

**Conceptual Closure Plan for
Landfill Increment 1 Buildout
Seminole Generating Station
Putnam County, Florida**

October 17, 2016



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Materials Consultants

October 17, 2016
File Number 16-13-0069

Seminole Electric Cooperative, Inc.
16313 North Dale Mabry
Tampa, FL 33618

Attention: Mr. Justin Gostnell

Subject: Conceptual Closure Plan for Landfill Increment 1 Buildout, Seminole Generating Station, Putnam County, Florida

Gentlemen/Ladies:

Regulations issued by the U.S. Environmental Protection Agency (EPA) addressing the disposal of Coal Combustion Residuals (CCRs) (40 CFR Part 257, Subpart D, effective October 19, 2015) (CCR Rule) require owners of existing and new CCR landfills to develop a written closure plan. As requested by Seminole Electric Cooperative, Inc. (SECI), Ardaman & Associates, Inc. (Ardaman) presents herein a conceptual closure plan for the active CCR landfill unit at the Seminole Generating Station (SGS) in Putnam County, Florida, as required by 40 CFR § 257.102.

CCR Landfill Units

A site plan that shows the different CCR landfill units at the SGS is displayed on an aerial photograph in Figure 1. As shown, these landfill units consist of the original landfill, which has been closed; the vertical expansion landfill (vertical expansion), which is expected to be closed in May 2017; and Increment 1, which remains active. Increment 1 is the only landfill unit that has received waste after October 19, 2015 and, therefore, is the only landfill subject to the CCR Rule.

Increment 1 is located within an approximately 27-acre parcel located to the southeast of the original landfill with a natural ground elevation of approximately +75 feet (NGVD), and “piggy back” on 7 acres of the southeastern slope of the original landfill. Increment 1 is provided with base and slope liner systems that are consistent with the requirements in Chapter 62-701, F.A.C., with the liner installation occurring in stages referred to as Stages I, IIA, IIB, and III. The Stage I and IIB areas cover the base of the 27-acre parcel and portions of the southeastern slope of the original landfill, whereas the Stage IIA and III areas consist entirely of slope area (i.e., without a base area on natural ground). To-date, lining of the Stage I, IIA, and IIB areas, with a combined area of approximately 23 acres and up to a slope elevation of approximately +115 feet (NGVD), has been completed. Lining of the approximately 4-acre Stage III slope area that extends from an elevation of approximately +115 feet (NGVD) to an elevation above +185 feet (NGVD) is scheduled to occur concurrently with closure construction of the vertical expansion. Increment 1 was activated in April 2013, and is expected to reach the top elevation of the Stage IIA and IIB slope liners (i.e., +115 feet, NGVD) in the early part of 2018. Based on the historical average

waste generation rate, Increment 1 is projected to reach the maximum design elevation of approximately +200 feet (NGVD) by the end of 2023.

The latest topographic survey of Increment 1 and adjacent areas, dated June 1, 2016, is included as Figure 2.

Conceptual Closure Plan for Increment 1

Construction of the Stage III lining and closure of the vertical expansion will be completed prior to closure of Increment 1 and were considered in developing the closure design for Increment 1. Figure 3 shows a conceptual closure plan for Increment 1 based on full utilization of its capacity. If Increment 1 is filled to capacity, the maximum surface area to be closed is approximately 27 acres. The closure configuration of Increment 1 is based on 3H:1V side slopes with a reverse sloping bench (i.e., a bench that is graded towards the inside to create a drainage swale) constructed at 20-foot vertical intervals from approximately elevation +95 to +195 feet (NGVD). The existing bench at elevations +95 to +100 feet (NGVD) only occurs on the east side of the landfill because the top of the containment dike is at an elevations of +100 to +106 feet (NGVD) on the southern and western sides of Increment 1. Above the bench at elevation +195 feet (NGVD), the top of the landfill will slope at a grade of 4 percent from the low point of the bench to the peak of Increment 1 at an elevation of approximately +200 feet (NGVD).

The reverse benches will be 15 to 20 feet wide and will be sloped toward concrete-lined flumes that drain directly into Pond B or to the perimeter swale on the west side of increment 1. Stormwater collected in the perimeter swale flows to the south and then to the east toward an inlet in the southeastern corner of Increment 1. The inlet is connected to a culvert that discharges into the southern end of Pond B.

