Allocation Rule for Total Nitrogen in the Connecticut River Watershed based on the Long Island Sound Total Nitrogen TMDL.

D. REAPPLICATION

*Correction 05/12/2014

If the permittee desires to continue to discharge after the expiration of this permit, the permittee shall reapply on the application forms then in use at least 180 days before this permit expires.

Reapply for a Discharge Permit by: March 31, 2018*.

E. OPERATING FEES

This discharge is subject to operating fees. The permittee shall submit the operating fees in accordance with the procedures provided by the Secretary.

F. WHOLE EFFLUENT TOXICITY TESTING

By no later than November 15, 2016, the permittee shall conduct and submit the results of a two-species (Pimephales promelas) and (Ceriodaphnia dubia), 48 hour acute Whole Effluent Toxicity (WET) tests to the Agency as specified below.

a. In August or September 2016, the permittee shall conduct a two-species acute WET test on S/N 001.

b. The WET tests shall be conducted according to the procedures and guidelines specified in: Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms (most recent edition) USEPA document.

c. Based upon the results of these tests or any other toxicity tests conducted on this discharge, this permit may be amended to require additional Whole Effluent Toxicity testing or a Toxicity Reduction Evaluation be conducted

G. MONITORING AND REPORTING

1. Sampling and Analysis

The sampling, preservation, handling, and analytical methods used shall conform to regulations published pursuant to Section 304(g) of the Clean Water Act, under which such procedures may be required. Guidelines establishing these test procedures have been published in the Code of Federal Regulations, Title 40, Part 136 (Federal Register, Vol. 56, No. 195, July 1, 1999 or as amended).

Samples shall be representative of the volume and quality of effluent discharged over the sampling and reporting period. All samples are to be taken during normal operating hours. The permittee shall identify the effluent sampling location used for each discharge.

2. **Effluent Monitoring**

The permittee shall monitor and record the quality and quantity of discharge(s) S/N 001 - outfall, the Whitingham Wastewater Treatment Facility, according to the following schedule and other provisions:

Until September 30, 2018

PARAMETER	MINIMUM FREQUENCY OF ANALYSIS	SAMPLE TYPE
Flow	Continuous	Daily Total, Max., Min.
BOD_5	1 x monthly	8 hour composite (1)
TSS	1 x monthly	8 hour composite (1)
Total Phosphorus (TP)	1 x monthly	8 hour composite (1)
Total Nitrogen (TN)	1 x monthly	Calculated (2)
Total Kjeldahl Nitrogen (TKN)	1 x monthly	Grab (2)
Nitrate/Nitrite Nitrogen (NOx)	1 x monthly	Grab (2)
Settleable Solids	1 x daily	grab (3)
Escherichia coli Bacteria	1 x monthly	grab
pH	1 x daily	Grab

(1) Composite samples for BOD5, TSS, and TP shall be taken during the hours 6:00 a.m. to 6:00 p.m., unless otherwise specified. Eight hours is the minimum period for the composite.

(2) Total Nitrogen = TKN+NO_x

(3) Settleable Solids samples shall be collected between 10:00 a.m. and 2:00 p.m. or during the period of peak flow.

3. Influent Monitoring

The permittee shall monitor the quality of the influent according to the following schedule and other provisions.

PARAMETER	MINIMUM FREQUENCY OF ANALYSIS	SAMPLE TYPE
Influent BOD5	1 x monthly	8 - hour composite, minimum (1)
Influent TSS	1 x monthly	8 - hour composite, minimum (1)
Total Nitrogen (TN)	1 x quarterly	Calculated (2,3)
Total Kjeldahl Nitrogen (TKN)	1 x quarterly	Grab (2,3)
Nitrate/Nitrite Nitrogen (NOx)	1 x quarterly	Grab (2,3)

(1) Composite samples for BOD5 and TSS shall be taken during the hours of 6:00 a.m. to 6:00 p.m., unless otherwise specified. Eight hours is the minimum period for the composite.

(2) $TN = TKN + NO_x$

(3) The influent TN (TKN & NO_x) sample shall be collected on the same day as an effluent TN (TKN & NO_x) sample.

4. Reporting

The permittee is required to submit monthly reports of monitoring results on form WR-43. Reports are due on the 15th day of each month, beginning with the month following the effective date of this permit.

If, in any reporting period, there has been no discharge, the permittee must submit that information by the report due date.

Signed copies of these, and all other reports required herein, shall be submitted to the Secretary at the following address:

Agency of Natural Resources
Department of Environmental Conservation
Watershed Management Division
One National Life Drive, Main Building, 2nd Floor
Montpelier VT 05620-3522

All reports shall be signed:

a. In the case of corporations, by a principal executive officer of at least the level of vice president, or his/her duly authorized representative, if such representative is responsible for the overall operation of the facility from which the discharge described in the permit form originates;

b. In the case of a partnership, by a general partner;

c. In the case of a sole proprietorship, by the proprietor;

d. In the case of a municipal, State, or other public facility, by either a principal executive officer, ranking elected official, or other duly authorized employee.

In addition to the monitoring and reporting requirements given above, daily monitoring of certain parameters for operational control are required by the Agency. Operations reports (reporting form WR-43) shall be submitted monthly.

6. Recording of Results

The permittee shall maintain records of all information resulting from any monitoring activities required, including:

a. The exact place, date, and time of sampling;
b. The dates and times the analyses were performed;
c. The person(s) who performed the analyses;
d. The analytical techniques and methods used including sample collection handling and preservation techniques;
e. The results of all required analyses.
f. The records of monitoring activities and results, including all instrumentation and calibration and maintenance records;
g. The original calculation and data bench sheets of the operator who performed analysis of the influent or effluent pursuant to requirements of Section I.(A) of this permit.

The results of monitoring requirements shall be reported (in the units specified) on the Vermont reporting form WR-43 or other forms approved by the Secretary.

7. Additional Monitoring

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form WR-43. Such increased frequency shall also be indicated.

H. DRY WEATHER FLOWS

Dry weather flows of untreated municipal wastewater from any sanitary or combined sewers are not authorized by this permit and are specifically prohibited by State and Federal laws and regulations.

I. OPERATION, MANAGEMENT, AND EMERGENCY RESPONSE PLANS

a. The permittee shall implement the Operation, Management, and Emergency Response Plan for the wastewater treatment facility, pump stations, and stream crossings as approved by the Agency on February 19, 2009.

b. The permittee shall implement the Operation, Management, and Emergency Response Plan for the wastewater collection system as approved by the Agency on February 19, 2009.

J. EMERGENCY ACTION - ELECTRIC POWER FAILURE

The permittee shall indicate in writing to the Secretary **within 30 days after the effective date of this permit** that the discharge shall be handled in such a manner that, in the event the primary source of electric power to the waste treatment facilities (including pump stations) fails, any discharge into the receiving waters will attempt to comply with the conditions of this permit, but in no case shall the wastes receive less than primary treatment (or in the case of ultraviolet light disinfection systems, not less than secondary treatment) plus disinfection.

The permittee shall either provide an alternative source of power for the operation of its treatment facilities, or demonstrate that the treatment facility has the capacity to store the wastewater volume that would be generated over the duration of the longest power failure that would have affected the facility in the last five years, excluding catastrophic events.

The alternative power supply, whether from a generating unit located at the plant site or purchased from an independent source of electricity, must be separate from the existing power source used to operate the waste treatment facilities. If a separate unit located at the plant site is to be used, the permittee shall certify in writing to the Secretary when the unit is completed and prepared to generate power.

The determination of treatment system storage capacity shall be submitted to the Watershed Management Division upon completion.

K. SEWER ORDINANCE

The permittee shall have in effect a sewer use ordinance acceptable to the Secretary which, at a minimum, shall

1. Prohibit the introduction by any discharger into the permittee's sewerage system or treatment facilities of any pollutant which:

    a. is a toxic pollutant in toxic amounts as defined in standards issued from time to time under Section 307(a) of the Clean Water Act;

b. creates a fire or explosion hazard in the permittee's treatment works;

c. causes corrosive structural damage to the permittee's treatment works, including all wastes with a pH lower than 5.0;

d. contains solid or viscous substances in amounts which would cause obstruction to the flow in sewers or other interference with proper operation of the permittee's treatment works; or

e. in the case of a major contributing industry, as defined herein, contains an incompatible pollutant, as further defined herein, in an amount or concentration in excess of that allowed under standards or guidelines issued from time to time pursuant to Sections 304, 306, and/or 307 of the Clean Water Act.

2. Require 45 days prior notification to the permittee by any person or persons of a:

a. proposed substantial change in volume or character of pollutants over that being discharged into the permittee's treatment works at the time of issuance of this permit;

b. proposed new discharge into the permittee's treatment works of pollutants from any source which would be a new source as defined in Section 306 of the Clean Water Act if such source were discharging pollutants; or

c. proposed new discharge into the permittee's treatment works of pollutants from any source which would be subject to Section 301 of the Clean Water Act if it were discharging such pollutants.

3. Require any industry discharging into the permittee's treatment works to perform such monitoring of its discharge as the permittee may reasonably require, including the installation, use, and maintenance of monitoring equipment methods, to keep records of the results of such monitoring, and to report the results of such monitoring to the permittee. Such records shall be made available by the permittee to the Secretary upon request.

4. Authorize the permittee's authorized representatives to enter into, upon, or through the premises of any industry discharging into the permittee's treatment works to have access to and copy any records, to inspect any monitoring equipment or method required under subsection 3 above, and to sample any discharge into the permittee's treatment works.

The permittee shall notify the Secretary of any discharge specified in subsection 2 above within 30 days of the date on which the permittee is notified of such discharge. This permit may be modified accordingly.

II. GENERAL CONDITIONS

A. MANAGEMENT REQUIREMENTS

Facility Modification / Change in Discharge

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than, or at a level in excess of, that identified and authorized by this permit shall constitute a violation of the terms and conditions of this permit. Such a violation may result in the imposition of civil and/or criminal penalties pursuant to 10 V.S.A. Chapters 47, 201, and/or 211. Any anticipated facility expansions or process modifications which will result in new, different, or increased discharges of pollutants must be reported by submission of a new permit application or, if such changes will not violate the effluent limitations specified in this permit, by notice to the permit issuing authority of such changes. Following such notice, the permit may be modified to specify and limit any pollutants not previously limited.

In addition, the permittee shall provide notice to the Secretary of the following:

a. any new introduction of pollutants into the treatment works from a source which would be a new source as defined in Section 306 of the Clean Water Act if such source were discharging pollutants;

b. except for such categories and classes of point sources or discharges specified by the Secretary, any new introduction of pollutants into the treatment works from a source which would be subject to Section 301 of the Clean Water Act if such source were discharging pollutants; and

c. any substantial change in volume or character of pollutants being introduced into the treatment works by a source introducing pollutants into such works at the time of issuance of the permit.

The notice shall include:

i. the quality and quantity of the discharge to be introduced into the system, and

ii. the anticipated impact of such change in the quality or quantity of the effluent to be discharged from the permitted facility.

2. Noncompliance Notification

In the event the permittee is unable to comply with any of the conditions of this permit due, among other reasons, to:

a. breakdown or maintenance of waste treatment equipment (biological and physical-chemical systems including, but not limited to, all pipes, transfer pumps, compressors, collection ponds or tanks for the segregation of treated or untreated wastes, ion exchange columns, or carbon absorption units),

b. accidents caused by human error or negligence, or

c. other causes such as acts of nature,

the permittee shall notify the Secretary within 24 hours of becoming aware of such condition or by the next business day and shall provide the Secretary with the following information, in writing, within five (5) days:

i. cause of non-compliance

ii. a description of the non-complying discharge including its impact upon the receiving water;

iii. anticipated time the condition of non-compliance is expected to continue or, if such condition has been corrected, the duration of the period of non-compliance;

iv. steps taken by the permittee to reduce and eliminate the non-complying discharge; and

v. steps to be taken by the permittee to prevent recurrence of the condition of non-compliance.

3. Operation and Maintenance

All waste collection, control, treatment, and disposal facilities shall be operated in a manner consistent with the following:

a. The permittee shall, at all times, maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit.

b. The permittee shall provide an adequate operating staff which is duly qualified to carry out the operation, maintenance, and testing functions required to insure compliance with the conditions of this permit; and

c. The operation and maintenance of this facility shall be performed only by qualified personnel. The personnel shall be certified as required under the Vermont Water Pollution Abatement Facility Operator Certification Regulations.

4. **Quality Control**

The permittee shall calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at regular intervals to ensure accuracy of measurements, or shall ensure that both activities will be conducted.

The permittee shall keep records of these activities and shall provide such records upon request of the Secretary.

The permittee shall demonstrate the accuracy of the flow measurement device weekly and report the results on the monthly report forms. The acceptable limit of error is ± 10%.

The permittee shall analyze any additional samples as may be required by the Agency of Natural Resources to ensure analytical quality control.

5. **Bypass**

The diversion or bypass of facilities (including pump stations) necessary to maintain compliance with the terms and conditions of this permit is prohibited, except where authorized under the terms and conditions of an Emergency Pollution Permit issued pursuant to 10 V.S.A. Section 1268.

6. **Duty to Mitigate**

The permittee shall take all reasonable steps to minimize or prevent any adverse impact to waters of the State resulting from non-compliance with any condition specified in this permit, including accelerated or additional monitoring as necessary to determine the nature and impact of the non-complying discharge.

7. **Records Retention**

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed, calibration and maintenance of instrumentation, and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, and shall be submitted to Department representatives upon request. This period shall be extended during the course of unresolved litigation regarding the discharge of pollutants or when requested by the Secretary.

8. **Solids Management**

Collected screenings, sludges, and other solids removed in the course of treatment and control of wastewaters shall be stored, treated and disposed of in accord with t 10 V.S.A., Chapter 159 and with the terms and conditions of any certification, interim or final, transitional operation authorization or order issued pursuant to 10 V.S.A., Chapter 159 that is in effect on the effective date of this permit or is issued during the term of this permit.

9. Emergency Pollution Permits

Maintenance activities, or emergencies resulting from equipment failure or malfunction, including power outages, which result in an effluent which exceeds the effluent limitations specified herein, shall be considered a violation of the conditions of this permit, unless the permittee immediately applies for, and obtains, an emergency pollution permit under the provisions of 10 V.S.A., Chapter 47, Section 1268. The permittee shall notify the Department of the emergency situation by the next working day.

10 V.S.A., Chapter 47, Section 1268 reads as follows:

"When a discharge permit holder finds that pollution abatement facilities require repairs, replacement or other corrective action in order for them to continue to meet standards specified in the permit, he may apply in the manner specified by the secretary for an emergency pollution permit for a term sufficient to effect repairs, replacements or other corrective action. The permit may be issued without prior public notice if the nature of the emergency will not provide sufficient time to give notice; provided that the secretary shall give public notice as soon as possible but in any event no later than five days after the effective date of the emergency pollution permit. No emergency pollution permit shall be issued unless the applicant certifies and the secretary finds that:

(1) there is no present, reasonable alternative means of disposing of the waste other than by discharging it into the waters of the state during the limited period of time of the emergency;

(2) the denial of an emergency pollution permit would work an extreme hardship upon the applicant;

(3) the granting of an emergency pollution permit will result in some public benefit;

(4) the discharge will not be unreasonably harmful to the quality of the receiving waters;

(5) the cause or reason for the emergency is not due to wilful or intended acts or omissions of the applicant."

Application shall be made to the Secretary of the Agency of Natural Resources, Department of Environmental Conservation, One National Life Drive, Main Building, 2nd Floor, Montpelier VT 05620-3522.

B. RESPONSIBILITIES

1. Right of Entry

The permittee shall allow the Secretary or authorized representative, upon the presentation of proper credentials:

a. to enter upon the permittee's premises in which an effluent source or any records required to be kept under terms and conditions of the permit are located;

b. to have access to and copy any records required to be kept under the terms and conditions of the permit;

c. to inspect any monitoring equipment or method required in the permit; or

d. to sample any discharge of pollutants.

2. Transfer of Ownership or Control

This permit is not transferable without prior written approval of the Secretary. All application and operating fees must be paid in full prior to transfer of this permit. In the event of any change in control or ownership of facilities from which the authorized discharges emanate, the permittee shall provide a copy of this permit to the succeeding owner or controller and shall send written notification of the change in ownership or control to the Secretary. The permittee shall also inform the prospective owner or operator of their responsibility to make an application for transfer of this permit.

This request for transfer application must include as a minimum:

a. A properly completed application form provided by the Secretary and the applicable processing fee.

b. A written statement from the prospective owner or operator certifying:

   i. The conditions of the operation that contribute to, or affect, the discharge will not be materially different under the new ownership.

   ii. The prospective owner or operator has read and is familiar with the terms of the permit and agrees to comply with all terms and conditions of the permit.

   iii. The prospective owner or operator has adequate funding to operate and maintain the treatment system and remain in compliance with the terms and conditions of the permit.

c. The date of the sale or transfer.

The Secretary may require additional information dependent upon the current status of the facility operation, maintenance, and permit compliance.

3. Confidentiality

Pursuant to 10 V.S.A. 1259(b):

"Any records, reports or information obtained under this permit program shall be available to the public for inspection and copying. However, upon a showing satisfactory to the secretary that any records, reports or information or part thereof, other than effluent data, would, if made public, divulge methods or processes entitled to protection as trade secrets, the secretary shall treat and protect those records, reports or information as confidential. Any records, reports or information accorded confidential treatment will be disclosed to authorized representatives of the state and the United States when relevant to any proceedings under this chapter."

4. **Permit Modification**

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:

a. violation of any terms or conditions of this permit;

b. obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or

c. a change in any condition that requires either a temporary or permanent reduction or elimination of the permitted discharge.

5. **Toxic Effluent Standards**

If a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under section 307(a) of the Federal Act for a toxic pollutant which is present in the permittee's discharge and such standard or prohibition is more stringent than any limitation upon such pollutant in this permit, then this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

6. **Oil and Hazardous Substance Liability**

Nothing in this permit shall be construed to preclude the institution of legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under 10 V.S.A. §1281.

7. **Other Materials**

Other materials ordinarily produced or used in the operation of this facility, which have been specifically identified in the application, may be discharged at the maximum frequency and maximum level identified in the application, provided:

a. They are not:

i. designated as toxic or hazardous under provisions of Sections 307 and 311, respectively, of the Clean Water Act, or

ii. known to be hazardous or toxic by the permittee, except that such materials indicated in (a) and (b) above may be discharged in certain limited amounts with the written approval of, and under special conditions established by, the Secretary or his designated representative, if the substances will not pose any imminent hazard to the public health or safety;

b. The discharge of such materials will not violate applicable water quality standards; and

c. The permittee is not notified by the Secretary to eliminate or reduce the quantity of such materials entering the watercourse.

8. Navigable Waters

This permit does not authorize or approve the construction of any onshore or offshore physical structures or facilities or the undertaking of any work in any navigable waters.

9. Civil and Criminal Liability

Except as provided in, "Bypass" (Part II.A., paragraph 5.), "Emergency Action - Electric Power Failures" (Part I, paragraph J.), and "Emergency Pollution Permits" (Part II.A., paragraph 9.), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance. Civil and criminal penalties for non-compliance are provided for in 10 V.S.A. Chapters 47, 201, and 211.

10. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Clean Water Act.

11. Property Rights

Issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State, or local laws or regulations.

12. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

13. Authority

This permit is issued under authority of 10 V.S.A. §§1258 and 1259 of the Vermont Water Pollution Control Act, the Vermont Water Pollution Control Permit Regulation, and Section 402 of the Clean Water Act, as amended. 10 V.S.A. §1259 states: "No person shall discharge any waste, substance, or material into waters of the State, nor shall any person discharge any waste, substance, or material into an injection well or discharge into a publicly owned treatment works any waste which interferes with, passes through without treatment, or is otherwise incompatible with those works or would have a substantial adverse effect on those works or on water quality, without first obtaining a permit for that discharge from the Secretary".

14. Definitions

For purposes of this permit, the following definitions shall apply.

The Act - The Vermont Water Pollution Control Act, 10 V.S.A. Chapter 47

Annual Average - The highest allowable average of daily discharges calculated as the sum of all daily discharges (mg/l, lbs or gallons) measured during a calendar year divided by the number of daily discharges measured during that year.

Average - The arithmetic means of values taken at the frequency required for each parameter over the specified period.

The Clean Water Act - The federal Clean Water Act, as amended.

Composite Sample - A sample consisting of a minimum of one grab sample per hour collected during a 24-hour period (or lesser period as specified in the section on Monitoring and Reporting) and combined proportionally to flow over that same time period.

Daily Discharge - The discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling.

For pollutants with limitations expressed in pounds the daily discharge is calculated as the total pounds of pollutants discharged over the day.

For pollutants with limitations expressed in mg/l the daily discharge is calculated as the average measurement of the pollutant over the day.

Grab Sample - An individual sample collected in a period of less than 15 minutes.

Incompatible Substance (Pollutant) - Any waste being discharged into the treatment works which interferes with, passes through without treatment, or is otherwise incompatible with said works or would have a substantial adverse effect on these works or on water quality. This includes all pollutants required to be regulated under the Federal Clean Water Act.

Instantaneous Maximum - A value not to be exceeded in any grab sample.

Major Contributing Industry - One that: (1) has a flow of 50,000 gallons or more per average work day; (2) has a flow greater than five percent of the flow carried by the municipal system receiving the waste; (3) has in its wastes a toxic pollutant in toxic amounts as defined in standards issued under Section 307(a) of the Clean Water Act; or (4) has a significant impact, either singly or in combination with other contributing industries, on a publicly owned treatment works or on the quality of effluent from that treatment works.

Maximum Day (maximum daily discharge limitation) - The highest allowable "daily discharge" (mg/l, lbs or gallons).

Mean - The mean value is the arithmetic mean.

Monthly Average - (Average monthly discharge limitation) - The highest allowable average of daily discharges (mg/l, lbs or gallons) over a calendar month, calculated as the sum of all daily discharges (mg/l, lbs or gallons) measured during a calendar month divided by the number of daily discharges measured during that month.

NPDES - The National Pollutant Discharge Elimination System.

Secretary - The Secretary of the Agency of Natural Resources

State Certifying Agency Agency of Natural Resources
Department of Environmental Conservation
Watershed Management Division
One National Life Drive, Main Building, 2nd Floor
Montpelier VT 05620-3522

Weekly Average - (Average weekly discharge limitation) - The highest allowable average of daily discharges (mg/l, lbs or gallons) over a calendar week, calculated as the sum of all daily discharges (mg/l, lbs or gallons) measured during a calendar week divided by the number of daily discharges measured during that week.

VERMONT

State of Vermont
Department of Environmental Conservation
Watershed Management Division
One National Life Drive – Building Main 2
Montpelier VT 05620-3522
http://www.watershedmanagement.vt.gov/

Agency of Natural Resources

March 4, 2016

Ms. Bonnie Jo Radasch
Town of Whitingham
PO Box 529
Jacksonville VT 05342-0529

SUBJECT: NPDES Discharge Permit 3-1229, Whitingham WWTF Corrected Pages
NPDES Discharge Permit 3-1230, Jacksonville WWTF Corrected Page

Dear Ms. Radasch:

For discharge permit 3-1229, enclosed are corrected Pages 4 and 5. Condition C.3., has been revised to update the formulas used to properly calculate Total Nitrogen pounds and Total Nitrogen pounds per day, annual average.

For discharge permit 3-1225, enclosed is a corrected Page 4. Condition C.3., has also been revised to update the same Total Nitrogen formulas noted above.

Please replace the enclosed corrected pages with the pages you have on file. Thank you. If you have any questions regarding this correction, please contact Julia Butzler via e-mail at julia.butzler@vermont.gov or call 802-490-6182.

Respectfully,

Carole Fowler

Carole Fowler
Business Operations Support Services Section

Enclosure: 3-1229, Page 4 & 5
3-1230, Page 4

Cc: David DiCantio, Chief Operator, Town of Whitingham WWTF & Jacksonville WWTF

VERMONT

Vermont Department of Environmental Conservation
Watershed Management Division
1 National Life Drive, Main-2
Montpelier VT 05620-3522

Agency of Natural Resources

[phone] 802-828-1535
[fax] 802-828-1544

April 9, 2014

Town of Whitingham
Attn: Keith Bronson
PO Box 529
Jacksonville, VT 05342

RE: Discharge Permit No. 3-1230: Jacksonville Wastewater Treatment Facility

Dear Mr. Bronson,

Enclosed is your copy of Discharge Permits No. 3-1230 which has been signed on behalf of the Commissioner of the Department of Environmental Conservation. This permit authorizes the discharge of treated and disinfected wastewater from the Jacksonville Wastewater Treatment Facility to the East Branch of the North River.

Please review the permit carefully and make note of the effluent limitations, monitoring requirements, and other special conditions. As proposed in the draft permit which was provided for comment, this permit contains several changes from the permit that currently authorizes your discharge. Specifically, the requirements of EPA's Long Island Sound Nitrogen TMDL are included in the permit (See Condition I.A.C). The TMDL requires the Town to monitor for Total Nitrogen, develop and implement a Nitrogen Optimization Plan, assess the adequacy of the Plan, and annually report the Total Nitrogen discharged from your facility. Also the permit includes a requirement to conduct quarterly ammonia testing and a Whole Effluent Toxicity test and chemical pollutant scan to confirm that this discharge does not have the potential to cause toxic impact in the river and to sample the discharge for Total Phosphorus to assess its potential to contribute to eutrophication.

Since we did not receive any comments on this draft permit during the public notice period, the final permit is unchanged from the draft that was placed on public notice for comment.

If there are any questions regarding this permit please contact Randy Bean at our office.

Sincerely,

Ernest F. Kelley, Manager
Wastewater Management Program

attachments
cc
David DiCantio, Town of Whitingham WWTF
David DiDomenico, VT DEC WSMD

AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATERSHED MANAGEMENT DIVISION
ONE NATIONAL LIFE DRIVE, MAIN BUILDING, 2nd FLOOR
MONTPELIER, VT 05620-3522

Permit No.: 3-1230
PIN: NS98-0215
NPDES No.: VT0101044

Name of Applicant:	Town of Whitingham PO Box 529 Whitingham, VT 05342
Expiration Date:	March 31, 2019

DISCHARGE PERMIT

In compliance with the provisions of the Vermont Water Pollution Control Act as amended (10 V.S.A. Chapter 47 §1251 et seq), the Vermont Water Pollution Control Permit Regulations, and the Federal Clean Water Act, as amended (33 U.S.C. §1251 et seq), the Town of Whitingham,Vermont (hereinafter referred to as the "permittee") is authorized by the Secretary, Agency of Natural Resources, to discharge from the Jacksonville Wastewater Treatment Facility to the East Branch of the North River in accordance with the following general and special conditions.

This permit shall become effective on the date of signing.

State of Vermont
Agency of Natural Resources

David K. Mears, Commissioner
Department of Environmental Conservation

BY:

Digitally signed by Peter LaFlamme
DN: cn=Peter LaFlamme, o=VTDEC, ou=Watershed Management Division, email=pete.laflamme@state.vt.us, c=US
Date: 2014.04.08 10:22:36 -04'00'

Peter LaFlamme, Director
Watershed Management Division

I. SPECIAL CONDITIONS

A. EFFLUENT LIMITS

1. From the date of signing through March 31, 2019, the permittee is authorized to discharge from S/N 001 - outfall, the Jacksonville Wastewater Treatment Facility, to the East Branch of the North River, an effluent whose characteristics shall not exceed the values listed below:

DISCHARGE LIMITATIONS							
Effluent Characteristic	**Monthly Average**	**Weekly Average**	**Maximum Day**	**Monthly Average**	**Weekly Average**	**Maximum Day**	**Instantaneous Maximum**
	.... (lbs / day)			.... (Concentration)			
Flow (Annual Avg)				0.0501 MGD			
Biochemical Oxygen Demand, 5-day, 20° C	12.5	18.8		30 mg/l	45 mg/l	50 mg/l	
Total Suspended Solids	12.5	18.8		30 mg/l	45 mg/l	50 mg/l	
Total Phosphorus						Monitor only (mg/l)	
Total Nitrogen (1,2)			See Condition I.C below				
Total Kjeldahl Nitrogen (TKN)						Monitor only (mg/l)	
Nitrate/Nitrite Nitrogen (NOx)						Monitor only (mg/l)	
Ammonia						Monitor only (mg/l)	
Settleable Solids							1.0 ml/l
Escherichia coli Bacteria							77/100 ml
pH(3)				Between 6.0 and 8.5 Standard Units			

(1) Total Nitrogen = Total Kjeldahl Nitrogen (TKN) + Nitrate/Nitrite Nitrogen (NOx).

(2) See Total Nitrogen monitoring report form WR43-TN.

(3) In accordance with Section 2-04 of the Vermont Water Quality Standards, effective January 1, 2008, this permit establishes a mixing zone in the East Branch of the North River for pH for a distance of 200 feet downstream from the outfall of the Jacksonville Wastewater Treatment Facility. Within this mixing zone Section 3-01 B.9. is waived in accordance with Section 2-04.

Permit 3-1230 is missing the paragraph requirement for ultraviolet (UV) disinfection cfowler 1/25/2016.

2. The effluent shall not have concentrations or combinations of contaminants including oil, grease, scum, foam, or floating solids which would cause a violation of the water quality standards of the receiving waters.

3. The discharge shall not cause visible discoloration of the receiving waters.

4. The monthly average concentrations of BOD5 and total suspended solids in the discharge shall not exceed 15 percent of the monthly average concentrations of BOD5 and total suspended solids in the influent into the permittee's wastewater treatment facilities. For the purposes of determining whether the permittee is in compliance with this condition, samples from the discharge and the influent shall be taken with appropriate allowance for detention times. See Part I, Special Conditions, Paragraph E.2., Effluent Monitoring.

5. When the effluent discharged for a period of 90 consecutive days exceeds 80 percent of the permitted flow limitation, the permittee shall submit to the permitting authority projected loadings and a program for maintaining satisfactory treatment levels consistent with approved water quality management plans.

6. Any action on the part of the Agency of Natural Resources in reviewing, commenting upon or approving plans and specifications for the construction of wastewater treatment facilities shall not relieve the permittee from the responsibility to achieve effluent limitations set forth in this permit and shall not constitute a waiver of, or act of estoppel against any remedy available to the Agency, the State of Vermont or the federal government for failure to meet any requirement set forth in this permit or imposed by state or federal law.

B. WASTE MANAGEMENT ZONE

In accordance with 10 V.S.A. Section 1252, this permit hereby establishes a waste management zone that extends from the outfall of the Jacksonville Wastewater Treatment Facility in the East Branch of the North River downstream 1.3 miles.

C. TOTAL NITROGEN

1. Optimization Plan

By September 30, 2014, the permittee shall develop and submit to the Department for review and approval a Nitrogen Removal Optimization Evaluation Plan (the Plan) for the evaluation of alternative methods of operating the existing wastewater treatment facility to optimize the removal of nitrogen. The methods to be evaluated include, but are not limited to: operational, process, or equipment changes designed to enhance nitrification and denitrification (seasonal and year-round); incorporation of anoxic zones; septage receiving policies and procedures; and side stream management. The permittee shall implement these recommended operational changes in order to maintain the existing mass discharge loading of total nitrogen. The baseline annual average daily total nitrogen load discharge from this facility is estimated to be **approximately 9 lbs/day**.

This Plan shall be developed by a qualified professional with experience in the operation and/or design of municipal wastewater treatment facilities in conjunction with the Chief Operator of the facility.

This Plan shall be provided to the Agency for review and approval prior to implementation and shall be revised upon the Agency's request or by the Permittee to address equipment or operational changes.

Implementation of the Plan shall commence within 30 days of its approval by the Agency.

2. Plan Evaluation

Within one year following the implementation of the Plan, the permitee shall evaluate the effectiveness of the Plan. The evaluation shall be conducted by a qualified professional with experience in the operation and/or design of municipal wastewater treatment facilities in conjunction with the Chief Operator of the facility. The results of the Evaluation shall be submitted to the Agency for review and approval within 60 days of its completion and shall be revised at the Agency's request. Actions to implement the approved nitrogen removal optimization practices, if any, shall be initiated within 90 days of the Department's approval.

3. Reporting

Annually, beginning in January 2015, the permittee shall submit, a report to the Agency, as an attachment to the December Discharge Monitoring Report form (WR-43), that documents the annual average daily Total Nitrogen discharged (in pounds per day) from the facility, summarizes nitrogen removal optimization and efficiencies, and tracks trends relative to the previous year.

Total Nitrogen (TN) = Total Kjeldahl Nitrogen (TKN) + Nitrite/Nitrate (NO_x).

TN pounds per day, annual average, shall be calculated as follows:

1. Calculate the pounds of TN discharged on each sample date:

TN (lbs) = TN (mg/L) × volume discharged (million gallons) on day of sample × 8.34

2. Calculate the TN, pounds per day, annual average:

TN (lbs/day, annual average) = (Sum of all TN [lbs])/(count of TN samples)

4. Wasteload Allocation

This permit does not establish a formal Waste Load Allocation for the facility nor does it convey any right to ownership of the facility's estimated baseline annual average total nitrogen load.

The Agency reserves the right to reopen and amend this permit to include an alternate Total Nitrogen limitation and/or additional monitoring requirements based on the monitoring data, the results of nitrogen optimization activities, or a formal Waste Load Allocation promulgated under Vermont's Waste Load Allocation Rule for Total Nitrogen in the Connecticut River Watershed based on the Long Island Sound Total Nitrogen TMDL.

D. REAPPLICATION

If the permittee desires to continue to discharge after the expiration of this permit, the permittee shall reapply on the application forms then in use at least 180 days before this permit expires.

Reapply for a Discharge Permit by: September 30, 2018.

E. OPERATING FEES

This discharge is subject to operating fees. The permittee shall submit the operating fees in accordance with the procedures provided by the Secretary.

F. TOXICITY TESTING

1. By no later than November 15, 2016, the permittee shall submit the results of a two-species (Pimephales promelas) and (Ceriodaphnia dubia), 48 hour acute Whole Effluent Toxicity (WET) test to the Agency as specified below.
   a. In August or September 2016, the permittee shall conduct a two-species acute WET test on S/N 001.
   b. The WET tests shall be conducted according to the procedures and guidelines specified in: Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms (most recent edition) USEPA document
2. By no later than November 15, 2016, the permittee shall conduct an effluent analysis of S/N 001 for the pollutants in Attachment A and submit the results to the Agency.
3. Based upon the results of these tests or any other toxicity tests conducted on this discharge, this permit may be amended to require additional toxicity testing or a Toxicity Reduction Evaluation be conducted.

G. MONITORING AND REPORTING

1. Sampling and Analysis

The sampling, preservation, handling, and analytical methods used shall conform to regulations published pursuant to Section 304(g) of the Clean Water Act, under which such procedures may be required. Guidelines establishing these test procedures have been published in the Code of Federal Regulations, Title 40, Part 136 (Federal Register, Vol. 56, No. 195, July 1, 1999 or as amended).

Samples shall be representative of the volume and quality of effluent discharged over the sampling and reporting period. All samples are to be taken during normal operating hours. The permittee shall identify the effluent sampling location used for each discharge.

2. Effluent Monitoring

The permittee shall monitor and record the quality and quantity of discharge(s) S/N 001 - outfall, the Jacksonville Wastewater Treatment Facility, according to the following schedule and other provisions:

Until March 31, 2019

PARAMETER	MINIMUM FREQUENCY OF ANALYSIS	SAMPLE TYPE
Flow	Continuous	Daily Total, Max., Min.
BOD_5	1 x monthly	8 hour composite [1]
TSS	1 x monthly	8 hour composite [1]
Total Phosphorus (TP)	1 x monthly	8 hour composite [1]
Total Nitrogen (TN)	1 x monthly	Calculated [2]
Total Kjeldahl Nitrogen (TKN)	1 x monthly	Grab [2,3]
Nitrate/Nitrite Nitrogen (NOx)	1 x monthly	Grab [2,3]
Ammonia	1 x quarterly	Grab[3]
Settleable Solids	1 x daily	Grab [4]
Escherichia coli Bacteria	1 x monthly	Grab
pH	1 x daily	Grab

(1) Composite samples for BOD5, TSS, and TP shall be taken during the hours 6:00 a.m. to 6:00 p.m., unless otherwise specified. Eight hours is the minimum period for the composite.

(2) Total Nitrogen = TKN+NO_x

(3) The TKN, NOx, and Ammonia analysis shall be conducted on the same sample

(4) Settleable Solids samples shall be collected between 10:00 a.m. and 2:00 p.m. or during the period of peak flow.

4. Influent Monitoring

The permittee shall monitor the quality of the influent according to the following schedule and other provisions.

PARAMETER	MINIMUM FREQUENCY OF ANALYSIS	SAMPLE TYPE
Influent BOD5	1 x monthly	8 - hour composite, minimum (1)
Influent TSS	1 x monthly	8 - hour composite, minimum (1)
Total Nitrogen (TN)	1 x quarterly	Calculated (2,3)
Total Kjeldahl Nitrogen (TKN)	1 x quarterly	Grab (2,3)
Nitrate/Nitrite Nitrogen (NOx)	1 x quarterly	Grab (2,3)

(1) Composite samples for BOD5 and TSS shall be taken during the hours of 6:00 a.m. to 6:00 p.m., unless otherwise specified. Eight hours is the minimum period for the composite.

(2) $TN = TKN + NO_x$

(3) The influent TN (TKN & NO_x) sample shall be collected on the same day as an effluent TN (TKN & NO_x) sample.

5. Reporting

The permittee is required to submit monthly reports of monitoring results on form WR-43. Reports are due on the 15th day of each month, beginning with the month following the effective date of this permit.

If, in any reporting period, there has been no discharge, the permittee must submit that information by the report due date.

Signed copies of these, and all other reports required herein, shall be submitted to the Secretary at the following address:

Agency of Natural Resources
Department of Environmental Conservation
Watershed Management Division
One National Life Drive, Main Building, 2nd Floor
Montpelier VT 05620-3522

All reports shall be signed:

a. In the case of corporations, by a principal executive officer of at least the level of vice president, or his/her duly authorized representative, if such representative is responsible for the overall operation of the facility from which the discharge described in the permit form originates;

b. In the case of a partnership, by a general partner;

c. In the case of a sole proprietorship, by the proprietor;

d. In the case of a municipal, State, or other public facility, by either a principal executive officer, ranking elected official, or other duly authorized employee.

In addition to the monitoring and reporting requirements given above, daily monitoring of certain parameters for operational control are required by the Agency. Operations reports (reporting form WR-43) shall be submitted monthly.

6. Recording of Results

The permittee shall maintain records of all information resulting from any monitoring activities required, including:

a. The exact place, date, and time of sampling;
b. The dates and times the analyses were performed;
c. The person(s) who performed the analyses;
d. The analytical techniques and methods used including sample collection handling and preservation techniques;
e. The results of all required analyses.
f. The records of monitoring activities and results, including all instrumentation and calibration and maintenance records;
g. The original calculation and data bench sheets of the operator who performed analysis of the influent or effluent pursuant to requirements of Section I.(A) of this permit.

The results of monitoring requirements shall be reported (in the units specified) on the Vermont reporting form WR-43 or other forms approved by the Secretary.

7. Additional Monitoring

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form WR-43. Such increased frequency shall also be indicated.

H. DRY WEATHER FLOWS

Dry weather flows of untreated municipal wastewater from any sanitary or combined sewers are not authorized by this permit and are specifically prohibited by State and Federal laws and regulations.

I. OPERATION, MANAGEMENT, AND EMERGENCY RESPONSE PLANS

a. The permittee shall implement the Operation, Management, and Emergency Response Plan for the wastewater treatment facility, pump stations, and stream crossings as approved by the Agency on February 19, 2009.

b. The permittee shall implement the Operation, Management, and Emergency Response Plan for the wastewater collection system as approved by the Agency on February 19, 2009

J. EMERGENCY ACTION - ELECTRIC POWER FAILURE

The permittee shall indicate in writing to the Secretary **within 30 days after the effective date of this permit** that the discharge shall be handled in such a manner that, in the event the primary source of electric power to the waste treatment facilities (including pump stations) fails, any discharge into the receiving waters will attempt to comply with the conditions of this permit, but in no case shall the wastes receive less than primary treatment (or in the case of ultraviolet light disinfection systems, not less than secondary treatment) plus disinfection.

The permittee shall either provide an alternative source of power for the operation of its treatment facilities, or demonstrate that the treatment facility has the capacity to store the wastewater volume that would be generated over the duration of the longest power failure that would have affected the faeility in the last five years, excluding catastrophic events.

The alternative power supply, whether from a generating unit located at the plant site or purchased from an independent source of electricity, must be separate from the existing power source used to operate the waste treatment facilities. If a separate unit located at the plant site is to be used, the permittee shall certify in writing to the Secretary when the unit is completed and prepared to generate power.

The determination of treatment system storage capacity shall be submitted to the Watershed Management Division upon completion.

K. SEWER ORDINANCE

The permittee shall have in effect a sewer use ordinance acceptable to the Secretary which, at a minimum, shall

1. Prohibit the introduction by any discharger into the permittee's sewerage system or treatment facilities of any pollutant which:

   a. is a toxic pollutant in toxic amounts as defined in standards issued from time to time under Section 307(a) of the Clean Water Act;

b. creates a fire or explosion hazard in the permittee's treatment works;

c. causes corrosive structural damage to the permittee's treatment works, including all wastes with a pH lower than 5.0;

d. contains solid or viscous substances in amounts which would cause obstruction to the flow in sewers or other interference with proper operation of the permittee's treatment works; or

e. in the case of a major contributing industry, as defined herein, contains an incompatible pollutant, as further defined herein, in an amount or concentration in excess of that allowed under standards or guidelines issued from time to time pursuant to Sections 304, 306, and/or 307 of the Clean Water Act.

2. Require 45 days prior notification to the permittee by any person or persons of a:

a. proposed substantial change in volume or character of pollutants over that being discharged into the permittee's treatment works at the time of issuance of this permit;

b. proposed new discharge into the permittee's treatment works of pollutants from any source which would be a new source as defined in Section 306 of the Clean Water Act if such source were discharging pollutants; or

c. proposed new discharge into the permittee's treatment works of pollutants from any source which would be subject to Section 301 of the Clean Water Act if it were discharging such pollutants.

3. Require any industry discharging into the permittee's treatment works to perform such monitoring of its discharge as the permittee may reasonably require, including the installation, use, and maintenance of monitoring equipment methods, to keep records of the results of such monitoring, and to report the results of such monitoring to the permittee. Such records shall be made available by the permittee to the Secretary upon request.

4. Authorize the permittee's authorized representatives to enter into, upon, or through the premises of any industry discharging into the permittee's treatment works to have access to and copy any records, to inspect any monitoring equipment or method required under subsection 3 above, and to sample any discharge into the permittee's treatment works.

The permittee shall notify the Secretary of any discharge specified in subsection 2 above within 30 days of the date on which the permittee is notified of such discharge. This permit may be modified accordingly.

II. GENERAL CONDITIONS

A. MANAGEMENT REQUIREMENTS

1. Facility Modification / Change in Discharge

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than, or at a level in excess of, that identified and authorized by this permit shall constitute a violation of the terms and conditions of this permit. Such a violation may result in the imposition of civil and/or criminal penalties pursuant to 10 V.S.A. Chapters 47, 201, and/or 211. Any anticipated facility expansions or process modifications which will result in new, different, or increased discharges of pollutants must be reported by submission of a new permit application or, if such changes will not violate the effluent limitations specified in this permit, by notice to the permit issuing authority of such changes. Following such notice, the permit may be modified to specify and limit any pollutants not previously limited.

In addition, the permittee shall provide notice to the Secretary of the following:

a. any new introduction of pollutants into the treatment works from a source which would be a new source as defined in Section 306 of the Clean Water Act if such source were discharging pollutants;

b. except for such categories and classes of point sources or discharges specified by the Secretary, any new introduction of pollutants into the treatment works from a source which would be subject to Section 301 of the Clean Water Act if such source were discharging pollutants; and

c. any substantial change in volume or character of pollutants being introduced into the treatment works by a source introducing pollutants into such works at the time of issuance of the permit.

The notice shall include:

i. the quality and quantity of the discharge to be introduced into the system, and

ii. the anticipated impact of such change in the quality or quantity of the effluent to be discharged from the permitted facility.

2. Noncompliance Notification

In the event the permittee is unable to comply with any of the conditions of this permit due, among other reasons, to:

a. breakdown or maintenance of waste treatment equipment (biological and physical-chemical systems including, but not limited to, all pipes, transfer pumps, compressors, collection ponds or tanks for the segregation of treated or untreated wastes, ion exchange columns, or carbon absorption units),

b. accidents caused by human error or negligence, or

c. other causes such as acts of nature,

the permittee shall notify the Secretary within 24 hours of becoming aware of such condition or by the next business day and shall provide the Secretary with the following information, in writing, within five (5) days:

i. cause of non-compliance

ii. a description of the non-complying discharge including its impact upon the receiving water;

iii. anticipated time the condition of non-compliance is expected to continue or, if such condition has been corrected, the duration of the period of non-compliance;

iv. steps taken by the permittee to reduce and eliminate the non-complying discharge; and

v. steps to be taken by the permittee to prevent recurrence of the condition of non-compliance.

3. Operation and Maintenance

All waste collection, control, treatment, and disposal facilities shall be operated in a manner consistent with the following:

a. The permittee shall, at all times, maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit.

b. The permittee shall provide an adequate operating staff which is duly qualified to carry out the operation, maintenance, and testing functions required to insure compliance with the conditions of this permit; and

c. The operation and maintenance of this facility shall be performed only by qualified personnel. The personnel shall be certified as required under the Vermont Water Pollution Abatement Facility Operator Certification Regulations.

4. Quality Control

The permittee shall calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at regular intervals to ensure accuracy of measurements, or shall ensure that both activities will be conducted.

The permittee shall keep records of these activities and shall provide such records upon request of the Secretary.

The permittee shall demonstrate the accuracy of the flow measurement device weekly and report the results on the monthly report forms. The acceptable limit of error is ± 10%.

The permittee shall analyze any additional samples as may be required by the Agency of Natural Resources to ensure analytical quality control.

5. Bypass

The diversion or bypass of facilities (including pump stations) necessary to maintain compliance with the terms and conditions of this permit is prohibited, except where authorized under the terms and conditions of an Emergency Pollution Permit issued pursuant to 10 V.S.A. Section 1268.

6. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any adverse impact to waters of the State resulting from non-compliance with any condition specified in this permit, including accelerated or additional monitoring as necessary to determine the nature and impact of the non-complying discharge.

7. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed, calibration and maintenance of instrumentation, and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, and shall be submitted to Department representatives upon request. This period shall be extended during the course of unresolved litigation regarding the discharge of pollutants or when requested by the Secretary.

8. Solids Management

Collected screenings, sludges, and other solids removed in the course of treatment and control of wastewaters shall be stored, treated and disposed of in accord with t 10 V.S.A., Chapter 159 and with the terms and conditions of any certification, interim or final, transitional operation authorization or order issued pursuant to 10 V.S.A., Chapter 159 that is in effect on the effective date of this permit or is issued during the term of this permit.

9. Emergency Pollution Permits

Maintenance activities, or emergencies resulting from equipment failure or malfunction, including power outages, which result in an effluent which exceeds the effluent limitations specified herein, shall be considered a violation of the conditions of this permit, unless the permittee immediately applies for, and obtains, an emergency pollution permit under the provisions of 10 V.S.A., Chapter 47, Section 1268. The permittee shall notify the Department of the emergency situation by the next working day.

