Operation and Maintenance Manual

For

STORMWATER/INDUSTRIAL WASTEWATER

EVAPORATION SYSTEM

Energy Northwest Columbia Generating Station

Prepared by Energy Northwest

Facilities and Commercial Engineering

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INTRODUCTION AND BACKGROUND

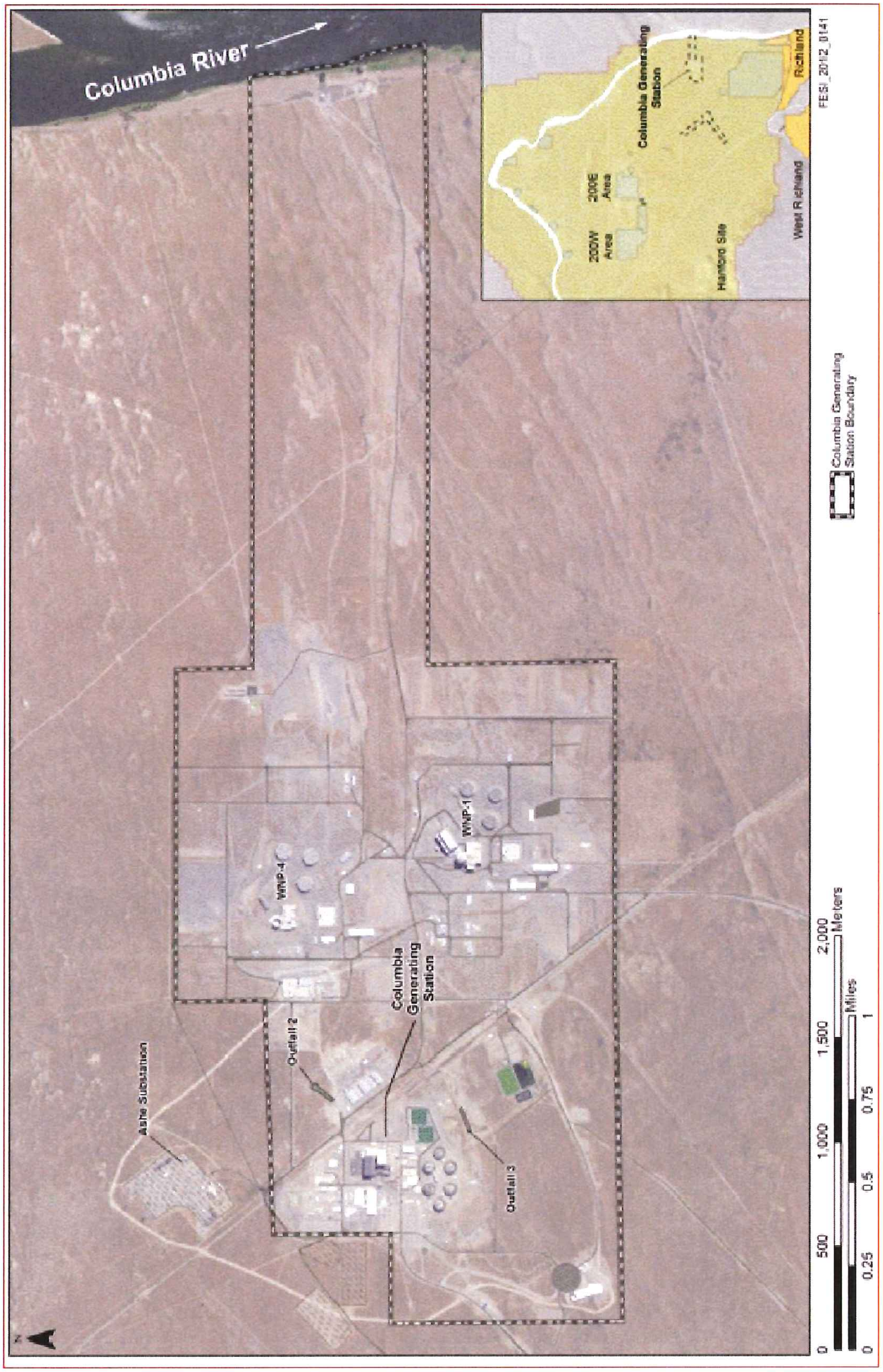
1.1 This document describes the Operation and Maintenance (O&M) practices at Columbia Generating Station (CGS) for the stormwater/industrial wastewater evaporation system. This O&M manual was prepared per the compliance schedule of National Pollutant Discharge Elimination System (NPDES) Wastewater Discharge Permit No. 002515-1 issued by the Energy Facility Site Evaluation Council (EFSEC) for the CGS. The NPDES permit mandates compilation of an O&M manual that meets the requirements of WAC 173-240-150 to assist in the proper operation and care of treatment facilities.

1.2 This document has been prepared in accordance with WAC 173-240-150. The purpose of the manual is to present technical guidance and regulatory requirements to the operator to enhance operation under both normal and emergency conditions.

1.3 Columbia Generating Station Overview

1.3.1 The CGS is a 1,150-megawatt boiling water reactor that uses nuclear fission to produce heat. CGS is owned and operated by Energy Northwest and is the only commercially operated nuclear power plant in the Northwest. CGS was first issued a 40-year operating license in December 1983 and has operated commercially since December 1984. The current lease agreement between Energy Northwest and DOE is valid through the year 2052. The CGS complex includes a reactor building, a turbine generator building, a radioactive waste building, a diesel generator building, six mechanical draft-cooling towers, and office and support buildings.

1.3.2 Figure 1 shows the location of the Columbia Generating Site.



Energy Northwest Property Extents

Figure 1

2. RESPONSIBLE INDIVIDUALS

2.1 The operational and maintenance responsibilities of the evaporation ponds are divided among multiple groups. The Chemistry Department provides overall ownership of the facility and implementation and ownership of this operation and maintenance manual.

2.1.1 The Chemistry Department maintains ownership of the facility.

The responsible contact is:	Brian Jones, Environmental Scientist 509-377-4375 bdjones@energy-northwest.com

2.1.2 Environmental Services is responsible for operating the evaporation ponds under a contract with Chemistry and is also the emergency contact.

The responsible contact is:	Jane LePage, Environmental Scientist 509-377-4061 jtlepage@energy-northwest.com

2.1.3 Facilities and Commercial Engineering (F&CE), is responsible for maintenance and housekeeping.

The responsible contacts are:	Scott Urban, Manager Facilities & Commercial Engineering 509-377-4453 sjurban@energy-northwest.com
	Robert Harris, Craft/Maintenance, Supervisor Facilities &Commercial Engineering 509-377-4582 rmharris@energy-northwest.com

2.1.4 Environmental and Regulatory Programs (E&RP), is responsible for regulatory oversight.

The responsible contact is:	Wayde (Kip) Whitehead, Environmental Scientist 509-377-8794 wkwhitehead@energy-northwest.com

3. SYSTEM DESCRIPTION

3.1 There is both stormwater (rain water) and industrial wastewater directed to the evaporation ponds. All discharge waters that are not rainwater are classified as industrial wastewater.

3.2 The process wastewater (industrial wastewater) and stormwater that is directed to the evaporation ponds is divided into two categories: 1) Non-power block wastewater originates outside the CGS Protected Area fence and includes potable water filter plant backwash, reverse osmosis (RO) filtrate, and fire test water totaling 6,234,000 gallons per year. The non-power block wastewater has no harmful chemical contamination and has had no opportunity to be radioactively contaminated. 2) Power block wastewater which could be radiologically contaminated originates inside the CGS Protected Area fence and includes; Reactor building air wash, and water from non-radioactive equipment dewatering, leakage, cleaning, and flushing totaling 4,758,400 gallons per year. The evaporation ponds will also handle rainwater amounting to 3,354,766 gallons per year, including rainwater that falls on the power block roofs.

