STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

J.R. "JOEY" HOPKINS
SECRETARY

September 13, 2024

U.S. Army Corps of Engineers
Asheville Regulatory Field Office
151 Patton Avenue, Room 208
Asheville, NC 28801-5006

ATTN: Ms. Crystal Amschler
NCDOT Coordinator

N.C. Division of Water Resources
Raleigh Central Office
3800 Barrett Drive
Raleigh, NC 27609

Ms. Beth Plummer
Division 12 Representative

SUBJECT: **Application for Section 404 Individual Permit and Section 401 Individual Water Quality Certification** for the Proposed upgrade of the US 74 at SR 1168 (N. Academy St/Lattimore Rd) Intersection to an Interchange and Replacement of Bridge Nos. 220048 and 220049 on US 74 over Sandy Run Creek in Cleveland County, North Carolina. STIP Project Nos. R-4045 & BR-0012; WBS Nos. 34598.1.2 & 67012.3.1., Federal Project No: NHF-74 (4) (for R-4045, none for BR-0012).

Debit $767.00 from WBS No. 34598.1.2

Dear Ma'ams:

The North Carolina Department of Transportation (NCDOT) proposes to upgrade the US 74 at SR 1168 (N. Academy St/Lattimore Rd) Intersection to an interchange and replace Bridge Nos. 220048 and 220049 on US 74 over Sandy Run Creek in Cleveland County, North Carolina (State Transportation Improvement Program [STIP] Project Nos. R-4045 and BR-0012). The improvement project begins just west of Ellenboro Road and extends east to just beyond the bridges over Sandy Run Creek, approximately 1.6 miles.

The purpose of this letter is to request approval for a Section 404 Individual Permit and Section 401 Individual Water Quality Certification. In addition to this cover letter, this application package includes the following: ENG Form 4345; R-4045 and BR-0012 Categorical Exclusion (CE); Concurrence Points (CP) 4B and 4C meeting minutes; stormwater management plan; permit drawings; roadway plans; North Carolina Division of Mitigation Services (DMS) In-Lieu Fee Mitigation Acceptance Letter; R-4045 and BR-0012 Natural Resource Technical Report (NRTR); United States Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) Species List; North Carolina Natural Heritage Program (NCNHP) Review letter; relevant Hydraulic Reports; Natural Resources Conservation Service (NRCS) soil survey mapping; and United States

Geological Survey (USGS) topographic mapping (included in Appendix F – NRTR).

Purpose and Need

The project purpose and need are as follows:

The **NEED** for the proposed project:

US 74 is currently a 4-lane freeway with a grass median and varying control of access (primarily fully access-controlled). NCDOT and the Federal Highway Administration (FHWA) have functionally classified this portion of US 74 as a Freeway, and NCDOT and their federal/state/regional stakeholders designated it a Strategic Transportation Corridor (Corridor U) for North Carolina. Based upon the NCDOT review of needs in the project vicinity (see memo dated June 2021 and provided to the Merger Team in March 2022; included in CE), the subject 1.2-mile portion of US 74 does not meet the aforementioned functional classification and is noncompliant with current roadway design requirements. The subject portion of US 74 also does not satisfy the highway network's established long-term vision and lacks continuity that negatively affects driver expectations and safety. Additionally, NCDOT identified the existing US 74 at-grade intersection at SR 1168 (Academy Street/Lattimore Road) in the 2021 Highway Safety Improvement Program (HSIP) because of the historical pattern of frontal impact crashes, and the relative severity of personal injuries involved in those crashes.

The **PURPOSE** of the proposed project:

The purpose of the R-4045/BR-0012 project is to provide a consistent facility to meet drivers' expectations for the US 74 corridor (from Kings Mountain to Columbus, North Carolina) by upgrading this portion of US 74 to meet NCDOT freeway standards.

Project Description

NCDOT proposes improvements to approximately 1.6 miles of US 74 from just west of Ellenboro Road to just east of the bridges over Sandy Run Creek in Cleveland County, North Carolina. The project includes an upgrade to the existing intersection of US 74 at SR 1168 (N. Academy St/Lattimore Rd) to an interchange.

The project also includes the replacement of two bridges, both over Sandy Run Creek (Bridge Numbers 220048 and 220049). The demolition of existing bridges and construction of new bridges will require the use of percussive activities, blasting, and tree clearing.

Within the project study area, US 74 is a four-lane freeway (two 12' lanes in both directions) with 4' paved shoulders, a grass median, and varying control of access. The proposed upgrade will provide two 12' lanes in both directions with a 12' total shoulder (10' paved). The project corridor has a high occurrence of frontal impact crashes, largely due to vehicles attempting to enter a 55 mile per hour facility from at grade intersections. The intersections of N. Academy Street/Lattimore Road and Ellenboro Road with US 74 are very close to one another and particularly troublesome with 23 frontal impacts over a five-year period. The proposed project would eliminate these at grade intersections.

Project Schedule

The project is programmed in the 2024-2033 NCDOT STIP that was amended by the NCDOT Board of Transportation and approved by FHWA in August 2024. Both the Right of Way and Letting date were July 20, 2023. The proposed project schedule is included in Table 1 and is based on the Merger

Plan.

Table 1. STIP R-4045/BR-0012 Project Schedule (tentative, subject to change)

Milestone	Format	Anticipated Date
CP 4B	Meeting/Virtual Meeting	March 14, 2024
Begin ROW Acquisition	---	July 20, 2023
CP 4C	Meeting/ Virtual Meeting	June 20, 2024
Begin Construction	---	November 2024

Summary of Impacts

The CE/CP 3 anticipated that the Preferred Alternative (Alternative 1A) would result in the following permanent jurisdictional impacts (Table 2a):

Table 2a. CE Impacts

Resources	Permanent Impacts (area [ac.] or linear feet [l.f.])	Notes
Wetlands	0.1 ac.	---
Surface Waters	1,500 l.f.	Included Tributaries; did not consider bank stabilization or countersunk rip rap pads

The current design prepared by NCDOT has avoided and minimized impacts to jurisdictional resources to the greatest extent practicable. Through avoidance and minimization efforts the proposed design has reduced jurisdictional impacts to the following (Table 2b):

Table 2b: Permanent and Temporary Jurisdictional Impacts, Permit Drawings

Resources	Impact Type	Area (ac.) or linear feet (l.f.)	Notes
Wetlands	Permanent Impact	0.02 ac.	Fill and Excavation
	Mechanized Clearing	---	---
	Temporary Fill	---	---
	Hand Clearing	<0.01 ac.	---
Surface Waters	Permanent Impact	2,033 l.f.*	---
	Temporary Impact	321 l.f.	

* Includes Bank Stabilization and countersunk riprap pads, both of which the United States Army Corps of Engineers (USACE) has agreed will not result in a permanent loss of water and will not count towards mitigation. These impacts total 510 linear feet.

Permanent impacts to Section 404 wetlands were reduced by 0.08 acre from the CE/CP 3 to the permit drawings. Permanent impacts to surface waters have increased by 533 linear feet from the CE/CP 4C to the permit drawings; however, 510 linear feet of that increase is due to either bank stabilization or countersunk rip rap pads.

Summary of Mitigation

Compensatory mitigation for unavoidable, mitigable impacts to jurisdictional streams and wetlands will be provided through mitigation credits provided by the North Carolina Department of Environmental Quality (NCDEQ) – DMS. The DMS In-lieu Fee Mitigation Acceptance Letter is attached to this application. A summary of the required compensatory mitigation for the project is provided below.

NEPA Document Status

A Type III CE was completed for the project on April 3, 2023. The CE can be found both attached and at the following link:

xfer.services.ncdot.gov - /pdea/EnvironmentalDocs/Documents/.

Merger History

Initial Merger Screening was held in April 2014 and, based on what was known at that time about the impacts and anticipated footprint, the project was screened out of merger. As the project developed, impacts were larger than expected; therefore, NCDOT brought the project back to the Merger MOU signatory agencies, who screened the project into Merger. CPs 1, 2, and 2A (Purpose and Need, Alternatives ,and Bridging Decisions) were achieved on May 19, 2022. CP 3 (Least Environmentally Damaging Practicable Alternative [LEDPA]) was achieved on October 12, 2022. The LEDPA is described in Section D (Proposed Improvements) of the Categorical Exclusion. CP 4A (Avoidance & Minimization) was achieved on December 13, 2022. CP 4B (Hydraulic Design) was held on March 14, 2024, and CP 4C (Permit Drawing Review) was held on June 20, 2024. The documentation for CPs 1-4a is available in the attached CE. Documentation for CPs 4B and 4C is also separately attached.

Resource Status

Water resources associated with the project are part of the Broad River Basin (United States Geological Survey [USGS] Hydrologic Unit Code [HUC] 03050105). Eight streams were identified in the study area, including Sandy Run Creek and unnamed tributaries flowing to Sandy Run Creek. There are no Outstanding Resource Waters (ORW), designated High Quality Waters (HQW), or Water Supply I or II Watersheds (WS-I or WS-II) within the study area or within 1.0 mile downstream of the study area. There are no anadromous fish waters or Primary Nursery Areas (PNAs) within the study area. The North Carolina 2022 Final 303(d) list of impaired waters identifies Sandy Run Creek approximately 1.8 river miles upstream of the project as impaired due to fish community exceeding criteria.

Wetland and stream delineations were performed for R-4045 and BR-0012 on the following dates: April 13-15, 2021, and May 10-11, 2021. Potential jurisdictional areas identified in the study area have not been verified by USACE or the North Carolina Division of Water Resources (NCDWR).

Impacts to Jurisdictional Resources

Final proposed impacts to jurisdictional streams and wetlands associated with road and bridge construction for R-4045/BR-0012 are summarized in Tables 3 and 4, respectively.

Table 3. Stream Impacts

Permit Drawing Site Number	NRTR Label (Perennial/ Intermittent)	Impact Type	Permanent Impacts (ac.)	Temporary Impacts (ac.)	Permanent Impacts (l.f.)	Temporary Impacts (l.f.)	Mitigation Required
1a	SD (I)	Roadway Fill Slope Rip Rap Channel	0.01	-	169	-	Yes
1a	SD (P)	Roadway Fill Slope Rip Rap Channel	0.02		209		Yes
1b	SD (P)	60” Pipe Outlet (Countersunk rip rap)	<0.01	<0.01	30	63	No
1c	SD (P)	Bank Stabilization	<0.01	-	33	-	No
2a	SB (P)	60” Pipe	<0.01	<0.01	122	58	Yes
2b	SB (P)	Pipe Outlet (Countersunk rip rap)	<0.01	-	22	-	No
2c	SB (P)	Bank Stabilization	<0.01	-	47	-	No
3	SF (P)	Roadway Fill Slope	<0.01	-	110		Yes
5	SB (P)	78” Pipe and Channel	0.01	<0.01	130	23	Yes
6a	SG (P)	66” Pipe Outlet (Countersunk rip rap)	<0.01	-	32	-	No
6b	SG (P)	Bank Stabilization	<0.01	-	31	-	No
6c	SG (I)	60” Pipe/ Stream Re-alignment	0.04	-	320		Yes
7a	SB (P)	8’ x 7’ RCBC	0.03	<0.01	184	25	Yes
7b	SB (P)	Culvert Outlet (Countersunk rip rap)	<0.01	-	24	-	No
7c	SB (P)	Bank Stabilization	0.03	-	161	-	No
8a	SB (P)	Rip Rap at Embankment	<0.01	<0.01	17	19	No
8b	SB (P)	Bank Stabilization	<0.01	<0.01	13	20	No
8c	SB (P)	Rip Rap at Embankment	<0.01	<0.01	21	33	No

Table 3. Stream Impacts

Permit Drawing Site Number	NRTR Label (Perennial/ Intermittent)	Impact Type	Permanent Impacts (ac.)	Temporary Impacts (ac.)	Permanent Impacts (l.f.)	Temporary Impacts (l.f.)	Mitigation Required
9	SE (P)	Rip Rap at Embankment	<0.01	-	34	-	No
10	SC (P)	Extend 48" Pipe	0.01	<0.01	132	10	Yes
11	Sandy Run Creek (P)	Bank Stabilization	<0.01	<0.01	19	20	No
12a	SC (I)	60" Pipe	<0.01	<0.01	147	23	Yes
12b	SC (I)	60" Pipe Outlet (Countersunk rip rap)	<0.01	<0.01	26	27	No
Total			**0.23**	**0.04**	**2,033**	**321**	

Table 4. Wetland Impacts[1]

Permit Drawing Site Number	NRTR Label	NCWAM Type	Riparian or Non-riparian	Permanent Impacts (ac.)	Temporary Impacts (ac.)	Excavation (ac.)	Mechanized Clearing (ac.)	Hand Clearing (ac.)	Mitigation Required (ac.)
4	WE	Seep	Non-Riparian	0.01	-	-	-	<0.01	0.01
12c	WC	Floodplain Pool	Riparian	<0.01	-	-	-	<0.01	<0.01
			Total[1]	**0.02**	**-**	**-**	**-**	**<0.01**	**0.02**

[1] Rounded totals are the sum of the actual impacts.

Utility Impacts

Project construction will entail the relocation of one water line. However, the water line will be relocated via directional drilling under Stream SB (Site 8). Therefore, no impacts to jurisdictional features are anticipated as a result of this relocation.

Federally Protected Species

As of the date of this application, the USFWS IPaC website lists one species for the project (Table 5). No bat species are currently listed for the project. Species with the federal classification of Endangered (E), Proposed Endangered (PE), Threatened (T), or Proposed Threatened (PT) are protected under Section 7 of the Endangered Species Act (ESA) of 1973, as amended. The Bald Eagle is protected by the Bald and Golden Eagle Protection Act and is not subject to Section 7 consultation.

Table 5. Federally protected species listed in the R-4045/BR-0012 Study Area[1]

Scientific Name	Common Name	Federal Status[2]	Habitat Present	Biological Conclusion[3]
Hexastylis naniflora	Dwarf-flowered Heartleaf	T	Yes	MANLAA

[1] USFWS IPaC website checked on August 14, 2024.
[2] T – Threatened
[3] MANLAA – May Affect, Not Likely to Adversely Affect

Dwarf-flowered Heartleaf (DFHL) is present in the project study area. A DFHL population of about 280 plants is located in the southeast quadrant of Site 10 along Stream SC. There is an existing 48-inch pipe that will be retained and a proposed 54-inch pipe that will be jack and bored. No impacts will occur to the DFHL population. There is a Green Sheet commitment to construct a retaining wall at this site to avoid impacting the DFHL at this location. However, during the 4B meeting, it was determined the retaining wall commitment to protect the DFHL population is not needed.

A review of the Summer (July) 2024 NCNHP dataset identified the following occurrences within 1.0 mile of the project:

- DFHL – Element Occurrence (EO) ID: 38147; this is the occurrence at Site 10. There is also a section of this occurrence to the northwest of the Study Area.

Biological Conclusions for ESA Listed Species
The CE addressed the analysis of potential effects on federally protected species at the time of the document. At that time, IPaC also included Northern Long-eared Bat on the Official Species List. Due to the Biological Conclusion of May Affect, Not Likely to Adversely Affect rendered for DFHL and Northern Long-eared Bat at that time, it was determined that formal consultation with USFWS was not required. Concurrence for this project was obtained from USFWS on August 2, 2022 (included in the CE).

Since the completion of the CE, the USFWS announced a final rule to reclassify the Northern Long-eared Bat as Endangered and proposals to list the Tricolored Bat as Endangered and Little Brown Bat as Under Review as an At-Risk Species under the Endangered Species Act. According to the latest IPAC review, this project is outside the known range for these species.

Bald and Golden Eagle Protection Act (BGPA)

Bald Eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d). Golden Eagles do not occur in North Carolina.

A desktop-GIS assessment of the study area, as well as the area within a 1.0-mile radius of the project limits, was performed on May 5, 2021 using 2017 color aerials. Water bodies large enough and sufficiently open to be considered potential feeding sources were not identified. Due to the absence of suitable foraging habitat within the review area, a survey of the study area and the area within 660 feet of the project limits was not required. Additionally, a review of the Summer (July) 2024 NCNHP database revealed no known occurrences of this species within 1.0 mile of the project study area. Due to the lack of habitat, known occurrences, and minimal impact anticipated for this project, it has been determined that this project will not affect this species.

Moratoria

A construction moratorium will not be required for this project.

Cultural Resources

This project was reviewed by NCDOT's Historic Architecture and Archaeology staff under a Programmatic Agreement with the State Historic Preservation Office (SHPO) in accordance with Section 106 of the National Historic Preservation Act. It was determined that no National Register Listed or Eligible archaeological sites, nor any sites that were in compliance with Section 106 of the National Historic Preservation Act, were present.

For historic architecture, the project area was reviewed on the HPOWeb website and in the field in 2002, 2006, and 2022 and several properties required evaluation for eligibility in the National Register of Historic Places. As a result of the consultation, there are three properties within the APE that are eligible for the National Register. It was determined that the project would result in No Adverse Effect to the Mooresboro Historic District or the Flora Burrus House and would result in No Effect to the Will McBrayer Farm.

Borrow

Several potential borrow sites are under consideration, but a borrow site has not currently been selected. Any borrow site will be evaluated to ensure no impacts to streams or wetlands would occur directly or indirectly through drainage. Impacts to jurisdictional resources associated with obtaining borrow are not anticipated.

FEMA Compliance

This project involves construction activities on or adjacent to Federal Emergency Management Agency (FEMA)-regulated stream(s). Therefore, the Division shall submit sealed as-built construction plans to the Hydraulics Unit upon completion of project construction, certifying that the drainage structure(s) and roadway embankment that are located within the 100-year floodplain were built as shown in the construction plans, both horizontally and vertically.

Mitigation Options

The NCDOT is committed to incorporating all reasonable and practicable design features to avoid and minimize jurisdictional impacts, and to provide full compensatory mitigation of all remaining, unavoidable jurisdictional impacts. Avoidance measures were taken during planning and NEPA compliance stages; minimization measures were incorporated as part of the project design.

Avoidance and Minimization: NCDOT employs many strategies to avoid and minimize impacts to jurisdictional areas in all of its designs. Avoidance and minimization measures for R-4045/BR-0012 were further discussed during the CP 4B and 4C meetings and are being implemented to the maximum extent practicable. All stream and wetland areas not affected by the project will be protected from unnecessary encroachment. Additional Avoidance and Minimization measures are listed below (from CP 4A).

- In the north half of the interchange, the slopes near the streams crossed by Ellenboro Road,

Lattimore Road and the Loop will be 1.5:1 rock plated in order to minimize stream impacts. The off-ramp bridge in the NE quadrant will utilize a bridge over the stream.

- Service Road Option 3 (Academy Street Connector)– Service Road Option 3 will include an alignment shifted approximately 100 feet south on the west end of the alignment near the grading company to avoid a more sinuous portion of stream SC.
- Hydraulic Design will follow NCDOT Hydraulic Manual Guidance (Chapter 9) to minimize impacts to aquatic passage.
- A new 54" pipe will be placed parallel to the existing 48" pipe on Stream SC under US 74 ensuring a more stable stream with less susceptibility to stream blockages, minimizing impacts to DFHL plants located feet from the stream edge.
- Service Road Option 3 (Academy Street Connector) will cross Stream SC more than 500 feet upstream of the current dwarf-flowered heartleaf locations. The pipe placed at this crossing will be designed at an appropriate size so as not to affect the flow of water either upstream or downstream, thereby avoiding affects to DFHL.
- During the 4C meeting, the proposed mechanized clearing of wetlands at Sites 4 and 7 were changed to hand clearing and the clearing limits were minimized as much as practicable, to minimize impacts to wetlands.
- During the 4C meeting, the proposed pipe at Site 6 was shown as being buried. After some discussion, it was decided that not burying the pipe would reduce the length of the pipe. Therefore, the pipe will not be buried, thus reducing the amount of stream impact at Site 6.

Compensation: The NCDOT has avoided and minimized impacts to jurisdictional resources to the greatest extent practicable.

The proposed construction of R-4045/BR-0012 will result in unavoidable, mitigable impacts to 0.02 acre of wetlands (<0.01 acre of riparian wetland impacts and 0.01 acre of non-riparian wetland impact) that will require mitigation. NCDOT assumes that a 2:1 mitigation ratio will be applied. The wetland impacts are in the 8-digit HUC 03050105 of the Broad River Basin.

The proposed construction of R-4045/BR-0012 will result in unavoidable, mitigable impacts to 1,523 linear feet of streams. It is assumed that a 2:1 mitigation ratio will be applied to all stream impacts. The stream impacts are in the 8-digit HUC 03050105 of the Broad River Basin.

If there are any wetland or stream features that the USACE believes would require lower than 2:1 mitigation, please let us know.

Compensatory mitigation for the unavoidable, mitigable impacts to streams and wetlands will be provided by compensatory mitigation credits from NCDEQ – DMS. Please see the attached DMS In-Lieu Fee Mitigation Acceptance Letter.

Indirect and Cumulative Effects

The project will not alter traffic capacity or travel patterns, reduce travel time, affect access to, or create new transportation or land use nodes. Due to its minimal transportation impact causing activities this project will neither influence nearby land uses nor stimulate growth. Therefore, a detailed indirect and cumulative effects study was not conducted.

Regulatory Approvals

Section 404/Section 10: Application is hereby made for a USACE Individual Section 404 Permit as required for the above-described activities.

Section 401: We are requesting a Section 401 Individual Water Quality Certification from NCDWR. We are providing this application to NCDEQ, for their approval. Authorization to debit the $767.00 Permit Application Fee from WBS Element 34598.1.2 is hereby given.

A copy of this permit request and its distribution list will be posted on the NCDOT website at: https://connect.ncdot.gov/resources/Environmental/Pages.

Thank you for your assistance with this project. If you have any questions or need additional information, please contact Jeff Wyatt at jlwyatt@ncdot.gov or (980) 552-4219.

Sincerely,

Jeffrey L. Wyatt

Jeffrey L. Wyatt
Division Environmental Officer
NCDOT Division 12

USACE ENG 4345

U.S. Army Corps of Engineers (USACE)

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT

33 CFR 325. The proponent agency is CECW-CO-R.

Form Approved - OMB No. 0710-0003 Expires: 01-08-2018

The public reporting burden for this collection of information, OMB Control Number 0710-0003, is estimated to average 11 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or burden reduction suggestions to the Department of Defense, Washington Headquarters Services, at whs.mc-alex.esd.mbx.dd-dod-information-collections@mail.mil. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR APPLICATION TO THE ABOVE EMAIL.

PRIVACY ACT STATEMENT

Authorities: Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332. Principal Purpose: Information provided on this form will be used in evaluating the application for a permit. Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public and may be made available as part of a public notice as required by Federal law. Submission of requested information is voluntary, however, if information is not provided the permit application cannot be evaluated nor can a permit be issued. One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and/or instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned. System of Record Notice (SORN). The information received is entered into our permit tracking database and a SORN has been completed (SORN #A1145b) and may be accessed at the following website: http://dpcld.defense.gov/Privacy/SORNsIndex/DOD-wide-SORN-Article-View/Article/570115/a1145b-ce.aspx

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME	8. AUTHORIZED AGENT'S NAME AND TITLE (agent is not required)
First - Jeffrey Middle - L Last - Wyatt Company - North Carolina Department of Transportation E-mail Address - jlwyatt@ncdot.gov	First - Middle - Last - Company - E-mail Address -
6. APPLICANT'S ADDRESS:	**9. AGENT'S ADDRESS:**
Address- PO Box 47 City - Shelby State - NC Zip - 28151 Country - USA	Address- City - State - Zip - Country -
7. APPLICANT'S PHONE NOs. w/AREA CODE	**10. AGENTS PHONE NOs. w/AREA CODE**
a. Residence b. Business 980-552-4204 c. Fax	a. Residence b. Business c. Fax

STATEMENT OF AUTHORIZATION

11. I hereby authorize, _____ to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

_____ _____
SIGNATURE OF APPLICANT DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE (see instructions)
Upgrade of US 74 at SR 1168 (N. Academy St/Lattimore Rd) Intersection to an Interchange and Replacement of Bridge Nos. 48 and 49

13. NAME OF WATERBODY, IF KNOWN (if applicable)	14. PROJECT STREET ADDRESS (if applicable)
Sandy Run Creek	Address Cleveland County
15. LOCATION OF PROJECT	City - Mooresboro State- NC Zip-
Latitude: ◦N 35.301111 Longitude: ◦W 81.675781	

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions)

State Tax Parcel ID Municipality

Section - Township - Range -

17. DIRECTIONS TO THE SITE

Please see attached Map for general location.

18. Nature of Activity (Description of project, include all features)

The North Carolina Department of Transportation (NCDOT) proposes to upgrade US 74 at SR 1168 (N. Academy St/Lattimore Rd) Intersection to an Interchange and replace Bridge Nos. 220048 and 220049 on US 74 over Sandy Run Creek in Cleveland County, North Carolina (State Transportation Improvement Program [STIP] Project Nos. R-4045 and BR-0012). The improvement project begins just west of Ellenboro Road and extends east to just beyond the bridges over Sandy Run Creek, approximately 1.6 miles.

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

The purpose of the R-4045 project is to provide a consistent facility to meet drivers' expectations for the US 74 corridor (from Kings Mountain to Columbus, NC) by upgrading this portion of US 74 to meet NCDOT freeway standards.

USE BLOCKS 20-23 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

Roadway fill, pipe/culvert construction/extension, and bridge replacement

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards:

Type Amount in Cubic Yards	Type Amount in Cubic Yards	Type Amount in Cubic Yards
See RFC Plans	See RFC Plans	See RFC Plans

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)

Acres 0.02 perm. fill, 0.01 hand clearing

or

Linear Feet 2,033 perm., 321 temp.

23. Description of Avoidance, Minimization, and Compensation (see instructions)

Minimization includes the examination of appropriate and practicable steps to reduce adverse impacts to streams and wetlands. General steps that were implemented during the final design state to minimize impacts by the proposed project include: Minimizing "in-stream" activities; Strictly enforcing the sedimentation and erosion control measures recommended by NCDOT's BMPs for the protection of streams and wetlands; Decreasing the footprint of the proposed project through the reduction of right-of-way widths and steepening of fill slopes where possible.

24. Is Any Portion of the Work Already Complete? ☐ Yes ☒ No IF YES, DESCRIBE THE COMPLETED WORK

25. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (if more than can be entered here, please attach a supplemental list).

a. Address- See Application

City - State - Zip -

b. Address-

City - State - Zip -

c. Address-

City - State - Zip -

d. Address-

City - State - Zip -

e. Address-

City - State - Zip -

26. List of Other Certificates or Approvals/Denials received from other Federal, State, or Local Agencies for Work Described in This Application.

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED
See Application					

* Would include but is not restricted to zoning, building, and flood plain permits

27. Application is hereby made for permit or permits to authorize the work described in this application. I certify that this information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

Jeffrey L. Wyatt — SIGNATURE OF APPLICANT

9/23/2024 — DATE

SIGNATURE OF AGENT — DATE

The Application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

Mitigation

ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
MARC RECKTENWALD
Director

NORTH CAROLINA
Environmental Quality

September 13, 2024

Mr. Jeff Wyatt
NCDOT Division 12 Environmental Officer
North Carolina Department of Transportation
Post Office Box 47
Shelby, North Carolina 28151-0047

Dear Mr. Wyatt:

Subject: Mitigation Acceptance Letter:

Division 12 Project – TIP R-4045 / BR-0012, Upgrade US 74 / SR 1168 (N. Academy Street / Lattimore Road) Intersection to Interchange and Replace Bridge Numbers 220048 and 220049, Cleveland County

The purpose of this letter is to notify you that the North Carolina Department of Environmental Quality – Division of Mitigation Services (NCDEQ-DMS) will provide the mitigation for the subject project. Based on the information received from you on April 25, 2023, and September 13, 2024, the impacts are located in CU 03050105 of the Broad River basin in the Southern Piedmont (SP) Eco-Region, and are as follows:

Broad 03050105 SP	Stream			Wetlands			Buffer (Sq. Ft.)	
	Cold	Cool	Warm	Riparian	Non-Riparian	Coastal Marsh	Zone 1	Zone 2
Impacts (feet/acres)	0	1,523.000	0	0.006	0.010	0	0	0

Non-riparian wetland mitigation credits are not available in this service area. In accordance with the directive from the February 8, 2011, IRT meeting, non-riparian wetland impacts located in the mountain or piedmont areas of North Carolina can be accepted as requested but mitigated for utilizing riparian wetland mitigation credits in the service area. NCDEQ – DMS commits to implementing sufficient compensatory wetland mitigation credits to offset the impacts associated with this project as determined by the regulatory agencies in accordance with the In-Lieu Fee Instrument dated July 28, 2010. If the above referenced impact amounts are revised, then this mitigation acceptance letter will no longer be valid and a new mitigation acceptance letter will be required from NCDEQ-DMS.

If you have any questions or need additional information, please contact Ms. Beth Harmon at 919-707-8420.

Sincerely,

Elizabeth Harmon

Elizabeth A. Harmon
DMS NCDOT ILF Coordinator

cc: Ms. Crystal Amschler, USACE
Ms. Beth Plummer, NCDWR
Mr. Brad Chilton, NCDOT – EAU
File: R-4045 / BR-0012 – Division 12

Permit Drawings

North Carolina Department of Transportation

Highway Stormwater Program

STORMWATER MANAGEMENT PLAN

FOR NCDOT PROJECTS

(Version 3.02; Released April 23, 2024)

General Project Information

WBS Element:	34598.2.2	**TIP Number:**	R-4045/BR-0012	**Project Type:**	Roadway Widening	**Date:**	8/29/2024
NCDOT Contact:	Andy Hussey			**Contractor / Designer:**	Brandon Johnson, PE		
Address:	1020 Birch Ridge Drive Room #16 Raleigh, NC 27610			**Address:**	3301 Benson Dr Suite 400 Raleigh, NC 27609		
Phone:	(919) 707-6641			**Phone:**	(919) 322-0115		
Email:	lahussey@ncdot.gov			**Email:**	brandon.johnson@summitde.com		
City/Town:	Mooresboro			**County(ies):**	Cleveland		
River Basin(s):	Broad			**CAMA County?**	No		
Wetlands within Project Limits?	Yes						

Project Description

Project Length (lin. miles or feet):	1.59	**Surrounding Land Use:**	Rural Area with Residential and Agricultural Land Use				
	Proposed Project			**Existing Site**			
Project Built-Upon Area (ac.)	19.2	ac.		15.6	ac.		
Typical Cross Section Description:	2 12' lane divided highway with 12' total shoulder (10' paved)			2 12' lane divided highway with 4' paved shoulder			
Annual Avg Daily Traffic (veh/hr/day):	Design/Future:	30300	Year: 2043	Existing:	22600	Year:	2023

General Project Narrative: (Description of Minimization of Water Quality Impacts)

State Project involves an upgrade of US 74 at SR 1168 insterection to an interchange and replacement of NCDOT Bridge 220048 and 220049 over Sandy Run Creek on US 74 in Cleveland County. An addition of 2 ramps that will fill over two jurisdictional streams, and one of the ramps will be a new crossing over UT to Sandy Run Creek. An addition of 1 ramp, 1 loop and a major collector that will be new crossings over UT to Sandy Run Creek. Minimization measures such as utilizing 1.5:1 fill slopes are used near wetlands and streams to reduce permanent stream impact. Grass lined ditches are used to help promote infiltration in proposed ditches and ditches with rip rap are used to reduce erosions. Bank stabilization and rip rap at embankment are utilized to reduce erosion at streams.

Stream SA is outside the project limits, so there are no surface water impacts to this stream.

Stream SB is crossed by four alignments (-Y1RPA-, -Y1LPA-, -Y1-, and -Y2-). The proposed -Y1RPA- crossing is a single span bridge. Proposed fill slopes of 2:1 and 1.5:1 ensure all fill is at least 10 feet outside top of bank. The existing topography around the stream is very steep, so ditches are lined with rip rap to reduce velocity and rip rap at embankment is used at the ties to the stream. The proposed -Y1LPA- crossing is an 8’ x 7’ box culvert. The culvert is aligned with the upstream and downstream channels to the greatest extent possible with minimal channel work. The culvert is embedded 1.0' and rip rap channels/protection at the inlet and outlet are embedded to align with the stream. 1.5:1 fill slopes are utilized to minimize culvert length, minimize impacts to Wetland WF, and ensure the fill slope does not impact the stream south of the culvert. Streambank stabilization is proposed to protect the banks during and after culvert phasing. The proposed -Y1- crossing is a 78” pipe. The pipe is aligned the upstream and downstream channels to the greatest extent possible with minimal channel work. The pipe is embedded 1.0' and rip rap channels/protection at the inlet and outlet are embedded to align with the stream. 1.5:1 fill slopes are utilized to minimize pipe length and minimize impacts to Wetland WE. Additionally, the alignment of -Y1- is shifted west of the existing which reduces the impact to Wetland WE with the grade increase required for the -Y1- bridge. The ditch tie in is located at the proposed rip rap channel at the pipe inlet. The proposed -Y2- crossing is a 60” pipe. The pipe is aligned the upstream and downstream channels to the greatest extent possible with minimal channel work. The pipe is embedded 1.0' and rip rap channels/protection at the inlet and outlet are embedded to align with the stream. 1.5:1 fill slopes is utilized to minimize pipe length. The drainage areas of the ditches in the northwest and southeast quadrants are large, so the ditches are lined with rip rap and the last ditch section has a slope of 0.005 ft/ft to reduce the velocity at the tie to the stream. Similarly, the ditch in the southwest quadrant utilizes rip rap to reduce velocity, and all ditches tie to the pipe inlet/outlet stabilization. With the large ditch in the southeast quadrant tying to Stream SB, adding additional drainage area to Stream SD is minimized.

Stream SE has a temporary impact due to a clean water diversion being used to divert clean water around the construction site tying to the stream.

Stream SC is crossed by alignment -SR1-. A proposed 60” pipe buried 1.0’ will be used as the crossing. Fill slopes are 2:1 on both sides of the alignment near the stream to minimize stream impacts. Outlet channel stabilization will be used to reduce erosion at the downstream end. Rip rap will be extended downstream to include the outlet of a closed drainage system that discharges into the stream. Due to the steepness of the existing topography, the storm drain system will also utilize elbows to reduce the velocity of the discharge going into the stream. Wetland WB and WC are directly downstream of the crossing. WB will not be impacted. The impacts to WC will be minimized with the use of 2:1 fill slopes. Existing topography near the stream is steep and stream bank stabilization will be installed at the inlet to reduce runoff velocity from the proposed ditches and minimize erosion.

WBS Element:	34598.2.2	TIP No.:	R-4045/BR-0012	County(ies):	Cleveland	Page	2	of	4

Additional General Project Information

General Project Narrative: (Description of Minimization of Water Quality Impacts)

Per the CE document, a new 54” pipe will be placed parallel to the existing 48” pipe on Stream SC under US 74, ensuring a more stable stream with less susceptibility to stream blockages, minimizing impacts to dwarf-flowered heartleaf plants located upstream from the existing inlet. The -L- alignment has been shifted north to avoid any impacts to the upstream stream section and the dwarf flowered heartleaf boundary. NCDOT Hydraulics design guidelines were followed to minimize impacts to aquatic passage. A jurisdictional stream rip rap protection pad is proposed at the outlet of retain existing 48" RCP extension. The proposed new 54" steel pipe will be trenchless installation parallel to the existing 48” RCP with sufficient clearance to avoid and minimize impacts to stream SC. During installation, temporary dikes will be utilized to separate pushing and receiving pits from stream SC. Due to the requirement to construct parallel to existing 48” RCP upstream and downstream, 54” pipe ends will not align with stream SC. A bench excavation upstream within the existing roadway slope limits is proposed as an overflow in accordance with RFP requirements. Downstream will require a proposed channel lined with rip rap from the 54” pipe to the existing stream SC tie in where pipe outlet channel stabilization is proposed. 1.5:1 roadway fill slopes will be utilized to minimize pipe length and stream impacts.

A new 60" pipe buried 1.0' will cross alignment -RPD-. Channel stabilization will be placed at outlet to reduce velocity and prevent erosion. Stream SG will be realigned downstream of the 60" -RPD- pipe and upstream of a new 66" pipe as a 47 ft long, 8 ft wide riprap-lined tail ditch with 2:1 side slopes. A proposed 66” pipe buried 1.0’ will replace the existing 48” RCP under US 74. The proposed 66" steel pipe will be trenchless installation with sufficient clearance to minimize impacts to stream SG. The proposed 66” pipe will discharge to the same outlet as the existing 48” RCP with pipe outlet stabilization. During installation, temporary dikes will be utilized to separate pushing and receiving pits from stream SG. A temporary diversion channel will be utilized downstream of the 66" pipe in order to stabilize the existing channel before restoring flow to the existing condition. 1.5:1 roadway fill slopes will be utilized to minimize pipe length and stream impacts.

Alignment -SR1- does not cross stream SG but discharges directly downstream to SG. Pipe outlet channel stabilization will be installed at the cross pipe upstream of SG to reduce velocity and prevent erosion.

Streams SD and SF south of -L- interchange Quadrant C are fully impacted by the preliminary and final proposed design/construction, so Stream SD and SF flows will be directed into a single 60” steel trenchless installed pipe. The outlet will be aligned with an existing ditch outside of stream SD north of -L- and pipe outlet channel is proposed to connect the outfall ditch with Stream SD. During trenchless installation, a temporary dike will be utilized to separate receiving pit from existing stream SD at the pipe outlet, and a temporary diversion channel will also be utilized. The proposed drainage will direct existing stream SD drainage north and south of -L- directly to Stream SB to minimize the effects of adding the existing SF drainage to SD.

Sandy Run Creek is crossed by one alignment (-L-/US 74). The proposed crossing are two-span dual bridges that are taller and longer than the existing bridges. Proposed spill through abutment slopes of 1.5:1 will ensure all fill is at least 10 feet outside top of bank. The single interior drill shaft bents are outside the stream. The proposed bents are located to avoid conflicts with the existing bents. A stormdrain system is proposed right of -L- near the eastbound lane to outfall the proposed 10-ft base ditch minimizing erosion to Sandy Run Creek. Extending the ditch to Sandy Run Creek will require a steep grade that would create undesired erosive velocity.

North Carolina Department of Transportation

Highway Stormwater Program

STORMWATER MANAGEMENT PLAN

FOR NCDOT PROJECTS

(Version 3.02; Released April 23, 2024)

WBS Element:	34598.2.2	TIP/Proj No.:	R-4045/BR-0012	County(ies):	Cleveland	Page	3	of	4

General Project Information

Waterbody Information

Surface Water Body (1):	Sandy Run Creek		**NCDWR Stream Index No.:**	9-46-(3.5)			
NCDWR Surface Water Classification for Water Body		**Primary Classification:**	Water Supply IV (WS-IV)				
		Supplemental Classification:	None				
Other Stream Classification:	None						
Impairments:	None						
Aquatic T&E Species?	No	Comments:					
NRTR Stream ID:	Sandy Run Creek			**Buffer Rules in Effect:**	N/A		
Project Includes Bridge Spanning Water Body?	Yes	**Deck Drains Discharge Over Buffer?**	N/A	**Dissipator Pads Provided in Buffer?**	N/A		
Deck Drains Discharge Over Water Body?	No	(If yes, provide justification in the General Project Narrative)		(If yes, describe in the General Project Narrative; if no, justify in the General Project Narrative)			
(If yes, provide justification in the General Project Narrative)							

Surface Water Body (2):	UT to Sandy Run Creek		**NCDWR Stream Index No.:**	9-46-(3.5)			
NCDWR Surface Water Classification for Water Body		**Primary Classification:**	Water Supply IV (WS-IV)				
		Supplemental Classification:	None				
Other Stream Classification:	None						
Impairments:	None						
Aquatic T&E Species?	No	Comments:					
NRTR Stream ID:	SB			**Buffer Rules in Effect:**	N/A		
Project Includes Bridge Spanning Water Body?	No	**Deck Drains Discharge Over Buffer?**	N/A	**Dissipator Pads Provided in Buffer?**	N/A		
Deck Drains Discharge Over Water Body?	N/A	(If yes, provide justification in the General Project Narrative)		(If yes, describe in the General Project Narrative; if no, justify in the General Project Narrative)			
(If yes, provide justification in the General Project Narrative)							

Surface Water Body (3):	UT to Sandy Run Creek		**NCDWR Stream Index No.:**	9-46-(3.5)			
NCDWR Surface Water Classification for Water Body		**Primary Classification:**	Water Supply IV (WS-IV)				
		Supplemental Classification:	None				
Other Stream Classification:	None						
Impairments:	None						
Aquatic T&E Species?	No	Comments:					
NRTR Stream ID:	SC			**Buffer Rules in Effect:**	N/A		
Project Includes Bridge Spanning Water Body?	Yes	**Deck Drains Discharge Over Buffer?**	N/A	**Dissipator Pads Provided in Buffer?**	N/A		
Deck Drains Discharge Over Water Body?	No	(If yes, provide justification in the General Project Narrative)		(If yes, describe in the General Project Narrative; if no, justify in the General Project Narrative)			
(If yes, provide justification in the General Project Narrative)							

WBS Element: 34598.2.2 **TIP No.:** R-4045/BR-0012 **County(ies):** Cleveland

Additional Waterbody Information

Surface Water Body (4):	UT to Sandy Run Creek		**NCDWR Stream Index No.:**	9-46-(3.5)		
NCDWR Surface Water Classification for Water Body		**Primary Classification:**	Water Supply IV (WS-IV)			
		Supplemental Classification:	None			
Other Stream Classification:	None					
Impairments:	None					
Aquatic T&E Species?	Yes	Comments:	Dwarf Flowered Heartleaf			
NRTR Stream ID:	SD			**Buffer Rules in Effect:**	N/A	
Project Includes Bridge Spanning Water Body?	No	**Deck Drains Discharge Over Buffer?**	N/A	**Dissipator Pads Provided in Buffer?**	N/A	
Deck Drains Discharge Over Water Body?	N/A	(If yes, provide justification in the General Project Narrative)		(If yes, describe in the General Project Narrative; if no, justify in the General Project Narrative)		
(If yes, provide justification in the General Project Narrative)						

Surface Water Body (5):	UT to Sandy Run Creek		**NCDWR Stream Index No.:**	9-46-(3.5)		
NCDWR Surface Water Classification for Water Body		**Primary Classification:**	Water Supply IV (WS-IV)			
		Supplemental Classification:	None			
Other Stream Classification:	None					
Impairments:	None					
Aquatic T&E Species?	No	Comments:				
NRTR Stream ID:	SE			**Buffer Rules in Effect:**	N/A	
Project Includes Bridge Spanning Water Body?	No	**Deck Drains Discharge Over Buffer?**	N/A	**Dissipator Pads Provided in Buffer?**	N/A	
Deck Drains Discharge Over Water Body?	N/A	(If yes, provide justification in the General Project Narrative)		(If yes, describe in the General Project Narrative; if no, justify in the General Project Narrative)		
(If yes, provide justification in the General Project Narrative)						

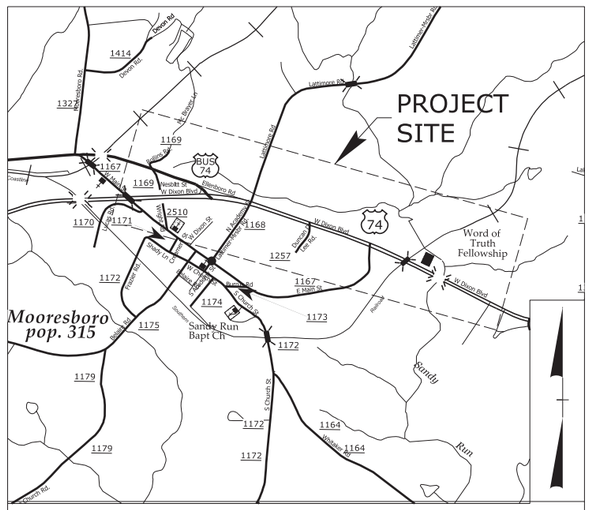
Surface Water Body (6):	UT to Sandy Run Creek		**NCDWR Stream Index No.:**	9-46-(3.5)		
NCDWR Surface Water Classification for Water Body		**Primary Classification:**	Water Supply IV (WS-IV)			
		Supplemental Classification:	None			
Other Stream Classification:	None					
Impairments:	None					
Aquatic T&E Species?	No	Comments:				
NRTR Stream ID:	SF			**Buffer Rules in Effect:**	N/A	
Project Includes Bridge Spanning Water Body?	No	**Deck Drains Discharge Over Buffer?**	N/A	**Dissipator Pads Provided in Buffer?**	N/A	
Deck Drains Discharge Over Water Body?	N/A	(If yes, provide justification in the General Project Narrative)		(If yes, describe in the General Project Narrative; if no, justify in the General Project Narrative)		
(If yes, provide justification in the General Project Narrative)						

Surface Water Body (7):	UT to Sandy Run Creek		**NCDWR Stream Index No.:**	9-46-(3.5)		
NCDWR Surface Water Classification for Water Body		**Primary Classification:**	Water Supply IV (WS-IV)			
		Supplemental Classification:	None			
Other Stream Classification:	None					
Impairments:	None					
Aquatic T&E Species?	No	Comments:				
NRTR Stream ID:	SG			**Buffer Rules in Effect:**	N/A	
Project Includes Bridge Spanning Water Body?	No	**Deck Drains Discharge Over Buffer?**	N/A	**Dissipator Pads Provided in Buffer?**	N/A	
Deck Drains Discharge Over Water Body?	N/A	(If yes, provide justification in the General Project Narrative)		(If yes, describe in the General Project Narrative; if no, justify in the General Project Narrative)		
(If yes, provide justification in the General Project Narrative)						

09/08/99

CONTRACT: C204860 TIP PROJECT: R-4045/BR-0012

See Sheet 1A For Index of Sheets
See Sheet 1B For Conventional Symbols



VICINITY MAP

NOTE: THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES FOR THE TOWN OF MOORESBORO.

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

CLEVELAND COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-4045/BR-0012	1	

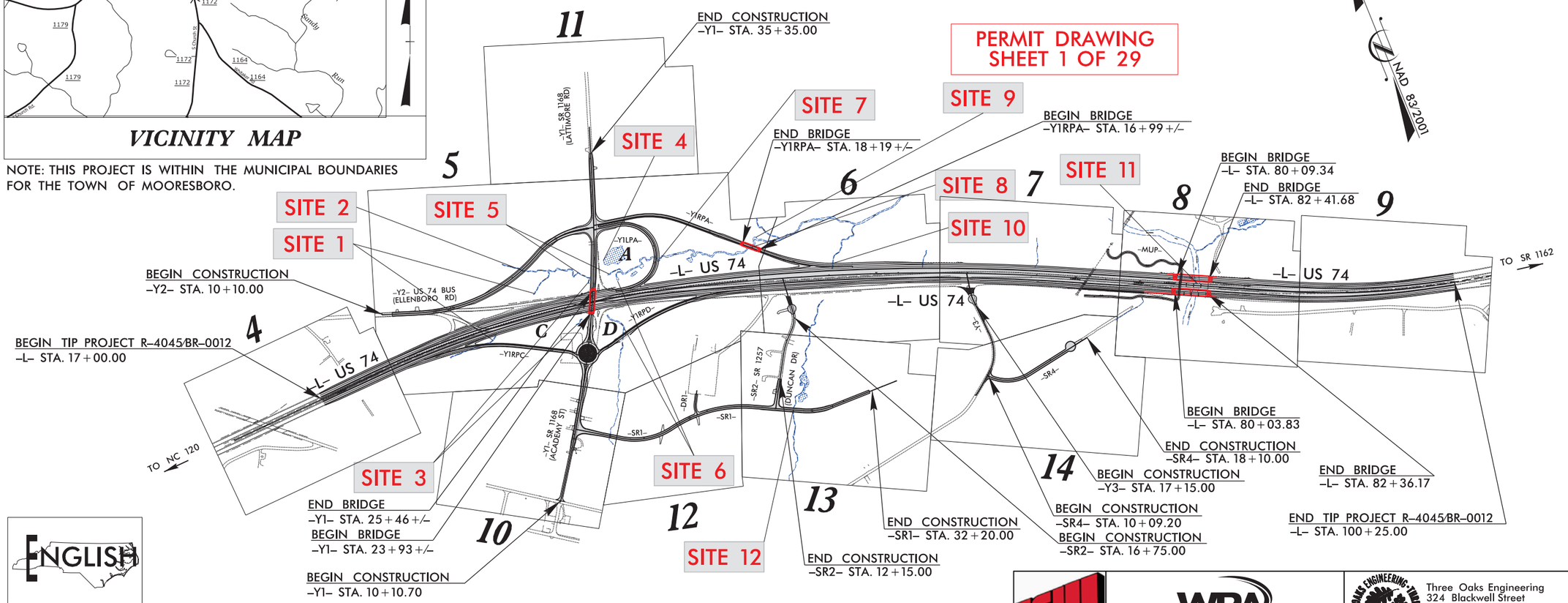
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
34598.2.2 & 67012.3.1	NHF-74 (4) (R-4045)	CONST.

LOCATION: UPGRADE OF US 74 AT SR 1168 (N. ACADEMY ST/LATTIMORE RD) INTERSECTION TO AN INTERCHANGE AND REPLACEMENT OF BRIDGE NOS. 220048 AND 220049 ON US 74 OVER SANDY RUN CREEK

TYPE OF WORK: DESIGN-BUILD AS SPECIFIED IN THE SCOPE OF WORK CONTAINED IN THE REQUEST FOR PROPOSALS

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING SHEET 1 OF 29



ENGLISH

THIS IS A CONTROLLED ACCESS PROJECT WITH ACCESS LIMITED BEING LIMITED TO INTERCHANGE. CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III.

E.S. WAGNER CO., LLC

WRA
Whitman, Requardt & Associates, LLP
1201 Edwards Mill Road, Suite 320, Raleigh, North Carolina 27606

THREE OAKS ENGINEERING · THREE OAKS ENGINEERING
Three Oaks Engineering
324 Blackwell Street
Suite 1200
Durham, NC 27701
919.732.1300

GRAPHIC SCALES

PLANS: 50 25 0 50 100
PROFILE (HORIZONTAL): 50 25 0 50 100
PROFILE (VERTICAL): 10 2.5 0 5 10

DESIGN DATA

ADT 2023 = 22,600
ADT 2043 = 30,300
K = 8 %
D = 55 %
T = 15 % *
V = 70 MPH
* TTST = 10% DUAL 5%
FUNC CLASS = FREEWAY/INTERSTATE

PROJECT LENGTH

LENGTH ROADWAY T.I.P. PROJECT R-4045/BR-0012 = 1.533 MILES

LENGTH STRUCTURE T.I.P. PROJECT R-4045/BR-0012 = 0.044 MILES

TOTAL LENGTH OF T.I.P. PROJECT R-4045/BR-0012 = 1.577 MILES

NCDOT CONTACT: ANDY HUSSEY, PE
PROJECT MANAGER, ALTERNATIVE DELIVERY UNIT

Prepared in the Office of:
SUMMIT DESIGN AND ENGINEERING SERVICES
FIRM NO. P-0339
320 Executive Ct.
Hillsborough, NC 27278-8551
Voice:(919) 732-3883
Fax: (919) 732-6776
www.summitde.com

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: JULY 20, 2023

LETTING DATE: JULY 20, 2023

BRANDON JOHNSON, PE
PROJECT ENGINEER

DOUGLAS SAUNDERS, PE
DEPUTY PROJECT ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: *P.E.*

ROADWAY DESIGN ENGINEER

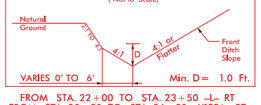
SIGNATURE: *P.E.*

STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION

29-AUG-2024 14:24
R-4045_Hyd_prm_psh_I(TSH).dgn
he.yang

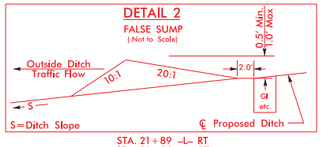
6/2/99

DETAIL 1
SPECIAL CUT DITCH wHINGE
(Not to Scale)



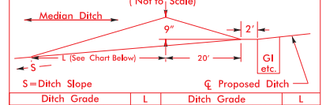
FROM STA. 22+00 TO STA. 23+50 –L– RT
FROM STA. 20+50 TO STA. 26+50 –Y1RPA– RT

DETAIL 2
FALSE SUMP
(Not to Scale)



STA. 21+89 –L– RT
STA. 50+39 –L– RT
STA. 61+21 –L– RT
STA. 83+62 –L– LT
STA. 85+24 –L– LT
STA. 92+15 –L– LT

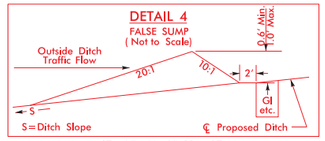
DETAIL 3
FALSE SUMP
(Not to Scale)



Ditch Grade	L	Ditch Grade	L
0.0% To 2.0%	20'	Over 4.0% To 6.0%	40'
Over 2.0% To 4.0%	30'	Over 6.0%	50'

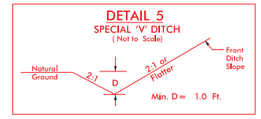
STA. 27+50 –Y1_RPA– LT
STA. 21+89 –L– CL
STA. 28+88 –L– CL
STA. 35+63 –L– CL
STA. 45+13 –L– CL
STA. 48+06 –L– CL
STA. 50+41 –L– CL
STA. 61+61 –L– CL
STA. 69+98 –L– CL
STA. 75+13 –L– CL
STA. 79+78 –L– CL
STA. 82+61 –L– CL
STA. 85+26 –L– CL
STA. 91+94 –L– CL

DETAIL 4
FALSE SUMP
(Not to Scale)



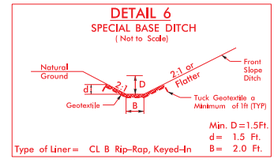
STA. 27+50 –Y1_RPA– RT
STA. 21+88 –L– LT
STA. 68+90 –L– LT
STA. 75+13 –L– LT
STA. 78+96 –L– LT
STA. 92+20 –L– RT
STA. 20+50 –Y1RPA– RT
STA. 18+50 –Y2– LT

DETAIL 5
SPECIAL 'V' DITCH
(Not to Scale)



FROM STA. 34+00 TO STA. 35+50 –L– LT
FROM STA. 51+00 TO STA. 52+00 –L– RT
FROM STA. 74+00 TO STA. 77+00 –L– RT
FROM STA. 13+50 TO STA. 15+00 –Y1– RT
FROM STA. 11+00 TO STA. 12+40.41 –SR1– LT
FROM STA. 12+65 TO STA. 14+50 –SR1– LT
FROM STA. 11+00 TO STA. 12+00 –SR1– RT

DETAIL 6
SPECIAL BASE DITCH
(Not to Scale)



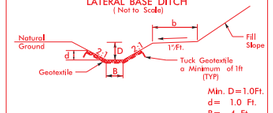
Type of Liner= CL B Rip–Rap, Keyed–In

FROM STA. 26+00 TO STA. 28+50 –L– RT

DETAIL 7
CUT DITCH
(Not to Scale)

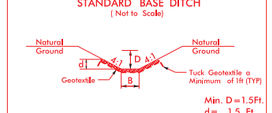
FROM STA. 25+50 TO STA. 29+00 –L– LT

DETAIL 8
LATERAL BASE DITCH
(Not to Scale)



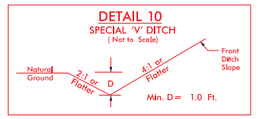
FROM STA. 36+00 TO STA. 37+00 –L– LT

DETAIL 9
STANDARD BASE DITCH
(Not to Scale)



FROM STA. 33+10 TO STA. 33+35 –L– RT
67 FT @ 0.037 FT/FT

DETAIL 10
SPECIAL 'V' DITCH
(Not to Scale)

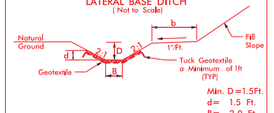


FROM STA. 23+50 TO STA. 26+00 –L– RT
FROM STA. 59+00 TO STA. 60+50 –L– RT
FROM STA. 20+00 TO STA. 23+50 –Y1RPA– LT
FROM STA. 26+50 TO STA. 28+50 –Y1RPA– RT
FROM STA. 30+62 TO STA. 32+50 –Y1– LT
FROM STA. 30+88 TO STA. 32+50 –Y1– RT
FROM STA. 10+50 TO STA. 12+50 –Y2– LT
FROM STA. 11+00 TO STA. 12+50 –Y2– RT
FROM STA. 25+00 TO STA. 26+50 –Y2– LT
FROM STA. 10+50 TO STA. 11+00 –SR1– LT
FROM STA. 14+00 TO STA. 19+00 –SR1– LT
FROM STA. 19+50 TO STA. 22+50 –SR1– LT
FROM STA. 28+50 TO STA. 31+00 –SR1– LT
FROM STA. 10+43.44 TO STA. 11+00 –SR1– RT
FROM STA. 17+00 TO STA. 18+50 –SR1– RT
FROM STA. 19+50 TO STA. 23+00 –SR1– RT
FROM STA. 14+50 TO STA. 15+50 –SR4– LT
FROM STA. 16+50 TO STA. 17+00 –SR4– LT
FROM STA. 10+22.65 TO STA. 11+00 –DR1– LT
FROM STA. 10+22.65 TO STA. 11+00 –DR1– RT

DETAIL 11
SPECIAL BASE DITCH
(Not to Scale)

FROM STA. 52+00 TO STA. 59+00 –L– RT
FROM STA. 19+00 TO STA. 19+66.67 –Y1– LT
FROM STA. 19+83 TO STA. 20+50 –Y1RPC– RT
FROM STA. 28+50 TO STA. 32+00 –SR1– RT
FROM STA. 10+50 TO STA. 11+50 –SR2– LT

DETAIL 12
LATERAL BASE DITCH
(Not to Scale)

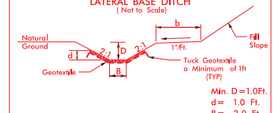


FROM STA. 61+85 TO STA. 63+85 –L– LT

DETAIL 13
SPECIAL BASE DITCH
(Not to Scale)

FROM STA. 77+48 TO STA. 78+50 –L– RT

DETAIL 14
LATERAL BASE DITCH
(Not to Scale)



FROM STA. 82+65 TO STA. 83+20 –L– LT

DETAIL 15
SPECIAL 'V' DITCH
(Not to Scale)

FROM STA. 12+00 TO STA. 12+55 –SR1– RT

DETAIL 16
SPECIAL 'V' DITCH
(Not to Scale)

FROM STA. 12+55 TO STA. 13+00 –SR1– RT

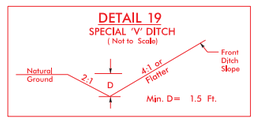
DETAIL 17
SPECIAL 'V' DITCH
(Not to Scale)

FROM STA. 13+00 TO STA. 14+50 –SR1– RT
FROM STA. 20+00 TO STA. 20+69 –Y1RPD– LT

DETAIL 18
SPECIAL 'V' DITCH
(Not to Scale)

FROM STA. 12+50 TO STA. 15+81 –Y2– RT
FROM STA. 14+50 TO STA. 17+00 –SR1– RT
FROM STA. 10+50 TO STA. 14+50 –SR4– LT

DETAIL 19
SPECIAL 'V' DITCH
(Not to Scale)



FROM STA. 18+50 TO STA. 19+50 –SR1– RT

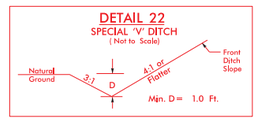
DETAIL 20
SPECIAL BASE DITCH
(Not to Scale)

FROM STA. 23+00 TO STA. 26+00 –SR1– RT
FROM STA. 18+50 TO STA. 19+57.71 –Y1– RT

DETAIL 21
SPECIAL BASE DITCH
(Not to Scale)

FROM STA. 19+00 TO STA. 20+45 –Y2– LT
FROM STA. 27+00 TO STA. 28+50 –SR1– RT

DETAIL 22
SPECIAL 'V' DITCH
(Not to Scale)

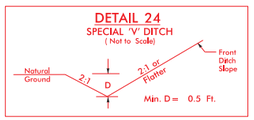


FROM STA. 15+50 TO STA. 16+50 –SR4– LT

DETAIL 23
SPECIAL BASE DITCH
(Not to Scale)

FROM STA. 12+00 TO STA. 17+50 –SR4– RT

DETAIL 24
SPECIAL 'V' DITCH
(Not to Scale)



FROM STA. 16+50 TO STA. 18+50 –Y1– RT

DETAIL 25
SPECIAL BASE DITCH
(Not to Scale)

FROM STA. 18+06 TO STA. 19+83 –Y1RPC– RT

DETAIL 27
SPECIAL BASE DITCH
(Not to Scale)

FROM STA. 13+62.12 TO STA. 18+06 –Y1RPC– RT

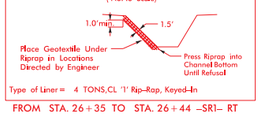
DETAIL 28
PIPE OUTLET CHANNEL STABILIZATION
(Not to Scale)

STA. 26+34 –SR1– LT

DETAIL 29
BANK STABILIZATION
(Not to Scale)

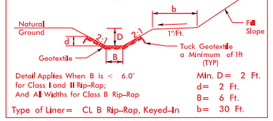
FROM STA. 26+28 TO STA. 26+33.38 –SR1– RT

DETAIL 30
BANK STABILIZATION
(Not to Scale)



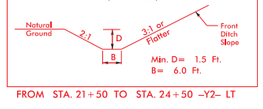
FROM STA. 26+35 TO STA. 26+44 –SR1– RT

DETAIL 31
LATERAL BASE DITCH
(Not to Scale)



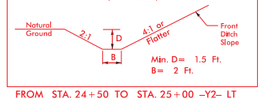
FROM STA. 20+55 TO STA. 21+50 –Y2– LT

DETAIL 32
SPECIAL BASE DITCH
(Not to Scale)



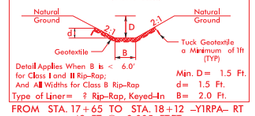
FROM STA. 21+50 TO STA. 24+50 –Y2– LT

DETAIL 33
SPECIAL BASE DITCH
(Not to Scale)



FROM STA. 24+50 TO STA. 25+00 –Y2– LT

DETAIL 34
TAIL DITCH
(Not to Scale)

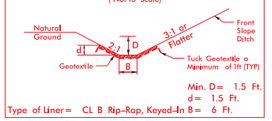


FROM STA. 17+65 TO STA. 18+12 –Y1RPA– RT
49 FT @ 0.005 FT/FT

DETAIL 35
SPECIAL 'V' DITCH
(Not to Scale)

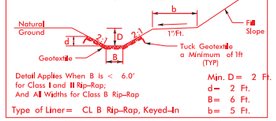
FROM STA. 10+50 TO STA. 11+00 –Y2– RT

DETAIL 36
SPECIAL BASE DITCH
(Not to Scale)



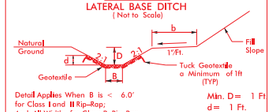
FROM STA. 15+81 TO STA. 19+00 –Y2– RT

DETAIL 37
LATERAL BASE DITCH
(Not to Scale)



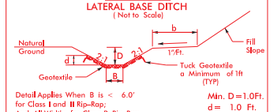
FROM STA. 19+50 TO STA. 21+35 –Y2– RT

DETAIL 38
LATERAL BASE DITCH
(Not to Scale)



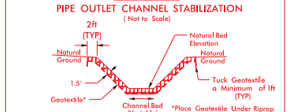
FROM STA. 18+12 TO STA. 20+00 –Y1RPA– RT

DETAIL 39
LATERAL BASE DITCH
(Not to Scale)



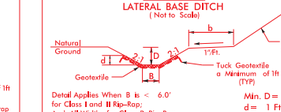
FROM STA. 26+44 TO STA. 27+00 –SR1– RT

DETAIL 40
PIPE OUTLET CHANNEL STABILIZATION
(Not to Scale)



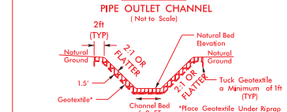
STA. 21+32 –Y2– RT

DETAIL 41
LATERAL BASE DITCH
(Not to Scale)



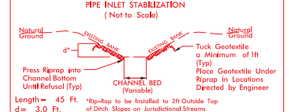
FROM STA. 26+04 TO STA. 26+57 –Y1– LT

DETAIL 42
PIPE OUTLET CHANNEL
(Not to Scale)



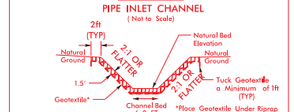
STA. 26+78 –Y1– RT

DETAIL 43
PIPE INLET STABILIZATION
(Not to Scale)



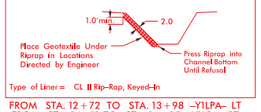
STA. 20+65 –Y2– LT

DETAIL 44
PIPE INLET CHANNEL
(Not to Scale)



STA. 26+72 –Y1– LT

DETAIL 45
BANK STABILIZATION
(Not to Scale)

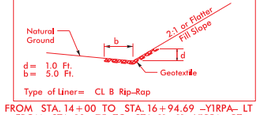


FROM STA. 12+72 TO STA. 13+98 –Y1LPA– LT
FROM STA. 14+11 TO STA. 14+25 –Y1LPA– RT
FROM STA. 16+84 TO STA. 17+10 –Y1RPA– RT
FROM STA. 17+19 TO STA. 17+36 –Y1RPA– RT

DETAIL 46
RIP RAP AT EMBANKMENT
(Not to Scale)

STA. 17+61 –Y1RPA– RT

DETAIL 47
TOE PROTECTION
(Not to Scale)



FROM STA. 14+00 TO STA. 16+94.69 –Y1RPA– LT
FROM STA. 10+75 TO STA. 11+11 –Y1RPA– RT
FROM STA. 11+42 TO STA. 13+40 –Y1RPA– RT
FROM STA. 17+50 TO STA. 19+00 –Y1– LT

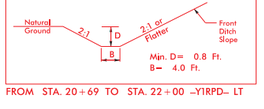
DETAIL 48
RIP RAP AT EMBANKMENT
(Not to Scale)

STA. 19+77 –Y1RPA– LT

DETAIL 49
TAIL DITCH
(Not to Scale)

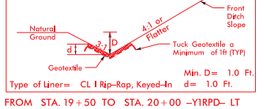
FROM STA. 19+77 TO STA. 20+00 –Y1RPA– LT
43 FT @ 0.062 FT/FT

DETAIL 50
SPECIAL BASE DITCH
(Not to Scale)



FROM STA. 20+69 TO STA. 22+00 –Y1RPD– LT

DETAIL 51
SPECIAL 'V' DITCH
(Not to Scale)



FROM STA. 19+50 TO STA. 20+00 –Y1RPD– LT

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	2D-1

ROADWAY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 053483 SPENCER W. MERRITT

PAVEMENT DESIGN ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared in the Office of: SUMMIT Design and Engineering Services
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320 Executive Ct.
Hillsborough, NC 27278
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Prepared in the Office of: WRA Wilkinson, Ringquist & Associates, LLP
1201 Edwards Mill Road, Suite 320,
Raleigh, NC 27606
(919) 859-0808

HYDRAULIC ENGINEER
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 040843 ENGINEER JIANBIAO LU

FOR –L– AND –MUP–
DESIGNED 10/2024
DRAWN 10/2024
CHECKED 10/2024
SEALED 10/2024

HYDRAULIC ENGINEER
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 046226 JASON R. HICKS

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 054713 JOSEPH M. HENG

FOR –Y1–, STA. 18+50 TO –Y1– STA. 24+30.19, –SR4–, –Y1RPC–, –Y1RPD–, –SR1–, –SR2–, –SR4–, –DR1–

FOR –Y1–, STA. 24+30.19 TO –Y1– STA. 33+50, –Y1LPA–, –Y1RPA–, Y2

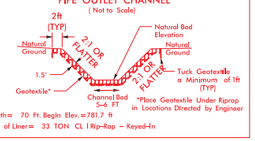
PERMIT DRAWING
SHEET 2 OF 25

ENGINEERING

2024/10/16 10:14:24
R-4045_hyd_prm_psh_2 (Detail Sheet 1).dgn
bewood

6/2/99

DETAIL 52
PIPE OUTLET CHANNEL
(Not to Scale)



Length= 70 Ft. Begin Elev.=781.7 ft
Type of Liner= 33 TON CL I Rip-Rap – Keyed-In

STA. 54+44 –L– LT

DETAIL 53
SPECIAL MEDIAN 'V' DITCH
(Not to Scale)

SEE DITCH PROFILE SHEET

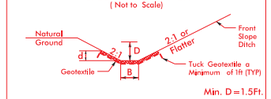
FROM STA. 36+50 TO STA. 37+50 –L– CL
FROM STA. 49+50 TO STA. 50+50 –L– CL

DETAIL 54
SPECIAL BASE DITCH
(Not to Scale)

Min. D= 1.0 Ft.
B= 4.0 Ft.

FROM STA. 11+00 TO STA. 11+45.18 –RAB– RT

DETAIL 55
SPECIAL BASE DITCH
(Not to Scale)

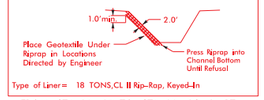


Min. D=1.5Ft.
d= 1.0 Ft.
B= 10.0 Ft.

Type of Liner= CL I Rip-Rap, Keyed-In

FROM STA. 78+50 TO STA. 80+45 –L– RT

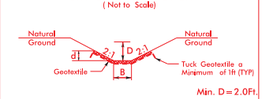
DETAIL 56
BANK STABILIZATION
(Not to Scale)



Type of Liner= 18 TONS,CL II Rip-Rap, Keyed-In

FROM STA. 80+87 TO STA. 80+96 –L– RT

DETAIL 57
STANDARD BASE DITCH
(Not to Scale)



Min. D= 2.0Ft.
d= 2 Ft.
B= 3 Ft.

Type of Liner= CL B Rip-Rap, Keyed-In

FROM STA. 48+05 TO STA. 48+08 –L– LT
27 FT @0.019 FT/FT

DETAIL 58
RIP RAP AT EMBANKMENT
(Not to Scale)

Type of Liner= 7 TONS,CL I Rip-Rap, Keyed-In

STA. 48+08 –L– LT

DETAIL 59
PIPE OUTLET CHANNEL
(Not to Scale)

Length= 50 Ft.
Type of Liner= 392 TON CL I Rip-Rap – Keyed-In

STA. 33+93 –L– LT

DETAIL 60
PIPE OUTLET CHANNEL STABILIZATION
(Not to Scale)

Length= 15 Ft.
Slope= 3.8%
Type of Liner= 41 TONS CL 'S' Rip-Rap – Keyed-In

STA. 12+65 –SR1– LT

DETAIL 61
SPECIAL BASE DITCH
(Not to Scale)

Min. D= 1.0 Ft.
d= 1.0 Ft.
B= 2.0 Ft.

Type of Liner= PSRM

FROM STA. 22+50 TO STA. 24+66.93 –SR1– LT

DETAIL 62
LATERAL BASE DITCH
(Not to Scale)

Detail Applies When B is < 6.0'
for Class I and II Rip-Rap
And All Widths for Class B Rip-Rap

Min. D=1.0Ft.
d= 1.0 Ft.
B= 4.0 Ft.
b= 5.0 Ft.

Type of Liner= 'B' Rip-Rap, Keyed-In

FROM STA. 26+00 TO STA. 26+28 –SR1– RT

DETAIL 63
BERM 'V' DITCH
(Not to Scale)

Min. D= 0.5 Ft.
b= 2 Ft.

FROM STA. 13+00 TO STA. 14+50 –Y1RPD– LT

DETAIL 64
BERM 'V' DITCH
(Not to Scale)

Min. D= 1.0 Ft.
b= 2 Ft.
d= 1.0 Ft.
Type of Liner= CL B Rip-Rap, Keyed-In

FROM STA. 14+50 TO STA. 19+50 –Y1RPD– LT

DETAIL 65
TAIL DITCH
(Not to Scale)

Min. D= 1.25 Ft.
B= 8 Ft.
Type of Liner= CL 1 Rip-Rap, Keyed-In

FROM STA. 18+91 TO STA. 19+13 –Y1RPD– RT
47 FT @0.058 FT/FT

DETAIL 66
PIPE OUTLET CHANNEL STABILIZATION
(Not to Scale)

Length= 20 Ft.
Type of Liner= 32 TON CL I Rip-Rap – Keyed-In

STA. 55+51 –L– LT

DETAIL 67
TAIL DITCH
(Not to Scale)

Min. D= 1.2 Ft.

Type of Liner= CL 'B' Rip-Rap, Keyed-In d= 1.2 Ft.

FROM STA. 46+58.86 TO STA. 47+50 –L– RT
91 FT @ 0.11 FT/FT
FROM STA. 47+50 TO STA. 48+50 –L– RT
100 FT @ 0.10 FT/FT
FROM STA. 48+50 TO STA. 49+50 –L– RT
100 FT @ 0.075 FT/FT
100 FT @ 0.10 FT/FT
FROM STA. 49+50 TO STA. 50+30 –L– RT
80 FT @ 0.035 FT/FT

DETAIL 68
TAIL DITCH
(Not to Scale)

Min. D= 1.5 Ft.

Type of Liner= CL II Rip-Rap, Keyed-In d= 1.0 Ft.

FROM STA. 17+39 TO STA. 17+80 –Y3– LT
46 FT @ 0.087 FT/FT

DETAIL 69
TAIL DITCH
(Not to Scale)

Min. D= 1.5 Ft.

FROM STA. 17+24 TO STA. 17+83 –Y3– RT
58 FT @ 0.069 FT/FT

DETAIL 70
PIPE OUTLET CHANNEL STABILIZATION
(Not to Scale)

Length= 25 Ft.
Type of Liner= 48 TON CL I Rip-Rap – Keyed-In

STA. 39+92 –L– LT

DETAIL 71
BANK STABILIZATION
(Not to Scale)

Type of Liner= CL I Rip-Rap, Keyed-In

FROM STA. 34+37 TO STA. 34+63 –L– LT
FROM STA. 39+75 TO STA. 39+86 –L– LT

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	2D-2

ROADWAY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 053483 ENGINEER SPENCER W. MERRITT

PAVEMENT DESIGN ENGINEER

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Prepared in the Office of: SUMMIT Design and Engineering Services
NC FIRM LICENSE No:P-0339
320 Executive Ct.
Hillsborough, NC 27278
(919) 732-3883
(919) 732-6676 (FAX)

Prepared in the Office of: WRA Watson, Rayyan & Associates, LLP
1201 Edwards Mill Road, Suite 320,
Raleigh, NC 27606
(919) 859-0808

HYDRAULIC ENGINEER
NORTH CAROLINA PROFESSIONAL SEAL 040843 ENGINEER JIANBIAO LU

FOR –L– AND –MUP–
HYDRAULIC ENGINEER
NORTH CAROLINA PROFESSIONAL SEAL 054713 ENGINEER

HYDRAULIC ENGINEER
NORTH CAROLINA PROFESSIONAL SEAL 046226 ENGINEER

FOR –Y1– STA. 24+30.19 TO –Y1– STA. 33+50, –Y1LPA–, –Y1RPA–, Y2

FOR –Y1– STA. 18+58 TO –Y1– STA. 24+30.19, –RAB–, –Y1RPC–, –Y1RPD–, –SR1–, –SR2–, –SR4–, –DR1–

ENGLISH

PERMIT DRAWING
SHEET 3 OF 27

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PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	5
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

INCOMPLETE PLANS
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Prepared in the Office of: WRA Wetlands, Regional & Associates, LLP — 120 Edwards Mill Road, Suite 320, Raleigh, NC 27606, (919) 859-0808

MATCHLINE –Y1– STA 33+50.00 (SEE SHEET 11)

MATCHLINE –L– STA 22+50.00 (SEE SHEET 4)

MATCHLINE –Y1– STA 18+50.00 (SEE SHEET 10)

MATCHLINE –L– STA 50+00.00 (SEE SHEET 6)

SEE DRAWING SHEET 8 OF 29 FOR ENLARGEMENT

SEE DRAWING SHEET 7 OF 29 FOR ENLARGEMENT

SEE DRAWING SHEET 7 OF 29 FOR ENLARGEMENT

SEE DRAWING SHEET 6 OF 29 FOR ENLARGEMENT

SEE DRAWING SHEET 9 OF 29 FOR ENLARGEMENT

SEE DRAWING SHEET 10 OF 29 FOR ENLARGEMENT

SEE DRAWING SHEET 11 OF 29 FOR ENLARGEMENT

SITE 1 — SITE 2 — SITE 3 — SITE 4 — SITE 5 — SITE 6 — SITE 7 — SITE 8 — SITE 9

A — B — C — D

–Y2– CURVE DATA

PI Sta 17+89.03	PI Sta 24+26.30	
Δ = 47° 03' 52.7" (LT)	Δ = 38° 24' 03.0" (RT)	
D = 4° 46' 28.7"	D = 11° 27' 33.0"	
L = 985.72'	L = 335.11'	
T = 522.58'	T = 174.12'	
R = 1,200.00'	R = 500.00'	
SE = 0.08	SE = 0.06	
RO = 150'	RO = SEE PLANS	
DS = 60 mph	DS = 30 mph	

–Y1– CURVE DATA

PI Sta 23+30.77
Δ = 15° 03' 06.8" (LT)
D = 0° 49' 09.6"
L = 1,833.94'
T = 924.79'
R = 7,000.00'
SE = NC
DS = 45 mph

–YIRPA– CURVE DATA

PI Sta 13+41.97	PI Sta 15+42.66	PI Sta 23+44.38
Δ = 13° 09' 39.5" (RT)	Δ = 4° 17' 49.9"	Δ = 9° 32' 57.5"
D = 4° 46' 28.7"	D = 4° 46' 28.7"	D = 9° 32' 57.5"
L = 282.65'	L = 180.00'	L = 234.40'
R = 1,200.00'	LT = 120.04'	T = 117.71'
SE = 0.08	ST = 60.03'	R = 600.00'
DS = 60 MPH		SE = 0.08
		RO = 200'
		DS = 45 MPH

–YIRPC– CURVE DATA

PI Sta 11+98.34	PI Sta 14+26.79	PI Sta 16+53.12	PI Sta 20+71.59
Δ = 4° 17' 49.9"	Δ = 15° 59' 06.3" (RT)	Δ = 4° 17' 49.9"	Δ = 24° 50' 57.4" (RT)
D = 4° 46' 28.7"	D = 4° 46' 28.7"	D = 4° 46' 28.7"	D = 44° 04' 25.2"
L = 180.04'	L = 334.79'	L = 180.00'	L = 55.85'
LT = 120.04'	L = 168.49'	LT = 120.04'	T = 28.36'
ST = 60.03'	R = 1,200.00'	ST = 60.03'	R = 130.00'
	SE = 0.08		
	DS = 60 MPH		

PI Sta 21+20.74	
Δ = 24° 28' 36.8" (LT)	
D = 57° 17' 44.8"	
L = 42.66'	
T = 21.66'	
R = 100.00'	

–YIRPD– CURVE DATA

PI Sta 11+60.05	PI Sta 15+63.12	PI Sta 19+37.14	PI Sta 21+46.39	PI Sta 22+03.48	PI Sta 22+54.16
Δ = 4° 26' 08.9"	Δ = 23° 13' 03.6" (LT)	Δ = 7° 19' 36.7"	Δ = 9° 08' 00.9" (RT)	Δ = 22° 00' 20.3" (LT)	Δ = 40° 47' 18.6" (RT)
D = 2° 40' 00.7"	D = 14° 19' 26.2"	Ls = 180.00'	D = 14° 19' 26.2"	D = 44° 04' 25.2"	D = 81° 51' 04.0"
L = 240.00'	L = 447.47'	LT = 120.02'	L = 63.76'	L = 49.93'	L = 49.83'
LT = 160.05'	L = 637.12'	ST = 60.02'	T = 31.95'	T = 25.28'	T = 28.02'
ST = 80.05'	T = 353.12'		R = 400.00'	R = 130.00'	R = 70.00'
	R = 1,550.00'		SE = NC		
	SE = 0.08		DS = 15 MPH		
	DS = 65 mph				

–YLPA– CURVE DATA

PIs Sta 11+38.12	PI Sta 22+84.18
Ls = 205.00'	Δ = 155° 56' 15.8" (LT)
Ls = 205.12'	D = 29° 54' 40.4"
LT = 138.12'	L = 626.34'
ST = 69.65'	T = 1,079.18'
	R = 230.00'
	SE = 0.08
	RO = 200'
	DS = 30 MPH

–RAB– CURVE DATA

PI Sta 12+18.08	PI Sta 12+84.18	PI Sta 13+15.36	PI Sta 13+78.38
Δ = 70° 40' 24.1" (LT)	Δ = 154° 36' 58.6" (LT)	Δ = 89° 44' 17.1" (LT)	Δ = 44° 58' 20.3" (LT)
D = 89° 31' 28.5"	D = 89° 31' 28.5"	D = 89° 31' 28.5"	D = 89° 31' 28.5"
L = 78.94'	L = 172.71'	L = 100.24'	L = 50.23'
T = 45.38'	T = 284.18'	T = 63.77'	T = 26.49'
R = 64.00'	R = 64.00'	R = 64.00'	R = 64.00'

–L– CURVE DATA

PI Sta 10+00.00	PI Sta 12+66.45	
Δ = 0° 00' 00.0" (RT)	Δ = 47° 47' 47.4"	
D = 0° 00' 00.0"	D = 11° 27' 33.0"	
L = 0.00'	L = 1,335.11'	
T = 0.00'	T = 1,141.12'	
R = 0.00'	R = 500.00'	
SE = 0.00'	SE = 0.06	
RO = 0'	RO = SEE PLANS	
DS = 0 mph	DS = 30 mph	

PI Sta 25+29.57		
Δ = 22° 23' 01.0" (LT)		
D = 9° 32' 57.5"		
L = 234.40'		
T = 118.71'		
R = 600.00'		
SE = 0.08		
RO = 200'		
DS = 45 MPH		

PERMIT DRAWING SHEET 4 OF 29

TS TS — TEMPORARY SURFACE WATER IMPACTS

S S — SURFACE WATER IMPACTS

F F — FILL IN WETLAND

HC HC — HAND CLEARING (NON-GRUBBING)

FOR –L– PROFILE, SEE SHEET 16 AND 17
FOR –Y1– PROFILE, SEE SHEET 22
FOR –Y1LPA– PROFILE, SEE SHEET 23
FOR –Y1RPA– PROFILE, SEE SHEET 23 AND 24
FOR –Y1RPC– PROFILE, SEE SHEET 24
FOR –Y1RPD– PROFILE, SEE SHEET 25
FOR –Y2– PROFILE SEE SHEET 25 AND 26

LATTIMORE RD (SR 1168)
800 / 1000
74 — 19,700 / 29,000
700 / 900 — 1,500 / 1,900
74 — 21,400 / 31,100
300 / 400 — 1,200 / 1,500
1,200 / 1,400
ACADEMY RD (SR 1168)
2020 AADT / 2045 AADT

GRAPHIC SCALE
50 25 0 50 100

ENGLISH

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	5
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

INCOMPLETE PLANS
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MATCHLINE –Y1– STA 33+50.00
(SEE SHEET 11)

MATCHLINE –L– STA 22+50.00
(SEE SHEET 4)

MATCHLINE –Y1– STA 18+50.00
(SEE SHEET 10)

MATCHLINE –L– STA 50+00.00
(SEE SHEET 6)

SEE DRAWING SHEET 8 OF 29 FOR ENLARGEMENT

SEE DRAWING SHEET 7 OF 29 FOR ENLARGEMENT

SEE DRAWING SHEET 9 OF 29 FOR ENLARGEMENT

SEE DRAWING SHEET 10 OF 29 FOR ENLARGEMENT

SEE DRAWING SHEET 11 OF 29 FOR ENLARGEMENT

SEE DRAWING SHEET 7 OF 29 FOR ENLARGEMENT

SEE DRAWING SHEET 6 OF 29 FOR ENLARGEMENT

SITE 1 · SITE 2 · SITE 3 · SITE 4 · SITE 5 · SITE 6 · SITE 7 · SITE 8 · SITE 9

A · B · C · D

-Y1- PT Sta. 32+44.31

-Y2- POT Sta. 27+12.21
-Y1- POC Sta. 30+04.38

-Y2- PT Sta. 26+87.28
S 79° 37' 31.9" E (AH)

-Y2- PRC Sta. 22+52.17

-Y1PA- PT Sta. 18+50.91
N 79° 37' 31.9" W (AH)

-Y1PA- POT Sta. 20+07.52
-Y1- PT Sta. 29+06.05

-Y1PA- SE Sta. 12+05.00

-Y1PA- PT Sta. 26+45.25
N 79° 37' 31.9" W (AH)

-Y1PA- SC Sta. 24+10.85

-Y1PA- TS Sta. 22+10.85

-Y1PA- ST Sta. 16+62.62

-Y1PA- Sta. 16+50.00

-Y1PA- Sta. 14+19.47

-Y1PA- ST Sta. 10+00.00

-Y1PA- Sta. 8+79.72

-Y1PA- Sta. 6+79.72

-Y1PA- Sta. 4+79.72

-Y1PA- Sta. 2+79.72

-Y1PA- Sta. 0+79.72

-Y1PA- ST Sta. 10+00.00

-Y1PA- SC Sta. 7+83.27

-Y1PA- CS Sta. 4+83.27

-Y1PA- Sta. 2+83.27

-Y1PA- Sta. 0+83.27

-Y1PA- POT Sta. 21+94.84
N 76° 46' 59.8" W (AH)

-Y1PA- POT Sta. 20+49.58
N 76° 46' 59.8" W (AH)

-Y1PA- POC Sta. 20+11.50

-Y1PA- PRC Sta. 20+07.52

-Y1PA- PT Sta. 19+77.52

-Y1PA- POC Sta. 20+49.58

-Y1PA- PRC Sta. 22+28.15

-Y1PA- PT Sta. 21+94.84

-Y1PA- POT Sta. 21+77.52

-Y1PA- POC Sta. 20+49.58

-Y1PA- PRC Sta. 20+28.15

-Y1PA- PT Sta. 19+77.52

-Y1PA- POT Sta. 19+60.20

-Y1PA- POC Sta. 19+22.18

-Y1PA- PRC Sta. 19+00.91

-Y1PA- PT Sta. 18+50.91

-Y1PA- POT Sta. 18+33.59

-Y1PA- POC Sta. 17+95.57

-Y1PA- PRC Sta. 17+73.60

-Y1PA- PT Sta. 17+43.60

-Y1PA- POT Sta. 17+26.28

-Y1PA- POC Sta. 16+88.26

-Y1PA- PRC Sta. 16+66.29

-Y1PA- PT Sta. 16+36.29

-Y1PA- POT Sta. 16+18.97

-Y1PA- POC Sta. 15+80.95

-Y1PA- PRC Sta. 15+58.98

-Y1PA- PT Sta. 15+28.98

-Y1PA- POT Sta. 15+11.66

-Y1PA- POC Sta. 14+73.64

-Y1PA- PRC Sta. 14+51.67

-Y1PA- PT Sta. 14+21.67

-Y1PA- POT Sta. 14+04.35

-Y1PA- POC Sta. 13+66.33

-Y1PA- PRC Sta. 13+44.36

-Y1PA- PT Sta. 13+14.36

-Y1PA- POT Sta. 12+97.04

-Y1PA- POC Sta. 12+59.02

-Y1PA- PRC Sta. 12+37.05

-Y1PA- PT Sta. 12+07.05

-Y1PA- POT Sta. 11+89.73

-Y1PA- POC Sta. 11+51.71

-Y1PA- PRC Sta. 11+29.74

-Y1PA- PT Sta. 10+99.74

-Y1PA- POT Sta. 10+82.42

-Y1PA- POC Sta. 10+44.40

-Y1PA- PRC Sta. 10+22.43

-Y1PA- PT Sta. 9+92.43

-Y1PA- POT Sta. 9+75.11

-Y1PA- POC Sta. 9+37.09

-Y1PA- PRC Sta. 9+15.12

-Y1PA- PT Sta. 8+85.12

-Y1PA- POT Sta. 8+67.80

-Y1PA- POC Sta. 8+29.78

-Y1PA- PRC Sta. 8+07.81

-Y1PA- PT Sta. 7+77.81

-Y1PA- POT Sta. 7+60.49

-Y1PA- POC Sta. 7+22.47

-Y1PA- PRC Sta. 7+00.50

-Y1PA- PT Sta. 6+70.50

-Y1PA- POT Sta. 6+53.18

-Y1PA- POC Sta. 6+15.16

-Y1PA- PRC Sta. 5+93.19

-Y1PA- PT Sta. 5+63.19

-Y1PA- POT Sta. 5+45.87

-Y1PA- POC Sta. 5+07.85

-Y1PA- PRC Sta. 4+85.88

-Y1PA- PT Sta. 4+55.88

-Y1PA- POT Sta. 4+38.56

-Y1PA- POC Sta. 3+60.54

-Y1PA- PRC Sta. 3+38.57

-Y1PA- PT Sta. 3+08.57

-Y1PA- POT Sta. 2+91.25

-Y1PA- POC Sta. 2+53.23

-Y1PA- PRC Sta. 2+31.26

-Y1PA- PT Sta. 2+01.26

-Y1PA- POT Sta. 1+83.94

-Y1PA- POC Sta. 1+45.92

-Y1PA- PRC Sta. 1+23.95

-Y1PA- PT Sta. 0+93.95

-Y1PA- POT Sta. 0+76.63

-Y1PA- POC Sta. 0+38.61

-Y1PA- PRC Sta. 0+16.64

-Y1PA- PT Sta. 0+86.64

-Y1PA- POT Sta. 0+69.32

-Y1PA- POC Sta. 0+31.30

-Y1PA- PRC Sta. 0+09.33

-Y1PA- PT Sta. 0+79.33

-Y1PA- POT Sta. 0+62.01

-Y1PA- POC Sta. 0+23.99

-Y1PA- PRC Sta. 0+02.02

-Y1PA- PT Sta. 0+72.02

-Y1PA- POT Sta. 0+54.70

-Y1PA- POC Sta. 0+16.68

-Y1PA- PRC Sta. 0+00.00

-Y1PA- PT Sta. 0+70.00

-Y1PA- POT Sta. 0+52.68

-Y1PA- POC Sta. 0+14.66

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	8
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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(919) 732-6676 (FAX)

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SHEET 6 OF 29

S S SURFACE WATER IMPACTS

TS TS TEMPORARY SURFACE WATER IMPACTS

ENGLISH

SITE 1

IMPACTS IN SURFACE WATER

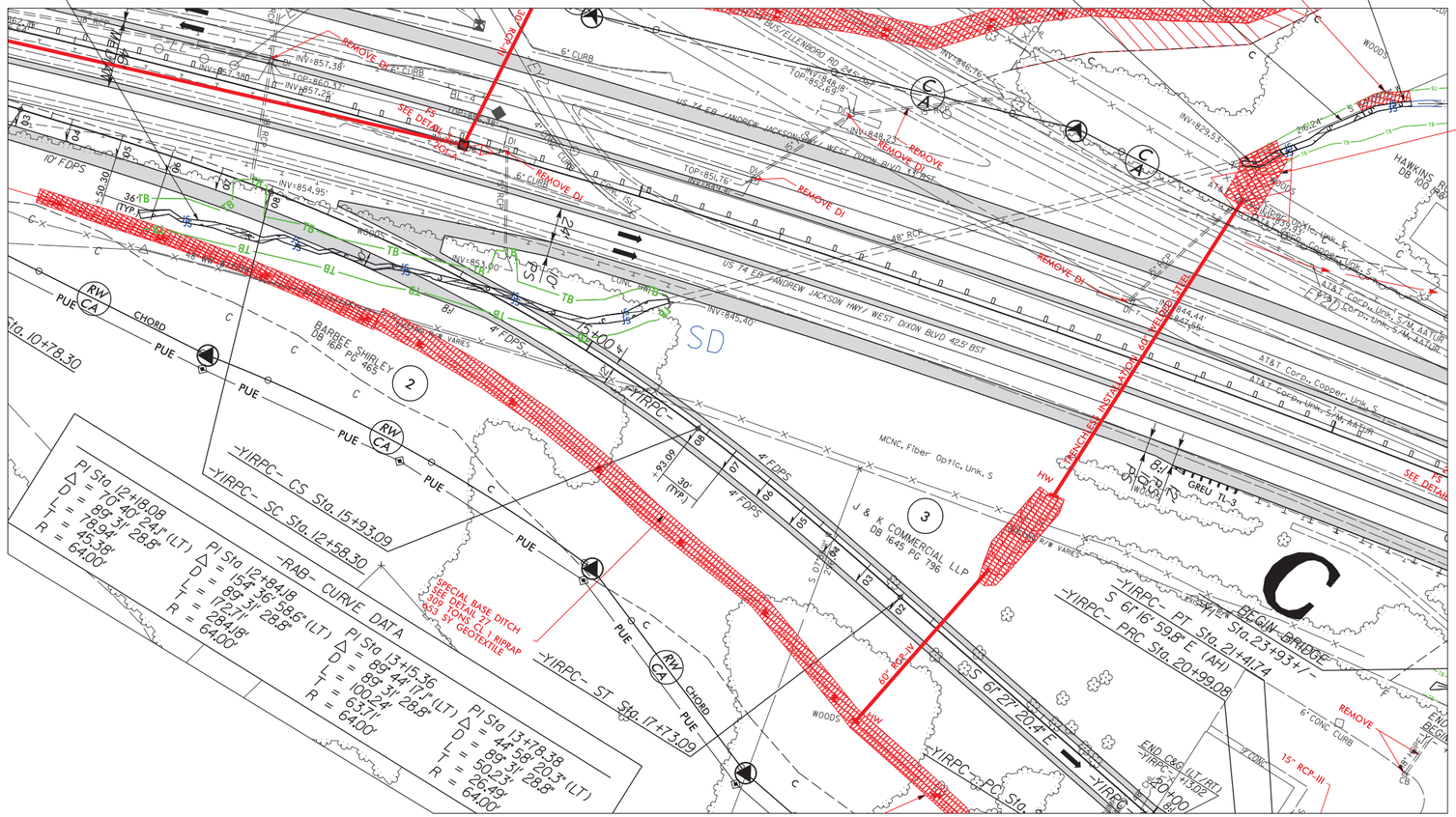
IMPACTS IN SURFACE WATER

BANK STABILIZATION FOR TEMPORARY DIVERSION SEE DETAIL 71

TEMPORARY IMPACTS IN SURFACE WATER

IMPACTS IN SURFACE WATER

PIPE OUTLET CHANNEL
SEE DETAIL 59
392 TONS CL 1 RIP RAP
173 SY GEOTEXTILE



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PLANS

REVISIONS 8/17/99

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PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	8
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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SHEET 7 OF 29

S/S SURFACE WATER IMPACTS

TS/TS TEMPORARY SURFACE WATER IMPACTS

ENGLISH

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REVISIONS

NAD 83/2011

6' BASE LATERAL RIP RAP DITCH
SEE DETAIL 31
100 TONS CL B RIP RAP
145 SY GEOTEXTILE
EST 223 CY DDE

HW

60" RCP-HI BURIED 1.5 FT

PIPE INLET STABILIZATION
SEE DETAIL 43

IMPACTS IN SURFACE WATER

PIPE OUTLET CHANNEL STABILIZATION
SEE DETAIL 40

TEMPORARY IMPACTS IN SURFACE WATER

2' BASE RIP RAP DITCH
SEE DETAIL 21
85 TONS CL B RIP RAP
170 SY GEOTEXTILE

IMPACTS IN SURFACE WATER

SITE 2

6' LATERAL RIP RAP DITCH
SEE DETAIL 37
138 TON CL B RIP RAP
307 SY GEOTEXTILE
EST. 2500 CY DDE

TEMPORARY IMPACTS IN SURFACE WATER

10 5 0 10 20
PLANS

IMPACTS IN SURFACE WATER

NAD 83/2011

PLUG & FILL WITH FLOWABLE FILL

REMOVE

IMPACTS IN SURFACE WATER

SITE 3

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PLANS

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8/17/99

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	8
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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SHEET 8 OF 29

S/S SURFACE WATER IMPACTS
TS/TS TEMPORARY SURFACE WATER IMPACTS
F/F FILL IN WETLAND
HC/HC HAND CLEARING (NON-GRUBBING)

ENGLISH

SITE 4

SITE 5

FILL IN WETLAND

PIPE INLET CHANNEL
SEE DETAIL 44

PIPE OUTLET CHANNEL
SEE DETAIL 42

-YILPA- POT Sta. 20+07.52 =
-YI- POC Sta. 29+86.06

-YILPA- SC Sta. 12+05.00

-YILPA- ST Sta. 10+00.00

END SBG (LT)
-YI- +00.00

END SBG (RT)
-YI- +50.00

BEGIN C&G
-L- +35.26

18" w/(2) ELBOWS

18" RCP

78" LRFD BURIED 1.0 FT

FLOWABLE FILL

FLOWABLE FILL

REMOVE

REMOVE 15 LF PIPE

15" w/(2) ELBOWS

BEDSAUL WILLIAM DAVID
DB 1624 PG 797

INV=813.04'

INV=813.07'

INV=814.

INV=807.96

INV=809.34'

INV=809.32'

48" CMP

48" CMP

24" RCP

CONC HW

BM1 #3

60.00

25' (TYP.)

4' LATERAL RIP RAP DITCH
SEE DETAIL 41
25 TON CL B RIP RAP
52 SY GEOTEXTILE
EST. 13 CY DDE

TEMPORARY IMPACTS
IN SURFACE WATER

IMPACTS IN
SURFACE WATER

SEE SHEET 7 OF 29
FOR SITE 3

IMPACTS IN
SURFACE WATER

TEMPORARY IMPACTS
IN SURFACE WATER

SEE SHEET 9 OF 29
FOR SITE 6

BANK STABILIZATION
FOR TEMPORARY DIVERSION
SEE DETAIL 71

PIPE OUTLET CHANNEL STABILIZATION
SEE DETAIL 70

NAD 83/2011

25 12.5 0 25 50
PLANS

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PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	8
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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SHEET 9 OF 29

SURFACE WATER IMPACTS

ENGLISH

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IMPACTS IN SURFACE WATER

IMPACTS IN SURFACE WATER

IMPACTS IN SURFACE WATER

SITE 6

25 12.5 0 25 50
PLANS

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8/17/99

REVISIONS

TEMPORARY IMPACTS IN SURFACE WATER

NOTE:BACKFILL CULVERT WITH CL B RIP RAP TOPPED WITH NATIVE MATERIAL TO SILL/BAFFLE

8' X 7' RCBC

TEMPORARY IMPACTS IN SURFACE WATER

NAD 83/2011

15" W/ (2) ELBOWS

INLET DETAIL SHOWN ON PSH 23

OUTLET DETAIL SHOWN ON PSH 23

BANK STABALIZATION SEE DETAIL 45 135 TONS CL II RIP–RAP

CL I RIP RAP TO EL. 809.8'

CB

F

SBT

TB

JS

S

TS

BANK STABILIZATION SEE DETAIL 45 40 TONS CL II RIP–RAP

SITE 7

BEGIN SBG
–YILPA– +00.00

10 5 0 10 20
PLANS

29-AUG-2024 14:25
R-4045_Fgd_prm_psh_5_Inset5 (Site 7).dgn
hewang

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	8
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
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NC FIRM LICENSE No: P-0339
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(919) 732-3883
(919) 732-6676 (FAX)

PERMIT DRAWING
SHEET 10 OF 29

S S SURFACE WATER IMPACTS

TS TS TEMPORARY SURFACE WATER IMPACTS

ENGLISH

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	8
R/W SHEET NO.	
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PERMIT DRAWING SHEET 11 OF 29

SURFACE WATER IMPACTS

TEMPORARY SURFACE WATER IMPACTS

ENGLISH

NAD 83/2011

8/17/99

REVISIONS

RW CA

C

FS
SEE DETAIL 4

3 TON CL B RIP RAP
7 SY GEOTEXTILE

2GI
3 TON CL B RIP RAP
7 SY GEOTEXTILE

15"

RIP RAP AT EMBANKMENT
SEE DETAIL 46

TO WING WALL
-YIRPA- 18+20.52

TO WING WALL
-YIRPA- 16+79.72

DUE E

C

8%

CAT-1

20+00

END SBG
-YIRPA- +00.00

N 47° 35' 33.4" W

2GI

15" W/ (2) ELBOWS

15" RCP-III

SBG

TYPE B-77
TB 2GI

2 TON CL I RIP RAP
6 SY GEOTEXTILE

SITE 9

TB

JS

SL

TEMPORARY IMPACTS IN SURFACE WATER

F

TYPE B-77

END BRIDGE
-YIRPA- Sta. 18+19+/-

SITE 8

TS

SB

BANK STABILIZATION
SEE DETAIL 45
25 TONS CL II RIP-RAP

TYPE B-77

TB 2GI

BEGIN BRIDGE
-YIRPA- Sta. 16+99+/-

-YIRPA- ST Sta. 16+62.62

IMPACTS IN SURFACE WATER

TEMPORARY IMPACTS IN SURFACE WATER

IMPACTS IN SURFACE WATER

TEMPORARY IMPACTS IN SURFACE WATER

IMPACTS IN SURFACE WATER

TEMPORARY IMPACTS IN SURFACE WATER

IMPACTS IN SURFACE WATER

TEMPORARY IMPACTS IN SURFACE WATER

RIP RAP AT EMBANKMENT
SEE DETAIL 58

TOE PROTECTION
SEE DETAIL 47
135 TONS CLASS B RIP RAP
290 SY GEOTEXTILE

RIP RAP TAIL DITCH
SEE DETAIL 57
35 TONS CL B RIP RAP
52 SY GEOTEXTILE

24" RCP-III

IMPACTS IN SURFACE WATER

TEMPORARY IMPACTS IN SURFACE WATER

SPECIAL MEDIAN DITCH
SEE DETAIL 53

10' PS

24'

4' PS

.02

BM #4

WOODS

20 10 0 20 40
PLANS

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Design

8/17/99

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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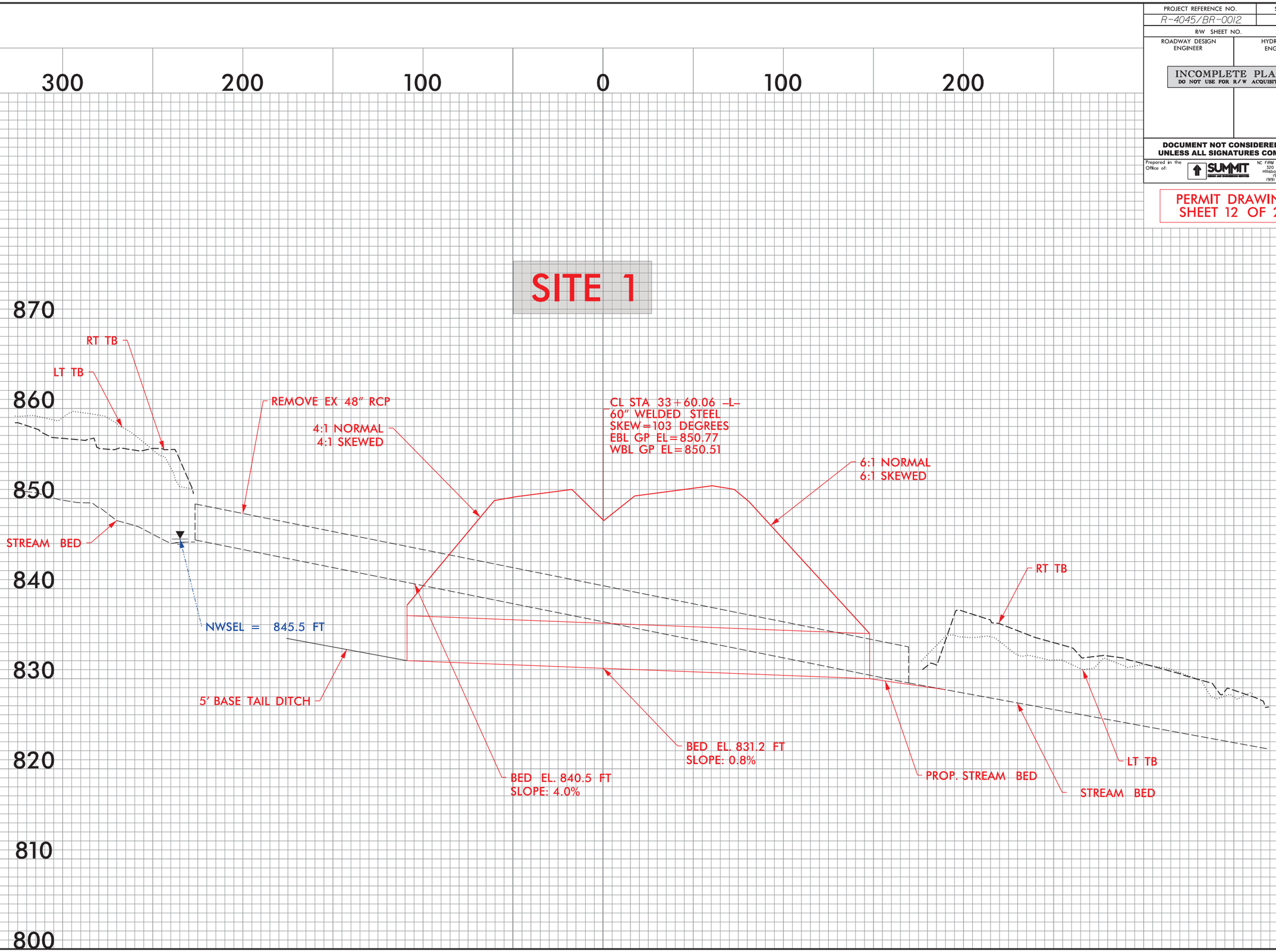
SHEET 12 OF 29

SITE 1



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hewang

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	13
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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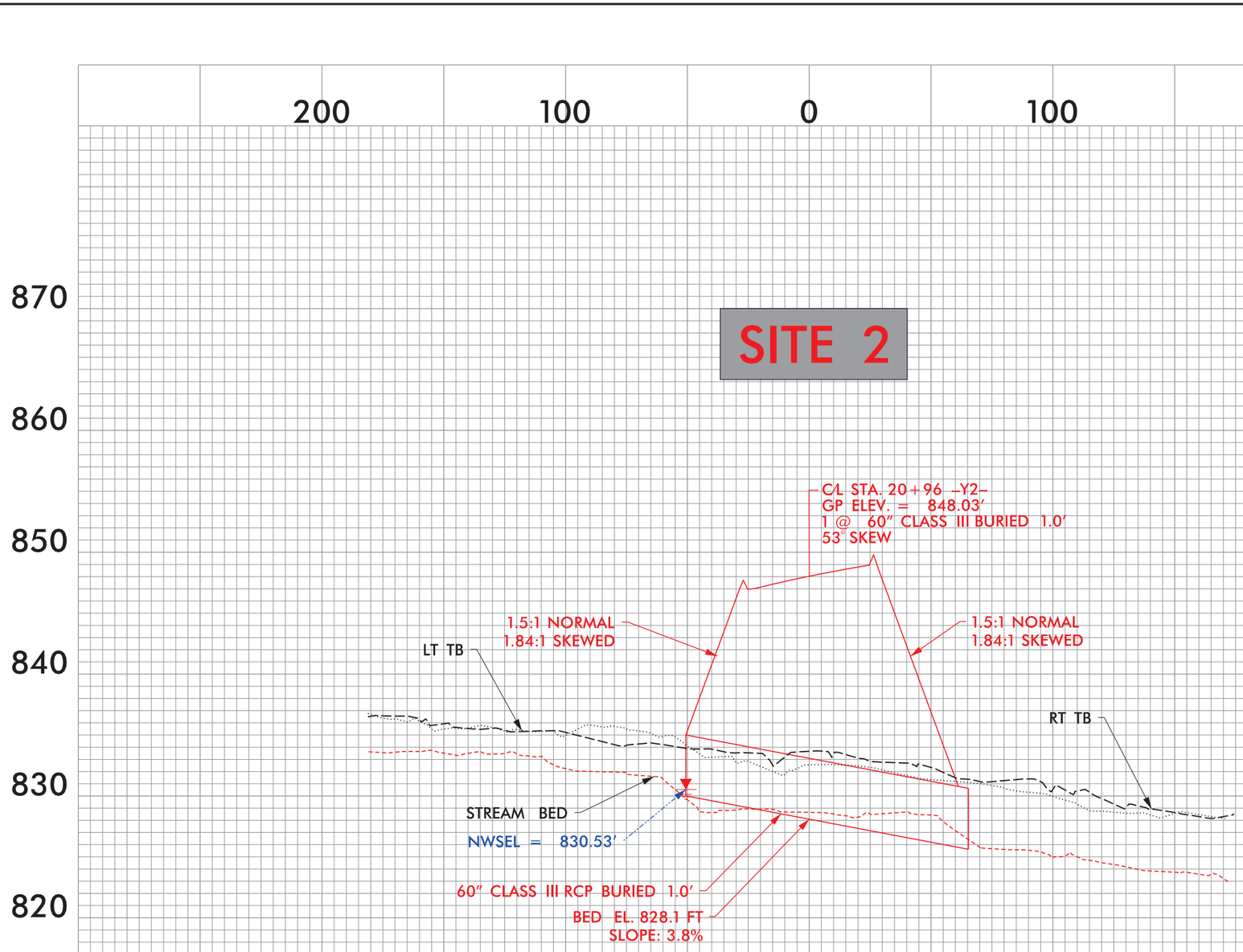
PERMIT DRAWING
SHEET 13 OF 29

REVISIONS

8/17/99

SITE 2



ENGLISH

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bewang

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-64

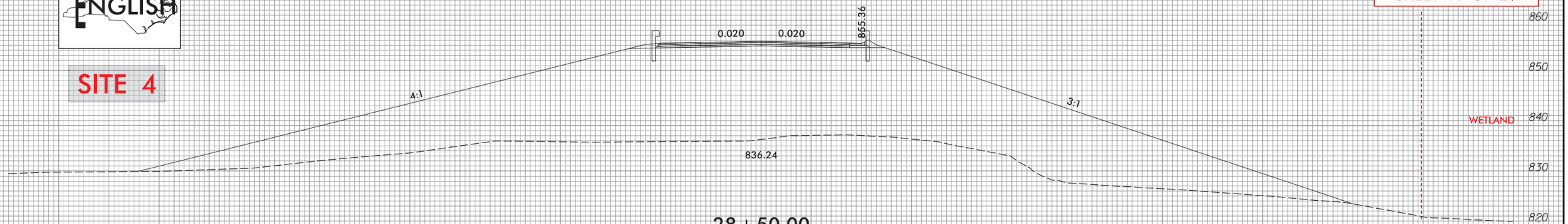
PERMIT DRAWING
SHEET 14 OF 29

ENGLISH

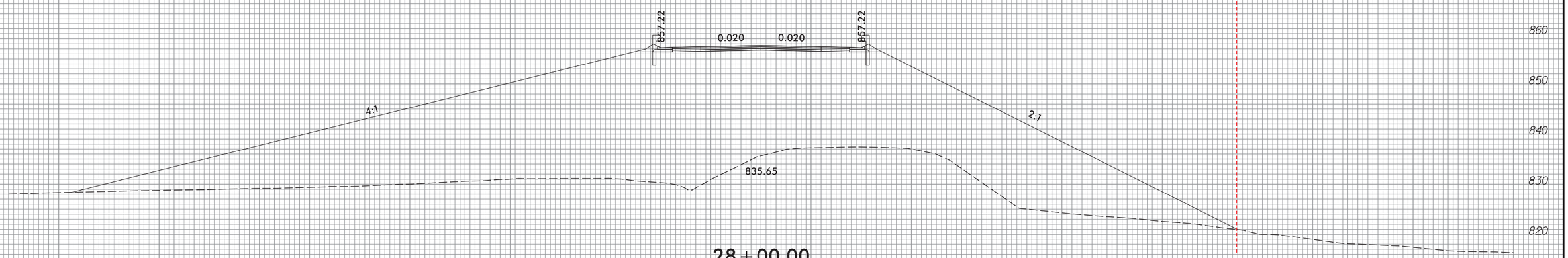
SITE 4

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

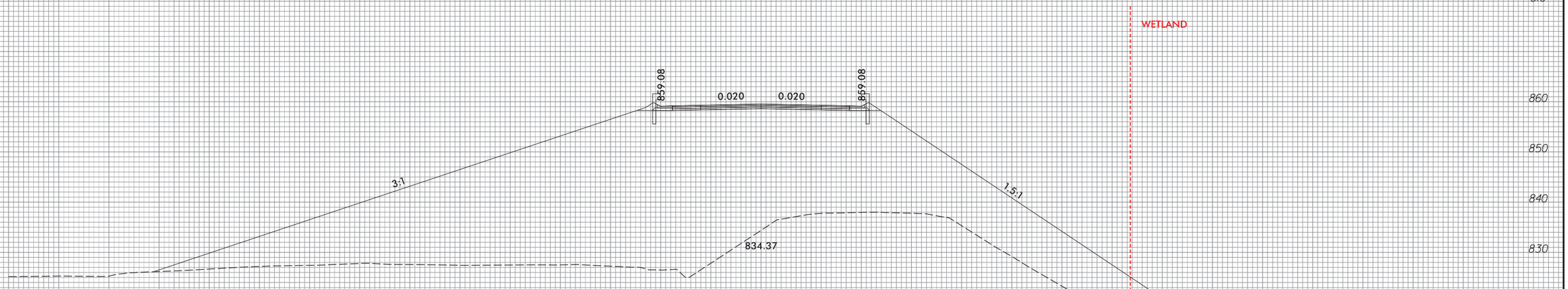
860 850 840 830 820 810



28+50.00



28+00.00



27+50.00

—Y1—

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

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he.jang

8/17/99

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	13
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
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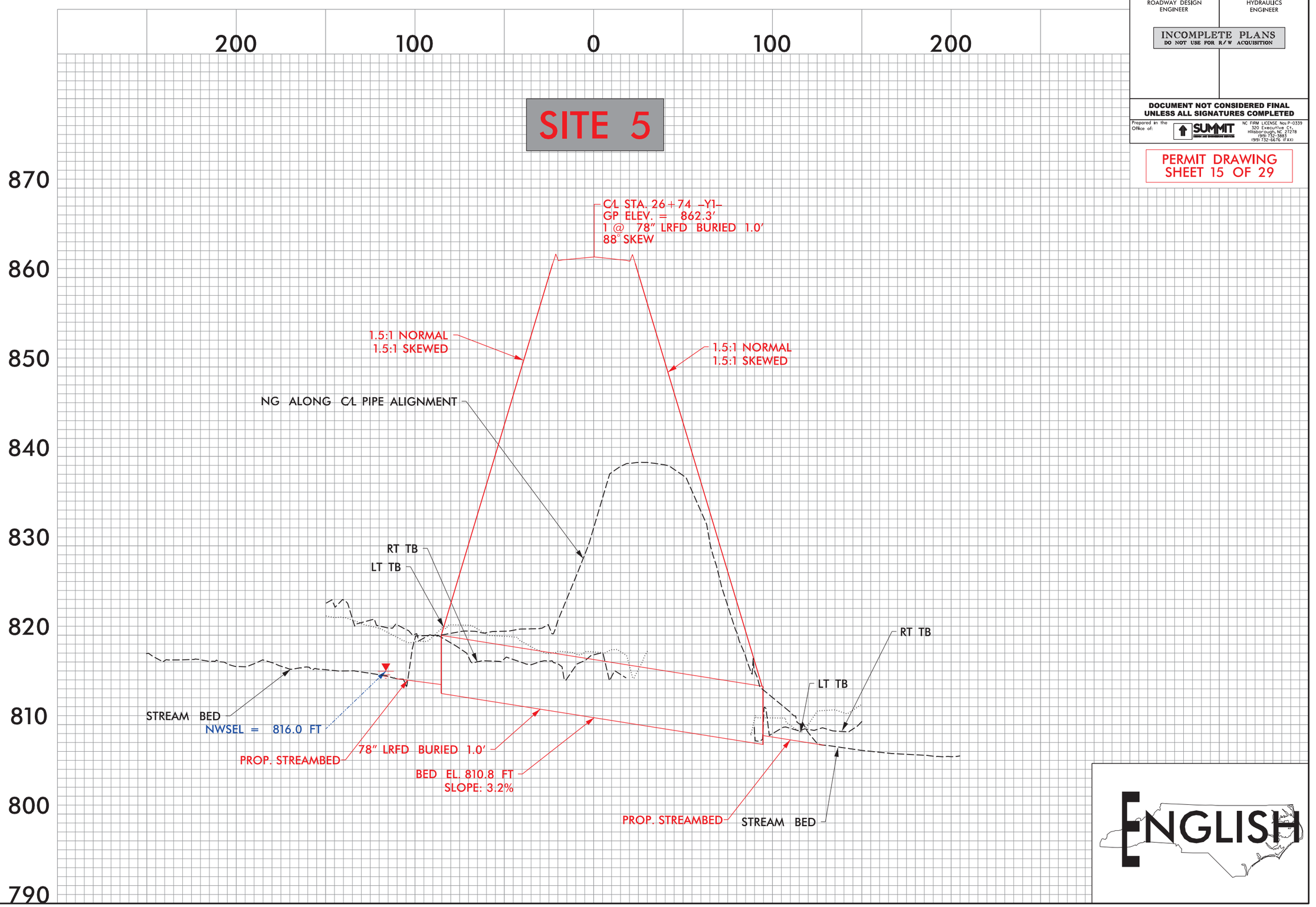
PERMIT DRAWING
SHEET 15 OF 29

SITE 5



ENGLISH

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brwang

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	13
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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PERMIT DRAWING
SHEET 16 OF 29

REVISIONS
8/17/99

SITE 6

300 200 100 0 100 200

870 860 850 840 830 820 810 800 790

–L– –Y1RPD–

℄ STA. 40+05 –L–
1@66" RCP–IV BURIED 1.0'
SKEW = 80°
ELEV. = 841.7'

℄ STA. 19+98 –Y1RPD–
1@54" RCP–IV
SKEW = 135°
ELEV. = 853.6'

NG ALONG C/L PIPE ALIGNMENT

NG ALONG C/L PIPE ALIGNMENT

1.5:1 NORMAL
1.51:1 SKEWED

LT TB

RT TB

4:1 NORMAL
5.7:1 SKEWED

RT TB

LT TB

STREAM BED

RT TB

LT TB

54" RCP–IV

BED EL. 832.2 FT
SLOPE: 6.1%

8' BASE TAIL DITCH

66" RCP–IV BURIED 1.0'

BED EL. 815.5 FT
SLOPE: 5.8%

STREAM BED

ENGLISH

29-AUG-2024 14:25
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hewang

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	13
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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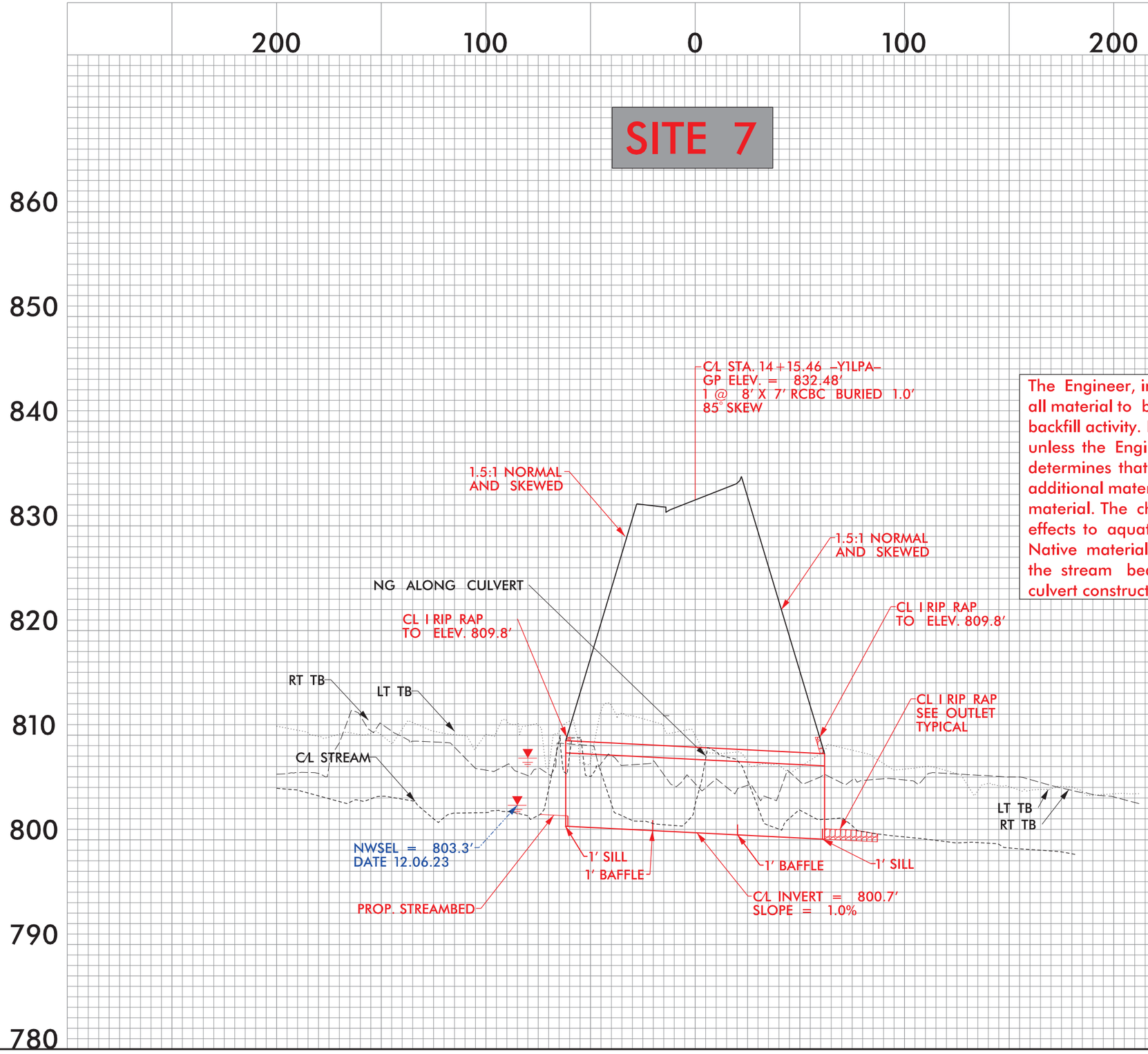
PERMIT DRAWING
SHEET 17 OF 29

REVISIONS 8/17/99

SITE 7



The Engineer, in consultation with DEO staff, shall review all material to be used as backfill prior to conducting the backfill activity. Backfill shall consist of native material only unless the Engineer, in consultation with DEO staff, determines that (1) the native material is unsuitable, or (2) additional material is required to supplement the native material. The chosen backfill material shall not have adverse effects to aquatic life, aquatic life passage, or water quality. Native material consists of material that is excavated from the stream bed or floodplain at the project site during culvert construction.

