



*Prepared for*

**TALLEN MONTANA, LLC**

303 N 28<sup>th</sup> St., Suite 400  
Billings, Montana 59101

**COLSTRIP WASTEWATER FACILITY CLOSURE PLAN  
PLANT SITE**

**Per Requirements of AOC Article IX**

**Colstrip Steam Electric Station  
Colstrip, Montana**

*Prepared by*

**Geosyntec**   
consultants

10211 Wincopin Circle, 4<sup>th</sup> Floor  
Columbia, Maryland 21044

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## ABBREVIATIONS AND ACRONYMS

AOC	Administrative Order on Consent
CCR	Coal Combustion Residuals
COI	Constituent of Interest
CSES	Colstrip Steam Electric Station
EHP	Effluent Holding Pond
GCL	Geosynthetic Clay Liner
HDPE	High Density Polyethylene
LCRS	Liquid Collection and Removal System
MDEQ	Montana Department of Environmental Quality
RPP	Reinforced Polypropylene
SOEP	Stage I Evaporation Pond
STEP	Stage II Evaporation Pond
USEPA	U.S. Environmental Protection Agency
USGS	United States Geologic Survey

## 1. INTRODUCTION

### 1.1 Purpose

This Facility Closure Plan (Plan) has been prepared by Geosyntec Consultants, Inc. (Geosyntec) on behalf of Talen Montana, LLC (Talen) pursuant to Article IX of the “Administrative Order on Consent Regarding Impacts Related to Wastewater Facilities Comprising the Closed-Loop System at Colstrip Steam Electric Station, Colstrip Montana” (AOC) [MDEQ 2012]. The AOC was entered between Talen, the successor of PPL Montana, LLC, and the Montana Department of Environmental Quality (MDEQ or the Department) in August 2012. The AOC for Colstrip Steam Electric Station (CSES or the Station) applies to three areas:

- i. Areas at and downgradient of Units 1&2 Stage I and Stage II evaporation ponds northwest of the main plant site (SOEP/STEP Site);
- ii. Areas at and downgradient of the main plant site (Plant Site); and
- iii. Areas at and downgradient of Units 3&4 effluent holding ponds southeast of the main plant site (EHP Site).

Article IX of the AOC requires a Facility Closure Plan be developed for each of the three areas (or sites). Figure 1 depicts the locations of the three sites. All wastewater facilities identified in Attachment A of the AOC will be addressed in one of the three plans. Table 1 replicates the facilities listed in Attachment A of the AOC and notes which plan addresses each facility. This Facility Closure Plan is for the Plant Site. The EHP Site and the SOEP/STEP Site will be addressed in separate facility closure plans.

### 1.2 Scope

This Plan specifically addresses the AOC Article IX requirements for the Plant Site including: (1) provisions for control, minimization, or elimination, to the extent necessary to protect human health and the environment, of post-closure escape of Constituents of Interest (COIs) to the environment; (2) proposed actions to inform and obtain input from the community consistent with AOC Article V – Public Participation; and (3) cost estimates for closure and post-closure care. Closure of all coal combustion residual (CCR) units will occur in compliance with the criteria for closure set forth in 40 CFR 257.102.

The current version of the CCR Master Plan Summary Report for the CSES (Master Plan Summary) prepared by Geosyntec [2016a], and the written closure plan and post-closure plan for existing impoundments prepared by Geosyntec [2016b, 2016c], serve as the baseline for this Plan for the Plant Site.

### 1.3 Plan Updates

This Plan will be updated either every five years or when a major change or modification is made to the facility, per the requirement of AOC Article IX.E.

## 2. BACKGROUND

### 2.1 Facility Location

The CSES is a coal-fired steam electric generating facility partially owned and operated by Talen. The Station is located near the City of Colstrip, which lies within Rosebud County in south central Montana, approximately 90 miles east of Billings, Montana. An aerial location map of the CSES is shown in Figure 1. Figure 2 presents the location of the Plant Site on United States Geologic Survey (USGS) 7 ½ minute topographic quadrangle maps [USGS 2014].

### 2.2 Plant Site Description

Electric power is generated by four coal-fired units which are typically addressed as two distinct facilities: Units 1&2 and Units 3&4. Units 1&2 generate 614 megawatts (MW) of power and began commercial operation in 1975 and 1976, respectively; Units 3&4 generate 1,480 MW of power and began commercial operation in 1984 and 1986, respectively. Electricity generation at the Plant Site produces two types of CCRs: (i) *scrubber slurry*, which includes the fly ash and flue gas desulfurization solids from the air pollution control system; and (ii) *bottom ash*, which is collected at the bottom of the boilers.

The Plant Site contains several impoundments (or ponds) currently used in the scrubber process and for dewatering bottom ash from Units 1 through 4 and other impoundments for water management purposes. Bottom ash is dewatered in bottom ash impoundments at the Plant Site, and then transported via truck to the EHP Site for final disposal. The scrubber slurry is transferred as a slurry through pipes to either the STEP Site (for CCR generated at Units 1&2) or to the EHP Site (for CCR generated at Units 3&4), where it is treated and dewatered (this resulting material is referred to as paste throughout this report) and then disposed. The impoundments at the Plant Site also store captured groundwater and stormwater runoff that is used in plant operations. Because the Station is a “zero discharge” operation, the storage and evaporation functions of the impoundments are critical to operations at the facility.

The individual impoundments within the Plant Site are identified on Figure 3. Table 2 summarizes the historic and current process wastewater impoundments at the Plant Site. Details of the construction history of the individual impoundments can be found in the “Colstrip Steam Electric Station History of Construction” prepared by Geosyntec [Geosyntec 2016d].