10 V.S.A., Chapter 47, Section 1268 reads as follows:

"When a discharge permit holder finds that pollution abatement facilities require repairs, replacement or other corrective action in order for them to continue to meet standards specified in the permit, he may apply in the manner specified by the secretary for an emergency pollution permit for a term sufficient to effect repairs, replacements or other corrective action. The permit may be issued without prior public notice if the nature of the emergency will not provide sufficient time to give notice; provided that the secretary shall give public notice as soon as possible but in any event no later than five days after the effective date of the emergency pollution permit. No emergency pollution permit shall be issued unless the applicant certifies and the secretary finds that:

(1) there is no present, reasonable alternative means of disposing of the waste other than by discharging it into the waters of the state during the limited period of time of the emergency;

(2) the denial of an emergency pollution permit would work an extreme hardship upon the applicant;

(3) the granting of an emergency pollution permit will result in some public benefit;

(4) the discharge will not be unreasonably harmful to the quality of the receiving waters;

(5) the cause or reason for the emergency is not due to wilful or intended acts or omissions of the applicant."

Application shall be made to the Secretary of the Agency of Natural Resources, Department of Environmental Conservation, One National Life Drive, Main Building, 2nd Floor, Montpelier VT 05620-3522.

B. RESPONSIBILITIES

1. Right of Entry

The permittee shall allow the Secretary or authorized representative, upon the presentation of proper credentials:

a. to enter upon the permittee's premises in which an effluent source or any records required to be kept under terms and conditions of the permit are located;

b. to have access to and copy any records required to be kept under the terms and conditions of the permit;

c. to inspect any monitoring equipment or method required in the permit; or

d. to sample any discharge of pollutants.

2. Transfer of Ownership or Control

This permit is not transferable without prior written approval of the Secretary. All application and operating fees must be paid in full prior to transfer of this permit. In the event of any change in control or ownership of facilities from which the authorized discharges emanate, the permittee shall provide a copy of this permit to the succeeding owner or controller and shall send written notification of the change in ownership or control to the Secretary. The permittee shall also inform the prospective owner or operator of their responsibility to make an application for transfer of this permit.

This request for transfer application must include as a minimum:

a. A properly completed application form provided by the Secretary and the applicable processing fee.

b. A written statement from the prospective owner or operator certifying:

  i. The conditions of the operation that contribute to, or affect, the discharge will not be materially different under the new ownership.

  ii. The prospective owner or operator has read and is familiar with the terms of the permit and agrees to comply with all terms and conditions of the permit.

  iii. The prospective owner or operator has adequate funding to operate and maintain the treatment system and remain in compliance with the terms and conditions of the permit.

c. The date of the sale or transfer.

The Secretary may require additional information dependent upon the current status of the facility operation, maintenance, and permit compliance.

3. Confidentiality

Pursuant to 10 V.S.A. 1259(b):

"Any records, reports or information obtained under this permit program shall be available to the public for inspection and copying. However, upon a showing satisfactory to the secretary that any records, reports or information or part thereof, other than effluent data, would, if made public, divulge methods or processes entitled to protection as trade secrets, the secretary shall treat and protect those records, reports or information as confidential. Any records, reports or information accorded confidential treatment will be disclosed to authorized representatives of the state and the United States when relevant to any proceedings under this chapter."

4. Permit Modification

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:

a. violation of any terms or conditions of this permit;

b. obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or

c. a change in any condition that requires either a temporary or permanent reduction or elimination of the permitted discharge.

5. Toxic Effluent Standards

If a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under section 307(a) of the Federal Act for a toxic pollutant which is present in the permittee's discharge and such standard or prohibition is more stringent than any limitation upon such pollutant in this permit, then this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

6. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under 10 V.S.A. §1281.

7. Other Materials

Other materials ordinarily produced or used in the operation of this facility, which have been specifically identified in the application, may be discharged at the maximum frequency and maximum level identified in the application, provided:

a. They are not:

  i. designated as toxic or hazardous under provisions of Sections 307 and 311, respectively, of the Clean Water Act, or

ii. known to be hazardous or toxic by the permittee, except that such materials indicated in (a) and (b) above may be discharged in certain limited amounts with the written approval of, and under special conditions established by, the Secretary or his designated representative, if the substances will not pose any imminent hazard to the public health or safety;

b. The discharge of such materials will not violate applicable water quality standards; and

c. The permittee is not notified by the Secretary to eliminate or reduce the quantity of such materials entering the watercourse.

8. Navigable Waters

This permit does not authorize or approve the construction of any onshore or offshore physical structures or facilities or the undertaking of any work in any navigable waters.

9. Civil and Criminal Liability

Except as provided in, "Bypass" (Part II.A., paragraph 5.), "Emergency Action - Electric Power Failures" (Part I, paragraph J.), and "Emergency Pollution Permits" (Part II.A., paragraph 9.), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance. Civil and criminal penalties for non-compliance are provided for in 10 V.S.A. Chapters 47, 201, and 211.

10. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Clean Water Act.

11. Property Rights

Issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State, or local laws or regulations.

12. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

13. Authority

This permit is issued under authority of 10 V.S.A. §§1258 and 1259 of the Vermont Water Pollution Control Act, the Vermont Water Pollution Control Permit Regulation, and Section 402 of the Clean Water Act, as amended. 10 V.S.A. §1259 states: "No person shall discharge any waste, substance, or material into waters of the State, nor shall any person discharge any waste, substance, or material into an injection well or discharge into a publicly owned treatment works any waste which interferes with, passes through without treatment, or is otherwise incompatible with those works or would have a substantial adverse effect on those works or on water quality, without first obtaining a permit for that discharge from the Secretary".

14. Definitions

For purposes of this permit, the following definitions shall apply.

The Act - The Vermont Water Pollution Control Act, 10 V.S.A. Chapter 47

Annual Average - The highest allowable average of daily discharges calculated as the sum of all daily discharges (mg/l, lbs or gallons) measured during a calendar year divided by the number of daily discharges measured during that year.

Average - The arithmetic means of values taken at the frequency required for each parameter over the specified period.

The Clean Water Act - The federal Clean Water Act, as amended.

Composite Sample - A sample consisting of a minimum of one grab sample per hour collected during a 24-hour period (or lesser period as specified in the section on Monitoring and Reporting) and combined proportionally to flow over that same time period.

Daily Discharge - The discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling.

For pollutants with limitations expressed in pounds the daily discharge is calculated as the total pounds of pollutants discharged over the day.

For pollutants with limitations expressed in mg/l the daily discharge is calculated as the average measurement of the pollutant over the day.

Grab Sample - An individual sample collected in a period of less than 15 minutes.

Incompatible Substance (Pollutant) - Any waste being discharged into the treatment works which interferes with, passes through without treatment, or is otherwise incompatible with said works or would have a substantial adverse effect on these works or on water quality. This includes all pollutants required to be regulated under the Federal Clean Water Act.

Instantaneous Maximum - A value not to be exceeded in any grab sample.

Major Contributing Industry - One that: (1) has a flow of 50,000 gallons or more per average work day; (2) has a flow greater than five percent of the flow carried by the municipal system receiving the waste; (3) has in its wastes a toxic pollutant in toxic amounts as defined in standards issued under Section 307(a) of the Clean Water Act; or (4) has a significant impact, either singly or in combination with other contributing industries, on a publicly owned treatment works or on the quality of effluent from that treatment works.

Maximum Day (maximum daily discharge limitation) - The highest allowable "daily discharge" (mg/l, lbs or gallons).

Mean - The mean value is the arithmetie mean.

Monthly Average - (Average monthly discharge limitation) - The highest allowable average of daily discharges (mg/l, lbs or gallons) over a calendar month, calculated as the sum of all daily discharges (mg/l, lbs or gallons) measured during a calendar month divided by the number of daily discharges measured during that month.

NPDES - The National Pollutant Discharge Elimination System.

Secretary - The Secretary of the Agency of Natural Resources

State Certifying Agency Agency of Natural Resources
Department of Environmental Conservation
Watershed Management Division
One National Life Drive, Main Building, 2nd Floor
Montpelier VT 05620-3522

Weekly Average - (Average weekly discharge limitation) - The highest allowable average of daily discharges (mg/l, lbs or gallons) over a calendar week, calculated as the sum of all daily discharges (mg/l, lbs or gallons) measured during a calendar week divided by the number of daily discharges measured during that week.

ATTACHMENT A

Metals, Cyanide and Phenols
Antimony, Total
Arsenic, Total
Beryllium, Total
Cadmium, Total
Copper, Total
Chromium, Total
Cyanide, Total
Lead, Total
Mercury, Total
Nickel, Total
Phenols, Total
Selenium, Total
Silver, Total
Thallium, Total
Zinc, Total

Volatiles
acrolein
acrylonitrile
benzene
bromoform
carbon tetrachloride
chlorobenzene
chlorodibromomethane
chloroethane
2-chloroethylvinyl ether
chloroform
dichlorobromomethane
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethylene
1,2-dichloropropane
1,3-dichloropropylene
ethylbenzene
methyl bromide
methyl chloride
methylene chloride
1,1,2,2-tetrachloroethane
tetrachloroethylene
toluene
1,2-trans-dichloroethylene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethylene
vinyl chloride

Acid Compounds
2-chlorophenol
2,4-dichlorophenol
2,4-dimethylphenol
4,6-dinitro-o-cresol
2,4-dinitrophenol
2-nitrophenol
4-nitrophenol
p-chloro-m-cresol
pentachlorophenol
phenol
2,4,6-trichlorophenol

Base/Neutral
acenaphthene
acenaphthylene
anthracene
benzidine
benzo(a)anthracene
benzo(a)pyrene
3,4-benzofluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
bis(2-chloroethoxy)methane
bis(2-chloroethyl)ether
bis(2-chloroisopropyl)ether
bis(2-ethylhexyl)phthalate
4-bromophenyl phenyl ether
butylbenzyl phthalate
2-chloronaphthalene
4-chlorophenyl phenl ether
chrysene
dibenzo(a,h)anthracene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
3,3'-dichlorobenzidine
diethyl phthalate
dimethyl phthalate
di-n-octyl phthalate
2,4-dinitrotoluene
2,6-dinitrotoluene
di-n-octyl phythalate
1,2-diphenylhydrazine
(as azobenzene)
fluroranthene

Base/Neutrals (continued)
fluorene
hexachlorobenzene
hexachlorobutadiene
hexachlorocyclopentadiene
hexachloroethane
indeno(1,2,3-cd)pyrene
isophorone
napthalene
nitrobenzene
N-nitrosodimethylamine
N-nitrosodi-n-propylamine
N-nitrosodiphenylamine
phenanthrene
pyrene
1,2,4-trichlorobenzene

Pesticides
aldrin
alpha-BHC
beta-BHC
gamma-BHC
delta-BHC
chlordane
4,4'-DDT
4,4'-DDE
4,4'-DDD
dieldrin
alpha-endosulfan
beta-endosulfan
endosulfan sulfate
endrin
endrin aldehyde
heptachlor
heptachlor epoxide
PCB-1242
PCB-1254
PCB-1221
PCB-1232
PCB-1248
PCB-1260
PCB-1016
toxaphene

APPENDIX B

Environmental Information Document

APPENDIX C

Vermont Population Projections – 2010-2030

State of Vermont

Vermont Population Projections – 2010 - 2030

August, 2013

Produced by:

Ken Jones, Ph.D., Economic Research Analyst

Vermont Agency of Commerce and Community Development

and

Lilly Schwarz, Community Based Learning Intern

Montpelier High School

This project was developed with the assistance and oversight of a committee of State Agency representatives. The Committee reviewed the methodology and results leading to the final figures presented in this report.

Population Projection Review Committee

Glenn Bailey, Vermont Agency of Education
Mathew Barewicz, Vermont Department of Labor
Sarah Lindberg, Vermont Department of Financial Regulation
Michael Moser, University of Vermont, Center for Rural
Studies Michael Nyland-Funke, Vermont Department of Health

Vermont Population Projections – 2010 - 2030

How are Population Projections developed?

Vermont's population projections are based on an age cohort model (defined age groupings such as: 35-39 year-olds) using US Census data as the basis for calculations. Mortality, birth rate and migration rate data from 1990-2010 are factors used to develop the projections.

In general, an age cohort projection model starts with the population total for a particular age group at a given point in time. The Census bureau reports most age cohorts in 5 year groups and thus, five year groups are used in this model. At the end of a ten year period, the population for an age cohort is equal to the beginning population total minus the mortality and plus or minus the migration during the ten year period. For example,

> In year 2000, according to the US census, Vermont's 25-29 age cohort population was 34,182. Ten years later, in year 2010, Vermont's 35-39 age cohort population was 36,358 - according to Census reporting. Between 2000 and 2010, about 50 people in that age cohort died (0.15% mortality rate over the ten year period).
>
> By taking into account the population increase and mortality rate for the the age cohort, the migration rate can be calculated.
> Migration = 36,358 – 34,182 + 50
> = 2226 or 6.51% of the 2000 five year age cohort

"Projecting" into the future, would suggest that the 2020 population of 35-39 year olds will equal the 2010 population of 25-29 year olds (35,441) minus mortality (again, about .15%) plus the 6.51% net migration rate. 2020 projected population of 35-39 year olds = 37,700

Migration

The migration rate for the 2010 to 2020 and 2020 to 2030 decades could be similar to the migration rate for the 2000 to 2010 period or the 1990 to 2000 period. These different migration assumptions are the basis for the two sets of projections presented in this report – Scenario A and Scenario B. In Vermont, there is a relationship between the national economy and the direction and magnitude of migration. During the 1990s (Scenario A), the national economy was generally healthier than during the 2000s (Scenario B) and Vermont saw greater rates of net in-migration. As a result, Scenario A using 1990s migration rates generally, show higher populations than Scenario B using the migration rates of the 2000s.

Mortality

The mortality rates for age cohorts greater than 50 years old continue to decrease. For the population projections, we use mortality rates that continue the decline. For younger populations, the mortality rate is leveling off and the mortality rates used for the projection do not have the same proportional decreases that other age cohorts exhibit.

Births

The number of children born during the projection period requires the use of age specific birth rates. The Vermont Department of Health publishes county and age-specific birth rates each year in its Vital Statistics publication. In Vermont, each county is witnessing decreases in the birth rates for teenage women. Birth rates for women in their 20s and early 30s are relatively more stable, while the birth rates for women in older age cohorts continue to increase. As with the mortality rates, these Vermont population projections assume a continuation in the trend in birth rates seen for the past twenty years to provide birth rates for each age cohort into the next twenty years. Unlike mortality, the birth rates in Vermont vary significantly for each county. Therefore, the county projections use county-specific birth rates for each age cohort.

In order to complete the projections for children born during the projection period, there are three steps. The first step is to complete the population projections for females in each county using statewide mortality rates and county and age specific migration rates based on 1990s and 2000s Census data. The second step is to apply the age and county specific birth rates to each projected female age cohort resulting in the number of births during the time period. The final step is to review the migration rates for young children during the 1990s and 2000s and apply those migration rates to the number of births projected from Steps One and Two.

Normalizing the county and town projections

For all age cohorts, a state projection is completed in addition to one for each county. Because the statistical validity of a projection is greater with larger numbers, the state projection serves as a base against which the county projections are normalized. In other words, for any age cohort, the state projected total is compared against the total of each county cohort. Any differences are normalized by reducing or increasing county figures proportionally to the population size of that cohort in each county. For example, the age 40-44 state population is projected to be 35,561 when assuming the migration pattern of the 2000s. The sum of the county projections for that cohort is 35,570. For consistency, the county population numbers for that cohort are decreased proportionally to result in a county total equal to the state projected figure.

Town and City projections

The county projections are the basis for determining town and city level projections. As with the county migration rates, the changes in the population for each town that took place in 2000-2010 and 1990 – 2000 combined with the projected changes in county numbers result in an equation to project town populations. Specifically,

2020 Town projected figure = Town population in 2010 + (50% of the rate of town population change from 2000-2010) + (25% of the rate of town population change from 1990 – 2000) + (25% of the rate of county population change from 2000-2010)

2030 Town projected figure = Town population in 2020 + (35% the rate of town population change from 2000-2010)+(15% of the rate of town population change from 1990 – 2000) + (50% of the rate of county population change from 2000-2010)

Similar to normalizing county age cohort figures to correspond to the state projections, town populations are either increased or decreased to assure that the sum of the town populations in a county equal the county population.

Caveats when considering the Vermont Population Projections

Projections, not predictions

Projections assume that conditions that occurred in the past will continue into the future. For these projections, there are assumptions about mortality rates (continuing a downward trajectory for the next 20 years), birth rates and two sets of assumptions about migration rates. Events may alter the conditions that led to population changes in the past 20 years and those events will affect the changes in population. Examples of changes that are not predicted for these estimates:

- Changes in the birth rate from social changes different than what has occurred in the past 20 years
- Changes in health care practices or epidemics that could affect mortality rates
- Changing economic conditions that result in shifts in national (internal) migration
- Changes in national immigration policies

Census populations, not the actual number of inhabitants at a given time

Many individuals, particularly those that are retired and those attending colleges and universities have more than one home. The Census Bureau does not have a requirement that individuals determine their residency with a particular set of standards and does not allow any individual to split their residence to multiple towns or states. The residence as of April 1, in the

Vermont 2010 Census Count Projections by Town, 2020, 2030 - Scenario A

Town	2010 Census	2020	%change from 2010	2030	%change from 2010
Windham County					
ATHENS	442	527	19.2%	591	33.7%
BRATTLEBORO	12,046	12,244	1.6%	12,271	1.9%
BROOKLINE	530	598	12.8%	642	21.1%
DOVER	1,124	1,150	2.3%	1,145	1.9%
DUMMERSTON	1,864	1,889	1.3%	1,886	1.2%
GRAFTON	679	721	6.2%	744	9.6%
GUILFORD	2,121	2,231	5.2%	2,286	7.8%
HALIFAX	728	777	6.7%	800	9.9%
JAMAICA	1,035	1,171	13.1%	1,258	21.5%
LONDONDERRY	1,769	1,895	7.1%	1,964	11.0%
MARLBORO	1,078	1,170	8.5%	1,227	13.8%
NEWFANE	1,726	1,819	5.4%	1,865	8.1%
PUTNEY	2,702	2,872	6.3%	2,960	9.5%
ROCKINGHAM	5,282	5,329	0.9%	5,315	0.6%
STRATTON	216	291	34.7%	357	65.3%
TOWNSHEND	1,232	1,341	8.8%	1,405	14.0%
VERNON	2,206	2,370	7.4%	2,460	11.5%
WARDSBORO	900	1,011	12.3%	1,081	20.1%
WESTMINSTER	3,178	3,273	3.0%	3,304	4.0%
WHITINGHAM	1,357	1,450	6.9%	1,501	10.6%
WILMINGTON	1,876	1,826	-2.7%	1,769	-5.7%
WINDHAM	419	518	23.6%	594	41.8%
SOMERSET	3	4	33.3%	4	33.3%
County Total	44,513	46,477	4.4%	47,429	6.6%

Vermont 2010 Census Count Projections by Town, 2020, 2030 - Scenario B

Town	2010 Census	2020	%change from 2010	2030	%change from 2010
Windham County					
ATHENS	442	505	14.3%	545	23.3%
BRATTLEBORO	12,046	11,700	-2.9%	11,275	-6.4%
BROOKLINE	530	572	7.9%	591	11.5%
DOVER	1,124	1,099	-2.2%	1,052	-6.4%
DUMMERSTON	1,864	1,805	-3.2%	1,733	-7.0%
GRAFTON	679	690	1.6%	685	0.9%
GUILFORD	2,121	2,132	0.5%	2,102	-0.9%
HALIFAX	728	743	2.1%	736	1.1%
JAMAICA	1,035	1,120	8.2%	1,159	12.0%
LONDONDERRY	1,769	1,812	2.4%	1,806	2.1%
MARLBORO	1,078	1,119	3.8%	1,129	4.7%
NEWFANE	1,726	1,739	0.8%	1,715	-0.6%
PUTNEY	2,702	2,746	1.6%	2,723	0.8%
ROCKINGHAM	5,282	5,092	-3.6%	4,883	-7.6%
STRATTON	216	279	29.2%	330	52.8%
TOWNSHEND	1,232	1,282	4.1%	1,293	5.0%
VERNON	2,206	2,267	2.8%	2,264	2.6%
WARDSBORO	900	968	7.6%	995	10.6%
WESTMINSTER	3,178	3,128	-1.6%	3,037	-4.4%
WHITINGHAM	1,357	1,386	2.1%	1,380	1.7%
WILMINGTON	1,876	1,744	-7.0%	1,624	-13.4%
WINDHAM	419	496	18.4%	548	30.8%
SOMERSET	3	3	0.0%	4	33.3%
County Total	44,513	44,427	-0.2%	43,609	-2.0%

APPENDIX D

Basis of Design Criteria

WHITINGHAM, VERMONT
VILLAGE OF WHITINGHAM
WASTEWATER TREATMENT FACILITY

DESIGN DATA

General

	Initial Year	Design Yr.(2003)
Average Daily Flow (Total)	6,000 gpd	12,300 gpd
Infiltration/inflow	600 gpd	3,400 gpd
Population Equivalent	77	127
BOD Loading	10 lbs/day	21 lbs/day
SS Loading	10 lbs/day	21 lbs/day

Septic Tanks

No. of Units	3
Detention time @ Avg. Design Flow	15.8 hrs.
Total Capacity, each unit	2,700 gal.

Flow Equalization Tanks

No. of Sections	2
Total Capacity	7,000 gal.

Flow Equalization/RBC Feed Pumps

No. of Pumps	2 alternating
Type	Diaphragm
Capacity	3-18 gpm
Pump Seed	14-56 spm
Motors	1 HP @ 1750 rpm
Variable Speed Unit Output Ranges	4:1
Control System	Bubbler type level sensor

Rotating Biological Contactor

No. of Units	1
Media Surface Area	12,000 Sq. Ft.
Hydraulic loading rate (Design)	1.03 gpd/Sq. Ft.
Tank Capacity	2,000 gal.
Detention Time @ Avg. Design Flow	3.9 hours
Shaft Speed	1.5 rpm
Motor	1.5 HP @ 1200 rpm

Secondary Clarifier

No. of Sections	1 w/2 sludge hoppers
Total Capacity	1,700 gal.
Surface Loading Rate @ Ave. Design Flow	385 gpd/sq. ft.
Weir Loading Rate @ Avg. Design Flow	3,075 gpd/ft.

Ultraviolet Disinfection

No. of Units	2 (1 is standby)
Capacity, each	15 gpm
No. of lamps, each	2
Residence Time @ Avg. Design Flow	6 seconds
Min. UV Transmittance of Secondary Effluent	60%

Collection System

Quantity 8" Gravity Sewer Pipe	4,394 L.F.
Quantity Force Mains	115 L.F.
No. Pump Stations	1
Pump Station:	
No. of Pumps	2 (alternating)
Type	Centrifugal grinder
Capacity, each	33 gpm
TDH	29 ft.
Motors	2 HP
Control System	float level switches
Wet Well Operating Volume	80 gal.
Emergency Storage Capacity	1,300 gal.
Approx. Power Outage Duration Capacity	6 hours

WHITINGHAM, VERMONT
VILLAGE OF JACKSONVILLE
WASTEWATER TREATMENT FACILITY

DESIGN DATA

General

	Initial Year	Design Yr.(2003)
Average Daily Flow (Total)	30,400 gpd	50,100 gpd
Infiltration/inflow	3,100 gpd	15,000 gpd
Population Equivalent	390	501
BOD Loading	51 lbs/day	84 lbs/day
SS Loading	51 lbs/day	84 lbs/day

Septic Tanks

No. of Units	4
Detention time @ Avg. Design Flow	15.3 hrs.
Total Capacity, each unit	8000 gal.

Flow Equalization Tanks

No. of Sections	4
Total Capacity	25,000 gal.
No. of Blowers (mixing and aeration)	2
Blower Capacity, each	75 scfm
Blower Motors	5 HP @ 1800 rpm

Flow Equalization/RBC Feed Pumps

No. of Pumps	2 alternating
Type	Diaphragm
Capacity	10-58 gpm
Pump Seed	30-58/60 spm
Motors	2 HP @ 1750 rpm
Variable Speed Unit Output Ranges	4:1
Control System	Bubbler type level sensor

Rotating Biological Contactor

No. of Units	1
Media Surface Area	51,000 Sq. Ft.
Hydraulic loading rate (Design)	0.98 gpd/Sq. Ft.
Tank Capacity	5,440 gal.
Detention Time @ Avg. Design Flow	2.6 hours
Shaft Speed	1.5 rpm
Motor	3 HP @ 1200 rpm

Secondary Clarifier

No. of Sections	2 each w/2 sludge hoppers
Total Capacity	8,200 gal.
Surface Loading Rate @ Avg. Design Flow	350 gpd/sq. ft.
Weir Loading Rate @ Avg. Design Flow	4,175 gpd/ft.

Ultraviolet Disinfection

No. of Units	2 (1 is standby)
Capacity, each	45 gpm
No. of lamps, each	6
Residence Time @ Avg. Design Flow	8 seconds
Min. UV Transmittance of Secondary Effluent	60%

Collection System

Quantity 8" Gravity Sewer Pipe	12,270 L.F.

APPENDIX E

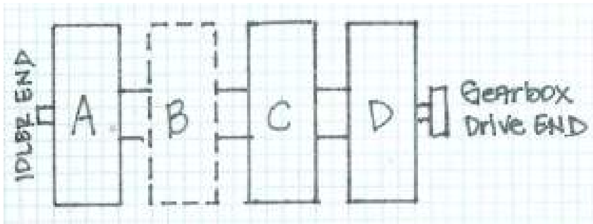
Mountain Machine Works RBC Repair Report & Evaluation

From: SewerMail <dave@whitinghamvt.org>
Sent: Friday, April 13, 2018 12:59 PM
To: Gig; Greg; Giannetti, Nick
Subject: Fwd: Jacksonville VT RBC assessment

Sent from my BLU smartphone device

---------- Forwarded message ----------
From: Emily Gauthier <emily@mountainmachineworks.com>
Date: Apr 13, 2018 12:50 PM
Subject: Jacksonville VT RBC assessment
To: Dave DiCantio <dave@whitinghamvt.org>

> Hi Dave,
>
> As per your request, an assessment of your RBC follows below. I want to make clear that Mountain Machine Works is not an engineering firm, we are an RBC repair and maintenance company. The assessment below is based on visual inspection, our experience at the facility in question, and our experience with RBC units in general. We cannot guarantee that this RBC unit will run for a specified period of time, or that we have seen and noted all signs of wear. However, we can make repair recommendations.
>
> The components of your RBC unit are in the following condition, based on visual inspection:
>
> 1. Bearings: both bearings appear to be in good working condition. The drive side bearing was replaced in February of 2018, and the idler side was freshly greased a the same time. Both bearings were not making any unusual noises, and there were no metal shavings that would indicate extensive shaft wear.
> 2. Drive end journal shaft: The drive end journal shaft showed slight wear at the bearing seal area when the bearing was replaced in February of 2018. However, we replaced the existing bearing with a Rexnord bearing that has an integrated sleeve, so that the bearing no longer makes direct contact with the shaft in the areas showing evidence of wear. We have had good experience with the Rexnord bearing, and consider the shaft to be in good working condition.
> 3. Idler end journal shaft: We did not remove the idler end bearing, so cannot make an assessment of the condition of the idler end shaft beyond the fact that it appeared to be in good working condition, there were no obvious warning signs of damage.
> 4. Center tube: from visual inspection, the center tube appears to be in good condition. The section of the tube we had access to showed no obvious signs of rust or deterioration, and the tube flanges (where the brackets attach to the tube) were in good condition.
> 5. Brackets: the A-frame brackets are in good condition, however, they have a lower saddle that requires a modified media pack that is no longer in production. In order to install new media, the A-frame brackets need to be replaced.
> 6. Media: See diagram below for reference
>
>   a. Row A: high density media, does not appear damaged, but is overloaded with biomass
>   b. Row B: medium density media removed from RBC unit in March of 2018
>   c. Row C: medium density media damaged by shifting of media removed from row B, starting to shift as RBC turns. Overloaded with biomass
>   d. Row D: medium density media, does not appear to be damaged, but is overloaded with biomass



All of the media on this RBC unit is overloaded with biomass. For reference, we usually work on RBC units that have 50-60 sheets of media per media pack. The media packs at this facility are about half that size at 25-30 sheets per pack. My crew said these were the heaviest media packs they can remember removing, and estimated that each of the eight media packs in the row that was removed weighed about 600 lbs each. They believe that the media on this RBC is carrying more biomass than media packs twice their size should. It is our experience, that with normal operation, media begins to deteriorate or fail at around 20 years after installation. The media at this facility was installed 35 years ago. The age of media could explain some of the excess accumulation of biomass. The combination of the age of the media, and the weight of the biomass on that media, is in our opinion what caused the media failure.

Recommendations:

1. Replace the missing media row as soon as possible. We have replacement media and brackets in process, and are aiming to be at the facility by 05/28/2018 at the latest. The replacement will take 3 or 4 12 hr workdays to complete. We will make every effort to expedite the project.
2. Careful hosing down of media row C to remove some of the biomass may alleviate some of the stress that the media is under while still in operation. This cleaning should be done as evenly as possible, and is not a long-term solution.
3. Replace the media and brackets in rows A, C, and D within the next 6-8 months. This would be a 2 week project, and would require that the RBC unit be removed from the tank and set up on stands outside of the building before we start disassembling the media and brackets.

Long-term recommendation: this RBC unit needs to be sloughed periodically to remove/limit biological overgrowth.

If you have any questions, please let me know.

Emily Gauthier

Mountain Machine Works

2589 Hotel Rd

Auburn, ME 04210

207-783-6680 (ext 102)

Email: Emily@mountainmachineworks.com

www.mountainmachineworks.com

www.northeastrbc.com

www.xpandrel.com

APPENDIX F

Manhole Inspection Report

Weston & Sampson

westonandsampson.com

98 South Main Street, Suite 2
Waterbury, VT 05676
tel: 802.244.5051

REPORT

January 2019

TOWN OF
Whitingham
VERMONT

Manhole Condition Report for the Whitingham and Jacksonville Wastewater Treatment Plants

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

\\wse03.local\WSE\Projects\VT\Whitingham VT\Manhole Inspections\Collection System Report\Manhole Inspection Report.docx

INTRODUCTION

Weston & Sampson, on behalf of the Town of Whitingham, conducted an evaluation of the manholes within the gravity sewer collection system that connect to the Whitingham and Jacksonville Wastewater Treatment Plants (WWTPs). The purpose of this evaluation is to determine the overall condition of existing manholes and identify the improvements needed to continue to allow the sewer collection systems to operate efficiently.

Combined, the Jacksonville and Whitingham wastewater collection systems contain approximately 3.4 miles of gravity sewer and were constructed in April of 1982 based on record drawings provide to Weston & Sampson by the Town of Whitingham. These record drawings, entitled Wastewater Collection System for the Village of Jacksonville and Wastewater Collection System for the Village of Whitingham both dated April 12, 1982 by Dufresne Henry indicated that the gravity sewer throughout both sewer collection systems were constructed with Polyvinyl Chloride (PVC) and Ductile Iron (DI) pipe which have gasketed joints and don't typically allow for infiltration. Therefore, it was decided that topside manhole inspections would provide sufficient information to evaluate the existing infrastructure. The manhole inspections were conducted by Weston & Sampson staff along with the Town of Whitingham wastewater treatment operator staff on November 15, 2018 and November 16, 2018. Using Weston & Sampson's iDataCollect program, information from inspected manholes was digitally recorded during the field inspection and converted into individual manhole inspection reports, which are included in Appendix C. The following sections detail the manhole and overall wastewater collection system evaluation.

\\wse03.local\WSE\Projects\VT\Whitingham VT\Manhole Inspections\Collection System Report\Manhole Inspection Report.docx

1.0 GRAVITY SEWER MANHOLE CONDITION ASSESSMENT

Existing Collection System

Target manholes were chosen prior to inspection based on critical areas within the collection system. Critical areas included junction manholes with three or more inverts and manholes on the upstream and downstream ends of stream crossings to visually assess and compare flows to determine if influences from the streams were present. Appendix A contains the compiled record drawings sets that identify the target manholes along with a tabular listing of target manholes. The manhole numbers used in the record documents were maintained for this project. A summary of the collection system components is provided in *Table 1: Collection System Summary* below:

Table 1: Collection System Summary

Component	Gravity Sewer	
	Jacksonville	Whitingham
Manholes (Total)	73	33
Target Manhole	25	9
LF of 8" DI Pipe	13,010'	4,224'
LF of SDR 35 PVC Pipe	0'	910'
Total LF of Pipe	13,010'	5,134'

There are one-hundred-six (106) total manholes throughout the two collection systems, all constructed with precast concrete. The chimney material as well as the bench and inverts for the manholes inspected were constructed with brick. The existing sewer pipe is mostly DI with the remaining sections constructed with PVC pipe. All gravity sewer mains within each collection system are 8-inches in diameter.

The Jacksonville collection system is the larger service area of the two systems inspected. The roads along the alignment include State Route 112 and State Route 100. There is a total of seventy-three (73) manholes, with all of the pipe being 8-inch DI. Manhole inspections were conducted on twenty-five (25) target manholes within the more critical areas of the collection system. The critical areas include any manholes located upstream and downstream of a stream crossing or junction manholes with three or more inverts. These were chosen with input from the Chief Operator and our consideration of the possibility of infiltration or inflow due to the possible influence from streams nearby and the common occurrence of leaks at invert connections.

The roads along the Whitingham collection system alignment include School Street, Stimpson Hill Road, State Route 100, and Church Street. There is a total of thirty-three (33) manholes, with the majority of pipe being 8-inch DI with the rest being 8-inch PVC. Manhole inspections were conducted on nine target manholes within the critical areas of the collection system. The same criteria were used for target manholes within the Whitingham system and Jacksonville system.

\\wse03.local\WSE\Projects\VT\Whitingham VT\Manhole Inspections\Collection System Report\Manhole Inspection Report.docx

2.0 MANHOLE INSPECTION OVERVIEW

Topside manhole inspections were conducted for target manholes for both the Jacksonville and Whitingham collection systems. Each manhole inspection consisted of a visual topside inspection of the manhole recording the manhole's general condition and characteristics. The following attributes were recorded during inspection:

- Manhole number
- Location
- Depth to Invert
- Surface type
- Cover type
- Manhole construction material
- Structural integrity
- Sources of infiltration
- Manhole cover relative elevation
- Number of riser rings
- Need for cleaning
- Cover Inflow
- Pipe sizes
- Pipe type
- Manhole configuration

Twenty-two (22) of the twenty-five (25) target manholes within the Jacksonville sewer collection system and eight target manholes in the Whitingham sewer collection system were inspected. There were three manholes within the Jacksonville system that were not inspected as they were unable to be located. Three manholes were added (manholes #S1, #23, #30) based on field observation during inspection bringing the total target manholes inspected to twenty-five (25). Only one target manhole in the Whitingham sewer collection system was unable to be inspected as it was unable to be opened (manhole #103). A summary of uninspected manholes is provided in ***Table 2: Jacksonville and Whitingham Uninspected Manholes*** below:

Table 2: Jacksonville and Whitingham Uninspected Manholes

Gravity Sewer Main	MH #	Inspection Status
Jacksonville	16	Unable to locate
Jacksonville	24	Unable to locate
Jacksonville	25	Unable to locate
Whitingham	103	Unable to open

\\wse03.local\WSE\Projects\VT\Whitingham VT\Manhole Inspections\Collection System Report\Manhole Inspection Report.docx

3.0 MANHOLE INSPECTION FINDINGS

During inspection, defects were identified in manholes throughout both sewer collection systems. These defects include structural issues, sources of infiltration, and maintenance issues such as the need for cleaning.

Weston & Sampson assigned a priority level for manhole to identify the level of recommended action for each inspected target manhole (MH). The priority level descriptions are as follows:

- Potential I/I contribution
- Structural defects
- Overall impact to the collection system (possible impacts to residences, upstream sewers, potential for clogging, etc.)
- Safety concerns (possible collapse, surcharging or discharging of raw sewage into the environment)

Descriptions of the priority ratings are outlines below:

<u>Priority 1:</u>

- MH repair recommended
- Heavy inflow/infiltration in multiple locations
- Structural deficiencies found

<u>Priority 2:</u>

- MH cleaning recommended
- Moderate inflow/infiltration in multiple locations
- Chimney repair recommended

<u>Priority 3:</u>

- MH cleaning recommended
- Minimal inflow/infiltration in multiple locations
- Chimney repair recommended

<u>Unassigned:</u>

- Unable to be field located
- Unable to be opened

The location map of all the inspected manholes with color coded priority indications is included in *Appendix B*. It should be noted that manholes S1 and #1 from the Jacksonville collection system are not shown on location maps as that plan sheet was not available at the time of inspections. Manholes S1 and #1 are classified as priority 1. A summary of manholes with defects is provided in ***Table 3: Jacksonville and Whitingham Manhole Defects*** below:

Table 3: Jacksonville and Whitingham Manhole Defects

Sewer	MH #	Street Name	Defects	Priority
Jacksonville	S1	Route 112	Cover in need of repair as 1/3 has been cut off, cover inflow is heavy, roots and grease visible, chimney infiltration is moderate.	1
Jacksonville	1	Route 112	Cover inflow is minimal, roots and grease visible, chimney infiltration is heavy, wall infiltration is moderate	1
Jacksonville	6	Route 112	Cover inflow is minimal, chimney infiltration is minimal, cone, wall, and bench and invert infiltration is minimal	2
Jacksonville	7	Route 112	Grease is visible, cone infiltration is minimal, lateral connection in MH is running onto bench and not into trough, needs repair	1
Jacksonville	8	Route 112	Grease is visible, chimney infiltration is moderate, cone, wall, and bench and invert infiltration is minimal	1
Jacksonville	10	Route 112	Grease is visible, steps look loose and holes are cracked, chimney infiltration is moderate, cone, wall, and bench and invert infiltration is minimal	1
Jacksonville	12	Route 112	Chimney infiltration is minimal, cone, wall and pipe connection infiltration is minimal	2
Jacksonville	13	Route 112	Chimney infiltration is minimal	3
Jacksonville	14	Route 112	Bench and invert, pipe connection infiltration minimal	3
Jacksonville	15	Route 112	Chimney infiltration minimal	3
Jacksonville	18	Route 112	Chimney infiltration minimal, bench and invert and pipe connection infiltration is minimal	2
Jacksonville	20	Route 112	Chimney infiltration is minimal	3
Jacksonville	23	Route 112	Chimney infiltration is moderate	1
Jacksonville	35	State Route 100	Cover inflow is minimal, chimney infiltration is heavy, wall and cone infiltration	1
Jacksonville	29	State Route 100	Cover inflow is minimal, roots visible, chimney infiltration is heavy, cone infiltration is moderate, wall infiltration is moderate, Heavy flows were found in this MH compared to the previous one	1
Jacksonville	30	State Route 100	Chimney infiltration is moderate	2

Table 3: Jacksonville and Whitingham Manhole Defects

Sewer	MH #	Street Name	Defects	Priority
Jacksonville	31	State Route 100	Chimney infiltration is moderate	2
Jacksonville	50	State Route 100	In need of re-cementing inside of chimney between frame and cone	1
Jacksonville	55	State Route 100	Cover inflow is minimal, cone and wall infiltration is minimal	3
Jacksonville	57	State Route 100	Cover inflow is minimal, cone infiltration is minimal	3
Jacksonville	67	State Route 100	Frame cover in need of repair, cover inflow is minimal	2
Whitingham	119	Stimpson Hill Road	Grease visible, chimney infiltration is minimal, cone and wall infiltration minimal	2
Whitingham	114	School Street	Grease visible, cone and wall infiltration minimal	3
Whitingham	110	School Street	Chimney infiltration is moderate	1
Whitingham	108	State Route 100	Chimney infiltration is moderate, cone and wall infiltration is minimal	1
Whitingham	102	State Route 100	Chimney infiltration is moderate, wall infiltration is minimal	1
Whitingham	S2	State Route 100	Frame cover in need of repair, cover inflow is moderate, chimney infiltration is heavy, wall infiltration is minimal	1
Whitingham	S1	Church Street	Chimney infiltration is minimal, bench needs cleaning	2

A complete summary of manhole inspection reports, including all manholes from *Table 3: Jacksonville and Whitingham Manhole Defects*, is included in *Appendix C.*

\\wse03.local\WSE\Projects\VT\Whitingham VT\Manhole Inspections\Collection System Report\Manhole Inspection Report.docx

4.0 CONCLUSIONS AND RECOMMENDATIONS OVERVIEW

The purpose of the manhole condition evaluation was to verify and evaluate the current state of the infrastructure within the Jacksonville and Whitingham sewer collection systems. Overall, the record documents provided to us by the Town of Whitingham were determined to be accurate in accordance with the type, size, and pipe material. There was no CCTV or pipe evaluation due to the record drawings indicating gasketed joints for all existing pipe, resulting in the approach to focus investigative efforts to select target manholes within each system to conduct topside manhole inspections. The results from the topside manhole inspections indicate that most of the manholes within both the Jacksonville and Whitingham sewer collection systems are in need of cleaning. Many manholes have some sort of infiltration or inflow from multiple locations, with almost half having moderate infiltration or greater in multiple locations. Nearly all the inspected manhole chimneys have some infiltration and are recommended to be repaired.

Based on the work conducted, there were defects identified by this topside manhole inspection that should be addressed. We have developed the following recommended plan of action to address them.

\\wse03.local\WSE\Projects\VT\Whitingham VT\Manhole Inspections\Collection System Report\Manhole Inspection Report.docx

5.0 RECOMMENDED PLAN OF ACTION

Overall, we recommend that any manhole indicated as priority 1, 2, or 3 should be worked into a remediation plan and be addressed over time. ***Table 4: Jacksonville and Whitingham Manhole Priority and Recommended Repairs*** identifies the recommended repairs to address defects found within each collection system. The recommended repairs were determined using the following criteria:

1. Defect priority ratings assigned in prior sections
2. The impact the repair measures will have on safety and overall system performance

The recommended repairs include the following approaches:

- Line Manhole – Application of a cementitious grout to the surface of the manhole, installation of exterior chemical grout at active leaks within the manhole, and all plugging and bypassing necessary to complete the work.
- Rebuild Chimney – Saw cut any asphalt pavement, if necessary, surrounding the manhole, removal of existing chimney, installation of concrete, metal, or brick risers, resetting the manhole frame and cover, and asphalt repair to surrounding area, if necessary
- Frame and Cover – Saw cut any asphalt pavement, if necessary, surrounding the manhole, removal of the existing frame and cover, installation of a new frame and cover, and asphalt repair to the surrounding area, if necessary
- Rebuild Bench – cleaning of the existing manhole, installation of a new concrete or brick bench

A summary of manhole recommended repairs can be found below in ***Table 4: Jacksonville Manhole Priority and Recommended Repairs*** and ***Table 5: Whitingham Manhole Priority and Recommended Repairs***. The table assigns the recommended repairs for each manhole based on the conditions found during the topside manhole inspection.

Table 4: Jacksonville Manhole Priority and Recommended Repairs

Sewer	Manhole	Street Name	Priority	Recommended Repairs
Jacksonville	S1	Route 112	1	Frame and Cover Line Manhole Rebuild Chimney
Jacksonville	1	Route 112	1	Line Manhole Rebuild Chimney
Jacksonville	7	Route 112	1	Line Manhole Rebuild Bench

Table 4: Jacksonville Manhole Priority and Recommended Repairs

Sewer	Manhole	Street Name	Priority	Recommended Repairs
Jacksonville	8	Route 112	1	Line Manhole Rebuild Chimney
Jacksonville	10	Route 112	1	Line Manhole Rebuild Chimney
Jacksonville	23	Route 112	1	Rebuild Chimney
Jacksonville	35	State Route 100	1	Line Manhole Rebuild Chimney
Jacksonville	29	State Route 100	1	Line Manhole Rebuild Chimney Frame and Cover
Jacksonville	50	State Route 100	1	Rebuild Chimney
Jacksonville	6	Route 112	2	Line Manhole Rebuild Chimney
Jacksonville	12	Route 112	2	Line Manhole Rebuild Chimney
Jacksonville	18	Route 112	2	Rebuild Chimney Rebuild Bench
Jacksonville	31	State Route 100	2	Rebuild Chimney
Jacksonville	30	State Route 100	2	Rebuild Chimney
Jacksonville	67	State Route 100	2	Frame and Cover
Jacksonville	13	Route 112	3	Rebuild Chimney
Jacksonville	14	Route 112	3	Rebuild Bench
Jacksonville	15	Route 112	3	Rebuild Chimney
Jacksonville	20	Route 112	3	Rebuild Chimney
Jacksonville	55	State Route 100	3	Line Manhole
Jacksonville	57	State Route 100	3	Frame and Cover Line Manhole

Table 5: Whitingham Manhole Priority and Recommended Repairs				
Sewer	Manhole	Street Name	Priority	Recommended Repairs
Whitingham	S2	State Route 100	1	Line Manhole Rebuild Chimney Frame and Cover
Whitingham	102	State Route 100	2	Line Manhole Rebuild Chimney
Whitingham	108	State Route 100	2	Line Manhole Rebuild Chimney
Whitingham	110	School Street	2	Rebuild Chimney
Whitingham	S1	Church Street	3	Rebuild Chimney
Whitingham	114	School Street	3	Line Manhole
Whitingham	119	Stimpson Hill Road	3	Line Manhole Rebuild Chimney

The implementation of these repair measures at the target manholes should reduce infiltration into the sewer collection systems and improve the overall integrity of the systems.

6.0 COST ANALYSIS

Based on both *Table 4: Jacksonville Manhole Priority and Recommended Repairs* and *Table 5: Whitingham Manhole Priority and Recommended Repairs,* costs for each recommended repair were developed. The basis of our cost estimates are based off of recent bid data that Weston & Sampson has compiled. The estimated repair costs are provided below:

Table 6: Jacksonville Manhole Cost Analysis

Manhole	Priority	Line MH	Rebuild Chimney	Frame & Cover	Rebuild Bench	Total
S1	1	$3,000.00	$1,500.00	$1,000.00	$0.00	$5,500.00
1	1	$3,000.00	$1,500.00	$0.00	$0.00	$4,500.00
7	1	$1,100.00	$0.00	$0.00	$1,000.00	$2,100.00
8	1	$1,000.00	$1,500.00	$0.00	$0.00	$2,500.00
10	1	$1,300.00	$1,500.00	$0.00	$0.00	$2,800.00
23	1	$0.00	$1,500.00	$0.00	$0.00	$1,500.00
35	1	$1,000.00	$1,500.00	$0.00	$0.00	$2,500.00
29	1	$1,100.00	$1,500.00	$1,000.00	$0.00	$3,600.00
50	1	$0.00	$1,500.00	$0.00	$0.00	$1,500.00
6	2	$1,100.00	$1,500.00	$0.00	$0.00	$2,600.00
12	2	$1,300.00	$0.00	$0.00	$0.00	$1,300.00
18	2	$0.00	$1,500.00	$1,000.00	$0.00	$2,500.00
31	2	$0.00	$1,500.00	$0.00	$0.00	$1,500.00
30	2	$0.00	$1,500.00	$0.00	$0.00	$1,500.00
67	2	$0.00	$0.00	$1,000.00	$0.00	$1,000.00
13	3	$0.00	$1,500.00	$0.00	$0.00	$1,500.00
14	3	$0.00	$0.00	$0.00	$1,000.00	$1,000.00
15	3	$0.00	$1,500.00	$0.00	$0.00	$1,500.00
20	3	$0.00	$1,500.00	$0.00	$0.00	$1,500.00

Table 6: Jacksonville Manhole Cost Analysis						
Manhole	Priority	Line MH	Rebuild Chimney	Frame & Cover	Rebuild Bench	Total
55	3	$1,000.00	$0.00	$0.00	$0.00	$1,000.00
57	3	$1,500.00	$0.00	$1,000.00	$0.00	$2,500.00
Subtotal						$46,000.00
30% Contingency						$14,000.00
Engineering (23%)						$11,000.00
Jacksonville Total						**$71,000.00**

Note: For manhole S1 and 1 since the record drawings were unavailable, a cost of $3,000.00 was used for an approximate price estimate for the Manhole Lining cost.

