

**Conceptual Closure Plan for
Cell 2
Orlando Utilities Commission
Stanton Energy Center
Orange County, Florida**

March 6, 2024



Ardaman & Associates, Inc.

Geotechnical, Environmental, and
Materials Consultants
A Tetra Tech Company

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March 6, 2024
File Number 23-13-0059

Orlando Utilities Commission
P.O. Box 3193
Orlando, FL 32802-2723

Attention: Mr. Tom Gaboian, P.E.
Senior Environmental Compliance Specialist

Subject: Conceptual Closure Plan for Cell 2, Orlando Utilities Commission, Stanton Energy Center, Orange County, Florida

Gentlemen/Ladies:

As requested by Orlando Utilities Commission (OUC), Ardaman & Associates, Inc., a Tetra Tech Company (TT-AAI), presents herein a conceptual closure plan for the Cell 2 coal combustion residuals (CCR) landfill unit at the Stanton Energy Center (SEC), in Orange County, Florida. The plan was required by the CCR rule issued by the United States Environmental Protection Agency (EPA) and published in the Federal Register on April 17, 2015. The rule became effective on October 19, 2015.

Regulatory Requirements

Excerpts of the CCR rule requirements under *40 CFR § 257.102 Criteria for conducting the closure or retrofit of CCR units*, which are pertinent to closure plans for CCR landfills that receive wastes on or after October 19, 2015, are as follows:

40 CFR § 257.102 (b) Written closure plan—(1) Content of the plan. The owner or operator of a CCR unit must prepare a written closure plan that describes the steps necessary to close the CCR unit at any point during the active life of the CCR unit consistent with recognized and generally accepted good engineering practices. The written closure plan must include, at a minimum, the information specified in paragraphs (b)(1)(i) through (vi) of this section.

- (i) A narrative description of how the CCR unit will be closed in accordance with this section.*
- (ii) If closure of the CCR unit will be accomplished through removal of CCR from the CCR unit, a description of the procedures to remove the CCR and decontaminate the CCR unit in accordance with paragraph (c) of this section.*
- (iii) If closure of the CCR unit will be accomplished by leaving CCR in place, a description of the final cover system, designed in accordance with paragraph (d) of this section, and the methods and procedures to be used to install the final cover. The closure plan must also discuss how the final cover system will achieve the performance standards specified in paragraph (d) of this section.*
- (iv) An estimate of the maximum inventory of CCR ever on-site over the active life of the CCR unit.*

- (v) *An estimate of the largest area of the CCR unit ever requiring a final cover as required by paragraph (d) of this section at any time during the CCR unit's active life.*
- (vi) *A schedule for completing all activities necessary to satisfy the closure criteria in this section, including an estimate of the year in which all closure activities for the CCR unit will be completed. The schedule should provide sufficient information to describe the sequential steps that will be taken to close the CCR unit, including identification of major milestones such as coordinating with and obtaining necessary approvals and permits from other agencies, the dewatering and stabilization phases of CCR surface impoundment closure, or installation of the final cover system, and the estimated timeframes to complete each step or phase of CCR unit closure. ...*

The owner or operator of a CCR unit was required to submit an initial written closure plan consistent with the above requirements by October 17, 2016. A conceptual closure plan for Cell 1 of the horizontal expansion, dated October 14, 2016 (at which time only Cell 1 was active), was prepared by TT-AAI. The owner or operator may amend the initial or any subsequent written closure plan at any time and must amend the written closure plan whenever there is a change in the operation of the CCR unit that would substantially affect the plan; or if unanticipated events necessitate a revision of the plan. The initial written closure plan is updated herein to reflect the current site condition. The updated plan incorporates the activation and closure of Cell 2.

Applicable requirements for the final closure system are stipulated under 40 CFR § 257.102(d) *Closure performance standard when leaving CCR in place*, as follows:

40 CFR § 257.102 (d) (1) *The owner or operator of a CCR unit must ensure that, at a minimum, the CCR unit is closed in a manner that will:*

- (i) *Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere;*
- (ii) *Preclude the probability of future impoundment of water, sediment, or slurry;*
- (iii) *Include measures that provide for major slope stability to prevent the sloughing or movement of the final cover system during the closure and post-closure care period;*
- (iv) *Minimize the need for further maintenance of the CCR unit; and*
- (v) *Be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices.*

40 CFR § 257.102 (d) (3) *Final cover system. If a CCR unit is closed by leaving CCR in place, the owner or operator must install a final cover system that is designed to minimize infiltration and erosion, and at a minimum, meets the requirements of paragraph (d)(3)(i) of this section, or the requirements of the alternative final cover system specified in paragraph (d)(3)(ii) of this section.*

- (i) *The final cover system must be designed and constructed to meet the criteria in paragraphs (d)(3)(i)(A) through (D) of this section. The design of the final cover system must be included in the written closure plan required by paragraph (b) of this section.*

(A) *The permeability of the final cover system must be less than or equal to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than 1×10^{-5} cm/sec, whichever is less.*

- (B) The infiltration of liquids through the closed CCR unit must be minimized by the use of an infiltration layer that contains a minimum of 18 inches of earthen material.*
- (C) The erosion of the final cover system must be minimized by the use of an erosion layer that contains a minimum of six inches of earthen material that is capable of sustaining native plant growth.*
- (D) The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.*

Description of CCR Landfill Units

As shown in Figure 1, the area that has been designated for disposal or storage of CCR generated at the SEC is located on the west side of the facility. The designated boundary of the entire combustion waste storage area (CWSA) initially encompassed approximately 312 acres. However, construction of Innovation Way to the west of the SEC and development of a solar energy facility in the northern part of the CWSA have reduced the potential ultimate footprint of the CWSA to approximately 250 acres. Waste materials that have been landfilled within the CWSA since the commencement of commercial operation of the first coal-fired generating unit in 1987 consisted primarily of fixated flue gas desulfurization (FGD) sludge (referred to by OUC as "ProMat"), unsold bottom ash, fly ash, and miscellaneous power plant wastes.