ENGLISH

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hewang

5/28/99

PERMIT DRAWING
SHEET 18 OF 29

–Y1LPA–

PROJECT REFERENCE NO.	SHEET NO.
R-4045	23
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

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ENGLISH

CULVERT HYDRAULIC DATA

DESIGN DISCHARGE	= 290	CFS
DESIGN FREQUENCY	= 100	YRS
DESIGN HW ELEVATION	= 807.8	FT
BASE DISCHARGE	= 290	CFS
BASE FREQUENCY	= 100	YRS
BASE HW ELEVATION	= 807.8	FT
OVERTOPPING DISCHARGE	= 1300	CFS
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING ELEVATION	= 833.8	FT

BEGIN GRADE –Y1LPA–
STA = 10+00.00
EL = 842.89'

PI = 11+25.00
EL = 840.70'
VC = 100'
K = 92
DS = 50 mph

(–)1.7517%
(–)12.8362%
(–)12.8362%
(+)5.0000%
(+)5.0000%
(+)12.6208%

PROPOSED GRADE

SITE 7

PI = 15+55.00
EL = 828.50'
VC = 300'
K = 38
DS = 30 mph

END GRADE –Y1LPA–
STA = 19+95.31
EL = 850.52'

EXISTING GRADE

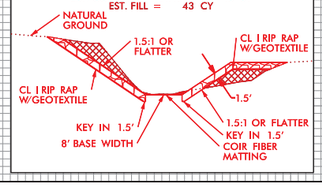
RCP 24" RCP-III

PROP. 8' X 7' RCBC BURIED 1.0'

INLET TYPICAL

NOT TO SCALE (LEFT TO RIGHT LOOKING DOWNSTREAM)

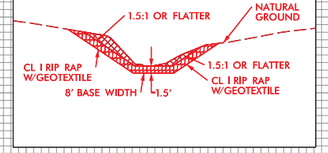
EST TONS CLASS I RIP RAP = 60 TONS
EST. GEOTEXTILE = 94 SY
EST. COIR FIBER MATTING = 15 SY
EST. FILL = 43 CY



OUTLET TYPICAL

NOT TO SCALE (LEFT TO RIGHT LOOKING DOWNSTREAM)

EST CLASS I RIP RAP = 67 TONS
EST. GEOTEXTILE = 119 SY
EST. CUT = 23 CY



PIPE HYDRAULIC DATA

24" RCP-III Sta.18+11 –Y1LPA–

DRAINAGE AREA	= 2.000	AC
DESIGN FREQUENCY	= 100	YRS
DESIGN DISCHARGE	= 6.5	CFS
DESIGN HW ELEVATION	= 836.6	FT
100 YEAR DISCHARGE	= 6.5	CFS
100 YEAR HW ELEVATION	= 836.6	FT
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING DISCHARGE	= 9.0	CFS
OVERTOPPING ELEVATION	= 837.11	FT

FOR –Y1LPA– PLAN SEE SHT. 5

10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00 18+00 19+00 20+00 21+00

880 870 860 850 840 830 820 810 800 790

–Y1RPA–

BRIDGE HYDRAULIC DATA

DESIGN DISCHARGE	= 310	CFS
DESIGN FREQUENCY	= 100	YRS
DESIGN HW ELEVATION	= 792.1	FT
BASE DISCHARGE	= 310	CFS
BASE FREQUENCY	= 100	YRS
BASE HW ELEVATION	= 792.1	FT
OVERTOPPING DISCHARGE	= 21200	CFS
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING ELEVATION	= 815.7	FT
	= _____	FT
DATE OF SURVEY	= 12.06.2023	
W.S.ELEVATION AT DATE OF SURVEY	= 788.5	FT

BEGIN GRADE –Y1RPA–
STA = 10+00.00
EL = 823.82'

PI = 11+55.00
EL = 822.89'
VC = 180'
K = 257
DS = >60 mph

(–)0.6000%
(–)1.3000%
(–)1.3000%
(–)0.8618%

PROPOSED GRADE

SITE 8

PI = 14+30.00
EL = 819.32'
VC = 180'
K = 411
DS = >60 mph

BEGIN BRIDGE –Y1RPA– 16+99 +/–
EL = 817.01'

END BRIDGE –Y1RPA– 18+19 +/–
EL = 815.97'

BEGIN 'A' DITCH W/ HINGE
PI=20+50 –Y1RPA– RT
EL = 812.18 FT

PI = 21+00.00
EL = 813.54'
VC = 510'
K = 97
DS = 50 mph

PI=22+00 –Y1RPA– RT
EL=814.43 FT

(–)0.8618%
(+)1.5000%
(+)4.3988%
(+)14.9000%
(+)14.5000%
(+)8.5000%
(+)19.2000%

WSEL = 788.5 FT
DATE 12.06.2023

NWSEL = 788.9 FT
DATE 12.06.2023

CLASS II
KEYED IN 3.5' (TYP)

BEGIN LATERAL BASE DITCH
STA.18+12
–Y1RPA– RT
EL.790.28

END LATERAL BASE DITCH
STA.20+00 –Y1RPA– RT
EL 807.58'

BEGIN 'A' DITCH
STA.20+00 –Y1RPA– LT
EL.800.95 FT

PI=21+00 –Y1RPA RT–
EL=809.45 FT

LEFT DITCH
RIGHT DITCH

FOR –Y1RPA– PLAN SEE SHT. 5 & 6

10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00 18+00 19+00 20+00 21+00 22+00

890 880 870 860 850 840 830 820 810 800

770 780 790 800 810 820 830 840 850 860

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Revised

6/2/99

PERMIT DRAWING
SHEET 19 OF 29

TS TS TEMPORARY SURFACE WATER IMPACTS

S S SURFACE WATER IMPACTS

50 25 0 50 100
PLANS

ENGLISH

-YIRPA- CURVE DATA

PIs Sta 11+33.38	PI Sta 13+41.97	PIs Sta 15+42.66
Θs = 4° 46' 28.7"	Δ = 13° 29' 39.5" (RT)	Θs = 4° 17' 49.9"
Ls = 200.00'	D = 4° 46' 28.7"	Ls = 180.00'
LT = 133.38'	L = 282.62'	LT = 120.04'
ST = 66.71'	T = 141.97'	ST = 60.03'
	R = 1,200.00'	
	SE = 0.08	
	DS = 60 MPH	

CURVE DATA FOR -L-

PI Sta 58+10.11
Δ = 10° 41' 35.2" (RT)
D = 0° 22' 41.5"
L = 2,827.44'
T = 1,417.84'
R = 15,150.00'
DS = 70 MPH
SE = NC

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	6
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

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Prepared in the Office of: WRA Withers, Ravenel & Associates, LLP, 1201 Edwards Mill Road, Suite 320, Raleigh, NC 27606, (919) 859-0808

-YIRPA- STA. 16+50.00

MATCHLINE -L- STA 50+00.00 (SEE SHEET 5)

MATCHLINE -L- STA 63+00.00 (SEE SHEET 7)

-YIRPA- CS Sta. 14+82.62

-YIRPA- SC Sta. 12+00.00

-YIRPA- ST Sta. 10+00.00

SITE 10

TEMPORARY IMPACTS IN SURFACE WATER

RIP RAP LINE EXISTING DITCH
103 TONS CL I RIP RAP
187 SY GEOTEXTILE

OUTLET ANALYSIS 2B

2' RIP RAP BASE DITCH
SEE DETAIL 12
161 TONS CL B RIP RAP
282 SY GEOTEXTILE

PIPE OUTLET CHANNEL
SEE DETAIL 52

PIPE OUTLET CHANNEL STABILIZATION
SEE DETAIL 66

TOE PROTECTION
SEE DETAIL 47
70 TONS CLASS B RIP RAP
143 SY GEOTEXTILE

TOE PROTECTION
SEE DETAIL 47
70 TONS CLASS B RIP RAP
143 SY GEOTEXTILE

3 TON CL B RIP RAP
10 SY GEOTEXTILE

1 TON CL B RIP RAP
5 SY GEOTEXTILE

PLUG&FILL WITH FLOWABLE FILL

300' TAPER

400' DECELERATION

OUTLET ANALYSIS 2A

END SBG
L=200.00

SPECIAL MEDIAN DITCH
SEE DETAIL 53

BEGIN SBG
-YIRPA- +50.00

PLUG & FILL WITH FLOWABLE FILL

RETAIN IMPACTS IN SURFACE WATER

REMOVE

TRENCHLESS INSTALLATION 54" WELDED STEEL

2' BASE DITCH
SEE DETAIL 11

SPECIAL 'V' DITCH
SEE DETAIL 10

REMOVE JB

REMOVE HW

PLUG&FILL WITH FLOWABLE FILL

-SR2- POT Sta.19+88.29
-L- POC Sta.51+63.98

-SR2- PT Sta. 17+18.09
N 4° 59' 11.0" E (AH)

-SR2- PC Sta. 15+87.47

BEGIN CONSTRUCTION
-SR2- Sta.16+75.00

EXCAVATION

300' LANE DROP

SPECIAL 'V' DITCH
SEE DETAIL 5

SPECIAL 'V' DITCH
SEE DETAIL 2

20 MCCLAIN WILLIAM J
DB 1509 PG 1519
PB 29 PG 141

21 LEDBETTER CLARK W
DB 1483 PG 1007
PB 028 PG 063

17

18 WILLIAMS DONNA E
DB 1029 PG 092
PB 008 PG 022

19 DUNCAN MARGARET H
DB 1005 PG 278

FOR -L- PROFILE, SEE SHEET 18
FOR -Y1RPA- PROFILE, SEE SHEET 23
FOR -SR2- PROFILE, SEE SHEET 27

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bewood

6/2/99

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SHEET 20 OF 29

TS TS TEMPORARY SURFACE WATER IMPACTS

S S SURFACE WATER IMPACTS

50 25 0 50 100
PLANS

ENGLISH

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	6
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

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Prepared in the Office of: WRA Wetherill, Hayworth & Associates, LLP — 1201 Edwards Mill Road, Suite 320, Raleigh, NC 27606, (919) 859-0808

-YIRPA- CURVE DATA

PI Sta 11+33.38
Θs = 4° 46' 28.7"
Ls = 200.00'
LT = 133.38'
ST = 66.71'

PI Sta 13+41.97
Δ = 13° 29' 39.5" (RT)
D = 4° 46' 28.7"
L = 282.62'
T = 141.97'
R = 1,200.00'
SE = 0.08
DS = 60 MPH

PI Sta 15+42.66
Θs = 4° 17' 49.9"
Ls = 180.00'
LT = 420.04'
ST = 60.03'

CURVE DATA FOR -L-

PI Sta 58+10.11
Δ = 10° 41' 35.2" (RT)
D = 0° 22' 41.5"
L = 2,827.44'
T = 1,417.84'
R = 15,150.00'
DS = 70 MPH
SE = NC

-YIRPA- STA. 16+50.00

-YIRPA- CS Sta. 14+82.62

-YIRPA- SC Sta. 12+00.00

-YIRPA- ST Sta. 10+00.90

MATCHLINE -L- STA 50+00.00 (SEE SHEET 5)

MATCHLINE -L- STA 63+00.00 (SEE SHEET 7)

20 MCCLAIN WILLIAM J DB 1509 PG 1519 PB 29 PG 141

21 LEDBETTER CLARK W DB 1483 PG 1007 PB 028 PG 063

17

18 WILLIAMS DONNA E DB 1029 PG 092 PB 008 PG 022

19 DUNCAN MARGARET H DB 1005 PG 278

SITE 10

TEMPORARY IMPACTS IN SURFACE WATER

RETAIN IMPACTS IN SURFACE WATER

RIP RAP LINE EXISTING DITCH
103 TONS CL B RIP RAP
187 SY GEOTEXTILE

2' RIP RAP BASE DITCH
SEE DETAIL 12
161 TONS CL B RIP RAP
282 SY GEOTEXTILE

OUTLET ANALYSIS 2B

OUTLET ANALYSIS 2A

PIPE OUTLET CHANNEL
SEE DETAIL 52

PIPE OUTLET CHANNEL STABILIZATION
SEE DETAIL 66

TOE PROTECTION
SEE DETAIL 47
70 TONS CLASS B RIP RAP
143 SY GEOTEXTILE

3 TON CL B RIP RAP
10 SY GEOTEXTILE

1 TON CL B RIP RAP
5 SY GEOTEXTILE

PLUG&FILL WITH FLOWABLE FILL

300' TAPER

400' DECELERATION

300' LANE DROP

SPECIAL MEDIAN DITCH
SEE DETAIL 53

SPECIAL 'V' DITCH
SEE DETAIL 5

SPECIAL 'V' DITCH
SEE DETAIL 10

2' BASE DITCH
SEE DETAIL 11

TRENCHLESS INSTALLATION
54" WELDED STEEL

EXCAVATION

PLUG & FILL WITH FLOWABLE FILL
SEE DETAIL 3

REMOVE DI

REMOVE

REMOVE JB

REMOVE HW

-SR2- POT Sta.19+88.29
-L- POC Sta.51+63.98

BEGIN CONSTRUCTION
-SR2- Sta.16+75.00

-SR2- PT Sta. 17+18.09
N 4° 59' 11.0" E (AH)

-SR2- PC Sta. 15+87.47

-SR2- +40.00
R = 30'

-SR2- +00.00

FOR -L- PROFILE, SEE SHEET 18
FOR -Y1RPA- PROFILE, SEE SHEET 23
FOR -SR2- PROFILE, SEE SHEET 27

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PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

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Prepared in the Office of:
SUMMIT DESIGN AND ENGINEERING SERVICES
NC FIRM LICENSE No: P-0339
320 Executive Ct.
Hillsborough, NC 27278
(919) 732-3883
(919) 732-6676 (FAX)

PERMIT DRAWING
SHEET 21 OF 29

SITE 10

200 100 0 100 200

840
830
820
810
800
790
780
770

CL STA 55+09.10 –L–
EXIST 48" RCP
SKEW=108 DEGREES
EBL GP EL=822.42
WBL GP EL=823.49

4:1 NORMAL
4:1 SKEWED

1.5:1 NORMAL
1.5:1 SKEWED

LT TB
RT TB
STREAM BED
NWSEL = 792.4 FT
PROP. 54"
BED EL. 787.1 FT
SLOPE: 3.5%
BED EL. 783.9 FT
SLOPE: 4.6%
LT TB
RT TB
BED EL. 781.2 FT
SLOPE: 0.9%
48" EXTENSION
STREAM BED

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PERMIT DRAWING
SHEET 22 OF 29

S S SURFACE WATER IMPACTS

TS TS TEMPORARY SURFACE WATER IMPACTS

50 25 0 50 100

PLANS

ENGLISH

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	8
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

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Prepared in the Office of: SUMMIT Design and Engineering Services — NC FIRM LICENSE Nos P-0339, 320 Executive Ct., Hillsborough, NC 27278, (919) 732-3883, (919) 732-6676 (FAX)

Prepared in the Office of: WRA Wilson, Ray & Associates, LLP — 1201 Edwards Mill Road, Suite 320, Raleigh, NC 27606, (919) 859-0808

MATCHLINE –L– STA 76+00.00 (SEE SHEET 7)

MATCHLINE –L– STA 89+00.00 (SEE SHEET 9)

BEGIN BRIDGE WB
–L– Sta.80+09.34

END BRIDGE WB
–L– Sta.82+41.67

–L– TS Sta. 87+04.75

BEGIN BRIDGE EB
–L– Sta.80+03.83

END BRIDGE EB
–L– Sta.82+36.17

SITE 11

SANDY RUN CREEK

SANDY RUN CREEK

SMITH RONNIE FRANKLIN
DB 1690 PG 2056

WORD OF TRUTH FELLOWSHIP
DB 1172 PG 2468

PARKER DALE LEE
DB 1723 PG 0963

BPB REALTY LLC
DB 1496 PG 893

STREFEZZA JOSEPH M
DB 1531 PG 1164

BAYER ROBERT WILLIAM
DB 1846 PG 2126
PB 029 PG 140

DAVIS RENTALS OF SHELBY LLC
DB 1700 PG 0431

CLARK RICHARD EUGENE
DB 1409 PG 1490

MCBRAYER DAVID
DB 1534 PG 1010

END NOISE WALL & SF BARRIER
–L– STA 77+82.00, 74' RT

SINGLE FACE CONC. BARRIER

PROP. NOISE WALL

TIE FENCE TO BRIDGE

REMOVE FENCE

REMOVE & RESET EXIST FENCE

TIE TO EXISTING FENCE

TIE TO PROP FENCE

RETAIN FENCE

PROPOSED CABLE GUIDERAIL

BEGIN CABLE GUIDERAIL

IMPACTS IN SURFACE WATER

TEMPORARY IMPACTS IN SURFACE WATER

2' RIP RAP BASE DITCH SEE DETAIL 14
2 TONS CL B RIP RAP
7 SY GEOTEXTILE
23 TONS CL B RIP RAP
71 SY GEOTEXTILE

OUTLET ANALYSIS 4

FILL DITCH TO NATURAL GROUND

DITCH FILL LIMIT

57 TONS CL B RIP RAP
186 SY GEOTEXTILE

6' RIP RAP BASE DITCH SEE DETAIL 13
106 TONS CL I RIP RAP
192 SY GEOTEXTILE

10' RIP RAP BASE DITCH SEE DETAIL 15
155 TONS CL I RIP RAP
382 SY GEOTEXTILE

BANK STABILIZATION SEE DETAIL 16

1' WIDTH BERM TOB = 780.0'

1' WIDTH BERM TOB = 766.0'

PLUG & FILL WITH FLOWABLE FILL

REMOVE DI

REMOVE

RETAIN

SPECIAL 'V' DITCH SEE DETAIL 5

TONS CL B RIP RAP SY GEOTEXTILE

Other, Unk. S/M, Cleveland County Water

AT&T Corp., Unk. S/M, AATUR

US 74 WB /ANDREW JACKSON HWY/ WEST DIXON BLVD 38.5' BST

US 74 EB /ANDREW JACKSON HWY/ WEST DIXON BLVD 37.5' BST

SR 1163 BROADWAY RD 20' BST

Other, 8 " PVC, Cleveland County Water (S/M from Records)

Other, PVC, (approx. 4") Conduits attached to bridge (S/M from Records) Indicate lines here.

S 64° 20' 15.4" E

L +88.01
118.40' RT

L +10.85
131.82' RT

51.25' (TYP)

CURVE DATA FOR –MUP–

PI Sta 12+72.20	PI Sta 12+71.37	PI Sta 14+13.23	PI Sta 15+06.06	PI Sta 15+75.51	PI Sta 16+20.74	PI Sta 16+64.47	PI Sta 17+68.07
Δ = 159° 10' 58.7" (LT)	Δ = 120° 57' 43.3" (RT)	Δ = 114° 13' 06.4" (LT)	Δ = 76° 39' 29.3" (RT)	Δ = 41° 29' 15.5" (LT)	Δ = 51° 34' 08.2" (RT)	Δ = 52° 22' 55.9" (RT)	Δ = 5° 53' 34.8" (RT)
D = 114° 35' 29.6"	D = 76° 23' 39.7"	D = 76° 23' 39.7"	D = 76° 23' 39.7"	D = 76° 23' 39.7"	D = 143° 14' 22.0"	D = 104° 10' 26.9"	D = 22° 55' 05.9"
L = 138.91'	L = 158.34'	L = 149.51'	L = 100.35'	L = 54.31'	L = 36.00'	L = 50.28'	L = 25.71'
T = 272.20'	T = 132.46'	T = 115.97'	T = 59.29'	T = 28.41'	T = 19.32'	T = 27.05'	T = 12.87'
R = 50.00'	R = 75.00'	R = 75.00'	R = 75.00'	R = 75.00'	R = 40.00'	R = 55.00'	R = 250.00'

CURVE DATA FOR –L–

PIs Sta 88+41.42	PI Sta 92+99.72
Θs = 1° 09' 46.6"	Δ = 8° 49' 52.4" (LT)
Ls = 205.00'	D = 1° 08' 04.5"
LT = 136.67'	L = 778.38'
ST = 68.34'	T = 389.96'
	R = 5,050.00'
	DS = 70 MPH
	SE = 0.04

CURVE DATA FOR –MUP–

PI Sta 17+94.31	PI Sta 19+07.39	PI Sta 19+92.93	PI Sta 21+20.86	PI Sta 21+72.46	PI Sta 22+29.53	PI Sta 23+24.21	PI Sta 23+71.18
Δ = 6° 07' 53.1" (LT)	Δ = 100° 18' 24.7" (RT)	Δ = 12° 23' 53.0" (LT)	Δ = 4° 34' 47.6" (RT)	Δ = 26° 26' 45.5" (LT)	Δ = 21° 58' 07.1" (RT)	Δ = 3° 26' 01.1" (RT)	Δ = 5° 15' 54.1" (LT)
D = 22° 55' 05.9"	D = 190° 59' 09.4"	D = 9° 01' 22.6"	D = 28° 38' 52.4"	D = 7° 37' 11.0"	D = 7° 37' 11.0"	D = 14° 19' 26.2"	D = 19° 05' 54.9"
L = 26.75'	L = 52.52'	L = 137.41'	L = 15.99'	L = 36.93'	L = 30.67'	L = 23.97'	L = 27.57'
T = 13.39'	T = 35.95'	T = 68.97'	T = 8.00'	T = 18.80'	T = 15.53'	T = 11.99'	T = 13.79'
R = 250.00'	R = 30.00'	R = 635.00'	R = 200.00'	R = 80.00'	R = 80.00'	R = 400.00'	R = 300.00'

FOR –L– PROFILE, SEE SHEET 20
FOR –MUP– PROFILE, SEE SHEET 29

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PERMIT DRAWING
SHEET 23 OF 29

S S SURFACE WATER IMPACTS

TS TS TEMPORARY SURFACE WATER IMPACTS

50 25 0 50 100
PLANS

ENGLISH

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	8
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared in the Office of: SUMMIT Design and Engineering Services — NC FIRM LICENSE Nos P-0339, 320 Executive Ct, Hillsborough, NC 27278, (919) 732-3883, (919) 732-6676 (FAX)

Prepared in the Office of: WRA Wilson, Ray & Associates, LLP — 1201 Edwards Mill Road, Suite 320, Raleigh, NC 27606, (919) 859-0808

MATCHLINE –L– STA 76+00.00 (SEE SHEET 7)

MATCHLINE –L– STA 89+00.00 (SEE SHEET 9)

SITE 11

BEGIN BRIDGE WB -L- Sta.80+09.34

END BRIDGE WB -L- Sta.82+41.67

BEGIN BRIDGE EB -L- Sta.80+03.83

END BRIDGE EB -L- Sta.82+36.17

-L- TS Sta. 87+04.75

BEGIN CABLE GUIDERAIL

END NOISE WALL & SF BARRIER -L- STA.77+82.00,74' RT

SINGLE FACE CONC. BARRIER & PROP. NOISE WALL

PROPOSED CABLE GUIDERAIL

TIE FENCE TO BRIDGE

REMOVE & RESET EXIST FENCE

TIE TO EXISTING FENCE

TIE TO PROP FENCE

REMOVE FENCE

RETAIN FENCE

IMPACTS IN SURFACE WATER

TEMPORARY IMPACTS IN SURFACE WATER

SANDY RUN CREEK

WORD OF TRUTH FELLOWSHIP DB 1172 PG 2468

SMITH RONNIE FRANKLIN DB 1690 PG 2056

PARKER DALE LEE DB 1723 PG 0963

BPB REALTY LLC DB 1496 PG 893

DAVIS RENTALS OF SHELBY LLC DB 1700 PG 0431

BAYER ROBERT WILLIAM DB 1846 PG 2126 PB 029 PG 140

STREFEZZA JOSEPH M DB 1531 PG 1164

CLARK RICHARD EUGENE DB 1409 PG 1490

MCBRAYER DAVID DB 1534 PG 1010

US 74 WB /ANDREW JACKSON HWY/ WEST DIXON BLVD 38.5' BST

US 74 EB /ANDREW JACKSON HWY/ WEST DIXON BLVD 37.5' BST

SR 1163 BROADWAY RD 20' BST

Other, Unk. S/M, Cleveland County Water

AT&T Corp., Unk. S/M, AATUR

CURVE DATA FOR -MUP-

PI Sta 12+72.20	PI Sta 12+91.37	PI Sta 14+13.23	PI Sta 15+06.06	PI Sta 15+75.51	PI Sta 16+20.74	PI Sta 16+64.47	PI Sta 17+68.07
Δ = 159° 10' 58.7" (LT)	Δ = 120° 57' 43.3" (RT)	Δ = 114° 13' 06.4" (LT)	Δ = 76° 39' 29.3" (RT)	Δ = 41° 29' 15.5" (LT)	Δ = 51° 34' 08.2" (RT)	Δ = 52° 22' 55.9" (RT)	Δ = 5° 53' 34.8" (RT)
D = 114° 35' 29.6"	D = 76° 23' 39.7"	D = 76° 23' 39.7"	D = 76° 23' 39.7"	D = 76° 23' 39.7"	D = 143° 14' 22.0"	D = 104° 10' 26.9"	D = 22° 55' 05.9"
L = 138.91'	L = 158.34'	L = 149.51'	L = 100.35'	L = 54.31'	L = 36.00'	L = 50.28'	L = 25.71'
T = 272.20'	T = 132.46'	T = 115.97'	T = 59.29'	T = 28.41'	T = 19.32'	T = 27.05'	T = 12.87'
R = 50.00'	R = 75.00'	R = 75.00'	R = 75.00'	R = 75.00'	R = 40.00'	R = 55.00'	R = 250.00'

CURVE DATA FOR -MUP-

PI Sta 17+94.31	PI Sta 19+07.39	PI Sta 19+92.93	PI Sta 21+20.86	PI Sta 21+72.46	PI Sta 22+29.53	PI Sta 23+24.21	PI Sta 23+71.18
Δ = 6° 07' 53.1" (LT)	Δ = 100° 18' 24.7" (RT)	Δ = 12° 23' 53.0" (LT)	Δ = 4° 34' 47.6" (RT)	Δ = 26° 26' 45.5" (LT)	Δ = 21° 58' 07.1" (RT)	Δ = 3° 26' 01.1" (RT)	Δ = 5° 15' 54.1" (LT)
D = 22° 55' 05.9"	D = 190° 59' 09.4"	D = 9° 01' 22.6"	D = 28° 38' 52.4"	D = 71° 37' 11.0"	D = 71° 37' 11.0"	D = 14° 19' 26.2"	D = 19° 05' 54.9"
L = 26.75'	L = 52.52'	L = 137.41'	L = 15.99'	L = 36.93'	L = 30.67'	L = 23.97'	L = 27.57'
T = 13.39'	T = 35.95'	T = 68.97'	T = 8.00'	T = 18.80'	T = 15.53'	T = 11.99'	T = 13.79'
R = 250.00'	R = 30.00'	R = 635.00'	R = 200.00'	R = 80.00'	R = 80.00'	R = 400.00'	R = 300.00'

CURVE DATA FOR -L-

PIs Sta 88+41.42	PI Sta 92+99.72
Δs = 1° 09' 46.6"	Δ = 8° 43' 52.4" (LT)
Ls = 205.00'	D = 1° 08' 04.5"
LT = 136.67'	L = 778.38'
ST = 68.34'	T = 389.96'
	R = 5,050.00'
	DS = 70 MPH
	SE = 0.04

FOR –L– PROFILE, SEE SHEET 20
FOR –MUP– PROFILE, SEE SHEET 29

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PROJECT REFERENCE NO.	SHEET NO.
R-4045	20
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 24 OF 29

–L– (EB)

SITE 11

PI = 80+35.00
EL = 765.15'
VC = 1600'
K = 182
DS = 70 MPH

PROPOSED GRADE

(–)3.42627%

(–)4.87701%

(–)14.0000%

(+)14.8000%

(–)0.5000%

(+)14.8000%

EXISTING GRADE

–MUP–

END DITCH GRADE
STA.77+00.00 –L– RT
EL.774.96 FT
BEGIN 24" CSP

BEGIN DITCH GRADE
STA.77+48.00 –L– RT
EL.773.29 FT
END 24" CSP

TRANSITION FROM 6' BASE DITCH TO 10' BASE DITCH STA. 79+00 TO STA. 80+00 –L– RT

PI =80+00.00 –L– RT
EL = 761.00 FT

END DITCH GRADE
STA.80+50.00 –L– RT
EL.760.75 FT

NWSEL = 742.54 FT
DATE 11.16.2023

BRIDGE HYDRAULIC DATA

DESIGN DISCHARGE	= 8,790	CFS
DESIGN FREQUENCY	= 100	YRS
DESIGN HW ELEVATION	= 760.8	FT
BASE DISCHARGE	= 8,790	CFS
BASE FREQUENCY	= 100	YRS
BASE HW ELEVATION	= 760.8	FT
OVERTOPPING DISCHARGE	= 51,600	CFS
OVERTOPPING FREQUENCY	= > 500	YRS
OVERTOPPING ELEVATION	= 782.6	FT
500 YEAR DISCHARGE	= 12,490	CFS
500 YEAR HW ELEVATION	= 763.5	FT
DATE OF SURVEY	= 11.16.2023	
W.S.ELEVATION AT DATE OF SURVEY	= 742.54	FT

FOR –L– PLAN SEE SHT. 8

730 740 750 760 770 780 790 800 810 820 830

76+00 77+00 78+00 79+00 80+00 81+00 82+00 83+00 84+00 85+00 86+00 87+00 88+00 89+00

–L– (WB)

SITE 11

PI = 81+00.00
EL = 760.81'
VC = 1710'
K = 182
DS = 70 MPH

PROPOSED GRADE

(–)14.0000%

EXISTING GRADE

(–)14.0000%

(+)5.4050%

(+)15.4050%

(+)9.0909%

–MUP–

BEGIN DITCH GRADE
STA.82+65.00 –L– LT
EL.767.00 FT

END DITCH GRADE
STA.85+20.00 –L– LT
EL.772.00 FT

NWSEL = 742.75 FT
DATE 11.16.2023

BRIDGE HYDRAULIC DATA

DESIGN DISCHARGE	= 8,790	CFS
DESIGN FREQUENCY	= 100	YRS
DESIGN HW ELEVATION	= 761.2	FT
BASE DISCHARGE	= 8,790	CFS
BASE FREQUENCY	= 100	YRS
BASE HW ELEVATION	= 761.2	FT
OVERTOPPING DISCHARGE	= 41,800	CFS
OVERTOPPING FREQUENCY	= > 500	YRS
OVERTOPPING ELEVATION	= 780.5	FT
500 YEAR DISCHARGE	= 12,490	CFS
500 YEAR HW ELEVATION	= 763.9	FT
DATE OF SURVEY	= 11.16.2023	
W.S.ELEVATION AT DATE OF SURVEY	= 742.75	FT

LEFT DITCH

RIGHT DITCH

FOR –L– PLAN SEE SHT. 8

730 740 750 760 770 780 790 800 810

76+00 77+00 78+00 79+00 80+00 81+00 82+00 83+00 84+00 85+00 86+00 87+00 88+00 89+00

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6/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	13
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

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Prepared in the Office of: WRA Withers, Ravenel & Associates, LLP — 1201 Edwards Mill Road, Suite 320, Raleigh, NC 27606, (919) 859-0808

MATCHLINE -SR1- STA 22+50.00 (SEE SHEET 12)

-SR2- PT Sta. 15+13.12
N 44° 47' 41.0" E (AH)

-SR2- PC Sta. 13+98.22

-SR2- CURVE DATA
PI Sta 14+55.98
Δ = 14° 31' 57.1" (RT)
D = 12° 38' 53.1"
L = 114.90'
T = 57.76'
R = 453.00'

END CONSTRUCTION
-SR2- Sta. 12+15.00

-SR1- POT Sta. 34+13.20

END CONSTRUCTION
-SR1- Sta. 32+20.00

END GRADE
-SR1- Sta. 32+00.00

-SR1- CURVE DATA

PI Sta 20+36.18	PI Sta 28+04.67
Δ = 38° 26' 03.9" (RT)	Δ = 26° 04' 45.5" (LT)
D = 6° 15' 42.6"	D = 11° 48' 48.8"
L = 613.79'	L = 220.76'
T = 318.94'	T = 112.32'
R = 915.00'	R = 485.00'
SE = 0.05	SE = 0.06
RO = 105'	RO = 126'
DS = 40 MPH	DS = 40 MPH

-SR1- PT Sta. 23+31.03

-SR2- POT Sta. 10+00.00 = -SR1- POT Sta. 24+97.66

-SR1- PC Sta. 26+92.35

-SR1- PT Sta. 29+13.11
END PVMT./BEGIN ABC

SITE 12

17 CORNERSTONE BAPTIST CHURCH INC DB 1402 PG 2149

ROBBINS NICHOLAS A DB 1861 PG 2891

CAMPBELL MARJORIE DB 1269 PG 1799

DUNCAN MARGARET H DB 1005 PG 276

DUNCAN MARGARET H DB 1005 PG 278

21 LEDBETTER CLARK W DB 1483 PG 1007 PB 028 PG 063

22

23

24 WILLIAMS DONNA E DB 1474 PG 15

BALDWIN GINGER ATKINS DB 1427 PG 281

SPECIAL BASE DITCH SEE DETAIL 61 215 SY PSRM

SPECIAL BASE DITCH SEE DETAIL 11

SPECIAL 'V' DITCH SEE DETAIL 10

3 TONS CL B RIP RAP 10 SY GEOTEXTILE OUTLET ANALYSIS 1310 & 1314

PIPE OUTLET CHANNEL STABILIZATION SEE DETAIL 28

TEMPORARY STREAM IMPACT

HAND CLEARING

PERMANENT STREAM IMPACT

SPECIAL BASE DITCH 147 TONS CL B RIP RAP 325 SY GEOTEXTILE SEE DETAIL 20

LATERAL BASE DITCH 12 TONS CL B RIP RAP 25 SY GEOTEXTILE SEE DETAIL 62 EST 40 CY DDE

BANK STABILIZATION SEE DETAIL 29

LATERAL BASE DITCH 39 TONS CL B RIP RAP 156 SY GEOTEXTILE SEE DETAIL 39 EST 105 CY DDE

BANK STABILIZATION SEE DETAIL 30

SPECIAL BASE DITCH 62 TONS CL B RIP RAP 137 SY GEOTEXTILE SEE DETAIL 21

SOIL DRIVE WIDTH VARIES

SR 1167 E. MAIN ST. 17.5' BST

AT&T Corp.

50 25 0 50 100

PLANS

TS TS	TEMPORARY SURFACE WATER IMPACTS
S S	SURFACE WATER IMPACTS
F F	FILL IN WETLAND
HC HC	HAND CLEARING (NON-GRUBBING)

PERMIT DRAWING SHEET 25 OF 29

FOR -SR1- PROFILE, SEE SHEET 26
FOR -SR2- PROFILE, SEE SHEET 27

ENGLISH

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PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	13
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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Prepared in the Office of: WRA Infrastructure Engineers & Surveyors, LLP, 2201 Gordards Mill Road, Suite 320, Roxboro, NC 27573, (919) 859-0809

MATCHLINE –SR1– STA 22+50.00 (SEE SHEET 12)

ROBBINS NICHOLAS A DB 1861 PG 289

CAMPBELL MARJORIE DB 1269 PG 1799

CORNERSTONE BAPTIST CHURCH INC DB 1402 PG 249

DUNCAN MARGARET H DB 1005 PG 278

DUNCAN MARGARET H DB 1005 PG 276

LEDBETTER-CLARK W DB 1483 PG 1007 PB 028 PG 063

WILLIAMS DONNA E DB 1474 PG 15

BALDWIN GINGER ATKINS DB 1427 PG 281

–SR2– PT Sta. 15+13.12
N 44° 47' 41.0" E (AH)

–SR2– PC Sta. 13+98.22

–SR2– CURVE DATA
PI Sta 14+55.98
Δ = 14° 31' 57" (RT)
D = 12° 38' 53"
L = 114.90'
T = 57.76'
R = 453.00'

END CONSTRUCTION
–SR2– Sta. 12+15.00

–SR1– POT Sta. 34+13.20

END CONSTRUCTION
–SR1– Sta. 32+20.00

END GRADE
–SR1– Sta. 32+00.00

–SR1– CURVE DATA

PI Sta 20+36.18	PI Sta 28+64.67
Δ = 38° 26' 03.9" (RT)	Δ = 26° 04' 45.5" (LT)
D = 6° 15' 42.5"	D = 11° 48' 48.8"
L = 613.79'	L = 220.76'
T = 318.94'	T = 112.32'
R = 918.00'	R = 485.00'
SE = 0.05	SE = 0.06
RO = 105°	RO = 126°
DS = 40 MPH	DS = 40 MPH

–SR1– PT Sta. 23+31.03

–SR2– POT Sta. 10+00.00 =
–SR1– POT Sta. 24+97.66

–SR1– PC Sta. 26+92.35

–SR1– PT Sta. 29+13.11
END PVMT./BEGIN ABC

SITE 12

BEGIN SBG –SR2– +50.00

END SBG –SR1– +00.00

BEGIN SBG –SR1– +00.00

END SBG –SR1– +00.00

SPECIAL 'V' DITCH SEE DETAIL 10

SPECIAL BASE DITCH SEE DETAIL 11

SPECIAL BASE DITCH SEE DETAIL 61 215 SY PSRM

SPECIAL BASE DITCH 147 TONS CL B RIP RAP 325 SY GEOTEXTILE SEE DETAIL 20

SPECIAL BASE DITCH 62 TONS CL B RIP RAP 137 SY GEOTEXTILE SEE DETAIL 21

LATERAL BASE DITCH 12 TONS CL B RIP RAP 25 SY GEOTEXTILE SEE DETAIL 62 EST 40 CY DDE

LATERAL BASE DITCH 39 TONS CL B RIP RAP 156 SY GEOTEXTILE SEE DETAIL 39 EST 105 CY DDE

BANK STABILIZATION SEE DETAIL 29

BANK STABILIZATION SEE DETAIL 30

8 TONS CL B RIP RAP 10 SY GEOTEXTILE OUTLET ANALYSIS (310 & 1314 SEE DETAIL 28

PIPE OUTLET CHANNEL STABILIZATION

TEMPORARY STREAM IMPACT

HAND CLEARING

PERMANENT STREAM IMPACT

TEMPORARY STREAM IMPACT

18" RCP-IV

18" RCP-III 80' TRANSITION

HWD=0.42

HWD=0.34

HW

JB w/MH

S 63° 30' 49.7" E 4 FDPS

S 89° 35' 35.2" E 30+00

S 71°34'45" E 150.47'

N 72°22'05" W 157.33'

N 30° 15' 43.3" E

S 74°44'19" E 654.31'

S 10°44'58" E 652.62'

S 13° 26' 26" E 475'

50 25 0 50 100

PLANS

TS TS TEMPORARY SURFACE WATER IMPACTS

S S SURFACE WATER IMPACTS

F F FILL IN WETLAND

HC HC HAND CLEARING (NON-GRUBBING)

PERMIT DRAWING SHEET 26 OF 29

FOR –SR1– PROFILE, SEE SHEET 26
FOR –SR2– PROFILE, SEE SHEET 27

ENGLISH

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REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	13
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared in the Office of: SUMMIT DESIGN AND ENGINEERING SERVICES
NC FIRM LICENSE No: P-0339
320 Executive Ct.
Hillsborough, NC 27278
(919) 732-3883
(919) 732-6676 (FAX)

PERMIT DRAWING
SHEET 27 OF 29

200 100 0 100 200

SITE 12

℄ STA. 26+34 –SR1–
1@'xx 60" RCP–IV BURIED 1.0'
SKEW = 90°
ELEV. = 852.2'

870
860
850
840
830
820
810
800
790

2:1 NORMAL
2:1 NORMAL
NG ALONG C/L PIPE ALIGNMENT
RT TB
LT TB
RT TB
LT TB
NWSEL = 818.6'
STREAM BED
60" RCP–IV BURIED 1.0'
BED EL. 819.9 FT
SLOPE: 2.6%

ENGLISH

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6/23/16

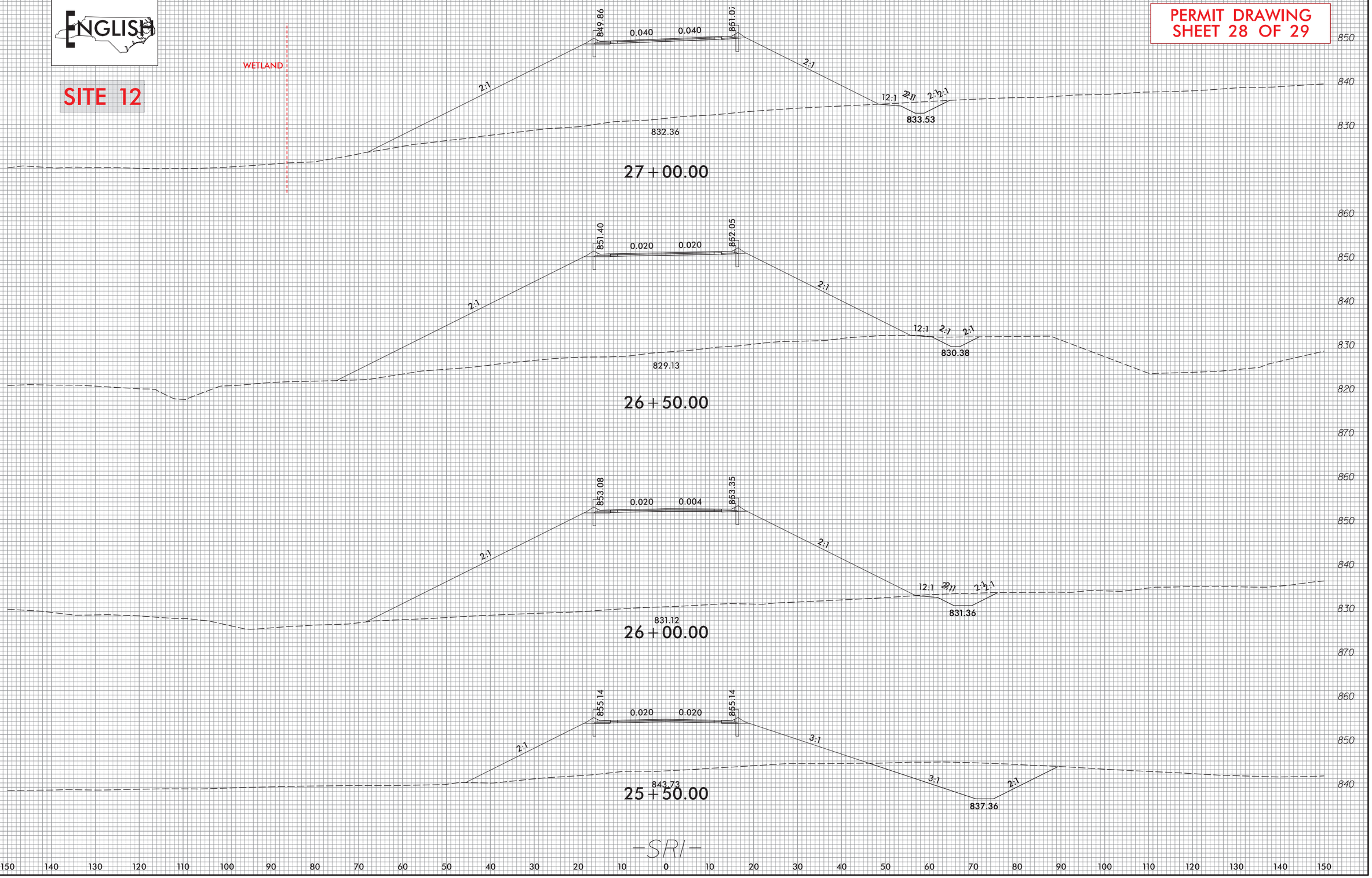
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-101

PERMIT DRAWING
SHEET 28 OF 29

ENGLISH

SITE 12

WETLAND



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WETLAND AND SURFACE WATER IMPACTS SUMMARY

			WETLAND IMPACTS					SURFACE WATER IMPACTS				
Site No.	Station (From/To)	Structure Size / Type	Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
1a	26+70 to 30+41 -L- RT	Roadway Fill Slope/Rip Rap Channel, SD						0.03		378		
1b	26+70 to 30+41 -L- LT	Proposed 60" Pipe Outlet, SD						< 0.01	< 0.01	30	63	
1c	26+70 to 30+41 -L- LT	Bank Stabilization, SD						< 0.01		33		
2a	20+65 to 21+32 Y2	60" Pipe, SB						< 0.01	< 0.01	122	58	
2b	20+65 to 21+32 Y2	Pipe Outlet, SB						< 0.01		22		
2c	20+65 to 21+32 Y2	Bank Stabilization, SB						< 0.01		47		
3	25+95 to 26+35 Y1	Roadway Fill Slope, SF						< 0.01		110		
4	27+32 to 28+56 Y1	Roadway Fill Slope, WE	0.01				< 0.01					
5	26+72 to 26+79 Y1	78" Pipe and Channel, SB						0.01	< 0.01	130	23	
6a	-L- 40+05 LT	66" Pipe Outlet, SG						< 0.01		32		
6b	-L- 40+05 LT	Bank Stabilization, SG						< 0.01		31		
6c	19+76 to 20+28 Y1RPD RT	60" Pipe / Stream Re-alignment, SG						0.04		320		
7a	14+08 to 14+20 Y1LPA	8' x 7' RCBC, SB						0.03	< 0.01	184	25	
7b	14+08 to 14+20 Y1LPA	Culvert Outlet, SB						< 0.01		24		
7c	14+08 to 14+20 Y1LPA	Bank Stabilization, SB						0.03		161		
8a	19+65 to 19+82 Y1RPA	Rip Rap at Embankment, SB						< 0.01	< 0.01	17	19	
8b	-L- 48+00 LT	Bank Stabilization, SB						< 0.01	< 0.01	13	20	
8c	17+49 to 17+61 Y1RPA	Rip Rap at Embankment,SB						< 0.01	< 0.01	21	33	
9	16+92 to 17+11 Y1RPA	Rip Rap at Embankment, SE						< 0.01		34		
10	-L- 55+09 LT	Extend EX 48" Pipe, SC						0.01	< 0.01	132	10	
11	-L- 81+20 RT	Bank Stabilization, Sandy Run Creek						< 0.01	< 0.01	19	20	
12a	26+25 to 26+55 SR1	60" Pipe, SC						< 0.01	< 0.01	147	23	
12b	26+25 to 26+55 SR1	60" Pipe Outlet, SC						< 0.01	< 0.01	26	27	
12c	26+56 to 26+88 SR1 LT	Roadway Fill Slope, WC	< 0.01				< 0.01					
TOTALS*:			0.02				< 0.01	0.23	0.04	2033	321	0

*Rounded totals are sum of actual impacts

NOTES:

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
8/29/2024
CLEVELAND COUNTY
R-4045/BR-0012
NG AND BRIDGE REPLACEMENT ON US-74 OVER S
SHEET 29 OF 29

Revised 2018 Feb

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NCDOT ACCEPTANCE

CULVERT SURVEY & HYDRAULIC DESIGN REPORT

N. C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
HYDRAULICS UNIT
RALEIGH, N. C.

34598.2.2

State Proj. Reference No. R-4045 WBS Project No. 67012.3.1 Proj. Station 14+14.23 –Y1LPA–

County CLEVELAND Stream UT TO SANDY RUN Struc. Inv. No. TBD

On Highway US-74 WB ON RAMP Between US-74 and LATIMORE ROAD SR 1168

Recommended Structure 8' x 7' RCBC BURIED 1.0' WITH 1' SILLS AT INLET AND OUTLET AND TWO (2) 1' BAFFLES AT 40' SPACING

Recommended Width of Roadway 28' CURB TO SHOULDER, 30.33' WITH SBG Skew 85°

Recommended Location is (Up, At, Down) Stream from Existing Crossing, NEW LOCATION

Latitude 35°18'10.67" N Longitude 81°41'39.67" W

Statewide Tier [X] Regional Tier [ ] Sub-Regional Tier [ ]

Bench Mark is BM 3 (PK NAIL IN NORTH END OF CONC ISLAND) STA. 25+89.18 –Y1– 39.60' RT

Northing 576065 Easting 1195773 Elev. 843.07 ft. Datum: NAD83

Temporary Crossing N/A

Designed by: JASON PATSKOSKI, PE, PhD, CFM

Assisted by: AARON R. SCHWARTZ, PE

NORTH CAROLINA PROFESSIONAL SEAL 046226 ENGINEER JASON M. PATSKOSKI

Date 03/2024

3/20/2024

DocuSigned by: JASON PATSKOSKI

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THREE OAKS ENGINEERING

NC Firm License No: F-1334
324 Blackwell Street
Suite 1200
Durham, NC 27701
919.732.1300

Review by: DocuSigned by: Andrew T. Nottingham C0F940DF9D7A475...

Date 3/21/2024

SITE DATA

Drainage Area 175 ACRES Source LIDAR DELINEATED DRAINAGE AREA

River Basin BROAD Character RURAL DEVELOPING TO URBAN

Stream Classification (Such as Trout, High Quality Water, etc.) WS-IV

Data on Existing Structure N/A

Total Waterway Opening N/A s.f.

Waterway Opening Below 100yr. WS EL. N/A s.f.

Debris Potential: Low ..... Moderate ..X.... High .....

Data on Structures Up and Down Stream US: 2 @ 24" RCP W/48" CMP EXTENSIONS (TO BE REPLACED WITH 78" RCP AT SR1186 AND 600' UPSTREAM)

DS: CONFLUENCE WITH SANDY RUN CREEK (PROPOSED D/S STRUCTURE IS 1@120' BRIDGE AT –Y1RPA– AND 750' DOWNSTREAM)

Gage Station No. N/A Period of Records N/A

Max. Discharge N/A c.f.s. Date N/A Frequency N/A

Historical Flood Information:

Date NO RECORDED FLOODING Elev. ft. Est. Freq. yr. Source CHRISTIAN LISTOE*, ASSISTANT DIVISION 12 CONSTRUCTION ENG. Period of Knowledge 7 yrs.

Date ..... Elev. ft. Est. Freq. yr. Source ..... Period of Knowledge yrs.

Date ..... Elev. ft. Est. Freq. yr. Source ..... Period of Knowledge yrs.

Allowable HW Elev. 807.8' – 1' ABOVE NATURAL 100-YEAR ELEVATION Normal Water Surface Elev. 801.9' ft.

Manning's n: Left O.B. 0.1 Channel 0.05 Right O.B. 0.1 Source FIELD OBSERVATIONS

Flood Study /Status N/A

Flood Study 100 yr. Discharge N/A c.f.s.; WS Elev.: With Floodway N/A ft. Without Floodway N/A ft. @River Station ?

DESIGN DATA

Hydrological Method USGS URBAN REGRESSION SIR 2014-530 (20% IMPERVIOUS)

Hydraulic Design Method HEC-RAS 4.1.0 (R-4045 PRJ)

Design Tailwater : Q_{10} 2.4 ft.; Q_{25} 2.7 ft.; Q_{50} 2.9 ft.; Q_{100} 3.1 ft.; Q_{500} 3.6 ft.

INV. IN EL. = 801.30', INV. OUT EL. = 800.06' (CULVERT MODELED AS 8' X 6' RCBC)

SIZE & TYPE: 8' X 7' RCBC @STATION 2174, APPROX. 30' UPSTREAM OF CULVERT.

FREQUENCY	Q (cfs)	Inlet Control			Outlet Control		Remarks
		HW/D	H.W.	WSEL	H.W.	WSEL	
10 YR	200	0.65	3.9	806.2	4.1	806.5	OUTLET CONTROL
50 YR	270	0.83	5.0	807.3	5.2	807.5	OUTLET CONTROL
100 YR	290	0.88	5.3	807.6	5.5	807.8	OUTLET CONTROL
500 YR	360	1.03	6.2	808.5	6.4	808.7	OUTLET CONTROL

Total Proposed Waterway Opening 48 s.f.

Outlet Velocity (V_{10}) 9.3 f.p.s. Natural Channel Velocity (V_{10}) 5.2 @ RS 1952 f.p.s.

Required Outlet Protection CLASS I, SEE OUTLET PROTECTION DETAIL

State Floodway Compliance Type N/A

INFORMATION TO BE SHOWN ON PLANS

HYDRAULIC DATA

DESIGN DISCHARGE	= 290 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 100 YRS.
DESIGN HIGH WATER ELEVATION	= 807.8
DRAINAGE AREA	= 175 AC.
BASIC DISCHARGE (Q100)	= 290 C.F.S.
BASIC HIGH WATER ELEVATION	= 807.8

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 1300 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YRS.
OVERTOPPING FLOOD ELEVATION	= 833.8 *

*STA. 14+14.23 –Y1LPA–

WS EL. Taken @ River Station 2174

ADDITIONAL INFORMATION AND COMPUTATIONS

USGS REGRESSION EQUATIONS

SOURCE

Q_{10} = 381(0.27)^0.7536 X 10^(0.0076*20) = 202 CFS = SAY 200 CFS

Q_{25} = 518(0.27)^0.7752 X 10^(0.0053*20) = 240 CFS = SAY 240 CFS

Q_{50} = 632(0.27)^0.7903 X 10^(0.0037*20) = 266 CFS = SAY 270 CFS

Q_{100} = 753(0.27)^0.8038 X 10^(0.0024*20) = 294 CFS = SAY 290 CFS

Q_{500} = 1045(0.27)^0.8160 = 359 CFS = SAY 360 CFS

USGS URBAN REGRESSION SCIENTIFIC INVESTIGATIONS 2014–530

20% IMPERVIOUS FUTURE

DRAINAGE AREA IS 174.7 AC., 0.27 SQUARE MILES USED IN THE CALCULATION.

CULVERT LENGTH BASED ON 14–INCH TOP SLAB THICKNESS FROM STRUCTURAL ENGINEER

IN ACCORDANCE WITH 9.6.1.5 OF THE GUIDELINES FOR DRAINAGE STUDIES AND HYDRAULIC DESIGN, AFTER CONSIDERATION OF ALL FACTORS INCLUDING AVAILABLE FREEBOARD, HW/D<1.0' FOR THE 100–YEAR STORM, AND LARGE FLOOD EVENTS BEING CONTAINED WITHIN THE CHANNEL BANKS, IT WAS DETERMINED THE PROPOSED CULVERT DOES NOT WARRENT UPSIZING TO ACCOUNT FOR POSSIBLE FUTURE REPLACEMENT/REHAB. PROPOSED NEW LOCATION HAS NO HISTORICAL FLOODING HISTORY AVAILABLE.

*CHRISTIAN LISTOE IS LISTED AS THE DIVISION BRIDGE ENGINEER. HE HAS BEEN WITH DIVISION 12 FOR 7 YEARS AND COULD NOT FIND ANY RECORD OF FLOODING IN THE AREA.

NATIVE MATERIAL SPECIFICATION FOR BACKFILLING NOTE

THE ENGINEER, IN CONSULTATION WITH DEO STAFF, SHALL REVIEW ALL MATERIAL TO BE USED AS BACKFILL PRIOR TO CONDUCTING THE BACKFILL ACTIVITY. BACKFILL SHALL CONSIST OF CLASS B RIP RAP TOPPED WITH NATIVE MATERIAL ONLY UNLESS THE ENGINEER, IN CONSULTATION WITH DEO STAFF, DETERMINES THAT THE NATIVE MATERIAL IS UNSUITABLE. THE CHOSEN BACKFILL MATERIAL SHALL NOT HAVE ADVERSE EFFECTS TO AQUATIC LIFE, AQUATIC LIFE PASSAGE, OR WATER QUALITY. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED OR FLOODPLAIN AT THE PROJECT SITE DURING CULVERT CONSTRUCTION.

NOTE: THERE ARE NO INSURABLE STRUCTURES IN THE PROPOSED CULVERT AREA WITHIN THE 100 YEAR FLOODPLAIN.

NOTE: STREAM CL WITHIN THE CULVERT IS THE NATURAL GROUND ALONG CULVERT ALIGNMENT.

PI = 15+55.00
EL = 828.50'
VC = 300'
K = 38
DS = 30 mph

(-1.28362)

(+15.0000%)

PROPOSED GRADE

NG UPSTREAM

NG CL

NG DOWNSTREAM

NWSEL = 803.3' DATE 12.06.23

WSEL = 802.8' DATE 12.06.23

1' SILLS

1 @ 8' x 7' RCBC BURIED 1.0' AT INLET INVERT = 801.30'

1' SILLS

NCDOT 100 YEAR WSEL = 807.8'

CL 1 RIP RAP TO ELEV. 809.8'

1.5:1 NORMAL AND SKEWED

CL STA. 14+15.46 –Y1LPA– GP ELEV. = 832.48' 1 @ 8' X 7' RCBC BURIED 1.0' 85° SKEW

1.5:1 NORMAL AND SKEWED

CL 1 RIP RAP TO ELEV. 809.8'

CL 1 RIP RAP SEE OUTLET TYPICAL

NCDOT 100 YEAR WSEL = 807.8'

RT TB

LT TB

CL STREAM

LT TB

RT TB

NWSEL = 803.3' DATE 12.06.23

WSEL = 802.8' DATE 12.06.23

PROP. STREAMBED

SEE INLET TYPICAL

1' SILL

1' BAFFLE

1' BAFFLE

1' SILL

CL INVERT = 800.7' SLOPE = 0.010 ft/ft

CL B RIP RAP OUTLET

EXCAVATE TO CHANNEL BED

85° SKEW

CL 1 RIP RAP SEE INLET TYPICAL

CLASS I RIP RAP TO ELEV 809.8'

BANK STABILIZATION

CLASS B RIP RAP OUTLET

8' RCBC

CB -Y1LPA-

TO SR 1186 (LATIMORE RD.)

TO US 74 WB

NOTE: BACKFILL CULVERT WITH CL B RIP RAP TOPPED WITH NATIVE MATERIAL TO SILL/BAFFLE HEIGHT

INSET SILL 1'

CL 1 RIP RAP SEE OUTLET DETAIL

JUT TO SANDY RUN

BANK STABILIZATION

CLASS I RIP RAP TO ELEV 809.8'

1 @ 8' X 7' RCBC BURIED 1.0'

1' BAFFLES NUMBER OF BAFFLES = 2 ON 40 FT CENTERS FROM DOWNSTREAM SILL

STREAM NOTE: EXISTING BED MATERIAL IS MOSTLY SAND WITH SOME COBBLE. BANKS ARE STABLE AND VEGETATED WITH MODERATE TO LARGE TREES AND BRUSH.

PLAN VIEW ALONG STRUCTURE

NCDOT PERFORMANCE TABLE

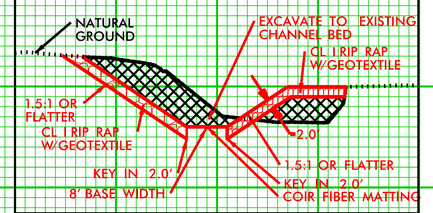
	FREQUENCY				
	10yr.	25yr.	50yr.	100yr.	500yr.
NATURAL	806.2	806.5	806.7	806.8	807.2
EXISTING	806.2	806.5	806.7	806.8	807.2
PROPOSED	806.5	807.1	807.5	807.8	808.7

@SECTION 2174
30 FT. FROM US FACE OF CULVERT

INLET TYPICAL

NOT TO SCALE (LEFT TO RIGHT LOOKING DOWNSTREAM)

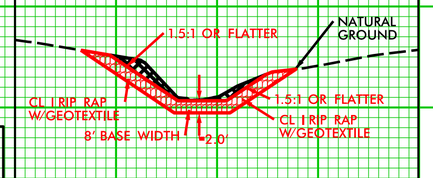
EST TONS CLASS I RIP RAP = 118 TONS
EST. GEOTEXTILE = 257 SY
EST. COIR FIBER MATTING = 15 SY
EST. CUT = 43 CY



OUTLET TYPICAL

NOT TO SCALE (LEFT TO RIGHT LOOKING DOWNSTREAM)

EST CLASS I RIP RAP = 67 TONS
EST. GEOTEXTILE = 119 SY
EST. CUT = 23 CY



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NCDOT ACCEPTANCE

BRIDGE SURVEY & HYDRAULIC DESIGN REPORT

N. C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
HYDRAULICS UNIT
RALEIGH, N. C.

34598.2.2

State Proj. Reference No. R-4045 WBS Project No. 67012.3.1 Proj. Station 17+59 -Y1RPA-

County CLEVELAND Bridge Over UT TO SANDY RUN CREEK Bridge Inv. No. 220510

On Highway US-74 WB EXIT RAMP Between US 74 and LATIMORE ROAD SR 1168

Recommended Structure 1 @ 120' 54" FIB BRIDGE WITH 4' CAPS UTILIZED

Recommended Width of Roadway 26' CLEAR ROADWAY Skew 110°

Recommended Location is (Up, At, Down) Stream from Existing Crossing, NEW LOCATION

Longitude 81° 41' 31.61" W Latitude 35° 18' 08.92" N

Statewide Tier [X] Regional Tier [ ] Sub-Regional Tier [ ]

Bench Mark is BM 3 (PK NAIL IN NORTH END OF CONC ISLAND), STA. 25+89.18 -Y1- 39.60' RT

Northing 576065 Easting 1195773 Elev. 843.07' ft. Datum: NAD83

Temporary Crossing NOT REQUIRED, NEW LOCATION

Designed by: JASON PATSKOSKI, PE, PhD, CFM

Assisted by: AARON R. SCHWARTZ, PE

NORTH CAROLINA PROFESSIONAL SEAL 046226 ENGINEER JASON L. PATSKOSKI
Date 03/07/24

THREE OAKS ENGINEERING
NC Firm License No: F-1334
324 Blackwell Street
Suite 1200
Durham, NC 27701
919.732.1300

Review by: DocuSigned by: Andrew T. Nottingham C0F940DF9D7A475... Date 3/14/2024

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SITE DATA

Drainage Area 189 ACRES Source LIDAR DELINEATED DRAINAGE AREA

River Basin BROAD Character RURAL DEVELOPING TO URBAN

Stream Classification (Such as Trout, High Quality Water, etc.) WS-IV

Data on Existing Structure N/A

Total Waterway Opening N/A s.f.

Debris Potential: Low ..... Moderate ..X.. High ..... Waterway Opening Below 100yr. WS EL. N/A s.f.

Data on Structures Up and Down Stream US: 2 @ 24" RCP W/48" CMP EXTENSIONS (TO BE REPLACED WITH 78" RCP LRFD) AT SR1168, 1350' UPSTREAM

PROPOSED US STRUCTURE IS 1 @ 8' X 7' RCBC BURIED 1.0' AT -Y1LPA-, 750' UPSTREAM

DS: CONFLUENCE WITH SANDY RUN CREEK

Design Control Elev. 793.1' - 1' ABOVE NATURAL 100-YEAR ELEVATION HEC-RAS SECTION 1279

Gage Station No. N/A Period of Records N/A

Max. Discharge N/A c.f.s. Date N/A Frequency N/A

Historical Flood Information:

Date NO RECORDED FLOODING Elev. ft. Est. Freq. yr. Source CHRISTIAN LISTOE*, ASSISTANT DIVISION 12 CONSTRUCTION ENG. Period of Knowledge 7 yrs.

Date ..... Elev. ft. Est. Freq. yr. Source ..... Period of Knowledge yrs.

Date ..... Elev. ft. Est. Freq. yr. Source ..... Period of Knowledge yrs.

Historical Scour Info: General N/A ft. Contraction N/A ft. Local N/A ft.

Channel Slope 0.027 ft/ft Source SURVEY Normal Water Surface Elev. 788.9' ft.

Manning's n: Left O.B. 0.1 Channel 0.05 Right O.B. 0.1 Source FIELD OBSERVATIONS

Flood Study /Status N/A

Flood Study 100yr. Discharge N/A c.f.s. WS Elev.: With Floodway N/A ft. Without Floodway N/A ft. @ River Station

DESIGN DATA

Hydrological Method USGS URBAN REGRESSION SIR 2014-530 (20% IMPERVIOUS FUTURE)

Hydraulic Design Method HEC-RAS 4.1.0 (R-4045.PRJ)

Floods Evaluated:	Freq. (yr.)	Q (c.f.s)	Elev. (ft.)	Backwater (ft.)	Bridge Opening Velocity (f.p.s.)
@ River Station 1250	10	220	791.5	0.0	7.0
	25	260	791.7	0.0	7.3
	50	290	791.9	0.0	7.4
	100	320	792.1	0.0	7.6
	500	390	792.5	0.0	8.0

Waterway Opening Provided Below: Design W.S. Elev. 53 s.f., 100yr W.S. Elev. 53 s.f., Total 1565.2 s.f.,

Average Channel Velocity (Design) 7.8 f.p.s. Average Overbank Velocity (Design) N/A f.p.s.

Computed Scour : General NONE ft. Contraction 0.0 ft. Local N/A ft. (100 & 500 YEAR)

State Floodway Compliance Type N/A

INFORMATION TO BE SHOWN ON PLANS

HYDRAULIC DATA

DESIGN DISCHARGE	= 320 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 100 YRS.
DESIGN HIGH WATER ELEVATION	= 792.1
DRAINAGE AREA	= 189 AC.
BASIC DISCHARGE (Q100)	= 320 C.F.S.
BASIC HIGH WATER ELEVATION	= 792.1

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 21200 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YRS.
OVERTOPPING FLOOD ELEVATION	= 815.7*

*STA. 19+28.55 -Y1RPA-

WS EL. Taken @ River Station 1279

ADDITIONAL INFORMATION AND COMPUTATIONS

USGS REGRESSION EQUATIONS SOURCE: USGS URBAN REGRESSION SCIENTIFIC INVESTIGATIONS 2014-530

Q_{10} = 381(0.30)^0.7536 X 10^(0.0076 X 20) = 218 CFS = SAY 220 CFS

Q_{25} = 518(0.30)^0.7752 X 10^(0.0053 X 20) = 260 CFS = SAY 260 CFS

Q_{50} = 632(0.30)^0.7903 X 10^(0.0037 X 20) = 289 CFS = SAY 290 CFS

Q_{100} = 753(0.30)^0.8038 X 10^(0.0024 X 20) = 320 CFS = SAY 320 CFS

Q_{500} = 1045(0.30)^0.8160 = 391 CFS = SAY 390 CFS

NOTE: DRAINAGE AREA IS 189 AC, 0.30 SQ. MI. USED FOR CALCULATIONS. 20% IMPERVIOUS FUTURE

SCOUR ANALYSIS

THE EXISTING STREAM IS WINDING AND STABLE WITH A SANDY, ROCKY BED. THE PROPOSED BRIDGE WILL MAINTAIN 10-FOOT SETBACKS FROM THE TOBS, AND NO PART OF THE BRIDGE IS INUNDATED DURING THE 100 OR 500 YEAR FLOOD EVENTS. NO EXCESSIVE SCOUR IS ANTICIPATED.

UNCONTRACTED SCOUR IS AT CROSS SECTION 1279 FROM PROPOSED MODEL

100-YEAR SCOUR ANALYSIS

Y_0 = 1.8 ft, Q_1 = 320 cfs, W_1 = 16.3 ft

Y_1 = 2.3 ft, Q_2 = 320 cfs, W_2 = 23.3 ft, K1 = 0.69

$Y_2 = Y_1 [Q_2/Q_1]^{.67} [W_1/W_2]^{0.69}$

$Y_2 = 2.3 [320/320]^{.67} [16.3/23.3]^{0.69}$

Y_2 = 1.8

$Y_s = Y_2 - Y_0$

Y_s = 1.8' - 1.8'

Y_s = 0.0

500-YEAR SCOUR ANALYSIS

Y_0 = 2.0 ft, Q_1 = 390 cfs, W_1 = 17.6 ft

Y_1 = 2.5 ft, Q_2 = 390 cfs, W_2 = 24.7 ft, K1 = 0.69

$Y_2 = Y_1 [Q_2/Q_1]^{.67} [W_1/W_2]^{0.69}$

$Y_2 = 2.5 [390/390]^{.67} [17.6/24.7]^{0.69}$

Y_2 = 2.0

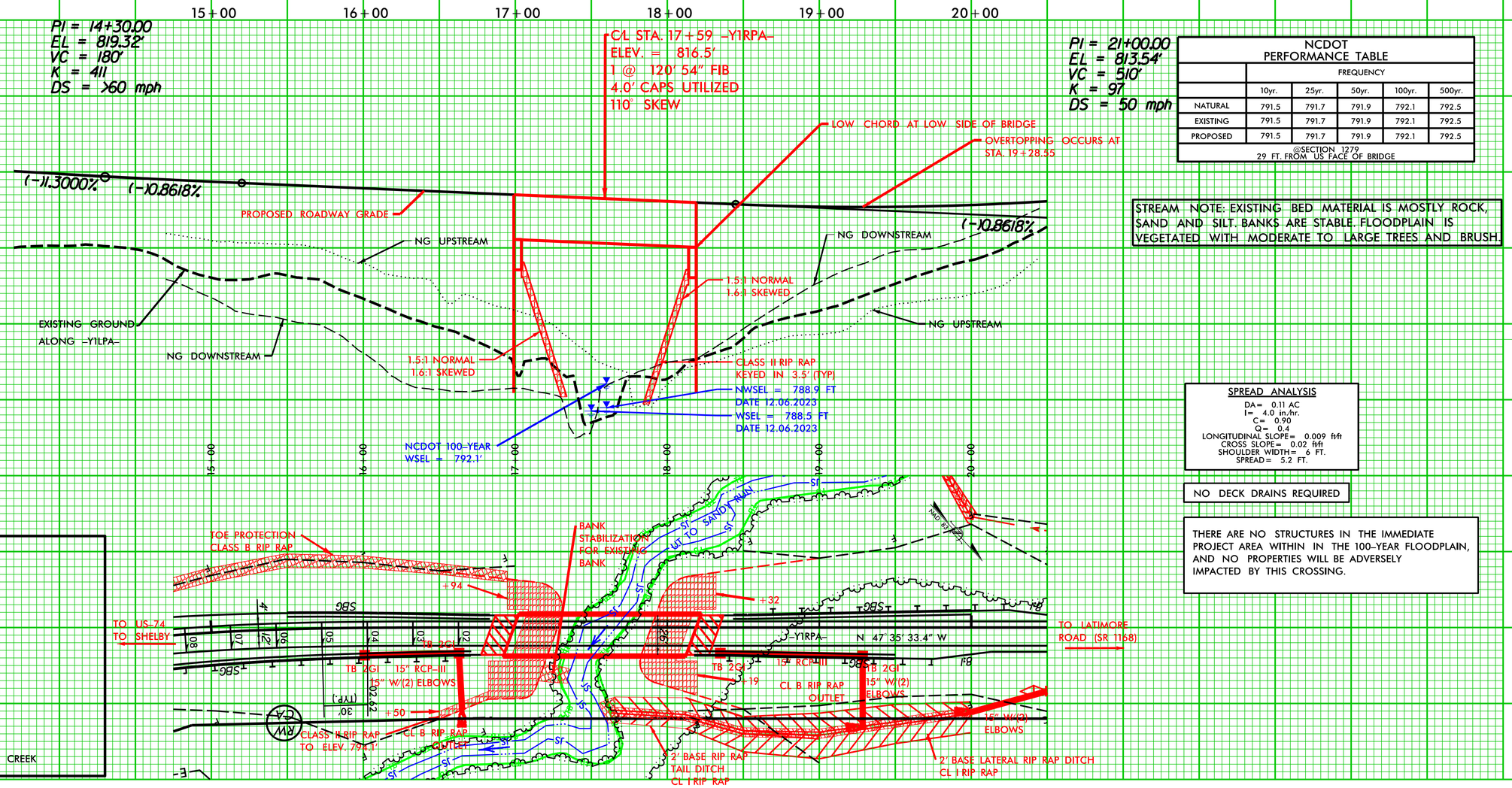
$Y_s = Y_2 - Y_0$

Y_s = 2.0' - 2.0'

Y_s = 0.0

NOTE: THE 500-YEAR NATURAL WSEL IS 792.5 FT UPSTREAM OF THE BRIDGE. THE ENTIRE SLOPE AND SPILL THRU IS ABOVE THIS ELEVATION EXCEPT WITHIN THE NE QUADRANT. THE 500 YEAR NATURAL WSEL IS 791.2 FT DOWNSTREAM OF THE BRIDGE AND THE ENTIRE SLOPE AND SPILL THRU IS ABOVE THIS ELEVATION EXCEPT FOR THE AREA WITHIN THE CHANNEL BEING FILLED IN. BASED UPON THIS THE BRIDGE WAS MODELED USING ENERGY ONLY FOR THE LOW FLOW CALCULATIONS.

*CHRISTIAN LISTOE IS LISTED AS THE DIVISION BRIDGE ENGINEER. HE COULD NOT FIND ANY RECORD OF FLOODING IN THE AREA.



BRIDGE TYPICAL SECTION
FOR BRIDGE OVER UN TRIB TO SANDY RUN CREEK
(NOT TO SCALE)

NCDOT PERFORMANCE TABLE

	FREQUENCY				
	10yr.	25yr.	50yr.	100yr.	500yr.
NATURAL	791.5	791.7	791.9	792.1	792.5
EXISTING	791.5	791.7	791.9	792.1	792.5
PROPOSED	791.5	791.7	791.9	792.1	792.5

@SECTION 1279
29 FT. FROM US FACE OF BRIDGE

STREAM NOTE: EXISTING BED MATERIAL IS MOSTLY ROCK, SAND AND SILT. BANKS ARE STABLE. FLOODPLAIN IS VEGETATED WITH MODERATE TO LARGE TREES AND BRUSH.

SPREAD ANALYSIS
DA= 0.11 AC
I= 4.0 in./hr.
C= 0.90
Q= 0.4
LONGITUDINAL SLOPE= 0.009 ft/ft
CROSS SLOPE= 0.02 ft/ft
SHOULDER WIDTH= 6 FT.
SPREAD= 5.2 FT.

NO DECK DRAINS REQUIRED

THERE ARE NO STRUCTURES IN THE IMMEDIATE PROJECT AREA WITHIN IN THE 100-YEAR FLOODPLAIN, AND NO PROPERTIES WILL BE ADVERSELY IMPACTED BY THIS CROSSING.

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BRIDGE SURVEY & HYDRAULIC DESIGN REPORT

N. C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
HYDRAULICS UNIT
RALEIGH, N. C.

NCDOT ACCEPTANCE

34598.2.2 — 81+20 –L– LT (WBL)

State Proj. Reference No. R-4045BR-0012 WBS Project No. 67012.3.1 Proj. Station 81+25.51 –L– RT (EBL) 220511 (EBL)

County CLEVELAND Bridge Over SANDY RUN CREEK Bridge Inv. No. 220512 (WBL)

On Highway US-74 Between SR 1168 and SR 1168

Recommended Structure DUAL STRUCTURES: TWO SPANS, 1 @ 109'-9", 1 @ 120'-9" with 4 girder lines of 63" FIB 4'-0" END BENT CAPS W/SLOPED ABUTMENTS, 42" CONCRETE BARRIER

Recommended Width of Roadway 40' CLR RDWY (WBL) 40' CLR RDWY (EBL) Skew 90°

Recommended Location is (Up, At, Down) Stream from Existing Crossing

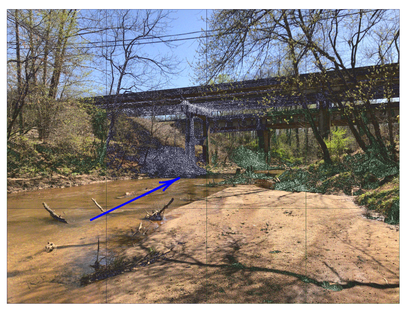
Longitude 35.29866 Latitude –81.68258

Statewide Tier [X] Regional Tier [ ] Sub-Regional Tier [ ]

Bench Mark is BM6, ON BL STA. 93+88, 182' RT, 60D NAIL IN BASE OF 20" SYCAMORE

573918 1200373 Elev. 813.77' ft. Datum: NAVD88

Temporary Crossing NOT REQUIRED, STAGED CONSTRUCTION



Designed by: Jianbiao Lu, PE

Assisted by: Bethany Taylor, EI

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 14160 DOUGLAS B. SAUNDERS 3/26/2024

Date 03/26/24

DocuSigned by: Douglas B Saunders 1B294A32D525494...

Review by: DocuSigned by: Andrew T. Nottingham C0F940DF9D7A475... Date 3/27/2024

WRA Whitman, Requardt & Associates, LLP
1201 Edwards Mill Road, Suite 320,
Raleigh, North Carolina 27606
NC License No. F-0941

SITE DATA

Drainage Area 40.7 SQ. MILES Source STREAM STATS PIEDMONT (REGION 1) – 97.48%

River Basin BROAD Character RURAL, BLUE RIDGE (REGION 2) –2.52%

Stream Classification (Such as Trout, High Quality Water, etc.) WS-IV

Data on Existing Structure DUAL BRIDGES EBL: 220048 210' LENGTH 1@52'–6", 2@52'–5", 1@52'–1" SKEW 90 CONCRETE T-BEAM, W/SPREAD FOOTINGS
WBL: 220049 209' LENGTH 4@52'–6" SKEW 90 STEEL MULTIGIRDER W/BATTERED H PILES AND SPREAD FOOTINGS FOR PIERS
Total Waterway Opening WBL = 3,554 s.f. EBL = 2,641 s.f.

Debris Potential: Low ..... Moderate X High .....
Waterway Opening Below 100yr. WS EL. WBL = 1,795 s.f. EBL = 1,606 s.f.

Data on Structures Up and Down Stream

US 220136 – SR 1168 STR # 190' LENGTH 5 SPAN 2@35' 1@50' 2@35" REINFORCED CONCRETE GIRDER

DS 220125 – SR 1164 STR # 208' LENGTH 5 SPAN 1@46'4-3/16" 2@45' 1@35" 1@36'4-3/16" PRESTRESSED CONCRETE CORED SLAB

Design Control Elev. EXIST 100 YR WSEL AT XSC 56040 = 762.0 ft.

Gage Station No. 02152000 Period of Records JUNE 1925 TO DECEMBER 1928, 3 yrs.

Max. Discharge N/A c.f.s. Date N/A Frequency N/A

Historical Flood Information:

Date 2017 Elev. 760 ft. Est. Freq. 50 yr. Source Residents Period of Knowledge 28 yrs.

Date N/A Elev. N/A ft. Est. Freq. N/A yr. Source N/A Period of Knowledge yrs.

Date N/A Elev. N/A ft. Est. Freq. N/A yr. Source N/A Period of Knowledge yrs.

Historical Scour Info: General N/A ft. Contraction N/A ft. Local N/A ft.

Channel Slope 0.003 ft/ft Source FIELD SURVEY Normal Water Surface Elev. WBL = 742.8 ft. EBL = 742.5 ft.

Manning's n: Left O.B. 0.035-0.1 Channel 0.05 Right O.B. 0.05-0.1 Source SANDY RUN FEMA MODEL AND FIELD OBS.

Flood Study /Status ZONE AE LIMITED DETAIL STUDY
2008 PANEL 1597 CLEVELAND CO. With Floodway N/A ft. Without Floodway 761.5' ft.
Flood Study 100yr. Discharge 8,790 c.f.s. WS Elev.: @ River Station 56270

DESIGN DATA

Hydrological Method EFFECTIVE FIS CLEVELAND CO. FEBRUARY 20, 2008; LOWERBROADHYDROLOGY20060712 REPORT

Hydraulic Design Method HEC RAS VERSION 3.1.3 PROJECT "Sandy Run Limited Detail Study"

Floods Evaluated: @ River Station 56040	Freq. (yr.)	Q (c.f.s)	Elev. (ft.)	Backwater (ft.)	Bridge Opening Velocity (f.p.s.)
	10	4,600	757.2	0.1	4.0
	50	7,370	760.0	0.1	4.5
	100	8,790	761.2	0.2	4.7
	500	12,490	763.9	0.3	5.3

Waterway Opening Provided Below: Design W.S. Elev. WBL 2,052 s.f. EBL 1,662 s.f. 100yr W.S. Elev. WBL 2,052 s.f. EBL 1,662 s.f. Total WBL 4,826 s.f. EBL 4,859 s.f.

Average Channel Velocity (Design) 5.3 f.p.s. Average Overbank Velocity (Design) 1.4 LT 2.2 RT f.p.s.

Computed Scour: General N/A ft. Contraction 100-YR: 3.9 500-YR: 3.9 ft. Local 100-YR: 8.1 500-YR: 8.8 ft.

State Floodway Compliance Type SFC TYPE B REQUIRED

INFORMATION TO BE SHOWN ON PLANS

HYDRAULIC DATA

DESIGN DISCHARGE	= 8,790 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 100 YRS.
DESIGN HIGH WATER ELEVATION	= 761.2 F.T.
DRAINAGE AREA	= 40.7 SQ. MI.
BASIC DISCHARGE (Q100)	= 8,790 C.F.S.
BASIC HIGH WATER ELEVATION	= 761.2 F.T.

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	WBL: 41,800 = EBL: 51,600 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YRS.
OVERTOPPING FLOOD ELEVATION	WBL: 780.5* = EBL: 782.6**

*LEFT SHOULDER AT STA. 79+72 –L–
**LEFT SHOULDER AT STA. 79+62 –L–

WS EL. Taken @ River Station 56040

ADDITIONAL INFORMATION AND COMPUTATIONS

USGS URBAN REGRESSION EQUATIONS WITH 20% FUTURE IMPERVIOUS – SIR 2014-5030 FOR REGION 1 AND FS007-00 FOR REGION 2

FEMA DISCHARGES EFFECTIVE 2/20/2008

Q10 = 0.9748X484(40.7)^0.5539X10^(0.006X20)+0.0252X122X(40.7)^0.655X20^0.515 = 5,010 CFS — Q10 = 4,600 CFS

Q25 = 0.9748X657(40.7)^0.547X10^(0.0046X20)+0.0252X228X(40.7)^0.611X20^0.436 = 6,220 CFS — Q25 = N/A CFS

Q50 = 0.9748X794(40.7)^0.5428X10^(0.0037*20)+0.0252X296X(40.7)^0.602X20^0.396 = 7,090 CFS — Q50 = 7,370 CFS

Q100 = 0.9748X941(40.7)^0.5386X10^(0.0028*20)+0.0252X374X(40.7)^0.593X20^0.358 = 7,930 CFS — Q100 = 8,790 CFS

Q500 = 0.9748X1319(40.7)^0.5305X10^(0.0011*20)+0.0252X12380 = 9,970 CFS — Q500 = 12,490 CFS

Note: REGION 2 URBAN Q500 IS EXTRAPOLATED BASED ON Q25, Q50 and Q100. FEMA 100 YR DISCHARGE OBTAINED FROM THE CLEVELAND COUNTY FIS AND THE 10, 50 AND 500 YEAR FLOWS FROM HYDROLOGY REPORT (LOWERBROADHYDROLOGY20060712) INCLUDED WITH THE FEMA EFFECTIVE MODEL. SINCE THE FEMA FLOWS ARE HIGHER AND MORE CONSERVATIVE THAN THE USGS URBAN REGRESSION EQUATIONS, THEY WILL BE USED FOR DESIGN AND FEMA COMPLIANCE.

SCOUR ANALYSIS: APPROACH CROSS SECTION 56136 FROM PROPOSED MODEL

CONTRACTION SCOUR (FWHA HEC-18, LARSON'S EQN)

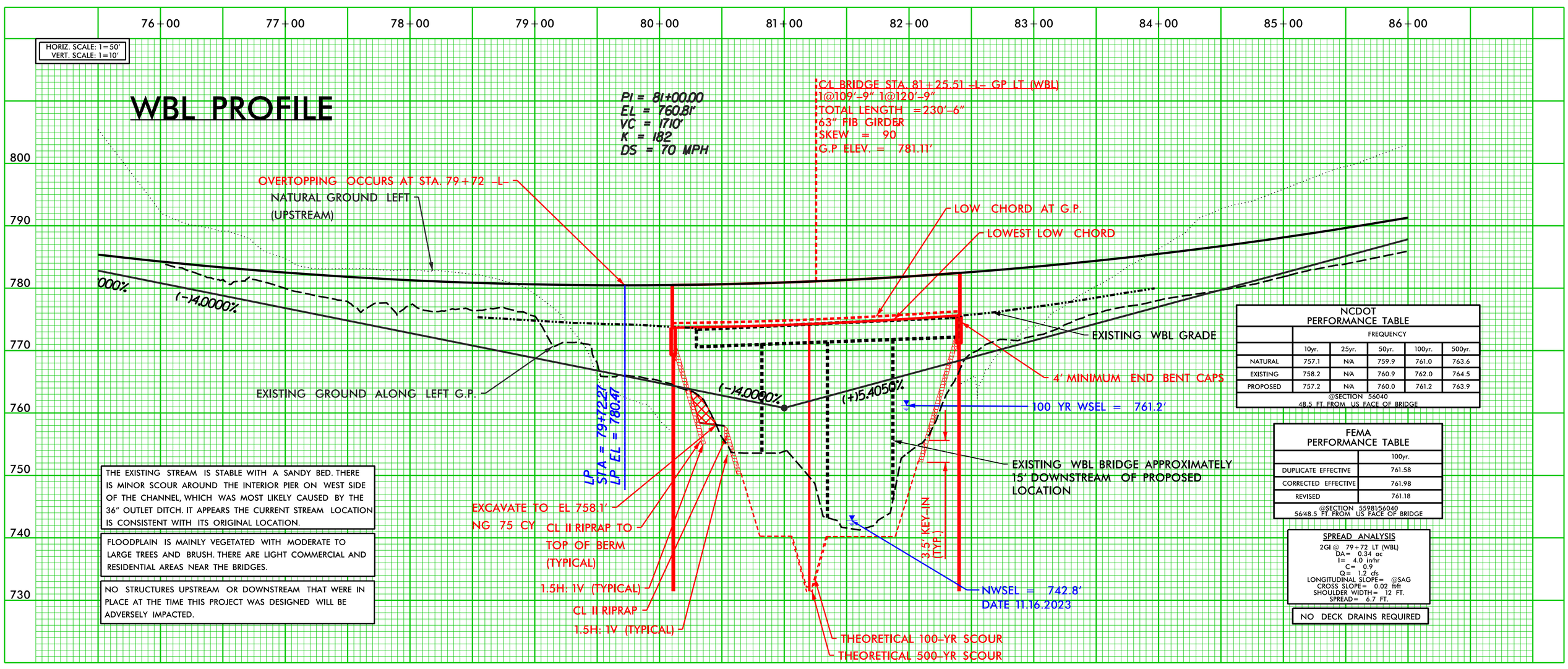
$YS = Y1[(Q2/Q1)^{6/7}(W1/W2)^{K1}]-Yo$

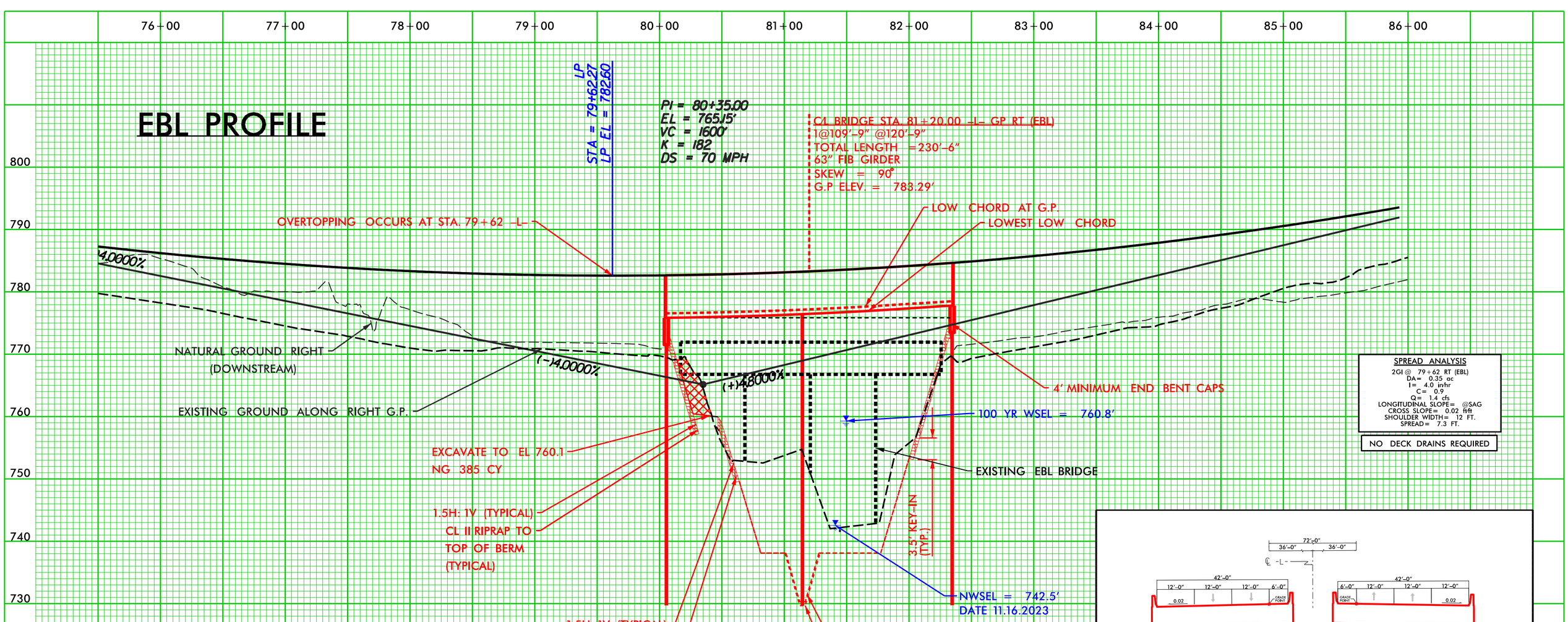
100 YR	WBL	EBL	500 YR	WBL	EBL
Y1	17.8	17.8	Y1	20.4	20.4
Yo	17.1	15.8	Yo	19.8	18.5
Q2	7312.1	7017.0	Q2	9578.1	9657.3
Q1	7188.4	7188.4	Q1	9657.3	8928.1
W1	87.9	87.9	W1	87.9	87.9
W2	87.1	73.2	W2	87.1	73.2
K1	0.69	0.69	K1	0.69	0.69
YS	1.0	3.9	YS	1.0	3.9

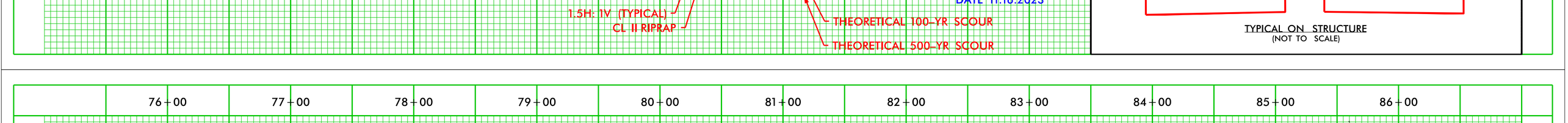
PIER SCOUR (FHWA HEC 18, COLORADO STATE EQN)

$Ys = Y1[2\ K1\ K2\ K3\ K4(a/Y1)^{0.65}\ Fr^{0.43}]$

	100 YR STA 81+20.0 –L– WBL	100 YR STA 81+14.52 –L– EBL	500 YR STA 81+20.0 –L– WBL	500 YR STA 81+14.52 –L– EBL
Y1	17.9	13.9	20.6	16.6
K1	1.0	1.0	1.0	1.0
K2	1.0	1.0	1.0	1.0
K3	1.1	1.1	1.1	1.1
K4	1.0	1.0	1.0	1.0
a	4.7	4.7	4.7	4.7
V1	4.6	4.6	5.4	5.4
FR	0.2	0.2	0.2	0.3
YS	8.1	7.8	8.8	8.6





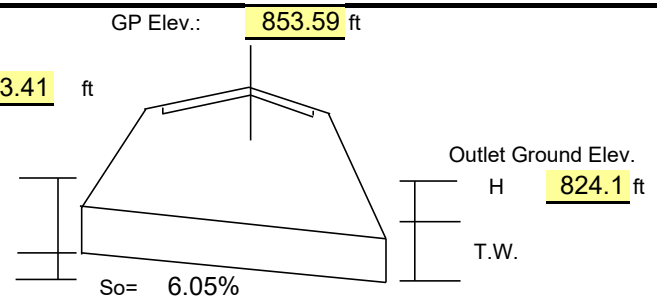


PIPE DATA SHEET

Date: 3/25/2024 Sheet of

Project Number: DB-4045.010 I.D. No.: R-4045 County: Cleveland Designed By: PMH Reviewed By: AY

Alignment: -Y1_RPD-
Station: 19+98
Skew: 120°
Size/Type Pipe: 60" RCP-III
Type Entrance: Headwall
Direction of Flow: Left to Right
Hydrologic Method: Rational
H.W. Control Elevation: 843.97 ft
H.W. Control Feature: Ditch Crest



Plan Summary Data

Drainage Area:	31.7 acres
Design Freq.:	100 YR
Design Disch.:	87 CFS
Design H.W. Elev.:	841.6 ft
Q100 Disch.:	87 CFS
Q100 Elev.:	841.6 ft
Overtopping Freq.:	500+ YR
Overtopping Disch.:	150 CFS
Overtopping Elev.:	844.5 ft

RCP=.012, CMP=.024
n= 0.012

TW Channel Specs.: Slope: 0.051 Lt. Side Slope= 2:1
Base Width= 8 n= 0.035 Rt. Side Slope= 2:1

BARRELS SIZE in	BARRELS No. Of Pipes	FREQ YR	TW ft	Q ft^3/s	Nat. H.W. ft	Allow. H.W. ft	Inlet Control HW/D ft/ft	Inlet Control HW (ft) ft	Outlet Control Ke	Outlet Control d_c ft	Outlet Control $(d_c+D)/2$ ft	Outlet Control h_o ft	Outlet Control H ft	Outlet Control LS_O ft	Outlet Control HW ft	HW ELEV.	V_o* ft/s	Remarks
48	1	10	2.7	65			0.85	3.39	0.2	2.42	3.21	3.21	1.304	14.39	-9.88	840.86	5.2	INLET CONTROL
48	1	25	3.0	74			0.92	3.68	0.2	2.61	3.30	3.30	1.591	14.39	-9.50	841.15	5.9	INLET CONTROL
48	1	50	3.2	81			0.98	3.90	0.2	2.75	3.37	3.37	1.830	14.39	-9.19	841.37	6.4	INLET CONTROL
48	1	100	3.4	87			1.02	4.10	0.2	2.87	3.43	3.43	2.045	14.39	-8.91	841.57	6.9	INLET CONTROL
48	1	500	3.6	100			1.17	4.69	0.2	3.11	3.56	3.57	2.543	14.39	-8.28	842.16	8.0	INLET CONTROL
48	1	OT	5.5	150			1.75	7.00	0.2	3.98	3.99	5.50	4.869	14.39	-4.02	844.47	11.9	INLET CONTROL

New location crosspipe under -Y1RPD-. Proposed pipe will be a 60" RCP-III buried 1.0 ft with headwalls. Please note this crosspipe was analyzed as a 54" RCP buried 1 ft. Please also note the pipe has been upsized 6" based on the RFP requirements since it is located under a ramp.The upstream and downstream inverts will be 837.47 ft and 825.13 ft respectively. The overtopping elevation is the ditch crest elevation at Sta. 19+50 -Y1RPD- LT.

Inlet control calculations performed using HDS-5.

A = 31.7 ac. Composite C = 0.41

I (10 yr) = 5 in/hr I (25 yr) = 5.6 in/hr I (50 yr) = 6.1 in/hr I (100 yr) = 6.6 in/hr I (500 yr) = 7.7 in/hr T_c is calculated using hydraulic toolbox.

Q_{10} = 65 CFS Q_{25} = 74 CFS Q_{50} = 81 CFS Q_{100} = 87 CFS Q_{500} = 100 CFS T_c used= 16 min

*V_o is full flow velocity.

SUMMARY AND RECOMMENDATIONS: 60" RCP-III buried 1 ft.

print date: 3/25/2024

PIPE DATA SHEET

Date: 3/1/2024 | Sheet 1 of 1

Project Number: R-4045 | I.D. No.: 34598.2.2 | County: Cleveland | Designed By: TO | Reviewed By: TO

Alignment:	-Y2-
Station:	20+96
Skew:	50.5 deg
Size/Type Pipe:	60" RCP III
Type Entrance:	HW
Direction of Flow:	Lt to Rt
Hydrologic Method:	USGS Reg.
H.W. Control Elevation:	845.7'
H.W. Control Feature:	Sag at 23+47

GP Elev.: 848.02 ft

Shoulder Elev.: 846.50 ft

Inlet Ground Elev. 831 ft

H.W. LS_o

Inlet Invert Elev.: 830.0 ft

Outlet Ground Elev. H 826.6 ft

T.W.

So= 3.8%

L= 116.0 ft

Outlet Inv. Elev. 825.6 ft

Plan Summary Data

Drainage Area:	64.000 acres
Design Freq.:	25-Yr
Design Disch.:	110 cfs
Design H.W. Elev.:	834.9'
Q100 Disch.:	130 cfs
Q100 Elev.:	835.6'
Overtopping Freq.:	500+
Overtopping Disch.:	330 cfs
Overtopping Elev.:	845.9'

RCP=.012, CMP=.024

n= 0.012

TW Channel Specs.: Slope: 0.038 Lt. Side Slope= 1.5

Base Width= 6 n= 0.05 Rt. Side Slope= 1.5

BARRELS SIZE in	BARRELS No. Of Pipes	FREQ YR	TW ft	Q ft^3/s	Nat. H.W. ft	Allow. H.W. ft	Inlet Control HW/D ft/ft	Inlet Control HW (ft) ft	Outlet Control Ke	Outlet Control d_c ft	Outlet Control $(d_c+D)/2$ ft	Outlet Control h_o ft	Outlet Control H ft	Outlet Control LS_O ft	Outlet Control HW ft	HW ELEV.	V_o* ft/s	Remarks
60	1	10	1.9	95	833.7	836.4	0.86	3.44	0.2	Calcs from HEC-RAS					3.52	834.52	9.7	OUTLET CONTRC
60	1	25	1.9	110	837.4	836.4	0.98	3.92	0.2						3.93	834.93	10.2	OUTLET CONTRC
60	1	100	2.1	130	837.6	836.4	1.14	4.57	0.2						4.53	835.57	10.9	INLET CONTROL
60	1	500	2.3	160	837.7	836.4	1.36	5.43	0.2						5.29	836.43	11.7	INLET CONTROL
60	1	OT	3.1	330	837.8	836.4	3.69	14.76	0.2						14.85	845.85	18.1	OUTLET CONTRC

Notes & Calculations

Hydrologic Method is the USGS Urban Regression Equations SIR 2014-5030 used with 20% impervious area

Pipe modeled as a 60" RCP-III buried 1.0 in HEC-RAS. All HW and velocities obtained from HEC-RAS Model

TW Depth obtained from D/S Cross-Section in HEC-RAS

Natrual HW obtained from Existing HEC-RAS model XC 3320 which includes backwater from the existing 24-inch pipes

Existing 24-inch pipes modeled just using inlet control

*V_o is partial flow velocity.

SUMMARY AND RECOMMENDATIONS: 60" RCP-III Buried 1.0'

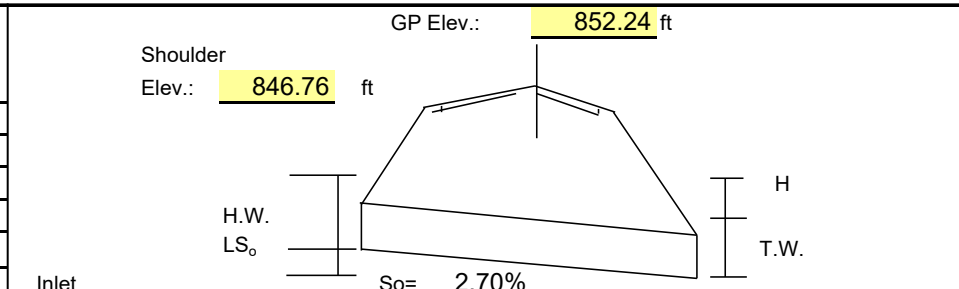
print date: 3/1/2024

PIPE DATA SHEET

Date: 3/25/2024 Sheet of

Project Number: DB-4045.010 I.D. No.: R-4045 County: Cleveland Designed By: AY Reviewed By: PMH

Alignment: -SR1-
Station: 26+34
Skew: 90°
Size/Type Pipe: 60" RCP-IV
Type Entrance: Headwall
Direction of Flow: Right to Left
Hydrologic Method: Rational
H.W. Control Elevation: 847.06 ft
H.W. Control Feature: Rdy CL



Plan Summary Data

Drainage Area:	27.1 acres
Design Freq.:	25 YR
Design Disch.:	73 CFS
Design H.W. Elev.:	826.3 ft
Q100 Disch.:	85 CFS
Q100 Elev.:	826.7 ft
Overtopping Freq.:	500+ YR
Overtopping Disch.:	350 CFS
Overtopping Elev.:	848.1 ft

RCP=.012, CMP=.024
n= 0.012

TW Channel Specs.: Slope: 0.018 Lt. Side Slope= 1.5:1
Base Width= 3 n= 0.035 Rt. Side Slope= 1.5:1

BARRELS SIZE in	BARRELS No. Of Pipes	FREQ YR	TW ft	Q ft^3/s	Nat. H.W. ft	Allow H.W. ft	Inlet Control HW/D ft/ft	Inlet Control HW (ft) ft	Outlet Control Ke	Outlet Control d_c ft	Outlet Control $(d_c+D)/2$ ft	Outlet Control h_o ft	Outlet Control H ft	Outlet Control LS_O ft	Outlet Control HW ft	HW ELEV.	V_o* (FULL FLO) ft/s	Remarks
48	1	10	1.8	64			0.98	3.42	0.2	1.83	2.67	2.67	0.712	3.66	-0.17	826.01	7.9	INLET CONTROL
48	1	25	2.0	73			1.06	3.71	0.2	1.97	2.74	2.74	0.926	3.66	0.43	826.30	8.2	INLET CONTROL
48	1	50	2.0	79			1.12	3.91	0.2	2.08	2.79	2.79	1.084	3.66	0.92	826.50	8.5	INLET CONTROL
48	1	100	2.1	85			1.17	4.10	0.2	2.16	2.83	2.83	1.255	3.66	1.33	826.69	8.7	INLET CONTROL
48	1	500	2.3	100			1.36	4.76	0.2	2.37	2.94	2.94	1.738	3.66	2.43	827.34	9.2	INLET CONTROL
48	1	OT	4.1	350			7.30	25.56	0.2	4.00	4.00	4.09	21.285	3.66	21.72	848.15	27.9	INLET CONTROL

New location crosspipe under -SR1-. Proposed pipe will be a 60" RCP-IV buried 1.0 ft with headwalls. Please note this crosspipe was analyzed as a 54" RCP buried 1 ft. Please also note the pipe has been upsized 6" due to fill height and under the proposed alignment.