Table 7: Whitingham Manhole Cost Analysis						
Manhole	Priority	Line MH	Rebuild Chimney	Frame & Cover	Rebuild Bench	Total
S2	1	$1,600.00	$1,500.00	$1,000.00	$0.00	$4,100.00
102	2	$1,500.00	$1,500.00	$0.00	$0.00	$3,000.00
108	2	$800.00	$1,500.00	$0.00	$0.00	$2,300.00
110	2	$0.00	$1,500.00	$0.00	$0.00	$1,500.00
S1	3	$0.00	$1,500.00	$0.00	$0.00	$1,500.00
114	3	$800.00	$0.00	$0.00	$0.00	$800.00
119	3	$2,600.00	$1,500.00	$0.00	$0.00	$4,100.00
Subtotal						$17,000.00
30% Contingency						$5,000.00
Engineering (23%)						$4,000.00
Whitingham Total						**$26,000.00**

Table 8: Overall Cost Analysis	
Jacksonville Total	$71,000.00
Whitingham Total	$26,000.00
Overall Total	**$97,000.00**

Engineering costs include design and construction administration.

\\wse03.local\WSE\Projects\VT\Whitingham VT\Manhole Inspections\Collection System Report\Manhole Inspection Report.docx

7.0 ADDITIONAL RECOMMENDATIONS:

In addition to addressing the physical defects noted above, Weston & Sampson offers the following asset management related recommendations:

- The Town should locate, uncover, and raise frames to grade on all manholes within the system. Once all manholes are located, they should be inspected in a similar fashion to those inspected as part of this report.
- The Town should review and update sewer ordinances to ensure they are in accordance with requirements of the State of Vermont, EPA, and general sewer operations standards.
- The Town should develop and implement a comprehensive operations and maintenance plan that includes periodic manhole inspections, CCTV inspection of sewer pipes, and periodic cleaning manholes and sewer pipes.
- The Town should create a comprehensive sewer system asset management plan. The plan should include development of GIS mapping system for the collection system that includes records of repairs, maintenance, cleaning, and reported issues.

APPENDIX A

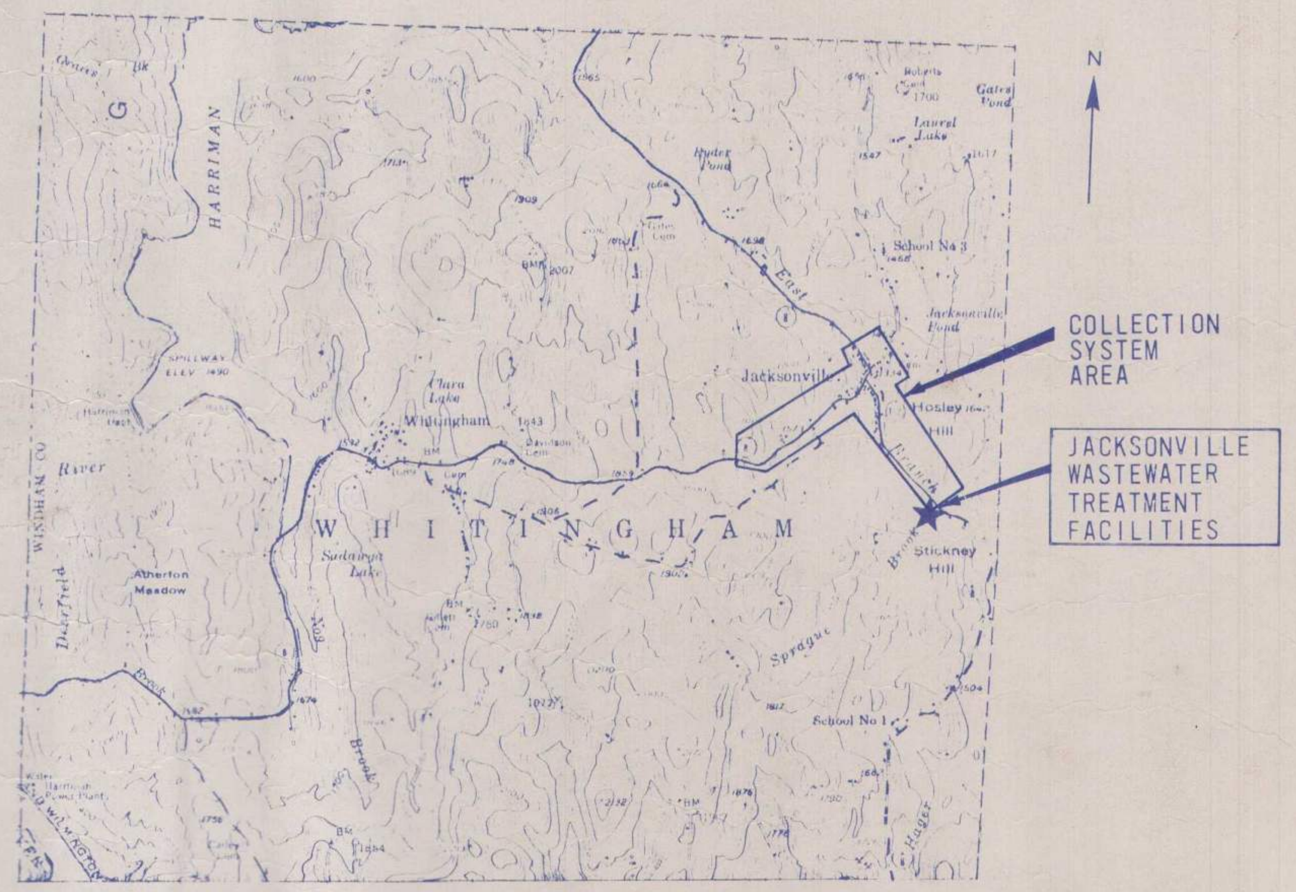
List of Target Manholes/ Record Drawings

Village of Whitingham, Vermont				Village of Jacksonville, Vermont			
Possible Manholes to be Inspected				Possible Manholes to be Inspected			
MH S-2				**MH 1**	**MH NOT ON OUR PLAN**		
MH S-1				MH 6			
MH 101				MH 7			
MH 102				MH 8			
MH 103				MH 10			
MH 108				MH 12			
MH 110				MH 13			
MH 114				MH 14			
MH 119				MH 15			
				MH 16			
				MH 17			
				MH 18			
				MH 20			
				MH 24	**UNABLE TO LOCATE, WILL TRY TO LOCATE**		
				MH 25			
				MH 29			
				MH 31			
				MH 35			
				MH 49			
				MH 50			
				MH 54			
				MH 55			
				MH 56			
				MH 57			
				MH 67			

PLANS FOR CONSTRUCTION
OF
WATER POLLUTION CONTROL FACILITIES
TOWN OF WHITINGHAM, VERMONT
WASTEWATER COLLECTION SYSTEM
FOR THE
VILLAGE OF JACKSONVILLE

CONTRACT II
E.P.A. PROJECT NO. C500116-02

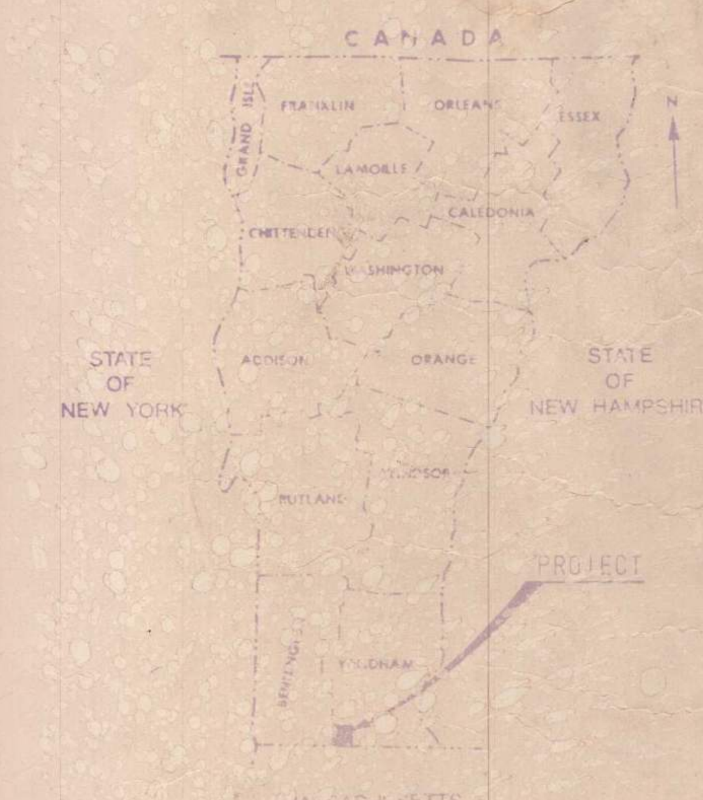
RECORD DRAWINGS



PROJECT PLAN
SCALE: 1" = 1 MILE

INDEX OF SHEETS

SHEET	DESCRIPTION
1	TITLE SHEET
2	PROJECT PLAN
3	SEWER PLAN AND PROFILE RIVER STREET
4	SEWER PLAN AND PROFILE RIVER STREET
5	SEWER PLAN AND PROFILE RIVER STREET TO HIGH STREET AND MILL HILL ROAD
6	SEWER PLAN AND PROFILE HIGH STREET AND MILL HILL ROAD
7	SEWER PLAN AND PROFILE MILL HILL ROAD TO CHURCH STREET
8	SEWER PLAN AND PROFILE ROUTE 100 NORTH
9	SEWER PLAN AND PROFILE ROUTE 100 NORTH
10	SEWER PLAN AND PROFILE ROUTE 100 NORTH
11	SEWER PLAN AND PROFILE, ROUTE 100 NORTH TO WHITINGHAM SCHOOL
12	MISCELLANEOUS DETAILS



LOCATION MAP

Collection System - JACK

Collection Sys. Jack

Consulting Engineers, Landscape Architects and Planners

Offices
North Springfield, Vermont 05150
Manchester Center, Vermont 05255
St. Johnsbury, Vermont 05819
Montpelier, Vermont 05602
Manchester, New Hampshire 03101
Portland, Maine 04103
Concord, Massachusetts 01742
Greenfield, Massachusetts 01301

Engineering Disciplines
Civil
Environmental
Transportation
Municipal
Mountain
Structural
Electrical
Mechanical
Industrial

Associated Disciplines
Planning & Urban Development
Landscape Architecture
Surveying
Construction Management

Applied Sciences
Water Quality
Geologic
Hydrologic

Dufresne-Henry Inc.
Precision Park
North Springfield,
Vermont 05150

GENERAL NOTES

1. THE LOCATION AND SIZES OF PIPES, DUCTS, CONDUITS, WIRES AND OTHER UNDERGROUND STRUCTURES SHOWN ON THESE PLANS ARE NOT WARRENTED TO BE EXACT. NOR IS IT WARRENTED THAT ALL UNDERGROUND STRUCTURES ARE SHOWN. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING THE APPROPRIATE UTILITY ORGANIZATION AND FOR VERIFYING THE EXACT LOCATIONS OF UNDERGROUND UTILITIES PRIOR TO START OF CONSTRUCTION.
2. LOCATIONS OF BORINGS ARE APPROXIMATE ONLY. SOIL LOGS CAN BE FOUND IN THE PROJECT MANUAL.
3. SEWER LINES TO BE LOCATED A MIN. OF 10 FEET FROM WATER LINES HORIZONTALLY AND 18 INCHES BELOW WATER LINES VERTICALLY.
4. WHEN SEWERS CROSS UNDER CULVERTS, THEY SHALL BE ADEQUATELY PROTECTED AGAINST EXTRA LOADS IMPOSED THEREBY. CONCRETE PROTECTION SHALL BE PROVIDED WHEN SO DIRECTED BY THE ENGINEER OR WHEN SHOWN ON THE SEWER PLAN AND PROFILE SHEETS.
5. SEE SPECIFICATIONS FOR SEWER PIPE MATERIALS. SEWER PIPE MATERIAL SHALL BE UNIFORM THROUGHOUT PROJECT EXCEPT AS NOTED ON THE PLANS.
6. PROVIDE INSULATION WHERE SEWERS HAVE LESS THAN 5' OF COVER IN ANY DIRECTION OR AS DIRECTED BY THE ENGINEER.
7. WELL TYPES AND LOCATIONS ARE APPROXIMATE ONLY BASED ON FIELD SURVEY INFORMATION.
8. PROVIDE 3" THICK RIGID INSULATION BOARD BETWEEN SEWER PIPE AND CULVERT WHEN THE DISTANCE BETWEEN SEWER O.D. AND CULVERT O.D. IS LESS THAN 3'-0". INSULATION TO EXTEND 2 CULVERT DIAMETERS ON EITHER SIDE OF ¢ OF SEWER PIPE.
9. A TWENTY FOOT WIDE CONSTRUCTION EASEMENT OVER THE SEWER LINE BUT NOT NECESSARILY CENTERED OVER IT HAS BEEN OBTAINED BY THE TOWN OF WHITINGHAM AT LOCATIONS WHERE WORK IS ANTICIPATED TO EXTEND ONTO PRIVATE PROPERTY. ANY ADDITIONAL CONSTRUCTION EASEMENTS CONSIDERED NECESSARY BY THE CONTRACTOR SHALL BE OBTAINED BY AND AT THE CONTRACTOR'S EXPENSE.

LEGEND

EXISTING

RIGHT-OF-WAY
EASEMENT
EDGE OF PAVEMENT
PROPERTY LINE
GRAVEL ROADWAY
WOOD FENCE/WOOD GUARD POST
GUARD CABLE
STONEWALL
EDGE OF WOODS
BRUSH/SHRUBS
10' CONTOUR
2' CONTOUR (JACKSONVILLE)
5' CONTOUR (WHITINGHAM)
BUILDING
BROOK

OHW — OVERHEAD WIRES
S — SEWER LINE (SIZE AND TYPE AS SHOWN)
W — WATER LINE (SIZE AND TYPE AS SHOWN)
T — TELEPHONE
EDGE OF WATER
CULVERT (SIZE AND TYPE AS SHOWN)
POWER POLE
SIGN
IRON PIN
TREE (SIZE AND TYPE AS SHOWN)
MAILBOX
WET AREA
BRIDGE
MANHOLE
DIRECTION OF WATER FLOW
LEDGE PROFILE

PROPOSED

198 FINISHED CONTOUR
MANHOLE
CONCRETE ENCASEMENT
FILL
TEST BORING

SEWER LINE (SIZE AND TYPE AS SHOWN)
WOODEN GUARD POST
PIPE WITH INSULATION
PIPE SLEEVE
IMPERVIOUS TRENCH DAM

AERIAL VIEW
SUPPLIED BY
LOCKWOOD MAPPING
ROCHESTER, NEW YORK

RECORD DRAWINGS

Rev.	Description	By	Date
1	RCD. DWG.	DDL	9-83

PROJECT PLAN
GENERAL NOTES AND LEGEND

JACKSONVILLE

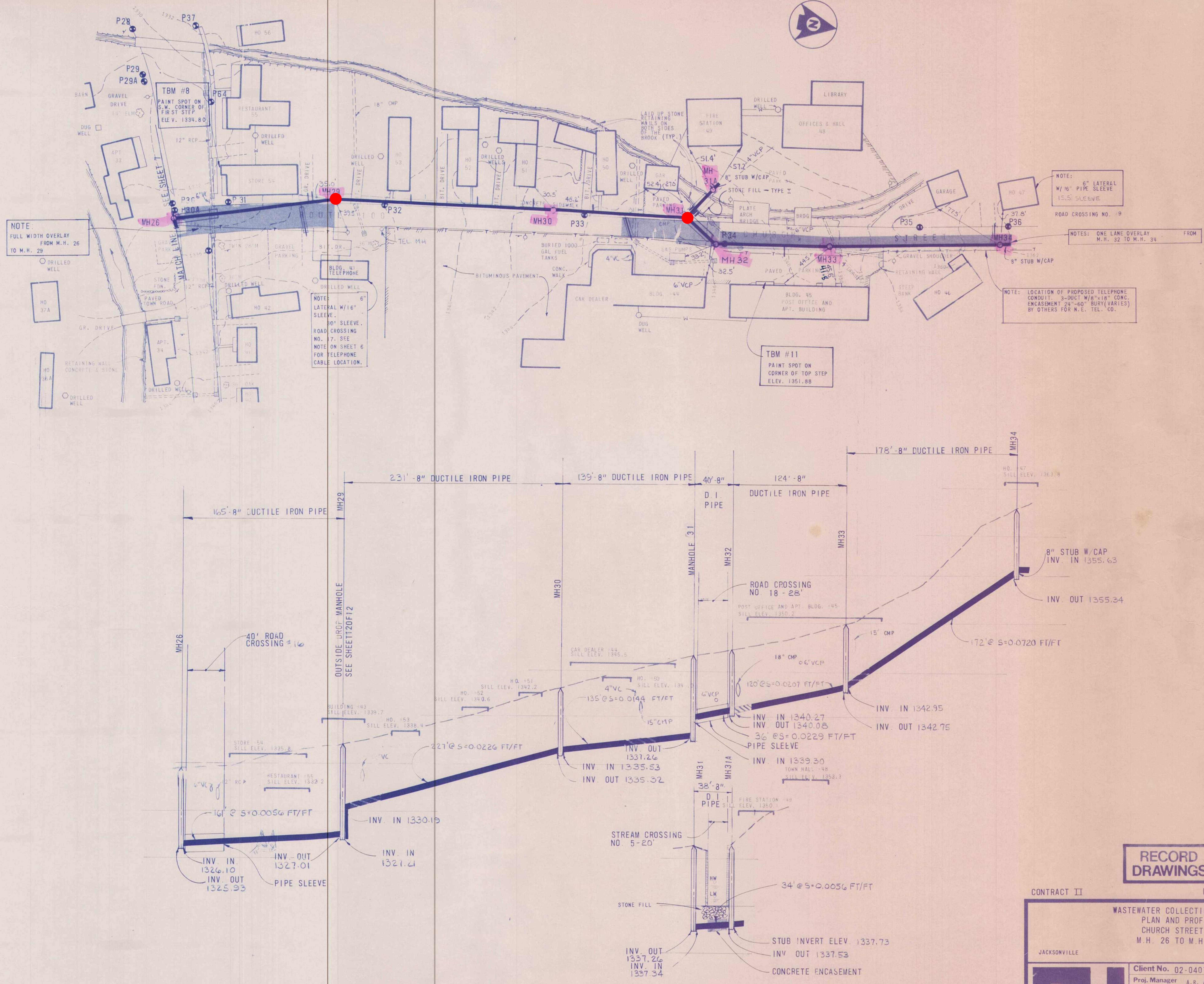
Dufresne-Henry Inc.
Precision Park
No. Springfield,
Vermont 05150

Client No.	02-0407
Proj. Manager	A.R. AU
Proj. Designer	J.E. LE
Drawn By	F.L. B
Checked By	A.R. A
Scale	1" = 2
Approved	
Date	4-12-82

NOTE: 6" LATERAL W/16" PIPE SLEEVE OPEN CUT 30' SLEEVE ROAD CROSSING NO. 2
EAST BRANCH OF NORTH RIVER
ROUTE 8A & 112
SEE SHEET 3
MATCH LINE
AUTOMOBILE SALVAGE YARD
First house (white)
Williams
GARAGE
GRAVEL PARKING
DRILLED WELL
NAIL IN OUT POLE
NAIL IN POLE
NAIL IN POLE JM/N/15
BROKE & ABANDONED
MEADOW
T.B.M. #3
R.R. SPIKE IN POLE #17
ELEV. 1275.05
T.B.M. #4
R.R. SPIKE IN P.P. #14
ELEV. 1281.08
T.B.M. #5
R.R. SPIKE IN P.P. #N/9/10/9
ELEV. 1292.91
APPROXIMATE LOCATION OF POLYETHYLENE WATER LINE
TO DUG WELL BEYOND BRUSH LINE
CORN. OF STONE FOUND
TO DUG WELL BEHIND HOUSE
8" STUB W/CAP (OUTSIDE DROP REQUIRED)
6" HEMLOCK
STONE FILL TYPE I & II
300'± TO DUG WELL
500'± TO DUG WELL
TRENCH DAM
BRIDGE
GRAVEL PARKING
WATER SUPPLIED FROM HO 8
DUG WELL
BARN
GARAGE
GRAVEL PARKING
MH 5
MH 6
MH 7
MH 8
MH 9
MH 10
MH 11
MH 12
MH 13
MH 14
P7
P8
P9
P10
P11
P12
P13
P14
P15
P16
P17
293.5
162
238
120
240
153
232
Pavement
160' - 8" DUCTILE IRON PIPE
33.5' - 8" D.I. PIPE
293.5' - 8" DUCTILE IRON PIPE
162' - 8" DUCTILE IRON PIPE
238' - 8" DUCTILE IRON PIPE
120' - 8" DUCTILE IRON PIPE
240' - 8" DUCTILE IRON PIPE
153' - 8 DUCTILE IRON PIPE
232' - 8" DUCTILE IRON PIPE
MATCH LINE SEE SHEET 3 OF 12
25' ROAD CROSSING NO.1
ROAD CROSSING NO. 3 30'
STREAM CROSSING NO. 1 36'
OUTSIDE DROP MANHOLE SEE DETAIL SHEET 12 OF 12
STONE FILL TYPE I ABOVE H.W. ELEV. TYPE II BELOW H.W. ELEV.
158' @ S=0.0163 FT/FT
INV. OUT 1266.47
INV. IN 1266.57
29.5' @ S=0.0064 FT/FT
293.5' @ S=0.004 FT/FT
INV. IN 1266.98
INV. OUT 1266.76
PIPE SLEEVE
158' @ S=0.0064
INV. IN 1268.34
INV. OUT 1268.06
234' @ S=0.0067
INV. IN 1269.46
INV. OUT 1271.03
INV. IN 1271.13
PIPE SLEEVE
CONCRETE ENCASEMENT
116' @ S=0.0034 FT/FT
INV. OUT 1271.55
INV. IN 1271.61
STUB INV. IN 1276.73/1271.67
INV. IN 1276.77
236' @ S=0.0194 FT/FT
149' @ S=0.0075
INV. IN 1281.39
INV. OUT 1281.34
INV. IN 1282.60
INV. OUT 1282.51
228' @ S=0.0140 FT./FT.
INV. OUT 1285.80
INV. IN 1285.86
4" VCP
15" RCP
15" CMP
1295
1290
1285
1280
1275
1270
1265
RECORD DRAWINGS
CONTRACT II
EPA PROJECT NO. C-500116
WASTEWATER COLLECTION SYSTEM
PLAN AND PROFILE
RIVER STREET
M.H. 5+ TO M.H. 14
JACKSONVILLE
VERMONT
Dufresne-Henry Inc.
Precision Park
No. Springfield, Vermont 05150
Client No. 02-0407
Proj. Manager A.R. AUSTIN
Proj. Designer J.E. LENS
Drawn By
Checked By A.R. AUSTIN
Scale 1"=50' HOR., 1"=5' VERT.
Approved Arthur R. Austin
Date 4-12-82
Sheet 4 of 12
D 8869
1 RCD. DWG. DDL 9-83
Rev. Description By Date
4-12-82


UNABLE TO LOCATE, WILL TRY TO FIND DURING MH INSPECTIONS
NOTE: FULL WIDTH PAVEMENT OVERLAY REQUIRED FROM MH 22 TO MH 25
NOTE: 6" DIA. D.I. LATERALS IN 16" SLEEVES TO HO 27,28,29 - 25 LF EACH
ROAD CROSSING NOS. 8,9,10
NEW DROP INLETS SEE DETAIL ON SHEET 12
3' OFF FACE OF WALL
MH 23
TBM #5 R.R. SPIKE IN P.P. #N/9/10/0 EL. 1292.9
TBM #6 SPIKE IN P.P. #N/5 ELEV. 1303.20
TBM #7 R.R. SPIKE IN PP #N/2/ ELEV. 1317.66
SEE SHEET 4 OF 12
MATCH LINE
MATCH LINE SEE SHEET 6 OF 12
ROUTE 9A & 112
RIVER STREET
EAST BRANCH OF NORTH RIVER
MH 14
MH 14A
MH 15
MH 16
MH 17
MH 18
MH 19
MH 20
MH 20A
MH 20B
MH 21
MH 22
MH 23
MH 24
MH 25
35'-8" DUCTILE IRON PIPE
ROAD CROSSING NO. 4 - 25'
STUB INVERT ELEV. 1286.19
INV. OUT 1286.09
31' @ S=0.005 FT/FT
INV. IN 1285.93
175'-8" DUCTILE IRON PIPE
31'-8" D.I. PIPE
225'-8" DUCTILE IRON PIPE
25' ROAD CROSSING NO.5
STREAM CROSSING NO. 2 - 22'
OUTSIDE DROP MH SEE DETAIL SHEET 12 OF 12
171' @ S=0.0174 FT/FT
27' @ S=0.006 FT/FT
251' @ S=0.0042 FT/FT
27' @ S=0.0137 FT/FT
INV. IN 1285.86
INV. OUT 1285.80
INV. OUT 1288.84
INV. IN 1289.22
INV. OUT 1289.10
PIPE SLEEVE
INV. IN 1288.92
CONCRETE ENCASEMENT
INV. OUT 1290.27
INV. IN 1290.34
INV. IN 1293.16
INV. OUT 1293.06
PIPE SLEEVE
31'-8" D.I.
180'-8" DUCTILE IRON PIPE
ROAD CROSSING NO. 6 - 20.2'
176' @ S=0.0193 FT/FT
INV. OUT 1296.55
90' @ S=0.0090 FT/FT
INV. IN 1296.65
INV. OUT 1297.47
INV. IN 1299.07
INV. 1293.74
INV. IN 1293.57
94'-8" DUCTILE IRON PIPE
303'-8" DUCTILE IRON PIPE
289' @ S=0.0280 FT/FT
INV. OUT 1307.38
INV. IN 1307.49
115' @ S=0.0524 FT/FT
119'-8" DUCTILE IRON PIPE
INV. IN 1313.87
INV. OUT 1313.72
225'-8" DUCTILE IRON PIPE
221' @ S=0.0182 FT/FT
INV. OUT 1317.89
INV. IN 1318.04
92'-8" DUCTILE IRON PIPE
62'-8" DUCTILE IRON PIPE
ROAD CROSSING NO. 11 - 54'
88' @ S=0.0034 FT/FT
58' @ S=0.0057 FT/FT
PIPE SLEEVE
INV. OUT 1318.82
INV. IN 1318.49
INV. OUT 1318.34
INV. IN 1318.89
DROP MH 25
103'-8" DUCTILE IRON PIPE
112'-8" DUCTILE IRON PIPE
ROAD CROSSING NO. 7 25'
STREAM CROSSING NO. 3 30'
108' @ S=0.0225 FT/FT
18' 6" D.I.
INV. EL. 1300.59
INV. OUT 1300.49
PIPE SLEEVE
CONCRETE ENCASEMENT
INV. IN 1298.06
INV. OUT 1298.00
99' @ S=0.0043 FT/FT
INV. IN 1297.57
RECORD DRAWINGS
CONTRACT II
EPA PROJECT NO. C-500116
WASTEWATER COLLECTION SYSTEM PLAN AND PROFILE RIVER STREET M.H. 14 TO M.H. 25
JACKSONVILLE
VERMONT
Dufresne-Henry Inc.
Precision Park No. Springfield, Vermont 05150
Client No. 02-0407
Proj. Manager A.R. AUSTIN
Proj. Designer J.E. LENS
Checked By A.R. AUSTIN
Scale 1"=50' HOR., 1"=5' VERT.
Approved Arthur R. Austin
Date 4-12-82
Sheet 5 of 12
D 8870
1 RCD. DWG DDL 9-83
Rev. Description By Date
BRUNING 44-132 45337


UNABLE TO LOCATE, WILL TRY TO FIND DURING MH INSPECTIONS
15" RED MAPLE
MH 25
MH 35
MH 36
STEEL POST
CORN. CONC. WALL
MH 37A
MH 37
MATCH LINE SEE SHEET 8
MATCH LINE SEE SHEET 5
MATCH LINE SEE THIS SHEET
TBM #12
SPIKE IN POLE #114
ELEV. 1381.82
TBM #8
PAINT SPOT ON S.W. CORNER OF FIRST STEP
TB #9
TBM #10
NOTE: ONE LANE OVERLAY
NOTE: UNDERGROUND TELEPHONE CABLES (APPROX. LOC.) VERIFY W/N.E.TEL. CO. BEFORE EXCAVATING.
NOTE: WATER SUPPLY FOR HO 41 IS FROM DRILLED WELL FOR HO 42
THERE IS PRESENTLY NO WATER SUPPLY TO HO 38
TO DUG WELL 200'± BEHIND HOUSE
ROUTE 100
ROUTE 8A & 112
MILL HILL ROAD
MH 28
8" D.I. STUB W/CAP
CONCRETE RET. WALL
INSTALL 9" Φ WOOD GUARD POSTS AT 5' O.C. (6 REQ'D.)
STREAM
CORN. OF BRIDGE DECK
CLEAN OUT-4' DEEP
INSULATED
6" SEWER PIPE
3000 PSI CONC. BEARING PADS UNREINFORCED
CONCRETE BEARING PAD DETAIL
NOT TO SCALE
172' -8" DUCTILE IRON PIPE
237' -8" DUCTILE IRON PIPE
OUTSIDE DROP MANHOLE SEE DETAIL SHEET 12 OF 12
49' 8" D.I. PIPE
29.5' 8" D.I. PIPE
ROAD CROSSING NO. 12 36'
ROAD CROSSING NO 13 29.5'
233' @ S=0.1012
INV. IN 1370.50
INV. OUT 1370.15
INV. IN 1351.69
INV. OUT 1351.34
INV. IN 1327.76
INV. OUT 1326.23
25.5' @ S=0.0655
INV. IN 1324.56
INV. OUT 1324.06
INV. IN 1321.50
45' @ S=0.0569
INV. IN 1318.90
INV. OUT 1318.82
205' -8" DUCTILE IRON PIPE
STREAM CROSSING NO. 4 - 12'
BURIED TELEPHONE CABLE
STONE FILL
CONCRETE ENCASEMENT
INV. IN 1318.89
INV. OUT 1318.82
201' @ S= 0.0350 FT/FT
CHURCH STREET INV. IN 1326.10
INV. IN 1326.03
INV. OUT 1325.93
8"x6" WYE CONNECTION SEE ABOVE
248' -8" DUCTILE IRON PIPE
90' - 6" DUCTILE IRON PIPE
6" C.O. TO GRADE & PLUG W/CAP
INV. 1339.36
AERIAL PIPE CROSSING ITEM 2J
CONC. BEARING PAD ON BOTH WALLS SEE DETAIL THIS SHEET
8"x6" WYE CONNECTION
INV. 1332.87
244' @ S=0.0711 FT/FT
INV. IN 1343.87
INV. OUT 1343.37
300' -8" DUCTILE IRON PIPE
STUB INV. 1379.57
INV. IN 1374.84
INV. OUT 1374.44
296' @ S=0.1032 FT/FT
RECORD DRAWINGS
CONTRACT II
EPA PROJECT NO. C-500116
WASTEWATER COLLECTION SYSTEM
PLAN AND PROFILE
HIGH STREET M.H. 25 TO M.H. 38
MILL HILL ROAD M.H. 25 TO M.H. 28
JACKSONVILLE
VERMONT
Client No. 02-0407
Proj. Manager A.R. AUSTIN
Proj. Designer J.E. LENS
Drawn By F.L. BALLA
Checked By A.R. AUSTIN
Scale HOR. 1"=50' VERT. 1"=5'
Approved Arthur R. Austin
Date 4-12-82
Sheet 6 of 12
D 8871
Dufresne-Henry Inc.
Precision Park
No. Springfield, Vermont 05150
1 RCD. DWG. DDL
Rev. Description By Date
BRUNING 44.132 45337



CONTRACT II

EPA PROJECT NO. C-500116

WASTEWATER COLLECTION SYSTEM
PLAN AND PROFILE
CHURCH STREET
M.H. 26 TO M.H. 34

JACKSONVILLE — VERMONT

Dufresne-Henry Inc.
Precision Park
No. Springfield, Vermont 05150

Client No.	02-0407
Proj. Manager	A.R. AUSTIN
Proj. Designer	J.E. LEWS
Drawn By	F.L. BALLA
Checked By	A.R. AUSTIN
Scale	HOR. 1"=50' VERT. 1"=5'
Approved	Arthur R. Austin
Date	4-12-82

Sheet 7 of 12

D 8872

Rev.	Description	By	Date
1	RCD. DWG.	DPL	9-83

4-12-82

BRUNING 44-132 45337

WASTEWATER COLLECTION SYSTEM
PLAN AND PROFILE
ROUTE 100
M.H. 37A TO M.H. 45

JACKSONVILLE — VERMONT

Client No.	02-0407
Proj. Manager	A.R. AUSTIN
Proj. Designer	J.E. LENS
Drawn By	
Checked By	A.R. AUSTIN
Scale	1" = 50' HOR., 1" = 5' VERT.
Approved	Arthur R. Austin
Date	4-12-82
Sheet	8 of 12
D	8873

Rev.	Description	By	Date
1	REC. DWG.	DDL	9-83

Dufresne-Henry Inc.
Precision Park
No. Springfield, Vermont 05150

MATCH LINE SEE SHEET 8
MH 45
MH 46
MH 47
MH 48
MH 49
MH 50
MH 51
MH 52
MH 53
MATCH LINE SEE SHEET 10
P 47
P 48
P 49
P 50
P 51
P 52
P 53
P 54
ROUTE 100
NO. 15 ROAD
TBM #16
PAINT SPOT ON S.E. CORNER OF BRIDGE WING WALL
ELEV. 1565.65
TBM #15
SPIKE IN POWER POLE
ELEV. 1544.55
TBM #7
SPIKE IN POWER POLE
ELEV. 1575.34
18" ACCOMP
18" RCP
NAIL IN 4 HEMLOCK
NAIL IN 8" POPLAR
NAIL IN 10" SPRUCE
30" MAPLE
STONE FILL
IMPERVIOUS FRENCH DAM
WOODEN GUARD RAILS
WATER TANK
TO DUG WELL
DRILLED WELL
DUG WELL IN BASEMENT
200'± TO DUG WELL
250'± TO DUG WELL
500'± TO DUG WELL
HO 69
HO 70
HO 71
HO 72
HO 73
BARN
GAR.
BIT. DRIVE
20" MAPLE
24" MAPLE
8" W.BIRCH
EXISTING 6" PVCCOMP UNDERDRAIN
8" STUB W/CAP
HO 71
SILL EL. 1589.4
200' -8" DUCTILE IRON PIPE
173' -8" DUCTILE IRON PIPE
215' -8" DUCTILE IRON PIPE
176' -8" DUCTILE IRON PIPE
44' -8" DUCTILE IRON PIPE
162' -8" DUCTILE IRON PIPE
293' -8" DUCTILE IRON PIPE
297' -8" DUCTILE IRON PIPE
HO 70
SILL EL. 1583.2
HO 72
SILL EL. 1583.2
HO 73
SILL EL. 1579.2
HO 69
SILL EL. 1574.3
20' STREAM CROSSING #6
25' ROAD CROSSING #22
STONE FILL
TYPE I ABOVE H.W.
TYPE II BELOW H.W.
CONCRETE ENCASEMENT
OUTSIDE DROP M.H. SEE DETAIL ON SHEET 12 OF 12
PIPE SLEEVE
EXCAVATION BELOW GRADE W/GRAVEL REFILL
196' @ S= 0.0668 FT/FT
163' @ S= 0.0727 FT/FT
209' @ S= 0.0235 FT/FT
172' @ S= 0.0098 FT/FT
40' @ S= 0.0425 FT/FT
158' @ S= 0.0053 FT/FT
289' @ S= 0.0072 FT/FT
293' @ S= 0.0048 FT/FT
INV. IN 1523.81
INV. OUT 1523.34
INV. IN 1537.10
INV. OUT 1536.90
INV. IN 1549.78
INV. OUT 1549.38
INV. IN 1554.79
INV. OUT 1554.69
INV. IN 1556.57
INV. OUT 1556.47
INV. IN 1562.72
INV. IN 1564.69
INV. OUT 1564.42
INV. 1565.68
INV. IN 1565.63
INV. OUT 1565.53
INV. IN 1567.79
INV. OUT 1567.72
INV. OUT 1569.20
1525
1530
1535
1540
1545
1550
1555
1560
1565
1575
1580
RECORD DRAWINGS
CONTRACT II
EPA PROJECT NO. C-500116
WASTEWATER COLLECTION SYSTEM
PLAN AND PROFILE
ROUTE 100
M.H. 45 TO M.H. 53
JACKSONVILLE
VERMONT
DH
Dufresne-Henry Inc.
Precision Park
No. Springfield, Vermont 05150
Client No. 02-0407
Proj. Manager A.R. AUSTIN
Proj. Designer J.E. LENS
Drawn By F.L. BALLA
Checked By A.R. AUSTIN
Scale 1"=50' HOR., 1"=5' VERT.
Approved Arthur R. Austin
Date 4-12-82
Sheet 9 of 12
D 8874
1 REC. DWGS. DDL 9-83
Rev. Description By Date
4-12-82
BRUNING 44-132 4C237

CONTRACT II

EPA PROJECT NO. C-500118

WASTEWATER COLLECTION SYSTEM
PLAN AND PROFILE
ROUTE 100
M.H. 53 TO M.H. 62

JACKSONVILLE VERMONT

Client No.	02-0407
Proj. Manager	A.R. AUSTIN
Proj. Designer	J.E. LENS
Drawn By	L.G. FARRAR
Checked By	A.R. AUSTIN
Scale	1"=50' HOR., 1"=5' VERT.
Approved	Arthur R. Austin
Date	4-12-82

Sheet 10 of 12

D 8875

Dufresne-Henry Inc.
Precision Park
No. Springfield,
Vermont 05150

Rev.	Description	By	Date
1	RCD DWGS	DEL	9-1-83

RECORD DRAWINGS

CONTRACT II — EPA PROJECT NO. C500116

WASTEWATER COLLECTION SYSTEM
PLAN AND PROFILE
ROUTE 100
M.H. 62 TO M.H. 68

JACKSONVILLE — VERMONT

Dufresne-Henry Inc.
Precision Park
No. Springfield, Vermont 05150

Client No.	02-0407
Proj. Manager	A.R. AUSTIN
Proj. Designer	J.E. LENS
Drawn By	F.L. BALLA
Checked By	A.R. AUSTIN
Scale	HOR. 1"=50' VERT. 1"=5'
Approved	Arthur R. Austin
Date	4-12-82
Sheet	11 of 12
D	8876

Rev.	Description	By	Date
1	RCD. DWG.	DDL	9-83

4-12-82

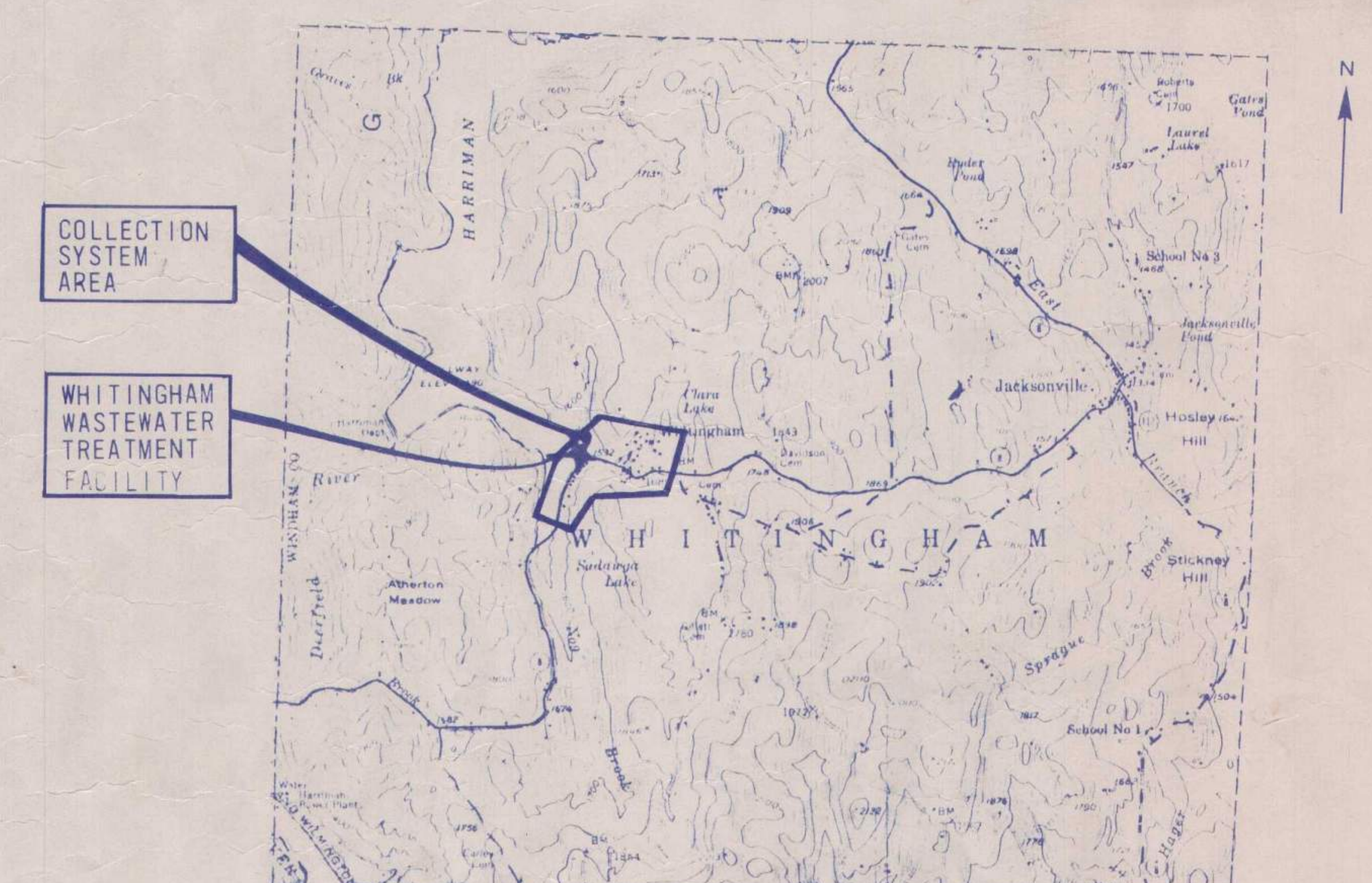
BRUNING 44-132 45337

SEWER
RADIUS
COVER PLATE
25 3/4
1 1/2"
COVER SECTION
26"
24"
28 1/2"
FRAME SECTION
MANHOLE FRAME & COVER DETAIL
MINIMUM WEIGHT - FRAME = 250
MINIMUM WEIGHT - COVER = 150
SCALE: 1"=1'-0"
2"
3 3/4"
MANHOLE STEP DETAIL
SECTION 2/12
NOT TO SCALE
FLOW
MAXIMUM DISTANCE TO FIRST PIPE JOINT (ALL SIDES)
SECTIONAL PLAN
STANDARD PRECAST MANHOLE DETAIL
NOT TO SCALE
DROP MANHOLE
OUTSIDE MANHOLE DROP DETAIL
NOT TO SCALE
2'-6"
2'-6"
PAY LIMITS FOR TOP ITEMS
TRAVELED LANE
CROSS COUNTRY
1 1/2" TYPE III WEARING COURSE
1'-6" MIN. SUBBASE
1 1/2" TYPE II BINDER COURSE
COMMON FILL MATERIAL
6'-0" MIN. COVER ROADWAY 5'-0" CROSS COUNTRY
0-2" MAX @ TOP OF PIPE
1'-0" MIN. SAND BLANKET FOR DUCTILE IRON COMMON FILL WITH NO STONES LARGER THAN 2" MAY BE USED IN PLACE OF THE SAND BLANKET
MIN. 6" - D/2
CRUSHED STONE
6" MIN
NEW SEWER
LEDGE
EARTH
TYPICAL TRENCH SECTION
NOT TO SCALE
VERTICAL PIPE RISER DETAIL
NOT TO SCALE
6" MIN.
6" HOUSE CONNECTION
WATER TIGHT CAP OR PLUG 4" OUTLET
45° BEND 6" SIZE
STANDARD Y-BRANCH
SEWER MAIN
FLOW
LATERAL CONNECTION DETAIL
NOT TO SCALE
ADJUST TO MEET EXISTING TERRAIN
FINISH GRADE
GROUT
ADJUST GRADES WITH BRICK OR PRECAST CONC. EXTENSION
2'-0" DIAM.
WATERTIGHT RUBBER GASKET JOINT OR AS APPROVED BY ENGINEER
M.H. STEPS 12" C-C
4'-0" MIN. DIA.
6" MIN.
VARIABLE FOR PIPE DIA.
8" MIN.
CAST IN PLACE FLEXIBLE WATERTIGHT SLEEVE
NOTE: COAT THE EXTERIOR SURFACE OF THE MANHOLE WITH A WATERTIGHT SEALANT SUCH AS KOPPERS BITUMASTIC NO. 50 OR APPROVED EQUIVALENT.
SECTION 1/12
SCALE: 1/2"=1'-0"
BRICK PAVED SHELF AND INVERT. UNDERLAYMENT OF INVERT AND SHELF SHALL CONSIST OF BRICK MASONRY.
WATERTIGHT CAP AT ALL OUTLETS OF FUTURE HOUSE CONNECTIONS
SEWER MAIN
INSTALL SEWER MAIN "WYE" AT 45° WHEREVER POSSIBLE
6" SEWER PIPE 1/4" PER FT. MIN SLOPE
TYPICAL HOUSE SERVICE LATERALS
NOT TO SCALE
SECTION
UNDISTURBED EARTH
MIN. 12"
PLAN
IMPERVIOUS TRENCH DAMS
NOT TO SCALE
12"
12"
3000 PSI CONCRETE
CONCRETE CRADLE
CONCRETE ENCASEMENT
TYPICAL PIPE PROTECTION DETAIL
NOT TO SCALE
NOTE: CONCRETE ENCASEMENT OF SEWER LINES WILL BE REQUIRED WHERE THEY PASS UNDER STORM DRAINS, WATER PIPES, OR OTHER STRUCTURES. ALSO REQUIRED AT STREAM CROSSINGS.
SAND FILL
STEEL CASING
ASPHALT PAPER AROUND PIPE
ROAD CROSSING DETAIL
NOT TO SCALE
STEEL SLEEVE
ROAD CROSSING DETAIL
2'-0"
BRICKS MAY BE USED FOR GRADE ADJUSTMENTS. FRAME TO BE SET IN FULL BED OF MORTAR
PIPE DIAMETER + 4"
SEALER
5"
3'-0"
8"
4'-0" SQ. BASE
PRECAST CONCRETE CATCH BASIN
SCALE: 3/4"=1'-0"
GRATE
23 7/8" SQ.
2"
GRATE SECTION
24" SQ.
22" SQ.
2"
8"
33" SQ.
CATCH BASIN FRAME & GRATE DETAIL
MIN. WEIGHT FRAME & GRATE 500#
NOT TO SCALE
RECORD DRAWINGS
CONTRACT II
EPA PROJECT NO. C5
WASTEWATER COLLECTION SYSTEM
MISCELLANEOUS DETAILS
JACKSONVILLE
Dufresne-Henry Inc.
Precision Park
No. Springfield,
Vermont 05150
Client No. 02-0407
Proj. Manager A.R. AUSTIN
Proj. Designer J.E. LENS
Drawn By F.L. BALLA
Checked By A.R. AUSTIN
Scale AS SHOWN
Approved Arthur R. Austin
Date 4-12-82
Sheet
D
1 REC DWG. DDL 9-83
Rev. Description By Date
BRUNING 44-132 45337

Collection System-WHIT

PLANS FOR CONSTRUCTION
OF
WATER POLLUTION CONTROL FACILITIES
TOWN OF WHITINGHAM, VERMONT
WASTEWATER COLLECTION SYSTEM
FOR THE
VILLAGE OF WHITINGHAM

CONTRACT III
E.P.A. PROJECT NO. C500116-02



PROJECT PLAN

SCALE: 1" = 1 MILE

INDEX OF SHEETS

SHEET	DESCRIPTION
1	TITLE SHEET
2	PROJECT PLAN
3	SEWER PLAN AND PROFILE - NO. NINE ROAD
4	SEWER PLAN AND PROFILE - ROUTE 100
5	SEWER PLAN AND PROFILE - SCHOOL STREET
6	SEWER PLAN AND PROFILE - BROOK STREET ROUTE 100 AND UPTON ROAD
7	MISCELLANEOUS DETAILS

LOCATIO

Consulting Engineers, Landscape Architects and Planners

Offices
North Springfield, Vermont 05150
Manchester Center, Vermont 05255
St. Johnsbury, Vermont 05819
Montpelier, Vermont 05602
Manchester, New Hampshire 03101
Portland, Maine 04 03
Concord, Massachusetts 01742
Greenfield, Massachusetts 01301

Engineering Disciplines
Civil
Environmental
Transportation
Municipal
Mountain
Structural
Electrical
Mechanical
Industrial

Associated Disciplines
Planning & Urban Development
Landscape Architecture
Surveying
Construction Management

Applied Sciences
Water Quality
Geologic
Hydrologic

RECORD DRAWINGS

AERIAL VIEW SUPPLIED BY
LOCKWOOD MAPPING,
ROCHESTER, NEW YORK

GENERAL NOTES

1. THE LOCATION AND SIZES OF PIPES, DUCTS, CONDUITS, WIRES AND OTHER UNDERGROUND STRUCTURES SHOWN ON THESE PLANS ARE NOT WARRENTED TO BE EXACT. NOR IS IT WARRENTED THAT ALL UNDERGROUND STRUCTURES ARE SHOWN. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING THE APPROPRIATE UTILITY ORGANIZATION AND FOR VERIFYING THE EXACT LOCATIONS OF UNDERGROUND UTILITIES PRIOR TO START OF CONSTRUCTION.
2. LOCATIONS OF BORINGS ARE APPROXIMATE ONLY. SOIL LOGS CAN BE FOUND IN THE PROJECT MANUAL.
3. SEWER LINES TO BE LOCATED A MIN. OF 10 FEET FROM WATER LINES HORIZONTALLY AND 18 INCHES BELOW WATER LINES VERTICALLY.
4. WHEN SEWERS CROSS UNDER CULVERTS, THEY SHALL BE ADEQUATELY PROTECTED AGAINST EXTRA LOADS IMPOSED THEREBY. CONCRETE PROTECTION SHALL BE PROVIDED WHEN SO DIRECTED BY THE ENGINEER OR WHEN SHOWN ON THE SEWER PLAN AND PROFILE SHEETS.
5. SEE SPECIFICATIONS FOR SEWER PIPE MATERIALS. SEWER PIPE MATERIAL SHALL BE UNIFORM THROUGHOUT PROJECT EXCEPT AS NOTED ON THE PLANS.
6. PROVIDE INSULATION WHERE SEWERS HAVE LESS THAN 5' OF COVER IN ANY DIRECTION OR AS DIRECTED BY THE ENGINEER.
7. WELL TYPES AND LOCATIONS ARE APPROXIMATE ONLY BASED ON FIELD SURVEY INFORMATION.
8. PROVIDE 3" THICK RIGID INSULATION BOARD BETWEEN SEWER PIPE AND CULVERT WHEN THE DISTANCE BETWEEN SEWER O.D. AND CULVERT O.D. IS LESS THAN 3'-0". INSULATION TO EXTEND 2 CULVERT DIAMETERS ON EITHER SIDE OF ¢ OF SEWER PIPE.
9. A TWENTY FOOT WIDE CONSTRUCTION EASEMENT OVER THE SEWER LINE BUT NOT NECESSARILY CENTERED OVER IT HAS BEEN OBTAINED BY THE TOWN OF WHITINGHAM AT LOCATIONS WHERE WORK IS ANTICIPATED TO EXTEND ONTO PRIVATE PROPERTY. ANY ADDITIONAL CONSTRUCTION EASEMENTS CONSIDERED NECESSARY BY THE CONTRACTOR SHALL BE OBTAINED BY AND AT THE CONTRACTOR'S EXPENSE.