## **2.3 Master Plan Summary**

The Master Plan Summary Report [Geosyntec 2016a] for the CSES was prepared to describe the means and methods for managing water and waste at CSES in a manner that complies with the United States Environmental Protection Agency's (USEPA's) Final Rule for regulation of CCR under Subtitle D of the Resource Conservation and Recovery Act (RCRA), hereafter referred to as the CCR Rule or the Rule [USEPA 2015]. The current version of the Master Plan Summary was prepared by Geosyntec for Talen and updated on 23 September 2016 to reflect the shutdown of Units 1 and 2 by 1 July 2022 and non-liquid disposal of CCRs at the EHP by 1 July 2022.

A key consideration of the Master Plan Summary is to identify and coordinate the actions that will be implemented to comply with the CCR Rule and the requirements of the AOC. The actions recommended in this Plan are consistent with both the Master Plan Summary and the AOC, at this time. However, as the site investigation and remediation requirements of the CCR Rule are addressed, it will be necessary to verify that the Plant Site development and wastewater facility closure activities described in the Master Plan Summary are consistent with the AOC implementation plans and potential regulatory changes.

## **3. HEALTH AND ENVIRONMENTAL PROTECTION**

### **3.1 Plant Site Closure Plan**

To provide for control, minimization, or elimination, to the extent necessary to protect human health and the environment, of post-closure impact of COIs to the environment, a closure plan and post-closure plan for each impoundment regulated by the CCR Rule has been prepared [2016b, 2016c]. Impoundments not regulated by the CCR Rule will be similarly closed by removal of water prior to use as stormwater containment structures or will be decommissioned, removed, and the disturbed area will be reclaimed with vegetation. The pipelines at the Plant Site will be drained and closed in place.

#### **3.1.1 Plant Site Wastewater Facility Closure**

Closure plans for the individual wastewater facilities within the Plant Site are described below. Table 2 summarizes these plans.

##### ***Units 1&2 A/B Ponds***

Units 1&2 A/B Ponds were originally clay lined and constructed as the Units 1&2 Flyash Pond in 1975. The single pond was divided into A side in the west and B side in the east by a peninsula dike in between. The pond received scrubber slurry on a short-term basis until the solids could be dredged to the Units 1&2 SOEP/STEP ponds for final disposal. Clear water from Units 1&2 Flyash Pond flowed into the Units 1&2 Flyash Pond Clearwell to the north, where it

was pumped back to the scrubbers for reuse. Later the pond was separated into two ponds, Units 1&2 A Pond in the west and Units 1&2 B Flyash Pond in the east.

Units 1&2 A Pond was removed from scrubber service in May of 2005. It was used as a water storage pond (stormwater runoff, etc.) until 2015 when it was dewatered and filled with dry scrubber slurry and dry bottom ash in preparation for closure.

In 2004, Units 1&2 B Flyash Pond was double-lined with 45 mil RPP and liquid collection systems were installed in between and below the liners. Currently the Units 1&2 B Flyash Pond receives scrubber return water from the STEP Site but can receive scrubber slurry during emergency conditions (i.e., scrubber slurry pipeline out of service).

Per the Master Plan Summary, Units 1&2 A/B Ponds will be closed in accordance with the requirements of the CCR Rule (Units 1&2 A Pond not regulated by the Rule). Units 1&2 A/B Ponds are planned to be closed in 2019 and 2023, respectively, with final alternative cover systems constructed over the entire area of the two ponds.

#### ***Units 1&2 Bottom Ash Pond with Clearwell***

Units 1&2 Bottom Ash Pond with Clearwell were originally constructed to the east of Units 1&2 B Flyash Pond in 1975. Disposal of bottom ash from Units 1&2 was changed to the area just north of the Units 1&2 B Flyash Pond in 1988. The original Units 1&2 Bottom Ash Ponds were placed out of service with CCR in place. In 2006, the Units 1&2 Flyash Pond Clearwell was double-lined with 45-mil RPP with liquid collection systems installed in between and below, and converted to the new Units 1&2 Bottom Ash Pond Clearwell. Per the Master Plan Summary, Units 1&2 Bottom Ash Ponds and the Clearwell will be closed by capping the impoundments after filling with soils or CCR solids, planned for 2022. A final alternative cover system will be constructed over the entire area of the unit.

#### ***Pond C North and Pond C South of Units 1&2 Cooling Tower Blowdown***

Units 1&2 Cooling Tower Blowdown (Pond C) was originally clay lined in 1978. The pond received cooling tower blowdown and raw water which was used as make-up to the Wastewater Concentrator. In 1987, the pond was split into two sections (Pond C North and Pond C South). Pond C South was relined with clay and erosion control was added in the form of a geotextile and scoria in 1987. From 1987 to 2000, Pond C South was used for cooling tower blowdown and raw water. Since 2000, this impoundment receives storm water runoff which is used for dust control on the Plant Site access roads.

In 2004, Pond C North began receiving groundwater collection water (Brine Pond area and 10S/10M collection systems) to be used for a highway construction project as approved by



MDEQ. In 2005, raw water and stormwater runoff was sent to this pond for additional raw water storage because of the anticipated drought conditions.

Pond C North and Pond C South are currently used to store stormwater runoff for water management purposes. The impoundments contain no CCRs and are not regulated by the CCR Rule. The impoundments will be closed by dewatering and pushing in the surrounding soil to achieve the natural-appearing grade that blends the area into the adjacent landscape. The disturbed area will be reclaimed with vegetation.

#### ***Units 3&4 North Plant Area Drain Pond***

Units 3&4 North Plant Area Drain Pond was originally Hypalon lined in 1984 and later replaced with a HDPE liner. The impoundment receives raw water, pretreatment filter backwash, cooling tower overflow, and miscellaneous drainage from the north plant area. The impoundment currently contains no CCRs and is not regulated by the CCR Rule. The impoundment will be closed by dewatering, removal of the HDPE liner, and pushing in the surrounding soil to achieve the natural-appearing grade that blends the area into the adjacent landscape. The disturbed area will be reclaimed with vegetation.

