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Bledsoe County Correctional Complex

1045 Horsehead Road
Pikeville, Tennessee 37367

SIXTH YEAR WETLAND AND STREAM MITIGATION MONITORING REPORT

Prepared for:

TN Department of Correction

Tennessee Department of Correction
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SECTION 1 — PROJECT OVERVIEW

Mitigation Site Name: Bledsoe County Correctional Complex (BCCX), Pikeville, Tennessee

DOA Permit Number: 200502425

TDEC Permit Number: NRS 09.009

Parties Responsible for Monitoring: James P. Groton/EnSafe Inc., and Paul C. Durr/ Water Resources, LLC, under subcontract to EnSafe.

Monitoring Dates: EnSafe and Water Resources completed the 2017 (Year 6) monitoring on June 20-21, 2016. Fifth-year monitoring occurred on June 21-23, 2016. Fourth-year monitoring occurred on June 15-18, 2015. Third-year monitoring occurred on September 23-26, 2014. Monitoring did not occur during the 2012 calendar year (Year 2). Initial (Year 1) site monitoring was conducted on September 26-30, 2011.

Project Description: In February 2010 the Tennessee Department of Environment and Conservation (TDEC) granted the Tennessee Department of Finance and Administration a §401 Water Quality Certification to allow the filling of 1.96 acres of jurisdictional wetlands and alteration of 560 linear feet of streams and 715 feet of wet weather conveyances at BCCX. Impacts to these aquatic resources were determined to be necessary to facilitate the development of a major prison expansion project at the site. In June 2010 the U.S. Army Corps of Engineers-Nashville District (USACE) granted a §404 permit for the same project. After minor modification, the final TDEC permit was reissued in December of that year.

Mitigation for the wetland and stream impacts was initiated in early October 2010. Wetland mitigation occurred entirely onsite and involved the creation (i.e., establishment) of 4.18 acres of palustrine wetlands (4:1 ratio) and the enhancement of 6.12 acres of existing degraded wetlands (5:1 ratio). The entire wetland mitigation site was then planted with water-tolerant tree species that are indigenous to the local watershed. Planting was done at an approximate rate of 435 stems per acre. Stream mitigation was also undertaken onsite. It involved Level 1 enhancement of 2,660 feet of intermittent headwater tributaries to Bee Creek. Riparian zones of four tributary segments were planted with native shrubs. Twenty-five-foot-wide upland buffers lying on either side of the streams and wetlands were also planted. Additional details can be found in the document titled *Aquatic Resources Mitigation Plan, Bledsoe County Correctional Complex Bee Creek Mile 11.4, Right Bank, Pikeville, Tennessee*, drafted by Water Resources, LLC.

Particularly intense rainfall events in November 2010 and March 2011 caused flooding and attending erosion within the Wetland Creation Area. In April 2011 efforts were made to lessen further damage by controlling the rate of inflow to the site by re-contouring the splitter pond, reinforcing and reconstructing spreader berms, and placing coir log erosion barriers in areas shown to be especially prone to erosion. While these actions were partly successful, they did not control the erosion of soil to the extent desired. Soil loss, the presence of a shallow fragipan on northern portions of the Creation Area, and a protracted drought during the summer of 2011, were thought to be largely responsible for low survivorship of planted trees and shrubs. Failure to meet desired performance standards were documented in the First Year Monitoring Report.

In response to the reported failure, USACE and TDEC requested that the permittee submit a revised work plan. The revised plan was submitted on October 1, 2012. The plan recommended a variety of corrective actions, most important of which were the installation of more than 2,500 feet of coir log erosion dams and the replanting of 5,650 wetland-adapted trees and shrubs. (See below for dates of corrective/maintenance actions.)

On August 24, 2015, Steve Westerman (Tennessee Department of Correction [TDOC]), Ron Dow and Jimmy Groton (EnSafe), and Paul Durr (Water Resources) met with Mike Lee (TDEC Division of Water Resources) during a Site Review at the BCCX mitigation site. The purpose of the site review was to observe current conditions at the Mitigation Area, discuss the preliminary 2015 monitoring results, and identify possible recommendations for future activities.

Mr. Lee summarized the findings of the site review in a letter on August 27, 2015. Mr. Lee noted that site performance generally appeared favorable. In particular he noted that the Enhancement Areas were meeting all performance criteria and that TDEC did not require any further monitoring of these areas.

Mr. Lee also noted that several areas did not meet performance criteria because heavy competition from sod-forming grasses and forbs had reduced tree seedling survival and that mowing incursions into stream buffers along the west side of Stream 1, the south side of Stream 2, and both sides of Stream 3 had further reduced stocking densities. He also noted that in the remaining stream buffer areas, density met performance criteria but not the requirement that no single tree species exceed 20 percent of the total density. Mr. Lee provided the following recommendations or conditions to help bring the site into compliance with the performance criteria:

- Unauthorized mowing has affected stream buffer zones along the west side of Stream 1, the south side of Stream 2, and both sides of Stream 3. Increase stream buffer zones from 25 to 50 feet in these three areas.

- Install signs at least every 300 feet along these areas that clearly state that no mowing or other disturbance is allowed. Prior to placement of the signs, these areas must be flagged so that signs are placed in the proper locations.

- Unauthorized mowing has also affected the upper segments of Wetland Enhancement Area U. The wetland boundary along the west side of the wetland should be flagged and marked with signs as described above.

- The Enhancement Areas are meeting all performance criteria, and no further monitoring is required.

- Monitoring of the Creation Area shall continue.

- The area to the northwest of the mitigation site, between its upper limits and the fence along the northern line that contains Wetland T and the hydrologic splitter that was installed to distribute water across the mitigation site, should be included within the

compensatory Mitigation Area. Signs shall be placed around it as well. A brief discussion of the plant community composition within Wetland T should be provided in next year's monitoring report.

- In addition, some treatment or control of the reed canary grass shall occur.

On September 23, 2015, Ron Dow and Jimmy Groton (EnSafe) met with Mark Carnes (USACE) at his office in Nashville to brief him on Mr. Lee's recommendations and to seek concurrence on TDEC's recommendations. On October 7, 2015, EnSafe sent a letter to Mr. Carnes requesting written concurrence from USACE in regard to TDEC's recommendations. On June 3, 2016, Mr. Carnes (USACE) formally concurred with TDEC's recommendations via email.

On October 2, 2015, EnSafe ordered warning signs identifying that the BCCX Mitigation Area contained protected streams and wetlands and was off-limits to mowing and other access or disturbance (see Section 3, Tables and Site Photos). On October 5-6, 2015, Jimmy Groton (EnSafe) and Paul Durr (Water Resources) staked 32 warning sign locations with wooden stakes marked with white surveyor's flagging at the BCCX mitigation site, characterized Wetland T, and treated five reed canary grass patches at the mitigation site with a 5 percent solution of glyphosate approved for use in wetlands and other aquatic habitats. The total area treated for reed canary grass control was approximately 0.16 acre. Four reed canary grass patches were inside the Mitigation Area; the fifth was located near the northeastern boundary of the site.

On October 12, 2015, EnSafe contacted Tennessee 811 and requested utility clearance within a 20-foot radius of all staked sign locations; utility clearance was completed on October 16, 2015. On October 19-20, 2015, EnSafe installed 32 warning signs around the perimeter of the mitigation site (see Section 4, Site Maps). The signs clearly marked the protected area with a minimum 50-foot buffer on Streams 1, 2, and 3. Warning signs were also installed around the area to the northwest of the mitigation site and between its upper limits and the fence along the northern line that contains Wetland T and the hydrologic splitter that was installed to distribute water across the mitigation site. The inclusion of Wetland T and the wetland area between the splitter pond and the Creation Area in the mitigation site protects an additional 0.62 acre and 0.07 acre of wetlands, respectively. The entire Mitigation Area includes approximately 31.12 acres of streams, wetlands, and uplands.

On March 4, 2017, Mike Lee (TDEC) responded to a request from EnSafe to suspend quantitative monitoring in the Creation Area. He concurred suggesting that the sixth-year monitoring should a qualitative evaluation of conditions in the stream and wetland mitigation areas and gooseberry transplant site. He requested that EnSafe focus on buffers to determine if they were disturbed or intact condition, make sure that signs are still up and visible, and provide updates on the status of invasive species and rare species (e.g., dwarf sundew, *Drosera brevifolia*). He noted that TDOC still needed to provide for long-term protection of the mitigation area and provided a template for a Notice of Land Use Restrictions that could be recorded to protect the site in perpetuity. On March 13, 2017, Mark Carnes (USACE) concurred with Mike Lee's recommendations for the sixth-year monitoring.