A site plan of the SEC that shows the locations of the CCR landfill unit is presented on a 2023 aerial photograph in Figure 2. As shown, the CCR landfill units consist of the 90-acre closed original combustion waste storage area (original CWSA) or original landfill, the closed vertical expansion above part of the original CWSA (vertical expansion), and the 90-acre horizontal expansion to the west of the original CWSA (horizontal expansion). As explained in more detail below, both the original CWSA and the closed vertical expansion above part of the original CWSA are exempt from the current CCR rule requirements. The horizontal expansion was planned to have three adjoining landfill units designated, from south to north, Cells 1, 2, and 3, with each cell having a base area of approximately 30 acres and a sloped area that piggybacks on the west slope of the closed original landfill. Cells 1 and 2 are currently the only active CCR landfill units at the SEC. Cell 3 was planned as part of the horizontal expansion, but the need for this future landfill cell is uncertain. The northern portion of the 250-acre CWSA is currently undeveloped.

The 90-acre closed original CWSA, which was placed in service in 1987 when the SEC began commercial operation, was provided with a layer of ProMat with a thickness of greater than 18 inches and a hydraulic conductivity of less than 1×10^{-7} cm/sec at the bottom of the landfill. It was designed to have a top elevation of approximately +150 feet (NAVD88). In 2010, OUC decided to construct a lined horizontal expansion to the west of the original CWSA. To ensure uninterrupted waste disposal operation during planning, design, and permitting of the 90-acre horizontal expansion and construction of the 30-acre Cell 1, OUC sought permission from the Florida Department of Environmental Protection (FDEP) and constructed a vertical expansion on top of the original CWSA, essentially raising the original CWSA by approximately 25 feet to a top elevation of approximately +175 feet (NAVD88). The vertical expansion has a base area (i.e., the top area of the original CWSA) of approximately 34 acres and a top area of approximately 16 acres. The vertical expansion ceased to receive wastes on August 28, 2015. The final closure of the original CWSA and vertical expansion was completed in January 2016 and was approved by the FDEP in a letter dated April 18, 2016. Because the original CWSA and vertical expansion ceased to receive CCR prior to October 19, 2015, these landfill units are exempt from the CCR rule requirements.

As mentioned previously, Cells 1 and 2 each has a base area of approximately 30 acres and piggyback on the closed west slope of the original CWSA and vertical expansion (i.e., the horizontal expansion will eventually be combined with the original CWSA and vertical expansion). The original designs for Cells 1, 2, and 3, which were approved by the FDEP on March 16, 2012, incorporated a double geomembrane liner system at the base and a single geomembrane liner system on the west slope of the original CWSA. The bottom and slope liner systems comply with applicable requirements of Chapter 62-701, F.A.C., which governs the design, construction, operation, and closure of solid waste management facilities in Florida.

Construction of Cell 1, which was based on the FDEP-approved design, was completed near the end of 2012. Cell 1 began to receive waste materials on May 28, 2015. This landfill unit was divided into four sub-cells, each with its own leachate collection and removal system. The leachate collection system drains to four leachate collection sumps (i.e., one for each sub-cell) located on the west side of Cell 1. The leachate in the sumps is pumped into an 8-inch diameter force main that discharges into the double-lined CWSA Runoff Pond located east of the 250-acre CWSA.

To comply with the CCR Rule requirements, Cell 2 was re-designed with a double-composite liner system at the base. However, the design of the single geomembrane liner system on the west slope of the original CWSA remained the same as the FDEP-approved design. The double-composite liner comprises two components, with the top component consisting of a single geomembrane liner, and the bottom component consisting of a composite liner with a geomembrane liner on top of a 12-inch thick compacted soil liner. Also, the low point of each subcell (i.e., the bottom elevation of the compacted soil liner beneath the leachate collection sump) was raised to the seasonal high groundwater elevation to comply with the CCR rule requirements. The bottom and slope liner systems for Cell 2 were connected to the bottom and slope liner systems for Cell 1 to form a continuous bottom and slope liner systems for the two adjoining landfill cells. Like Cell 1, Cell 2 was divided into four sub-cells, each with its own leachate collection system. The collected leachate from Cells 1 and 2 is conveyed via a force main and discharged to the CWSA Runoff Pond located to the east of the closed original CWSA. Construction of Cell 2 was completed near the end of 2020, and Cell 2 was activated (i.e., when waste was first placed into the landfill cell) on May 28, 2022.

Cell 1 is expected to reach the maximum design elevations in 2024, and closure construction for Cell 1 will begin soon after. The closure design of Cell 1 was submitted for regulatory review on June 23, 2023. The closure construction of Cell 1 is scheduled to start in CY2024, with an estimated construction period of 10 months.

Current Condition of Cells 1 and 2

A topographic map, composited from the most recent topographic survey performed within the waste limits of Cells 1 and 2 by Mikon Corporation dated September 9, 2023, the topographic survey performed for the as-built condition of Cell 2 by L&S Diversified, and the topographic survey performed by Pickett and Associates dated March 3, 2018 for areas outside Cells 1 and 2, is presented in Figure 3.

As shown in Figure 3, along the east side of Cell 1 that piggybacks on the west slope of the closed original CWSA and vertical expansion, the waste materials had typical elevations of approximately +160 to +170 feet (NAVD88) and a maximum elevation of approximately +172 feet (NAVD88). The west slope of the closed vertical expansion (i.e., part of the Cells 1 and 2 waste disposal areas) that had not yet been covered with waste had an area of approximately 1 acre. The waste

surface within the base area of Cell 1 had typical elevations of approximately +167 to +170 feet (NAVD88). Approximately 11 acres of the base area of Subcells A and B (i.e., the two southernmost subcells) of Cell 2 had been covered with waste, with a maximum waste elevation of approximately +116 feet (NAVD88). Cells 1 and 2 were designed to have a maximum design elevation of +175 feet (NAVD88) at closure, corresponding to a height of approximately 90 feet above natural grade.

Conceptual Closure Plan for Cell 2

The conceptual closure plan and associated cross sections for Cell 2 are depicted in Figures 4 through 6. As shown in Figure 4, the Cell 2 closure covers approximately 45 acres, which includes the area piggybacked on the Cell 1 north slope. Cell 2 is planned to be raised on a sideslope of 3.0 horizontal to 1.0 vertical (3.0H:1.0V) to a slope crest elevation of approximately +175 feet (NAVD88), with one 20-foot wide reverse sloping bench (i.e., a bench that is graded towards the inside to create a drainage swale) at approximate elevations of +140 to +142 feet (NAVD88).