#### ***Units 3&4 Wash Tray Pond***

Units 3&4 Wash Tray Pond was originally clay lined in 1983 and served as a scrubber pond for the wash tray loop. In 1988, the bank on the southern half of the impoundment was covered with geotextile and baked shale to reduce bank erosion. The impoundment was placed out of service in 1995.

The CCRs in the impoundment were removed in 2015 and placed at the Units 1&2 A Pond. Units 3&4 Wash Tray Pond currently receives stormwater and is named Stormwater Pond 1 (SWP-1). The impoundment will be closed by dewatering and pushing in the surrounding soil to achieve the natural-appearing grade that blends the area into the adjacent landscape. The disturbed area will be reclaimed with vegetation.

#### ***Units 3&4 Scrubber Drain Collection Pond***

Units 3&4 Scrubber Drain Collection (DC Pond) was clay lined in 1983 and received miscellaneous flow from the scrubber plant drains. This impoundment received scrubber slurry at times. In 1989, the DC Pond was relined with 3 inches of clay and the east and south banks were shored up to address dredging and bank erosion issues. In 1999, the DC Pond was taken out of service and flow from the scrubber drains and washdown were sent to the Units 3&4 EHP. In 2009, the DC Pond was used to store the cleanup of materials from the Units 1&2 Bottom Ash Pond.

The CCRs in the impoundment were removed in 2015 and placed at the Units 1&2 A Pond. The impoundment currently receives stormwater and is named Stormwater Pond 2 (SWP-2). The impoundment will be closed by dewatering and pushing in the surrounding soils to achieve the natural-appearing grade that blends the area into the adjacent landscape. The disturbed area will be reclaimed with vegetation.

#### ***Units 3&4 Bottom Ash Pond with Clearwell***

Units 3&4 Bottom Ash Pond with Clearwell were originally clay lined in 1983. Bottom ash generated at Units 3&4 is dewatered in the bottom ash ponds, and then transported via truck to EHP for disposal. Clearwater flows into the clearwell section and is returned to the plant bottom ash system for reuse. In 1991, the initial settlement cells of this impoundment were relined with clay and reshaped. The impoundments are currently in use for bottom ash dewatering and contain bottom ash and water.

Per the Master Plan Summary, Units 3&4 Bottom Ash Ponds and the Clearwell will be closed by capping the impoundments after filling with CCR solids, planned for 2020. A final alternative cover system will be constructed over the entire area of the unit.

#### ***Units 1-4 Sediment Retention Pond***

Units 1-4 Sediment Retention Pond was originally Hypalon lined in 1975 and relined with HDPE in 1989. The impoundment receives plant storm water drainage and some process water overflow at times. The impoundment currently contains no CCRs and is not regulated by the CCR Rule. The impoundment will be closed by dewatering, removal of the HDPE liner, and pushing in the surrounding soil to achieve the natural-appearing grade that blends the area into the adjacent landscape. The disturbed area will be reclaimed with vegetation.

#### ***Units 1-4 North Plant Sediment Retention Pond***

Units 1-4 North Plant Sediment Retention Pond was originally clay lined in 1975. The impoundment receives surface drainage from the north plant and warehouse areas. The impoundment currently contains no CCRs and is not regulated by the CCR Rule. Units 1-4 North Plant Sediment Retention Pond will be closed by dewatering and pushing in the surrounding soil to achieve the natural-appearing grade that blends the area into the adjacent landscape. The disturbed area will be reclaimed with vegetation.

### 3.1.2 Final Cover System

As discussed above, the closures for Units 1&2 A/B Ponds, Units 1&2 Bottom Ash Pond with Clearwell, and Units 3&4 Bottom Ash Pond with Clearwell will be designed in accordance with the requirements of the CCR Rule §257.102(d)(3)(ii) for an alternative final cover system. A low-permeability final cover will be used to close all CCR Rule-regulated impoundments to control and reduce, to the extent feasible, post-closure infiltration of stormwater into the waste. The infiltration layer of the alternative final cover system will achieve an equivalent reduction in infiltration as the prescriptive final cover system such that the permeability of the final cover system is less than or equal to the permeability of the bottom liner or natural subsoils present (or  $1 \times 10^{-5}$  cm/sec, whichever is less). The design of the final cover system will include an erosion layer that provides equivalent protection from wind or water erosion and contains a minimum of six inches of earthen material capable of sustaining native plant growth.

The final cover will be constructed of earthen and geosynthetic components that are sufficiently flexible to accommodate expected local differential settlements and subsidence. The design of the final cover system, lateral drainage layer, and dewatering system are such that there will be no further impounding of water, sediment, or slurry in the closed impoundment.

Quality control and quality assurance measures will be implemented at the time of final cover system construction such that the final cover will be constructed as designed to achieve and maintain slope stability and integrity throughout the closure and post-closure periods. The specific closure design varies depending on the future use of the unit. For more details of the final cover system design for each pond, please see the written closure plan for existing impoundments [Geosyntec 2016b].

The specific design for each pond varies depending on the future use of the pond. The general cross section for the final alternative cover system used in the Plant Site is demonstrated in Figure 4.

#### Final Alternative Cover Design

The area of Units 1&2 A/B Ponds and Units 1&2 Bottom Ash Pond with Clearwell, and the area of Units 3&4 Bottom Ash Pond with Clearwell will be closed with a cover design that includes (from top to bottom):

- 6-inch thick erosion layer capable of sustaining native plant growth;
- 12-inch thick layer of earthen material serving as an infiltration layer;
- geocomposite drainage layer (where needed);
- 40-mil textured HDPE geomembrane; and
- 8-oz non-woven geotextile cushion (where needed).

The geotextile will be installed above a prepared subgrade of CCR material.