Project Location: The mitigation site is located approximately 1,100 feet north-northeast of the intersection of State Route (SR) 285 and SR 301 in rural Bledsoe County, Tennessee (N35.7508°, W85.2359°). (See Section 4 for a general location map.)

Dates When the Mitigation Project Began and Was Completed: Initial mitigation construction began in September 2010 and was completed in October 2011. Initial wetland and riparian buffer vegetation planting was completed on December 11, 2010.

Performance Standards:

Created (i.e., Established) Wetlands — The site's performance standards for hydrology have been met, but have not yet been met for soils or herbaceous layer vegetation. They have been conditionally met for planted woody vegetation in terms of average density, but two individual species (sweetgum and buttonbush) exceed 20 percent of the stocking density. In an email dated March 3, 2017 Mr. Lee (TDEC) concurred with TDOC's request to suspend quantitative monitoring in the creation area since the vegetation measures continued to improve each year and were sufficiently close to meeting the performance criteria.

Enhanced Wetlands — Performance standards have been met for planted woody vegetation, herbaceous-layer vegetation, hydrology, and soils. In a letter dated August 27, 2015, Mr. Lee (TDEC) concurred, stating, "The division believes that the enhancement [wetland] areas are meeting all performance criteria and no further monitoring is required." On June 3, 2016, Mr. Carnes (USACE) concurred with TDEC's recommendations. EnSafe conducted qualitative, visual surveys of the Enhancement Areas in June and August 2016 to confirm that the Enhancement Areas were functioning as intended.

Streams — Performance standards have been conditionally met with respect to planted woody vegetation. In a letter dated August 27, 2015, Mr. Lee (TDEC) released the streams from further quantitative monitoring as long as buffer zones along all stream reaches were increased from 25 to 50 feet and protective signs were installed to prevent unauthorized mowing in the stream and wetland buffers. TDOC authorized EnSafe to increase all stream buffers to a minimum of 50 feet. On June 3, 2016, USACE concurred with TDEC's recommendations.

Gooseberry Transplant Area — The granite gooseberry coverage has increased by more than 59 percent over last year (4,128 ft^2 vs. 6,555 ft^2) in spite of strong competition from Japanese honeysuckle and native blackberry.

Other — The declaration of restriction for protecting the site in perpetuity still needs to be prepared and executed. In the meantime, the danger of disturbance is relatively low since the site lies on state-owned property. Signs designating the area as a protected stream and wetland Mitigation Area were installed in October 2015. Throughout 2016 and 2017, mowers have respected the no mowing zones, and the widened buffers are developing into a more natural state. In June 2017, EnSafe treated nine relatively small reed canary grass infestations (the same five areas treated in 2015 and four additional areas discovered in 2016) with a 5 percent solution of glyphosate approved for use in wetlands and other aquatic habitats. EnSafe also spot-treated several invasive pest plants growing in the Mitigation Area: glossy false buckthorn, autumn-olive, multiflora rose, pear, Chinese privet, tree-of-heaven, and sericea lespedeza.

Dates of Corrective Actions or Maintenance:
Fall 2011 — Excess water coming from the splitter pond was diverted to the western half of the mitigation site. Also repairs were made to breaches in the rock spreader berm.

October 22, 2012 — The entire Enhancement Area was mowed to prepare for tree planting.

January 8-9, 2013 — Coir log erosion dams were installed in the Creation Area, and both the Enhancement and Creation Areas were replanted.

October 2015 — Per TDEC's request protective signs were placed around the perimeter of the entire 31.5-acre Mitigation Area to prevent unauthorized mowing or site access. The area to the northwest of the mitigation site, between its upper limits and the fence along the northern line that contains Wetland T and the hydrologic splitter that was installed to distribute water across the mitigation site, was also included within the compensatory Mitigation Area. On June 3, 2016, Mr. Carnes (USACE) concurred with TDEC's recommendations.

Recommendations for Additional Corrective Actions: As previously noted, performance standards for woody vegetation in the Creation Area are being conditionally met (i.e., the area contains the target density of stems/acre, but survival rates of planted species cannot specifically be determined because of the influx of seedlings from adjacent seed sources, or, the species mix may be skewed too heavily towards one or more taxa). We recommend a discussion in 2017 with personnel from USACE and TDEC to determine what steps need to be taken to satisfy the oversight agencies.

Because of the occurrence of glossy false buckthorn, autumn-olive, multiflora rose, pear, Chinese privet, tree-of-heaven, and other invasive shrubs and small trees in the Mitigation Area, we strongly recommend that a regimen of herbicide applications should continue to control these and other invasive species at the site until the regulators release the site. The buckthorn and privet are capable of rapidly colonizing open, moist, or wet areas and supplanting desirable native vegetation until regulators release the site from any further monitoring and maintenance requirements. Although the other invasive woody species (i.e., autumn-olive, multiflora rose, tree-of-heaven, and pear) have the ability to spread rapidly, they are not considered wetland species and would be most problematic in uplands and buffer zones adjacent to the Mitigation Areas. Because of this, these other woody species would not be primary targets for control, but controlling them with herbicide applications whenever possible should be given consideration. Reed canary grass is extremely tolerant of wetland conditions; it can quickly spread into wetlands and crowd out native species.

In the near future, once TDEC and USACE agree that all performance standards have been attained and are sustainable, TDOC should execute the declaration of restrictions for the mitigation site. This step will be critical for the perpetual protection of these sensitive aquatic resources.

Finally, while not a corrective action per se, we strongly recommend to TDOC that going forward, all future site monitoring continue to occur at approximately the same time each year (mid-June to early July), if any continued monitoring is required. Herbaceous plant communities grow and

reach maturity at different times throughout the growing season so unless sampling is conducted at the same time from one year to the next, comparisons of herbaceous population data cannot be made in a meaningful way. In 2014, for example, plant inventories took place in September when many of the autumn-flowering herbs and grasses were head-high in many locations. As a consequence it is very likely that populations of planted trees were underestimated because they were hidden beneath the dense, luxuriant growth of the herbaceous plants. The optimal time to sample wetlands on the Cumberland Plateau in Tennessee is in June or early July. This is also the time of year when wetland herb species diversity reaches a maximum and conditions are optimal to identify the grasslike plants – the grasses, rushes, and sedges.

Recommendations for the Future

- After submission of the Sixth Year Monitoring Report (2017 growing season), request a No Further Action finding from the regulators. If necessary, meet with regulators to discuss the site history, findings of past monitoring events, current project status, and other pertinent details. Conduct a final delineation of the site (including Wetland T) only if required by regulators.

- Contract with a Tennessee-licensed professional land surveyor to have the boundaries of the Mitigation Area determined. Obtain a final boundary survey map with a written description of the boundaries.

- Work with the regulators and TDOC administration and solicitors to determine, and then put in place, the appropriate type of permanent protection mechanism for the property (i.e., deed restriction, conservation easement).

- Until the mitigation site is released from any further requirements, continue to control invasive pest plants such as glossy false buckthorn, multiflora rose, sericea lespedeza, and reed canary grass throughout the site.