It is anticipated that the final cover system will consist of the following key components in descending order:

- A sod cover for erosion protection.
- A minimum 2-foot thick drainage and protective soil layer for stormwater drainage and liner protection, the upper 6 inches of which will be prepared to be favorable to turf growth in all areas to be sodded.
- A double-sided HDPE geocomposite connected to a toe drain system for stormwater drainage and protective soil layer stability on the slope area.
- A 60-mil textured HPDE liner for infiltration control.
- A minimum 6-inch thick bedding soil layer for liner protection and support.

The final cover system will either be tied into or overlap the outer limits of the bottom liner system for Increment 1 and the closure liner for the vertical expansion.

Because Increment 1 has a double geomembrane liner system, the final cover system must also include a geomembrane to meet the permeability criterion for the final cover system. With the geomembrane, the proposed final cover system complies with the standards of 40 CFR § 257.102 (d)(3)(i)(A) through (D). The 2-foot thick drainage and protective cover layer will meet the CCR

rule requirement for an infiltration layer, and the upper 6 inches and sod will meet the requirements for an erosion control layer

The toe drain system, which will be installed at the low point on the inside of the reverse bench, will consist of a slotted HDPE pipe surrounded by gravel encased within a geotextile filter fabric. The slotted pipes will be connected to a solid pipe that will daylight and discharge the infiltrated stormwater collected in the drains to the concrete flumes.

The final cover system is designed with an infiltration layer and a barrier layer to minimize infiltration of rainwater into the waste. The slope of the landfill, the inclusion of a geocomposite drainage layer, and the toe drains on the benches are designed to prevent ponding on the surface of the unit.

Per 62-701.600(3)(g)5, F.A.C., the final cover design will include an evaluation of the stability of the cover system and the disposed waste and shall be designed to provide a minimum the factor of safety of 1.5. Stability evaluations for Increment 1 and the vertical expansion landfill, which have comparable side slopes and benching have demonstrated stability of the proposed landfill configuration. Although CCR do not decompose, the detailed closure design will also consider anticipated settlement of the waste during the closure and long-term care period.

If, because of waste reduction or diversion, Increment 1 is not going to be filled to capacity, the closure grading plan will be modified based on the anticipated final elevations of the waste. This may require exposing and tying into the Stage III slope liner system and providing for diversion of run-off and water collected in the geocomposite on the slope above the Increment 1 closure.

Maximum Inventory of CCR in Increment 1

As noted previously, Increment 1 is currently the only active waste disposal area at the SGS. If Increment 1 is filled to the final closure elevations shown in Figure 3, the total volume between the closure grades and the bottom liner and leachate collection system was computed to be approximately 2.3 million cubic yards. Allowing for a 2-foot thick protective soil cover above and a 6-inch thick soil bedding layer below the closure geomembrane liner over approximately 27 acres of closure area would reduce the total airspace by approximately 110,000 cubic yards to a net airspace of approximately 2.2 million cubic yards for waste storage. Considering an average CCR dry density of 1.2 tons per cubic yard (as established in previous studies), the net airspace will provide storage for approximately 2.64 million dry tons of waste materials, corresponding to approximately 10 years of waste storage life in the entire Increment 1. This is the maximum potential inventory of CCR in Increment 1.

As part of the annual landfill inspection performed in January 2016, Ardaman estimated that approximately 529,000 dry tons of CCR had been placed within Increment 1 by the date of the landfill inspection. Considering a total waste generation rate of 270,000 dry tons per year and an average dry density of 1.2 tons per cubic yard (as established in previous studies), Increment 1 is anticipated to reach capacity by November 2023.

Schedule for Closure Activities

The closure activities extend from design through certification of construction completion. The schedule assumes that the entire 27-acre Increment 1 landfill will be closed as a single project after Increment 1 reaches capacity. The project is assumed to start on November 30, 2023 with

receipt of an up to-date topographic survey and aerial photograph, which will be used as the basis for the design, and an on-site kickoff meeting attended by key Ardaman and SECI personnel.

Based on experience with previous projects, the design is anticipated to require approximately 6 months. Assuming the design process starts at the end of November 2023, the submittal to FDEP is anticipated to take place in early June 2024 with approval sometime in July 2024. If the design process is started while Increment 1 is still active, the submittal could take place earlier. The bidding process from preparation of the bid package through construction contract award is anticipated to take approximately 2 months.