3.3 Non-Power Block Wastewater:

3.3.1 The non-power block "wastewater" is essentially river water from filter plant backwash, reverse osmosis filtrate, and fire test water. The non-power block wastewater is sent directly to Ponds 1and 2 where the water can be used for construction water or road watering. Pond 1 is divided into two ponds (1A and 1B). Pond 1B receives the waste water. In order to use available land and get more surface area for evaporation, Pond 1A is actually at a higher elevation than Pond 1B. Depending on water levels determined by level floats in each pond, 1B and 1A, waste water is automatically pumped to Pond 1A from Pond 1B. Pond 1A also has an overflow back into Pond 1B in case excessive water is accidently pumped to Pond 1A.

3.3.2 A cistern labeled Cistern 1 will have the level of Pond 1B. Cistern 1 has an overflow pipe set at the maximum allowable level in Pond 1B. The overflow pipe is routed to Pond 2 that is at a lower elevation than Pond 1B. A cistern labeled Cistern 2 will have the level of Pond 2. Cistern 2 has an overflow pipe set at the maximum allowable level in Pond 2. The overflow pipe is routed to Pond 3 that is at a lower elevation than Pond 2.

3.3.3 Piping and valves have been installed to allow Ponds 1A&1B or Pond 2 to be individually isolated for cleaning or repair while the overall evaporation system is still operating.

3.3.4 The CGS potable water filter bed is presently backwashed about 15 times per month at approximately 15,000 gallons per backwash totaling approximately 2,700,000 gallons per year. The backwash is potable water and includes filtrate and some flocculation agents.

3.3.5 A reverse osmosis system produces a substantial amount of filtrate water that is also directed to Ponds 1 and 2 for potential reuse. The estimated reverse osmosis filtrate water totals approximately 3,504,000 gallons per year.

3.3.6 CGS performs a main fire pump test once per year. The test water totals approximately 30,000 gallons that is directed to Ponds 1 and 2.

3.4 Power Block Wastewater:

3.4.1 The power block wastewater is sent directly to Ponds 3 and 4. Ponds 3 & 4 are at the same elevation but have separate fill pipes emanating from a cistern labeled Cistern 3. Bypass piping and valves has been installed that allows either Pond 3 or Pond 4 to be isolated.

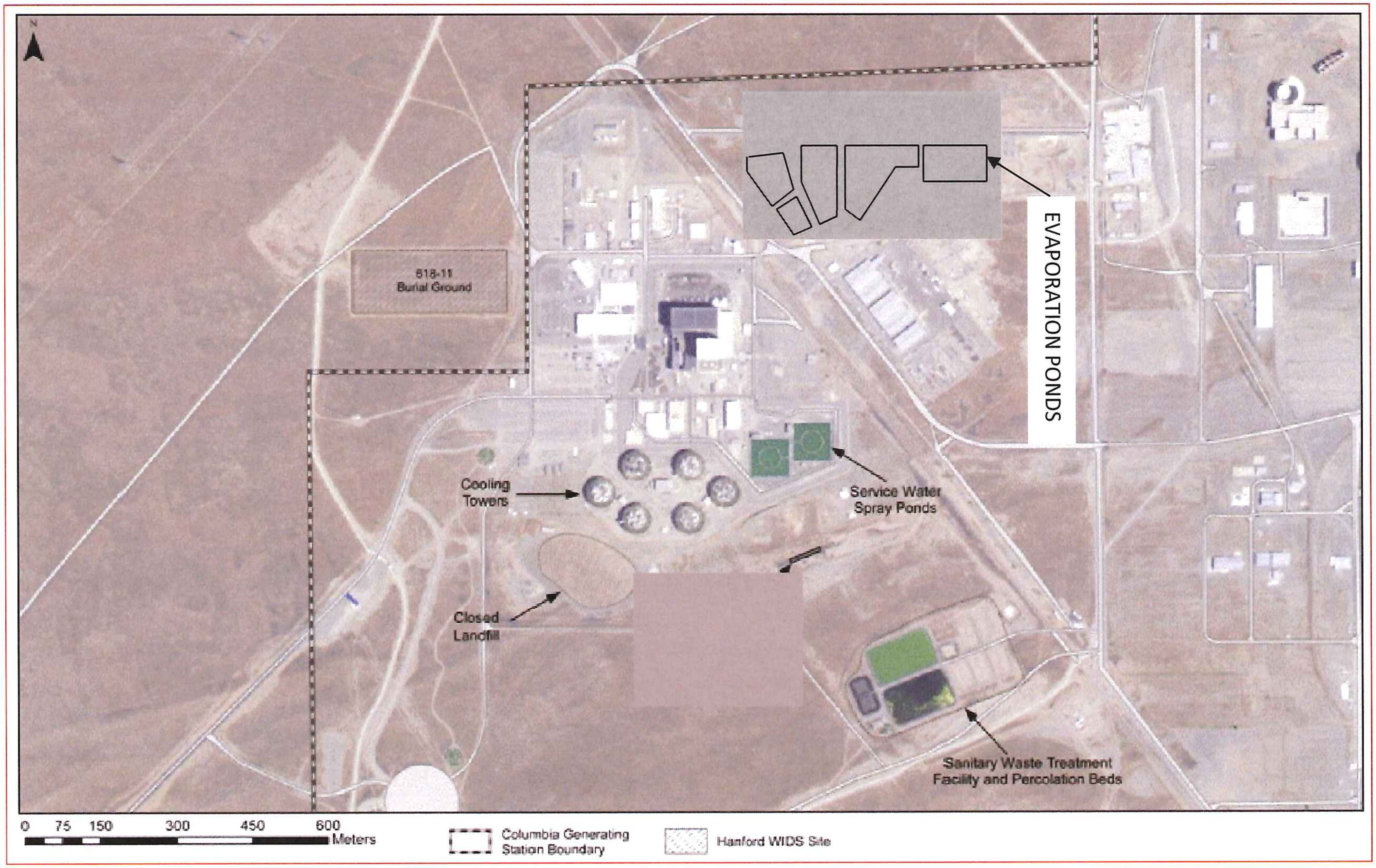
3.4.2 The Reactor and Radwaste buildings air wash blow down streams have been estimated at 10 gpm for 7 months, March through September, or 3,081,600 gallons per year. The air washers are evaporative coolers that distribute cooled fresh air into the Reactor and Radwaste buildings. Water makeup to the air washers is from the potable water system.

3.4.3 During the biennial plant shut down for maintenance and refueling, the water side of the main condenser is sometimes drained. Approximately 100,000 gallons of water that may be discharged every other year has been added to the sum of water to be evaporated in the evaporation pond sizing calculations.

3.4.4 There is an estimated 3 gpm average gland water flow and miscellaneous floor drain load that is directed to the storm drain system for a yearly total of approximately 1,576,800 gallons. The following is a list of potential influent streams from generating plant floor drains.

- Wastewater from drains in the General Services and Diesel-Generator Buildings
- Floor drains from Rad Waste Building 525' A/C units
- Floor drains from Rad Waste Building 484' cable spreading room
- Floor drain from Reactor Building 572 HVAC unit
- Condensate storage tank pit drain

3.5 See Figure 2 for location of evaporation ponds, Figure 2A for location of power and non-power block areas and Figure 2B for the general layout of the piping to the evaporation ponds.



