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TRANSMITTAL LETTER

To: Mike Hepp
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Department of Ecology
Eastern Regional Office
4601 N. Monroe St. Suite 100
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Date: 04/02/2015
Project: Warden Hutterian Brethren Headquarters Wastewater System Manual
Project No.: 70-10-023

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1	Jan 2012	Manual for Operations and Maintenance

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Cc:

Paul Wollman, Warden Hutterian Brethren

Signed: Doug Ensor
Douglas E. Ensor, P.E.

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Warden Hutterian Brethren
Headquarters Wastewater System
Warden, Washington

Operation and Maintenance Manual

January 2012

Prepared by

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Table of Contents

Tables

Figures

Appendices

1 Introduction

1.1 General

This Operations and Maintenance Manual (O&M Manual) is for the Warden Hutterian Brethren (WHB) Headquarters Wastewater System. Use of this manual is intended to assist the operators and maintenance personnel to better understand intended operation of the equipment and facilities in the project.

This manual is designed as an on-the-job reference for operators, maintenance, and administrative personnel. The manual does not provide an in-depth coverage of wastewater treatment principles, but assumes that the reader already has a working knowledge of wastewater treatment. This manual is not intended to be a detailed equipment guide. The individual equipment manufacturer's O&M Manuals are a part of this Manual by reference only and should always be reviewed before operating equipment. The manual does provide the information necessary for an operator to specifically apply this knowledge to the wastewater system.

The wastewater system O&M Manual consists of this document and manufacturer's O&M literature bound separately. An additional vital resource is the project Record Drawings included in **Appendix F**. This document provides general and detailed descriptions on the operating processes, parameters, and procedures needed for day-to-day plant operations. The manufacturer's O&M literature contains more specific and detailed information about equipment maintenance.

1.2 Facility History

The former waste water system consists of two unlined facultative lagoons constructed more than 20 years ago. A gravity flow collection system conveyed wastewater to the lagoon site.

J-U-B ENGINEERS, Inc. (J-U-B) was retained to replace the previous facility in order to increase capacity, improve environmental performance and reduce proximity to living areas.

1.3 Flow Projections

The projected flow for the wastewater system assumes a wastewater generation estimate of 75 gallons per capita per day. Based on the net evaporation volume at the maximum water level, which is 10,890 gallons per day, the wastewater system is adequate for a population of approximately 145.

As the new facility is operated, data shall be observed and recorded related to actual inflow population levels and depth of water tracked during the year to confirm the facility capacity.

1.4 Operation & Maintenance Managerial & Personnel Responsibilities

The WHB Headquarters wastewater system is owned and operated by the WHB for the purpose of protecting the health of their residents, neighbors and to protect the quality of the environment.

The system O&M personnel have the following responsibilities:

- Perform all work with SAFETY as the number one priority.
- Learn proper operating procedures and apply them diligently. Thoroughly study this manual, manufacturer's literature, and other reference material and accumulate "hands-on" experience.
- Maintain accurate and current operation and maintenance records.
- Advise management of any factors or problems that might adversely affect system operation or maintenance.
- Monitor the system to evaluate performance.
- Participate in training and certification programs.

The management has the following responsibilities:

- Establish a good working relationship with operating personnel, impressing upon them the necessity of efficient plant operation and maintenance and an adequate system of O&M records.
- Provide operational personnel with adequate funds to support proper operation and maintenance of the facility.
- Provide working conditions, tools, and equipment to safely and efficiently operate and maintain the wastewater system.
- Provide adequate and appropriate training opportunities for O&M personnel.
- Keep the lines of communication open with O&M personnel, resulting in O&M personnel keeping management informed about plant performance, needs, and problems.
- Plan for future facility needs and the necessary financing to satisfy those needs.

2 Permits and Standards

2.1 General

A permit from Washington State Department of Ecology is required for the new facility. A copy of the permit is contained in **Appendix A**.

2.2 Discharge Permit

The current system relies strictly on evaporation to dispose of effluent and thus requires no discharge permit.

2.3 Future Discharge Conditions

As population grows and wastewater flows exceed the evaporative capacity, additional capacity may be added with the addition of a land application system. Procurement of NPDES permit(s) and compliance with environmental process and additional standards will be necessary. Design of facility modifications will be required.

3 General Facility Description

3.1 Introduction

The Warden Hutterian Brethren Headquarters wastewater system treats residential/commercial wastewater from the headquarters site. A hydraulic grade line through the facility is shown in **Figure 3-2**. The process chain is as follows:

- Pretreatment in 6,000 gallon septic tank
- Influent flow measurement
- Treatment Lagoon No. 1
- Transfer structure
- Treatment Lagoon No. 2
- Effluent Evaporation

3.2 Brief Component Description

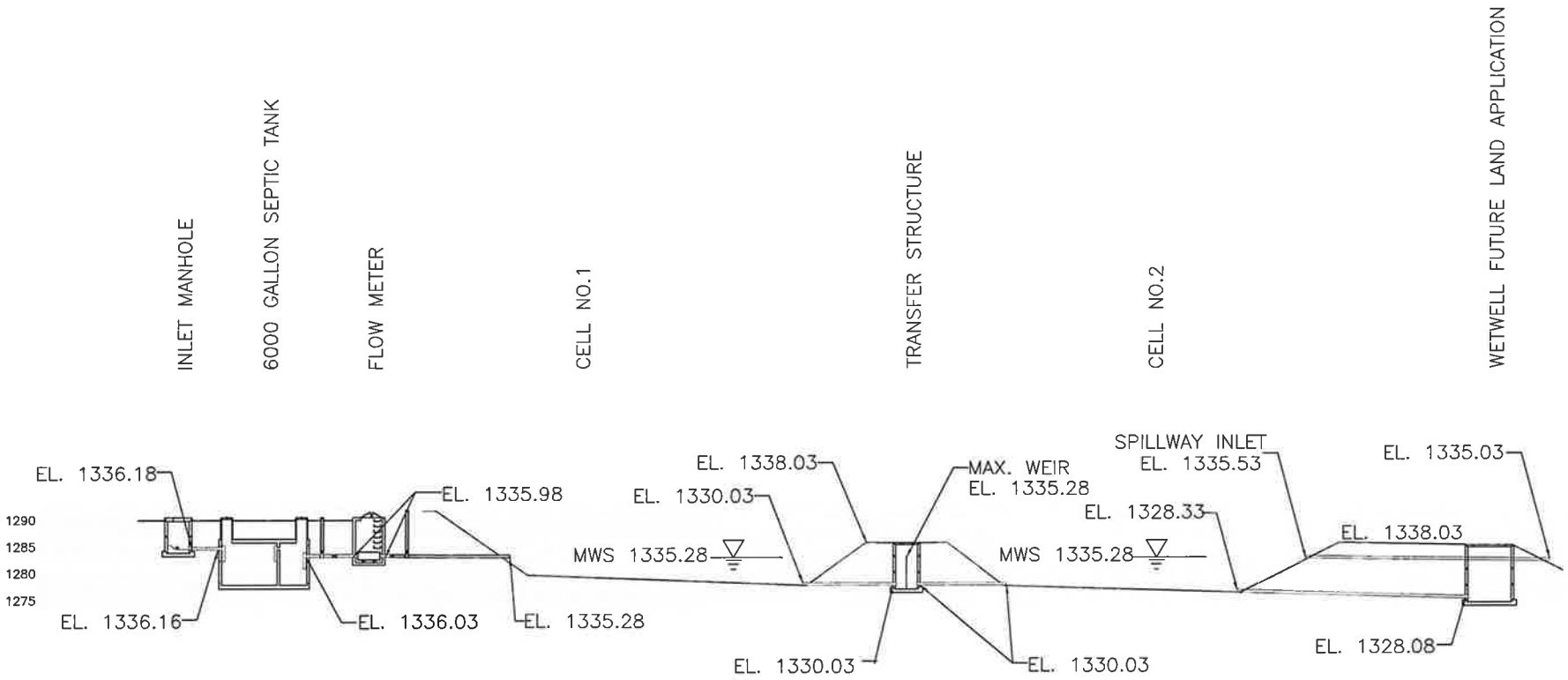
The following descriptions are a brief overview of the facility's components. A more detailed discussion of these components is presented in subsequent chapters.

3.2.1 Headworks

Raw wastewater enters the system from a single 8" gravity flow conveyance pipe at the inlet manhole and flows through the treatment processes under gravity.

6,000 gallon septic tank: Following the inlet manhole is a two compartment 6,000 gallon concrete septic tank. This will retain floatables and other solids, remove a portion of the suspended solids and enhance treatment.

Influent Flow Measurement: A precast concrete vault houses a trapezoidal flume flow meter enabling the operator to monitor and document the flow into the system.



NOTE:
ALL PIPE ELEVATIONS ARE AT THE INVERT.

LAST UPDATE: 10/4/2012
PLOT DATE: 10/10/2012
FILE: HYD PROF

J-U-B ENGINEERS, INC.

FIGURE 3-2

WARDEN HUTTERIAN BRETHREN
WARDEN WASHINGTON
HEADQUARTERS WASTEWATER SYSTEM
HYDRAULIC PROFILE

3.2.2 Lagoon Cells

The system uses two lagoon cells that treat wastewater using facultative biological processes. The lagoon cells also serve as evaporation ponds and effluent storage during seasons where the inflow exceeds effluent evaporation.

3.2.3 Transfer Structure

The transfer structure between lagoon cells 1 and 2 is stoplog type structure, using aluminum weir plates. This allows the operator to adjust the water level in the lagoons.

3.3 List of Major Equipment and Suppliers

The HDPE Lagoon liners and interstitial leak detection system (between liners) was supplied by: Northwest Linings, 21000 77th Ave S. Kent, WA 98032, (253) 872-0244.

4 Headworks

4.1 6000 Gallon Septic Tank

Following the inlet manhole, raw wastewater enters a 6,000 gallon two compartment precast concrete septic tank. The septic tank will allow settable and some suspended solids to settle, reducing the load into the lagoons to improve effluent quality. The tank will also aid in the retention of floatable solids. The septic tank must be pumped at regular intervals to maintain proper system functionality. The operator must monitor the solids level in the tank to determine when pumping is necessary.

4.2 Influent Flow Measurement

Following the septic tank is the influent flow monitoring flume. The device consists of a trapezoidal flume calibrated to various flow levels. Flow is determined through level measurement and the use of a rating curve. The data is transmitted to headquarters through a wireless telemetry system.

5 Lagoon Cells

5.1 Introduction

This chapter presents the physical and biochemical processes occurring within the treatment facility. Although not required to operate the facility, familiarity with these concepts will help the operator during daily operations.

The lagoons are not mechanically aerated, but rather naturally aerated at the surface creating an oxygen-rich (aerobic) zone overlying an oxygen-depleted (anaerobic) zone.

5.2 Operational Theory

Treatment of raw sewage is accomplished by three processes in lagoons. These processes are:

1. Sedimentation (i.e., settling)
2. Aerobic (presence of oxygen) decomposition
3. Anaerobic (absence of oxygen) decomposition

The processes are similar to purification of a river or lake. As raw sewage enters the first lagoon cell, many of the heavy or large particles will settle in areas of the lagoon that do not receive sufficient mixing to maintain them in suspension. Some of the lighter organic particles come in contact with each other and form flocs, which may also settle in quiescent areas. The settling process is called sedimentation.

Sedimentation does not remove the objectionable characteristics of sewage, it just relocates some of them to the lagoon bottom. Actual purification of sewage occurs as bacteria uses the settled sludge and organic material remaining in the solution as a food source. To understand the biological process, it is helpful to think of the lagoon as stratified into two layers, the top layer being aerobic and the bottom layer being anaerobic.

Aerobic bacteria functions only in the presence of free dissolved oxygen (DO). They attack the organic material in the following manner:

$$\textit{Organic material} + \textit{oxygen} + \textit{aerobic bacteria} \rightarrow CO_2 + H_2O + \textit{more aerobic bacteria}$$

Part of the organic material is reduced to water and carbon dioxide while the remaining portion is used to create new bacteria. As aerobic decomposition proceeds, an increasing amount of oxygen is used. Wind supplies the oxygen and also mixes the liquid in the lagoon contents, which allows for better contact between oxygen, aerobic bacteria, and sewage.

The anaerobic layer extends from the bottom of the lagoon through the sludge deposits to the aerobic layer. Biological activity in this region occurs in two steps. The first step is the reduction of complex organic material in the sludge with the end product being organic acids. The second step is the reduction of the organic acids to the end products of methane, hydrogen sulfide, and carbon dioxide. The two-step process may be pictured as:

Complex Organics + Anaerobic Bacteria → *Organic Acids*

and

Organic Acids + Anaerobic Bacteria → $CH_4 + CO_2 + H_2O$

Anaerobic processes generally require more reaction time than aerobic decomposition. For this reason, a long solids detention period is necessary to achieve the desired degree of treatment.

During the warm months, the biological processes will occur as they have been described. However, all biological processes are sensitive to cold weather. Aerobic activity will decrease during the winter and anaerobic activity will nearly cease. Therefore, sludge deposits may tend to increase during the winter. In spring, the anaerobic activity will begin again. Sometimes the first step in anaerobic decomposition, breakdown of organic material to organic acids, begins at a faster rate than the second step thus creating an excess of organic acids and subsequent release of hydrogen sulfide which has a pungent odor. Unfortunately, the reaction rates of the anaerobic bacteria cannot be controlled in a lagoon system. In a passive system, the extent of aerobic activity in the upper stratum can only be influenced by climatic activity and strength of wastewater. A period of odor usually occurs in the spring time.

Initially, the lagoon system will operate as an evaporative facility. As summer progresses and water levels drop, solids and salts remain in the lagoon bottom. Solids will tend to decompose and consolidate over time. Salts, however, continue to increase year after year. Eventually, the remaining solids or sludge in the cells will be very high in salt content.

5.3 Lagoons

The system has two lagoon cells, each lined with a 60 mil HDPE liner on top of a 40 mil HDPE base liner. Lagoon Cell No. 1 has a volume of approximately 2.11 million gallons, a maximum surface area of 1.65 acres with a maximum depth (at the transfer structure) of approximately 5.25 feet. Lagoon Cell No. 2 has a volume of approximately 4.30 million gallons, a maximum surface area of 2.46 acres with a maximum depth (at the wet well inlet) of approximately 6.95 feet.

Appendix B contains depth versus storage volume data and depth varsus surface area data from each lagoon cell.

5.4 Transfer Structures

5.4.1 General

The transfer structure is used for transferring lagoon contents from lagoon to lagoon or for bypassing. The transfer piping uses 6-inch HDPE pipe. A 4-foot-diameter manhole located between the lagoons serves as the transfer structure vault. This structure houses a divider wall with a 2-foot-wide weir to control the upstream lagoon level. The penetrations into the lagoons are composed of a 9" thick rectangular concrete collar with the HDPE liner welded on to it.

The operator can use 12", 6", or 3" aluminum weir plates to adjust the water surface level in the lagoon cells. It is recommended that the water surface be kept near the same level in both cells during normal operation.

If maintenance work is required on the interior of the transfer structure, it will be necessary to dewater the adjacent lagoon cells.