The top of Cell 2 will have an elevation that varies from +169.5 to +175 feet (NAVD88) and an average slope of approximately 0.6 percent to promote surface drainage towards a culvert pipe located at the southwest corner of Cell 2 (i.e., the northwest corner of Cell 1). The reverse bench located along the north and west sides of Cell 2 will be provided with multiple inlet structures and associated culvert pipes to convey the runoff from the upper slope areas and the reverse bench. The runoff through the culvert pipes from the top and reverse bench areas will be discharged onto the concrete uniform section mat (Fabriform) flumes constructed along the slope. The flumes will discharge the runoff into the stormwater runoff ditch, which runs around the perimeter of Cell 2. The water in the stormwater runoff ditch eventually discharges into the wet detention pond located to the south of the designated CWSA via two Type-D FDOT drainage control structures and two 36-inch diameter HDPE pipes. The locations of the drainage control structures and associated piping are shown in Figure 4.

The final cover system for the west slope, north slope, and the top area of Cell 2 will consist of the following key components in descending order:

- A sod cover for erosion protection.
- A minimum 2-foot thick protective soil layer for stormwater drainage and liner protection.
- A double-sided HDPE geocomposite connected to two gravel drain systems (i.e., reverse bench drain and anchor trench drain) for stormwater drainage and protective soil layer stability on the slope area.
- A 60-mil textured HDPE liner for infiltration control.
- A minimum 6-inch thick bedding soil layer for liner protection and support.

The gravel drain systems will be installed along the low side of the reverse bench (reverse bench drain) and along the liner system anchor trench (anchor trench drain) at the toe of the lower slope. The drain will consist of a slotted HDPE pipe surrounded by gravel wrapped in a geotextile. The slotted HDPE pipes will be connected to a solid pipe that will discharge the infiltrated stormwater collected in the drains either to the inlet structures located at the reverse bench or to the stormwater runoff ditch located around Cell 2.

The proposed conceptual closure design complies with the standards of § 257.102 (d)(3)(i)(A) through (D) cited previously, as well as the requirements of Rule 62-701.600(3)(g), F.A.C. Specifically, to comply with the requirements under § 257.102 (d)(3)(i)(A), the closure design incorporates an HDPE liner as the infiltration barrier because a geomembrane liner system was used as the bottom liner system.

Landfill Airspace

As noted previously, Cell 1 will undergo closure construction in CY 2024. Based on the detailed design prepared for Cell 1 closure, Cell 1 was designed to provide a waste storage capacity of approximately 3.1 million cubic yards. Based on the conceptual closure plan shown in Figure 4 for combined Cells 1 and 2, the total waste storage volume would be approximately 6.6 million cubic yards. Accordingly, the Cell 2 and the “V” notch between Cells 1 and 2 (i.e., the valley of airspace between the Cell 1 north slope and the Cell 2 south slope) will provide a storage capacity of approximately 3.5 million cubic yards.

The survey by MIKON on September 14, 2021 showed approximately 2.43 million cubic yards of consumed airspace in Cell 1. The survey by MIKON on September 18, 2022, revealed an increase in the consumed airspace to approximately 2.73 million cubic yards. Based on the latest topographic survey performed by MIKON on September 9, 2023, the consumed airspace in Cell 1 increased to approximately 3.03 million cubic yards and the remaining airspace decreased to approximately 0.07 million cubic yards. The consumed airspace in Cell 2 as of September 9, 2023 was approximately 0.17 million cubic yards, and the remaining airspace was approximately 3.33 million cubic yards. The total consumed airspace in Cells 1 and 2 as of September 9, 2023 was approximately 3.2 million cubic yards. The total remaining airspace in Cells 1 and 2 as of September 9, 2023 was approximately 3.4 million cubic yards.

Based on the last three annual topographic surveys by MIKON, the average airspace consumption rate in Cells 1 and 2 was calculated to be approximately 0.39 million cubic yards per year. The overall average airspace consumption rate in Cells 1 and 2 between May 28, 2015 and September 9, 2023 (i.e., the date of MIKON’s latest survey in Figure 2) was estimated to be 0.38 million cubic yards per year. The overall average airspace consumption rate in Cell 1 between May 28, 2015 and September 9, 2023 (i.e., the date of MIKON’s latest survey in Figure 2) was estimated to be 0.36 million cubic yards per year.

Considering the latest airspace consumption rate in Cells 1 and 2 to be 0.4 million cubic yards per year, OUC should be able to utilize the remaining airspace and fill Cell 1 to capacity in the early part of 2024, if all waste materials were diverted into Cell 1. Considering the remaining landfill airspace of 3.4 million cubic yards on September 9, 2023 and an airspace consumption rate of 0.4 million cubic yards, Cell 2 is expected to reach the design capacity in March 2032.

Schedule for Closure Activities

The closure activities for Cell 2 will involve planning, design, permitting, and construction. Assuming that Cell 2 will be filled to capacity and ready for closure in March 2032, the closure planning should begin around the latter part of 2030, and the closure design should be completed before October 2031 to provide 5 months for regulatory review and approval, and construction bidding. Closure construction for 45 acres of the Cell 2 closure area may take up to 12 months. If Cell 2 is ready for closure in March 2032 and closure construction could proceed shortly thereafter, completion of the closure construction for Cell 2 would be in March 2033. Preparation of the as-built survey and completion of the certification of closure construction will likely require

approximately 2 months after closure construction has been completed. Allowing 3 months for regulatory review and approval of the closure construction, it is anticipated that Cell 2 can be considered officially closed by the fall of 2033.

It should be noted that fly ash production and waste generation are tied to power generation. Therefore, OUC should be cognizant of any plans that may increase or decrease energy production from coal in the future. Furthermore, OUC should periodically review the operation data, including airspace consumption, to make sure that the waste generation rate used in storage life projection continues to be valid, note any changes in processes that may affect waste generation and waste management planning and, if needed, update this conceptual closure plan.