Location of Evaporation Ponds

Figure 2

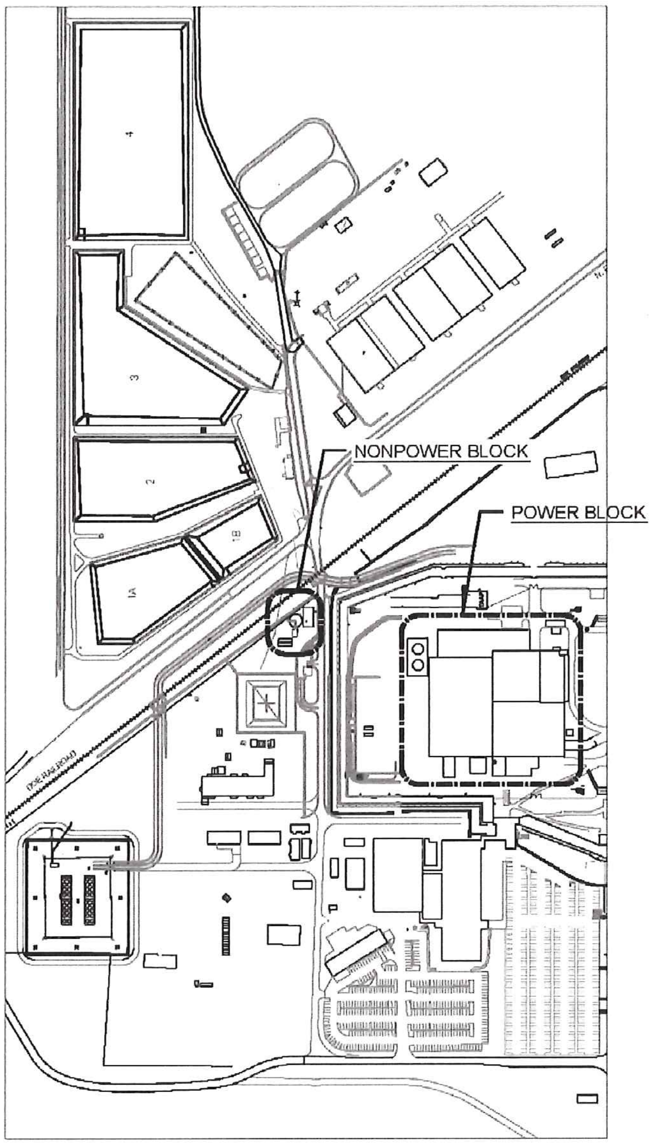


FIGURE 2A

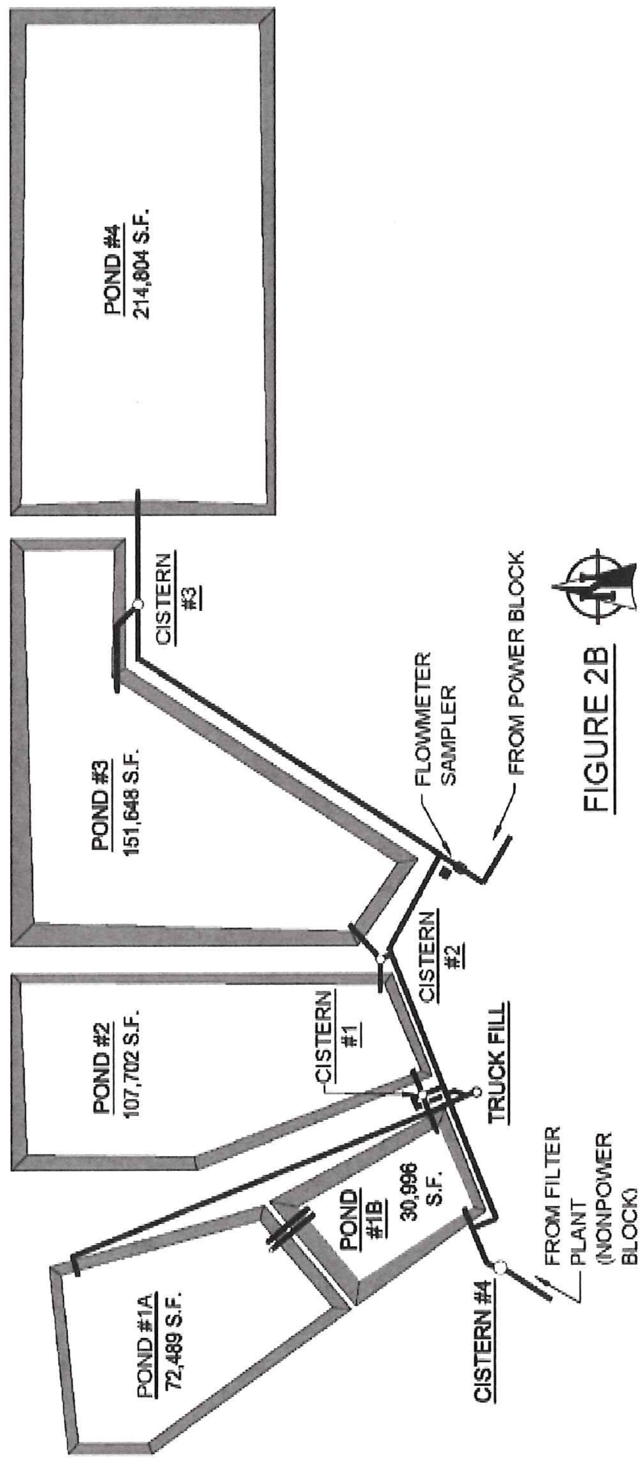

POND #4
214,804 S.F.
POND #3
151,648 S.F.
CISTERN #3
FLOWMETER
SAMPLER
FROM POWER BLOCK
CISTERN #2
POND #2
107,702 S.F.
CISTERN #1
TRUCK FILL
POND #1B
30,996 S.F.
FROM FILTER PLANT (NONPOWER BLOCK)
CISTERN #4
POND #1A
72,489 S.F.

FIGURE 2B

4. DESIGN CRITERIA

4.1 Plant stormwater and industrial wastewater historically was directed to an unlined channel and infiltration pond. The evaporation ponds are sized to evaporate all the plant wastewater routed to them during a yearly time period.

4.2 Calculations modeled the evaporation rate versus the quantity of wastewater to develop the surface area necessary for the evaporation ponds. The calculations were projected for three years to show the carryover effect between years.

4.3 Rainfall data was taken from the Hanford Meteorological Station. Evaporation data was taken from the Western Regional Climate Center and extrapolated for the area between Prosser, Washington and Eltopia, Washington.

4.4 The quantity of wastewater to be evaporated and resultant calculation determined the necessary size of the evaporation ponds. It is intended that the non-power block wastewater will fill Ponds 1A, 1B and 2 and then internally overflow into Ponds 3 and 4. There are no valves in the overflow system. The internal overflow system at Ponds 1A, 1B, 2 is set at 1' below the top of each pond so the ponds cannot overflow the top of the ponds walls. The surface area evaporation requirement for the non-power block wastewater is actually greater than the evaporation requirement for the power block wastewater that flows directly to Ponds 3 and 4. To maintain a uniform evaporation rate, there will be periods in the summer when the water level in Ponds 1A, 1B, and 2 can be lowered by diverting water to Ponds 3 and 4. Operational procedures (see Section 7) will direct the redistribution of water to allow uniform evaporation from all the ponds.

5. PROCESS DESCRIPTION

5.1 Evaporation of the stormwater and wastewater is the least expensive and most maintenance free water treatment available. The filter plant wastewater (filter backwash, reverse osmosis, and fire test water) will be directed to evaporation Ponds 1A, 1B, and 2 where the water can be used around CGS for maintenance and dust control. The filter plant waste water is metered and the quantity directed to the ponds recorded.

5.2 The stormwater from the plant roof drains as well as the power block industrial wastewater is directed to Ponds 3 and 4. The power block wastewater cannot be directed to Ponds 1A, 1B, 2. The wastewater is metered / recorded and samples are collected from the effluent stream for radiological testing by a proportional sampler as has been done previously for NPDES outfall 002.

5.3 The surface area evaporation requirement for the non-power block wastewater is greater than the evaporation requirement for the power block wastewater that flows directly to Ponds 3 and 4. To maintain a uniform evaporation rate, there will be periods in the summer when the water level in Ponds 1A, 1B and 2 may be lowered by opening the lower cistern valves to allow water to go to Ponds 3 and 4. Operational procedures will direct the redistribution of water to allow uniform evaporation from all the ponds.

5.4 All the ponds have bypass piping provisions for pond cleaning and repair.

5.5 See Appendix A for construction documents for the evaporation ponds.

6. OPERATIONAL OBJECTIVES

6.1 The operational objective of the evaporation ponds is to treat wastewater by evaporation and thereby eliminating the use of an unlined channel and infiltration pond and associated wastewater discharge to ground.

7. DESCRIPTION OF DETAILED OPERATION

7.1 <u>Normal Operation</u>

7.1.1 See Figure 3 for Valve and Cistern callout. A full size print of Figure 3 is included in the Appendix if needed for clarity.