As designed, the final alternative cover system will provide sufficient lateral drainage of liquids off the cap, which will reduce the head on the geomembrane and thus, the infiltration through the final cover. The geomembrane infiltration layer will be overlain by an 18-inch protective cover soil layer, which will protect the geomembrane infiltration layer and provide vegetative support to limit erosion of the final cover. The drainage layer will be graded at a sufficient slope to allow free flow of liquid through the geocomposite. Liquids collected within the drainage layer will be conveyed off the cover and collected in stormwater management features such as channels, culverts, and storage ponds.

### **3.2 Post-Closure Care**

Post-closure care activities considered in this Plan include maintenance of final covers as needed to maintain integrity and effectiveness and to address settlement and erosion, and operation and management of liquid collection and removal system. Groundwater activities, such as operation and maintenance of groundwater monitoring and groundwater capture systems, will be addressed by the groundwater remediation reports under the AOC.

#### **3.2.1 Property Uses During Post-Closure Period**

No future use is planned for the aforementioned Plant Site wastewater facilities. However, the closed area may be used for cattle grazing after the plant is no longer in service. Cattle grazing is recommended by a reclamation consultant to facilitate good vegetative cover. Disturbance to the integrity of the closure/containment system is not anticipated. To provide for control, minimization, or elimination, to the extent necessary to protect human health and the environment, of post-closure escape of COIs, an appropriate institutional control may be imposed on the real property, without conveying the property or creating a dominant and servient estate.

#### **3.2.2 Final Cover System Maintenance**

Construction of the final cover as described above uses passive management systems to the extent possible to reduce the need for long-term maintenance of cells after closure or after construction of an overfill cell. If the closed unit is not used for storage of stormwater or captured groundwater, the final cover will be vegetated with native, non-woody vegetation requiring little maintenance such as mowing. Following decommissioning, the areas of Pond C North of Units 1&2 Cooling Tower Blowdown, Pond C South of Units 1&2 Cooling Tower Blowdown, Units 3&4 North Plant Area Drain Pond, Units 3&4 Wash Tray Pond, Units 3&4 Scrubber Drain Collection Pond, Units 1-4 Sediment Retention Pond, and Units 1-4 North Plant Sediment Retention Pond will be reclaimed with vegetation and require no post-closure care.

Following the closure of a CCR surface impoundment where no stormwater storage is planned (i.e., Units 1&2 A/B Ponds, Units 1&2 Bottom Ash Pond with Clearwell, and Units 3&4 Bottom Ash Pond with Clearwell), erosion and sedimentation control measures will be maintained until vegetated surfaces of the final cover system are fully stabilized. After vegetation is fully established, routine site inspections will be performed as part of post-closure care to monitor the condition of the access roads, stormwater channels, and final cover, and evaluate if repair maintenance is needed.

When identified during routine site inspections, eroded, non-vegetated, or otherwise damaged areas of the final cover will be repaired by the addition of soil, regrading, and revegetation, as necessary.

During detailed design of impoundment closure, a run-on and run-off control and stormwater management system will be developed. The run-on and run-off control system will be designed and constructed to limit erosion and other damage to the final cover. The run-on and run-off control system will also be designed and constructed to maintain its effectiveness following closure of the surface impoundment.

The drainage systems will be operated and monitored as needed to remove liquids from above the cover system. If routine inspections and/or monitoring, or performance of the drainage system, indicate that the drainage system is not operating as designed, maintenance will be performed to correct the deficiency.

### **3.2.3 Liquid Collection and Removal System Maintenance**

As discussed above, Units 1&2 B Flyash Pond and Units 1&2 Flyash Pond Clearwell were constructed with a liquid collection and removal system (LCRS) placed between and beneath the double-liner system. The underdrain collections systems for the Units 1&2 B Flyash Pond and the Units 1&2 Bottom Ash Clearwell consist of: (i) one underdrain collection system situated between the primary and secondary liners (between liner collection), and (ii) a second underdrain collection system situated beneath the secondary liner (under liner). The double liner and underdrain collection systems generally consist of the following components (from top to bottom) [Hydrometrics, 2015]:

- 45-mil RPP primary geomembrane liner;
- 350-mil geocomposite drainage layer consisting of a geonet between two geosynthetic cushions (between liner or primary collection system);
- 36-mil RPP secondary geomembrane liner;
- geosynthetic cushion layer;
- minimum of 0.5 feet of drain rock (under liner or secondary collection system), which is not continuous over the entire pond footprint area; and
- 2- to 3-foot thick layer of compacted native clay soil.

Liquids collected in the drainage system will be conveyed to a sump fitted with riser pipes in which a pump will be operated to remove liquids to the decant water pond for use by the plant and after plant shutdown to the treatment system identified in the Master Plan Summary. The LCRS installed above the geosynthetic liner will reduce the liquid head on the liner and limit infiltration from the overlying cells. The LCRS installed below the geosynthetic liner will be operated to remove any liquid seeping through the liner.

The LCRS will be operated and maintained throughout the post-closure period managing liquid produced by the waste placed in the impoundments if necessary. If monitoring or performance of the LCRS indicates that the system is not operating as designed, maintenance will be performed to correct the deficiency.

#### **4. PROPOSED ACTIONS FOR PUBLIC PARTICIPATION**

Per Article IX.C of the AOC, this Plan “shall include proposed actions to inform and obtain input from the community consistent with Article V.” The proposed actions that Talen will conduct for public participation and that the Department shall perform as part of its action on this submission are in accordance with Article V.F of the AOC (Amendment entered effective 1 March 2017). The following bullet points are a summary of those requirements:

- Talen will submit this Plan to the Department per the requirements of the AOC;
- The Department shall post this Plan on its website upon receipt of this report. If the Department disapproves the plan, it shall also post its written disapproval;
- The Department shall post any revised plans submitted by Talen addressing concerns identified by the Department in its disapproval;
- The Department shall post a preliminary approval or preliminary conditional approval of the plan or revised plan on its website and a notice to the public of a 30-day period within which to comment on the report;
- Upon receipt of a written request within 10 days of posting by 10 or more persons or by a group having 10 or more members, the Department will conduct a public meeting on the plan;
- If a request for a public meeting has been received, the Department will set a public meeting and publish a public notice of the meeting on its website and in the local newspaper and the Billings Gazette;
- The public meeting must be held at least 10 days prior to the close of the public comment period. The Department shall conduct the public meeting;
- The Department will respond to substantive public comment as part of its final action on the submission; and

- The Department shall conduct a public meeting annually to inform the public of progress made by the Department and Talen under the AOC and to accept any input the public may have on implementation of the AOC.