Inlet control calculations performed using HDS-5

A = 27.1 ac. Composite C = 0.46

I (10 yr) = 5.1 in/hr I (25 yr) = 5.8 in/hr I (50 yr) = 6.3 in/hr I (100 yr) = 6.8 in/hr I (500 yr) = 8 in/hr T_c is calculated using hydraulic toolbox.

Q_{10} = 64 CFS Q_{25} = 73 CFS Q_{50} = 79 CFS Q_{100} = 85 CFS Q_{500} = 100 CFS T_c used= 14 min

*All full flow.

SUMMARY AND RECOMMENDATIONS: Install 60" RCP-IV buried 1'. Inverts, length, and slope are 821.59 ft and 817.93 ft, 135.8 ft, and 2.70% slope, respectively.

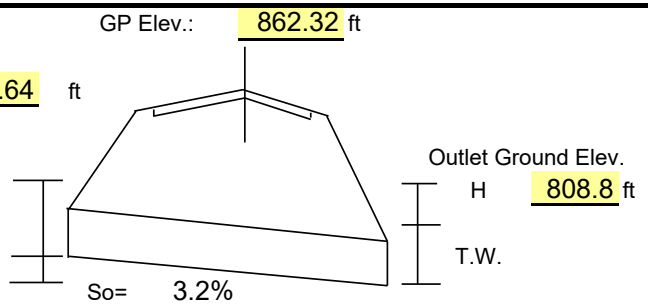
print date: 3/25/2024

PIPE DATA SHEET

Date: 3/1/2024 Sheet 1 of 1

Project Number: R-4045 I.D. No.: 34598.2.2 County: Cleveland Designed By: TO Reviewed By: TO

Alignment: -Y1-
Station: 26+75
Skew: 88 deg
Size/Type Pipe: 78" LRFD
Type Entrance: HW
Direction of Flow: Lt to Rt
Hydrologic Method: USGS Reg.
H.W. Control Elevation: 847.41'
H.W. Control Feature: Sag at 32+00



Plan Summary Data

Drainage Area:	128 acres
Design Freq.:	25-Yr
Design Disch.:	190 cfs
Design H.W. Elev.:	819.3'
Q100 Disch.:	230 cfs
Q100 Elev.:	820.7'
Overtopping Freq.:	500+
Overtopping Disch.:	650 cfs
Overtopping Elev.:	847.7'

RCP=.012, CMP=.024
n= 0.012

TW Channel Specs.: Slope: 0.038 Lt. Side Slope= 1.5
Base Width= 8 n= 0.05 Rt. Side Slope= 1.5

BARRELS SIZE in	BARRELS No. Of Pipes	FREQ YR	TW ft	Q ft^3/s	Nat. H.W. ft	Allow. H.W. ft	Inlet Control HW/D ft/ft	Inlet Control HW (ft) ft	Outlet Control Ke	Outlet Control d_c ft	Outlet Control $(d_c+D)/2$ ft	Outlet Control h_o ft	Outlet Control H ft	Outlet Control LS_O ft	Outlet Control HW ft	HW ELEV.	V_o* ft/s	Remarks
72	1	10	1.9	160		820.5	0.75	3.73	0.2	Calcs from HEC-RAS					3.73	818.23	10.7	OUTLET CONTRC
72	1	25	1.9	190		820.5	0.95	4.76	0.2						4.70	819.26	11.5	INLET CONTROL
72	1	100	2.1	230		820.5	1.13	5.67	0.2						5.62	820.17	12.3	INLET CONTROL
72	1	500	2.3	280		820.5	1.23	6.17	0.2						6.05	820.67	12.6	INLET CONTROL
72	1	OT	3.1	650		820.5	4.98	24.92	0.2						33.20	847.70	13.6	OUTLET CONTRC

Notes & Calculations

Hydrologic Method is the USGS Urban Regression Equations SIR 2014-5030 used with 20% impervious area

Pipe modeled as a 72" RCP-III buried 1.0 in HEC-RAS. All HW and velocities obtained from HEC-RAS Model. Pipe Length based on a 78" pipe

TW Depth obtained from D/S Cross-Section in HEC-RAS

Per RFP, the fill over the pipe requires upsizing 6" to a 78" pipe

Inlet calcs based on concrete groove end with HW

Pipe material modeled as RCP as it will be open cut

The lowest U/S shoulder on -Y1- is 846.8', but the lowest shoulder on -Y2- subject to backwater is 844.6'

*V_o is partial flow velocity.

SUMMARY AND RECOMMENDATIONS: Install 78" LRFD

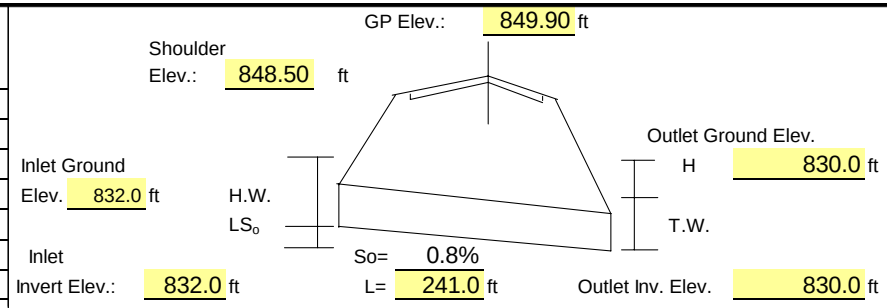
print date: 3/1/2024

PIPE DATA SHEET

Date: 3/7/2024 | Sheet 1 of 1

Project Number: 34598.2.2 | I.D. No.: R-4045 | County: Cleveland | Designed By: JL | Reviewed By: DBS

Alignment:	-L-
Station:	33+60
Skew:	103 degrees
Size/Type Pipe:	60" WSP
Type Entrance:	HW
Direction of Flow:	Right to Left
Hydrologic Method:	Rational
H.W. Control Elevation:	842.5
H.W. Control Feature:	Shoulder 37+20



Plan Summary Data

Drainage Area:	41.4 ac
Design Freq.:	100 yr
Design Disch.:	120 cfs
Design H.W. Elev.:	837.28 ft
Q100 Disch.:	120 cfs
Q100 Elev.:	837.28 ft
Overtopping Freq.:	500+ yr
Overtopping Disch.:	240 cfs
Overtopping Elev.:	844.01 ft

RCP=.012, CMP=.024 n= 0.012

TW Channel Specs.: Base Width= 5 | Slope: 0.0367 n= 0.045 | Lt. Side Slope= 1 | Rt. Side Slope= 1

BARRELS SIZE in	BARRELS No. Of Pipes	FREQ YR	TW ft	Q ft^3/s	Nat. H.W. ft	Allow. H.W. ft	Inlet Control HW/D ft/ft	Inlet Control HW (ft) ft	Outlet Control Ke	Outlet Control d_c ft	Outlet Control $(d_c+D)/2$ ft	Outlet Control h_o ft	Outlet Control H ft	Outlet Control LS_O ft	Outlet Control HW ft	HW ELEV.	V_o* ft/s	Remarks
54	1	Q10	1.8	88		5.4	0.93	4.20							1.87	836.20	11.7	INLET CONTROL
54	1	Q25	1.9	100		5.4	1.02	4.59							2.39	836.59	12.0	INLET CONTROL
54	1	Q50	2.0	110		5.4	1.10	4.93							2.84	836.93	12.3	INLET CONTROL
54	1	Q100	2.1	120		5.4	1.17	5.28	Calcs from HY-8						3.31	837.28	12.5	INLET CONTROL
54	1	Q200	2.2	130		5.4	1.26	5.67							3.80	837.67	12.8	INLET CONTROL
54	1	Q500	2.3	140		5.4	1.35	6.08							4.83	838.08	13.0	INLET CONTROL
54	1	Overtop	3.1	240		5.4	2.67	12.01							10.70	844.01	15.4	INLET CONTROL

Notes & Calculations

HW Control Elevation is 1.5' below shoulder point @ Sta. 37+20 -L- RT

Pipe modeled as a 54" WSP in HY-8. All TW, HW and Velocities obtained from HY-8 Model.

Per RFP, the pipe is required upsizing 6" to a 60" pipe

Hydrology Summary

DA = 41.4 ac

Tc = 16 min

C = 0.43

	Intensity (in/hr)	Discharge (cfs)
Q10=	4.9	88
Q25=	5.6	100
Q50=	6.1	110
Q100=	6.5	120
Q200=	7.0	130
Q500=	7.6	140

*V_o is partial flow velocity.

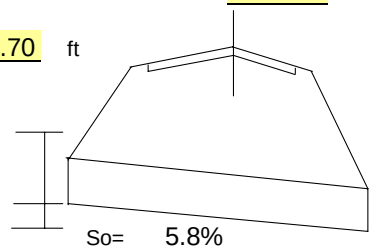
SUMMARY AND RECOMMENDATIONS: 60" Welded Steel Pipe Bored and Jacked

print date: 3/7/2024

PIPE DATA SHEET

Date: 3/22/2024 | Sheet 1 of 1
Project Number: 34598.2.2 | I.D. No.: R-4045 | County: Cleveland | Designed By: JL | Reviewed By: DBS

Alignment:	-L-
Station:	40+05
Skew:	81 deg
Size/Type Pipe:	66" WSP
Type Entrance:	HW
Direction of Flow:	Right to Left
Hydrologic Method:	Rational
H.W. Control Elevation:	831.94
H.W. Control Feature:	SP at 45+00



Plan Summary Data

Drainage Area:	34.63 ac
Design Freq.:	100 yr
Design Disch.:	100 cfs
Design H.W. Elev.:	827.24 ft
Q100 Disch.:	100 cfs
Q100 Elev.:	827.24 ft
Overtopping Freq.:	500+ yr
Overtopping Disch.:	217 cfs
Overtopping Elev.:	833.06 ft

RCP=.012, CMP=.024
n= 0.012

TW Channel Specs.: Slope: 0.0154 Lt. Side Slope= 1
Base Width= 4 n= 0.045 Rt. Side Slope= 1

BARRELS SIZE in	BARRELS No. Of Pipes	FREQ YR	TW ft	Q ft^3/s	Nat. H.W. ft	Allow. H.W. ft	Inlet Control HW/D ft/ft	Inlet Control HW (ft) ft	Outlet Control Ke	Outlet Control d_c ft	Outlet Control $(d_c+D)/2$ ft	Outlet Control h_o ft	Outlet Control H ft	Outlet Control LS_O ft	Outlet Control HW ft	HW ELEV.	V_o* ft/s	Remarks
60	1	Q10	2.4	77		4.8	0.84	3.36							-8.92	826.50	6.9	INLET CONTROL
60	1	Q25	2.5	87		4.8	0.92	3.67							-8.04	826.81	7.3	INLET CONTROL
60	1	Q50	2.6	95		4.8	0.98	3.93							-7.32	827.07	7.6	INLET CONTROL
60	1	Q100	2.7	100		4.8	1.03	4.10	Calcs from HY-8						-6.78	827.24	7.8	INLET CONTROL
60	1	Q200	2.9	110		4.8	1.11	4.45							-5.90	827.59	8.2	INLET CONTROL
60	1	Q500	3.0	120		4.8	1.21	4.82							-4.87	827.96	8.6	INLET CONTROL
60	1	Overtop	4.0	217		4.8	2.48	9.92							7.23	833.06	12.9	INLET CONTROL

Notes & Calculations

HW control elevation is 1.5' below low shoulder at station 45+00 -L- RT/14+50 -RPD- RT

Overtopping occurs at Station 45+00 -L- RT @ elevation 833.44'

Pipe modeled as a 60" WSP buried 1' in HY-8. All TW, HW and Velocities obtained from HY-8 Model.

Per RFP, the pipe is required upsizing 6" to a 66" pipe

Hydrology Summary

DA = 34.63 ac
Tc = 16 min
C = 0.45

	Intensity (in/hr)	Discharge (cfs)
Q10=	4.9	77
Q25=	5.6	87
Q50=	6.1	95
Q100=	6.5	100
Q200=	7.0	110
Q500=	7.6	120

*V_o is partial flow velocity.

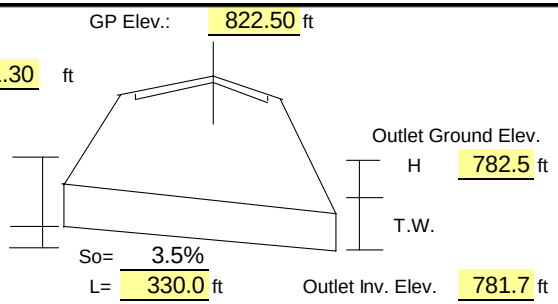
SUMMARY AND RECOMMENDATIONS: 66" Welded Steel Pipe Bored and Jacked

print date: 4/5/2024

PIPE DATA SHEET

Date: 3/6/2024 | Sheet 1 of 2
Project Number: 34598.2.2 | I.D. No.: R-4045 | County: | Designed By: JL | Reviewed By: DBS

Alignment:	-L-
Station:	54+89
Skew:	108 deg
Size/Type Pipe:	54" Welded Steel Pipe
Type Entrance:	Concrete HW
Direction of Flow:	Right to Left
Hydrologic Method:	Rational
H.W. Control Elevation:	819.8
H.W. Control Feature:	LP/SP @ 54+54



Plan Summary Data

Drainage Area:	64.09 ac
Design Freq.:	100 yr
Design Disch.:	160 cfs
Design H.W. Elev.:	796.99 ft
Q100 Disch.:	160 cfs
Q100 Elev.:	796.99 ft
Overtopping Freq.:	500+ yr
Overtopping Disch.:	620 cfs
Overtopping Elev.:	819.85 ft

RCP=.012, CMP=.024 n= 0.012

TW Channel Specs.: Slope: 0.03 Lt. Side Slope= 5
Base Width= 5 n= 0.05 Rt. Side Slope= 5

BARRELS SIZE in	No. Of Pipes	FREQ YR	TW ft	Q ft^3/s	Nat. H.W. ft	Allow. H.W. ft	Inlet Control HW/D ft/ft	Inlet Control HW (ft) ft	Outlet Control Ke	d_c ft	$(d_c+D)/2$ ft	h_o ft	H ft	LS_O ft	HW ft	HW ELEV.	V_o* ft/s	Remarks
48	1	Q10	1.7	120		3.84	0.92	2.94							-8.85	796.19	7.3	INLET CONTROL
48	1	Q25	1.8	130		3.84	0.98	3.13							-8.60	796.38	7.5	INLET CONTROL
48	1	Q50	1.9	150		3.84	1.10	3.53							-8.04	796.78	8.0	INLET CONTROL
48	1	Q100	1.9	160		3.84	1.17	3.74	Calcs from HY-8						-7.74	796.99	8.3	INLET CONTROL
48	1	Q200	2.0	170		3.84	1.23	3.95							-7.43	797.20	8.5	INLET CONTROL
48	1	Q500	2.0	180		3.84	1.30	4.17							-7.10	797.42	8.8	INLET CONTROL
48	1	Overtop	3.1	620		3.84	8.31	26.60							19.20	819.85	24.5	INLET CONTROL

Notes & Calculations

HW control elevation is 1.5' below LP. SP. Station 54+54-L-RT.

The project CE document has a commitment for the Dwarf Flowered Heartleaf: A new 54" pipe will be placed parallel to the existing 48" pipe on Stream SC under US 74 ensuring a more stable stream with less susceptibility to stream blockages, minimizing impacts to dwarf-flowered heartleaf plants located feet from the stream edge.

Pipe modeled as a 48" RCP with a parallel 48" welded steel pipe in HY-8. All TW, HW and Velocities obtained from HY-8 Model.

Per RFP, the pipe is required upsizing 6" to a 54" pipe

Hydrology Summary

DA = 64.09 ac
Tc = 20 min
C = 0.4

	Intensity (in/hr)	Discharge (cfs)
Q10=	4.6	120
Q25=	5.2	130
Q50=	5.7	150
Q100=	6.1	160
Q200=	6.6	170
Q500=	7.2	180

*V_o is partial flow velocity.

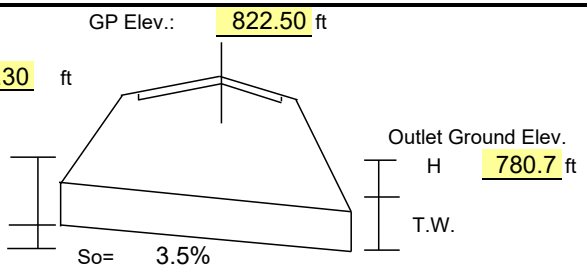
SUMMARY AND RECOMMENDATIONS: Propsed parallel 54" welded steel pipe

print date: 3/22/2024

PIPE DATA SHEET

Date: 3/6/2024 | Sheet 2 of 2
Project Number: 34598.2.2 | I.D. No.: R-4045 | County: | Designed By: JL | Reviewed By: DBS

Alignment:	-L-
Station:	55+09
Skew:	108 deg
Size/Type Pipe:	48" RCP
Type Entrance:	Concrete HW
Direction of Flow:	Right to Left
Hydrologic Method:	Rational
H.W. Control Elevation:	819.8
H.W. Control Feature:	LP/SP @ 54+54



Plan Summary Data

Drainage Area:	64.09	ac
Design Freq.:	100	yr
Design Disch.:	160	cfs
Design H.W. Elev.:	796.99	ft
Q100 Disch.:	160	cfs
Q100 Elev.:	796.99	ft
Overtopping Freq.:	500+	yr
Overtopping Disch.:	620	cfs
Overtopping Elev.:	819.85	ft

RCP=.012, CMP=.024
n= 0.012

TW Channel Specs.: Slope: 0.03 Lt. Side Slope= 5
Base Width= 5 n= 0.05 Rt. Side Slope= 5

BARRELS SIZE in	BARRELS No. Of Pipes	FREQ YR	TW ft	Q ft^3/s	Nat. H.W. ft	Allow. H.W. ft	Inlet Control HW/D ft/ft	Inlet Control HW (ft) ft	Outlet Control Ke	Outlet Control d_c ft	Outlet Control $(d_c+D)/2$ ft	Outlet Control h_o ft	Outlet Control H ft	Outlet Control LS_O ft	Outlet Control HW ft	HW ELEV.	V_o* ft/s	Remarks
48	1	Q10	1.7	120		4.8	0.99	3.94							-7.82	796.19	16.0	INLET CONTROL
48	1	Q25	1.8	130		4.8	1.03	4.13							-7.64	796.38	16.4	INLET CONTROL
48	1	Q50	1.9	150		4.8	1.13	4.53							-7.26	796.78	17.1	INLET CONTROL
48	1	Q100	1.9	160		4.8	1.19	4.74							-7.06	796.99	17.4	INLET CONTROL
48	1	Q200	2.0	170		4.8	1.24	4.95							-6.85	797.20	17.7	INLET CONTROL
48	1	Q500	2.0	180		4.8	1.29	5.17							-6.63	797.42	17.9	INLET CONTROL
48	1	Overtop	3.1	620		4.8	6.90	27.60							14.96	819.85	24.6	INLET CONTROL

Calcs from HY-8

Notes & Calculations

HW control elevation is 1.5' below SP elevation at LP Station 54+54-L-RT.

The project CE document has a commitment for the Dwarf Flowered Heartleaf: A new 54” pipe will be placed parallel to the existing 48” pipe on Stream SC under US 74 ensuring a more stable stream with less susceptibility to stream blockages, minimizing impacts to dwarf-flowered heartleaf plants located feet from the stream edge.

Existing pipe modeled as a 48" RCP with a parallel 48" welded steel pipe in HY-8. All TW, HW and Velocities obtained from HY-8 Model.

Per RFP, existing 48" is not required to be upsized.

Hydrology Summary

DA = 64.09 ac
Tc = 20 min
C = 0.4

	Intensity (in/hr)	Discharge (cfs)
Q10=	4.6	120
Q25=	5.2	130
Q50=	5.7	150
Q100=	6.1	160
Q200=	6.6	170
Q500=	7.2	180

*V_o is partial flow velocity.

SUMMARY AND RECOMMENDATIONS: Extend the existing 48" with 48" RCP-V

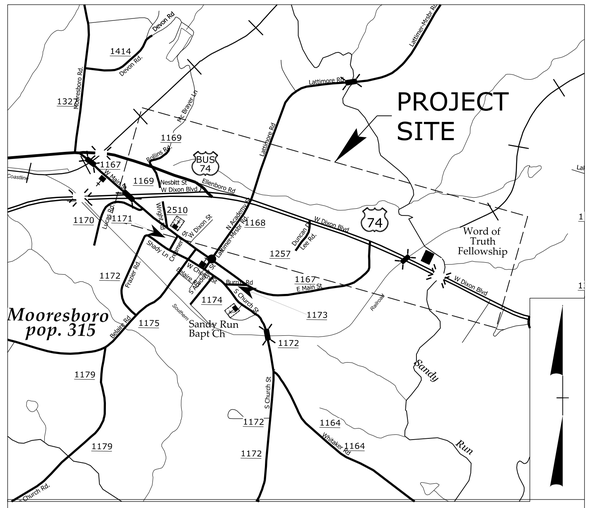
print date: 3/25/2024

Right-of-Way Plans

09/08/99

CONTRACT: C204860 TIP PROJECT: R-4045/BR-0012

See Sheet 1A For Index of Sheets
See Sheet 1B For Conventional Symbols



VICINITY MAP

NOTE: THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES FOR THE TOWN OF MOORESBORO.

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

CLEVELAND COUNTY

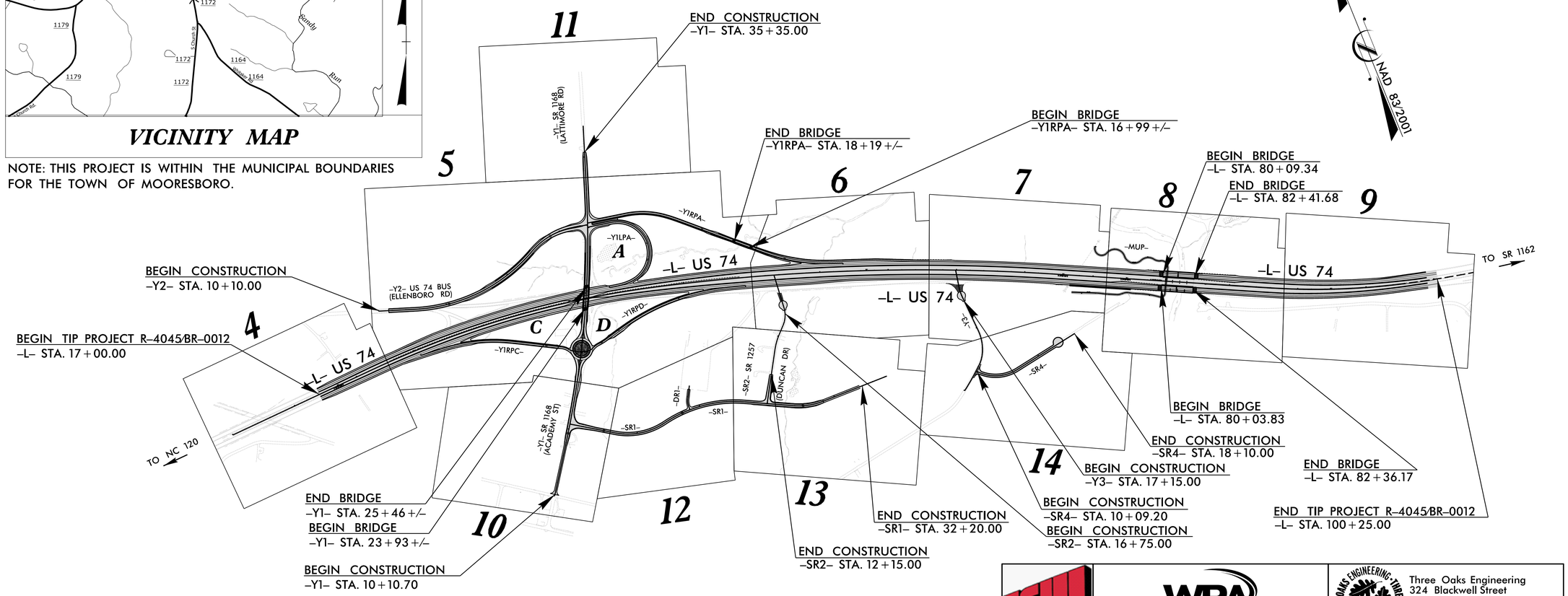
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-4045/BR-0012	1	
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	
34598.2.2 & 67012.3.1	NHF-74 (4) (R-4045)	CONST.	

RIGHT OF WAY PLANS SUBMITTAL
SUBMITTAL: S-029
JULY 2, 2024

LOCATION: UPGRADE OF US 74 AT SR 1168 (N. ACADEMY ST/LATTIMORE RD) INTERSECTION TO AN INTERCHANGE AND REPLACEMENT OF BRIDGE NOS. 220048 AND 220049 ON US 74 OVER SANDY RUN CREEK

TYPE OF WORK: DESIGN-BUILD AS SPECIFIED IN THE SCOPE OF WORK CONTAINED IN THE REQUEST FOR PROPOSALS

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



THIS IS A CONTROLLED ACCESS PROJECT WITH ACCESS LIMITED BEING LIMITED TO INTERCHANGE. CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III.

E.S. WAGNER CO., LLC

WRA
Whitman, Requardt & Associates, LLP
1201 Edwards Mill Road, Suite 320, Raleigh, North Carolina 27606

THREE OAKS ENGINEERING
Three Oaks Engineering
324 Blackwell Street
Suite 1200
Durham, NC 27701
919.732.1300

GRAPHIC SCALES

PLANS: 50 25 0 50 100
PROFILE (HORIZONTAL): 50 25 0 50 100
PROFILE (VERTICAL): 10 2.5 0 5 10

DESIGN DATA

ADT 2023 = 22,600
ADT 2043 = 30,300
K = 8 %
D = 55 %
T = 15 % *
V = 70 MPH
* TTST = 10% DUAL 5%
FUNC CLASS = FREEWAY/INTERSTATE

PROJECT LENGTH

LENGTH ROADWAY T.I.P. PROJECT R-4045/BR-0012 = 1.533 MILES
LENGTH STRUCTURE T.I.P. PROJECT R-4045/BR-0012 = 0.044 MILES
TOTAL LENGTH OF T.I.P. PROJECT R-4045/BR-0012 = 1.577 MILES

NCDOT CONTACT: ANDY HUSSEY, PE
PROJECT MANAGER, ALTERNATIVE DELIVERY UNIT

Prepared In the Office of:
SUMMIT DESIGN AND ENGINEERING SERVICES FIRM NO. P-0339
320 Executive Ct.
Hillsborough, NC 27278-8551
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Fax: (919) 732-6776
www.summitde.com

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: JULY 20, 2023

LETTING DATE: JULY 20, 2023

BRANDON JOHNSON, PE
PROJECT ENGINEER

DOUGLAS SAUNDERS, PE
DEPUTY PROJECT ENGINEER

HYDRAULICS ENGINEER

P.E.
SIGNATURE:

ROADWAY DESIGN ENGINEER

P.E.
SIGNATURE:

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

02-JUL-2024 16:55
R4045_Rdy_tsh.dgn
Josh.Jernigan

9/10/2021

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	1B

STATE OF NORTH CAROLINA, DIVISION OF HIGHWAYS

CONVENTIONAL PLAN SHEET SYMBOLS

Note: Not to Scale

BOUNDARIES AND PROPERTY:

- State Line
- County Line
- Township Line
- City Line
- Reservation Line
- Property Line
- Existing Iron Pin (EIP)
- Computed Property Corner
- Existing Concrete Monument (ECM)
- Parcel/Sequence Number
- Existing Fence Line
- Proposed Woven Wire Fence
- Proposed Chain Link Fence
- Proposed Barbed Wire Fence
- Existing Wetland Boundary
- Proposed Wetland Boundary
- Existing Endangered Animal Boundary
- Existing Endangered Plant Boundary
- Existing Historic Property Boundary
- Known Contamination Area: Soil
- Potential Contamination Area: Soil
- Known Contamination Area: Water
- Potential Contamination Area: Water
- Contaminated Site: Known or Potential

BUILDINGS AND OTHER CULTURE:

- Gas Pump Vent or U/G Tank Cap
- Sign
- Well
- Small Mine
- Foundation
- Area Outline
- Cemetery
- Building
- School
- Church
- Dam

HYDROLOGY:

- Stream or Body of Water
- Hydro, Pool or Reservoir
- Jurisdictional Stream
- Buffer Zone 1
- Buffer Zone 2
- Flow Arrow
- Disappearing Stream
- Spring
- Wetland
- Proposed Lateral, Tail, Head Ditch
- False Sump

RAILROADS:

- Standard Gauge
- RR Signal Milepost
- Switch
- RR Abandoned
- RR Dismantled

RIGHT OF WAY & PROJECT CONTROL:

- Primary Horiz Control Point
- Primary Horiz and Vert Control Point
- Secondary Horiz and Vert Control Point
- Vertical Benchmark
- Existing Right of Way Monument
- Proposed Right of Way Monument (Rebar and Cap)
- Proposed Right of Way Monument (Concrete)
- Existing Permanent Easement Monument
- Proposed Permanent Easement Monument (Rebar and Cap)
- Existing C/A Monument
- Proposed C/A Monument (Rebar and Cap)
- Proposed C/A Monument (Concrete)
- Existing Right of Way Line
- Proposed Right of Way Line
- Existing Control of Access Line
- Proposed Control of Access Line
- Proposed ROW and CA Line
- Existing Easement Line
- Proposed Temporary Construction Easement
- Proposed Temporary Drainage Easement
- Proposed Permanent Drainage Easement
- Proposed Permanent Drainage/Utility Easement
- Proposed Permanent Utility Easement
- Proposed Temporary Utility Easement
- Proposed Aerial Utility Easement

ROADS AND RELATED FEATURES:

- Existing Edge of Pavement
- Existing Curb
- Proposed Slope Stakes Cut
- Proposed Slope Stakes Fill
- Proposed Curb Ramp
- Existing Metal Guardrail
- Proposed Guardrail
- Existing Cable Guiderail
- Proposed Cable Guiderail
- Equality Symbol
- Pavement Removal

VEGETATION:

- Single Tree
- Single Shrub
- Hedge
- Woods Line
- Orchard
- Vineyard

EXISTING STRUCTURES:

MAJOR:

- Bridge, Tunnel or Box Culvert
- Bridge Wing Wall, Head Wall and End Wall

MINOR:

- Head and End Wall
- Pipe Culvert
- Footbridge
- Drainage Box: Catch Basin, DI or JB
- Paved Ditch Gutter
- Storm Sewer Manhole
- Storm Sewer

UTILITIES:

** SUE – Subsurface Utility Engineering*
LOS – Level of Service – A,B,C or D (Accuracy)

POWER:

- Existing Power Pole
- Proposed Power Pole
- Existing Joint Use Pole
- Proposed Joint Use Pole
- Power Manhole
- Power Line Tower
- Power Transformer
- U/G Power Cable Hand Hole
- H–Frame Pole
- U/G Power Line Test Hole (SUE – LOS A)*
- U/G Power Line (SUE – LOS B)*
- U/G Power Line (SUE – LOS C)*
- U/G Power Line (SUE – LOS D)*

TELEPHONE:

- Existing Telephone Pole
- Proposed Telephone Pole
- Telephone Manhole
- Telephone Pedestal
- Telephone Cell Tower
- U/G Telephone Cable Hand Hole
- U/G Telephone Test Hole (SUE – LOS A)*
- U/G Telephone Cable (SUE – LOS B)*
- U/G Telephone Cable (SUE – LOS C)*
- U/G Telephone Cable (SUE – LOS D)*
- U/G Telephone Conduit (SUE – LOS B)*
- U/G Telephone Conduit (SUE – LOS C)*
- U/G Telephone Conduit (SUE – LOS D)*
- U/G Fiber Optics Cable (SUE – LOS B)*
- U/G Fiber Optics Cable (SUE – LOS C)*
- U/G Fiber Optics Cable (SUE – LOS D)*

WATER:

- Water Manhole
- Water Meter
- Water Valve
- Water Hydrant
- U/G Water Line Test Hole (SUE – LOS A)*
- U/G Water Line (SUE – LOS B)*
- U/G Water Line (SUE – LOS C)*
- U/G Water Line (SUE – LOS D)*
- Above Ground Water Line

TV:

- TV Pedestal
- TV Tower
- U/G TV Cable Hand Hole
- U/G TV Test Hole (SUE – LOS A)*
- U/G TV Cable (SUE – LOS B)*
- U/G TV Cable (SUE – LOS C)*
- U/G TV Cable (SUE – LOS D)*
- U/G Fiber Optic Cable (SUE – LOS B)*
- U/G Fiber Optic Cable (SUE – LOS C)*
- U/G Fiber Optic Cable (SUE – LOS D)*

GAS:

- Gas Valve
- Gas Meter
- U/G Gas Line Test Hole (SUE – LOS A)*
- U/G Gas Line (SUE – LOS B)*
- U/G Gas Line (SUE – LOS C)*
- U/G Gas Line (SUE – LOS D)*
- Above Ground Gas Line

SANITARY SEWER:

- Sanitary Sewer Manhole
- Sanitary Sewer Cleanout
- U/G Sanitary Sewer Line
- Above Ground Sanitary Sewer
- SS Force Main Line Test Hole (SUE – LOS A)*
- SS Force Main Line (SUE – LOS B)*
- SS Force Main Line (SUE – LOS C)*
- SS Force Main Line (SUE – LOS D)*

MISCELLANEOUS:

- Utility Pole
- Utility Pole with Base
- Utility Located Object
- Utility Traffic Signal Box
- Utility Unknown U/G Line (SUE – LOS B)*
- U/G Tank; Water, Gas, Oil
- Underground Storage Tank, Approx. Loc.
- A/G Tank; Water, Gas, Oil
- Geoenvironmental Boring
- Abandoned According to Utility Records — AATUR
- End of Information — E.O.I.

6/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	2A-1
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

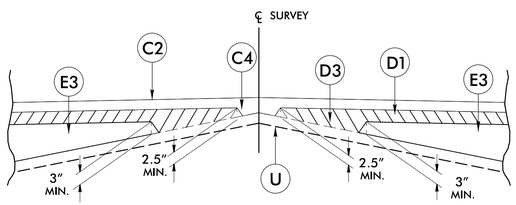
Prepared in the Office of: SUMMIT DESIGN AND ENGINEERING SERVICES
NC FIRM LICENSE Nos P-0339
320 Executive Ct.
Hillsborough, NC 27278
(919) 732-3883
(919) 732-6676 (FAX)

Prepared in the Office of: WRA Withers, Ravenel & Associates, LLP
1201 Edwards Mill Road, Suite 320,
Raleigh, NC 27606
(919) 859-0808

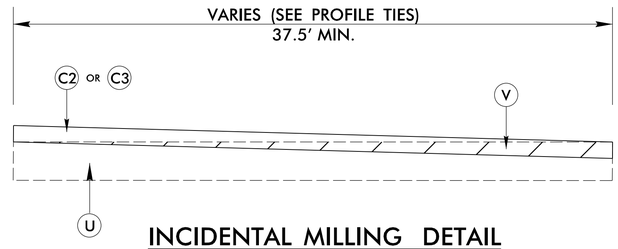
PAVEMENT SCHEDULE

C1	PROP. APPROX. 3″ ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 165 LBS. PER SQ. YD. IN EACH OF TWO LAYERS.	E3	PROP. VAR. DEPTH ASPHALT CONCRETE BASE COURSE, TYPE B25.0C, AT AN AVERAGE RATE OF 114 LBS. PER SQ. YD. PER 1″ DEPTH. TO BE PLACED IN LAYERS NOT LESS THAN 3″ IN DEPTH OR GREATER THAN 5½″ IN DEPTH.	R6	4″ ISLAND COVER
C2	PROP. APPROX. 3″ ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5C, AT AN AVERAGE RATE OF 168 LBS. PER SQ. YD. IN EACH OF TWO LAYERS.	J1	PROP. 8″ AGGREGATE BASE COURSE.	R7	12″ JOINTED CONCRETE TRUCK APRON W/ 4 X 4 W5.5 X E5.5 WIRE MESH REINFORCEMENT
C3	PROP. VAR. DEPTH ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 110 LBS. PER SQ. YD. PER 1″ DEPTH. TO BE PLACED IN LAYERS NOT TO EXCEED 1½″ IN DEPTH.	J2	PROP. 6″ AGGREGATE BASE COURSE.	T	EARTH MATERIAL.
C4	PROP. VAR. DEPTH ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5C, AT AN AVERAGE RATE OF 112 LBS. PER SQ. YD. PER 1½″ DEPTH. TO BE PLACED IN LAYERS NOT TO EXCEED 3″ IN DEPTH.	J3	PROP. VAR. DEPTH AGGREGATE BASE COURSE.	U	EXISTING PAVEMENT.
D1	PROP. APPROX. 4″ ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0C, AT AN AVERAGE RATE OF 456 LBS. PER SQ. YD.	R1	2′-6″ CONCRETE CURB AND GUTTER.	V	VARIABLE DEPTH MILLING 0″ TO 1.5″.
D2	PROP. APPROX. 2½″ ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0C, AT AN AVERAGE RATE OF 285 LBS. PER SQ. YD.	R2	1′-6″ CONCRETE CURB AND GUTTER.	W1	VARIABLE DEPTH ASPHALT PAVEMENT (SEE WEDGING DETAIL 1).
D3	PROP. VAR. DEPTH ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0C, AT AN AVERAGE RATE OF 114 LBS. PER SQ. YD. PER 1″ DEPTH, TO BE PLACED IN LAYERS NOT LESS THAN 2½″ IN DEPTH OR GREATER THAN 4″ IN DEPTH.	R3	5″ MONOLITHIC CONCRETE ISLAND, KEYED-IN.	Y	MILLED RUMBLE STRIPS
E1	PROP. APPROX. 4″ ASPHALT CONCRETE BASE COURSE, TYPE B25.0C, AT AN AVERAGE RATE OF 456 LBS. PER SQ. YD.	R4	SHOULDER BERM GUTTER.		
E2	PROP. APPROX. 4½″ ASPHALT CONCRETE BASE COURSE, TYPE B25.0C, AT AN AVERAGE RATE OF 513 LBS. PER SQ. YD. IN EACH OF TWO LAYERS.	R5	9″x18″ CURB		

NOTE: PAVEMENT EDGE SLOPES ARE 1:1 UNLESS SHOWN OTHERWISE.



WEDGING DETAIL (W1)



INCIDENTAL MILLING DETAIL
USE MILLING DETAIL AT RESURFACING TIES

DRIVEWAY CONSTRUCTION GUIDANCE:

XX′ GR = PROPOSED GRAVEL DRIVE WITH 8″ OF AGGREGATE BASE COURSE.

XX′ CONC. = PROPOSED CONCRETE DRIVE WITH 6″ JOINTED CONCRETE REINFORCED WITH WOVEN WIRE MESH.

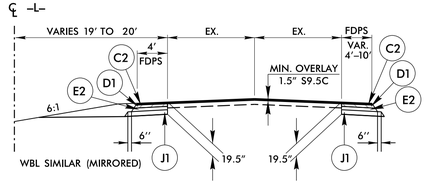
XX′ BST = PROPOSED ASPHALT DRIVE WITH 1.5″ S9.5B (OR S9.5C) AND 8″ AGGREGATE BASE COURSE WITH PRIME COAT, OR 2.0″ S9.5B (OR S9.5C) AND 6″ AGGREGATE BASE COURSE WITH PRIME COAT.

Plotted: 2024 17:06
R-4045_BR-0012_Typ-Sh
josh.jernigan

6/2/99

PAVEMENT SCHEDULE	
C1	3.0″ S9.5B
C2	3.0″ S9.5C
C3	VAR. S9.5B
C4	VAR. S9.5C
D1	4.0″ I19.0C
D2	2.5″ I19.0C
D3	VAR. I19.0B
E1	4.0″ B25.0C
E2	4.5″ B25.0C
E3	VAR. B25.0C
J1	8″ ABC
J2	6″ ABC
J3	VAR. ABC
R1	2′ 6″ C&G
R2	1′ 6″ C&G
R3	5″ MONO. ISLAND
R4	SBG
R5	9″x18″ CURB
R6	4″ ISLAND COVER
R7	12″ JC TRUCK APRON
T	EARTH MATERIAL
U	EX. PAVEMENT
V	VAR. MILLING
W1	WEDGING (DTL 1)
Y	MILLED RMBL STR.

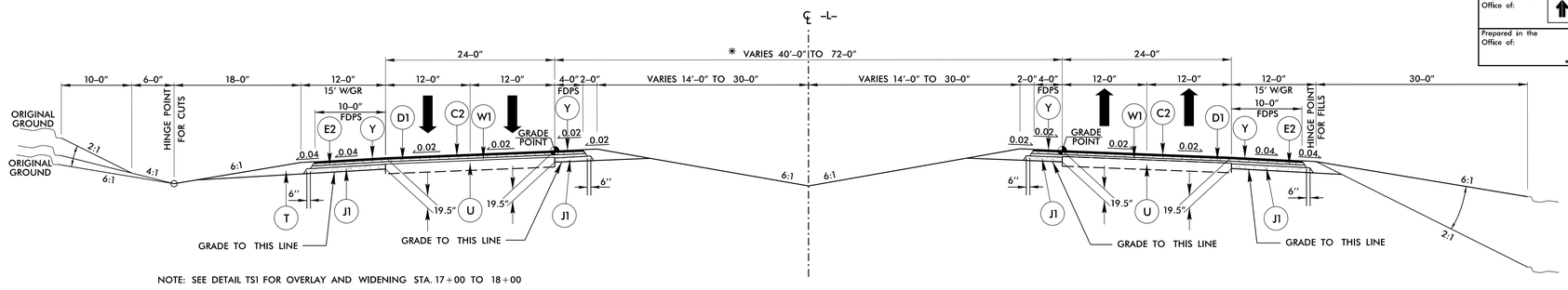
NOTE: PAVEMENT EDGE SLOPES ARE 1:1 UNLESS SHOWN OTHERWISE.



OVERLAY AND WIDENING DETAIL (TS1)

USE IN CONJUNCTION WTIH TYPICAL SECTION 1

–L– STA. 17+00.00 TO STA. 18+00.00 EBL & WBL



NOTE: SEE DETAIL TS1 FOR OVERLAY AND WIDENING STA. 17+00 TO 18+00

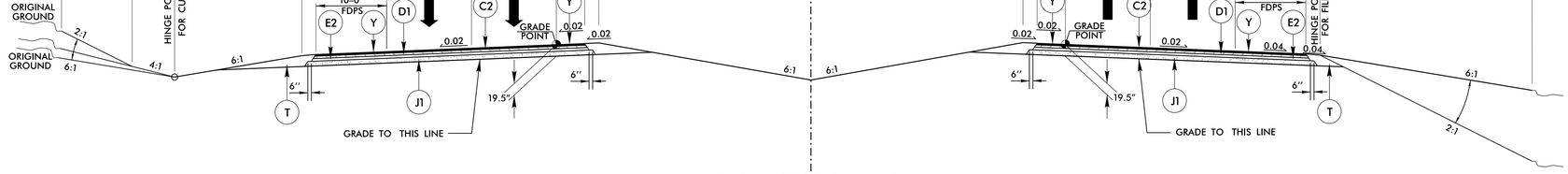
NOTE:
RESURFACE EXISTING PAVEMENT ONLY
FROM STA. 97+46.19 TO STA. 101+02.60

TYPICAL SECTION NO. 1

** –L– STA. 18+00.00 TO STA. 40+00.00
–L– STA. 88+36.20 TO STA. 100+25.00

* MEDIAN TRANSITIONS FROM 72′ to 46′
FROM STA. 89+09.75 TO STA. 98+19.75

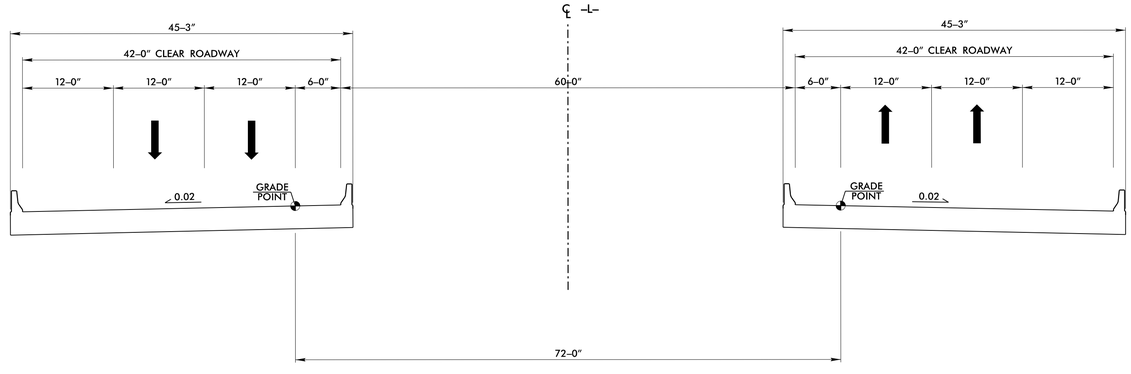
** OVERLAY DEPTH VARIES FROM –L– STA. 18+00.00 TO STA. 21+00.00 TO CORRECT ADVERSE CROWN



TYPICAL SECTION NO. 2

–L– STA. 40+00.00 TO STA. 80+03.83 (BEGIN BRIDGE) EBL
–L– STA. 82+36.17 (END BRIDGE) TO STA. 88+36.20 EBL
–L– STA. 40+00.00 TO STA. 80+09.34 (BEGIN BRIDGE) WBL
–L– STA. 82+41.67 (END BRIDGE) TO STA. 88+36.20 WBL

*** MEDIAN TRANSITIONS FROM 46′ TO 72′
FROM STA. 40+00.00 TO STA. 49+10.00



TYPICAL ON STRUCTURE

–L– STA. 80+03.83 TO STA. 82+36.17 EBL
–L– STA. 80+09.34 TO STA. 82+41.67 WBL

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	2A-2
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

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Prepared in the Office of: SUMMIT DESIGN AND ENGINEERING SERVICES
NC FIRM LICENSE Nos P-0339
320 Executive Ct.
Hillsborough, NC 27278
(919) 732-3883
(919) 732-6676 (FAX)

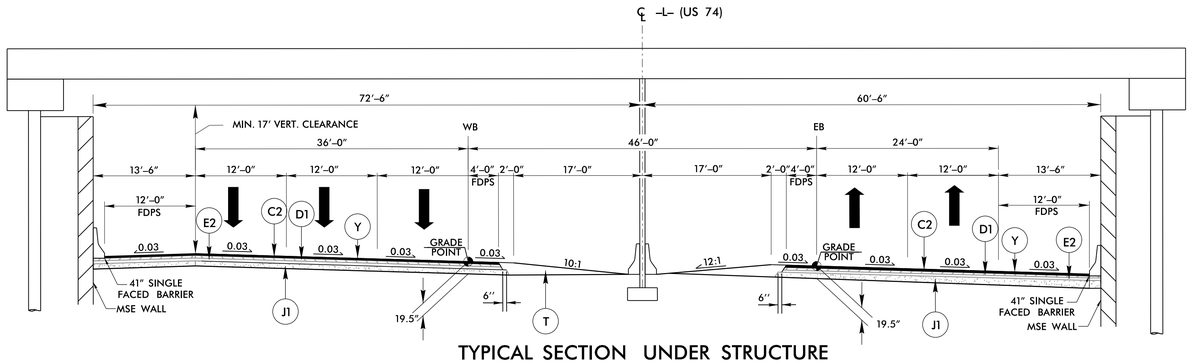
Prepared in the Office of: WRA Whitson, Bagwell & Associates, LLP
1201 Edwards Mill Road, Suite 320,
Raleigh, NC 27606
(919) 859-0808

R-4045_2024_17-06
R-4045_typ-sec
josh.grubb

6/2/99

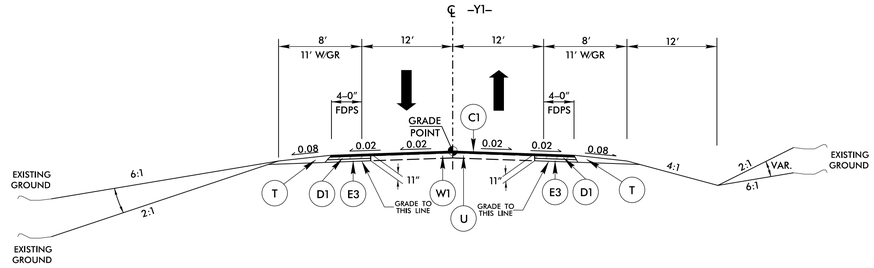
PAVEMENT SCHEDULE	
C1	3.0″ S9.5B
C2	3.0″ S9.5C
C3	VAR. S9.5B
C4	VAR. S9.5C
D1	4.0″ I19.0C
D2	2.5″ I19.0C
D3	VAR. I19.0B
E1	4.0″ B25.0C
E2	4.5″ B25.0C
E3	VAR. B25.0C
J1	8″ ABC
J2	6″ ABC
J3	VAR. ABC
R1	2′ 6″ C&G
R2	1′ 6″ C&G
R3	5″ MONO. ISLAND
R4	SBG
R5	9″x18″ CURB
R6	4″ ISLAND COVER
R7	12″ JC TRUCK APRON
T	EARTH MATERIAL
U	EX. PAVEMENT
V	VAR. MILLING
W1	WEDGING (DTL 1)
Y	MILLED RMBL STR.

NOTE: PAVEMENT EDGE SLOPES ARE 1:1 UNLESS SHOWN OTHERWISE.



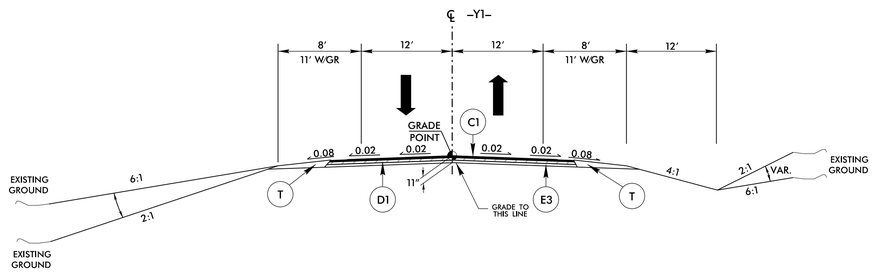
TYPICAL SECTION UNDER STRUCTURE

DISTANCES PERPENDICULAR TO –L–
SEE PLANS FOR SUPERELEVATION TRANSITION



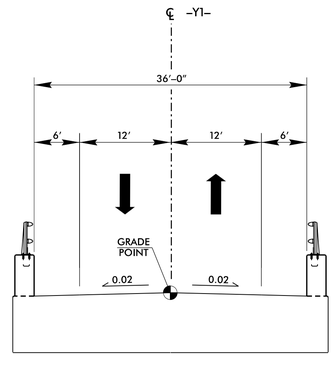
TYPICAL SECTION NO. 3

–Y1– STA. 13+75.00 TO STA. 17+50.00
–Y1– STA. 32+50.00 TO STA. 35+35.00



TYPICAL SECTION NO. 4

–Y1– STA. 17+50.00 TO STA. 23+93+/– (BEGIN BRIDGE)
–Y1– STA. 25+46+/– (END BRIDGE) TO STA. 32+50.00



TYPICAL ON STRUCTURE

–Y1– STA. 23+93+/– (BEGIN BRIDGE) TO –Y1– STA. 25+46+/– (END BRIDGE)

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	2A-3
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

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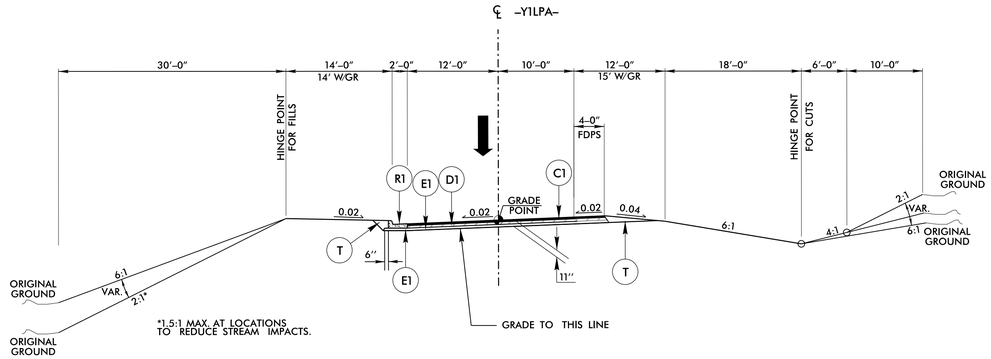
(919) 859-0808

R-4045_BR-0012_typ-sec
josh.lemay
Fri Jul 19 2024 17:06

6/2/99

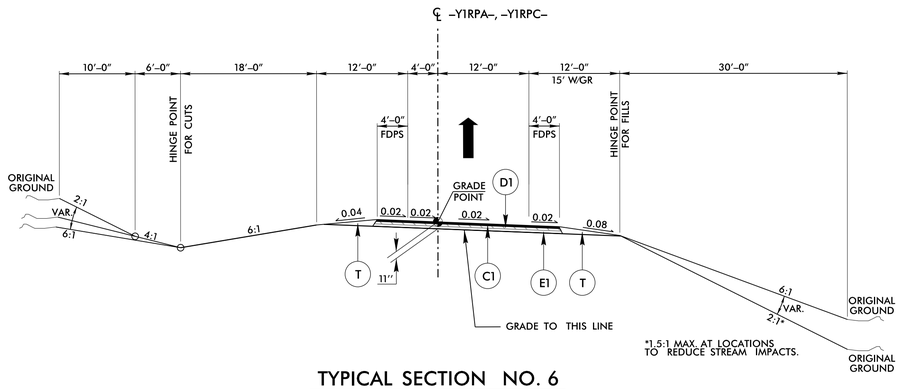
PAVEMENT SCHEDULE	
C1	3.0″ S9.5B
C2	3.0″ S9.5C
C3	VAR. S9.5B
C4	VAR. S9.5C
D1	4.0″ I19.0C
D2	2.5″ I19.0C
D3	VAR. I19.0B
E1	4.0″ B25.0C
E2	4.5″ B25.0C
E3	VAR. B25.0C
J1	8″ ABC
J2	6″ ABC
J3	VAR. ABC
R1	2′ 6″ C&G
R2	1′ 6″ C&G
R3	5″ MONO. ISLAND
R4	SBG
R5	9″x18″ CURB
R6	4″ ISLAND COVER
R7	12″ JC TRUCK APRON
T	EARTH MATERIAL
U	EX. PAVEMENT
V	VAR. MILLING
W1	WEDGING (DTL 1)
Y	MILLED RMBL STR.

NOTE: PAVEMENT EDGE SLOPES ARE 1:1 UNLESS SHOWN OTHERWISE.



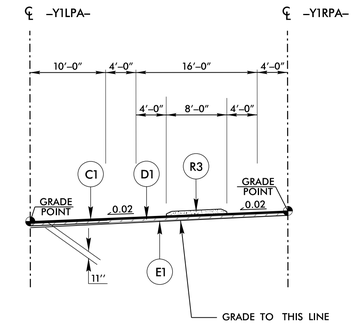
TYPICAL SECTION NO. 5

–Y1LPA– STA. 10+00.00 TO STA. 19+82.43



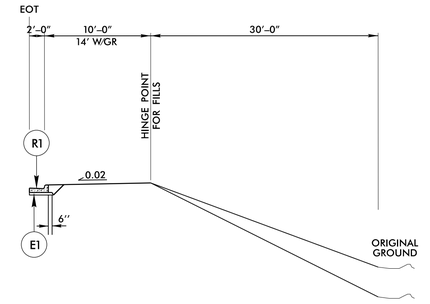
TYPICAL SECTION NO. 6

–Y1RPA– STA. 10+00.00 TO STA. 16+99 +/– (BEGIN BRIDGE)
–Y1RPA– STA. 18+19 +/– (END BRIDGE) TO STA. 29+20.44
–Y1RPC– STA. 10+00.00 TO STA. 21+16.57



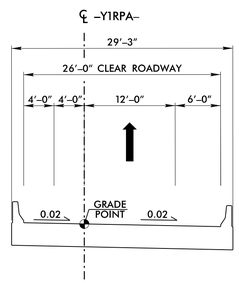
PARTIAL TYPICAL

USE IN CONJUCTION WITH
TYPICAL SECTION NO. 5 & 6
–Y1LPA– STA. 17+81.64 TO STA. 19+54.45
–Y1RPA– STA. 27+21.34 TO STA. 28+98.08



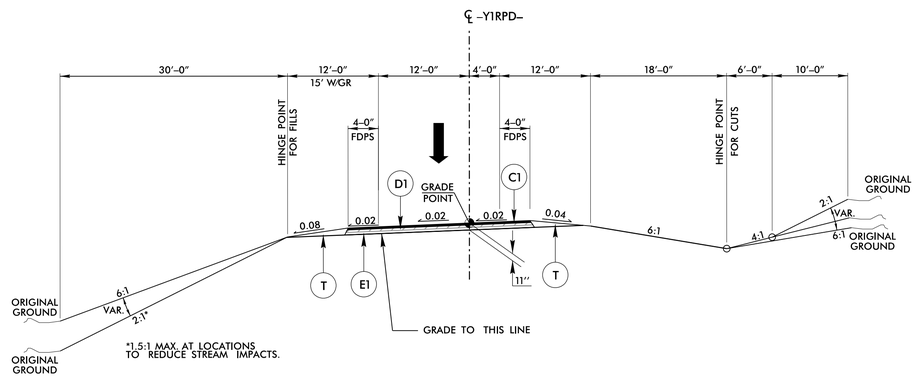
PARTIAL TYPICAL

USE IN CONJUCTION WITH
TYPICAL SECTION NO. 6 & 7
–Y1RPC– STA. 20+12.77 TO STA. 21+06.21 LT
–Y1RPC– STA. 20+12.76 TO STA. 21+32.66 RT
–Y1RPD– STA. 20+62.83 TO STA. 22+52.62 LT
–Y1RPD– STA. 20+83.98 TO STA. 22+19.27 RT



TYPICAL SECTION ON STRUCTURE

–Y1RPA– STA. 16+99 +/– (BEGIN BRIDGE) TO –Y1RPA– STA. 18+19 +/– (END BRIDGE)



TYPICAL SECTION NO. 7

–Y1RPD– STA. 10+00.00 TO STA. 22+34.20

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	2A-4
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

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(919) 859-0808

RAMS 2024 17:06
R4045_2A_TYP-Sch
josh.lemay

6/2/99

PAVEMENT SCHEDULE	
C1	3.0″ S9.5B
C2	3.0″ S9.5C
C3	VAR. S9.5B
C4	VAR. S9.5C
D1	4.0″ I19.0C
D2	2.5″ I19.0C
D3	VAR. I19.0B
E1	4.0″ B25.0C
E2	4.5″ B25.0C
E3	VAR. B25.0C
J1	8″ ABC
J2	6″ ABC
J3	VAR. ABC
R1	2′ 6″ C&G
R2	1′ 6″ C&G
R3	5″ MONO. ISLAND
R4	SBG
R5	9″x18″ CURB
R6	4″ ISLAND COVER
R7	12″ JC TRUCK APRON
T	EARTH MATERIAL
U	EX. PAVEMENT
V	VAR. MILLING
W1	WEDGING (DTL 1)
Y	MILLED RMBL STR.

NOTE: PAVEMENT EDGE SLOPES ARE 1:1 UNLESS SHOWN OTHERWISE.

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	2A-5
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

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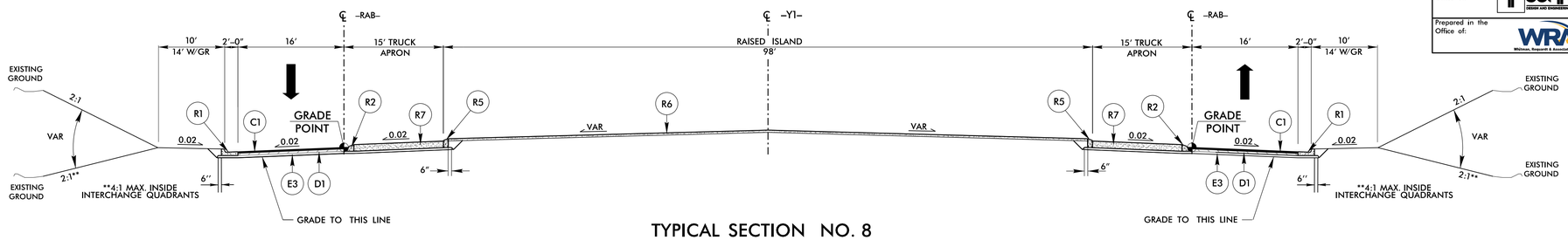
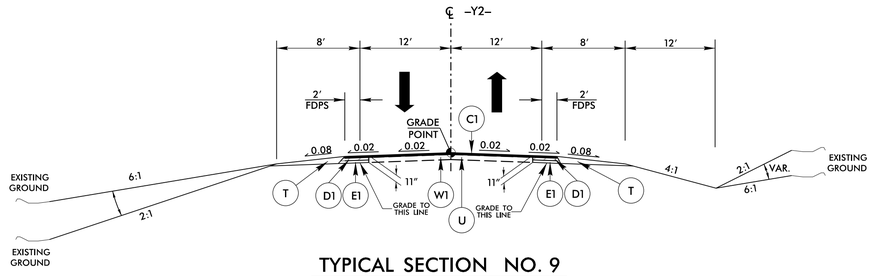
NC FIRM LICENSE Nos P-0339
320 Executive Ct.
Hillsborough, NC 27278
(919) 732-3883
(919) 732-6676 (FAX)

Prepared in the Office of: WRA Wilkinson, Ragsdell & Associates, LLP
1201 Edwards Mill Road, Suite 320
Raleigh, NC 27606
(919) 859-0808



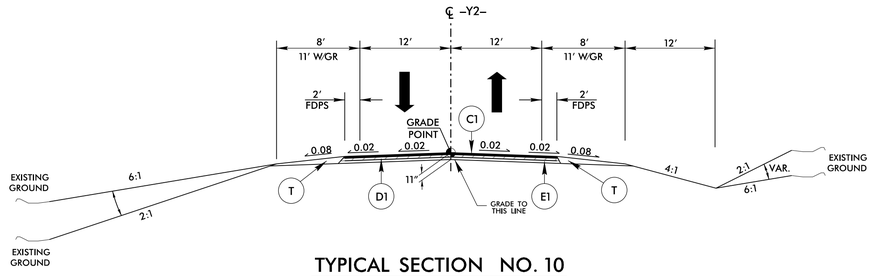
TYPICAL SECTION NO. 8

–RAB– STA. 10+00 TO –RAB– STA. 14+02.12



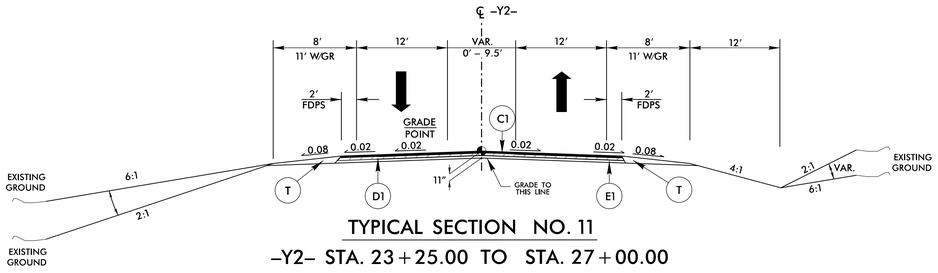
TYPICAL SECTION NO. 9

–Y2– STA. 11+00.00 TO STA. 15+50.00



TYPICAL SECTION NO. 10

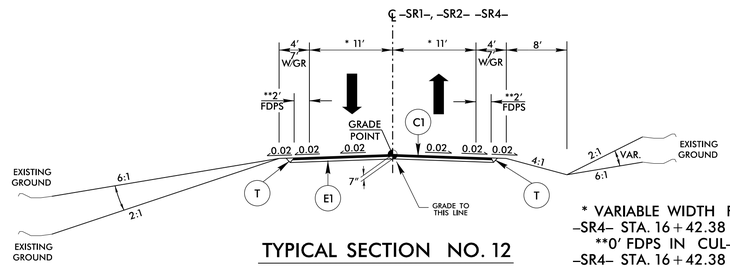
–Y2– STA. 15+50.00 TO STA. 23+25.00



TYPICAL SECTION NO. 11

–Y2– STA. 23+25.00 TO STA. 27+00.00

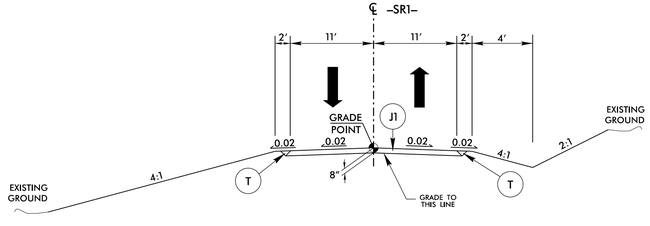
*RAISED MEDIAN ISLAND FROM
–Y2– STA. 26+00.00 TO STA. 26+75.00
(SEE PLANS)



TYPICAL SECTION NO. 12

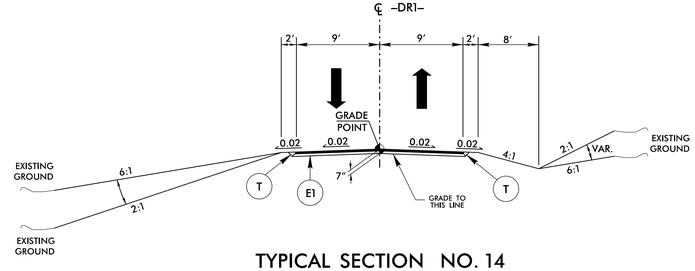
–SR1– STA. 10+12.00 TO STA. 29+13.11
–SR2– STA. 10+11.00 TO STA. 12+15.00
–SR4– STA. 10+09.20 TO STA. 17+11.97

* VARIABLE WIDTH FOR CUL-DE-SAC:
–SR4– STA. 16+42.38 TO STA. 17+11.97
**0′ FDPS IN CUL-DE-SAC FROM:
–SR4– STA. 16+42.38 TO STA. 17+11.97



TYPICAL SECTION NO. 13

–SR1– STA. 29+13.11 TO STA. 32+00.00



TYPICAL SECTION NO. 14

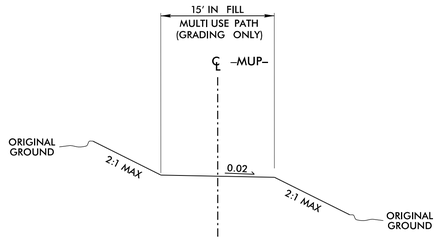
–DR1– STA. 10+10.00 TO STA. 11+52.00

RAMS 2024 17:06
R4045_BR_0012_typ-sec
josh.jernigan

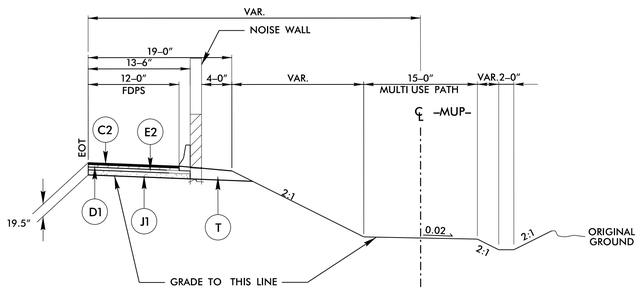
6/2/99

PAVEMENT SCHEDULE	
C1	3.0″ S9.5B
C2	3.0″ S9.5C
C3	VAR. S9.5B
C4	VAR. S9.5C
D1	4.0″ I19.0C
D2	2.5″ I19.0C
D3	VAR. I19.0B
E1	4.0″ B25.0C
E2	4.5″ B25.0C
E3	VAR. B25.0C
J1	8″ ABC
J2	6″ ABC
J3	VAR. ABC
R1	2′ 6″ C&G
R2	1′ 6″ C&G
R3	5″ MONO. ISLAND
R4	SBG
R5	9″x18″ CURB
R6	4″ ISLAND COVER
R7	12″ JC TRUCK APRON
T	EARTH MATERIAL
U	EX. PAVEMENT
V	VAR. MILLING
W1	WEDGING (DTL 1)
Y	MILLED RMBL STR.

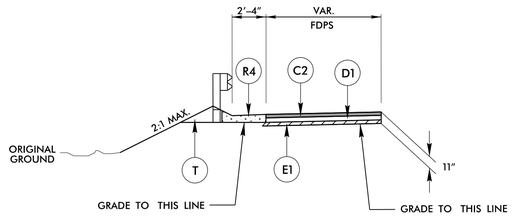
NOTE: PAVEMENT EDGE SLOPES ARE 1:1 UNLESS SHOWN OTHERWISE.



TYPICAL SECTION NO. 15
–MUP– STA. 10+00.00 TO STA. 19+23.21



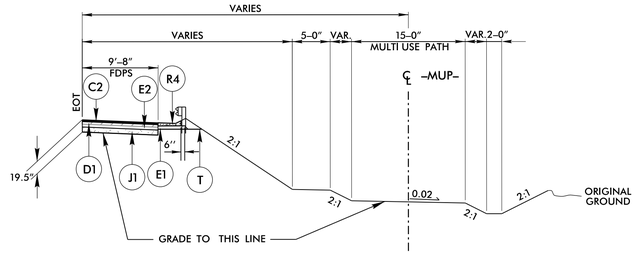
TYPICAL SECTION NO. 17
–MUP– STA. 20+94.10 TO STA. 25+74.60



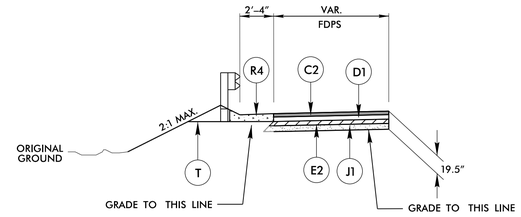
SHOULDER BERM GUTTER DETAIL 2
GUARDRAIL WHERE SHOULDER BERM GUTTER IS REQUIRED
USE IN CONJUNCTION WTIH TYPICALS AT STATIONS:

–Y1– STA. 22+84.06 TO STA. 23+74.01 (LT)
–Y1– STA. 22+97.40 TO STA. 23+82.88 (RT)
–Y1– STA. 25+55.93 TO STA. 28+00.00 (LT)
–Y1– STA. 25+63.89 TO STA. 28+50.00 (RT)
–Y2– STA. 19+00.00 TO STA. 22+50.00 (LT)
–Y2– STA. 18+50.00 TO STA. 22+50.00 (RT)
–Y1LPA– STA. 13+00.00 TO STA. 15+50.00 (RT)
–Y1RPA– STA. 15+50.00 TO STA. 16+86.06 (LT)
–Y1RPA– STA. 10+00.00 TO STA. 16+77.43 (RT)
–Y1RPA– STA. 18+36.94 TO STA. 20+00.00 (LT)
–Y1RPA– STA. 18+28.30 TO STA. 19+50.00 (RT)
–Y1RPD– STA. 19+75.00 TO STA. 20+62.83 (LT)

NOTE: SBG ON THE HIGH SIDE OF A CURVE SHALL MATCH THE SLOPE OF THE SUPERELEVATED PAVEMENT.



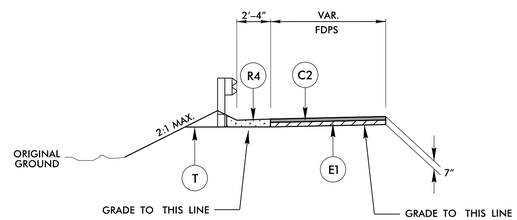
TYPICAL SECTION NO. 16
–MUP– STA. 19+23.21 TO STA. 20+94.10



SHOULDER BERM GUTTER DETAIL 1
GUARDRAIL WHERE SHOULDER BERM GUTTER IS REQUIRED
USE IN CONJUNCTION WTIH TYPICALS AT STATIONS:

–L– STA. 77+82.00 TO STA. 80+03.83 (RT)
–L– STA. 82+36.17 TO STA. 83+00.00 (RT)
–L– STA. 79+36.72 TO STA. 80+09.34 (LT)
–L– STA. 82+41.67 TO STA. 83+00.00 (LT)

NOTE: SBG ON THE HIGH SIDE OF A CURVE SHALL MATCH THE SLOPE OF THE SUPERELEVATED PAVEMENT.



SHOULDER BERM GUTTER DETAIL 3
GUARDRAIL WHERE SHOULDER BERM GUTTER IS REQUIRED
USE IN CONJUNCTION WTIH TYPICALS AT STATIONS:

–SR1– STA. 25+45.46 TO STA. 28+00.00 (LT)
–SR1– STA. 25+00.00 TO STA. 28+00.00 (RT)
–SR2– STA. 10+15.79 TO STA. 11+54.06 (RT)

NOTE: SBG ON THE HIGH SIDE OF A CURVE SHALL MATCH THE SLOPE OF THE SUPERELEVATED PAVEMENT.

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	2A-6
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared in the Office of: SUMMIT DESIGN AND ENGINEERING SERVICES
NC FIRM LICENSE Nos P-0339
320 Executive Ct.
Hillsborough, NC 27278
(919) 732-3883
(919) 732-6676 (FAX)

Prepared in the Office of: WRA Withers, Ravenel & Associates, LLP
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Raleigh, NC 27606
(919) 859-0808

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josh.jernigan

PAVEMENT SLOPE TRANSITION DETAIL

FOR PLAN, SEE SHEET 5

PROJECT REFERENCE NO.	SHEET NO.
R-4045	2B-1
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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320 Executive Ct.
Hillsborough, NC 27278
(919) 732-3883
(919) 732-6676 (FAX)

NAD 83/2011

REVISIONS

8/17/99

–Y1–

–Y1 RPC–

–Y1 RPD–

–Y1– +82.86
–Y1– +72.36
–RAB– +01.80
–RAB– +45.89
–RAB– +92.14
–RAB– +98.88
–Y1– +12.36
–Y1– +91.36
–RAB– +98.03
–RAB– +84.65
–RAB– +37.31
–RAB– +99.33

SEE SHEET 2B–2 FOR GENERAL RAB DETAIL

20′ 10′ 0 20′ 40′

01-JUL-2024 17:06
R-4045 rab_2B1.dgn
josh.ferguson

ROUNDABOUT DETAIL

FOR PLAN, SEE SHEET 5

PROJECT REFERENCE NO.	SHEET NO.
R-4045	2B-2
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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Hillsborough, NC 27278
(919) 732-3883
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NAD 83/2011

REVISIONS

8/17/99

-Y1-

+84.06

+97.42

+69.36
0.00' RT
R=3'

+47.34
OS=0.75'

12'

+59.34
OS=0.75'

2'6" C&G

R=135'

5" MONOLITHIC ISLAND
(KEYED-IN)

+75.07
11.94' LT
R=2'

R=175'

R=80'

+76.43
12.07' RT
R=2'

-YIRPD- ST Sta. 20+57.12
S 75° 48' 01.5" W (AH)

-RAB- POC Sta. 12+51.65=
-Y1- POC Sta. 21+56.36

+70.42

OS=1.5'

18'

OS=3'

+69.55

+92.36
0.00' RT

-YIRPD- PC Sta. 21+14.44

+83.98

R=118'

8:1

-YIRPC- PT Sta. 21+41.74
S 61° 16' 59.8" E (AH)

-YIRPC- PC Sta. 20+43.23

+13.02

R=118'

S 61° 27' 20.4" E

-Y1 RPC-

8:1

2'6" C&G

16'

R=15'

R=64'

R=80'

R=40'

-Y1 RPD-

SBG

+75.00

+14.00

R=118'

+43.23

+13.02

R=118'

-YIRPC- PRC Sta. 20+99.08

-YIRPD- PRC Sta. 21+78.20

-RAB- POC Sta. 13+72.86=
-YIRPC- POC Sta. 21+34.27

-YIRPD- PRC Sta. 22+28.13

-RAB- POC Sta. 10+00.00=
-RAB- POC Sta. 14+02.12

-RAB- POC Sta. 11+50.76=
-YIRPD- POC Sta. 22+54.47

-YIRPD- PT Sta. 22+77.97
N 76° 16' 59.8" W (AH)

-YIRPD- POT Sta. 23+22.18 =
-YIRPC- POT Sta. 21+94.84 =
-Y1- POC Sta. 20+71.30

+15.22

+14.31

-RAB- POC Sta. 10+50.00=
-Y1- POC Sta. 20+28.36

+08.29
13.04' LT
R=2'

+09.67
11.15' RT
R=2'

5" MONOLITHIC ISLAND
(KEYED-IN)

R=135'

+40.69
OS=0.75'

+20.77
OS=0.75'

+15.36
0.00' RT
R=3'

+09.20

+87.80

SEE SHEET 2B-1 FOR -RAB- PAVEMENT SLOPES

20' 10' 0 20' 40'

01-JUL-2024 17:06
R-4045_2B2.dgn
josh.jernigan

MUP ALIGNMENT DETAIL

FOR PLANS, SEE SHEETS 7 & 8

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	2B-3

ROADWAY DESIGN ENGINEER

PAVEMENT DESIGN ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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Hillsborough, NC 27278
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Prepared in the Office of: WRA Wilkinson, Requardt & Associates, LLP
1201 Edwards Mill Road,
Suite 320,
Raleigh, NC 27606
(919) 859-0808

CURVE DATA FOR -MUP-							
PI Sta 12+72.20	PI Sta 12+71.37	PI Sta 14+13.23	PI Sta 15+06.06	PI Sta 15+75.51	PI Sta 16+20.74	PI Sta 16+64.47	PI Sta 17+68.07
△ = 159° 10' 58.7" (LT)	△ = 120° 57' 43.3" (RT)	△ = 114° 13' 06.4" (LT)	△ = 76° 39' 29.3" (RT)	△ = 41° 29' 15.5" (LT)	△ = 51° 34' 08.2" (RT)	△ = 52° 22' 55.9" (RT)	△ = 5° 53' 34.8" (RT)
D = 114° 35' 29.6"	D = 76° 23' 39.7"	D = 76° 23' 39.7"	D = 76° 23' 39.7"	D = 76° 23' 39.7"	D = 143° 14' 22.0"	D = 104° 10' 26.9"	D = 22° 55' 05.9"
L = 138.91'	L = 158.34'	L = 149.51'	L = 100.35'	L = 54.31'	L = 36.00'	L = 50.28'	L = 25.71'
T = 272.20'	T = 132.46'	T = 115.97'	T = 59.29'	T = 28.41'	T = 19.32'	T = 27.05'	T = 12.87'
R = 50.00'	R = 75.00'	R = 75.00'	R = 75.00'	R = 75.00'	R = 40.00'	R = 55.00'	R = 250.00'

-MUP- PC Sta. 10+00.00
= -L- Sta. 75+02.09 (222.03' LT)

-MUP- PRC Sta. 11+38.91

-MUP- PRC Sta. 12+97.25

-MUP- PRC Sta. 14+46.76

-MUP- PRC Sta. 15+47.11

-MUP- PRC Sta. 16+01.42

-MUP- PCC Sta. 16+37.42

-MUP- PT Sta. 16+87.70

S 27° 53' 22.0" W

-MUP- PC Sta. 17+55.20

-MUP- PRC Sta. 17+80.92

-MUP- PT Sta. 18+07.67

S 27° 39' 03.7" W

-MUP- PC Sta. 18+71.44

-MUP- PRC Sta. 19+23.96

-MUP- POT Sta. 25+74.60
= -L- Sta. 73+50.00 (124.69' RT)

N 66° 10' 08.4" W

-MUP- PT Sta. 23+84.96

-MUP- PC Sta. 23+57.39

N 60° 54' 14.3" W

-MUP- PT Sta. 23+36.19

-MUP- PC Sta. 23+12.22

N 64° 20' 15.4" W

-MUP- PT Sta. 22+44.68

N 86° 18' 22.5" W

-MUP- PC Sta. 22+14.00

-MUP- PT Sta. 20+61.37

N 64° 26' 24.6" W

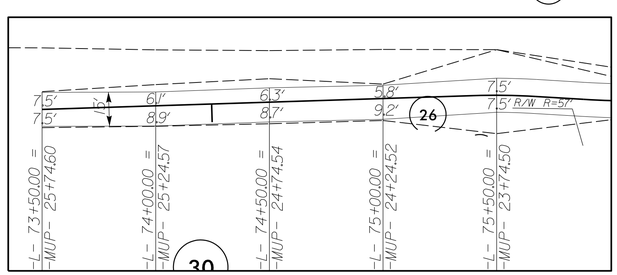
-MUP- PC Sta. 21+12.86

-MUP- PT Sta. 21+28.85

N 59° 51' 37.0" W

-MUP- PC Sta. 21+53.67

-MUP- PT Sta. 21+90.59



GRADING DETAIL
(MAGNIFIED 1.5 X FOR CLARITY)

CURVE DATA FOR -MUP-							
PI Sta 17+94.31	PI Sta 19+07.39	PI Sta 19+92.93	PI Sta 21+20.86	PI Sta 21+72.46	PI Sta 22+29.53	PI Sta 23+24.21	PI Sta 23+71.18
△ = 6° 07' 53.1" (LT)	△ = 100° 18' 24.7" (RT)	△ = 12° 23' 53.0" (LT)	△ = 4° 34' 47.6" (RT)	△ = 26° 26' 45.5" (LT)	△ = 21° 58' 07.1" (RT)	△ = 3° 26' 01.1" (RT)	△ = 5° 15' 54.1" (LT)
D = 22° 55' 05.9"	D = 190° 59' 09.4"	D = 9° 01' 22.6"	D = 28° 38' 52.4"	D = 71° 37' 11.0"	D = 71° 37' 11.0"	D = 14° 19' 26.2"	D = 19° 05' 54.9"
L = 26.75'	L = 52.52'	L = 137.41'	L = 15.99'	L = 36.93'	L = 30.67'	L = 23.97'	L = 27.57'
T = 13.39'	T = 35.95'	T = 68.97'	T = 8.00'	T = 18.80'	T = 15.53'	T = 11.99'	T = 13.79'
R = 250.00'	R = 30.00'	R = 635.00'	R = 200.00'	R = 80.00'	R = 80.00'	R = 400.00'	R = 300.00'

FOR -MUP- PROFILE, SEE SHEET 29

GRAPHIC SCALE
25 12.5 0 25 50

R-4045_Rdy_de1_283.dgn
jsmith_jsmith

8/17/99

REVISIONS

–Y1–/–Y1RPA–/–Y1LPA–/–Y2–
INTERSECTION DETAIL

FOR PLAN, SEE SHEET 5

PROJECT REFERENCE NO.	SHEET NO.
R-4045	2B-4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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NC FIRM LICENSE No: P-0339
320 Executive Ct.
Hillsborough, NC 27278
(919) 732-3883
(919) 732-6676 (FAX)

NAD 83/2011

4" FDPS
–Y1–
4" FDPS
+18.61
+97.19
+81.16
12'
12'
+90.41
5" MONOLITHIC ISLAND
(KEYED-IN)
5" MONOLITHIC ISLAND
(KEYED-IN)
R=80'
R=70'
R=70'
R=50'
+73.00
2.00' RT
R=2'
R=45'
+04.00
0.00' RT
R=4'
4' FDPS
4' FDPS
–Y1RPA–
8'
16'
0S=4"
8' FDPS
8:1
0S=7.5"
15'
4' FDPS
–Y1LPA–
0S=4"
22'
2' FDPS
–Y2–
8'
15'
0S=7.5"
2'6" C&G
R=50'
8' FDPS
–Y1LPA– +54.14
–Y1LPA–
+89.78
20.00' RT
R=6'
2' FDPS
8:1
8' FDPS
R=50'
–Y1LPA–
+65.00
18.00' RT
R=4'
R=80'
R=100'
12'
+10.80
+83.23
12'
8' FDPS
–Y1–
8' FDPS
+50.00
SBG

20' 10' 0 20' 40'
PLANS

01-JUL-2024 17:06
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josh.gerdan

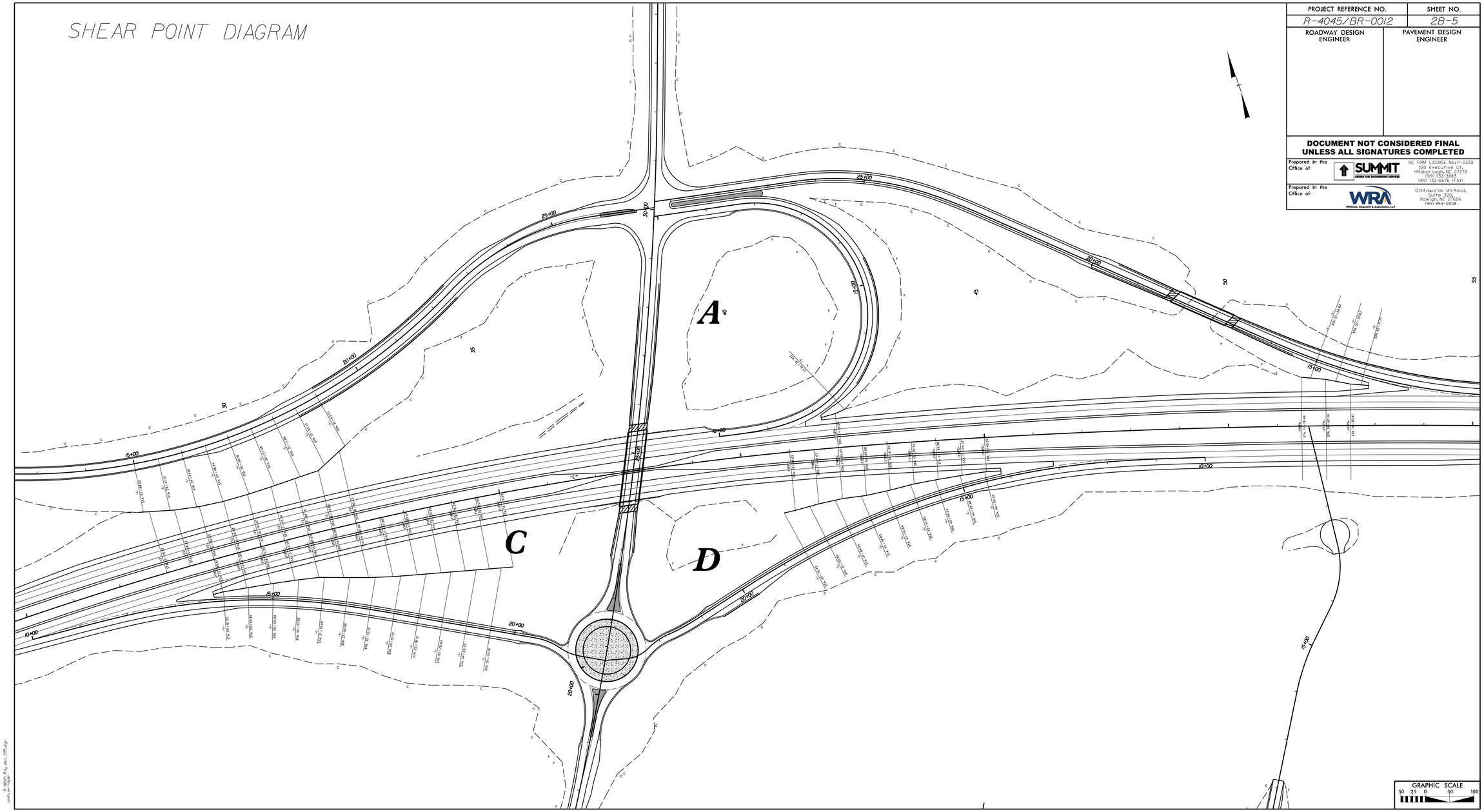
SHEAR POINT DIAGRAM

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	2B-5
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared in the Office of: SUMMIT DESIGN AND ENGINEERING SERVICES
NC FIRM LICENSE No: P-0339
320 Executive Ct.
Hillsborough, NC 27278
(919) 732-3883
(919) 732-6676 (FAX)

Prepared in the Office of: WRA Withrow, Ragsdell & Associates, LLP
120 Edwards Mill Road,
Suite 320,
Raleigh, NC 27606
(919) 859-0808

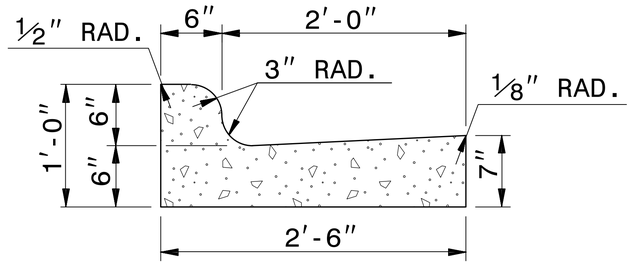


R-4045_Rdy_dwn_285.dgn
jones_jeff_roger

5/14/99

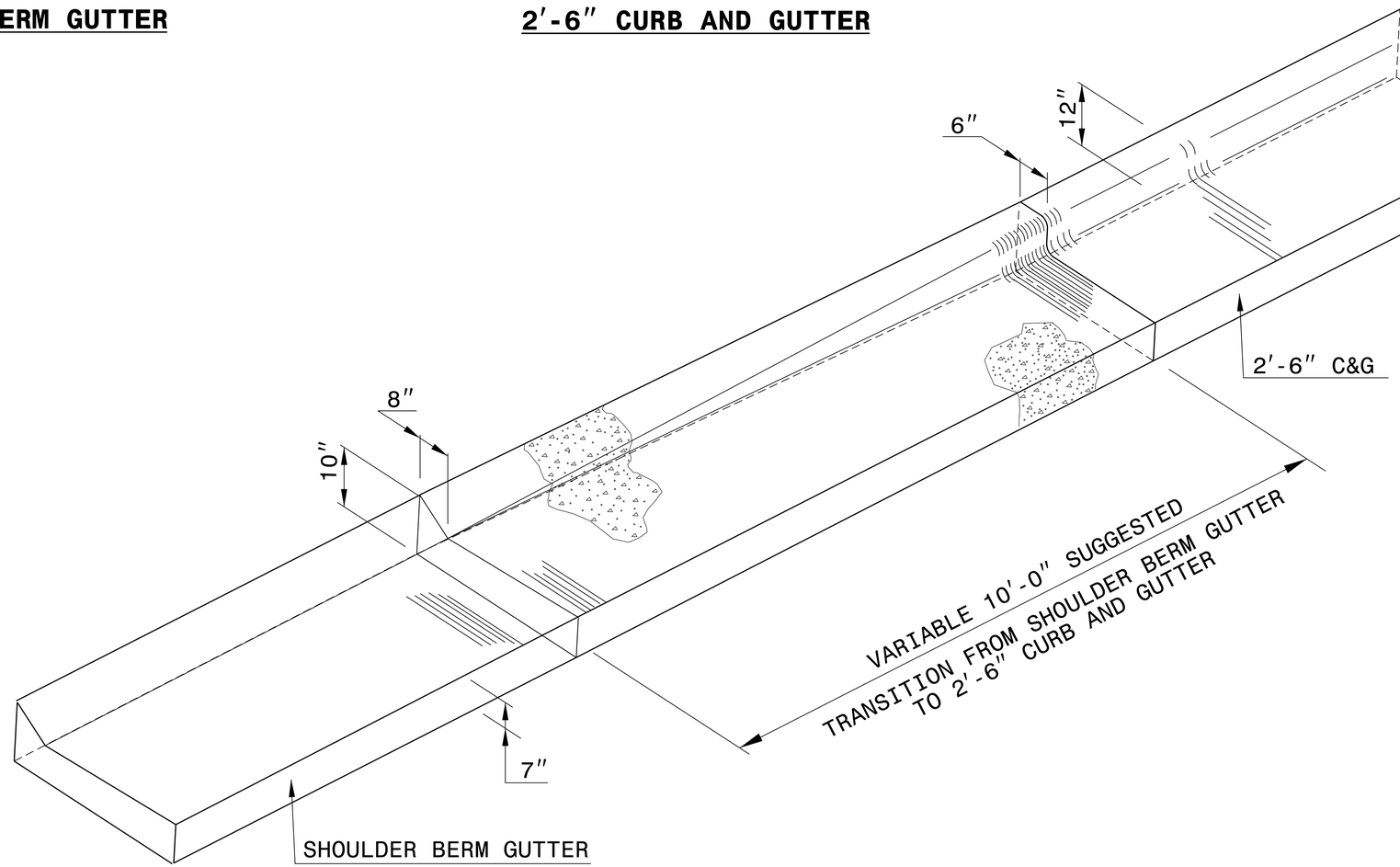
PROJECT REFERENCE NO.	SHEET NO.
R-4045	2B-6

SHOULDER BERM GUTTER



2′-6″ CURB AND GUTTER

*NOTE: SEE STD. DWG. 846.01 FOR GENERAL NOTES



ISOMETRIC VIEW OF TRANSITION

NORTH CAROLINA PROFESSIONAL SEAL 33144 ENGINEER NICOLE M HEWLETT

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CONTRACT STANDARDS AND DEVELOPMENT UNIT
Office 919-707-6950 FAX 919-250-4119

DETAIL OF SHOULDER BERM GUTTER TO 2′-6″ CURB & GUTTER TRANSITION SECTION

ORIGINAL BY: E.E. WARD DATE: 5-29-02
MODIFIED BY: _____ DATE: _____
CHECKED BY: _____ DATE: _____
FILE SPEC.: /usr/details/stand/cgtransit.dgn

20-OCT-2017 09:40
$$\Contracts\Special Details\erioward\usr\details\stand\c&g transition sections.dgn
jhowerton

6/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	2D-1
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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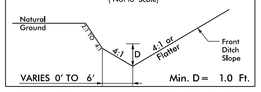
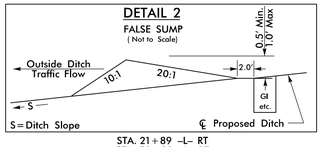
Raleigh, NC 27606
(919) 859-0808

DETAIL 1
SPECIAL CUT DITCH wHINGE
(Not to Scale)



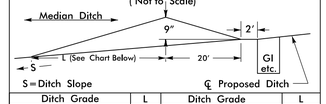
FROM STA. 22+00 TO STA. 23+50 –L– RT
FROM STA. 20+50 TO STA. 26+50 –Y1RPA– RT

DETAIL 2
FALSE SUMP
(Not to Scale)



STA. 21+89 –L– RT
STA. 50+39 –L– RT
STA. 61+21 –L– RT
STA. 83+62 –L– LT
STA. 85+24 –L– LT
STA. 92+15 –L– LT

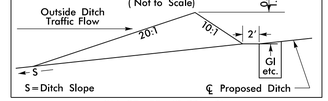
DETAIL 3
FALSE SUMP
(Not to Scale)



Ditch Grade	L	Ditch Grade	L
0.0% To 2.0%	20'	Over 4.0% To 6.0%	40'
Over 2.0% To 4.0%	30'	Over 6.0%	50'

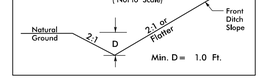
STA. 27+50 –Y1 RPA– LT
STA. 21+89 –L– CL
STA. 28+88 –L– CL
STA. 35+63 –L– CL
STA. 45+13 –L– CL
STA. 48+06 –L– CL
STA. 50+41 –L– CL
STA. 61+61 –L– CL
STA. 69+98 –L– CL
STA. 75+13 –L– CL
STA. 79+78 –L– CL
STA. 82+61 –L– CL
STA. 85+26 –L– CL
STA. 91+94 –L– CL

DETAIL 4
FALSE SUMP
(Not to Scale)



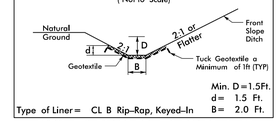
STA. 27+50 –Y1 RPA– RT
STA. 21+88 –L– LT
STA. 68+90 –L– LT
STA. 75+13 –L– LT
STA. 78+96 –L– LT
STA. 92+20 –L– RT
STA. 20+50 –Y1RPA– RT
STA. 18+50 –Y2– LT

DETAIL 5
SPECIAL 'V' DITCH
(Not to Scale)



FROM STA. 34+00 TO STA. 35+50 –L– LT
FROM STA. 51+00 TO STA. 52+00 –L– RT
FROM STA. 74+00 TO STA. 77+00 –L– RT
FROM STA. 13+50 TO STA. 15+00 –Y1– RT
FROM STA. 11+00 TO STA. 12+40.41 –SR1– LT
FROM STA. 12+65 TO STA. 14+50 –SR1– LT
FROM STA. 11+00 TO STA. 12+00 –SR1– RT

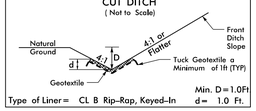
DETAIL 6
SPECIAL BASE DITCH
(Not to Scale)



Min. D = 1.5Ft.
d = 1.5 Ft.
Type of Liner = CL B Rip–Rap, Keyed–In B = 2.0 Ft.

FROM STA. 26+00 TO STA. 28+50 –L– RT

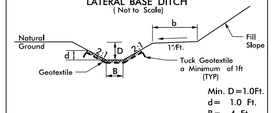
DETAIL 7
CUT DITCH
(Not to Scale)



Min. D = 1.0Ft.
Type of Liner = CL B Rip–Rap, Keyed–In d = 1.0 Ft.

FROM STA. 25+50 TO STA. 29+00 –L– LT

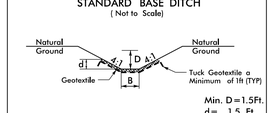
DETAIL 8
LATERAL BASE DITCH
(Not to Scale)



Min. D = 1.0Ft.
d = 1.0 Ft.
B = 4 Ft.
Type of Liner = CL B Rip–Rap, Keyed–In b = 5 Ft.

FROM STA. 36+00 TO STA. 37+00 –L– LT

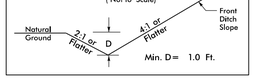
DETAIL 9
STANDARD BASE DITCH
(Not to Scale)



Min. D = 1.5Ft.
Type of Liner = CL I Rip–Rap, Keyed–In B = 10.0 Ft.

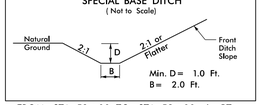
FROM STA. 33+10 TO STA. 33+35 –L– RT
67 FT @ 0.037 FT/FT

DETAIL 10
SPECIAL 'V' DITCH
(Not to Scale)



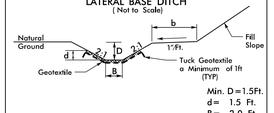
FROM STA. 23+50 TO STA. 26+00 –L– RT
FROM STA. 59+00 TO STA. 60+50 –L– RT
FROM STA. 20+00 TO STA. 23+50 –Y1RPA– LT
FROM STA. 26+50 TO STA. 28+50 –Y1RPA– RT
FROM STA. 30+62 TO STA. 32+50 –Y1– LT
FROM STA. 30+88 TO STA. 32+50 –Y1– RT
FROM STA. 10+50 TO STA. 12+50 –Y2– LT
FROM STA. 11+00 TO STA. 12+50 –Y2– RT
FROM STA. 25+00 TO STA. 26+50 –Y2– LT
FROM STA. 10+50 TO STA. 11+00 –SR1– LT
FROM STA. 14+00 TO STA. 19+00 –SR1– LT
FROM STA. 19+50 TO STA. 22+50 –SR1– LT
FROM STA. 28+50 TO STA. 31+00 –SR1– LT
FROM STA. 10+43.44 TO STA. 11+00 –SR1– RT
FROM STA. 17+00 TO STA. 18+50 –SR1– RT
FROM STA. 19+50 TO STA. 23+00 –SR1– RT
FROM STA. 14+50 TO STA. 15+50 –SR4– LT
FROM STA. 16+50 TO STA. 17+00 –SR4– LT
FROM STA. 10+22.65 TO STA. 11+00 –DR1– LT
FROM STA. 10+22.65 TO STA. 11+00 –DR1– RT

DETAIL 11
SPECIAL BASE DITCH
(Not to Scale)



FROM STA. 52+00 TO STA. 59+00 –L– RT
FROM STA. 19+00 TO STA. 19+66.67 –Y1– LT
FROM STA. 19+83 TO STA. 20+50 –Y1RPC– RT
FROM STA. 28+50 TO STA. 32+00 –SR1– RT
FROM STA. 10+50 TO STA. 11+50 –SR2– LT

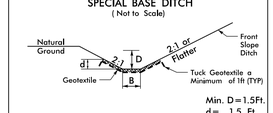
DETAIL 12
LATERAL BASE DITCH
(Not to Scale)



Min. D = 1.5Ft.
d = 1.5 Ft.
B = 2.0 Ft.
Type of Liner = CL B Rip–Rap, Keyed–In b = 5.0 Ft.

FROM STA. 61+85 TO STA. 63+85 –L– LT

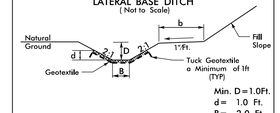
DETAIL 13
SPECIAL BASE DITCH
(Not to Scale)



Min. D = 1.5Ft.
d = 1.5 Ft.
Type of Liner = CL I Rip–Rap, Keyed–In B = 6.0 Ft.

FROM STA. 77+48 TO STA. 78+50 –L– RT

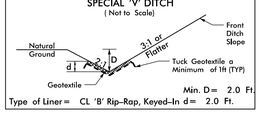
DETAIL 14
LATERAL BASE DITCH
(Not to Scale)



Min. D = 1.0Ft.
d = 1.0 Ft.
B = 2.0 Ft.
Type of Liner = CL B Rip–Rap, Keyed–In b = 5.0 Ft.

FROM STA. 82+65 TO STA. 83+20 –L– LT

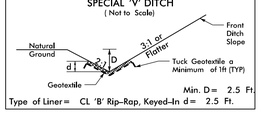
DETAIL 15
SPECIAL 'V' DITCH
(Not to Scale)



Min. D = 2.0 Ft.
Type of Liner = CL 'B' Rip–Rap, Keyed–In d = 2.0 Ft.

FROM STA. 12+00 TO STA. 12+55 –SR1– RT

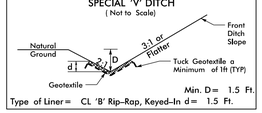
DETAIL 16
SPECIAL 'V' DITCH
(Not to Scale)



Min. D = 2.5 Ft.
Type of Liner = CL 'B' Rip–Rap, Keyed–In d = 2.5 Ft.

FROM STA. 12+55 TO STA. 13+00 –SR1– RT

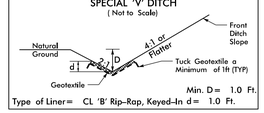
DETAIL 17
SPECIAL 'V' DITCH
(Not to Scale)



Min. D = 1.5 Ft.
Type of Liner = CL 'B' Rip–Rap, Keyed–In d = 1.5 Ft.

FROM STA. 13+00 TO STA. 14+50 –SR1– RT
FROM STA. 20+00 TO STA. 20+69 –Y1RPD– LT

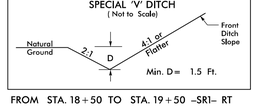
DETAIL 18
SPECIAL 'V' DITCH
(Not to Scale)



Min. D = 1.0 Ft.
Type of Liner = CL 'B' Rip–Rap, Keyed–In d = 1.0 Ft.

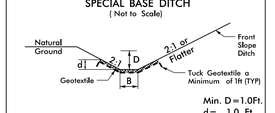
FROM STA. 12+50 TO STA. 15+81 –Y2– RT
FROM STA. 14+50 TO STA. 17+00 –SR1– RT
FROM STA. 10+50 TO STA. 14+50 –SR4– LT

DETAIL 19
SPECIAL 'V' DITCH
(Not to Scale)



FROM STA. 18+50 TO STA. 19+50 –SR1– RT

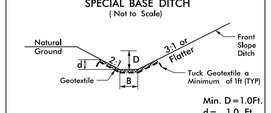
DETAIL 20
SPECIAL BASE DITCH
(Not to Scale)



Min. D = 1.0Ft.
d = 1.0 Ft.
Type of Liner = CL 'B' Rip–Rap, Keyed–In B = 4.0 Ft.

FROM STA. 23+00 TO STA. 26+00 –SR1– RT
FROM STA. 18+50 TO STA. 19+57.71 –Y1– RT

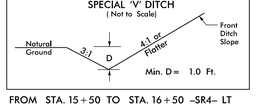
DETAIL 21
SPECIAL BASE DITCH
(Not to Scale)



Min. D = 1.0Ft.
d = 1.0 Ft.
Type of Liner = CL 'B' Rip–Rap, Keyed–In B = 2.0 Ft.

FROM STA. 19+00 TO STA. 20+45 –Y2– LT
FROM STA. 27+00 TO STA. 28+50 –SR1– RT

DETAIL 22
SPECIAL 'V' DITCH
(Not to Scale)



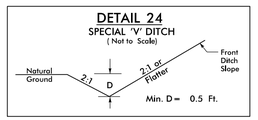
FROM STA. 15+50 TO STA. 16+50 –SR4– LT

DETAIL 23
SPECIAL BASE DITCH
(Not to Scale)

Min. D = 1.5Ft.
d = 1.5 Ft.
Type of Liner = CL 'B' Rip–Rap, Keyed–In B = 4.0 Ft.

FROM STA. 12+00 TO STA. 17+50 –SR4– RT

DETAIL 24
SPECIAL 'V' DITCH
(Not to Scale)



FROM STA. 16+50 TO STA. 18+50 –Y1– RT

DETAIL 25
SPECIAL BASE DITCH
(Not to Scale)

Min. D = 1.8Ft.
Type of Liner = CL I Rip–Rap, Keyed–In B = 2.0 Ft.

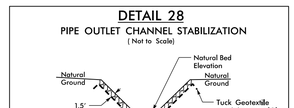
FROM STA. 18+06 TO STA. 19+83 –Y1RPC– RT

DETAIL 27
SPECIAL BASE DITCH
(Not to Scale)

Min. D = 1.6Ft.
Type of Liner = CL 'I' Rip–Rap, Keyed–In B = 2.0 Ft.

FROM STA. 13+62.12 TO STA. 18+06 –Y1RPC– RT

DETAIL 28
PIPE OUTLET CHANNEL STABILIZATION
(Not to Scale)



Length= 20 Ft.
Type of Liner= 47 TONS CL 'I' Rip–Rap – Keyed–In

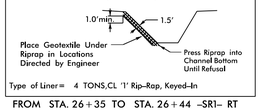
STA. 26+34 –SR1– LT

DETAIL 29
BANK STABILIZATION
(Not to Scale)

Type of Liner = 3 TONS,CL 'I' Rip–Rap, Keyed–In

FROM STA. 26+28 TO STA. 26+33.38 –SR1– RT

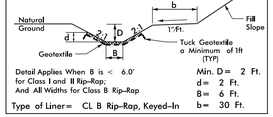
DETAIL 30
BANK STABILIZATION
(Not to Scale)



Type of Liner = 4 TONS,CL 'I' Rip–Rap, Keyed–In

FROM STA. 26+35 TO STA. 26+44 –SR1– RT

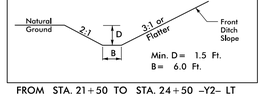
DETAIL 31
LATERAL BASE DITCH
(Not to Scale)



Detail Applies When B is < 6.0'
for Class I and II Rip–Rap;
And All Widths for Class B Rip–Rap
Min. D = 2 Ft.
d = 2 Ft.
B = 6 Ft.
Type of Liner = CL B Rip–Rap, Keyed–In b = 30 Ft.

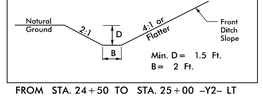
FROM STA. 20+55 TO STA. 21+50 –Y2– LT

DETAIL 32
SPECIAL BASE DITCH
(Not to Scale)



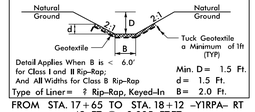
FROM STA. 21+50 TO STA. 24+50 –Y2– LT

DETAIL 33
SPECIAL BASE DITCH
(Not to Scale)



FROM STA. 24+50 TO STA. 25+00 –Y2– LT

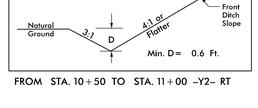
DETAIL 34
TAIL DITCH
(Not to Scale)



Detail Applies When B is < 6.0'
for Class I and II Rip–Rap;
And All Widths for Class B Rip–Rap
Min. D = 1.5 Ft.
d = 1.5 Ft.
B = 2.0 Ft.
Type of Liner = ? Rip–Rap, Keyed–In

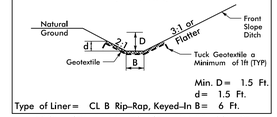
FROM STA. 17+65 TO STA. 18+12 –Y1RPA– RT
49 FT @ 0.005 FT/FT

DETAIL 35
SPECIAL 'V' DITCH
(Not to Scale)



FROM STA. 10+50 TO STA. 11+00 –Y2– RT

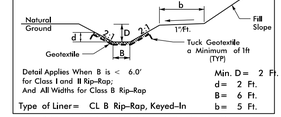
DETAIL 36
SPECIAL BASE DITCH
(Not to Scale)



Min. D = 1.5 Ft.
d = 1.5 Ft.
Type of Liner = CL B Rip–Rap, Keyed–In B = 6 Ft.

FROM STA. 15+81 TO STA. 19+00 –Y2– RT

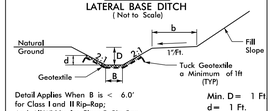
DETAIL 37
LATERAL BASE DITCH
(Not to Scale)



Detail Applies When B is < 6.0'
for Class I and II Rip–Rap;
And All Widths for Class B Rip–Rap
Min. D = 2 Ft.
d = 2 Ft.
B = 6 Ft.
Type of Liner = CL B Rip–Rap, Keyed–In b = 5 Ft.

FROM STA. 19+50 TO STA. 21+35 –Y2– RT

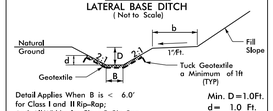
DETAIL 38
LATERAL BASE DITCH
(Not to Scale)



Detail Applies When B is < 6.0'
for Class I and II Rip–Rap;
And All Widths for Class B Rip–Rap
Min. D = 1 Ft
d = 1 Ft.
B = 2.0 Ft.
Type of Liner = CL 1 Rip–Rap, Keyed–In b = 5.0 Ft.

FROM STA. 18+12 TO STA. 20+00 –Y1RPA– RT

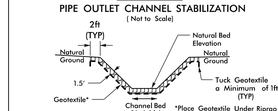
DETAIL 39
LATERAL BASE DITCH
(Not to Scale)



Detail Applies When B is < 6.0'
for Class I and II Rip–Rap;
And All Widths for Class B Rip–Rap
Min. D = 1.0Ft.
d = 1.0 Ft.
B = 2.0 Ft.
Type of Liner = 'B' Rip–Rap, Keyed–In b = 5.0 Ft.

FROM STA. 26+44 TO STA. 27+00 –SR1– RT

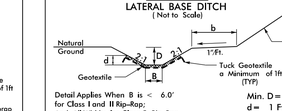
DETAIL 40
PIPE OUTLET CHANNEL STABILIZATION
(Not to Scale)



Length= 25 Ft.
Type of Liner= 70 TON CL II Rip–Rap – Keyed–In

STA. 21+32 –Y2– RT

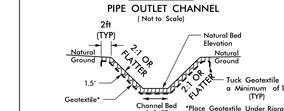
DETAIL 41
LATERAL BASE DITCH
(Not to Scale)



Detail Applies When B is < 6.0'
for Class I and II Rip–Rap;
And All Widths for Class B Rip–Rap
Min. D = 1 Ft
d = 1 Ft.
B = 4 Ft.
Type of Liner = CL B Rip–Rap, Keyed–In b = 15 Ft.