SECTION 2 — PROJECT REQUIREMENTS

WETLANDS

Performance Standards	Year 6 Monitoring and Monitoring Conditions		Performance Standards Met?		Data References (see Sections 3 & 4)
Onsite mitigation will involve the creation of 4.18 acres of wetlands and the enhancement of 6.12 acres of wetlands in the headwaters of Bee Creek. Bare root seedlings will be planted at the rate of 435 stems/acre. No one species shall comprise more than 20% of the total. The entire wetland mitigation is to be protected in perpetuity through deed restriction and signage erected to indicate the protected status of the property. The specific performance standards associated with the mitigation action are summarized below.	Vegetation demographics were determined from 0.05-acre fixed area sample plots (for woody species) and 1-yd^2 plots (for herbs). Sampling methods are described in the site's final Aquatic Resource Mitigation Plan. Because native hydric soils were not known within the Creation Area prior to mitigative actions, soil profiles will be taken annually at each of the vegetation monitoring plots in order to document the transition to the hydric condition. The principal means used to judge the successful restoration of positive wetland hydrology will be the establishment of wetland vegetation. Other primary and secondary hydrologic indicators will be noted during monitoring.		NA		
Creation Area: Success will be measured as a function of wetland plant dominance and the presence of positive wetland hydrology. At the end of 5 years, approximately 70% of herbaceous plant cover must consist of wetland-adapted species, and survival rates for planted woody species must be at least 75% (326 stems/acre). Areal coverage of exotic invasive species must be less than 5%. While the development of hydric soils is a desired goal, it is understood that hydric soil formation may take greater than 5 years to occur.	Vegetation	With permission from TDEC and USACE quantitative vegetation monitoring was suspended in the Creation Area during 2017. Monitoring in 2017 consisted of qualitative monitoring of all the four monitoring plots. Although wetland-adapted species comprised only 67.27% of the cover in 2016 (less than 4% below the target goal of 70% at the end of 5 years), each monitoring year the site has steadily improved in this regard. Species diversity continues to be high in the Creation Area plant cover is good throughout the area. Woody species density in the Creation Area continues to improve. The seedlings planted in the Creation Area continue to grow taller and more visible each year; natural regeneration is also apparent. Planted false indigobush, a nitrogen fixing shrub, has begun to reproduce naturally. In 2016 99% of the species were considered wetland-adapted. Tree heights generally ranged from 2 feet to 6 feet high.	Herbaceous Vegetation Woody Vegetation	Conditionally Yes Conditionally Yes	Section 3: Photos 1-8, 25 Section 4: Maps 1 & 2

Performance Standards	Year 6 Monitoring and Monitoring Conditions		Performance Standards Met?		Data References (see Sections 3 & 4)
		Trees appear to be generally taller around Plots C1 and C2 where soils are deeper. Dwarf sundew plants were again observed growing in the Creation Area and the wetland area around the splitter berm in 2017. Hundreds of plants were observed in June 2017. This was very good news since dwarf sundew plants have not been seen in the Creation Area since 2015. No plants were observed in 2016, presumably a result of the exceptionally dry weather last year. TDEC's Division of Natural Areas has designated this insectivorous plant as a Threatened species. Its listing as an S2 species indicates that there are < 20 known occurrences statewide.			
	Soils	Soils in the Creation Area have been mapped by the Natural Resources Conservation Service as containing Lily loam and Morehead-Bonair complex. The latter contains inclusions of hydric Bonair soils in low-lying areas and depressions. Soil morphology was not examined in 2017 but in 2016 residual hydric soils with depleted matrices were confirmed in all but one plot.	Soils	Yes	
	Hydrology	A variety of primary and secondary hydrologic indicators continue to be present in the Creation Area. These include sediment deposits, algal crust (*Nostoc* sp.), surface soil cracks, sparsely vegetated concave surfaces, drainage patterns, crayfish burrows, geomorphic position, and a shallow aquitard.	Hydrology	Yes	
Enhancement Areas: The same performance standards described above for the Creation Area shall also apply for the Enhancement Areas. However, because the Enhancement Areas are already jurisdictional wetlands and contain hydric soils, they will not be monitored for that parameter.	Vegetation	In 2017 monitoring in the Enhancement Area consisted of a qualitative survey to check on current conditions and identify any potential problems. On August 27, 2015, TDEC indicated that the Enhancement Areas were meeting all performance criteria and no further monitoring was required. On June 3, 2016, USACE concurred with TDEC's determination. Quantitative monitoring was discontinued in	Herbaceous Vegetation	Yes	Section 3: Photos 9-10, 17, 23-24, and 26 Section 4: Maps 1 & 2

Performance Standards	Year 6 Monitoring and Monitoring Conditions		Performance Standards Met?		Data References (see Sections 3 & 4)
		the Enhancement Areas in 2016. Wetland T was added to the Enhancement area at TDEC's request. Woody species density in the Creation Area continues to look good. The seedlings planted in the Enhancement Area continue to grow taller and more visible each year, especially in the Area along the southeastern side of the site; natural regeneration is also apparent. In 2017 tree heights generally ranged from 4 feet to 10 feet high. In 2014 small populations of two rare sedge species listed as Endangered by TDEC's Division of Natural Areas were discovered growing in the Enhancement Areas. These included brown bog sedge and southern long sedge. Brown bog sedge is considered an S1 species meaning that there are five or fewer known occurrences in the state. The southern long sedge is an S2 species indicating < 20 known occurrences. Qualitative, visual surveys in the Enhancement Areas in 2015, 2016, and 2017 confirmed that both of these populations are still intact. In 2016 a small population of a rare grass species listed as a Special Concern Species by TDEC's Division of Natural Areas was discovered in the Enhancement Areas. Bog oat-grass is an S1S2 species indicating <20 known occurrences. Qualitative, visual surveys in the Enhancement Areas in 2017 confirmed that this population is still intact. Previously identified reed canary grass patches were treated with a 5% glyphosate solution approved for use in wetlands and aquatic habitats. Spot herbicide treatments were also applied to autumn olive, Chinese privet, glossy false buckthorn, multiflora rose, pear, tree-of-heaven, and other woody	Woody Vegetation	Yes	

Performance Standards	Year 6 Monitoring and Monitoring Conditions		Performance Standards Met?		Data References (see Sections 3 & 4)
		invasive plants wherever they were encountered.			
	Soils	Morehead-Bonair complex. This series is recognized as containing inclusions of hydric Bonair soils in low areas and depressions. Hydric soils were confirmed by USACE during a jurisdictional determination visit to the site in November 2008.	Soils	Yes	
	Hydrology	Several hydrologic indicators were observed during the monitoring survey. These include scattered soil saturation and shallow inundation, sediment deposits, drift lines, drainage patterns, crayfish burrows, and geomorphic position.	Hydrology	Yes	
Upland Buffer Area: 25-foot-wide buffers, external to riparian buffers on streams are to be planted with upland oaks in order to provide extra protection to the restored streams. Initial planting is to be at 435 stems/acre, but no performance standards for seedling survival are stipulated.	Vegetation	In 2017 monitoring in the Upland Buffer Area consisted of a qualitative survey to check on current conditions and identify any potential problems. Total stocking density within upland buffer zones was 275 stems/acre in 2016; density of planted oak was 157.5 stems/ acre. In 2016 many new stems were present due to red maple seeding in to the buffer areas. At the request of TDEC in 2015, oak/riparian buffers were increased by a **minimum** of 25 feet on the west side of Stream 1, the south side of Stream 2, and on the north and south sides of Stream 3. The placement of signage in 2015 to deter mowing in the buffer zones was effective in 2016 and continues to be effective in 2017. In 2017 previously identified reed canary grass patches were treated with a 5% glyphosate solution approved for use in wetlands and aquatic habitats. Spot herbicide treatments were also applied to autumn olive, Chinese privet, glossy false buckthorn, multiflora rose, pear, tree-of-heaven, and other woody invasive plants wherever they were encountered.	Vegetation	Not Applicable	Section 3: Photos 15-16 Section 4: Maps 1 & 2
	Soils	Not Applicable	Soils	Not Applicable	

Performance Standards	Year 6 Monitoring and Monitoring Conditions		Performance Standards Met?		Data References (see Sections 3 & 4)
	Hydrology	Not Applicable	Hydrology	Not Applicable	
Gooseberry Transplant Area: Multi-stemmed granite gooseberry shrubs are to be removed from the prison expansion footprint and transplanted to an upland area on the stream and wetland mitigation property. This effort will be undertaken in an attempt to preserve this exceptionally rare shrub. No performance standards for shrub survival are stipulated. (This action was completed in March 2009.)	Vegetation	Because of its highly colonial nature, it was not possible to make an accurate count of individual stems. As in previous years, an estimate of the plants' areal coverage was obtained by measuring the major and minor axes of all shrubs that could be located within the transplant area. Gooseberry areal coverage has decreased by 25% increase in areal coverage since the last monitoring period (4,893 ft^2 in 2017 compared to 6,555 ft^2 in 2016). The prolonged drought period in 2016 have influenced this apparent decline in areal extent. However, this species is adapted to living on very thin soils directly over bedrock (hence the common name, granite gooseberry). The decline in extent may also reflect the effect of strong competition from Japanese honeysuckle, poison ivy and native blackberry. In 2017 spot treatments of a 5% glyphosate solution were applied to autumn olive, Chinese privet, glossy false buckthorn, multiflora rose, pear, tree-of-heaven, and other woody invasive plants wherever they were encountered.	Vegetation	Not Applicable	Section 3: Photo 21-22 Section 4: Maps 1 & 2
	Soils	Not Applicable	Soils	Not Applicable	
	Hydrology	Not Applicable	Hydrology	Not Applicable	
Note: Multiflora rose (*Rosa multiflora*) and autumn-olive (*Elaeagnus umbellata*) are Asiatic shrubs that are becoming invasive in upland buffers and adjacent to one or more of the stream Enhancement Areas. Multiflora rose is particularly evident near the lower (south) end of Stream Segment 1. While not yet a problem, they have the potential to rapidly overtake open, sunny areas such as those found on the mitigation site. Consideration should be given to controlling these species before they have a chance to spread further. The Tennessee Invasive Plant Council offers suggestions for mechanical, biological, and chemical control on its website (http://www.tnipc.org/invasive-plants/). We have also noted the establishment of a small number of glossy false buckthorns (*Frangula alnus*) along several of the mitigated stream segments. Unfortunately, this shrub was improperly included in the plant species mix received from the nursery and was probably confused with stream alder (*Alnus serrulata*). Though known in Tennessee from only one other county, this Eurasian species is a well-documented pest plant in other parts of the United States and should be eradicated as soon as possible. Several plants were pulled up or sprayed with herbicide during the sampling effort, but other larger individuals will have to be sprayed with herbicide during the next growing season. Reed canary grass is another invasive plant that has become established within					Section 3: Photos 18-20 Section 4: Maps 1, 2, & 3