Closure construction is anticipated to require approximately 6 months. The certification of closure construction completion including as-built surveys is anticipated to require approximately 1 month after construction.

Findings and Recommendations

It is our professional opinion that this closure plan for the active CCR landfill at the SGS (i.e., Increment 1) generally meets the requirements of 40 CFR § 257.102(b) and (d).

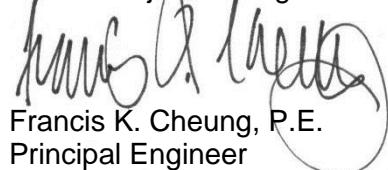
SECI should be cognizant of the following CCR rule requirements: (i) The most recent closure plan, including any amendment of the plan, must be maintained in the operating record at the facility as stipulated in by 40 CFR § 257.105(i)(4); (ii) the State Director must be notified of the availability of the written closure plan, and any amendment of the plan, as stipulated in 40 CFR § 257.106(i)(4); and (iii) the written closure plan, and any amendment of the plan, must be posted on the SECI website as stipulated in 40 CFR § 257.107(i)(4).

Ardaman appreciates the opportunity of providing our service to SECI. If you have any questions or need additional information, please contact us.

Very truly yours,
ARDAMAN & ASSOCIATES, INC.
Certificate of Authorization No. 5950



Patrick A. Kennedy, P.E.
Senior Project Manager



Francis K. Cheung, P.E.
Principal Engineer
Florida License Number 36382



Enclosure

10/17/2016

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1967600

1967000

1966400

1965800

1965200

301200

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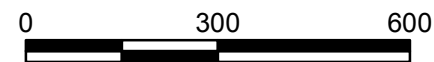
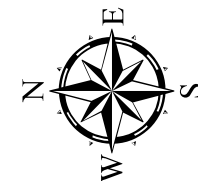
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Scale: 1" = 300'

SOURCE: AERIAL PHOTOGRAPH TAKEN BY PICKETT & ASSOCIATES, INC. JANUARY 18, 2016.