Before a person enters the transfer structure after it is drained, it is necessary to develop and follow all the training, procedures and regulations required for a **PERMIT-REQUIRED CONFINED SPACE.** A partial list will involve the following. Ventilation of the structure and the use of a gas detection meter that can detect the lack of oxygen or presence of a poisonous or flammable gas. Persons entering the transfer structure shall also wear personal flotation devices in the unlikely event that water enters the structure. Persons must also wear a safety harness connected to a retrieval system to facilitate extraction by personnel outside of the space in the event of an emergency. Work in the structure must never be done alone. All work must conform to the permit-required confined space regulations.

5.4.2 Normal Operation

During normal operation, the lagoon system is operated in series (See **Appendix F** Record Drawings). The wastewater exits the measurement flume, bypassing the closed valve to cell 2 and enters lagoon cell 1 through the open valve into lagoon cell 1. From Cell No.1, effluent spills over the 2-foot weir located in the transfer structure and into Lagoon No. 2.

It may be necessary for maintenance or repairs to bypass lagoon No. 1 and direct flow to lagoon 2. This process is outlined in the following section

5.4.3 Bypass Lagoon No. 1

It may be necessary to operate the system with Lagoon No. 1 completely offline. This may be necessary due to maintenance in the lagoon, a lagoon leakage test, repair work to the transfer structure, a toxic event, etc.

The step-by-step process for bypassing Lagoon No. 1 is as follows:

- Headworks
    - Open the valve to Lagoon No. 2, which is on the pipe branch immediately downstream of the flow meter.
    - Close the valve to Lagoon No. 1, which is on the western dike of Lagoon No. 1 near the south end.
- The preceding steps prevent any further flow from entering Lagoon No. 1.
- Insert weir plates to top of weir plate guide to prevent flow from Lagoon No. 2 into Lagoon No.1, through the transfer structure.
- Verify water flow from Lagoon No. 1 to Lagoon No. 2 has ceased.
    - CAUTION: IF THE WATER LEVEL IN LAGOON 2 EXCEEDS THE MAXIMUM CAPACITY, WATER WILL BEGIN TO FLOW FROM LAGOON 2 INTO LAGOON 1 BY OVER

TOPPING THE WEIR PLATES IN THE TRANSFER STRUCTURE. MONITOR THE LEVEL OF LAGOON NO. 2 CAREFULLY.

5.4.6 Drain Each Lagoon

If required, all of the contents of an individual lagoon may be removed. In order to drain a lagoon, the flow must be diverted to the other lagoon cell.

- Bypass the lagoon to be drained as outlined above
- The contents of the lagoon will need to be removed with a suitable portable pump.
- In order to avoid damage to the lagoon liner, it is recommended that the pump be placed in the upstream side of the transfer structure when draining lagoon No. 1.
- Similarly, the contents of lagoon No.2 should be drained by opening the valve to the wetwell and placing the portable pump in wetwell, eliminating contact between the pump and liner.

5.5 Wetwell Structure

A wetwell structure has been constructed in the south dike at Lagoon Cell No. 2 with an 8" pipe and valve. The valve is next to the wetwell structure. The purpose of the wetwell is a provision for future land application of wastewater. A pump and other mechanical equipment and controls must be installed to make it operational.

5.6 Lagoon No. 1 Overflow

The water level in Lagoon No. 1 is controlled by the transfer structure weir. Should the water volume in Lagoon No. 1 exceed the maximum capacity, the weir will overtop, automatically diverting excess flow to Lagoon No. 2.

5.7 Lagoon No. 2 Overflow

If the water volume in Lagoon No. 2 exceeds the maximum capacity, the weir in the transfer structure will overtop and attempt to equalize the water level by transferring the excess to Lagoon No. 1. In the instance that both lagoons are at maximum capacity, the excess flow will be diverted to an 8" overflow pipe and spillway located through the south dike of Lagoon No. 2, to prevent discharge over the dikes.

The overflow spillway should only be used in an absolute state of emergency; i.e., when the integrity of the entire lagoon system is in jeopardy and no other alternatives for maintaining impoundment is available. If the spillway is not functional and an uncontrolled discharge over the lagoon dikes occurs, the uncontrolled discharge can cause severe erosion in a short period of time (several hours or less) and ultimately cause a liner and dike failure.

Use of the overflow spillway will constitute a discharge of unpermitted wastewater on the agricultural land south of the dikes, which is not a permitted activity. Should a discharge occur, the water should be impounded with temporary berms and Washington State Department of Ecology contacted for reporting and to develop a cleanup plan.

6 Leak Detection

6.1 General

Each lagoon is a double lined structure with a 60 mil HDPE top liner (exposed) and a 40 mil HDPE base liner. Between the liners is a geo-composite net which will convey water through the interstitial space between the liners.

Each lagoon has been installed with a leak detection sump (See **Appendix F** Record Drawings). If a leak occurs in the 60 mil HDPE top liner, it will be intercepted in the interstitial net above the 40 mil HDPE bottom liner. Liquid will flow through the space between the top and bottom liners created by the drainage net placed between them to a gravel filled leak detection trench. A perforated HDPE pipe will direct all leakage to the leak detection sump of the respective lagoon.

The leak detection sumps should be monitored at least monthly for the presence of wastewater. Should the presence of wastewater be detected, it shall be removed and the rate of refill noted to assess the size of a potential leak. If, after repeated pump out cycles, the sump consistently refills in less than five (5) minutes, the lagoon cell should be removed from service and corrective action taken.

During construction, the base liner for each lagoon cell was tested after installation for integrity using a high energy sweep method. The leak location survey found no leaks in either cell base liner. A copy of the survey report is contained in **Appendix C**. Once the survey was complete, the geo-net and top liner were installed over the base without delay.

7 Future Land Application and Pump Station

7.1 General

The current lagoon system relies on solely on evaporation to manage effluent. The capacity of the lagoon system can be increased with the installation of a system to land apply the effluent using the existing center pivot irrigation infrastructure nearby. The lagoons will be used to store wastewater during the winter, and then the effluent will be applied during the growing season. Land application will also prevent the accumulation of salts in the treatment lagoons that can occur with an evaporation only system.

7.2 Wetwell

A wetwell and drawoff pipe from lagoon cell 2 have been installed to simplify future installation of an irrigation pump. For land application, a chlorine injection system and contact pipe will be required before the effluent is discharged. The wetwell will house the pump intake and pump float control. Piping will be installed to a center pivot irrigation system or some other type of irrigation system for land application.

7.3 Permits

Land application will require an NPDES permit and the effluent to meet certain quality standards.

8 Maintenance Management

8.1 General

Preventive maintenance and implementation of best management practices for the wastewater treatment system is a very important responsibility. Regular maintenance greatly reduces the necessity of expensive repairs and replacement of system components and equipment, and reduces problems associated with operation when a part of the system is not able to be used. Therefore, good preventative maintenance contributes directly to the economical and operational efficiency of the treatment facility.

The waste water system requires periodic maintenance and inspection. Areas of particular attention are: periodic inspection of the solids level in the septic tank and solids pumping when necessary; periodic inspection of the leak detection sumps; and collecting and maintaining inflow and water level data to gauge system performance. Unscheduled or crisis maintenance is almost always a contributor to substandard facility operation, as well as costing more in the long-term than routine preventative maintenance.

8.2 Suggested Maintenance Activities

1. Conduct a thorough inspection of the wastewater treatment facility and make any necessary repairs.
2. Perform required daily housekeeping duties, including sweeping, replacing tools and equipment, gather and dispose of garbage, removal of weeds/debris, removal of wind-blown weeds from perimeter fence. (Hand remove, burning destroys galvanized coating of the fence).
3. Inspect septic tank and determine if solids pumping is needed.
4. Inspect measurement flume for proper operation and remove any debris.
5. Brush down accumulation of scum on weirs in transfer structure.
6. Inspect the leak detection sump for each cell at least monthly for indications of leakage.
7. Ensure runoff diversion channel is free of obstructions.
8. Inspect all safety equipment.
9. Operate valves periodically (at least annually) to ensure free operation. Repair as needed.
10. Check flow meter calibration at least annually.
11. Ensure facility is secure and gate is locked.

Table 8-3 contains a Monthly Maintenance Record form provided as an example for record keeping on maintenance activities.

8.3 Lagoon Dike Maintenance

The dike embankment should be inspected at least weekly so early detection of erosion and rodent damage can be found. Rodent damage is easily detected by small mounds of dike material on the slopes or around the dike. Control of the pests should be discussed with the County Extension Agent. The use of firearms to control the rodents is not recommended, as misfired or ricocheting bullets could damage the lagoon liner.

Erosion of the dike materials should be repaired immediately with similar materials. If the erosion continues at a particular location, measures should be taken to observe the storm water flow path and divert it away from the eroded area.

A detailed operation and maintenance plan for the lagoon dikes is contained in **Appendix D**. This plan shall be closely followed. Additional detailed information on embankment inspection can be found in Dam Safety Guidelines, Part III, obtainable from the Washington State Department of Ecology.

Each year, the lagoon dikes for each cell, the liners, the spillway and other external stormwater related facilities shall be inspected and reported to Washington State Department of Ecology Dam Safety Section. The Annual Inspection Form for this activity is contained in **Appendix E**.

Table 8-3 - Example Monthly Maintenance Record Sheet

Date: _____ Weather: _____ Maintenance Personnel: _____

Time: _____ _____ _____

Maintenance Item	Completed (Y/N)	Describe Any Problems	Maintenance Performed to Correct Problems	Maintenance Costs	Date of Next Maintenance	Comments
Remove weeds from fence and access areas						
Inspect septic tank and determine if solids pumping is needed						
Inspect measurement flume for proper operation and remove any debris						
Brush down accumulation of scum from transfer structure weir						
Inspect leak detection sump Cell No. 1						
Inspect leak detection sump Cell No. 2						
Ensure runoff diversion channel is free of obstructions						

9 Monitoring, Sampling, and Record Keeping

9.1 General

In order to maintain system performance it is recommended that records be kept of inflow and the water levels at the ends of the seasons (annual high level, annual low level). It is also recommended that occasional samples be taken to monitor water quality and ensure treatment is occurring. A sample should be taken at the end of the evaporative season (when the water level is lowest) to monitor the level of accumulated salts.

The permit issued by Washington State Department of Ecology for this facility has flow monitoring requirements (See **Appendix A**, Facility Permit).

Data on inflow shall be continually collected and submitted to Ecology when requested.

10 Emergency Operations

Operation and maintenance personnel must be familiar with emergency plans and procedures for the wastewater treatment system, and understand their duties for all emergency situations so that the appropriate steps can be taken. This section describes the steps that should be taken if one of the following emergency situations develops:

1. Electrical power failure
2. Equipment failure
3. Lagoon dike or liner failure
4. Pipe Breaks

10.1 Electrical Power Failure

All critical wastewater system operations occur under gravity flow. Electrical power disruption will not affect treatment. Inflow data collection will be lost during power failure. If a future land application system is installed the lagoons should provide adequate effluent storage capacity until power is restored.

10.2 Equipment Failure

If the flow meter or telemetry system fails, it should be returned to service as soon as possible to ensure data is provided for proper system operation and permit compliance.

10.3 Lagoon Dike or Liner Failure

In the unlikely event that a lagoon dike inspection results in the determination that the integrity of the structure is deteriorating to the point of failure, immediate remedial action must be taken. The Department of Ecology Dam Safety Section must be notified, and an engineer should be called in to assess the damage and identify possible repair (See Section 11.6 Emergency Contact List).

If leaks are detected in the liner, the influent to the lagoon should be immediately stopped and the water level pumped below the level of the leak. Once the water level has been sufficiently lowered the liner should be repaired, and the repair should be tested to verify no leaks are present. To repair the liner contact:

Northwest Linings
21000 77th Avenue S.
Kent, WA 98032
(253)-872-0244

10.4 Pipe Breaks

All pipe breaks/leaks should be repaired immediately. If the leaking pipe is under, in or adjacent to any of the lagoon dikes then flow to the affected lagoon should be stopped immediately, the water level lowered to below the affected pipe and repairs performed. Piping/and or dike saturation can potentially result in dike failure.

11 Safety

The wastewater system endeavors to provide safe working conditions and promote safety consciousness among workers to reduce accidents and personal injuries. To this end, all work associated with operation and maintenance of the wastewater treatment system shall conform to the applicable Federal, State, and local safety regulations.

11.1 Causes and Prevention of Accidents

The major causes of accidents at wastewater treatment facilities may be generalized as follows:

Failure of the person in charge to:

- Give adequate instructions.
- Make thorough inspections and investigate follow-up action.
- Assign safety responsibilities.
- Check equipment and safety devices before commencing tasks.
- Plan safety procedures for proposed activities.
- Use safe methods and follow safety rules.
- Use experienced or skilled workers.
- Maintain discipline and enforce safety rules.
- Require reasonable working hours.

Failure of employees to:

- Observe established safety rules and practices.
- Use equipment at rated speeds, or follow other instructions.
- Get permission to perform work not regularly assigned.
- Use protective devices or equipment.
- Properly use tools, equipment, or materials suitable for the work to be performed.
- Work as a team on tasks.

The mental attitude or physical condition of the employee, such as:

- Divided attention or inability to concentrate.
- Lack of knowledge or comprehension.
- Failure to use good judgment.
- Tendency to hurry a job or take hazardous short cuts.
- Inability to work with others (anger or impulsive action).
- Excitement, fright and other involuntary reactions.
- Physical handicaps or lack of strength.
- Conditions caused by allergies.

- Reduced human reliability due to environmental pollutants, such as excessive noise or exposure to hazardous gases or fumes.

11.2 Safety Hazards

Typical safety hazards associated with the operation and maintenance of a WWTP are discussed in the following sections. These items are discussed in the following sections. Specific hazards associated with the system components are addressed in the manufacturer's literature.

11.2.1 Blood Borne Pathogens

Personnel performing operation and maintenance on the wastewater treatment system have the potential of exposure to blood borne pathogens, including, but not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV). All O&M personnel should receive HBV and tetanus shots. All personnel should be trained on methods to reduce the acquisition and transmission of blood borne pathogens. These methods include:

- Medical abatement through vaccinations and inoculations.
- Maintaining good personal hygiene.
- Utilizing the appropriate personal protective equipment.
- Decontaminating or disposing of contaminated equipment.
- Education and training.

11.2.2 Personal Hygiene

Cleanliness is basic to good health and is of critical importance to those persons working with wastewater facilities. Infection and disease are a constant threat to the employee and those with whom he/she associates. A number of diseases are transmitted by wastewater that passes through the treatment system. To avoid infection, personal protective equipment (i.e., rubber gloves, rubber footwear, eye protection, coveralls, hard hat, etc.) must be used. Frequent changes in personal protective equipment and clothing will help prevent transmission of infection or disease to other persons. Contaminated personal protective equipment should be disposed of, or thoroughly decontaminated prior to re-use.

After coming in contact with wastewater or contaminated equipment, all exposed skin should be thoroughly washed. Protective waterproof dressings should be worn to prevent open cuts or wounds from coming in contact with wastewater or contaminated equipment. If contact occurs, wash the area thoroughly in clean water containing either a weak solution of disinfectant or a good antiseptic, sponge the area with an antiseptic solution, and cover it with a clean, dry dressing and waterproof adhesive. If penetration is more than superficial, see a doctor as soon as possible. In the event of deep wounds, the employee should get a tetanus booster within 48 hours. Bandages covering wounds should be changed frequently.