## **5. COST ESTIMATE FOR CLOSURE AND POST-CLOSURE CARE**

Cost estimates are based on recent cost experience at CSES for similar construction work and Geosyntec's experience with similar projects. To estimate costs for future development activities, costs for typical construction activities anticipated to be performed at the Station were developed (e.g., capping, liner system) and these costs were then normalized on a per unit basis (e.g., acre, foot, square foot). This per unit cost was then used to estimate construction costs for each of the anticipated impoundment construction activities based on the size of the existing or proposed impoundment and the type of construction activity being performed. Costs for closure and post-closure care activities are presented in 2017 dollars.

Table 3 presents the cost estimate for closure and post-closure care of wastewater facilities at the Plant Site. It is notable that the future construction costs are heavily dependent on a few construction components (primarily geosynthetics but also, for some units, excavation), for which the costs are reasonably well known, and on several ancillary construction items (e.g., liquid or cover drainage systems), which are affected by specific design details and, therefore, are less certain. More detailed cost estimates will be developed during the design phase for each construction activity. In addition, the costs are dependent on the assumptions discussed throughout this Plan.

## 6. REFERENCES

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## **TABLES**

**Table 1 AOC Attachment A Facilities with Plan Reference**

<b>Wastewater Facility <sup>(1)</sup></b>	<b>Facility Closure Plan</b>
<b>Units 1&amp;2 A/B Flyash Pond</b>	Plant Site
Clearwell	
A Pond	
B Pond	
<b>Units 1&amp;2 Scrubber Pipeline <sup>(2)</sup></b>	SOEP/STEP Site
<b>Units 1&amp;2 Wash Tray Pond</b>	Plant Site (current Units 1&2 Bottom Ash Clearwell)
<b>Units 1&amp;2 Bottom Ash Pond w/ Clearwell</b>	Plant Site
<b>Units 1&amp;2 Brine Waste Disposal Ponds</b>	Not Applicable (previously closed per MDEQ approval)
D1-D3 ponds	
D4 pond	
<b>Units 1&amp;2 Cooling Tower Blowdown (Pond C)</b>	Plant Site
Pond C North	
Pond C South	
<b>Units 1&amp;2 Stage I Evaporation Pond (E Pond)</b>	Not Applicable (previously closed per MDEQ approval)
<b>Units 1&amp;2 Stage II Evaporation Pond</b>	SOEP/STEP Site
Cells A-E	
Cell B	
Old Clearwell	
Cell D	
<b>Units 3&amp;4 Auxiliary Scrubber Drain Pond</b>	Not Applicable (concrete structure being removed as part of plant demolition work)
<b>Units 3&amp;4 North Plant Area Drain</b>	Plant Site
<b>Units 3&amp;4 Wash Tray Pond</b>	Plant Site
<b>Units 3&amp;4 Scrubber Drain Collection (DC Pond)</b>	Plant Site
<b>Units 3&amp;4 Bottom Ash Pond w/ Clearwell</b>	Plant Site
<b>Units 3&amp;4 Effluent Holding Pond w/ Clearwell (EHP)</b>	EHP Site
Effluent Holding Pond	
<b>Units 3&amp;4 Scrubber-EHP Pipeline <sup>(2)</sup></b>	EHP Site
<b>Units 1-4 Sediment Retention Pond</b>	Plant Site

**Table 1 AOC Attachment A Facilities with Plan Reference (cont.)**

<b>Wastewater Facility (1)</b>	<b>Facility Closure Plan</b>
<b>Units 1-4 North Plant Sediment Retention Pond</b>	Plant Site
<b>Units 1-4 Surge Pond (Castle Rock Lake)</b>	Not Applicable (Fresh water supply pond, not a wastewater facility)
<b>Unit 4 Cooling Tower Canal</b>	Not Applicable (concrete structure being removed as part of plant demolition work)
<b>Drain Pit #3 <sup>(2)</sup></b>	EHP Site
<b>Drain Pit #5 <sup>(2)</sup></b>	EHP Site
<b>Drain 1AD Drain Pond <sup>(2)</sup></b>	SOEP/STEP Site

Notes: (1) Wastewater facilities from AOC Attachment A unless otherwise specified.

(2) Drain pits along the pipelines were not listed in AOC Attachment A.

**Table 2 Description of Wastewater Facility Construction and Service History at the Plant Site**

Wastewater Facility (1)	Surface Area (acre) (1)(3)	Years in Service	Contents Stored	Construction Upgrades/Operational Changes
Units 1&2 A Pond	14	1975 - 2005	CCR Water and Solids	Clay lined originally; Stored scrubber slurry until 2005
		2006 - 2015	Stormwater	Close by capping the unit after filling with soils or CCR solids (beneficial re-use), planned for 2019
Units 1&2 B Flyash Pond	14	1975 - 2003	CCR Water and Solids	Clay lined originally; Stored scrubber slurry until 2003
	12 (2)	2004 - 2023	CCR Water and Solids	Double-lined with 45 mil RPP and liquid collection systems installed below and in between the liners in 2004. Close by capping the unit after filling with soils or CCR solids, planned for 2023
Units 1&2 Bottom Ash Pond with Clearwell	8.2 (2)	1988 - 2022	CCR Water and Solids	Disposal of Units 1&2 Bottom Ash was changed to the area just north of the Units 1&2 A/B Ponds in 1988. The original Units 1&2 Bottom Ash Ponds were left with CCR in place, which was removed in 2016 and placed in the 3&4 Bottom Ash Pond in preparation for closure. In 2006, the Units 1&2 Flyash Pond Clearwell was double-lined with 45-mil RPP and liquid collection systems installed below and in between the liners. This pond was converted to the new Units 1&2 Bottom Ash Pond Clearwell. The Units 1&2 Bottom Ash Pond Clearwell has a liquid collection system installed below and in between the membranes. Close by capping the units after filling with soils or CCR solids, planned for 2022