7.1.2 The filter plant backwash and the filtrate from the intermittently operated Reverse Osmosis, RO, plant will be directed to Pond 1B. When the fire water pump is tested, the discharged water will be directed to Pond 1B. The overflow from the fire protection water tank is directed to Pond 1B. All of the water will pass through Cistern 4. Valve (V1) will be open and (V2) will be closed.

7.1.3 When Pond 1B becomes full, the water in the pond will overflow into Pond 2. Valve (V3) is open and (V4), (V5) & (V6) are closed. At Cistern 1, there is an internal overflow pipe with no valves that when the water level in Pond 1B reaches maximum allowable depth, the excessive water in Pond 1B will internally overflow by gravity into Pond 2.

7.1.4 When Pond 2 reaches maximum allowable depth, the water in the pond will overflow in same fashion as Cistern 1 at Cistern 2 into Pond 3. Valves (V8) are open and (V9), (V10) & (V11) are closed.

7.1.5 Pond 3 and Pond 4 are connected at common fill lines in Cistern 3. There is no internal overflow piping at Ponds 3 & 4. Valves (V12), (V13) & (V14) are open. Valves (V15) & (V16) are closed.

7.2 <u>Normal Operation for transferring water to Pond 1A.</u>

7.2.1 Water fills Cistern 1 to the level in Pond 1B.

7.2.2 If the desired level in Pond 1B is exceeded, water pump PP-1 in Cistern 1 will automatically be activated (turned on) and pump water to Pond 1A. The water level transmitter in Cistern 1 and the related level controller are designated as 1BL. See Figure 4 and Figure 5.

7.2.3 Valves TV1 and TV2 shall be closed and valve TV3 is to be open. Check valve CV1 will prevent water from coming back to Cistern 1.

7.2.4 The signal from 1BL to pump water to Pond 1A will be in series with the level signal of the level float located in Pond 1A so that if the level in Pond 1A is too high, the pump will not be activated. The level transmitter and controller are designated as 1AL.

7.2.5 Pond 1A will internally overflow into Pond 1B if Pond 1A becomes full (1' below top of the pond). There is a drain valve located between Ponds 1A and 1B labeled Valve (V7) which is to be closed during normal operation. See Figure 4.

7.2.6 If both Ponds 1A and 1B are full, the water in Pond 1B will overflow at Cistern 1 to Pond 2.

7.3 <u>Bypass Pond 1B or 1A</u>

7.3.1 To bypass Pond 1B, close (V1) & (V3) and open (V2), (V4) & (V5). Water will now flow into Pond 2 first.

7.3.2 To bypass Pond 1A, close (TV3) and shut off the power to PP-1. Pump PP-1 can be operated manually if (TV3) is closed and valve (TV1) or (TV2) is open.

7.4 <u>Bypass Pond 2</u>

7.4.1 To bypass Pond 2, close valves (V5), & (V8). Open valves (V1), (V3), (V4), (V6), (V9) & (V10). Water will now flow around Pond 2 and into Pond 3.

7.5 <u>Bypass Pond 3</u>

7.5.1 To bypass Pond 3, close valves (V6), (V9), (V13), (V15) & (V16). Open valves (V8), (V10), (V11), (V12), & (V14). Water will now flow around Pond 3 and into Pond 4.

7.6 <u>Bypass Pond 4</u>

7.6.1 To bypass Pond 4, close valves (V14) & (V16). All other valves are to remain in normal operation position. Water will now flow into Pond 3 only.

7.7 <u>Truck Fill at Cistern 1</u>

7.7.1 To pump water from Pond 1B to the truck fill line, valve (TV1) is to be manually opened and valve (TV3) is to be manually closed. Valve (TV2) can be opened and (TV1) can be closed to use the lower hose bib at the truck fill station. Valves (TV1), (TV2) & (TV3) are all near the truck fill station. Valves (TV1) & (TV2) are above ground and (TV3) is below ground.

7.7.2 Once the valves are aligned as above, Pump PP-1 can be manually activated to fill a truck.

7.7.3 The truck fill above ground line and the above ground line to Pond 1A will automatically drain after each fill use via 1" drain lines and ½" drain bleed valves (TV4 & TV5)) located underground at the base of the truck fill column. The bleed line flows by gravity to the Pond 2 fill line. Valves (TV4 & TV5) are to be left in the partially open position. See Figures 3A & 4A.

7.8 <u>Truck Fill at Cistern 3</u>

7.8.1 To pump water from Cistern 3 with both Pond 3 and Pond 4 in operation, only valve (TV6) needs be open to fill a truck. All other valves remain in normal position. Pump PP-2 is manually activated to fill the truck.

7.8.2 To pump water from Cistern 3 to empty Pond 3, Cistern 3 has to be bypassed to allow waste water to be rerouted to Pond 4. Close valves (V12), (V14) & (V15). Open Valve

(V13), (V16) & (TV6). Pump PP-2 is manually operated to fill a truck or to use a hose to pump the excess water to Pond 4.

7.8.3 To pump water from Cistern 3 to empty Pond 4, Cistern 4 has to be bypassed to allow waste water to be rerouted to Pond 3. Close valves (V12), (V13) & (V16). Open Valve (V14), (V15) & (TV6). Pump PP-2 is manually activated to fill a truck or to use a hose to pump the excess water to Pond 3.

7.9 <u>To Clean Pond 1A</u>

7.9.1 In time, sludge buildup from blowing dust will accumulate in the evaporation ponds. Individual ponds will be bypassed during the low volume part of the year and the sludge will be physically removed.

7.9.2 Shut off the Transfer Pump PP-1 so no new water is directed to Pond 1A. See Section 7.2 above.

7.9.3 Drain Pond 1A into Pond 1B using the underground valve (V7) located between Ponds 1A & 1B.

7.9.4 If the solids are deep enough, procure the services of a vacuum truck with a long hose. Close valve (V7). Using a water truck and a portable pump with spray hose, wash the floor of the pond to the low end where the vacuum truck can suck up the muddy water. The vacuum solids material can then be delivered for disposal at the CGS cooling system sediment disposal cells or other appropriate location on the Energy Northwest property.

7.9.5 Open valve (V7). Using the water truck with the spray hose, wash the remaining muddy water from Pond 1A into Pond 1B. Then close valve (V7).

7.10 <u>To Clean Pond 1B</u>

7.10.1 Isolate Pond 1B following the steps listed above in Section 7.3.

7.10.2 Drain Pond 1B by opening valves (V3) & (V5). Close (V5) once Pond 1B is empty.

7.10.3 Divert the water from the filter plant to Pond 3 by opening valves (V2), (V6), (V9) & (V10) and closing valves (V1), (V4), (V8) & (V11).

7.10.4 If the solids are great enough, procure the services of a vacuum truck with a long hose. Close valves (V3), (V4) & (V5). Using a water truck and a portable pump with spray hose, wash the floor of the pond to the low end where the vacuum truck can suck up the muddy water, both from the pond and from Cistern 1. The vacuum solids material can then be delivered for disposal at the CGS cooling system sediment disposal cells or other appropriate location on the Energy Northwest property.

7.10.5 Open valve (V3). Pump, using PP-1, the remaining cleanup water coming into Cistern 1 to a water truck for disposal at the CGS cooling system sediment disposal cells or other appropriate location. See Section 7.7 to fill a truck at Cistern 1.

7.11 <u>To Clean Pond 2</u>

7.11.1 Isolate Pond 2 following the steps listed above in Section 7.4.

7.11.2 Drain Pond 2 into Pond 3 by opening valves (V8) & (V9) and closing (V5) & (V10).

7.11.3 Divert the water from Pond 1B by opening valves (V4), (V6) & (V11).

7.11.4 If the solids are great enough, procure the services of a vacuum truck with a long hose. Close valves (V8), (V9) & (V10). Using a water truck and a portable pump with spray hose, wash the floor of the pond to the low end where the vacuum truck can suck up the muddy water, both from the pond and from Cistern 2. The vacuum solids material can then be delivered for disposal at the CGS cooling system sediment disposal cells or other appropriate location on the Energy Northwest property.