"Keep your hands below your collar" is a good rule to follow while working in sewers and while handling wastewater. Since many infections reach the body by way of the mouth, nose, eyes, and ears, the hands should be thoroughly washed prior to smoking, eating or drinking. Any illness or symptom, such as dysentery or stomach pain, should be reported immediately.

11.2.3 Physical Injuries

Physical injuries may occur as a result of improperly lifting objects, lifting objects that are too heavy, over-reaching, slips, trips, and falls. These hazards may be mitigated by properly training O&M personnel, including:

- The proper techniques for lifting objects.
- Providing the appropriate equipment for lifting heavy objects.
- Good housekeeping procedures.
- Identifying, marking, or limiting access to hazardous areas.
- Providing the appropriate personal protective equipment.

The improper handling of materials can be a significant cause of injury to personnel. Poor handling practices can lead to hernias, back strains, crushed toes, lacerations and other injuries. Ensure that adequate help is available, use the proper equipment when moving or installing equipment, and wear personal protective equipment.

Before lifting an object, ensure that the surface is free of oil, grease or other substances that could make the object slippery. Check the floor to ensure that no obstructions are in the way and the path is clearly visible. Set feet and take a firm grasp that can be retained if the center of gravity of the object shifts. Lift the object from a squatting position with the back straight and the legs exerting most of the lifting force. Lift smoothly and evenly, and avoid twisting the body. Any lift that requires excessive exertion must not be attempted without assistance. The load should be carried as close to the body as possible, and the grip should not be shifted.

11.2.4 Hazardous Gases and Vapors

Sewer gas (which includes a variety of gas mixtures) is found in wastewater collection lines and manholes, wetwells and other confined areas within the treatment system. The sewer gas typically contains high percentages of carbon dioxide, varying amounts of methane, hydrogen, and hydrogen sulfide, and low percentages of carbon monoxide, nitrogen, and oxygen. Such a mixture of gases accumulates in the system as the result of fermentation or decomposition of organic matter in the wastewater.

These noxious gases are harmful to human health, and O&M personnel must be aware of the potential hazards, including:

- Flammability
- Suffocation
- Poisoning

A gas may exhibit any one or all three of the hazards listed above. Typically the greatest hazard comes from the displacement of oxygen in the area where work is being conducted, causing suffocation if the area is entered without proper ventilation. Some of the gases, such as methane, are explosive when present in a proper ratio to oxygen. As a result, O&M personnel should never smoke, drop lighted matches or use an open flame in or around sewers. In addition, personnel must follow all appropriate confined space entry requirements

(i.e., air monitoring, ventilation, rescue equipment, buddy system, etc.) prior to entering a space in the sewer system that meets the confined space definition (see **Appendix C**).

In confined areas of wastewater facilities, explosive gas mixtures may develop from mixtures of air and methane, natural gas, manufactured fuel gas, or gasoline vapors. Explosive ranges can be detected by using a combustible gas indicator. Explosions can be avoided by providing adequate ventilation to the area with fans or blowers, and by keeping open flames away from areas capable of developing explosive mixtures.

11.2.5 Heavy Equipment Operation

The operation of heavy equipment (i.e., trucks, backhoe, etc.) presents a hazard to personnel during operation and maintenance procedures. All O&M personnel should be trained as to the proper inspection and operating procedures for all heavy equipment they are expected to utilize. Personnel should also demonstrate continued proficiency by successfully undergoing any additional periodic training that may be required to inspect and operate any necessary heavy equipment.

11.2.6 Electrical Hazards

All machines and equipment which require electricity to operate (i.e., pumps, blowers, screens, etc.) present an electrical shock hazard. Electrical hazards can be prevented by making sure the electrical source is disconnected prior to performing O&M on the equipment. Before working on any piece of electrical equipment, make sure the main switch at the control panel is in the OFF position. Locking-out and/or tagging the equipment should be done to ensure that the machine or equipment is stopped and isolated from all potentially hazardous energy sources before employees perform any servicing or maintenance where the unexpected energization or start-up of the machine or equipment, or release of stored energy, could cause injury.

11.2.7 Drowning

Several processes and facilities pose a drowning hazard. Personnel or visitors to the facility must use extreme caution around the Lagoons. Always work in pairs to minimize the potential for drowning.

11.2.8 Confined Space

The inlet manhole, septic tank, flow meter vault, transfer structure and wet well are designated as permit required confined spaces. Before a person enters any of these structures it is necessary to develop and follow all training, procedures and regulations required for a permit required confined space. A partial list will involve the following:

- Ventilation of the structure and the use of a gas detection meter that can detect the lack of oxygen or a presence of poisonous or flammable gas
- Personal flotation devices shall be worn in the unlikely event of valve failure or leakage, causing the water to fill the structure.
- A safety harness connected to an emergency retrieval system should also be worn to facilitate extraction by personnel outside of the space in the event of an emergency.

- Work must **NEVER** be done alone
- All work must conform to the permit required confined space regulations WAC 296-809

Records pertaining to confined space programs shall be developed and maintained in accordance with WAC 296-809. Permits issued and data collected for the entry of a permit required confined space shall be kept on file for a period of at least one year. An annual review of entry permits issued and confined space programs shall be conducted and the program updated as required by regulation.

11.2.9 Housekeeping

A high standard of housekeeping is emphasized because it is the greatest single deterrent to fire, accidents, and disease. Every effort should be made to eliminate fire hazards by using proper containers for wastes, papers and rags, and by emptying the containers frequently. Clean out deposits in cabinets, ductwork and piping frequently. Immediately clean up liquid or chemical spills such as oil or water to prevent falls. Thoroughly clean tools after contact with wastewater or sludge to reduce the chance of infection or disease. Maintain all tools and portable equipment in a dedicated location that is out of the way of high traffic areas.

The following actions should be avoided when housekeeping:

- Cleaning on or near equipment that is operating. Normally, equipment must be shut down and locked-out and tagged when cleaning nearby.
- Mixing common cleaning compounds that produce a potentially hazardous compound when combined. Read the instructions on all containers prior to use.
- Using hazardous cleaning chemicals without the proper personal protective equipment.
- Over-reaching.
- Climbing on pipes and other equipment.
- Entering hazardous areas, such as manholes, without adequate training, protection, and assistance.
- Moving or attempting to move objects that are too heavy, or lifting heavy objects incorrectly.
- Hosing down areas where electrical equipment is located.
- Using ladders improperly.

11.3 Personal Protective Equipment

Personal protective equipment should be utilized by all personnel exposed to wastewater or contaminated equipment to reduce the number of injuries, infection, diseases, suffocation, or exposure to other hazards. This may include, but is not limited to:

- Rubber gloves
- Rubber footwear
- Eye protection
- Ear protection

All personnel should be trained in the proper use of and wear appropriate personal protective equipment while engaged in necessary work and related tasks or activities. Management should ensure that all necessary training and personal protective equipment are provided to personnel.

The personal protective equipment should be properly fitted and operating. Employees should report all defective equipment to their supervisor and the defective equipment tagged and documented with an explanation of problems or defects. All defective equipment should be inspected by qualified personnel, repaired and returned to service or recommended for replacement.

11.4 Training

All personnel should be trained in regards to all applicable local, State, and Federal safety standards and regulations. This may include:

- Potential safety hazards.
- Confined space entry.
- First aid and cardiopulmonary resuscitation (CPR).
- Operation of treatment facilities equipment.
- Heavy equipment operation.
- Use of personal protective equipment.
- Accident reporting.

11.5 Reporting Accidents

All on-the-job accidents to O&M personnel should be reported to their supervisor or management using the Accident Report Form shown in **Figure 11-1**. All Accident Report Forms should be reviewed and investigated by management, and follow-up action taken to prevent further accidents by reducing or eliminating the hazard. Personnel should also report conditions that they feel are unsafe or need attention for further evaluation and corrective action, if necessary, by their supervisor or management.

Figure 11-1 - Example Accident Report Form

Name: (First) (Middle) (Last)			Date:
Employee Address:	City:	State:	Zip Code:
Place of Accident:	Was Place of Accident on Employers Premises? [ ] Yes [ ] No		
Date of Accident:	Time of Accident:		
Date that Accident was Reported to Employer:	Who Was Injury Reported To?:		
Did Accident Result in Lost Time?: [ ] Yes [ ] No	If Yes, Give Date Last Worked:		
What was Employee Doing when Accident Occurred? (Describe Briefly):			
How did the Accident Happen? (Describe Fully):			
What Machine, Tool, Substance or Object was Most Closely Connected with the Accident?:	Were the Appropriate Safeguards in Place? [ ] Yes [ ] No		
Where Other People Injured in the Accident?: [ ] Yes [ ] No	If Yes, Who was Involved?:		
Describe the Injury or Illness in Detail:			
Did Employee Receive Treatment?: [ ] Yes [ ] No	If Yes, Provide a Brief Description of Treatment:		
Name and Address of Physician:			
Name and Address of Hospital:			
Signature of Employer:	Signature of Employee:		

11.6 Emergency Contact List

Table 11-1 outlines emergency contacts and phone numbers that should be posted near telephones and carried by personnel with mobile telephones.

Table 11-1 – Emergency Contact List

Emergency Contact	Telephone Number
Paul Wollman, System Operator	509-760-1808
Fire Department	911
Sheriff's Department	911
Ambulance	911
Washington Department of Ecology – Dam Safety	360-407-6606
Washington Department of Ecology – Water Quality	509-329-3400
Adams County Health Department	509-488-2031

11.7 Safety Equipment List

Throwable flotation devices/life preserver must be maintained on site. Personal protective equipment, air monitor, confined space ventilation fan and rescue/retrieval system will need to be brought on site any time it is anticipated it will be needed. First aid kit is required any time personnel are on site. A fire extinguisher shall also be located on the site.

The Emergency Contact List shall be posted on site.

APPENDIX A

Facility Permit

COPY

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
4601 N Monroe Street • Spokane, Washington 99205-1295 • (509)329-3400

September 4, 2012

RECEIVED
SEP - 6 2012
J-U-B ENGINEERS INC

Mr. Paul Wollman
Warden Hutterian Brethren
1054 W. Harder Road
Warden, WA 99857

Dear Mr. Wollman:

RE: Temporary Permit for Warden Hutterian Brethren– Permit No. ST-0045509

This letter is to confirm that Ecology received a State Waste Discharge Permit application on August 10, 2011 from Warden Hutterian Brethren. By statue (Chapter 90.48.200 RCW) Temporary Permit No. ST-0045509 is being issued allowing Warden Hutterian Brethren to discharge wastewater to non-discharging Facultative Lagoons. If you wish to discharge via land application, an amended application will be required.

Your application for a State Waste Discharge Permit has been reviewed and accepted and a public notice of application was published on April 5, 2012 and April 12, 2012 in the Columbia Basin Herald per WAC 173-216-090.

Until Ecology issues an Order or Permit with limits and monitoring requirements we request that you monitor the flows to your lagoon at least weekly and track the flow data in a spreadsheet or report that can be provided to Ecology upon request. This temporary permit is effective immediately and will remain in force for up to five years or until a new permit is issued for your facility.

Please feel free to contact Diana Washington at (509) 329-3504 or by email at dwas461@ecy.wa.gov if you have any questions or need assistance.

Sincerely,

James M. Bellatty
Section Manager
Water Quality Program

CERTIFIED MAIL (7011 0110 0000 7276 2791)

JMB:slt
cc: Douglas Ensor, JUB Engineering
Loren Wiltse, Adams County Planning
David Greenwalt, Carpenter McGuire & DeWulf, P.S.
Scott Yaeger, Adams County

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
4601 N Monroe Street • Spokane, Washington 99205-1295 • (509)329-3400

April 2, 2012

TO: Interested Parties (Mailing List)

FROM: Shara Joy, Permit Coordinator

SUBJECT: Notice of State Waste Discharge Permit Application ST-0045509; Warden Hutterian Brethren

Enclosed is a copy of the public notice for the Warden Hutterian Brethren State Waste Discharge Permit Application for its municipal wastewater facility. This public notice will be published **April 5, 2012** and **April 12, 2012** in the Columbia Basin Herald. Interested persons are invited to submit their name, address and comments regarding this permit to:

Water Quality Permit Coordinator
Department of Ecology
Water Quality Program
4601 N. Monroe Street
Spokane, WA 99205-1295
stra461@ecy.wa.gov

All respondents to this notice will receive a copy of the draft permit and fact sheet before the final permit is issued.

Please contact Mike Hepp (Facility Manager) at (509) 329-3536 or by email at mhep461@ecy.wa.gov if you desire more pertinent information about this entity.

SLJ:slj

NOTICE: ANNOUNCEMENT OF AVAILABILITY OF APPLICATION

PERMIT NO.: ST-0045509

APPLICANT: Warden Hutterian Brethren
1054 W. Harder Road
Warden, WA 99857

FACILITY: 1054 W. Harder Road
Warden, WA 99857

Warden Hutterian Brethren has applied for a State Waste Discharge Permit (SWDP) in accordance with the provisions of Chapter 90.48 Revised Code of Washington (RCW), Chapter 173-216 Washington Administrative Code (WAC).

Warden Hutterian Brethren presently owns and operates a municipal facility that discharges wastewater to two cell evaporative lagoons which are designed for an average monthly flow of 10,890 gallons per day. The wastewater, following treatment, must meet the requirements of the Washington State Water Pollution Control Act and applicable regulations for a permit to be issued.

The Department of Ecology is proposing to issue the permit and is hereby issuing public notice of its intent. Interested persons are invited to submit their name, address, and comments regarding this permit to:

Water Quality Permit Coordinator
Department of Ecology
Eastern Regional Office
4601 N. Monroe Street
Spokane, WA 99205

E-mail comments should be sent to Mike Hepp at mhep461@ecy.wa.gov.

All respondents to this notice will receive a copy of the draft permit and fact sheet before the final permit is issued.

Ecology is an equal opportunity agency. If you need this publication in an alternate format, please contact us at (509) 329-3455 or TTY (for the speech and hearing impaired) at 711 or 1-800-833-6388.