**Table 2 Description of Wastewater Facility Construction and Service History at the Plant Site (cont.)**

<b>Wastewater Facility (1)</b>	<b>Surface Area (acre) (1)</b>	<b>Years in Service</b>	<b>Contents Stored</b>	<b>Construction Upgrades/Operational Changes</b>
Pond C North of Units 1&2 Cooling Tower Blowdown	10	1978 - 2000	Cooling tower blowdown and raw water	Originally the north portion of the Units 1&2 Cooling Tower Blowdown (Pond C), split into Pond C North and Pond C South in 1987.
		2001 - present	Raw water and stormwater	Close by dewatering and pushing in to achieve the natural-appearing grade that blends the area into the surrounding landscape. The disturbed area will be reclaimed with vegetation after Units 1 & 2 are shutdown.
Pond C South of Units 1&2 Cooling Tower Blowdown	10.5	1978 - 2000	Cooling tower blowdown and raw water	Originally the south portion of the Units 1&2 Cooling Tower Blowdown (Pond C), split into Pond C North and Pond C South in 1987.
		2001 - present	Raw water and stormwater	Close by dewatering and pushing in to achieve the natural-appearing grade that blends the area into the surrounding landscape. The disturbed area will be reclaimed with vegetation after Units 1 & 2 are shutdown.
Units 3&4 North Plant Area Drain	1	1984 - present	Raw water pretreatment filter backwash, cooling tower overflow, and miscellaneous north plant drainage	Close by dewatering, removing HDPE liner for disposal, and pushing in to achieve the natural-appearing grade that blends the area into the surrounding landscape. The disturbed area will be reclaimed with vegetation

**Table 2 Description of Wastewater Facility Construction and Service History at the Plant Site (cont.)**

<b>Wastewater Facility</b>	<b>Surface Area (acre) <sup>(1)</sup></b>	<b>Years in Service</b>	<b>Contents Stored</b>	<b>Construction Upgrades/Operational Changes</b>
Units 3&4 Wash Tray Pond (Stormwater Pond 1)	8	1983 - 1995	CCR Water and Solids	Originally clay lined; abandoned in 1995
		1996 - 2015	CCR Water and Solids	Remaining but no longer utilized, CCR material removed in 2015
		2016 - present	Stormwater	Close by dewatering, and pushing in to achieve the natural-appearing grade that blends the area into the surrounding landscape. The disturbed area will be reclaimed with vegetation.
Units 3&4 Scrubber Drain Collection (DC Pond) (Stormwater Pond 2)	6	1983 - 1999	miscellaneous scrubber plant drains and washdown	Originally clay lined; taken out of service in 1999
		2000 - 2015	CCR Water and Solids	Remaining but no longer utilized, CCR material removal in 2015
		2016 - present	Stormwater	Close by dewatering, and pushing in to achieve the natural-appearing grade that blends the area into the surrounding landscape. The disturbed area will be reclaimed with vegetation
Units 3&4 Bottom Ash Pond with Clearwell	15 <sup>(2)</sup>	1983 - 2020	CCR Water and Solids	Close by capping the unit after filling with CCR solids, planned for 2020

**Table 2 Description of Wastewater Facility Construction and Service History at the Plant Site (cont.)**

<b>Wastewater Facility</b>	<b>Surface Area (acre) <sup>(1)</sup></b>	<b>Years in Service</b>	<b>Contents Stored</b>	<b>Construction Upgrades/Operational Changes</b>
Units 1-4 Sediment Retention Pond	3.6	1975 - present	Stormwater (Historically stormwater and occasional scrubber overflow or cooling lower basin overflow)	Hypalon lined originally and relined with HDPE in 1989. Close by dewatering, removing HDPE liner for disposal, and pushing in to achieve the natural-appearing grade that blends the area into the surrounding landscape. The disturbed area will be reclaimed with vegetation
Units 1-4 North Plant Sediment Retention Pond	0.6	1975 - present	Stormwater (surface drainage from north plant and warehouse areas)	Close by dewatering, and pushing in to achieve the natural-appearing grade that blends the area into the surrounding landscape. The disturbed area will be reclaimed with vegetation

Notes: (1) Units 1&2 scrubber and Units 3&4 EHP-scrubber pipelines and the drain pits along the pipelines are included in the closure reports for the SOEP/STEP and EHP Sites.

(2) This is the surface area from AOC Attachment A, unless otherwise specified.

(3) Data from the Master Plan Summary [Geosyntec 2016a].