LEGEND

EXISTING

- RIGHT-OF-WAY
- EASEMENT
- EDGE OF PAVEMENT
- PROPERTY LINE
- GRAVEL ROADWAY
- WOOD FENCE/WOOD GUARD POST
- GUARD CABLE
- STONEWALL
- EDGE OF WOODS
- BRUSH/SHRUBS
- 10' CONTOUR
- 2' CONTOUR (JACKSONVILLE)
- 5' CONTOUR (WHITINGHAM)
- BUILDING
- BROOK
- OHW — OVERHEAD WIRES
- S — SEWER LINE (SIZE AND TYPE AS SHOWN)
- W — WATER LINE (SIZE AND TYPE AS SHOWN)
- T — TELEPHONE
- EDGE OF WATER
- CULVERT (SIZE AND TYPE AS SHOWN)
- POWER POLE
- SIGN
- IRON PIN
- TREE (SIZE AND TYPE AS SHOWN)
- MAILBOX
- WET AREA
- BRIDGE
- MANHOLE
- DIRECTION OF WATER FLOW

PROPOSED

- 98 — FINISHED CONTOUR
- MANHOLE
- CONCRETE ENCASEMENT
- FILL
- TEST BORING
- SEWER LINE (SIZE AND TYPE AS SHOWN)
- WOODEN GUARD POST
- PIPE WITH INSULATION
- PIPE SLEEVE
- IMPERVIOUS TRENCH DAM

RECORD DRAWINGS

Rev.	Description	By	Date

CONTRACT III   EPA PROJECT NO. [illegible]-90116-02

WASTEWATER COLLECTION SYSTEM
PROJECT PLAN
GENERAL NOTES AND LEGEND

WHITINGHAM   VERMONT

Dufresne-Henry Inc.
Precision Park
No. Springfield
Vermont 05150

Client No.	
Proj. Manager	[illegible]
Proj. Designer	[illegible]
Drawn By	[illegible] BALLA
Checked By	A. R. AUSTIN
Scale	AS SHOWN
Approved	Arthur R. Austin
Date	4-12-82
Sheet	[illegible] of [illegible]
D	8879

4-12-82
No. 3578

BRUNING 44-132 45337

CONTRACT III

EPA PROJECT NO. C-500116

WASTEWATER COLLECTION SYSTEM

NO. NINE ROAD
M.H. S-2 TO M.H. 129

WHITINGHAM VERMONT

RECORD DRAWINGS

Rev.	Description	By	Date

Dufresne-Henry Inc.
Precision Park
No. Springfield,
Vermont 05150

Client No.	762
Proj. Manager	A.R. AUSTIN
Proj. Designer	J.E. LENS
Drawn By	F.L. BALLA
Checked By	A.R. AUSTIN
Scale	H.R., 1"=50' VERT. 1"=5'
Approved	Arthur R. Austin
Date	4-12-82

Sheet 3 of 7

D 8880

4-12-82

BRUNING 44-132 45337

NOTE: FOR EXACT LOCATIONS & DIMENSIONS OF 6" DI HOUSE SERVICES SEE HOUSE SERVICE SHEETS AVAILABLE FROM TREATMENT PLANT OPERATOR

CONTRACT III

EPA PROJECT NO. C-500116

WASTEWATER COLLECTION SYSTEM
PLAN AND PROFILE
ROUTE 100
M.H. S1 TO M.H. 109

WHITINGHAM — VERMONT

RECORD DRAWINGS

Rev.	Description	By	Date

Dufresne-Henry Inc.
Precision Park
No. Springfield, Vermont 05150

Client No.	23-7.2
Proj. Manager	A.R. AUSTIN
Proj. Designer	J.E. LENS
Drawn By	F.L. BALLA
Checked By	A.R. AUSTIN
Scale	HOR., 1"=50' VERT. 1"=5'
Approved	Arthur R. Austin
Date	4-12-82

Sheet 4 of 7
D 8881

BRUNING 44-132 45337

CONTRACT III

EPA PROJECT NO. C-500116

WASTEWATER COLLECTION SYSTEM
PLAN AND PROFILE
SCHOOL STREET
M.H. 109 TO M.H. 115

WHITINGHAM — VERMONT

Dufresne-Henry Inc.
Precision Park
No. Springfield, Vermont 05150

Client No	22
Proj. Manager	A. R. AUSTIN
Proj. Designer	J. E. LENS
Drawn By	F. L. BALLA
Checked By	A. R. AUSTIN
Scale	HOR., 1"=50' VERT. 1"=5'
Approved	Arthur R. Austin
Date	4-12-82
Sheet	5 of 7
D	8882

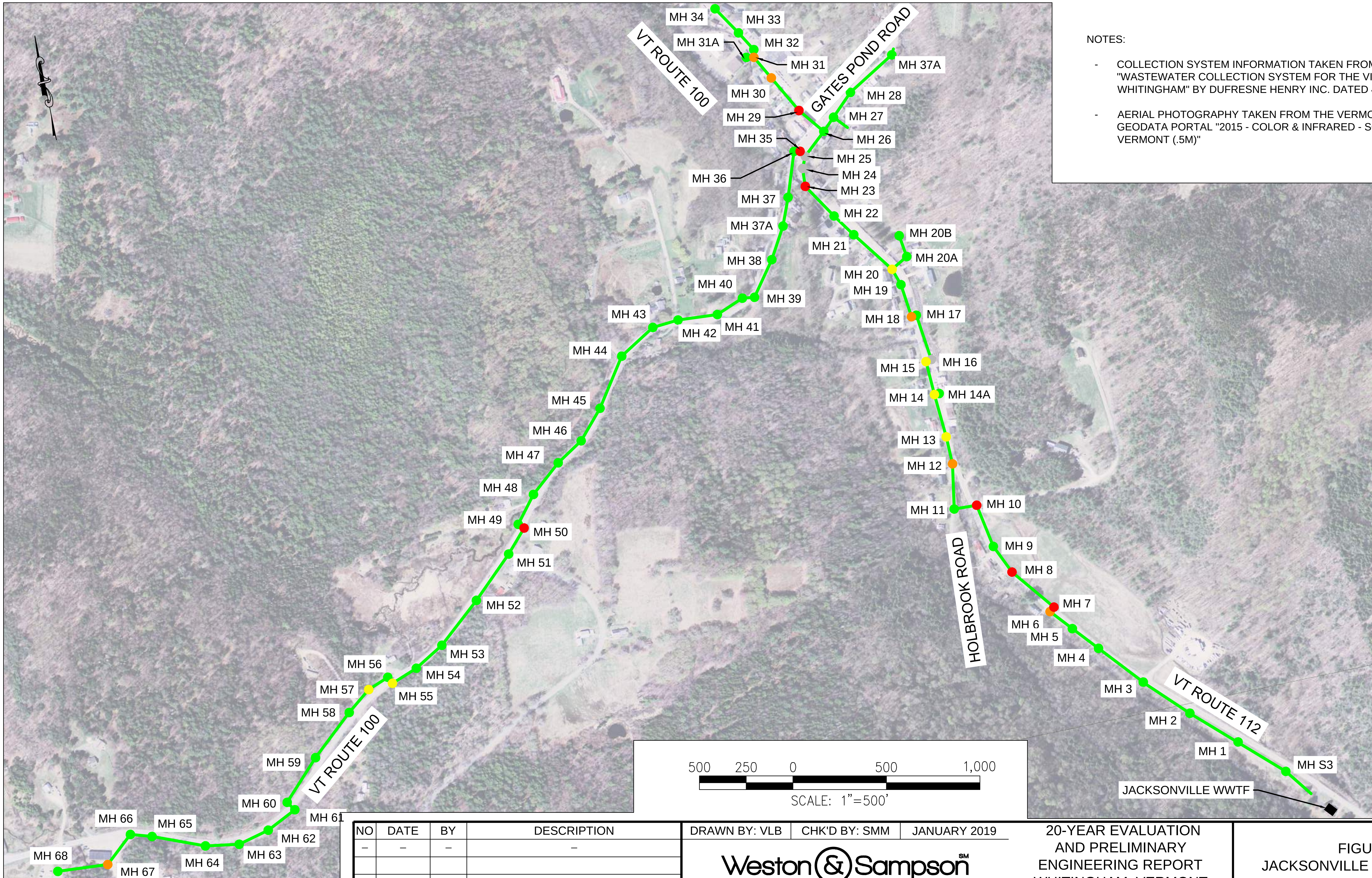
Rev.	Description	By	Date


TBM #111
PAINT SPOT ON N.W. CORNER OF SLAB ELEV. 1598.34
NOTE: PAY ITEM NO. 31
REPLACE & RELOCATE 1" POLYETHELENE WATER LINE TO PROVIDE 10' HORIZONTAL SEPARATION FROM SEWER. BURY MIN. 6' APPROX. DISTANCE OF RELOCATION IS 200' PROVIDE 6" SAND ENVELOPE AROUND WATER PIPE
BLOCK RETAINING WALL
ROUTE 100
MH118
MH119
MH120
MH 109
MATCH LINE SHEET 5
MATCH LINE SHEET 4
PAVED PARKING
POST OFFICE & STORE 20
CHURCH 21
STIMPSON HILL ROAD
STUB W/CAP
BURIED FUEL TANK
STONE RETAINING WALL
TO DUG WELL IN MEADOW
400'± TO DUG WELL
TO DUG WELL IN MEADOW ACROSS STIMPSON HILL RD.
TO DUG WELL BEHIND HOUSE
76'-8" DUCTILE IRON PIPE
162.5'-8" DUCTILE IRON PIPE
54'-8" D.I.
ROAD CROSSING NO. 103 PAY LIMIT 35
STUB INLET ELEV. 1591.36
156.5' @ S= 0.0123FT/FT
INV. IN 1588.71
INV. OUT 1588.48
INV. OUT 1590.64
INV. IN 1590.81
INV. OUT 1591.26
48' @ S= 0.0094FT/FT
70' @ S=0.0771FT/FT
INV. OUT 1582.64
INV. IN 1583.08
PIPE SLEEVE
TO DUG WELL NEAR LAKE CLARA
MATCH LINE SHEET 5
4" METAL PIPE, PRESENTLY SILTED IN SO THAT ONLY 18" OPENING REMAINS
UPTON ROAD
MH115
MH 116
MH 117
8" STUB W/CAP
TBM #109
SPIKE IN P.P. #11 ELEV. 1652.37
DUG WELL IN BASEMENT
DUG WELL
124'-8" DUCTILE IRON PIPE
226.5'-8" DUCTILE IRON PIPE
DROP MH115 SEE DETAIL SHEET 7 OF 7
STUB INLET ELEV. 1646.00
118' @ S= 0.011 FT/FT
INV. OUT 1642.87
INV. IN 1643.10
INV. IN 1644.66
INV. OUT 1644.40
RIGID BOARD INSULATION
220.5' @ S=0.0634FT/FT
INV. IN 1658.75
INV. OUT 1658.65
INV @ MH117 +23' 1661.63
TBM #106
R.R. SPIKE IN P.P. #160/396 ELEV. 1581.84
300'± TO DUG WELL ON HILL
BROOK STREET
MH105
MH121
MH 122
MH123
MH124
FIRE HOUSE
3'± Shot rock
12" m (...)
NAIL IN 18" MAPLE
ABANDONED MILL BLDG.
FOUNDATION FOR MILL
TB #110
R.R. SPIKE IN POWER POLE ELEV. 1635.51
300.5'-8" DUCTILE IRON PIPE
147.5'-8" DUCTILE IRON PIPE
149.5'-8" DUCTILE IRON PIPE
148.5'-8" DUCTILE IRON PIPE
STUB INLET ELEV. 164...
INV. OUT 1640.37
294.5' @ S=0.0459FT/FT
INV. IN 1626.85
INV. OUT 1626.56
141.5' @ S= 0.0908 FT/FT
INV. IN 1613.71
INV. OUT 1612.96
143.5' @ S= 0.142 FT/FT
INV. IN 1592.56
INV. OUT 1591.76
141' @ S= 0.1239 FT/FT
DROP MH 105' SEE DETAIL SHEET 7 OF 7
INV. OUT 1568.02
INV. IN 1574.29 @ MH 105' + 45' - END OUTSIDE MH DROP
NOTE: FOR EXACT LOCATION & DIMENSIONS OF 6" DI HOUSE SERVICES SEE HOUSE SERVICE SHEETS AVAILABLE FROM TREATMENT PLANT OPERATOR.
CONTRACT III
EPA PROJECT NO. C-500...
WASTEWATER COLLECTION SYSTEM PLAN AND PROFILE
BROOK STREET M.H. 106 TO M.H. 124
UPTON ROAD M.H.115 TO M.H.117
ROUTE 100 M.H.109 TO M.H. ...
WHITINGHAM
RECORD DRAWINGS
Dufresne-Henry Inc.
Precision Park No. Springfield, Vermont 05150
Client No.
Proj. Manager A.R. AUSTIN
Proj. Designer J.E. LENS
Drawn By F.L. BALLA
Checked By
Scale 1"=50' HOR., 1"=5' VERT.
Approved
Date 4-12-82
Sheet 6 of 7
D 8883
Rev. Description By Date
BRUNING 44-132 45337

SEWER
COVER PLATE
COVER SECTION
FRAME SECTION
MANHOLE FRAME & COVER DETAIL
MINIMUM WEIGHT - FRAME = 250#
MINIMUM WEIGHT - COVER = 150#
MANHOLE STEP DETAIL
SECTION 2/7
NOT TO SCALE
SECTIONAL PLAN
STANDARD PRECAST MANHOLE DETAIL
NOT TO SCALE
MAXIMUM DISTANCE TO FIRST PIPE JOINT (ALL SIDES)
FLOW
DROP MANHOLE
OUTSIDE MANHOLE DROP DETAIL
NOT TO SCALE
TYPICAL TRENCH SECTION
NOT TO SCALE
PAY LIMITS FOR TOP ITEMS
TRAVELLED LANE
CROSS COUNTRY
COMMON FILL MATERIAL
CRUSHED STONE
LEDGE
EARTH
NEW SEWER
IMPERVIOUS TRENCH DAMS
NOT TO SCALE
UNDISTURBED EARTH
CONCRETE CRADLE
3000 PSI CONCRETE
CONCRETE ENCASEMENT
TYPICAL PIPE PROTECTION DETAIL
NOT TO SCALE
NOTE: CONCRETE ENCASEMENT OF SEWER LINES WILL BE REQUIRED WHERE THEY PASS UNDER STORM DRAINS, WATER PIPES, OR OTHER STRUCTURES. ALSO REQUIRED AT STREAM CROSSINGS.
VERTICAL PIPE RISER DETAIL
NOT TO SCALE
TEE OR WYE
BEDDING
PLUG
ROAD CROSSING DETAIL
NOT TO SCALE
STEEL CASING
SAND FILL
LATERAL CONNECTION DETAIL
NOT TO SCALE
6" HOUSE CONNECTION
WATER TIGHT CAP OR PLUG AT OUTLET
45° BEND 6" SIZE
STANDARD Y-BRANCH
SEWER MAIN
TYPICAL HOUSE SERVICE LATERALS
NOT TO SCALE
HIGHWAY PAVEMENT
CURB
LAWN
SIDEWALK
TERMINATE AT PROPERTY LINE OR AS DIRECTED BY ENGINEER
2"x2" WOOD LOCATION POST
5' MIN. COVER AT ALL POINTS
WATERTIGHT CAP AT ALL OUTLETS OF FUTURE HOUSE CONNECTIONS
6" SEWER PIPE, 1/8" PER FT. MIN SLOPE
INSTALL SEWER MAIN "WYE" AT 45° WHEREVER POSSIBLE
NOTE: COAT THE EXTERIOR SURFACE OF THE MANHOLE WITH A WATERTIGHT SEALANT SUCH AS KOPPERS BITUMASTIC NO. 50 OR APPROVED EQUIVALENT.
SECTION 1/7
NOT TO SCALE
BRICK PAVED SHELF AND INVERT. UNDERLAYMENT OF INVERT AND SHELF SHALL CONSIST OF BRICK MASONRY.
CAST IN PLACE FLEXIBLE WATER TIGHT SLEEVE
CONTRACT III
WASTEWATER COLLECTION SYSTEM
MISCELLANEOUS DETAILS
WHITINGHAM
VERMONT
RECORD DRAWINGS
Dufresne-Henry Inc.
Precision Park
No. Springfield, Vermont 05150
Client No.
Proj. Manager
Proj. Designer
Drawn By
Checked By
Scale AS SHOWN
Approved
Date 4-12-86
Sheet
Rev.
Description
By
Date

APPENDIX B

Priority Rated Manholes



NOTES:

- COLLECTION SYSTEM INFORMATION TAKEN FROM "WASTEWATER COLLECTION SYSTEM FOR THE VILLAGE OF WHITINGHAM" BY DUFRESNE HENRY INC. DATED 4/12/82
- AERIAL PHOTOGRAPHY TAKEN FROM THE VERMONT OPEN GEODATA PORTAL "2015 - COLOR & INFRARED - SOUTHERN VERMONT (.5M)"

NO	DATE	BY	DESCRIPTION
–	–	–	–

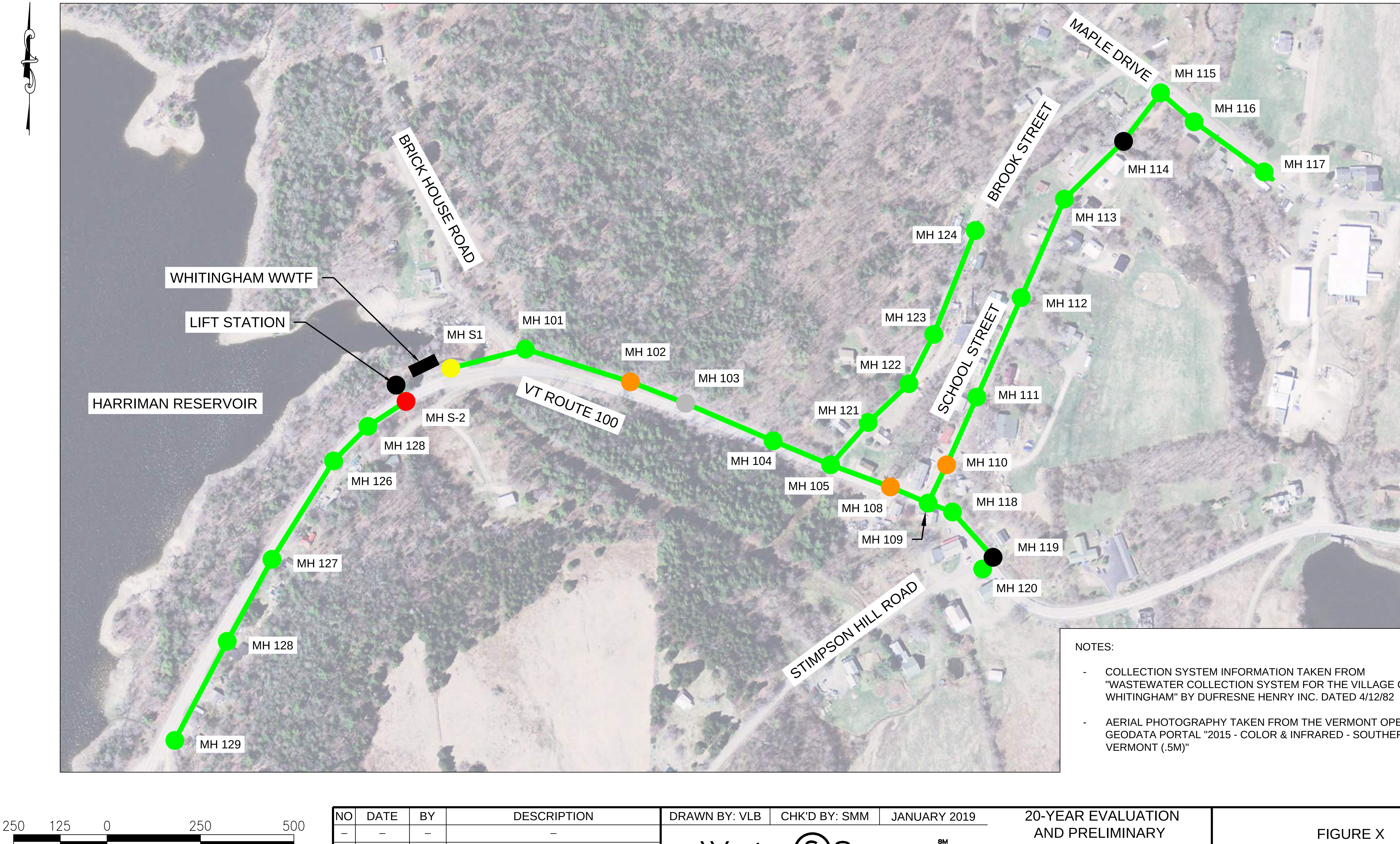
DRAWN BY: VLB | CHK'D BY: SMM | JANUARY 2019

Weston & Sampson

20-YEAR EVALUATION AND PRELIMINARY ENGINEERING REPORT
WHITINGHAM, VERMONT

FIGURE X
JACKSONVILLE SERVICE AREA

\\wse03.local\WSE\Projects\VT\Whitingham VT\CAD\APP B MH REPORT.dwg



NOTES:

- COLLECTION SYSTEM INFORMATION TAKEN FROM "WASTEWATER COLLECTION SYSTEM FOR THE VILLAGE OF WHITINGHAM" BY DUFRESNE HENRY INC. DATED 4/12/82
- AERIAL PHOTOGRAPHY TAKEN FROM THE VERMONT OPEN GEODATA PORTAL "2015 - COLOR & INFRARED - SOUTHERN VERMONT (.5M)"

NO	DATE	BY	DESCRIPTION
–	–	–	–

DRAWN BY: VLB | CHK'D BY: SMM | JANUARY 2019

Weston & Sampson

20-YEAR EVALUATION AND PRELIMINARY ENGINEERING REPORT WHITINGHAM, VERMONT

FIGURE X
WHITINGHAM SERVICE AREA

\\wse03.local\WSE\Projects\VT\Whitingham VT\CAD\APP B MH REPORT.dwg

APPENDIX C

Manhole Inspection Reports

VT Manhole Inspection

Record: 100	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-15*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*S1*
Street Name	*Other*
Other Street Name	*Route 112*
Street or Easement	*STREET*
Surface Type	*Grass*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*Needs Repair*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*Other*
Other Number of Riser Rings	*3*
MH Cover Elevation	*At Grade*
Cover Inflow	*Heavy*
MH cleaning Required	*Yes*
MH Grease Visible	*Yes*
Roots	*Yes*
Steps	*No*
Chimney Material	*Brick*
Chimney Condition	*Needs Repair*
Chimney Infiltration	*Moderate*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:0.000000, Longitude:0.000000, Altitude:0.000000, Speed:0.000000, Horizontal Accuracy:0.000000, Vertical Accuracy:0.000000, Time:(null)*
Additional Comments	*Unable to inspect walls due to a high level of grease and sludge. One third of the cover has been cut off.*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*3.7*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*2*
Depth to Invert	*3.5*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)

Photo

Photo(s)

Photo

Photo(s)

Photo

Photo(s)	
Photo	

Photo(s)	
Photo	

VT Manhole Inspection

Record: 97	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-15*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*1*
Street Name	*Other*
Other Street Name	*Route 112*
Street or Easement	*STREET*
Surface Type	*Grass*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*Other*
Other Number of Riser Rings	*3*
MH Cover Elevation	*Above Grade*
Cover Inflow	*Minimal*
MH cleaning Required	*Yes*
MH Grease Visible	*Yes*
Roots	*Yes*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Needs Repair*
Chimney Infiltration	*Heavy*
Wall Material	*Precast*
Wall Condition	*Needs Repair*
Wall Infiltration	*Moderate*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:0.000000, Longitude:0.000000, Altitude:0.000000, Speed:0.000000, Horizontal Accuracy:0.000000, Vertical Accuracy:0.000000, Time:(null)*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*5.5*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*11*
Depth to Invert	*5.4*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*PVC*

Photo(s)

Photo

Photo(s)

Photo

Photo(s)

Photo

Photo(s)	
Photo	

Photo(s)	
Photo	

VT Manhole Inspection

Record: 94	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-15*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*6*
Street Name	*Other*
Other Street Name	*Route 112*
Street or Easement	*STREET*
Surface Type	*Grass*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*2*
MH Cover Elevation	*Below Grade*
Cover Inflow	*Minimal*
MH cleaning Required	*Yes*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Needs Repair*
Chimney Infiltration	*Minimal*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*Minimal*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*Minimal*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Needs Repair*
Bench and Invert Infiltration	*Minimal*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:0.000000, Longitude:0.000000, Altitude:0.000000, Speed:0.000000, Horizontal Accuracy:0.000000, Vertical Accuracy:0.000000, Time:(null)*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*7.9*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*3*
Depth to Invert	*7.8*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)

Photo	

Photo(s)

Photo	

Photo(s)

Photo	

VT Manhole Inspection

Record: 91	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-15*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*7*
Street Name	*Other*
Other Street Name	*Route 112*
Street or Easement	*STREET*
Surface Type	*Grass*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*1*
MH Cover Elevation	*At Grade*
Cover Inflow	*None*
MH cleaning Required	*Yes*
MH Grease Visible	*Yes*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Satisfactory*
Chimney Infiltration	*None*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*Minimal*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*None*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:0.000000, Longitude:0.000000, Altitude:0.000000, Speed:0.000000, Horizontal Accuracy:0.000000, Vertical Accuracy:0.000000, Time:(null)*
Additional Comments	*Lateral connection in manhole is running onto bench and not into trough, needs repair*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*7*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details	
Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*9*
Depth to Invert	*6.9*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details	
Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*1*
Depth to Invert	*5.9*
Service Connection	*Yes*
Pipe Diameter	*4*
Pipe Material	*PVC*

Photo(s)	
Photo	

Photo(s)	
Photo	

Photo(s)	
Photo	

VT Manhole Inspection

Record: 88

Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-15*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*8*
Street Name	*Other*
Other Street Name	*Route 112*
Street or Easement	*STREET*
Surface Type	*Grass*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*Other*
Other Number of Riser Rings	*0*
MH Cover Elevation	*Below Grade*
Cover Inflow	*None*
MH cleaning Required	*Yes*
MH Grease Visible	*Yes*
Roots	*No*
Steps	*No*
Steps Condition	*Satisfactory*
Chimney Condition	*Needs Repair*
Chimney Infiltration	*Moderate*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*Minimal*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*Minimal*
Bench and Invert Material	*Concrete*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*Minimal*
Location Coordinates (click white space below to obtain)	*Latitude:0.000000, Longitude:0.000000, Altitude:0.000000, Speed:0.000000, Horizontal Accuracy:0.000000, Vertical Accuracy:0.000000, Time:(null)*

Pipe Details

Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*10.2*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details	
Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*8*
Depth to Invert	*10.1*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)	
Photo	

Photo(s)	
Photo	

Photo(s)	
Photo	

VT Manhole Inspection

Record: 85	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-15*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*10*
Street Name	*Other*
Other Street Name	*Route 112*
Street or Easement	*STREET*
Surface Type	*Asphalt*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*1*
MH Cover Elevation	*At Grade*
Cover Inflow	*None*
MH cleaning Required	*Yes*
MH Grease Visible	*Yes*
Roots	*No*
Steps	*Yes*
Steps Condition	*Needs Repair*
Chimney Material	*Brick*
Chimney Condition	*Needs Repair*
Chimney Infiltration	*Moderate*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*Minimal*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*Minimal*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Needs Repair*
Bench and Invert Infiltration	*Minimal*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:0.000000, Longitude:0.000000, Altitude:0.000000, Speed:0.000000, Horizontal Accuracy:0.000000, Vertical Accuracy:0.000000, Time:(null)*
Additional Comments	*Some steps look very loose and holes are cracked*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*13.9*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details	
Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*9*
Depth to Invert	*13.7*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)	
Photo	

Photo(s)	
Photo	

Photo(s)	
Photo	

VT Manhole Inspection

Record: 82	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-15*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*12*
Street Name	*Other*
Other Street Name	*Route 112*
Street or Easement	*STREET*
Surface Type	*Asphalt*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*Other*
Other Number of Riser Rings	*3*
MH Cover Elevation	*At Grade*
Cover Inflow	*None*
MH cleaning Required	*Yes*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Needs Repair*
Chimney Infiltration	*Minimal*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*Minimal*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*Minimal*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*Minimal*
Location Coordinates (click white space below to obtain)	*Latitude:0.000000, Longitude:0.000000, Altitude:0.000000, Speed:0.000000, Horizontal Accuracy:0.000000, Vertical Accuracy:0.000000, Time:(null)*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*7.25*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*12*
Depth to Invert	*7.1*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)

Photo

Photo(s)

Photo

Photo(s)

Photo

VT Manhole Inspection

Record: 79	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*13*
Street Name	*Other*
Other Street Name	*Route 112*
Street or Easement	*STREET*
Surface Type	*Asphalt*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*Other*
Other Number of Riser Rings	*3*
MH Cover Elevation	*At Grade*
Cover Inflow	*None*
MH cleaning Required	*Yes*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Needs Repair*
Chimney Infiltration	*Minimal*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*None*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*None*
Bench and Invert Material	*Concrete*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*7*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*12*
Depth to Invert	*6.9*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)

Photo	

Photo(s)

Photo	

Photo(s)

Photo	

VT Manhole Inspection

Record: 76	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*14*
Street Name	*Other*
Other Street Name	*Route 112*
Street or Easement	*STREET*
Surface Type	*Asphalt*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*1*
MH Cover Elevation	*At Grade*
Cover Inflow	*None*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Satisfactory*
Chimney Infiltration	*None*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*None*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*None*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Needs Repair*
Bench and Invert Infiltration	*Minimal*
Pipe Connection Infiltration	*Minimal*
Location Coordinates (click white space below to obtain)	*Latitude:0.000000, Longitude:0.000000, Altitude:0.000000, Speed:0.000000, Horizontal Accuracy:0.000000, Vertical Accuracy:0.000000, Time:(null)*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*7.6*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*12*
Depth to Invert	*7.5*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*3*
Depth to Invert	*7.5*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)

Photo

Photo(s)

Photo

Photo(s)

Photo	

VT Manhole Inspection

Record: 73	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*15*
Street Name	*Other*
Other Street Name	*Route 112*
Street or Easement	*STREET*
Surface Type	*Asphalt*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*2*
MH Cover Elevation	*At Grade*
Cover Inflow	*None*
MH cleaning Required	*Yes*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Needs Repair*
Chimney Infiltration	*Minimal*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*None*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*None*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*7.8*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*3*
Depth to Invert	*7.7*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)

Photo

Photo(s)

Photo

Photo(s)

Photo

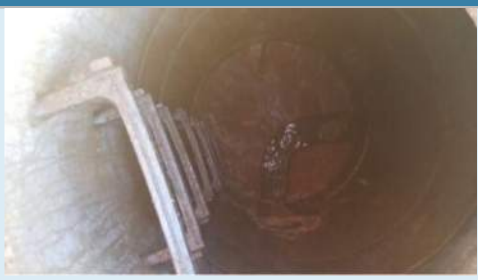
VT Manhole Inspection

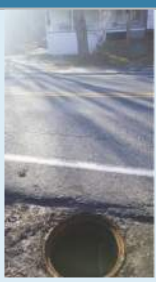
Record: 70	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*17*
Street Name	*Other*
Other Street Name	*Route 112*
Street or Easement	*STREET*
Surface Type	*Asphalt*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*Other*
Other Number of Riser Rings	*0*
MH Cover Elevation	*At Grade*
Cover Inflow	*None*
MH cleaning Required	*Yes*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*None*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*None*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*9*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details	
Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*9*
Depth to Invert	*8.8*
Drop Connection (Mainline)	*Outside*
Invert Depth of Drop Connection	*6.6*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)	
Photo	

Photo(s)	
Photo	

Photo(s)	
Photo	

VT Manhole Inspection

Record: 67	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*18*
Street Name	*Other*
Other Street Name	*Route 112*
Street or Easement	*STREET*
Surface Type	*Asphalt*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*2*
MH Cover Elevation	*At Grade*
Cover Inflow	*None*
MH cleaning Required	*Yes*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Needs Repair*
Chimney Infiltration	*Minimal*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*None*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*None*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Needs Repair*
Bench and Invert Infiltration	*Minimal*
Pipe Connection Infiltration	*Minimal*
Location Coordinates (click white space below to obtain)	

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*7.3*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*3*
Depth to Invert	*7.05*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*9*
Depth to Invert	*6.6*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)

Photo

Photo(s)

Photo

Photo(s)

Photo	

VT Manhole Inspection

Record: 64

Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*20*
Street Name	*Other*
Other Street Name	*Route 112*
Street or Easement	*STREET*
Surface Type	*Asphalt*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*Other*
Other Number of Riser Rings	*3*
MH Cover Elevation	*At Grade*
Cover Inflow	*None*
MH cleaning Required	*Yes*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Needs Repair*
Chimney Infiltration	*Minimal*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*None*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*None*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:0.000000, Longitude:0.000000, Altitude:0.000000, Speed:0.000000, Horizontal Accuracy:0.000000, Vertical Accuracy:0.000000, Time:(null)*

Pipe Details

Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*7.9*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*12*
Depth to Invert	*6.3*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*3*
Depth to Invert	*7.8*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)

Photo	

Photo(s)

Photo	

Photo(s)	
Photo	

VT Manhole Inspection

Record: 61	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*23*
Street Name	*Other*
Other Street Name	*Route 112*
Street or Easement	*STREET*
Surface Type	*Asphalt*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*Other*
Other Number of Riser Rings	*3*
MH Cover Elevation	*At Grade*
Cover Inflow	*None*
MH cleaning Required	*Yes*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Needs Repair*
Chimney Infiltration	*Moderate*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*None*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*None*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:0.000000, Longitude:0.000000, Altitude:0.000000, Speed:0.000000, Horizontal Accuracy:0.000000, Vertical Accuracy:0.000000, Time:(null)*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*11.5*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*12*
Depth to Invert	*11.4*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)

Photo

Photo(s)

Photo

Photo(s)

Photo

VT Manhole Inspection

Record: 55	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*29*
Street Name	*State Route 100*
Street or Easement	*STREET*
Surface Type	*Grass*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*Other*
Other Number of Riser Rings	*3*
MH Cover Elevation	*At Grade*
Cover Inflow	*Minimal*
MH cleaning Required	*Yes*
MH Grease Visible	*No*
Roots	*Yes*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Needs Repair*
Chimney Infiltration	*Heavy*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*Moderate*
Wall Material	*Precast*
Wall Condition	*Needs Repair*
Wall Infiltration	*Moderate*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:0.000000, Longitude:0.000000, Altitude:0.000000, Speed:0.000000, Horizontal Accuracy:0.000000, Vertical Accuracy:0.000000, Time:(null)*
Additional Comments	*Heavy flow in this manhole, little flow in previous manhole*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*10.5*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*8*
Depth to Invert	*10.4*
Drop Connection (Mainline)	*Outside*
Invert Depth of Drop Connection	*7.3*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)

Photo

Photo(s)

Photo

Photo(s)

Photo

Photo(s)	
Photo	

VT Manhole Inspection

Record: 52

Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*30*
Street Name	*State Route 100*
Street or Easement	*STREET*
Surface Type	*Asphalt*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*2*
MH Cover Elevation	*At Grade*
Cover Inflow	*None*
MH cleaning Required	*Yes*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Needs Repair*
Chimney Infiltration	*Moderate*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*None*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*None*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:0.000000, Longitude:0.000000, Altitude:0.000000, Speed:0.000000, Horizontal Accuracy:0.000000, Vertical Accuracy:0.000000, Time:(null)*

Pipe Details

Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*8*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details	
Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*12*
Depth to Invert	*7.9*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)	
Photo	

Photo(s)	
Photo	

Photo(s)	
Photo	

VT Manhole Inspection

Record: 49

Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*31*
Street Name	*State Route 100*
Street or Easement	*STREET*
Surface Type	*Asphalt*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*Other*
Other Number of Riser Rings	*3*
MH Cover Elevation	*At Grade*
Cover Inflow	*None*
MH cleaning Required	*No*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Needs Repair*
Chimney Infiltration	*Moderate*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*None*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*None*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:0.000000, Longitude:0.000000, Altitude:0.000000, Speed:0.000000, Horizontal Accuracy:0.000000, Vertical Accuracy:0.000000, Time:(null)*

Pipe Details

Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*9.1*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*11*
Depth to Invert	*9*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*1*
Depth to Invert	*7.2*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)

Photo

Photo(s)

Photo

Photo(s)	
Photo	

VT Manhole Inspection

Record: 58	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*35*
Street Name	*State Route 100*
Street or Easement	*STREET*
Surface Type	*Asphalt*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*1*
Cover Inflow	*Minimal*
MH cleaning Required	*Yes*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Needs Repair*
Chimney Infiltration	*Heavy*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*Minimal*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*Minimal*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:0.000000, Longitude:0.000000, Altitude:0.000000, Speed:0.000000, Horizontal Accuracy:0.000000, Vertical Accuracy:0.000000, Time:(null)*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*7.7*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*12*
Depth to Invert	*7.3*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)

Photo

Photo(s)

Photo

Photo(s)

Photo

VT Manhole Inspection

Record: 46	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*49*
Street Name	*State Route 100*
Street or Easement	*STREET*
Surface Type	*Grass*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*1*
MH Cover Elevation	*At Grade*
Cover Inflow	*None*
MH cleaning Required	*No*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Satisfactory*
Chimney Infiltration	*None*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*None*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*None*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:42.569561, Longitude:-73.701262, Altitude:84.270844, Speed:-1.000000, Horizontal Accuracy:165.000000, Vertical Accuracy:25.596008, Time:5:49:48 AM EST*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*12.6*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details	
Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*3*
Depth to Invert	*12.5*
Drop Connection (Mainline)	*Outside*
Invert Depth of Drop Connection	*8.3*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)	
Photo	

Photo(s)	
Photo	

VT Manhole Inspection

Record: 43	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*50*
Street Name	*State Route 100*
Street or Easement	*STREET*
Surface Type	*Asphalt*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*Other*
Other Number of Riser Rings	*0*
MH Cover Elevation	*Below Grade*
Cover Inflow	*None*
MH cleaning Required	*No*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*None*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*None*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:42.569561, Longitude:-73.701262, Altitude:84.270844, Speed:-1.000000, Horizontal Accuracy:165.000000, Vertical Accuracy:25.596008, Time:5:49:48 AM EST*
Additional Comments	*Need to re cement inside of chimney between frame and cone*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*7.4*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*3*
Depth to Invert	*7.2*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)

Photo

Photo(s)

Photo

Photo(s)

Photo

VT Manhole Inspection

Record: 40	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*54*
Street Name	*State Route 100*
Street or Easement	*STREET*
Surface Type	*Grass*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*1*
MH Cover Elevation	*Below Grade*
Cover Inflow	*None*
MH cleaning Required	*Yes*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Satisfactory*
Chimney Infiltration	*None*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*None*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*None*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:42.569561, Longitude:-73.701262, Altitude:84.270844, Speed:-1.000000, Horizontal Accuracy:165.000000, Vertical Accuracy:25.596008, Time:5:49:48 AM EST*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*9.7*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*PVC*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*12*
Depth to Invert	*9.3*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)

Photo

Photo(s)

Photo

Photo(s)

Photo

VT Manhole Inspection

Record: 37	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*55*
Street Name	*State Route 100*
Street or Easement	*STREET*
Surface Type	*Grass*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*1*
MH Cover Elevation	*At Grade*
Cover Inflow	*Minimal*
MH cleaning Required	*Yes*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Satisfactory*
Chimney Infiltration	*None*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*Minimal*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*Minimal*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:42.569561, Longitude:-73.701262, Altitude:84.270844, Speed:-1.000000, Horizontal Accuracy:165.000000, Vertical Accuracy:25.596008, Time:5:49:48 AM EST*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*6.5*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*3*
Depth to Invert	*6.4*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)

Photo

Photo(s)

Photo

Photo(s)

Photo

VT Manhole Inspection

Record: 34

Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*56*
Street Name	*State Route 100*
Street or Easement	*STREET*
Surface Type	*Grass*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*Other*
Other Number of Riser Rings	*4*
MH Cover Elevation	*Below Grade*
Cover Inflow	*None*
MH cleaning Required	*No*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Satisfactory*
Chimney Infiltration	*None*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*None*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*None*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:42.569561, Longitude:-73.701262, Altitude:84.270844, Speed:-1.000000, Horizontal Accuracy:165.000000, Vertical Accuracy:25.596008, Time:5:49:48 AM EST*

Pipe Details

Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*7.25*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details	
Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*3*
Depth to Invert	*7*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)	
Photo	

Photo(s)	
Photo	

Photo(s)	
Photo	

VT Manhole Inspection

Record: 31	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*57*
Street Name	*State Route 100*
Street or Easement	*STREET*
Surface Type	*Grass*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*Other*
Other Number of Riser Rings	*0*
MH Cover Elevation	*At Grade*
Cover Inflow	*Minimal*
MH cleaning Required	*No*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*Minimal*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*None*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:42.569561, Longitude:-73.701262, Altitude:84.270844, Speed:-1.000000, Horizontal Accuracy:165.000000, Vertical Accuracy:25.596008, Time:5:49:48 AM EST*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*6.5*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*PVC*

Pipe Details	
Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*12*
Depth to Invert	*6.1*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*PVC*

Pipe Details	
Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*3*
Depth to Invert	*5.8*
Service Connection	*Yes*
Pipe Diameter	*4*
Pipe Material	*PVC*

Photo(s)	
Photo	

Photo(s)	
Photo	

Photo(s)	
Photo	

VT Manhole Inspection

Record: 28	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Jacksonville WWTP*
Manhole	*67*
Street Name	*State Route 100*
Street or Easement	*STREET*
Surface Type	*Asphalt*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*Needs Repair*
Riser Rings	*Other*
Other Number of Riser Rings	*0*
MH Cover Elevation	*At Grade*
Cover Inflow	*Minimal*
MH cleaning Required	*Yes*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*None*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*None*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:42.569561, Longitude:-73.701262, Altitude:84.270844, Speed:-1.000000, Horizontal Accuracy:165.000000, Vertical Accuracy:25.596008, Time:5:49:48 AM EST*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*10.3*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*PVC*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*2*
Depth to Invert	*9.9*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)

Photo

Photo(s)

Photo

Photo(s)

Photo

VT Manhole Inspection

Record: 1

Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Whitingham WWTP*
Manhole	*S1*
Street Name	*Church Street*
Street or Easement	*STREET*
Surface Type	*Grass*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*1*
MH Cover Elevation	*At Grade*
Cover Inflow	*None*
MH cleaning Required	*Yes*
MH Grease Visible	*Yes*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Precast*
Chimney Condition	*Satisfactory*
Chimney Infiltration	*Minimal*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*None*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*None*
Bench and Invert Material	*Concrete*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:42.569561, Longitude:-73.701262, Altitude:84.270844, Speed:-1.000000, Horizontal Accuracy:165.000000, Vertical Accuracy:25.596008, Time:5:49:48 AM EST*
Additional Comments	*Bench needs to be cleaned*

