4.0 STORM WATER MANAGEMENT CONTROL

4.1 Preventive Maintenance

Caithness will maintain all equipment according to the facility's Maintenance Plan. The Maintenance Plan will specify routine maintenance and servicing of the plant facilities and equipment at regular intervals based on manufacturers' recommendations or good engineering practices. This preventive maintenance program will be instrumental in preventing a breakdown in the facility or equipment that could result in impact to the storm water drainage system and accidental leaks to off-site locations. Additionally, this preventive maintenance program will detect small leaks before they become major items of concern.

If maintenance, operation, control room, or other plant personnel notice unusual operation characteristics from equipment or leaks, they are trained to notify appropriate plant supervisory personnel. The situation will be immediately investigated and necessary actions taken. Action can include a shutdown of equipment or submittal of a repair order to the Maintenance Supervisor to correct the problem. This procedure should also reduce potential spill situations.

4.2 Good Housekeeping

The maintenance of a clean and orderly facility will be crucial to the success of a well planned and implemented SWPPP. It will be important to manage hazardous materials and waste properly. Management of chemicals at the plant will be maintained by proper indoor and outdoor storage in an appropriately labeled container. This proper storage will be maintained by good housekeeping practices. Pieces of equipment, accessory, or discarded items will not be left exposed in an improper location or container so that a leak could impact storm water.

The Environmental/Safety Engineer will conduct weekly environmental audits of the plant. These audits will consist of inspection of plant locations or equipment with potential impact to the storm water system. Additionally, these inspections will address pollution prevention and noncompliance issues. If a pollution prevention issue or noncompliance items are observed during one of these inspections, corrective action will be taken to remedy the issue or item.

Plant personnel also will be instructed and trained to recognized potential problems and to report them to management immediately so appropriate action takes place.

4.3 Spill Prevention and Response

Caithness will develop a facility wide Spill Prevention Control and Countermeasure (SPCC) plan and other documents for preventing and responding to petroleum hydrocarbon and other chemical spills. These various plans and regulatory requirements will be incorporated as part of the facility operating procedures. These plans and documents will address spills, spill controls, spill response, and decontamination equipment as well as procedures to deal with chemical spills.

A spill response team will be HAZWOPER trained in hazardous material handling and spill response. Caithness will address spill prevention and response as part of its hazardous materials and waste management program. These programs will be administered by the Environmental/Safety Engineer.

4.4 Storm Water Diversion and Management Practices

4.4.1 Main Plant Area Drainage and Evaporation Pond Design

Caithness plans to construct a storm water system for the power plant site which will divert all liquid from the main plant area to a drainage system that flows directly into the evaporation ponds. The main plant area will be covered with structures for housing plant facilities. The area surrounding these structures will be paved with concrete or asphalt along with roadways in the plant. Remaining areas in the plant will be covered with rock. This will allow for easy control and drainage of liquids from the main plant area into the storm water system and into the evaporation ponds. These evaporation ponds will be regulated separately under an Aquifer Protection Plan permit issued by the ADEQ.

The Project will have two evaporation ponds to accept and evaporate the plant operation wastewater and storm water runoff from the main plant area. Each pond will have the same approximate surface area. The total combined evaporative surface area of the ponds is approximately18 acres, with each pond covering about nine acres. Current analysis indicated that this acreage will be sufficient to evaporate all of the plant wastewater flow and direct rainfall into the ponds.

The inside depth of each cell will provide:

- Sufficient depth to provide storage of the entire salt production for a period of 40 years plus 50 percent.
- Sufficient additional depth to provide for normal water level variation throughout the year due to variations in plant inflow, rainfall, and the evaporation rates.
- Sufficient additional depth to provide for the increase in water level that would occur when the evaporation rate is 90 percent of the mean evaporation rate for two years in a row.

- Sufficient depth to provide additional storage capacity for increased inflow for a minimum of two-weeks assuming the brine concentration and reverse osmosis (RO) equipment are both inoperable.

- Sufficient depth to provide an allowance for an increase in water level during pond maintenance, assuming one cell will need maintenance for a two-month period.

- Sufficient additional depth to provide for the 100 year rainfall on top of the maximum water level resulting from water level variations.

- Sufficient freeboard above the maximum water level to provide the greater of 24 inches or the height of the wind wave run-up plus 12 inches.

The ponds will be constructed partially above grade and partially below grade to balance the earthwork. The above grade earthwork will be compacted according to good engineering practice to meet design requirements.

Each cell will be provided with two liners. A leak detection and removal system will be installed between the liners. The outer liner will consist of 12 inches of clay or an alternative material with a hydraulic conductivity of 1×10^{-6} cm/sec. The outer layer and inner will be covered with a 60 mil high-density polyethylene (HDPE) geomembrane. The HDPE will be textured on both sides to increase frictional resistance to slippage of cover material.

The interior bottom of the pond will be covered with a 12 inch thick layer of prepared cover material. The maximum particle size of this cover material will be ½ inch to prevent wind uplifting, mechanical damage, and other types of potential damage.