APPENDIX B

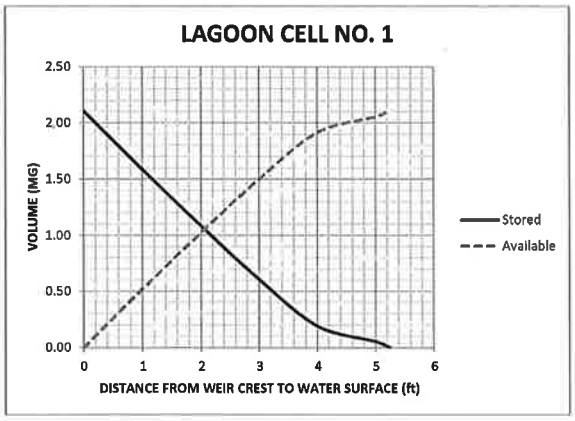
Depth/Storage Data
Depth/Surface Area Data

VOLUME VS. DEPTH, LAGOON CELL NO. 1, NO. 2 AND COMBINED VOLUME
DATE: 2/13/2012

Maximum Water Surface Elevation
1335.28

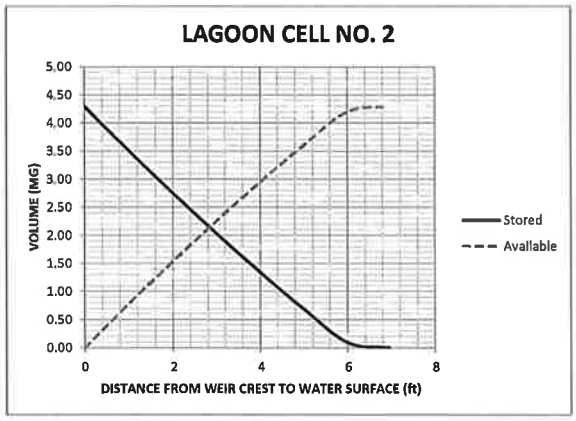
CELL NO. 1

Water Surface Elevation	Distance from Weir Crest to Water Surface (ft)	Stored Volume (m. gal)	Remaining Storage (m. gal)
1335.28	0	2.11	0.00
1334.28	1	1.59	0.52
1333.28	2	1.09	1.02
1332.28	3	0.61	1.50
1331.28	4	0.19	1.92
1330.28	5	0.05	2.06
1330.03	5.25	0.00	2.11



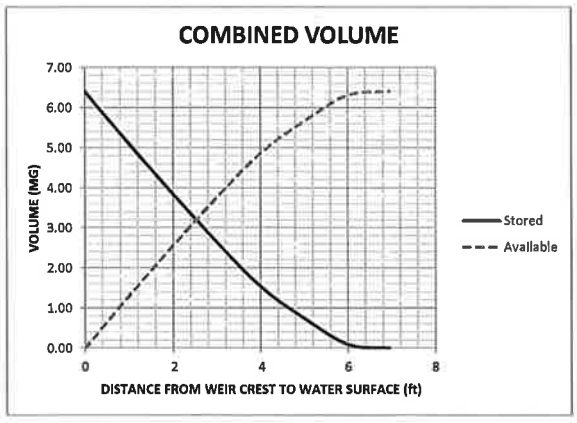
CELL NO. 2

Water Surface Elevation	Distance from Weir Crest to Water Surface (ft)	Stored Volume (m. gal)	Remaining Storage (m. gal)
1335.28	0	4.30	0.00
1334.28	1	3.51	0.79
1333.28	2	2.76	1.54
1332.28	3	2.03	2.27
1331.28	4	1.35	2.95
1330.28	5	0.69	3.61
1329.28	6	0.09	4.21
1328.33	6.95	0.00	4.30



COMBINED VOLUME

Water Surface Elevation	Distance from Weir Crest to Water Surface (ft)	Stored Volume (m. gal)	Remaining Storage (m. gal)
1335.28	0	6.41	0.00
1334.28	1	5.10	1.31
1333.28	2	3.84	2.57
1332.28	3	2.64	3.77
1331.28	4	1.54	4.87
1330.28	5	0.74	5.67
1329.28	6	0.09	6.32
1328.33	6.95	0.00	6.41

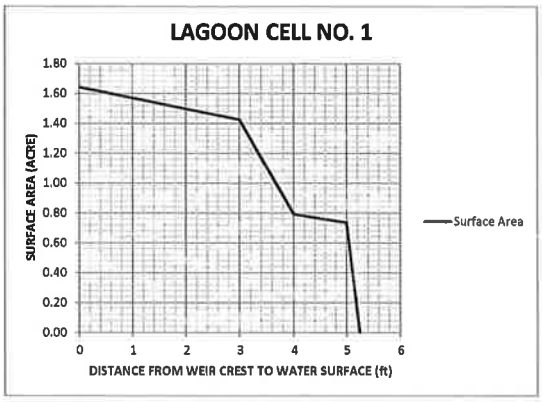


SURFACE AREA VS. DEPTH, LAGOON CELL NO. 1, NO. 2 AND COMBINED SURFACE AREA
DATE: 2/13/2012

Maximum Water Surface Elevation
1335.28

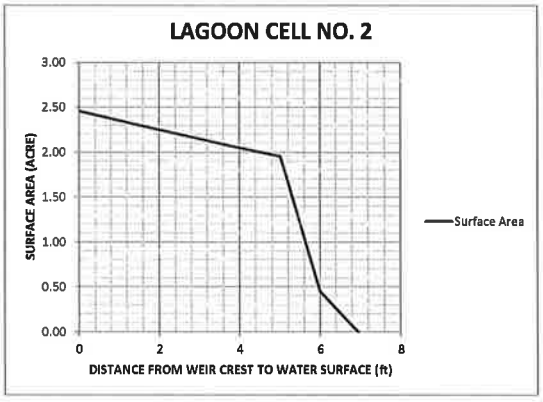
CELL NO. 1

Water Surface Elevation	Distance from Weir Crest to Water Surface (ft)	Water Surface Area (acre)
1335.28	0	1.65
1334.28	1	1.57
1333.28	2	1.50
1332.28	3	1.43
1331.28	4	0.79
1330.28	5	0.74
1330.03	5.25	0



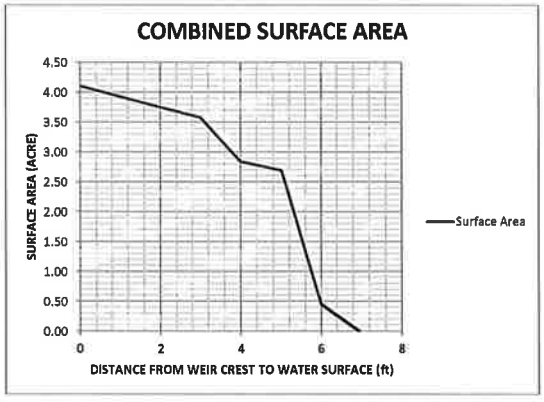
CELL NO. 2

Water Surface Elevation	Distance from Weir Crest to Water Surface (ft)	Water Surface Area (acre)
1335.28	0	2.46
1334.28	1	2.36
1333.28	2	2.25
1332.28	3	2.15
1331.28	4	2.05
1330.28	5	1.95
1329.28	6	0.45
1328.33	6.95	0



COMBINED SURFACE AREA

Water Surface Elevation	Distance from Weir Crest to Water Surface (ft)	Water Surface Area (acre)
1335.28	0	4.11
1334.28	1	3.93
1333.28	2	3.75
1332.28	3	3.58
1331.28	4	2.85
1330.28	5	2.69
1329.28	6	0.45
1328.33	6.95	0



APPENDIX C

Base Liner Leak Locations Survey Report

LEAK LOCATION SERVICES, INC.

16124 UNIVERSITY OAK • SAN ANTONIO, TEXAS 78249 • (210) 408-1241 / FAX (210) 408-1242

July 29, 2011

Brett Holmstrom
Northwest Linings
2100 77th Avenue South
Kent, WA 98032

Email: bretth@northwestlinings.com

Subject: Report for "Geomembrane Leak Location Survey of the Secondary Geomembrane of Two Lagoons in Warden, Washington";
LLSI Proposal 1603

Dear Mr. Holmstrom:

On July 25 and 26, 2011, Thane Hefley of Leak Location Services, Inc. (LLSI) conducted a geomembrane leak location survey of the subject lagoons. The water puddle method was used to test for leaks in the bare secondary geomembrane. The area that was tested included the floor area and the side slopes. The lagoons have a combined area of approximately 257,000 square feet and is lined with a 40-mil HDPE secondary geomembrane on top of a prepared subgrade. This report documents the results of the survey.

I. RESULTS

No leaks were found. The leak location equipment and survey procedures for the leak location method were demonstrated according to ASTM D7002. This involves performing a leak location survey on a piece of geomembrane with a 0.04-inch diameter leak. Proper operation is indicated when a reading greater than 10 percent of full scale is obtained on the leak detection electronics. The actual deflection was 60 to 80 percent of full scale.

II. TECHNIQUE

The electrical leak location method detects electrical paths through the geomembrane caused by water or moisture in the leaks. The water puddle method is to use a squeegee device to push a small amount of water over the geomembrane providing the electrical conduction pathway. A low voltage electrical supply is connected to earth ground and to the squeegee. When a hole in the geomembrane is encountered, electrical current will flow through water in the leak contacting earth ground. This current is monitored using an electronic detector that converts the increase in the current to an audible tone indication and a meter indication. Only the area immediately in front of the squeegee is temporarily covered with water.

The water puddle test is also not effective on wrinkles or on areas where the geomembrane is bridging over the soil subgrade. Therefore, most squeegee work is scheduled at night or early morning hours when wrinkles are minimized.

The survey of the bare geomembrane of the cell was conducted before cover material is placed on the geomembrane. The geomembrane was surveyed using a custom-designed squeegee sensor. The geomembrane was systematically scanned with overlapping coverage. The area that was surveyed was noted and/or marked so all of the bare geomembrane area is surveyed.

We appreciate this opportunity to have been of services to Northwest Linings, Inc. on this important service requirement. If we may be of additional assistance, please call on us.

Very truly yours,

Matthew Kemnitz
Senior Project Manager

Doug Ensor

From: Brett Holmstrom <bretth@northwestlinings.com>
Sent: Wednesday, September 12, 2012 2:55 PM
To: Doug Ensor
Subject: FW: LLSI Report #1603
Attachments: image001.emz; image002.emz; R-1603-Northwest-Warden.pdf

Here you go!

Thanks,

Brett Holmstrom
Project Manager
Northwest Linings and Geotextile Products, Inc.
21000 77th Ave South
Kent, WA 98032
direct: 253.867.5368
cell: 206.714.2555
fax: 253.872.6953
bretth@northwestlinings.com
www.northwestlinings.com
"Helping to Protect the Environment"

From: Brett Holmstrom [mailto:bretth@northwestlinings.com]
Sent: Friday, July 29, 2011 7:39 AM
To: Garry Kneedler
Cc: joelm@northwestlinings.com; stank@northwestlinings.com
Subject: FW: LLSI Report #1603

Leak Location report, no leaks found.

Brett Holmstrom
Project Manager
Northwest Linings and Geotextile Products, Inc.
direct: 253.867.5368
cell: 206.714.2555
fax: 253.872.6953
email: bretth@northwestlinings.com

From: Matthew Kemnitz [mailto:mkemnitz@llsi.com]
Sent: Friday, July 29, 2011 7:36 AM
To: bretth@northwestlinings.com
Subject: LLSI Report #1603

Mr. Holmstrom-

Please find the attached report for leak location of the Secondary Geomembrane of Two Lagoons in Warden, Washington. Please feel free to contact us with any questions regarding this report.

Thanks,

Matthew P. Kemnitz, EIT
Leak Location Services, Inc.
16124 University Oak
San Antonio, Texas 78249
Tel. (210) 408-1241
Fax (210) 408-1242
www.llsi.com

APPENDIX D

Lagoon Dike Operation and Maintenance Plan

WASHINGTON STATE DEPARTMENT OF ECOLOGY

WATER RESOURCES PROGRAM
DAM SAFETY OFFICE

OPERATION AND MAINTENANCE PLAN FORM

1. PROJECT DATA:

Dam Name: Unnamed

Reservoir Name: Warden Hutterian Brethren Wastewater Lagoon

Owner's Name: Warden Hutterian Brethren

Creek/River: Offstream, tributary of Lind Coulee

Location: Section 8 Township 18 N. Range 31 E.

Dam Type: Homogeneous earthen

Dam Height: 14 ft. Crest Length: 700 ft. Crest Width: 15 ft.

2. INDIVIDUALS WHO ARE RESPONSIBLE FOR:

	Name	Title	Telephone #
Operation:	Paul Wollman	_____	(509)-349-8405
Maintenance:	Paul Wollman	_____	(509)-349-8405
Inspections:	Paul Wollman	_____	(509)-349-8405
Monitoring of Instrumentation:	Paul Wollman	_____	(509)-349-8405

3. LISTING OF HYDRAULIC ELEMENTS FOR CONTROLLING INFLOW TO OR OUTFLOW FROM RESERVOIR: *(Include gates, valves, spillways, stoplogs, structures, etc. location and dimensions of structures)*

Inflow to the lagoon is gravity flow, and diversions to one or both cells is controlled by inline gate valves. Flow between Cell #1 and Cell #2 is regulated by a flow transfer structure with removeable stop logs. Outflow from Cell #2 for future irrigation will be piped to a pump station for pressurized delivery to crops. Emergency outflow from Cell #2 is provided by an 8" gravity spillway pipe with a riprap termination.

4. RULES AND PROCEDURES FOR RESERVOIR OPERATION (How is reservoir level controlled? Include proposed reservoir levels for given time of year, periods of drawdown and filling, and operation during floods)

The reservoir level between cells is controlled by a stop log flow transfer structure. Flow level in Cell #2 is regulated through pumping for irrigation during the growing season.

5. **LIST OF ITEMS REQUIRING PERIODIC MAINTENANCE, AND PROCEDURES FOR PERFORMING MAINTENANCE.** *(Include type of maintenance performed, frequency, method, and record keeping):*

Items requiring periodic maintenance may include the inflow manholes (cleaning when required), the septic tank (pumping when required), pumping for irrigation (when required by lagoon level or when desired). A log of maintenance procedures will be maintained on a monthly basis.

6. **LIST OF INSTRUMENTATION, FREQUENCY OF MONITORING, AND METHOD OF RECORD KEEPING:**

A flume will be installed to monitor the inflow to the lagoons. The flume reading will be recorded on a monthly basis.

7. **LIST OF EQUIPMENT TO BE PERIODICALLY TEST OPERATED.** *(Gates, valves, hoists, etc. Include frequency of test operation.):*

Gate valves on inflow lines will be tested annually for proper operation.

8. **FREQUENCY OF ROUTINE INSPECTIONS:** *(e.g. Weekly, monthly, or quarterly. Include list of key elements inspected)*

Routine inspections will be made weekly. Lagoon levels will be inspected and general operation observed. The overflow spillway will be checked to verify the inlet is open and operational.

9. **ANNUAL INSPECTIONS BY OWNER:** (*Time of year when performed, special items to be examined, reviewed, and/or test operated*)

Annual inspections will include manhole flow observations, septic tank sludge level measurement, proper pump operation, flow level review, transfer structure inspection, and general dike condition.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
P.O. Box 47600 • Olympia, Washington 98504-7600
(360) 407-6000 • TDD Only (Hearing Impaired) (360) 407-6006

December 16, 2011

Mr. Paul Wollman
Warden Hutterian Brethren
1054 W. Harder
Warden, WA 98857

PROJECT: Warden Hutterian Brethren Headquarters Wastewater System Project
FILE NO.: AS41-2034

Dear Mr. Wollman,

This letter serves as a formal notice from the Dam Safety Office that the Wastewater Cells may be placed in service. This authorization is given following our receipt of the Declaration of Dam Construction Completion from the engineer of record, Mr. Ensor.