Closure

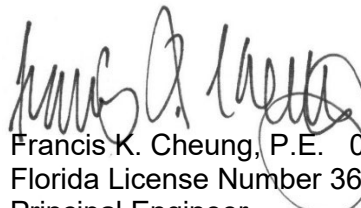
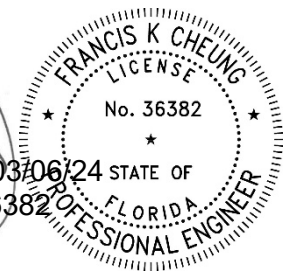
OUC should be cognizant of the following CCR rule requirements that relate to filings and notifications of closure plans for CCR landfills: (i) The most recent closure plan, including any amendment of the plan, must be maintained in the operating record at the facility as stipulated in by 40 CFR § 257.105(i)(4); (ii) the State Director¹ 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 OUC website as stipulated in 40 CFR § 257.107.

To allow the operators to be aware of the final geometrical configuration of Cells 1 and 2, TT-AAI recommends that the detailed closure design of Cell 1 and the conceptual closure plan for Cell 2 be referenced or incorporated in the Landfill Operation Plan.

TT-AAI appreciates the opportunity of providing our service to OUC. If you have any questions or need additional information, please contact us.

Very truly yours,
ARDAMAN & ASSOCIATES, INC. – A Tetra Tech Company
Certificate of Authorization No. 5950


Jeyisanker Mathiyaparanam, P.E.
Project Engineer

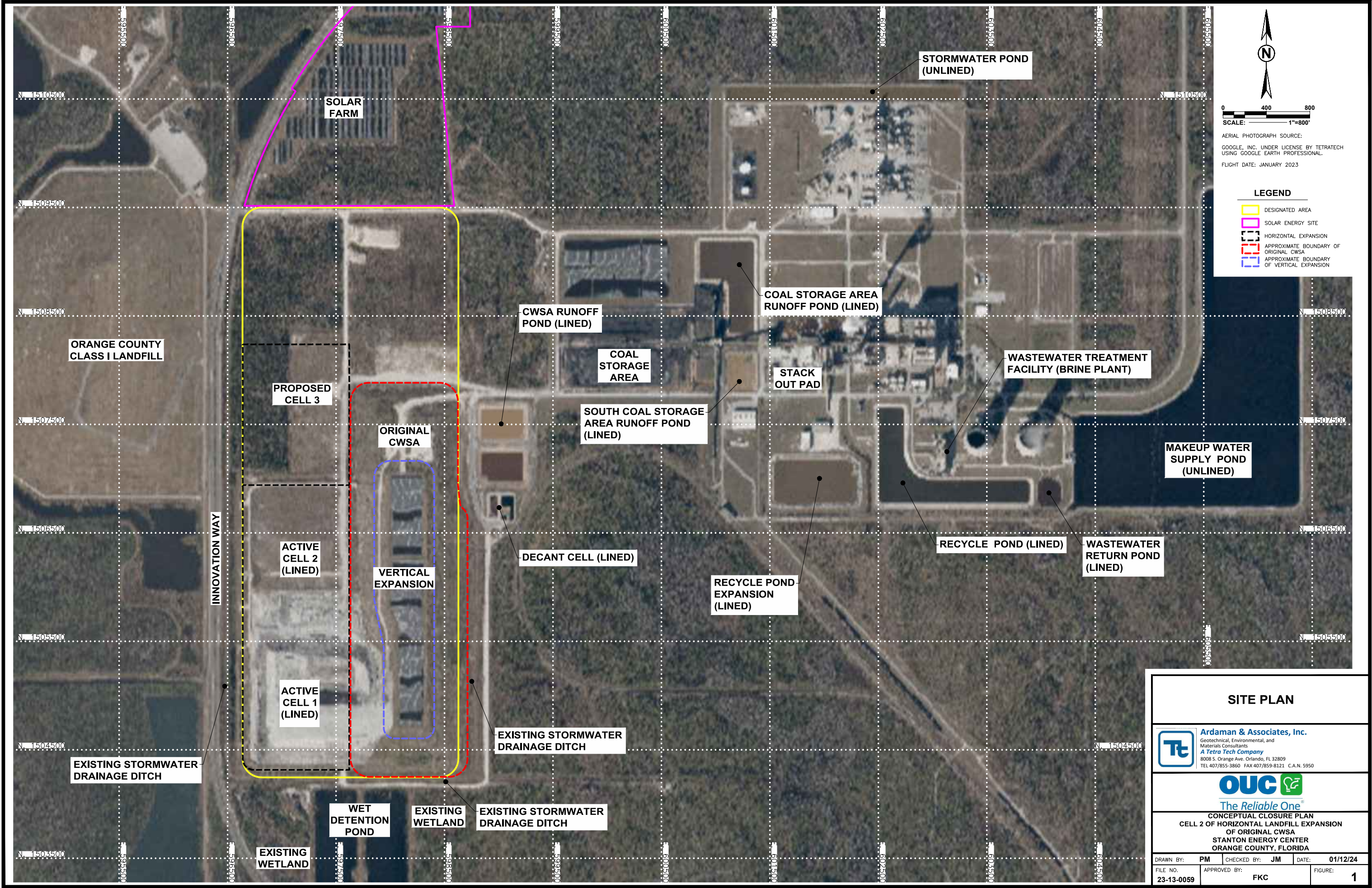

Francis K. Cheung, P.E. 03/06/24 STATE OF
Florida License Number 36382
Principal Engineer

Francis K Cheung Digitally signed by Francis K Cheung
Date: 2024.03.06 14:07:06 -05'00'

This item has been digitally signed and sealed by Francis K. Cheung on the date adjacent to the seal.

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

Enclosures

¹ In the CCR Rule, the State Director refers to “the chief administrative officer of the lead state agency responsible for implementing the state program regulating disposal in CCR landfills, CCR surface impoundments, and all lateral expansions of a CCR unit.”