**Table 3 Cost Estimates for Wastewater Facility Closure and Post-Closure Care at the Plant Site**

<b>Wastewater Facility</b>	<b>Closure <sup>(1)</sup></b>	<b>Post-Closure Care <sup>(1)(2)(3)</sup></b>	<b>Subtotal <sup>(1)</sup></b>
Units 1&2 A Pond (west)	\$ 2.65 M	\$ 0.84 M	\$ 3.49 M
Units 1&2 B Flyash Pond (east)	\$ 2.95 M	\$ 0.72 M	\$ 3.67 M
Units 1&2 Bottom Ash Pond with Clearwell	\$ 2.00 M	\$ 0.49 M	\$ 2.49 M
Pond C North of Units 1&2 Cooling Tower Blowdown	\$ 0.87 M	\$ 0.00	\$ 0.87 M
Pond C South of Units 1&2 Cooling Tower Blowdown	\$ 0.91 M	\$ 0.00	\$ 0.91 M
Units 3&4 North Plant Area Drain	\$ 0.22 M	\$ 0.00	\$ 0.22 M
Units 3&4 Wash Tray Pond	\$ 0.70 M	\$ 0.00	\$ 0.70 M
Units 3&4 Scrubber Drain Collection (DC Pond)	\$ 0.52 M	\$ 0.00	\$ 0.52 M
Units 3&4 Bottom Ash Pond with Clearwell	\$ 3.40 M	\$ 0.90 M	\$ 4.30 M
Units 1-4 Sediment Retention Pond	\$ 0.78 M	\$ 0.00	\$ 0.78 M
Units 1-4 North Plant Sediment Retention Pond	\$ 0.05 M	\$ 0.00	\$ 0.05 M
<b>PLANT SITE TOTAL</b>			<b>\$ 18.00 M</b>

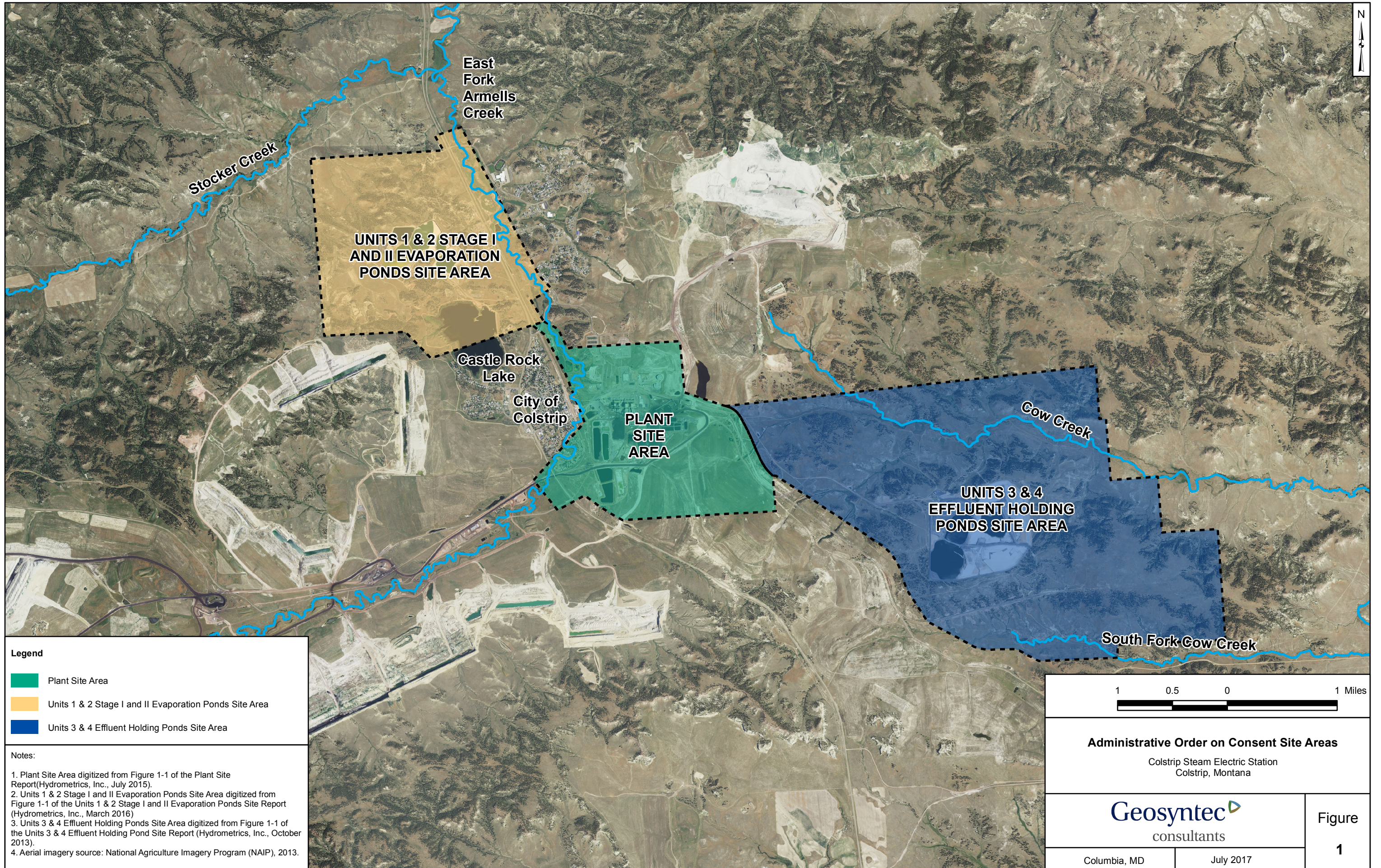
Notes: (1) Costs for closure and post-closure care activities are presented in 2017 dollars.

(2) A post-closure care period of 30 years is considered after the Plant Site is closed after plant shutdown. Under the CCR Rule, the owner or operator of a CCR unit should conduct post-closure care for 30 years.

(3) Post-Closure Care includes maintenance of final cover as needed to maintain integrity and effectiveness and addresses settlement and erosion, operation and management of liquid collection and removal system. Operation and maintenance of groundwater monitoring system and groundwater capture system will be addressed by the remediation report under the AOC.