Pipe Details

Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*6.75*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*9*
Depth to Invert	*6.6*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)

Photo	

Photo(s)

Photo	

Photo(s)

Photo	

VT Manhole Inspection

Record: 4	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Whitingham WWTP*
Manhole	*S2*
Street Name	*State Route 100*
Street or Easement	*STREET*
Surface Type	*Grass*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*Needs Repair*
Riser Rings	*2*
MH Cover Elevation	*Below Grade*
Cover Inflow	*Moderate*
MH cleaning Required	*No*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Needs Repair*
Chimney Infiltration	*Heavy*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*None*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*Minimal*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:42.569561, Longitude:-73.701262, Altitude:84.270844, Speed:-1.000000, Horizontal Accuracy:165.000000, Vertical Accuracy:25.596008, Time:5:49:48 AM EST*
Additional Comments	*Inflow in around frame, infiltration around brick riser*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*15.2*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*3*
Depth to Invert	*15.1*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)

Photo

Photo(s)

Photo

VT Manhole Inspection

Record: 7	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Whitingham WWTP*
Manhole	*101*
Street Name	*State Route 100*
Street or Easement	*STREET*
Surface Type	*Grass*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*1*
MH Cover Elevation	*Below Grade*
Cover Inflow	*None*
MH cleaning Required	*Yes*
MH Grease Visible	*Yes*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Satisfactory*
Chimney Infiltration	*None*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*None*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:42.569561, Longitude:-73.701262, Altitude:84.270844, Speed:-1.000000, Horizontal Accuracy:165.000000, Vertical Accuracy:25.596008, Time:5:49:48 AM EST*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*5.3*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*2*
Depth to Invert	*5.2*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*PVC*

Photo(s)

Photo	

Photo(s)

Photo	

Photo(s)

Photo	

VT Manhole Inspection

Record: 10	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Whitingham WWTP*
Manhole	*102*
Street Name	*State Route 100*
Street or Easement	*STREET*
Surface Type	*Grass*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*2*
MH Cover Elevation	*Below Grade*
Cover Inflow	*None*
MH cleaning Required	*Yes*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Needs Repair*
Chimney Infiltration	*Moderate*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*None*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*Minimal*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:42.569561, Longitude:-73.701262, Altitude:84.270844, Speed:-1.000000, Horizontal Accuracy:165.000000, Vertical Accuracy:25.596008, Time:5:49:48 AM EST*
Additional Comments	*Chimney repair needed*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*9.9*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*PVC*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*12*
Depth to Invert	*9.8*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*PVC*

Photo(s)

Photo	

Photo(s)

Photo	

Photo(s)

Photo	

VT Manhole Inspection

Record: 13

Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Whitingham WWTP*
Manhole	*103*
Street Name	*State Route 100*
Street or Easement	*STREET*
Surface Type	*Grass*
MH Inspection Status	*Could not open*
Location Coordinates (click white space below to obtain)	

Photo(s)

Photo	
Photo Description	*Unable to open*

VT Manhole Inspection

Record: 16	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Whitingham WWTP*
Manhole	*108*
Street Name	*State Route 100*
Street or Easement	*STREET*
Surface Type	*Grass*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*2*
MH Cover Elevation	*At Grade*
Cover Inflow	*None*
MH cleaning Required	*Yes*
MH Grease Visible	*No*
Roots	*No*
Steps Condition	*Satisfactory*
Chimney Material	*Precast*
Chimney Condition	*Needs Repair*
Chimney Infiltration	*Moderate*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*Minimal*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*Minimal*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:42.569561, Longitude:-73.701262, Altitude:84.270844, Speed:-1.000000, Horizontal Accuracy:165.000000, Vertical Accuracy:25.596008, Time:5:49:48 AM EST*
Additional Comments	*Brick and precast chimney needs repair*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*16.5*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*12*
Depth to Invert	*16.4*
Drop Connection (Mainline)	*Outside*
Invert Depth of Drop Connection	*10.5*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)

Photo

Photo(s)

Photo

Photo(s)

Photo

VT Manhole Inspection

Record: 19	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Whitingham WWTP*
Manhole	*110*
Street Name	*School Street*
Street or Easement	*STREET*
Surface Type	*Asphalt*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*1*
MH Cover Elevation	*At Grade*
Cover Inflow	*None*
MH cleaning Required	*Yes*
MH Grease Visible	*No*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Needs Repair*
Chimney Infiltration	*Moderate*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*None*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:42.569561, Longitude:-73.701262, Altitude:84.270844, Speed:-1.000000, Horizontal Accuracy:165.000000, Vertical Accuracy:25.596008, Time:5:49:48 AM EST*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*5.25*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details	
Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*12*
Depth to Invert	*5.1*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)	
Photo	

Photo(s)	
Photo	

VT Manhole Inspection

Record: 25	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Whitingham WWTP*
Manhole	*114*
Street Name	*School Street*
Street or Easement	*STREET*
Surface Type	*Grass*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*Other*
Other Number of Riser Rings	*0*
MH Cover Elevation	*At Grade*
Cover Inflow	*None*
MH cleaning Required	*Yes*
MH Grease Visible	*Yes*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Infiltration	*None*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*Minimal*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*Minimal*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:42.569561, Longitude:-73.701262, Altitude:84.270844, Speed:-1.000000, Horizontal Accuracy:165.000000, Vertical Accuracy:25.596008, Time:5:49:48 AM EST*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*9.66*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*12*
Depth to Invert	*7.8*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)

Photo

Photo(s)

Photo

Photo(s)

Photo

VT Manhole Inspection

Record: 22	
Client	*Town of Whitingham, Vermont*
Project Title	*Whitingham/Jacksonville WWTF – 20-year Evaluation*
Inspection Date	*2018-11-14*
Inspector	*Bill Lindemann*
Sewer	*Whitingham WWTP*
Manhole	*119*
Street Name	*Other*
Other Street Name	*Stimpson Hill Road*
Street or Easement	*STREET*
Surface Type	*Asphalt*
MH Inspection Status	*Inspected*
Cover Type	*Standard*
Cover Material	*Cast Iron*
Cover Condition	*OK*
Frame Material	*Cast Iron*
Frame Condition	*OK*
Riser Rings	*2*
MH Cover Elevation	*At Grade*
Cover Inflow	*None*
MH cleaning Required	*Yes*
MH Grease Visible	*Yes*
Roots	*No*
Steps	*Yes*
Steps Condition	*Satisfactory*
Chimney Material	*Brick*
Chimney Condition	*Needs Repair*
Chimney Infiltration	*Minimal*
Cone Material	*Precast*
Cone Condition	*Satisfactory*
Cone Infiltration	*Minimal*
Wall Material	*Precast*
Wall Condition	*Satisfactory*
Wall Infiltration	*Minimal*
Bench and Invert Material	*Brick*
Bench and Invert Condition	*Satisfactory*
Bench and Invert Infiltration	*None*
Pipe Connection Infiltration	*None*
Location Coordinates (click white space below to obtain)	*Latitude:42.569561, Longitude:-73.701262, Altitude:84.270844, Speed:-1.000000, Horizontal Accuracy:165.000000, Vertical Accuracy:25.596008, Time:5:49:48 AM EST*

Pipe Details	
Outgoing or Incoming Pipe	*Outgoing*
Pipe Clock Position (Outgoing should be 6 O'clock)	*6*
Depth to Invert	*8.33*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Pipe Details

Outgoing or Incoming Pipe	*Incoming*
Pipe Clock Position (Outgoing should be 6 O'clock)	*12*
Depth to Invert	*8.25*
Drop Connection (Mainline)	*None*
Service Connection	*No*
Pipe Shape	*Round*
Pipe Diameter	*8*
Pipe Material	*DI*

Photo(s)

Photo

Photo(s)

Photo

Photo(s)

Photo

APPENDIX G

RCAP Solutions Report, FY18/19 Budget Report and O&M Cost Detail for Facilities

10:55 am

Comperetive Budget Report

Town Sewer

Account	Current Budget FY - 2018	Actuel FY-2018 Pd:12	Budget FY - 2019 next Year budget
TS-70EMP-0-BOOKKP Bookkeeping Services	432.00	432.00	432.00
TS-70EMP-0-FICATS FICA/Medicere-Town Shere	3,840.00	3,963.37	4,712.00
TS-70EMP-0-PENALT Reimburse User Peneltles	2,300.00	2,361.28	2,400.00
TS-70EMP-0-RETIRE Retirement-Town Shere	2,601.00	2,649.15	3,164.00
TS-70EMP-0-SSCOMM Wages-Sewer Commissioners	625.00	375.00	0.00
TS-70EMP-0-SSWRCJ Assistent	1,500.00	1,365.00	8,000.00
TS-70EMP-0-SSWRDD Plent Operetor Selery	47,296.00	47,296.00	48,242.00
TS-70EMP-0-SSWRRH Treesurer Salery	2,892.00	2,892.00	2,950.00
TS-70INS-0-HEALTH Heelth Insurance	25,370.00	29,323.63	26,362.00
TS-70INS-0-LIABIN Liability Insurence	2,100.00	1,603.67	2,100.00
TS-70INS-0-UNEMPL Unemployment Insurence	1,200.00	825.59	1,300.00
TS-70INS-0-WORKIN Workers' Compensetion	1,800.00	2,209.36	2,500.00
TS-72GEN-0-CHEMIC Chemicels	500.00	992.12	500.00
TS-72GEN-0-CONSVC Contrected Services	2,500.00	2,395.00	2,500.00
TS-72GEN-0-ELECTR Electricity	15,000.00	13,355.93	15,000.00
TS-72GEN-0-EQUPUR Equipment Purcheses	1,000.00	1,528.50	1,000.00
TS-72GEN-0-GRANT0 Grent Expenditure	0.00	6,300.00	0.00
TS-72GEN-0-HEATIN Heeting	0.00	807.76	0.00
TS-72GEN-0-MILEDD Mileege - Operetor	1,500.00	364.52	1,500.00
TS-72GEN-0-MISCEL Miscellaneous	300.00	332.62	3,000.00
TS-72GEN-0-OPERAT Plent Opereting Fee - VT	450.00	690.00	400.00
TS-72GEN-0-POSTAG Postege	200.00	105.90	200.00
TS-72GEN-0-PROFSV Professionel Services	0.00	6,000.00	0.00
TS-72GEN-0-REPFAC Repeirs: Fecility & Equip	1,000.00	1,181.32	2,000.00
TS-72GEN-0-REPLNP Repeirs: Line & Pump	1,000.00	2,293.00	5,000.00
TS-72GEN-0-REPMET Repeirs: Meters	1,000.00	0.00	1,000.00
TS-72GEN-0-SLUDGE Sludge Removel	20,000.00	20,000.00	30,000.00
TS-72GEN-0-SUPPLY Supplies	1,500.00	991.90	1,500.00
TS-72GEN-0-TELEPH Telephone	650.00	770.36	650.00
TS-72GEN-0-TESTNG Outside Testing	6,500.00	5,606.50	8,000.00
TS-72GEN-0-TRAING Treining	200.00	192.00	200.00
TS-72GEN-0-UNIFOR Uniforms/Sefety Glesses	200.00	1,023.64	200.00
TS-73CAP-0-PRJCTE Project Expenditures	0.00	0.00	0.00
TS-76CAP-0-PLANT0 Plent Improvements	5,000.00	59,239.86	8,000.00
Total Expenditures	**150,456.00**	**219,466.98**	**182,812.00**
Total Town Sewer	**-150,456.00**	**-219,466.98**	**-182,812.00**
Total All Funds	**-150,456.00**	**-219,466.98**	**-182,812.00**

Whitingham / Jacksonville Wastewater Rate Analysis

Contents

This report has been prepared by RCAP Solutions, Inc. at no cost to the Town of Whitingham. The work is funded under a grant from the Rural Utilities Service, United States Department of Agriculture. Any opinions, findings, and conclusions or recommendations expressed in this report are solely the responsibility of the author and do not necessarily represent the official views of the Rural Utilities Service. Any actions taken in response to the recommendations or analysis provided by RCAP Solutions, Inc. and the outcomes of such actions, are the responsibility of the wastewater system managers.

Whitingham / Jacksonville Wastewater Rate Analysis – Background

RCAP Solutions, Inc. is the Northeast partner of a national network of nonprofits, the Rural Community Assistance Partnership (RCAP). On a national level, RCAP works to ensure that rural and small communities have access to safe drinking water and sanitary wastewater disposal. In the northeastern United States and Puerto Rico, the Community Resources Division of RCAP Solutions promotes public, environmental and economic health by providing consulting, planning, financing, build-out oversight, regulatory and compliance oversight, management and operational support for a wide range of community development and infrastructure projects. RCAP Solutions offers both no-cost and fee-for-service technical assistance in the areas of needs assessment, planning, finance, project development, education, and administration. RCAP Solutions is currently funded by federal grants, and our services have been provided at no cost to the Town of Whitingham.

RCAP Solutions was contacted in 2017 by David DiCantio to assist with the process of transitioning to a flat rate fee structure. A considerable amount of work was done prior to contacting RCAP Solutions by the Sewer Commission and Mr. DiCantio to ensure that rates are applied fairly and consistently, and they should be applauded for these efforts. However, the transition to the flat rate structure could have unintended impacts. This document is an effort to begin looking at some of these impacts and determine options for moving forward. Any actions taken in response to the recommendations or analysis provided by RCAP Solutions, and the outcomes of such actions, are the responsibility of the wastewater system managers.

Based on the User Charge System document, the user charge system for the Villages of Jacksonville and Whitingham results in the "distribution of treatment works operation and maintenance costs to each user in approximate proportions to the user's contribution to the total wastewater loading of the treatment works." Additionally, the document specifies the following goals:

- **Proportional distribution of costs among users and user classes**
- **Sufficient revenue to provide adequate operation and maintenance funds**
- **Application of excess revenue from a particular class of users to that class in future years**

These goals address elements of equity and fairness. As the community attempts to move forward with modification of its rate structure to support a sustainable wastewater system, issues of affordability should also be considered. In considering these issues and others, RCAP Solutions is looking at the impacts of three options:

- Option A: Keep current structure; replace some or all of meters over time
- Option B: Move to a flat rate system using updated EU guidelines
  - "Option B adjusted" is a flat rate system using customized EU assignments (see Addendum)
- Option C: Create two classes of user accounts, residential and non-residential. Charge residential users a flat rate, and bill non-residential accounts a combination of flat (base) rate and volumetric fees.

This analysis is based on the Selectboard's desire to understand the impacts of modifying the rate structure on fairness, affordability, and revenue. There are several distinct, but related issues to consider: rate structure, which drove some of the initial conversations (i.e., flat fee vs. volumetric rates); the adjustment of equivalent units in the system; and the inevitability that revenue requirements need to be increased for the fall 2018 billing (based on equipment failure at one of the treatment facilities). The rate structure options described in the first few sections of the report are compared with the existing rate structure and fees (FY18). Further on in the report, there is a discussion of the increasing revenue requirements and the need for rate adjustment, once the rate structure has been decided on.

Option A – Description

Keep current rate structure

The Sewer Commission, along with the system's operator, discussed modification of the rate structure for over a year. This process, which was driven by issues that have come up over many years, has become more urgent as time goes on. The failure of the water meters used to estimate wastewater flow becomes more and more common as the meters age. In addition, the Commission recognized that the long-term sustainability of the wastewater system is dependent on their ability to plan for infrastructure repair and replacement as the system ages. The user charge system is the only resource that a utility has to ensure long-term sustainability. Option A will consider the impact of leaving the current rate structure in place.

Current sewer user charges are structured on a fixed fee per equivalent unit (EU) plus a volumetric fee based on actual, estimated, or averaged water meter consumption. The number of equivalent units assigned to each account was at one time based on guidance from the state of Vermont, although some accounts have been modified over the years to reflect changes in use. The bills are generated twice per year. A breakdown of the basic fee structure follows:

a. Fixed fee - $133.76 per billing per EU
b. Volumetric fee - $15.12/thousand gallons used

While the fixed fee portion of the bills appears to be applied consistently, assuming that the EU assignments are appropriate, the volumetric portions of the system's bills are not. Currently, some customers are billed based on actual usage, some on estimates, and some on average usage. As of May 2017, over 1/3 accounts were being billed based either on an average or an estimate of their water usage for the volumetric portion of the bill. This practice is employed on a case-by-case basis and presumably intended to rectify some billing issue that has come up. However, the long-term use of this practice is neither equitable nor sustainable.

Maintaining the current rate structure would require that the system accept the inconsistent application of volumetric charges, or make plans to replace the failing meters on the water sources (i.e. the main source of perceived inequity). Because there is no community water system to drive the replacement of meters, the wastewater system would likely assume responsibility for the replacement of the meters.

An estimate of the size and number of meters in the system could be made to better understand the replacement costs of this endeavor, and should be included in the ongoing asset management plan.

If this option is chosen, the decision of whether or not the system moves to the updated state guidance for EU assignment is not integral to the discussion of impacts. Some customers would see increases in the flat fee portion of the bill, and some would see decreases. Overall, all customers could see a slight increase in the amount that they pay per EU based on a slight reduction in the overall number of EUs in the system, but whether this change equates to an overall “fair” bill is difficult to ascertain.

Option B – Description

Move to a flat rate system, 248 EUs

The move to a flat fee structure for wastewater billing in the Town of Whitingham seems to be driven by a desire for equity among customers amid an environment of failing water meters and varied billing practices. It is admirable that the system is attempting to simplify the billing structure; it is important to understand that the move to a flat fee structure could have considerable impacts, both positive and negative, on the system and its customers. Option B considers the impact of moving to such a system.

The impact on an individual customer of moving to a flat fee structure – and getting rid of the volumetric fee – varies greatly depending on whether the volume billed was above or below the corresponding EU assignment. For example, a customer with 2 EUs – and using exactly 2 EUs’ worth of volume – would generally not see a significant change in their bill. The fact that the majority of the residential users (about 71 out of 113) would see increases in their bills based on the loss of the volumetric fee indicates that they are using, or being charged for, less volume than one would expect based on their EU assignment. In effect, the customers who have attempted to conserve water, and therefore minimized contributions to the wastewater system, would see a jump in their bills. Conversely, those who have been heavy contributors would see decreases; the remaining 37 (est.) residential users would see an average decrease in their bills of approximately $228 / year, based on the fact that they are currently being charged for their high usage. Approximately 5 residential customers are using about their expected volume, and would see no significant change.

For large users, or those customers with high EU assignments, the volumetric portion of the bill can have drastic impacts. The school is the most obvious example of this, with 61 assigned EUs. In the proposed rate structure under Option B, the school could see an increase of over $11,000 per year. In the water and wastewater industry, it is a common practice to look at fairness when conducting a rate study. To come up with a target revenue goal for a customer or customer class, the portion of the overall system made up by that customer, or class, is averaged with the overall percentage of system usage contributed by that customer (or customer class). This needs to be considered when looking at the contribution of the school into the overall system. The reason for the potential jump in billing is simply the reality of basing the rate structure on EU-assignment only; the school, which makes up approximately 24% of the system (61 of the total 248 EUs), would be responsible to pay approximately 24% of the annual revenue requirements. Reducing the number of EUs assigned to the school would decrease this burden on the school, but spread it among the remaining customers.

Observations and Impacts – Option B

1. The Sewer Commission has attempted to reassign Equivalent Units based on state guidelines for facility type. Of the 139 accounts:
    a. **113 accounts would see no change in EU assignment.**
        i. 37 of the 113 would see a decrease in their bill.
        ii. 5 of the 113 would see no change in their bill.
        iii. 71 of the 113 would see an increase in their bill.
    b. **17 accounts would see a decrease in EU assignment.**
        i. 10 of the 17 would see a decrease in their bill.
        ii. 7 of the 17 would see an increase in their bill.
    c. **9 accounts would see an increase in EU assignment.**
        i. 3 of the 9 would see a decrease in their bill.
        ii. 6 of the 9 would see an increase in their bill.

2. Based on the new EU assignments, the overall number of EUs in the system decreases slightly. Prior to the reassignment, there are 253 EUs. Following, there would be 248.4 EUs.
    a. By itself, this process would spread the cost of operating the system among fewer users. In other words, it would be expected that even if an account has not had any changes to its assigned EUs, you would expect to see an increase of approximately 1.8% per EU.

3. As of May 2017, approximately 53 out of 139 accounts were being billed based on either an estimate or an average of water usage for the volumetric portion of the bill. By itself, this is not the issue. Of the 53 accounts, about half would see an increase and half would see a decrease in the new billing structure.

4. Overall, 84 of the 139 accounts would see increases in their sewer bills.
    a. 71 of the 84 are (presumed) residential, or the equivalent of 1 EU under the new assignment
        i. These 71 accounts would see an average increase of 63% (approx. avg. of $204/year).
    b. 13 of the 84 include accounts of between 1.5 EUs and 61 EUs
        i. These 13 accounts would see an average increase of 41%

Option C – Description

Create two classes of user accounts, residential and non-residential. Charge residential users a flat rate, and bill non-residential accounts a combination of flat rate and volumetric fees.

The use of multiple classes in water and wastewater billing is a common practice. Residential customers generally do not vary in their usage as appreciably as commercial or industrial (non-residential) accounts. While households of varying sizes do contribute varying amounts of wastewater into the system, the main benefit of having a sewer system does not vary by household size. The capacity to discharge to a sewer system - regardless of actual usage - should be considered, just as the benefit of having a fire department is a benefit regardless of whether an individual home has a fire. The same sentiment could be considered of police services and of schools. Regardless of a taxpayer's actual use of these services, the capacity to have them at their disposal is a big part of what defines a community. In the case of the wastewater system, the benefit of meters to the individual resident for the purpose of more equitable sewer charges may not outweigh the cost to the wastewater system of maintaining, reading, and replacing water meters over time. For this reason, Option C considers the impacts of creating two customer classes, residential and non-residential. Ideally, the rate structure design would not drastically change anyone's individual bill. However, any changes to the design of the existing system will impact some customers more than others. RCAP Solutions has attempted to ensure that the proposed rate structure considers equity, affordability, and the goals outlined in the system's User Charge System document.

Presumably, the system for assigning equivalent units is not perfect – whether the "old" guideline or an updated version is used. However, the EU system is based on a "capacity to serve" concept that is critical to understand when looking at rates. The idea that a school, factory, restaurant, etc. have a number of EUs assigned to them based on how much volume they could produce, rather than entirely on actual usage, ensures that capacity in the system is available when needed. This can be a difficult concept for customers to grasp, and often leads into the question, "Why can't you bill me on my usage alone?" Customers not understanding the "capacity to serve" principle will not be inclined to think that a billing structure without any volumetric component is "fair." By incorporating a volumetric fee into the rate structure, the capacity portion – or fixed, base rate assigned on this principle– may be de-emphasized slightly, allowing for a more "fair" system in the eyes of the customer. They see a slightly smaller bill when their usage is lower.

With Option C, an equitable rate structure would be designed for customers based on target revenue for the respective customer class. Target revenue has been calculated to be approximately 58% residential and 42% non-residential, based on water consumption and the overall makeup of the system. More details on these calculations are found in the section on "Equity" further along in this document. Using these target goals, the necessary revenue from each class can be calculated. For residential customers, based on the 2017-18 budget, this would mean a flat fee per EU of about $635.82 per year, or $317.91 per billing. For non-residential customers, there would be a flat fee per EU of about $297.68 per year (or $148.84 per billing) plus a volumetric rate of $16.13 per thousand gallons.

Observations and Impacts – Option C

Impact to residential customers

In the proposed Option C, and using current 2017-18 revenue requirements, residential customers would see a predictable flat fee of $317.91 per billing, or $635.82 per year. Under the existing billing scenario, residential customers with one assigned EU pay, on average, about $274 per billing ($548 per year). However, there are residential customers in this category who pay less than half of this amount - and some who pay more than double. The proposed structure under Option C has the benefit of being more predictable and easier to understand for the residential customer and for the utility.

Impact to nonresidential customers

Using the 2017-18 bills for comparison, nonresidential customers would not generally see a significant change to their bills. This is because rates would be set to achieve a target revenue, which is discussed further in the document. The exception would be for those who have had a change in the number of units assigned to their accounts. However, the rate structure design in Option C minimizes the impact of the change in units for those not using their equivalent flow by maintaining the volumetric portion of the bill.

In Option C, all nonresidential meters would have to be maintained and replaced, if necessary. These costs should be included in the WW system's asset management program that is being developed.

Affordability – All Options

There is no universal measure of affordability criteria for water or wastewater rates. Commonly used indicators of affordability for annual rates are between 1% and 2% of MHI. The USDA affordability criterion of 1.5% of MHI is generally accepted as a baseline indicator.

Whether using the MHI from the 2010 census data (55,761) or from the 2015 census data (49,076) for the town of Whitingham, affordability based on the typical residential unit's existing bill is either 0.9% or 1.1% of MHI. This is well within the acceptable levels of affordability, based on current industry standards. Looking at the more conservative estimate (2015), the % MHI affordability for residential customers with 1 EU is listed below for all three options:

Option A: 1.1% MHI based on average of $553. Individual affordability ranges from 0.55% to 2.7%, although it is difficult to look at "individual" affordability due to the variation in income.

Option B: 1.2% MHI based on flat rate of $600 per EU

Option C: 1.3% MHI based on flat rate of $635.82

Equity – All Options

To determine equitability of the current billing structure, and any proposed changes to that structure, a target revenue for each customer class has been estimated. Customers were divided into two general classes, residential customers and non-residential customers (commercial, industrial). The process considers how much revenue would ideally be collected from each customer class. This target revenue is the average of the following two factors:

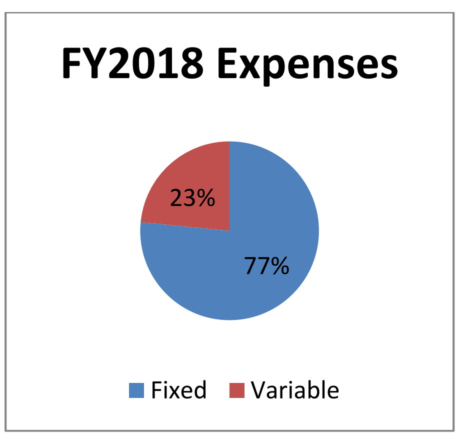
- Percentage of customer base
- Percentage of sewer volume based on average bills

Customer Class	**Target Revenue**	Option A	Option B	Option C
Residential	**58%**	54%	54%	58%
Non-residential	**42%**	46%	46%	42%

Revenue Requirements

Fixed vs. Variable Portion of Budget

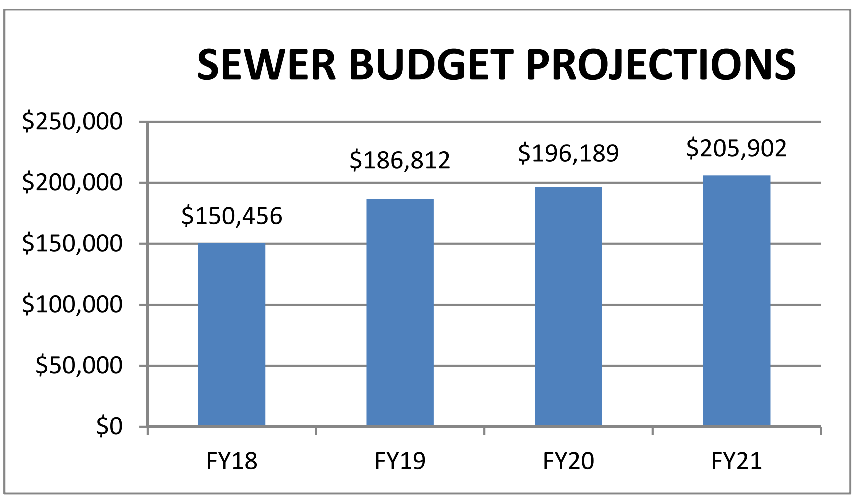
Under the current rate structure, approximately half of all revenue is from the volumetric portion of the billing. Option B would remove any use of the volumetric component of the billing. Option C would realize about 18% of revenue from the volumetric portion of the billing. Considering that most costs associated with the wastewater system are fixed – and, in the case of Whitingham, an analysis of the budget confirms that the system is typical in this regard - a reduction in the volumetric (I.e. variable) component of the bill is recommended. Approximately 77% of the budget could be considered fixed, or predictable and not contingent on volume treated.



Budget Projections

Based on current projections, the cost of providing wastewater services in Whitingham and Jacksonville will increase approximately 37% by FY2021. Anticipated capital improvements at treatment facilities will likely be financed through one of the major wastewater funding mechanisms in the state, the Clean Water State Revolving Loan Fund (SRF) or USDA Rural Development Water and Environment Program (WEP). Costs of providing wastewater services continue to increase, although the system has done well to contain typical operational costs with aging infrastructure.

In addition to a placeholder for the bond payment that has been included in the projected budget, the system has provided a list of equipment requiring servicing or replacement, the frequency, and the anticipated costs. These costs have been worked into the projections as Plant Improvement Reserve. At this point, neglecting to increase rates annually - at the cost of inflation, minimally – will likely have negative consequences for the system. Options for raising fees, depending on the rate structure chosen, are presented in the following section.



Current and Projected Budgets				
		PROJECTED	**PROJECTED**	**PROJECTED**
	FY18	**FY19**	**FY20**	**FY21**
REVENUES				
Current User Fees	$144,156	$184,400	$193,189	$202,902
Interest on Fees	$2,000	$1,000	$1,000	$1,000
Penalties	$2,300	$1,000	$1,000	$1,000
Sludge Revenue	$2,000	$1,000	$1,000	$1,000
TOTAL	**$150,456**	**$187,400**	**$196,189**	**$205,902**
EXPENSES				
LABOR				
TOTAL	**$61,486**	**$69,900**	**$71,345**	**$72,546**
INSURANCE				
TOTAL	**$30,470**	**$32,262**	**$35,598**	**$37,248**
SEWER PLANT EXPENSES				
TOTAL	**$53,500**	**$72,650**	**$74,466**	**$76,328**
PLANT CAPITAL IMPROVEMENT				
Plant Improvements Reserve	$5,000	$8,000	$6,780	$6,780
Capital Improvement (Bond)	$0	$4,000	$8,000	$13,000
TOTAL	**$5,000**	**$12,000**	**$14,780**	**$19,780**
	FY18	**FY19**	**FY20**	**FY21**
TOTAL SEWER BUDGET	**$150,456**	**$186,812**	**$196,189**	**$205,902**

Rate Adjustment – Example, Option C

To ensure that anticipated debt service obligations and the increasing cost of providing service are met, it is recommended that rates be increased for the next billing cycle. Based on the budget projections, a 27% increase should be made to revenue realized from user fees as a first step. Depending on the option for rate structure chosen, the mechanics of the rate adjustment would vary. Based on conversation with the Selectboard and the stated desire to create a more equitable rate structure, the impact of a rate adjustment on Option C has been prepared. However, this does not preclude the Selectboard from further investigating any of the options for rate structure modification.

As discussed earlier in this document, choosing Option C for the rate structure would promote equity, in terms of target revenue. For comparison with the current structure, the following rates would have approximately met 2017-18 revenue:

Customer Type	Fixed Rate, per EU (Annual)	Volumetric Rate, per 1000 gal
Residential	$635.82	N/A
Non-residential	$298.68	$16.13

To maintain the target revenue goals and provide necessary rate increases, the following fees could be set for the next billing cycle:

Customer Type	Fixed Rate, per EU (Annual)	Volumetric Rate, per 1000 gal
Residential	$813.85	N/A
Non-residential	$381.03	$20.64

Following the significant rate increase being recommended for FY19, incremental increases of 5% for FY2020 and FY2021 should be expected. Based on the projected budgets, the following fee schedule could result by FY2021:

Customer Type	Fixed Rate, per EU (Annual)	Volumetric Rate, per 1000 gal
Residential	$897.27	N/A
Non-residential	$441.09	$22.76

Affordability – Option C, New Rates

To reiterate the principle, there is no universal measure of affordability criteria for water or wastewater rates. Commonly used indicators of affordability for annual rates are between 1% and 2% of MHI. The USDA affordability criterion of 1.5% of MHI is generally accepted as a baseline indicator, although communities in Vermont have been moving toward 2% (or higher).

Using the more conservative MHI from 2015 (49,076), the increase would result in a 1.7% MHI for wastewater billing for an average residential customer in FY2019. This is based on new EU assignments, Option C, and a 28% overall rate increase. Extending a 5% annual increase for FY2020 and FY2021, the average residential customer would spend about 1.83% of their annual household income on wastewater services.

Addendum – 09/04/2018

Option B, Adjusted – Description

Move to a flat rate system based on modified EU assignments

At a working meeting in mid-August with RCAP Solutions, members of the Selectboard expressed interest in understanding the impact of re-assigning equivalent units based on local knowledge of usage and what would be considered fair to members of the community. Participants in the meeting on 8/21 worked through a list of all the accounts and considered these factors to determine a modified EU assignment:

- Current EU assignments by account
- Industry and state EU assignment based on facility type
- Customer-specific considerations for EU assignment

The list of equivalent units that the group decided on has been included as an appendix to this document. The group acknowledged instances where state guidelines for EU assignment were not representative of specific facilities and customers in the community. The group determined that a 0.75 EU assignment should be the minimum user charge for a commercial account, suggesting that some of these customers in the system should not be responsible for the same share of wastewater expenses as a typical residence. The minimum EU assignment for a residence will be 1.0 EU.

Observations and Impacts – Option B, Adjusted

Many of the impacts noted in Option B apply to this adjusted version. Impacts on individual customers will vary based on previous water usage and changes to assigned equivalent units.

While local knowledge of facilities and usage is critical to the overall evaluation of equity in the system, the customization of EU assignments can lead to questions about how the determinations were made. Despite the inaccuracies noted with the metering system, past usage patterns were considered in identifying commercial accounts who would be assigned the minimum of 0.75 EU. Changing the EU assignments for one customer will, theoretically, impact everyone's bill. The impact on other customers would likely not take place until the next billing or the next rate-setting in the annual budgeting process.

Twenty-one customers had their EU assignment reduced during this process. The most notable of those reductions was the school, who was given a new EU assignment of 56 EUs (reduced from 61 EUs). Nine accounts were given increased EU assignments. The overall result of the changes was an approximate system EU reduction of 4%, with a new total of 242.7 EUs (reduced from 253 EUs). Even with the 8% EU reduction for the school, the move to a flat rate results in a 22% increase in their bill - before any rate "increases" are made.

Prior to any increases in the budget or adjustments in EU assignments, a flat fee system would have resulted in a flat user fee of approximately $570 per EU per year. With the reduction of EUs, the flat fee would increase to about $594 per EU per year.

Increasing revenue requirements would suggest that the fees should increase to $759.94 per EU per year for the upcoming billing (FY19). The impact on the school would be an increase of over $17k per year for FY19, and over $21k per year by FY21.

***This amount represents the equivalent flat fee that would have been collected based on current revenue.**

Anticipated User Fees based on Current and Projected Revenue Requirements	FY18	PROJECTED FY19	PROJECTED FY20	PROJECTED FY21
User Fees	$144,156	$184,400	$193,189	$202,902
Anticipated Annual Flat User Fee / EU (based on 242.65 EUs)	$594.09*	$759.94	$796.16	$836.19
Affordability for Residential Customers (MHI - $49076)	1.21%	1.55%	1.62%	1.70%
Average Rate Increase	N/A	27.9%	4.8%	5.0%

RCAP Solutions
Resources for Communities And People

Appendices

TOWN OF WHITINGHAM, VERMONT
EU CLASSIFICATION SYSTEM

	USER CLASSIFICATION	UNIT OF MEASUREMENT	EU PER UNIT	RATE, EFF. SEPT. 2018
1a	SINGLE FAMILY HOUSE	EACH HOUSE	1.00	**$759.94**
1b	CHURCH PARSONAGE	EACH	1.00	**$759.94**
1c	CHURCH SANCTUARY	SEATS x 25%	0.01	**$7.60**
2	APARTMENT	EACH APT.	1.00	**$759.94**
4a	ROOM RENTAL (NON-APARTMENT)	SLEEPING SPACE	0.20	**$151.99**
5a	SCHOOL (WITHOUT CAFETERIA, GYM OR SHOWERS)	PUPILS & STAFF	0.15	**$113.99**
5b	SCHOOL (WITH CAFETERIA, GYM AND SHOWERS)	PUPILS & STAFF	0.20	**$151.99**
5c	SCHOOL (WITH CAFETERIA, GYM BUT NO SHOWERS)	PUPILS & STAFF	0.175	**$132.99**
6f	OFFICE/BUSINESS (UPTO 6 EMPLOYEES)	EACH OFFICE	1.00	**$759.94**
6g	OFFICE/BUSINESS (EACH ADDITIONAL EMPLOYEE)	EACH EMPLOYEE	0.15	**$113.99**
7	LIBRARY	EACH	1.00	**$759.94**
8a	STORE/RETAIL SPACE (UPTO 2,000 SQUARE FEET)	PER 2,000 SQ FT	1.00	**$759.94**
8c	STORE/RETAIL SPACE WITH MEAT DEPARTMENT	PER 1,000 SQ FT	0.55	**$417.97**
9	BOWLING ALLEY	ALLEY (LANE)	0.40	**$303.98**
10	LAUNDROMAT	WASHER	1.25	**$949.93**
11	BARBER AND/OR BEAUTY SHOPS	CHAIR	0.55	**$417.97**
12	ASSEMBLY HALL	SEAT	0.01	**$7.60**
13e	ANY SEAT SERVING FOOD OR DRINK	SEAT	0.06	**$45.60**
14b	AUTO SERVICE STATION (EACH SET OF PUMPS)	EACH	0.75	**$569.96**
15	BREWERY CLEAN-UP	EACH	0.20	**$151.99**
16	DENTAL/MEDICAL OFFICE	EACH EXAMINING ROOM	0.55	**$417.97**
17	DAYCARE	PER CHILD	0.125	**$94.99**
18	BUS/CAR WASH (DAILY DESIGN DISCHARGE)	PER GALLON	0.01	**$7.60**

Non-residential parcels to be assessed a minimum of 0.75 EU. Residential parcels to be assessed a minimum of 1.0 EU.
Based on FY17-18 revenue, the unit cost per in a flat-rate system per ECU would have been: $594.10
Based on the FY19 revenue requirements, the unit cost per in a flat-rate system per EU would be: $759.94
In certain cases, a minimum commercial designation of 0.75 EU has been made.

Wastewater Rates are Changing!

The Town of Whitingham has undertaken an effort to re-evaluate the wastewater billing structure and overall wastewater fees. This document is an effort to communicate the changes and impacts to wastewater customers.

Why is this necessary?

In April of 2018, the Selectboard voted to decommission the Sewer Commission and take control of the Sewer Department. The action was reflective of significant challenges faced by the community regarding critical upcoming wastewater infrastructure projects and a desire to ensure continued financial and operational sustainability. The Selectboard has been working with a non-profit organization, RCAP Solutions, to perform an analysis of the rates and rate structure.

How is your bill calculated?

Current sewer user charges are based on a combination of a flat fee and a volumetric fee. More specifically, there is a fixed fee per equivalent unit (EU) that is based on the type of facility plus a volumetric fee based on actual, estimated, or averaged water meter consumption. Typically, the volume of water passing through a water meter is equivalent to the amount of wastewater discharged to the sewer system – with a few exceptions for irrigation water and water used in a manufacturing process.

The bills are generated twice per year. A breakdown of the basic fees in place for FY18 follows:

a. Fixed fee - $133.76 per billing per EU
b. Volumetric fee - $15.12/thousand gallons used

What is the problem?

While the fixed fee portion of the bills are applied consistently based on facility type, the volumetric portions of the bills are not. Currently, some customers are billed based on actual usage, some on estimates, and some on average usage. As of 2018, over 1/3 accounts were being billed based either on an average or an estimate of their water usage for the volumetric portion of the bill. In an effort to be more consistent, the Selectboard is proposing a change to how bills are calculated.

What will change?

Rather than continuing to charge a volumetric fee, the Selectboard is considering a move to a flat fee system of user charges. During the process, the number of EUs assigned to each account has been reviewed and updated based on updated facility usage estimates and industry guidelines. A typical single family home comprises 1.0 EU, while other types of facilities may be assigned more. The table used in the evaluation of facility EUs is available for review at the town office.

Why don't we just replace the meters?

For the villages of Whitingham and Jacksonville, there is no public water system to ensure that meters are maintained or replaced over time. Many of the meters installed on the private water sources in the community currently are not even used for their intended purpose because they have failed. Meter replacement programs are costly, and the Selectboard has determined that the move to a flat fee system results in an equitable solution without the added expense of meter replacement and semi-annual meter reading. In addition, the move to a flat rate system provides consistent revenue for the Town without being impacted by changes in customer usage patterns. This concept is further supported when you consider the “capacity to serve” principle, which acknowledges that the overall operating expenses of the system are not significantly impacted by the volume of wastewater treated.

How will your bill be calculated?

Beginning with the October 2018 billing, meters will not be used in the determination of user charges. Bills will continue to be sent out twice per year. The user charges will be based solely on the number of equivalent units assigned to each facility. If you have questions about how your equivalent units were calculated, you may contact the Town to learn more.

What will the new wastewater rate be?

Town staff will continue to look at user rates on an annual basis, and to keep you informed of changes to the wastewater fees. For the October 2018 billing, user rates for most customers will increase. The amount of the change to your bill is based on two primary factors:

- Whether the number of equivalent units for your account changed
- How much volume you were billed for under the previous rate structure

Based on budget projections and revenue requirements for user fees, there will be a 27.9% overall rate increase for the October 2018 billing. This increase will impact users differently based on the factors described above. On a positive note, fees should be more predictable for customers.

Anticipated User Fees based on Current and Projected Revenue Requirements		**PROJECTED[1]**	**PROJECTED[1]**	**PROJECTED[1]**
	FY18	**FY19**	**FY20**	**FY21**
User Fees	$144,156	$184,400	$193,189	$202,902
Anticipated Annual Flat User Fee / EU (based on 242.65 EUs)	$594.09[2]	$759.94	$796.16	$836.19
Affordability[3] for Residential Customers (MHI - $49076)	1.21%	1.55%	1.62%	1.70%
Average Rate Increase	N/A	27.9%	4.8%	5.0%

1. Projections makes assumptions about potential bond payments for infrastructure improvements.
2. This theoretical number is based on current user revenue, if the system had been using a flat fee structure for the previous billings.
3. Affordability is an estimate of the percentage of Median Household Income in a community that goes toward the annual wastewater rates. Generally, communities in VT are between 1% and 2% of MHI.

For more information contact the Selectboard Office at (802) 368-7500.

SEWER BUDGET FY19				
	CURRENT	PROPOSED	PROPOSED	PROPOSED
ACCOUNT	FY18	FY19	FY20	FY21
REVENUES				
Current User Fees	$144,156	$184,400	$193,189	$202,902
Interest on Fees	$2,000	$1,000	$1,000	$1,000
Penalties	$2,300	$1,000	$1,000	$1,000
Sludge Revenue	$2,000	$1,000	$1,000	$1,000
TOTAL	**$150,456**	**$187,400**	**$196,189**	**$205,902**
% Increase		27.9%	4.8%	5.0%
EXPENSES				
LABOR				
Bookkeeping Services	$432	$432	$432	$432
FICA/Medicare-Town Share	$3,840	$4,712	$4,810	$4,902
Reimburse User Penalties	$2,300	$2,400	$2,500	$2,500
Retirement-Town Share	$2,601	$3,164	$3,227	$3,291
Wages-Sewer Commissioners	$625	$0	$0	$0
Assistant	$1,500	$8,000	$8,160	$8,160
Plant Operator Salary	$47,296	$48,242	$49,207	$50,191
Treasurer Salary	$2,892	$2,950	$3,009	$3,070
TOTAL	**$61,486**	**$69,900**	**$71,345**	**$72,546**
INSURANCE				
Health Insurance	$25,370	$26,362	$28,998	$30,448
Liability Insurance	$2,100	$2,100	$2,150	$2,200
Unemployment Insurance	$1,200	$1,300	$1,350	$1,400
Workers' Compensation	$1,800	$2,500	$3,100	$3,200
TOTAL	**$30,470**	**$32,262**	**$35,598**	**$37,248**
SEWER PLANT EXPENSES				
Chemicals	$500	$500	$513	$525
Contracted Services	$2,500	$2,500	$2,563	$2,627
Electricity	$15,000	$15,000	$15,375	$15,759
Equipment Purchases	$1,000	$1,000	$1,025	$1,051
Mileage - Operator	$1,500	$1,500	$1,538	$1,576
Miscellaneous	$300	$3,000	$3,075	$3,152
Plant Operating Fee - VT	$450	$400	$410	$420
Postage	$200	$200	$205	$210
Repairs: Facility & Equip	$1,000	$2,000	$2,050	$2,101
Repairs: Line & Pump	$1,000	$5,000	$5,125	$5,253
Repairs: Meters	$1,000	$1,000	$1,025	$1,051
Sludge Removal	$20,000	$30,000	$30,750	$31,519
Supplies	$1,500	$1,500	$1,538	$1,576
Telephone	$650	$650	$666	$683
Outside Testing	$6,500	$8,000	$8,200	$8,405
Training	$200	$200	$205	$210
Uniforms/Safety Glasses	$200	$200	$205	$210
TOTAL	**$53,500**	**$72,650**	**$74,466**	**$76,328**
PLANT CAPITAL IMPROVEMENT				
Plant Improvements Reserve	$5,000	$8,000	$6,780	$6,780
Capital Improvement (Bond)	$0	$4,000	$8,000	$13,000
TOTAL	**$5,000**	**$12,000**	**$14,780**	**$19,780**
	FY18	**FY19**	**FY20**	**FY21**
TOTAL SEWER BUDGET	**$150,456**	**$186,812**	**$196,189**	**$205,902**

TOWN OF WHITINGHAM, VERMONT

USER CHARGE SYSTEM

I. GENERAL

The user charge is a means of accounting to insure that each recipient of waste treatment services will pay its proportionate share of the costs of operation and maintenance, including replacement. The intent of the user charge and user surcharge revenue structure is to distribute the cost of operation and maintenance of the publicly owned treatment works to the pollutant source and to promote self-sufficiency of treatment works with respect to operation and maintenance costs.

The user charge system for the Villages of Jacksonville and Whitingham results in the distribution of treatment works operation and maintenance costs to each user in approximate proportions to the user's contribution to the total wastewater loading of the treatment works.

The total annual sewer user charge contribution shall not be less than the annual cost of operating and maintaining the system. The charges must be sufficient to allow the treatment works to be operated self-sufficiently.

The user charge system shall be reviewed annually to adjust and provide for: (1) proportional distribution of costs among users and user classes, (2) sufficient revenue to provide adequate operation and maintenance funds, and (3) application of excess revenue from a particular class of users to that class in future years.

II. REVENUE REQUIREMENTS

The Revenue requirements for the first year of operation, maintenance and replacement for the wastewater facilities are shown in Table 1. This information shall be presented annually to each user in conjunction with regular billing to notify the user of the wastewater rate and which costs are attributable to wastewater.

III. USER CHARGE SYSTEM

A system of user charges is proposed for the Town of Whitingham which defines and equivalent unit service as follows:

3.2 persons per service or user
x 70 gallons per capita per day of wastewater
224 gallons wastewater per service or equivalent user.

The number of equivalent users in Whitingham is the number of domestic users and industrial and commercial users equated with respect to flow (224 gpd/equivalent user) in terms of a typical domestic user. Based on present information, approximately _________ equivalent users will be serviced the first year of operation.

