LYLE CREEK MITIGATION SITE

Catawba County, NC
DENR Contract 003241
NCEEP Project Number 94643

Baseline Monitoring Document and As-Built Baseline Report

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APPENDICES

EXECUTIVE SUMMARY

The Lyle Creek Mitigation Site, hereafter referred to as the Site, is a full-delivery stream and wetland restoration project for the North Carolina Ecosystem Enhancement Program (NCEEP) in Catawba County, NC. The Site is located west of NC Highway 10/ North Main Street in the Town of Catawba, NC (Figure 1). The project is located in the Catawba River Basin Hydrologic Unit Code (HUC) 03050101140010, which is a NCEEP Targeted Local Watershed. This HUC qualifies as a service area for an adjacent HUC; therefore, the Lyle Creek Mitigation Site was submitted for mitigation credit in the Catawba River Basin HUC 03050103.

The primary objectives of the project were to provide ecological and water quality enhancements to the Catawba River Basin while creating a functional riparian corridor at the site level, providing wetland habitat and ecological function, and restoring a Piedmont Bottomland Forest as described by Schafale and Weakley (1990). These objectives were achieved by restoring 5,411 linear feet (LF) of perennial and intermittent stream channel and 6.6 acres (ac) of wetland area, enhancing 1,384 LF of intermittent stream channel and creating 2.9 ac of wetland area. Approximately 179 LF of stream was excluded from the total project credit calculations from crossings (farm roads and power line easements). Buffer restoration of 23.1 ac and buffer enhancement of 3.5 ac was also established, but was not intended for mitigation credit at this time. The Site's riparian areas were also planted to stabilize streambanks and wetland areas, improve habitat and protect water quality.

Pre-Construction Site Conditions

The Site is located in the Kings Mountain Belt of the Piedmont physiographic province (USGS, 1998). Land use within the watershed is historically rural and dominated by forest and agriculture and is approximately 50% forested, 20% developed, 17% agricultural, 8% shrubland, and 5% herbaceous upland. The Site consists of one second order tributary (UT), three first order UTs, and one UT that transitions from a first order to a third order tributary within the project limits. All UTs drain to Lyle Creek, which is a tributary to the Catawba River. At the downstream limits of the project, the drainage area is 315 ac (0.5 square miles).

Prior to construction activities, the onsite UTs to Lyle Creek were regularly modified and maintained and therefore lacked bedform diversity, habitat, and riparian buffer. The primary impacts to the project channels were the result of mowing, ditching, vegetation maintenance, and dredging associated with tree farming activities. As a result of the aforementioned land activities, the onsite streams were incised and overly wide with shallow flow. These stream conditions resulted in many of the onsite streams being unable to maintain channel form and subsequently filled in with sediment, organic matter and vegetation. In-stream bedform diversity was extremely poor and the longitudinal profile was dominated by shallow runs. The lack of bedform diversity combined with continued anthropogenic disturbance resulted in degraded aquatic habitat, altered hydrology (related to loss of floodplain connection and lowered water table) and water quality concerns such as lower dissolved oxygen levels (due to shallow flow with few re-aeration points).

Table 5 in Appendix 2 presents the pre-restoration conditions in detail for the Site.

Restoration Approach and Implementation

The purpose of the project site restoration was to restore a high quality riparian corridor at the site level, provided wetland habitat, and enhanced ecological function on the Site. The ecological uplift can be summarized as starting from tree farming-impacted streams and wetlands and moving to stable channels and wetlands in a protected riparian corridor. Restoration of dimension, pattern and profile was implemented for UT1, UT1a and UT1b; enhancement of profile and dimension was implemented for UT1c and UT1d. Wetland restoration and creation included RW1 and RW2. UT1a, and UT1b discharge into an anastomosed wetland complex upstream of their confluence with UT1 as depicted in the as-built plans in Appendix 4. This anastomosed wetland complex was not proposed for stream mitigation credit. Figure 2 and Table 1 present the implemented design for the Site.

The final restoration plan was submitted and accepted by the NCEEP in August 2011. Construction activities were completed by River Works, Inc. in April 2012. The baseline monitoring and as-built survey were completed between April and May of 2012. There were no significant deviations reported in the project elements in comparison to the design plans. A few structures were either eliminated or adjusted slightly based on field conditions. An additional log sill was added at 102+85 on UT1 to help turn the water in the bend. Log sill 104+25 on UT1, which was intended to provide grade control in combination with log vane 104+26, was eliminated. Instead, log vane 104+26 was converted to a j-hook vane to provide the same function that the log vane/log sill combination would have provided. Log vanes 107+74 and 107+98 on UT1 were eliminated because they were determined to not be necessary in the field. Additionally, from stations 104+60 to 105+15 and from 106+00 to 106+75 on UT1, the design profile was altered slightly in the field to ease the transition between UT1 Reach 1 Upper and UT1 Reach 1 Lower. On UT1A, 4 log sills from station 300+58 to 300+67 were replaced with two boulder sills. The enhancement approach on UT1c was changed slightly. The proposed construction technique of filling in alternating sides of the overly wide channel in order to establish pattern proved difficult during construction due to poor side slope compaction. To overcome this, the old channel was completely filled in to bankfull elevation and a meandering channel was established at a higher elevation connected to the existing floodplain.

All brush toe was eliminated from the project plans and replaced with either sod mats or brush mattress. This field change was decided upon because the brush toe seemed to overwhelm the small constructed cross sections. All cross sections were built to the design dimensions and spot checked in the field by Wildlands Engineering, Inc. (WEI). Native sod material was then applied to the banks. The juncus/sod mats were harvested onsite and had varying degrees of thickness which ranged from 0.3’ to 0.5’. The mats slightly decreased the cross sectional dimensions, but this change was considered

positive. Vegetation usually bioaccumulates on the constructed banks for several years post-construction and effectively narrows the cross sections in the same way.

Appendix 1 provides more detailed project activity, history, contact information and watershed/site background information for this project.

Monitoring

Baseline monitoring (Year 0 of 5) was conducted in April and May of 2012. The first annual monitoring assessment (Year 1 of 5) will be completed in the fall of 2012. The Site will be monitored for a total of seven (7) years; the stream and vegetation assessment will only be monitored for five (5) years and the wetland assessment will be monitored for seven (7) years. The final monitoring activities will be conducted in 2018 and the close-out in 2019. Monitoring will consist of collecting morphological, vegetative, and hydrological data on an annual basis to assess the project success based on the restoration goals and objectives. The success of the Site will be assessed using measurements of the stream channel's dimension, pattern, profile, permanent photographs, stream and wetland vegetation, and groundwater and surface water hydrology. Any areas with identified high priority problems, such as streambank instability, aggradation/degradation, lack of vegetation establishment, or failure to meet groundwater hydrology success criteria will be evaluated on a case-by-case basis. The problem areas will be visually noted and remedial actions will be discussed with NCEEP staff to determine a plan of action. A proposal of work will be submitted if remediation of an area is required.

1.0 Project Goals, Background and Attributes

1.1 Project Location and Setting

The Site is located west of NC Highway 10/ North Main Street in the Town of Catawba, NC (Figure 1). The site is 18 miles east of Hickory, 15 miles southwest of Statesville and approximately 2 miles south of I-40. The Site is located on an active tree farm surrounded by woods and residential land use. The Site is bounded by Lyle Creek to the north, NC Highway 10/ North Main Street to the east and an elevated railroad right-of-way to the south.

The Site is located on one parcel owned by the Garmon Family. A Conservation Easement held by the State of North Carolina has been recorded with the Catawba County Register of Deeds on the 26.62-acre Lyle Creek project study area within the Garmon parcel. The conservation easement allows the restoration work to occur and protects the project area in perpetuity. Signage and demarcation were placed along the easement per current NCEEP guidance at the time the proposal was submitted.

The Site is located within the NCEEP targeted watershed for the Catawba River Basin (HUC 03050101140010) and North Carolina Division of Water Quality (NCDWQ) Subbasin 03-08-32. This are in HUC 03050101140010, is within the service area for the adjacent HUC 03050103; therefore, the Lyle Creek Mitigation Site was submitted for mitigation credit in the Catawba River Basin HUC 03050103. Lyle Creek flows into the Catawba River less than a mile downstream of the proposed mitigation site. The NCDWQ assigns best usage classifications to State Waters that reflect water quality conditions and potential resource usage. Lyle Creek (NCDWQ Index No. 11-76-4.5) is the main receiving tributary of the project reaches and has been classified as Class WS-IV; CA waters. Class WS-IV waters are used as sources of water supply for drinking or food processing purposes where a more restrictive WS-I, WS-II, or WS-III classification is not feasible. These waters are also protected for Class C uses such as secondary recreation, fishing, wildlife, fish and aquatic life propagation and survival and agriculture. WS-IV waters are generally in moderately to highly-developed watersheds or Protected Areas. This portion of Lyle Creek is also located within the Critical Area (CA) of the Catawba River/ Lake Norman.
Directions and a map of the Site are provided in Figure 1.

1.2 Project Goals and Objectives

The major goals of the mitigation project were to provide ecological and water quality enhancements to the Catawba River Basin while creating a functional riparian corridor at the site level, providing wetland habitat and ecological function, and restoring a Piedmont Bottomland Forest as described by Schafale and Weakley (1990). Monitored enhancements to water quality and ecological processes established in the mitigation plan are outlined below, followed by expected project benefits which are associated with restoration, but will not be monitored as part of this project:

Monitored Project Goals

- Wetland areas will be disked to increase surface roughness and better capture rainfall which will improve connection with the water table for groundwater recharge.

Adjacent streams will be stabilized and established with a floodplain elevation to promote hydrologic transfer between wetland and stream.

- A channel with riffle-pool sequences and some rock and wood structures will be created in the steeper project reaches and a channel with run-pool sequences and woody debris structures will be created in the low sloped project reaches for macroinvertebrate and fish habitat. Introduction of wood including root wads and woody 'riffles' along with native stream bank vegetation will substantially increase habitat value. Gravel areas will be added as appropriate to further diversify available habitats.
- Adjacent buffer areas will be restored by removing invasive vegetation and planting native vegetation. These areas will be allowed to receive more regular and inundating flows. Riparian wetland areas will be restored and enhanced to provide wetland habitat.
- Sediment input from eroding stream banks will be reduced by installing bioengineering and in-stream structures while creating a stable channel form using geomorphic design principles.

Expected Project Benefits

- Chemical fertilizer and pesticide levels will be decreased by filtering runoff from adjacent tree farm operations through restored native buffer zones and wetlands. Offsite nutrient input will be absorbed onsite by filtering flood flows through restored floodplain areas and wetlands, where flood flows can disperse through native vegetation and be captured in vernal pools. Increased surface water residency time will provide contact treatment time and groundwater recharge potential.
- Sediment from offsite sources will be captured during bankfull or greater flows by deposition on restored floodplain areas where native vegetation will slow overland flow velocities.
- Restored riffle/step-pool sequences on the upper reach of UT1a, where distinct points of re-aeration can occur, will allow for oxygen levels to be maintained in the perennial reaches. Small log steps on the upstream portion of UT1b and UT1 Reach 1 Upper will also provide re-aeration points.
- Creation of deep pool zones will lower temperature, helping to maintain dissolved oxygen concentrations. Pools will form below drops on the steeper project reaches and around areas of woody debris on the low-sloped project reaches. Establishment and maintenance of riparian buffers will create long-term shading of the channel flow to minimize thermal heating.

1.3 Project Structure, Restoration Type and Approach

1.3.1 Project Structure

Please refer to Figure 2 for the project component/asset map for the monitoring and restoration feature exhibits on Lyle Creek and its tributaries and Table 1 for the project component and mitigation credit information.

1.3.2 Restoration Type and Approach

The design streams and wetlands were restored to the appropriate type based on the surrounding landscape, climate, and natural vegetation communities but with also strong consideration to existing watershed conditions and trajectory. The specific design stream and wetland types are described below.

1.3.2.1 Designed Stream Approach

The stream restoration portion of this project includes seven reaches (Appendix 4):

UT1 – Reach 1 Upper: UT1 from the southwestern corner of the project to the break in valley slope and beginning of RW2 (sta: 100+00 to 108+15)
UT1 – Reach 1 Lower: UT1 from the upstream extent of RW2 to the confluence with UT1a and UT1b (sta: 108+15 to 132+69)
UT1 – Reach 2: UT1 from the confluence with UT1a and UT1b to the confluence with Lyle Creek (sta: 132+69 to 141+50)
UT1a – Upper: UT1a from the southern project limits to the break in valley slope and beginning of RW1 (sta: 300+00 to 302+01)
UT1a – Lower: UT1a from upstream extent of RW1 to the beginning of anastomosed wetland complex in RW1 (sta: 302+01 to 306+15)
UT1b: UT1b from southern project limits to the beginning of anastomosed wetland complex in RW1 (sta: 200+00 to 209+97)
UT1c: UT1c from the outfall of a farm culvert to the confluence with UT1 (sta: 400+00 to 406+30)
UT1d: UT1d from the outfall of a farm culvert on the western project limit to the confluence with UT1 (sta: 500+00 to 507+07)

All stream reaches were designed as the optimal stream type for their valley types and slopes. UT1 – Reach 1 Upper was constructed as a Bc type stream according to Rosgen's classification system (1994). UT1a – Upper was constructed as a B type stream. UT1 – Reach 1 Lower, UT1 – Reach 2, UT1a – Lower and UT1b were constructed as C type streams according to Rosgen's classification system. UT1c was enhanced by modifying the channel pattern and dimension. A meandering pattern was established and logs sills were installed to provide habitat diversity and some pattern. UT1d was enhanced in place by installing instream structures to raise the bed, reconnecting the stream with the left floodplain. A bankfull bench was constructed on the right bank and the buffer was planted.

The morphologic design parameters for the design reaches fell within the ranges specified for Rosgen's B, Bc, and C stream types. The specific values for the design parameters were selected based on reference reach surveys and designer experience. Selected ratios were compared to the reference reaches to ensure they were within the range seen in similar, natural streams. Finally, existing conditions stream power was compared to design stream power. Each of the design restoration reaches were reconnected with the existing floodplain (Priority 1) except along portions of the design reaches where excavation of a new floodplain at a lower level was necessary due to stream and floodplain grade transitions (Priority 2). In either case, the restored C channels were designed to have entrenchment ratios of greater than 2.2.

1.3.1.2 Designed Wetland Approach

The wetland elements of this project established in the mitigation plan include the following (Appendix 4):

RW1: This wetland component of the project is located in the eastern portion of the project area and is fed by the drainage areas of UT1a and UT1b. RW1 encompasses the lower floodplain area of these newly restored reaches and consists of 5.8 acres of wetland restoration and 1.1 acres of wetland creation. This wetland area was restored to a Piedmont Bottomland Hardwood Forest (Schafale and Weakley, 1990).

RW2: This wetland component is located in the western portion of the project area and will receive the majority of its hydrology from the newly restored UT1 Reach 1 Lower. RW2 includes a small portion of the adjacent UT1 floodplain area and consists of 0.8 acre of wetland restoration and 1.8 acres of wetland creation. As with RW1, RW2 was also restored to a Piedmont Bottomland Hardwood Forest.

Pocket Wetlands: The restoration of the streams described above included reconnecting the stream to the natural floodplain in some sections and creating a new lower floodplain for other sections. Pocket wetlands are likely to be created or enhanced simply by raising the existing stream beds to a degree that the floodplain will be frequently inundated. No mitigation credit will be claimed for this condition. Communities planted in these zones will be appropriate for Piedmont Bottomland Hardwood Forests.

As a final stage of construction, restored and created wetlands (including RW1, RW2, and any pocket wetlands) and riparian buffer zones were planted and restored to the dominant natural plant community based on reference conditions. The main reference site was a Piedmont Bottomland Hardwood Forest located upstream on Lyle Creek. Because most of the wetland restoration and creation areas as well as the riparian buffer have hydrology similar to the Piedmont Bottomland Hardwood Forest, this community was the primary target. Stream buffers were also restored to a Piedmont Bottomland Hardwood Forest community as described in the natural plant community restoration plan in Section 7.4 of the mitigation plan.

Proposed plant and seed materials were placed on stream banks and bench areas as well as from the tops of banks out to the project easement limits. These areas were planted with juncus/sod mats, bare root trees, live stakes, and a seed mixture of permanent herbaceous vegetation ground cover. A permanent seed mixture of native herbaceous and grass species was also to all disturbed areas within the project easement. The herbaceous seed mixture was chosen to provide quick stabilization of constructed stream banks, benches, and side slopes. These species will also provide early habitat value through rapid growth of ground cover to the tops of banks and floodplain areas.

1.4 Project History, Contacts and Attribute Data

Lyle Creek was restored by WEI through a full-delivery contract with NCEEP. Tables 2, 3 and 4 provide detailed information regarding the Project Activity and Reporting History, Project Contacts and Project Baseline Information and Attributes.

2.0 Success Criteria

The stream restoration success criteria for the Site follows the approved performance criteria presented in the NCEEP Mitigation Plan Template (version 1.0, 11/20/2009) and the Stream Mitigation Guidelines issued in April 2003 by the USACE and NCDWQ. Annual monitoring and quarterly site visits will be conducted to assess the condition of the finished project for five years, or until success criteria are met. The stream restoration reaches (UT1, UT1a and UT1b) of the project were assigned specific performance criteria components for stream morphology, hydrology, and vegetation. The enhancement reaches (UT1c and UT1d) were documented through photographs and visual assessments to verify that no significant degradational changes are occurring in the stream channel or riparian corridor. Monitoring for wetland vegetation will extend seven years beyond completion of construction. The wetland restoration and creation sections will be assigned specific performance criteria for hydrology and vegetation. These success criteria are covered in detail as follows.

2.1 Hydrology

2.1.1 Streams

Stream hydrology attainment will be monitored in accordance to the USACE (2003) standards. Two bankfull flow events in separate years must be documented on the project within the five-year monitoring period. Bankfull events will be documented using a crest gage, photographs, and visual assessments such as debris lines.

2.2 Morphological Parameters and Channel Stability

2.2.1 Dimension

Riffle/run cross-sections on the restoration reaches should remain relatively stable; however, due to the sand/silt nature of the substrate throughout the project reaches, fluctuations of the riffle/run bed elevation over time are expected plus or minus 6 inches. These fluctuations should be temporary and will likely correspond to storm events. Riffle/run cross-sectional ratios (width-to-depth, depth ratio, and bank height ratio) should fall within the parameters defined for channels of the appropriate Rosgen stream type. If persistent changes are observed, these changes will be evaluated to assess whether the stream channel is showing signs of long term instability. Indicators of instability include a vertically incising thalweg or eroding channel banks. Changes in the channel that indicate a movement toward stability or enhanced habitat include a decrease in the width-to-depth ratio in meandering channels or an increase in pool depth. Remedial action would not be taken if channel changes indicate a movement toward stability.

2.2.2 Pattern and Profile

Longitudinal profile data for the stream restoration reaches should show that the bedform features remain relatively stable however they may fluctuate some due to the fine nature of sediments from the watershed. The riffles/runs should be steeper and shallower than the pools. Pools in meander bends are expected to be deeper than riffles however the bed elevation may fluctuate up or down over time depending on the amount of sand contributed from the watershed. Deeper pools will likely develop in areas with woody debris or below step structures. Adjustments in length and slope of run and glide features are expected and

will not be considered a sign of instability. The longitudinal profile should show that the bank height ratio remains very near to 1.0 for the majority of the restoration reaches.

2.3 Vegetation

The final vegetative success criteria will be the survival of 260 planted stems per acre in the riparian corridor along restored and enhanced reaches at the end of year five monitoring, and 200 planted stems per acre within the wetland restoration and creation areas at the end of year seven monitoring. The interim measure of vegetative success for the entire site will be the survival of at least 320 planted stems per acre at the end of the third monitoring year. The extent of invasive species coverage will also be monitored and controlled as necessary throughout the five-year monitoring period for streams and seven-year monitoring period for wetlands.

2.4 Photograph Reference Points

Photographs should illustrate the site's vegetation and morphological stability on an annual basis. Cross-section photos should demonstrate no excessive erosion or degradation of the banks. Longitudinal photos should indicate the absence of vertical incision or bank erosion. Grade control structures should remain stable. Deposition of sediment on the bank side of vane arms is preferable. Maintenance of scour pools on the channel side of vane arms is expected. Reference photos will also be taken for each of the vegetation plots.

2.5 Wetlands

The final performance criteria for wetland hydrology will be a free groundwater surface within 12 inches of the ground surface for 7 percent of the growing season, which is measured on consecutive days under typical precipitation conditions. This success criteria was determined through model simulations of post restoration conditions and comparison to an immediately adjacent existing wetland system. If a particular well does not meet this criteria for a given monitoring year, rainfall patterns will be analyzed and the hydrograph will be compared to that of the reference well to assess whether atypical weather conditions occurred during the monitoring period.

2.6 Schedule and Reporting

Monitoring reports will be prepared in the fall of each year of monitoring and submitted to NCEEP. Based on the NCEEP Monitoring Report Template (version 1.3, 1/15/2010), the monitoring reports will include the following:

1. Project background which includes project objectives, project structure, restoration type and approach, location and setting, history and background.
2. As-built topographic plans of major project elements including such items as grade control structures, vegetation plots, monitoring cross-sections, groundwater gages and crest gages.
3. Photographs showing views of the project area taken from fixed point stations.
4. Assessment of the stability of the project based on the cross-sections and longitudinal profile, where applicable.
5. Vegetative data as described above including the identification of any invasion by undesirable plant species.
6. Hydrology data as described above.

7. A description of damage by animals or vandalism.
8. Maintenance issues and recommended remediation measures will be detailed and documented.
9. Wildlife observations.

3.0 Monitoring Plan

Monitoring reports will be prepared in the fall of each year of monitoring and submitted to NCEEP. These reports will be based on the NCEEP Monitoring Report Template (version 1.3, 1/15/2010). The monitoring period will extend five years beyond completion of construction or until performance criteria have been met. Monitoring for wetland vegetation will extend seven years beyond completion of construction.

3.1 Streams

3.1.1 Dimension

In order to monitor the channel dimension, a total of 12 permanent cross-sections have been installed along the UTs to Lyle Creek; 8 on UT1, 2 on UT1a and 2 on UT1b. Cross-sections are located at representative riffle/run and pool sections on each monitored reach. Each cross-section is permanently marked with pins to establish its location. Cross-section surveys will be performed annually and will include points measured at all breaks in slope, including top of bank, bankfull, edge of water and thalweg.

3.1.2 Pattern and Profile

A longitudinal profile will be completed for the 4,460 LF of the restoration reaches (3,000 LF on UT1, 615 LF on UT1a and 845 LF on UT1b) on the Site immediately post-construction and annually throughout the five year monitoring period. The initial as-built survey will be used for baseline comparisons. Measurements in the survey will include thalweg, water surface, bankfull and top of low bank. These profile measurements will be taken at the head of each riffle, run, pool and glide, as well as at the maximum pool depth. The survey will be tied to a permanent benchmark and NC State Plane coordinates.

3.1.3 Photo Documentation

A total of 34 permanent photographs were established within the project stream and wetland areas after construction. Photographs will be taken once a year to visually document stability for five years following construction. Permanent markers were established so that the same locations and view directions on the site are monitored each year. Photographs will be used to monitor restoration, enhancement and creation stream and wetland areas as well as vegetation plots. The photographer will make every effort to maintain the same area in each photo over time. Reference photos were also taken for each of the vegetation plots and cross-sections. The representative digital photo(s) will be taken on the same day the surveys are conducted.

3.1.4 Substrate

Because the streams through the project site are dominated by sand and silt-size particles, pebble count and/or bulk sampling procedures would not show a significant change in bed

material size or distribution over the monitoring period; therefore, bed material analyses will not be conducted for this project.

3.1.5 Bankfull Events

Bankfull events will be documented using a crest gage, photographs and visual assessments such as debris lines. Three crest gages were installed; one on UT1, one on UT1a, and one on UT1b. The crest gages were installed in a permanent riffle cross-section of the restored channels. The gages will be checked at each site visit to determine if a bankfull event has occurred. Photographs will be used to document the occurrence of debris lines and sediment deposition.

3.1.6 Visual Assessment

Visual assessments will be conducted along all reaches each year to obtain qualitative geomorphic data. Each visual assessment evaluation after the baseline survey will include re-evaluation along the same profile.

3.3 Vegetation

A total of 35 vegetation monitoring plots were installed and evaluated within the restoration, enhancement and creation areas to measure the survival of the planted trees. The number of monitoring quadrants required is based on the NCEEP monitoring guidance documents (version 2.0, 10/14/10). The size of individual quadrants is 100 square meters for woody tree species and shrubs. Vegetation assessments will be conducted following the Carolina Vegetation Survey (CVS) Level 2 Protocol for Recording Vegetation (Lee et al., 2008).

The initial baseline survey was conducted within 21 days from completion of site planting and will be used for subsequent monitoring year comparisons. The first annual vegetation monitoring activities will be conducted at the end of the first growing season, during the month of September. The restoration and enhancement sites will then be evaluated each subsequent year between June 1 and September 31. Species composition, density and survival rates will be evaluated on an annual basis by plot and for the entire site. Individual plot data will be provided and will include diameter, height, density, vigor, damage (if any) and percent survival. Planted woody stems will be marked annually as needed, based off of a known origin, so they can be found in succeeding monitoring years. Mortality will be determined from the difference between the baseline year's living planted stems and the current year's living planted stems.

3.4 Wetlands

Groundwater monitoring gages were established throughout the wetland restoration, enhancement and creation areas. The gages were installed at appropriate locations so that the data collected will provide an indication of groundwater levels throughout the wetland project area. A total of 8 groundwater gages were installed within the wetland areas; 5 in RW1 and 3 in RW2. To determine the growing season for the Site, two soil temperature loggers were also installed within each wetland. A barrotroll logger and a rain gage were also installed onsite. All monitoring gages will be downloaded on a quarterly basis and will be maintained on an as needed basis. Refer to the as-built plans in Appendix 4 for the monitoring gages location within the Site.

4.0 Maintenance and Contingency Plans

Any identified high priority problem areas, such as streambank instability, aggradation/degradation, lack of vegetation establishment, or failure to meet groundwater hydrology success criteria will be evaluated on a case-by-case basis. The problem areas will be visually noted and remedial actions will be discussed with NCEEP staff to determine a plan of action. A proposal of work will be submitted if remediation of an area is required.

4.1 Vegetation

Vegetative problem areas will be mapped and included in the Current Condition Plan View (CCPV) as part of the annual vegetation assessment. Vegetation problems areas may include planted vegetation not meeting success criteria, persistent invasive species, barren areas with little to no herbaceous cover, or grass suffocation/crowding of planted stems. Appropriate remedial actions will be determined with NCEEP correspondence. A proposal of work will be submitted if remediation of an area is required.

4.2 Stream

Stream problem areas will be mapped and included in the CCPV as part of the annual stream assessment. Stream problems areas may include bank erosion, structure failure, beaver dams, aggradation/degradation, etc. Appropriate remedial actions will be determined with NCEEP correspondence. A proposal of work will be submitted if remediation of an area is required.

4.3 Wetlands

Wetland problem areas will be mapped and included in the CCPV as part of the annual wetland assessment. Wetland problems areas may include planted vegetation not meeting success criteria, persistent invasive species, barren areas with little to no herbaceous cover, grass suffocation/crowding of planted stems, or wetland hydrology not meeting success criteria. Appropriate remedial actions will be determined with NCEEP correspondence. A proposal of work will be submitted if remediation of an area is required.

5.0 As-Built Condition (Baseline)

The Site construction and as-built survey were completed during April and May 2012. The survey included locating the channel boundaries, structures, cross-sections, and monitoring features such as photo points, vegetation plots, groundwater gages, and crest gauges. For comparison purposes, the baseline monitoring divided the reach assessments in the same way they were established for design parameters: UT1 Upper Reach, Lower Reach, and Reach 2, UT1a, UT1b, UT1c, and UT1d.

5.1 As-Built/Record Drawings

A half size as-built plan is located in Appendix 4 with the pre-construction, design, and post-construction locations and alignments for the project. Field adjustments made to the design plans during construction included eliminating or moving a few habitat structures based on observed field conditions. An additional log sill was added at 102+85 on UT1 to help turn the water in the bend. Log sill 104+25 on UT1, which was intended to provide grade control in combination with log vane 104+26, was eliminated. Instead, log vane 104+26 was converted to a j-hook vane to provide the same function that the log vane/log sill combination would have provided. Log vanes 107+74 and 107+98 on UT1 were eliminated because they were

determined to not be necessary in the field. Additionally, from stations 104+60 to 105+15 and from 106+00 to 106+75 on UT1, the design profile was altered slightly in the field to ease the transition between UT1 Reach 1 Upper and UT1 Reach 1 Lower. On UT1A, 4 log sills from station 300+58 to 300+67 were replaced with two boulder sills. The enhancement approach on UT1c was changed slightly. The proposed construction technique of filling in alternating sides of the overly wide channel in order to establish pattern proved difficult during construction due to poor side slope compaction. To overcome this, the old channel was completely filled in to bankfull elevation and a meandering channel was established at a higher elevation connected to the existing floodplain.

All brush toe was eliminated from the project plans and replaced with either juncus/sod mats or brush mattresses. This field change was decided upon because the brush toe seemed to overwhelm the small constructed cross sections. All cross sections were built to the design dimensions and spot checked in the field by WEI. Native sod material was then applied to the banks. The juncus/sod mats were harvested onsite and had varying degrees of thickness which ranged from 0.3' to 0.5'. The mats slightly decreased the cross sectional dimensions, but this change was considered positive. Vegetation usually bioaccumulates on the constructed banks for several years post-construction and effectively narrows the cross sections in the same way.

5.2 Baseline Data Assessment

5.2.1 Morphological State of the Channel

Morphological data for the as-built profile was collected in April 2012. Please refer to Appendix 2 for summary data tables, morphological plots, and stream photographs.

Profile

The baseline (MY-0) profile numbers are closely matched to the design parameters. Although some of the baseline parameters fall outside of the design ratios, the installed stream meets the design intent. These changes are most likely due to the small dimension of the channel, where slight grade changes within construction tolerances and slight shifts in survey data collection locations can significantly impact calculation of facet slopes and other profile parameters. The plotted longitudinal profile and related summary data can be found in Appendix 2.

Dimension

The baseline (MY-0) dimension numbers are closely matched to the design parameters. Although some of the baseline parameters fall outside of the design ratios, the installed stream meets the design intent. These changes are most likely due to the small dimension of the channel, where slight grade changes within construction tolerances and slight shifts in survey data collection locations can significantly impact dimension ratio calculations. Summary data and cross-section plots can be found in Appendix 2.

Pattern

The baseline (MY-0) radius of curvature and channel belt width numbers are similar to design objectives for all three reaches. Pattern data will be completed in MY-5 if there are

any indicators through the profile or dimensions that significant geomorphic adjustments have occurred. The summary data can be found in Appendix 2.

5.2.2 Vegetation

The baseline monitoring (MY-0 of 5) vegetative survey was completed in April and May 2012. The baseline vegetation monitoring resulted in an average survivability of 532 stems per acre, which is greater than the required density. There was an average of 13 stems per plot. Refer to Appendix 3 for vegetation summary tables, raw data tables, and vegetation plot photographs.

5.2.3 Photo Documentation

Permanent photographs locations were surveyed by Dewberry and photographed by WEI. These photographs can be found in Appendix 2.

5.2.4 Hydrology

No bankfull events were recorded with the crest gauges during the baseline data collection.

9.0 References

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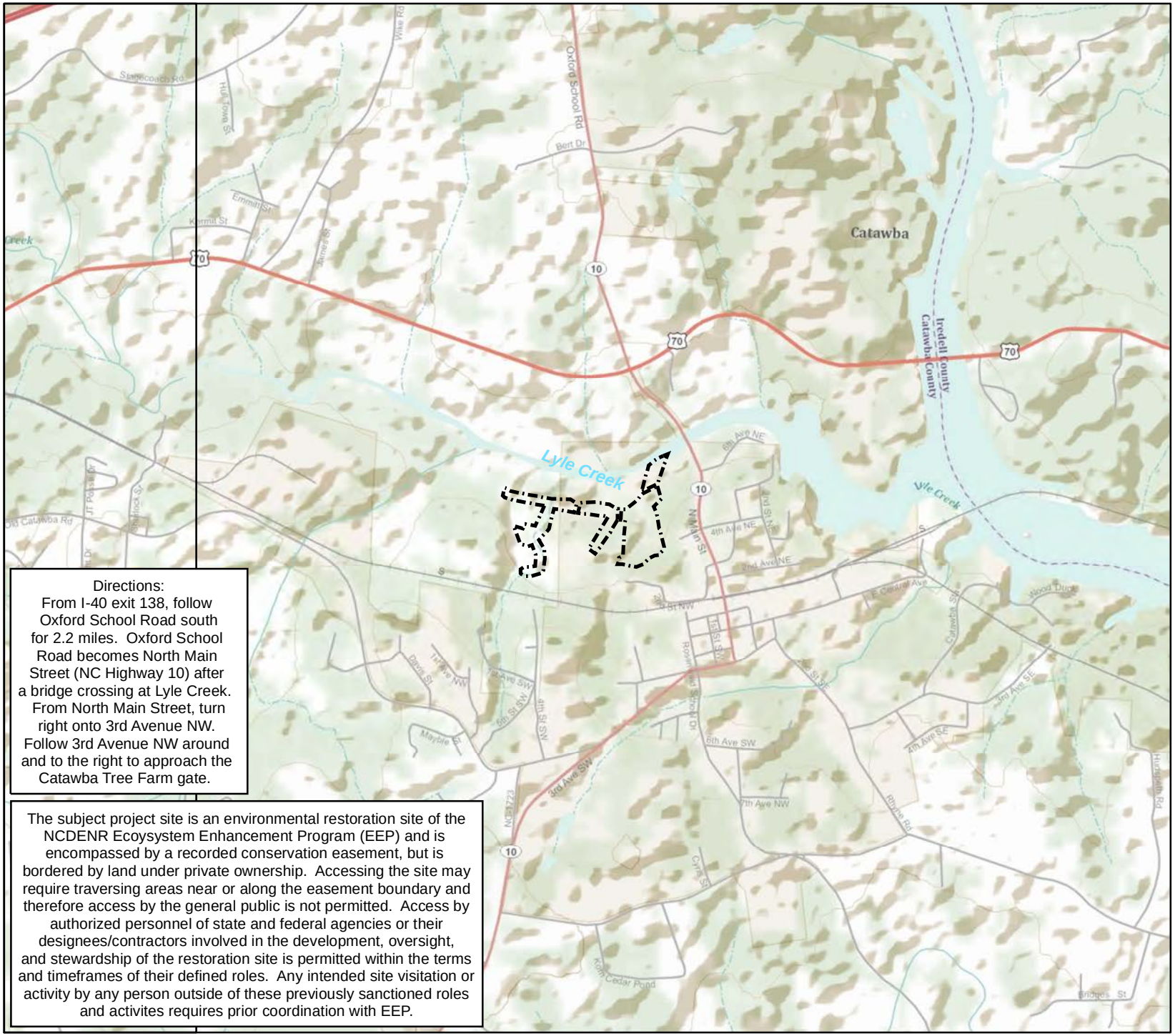
APPENDIX 1. General Tables and Figures



Directions:
From I-40 exit 138, follow Oxford School Road south for 2.2 miles. Oxford School Road becomes North Main Street (NC Highway 10) after a bridge crossing at Lyle Creek. From North Main Street, turn right onto 3rd Avenue NW. Follow 3rd Avenue NW around and to the right to approach the Catawba Tree Farm gate.

The subject project site is an environmental restoration site of the NCDENR Ecosystem Enhancement Program (EEP) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/contractors involved in the development, oversight, and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activites requires prior coordination with EEP.

Figure 1. Project Vicinity Map
Lyle Creek Mitigation Site
EEP Project Number 94643
Monitoring Year 0 of 5

Catawba County, NC

Easement Area

N

0 1,000 2,000 ft

WILDLANDS ENGINEERING

Ecosystem Enhancement PROGRAM

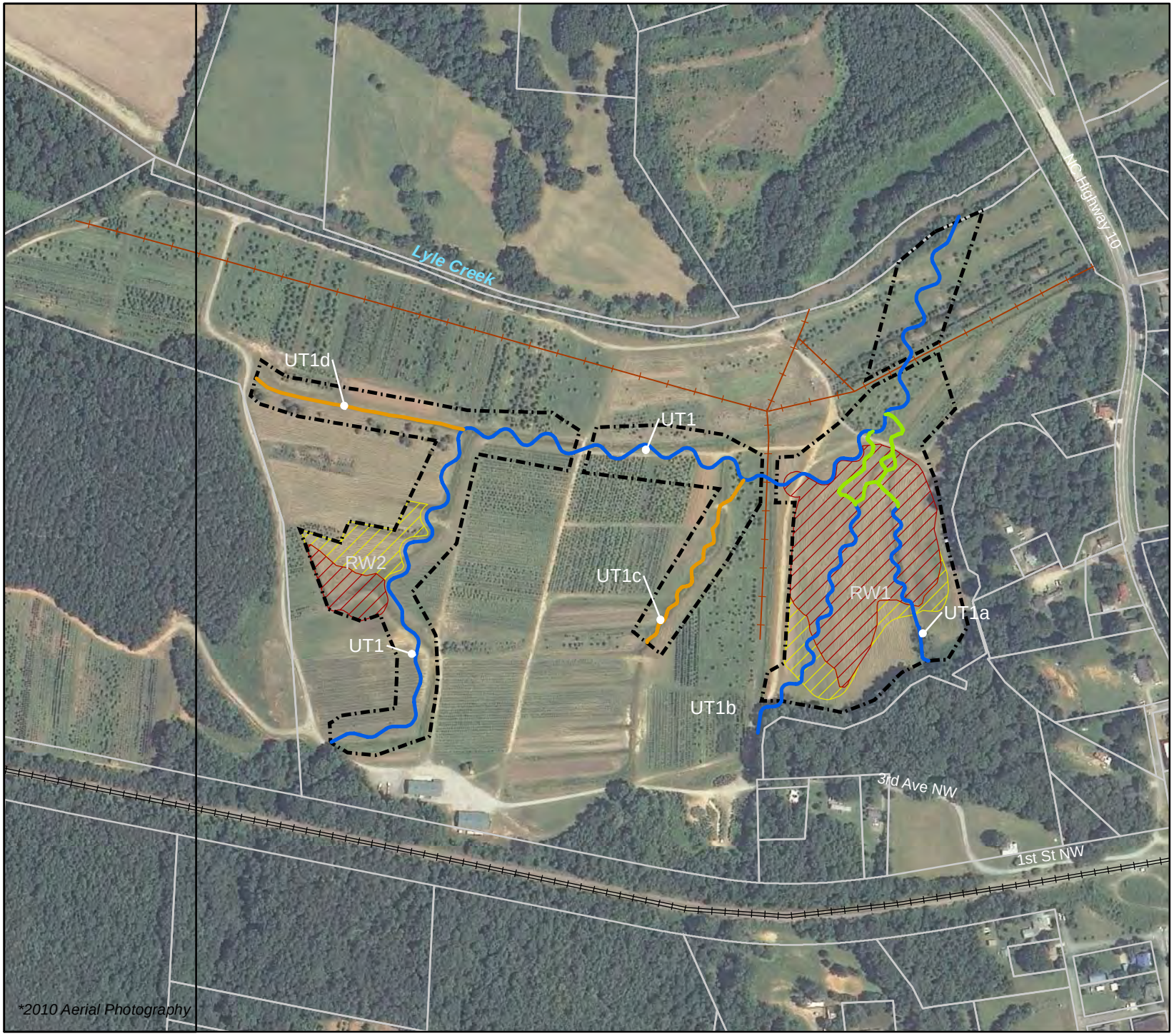


Figure 2. Project Component/ Asset Map
Lyle Creek Mitigation Site
EEP Project Number 94643
Monitoring Year 0 of 5

Catawba County, NC

- Stream Restoration
- Stream Enhancement
- Braided Reach (no credit)
- Wetland Restoration
- Wetland Creation
- Conservation Easement
- Railroad
- Power Lines
- Parcels

N

0 225 450 ft

WILDLANDS ENGINEERING

Ecosystem Enhancement PROGRAM

Appendix 1. General Tables and Figures
Table 1. Project Components and Mitigation Credits
Lyle Creek Mitigation Site (NCEEP Project No.94643)
Monitoring Year 0

Mitigation Credits									
	Stream		Riparian Wetland		Non-Riparian Wetland		Buffer	Nitrogen Nutrient Offet	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	5,411	554	6.6	1.0	N/A	N/A	N/A	N/A	N/A

Project Components						
Reach ID	As-Built Stationing/ Location	Existing Footage (LF)	Approach	Restoration or Restoration Equivalent	As-Built Mitigation Length/Area (LF/acres)	Mitigation Ratio
UT1	100+00-141+30	4,071 LF	Priority 1/2	Restoration	3,951 LF[1]	1:1
UT1a	300+00-306+15	1,141 LF	Priority 1	Restoration	615 LF[2]	1:1
UT1b	201+52-209+97	890 LF	Priority 1/2	Restoration	845 LF[3]	1:1
UT1c	400+00-406+77	695 LF	in-stream structures, grading, planting	Enhancement II	677 LF[4]	2.5:1
UT1d	500+00-507+07	760 LF	in-stream structures, grading, planting	Enhancement II	707 LF	2.5:1
RW1	N/A	N/A	grading, planting	Restoration	5.8 AC	1:1
RW1	N/A	N/A	grading, planting	Creation	1.1 AC	3:1
RW2	N/A	N/A	grading, planting	Restoration	0.8 AC	1:1
RW2	N/A	N/A	grading, planting	Creation	1.8 AC	3:1

Component Summation						
Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-Riparian Wetland (acres)	Buffer (square feet)	Upland (acres)
		Riverine	Non-Riverine			
Restoration	5,411	6.6				
Enhancement						
Enhancement I						
Enhancement II	1,384					
Creation		1.0				
Preservation						
High Quality Preservation						

BMP Elements			
Elements	Location	Purpose/Function	Notes

BR = Bioretention Cell; S F= Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond; FS = Filter Strip; S = Grassed Swale; LS = Level Spreader; NI = Natural Infiltration Area; FB = Forested Buffer

[1] Excludes 179 LF in crossings (farm road and power line easements). Includes length from station 125+42 to 125+60 where left bank buffer width ranges from 48.5' to 50'. The right bank buffer width in this area exceeds 100'.

[2] Excludes downstream 306 LF of UT1a that is in the anastomosed wetland complex

[3] Excludes downstream 243 LF of UT1b that is in the anastomosed wetland complex

[4] Includes length from station 4+48 to 6+11 where left bank buffer width ranges from 28.7' to 50'. The right bank buffer width in this area ranges from 65.5' to 102.6'.

Appendix 1. General Tables and Figures
Table 2. Project Activity and Reporting History
Lyle Creek Mitigation Site (NCEEP Project No.94643)
Monitoring Year 0

Activity or Report	Date Collection Complete	Completion or Scheduled Delivery
Mitigation Plan	May 2011	August 2011
Final Design - Construction Plans	October 2011	December 2011
Construction	Jan-Apr 2012	April 2012
Temporary S&E mix applied to entire project area*	April 2012	April 2012
Permanent seed mix applied to reach/segments	April 2012	April 2012
Containerized and B&B plantings for reach/segments	April 2012	April 2012
Baseline Monitoring Document (Year 0 Monitoring - baseline)	April 2012	June 2012
Year 1 Monitoring	Sept/Oct 2012	December 2012
Year 2 Monitoring	2013	December 2013
Year 3 Monitoring	2014	December 2014
Year 4 Monitoring	2015	December 2015
Year 5 Monitoring	2016	December 2016
Year 6 Monitoring	2017	December 2017
Year 7 Monitoring	2018	December 2018

*Seed and mulch is added as each section of construction is completed.

Appendix 1. General Tables and Figures
Table 3. Project Contact Table
Lyle Creek Mitigation Site (NCEEP Project No.94643)
Monitoring Year 0

Designer	**Wildlands Engineering, Inc.**
Emily Reinicker, PE, CFM	1430 S. Mint St, Suite 104 Charlotte, NC 28203 704.332.7754
Construction Contractor	**River Works, Inc.**
Bill Wright	6105 Chapel Hill Rd Raleigh, NC 27607 336.279.1002
Planting Contractor	**River Works, Inc.**
George Morris	6105 Chapel Hill Rd Raleigh, NC 27607 336.279.1002
Seeding Contractor	**River Works, Inc.**
George Morris	6105 Chapel Hill Rd Raleigh, NC 27607 336.279.1002
Seed Mix Sources	**Green Resource**
Nursery Stock Suppliers	**ArborGlen** **Superior Tree** **Mellow Marsh Farm**
Monitoring Performers	**Wildlands Engineering, Inc.**
Stream, Vegetation and Wetland Monitoring, POC	Kirsten Y. Gimbert 704.332.7754, ext. 110

Appendix 1. General Tables and Figures
Table 4. Project Information and Attributes
Lyle Creek Mitigation Site (NCEEP Project No.94643)
Monitoring Year 0

Project Information							
Project Name	Lyle Creek Mitigation Site						
County	Catawba County, NC						
Project Area (acres)	26.62						
Project Coordinates (latitude and longitude)	35° 42' 39.218" N, 81° 4' 54.628" W						
Project Watershed Summary Information							
Physiographic Province	Piedmont						
River Basin	Catawba						
USGS Hydrologic Unit 8-digit	03050101						
USGS Hydrologic Unit 14-digit	03050101140010						
DWQ Sub-basin	Catawba River Subbasin 03-08-32						
Project Drainiage Area (acres)	315						
Project Drainage Area Percentage of Impervious Area	5%						
CGIA Land Use Classification	50% Forested, 20% Developed, 17% Agricultural, 8% Shrubland, 5% Herbaceous Upland						
Reach Summary Information							
Parameters	**UT1**	**UT1A**	**UT1B**	**UT1C**	**UT1D**	**RW1**	**RW2**
Length of reach (linear feet) - Post-Restoration	3,941 [1]	615 [2]	845 [3]	677	707	N/A	N/A
Drainage area (acres)	315	56	78	26	9	96	134
NCDWQ stream identification score	Lyle Creek - 11-76-(4.5)						
NCDWQ Water Quality Classification	Lyle Creek - WS-IV;CA						
Morphological Desription (stream type) of Pre-Existing	F5 [4], F6 [4], G6 [4]	F6 [4]	F6 [4]	F6 [4]	F6 [4]	N/A	N/A
Morphological Desription (stream type) of Design	B5c, C6	B6c, C6	C6	C6	C6	N/A	N/A
Evolutionary trend (Simon's Model) - Pre- Restoration	Stage II - Channelized						
Underlying mapped soils	Chewacla loam	Chewacla loam	Wehadkee fine sandy loam	Chewacla loam	Congaree complex	Chewacla loam and Wehadkee fine sand	Chewacla loam
Drainage class	somewhat poorly drained	somewhat poorly drained	frequently flooded	somewhat poorly drained	moderately well drained	somewhat poorly drained and frequently flooded	somewhat poorly drained
Soil Hydric status	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Slope	0-2%	0-2%	0-2%	0-2%	0-2%	0-2%	0-2%
FEMA classification	AE[5]						
Native vegetation community	Palustrine Emergent System						
Percent composition of exotic invasive vegetation - Post-Restoration	0%						

Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States - Section 404	X	X	USACE Nationwide Permit No.27 and DWQ 401 Water Quality Certification No. 3689
Waters of the United States - Section 401	X	X	
Division of Land Quality (Dam Safety)	N/A	N/A	N/A
Endangered Species Act	X	X	Lyle Creek Mitigation Plan; two federally listed species, the bald eagle (*Haliaeetus leucocephalus*) and dwarf-flowered hearleaf (*Hexastylis naniflora*), are currently listed in Catawba County. Studies found "no individual species, critical habitat, or suitable habitat was found to exist on the site" (letter to USFWS; no response was received within the 30-day time frame from USFWS)
Historic Preservation Act	X	X	No historic resources were found to be impacted (letter from SHPO and THPO)
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	N/A	N/A	N/A
FEMA Floodplain Compliance	X	X	No-rise certification and floodplain development permit approved by Catawba County floodplain administrator.
Essential Fisheries Habitat	X	X	Project area has warm water fisheries; found no reason to object to the restoration project (letter from NCWRC)

[1] Excludes 200 LF of crossings

[2] Excludes 306 LF of UT1a in the anastomosed wetlands complex

[3] Excludes 243 LF of UT1b in the anastomosed wetlands complex

[4] The Rosgen classification system is for natural streams. These channels have been heavily manipulated by man and therefore the Rosgen classification system is not applicable. These classifications are provided for illustrative purposes only.

[5]The project area does not have an associate regulated floodplain; however, the project reaches and wetland areas area located within the floodway and flood fringe of Lyle Creek.

APPENDIX 2. Morphological Summary and Data Plots

Appendix 2. Morphological Summary Data and Plots
Table 5a. Baseline Stream Data Summary
Lyle Creek Mitigation Site (EEP Project No. 94643)
UT1 Reaches 1 and 2
Monitoring Year 0 of 5

Parameter	Gauge	Regional Curve									Pre-Restoration Condition[1]						Reference Reach Data								Design						As-Built/Baseline					
		UT1 Reach 1			UT1 Reach 2			UT1 Reach 3			Reach 1		Reach 2		Reach 3		UT to Lyle Creek		UT to Catawba River		UT to Lake Wheeler		Westbrook Lowlands		UT1 Reach 1 Upper		UT1 Reach 1 Lower		UT1 Reach 2		UT1 Reach 1 Upper		UT1 Reach 1 Lower		UT1 Reach 2	
		LL	UL	Eq.	LL	UL	Eq.	LL	UL	Eq.	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle																																				
Bankfull Width (ft)											23.1	31.5	19.4		10.0		15.2		13.8		10.6		9.7		8.0		15.2		12.4		11.2		12.3		22.4	
Floodprone Width (ft)											43.0	48.0	62.0		34.0		38+		80+		N/A[5]		100+		17.6+		33.4+		27.3+		65.0		62.6		79.6	
Bankfull Mean Depth											0.65		0.93		1.05		0.5		1.5		1.3		0.8		0.6		0.8		0.9		0.3		0.6		0.7	
Bankfull Max Depth											1.1		1.5		1.7		1.4		2.0		2.2		1.1		1.0		1.2		1.4		0.8		1.5		1.7	
Bankfull Cross-sectional Area (ft^2)	n/a										14.9	19.2	18.1		10.5		7.3		20.8		17.4		8.0		4.6		12.4		11.5		3.3		9.0		14.3	
Width/Depth Ratio											35.8	48.8	20.8		9.5		31.7		9.1		6.5		12.0		13.9		18.6		13.4		37.5		16.8		35.0	
Entrenchment Ratio											1.5	1.8	3.2		3.4		2.5+		5.8+		15.7		2.2+		2.2+		2.2+		2.2+		2.2+		2.2+		2.2+	
Bank Height Ratio											1.6	3.0	1.4	2.3	1.7	2.4	1.0		1.0		N/A[5]		1.0		1.0		1.0		1.0		1.0		1.0		1.0	
D50 (mm)											Very Fine Sand		Silt		Silt[2]		Fine Sand		V.Coarse Sand		V. Fine Gravel		Coarse Sand													
Profile																																				
Riffle Length (ft)											-		-		-		-		-		-		-		-	-	-	-	-	-	7	23	10	75	27	47
Riffle Slope (ft/ft)											0.0030	0.0260	0.0033	0.0060	0.0030	0.0110	0.0055	0.0597	0.011	0.03	0.043		N/A[6]		0.0167	0.0283	0.0025	0.0032	0.0000	0.0005	0.0025	0.0598	0.0000	0.0289	0.0020	0.0180
Pool Length (ft)											-		-		-		-		-		-		-		6	32	12	76	19	53	10	39	6	81	15	62
Pool Max Depth (ft)	n/a										1.9	2.3	2.5	5.9	4.1	5.6	1.7		2.9		1.4		1.5		1.2	1.8	1.6	2.4	1.8	2.7	1.2	2.9	1.4	3.6	2.1	3.4
Pool Spacing (ft)*											2.2	3.2	2.5	5.9	4.1	5.6	15	28	31	60	42		16	59	14.0	41.0	55.6	114.2	62.2	96.1	23	49	51	131	48	99
Pool Volume (ft^3)																																				
Pattern																																				
Channel Beltwidth (ft)											N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	21		55		26	64	14	20	N/A	N/A	36	78	41	65	N/A	N/A	36	78	41	65
Radius of Curvature (ft)											N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	19	32	31	56	8	34	15	27	N/A	N/A	27	48	27	34	N/A	N/A	27	48	27	34
Rc:Bankfull Width (ft/ft)	n/a										N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	1.3	2.1	2.2	4.1	0.8	3.2	1.5	2.8	N/A	N/A	2	3	2	3	N/A	N/A	2	3	2	3
Meander Wave Length (ft)											N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	39	44	65	107	40	191	50		N/A	N/A	100	166	113	161	N/A	N/A	100	166	113	161
Meander Width Ratio											N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	1.3		4		6	11	1.4	2.1	N/A	N/A	2	5	3	5	N/A	N/A	2	5	3	5
Substrate, Bed and Transport Parameters																																				
Ri%/Ru%/P%/G%/S%																																				
SC%/Sa%/G%/C%/B%/Be%																																				
d16/d35/d50/d84/d95/d100	n/a										0.013/0.08/0.12/0.3/1.2/4.8		0.0016/0.008/0.019/0.13/0.26/0.9		-		n/a/0.1/0.2/0.5/4.0/8.0		0.3/0.4/1.8/12.8/25.2/90.0		N/A		N/A								-		-		-	
Reach Shear Stress (Competency) lb/ft^2											Reach 1 Upper: 0.48, Reach 1 Lower: 0.06, Reach 2: 0.24														0.49		0.07		0.26		-		-		-	
Max part size (mm) mobilized at bankfull											Reach 1 Upper: 30, Reach 1 Lower: 4, Reach 2: 15														30		5		16		-		-		-	
Stream Power (Capacity) W/m^2																																				
Additional Reach Parameters																																				
Drainage Area (SM)											0.10	0.16	0.16	0.35	0.35	0.49	0.25		1.60		0.4		0.9													
Impervious Cover Estimate (%)											5%						-		-		-		-													
Rosgen Classification											$F5^2$		$F6^2$		$G6^2$		C5		E5		E4		E/C5		B5c		C6		C6		Bc		C		C	
Bankfull Velocity (fps)											0.7	0.9	0.8		2.7										3.0		1.2		2.4		-		-		-	
Bankfull Discharge (cfs)		17	24	-	24	42	-	42	52	-	14		15		28		33		119		N/A[7]		N/A[6]		14		15		28							
Q-NFF regression											37		65		79																					
Q-USGS extrapolation	n/a										8	15	15	31	31	49																				
Q-Mannings											-		-		-		-																			
Valley Length (ft)											-		-		-		-		-		-		-		651		2012		692							
Channel Thalweg Length (ft)											4017						-		-		-		-		761		2369		520		700		2558		883	
Sinuosity (ft)											1.2		1.0		1.1		1.7		1.3		1.6		1.2		1.1		1.3		1.3		1.1		1.3		1.3	
Water Surface Slope (ft/ft)											0.012		0.0011		0.0036 [4]		0.0048		0.0046		0.006		0.0022		0.0142		0.0013		0.0047		0.0140		0.0015		0.0047	
Bankfull Slope (ft/ft)											0.012		0.0011		0.0036 [4]		-		-		-		-		0.0142		0.0013		0.0047		0.0140		0.0015		0.0049	

(-): Data was not provided
N/A: Not Applicable

[1]Pre-Restoration Reaches differ from the as-built/baseline reaches.

[2]Channel was straightened, moved, and/or maintained to prevent pattern formation prior to restoration.

[3]The Rosgen classification system is for natural streams. These channels have been heavily manipulated by man and therefore theRosgen classification system is not applicable. These classifications are provided for illustrative purposes only.

[4]UT1 Reach 3 drops down to meet the Lyle Creek water surface elevation, which accounts for a channel slope steeper than the valley slope.

[5]Data not provided in reference reach report (Lowther, 2008).

[6]Data not provided in Neu-Con Umbrella Wetland and Stream Mitigation Bank Westbrook Lowgrounds Site Specific MitigationPlan (Environmental Bank and Exchange, 2002).

[7]Lowther reported a range of possible discharges from 46.8 to 108.9 cfs based on different Manning's 'n' estimation techniques(Lowther, 2008).

Appendix 2. Morphological Summary Data and Plots
Table 5b. Baseline Stream Data Summary
Lyle Creek Mitigation Site (EEP Project No. 94643)
UT1A and UT1B
Monitoring Year 0 of 5

Parameter	Gauge	Regional Curve						Pre-Restoration Condition[1]				Reference Reach Data		Design								As-Built/Baseline									
		UT1A			UT1B			UT1A		UT1B				UT1A Upper		UT1A Lower		UT1B 200+00 to 203+20		UT1B 203+21 to 207+18		UT1B 207+18 to 209+97		UT1A Upper		UT1A Lower		UT1B 200+00 to 203+20		UT1B 203+21 to 207+18		UT1B 207+18 to 209+97	
		LL	UL	Eq.	LL	UL	Eq.	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle																																	
Bankfull Width (ft)	n/a							8.7		16.3		refer to table 5a		6.5				8.0						5.8				4.5					
Floodprone Width (ft)								21.0		42.0				14.3+				11.0+						30.5				67.3					
Bankfull Mean Depth								0.53		0.48				0.5				0.6						0.4				0.5					
Bankfull Max Depth								0.8		1.0				0.8				1.0						0.8				1.0					
Bankfull Cross-sectional Area (ft^2)								4.6		7.9				3.2				5.0						2.1				2.2					
Width/Depth Ratio								16.5		33.6				13.3				12.8						16.0				9.0					
Entrenchment Ratio								2.4		2.6				2.2+				2.2+						2.2+				2.2+					
Bank Height Ratio								0.8		1.0				1.0				1.0						1.0				1.0					
D50 (mm)								Silt[2]		Silt[2]																							
Profile																																	
Riffle Length (ft)	n/a							-	-	-	-	refer to table 5a		-	-	-	-	-	-	-	-	-	-	8	19	10	23	19	31	15	22	10	20
Riffle Slope (ft/ft)								0.0035	0.0320	0.0056	0.0160			0.0350	0.0571	0.0156	0.0192	0.0263	0.0309	0.0145	0.0218	0.0045	0.0079	0.0353	0.0477	0.0086	0.0290	0.0224	0.0593	0.0072	0.0323	0.0032	0.0217
Pool Length (ft)								-	-	-	-			4	14	10	25	18	64	15	22	16	20	5	12	12	34	23	40	17	41	28	42
Pool Max Depth (ft)								1.1		1.6				1.25	1.45	1.05	1.45	1.6	1.8	1.2	1.8	1.4	1.7	1.0	1.9	1.2	1.9	1.2	2.1	1.3	2.4	1.9	2.2
Pool Spacing (ft)								35	68	28	87			13	30	31	52	49	63	37	58	49	57	4	33	29	90	43	71	34	61	46	66
Pool Volume (ft^3)																																	
Pattern																																	
Channel Beltwidth (ft)	n/a							N/A[2]	N/A[2]	N/A[2]	N/A[2]	refer to table 5a		N/A	N/A	25	35	35	39	23	39	29	41	N/A	N/A	25	35	35	39	23	39	29	41
Radius of Curvature (ft)								N/A[2]	N/A[2]	N/A[2]	N/A[2]			N/A	N/A	14	20	19	27	16	26	19	26	N/A	N/A	14	20	19	27	16	26	19	26
Rc:Bankfull Width (ft/ft)								N/A[2]	N/A[2]	N/A[2]	N/A[2]			N/A	N/A	2	3	2	3	2	3	2	3	N/A	N/A	2	3	2	3	2	3	2	3
Meander Wave Length (ft)								N/A[2]	N/A[2]	N/A[2]	N/A[2]			N/A	N/A	53	82	83	106	78	86	79	90	N/A	N/A	53	82	83	106	78	86	79	90
Meander Width Ratio								N/A[2]	N/A[2]	N/A[2]	N/A[2]			N/A	N/A	4	5	4	5	3	5	4	5	N/A	N/A	4	5	4	5	3	5	4	5
Substrate, Bed and Transport Parameters																																	
Ri%/Ru%/P%/G%/S%	n/a											refer to table 5a																					
SC%/Sa%/G%/C%/B%/Be%																																	
d16/d35/d50/d84/d95/d100								-		-														N/A									
Reach Shear Stress (Competency) lb/ft^2								0.35		0.06				0.84		0.28		0.6		0.32		0.12		-									
Max part size (mm) mobilized at bankfull								20		4				60		17		38		20		7		-									
Stream Power (Capacity) W/m^2																																	
Additional Reach Parameters																																	
Drainage Area (SM)	n/a							0.05		0.13		refer to table 5a																					
Impervious Cover Estimate (%)																																	
Rosgen Classification								F6[3]		F6[3]				B6		C6		C6						C				E					
Bankfull Velocity (fps)								2.0		1.6				2.8				2.6						-				-					
Bankfull Discharge (cfs)								8		13				9				13															
Q-NFF regression								-		-																							
Q-USGS extrapolation								4	9	10	18																						
Q-Mannings								-		-																							
Valley Length (ft)								-		-				190		352		279		326		227											
Channel Thalweg Length (ft)								1141		890				201		414		320		398		279		201		414		320		398		279	
Sinuosity (ft)								1.0		1.0				1.1		1.2		1.1		1.2		1.2		1.1		1.2		1.1		1.2		1.2	
Water Surface Slope (ft/ft)								0.0106		0.0085				0.0284		0.0095		0.0131		0.0086		0.0032		0.0296		0.0089		0.0187		0.0080		0.0039	
Bankfull Slope (ft/ft)								0.0106		0.0085				0.0284		0.0095		0.0161		0.0086		0.0032		0.0294		0.0091		0.0190		0.0079		0.0039	

(-): Data was not provided
N/A: Not Applicable

[1]Pre-Restoration Reaches differ from the as-built/baseline reaches.

[2]Channel was straightened, moved, and/or maintained to prevent pattern formation prior to restoration.

[3]The Rosgen classification system is for natural streams. These channels have been heavily manipulated by man and therefore theRosgen classification system is not applicable. These classifications are provided for illustrative purposes only.

[4]UT1 Reach 3 drops down to meet the Lyle Creek water surface elevation, which accounts for a channel slope steeper than the valley slope

[5]Data not provided in reference reach report (Lowther, 2008).

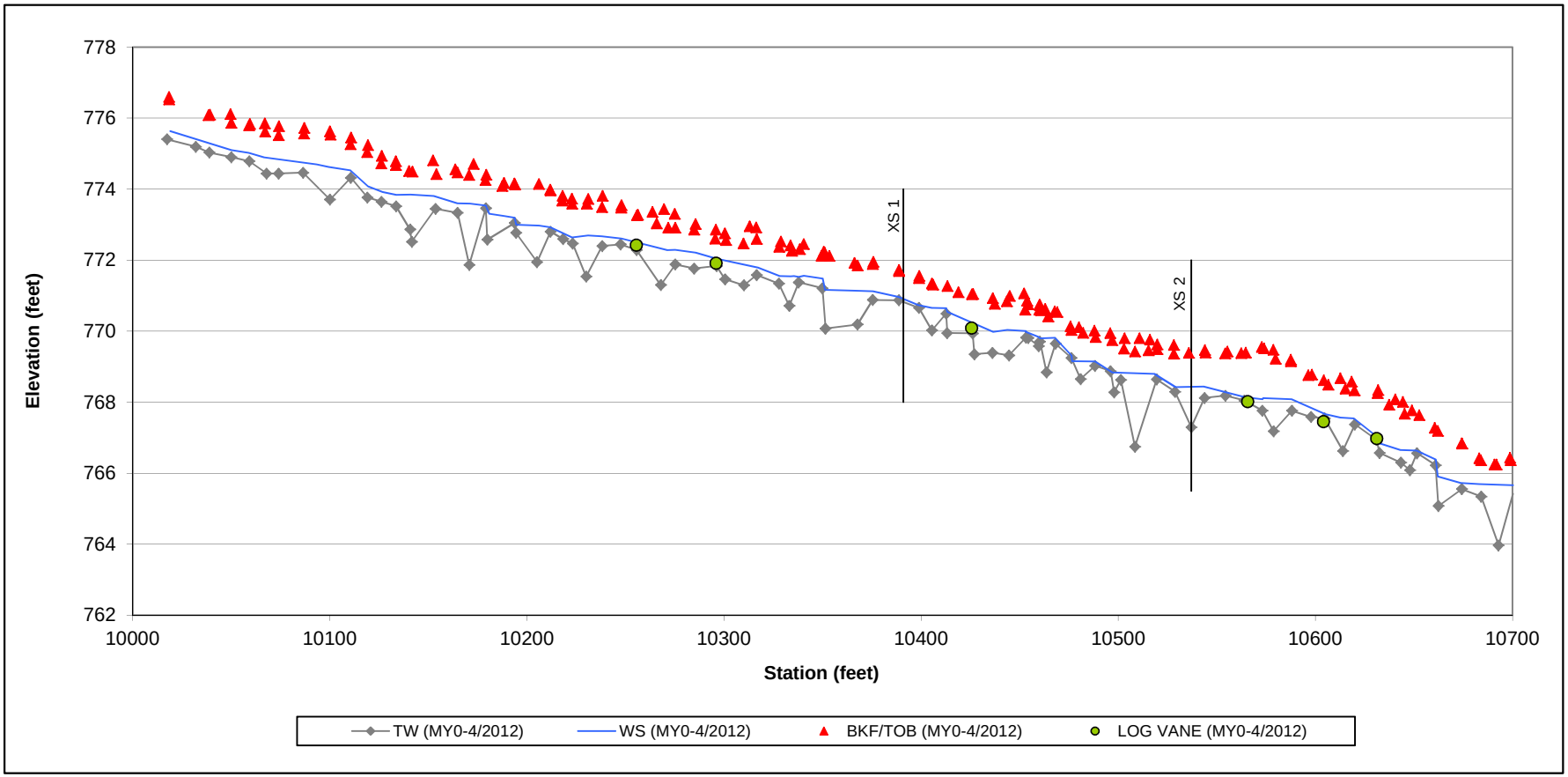
[6]Data not provided in Neu-Con Umbrella Wetland and Stream Mitigation Bank Westbrook Lowgrounds Site Specific MitigationPlan (Environmental Bank and Exchange, 2002).

[7]Lowther reported a range of possible discharges from 46.8 to 108.9 cfs based on different Manning's 'n' estimation techniques(Lowther, 2008).