I understand that a copy of the construction records summary of the work on the two cells along with a set of as-built plans will be emailed to us by your engineer in the coming weeks. Mr. Ensor has already provided an Operation & Maintenance Plan. Accordingly, only one other item is required of the project to fully comply with the Dam Safety Statutes. Specifically, under the provisions of WAC 173-175-510[1] you or one of your staff needs to conduct an annual inspection of the impounding system.

A draft annual inspection form for this purpose has been provided at the end of this letter. The form has been tailored to your project. A copy of each annual inspection should be sent to this office. The last page of the inspection form contains the necessary information to mail or email this office a copy of the inspection reports. Please provide this office with your email address to facilitate sending you an electronic copy of the inspection form and to more efficiently communicate with you in the future.

[1] http://apps.leg.wa.gov/WAC/default.aspx?cite=173-175-510

If you need to contact me for any reason, my number is (360) 407-6625 and my email address is jlsd461@ecy.wa.gov

Sincerely,

Jerald LaVassar

Jerald LaVassar, M.S., P.E.
Water Resources Program
Dam Safety Office

Attachment: Annual Inspection Form (draft)

Cc: Douglas Ensor, JUB Engineers

APPENDIX E

Dam Safety – Annual Inspection Form

ANNUAL INSPECTION FORM

Project Data:		
Dam Name: Warden Hutterian Brethren Headquarters Wastewater System		
Owner Name: Warden Hutterian Brethern		
Address: 1054 W. Harder Warden, WA 98857	Telephone No.: (509) 458-3727	
Inspected by:	Date of Inspection:	Weather:

Reservoir Data
Reservoir Level at time of Inspection _____ (Drained or estimate the elevation below dam crest)
Reservoir Outflow at time of Inspection _____ (0 inches likely of water depth in inches exiting the 8 inch pipe)

Condition of Perimeter Embankment of Cells

(Mark approximate location of any problem on the plan of the dam footprint on page 3 & attach photos)

Crest:_____

_____

_____

(Check for: cracks that have a vertical offset from one side to the other (to differentiate between normal shrinkage cracking) or depressions either of which may suggest slope movement, check that vehicular traffic is not running on any exposed portions of the HDPE liner as that can damage the liner and potentially result in the vehicle sliding into the pond.)

Geomembrane (HDPE) Lined Upstream face:_____

_____

_____

(Check for: evidence of liner tears, pull out of the liner from the anchor trench, signs of burrowing animals that may extend under the liner, and depressions in the plane of the liner on the upper reaches of the slope or bulging near the base of the slope that indicate movement of the underlying soils.

Downstream face: _____

_____

_____

(Check for: wet soft areas , seepage [if bubbling up and carrying soil particles implement contact the Dam Safety Office] , slides/slumps/scarps/anomalous change in slope or toe bulging, animal runs, erosion, brush)

Leak Collection System between Liners (PVC Sump): _____

_____

_____

(Check for: leakage that has or is entering the sump, see O&M Plan for follow up actions in the event leakage exceeds an established threshold rate.)

Flow Routing and Discharge Piping

Flow Transfer Structure between Cells 1 & 2: _____

_____

_____

(Check for: debris accumulations and confirm appropriate stoplog configuration.)

8 inch Spillway Pipe: _____

_____

_____

(Check that: the pipe inlet and outlet are clear)

Diversion Channel

Channel Section: _____

_____

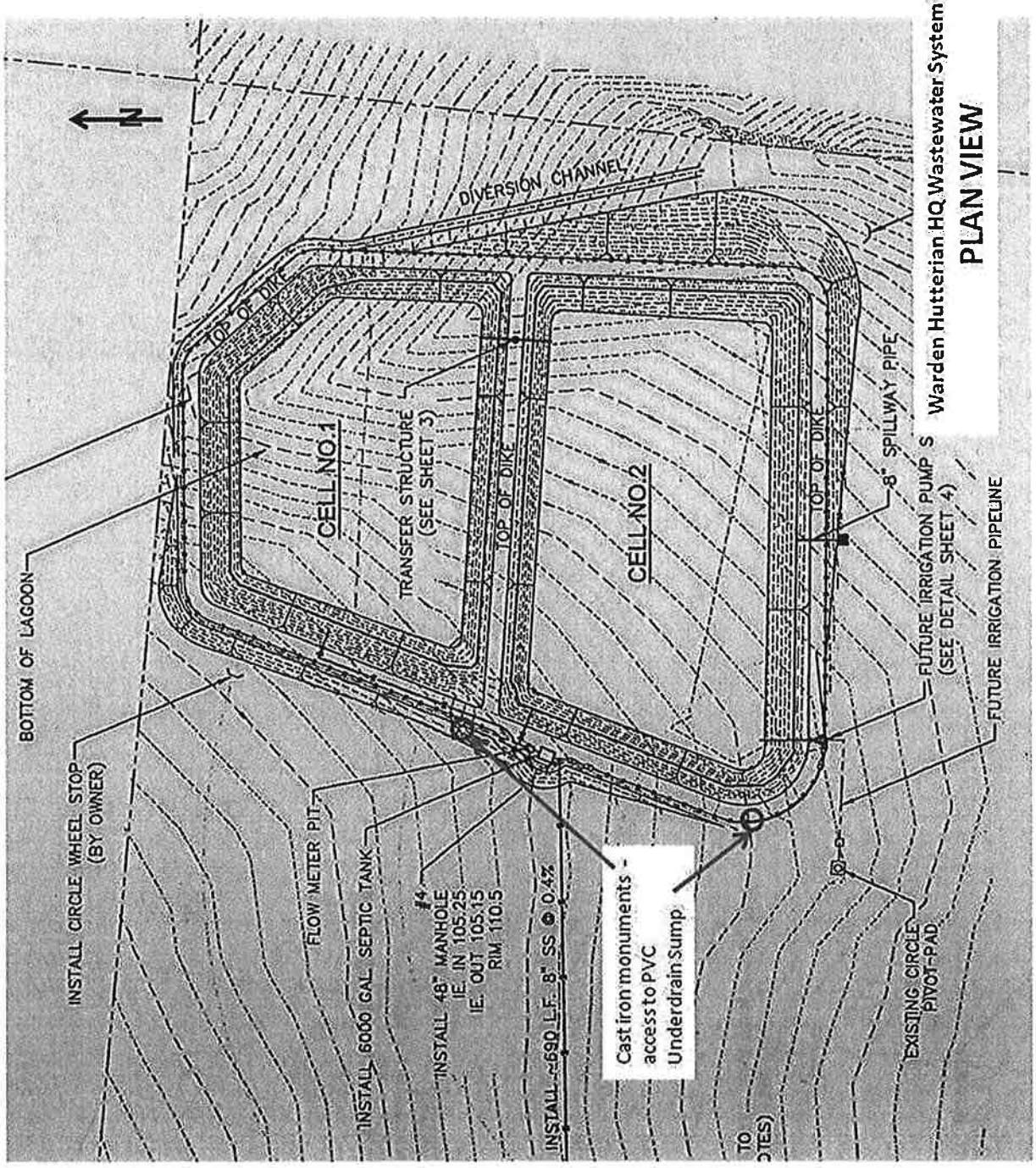
_____

(Check for: erosion damage to the channel and brush encroaching into the channel)

Maintenance Deficiencies

Additional Comments

Plan View


Warden Hutterian HQ Wastewater System Cells
PLAN VIEW
N
DIVERSION CHANNEL
TOP OF DIKE
CELL NO.1
TRANSFER STRUCTURE
(SEE SHEET 3)
TOP OF DIKE
CELL NO.2
TOP OF DIKE
8" SPILLWAY PIPE
FUTURE IRRIGATION PUMP S
(SEE DETAIL SHEET 4)
FUTURE IRRIGATION PIPELINE
BOTTOM OF LAGOON
INSTALL CIRCLE WHEEL STOP
(BY OWNER)
FLOW METER PIT
INSTALL 6000 GAL SEPTIC TANK
#4
INSTALL 48" MANHOLE
IE. IN 105.25
IE. OUT 105.15
RIM 110.5
INSTALL ±690 L.F. 8" SS @ 0.4%
Cast iron monuments -
access to PVC
Underdrain Sump
EXISTING CIRCLE
PIVOT-PAD

Append Photos

Please send a copy (electronic or paper) to the Attention of the Dam Safety Office at the following address:

Washington State Dept. of Ecology
PO Box 47600
Olympia, WA 98504-7600

Note, if a problem is observed in the inspection, please call the Dam Safety Office at (360) 971-6347 24 hr pager or 407-6625 for guidance and assistance.

Signature of Individual Completing this Form _____

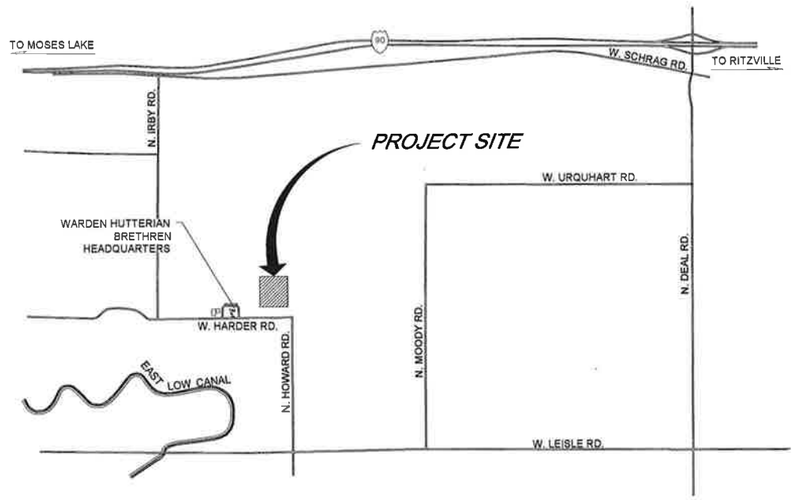
Date_____

APPENDIX F

Record Drawings

WARDEN HUTTERIAN BRETHREN

WARDEN WASHINGTON
HEADQUARTERS WASTEWATER SYSTEM PROJECT
2011



VICINITY MAP

N.T.S.

NOTES:

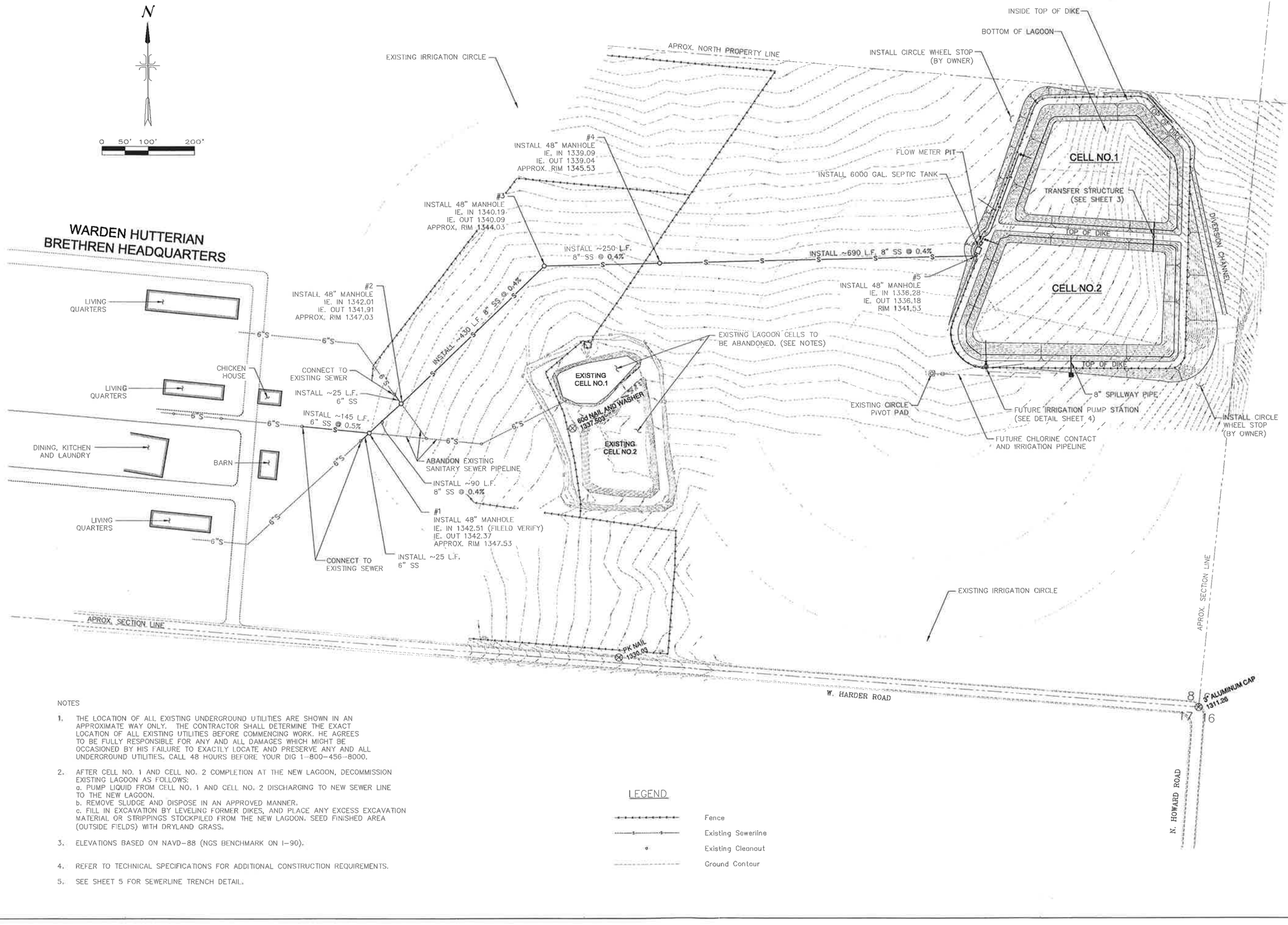
1. THE CONTRACTOR SHALL CALL 811 48 HOURS BEFORE DIGGING TO LOCATE UNDERGROUND UTILITIES. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE TO PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

2. ALL MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH REQUIREMENTS OF ADAMS COUNTY, WSDOT/APWA 2006 STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION AND PROJECT TECHNICAL SPECIFICATIONS.

3. ALL ELECTRIC EQUIPMENT, MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL CODES.

INDEX

RECORD DRAWINGS
OCT. 28, 2011
ELEV. CORRECTED TO NAVD 88 SEPT. 28, 2012



NOTES

1. THE LOCATION OF ALL EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. HE AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES. CALL 48 HOURS BEFORE YOUR DIG 1-800-456-8000.

2. AFTER CELL NO. 1 AND CELL NO. 2 COMPLETION AT THE NEW LAGOON, DECOMMISSION EXISTING LAGOON AS FOLLOWS:
   a. PUMP LIQUID FROM CELL NO. 1 AND CELL NO. 2 DISCHARGING TO NEW SEWER LINE TO THE NEW LAGOON.
   b. REMOVE SLUDGE AND DISPOSE IN AN APPROVED MANNER.
   c. FILL IN EXCAVATION BY LEVELING FORMER DIKES, AND PLACE ANY EXCESS EXCAVATION MATERIAL OR STRIPPINGS STOCKPILED FROM THE NEW LAGOON. SEED FINISHED AREA (OUTSIDE FIELDS) WITH DRYLAND GRASS.