## **FIGURES**



Stocker Creek

East Fork Armells Creek

UNITS 1 & 2 STAGE I AND II EVAPORATION PONDS SITE AREA

Castle Rock Lake

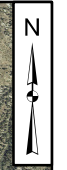
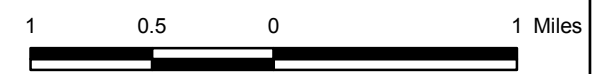
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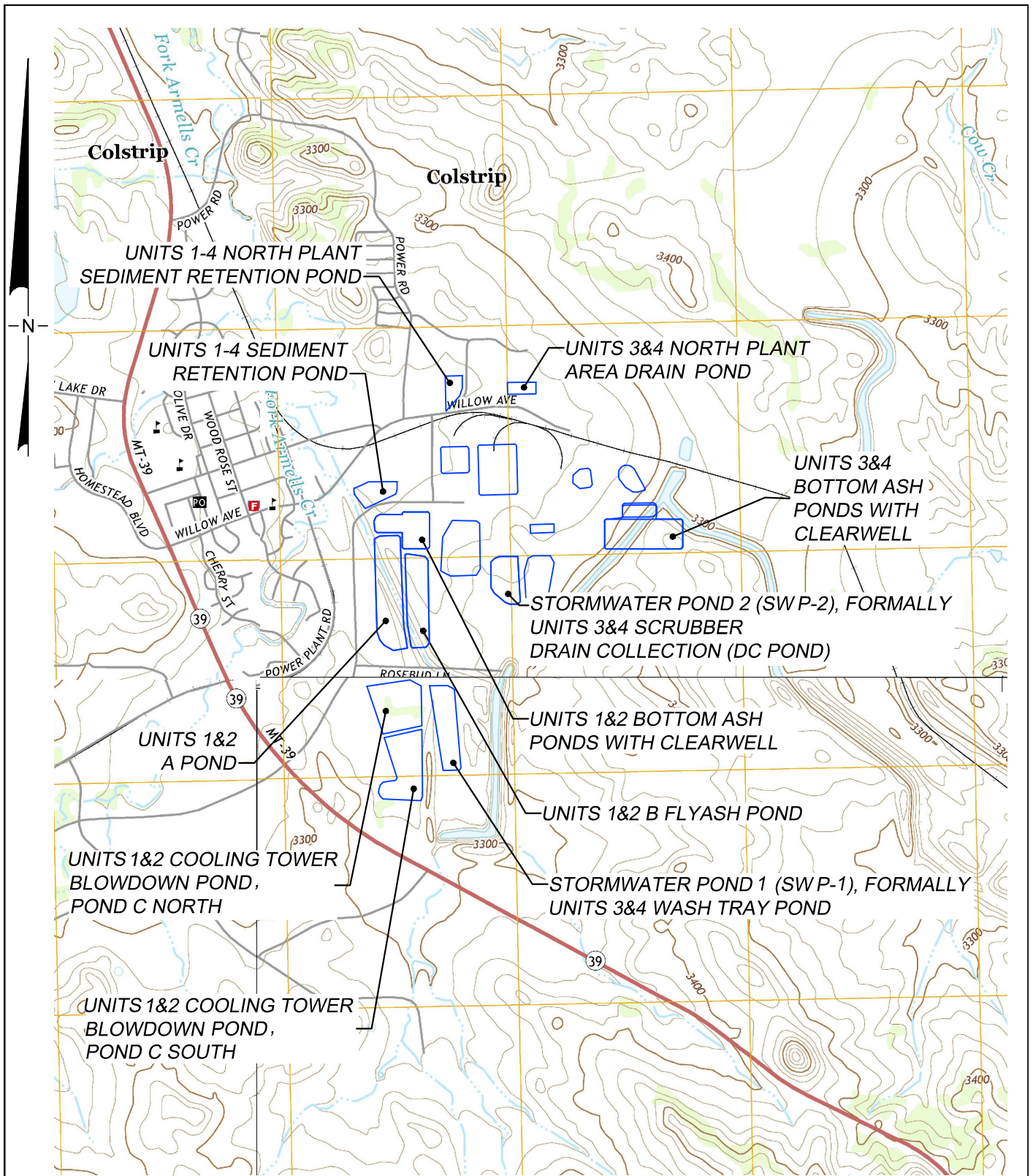
PLANT SITE AREA

Cow Creek

UNITS 3 & 4 EFFLUENT HOLDING PONDS SITE AREA

South Fork Cow Creek





SOURCE: USGS MAP (7.5, MINUTE SERIES, ROSEBUD COUNTY, 2014)



## POND LOCATIONS PLANT SITE AREA

**Geosyntec**  
consultants

COLUMBIA, MARYLAND

DATE:	JULY 2017
PROJECT NO.	ME1431
DOCUMENT NO.	MD17151
FILE NO.	F001-003
FIGURE NO.	2



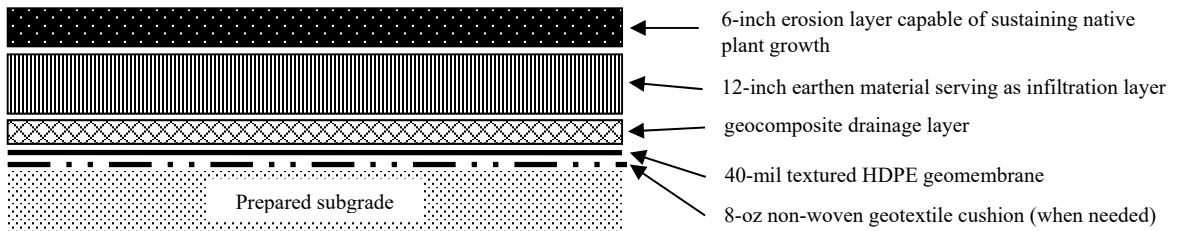
BACKGROUND: GOOGLE (2017)

## SITE LAYOUT PLANT SITE AREA

**Geosyntec**  
consultants

COLUMBIA, MARYLAND

DATE:	JULY 2017
PROJECT NO.	ME1431
DOCUMENT NO.	MD17151
FILE NO.	F001-003
FIGURE NO.	3



**Figure 4 Final Alternative Cover System**