SITE PLAN

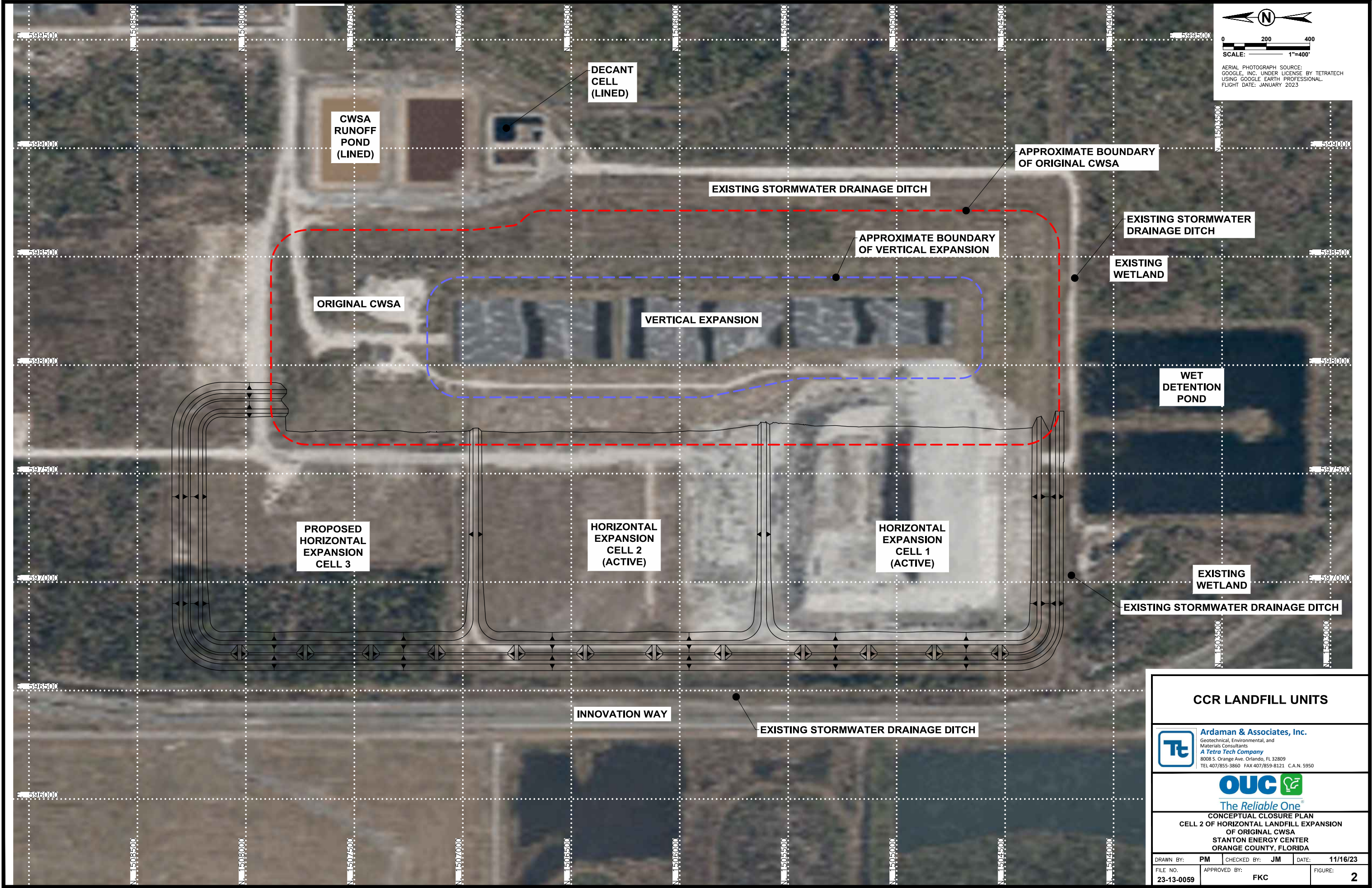


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**CONCEPTUAL CLOSURE PLAN
CELL 2 OF HORIZONTAL LANDFILL EXPANSION
OF ORIGINAL CWSA
STANTON ENERGY CENTER
ORANGE COUNTY, FLORIDA**