Pond 8

Pond 7

Stormwater Pond B

Stormwater Pond 2

Pond 9

Pond 2

Pond 3

Pond 1

Stormwater Pond 1

APPROXIMATE BOUNDARY OF VERTICAL EXPANSION LANDFILL CLOSURE CONSTRUCTION AREA

VERTICAL EXPANSION LANDFILL

CLOSED ORIGINAL LANDFILL

LANDFILL INCREMENT 1 BUILDOUT

STAGE IIA

STAGE I

PROPOSED STAGE III CONSTRUCTION AREA

STAGE IIB

EFFLUENT PROCESSING FACILITY



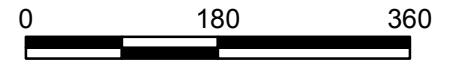
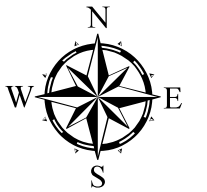
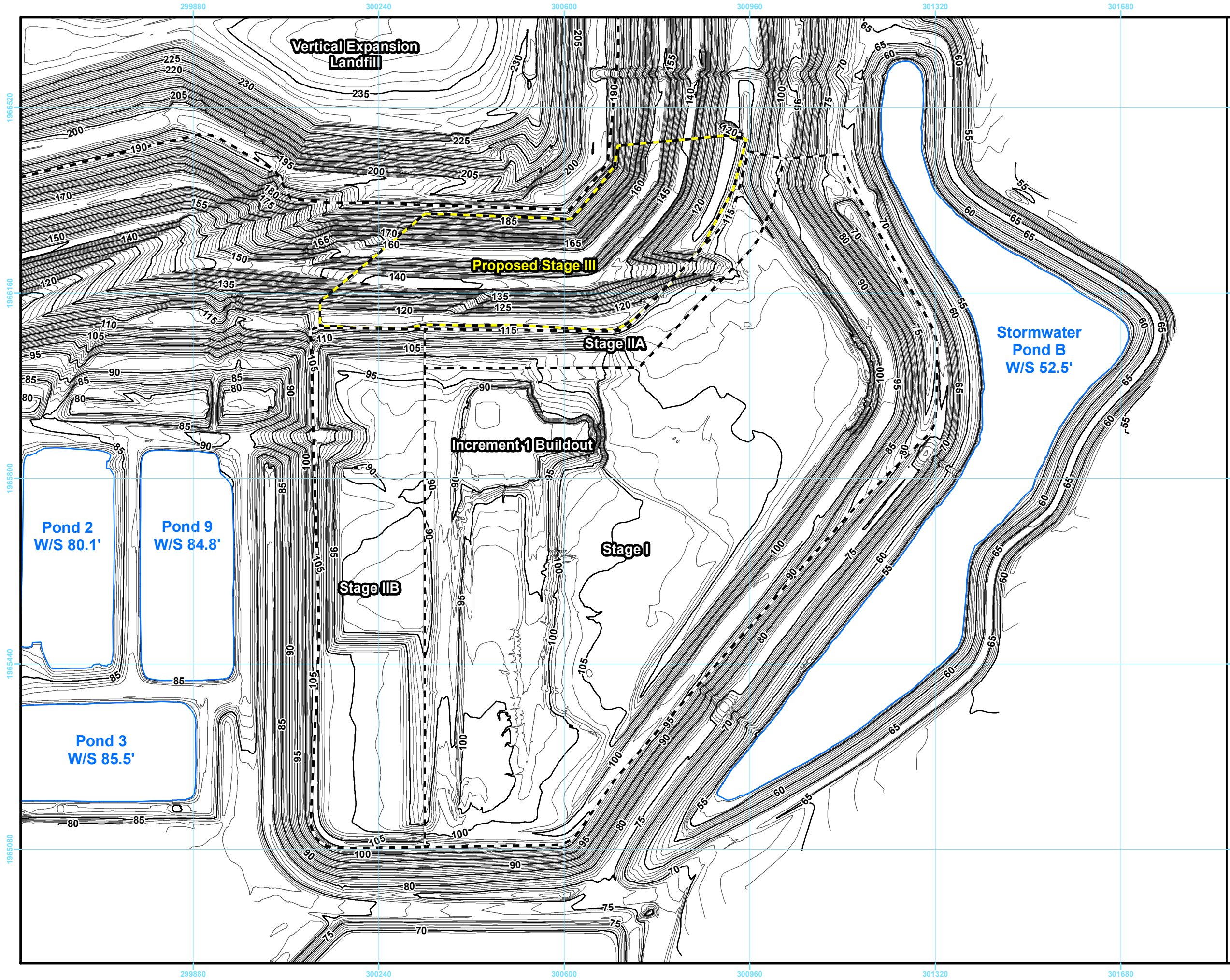
LANDFILL LAYOUT



INCREMENT 1 BUILDOUT CLOSURE PLAN SEMINOLE GENERATING STATION PUTNAM COUNTY, FLORIDA

DRAWN BY: TJC	CHECKED BY: PAK	DATE: 08/24/16
FILE NO. 16-13-0069	APPROVED BY: FKC	FIGURE: 1

Y:\Projects\2016\16-13-0069 Seminole\ArcGIS\ArcLayouts\20160824\20160601 Topography.mxd



Scale: 1" = 180'

SOURCE: PHOTOGRAMMETRIC TOPOGRAPHIC SURVEY COMPILED BY PICKETT & ASSOCIATES, INC. FROM AERIAL PHOTOGRAPHS TAKEN JUNE 1, 2016.

Legend

Elevation (feet, NGVD)