7.11.5 As an alternate, a portable pump may be used in Cistern 2 to pump the wash water into a water truck for disposal of the wash water on the Energy Northwest site. Close (V9) & (V10) to keep the wash water in Cistern 2.

7.12 <u>To Clean Pond 3</u>

7.12.1 Isolate Pond 3 by closing valves (V6), (V9), (V12), (V14), & (V15). Open valves (V8), (V10), (V11), & (V16). Water will now flow around Pond 3 and Cistern 3 and into Pond 4.

7.12.2 Using pump PP-2 and opening valve (TV6), pump the remaining water in Pond 3 over to Pond 4 using a hose from the PP-2 pump discharge to Pond 4.

7.12.3 Sediments on the pond floor will be sampled and analyzed per Standard Operating Procedure (SOP) 11.02 and Plant Procedure Manual, PPM, 12.5.38 & 12.2.14 to verify the residue meets the acceptance criteria prior to being moved to the CGS cooling system sediment disposal cells or other appropriate location. PPM 12.5.38 describes the process for sampling and analysis to verify acceptance criteria for the disposal of cooling system sediments in accordance with Resolution No. 299. PPM 12.2.14 describes the sampling and analysis requirements for release of nonradioactive liquids and solids. If the sludge is found to be contaminated, then E&RP will determine the extent of contamination and recommend necessary cleanup procedures.

7.12.4 If the solids are great enough, procure the services of a vacuum truck with a long hose. Close valve (V13). Using a water truck and a portable pump with spray hose, wash the floor of the pond to the low end where the vacuum truck can suck up the muddy water, both from the pond and from Cistern 3. The vacuum solids material can then be delivered for disposal at the CGS cooling system sediment disposal cells or other appropriate location on the Energy Northwest property.

7.12.5 As an alternate, pump using PP-2 the waste water from Pond 3 into a water truck for disposal on the Energy Northwest site or other appropriate location.

7.13 <u>To Clean Pond 4</u>

7.13.1 Isolate Pond 4 by closing valves (V12), (V13) & (V16). Open valves (V14) & (V15). Water will now flow around Pond 4 and Cistern 3 and into Pond 3.

7.13.2 Using pump PP-2 and opening valve (TV6), pump the remaining water in Pond 4 over to Pond 3 using a hose from the PP-2 pump discharge to Pond 3.

7.13.3 Sediments on the pond floor will be sampled and analyzed per SOP 11.02 and Plant Procedure Manual, PPM, 12.5.38 & 12.2.14 to verify the residue meets the acceptance criteria prior to being moved to the CGS cooling system sediment disposal cells or other appropriate location. PPM 12.5.38 describes the process for sampling and analysis to verify acceptance criteria for the disposal of cooling system sediments in accordance with Resolution No. 299. PPM 12.2.14 describes the sampling and analysis requirements for release of nonradioactive liquids and solids. If the sludge is found to be contaminated, then E&RP will determine the extent of contamination and recommend necessary cleanup procedures.

7.13.4 If the solids are great enough, procure the services of a vacuum truck with a long hose. Close valve (V13. Using a water truck and a portable pump with spray hose, wash the floor of the pond to the low end where the vacuum truck can suck up the muddy water, both from the pond and from Cistern 3. The vacuum solids material can then be delivered for disposal at the CGS cooling system sediment disposal cells or other appropriate location on the Energy Northwest property.

7.13.5 As an alternate, pump, using PP-2, the waste water from Pond 4 into a water truck for disposal on the Energy Northwest site or other appropriate location.

7.14 Radiological Monitoring of Power Block Wastewater

7.14.1 Sampling of power block wastewater (influent to Ponds 3 and 4) will be performed in accordance with SOP 11.07 and the CGS radiological environmental monitoring program (REMP). Samples will be analyzed for gamma isotopic, tritium and gross beta or as directed by the REMP.

7.15 Maximizing Pond Evaporation

7.15.1 There will be periods (summer months) when Ponds 1A &1B and 2 have a substantial water level while Ponds 3 and 4 have evaporated all of the plant wastewater. Some of the water in Ponds 1 and 2 will be transferred to Ponds 3 and 4.

7.15.2 To lower the water level in Pond 2 and transfer water to Pond 3, Open Valve (V9) and let water flow until desired level in Pond 3 is reached (approximately 18" deep at the pond base near the outfall to Cistern 3) or Pond 2 level is lowered to 12" deep at the outlet end of the pond.

7.15.3 To lower the water level in Pond 1B and transfer water to Pond 3 via Pond 2, open valve (V5) Leaving valve (V9) open and let water flow through Pond 2 until desired level in Pond 3 is reached or Pond 1B level is lowered to 12" deep at the outlet end of the pond.

7.15.4 In normal operation, Pond 4 will also rise when the water is transferred to Pond 3.

7.16 Full Ponds

7.16.1 No overflow over the top of the ponds is allowed. If all the ponds are full, water in the ponds will have to be pumped to a water truck for disposal elsewhere. Ponds 1A, 1B and 2 are water from potable and demineralized water production and can be pumped to a water truck. The pumped water can be evaporated elsewhere or discharged to the ground as appropriate. Water in Ponds 1A, 1B, and 2 will initially be sampled and characterized prior to the first use and subsequently on an annual basis to verify the ongoing water quality of the ponds. Additional or more frequent sampling will be implemented if justified due to the sampling results.

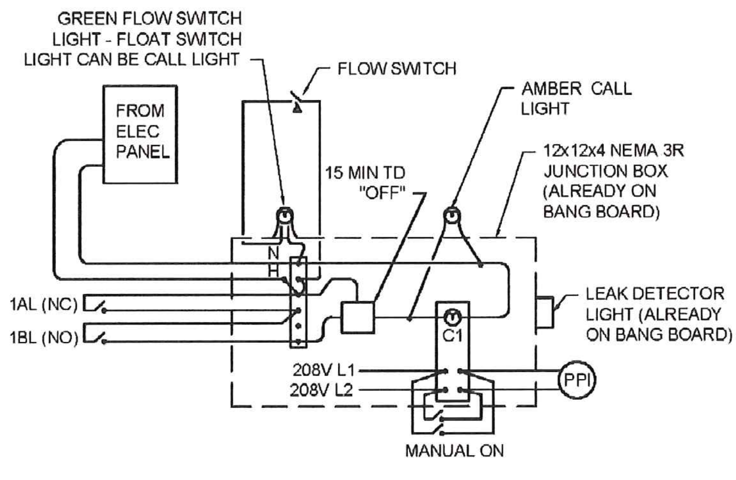
7.16.2 If the level in Ponds 3 or 4 must be lowered, the water must be tested for radionuclides before the water can be pumped and disposed of as described in paragraph 7.16.1. If contamination is discovered, then E&RP will determine the extent of contamination and provide recommendations for treatment.

7.17 Fountains

7.17.1 600 gpm fountains have been installed in Ponds 1A, 1B, 2 and 3. The fountains are expected to evaporate 1% to 5% of the water flow through the fountains. The fountains are to be turned off if the water level in the ponds is less than the manufacturer's recommendation for operation.

CONTROL PARTS LIST:

1. 1AL - POND 1A FLOAT, NORMALLY CLOSED (NC): GRAINGER 3HCW8
2. 1BL - POND 1B FLOAT, NORMALLY OPEN (NO): GRAINGER 6PNV7
3. TIME DELAY OFF (TD), 15 MIN: GRAINGER 6CUW7, BASE - GRAINGER 6X156
4. CONTACTOR,(C1) 2-POLE, 30 AMP, 120 VOLT COIL: GRAINGER 5B126
5. TERMINAL STRIP; 6 TERMINALS; GRAINGER 6YH65



PONDS 1A & 1B LEVEL CONTROL

FIGURE 5

8. LEAK DETECTION PLAN

8.1 The Evaporation ponds are constructed with two layers of 60 mil high density polyethylene, HDPE, with an interstitial porous layer to allow a leak in the surface HDPE layer to be routed to a collection chamber. Installation experience has shown that the HDPE will always leak a little even with fully sealed HDPE seams. A standard allowable leakage rate (ALR) of 300 gallons per day per acre has been found acceptable. The ALR was derived from a white paper created by the Geosynthetic Institute titled *Survey of U.S. State Regulations on Allowable Leakage Rates in Liquid Impoundments and Wastewater Ponds*.