FROM STA. 26+04 TO STA. 26+57 –Y1– LT

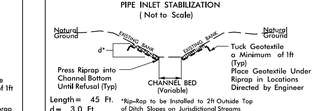
DETAIL 42
PIPE OUTLET CHANNEL
(Not to Scale)



Length= 35 Ft.
Type of Liner= 65 TON CL II Rip–Rap – Keyed–In

STA. 26+78 –Y1– RT

DETAIL 43
PIPE INLET STABILIZATION
(Not to Scale)

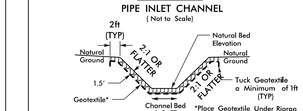


Length= 45 Ft.
d= 3.0 Ft.
Est.= 45 Tons of Class II Rip–Rap, Keyed–In

*Rip–Rap to be Installed to 2ft Outside Top of Ditch Slopes on Jurisdictional Streams

STA. 20+65 –Y2– LT

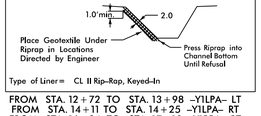
DETAIL 44
PIPE INLET CHANNEL
(Not to Scale)



Length= 26 Ft.
Type of Liner= 50 TON CL II Rip–Rap – Keyed–In

STA. 26+72 –Y1– LT

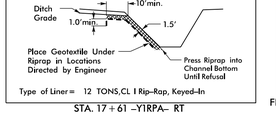
DETAIL 45
BANK STABILIZATION
(Not to Scale)



Type of Liner = CL II Rip–Rap, Keyed–In

FROM STA. 12+72 TO STA. 13+98 –Y1LPA– LT
FROM STA. 14+11 TO STA. 14+25 –Y1LPA– RT
FROM STA. 16+84 TO STA. 17+10 –Y1RPA– RT
FROM STA. 17+19 TO STA. 17+36 –Y1RPA– RT

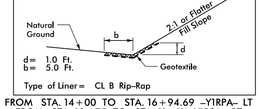
DETAIL 46
RIP RAP AT EMBANKMENT
(Not to Scale)



Type of Liner = 12 TONS,CL I Rip–Rap, Keyed–In

STA. 17+61 –Y1RPA– RT

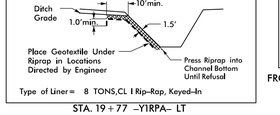
DETAIL 47
TOE PROTECTION
(Not to Scale)



d= 1.0 Ft.
b= 5.0 Ft.
Type of Liner = CL B Rip–Rap

FROM STA. 14+00 TO STA. 16+94.69 –Y1RPA– LT
FROM STA. 10+75 TO STA. 11+11 –Y1RPA– RT
FROM STA. 11+42 TO STA. 13+40 –Y1RPA– RT
FROM STA. 17+50 TO STA. 19+00 –Y1– LT

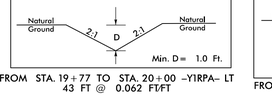
DETAIL 48
RIP RAP AT EMBANKMENT
(Not to Scale)



Type of Liner = 8 TONS,CL I Rip–Rap, Keyed–In

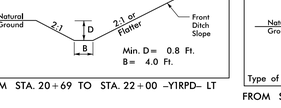
STA. 19+77 –Y1RPA– LT

DETAIL 49
TAIL DITCH
(Not to Scale)



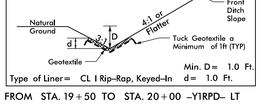
FROM STA. 19+77 TO STA. 20+00 –Y1RPA– LT
43 FT @ 0.062 FT/FT

DETAIL 50
SPECIAL BASE DITCH
(Not to Scale)



FROM STA. 20+69 TO STA. 22+00 –Y1RPD– LT

DETAIL 51
SPECIAL 'V' DITCH
(Not to Scale)



Type of Liner = CL I Rip–Rap, Keyed–In d = 1.0 Ft.

FROM STA. 19+50 TO STA. 20+00 –Y1RPD– LT

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R-4045/BR-0012
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6/2/99

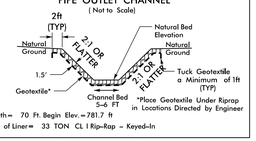
PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	2D-2
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared in the Office of:
SUMMIT DESIGN AND ENGINEERING SERVICES
NC FIRM LICENSE No:P-0339
320 Executive Ct.
Hillsborough, NC 27278
(919) 732-3883
(919) 732-6676 (FAX)

Prepared in the Office of:
Withrow, Redpath & Associates, LLP
(201 Edwards Mill Road,
Suite 320,
Raleigh, NC 27606
(919) 859-0808

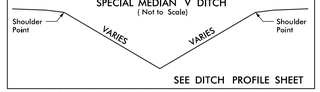
DETAIL 52
PIPE OUTLET CHANNEL
(Not to Scale)



Length= 70 Ft. Begin Elev. =781.7 ft
Type of Liner= 33 TON CL I Rip-Rap – Keyed-In

STA. 54+44 –L– LT

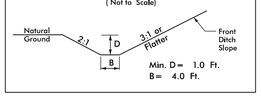
DETAIL 53
SPECIAL MEDIAN V DITCH
(Not to Scale)



SEE DITCH PROFILE SHEET

FROM STA. 36+50 TO STA. 37+50 –L– CL
FROM STA. 49+50 TO STA. 50+50 –L– CL

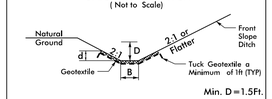
DETAIL 54
SPECIAL BASE DITCH
(Not to Scale)



Min. D= 1.0 Ft.
B= 4.0 Ft.

FROM STA. 11+00 TO STA. 11+45.18 –RAB– RT

DETAIL 55
SPECIAL BASE DITCH
(Not to Scale)

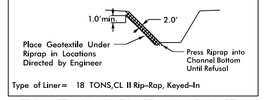


Min. D=1.5Ft.
d= 1.0 Ft.
B= 10.0 Ft.

Type of Liner= CL I Rip-Rap, Keyed–In

FROM STA. 78+50 TO STA. 80+45 –L– RT

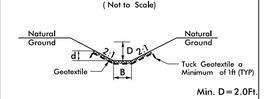
DETAIL 56
BANK STABILIZATION
(Not to Scale)



Type of Liner= 18 TONS,CL II Rip–Rap, Keyed–In

FROM STA. 80+87 TO STA. 80+96 –L– RT

DETAIL 57
STANDARD BASE DITCH
(Not to Scale)



Min. D= 2.0Ft.
d= 2 Ft.
B= 3 Ft.

Type of Liner= CL B Rip–Rap, Keyed–In

FROM STA. 48+05 TO STA. 48+08 –L– LT
27 FT @0.019 FT/FT

DETAIL 58
RIP RAP AT EMBANKMENT
(Not to Scale)

Type of Liner= 7 TONS,CL I Rip–Rap, Keyed–In

STA. 48+08 –L– LT

DETAIL 59
PIPE OUTLET CHANNEL
(Not to Scale)

Length= 50 Ft.
Type of Liner= 392 TON CL I Rip–Rap – Keyed–In

STA. 33+93 –L– LT

DETAIL 60
PIPE OUTLET CHANNEL STABILIZATION
(Not to Scale)

Length= 15 Ft.
Slope= 3.8%
Type of Liner= 41 TONS CL 'I' Rip–Rap – Keyed–In

STA. 12+65 –SR1– LT

DETAIL 61
SPECIAL BASE DITCH
(Not to Scale)

Min. D= 1.0 Ft.
d= 1.0 Ft.
B= 2.0 Ft.

Type of Liner= PSRM

FROM STA. 22+50 TO STA. 24+66.93 –SR1– LT

DETAIL 62
LATERAL BASE DITCH
(Not to Scale)

Detail Applies When B is < 6.0' for Class I and II Rip-Rap, And All Widths for Class B Rip–Rap

Min. D=1.0Ft.
d= 1.0 Ft.
B= 4.0 Ft.
b= 5.0 Ft.

Type of Liner= 'B' Rip–Rap, Keyed–In

FROM STA. 26+00 TO STA. 26+28 –SR1– RT

DETAIL 63
BERM 'V' DITCH
(Not to Scale)

Min. D= 0.5 Ft.
b= 2 Ft.

FROM STA. 13+00 TO STA. 14+50 –Y1RPD– LT

DETAIL 64
BERM 'V' DITCH
(Not to Scale)

Min. D= 1.0 Ft.
b= 2 Ft.
d= 1.0 Ft.
Type of Liner= CL B Rip–Rap, Keyed–In

FROM STA. 14+50 TO STA. 19+50 –Y1RPD– LT

DETAIL 65
TAIL DITCH
(Not to Scale)

Min. D= 1.25 Ft.
B= 8 Ft.
Type of Liner= CL 1 Rip–Rap, Keyed–In

FROM STA. 18+91 TO STA. 19+13 –Y1RPD– RT
47 FT @0.058 FT/FT

DETAIL 66
PIPE OUTLET CHANNEL STABILIZATION
(Not to Scale)

Length= 20 Ft.
Type of Liner= 32 TON CL I Rip–Rap – Keyed–In

STA. 55+51 –L– LT

DETAIL 67
TAIL DITCH
(Not to Scale)

Min. D= 1.2 Ft.
Type of Liner= CL 'B' Rip–Rap, Keyed–In d= 1.2 Ft.

FROM STA. 46+58.86 TO STA. 47+50 –L– RT
91 FT @ 0.11 FT/FT
FROM STA. 47+50 TO STA. 48+50 –L– RT
100 FT @ 0.10 FT/FT
FROM STA. 48+50 TO STA. 49+50 –L– RT
100 FT @ 0.075 FT/FT
100 FT @ 0.10 FT/FT
FROM STA. 49+50 TO STA. 50+30 –L– RT
80 FT @ 0.035 FT/FT

DETAIL 68
TAIL DITCH
(Not to Scale)

Min. D= 1.5 Ft.
Type of Liner= CL II Rip–Rap, Keyed–In d= 1.0 Ft.

FROM STA. 17+39 TO STA. 17+80 –Y3– LT
46 FT @ 0.087 FT/FT

DETAIL 69
TAIL DITCH
(Not to Scale)

Min. D= 1.5 Ft.

FROM STA. 17+24 TO STA. 17+83 –Y3– RT
58 FT @ 0.069 FT/FT

DETAIL 70
PIPE OUTLET CHANNEL STABILIZATION
(Not to Scale)

Length= 25 Ft.
Type of Liner= 48 TON CL I Rip–Rap – Keyed–In

STA. 39+92 –L– LT

DETAIL 71
BANK STABILIZATION
(Not to Scale)

Type of Liner= CL I Rip–Rap, Keyed–In

FROM STA. 34+37 TO STA. 34+63 –L– LT
FROM STA. 39+75 TO STA. 39+86 –L– LT

FROM STA. 34+37 TO STA. 34+63 –L– LT
FROM STA. 39+75 TO STA. 39+86 –L– LT

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R-4045 Details 202.dgn
josh.ferrington

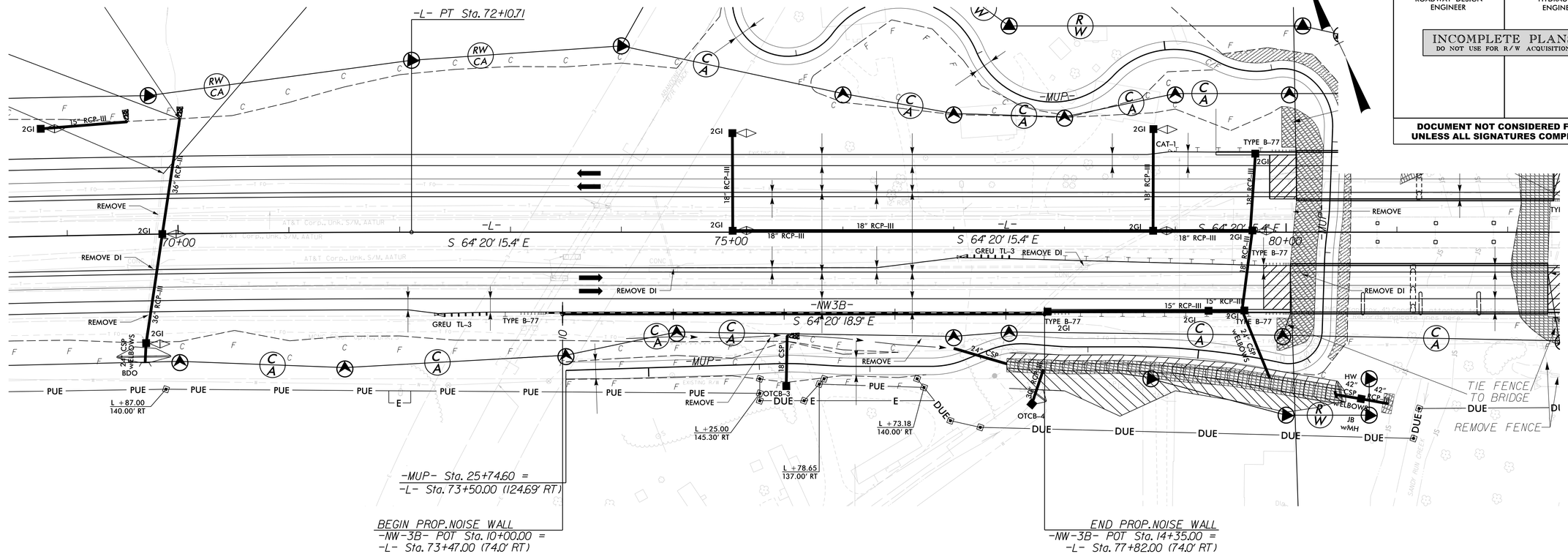
8/17/99

PLAN AND PROFILE OF NOISE WALL NW-3B

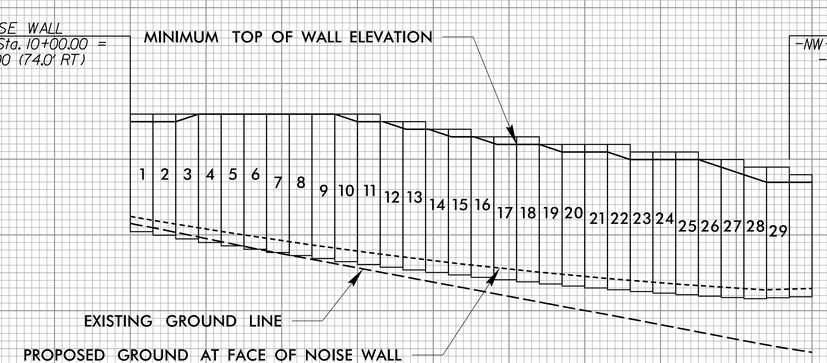
PROJECT REFERENCE NO.	SHEET NO.
R-4045	2N-1
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



PANEL NUMBER	1	2	3–6	7–8	9–11	12–13	14–16	17–20	21–24	25–29
TOP ELEVATION (FT)	805	806	807	806	805	804	803	802	801	800
PANEL LENGTH (FT)	15	15	60	30	45	30	45	60	60	75



50 25 0 50 100
PROFILE (HORIZONTAL)

10 5 0 10 20
PROFILE (VERTICAL)

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R4045_2N_NW_Detail.dgn
josh.jernigan

6/16/99

COMPUTED BY: FEJ DATE: 4/1/24
CHECKED BY: DATE:

PROJECT REFERENCE NO.	SHEET NO.
R-4045	3B-1

"N" = DISTANCE FROM EDGE OF LANE TO FACE OF GUARDRAIL.
TOTAL SHOULDER WIDTH = DISTANCE FROM EDGE OF TRAVEL LANE TO SHOULDER BREAK POINT.
FLARE LENGTH = DISTANCE FROM LAST SECTION OF PARALLEL GUARDRAIL TO END OF GUARDRAIL.
W = TOTAL WIDTH OF FLARE FROM BEGINNING OF TAPER TO END OF GUARDRAIL.
G = GATING IMPACT ATTENUATOR TYPE 350
NG = NON-GATING IMPACT ATTENUATOR TYPE 350

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

GUARDRAIL SUMMARY

SURVEY LINE	BEG. STA.	END STA.	LOCATION	LENGTH			WARRANT POINT		"N" DIST. FROM E.O.L.	TOTAL SHOULDER WIDTH	FLARE LENGTH		W		ANCHORS								IMPACT ATTENUATOR TYPE 350			DOUBLE FACED GUARDRAIL	REMOVE EXISTING GUARDRAIL	REMOVE AND STOCKPILE EXISTING GUARDRAIL	REMARKS
				STRAIGHT	SHOP CURVED	DOUBLE FACED	APPROACH END	TRAILING END			APPROACH END	TRAILING END	APPROACH END	TRAILING END	B-77	GREU TL-2	GREU TL-3	M-350	TYPE III	CAT-1	VI MOD	BIC	AT-1	NO.	PERMITTED G	PERMITTED NG				
-L-	17+00.00	22+49.25	MEDIAN	1,075'			17+00.00	22+25.00	17'	20'		70'		5'										1						
-L-	34+05.50	36+86.78	RT	285.375'			36+86.78		12'	15'	50'		1'		1		1							2						
-L-	36+67.63	38+88.50	MEDIAN	390'			37+53.14				70'	70'	2.75'	2.75'	4															
-L-/-LPA-	-L- 38+68.69	-LPA- 16+32.66	LT	672.875'			15+50.00		14'	17'	25'		0.5'		1	1														
-LPA-	12+95.00	15+50.00	RT	368.75'			15+50.00	13+22.39	12'	15'	25'		0.5'			1				1										
-L-	72+47.08	73+47.00	EB RT	110.375'			73+47.00		12'	15'	50'		1'		1		1													
-L-	77+03.00	80+03.83	EB LT	310.375'			80+03.83		6'	9'	50'		1'		1		1													
-L-	77+82.00	80+03.83	EB RT	220.75'			80+03.83	77+82.00	12'	15'					2															
-L-	78+94.70	80+09.34	WB LT	116.625'				80+09.34	12'	15'					1					1										
-L-	82+36.17	82+76.82	EB RT	41.625'				82+36.17	12'	15'					1					1										
-L-	82+41.67	85+41.54	WB RT	310.375'			82+41.67		13'	16'	50'		1'		1		1													
-L-	82+41.67	85+41.54	WB LT	310.375'			82+41.67		7'	10'	50'		1'		1		1													
-Y1-/-RPD-	-Y1- 17+97.62	-RPD- 19+75.00	RT	581.25'			-Y1- 19+00.00	-RPD- 19+75.00	12'	15'	25'		0.5'			1				1										
-Y1-	21+48.96	23+97.63	RT	293.75'			23+97.63		8'	11'	25'		0.5'			1			1											
-Y1-	21+68.42	23+87.56	LT	250'				23+87.56	8'	11'									1	1										
-Y1-	25+41.15	29+03.33	LT	406.25'			25+41.15		8'	11'	25'		0.5'			1			1											
-Y1-/-LPA-	-Y1- 25+50.38	-LPA- 19+20.02	RT	475'				-Y1- 25+50.38	8'	11'									1	1										
-Y2-	18+27.41	23+44.90	LT	625'			22+00.00	19+50.00	8'	11'	50'	50'	1'	1'			2													
-Y2-	16+74.01	23+73.78	RT	1150'			18+50.00	22+50.00	8'	11'	50'	50'	1'	1'			2													
-RPA-	19+75.00	18+12.45	RT	191.625'				18+12.45	8'	15'					1					1										
-RPA-	20+25.00	18+21.91	LT	241.625'				18+21.91	9'	12'					1					1										
-RPA-	17+01.91	14+25.52	LT	360.375'			16+00.00		4'	7'					1		1													
-RPA-/-L-	-RPA- 16+92.45	-L- 64+66.00	RT	1485.375'			-RPA- 16+92.45		12'	15'					1		1													
-SR1-	23+99.30	28+50.00	RT	462.5'			25+00.00	28+00.00	4'	7'						2														
-SR1-/-SR2-	-SR2- 11+80.00	-SR1- 28+75.00	LT	462.5'	50'		-SR1- 28+00.00	-SR2- 11+55.00	4'	7'						2														
			SUBTOTAL	11,197.75	50'																									
			(-) LESS ANCHOR DEDUCTIONS																											
			(18) B-77 @ 22.875' EA	411.75'																										
			(9) GREU TL-2 @ 25' EA	225'																										
			(11) GREU TL-3 @ 50' EA	550'																										
			(4) TYPE III @ 18.75' EA	75'																										
			(8) CAT-1 @ 6.25' EA	50'																										
			PROJECT TOTALS	9,886	50'										18	9	11		4	8										

CABLE GUIDERAIL SUMMARY

SURVEY LINE	STATION	STATION	LENGTH	END ANCHOR UNIT	INTERMEDIATE ANCHOR UNIT	COMMENTS
-L-	22+69	36+48	1,379	2		
-L-	39+04	49+10	906	2		
-L-	89+00	97+46	846	2		
-L-	97+46		N/A	1		TERMINATE EX. GUIDERAIL
		SUBTOTAL:	3,530			
		LESS TERMINAL ANCHOR UNITS	175			
		GRAND TOTALS:	3,355	7		
		SAY:	3,355	7		

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PROJ. REFERENCE NO.	SHEET NO.
R-4045/BR-0012	3P-1

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

PARCEL INDEX SHEET

PARCEL No.	SHEET No.	PROPERTY OWNER NAME
1	5	PIERCY, JAMES RICHARD
2	5	BARBEE, SHIRLEY
3	5	J & K COMMERCIAL, LLP
4	5	HAWKINS, ROBERT Z
5	5	BEDSAUL, WILLIAM DAVID
6	5/11	SWINK, CAROLYN WHITAKER
7	5/11	CHAMPION, CAROLYN WHITAKER
8	5/10	COLLUM, LEORA S
9	10	ALEXANDER, WESLEY BLAKE
10	10	WITHERSPOON, CYNTHIA HORD
11	10	EDWARDS, JAMES MICHAEL
12	10/12	JOHNSON, GINGER BALDWIN
13	12	MONTGOMERY, ANDRIAN L
14	10/12	WALLACE, WILLIAM
15	5	WILLIAM, CLIFF DYSART HEIRS
16	5	CORNERSTONE BAPTIST CHURCH
17	5/12/13	CORNERSTONE BAPTIST CHURCH, INC
18	6	WILLIAMS, DONNA E
19	6	DUNCAN, MARGARET H
20	5/6/7	MCCLAIN, WILLIAM J
21	6/7/13/14	LEDBETTER, CLARK W
22	13	DODSON, JENNA L
23	13	DUNCAN, MARGARET H
24	12/13	WILLIAMS, DONNA E
25	7/14	BAYER, ROBERT WILLIAM
26	7/14	RAILROAD EASEMENT POSSIBLY ABANDONED NO RECORDS FOUND
27	7/14	RAILROAD EASEMENT POSSIBLY ABANDONED NO RECORDS FOUND
28	7	RAILROAD EASEMENT POSSIBLY ABANDONED NO RECORDS FOUND
29	7/8	RAILROAD EASEMENT POSSIBLY ABANDONED NO RECORDS FOUND
30	7/8/14	DAVIS RENTALS OF SHELBY, LLC
31	7/8	SMITH, RONNIE FRANKLIN
32	8/14	BAYER, ROBERT WILLIAM
33	8	STREFEZZA, JOSEPH M
34	8	CLARK, RICHARD EUGENE
35	8	PARKER, DALE LEE
36	8/9	BPB REALTY LLC
37	10	WEAVER, SHARAYAH C
38	10	ALLEN, KEN
39	4	COGGINS, CHRISTOPHER W
40	4/5	COGGINS, DAVID ANDERSON
41	4	COGGINS, CHRISTOPHER W
42	4/5	TOWN OF MOORESBORO, A NC MUNICIPAL CORP
43	5	BRACKEN, MARY JO

PARCEL No.	SHEET No.	PROPERTY OWNER NAME

6/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	4
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared in the Office of: SUMMIT DESIGN AND ENGINEERING SERVICES — NC FIRM LICENSE No: P-0339, 320 Executive Ct., Hillsborough, NC 27278, (919) 732-3883, (919) 732-6676 (FAX)

Prepared in the Office of: WRA Wetmore, Hepworth & Associates, LLP — 1201 Edwards Mill Road, Suite 320, Raleigh, NC 27606, (919) 859-0808

CURVE DATA FOR -L-

PIs Sta 21+72.00	PI Sta 32+15.65
Θs = 0° 50' 46.4"	Δ = 15° 59' 57.8" (RT)
Ls = 205.00'	D = 0° 49' 32.1"
LT = 136.67'	L = 1,937.94'
ST = 68.33'	T = 975.32'
	R = 6,940.00'
	DS = 70 MPH
	SE = 0.03
	LR = 135'

–BEGIN TIP PROJECT R–4045
–L– STA. 17+00.00

–L– POT Sta. 10+00.00

100' RESURFACING & WIDENING ONLY

300' TRANSITION

–L– TS Sta. 20+35.33

–L– SC Sta. 22+40.33

TIE TO EXISTING GUARDRAIL

RETAIN

REMOVE AND REPLACE EXISTING GUARDRAIL

–L– STA 22+50.00
MATCHLINE –L–
(SEE SHEET 5)

FOR –L– PROFILE, SEE SHEET 15

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esh.jernigan

Prepared in the Office of:		
	SUMMIT DESIGN AND ENGINEERING SERVICES	NC FIRM LICENSE No: P-0339 320 Executive Ct. Hillsborough, NC. 27278 (919) 732-3883 (919) 732-6676 (FAX)
Prepared in the Office of:	WRA Wilkinson, Request & Associates, LLP	120 Edwards Mill Road, Suite 320, Raleigh, NC 27606 (919) 859-0808

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	5
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

MATCHLINE –Y1– STA 33+50.00
(SEE SHEET 11)

MATCHLINE –L– STA 50+00.00
(SEE SHEET 6)

MATCHLINE –L– STA 22+50.00
(SEE SHEET 4)

MATCHLINE –Y1– STA 18+50.00
(SEE SHEET 10)

-YIRPA- STA. 16+50.00

CURVE DATA FOR –L–

PI Sta 32+15.65	PIs Sta 42+68.08	PI Sta 58+00.11
Δ = 15°59' 51.8" (RT)	Gs = 0°23' 13.5"	Δ = 10° 41' 35.2" (RT)
D = 0° 49' 12.7"	Gs = 0°50' 46.4"	D = 0°32' 41.5"
L = 1,937.94'	Ls = 205.00'	L = 2,827.44'
T = 975.32'	LT = 115.20'	T = 1,417.84'
R = 6,940.00'	ST = 89.81'	R = 11,150.00'
DS = 70 MPH		DS = 70 MPH
SE = 0.03		SE = NC

-Y2- CURVE DATA

PI Sta 17+89.03	PI Sta 24+26.30
Δ = 41° 03' 52.7" (LT)	Δ = 38° 24' 03.0" (RT)
D = 4° 46' 28.7"	D = 11° 27' 33.0"
L = 985.72'	L = 335.11'
T = 522.58'	T = 174.12'
R = 1,200.00'	R = 500.00'
SE = 0.08	SE = 0.06
RO = 100	RO = SEE PLANS
DS = 60 mph	DS = 30 mph

-YIRPA- CURVE DATA

PIs Sta 11+33.38	PI Sta 13+41.97	PIs Sta 15+42.66	PIs Sta 23+44.38	PIs Sta 25+29.57
Gs = 4° 46' 28.7"	Δ = 13° 09' 39.5" (RT)	Gs = 4° 17' 49.9"	Gs = 9° 32' 57.5"	Δ = 22° 23' 01.0" (LT)
Ls = 200.00'	D = 4° 46' 28.7"	Ls = 180.00'	Ls = 200.00'	D = 9° 32' 57.5"
LT = 133.39'	L = 282.65'	LT = 120.04'	LT = 133.53'	L = 234.40'
ST = 66.27'	LT = 141.97'	ST = 60.03'	ST = 66.84'	T = 118.71'
	R = 1,200.00'			R = 600.00'
	SE = 0.08			SE = 0.08
	DS = 60 MPH			RO = 200'
				DS = 45 MPH

-YILPA- CURVE DATA

Pis Sta 11+38.12	PI Sta 22+84.18
Gs = 25° 32' 02.4"	Δ = 155° 56' 15.8" (LT)
Ls = 205.00'	D = 28° 54' 40.4"
LT = 138.12'	L = 626.34'
ST = 69.65'	T = 1,079.18'
	R = 230.00'
	SE = 0.08
	RO = 200'
	DS = 30 MPH

-YIRPC- CURVE DATA

Pis Sta 11+98.34	PIs Sta 14+26.79	PIs Sta 16+53.12	PI Sta 20+71.59	PIs Sta 21+20.74
Gs = 4° 17' 49.9"	Δ = 15° 59' 06.3" (RT)	Gs = 4° 17' 49.9"	Δ = 24° 50' 57.4" (RT)	Δ = 24° 28' 36.8" (LT)
Ls = 180.00'	D = 4° 46' 28.7"	Ls = 180.00'	D = 44° 04' 25.2"	D = 57° 17' 44.8"
LT = 120.04'	L = 334.79'	LT = 120.04'	L = 55.82'	L = 42.66'
ST = 60.03'	T = 168.49'	ST = 60.03'	T = 28.36'	T = 21.82'
	R = 1,200.00'		R = 130.00'	R = 100.00'
	SE = 0.08			
	DS = 60 MPH			

-Y1- CURVE DATA

PI Sta 23+30.27
Δ = 15° 03' 06.8" (LT)
D = 0° 49' 06.6"
L = 1,838.94'
T = 924.79'
R = 7,000.00'
SE = NC
DS = 45 mph

-YIRPD- CURVE DATA

Pis Sta 11+60.05	PIs Sta 15+63.12	PIs Sta 19+37.14	PIs Sta 21+46.39	PIs Sta 22+03.48	PIs Sta 22+54.16
Gs = 4° 26' 08.5"	Δ = 25° 33' 03.6" (LT)	Gs = 3° 19' 36.2"	Δ = 9° 08' 00.9" (RT)	Δ = 22° 00' 20.5" (LT)	Δ = 40° 47' 18.6" (RT)
Ls = 240.00'	D = 3° 49' 41.4"	Ls = 180.00'	D = 14° 19' 26.2"	D = 44° 04' 25.2"	D = 81° 51' 04.0"
LT = 160.05'	L = 637.12'	LT = 120.02'	L = 63.76'	L = 49.93'	L = 49.83'
ST = 80.09'	T = 323.12'	ST = 60.02'	T = 31.95'	T = 25.28'	T = 28.02'
	R = 1,550.00'		R = 400.00'	R = 130.00'	R = 70.00'
	SE = 0.08		SE = NC		
	DS = 65 mph		DS = 15 MPH		

-RAB- CURVE DATA

PI Sta 12+18.08	PI Sta 12+84.18	PI Sta 13+15.36	PI Sta 13+78.38
Δ = 70° 40' 24.2" (LT)	Δ = 154° 36' 58.6" (LT)	Δ = 89° 44' 17.1" (LT)	Δ = 44° 58' 20.3" (LT)
D = 89° 31' 28.8"	D = 89° 31' 28.8"	D = 89° 31' 28.8"	D = 89° 31' 28.8"
L = 78.94'	L = 17.27'	L = 100.24'	L = 50.23'
T = 45.39'	T = 284.18'	T = 63.73'	T = 26.49'
R = 64.00'	R = 64.00'	R = 64.00'	R = 64.00'

FOR –RAB– DETAIL, SEE SHEET 2B–2
FOR –L– PROFILE, SEE SHEET 16 AND 17
FOR –Y1– PROFILE, SEE SHEET 22
FOR –Y1LPA– PROFILE, SEE SHEET 23
FOR –Y1RPA– PROFILE, SEE SHEET 23 AND 24
FOR –Y1RPC– PROFILE, SEE SHEET 24
FOR –Y1RPD– PROFILE, SEE SHEET 25
FOR –Y2– PROFILE SEE SHEET 25 AND 26

-Y1RPC-	-Y1- ACADEMY ST (SR 1168)	-Y1RPD-	2020 AADT
74	2600 3100	74	2045 AADT
300 400	200 300 — 1100 1200	1200 1500	
	100 100 — 100 300		
	1500 2000		
	-Y1- ACADEMY ST (SR 1168)		

-Y2- BUS	-Y1- LATTIMORE RD (SR 1168)	-Y1RPA- -Y1LPA-	2020 AADT
74	800 1000	74	2045 AADT
2600 3500	100 200 — 400 500	2200 2800	
	1500 1900 — 800 900		
	2600 3100		
	-Y1- LATTIMORE RD (SR 1168)		

GRAPHIC SCALE
50 25 0 50 100

6/2/99

-YIRPA- CURVE DATA		
PIs Sta 11+33.38	PI Sta 13+41.97	PIs Sta 15+42.66
Θs = 4° 46' 28.7"	△ = 13° 29' 39.5" (RT)	Θs = 4° 17' 49.9"
Ls = 200.00'	D = 4° 46' 28.7"	Ls = 180.00'
LT = 133.38'	L = 282.62'	LT = 120.04'
ST = 66.71'	T = 141.97'	ST = 60.03'
	R = 1,200.00'	
	SE = 0.08	
	DS = 60 MPH	

CURVE DATA FOR -L-
PI Sta 58+10.11
△ = 10° 41' 35.2" (RT)
D = 0° 22' 41.5"
L = 2,827.44'
T = 1,417.84'
R = 15,150.00'
DS = 70 MPH
SE = NC

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	6
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

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Prepared in the Office of: SUMMIT DESIGN AND ENGINEERING SERVICES — NC FIRM LICENSE No: P-0339, 320 Executive Ct., Hillsborough, NC 27278, (919) 732-3883, (919) 732-6676 (FAX)

Prepared in the Office of: WRA Wilkinson, Ragouzeli & Associates, LLP — 1201 Edwards Mill Road, Suite 310, Raleigh, NC 27606, (919) 859-0808

-YIRPA- STA. 16+50.00

MATCHLINE -L- STA 50+00.00 (SEE SHEET 5)

MATCHLINE -L- STA 63+00.00 (SEE SHEET 7)

-YIRPA- CS Sta. 14+82.62

-YIRPA- SC Sta. 12+00.00

-YIRPA- ST Sta. 10+00.00

Y1RPA +28.00 132.00' RT

Y1RPA +90.00 105.00' RT

Y1RPA +82.62 60.00' RT

Y1RPA +05.00 76.07' RT

Y1RPA +00.00 104.00' RT

L +61.00 172.00' LT

L +59.00 260.00' LT

L +24.00 179.66' LT

L +18.00 165.98' LT

L +80.00 260.00' LT

L +62.00 160.00' LT

L +00.00 244.00' LT

L +75.00 232.00' LT

L +00.00 215.50' LT

L +90.00 165.00' LT

L +00.00 127.00' LT

L +50.00 141.00' LT

L +00.00 145.00' LT

L +75.00 128.06' LT

20 MCCLAIN WILLIAM J DB 1509 PG 1519 PB 29 PG 141

21 LEDBETTER CLARK W DB 1483 PG 1007 PB 028 PG 063

17

18

19

WILLIAMS DONNA E DB 1029 PG 092 PB 009 PG 022

DUNCAN MARGARET H DB 1005 PG 278

TOE PROTECTION SEE DETAIL 47 70 TONS CLASS B RIP RAP 143 SY GEOTEXTILE

PIPE OUTLET CHANNEL SEE DETAIL 52

PIPE OUTLET CHANNEL STABILIZATION SEE DETAIL 66

3 TON CL B RIP RAP 10 SY GEOTEXTILE

1 TON CL B RIP RAP 5 SY GEOTEXTILE

RIP RAP LINE EXISTING DITCH 103 TONS CL I RIP RAP 187 SY GEOTEXTILE

2' RIP RAP BASE DITCH SEE DETAIL 12 161 TONS CL B RIP RAP 282 SY GEOTEXTILE

OUTLET ANALYSIS 2B

OUTLET ANALYSIS 2A

PLUG&FILL WITH FLOWABLE FILL

300' TAPER

400' DECELERATION

SPECIAL MEDIAN DITCH SEE DETAIL 53

GREU TL-3

PLUG & FILL WITH FLOWABLE FILL

RETAIN

REMOVE

REMOVE DI

REMOVE JB

REMOVE HW

TRENCHLESS INSTALLATION 24" WELDED STEEL

TRENCHLESS INSTALLATION 54" WELDED STEEL

2' BASE DITCH SEE DETAIL 11

SPECIAL 'V' DITCH SEE DETAIL 5

SPECIAL 'V' DITCH SEE DETAIL 10

FS SEE DETAIL 3

FS SEE DETAIL 2

-SR2- POT Sta.19+68.29= -L- POC Sta.51+63.98

-SR2- PT Sta. 17+18.09 N 4° 59' 11.0" E (AH)

-SR2- PC Sta. 15+87.47

BEGIN CONSTRUCTION -SR2- Sta.16+75.00

300' LANE DROP

+19.60

SR2 +97.69 EXIST R/W

SR2 +74.21 EXIST R/W

SR2 +78.06 EXIST R/W

SR2 +75.00 40.00' LT R=27'

SR2 +59.00 120.00' LT

SR2 +25.00 120.00' LT R=13'

SR2 +18.09 40.00' LT

SR2 +40.00 R = 30'

SR2 +75.00 EX. R/W

SR2 +18.09 56.00' RT

SR2 +18.09 40.00' RT EXCAVATION

SR2 +75.00 EX. R/W

-SR2- +00.00

R=25'

FOR -L- PROFILE, SEE SHEET 18
FOR -Y1RPA- PROFILE, SEE SHEET 23
FOR -SR2- PROFILE, SEE SHEET 27

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PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	7
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

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Prepared in the Office of: SUMMIT DESIGN AND ENGINEERING SERVICES — NC FIRM LICENSE Nos P-0339, 320 Executive Ct., Hillsborough, NC 27278, (919) 732-3883, (919) 732-6676 (FAX)

Prepared in the Office of: WRA Wilkinson, Ragsdell & Associates, LLP — 1201 Edwards Mill Road, Suite 320, Raleigh, NC 27606, (919) 859-0808

CURVE DATA FOR -L-

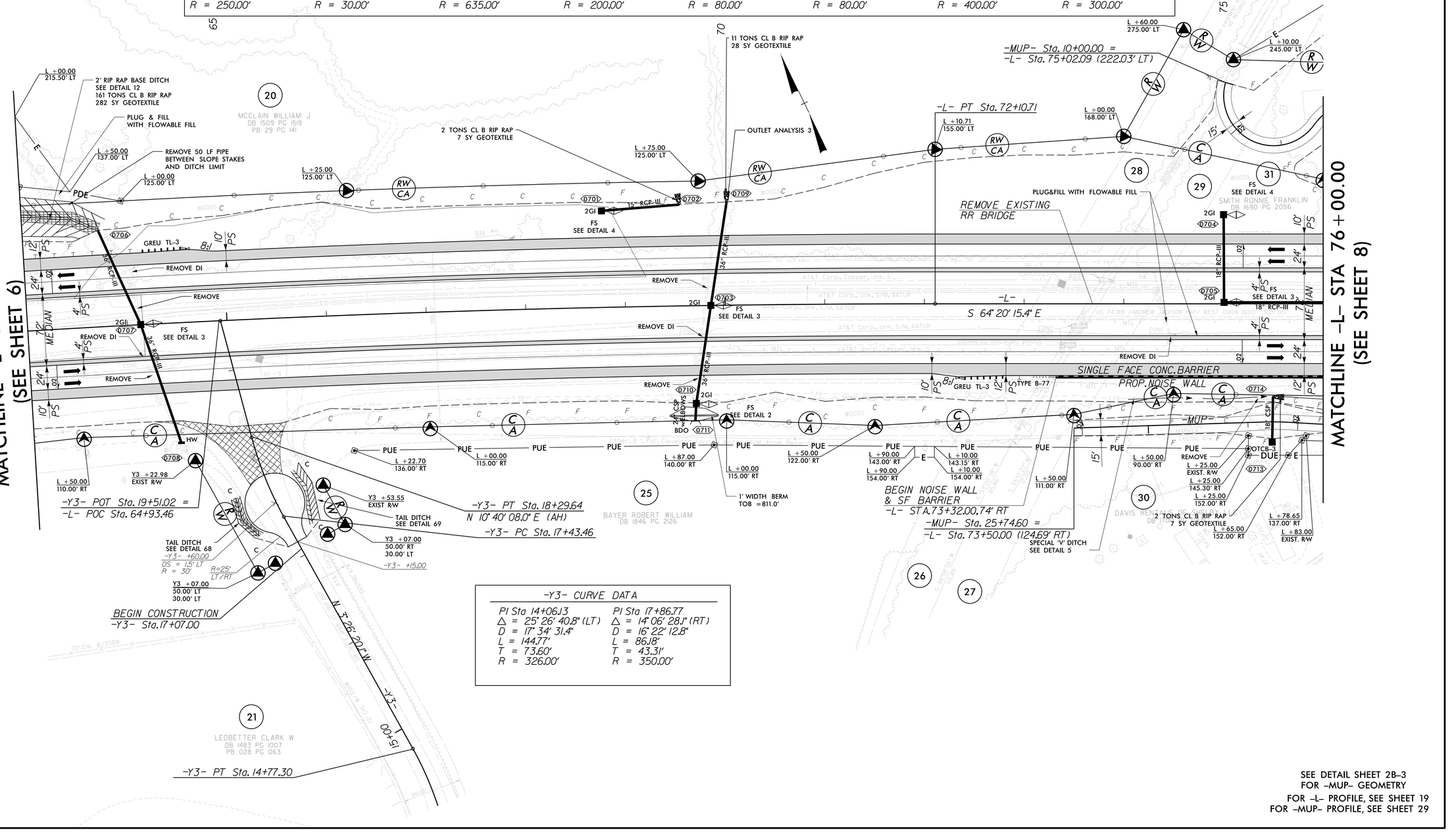
PI Sta 58+01.11
△ = 10° 41' 35.2" (RT)
D = 0° 22' 41.5"
L = 2,827.44'
T = 1,417.84'
R = 15,150.00'
DS = 70 MPH
SE = NC

CURVE DATA FOR -MUP-

PI Sta 12+72.20	PI Sta 12+71.37	PI Sta 14+13.23	PI Sta 15+06.06	PI Sta 15+75.51	PI Sta 16+20.74	PI Sta 16+64.47	PI Sta 17+68.07
△ = 159° 10' 58.7" (LT)	△ = 120° 57' 43.3" (RT)	△ = 114° 13' 06.4" (LT)	△ = 76° 39' 29.3" (RT)	△ = 41° 29' 15.5" (LT)	△ = 51° 34' 08.2" (RT)	△ = 52° 22' 55.9" (RT)	△ = 5° 53' 34.8" (RT)
D = 114° 35' 29.6"	D = 76° 23' 39.7"	D = 76° 23' 39.7"	D = 76° 23' 39.7"	D = 76° 23' 39.7"	D = 143° 14' 22.0"	D = 104° 10' 26.9"	D = 22° 55' 05.9"
L = 138.91'	L = 158.34'	L = 149.51'	L = 100.35'	L = 54.31'	L = 36.00'	L = 50.28'	L = 25.71'
T = 272.20'	T = 132.46'	T = 115.97'	T = 59.29'	T = 28.41'	T = 19.32'	T = 27.05'	T = 12.87'
R = 50.00'	R = 75.00'	R = 75.00'	R = 75.00'	R = 75.00'	R = 40.00'	R = 55.00'	R = 250.00'

CURVE DATA FOR -MUP-

PI Sta 17+94.31	PI Sta 19+07.39	PI Sta 19+92.93	PI Sta 21+20.86	PI Sta 21+72.46	PI Sta 22+29.53	PI Sta 23+24.21	PI Sta 23+71.18
△ = 6° 07' 53.1" (LT)	△ = 100° 18' 24.7" (RT)	△ = 12° 23' 53.0" (LT)	△ = 4° 34' 47.6" (RT)	△ = 26° 26' 45.5" (LT)	△ = 21° 58' 07.1" (RT)	△ = 3° 26' 01.1" (RT)	△ = 5° 15' 54.1" (LT)
D = 22° 55' 05.9"	D = 190° 59' 09.4"	D = 9° 01' 22.6"	D = 28° 38' 52.4"	D = 71° 37' 11.0"	D = 71° 37' 11.0"	D = 14° 19' 26.2"	D = 19° 05' 54.9"
L = 26.75'	L = 52.52'	L = 137.41'	L = 15.99'	L = 36.93'	L = 30.67'	L = 23.97'	L = 27.57'
T = 13.39'	T = 35.95'	T = 68.97'	T = 8.00'	T = 18.80'	T = 15.53'	T = 11.99'	T = 13.79'
R = 250.00'	R = 30.00'	R = 635.00'	R = 200.00'	R = 80.00'	R = 80.00'	R = 400.00'	R = 300.00'



-Y3- CURVE DATA

PI Sta 14+06.13	PI Sta 17+86.77
△ = 25° 26' 40.8" (LT)	△ = 14° 06' 28.1" (RT)
D = 17° 34' 31.4"	D = 16° 22' 12.8"
L = 144.77'	L = 86.18'
T = 73.60'	T = 43.31'
R = 326.00'	R = 350.00'

SEE DETAIL SHEET 2B-3 FOR -MUP- GEOMETRY
FOR -L- PROFILE, SEE SHEET 19
FOR -MUP- PROFILE, SEE SHEET 29

R-4045_2024.dgn
R-4045_Roll_Plot_Style_summit.ctb
(plotted by DJD)

6/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	8
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared in the Office of: SUMMIT DESIGN AND ENGINEERING SERVICES — NC FIRM LICENSE No: P-0339, 320 Executive Ct, Hillsborough, NC 27278, (919) 732-3883, (919) 732-6676 (FAX)

Prepared in the Office of: Whitman, Requardt & Associates, LLP — 1201 Edwards Mill Road, Suite 310, Raleigh, NC 27606, (919) 859-0808

MATCHLINE –L– STA 76+00.00 (SEE SHEET 7)

MATCHLINE –L– STA 89+00.00 (SEE SHEET 9)

BEGIN BRIDGE WB
–L– Sta.80+09.34

END BRIDGE WB
–L– Sta.82+41.67

–L– TS Sta.87+04.75

BEGIN CABLE GUIDERAIL

PROPOSED CABLE GUIDERAIL

BEGIN BRIDGE EB
–L– Sta.80+03.83

END BRIDGE EB
–L– Sta.82+36.17

END NOISE WALL & SF BARRIER
–L– STA.77+82.00,74' RT

SINGLE FACE CONC.BARRIER

PROP.NOISE WALL

–MUP–

–L–

S 64° 20' 15.4" E

TIE FENCE TO BRIDGE

REMOVE FENCE

RETAIN FENCE

WORD OF TRUTH FELLOWSHIP DB 1172 PG 2468

SMITH RONNIE FRANKLIN DB 1690 PG 2056

PARKER DALE LEE DB 1723 PG 0963

BPB REALTY LLC DB 1496 PG 893

DAVIS RENTALS OF SHELBY LLC DB 1700 PG 0431

BAYER ROBERT WILLIAM DB 1846 PG 2126 PB 029 PG 140

STREFEZZA JOSEPH M DB 1531 PG 1164

CLARK RICHARD EUGENE DB 1409 PG 1490

MCBRAYER DAVID DB 1534 PG 1010

SR 1163 BROADWAY RD 20' BST

US 74 WB MORRISON JACKSON HWY WEST DIXON BLVD 385' BST

29 31 35 36 33 32 34

L +30.00 318.00' LT
L +31.00 286.00' LT
L +75.00 240.00' LT
L +13.00 240.00' LT
L +10.00 278.00' LT
L +90.00 228.00' LT
L +35.00 254.00' LT
L +15.00 186.00' LT
L +53.00 210.00' LT
L +50.00 186.00' LT
L +50.00 178.00' LT
L +00.00 125.00' LT
L +00.00 125.00' LT
L +00.00 107.00' LT
L +00.00 125.00' LT
L +03.00 125.00' LT
L +00.00 104.00' LT
L +41.00 135.00' LT
L +41.00 125.00' LT
L +88.00 168.00' LT
L +06.00 185.00' LT
L +09.00 163.00' LT
L +22.00 163.00' LT
L +22.00 135.00' LT
L +86.00 182.00' LT
L +88.00 168.00' LT
L +04.75 135.00' LT
L +96.85 92.96' RT
L +75.00 EXIST. R/W
L +67.00 EXIST. R/W
L +73.18 140.00' RT
L +82.71 152.00' RT
L +00.00 94.00' RT
L +50.00 90.00' RT
L +24.00 176.00' RT
L +97.00 170.00' RT
L +78.00 EXIST. R/W
L +00.00 165.00' RT
L +75.00 165.00' RT
L +20.00 159.00' RT
L +15.00 186.00' RT
L +50.00 98.00' RT
L +90.00 94.00' RT
L +90.00 125.36' RT
L +74.35 EXIST. R/W

PLUG&FILL WITH FLOWABLE FILL
PLUG & FILL WITH FLOWABLE FILL
REMOVE
REMOVE DI
REMOVE RETAIN
GREU TL-3
FS SEE DETAIL 2
FS SEE DETAIL 3
FS SEE DETAIL 4
2GI
2GI-A
CAT-1
TYPE B-77
SBG
8:1
10' PS
12' PS
24" PS
4' PS
6' PS
45.0' (TYP)
+39.75
+36.72
+00.00
18" RCP-III
24" RCP-III
30" RCP-III
15" RCP-III
24" CSP
18" CSP W/ELBOWS
HW 42" CSP
JB w/MH
OTCB-4
0801 0802 0803 0804 0805 0806 0807 0808 0809 0810 0811 0812 0813 0814 0815 0816 0817 0818 0819 0820 0821 080

1' WIDTH BERM TOB =780.0'
1' WIDTH BERM TOB =768.0'
6' RIP RAP BASE DITCH SEE DETAIL 13 106 TONS CL I RIP RAP 192 SY GEOTEXTILE
10' RIP RAP BASE DITCH SEE DETAIL 55 155 TONS CL I RIP RAP 382 SY GEOTEXTILE
SPECIAL 'V' DITCH SEE DETAIL 5
2' RIP RAP BASE DITCH SEE DETAIL 14 23 TONS CL B RIP RAP 71 SY GEOTEXTILE
2 TONS CL B RIP RAP 7 SY GEOTEXTILE
OUTLET ANALYSIS 4
FILL DITCH TO NATURAL GROUND
DITCH FILL LIMIT
57 TONS CL II RIP RAP 66 SY GEOTEXTILE
BANK STABILIZATION SEE DETAIL 56 18 TONS OF CL II RIP RAP
DUE
RW
CA
–MUP–
–L–

CURVE DATA FOR –MUP–

PI Sta 12+72.20	PI Sta 12+71.37	PI Sta 14+13.23	PI Sta 15+06.06	PI Sta 15+75.51	PI Sta 16+20.74	PI Sta 16+64.47	PI Sta 17+68.07
Δ = 159° 10' 58.7" (LT)	Δ = 120° 57' 43.3" (RT)	Δ = 114° 13' 06.4" (LT)	Δ = 76° 39' 29.3" (RT)	Δ = 41° 29' 15.5" (LT)	Δ = 51° 34' 08.2" (RT)	Δ = 52° 22' 55.9" (RT)	Δ = 5° 53' 34.8" (RT)
D = 114° 35' 29.6"	D = 76° 23' 39.7"	D = 76° 23' 39.7"	D = 76° 23' 39.7"	D = 76° 23' 39.7"	D = 143° 14' 22.0"	D = 104° 10' 26.9"	D = 22° 55' 05.9"
L = 138.91'	L = 158.34'	L = 149.51'	L = 100.35'	L = 54.31'	L = 36.00'	L = 50.28'	L = 25.71'
T = 272.20'	T = 132.46'	T = 115.97'	T = 59.29'	T = 28.41'	T = 19.32'	T = 27.05'	T = 12.87'
R = 50.00'	R = 75.00'	R = 75.00'	R = 75.00'	R = 75.00'	R = 40.00'	R = 55.00'	R = 250.00'

CURVE DATA FOR –L–

PIs Sta 88+41.42	PI Sta 92+99.72
Θs = 1° 09' 46.6"	Δ = 8° 49' 52.4" (LT)
Ls = 205.00'	D = 1° 08' 04.5"
LT = 136.67'	L = 778.38'
ST = 68.34'	T = 389.96'
	R = 5,050.00'
	DS = 70 MPH
	SE = 0.04

CURVE DATA FOR –MUP–

PI Sta 17+94.31	PI Sta 19+07.39	PI Sta 19+92.93	PI Sta 21+20.86	PI Sta 21+72.46	PI Sta 22+29.53	PI Sta 23+24.21	PI Sta 23+71.18
Δ = 6° 07' 53.1" (LT)	Δ = 100° 18' 24.7" (RT)	Δ = 12° 23' 53.0" (LT)	Δ = 4° 34' 47.6" (RT)	Δ = 26° 26' 45.5" (LT)	Δ = 21° 58' 07.1" (RT)	Δ = 3° 26' 01.1" (RT)	Δ = 5° 15' 54.1" (LT)
D = 22° 55' 05.9"	D = 190° 59' 09.4"	D = 9° 01' 22.6"	D = 28° 38' 52.4"	D = 71° 37' 11.0"	D = 71° 37' 11.0"	D = 14° 19' 26.2"	D = 19° 05' 54.9"
L = 26.75'	L = 52.52'	L = 137.41'	L = 15.99'	L = 36.93'	L = 30.67'	L = 23.97'	L = 27.57'
T = 13.39'	T = 35.95'	T = 68.97'	T = 8.00'	T = 18.80'	T = 15.53'	T = 11.99'	T = 13.79'
R = 250.00'	R = 30.00'	R = 635.00'	R = 200.00'	R = 80.00'	R = 80.00'	R = 400.00'	R = 300.00'

SEE DETAIL SHEET 2B-3 FOR –MUP– GEOMETRY
FOR –L– PROFILE, SEE SHEET 20
FOR –MUP– PROFILE, SEE SHEET 29

RAMS 2024.17.07
R4045_BR0012_sht8_summit.dgn
josh.jernigan

6/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	9
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared in the Office of: SUMMIT DESIGN AND ENGINEERING SERVICES — NC FIRM LICENSE Nos P-0339, 320 Executive Ct, Hillsborough, NC 27278, (919) 732-3883, (919) 732-6676 (FAX)

Prepared in the Office of: WRA Withers, Ravenel & Associates, LLP — 120 Edwards Mill Road, Suite 320, Raleigh, NC 27606, (919) 859-0808

CURVE DATA FOR -L-	CURVE DATA FOR -L- EXISTING
PI Sta 92+99.72	PI Sta 106+08.53
△ = 8° 49' 52.4" (LT)	△ = 14° 35' 22.7" (LT)
D = 1° 08' 04.5"	D = 0° 47' 48.8"
L = 778.38'	L = 1,830.84'
T = 389.96'	T = 920.40'
R = 5,050.00'	R = 7,190.00'
DS = 70 MPH	DS = 70 MPH
SE = 0.04	SE = 0.03

MATCHLINE -L- STA 89+00.00
(SEE SHEET 8)

-END TIP PROJECT R-4045
-L- STA. 100+25.00

910' UNIFORM TRANSITION
FROM 72' MEDIAN TO 46' MEDIAN

-L- SC Sta. 89+09.75

-L- PCC Sta. 96+88.13

EX. 300' LANE DROP

45.0' (TYP)

+78.68

+19.75

+50.00

75' RESURFACING ONLY

TIE TO EXISTING FENCE

L +09.75
125.00' LT

L +00.00
EXIST. R/W

RW
CA

FS
SEE DETAIL 2

090I
2GI

REMOVE DI

PLUG&FILL WITH FLOWABLE FILL

18" RCP-III

FS
SEE DETAIL 3

2GI-A

090Z

-L-

24" RCP-III

REMOVE DI

PLUG&FILL WITH FLOWABLE FILL

24" RCP-III

FS
SEE DETAIL 4

090Y

2GI

PLUG&FILL WITH FLOWABLE FILL

RETAIN

RESET FENCE AFTER CONST.

090

PROPOSED CABLE GUIDERAIL

END CABLE GUIDERAIL

10' PS

24' PS

4' PS

72' MEDIAN

36'

24'

4' MEDIAN

46'

EX. PS

EX. MEDIAN

BPB REALTY LLC
DB 1496 PG 893

BUCKNER MAURICA MCBRAYER LIFE ESTATE
DB 1824 PG 2884

MCBRAYER DAVID
DB 1534 PG 1010

MCBRAYER DAVID
DB 1534 PG 1010

HELEN MCBRAYER DR
DB 1534 PG 1010

BL-52
(R2707)

BM #6

BM-2

WOODS

HTR

GR

EXISTING R/W VARIES

48" WW & ISBW

24" RCP

18" RCP

Other, Unk. S/M, Cleveland County Water

Other, Unk. O/S/M, Possible Abn. Water Line

Other, 8", PVC, Cleveland County Water (S/M from Records)

MCNC, Fiber Optic, Unk. S

AT&T Corp Unk.

AT&T Corp Unk. S/M

SR 1163 BROADWAY RD 20' BST

US 74 W DIXON BLVD EB 38' BST

US 74 EB ANDREW JACKSON WEST DIXON BLVD 40' BST

35' SLOPE GUIDE RAIL

BROOI2-I

S 24°13'18" W
592.25'

FOR -L- PROFILE, SEE SHEET 21

DLHILL 2024 17:07
R4045_BR0012_sht7_summit.dgn
josh.jernigan

6/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	10
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared in the Office of: SUMMIT DESIGN AND ENGINEERING SERVICES — NC FIRM LICENSE Nos P-0339, 320 Executive Ct, Hillsborough, NC 27278, (919) 732-3883, (919) 732-6676 (FAX)

Prepared in the Office of: WRA Withers, Ravenel & Associates, LLP — 1201 Edwards Mill Road, Suite 320, Raleigh, NC 27606, (919) 859-0808

MATCHLINE –Y1– STA 18+50.00 (SEE SHEET 5)

MATCHLINE –SR1– STA 13+00.00 (SEE SHEET 12)

–Y1– CURVE DATA

PI Sta 23+30.77
Δ = 15° 03' 06.8" (LT)
D = 0° 49' 06.6"
L = 1,838.94'
T = 924.79'
R = 7,000.00'
SE = NC
DS = 45 mph

DRIVEWAY RADI ARE 10' UNLESS SHOWN OTHERWISE ON PLAN.

FOR –Y1– PROFILE, SEE SHEET 22
FOR –SR1– PROFILE, SEE SHEET 26

11 EDWARDS JAMES MICHAEL DB 1706 PG 0611

12 JOHNSON GINGER BALDWIN DB 1840 PG 1453 PB 43 PG 142

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PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	11
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared in the Office of: SUMMIT DESIGN AND ENGINEERING SERVICES
NC FIRM LICENSE Nos P-0339
320 Executive Ct.
Hillsborough, NC 27278
(919) 732-3883
(919) 732-6676 (FAX)

Prepared in the Office of: WRA Withson, Ragouzis & Associates, LLP
120 Edwards Mill Road, Suite 320,
Raleigh, NC 27606
(919) 859-0808

6/2/99

ALLEN DONALD JOSEPH
DB 1417 PG 413
PB 027 PG 006

N 57°15'22" W
534.33'

SOLAR PANELS

WOODS

BM #2

BY3-15

-Y1- POT Sta. 37+29.26

S 57°16'28" E
407.6'

48" WW W/SEW

12"CMP W/SEW

N 19°06'38.0" E

RETAIN

END CONSTRUCTION
-Y1- Sta. 35+35.00

Y1 +35.00
50.00' RT
EX. R/W

+25.71

CHAMPION CAROLYN WHITAKER
DB 1644 PG 122

7

6

SWINK CAROLYN WHITAKER
DB 04E PG 501

Y1 +35.00
60.00 LT
EXIST R/W

Y1 +90.00
50.00' LT

END CA FENCE

100' TAPER TO EX.

-Y1-

REMOVE

1101

END CA FENCE

Y1 +07.00
70.00' RT

Y1 +07.00
49.35' RT

PUE

24' (TYP.)

60' RD

MATCHLINE –Y1– STA 33+50.00
(SEE SHEET 5)

DRIVEWAY RADI ARE 10' UNLESS SHOWN OTHERWISE ON PLAN.

FOR –Y1– PROFILE, SEE SHEET 22

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josh.jernigan

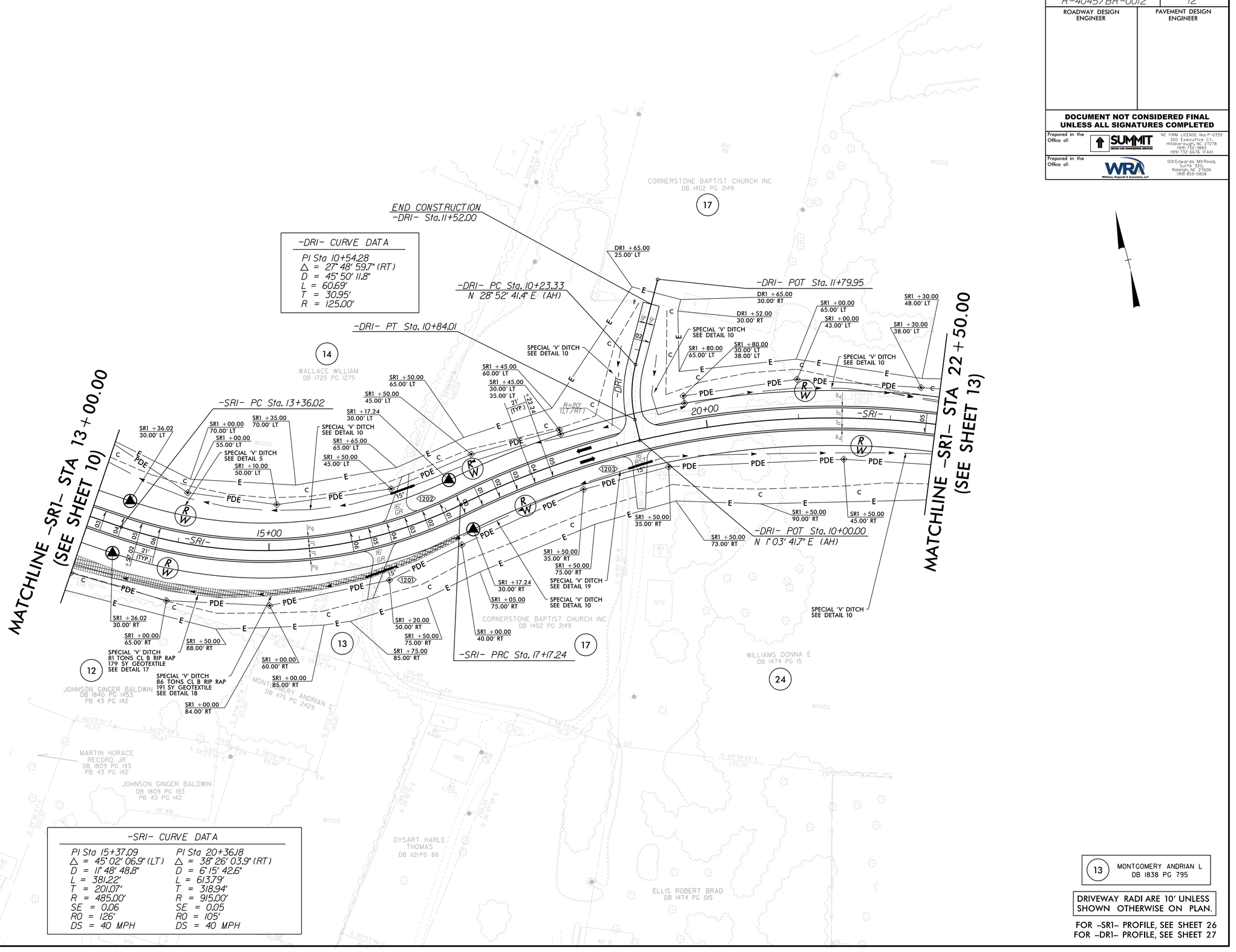
6/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	12
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared in the Office of: SUMMIT DESIGN AND ENGINEERING SERVICES
NC FIRM LICENSE No: P-0339
320 Executive Ct.
Hillsborough, NC 27278
(919) 732-3883
(919) 732-6676 (FAX)

Prepared in the Office of: WRA Withers, Ravenel & Associates, LLP
1201 Edwards Mill Road, Suite 310,
Raleigh, NC 27606
(919) 859-0808



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6/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	13
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared in the Office of: SUMMIT DESIGN AND ENGINEERING SERVICES — NC FIRM LICENSE No: P-0339, 320 Executive Ct., Hillsborough, NC 27278, (919) 732-3883, (919) 732-6676 (FAX)

Prepared in the Office of: Withers, Ravenel & Associates, LLP — 1201 Edwards Mill Road, Suite 310, Raleigh, NC 27606, (919) 859-0808

MATCHLINE -SR1- STA 22+50.00 (SEE SHEET 12)

-SR2- PT Sta. 15+13.12
N 44° 47' 41.0" E (AH)

-SR2- PC Sta. 13+98.22

-SR2- CURVE DATA
PI Sta 14+55.98
△ = 14° 31' 57.1" (RT)
D = 12° 38' 53.1"
L = 114.90'
T = 57.76'
R = 453.00'

END CONSTRUCTION
-SR2- Sta. 12+15.00

-SR2- POT Sta. 10+00.00 =
-SRI- POT Sta. 24+97.66

-SRI- PT Sta. 23+31.03

-SRI- PC Sta. 26+92.35

-SRI- POT Sta. 34+13.20

END CONSTRUCTION
-SRI- Sta. 32+20.00

END GRADE
-SRI- Sta. 32+00.00

-SRI- PT Sta. 29+13.11
END PVMT./BEGIN ABC

-SRI- CURVE DATA

PI Sta 20+36.18	PI Sta 28+04.67
△ = 38° 26' 03.9" (RT)	△ = 26° 04' 45.5" (LT)
D = 6° 15' 42.6"	D = 11° 48' 48.8"
L = 613.79'	L = 220.76'
T = 318.94'	T = 112.32'
R = 915.00'	R = 485.00'
SE = 0.05	SE = 0.06
RO = 105'	RO = 126'
DS = 40 MPH	DS = 40 MPH

DRIVEWAY RADI ARE 10' UNLESS SHOWN OTHERWISE ON PLAN.

FOR -SR1- PROFILE, SEE SHEET 26
FOR -SR2- PROFILE, SEE SHEET 27

CAMPBELL MARJORIE DB 1269 PG 1799
CORNERSTONE BAPTIST CHURCH INC DB 1402 PG 2149
ROBBINS NICHOLAS A DB 1861 PG 2891
DUNCAN MARGARET H DB 1005 PG 276
DUNCAN MARGARET H DB 1005 PG 278
LEDBETTER CLARK W DB 1483 PG 1007 PB 028 PG 063
WILLIAMS DONNA E DB 1474 PG 15
BALDWIN GINGER ATKINS DB 1427 PG 281
DODSON JENNA L DB 1716 PG 1466

04-JUL-2024 17:07
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josh.jernigan

6/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-4045/BR-0012	14
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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Prepared in the Office of: WRA Withers, Ravenel & Associates, LLP — 120 Edwards Mill Road, Suite 320, Raleigh, NC 27606, (919) 859-0808

-Y3- PC Sta. 13+32.53

-Y3- PT Sta. 13+26.23
N 22° 00' 20.7" E (AH)

-Y3- PC Sta. 12+15.70

-Y3- PT Sta. 12+15.14
N 48° 10' 27.4" E (AH)

-SR4- POT Sta. 10+00.00 =
S 44° 58' 23.8" E (AH)

-Y3- POC Sta. 11+65.49

BEGIN CONSTRUCTION
-SR4- Sta. 10+09.20

-SR4- PC Sta. 10+27.35

-Y3- PC Sta. 10+00.00

-SR4- POT Sta. 18+12.85

END CONSTRUCTION
-SR4- Sta. 18+10.00

-SR4- PT Sta. 13+16.07

HW/D = 1.07

R/W R=57'

SPECIAL 'V' DITCH
SEE DETAIL 10

SPECIAL 'V' DITCH
SEE DETAIL 22

SPECIAL 'V' DITCH
SEE DETAIL 10

REMOVE

SPECIAL 'V' DITCH
112 TONS CL B RIP RAP
249 SY GEOTEXTILE
SEE DETAIL 18

EXTEND RIPRAP 20 FEET
INTO EXISTING DITCH
8 TONS CL B RIP RAP
18 SY GEOTEXTILE

OUTLET ANALYSIS
1401

SPECIAL BASE DITCH
372 TONS CL B RIP RAP
826 SY GEOTEXTILE
SEE DETAIL 23

R=35' (LT/RT)

R=30' (LT/RT)

R=10' (LT/RT)

-SR4-

-Y3-

15+00 N 79°53'05.0" E

SR4 +10.00 15.00' LT
SR4 +75.00 20.00' LT
SR4 +25.00 50.00' LT
SR4 +26.22 35.00' LT
SR4 +10.00 65.00' LT
SR4 +50.00 90.00' LT
SR4 +25.00 70.00' RT
SR4 +34.39 50.00' LT
SR4 +21.62 30.00' LT
SR4 +75.00 38.00' LT
SR4 +10.00 15.00' RT
SR4 +75.00 20.00' RT
SR4 +20.00 38.00' LT
SR4 +16.07 30.00' LT
SR4 +00.00 70.00' LT
SR4 +75.00 60.00' LT
SR4 +25.00 38.00' LT
SR4 +50.00 45.00' LT
SR4 +35.37 EXIST R/W
SR4 +70.00 30.00' LT
SR4 +24.69 EXIST R/W
SR4 +50.00 30.00' RT
SR4 +50.00 75.00' RT
SR4 +75.00 45.00' RT
SR4 +80.00 30.00' RT 50.00' RT
SR4 +50.00 85.00' RT
SR4 +50.00 60.00' RT
SR4 +16.07 30.00' RT
SR4 +30.00 80.00' RT
SR4 +75.00 60.00' RT
SR4 +34.39 30.00' RT
SR4 +15.00 90.00' RT
SR4 +50.00 40.00' RT
SR4 +70.00 85.00' RT
SR4 +00.00 100.00' RT
SR4 +00.00 122.00' RT

21' (TYP.)
+15.00

DAVIS RENTALS OF SHELBY LLC
DB 1700 PG 0431

BAYER ROBERT WILLIAM
DB 1846 PG 2126

BAYER ROBERT WILLIAM
DB 1846 PG 2126
PB 029 PG 140

LEDBETTER CLARK W
DB 1483 PG 1007
PB 028 PG 063

GREENE RICKY M JR
DB 1521PG 2268

DAVIS STEPHEN C
DB 1489 PG 978

26 27 25 32 21

-SR4- CURVE DATA

PI Sta 11+83.99
△ = 55° 08' 31.2" (LT)
D = 19° 05' 54.9"
L = 288.72'
T = 156.64'
R = 300.00'
RO = 126'
DS = 30 MPH

-Y3- CURVE DATA

PI Sta 11+07.68	PI Sta 12+71.94	PI Sta 14+06.13
△ = 6° 21' 14.3" (LT)	△ = 26° 10' 06.8" (LT)	△ = 25° 26' 40.8" (LT)
D = 2° 57' 12.2"	D = 23° 40' 33.4"	D = 17° 34' 31.4"
L = 215.14'	L = 110.53'	L = 144.77'
T = 107.68'	T = 56.25'	T = 73.60'
R = 1,940.00'	R = 242.00'	R = 326.00'

DRIVEWAY RADI ARE 10' UNLESS SHOWN OTHERWISE ON PLAN.

FOR -SR4- PROFILE, SEE SHEET 28

02 JUL 2024 16:15
R4045_ROD_SHT_summit.dgn
josh.lassiter

5/28/99

PROJECT REFERENCE NO.	SHEET NO.
R-4045	15
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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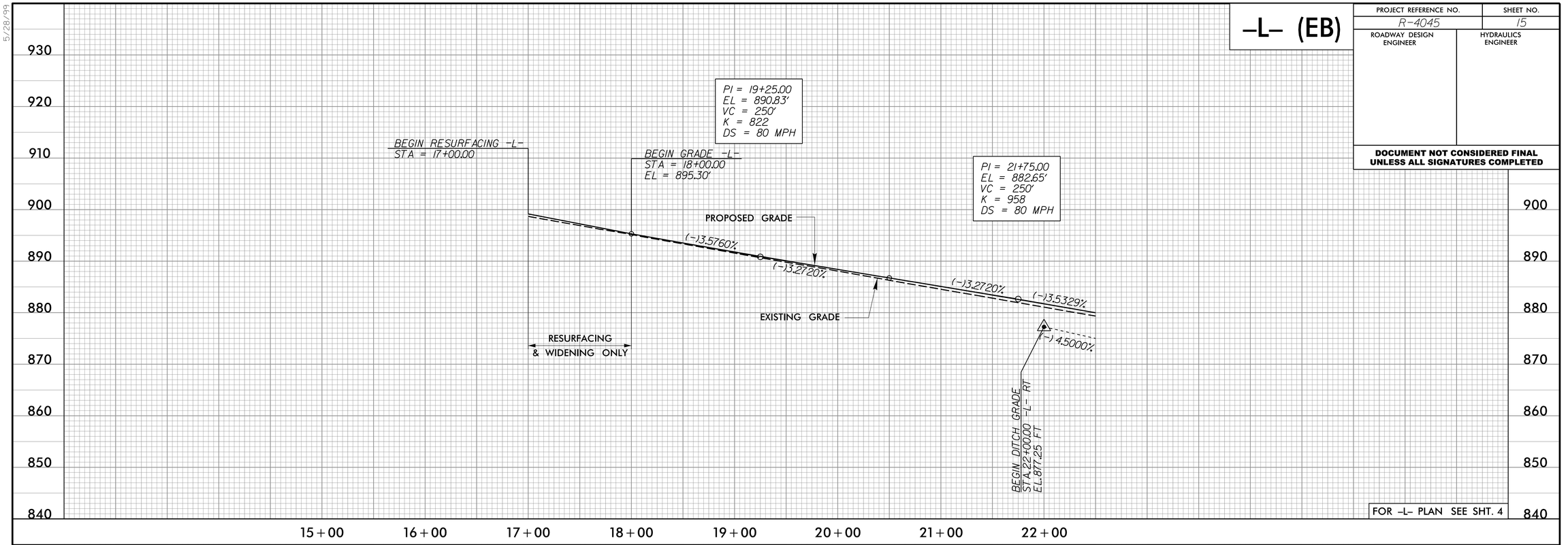
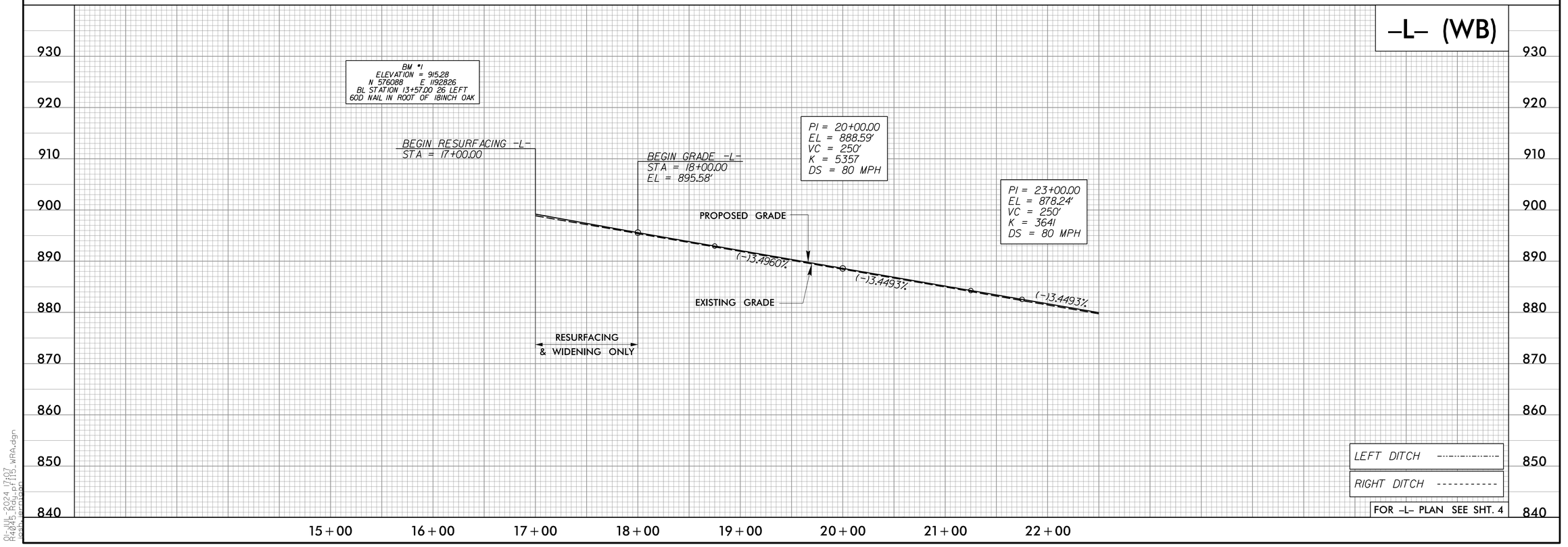
–L– (EB)



FOR –L– PLAN SEE SHT. 4

–L– (WB)



FOR –L– PLAN SEE SHT. 4

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R4045_PROFILES_WRA.dgn
jeh, erjap

5/28/99

PROJECT REFERENCE NO.	SHEET NO.
R-4045	16
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

–L– (EB)

PI = 21+75.00
EL = 882.65'
VC = 250'
K = 958
DS = 80 MPH

PI = 24+25.00
EL = 873.82'
VC = 250'
K = 1224
DS = 80 MPH

PI = 27+50.00
EL = 863.00'
VC = 400'
K = 345
DS = 80 MPH

PI = 32+10.00
EL = 853.02'
VC = 250'
K = 373
DS = 80 MPH

(–)3.5329%
(–)3.5329%
(–)3.3286%
(–)4.5000%
(–)3.3286%
(–)2.1700%
(–)2.7600%
(–)2.1700%
(–)1.5000%

PROPOSED GRADE
EXISTING GRADE

PI =26+50.00 –L– RT
EL. = 857.00 FT

END DITCH GRADE
STA.28+50.00 –L– RT
= STA.13+62.12 –Y1RPC– RT
EL.851.48 FT

TRANSITION FROM SPECIAL 'V' DITCH TO 2' BASE DITCH STA. 26+00 TO STA. 26+50 –L– RT

PROP. 60" WELDED STEEL PIPE

PIPE HYDRAULIC DATA
60" WSP –L– Sta. 33+60

DRAINAGE AREA	= 41.4	AC
DESIGN FREQUENCY	= 100	YRS
DESIGN DISCHARGE	= 120	CFS
DESIGN HW ELEVATION	= 837.28	FT
100 YEAR DISCHARGE	= 120	CFS
100 YEAR HW ELEVATION	= 837.28	FT
OVERTOPPING FREQUENCY	= >500	YRS
OVERTOPPING DISCHARGE	= 240	CFS
OVERTOPPING ELEVATION	= 844.01	FT

LEFT DITCH ----------
RIGHT DITCH ----------

FOR –L– PLAN SEE SHT. 5

900 890 880 870 860 850 840 830 820 810

23+00 24+00 25+00 26+00 27+00 28+00 29+00 30+00 31+00 32+00 33+00 34+00 35+00 36+00

–L– (WB)

PI = 23+00.00
EL = 878.24'
VC = 250'
K = 3641
DS = 80 MPH

PI = 25+50.00
EL = 869.45'
VC = 250'
K = 440
DS = 80 MPH

PI = 30+50.00
EL = 854.70'
VC = 650'
K = 406
DS = 80 MPH

BM #2
ELEVATION = 861.85
N 576155 E 1194781
BL STATION 33+12.00 56 LEFT
PK NAIL IN SE CORNER OF CONC ISLAND

(–)3.4493%
(–)3.5180%
(–)3.5180%
(–)12.9500%
(–)4.9200%
(–)12.9500%
(–)11.3500%
(–)11.3500%
(–)5.7400%
(–)10.0000%

EXISTING GRADE
PROPOSED GRADE

BEGIN DITCH GRADE
STA.25+50.00 –L– LT
EL.867.22 FT

END DITCH GRADE
STA.29+00.00 –L– LT
= STA.16+05.10 –Y2– RT
EL.850.00 FT

BEGIN DITCH GRADE
STA.34+00.00 –L– LT
EL.845.48 FT

PI =36+00.00 –L– LT
EL. = 834.00 FT

PROP. 60" WELDED STEEL PIPE

TRANSITION FROM SPECIAL 'Y' DITCH TO 4' BASE DITCH STA. 35+50 TO STA. 36+00 –L– LT

PIPE HYDRAULIC DATA
60" WSP –L– Sta. 33+60

DRAINAGE AREA	= 41.4	AC
DESIGN FREQUENCY	= 100	YRS
DESIGN DISCHARGE	= 120	CFS
DESIGN HW ELEVATION	= 837.28	FT
100 YEAR DISCHARGE	= 120	CFS
100 YEAR HW ELEVATION	= 837.28	FT
OVERTOPPING FREQUENCY	= >500	YRS
OVERTOPPING DISCHARGE	= 240	CFS
OVERTOPPING ELEVATION	= 844.01	FT

FOR –L– PLAN SEE SHT. 5

900 890 880 870 860 850 840 830 820 810

23+00 24+00 25+00 26+00 27+00 28+00 29+00 30+00 31+00 32+00 33+00 34+00 35+00 36+00

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PROJECT REFERENCE NO.	SHEET NO.
R-4045	17
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

–L– (EB)

PI = 37+75.00
EL = 844.54'
VC = 250'
K = 716
DS = 80 MPH

PI = 43+50.00
EL = 837.93'
VC = 350'
K = 318
DS = 75 MPH

PI = 48+30.75
EL = 827.11'
VC = 350'
K = 280
DS = 80 MPH

PROPOSED GRADE

EXISTING GRADE

(–)11.5000%
(+) 0.3000%
(–)11.1510%
(–)11.1510%
(–)12.2500%
(–)12.2500%
(–)11.0000%
(–) 0.3000%

BEGIN SP.MED.DITCH GRADE
STA=36+50.00 –L– MED
EL.844.20 FT

END SP.MED.DITCH GRADE
STA=37+50.00 –L– MED
EL.844.50 FT

BEGIN SP.MED.DITCH GRADE
STA=49+50.00 –L– MED
EL.819.74 FT

END SP.MED.DITCH GRADE
STA=50+50.00 –L– MED
EL.819.44 FT

PROP.66" WELDED STEEL PIPE

PIPE HYDRAULIC DATA

66" WSP –L– Sta.40+05

DRAINAGE AREA	= 34.63	AC
DESIGN FREQUENCY	= 100	YRS
DESIGN DISCHARGE	= 100	CFS
DESIGN HW ELEVATION	= 827.65	FT
100 YEAR DISCHARGE	= 100	CFS
100 YEAR HW ELEVATION	= 827.65	FT
OVERTOPPING FREQUENCY	= >500	YRS
OVERTOPPING DISCHARGE	= 217	CFS
OVERTOPPING ELEVATION	= 833.45	FT

FOR –L– PLAN SEE SHT. 5

870 860 850 840 830 820 810 800 790 780

37+00 38+00 39+00 40+00 41+00 42+00 43+00 44+00 45+00 46+00 47+00 48+00 49+00 50+00

–L– (WB)

PI = 39+25.00
EL = 842.88'
VC = 250'
K = 586
DS = 80 MPH

BM #3
ELEVATION = 843.07
N 576065 E 1195773
BL STATION 42+84.00 95 LEFT
PK NAIL IN NORTH END OF CONC ISLAND

PI = 44+00.00
EL = 834.45'
VC = 250'
K = 345
DS = 75 MPH

PI = 49+50.00
EL = 820.70'
VC = 550'
K = 183
DS = 70 MPH

EXISTING GRADE

PROPOSED GRADE

(–)11.3500%
(–)11.7763%
(–)11.7763%
(–)12.5000%
(–)12.5000%
(+)10.5000%
(–)10.0000%

END DITCH GRADE
STA.37+00.00 –L– LT
= STA.26+06.34 –Y1– LT
EL.824.00 FT

PROP.66" WELDED STEEL PIPE

PIPE HYDRAULIC DATA

66" WSP –L– Sta.40+05

DRAINAGE AREA	= 34.63	AC
DESIGN FREQUENCY	= 100	YRS
DESIGN DISCHARGE	= 100	CFS
DESIGN HW ELEVATION	= 827.65	FT
100 YEAR DISCHARGE	= 100	CFS
100 YEAR HW ELEVATION	= 827.65	FT
OVERTOPPING FREQUENCY	= >500	YRS
OVERTOPPING DISCHARGE	= 217	CFS
OVERTOPPING ELEVATION	= 833.45	FT

MEDIAN DITCH – – – – – –
LEFT DITCH ·–·–·–·–·–·
RIGHT DITCH ----------

FOR –L– PLAN SEE SHT. 5

870 860 850 840 830 820 810 800 790 780

37+00 38+00 39+00 40+00 41+00 42+00 43+00 44+00 45+00 46+00 47+00 48+00 49+00 50+00

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PROJECT REFERENCE NO.	SHEET NO.
R-4045	18
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

–L– (EB)

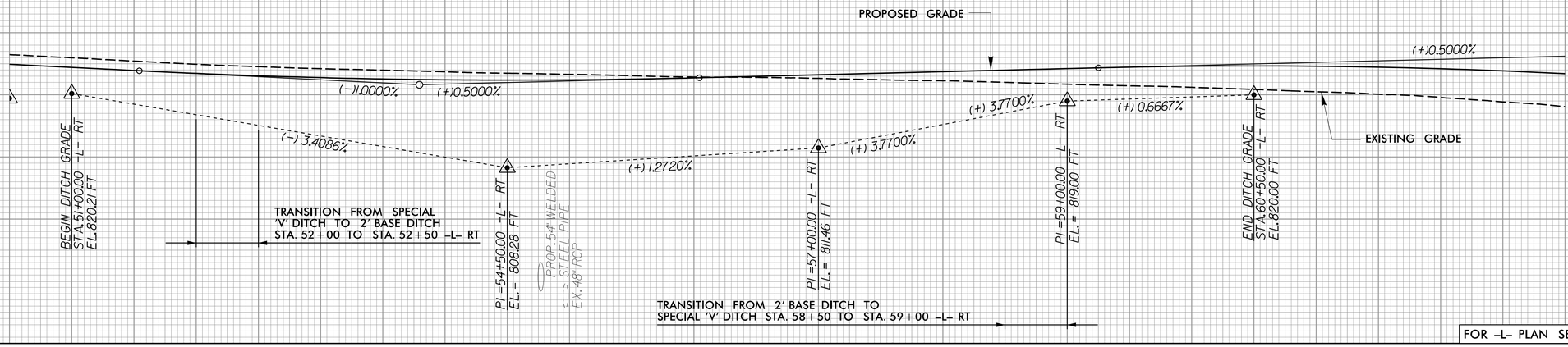
PIPE HYDRAULIC DATA
54" WSP –L– Sta.54+89

DRAINAGE AREA	= 64.09	AC
DESIGN FREQUENCY	= 100	YRS
DESIGN DISCHARGE	= 160	CFS
DESIGN HW ELEVATION	= 796.99	FT
100 YEAR DISCHARGE	= 160	CFS
100 YEAR HW ELEVATION	= 796.99	FT
OVERTOPPING FREQUENCY	= >500	YRS
OVERTOPPING DISCHARGE	= 620	CFS
OVERTOPPING ELEVATION	= 819.85	FT

PI = 53+79.37
EL = 821.62'
VC = 450'
K = 300
DS = 80 MPH

PIPE HYDRAULIC DATA
EX.48" RCP-V –L– Sta.55+09

DRAINAGE AREA	= 64.09	AC
DESIGN FREQUENCY	= 100	YRS
DESIGN DISCHARGE	= 160	CFS
DESIGN HW ELEVATION	= 796.94	FT
100 YEAR DISCHARGE	= 160	CFS
100 YEAR HW ELEVATION	= 796.99	FT
OVERTOPPING FREQUENCY	= >500	YRS
OVERTOPPING DISCHARGE	= 620	CFS
OVERTOPPING ELEVATION	= 819.85	FT



FOR –L– PLAN SEE SHT. 6

–L– (WB)

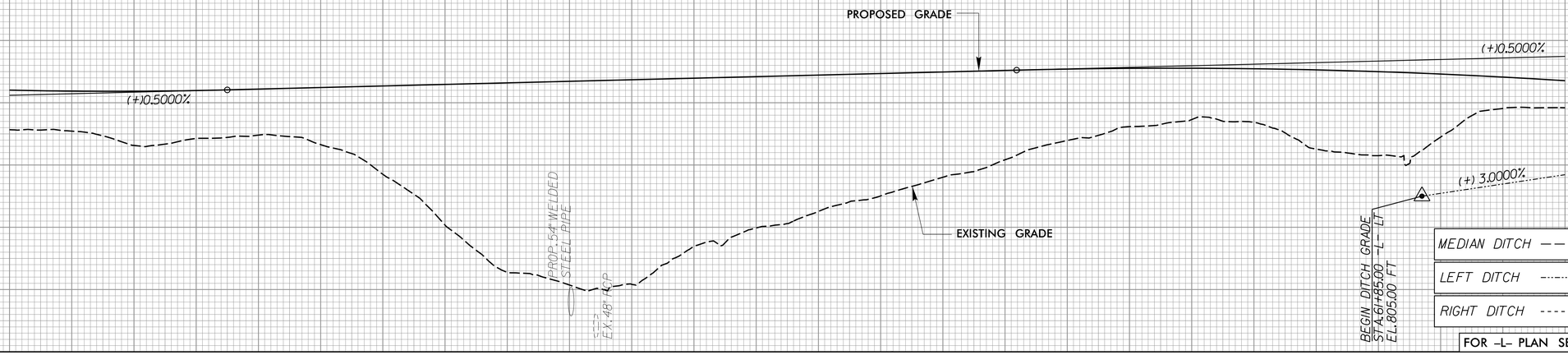
PIPE HYDRAULIC DATA
54" WSP –L– Sta.54+89

DRAINAGE AREA	= 64.09	AC
DESIGN FREQUENCY	= 100	YRS
DESIGN DISCHARGE	= 160	CFS
DESIGN HW ELEVATION	= 796.99	FT
100 YEAR DISCHARGE	= 160	CFS
100 YEAR HW ELEVATION	= 796.99	FT
OVERTOPPING FREQUENCY	= >500	YRS
OVERTOPPING DISCHARGE	= 620	CFS
OVERTOPPING ELEVATION	= 819.85	FT

BM #4
ELEVATION = 820.90
N 5756.30 E 1196762
BL STATION 53+42.00 89 LEFT
60D NAIL IN BASE OF 15INCH OAK

PIPE HYDRAULIC DATA
EX.48" RCP-V –L– Sta.55+09

DRAINAGE AREA	= 64.09	AC
DESIGN FREQUENCY	= 100	YRS
DESIGN DISCHARGE	= 160	CFS
DESIGN HW ELEVATION	= 796.94	FT
100 YEAR DISCHARGE	= 160	CFS
100 YEAR HW ELEVATION	= 796.99	FT
OVERTOPPING FREQUENCY	= >500	YRS
OVERTOPPING DISCHARGE	= 620	CFS
OVERTOPPING ELEVATION	= 819.85	FT



FOR –L– PLAN SEE SHT. 6

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PROJECT REFERENCE NO.	SHEET NO.
R-4045	19
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

–L– (EB)

PI = 64+85.00
EL = 827.15'
VC = 1120'
K = 249
DS = 70 MPH

PIPE HYDRAULIC DATA
36" RCP-III –L– Sta.69+86

DRAINAGE AREA	= 5.09	AC
DESIGN FREQUENCY	= 100	YRS
DESIGN DISCHARGE	= 17	CFS
DESIGN HW ELEVATION	= 800.09	FT
100 YEAR DISCHARGE	= 17	CFS
100 YEAR HW ELEVATION	= 800.09	FT
OVERTOPPING FREQUENCY	= >500	YRS
OVERTOPPING DISCHARGE	= 29	CFS
OVERTOPPING ELEVATION	= 803.56	FT

PIPE HYDRAULIC DATA
36" RCP-III –L– Sta.64+14

DRAINAGE AREA	= 6.52	AC
DESIGN FREQUENCY	= 100	YRS
DESIGN DISCHARGE	= 22	CFS
DESIGN HW ELEVATION	= 815.63	FT
100 YEAR DISCHARGE	= 22	CFS
100 YEAR HW ELEVATION	= 815.63	FT
OVERTOPPING FREQUENCY	= >500	YRS
OVERTOPPING DISCHARGE	= 48	CFS
OVERTOPPING ELEVATION	= 819.01	FT

(+)0.5000%
(–)4.0000%
PROPOSED GRADE
PROP. 36" RCP
PROP. 36" RCP
EXISTING GRADE
(–)3.4267%
(–)4.0000%
BEGIN DITCH GRADE
STA.74+00.00 –L– RT
EL.785.14 FT

FOR –L– PLAN SEE SHT. 7

63+00 64+00 65+00 66+00 67+00 68+00 69+00 70+00 71+00 72+00 73+00 74+00 75+00 76+00

850 840 830 820 810 800 790 780 770 760

–L– (WB)

PI = 64+19.29
EL = 828.04'
VC = 1120'
K = 249
DS = 70 MPH

PIPE HYDRAULIC DATA
36" RCP-III –L– Sta.64+14

DRAINAGE AREA	= 6.52	AC
DESIGN FREQUENCY	= 100	YRS
DESIGN DISCHARGE	= 22	CFS
DESIGN HW ELEVATION	= 815.63	FT
100 YEAR DISCHARGE	= 22	CFS
100 YEAR HW ELEVATION	= 815.63	FT
OVERTOPPING FREQUENCY	= >500	YRS
OVERTOPPING DISCHARGE	= 48	CFS
OVERTOPPING ELEVATION	= 819.01	FT

PIPE HYDRAULIC DATA
36" RCP-III –L– Sta.69+86

DRAINAGE AREA	= 5.09	AC
DESIGN FREQUENCY	= 100	YRS
DESIGN DISCHARGE	= 17	CFS
DESIGN HW ELEVATION	= 800.09	FT
100 YEAR DISCHARGE	= 17	CFS
100 YEAR HW ELEVATION	= 800.09	FT
OVERTOPPING FREQUENCY	= >500	YRS
OVERTOPPING DISCHARGE	= 29	CFS
OVERTOPPING ELEVATION	= 803.56	FT

(+)0.5000%
(–)4.0000%
(+) 3.0000%
END DITCH GRADE
STA.63+85.00 –L– LT
EL.811.00 FT
PROP. 36" RCP
EXISTING GRADE
PROPOSED GRADE
PROP. 36" RCP
(–)4.0000%

BM #5
ELEVATION = 814.70
N 575093 E 1198568
BL STATION 72+55.00 95 LEFT
60D NAIL IN BASE OF 18INCH WATER OAK

LEFT DITCH
RIGHT DITCH

FOR –L– PLAN SEE SHT. 7

63+00 64+00 65+00 66+00 67+00 68+00 69+00 70+00 71+00 72+00 73+00 74+00 75+00 76+00

850 840 830 820 810 800 790 780 770 760

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josh.erdman

5/28/99

PROJECT REFERENCE NO.	SHEET NO.
R-4045	20
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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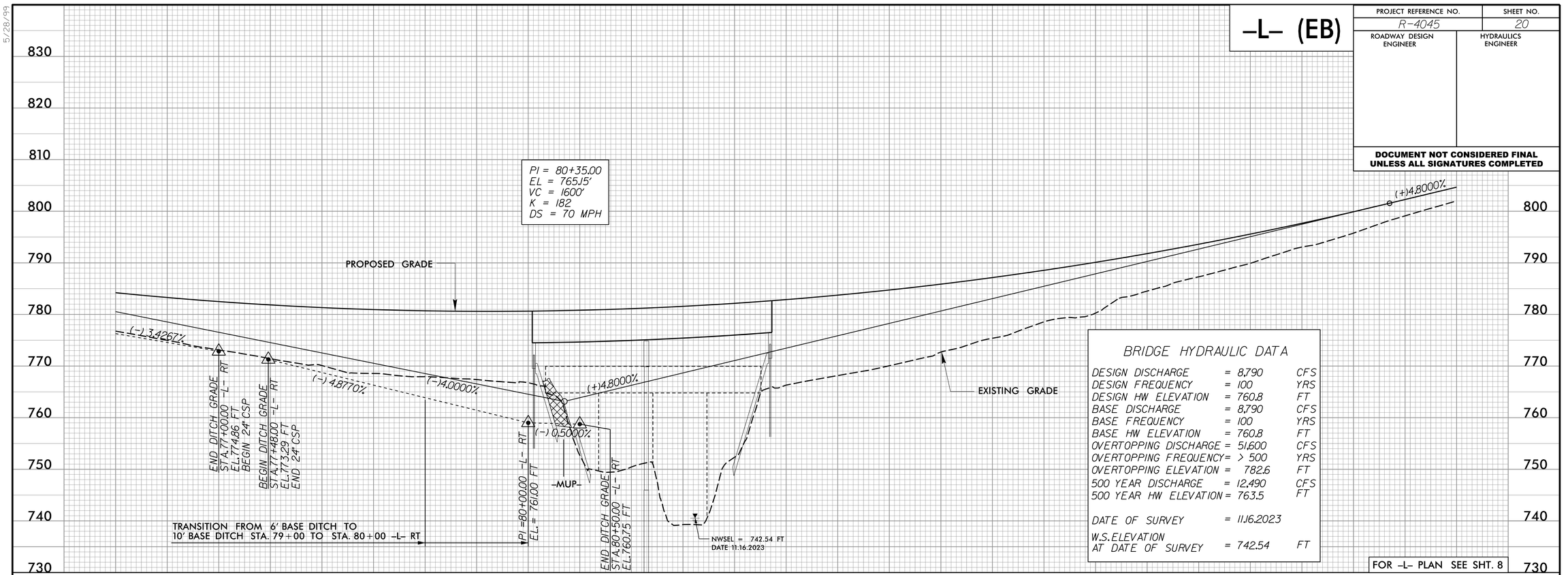
–L– (EB)

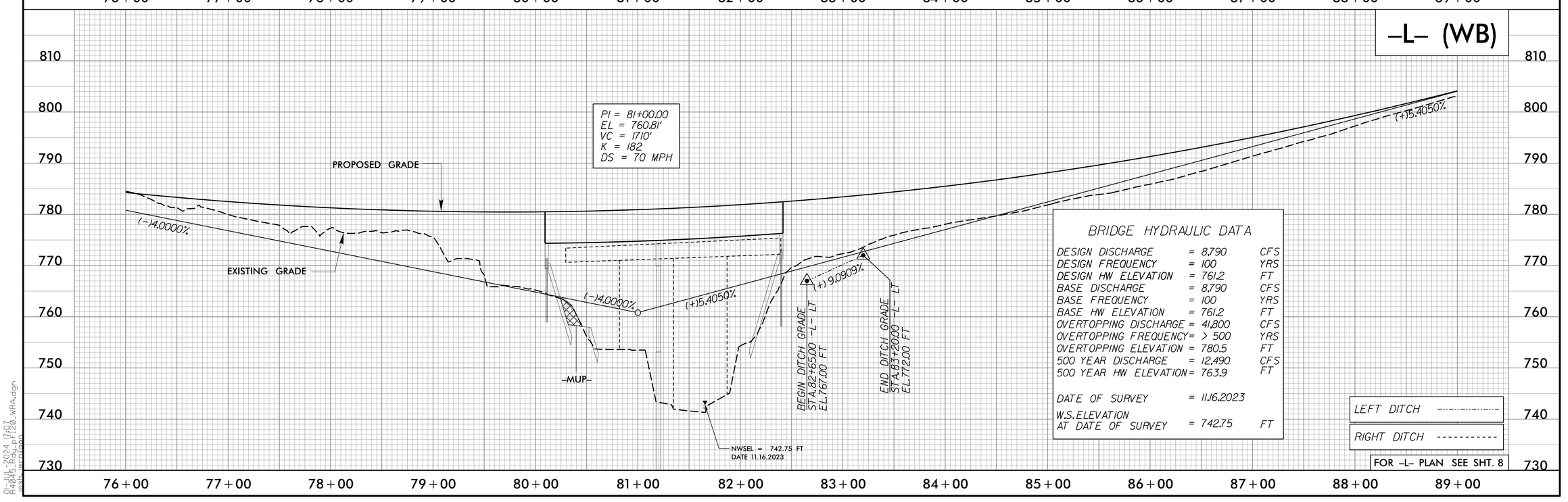


BRIDGE HYDRAULIC DATA

DESIGN DISCHARGE	= 8,790	CFS
DESIGN FREQUENCY	= 100	YRS
DESIGN HW ELEVATION	= 760.8	FT
BASE DISCHARGE	= 8,790	CFS
BASE FREQUENCY	= 100	YRS
BASE HW ELEVATION	= 760.8	FT
OVERTOPPING DISCHARGE	= 51,600	CFS
OVERTOPPING FREQUENCY	= > 500	YRS
OVERTOPPING ELEVATION	= 782.6	FT
500 YEAR DISCHARGE	= 12,490	CFS
500 YEAR HW ELEVATION	= 763.5	FT
DATE OF SURVEY	= 11.16.2023	
W.S.ELEVATION AT DATE OF SURVEY	= 742.54	FT

FOR –L– PLAN SEE SHT. 8

–L– (WB)



BRIDGE HYDRAULIC DATA

DESIGN DISCHARGE	= 8,790	CFS
DESIGN FREQUENCY	= 100	YRS
DESIGN HW ELEVATION	= 761.2	FT
BASE DISCHARGE	= 8,790	CFS
BASE FREQUENCY	= 100	YRS
BASE HW ELEVATION	= 761.2	FT
OVERTOPPING DISCHARGE	= 41,800	CFS
OVERTOPPING FREQUENCY	= > 500	YRS
OVERTOPPING ELEVATION	= 780.5	FT
500 YEAR DISCHARGE	= 12,490	CFS
500 YEAR HW ELEVATION	= 763.9	FT
DATE OF SURVEY	= 11.16.2023	
W.S.ELEVATION AT DATE OF SURVEY	= 742.75	FT

LEFT DITCH ----------

RIGHT DITCH ----------

FOR –L– PLAN SEE SHT. 8

DGN: US_2024_17.07
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joshjernigan

5/28/99

PROJECT REFERENCE NO.	SHEET NO.
R-4045	21
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

–L– (EB)

BM #6
ELEVATION = 813.77
N 573918 E 1200373
BL STATION 93+88.00 182' RIGHT
60D NAIL IN BASE OF 20INCH SYCAMORE

PI = 97+20.00
EL = 846.03'
VC = 680'
K = 238
DS = 65 MPH

END GRADE –L–
STA = 99+50.00
EL = 850.23'

END RESURFACING
–L– STA = 100+25.00
EL = 851.80'

RESURFACING ONLY

(+)4.8000%

(+)4.8000%

(+)1.9388%

PROPOSED GRADE

EXISTING GRADE

FOR –L– PLAN SEE SHT. 9

–L– (WB)

PI = 96+50.00
EL = 844.56'
VC = 780'
K = 225
DS = 65 MPH

END GRADE –L–
STA = 99+50.00
EL = 850.19'

END RESURFACING
–L– STA = 100+25.00
EL = 851.82'

RESURFACING ONLY

(+)5.4050%

(+)5.4027%

(+)1.9388%

PROPOSED GRADE

EXISTING GRADE

FOR –L– PLAN SEE SHT. 9

890 880 870 860 850 840 830 820 810 800

89+00 90+00 91+00 92+00 93+00 94+00 95+00 96+00 97+00 98+00 99+00 100+00 101+00 102+00 103+00

Plotted: 2024.11.07
R4045_Sht_21_WRA.dgn
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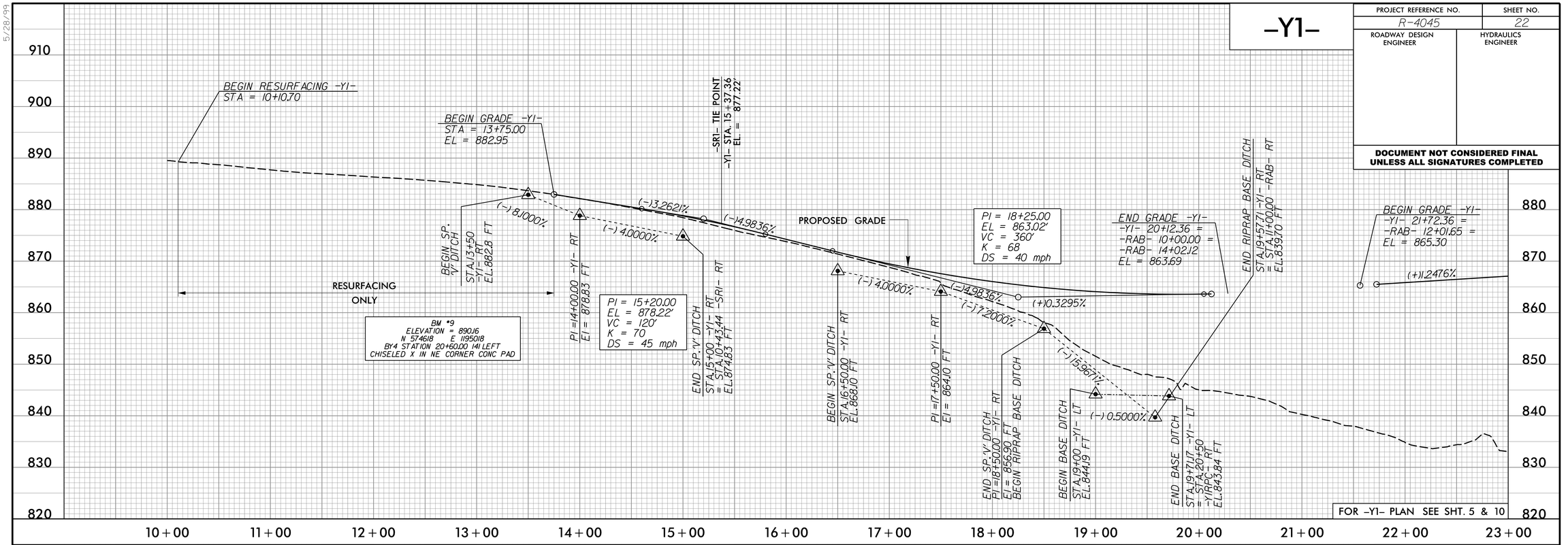
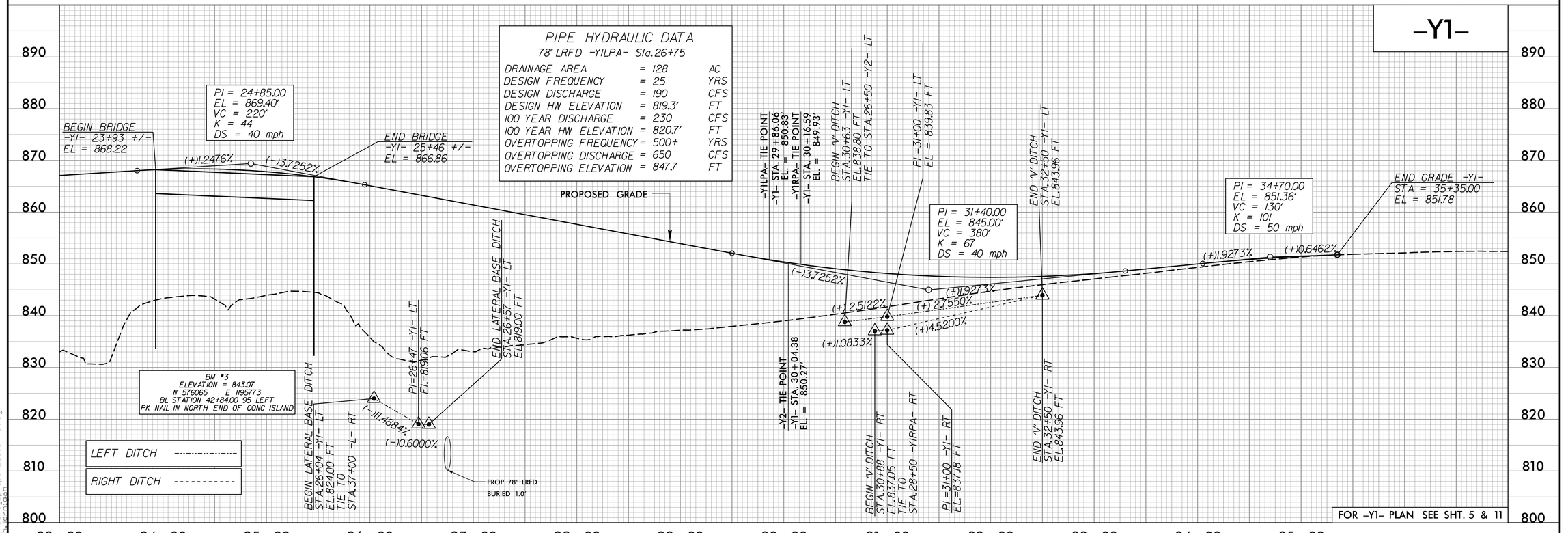
5/28/99

PROJECT REFERENCE NO.	SHEET NO.
R-4045	22
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

–Y1–





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josh.ingram

5/28/99

–Y1LPA–

PROJECT REFERENCE NO.	SHEET NO.
R-4045	23
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

CULVERT HYDRAULIC DATA

DESIGN DISCHARGE	= 290	CFS
DESIGN FREQUENCY	= 100	YRS
DESIGN HW ELEVATION	= 807.8	FT
BASE DISCHARGE	= 290	CFS
BASE FREQUENCY	= 100	YRS
BASE HW ELEVATION	= 807.8	FT
OVERTOPPING DISCHARGE	= 1300	CFS
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING ELEVATION	= 833.8	FT

BEGIN GRADE –Y1LPA–
STA = 10+00.00
EL = 842.89'

PI = 11+25.00
EL = 840.70'
VC = 100'
K = 92
DS = 50 mph

PI = 15+55.00
EL = 828.50'
VC = 300'
K = 38
DS = 30 mph

END GRADE –Y1LPA–
STA = 19+95.31
EL = 850.52'

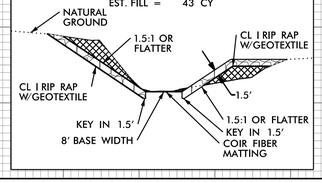
(–)11.7517%
(–)12.8362%
(–)12.8362%
(+)5.0000%
(+)5.0000%
(+)12.6208%

PROPOSED GRADE
EXISTING GRADE
PROP. 24" RCP-III
PROP. 8' X 7' RCBC BURIED 1.0'

INLET TYPICAL

NOT TO SCALE (LEFT TO RIGHT LOOKING DOWNSTREAM)

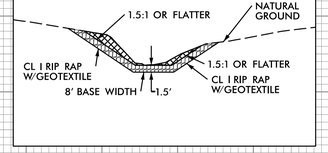
EST TONS CLASS I RIP RAP = 60 TONS
EST. GEOTEXTILE = 94 SY
EST. COIR FIBER MATTING = 15 SY
EST. FILL = 43 CY



OUTLET TYPICAL

NOT TO SCALE (LEFT TO RIGHT LOOKING DOWNSTREAM)

EST CLASS I RIP RAP = 67 TONS
EST. GEOTEXTILE = 119 SY
EST. CUT = 23 CY



PIPE HYDRAULIC DATA

24" RCP-III Sta.18+11 –Y1LPA–

DRAINAGE AREA	= 2.000	AC
DESIGN FREQUENCY	= 100	YRS
DESIGN DISCHARGE	= 6.5	CFS
DESIGN HW ELEVATION	= 836.6	FT
100 YEAR DISCHARGE	= 6.5	CFS
100 YEAR HW ELEVATION	= 836.6	FT
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING DISCHARGE	= 9.0	CFS
OVERTOPPING ELEVATION	= 837.11	FT

FOR –Y1LPA– PLAN SEE SHT. 5

–Y1RPA–

BRIDGE HYDRAULIC DATA

DESIGN DISCHARGE	= 310	CFS
DESIGN FREQUENCY	= 100	YRS
DESIGN HW ELEVATION	= 792.1	FT
BASE DISCHARGE	= 310	CFS
BASE FREQUENCY	= 100	YRS
BASE HW ELEVATION	= 792.1	FT
OVERTOPPING DISCHARGE	= 21200	CFS
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING ELEVATION	= 815.7	FT
	= _____	FT
DATE OF SURVEY	= 12.06.2023	
W.S.ELEVATION AT DATE OF SURVEY	= 788.5	FT

BEGIN GRADE –Y1RPA–
STA = 10+00.00
EL = 823.82'