3. ELEVATIONS BASED ON NAVD-88 (NGS BENCHMARK ON I-90).

4. REFER TO TECHNICAL SPECIFICATIONS FOR ADDITIONAL CONSTRUCTION REQUIREMENTS.

5. SEE SHEET 5 FOR SEWERLINE TRENCH DETAIL.

LEGEND

- Fence
- Existing Sewerline
- Existing Cleanout
- Ground Contour

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RECORD DRAWINGS
OCT. 28, 2011

ELEV. CORRECTED
SEPT. 28, 2012

NO.	REVISION	BY	APP'D	DATE
1	REVISED FOR DAM SAFETY	TJF	DEE	9-10-10

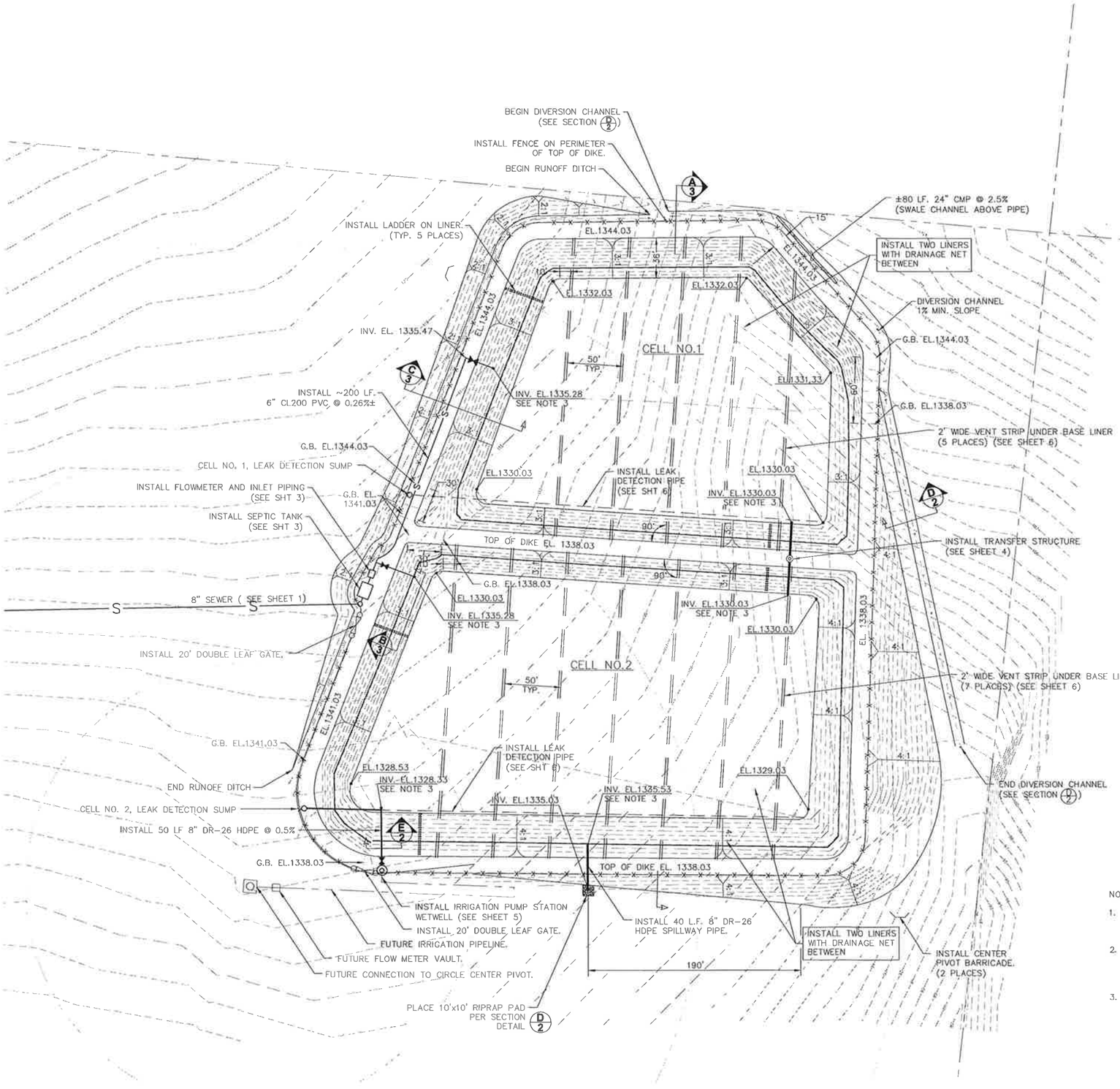
WARDEN HUTTERIAN BRETHREN HEADQUARTERS WASTEWATER SYSTEM

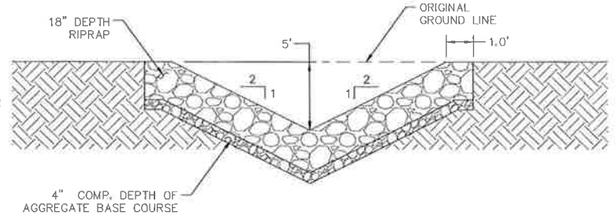
SITE PLAN AND SEWER MAIN INSTALLATION

CAD FILE: 70-318-031-RD
PROJ. #: 70318
DRAWING NO.: 70318B-2AC
DRAWN BY: TJF
DESIGN BY: DEE
CHECKED BY: DEE
SCALE OF SHEET
HOR SCALE: 1"=50'
VER SCALE: 1"=50'
LAST UPDATED: 3-18-09

SHEET 1 OF 7

5/03 (JUB-02-VERT)





SECTION D/2

DIVERSION CHANNEL

N.T.S.

NOTES

1. STRIP ALL VEGETATION AND GRUB ALL ROOTS FROM GROUND SURFACE PRIOR TO PLACING ANY FILL OR EXCAVATING FROM BORROW. DISPOSE OF ROOTS AND COARSE ORGANIC MATTER. STOCKPILE STRIPPINGS FOR LATER PLACEMENT IN EXISTING CELL NO. 1.
2. THE FLOOR AND DIKE SLOPES OF LAGOON CELL NO. 1 AND CELL NO. 2 SHALL BE GRADED AND APPROVED BY THE LINER INSTALLATION CONTRACTOR PRIOR TO LINER INSTALLATION. IF NECESSARY, THE SURFACES SHALL BE HAND RAKED TO DISPOSE OF ANY SHARP OBJECTS OR VEGETATION.
3. CONSTRUCT CONCRETE PENETRATION PADS (SEE SHEET 5) AND PIPE LINE BOOT (SEE SHEET 7).

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OCT. 28, 2011

ELEV. CORRECTED
SEPT. 28, 2012

NO.	REVISION	BY	DATE
1	REVISED FOR LOAN SAFETY INSPECTION	DEE	9-10-10

WARDEN HUTTERIAN BRETHREN HEADQUARTERS
WASTEWATER SYSTEM

EARTHWORK AND LINER INSTALLATION
LAGOON CELL NO.1 AND NO.2

CAD FILE:	70-318-031B
PROJ. #:	70318
DRAWING NO.:	70-318-031B
DRAWN BY:	TJF
DESIGN BY:	DEE
CHECKED BY:	DEE
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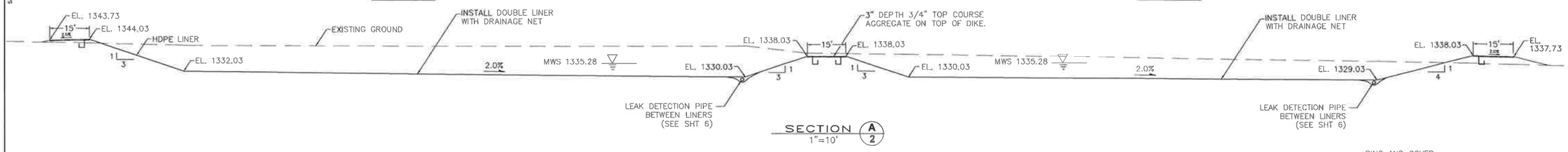
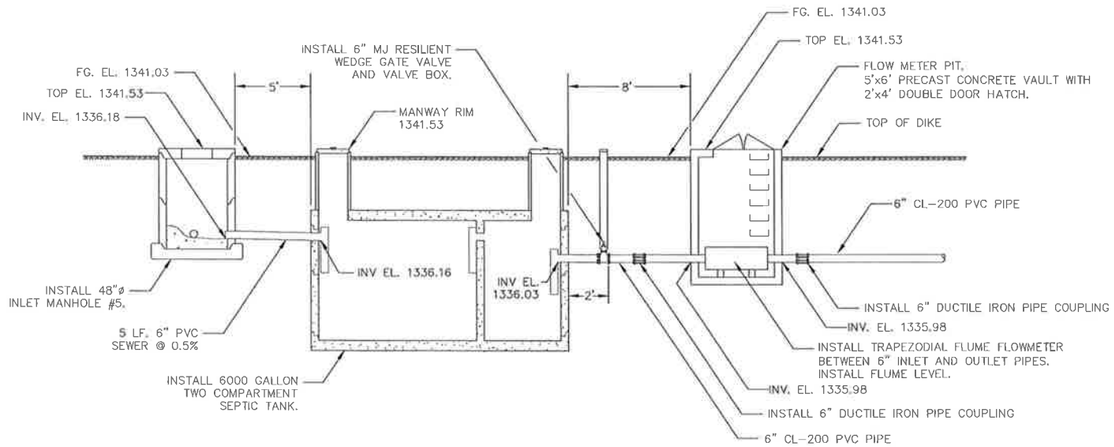
HOR SCALE:	1"=50'
VER SCALE:	1"=50'
LAST UPDATED:	3-18-09

SHEET 2 OF 7

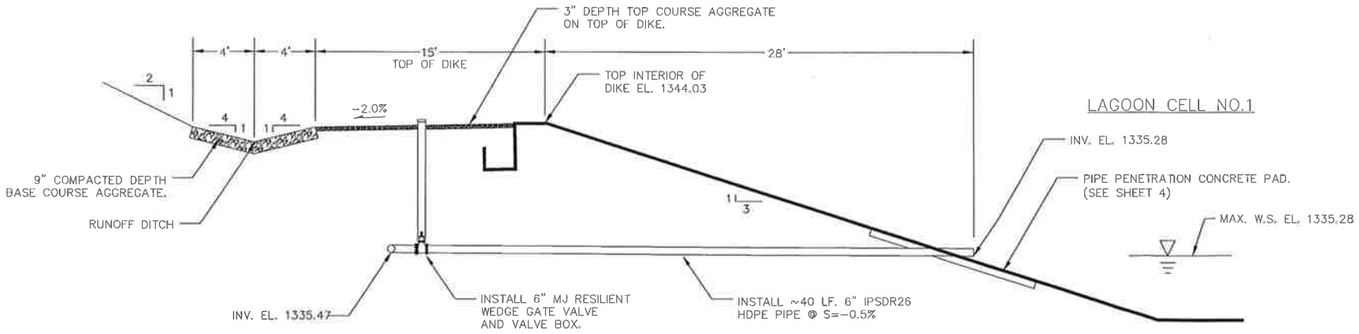
5/03 (JUB-02-VERT)



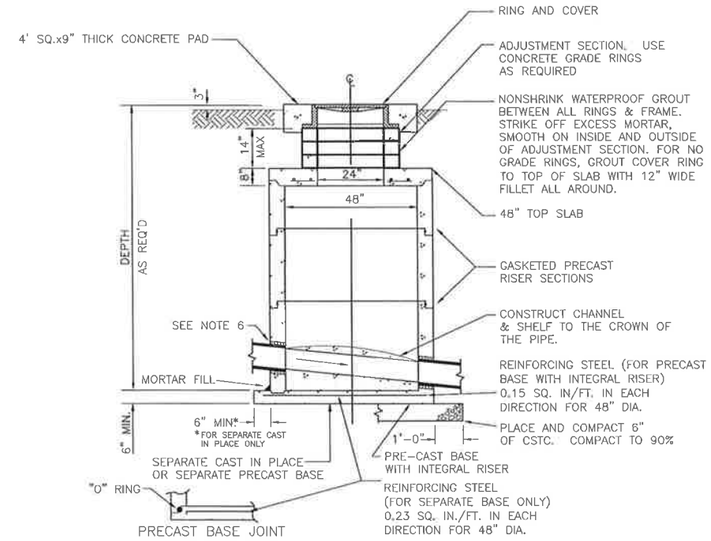
SECTION A 2
1"=10'



SECTION B 2
1"=10'



SECTION C 2
1"=10'



NOTES

1. MANHOLES TO BE CONSTRUCTED IN ACCORDANCE WITH AASHTO M-199 (ASTM C 478) UNLESS OTHERWISE SHOWN ON PLANS OR NOTED IN THE STANDARD SPECIFICATIONS, AND IN ACCORDANCE WITH CURRENT WSDOT/APWA STANDARD SPECIFICATIONS.
2. ALL REINFORCED CAST IN PLACE CONCRETE SHALL BE CLASS 4000. NON-REINFORCED CONCRETE IN CHANNEL AND SHELF SHALL BE CLASS 3000. ALL PRECAST CONCRETE SHALL BE CLASS 4000.
3. PRECAST BASES SHALL BE FURNISHED WITH CUTOUTS OR KNOCKOUTS. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MINIMUM.
4. KNOCKOUT OR CUTOUT HOLE SIZE IS EQUAL TO PIPE OUTER DIAMETER PLUS MANHOLE WALL THICKNESS.
5. ALL BASE REINFORCING SHALL HAVE A MINIMUM YIELD STRENGTH OF 60,000 PSI AND BE PLACED IN THE UPPER HALF OF THE BASE WITH 1" MINIMUM CLEARANCE.
6. USE A-LOK,KOR-N-SEAL, INSERTA TEE, DURA-SEAL III, OR APPROVED EQUAL MANHOLE ADAPTOR.