Appendix 2. Morphological Summary Data and Plots
Table 6. Morphology and Hydraulic Monitoring Summary (Dimensional Parameters - Cross-Section)
Lyle Creek Mitigation Site (EEP Project No. 94643)
UT1 Reaches 1 and 2, UT1A and UT1B
Monitoring Year 0 of 5

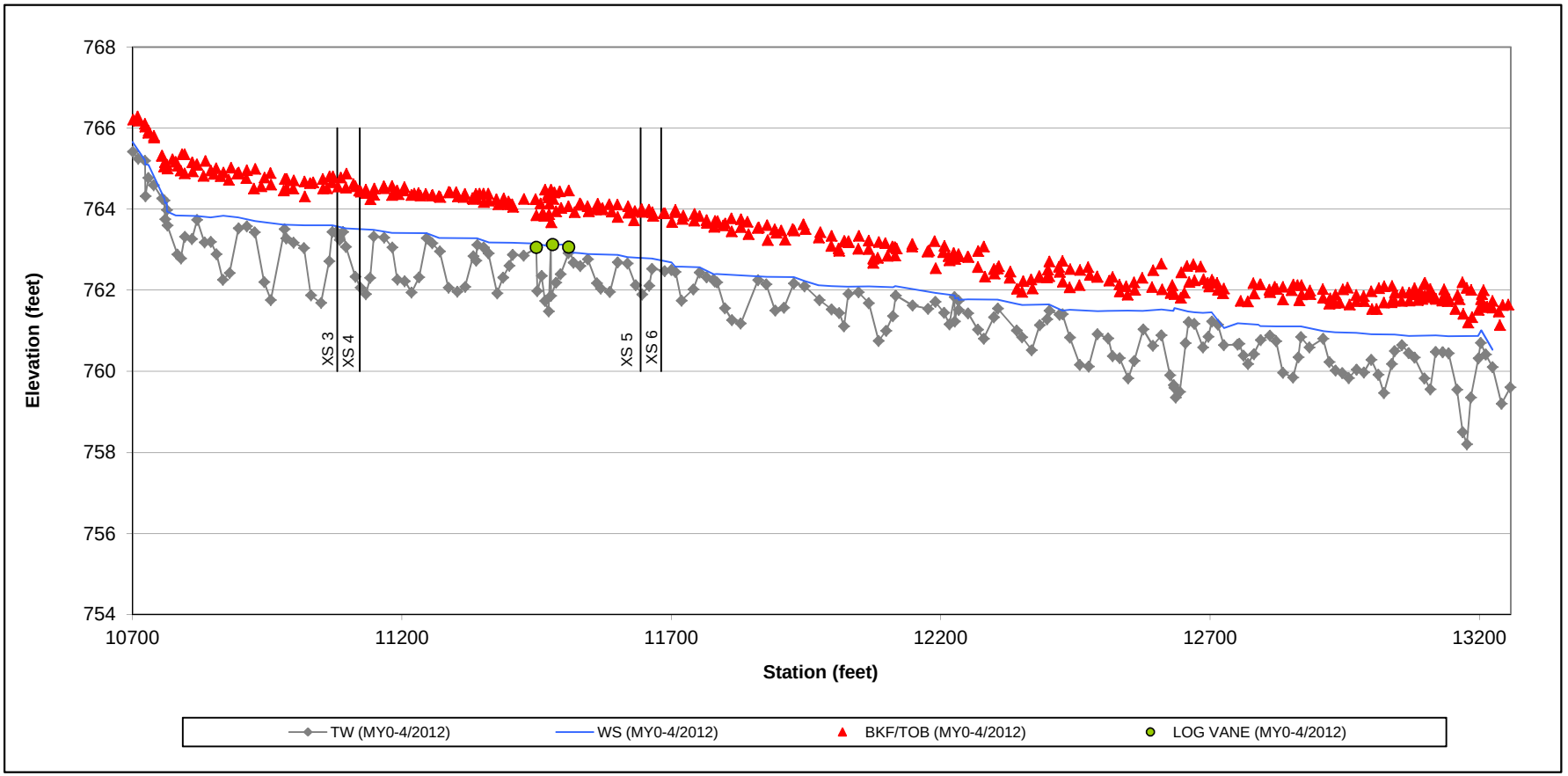
	UT1 Reach 1 Upper												UT1 Reach 1 Lower											
	Cross-Section 1 (Riffle)						Cross-Section 2 (Pool)						Cross-Section 3 (Riffle)						Cross-Section 4 (Pool)					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation																								
Bankfull Width (ft)	11.2						13.6						22.4						20.7					
Floodprone Width (ft)	65.0						N/A						62.6						N/A					
Bankfull Mean Depth (ft)	0.3						1.0						0.6						1.1					
Bankfull Max Depth (ft)	0.8						2.4						1.7						2.4					
Bankfull Cross-Sectional Area (ft^2)	3.3						14.2						14.3						22.5					
Bankfull Width/Depth Ratio	37.5						13.0						35.0						19.0					
Bankfull Entrenchment Ratio	2.2+						N/A						2.2+						N/A					
Bankfull Bank Height Ratio	1.0						1.0						1.0						1.0					
	UT1 Reach 1 Lower												UT1 Reach 2											
	Cross-Section 5 (Pool)						Cross-Section 6 (Riffle)						Cross-Section 7 (Riffle)						Cross-Section 8 (Pool)					
based on fixed bankfull elevation	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
Bankfull Width (ft)	16.6						12.3						14.7						22.1					
Floodprone Width (ft)	N/A						79.6						69.7						N/A					
Bankfull Mean Depth (ft)	1.0						0.7						0.8						1.2					
Bankfull Max Depth (ft)	2.1						1.5						1.8						2.9					
Bankfull Cross-Sectional Area (ft^2)	16.5						9.0						12.3						27.0					
Bankfull Width/Depth Ratio	16.7						16.8						17.6						18.1					
Bankfull Entrenchment Ratio	N/A						2.2+						2.2+						N/A					
Bankfull Bank Height Ratio	1.0						1.0						1.0						1.0					
	UT1A												UT1B											
	Cross-Section 9 (Riffle)						Cross-Section 10 (Pool)						Cross-Section 11 (Riffle)						Cross-Section 12 (Pool)					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation																								
Bankfull Width (ft)	5.8						6.3						4.5						7.8					
Floodprone Width (ft)	30.5						N/A						67.3						N/A					
Bankfull Mean Depth (ft)	0.4						0.5						0.5						0.6					
Bankfull Max Depth (ft)	0.8						1.0						1.0						1.2					
Bankfull Cross-Sectional Area (ft^2)	2.1						2.9						2.2						4.6					
Bankfull Width/Depth Ratio	16.0						13.6						9.0						13.1					
Bankfull Entrenchment Ratio	2.2+						N/A						2.2+						N/A					
Bankfull Bank Height Ratio	1.0						1.0						1.0						1.0					

Appendix 2. Morphological Summary Data and Plots
Figure 3a. Longitudinal Profile Plots
Lyle Creek Mitigation Site (EEP Project No. 94643)
UT1 Reach 1 Upper
Monitoring Year 0 of 5



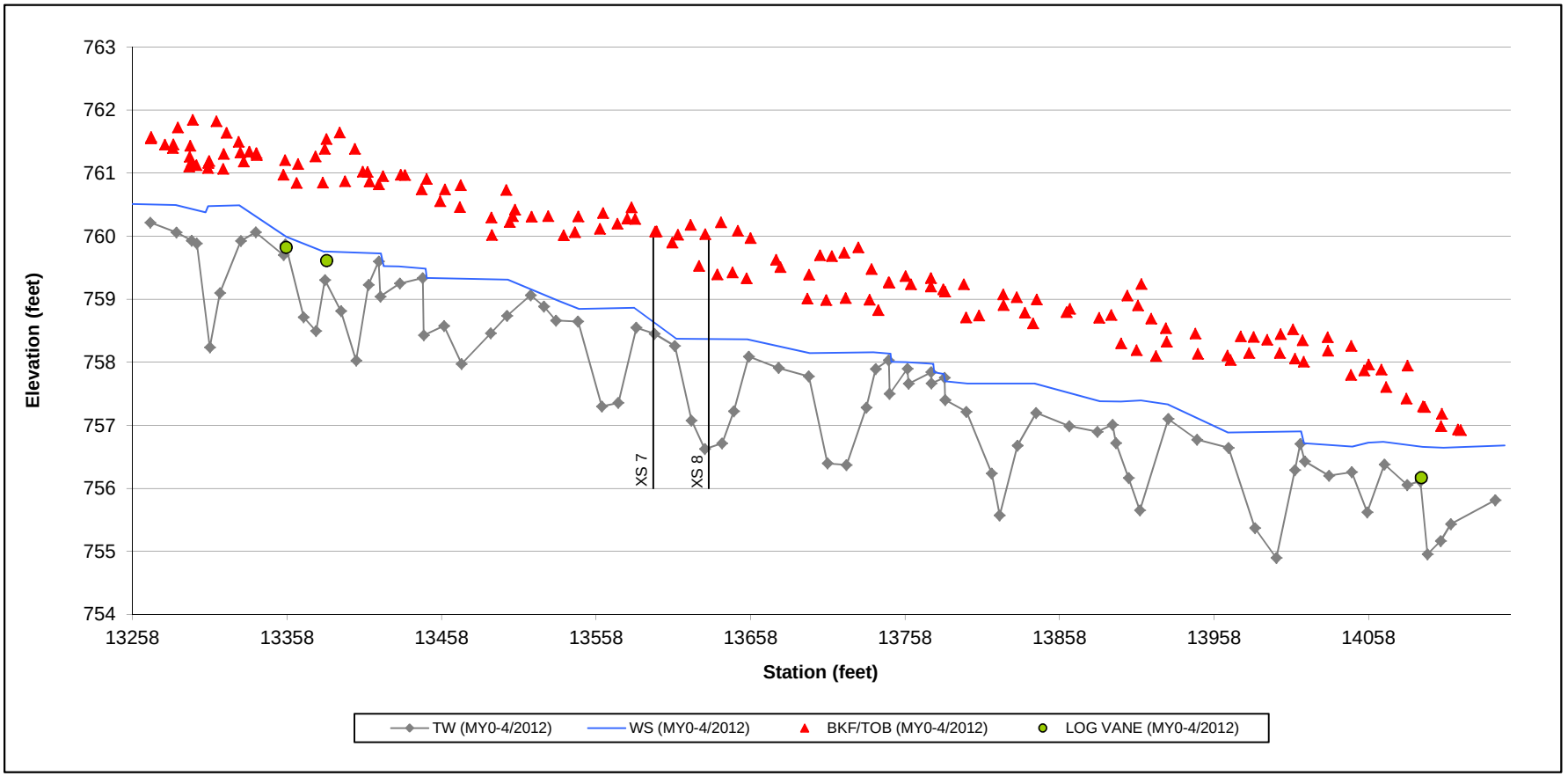
BKF=-0.014*STA+916.38
WS=-0.014*STA+917.57

Appendix 2. Morphological Summary Data and Plots
Figure 3b. Longitudinal Profile Plots
Lyle Creek Mitigation Site (EEP Project No. 94643)
UT1 Reach 1 Lower
Monitoring Year 0 of 5



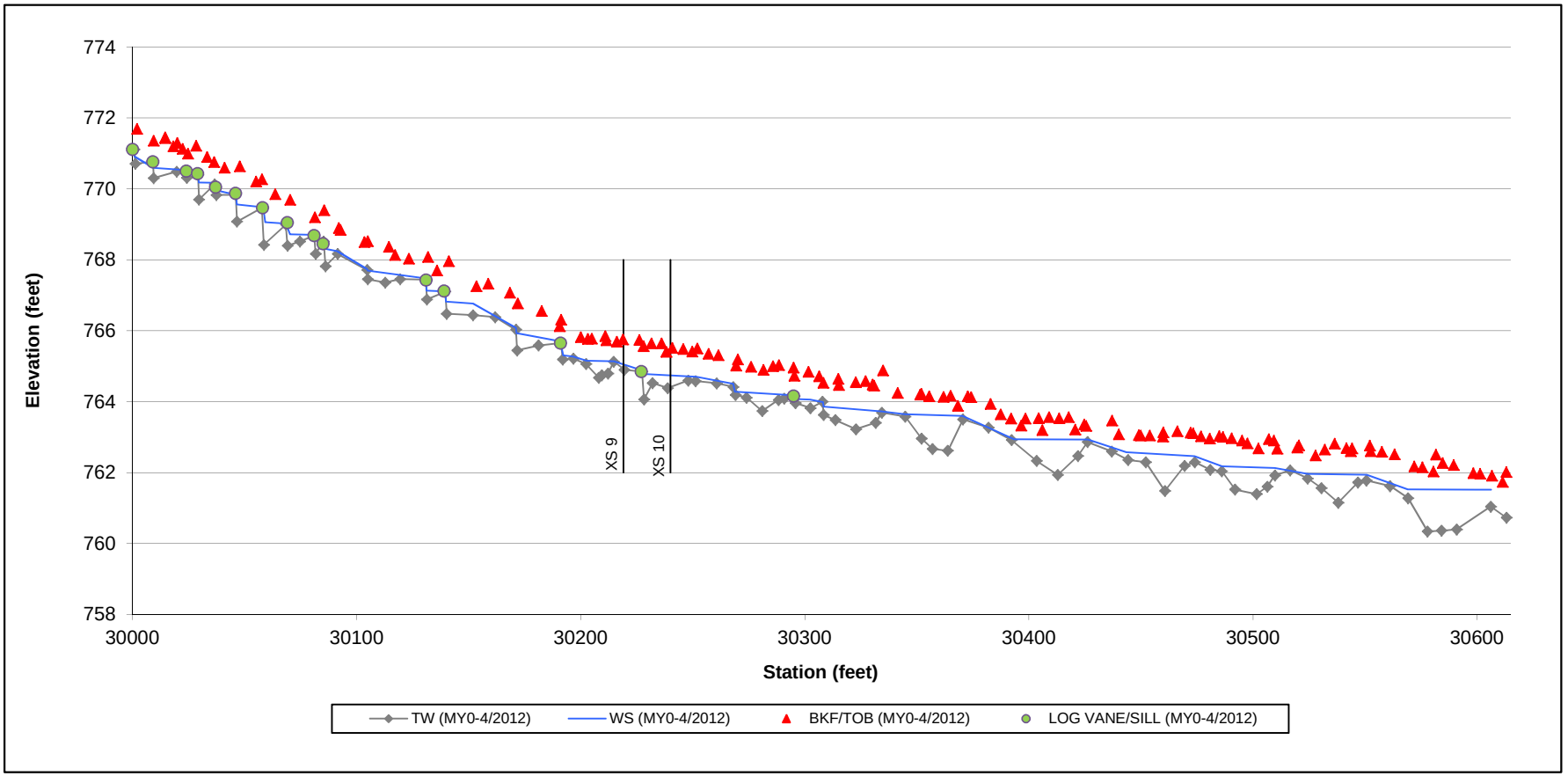
BKF=-0.0015*STA+781.59
WS=-0.0015*STA+779.83

Appendix 2. Morphological Summary Data and Plots
Figure 3c. Longitudinal Profile Plots
Lyle Creek Mitigation Site (EEP Project No. 94643)
UT1 Reach 2
Monitoring Year 0 of 5



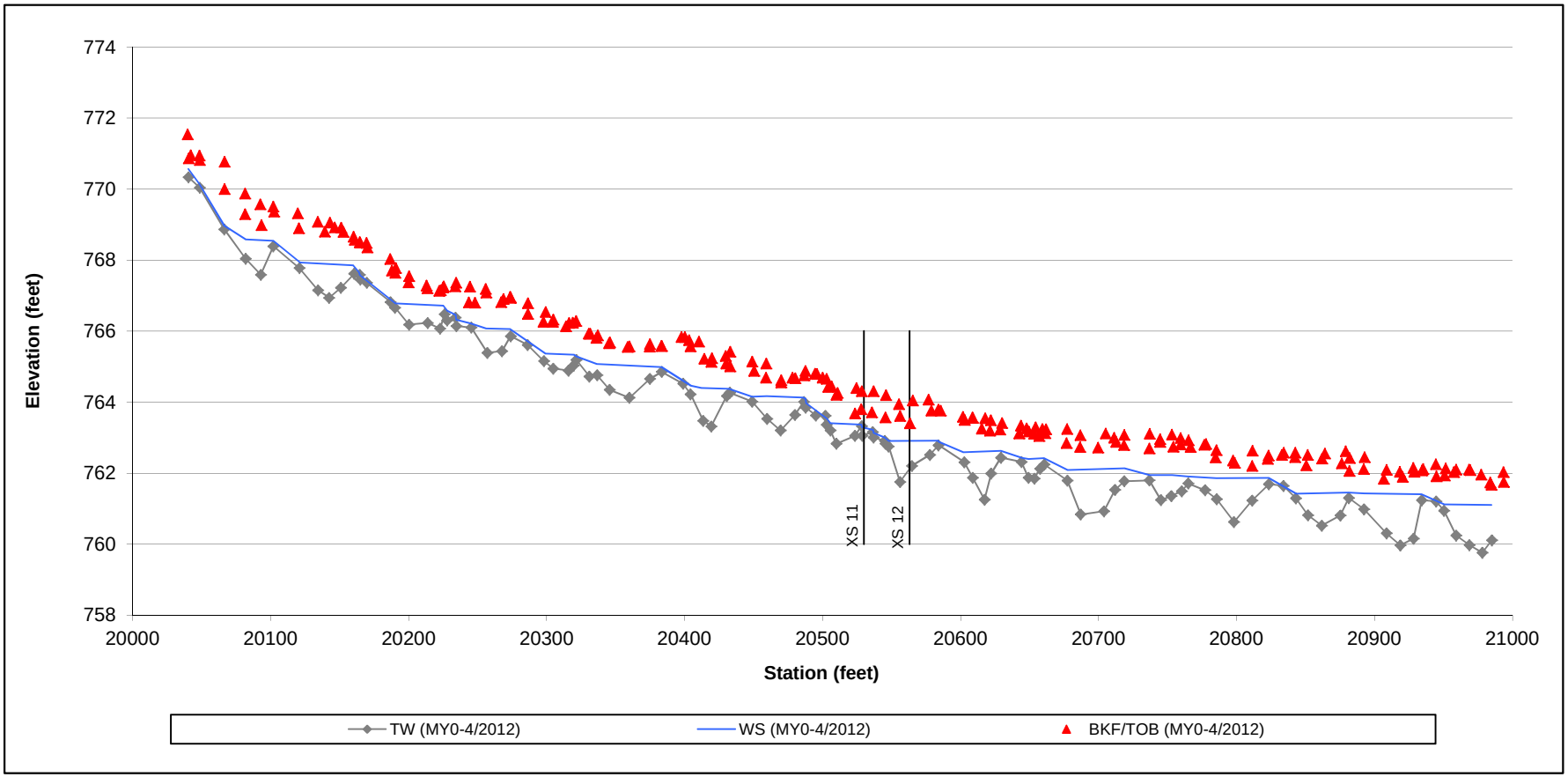
BKF=-0.0049*STA+826.16
WS=-0.0047*STA+822.45

Appendix 2. Morphological Summary Data and Plots
Figure 3d. Longitudinal Profile Plots
Lyle Creek Mitigation Site (EEP Project No. 94643)
UT1A
Monitoring Year 0 of 5



BKF=-0.0149*STA+1217.6
WS=-0.0164*STA+1261.1

Appendix 2. Morphological Summary Data and Plots
Figure 3e. Longitudinal Profile Plots
Lyle Creek Mitigation Site (EEP Project No. 94643)
UT1B
Monitoring Year 0 of 5



BKF=-0.0087*STA+942.82
WS=-0.0092*STA+952.24

Appendix 2. Morphological Summary Data and Plots
Figure 4a. Cross-Section Plots
Lyle Creek Mitigation Site (EEP Project No. 94643)
UT1 Reach 1 Upper, Cross-Section 1 (Riffle)
Monitoring Year 0 of 5

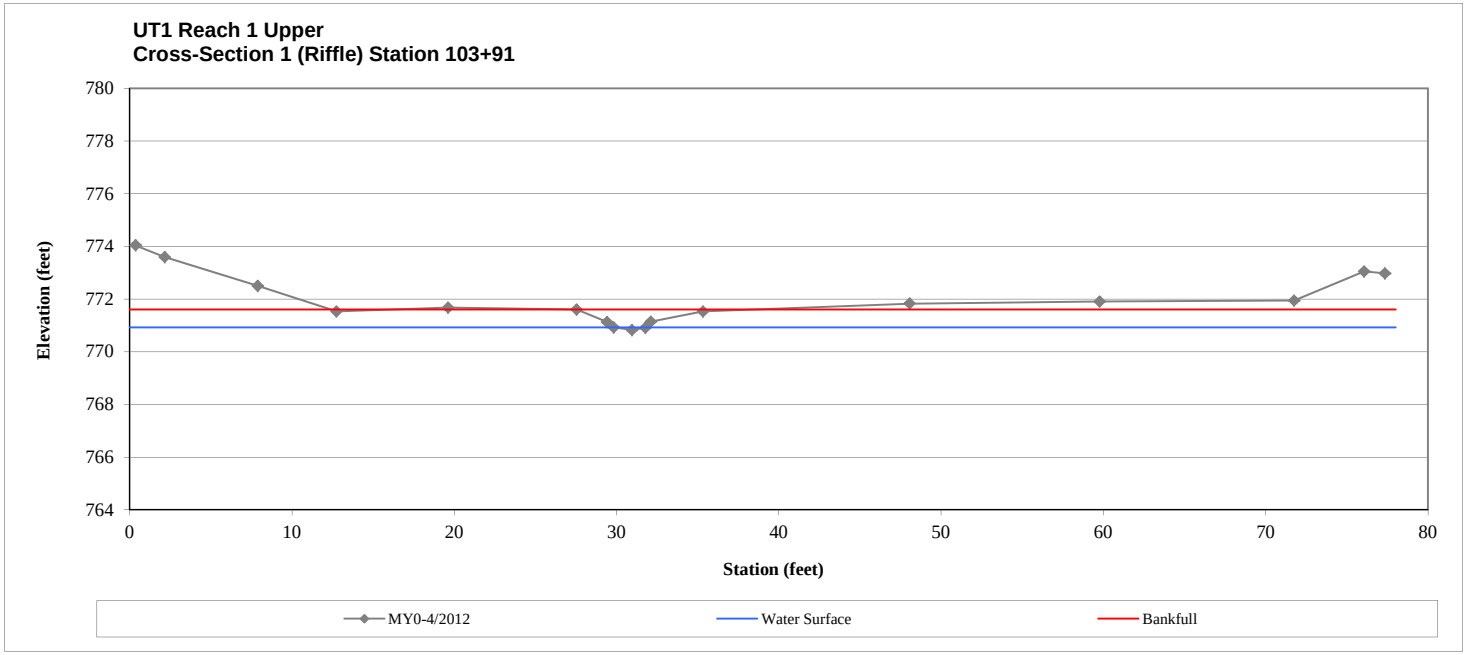
River Basin	Catawba 03050101
Watershed	NCDWQ Subbasin 03-08-32
XS ID	1
Drainage Area	315 Acres
Date	4/2012
Field Crew	Dewberry

Summary Data	
Bankfull Elevation (ft)	771.6
Bankfull Cross-Sectional Area (ft2)	3.3
Bankfull Width (ft)	11.2
Flood Prone Area Elevation (ft)	772.4
Flood Prone Width (ft)	65.0
Max Depth at Bankfull (ft)	0.8
Mean Depth at Bankfull (ft)	0.3
W/D Ratio	37.5
Entrenchment Ratio	2.2+
Bank Height Ratio	1.0
Stream Type	Bc

Cross-Section 1: View Upstream (5/2/2012)

Cross-Section 1: View Downstream (5/2/2012)

Station	Elevation	Station	Elevation
0.36	774.04		
2.15	773.59		
7.89	772.51		
12.75	771.53		
19.63	771.68		
27.55	771.61		
29.42	771.13		
29.84	770.93		
30.96	770.83		
31.79	770.92		
32.12	771.14		
35.32	771.53		
48.07	771.83		
59.77	771.91		
71.76	771.95		
76.06	773.05		
77.36	772.98		



Appendix 2. Morphological Summary Data and Plots
Figure 4b. Cross-Section Plots
Lyle Creek Mitigation Site (EEP Project No. 94643)
UT1 Reach 1 Upper, Cross-Section 2 (Pool)
Monitoring Year 0 of 5

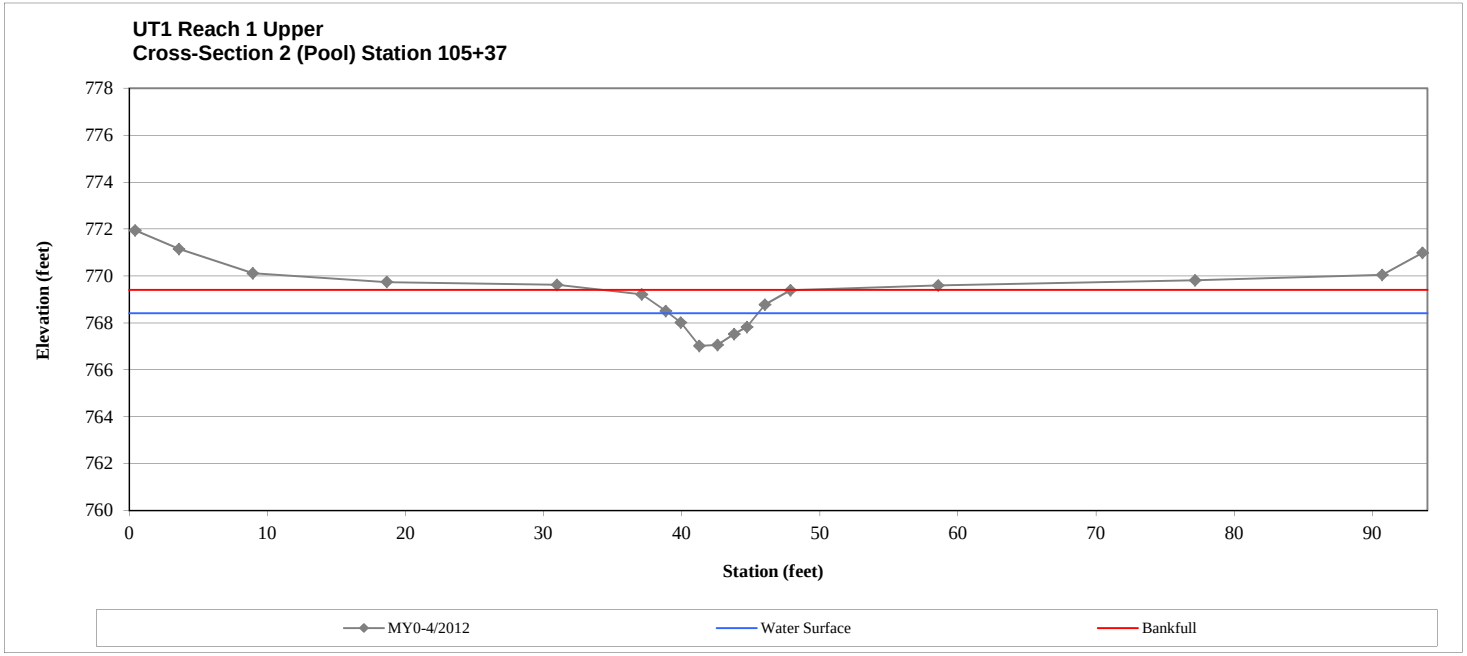
River Basin	Catawba 03050101
Watershed	NCDWQ Subbasin 03-08-32
XS ID	2
Drainage Area	315 Acres
Date	4/2012
Field Crew	Dewberry

Summary Data	
Bankfull Elevation (ft)	769.4
Bankfull Cross-Sectional Area (ft2)	14.2
Bankfull Width (ft)	13.6
Flood Prone Area Elevation (ft)	N/A
Flood Prone Width (ft)	N/A
Max Depth at Bankfull (ft)	2.4
Mean Depth at Bankfull (ft)	1.0
W/D Ratio	13.0
Entrenchment Ratio	N/A
Bank Height Ratio	1.0
Stream Type	N/A

Cross-Section 2: View Upstream (5/2/2012)

Cross-Section 2: View Downstream (5/2/2012)

Station	Elevation	Station	Elevation
0.43	771.94		
3.60	771.15		
8.96	770.11		
18.66	769.74		
30.98	769.63		
37.11	769.22		
38.85	768.51		
39.93	768.01		
41.28	767.02		
42.60	767.06		
43.80	767.52		
44.72	767.83		
46.03	768.78		
47.89	769.40		
58.58	769.59		
77.18	769.81		
90.72	770.05		
93.65	770.99		



Appendix 2. Morphological Summary Data and Plots
Figure 4c. Cross-Section Plots
Lyle Creek Mitigation Site (EEP Project No. 94643)
UT1 Reach 1 Lower, Cross-Section 3 (Riffle)
Monitoring Year 0 of 5

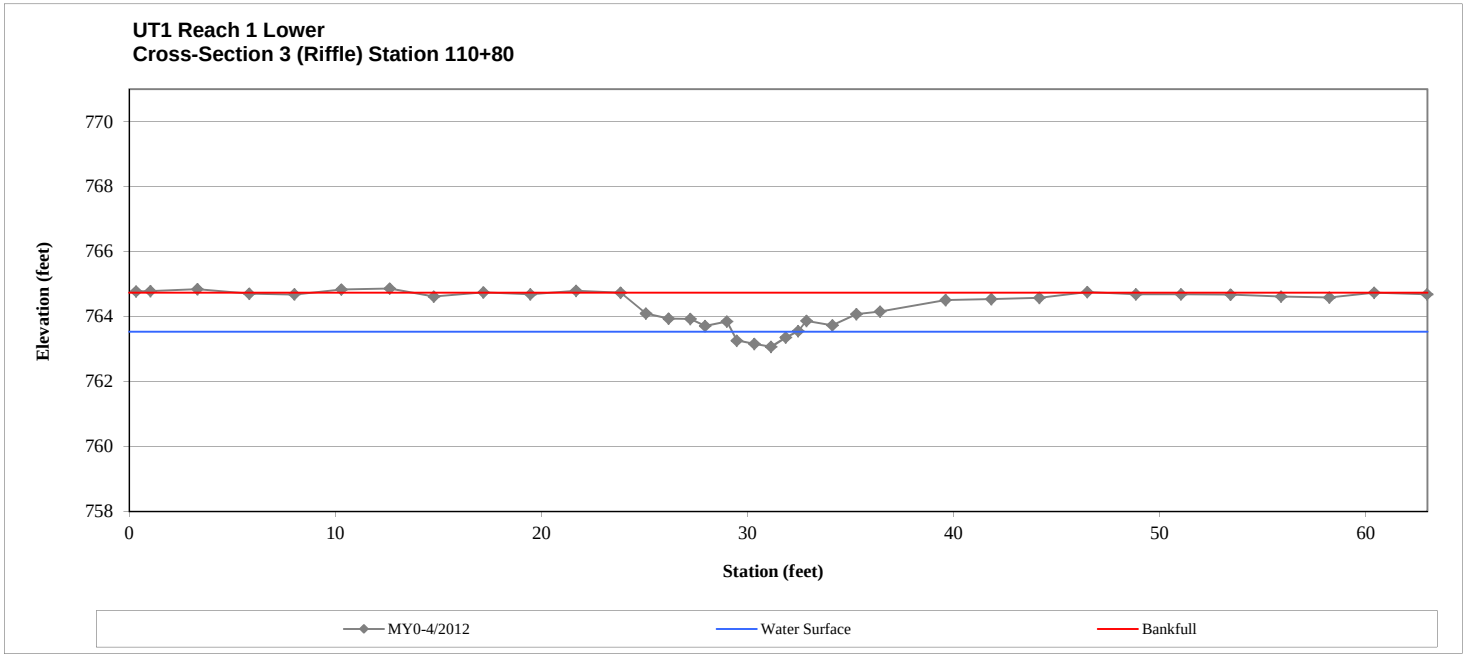
River Basin	Catawba 03050101
Watershed	NCDWQ Subbasin 03-08-32
XS ID	3
Drainage Area	315 Acres
Date	4/2012
Field Crew	Dewberry

Summary Data	
Bankfull Elevation (ft)	764.7
Bankfull Cross-Sectional Area (ft2)	14.3
Bankfull Width (ft)	22.4
Flood Prone Area Elevation (ft)	766.4
Flood Prone Width (ft)	62.6
Max Depth at Bankfull (ft)	1.7
Mean Depth at Bankfull (ft)	0.6
W/D Ratio	35.0
Entrenchment Ratio	2.2+
Bank Height Ratio	1.0
Stream Type	C

Cross-Section 3: View Upstream (5/2/2012)

Cross-Section 3: View Downstream (5/2/2012)

Station	Elevation	Station	Elevation
0.33	764.78	35.29	764.08
1.04	764.78	36.43	764.15
3.31	764.84	39.62	764.51
5.83	764.71	41.84	764.54
8.02	764.68	44.17	764.58
10.30	764.83	46.50	764.75
12.64	764.86	48.85	764.69
14.78	764.62	51.04	764.69
17.19	764.75	53.45	764.68
19.47	764.69	55.90	764.62
21.69	764.79	58.25	764.59
23.85	764.74	60.41	764.73
25.08	764.09	62.97	764.69
26.18	763.93		
27.24	763.93		
27.95	763.71		
29.00	763.84		
29.48	763.26		
30.34	763.16		
31.15	763.07		
31.86	763.35		
32.47	763.55		
32.86	763.87		
34.12	763.73		



Appendix 2. Morphological Summary Data and Plots
Figure 4d. Cross-Section Plots
Lyle Creek Mitigation Site (EEP Project No. 94643)
UT1 Reach 1 Lower, Cross-Section 4 (Pool)
Monitoring Year 0 of 5

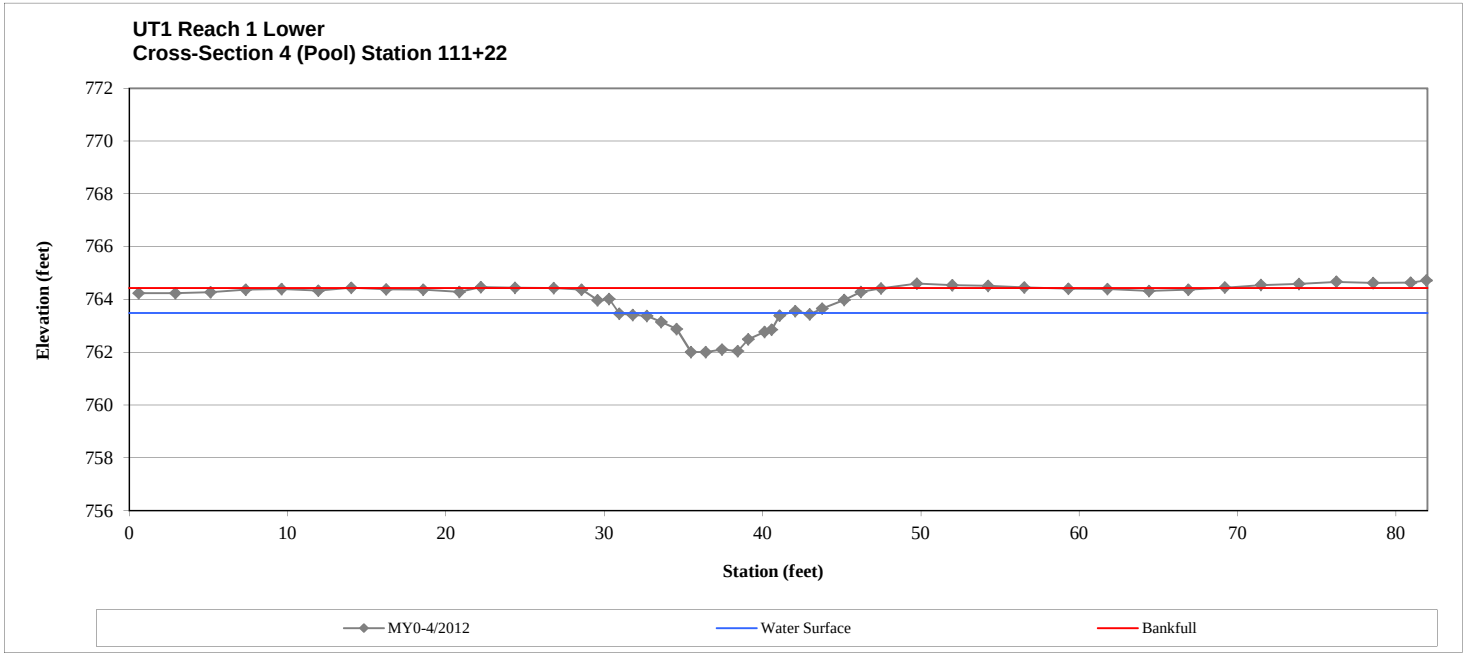
River Basin	Catawba 03050101
Watershed	NCDWQ Subbasin 03-08-32
XS ID	4
Drainage Area	315 Acres
Date	4/2012
Field Crew	Dewberry

Summary Data	
Bankfull Elevation (ft)	764.4
Bankfull Cross-Sectional Area (ft2)	22.5
Bankfull Width (ft)	20.7
Flood Prone Area Elevation (ft)	N/A
Flood Prone Width (ft)	N/A
Max Depth at Bankfull (ft)	2.4
Mean Depth at Bankfull (ft)	1.1
W/D Ratio	19.0
Entrenchment Ratio	N/A
Bank Height Ratio	1.0
Stream Type	N/A

Cross-Section 4: View Upstream (5/2/2012)

Cross-Section 4: View Downstream (5/2/2012)

Station	Elevation	Station	Elevation
0.60	764.24	39.10	762.49
2.91	764.24	40.13	762.77
5.14	764.27	40.58	762.86
7.36	764.38	41.09	763.40
9.62	764.40	42.07	763.56
11.94	764.34	42.99	763.44
14.03	764.45	43.77	763.66
16.23	764.38	45.17	763.98
18.58	764.37	46.22	764.29
20.85	764.29	47.49	764.42
22.21	764.47	49.75	764.60
24.38	764.44	51.99	764.54
26.82	764.43	54.26	764.52
28.57	764.37	56.54	764.46
29.59	763.97	59.33	764.41
30.31	764.02	61.78	764.39
30.97	763.47	64.41	764.33
31.80	763.42	66.89	764.37
32.69	763.38	69.21	764.45
33.61	763.15	71.49	764.55
34.57	762.89	73.89	764.59
35.49	762.01	76.25	764.67
36.41	762.01	78.57	764.63
37.45	762.10	80.94	764.64
38.43	762.05	81.94	764.72



Appendix 2. Morphological Summary Data and Plots
Figure 4e. Cross-Section Plots
Lyle Creek Mitigation Site (EEP Project No. 94643)
UT1 Reach 1 Lower, Cross-Section 5 (Pool)
Monitoring Year 0 of 5

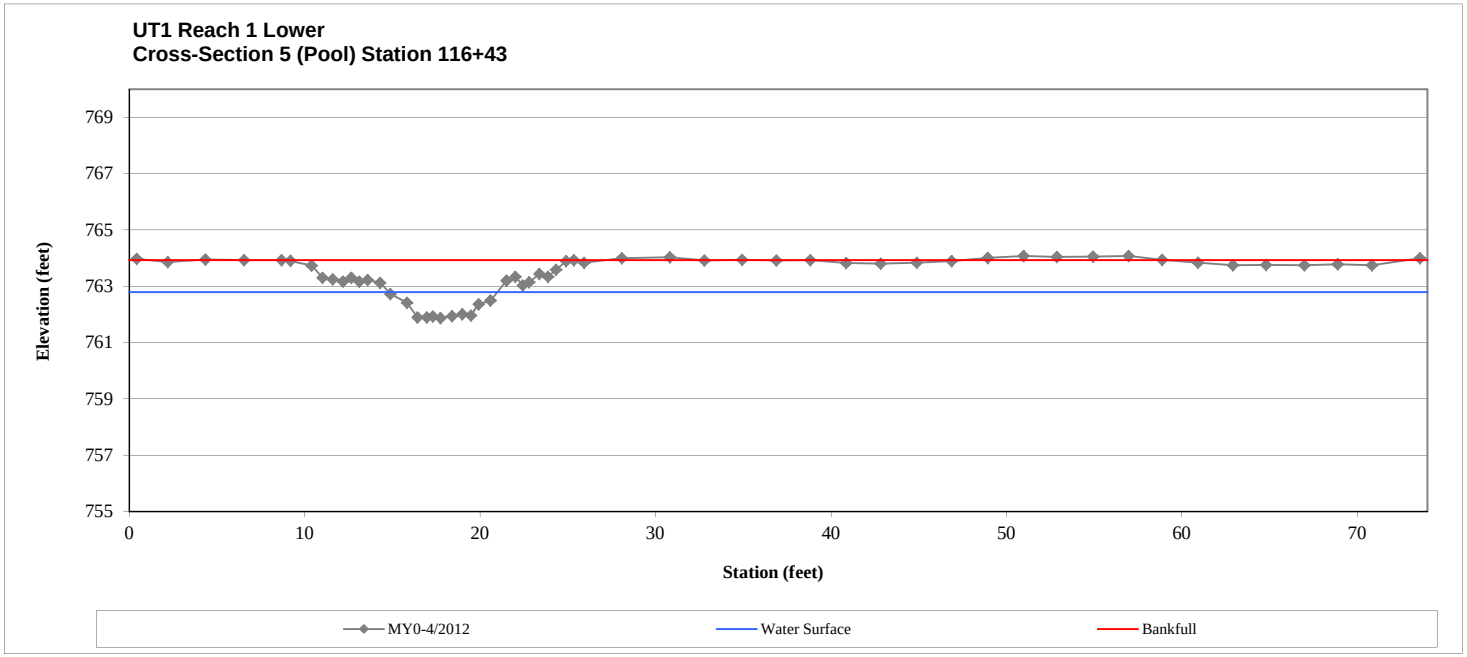
River Basin	Catawba 03050101
Watershed	NCDWQ Subbasin 03-08-32
XS ID	5
Drainage Area	315 Acres
Date	4/2012
Field Crew	Dewberry

Summary Data	
Bankfull Elevation (ft)	763.9
Bankfull Cross-Sectional Area (ft2)	16.5
Bankfull Width (ft)	16.6
Flood Prone Area Elevation (ft)	N/A
Flood Prone Width (ft)	N/A
Max Depth at Bankfull (ft)	2.1
Mean Depth at Bankfull (ft)	1.0
W/D Ratio	16.7
Entrenchment Ratio	N/A
Bank Height Ratio	1.0
Stream Type	N/A

Cross-Section 5: View Upstream (5/2/2012)

Cross-Section 5: View Downstream (5/2/2012)

Station	Elevation	Station	Elevation
0.42	763.98	23.38	763.45
2.20	763.86	23.87	763.34
4.35	763.95	24.33	763.59
6.55	763.93	24.92	763.89
8.69	763.93	25.35	763.92
9.19	763.90	25.94	763.84
10.41	763.73	28.08	764.00
11.02	763.30	30.82	764.03
11.61	763.24	32.79	763.92
12.19	763.17	34.94	763.94
12.67	763.31	36.89	763.92
13.12	763.16	38.82	763.93
13.60	763.22	40.86	763.83
14.31	763.12	42.83	763.80
14.89	762.73	44.90	763.83
15.83	762.42	46.88	763.90
16.43	761.89	48.95	764.01
16.96	761.89	50.99	764.08
17.31	761.93	52.88	764.04
17.74	761.88	54.94	764.05
18.40	761.94	56.97	764.08
18.98	762.01	58.87	763.94
19.48	761.96	60.92	763.84
19.92	762.37	62.91	763.75
20.60	762.50	64.81	763.75
21.50	763.20	66.99	763.74
22.02	763.34	68.88	763.78
22.44	763.03	70.84	763.75
22.80	763.14	73.57	764.00



Appendix 2. Morphological Summary Data and Plots
Figure 4f. Cross-Section Plots
Lyle Creek Mitigation Site (EEP Project No. 94643)
UT1 Reach 1 Lower, Cross-Section 6 (Riffle)
Monitoring Year 0 of 5

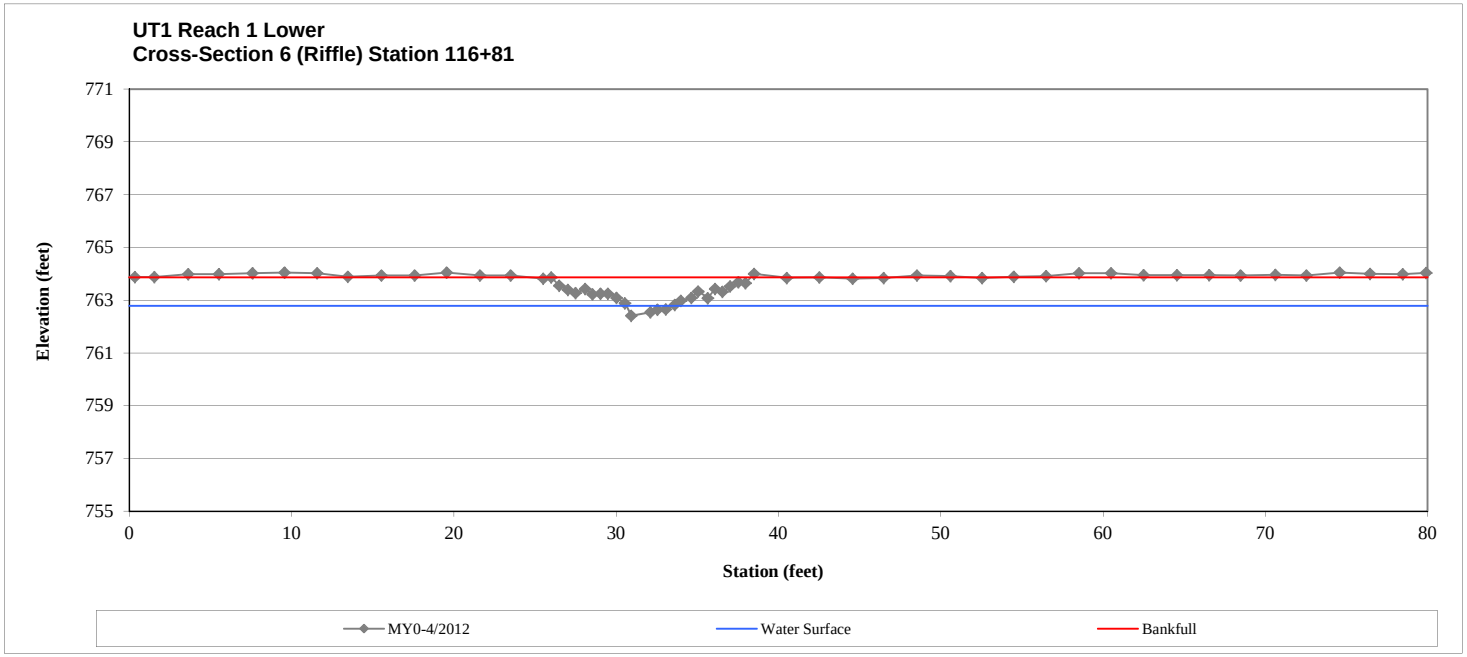
River Basin	Catawba 03050101
Watershed	NCDWQ Subbasin 03-08-32
XS ID	6
Drainage Area	315 Acres
Date	4/2012
Field Crew	Dewberry

Summary Data	
Bankfull Elevation (ft)	763.9
Bankfull Cross-Sectional Area (ft2)	9.0
Bankfull Width (ft)	12.3
Flood Prone Area Elevation (ft)	765.3
Flood Prone Width (ft)	79.6
Max Depth at Bankfull (ft)	1.5
Mean Depth at Bankfull (ft)	0.7
W/D Ratio	16.8
Entrenchment Ratio	2.2+
Bank Height Ratio	1.0
Stream Type	C

Cross-Section 6: View Upstream (5/2/2012)

Cross-Section 6: View Downstream (5/2/2012)

Station	Elevation	Station	Elevation
0.34	763.88	34.64	763.09
1.54	763.88	35.06	763.33
3.63	763.98	35.65	763.08
5.52	763.98	36.10	763.43
7.59	764.02	36.56	763.32
9.56	764.04	37.02	763.53
11.58	764.02	37.53	763.68
13.47	763.89	37.98	763.65
15.55	763.94	38.50	764.00
17.60	763.94	40.52	763.85
19.56	764.05	42.52	763.87
21.61	763.94	44.58	763.82
23.51	763.94	46.49	763.84
25.51	763.82	48.54	763.94
26.00	763.87	50.60	763.91
26.49	763.55	52.55	763.84
27.04	763.40	54.50	763.89
27.51	763.27	56.50	763.91
28.10	763.42	58.52	764.03
28.55	763.22	60.50	764.03
29.05	763.25	62.50	763.94
29.50	763.25	64.56	763.95
30.03	763.09	66.54	763.95
30.55	762.88	68.49	763.94
30.94	762.41	70.62	763.97
32.11	762.54	72.55	763.94
32.56	762.64	74.59	764.05
33.07	762.65	76.46	764.00
33.61	762.82	78.47	763.99
33.98	762.98	79.91	764.04



Appendix 2. Morphological Summary Data and Plots
Figure 4g. Cross-Section Plots
Lyle Creek Mitigation Site (EEP Project No. 94643)
UT1 Reach 2, Cross-Section 7 (Riffle)
Monitoring Year 0 of 5

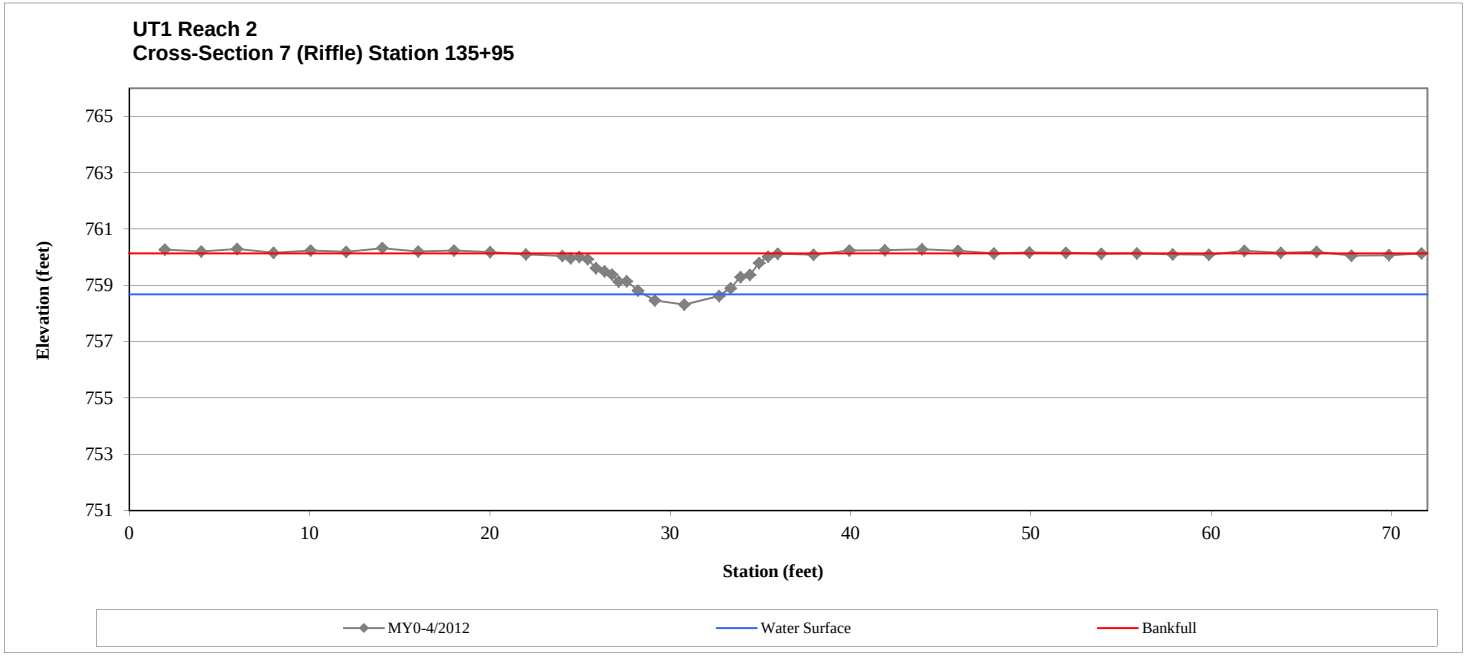
River Basin	Catawba 03050101
Watershed	NCDWQ Subbasin 03-08-32
XS ID	7
Drainage Area	315 Acres
Date	4/2012
Field Crew	Dewberry

Summary Data	
Bankfull Elevation (ft)	760.1
Bankfull Cross-Sectional Area (ft2)	12.3
Bankfull Width (ft)	14.7
Flood Prone Area Elevation (ft)	762.0
Flood Prone Width (ft)	69.7
Max Depth at Bankfull (ft)	1.8
Mean Depth at Bankfull (ft)	0.8
W/D Ratio	17.6
Entrenchment Ratio	2.2+
Bank Height Ratio	1.0
Stream Type	C

Cross-Section 7: View Upstream (5/2/2012)

Cross-Section 7: View Downstream (5/2/2012)

Station	Elevation	Station	Elevation
1.97	760.27	33.35	758.90
4.00	760.21	33.90	759.30
5.99	760.29	34.42	759.37
8.01	760.15	34.93	759.79
10.07	760.23	35.44	760.02
12.04	760.19	35.96	760.13
14.04	760.32	37.95	760.09
16.03	760.20	39.94	760.24
18.02	760.24	41.90	760.25
20.02	760.18	43.97	760.28
22.01	760.10	45.97	760.23
24.03	760.04	47.96	760.13
24.49	759.96	49.92	760.17
24.96	760.00	51.94	760.16
25.43	759.92	53.91	760.12
25.89	759.61	55.89	760.13
26.37	759.50	57.87	760.10
26.78	759.38	59.87	760.08
27.15	759.13	61.84	760.22
27.59	759.15	63.86	760.16
28.22	758.81	65.85	760.19
29.16	758.46	67.78	760.05
30.78	758.31	69.86	760.07
32.72	758.62	71.68	760.13



Appendix 2. Morphological Summary Data and Plots
Figure 4h. Cross-Section Plots
Lyle Creek Mitigation Site (EEP Project No. 94643)
UT1 Reach 2, Cross-Section 8 (Pool)
Monitoring Year 0 of 5

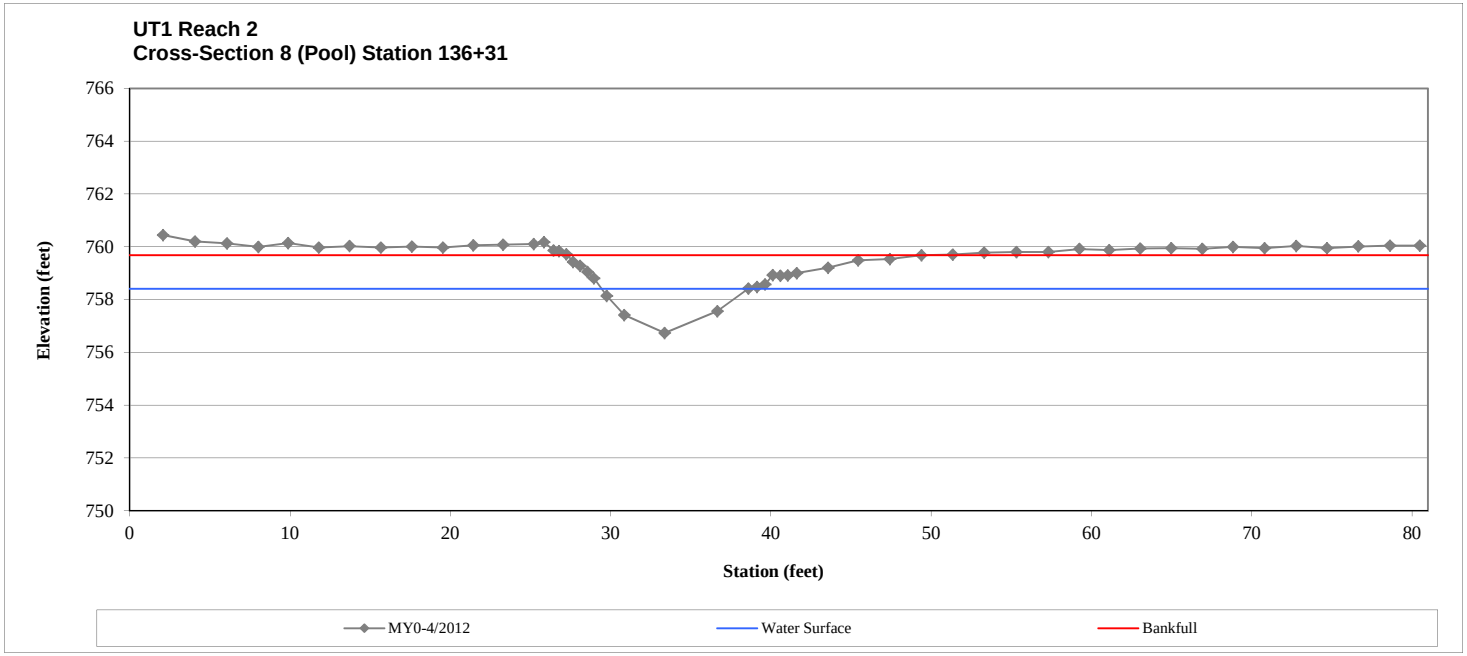
River Basin	Catawba 03050101
Watershed	NCDWQ Subbasin 03-08-32
XS ID	8
Drainage Area	315 Acres
Date	4/2012
Field Crew	Dewberry

Summary Data	
Bankfull Elevation (ft)	759.7
Bankfull Cross-Sectional Area (ft2)	27.0
Bankfull Width (ft)	22.1
Flood Prone Area Elevation (ft)	N/A
Flood Prone Width (ft)	N/A
Max Depth at Bankfull (ft)	2.9
Mean Depth at Bankfull (ft)	1.2
W/D Ratio	18.1
Entrenchment Ratio	N/A
Bank Height Ratio	1.0
Stream Type	N/A

Cross-Section 8: View Upstream (5/2/2012)

Cross-Section 8: View Downstream (5/2/2012)

Station	Elevation	Station	Elevation
2.08	760.45	39.14	758.48
4.08	760.20	39.64	758.58
6.07	760.13	40.13	758.93
8.04	760.00	40.60	758.90
9.89	760.15	41.06	758.91
11.81	759.97	41.61	759.00
13.72	760.03	43.58	759.21
15.68	759.97	45.44	759.48
17.61	760.01	47.42	759.53
19.54	759.97	49.40	759.68
21.44	760.06	51.35	759.71
23.30	760.09	53.31	759.78
25.21	760.11	55.33	759.81
25.86	760.17	57.32	759.80
26.45	759.87	59.26	759.92
26.80	759.84	61.12	759.88
27.26	759.72	63.06	759.93
27.66	759.43	64.99	759.95
28.10	759.29	66.93	759.93
28.56	759.05	68.83	760.00
28.96	758.81	70.82	759.94
29.76	758.15	72.79	760.03
30.87	757.41	74.70	759.95
33.37	756.74	76.67	760.02
36.66	757.56	78.63	760.05
38.60	758.42	80.49	760.04



Appendix 2. Morphological Summary Data and Plots
Figure 4i. Cross-Section Plots
Lyle Creek Mitigation Site (EEP Project No. 94643)
UT1A, Cross-Section 9 (Riffle)
Monitoring Year 0 of 5

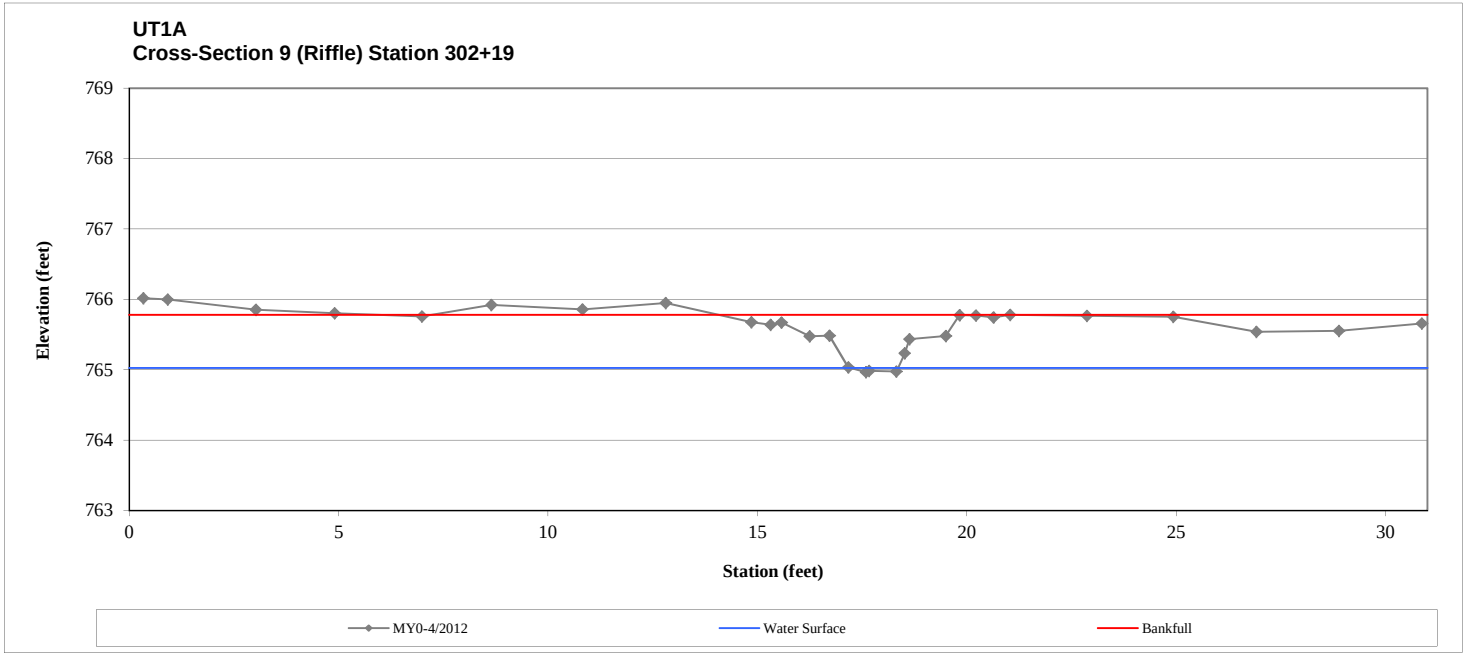
River Basin	Catawba 03050101
Watershed	NCDWQ Subbasin 03-08-32
XS ID	9
Drainage Area	615 Acres
Date	4/2012
Field Crew	Dewberry

Summary Data	
Bankfull Elevation (ft)	765.8
Bankfull Cross-Sectional Area (ft2)	2.1
Bankfull Width (ft)	5.8
Flood Prone Area Elevation (ft)	766.6
Flood Prone Width (ft)	30.5
Max Depth at Bankfull (ft)	0.8
Mean Depth at Bankfull (ft)	0.4
W/D Ratio	16.0
Entrenchment Ratio	2.2+
Bank Height Ratio	1.0
Stream Type	C

Cross-Section 9: View Upstream (5/2/2012)

Cross-Section 9: View Downstream (5/2/2012)

Station	Elevation	Station	Elevation
0.34	766.02	22.87	765.77
0.92	766.00	24.93	765.76
3.03	765.85	26.92	765.54
4.91	765.80	28.89	765.55
6.99	765.76	30.87	765.66
8.65	765.92		
10.83	765.86		
12.81	765.95		
14.86	765.68		
15.32	765.64		
15.58	765.67		
16.25	765.48		
16.72	765.49		
17.17	765.03		
17.59	764.97		
17.67	764.99		
18.32	764.98		
18.52	765.24		
18.63	765.43		
19.50	765.48		
19.83	765.78		
20.22	765.77		
20.64	765.75		
21.04	765.78		



Appendix 2. Morphological Summary Data and Plots
Figure 4j. Cross-Section Plots
Lyle Creek Mitigation Site (EEP Project No. 94643)
UT1A, Cross-Section 10 (Pool)
Monitoring Year 0 of 5

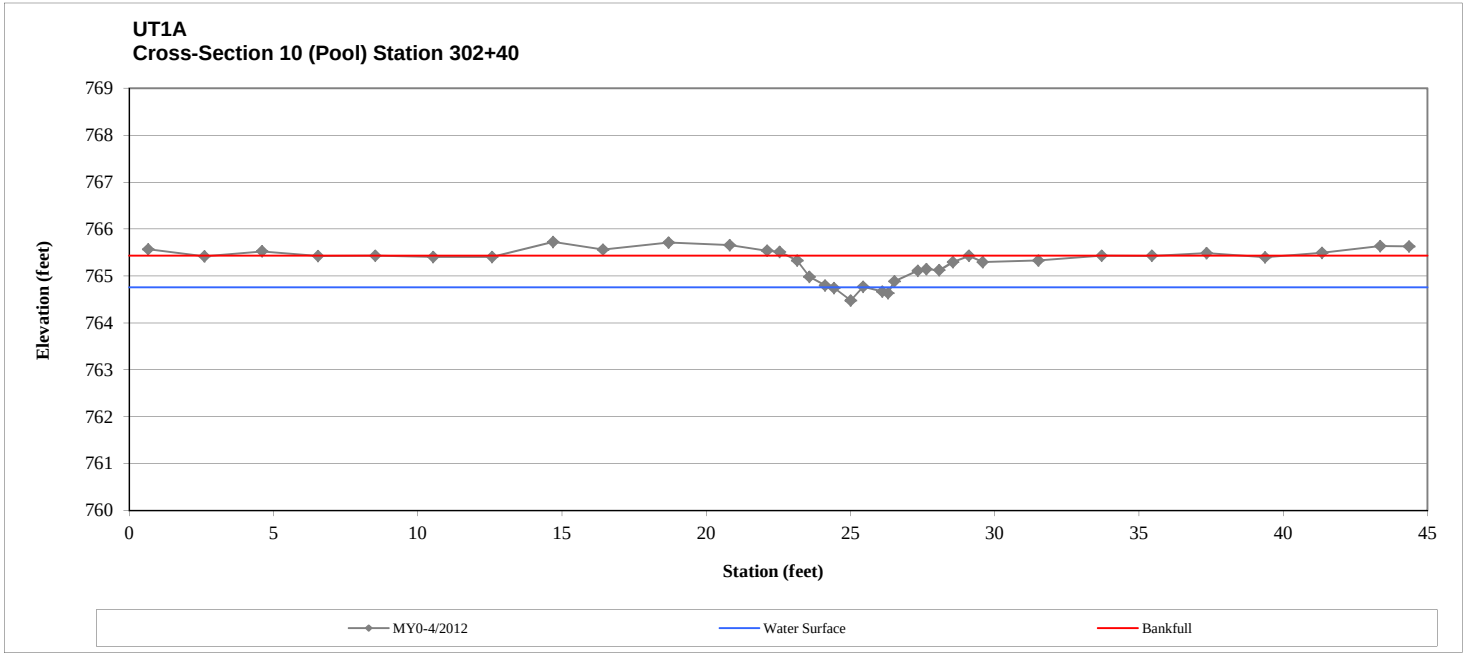
River Basin	Catawba 03050101
Watershed	NCDWQ Subbasin 03-08-32
XS ID	10
Drainage Area	615 Acres
Date	4/2012
Field Crew	Dewberry

Summary Data	
Bankfull Elevation (ft)	765.4
Bankfull Cross-Sectional Area (ft2)	2.9
Bankfull Width (ft)	6.3
Flood Prone Area Elevation (ft)	N/A
Flood Prone Width (ft)	N/A
Max Depth at Bankfull (ft)	1.0
Mean Depth at Bankfull (ft)	0.5
W/D Ratio	13.6
Entrenchment Ratio	N/A
Bank Height Ratio	1.0
Stream Type	N/A

Cross-Section 10: View Upstream (5/2/2012)

Cross-Section 10: View Downstream (5/2/2012)

Station	Elevation	Station	Elevation
0.66	765.57	28.08	765.12
2.61	765.42	28.55	765.30
4.61	765.52	29.11	765.43
6.55	765.42	29.59	765.30
8.53	765.43	31.51	765.33
10.54	765.41	33.71	765.43
12.58	765.41	35.45	765.43
14.70	765.72	37.34	765.49
16.42	765.56	39.37	765.40
18.70	765.71	41.35	765.50
20.82	765.66	43.36	765.64
22.11	765.54	44.36	765.63
22.55	765.52		
23.15	765.33		
23.58	764.98		
24.12	764.80		
24.43	764.74		
25.01	764.48		
25.44	764.77		
26.10	764.67		
26.30	764.63		
26.53	764.89		
27.33	765.11		
27.63	765.15		



Appendix 2. Morphological Summary Data and Plots
Figure 4k. Cross-Section Plots
Lyle Creek Mitigation Site (EEP Project No. 94643)
UT1B, Cross-Section 11 (Riffle)
Monitoring Year 0 of 5

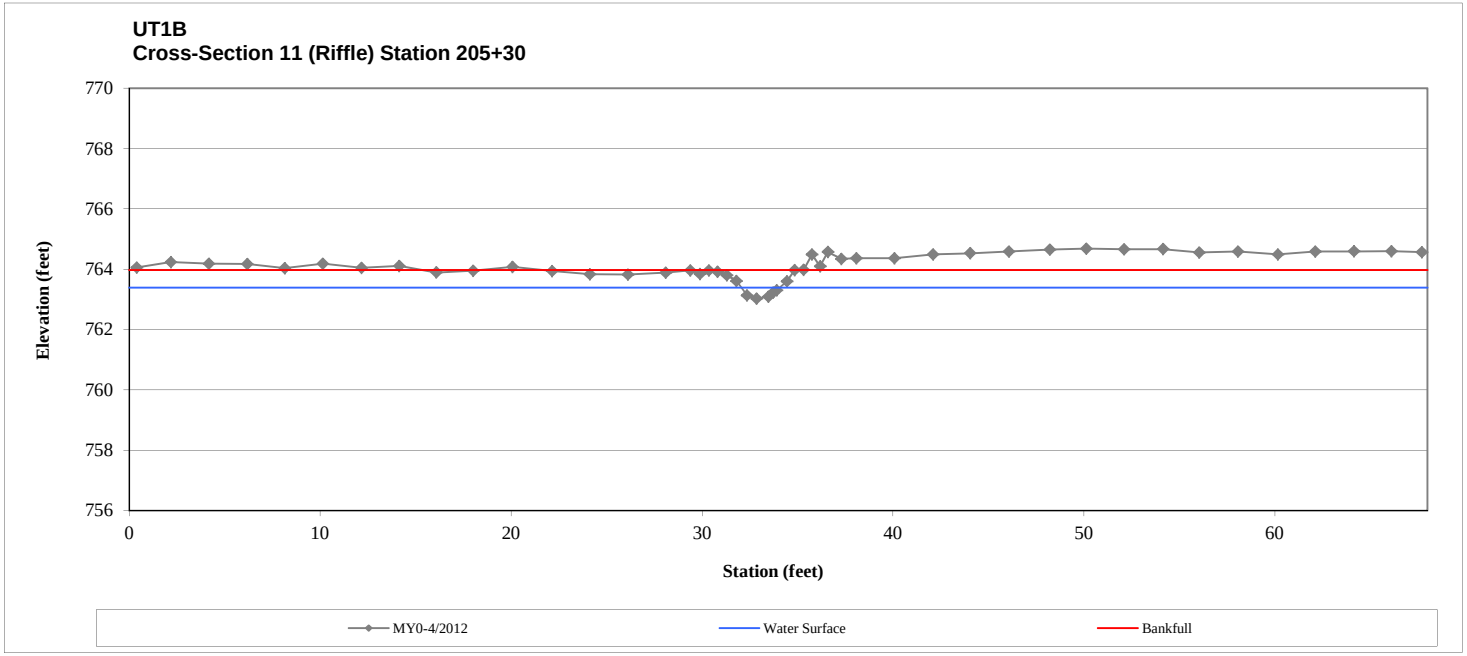
River Basin	Catawba 03050101
Watershed	NCDWQ Subbasin 03-08-32
XS ID	11
Drainage Area	845 Acres
Date	4/2012
Field Crew	Dewberry

Summary Data	
Bankfull Elevation (ft)	764.0
Bankfull Cross-Sectional Area (ft2)	2.2
Bankfull Width (ft)	4.5
Flood Prone Area Elevation (ft)	764.9
Flood Prone Width (ft)	67.3
Max Depth at Bankfull (ft)	1.0
Mean Depth at Bankfull (ft)	0.5
W/D Ratio	9.0
Entrenchment Ratio	2.2+
Bank Height Ratio	1.0
Stream Type	C/E

Cross-Section 11: View Upstream (5/2/2012)

Cross-Section 11: View Downstream (5/2/2012)

Station	Elevation	Station	Elevation
0.40	764.06	33.91	763.30
2.18	764.24	34.46	763.60
4.18	764.18	34.86	763.97
6.19	764.17	35.33	763.99
8.15	764.03	35.76	764.49
10.15	764.18	36.19	764.10
12.17	764.05	36.59	764.57
14.14	764.11	37.30	764.35
16.09	763.89	38.09	764.37
18.01	763.95	40.08	764.37
20.08	764.08	42.11	764.49
22.16	763.94	44.05	764.53
24.13	763.83	46.08	764.59
26.12	763.82	48.23	764.65
28.10	763.89	50.14	764.68
29.39	763.97	52.11	764.66
29.90	763.84	54.15	764.67
30.36	763.96	56.05	764.56
30.82	763.92	58.08	764.59
31.30	763.80	60.17	764.50
31.81	763.62	62.13	764.59
32.36	763.14	64.15	764.59
32.86	763.03	66.11	764.60
33.48	763.09	67.71	764.56
33.74	763.23		



Appendix 2. Morphological Summary Data and Plots
Figure 4l. Cross-Section Plots
Lyle Creek Mitigation Site (EEP Project No. 94643)
UT1B, Cross-Section 12 (Pool)
Monitoring Year 0 of 5