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CCR LANDFILL UNITS

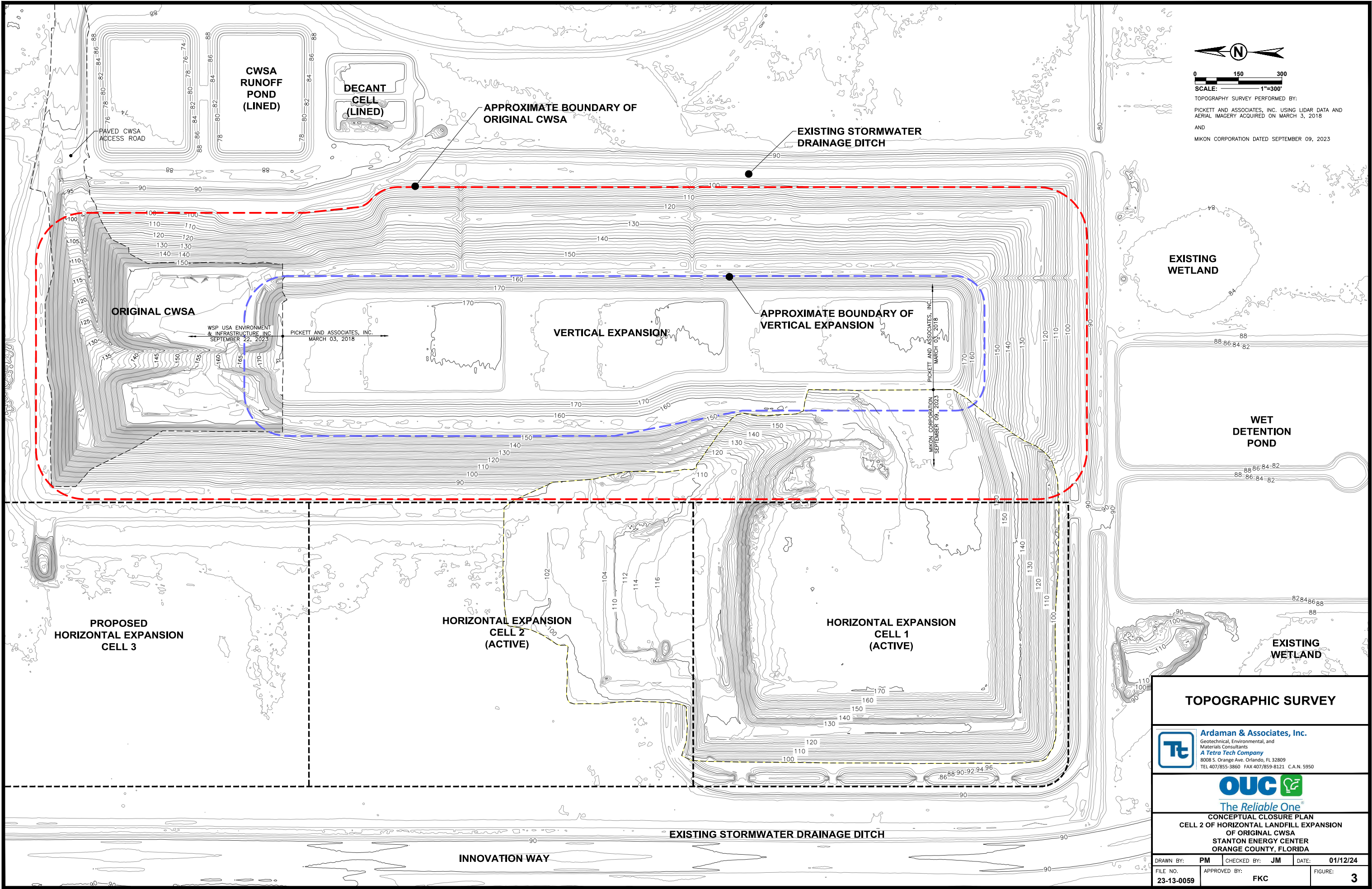


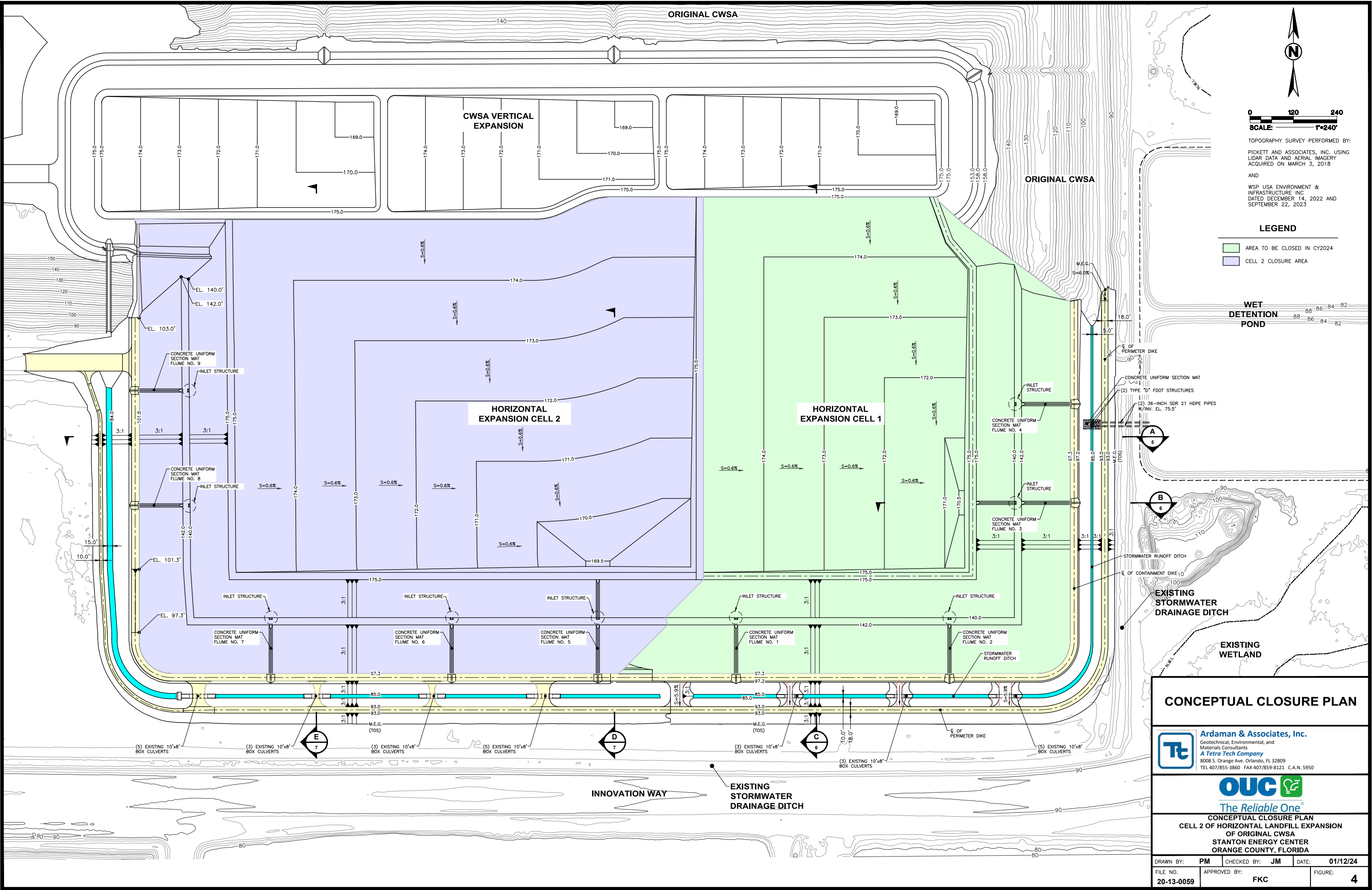
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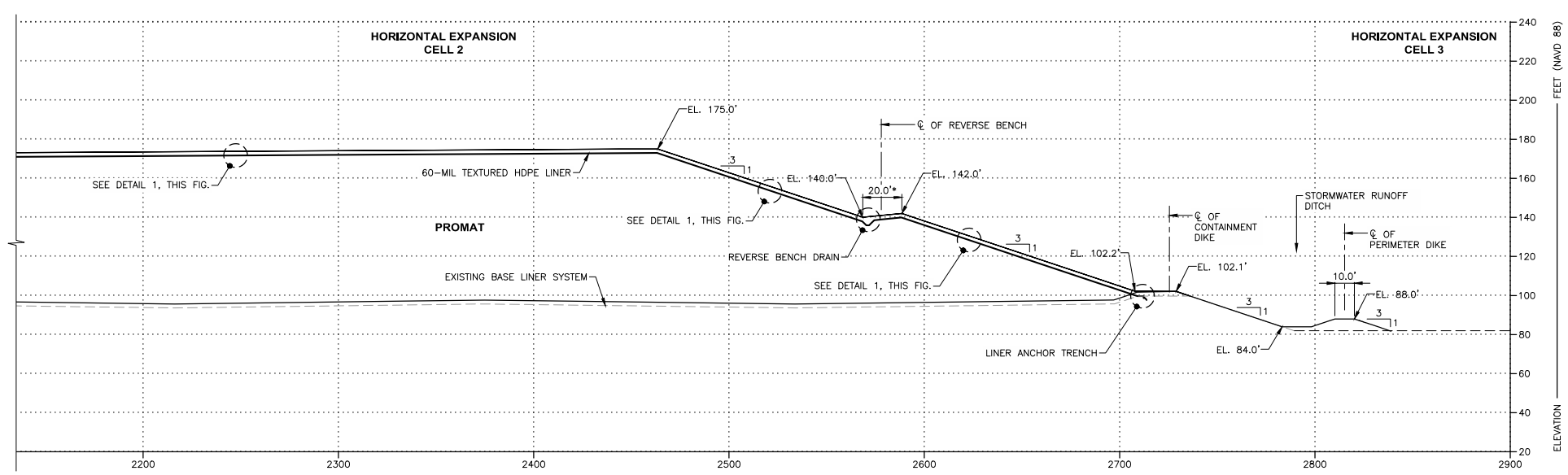