Performance Standards	Year 6 Monitoring and Monitoring Conditions	Performance Standards Met?	Data References (see Sections 3 & 4)
the mitigation site. This Eurasian species has been planted throughout the United States and is a major threat to natural wetlands. It outcompetes most native species and presents a major challenge in wetland mitigation efforts. This plant forms large, single-species stands, with which other species cannot compete. Other invasive plants growing within the Mitigation Area include pear (*Pyrus* sp.), Chinese privet (*Ligustrum sinense*), sericea lespedeza (*Lespedeza cuneata*), tree-of-heaven (*Ailanthus altissima*), and Amur bush-honeysuckle (*Lonicera maackii*).			

STREAMS

Performance Standards	Year 4 Monitoring and Monitoring Conditions	Performance Standards Met?	Data References (see Sections 3 & 4)
Stream mitigation will involve the enhancement of 2,660 feet of headwater tributaries to Bee Creek. Four individual segments are to be treated. Riparian shrub vegetation shall be planted 25 feet along both banks. Plantings shall be at least three rows deep along each channel and staggered on 10-foot centers. Bare root or containerized stock is permissible. No one species can comprise more than 20% of the total. Stream Mitigation Areas are to be protected in perpetuity through deed restriction and signage erected to indicate the protected status of the properties. The performance standards for the mitigation actions are described briefly below.	On August 27, 2015, TDEC recognized that tree and shrub survival was low along Stream 3 due to heavy competition from sod-forming grasses and forbs; mowing incursions along the west side of Stream 1, south side of Stream 2, and along both buffer areas of Steam 3 have further reduced stocking densities; in other areas, density meets performance criteria but not the requirement that no one species exceed 20% of the total. TDEC also recognized that it was not feasible to replant these riparian zones to bring them into compliance, because of the heavy growth of herbaceous species. Therefore, TDEC indicated that no further stream monitoring would be required if TDOC increased the riparian buffer areas from 25 to 50 feet on both sides of Stream 3, the west side of Stream 1, and the south side of Stream 2, and installed signs at least every 300 feet along these areas clearly stating that no mowing or disturbance is allowed. On April 26, 2016, TDEC further clarified that no additional monitoring was required on Stream 4. On June 3, 2016, USACE concurred with TDEC's determination and recommendations. Quantitative monitoring of streams was discontinued in 2016. During site visits in June and August 2016 and again in June 2017, it was apparent that mowing crews continue to comply with the No Mow zones established throughout the Mitigation Area in 2015. In 2017 previously identified reed canary grass patches were treated with a 5% glyphosate solution approved for use in wetlands and aquatic habitats. Spot herbicide treatments were also applied to autumn olive, Chinese privet, glossy false buckthorn, multiflora rose, pear, tree-of-heaven, and other woody invasive plants wherever they were encountered.	Yes	Section 3: Photos 11-14 Section 4: Maps 1 & 2
Note: Multiflora rose (*Rosa multiflora*) and autumn-olive (*Elaeagnus umbellata*) are Asiatic shrubs that are becoming invasive in upland buffers and adjacent to one or more of the stream Enhancement Areas. Multiflora rose is particularly evident near the lower (south) end of Stream Segment 1. While not yet a problem, they have the potential to rapidly overtake open, sunny areas such as those found on the mitigation site. Consideration should be given to controlling these species before they have a chance to spread further. The Tennessee Invasive Plant Council offers suggestions for mechanical, biological, and chemical control on its website (http://www.tnipc.org/invasive-plants/). We have also noted the establishment of a small number of glossy false buckthorns (*Frangula alnus*) along several of the mitigated stream segments. Unfortunately, this			Section 3: Photos 18-20 Section 4: Maps 1, 2, & 3

Performance Standards	Year 4 Monitoring and Monitoring Conditions	Performance Standards Met?	Data References (see Sections 3 & 4)
shrub was improperly included in the plant species mix received from the nursery and was probably confused with stream alder (*Alnus serrulata*). Though known in Tennessee from only one other county, this Eurasian species is a well-documented pest plant in other parts of the United States and should be eradicated as soon as possible. Several plants were pulled up or sprayed with herbicide during the sampling effort, but other larger individuals will have to be sprayed with herbicide during the next growing season. Reed canary grass is another invasive plant that has become established within the mitigation site. This Eurasian species has been planted throughout the United States and is a major threat to natural wetlands. It outcompetes most native species and presents a major challenge in wetland mitigation efforts. This plant forms large, single-species stands, with which other species cannot compete. Other invasive plants growing within the Mitigation Area include pear (*Pyrus* sp.), Chinese privet (*Ligustrum sinense*), sericea lespedeza (*Lespedeza cuneata*), tree-of-heaven, and Amur bush-honeysuckle (*Lonicera maackii*).			

SECTION 3
WETLAND CREATION AREA PHOTO REFERENCE POINTS

Photo 1.

Creation Area, Photo Reference Point C2: North

Dominant Vegetation: sweetgum (Fac), red maple (Fac), false indigobush (Facw), broom rosette grass (Facw), soft rush (Facw), Georgia bulrush (Obl), broom-sedge (Facu)

Comments: Corrective actions such as installing coir logs has helped a great deal to trap eroding soils and by doing so, provided a growth medium for planted and naturally invading vegetation.

Photo 2.

Creation Area, Photo Reference Point C2: South

Dominant Vegetation: buttonbush (Obl), sweetgum (Fac), soft rush (Facw), greater povery rush (Facw), Georgia bulrush (Obl), broom-sedge (Facu), boneset (Facw), giant goldenrod (Facw)

Comments: Despite severe drought, which lasted throughout the latter half of 2016, wetland vegetation has persisted into the current growing season, thanks in part to accreted soils.

Photo 3.

Creation Area, Photo Reference Point C2: East

Dominant Vegetation: red maple (Fac), buttonbush (Obl), false indigobush (Facw), deer- tongue grass (Fac), soft rush (Facw), Georgia bulrush (Facw), broom rosette grass (Facw), common cinquefoil (Facu), broom-sedge (Facu)

Comments: Deeper soils, especially on the northern half of the creation area, have helped to increase herb populations, but planted woody species have struggled somewhat because of low soil fertility.

Photo 4.

Creation Area, Photo Reference Point C2: West

Dominant Vegetation: buttonbush (Obl), sweetgum (Fac), false indigobush (Facw), broom rosette grass (Facw), soft rush (Facw), slender spikerush (Facw), boneset (Facw), broom-sedge (Facw)

Comments: Although soils in the creation area are largely infertile, planted false indigobush, a nitrogen fixing shrub, is beginning to reproduce naturally.

Photo 5.

Creation Area, Photo Reference Point C4: North

Dominant Vegetation: red maple (Fac), buttonbush (Obl), slender spikerush (Facw), tapered rosette grass (Fac), purplehead sneezeweed (Fac), common cinquefoil (Facu), broom-sedge (Facu)

Comments: Many of the planted trees and shrubs are stunted and sometimes difficult to find among the herbs. While this is due in part to poor soils, seasonal ponding of concave surfaces also plays a role.

Photo 6.