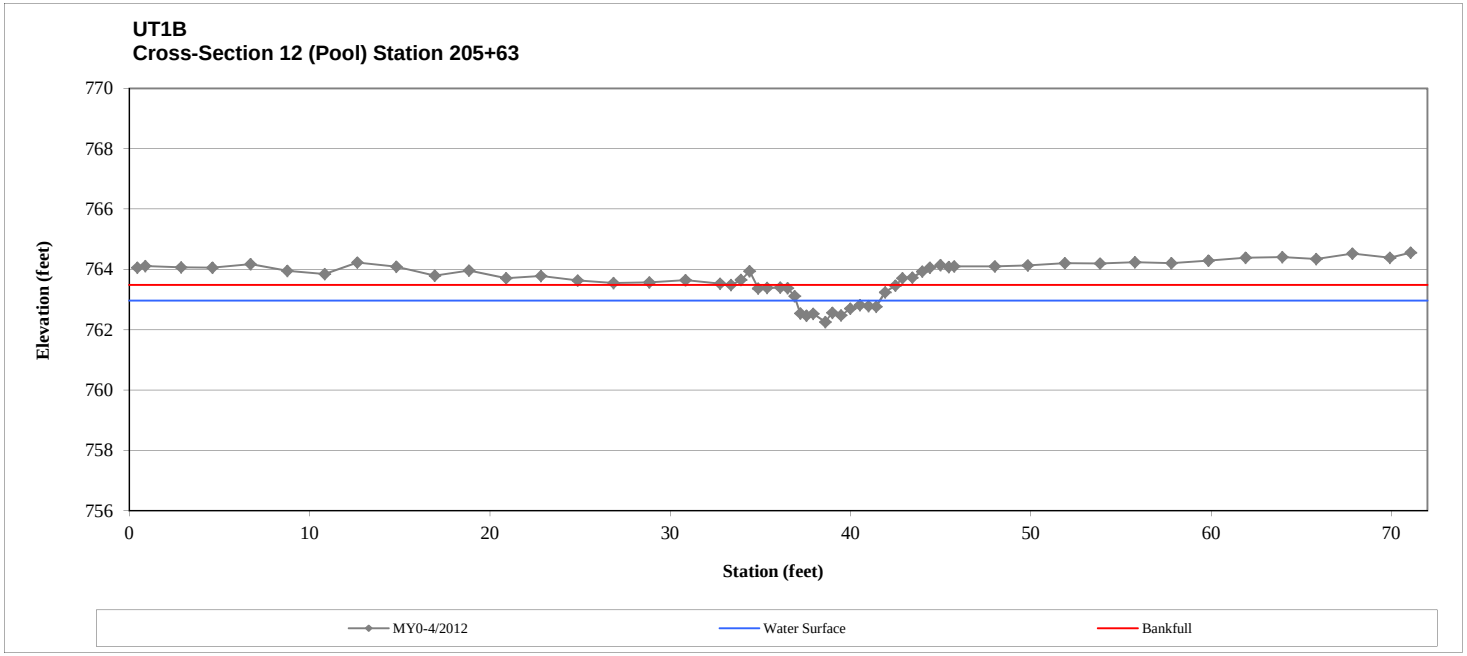
River Basin	Catawba 03050101
Watershed	NCDWQ Subbasin 03-08-32
XS ID	12
Drainage Area	845 Acres
Date	4/2012
Field Crew	Dewberry

Summary Data	
Bankfull Elevation (ft)	763.5
Bankfull Cross-Sectional Area (ft2)	4.6
Bankfull Width (ft)	7.8
Flood Prone Area Elevation (ft)	N/A
Flood Prone Width (ft)	N/A
Max Depth at Bankfull (ft)	1.2
Mean Depth at Bankfull (ft)	0.6
W/D Ratio	13.1
Entrenchment Ratio	N/A
Bank Height Ratio	1.0
Stream Type	N/A

Cross-Section 12: View Upstream (5/2/2012)

Cross-Section 12: View Downstream (5/2/2012)

Station	Elevation	Station	Elevation
0.45	764.06	38.60	762.26
0.89	764.11	38.99	762.56
2.88	764.07	39.48	762.48
4.62	764.06	39.99	762.70
6.74	764.18	40.52	762.82
8.78	763.95	41.00	762.79
10.84	763.84	41.42	762.77
12.65	764.22	41.92	763.24
14.82	764.09	42.50	763.46
16.95	763.79	42.89	763.71
18.84	763.96	43.44	763.73
20.91	763.71	43.98	763.93
22.84	763.79	44.40	764.05
24.88	763.63	45.00	764.14
26.87	763.55	45.46	764.08
28.86	763.57	45.75	764.10
30.85	763.64	48.01	764.10
32.77	763.53	49.84	764.13
33.38	763.49	51.89	764.20
33.93	763.65	53.84	764.20
34.40	763.95	55.78	764.24
34.89	763.36	57.80	764.21
35.38	763.39	59.86	764.29
36.11	763.40	61.91	764.38
36.52	763.38	63.95	764.41
36.90	763.12	65.83	764.35
37.22	762.54	67.84	764.53
37.57	762.47	69.91	764.39
37.93	762.53	71.07	764.56



Stream Photographs

	
Photo Point 1 – looking upstream (05/02/2012)	Photo Point 1 – looking downstream (05/02/2012)
	
Photo Point 2 – looking upstream (05/02/2012)	Photo Point 2 – looking downstream (05/02/2012)
	
Photo Point 3 – looking upstream (05/02/2012)	Photo Point 3 – looking downstream (05/02/2012)

	
Photo Point 4 – looking upstream (05/02/2012)	Photo Point 4 – looking downstream (05/02/2012)
	
Photo Point 5 – looking upstream (05/02/2012)	Photo Point 5 – looking downstream (05/02/2012)
	
Photo Point 6 – looking upstream (05/02/2012)	Photo Point 6 – looking downstream (05/02/2012)

	
Photo Point 7 – looking upstream (05/02/2012)	Photo Point 7 – looking downstream (05/02/2012)
	
Photo Point 8 – looking upstream (05/02/2012)	Photo Point 8 – looking downstream (05/02/2012)
	
Photo Point 9 – looking upstream (05/02/2012)	Photo Point 9 – looking downstream (05/02/2012)

	
Photo Point 10 – looking upstream (05/02/2012)	Photo Point 10 – looking downstream (05/02/2012)
	
Photo Point 11 – looking upstream (05/02/2012)	Photo Point 11 – looking downstream (05/02/2012)
	
Photo Point 12 – looking upstream (05/02/2012)	Photo Point 12 – looking downstream (05/02/2012)

	
Photo Point 13 – looking upstream (05/02/2012)	Photo Point 13 – looking downstream (05/02/2012)
	
Photo Point 14 – looking upstream (05/02/2012)	Photo Point 14 – looking downstream (05/02/2012)
	
Photo Point 15 – looking upstream (05/02/2012)	Photo Point 15 – looking downstream (05/02/2012)

	
Photo Point 16 – looking upstream (05/02/2012)	Photo Point 16 – looking downstream (05/02/2012)
	
Photo Point 17 – looking upstream (05/02/2012)	Photo Point 17 – looking downstream (05/02/2012)
	
Photo Point 18 – looking upstream (05/02/2012)	Photo Point 18 – looking downstream (05/02/2012)

	
Photo Point 19 – looking upstream (05/02/2012)	Photo Point 19 – looking downstream (05/02/2012)
	
Photo Point 20 – looking upstream (05/02/2012)	Photo Point 20 – looking downstream (05/02/2012)
	
Photo Point 21 – looking upstream (05/02/2012)	Photo Point 21 – looking downstream (05/02/2012)

	
Photo Point 22 – looking upstream (05/02/2012)	Photo Point 22 – looking downstream (05/02/2012)
	
Photo Point 23 – looking upstream (05/02/2012)	Photo Point 23 – looking downstream (05/02/2012)
	
Photo Point 24 – looking upstream (05/02/2012)	Photo Point 24 – looking downstream (05/02/2012)

	
Photo Point 25 – looking upstream (05/02/2012)	Photo Point 25 – looking downstream (05/02/2012)
	
Photo Point 26 – looking upstream (05/02/2012)	Photo Point 26 – looking downstream (05/02/2012)
	
Photo Point 27 – looking upstream (05/02/2012)	Photo Point 27 – looking downstream (05/02/2012)

	
Photo Point 28 – looking upstream (05/02/2012)	Photo Point 28 – looking downstream (05/02/2012)
	
Photo Point 29 – looking upstream (05/02/2012)	Photo Point 29 – looking downstream (05/02/2012)
	
Photo Point 30 – looking upstream (05/02/2012)	Photo Point 30 – looking downstream (05/02/2012)

	
Photo Point 31 – looking upstream (05/02/2012)	Photo Point 31 – looking downstream (05/02/2012)
	
Photo Point 32 – looking upstream (05/02/2012)	Photo Point 32 – looking downstream (05/02/2012)
	
Photo Point 33 – looking upstream (05/02/2012)	Photo Point 33 – looking downstream (05/02/2012)

	
Photo Point 34 – looking upstream (05/02/2012)	Photo Point 34 – looking downstream (05/02/2012)

APPENDIX 3. Vegetation Plot Data

Appendix 3. Vegetation Plot Data
Table 7a. Planted and Total Stem Counts (Species by Plot with Annual Means)
Lyle Creek Mitigation Site (NCEEP Project No. 94643)
UT1
Monitoring Year 0 of 5

			Current Data (MY0-4/2012)																				Annual Means	
			Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7		Plot 8		Plot 9		Plot 10		Current Mean	
Species	**Common Name**	**Type**	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T
Acer negundo	boxelder	Tree	2	2	1	1			2	2			3	3	3	3			2	2			**3**	**3**
Alnus serrulata	hazel alder	Tree/Shrub			2	2					3	3	3	3	1	1			1	1			**2**	**2**
Betula nigra	river birch	Tree							3	3									3	3			**2**	**2**
Carpinus caroliniana	American hornbeam	Tree/Shrub	3	3	1	1			1	1					2	2			1	1	2	2	**2**	**2**
Celtis laevigata	sugarberry	Tree/Shrub			5	5											2	2					**4**	**4**
Diospyros virginiana	common persimmon	Tree			1	1					3	3			1	1					1	1	**1**	**1**
Fraxinus pennsylvanica	green ash	Tree			1	1	1	1			2	2	2	2			4	4	1	1			**2**	**2**
Liriodendron tulipifera	tuliptree	Tree			1	1					2	2	3	3	1	1	4	4	1	1			**2**	**2**
Nyssa sylvatica	blackgum	Tree	3	3					2	2			1	1			1	1					**2**	**2**
Platanus occidentalis	American sycamore	Tree	5	5	1	1	5	5			1	1	3	3	3	3					8	8	**3**	**3**
Quercus michauxii	swamp chestnut oak	Tree					4	4	1	1													**2**	**2**
Quercus phellos	willow oak	Tree			1	1	2	2	1	1	1	1							3	3			**1**	**1**
		Plot Area (acres)	**0.0247**																					
		Species Count	**4**	**4**	**9**	**9**	**4**	**4**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**4**	**4**	**7**	**7**	**3**	**3**	**5**	**5**
		Stem Count	**13**	**13**	**14**	**14**	**12**	**12**	**10**	**10**	**12**	**12**	**15**	**15**	**11**	**11**	**11**	**11**	**12**	**12**	**11**	**11**	**13**	**13**
		Stems per Acre	**526**	**526**	**567**	**567**	**486**	**486**	**405**	**405**	**486**	**486**	**607**	**607**	**445**	**445**	**445**	**445**	**486**	**486**	**445**	**445**	**531**	**531**

Type=Shrub or Tree
P = Planted
T = Total

Appendix 3. Vegetation Plot Data
Table 7b. Planted and Total Stem Counts (Species by Plot with Annual Means)
Lyle Creek Mitigation Site (NCEEP Project No. 94643)
UT1A, B, C and D
Monitoring Year 0 of 5

			Current Data (MY0-4/2012)																								Annual Means	
			Plot 11		Plot 12		Plot 13		Plot 14		Plot 15		Plot 16		Plot 17		Plot 18		Plot 19		Plot 20		Plot 21		Plot 22		Current Mean	
Species	Common Name	Type	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T
Acer negundo	boxelder	Tree													6	6	1	1					4	4			**3**	**3**
Alnus serrulata	hazel alder	Tree/Shrub															1	1	1	1	1	1	1	1			**2**	**2**
Betula nigra	river birch	Tree	2	2	2	2	4	4			6	6	2	2	4	4	1	1			1	1	1	1	2	2	**2**	**2**
Carpinus caroliniana	American hornbeam	Tree/Shrub							1	1											1	1	2	2	2	2	**2**	**2**
Celtis laevigata	sugarberry	Tree/Shrub															2	2									**4**	**4**
Diospyros virginiana	common persimmon	Tree													1	1											**1**	**1**
Fraxinus pennsylvanica	green ash	Tree	3	3	1	1	5	5	10	10	3	3	4	4					1	1	2	2	2	2	5	5	**2**	**2**
Liriodendron tulipifera	tuliptree	Tree	1	1	2	2					5	5	1	1	4	4					1	1	1	1	1	1	**2**	**2**
Nyssa sylvatica	blackgum	Tree	1	1	2	2	4	4					6	6									1	1			**2**	**2**
Platanus occidentalis	American sycamore	Tree	6	6	5	5	1	1									4	4	9	9	8	8	3	3	3	3	**3**	**3**
Quercus michauxii	swamp chestnut oak	Tree					1	1									2	2									**2**	**2**
Quercus phellos	willow oak	Tree															1	1	1	1			1	1	1	1	**1**	**1**
Plot Area (acres)			**0.0247**																									
Species Count			**5**	**5**	**5**	**5**	**5**	**5**	**2**	**2**	**3**	**3**	**4**	**4**	**4**	**4**	**7**	**7**	**4**	**4**	**6**	**6**	**9**	**9**	**6**	**6**	**5**	**5**
Stem Count			**13**	**13**	**12**	**12**	**15**	**15**	**11**	**11**	**14**	**14**	**13**	**13**	**15**	**15**	**12**	**12**	**12**	**12**	**14**	**14**	**16**	**16**	**14**	**14**	**13**	**13**
Stems per Acre			**526**	**526**	**486**	**486**	**607**	**607**	**445**	**445**	**567**	**567**	**526**	**526**	**607**	**607**	**486**	**486**	**486**	**486**	**567**	**567**	**648**	**648**	**567**	**567**	**531**	**531**

Type=Shrub or Tree
P = Planted
T = Total

Appendix 3. Vegetation Plot Data
Table 7c. Planted and Total Stem Counts (Species by Plot with Annual Means)
Lyle Creek Mitigation Site (NCEEP Project No. 94643)
RW 1 and 2
Monitoring Year 0 of 5

			Current Data (MY0-4/2012)																								Annual Means	
			Plot 23		Plot 24		Plot 25		Plot 26		Plot 27		Plot 28		Plot 29		Plot 30		Plot 31		Plot 32		Plot 33		Plot 34		Plot 35		Current Mean	
Species	Common Name	Type	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T
Acer negundo	boxelder	Tree																									**3**	**3**
Alnus serrulata	hazel alder	Tree/Shrub					1	1			2	2					2	2			2	2			4	4			**2**	**2**
Betula nigra	river birch	Tree	3	3	6	6	5	5					8	8	4	4	1	1			3	3	5	5			5	5	**2**	**2**
Carpinus caroliniana	American hornbeam	Tree/Shrub			1	1																							**2**	**2**
Celtis laevigata	sugarberry	Tree/Shrub	1	1			1	1													4	4							**4**	**4**
Diospyros virginiana	common persimmon	Tree									1	1							1	1									**1**	**1**
Fraxinus pennsylvanica	green ash	Tree	3	3	2	2	4	4	1	1	1	1	4	4			1	1	3	3					2	2	1	1	**2**	**2**
Liriodendron tulipifera	tuliptree	Tree			1	1			2	2					5	5	14	14	2	2									**2**	**2**
Nyssa sylvatica	blackgum	Tree	4	4	3	3	1	1	6	6											2	2	5	5			6	6	**2**	**2**
Platanus occidentalis	American sycamore	Tree					4	4	6	6	5	5	1	1	3	3			4	4									**3**	**3**
Quercus michauxii	swamp chestnut oak	Tree			1	1													2	2							3	3	**2**	**2**
Quercus phellos	willow oak	Tree									6	6	3	3											6	6			**1**	**1**
Plot Area (acres)			**0.0247**																											
Species Count			**4**	**4**	**6**	**6**	**6**	**6**	**4**	**4**	**5**	**5**	**4**	**4**	**3**	**3**	**4**	**4**	**5**	**5**	**4**	**4**	**2**	**2**	**3**	**3**	**4**	**4**	**5**	**5**
Stem Count			**11**	**11**	**14**	**14**	**16**	**16**	**15**	**15**	**15**	**15**	**16**	**16**	**12**	**12**	**18**	**18**	**12**	**12**	**11**	**11**	**10**	**10**	**12**	**12**	**15**	**15**	**13**	**13**
Stems per Acre			**445**	**445**	**567**	**567**	**648**	**648**	**607**	**607**	**607**	**607**	**648**	**648**	**486**	**486**	**729**	**729**	**486**	**486**	**445**	**445**	**405**	**405**	**486**	**486**	**607**	**607**	**531**	**531**

Type=Shrub or Tree
P = Planted
T = Total

Appendix 3. Vegetation Plot Data
Table 8. CVS Vegetation Tables - Metadata
Lyle Creek Mitigation Site (NCEEP Project No. 94643)
Monitoring Year 0 of 5

Report Prepared By	Kirsten Gimbert
Date Prepared	*5/15/2012 15:13*
database name	*Lyle Creek-cvs-eep-entrytool-v2.2.7.mdb*
database location	*Q:\ActiveProjects\005-02123 Lyle Creek Mitigation FDP\Monitoring\Baseline Monitoring\Vegetation Assessment*
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	*Description of database file, the report worksheets, and a summary of project(s) and project data.*
Plots	*Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.*
Vigor	*Frequency distribution of vigor classes for stems for all plots.*
Vigor by Spp	*Frequency distribution of vigor classes listed by species.*
Damage	*List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.*
Damage by Spp	*Damage values tallied by type for each species.*
Damage by Plot	*Damage values tallied by type for each plot.*
Stem Count by Plot and Spp	*A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.*
PROJECT SUMMARY----------	
Project Code	94643
project Name	Lyle Creek Mitigation Site
Description	Stream and Wetland Mitigation
length (ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	35
Sampled Plots	35

Appendix 3. Vegetation Plot Data

Table 9. CVS Vegetation Tables - Vigor by Species

Lyle Creek Mitigation Site (NCEEP Project No. 94643)

Monitoring Year 0 of 5

	Species	**4**	**3**	**2**	**1**	**0**	**Missing**
	Acer negundo	24					
	Alnus serrulata	25					
	Betula nigra	69	2				
	Celtis laevigata	14	1				
	Diospyros virginiana	10					
	Fraxinus pennsylvanica	69					
	Nyssa sylvatica	46	2				
	Quercus michauxii	14					
	Quercus phellos	27					
	Carpinus caroliniana	17					
	Liriodendron tulipifera	52					
	Platanus occidentalis	86	2				
	TOT:	453	7				

vigor	**Count**	**Percent**
0	0	0%
1	0	0%
2	0	0%
3	7	2%
4	453	98%
TOT:	**460**	**100%**

Notes: Vigor Scores

4: Excellent

3: Good

2: Fair

1: Unlikely to survive year

2: Dead

Appendix 3. Vegetation Plot Data

Table 10. CVS Vegetation Tables - Damage by Species

Lyle Creek Mitigation Site (NCEEP Project No. 94643)

Monitoring Year 0 of 5

Species	Common Name	no damage	other
Acer negundo	boxelder	24	
Alnus serrulata	hazel alder	24	1
Betula nigra	river birch	70	1
Carpinus caroliniana	American hornbeam	17	
Celtis laevigata	sugarberry	14	1
Diospyros virginiana	common persimmon	10	
Fraxinus pennsylvanica	green ash	69	
Liriodendron tulipifera	tuliptree	52	
Nyssa sylvatica	blackgum	48	
Platanus occidentalis	American sycamore	87	1
Quercus michauxii	swamp chestnut oak	14	
Quercus phellos	willow oak	27	
	TOT:	**456**	**4**

Damage	Count	Percent Of Stems
no damage	456	99%
other	4	1%

Appendix 3. Vegetation Plot Data
Table 11. CVS Vegetation Tables - Stem Count by Plot and Species
Lyle Creek Mitigation Site (NCEEP Project No. 94643)
Monitoring Year 0 of 5

	Species	Total Stems	# plots	avg# stems	94643-WEI-0001	94643-WEI-0002	94643-WEI-0003	94643-WEI-0004	94643-WEI-0005	94643-WEI-0006	94643-WEI-0007	94643-WEI-0008	94643-WEI-0009	94643-WEI-0010	94643-WEI-0011	94643-WEI-0012	94643-WEI-0013	94643-WEI-0014	94643-WEI-0015	94643-WEI-0016	94643-WEI-0017	94643-WEI-0018	94643-WEI-0019	94643-WEI-0020	94643-WEI-0021	94643-WEI-0022	94643-WEI-0023	94643-WEI-0024	94643-WEI-0025	94643-WEI-0026	94643-WEI-0027	94643-WEI-0028	94643-WEI-0029	94643-WEI-0030	94643-WEI-0031	94643-WEI-0032	94643-WEI-0033	94643-WEI-0034	94643-WEI-0035
	Acer negundo	24	9	3	2	1		2		3	3		2							6	1			4														
	Alnus serrulata	25	14	2		2			3	3	1		1								1	1	1	1				1		2			2		2		4	
	Betula nigra	71	21	3				3					3		2	2	4		6	2	4	1		1	1	2	3	6	5			8	4	1		3	5		5
	Carpinus caroliniana	17	11	2	3	1		1			2		1	2				1						1	2	2		1										
	Celtis laevigata	15	6	3		5						2										2					1		1						4			
	Diospyros virginiana	10	7	1		1			3		1			1							1									1				1				
	Fraxinus pennsylvanica	69	26	3		1	1		2	2		4	1		3	1	5	10	3	4			1	2	2	5	3	2	4	1	1	4		1	3			2	1
	Liriodendron tulipifera	52	19	3		1			2	3	1	4	1		1	2			5	1	4			1	1	1		1		2			5	14	2				
	Nyssa sylvatica	48	16	3	3			2		1		1			1	2	4			6					1		4	3	1	6						2	5		6
	Platanus occidentalis	88	21	4	5	1	5		1	3	3			8	6	5	1					4	9	8	3	3			4	6	5	1	3		4				
	Quercus michauxii	14	7	2			4	1									1					2						1							2				3
	Quercus phellos	27	12	2		1	2	1	1				3									1	1		1	1					6	3						6	
TOT:		**459**	**35**	**13**	**13**	**14**	**12**	**10**	**12**	**15**	**11**	**11**	**12**	**11**	**13**	**12**	**15**	**11**	**14**	**13**	**15**	**12**	**12**	**14**	**16**	**14**	**11**	**14**	**16**	**15**	**15**	**16**	**12**	**18**	**12**	**11**	**10**	**12**	**15**

Vegetation Photographs

Vegetation Plot 1 (04/11/2012)

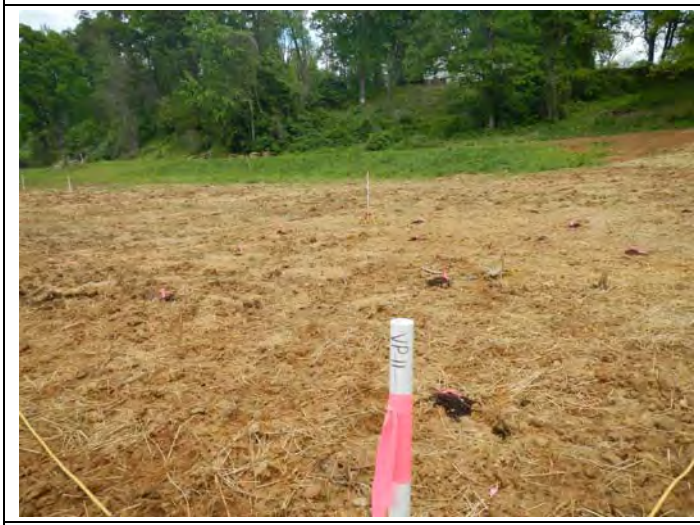
Vegetation Plot 2 (04/11/2012)

Vegetation Plot 3 (04/11/2012)

Vegetation Plot 4 (04/11/2012)

Vegetation Plot 5 (04/11/2012)

Vegetation Plot 6 (04/19/2012)

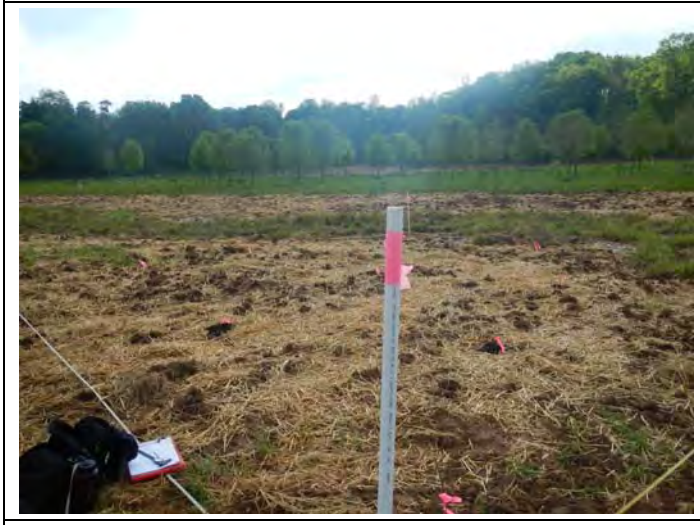
	
Vegetation Plot 7 (04/11/2012)	Vegetation Plot 8 (04/23/2012)
	
Vegetation Plot 9 (04/23/2012)	Vegetation Plot 10 (04/23/2012)
	
Vegetation Plot 11 (04/19/2012)	Vegetation Plot 12 (05/02/2012)

Vegetation Plot 13 (05/02/2012)

Vegetation Plot 14 (04/19/2012)

Vegetation Plot 15 (05/02/2012)

Vegetation Plot 16 (04/23/2012)



Vegetation Plot 17 (04/19/2012)

Vegetation Plot 18 (04/19/2012)

Vegetation Plot 19 (04/19/2012)

Vegetation Plot 20 (04/11/2012)

Vegetation Plot 21 (04/11/2012)

Vegetation Plot 22 (04/11/2012)

Vegetation Plot 23 (04/19/2012)

Vegetation Plot 24 (04/19/2012)

Vegetation Plot 25 (04/23/2012)

Vegetation Plot 26 (0/23/2012)

Vegetation Plot 27 (04/19/2012)

Vegetation Plot 28 (04/19/2012)

Vegetation Plot 29 (05/02/2012)

Vegetation Plot 30 (05/02/2012)

Vegetation Plot 31 (05/02/2012)

Vegetation Plot 32 (04/11/2012)

Vegetation Plot 33 (04/11/2012)

Vegetation Plot 34 (04/11/2012)

Vegetation Plot 35 (04/11/2012)

APPENDIX 4. As-Built Plan Sheets

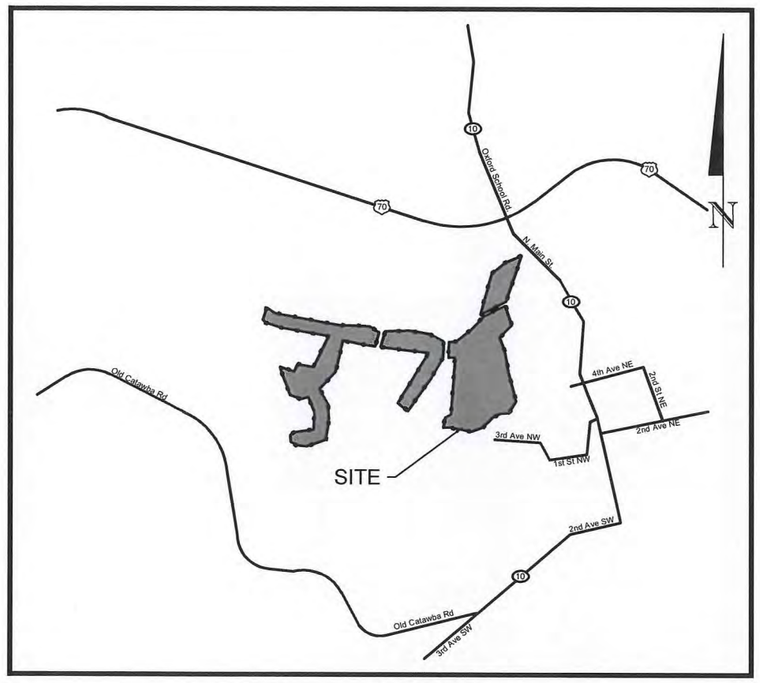
Lyle Creek Mitigation Site

Catawba County, NC

Catawba River Basin Cataloging Unit 03050101

for

North Carolina Ecosystem Enhancement Program



Vicinity Map
Not to Scale

BEFORE YOU DIG!
CALL 1-800-632-4949
N.C. ONE-CALL CENTER
IT'S THE LAW!

Ecosystem Enhancement PROGRAM

FINAL
AS-BUILT PLANS
& RECORD DRAWINGS
ISSUED JULY 17, 2012

REACH ORIGINS

Reach	Latitude	Longitude
UT1 Reach 1	N35°42'33.8"	W81°05'08.7"
UT1 Reach 2	N35°42'38.2"	W81°05'06.1"
UT1A	N35°42'36.8"	W81°04'45.0"
UT1B	N35°42'34.4"	W81°04'51.7"
UT1C	N35°42'37.2"	W81°04'56.2"
UT1D	N35°42'45.6"	W81°05'12.0"

Sheet Index

Project Directory

Engineering
Wildlands Engineering, Inc.
License No. F-0831
1430 South Mint Street, Ste 104
Charlotte, NC 28203
Emily G. Reinicker, PE
704-332-7754

Surveying
Dewberry and Davis, Inc.
6135 Lakeview Road
Charlotte, NC 28269
John B. Primm, PLS
704-509-9918
License: F-0679
Survey information provided:
Post-Construction As-Built Survey

Date of Completed Survey: 4-17-2012

Owner
Ecosystem Enhancement Program
NC Department of Environment and Natural Resources
1652 Mail Service Center
Raleigh, NC 27699-1652
Guy Pearce
919-715-1157

DENR Contract No.003241
NCEEP Project No. 94643

Contractor
River Works
6105 Chapel Hill Road
Raleigh, NC 27607
Bill Wright
336-279-1002

NORTH CAROLINA PROFESSIONAL SEAL 29913 ENGINEER EMILY G. REINICKER 7/17/12

WILDLANDS ENGINEERING
1430 South Mint Street, Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

Lyle Creek Mitigation Site
Catawba, North Carolina
Catawba River Basin Cataloging Unit 03050101
Cover Sheet

Revisions:

Date: June 15, 2012
Job Number: 005-02123
Project Engineer: CDM
Drawn By: JCK
Checked By: EGR

Sheet 0.1

Final As-Built Plans

Glenda
Frazier
378217027155

Tommy
Stewart
378217112937

Carolina
Centers
LLC
378217214616

LYLE CREEK

UT1D

UT1 REACH 1
LOWER

UT1 REACH 2
UT1 REACH 1
LOWER

RW2

UT1 REACH 1
LOWER
UT1 REACH 1
UPPER

RW1

UT1C

UT1B

UT1A

David and
Joesph
Garmon
378218303635

Richard
Lambert
378218301451

Joseph
Garmon
378217103129

Scotty Altizer
378218303287

Gayle Killian
378218301273

David Arndt
378218304114

Pang Chang
378218301062

Mary
3782

Joseph
Garmon
377108897962

John Little
378106298563

GROUND WATER GAGE #1
GROUND WATER GAGE #2
GROUND WATER GAGE #3
SOIL TEMP LOGGER #1
GROUND WATER GAGE #4
GROUND WATER GAGE #5
GROUND WATER GAGE #6
GROUND WATER GAGE #7
GROUND WATER GAGE #8
SOIL TEMP LOGGER #2
RAIN GAUGE
CREST GAGE #1
CREST GAGE #2
CREST GAGE #3

N

0' 100' 200' 300'
(HORIZONTAL)

NORTH CAROLINA
PROFESSIONAL
SEAL
29913
7/17/2012
ENGINEER
EMILY G. REINICKER

WILDLANDS ENGINEERING
1430 South Mint Street, Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. P-0831

Lyle Creek Mitigation Site
Catawba, North Carolina

Project Overview

Revisions:

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Sheet 0.2

Final As-Built Plans

Existing Property Line

Pre-Project Thalweg

W W W Existing Irrigation Line

100 Pre-Project Major Contour

101 Pre-Project Minor Contour

OHE OHE Existing Overhead Electric

Existing Power Pole

Existing Easement

Existing Building

Existing Wetlands

Existing Farm Road

Pre-Construction Groundwater Gage

10+00 As-Built Alignment

As-Built Alignment Deviation

As-Built Top of Bank

100 As-Built Major Contour

101 As-Built Minor Contour

Permanent Cross Section (XS)

VP #1 Vegetation Plot

Monitoring Gage

PP #1 Photo Point

Crest Gage

As-Built Log Sill

As-Built Rock Sill

As-Built Constructed Riffle

As-Built Log J-Hook

As-Built Log Vane

As-Built Log Cross Vane

As-Built Rock "A" Vane

CE CE CE Conservation Easement

10+00 Designed Thalweg Alignment

Designed Bankfull

100 Designed Major Contour

100 Designed Major Contour (Overlay Plans)

101 Designed Minor Contour

101 Designed Minor Contour (Overlay Plans)

Designed Silt Fence

SAF SAF Designed Safety Fence

LOD LOD Designed Limits of Disturbance

Designed Farm Road Relocation

CHAPTER 1 - CONSTRUCTION PLAN

Designed Log Sill

Designed Rock Sill

Designed Constructed Riffle

Designed Log J-Hook

Designed Brush Sill

Designed Log Vane

Designed Log Cross Vane

Designed Rock "A" Vane

Designed Angled Log Step Pool

Stream Crossing

Designed Brush Mattress

Designed Brush Toe

Designed Construction Entrance

Designed Temporary Rock Sediment Dam

Designed Earthen Berm

NORTH CAROLINA PROFESSIONAL SEAL L-4756 LAND SURVEYOR JOHN B. PRIMM

AS-BUILT PLANS
SURVEYOR'S CERTIFICATION

I, JOHN B. PRIMM, CERTIFY THAT THE INFORMATION SHOWN ON THESE PLANS WAS DERIVED FROM AN ACTUAL FIELD SURVEY MADE UNDER MY SUPERVISION, THAT THE RATIO OF PRECISION AS CALCULATED IS 1:10,000+. THE PURPOSE OF THIS SURVEY IS FOR TOPOGRAPHIC INFORMATION ONLY, NO BOUNDARY DETERMINATIONS WERE MADE AT THIS TIME.

WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER AND SEAL THIS 1ST DAY OF JUNE, 2012.

7/17/2012

PROFESSIONAL LAND SURVEYOR L-4756 DATE

WILDLANDS ENGINEERING
1430 South Mint Street, Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. P-0831

Lyle Creek Mitigation Site
Catawba, North Carolina

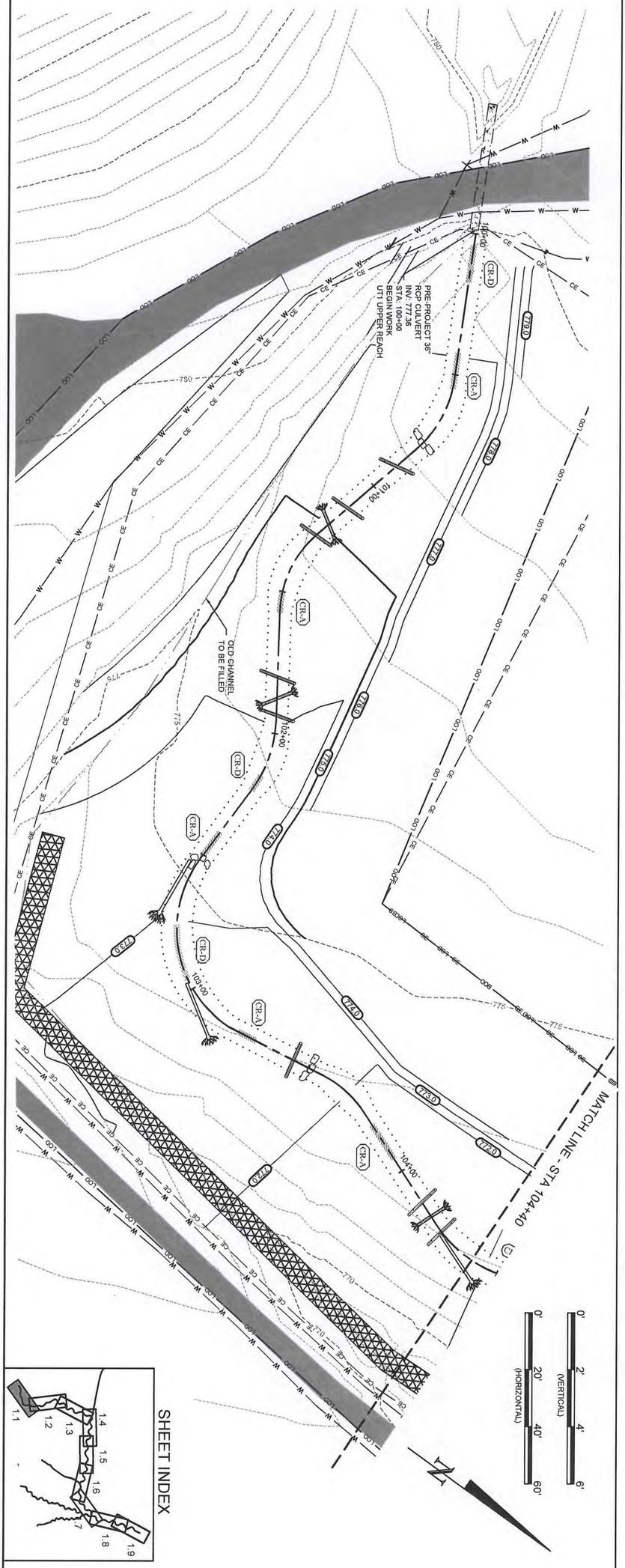
General Notes and Symbols

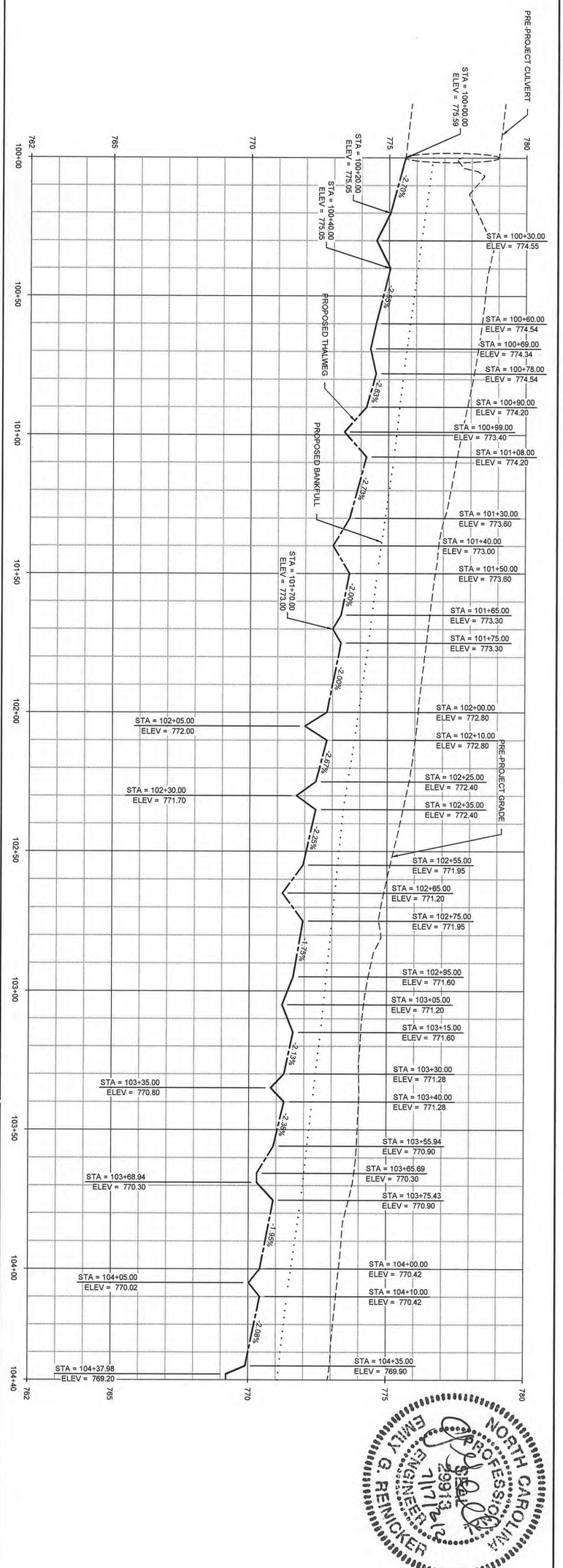
Revisions:

Date: June 15, 2012
Job Number: 008-02123
Project Engineer: CDM
Drawn By: JCK
Checked By: EGR

Sheet 0.3

Final As-Built Plans





NORTH CAROLINA PROFESSIONAL ENGINEER EMILY G. REINICKER 29913 7/17/12

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

1.1
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Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Construction Plans UT1 Reach 1 Upper

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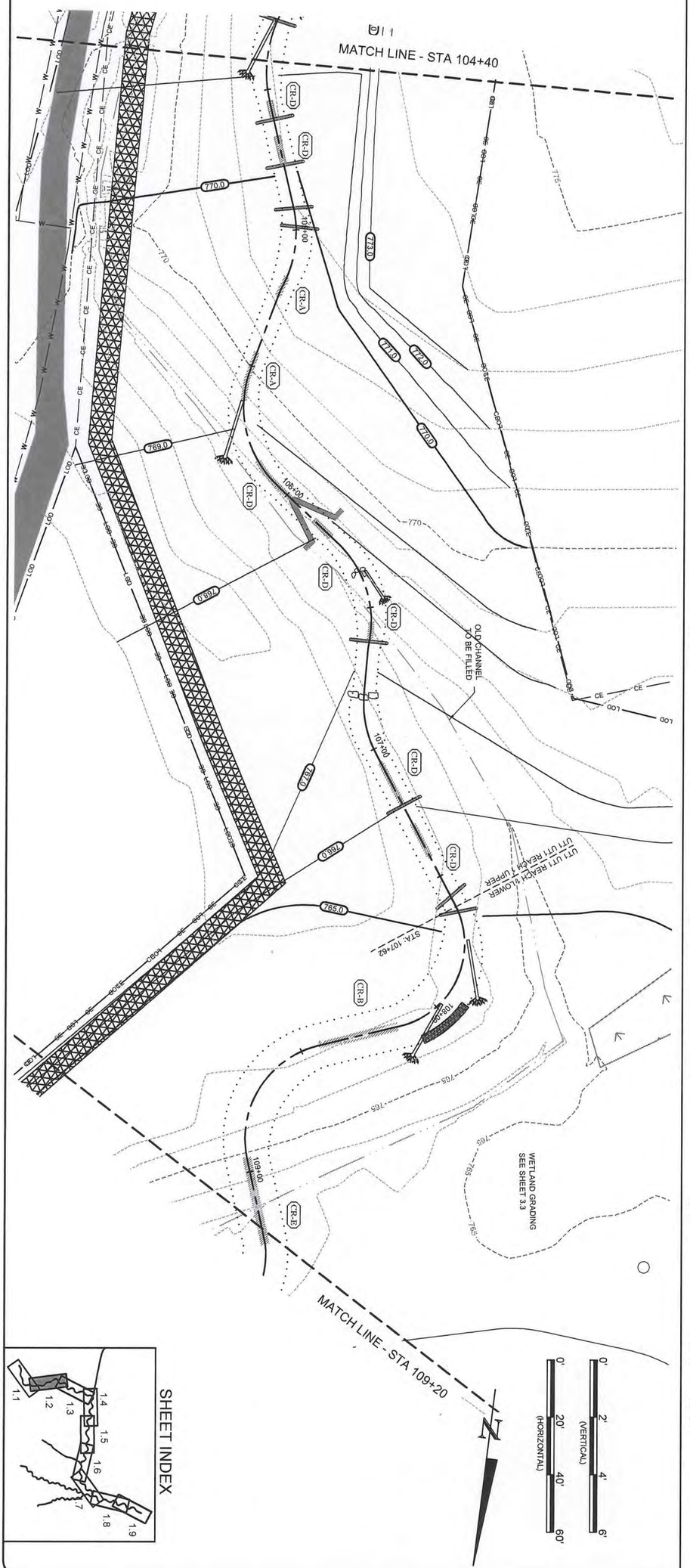
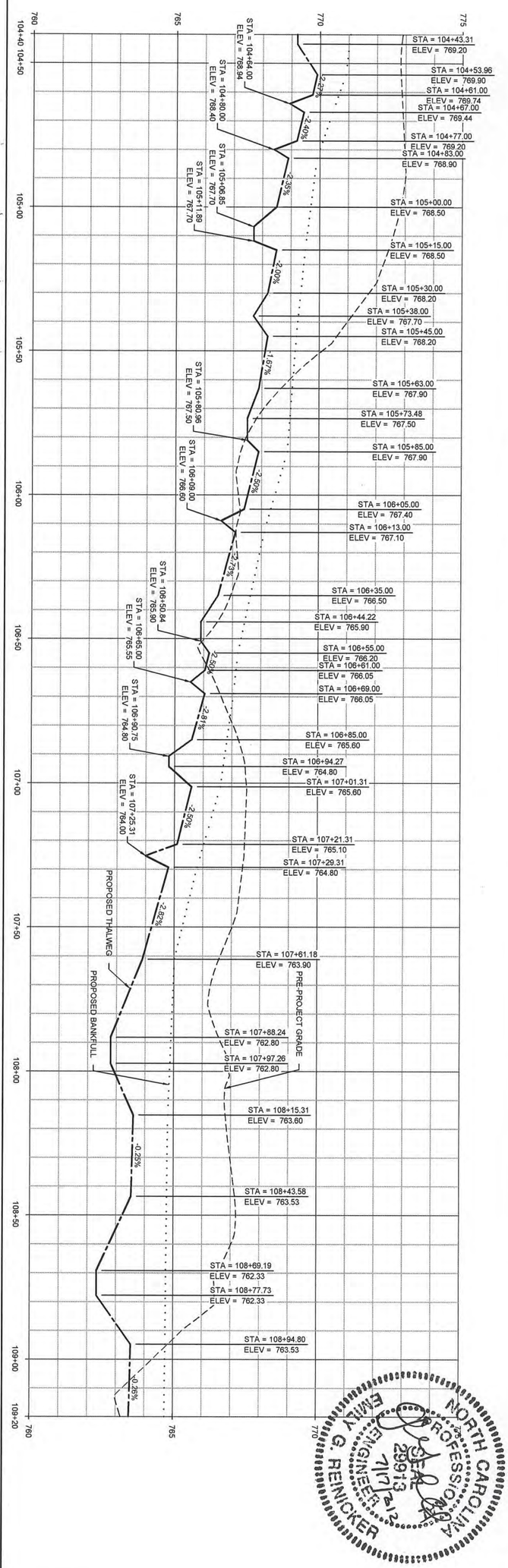
Final As-Built Plans





Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

1.2
Sheet

Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Construction Plans UT1 Reach 1 Upper and Lower

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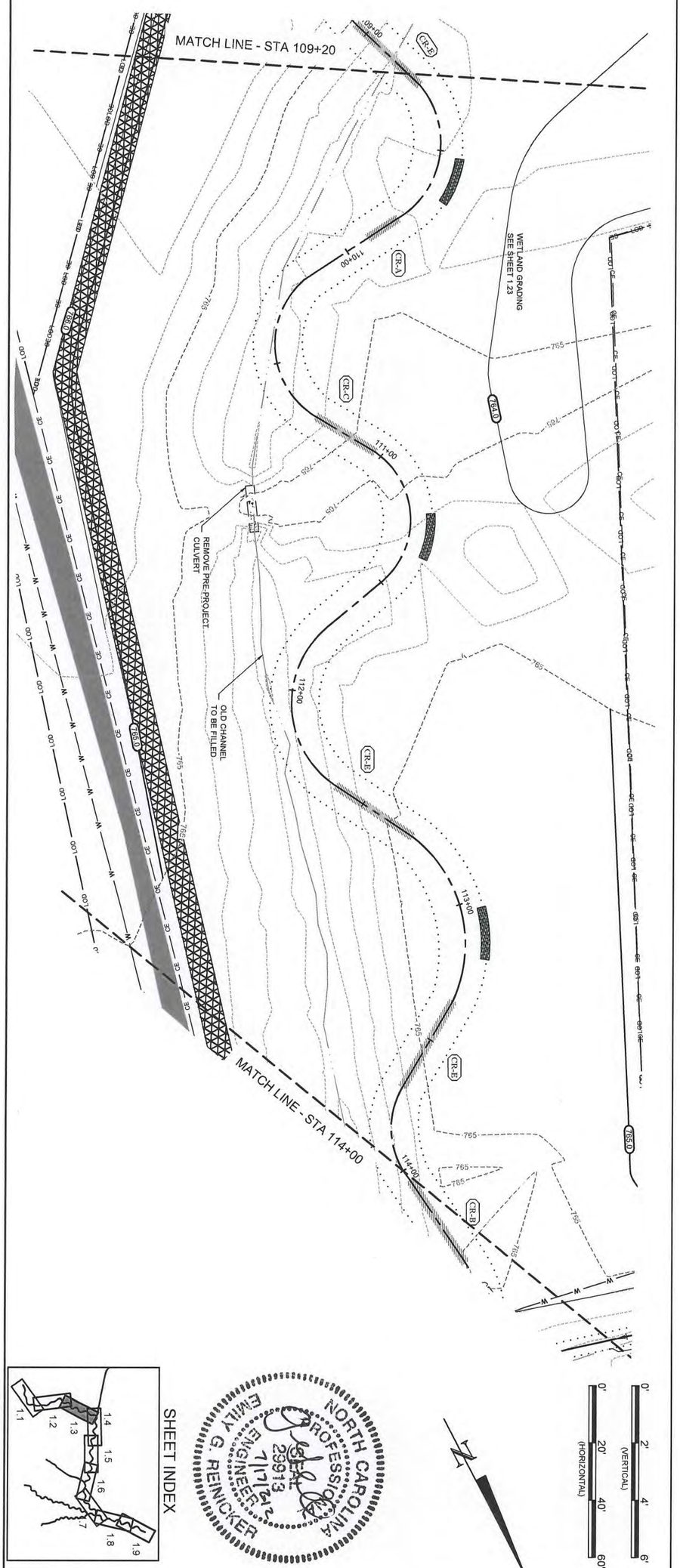
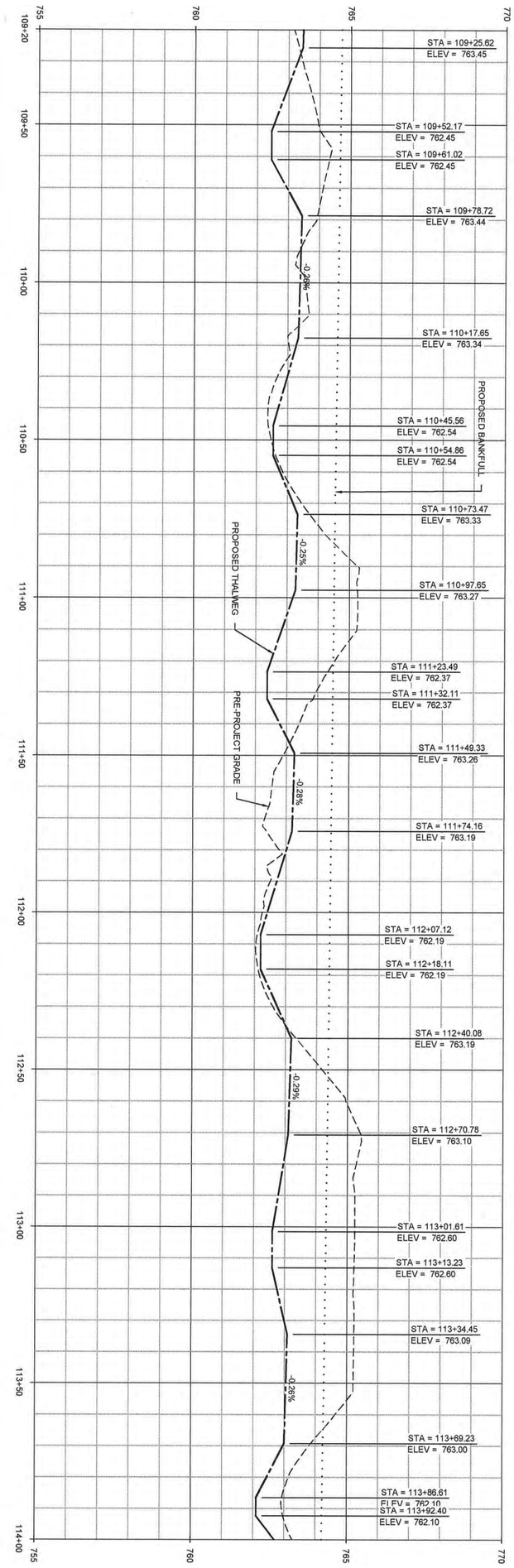
Firm License No. F-0831

Final As-Built Plans





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Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Construction Plans UT1 Reach 1 Lower

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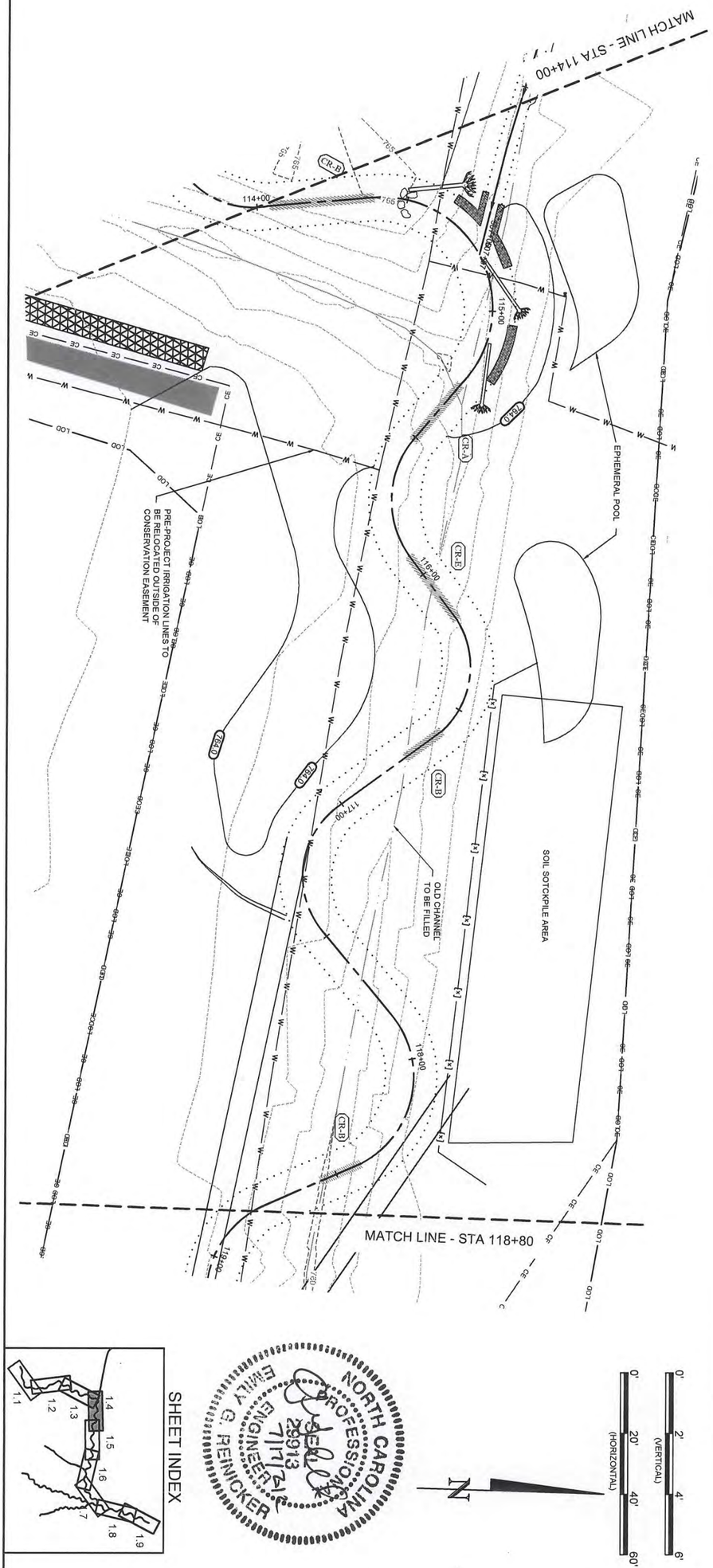
Final As-Built Plans



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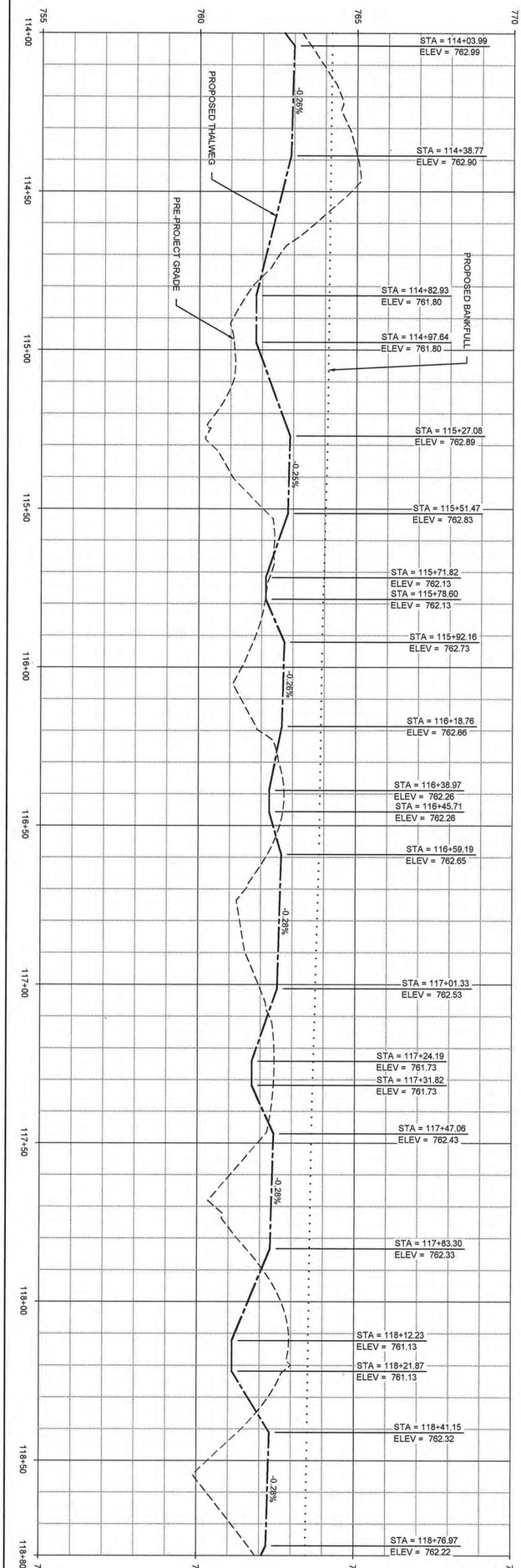

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Final As-Built Plans

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Construction Plans UT1 Reach 1 Lower

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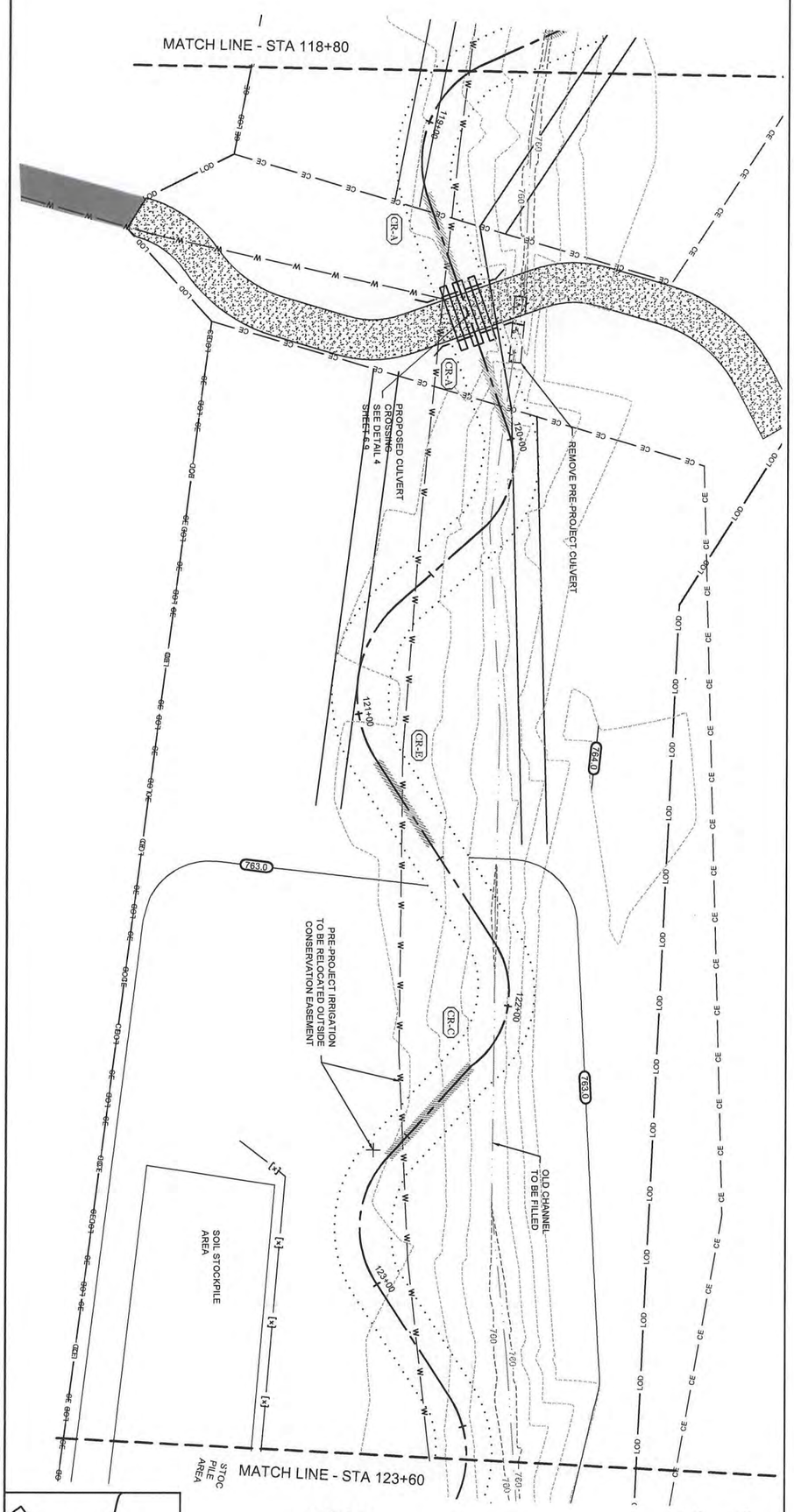

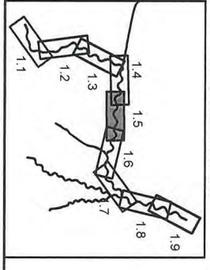

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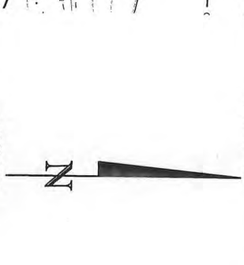

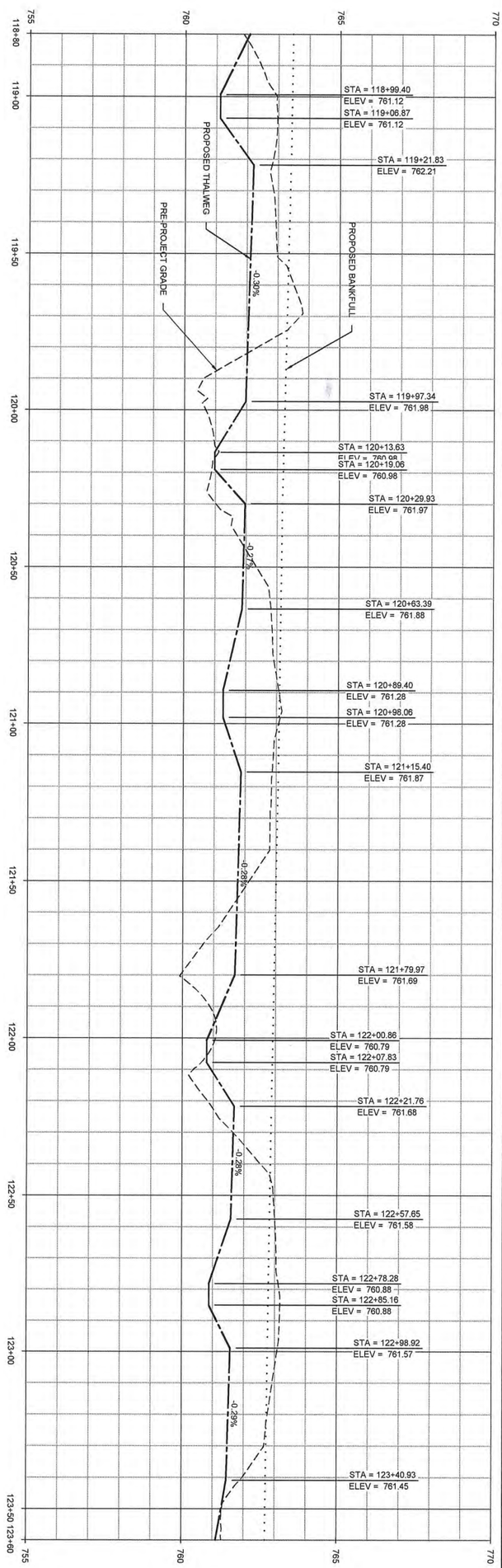

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

1.5
Sheet

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Construction Plans UT1 Reach 1 Lower

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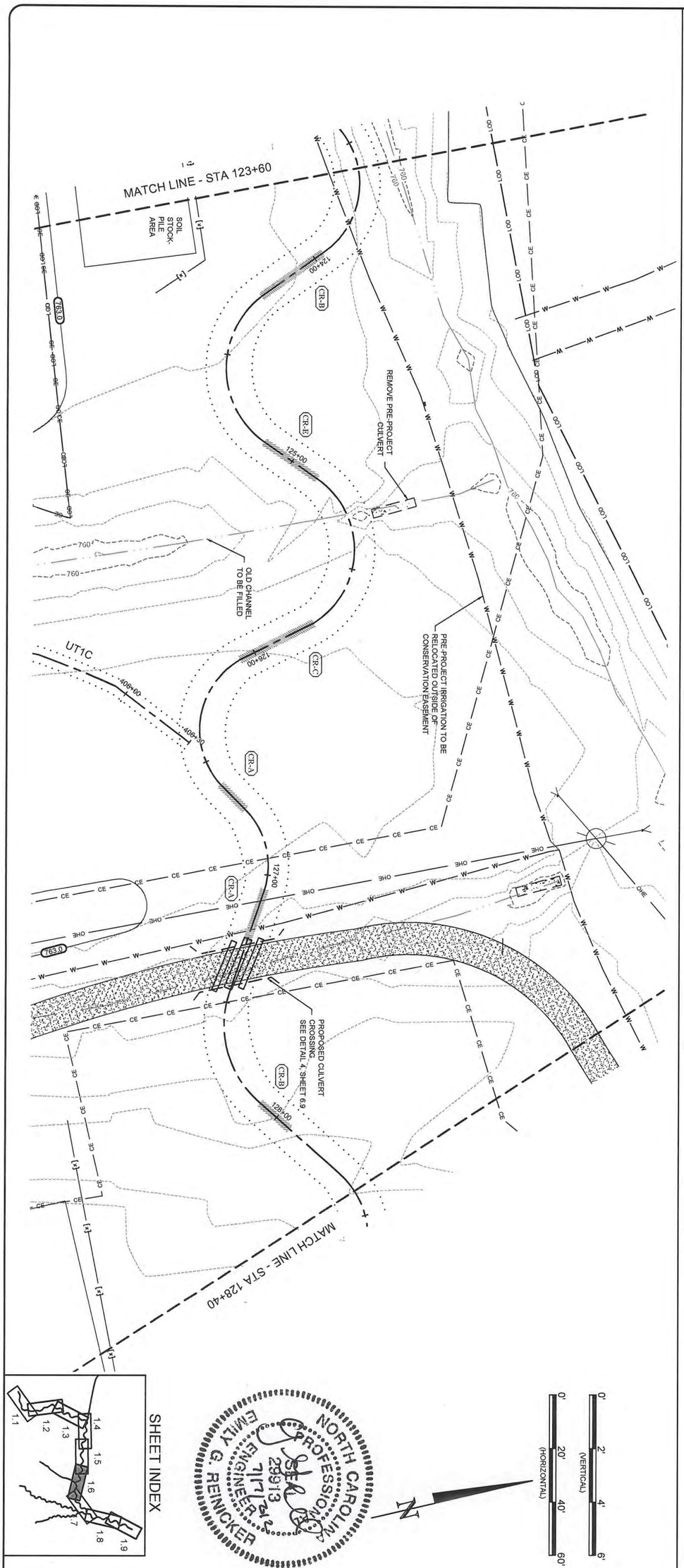

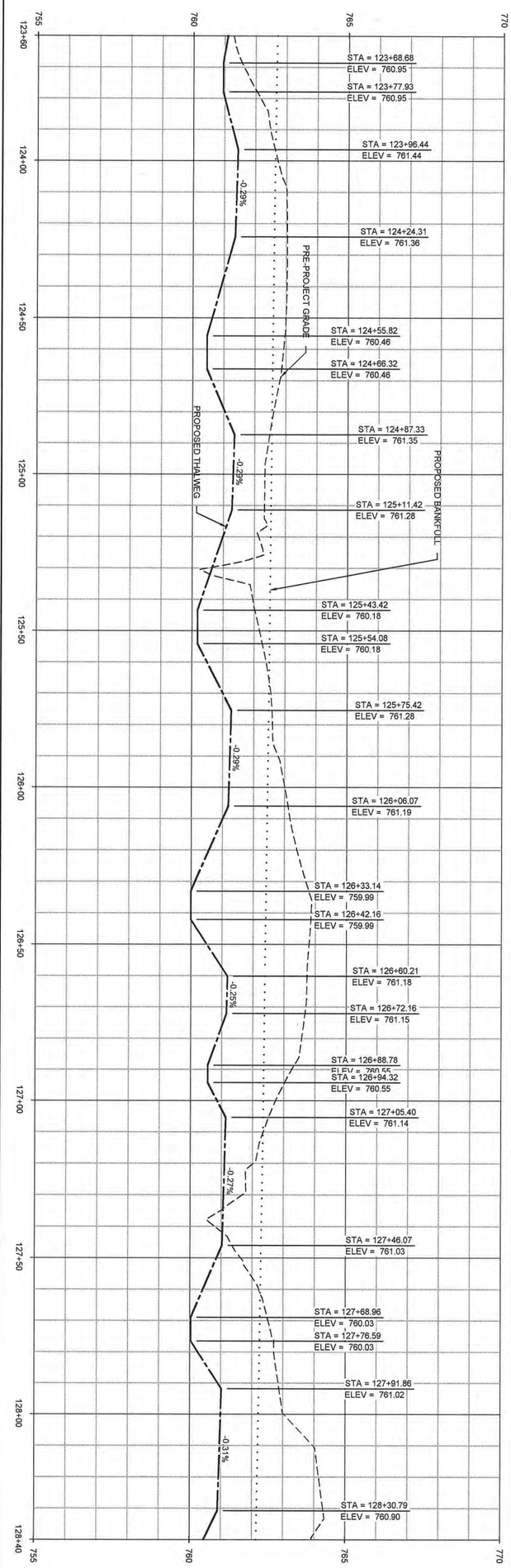

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NORTH CAROLINA PROFESSIONAL SEAL 29913 ENGINEER EMILY G. REINICKER

0' 20' 40' 60' (HORIZONTAL)