IV. IMPLEMENTATION

A. Unmetered connections - all unmetered users will be billed annually for user charges in terms of an equivalent user cost. The equivalent user cost is determined as follows:

$$\frac{\text{1st year's O\&M Cost}}{\text{Total number of equivalent users}}$$

21,020 = _______/per user

A typical household would be charged _________ per year for one equivalent user while a restaurant might be charged ________ per year because its calculated wastewater flow is eight (8) times greater than that for a typical household equivalent user. The wastewater flow can be calculated for a specific user such as a restaurant by utilizing flow rates established by the State of Vermont (Table II). Referring to Appendix A, Chapter 5 of Subchapter 10, Part III of Vt. Health Regulations, a 60-seat restaurant, serving lunch and dinner will yield an approximate flow of 1800 gallons per

per seat. As the equivalent user rate is 224 gallons per day, the restaurant is equated in terms of 8 equivalent users.

B. Metered connections - all metered users will be billed quarterly for user charges in terms of wastewater actually discharged. The amount of wastewater discharged during the billing period will be estimated from water meter readings assuming that 90 percent of metered water is actually discharged to the wastewater collection system. The wastewater user rate is computed as follows:

$$\frac{\$\underline{\hspace{2cm}}\text{/year/equivalent user}}{\text{224 gallons/day/equivalent user x 365 days/year}} = \$\underline{\hspace{1cm}}\text{/1000 gals.}$$

If the water meter reads 1000 cubic feet, then the quantity must be multiplied by 7.481 to convert to gallons. For instance, if a household water meter indicated that 4000 cubic feet of water was used during the quarter billing period, the wastewater flow would be estimated at 3600 cubic feet (4000 x 0.9) or 26,932 gallons (3600 x 7.481). The user charge is then computed as follows:

26,932 gal. x \$1.08/1000 gallons =
\$29.09/quarter = \$116.35/year

C. User Surcharges - Each user in the Village of Whitingham and Jacksonville suspected of discharging strong or toxic wastes will be evaluated for user surcharges by the Town of Whitingham Water and Sewer Department as delineated in the sewer use ordinance for the Town.

BOD_5 and Suspended Solids tests and flow determinations would be performed by an independent testing laboratory of the suspected strong wastes. If the tests indicate that BOD_5 and Suspended Solids concentrations exceed the design concentrations of the facility, the user shall pay for all tests and surcharges. If the tests indicate that said concentrations are less than or equal to the design concentrations, the Town shall pay for all tests and no surcharge shall be levied.

The surcharge must be paid by the user in addition to the user charge calculated above in Part IV, A or B. User surcharges are calculated as follows for the Whitingham Wastewater Treatment Facilities.

TABLE III

USER SURCHARGE COMPUTATIONS

Unit Cost Determinations	Q	BOD5	S.S.
Percent	10%	54%	35%
Total O&M Cost $16,660	$1666	$8996	$5998
Normal Sewage Strength or	N/A	200 mg/1 .00167 1b/gal	220 mg/1 .00184 1b/gal
Annual Pounds of Wasteload		38,013 1bs/yr	41,814 1bs/yr
Cost per Pound of Wasteload		.2367 $/1b	.1434 $/1b
Surcharge per pound of additional wasteload treated		.00198 $ per 1000 gal for each 1.0 ppm in excess of design	.00120 $ per 1000 gal for each 1.0 ppm in excess of design

As an example, if the restaurant in the previous example discharged a wastewater with a BOD5 = 400 mg/1 and Suspended Solids equal to 600 mg/1, the surcharge would be computed as follows:

(BOD_5) \$0.00198 (400-200) = \$0.396/1000 gallons

(S.S.) \$0.00120 (600-220) = \$0.456/1000 gallons

Total Surcharge \$0.852/1000 gallons

Total user cost = user charge + surcharge

User charge - (previously calculated) = \$176.76/quarter

Surcharge = 164,250* (\$0.852/1000 gal) = \$139.94/quarter

Total user cost = \$316.70/quarter

Total user cost = 164,250 (\$1.08 + 0.852) = 317.33/quar

*Estimated quarterly flow based on 1800 GPD flow of the example restaurant.

TABLE I

TOWN OF WHITINGHAM, VERMONT
WASTEWATER COLLECTION & TREATMENT FACILITIES
REVENUE ALLOCATION

INITIAL OPERATION

Salaries and Wages	\$10,500.00
Treatment Plant	\$ 8,220.00
Operating Supplies	
Chemicals	
Electrical	
Fuel	
Repair and Maintenance	
Communications	
New Equipment	
Collection and Interceptor System	\$ 1,000.00
Operating Supplies	
Repair and Maintenance	
Small Tools and Equipment	
Communications	\$ 3,000.00
Sludge Removal	\$ 8,000.00
Division Services	
Operating Supplies	
Insurance and Fidelity Bond	
Purchased SErvices, Other	
Rentals of Private Equipment	
Unclassified	
Capital Reserve for Renewal/Replacement	\$ 2,000.00
Customer Accounts Expense	\$ 1,500.00
Supervision	
Meter Reading	
Customer Records and Collections	
Uncollectible Accounts	
Total O&M Replacement	\$21,020.00

USER SURCHARGE COMPUTATIONS

The treatment facilities have a total design flow of 62,400 GPD, BOD loading of 200 mg/l yields a design wasteload of 89 lbs./day and Suspended Solids at 220 mg/l yeilds a design wasteload of 89 lbs/day.

V. Any user which discharges any toxic pollutants which cause an increase in the cost of managing the effluent or the sludge of the Whitingham treatment works shall pay for such increased costs.

VI. ENACTMENT

These rules and regulations become effective upon their adoption by the Board of Selectmen of the Town of Whitingham, Vermont this 23 day of May, 1984, by the Board of Selectmen, Town of Whitingham, County of Windham, State of Vermont.

BOARD OF SELECTMEN

TOWN OF WHITINGHAM, VERMONT

Dan Ott

Th. C. Herrmann

Richard M. Tefft

DATE May 23, 1984

Harold A. [illegible]

Lewis M. Corse

TABLE II
TAKEN FROM VERMONT HEALTH REGULATIONS
CHAPTER 5 OF SUBCHAPTER 10, PART III

APPENDIX A
FLOW QUANTITIES

ESTABLISHMENT	GALLONS/PERSON/DAY (Unless otherwise noted)
Airports (per passenger)	
Bathhouses and swimming pools	5
Camps:	10
Campground with central comfort stations	
with flush toilets, no showers	35
Construction camps (semi-permanent)	25
Day camps (no meals served)	50
Resort camps (night & day) with limited plumbing	15
Cottages	50
Country Clubs (per resident member)	50
Country Clubs (per non-resident member present)	.100
Dwellings:	25
Apartments	
Boarding Houses	75
Addition for non-resident boarders	50
Multiple Dwellings (condominiums, townhouses, clustered housing)	10
Rooming Houses	75
Single family dwellings	40
Factories (gallons per person, per shift, exclusive of industrial waste	75
Institutions other than hospitals (per bed)	15
*Hotels with private baths	.125
Laundries, self-service (gallons per machine)	50
Mobile home parks (per space)	.500
tels with bath, toilet (per bed space)	.250
Picnic parks (toilet wastes only/picknicker)	50
Picnic parks with bathhouses, showers, and flush toilets	5
Restaurants (toilet and kitchen wastes/meal/seat)	10
Restaurants additional for bars and cocktail lounges	15
Schools:	3
Boarding	
Day, without gyms, cafeterias, or showers	.100
Day, with gyms, cafeterias, and showers	15
Day, with cafeteria, but without gyms or showers	25
Service stations (first set of gas pumps)	20
(each set thereafter	.500
Theaters:	.300
Movie (per auditorium seat)	
Drive-in (per car space)	5
Travel trailer parks without individual water and sewer hook-ups	5
(per trailer space)	
Traveltrailer parks with individual water and sewer hook-ups	.50
(per car space)	.100
Workers:	
Construction (at semi-permanent camps)	50
Day at schools and offices (per shift)	15

* Does not include laundry or restaurant waste.

WHITINGHAM, VERMONT , TOWN CLERK'S OFFICE, THIS 26th DAY OF MAY IN THE YEAR OF OUR LORD ONE THOUSAND NINE HUNDRED EIGHTY-FOUR AT 11 O'CLOCK Thirty eight MINUTES IN THE FORE NOON RECEIVED FOR RECORD THIS INSTRUMENT OF WHICH THE FOREGOING IS A TRUE RECORD ,

Attest, Q. D. Blinder[illegible]
Town Clerk

2000 new AA copy

ORDINANCE
REGULATING THE USE
OF
PUBLIC AND PRIVATE
SANITARY SEWAGE
SYSTEMS

TOWN OF WHITINGHAM
VERMONT

ORDINANCE
REGULATING THE USE OF
PUBLIC AND PRIVATE SANITARY SEWAGE SYSTEMS
WHITINGHAM, VERMONT

CONTENTS

Pursuant to law, notice is hereby given that the Whitingham Board of Selectmen, on January, 26, 2000, adopted changes to the following Articles and Sections of the Ordinance Regulating the Use of Public and Private Sanitary Sewer Systems within the Town of Whitingham:

(Note: All Articles are changed from Roman Numerals to Numerical Units; Article #'s change to provide for added and deleted articles; there are semantic and sentence construction changes throughout the document for clarification and consistency.)

Article I -	Sec. 106 deleted
Article II -	Sec. #'s deleted; "Scavenger Waste" deleted
Article III -	Sec. #'s deleted
Article IV -	Sec. 404: "In all cases, the Commissioners shall provide rights-of-way from the property line to the main sewer. All easements must be obtained must be obtained prior to construction or other developments, minimum width to be determined by the sewer commissioners." added

New Article 5 added: Capacity Allocation and Connection: includes numerous allocation references

Former Article V:	Sec. 502: "industrial waste" added
Article VI -	"Scavenger Waste language deleted
Article VIII -	Private Sewerage Systems deleted
Article IX -	Vitrified Pipe and Fittings; Asbestos Cement Pipe and Fittings - all language deleted
Article XI -	Sewer Rents changed to "Charges" Sec. 1104 - change (by the assessment of appropriate impact fees to "through the assessmemt of a capitol construction fee"
New Article 12 -	Dedicated Fund for Major Rehabilitation, Major Maintenance and Upgrade Costs
Article XII -	changed to Enforcement and Penalties
New Article 16 -	Civil Ordinance Designation

The full text of the Ordinance Regulating the Use of Public and Private Sanitary Sewer Systems within the Town of Whitingham is available at the Office of Town Clerk at the Jacksonville Municipal Center in Jacksonville, Vermont. Questions regarding these changes may be directed to the Town Clerk, Earle Holland Jr. at 368-7887. This amended Ordinance will take effect sixty days from January 26, 2000, unless a petition signed by at least five percent of the voters of Whitingham is filed with the municipal clerk by March 10, 2000, asking for a vote to disapprove the Ordinance. If a petition is received, the Board of Selectmen will warn a special meeting and the voters may vote on that question. 24 VSA $1973.

ORDINANCE
REGULATING THE USE OF PUBLIC AND PRIVATE SANITARY SEWAGE SYSTEMS

Pursuant to Title 24 Section 3617 of the Vermont Statutes Annotated, it is hereby ordained by the COMMISSIONERS of Selectmen of the TOWN of Whitingham, Vermont that the protection of the health and safety of the TOWN of Whitingham and of the general public requires the establishment of minimum standards governing the design, construction, installation and operation of public and private sanitary SEWAGE systems.

ARTICLE I - GENERAL PROVISIONS

SECTION 101 - All rules and regulations contained herein, together with such additions and amendments as may be hereafter adopted, are hereby designated as the "ORDINANCE Regulating the Use of Public and Private Sanitary SEWAGE Systems" hereinafter sometimes referred to as the ORDINANCE.

SECTION 102 - The TOWN Clerk of the TOWN of Whitingham shall file certified copies of the ORDINANCE, as well as certified copies of any additions or amendments to this ORDINANCE as may be hereafter adopted, with the Board of Selectmen, Sewer COMMISSIONERS, and Health Officer.

SECTION 103 - The principal objective of SEWAGE facilities is to collect SEWAGE and industrial wastes and to provide the required or justified degree of treatment under the most favorable and economic conditions possible. Therefore, the discharge of waste waters into the public SANITARY SEWERS which do not require nor justify treatment or which will cause damage to or stoppage of the SEWAGE system or interfere with SEWAGE treatment processes is prohibited.

SECTION 104- The provisions of this ORDINANCE shall be reviewed at intervals not exceeding five (5) years by the Board of Selectmen with the objective of assessing the continued applicability of these provisions; to consider any recommendations proposed for their improvement; and to determine if and what changes are advisable due to advances in the technical methods and processes of waste treatment and SEWAGE collection available to the TOWN of Whitingham.

SECTION 105 - In the case of any other applicable regulation, bylaw, ORDINANCE, or statute which differs from the rules and regulations of this ORDINANCE, the more strict shall apply

SECTION 106 - It shall be the function of the COMMISSIONERS to vary or modify the application of any of the provisions of this ORDINANCE when strict enforcement would result in practical difficulties or unnecessary hardship, providing, however, that no modification be in conflict or contrary to existing Federal Regulations.

ARTICLE 2 - DEFINITIONS

For the purpose of this ORDINANCE, the following terms and phrases shall have the meanings ascribed to them under this ARTICLE:

BUILDING SEWER shall mean that part of the SEWAGE System which receives the SEWAGE from the House Plumbing System and conveys it to the nearest end of the House Connection, unless a House Connection is not available, whereby the BUILDING SEWER shall be extended to the nearest available "Y" branch on the Main Sewer.

CLERK shall mean the TOWN Clerk of the TOWN of Whitingham, Vermont.

COMBINED SEWER shall mean a sewer receiving both surface runoff and SEWAGE.

COMMITTED RESERVE CAPACITY shall mean the total amount of DEVELOPMENT wastewater flow (gallons per day) from all projects/buildings approved by the SEWER COMMISSIONERS for discharge to the treatment PLANTS, but not yet discharging at the time of the calculation.

DEVELOPMENT shall mean the construction of improvements on a tract of land for any purpose, including, but not limited to, residential, commercial, industrial, manufacturing, farming, educational, medical, charitable, civic, recreational and religious uses.

GARBAGE shall mean solid wastes from the preparation, cooking, and dispensing of food and from the handling, storage and sale of produce.

HEALTH OFFICER shall mean the legally designated Health Officer or Deputy Health Officer of the TOWN of Whitingham, Vermont.

HOUSE CONNECTION shall mean that part of the SEWAGE System that runs from the Main Sewer to the property line and includes all necessary fittings.

HOUSE PLUMBING SYSTEM shall mean all the plumbing work within the building and to a point five (5) feet (1 1/5 meters) outside of the building which conveys SEWAGE from within the building to the BUILDING SEWER outside the building.

INDUSTRIAL WASTES shall mean the liquid wastes from industrial manufacturing processes, trade or business as distinct from sanitary SEWAGE.

MAIN SEWER shall mean the sewers laid longitudinally along the centerline or other part of the streets or other rights-of-way and which all OWNERS or abutting properties have equal rights and which is controlled by public authority.

NATURAL OUTLET shall mean any outlet into a watercourse, pond, ditch, lake or other body of surface or groundwater.

OWNER shall mean any person, vested with ownership, legal or equitable, sole or partial, or possession of any property.

PERSON shall mean any individual, firm, company, association, society, corporation, institution, partnership, group, or other entity.

PRIVATE SEWAGE SYSTEM OR FACILITIES shall mean all facilities or collection, pumping, treating and disposing of SEWAGE, and is not under the control of nor operated by the TOWN of Whitingham.

PROPERLY SHREDDED GARBAGE shall mean the wastes from preparation, cooking and dispensing of food that has been shredded to such a degree that all particles will be carried freely under the flow conditions normally prevailing in public sewers, with no particle greater than one-half (1/2) inch (1/27 centimeters) in any dimension.

PUBLIC SEWAGE SYSTEM OR FACILITIES shall mean all facilities for collecting, pumping, treating and disposing of SEWAGE, and is controlled and operated by the TOWN of Whitingham.

SANITARY SEWER shall mean a sewer which carries SEWAGE and industrial waste and to which storm, surface and ground waters are not intentionally admitted.

SECRETARY shall mean the Secretary of the Agency of Environmental Conservation, State of Vermont, or the Secretary's representative.

SELECTMEN shall mean members of the Board of Selectmen of the TOWN of Whitingham, Vermont.

SEWAGE shall mean a combination of the water-carried wastes from residents, institutions and commercial and industrial establishments together with such ground waters as may be present.

SEWAGE TREATMENT PLANT or WASTEWATER TREATMENT PLANT shall mean any arrangement of devices and structures used for treating SEWAGE and/or industrial wastes.

SEWER shall mean a pipe or conduit.

SEWER COMMISSIONERS (COMMISSIONERS) shall mean members of the COMMISSIONERS of Selectmen and/or the group of individuals who shall be designated from time to time by the COMMISSIONERS of Selectmen to have that title, or their authorized deputy, agent or representative.

SHALL is mandatory; MAY is permissive.

SLUG shall mean any discharge of water, SEWAGE or industrial waste which in concentration of any given constituent or in quantity of flow exceeds for any period of duration longer than fifteen (15) minutes more than five (5) times the average twenty-four (24) hour concentration or flows during normal operation.

STORM SEWER or STORM DRAIN shall mean a sewer which carries storm and surface waters and drainage, but excludes SEWAGE and industrial wastes other than unpolluted cooling water.

SUBDIVISION shall mean a tract of land, owned or controlled by a person, which has been partitioned or divided for the purpose of resale into two (2) or more lots.

SUBSURFACE SEWAGE DISPOSAL SYSTEM shall mean any SEWAGE treatment system whereby the tank or plant effluent is leached into the ground by subsurface disposal.

MUNICIPAL DESIGNEE shall mean that employee of the TOWN who shall be designated from time to time by the COMMISSIONERS of Selectmen to operate and maintain the Public SEWAGE Facilities and oversee connection processes.

SUSPENDED SOLIDS shall mean solids that either float on the surface of, or are in suspension in water, SEWAGE or other liquids; and which are removable by laboratory filtering.

TOWN shall mean the TOWN of Whitingham, Vermont.

UNCOMMITTED RESERVE CAPACITY shall mean that amount of daily flow in gallons after subtracting the daily average flow and committed reserve capacity from the daily design capacity of the plants.

WATERCOURSE shall mean a channel in which a flow of water occurs, either continuously or intermittently.

ARTICLE 3 - ABBREVIATIONS

For the purpose of this ORDINANCE, the following abbreviations shall have the meanings ascribed to them under this ARTICLE. References to standards of the following organizations shall refer to the latest editions of the same.

ANSI shall mean American National Standards Institute.

ASME shall mean American Society of Mechanical Engineers.

ASTM shall mean American Society for Testing and Materials.

AWWA shall mean American Water Works Association.

B.O.D. (denoting Biochemical Oxygen Demand) shall mean the quantity of oxygen utilized in the biochemical oxidation of organic matter under standard laboratory procedure in five (5) days at 20 degrees C, expressed in milligrams per liter.

BOCA shall mean Building Occupational Code Administration.

cm. shall mean centimeter.

CS shall mean Commercial Standard.

DEGREES F shall mean degrees Fahrenheit.

DEGREES C shall mean degrees Centigrade.

gpd shall mean gallons per day.

hp shall mean horsepower.

Kg. shall mean kilograms.

l. shall mean liters.

mg./1 shall mean milligrams per liter.

m. shall mean meter.

NPC shall mean National Plumbing Code.

pH shall mean the logarithm of the reciprocal of the weight of hydrogen ions in grams per liter of solution.

ppm shall mean parts per million.

sq.m. shall mean square meters.

ARTICLE 4 - USE OF PUBLIC SEWERS REQUIRED

SECTION 401 - It shall be unlawful for any person to place, deposit or permit to be placed or deposited upon public or private property within the TOWN of Whitingham, or in any area under the jurisdiction of said TOWN, any human excrement or other objectionable waste except through a PUBLIC SEWAGE SYSTEM or other approved system.

SECTION 402 - It shall be unlawful to discharge to any natural outlet within the TOWN of Whitingham or in any area under the jurisdiction of said TOWN, any SEWAGE or other polluted waters, except where suitable treatment has been provided in accordance with the provisions of this ORDINANCE and the laws of the State of Vermont.

SECTION 403 - It shall be unlawful to construct or maintain any privy, privy vault, septic tank, cesspool, or other facility intended or used for the disposal of SEWAGE, unless specific approval is granted.

SECTION 404 - The OWNERs of all houses, buildings, and properties used for human occupancy, employment, recreation, or other purpose, situated within the TOWN and abutting any street, alley, or right-of-way in which there is now located or may in the future be located a public sanitary, is hereby required, if SEWAGE is generated, to install suitable toilet facilities therein and to connect such facilities directly with such sewer in accordance with the provisions of this ORDINANCE, within forty-five (45) days after the date of official notice to do so, provided that said public sewer is within one hundred (100) feet (30.5 m.) of the building(s) requiring service. Installation of or repair to any other SEWAGE system is not permitted unless the COMMISSIONERS find that connection to the public sewer would cause extreme hardship to the OWNER and the alternative SEWAGE system would meet all pertinent State of Vermont and TOWN rules.

SECTION 405 - At the discretion of the COMMISSIONERS, an OWNER of a private SEWAGE system which is abandoned because of the availability of a public sanitary sewer may be required to thoroughly and properly clean, disinfect, and fill or remove the system or removed according to good sanitation practice and under the inspection and direction of the COMMISSIONERS.

ARTICLE 5 -CAPACITY ALLOCATION AND CONNECTION

SECTION 501 - Ownership & Permit

The TOWN owns and operates two PLANTS and two SANITARY SEWERS. The PLANTS have permitted capacities and are operated in accordance with discharge permits issued by the Vermont Department of Environmental Conservation (DEPARTMENT) under authority granted in 10 V.S.A. chapter 47. The COMMISSIONERS are obligated by law to comply with the conditions of such permits.

SECTION 502 - Introduction to Reserve Capacity Allocation

The permitted capacities of the PLANTS and the SEWERS are the property of the

TOWN. The uncommitted reserve capacities of the PLANTS and the SEWERS shall be allocated by the COMMISSIONERS in the manner described below. This ORDINANCE shall not be construed as an abandonment or relinquishment of the authority or the responsibility of the COMMISSIONERS to regulate, control, and supervise all means and methods of SEWAGE collection, treatment and disposal within the TOWN, nor shall it be construed to impair or inhibit the ability of the TOWN to contract with persons for the collection, transmission and treatment of SEWAGE.

The PLANT located in the Village of Whitingham has a design capacity of 12,300 gallons per day and currently operates at an average of 6054 gallons per day. The PLANT located in the Village of Jacksonville has a design capacity of 50,100 gallons per day and currently operates at an average of 20,432 gallons per day. At the time of the adoption of this ORDINANCE, committed reserve capacity of the PLANT in the Village of Whitingham equals 1800 gallons per day and the uncommitted reserve capacity equals 3446 gallons per day. Committed reserve capacity of the PLANT in the Village of Jacksonville equals 3420 gallons per day and the uncommitted reserve capacity equals 26248 gallons per day. These amounts are subject to change.

SECTION 503 - Reserve Capacity Allocation

A. - Allocation Flow Basis

An allocation to a DEVELOPMENT shall be based on the OWNER's wastewater flow basis. Any differential between actual flows and DEVELOPMENT wastewater flows which occurs is not available to the OWNER for re-allotment to another DEVELOPMENT or a DEVELOPMENT expansion.

B. - Allocation Priorities

Allocation of uncommitted reserve capacity shall comply with the following priority intended to govern the gross allocation of reserve capacity before the allocation principles are applied to a specific DEVELOPMENT.

Residential, commercial, institutional and industrial facilities existing within the sewer service areas on the date of the adoption of this ORDINANCE which are required to connect to the PUBLIC SEWAGE SYSTEM shall be entitled to first priority in allocation of uncommitted reserve capacity. New OWNERs within or outside the sewer service areas shall have second priority in allocation of uncommitted reserve capacity provided that the DEVELOPMENT is in the best interests of the TOWN as determined by the COMMISSIONERS.

In no instance shall any one of the described customer categories (i.e. residential, commercial, institutional, and industrial) be allocated more than 75% of the annual allocation in any given year.

SECTION 504 - Allocation Principles

Subsequent to application of the allocation priority, uncommitted reserve capacity in the PLANTS may be allocated to a specific DEVELOPMENT according to the following procedure:

A. Once an application and fee have been returned to the TOWN office and marked with the time and date of receipt by the person receiving the application and fee, the COMMISSIONERS or the COMMISSIONERS's MUNICIPAL DESIGNEE may review applications on a first come-first served basis. The total remaining uncommitted wastewater reserve capacity shall be allocated by the COMMISSIONERS or the COMMISSIONERS's MUNICIPAL DESIGNEE in a manner consistent with the TOWN's allocation priorities. The total uncommitted reserve capacity shall be determined at six month intervals and committed reserve continuously shall be recorded and updated for use in allocation decisions.

B. The COMMISSIONERS retain the right to review applications and make allocations on other than a first come-first served basis if they find such practice is in the TOWN's best interests.

SECTION 505 - Application for Allocation

OWNERS wishing to use the PUBLIC SEWAGE SYSTEM shall apply to the COMMISSIONERS on an application form prescribed by the COMMISSIONERS. Such application form shall:

A. Be accompanied by a calculation of the OWNER'S wastewater flow to be generated by the DEVELOPMENT;

B. Include calculations for the volume, flow rate, strength, and any other characteristic determined appropriate by the COMMISSIONERS;

C. Unless waived by the COMMISSIONERS all calculations required in (a) and (b) above for a DEVELOPMENT generating over 1000 g.p.d. shall be certified by a Vermont registered professional engineer;

D. Be accompanied by plans and specifications prepared by a Vermont registered engineer for the construction of BUILDING SEWERS and any municipal sewer extensions, including pump stations, required to service the DEVELOPMENT prepared by a Vermont registered engineer. This requirement to submit plans and specifications may be waived by the COMMISSIONERS until final connection approval.

E. Include payment of fee as set forth in fee schedule.

SECTION 506 - Preliminary Allocation Approval Requirements

Upon receipt of an acceptable application and supporting documents, the COMMISSIONERS may make a preliminary allocation of uncommitted reserve capacity upon making affirmative findings that:

A. The proposed wastewater is of domestic, sanitary origin and there is sufficient uncommitted reserve capacity to accommodate the volume and strength of the wastewater from the proposed connection; or

B. The proposed wastewater is not of domestic sanitary origin and that sufficient evidence has been presented to demonstrate that the flow and character of the wastewater is compatible with the proper operation of the PUBLIC SEWAGE SYSTEM and that the proposed wastewater shall not alone or in combination with other wastes cause a violation of the discharge permit, pass through the PLANT without treatment, interfere or otherwise disrupt the proper quality and disposal of PLANT sludge or be injurious in any other manner to the PUBLIC SEWAGE SYSTEM and that there is sufficient uncommitted reserve capacity to accommodate the strength and volume of wastewater from the proposed DEVELOPMENT; and

C. The proposed use of wastewater capacity complies with the allocation priorities and principles and is not in conflict with any other enactment adopted by the COMMISSIONERS or TOWN.

SECTION 507 - Conditions of Preliminary Allocation Permit Approval

The COMMISSIONERS, or MUNICIPAL DESIGNEE, after making the findings required above, may issue a preliminary wastewater allocation permit, which approval shall be a binding commitment of capacity to the OWNER contingent only upon compliance with any conditions attached to the preliminary permit and the subsequent issuance of a final allocation permit. Preliminary allocation permit conditions shall include:

A. Specification of the one year period during which the interim connection approval shall remain valid. The COMMISSIONERS may issue extension(s) upon a request of OWNER made prior to the date a permit expires..

B. Specific conditions which must be fulfilled by the OWNER to maintain validity of the preliminary allocation approval.

C. Provision for revocation by the COMMISSIONERS upon failure of the OWNER to fulfill requirements of the preliminary allocation approval.

D. Specification that the recipient of the preliminary allocation approval may not connect to the PUBLIC SEWAGE SYSTEM or transfer to any other person, by any means, such preliminary allocation approval.

SECTION 508 - Final Allocation Permit Approval Requirements

Prior to final allocation approval, the following requirements shall be met by the OWNER:

A. All applicable local, State, and Federal permits shall have been secured for the DEVELOPMENT;

B. Allocation fees and other local fees or taxes set by the COMMISSIONERS shall have been paid in full to the TOWN. Allocation fees shall be based partially on the volume and strength of the proposed wastewater flow. The COMMISSIONERS shall establish the fee schedule.

D. Financial hardship cases. The due date for allocation fees may be extended by the COMMISSIONERS, if the OWNER demonstrates an inability to pay the allocation fees at the time of application. Such OWNER may file a request in writing to the COMMISSIONERS for the COMMISSIONERS' review. All allocation and connection fees, however, shall be paid by the OWNER prior to sewer connection.

SECTION 509 - Final Allocation Permit Approval Conditions

A final allocation permit is an agreement between the TOWN and the OWNER. The OWNER who is issued a final allocation permit does not own the capacity and forfeits all rights to such capacity if preliminary and final allocation permit conditions are not met.

The COMMISSIONERS, or MUNICIPAL DESIGNEE, on making affirmative findings that all conditions of the preliminary allocation approval prerequisites in SECTION 506 of this ARTICLE have been fulfilled, shall issue the final wastewater allocation permit, which may be conditioned as follows:

A. The permit shall specify the permitted volume, flow rate, strength, frequency and any other characteristics of the proposed discharge determined appropriate by the COMMISSIONERS.

B. The capacity allocation is not transferable to any other person or to any other DEVELOPMENT unless requested by the original OWNER and approved by the COMMISSIONERS.

C. Incorporation of specific conditions which must be fulfilled by the OWNER to maintain validity of the final allocation approval.

D. Provision for revocation by the action of the COMMISSIONERS on failure of the

OWNER to fulfill requirements of the final allocation approval.

E. Capacity allocated in conjunction with the final allocation permit for DEVELOPMENT shall revert to the TOWN if the permit recipient has failed to initiate construction within one year of the issued date on the final wastewater allocation permit.

F. A final allocation permit shall expire two (2) years from the date of its issuance. A revised DEVELOPMENT plan and sewer use application may be approved by the COMMISSIONERS, or MUNICIPAL DESIGNEE, in the same manner as the original. Such revised plans must be approved under this ORDINANCE and by applicable State laws and regulations. If the COMMISSIONERS, or MUNICIPAL DESIGNEE, approves a revised sewer use application, it may issue a revised final allocation permit with reduced or increased capacity allocation determined in accord with the allocation priorities and principles. Where reduced capacity is granted in a revised allocation permit, the unused capacity shall revert to the TOWN. The COMMISSIONERS shall determine the amount of unused capacity returned. With any approval of a revised allocation and allocation permit, the COMMISSIONERS may consider extension of the original two (2) year allocation permit expiration date.

If a permit expires after two (2) years or after any extension of time provided by the COMMISSIONERS, the unused portion of the committed capacity allocation at the time of expiration shall revert to the TOWN and there shall be no refund of allocation, permit or other fees paid.

Regardless of the permit expiration period above, the COMMISSIONERS may extend the final wastewater allocation permit expiration date if this action is determined to be in the TOWN's best interests.

G. For subdivisions, the OWNER for a proposed subdivided parcel shall describe the DEVELOPMENT planned for each lot within the subdivision. If all prerequisites defined for final allocation approval are met, final allocation permits shall be issued to the OWNER for each lot with a specific reserve capacity allocation associated with the proposed DEVELOPMENT. These final allocation permits shall expire after two (2) years from the date of preliminary issuance unless the OWNER has sold the lot or has completed construction in accord with the approved DEVELOPMENT plan. The expiration of a permit two years from date of original issuance shall not be modified by any revisions to the DEVELOPMENT plan subsequent to the preliminary approval. The COMMISSIONERS shall notify the Vermont Agency of Natural Resources of expired subdivision allocation permits.

The reserve capacity allotted to lots that either are unsold or do not have construction completed the date of permit expiration shall revert to the TOWN from any reductions made to the DEVELOPMENT wastewater flow planned for each lot subsequent to preliminary approval.

The OWNER shall record the final allocation permits in the land records of the TOWN along with receipts for all fees paid and reference to the location of the approved connection plans and specifications. When an OWNER sells individual subdivided lots within the two (2) year time frame, the final allocation permit shall transfer when the titled property passes and the new OWNER becomes bound to comply with all permits issued and the plans and specifications for connecting to the PUBLIC SEWAGE SYSTEM. The transferred permit shall be considered to be a new final allocation permit issued on the date of property transfer; the provisions of this ORDINANCE shall apply to such permit. The permit shall expire as provided by this ORDINANCE.

SECTION 510 - Transfer of Allocation

A. Initially, reserve capacity is allocated by the COMMISSIONERS, or MUNICIPAL DESIGNEE, to a specific OWNER, DEVELOPMENT and parcel of land.

B. The capacity allocation belongs to the TOWN and is not transferable until the DEVELOPMENT is completed and connected to the MAIN SEWER. The transfer of the capacity allocation is prohibited unless approved in writing by the COMMISSIONERS at the original OWNER's request.

C. The COMMISSIONERS may approve transfer of capacity from one DEVELOPMENT to another and one OWNER to another provided the new DEVELOPMENT and OWNER meet all the requirements for the final connection approval originally issued and the original OWNER requests such transfer.

SECTION 511 - Connection Permit Approval Requirements

A. The construction of a connection and, if necessary a SEWER extension, must be overseen to assure compliance with the plans and specifications and good construction practice in a manner acceptable to the COMMISSIONERS or MUNICIPAL DESIGNEE.

B. The COMMISSIONERS or MUNICIPAL DESIGNEE shall be notified at least five (5) business days in advance of any proposed SEWER connection authorized by a connection permit. The connection to the municipal sewer shall not be performed unless the COMMISSIONERS or MUNICIPAL DESIGNEE are present and shall not be covered until approved by the COMMISSIONERS or MUNICIPAL DESIGNEE.

The COMMISSIONERS and MUNICIPAL DESIGNEE shall have the authority to inspect activities pertaining to the construction of the HOUSE CONNECTION, BUILDING SEWER and other related facilities, by way of illustration such as grinder pumps and pump stations, which may affect the PUBLIC SEWAGE SYSTEM. Given the nature of a connection or extension, the COMMISSIONERS may obtain engineering services for consultation and inspection during construction and at the expense of the OWNER.

D. Connection fees shall be set by the COMMISSIONERS and shall be paid in full prior to granting connection approval to the TOWN.

SECTION 512 - Authority to Require Connection

Nothing herein shall be construed as limiting or impairing the authority of the TOWN and its COMMISSIONERS to require connections to the PUBLIC SEWAGE SYSTEM under the general laws of the State or under local ordinances.

ARTICLE 6- CONNECTION TO PUBLIC SEWER

SECTION 601 - No person shall cover or uncover, make any connections with or opening into, use, alter or disturb the PUBLIC SEWAGE SYSTEM without first obtaining a permit.

SECTION 602 - There shall be three (3) classes of Sanitary Sewer Connection permits: (1) residential, (2) commercial, and (3) industrial. In any case, the OWNER, or OWNER's agent, shall make application on a form provided by the COMMISSIONERS. The permit application shall be supplemented by plans, specifications, and other information in the judgment of the COMMISSIONERS considered to be pertinent.

SECTION 603 - There shall be obtained prior to issuance of a sewer connection permit for work requiring excavation in a paved street or highway, a Road Opening Permit. For streets or highways under jurisdiction of governmental agencies other than the TOWN written permission for excavation shall be obtained from the agencies in question and such shall be presented to the COMMISSIONERS and meet their approval prior to issuance of the sewer connection permit.

SECTION 604 - All costs and expenses incident to installation and connection shall be borne by the OWNER. The OWNER shall indemnify the TOWN from any loss or damage that directly or indirectly may be occasioned by the installation of sewer connection.

SECTION 605 - A separate SEWER connection shall be provided for each building except where one building stands at the rear of another on an interior lot and no private SEWER is available or can be constructed to the rear building through an adjoining alley, court, yard, or driveway, the BUILDING SEWER from the front building may be extended to the rear building and the whole be considered as one sewer connection. Use of private SEWERS which accept and convey flow from more than one building may not be used except when found, on examination and test by the COMMISSIONERS, to be in satisfactory condition and meeting all requirements of this

ORDINANCE. The burden of proof and all expenses incurred by the COMMISSIONERS to determine the condition and adequacy of the private SEWER shall be borne by the OWNERS of such private sewer.

SECTION 606 - The COMMISSIONERS may require the OWNER of a DEVELOPMENT to install a water meter so recorded water flow can be used to determine the yearly wastewater charge. Water saving fixtures and equalization tanks may be required by the COMMISSIONERS for DEVELOPMENTS connecting to the PUBLIC SEWAGE SYSTEM. The TOWN owns the meters and will maintain same.

SECTION 607 - A portion of the HOUSE PLUMBING SYSTEM existing outside the structure may be used with the sewer connection only when it is found, on examination and test by the COMMISSIONERS, to meet all requirements of this ORDINANCE.

SECTION 608 - The diameter of the BUILDING SEWER shall not be less than four (4) inches (10.2 cm). Materials used in construction shall comply with the applicable sections of the ORDINANCE and as required and approved by the COMMISSIONERS. The BUILDING SEWER shall be laid on a uniform grade, wherever practicable, at a straight grade of at least one-fourth (1/4) of an inch per foot (2%). Where, in special cases, a minimum grade of one-fourth (1/4) inch per foot cannot be maintained, a grade of one-eighth (1/8) inch per foot (1%) will be permitted, but only if the COMMISSIONERS approve.

SECTION 609 - Whenever possible, the BUILDING SEWER shall be brought to the building at an elevation below the basement floor. No BUILDING SEWER shall be laid parallel to or within three (3) feet (91.4 cm) of any bearing wall which might thereby be weakened. The depth shall be sufficient to afford protection from frost. The BUILDING SEWER shall be laid at a uniform grade in the direction from the main sewer to the building and in a straight alignment insofar as possible. Change in direction shall be made only with properly curved pipes and fittings with suitable clean-outs or flush holes as described in SECTION 618.

SECTION 610 - In all buildings in which the house plumbing is too low to permit gravity flow to the public sewer, sanitary SEWAGE carried by such sewer shall be lifted by approved artificial means and discharged to the BUILDING SEWER. Such lifting devices shall be located outside the building foundation and have no access or ventilation through the building.

SECTION 611 - No person shall make connection of roof downspouts, exterior foundation drains, areaway drains, cellar drains, basement sumps, or other sources or surface runoff or groundwater to a BUILDING SEWER which, in turn, is connected directly or indirectly to a public sanitary sewer. All such connections which exist shall be disconnected by the OWNER, at his expense, within thirty (30) days upon receipt of notification by the COMMISSIONERS.

SECTION 612- When installing the BUILDING SEWER, the trenches shall be dug in a careful manner and properly sheathed where required. The excavated materials shall be placed in a separate pile from road materials and not mixed with rest of the excavated materials which must be piled in a compact heap so placed as to cause the least possible inconvenience to the public.

SECTION 613 - In backfilling, the material under, around and for two (2) feet (61 cm) immediately over the pipe shall be selected so it contains no stones capable of damaging the installation. This must be carefully tamped, the balance of the trench to be backfilled in a professional manner, tamping and filling in eight (8) inch (20.3 cm) layers so as to avoid any settlement. When the trench has been filled to the proper height, the road material is to be replaced and heavily tamped or rolled.

SECTION 614 - Where the trench is excavated in rock, the rock must be carefully excavated to a depth of six (6) inches (15.2 cm) below the bottom of the sewer and the trench brought to the proper elevation with gravel or other material satisfactory to the COMMISSIONERS. The remainder of the trench must be backfilled with suitable material as described in SECTION 613.

SECTION 615 - Where sub-soil conditions warrant, such special precautions must be taken as may be directed by the COMMISSIONERS. In quicksand, all pipes must be laid out on planking two (2) inches (5.1 cm) thick by at least six (6) inches (15.2 cm) wide.

SECTION 616 - The connection of the BUILDING SEWER to the main sewer shall be made at the house connection at the property line or, if no house connection exists, connection shall be made at the nearest available "Y" connection on the main sewer. The COMMISSIONERS will designate the position of the end of the house connection at the property line or the "Y" connection on the main sewer, whichever is appropriate. If it becomes necessary to cut into the main sewer, since no other source of connection is available, then such connection shall be made as directed by and under the supervision of the COMMISSIONERS. The dead-ends of all pipes not immediately connected with the house plumbing system must be securely closed by a watertight cover of imperishable material and properly marked and located.

SECTION 617 - Prior to any connection with the HOUSE CONNECTION, "Y" or to the MAIN SEWER, the COMMISSIONERS shall be given proper notice in order that they may inspect such work. If the COMMISSIONERS have not been properly notified, they may require the completed work to be uncovered for examination at the OWNER's expense.

SECTION 618 - Clean-outs on BUILDING SEWERS shall be made by installing a "Y" and one-eighth (1/8) bends. Clean-outs ordinarily shall be installed at the point of connection between the BUILDING SEWER and the HOUSE PLUMBING SYSTEM at all curves in the BUILDING SEWER and on the straight run of the BUILDING SEWER to the HOUSE CONNECTION. Clean-outs in a BUILDING SEWER shall be installed at least every one hundred (100) feet with manholes installed every three hundred (300) feet. Clean-outs shall be brought up from the BUILDING SEWER to four (4) inches (10.2 cm) below ground level and shall be capped properly. Locations of all clean-outs shall be documented and the documentation delivered to the COMMISSIONERS. Where the distance from the building to the MAIN SEWER is less than fifty (50) feet (15.2 m), and there are no curves in the SEWER, a clean-out in the building will be sufficient if it is at least six (6) inches (15.2 cm) above the basement floor. Where such distance exceeds fifty (50) feet (15.2 m) at least one (1) clean-out twenty (20) feet (6.1 m) from the building shall be provided. Clean-outs shall be of the same diameter as the BUILDING SEWER.

SECTION 619 - Before any portion of an existing BUILDING SEWER or the HOUSE PLUMBING SYSTEM is connected to the HOUSE CONNECTION, the OWNER shall prove, to the satisfaction of the COMMISSIONERS, that it is clean, conforms in every respect to this ORDINANCE, and all joints are water-tight.

SECTION 620 - BUILDING SEWERS shall be installed by a Vermont licensed plumber.

SECTION 621 - The COMMISSIONERS shall appropriately test all BUILDING SEWERS. The plumber, at the plumber's own expense, shall furnish all necessary tools, labor, materials, and assistance for such tests and shall remove any defective materials and shall repair any defective work when so ordered by the COMMISSIONERS.

SECTION 622 - Each plumber, contractor or other person performing work on public property for the purpose of installing a BUILDING SEWER shall file with the COMMISSIONERS satisfactory evidence of adequate insurance coverage for liability and property damage. Minimum amounts of coverage shall be established by the COMMISSIONERS and posted in the Clerk's office.

SECTION 623 - Proper safety barricades, lights, and other reasonably necessary measures for protection of the public from injury to persons and property shall be maintained at all work sites. Streets, sidewalks, curbs and other public property disturbed in the course of work shall be restored in a manner satisfactory to the TOWN and other authorities having jurisdiction.

SECTION 624 - No person shall block any driveway, street or road at any time without permission of the COMMISSIONERS and other authorities having jurisdiction. Every reasonable effort shall be made to permit the movement of vehicular and pedestrian traffic at all times. Whenever it becomes necessary to cross or interfere with streets, roads, walks, or drives, whether public or private, the OWNER shall maintain, at the OWNER'S own expense and subject to the approval of the COMMISSIONERS, safe bridges or other means of passage.

SECTION 625 - <u>MAINTENANCE</u> - Maintenance of all privately owned SEWAGE facilities including, but not limited to (1) HOUSE PLUMBING SYSTEMS, (2) BUILDING SEWERS, (3) HOUSE CONNECTIONS, (4) SEWERS and (5) appurtenances shall be the responsibility of the OWNER at the OWNER'S expense. The OWNER, solely, shall be responsible for continually maintaining such facilities in satisfactory operating condition. Maintenance shall include, but not limited to (1) maintaining flow, (2) clearing obstructions, (3) maintaining all joints gas-tight and water-tight , (4) repairing or replacing collapsed, deteriorated or defective materials, and (5) all other work which is necessary and essential to maintain proper operation and preserve the structural integrity and water tightness of the system.

SECTION 626 - If the COMMISSIONERS reject an application for an industrial connection permit, the basic application fee shall be forfeited together with such portion of the fee required to cover the costs of the industrial waste review as may be determined by the COMMISSIONERS.

SECTION 627 - The OWNERS of all new and existing DEVELOPMENT within the TOWN not being served by the PUBLIC SEWAGE SYSTEM shall provide engineering proof of SEWAGE disposal capability complying with the Sub-Surface Regulations of the TOWN and the State of Vermont Agency of Environmental Conservation. Connections to and use of the TOWN's PUBLIC SEWAGE FACILITIES shall be within sole discretion of the COMMISSIONERS who shall consider, among other things, the following:

1. Capacity of existing facilities;
2. Location of the DEVELOPMENT and future potential impact on the TOWN as a result of the contemplated extension of the PUBLIC SEWAGE FACILITIES;
3. Costs of the TOWN;
4. Economic and social benefit to the TOWN; and
5. Availability of funding.

The local share cost to the TOWN for all future PUBLIC SEWAGE FACILITY extensions and expansions shall be borne by the OWNERS to be benefitted by the extension or expansion, unless the voters of the TOWN shall vote at a duly warned or special TOWN Meeting to assume the costs involved in such extension of expansion.

SECTION 628 - In the case of new DEVELOPMENTS, the required SANITARY SEWERS shall be designed, installed, and operational prior to the generation of any SEWAGE from the DEVELOPMENT.

SECTION 629 - All provisions of this ARTICLE shall apply to SANITARY SEWERS within DEVELOPMENTS, except as hereinafter noted.

SECTION 630 - Materials and design and installation shall comply with this

ORDINANCE and as required and approved by the COMMISSIONERS.

SECTION 631 - At the discretion of the COMMISSIONERS, the TOWN may accept such facilities as part of the PUBLIC SEWAGE SYSTEM and will operate and maintain the same provided the following conditions are met by the OWNER of the DEVELOPMENT:

1. The OWNER shall provide the TOWN with a signed affidavit that such facilities are free from debt and that all bills for materials, labor, engineering, etc., and claims for damage have been satisfied.
2. The OWNER shall provide warranty instruments of conveyance of either fee title or permanent easemens to the TOWN for the lands on which such facilities are located.
3. The OWNER shall commit to the TOWN to pay for all repairs and replacements of defective structures, materials, equipment, etc., during twelve (12) consecutive months from the date the COMMISSIONERS accept the facilities.
4. The OWNER shall provide a Bill of Sale conveying ownership of the facilities to the TOWN.
5. The OWNER shall provide other statements, affidavits, and materials as required by the COMMISSIONERS.
6. The OWNER shall pay all costs for the transfer of ownership and for all expenses incurred in complying with the requirements of this ORDINANCE.

ARTICLE 7 - USE OF PUBLIC SEWERS

SECTION 701 - No person shall discharge or cause to be discharged any storm water, surface water, ground water, roof runoff, subsurface drainage, cooling water, or unpolluted industrial process waters to any SANITARY SYSTEM.

SECTION 702 - Storm water and all other unpolluted drainage shall be discharged to such SEWERS as are specifically designated as COMBINED SEWERS or STORM SEWERS or to a NATURAL OUTLET approved by the COMMISSIONERS. Industrial cooling water and unpolluted process waters may be discharged, upon approval of the COMMISSIONERS, to a STORM SEWER, COMBINED SEWER or NATURAL OUTLET.