PI = 11+55.00
EL = 822.89'
VC = 180'
K = 257
DS = >60 mph

PI = 14+30.00
EL = 819.32'
VC = 180'
K = 411
DS = >60 mph

PI = 21+00.00
EL = 813.54'
VC = 510'
K = 97
DS = 50 mph

(–)10.6000%
(–)11.3000%
(–)11.3000%
(–)10.8618%
(–)10.8618%
(+)1.5000%
(+)4.3988%
(+)4.9000%
(+)14.5000%
(+)18.5000%
(+)19.2000%

PROPOSED GRADE

BEGIN BRIDGE –Y1RPA– 16+99 +/–
EL = 817.01'

END BRIDGE –Y1RPA– 18+19 +/–
EL = 815.97'

BEGIN 'Y' DITCH W/ HINGE
PI=20+50 –Y1RPA– RT
EL. = 812.18 FT

PI=22+00 –Y1RPA– RT
EL=814.43 FT

WSEL = 788.5 FT
DATE 12.06.2023

NWSEL = 788.9 FT
DATE 12.06.2023

CLASS II
KEYED IN 3.5' (TYP)

BEGIN LATERAL BASE DITCH
STA.18+12
–Y1RPA– RT
EL.790.28'

END LATERAL BASE DITCH
STA.20+00 –Y1RPA– RT
EL. 807.58'

BEGIN 'Y' DITCH
STA.20+00 –Y1RPA– LT
EL.800.95 FT

PI=21+00 –Y1RPA RT–
EL.=809.45 FT

LEFT DITCH
RIGHT DITCH

FOR –Y1RPA– PLAN SEE SHT. 5 & 6

10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00 18+00 19+00 20+00 21+00 22+00

770 780 790 800 810 820 830 840 850 860 870 880 890

RLHILL 2024.11.07
R4045_Sheet_ps23_summit.dgn
josh.ermon

5/28/99

PROJECT REFERENCE NO.	SHEET NO.
R-4045	24
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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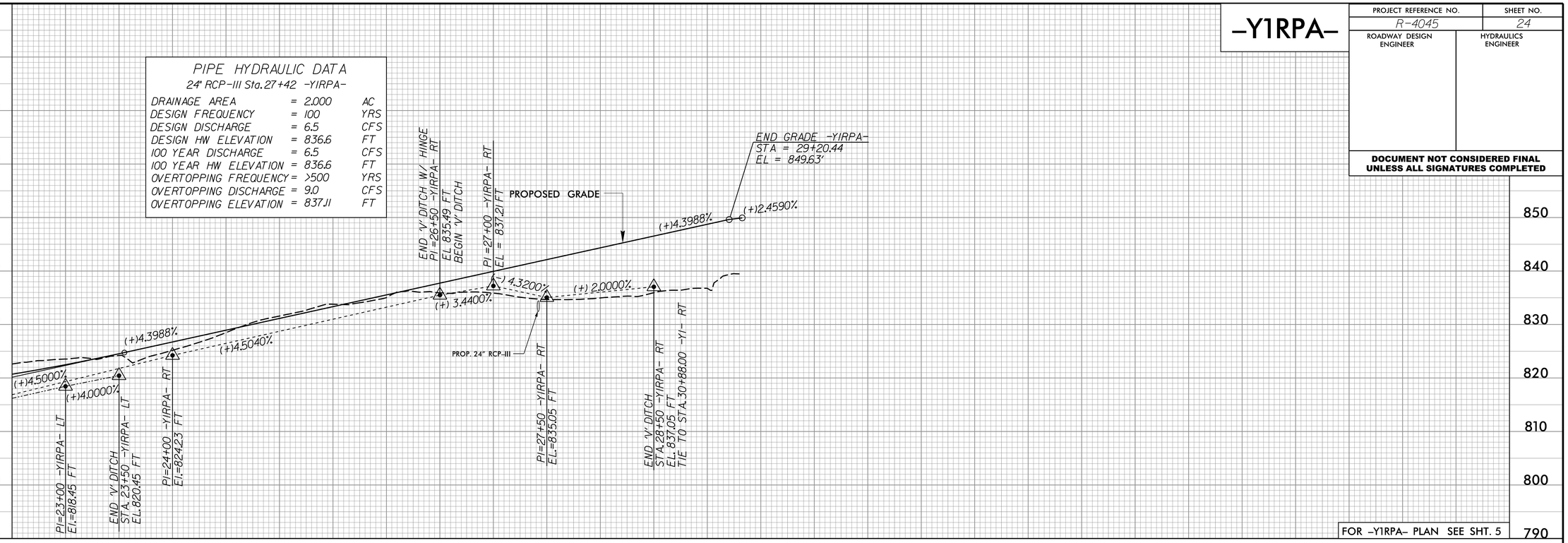
–Y1RPA–

PIPE HYDRAULIC DATA
24" RCP-III Sta.27+42 -Y1RPA-

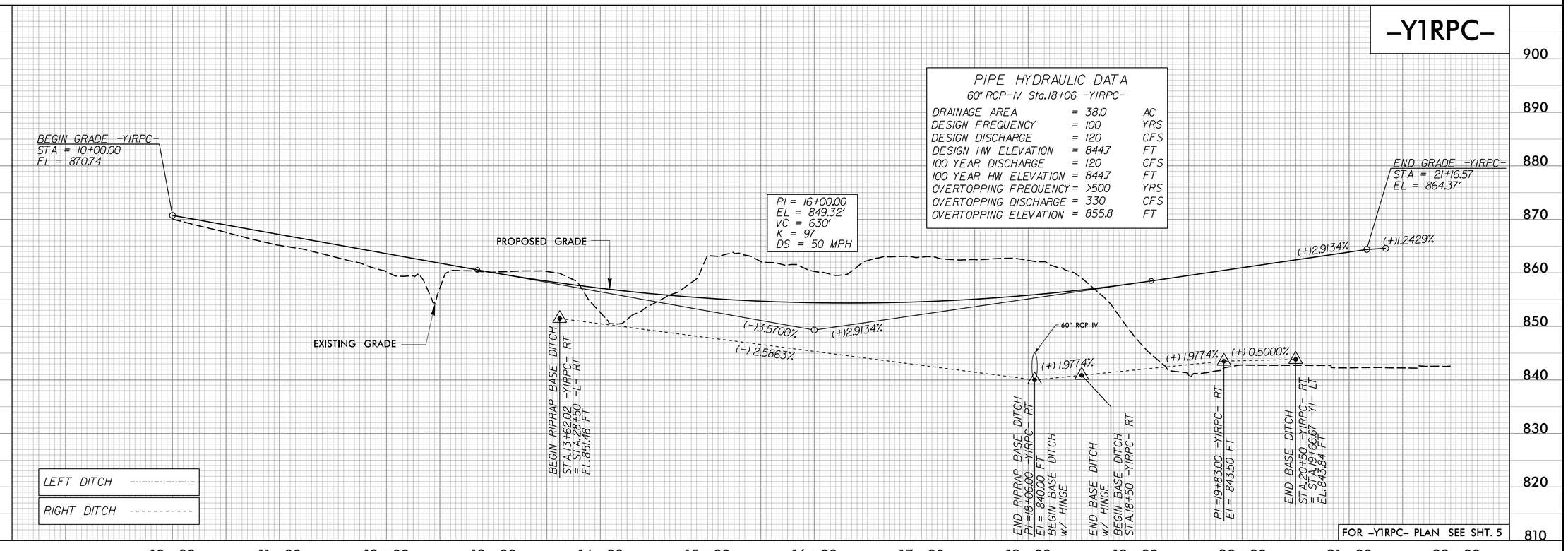
DRAINAGE AREA	=	2.000	AC
DESIGN FREQUENCY	=	100	YRS
DESIGN DISCHARGE	=	6.5	CFS
DESIGN HW ELEVATION	=	836.6	FT
100 YEAR DISCHARGE	=	6.5	CFS
100 YEAR HW ELEVATION	=	836.6	FT
OVERTOPPING FREQUENCY	=	>500	YRS
OVERTOPPING DISCHARGE	=	9.0	CFS
OVERTOPPING ELEVATION	=	837.11	FT



–Y1RPC–

PIPE HYDRAULIC DATA
60" RCP-IV Sta.18+06 -Y1RPC-

DRAINAGE AREA	=	38.0	AC
DESIGN FREQUENCY	=	100	YRS
DESIGN DISCHARGE	=	120	CFS
DESIGN HW ELEVATION	=	844.7	FT
100 YEAR DISCHARGE	=	120	CFS
100 YEAR HW ELEVATION	=	844.7	FT
OVERTOPPING FREQUENCY	=	>500	YRS
OVERTOPPING DISCHARGE	=	330	CFS
OVERTOPPING ELEVATION	=	855.8	FT



RLUK 2024.1.07
R4045_Sht_Plts24_summit.dgn
josh.ferguson

5/28/99

–Y1RPD–

PROJECT REFERENCE NO.	SHEET NO.
R-4045	25
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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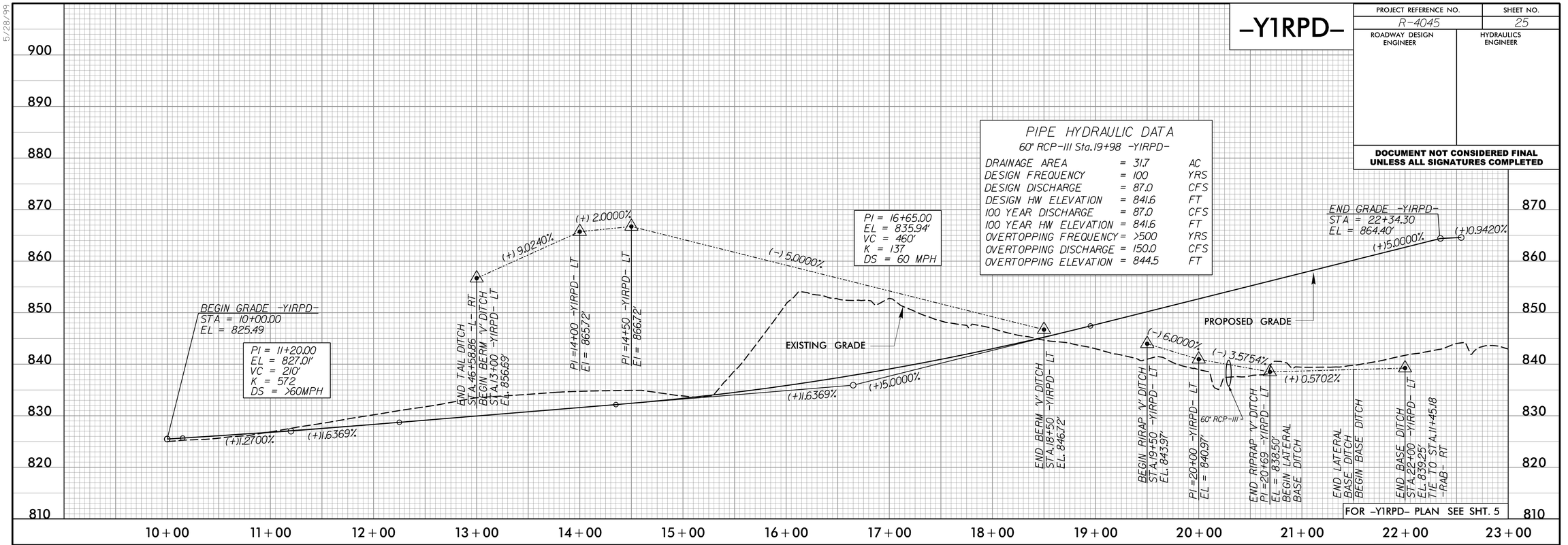

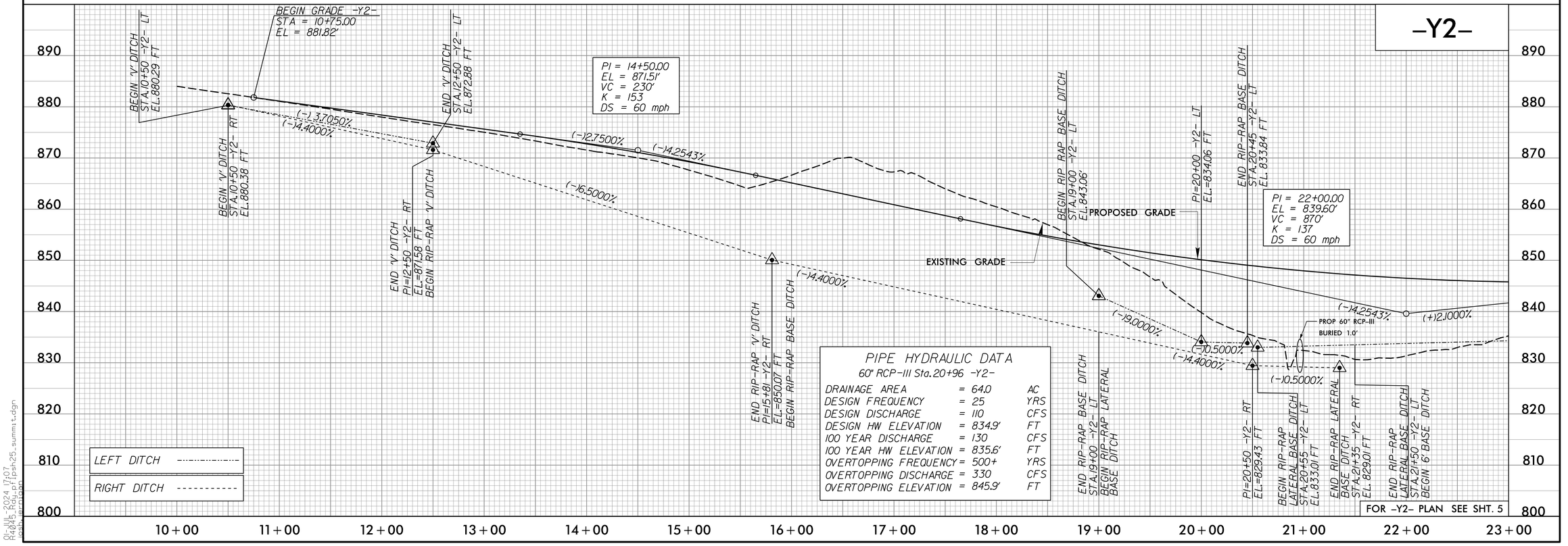

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r4045_25_hyd_prs25_summit.dgn
josh.arrington

5/28/99

PROJECT REFERENCE NO.	SHEET NO.
R-4045	26
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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–Y2–

PI = 22+00.00
EL = 839.60'
VC = 870'
K = 137
DS = 60 mph

END GRADE –Y2–
STA = 27+00.00
EL = 850.10'

PROPOSED GRADE

(+)2.1000%

(+)1.4742%

(+)2.1000%

EXISTING GRADE

(+) 2.3025%

(+) 0.5250%

END 6' BASE DITCH
STA.24+50 –Y2– LT
BEGIN 2' BASE DITCH

END 2' BASE DITCH
PI =25+00 –Y2– LT
EL = 835.35 FT
BEGIN 'V' DITCH

END 'V' DITCH
STA.26+50 –Y2– LT
EL. 838.80 FT
TIE TO STA.30+63 –Y1– LT

FOR –Y2– PLAN SEE SHT. 5

–SR1–

42" RCP–III HYDRAULIC DATA
STRUCTURE 1001

DRAINAGE AREA	= 16.9	AC.
DESIGN DISCHARGE	= 48	CFS
DESIGN FREQUENCY	= 25	YRS
DESIGN HW ELEVATION	= 868.2	FT
BASE DISCHARGE	= 56	CFS
BASE FREQUENCY	= 100	YRS
BASE HW ELEVATION	= 868.6	FT
OVERTOPPING DISCHARGE	= 150	CFS
OVERTOPPING FREQUENCY	= >500	YRS
OVERTOPPING ELEVATION	= 874.8	FT

PI = 12+75.00
EL = 871.72'
VC = 400'
K = 67
DS = 40 MPH

PROPOSED GRADE

BEGIN GRADE –SR1–
STA = 10+12.00
EL = 876.98'

BEGIN SP. 'V' DITCH
STA.10+43.44 –SR1– RT
= STA.15+00 –Y1– RT
EL.874.83 FT

(–) 4.0000%

PI =10+50.00 –SR1– RT
EI = 874.56 FT

END SP. 'V' DITCH
PI =12+00.00 –SR1– RT
EI = 867.15 FT

BEGIN RIPRAP 'V' DITCH
PI =12+65.00 –SR1– RT
EI = 865.18 FT

PI =13+00.00 –SR1– RT
EI = 865.42 FT

PI =14+50.00 –SR1– RT
EI = 870.67 FT

EXISTING GRADE

–12.0000%

(–)12.0000%

(–) 4.9564%

(–) 5.5000%

(–)12.0000%

(–) 3.0000%

(–) 8.0000%

(–) 4.0000%

(+)4.0000%

(+) 0.7000%

(+) 3.5000%

(+)4.0000%

(+) 2.0000%

(+) 5.6000%

(+) 4.9540%

42" RCP–III

BEGIN SP. 'V' DITCH
STA.10+50 –SR1– LT
EL.873.37 FT

PI =11+00.00 –SR1– LT
EI = 870.62 FT

PI =12+00.00
–SR1– LT
EI = 862.62 FT

END SP. 'V' DITCH
STA.12+40.41
–SR1– LT
EL.861.00 FT

BEGIN SP. 'V' DITCH
STA.12+65
–SR1– LT
EL.861.00 FT

END RIPRAP 'V' DITCH
PI =17+00.00 –SR1– RT
EI = 884.67 FT
BEGIN SP. 'V' DITCH

FOR –SR1– PLAN SEE SHT. 10 & 12

–SR1–

PI = 19+50.00
EL = 898.72'
VC = 520'
K = 44
DS = 40 MPH

(+)4.0000%

(+) 1.0000%

(+) 4.9540%

(+) 2.0000%

(+) 0.5000%

(–)17.7657%

(–) 5.3199%

(–) 5.9471%

(–) 11.0000%

(–)12.0000%

PI =18+50.00 –SR1– RT
EI = 887.67 FT

PI =18+50.00 –SR1– LT
EI = 889.98 FT

END SP. 'V' DITCH
STA.19+00 –SR1– LT
= STA.10+22.65 –DR1– LT
EL.890.48 FT

–DR1– TIE POINT
–SR1– STA.19+25.00
EL. = 891.47'

PI =19+50.00 –SR1– RT
EI = 888.17 FT

BEGIN SP. 'V' DITCH
STA.19+50 –SR1– LT
= STA.10+22.65 –DR1– RT
EL.889.82 FT

END SP. 'V' DITCH
PI =23+00.00 –SR1– RT
EI = 867.36 FT
BEGIN RIPRAP BASE DITCH

END SP. 'V' DITCH
PI =22+50.00 –SR1– LT
EI = 873.86 FT
BEGIN BASE DITCH

END BASE DITCH
STA.24+66.93 –SR1– LT
= STA.10+50 –SR2– LT
EL.850.00 FT

–SR2– TIE POINT
–SR1– STA. 24 +97.66
EL. = 858.07'

PI = 25+75.00
EL = 850.18'
VC = 465'
K = 64
DS = 40 MPH

PROPOSED GRADE

(–)17.7657%

(–)10.5000%

(–)10.5000%

(+) 0.5000%

(+) 0.5000%

(+) 3.6840%

EXISTING GRADE

(+) 6.3000%

(–)12.0000%

(+) 6.3000%

BEGIN SP. 'V' DITCH
STA.28+50 –SR1– LT
EL.845.01 FT

PI =29+00.00 –SR1– RT
EI = 844.82 FT

END SP. 'V' DITCH
STA.31+00 –SR1– LT
EL.846.26 FT

END RIPRAP BASE DITCH
–SR1– RT

END RIPRAP BASE DITCH
STA.26+00
–SR1– RT
BEGIN RIPRAP BASE DITCH
w/ HINGE

END RIPRAP BASE DITCH
w/ HINGE
STA.26+28
–SR1– RT
EL.828.00 FT

60" RCP–IV
BURIED 1'

BEGIN RIPRAP BASE DITCH
w/ HINGE
STA.26+44
–SR1– RT
EL.830.00 FT

END RIPRAP BASE DITCH
w/ HINGE

BEGIN RIPRAP BASE DITCH
STA.27+00
–SR1– RT

END RIPRAP BASE DITCH
PI =28+50.00 –SR1– RT
EI = 842.98 FT
BEGIN BASE DITCH

60" RCP–IV HYDRAULIC DATA
STRUCTURE 1313

DRAINAGE AREA	= 27.1	AC.
DESIGN DISCHARGE	= 73	CFS
DESIGN FREQUENCY	= 25	YRS
DESIGN HW ELEVATION	= 826.3	FT
BASE DISCHARGE	= 85	CFS
BASE FREQUENCY	= 100	YRS
BASE HW ELEVATION	= 826.7	FT
OVERTOPPING DISCHARGE	= 350	CFS
OVERTOPPING FREQUENCY	= >500	YRS
OVERTOPPING ELEVATION	= 848.1	FT

LEFT DITCH ----------

RIGHT DITCH ----------

FOR –SR1– PLAN SEE SHT. 12 & 13

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r4045_26.dgn
dgn_plot.pl.s26_summit.dgn
dgn_plot.pl

5/28/99

PROJECT REFERENCE NO.	SHEET NO.
R-4045	27
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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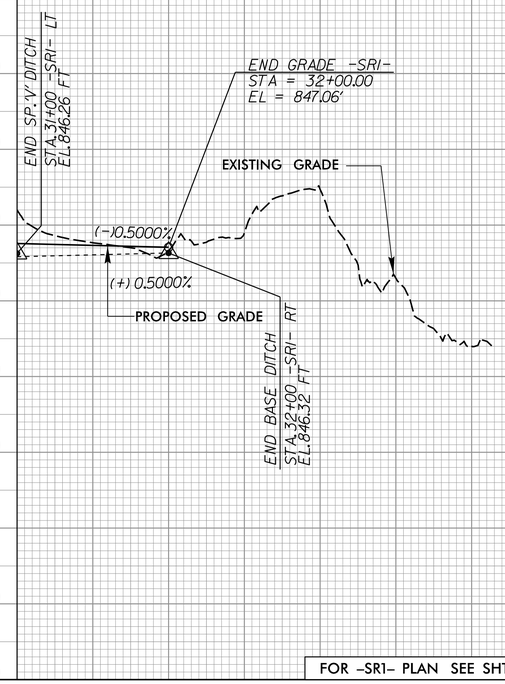
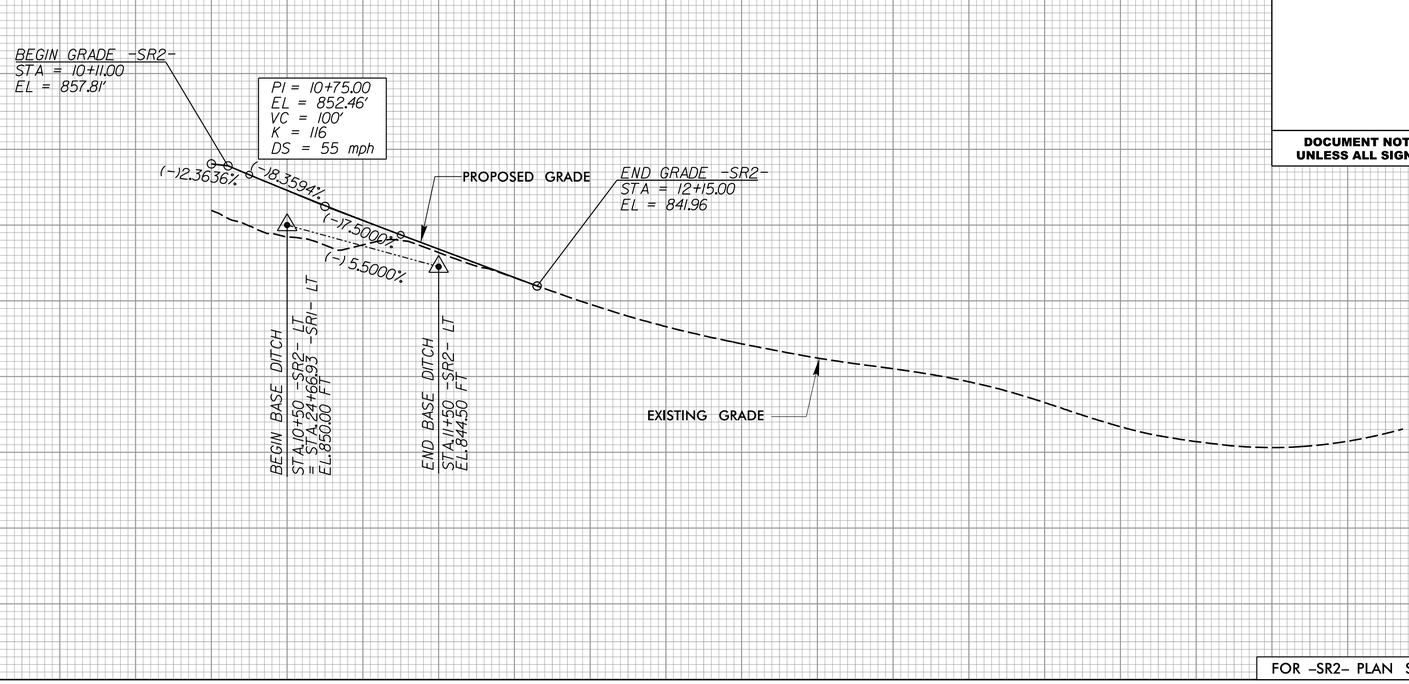
–SR1–



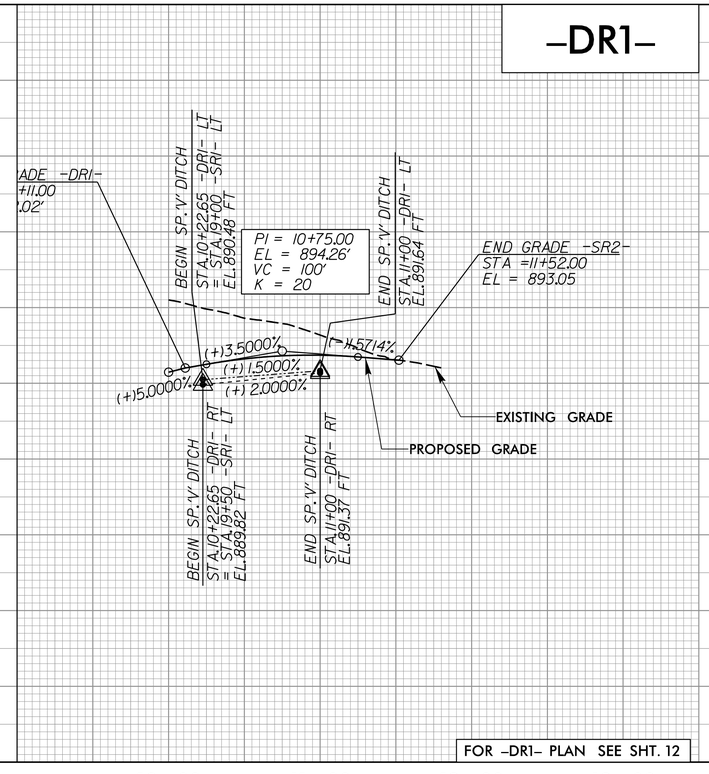
FOR –SR1– PLAN SEE SHT. 13

–SR2–



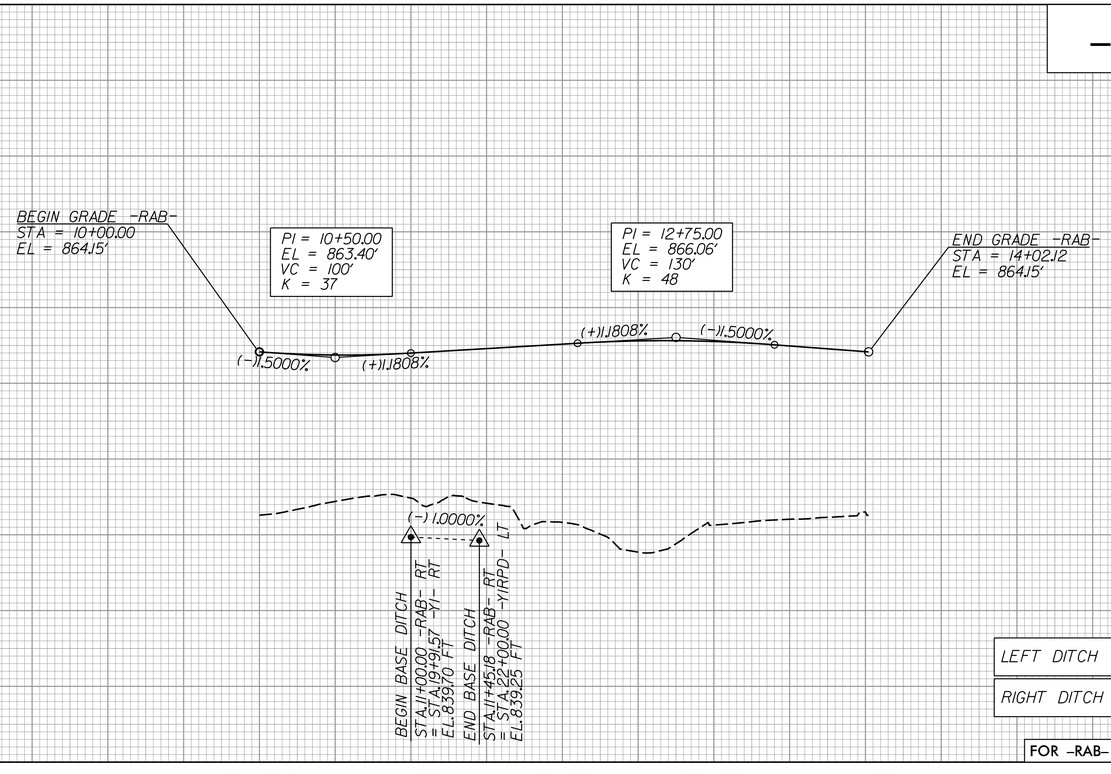
FOR –SR2– PLAN SEE SHT. 13

–DR1–



FOR –DR1– PLAN SEE SHT. 12

–RAB–



FOR –RAB– PLAN SEE SHT. 5

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R4045_27_summit.dgn
R4045_27_summit.pst
josh.ernest

5/28/99

–SR4–

PROJECT REFERENCE NO.	SHEET NO.
R-4045	28
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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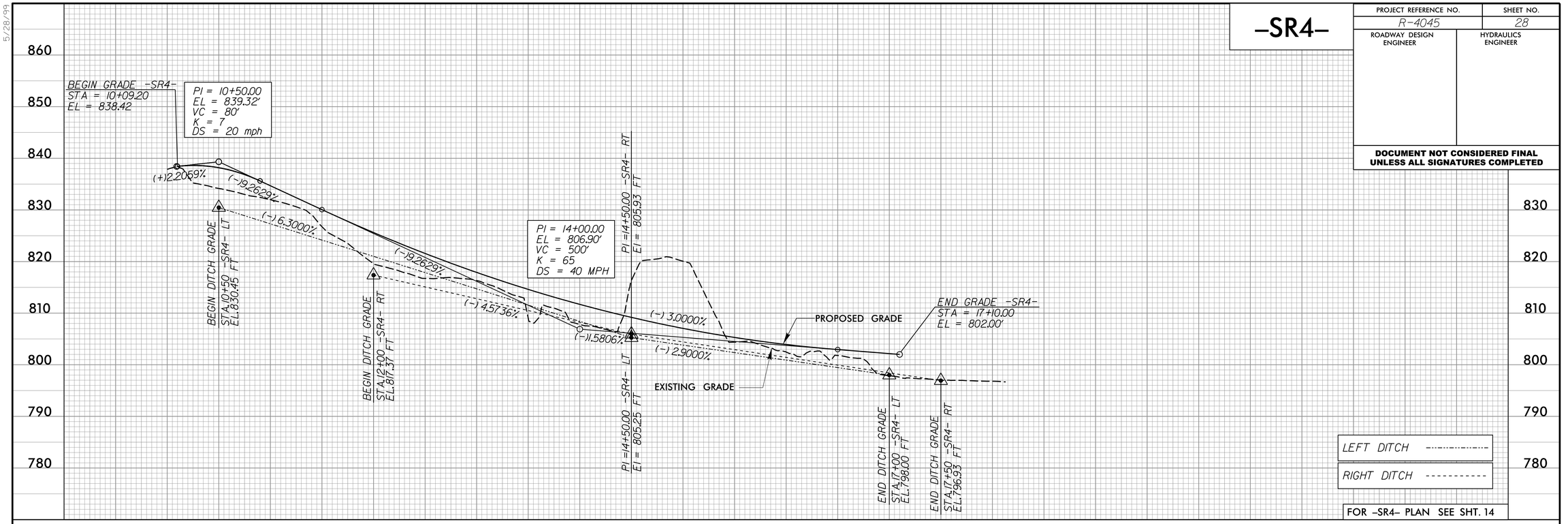

LEFT DITCH ----------

RIGHT DITCH ----------

FOR –SR4– PLAN SEE SHT. 14

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jeh_ergon

5/28/99

–MUP–

PROJECT REFERENCE NO.	SHEET NO.
R-4045	29
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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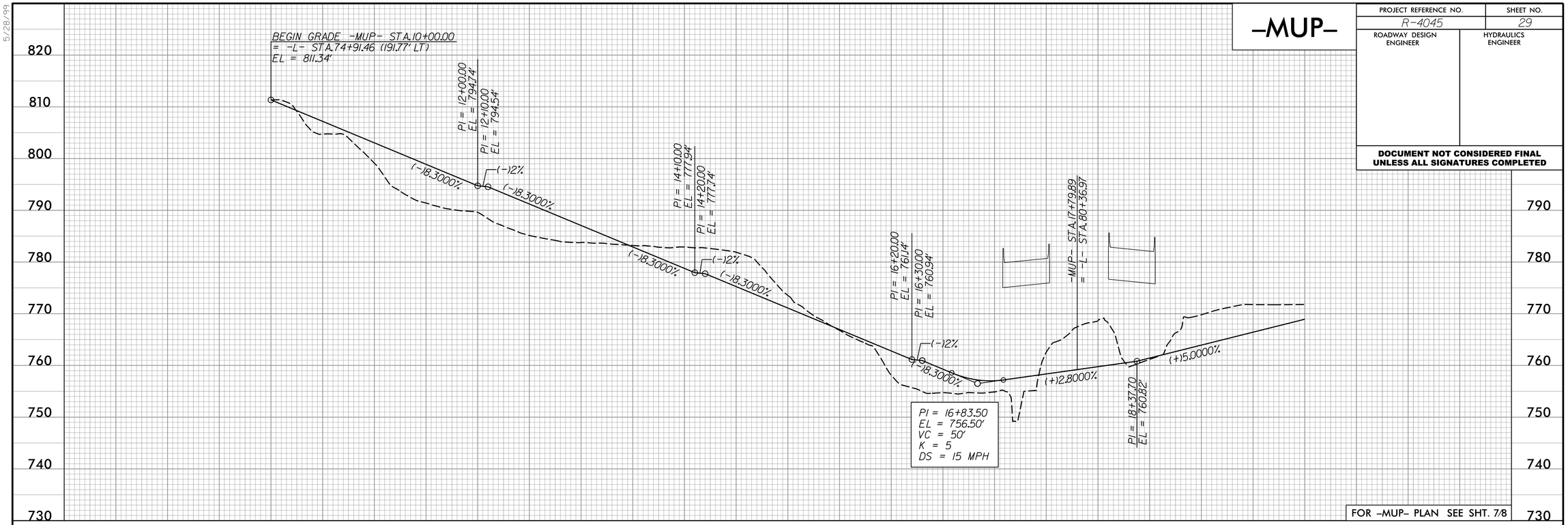

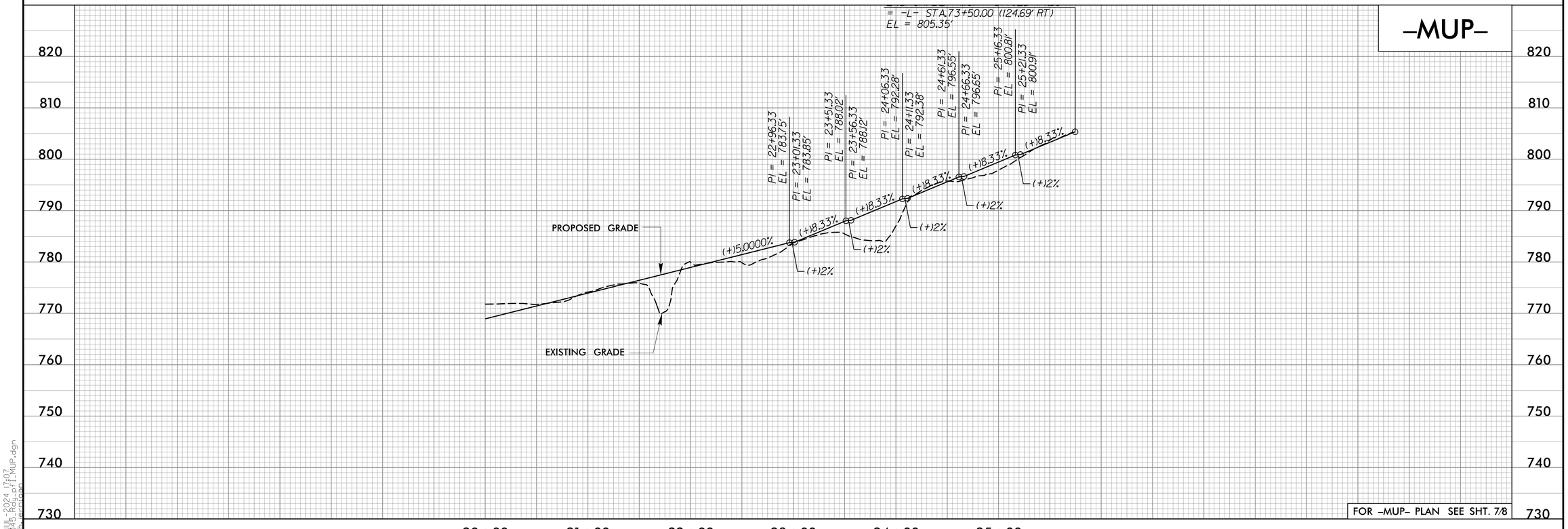

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jeh jernigan

6/23/16

PROJ. REFERENCE NO.	SHEET NO.
R-4045	X-0

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

CROSS-SECTIONS INDEX OF SHEETS

-L-	X-1 THRU X-57
-Y1-	X-58 THRU X-68
-Y1LPA-	X-69 THRU X-71
-Y1RPA-	X-72 THRU X-79
-Y1RPC-	X-80 THRU X-83
-Y1RPD-	X-84 THRU X-88
-Y2-	X-89 THRU X-96
-Y3-	X-97
-SR1-	X-98 THRU X-107
-SR2-	X-108 THRU X-110
-SR4-	X-111 THRU X-113
-DR1-	X-114
-RAB-	X-115 THRU X-119
-MUP-	X-120 THRU X-124

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Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-1

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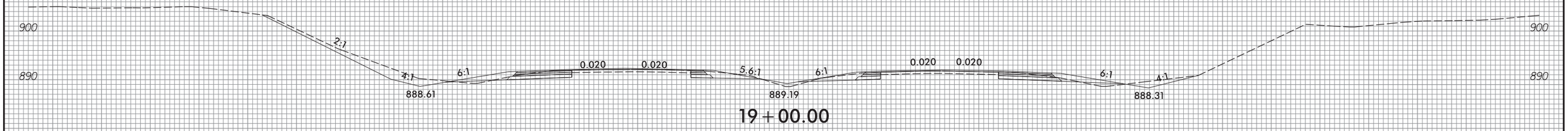

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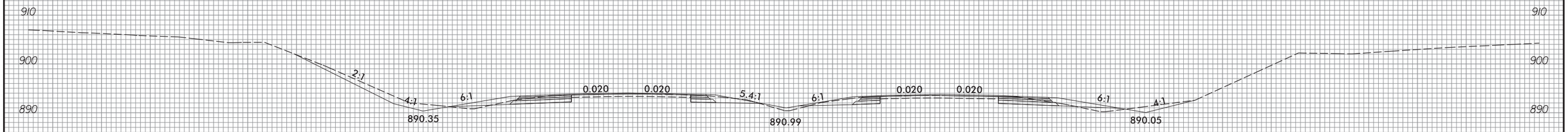

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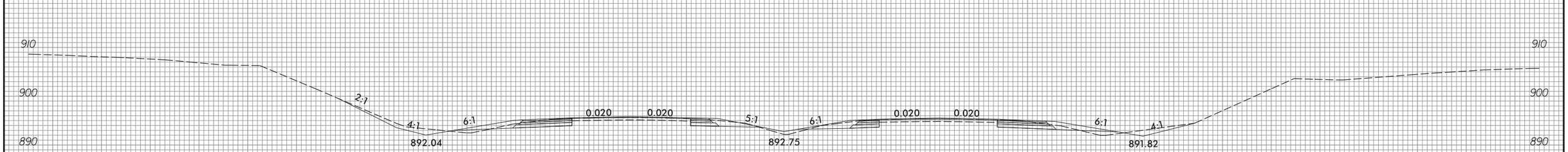
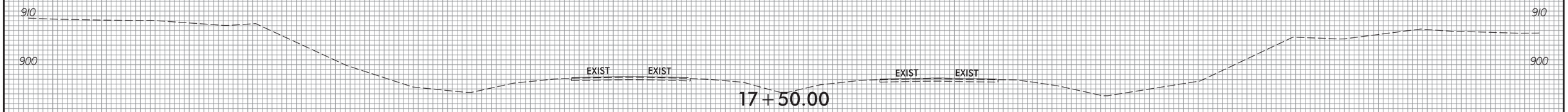
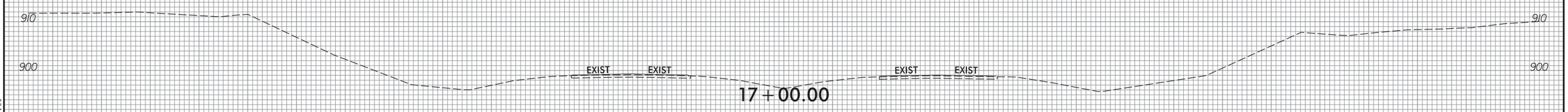


18 + 00.00



17 + 50.00



17 + 00.00

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Spencer.Merritt

6/23/16

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	R-4045	X-2

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900 890 880

2:1 4:1 6:1 0.020 6:1 6:1 0.020 6:1 4:1 2.2:1

882.14 882.27 881.13

21+00.00

900 890 880

2:1 4:1 6:1 0.005 0.020 5.9:1 6.4:1 0.005 0.020 6:1 4:1 2.6:1

883.69 883.93 882.96

20+50.00

900 890 880

2:1 4:1 6:1 0.012 0.020 5.5:1 6:1 0.012 0.020 6:1 4:1 3.1:1

885.22 885.53 884.82

20+00.00

900 890

2:1 4:1 6:1 0.020 0.020 5.5:1 6:1 0.020 0.020 6:1 4:1

886.86 887.34 886.59

19+50.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

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Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-3

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890
880
870

2:1 4:1 6:1 0.030 6:1 5.1:1 0.030 6:1 4:1 2:1

875.56 875.14 872.75

23+00.00

890
880

2:1 4:1 6:1 0.030 6:1 5.1:1 0.030 6:1 4:1 2:1

877.30 876.90 875.00

22+50.00

890
880

2:1 4:1 6:1 0.021 6:1 5.2:1 0.021 6:1 4:1 2:1

878.72 878.63 877.25

22+00.00

900
890
880

2:1 4:1 6:1 0.020 6:1 5.4:1 0.020 6:1 4:1 2.1:1

880.41 880.42 879.46

21+50.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:42
R4045_ROADWAY_X.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-4

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

890 880 870

RPC
10+03.81

6:1 6:1 0.030 6:1 5.2:1 0.030 5:1 2:1

868.80 868.26 863.75

25+00.00

890 880 870

6:1 6:1 0.030 6:1 5.1:1 0.030 5.4:1 2:1

870.44 869.93 866.00

24+50.00

890 880 870

6:1 6:1 0.030 6:1 5.1:1 0.030 5.8:1 2:1

872.15 871.65 868.25

24+00.00

890 880 870

6:1 6:1 0.030 6:1 5.1:1 0.030 6:1 2:1

873.84 873.38 870.50

23+50.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:42
R4045_Roll_X.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-5

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

890 880 870 860

–RPC–
11+52.98

0.030 0.030 0.030 0.051

6:1 4:1 6:1 5.2:1 4:1 2:1

862.30 863.45 857.00

26+50.00

890 880 870 860

–RPC–
11+03.29

0.030 0.030 0.037

6:1 4:1 6:1 5.3:1 4.3:1 2:1

864.76 865.02 859.25

26+00.00

890 880 870 860

–RPC–
10+53.57

0.030 0.030 0.030

6:1 6:1 6:1 5.3:1 4.6:1 2:1

867.22 866.62 861.50

25+50.00

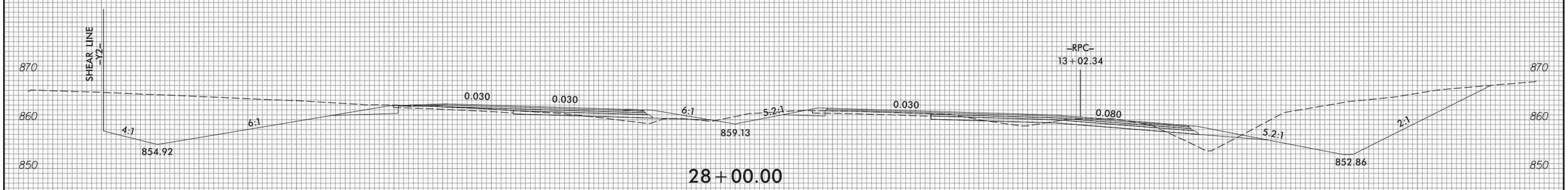
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:42
R-4045_EOR_X-SECT.dgn
Spencer.Merritt

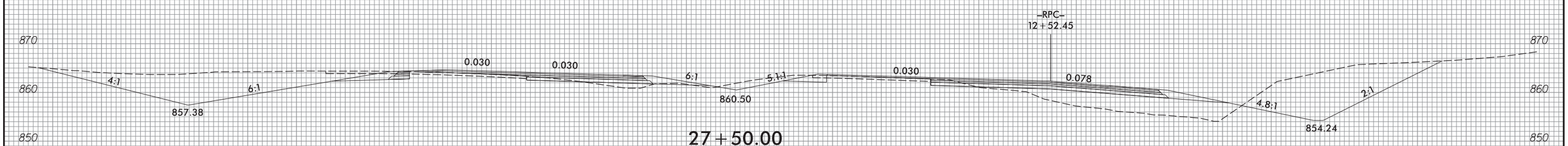
6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-6

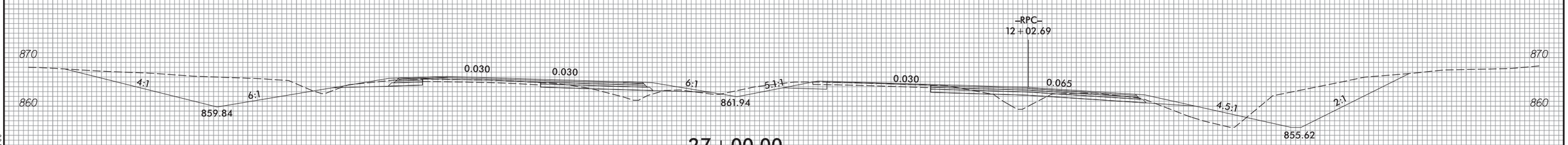
140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160



28+00.00



27+50.00



27+00.00

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160

01-JUL-2024 16:42
R-4045_RDY_X-SHT.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-7

130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170

890 880 870 860 850

SHEAR LINE –Y2–

SHEAR LINE –Y1RPC–

0.030 0.030 0.030

6:1 6:1 5.3:1 9:1

12:1

855.43

29+50.00

SHEAR LINE –Y2–

SHEAR LINE –Y1RPC–

0.030 0.030 0.030

7:1 6:1 5.3:1 10:1

856.61

29+00.00

SHEAR LINE –Y2–

–Y1RPC–
13+52.41

0.030 0.030 0.030 0.080

6:1 6:1 5.2:1 5.2:1 2:1

857.82 851.48

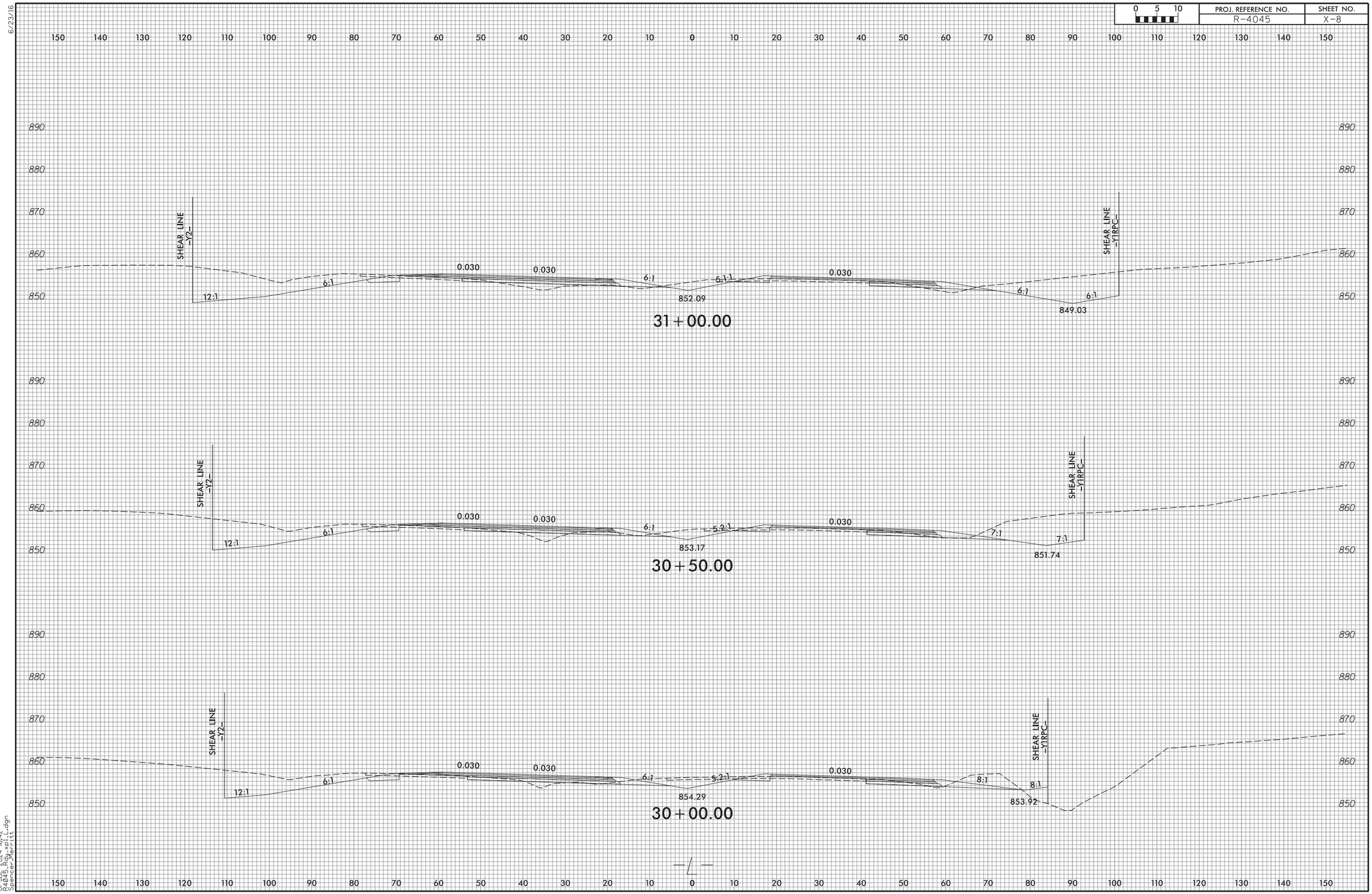
28+50.00

130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170

01-JUL-2024 16:42
R4045_Roll_Plot_X.dgn
Spencer.Merritt

6/23/16

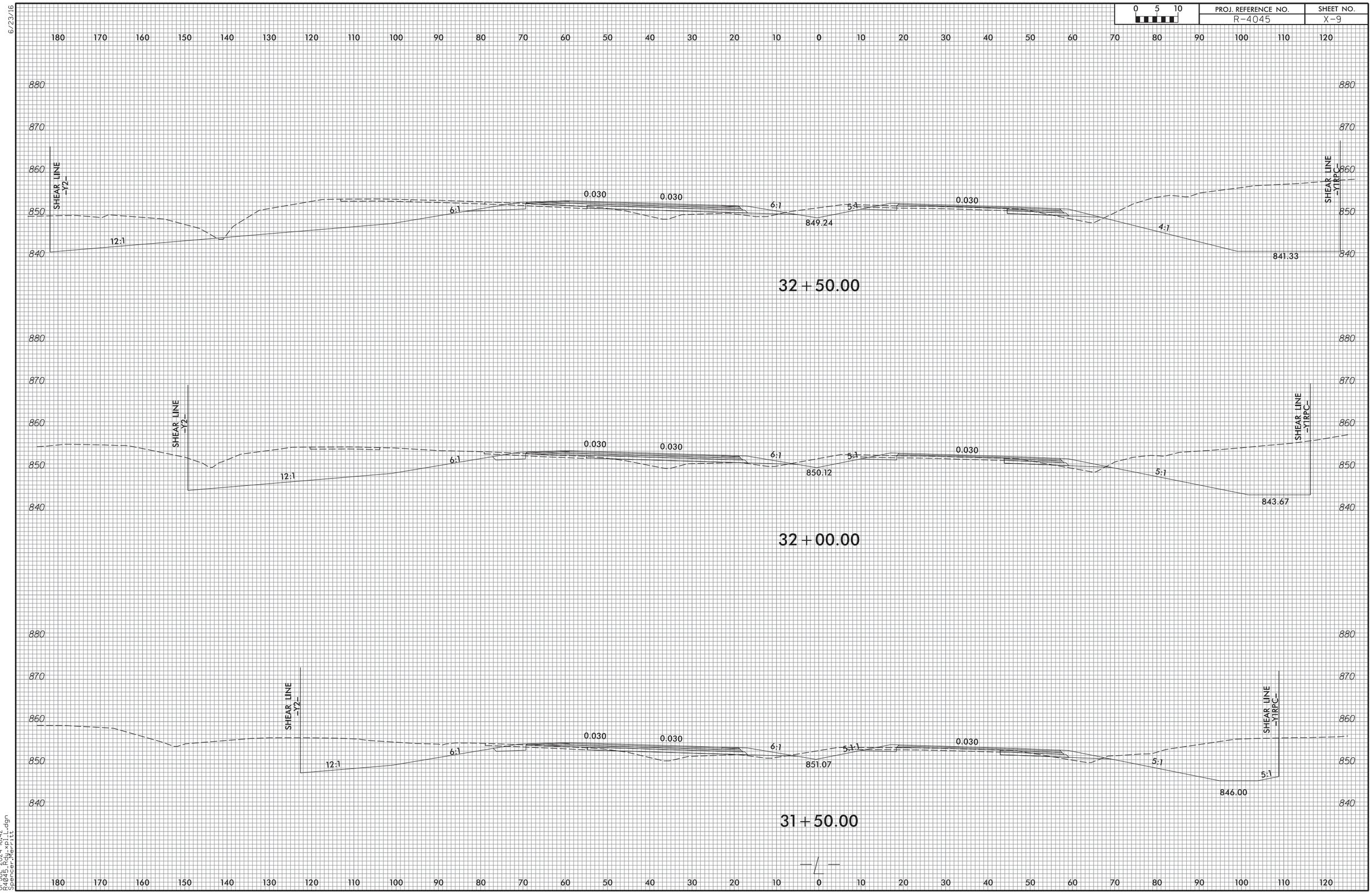
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-8



01-JUL-2024 16:42
R4045_E01_X-L.dgn
Spencer.Merritt

6/23/16

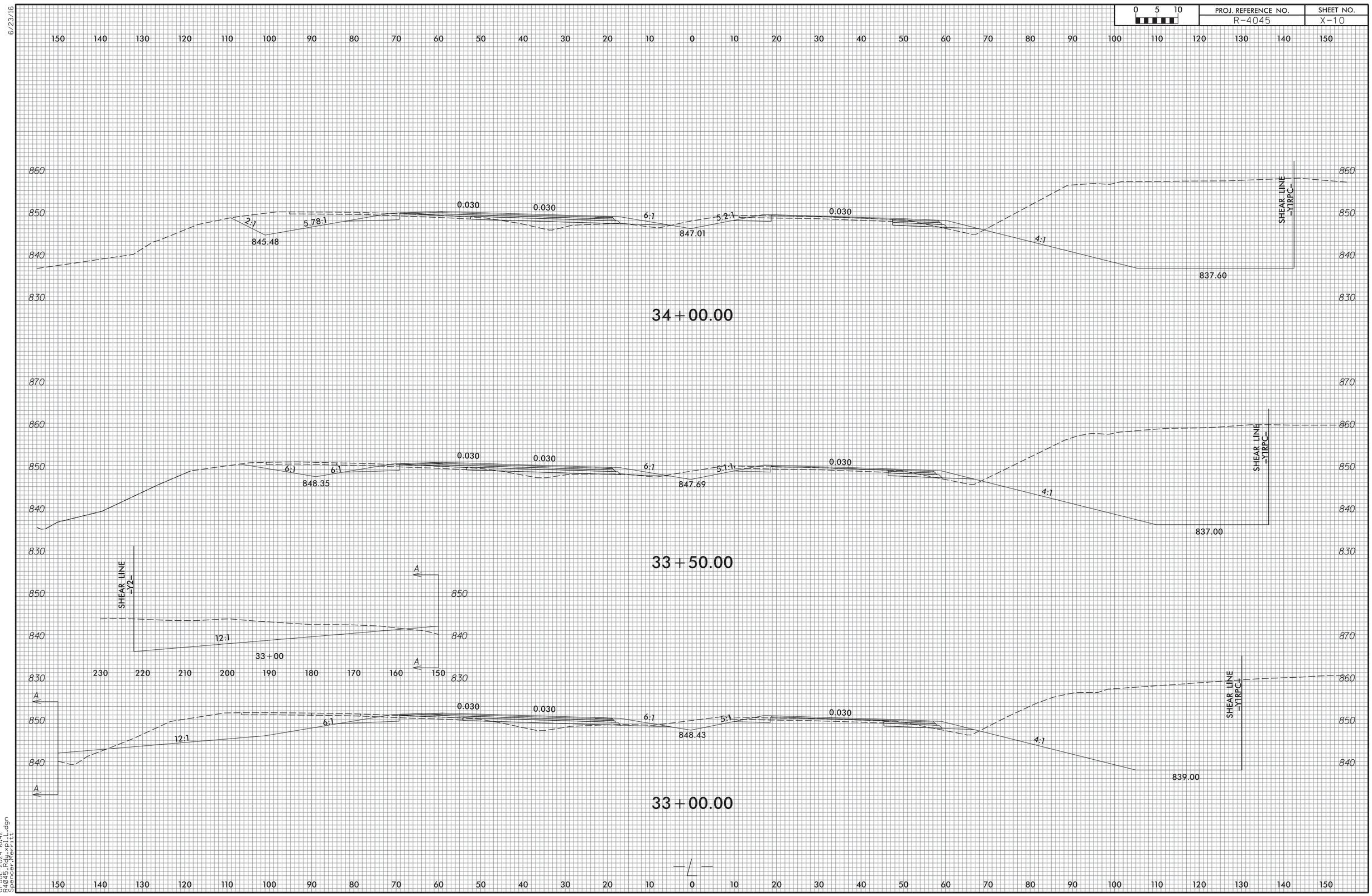
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-9



01-JUL-2024 16:42
R4045_Roll_X1.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-10



01-JUL-2024 16:42
R4045_R02_01.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-11

130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170

850 840 830

0.030 0.030 6:1 6:1 0.030 4:1 4:1 2:1

836.87 845.11 839.40

35+50.00

SHEAR LINE –YTRPC–

0.030 0.030 6:1 5.2:1 0.030 4:1 2:1 4:1

839.74 845.60 838.80

35+00.00

SHEAR LINE –YTRPC–

B B

850 840 830

4:1

838.50

34+50

170 180 190 200 210

860 850 840 830

0.030 0.030 6:1 5.2:1 0.030 4:1 2:1 4:1

842.61 846.30 838.20

34+50.00

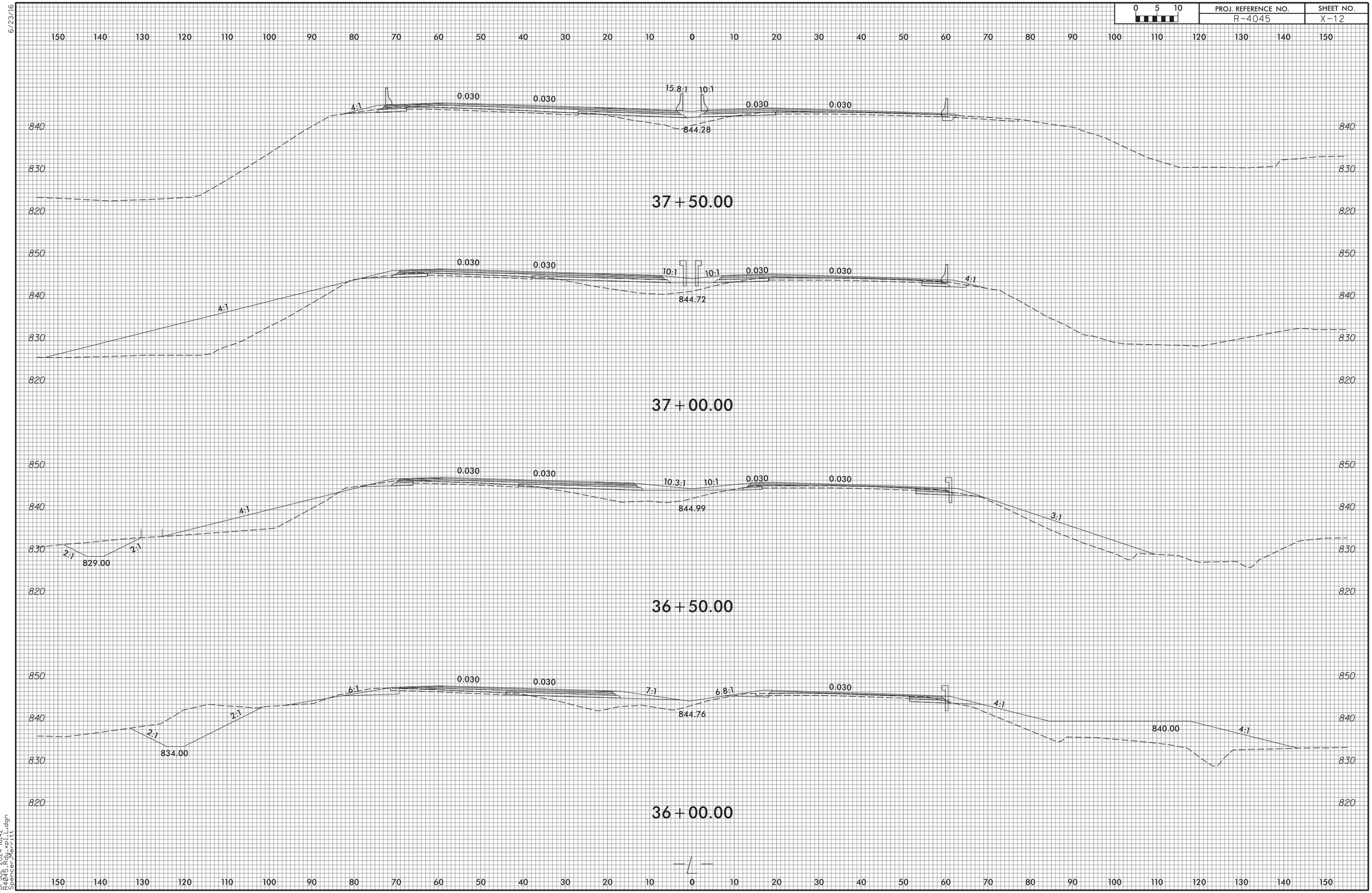
B B

130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170

01-JUL-2024 16:42
R4045_Roll.dgn
Spencer.Merritt

6/23/16

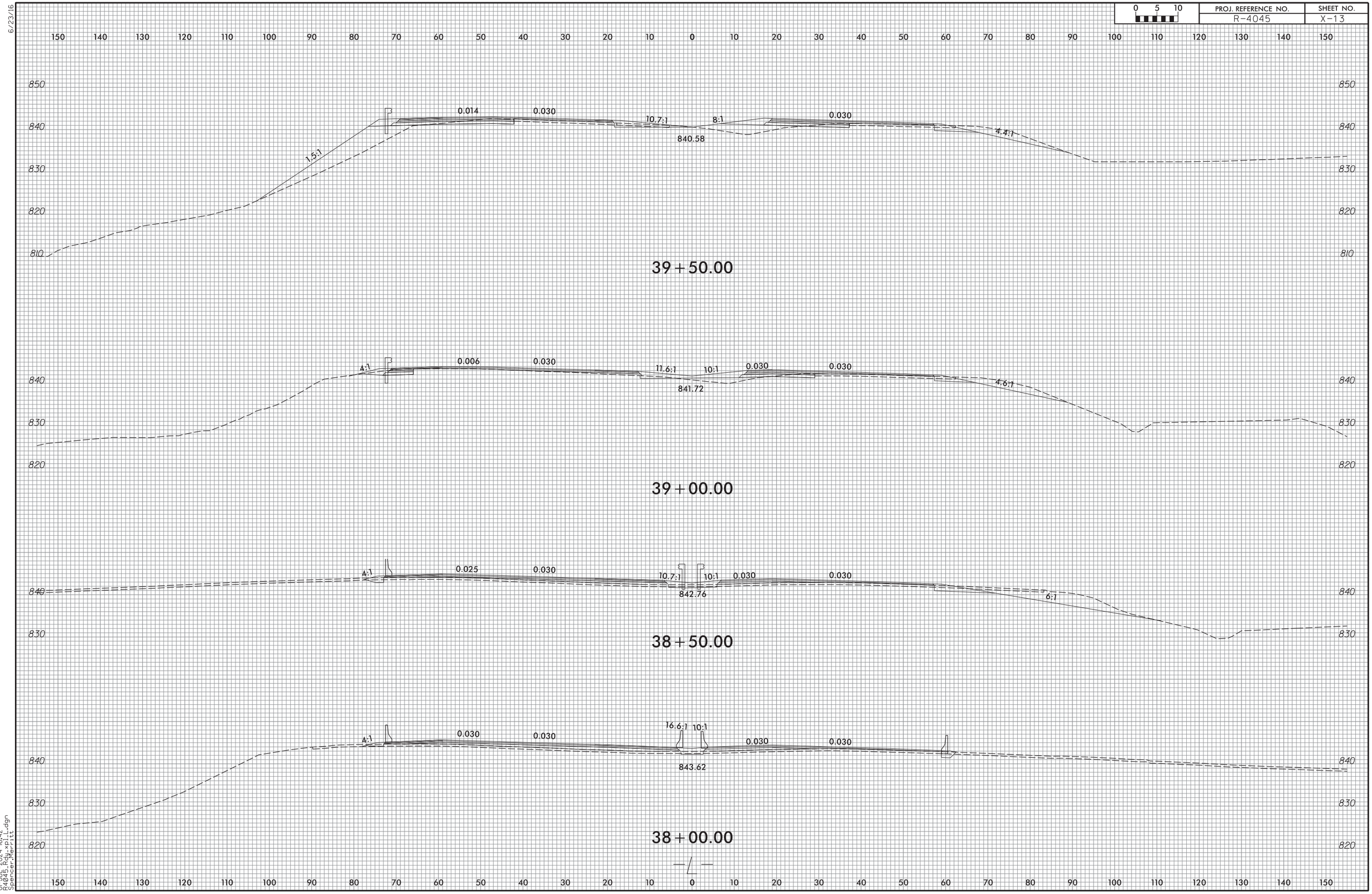
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-12



01-JUL-2024 16:42
R4045_ROW_X-SECT.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-13



01-JUL-2024 16:42
R-4045_RDX_XPLT.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-14

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

850 840 830 820 810

–Y1LPA–
11+40.21

0.029 0.030 6:1 5:1 0.030 6.4:1 2:1

1.5:1

836.85

831.81

41+00.00

850 840 830 820 810

–Y1LPA–
10+89.15

0.020 0.030 5.5:1 5:1 0.030 6.7:1 2:1

1.5:1

837.62

831.35

40+50.00

850 840 830 820 810

–Y1LPA–
10+38.71

0.018 0.030 8.3:1 6:1 0.030 5.3:1

1.5:1

839.30

40+00.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:42
R-4045_RDX_XPLT.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-15

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

860 850 840 830 820 810

SHEAR LINE
–YILPA–

6:1 0.025 5:4:1 4.5:1 0.025 5:2:1 2:1

834.71 832.74

42+00.00

860 850 840 830 820 810

–YILPA–
11+93.49

1.5:1 0.051 0.030 5:8:1 5:1 0.030 6:1 2:1

835.94 832.27

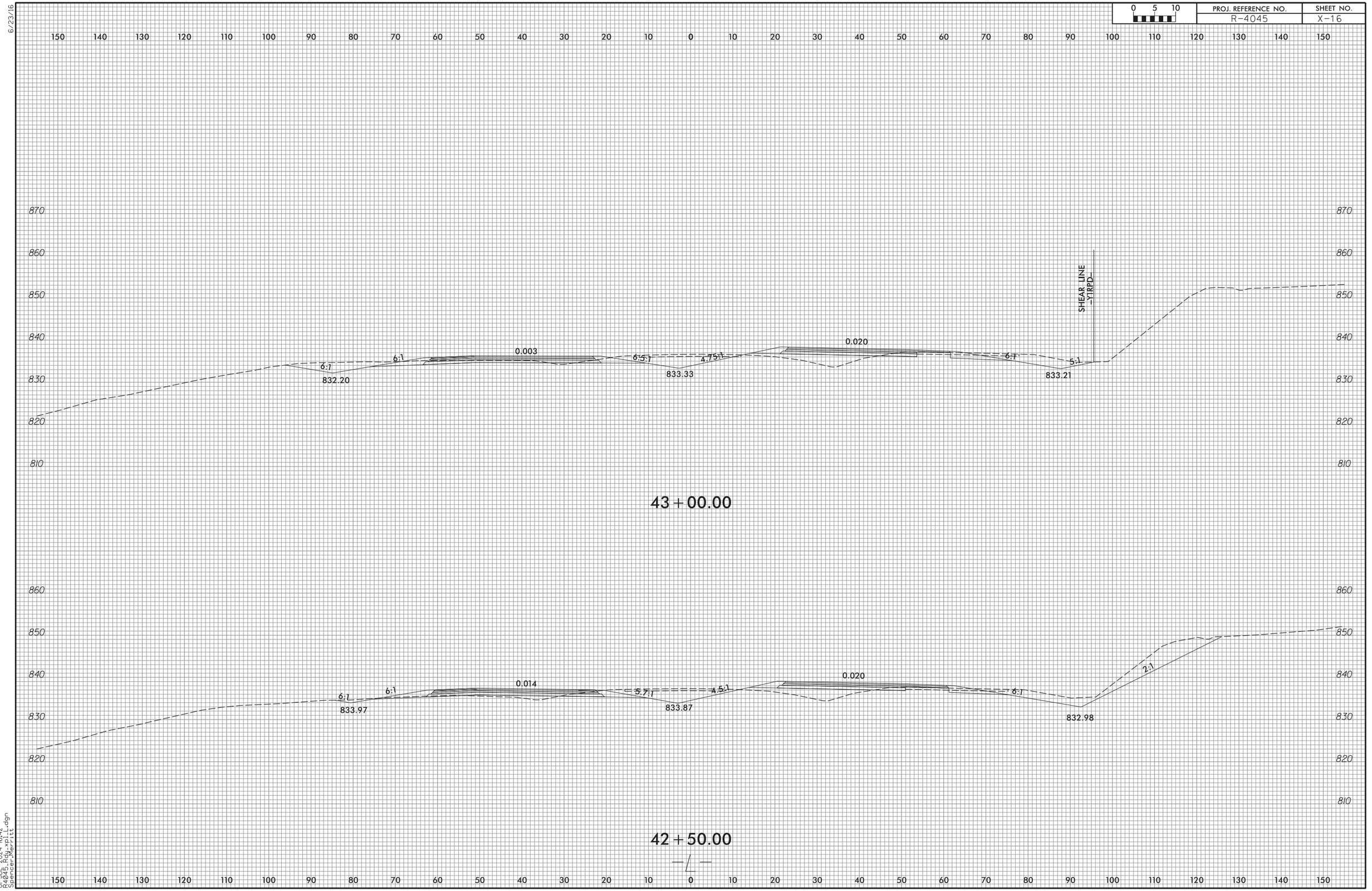
41+50.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:42
R4045_ROW_X-SECT.dgn
Spencer.Merritt

6/23/16

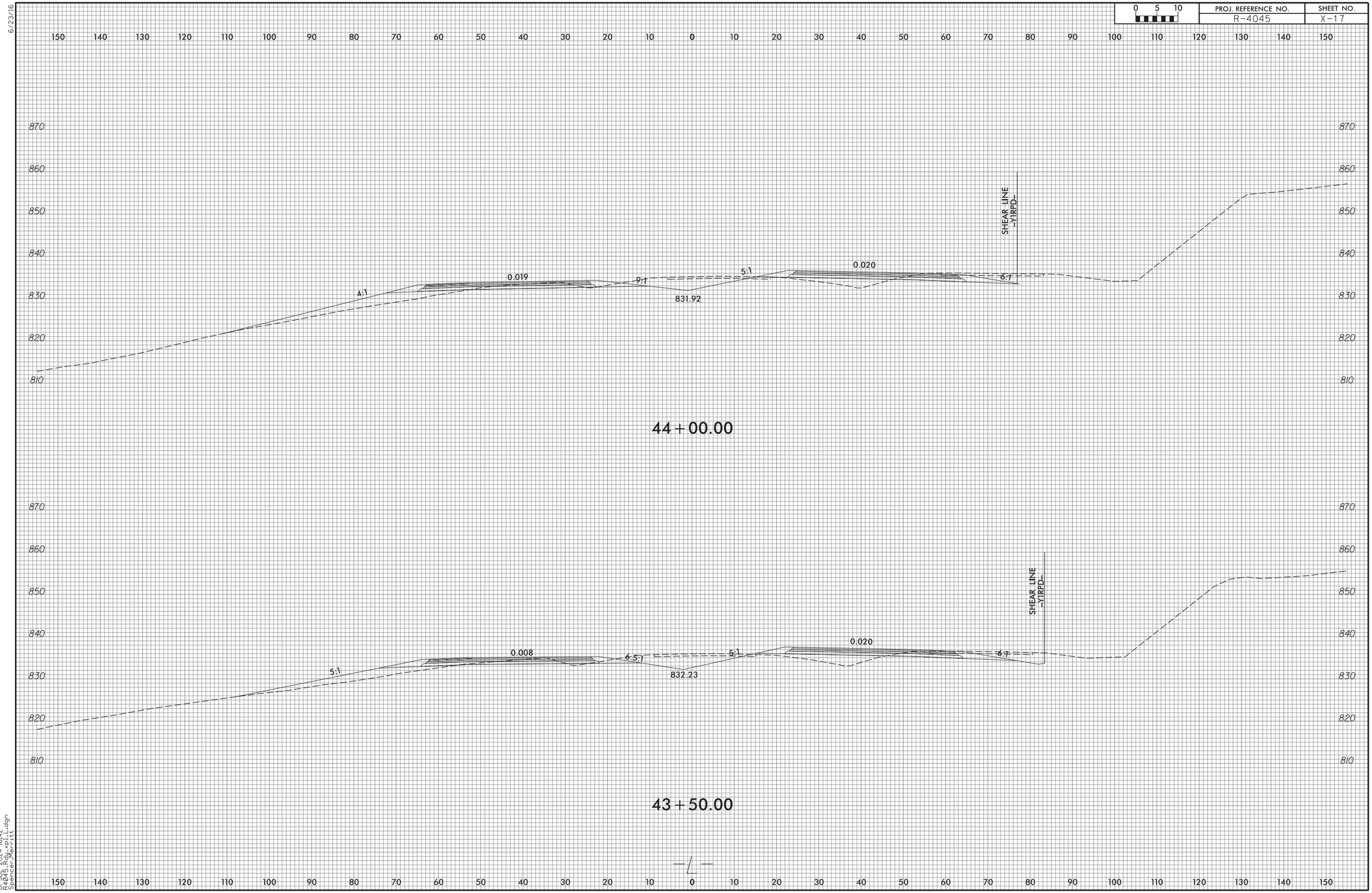
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-16



01-JUL-2024 16:42
R4045_ROW_X-SECT.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-17



01-JUL-2024 16:42
R4045_ROW_X-Y.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-18

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

870 860 850 840 830 820 810

SHEAR LINE
YTRPD

0.020
4:1
9:1
5:1
829.54
0.020
4:6:1
5:4:1
832.73

45+00.00

860 850 840 830 820 810

SHEAR LINE
YTRPD

0.020
4:1
9.3:1
5:1
830.82
0.020
4.7:1
5.6:1
832.67

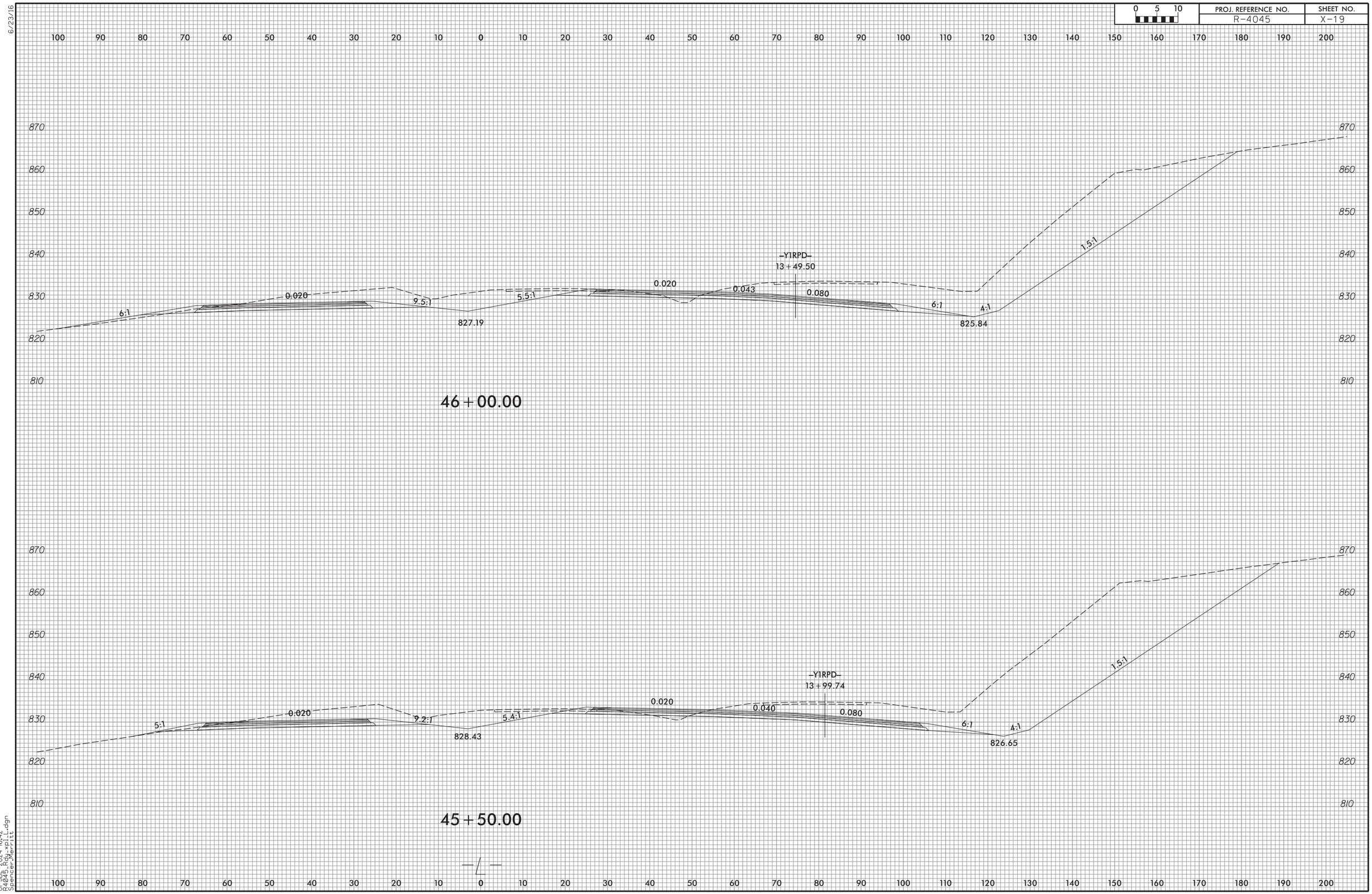
44+50.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:42
R4045_ROW_X-SECT.dgn
Spencer.Merritt

6/23/16

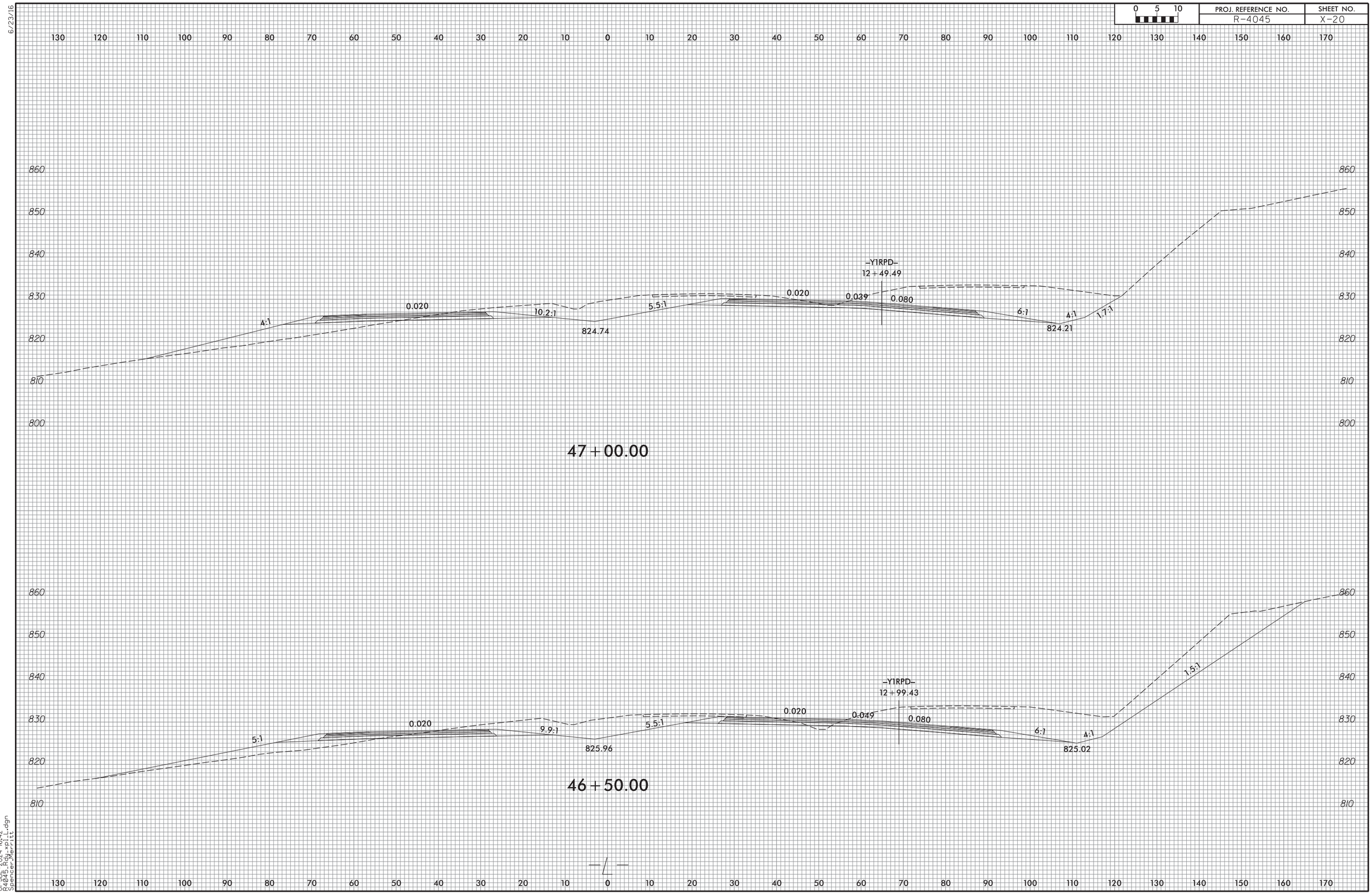
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-19



01-JUL-2024 16:42
R4045_ROW_X-Sect.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-20



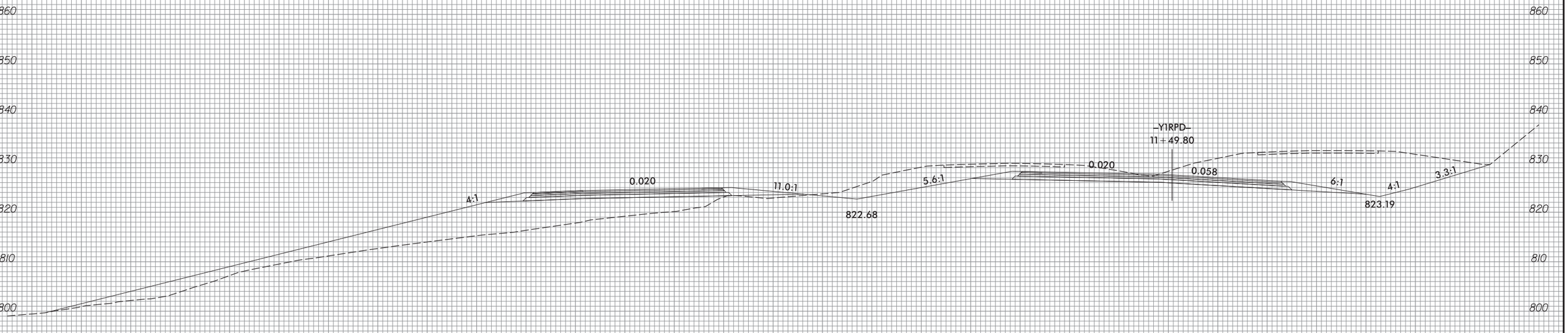
01-JUL-2024 16:42
R-4045_ROW_X-SECT.dgn
Spencer.Merritt

6/23/16

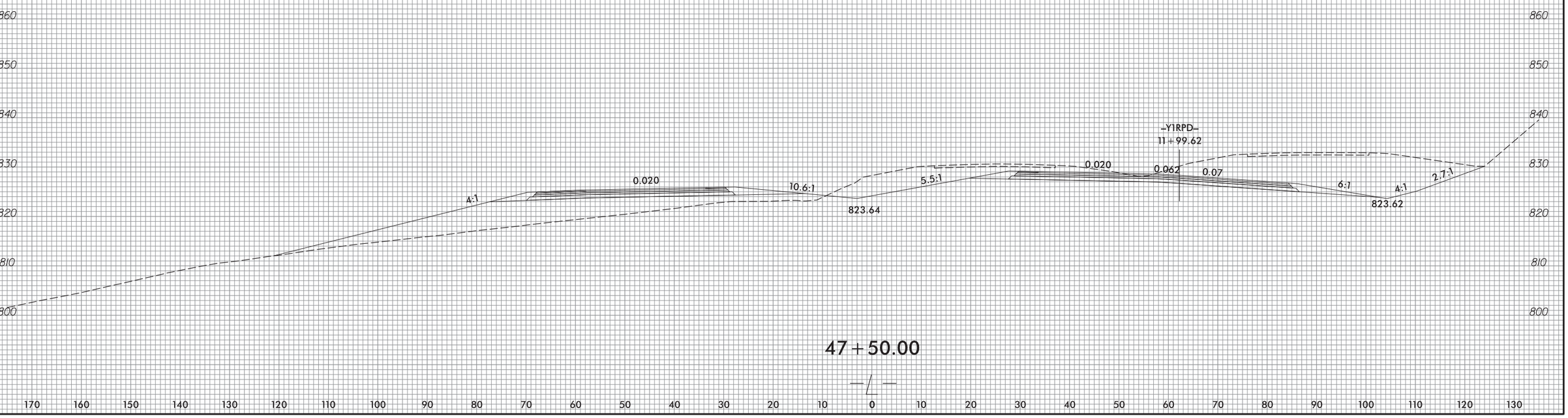
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-21

170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130

860 850 840 830 820 810 800



48+00.00



47+50.00

01-JUL-2024 16:42
R4045_ROW_X-21.dgn
Spencer.Merritt

170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-22

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

840 830 820 810 800

–Y1RPD–
10+00.40

0.020 0.020 0.020 6:1 6:1 4:1 4:1 11.8:1 6:1

820.59 821.76

49+50.00

840 830 820 810 800

–Y1RPD–
10+50.20

0.020 0.020 0.033 6:1 4:1 3.729:1 4:1 11.7:1 5.9:1

821.16 822.24

49+00.00

850 840 830 820 810 800

–Y1RPD–
11+00.00

0.020 0.020 0.045 6:1 4:1 3.5:1 4:1 11.4:1 5.7:1

821.85 822.75

48+50.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:42
R4045_R04_xplt.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-23

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

830
820
810
800

4:1 0.020 12:1 819.77 6:1 0.020 6:1 4:1 2:1 820.71

50+50.00

840
830
820
810
800

4:1 0.020 12:1 820.14 6:1 0.020 6:1 4:1 2:1 821.21

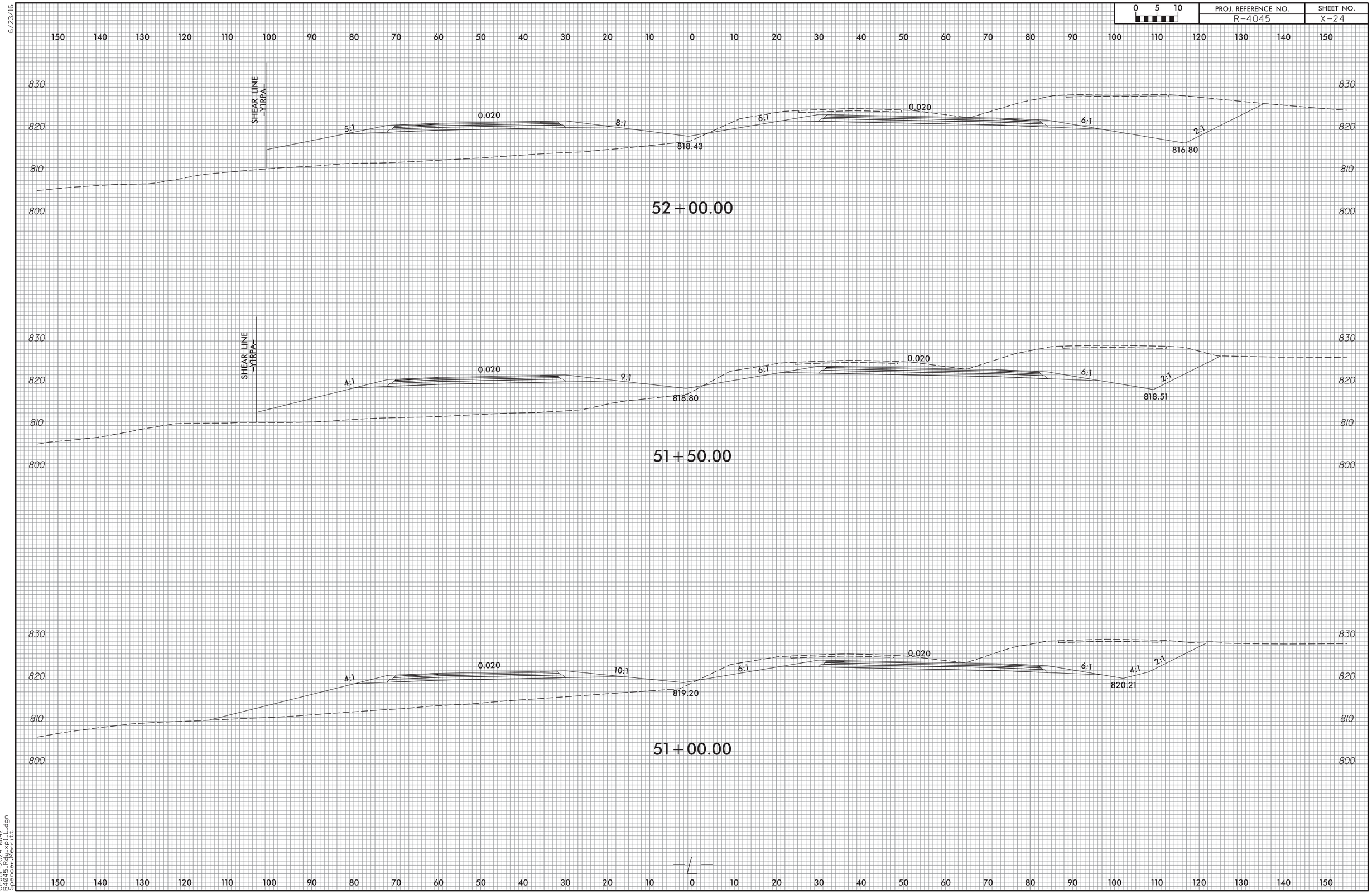
50+00.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:42
R-4045_RDX_XSL.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-24

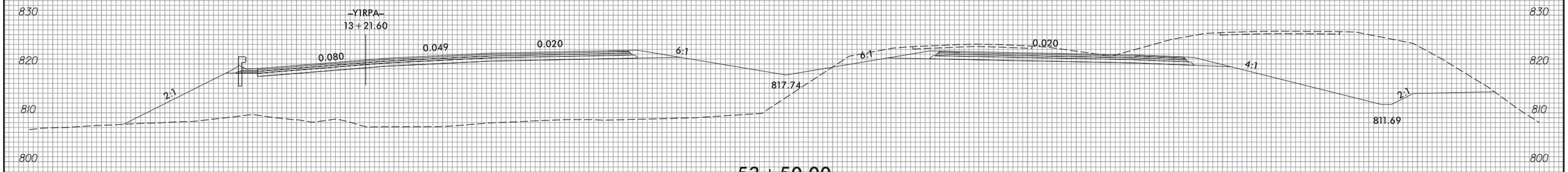


01-JUL-2024 16:42
R-4045_Roll_Plot.dgn
Spencer.Merritt

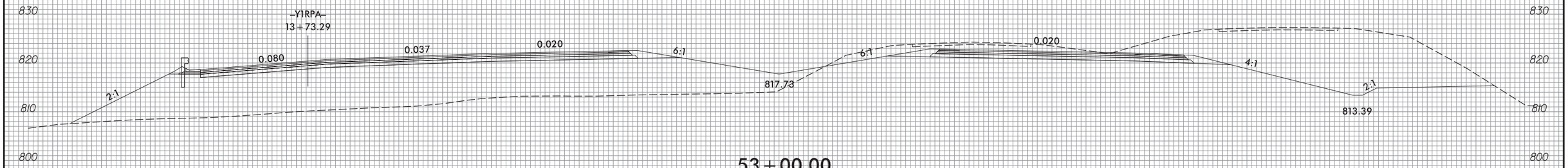
6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-25

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



53+50.00



53+00.00

52+50.00

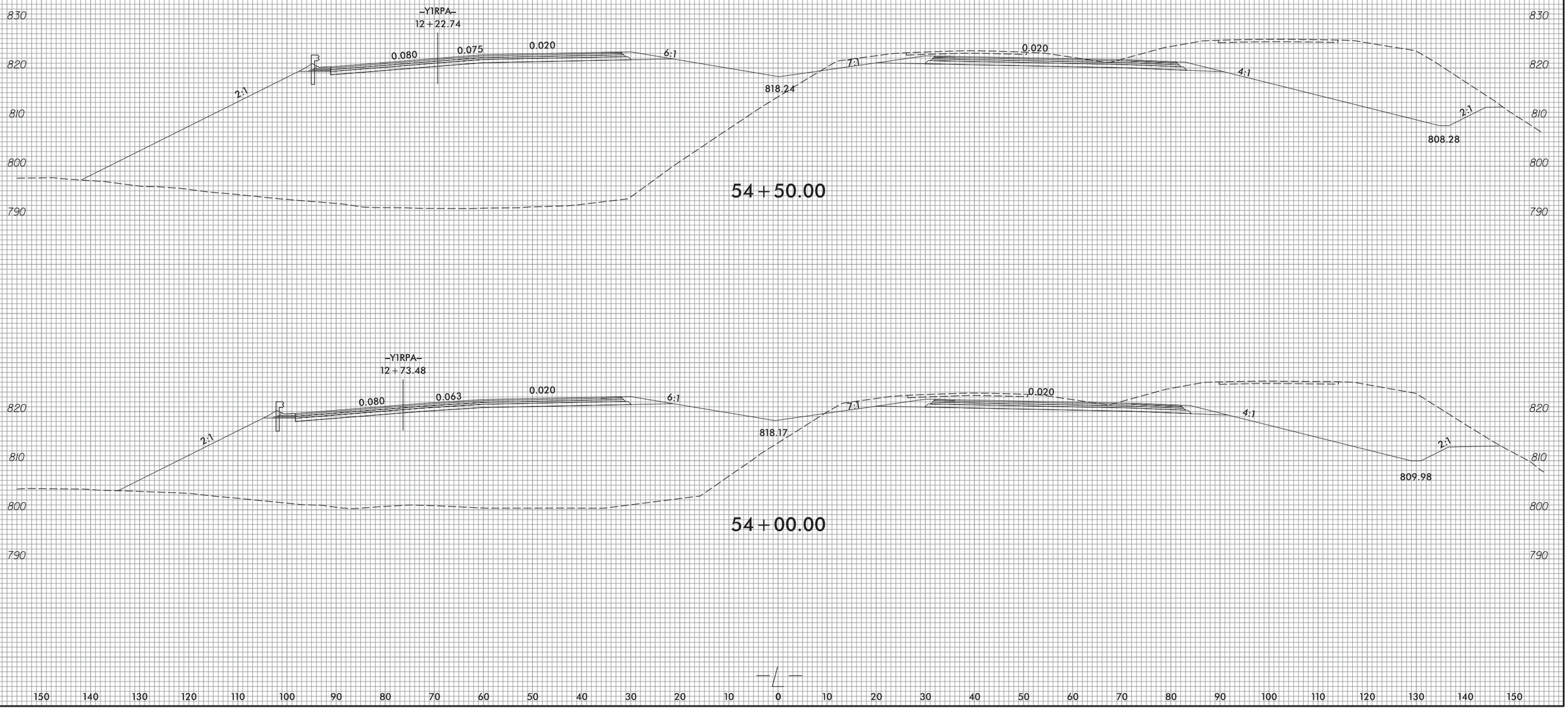
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:42
R-4045_Roll_
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-26

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

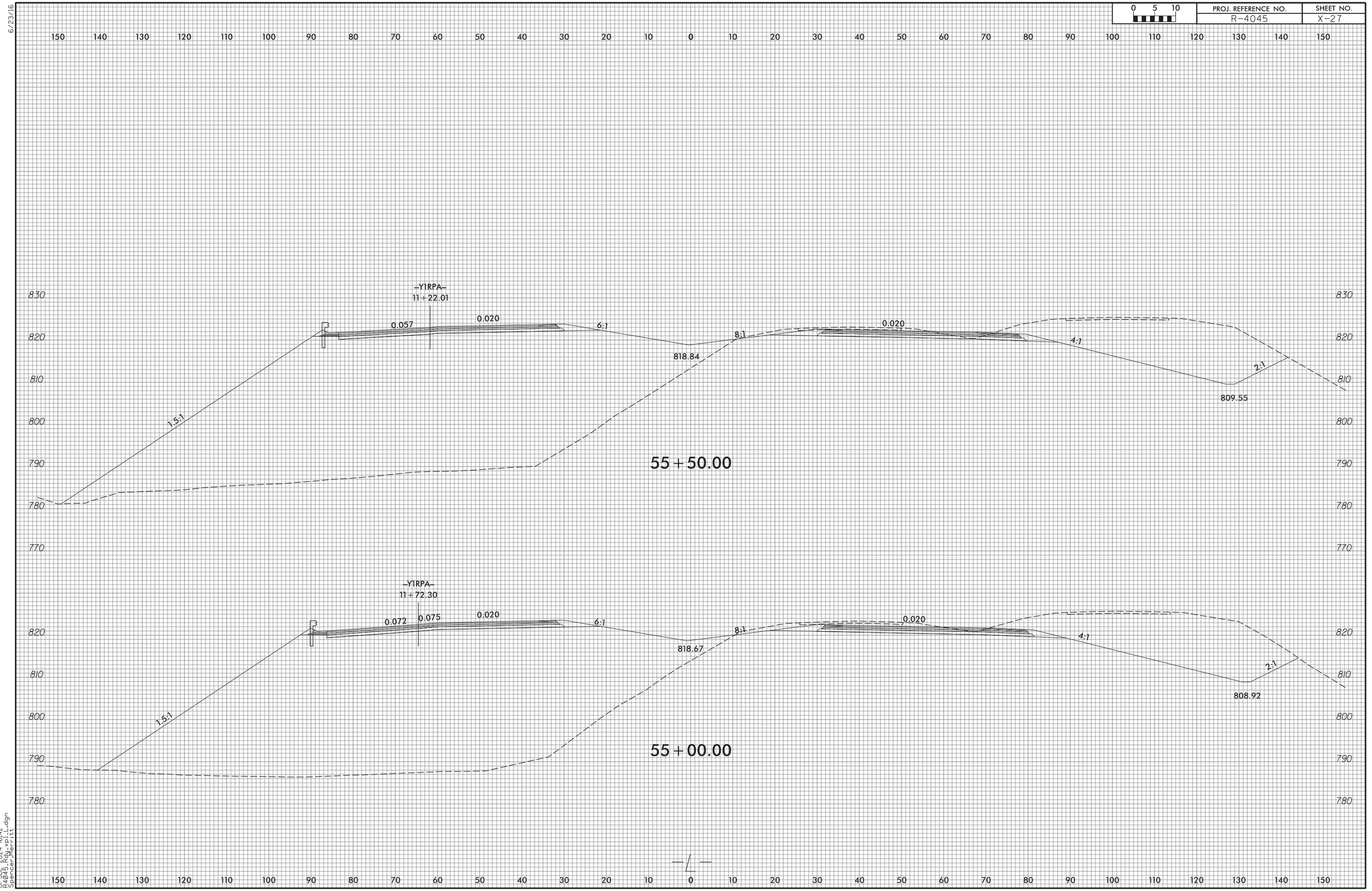


150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:42
R4045_ROW_XPLL.dgn
Spencer.Merritt

6/23/16

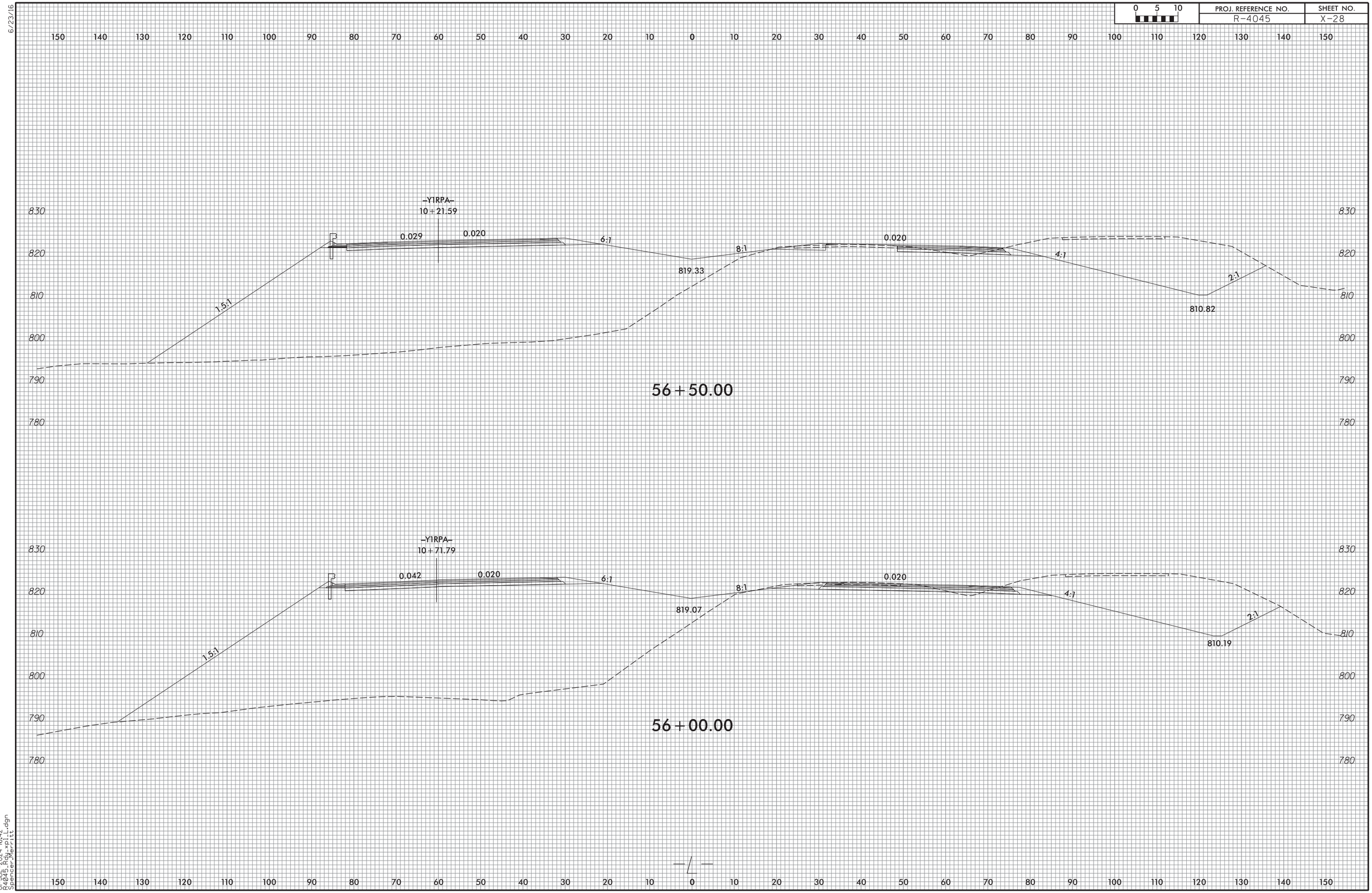
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-27



01-JUL-2024 16:42
R4045_ROW_X-Y_L
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-28



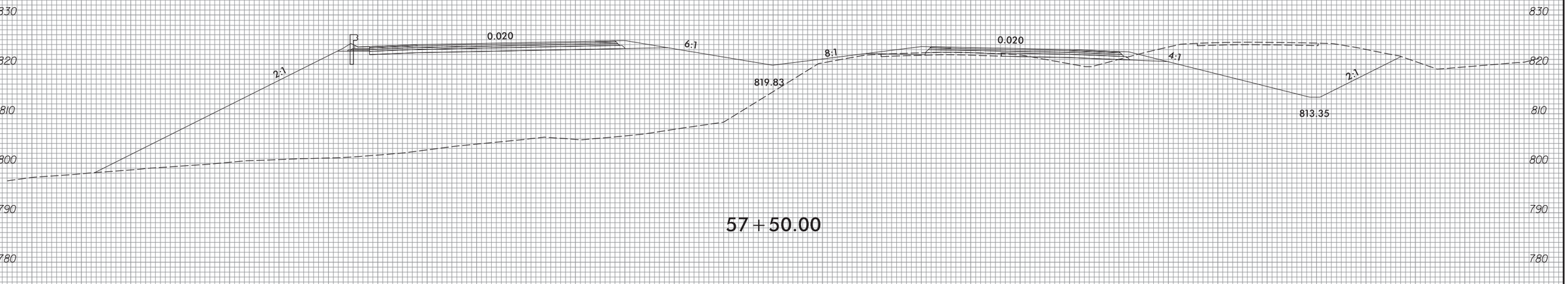
01-JUL-2024 16:42
R4045_E01_X-Sheets.dgn
Spencer.Merritt

6/23/16

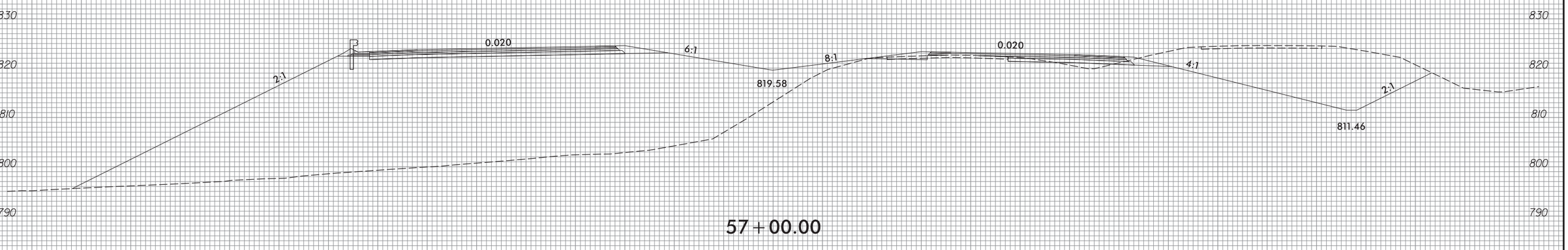
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-29

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

830 820 810 800 790 780



57+50.00



57+00.00

01-JUL-2024 16:42
R4045_ROW_XL.dgn
Spencer.Merritt

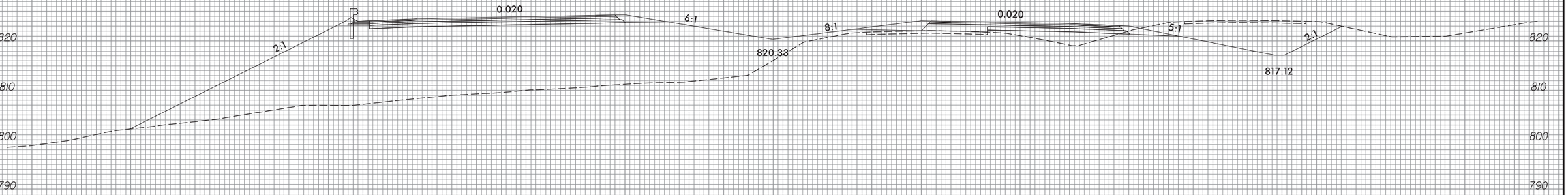
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

6/23/16

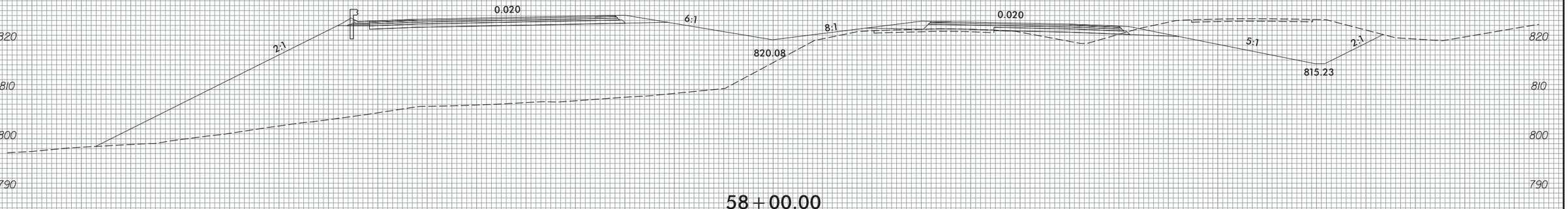
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-30