- 5' Contour
- - - - 1' Contour



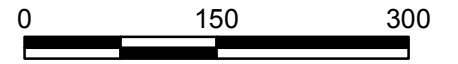
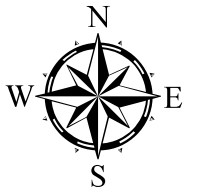
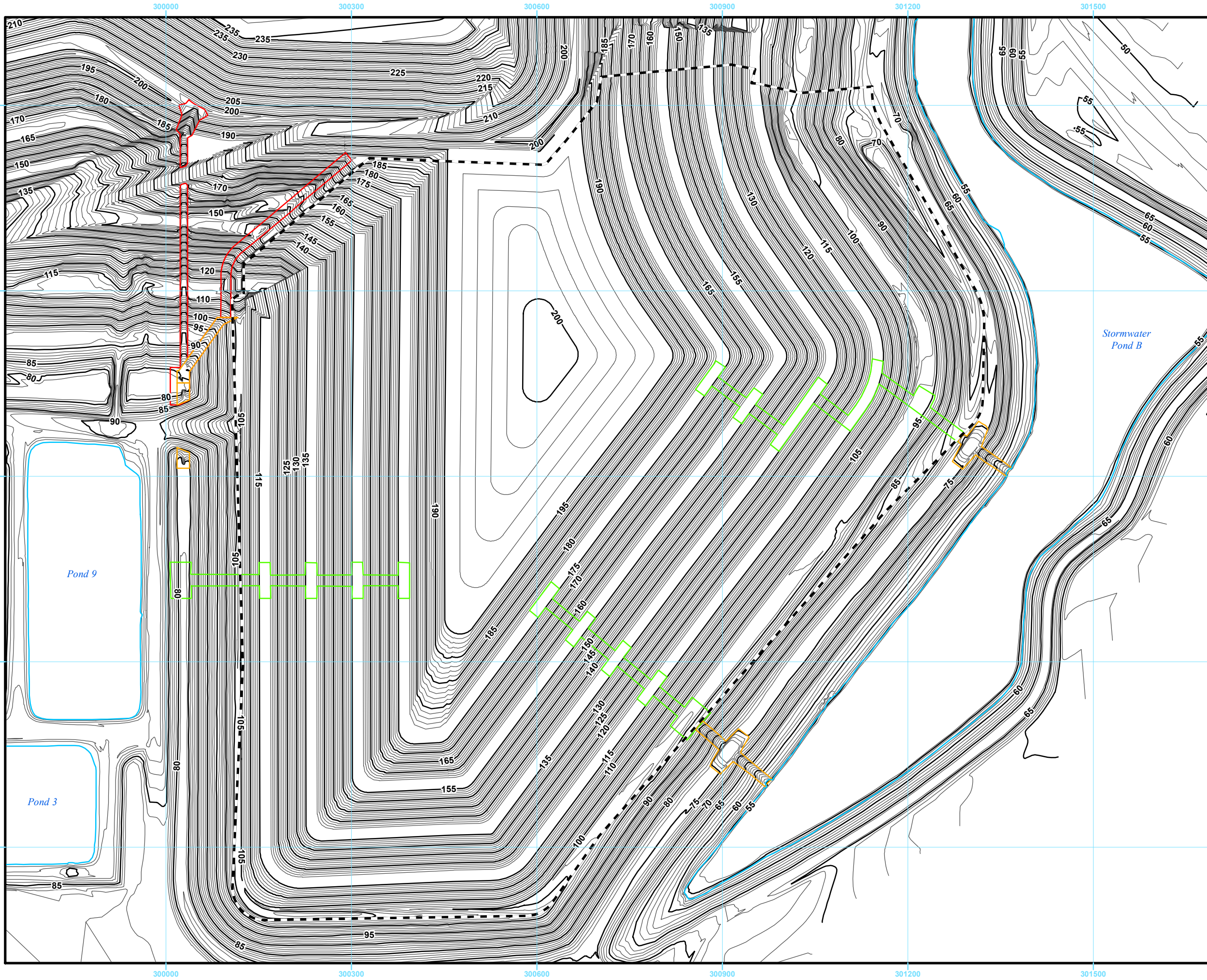
SITE TOPOGRAPHY



**INCREMENT 1 BUILDOUT
CLOSURE PLAN
SEMINOLE GENERATING STATION
PUTNAM COUNTY, FLORIDA**






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FILE NO. 16-13-0069	APPROVED BY: FKC	FIGURE: 2

Y:\Projects\2016\16-13-0069 Seminole\ArcGIS\ArcLayouts\Conceptual Closure Grading Plan.mxd





Scale: 1" = 150'

Legend

-  Boundary of Increment 1
-  Water Surface
-  New Concrete Flume for Closure
-  Existing Concrete Flume
-  Proposed Concrete Flume

Elevation (feet, NGVD)

-  5' Contour
-  1' Contour



CONCEPTUAL CLOSURE GRADING PLAN



**INCREMENT 1 BUILDOUT CLOSURE PLAN
SEMINOLE GENERATING STATION
PUTNAM COUNTY, FLORIDA**

DRAWN BY: TJC	CHECKED BY: PAK	DATE: 10/14/16
FILE NO. 16-13-0069	APPROVED BY: FKC	FIGURE: 3