Creation Area, Photo Reference Point C4: South

Dominant Vegetation: sweetum (Fac), purplehead sneezeweed (Fac), common cinquefoil (Facu), slender spikerush (Facw), broom-sedge (Facu)

Comments: Parts of the creation area are wet in winter through early summer. By mid-summer and fall they dry significantly. Such locations typically contain a mixture of wetland and non-wetland species.

Photo 7.

Creation Area, Photo Reference Point C4: East

Dominant Vegetation: sweetgum (Fac), buttonbush (Obl), soft rush (Facw), deer-tongue grass (Fac), slender spikerush (Facw), globe beak-sedge (Facw), common cinquefoil (Facu)

Comments: A shallow, relatively impervious fragipan restricts rooting in this area. It also traps water at the surface. After heavy rains this area can become ponded. Dried cyanobacteria (*Nostoc* sp.) were commonly observed on the soil surface.

Photo 8.

Creation Area, Photo Reference Point C4: West

Dominant Vegetation: sweetgum (Fac), false indigobush (Facw), purple-head sneezeweed (Fac), soft rush (Facw), slender spikerush (Facw), bog rush (Facw), broomsedge (Facu)

Comments: Other indicators of positive wetland hydrology that were noted include silt deposits on low-lying vegetation, and, in one instance, saturated soils and perched water within 3 in. of the surface.

Photo Supplement

Wetland Enhancement Areas
Stream Enhancement Areas
Upland Buffer Areas
Wetland Addition
Reed Canary Grass Control Areas
Gooseberry Transplant Area
Rare Species Accounts

Photo 9.

Enhancement Areas: Former wetland fields and pastures were enhanced by planting tree and shrub seedlings at the rate of 435 trees/acre. The most dominant woody species include sweetgum and red maple, but blackgum and wetland oaks are also frequently observed. These enhancement areas, along with the rest of the mitigation site will be protected from future disturbance by placing them under a deed restriction or conservation easement. Because they have consistently met or exceeded performance standards in all phases (vegetation, soils, hydrology), the oversight agencies are no longer requiring monitoring at these locations.

Photo 10.

Enhancement Areas: On the wettest parts of the enhancement areas planted wetland shrubs such as buttonbush, elderberry, and false indigobush are more commonly encountered than trees. Dense stands of rushes and sedges are responsible for retarding the establishment of trees.

Photo 11.

Photo 12.

Stream 1 Enhancement Area:

Like the wetland enhancement areas, stream enhancement areas have been determined by the regulatory agencies to have attained an acceptable level of performance. Consequently they are no longer being monitored for plant demographics or channel morphology. Even though Stream 1 is the largest of the streams, and carries the most protracted flow, this view shows the degree to which stabilizing riparian vegetation obscures the channel. No signs of stream erosion have been detected, largely because of the dense cover.

Stream 2 Enhancement Area:

The riparian zone around Stream 2 is also very stable. This view looking downstream demonstrates how quickly the vegetation has recovered after the cessation of agricultural activities. Typical woody plants include black willow, silky dogwood, and winged sumac, while dominant herbs are rice cut grass and soft rush.

Photo 13.

Photo 14.

Stream 3 Enhancement Area:

Stream 3 is similar in composition to Stream 2 although the amount of woody plant development is somewhat less. Again the dominant herbs are rice cut grass and soft rush while the shrub layer is comprised largely of planted buttonbush, silky dogwood, and elderberry.

Stream 4 Enhancement Area:

Stream 4 is positioned at the extreme southeastern corner of the mitigation site and lies below the discharge point of a farm pond. Embankments are completely vegetated with a mixture of herbs such as deer-tongue grass, harvest-lice and clustered mountain mint. The shrub layer is very strongly dominated by swamp rose. The upper half of the channel was dry at the time of the survey.

Photo 15.

Upland Buffers: The site's mitigation plan called for the establishment of 25 ft wide upland buffers around all mitigated streams and wetlands. These areas were then planted with a mixture of oaks. Competition from residual pasture grasses and heavy deer browsing has slowed growth of some individuals while others, such as this white oak, are approaching 8 ft tall.

Photo 16.

Upland Buffers: In order to compensate for the failure to establish enough woody plants (and also the proper species ratios) in some areas, TDEC requested that the buffer zones around the west side of Stream 1, the south side of Stream 2, and both sides of Stream 3 be expanded from 25 to 50 ft. Also because of mowing incursions into the buffer zones, TDEC also asked that signs be erected to prevent this from happening in the future. This photo was taken looking east along an upland buffer lying adjacent to Stream 3.

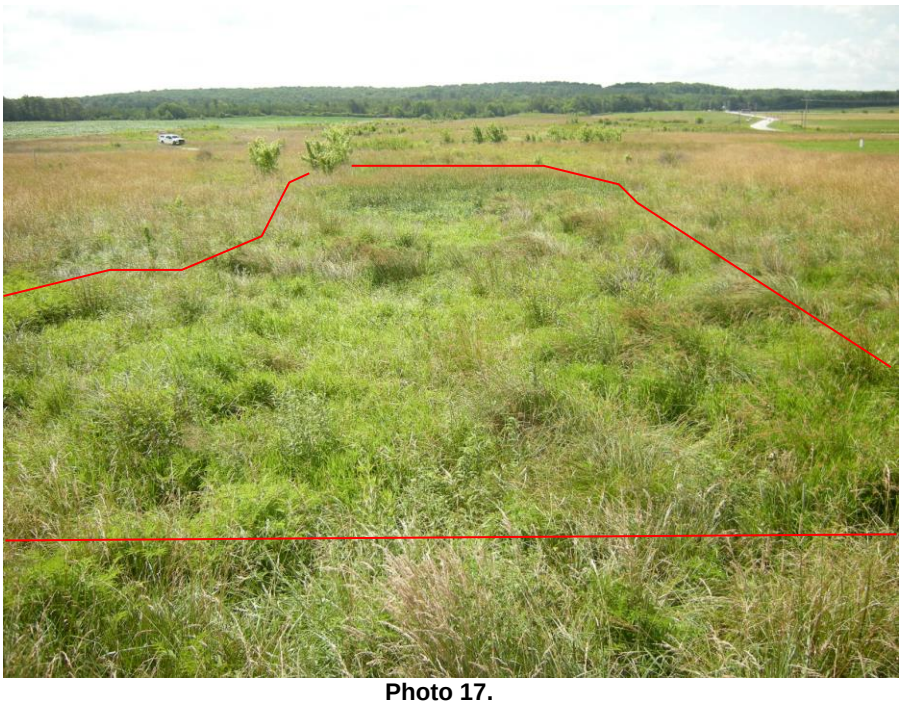


Photo 17.

Wetland Addition: As another way to compensate for the failure to establish enough woody vegetation in some locales, TDEC requested that a seepage wetland lying immediately to the north of the mitigation property also be incorporated into the mitigation effort and protected in perpetuity from future disturbance. This photo of the wetland addition taken in 2016 is looking southward. Its approximate boundaries are outlined in red. Total wetland area is approximately 0.6 acre.

Photo 18.

Reed Canary Grass Control: Non-native strains of reed canary grass (rcg) are aggressive invaders of open wetland areas. If left unchecked, they could jeopardize the success of wetland mitigation efforts. As of 2015, nine small populations of rcg had been identified. With the consent of TDOC, EnSafe began an herbicide spraying regimen designed to bring rcg under control and prevent its future spread.

Photo 19.

Reed Canary Grass Control: This small patch was treated with herbicide in the early summer 2016. Follow-up monitoring showed that some plants continued to survive so they were treated again in late August. Experience has shown that after rcg is eliminated, native wetland herbs quickly become reestablished. Complete elimination, however, almost always requires repeated herbicide applications.

Photo 20.

Reed Canary Grass Control: This view of the same rcg population taken from the opposite direction one year later indicates a significant improvement. While small sprigs of rcg are visible in the foreground, the majority of plants are native hydrophytes such as marsh bedstraw, purpleleaf willowherb, and giant goldenrod.

Photo 21.

Gooseberry Transplant Area: The BCCX Mitigation Area is important for the protection of a variety of stream and wetland functional values. Beyond this it is also important since it provides habitat for 5 state-listed rare plant species. Rare granite gooseberry shrubs, rescued from the prison construction site, and transplanted to the mitigation area in 2009, have survived and thus far appear to be doing relatively well. Despite weather extremes and strong competition from Japanese honeysuckle vines and native blackberries, they have managed to maintain themselves for eight growing seasons. (See text below.)