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

830 820 810 800 790



58+50.00



58+00.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

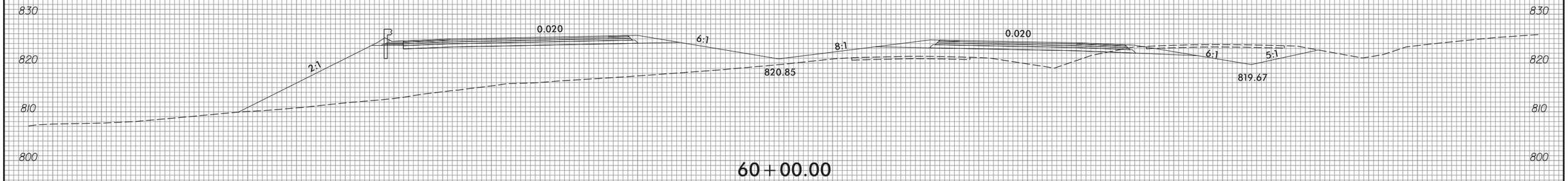
830 820 810 800 790

01-JUL-2024 16:42
R4045_ROW_X-SECT.dgn
Spencer.Merritt

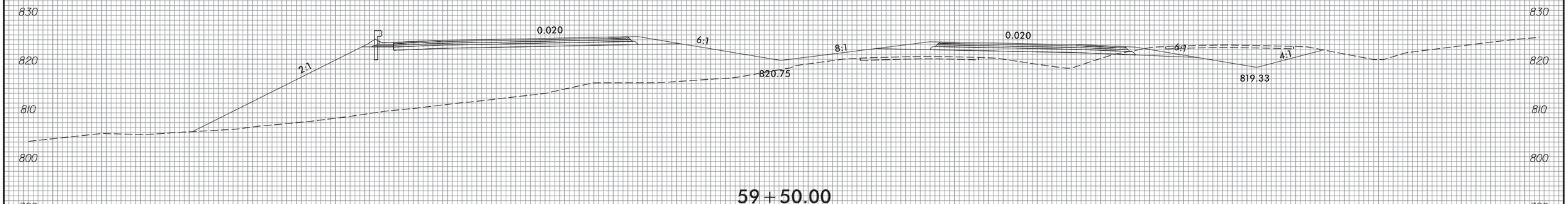
6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-31

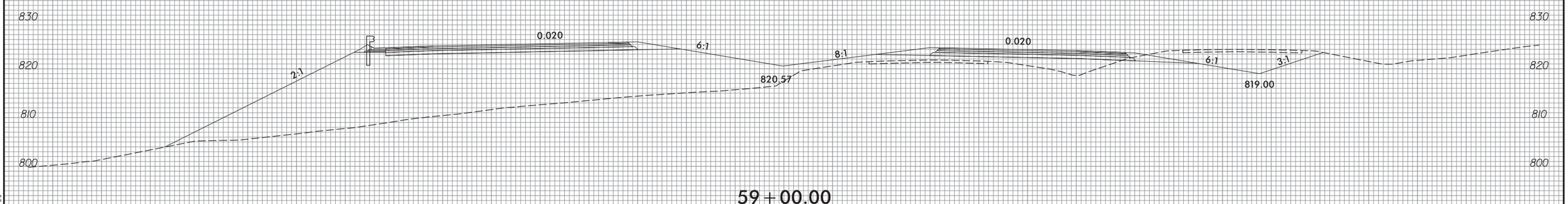
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



60+00.00



59+50.00



59+00.00

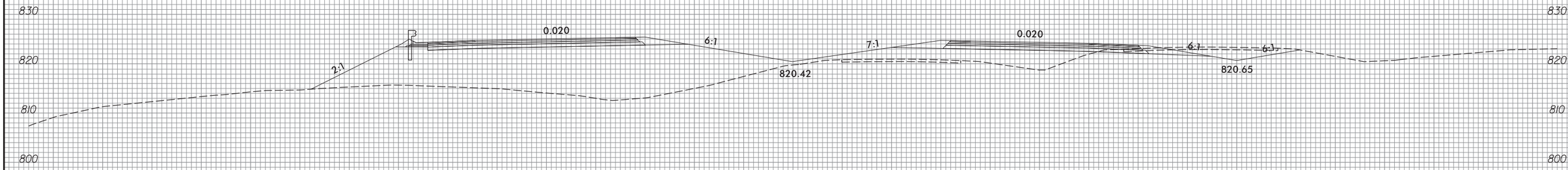
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:42
R-4045_ROW_X-SECT.dgn
Spencer.Merritt

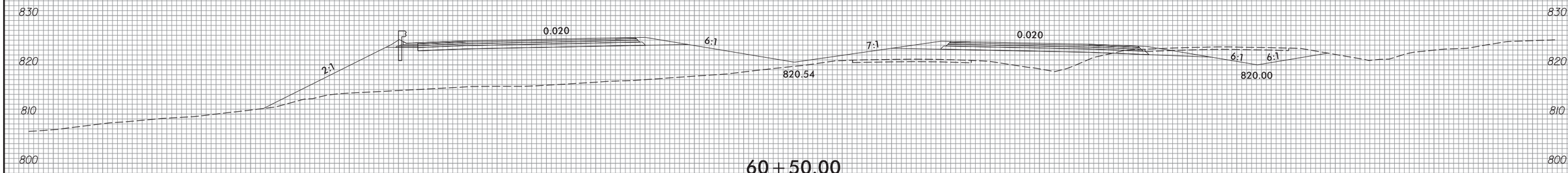
6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-32

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



61+00.00



60+50.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

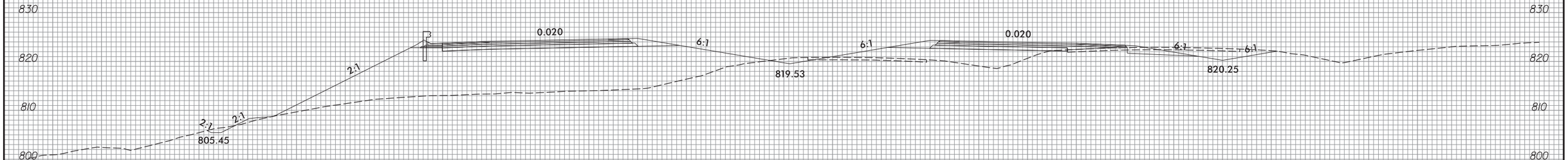
01-JUL-2024 16:42
R4045_E04_xrail.dgn
Spencer.Merritt

6/23/16

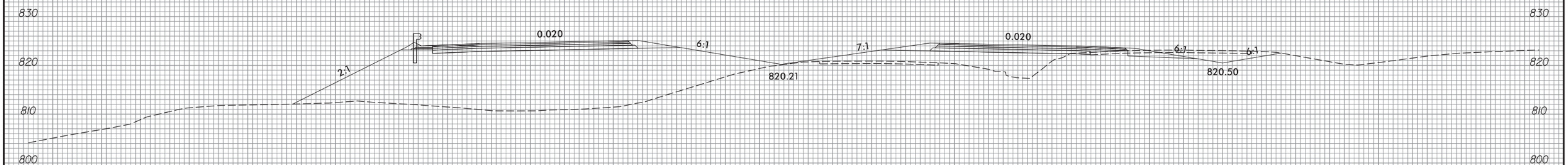
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-33

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

830
820
810
800
790



62+00.00



61+50.00

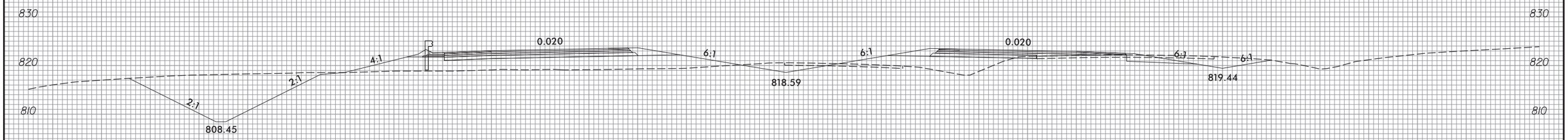
01-JUL-2024 16:42
R4045_ROW_X-33.dgn
Spencer.Merritt

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

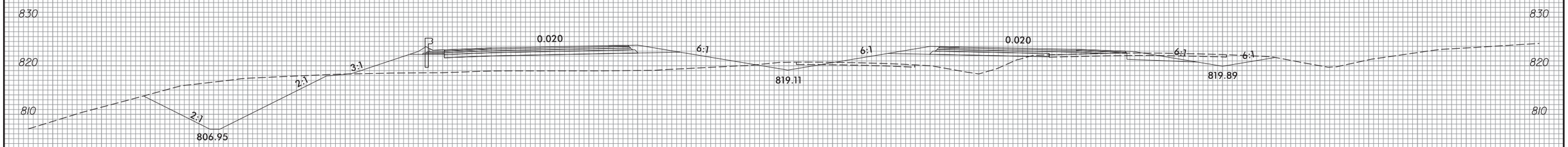
6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-34

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



63+00.00



62+50.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:42
R4045_ROW_X_L.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-35

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

830 820 810 800

6:1 6:1 816.63 0.020 6:1 816.43 6:1 0.020 6:1 6:1 817.48

64+50.00

830 820 810

3:1 5:1 817.36 0.020 6:1 817.25 6:1 0.020 6:1 6:1 818.23

64+00.00

830 820 810 800

2:1 2:1 809.95 4:1 0.020 6:1 817.97 6:1 0.020 6:1 6:1 818.89

63+50.00

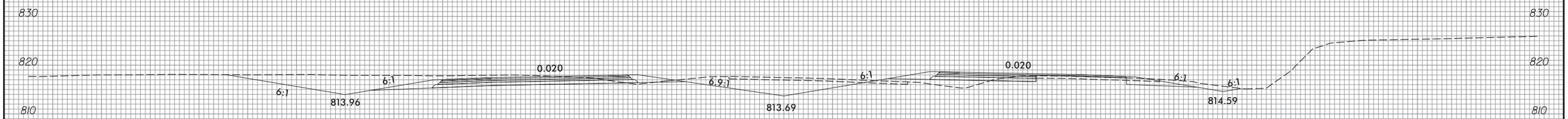
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:42
R4045_RDX_XSL.dgn
Spencer.Merritt

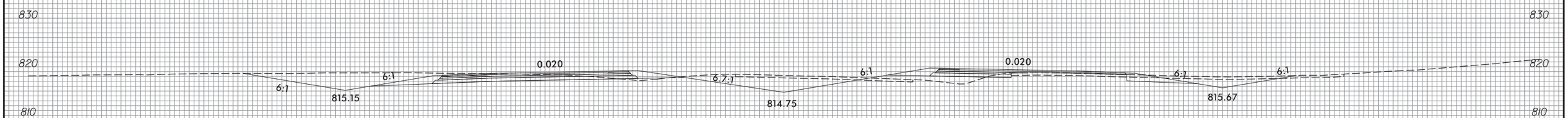
6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-36

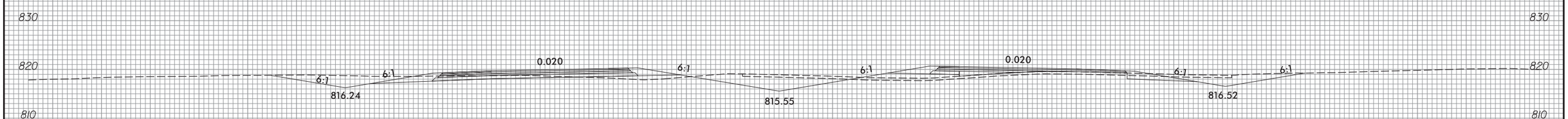
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



66+00.00



65+50.00



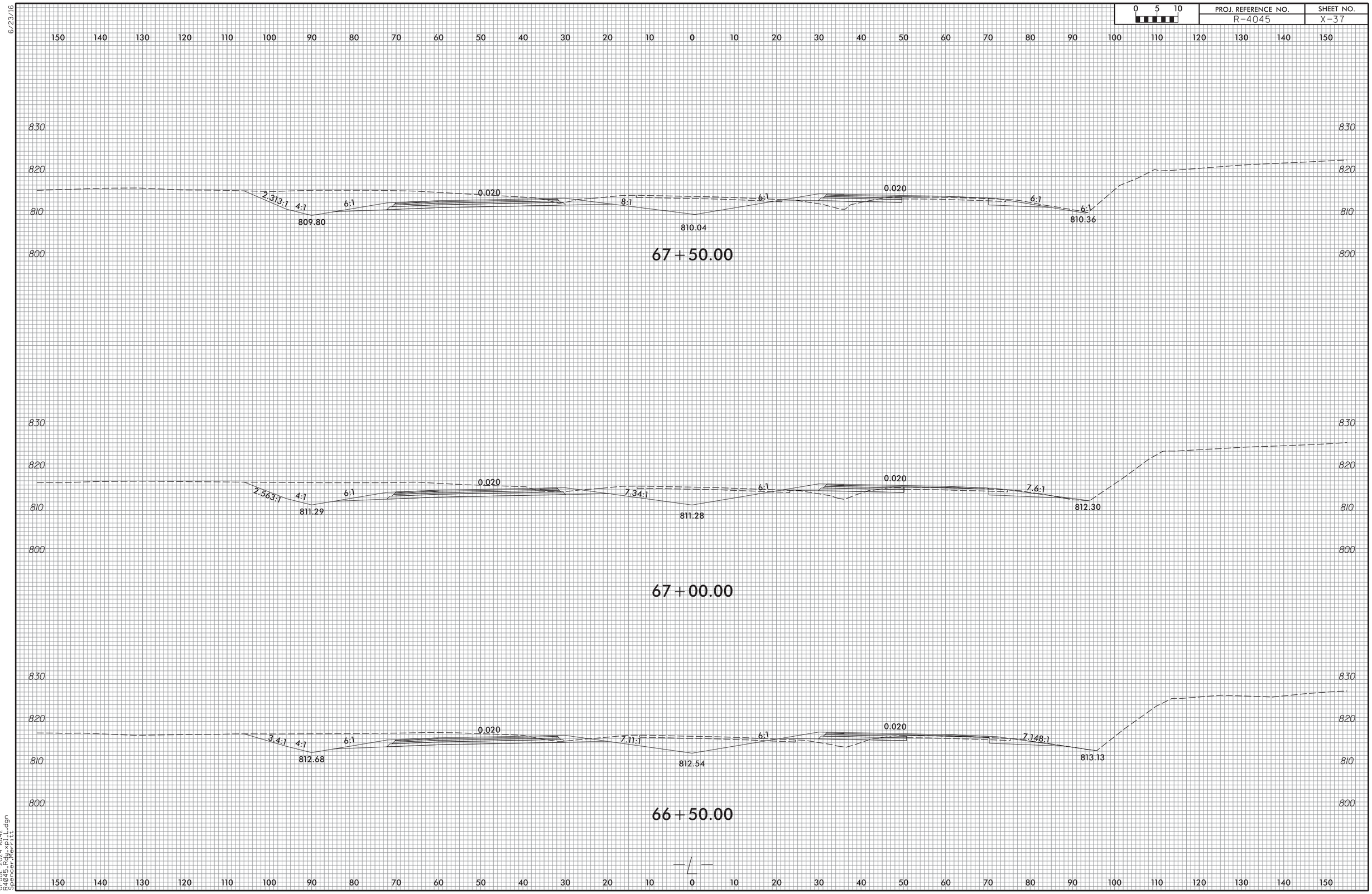
65+00.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:42
R4045_ROW_X-SECT.dgn
Spencer.Merritt

6/23/16

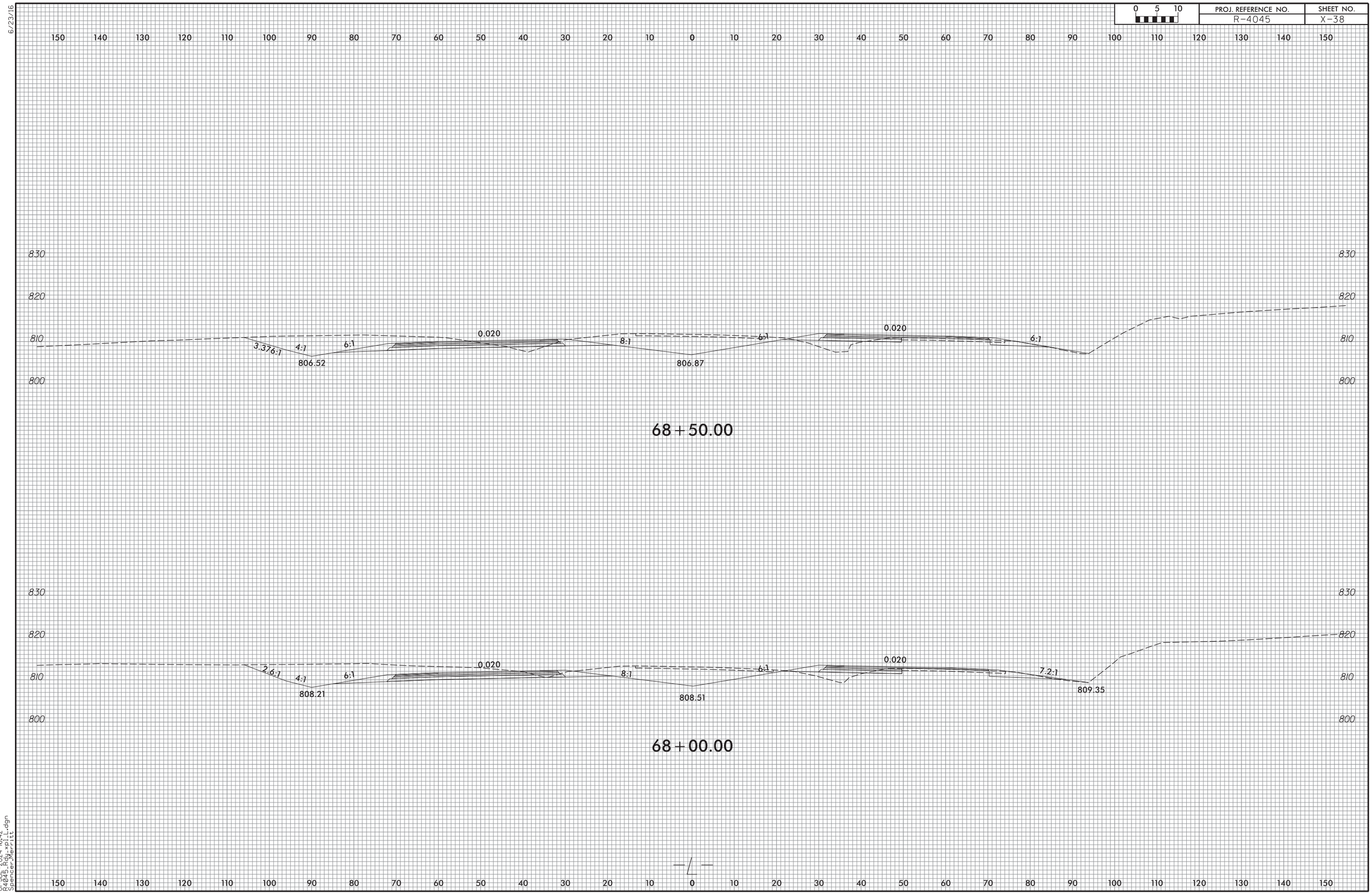
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-37



01-JUL-2024 16:42
R4045_E02_P01.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-38



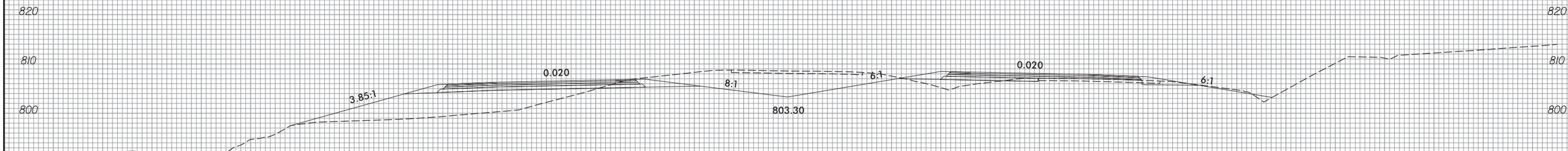
01-JUL-2024 16:42
R4045_E01_xL.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-39

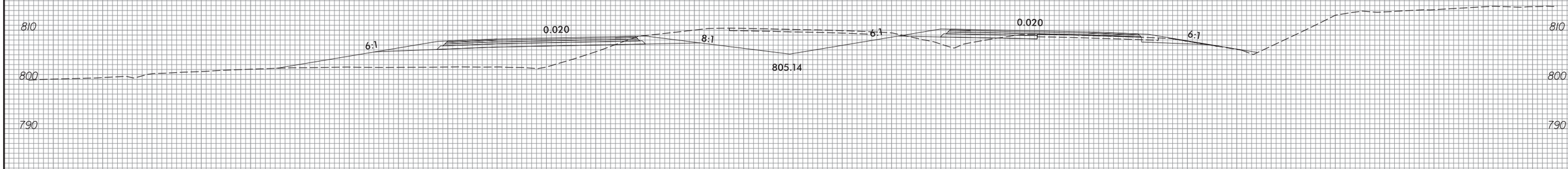
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

820
810
800
790
780



69+50.00

820
810
800
790
780



69+00.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

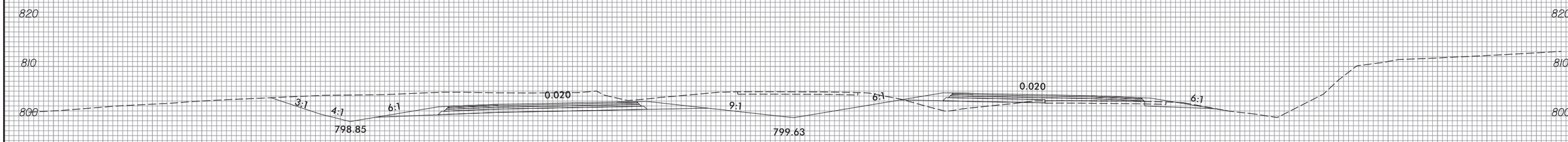
01-JUL-2024 16:42
R4045_ROW_XL.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-40

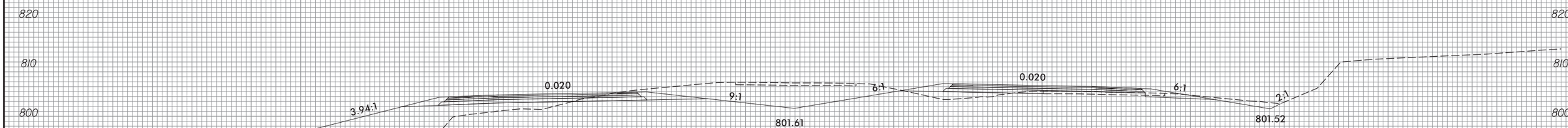
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

820
810
800
790



70+50.00

820
810
800
790



70+00.00

780

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

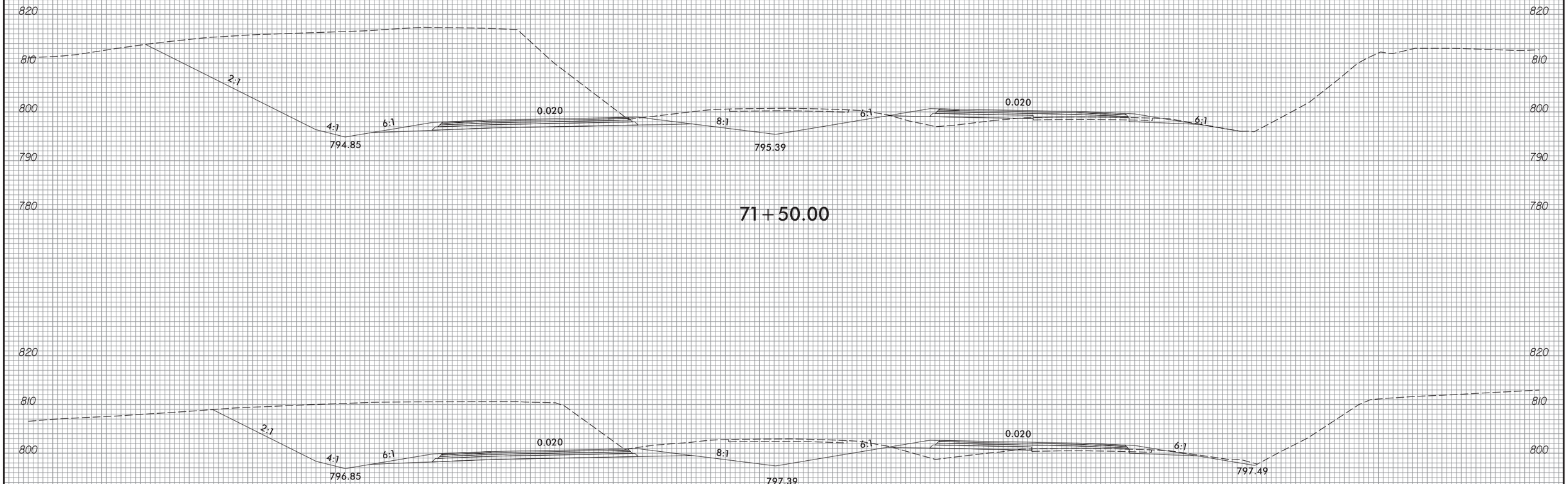
01-JUL-2024 16:43
R4045_ROW_X-Sec.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-41

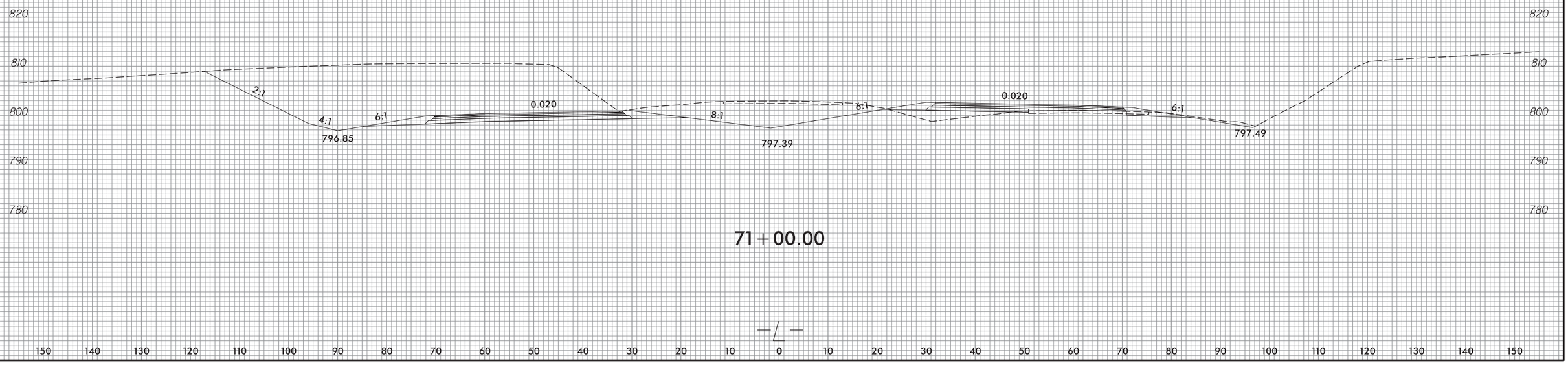
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

820
810
800
790
780



71+50.00

820
810
800
790
780



71+00.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R4045_ROW_X-41.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-42

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

820 810 800 790 780

2:1 4:1 6:1 0.020 8:1 6:1 0.020 6:1

788.94 789.49

73+00.00

820 810 800 790 780

2:1 4:1 6:1 0.020 8:1 6:1 0.020 6:1

790.85 791.40

72+50.00

820 810 800 790 780

2:1 4:1 6:1 0.020 8:1 6:1 0.020 6:29:1

792.85 793.39

72+00.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_Roll_X.dgn
Spencer.Merritt

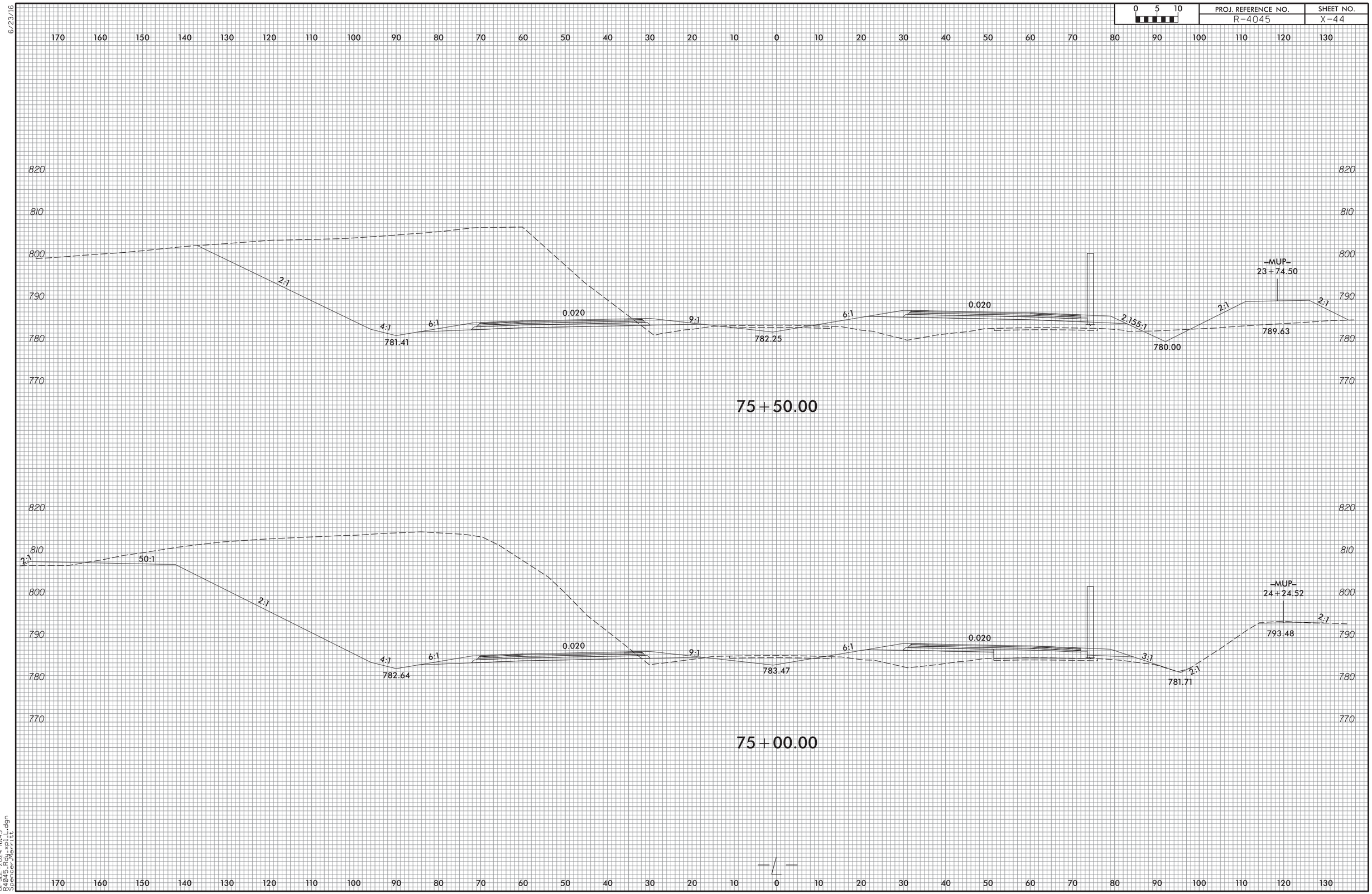
6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-43

01-JUL-2024 16:43
R4045_R021_X41.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-44



01-JUL-2024 16:43
R4045_ROW_X_11.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-45

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

810 800 790 780 770

2:1 4:1 6:1 0.020 9:1 6:1 0.020 3:1 2:1 2:1

779.36 780.23 776.57 782.66

–MUP–
22+74.43

76+50.00

810 800 790 780 770 760

2:1 4:1 6:1 0.020 9:1 6:1 0.020 2.5:1 2:1 2:1 2:1

780.32 781.17 778.28 785.78

–MUP–
23+24.44

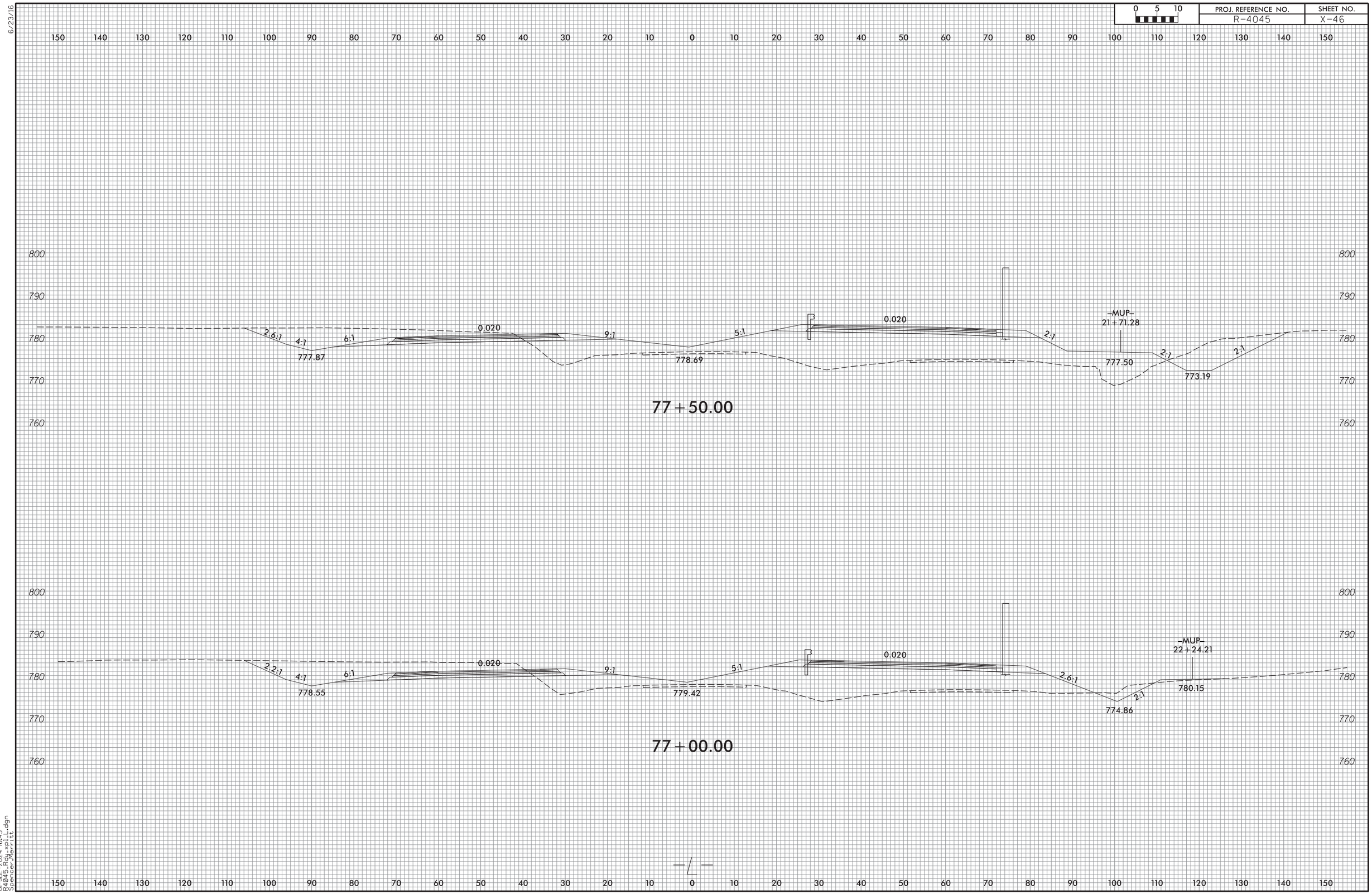
76+00.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R4045_ROW_X-SECT_1.dgn
Spencer.Merritt

6/23/16

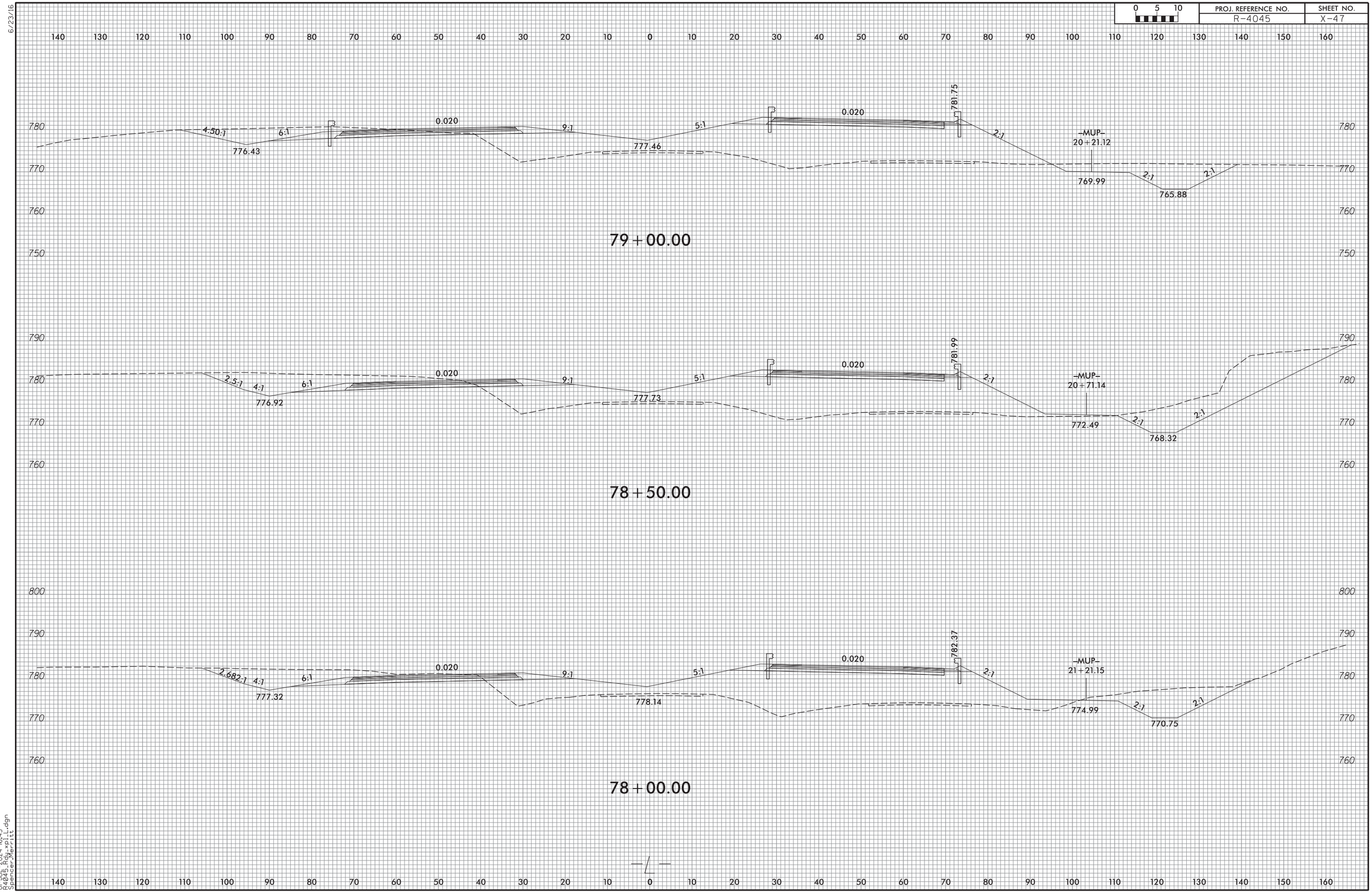
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-46



01-JUL-2024 16:43
R4045_ROW_X_11.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-47



01-JUL-2024 16:43
R4045_ROW_X.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-48

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160

780 770 760 750

0.020

0.020

760.75

2:1

2:1

2:1

80+50.00

779.53

0.020

10:1

5.169:1

777.60

781.64

0.020

2:1

2:1

–MUP–
19+20.05

764.94

761.00

2:1

2:1

80+00.00

779.52

0.020

9:1

5:1

777.32

781.65

0.020

2:1

2:1

–MUP–
19+70.85

767.48

763.44

2:1

2:1

79+50.00

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160

01-JUL-2024 16:43
R-4045_Roll_x-sht.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-49

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

780
770
760
750

0.020

0.020

82+00.00

780
770

0.020

0.020

760
750
740

81+50.00

780
770
760

0.020

0.020

750

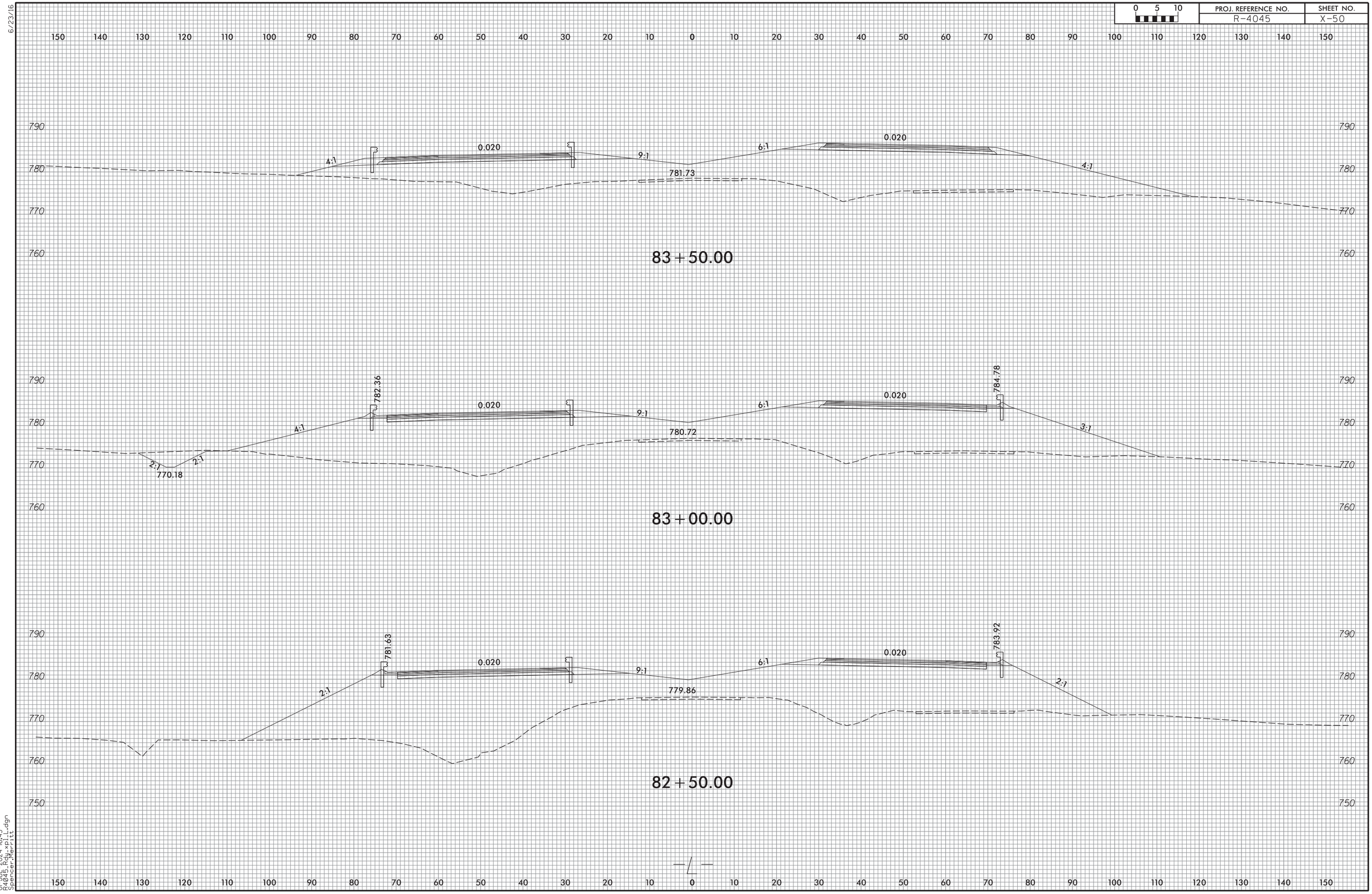
81+00.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R4045_ROW_X-Sect.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-50



01-JUL-2024 16:43
R-4045_Roadway_XPLT.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-51

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

790
780
770
760

2:1 4:1 6:1 0.020 9:1 6:1 0.020 4:1

783.92 785.57

85+00.00

790
780
770
760

2:1 4:1 6:1 0.020 9:1 6:1 0.020 4:1

782.55 784.15

84+50.00

790
780
770
760

3.27:1 4:1 6:1 0.020 9:1 6:1 0.020 4:1

781.31 782.87

84+00.00

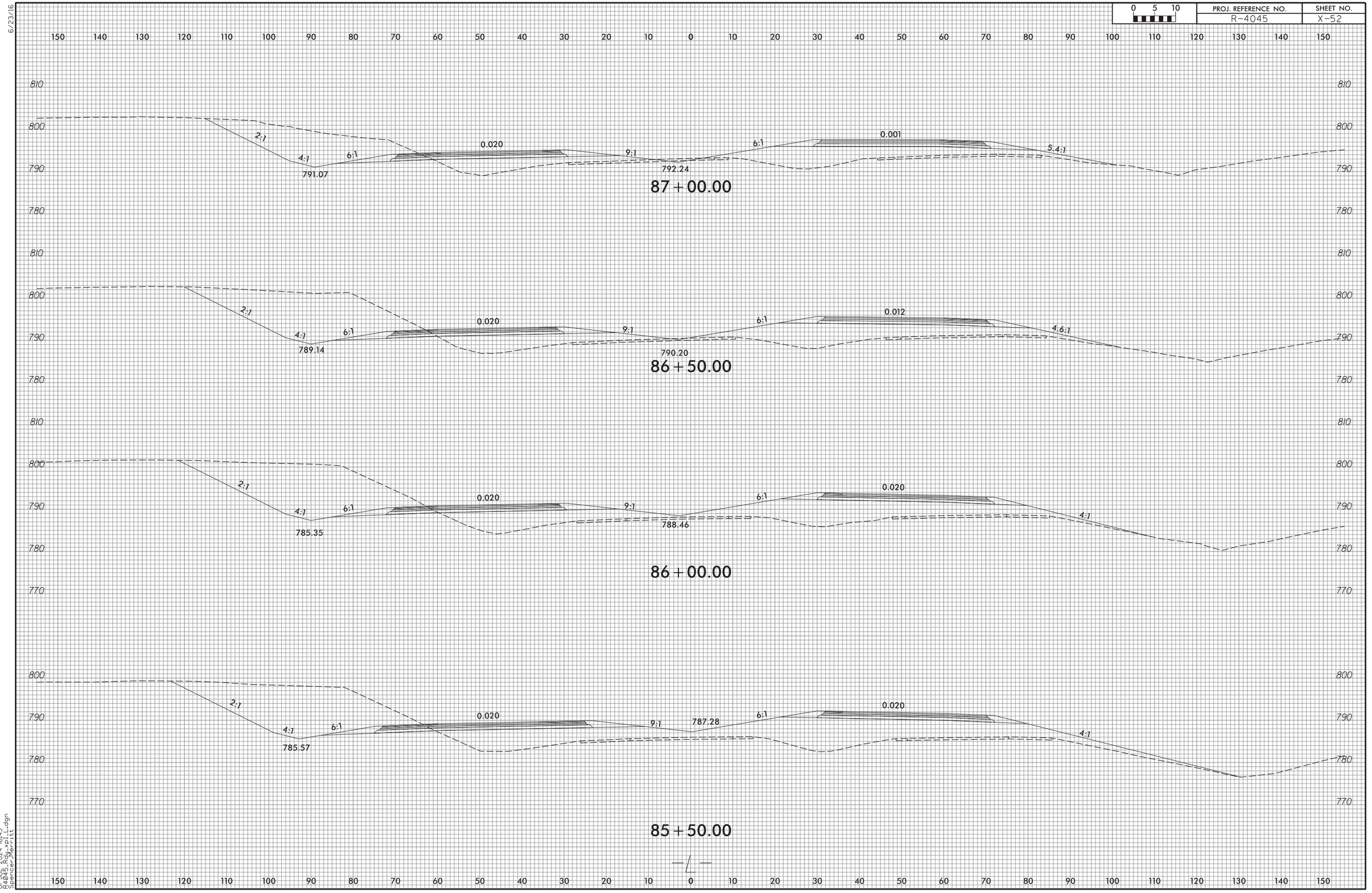
790
780
770
760

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R4045_ROW_X-51.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-52

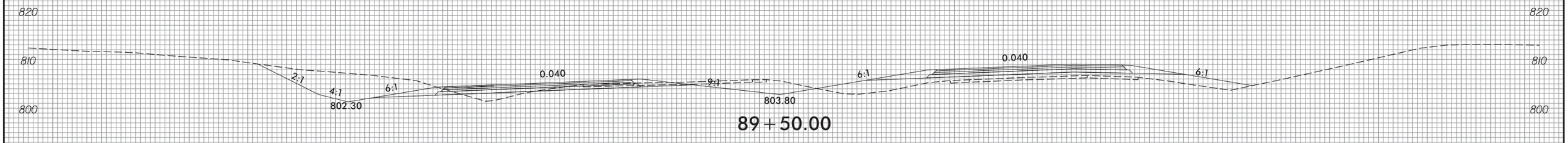


01-JUL-2024 16:43
R4045_ROW_X-Sect.dgn
Spencer.Merritt

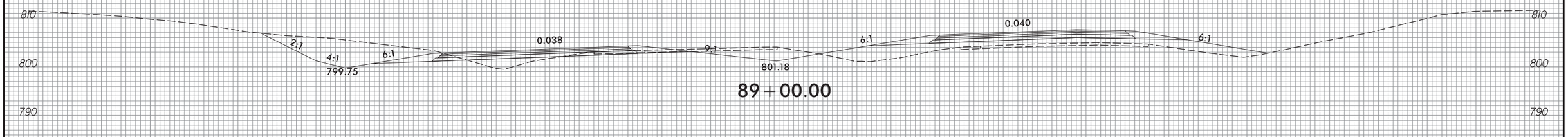
6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-53

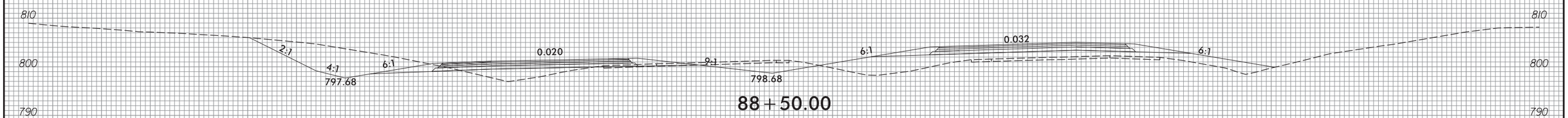
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



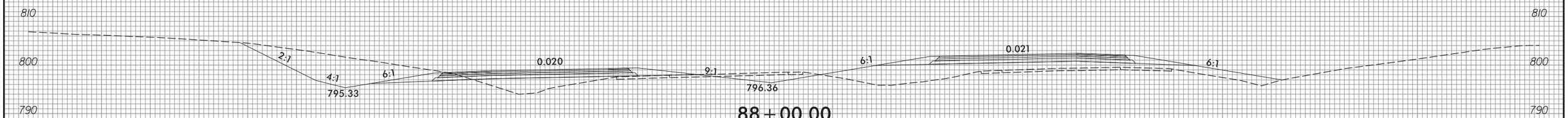
89+50.00



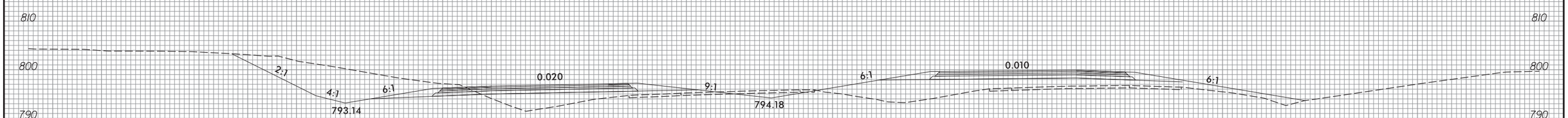
89+00.00



88+50.00



88+00.00



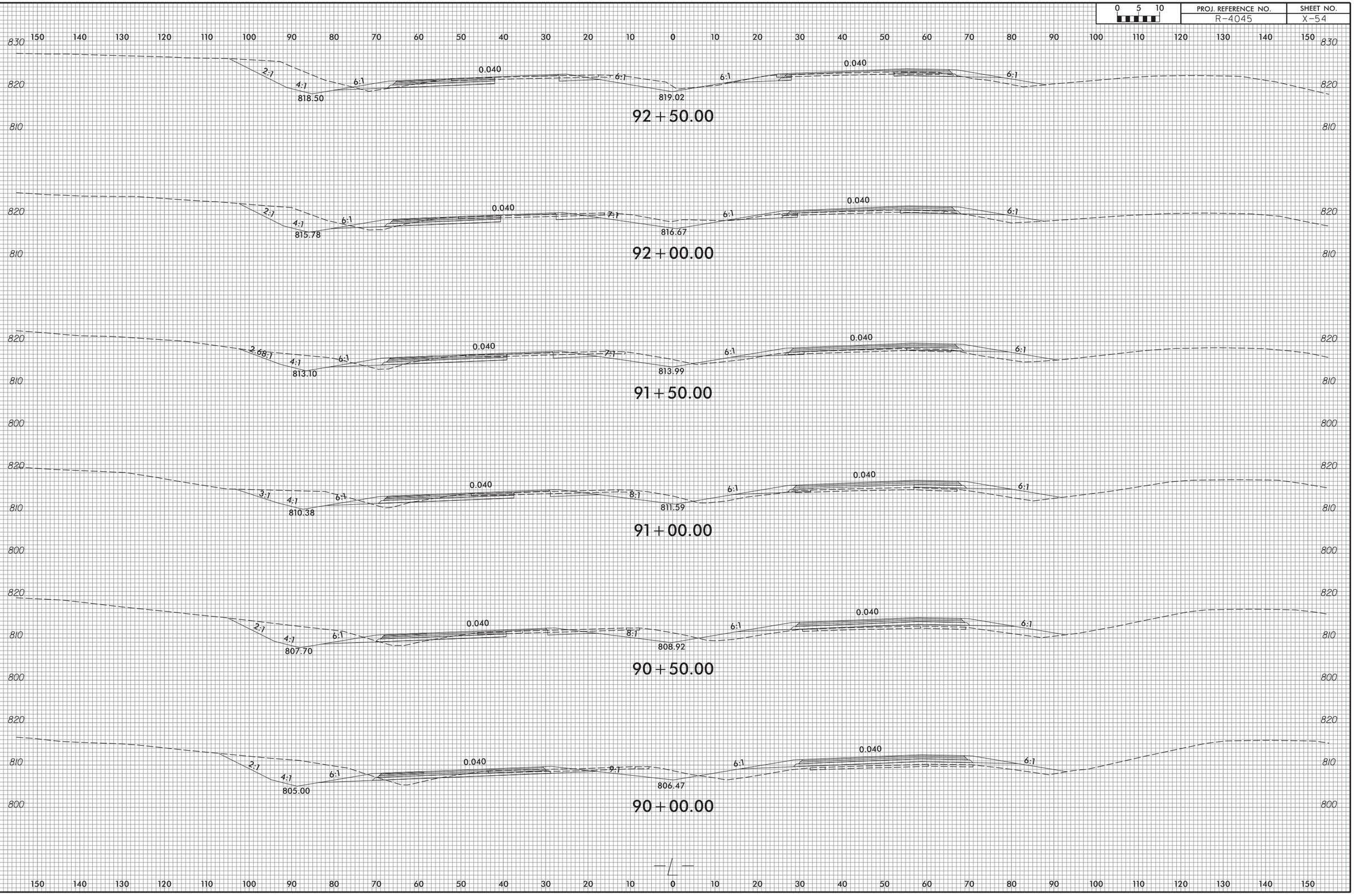
87+50.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_ROW_X-SECT.dgn
Spencer.Merritt

6/23/16

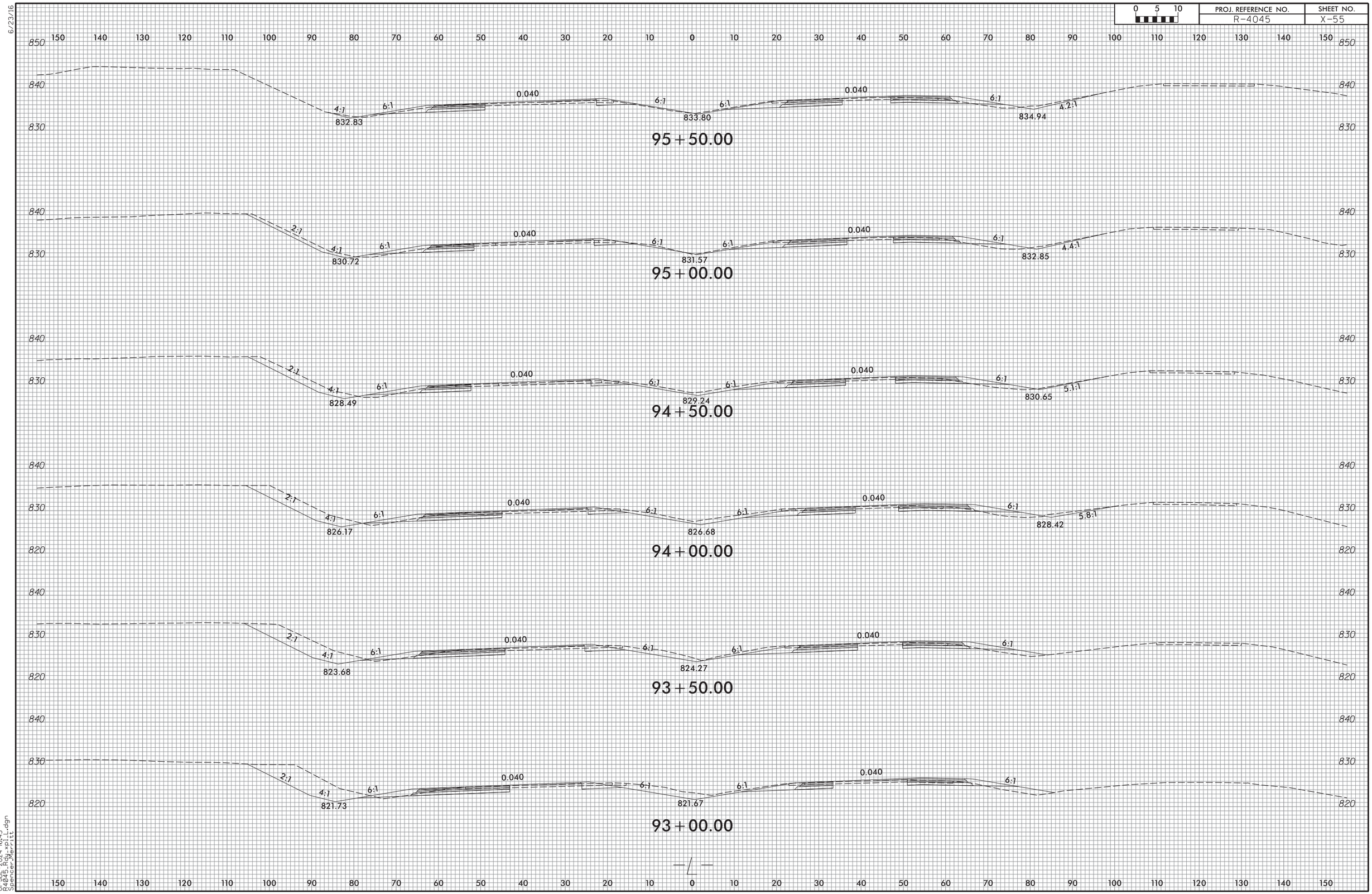
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-54



01-JUL-2024 16:43
R4045_ROW_X-54.dgn
Spencer.Merritt

6/23/16

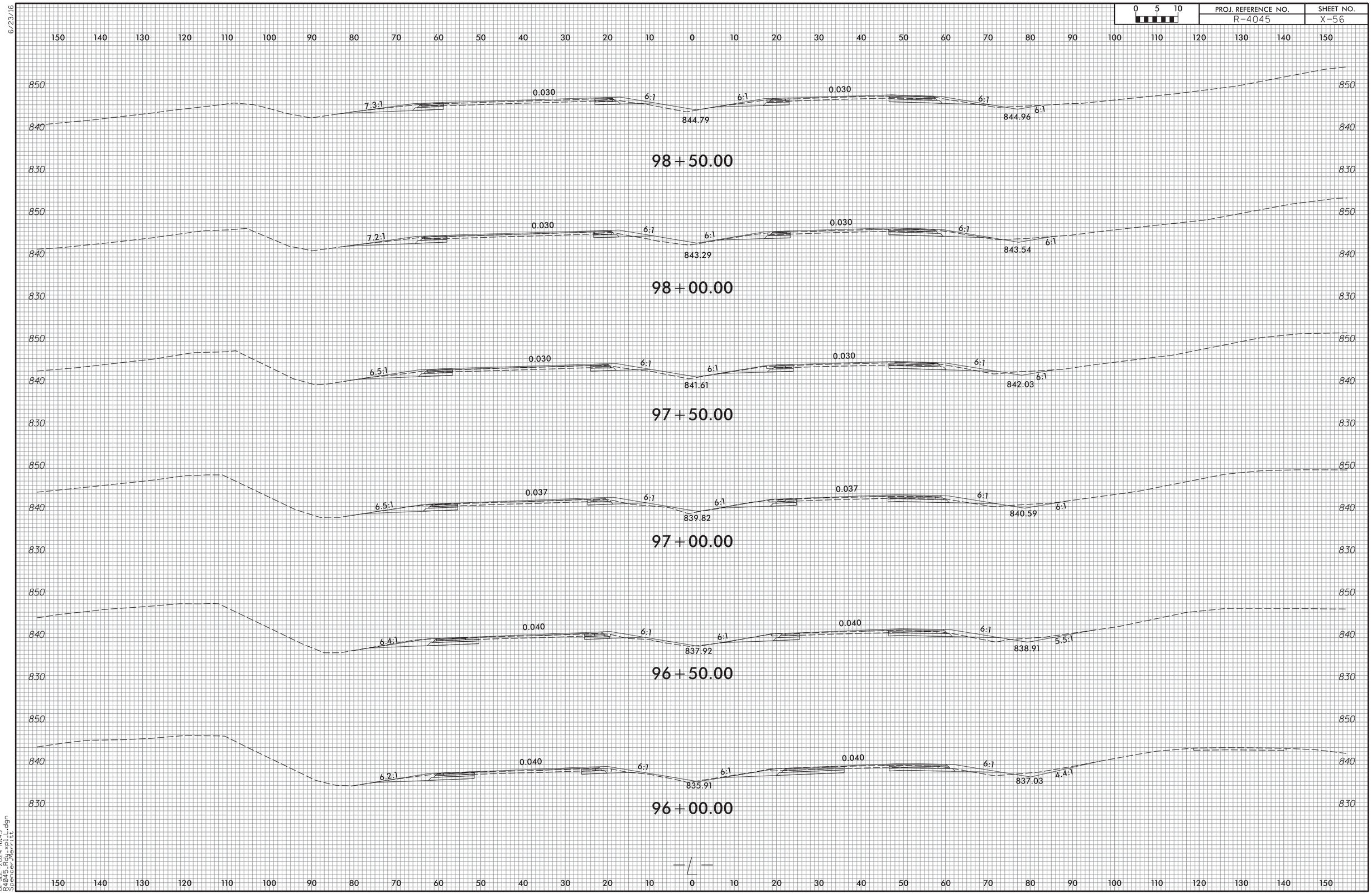
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-55



01-JUL-2024 16:43
R-4045_ROW_X-Sect.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-56



01-JUL-2024 16:43
R-4045_ROW_X-SECT.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-57

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

860 850 840

101+50.00

860 850 840

101+00.00

860 850 840

100+50.00

860 850 840

100+00.00

0.030 0.030

850 840

7.5:1 0.030 6:1 6:1 0.030 6:1 6:1

847.38 847.57

99+50.00

850 840 830

7.6:1 0.030 6:1 6:1 0.030 6:1 6:1

846.14 846.32

99+00.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R4045_RDWY_X-SECT_1.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-58

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

870
860
880

–SR1–

4:1 0.020 0.020

873.78

16+00.00

875.97

15+50.00

878.43 4:1 2:1 874.83

15+00.00

880.36 4:1 2:1 876.83

14+50.00

2:1 4:1 879.87 882.12 879.87

DRIVEWAY

14+00.00

BEGIN GRADE –Y1– STA. 13+75.00

883.66

13+50.00

–Y1–

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

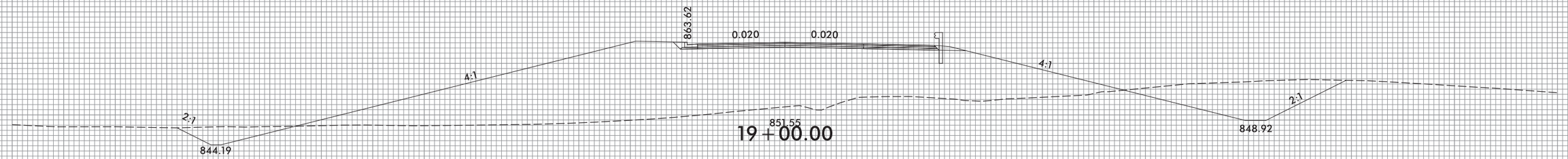
01-JUL-2024 16:43
R-4045_50_Y1.dgn
Spencer.Merritt

6/23/16

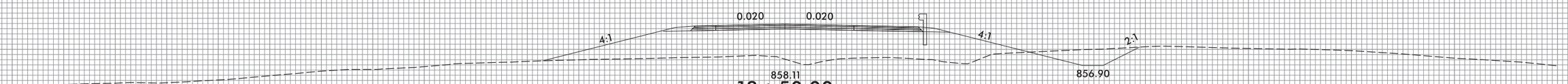
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-59

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

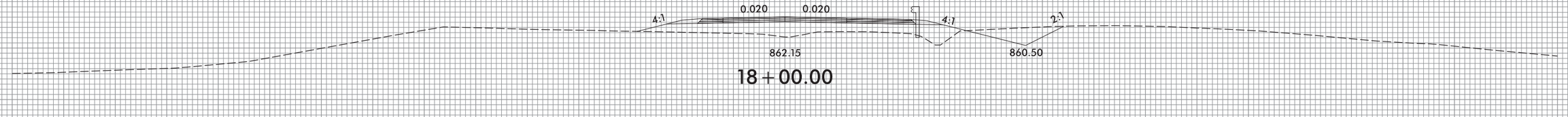
870 860 850 840



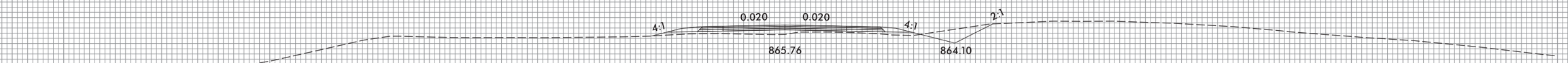
19 + 00.00



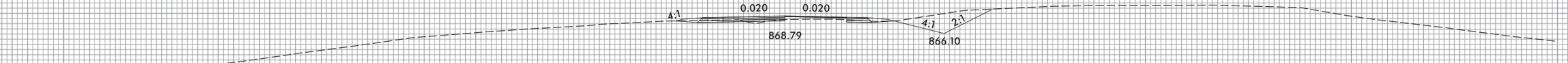
18 + 50.00



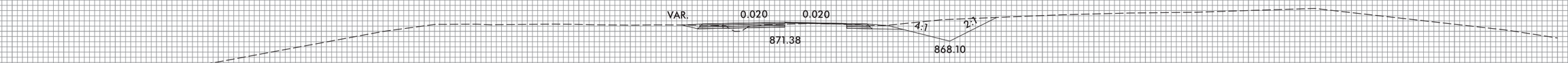
18 + 00.00



17 + 50.00



17 + 00.00



16 + 50.00

—Y1—

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_GRADING_Y1.dgn
Spencer.Marritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-60

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

840
830

837.99
21+50.00

840
830

840.26
21+00.00

840
830

843.76
20+50.00

840
830
870
860
850

862.80 0.020 0.020 862.88
4:1
2:1

845.05
20+00.00

840
850
860
870

863.17 0.020 0.020 863.21
4:1
2:1
3:1
2:1

843.94
840.93

848.03
19+50.00

840
850

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045 RDWY X1.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-61

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

870 860 850 840 830 820

866.60 0.020 0.020 866.60

2:1 2:1

833.06

23+00.00

870 860 850 840 830 820

866.03 0.020 0.020 866.03

3:1 3:1

834.38

22+50.00

870 860 850 840 830 820

865.24 0.020 0.020 865.20

4:1 4:1

834.84

22+00.00

—Y1—

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

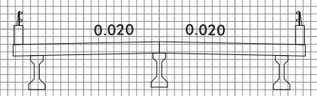
01-JUL-2024 16:43
R-4045_RDWAY1.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-62

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

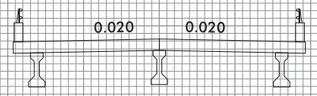
870 860 850 840 830



843.21

24+50.00

870 860 850



850 840 830 820

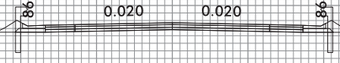
843.35

24+00.00

BEGIN BRIDGE –Y1– STA. 23+93+/–

867.29 867.28

870 860 850



2:1 2:1

840 830 820

831.87

23+50.00

–Y1–

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

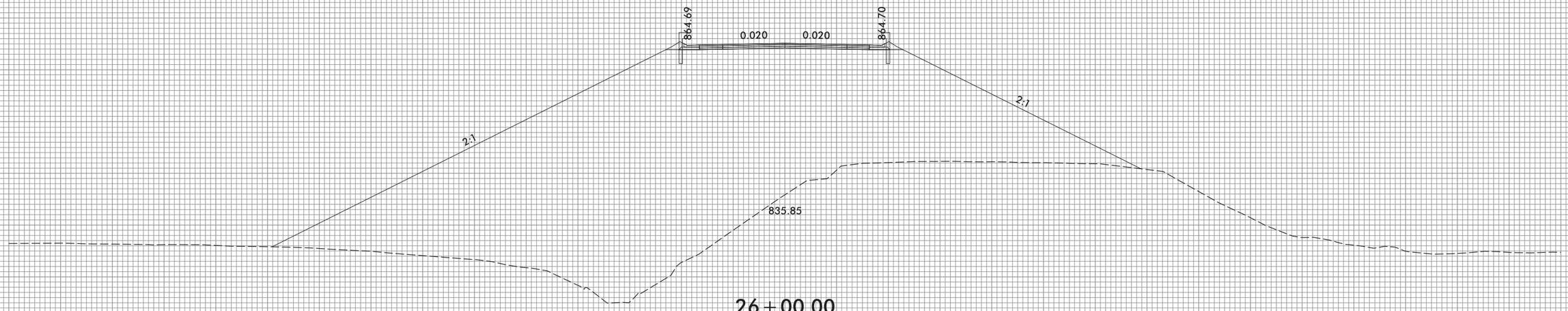
01-JUL-2024 16:43
R-4045_504_XS_Y1.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-63

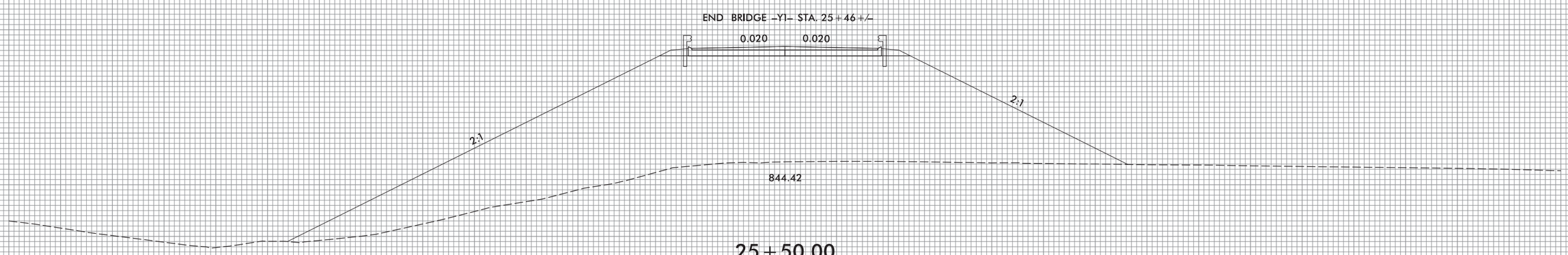
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

870 860 850 840 830 820 810

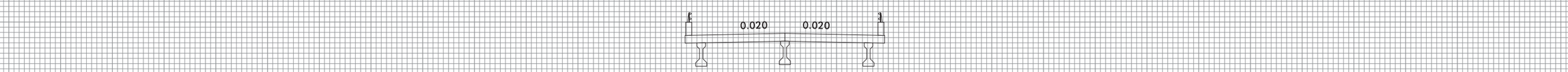


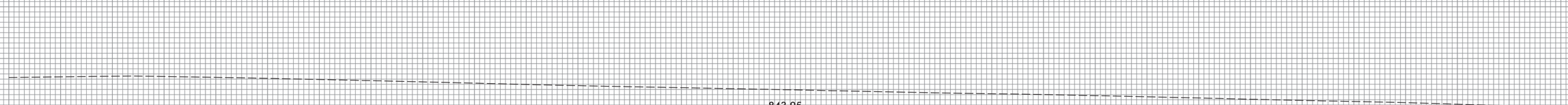
26+00.00

END BRIDGE –Y1– STA. 25+46+/–



25+50.00





25+00.00

–Y1–

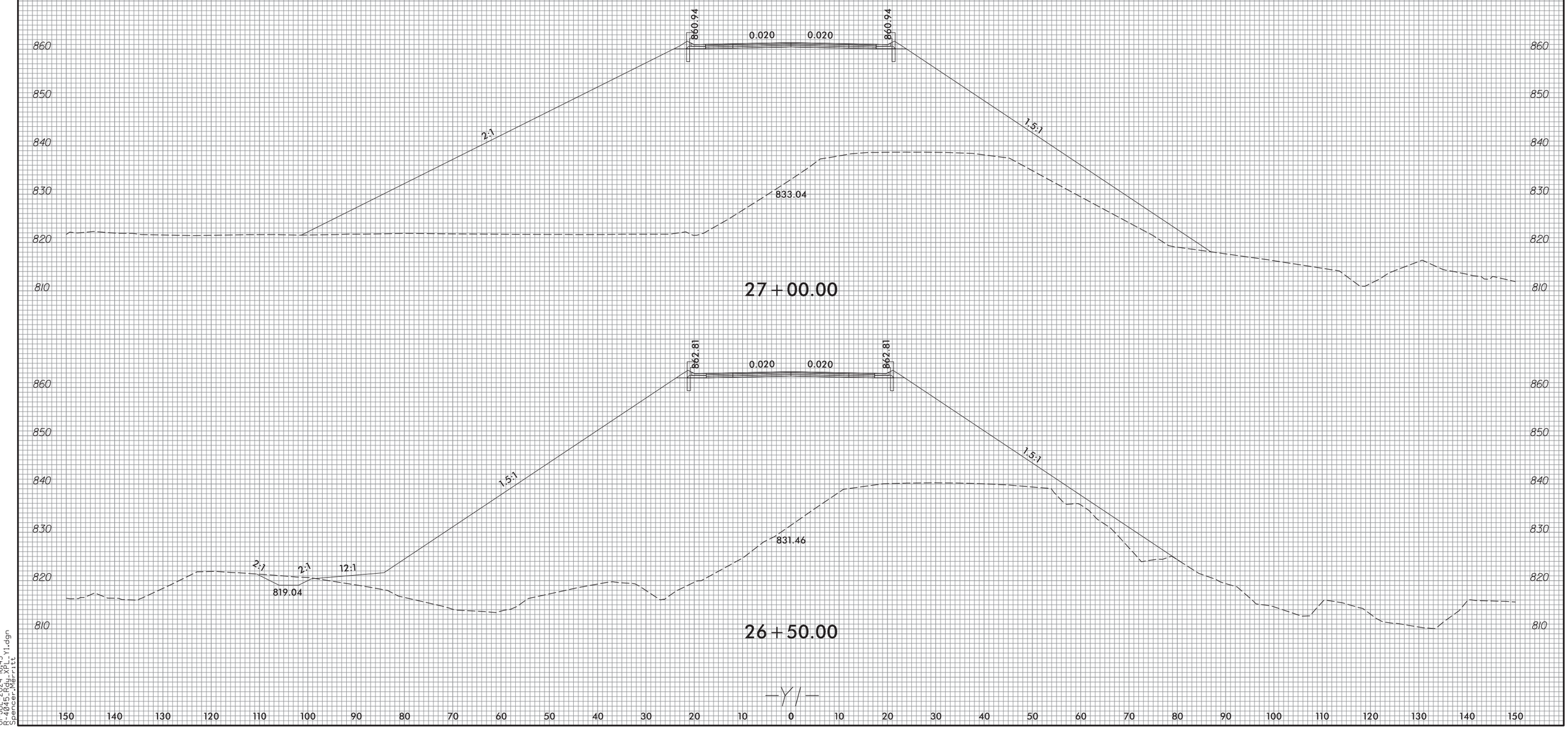
01-JUL-2024 16:43
R-4045 RDWY X-SEC Y1.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-64

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

860 850 840 830 820 810



01-JUL-2024 16:43
R-4045_PROF_X64_Y1.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-65

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

860 850 840 830 820 810

0.020 0.020

855.36

4:1

3:1

836.24

28+50.00

857.22 0.020 0.020 857.22

4:1

2:1

835.65

28+00.00

859.08 0.020 0.020 859.08

3:1

1.5:1

834.37

27+50.00

—Y1—

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_PROFILE_Y1.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-66

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

850
840
830

–Y2– 0.020 –Y1RPA– 0.020

840.29

30 + 50.00

850
840
830

–Y2– 0.020 –Y1LPA– 0.020

839.00

30 + 00.00

850
840
830
820

0.020 0.020

4:1 4:1

837.95

29 + 50.00

860
850
840
830
820

0.020 0.020

4:1 4:1

837.18

29 + 00.00

–Y1–

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_SUM_X66_Y1.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-67

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

850
840

2:1 4:1 0.020 0.020 4:1 2:1
845.41 848.20 845.41
33+50.00

850
840

2:1 4:1 0.020 0.020 4:1 2:1
844.51 847.10 844.51
33+00.00

850
840

2:1 4:1 0.020 0.020 4:1 2:1
843.96 846.01 843.96
32+50.00

850
840

2:1 4:1 0.020 0.020 4:1 2:1
842.58 844.76 841.70
32+00.00

850
840
830

2:1 4:1 0.020 0.020 4:1 2:1
841.21 843.28 839.44
31+50.00

850
840
830

2:1 4:1 0.020 0.020 4:1 2:1
839.83 841.73 837.18
31+00.00

—Y1—

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_SHT_Y1.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-68

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

860
850
840

851.88
35+50.00

END CONSTRUCTION –Y1– STA. 35+35.00

2:1 4:1 0.020 0.038 4:1 2:1
847.77 851.35 847.53
35+00.00

2:1 4:1 0.020 0.020 4:1 2:1
847.24 850.44 847.24
34+50.00

2:1 4:1 0.020 0.020 4:1 2:1
846.37 849.35 846.37
34+00.00

–Y1–

01-JUL-2024 16:43
R-4045_PRL_Y1.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-69

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

840 830 820 810 800

833.12 0.080 0.080 836.08

1.5:1 2:1

815.44

13+50.00

837.49 834.54 0.080 0.080 3:1

1.5:1

826.14

13+00.00

SHEAR LINE
-L- 42+19.13

836.12 0.068 0.068 4:1

1.5:1

829.63

12+50.00

-YILPA-

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_PDU_X-Y1LPA.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-70

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

830 820 810

830.19 0.080 0.080 833.15

4:1 4:1

820.33

15+50.00

830 820 810

830.04 0.080 0.080 833.00

3:1 3:1

816.18

15+00.00

830 820 810 800

830.55 0.080 0.080 833.50

2:1 2:1

813.47

14+50.00

830 820 810 800

831.70 0.080 0.080 834.66

1.5:1 1.5:1

804.91

14+00.00

790

YILPA

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045 RDWAY YILPA.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-71

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

840
830
820

832.45
0.080
0.080
4:1
5:1
828.28

16+50.00

830.99
0.080
0.080
4:1
4:1
823.86

16+00.00

-YILPA-

810

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_202_YILPA.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-72

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

820 810 800 790 780

818.88 0.058 0.058 817.15

4:1 2:1

806.36

15+50.00

SHEAR LINE
-L- 51++68.83

817.21 0.074 0.074

5.5:1 2:1

806.07

15+00.00

SHEAR LINE
-L- 52+20.03

817.50 0.080 0.080

5.5:1 2:1

809.81

14+50.00

-YIRPA-

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_PRJ_XS_YIRPA.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-73

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

820
810
800
790
780

0.020 0.020

794.02

17+00.00

817.63 816.94

0.024 0.024

2:1 1.5:1

799.50

16+50.00

818.24 817.06

0.041 0.041

3:1 2:1

803.30

16+00.00

-YIRPA-

820 810 800 790 780

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

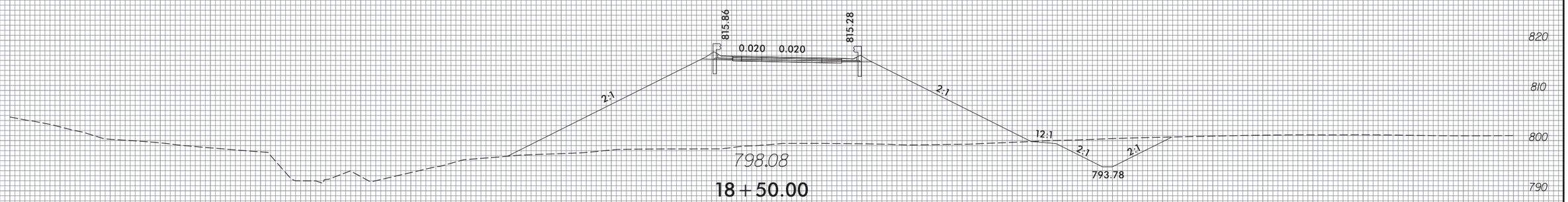
01-JUL-2024 16:43
R-4045_SUM_YIRPA.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-74

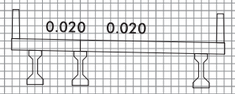
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

820 810 800 790



18 + 50.00

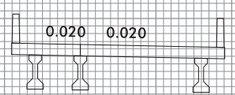
820 810 800 790 780



792.77

18 + 00.00

820 810 800 790 780



786.98

17 + 50.00

-YIRPA-

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045-RDWY-YIRPA.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-75

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

820 / 810 / 800

0.020 0.020

5:1 4:1 6:1 4:1

812.78

805.20

812.18

20+50.00

820 / 810 / 800

0.020 0.020

4:1 4:1 5:1 12:1 2:1 2:1

808.37

800.95

807.58

20+00.00

790 / 820 / 810 / 800

815.60 814.95

0.020 0.020

3:1 4:1 12:1 2:1 2:1

805.27

802.98

19+50.00

790 / 820 / 810 / 800

815.60 814.99

0.020 0.020

2:1 3:1 12:1 2:1 2:1

801.71

798.38

19+00.00

790

-YIRPA-

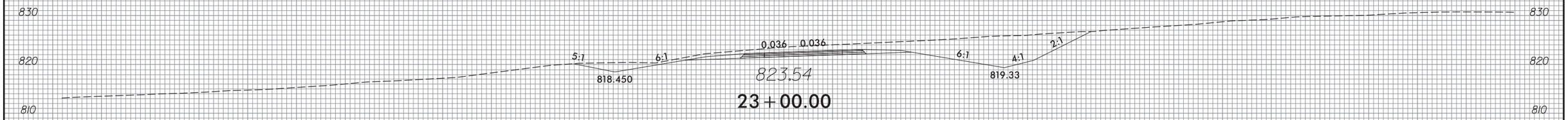
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

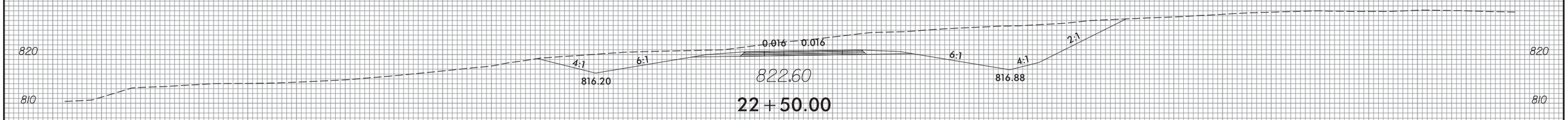
01-JUL-2024 16:43
R-4045 YIRPA.dgn
Spencer.Merritt

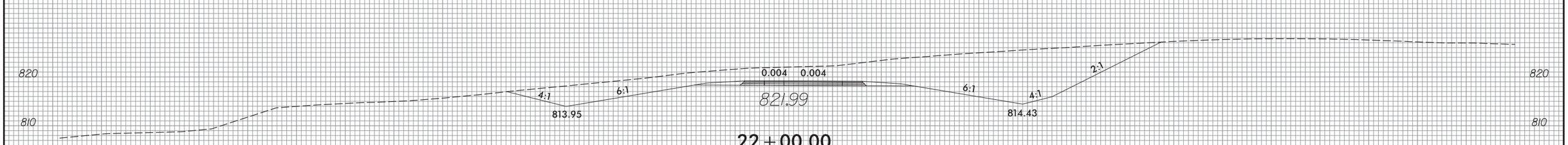
6/23/16

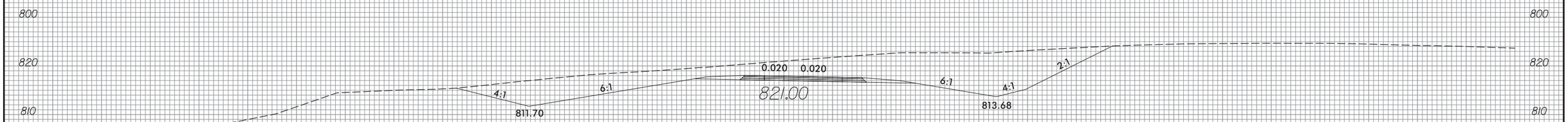
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-76

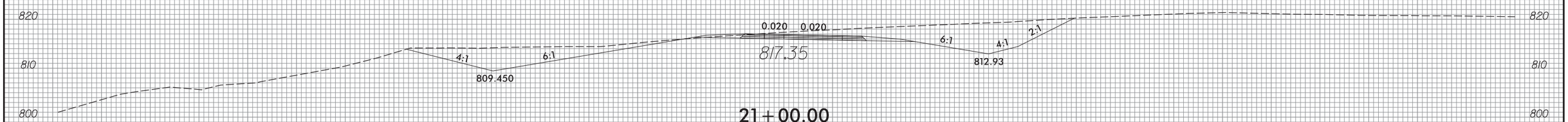
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150











-YIRPA-

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_RDWY_XSEC_YIRPA.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-77

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

840 / 830 / 820

6:1 6:1 0.080 0.080 6:1 4:1 2:1

829.06 830.99

833.79

25+50.00

840 / 830 / 820

6:1 6:1 0.080 0.080 6:1 4:1 2:1

826.86 828.73

831.58

25+00.00

830 / 820

6:1 6:1 0.080 0.080 6:1 4:1 2:1

824.66 826.48

828.49

24+50.00

830 / 820 / 810

6:1 6:1 0.076 0.076 6:1 4:1 2:1

822.49 824.23

825.17

24+00.00

830 / 820 / 810

6:1 6:1 0.056 0.056 6:1 4:1 2:1

820.45 821.78

824.22

23+50.00

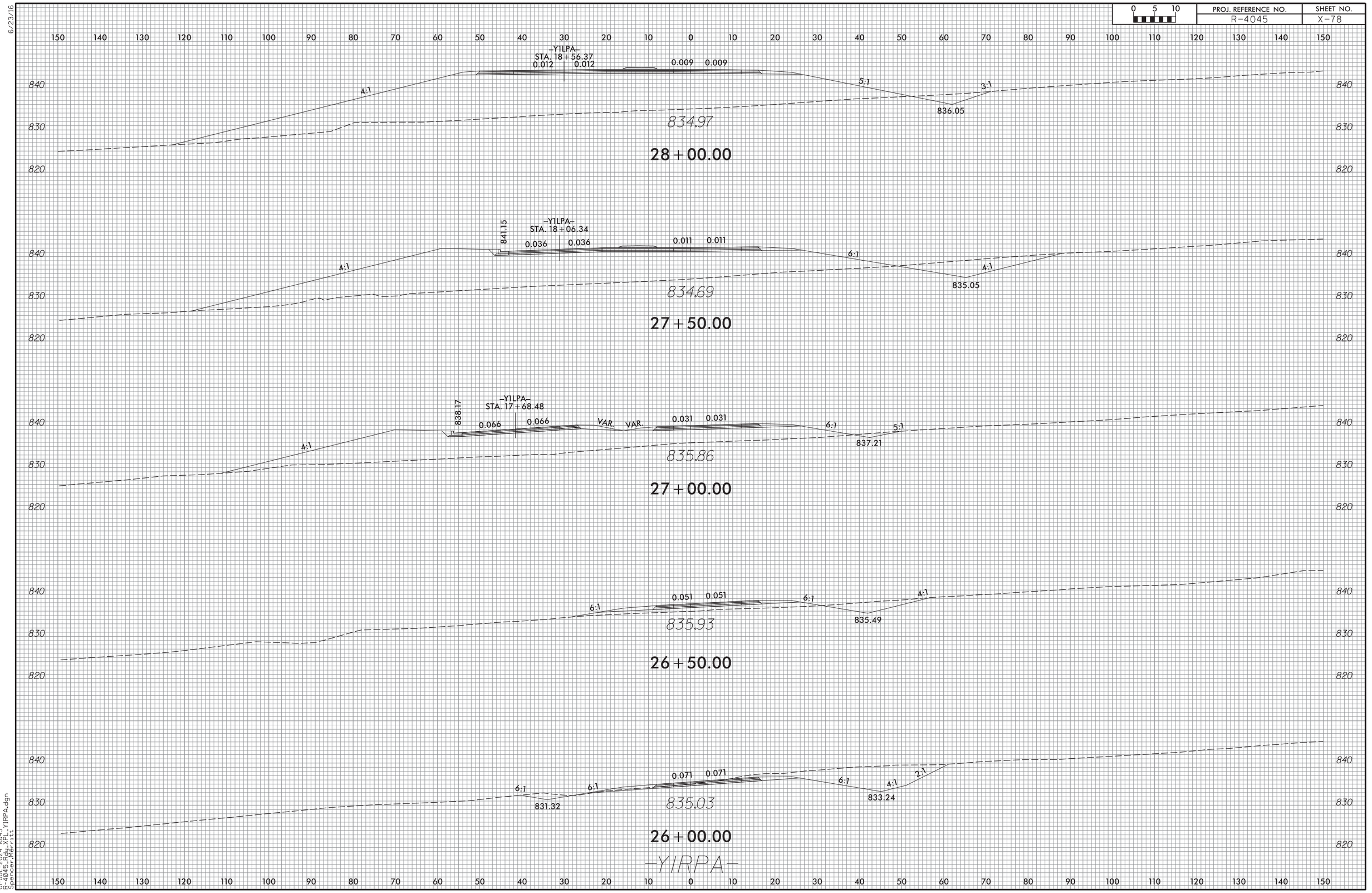
-YIRPA-

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_SHT_YIRPA.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-78



01-JUL-2024 16:43
R-4045_PRJ_YIRPA.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-79

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

END CONSTRUCTION
–Y1RPA– STA. 29+20.44

–Y1LPA–
STA. 19+56.37

0.020 0.020 0.022 0.022

4:1 4:1

850 840 830

836.77

29+00.00

–Y1LPA–
STA. 19+06.37

0.008 0.008 0.020 0.020

4:1 4:1 2:1

837.05

850 840 830 820

835.94

28+50.00

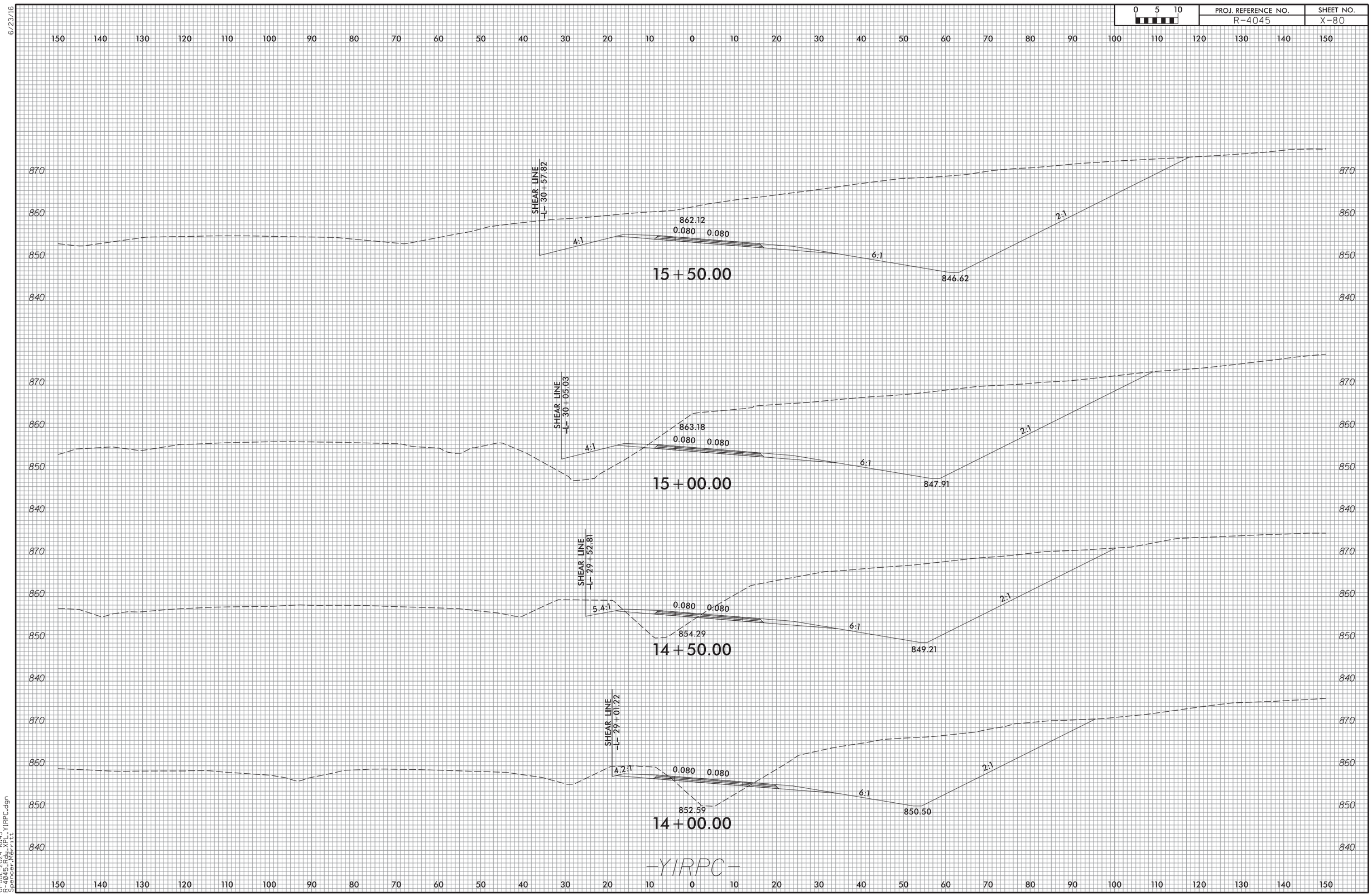
–Y1RPA–

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_PLN_X-Y1RPA.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-80



01-JUL-2024 16:43
R-4045 RDWY YIRPC.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-81

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

860 850 840

SHEAR LINE
-L- 33+18.15

862.34
0.020 0.020

4:1 4:1 2:1

837.85 840.16

18+00.00

860 850 840

SHEAR LINE
-L- 32+65.91

862.49
0.028 0.028

4:1 4:1 2:1

840.10 841.45

17+50.00

860 850 840

SHEAR LINE
-L- 32+13.13

862.95
0.044 0.044

4:1 4:1 2:1

842.68 842.74

17+00.00

870 860 850 840

SHEAR LINE
-L- 31+62.08

862.30
0.061 0.061

4:1 5:1 2:1

845.24 844.04

16+50.00

870 860 850 840

SHEAR LINE
-L- 31+10.68

860.28
0.078 0.078

5:1 6:1 2:1

847.96 845.33

16+00.00

-YIRPC-

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045 SHEET YIRPC.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-82

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

860 850 840 830

0.020 0.020

4:1 5:1 2:1

843.59

842.78

20+00.00

860 850 840 830

SHEAR LINE
–L– 34+75.19

0.020 0.020

4:1 5:1 2:1

838.76 842.85

840.91

19+50.00

860 850 840 830

SHEAR LINE
–L– 34+22.75

0.020 0.020

4:1 4:1 2:1

838.09 841.86

847.95

19+00.00

860 850 840 830

SHEAR LINE
–L– 33+70.40

0.020 0.020

4:1 4:1 2:1

837.41 840.87

859.01

18+50.00

–YIRPC–

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045 RGL_YIRPC.dgn
Spencer Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-83

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

840 830

842.24

21+50.00

END CONSTRUCTION
-Y1RPC- STA. 21+16.57

864.77 0.020 0.020 864.21

870 860 850 840 830

4:1 4:1

Y1 LEFT DITCH
TO TIE TO
Y1RPC STA. 20+50

842.24

21+00.00

870 860 850 840 830

863.25 0.020 0.020 862.69

4:1 5:1 2:1

843.84

842.73

20+50.00

-Y1RPC-

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_504_X83_Y1RPC.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-84

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

870 860 850 840 830 820

2:1 2:1 866.72 1.5:1 4:1 827.50 6:1 0.080 0.080 834.94 6:1

SHEAR LINE
-L- 44+96.53

14+50.00

2:1 2:1 865.72 1.5:1 4:1 826.68 6:1 0.080 0.080 834.74

SHEAR LINE
-L- 45+49.12

14+00.00

2:1 2:1 861.21 1.5:1 4:1 825.86 6:1 0.080 0.080 834.16

SHEAR LINE
-L- 45+99.00

13+50.00

-YIRPD-

01-JUL-2024 16:43
R-4045_SHT_YIRPD.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-85

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

860 850 840 830 820

2:1 2:1 859.22 2:1 851.69 4:1 830.95 6:1 0.080 0.080 4.6:1

SHEAR LINE
-L- 43+42.83

16+00.00

870 860 850 840 830 820

2:1 2:1 861.72 1.5:1 4:1 829.62 6:1 0.080 0.080 838.71 5.2:1

SHEAR LINE
-L- 43+94.24

15+50.00

870 860 850 840 830 820

2:1 2:1 864.22 1.5:1 4:1 828.47 6:1 0.080 0.080 833.85 5.5:1

SHEAR LINE
-L- 44+45.48

15+00.00

-YIRPD-

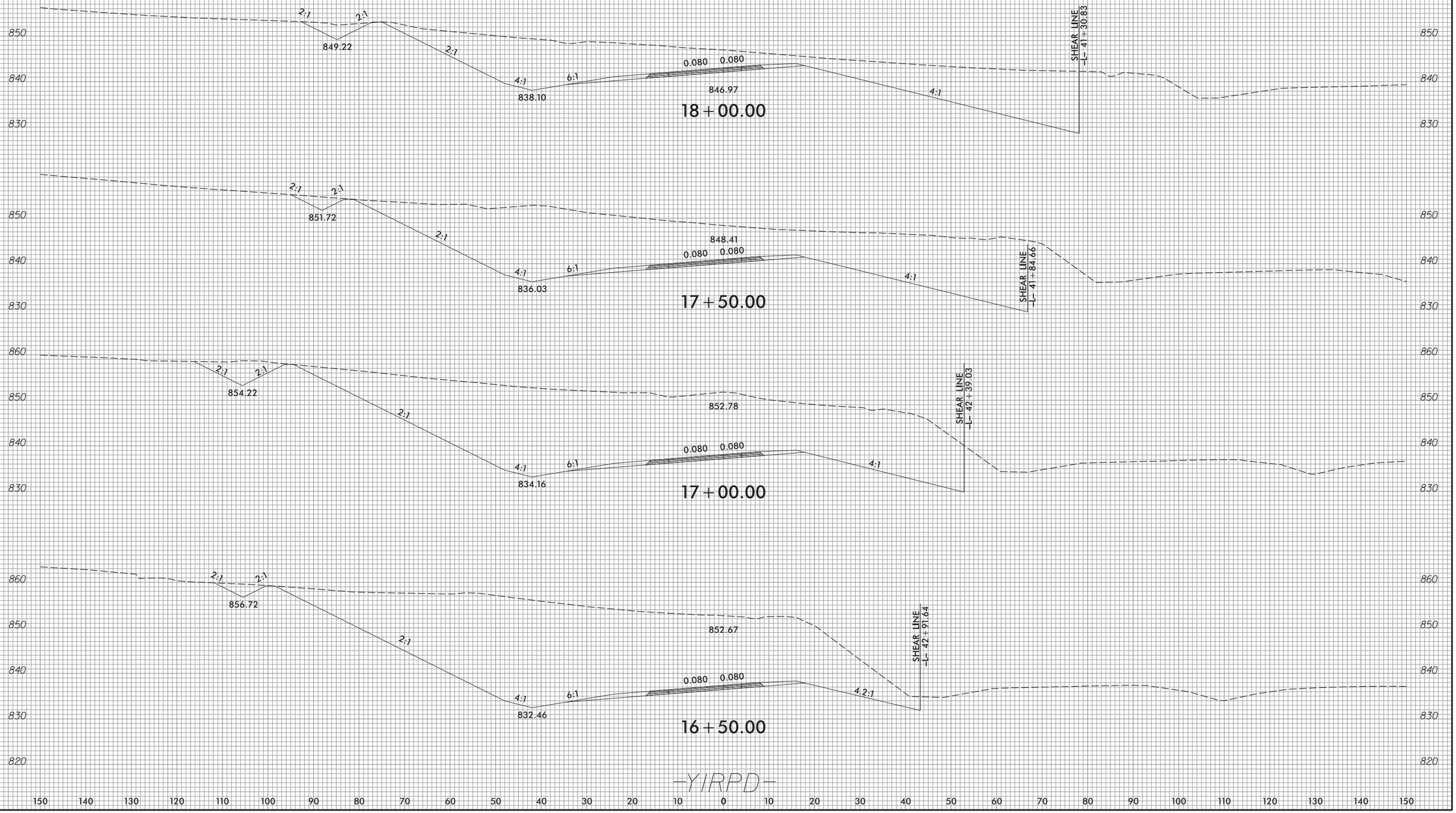
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_PRO_X-85_YIRPD.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-86

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_SHEET_XS_YIRPD.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-87

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

850 840 830

854.36

0.022 0.022

3:1 2:1 4:1

839.18

837.74

20+50.00

851.66

0.039 0.039

3:1 4:1 4:1

840.97

838.95

20+00.00

820

850 840 830

0.056 0.056

4:1 5:1 4:1

843.97

840.98

19+50.00

850 840 830

2:1 2:1 2:1 4:1 6:1 5:1

845.34

841.59

0.072 0.072

843.00

19+00.00

850 840 830

2:1 2:1 2:1 4:1 6:1 4:1

846.72

840.34

0.080 0.080

844.68

18+50.00

SHEAR LINE
-L- 40+76.43

-YIRPD-

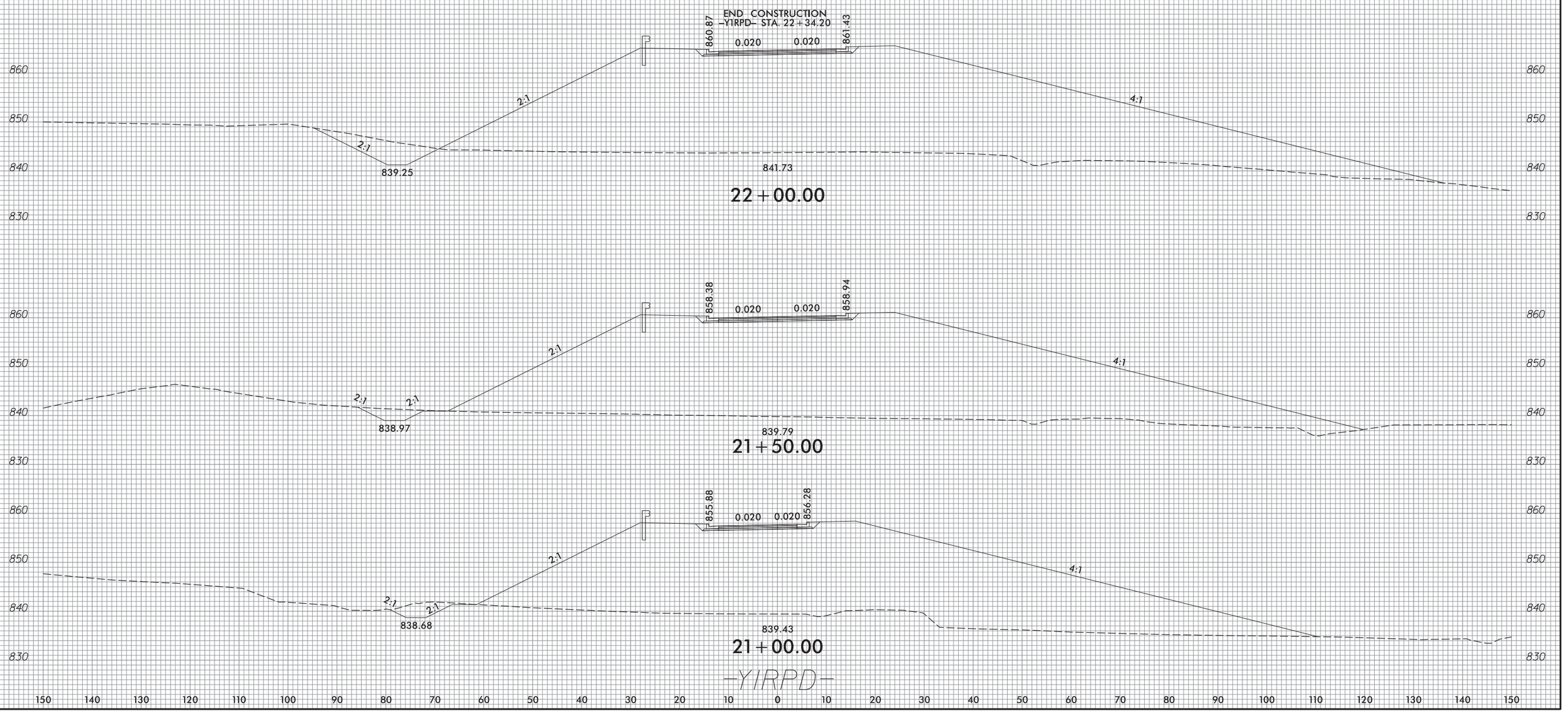
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045 RGL YIRPD.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-88

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

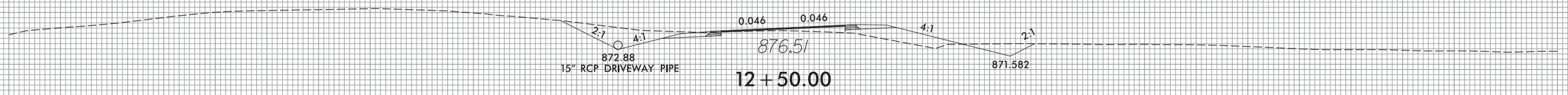
01-JUL-2024 16:43
R-4045_RPL_YIRPD.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-89

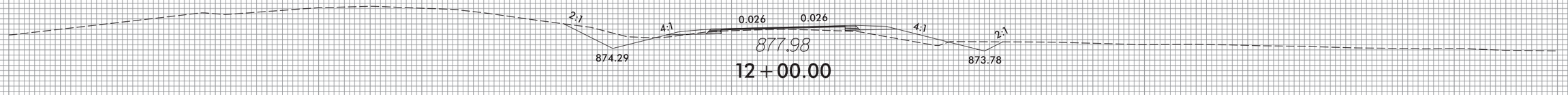
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

890
880
870



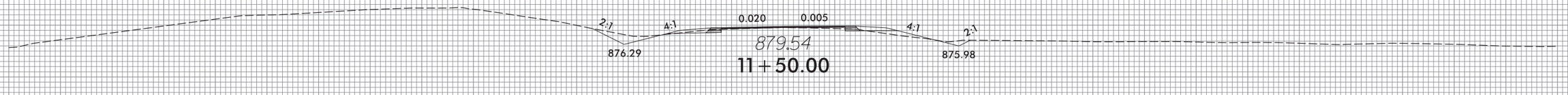
876.51
12 + 50.00

890
880



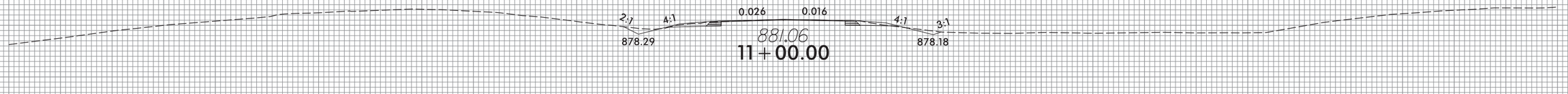
877.98
12 + 00.00

890
880
900



879.54
11 + 50.00

890
880
900
890



881.06
11 + 00.00

890
900
890

BEGIN GRADE –Y2– STA. 10 + 75.00

882.54
10 + 50.00

880
900
890
880

883.99
10 + 00.00

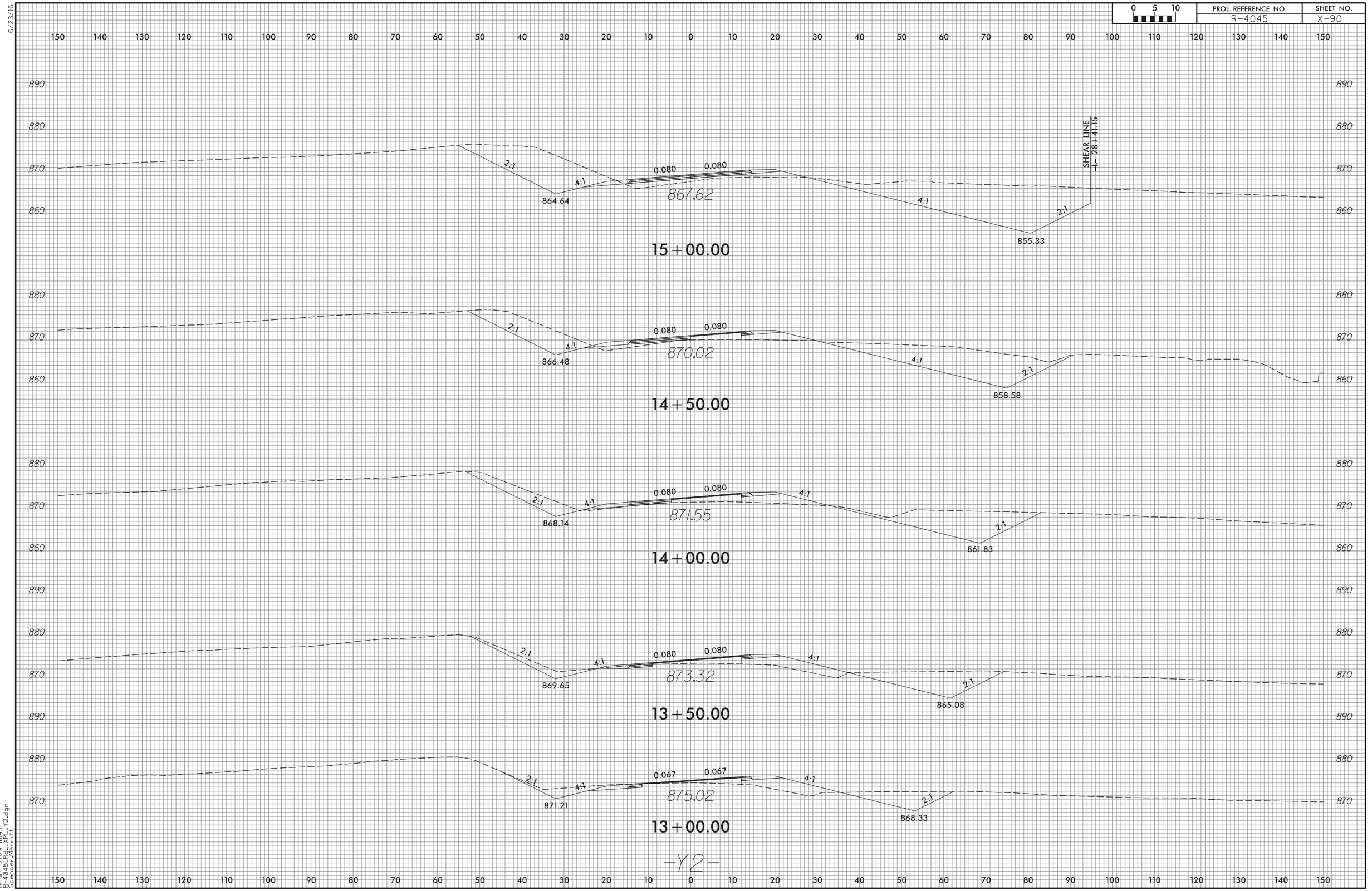
–Y2–

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_GRADE_Y2.dgn
Spencer.Merritt