MANHOLE DETAIL
Not to Scale

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NO.	REVISION / DESCRIPTION	BY APPR.	DATE
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WARDEN HUTTERIAN BRETHREN HEADQUARTERS
WASTEWATER SYSTEM

LAGOON CELL CROSS SECTIONS AND INLET WORKS

CAD FILE:	70318B-2AC
PROJ. #:	70318
DRAWING NO.:	70318B-2AC
DRAWN BY:	TJF
DESIGN BY:	DEE
CHECKED BY:	DEE
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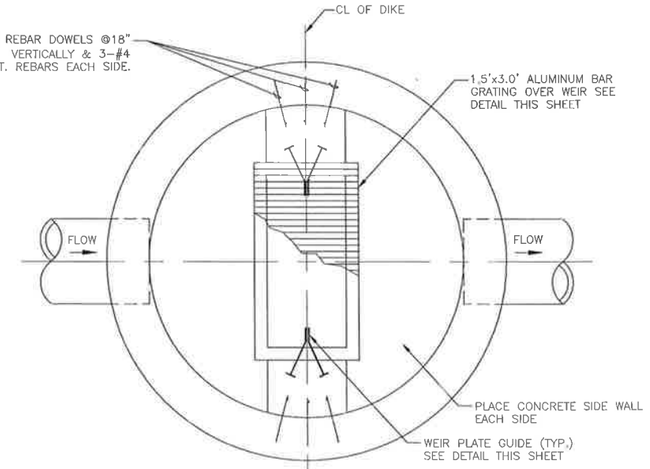
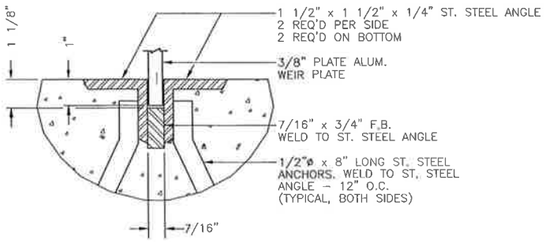
HOR SCALE:	1"=50'
VER SCALE:	1"=50'
LAST UPDATED:	3-10-09

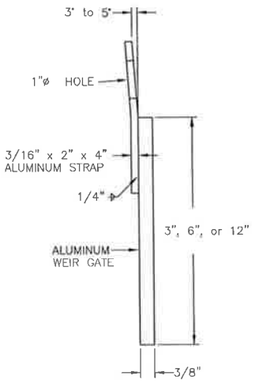
SHEET 3 OF 7



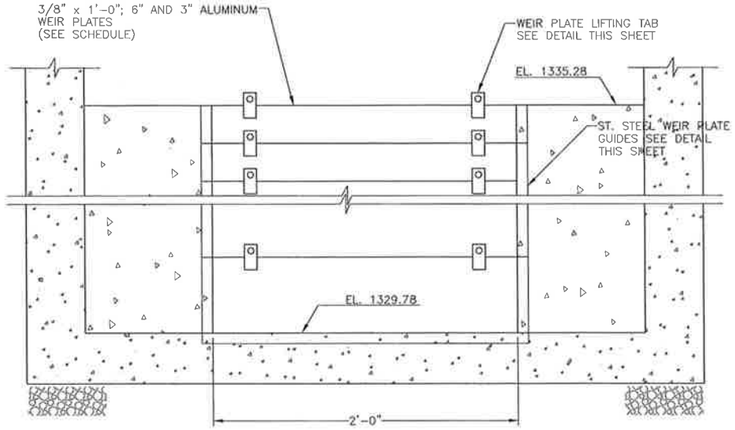
PLAN
Not to Scale



WEIR PLATE GUIDE DETAIL
Not to Scale

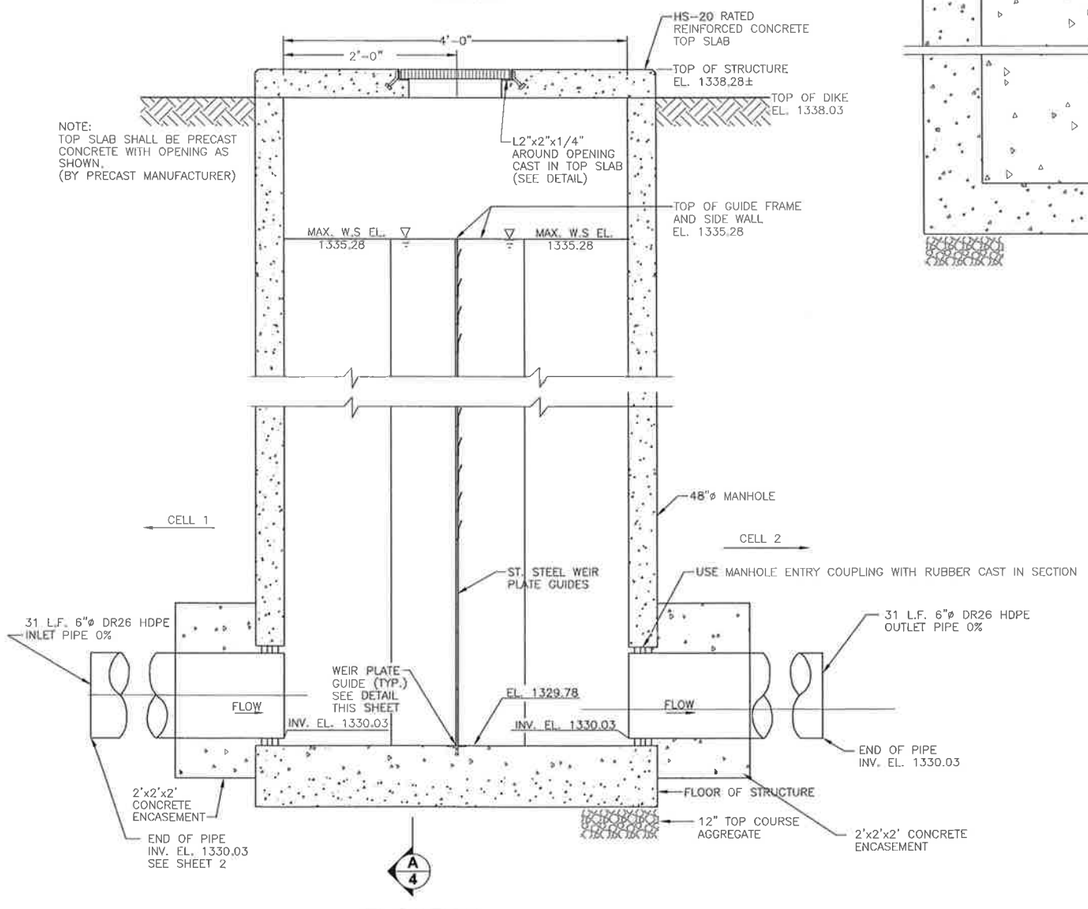


WEIR PLATE DETAIL
Not to Scale

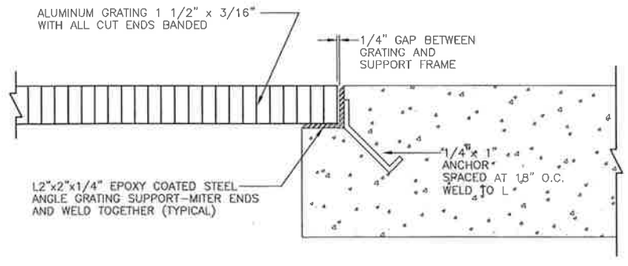


SECTION A/4

WEIR PLATES
Not to Scale



ELEVATION
TRANSFER STRUCTURE
Not to Scale



TYPICAL GRATING SUPPORT FRAME
Not to Scale

WEIR PLATE SCHEDULE

ALUMINUM: 28,000 PSI YIELD, 41,000 PSI ULTIMATE STRENGTH.

3"	WEIR PLATES	QTY. 2
6"	WEIR PLATES	QTY. 6
12"	WEIR PLATES	QTY. 2

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ELEV. CORRECTED SEPT. 28, 2012

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1	REVISED FOR DAM SAFETY DESCRIPTION	TF	DEE	9-10-10

WARDEN HUTTERIAN BRETHREN HEADQUARTERS WASTEWATER SYSTEM

TRANSFER STRUCTURE

CAD FILE: 70318B-2AC
PROJ.#: 70318
DRAWING NO.: 70318B-2AC
DRAWN BY: TJF
DESIGN BY: DEE
CHECKED BY: DEE
SCALE OF SHEET
HOR SCALE: 1"=50'
VER SCALE: 1"=50'
LAST UPDATED: 3-10-09

SHEET 4 OF 7

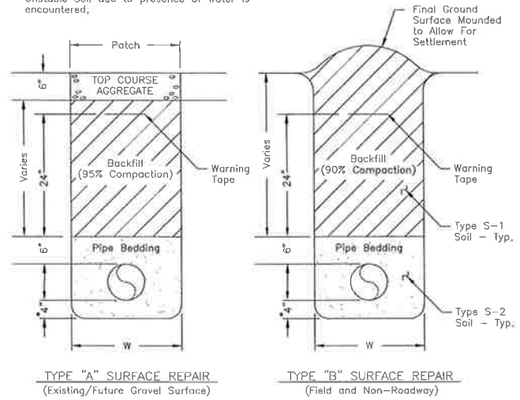
5/03 (JUB-02-VERT)

503 (JUB-02-VENT)

NOTE: MEET ALL FEDERAL, STATE AND LOCAL REQUIREMENTS FOR WORKMAN SAFETY IN ALL EXCAVATIONS AND TRENCHES.

* 6" Pipe Bedding to be Placed Under Pipe where Cemented Gravels, Solid Rock or Unstable Soil due to presence of water is encountered.

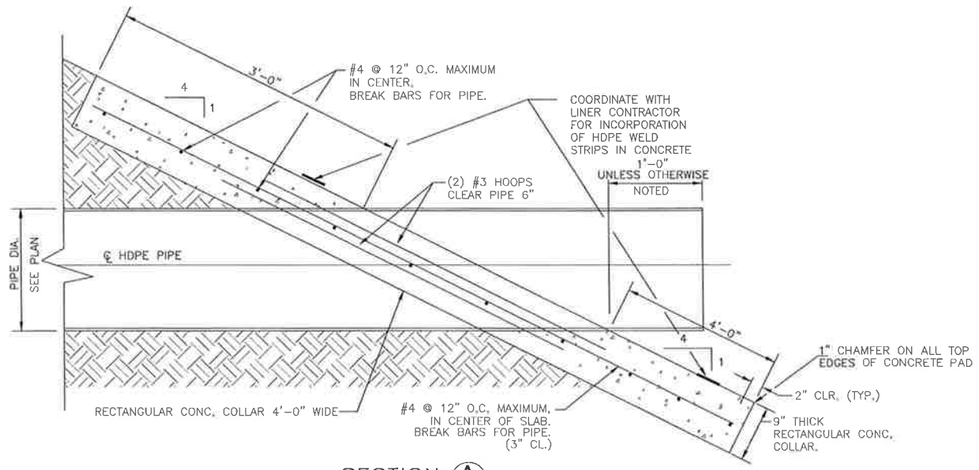
W = Min. 24" for Pipe 12" or less
W = Min. 42"+ O.D. for Pipe > 12"



TYPE "A" SURFACE REPAIR
(Existing/Future Gravel Surface)

TYPE "B" SURFACE REPAIR
(Field and Non-Roadway)

TRENCH BACKFILL & SURFACE REPAIR
NOT TO SCALE



SECTION A/4
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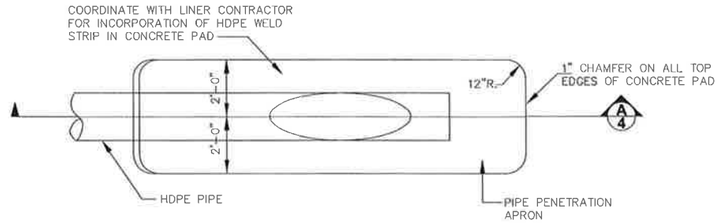
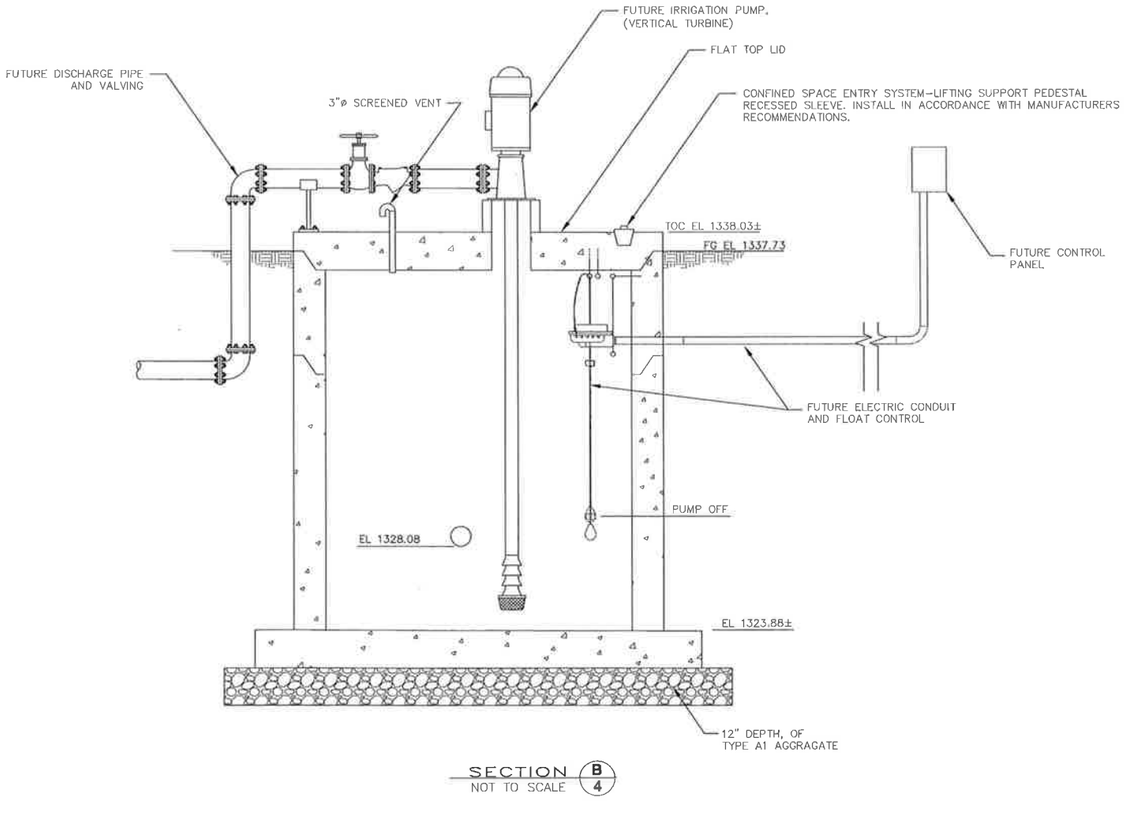


NOTE:
REINFORCEMENT THROUGH APRON SHALL BE AS SHOWN ON PIPE PENETRATION DETAIL THIS SHEET.