SECTION 703 - No person shall discharge or cause to be discharged any of the following described waters or wastes to any PUBLIC SEWAGE SYSTEM:

A. Liquor or vapor having a temperature higher than 150 degrees F(65 degrees C);

B. Water or waste which may contain more than 100 parts per million, by weight, of fat, oil, wax or grease, whether emulsified or not, or containing substances which may solidify or become viscous at temperatures between 32 degrees F (0 degrees C) and 150 degrees F (65 degrees C);

C. Gasoline, benzene, naptha, fuel oil or other flammable or explosive liquid, solid, or gas;

D. Garbage that has not been properly shredded; (The installation and operation of a garbage grinder equipped with a motor of 3/4 hp (0.76 hp metric) or greater shall be subject to the review and approval of the COMMISSIONERS.)

E. Ashes, cinder, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastics, wood, paunch manure, unground garbage, whole blood, hair, fleshings, entrails, paper dishes, cups, milk containers, or any other solid or viscous substance, either whole or ground by garbage grinders, capable of causing obstruction to the flow in SEWERS or other interference with the proper operation of the PUBLIC SEWAGE FACILITIES;

F. Waters or wastes having a pH lower than 5.5 or higher than 9.0, or having any other corrosive property capable of causing damage or hazard to structures, equipment and personnel of the PUBLIC SEWAGE FACILITIES.

G. Waters or wastes containing toxic or poisonous solids,liquids or gases in sufficient quantity, whether singly or by interaction with other wastes, to injure or interfere with any SEWAGE treatment process, to constitute a hazard to humans or animals, create a public nuisance, or to create any hazard in the receiving waters of the wastewater treatment plant.;

H. Chemicals or chemical compounds of the following nature or characteristics or having similarly objectionable characteristics: alcohols, arsenic and arsenicals, phenols or creosols, formaldehydes, iodine, manganese, cyanide, heavy metals and other metal finishing or plant wastes, acid pickling waste, mercury and mercurials, silver and silver compounds, sulfonamides, toxic dyes (organic or mineral), zinc, all strong oxidizing agents such as chromates, dichromates, permanganates, peroxide and the like, compounds producing hydrogen sulfide or any other toxic or inflammable or explosive gases, whether upon acidification or alkalization or oxidation or reduction, strong reducing agents such as nitrites, sulphides, sulphites, and the like, radioactive materials and isotopes;

I. Water or wastes containing excessive settleable solids exerting an excessive chlorine demand or exerting an unusual chemical oxygen demand or containing any other material or constituent in concentrations which exceed limits which may be established by the COMMISSIONERS;

J. Materials which exert or cause unusual concentrations of inert suspended solids (such as, but not limited to, Fullers earth, lime slurries and lime residuals) or dissolved solids (such as, but not limited to, sodium chloride and sodium sulfate);

K. Materials which cause excessive discoloration (such as, but not limited to, dye wastes and vegetable tanning solutions);

L. Materials which exert or cause an unusual volume of flow or concentrations of wastes constituting a slug;

M. Waters or wastes containing suspended solids of such character and quantity that unusual attention or expense is required to handle such materials at the WASTEWATER TREATMENT PLANT;

N. Waters or wastes if it appears likely, in the opinion of the COMMISSIONERS, that such wastes can harm SEWERS, SEWAGE TREATMENT PLANT process or equipment, can have an adverse effect on the receiving stream, or can otherwise endanger human or animal life, limb, property, or constitute a nuisance;

O. Noxious or malodorous gas or other substance capable of creating a public nuisance; and

P. Waters or wastes containing substances which are not amenable to treatment or reduction by the SEWAGE treatment process employed or are amenable to treatment only to such a degree that the SEWAGE TREATMENT PLANT effluent cannot meet the requirements of its discharge permit or the requirements of other agencies having jurisdiction over discharge to the receiving waters.

SECTION 704 - Grease, oil, hair and sand interceptors shall be provided when, in the opinion of the COMMISSIONERS, they are necessary for the proper handling of liquid wastes containing grease or flammable wastes, sand or other objectionable ingredients. Grease interceptors are shall be installed at restaurants, schools, and other establishments which prepare food for public consumption. Interceptors shall be of a type and capacity approved by the COMMISSIONERS and shall be located so as to be readily and easily accessible for cleaning and inspection.

SECTION 705 - Interceptors shall be constructed of impervious materials capable of withstanding abrupt and extreme changes in temperature. They shall be of substantial construction, watertight, and equipped with easily removable covers which, when bolted in place, shall be gas-tight and watertight.

SECTION 706 - Interceptors shall be maintained by the OWNER, at the OWNER'S expense, in continually efficient operation. Materials collected by interceptors shall not be introduced into the PUBLIC SEWAGE SYSTEM.

SECTION 707 - Discharging or causing to be discharged into thePUBLIC SEWAGE SYSTEM of any waters or wastes having (a) a five (5) day B.O.D. greater than 300 mg./l, (b) containing more than 350 mg./l of suspended solids, (c) containing any substances having the characteristics described in SECTION 703, or (d) having an average daily flow greater than two percent (2%) of the average daily SEWAGE flow received at the TOWN'S SEWAGE TREATMENT PLANT shall be subject to review by the COMMISSIONERS. The COMMISSIONERS may reject the wastes or:

a. may require pretreatment to an acceptable condition for discharge to the PUBLIC SEWAGE SYSTEM and
b. may establish quantities and rates of discharge.

If the COMMISSIONERS are willing to consider pretreatment or equalization of waste flows, the design, plans, specifications and all other pertinent information relating to proposed equipment and facilities shall be submitted for review by the COMMISSIONERS and the Agency of Environmental Conservation; no construction of such facilities shall be commenced until approved by both the COMMISSIONERS and the Agency and such approvals to be in writing.

SECTION 708 - Where preliminary treatment or flow-equalizing facilities are provided for any waters or wastes, they shall be maintained continually in satisfactory and effective operation by the OWNER at the OWNER'S expense.

SECTION 709 - When required by the COMMISSIONERS, the OWNER of property served by a BUILDING SEWER carrying industrial wastes shall install a suitable control manhole in the BUILDING SEWER to facilitate observation, sampling and measurement of the wastes. Such manhole shall be accessibly and safely located and shall be constructed in accord with plans approved by the COMMISSIONERS. Such manhole shall be installed by the OWNER, at the OWNER'S expense, and shall be maintained so as to be safe and accessible at all times.

SECTION 710 - Any person discharging INDUSTRIAL WASTES into a PUBLIC SEWAGE SYSTEM shall perform such monitoring of the discharges as the COMMISSIONERS may reasonably require, including the installation, use, and maintenance of monitoring equipment, keeping records, and providing the records of such monitoring to the COMMISSIONERS upon demand. Where industrial pretreatment permits are issued by the State of Vermont, monitoring records also must be submitted to the State in accord with such permit. Such monitoring records shall be provided to the COMMISSIONERS upon demand.

SECTION 711 - All measurements, tests and analysis of the characteristics of waters and wastes to which reference is made in this ORDINANCE shall be determined in accord with the latest edition of "Standard Methods of the Examination of Water and Wastewater" published by the American Public Health Association and shall be accomplished at the control manhole provided or upon suitable samples taken at said control manhole. In the event that no special manhole has been required, the control manhole shall be considered to be the downstream manhole in the SEWER nearest to the point at which the BUILDING SEWER is connected. Sampling shall be carried out by customarily accepted methods. The particular analysis involved will determine whether a twenty-four (24) hour composite of all discharges is appropriate or whether a grab sample or samples should be taken.

SECTION 712 - Any OWNER found to be in violation of this ORDINANCE may have any disposal authorization terminated. DICK ADVISES THAT THIS BE MOVED TO ARTICLE 13.

SECTION 713 - Any person proposing a new discharge into the PUBLIC SEWAGE SYSTEM or a substantial change in volume or character of pollutants to be discharged into the PUBLIC SEWAGE SYSTEM shall notify the COMMISSIONERS at least forty-five (45) days prior to the proposed new discharge or change, and shall provide such laboratory analyses, technical data, engineering reports, and all other information requested by the COMMISSIONERS. No such change or connection shall be made without the written consent of the COMMISSIONERS.

SPECIAL AGREEMENTS

SECTION 714 - Notwithstanding the provisions of this ARTICLE, the TOWN may execute an agreement with an industrial concern whereby INDUSTRIAL WASTE of unusual strength or character may be accepted by the TOWN for treatment, subject to payment of additional fees by the industrial concern, provided that such agreement does not contravene any requirement of Federal and State law and regulation.

ARTICLE 8 - PROTECTION FROM DAMAGE

SECTION 801 - No person shall break, damage, destroy, uncover, deface or tamper with any structure, appurtenance or equipment which is part of the PUBLIC SEWAGE SYSTEM without the knowledge and consent of the COMMISSIONERS.

ARTICLE 9 - SEWER CONSTRUCTION MATERIALS

SECTION 901 - The COMMISSIONERS may allow or disallow the use of any construction material as they, in theirdiscretion and in accord with the best available technology, may deem appropriate. They shall have the authority to order changes in construction materials used in systems under the TOWN'S jurisdiction at any time.

SECTION 902 - Improvements in materials used for construction and improvements in jointing methods may be submitted to the COMMISSIONERS for approval, but the COMMISSIONERS shall not be obligated to approve such improved materials or jointing methods.

SECTION 903 - Although it is intented that all joints shall be water-tight, allowable leakage by infiltration or exfiltration tests as prescribed in SECTION 905 shall not exceed fifty (50) gallons per inch diameter per mile per day (0.46

cu.m./day/cm.diameter/KM) except when the SEWER is within the sensitive areas of water sources as defined in SECTION 904. The allowable leakage shall be zero in sensitive areas of water sources and shall be demonstrated by infiltration or exfiltration tests as described in SECTION 905. In no case will cement or mortar joints be acceptable.

SECTION 904 - The following criteria define sensitive field conditions and establish guidelines for the design and construction of gravity and pressure SEWERS within sensitive areas of water sources. These guidelines shall be followed in order to help ensure that water sources are adequately protected from SEWAGE contamination:

1. All public and private drinking water sources within the distances listed below shall be located, and defined as to type, on a SEWER permit application. The construction of each water source also should be shown to the extent such information is available from well records or local knowledge.

2. No publicly or privately owned SEWERS shall be installed closer than 400 feet from a public or multiple-home water supply without the specific written approval of Environmental Engineering Division, Vermont Health Department and the COMMISSIONERS.

3. Isolation distances from sewers (including HOUSE PLUMBING SYSTEMS) to private water supplies shall be governed by the following:

a. In all instances, the maximum reasonable distances based on actual field conditions shall be provided.
b. In no case shall the isolation distance be less than 50 feet from a drilled well or 75 feet from a dug (shallow) well unless adequate provisions (as defined in C below) are made to reduce the likelihood of contamination. Specific site conditions may require greater isolation distances as directed by the COMMISSIONERS.
c. Minimum criteria follow:
    1.) Where an isolation distance is less than 50 feet but greater than 25 feet from a drilled well or less than 75 feet but greater than 35 feet from a dug (shallow) well, the pipe material must be ductile iron gravity pipe with mechanical or push-on joints. Other materials may be proposed and will be reviewed by the COMMISSIONERS, State Environmental Engineering Division, and Vermont Health Department if supported by reasonable justification.
    2.) Where an isolation distance is less than 25 feet from a drilled well or less than 35
    feet from a dug (shallow) well, the SEWER must be encased in concrete to a point where the 25 foot or 35 foot isolation distance is achieved unless the SEWER involved is a BUILDING SEWER. These minimum isolation distances shall be avoided whenever possible.

3.) No manholes shall be allowed within 50 feet of a drilled well or 75 feet of a dug (shallow) well.

4.) All gravity SEWERS within 50 feet of a drilled well or within 75 feet of a dug (shallow) well must pass low pressure air tests and all pressure SEWERS within these distances must pass a water exfiltration test or not be used.

SECTION 905 - Infiltration and exfiltration testing shall be conducted as follows:

1. Infiltration - Test BUILDING SEWERS and HOUSE CONNECTIONS for infiltration only when groundwater is at least two feet above the invert. Test by measuring the flow in the completed SEWER line. No infiltration shall be allowed.

2. Exfiltration - Test BUILDING SEWERS and HOUSE CONNECTIONS for exfiltration by water or pressure air test. Exfiltration by water test shall consist of:

a. Minimum of 2 feet of head over upstream end.
b. Minimum of 6 feet of head over downstream end.
c. Adjust head after one hour.
d. Measure loss of water during next hour.
e. Maximum allowable exfiltration shall be 50 gallons per inch of SEWER diameter per mile of SEWER per day for normal field conditions and shall be zero when installed in sensitive areas of water sources.

Exfiltration testing by pressurized air shall be according to the Ramseier procedure as recommended by the Uni-Bell Plastic Pipe Association specification, Uni-B-6-79.

a. Compute test pressure using the following equation:

$$P = 3.5 + \frac{H}{2.31} \text{ (psig)}$$

P = Test pressure, maximum 9 P.S.I.

H = Height of groundwater above invert.

b. Minimum holding time shall be calculated using Ramseier's equation:

$$T = 0.085 \frac{DK}{Q}$$

Where: T = Shortest time, in seconds, allowed for the air pressure to drop 1.0 psig,
K = 0.000419 DL, but not less than 1.0
Q = 0.0015 cubic/minute.square feet of internal surface,

D = Nominal SEWER diameter in inches, and
L = Length of SEWER being rested in feet.

Except, In sensitive areas of water sources, the test pressure will be held at a minimum of ten (10) minutes with no pressure lost.

SECTION 906 - The following materials shall be the only generally acceptable materials for constructing SANITARY SEWERS discharging domestic SEWAGE or wastewaters to a PUBLIC SEWAGE SYSTEM. Othe materials may be employed only with specific written permission from the COMMISSIONERS.

CAST IRON PIPE

a. Pipe - Class 100	ANSI A21.6 or A21.8
b. Fittings	ANSI A21.10
c. Rubber Gasketed Joints - Mechanical and push-on type	ANSI 21.11
d. Coatings - Cement mortar lining, bituminous coatings inside and outside	ANSI A21.4
e. Acrylonitrile - Butadiene - Styrene (ABS) Pipe	
a. Pipe	ASTM D2751
b. Solvent and Cement	ASTM D2780

POLY (VINYL CHLORIDE) (PVC)

a. Pipe and Fittings	ASTM D3034
b. Joints - Bell & Spigot, rubber compression type	ASTM D1869

CAST IRON SOIL PIPE

a. Pipe and Fittings	ASTM A74
b. Joints - Lead and twisted jute or rubber ring compression type	ASTM C564

DUCTILE IRON PIPE (for sensitive field conditions)

a. Pipe and Fittings	
1. Class 50 for 3" to 6" Diameter Pipe	ANSI A21.50
2. Class 51 for 8" to 10" Diameter Pipe	AND A21.51

b. Joints - Push-on or mechanical joints ANSI 21.11

SECTION 907 - The preceding materials represent minimum requirements; higher strength materials shall be used when required by the COMMISSIONERS.

ARTICLE 10 - POWERS AND AUTHORITY OF INSPECTORS

SECTION 1001 - Selectmen, Health Officer, COMMISSIONERS and other duly authorized employees of the TOWN bearing proper Identification shall be permitted to enter upon all properties for the purposes of inspection, observation, measurement, sampling and testing in accord with this ORDINANCE. They shall have no authority to inquire into any industrial processes including metallurgical, chemical, oil, refining, ceramic, paper, or other, except to the extent such industry has a direct bearing on the source of discharge to the SEWERS, waterways or PUBLIC SEWAGE FACILITIES.

ARTICLE 11 -SEWER CHARGES

SECTION 1101 - OPERATION AND MAINTENANCE - An annual charge shall be determined by the COMMISSIONERS and such charge is hereby imposed upon each parcel of real property having a building or structure and served by thePUBLIC SEWAGE SYSTEM. This charge shall be used by the TOWN for the payment of the costs of operating, maintaining, and repairing such system.

SECTION 1102 - Charges shall be determined for recovery of capital costs and administrative costs whether or not the property is occupied and whether or not such system is being used.

SECTION 1103 - CAPITAL COSTS - Design and construction costs of a PUBLIC SEWAGE SYSTEM expansion or extension which has been approved by the COMMISSIONERS shall be borne through the assessment of a capital construction fee on the developer or OWNER requiring, requesting, or directly benefiting from such extension or expansion, unless the voters of the TOWN shall vote at a duly warned annual or special TOWN Meeting to assume all or a portion of such costs involved. When the voters of the TOWN vote to assume all or a portion of such costs, such costs will be paid from the collection of taxes unless the voters of the TOWN approve some other means of raising the required monies.

SECTION 1105 - COLLECTION - Collection of delinquent charges shall be enforced by the TOWN. In the event any charge is not paid within thirty (30) days from the billing date, a late penalty shall be added to the sewer charge together with interest. The amount of the late penalty and the interest rate on overdue charges shall be the same as those applied to the collection of real estate taxes. If payment is not made, such charges shall be a lien upon such real estate in the same manner and to the same effect as real estate taxes are a lien upon real estate under 32 V.S.A. Sec. 5061.

ARTICLE 12 -DEDICATED FUND FOR MAJOR REHABILITATION, MAJOR MAINTENANCE AND UPGRADE COSTS

SECTION 1201 - The COMMISSIONERS may create a dedicated fund to finance major maintenance, major rehabilitation and upgrade costs for the PUBLIC SEWAGE SYSTEM. Such dedicated fund may be authorized through a written policy of the TOWN enacted by the Board of Selectmen. Any such policy shall contain at least the following: major rehabilitation, major maintenance, and upgrade identification, estimated costs, estimated year of expenditure, contribution amount, type of account to be used to hold fund contributions, source of funding and when contributions are to stop. Alternatively, a dedicated fund may be established at a TOWN Meeting pursuant to 24 V.S.A. Sec. 2804.

SECTION 1202 - Total annual contributions to the dedicated fund shall not exceed 15% of the normal operations, maintenance and bond payment costs. The COMMISSIONERS shall have authority to withdraw from the dedicated fund amounts only for the purpose of paying for major rehabilitation, major maintenance and upgrade costs.

SECTION 1203 - When dedicated fund assets are not fully disbursed remaining shall be retained in the fund for future expenditures. This fund shall not exceed the estimated future major rehabilitation, major maintenance, and upgrade costs.

ARTICLE 13 - ENFORCEMENT AND PENALTIES

A violation of this ORDINANCE shall be a civil matter enforced in accord with the provisions of 24 VSA, Chapter 59. A civil penalty of not more than $500.00 shall be imposed for a violation of this civil ORDINANCE and the waiver fee shall be $100.00 for a first offense, and $300.00 for a subsequent offense within six months of the most recent offense. Each day a violation continues constitutes a separate violation.

ARTICLE 14 - APPLICATIONS/PERMITS/FEES

SECTION 1401 - Applications for permits shall be made on forms established and provided by the COMMISSIONERS.

SECTION 1402 - Any false or misleading statement in any application for a permit shall invalidate the permit and shall be deemed a violation of this ORDINANCE.

SECTION 1403 - Any permit issued by the COMMISSIONERS may be suspended or revoked by the COMMISSIONERS at any time for:

a. Violation of any provision of this ORDINANCE.
b. Violation of the specific terms and conditions of the permit.

c. Refusal to allow inspection by the COMMISSIONERS of their duly authorized representatives.

SECTION 1404 - The COMMISSIONERS, or MUNICIPAL DESIGNESS, may orally suspend or revoke a permit at any time for any practice or operation which violates or contravenes the provisions or the purpose of this ORDINANCE or the permit whereupon the suspension or revocation shall take effect immediately. Such action shall promptly be confirmed in writing by the COMMISSIONERS. When possible, the COMMISSIONERS shall provide written notice to desist from or make correction of any practice or operation which violates or contravenes the provisions or the purpose of this ORDINANCE or a permit and shall allow reasonable time for correction of the violation.

SECTION 1405 - All permits must be kept on the premises to which the permit pertains and shall be made available to the COMMISSIONERS or their duly authorized representatives at any time. Failure to keep permits available shall be presumptive evidence that the work or operation is conducted without a permit and is in violation of this ORDINANCE.

SECTION 1406 - All fees required by this ORDINANCE shall be determined by the COMMISSIONERS and a schedule thereof shall be posted in the office of the CLERK. All fees shall be payable to the TOWN and delivered to the TOWN TREASURER.

ARTICLE 15 - VALIDITY

SECTION 1501 - All rules and regulations in the TOWN in conflict herewith are hereby repealed.

SECTION 1502 - Each section or part of a section in this ORDINANCE is hereby declared to be a separate and distinct enactment. If any section, or portion thereof, is found to be void, invalid, unconstitutional, inoperative, or ineffective for any cause, such funding shall not affect the validity of any other section, or part thereof, which can be given effect without such invalid part or parts.

ARTICLE 16 -CIVIL ORDINANCE DESIGNATION

This ORDINANCE is designated as a civil ORDINANCE.

ARTICLE 17 - ORDINANCE ADOPTED AND IN FORCE

SECTION 1701 - Duly adopted and ordained by the BOARD of Selectmen of the TOWN of Whitingham, Windham County, State of Vermont, on this 26th day of January, 2000, at a duly called and duly held meeting. This ORDINANCE shall become effective sixty (60) days from the date hereof.

Attest by:

Earle S. Holland

Earie Holland, TOWN CLERK

1-26-2000

Richard M. Tefft

Richard Tefft, Chair

Steven A. Morse

Steven Morse, Member

Norman O. Stevens

Norman Stevens, Member

Keith Bronson

Keith Bronson, Member

Allan Twitchell

Allan Twitchell, Member

WHITINGHAM, VERMONT
TOWN CLERK'S OFFICE
RECEIVED FOR RECORD
this 16 day of NOV
A.D. 2000 at 11 o'clock
30 minutes A M. and
Recorded in Vol. 16 at
Page 436 of LAND RECOR...
Attest Earle S. Holland
Town Clerk

ORDINANCE REGULATING THE USE OF PUBLIC AND PRIVATE SANITARY SEWAGE SYSTEMS TOWN OF WHITINGHAM

DELINQUENT SEWER FEE COLLECTION POLICY

When the sewer fees remain unpaid more than two billing periods, the TOWN TREASURER may issue a warrant for collection on the delinquent accounts to the TAX COLLECTOR who shall have the same power to enforce the collection and shall proceed in the same manner as provided by law for the collection of taxes under VSA 32 Subchapter 9 of Chapter 133. Upon receipt of the TOWN TREASURER'S warrant, the TAX COLLECTOR shall give notice to each delinquent sewer fee payer within 30 days. The TAX COLLECTOR shall notify each named sewer user of the following: amount delinquent, penalties, monthly interest charges, TAX COLLECTOR'S fee, total amount due including all fees and charges and dates and location where payment can be made. This notice shall be given to the sewer user at least 30 days before the payment due date. The notice should include the following statement: "If your sewer bill remains unpaid after the due date on this notice, you will be responsible for any additional fees and costs associated with the tax sale according to VSA 32 Section 5258."

Policy adopted on November 2, 2000

Sewer Commissioners:

Richard M. Tefft

Rosemary J. Tefft

Stewart Reynolds

Policy.wpd

APPENDIX H

Alternative 1- Design Summary from Equipment Manufacturers

WALKER PROCESS EQUIPMENT

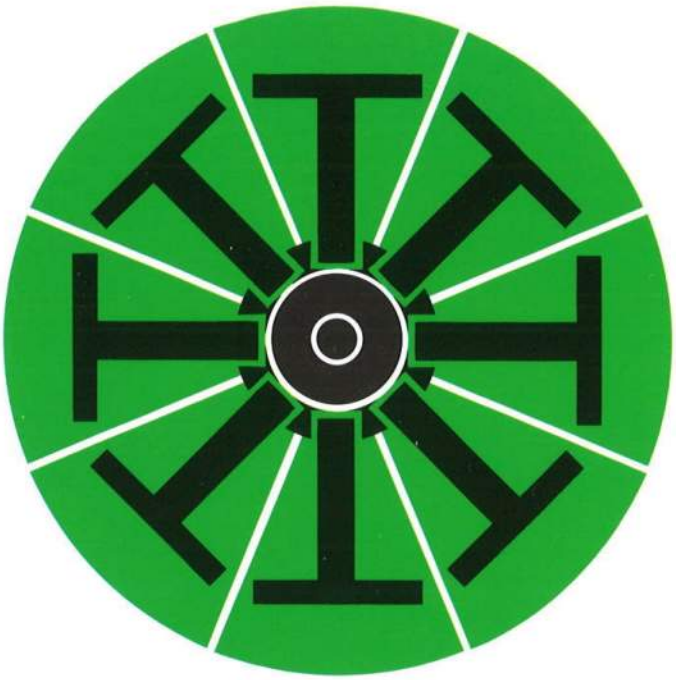
Dedicated to the Water & Wastewater Industry

DIVISION OF McNISH CORPORATION

EnviroDisc™

ROTATING BIOLOGICAL CONTACTOR

ROTATING BIOLOGICAL CONTACTOR SYSTEMS



The Walker Process Rotating Biological Contactor provides a simple and effective method of providing secondary and/or advanced wastewater treatment by a natural biological process.

The widespread use of Rotating Biological Contactors (RBC) began in Europe over two decades ago. Since the first installations in the United States in the early 1970's this wastewater treatment process has gained wide acceptance and has been applied successfully in hundreds of installations. They can be added to upgrade existing wastewater facilities or incorporated into the planning of new facilities. Rotating Biological Contactors are used to treat in a cost effective manner from 5,000 gallons to millions of gallons per day of domestic and industrial wastewaters.

The RBC process provides an extremely high degree of treatment providing effluent qualities as low as 5 mg/l of soluble Biochemical Oxygen Demand (BOD) and 1 mg/l ammonia nitrogen. They are also used for significantly lowering the levels of soluble organics and Chemical Oxygen Demand (COD).

The Walker Process Rotating Biological Contactor offers the user the following benefits:

- Low power requirements
- Low construction and installation costs
- Easily installed under any hydraulic gradient; minimum head loss
- Capability to treat high temperature waste — up to 90°F with standard media material
- Eliminates the need for operator control of oxygen and solids return
- Reduced chemical and electrical needs minimize operation costs
- Flexible design allows for units to be shipped fully assembled or knocked down for assembly in existing buildings
- Treatment flexibility with wastewater flow path variations

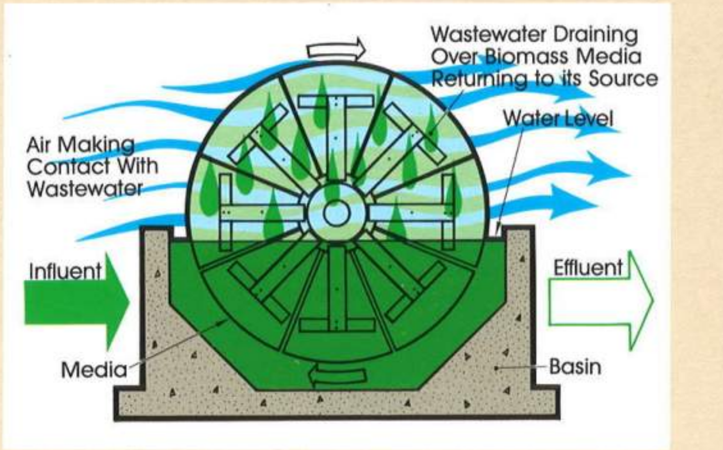
METHOD OF OPERATION

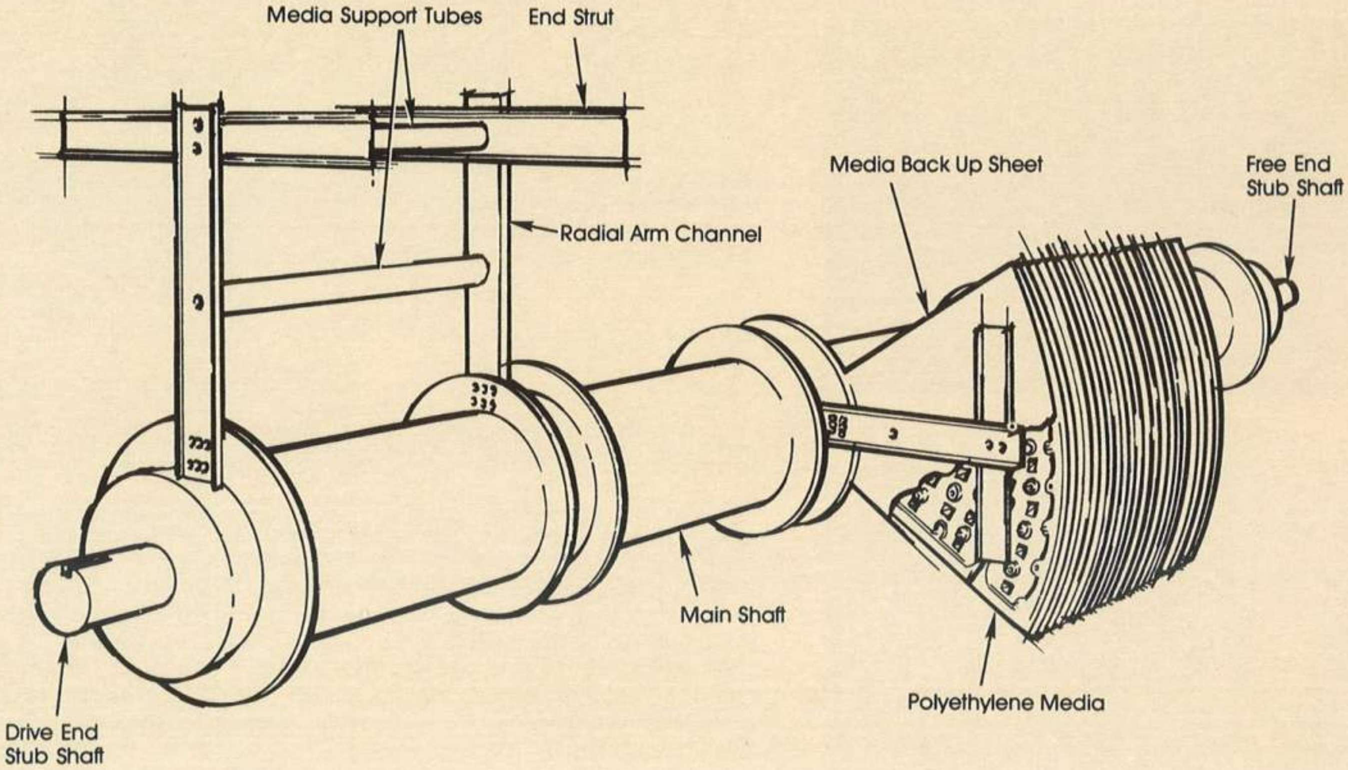
The Walker Process Rotating Biological Contactor consists of a multitude of plastic media sheets in bundles. These bundles are mounted on a shaft by means of a simple, internal radial structure. The vacuum formed plastic media sheets are assembled in a manner which provides intricate flow paths with maximum effective biological surface area. The media is designed to permit ample space between adjacent sheets and to provide sufficient turbulence and oxygenation when moving through the wastewater thus achieving the desired levels of liquid mixing and shear.

The RBC is immersed in wastewater to a depth which submerges approximately 40% of the media. When the RBC is rotated at a normal operating speed of 1-1/2 RPM the media is alternately exposed to the air and wastewater. Once exposed to wastewater a biological growth begins to develop on the plastic media, using the contaminants in the effluent as their food source. As the RBC rotates, the media with biomass growth will continuously come out of the wastewater with each rotation of the shaft. When the media lifts from the effluent in the treatment basin, some of the wastewater is carried out on the media. The wastewater immediately begins draining over the media back to its source. This draining action provides a thin film of liquid which permits high exchange rates of oxygen from the atmosphere to the liquid. It also allows for the release of gaseous by-products of the biogrowth to the air.

As long as neither food nor oxygen become limiting factors the biogrowth continues to grow. Through several mechanisms, predominantly the shearing action from the rotation of the RBC shaft, the biogrowth is continously being sloughed off on a gradual basis from the media. As the sloughing of the biogrowth occurs new organisms grow to replace it.

The sloughed biomass becomes suspended solids and eventually sludge in a clarifier. Since the biomass attached to the media represents 99% of the system's biogrowth, the recycling of sludge is not required. Once the effluent is treated by the RBC, it flows to a secondary clarifier for suspended solids removal and discharged to the receiving water source.

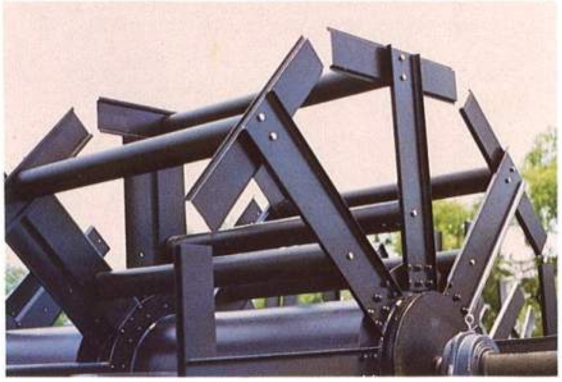




DESIGN FEATURES OF THE WALKER ENVIRODISC™ ROTATING BIOLOGICAL CONTACTOR

BIOMASS MEDIA

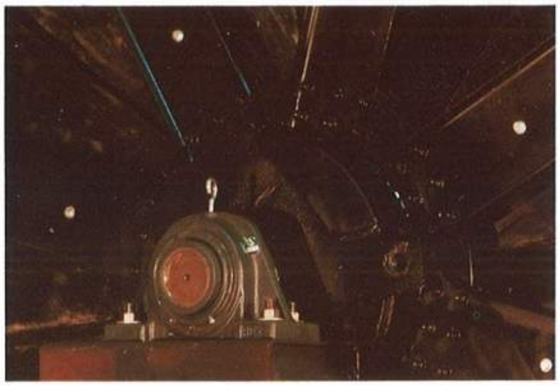
The biomass media bundles are a multitude of thin individual wedge-shaped sheets of high molecular weight polyethylene. The media is vacuum thermoformed with a pattern of truncated pyramids and conical spacers which provide maximum surface and drainage area while contributing to the rigidity of the sheet. The conical spacers allow for a clog free flow path between the sheets of media. This configuration creates an open media system which allows for excellent contact of wastewater and oxygen with the biomass. The media bundles are fully removable from their supporting members without having to raise or remove the entire shaft assembly.



MEDIA SUPPORT STRUCTURE & SHAFT

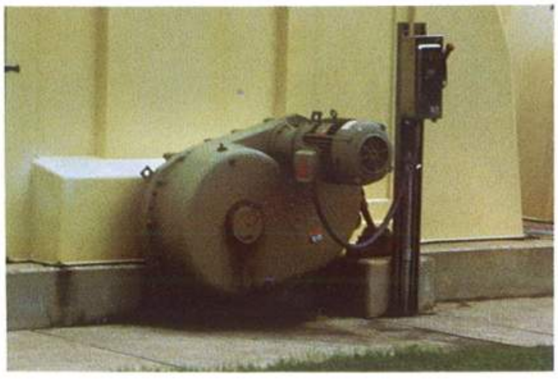
The media support structure consists of dual support tubes which are mounted to the radial structure. The radial structure is attached directly to mounting rings which are welded to the main shaft of the RBC. Dual support tubes pass through the media with operational loading being distributed throughout the plastic media at acceptable levels rather than being concentrated. For added strength the media has a support tube reinforcing collar molded in it.

The shaft is a fabricated carbon steel cylinder which is coated with coal tar epoxy for corrosion resistance. The use of a cylindrical shape eliminates the stress risers that occur when square or other angular shapes are rotated.



SHAFT BEARING

The main shaft uses heavy duty, self aligning, pillow-block roller bearings. They are designed for high humidity, slow speed operation with a B-10 life of over twenty years of operating loads and speeds. The drive end of the shaft is equipped with an expansion type bearing to allow for expansion and contraction of the shaft while the free end has a non-expansion type bearing. The bearings are equipped with springloaded bearing lip seals which are designed to maintain contact with the shaft if misalignment should occur.



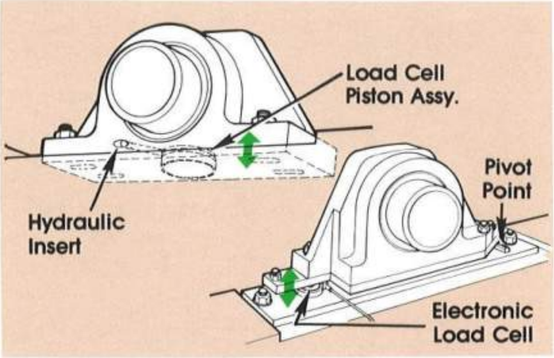
DRIVE SYSTEM

The drive unit for the Walker Process Rotating Biological Contactor was designed in cooperation with the gear reducer manufacturer for reliable and energy efficient operation. The drive system is mounted directly on the stub end of the shaft for ease of installation and maintenance. By mounting the drive directly on the shaft adjustable bases are not required. The drive motor is directly coupled to the gear reducer eliminating belts and sheaves. A two piece weather-proof corrosion resistant casing fully encloses the drive system and is specially designed or operation in high humidity areas.

OPTIONAL EQUIPMENT

FIBERGLASS ENCLOSURES

The fiberglass enclosures are custom designed for use with RBC assemblies and feature modular interlocking construction for ease of assembly in the field. Because of their design interlocking sections allow for partial ventilation of the RBC shafts. Access doors and inspection ports are included with the enclosures. The enclosures can also be provided with insulation for use in colder climates.



BEARING LOAD CELLS

Two types of bearing load cells are available for weighing the RBC shaft while it is operating. Either type monitors the growth of the biomass forming on the shaft assembly. The far left illustration shows the hydraulic cell type. It is filled with a quick disconnect for use with a portable hydraulic pump and gauge system for periodic inspection. The near left illustration shows an electronic load cell system for automatic and continuous monitoring of biomass weight.

HIGH DENSITY MEDIA

When the RBC is used for nitrification and/or low BOD environments the media spacing may be reduced. Both the nitrifying and carbonaceous organisms develop in a less dense growth so less space between the media is required. The use of high density media decreases the space between each sheet while increasing the surface area of the RBC. The overall length of the RBC shaft is not affected.

PROCESSES

BOD & COD REDUCTION

Influent BOD can be easily reduced using the rotating biological contactor process. Levels of soluble BOD can be lowered to 5 mg/l. Processes with properly designed basins and staging can achieve 90% or more COD reduction.

NITRIFICATION

When the proper influent environmental conditions exist within the wastewater such as alkalinity, temperature, low BOD, and ph, the reduction of ammonia nitrogen can be easily achieved. Ammonia nitrogen values can be reduced to values less than 1.0 mg/l.

AIR STRIPPING OF CHEMICALS

Since the Rotating Biological Contactor process is less susceptible to upset from toxic and hydraulic shock, its applications extend beyond the treatment of typical domestic and industrial wastes. RBC's can be used for air stripping and biological degradation of materials found in wastewater or contaminated groundwater. RBC's have been used successfully to remove acetone, cyanide, ammonia, chlorinated compounds, organic solvents, as well as many other materials from wastewater.

DESIGN CONSIDERATIONS

Proper evaluation and application of an RBC system requires careful consideration of many factors that affect system sizing and performance. The first step in properly designing a system is to determine the basic wastewaster characteristics and effluent requirements. Design can be completed with the following parameters:

INFLUENT TO RBC SYSTEM

Flow, daily average .... GPD
Flow, peak two hour duration .... GPD
Flow, minimum .... GPD
Total BOD_5 .... mg/l
Soluble BOD_5 .... mg/l
TSS .... mg/l
*TKN .... mg/l
*NH_3N .... mg/l
*Alkalinity ($CaCO_3$) .... mg/l
Temperature/summer .... °F
Temperature/winter .... °F
pH ....

When ammonia nitrogen reduction is required.

EFFLUENT

Total BOD_5 .... mg/l
Soluble BOD_5 .... mg/l
*NH_3N/summer .... mg/l
*NH_3N/winter .... mg/l

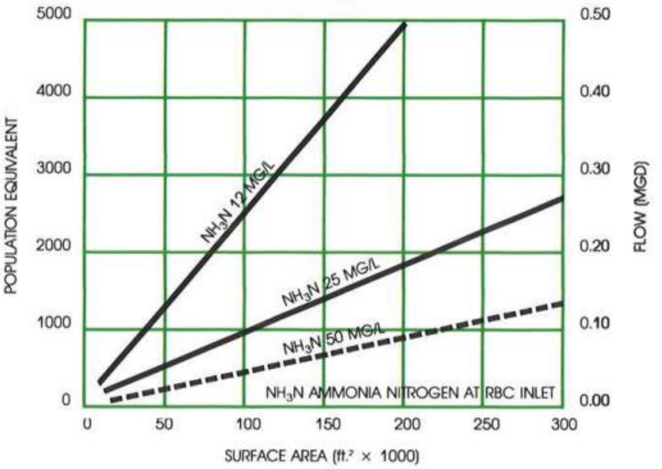
In evaluating these parameters, the designer will also rationally apply loading values, temperature corrections, staging and other design considerations to arrive at the proper RBC system size and arrangement.

For purposes of allowing the designer to gain a rough approximation of the RBC system for his application, Walker Process has developed sizing charts for determining surface area required for various BOD_5 and NH_3N loadings. These are preliminary design values, of course, and the designer should contact his local Walker Process Sales Representative for specific information. Walker Process engineers will assist the designer and will perform a careful analysis of each particular application and provide specific information suitable for that application. Proper shaft arrangement, staging and exact design application can significantly affect the surface area from the charts. Consult Walker Process for flows or influent loadings beyond the limits of the curves.

SIZING CHARTS

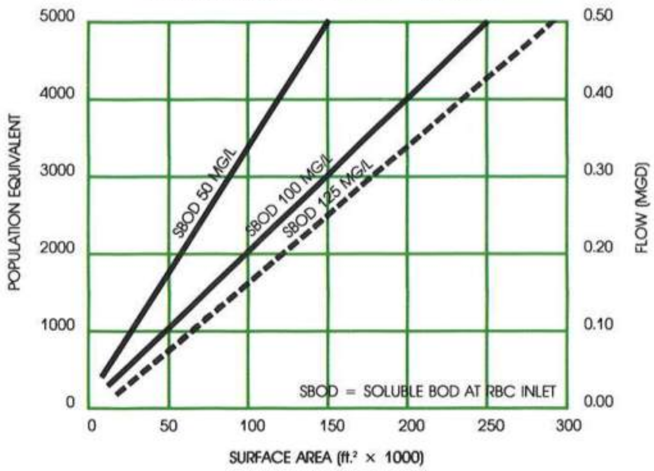
NH_3N REMOVAL

FOR EFFLUENT NH_3N OF 4 MG/L



BOD REMOVAL

FOR EFFLUENT SBOD OF 15 MG/L



TEMPERATURE CORRECTION TABLE

TEMP. (°F)	TEMP. CORR. FACTOR
45	0.56
50	0.78
55	1.00

TEMPERATURE CORRECTION TABLE

TEMP. (°F)	TEMP. CORR. FACTOR
45	0.73
50	0.87
55	1.00

FOOTNOTES

1. Charts are based on 100 GPD/capita.
2. Temperature correction must be applied to values from charts below temperatures of 55° F.
3. Effluent total BOD is 30 mg/l with soluble BOD of 15 mg/l.
4. Normally, and for purposes of approximation, standard density media is applied for BOD removal and high density media for NH_3H removal.
5. Standard shafts normally utilize 100,000 ft.² (standard density) and 150,000 ft.² (high density) maximum media surface area per shaft. For total surface areas beyond these values apply multiple shafts.
6. NH_3N removal chart assumes SBOD level is reduced to about 15 mg/l.
7. For purposes of approximation, add surface areas obtained from the charts for combined BOD and NH_3N removal. In actual practice this is generally conservative.
8. Flowrates may have to be adjusted prior to entering the charts if the peak to average ratio exceeds 2.5.
9. Consult Walker Process for values not listed in the charts, for specific design applications, and staging arrangements.

EXAMPLES

Example 1: (BOD removal only)

Flow = 0.28 MGD

SBOD = 100 mg/l (RBC Influent)

TBOD = 30 mg/l (effluent)

Winter min. wastewater temperature = 45° F

From chart: 140,000 ft.² is required.
Applying temperature correction:

$$\frac{140{,}000}{0.73} = 191{,}800 \text{ ft.}^2$$

Use two standard density shafts @ 100,000 ft.² each; 200,000 ft.² total; two parallel tanks.

Example 2: (BOD and NH_3N removal)

Flow = 0.45 MGD

SBOD = 50 mg/l (RBC Influent)

NH_3N = 12 mg/l (RBC Influent)

TBOD = 30 mg/l (effluent)

NH_3N = 4 mg/l (effluent)

Winter min. wastewater temperature = 45° F

From charts and applying correction factors:

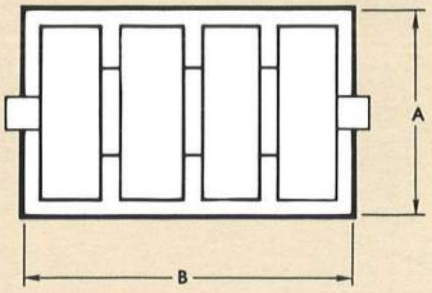
For BOD removal: $\frac{130{,}000}{0.73} = 178{,}000 \text{ ft.}^2$

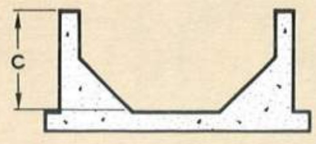
For NH_3N removal: $\frac{180{,}000}{0.56} = 321{,}000 \text{ ft.}^2$

Use two standard density shafts @ 100,000 ft.² each; two high density shafts @ 150,000 ft.² each; 500,000 ft.² total; two parallel tanks.

DIMENSIONAL DATA:

MODEL	Media Area*	Tank Width A	Tank Length B	Tank Depth C	Shaft Weight Less Biomass	Horsepower
A-10	11,000	13′ - 0″	6′ - 7″	6′ - 6″	6,500	1
B-15	16,500	13′ - 0″	7′ - 10″	6′ - 6″	7,500	1-1/2
B-20	22,000	13′ - 0″	9′ - 1″	6′ - 6″	8,250	1-1/2
C-25	27,500	13′ - 0″	10′ - 4″	6′ - 6″	9,250	2
C-30	33,000	13′ - 0″	11′ - 7″	6′ - 6″	10,000	2
D-37	42,000	13′ - 0″	13′ - 4″	6′ - 6″	11,250	3
D-45	51,000	13′ - 0″	15′ - 4″	6′ - 6″	12,500	3
E-53	60,000	13′ - 0″	17′ - 4″	6′ - 6″	14,500	3
E-62	70,000	13′ - 0″	19′ - 7″	6′ - 6″	16,500	5
E-69	79,000	13′ - 0″	21′ - 4″	6′ - 6″	17,500	5
F-77	88,000	13′ - 0″	23′ - 6″	6′ - 6″	20,500	5
F-89	100,000	13′ - 0″	26′ - 4″	6′ - 6″	22,500	5

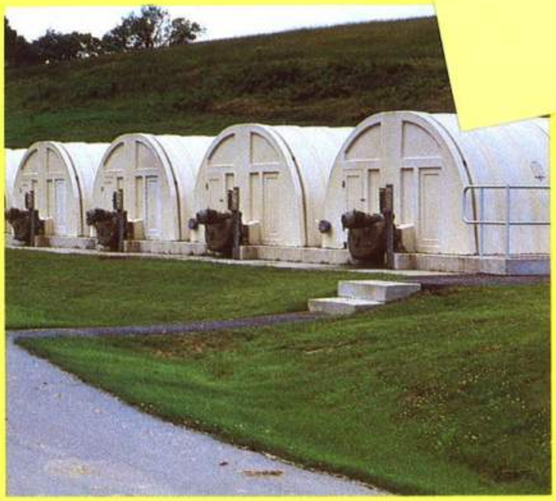




Dimensions subject to change without notice
*Areas shown are standard density media. Increase by 50% for high density media.