Photo 22.

Rare Species: The granite gooseberry is listed by TDEC's Division of Natural Areas as "threatened". While relatively common in the immediately vicinity of BCCX, there are five or fewer other known populations in the state.

Photo 23.

Rare Species: Perhaps the rarest plant on the mitigation property is the grass-like brown bog sedge. Like the granite gooseberry, there are fewer than five known occurrences statewide. But because the populations contain so few individuals, it is listed by TDEC as "endangered".

Photo 24.

Rare Species: Also "endangered" is the southern long sedge. Other than Bledsoe County, it has been documented from only one other TN county (Lincoln).

Photo 25.

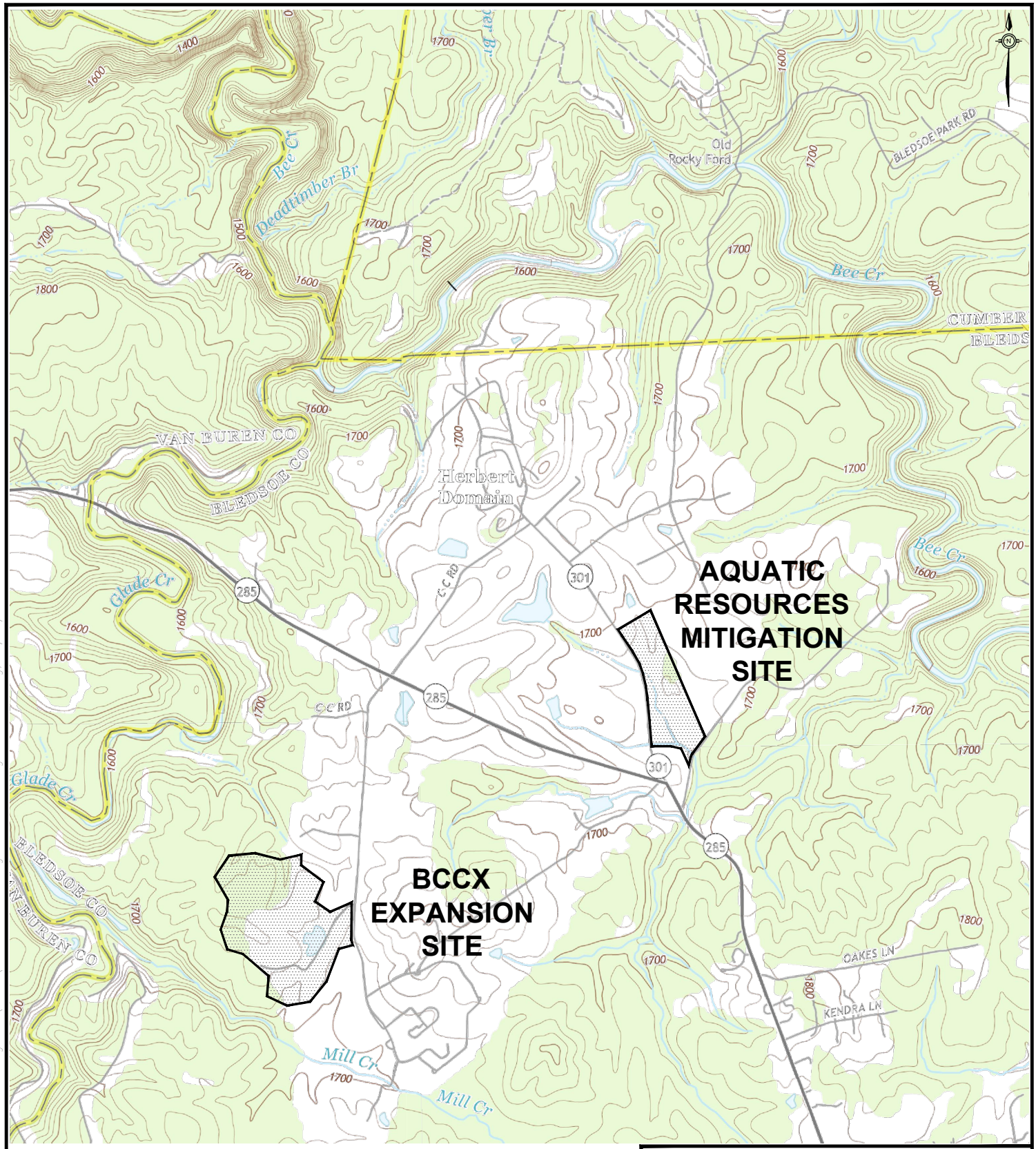
Rare Species: Resurgent this year is the dwarf sundew; a state "threatened" species. This tiny plant was last seen onsite in 2015 but this year hundreds of individuals were observed. The reason for their disappearance in 2016 remains a mystery. Sundews inhabit nitrogen poor soils and supplement their nutrient intake by capturing insect prey. This is done by trapping insects with sticky hairs that coat the leaf surface and then dissolving the prey with specialized enzymes. The nutrients from the insect are then absorbed through the leaves.

Photo 26.

Rare Species: Newly discovered at the BCCX mitigation site is bog oat grass. TDEC's Division of Natural Areas considers it to be a species of "special concern". This ranking applies to plants that are uncommon in Tennessee, or have unique or highly specific habitat requirements or scientific value.

SECTION 4

FIGURES



NOTES

1. SOURCE – U.S.G.S. 7.5 MINUTE TOPOGRAPHIC QUADRANGLE OF: HERBERT DOMAIN, BILLINGSLEY GAP, SAMPSON, LONEWOOD, TN 2013

0 2000 4000

SCALE IN FEET

FIGURE 1
SITE LOCATION MAP
BLEDSOE COUNTY CORRECTIONAL COMPLEX
PIKEVILLE, TENNESSEE

REQUESTED BY:	JG
DRAWN BY:	JDL
DWG DATE:	18AUG2015
PROJECT:	0888816090

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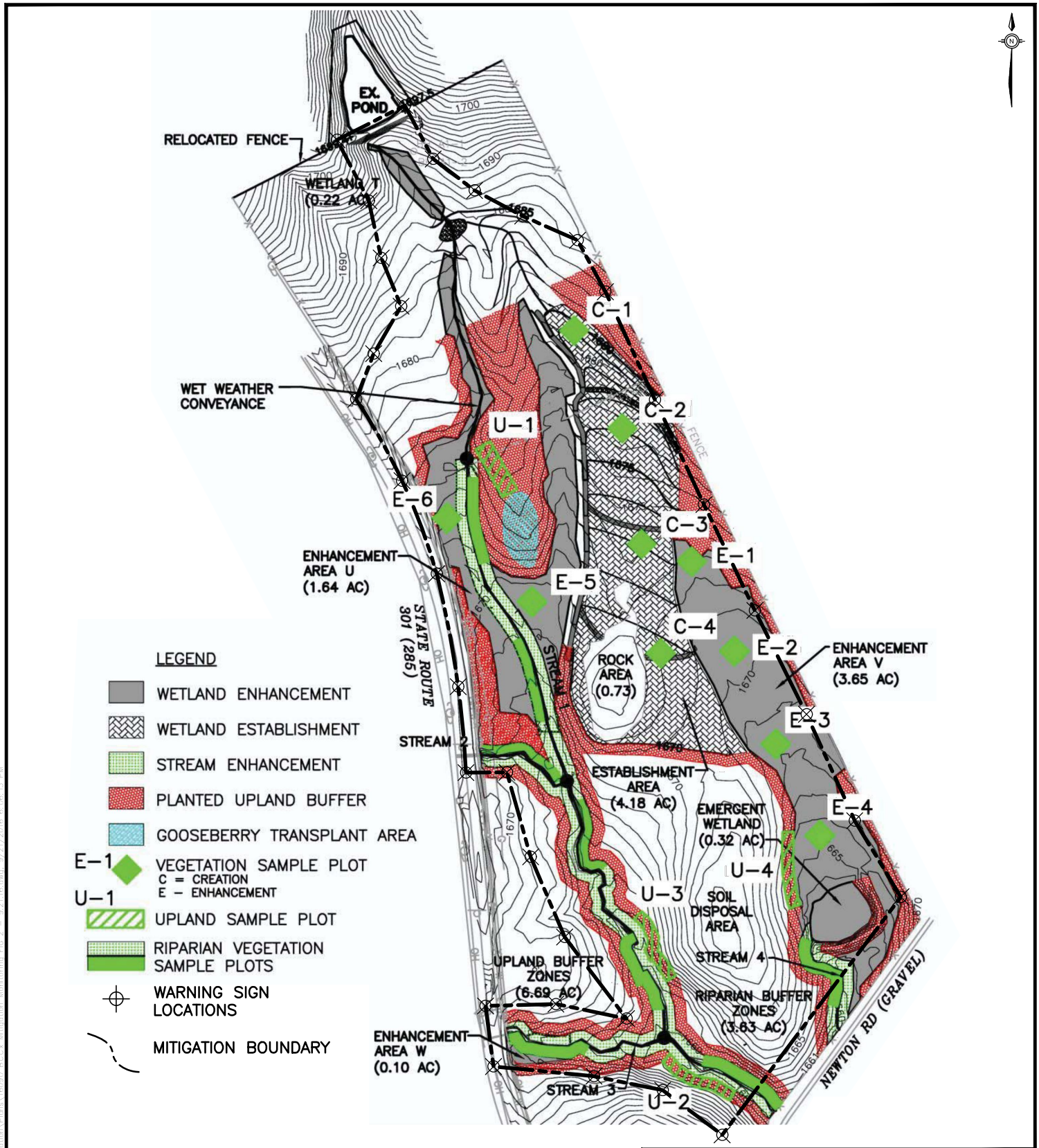