0' 2' 4' 6' (VERTICAL)

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Sheet

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Construction Plans UT1 Reach 1 Lower

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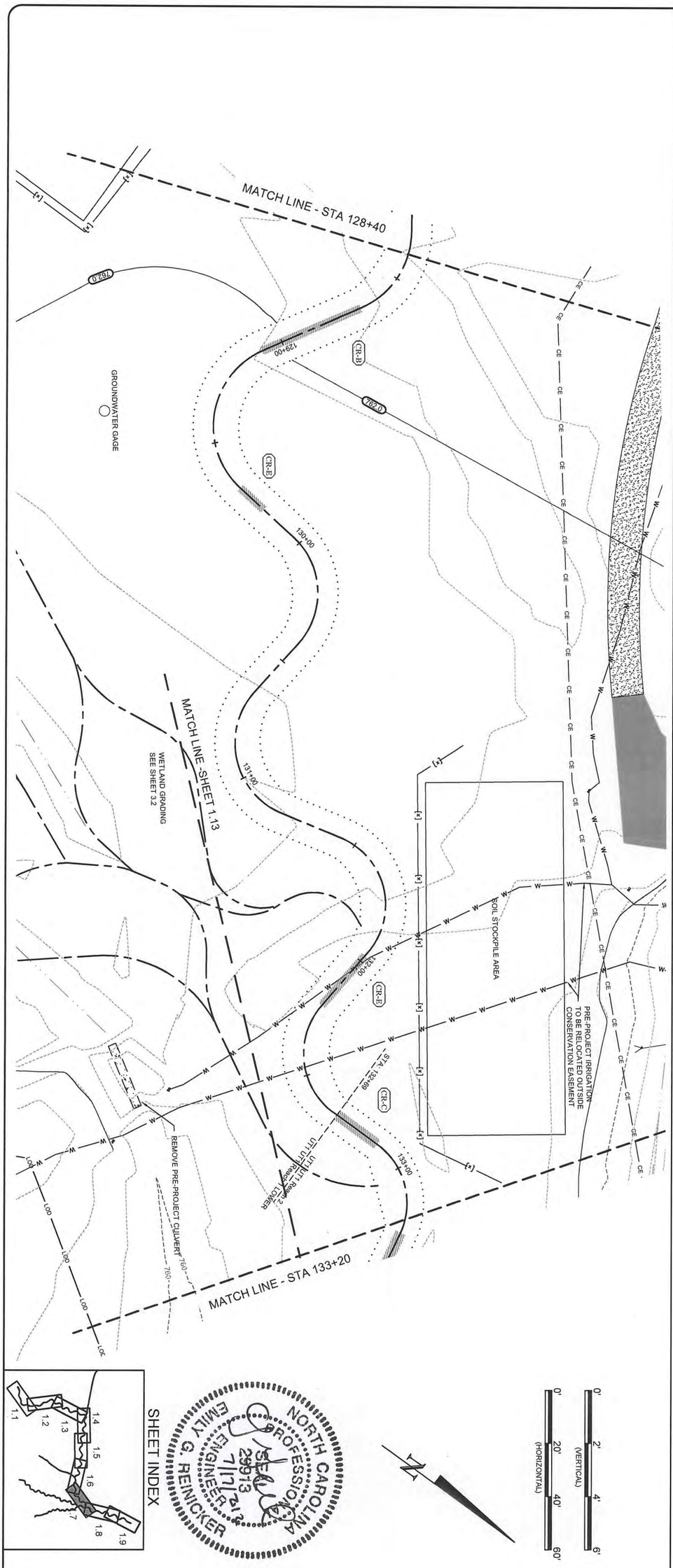

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NORTH CAROLINA PROFESSIONAL SEAL 29013 ENGINEER EMILY G. REINICKER 7/17/12

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Construction Plans UT1 Reach 1 Lower

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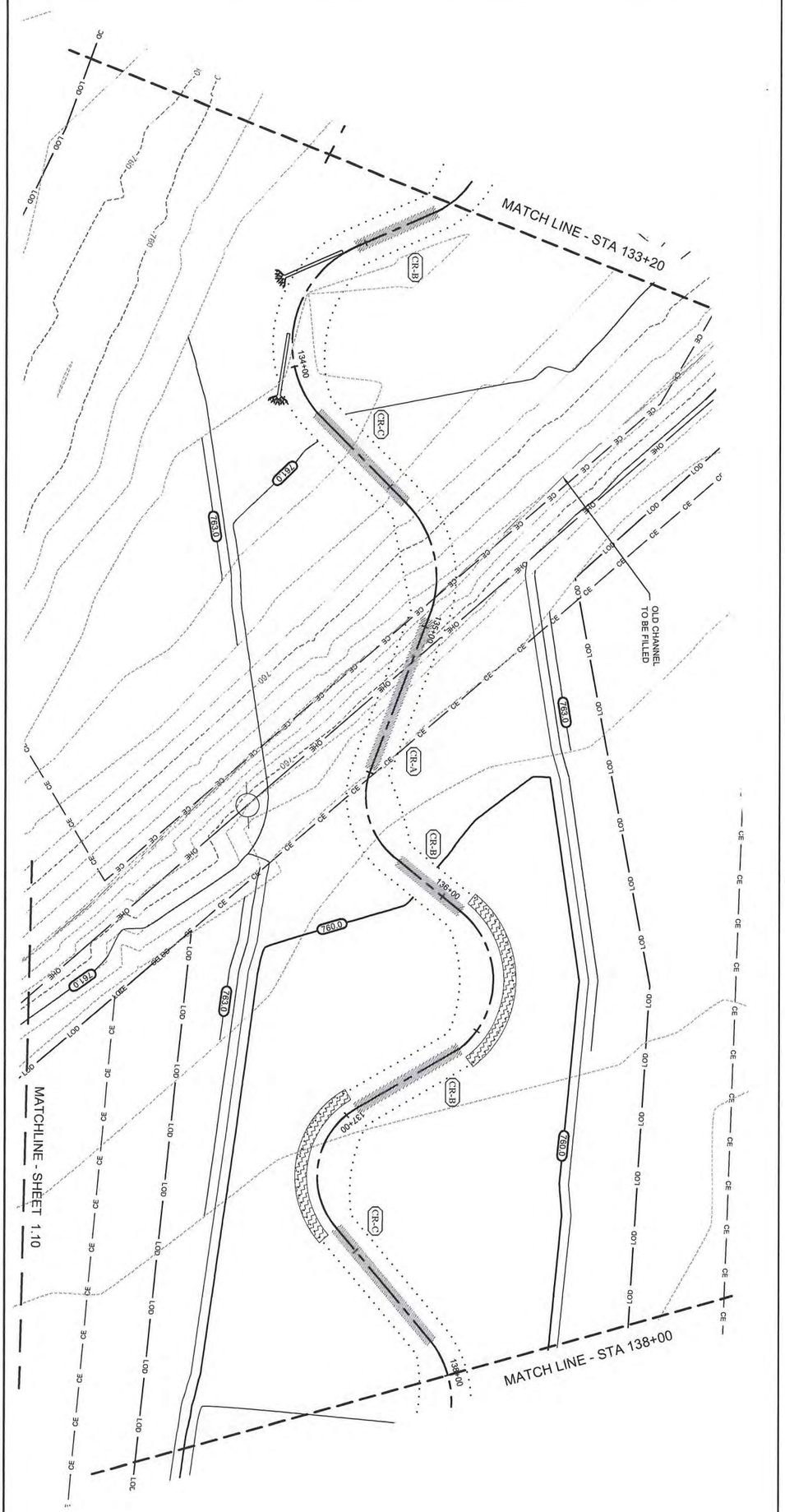

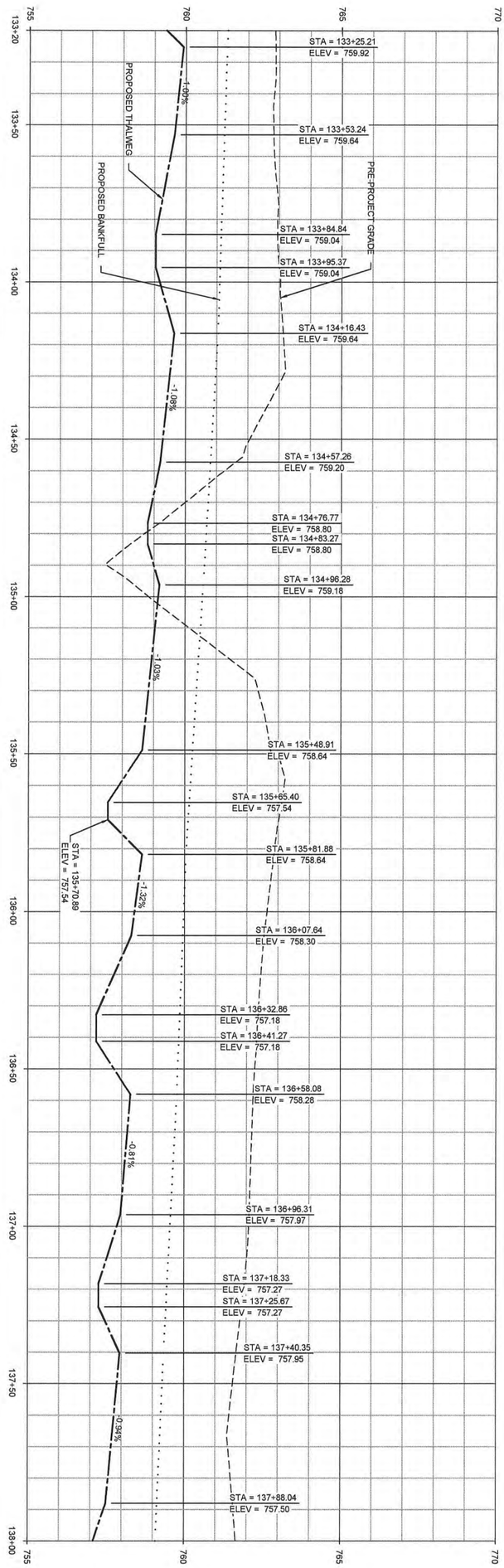

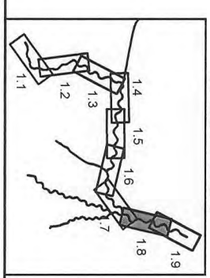

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 29913 EMILY G. REINICKER 7/17/2012

0' 20' 40' 60' (HORIZONTAL)

0' 2' 4' 6' (VERTICAL)

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

1.8
Sheet

Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Construction Plans UT1 Reach 2

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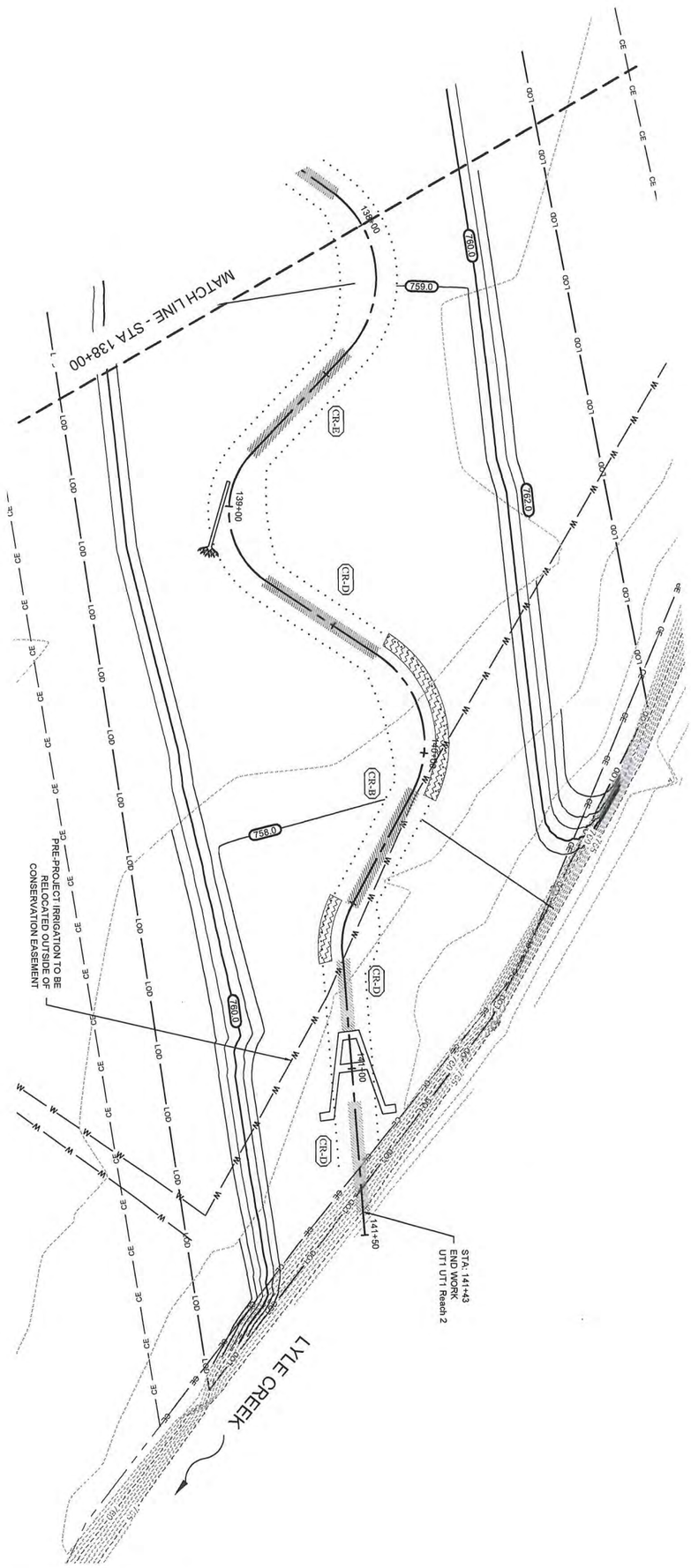
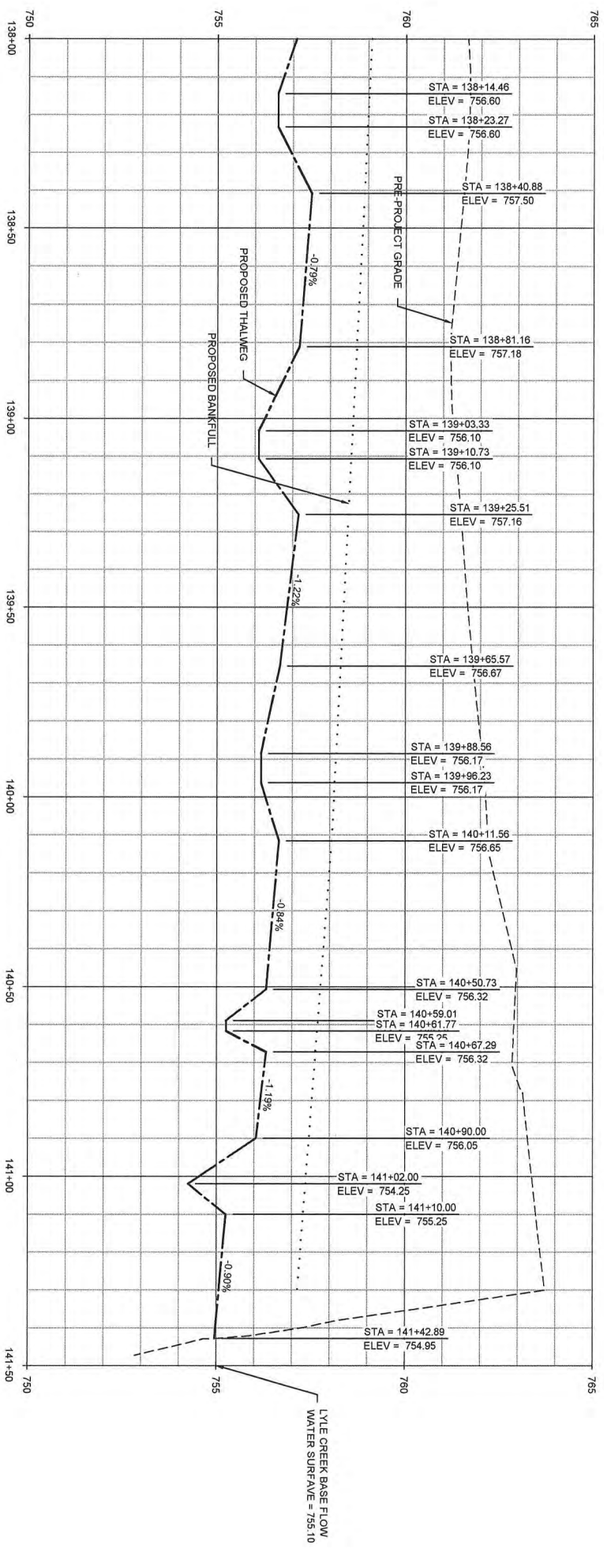
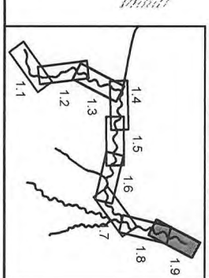
Final As-Built Plans







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NORTH CAROLINA
PROFESSIONAL
EMILY G. REINICKER
29913
7/17/12
ENGINEER

N

0' 20' 40' 60' (HORIZONTAL)

0' 2' 4' 6' (VERTICAL)

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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Sheet

Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Construction Plans UT1 Reach 2

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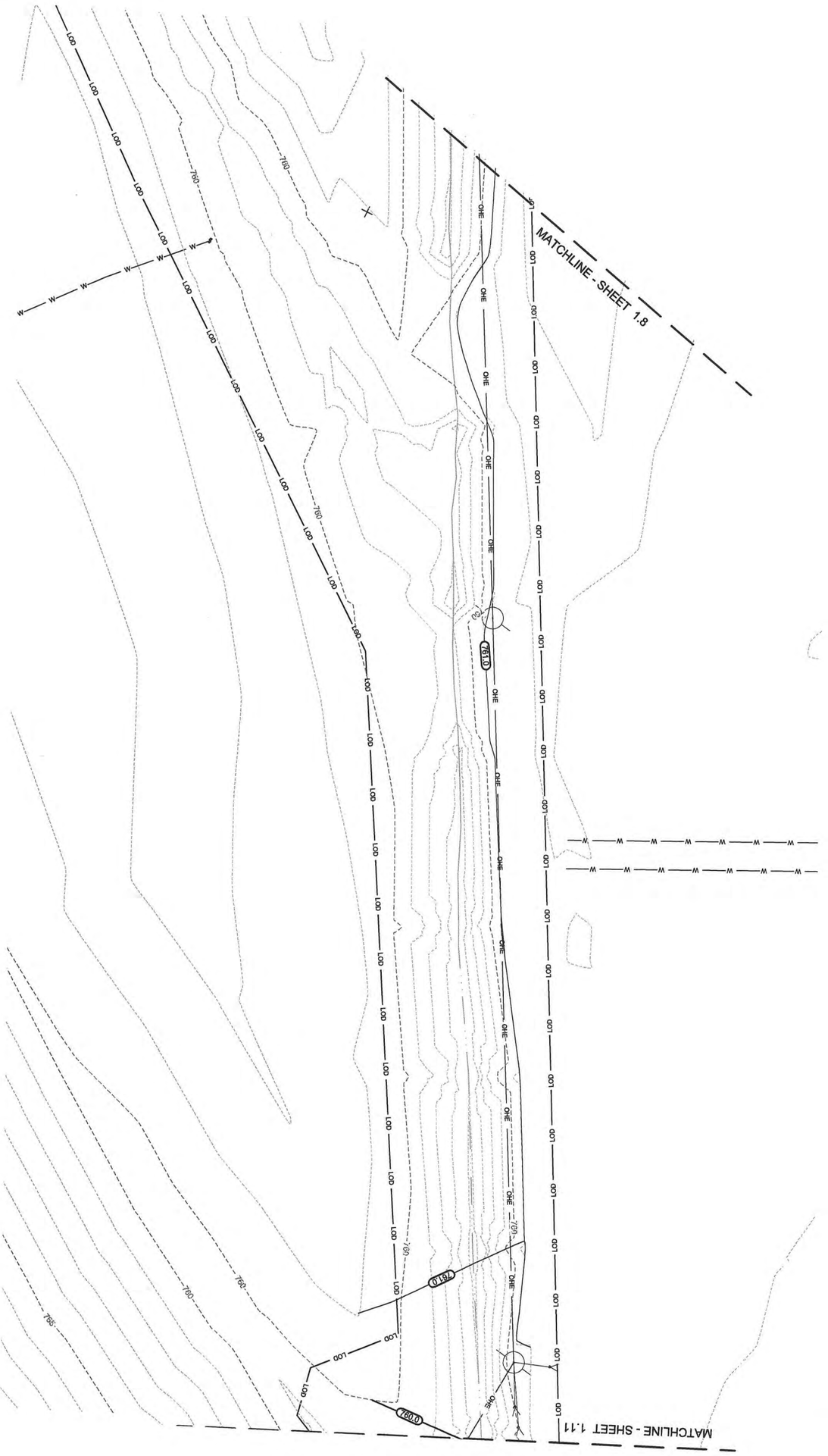

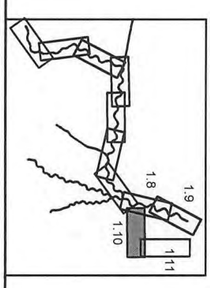

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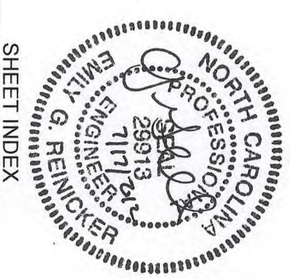

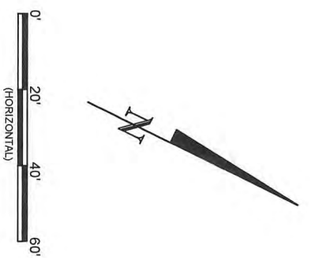

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Contruction Plans Fill PRE-PROJECT Channel

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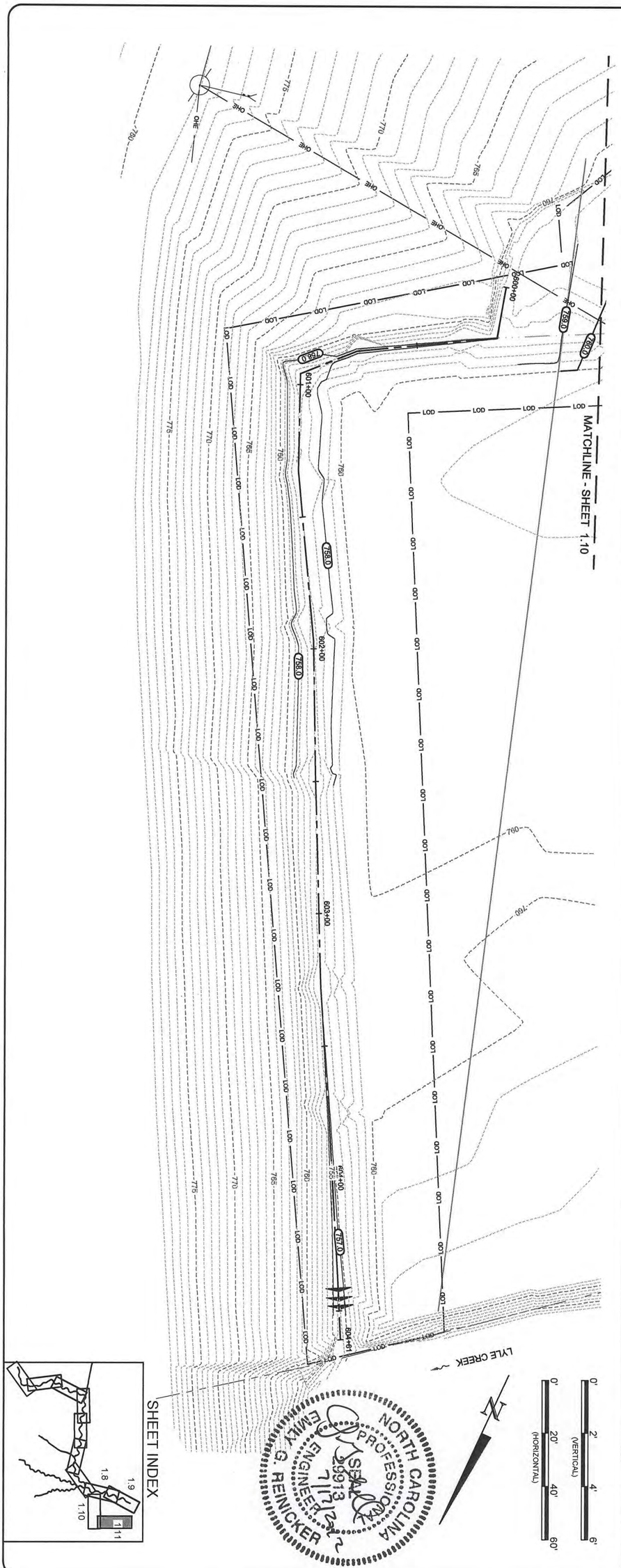
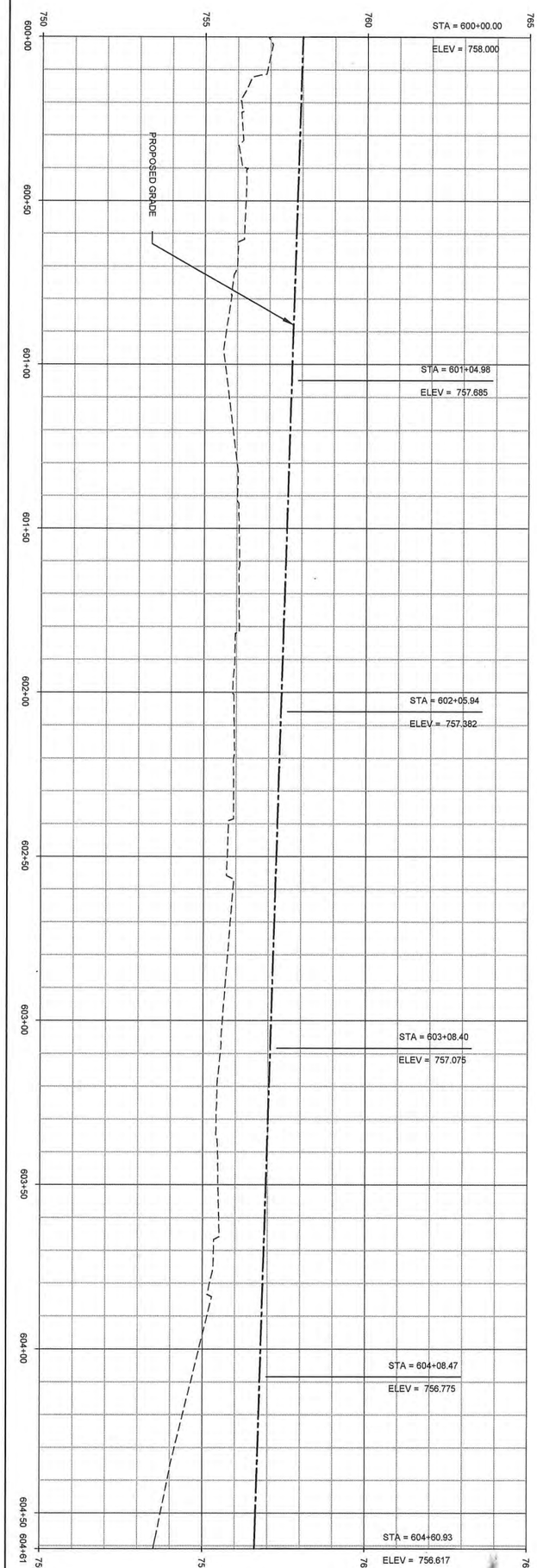
Final As-Built Plans





Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Contruction Plans Fill PRE-PROJECT Channel

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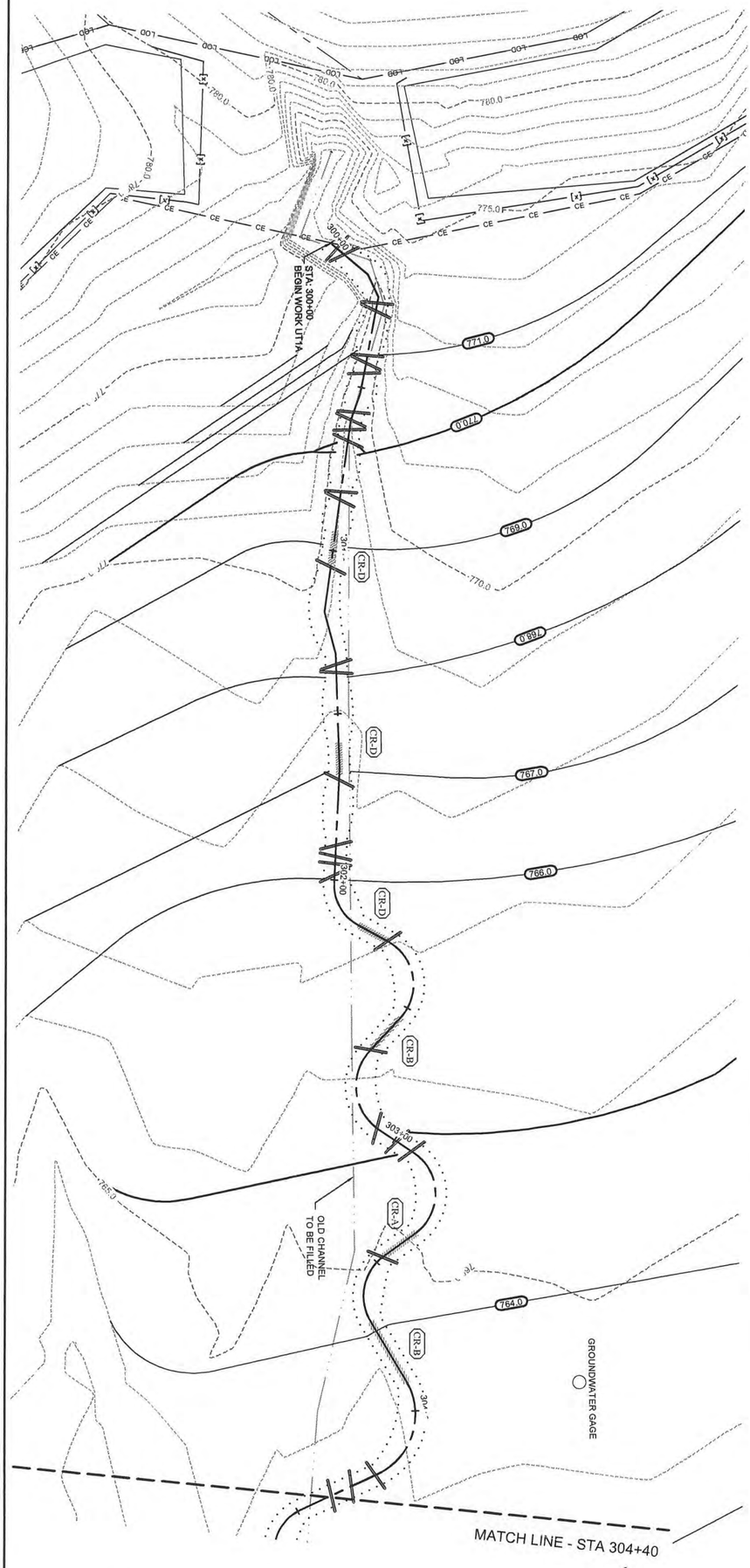

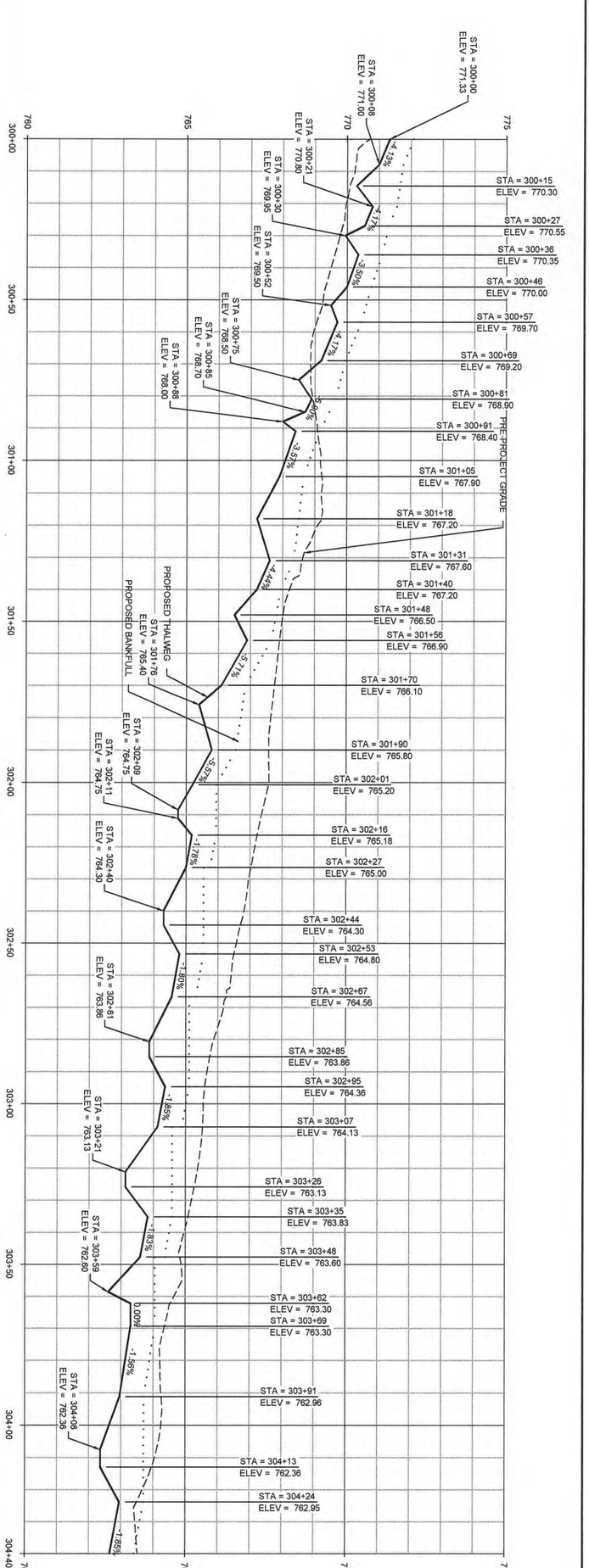

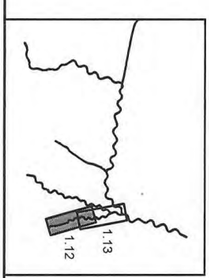

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 29913 EMILY G. REINICKER 7/17/12

0' 20' 40' 60' (HORIZONTAL)
0' 2' 4' 6' (VERTICAL)

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Sheet

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Construction Plans UT1A

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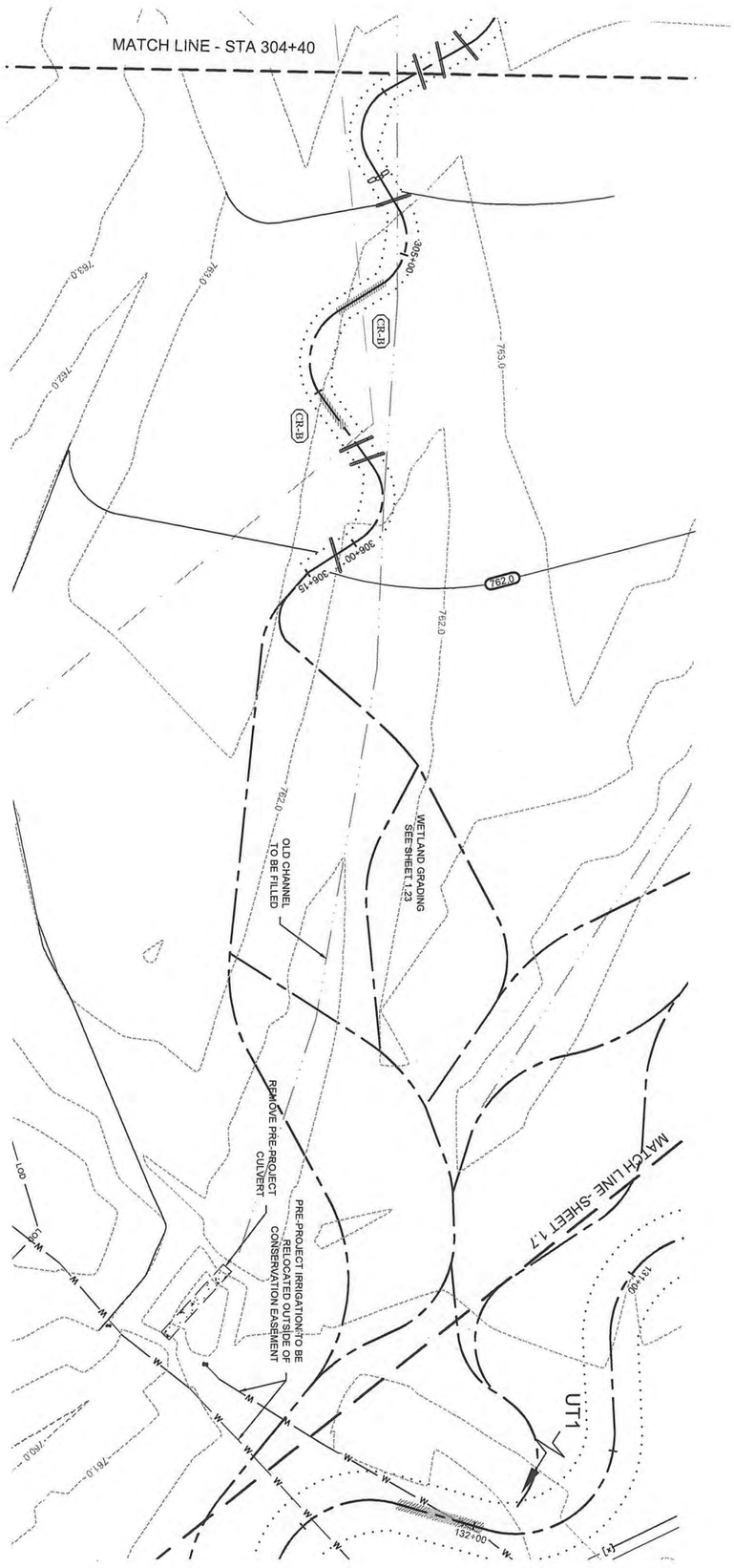

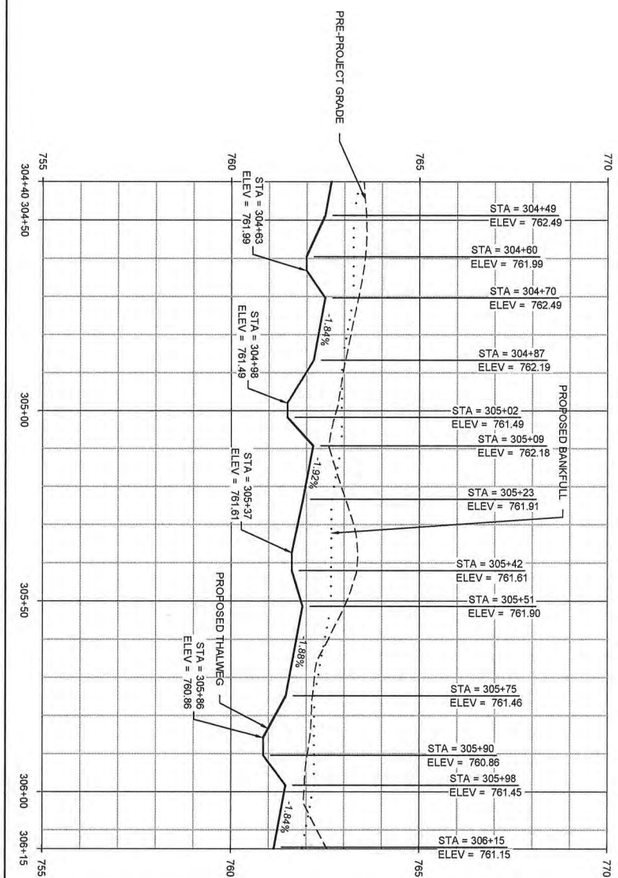

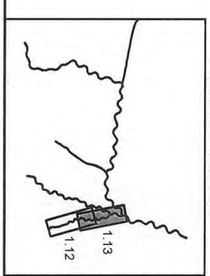

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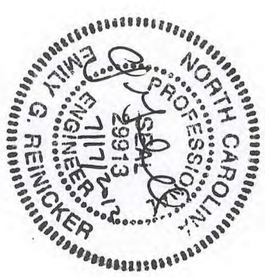

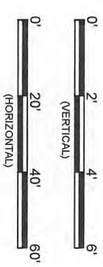

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Construction Plans UT1A

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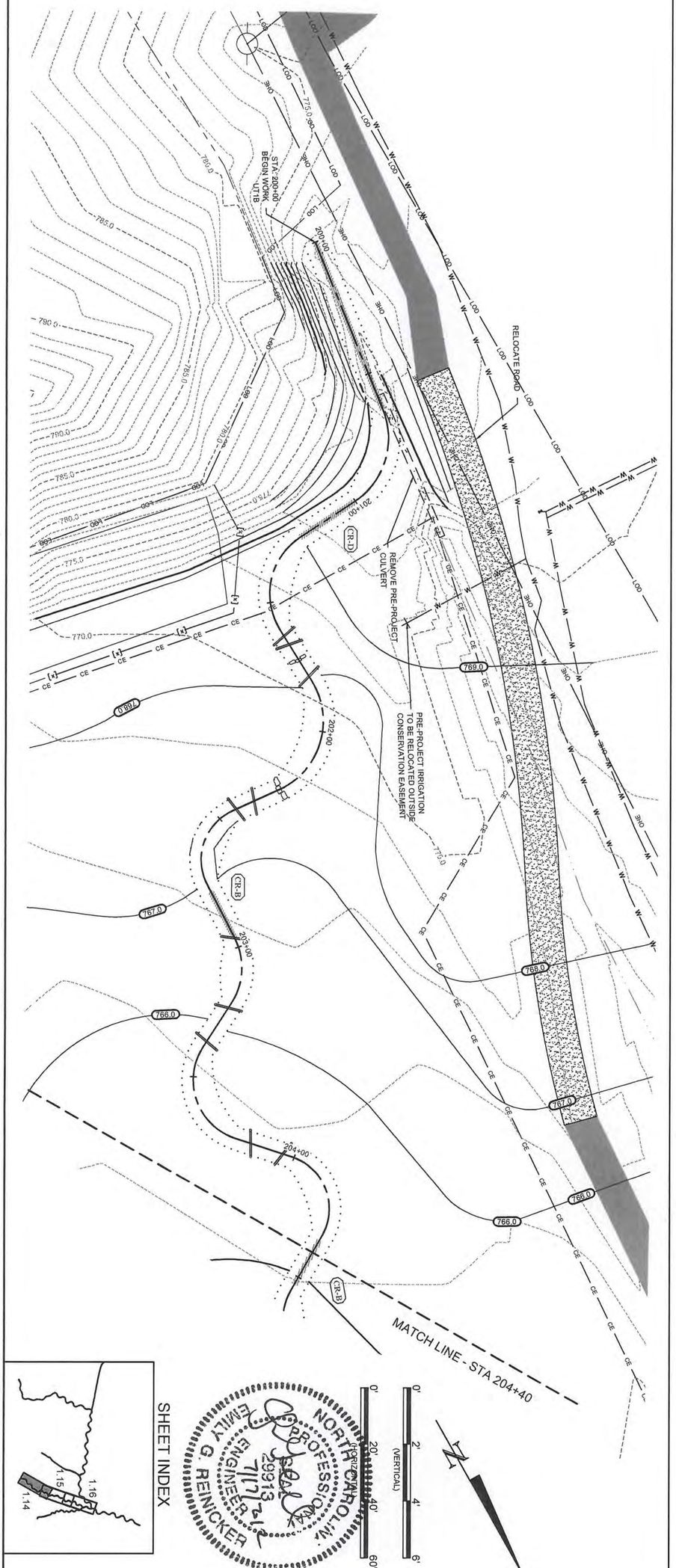

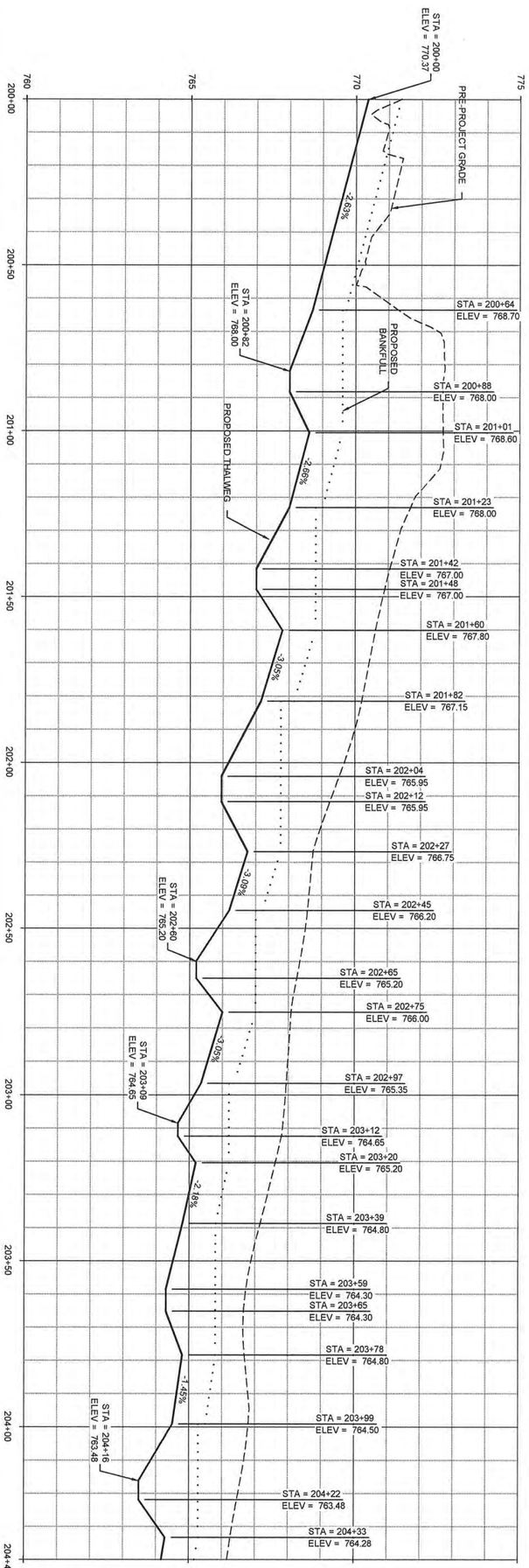

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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Final As-Built Plans

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Construction Plans UT1B

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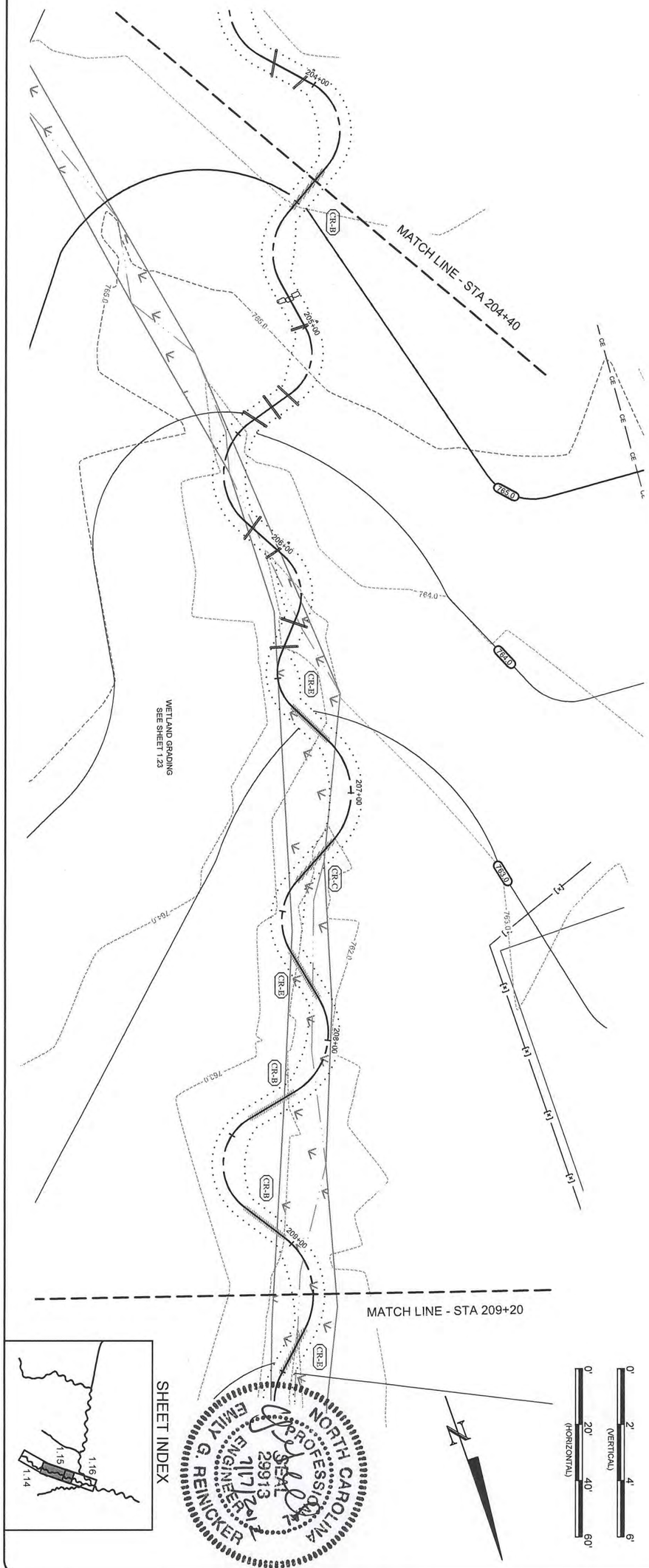

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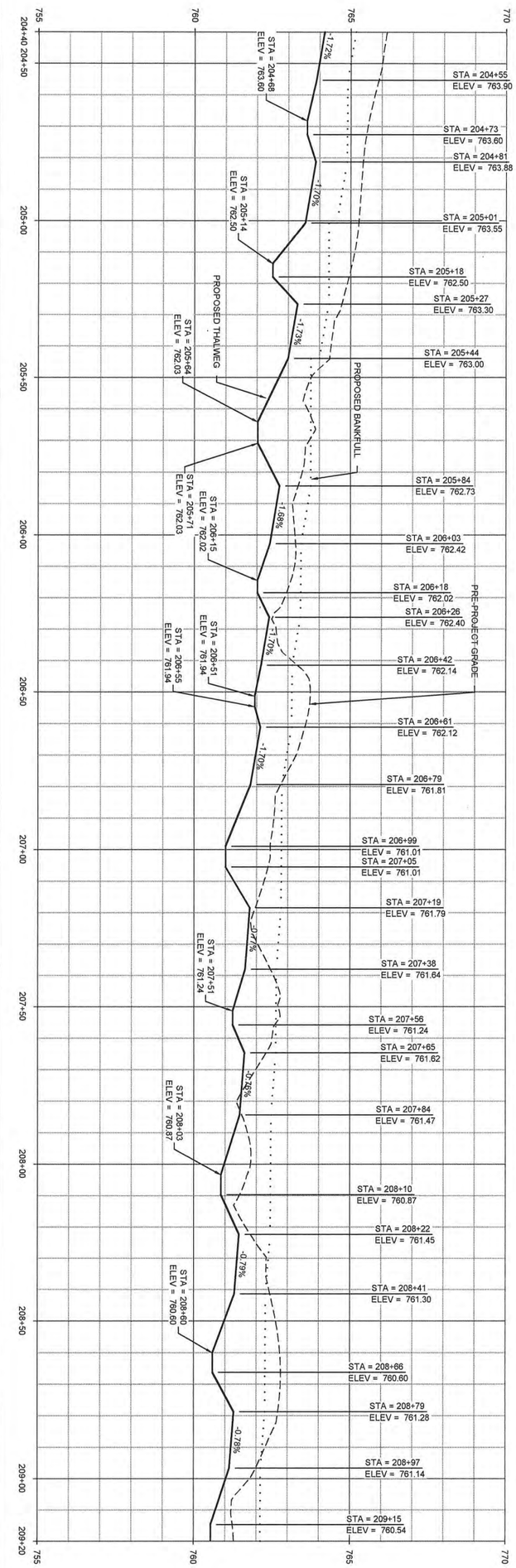

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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Sheet

Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Construction Plans UT1B

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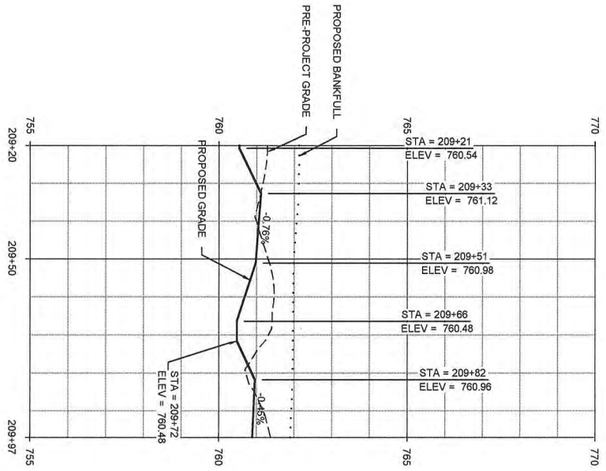

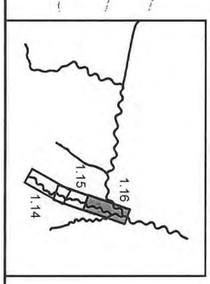

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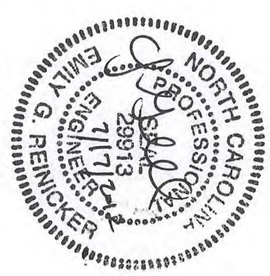

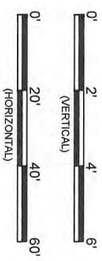

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Construction Plans UT1B

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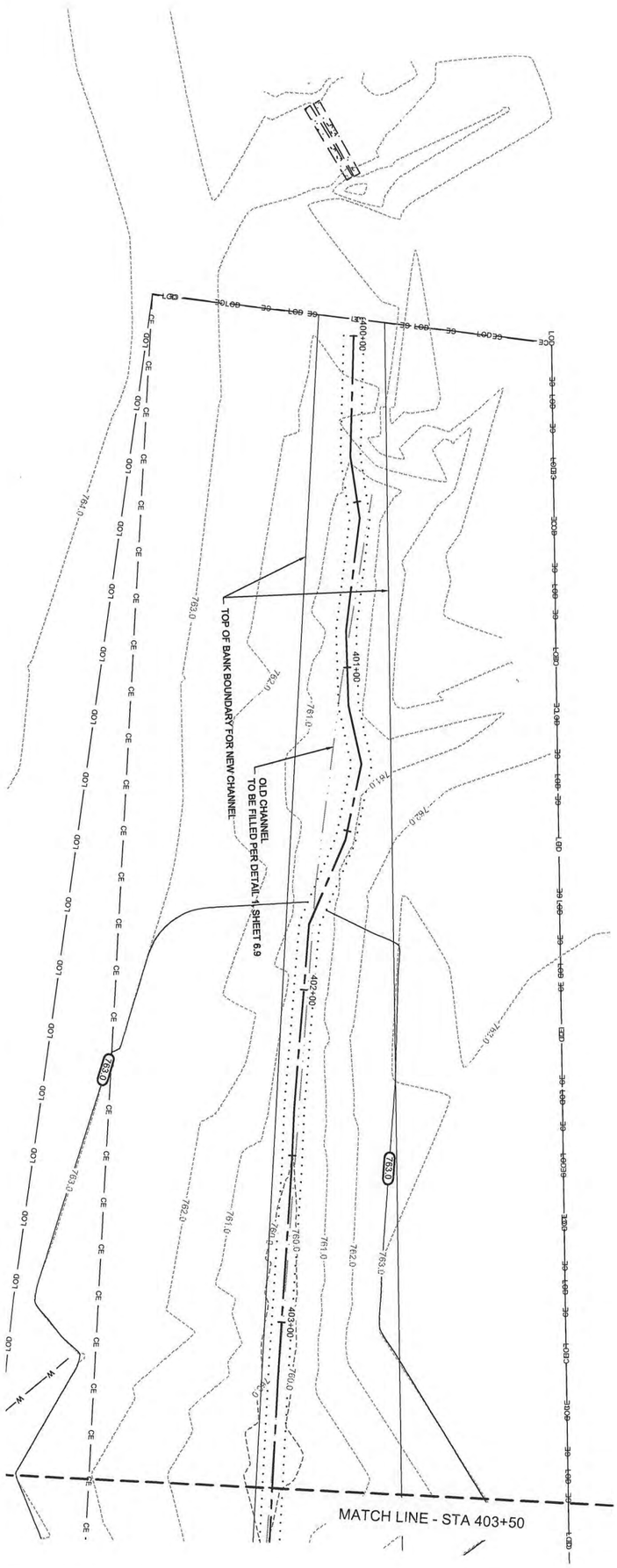
Firm License No. F-0831

Final As-Built Plans



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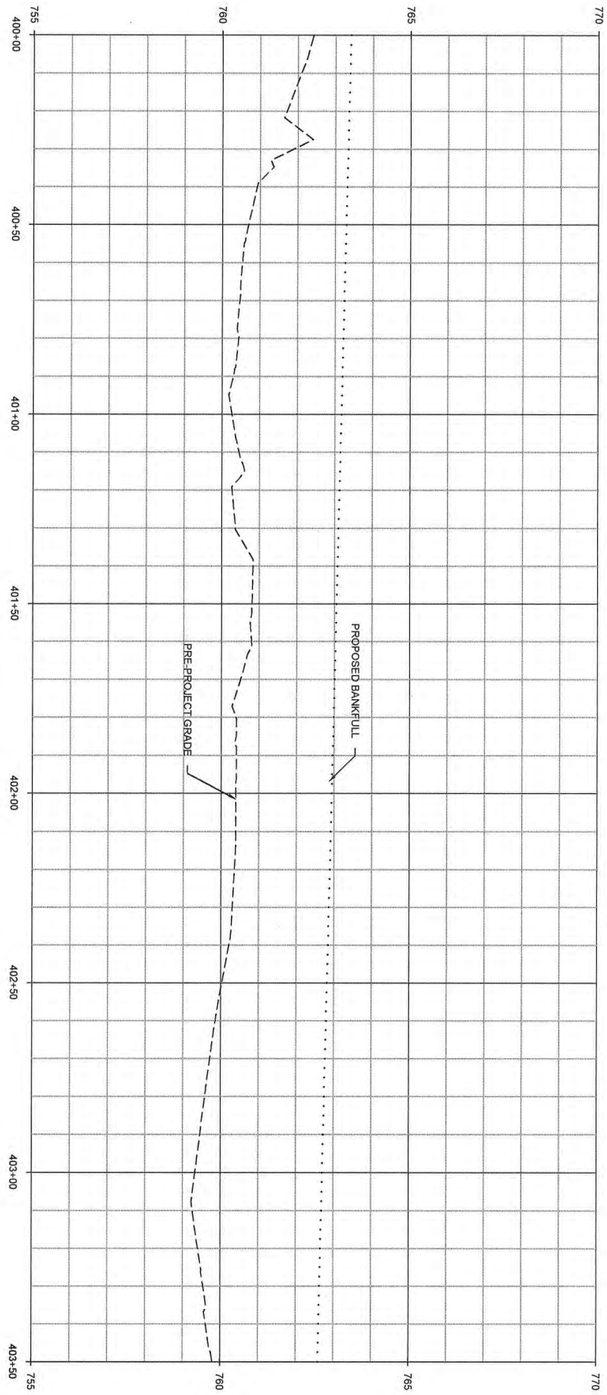

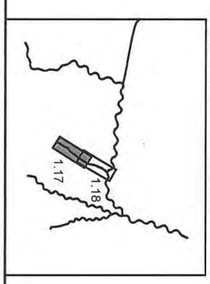

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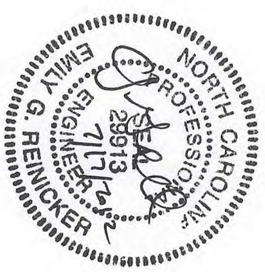

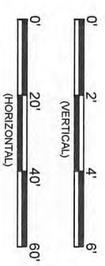

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Construction Plans UT1C

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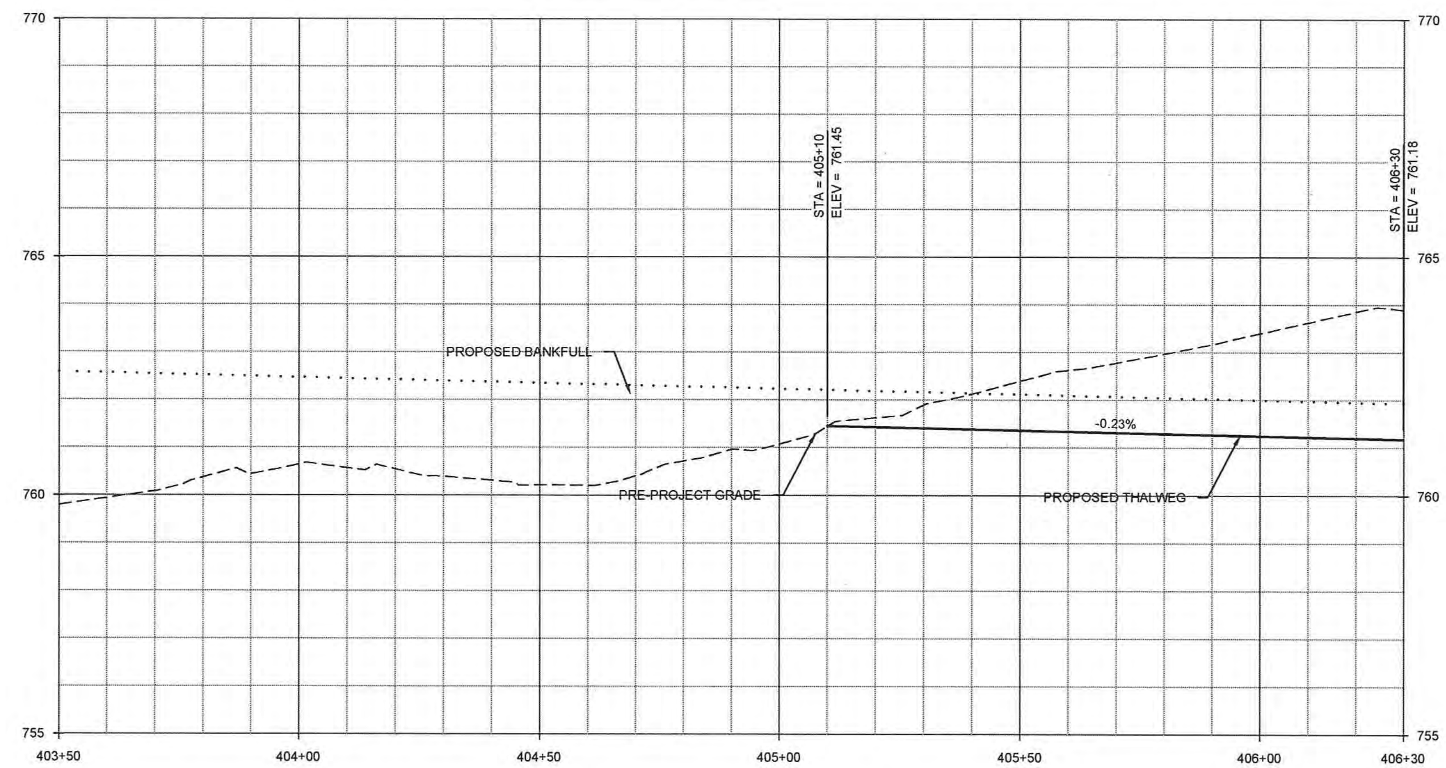

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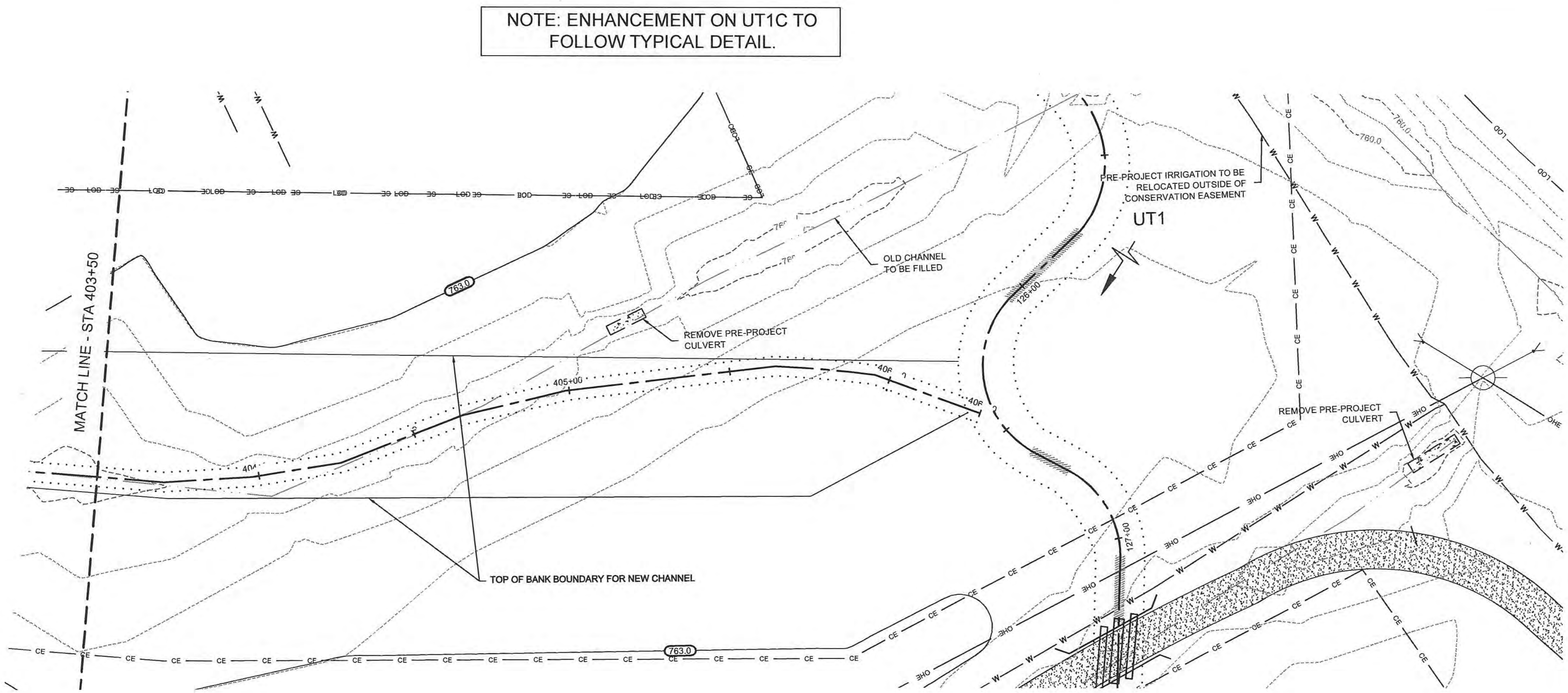

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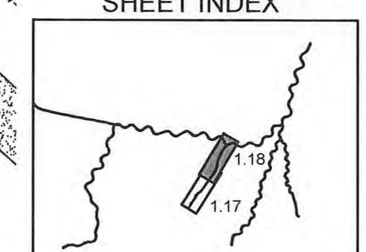

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Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Construction Plans UT1C

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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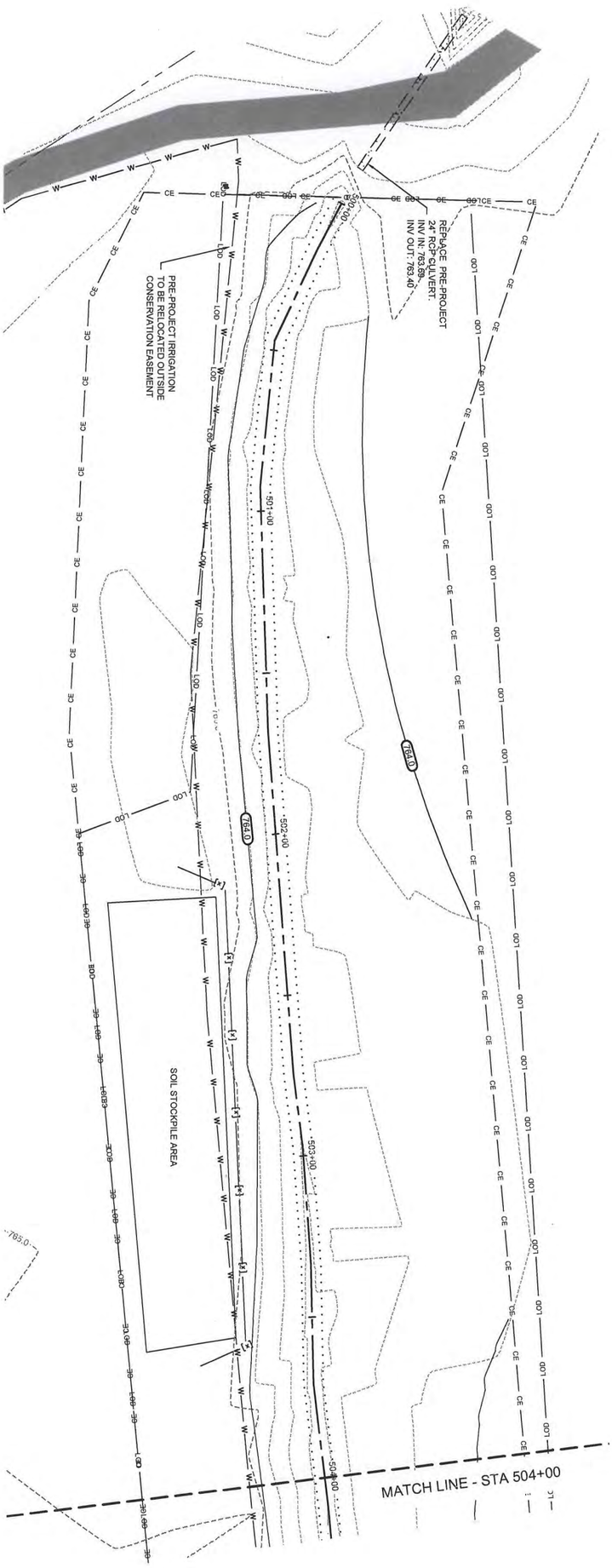
Final As-Built Plans