8.2 The evaporation ponds are sloped at a minimum 0.5% to allow any leakage caught in the interstitial layer to be routed to a collection chamber. Each pond has a leakage drain pipe that is routed to the nearest cistern.

8.3 At the cisterns, the leakage collection pipe will be connected to a 2" vertical pipe with a float set inside the pipe chamber that will activate a red light on the cistern lid electrical distribution center indicating a high level of water in the interstitial layer of the representative pond. The floats are labeled LDF-1 to 5 (LDF stands for Level Detection Float). See Figure 6.

8.4 The leakage collection pipe from each pond will also be connected via an electric solenoid valve and hose to a 10" vertical standpipe (pump chamber) located in their respective cisterns in which a small pump will be placed that will pump the collected leakage into the cistern or overflow line from the cistern. The solenoid valves will be opened when the leak detection floats LDF-1 to 5 are activated by the respective pond water detection in the interstitial layer.

8.5 The pumps labeled PP-3, 4 & 5 will be controlled by the level in the 10" PVC pump chamber. There will be a lower float to turn off the pump and an upper float to turn on the pump. The pumps will turn off when the water in the 10" pump column is removed showing the level in the interstitial layer has been pumped out. See Figure 7.

8.6 In order to determine if a substantial leak is present, a recorder, RC1A, 1B, 2, 3 & 4, will record the length of time the pumps are activated. An increase in alarm activation and pump actuation record will indicate if a real leak in the respective pond has occurred.

8.7 Table 1 shows the acceptable time period the individual leak detection pumps may operate before a leak is suspected. If a respective leak detection pump operates as indicated by the time clock more than the acceptable rate of leakage, then corrective action will be conducted as necessary.

8.7 Table 2 is an example of the monthly recording of the individual pond interstitial leak pump on-time which is an indication of leakage rate. The leakage rate for each pond is monitored to provide assurance regarding the structural integrity of the pond liners.

Table 1
Allowable Leakage Rate (ALR)

Pond No.	Ft^2	ALR Gal/Acre day	ALR Gal/Ft^2 min	ALR Gal/Pond day	Leak Rate gpm	Allowable Pond On time at 6 gpm pump out Min/day
1A	73,000	300	4.78E-06	503	0.349	84
1B	31,000	300	4.78E-06	213	0.148	36
2	107,702	300	4.78E-06	742	0.515	124
3	152,000	300	4.78E-06	1047	0.727	174
4	215,000	300	4.78E-06	1481	1.028	247

Table 2
On-Time Record
Leak Detection Pumps

Pond 1A			Pond 1B			Pond 2			Pond 3			Pond 4		
Initial Reading			Initial Reading			Initial Reading			Initial Reading			Initial Reading		
Month End Reading	Pump On-Time Hr/Month	Allowable On-time Hr/	Month End Reading	Pump On-Time Hr/Month	Allowable On-time Hr/ Month	Month End Reading	Pump On-Time Hr/Month	Allowable On-time Hr/	Month End Reading	Pump On-Time Hr/Month	Allowable On-time Hr/ Month	Month End Reading	Pump On-Time Hr/Month	Allowable On-time Hr/ Month
	0	43.4		0	18.6		0	64.1		0	89.9		0	127.6
	0	39.2		0	16.8		0	57.9		0	81.2		0	115.3
	0	43.4		0	18.6		0	64.1		0	89.9		0	127.6
	0	42.0		0	18.0		0	62.0		0	87.0		0	123.5
	0	43.4		0	18.6		0	64.1		0	89.9		0	127.6
	0	42.0		0	18.0		0	62.0		0	87.0		0	123.5
	0	43.4		0	18.6		0	64.1		0	89.9		0	127.6
	0	43.4		0	18.6		0	64.1		0	89.9		0	127.6
	0	42.0		0	18.0		0	62.0		0	87.0		0	123.5
	0	43.4		0	18.6		0	64.1		0	89.9		0	127.6
	0	42.0		0	18.0		0	62.0		0	87.0		0	123.5
	0	43.4		0	18.6		0	64.1		0	89.9		0	127.6

VALVE NOMENCLATURE		
CISTERN	VALVE #	SOLENOID VALVE #
C1	LKV1	SV1
C1	LVK2	SV2
C2	LKV3	SV3
C3	LKV4	SV4
C3	LKV5	SV5

LEAK DETECTION FLOAT NOMENCLATURE		
CISTERN	FLOAT #	POND
C1	LDF1	1A
C1	LDF2	1B
C2	LDF3	2
C3	LDF4	3
C3	LDF5	4

PUMP NOMENCLATURE	
CISTERN	PUMP #
C1	PP3
C2	PP4
C3	PP5

PUMP FLOAT NOMENCLATURE		
CISTERN		POND
C1	1A1	1A & 1B
C1	2A1	1A & 1B
C2	1A2	2
C2	2A2	2
C3	1A3	3 & 4
C3	2A3	3 & 4

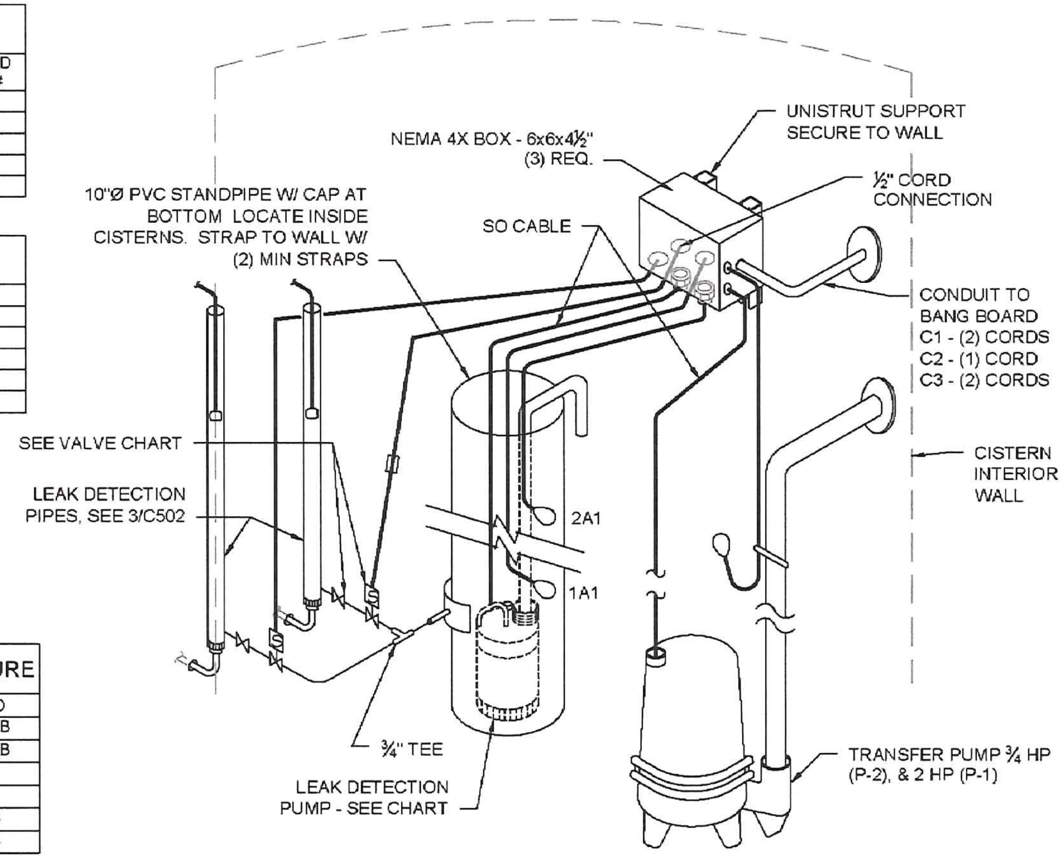
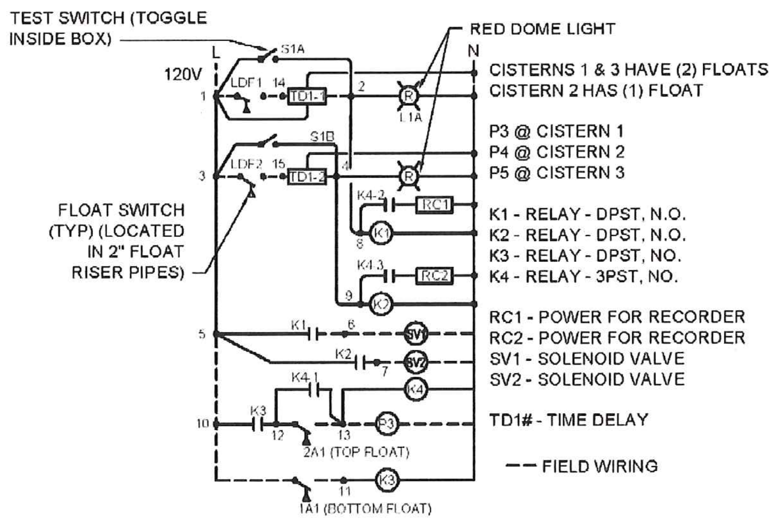
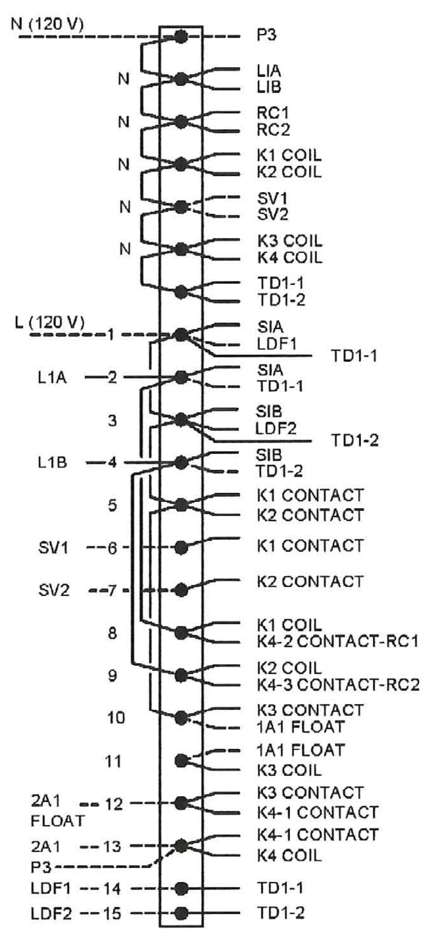