TYPICAL APPLICATIONS

Walker Process Equipment Rotating Biological Contactors have a proven track record in a variety of applications. Many sizes are available making them the ideal choice to meet the requirements of most wastewater treatment applications.



MUNICIPAL APPLICATIONS

The Rotating Biological Contactor has gained wide acceptance as the principal secondary treatment process for new facilities. They are also used as polishing systems to upgrade existing treatment plants to conform to existing discharge regulations. RBC's are particularly suitable to municipal applications due to the high degree of performance they deliver with relatively low energy requirements. Because of the modular configuration of the equipment more units can be easily added when additional plant capacity is required.

LAND DEVELOPMENT APPLICATIONS

The Rotating Biological Contactor process is well suited for use in land development applications such as subdivisions, apartment complexes, nursing homes, mobile home parks and campgrounds. The simplicity of operation and high treatment efficiency of RBC's make them an ideal choice for new installations or for the expansion of existing plants.

INDUSTRIAL APPLICATIONS

The reduction of high BOD and COD levels found in wastewater prior to discharge is essential to the efficient and profitable operation of manufacturers in the processing industries. Rotating Biological Contactors have been used successfully in food processing plants such as dairies, cheese producers, large bakeries, wineries, distilleries and poultry processing. They have also been used in applications treating wastewater from petroleum refining facilities, steel mill blast furnace blowdown, and chemical plant effluent.

In addition to EnviroDisc™ Rotating Biological Contactors, Walker Process supplies a full line of water and wastewater components and systems including clarifiers, anaerobic digestion equipment, Solids Contact Clarifiers, Filters and much more. Sales Representatives are located throughout the United States and in foreign countries. For specific recommendations or for further information and assistance on this product or any other, write or call your local Sales Representative.

WALKER PROCESS EQUIPMENT

DIVISION OF McNISH CORPORATION

WALKER PROCESS EQUIPMENT
DIVISION OF McNISH CORPORATION
840 North Russell Avenue
Aurora, IL 60506 U.S.A.
PHONE: 708-892-7921
FAX: 708-892-7951

Bulletin No. 11-S-95

Evoqua Water Technologies
Envirex® Rotating Biological Contactors
Questionnaire

Project: Jacksonville WWTF

Engineer: Weston & Sampson

Please supply the following information:

		Max.	Ave.	Min.
1.	Flow – MGD*		0.0501	
2.	T-BOD_5 – mg/l			
3.	S-BOD_5 – mg/l			
4.	TSS – mg/l			
5.	VSS – mg/l			
6.	TKN – mg/l			
7.	NH_3 – mg/l			
8.	Phosphorus – mg/l			
9.	Water Temperature – °F			
10.	pH			
11.	Alkalinity @ $CaCO_3$ – mg/l			

* Please supply peak hourly and average daily flow rates.

12. Please note any pertinent industrial was contribution: none

13. Describe fully any biological treatment prior to RBC (grit removal and primary clarifier/settling are assumed: primary settling tanks upstream of unit

14. Effluent Requirements:
T-BOD_5 30 TSS 30 NH_3-N______ Total N ______ Total P____
Please note with an "X" if above values are not monthly average limitations.

15. Existing equipment to be used (blowers, process equipment, etc.):
primary settling tankage, EQ tankage

16. Physical constraints (area, depth, etc.): Footprint of existing facility

Please attach sketch of proposed system, existing or proposed site (if available).

17. Existing concrete tankage available: (X) Yes ( ) No If yes, give dimensions:
primary settling - four 16 x 14 x 4 cells
equalization - four 10 x 16 x 5.5 cells

18. Any other pertinent information:
plans of existing facilities attached.

RETURN TO:

Evoqua Water Technologies
2606 N. Grandview Blvd., Suite 130, Waukesha, WI 53188
TEL: 262-547-0141 FAX: 262-547-4120

Evoqua Water Technologies
Envirex® Rotating Biological Contactors
Questionnaire

Project: Whitingham WWTF

Engineer: Weston & Sampson

Please supply the following information:

		Max.	Ave.	Min.
1.	Flow – MGD*		0.0123	
2.	T-BOD_5 – mg/l			
3.	S-BOD_5 – mg/l			
4.	TSS – mg/l			
5.	VSS – mg/l			
6.	TKN – mg/l			
7.	NH_3 – mg/l			
8.	Phosphorus – mg/l			
9.	Water Temperature – °F			
10.	pH			
11.	Alkalinity @ $CaCO_3$ – mg/l			

* Please supply peak hourly and average daily flow rates.

12. Please note any pertinent industrial was contribution: none

13. Describe fully any biological treatment prior to RBC (grit removal and primary clarifier/settling are assumed: primary settling tanks upstream of unit

14. Effluent Requirements:
T-BOD_5 30 TSS 30 NH_3-N______ Total N ______ Total P____
Please note with an "X" if above values are not monthly average limitations.

15. Existing equipment to be used (blowers, process equipment, etc.): primary settling tankage, EQ tankage

16. Physical constraints (area, depth, etc.): Footprint of existing facility

Please attach sketch of proposed system, existing or proposed site (if available).

17. Existing concrete tankage available: (X) Yes ( ) No If yes, give dimensions:
primary settling - three 8 x 15 x 5 cells
equalization - two 9 x 15 x 5.5 cells

18. Any other pertinent information:
plans of existing facilities attached.

RETURN TO:
Evoqua Water Technologies
2606 N. Grandview Blvd., Suite 130, Waukesha, WI 53188
TEL: 262-547-0141 FAX: 262-547-4120

Mullen, Shane

From: Dennis Geran <dennisgeran@frmahony.com>
Sent: Tuesday, February 26, 2019 10:25 AM
To: Mullen, Shane
Subject: FW: whitingham VT - RBC quote
Attachments: EnviroDisc 11-S-95 (1995).pdf

Shane,
Please review the suggestions from Walker Process regarding the replacement RBC's. We team up with Legacy Environmental to supply the tankage for the RBCs. The tanks are epoxy coated carbon steel. A budget price for a tank for the model A10N2 unit is $95,000.00. A budget price for the tank for the model D45 is $150,000.00. Do not hesitate to contact me if you would like to discuss.
Regards,
Dennis Geran
781-254-3855

From: Jeff Thomas <jthomas@walker-process.com>
Sent: Monday, February 25, 2019 11:48 AM
To: Dennis Geran <dennisgeran@frmahony.com>
Subject: RE: whitingham VT - RBC quote

Dennis:

Upon review, based on the media surface area of the existing unit, we would suggest a A10N2 RBC for the Whitingham facility. A new steel tank will be required as the existing tank appears to be slightly narrower and shallower than what is needed for the suggested model. The A10N2 has a media area of 13,750 ft². Tank width is 13'-0", tank length is 6'-7" and the tank depth is 6'-6". A Budget price for this unit would be $50,000. This includes the FRP cover, however, it does not include the steel tank. Freight & Field Service are included.

Based on the media surface area of the existing unit, we would suggest a D45 RBC for the Jacksonville facility. A new steel tank will be required as the existing tank appears to be slightly narrower and shallower than what is needed for the suggested model. The D45 has a media area of 51,000 ft². Tank width is 13'-0", tank length is 15'-4" and the tank depth is 6'-6". A Budget price for this unit would be $80,000. This includes the FRP cover, however, it does not include the steel tank. Freight & Field Service are included.

The above pricing is based on a direct drive arrangement in lieu of the existing chain and sprocket arrangement.

Hope this helps!

Jeffrey C. Thomas
Regional Sales Manager

Walker Process Equipment

Division of McNish Corporation
840 N. Russell Ave
Aurora, IL 60506
(630) 264-5213 Direct Line

www.walker-process.com

From: Dennis Geran [mailto:dennisgeran@frmahony.com]
Sent: Monday, February 25, 2019 9:44 AM
To: Jeff Thomas
Subject: FW: whitingham vt - RBC quote

Jeff,
Give me a call regarding this project.
Regards,
Dennis Geran
781-254-3855

From: Mullen, Shane <MullenS@wseinc.com>
Sent: Friday, February 22, 2019 4:41 PM
To: Dennis Geran <dennisgeran@frmahony.com>
Subject: whitingham vt - RBC quote

Dennis,

Good talking to you. As discussed, attached are excerpts from the O&M manual and old design plans to give some context of the two facilities. We are looking for budgetary quotes for new RBCs to replace the existing aging units. Let me know if you have any questions on this matter.

Regards,

Shane M. Mullen, PE, CPESC
SENIOR PROJECT ENGINEER
direct: 802-882-7030
mobile: 802-595-4495

Weston & Sampson

Weston & Sampson
98 South Main Street, Suite 2 | Waterbury, Vermont 05676
tel: 802-244-5051
westonandsampson.com

Facebook | Twitter | LinkedIn

APPENDIX I

Alternative 4 - Design Summary from Equipment Manufacturers

JACKSONVILLE WWTF VT AASI Design Number 155620

Avg Flow (MGD):	0.05
Unit Selected:	Aqua BioMax 35/4
Unit Quantity:	1

I. LUBRICATION REQUIREMENTS

	# of Units		Minutes/Unit		Times/Year		Hours/Year
1) Backwash / Solids Pump - Routine Lubrication:	1	X	5	X	12	/ 60 =	1.00
2) Backwash / Solids Pump - Drain and Refill:	1	X	30	X	1	/ 60 =	0.50
3) Support shaft bearing:	1	X	30	X	4	/ 60 =	2.00
4) Drive motor:	1	X	20	X	0.2	/ 60 =	0.07
5) Gearbox:	1	X	20	X	0.2	/ 60 =	0.07

TOTAL LUBRICATION REQUIREMENTS: 3.57

II. PARTS REPLACEMENT

	Replace Interval (Years)	# of Units		Minutes/Unit		Hours Per Replacement	Material Cost Per Unit	Total Material Cost
1) Filter Media Cloth	4	1	X	720	=	12	$ 1,160.00	$ 1,160.00
2) Drive Motor	10	1	X	240	=	4	$ 1,500.00	$ 1,500.00
3) Pumps	7	2	X	120	=	4	$ 400.00	$ 800.00

III. POWER CONSUMPTION

	Power Consumption (kW-hrs /year)
Total Annual Power Usage:	6,190.0

6306 N. Alpine Rd. Loves Park, IL 61111-7655 p 815.654.2501 f 815.654.2508 www.aqua-aerobic.com

Process Design Report

JACKSONVILLE WWTF VT

Design# 155616

Option: Preliminary Design

Aqua BioMax®

Dual Treatment System

March 06, 2019

Designed By: Jakob Nowicki

6306 N. Alpine Rd Loves Park, IL 61111

(815) 654-2501 www.aqua-aerobic.com

Design Notes

Flow

- The maximum flow, as shown on the design, has been assumed as a hydraulic maximum and does not represent an additional organic load.

Pre- Aqua BioMax

- Neutralization is recommended/required ahead of the Aqua BioMax if the pH is expected to fall outside of 6.5-8.5 for significant durations.

Filtration

- The filter influent should be free of algae and other solids that are not filterable. Provisions to treat algae and condition the solids to be filterable are the responsibility of others.

- For this application, pile filter cloth is recommended.

Equipment

- Aqua-Aerobic Systems, Inc. is familiar with various “Buy American” Acts (i.e. AIS, ARRA, Federal FAR 52.225, EXIM Bank, USAid, PA Steel Products Act, etc.). As the project develops Aqua-Aerobic Systems can work with you to ensure full compliance of our goods with various Buy American provisions if they are applicable/required for the project. When applicable, please provide us with the specifics of the project’s “Buy American” provisions.

Aqua BioMax - Design Summary

DESIGN INFLUENT CONDITIONS

Avg. Design Flow	= 0.05 MGD	=	189	m^3/day
Max. Design Flow	= 0.05 MGD	=	189	m^3/day

DESIGN PARAMETERS	Influent	mg/l	Effluent Required	≤ mg/l	Effluent Anticipated	≤ mg/l
Bio/Chem Oxygen Demand:	BOD5*	154	BOD5	30	BOD5	30
Suspended Solids:	TSS**	66	TSS	30	TSS	30

* Assuming a 30 % reduction in BOD across the upstream septic ank

** Assuming a 70 % reduction in TSS across the upstream septic tank

SITE CONDITIONS	Maximum		Minimum		Design		Elevation (MSL)
Ambient Air Temperature:	80 °F	26.7 °C	40 °F	4.4 °C	80 °F	26.7 °C	1920 ft
Influent Waste Temperature:	68 °F	20 °C	50 °F	10 °C	68 °F	20 °C	585 m

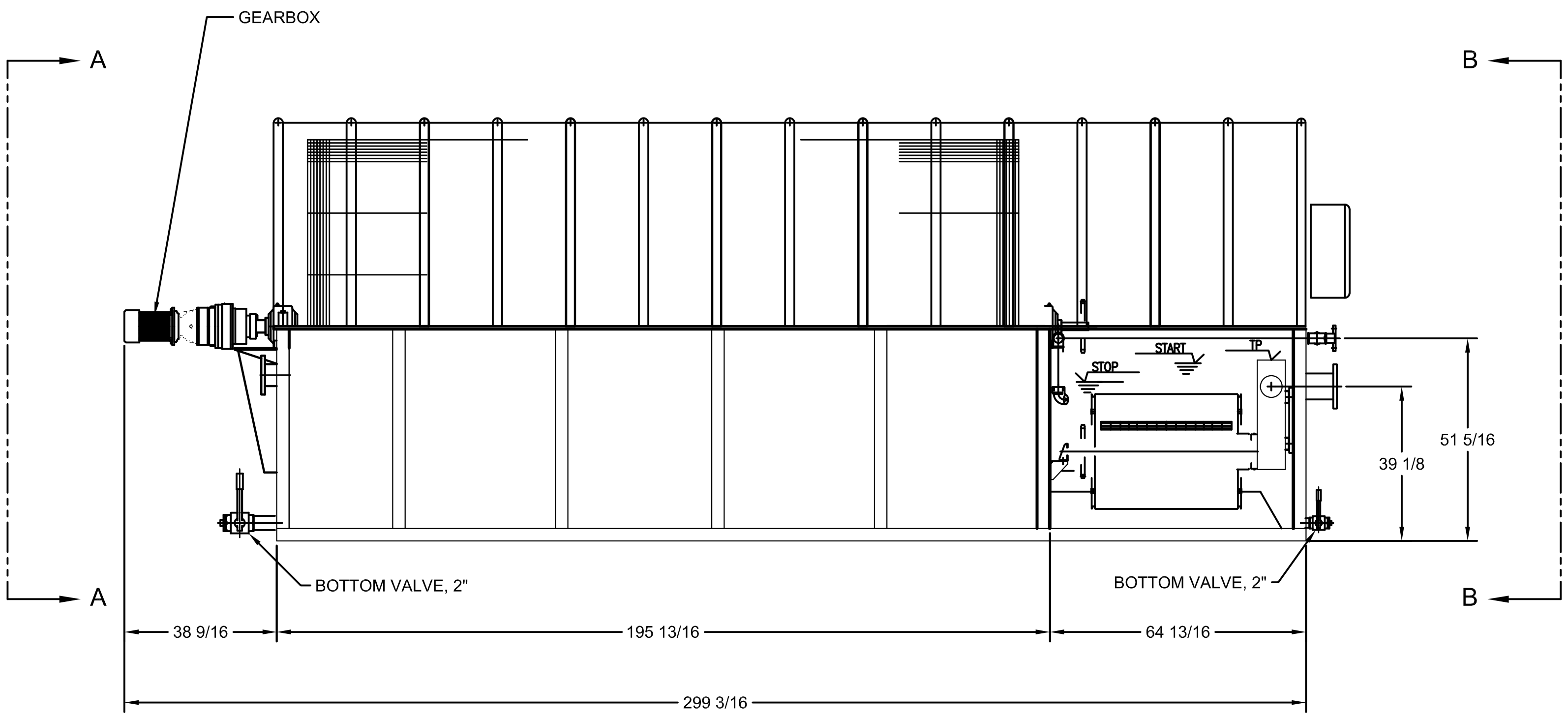
AquaBioMax RBC/CMF RECOMMENDATION

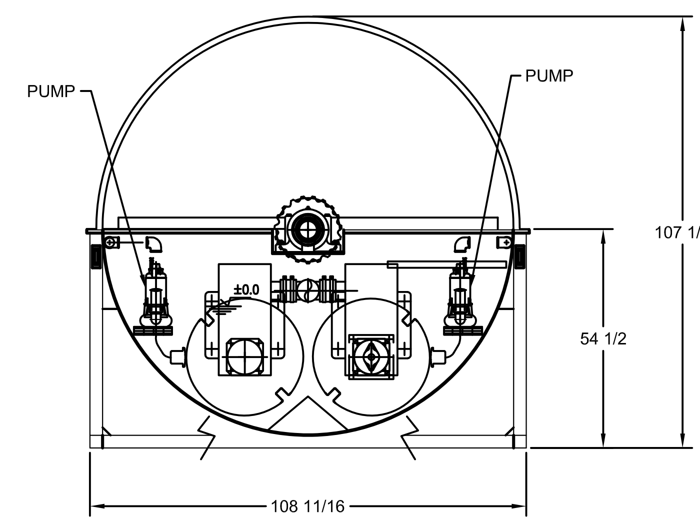
Qty of Units Recommended:	=	1			
Model Recommended:		**Aqua BioMax 35/4**			
Media Surface Area:	=	36,600	ft^2	3400	m^2
Filter Surface Area:	=	43	ft^2	4	m^2
Organic Loading Rate:	=	1.76	lbs BOD_5/1000 ft^2-day	8.57	g BOD_5/m^2-day
Nitrogen Loading Rate:	=	0.00	lbs NH_3-N/1000 ft^2-day	0.00	g NH_3-N/m^2-day
Max. Biodisc Hydraulic Loading Rate	=	1.37	gal/ft^2/day	0.06	m/day
Solids Produced:	=	32.1	lbs/day	14.57	kg/day
Backwash Flow Rate:	=	61.6	gpm	14.0	m^3/hr
Backwashes/Hour:	=	4	backwashes/hour/unit		
Total Daily Backwash Volume:	=	5,914	gallons/day	22.4	m^3/day
Avg. Filter Hydraulic Loading Rate:	=	0.90	gpm/ft^2	2.21	m^3/m^2-hr
Avg. Filter Solids Loading Rate:	=	0.7	lbs/ft^2-day	282	g/m^2-hr
Estimated Backwash Solids Concentration:	=	650	mg/L	650	g/m^3
Recommended 27.695-Day Septic Tank Storage Volume:		1070	ft^3	30	m^3
Total Power Consumption:	=	33.8	kW-hrs/day		

Aqua BioMax

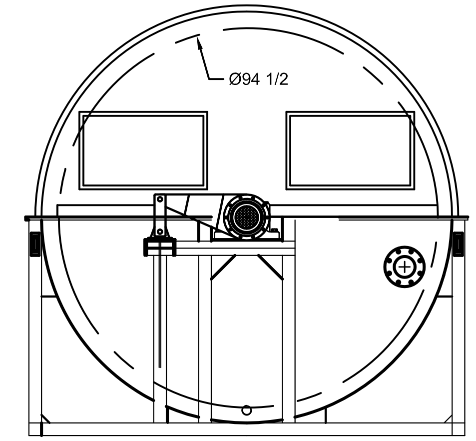
1 Aqua BioMax™ 35/4 Assembly(ies) will be provided as follows:

- Painted steel tank(s).
- Modular GRP, RAL 7035 cover(s).
- Isotactic polypropylene discs with stainless steel shaft.
- Galvanized steel arms, intermediate crosses, and flanges.
- Isotactic polypropylene spacers.
- Tank housing with roller bearings, sleeves, and stop rings.
- Gear reducer.
- 304 Stainless steel drum with filter cloth media.
- Cleaning device with suction nozzle and 1HP backwash pump(s).
- Level probes.
- Controls and appurtenances.

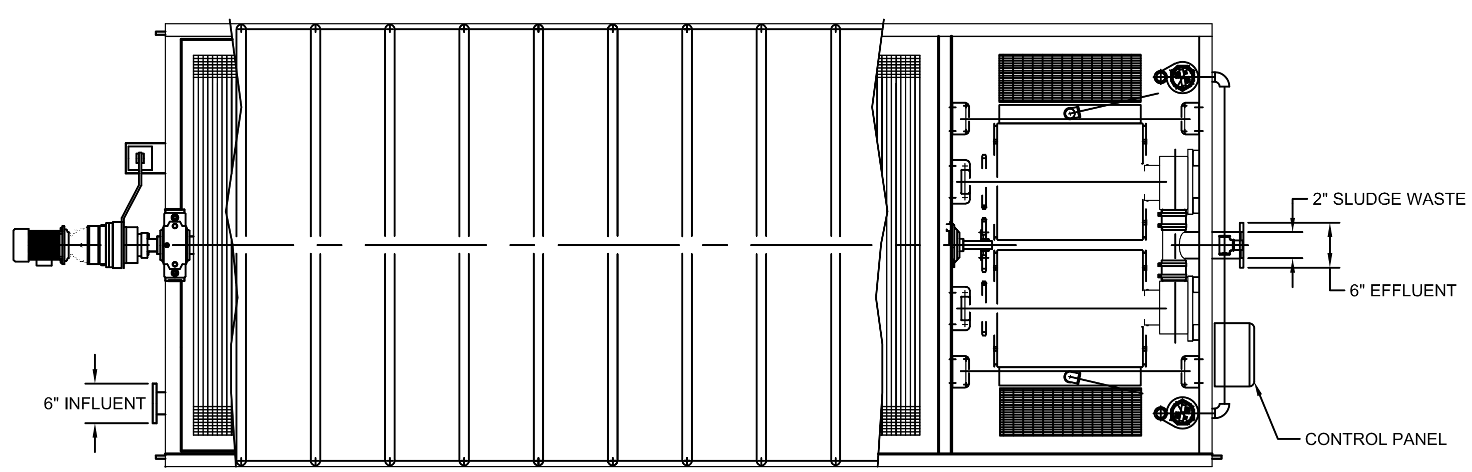




VIEW B-B



VIEW A-A



PLAN

NOT FOR CONSTRUCTION

JOB NAME:				
JOB LOCATION:				
REV	ERN / ECO	DATE	BY	REVISION DESCRIPTION
DRAWING NAME: AQUA BIOMAX, 35/4				

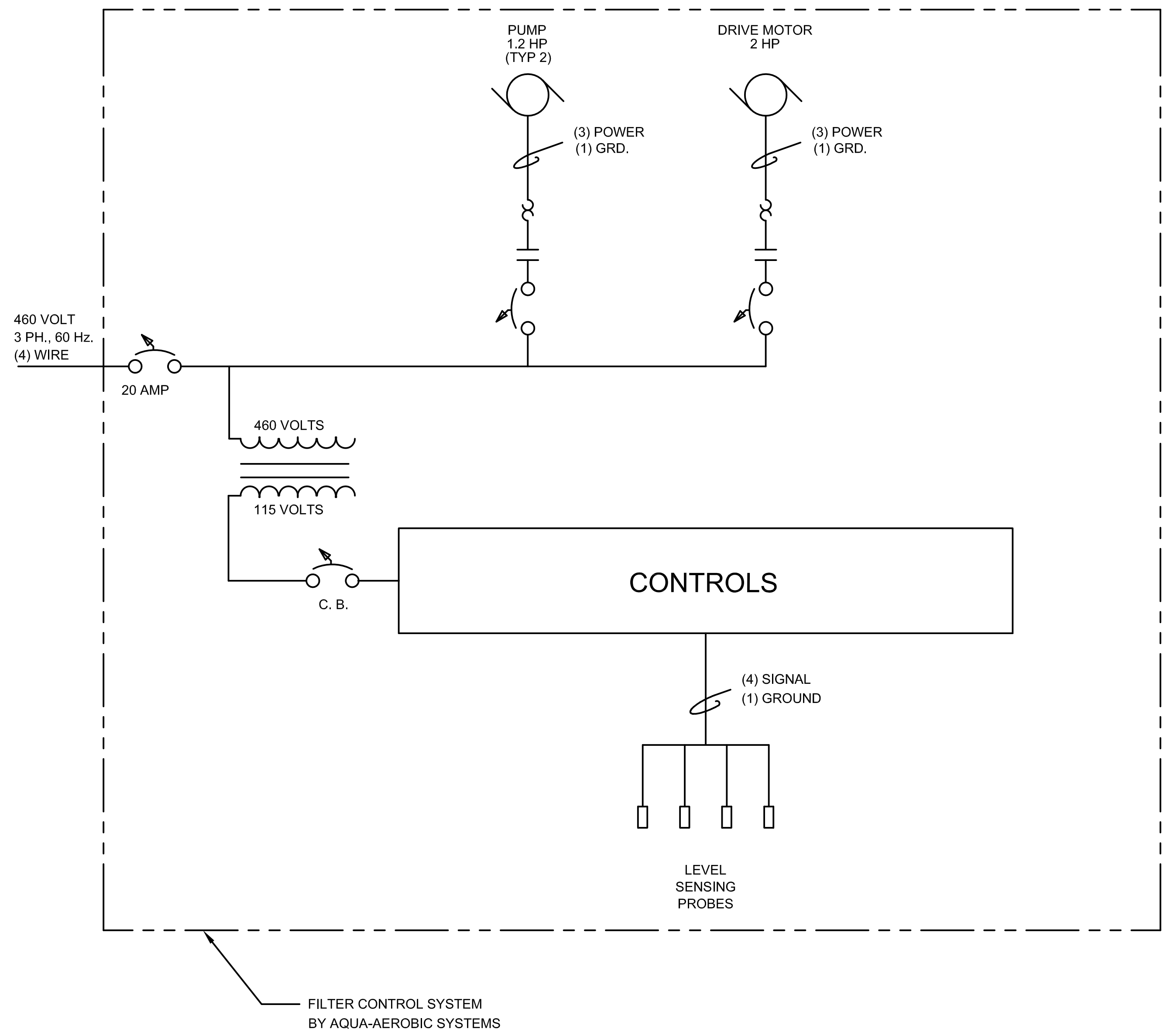
AQUA-AEROBIC SYSTEMS, INC.

DO NOT SCALE DRAWING	UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES FRACTIONAL DIMENSIONS +/- 1/16 ALL TWO PLACE DECIMALS +/- 0.010 ALL THREE PLACE DECIMALS +/- 0.005 ALL ANGLES +/- 1/2°	ANSI
MATERIAL:		
SIMILAR TO:		
TYPE:		
DRAWN BY: AMG	DATE: 2014-03-12	
WEIGHT:	SHEET: 1 OF 2	
DRAWING NUMBER: 2802198	SCALE:	SIZE: D

SYMBOL KEY

	MOTOR		CIRCUIT BREAKER		ELECTRICAL DISCONNECT	VFD	VARIABLE FREQUENCY DRIVE		TRANSDUCER		STARTER CONTACTOR
M	MOTOR OPERATED VALVE		TRANSFORMER		MOTOR OVERLOAD	P	PNEUMATIC OPERATED VALVE		FUSE		FLOAT SWITCH

NOTE: SOME SYMBOLS MAY NOT BE APPLICABLE



NOT FOR CONSTRUCTION

JOB NAME:

JOB LOCATION:

REV	ERN / ECO	DATE	BY	REVISION DESCRIPTION

AQUA-AEROBIC SYSTEMS, INC.

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES

FRACTIONAL DIMENSIONS	+/- 1/16
ALL TWO PLACE DECIMALS	+/- 0.010
ALL THREE PLACE DECIMALS	+/- 0.005
ALL ANGLES	+/- 1/2°

ANSI

MATERIAL:

SIMILAR TO:

TYPE:

DRAWN BY: AMG | DATE: 2014-03-12

WEIGHT: | SHEET: 2 OF 2

DRAWING NAME: AQUA BIOMAX, 35/4

DRAWING NUMBER: 2802198 | SCALE: | SIZE: D

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Process Design Report

WHITINGHAM WWTF VT

Design# 155615

Option: Preliminary Design

Aqua BioMax®
Dual Treatment System

March 06, 2019

Designed By: Jakob Nowicki

6306 N. Alpine Rd Loves Park, IL 61111
(815) 654-2501 www.aqua-aerobic.com

Design Notes

Flow

- The maximum flow, as shown on the design, has been assumed as a hydraulic maximum and does not represent an additional organic load.

Pre-BioMax

- Neutralization is recommended/required ahead of the Aqua BioMax if the pH is expected to fall outside of 6.5-8.5 for significant durations.

Filtration

- The filter influent should be free of algae and other solids that are not filterable. Provisions to treat algae and condition the solids to be filterable are the responsibility of others.

- For this application, pile filter cloth is recommended.

Equipment

- Aqua-Aerobic Systems, Inc. is familiar with various “Buy American” Acts (i.e. AIS, ARRA, Federal FAR 52.225, EXIM Bank, USAid, PA Steel Products Act, etc.). As the project develops Aqua-Aerobic Systems can work with you to ensure full compliance of our goods with various Buy American provisions if they are applicable/required for the project. When applicable, please provide us with the specifics of the project’s “Buy American” provisions.

Aqua BioMax - Design Summary

DESIGN INFLUENT CONDITIONS

Avg. Design Flow	= 0.012 MGD	=	45 m^3/day
Max. Design Flow	= 0.012 MGD	=	45 m^3/day

DESIGN PARAMETERS

			Effluent			
	Influent	mg/l	Required	≤ mg/l	Anticipated	≤ mg/l
Bio/Chem Oxygen Demand:	BOD5*	154	BOD5	30	BOD5	30
Suspended Solids:	TSS**	66	TSS	30	TSS	30

* Assuming a 30 % reduction in BOD across the upstream septic ank

** Assuming a 70 % reduction in TSS across the upstream septic tank

SITE CONDITIONS

	Maximum		Minimum		Design		Elevation (MSL)
Ambient Air Temperature:	80 °F	26.7 °C	40 °F	4.4 °C	80 °F	26.7 °C	1920 ft
Influent Waste Temperature:	68 °F	20 °C	50 °F	10 °C	68 °F	20 °C	585 m

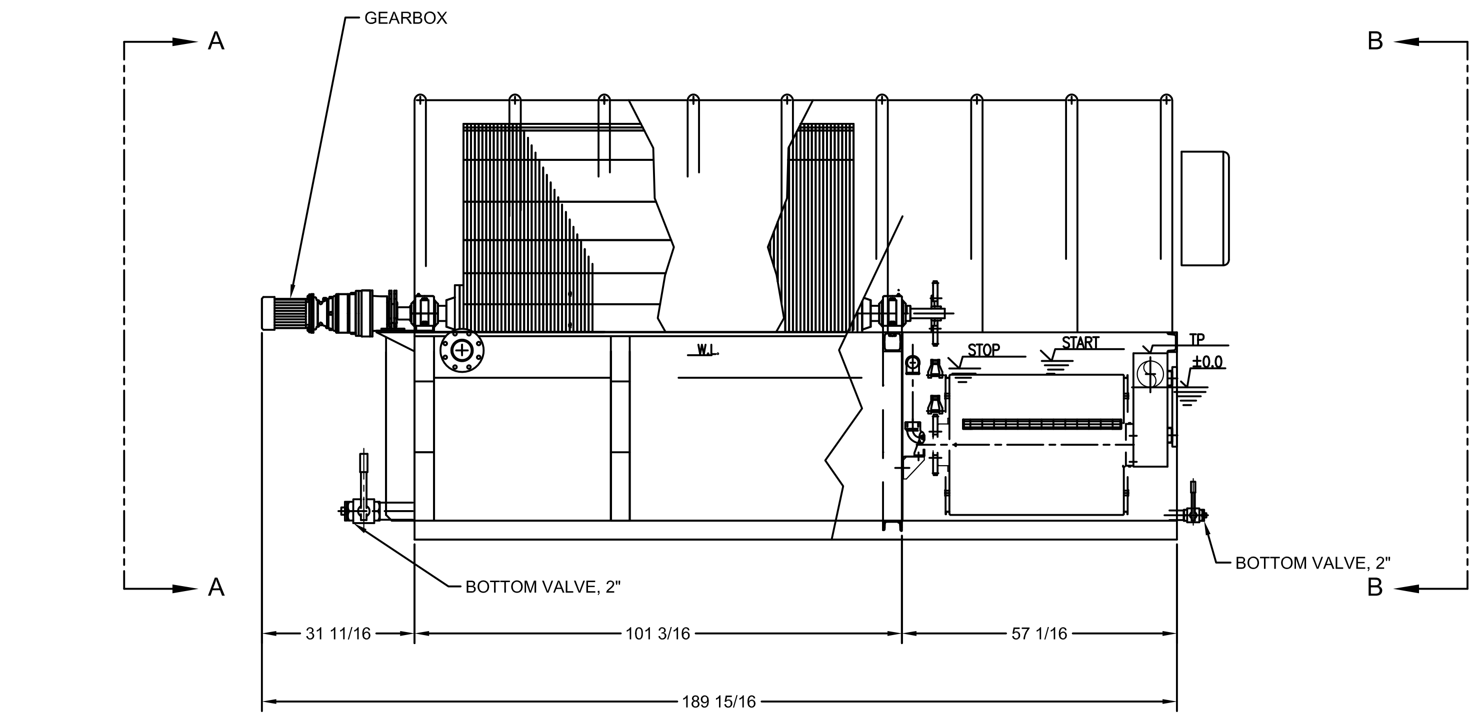
AquaBioMax RBC/CMF RECOMMENDATION

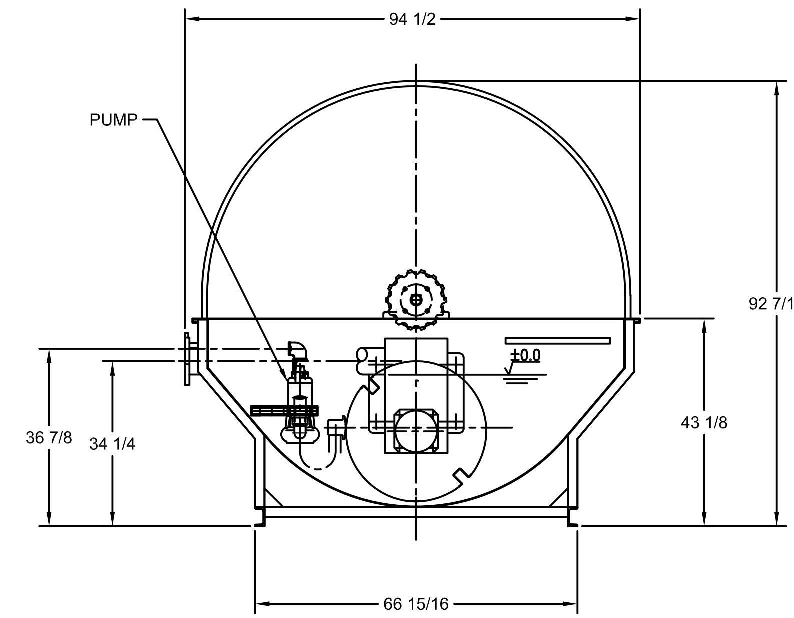
Qty of Units Recommended:	=	1		
Model Recommended:		**Aqua BioMax 10/2**		
Media Surface Area:	=	10,760 ft^2		1000 m^2
Filter Surface Area:	=	22 ft^2		2 m^2
Organic Loading Rate:	=	1.43 lbs BOD_5/1000 ft^2-day		7.00 g BOD_5/m^2-day
Nitrogen Loading Rate:	=	0.00 lbs NH_3-N/1000 ft^2-day		0.00 g NH_3-N/m^2-day
Max. Biodisc Hydraulic Loading Rate	=	1.12 gal/ft^2/day		0.05 m/day
Solids Produced:	=	7.7 lbs/day		3.50 kg/day
Backwash Flow Rate:	=	61.6 gpm		14.0 m^3/hr
Backwashes/Hour:	=	4 backwashes/hour/unit		
Total Daily Backwash Volume:	=	2,957 gallons/day		11.2 m^3/day
Avg. Filter Hydraulic Loading Rate:	=	0.48 gpm/ft^2		1.18 m^3/m^2-hr
Avg. Filter Solids Loading Rate:	=	0.4 lbs/ft^2-day		135 g/m^2-hr
Estimated Backwash Solids Concentration:	=	310 mg/L		310 g/m^3
Recommended 39.03-Day Septic Tank Storage Volume:		361 ft^3		10 m^3
Total Power Consumption:	=	16.9 kW-hrs/day		

Aqua BioMax

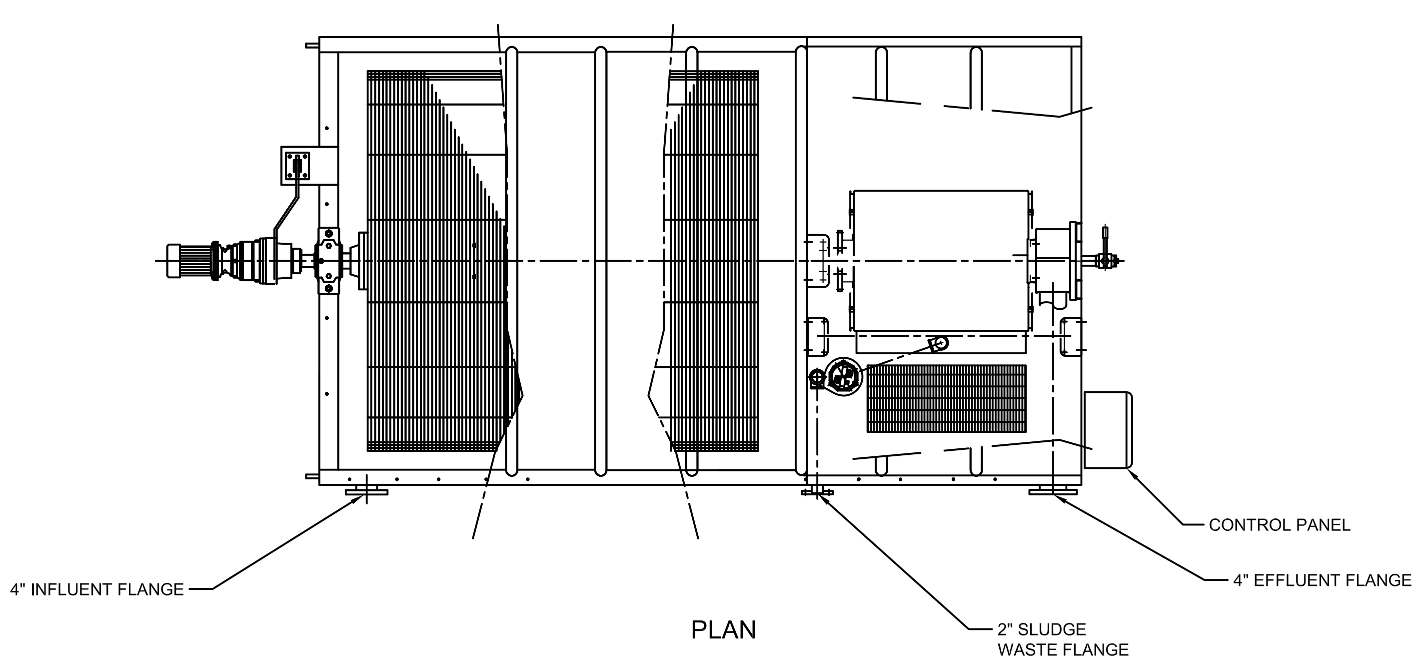
1 Aqua BioMax™ 10/2 Assembly(ies) will be provided as follows:

- Painted steel tank(s).
- Modular GRP, RAL 7035 cover(s).
- Isotactic polypropylene discs with stainless steel shaft.
- Galvanized steel arms, intermediate crosses, and flanges.
- Isotactic polypropylene spacers.
- Tank housing with roller bearings, sleeves, and stop rings.
- Gear reducer.
- 304 Stainless steel drum with filter cloth media.
- Cleaning device with suction nozzle and 1HP backwash pump(s).
- Level probes.
- Controls and appurtenances.

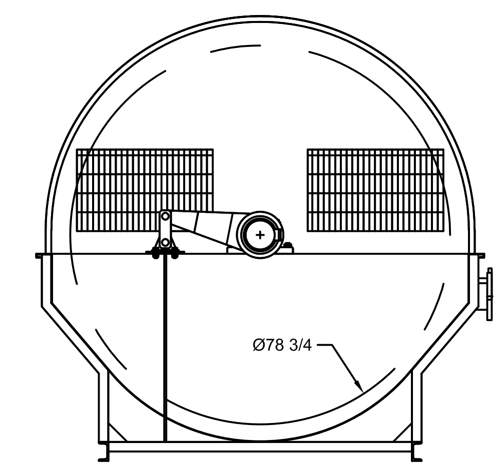




VIEW B-B



PLAN



VIEW A-A

NOT FOR CONSTRUCTION

JOB NAME:				
JOB LOCATION:				
REV	ERN / ECO	DATE	BY	REVISION DESCRIPTION
DRAWING NAME: AQUA BIOMAX, 10/2				

AQUA-AEROBIC SYSTEMS, INC.

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES

FRACTIONAL DIMENSIONS	+/- 1/16
ALL TWO PLACE DECIMALS	+/- 0.010
ALL THREE PLACE DECIMALS	+/- 0.005
ALL ANGLES	+/- 1/2°

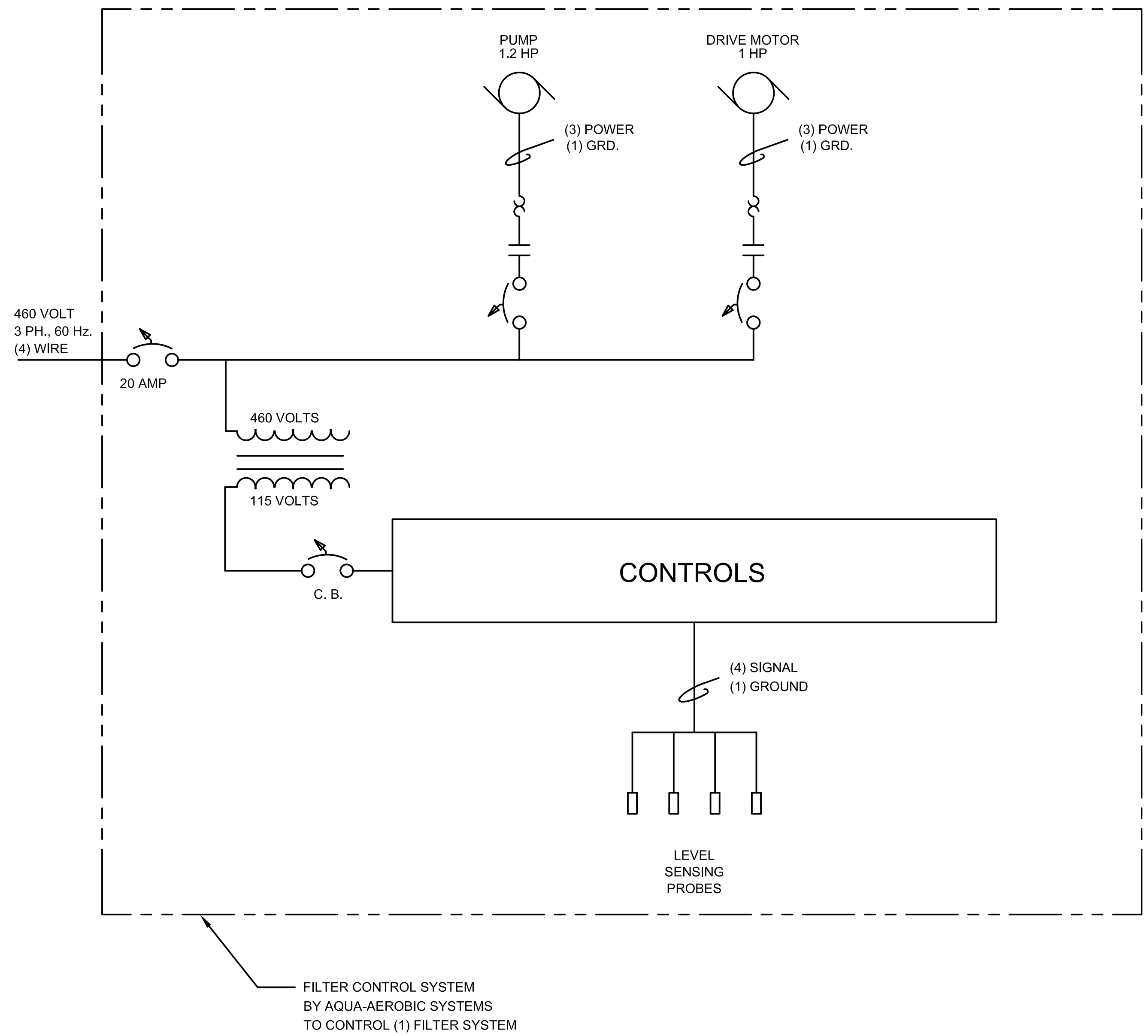
ANSI

MATERIAL:			
SIMILAR TO:			
TYPE:			
DRAWN BY: AMG		DATE: 2014-03-12	
WEIGHT:		SHEET: 1 OF 2	
DRAWING NUMBER: 2802193		SCALE:	SIZE: D

SYMBOL KEY

	MOTOR		CIRCUIT BREAKER		ELECTRICAL DISCONNECT	VFD	VARIABLE FREQUENCY DRIVE		TRANSDUCER		STARTER CONTACTOR
M	MOTOR OPERATED VALVE		TRANSFORMER		MOTOR OVERLOAD	P	PNEUMATIC OPERATED VALVE		FUSE		FLOAT SWITCH

NOTE: SOME SYMBOLS MAY NOT BE APPLICABLE



NOT FOR CONSTRUCTION

JOB NAME:	AQUA-AEROBIC SYSTEMS, INC.
JOB LOCATION:	DO NOT SCALE DRAWING
REV / ERN / ECO / DATE / BY / REVISION DESCRIPTION	UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES FRACTIONAL DIMENSIONS +/- 1/16 ALL TWO PLACE DECIMALS +/- 0.010 ALL THREE PLACE DECIMALS +/- 0.005 ALL ANGLES +/- 1/2° ANSI
	MATERIAL:
	SIMILAR TO:
	TYPE:
	DRAWN BY: AMG — DATE: 2014-03-12
	WEIGHT: — SHEET: 2 OF 2
DRAWING NAME: AQUA BIOMAX, 10/2	DRAWING NUMBER: 2802193 — SCALE: — SIZE: D

Aqua BioMax: Operation & Maintenance Requirements Design# 155615

WHITINGHAM WWTF VT AASI Design Number 155615

AQUA-AEROBIC SYSTEMS, INC.

Avg Flow (MGD):	0.01
Unit Selected:	Aqua BioMax 10/2
Unit Quantity:	1

I. LUBRICATION REQUIREMENTS

	# of Units		Minutes/Unit		Times/Year		Hours/Year
1) Backwash / Solids Pump - Routine Lubrication:	1	X	5	X	12	/ 60 =	1.00
2) Backwash / Solids Pump - Drain and Refill:	1	X	30	X	1	/ 60 =	0.50
3) Support shaft bearing:	1	X	30	X	4	/ 60 =	2.00
4) Drive motor:	1	X	20	X	0.2	/ 60 =	0.07
5) Gearbox:	1	X	20	X	0.2	/ 60 =	0.07

TOTAL LUBRICATION REQUIREMENTS: 3.57

II. PARTS REPLACEMENT

	Replace Interval (Years)	# of Units		Minutes/Unit		Hours Per Replacement	Material Cost Per Unit	Total Material Cost
1) Filter Media Cloth	4	1	X	720	=	12	$ 1,160.00	$ 1,160.00
2) Drive Motor	10	1	X	240	=	4	$ 1,500.00	$ 1,500.00
3) Pumps	7	2	X	120	=	4	$ 400.00	$ 800.00

III. POWER CONSUMPTION

	Power Consumption (kW-hrs /year)
Total Annual Power Usage:	6,190.0