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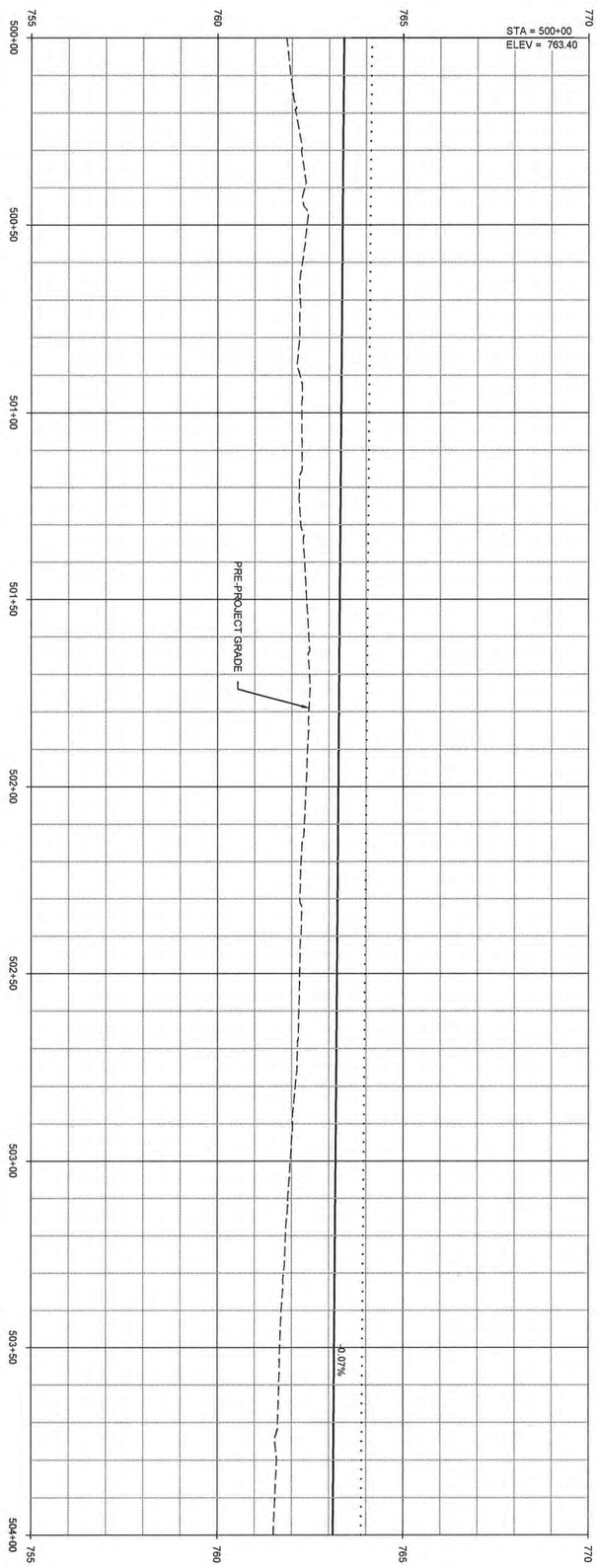

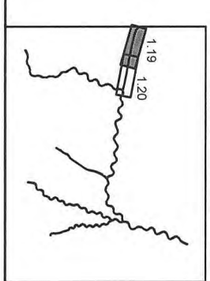

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Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
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Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Construction Plans UT1D

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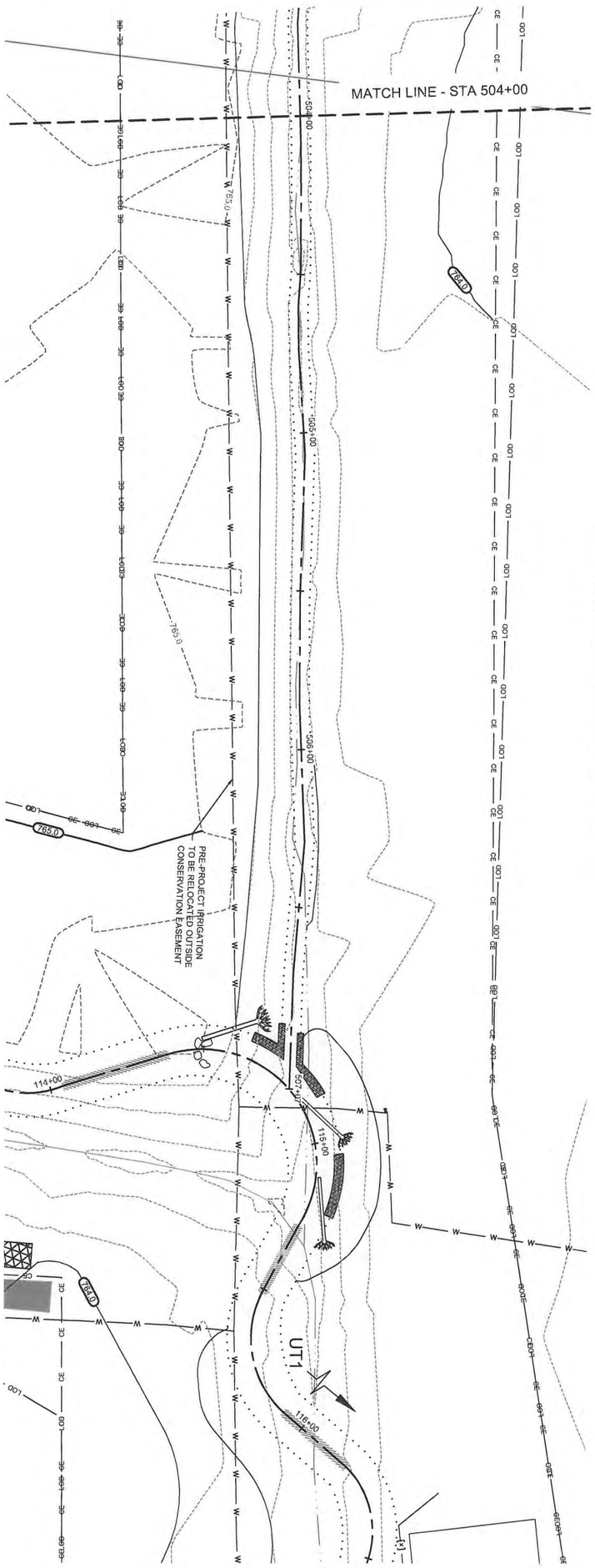

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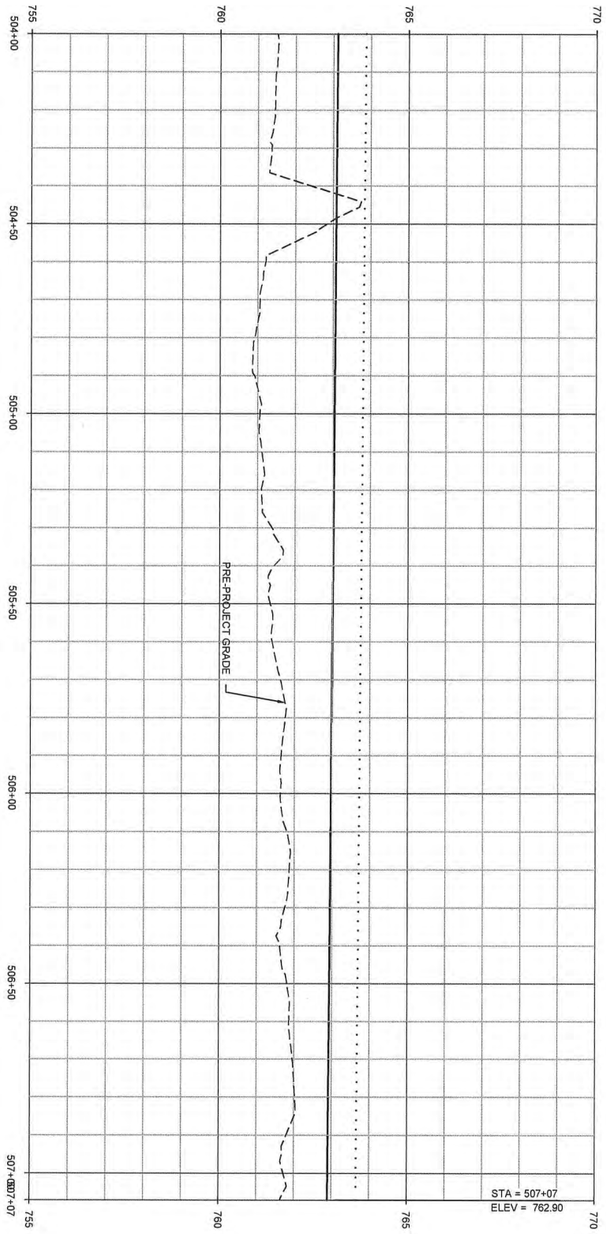

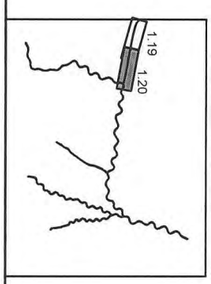

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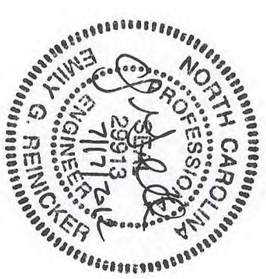

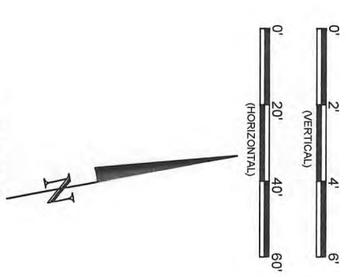

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Construction Plans UT1D

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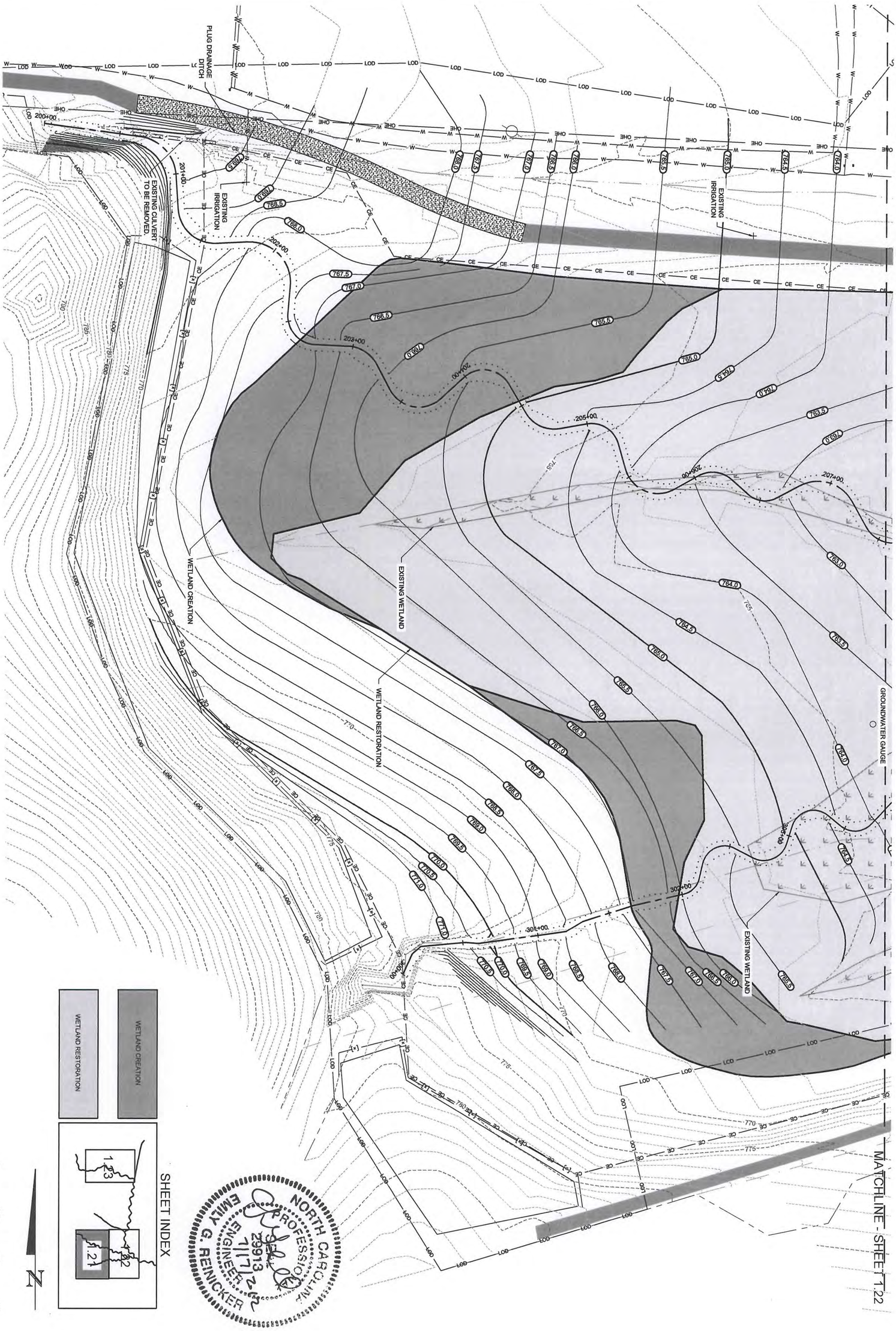

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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Lyle Creek Mitigation Site
Catawba, North Carolina

Wetland RW1
Construction Plans

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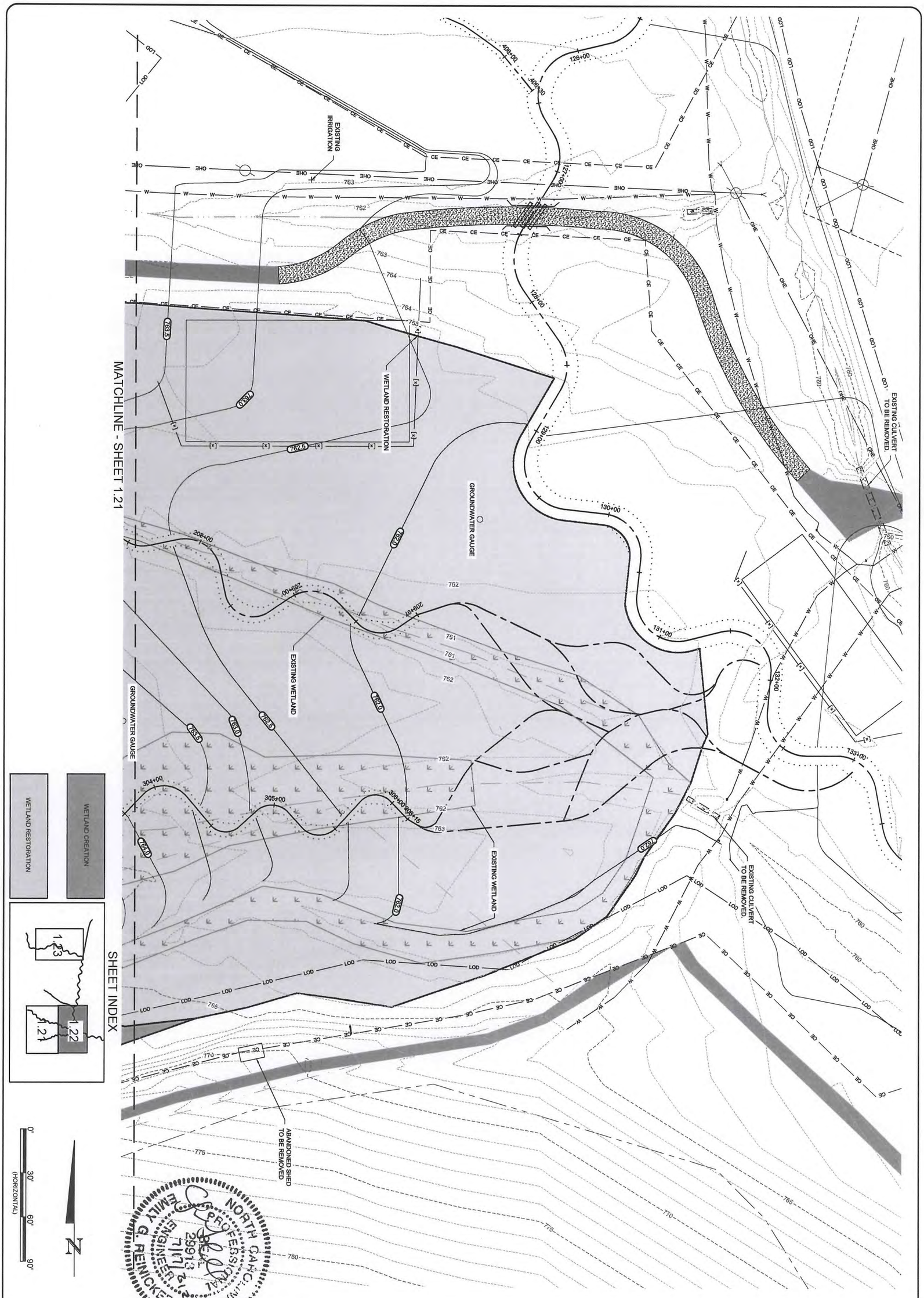
Fax: 704.332.3306
Firm License No. P-0831

Final As-Built Plans



NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 29913 EMILY G. REINICKER 7/11/12

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Wetland RW1
Construction Plans

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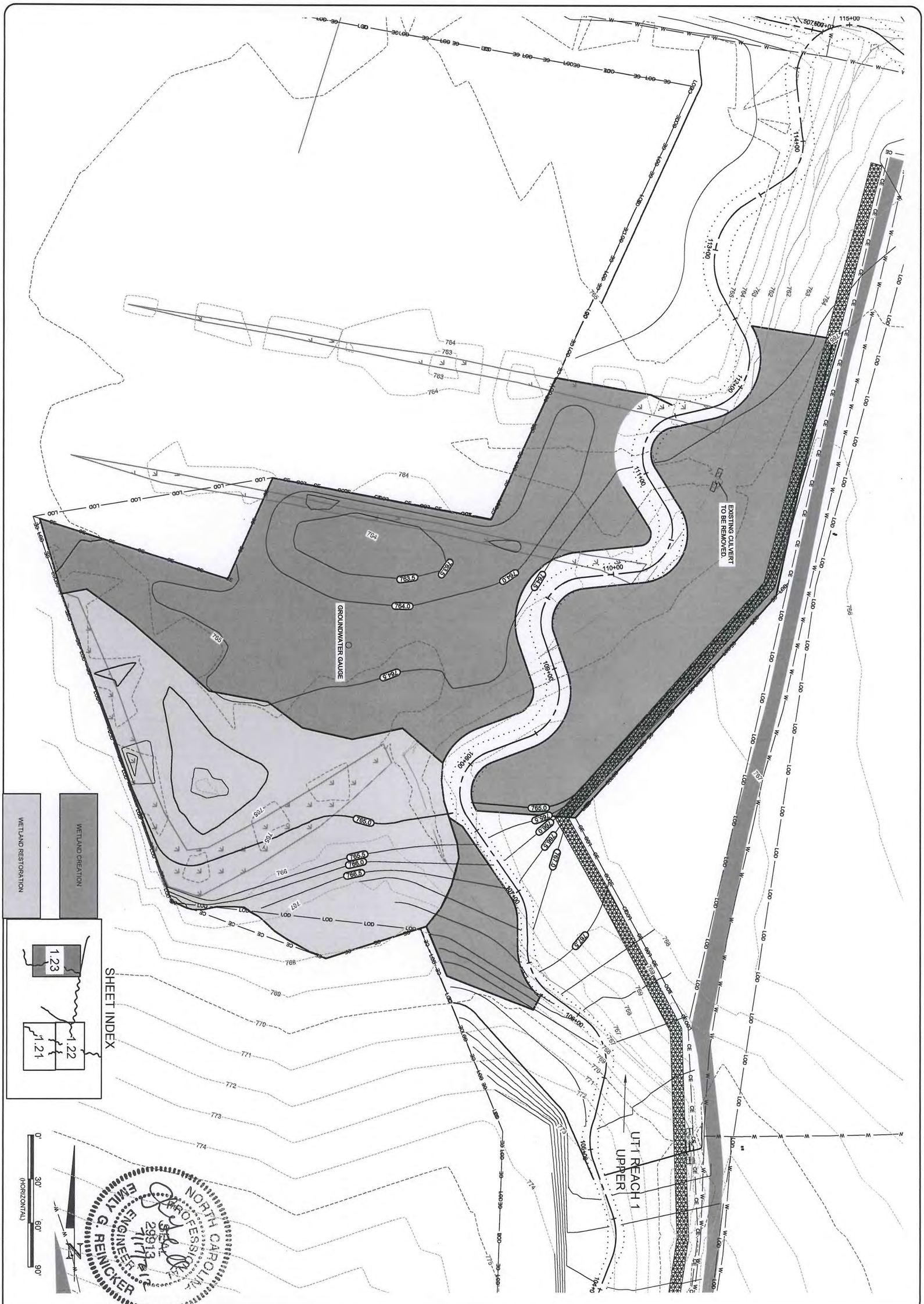
Firm License No. F-0831

Final As-Built Plans



Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Wetland RW2
Construction Plans

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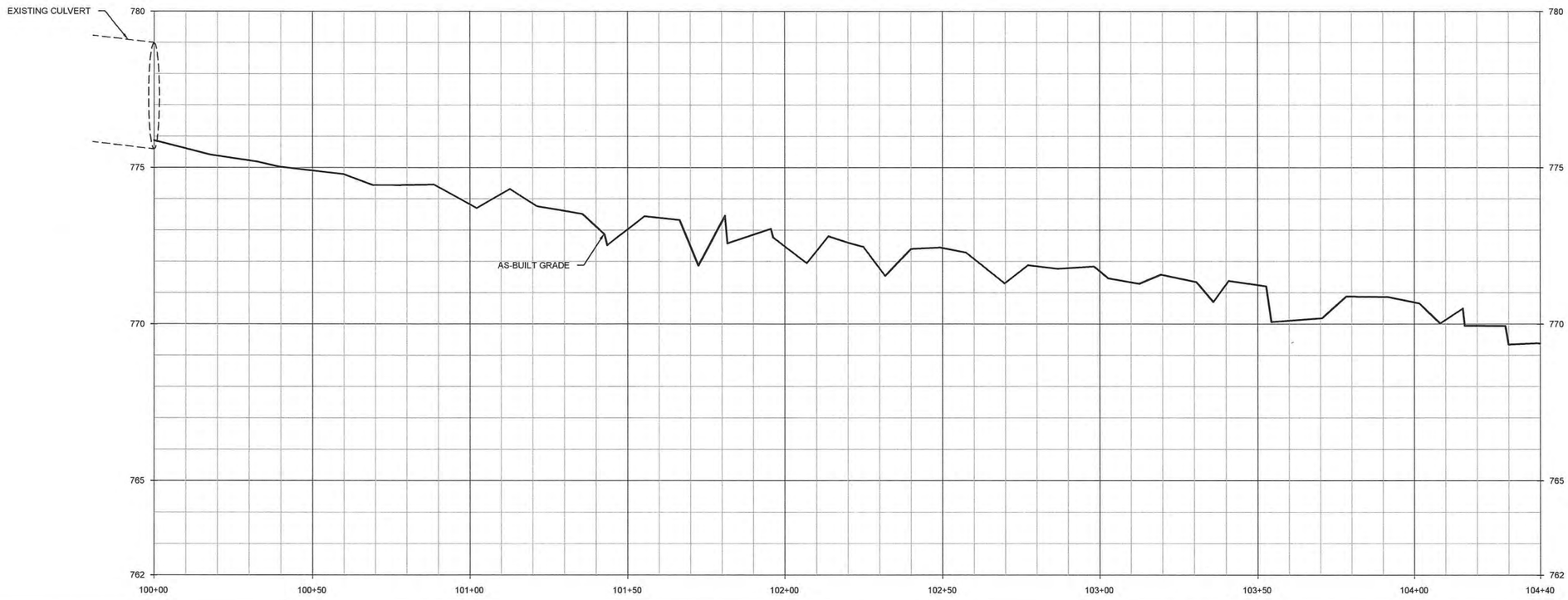
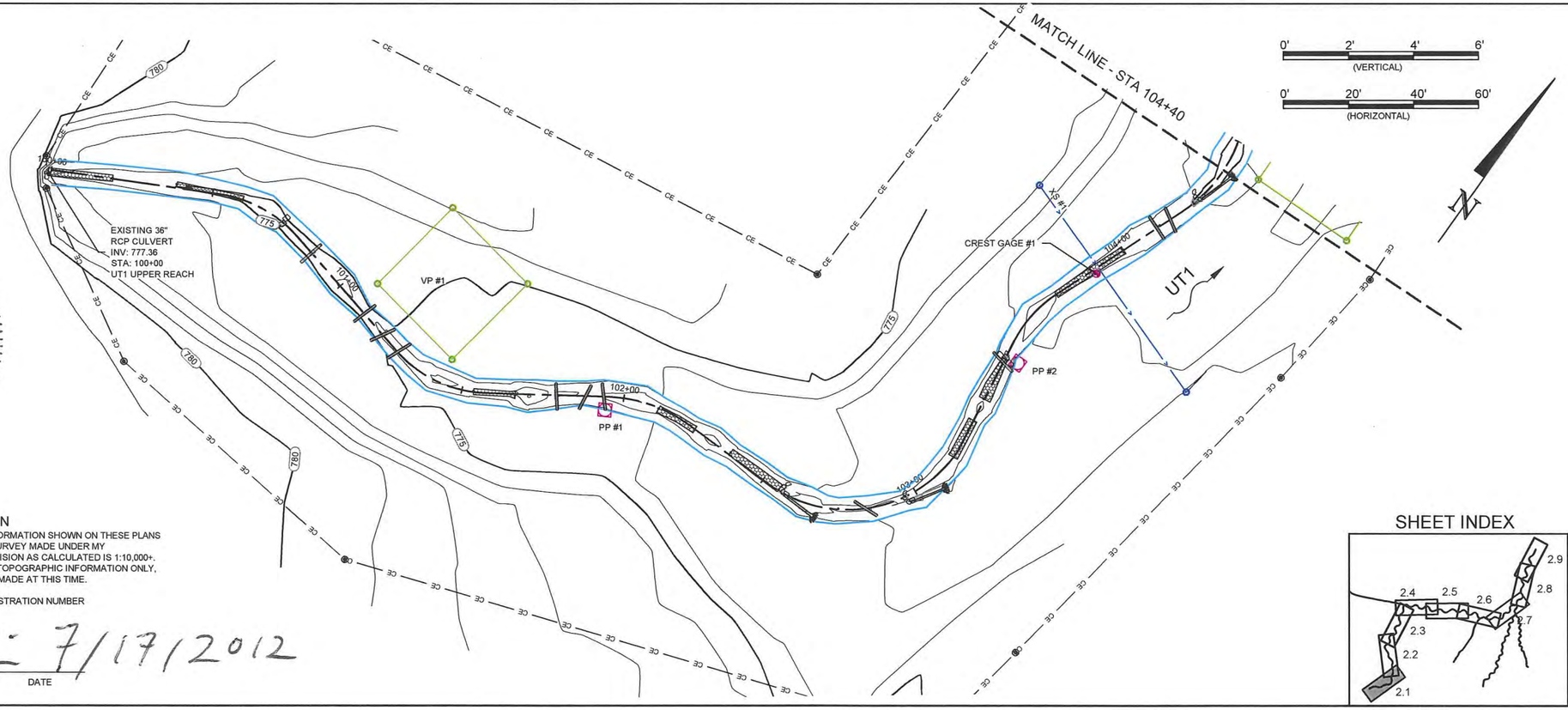
Firm License No. F-0831

Final As-Built Plans





NORTH CAROLINA PROFESSIONAL SEAL L-4756 LAND SURVEYOR JOHN B. PRIMM

SURVEYOR'S CERTIFICATION

I, JOHN B. PRIMM, CERTIFY THAT THE INFORMATION SHOWN ON THESE PLANS WAS DERIVED FROM AN ACTUAL FIELD SURVEY MADE UNDER MY SUPERVISION, THAT THE RATIO OF PRECISION AS CALCULATED IS 1:10,000+. THE PURPOSE OF THIS SURVEY IS FOR TOPOGRAPHIC INFORMATION ONLY, NO BOUNDARY DETERMINATIONS WERE MADE AT THIS TIME.

WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER AND SEAL THIS 1ST DAY OF JUNE, 2012.

7/17/2012

PROFESSIONAL LAND SURVEYOR L-4756 DATE

SHEET INDEX

WILDLANDS ENGINEERING
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Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. P-0831

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
As-Built Plans UT1 Reach 1 Upper

Revisions:

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

2.1

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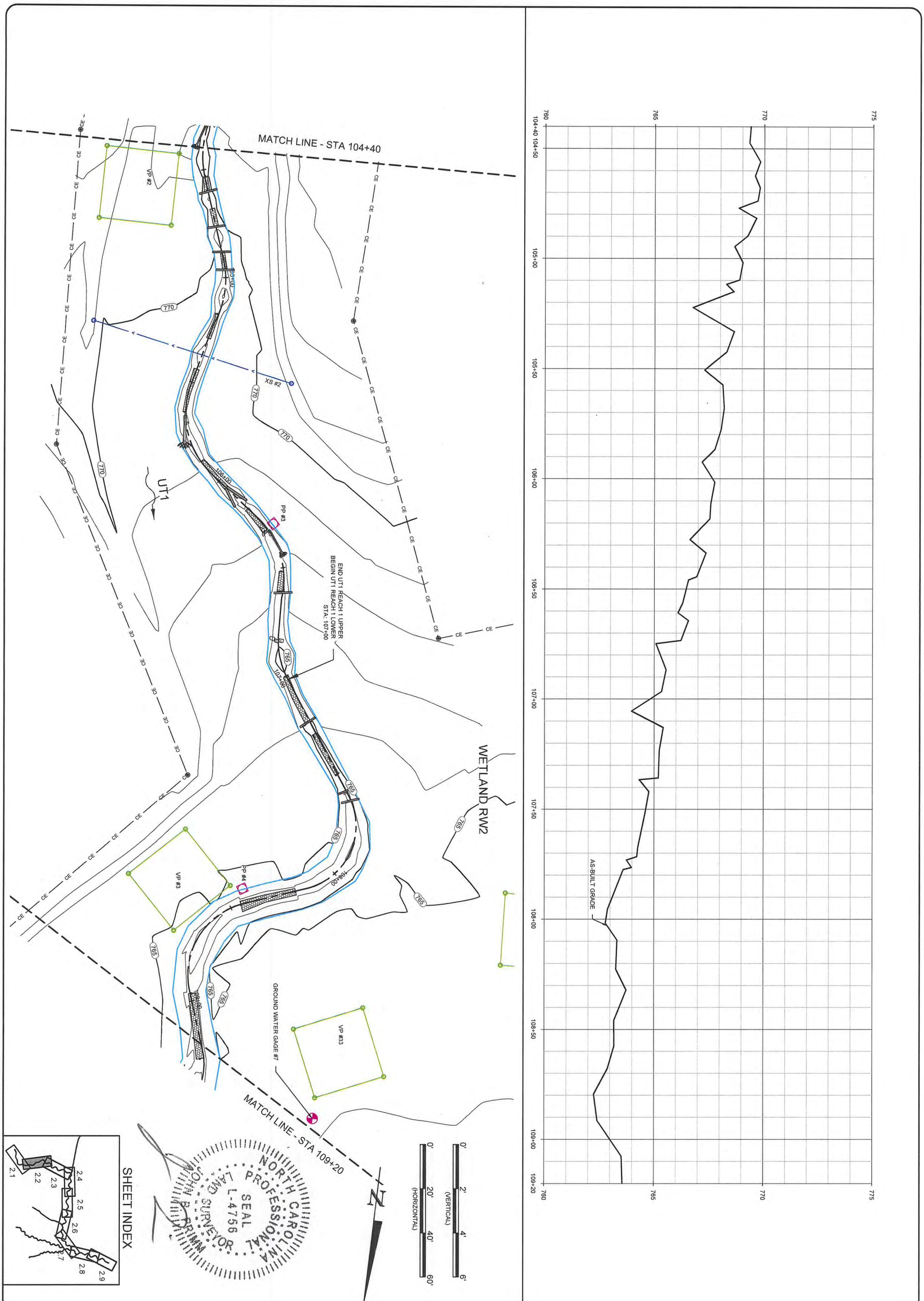
Final As-Built Plans



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NORTH CAROLINA PROFESSIONAL LAND SURVEYOR SEAL L-4756 JOHN C. PRIMM

Date:	June 15, 2012
Job Number:	003-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
As-Built Plans UT1 Reach 1 Upper and Lower

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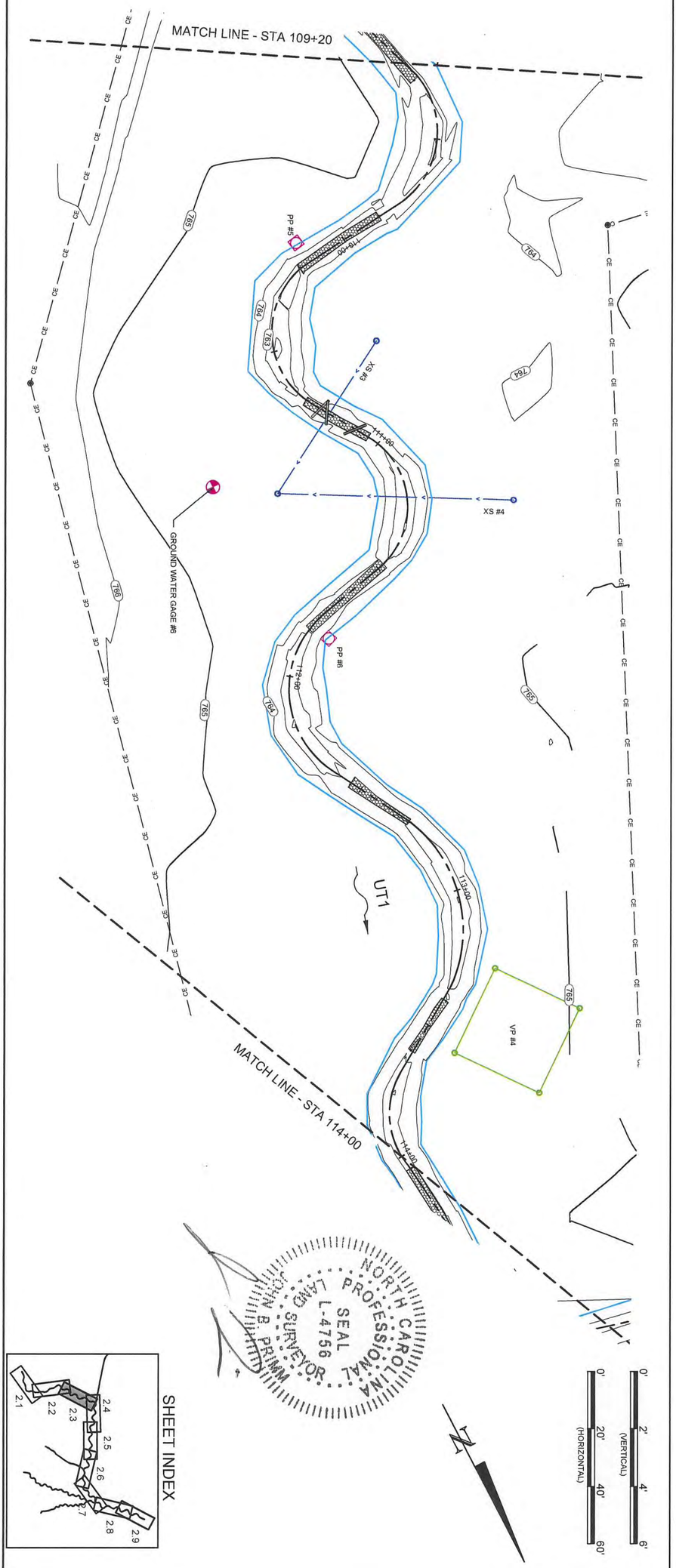
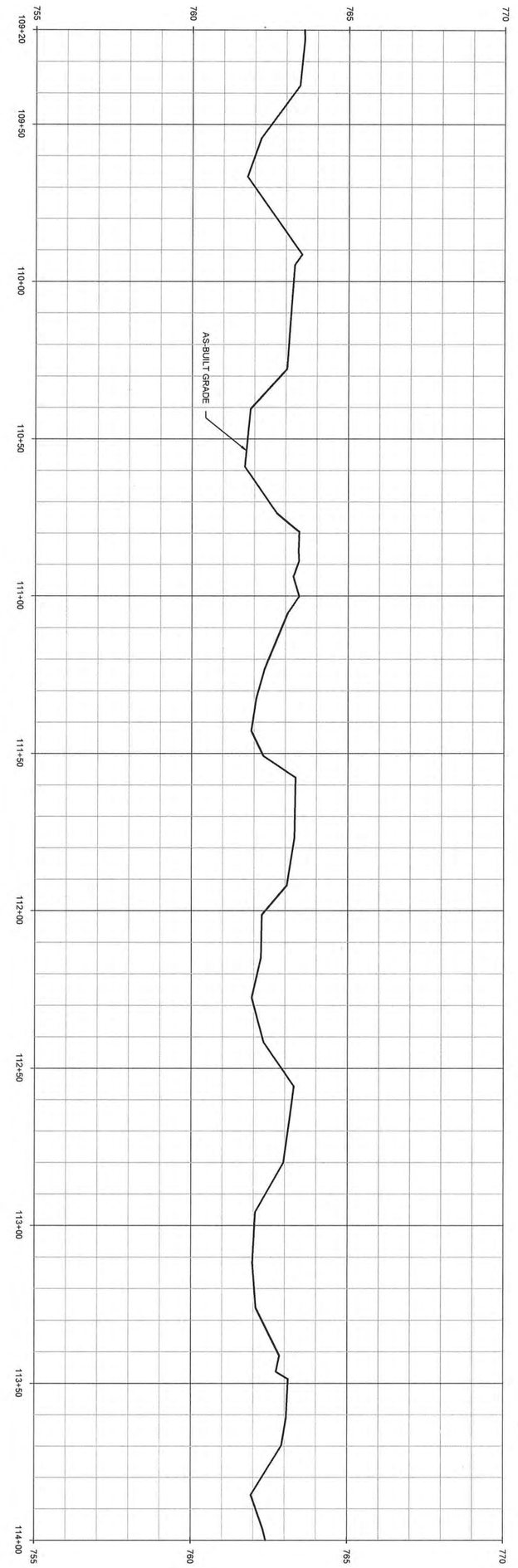
Final As-Built Plans





Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
As-Built Plans UT1 Reach 1 Lower

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Charlotte, NC 28203
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Fax: 704.332.3306
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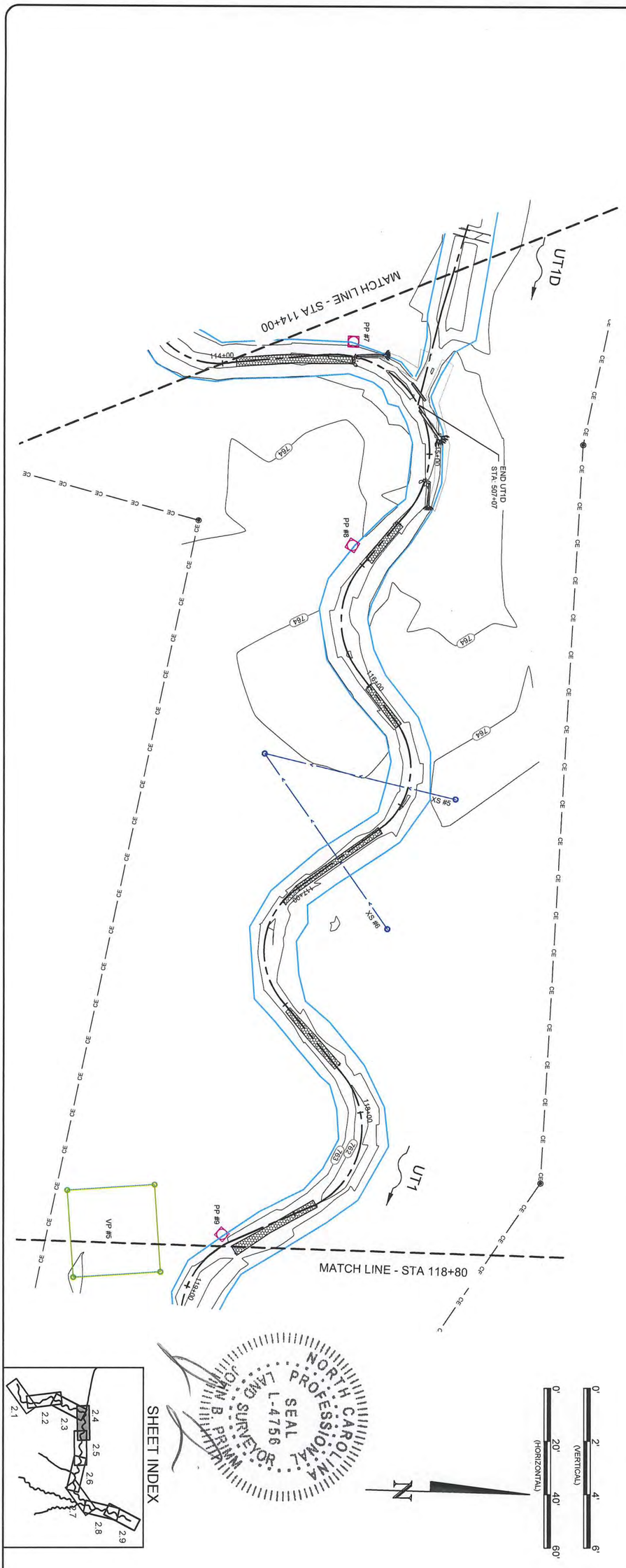
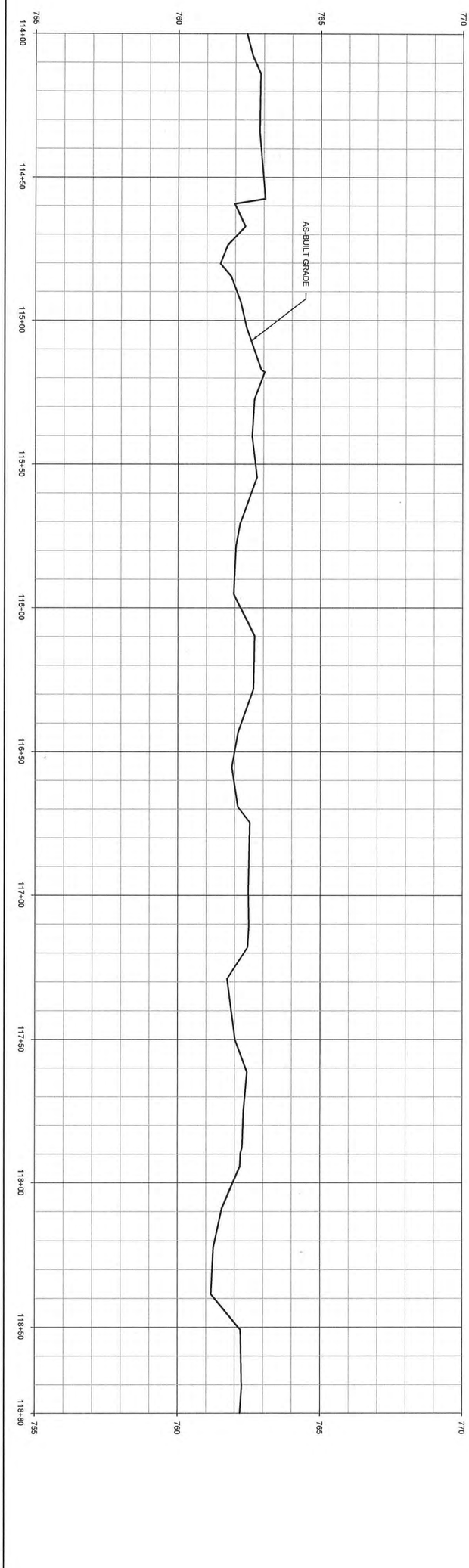
Final As-Built Plans





Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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Sheet

Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
As-Built Plans UT1 Reach 1 Lower

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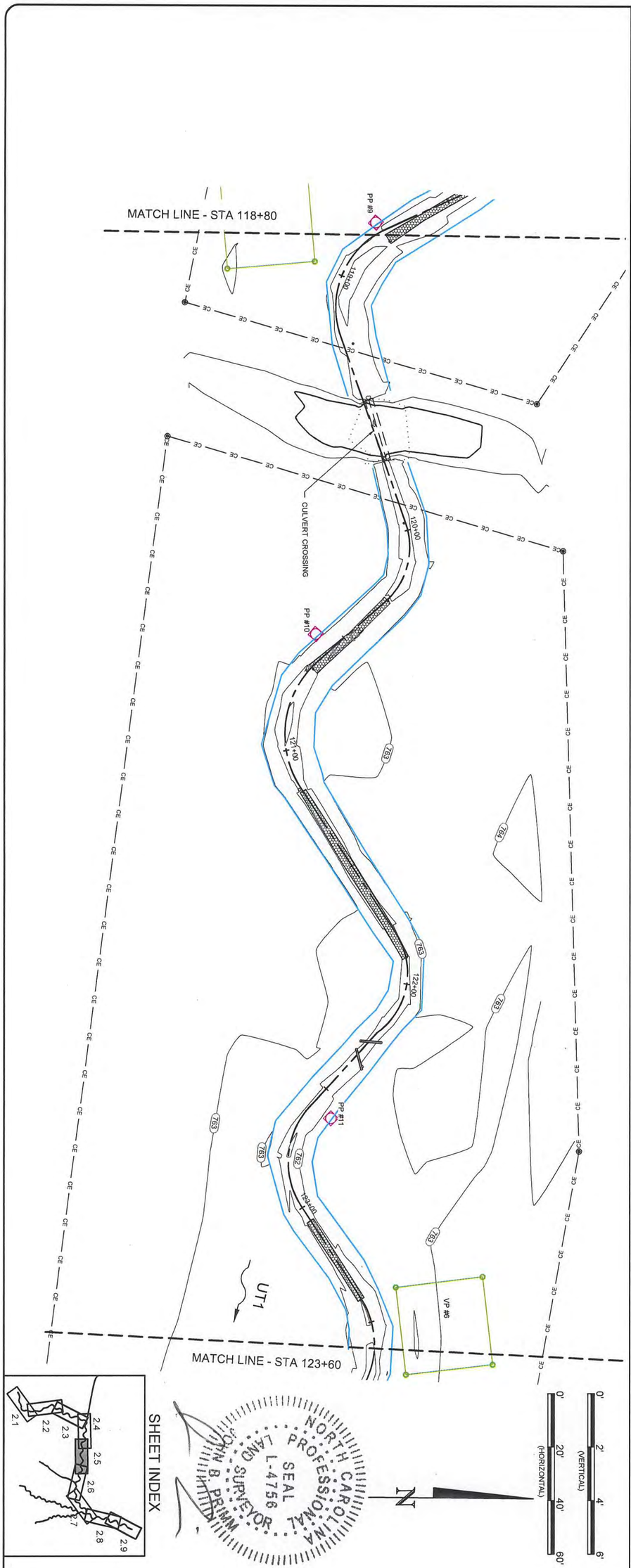
Final As-Built Plans



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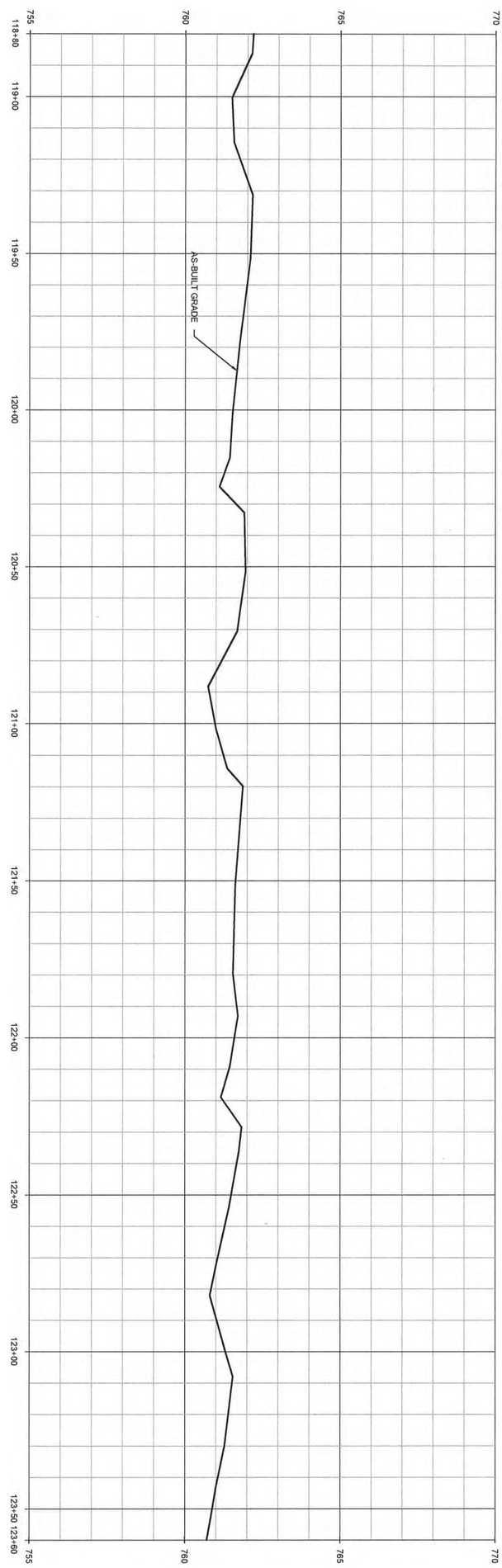

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
As-Built Plans UT1 Reach 1 Lower

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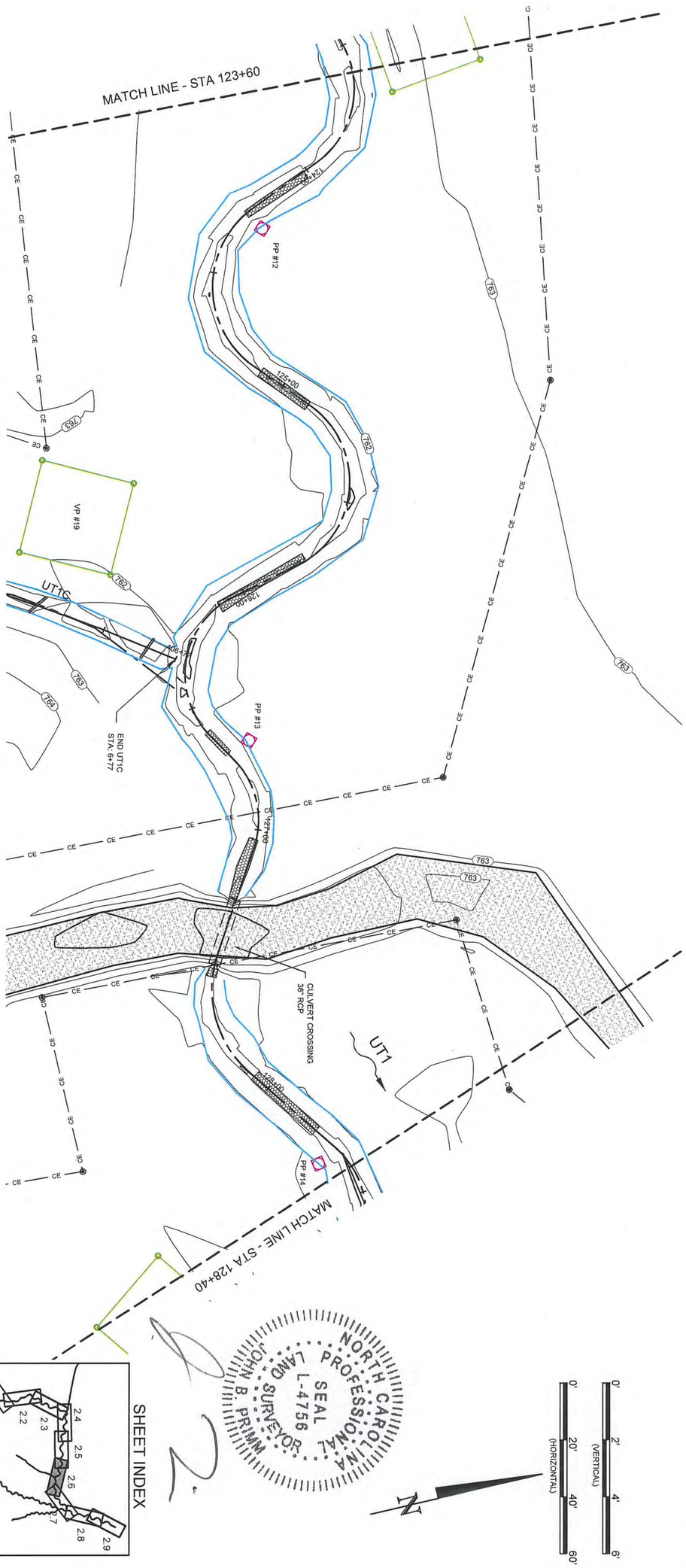
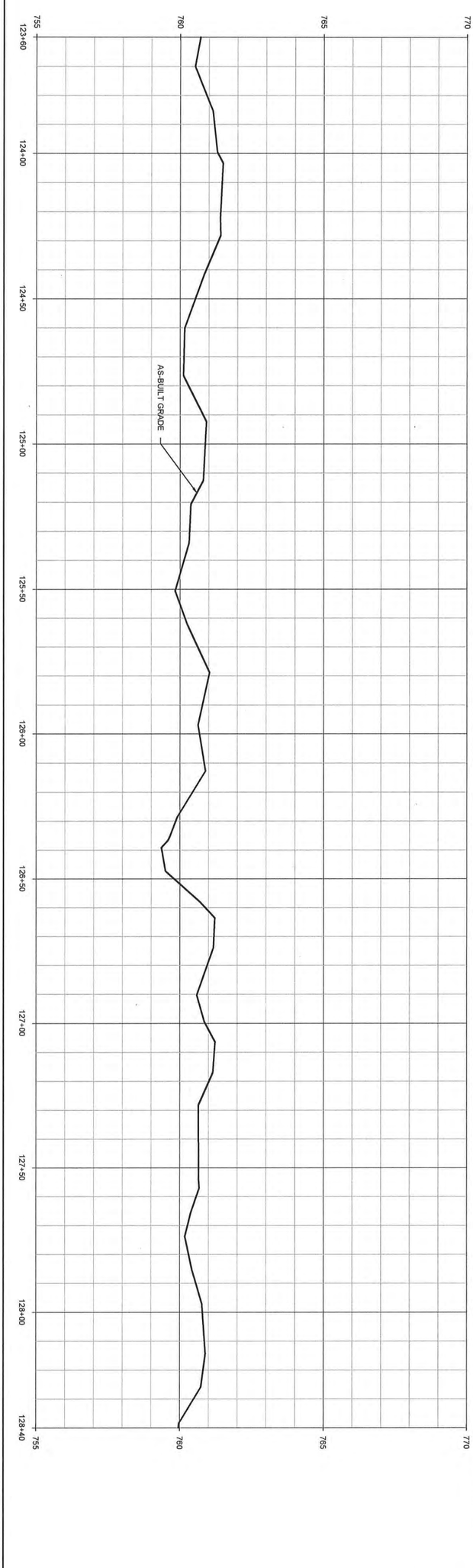
Final As-Built Plans





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NORTH CAROLINA PROFESSIONAL SEAL L-4756 LAND SURVEYOR JOHN B. PRIMM

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
As-Built Plans UT1 Reach 1 Lower

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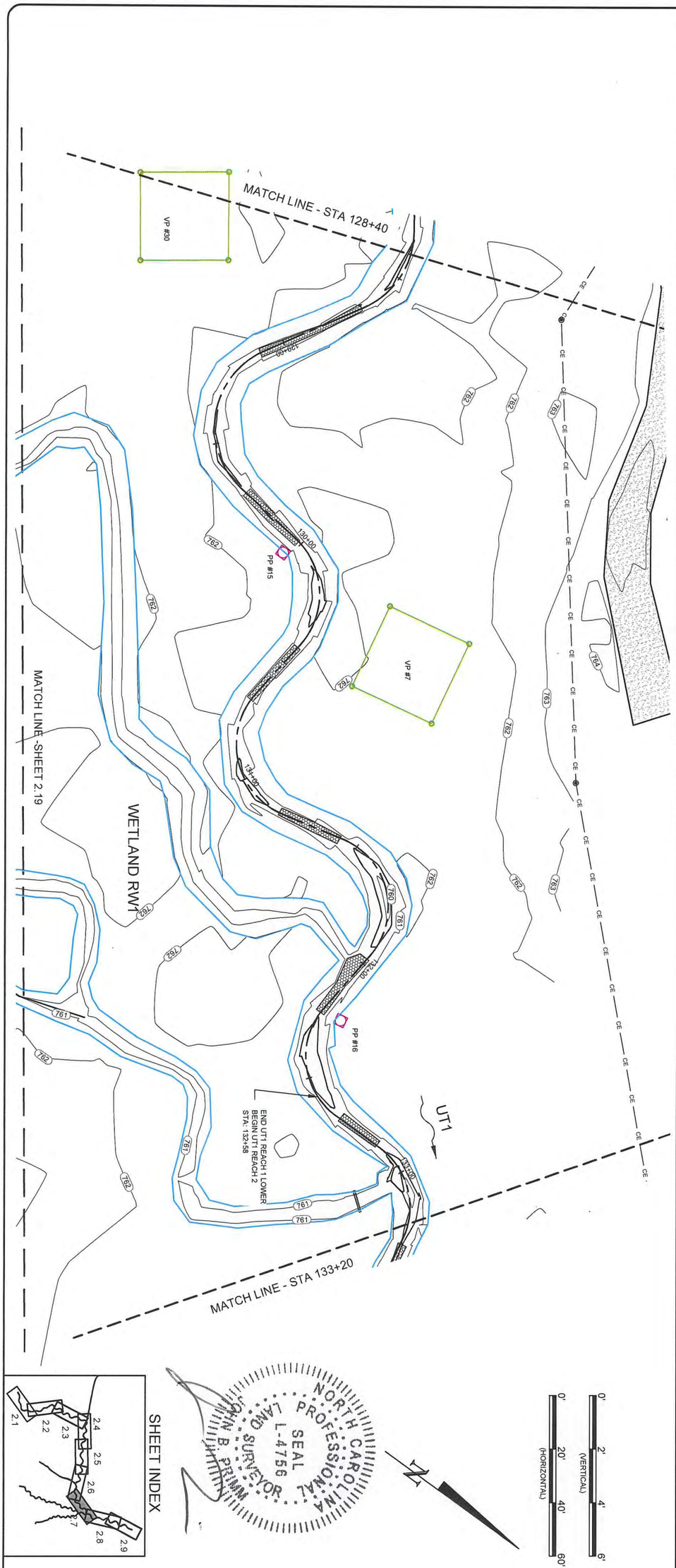
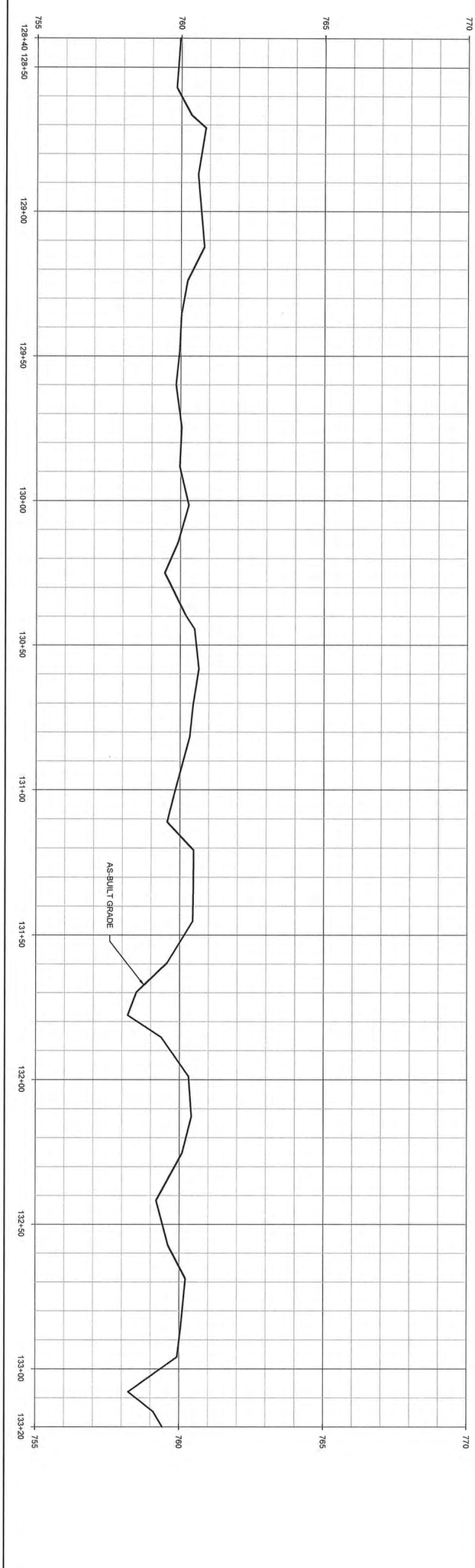
Final As-Built Plans





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NORTH CAROLINA PROFESSIONAL LAND SURVEYOR SEAL L-4756 JOHN B. PRIMM

0' 20' 40' 60' (HORIZONTAL)

0' 2' 4' 6' (VERTICAL)

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
As-Built Plans UT1 Reach 1 Lower

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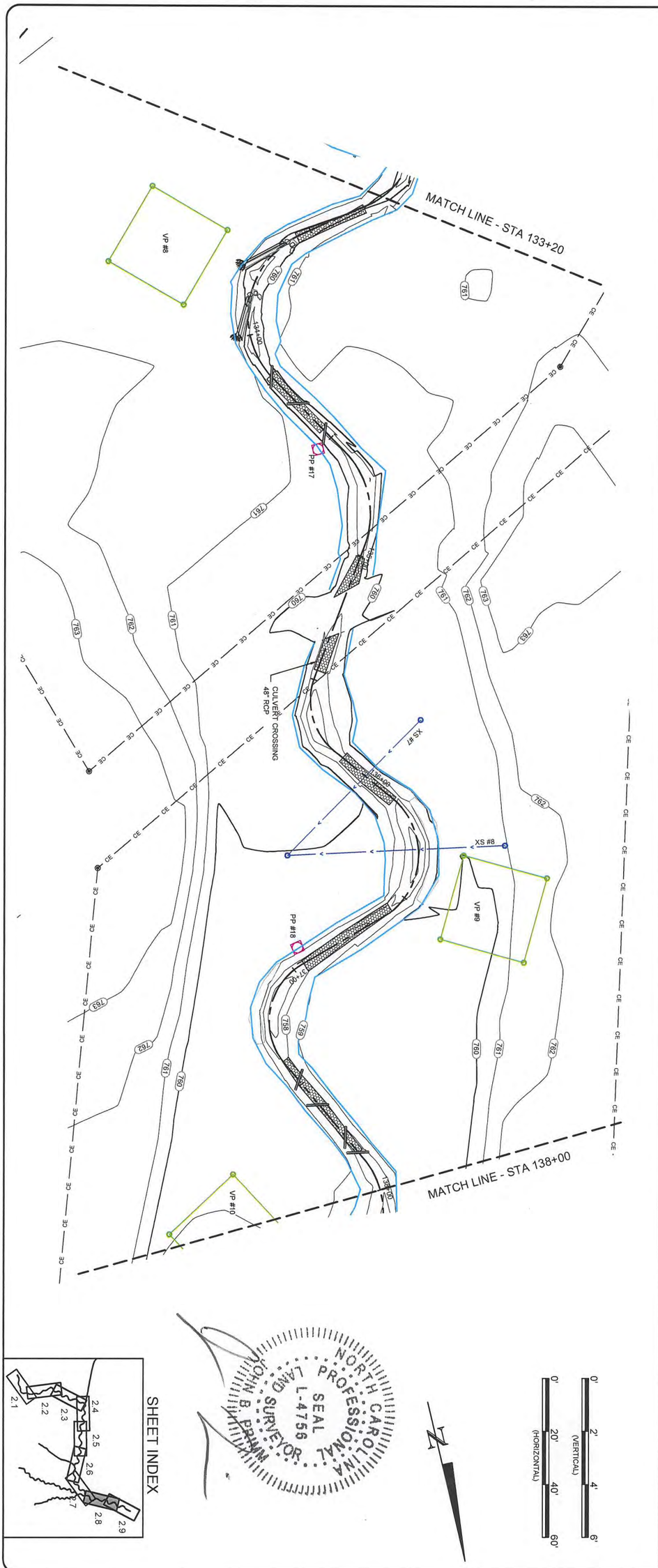
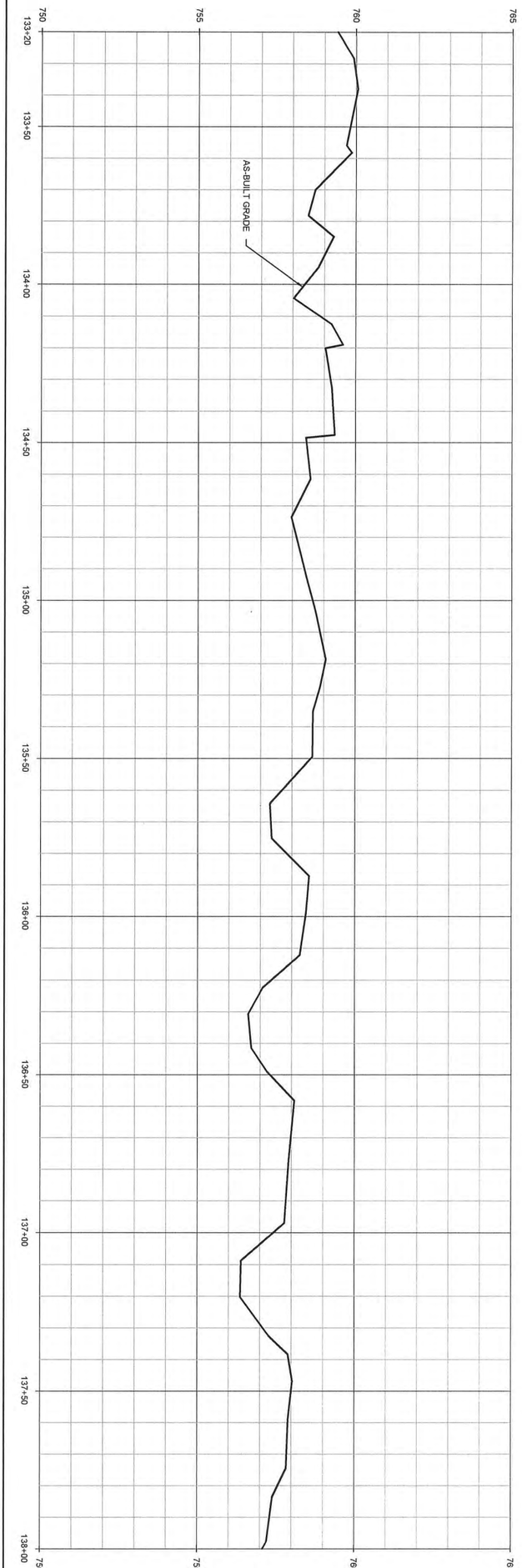
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

Final As-Built Plans





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NORTH CAROLINA PROFESSIONAL SEAL L-4756 LAND SURVEYOR JOHN B. PRIM

0' 20' 40' 60' (HORIZONTAL)

0' 2' 4' 6' (VERTICAL)

Date:	June 15, 2012
Job Number:	005-02121
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
As-Built Plans UT1 Reach 2

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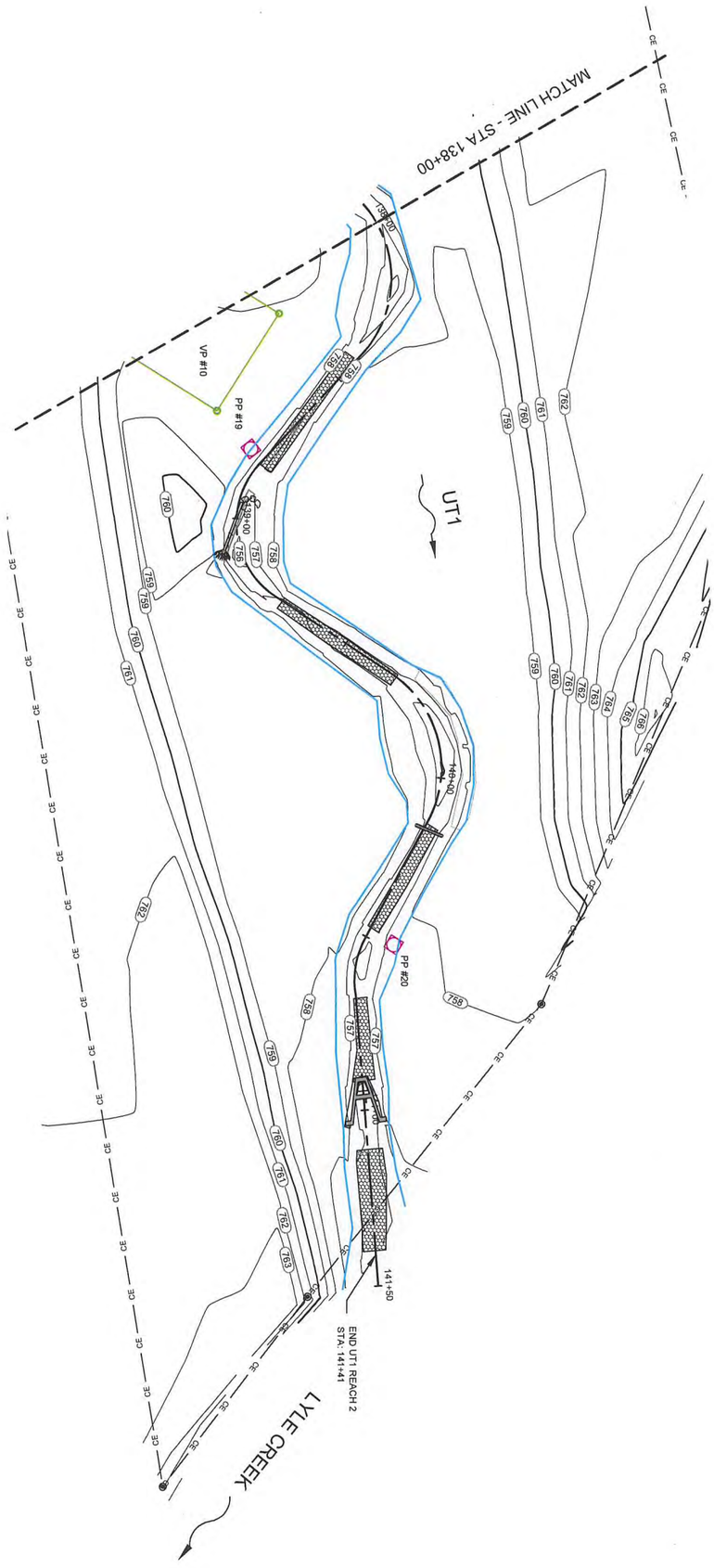
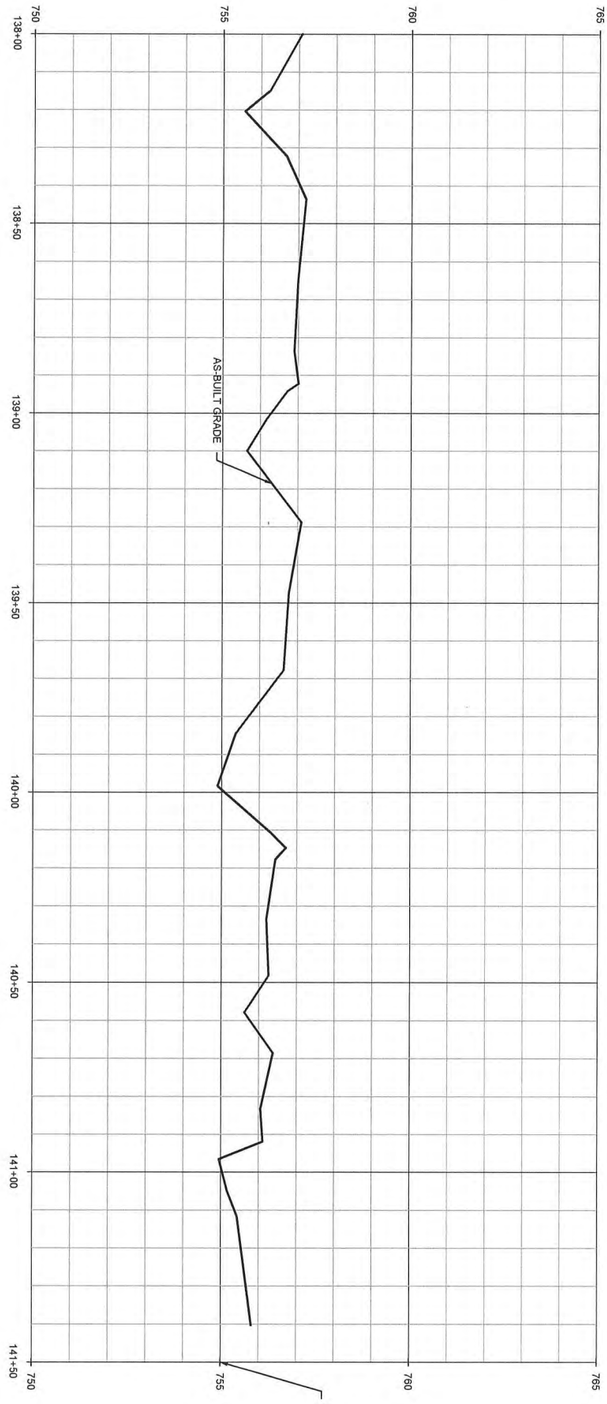
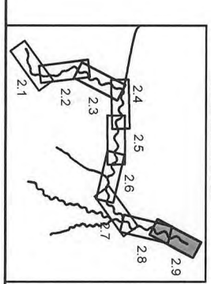
Final As-Built Plans