FIGURE 6



LEAK DETECTOR WIRING DIAGRAM



NOTE: TERMINAL STRIPS FOR PONDS 2, 3 & 4 ARE SIMILAR.

LEAK DETECTOR PUMP WIRING TERMINAL TB2

FIGURE 7

9. TESTING REQUIREMENTS

9.1 Ponds 1A, 1B, and 2 receive filter plant backwash and RO filtrate water. Due to the extreme variations of flow rates to Ponds 1A, 1B, and 2, the filter plant backwash and RO filtrate wastewaters will be metered and recorded separately. The annual fire pump test will be estimated based on pump curves and testing duration.

9.2 The flow rate and totalized flow of the stormwater and wastewater that is routed to Ponds 3 and 4 will be metered and recorded by an electronic level indicator located above a Parshall flume that has been incorporated in the gravity flow to the evaporation ponds.

9.3 Report evaporation pond influent flows annually to EFSEC. Provide a summary of monthly totalized flows. Annual monitoring periods are July through June.

9.4 Samples of the discharge water to Ponds 3 and 4 will be collected in accordance with SOP 11.07 and the CGS REMP. The collected discharge water samples will be tested on a monthly basis for gamma isotopic, gross beta, and tritium or as directed by the REMP.

9.5 Field samples from each pond will be collected/tested annually for gamma isotopic, gross beta and tritium or as directed by the REMP.

9.6 Field samples of sludge/sediment from each pond will be collected/tested per SOP 11.02 prior to removing sediments.

10. RECORDKEEPING PROCEDURES

10.1 The monthly quantity of water that is directed to Ponds 1 and 2 from the filter plant backwash, RO discharge and any fire water flow tests will be recorded as shown in Table 3.

10.2 The flow rate and totalized flow of the stormwater and wastewater from the power-block that is routed to Ponds 3 and 4 will be measured and recorded on Table 3 also.

10.3 The operating time of the leak detection systems for each pond will be recorded every month on Table 2.

10.4 The O&M manual will be linked to the CGS NPDES permit. NPDES records must be retained for a minimum of (3) years. The written records will be kept with the NPDES records.

10.5 See Section 11 for the record keeping of maintenance inspections around the evaporation ponds.

Table 3

Waste Water Flow to the Evaporation Ponds

Page ________

Filter Plant Backwash Flow Totalizer Initial Reading ____________________

RO Concentrate Flow Totalizer Initial Reading ____________________

Power Block Waste Water Flow Totalizer Initial Reading ____________________

Month/ Date	Filter Plant Backwash Flow Totalizer gallons		RO Concentrate Flow Totalizer gallons		Fire Pump test Estimated Gallons	Filter Plant Waste Water to Ponds Gallons	Power Block Wastewater Totalizer gallons		Total Water to Evap Ponds gallons
	End	Total	End	Total			End	Total	
		0		0		0		0	0
		0		0		0		0	0
		0		0		0		0	0
		0		0		0		0	0
		0		0		0		0	0
		0		0		0		0	0
		0		0		0		0	0
		0		0		0		0	0
		0		0		0		0	0
		0		0		0		0	0
		0		0		0		0	0
		0		0		0		0	0
Year	Total					0		0	0

11. MAINTENANCE SCHEDULES

11.1 The evaporation ponds require little maintenance as the flow to the ponds is by gravity.

11.2 It is anticipated that due to the accumulation of solids the ponds will require cleaning about every 8 years. Ponds will be inspected quarterly for solid accumulation or other needed maintenance and inspection results recorded on Table 6 "Pond Inspection Report." The quarterly inspections will be conducted by FC&E and Environmental Services. The cleaning procedure is outlined in Section 7. When and if a pond becomes dry, a liner inspection will be performed and large wind-blown objects like tumbleweeds will be removed from the ponds.

11.3 Cisterns 4 & 5 should be inspected at least once per year to verify there is no sludge buildup in the cistern. If there is appreciable sludge buildup, then the cistern should be cleaned with a Vacuum pump.

11.4 The filter plant flow meters and the new Parshall Flume flow meter shall be calibrated at a minimum of once per year or in accordance with the manufacturer's recommendations.

11.5 When the pumps are first activated, the amperage to all the pumps should be recorded. At least once per year, the pump amperage should be measured to see if the pump is still operating near original capacity. The pump operating amps should be documented. See Table 4 for an example of pump test record. If a pump amperage changes substantially (20% Change) or if the pump fails to operate at any time, then the pump should be pulled for maintenance. The maintenance records will be kept by the Facilities and Commercial Engineering Department for a minimum of 3 years.

11.6 Once per year, verify that the level control operation for Ponds 1A and1B are operational by forcing PP-1 into operation and observing the pumped flow and the flow activation signaling, the amber and green lights. If the level in pond 1B is above 2'-0 and there is less than 1'-0 of water in Pond 1A, then PP-1 operation should be investigated. Verify the activation floats are free floating and the valves are in the proper position.

11.7 For the leak detection pumps, PP-3-5, the pumps should be forced on and flow from the pump verified once per year. When the cistern access door is opened, the level in the 10" leak detection pump standpipe should be verified to be below the alarm level float level. If the leak detection alarm does not go off automatically after activation, then the pump operation should be investigated. Reoccurring work orders will be developed to assure the pumps are tested every year.