NOTES

1. AREA OF MITIGATION SITE IS 30.38 ACRES

0 300 600

SCALE IN FEET

FIGURE 2
STREAM & WETLAND MONITORING MAP
BLEDSOE COUNTY CORRECTIONAL COMPLEX
PIKEVILLE, TENNESSEE

REQUESTED BY:	JG
DRAWN BY:	JDL
DWG DATE:	21SEP2016
PROJECT:	0888816090

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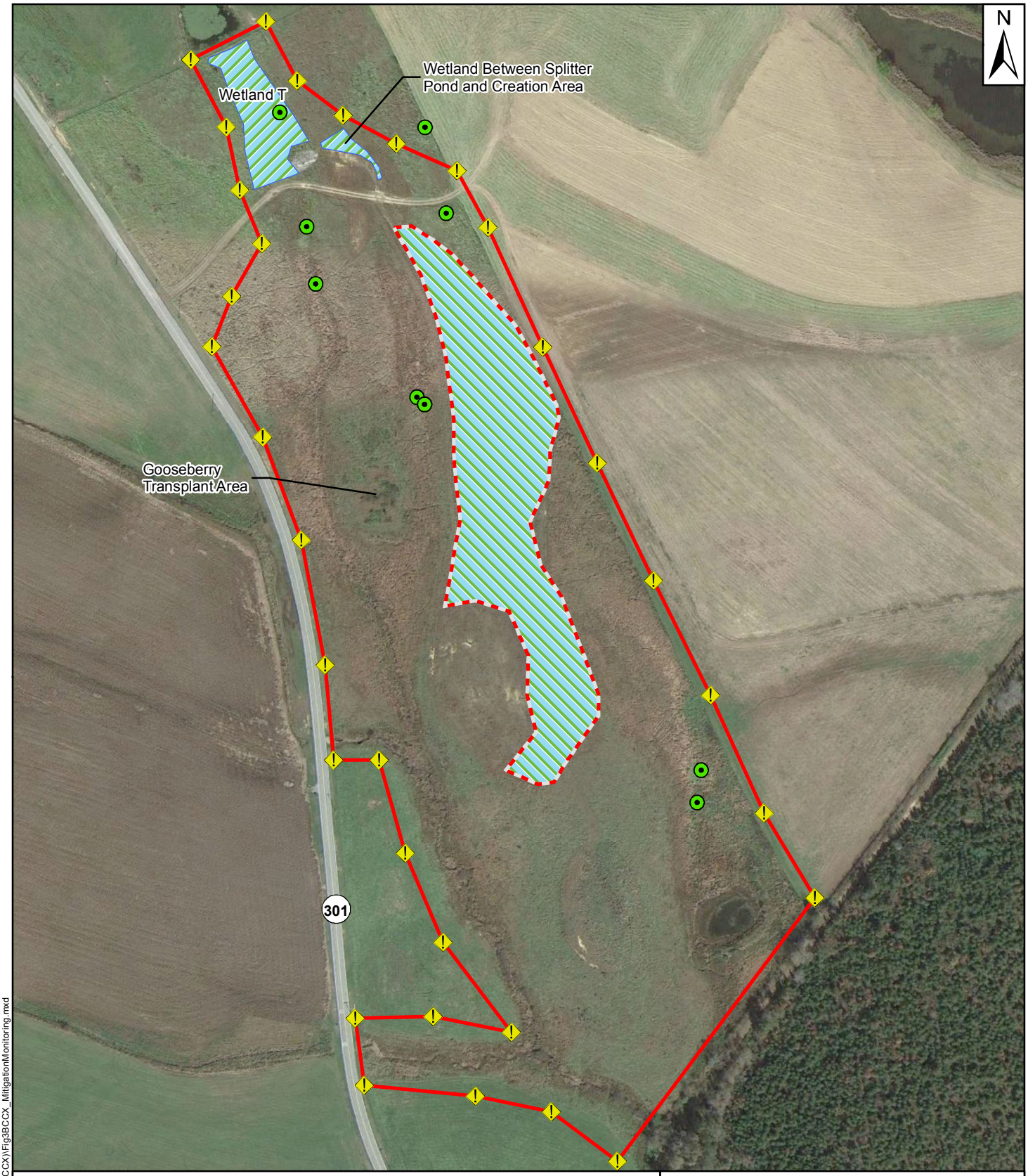

Legend

- No Mow Sign Location
- Reed Canary Grass Treatment Area
- Wetland
- Wetland Creation Area
- Mitigation Area Boundary

0 275 550 Feet

FIGURE 3
LOCATION OF MITIGATION SITE WARNING SIGNS AND REED CANARY GRASS TREATMENT AREAS
BLEDSOE COUNTY CORRECTIONAL COMPLEX
PIKEVILLE, TENNESSEE

REQUESTED BY: J. Groton	
DRAWN BY: MSenne	
DATE: 9/20/2016	
PROJECT NO: 0888816090	

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Service Layer Credits: Google Earth Pro Imagery - 10/22/2014

SECTION 5 — CONCLUSIONS

Wetland Mitigation

Summary Statement: Corrective actions in 2017 involved continued herbicide treatments of reed canary grass infestations in June and August at nine locations at the site: one area in Wetland T, six areas in the Wetland Enhancement Area, and two areas in upland buffers near the Wetland Creation Area. Herbicide treatments to control invasive species began in 2015 and continued in 2016 and 2017 using a 5 percent glyphosate solution approved for use in wetlands and other aquatic habitats. Invasive species control also included spot treatments of glossy false buckthorn, autumn-olive, multiflora rose, Callery pear, Chinese privet, tree-of-heaven, sericea lespedeza, and other woody and semi-woody invasive plants encountered throughout the Mitigation Area. Pedestrian surveys around the site perimeter verified that mowing crews are continuing to comply with no-mow zones. Vegetation within these upland buffer areas continues to grow and develop into much higher-quality habitat.

Corrective actions in 2015 included installing 32 signs to protect the boundaries of the stream and wetland Mitigation Area. EnSafe Inc. installed the signs to clearly identify the Mitigation Area as an area free from mowing, trespassing, and other human disturbance. Signs were placed at least 50 feet from the channel of Streams 1, 2, and 3. The average distance between signs was estimated to be 182 feet. EnSafe also treated glossy false buckthorn trees that were inadvertently planted at the site and five reed canary grass patches with a combined area of approximately 0.16 acre. In addition, Wetland T and the wetland between the splitter pond and the Creation Area were formally included within the Mitigation Area, protecting an additional 0.62 acre and 0.07 acre of wetlands at the site, respectively.

Past corrective actions taken during the early winter 2013 involved the replanting of 5,650 wetland-adapted trees and shrubs, as well as the installation of more than 2,500 feet of coir log erosion dams. These measures helped move the mitigation site towards meeting its principal goal of replacing historic wetlands and streams by making available a diversity of habitats for water-dependent plants and animals. The mitigation is also providing a variety of important functions, such as water storage capacity, soil stabilization, sediment trapping, and groundwater recharge.