6/23/16

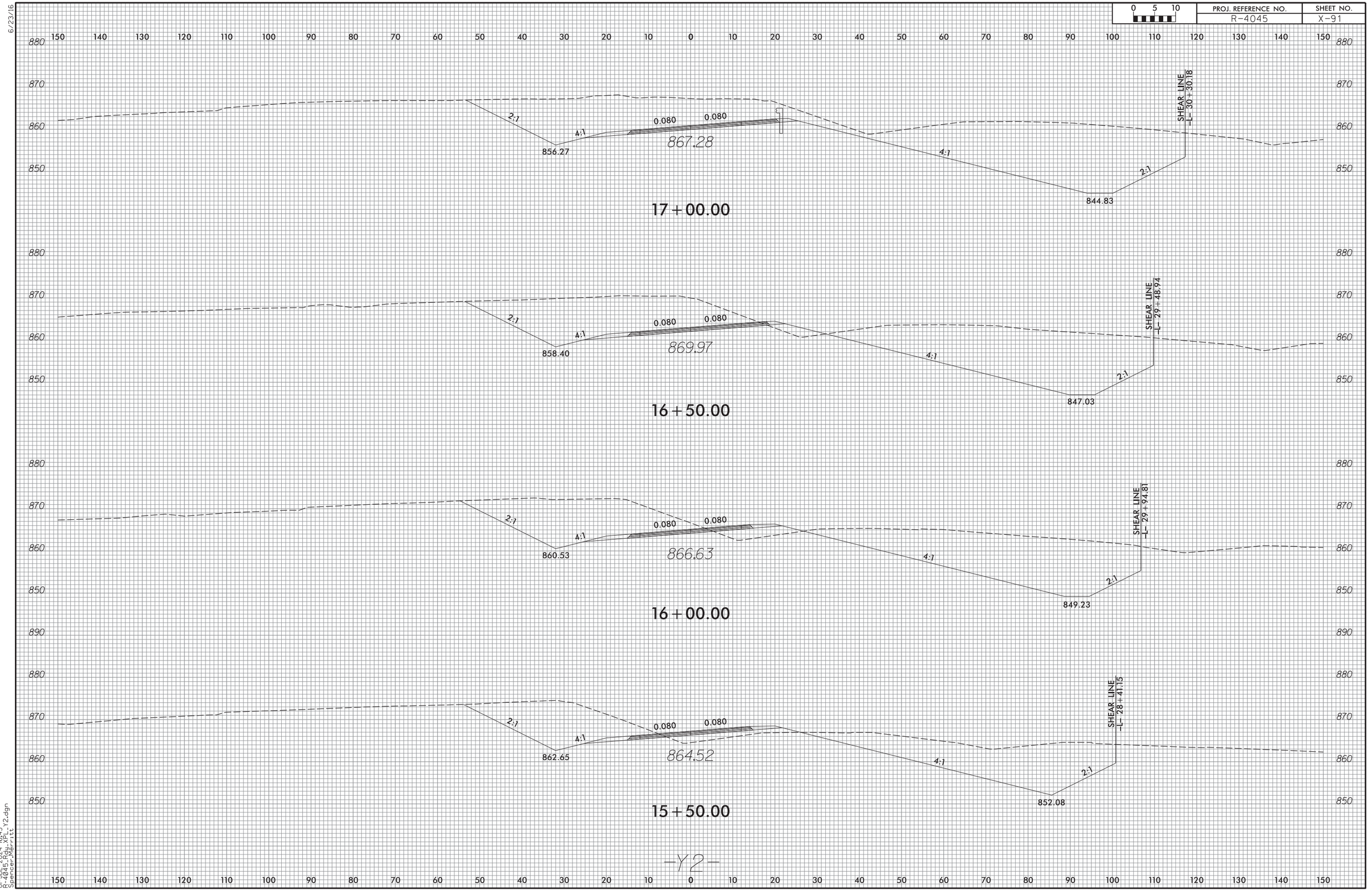
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-90



01-JUL-2024 16:43
R-4045_SHEET_XSL_Y2.dgn
Spencer.Merritt

6/23/16

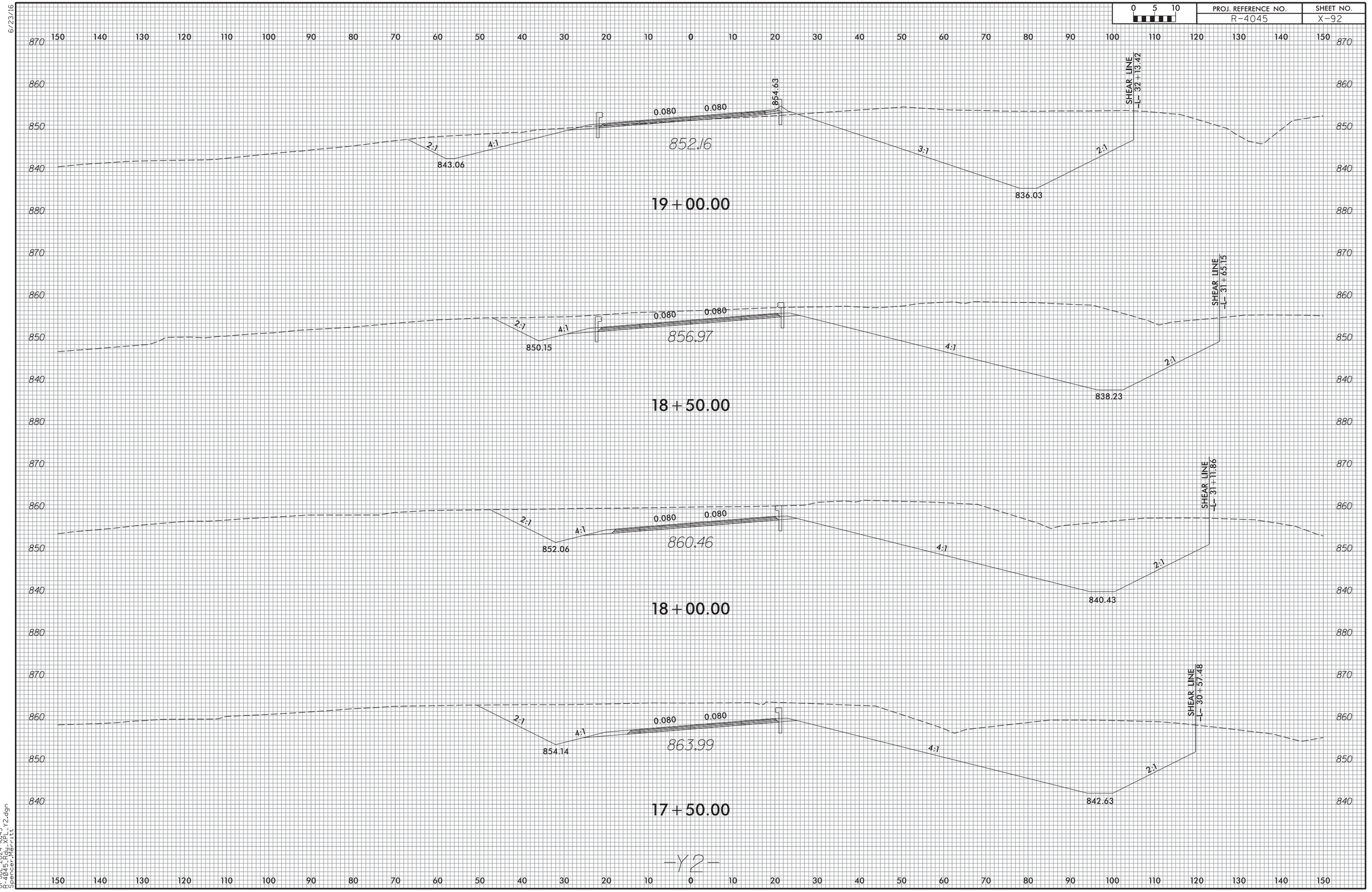
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-91



01-JUL-2024 16:43
R-4045_SHEET_X2.dgn
Spencer.Merritt

6/23/16

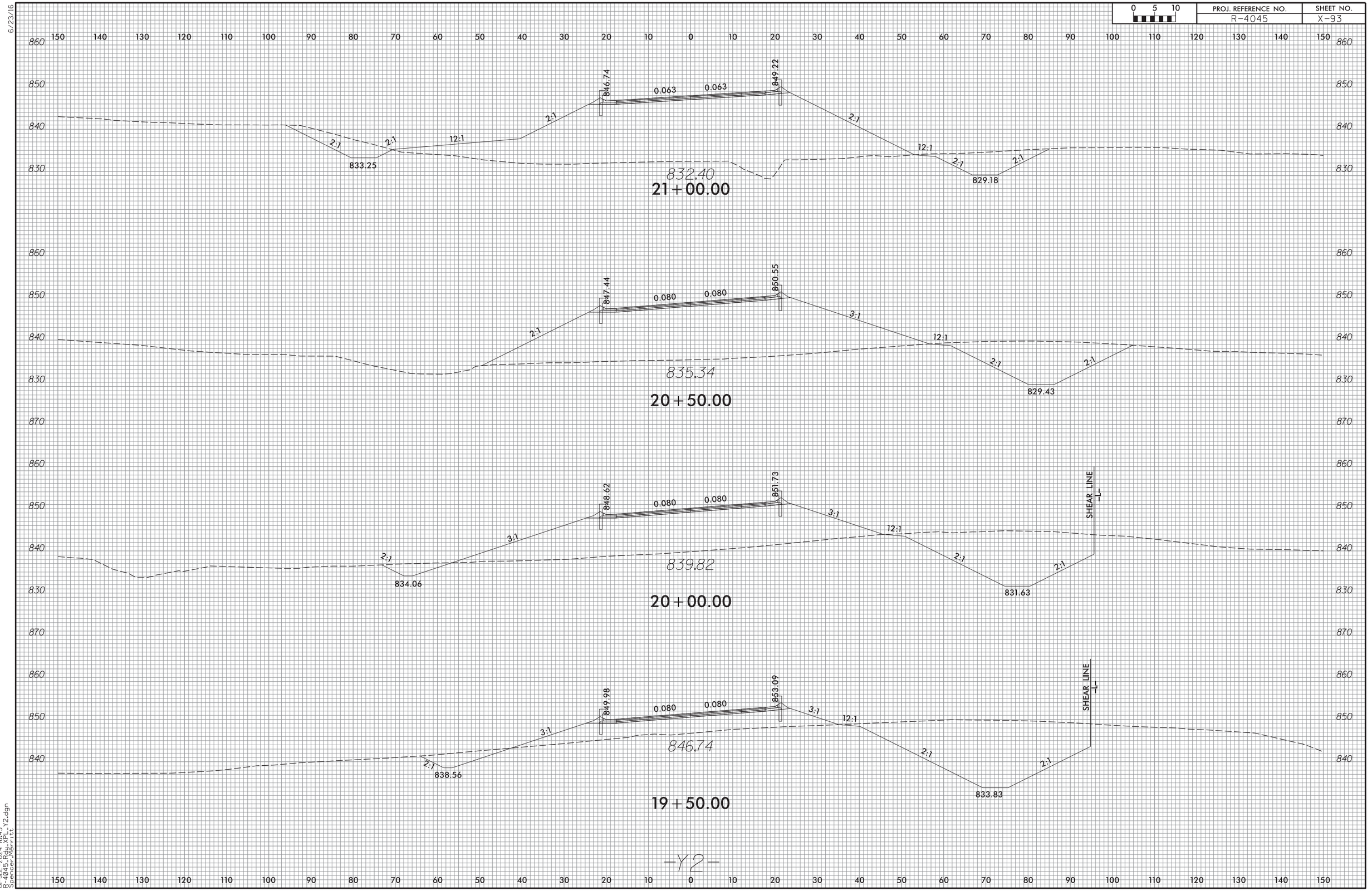
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-92



01-JUL-2024 16:43
R-4045_SHEET_X2.dgn
Spencer.Merritt

6/23/16

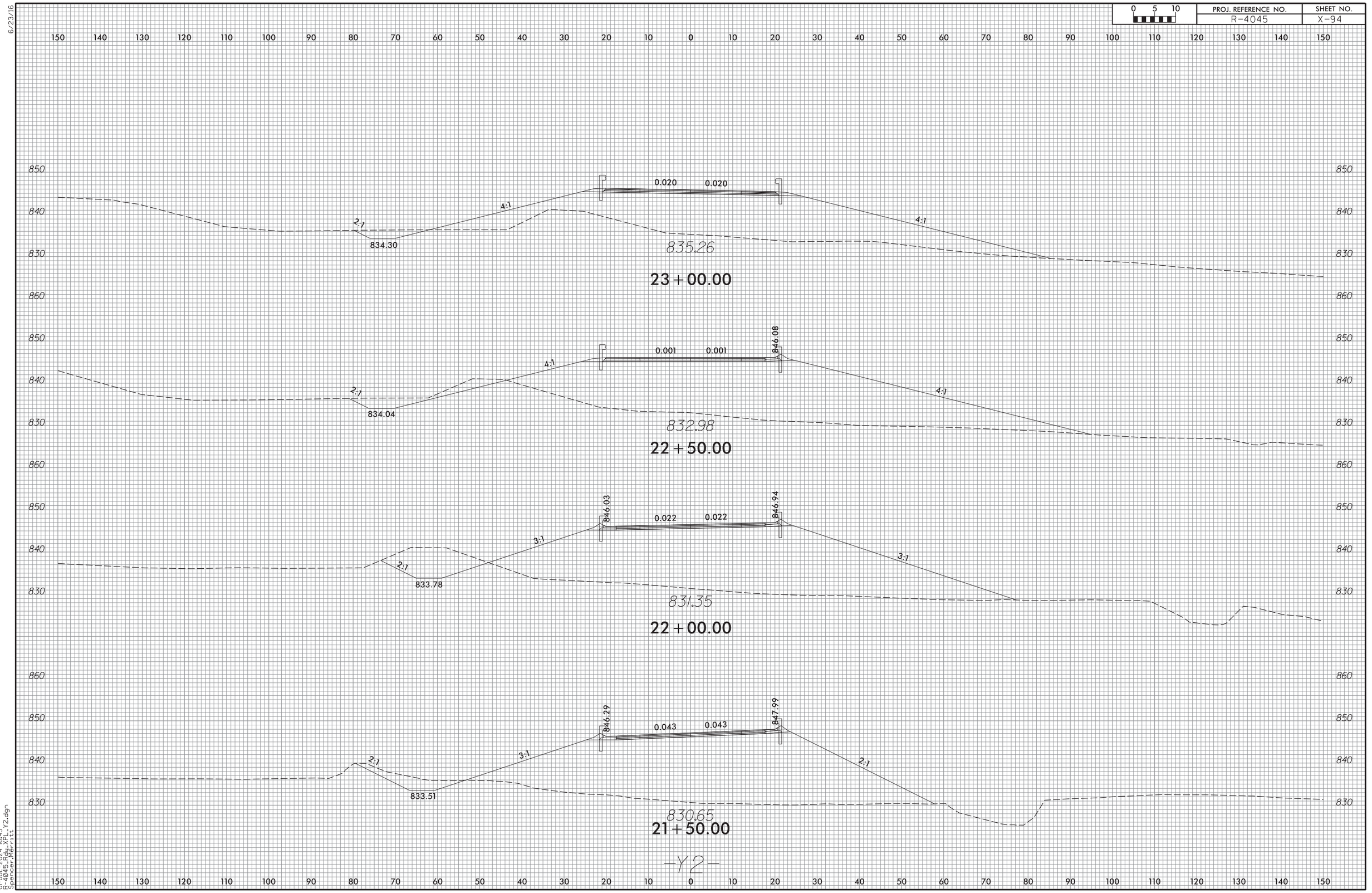
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-93



01-JUL-2024 16:43
R-4045_SHEET_XSL_Y2.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-94



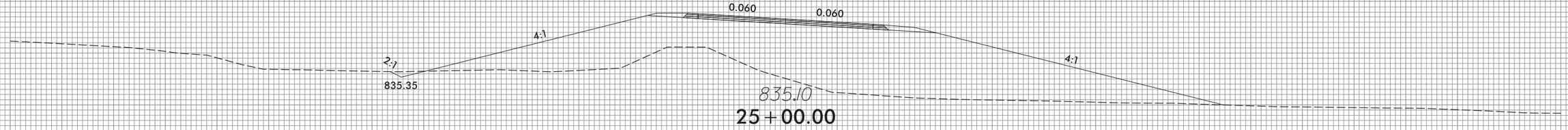
01-JUL-2024 16:43
R-4045_PRL_Y2.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-95

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

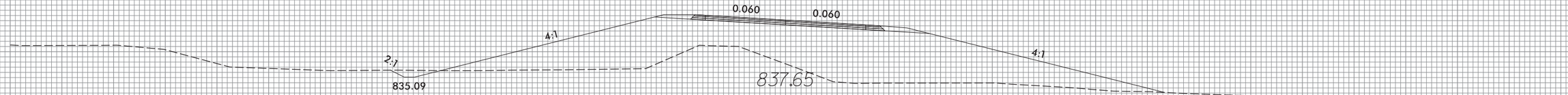
860 850 840 830



835.10

25+00.00

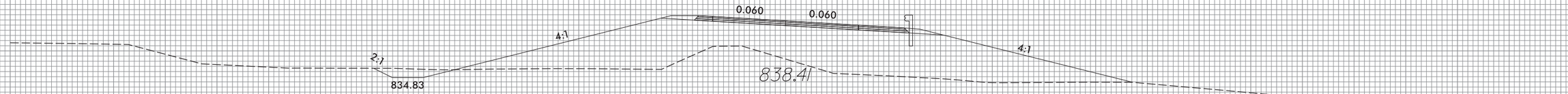
850 840 830



837.65

24+50.00

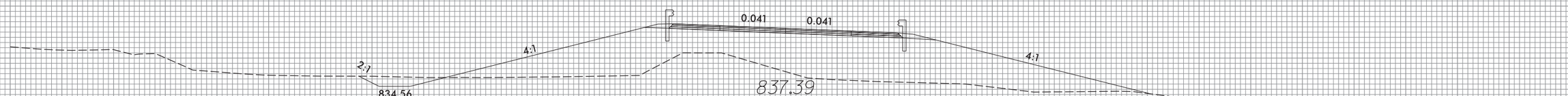
850 840 830



838.41

24+00.00

850 840 830



837.39

23+50.00

-Y2-

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_PLAN_Y2.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-96

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

860 850 840

SHEAR POINT
-Y1-

END CONSTRUCTION
-Y2- STA. 27+00.00

0.028

4:1

837.68
27+00.00

860 850 840

0.005 0.005

4:1 2:1 4:1

838.80

835.67
26+50.00

860 850 840 830

0.023 0.023

4:1 2:1 4:1

837.65

834.30
26+00.00

860 850 840 830

0.051 0.051

4:1 2:1 4:1

836.50

833.27
25+50.00

-Y2-

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_SHT_XS_-Y2.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-97

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

830
820

821.39
18+00.00

830
820

2:1 2:1 EX. EX. 2:1 2:1

820.87 822.11

824.00
17+50.00

830

826.42
17+00.00

-Y3-

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_Cover_XS_Y3.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-98

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

880 870 860

0.020 0.020

4:1 4:1 2:1

865.63

863.73

12 + 50.00

880 870 890

0.020 0.020

2:1 4:1 4:1 2:1

867.13

868.00

862.62

12 + 00.00

880 870 890

0.020 0.020

2:1 4:1 4:1 2:1

872.95

869.61

866.62

11 + 50.00

880 870 890

0.020 0.020

2:1 4:1 4:1 2:1

872.09

876.69

870.62

11 + 00.00

880 890

0.025 0.025

2:1 4:1 4:1 2:1

874.57

877.82

873.37

10 + 50.00

BEGIN CONSTRUCTION –SR1– STA. 10+12.00

880 870

876.58

10 + 00.00

–SR1–

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

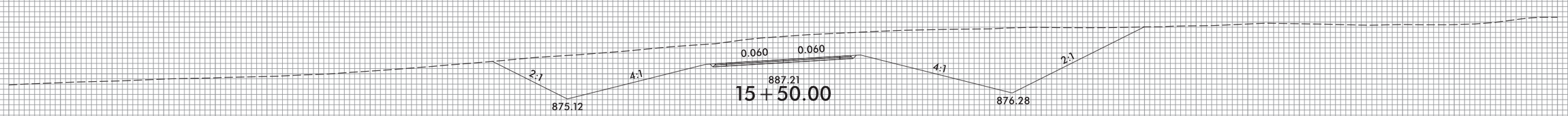
01-JUL-2024 16:43
R-4045_PROFILE_SR1.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-99

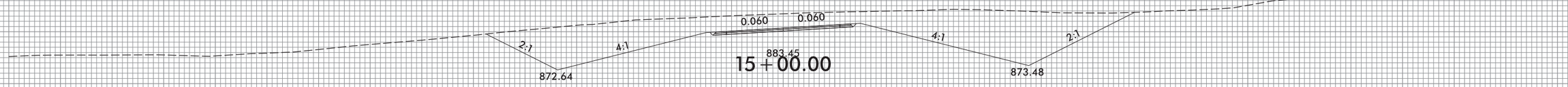
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

900
890
880



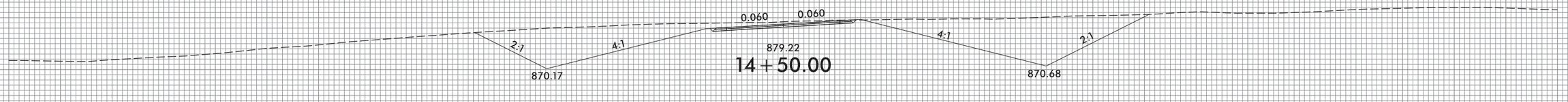
15 + 50.00

890
880
890



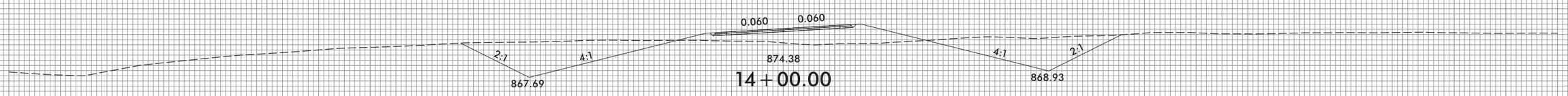
15 + 00.00

880
890
880



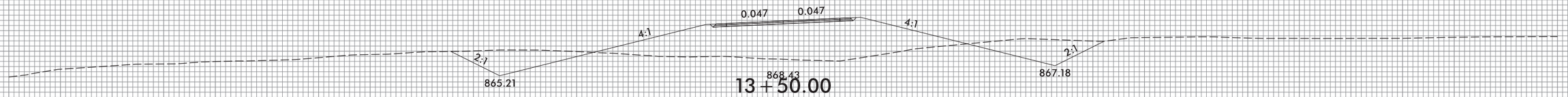
14 + 50.00

880
870



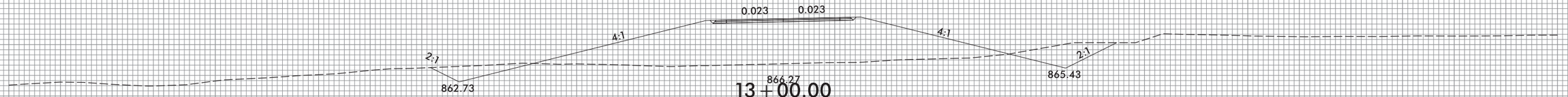
14 + 00.00

880
870



13 + 50.00

880
870



13 + 00.00

-SR1-

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_SR1_XS.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-100

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

910 / 900 / 890

2:1 4:1 0.039 0.039 4:1 2:1

887.50 897.79 886.68

18+00.00

910 / 900 / 890

2:1 4:1 0.016 0.016 4:1 2:1

885.03 895.95 885.68

17+50.00

910 / 900 / 890

2:1 4:1 0.008 0.008 4:1 2:1

882.55 893.65 884.68

17+00.00

DRIVEWAY
–SR1– STA. 16+50

1.0% 1.8%

2:1 4:1 0.032 0.032 4:1 2:1

880.07 890.49 881.88

16+50.00

DRIVEWAY
–SR1– STA. 16+20

900 / 890 / 880

2:1 4:1 0.056 0.056 10.6% 10.9% 4:1 2:1

877.60 889.07 879.08

16+00.00

–SR1–

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

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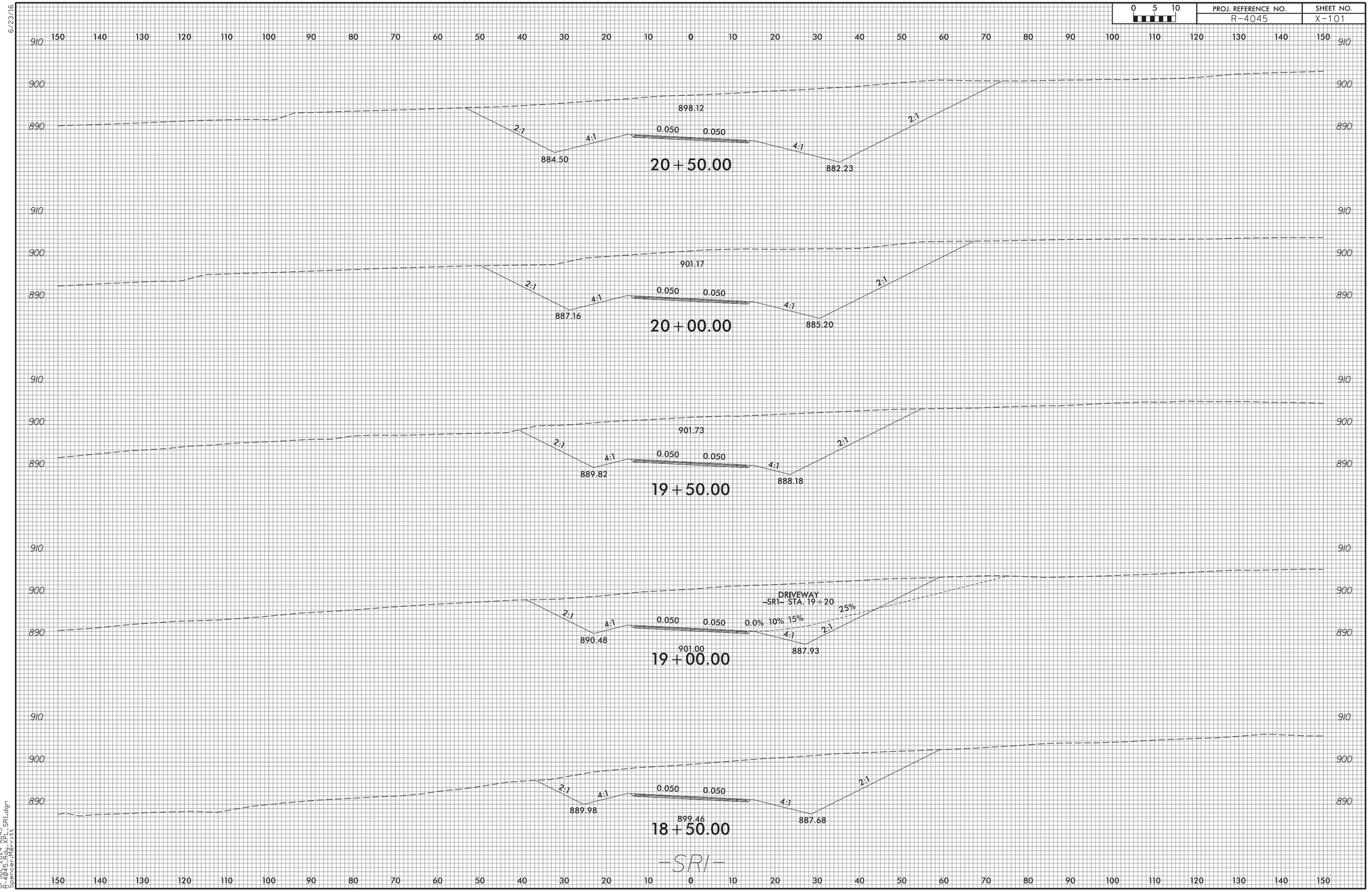
R-4045_SR1_XS.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-101



01-JUL-2024 16:43
R-4045_SR1_SR1.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-102

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

900
890
880
870

2:1 4:1 0.050 0.050 4:1 2:1

873.86 879.71 870.33

22+50.00

900
890
880

2:1 4:1 0.050 0.050 4:1 2:1

876.52 881.60 873.31

22+00.00

900
890
880

2:1 4:1 0.050 0.050 4:1 2:1

879.18 888.43 876.28

21+50.00

910
900
890
880

2:1 4:1 0.050 0.050 4:1 2:1

894.11 881.84 879.25

21+00.00

-SR1-

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_PR_XS_SR1.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-103

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

870 860 850 870

–SR2–

0.020 0.020

857.60

851.75

4:1 2:1

843.36

25+00.00

860 850 870

0.020 0.020

3:1 2:1

858.37

851.86

4:1 2:1

849.36

24+50.00

880 870 860 890

0.000 0.020

4:1 2:1

863.82

857.36

4:1 2:1

855.36

24+00.00

880 870 860

0.024 0.024

2:1 4:1

869.67

862.86

4:1 2:1

861.36

23+50.00

890 880 870 860

0.048 0.048

2:1 4:1

874.96

868.36

4:1 2:1

867.36

23+00.00

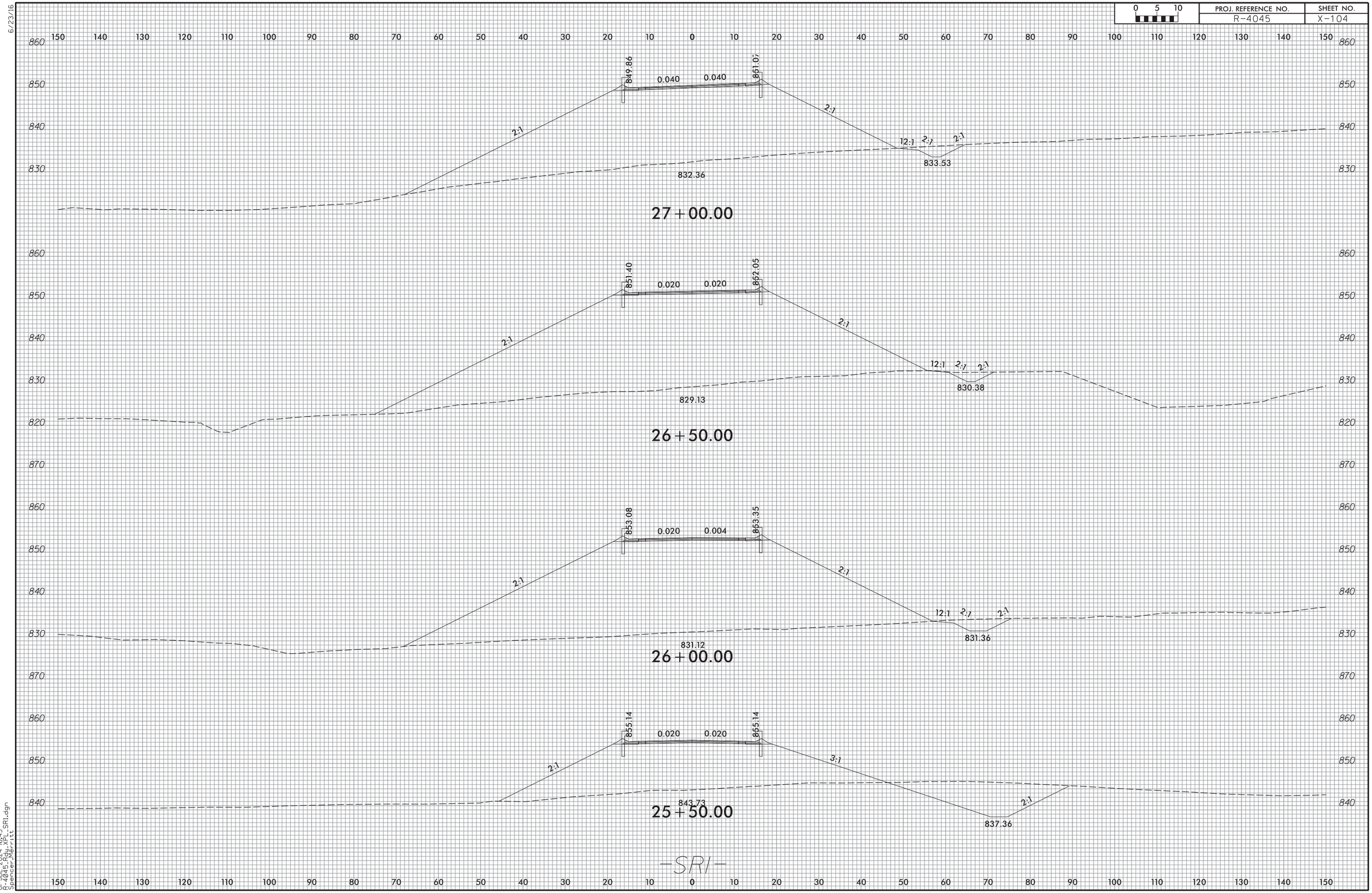
–SR1–

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_PROFILE_SR1.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-104



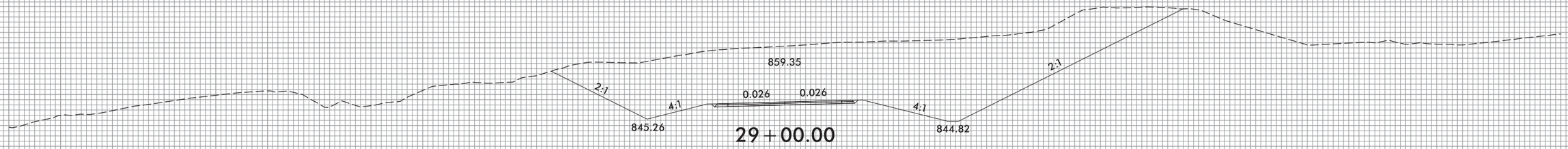
01-JUL-2024 16:43
R-4045_SR1_XS.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-105

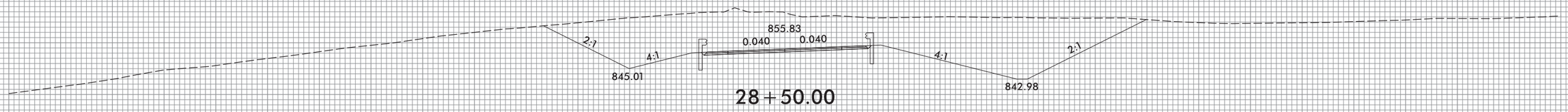
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

870
860
850



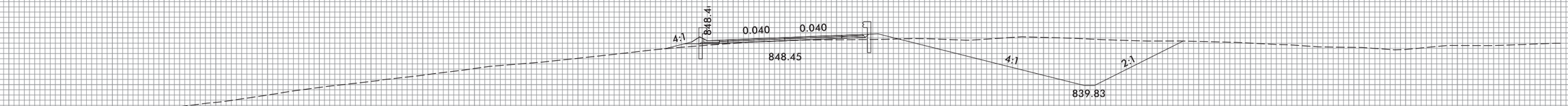
29+00.00

860
850



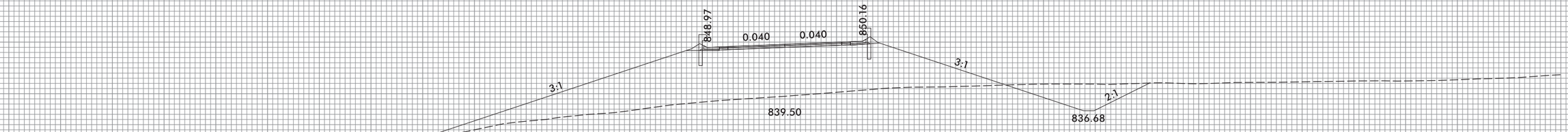
28+50.00

860
850
840



28+00.00

860
850
840
830



27+50.00

-SR1-

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_SR1_SR1.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-106

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

860 850 840

852.00
2:1
4:1
0.020
0.020
4:1
2:1
846.26
845.82

31+00.00

870 860 850 840

860.96
2:1
4:1
0.020
0.020
4:1
2:1
846.01
845.57

30+50.00

880 870 860 850 840

863.41
2:1
4:1
0.020
0.020
4:1
2:1
845.76
845.32

30+00.00

870 860 850 840

863.09
2:1
4:1
0.020
0.020
4:1
2:1
846.51
845.07

29+50.00

-SR1-

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_SR1_XS.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-107

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

860
850
870
860
850

END CONSTRUCTION –SR1– STA. 32+20.00

4:1 0.020 0.020 4:1 2:1

846.59 846.32

32+00.00

4:1 0.020 0.020 4:1 2:1

847.66 846.07

31+50.00

–SR1–

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_Roll_XS_SR1.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-108

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

860 850 840 830 820

2:1 3:1 0.020 0.020 860.22 3:1

847.50 847.39

11+00.00

870 860 850 840 830 820

2:1 3:1 0.028 0.028 854.02 2:1

850.00 848.44

10+50.00

870 860 850 840 830

BEGIN CONSTRUCTION –SR2– STA. 10+11.00

851.93

10+00.00

–SR2–

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_PROFILE_SR2.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-109

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

860
850
840
830
820

839.55

12+50.00

860
850
840
830
820

END CONSTRUCTION –SR2– STA. 12+15.00

0.012 0.020 4:1

843.05

12+00.00

860
850
840
830
820

2:1 3:1 0.020 0.020 846.49 3:1

844.50 846.37

11+50.00

-SR2-

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_SR2_XS_SR2.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-110

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

840
830
820
810

3:1

EX.

EX.

821.46

3:1

17+50.00

840
830
820
810

820.63

17+00.00

860
850
840
830

836.59

820

13+00.00

-SR2-

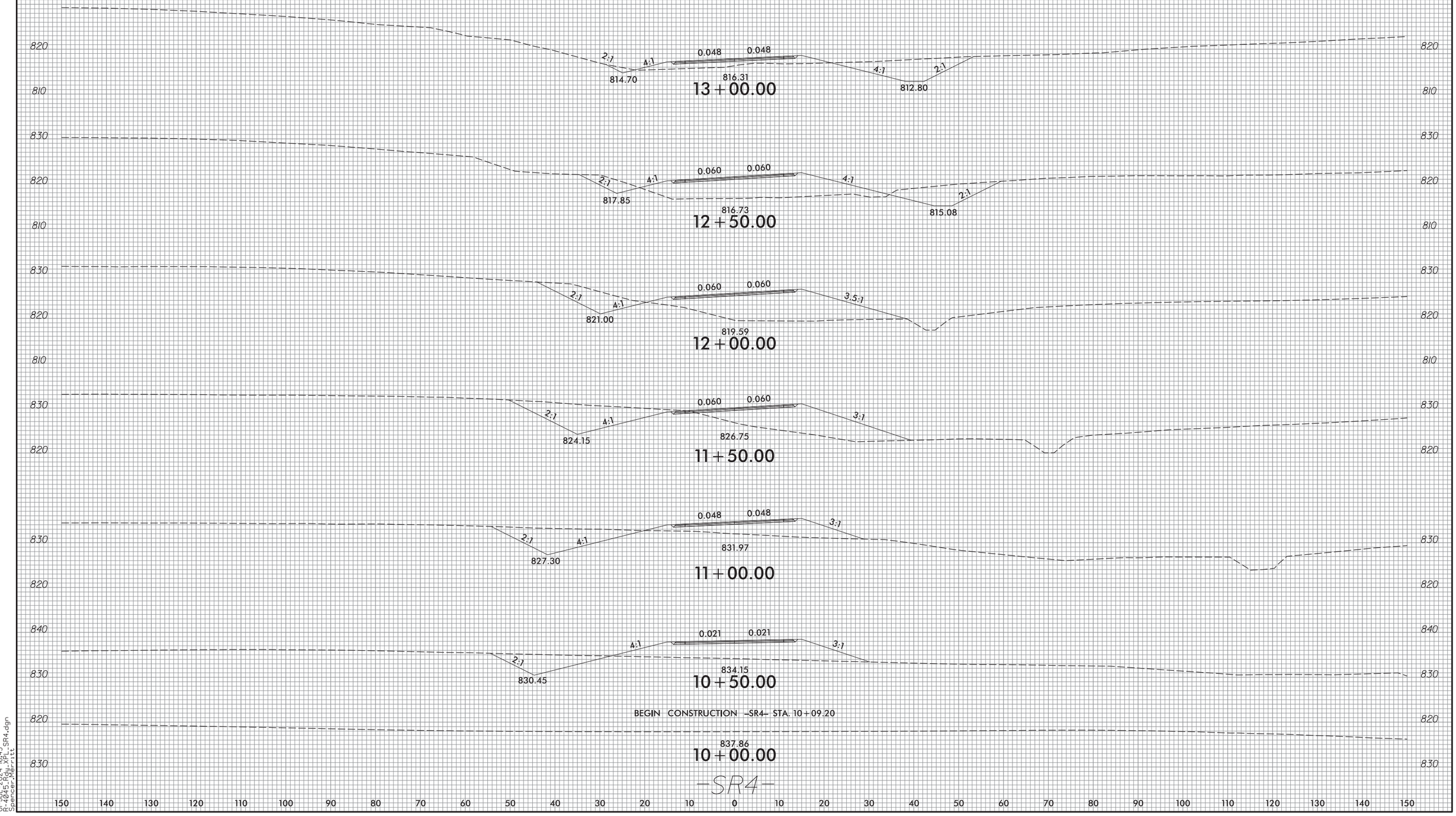
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_SR2_XS
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-111

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045_001_XS1_SR4.dgn
Spencer.Merritt

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-112

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

820 / 810 / 800 / 790

2:1 4:1 0.020 0.020 4:1 2:1

802.35 804.38 802.94

15+50.00

820 / 810 / 800 / 790

820.06

2:1 4:1 0.020 0.020 4:1 2:1

803.80 804.44

15+00.00

820 / 810 / 800 / 790

816.35

2:1 4:1 0.020 0.020 4:1 2:1

805.25 805.94

14+50.00

820 / 810 / 800

2:1 4:1 0.020 0.000 4:1 2:1

808.40 807.80 808.22

14+00.00

820 / 810 / 800

2:1 4:1 0.024 0.024 4:1 2:1

811.55 809.04 810.51

13+50.00

-SR4-

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

01-JUL-2024 16:43
R-4045 RDWAY SR4.dgn
Spencer.Merritt

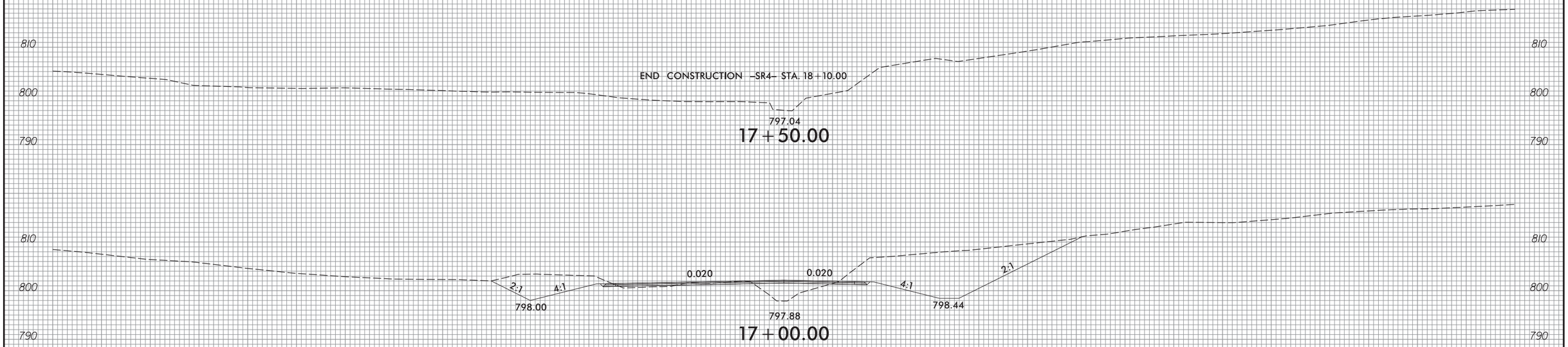
6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-113

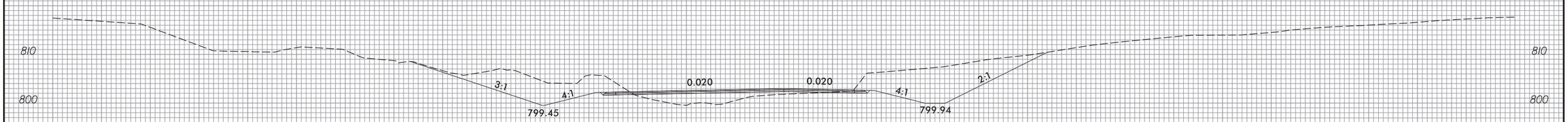
END CONSTRUCTION –SR4– STA. 18+10.00

797.04

17+50.00

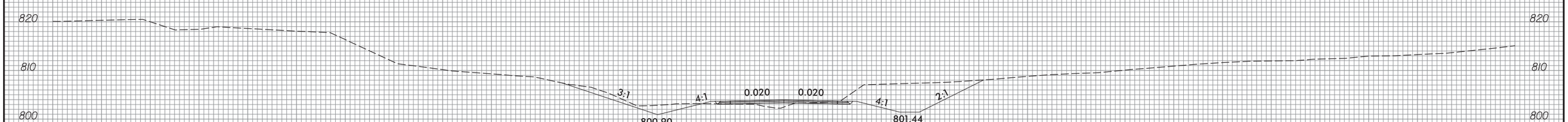


17+00.00



801.80

16+50.00



802.48

16+00.00

–SR4–

01-JUL-2024 16:43
R-4045-SR4-XSL-SR4.dgn
Spencer.Merritt

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-114

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

900
895
890
885

END CONSTRUCTION –DR1– STA. 11+52.00

4:1

893.07
11+50.00

895
890
885

0.020

2:1 4:1 4:1 2:1

891.64 896.37 891.37
11+00.00

898.59
0.020

2:1 4:1 4:1 2:1

890.89 890.37
10+50.00

905
900
895

BEGIN CONSTRUCTION –DR1– STA. 10+11.00

901.01
10+00.00

–DR1–

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

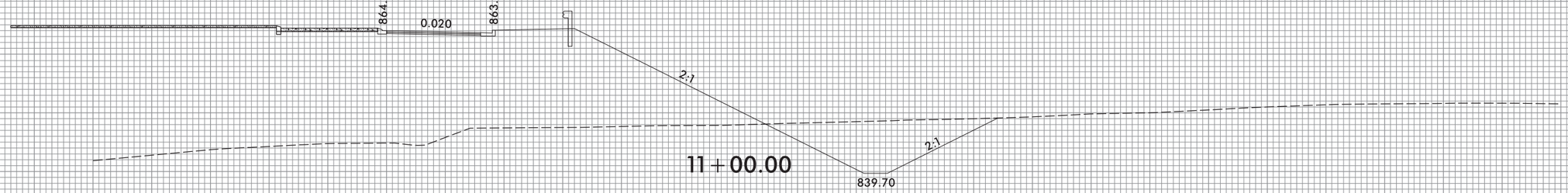
01-JUL-2024 16:43
R-4045_PROFILE_DR1.dgn
Spencer.Merritt

6/23/16

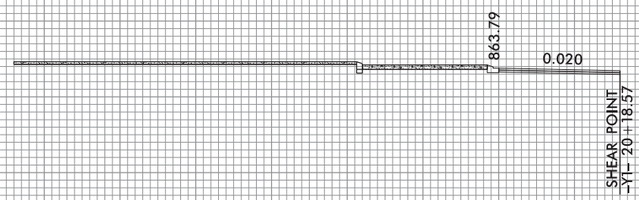
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-115

90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210

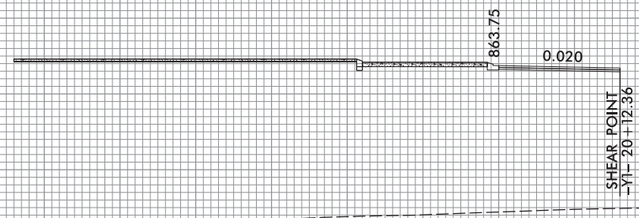
880 870 860 850



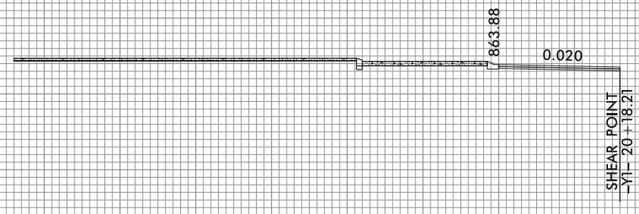
11+00.00



10+75.00



10+50.00



10+25.00

-RAB-

01-JUL-2024 16:43
R-4045_RAB
Spencer.Merritt
R-4045_RAB.dgn

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-4045	X-116

90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210

880 870 860 850 840

864.89

0.020

SHEAR POINT
–YTRPD– 22+24.01

11+75.00

880 870 860 850

864.60

0.020

SHEAR POINT
–YTRPD– 22+43.41

11+50.00

880 870 860 850

864.30

0.020

863.88

2:1

2:1

839.45

11+25.00

–RAB–

90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210

01-JUL-2024 16:43
R-4045_PLT_XSL_RAB.dgn
Spencer.Merritt

6/23/16

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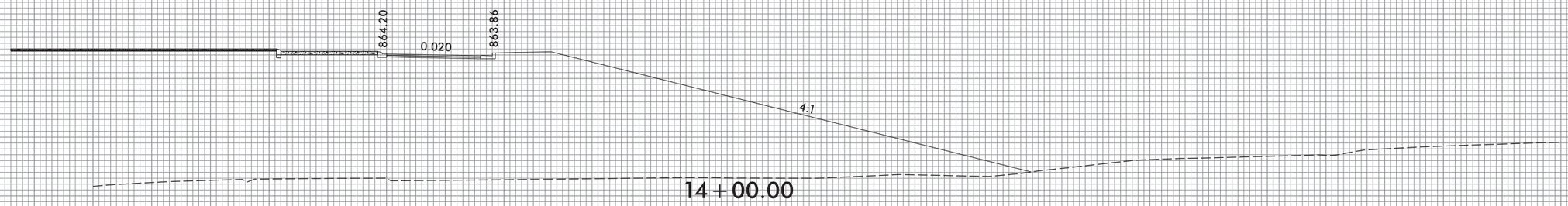

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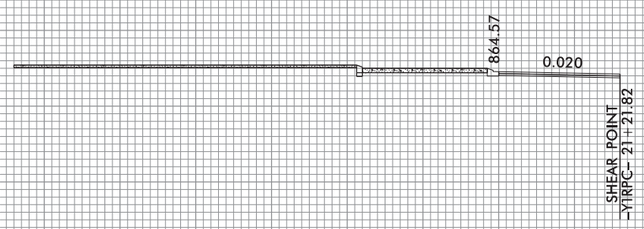

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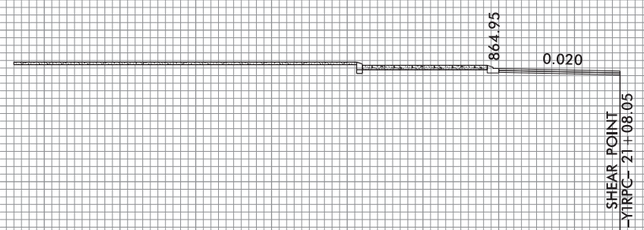

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800
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6/23/16

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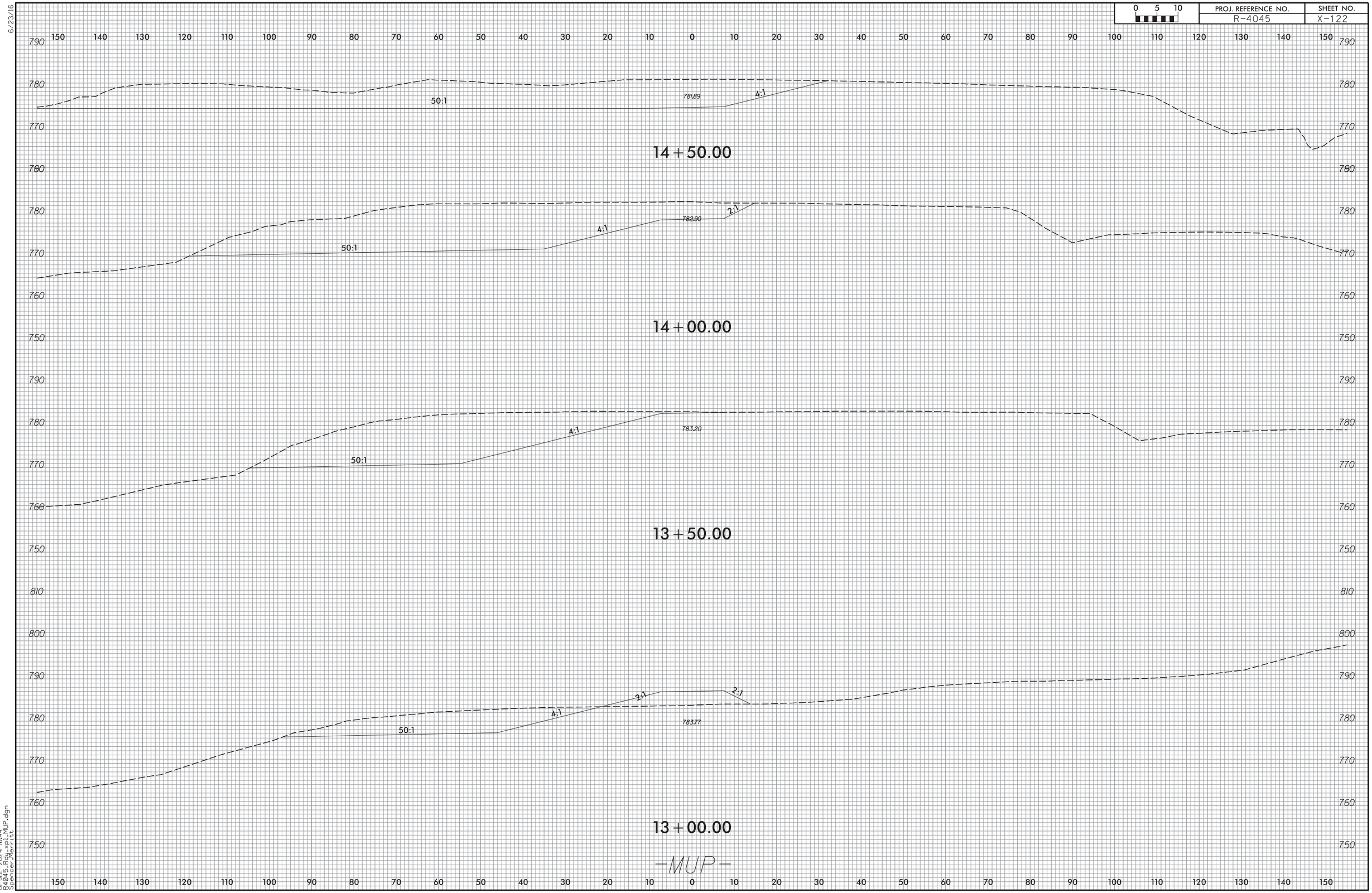

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6/23/16

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6/23/16

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2:1
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-MUP-

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Protected Species/ Section 7

DRAFT
NATURAL RESOURCES TECHNICAL REPORT

US 74 – SR 1168 (Lattimore Road) Intersection, Upgrade at-grade intersection to interchange and upgrade US 74 to full control of access from west of US 74 business (Ellenboro Road) to east of Bridges 48 and 49 over Sandy Run
Cleveland County, NC

STIP R-4045 & BR-0012
WBS Element No. 34598.1.2

THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Division 12

June 2021

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1.0 INTRODUCTION

The North Carolina Department of Transportation (NCDOT) proposes to upgrade at-grade intersection at US 74 and SR 1168 (Lattimore Road) to interchange and upgrade US 74 to full control of access from west of US 74 business (Ellenboro Road) to east of Bridges 48 and 49 over Sandy Run in Cleveland County (Figures 1 and 2). The following Natural Resources Technical Report (NRTR) has been prepared to assist in the preparation of a document for the purposes of the National Environmental Policy Act (NEPA) or the State Environmental Policy Act (SEPA).

2.0 METHODOLOGY

All work was conducted in accordance with the NCDOT Environmental Coordination and Permitting's Preparing Natural Resources Technical Reports Procedure and the latest NRTR Template issued November 2017. Field work was conducted on April 13-15, 2021 as well as on May 10-11, 2021. Jurisdictional areas identified in the study area have not been verified by the U.S. Army Corps of Engineers (USACE) and the North Carolina Division of Water Resources (NCDWR). Documentation of this jurisdictional determination will be provided upon receipt from the agencies. The principal personnel contributing to the field work and document is provided in Appendix B.

3.0 TERRESTRIAL COMMUNITIES

Six terrestrial communities were identified in the study area. Figure 4 shows the location and extent of these terrestrial communities. Terrestrial community data are presented in the context of total coverage of each type within the study area (Table 1).

Table 1. Coverage of terrestrial communities in the study area

Community	Dominant Species (scientific name)	Coverage (ac.)
Maintained/Disturbed	Japanese honeysuckle (*Lonicera japonica*) red fescue (*Festuca rubra*) kudzu (*Pueraria montana*)	256
Mixed hardwood forest	tulip tree (*Liriodendron tulipifera*) red maple (*Acer rubrum*) pignut hickory (*Carya glabra*)	61
Mixed pine/Hardwood forest	sweetgum (*Liquidambar styraciflua*) red maple (*Acer rubrum*) loblolly pine (*Pinus taeda*)	4
Mixed pine forest	loblolly pine (*Pinus taeda*) shortleaf pine (*Pinus echinate*) Christmas fern (*polystichum acrostichoides*)	2
Mixed hardwood/Pine forest	loblolly pine (*Pinus taeda*) shortleaf pine (*Pinus echinate*) red maple (*Acer rubrum*)	8
Pine plantation	loblolly pine (*Pinus taeda*)	4
	Total	**335**

4.0 PROTECTED SPECIES

4.1 Endangered Species Act Protected Species

As of July 17, 2020, the United States Fish and Wildlife (USFWS) lists two federally protected species, under the Endangered Species Act (ESA) for Cleveland County (Table 2). For each species, a discussion of the presence or absence of habitat is included below along with the Biological Conclusion rendered based on survey results in the study area.

Table 2. ESA federally protected species listed for Cleveland County.

Scientific Name	Common Name	Federal Status	Habitat Present	Biological Conclusion
Hexastylis naniflora	Dwarf-flowered heartleaf	T	Yes	Unresolved
Myotis septentrionalis	Northern long-eared bat	T	Undetermined	MA-NLAA

T – Threatened
MA-NLAA – May Affect – Not Likely to Adversely Affect

Dwarf-flowered heartleaf
USFWS optimal survey window: March - May

Biological Conclusion: Unresolved

Dwarf-flowered heartleaf is present within the study area. RK&K biologists; Hal Bain, Neil Medlin and Gordon Marsh performed a field survey May 10-11, 2021 and observed 283 plants within two populations. This species was observed on the north facing slopes along stream SC within the study area. The moist soils and semi-open canopy of the mixed hardwood forest provide habitat for this species. These two populations were first observed by NHP on April 4, 2006 (EO Num: 328) and are current. There is also a third population located approx. 300 ft. northwest of the study area, which is a part of the same elemental occurrence. Project design has not been finalized; therefore, the biological conclusion has been determined as unresolved until additional information is available.

Northern long-eared bat
USFWS optimal survey window: June 1 – August 15

Biological Conclusion: May Affect – Not Likely to Adversely Affect

Review of the NCNHP records, updated January 2021, indicates no known northern long-eared bat occurrences within 1.0 mile of the study area. Due to no known hibernacula or maternity roosts and the lack of known populations, this project has met the criteria for the 4(d) rule and no further action is required.

4.2 Bald and Golden Eagle Protection Act

The bald eagle is protected under the Bald and Golden Eagle Protection Act and enforced by the USFWS. Habitat for the bald eagle primarily consists of mature forests in proximity

to large bodies of open water for foraging. Large dominant trees are utilized for nesting sites, typically within 1.0 mile of open water.

A desktop-GIS assessment of the project study area, as well as the area within a 1.0-mile radius of the project limits, was performed on May 5, 2021 using 2017 color aerials. No water bodies large enough or sufficiently open to be considered potential feeding sources were identified. Since there was no foraging habitat within the review area, a survey of the project study area and the area within 660 feet of the project limits was not conducted. Additionally, a review of the January 2021 NHP database on May 5, 2021 revealed no known occurrences of this species within 1.0 mile of the project study area. Due to the lack of habitat, known occurrences, and minimal impact anticipated for this project, it has been determined that this project will not affect this species.

5.0 WATER RESOURCES

Water resources in the study area are part of the Broad River basin [U.S. Geological Survey (USGS) Hydrologic Unit [03050105]]. Eight streams were identified in the study area (Table 3). The location of each stream is shown in Figure 3.

Table 3. Streams in study area

Stream Name	Map ID	NCDWR Index Number	Best Usage Classification	Bank Height (ft)	Bankfull width (ft)	Depth (in)
UT to Sandy Run Creek	SA	9-46	C	3-4	10	12-24
UT to Sandy Run Creek	SB	9-46	C	3	8	6-12
UT to Sandy Run Creek	SC	9-46	C	1-3	4-6	2-6
UT to Sandy Run Creek	SD	9-46	C	2	4	4
UT to Sandy Run Creek	SE	9-46	C	3-5	3-4	3-12
UT Sandy Run Creek	SF	9-46	C	2	2-3	2-3
UT Sandy Run Creek	SG	9-46	C	1-3	4	3-6
Sandy Run Creek	Sandy Run Creek	9-46	C	4-6	30-50	18-48

There are no Outstanding Resource Water (ORW), designated High Quality Waters (HQW), or water supply watersheds (WS-I or WS-II) within 1.0 mile of the study area. The North Carolina 2018 Final 303(d) list does not identify any impaired streams within 1.0 mile of the study area.

6.0 REGULATORY CONSIDERATIONS

6.1 Clean Water Act Waters of the U.S.

Eight potential jurisdictional streams were identified in the study area (Table 4). The location of these streams is shown on Figure 3. North Carolina Stream Assessment Method (NCSAM) and NCDWR stream identification forms are included a separate Preliminary Jurisdictional Determination (PJD) Package. All potential jurisdictional streams in the study area have been designated as ~~warm~~ cool water streams for the purposes of stream mitigation.

Table 4. Characteristics of potential jurisdictional streams in the study area

Map ID	Length (ft.)	Classification	Compensatory Mitigation Required	River Basin Buffer	Figure Number
SA	639	Perennial	Yes	No	3-2
SB	3523	Perennial	Yes	No	3-1
SC	584	Perennial	Yes	No	3-1
SC (Int)	1348	Intermittent	Yes	No	3-1
SD	423	Perennial	Yes	No	3-1
SD (Int)	169	Intermittent	Yes	No	3-1
SE	303	Perennial	Yes	No	3-1
SF	68	Perennial	Yes	No	3-1
SG	103	Perennial	Yes	No	3-1
SG (Int)	306	Intermittent	Yes	No	3-1
Sandy Run	1192	Perennial	Yes	No	3-2
Total	**8,658**				

* NCSAM forms are available in the PJD package

Six potential jurisdictional wetlands were identified within the study area (Table 5). The location of these wetlands is shown on Figure 3. All wetlands in the study area are located within the Broad basin [USGS Hydrologic Unit [03050105]]. USACE wetland determination forms and NCWAM forms for each site are included in a separate Preliminary Jurisdictional Determination Package.

Table 5. Characteristics of potential jurisdictional wetlands in the study area

Map ID	NCWAM Classification	NCWAM Rating	Hydrologic Classification	Area (ac.) in Study Area	Figure Number
WB	Floodplain pool	High	Riparian	0.01	3-1
WC	Floodplain pool	High	Riparian	0.13	3-1
WD	Headwater forest	Low	Riparian	0.30	3-2
WE	Seep	Med	Non-Riparian	0.32	3-1
WF	Seep	Low	Non-Riparian	0.02	3-1
WG	Bottomland hardwood forest	Low	Riparian	0.02	3-1
			Total	**0.80**	

6.2 Construction Moratoria

A construction moratorium will not be required for this project.

6.3 N.C. River Basin Buffer Rules

River basin buffer rules do not apply in the Broad River basin.

6.4 Rivers and Harbors Act Section 10 Navigable Waters

There are no streams or rivers that have been designated by the USACE as a Navigable Water under Section 10 of the Rivers and Harbors Act.

7.0 REFERENCES

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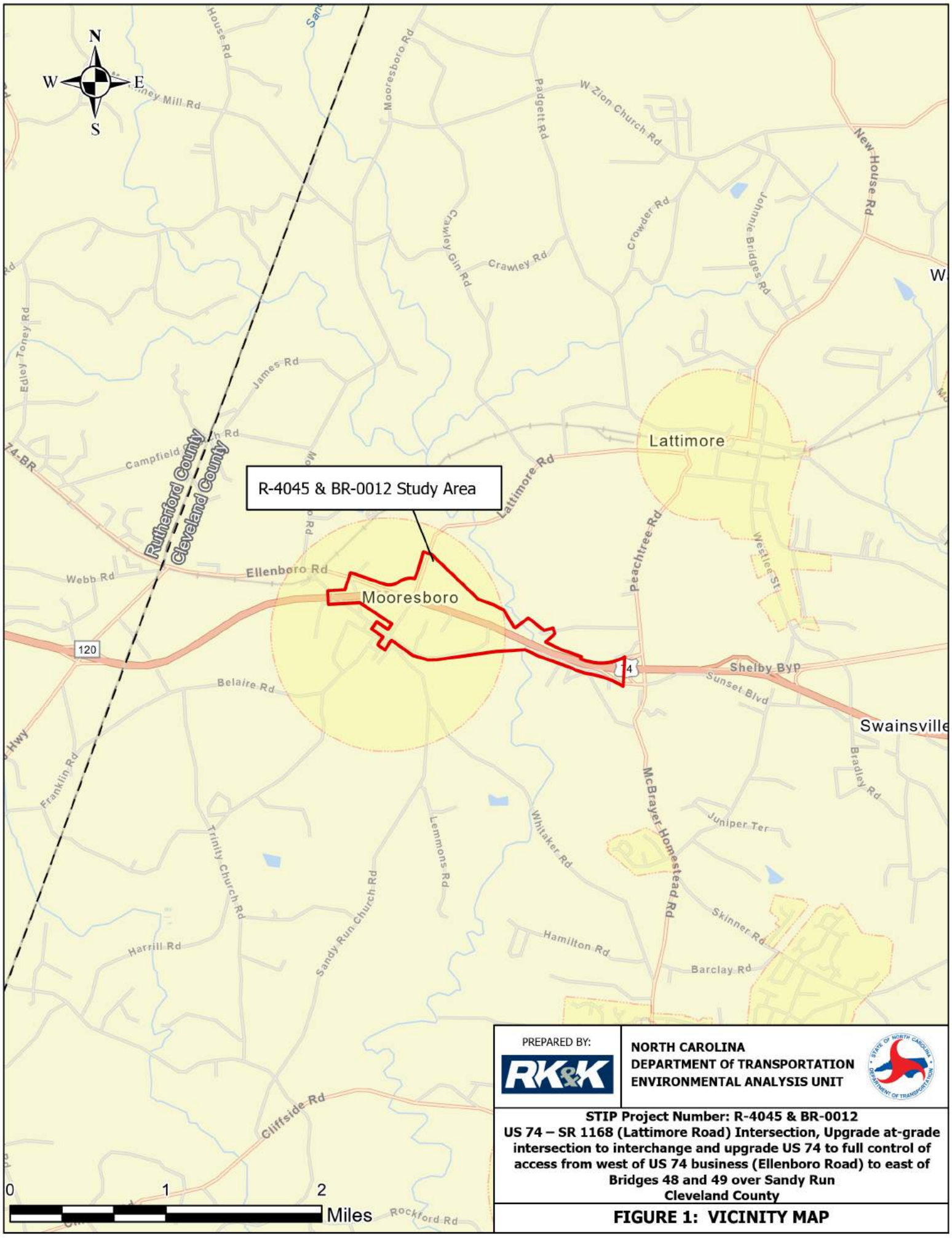
Appendix A

Figures

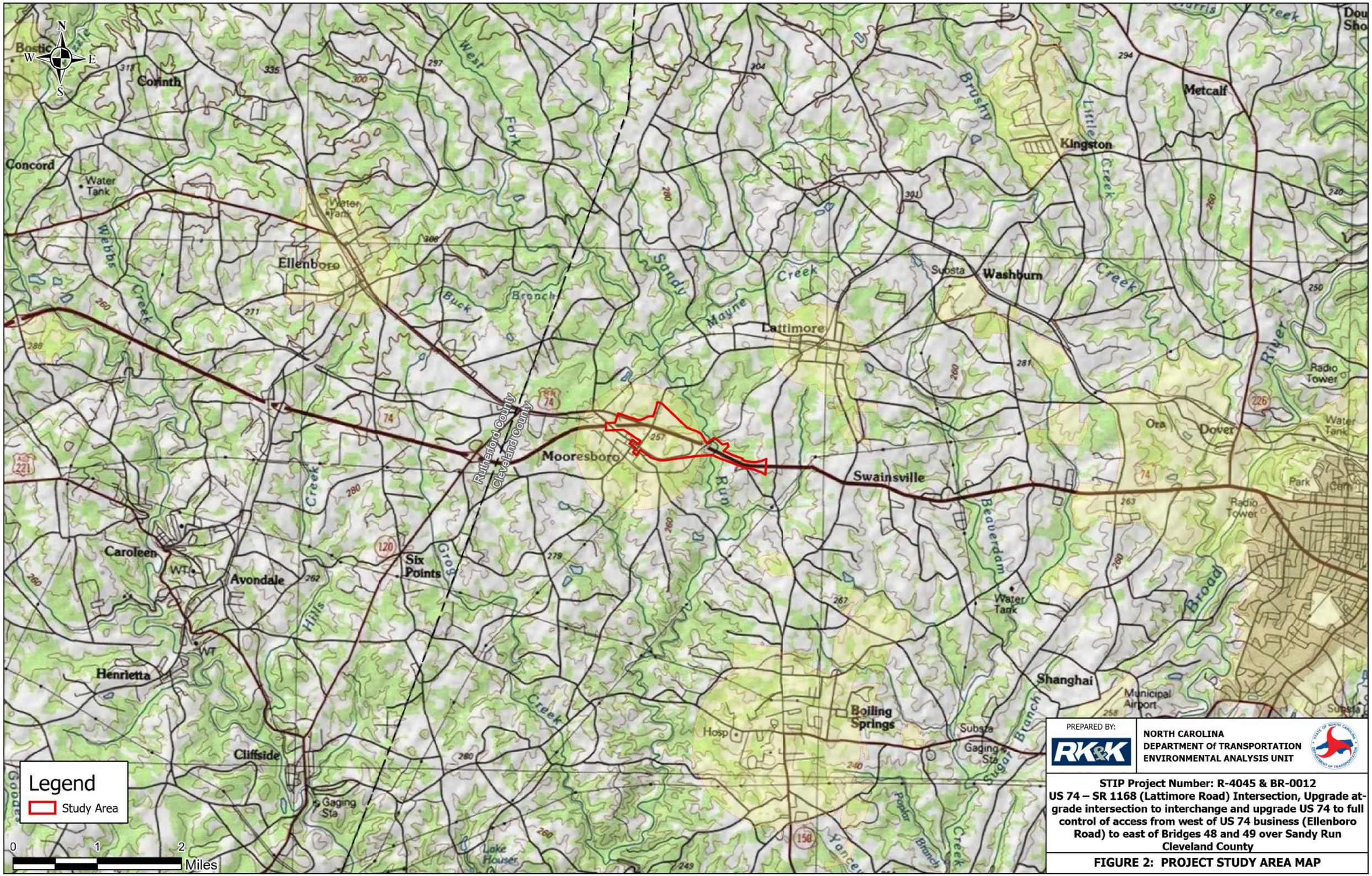


PREPARED BY: RK&K

NORTH CAROLINA
DEPARTMENT Of TRANSPORTATION
ENVIRONMENTAL ANALYSIS UNIT

STIP Project Number: R-4045 & BR-0012
US 74 – SR 1168 (Lattimore Road) Intersection, Upgrade at-grade intersection to interchange and upgrade US 74 to full control of access from west of US 74 business (Ellenboro Road) to east of Bridges 48 and 49 over Sandy Run
Cleveland County

FIGURE 1: VICINITY MAP



PREPARED BY:

RK&K

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FIGURE 2: PROJECT STUDY AREA MAP

PREPARED BY: RK&K

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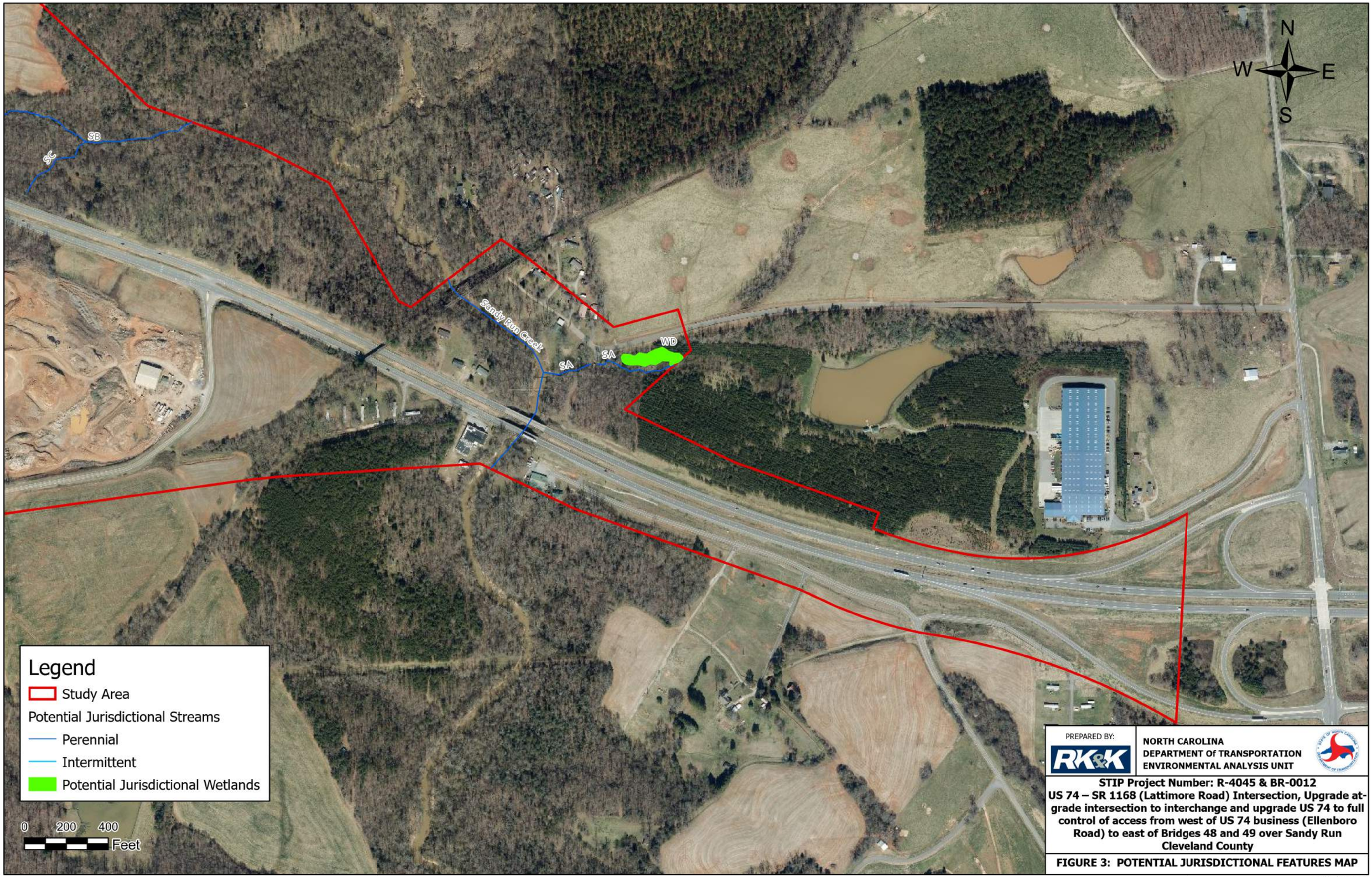
FIGURE 3: POTENTIAL JURISDICTIONAL FEATURES MAP



PREPARED BY: RK&K

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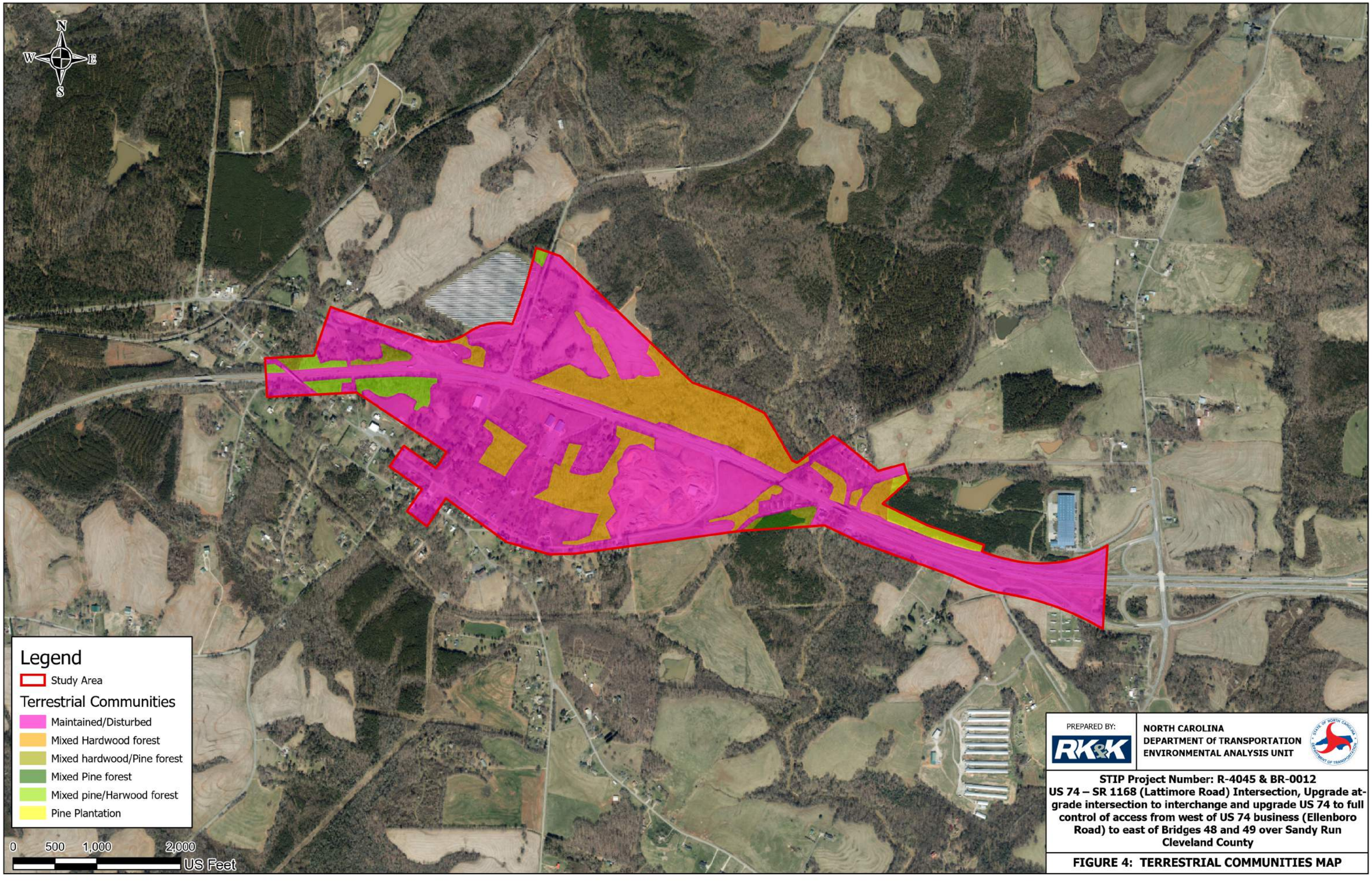

PREPARED BY: RK&K

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FIGURE 4: TERRESTRIAL COMMUNITIES MAP

Appendix B

Qualifications of Contributors

Principal Investigator:	Gordon Marsh, Rummel Klepper and Kahl, LLP
Education:	Master of Environmental Assessment, NC State University, 2019 B.S. Environmental Science, UNC Wilmington, 2017
Experience:	Associate Environmental Scientist, Rummel Klepper and Kahl, LLP, 2017-Present
Responsibilities:	Preparation of forms, wetland and stream delineations, natural communities assessment, NRTR document preparation, GIS surveys and mapping

Investigator:	Hal Bain, Rummel Klepper and Kahl, LLP
Education:	M.S. Coastal Ecology Track, UNC Wilmington, 1989 B.S. Biology, Campbell University, 1985
Experience:	Senior Environmental Project Scientist, Rummel Klepper and Kahl, LLP, 2009-Present Natural Resources Team Leader, ARCADIS, 2003-2008 Biological Surveys Group Leader, NCDOT, 1995-2003 Senior Biologist, NCDOT, 1992-1995 Biology Teacher/Coach, Wake County Public Schools, 1989-1992
Responsibilities:	T/E species assessment, wetland and stream delineation and QA/QC

Investigator:	Neil Medlin, Rummel Klepper and Kahl, LLP
Education:	M.A. Biology, Appalachian State University, 1986 B.S. Biology, Appalachian State University, 1984
Experience:	Manager, Natural Resources, Rummel Klepper and Kahl, LLP, 2016-Present Biological Surveys Group Leader, NCDOT, 2012-2016 Environmental Specialist/Supervisor, NCDOT, 2002-2012 Environmental Biologist, NCDWQ, 1990-2002 Environmental Specialist, FLDER, 1986-1990
Responsibilities:	T/E species assessment and QA/QC

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NATURAL RESOURCES TECHNICAL REPORT

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THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Division 12

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1.0 INTRODUCTION

The North Carolina Department of Transportation (NCDOT) proposes to upgrade at-grade intersection at US 74 and SR 1168 (Lattimore Road) to interchange and upgrade US 74 to full control of access from west of US 74 business (Ellenboro Road) to east of Bridges 48 and 49 over Sandy Run in Cleveland County (Figures 1 and 2). The following Natural Resources Technical Report (NRTR) has been prepared to assist in the preparation of a document for the purposes of the National Environmental Policy Act (NEPA) or the State Environmental Policy Act (SEPA).

2.0 METHODOLOGY

All work was conducted in accordance with the NCDOT Environmental Coordination and Permitting's Preparing Natural Resources Technical Reports Procedure and the latest NRTR Template issued November 2017. Field work was conducted on April 13-15, 2021 as well as on May 10-11, 2021. Jurisdictional areas identified in the study area have not been verified by the U.S. Army Corps of Engineers (USACE) and the North Carolina Division of Water Resources (NCDWR). Documentation of this jurisdictional determination will be provided upon receipt from the agencies. The principal personnel contributing to the field work and document is provided in Appendix B.

3.0 TERRESTRIAL COMMUNITIES

Six terrestrial communities were identified in the study area. Figure 4 shows the location and extent of these terrestrial communities. Terrestrial community data are presented in the context of total coverage of each type within the study area (Table 1).

Table 1. Coverage of terrestrial communities in the study area

Community	Dominant Species (scientific name)	Coverage (ac.)
Maintained/Disturbed	Japanese honeysuckle (*Lonicera japonica*) red fescue (*Festuca rubra*) kudzu (*Pueraria montana*)	256
Mixed hardwood forest	tulip tree (*Liriodendron tulipifera*) red maple (*Acer rubrum*) pignut hickory (*Carya glabra*)	61
Mixed pine/Hardwood forest	sweetgum (*Liquidambar styraciflua*) red maple (*Acer rubrum*) loblolly pine (*Pinus taeda*)	4
Mixed pine forest	loblolly pine (*Pinus taeda*) shortleaf pine (*Pinus echinate*) Christmas fern (*polystichum acrostichoides*)	2
Mixed hardwood/Pine forest	loblolly pine (*Pinus taeda*) shortleaf pine (*Pinus echinate*) red maple (*Acer rubrum*)	8
Pine plantation	loblolly pine (*Pinus taeda*)	4
	Total	**335**

4.0 PROTECTED SPECIES

4.1 Endangered Species Act Protected Species

As of July 17, 2020, the United States Fish and Wildlife (USFWS) lists two federally protected species, under the Endangered Species Act (ESA) for Cleveland County (Table 2). For each species, a discussion of the presence or absence of habitat is included below along with the Biological Conclusion rendered based on survey results in the study area.

Table 2. ESA federally protected species listed for Cleveland County.

Scientific Name	Common Name	Federal Status	Habitat Present	Biological Conclusion
Hexastylis naniflora	Dwarf-flowered heartleaf	T	Yes	Unresolved
Myotis septentrionalis	Northern long-eared bat	T	Undetermined	MA-NLAA

T – Threatened
MA-NLAA – May Affect – Not Likely to Adversely Affect

Dwarf-flowered heartleaf
USFWS optimal survey window: March - May

Biological Conclusion: Unresolved

Dwarf-flowered heartleaf is present within the study area. RK&K biologists; Hal Bain, Neil Medlin and Gordon Marsh performed a field survey May 10-11, 2021 and observed 283 plants within two populations. This species was observed on the north facing slopes along stream SC within the study area. The moist soils and semi-open canopy of the mixed hardwood forest provide habitat for this species. These two populations were first observed by NHP on April 4, 2006 (EO Num: 328) and are current. There is also a third population located approx. 300 ft. northwest of the study area, which is a part of the same elemental occurrence. Project design has not been finalized; therefore, the biological conclusion has been determined as unresolved until additional information is available.

Northern long-eared bat
USFWS optimal survey window: June 1 – August 15

Biological Conclusion: May Affect – Not Likely to Adversely Affect

Review of the NCNHP records, updated January 2021, indicates no known northern long-eared bat occurrences within 1.0 mile of the study area. Due to no known hibernacula or maternity roosts and the lack of known populations, this project has met the criteria for the 4(d) rule and no further action is required.

4.2 Bald and Golden Eagle Protection Act

The bald eagle is protected under the Bald and Golden Eagle Protection Act and enforced by the USFWS. Habitat for the bald eagle primarily consists of mature forests in proximity

to large bodies of open water for foraging. Large dominant trees are utilized for nesting sites, typically within 1.0 mile of open water.

A desktop-GIS assessment of the project study area, as well as the area within a 1.0-mile radius of the project limits, was performed on May 5, 2021 using 2017 color aerials. No water bodies large enough or sufficiently open to be considered potential feeding sources were identified. Since there was no foraging habitat within the review area, a survey of the project study area and the area within 660 feet of the project limits was not conducted. Additionally, a review of the January 2021 NHP database on May 5, 2021 revealed no known occurrences of this species within 1.0 mile of the project study area. Due to the lack of habitat, known occurrences, and minimal impact anticipated for this project, it has been determined that this project will not affect this species.

5.0 WATER RESOURCES

Water resources in the study area are part of the Broad River basin [U.S. Geological Survey (USGS) Hydrologic Unit [03050105]]. Eight streams were identified in the study area (Table 3). The location of each stream is shown in Figure 3.

Table 3. Streams in study area

Stream Name	Map ID	NCDWR Index Number	Best Usage Classification	Bank Height (ft)	Bankfull width (ft)	Depth (in)
UT to Sandy Run Creek	SA	9-46	C	3-4	10	12-24
UT to Sandy Run Creek	SB	9-46	C	3	8	6-12
UT to Sandy Run Creek	SC	9-46	C	1-3	4-6	2-6
UT to Sandy Run Creek	SD	9-46	C	2	4	4
UT to Sandy Run Creek	SE	9-46	C	3-5	3-4	3-12
UT Sandy Run Creek	SF	9-46	C	2	2-3	2-3
UT Sandy Run Creek	SG	9-46	C	1-3	4	3-6
Sandy Run Creek	Sandy Run Creek	9-46	C	4-6	30-50	18-48

There are no Outstanding Resource Water (ORW), designated High Quality Waters (HQW), or water supply watersheds (WS-I or WS-II) within 1.0 mile of the study area. The North Carolina 2018 Final 303(d) list does not identify any impaired streams within 1.0 mile of the study area.

6.0 REGULATORY CONSIDERATIONS

6.1 Clean Water Act Waters of the U.S.

Eight potential jurisdictional streams were identified in the study area (Table 4). The location of these streams is shown on Figure 3. North Carolina Stream Assessment Method (NCSAM) and NCDWR stream identification forms are included a separate Preliminary Jurisdictional Determination (PJD) Package. All potential jurisdictional streams in the study area have been designated as warm water streams for the purposes of stream mitigation.

Table 4. Characteristics of potential jurisdictional streams in the study area

Map ID	Length (ft.)	Classification	Compensatory Mitigation Required	River Basin Buffer	Figure Number
SA	639	Perennial	Yes	No	3-2
SB	3523	Perennial	Yes	No	3-1
SC	584	Perennial	Yes	No	3-1
SC (Int)	1348	Intermittent	Yes	No	3-1
SD	423	Perennial	Yes	No	3-1
SD (Int)	169	Intermittent	Yes	No	3-1
SE	303	Perennial	Yes	No	3-1
SF	68	Perennial	Yes	No	3-1
SG	103	Perennial	Yes	No	3-1
SG (Int)	306	Intermittent	Yes	No	3-1
Sandy Run	1192	Perennial	Yes	No	3-2
Total	**8,658**				

* NCSAM forms are available in the PJD package

Six potential jurisdictional wetlands were identified within the study area (Table 5). The location of these wetlands is shown on Figure 3. All wetlands in the study area are located within the Broad basin [USGS Hydrologic Unit [03050105]]. USACE wetland determination forms and NCWAM forms for each site are included in a separate Preliminary Jurisdictional Determination Package.

Table 5. Characteristics of potential jurisdictional wetlands in the study area

Map ID	NCWAM Classification	NCWAM Rating	Hydrologic Classification	Area (ac.) in Study Area	Figure Number
WB	Floodplain pool	High	Riparian	0.01	3-1
WC	Floodplain pool	High	Riparian	0.13	3-1
WD	Headwater forest	Low	Riparian	0.30	3-2
WE	Seep	Med	Non-Riparian	0.32	3-1
WF	Seep	Low	Non-Riparian	0.02	3-1
WG	Bottomland hardwood forest	Low	Riparian	0.02	3-1
			Total	**0.80**	

6.2 Construction Moratoria

A construction moratorium will not be required for this project.

6.3 N.C. River Basin Buffer Rules

River basin buffer rules do not apply in the Broad River basin.

6.4 Rivers and Harbors Act Section 10 Navigable Waters

There are no streams or rivers that have been designated by the USACE as a Navigable Water under Section 10 of the Rivers and Harbors Act.

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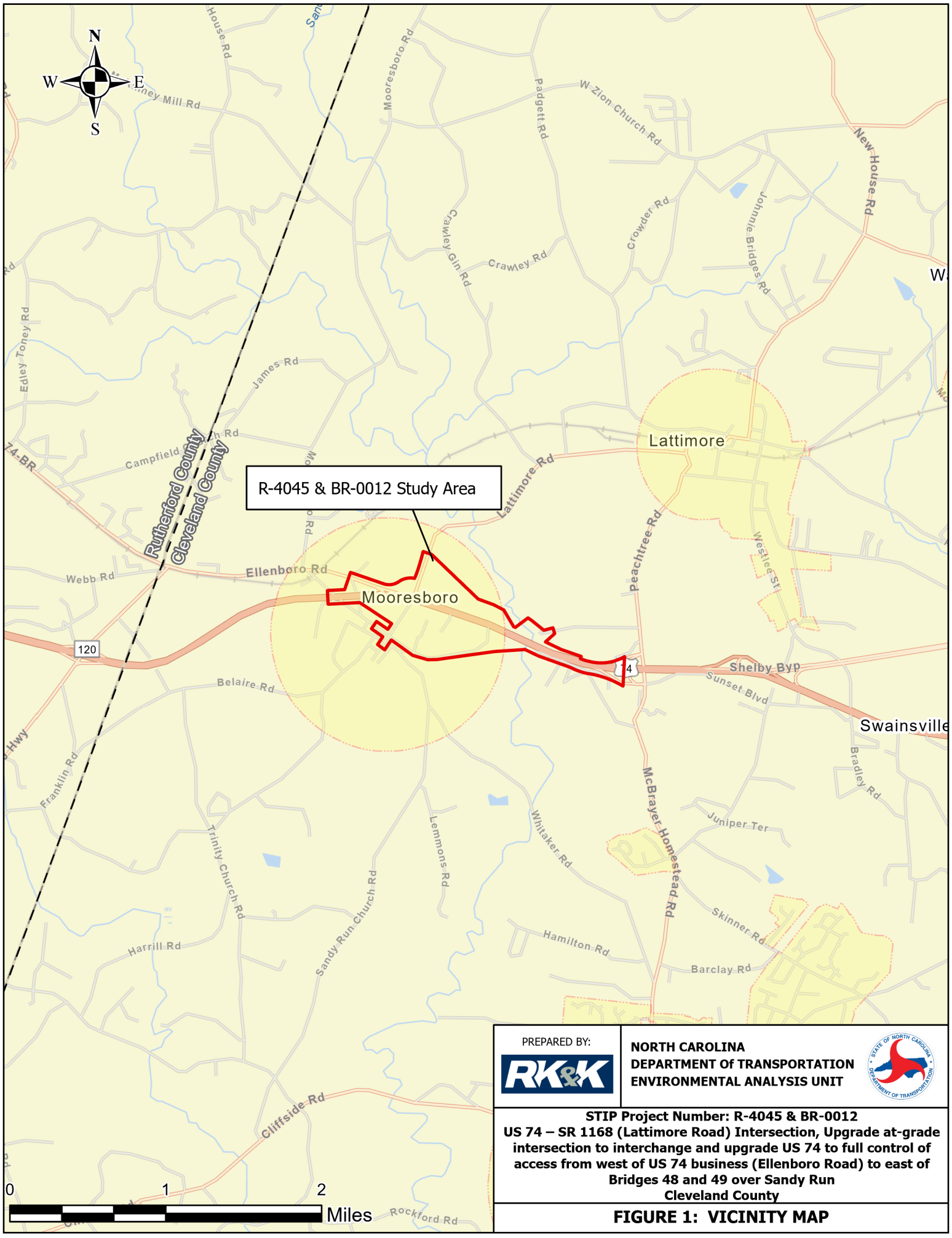
Appendix A

Figures



PREPARED BY:

RK&K

NORTH CAROLINA
DEPARTMENT Of TRANSPORTATION
ENVIRONMENTAL ANALYSIS UNIT

STIP Project Number: R-4045 & BR-0012
US 74 – SR 1168 (Lattimore Road) Intersection, Upgrade at-grade intersection to interchange and upgrade US 74 to full control of access from west of US 74 business (Ellenboro Road) to east of Bridges 48 and 49 over Sandy Run
Cleveland County

FIGURE 1: VICINITY MAP

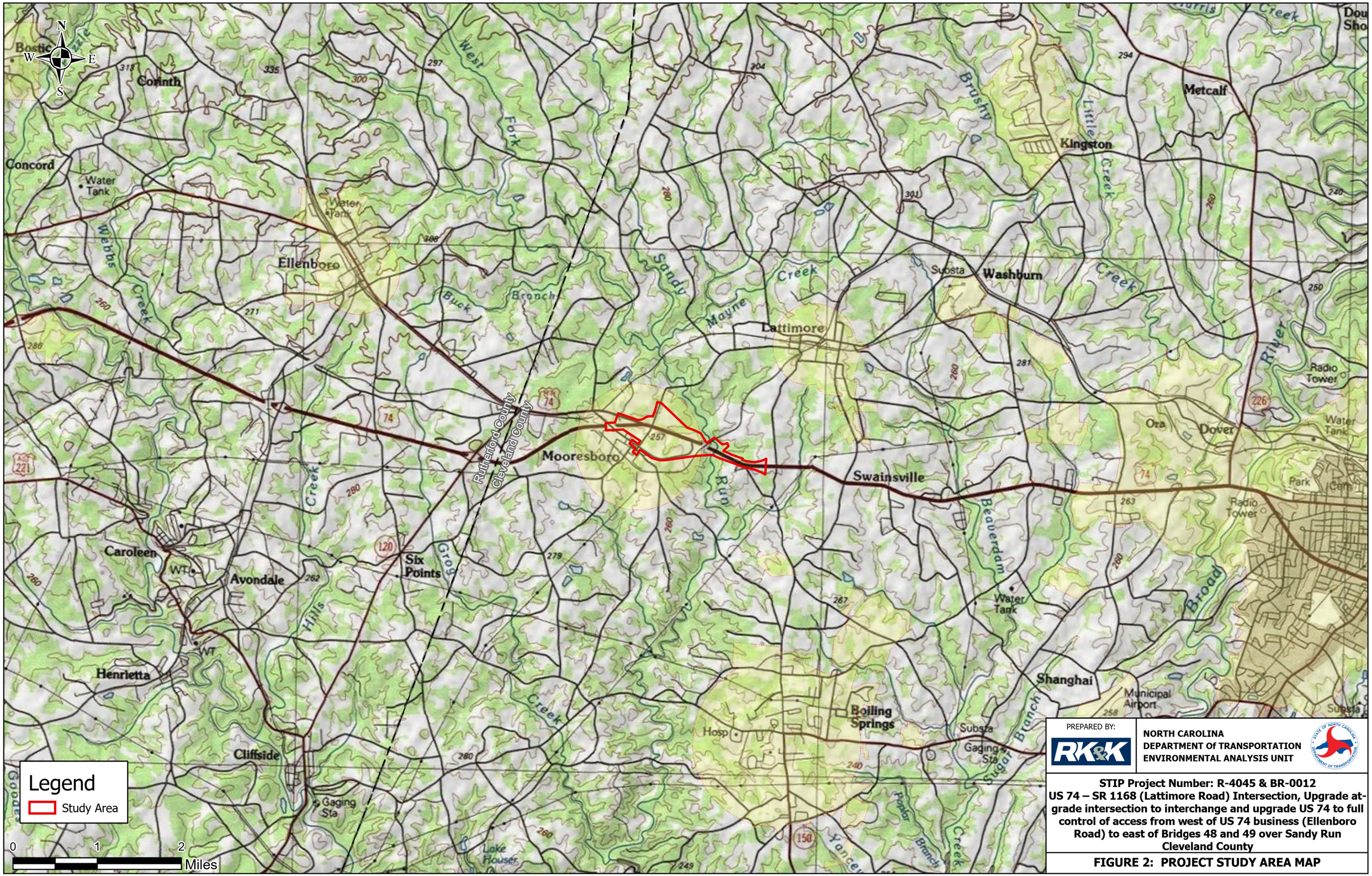


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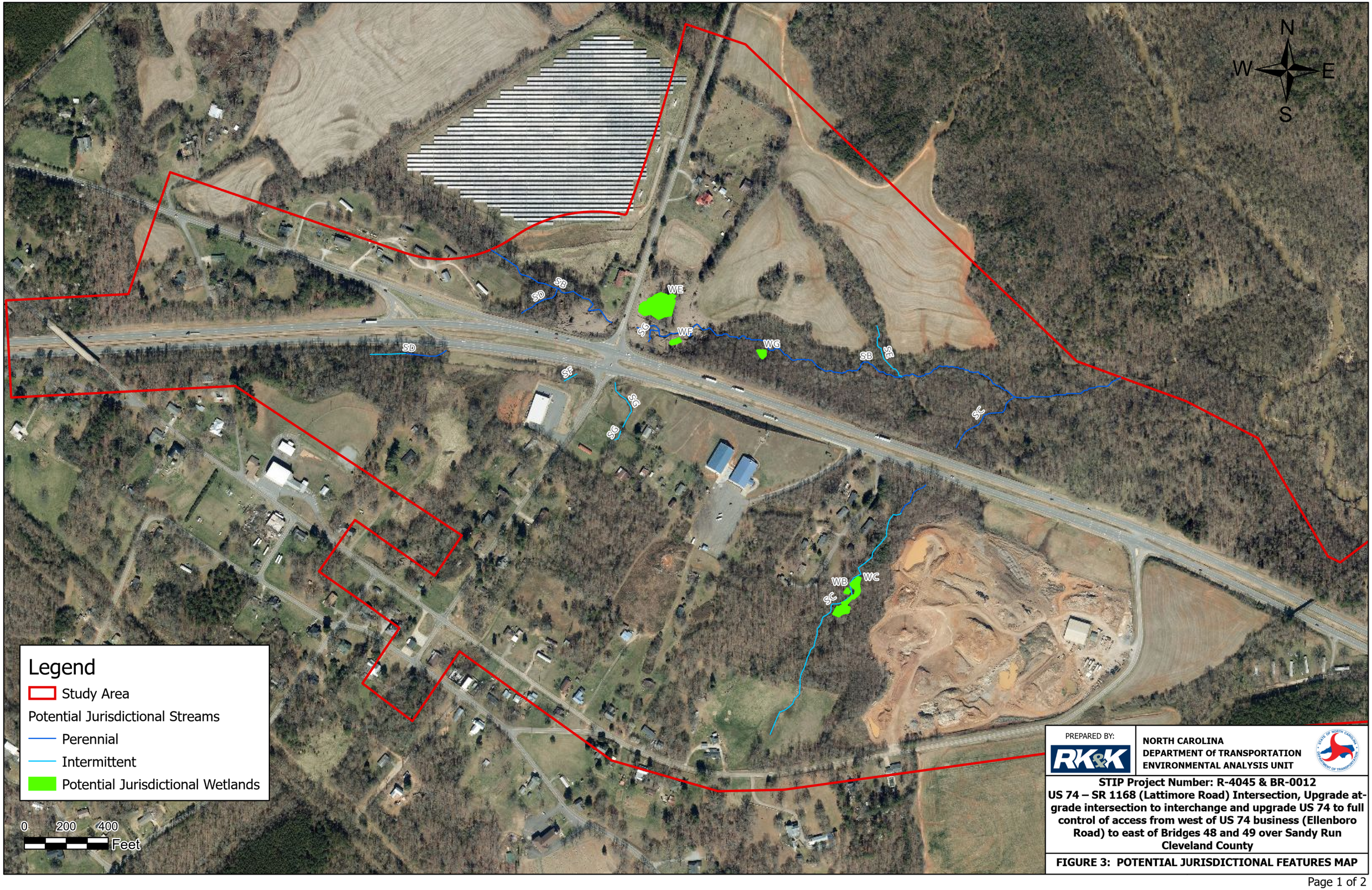
FIGURE 2: PROJECT STUDY AREA MAP



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US 74 – SR 1168 (Lattimore Road) Intersection, Upgrade at-grade intersection to interchange and upgrade US 74 to full control of access from west of US 74 business (Ellenboro Road) to east of Bridges 48 and 49 over Sandy Run Cleveland County

FIGURE 3: POTENTIAL JURISDICTIONAL FEATURES MAP

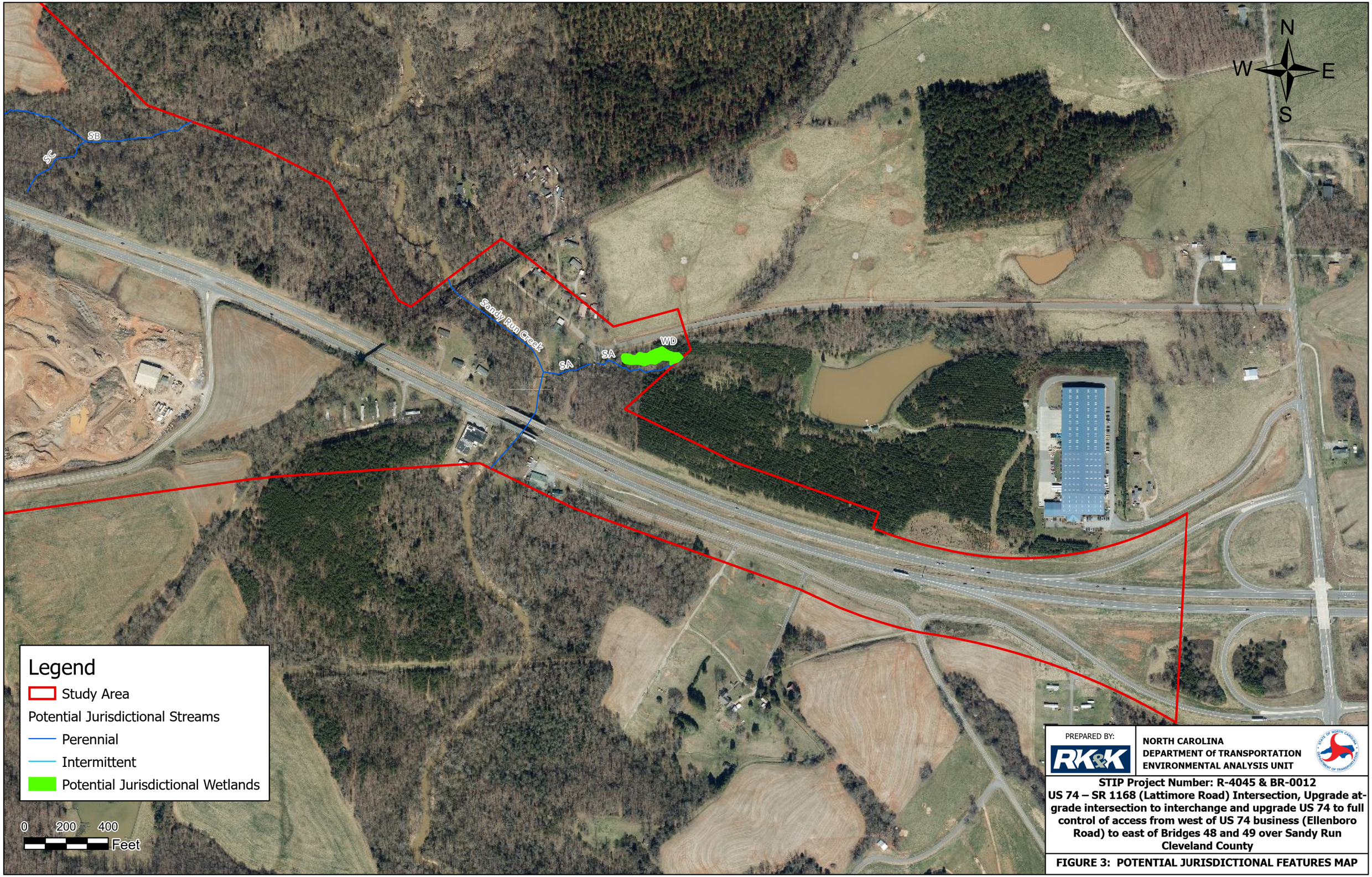

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FIGURE 3: POTENTIAL JURISDICTIONAL FEATURES MAP

N
W E
S

Legend

Study Area

Terrestrial Communities

- Maintained/Disturbed
- Mixed Hardwood forest
- Mixed hardwood/Pine forest
- Mixed Pine forest
- Mixed pine/Harwood forest
- Pine Plantation

0 500 1,000 2,000

US Feet

PREPARED BY: RK&K

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DEPARTMENT Of TRANSPORTATION
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US 74 – SR 1168 (Lattimore Road) Intersection, Upgrade at-grade intersection to interchange and upgrade US 74 to full control of access from west of US 74 business (Ellenboro Road) to east of Bridges 48 and 49 over Sandy Run
Cleveland County

FIGURE 4: TERRESTRIAL COMMUNITIES MAP

Appendix B

Qualifications of Contributors

Principal Investigator:	Gordon Marsh, Rummel Klepper and Kahl, LLP
Education:	Master of Environmental Assessment, NC State University, 2019 B.S. Environmental Science, UNC Wilmington, 2017
Experience:	Associate Environmental Scientist, Rummel Klepper and Kahl, LLP, 2017-Present
Responsibilities:	Preparation of forms, wetland and stream delineations, natural communities assessment, NRTR document preparation, GIS surveys and mapping

Investigator:	Hal Bain, Rummel Klepper and Kahl, LLP
Education:	M.S. Coastal Ecology Track, UNC Wilmington, 1989 B.S. Biology, Campbell University, 1985
Experience:	Senior Environmental Project Scientist, Rummel Klepper and Kahl, LLP, 2009-Present Natural Resources Team Leader, ARCADIS, 2003-2008 Biological Surveys Group Leader, NCDOT, 1995-2003 Senior Biologist, NCDOT, 1992-1995 Biology Teacher/Coach, Wake County Public Schools, 1989-1992
Responsibilities:	T/E species assessment, wetland and stream delineation and QA/QC

Investigator:	Neil Medlin, Rummel Klepper and Kahl, LLP
Education:	M.A. Biology, Appalachian State University, 1986 B.S. Biology, Appalachian State University, 1984
Experience:	Manager, Natural Resources, Rummel Klepper and Kahl, LLP, 2016-Present Biological Surveys Group Leader, NCDOT, 2012-2016 Environmental Specialist/Supervisor, NCDOT, 2002-2012 Environmental Biologist, NCDWQ, 1990-2002 Environmental Specialist, FLDER, 1986-1990
Responsibilities:	T/E species assessment and QA/QC

NATURAL RESOURCES TECHNICAL REPORT

Proposed Bridge Replacement on US 74 over Sandy Run
Cleveland County, North Carolina

STIP BR-0012

THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Division 12

June 2019

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1.0 INTRODUCTION

The North Carolina Department of Transportation (NCDOT) proposes to replace the bridge on US 74 over Sandy Run. The following Natural Resources Technical Report (NRTR) has been prepared to assist in the preparation of a document for the purposes of the National Environmental Policy Act (NEPA) or the State Environmental Policy Act (SEPA).

2.0 METHODOLOGY

All work was conducted in accordance with the NCDOT Environmental Coordination and Permitting's Preparing Natural Resources Technical Reports Procedure and the latest NRTR Template of November 2017. Wetland and stream field work was conducted on August 21st, 2018. Protected species surveys were completed April 10th, 2019. Jurisdictional areas identified in the study area have not been field verified by the U.S. Army Corps of Engineers (USACE) and the North Carolina Division of Water Resources (NCDWR). The principal personnel contributing to the field work and document is provided in Appendix B.

3.0 TERRESTRIAL COMMUNITIES

Two terrestrial communities were identified in the study area. Figure 4 shows the location and extent of these terrestrial communities. Terrestrial community data are presented in the context of total coverage of each type within the study area (Table 1).

Table 1. Coverage of terrestrial communities in the study area

Community	Dominant Species (scientific name)	Coverage (ac.)
Maintained/ Disturbed	American pokeweed (*Phytolacca americana*) red fescue (*Festuca rubra*) Japanese stiltgrass (*Microstegium vimineum*)	37
Mixed Pines	loblolly pine *(Pinus taeda)* Virginia pine *(Pinus virginiana)* red maple *(Acer rubrum)*	9
	Total	**46**

4.0 PROTECTED SPECIES

4.1 Endangered Species Act Protected Species

As of April 25, 2018, the United States Fish and Wildlife (USFWS) lists two federally protected species, under the Endangered Species Act (ESA) for Cleveland County (Table 2). For each species, a discussion of the presence or absence of habitat is included below along with the Biological Conclusion rendered based on survey results in the study area.