PLAN
PIPE PENETRATION CONCRETE PAD DETAIL
NOT TO SCALE



SECTION B/4
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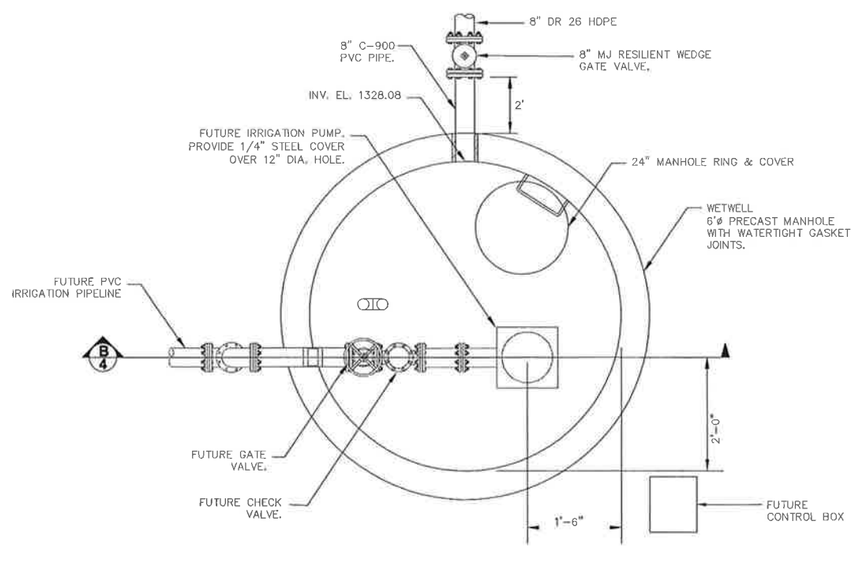

PUMP STATION PLAN VIEW
NOT TO SCALE

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NO.	REVISION / DESCRIPTION	BY APPR.	DATE
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WARDEN HUTTERIAN BRETHREN HEADQUARTERS WASTEWATER SYSTEM

PUMP STATION WETWELL AND CONSTRUCTION DETAILS

CAD FILE:	70318B-TJF
PROJ. #:	70318
DRAWING NO.:	70318B-TJF
DRAWN BY:	TJF
DESIGN BY:	DEE
CHECKED BY:	DEE
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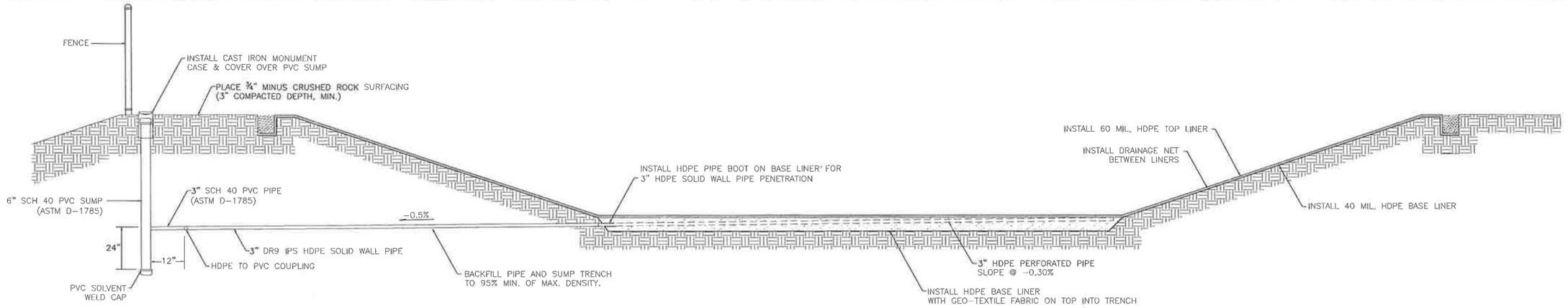
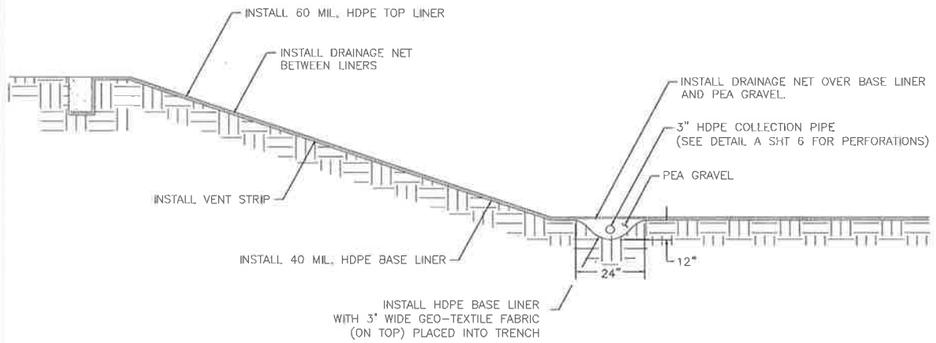
HOR SCALE:	AS SHOWN
VER SCALE:	AS SHOWN
LAST UPDATED:	3-10-09

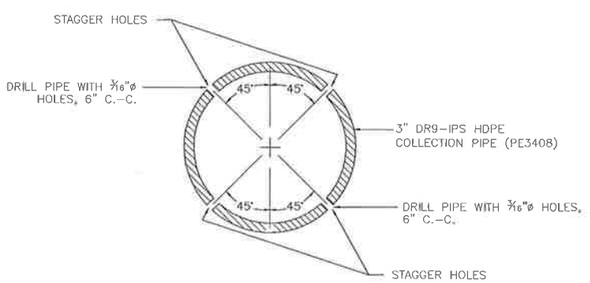
SHEET 5 OF 7



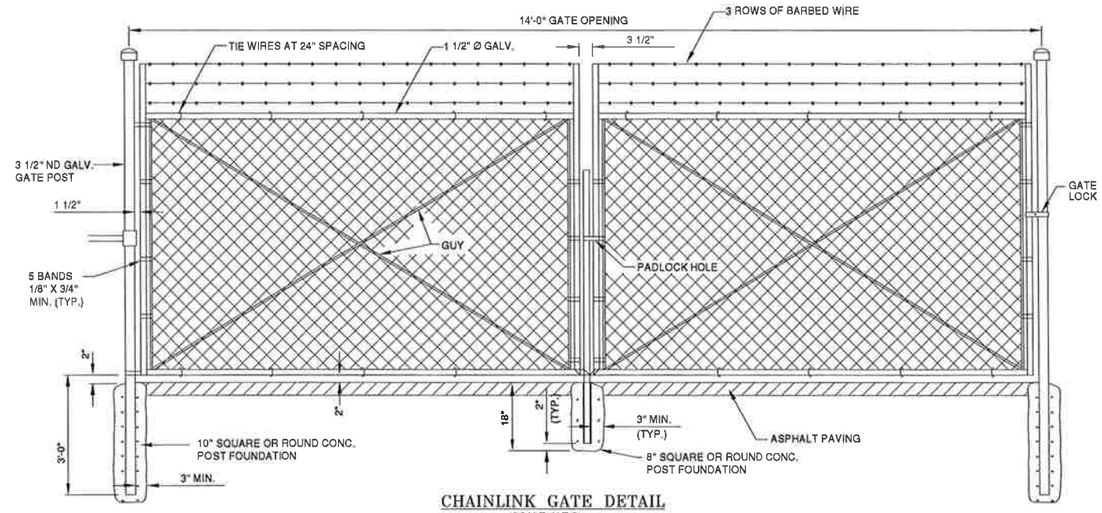
COLLECTION PIPE PROFILE
N.T.S.



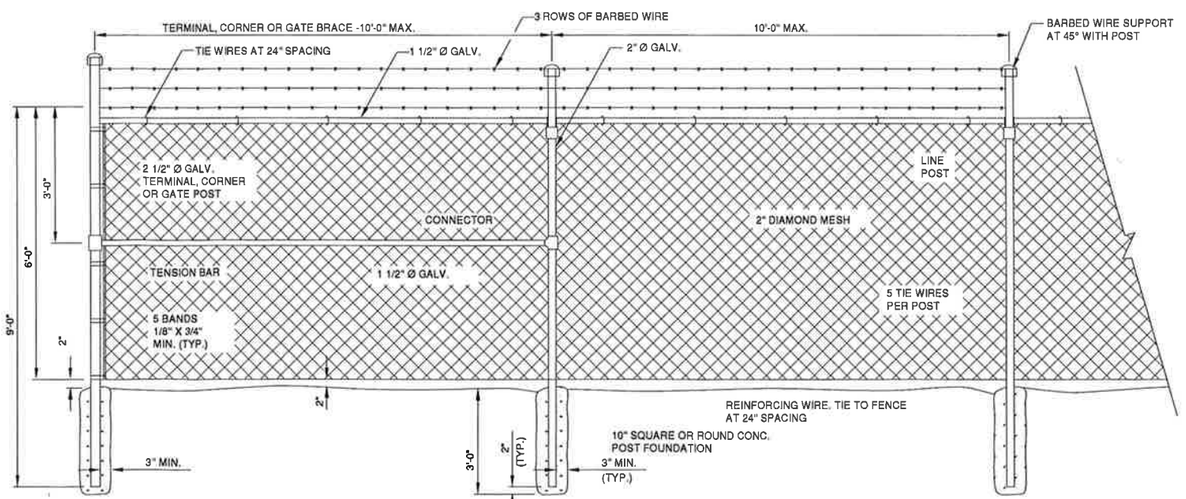
ELEVATION
COLLECTION PIPE CROSS-SECTION



DETAIL A
N.T.S.



CHAINLINK GATE DETAIL
SCALE: N.T.S.



CHAINLINK FENCE DETAIL
SCALE: N.T.S.

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ELEV. CORRECTED SEPT. 28, 2012

NO.	REVISION	BY	APP'L	DATE
1	REVISED FOR DAM SAFETY	TF	DEE	9-10-10
	DESCRIPTION			

WARDEN HUTTERIAN BRETHREN HEADQUARTERS
WASTEWATER SYSTEM

DUAL LINER AND LEAK DETECTION SYSTEM AND FENCE DETAILS

CAD FILE:	70318B-TJF
PROJ. #:	70318
DRAWING NO.:	70318B-TJF
DRAWN BY:	TJF
DESIGN BY:	DEE
CHECKED BY:	DEE
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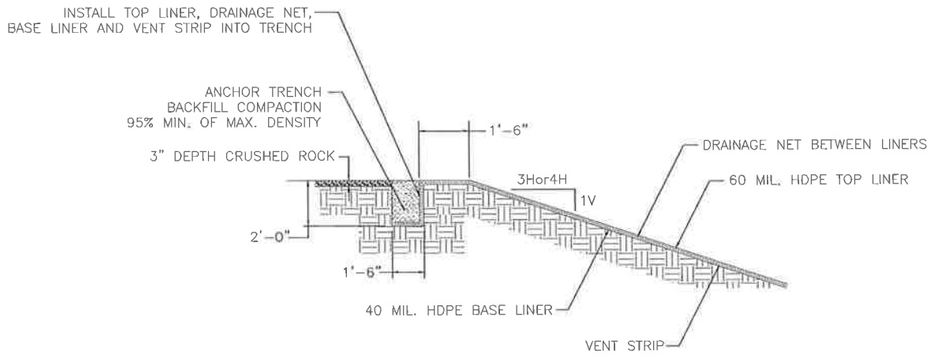
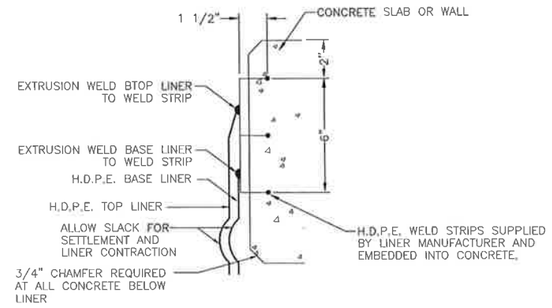
HOR SCALE:	AS SHOWN
VER SCALE:	AS SHOWN
LAST UPDATED:	3-10-09

SHEET 6 OF 7

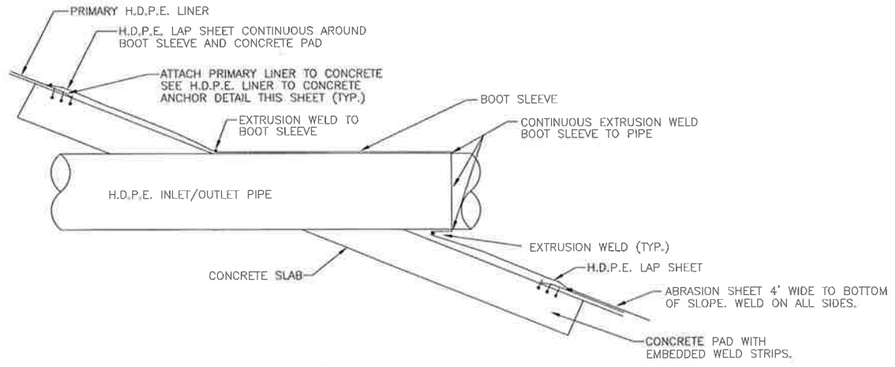


LINER ANCHOR TRENCH
NOT TO SCALE

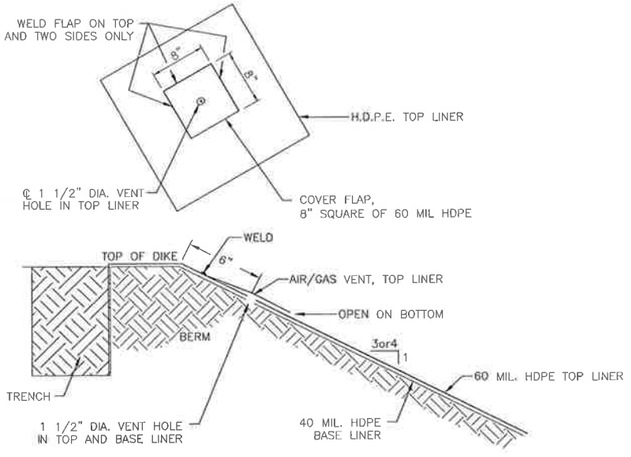
NOTE:
MAINTAIN 1' CLEARANCE FROM EDGE OF LINER WITH CONSTRUCTION EQUIPMENT BLADES, TIRES AND ROLLERS WHILE PLACING BACK FILL AND CRUSHED ROCK ON TOP OF THE DIKES.



H.D.P.E. LINER TO CONCRETE DETAIL
NOT TO SCALE

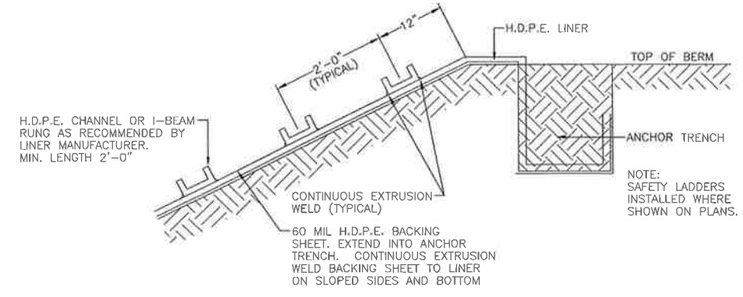


HDPE LINER BOOT
PIPE PENETRATION DETAILS
NOT TO SCALE



NOTE:
AIR/GAS VENTS TO BE LOCATED AT 25' O.C. AN ALL LAGOON SIDES AND IN ALL CORNERS OF LAGOONS.

AIR/GAS VENT DETAIL
NOT TO SCALE



SAFETY LADDER
NOT TO SCALE

J-U-B ENGINEERS, Inc.
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RECORD DRAWINGS OCT. 28, 2011

ELEV. CORRECTED SEPT. 28, 2012

NO.	REVISION	BY	APP.	DATE
1	REVISED FOR DAM SAFETY	TF	DEE	9-10-10
	DESCRIPTION			

WARDEN HUTTERIAN BRETHREN HEADQUARTERS WASTEWATER SYSTEM

LINER DETAILS

CAD FILE:	70318B-2AC
PROJ. #:	70318
DRAWING NO.:	70318B-2AC
DRAWN BY:	TJF
DESIGN BY:	DEE
CHECKED BY:	DEE
SCALE OF SHEET	
HOR SCALE:	AS SHOWN
VER SCALE:	AS SHOWN
LAST UPDATED:	3-10-09

SHEET 7 OF 7