Vegetation: Although performance standards calling for a 70 percent coverage of wetland-adapted herbs have not yet been met within the Creation Area, TDEC and USACE both agreed that the site was close enough to meeting the performance criteria and agreed to suspend quantitative monitoring at the site in 2017. Pedestrian surveys throughout the Creation Area in 2017 indicated that wetland vegetation is well established and no bare areas or other indications of potential performance problems were observed. In 2016 wetland herbs constituted 67.27 percent of the plant cover, an increase of 4.12 percent from the 2015 data, a trend that has continued to move in the right direction for the past three growing seasons; hydrophyte cover was 63.15 percent in 2015 and about 61.9 percent in 2014.

Hundreds of dwarf sundew, a state-listed Threatened species, were discovered growing in the Creation Area and the area between the splitter pond and the Creation Area in 2017. This plant had been discovered growing in the Creation Area in 2014 and in 2015 it was found in the splitter

pond area. During the extended drought in 2016 the plant appeared to have disappeared from the area. Repeated searches in June and August 2016 failed to locate a single plant. A more normal rainfall pattern during the spring and summer of 2017 may have contributed to the plant's resurgence in 2017.

No stem counts of woody species were conducted in the Creation Area in 2017 since regulators agreed to suspend quantitative monitoring. Planted woody density was conditionally met in 2016 with overall site density averaging 520 stems/ acre, an increase of 110 stems per acre since 2015. Most of this increase was probably the result of the plants becoming taller and more visible above the herbaceous plant cover, but natural regeneration was also taking place. Planted false indigobush, a nitrogen fixing shrub, has begun to reproduce naturally in the Creation Area. Tree heights generally ranged from 2 feet to 6 feet high. Trees appear to be generally taller around Plots C1 and C2 where soils are deeper. While planted tree survival exceeds the required 326 stems/acre, performance standards stipulate that no one species can comprise more than 20 percent of the total. Two species, buttonbush and sweetgum, continue to exceed this threshold. Despite this "conditional" result, we remain pleased given the fact that during the first monitoring effort, four years ago, stem density was only 65 stems/acre.

Vegetation performance standards for Enhancement Areas were attained in 2015, and regulators released these areas from further monitoring requirements. In 2017 tree heights generally ranged from 4 feet to 10 feet high. Populations of the state-listed Endangered brown bog sedge and southern long sedge were discovered in the Enhancement Areas in 2013. In 2016 bog oat-grass, a state listed Special Concern Species, was also found growing with southern long sedge in a portion of the Enhancement Areas. Pedestrian surveys throughout the Enhancement Areas in 2017 indicated that these wetlands are healthy and doing very well and the populations of brown bog sedge, southern long sedge, and bog oat grass continue to thrive.

Soils: Since quantitative monitoring was suspended in the Creation Area, soil morphology was not examined in 2017. Soils in the Creation Area have been mapped by the Natural Resources Conservation Service (NRCS) as containing Lily loam and Morehead-Bonair complex. The latter contains inclusions of hydric Bonair soils in low-lying areas and depressions. Indeed, residual hydric soils with depleted matrices (NRCS Field Indictor of Hydric Soil, F3) were confirmed in 75 percent of the samples. Creation Areas have been exposed to conditions of augmented hydrology for only a short period of time but are already showing signs of developing hydric characteristics. Although performance standards for soils have not been met within all Creation Area plots, a gradual conversion of the native soils seems to be occurring. As a consequence, we continue to recommend no actions at this time. The rates at which hydric indicators evolve in soils vary widely, but hydrologic modification should not be necessary.

Hydrology: Shallow groundwater monitoring wells were not required as a condition of this permit. Positive wetland hydrology was, therefore, inferred from the successful establishment of wetland vegetation and a variety of primary and secondary hydrologic indicators that are evident in both the Creation and Enhancement Areas. As has been seen, wetland plant dominance occurs throughout the site. Hydrologic indicators observed this year in either the Creation or Enhancement Areas include scattered occurrences of soil saturation and inundation, sediment

and drift deposits, surface soil cracks, algal crust (*Nostoc* sp.), drainage patterns, crayfish burrows, geomorphic position, and a shallow aquitard.

Stream Mitigation

Summary Statement: Principal performance goals for the onsite stream segments are to maintain stable, non-eroding embankments and to establish sustainable vegetated riparian and upland buffers for long-term protection. In a letter dated August 27, 2015, Mike Lee (TDEC Division of Water Resources) concurred that mitigation goals in the Enhancement Areas had been met and that further quantitative monitoring of woody plants was no longer required. Concurrence from USACE on TDEC's recommendations was received on June 3, 2016. In October 2015 TDOC increased the width of buffer zones adjacent to streams and wetlands to a minimum of 50-foot no-mow zones as previously described. Pedestrian surveys throughout the stream mitigation areas in 2017 indicated that the streambanks are very stable and vegetation in the riparian zone, especially woody plants, continues to expand and develop.

Granite Gooseberry Transplant Area

Granite gooseberry transplant efforts continue to appear to be successful thus far. However, we were disappointed that the areal extent of gooseberry decreased by 25 percent from last year's measurements. The extent of this population has steadily decreased each year since it was established. The decrease may be a reflection of stress during the prolonged drought of 2016 but these plants are adapted to grow in areas of very shallow soil. The decline may be attributable to increased competition from Japanese honeysuckle, poison ivy, and native blackberry. Because these plants are so entwined, there is very little that can be done to remove them. Despite their rarity, granite gooseberries are tenacious, and it is possible that some of the plants will survive over the long term. In 2016 several large invasive autumn-olive and tree-of-heaven were removed from the gooseberry restoration area; the stumps were treated with herbicide to prevent sprouting again. In 2017 several woody invasive plants were treated with herbicide to reduce competition and prevent their spread at the site.

Mitigation Site Additions

Apart from the expansion of the oak/riparian zones and installation of signage to protect them from mowing, TDEC also requested that TDOC take several other actions. TDEC requested the addition of Wetland T (abutting the northern boundary of the mitigation site) to the Mitigation Area. This wetland and surrounding buffer total approximately 0.62 acre. TDEC also requested the inclusion of the splitter pond and wetland drainage channel leading from the splitter pond to the north end of the Creation Area. This encompasses another 0.07 acre. In October 2015 signage was placed around the perimeter of both areas and the rest of the site to protect them from future disturbance. The entire Mitigation Area now consists of approximately 31.12 acres of streams, wetlands, and uplands. Mowers in 2016 complied with the no-mow zones around the site perimeter. Pedestrian surveys in Wetland T and the splitter pond area in 2017 did not indicate any problems. Efforts continued to treat the reed canary grass infestation in Wetland T. Coverage of that plant in the wetland has decreased steadily since treatments began. In the splitter pond area we were delighted to find hundreds of dwarf sundew plants. These plants had seemingly disappeared from the site during the drought in 2016.

Long-term Site Protection

The permittee's commitment to protect the site in perpetuity via deed restriction has yet to be fulfilled. This has been delayed until such time that the permittee is certain that all performance standards have reasonably been reached and are sustainable. Because the property is state-owned, there are no immediate outside threats to the Mitigation Area. Signage designating the mitigation site as protected property was installed around the mitigation site perimeter in October 2015. Long-term protection of the site may be the last requirement to do before closing out the permits on this project.

Recommendations

Based on a thorough analysis of the monitoring data from 2017 and previous years, EnSafe makes the following recommendations regarding future activities at the BCCX Mitigation area:

- Request from the regulators a No Further Action finding. If necessary, meet with regulators to discuss the site history, findings of past monitoring events, current project status, and other pertinent details.

- Contract with a land surveyor to have the boundaries of the Mitigation Area determined. Obtain a final boundary survey map with a written description of the boundaries.

- Work with the regulators and TDOC administration and solicitors to determine, and then put in place, the appropriate type of permanent protection mechanism for the property (e.g., deed restriction, conservation easement).

- Until the mitigation is closed out, continue to control invasive plants such as glossy false buckthorn, multiflora rose, sericea lespedeza, and reed canary grass throughout the site.

- Until the mitigation is closed out, continue qualitative monitoring of herbaceous and woody plants in the Wetland Creation Area, the Wetland Enhancement Areas, and Stream Mitigation Areas.

- Continue to engage with regulators and TDOC staff in regard to future monitoring, maintenance, and management of the mitigation site. Keep regulators and TDOC staff aware of the conditions present at the site so they can make informed decisions about future actions at the site.

- Continue to monitor the buffer zones around the Mitigation Area perimeter to make sure that BCCX facility staff are cooperating with mowing restrictions. Also monitor the condition of all signs to ensure they are in place, free from damage, and visible.