11.8 Facilities and Commercial Engineering conducts a semi- annual inspection of the pond embankments and fences and will inspect the embankments and fences after significant storm events that could result in erosional damage. The inspection record will be kept by the Facilities and Commercial Engineering Department for a minimum of 3 years.

11.9 The ponds may require occasional maintenance to control midge/mosquito infestations, algae, or aquatic plant growth. See GBP-ENV-05 for guidance when planning chemical use for control of nuisance pests or flora. Chemical application must be conducted by a licensed commercial pesticide applicator and following product label directions. Use of chemicals in ponds 1A, 1B and 2 should be avoided and/or carefully planned with other facility needs because this water may be used for maintenance and dust control. The water in ponds 1A, 1B, and 2 may not be used for maintenance and dust control for at least two weeks following chemical application. Any algaecide or aquatic pesticide should be evaluated for compatibility with pond liner before use. Record this maintenance in the Pond Inspection Report, Table 6.

Whenever possible, consider Energy Northwest's commitments to environmental policy in the execution of pond stewardship. Reduce the impact and risk of the control of nuisance pests and flora by identifying natural, biological, or less toxic means of control.

Table 4

Evaporation Ponds

Pump Amperage Record

Date	Voltage	Pump No. 1 Amps	Pump No. 2 Amps	Voltage	Pump No. 3 Amps	Pump No. 4 Amps	Pump No. 5 Amps

Table 5

Evaporation Ponds

Maintenance Record

The following equipment should be inspected or checked once per year in the summer.

Date __________

Item	Equipment	Comments
1	Inspect Cisterns	
	1	
	2	
	3	
	4	
	5	
2	Log Pump Amperage	
	1	
	2	
	3	
	4	
	5	
3	Verify Pump Flow	
	1	
	2	
	3	
	4	
	5	
4	Calibrate Flow Meters	
	Flow from Power Block	
	Flow from RO unit	
5	Verify Ponds 1A & 1B level control operation is functioning	
6	Verify Leak detection system is functional	
	1A	
	1B	
	2	
	3	
	4	

Table 6
Pond Inspection Report
(To Be Conducted Quarterly)

Date	Pond	Comments
	1A	
	1B	
	2	
	3	
	4	
	1A	
	1B	
	2	
	3	
	4	
	1A	
	1B	
	2	
	3	
	4	
	1A	
	1B	
	2	
	3	
	4	
	1A	
	1B	
	2	
	3	
	4	
	1A	
	1B	
	2	
	3	
	4	
	1A	
	1B	
	2	
	3	
	4	

Table 6

Pond Inspection Report

Expanded Notes

Date	Pond	Comments

12. Equipment Maintenance and Warranty Data

12.1 Maintenance information for the following equipment is included in Appendix-B:

a. Cisterns
b. Pumps 1-5
c. Valves
d. Floats
e. Leak detection alarm recorder
f. Alarm lights
g. Alarm and activation relays
h. Electrical disconnects
i. Electrical service panels
j. Electrical Transformers
k. Exterior light fixtures
l. Electrical switches
m. Contactors
n. Receptacles
o. Junction boxes
p. Care and repair of the pond liner
q. Flow meter
r. Flow coordinated sampler
s. Aerators

12.2 Warranty Data for the above listed equipment will be included with the vender data of each piece of equipment as applicable in Appendix B of the O&M Manual.

13. SAFETY

13.1 The ponds are lined with High-Density polypropylene which is slick when wet. A person can slip if they step onto the poly lining. The ponds are only 4' deep and each pond has a 5% incline ramp to allow walking out of the pond. The pond complex will be enclosed by a fence with gates for access to restrict nonessential personnel from walking the berms of the ponds.

13.2 The cisterns have completely covered lids with latched access panels. The cisterns are classified as a Confined Space, reference ISPM-3. A sign will be posted at each cistern that designates the cistern as a confined space. Testing is required before entering the cistern. The pumps in the cisterns are designed to be removed without going into the cisterns. The leak detection and water removal system is also to be operated without requiring access into the cistern.

13.3 Most of the system valves are located in the cisterns or underground. All of the valves have been designed with above ground operating capability to improve the safety when operating the valves.

13.4 The water truck loading station has been designed to allow operating the fill pump PP-1, from the fill station outside the pond access fence.

13.5 All of the electrical systems around the evaporation ponds will have lock out capability before servicing the connected equipment.

13.6 When it is necessary to enter the ponds, access will be as per CGS safety department procedures/protocol.

14. Emergency Procedures

14.1 The Evaporation Pond system is basically a static system with only a few emergency situations. There are also a number of abnormal situations that are listed below.

14.2 The water in Ponds 1A, 1B, and 2 is from non-plant sources. The waste water influents to Ponds 3 and 4 are monitored in accordance with the CGS REMP. If abnormally elevated radionuclides are detected, isolate the pond, review the monitoring results, conduct additional sampling as warranted, and determine appropriate compensatory actions.

14.3 Break in pond wall: If a wall around the ponds fails, allowing the pond contents to spill onto the exposed ground around the pond, the pond will immediately be isolated by closing the valves to the pond. Evaluate the extent of the pond failure and potential notification and reportability requirements. The wall will then be repaired and the pond returned to service.

14.4 Break in drain line: If a drain line fails, the wastewater to the failed transfer line shall be shut off or isolated and the line repaired as soon as possible.

14.5 Abnormal Situations:

14.5.1 It is expected that water fowl will utilize the ponds. There is little that can be done to regulate the incurrence.

14.5.2 Small animals such as rabbits may also find a way to the ponds. If the animal has not drowned, rescue and release the animal.

14.5.3 If a large animal such as a deer jumps the fence and falls in a pond, rescue and release the animal.

14.5.6 If a vehicle drives into a pond, tow the vehicle out of the pond being careful to not damage the pond liner.

14.5.7 Snakes and spiders will also like the moisture of the ponds so care should be taken around the cisterns and electrical distribution centers during maintenance or surveillance around the ponds.

14.5.8 Due to the frequent wind storms, tumbleweeds will be blown into and over the pond access fence. The fence around the ponds should be cleaned of tumbleweeds as soon as possible. Tumbleweeds in a pond should be removed so they do not build up and plug pond discharge lines. Care must be taken during the removal process not to damage the pond liner.

14.5.9 If flow monitoring equipment fails, daily measurements or estimates will be used to determine flows.

APPENDIX A **Construction Plans** (Attached Separately)

Figures 3 & 4 (Attached Separately)

APPENDIX B **Maintenance and Warranty Data**

1. Liner Information
   a. Installer
   b. Liner Material
   c. Liner Test Certificate
   d. Geo-Net Material
   e. Liner Warranty
   f. Ballast Bag Material

2. Cistern Information
   a. Manufacturer's Data
   b. Access Door

3. Pumps
   a. PP-1
   b. PP-2
   c. PP-3-5

4. Valves
   a. V-1 to V-6, V-8 to V-14
   b. V15, V16
   c. V7
   d. TV-1
   e. TV-2
   f. TV-3
   g. TY-4, TV-5
   h. TV-6
   i. LKV-1TO 5
   j. SV-1 TO 5
   k. CV-1
   l. Valve Handles
   m. Vacuum Relief Valve
   n. Valve Riser Boxes

5. Piping
   a. Fernco Couplings
   b. Pipe Saddles
   c. Sleeve Weld Procedure
   d. Culvert Grating

6. Controls
    a. Float 1BL
    b. Float 1AL
    c. Floats LDF 1TO 5
    d. Floats 1A3, 2A3, 1A4, 2A4, 1A5, 2A5
    e. Float Switch FS-1
    f. Hour Meter RC1 to 5
    g. Relay K1 to K2
    h. Power Contactor, C1
    i. Time Delay Relay

7. Light Fixtures
    a. Signal Lighting
    b. Area Light Fixture

8. Electrical Gear
    a. Electrical Disconnects
    b. Electrical Service Panels
    c. Electrical Transformers
    d. Electrical Switches

9. Flow Meters
    a. RO Concentrate Flow Totalizer
    b. Open channel Parshall Flume
    c. Ultrasonic Flow Meter

10. Flow Coordinated Sampler

11. Aerators