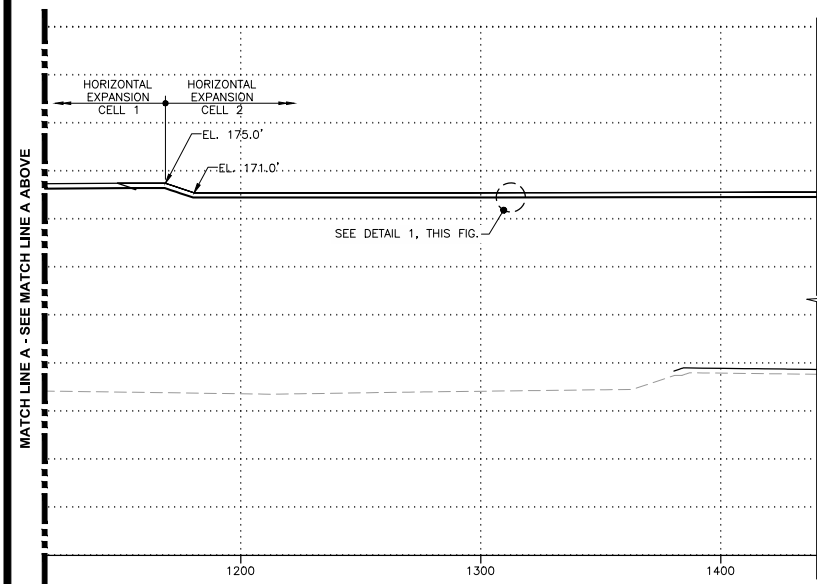
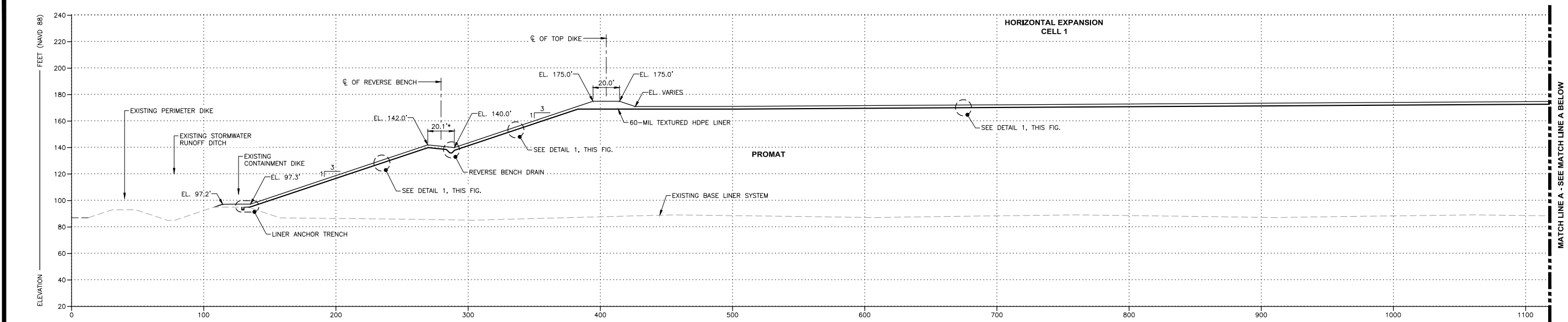


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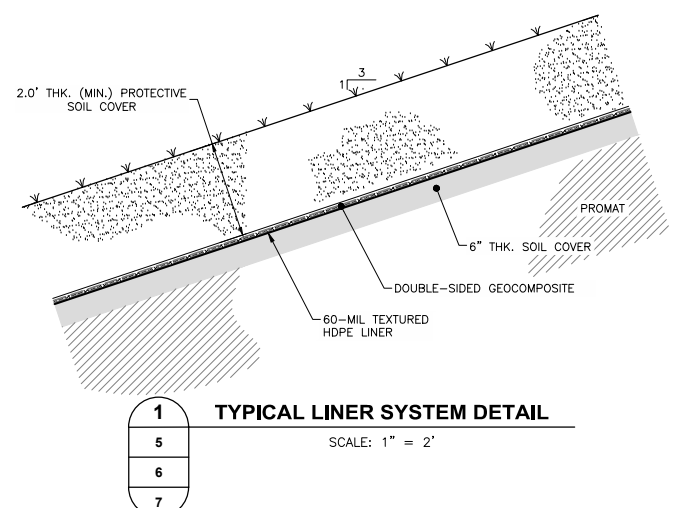
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A CROSS SECTION
4 SCALE: 1" = 80'