NORTH CAROLINA PROFESSIONAL SEAL L-4756 LAND SURVEYOR JOHN B. PRIMM

0' 20' 40' 60' (HORIZONTAL)

0' 2' 4' 6' (VERTICAL)

Date:	June 15, 2012
Job Number:	003-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
As-Built Plans UT1 Reach 2

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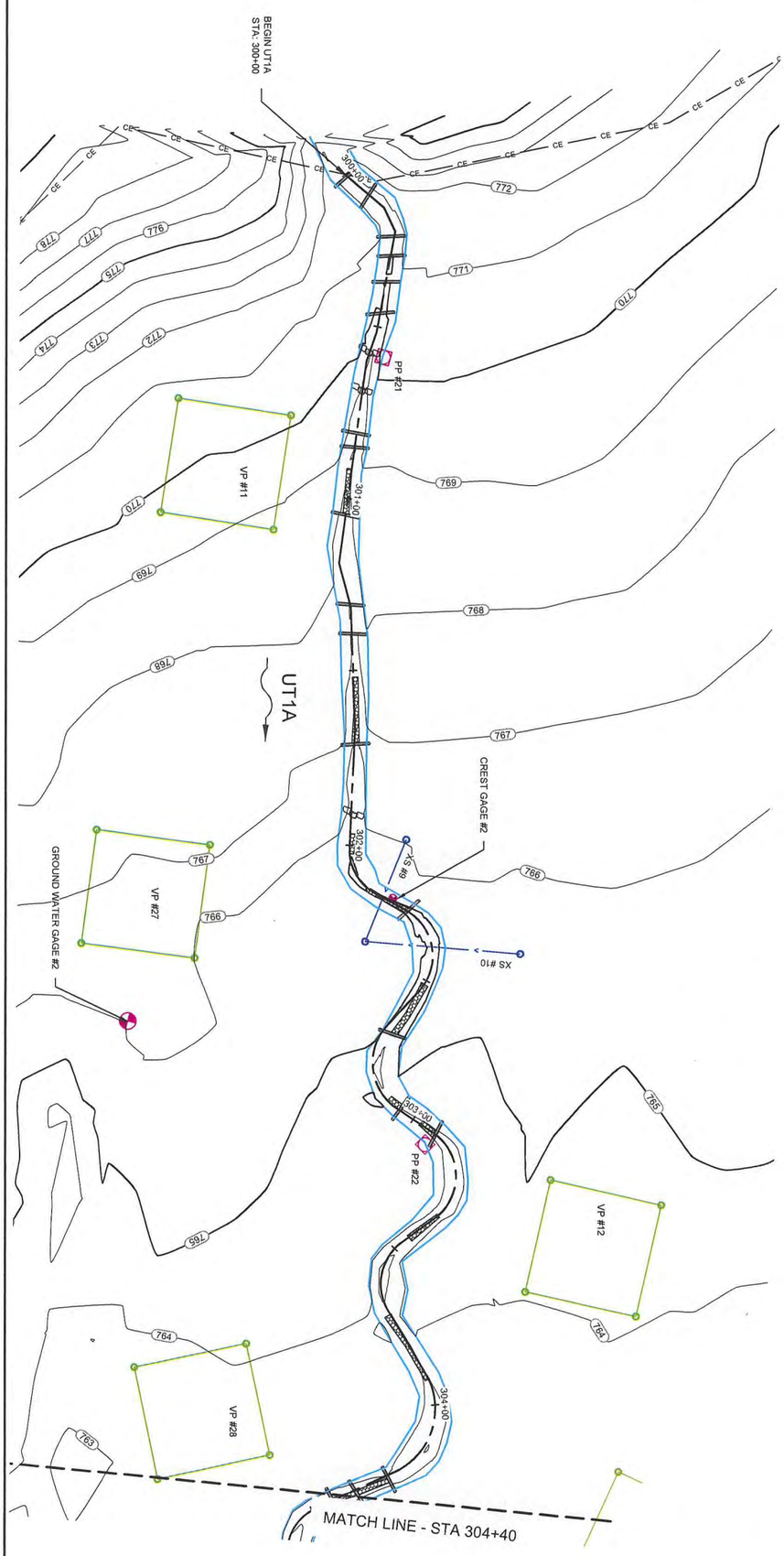
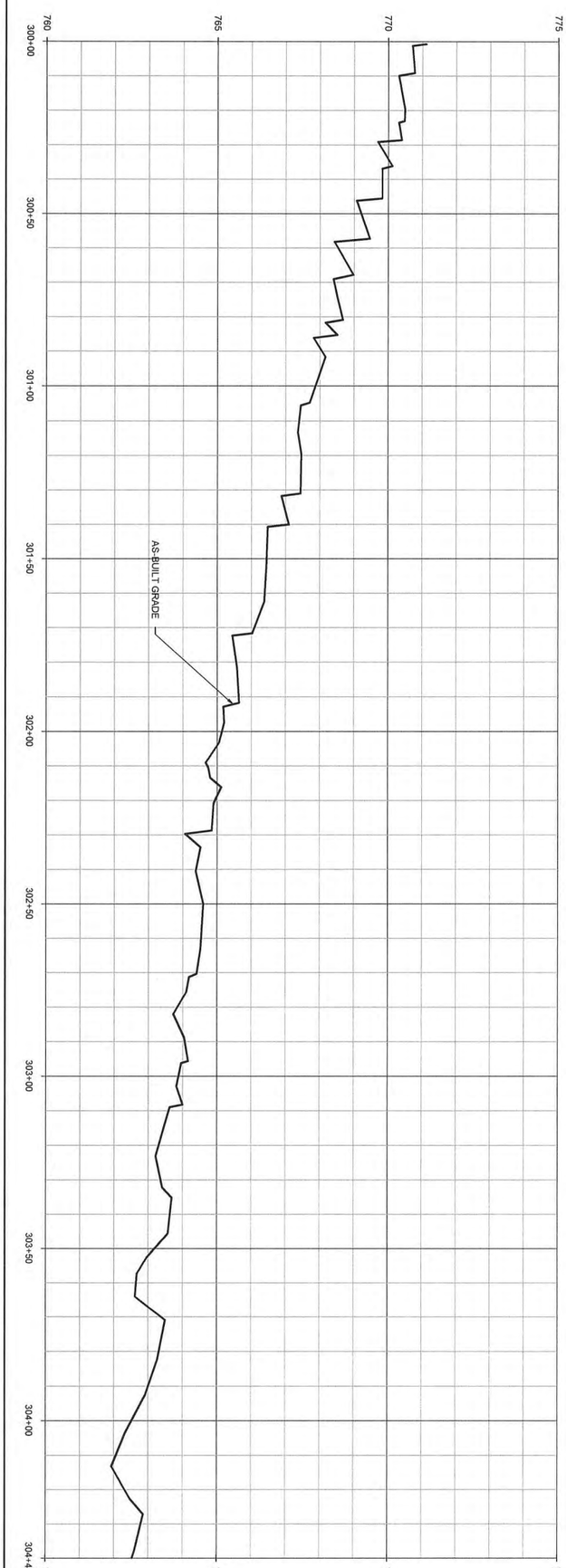
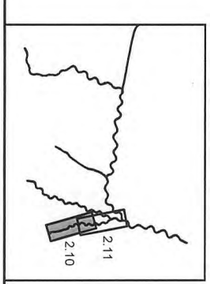
Final As-Built Plans







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NORTH CAROLINA PROFESSIONAL SEAL L-4756 LAND SURVEYOR JOHN B. PRUM

N

0' 20' 40' 60' (HORIZONTAL)

0' 2' 4' 6' (VERTICAL)

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Sheet

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
As-Built Plans UT1A

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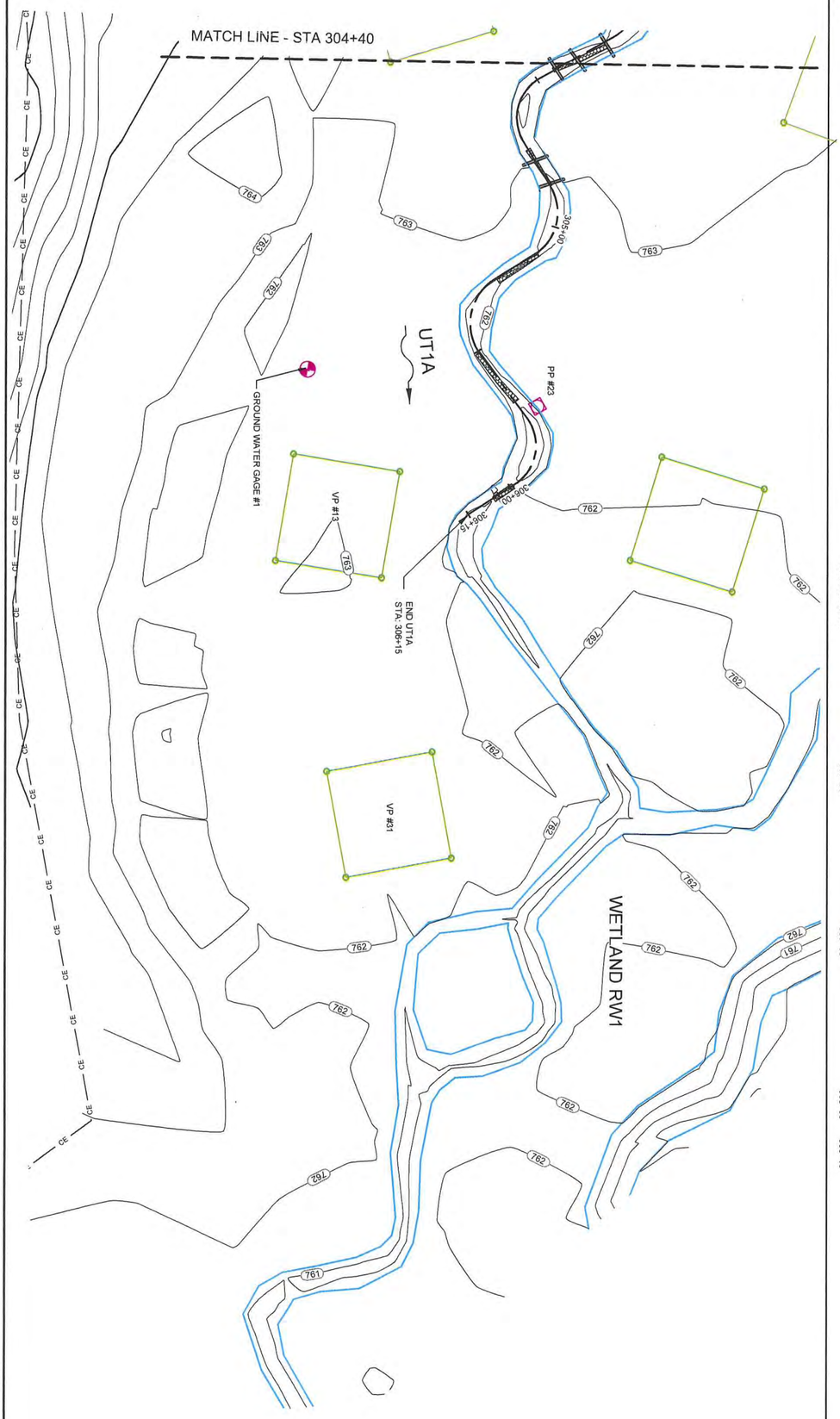
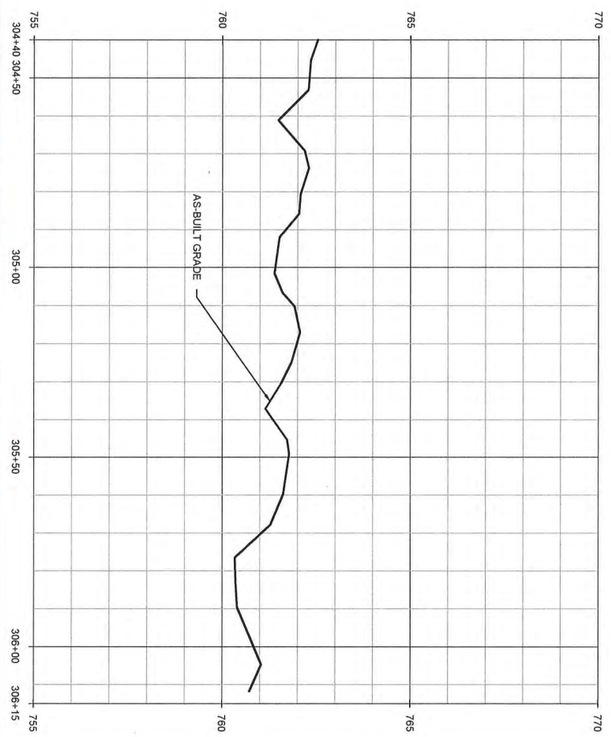
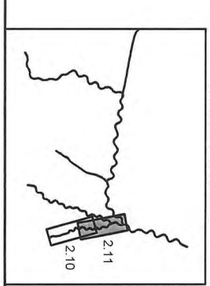
Final As-Built Plans







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NORTH CAROLINA PROFESSIONAL SEAL L-4756 LAND SURVEYOR JOHN B. PRIMM

N

0' 20' 40' 60' (HORIZONTAL)

0' 2' 4' 6' (VERTICAL)

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Final As-Built Plans

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
As-Built Plans UT1A

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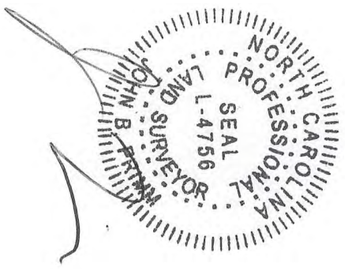

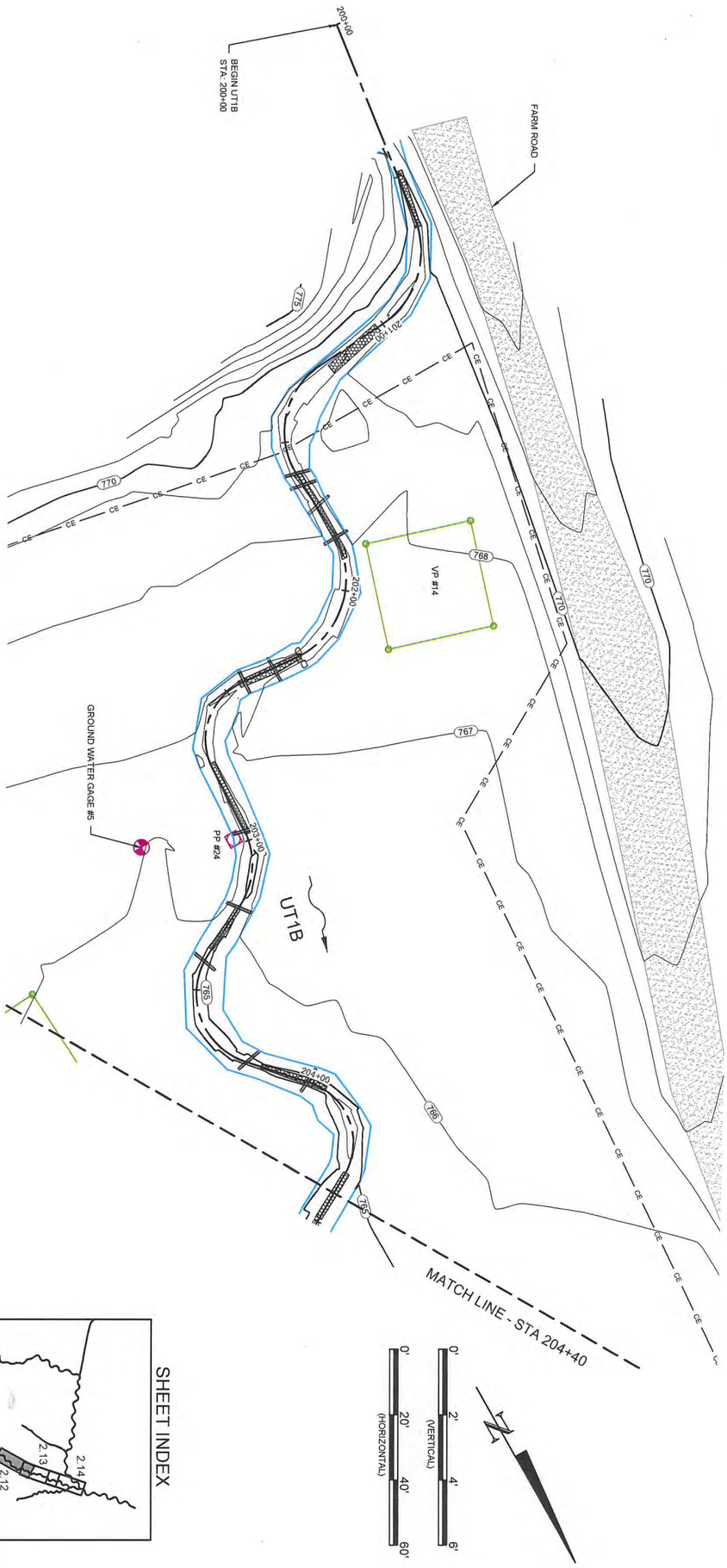

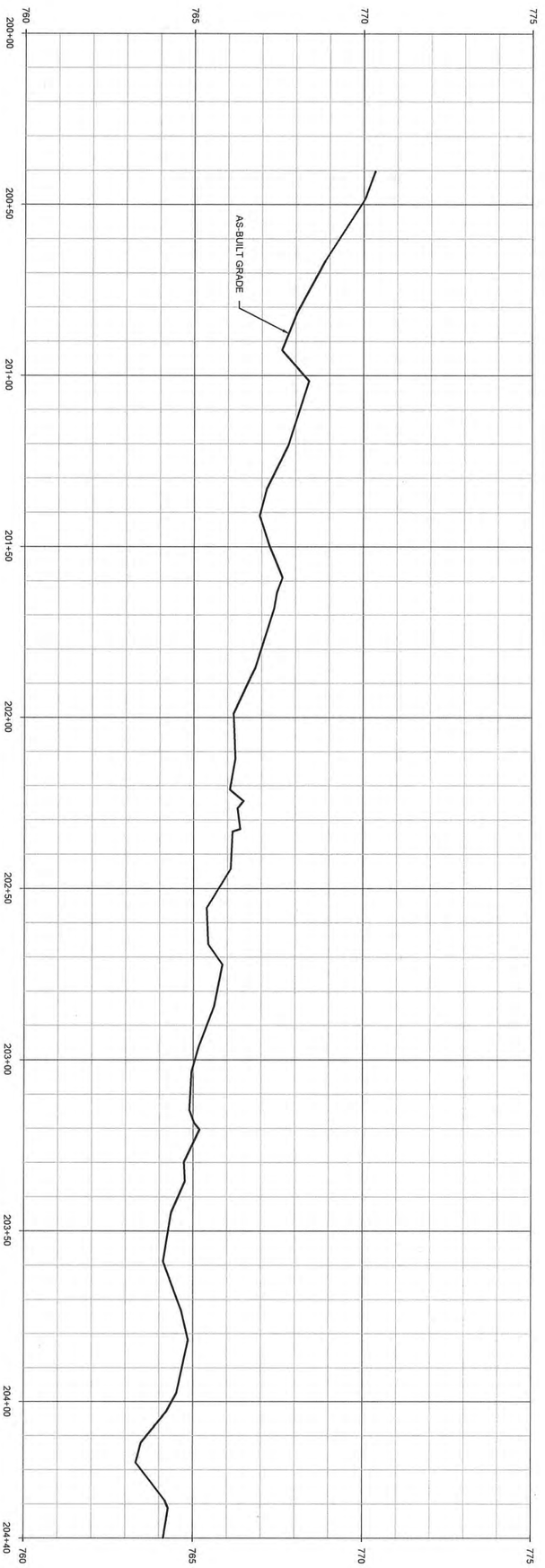

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Date:	June 15, 2012
Job Number:	003-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
As-Built Plans UT1B

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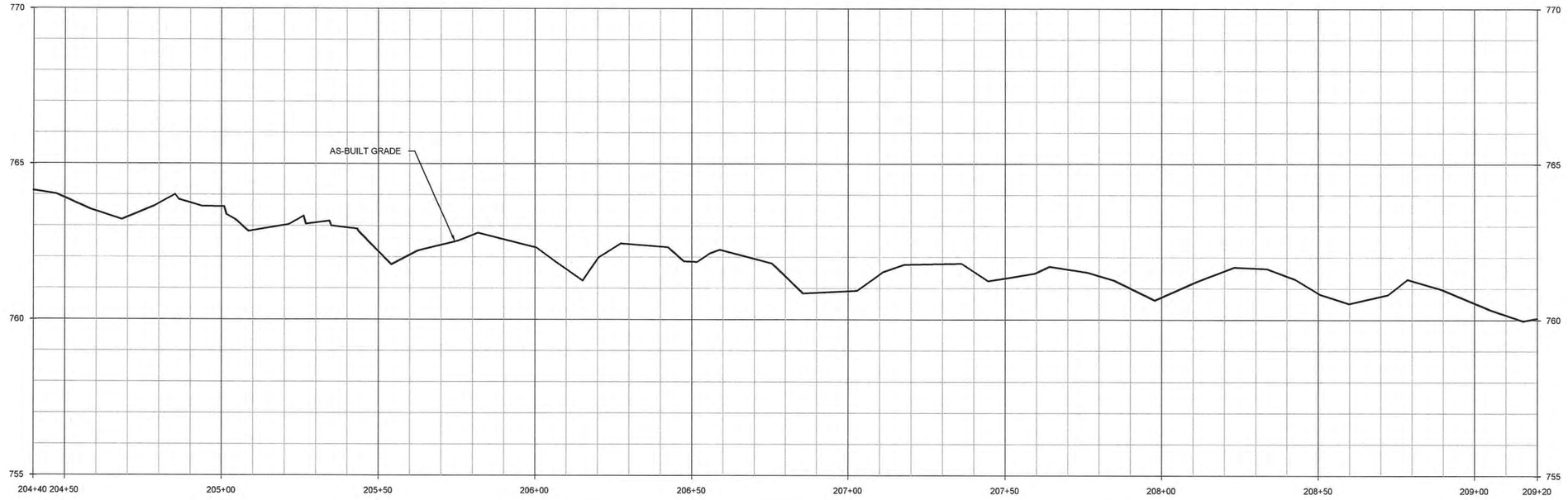

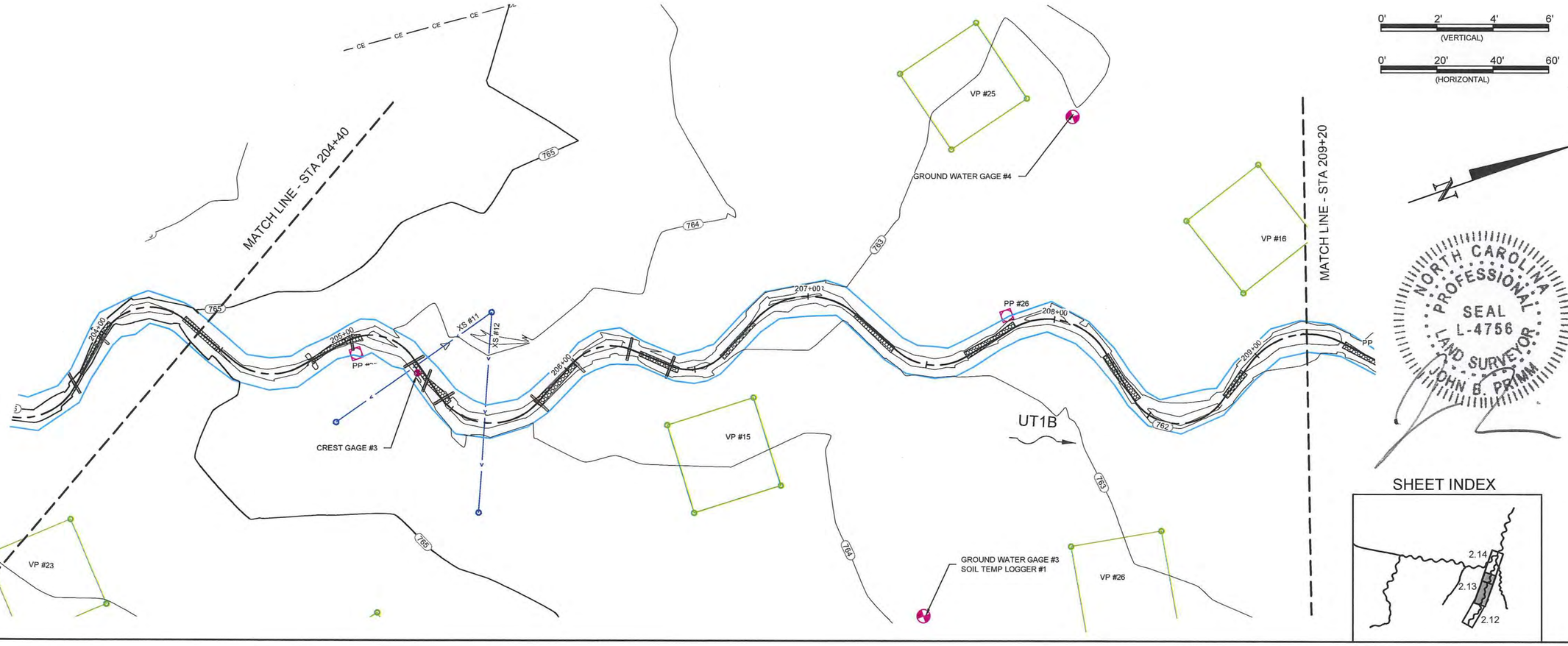

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Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
As-Built Plans UT1B

Revisions:

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGB

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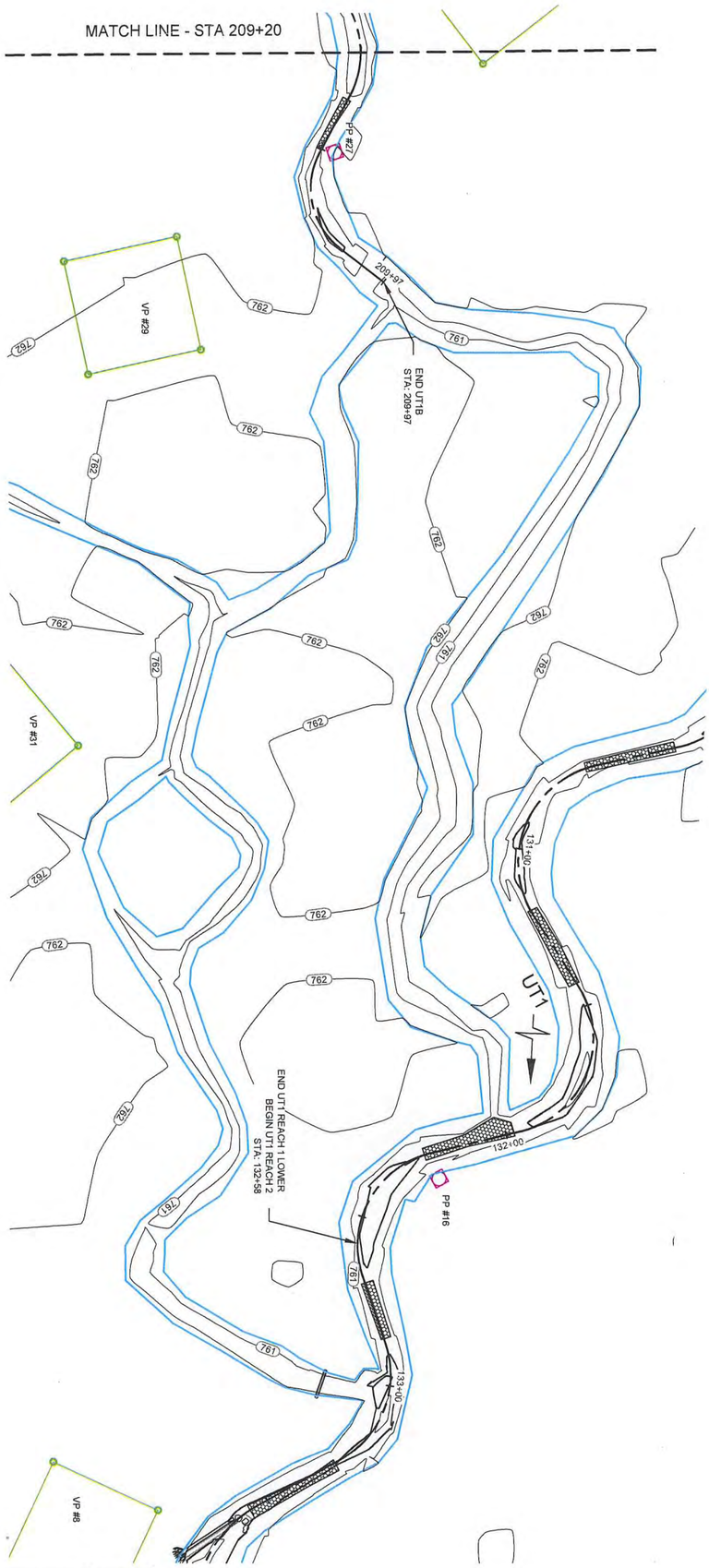
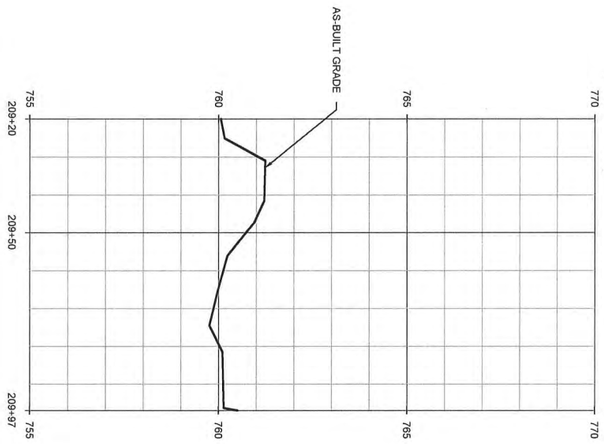
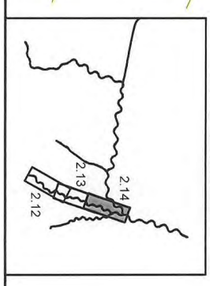
Final As-Built Plans







SHEET INDEX

NORTH CAROLINA PROFESSIONAL SEAL L-4756 LAND SURVEYOR JOHN B. PRIMM

0' 20' 40' 60' (HORIZONTAL)

0' 2' 4' 6' (VERTICAL)

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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Sheet

Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
As-Built Plans UT1B

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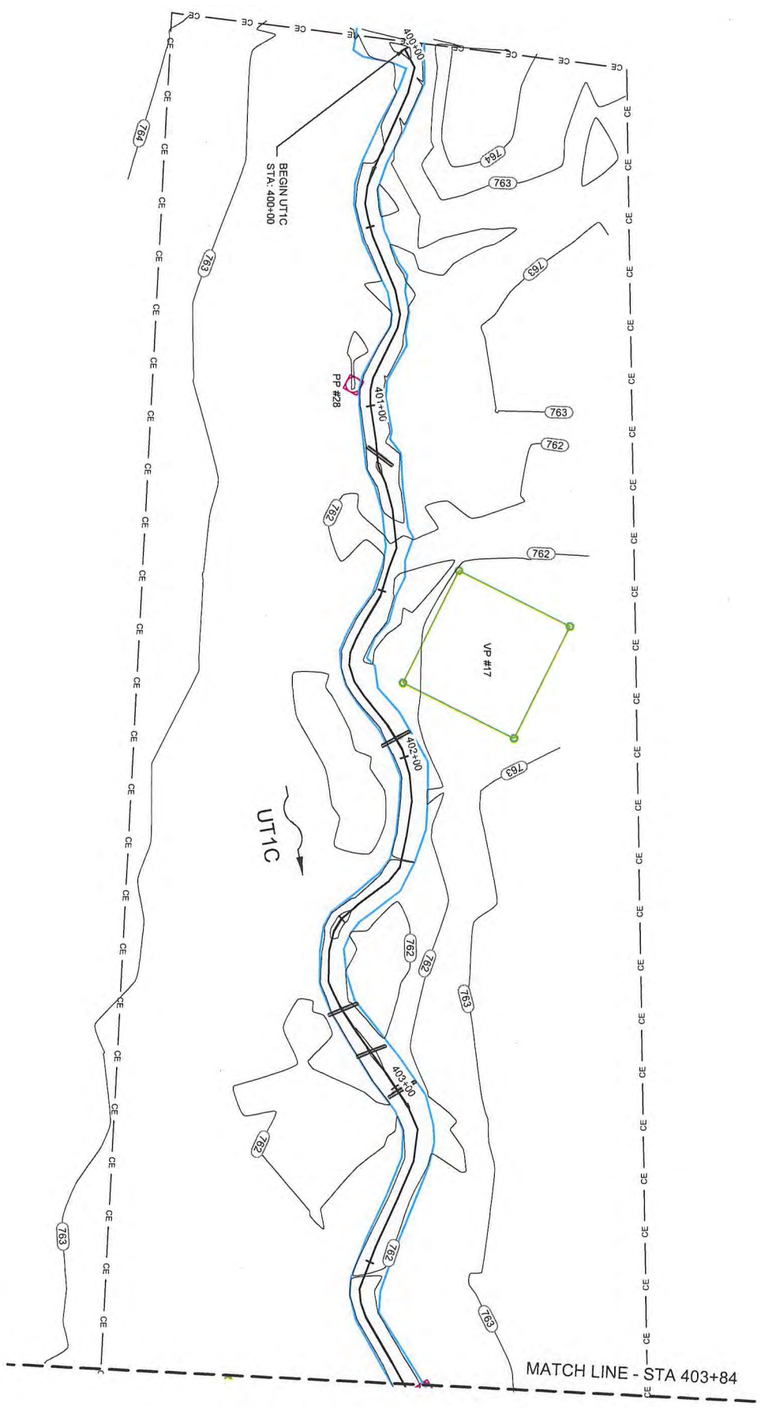
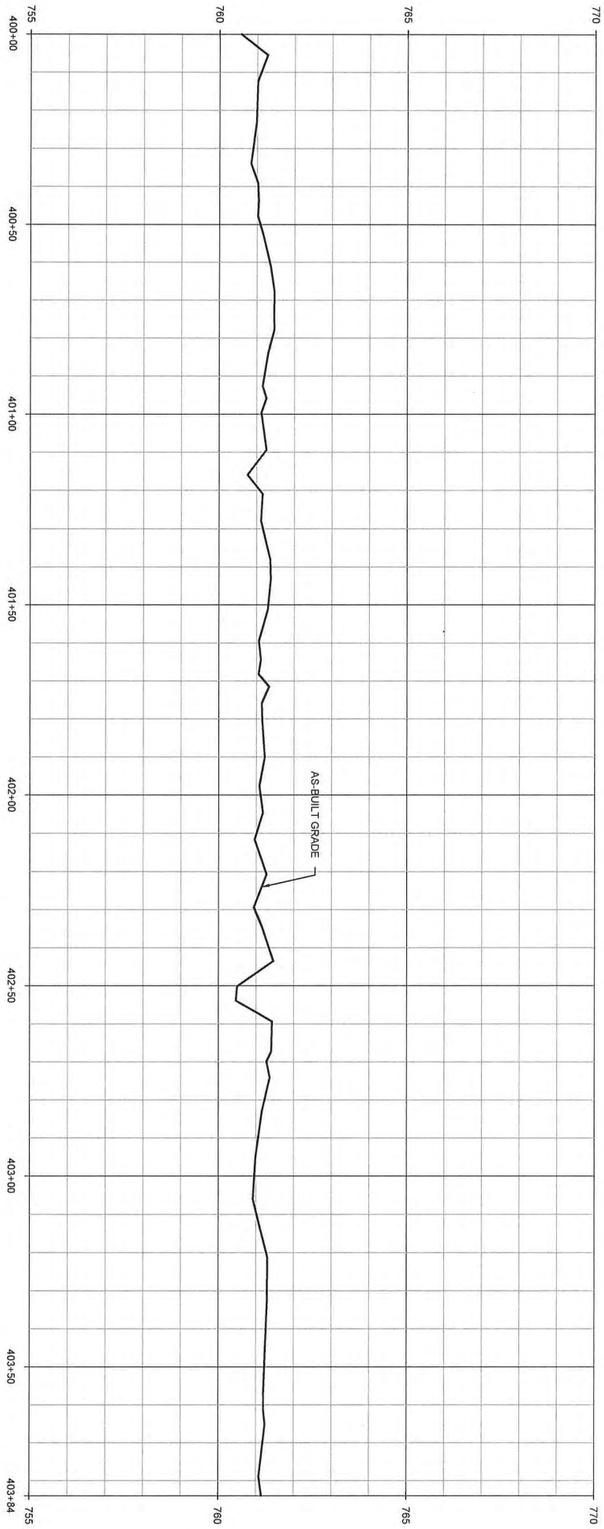
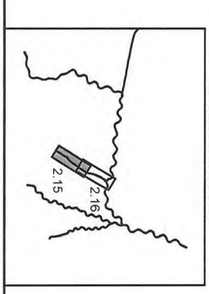
Final As-Built Plans







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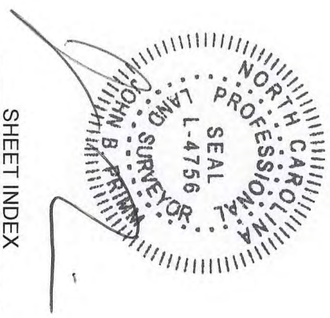

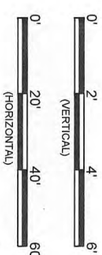

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Final As-Built Plans

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
As-Built Plans UT1C

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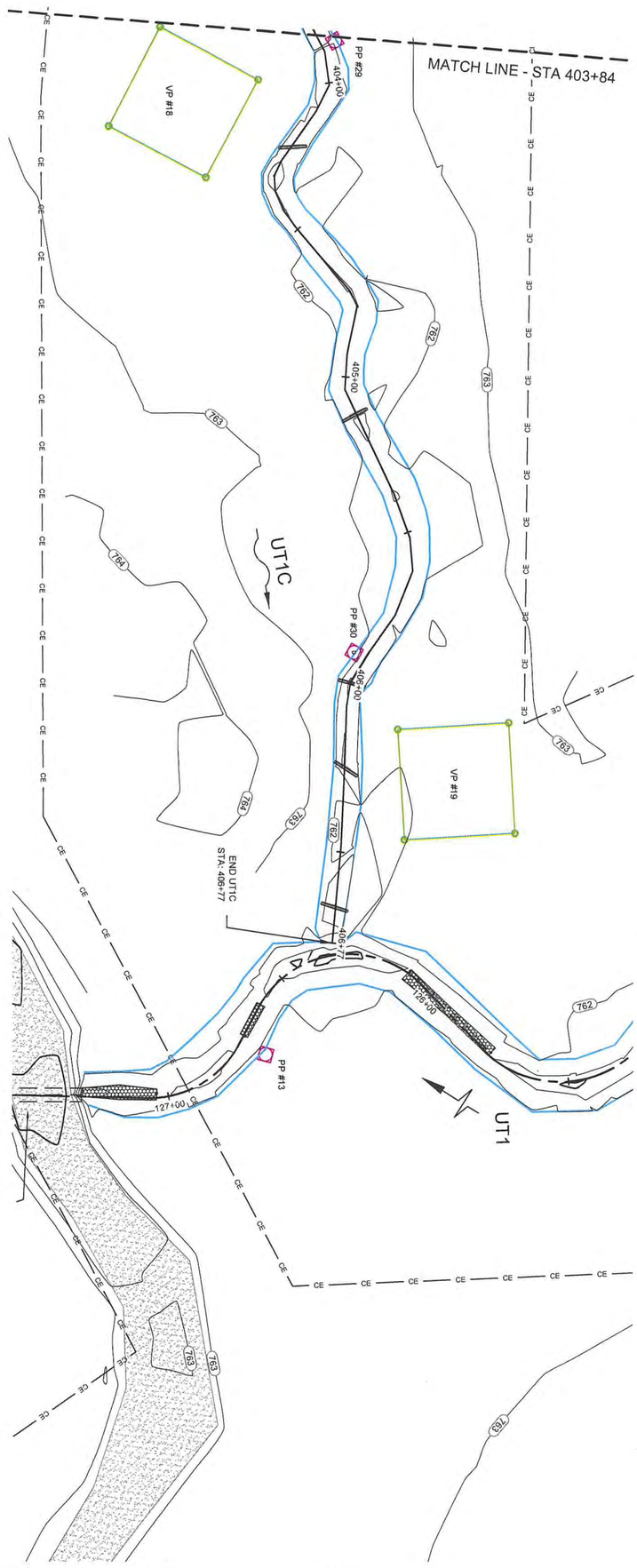

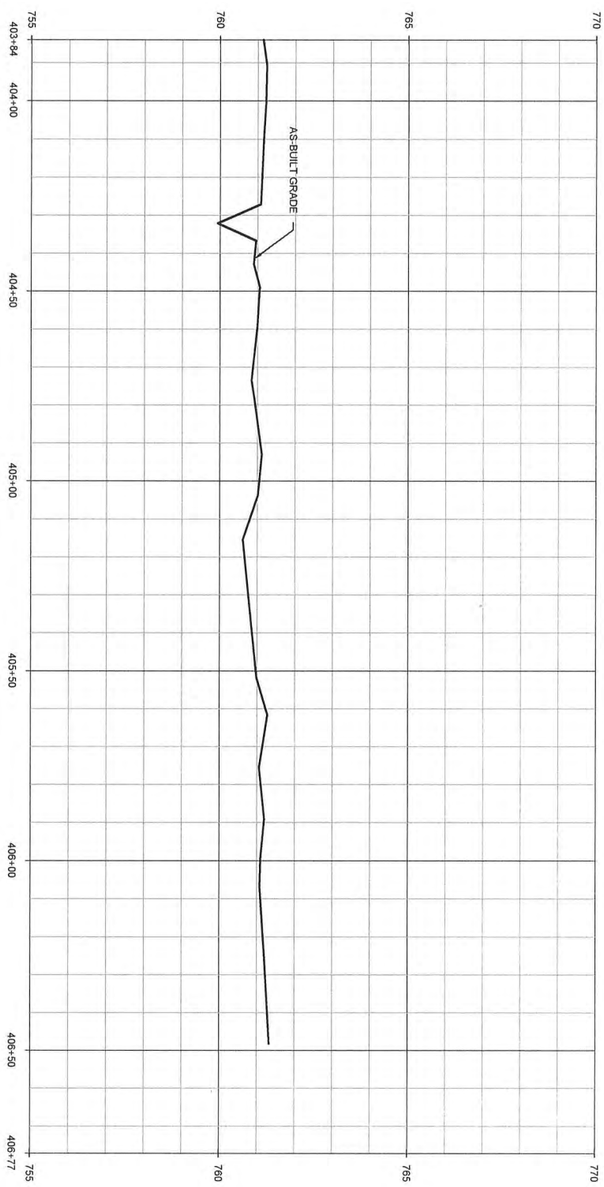

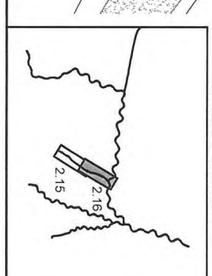

SHEET INDEX

NORTH CAROLINA PROFESSIONAL SEAL L-4756 LAND SURVEYOR JOHN B. PRIMM

0' 20' 40' 60' (HORIZONTAL)

0' 2' 4' 6' (VERTICAL)

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Final As-Built Plans

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
As-Built Plans UT1C

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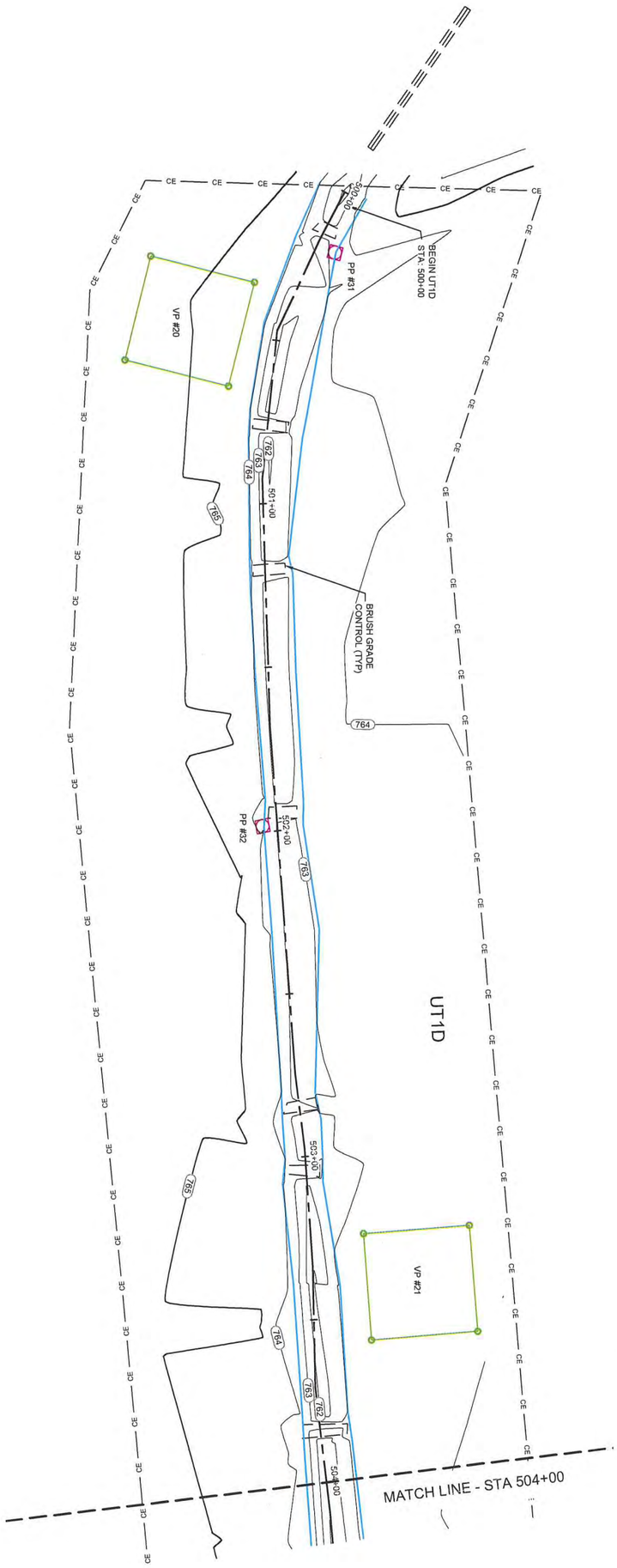

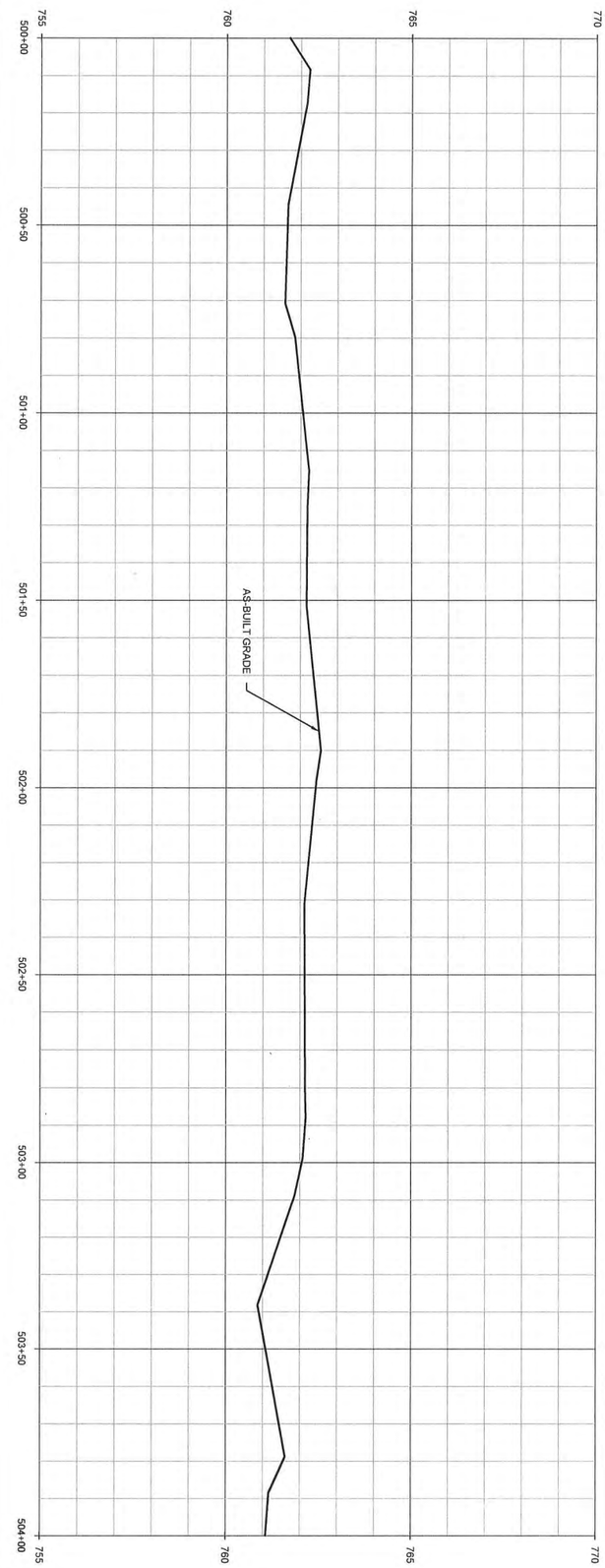

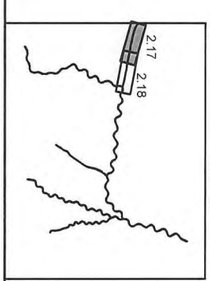

SHEET INDEX

NORTH CAROLINA PROFESSIONAL SEAL L-4756 LAND SURVEYOR JOHN B. PRIMM

0' 20' 40' 60' (HORIZONTAL)

0' 2' 4' 6' (VERTICAL)

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
As-Built Plans UT1D

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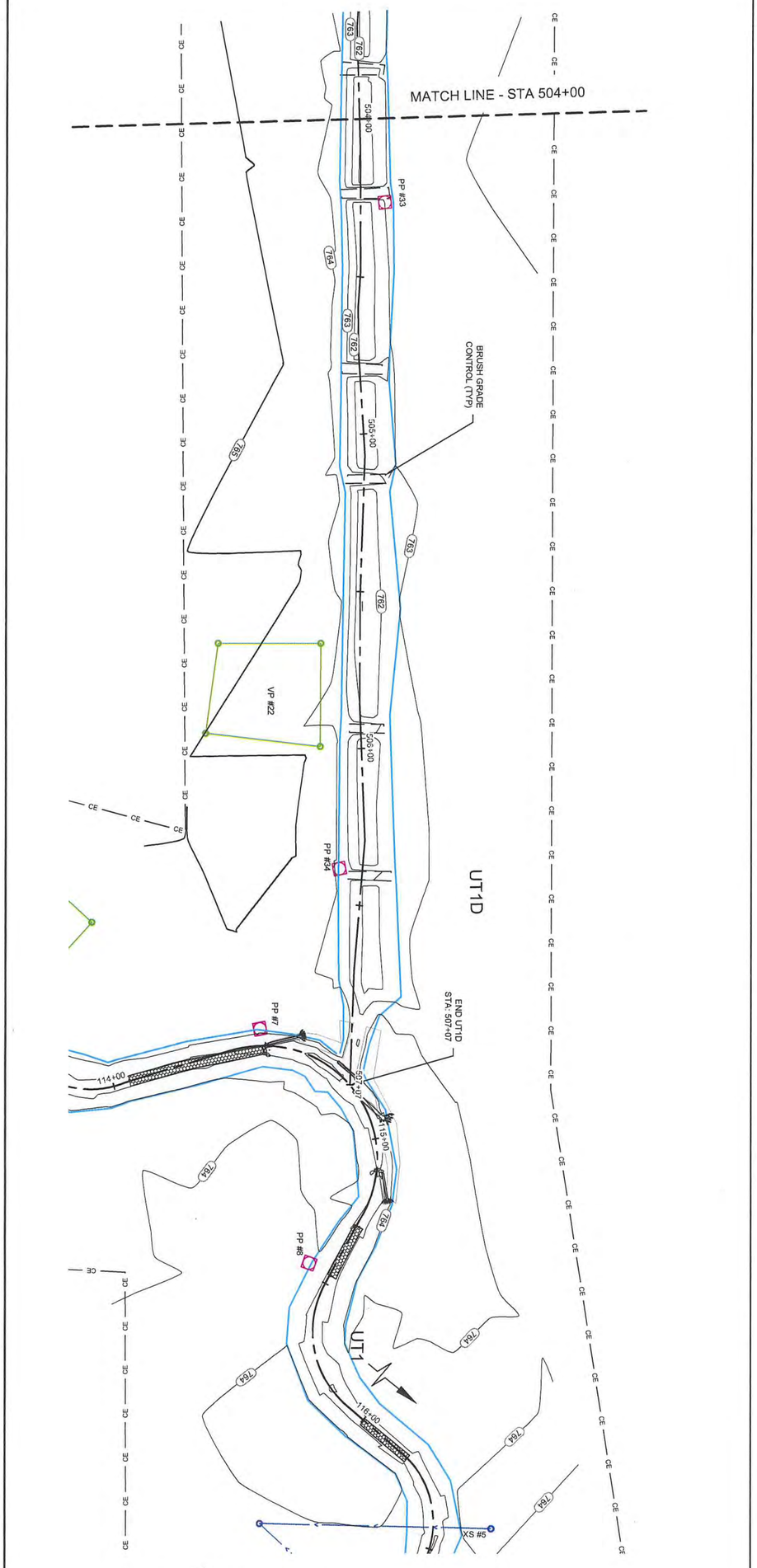

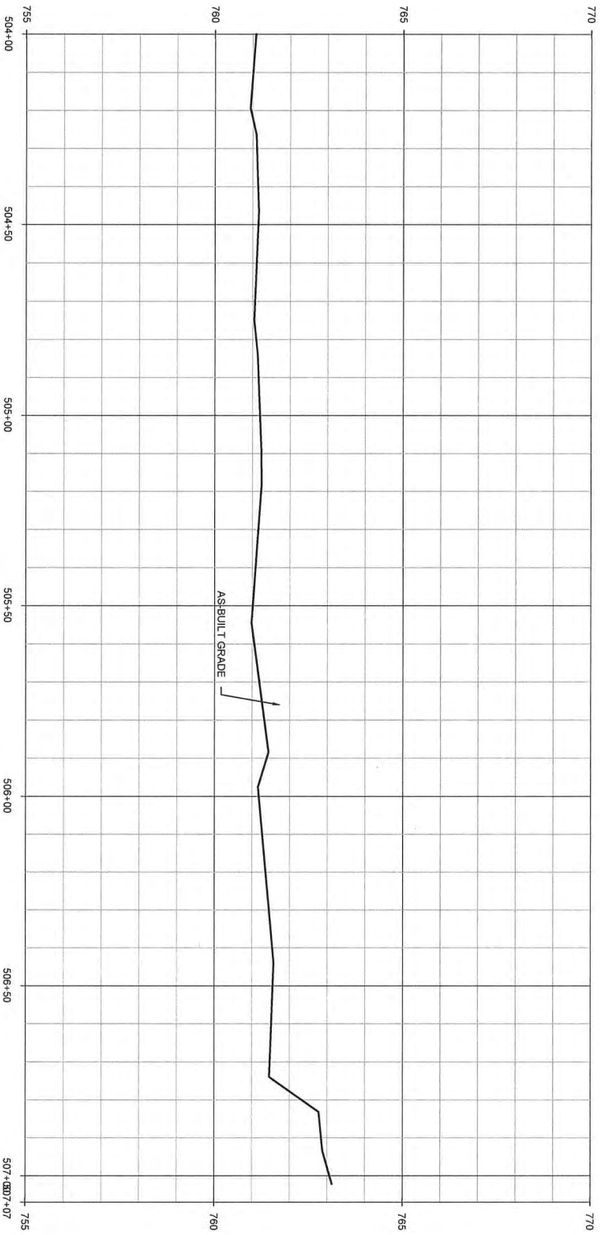

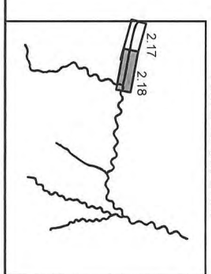

SHEET INDEX

NORTH CAROLINA PROFESSIONAL SEAL L-4756 LAND SURVEYOR JOHN B. PRIM

0' 20' 40' 60' (HORIZONTAL)

0' 2' 4' 6' (VERTICAL)

Date:	June 15, 2012
Job Number:	005-02121
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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Sheet

Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
As-Built Plans UT1D

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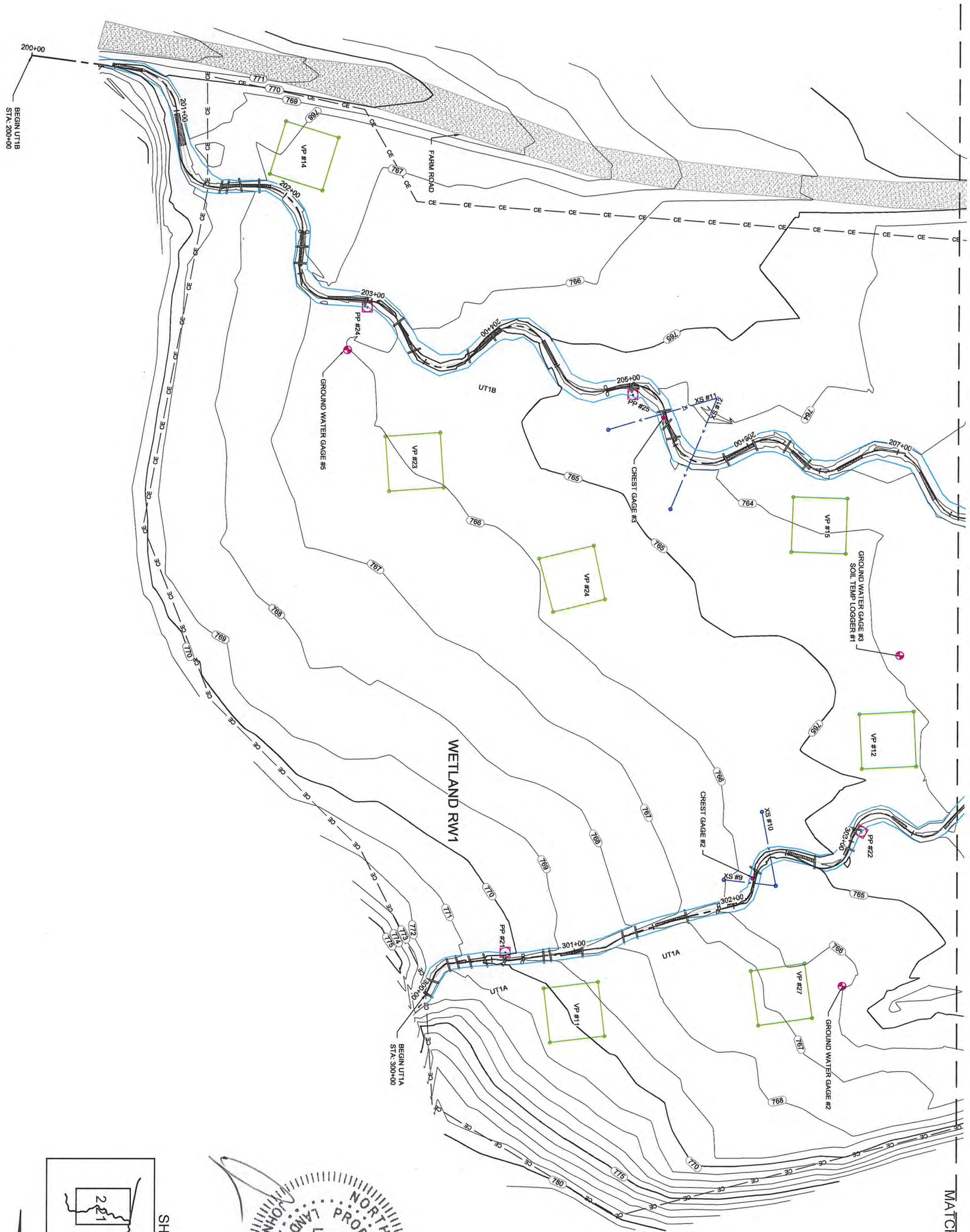

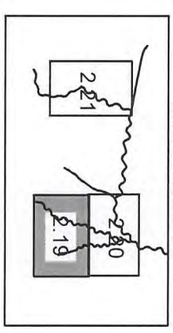

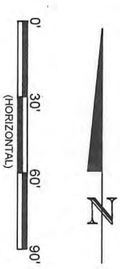

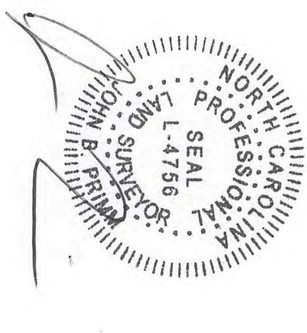

Date:	June 15, 2012
Job Number:	005-02121
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Lyle Creek Mitigation Site
Catawba, North Carolina

Wetland RW1
As-Built Plans

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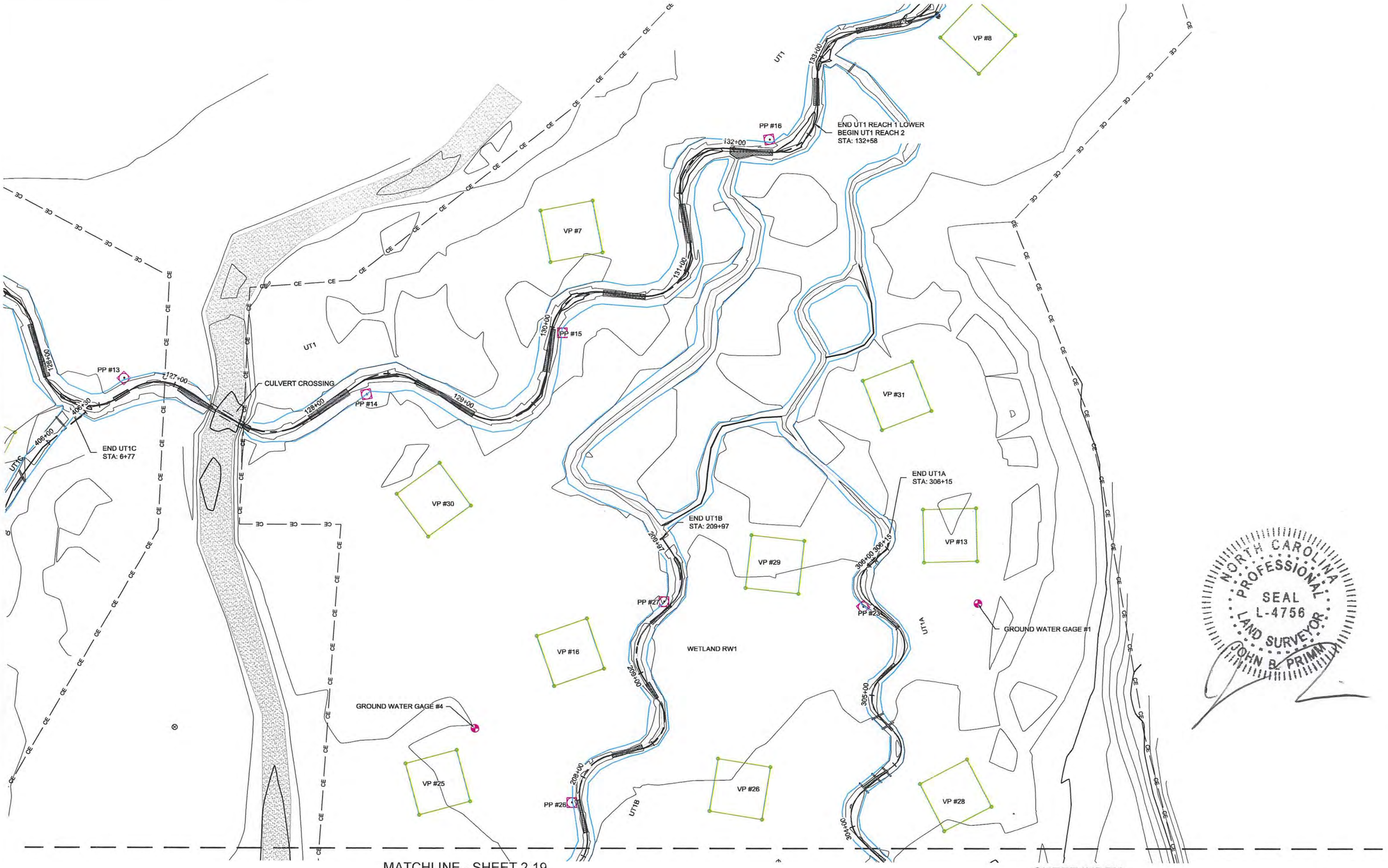
Final As-Built Plans



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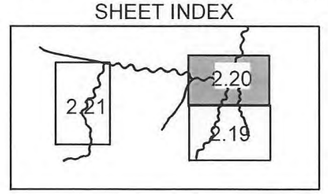

N

0' 30' 60' 90'
(HORIZONTAL)

NORTH CAROLINA PROFESSIONAL SEAL L-4756 LAND SURVEYOR JOHN B. PRIMM

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Lyle Creek Mitigation Site
Catawba, North Carolina

Wetland RW1
As-Built Plans

Revisions:

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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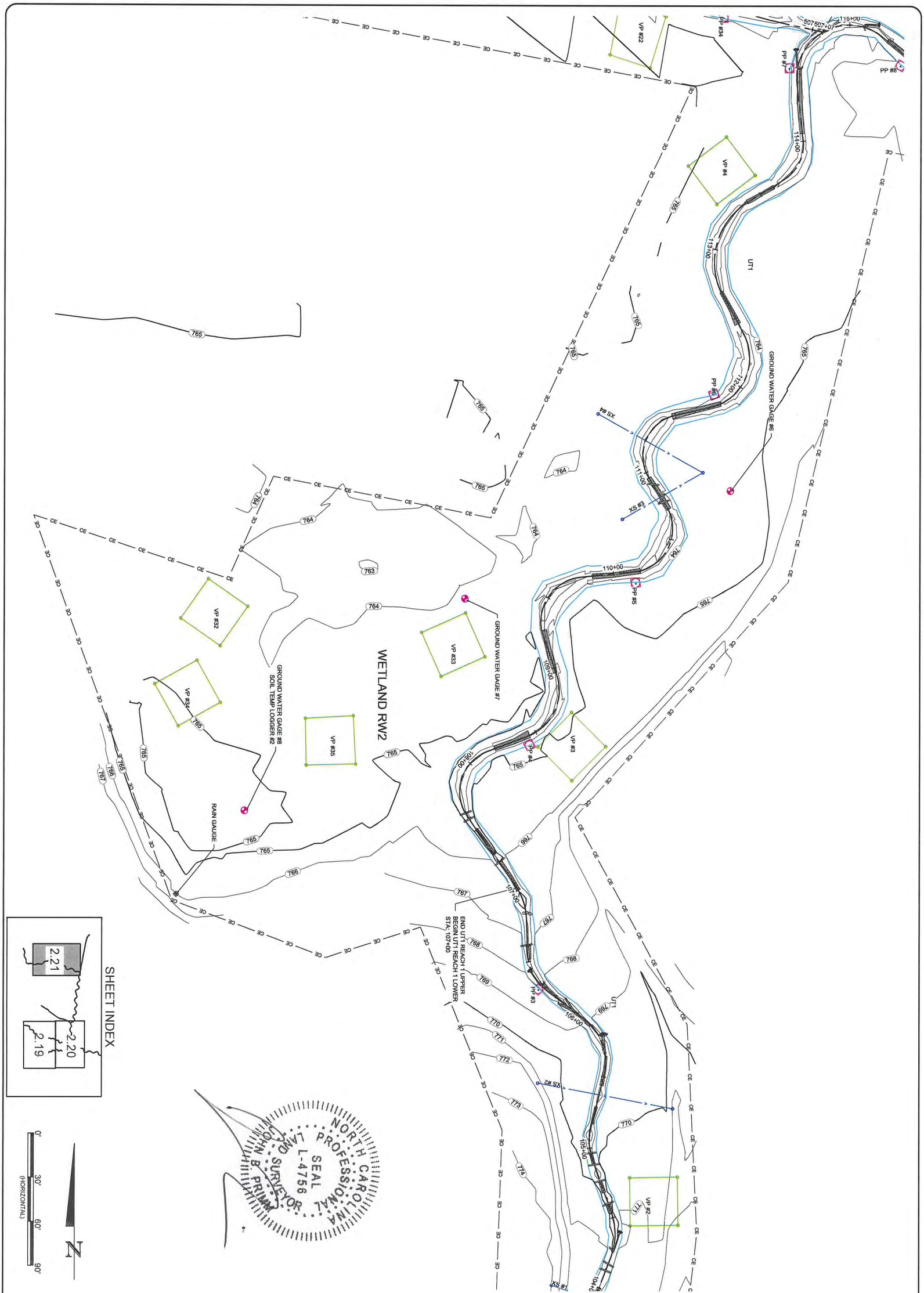
Final As-Built Plans



Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCS
Checked By:	EGR

Revisions:

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Lyle Creek Mitigation Site
Catawba, North Carolina

Wetland RW2
As-Built Plans

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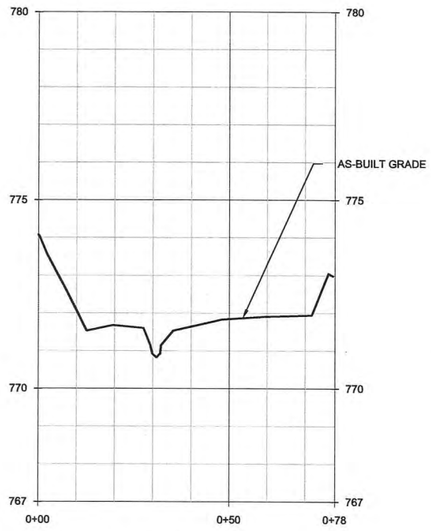
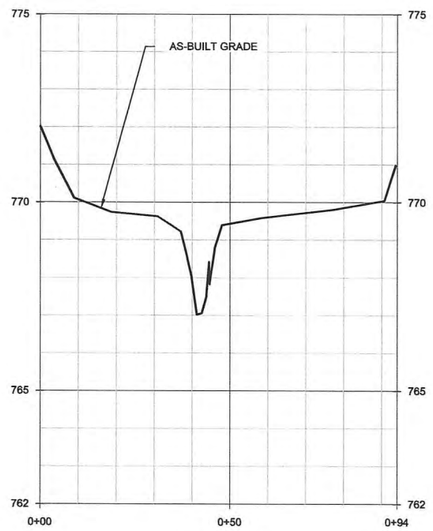
Final As-Built Plans



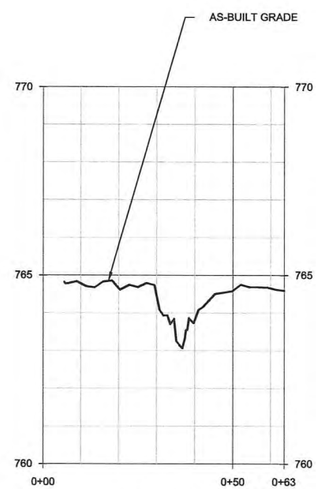
XS1-MY0

UT1
Sta: 103+91
Riffle



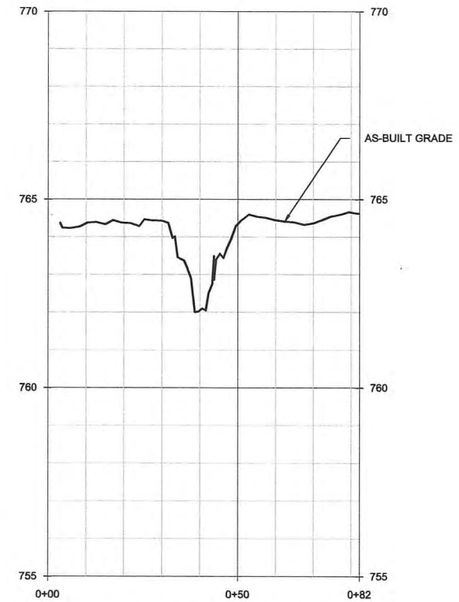
XS2-MY0

UT1
Sta: 105+37
Pool



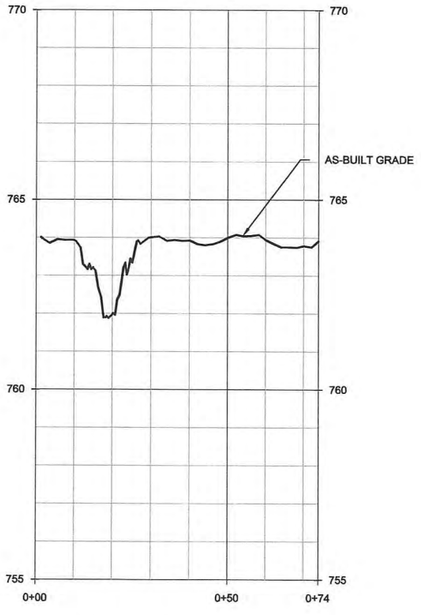
XS3-MY0

UT1
Sta: 110+80
Riffle



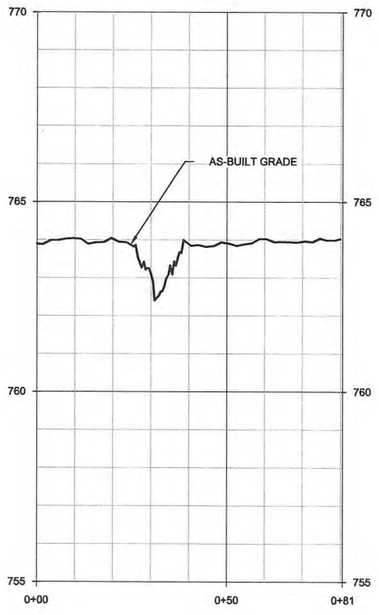
XS4-MY0

UT1
Sta: 111+22
Pool



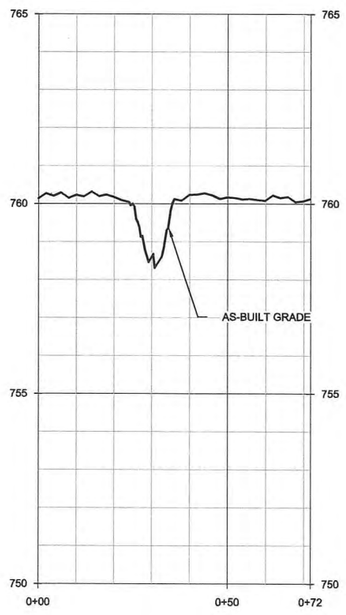
XS5-MY0

UT1
Sta: 116+43
Pool



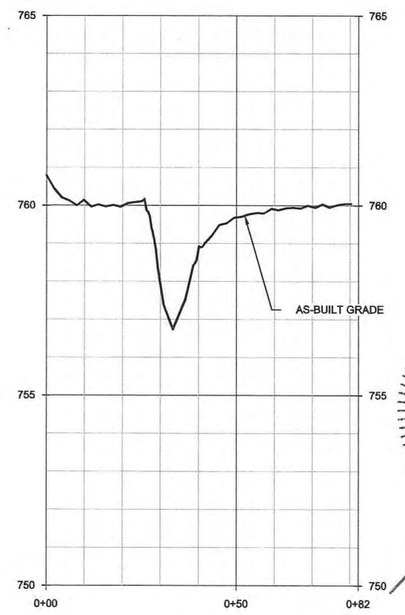
XS6-MY0

UT1
Sta: 116+81
Riffle



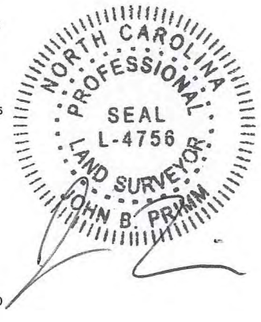
XS7-MY0

UT1
Sta: 135+95
Riffle



XS8-MY0

UT1
Sta: 136+31
Pool



0' 2' 4' 6'
(VERTICAL)

0' 20' 40' 60'
(HORIZONTAL)

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ENGINEERING
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Lyle Creek Mitigation Site
Catawba, North Carolina

Cross Sections
As-Built Plans

Revisions:

Date:	June 15, 2012
Job Number:	003-02121
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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Final As-Built Plans

Jun 17, 2012

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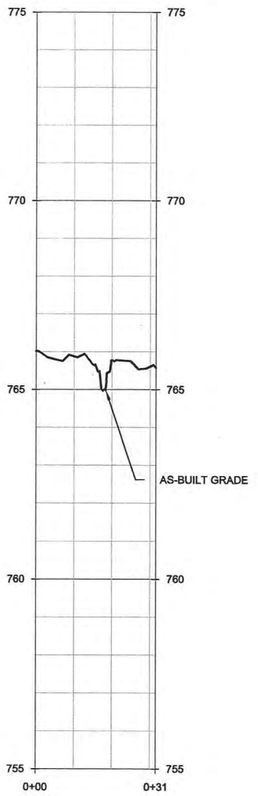
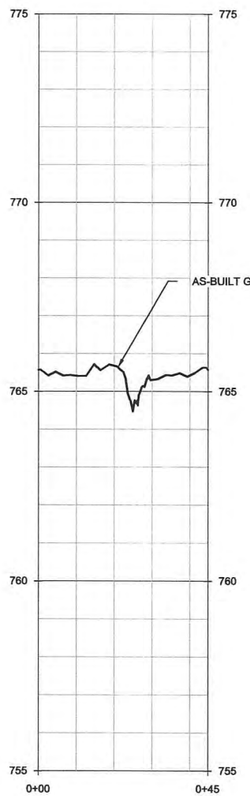


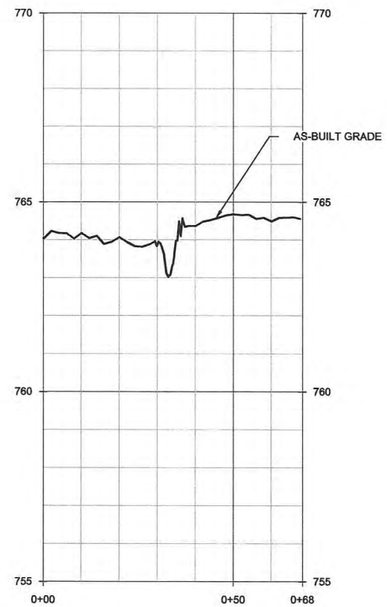
XS9-MY0

UT1A
Sta: 302+19
Riffle



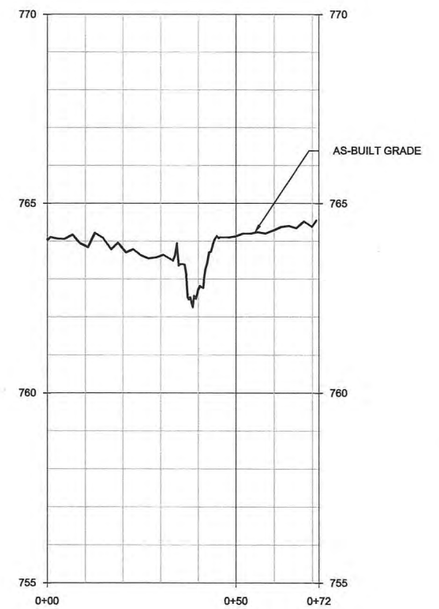
XS10-MY0

UT1A
Sta: 302+40
Pool



XS11-MY0

UT1B
Sta: 205+30
Riffle



XS12-MY0

UT1B
Sta: 205+63
Pool

NORTH CAROLINA PROFESSIONAL SEAL L-4756 LAND SURVEYOR JOHN B. PRIMM

0' 2' 4' 6'
(VERTICAL)

0' 20' 40' 60'
(HORIZONTAL)

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Lyle Creek Mitigation Site
Catawba, North Carolina

Cross Sections
As-Built Plans

Revisions:

Date: June 15, 2012
Job Number: 005-02123
Project Engineer: CDM
Drawn By: JCK
Checked By: EGR

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Sheet

Final As-Built Plans

July 17, 2012

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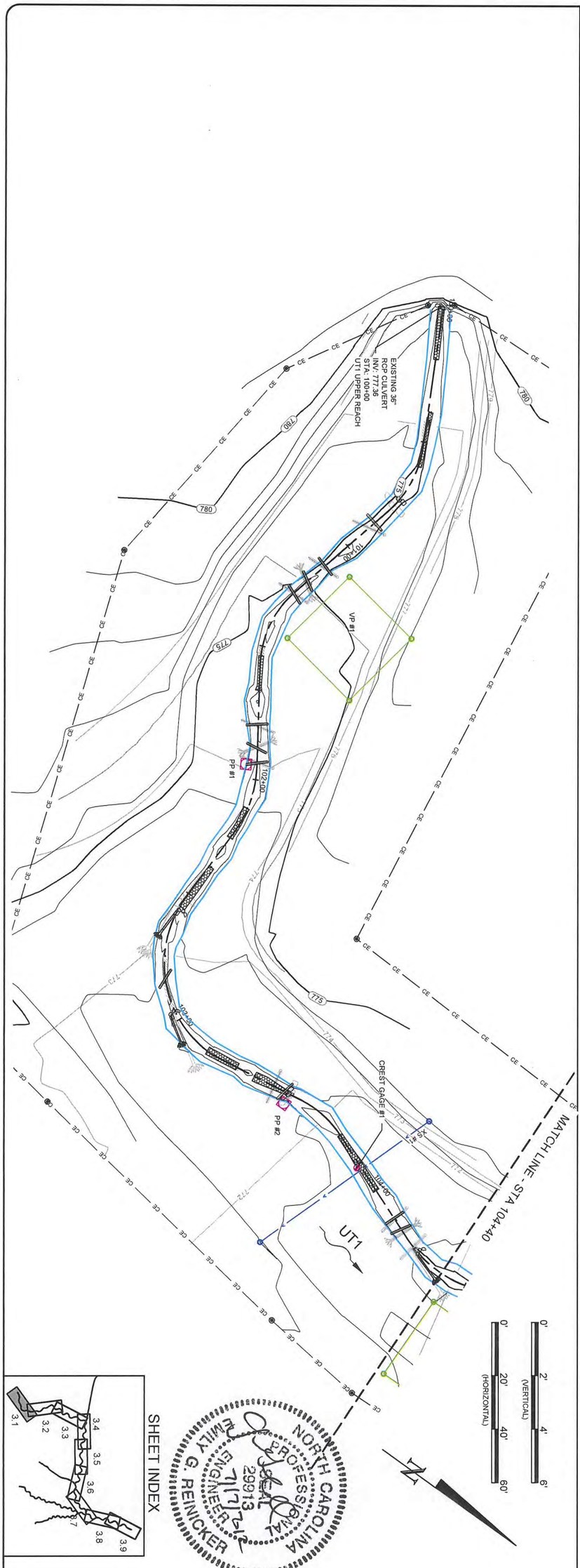

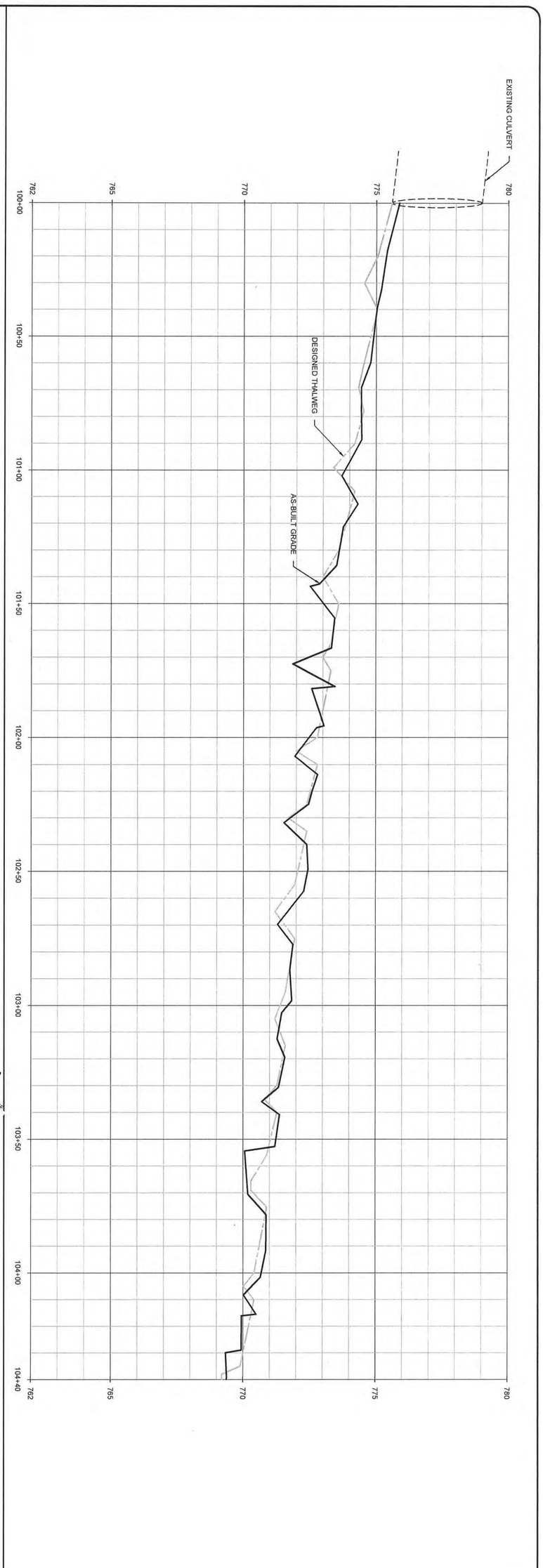

NORTH CAROLINA
PROFESSIONAL
SEAL
29913
ENGINEER
EVAN G. REINICKER
7/11/12

Date:	June 15, 2012
Job Number:	005-02121
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Overlay Plans UT1 Reach 1 Upper

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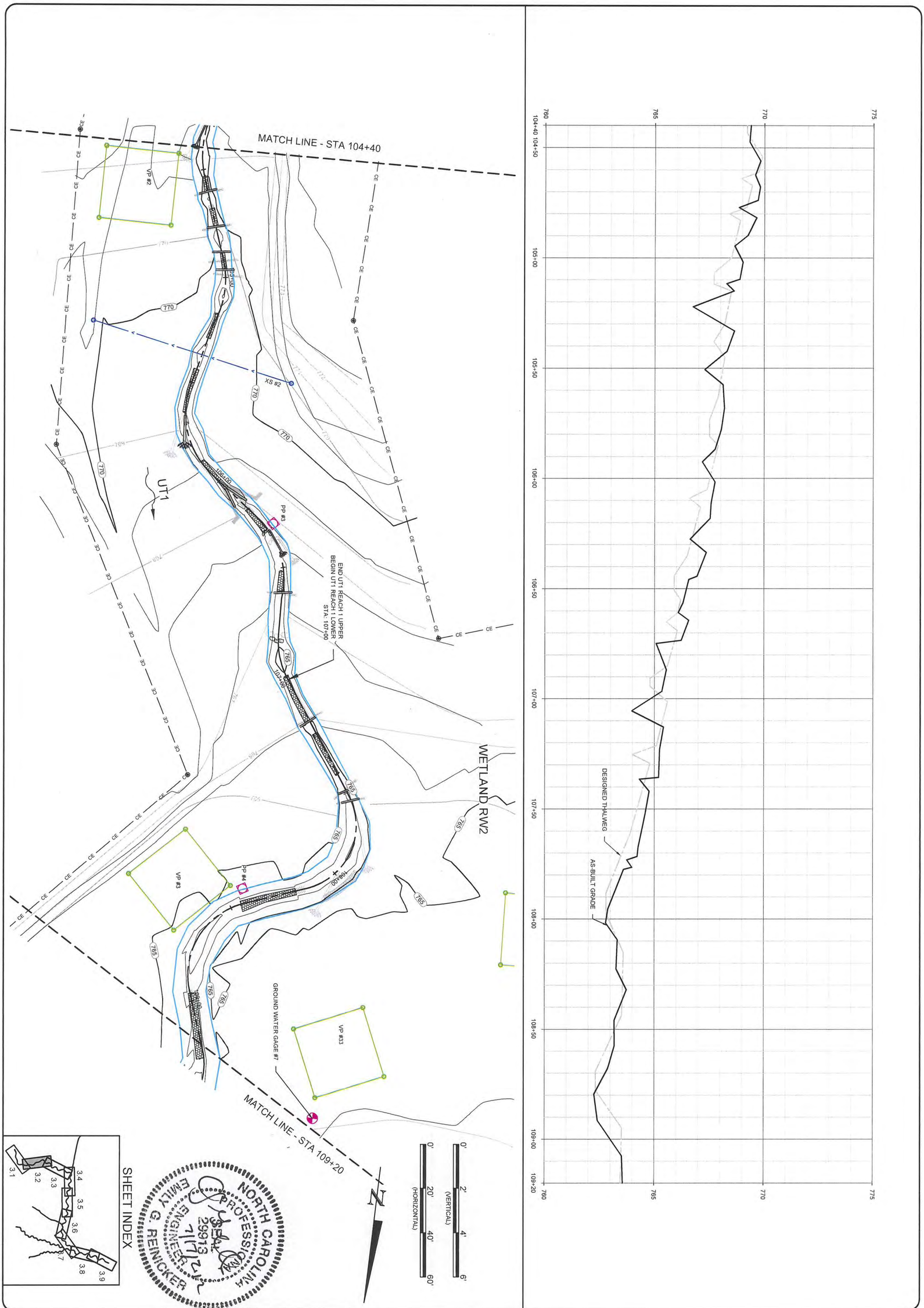
Final As-Built Plans



Date:	June 15, 2012
Job Number:	003-02123
Project Engineer:	CTM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Sheet

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Overlay Plans UT1 Reach 1 Upper and Lower

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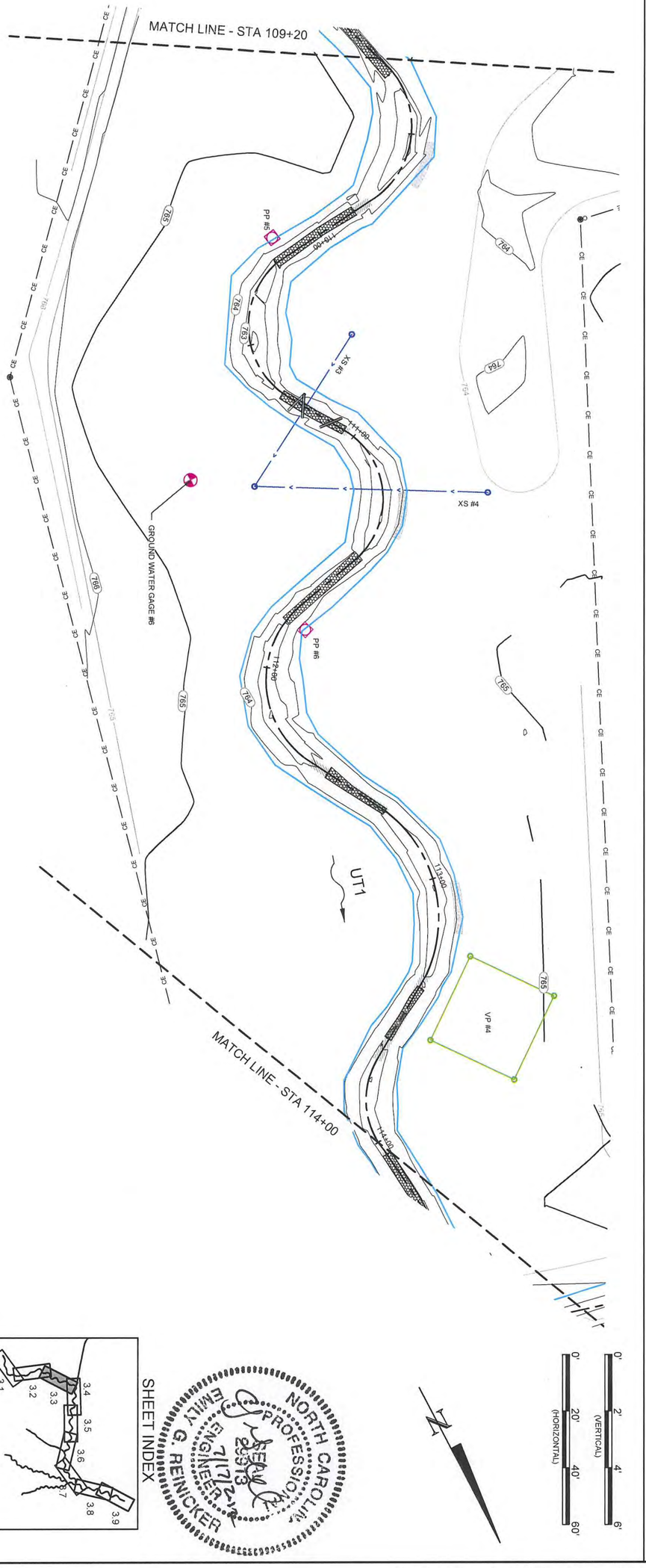
Final As-Built Plans



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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 22313 EGR G. REINICKER 7/12/12

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Overlay Plans UT1 Reach 1 Lower

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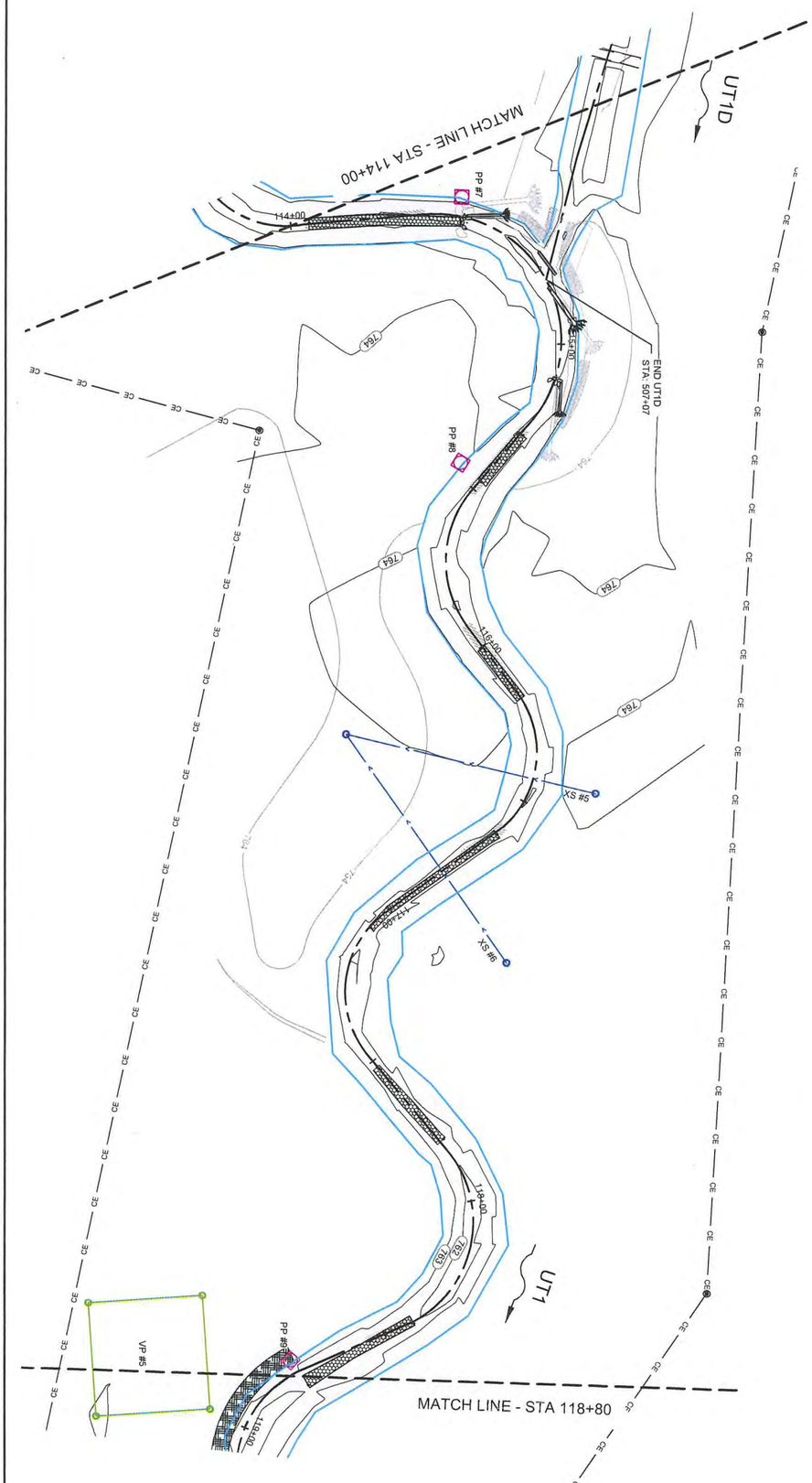

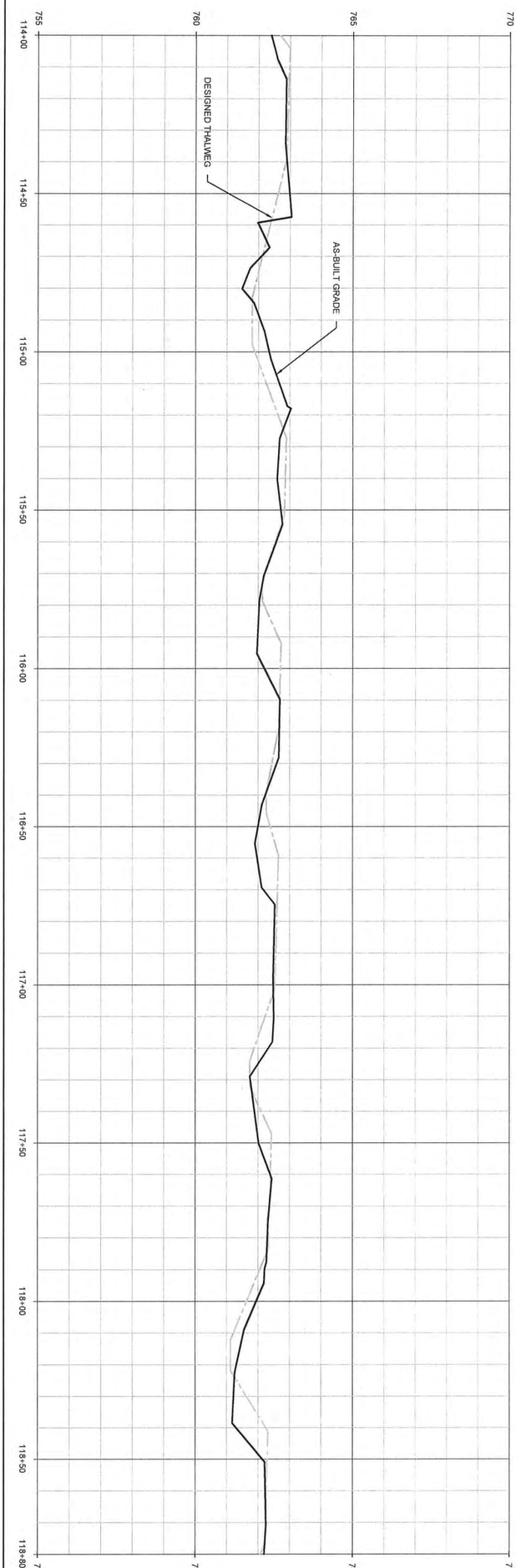

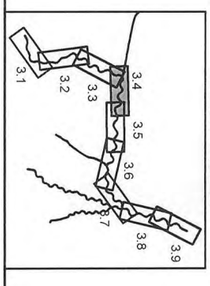

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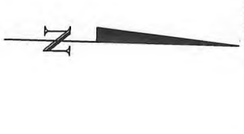

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

3.4
Sheet

Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Overlay Plans UT1 Reach 1 Lower

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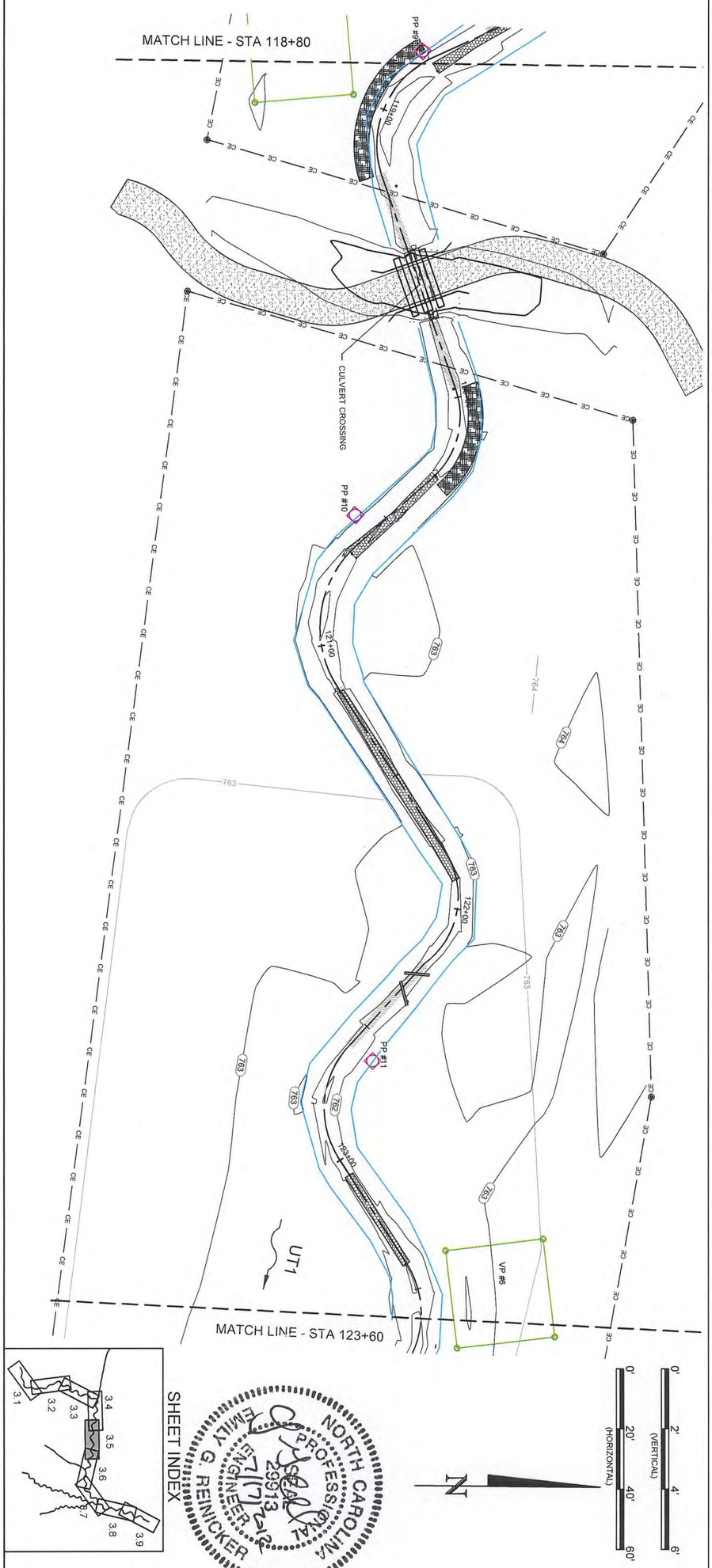

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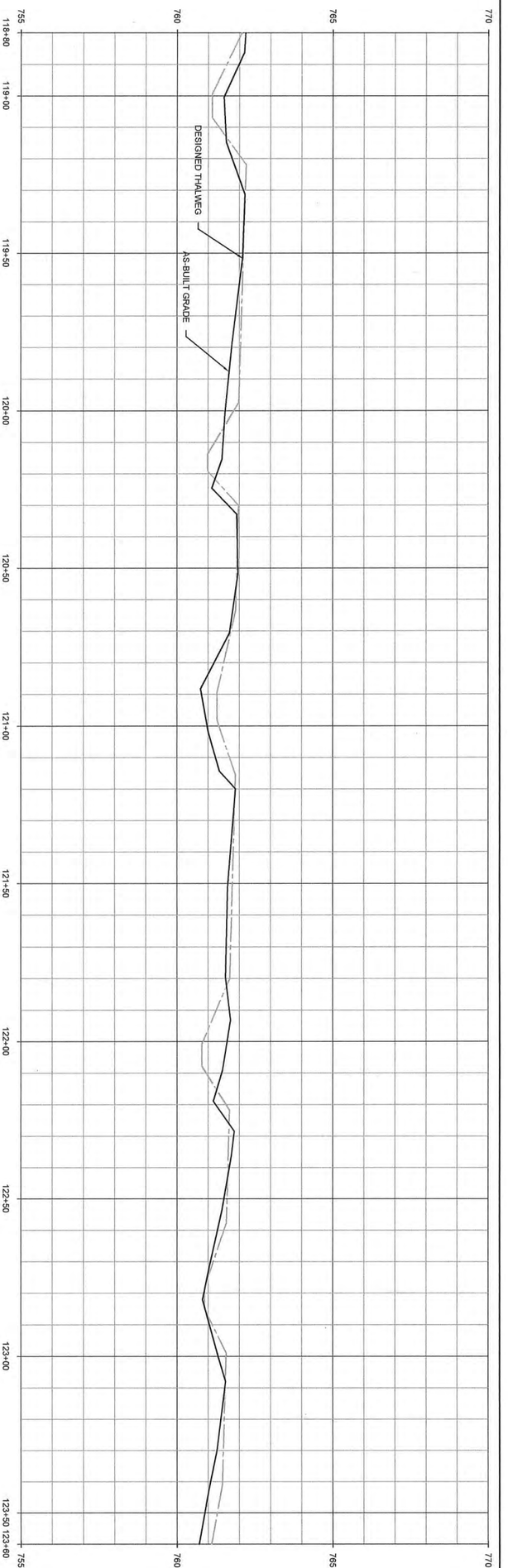

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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Sheet

Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Overlay Plans UT1 Reach 1 Lower

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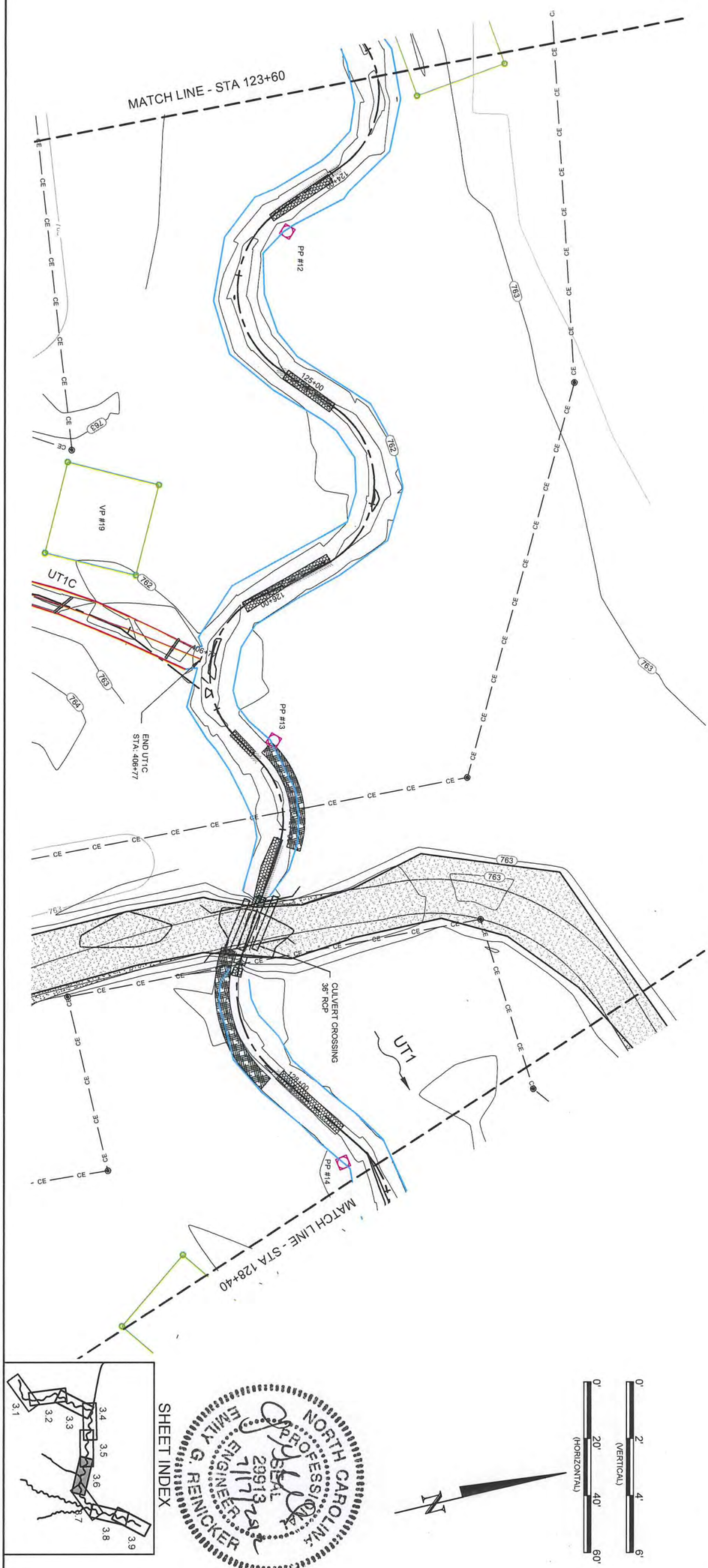

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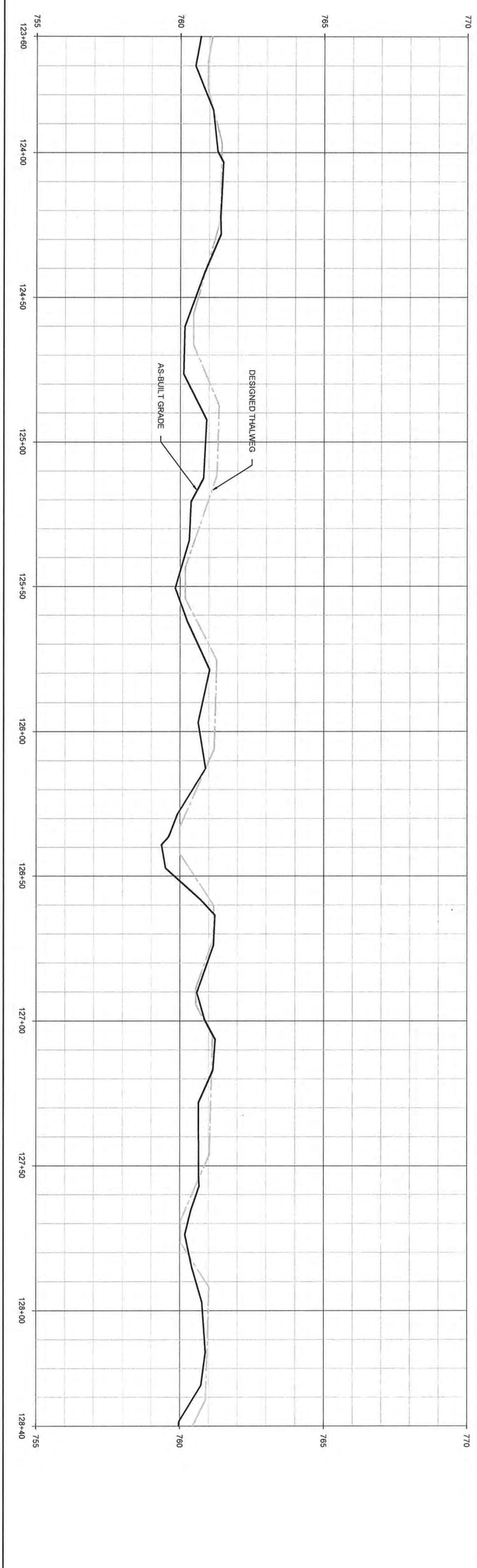

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

3.6
Sheet

Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Overlay Plans UT1 Reach 1 Lower

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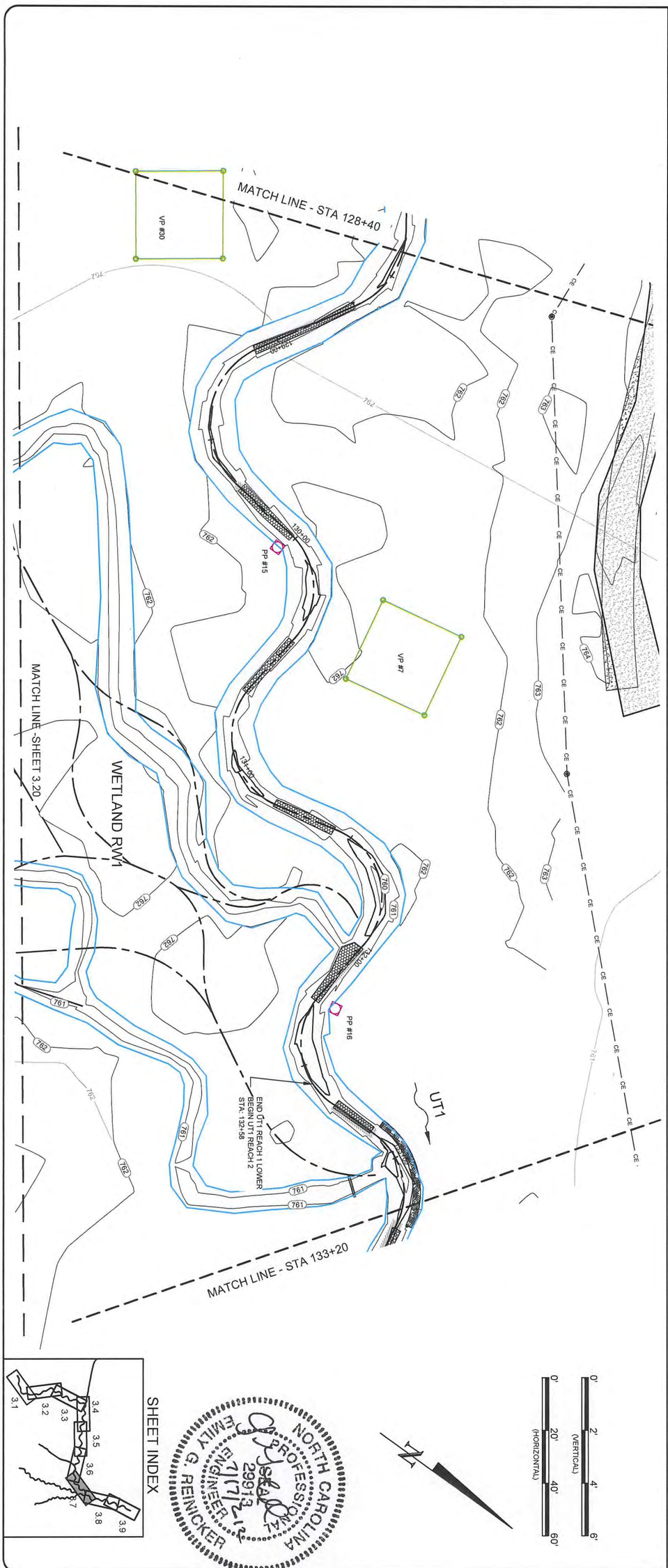

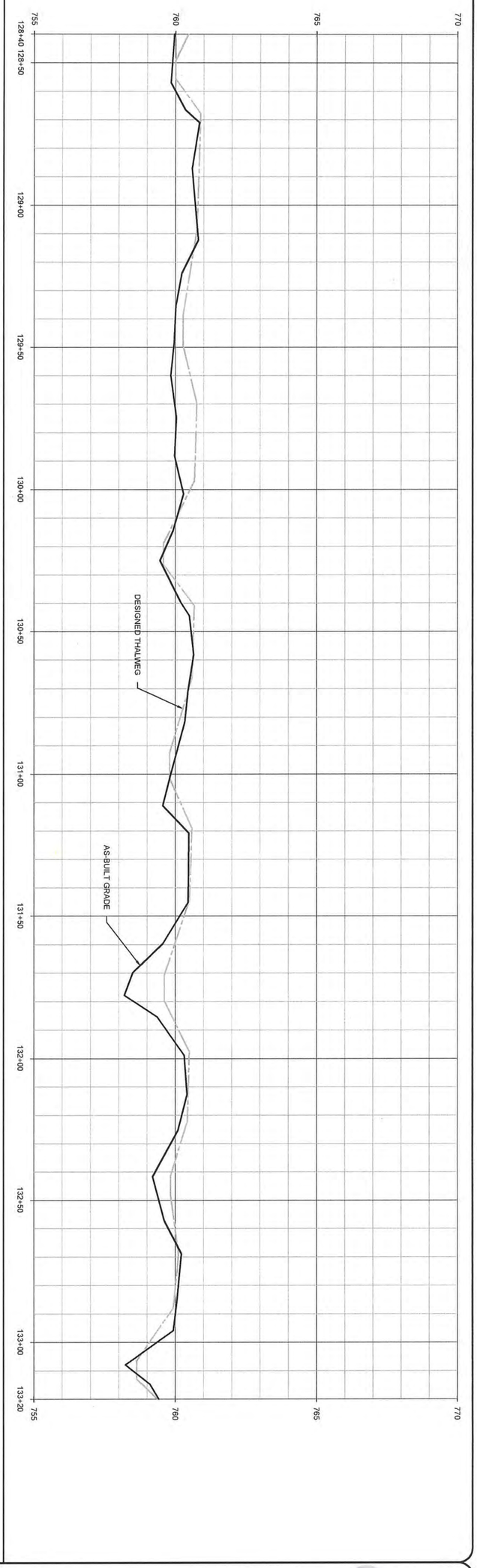

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Date:	June 15, 2012
Job Number:	003-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Overlay Plans UT1 Reach 1 Lower

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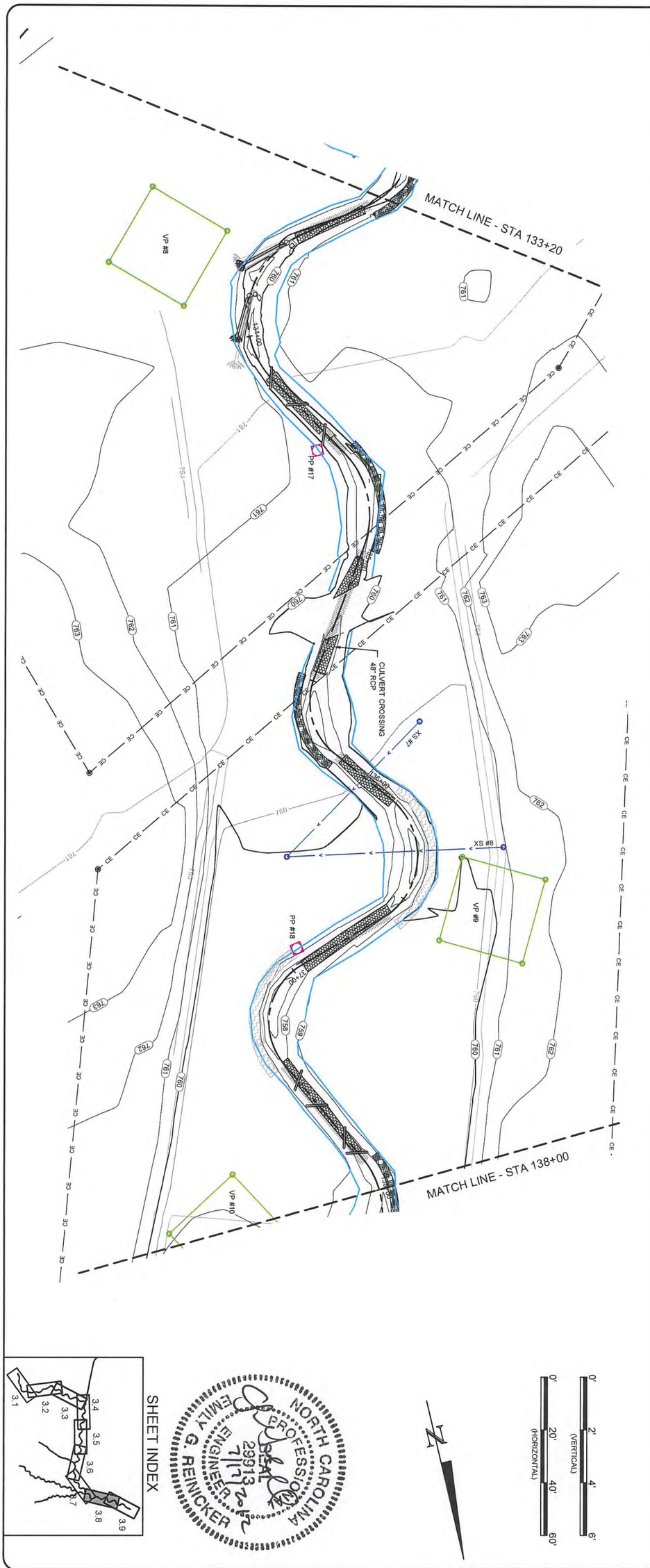
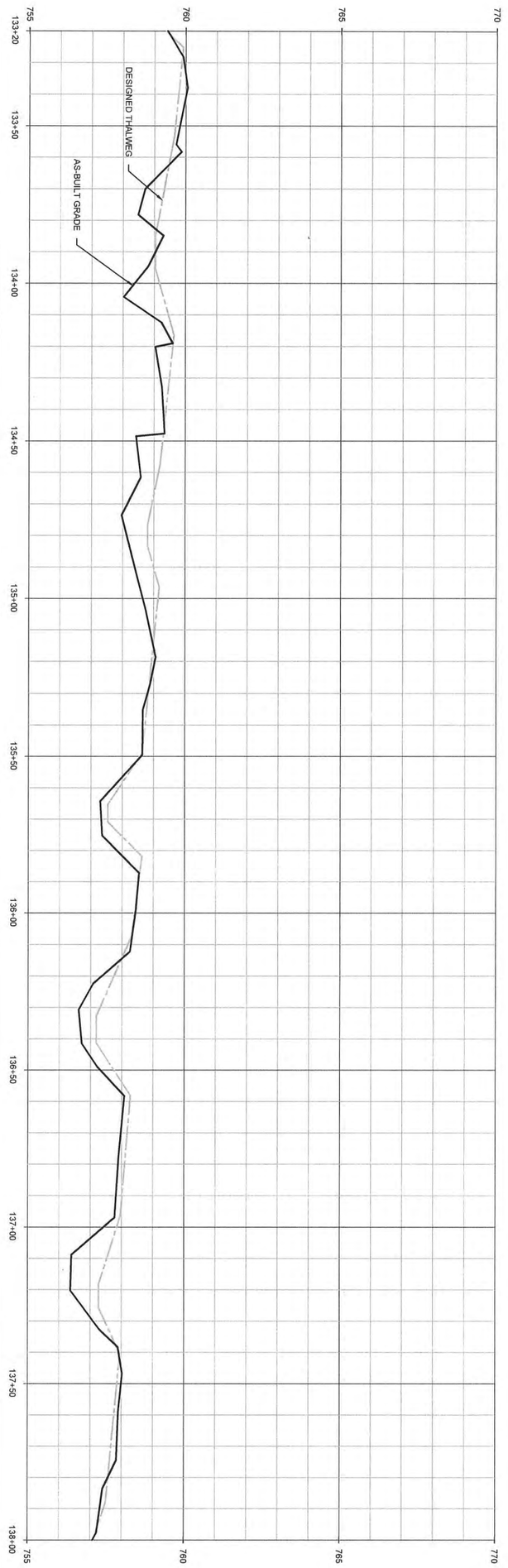
Final As-Built Plans





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Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

3.8

Sheet

Final As-Built Plans

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Overlay Plans UT1 Reach 2

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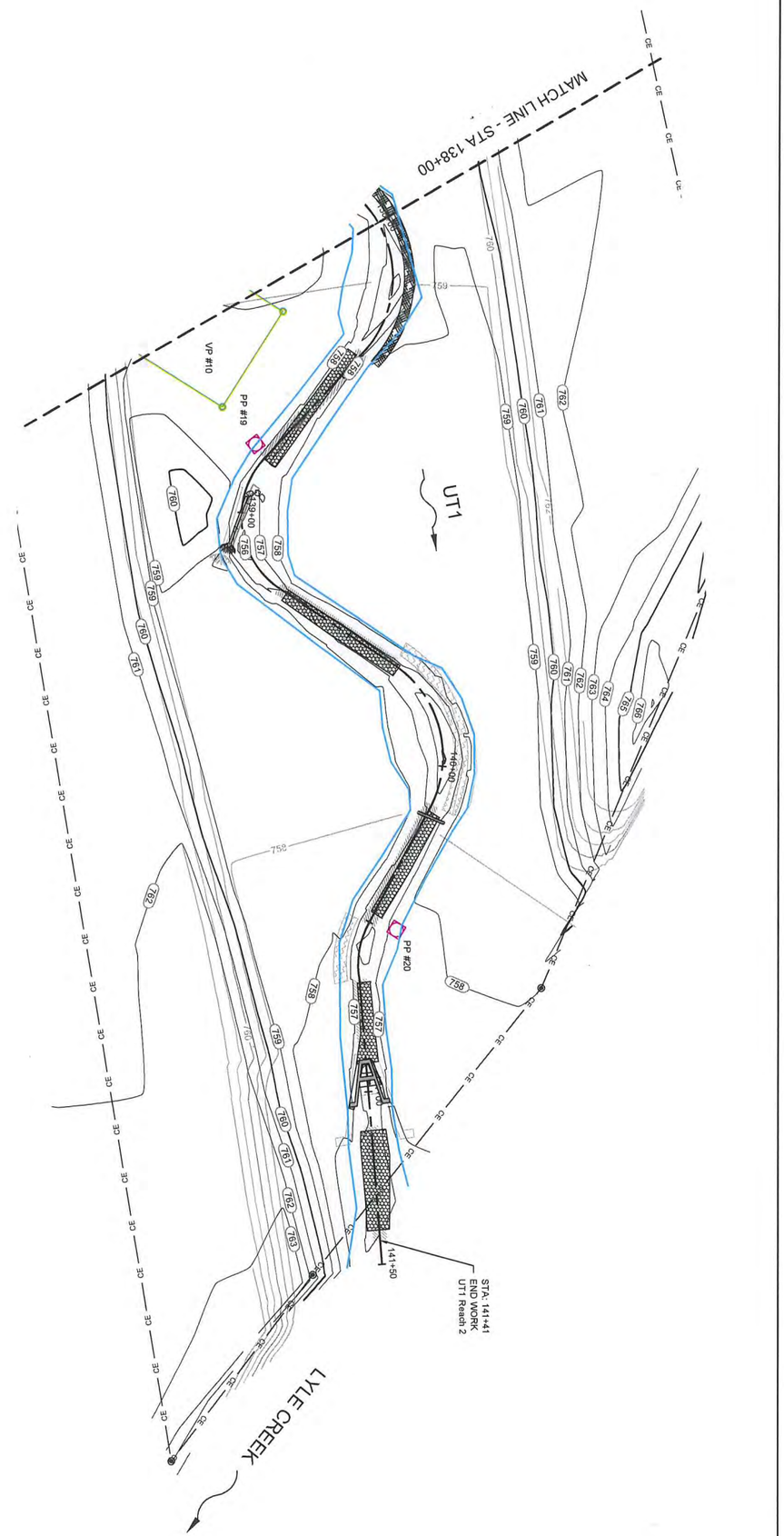

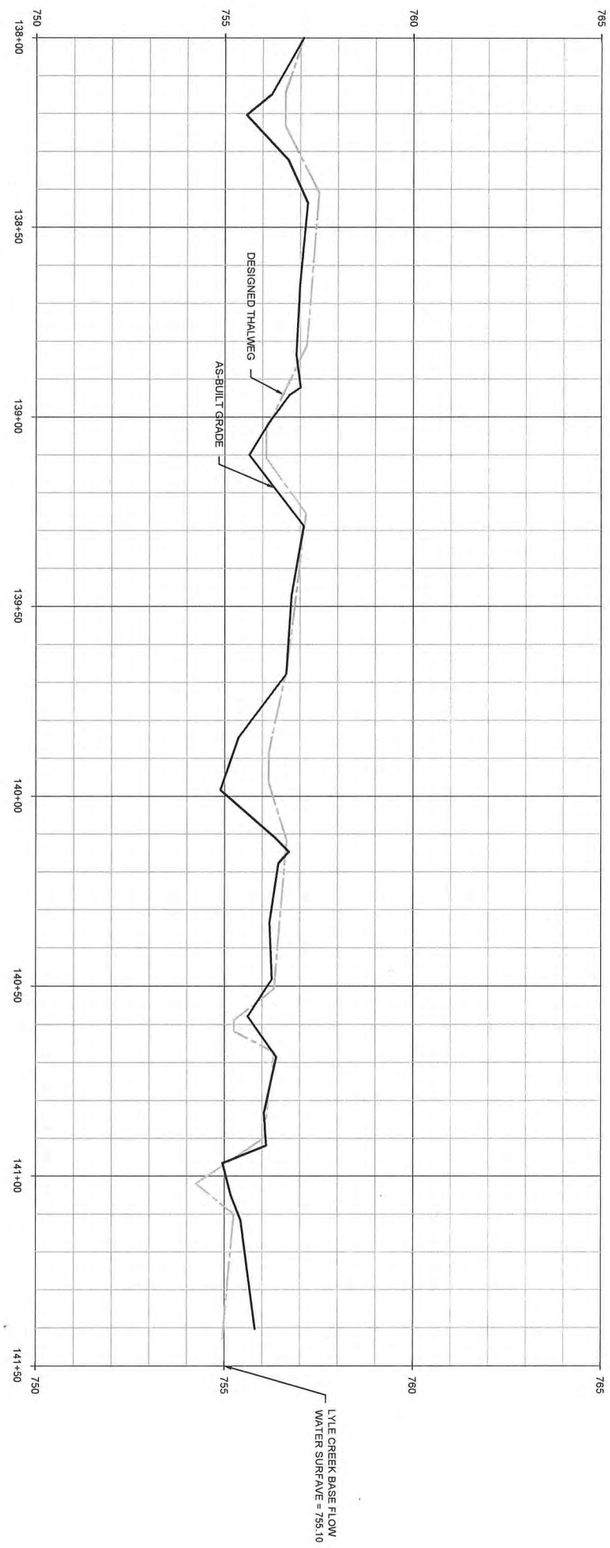

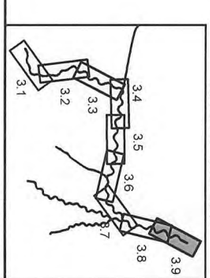

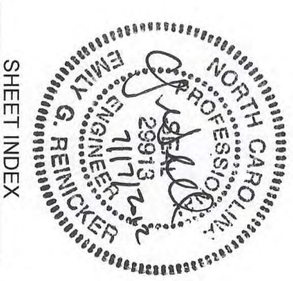

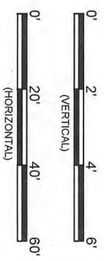

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

3.9

Sheet

Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Overlay Plans UT1 Reach 2

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Charlotte, NC 28203
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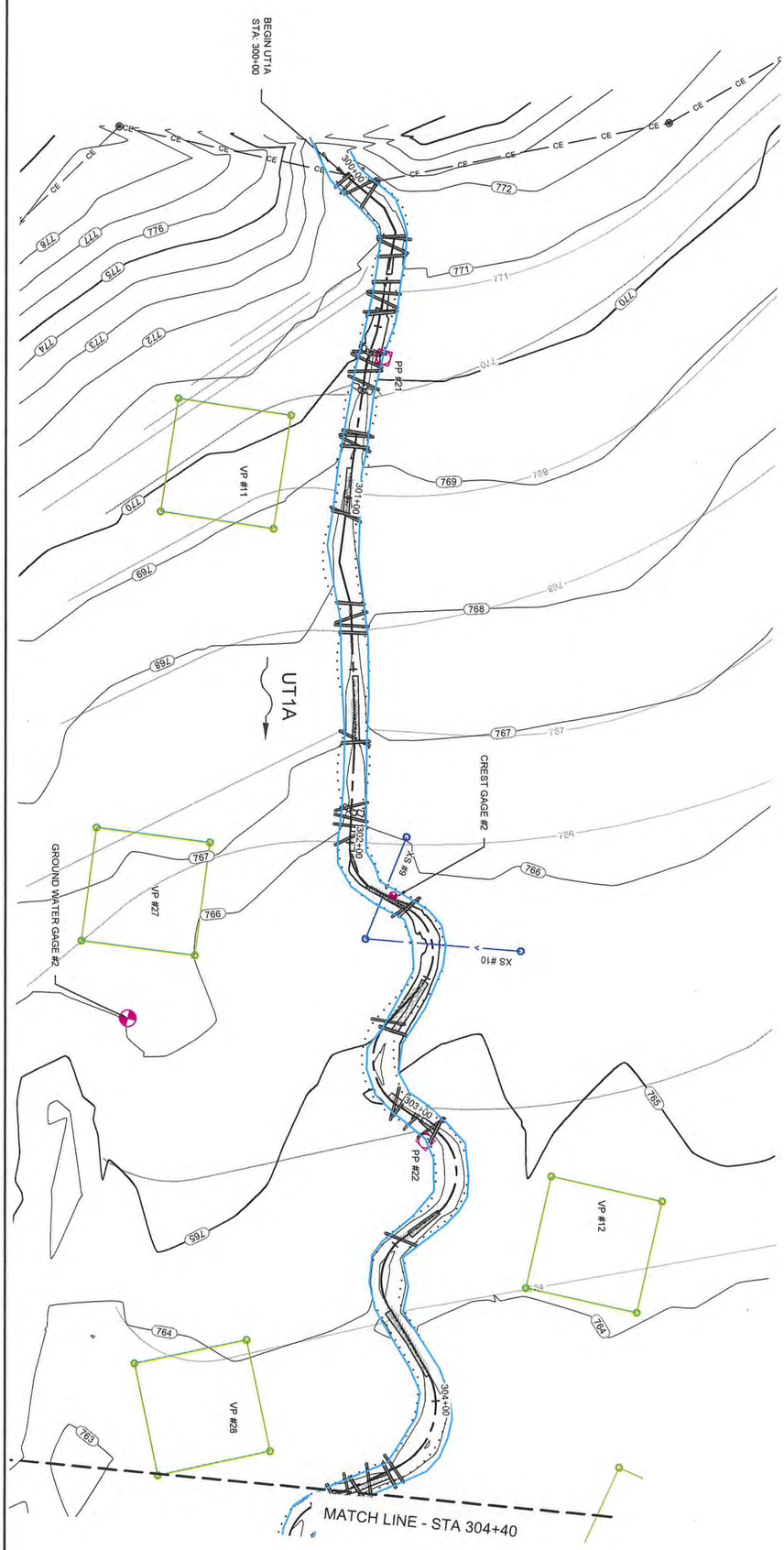
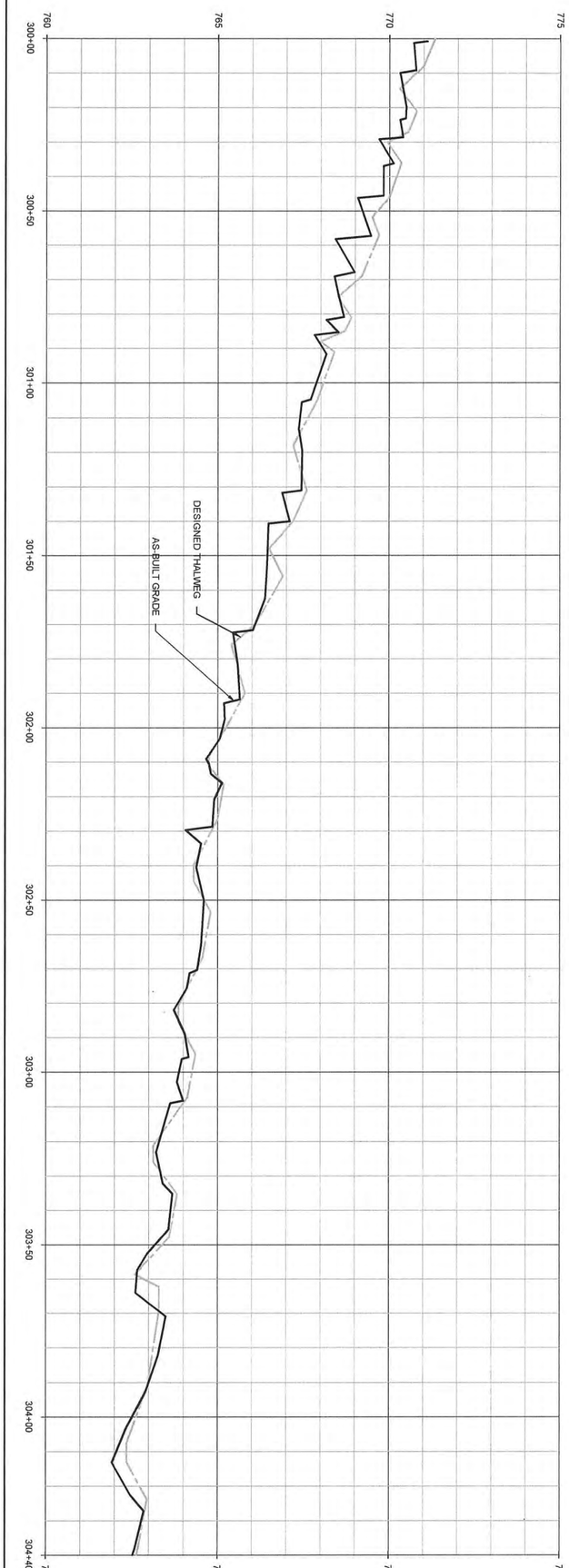
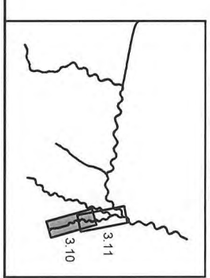
Fax: 704.332.3306
Firm License No. F-0831

Final As-Built Plans







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NORTH CAROLINA PROFESSIONAL SEAL 29913 ENGINEER EMILY G. REINICKER 7/17/2012

0' 20' 40' 60' (HORIZONTAL)
0' 2' 4' 6' (VERTICAL)