Interior slopes of the pond will be covered with a 12 inch thick layer of prepared cover material, a layer of 10 oz sewn polypropylene geotexitle, and a minimum of a nine inch thick layer of rip rap with an average size of 6 inches. The size of the rip rap may be increased due to surface waves in the pond. Exterior slopes of the dike will be covered with a 6-inch layer of gravel or crushed rock for wind and rainwater protection.

Each cell will be provided with an independent leak detection and removal system (LDRS) between the inner and outer liners. This LDRS will be designed to detect a leak in the inner liner within one-hour of a leak occurrence. An HDPE geonet with a minimum thickness of 150 mils will be installed between the liners to collect leakage through the inner liner and carry the liquids to a drainage trench located in the center bottom of each cell. The drainage trench will be rock-filled and have a minimum of a six inch diameter perforated HDPE pipe. A geotextile cushion layer will be placed around the rock to prevent punctures of the geomembrane liner.

The cells will have a rock-filled collection sump. This collection sump will have a minimum depth of 30 inches. A perforated HDPE sump pipe will be installed inside of each sump. Each sump pipe will extend up the side slope to a concrete access area. A horizontal sump pump will be installed inside each sump pipe to pump out leakage and return it back into the cell. Each pump will have a local mounted controller with instrumentation. Each pump will be sized to remove twice the maximum leakage resulting from one 100 millimeter diameter hole per acre with the pond at its maximum water level.

The pond influent system will be designed so that each cell can operate independently should a shutdown of a cell for maintenance be required. Discharge into each cell will be via pipes installed over the top of a dike and into each cell.

4.4.2 Other Plant Drainage

It is possible that some of the drainage outside of the main plant area may be diverted to the evaporation ponds located west of the facility. The location of the ponds is generally at the lowest plant elevation. Therefore, rainwater runoff will flow by gravity toward this location and be retained in the ponds.

Contamination of this area from chemicals used at the plant is not anticipated, because no chemicals are stored away from the main plant area. Except for the evaporation ponds, most of this area is compacted native soil. Heavy rainfall in this area will cause minor localized soil erosion. This soil erosion will result in an increase in turbidity as a result of silt and clay in the runoff water. The silt and clay material, however, will be collected and allowed to settle in the ponds or containment area if this system is constructed at the site.

Some localized areas of the plant will drain into drainage channels located along the western portion of the plant. The area inside of the Big Sandy Power, LLC plant property that drains into these channels should be small and consist of undeveloped fringe location along the east, south, and west borders of the property. None of these fringe areas will contain chemicals used at the plant or have uncontrolled main plant drainage. Therefore, pollutants from the main plant area should not affect these local drainage channels.

Portions of the plant may be landscaped with native vegetation. This vegetation could be irrigated with a drip type system to minimize water consumption and runoff if a water system is needed for the vegetation. Therefore, runoff and resultant pollution to local storm water channels along the perimeter of the property are not anticipated.

4.4.3 Non-Storm Water Discharges

The plant has a variety of close-loop water sources. Examples of some of these close-loop systems are the cooling tower, chiller tower, and other water uses in the facility. None of these sources will be discharged into the storm drain.

The primary non-storm water stream discharge will be from the circulating ion reduction plant. This discharge will be to the evaporation ponds. The ion reduction plant will be an advanced treatment system design to recover essentially all water for reuse, leaving only a very small stream for disposal in the evaporation ponds. This stream will be a brine, with very high concentrations of total dissolved solids and other nonhazardous constituents. The expected water quality of each stream for the plant is provided in **Table 3**. The typical flow rate will be approximately 60 gallons per minute (gpm). This stream will be discharged to the evaporation ponds where the remaining water will be evaporated.

The only other non-storm water stream will be from the sanitary sewer system. This system will be an onsite septic system designed to meet local and state regulatory requirements.

4.5 Employee Training

Project employees will receive HAZWOPER and internal training in handling chemicals and responding to spills. This training will include cleanup and decontamination procedures. As a result of this HAZWOPER training and yearly updates, the SWPPP should not require the introduction of a new training program. Additionally, Caithness will emphasize spill prevention, good housekeeping, and sound chemical management internal training programs during initial employee orientation, during onsite job training, and during periodic employee meetings. The goals of these training programs will be the elimination of sources, processes, procedures, and/or incidents that may result in the pollution of the storm water drainage system.

4.6 Inspection

The plant will be inspected weekly by the Environmental/Safety Engineer. The inspection procedure selected will ensure all monitoring, safety and emergency equipment, security devices, and facility that are vital to prevent or respond to environmental or human health hazards are kept in good working order and potential pollution issues are addressed. Part of the weekly inspection will be to check all chemical storage areas, the general plant, the storm water drainage system, and the sanitary sewer system. As a weekly inspection, all seasons of the year will be covered, including the rainy wet season. A copy of the proposed onsite visual inspection Checklist is provided in **Appendix B**.