CROSS SECTION A



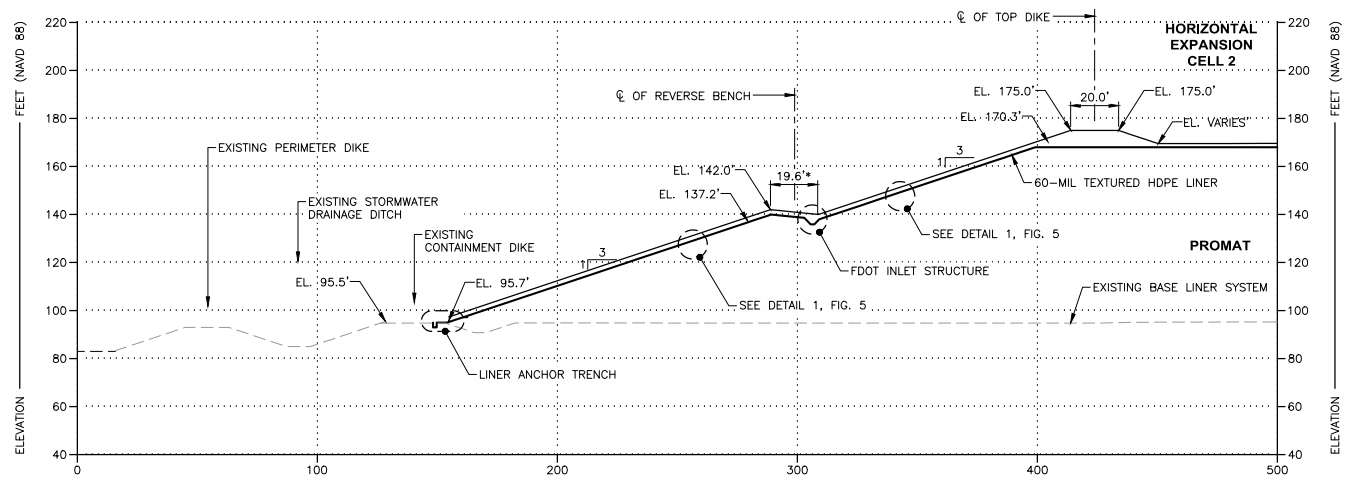
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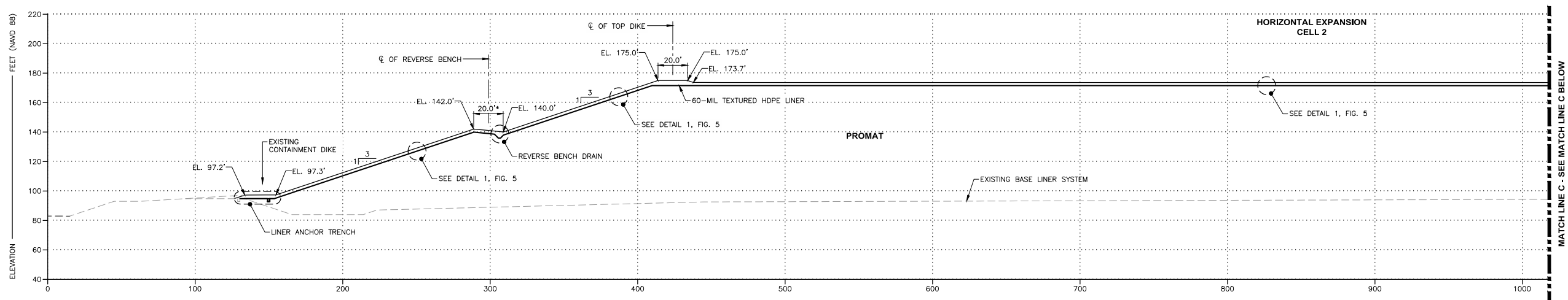
OUC
The Reliable One

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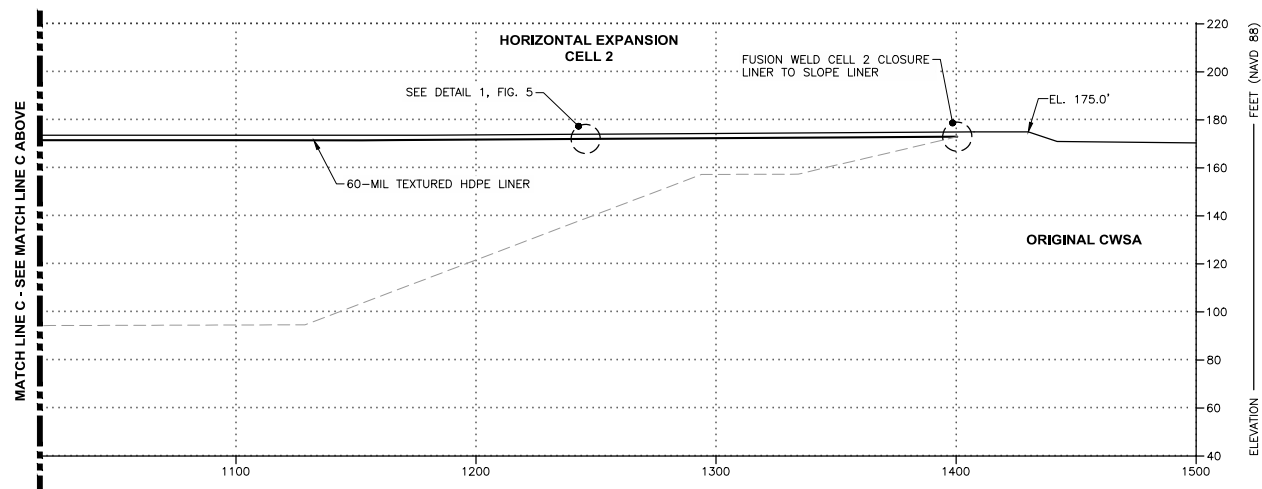
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D CROSS SECTION
4 SCALE: 1" = 80'



E CROSS SECTION
4 SCALE: 1" = 80'



CROSS SECTIONS D AND E



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FILE NO.	20-13-0059	APPROVED BY:	FKC	FIGURE:	7