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

3.10
Sheet

Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Overlay Plans UT1A

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Charlotte, NC 28203
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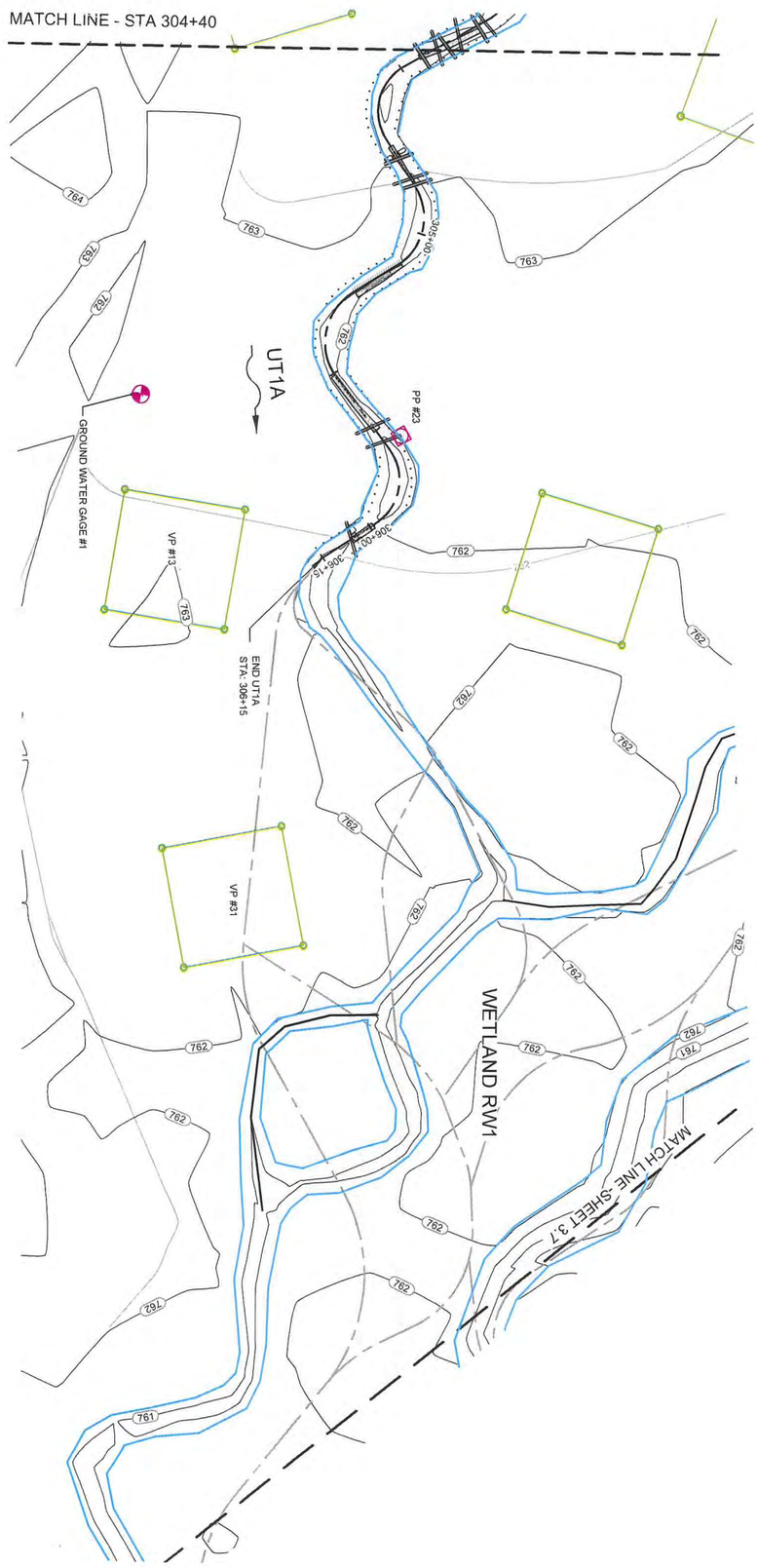
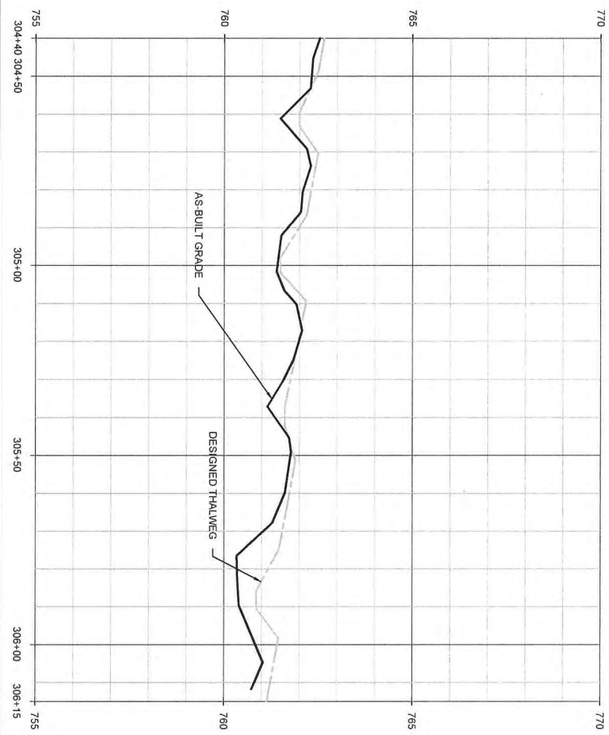
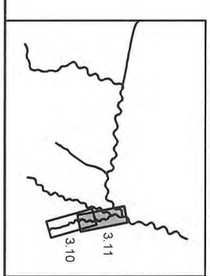
Final As-Built Plans







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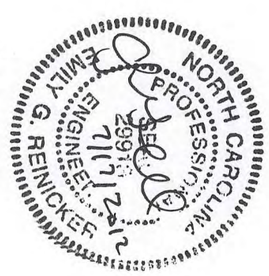

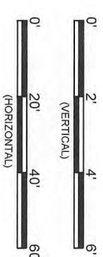

Date:	June 15, 2012
Job Number:	905-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

3.11
Sheet

Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Overlay Plans UT1A

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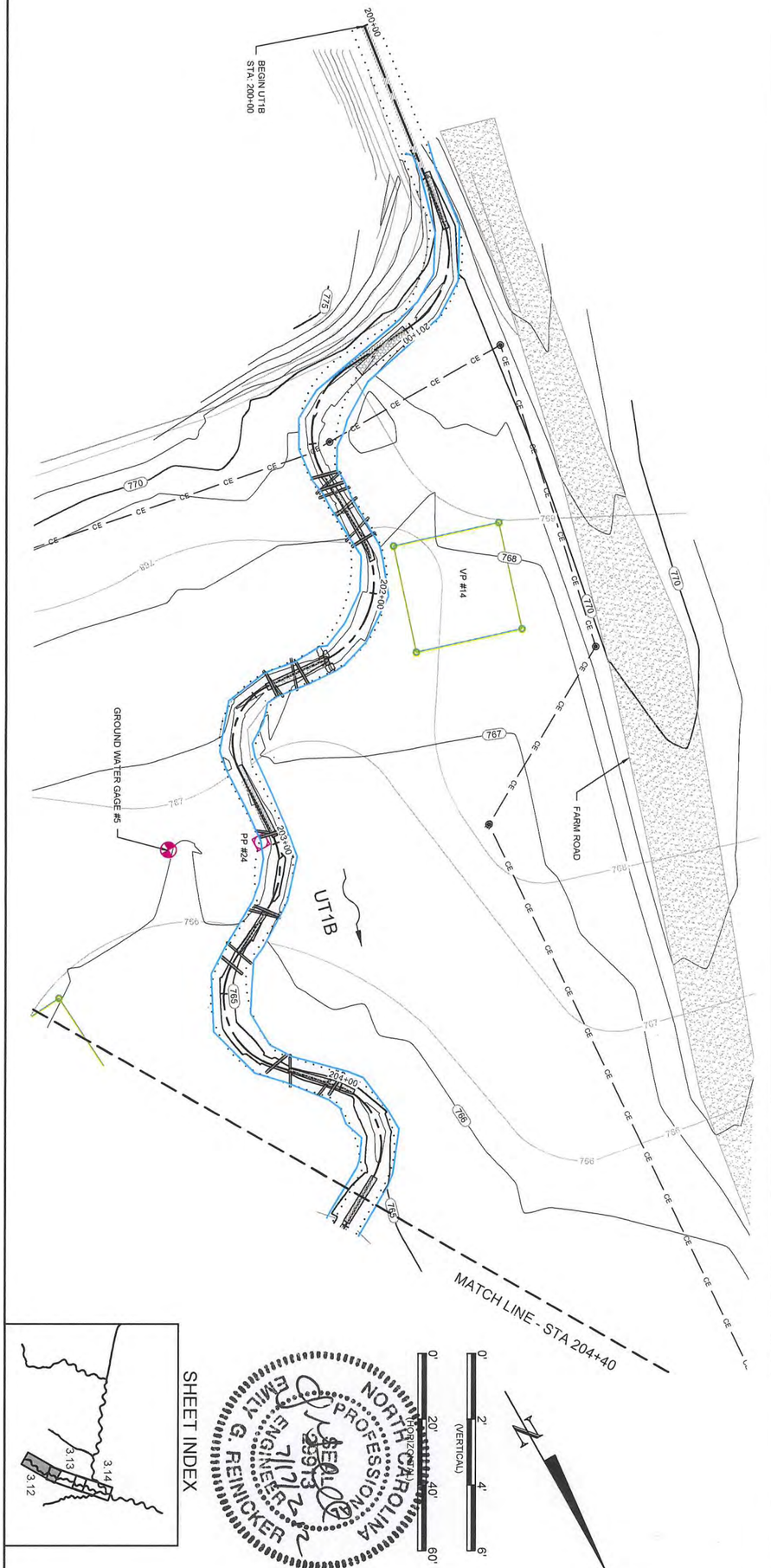

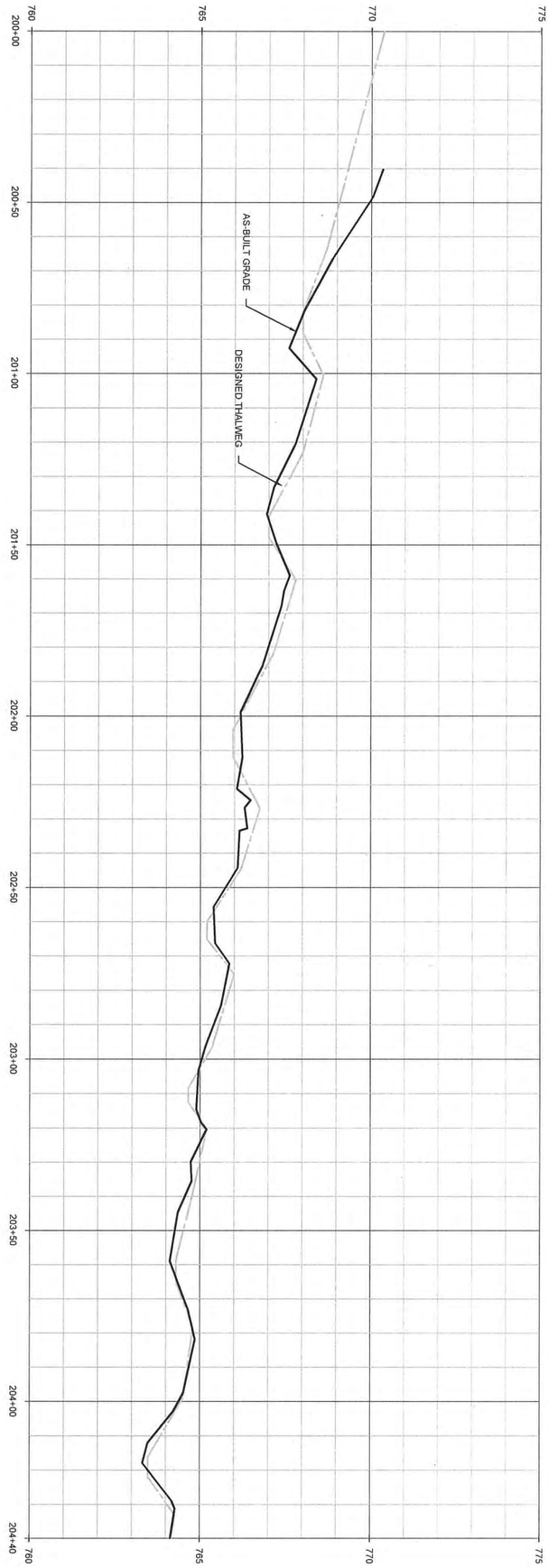

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Date:	June 15, 2012
Job Number:	003-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Overlay Plans UT1B

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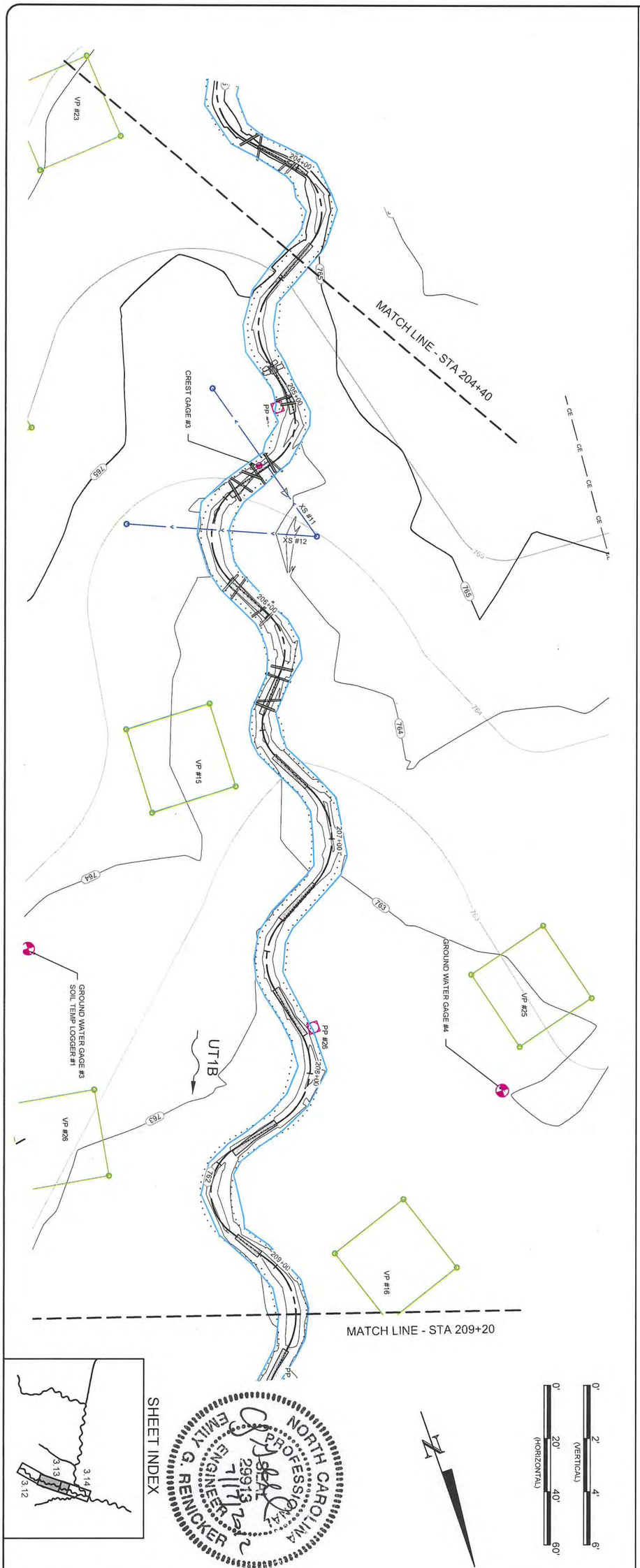
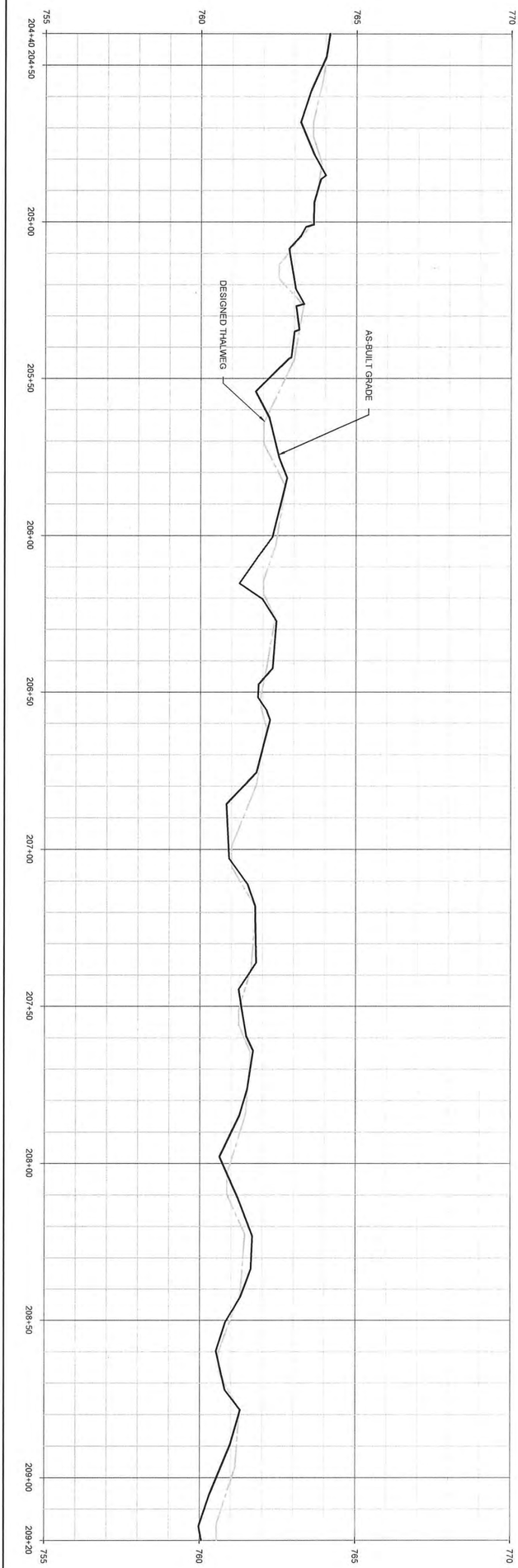
Final As-Built Plans





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Date:	June 15, 2012
Job Number:	003-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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Sheet

Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Overlay Plans UT1B

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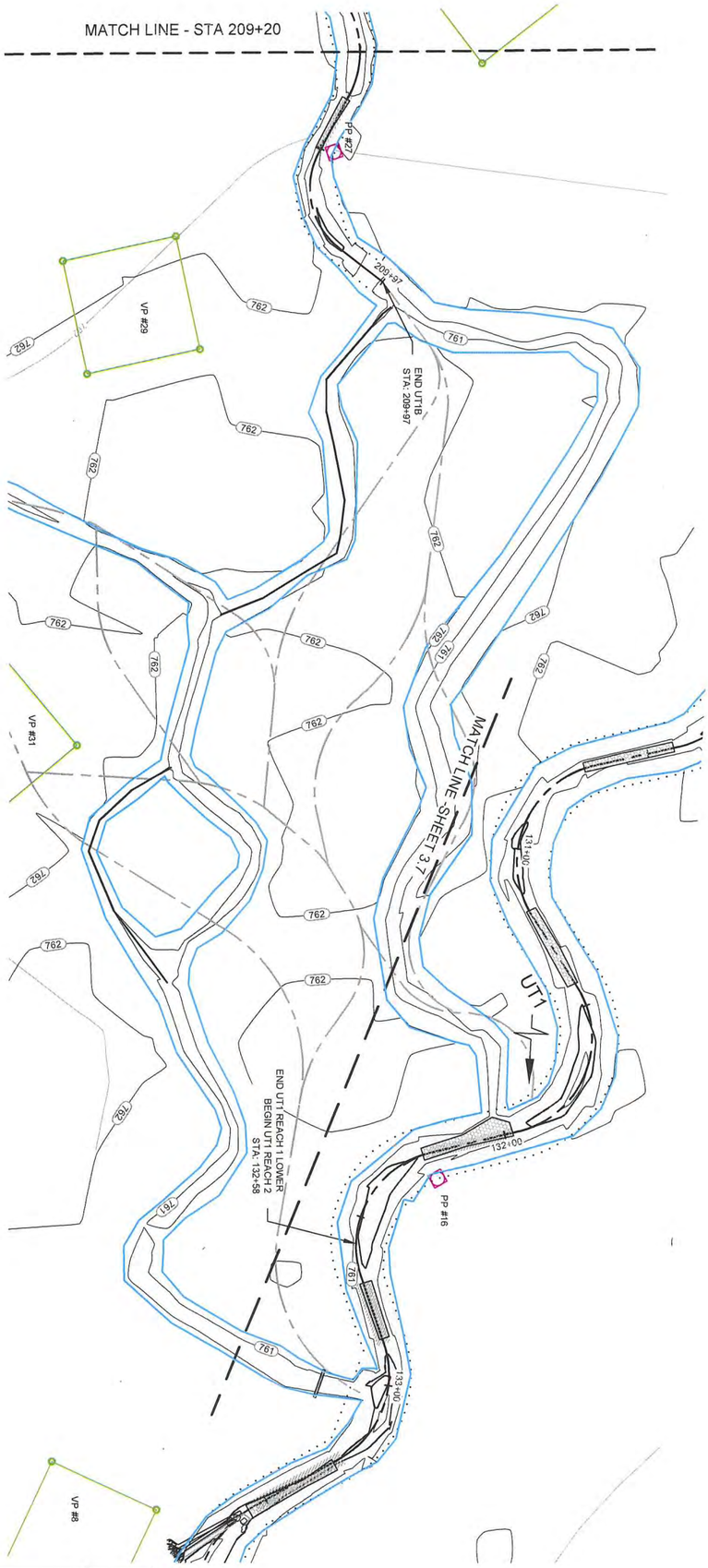
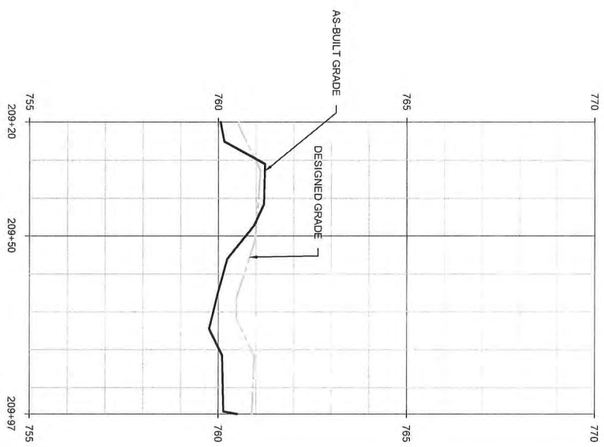
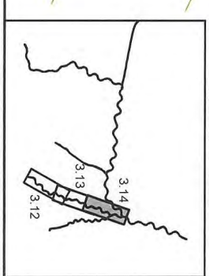
Firm License No. F-0831

Final As-Built Plans







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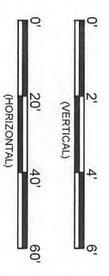

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Sheet

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Overlay Plans UT1B

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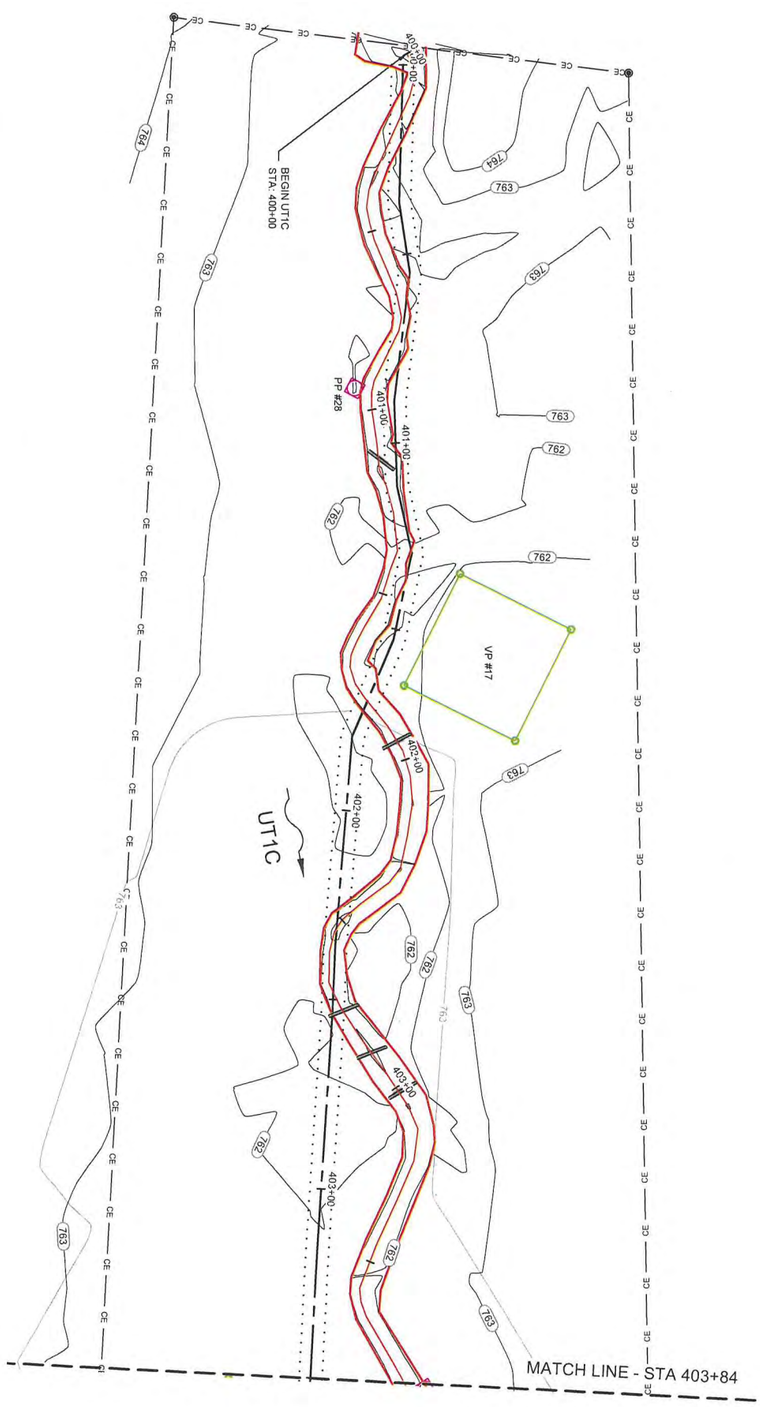

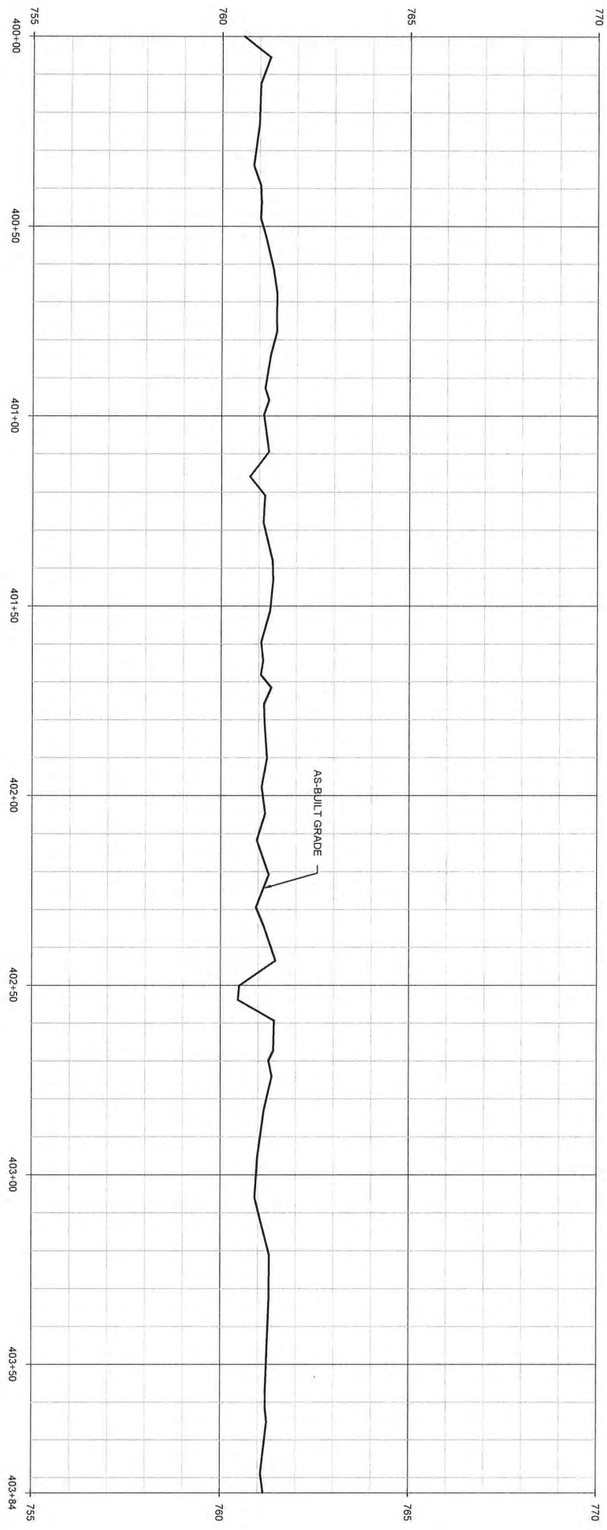

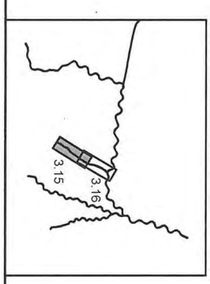

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 29913 EMILY G. REINICKER 7/17/12

0' 20' 40' 60' (HORIZONTAL)
0' 2' 4' 6' (VERTICAL)

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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Sheet

Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Overlay Plans UT1C

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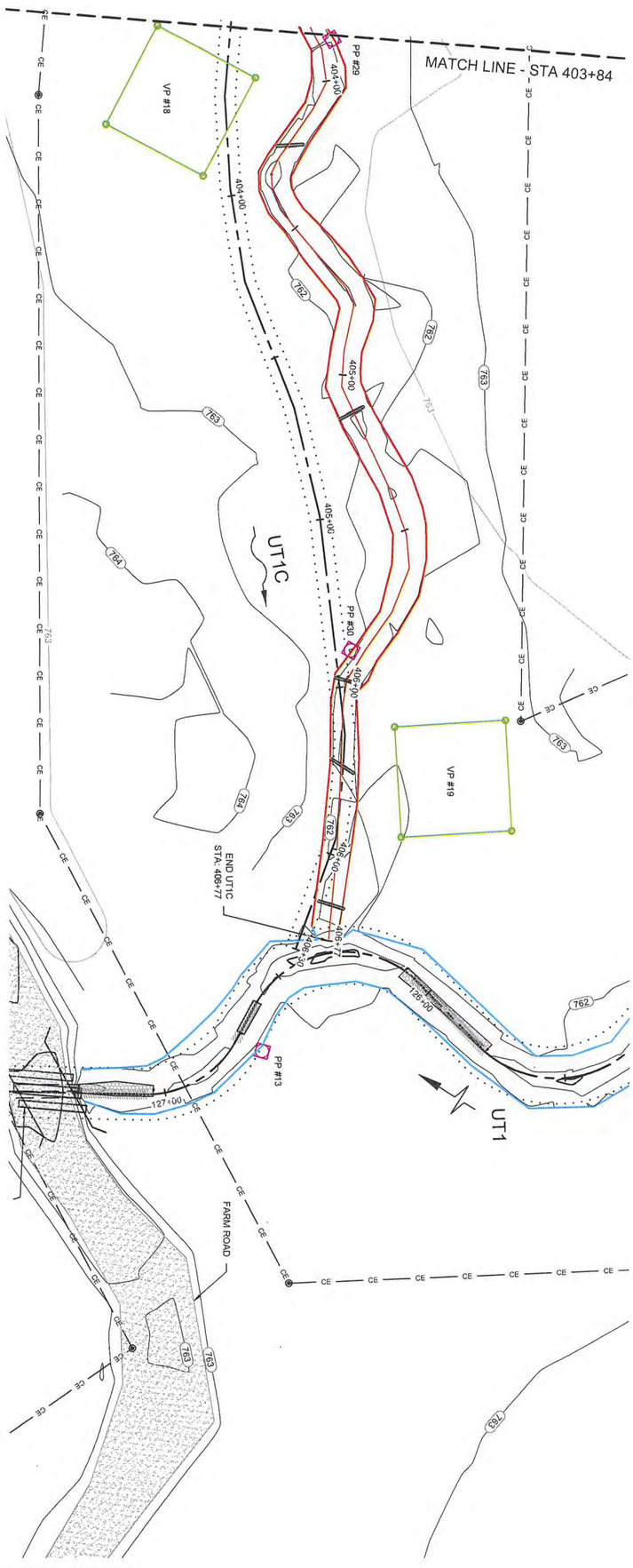
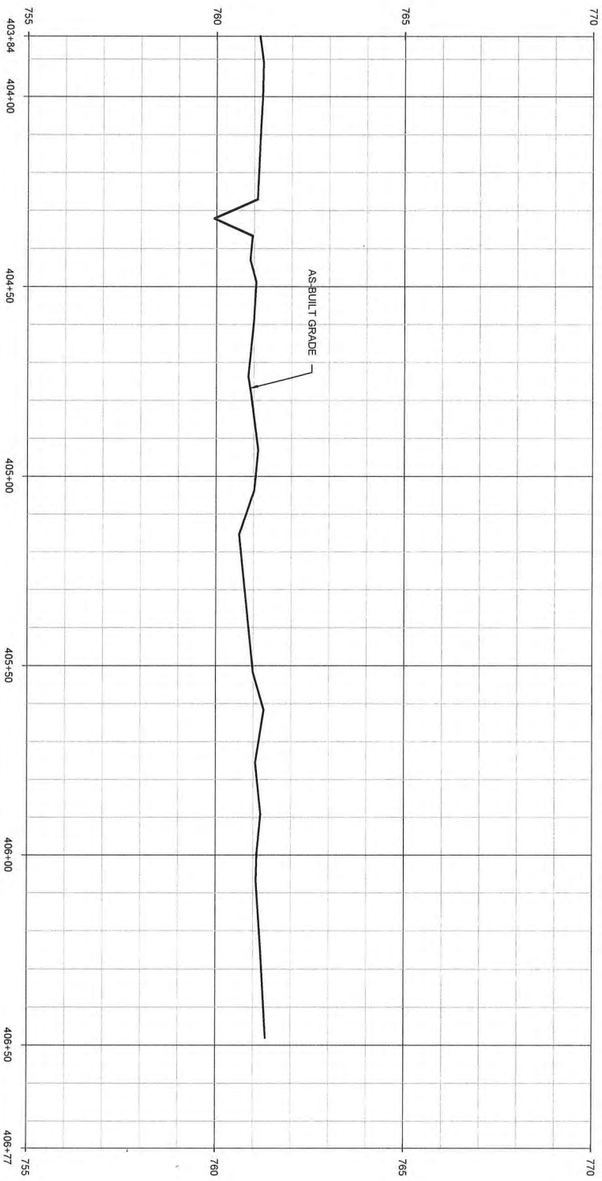
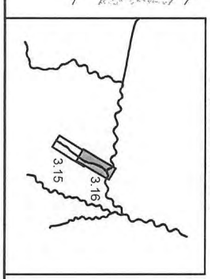
Final As-Built Plans







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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 29913 7/17/12 G. REINICKER

0' 20' 40' 60' (HORIZONTAL)
0' 2' 4' 6' (VERTICAL)

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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Sheet

Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Overlay Plans UT1C

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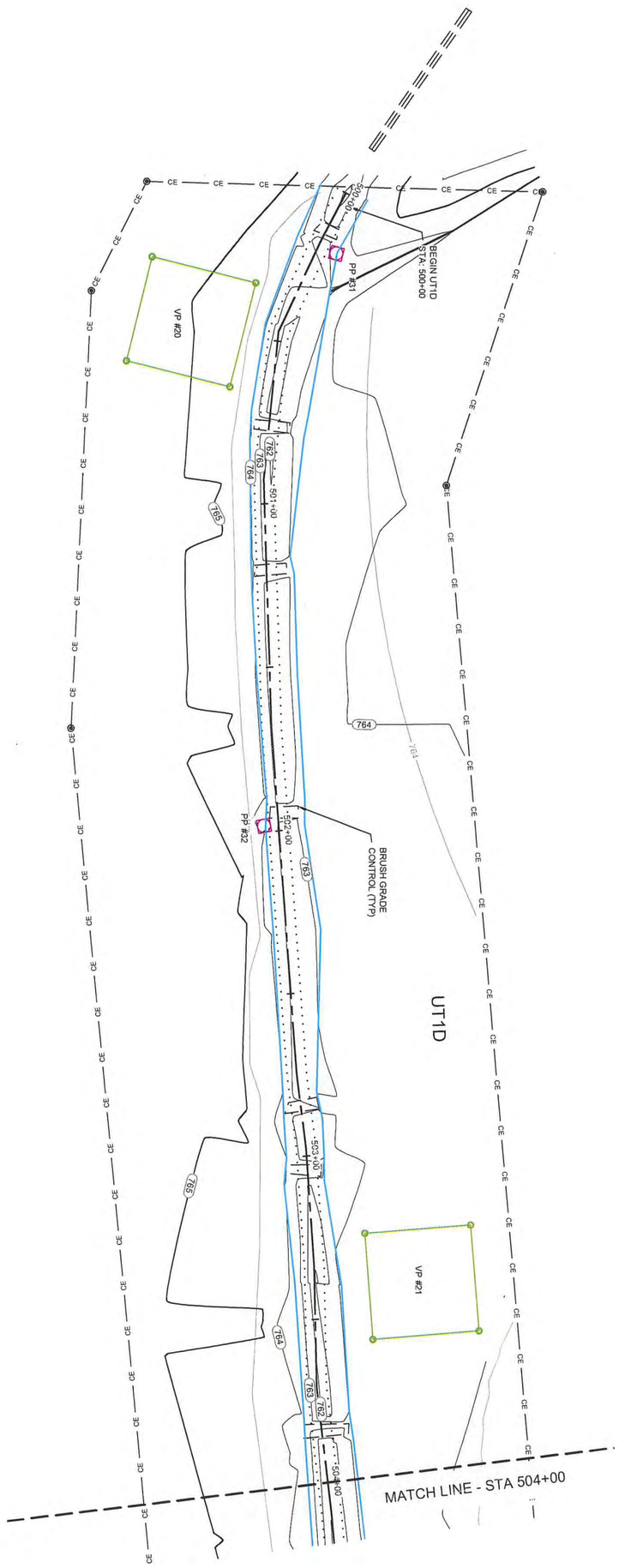

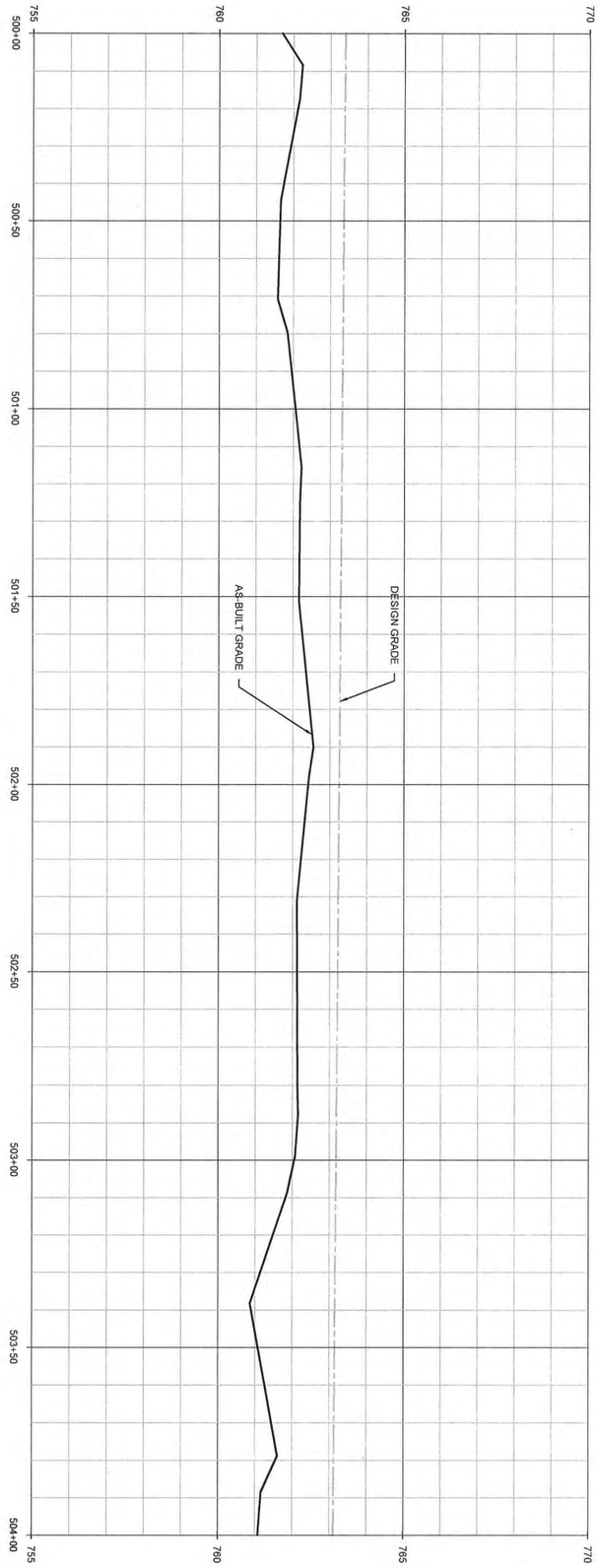

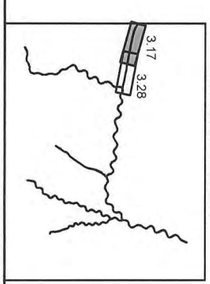

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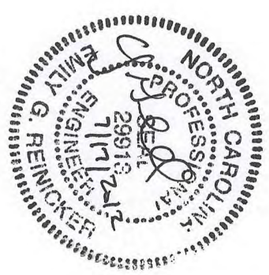

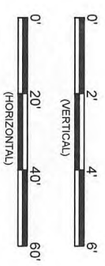

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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Sheet

Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Overlay Plans UT1D

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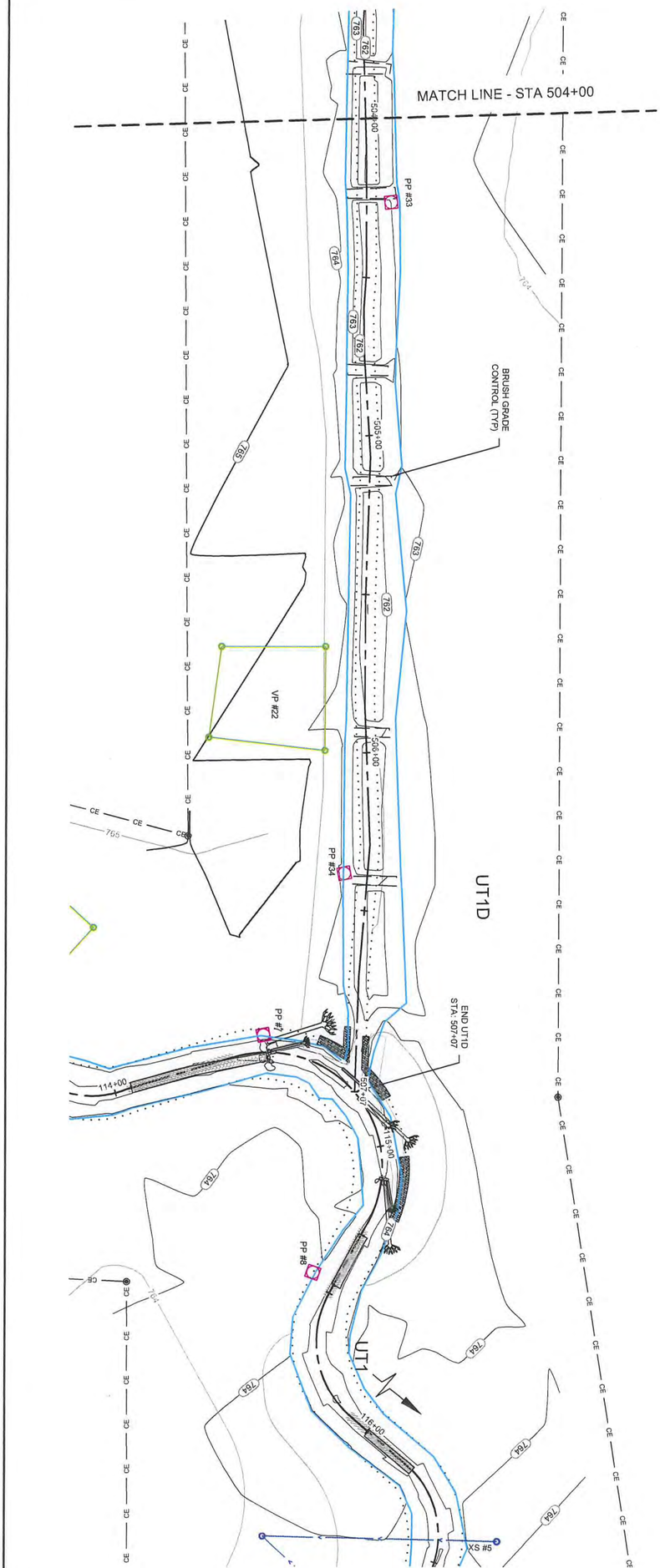

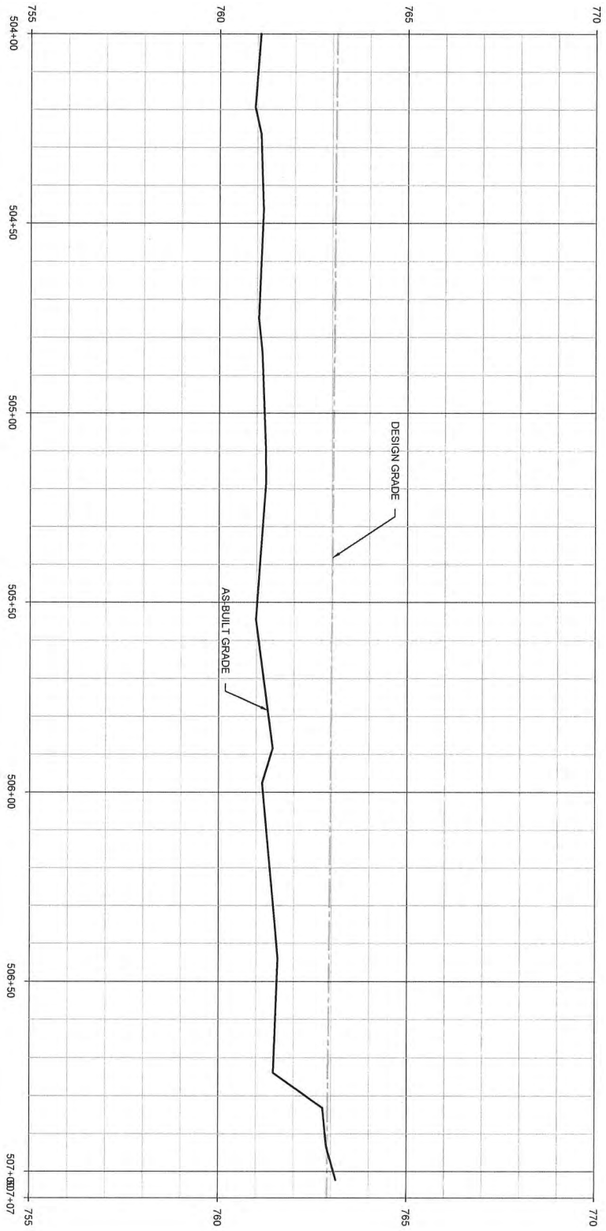

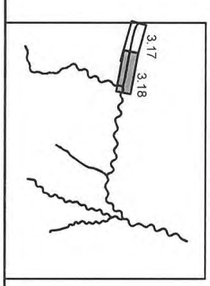

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Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Lyle Creek Mitigation Site
Catawba, North Carolina

Stream Plan and Profile
Overlay Plans UT1D

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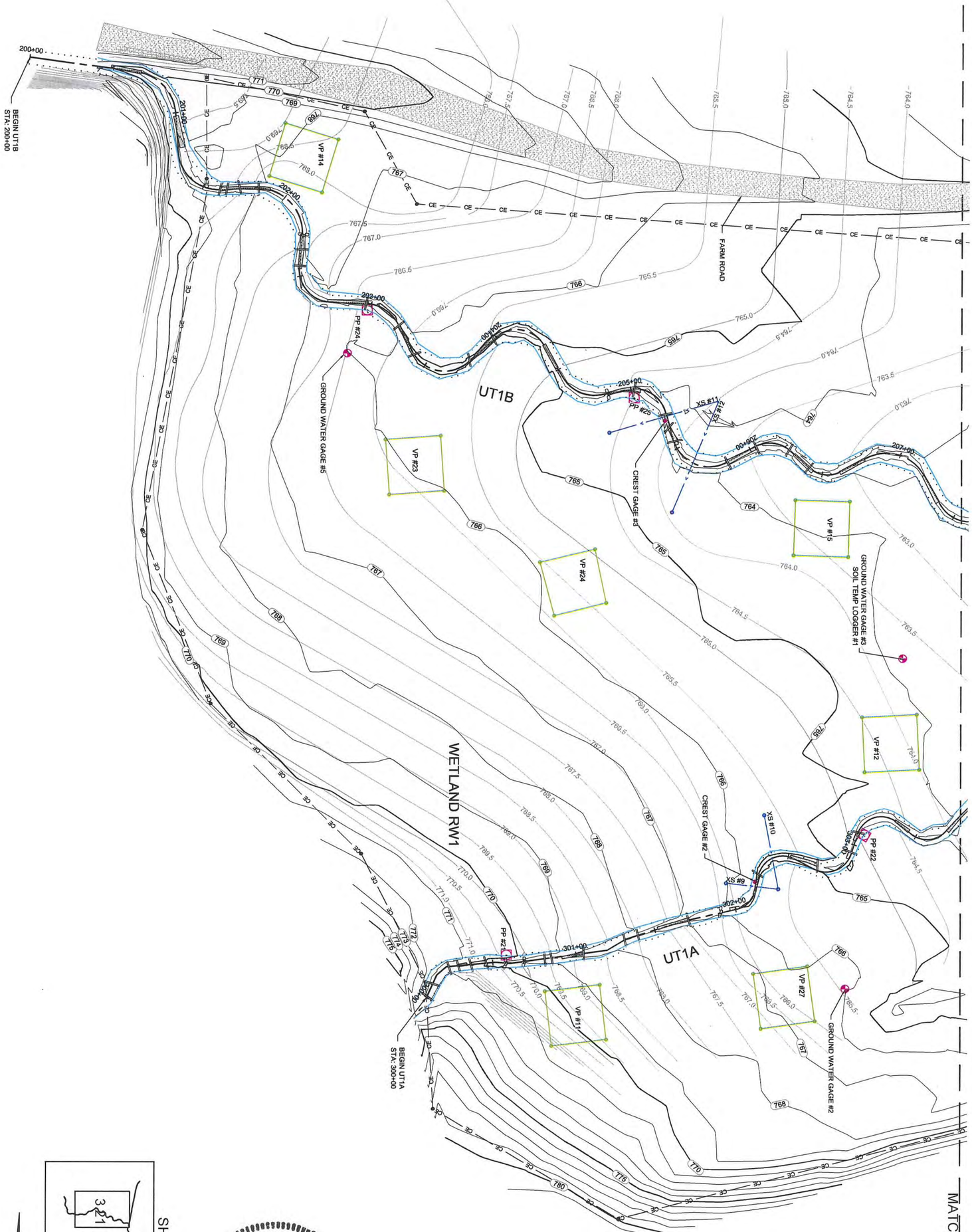
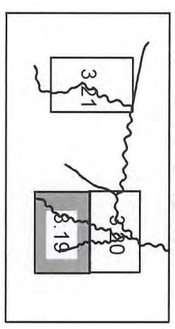
Final As-Built Plans





SHEET INDEX

0' 30' 60' 90'
(HORIZONTAL)

N

NORTH CAROLINA
PROFESSIONAL SEAL
29912
ENGINEER
EMILY G. REINICKER
7/17/2012

Date:	June 15, 2012
Job Number:	003-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

3.19
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Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Wetland RW1
Overlay Plans

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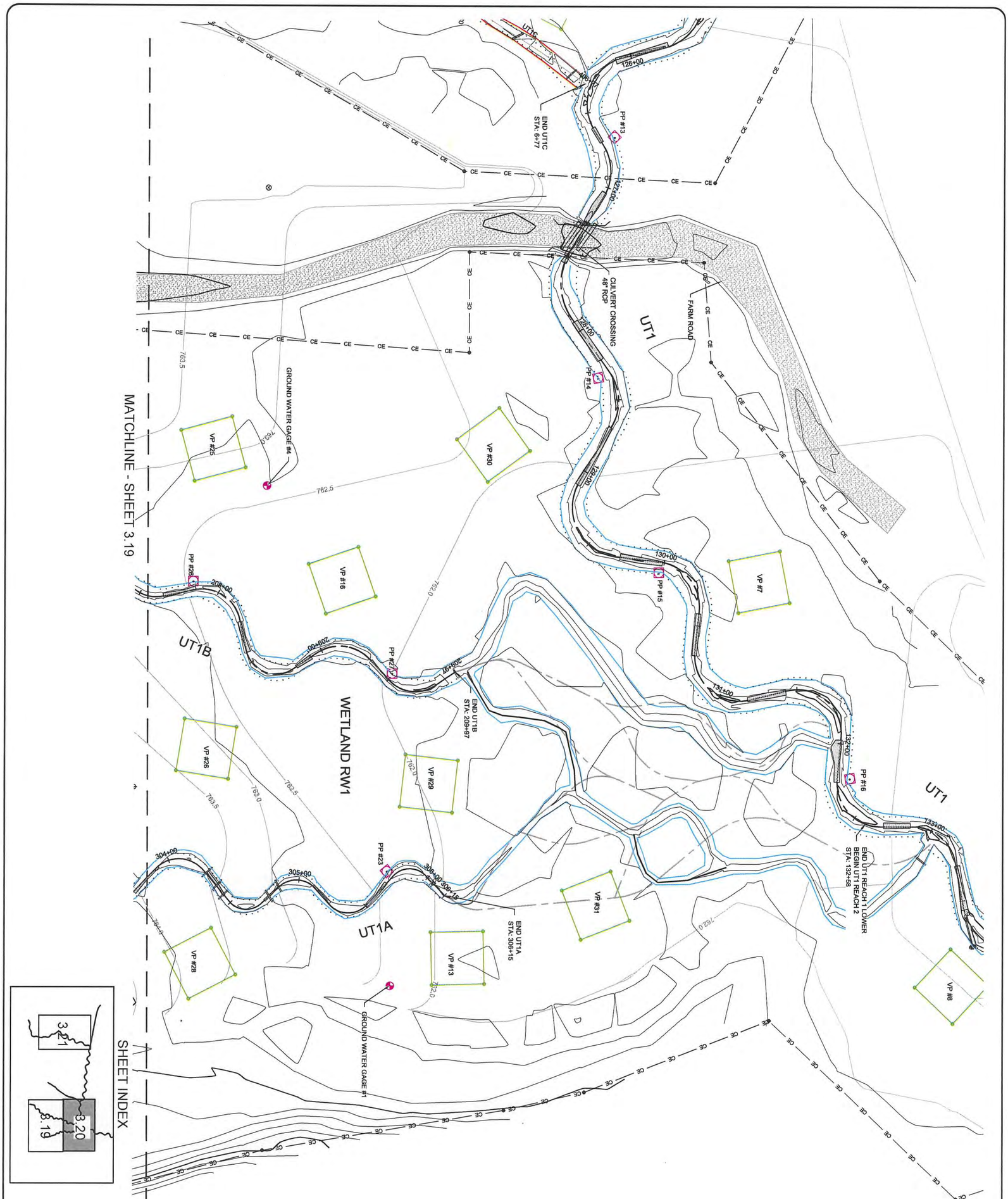
Final As-Built Plans



Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

3.20
Sheet

Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Wetland RW1
Overlay Plans

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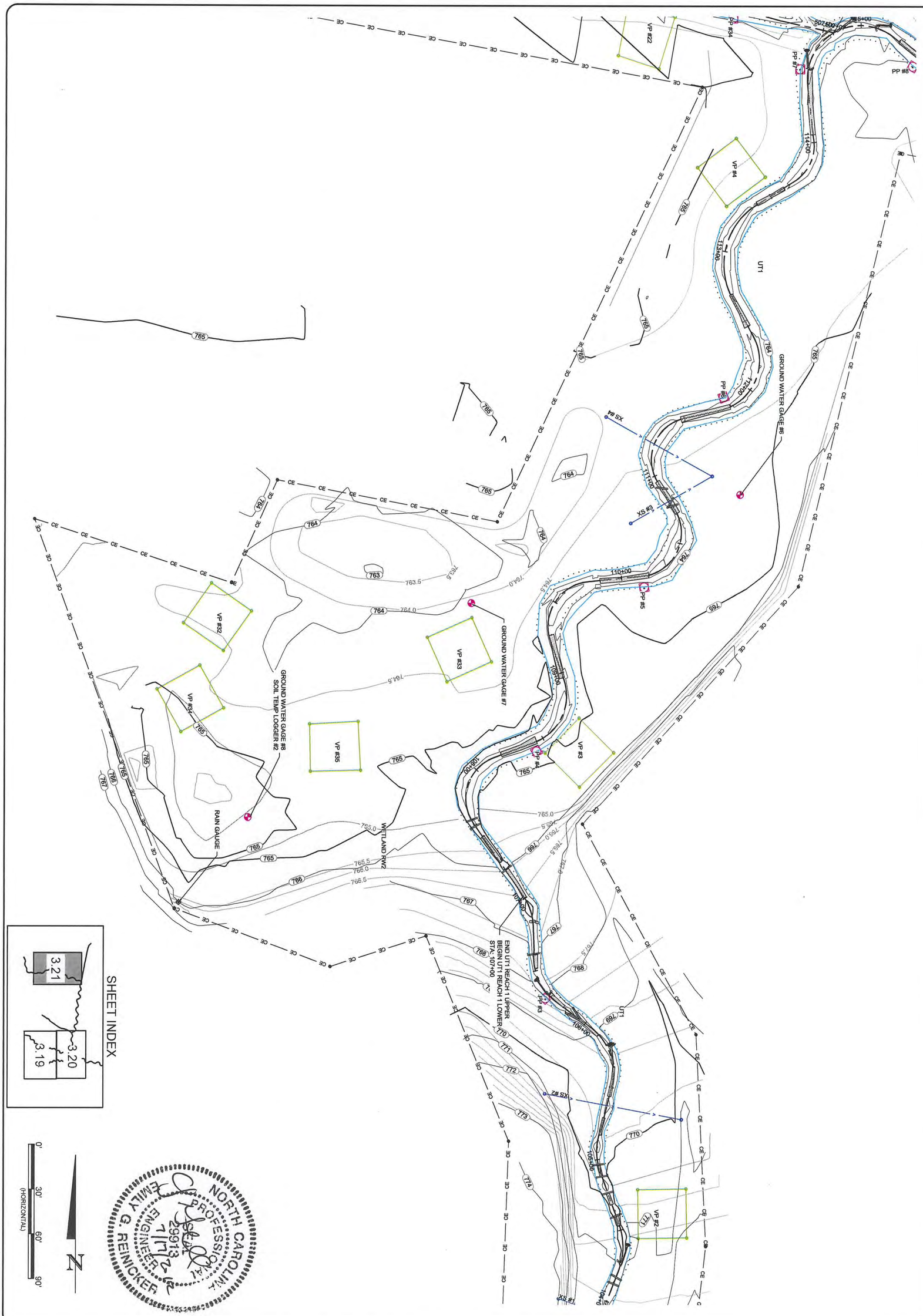
Final As-Built Plans



Date:	June 15, 2012
Job Number:	003-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

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Sheet

Revisions:

Lyle Creek Mitigation Site
Catawba, North Carolina

Wetland RW2
Overlay Plans

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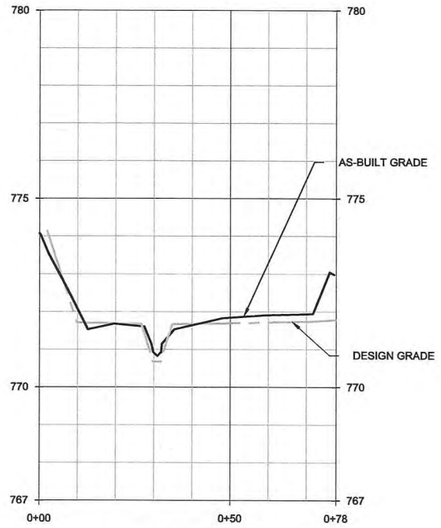
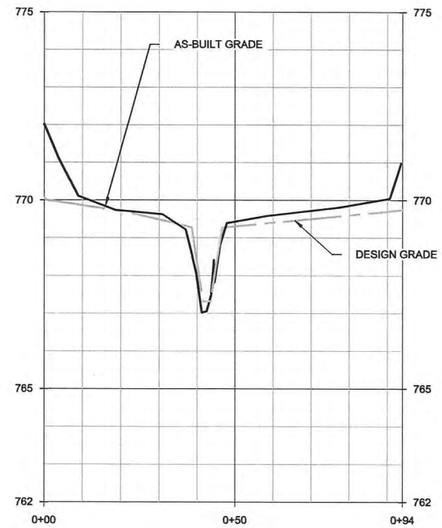
Final As-Built Plans



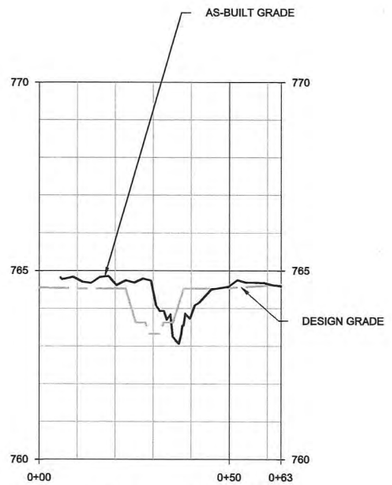
XS1-MY0

UT1
Sta: 103+91
Riffle



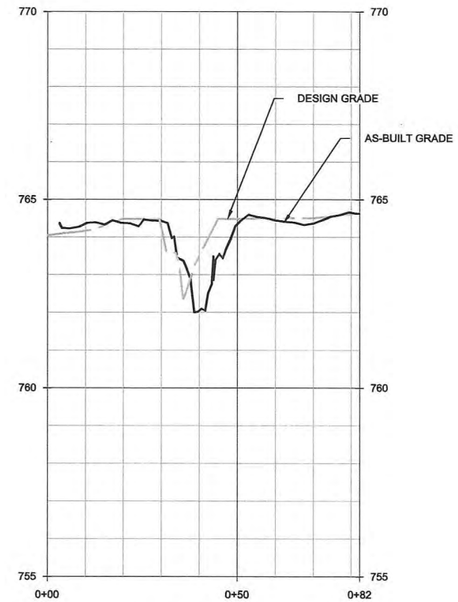
XS2-MY0

UT1
Sta: 105+37
Pool



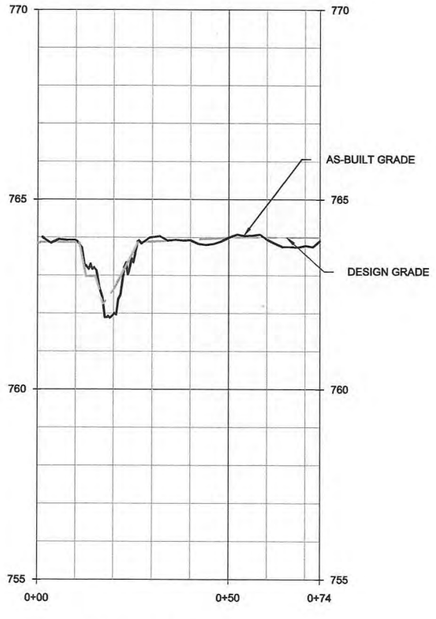
XS3-MY0

UT1
Sta: 110+80
Riffle



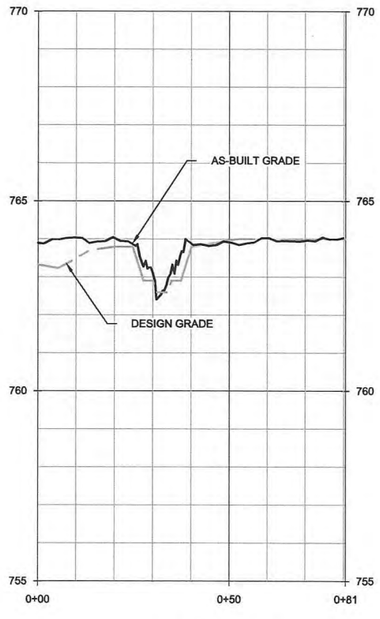
XS4-MY0

UT1
Sta: 111+22
Pool



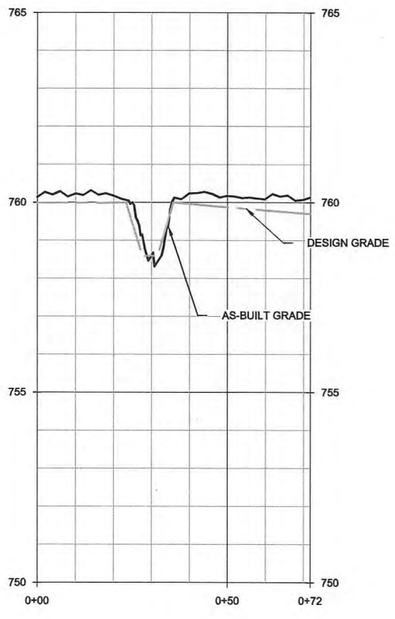
XS5-MY0

UT1
Sta: 116+43
Pool



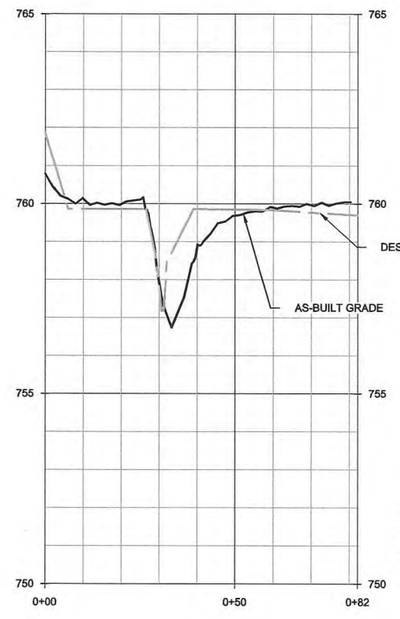
XS6-MY0

UT1
Sta: 116+81
Riffle



XS7-MY0

UT1
Sta: 135+95
Riffle



XS8-MY0

UT1
Sta: 136+31
Pool

0' 2' 4' 6'
(VERTICAL)

0' 20' 40' 60'
(HORIZONTAL)

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Lyle Creek Mitigation Site
Catawba, North Carolina

Cross Sections
Overlay Plans

Revisions:

Date: June 15, 2002
Job Number: 005-02121
Project Engineer: CDM
Drawn By: JCR
Checked By: EGR

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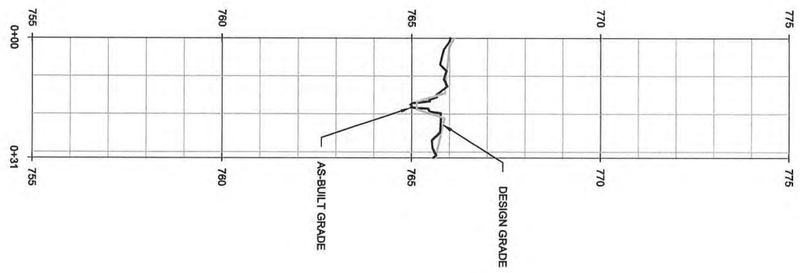
Sheet

Final As-Built Plans

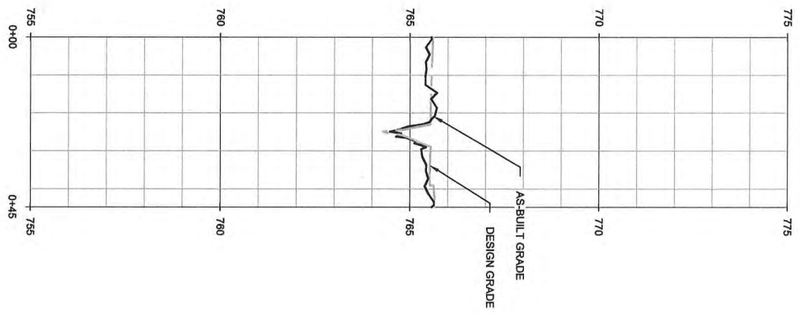
XS9-MY0

UT1A
Sta: 302+19
Riffle



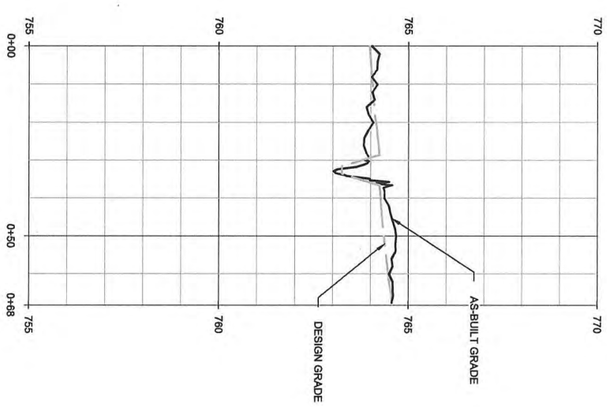
XS10-MY0

UT1A
Sta: 302+40
Pool



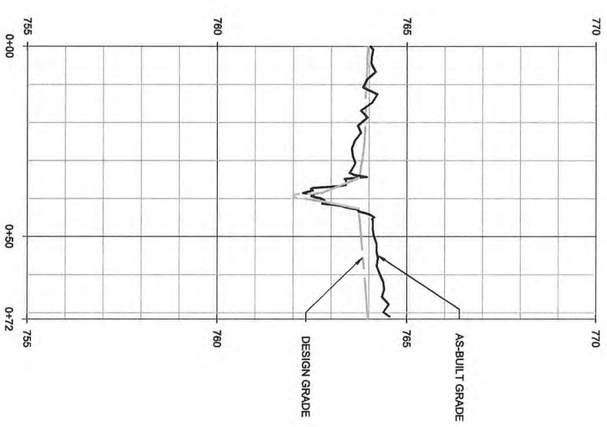
XS11-MY0

UT1B
Sta: 205+30
Riffle



XS12-MY0

UT1B
Sta: 205+63
Pool



0' 2' 4' 6' (VERTICAL)
0' 20' 40' 60' (HORIZONTAL)

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 29913 EMILY G. REINICKER 7/17/12

Date:	June 15, 2012
Job Number:	005-02123
Project Engineer:	CDM
Drawn By:	JCK
Checked By:	EGR

Revisions:

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Final As-Built Plans

Lyle Creek Mitigation Site
Catawba, North Carolina

Cross Sections
Overlay Plans

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