Table 3. Expected Water Quality of Evaporation Ponds for Big Sandy Energy Plant

Constituent	Units	Evaporation Pond Influents
Calcium	ppm as CA	460.78
Magnesium	ppm as Mg	153.59
Sodium	ppm as Na	1,919.90
Potassium	ppm as K	76.80
Sulfate	ppm as SO4	1,535.92
Chloride	ppm as Cl	1535.92
pH	none	
Silica (Total)	ppm as SiO2	191.99
Silica (Reactive)	ppm as SiO2	191.99
Iron	ppm as Fe	7.68
Specific Conductivity	mhos/cm	11,519.40
Total Dissolved Solids	ppm as TDS	5,759.70
Total Suspended Solids	ppm as TSS	38.40
Nitrate	ppm N	11.52
Phosphate	ppm as PO4	3.84
M Alkalinity	ppm as CaCO3	2,111.89
P Alkalinity	ppm as CaCO3	0.00
Ammonia	ppm as NH3	7.68
Silt Density Index (0.45 m)	none	15.36
Turbidity	NTU	53.76
Biological Oxygen Demand	ppm BOD	23.04
Total Organic Carbon	ppm as C	7.68
Total Nitrogen	ppm as N	15.36
Aluminum	ppm as Al	3.84
Arsenic	ppm as Ba	0.77
Barium	ppm as Ba	0.77
Boron	ppm as B	8.45

Table 3. Expected Water Quality of Evaporation Ponds for Big Sandy Energy Plant

Cadmium	ppm as Cd	0.02
Copper	ppm as Cu	0.08
Cyanide	ppm as CN	0.08
Fecal Coliform	NMP/100 ml	76.80
Flouride	ppm as F	30.72
Hexavalent Chromium	ppm as Cr	0.12
Total Chromium	ppm as Cr	0.12
Lead	ppm as Cr	0.23
Mercury	ppm as Hg	0.12
Nickel	ppm as Ni	0.08
Selenium	ppm as Se	0.15
Strotium	ppm as Sr	0.08
Tin	ppm as Sn	0.15
Zinc	ppm as Zn	3.84

A general seasonal review of items covered during the storm drainage system inspection is provided as follows:

- Dry Season Inspection (May through September) - Requires checking the storm water drains in the main plant area for the presence of non-storm discharges and contaminants. Requires the checking of evaporation ponds for buildup of silt or non-storm discharges and contaminants. Requires examination of boundary drainage channels for the present of non-storm discharges and contaminants.

- Wet Season Inspection (October through August) - Requires taking grab samples of storm water runoff into the evaporation ponds. When possible, these samples should be taken monthly during the rainy seasons. These grab samples will be physically examined for floating or suspended material, oil and grease, discolorations, turbidity, and odor. Requires two additional annual grab samples be taken at the storm water discharge into the evaporation ponds. These samples will be analyzed for prescribed pollutants such total suspended solids (TSS), conductivity, total organic carbon (TOC), oil & grease (O&G), semi-volatile organic compounds (SVOCs), and pH. The grab samples taken at a proposed "L-shaped" berm will be analyzed for TSS, conductivity, and TOC.

4.7 Environmental Work Instruction for Secondary Containment Areas

The Environmental/Safety Engineer has developed general work instruction for visually examining secondary containment areas after each storm event to insure that only clean water is drained into the main plant storm water drainage system. A copy of these general work instructions is provided in **Appendix C**.

4.8 Waste Handling and Recycling

Although the Big Sandy Energy Project will have a U.S. EPA Identification Number for the disposal of hazardous material from the site, significant quantities of hazardous waste are not expected to be routinely generated at the facility. Almost all of the chemicals used at the plant will be consumed as part of the facility operation.

Hazardous waste generated at the facility will be mostly from maintenance of equipment or off-spec materials. An example of a maintenance activity which could generate a short-term high level of waste is the 3 to 5 year -maintenance on the Heat Recovery Steam Generators. Normal maintenance activities will generate small levels of waste materials. An example of an off-spec material waste source would be used transformer mineral oil. All of these major sources of waste will be handled and recycled through maintenance contracts on the equipment.

The normal small quantities of waste generated at the facility will be stored in the facility's covered chemical storage facility in an appropriate container. The container will be labeled according to Resource Control and Recovery Act (RCRA) regulations. Additionally, this facility will be designed to store hazardous materials. This material will be disposed of by an approved contractor at a licenced facility which handles the waste.

As mentioned earlier, the chemical storage facility will be located within the main plant area. Therefore, all drains in the area of the chemical storage facility will be to the evaporation ponds.

4.9 Erosion Control and Site Stabilization

The main plant area will be covered with asphalt or concrete or with rock. Therefore, soil erosion from this area should not be a problem.

The area near the evaporation ponds will be soil. This soil, however, will be compacted to minimize erosion. Additionally, theWikieup region has a low annual rainfall (10 inches), and the plant property does not have a history of flash flooding. Therefore, significant erosion of this area is not anticipated.

Portions of the plant's perimeter and interior may be landscaped with native vegetation. This vegetation could provide some erosion control and soil stability in localized areas.