Table 2. ESA federally protected species listed for Cleveland County.

Scientific Name	Common Name	Federal Status	Habitat Present	Biological Conclusion
Hexastylis naniflora	Dwarf-flowered heartleaf	T	Yes	No Effect
Myotis septentrionalis	Northern long-eared bat	T	Yes	Unresolved

T - Threatened

Dwarf-flowered heartleaf
USFWS Recommended Survey Window: March -May

Biological Conclusion: No Effect

Dwarf-flowered heartleaf habitat is present on site in the form of north facing slopes along stream sides. A field review of the site reveled no species of *Hexastylis* present on the site. A review of the NCNHP database, updated April 2018, revealed one occurrence within 0.5 miles and several occurrences within 2.0 miles of the study area.

Northern long-eared bat
USFWS Recommended Survey Window: June 1- August 15

Biological Conclusion: Unresloved

This information will be provided by the NCDOT Biological Surveys Group (BSG). A review of NCHNP records, updated April 2018, indicates no known northern long-eared bat occurrence within 1.0 of the study area.

4.2 Bald and Golden Eagle Protection Act

The bald eagle is protected under the Bald and Golden Eagle Protection Act, and enforced by the USFWS. Habitat for the bald eagle primarily consists of mature forests in proximity to large bodies of open water for foraging. Large dominant trees are utilized for nesting sites, typically within 1.0 mile of open water.

A desktop-GIS assessment of the project study area, as well as the area within a 1.0-mile radius of the project limits, was performed on August 23, 2018 using 2015 color aerials and the NCNHP database dated April 2018. This desktop-GIS assessment revealed no known occurrences of this species within 1.0 mile of the project study area. Due to the lack of known occurrences, and minimal impact anticipated for this project, it has been determined that this project will not affect this species.

5.0 WATER RESOURCES

Water resources in the study area are part of the Broad River Basin [U.S. Geological Survey (USGS) Hydrologic Unit 03050105]. Two streams were identified in the study area (Table 3). The location of each stream is shown in Figure 3.

Table 3. Streams in the study area

Stream Name	Map ID	NCDWR Index Number	Best Usage Classification	Bank Height (ft)	Bankfull width (ft)	Depth (in)
UT to Sandy Run	SA	9-46 (3.5)	WS-IV	3-4	12	5
Sandy Run	Sandy Run	9-46 (3.5)	WS-IV	6	30	24

There are no Outstanding Resource Water (ORW), designated High Quality Waters (HQW) or water supply watersheds (WS-I or WS-II) within 1.0 mile downstream of the study area. The North Carolina 2016 Final 303(d) list does not identify any streams as impaired within the project study area or within 1.0 mile downstream of the study area.

No surface waters have been identified in the study area.

6.0 REGULATORY CONSIDERATIONS

6.1 Clean Water Act Waters of the U.S.

Two streams were identified in the study area (Table 4). The location of these streams is shown on Figure 3. North Carolina Stream Assessment Method (NCSAM) forms are included in a separate Preliminary Jurisdictional Determination (PJD) Package. All jurisdictional streams in the study area have been designated as warm water streams for the purposes of stream mitigation.

Table 4. Characteristics of jurisdictional streams in the study area

Map ID	Length (ft.)	Classification	Compensatory Mitigation Required	River Basin Buffer	Figure Number
SA	50	Perennial	Yes	Not Subject	3
Sandy Run	573	Perennial	Yes	Not Subject	3
Total	623				

* NCSAM forms are available in the PJD package

No jurisdictional wetlands were identified within the study area.

6.2 Construction Moratoria

No construction moratoria will be required for this project.

6.3 N.C. River Basin Buffer Rules

No streams in the project study area are subject to buffer rule protection.

6.4 Rivers and Harbors Act Section 10 Navigable Waters

There are no streams in the project area that have been designated by the USACE as a Navigable Water under Section 10 of the Rivers and Harbors Act.

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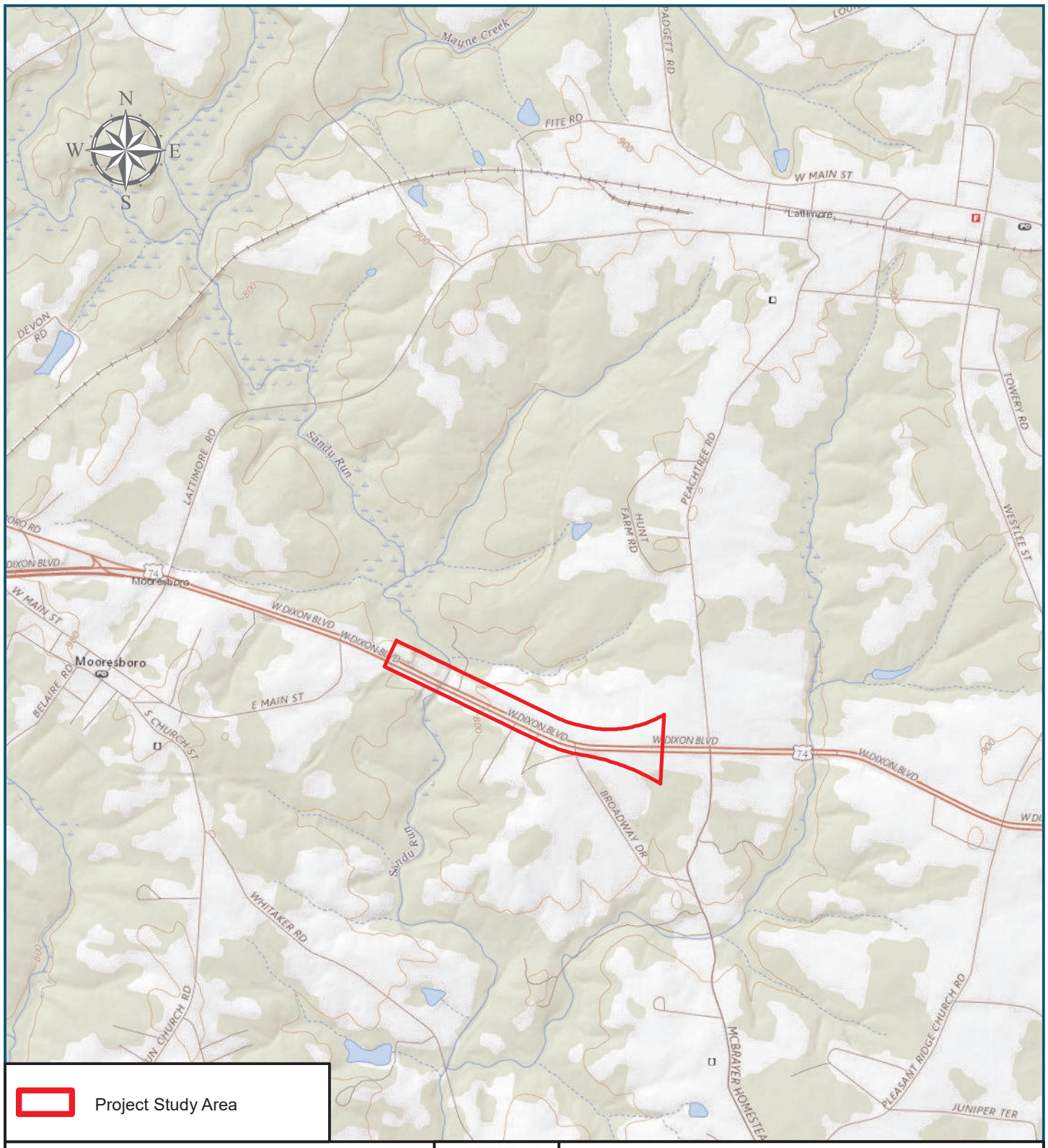
Appendix A

Figures

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION 12

STIP PROJECT BR-0012
PROPOSED BRIDGE REPLACEMENT
US 74 OVER SANDY RUN
CLEVELAND COUNTY, COUNTY

VICINITY MAP FIGURE 1

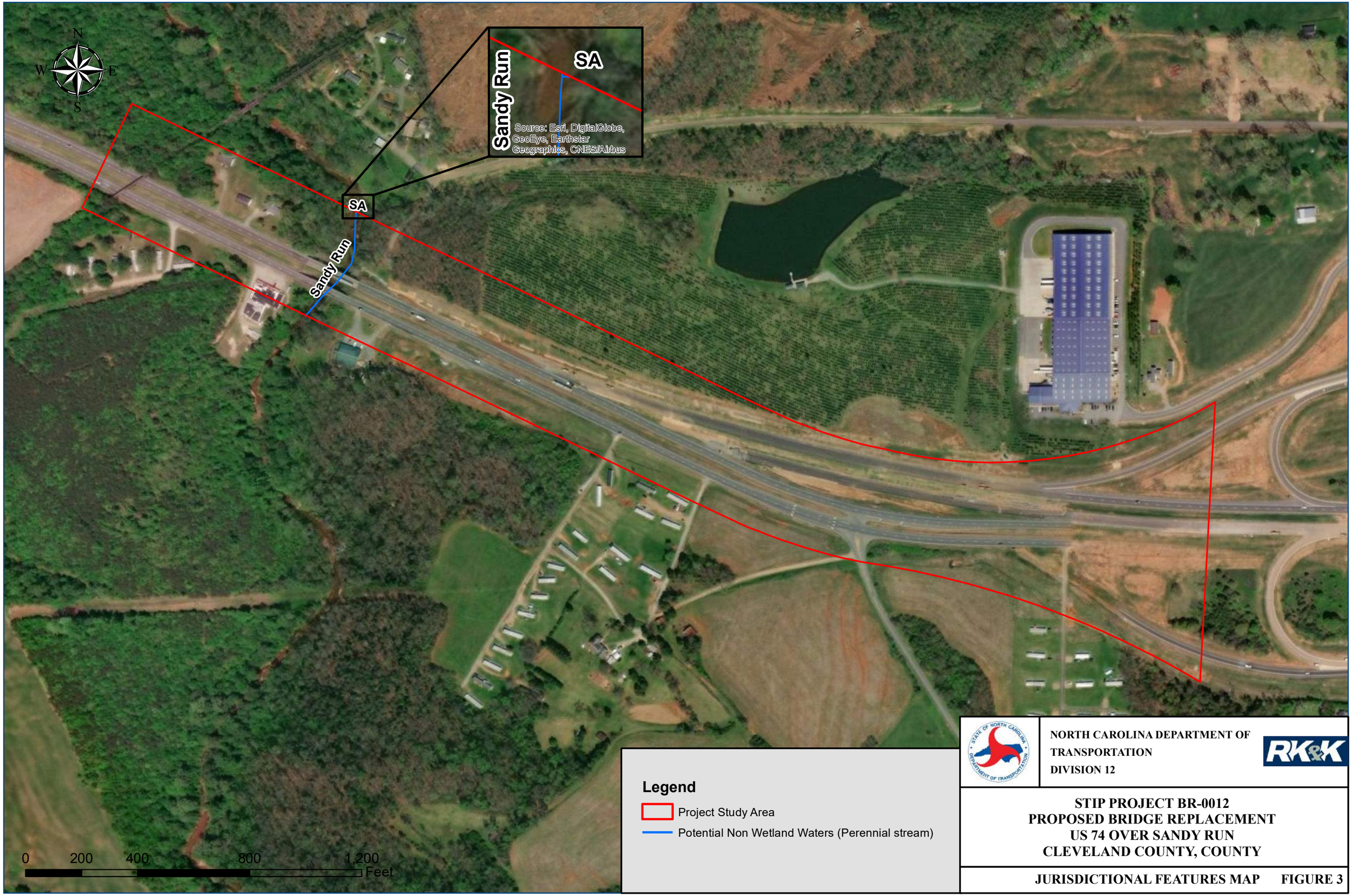


NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION 12

RK&K

STIP PROJECT BR-0012
PROPOSED BRIDGE REPLACEMENT
US 74 OVER SANDY RUN
CLEVELAND COUNTY, COUNTY

PROJECT STUDY AREA MAP FIGURE 2



Legend

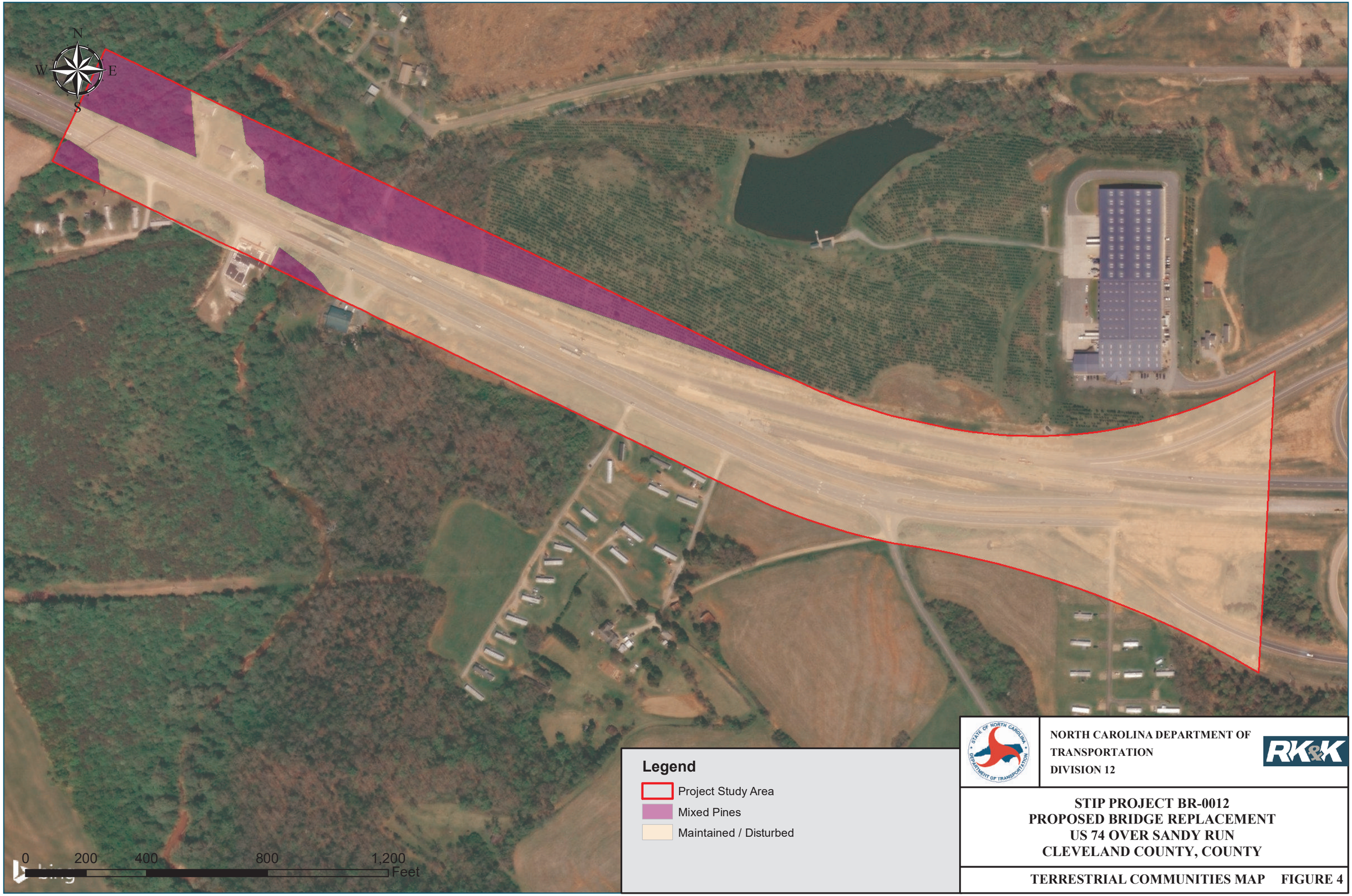
- Project Study Area
- Potential Non Wetland Waters (Perennial stream)

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION 12

RK&K

STIP PROJECT BR-0012
PROPOSED BRIDGE REPLACEMENT
US 74 OVER SANDY RUN
CLEVELAND COUNTY, COUNTY

JURISDICTIONAL FEATURES MAP **FIGURE 3**



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION 12

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STIP PROJECT BR-0012
PROPOSED BRIDGE REPLACEMENT
US 74 OVER SANDY RUN
CLEVELAND COUNTY, COUNTY

TERRESTRIAL COMMUNITIES MAP FIGURE 4

Appendix B

Qualifications of Contributors

Investigator: Matt Martin, Rummel Klepper and Kahl, LLP
Education: B.A. Environmental Studies, UNC Wilmington, 2015
Experience: Biologist, Rummel Klepper and Kahl, LLP, 2018-Present
Field Biologist-2, Amec Foster Wheeler, 2015-2018
Regulatory Intern, USACE-SAW, 2014

Responsibilities: Preparation of forms, wetland and stream delineations, natural communities assessment, NRTR document preparation, GIS surveys and mapping

Investigator: Pete Stafford, PWS, Rummel Klepper and Kahl, LLP
Education: B.S. Environmental Science, UNC Wilmington, 2000
Experience: Manager, Rummel Klepper and Kahl, LLP, 2001-Present
Responsibilities: Preparation of forms, wetland and stream delineations, NRTR document preparation

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Asheville Ecological Services Field Office
160 Zillicoa Street, Suite B
Asheville, NC 28801-1082
Phone: (828) 258-3939 Fax: (828) 258-5330

In Reply Refer To: 08/14/2024 15:22:18 UTC
Project Code: 2024-0130279
Project Name: R-4045/BR-0012

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The enclosed species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Please note that new species information can change your official species list. Under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends you visit the ECOS-IPaC website at regular intervals during project planning and implementation to ensure your species list is accurate or obtain an updated species list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A biological assessment (BA) or biological evaluation (BE) should be completed for your project. A BA is required for major construction activities (or other undertakings having similar physical impacts) considered to be Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2) (c)) (NEPA). For projects other than major construction activities, the Service suggests that a BE be prepared to determine effects of the action and whether those effects may affect listed species and/or designated critical habitat. Effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other

activities that are caused by the proposed action. A consequence is caused by the proposed action if it is reasonably certain to occur and would not occur “but for” the proposed action.. Recommended contents of a BA/BE are described at 50 CFR 402.12. More information and resources about project review and preparing a BA/BE can be found at the following web link: https://www.fws.gov/office/asheville-ecological-services/asheville-field-office-online-review-process-overview.

If a Federal agency determines listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. The Service is not required to concur with "no effect" determinations from Federal action agencies. If consultation is required, the Service recommends that candidate species, proposed species, proposed critical habitat, and at-risk species be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or licensed applicants, can be found in the "Endangered Species Consultation Handbook" at the following web link: https://www.fws.gov/media/endangered-species-consultation-handbook.

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Act, there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). More information about MBTA and BGEPA can be found at the following web link: https://www.fws.gov/program/migratory-birds.

We appreciate your consideration of Federally listed species. The Service encourages Federal agencies to include conservation of threatened and endangered species in their project planning to further the purposes of the Act. Please contact our staff at 828-258-3939, if you have any questions. In any future correspondence concerning this project, please reference the Consultation Code which can be found in the header of this letter.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- Migratory Birds
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether

any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Asheville Ecological Services Field Office
160 Zillicoa Street, Suite B
Asheville, NC 28801-1082
(828) 258-3939

PROJECT SUMMARY

Project Code: 2024-0130279
Project Name: R-4045/BR-0012
Project Type: Road/Hwy - Maintenance/Modification
Project Description: US 74 Improvements, Interchange, and Bridge Replacement
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@35.30093655,-81.69238618039284,14z

Counties: Cleveland County, North Carolina

ENDANGERED SPECIES ACT SPECIES

There is a total of 2 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

FLOWERING PLANTS

NAME	STATUS
Dwarf-flowered Heartleaf *Hexastylis naniflora* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2458	Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

BALD & GOLDEN EAGLES

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act[1] and the Migratory Bird Treaty Act[2].

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats[3], should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

1. The Bald and Golden Eagle Protection Act of 1940.
2. The Migratory Birds Treaty Act of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

THERE ARE NO BALD AND GOLDEN EAGLES WITHIN THE VICINITY OF YOUR PROJECT AREA.

MIGRATORY BIRDS

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats[3] should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9406	Breeds Mar 15 to Aug 25
Chuck-will's-widow *Antrostomus carolinensis* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9604	Breeds May 10 to Jul 10
Grasshopper Sparrow *Ammodramus savannarum perpallidus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/8329	Breeds Jun 1 to Aug 20
Prairie Warbler *Setophaga discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9513	Breeds May 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9398	Breeds May 10 to Sep 10

NAME	BREEDING SEASON
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9478	Breeds elsewhere
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9431	Breeds May 10 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

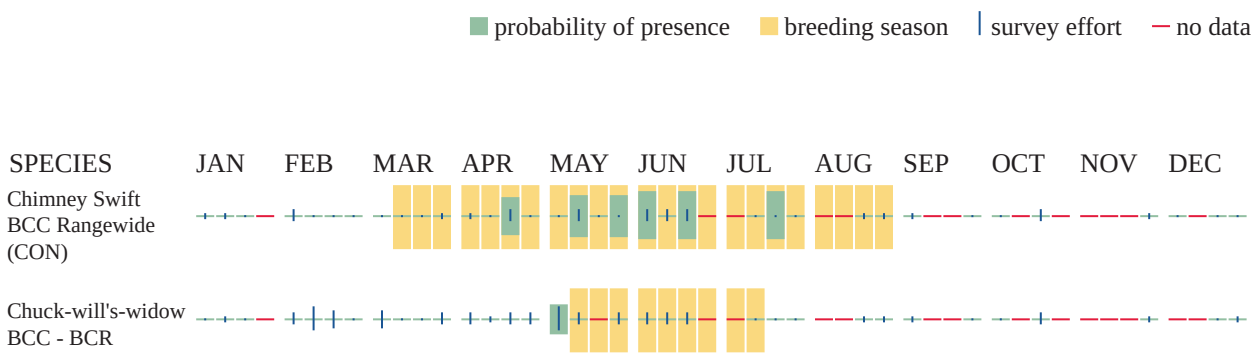
Probability of Presence (■)

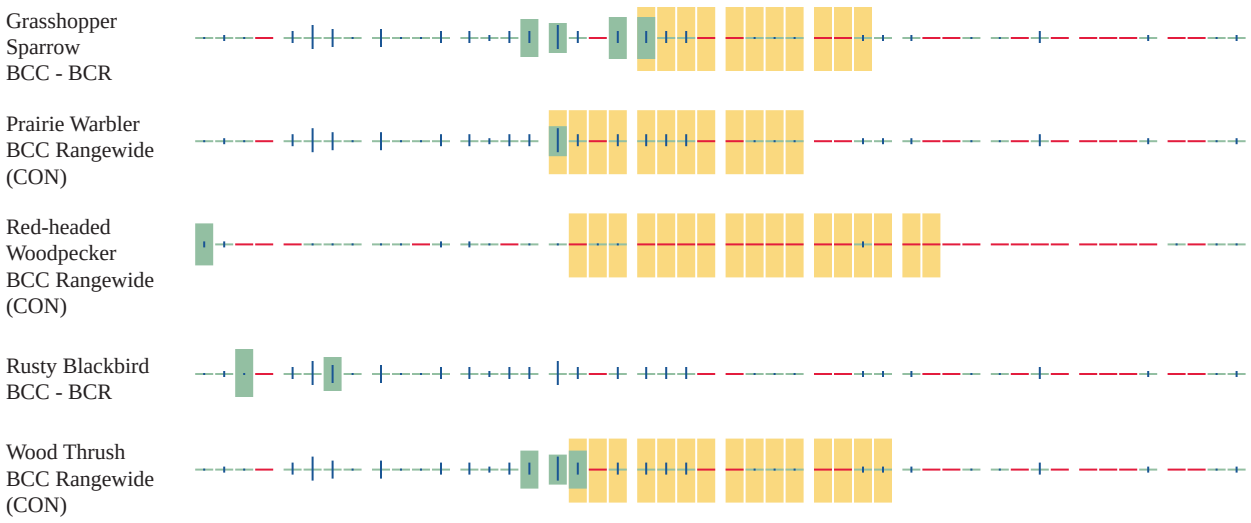
Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.





Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

RIVERINE

- R2UBH
- R4SBC

FRESHWATER FORESTED/SHRUB WETLAND

- PFO1A

IPAC USER CONTACT INFORMATION

Agency: Three Oaks Engineering
Name: Nancy Oberle
Address: 324 Blackwell Street, Suite 1200
City: Durham
State: NC
Zip: 27701
Email nancy.oberle@threeoaksengineering.com
Phone: 9197321300

NC DEPARTMENT OF
NATURAL AND CULTURAL RESOURCES

Roy Cooper, **Governor**

D. Reid Wilson, **Secretary**

Misty Buchanan
Deputy Director, Natural Heritage Program

NCNHDE-27114

August 16, 2024

Three Oaks
Three Oaks Engineering
324 Blackwell Street
Durham, NC 27701
RE: Upgrade US 74 in Mooresboro NC; R-4045/BR-0012

Dear Three Oaks:

The North Carolina Natural Heritage Program (NCNHP) appreciates the opportunity to provide information about natural heritage resources for the project referenced above.

A query of the NCNHP database indicates that there are records for rare species, important natural communities, natural areas, and/or conservation/managed areas within the proposed project boundary. These results are presented in the attached 'Documented Occurrences' tables and map.

The attached 'Potential Occurrences' table summarizes rare species and natural communities that have been documented within a one-mile radius of the property boundary. The proximity of these records suggests that these natural heritage elements may potentially be present in the project area if suitable habitat exists. Tables of natural areas and conservation/managed areas within a one-mile radius of the project area, if any, are also included in this report.

If a Federally-listed species is documented within the project area or indicated within a one-mile radius of the project area, the NCNHP recommends contacting the US Fish and Wildlife Service (USFWS) for guidance. Contact information for USFWS offices in North Carolina is found here: https://www.fws.gov/offices/Directory/ListOffices.cfm?statecode=37.

Please note that natural heritage element data are maintained for the purposes of conservation planning, project review, and scientific research, and are not intended for use as the primary criteria for regulatory decisions. Information provided by the NCNHP database may not be published without prior written notification to the NCNHP, and the NCNHP must be credited as an information source in these publications. Maps of NCNHP data may not be redistributed without permission.

Also please note that the NC Natural Heritage Program may follow this letter with additional correspondence if a Dedicated Nature Preserve, Registered Heritage Area, Land and Water Fund easement, or an occurrence of a Federally-listed species is documented near the project area.

If you have questions regarding the information provided in this letter or need additional assistance, please contact the NCNHP at natural.heritage@dncr.nc.gov.

Sincerely,
NC Natural Heritage Program

Natural Heritage Element Occurrences, Natural Areas, and Managed Areas Intersecting the Project Area
Upgrade US 74 in Mooresboro NC
Project No. R-4045/BR-0012
August 16, 2024
NCNHDE-27114

Element Occurrences Documented Within Project Area

Taxonomic Group	EO ID	Scientific Name	Common Name	Last Observation Date	Element Occurrence Rank	Accuracy	Federal Status	State Status	Global Rank	State Rank
Vascular Plant	38147	Hexastylis naniflora	Dwarf-flowered Heartleaf	2013-04-30	D	2-High	Threatened	Threatened	G3	S3

No Natural Areas are Documented within the Project Area

No Managed Areas Documented within the Project Area

Definitions and an explanation of status designations and codes can be found at https://ncnhde.natureserve.org/help. Data query generated on August 16, 2024; source: NCNHP, Summer (July) 2024. Please resubmit your information request if more than one year elapses before project initiation as new information is continually added to the NCNHP database.

Natural Heritage Element Occurrences, Natural Areas, and Managed Areas Within a One-mile Radius of the Project Area
Upgrade US 74 in Mooresboro NC
Project No. R-4045/BR-0012
August 16, 2024
NCNHDE-27114

Element Occurrences Documented Within a One-mile Radius of the Project Area

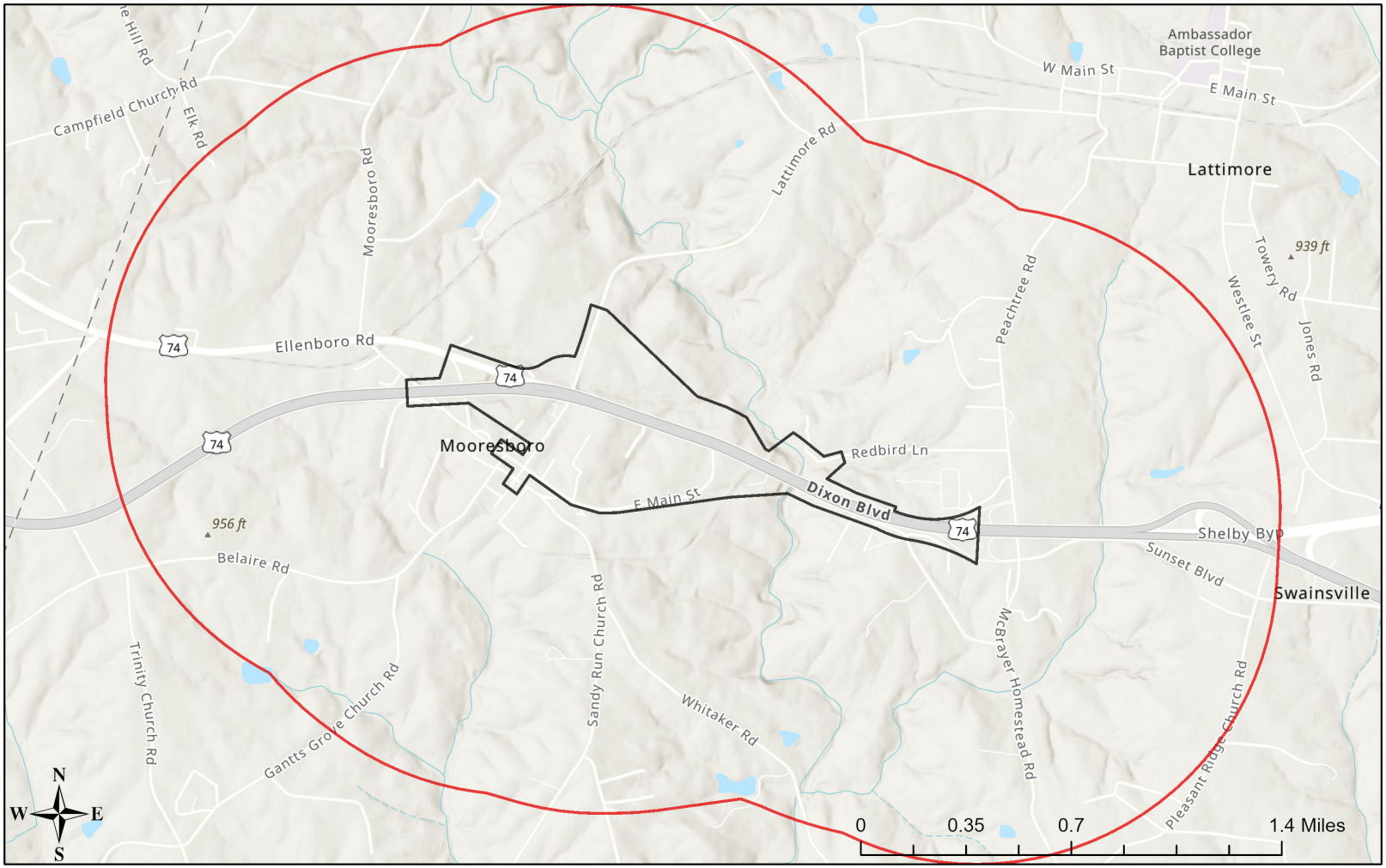
Taxonomic Group	EO ID	Scientific Name	Common Name	Last Observation Date	Element Occurrence Rank	Accuracy	Federal Status	State Status	Global Rank	State Rank
Vascular Plant	38147	Hexastylis naniflora	Dwarf-flowered Heartleaf	2013-04-30	D	2-High	Threatened	Threatened	G3	S3

No Natural Areas are Documented Within a One-mile Radius of the Project Area

No Managed Areas are Documented Within a One-mile Radius of the Project Area

Definitions and an explanation of status designations and codes can be found at https://ncnhde.natureserve.org/help. Data query generated on August 16, 2024; source: NCNHP, Summer (July) 2024. Please resubmit your information request if more than one year elapses before project initiation as new information is continually added to the NCNHP database.

NCNHDE-27114: Upgrade US 74 in Mooresboro NC



August 16, 2024

Buffered Project Boundary

Project Boundary

Esri, NASA, NGA, USGS, FEMA
State of North Carolina DOT, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, USFWS

Archaeology

NO NATIONAL REGISTER OF HISTORIC PLACES ELIGIBLE OR LISTED ARCHAEOLOGICAL SITES PRESENT FORM

This form only pertains to ARCHAEOLOGICAL RESOURCES for this project. It is not valid for Historic Architecture and Landscapes. You must consult separately with the Historic Architecture and Landscapes Team.

PROJECT INFORMATION

Project No:	**R-4045**	*County:*	Cleveland
WBS No:	34598.1.2	*Document:*	Federal Categorical Exclusion
F.A. No:	TBD	*Funding:*	☐ State ☒ Federal

Federal Permit Required? ☒ Yes ☐ No *Permit Type:* USACE

Project Description: Upgrade the at-grade intersection of US 74 and SR 1168 (Lattimore Rd.) in Mooresboro to an interchange, and replace Bridges 48 and 49 on US 74 over Sandy Run Creek in Cleveland County. The Area of Potential Effects (A.P.E.), based on the study area provided by the project manager, includes a 320-acre tract that is approximately 2,861 meters (9,387 ft.) long (along US 74) and 1,108 meters (3,637 ft.) wide (along SR 1168). Bridges 48 and 49 are located at the east end of the A.P.E. The project is federally funded and will require federal permits, so this project is conducted pursuant to Section 106 of the National Historic Preservation Act.

SUMMARY OF ARCHAEOLOGICAL FINDINGS

The North Carolina Department of Transportation (NCDOT) Archaeology Team has reviewed the subject project and determined:

☒ There are no National Register listed ARCHAEOLOGICAL SITES within the project's area of potential effects. (Attach any notes or documents as needed.)
☐ No subsurface archaeological investigations were required for this project.
☐ Subsurface investigations did not reveal the presence of any archaeological resources.
☒ Subsurface investigations did not reveal the presence of any archaeological resources considered eligible for the National Register.
☒ All identified archaeological sites located within the APE have been considered and all compliance for archaeological resources with Section 106 of the National Historic Preservation Act and GS 121-12(a) has been completed for this project.

Brief description of review activities, results of review, and conclusions:

The archaeological survey of the A.P.E. focused on three study areas (1-3) with the potential for archaeological sites that had been identified in the *Archaeology Survey Required* form submitted on 6/23/2021. The field survey was conducted by New South Associates, Inc. on October 11-15, 2021. The survey identified three archaeological sites (31CL175-177) in study area 2, and no sites in study areas 1 and 3. The three sites are the remains of late nineteenth to mid twentieth century farmsteads (on also has a precontact component) that are recommended ineligible for the National Register of Historic Places (NRHP). No additional archaeological work is recommended for this project. (See attached archaeological survey report by Samantha Taylor and Brittany McKee Hyder for a detailed description of the project.)

(This project falls within a North Carolina County in which the following federally recognized tribes have expressed an interest: The Cherokee Nation; the Eastern Band of Cherokee Indians; the United Keetoowah Band of Cherokee Indians; the Catawba Nation. *We recommend that you ensure that this documentation is forwarded to these tribes using the process described in the current NCDOT Tribal Protocol and PA Procedures Manual.)*

SUPPORT DOCUMENTATION

See attached: ☒ Map(s) ☐ Previous Survey Info ☒ Photos ☐ Correspondence

Other: see attached archaeological survey report

Signed:

CALEB SMITH	**2/28/2022**
NCDOT ARCHAEOLOGIST	Date

Archaeological Survey and Evaluation for Proposed Upgrades to the Intersection of US-74 and SR 1168 (Lattimore Road)

Cleveland County, North Carolina

New South Associates, Inc.

ARCHAEOLOGICAL SURVEY AND EVALUATION FOR PROPOSED UPGRADES TO INTERSECTION OF US-74 AND SR 1168 (LATTIMORE ROAD)

Cleveland County, North Carolina

NCDOT TIP R-4045 (PA 12-12-0013)

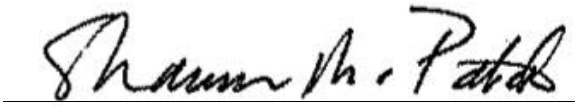
New South Associates Contract no. 7000018101
Function Code 2P03
Cost Center 151156(F)

Report submitted to:

NCDOT, Human Environment Section • 1598 Mail Service Center • Raleigh, North Carolina 27699

Report prepared by:

New South Associates • 6150 East Ponce de Leon Avenue • Stone Mountain, Georgia 30083
and
New South Associates • 1006 Yanceyville Street • Greensboro, North Carolina 27405



Shawn Patch – Principal Investigator

Samantha Taylor – Archaeologist and Co-Author
Brittany McKee Hyder – Historian and Co-Author

March 16, 2022 • Revised Report
New South Associates Technical Report 4257

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INTRODUCTION

The North Carolina Department of Transportation (NCDOT) proposes to upgrade the intersection of US-74 and SR 1168 (Lattimore Road) in Cleveland County in the southern piedmont region of North Carolina. The proposed project extends from 1,748 feet (533 m) west of the intersection of US-74 and McBrayer Homestead Road and extends 288 feet (88 m) west of West Main Street as it crosses US-74. The upgrades will include the replacement of Bridges 48 and 49 on US-74 over Sandy Run Creek. The proposed project encompasses a 1.7-mile segment of US-74. Following the survey, two alternative design plans were proposed, neither of which changed the scope of the survey.

In June 2021, NCDOT archaeologist Caleb Smith conducted a review of cultural resources within the proposed project area (Smith 2021). This review consisted of background research and pedestrian reconnaissance, which resulted in the identification of three potential survey areas along a level ridge overlooking a tributary stream on the north side of US-74. The remainder of the proposed project area was excluded from archaeological survey due to low probability and disturbances related to development. Archaeological survey associated with this undertaking occurred in three "potential areas," hereby referred to as study areas, located along the north side of US-74 on ridge landforms overlooking Sandy Run Creek. The surveyed areas totaled 37 acres, and no archaeological survey was required for the remainder of the project corridor (Figures 1–4).

Background Research

Initial background research was conducted by NCDOT archaeologist Caleb Smith. Background research determined that there are no previously recorded archaeological sites within the study areas. A review of records compiled by the North Carolina Office of State Archaeology (NC OSA) determined that three previously identified archaeological sites (31CL36, 31CL37, and 31CL50) have been recorded within a mile of the study areas (Table 1; Figure 5). These sites were identified as a result of several surveys in the area. Previous cultural resource surveys conducted within a mile of the study areas include an archaeological survey for the US-74 bypass, a survey for a proposed communication tower in the Mooresboro vicinity (Edwards 2000), and a cultural resources survey of the proposed Telecom Tower Site (Webb and Miles 2000). Two environmental reviews (ER 21-0583 and 95-E-4220-0384) also intersect the project area. The environmental reviews include an active installation of broadband fiber along US 74 (ER 21-0583) and the US 74 Bypass (95-E-4220-0384). Two of the sites within a mile of the study areas (31CL36 and 31CL37) are nineteenth- to twentieth-century domestic sites that were recommended not eligible for the National Register of Historic Places (NRHP). A multicomponent site (31CL50) consisting of an undetermined precontact component and a nineteenth- to twentieth-century farmstead and commercial area was also identified and recommended not eligible for the NRHP (Edwards 2000; Petersen 2018; Smith et al. 2000; Webb and Miles 2000).

Table 1. Archaeological Sites within One Mile of the APE

State	Component	Temporal	Site Type	NRHP Rec.
31CL36	Historic	19th–20th century	Domestic	Not Eligible
31CL37	Historic	19th–20th century	Domestic	Not Eligible
31CL50	Both	Undetermined Precontact; 19th–20th century	Undetermined Precontact; Historic Farmstead/Commercial Area	Not Eligible

New South Associates, Inc. (NSA) conducted the archaeological survey. Fieldwork was directed by Samantha Taylor with assistance from Hunter Saunders on October 11–15, 2021.

Archaeological Survey

NSA conducted an intensive shovel testing survey of the study areas in October 2021 (see Appendix A Shovel Test Data). Shovel tests were excavated at 30-meter (100-ft.) intervals throughout the study areas. Shovel tests measured 30 centimeters (11.8 inches) in diameter and were excavated into sterile subsoil, the water table, a natural impasse, or the maximum feasible depth (approximately 1 m). Soils were screened by stratum through 0.25-inch screens. A shovel test database is attached at the end of this report.

The survey determined that each study area included unique topography, vegetation, and land uses that contributed to the presence or absence of archaeological sites (Figure 6-8). Study Area 1 encompasses a small landform located northwest of the intersection of US-74 and SR 1168. This landform is directly south of a solar farm. This study area measures 1.5 acres (6,311.55 m^2). Survey determined that Study Area 1, located on a ridge-toe landform, has been extensively disturbed by the solar farm to the north and an associated retention pond (Figures 9 and 10). The soils throughout much of Study Area 1 were shallow and eroded as a result of the nearby development. A 1947 aerial photograph depicts Study Area 1 in an agricultural field bordered by a wooded inlet to the south (Figure 11 and 12). No archaeological sites were identified in Study Area 1.

Study Area 2 is located northeast of the intersection of US-74 and SR 1168 and encompasses the landform directly north of the unnamed tributary of Sandy Run Creek. Study Area 2 measures 14.1 acres (57,148.12 m^2). Study Area 2 is located atop two moderately sloped ridge toes that are separated by a wooded drainage. Currently, much of the land is used for soybean cultivation, although the southern and easternmost portions of this study area are wooded (see Figure 10). Soils vary in depth throughout Study Area 2. They are notably deeper in the wooded portions and heavily eroded throughout the agricultural field. A 1947 aerial photograph depicts Study Area 2 as two large agricultural fields (see Figure 11). The western agricultural field contained a single farmstead complex with several buildings. All three of the newly identified archaeological sites are located in this study area.

Study Area 3 is bordered by the unnamed tributary of Sandy Run Creek to the north and US-74 to the south. It measures 21.7 acres (88,181.94 m^2). Study Area 3 is located along two gently sloping ridges just north of US-74 (see Figure 10). These ridges appear to be the remnants of a larger landform directly south of US-74. The entirety of Study Area 3 is wooded, with some areas dominated secondary growth. The soils vary throughout the study area, with several areas exhibiting moderate erosion and other areas containing relatively intact soils. A 1947 aerial photograph depicts the eastern half of Study Area 3 as agricultural fields and the western terminus as wooded (see Figure 11).

The study areas appear on the Boiling Springs North Quadrangle USGS 7.5′ series topographic map. Study Area 2 and Study Area 3 are separated by an unnamed tributary of Sandy Run Creek. However, the tributary does not directly intersect the study areas. Sandy Run Creek is a tributary of the Broad River, which joins the Saluda River to Columbia to form the Congaree River. The landscape of the Study Areas includes rolling uplands that alternate between farmland and mixed pine and hardwood forests. Soils in the study areas are predominately well-drained sandy clay loams that are moderately eroded.

NSA investigated 195 shovel test locations (see Appendix A). Of these, 178 were negative, 2 were positive, and 15 could not be excavated due to gravel impasse, standing water, and slopes over 15 percent. Shovel testing identified three sites, all of which were within Study Area 2 (Table 2; see Figures 6-8).

Table 2. Summary of Archaeological Sites in the Study Area

Trinomial	Component	Temporal	Site Type	NRHP Recommendation
31CL175	Precontact and Historic	Indeterminate Precontact; Twentieth Century Historic	Lithic Scatter and Historic House Site	Not Eligible; No Further Work
31CL176	Historic	Twentieth Century	Historic House Site	Not Eligible; No Further Work
31CL177	Historic	Twentieth Century	Historic House Site	Not Eligible; No Further Work

All artifacts were returned to NSA's laboratory in Stone Mountain, Georgia, where they were washed and identified. NSA analysts identified the type, material, age, affiliation, and metrics of the collected artifacts according to standard techniques/typologies for both precontact and historic materials. Hafted bifaces were typed when possible. All diagnostic artifacts were photographed.

Site 31CL175

Field Number:	SET01
UTM Coordinates:	436830.98 E 3906911.63 N (Zone 17N, NAD83)
Datum Coordinates:	500N/500E (STP 12)
Elevation:	824 feet amsl
USGS Quadrangle (7.5′):	Boiling Springs North
Property/Site Type:	Precontact Lithic Scatter and Historic House Site
Temporal Affiliations:	Unknown Precontact; Twentieth Century Historic
Setting:	Ridge
Soils:	Pacolet-Bethlehem Complex
Site Size:	19x28 meters (62x91 ft.)
Archaeological Deposit Depth:	Surface
Features:	Collapsed Tin Roof
NRHP Recommendation:	Not Eligible
Management Recommendation:	No Further Work Recommended

Site 31CL175 is a multicomponent site located along the northern boundary of Study Area 2. It is 235 meters (771 ft.) northeast of the intersection of US-74 and SR 1168 (Figures 13). The site was initially identified by a collapsed segment of metal roofing along the northern edge of a wooded thicket in the center of a large soybean field (Figure 14). The area within the thicket was obscured by several large fallen trees and thick secondary growth. A pedestrian survey of the thicket determined that there were no additional structural remains along the surface or within the immediate vicinity of the metal roofing. The area immediately north of the thicket had been heavily eroded, and subsoil was visible along the surface. This area contained a sparse artifact scatter containing both precontact and historic materials. Regular interval shovel tests within the site boundary were negative. NSA delineated Site 31CL175 using pedestrian reconnaissance and radial shovel testing. All shovel tests within the boundary of the scatter were negative.

The stratigraphic sequence of the area consisted of reddish brown (2.5YR 4/4) sandy loam terminating at 28 centimeters (11 in.) below the surface (cmbs), beneath which lay a dark red (10R 3/6) sandy clay subsoil. The soil profile in this area was consistent with soils identified throughout the surrounding agricultural field (Figure 15). The soils within the boundaries of Site 31CL175 suggest that the area has been heavily eroded as a result of intensive cultivation of the surrounding area.

Site 31CL175 was associated with a farm complex located in the southwest quadrant of a 218.59-acre parcel on the north side of West Dixon Boulevard (US 74). A review of aerial images and USGS historic topographic maps indicates that, by 1947, the farm complex included a dwelling and an outbuilding. Intentional land is also visible on the farmstead and likely served to control erosion (Figure 16; See Figure 11).

The complex was accessed by a dirt road that traveled northeast from Lattimore Road (NETR Online 2020). After being sold at public auction in 1953, the property changed hands multiple times, passing through the Harris, Elliott, Barroso, and Holiday families. Most recently, William J. McClain of Rutherfordton purchased the parcel in which Site 31CL175 is located from JBY-CC, a limited liability company, in January 2007 (Cleveland County Deed Book [CCDB] 1509:1522).

The parcel is historically associated with the lands of Dovie Logan Daniel (CCDB 6-W:37). The earliest record of the Daniel family in the Sandy Run section of Cleveland County is the 1900 U.S. Census. Robert J. Daniel (1838–1931), originally of Spartanburg, South Carolina, and Dovie Logan Daniel were married in 1868 and settled in the Sandy Run area shortly afterward. The census lists Robert Daniel's occupation as a landlord, indicating that he may have rented tracts of this land to farmers who constructed multiple modest frame dwellings and outbuildings on the parcel (U.S. Census Bureau 1900). The couple continued to live in the Sandy Run area until Robert Daniel's death, in 1931 (U.S. Census Bureau 1930). Their landholdings were conveyed to Dovie Logan Daniel's heir, Charles P. Logan, and remained in the family until 1953 (CCDB 6-W:37). Background research indicates that although the Daniel family was present in the area during the nineteenth century, no members of the family are of known historical significance as they relate to Site 31CL175.

The presence of multiple farmsteads on the Daniel parcel, along with census data listing Robert J. Daniel as a landlord, suggests that Sites 31CL175, 31CL176, and 31CL177 might have been part of the tenant farming system. Tenant farming was an economic system that was widely adopted in the southeast following the Civil War in which landowners rented farmland and houses to farmers who were unable to purchase their own. After renting the land, tenant farmers were then responsible for planting, harvesting, and selling crops grown there. Some of that profit was then redistributed to the landowner through rent (Bolton 2004).

The artifact assemblage (n=12) for Site 31CL175 is summarized in Table 3. Of the 12 artifacts, 6 were historic and 6 were precontact. None of the artifacts recovered were diagnostic, and all were recovered from the eroded surface directly north of the thicket of trees. The precontact artifacts were all manufactured from quartz, and include one unidentified projectile point, two biface fragments, two flakes, and one flake fragment (Figure 17). The precontact sample is typical for the Piedmont and likely reflects generalized activity over a long period. Historic artifacts include container glass and plain whiteware, both of which fall under Orser's (1987) foodways functional group. Orser's functional groups are used to discern functional patterns within historic artifact assemblages and are particularly useful to apply to postbellum farmstead sites (Orser et al. 1987). Historic artifacts likely originated as domestic refuse. No building debris was recovered or sent to the laboratory for analysis.

Table 3. Artifact Assemblage from Site 31CL175

Shovel Test	Artifact Description	Functional Group	Count	Weight
Precontact Artifacts				
N500 E500 (STP 12), Surface	Quartz Biface Fragment	N/A	2	18.5
	Quartz Flake Fragment	N/A	1	1.3
	Quartz Flake, Flat Platform	N/A	2	3.5
	Quartz Unidentified Projectile Point/Knife	N/A	1	6
Historic Artifacts				
N500 E500 (STP 12), Surface	Clear Container Glass, Machine Made	Foodways	1	22.4
	Milk Glass Container Glass	Foodways	1	1.9
	Clear Container Glass	Foodways	2	28.2
	Plain Whiteware	Foodways	1	1.2
	Aqua Container Glass	Foodways	1	4.4
Total			12	87.4

Site 31CL175 is a multicomponent site located along the northern boundary of Study Area 2. It consists of an indeterminate precontact lithic scatter and a historic scatter associated with a twentieth-century farmstead complex. The site is a surface scatter with no accompanying subsurface contexts. Artifacts recovered from Site 31CL175 do not embody distinctive characteristics of a type or period. The site lacks the integrity to display association with broad patterns in history or significant individuals. Limited artifact recovery, lack of subsurface context, and the site's location in a plowed field indicate the site lacks integrity and is unlikely to yield significant archaeological data. Site 31CL175 is recommended not eligible for the NRHP under Criterion A, B, C, or D, and no further work is recommended.

Site 31CL176

Field Number:	SET02
UTM Coordinates:	436966.96 E 3906951.922 N (Zone 17N, NAD83)
Datum Coordinates:	500N/500E
Elevation:	790 feet amsl
USGS Quadrangle (7.5′):	Boiling Springs North
Property/Site Type:	Historic House Site
Temporal Affiliations:	Twentieth Century Historic
Setting:	Ridge Toe
Soils:	Pacolet-Bethlehem Complex
Site Size:	27x35 meters (88x114 ft.)
Archaeological Deposit Depth:	20 cmbs
Features:	Collapsed Wooden House; Surface Bottle Midden
NRHP Recommendation:	Not Eligible
Management Recommendation:	No Further Work Recommended

Site 31CL176 is a historic twentieth-century house site located 556 meters (1,824 ft.) east of the intersection of US-74 and SR 1168, in the southeastern corner of Study Area 2 (Figure 18). The site was identified by Feature 1, a collapsed frame house in a wooded area directly southeast of the agricultural fields that constitute most of Study Area 2. Feature 1 measured 10x8.6 meters (32x28.2 ft.). The building's remnants suggest it was a wooden clapboard frame house with a gabled metal saltbox roof (a roof with asymmetrical planes) (Figure 19). The roof's northern side is almost twice as long as its southern side, this would suggest that the building was at least 1.5-stories tall. Two metal spring mattresses were identified adjacent to the house, suggesting a domestic function. A large bottle midden, measuring 14.8x7.8 meters (48.5x25.5 ft.), was identified 2.8 meters (9.1 ft.) north of Feature 1. The bottle midden could be indicative of the Piedmont Refuse Disposal Pattern, in which residence disposed of their refuse away from the house (Drucker et al. 1983). A sample of bottles from the midden was collected for analysis. Regular interval shovel tests within the site boundary were negative. NSA delineated Site 31CL176 using pedestrian reconnaissance and radial shovel testing. NSA identified two positive shovel tests (STP N500 E500 and STP N515 E500) at the site. The remaining radial tests were negative and terminated at 30 cmbs.

The stratigraphic sequence inside the site boundary consisted of dark reddish brown (2.5YR 3/3) silty loam at approximately 10 cmbs, beneath which was a red (2.5YR 4/8) silty clay subsoil (Figure 20). Artifacts were recovered from the first stratum. The soils present in Site 31CL176 suggest that the area has been subjected to extensive natural erosion processes, resulting in a shallow profile. This is further supported by the presence of intentional farmland contouring on the 1947 map, which likely served as a means to prevent erosion.

Site 31CL176 is located directly east of Site 31CL175. Both sites occupy the same parcel. No dwelling was extant at the time of the survey, although a gable-roof dwelling is visible on historic aerials as early as 1947 (see Figure 11). The dwelling is no longer present on the 1984 aerials. A review of deed records and archival sources revealed that J. McClain of Rutherfordton from JBY-CC, a limited liability company, purchased the parcel in January 2007 (CCDB 1509:1522). After being sold at a public auction in 1953, the property changed hands multiple times, passing through the Harris, Elliott, Barroso, and Holiday families.

The parcel is historically associated with the lands of Dovie Logan Daniel (CCDB 6-W:37). The earliest record of the Daniel family in the Sandy Run section of Cleveland County is the 1900 U.S. Census. Robert J. Daniel (1838–1931), originally of Spartanburg, South Carolina, and Dovie Logan Daniel were married in 1868 and settled in the Sandy Run area shortly afterward. The census lists Robert Daniel's occupation as a landlord, indicating that he may have rented tracts of this land to farmers who constructed multiple modest frame dwellings and outbuildings on the parcel (U.S. Census Bureau 1900). The couple continued to live in the Sandy Run area until Robert Daniel's death, in 1931 (U.S. Census Bureau 1930). Their landholdings were conveyed to Dovie Logan Daniel's heir, Charles P. Logan, and remained in the family until 1953 (CCDB 6-W:37). Background research indicates that although the Daniel family was present in the area during the late nineteenth century to middle twentieth century, no members of the family are of known historical significance as they relate to Site 31CL176.

The presence of multiple farmsteads on the Daniel parcel along with census data listing Robert J. Daniel as a landlord suggests that sites 31CL175, 31CL176, and 31CL177 might have been part of the tenant farming system. Tenant farming was an economic system that was widely adopted in the southeast following the Civil War in which landowners rented farmland and houses to farmers who were unable to purchase their own land. After renting the land, tenant farmers were then responsible for planting, harvesting, and selling crops grown on that land. Some of that profit was then redistributed to the landowner through rent (Bolton 2004).

The artifact assemblage (*n*=17) for Site 31CL176 is summarized in Table 4. Glass containers dominated the assemblage. Coal was also recovered in small quantities, in STP N515 E500, within the first 20 centimeters (7.8 in.).Medicine bottles dominated the bottle assemblage. Diagnostic artifacts included a clear glass Sloan's Liniment bottle manufactured by the Maryland Glass Company (1921–1971), plain, molded whiteware (began production in 1830), purple transfer-printed whiteware (began production in 1828), a clear glass jar manufactured by the Knox Glass Bottle Company (1932–1952), a clear glass medicine bottle manufactured by Owens-Illinois Glass Company (1929–1960), a clear glass Sloan's Liniment bottle manufactured by Owens-Illinois Class Company (began production in 1954), a clear bottle manufactured by Tygart Valley Glass Company (1927–1929), a glass bottle manufactured by the Knox Glass Company (1932–1952), and a small amber bottle for Vick's Va Tro Nol nose drops (1931–c. 1950s; Lockhart et al. 2008, 2013; Paquette 2010). These dates indicate the site was likely occupied during the 1940s (Figure 21).

Table 4. Artifact Assemblage from Site 31CL176

Shovel Test	Artifact Description	Functional Group	Count	Weight
N500 E500, 0-20 cmbs	Aqua Container Glass	Foodways	1	5.4
N515 E500, 0-20 cmbs	Embossed Clear Container Glass	Foodways	1	6.7
	Coal	Other	3	22.4
Bottle Midden, Surface	Clear Glass Bottle, "Sloan's Liniment," Maryland Glass Company	Foodways	1	115.7
	Clear Container Glass, Base Fragment	Foodways	1	59.5
	Plain, Molded Whiteware Cup	Foodways	1	82.9
	Whiteware, Purple Transfer Print	Foodways	2	21.2
	Clear Glass jar, Knox Glass Bottle Company	Foodways	1	82.4
	Clear Glass Medicine Bottle, Metal Screw Cap, Owens-Illinois Glass Company	Foodways	1	168.6
	Clear Glass Medicine Bottle, "Sloan's Liniment," Owens-Illinois Glass Company	Foodways	1	111.8
	Clear Glass Bottle, Tygart Valley Glass Company	Foodways	1	261
	Clear Container Glass, Metal Lid, Knox Glass Bottle Company	Foodways	1	109.2
	Amber Glass Bottle, Vicks Va Tro Nol Nose Drops	Foodways	1	36.8
	Clear Container Glass	Foodways	1	21.1
Total			17	1,104.7

Site 31CL176 is a late nineteenth to middle twentieth-century farmstead located in the southeastern corner of Study Area 2. Artifacts recovered from Site 31CL176 do not embody distinctive characteristics of a type or period and are instead indicative of mass-produced consumer goods available throughout the region. As such, these artifacts have broad date ranges of production and usage and cannot be narrowed to a date of occupation. The site lacks the integrity to display association with broad patterns in history, and although the Daniel family was present in the area during the nineteenth century, no members of the family are of known historical significance as they relate to Site 31CL176. Limited sub-surface artifact recovery, soil erosion, and the absence of an intact A horizon suggest the site lacks integrity and is unlikely to yield significant archaeological data. Site 31CL176 is recommended not eligible for the NRHP under Criterion A, B, C, or D, and no further work is recommended.

Site 31CL177

Field Number:	SET03
UTM Coordinates:	437311.42 E 3906831.71 N (Zone 17N, NAD83)
Datum Coordinates:	STP 177
Elevation:	810 feet amsl
USGS Quadrangle (7.5′):	Boiling Springs North
Property/Site Type:	Historic House Site
Temporal Affiliations:	Twentieth Century Homestead
Setting:	Ridge
Soils:	Pacolet Sandy Clay Loam
Site Size:	22x28 meters (72x92 ft.)
Archaeological Deposit Depth:	Surface
Features:	Collapsed House
NRHP Recommendation:	Not Eligible
Management Recommendation:	No Further Work Recommended

Site 31CL177 is a twentieth-century historic house site located 105 meters (344 ft.) northeast of the intersection of US-74 and SR 1168, in the westernmost portion of Study Area 2 (Figure 22). The site was identified by a collapsed house (Feature 1) obscured by kudzu. Feature 1 is 11.7x11.5 meters (38.3x37.7 ft.). The kudzu makes it difficult to discern any of the house's structural characteristics. The interior of the house is visible along its southern elevation. A refrigerator, stove, water heater, and various structural debris were visible within the building's interior (Figure 23). The area directly west of Feature 1 appears to have been used as a drive from Lattimore Road. A sample of artifacts was collected from the building debris. NSA delineated Site 31CL177 using pedestrian reconnaissance and shovel testing. NSA excavated one shovel test near each elevation, all four of which were negative. Shovel Test 178 along the house's western elevation was terminated when a gravel drive was encountered at 18 cmbs.

The soils at Site 31CL177 differed from those of the surrounding area. The stratigraphic sequence in Shovel Test 177 to the south of the house consisted of brown (7.5YR 5/2) sandy loam terminating at 24 cmbs, beneath which was a light reddish brown (2.5YR 6/4) sandy loam terminating at 55 cmbs, then a yellowish red (5YR 4/6) sandy clay subsoil (Figure 24). The stratigraphic sequence in Shovel Test 177 was not present in the other three tests at the site. Shovel Test 179 to the north of the building did not contain any brown (7.5YR 5/2) sandy loam, and subsoil was encountered at 48 cmbs. Shovel Test 20, to the east of the building, was shallow and eroded, consistent with the soils identified in the remainder of the soybean field. The presence of intact soils to the south of the house suggests that the area directly south of the house was likely used as a yard. This is further supported by historic images of the property.

Site 31CL177 contains the remnants of a frame dwelling that occupied the south end of the 9.183-acre parcel currently owned by Carolyn Whitaker Champion and Jeffery D. Champion. The parcel has been associated with the Whitaker family since 1944, and archival research indicates that the family rented a house in the Sandy Run area of Cleveland County as early as 1930. In July 1944, Fred and Mary Texie Whitaker purchased a 36-acre tract containing this 9.183-acre parcel from B.B. Harris (et al). At that time, the property included land on either side of a dirt wagon road, likely present-day Lattimore Road. The property was surveyed in 1918, indicating that the dwellings on the property could have been constructed prior to the Whitakers' purchase (CCDB 9-A: 445). Fred Whitaker was born in nearby Rutherfordton, North Carolina in 1890. By 1930, he was living in Township 7 in Sandy Run. By the 1940 U.S. Census, Fred, his wife Texie, his stepdaughter Edna, and his four sons, Lawrence, Carl, Paul, and Fred Whitaker, Jr., rented a house in the Sandy Run area. Fred worked as a farmer on his own account, and Texie worked as a weaver at a cotton mill (U.S. Census Bureau 1940). In 1961, Fred and Texie conveyed this 36-acre tract to their son Carl G. Whitaker (CCDB 9-A:445). The property was conveyed to Carolyn Whitaker Swink by Mark Steven Swink in 2007 (CCDB 1527:182). A review of historic aerial images indicates that the building associated with Site 31CL177 was extant by 1947 and was demolished between 1999 and 2006 (see Figure 11; NETR Online 2020). Background research indicates, that although the Whitaker family was in the area during the early to mid-twentieth century, no members of the family are of known historical significance.

Table 5 summarizes the artifact assemblage (*n*=3) for Site 31CL177. None of the artifacts recovered were diagnostic, and all were recovered from the surface near STP 177, to the south of the house's foundation (Figure 25). Sponge-decorated ceramics, such as the vessel identified at Site 31CL177, were especially popular among consumers from the 1820s until the turn of the twentieth century (Brown 1982).

Table 5. Artifact Assemblage from Site 31CL177

Shovel Test	Artifact Description	Functional Group	Count	Weight
STP 177 Surface	Burned Milk Glass Container Glass, Leaf Decoration	Foodways	1	14.5
	Plastic PVC Pipe Fragment	Other	1	7
	Bristol Slipped Blue Sponge Decorated Stoneware Plate	Foodways	1	173.1
Total			3	194.6

Site 31CL177 is a twentieth-century historic farmstead located in the westernmost portion of Study Area 2. Artifacts recovered from Site 31CL177 do not embody distinctive characteristics of a type or period. The site lacks the integrity to display association with broad patterns in history. Background research indicates that, although the Whitaker family was in the area during the early to mid-twentieth century, no family members are of known historical significance. Limited artifact recovery and the absence of intact subsurface context indicate that the site lacks integrity and is unlikely to yield significant archaeological data. Site 31CL177 is recommended not eligible for the NRHP under Criterion A, B, C, or D, and no further work is recommended.

Summary of Findings

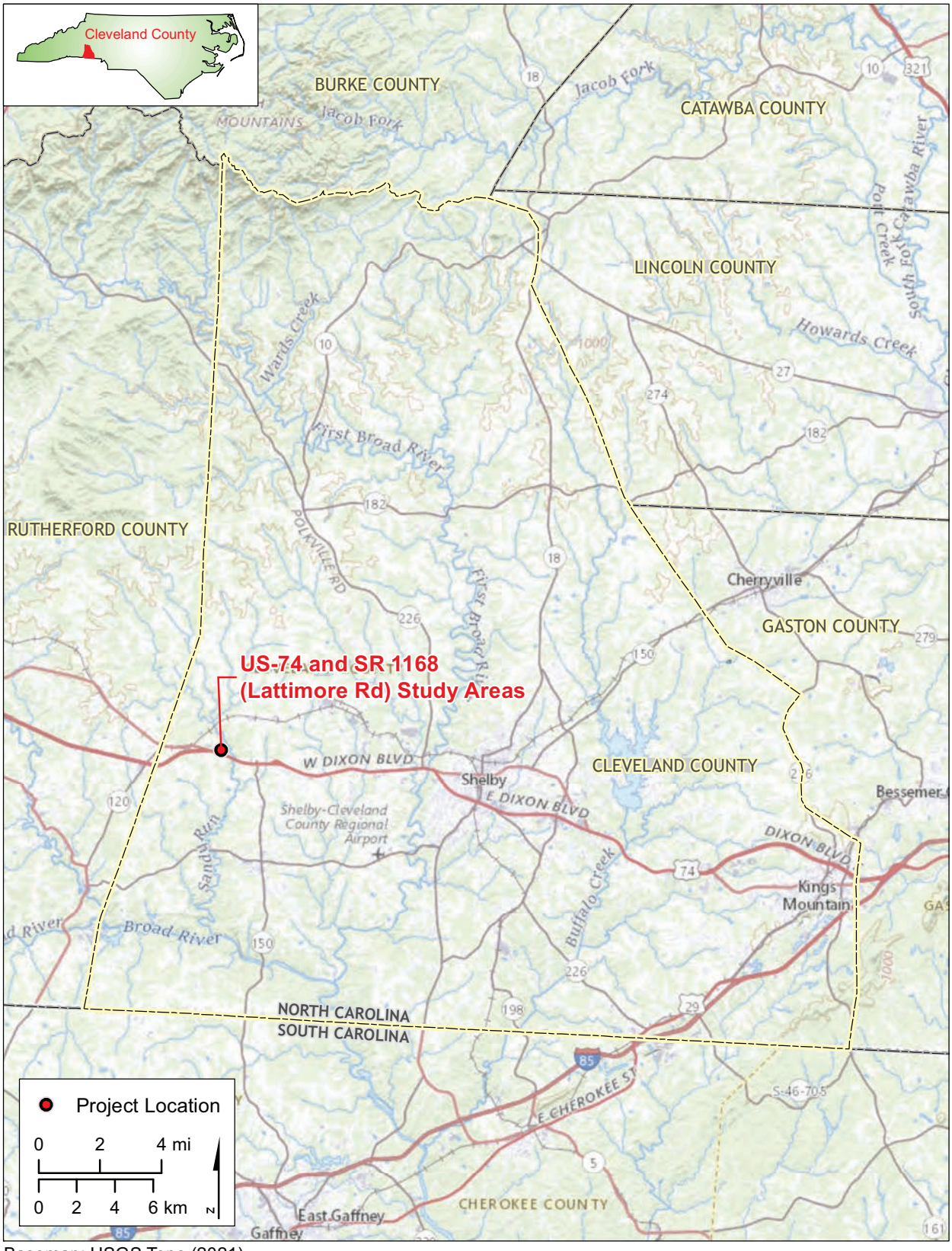
In October of 2021, NSA recorded 195 shovel tests in the Study Areas ahead of the proposed upgrade to the intersection of US-74 and SR 1168 (Lattimore Road) in Cleveland County, North Carolina. The survey resulted in the identification of three archaeological sites (31CL175, 31CL176, and 31CL177), all of which were previously unrecorded. All three sites were recommended not eligible for the NRHP. No additional work is recommended within the Study Areas.

SUPPORT DOCUMENTATION

See attached: ☒ Map(s) ☐ Previous Survey Info ☒ Photos ☐ Correspondence
Signed:

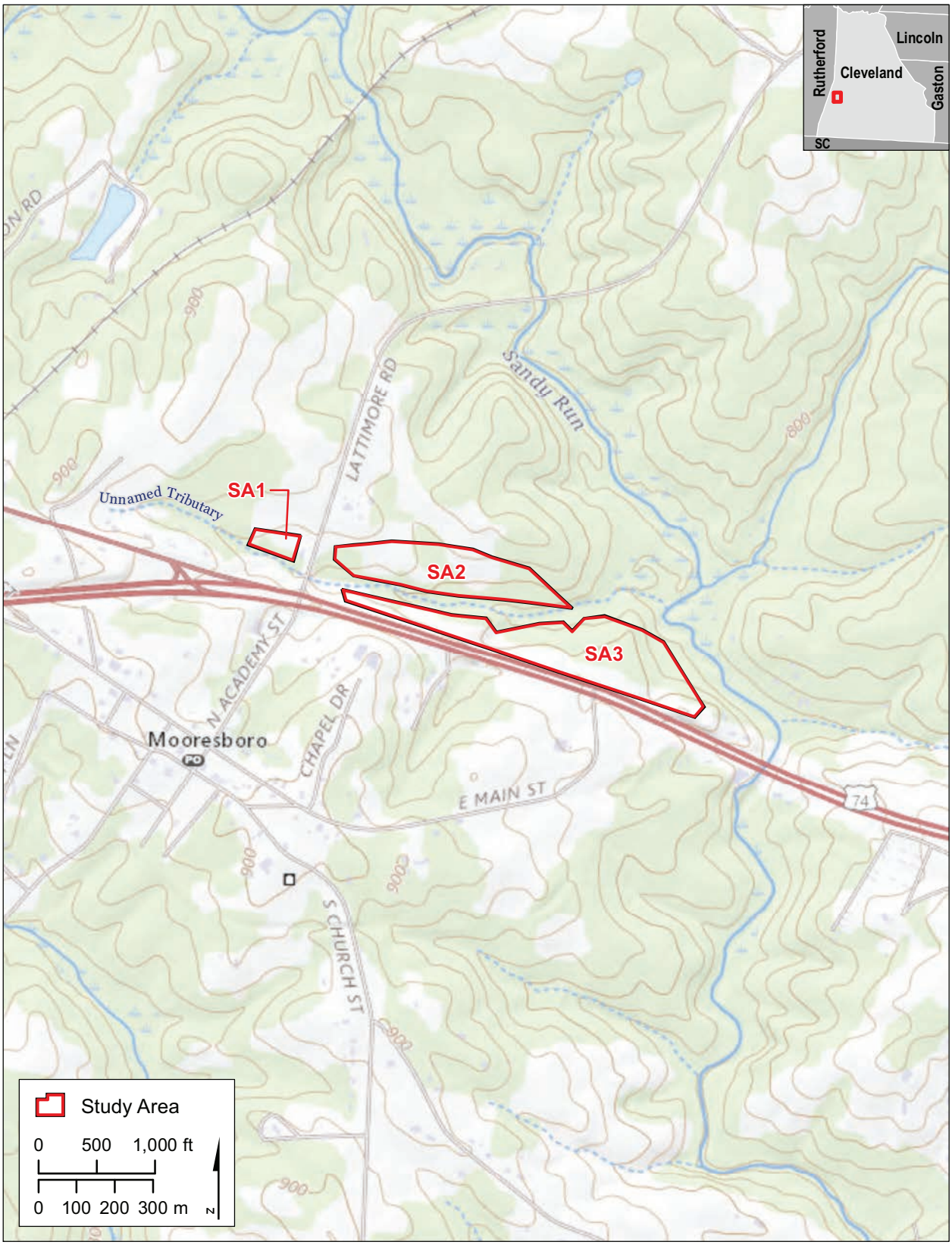
NCDOT ARCHAEOLOGIST **Date**

Figure 1.
Location of the Study Areas in Cleveland County

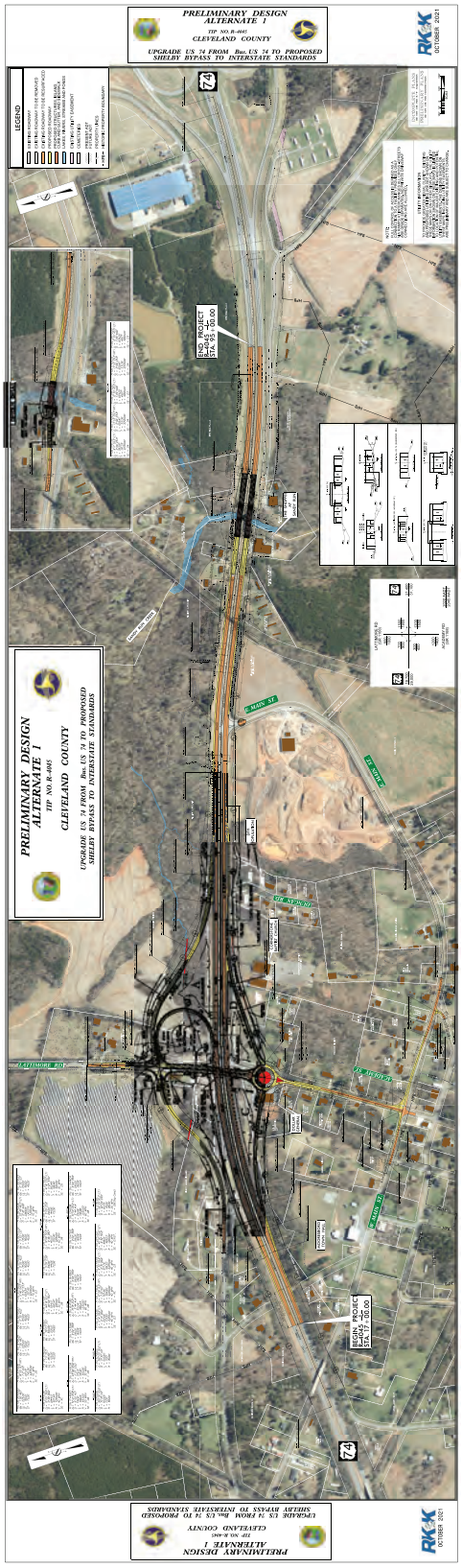


Basemap: USGS Topo (2021)

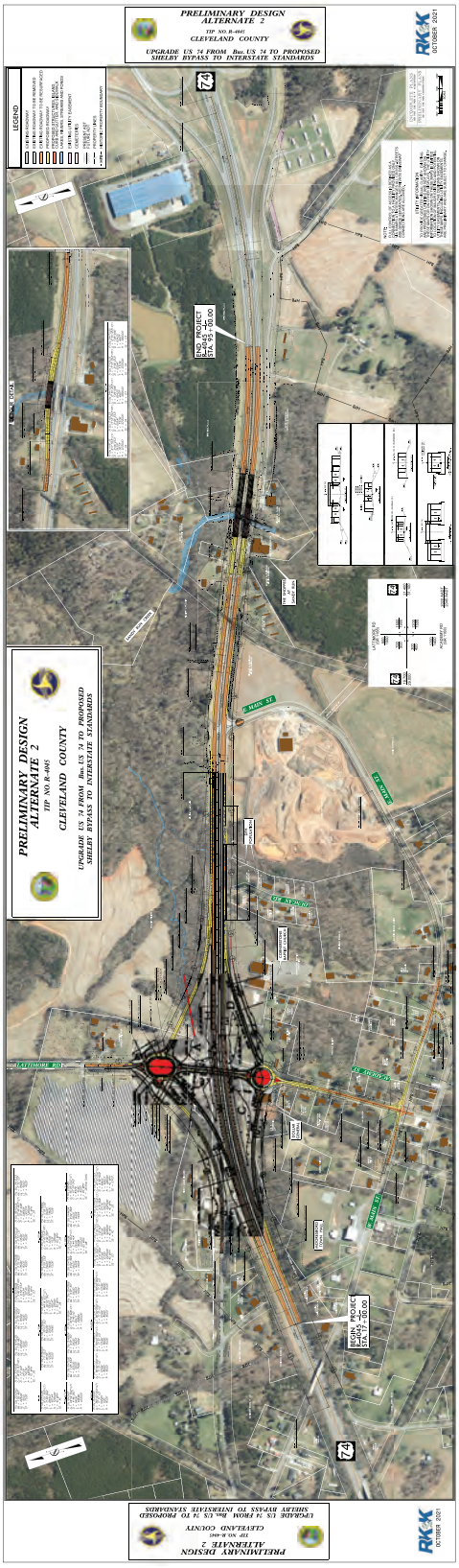
Figure 2.
Topographic Map of the Study Areas



Basemap: USGS Topo (2021)



A. Preliminary Design Alternative 1



B. Preliminary Design Alternative 2

Figure 3.
Alternative Plans for the Proposed Road Improvements

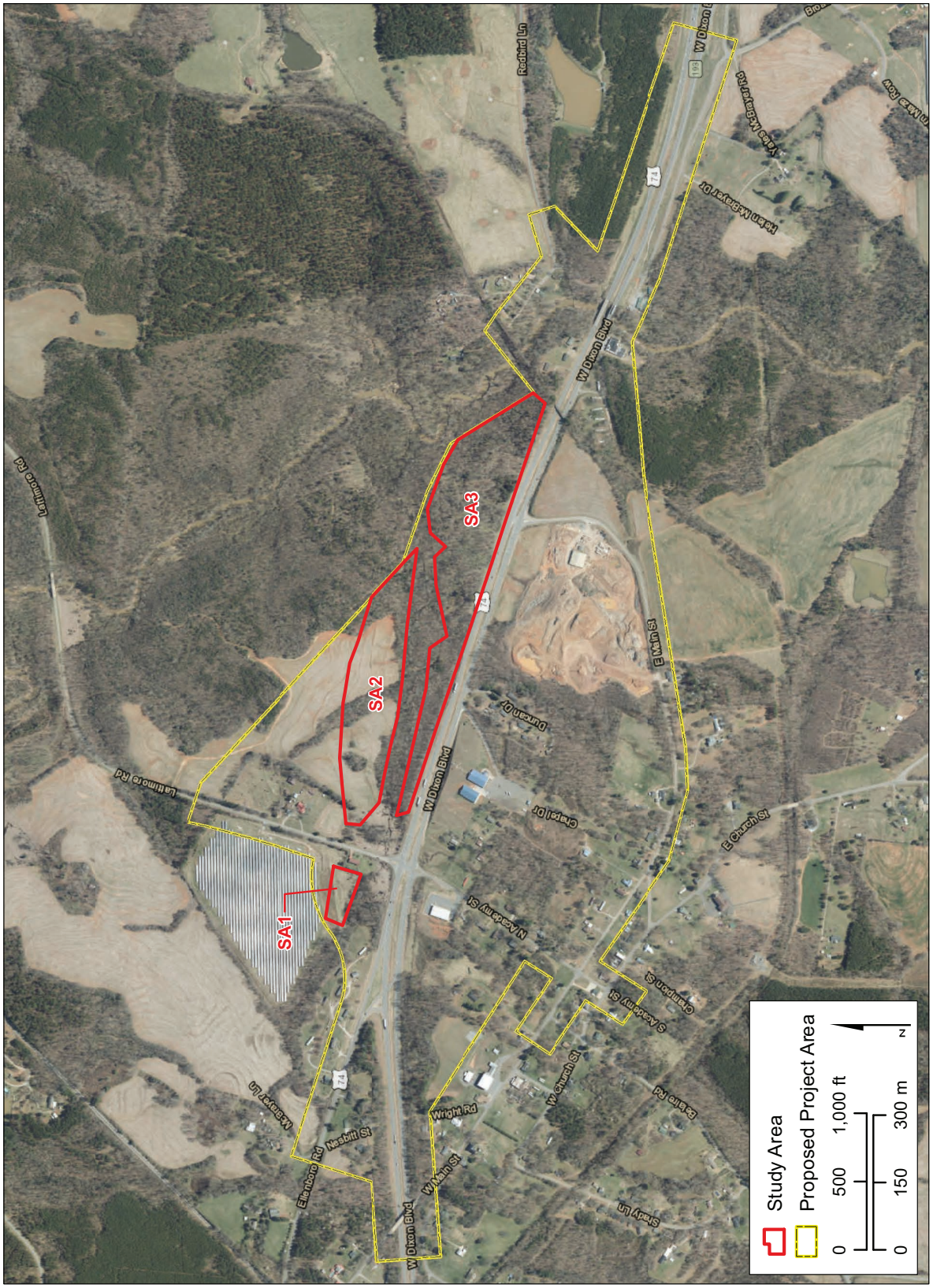


Figure 4.
Aerial Photograph of the Study Areas in the Proposed Project Area

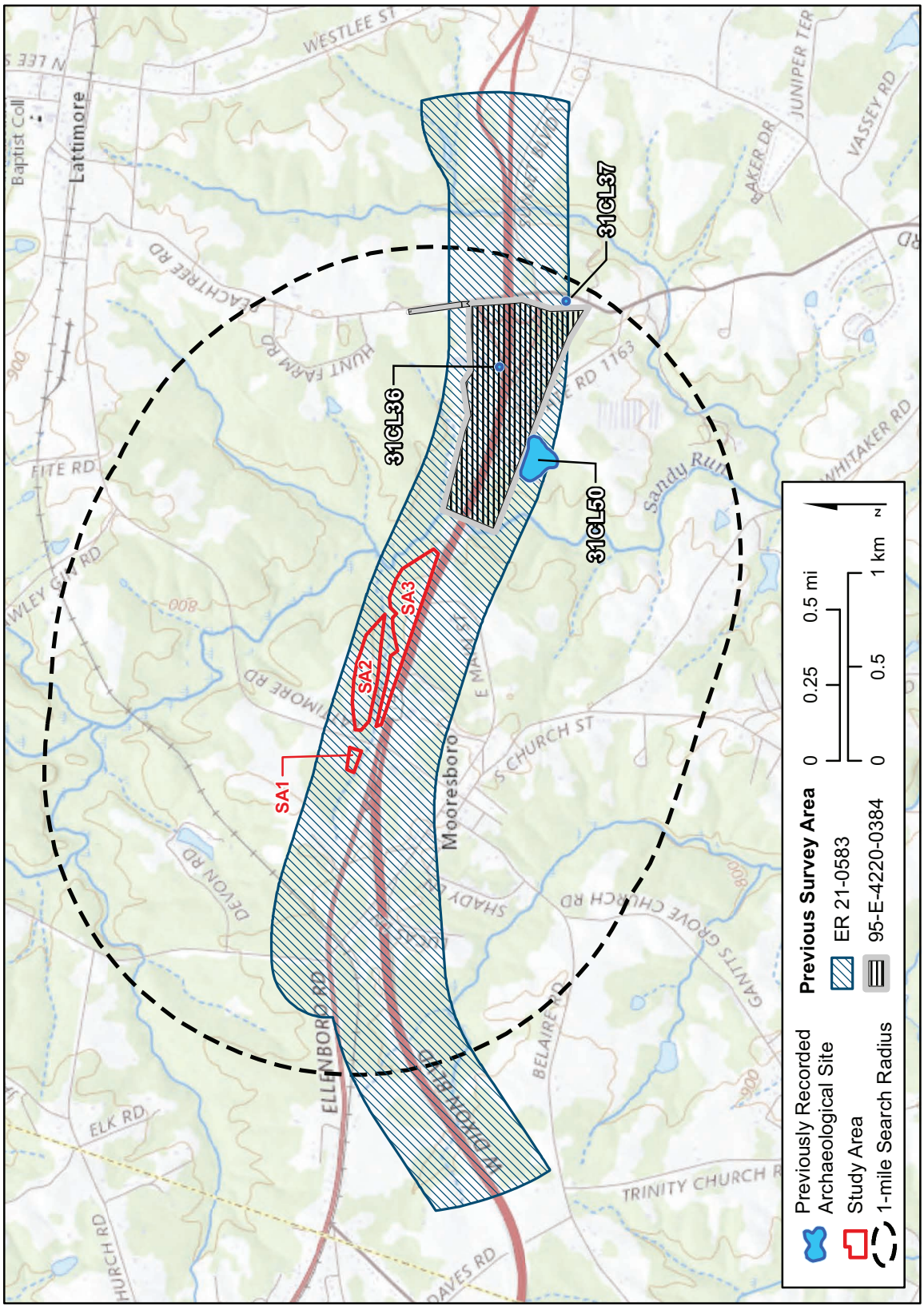
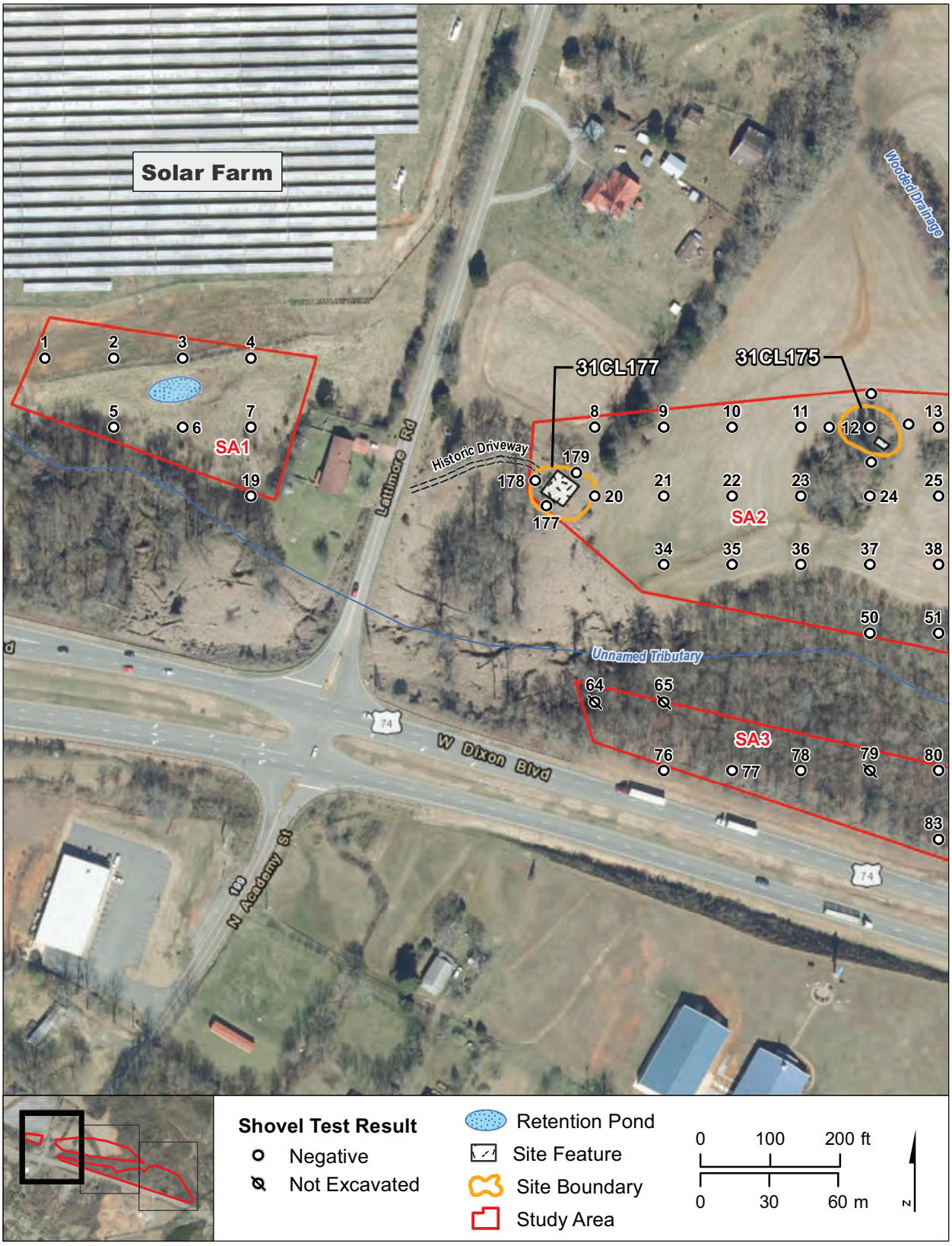


Figure 5.
Topographic Map Showing Previously Recorded Sites, Previous Surveys, and Previous Environmental Reviews within One Mile of the Study Areas

Figure 6.
Aerial Photograph Showing Survey Results in the Study Areas, 1 of 3



Basemap: ESRI, NC CGIA (2019)

Figure 7.
Aerial Photograph Showing Survey Results in the Study Areas, 2 of 3

Basemap: ESRI, NC CGIA (2019)

Figure 8.
Aerial Photograph Showing Survey Results in the Study Areas, 3 of 3

Basemap: ESRI, NC CGIA (2019)

Figure 9.
Overview of Study Areas, 1 of 2

A. Study Area 1, Facing East

B. Study Area 1, Facing North Toward the Solar Farm

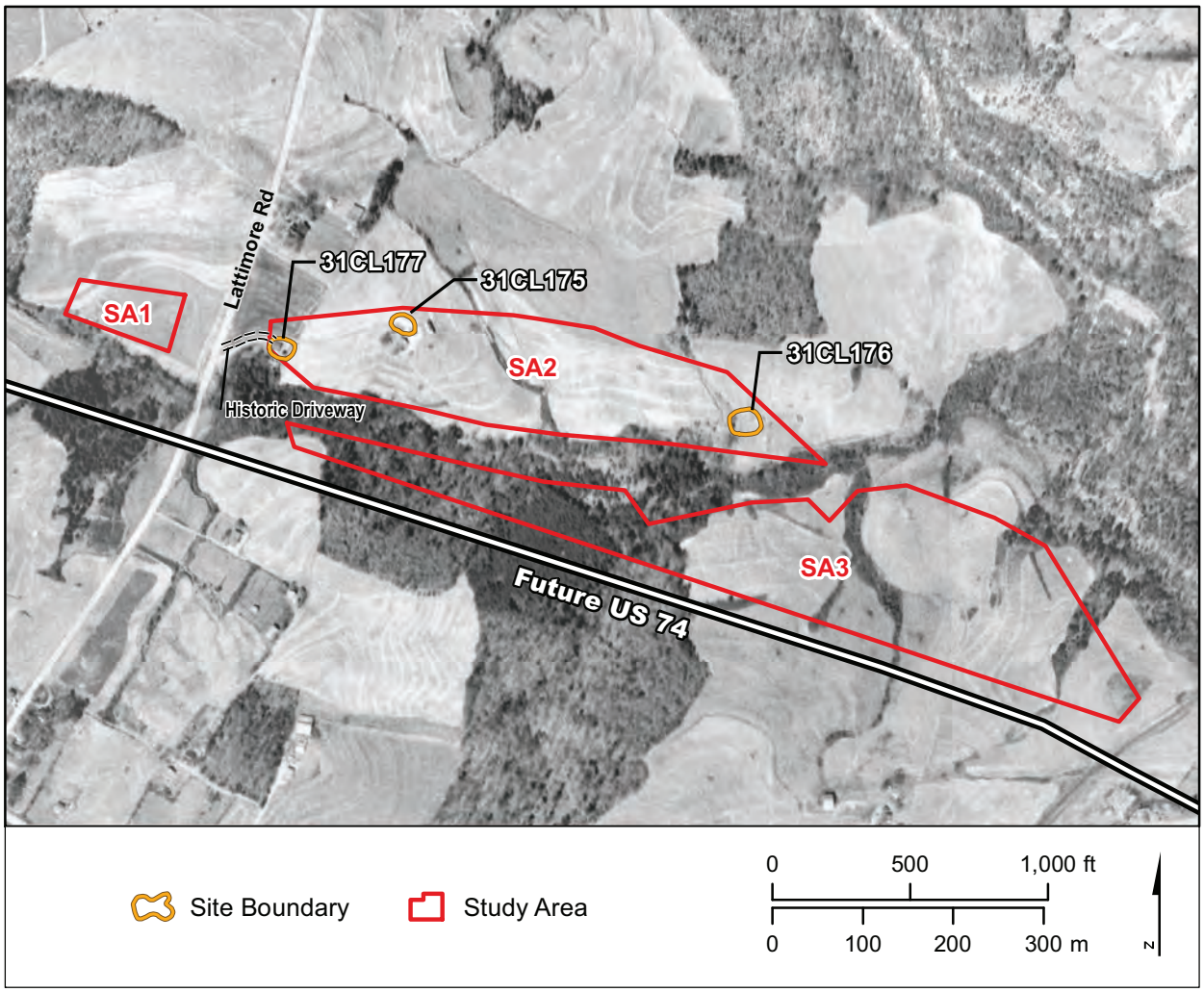
Figure 10.
Overview of Study Areas, 2 of 2

A. Study Area 2, Facing North

B. Study Area 3, Facing East

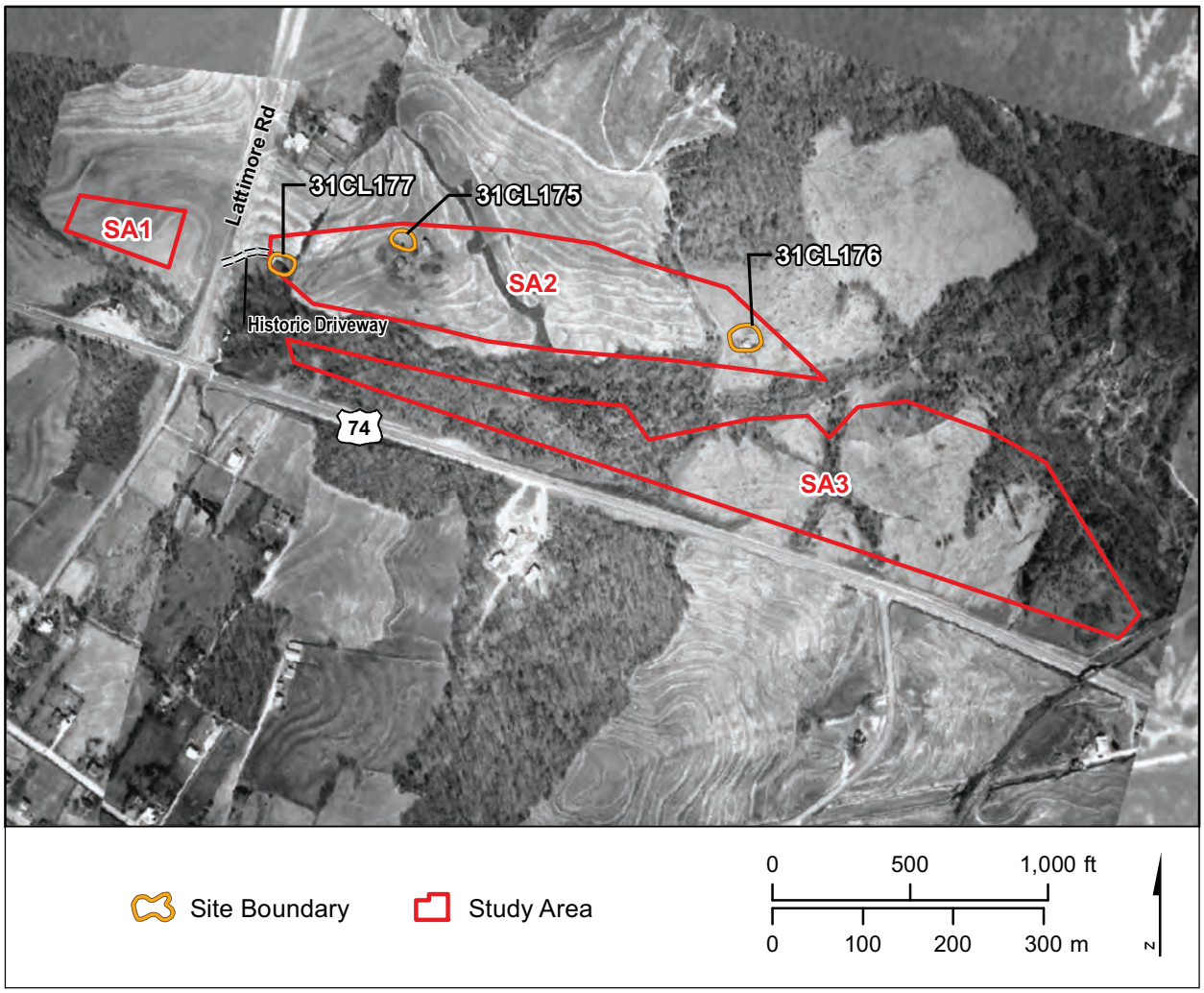
C. Study Area 3, Uneven Topography Facing Northwest

Figure 11.
Study Areas as Depicted on the 1947 Historic Aerial Photograph



Basemap: 1947 Aerial Photograph from NETR, LLC

Figure 12.
Study Areas as Depicted on the 1961 Historic Aerial Photograph



Basemap: 1961 Aerial Photograph from NC DOT

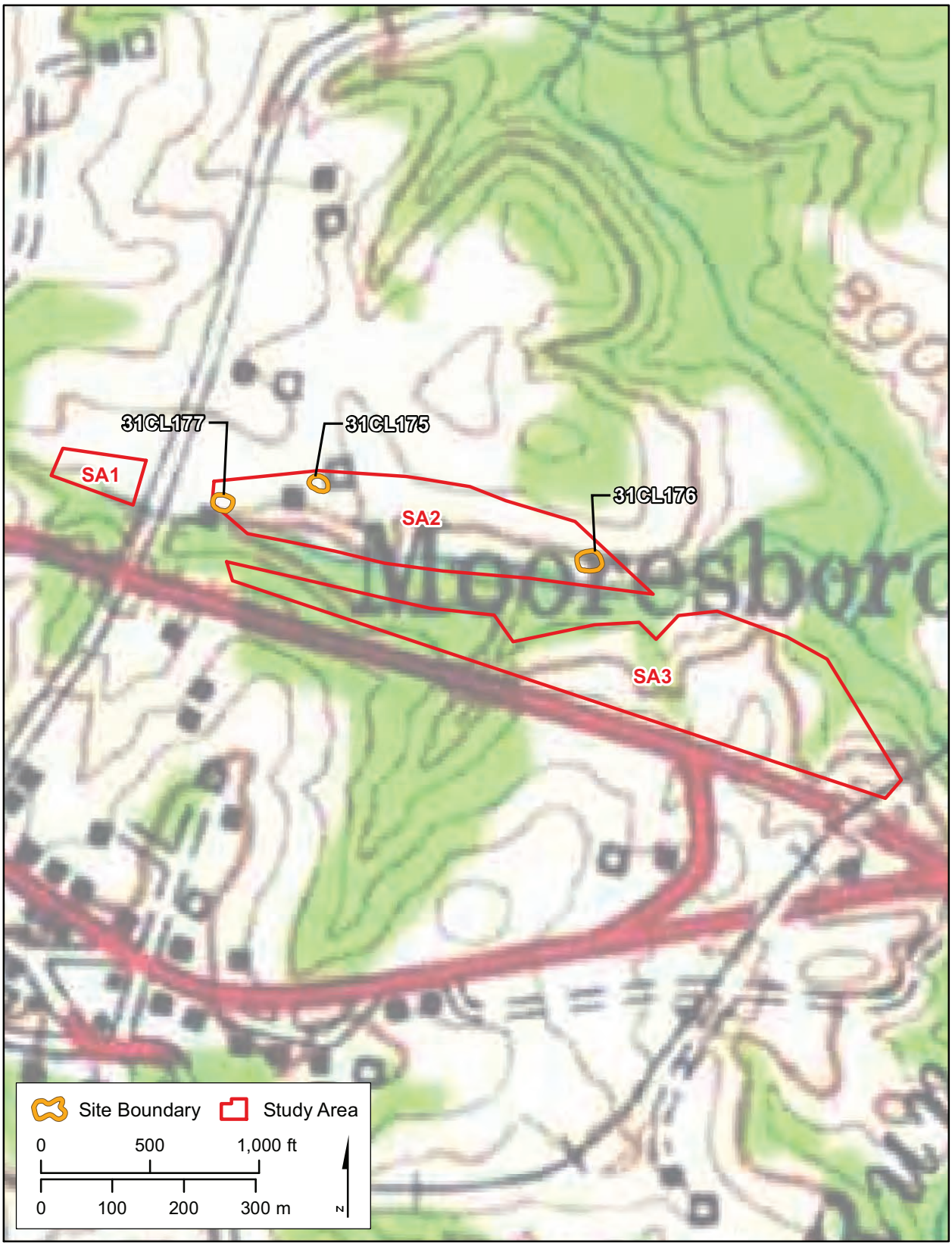
Figure 13.
Aerial Photograph Showing Map of Site 31CL175 in Study Area 2

Basemap: ESRI, NC CGIA (2019)

Figure 14.
Site 31CL175, Facing South Toward the Metal Roofing

Figure 15.
Shovel Test 12 (N500 E500) Profile at Site 31CL175

Figure 16.
Archaeological Sites as Depicted on the 1950 USGS Topographic map



Basemap: USGS 15-minute Shelby (1950), NC Topographic Quadrangle

Figure 17.
Site 31CL175, Unidentified Quartz Projectile Point

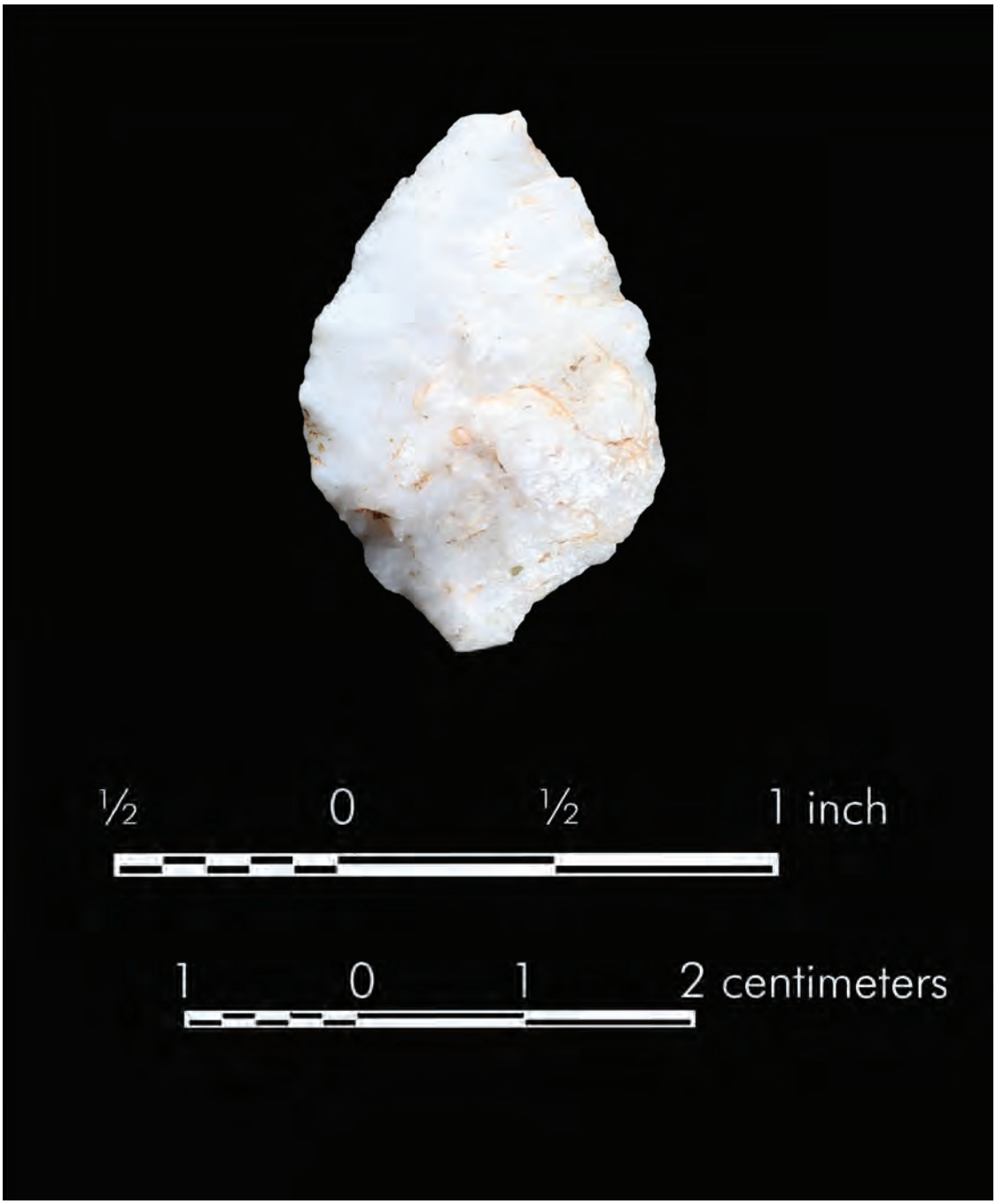


Figure 18.
Aerial Photograph Showing Map of Site 31CL176 in Study Area 2

Basemap: ESRI, NC CGIA (2019)

Figure 19.
Site 31CL176, Feature 1

A. The Western Elevation of Feature 1 Facing East

B. Northeast Corner of Feature 1 Facing Southwest

Figure 20.
Shovel Test Profile of N500 E500 at Site 31CL176

Figure 21.
Diagnostic Artifacts from Site 31CL176

a. Sloan's Liniment Bottle manufactured by the Maryland Glass Company; b. Vicks Va Tro Nol nose drop bottle; c. Purple transfer-printed whiteware

Figure 22.
Aerial Photograph Showing Map of Site 31CL177 in Study Area 2

Basemap: ESRI, NC CGIA (2019)

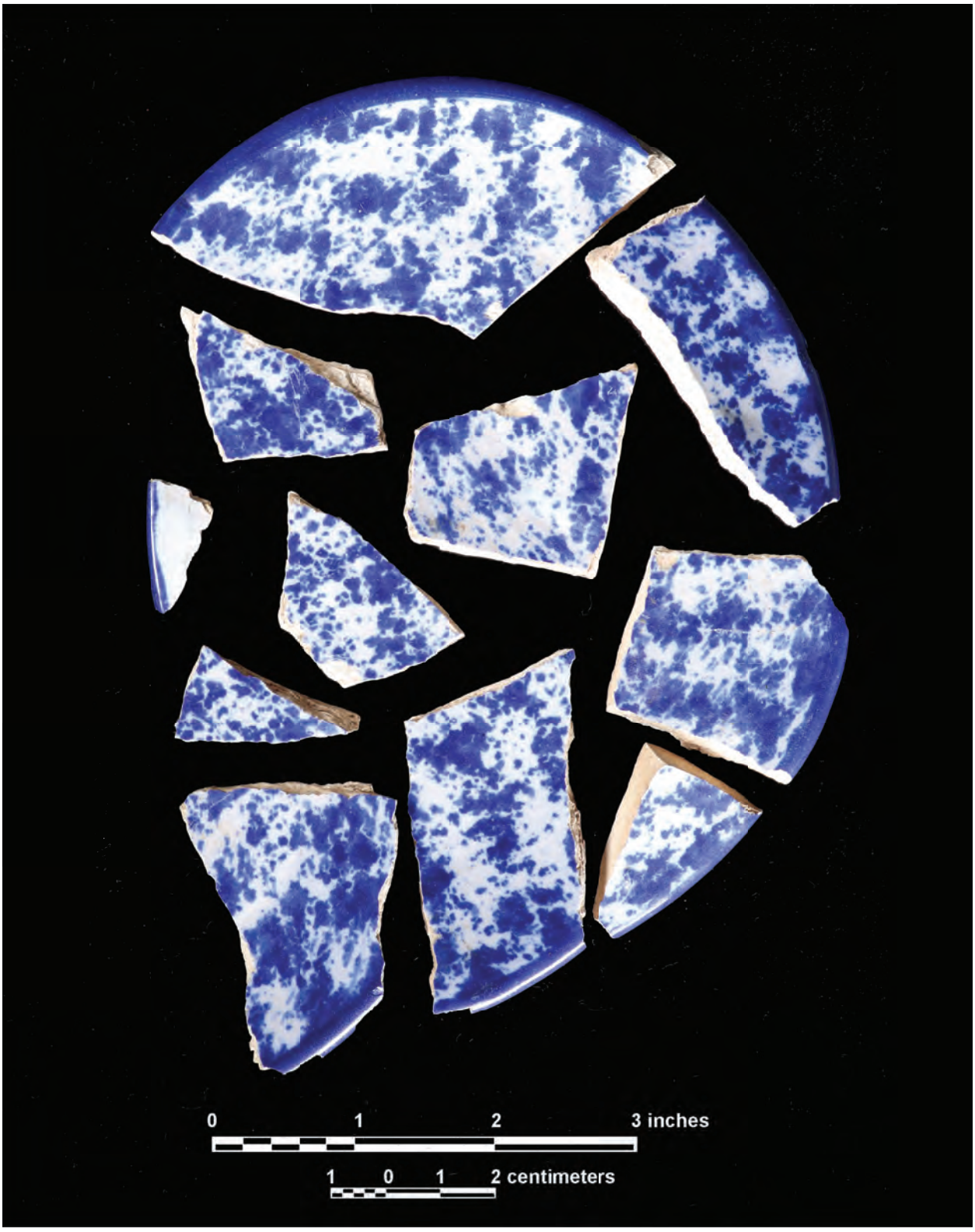
Figure 23.
Site 31CL177, Feature 1

A. Feature 1 Facing Northeast

B. Interior of Feature 1 Facing North

Figure 24.
Shovel Test 177 Profile at Site 31CL177

Figure 25.
Site 31CL177, Bristol Slipped Blue Sponge-Decorated Stoneware



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APPENDIX A: SHOVEL TEST DATA

STP Database

STP ID	Results	Site ID	N	E	Find Notes	A Bag ID	A CMBS	A Bag Comment	01 CMBS	01 Color	01 Texture	02 CMBS	02 Color	02 Texture	03 CMBS	03 Color	03 Texture
1	Negative								0,10	2.5YR4/8 Red	Silty Clay	10,20,26	7.5YR5/6 Strong Brown	Clay			
10	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
100	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
101	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
102	Negative								28	2.5YR4/4 Reddish Brown	Sandy Loam	42	10R4/6 Red	Sandy Clay			
103	Negative								28	2.5YR4/4 Reddish Brown	Sandy Loam	44	10R4/6 Red	Sandy Clay			
104	Negative								25	10YR5/2 Grayish Brown	Sandy Loam	38	5YR4/6 Yellowish Red	Sandy Clay			
105	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
106	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
107	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
108	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
109	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
11	Negative								38	2.5YR4/3 Reddish Brown	Sandy Loam	46	10R3/6 Dark Red	Sandy Clay			
110	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
111	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
112	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
113	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
114	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
115	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
116	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
117	Negative								28	2.5YR4/4 Reddish Brown	Sandy Loam	44	10R4/6 Red	Sandy Clay			
118	Negative								28	2.5YR4/4 Reddish Brown	Sandy Loam	36	10R4/6 Red	Sandy Clay			
119	Negative								20	2.5YR4/4 Reddish Brown	Sandy Loam	34	10R3/4 Dusky Red	Sandy Clay			
12	Negative								25	2.5YR4/3 Reddish Brown	Sandy Loam	36	10R3/6 Dark Red	Sandy Clay			
120	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
121	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
122	Not Excavated																
123	Not Excavated																
124	Not Excavated																
125	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
126	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
127	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
128	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
129	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
13	Negative								28	2.5YR4/3 Reddish Brown	Sandy Loam	36	10R3/6 Dark Red	Sandy Clay			
130	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
131	Negative								20	2.5YR4/4 Reddish Brown	Sandy Loam	31	10R3/4 Dusky Red	Sandy Clay			
132	Not Excavated																
133	Negative								26	10R3/6 Dark Red	Sandy Clay						
134	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
135	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
136	Not Excavated																
137	Negative								48	10R3/6 Dark Red	Sand	64	2.5YR4/3 Reddish Brown	Sandy Clay			
138	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
139	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
14	Negative								28	2.5YR5/4 Reddish Brown	Sandy Loam	38	10R5/8 Red	Sandy Loam			
140	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
141	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			

STP ID	Results	Site ID	N	E	Find Notes	A Bag ID	A CMBS	A Bag Comment	01 CMBS	01 Color	01 Texture	02 CMBS	02 Color	02 Texture	03 CMBS	03 Color	03 Texture
142	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
143	Negative								30	2.5YR4/4 Reddish Brown	Sandy Loam	40	10R3/4 Dusky Red	Sandy Clay			
144	Negative								35	7.5YR5/3 Brown	Sandy Loam	42	5YR4/6 Yellowish Red	Sandy Clay			
145	Negative								35	2.5YR4/3 Reddish Brown	Sandy Loam	44	2.5YR4/8 Red	Sandy Clay			
146	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
147	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
148	Negative								28	5YR6/4 Light Reddish Brown	Sandy Loam	36	2.5YR5/6 Red	Sandy Clay			
149	Negative								28	5YR6/4 Light Reddish Brown	Sandy Loam	40	7.5YR6/6 Reddish Yellow	Sandy Clay			
15	Negative								25	2.5YR5/4 Reddish Brown	Sandy Loam	38	10R5/8 Red	Sandy Loam			
150	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
151	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
152	Negative								28	2.5YR4/4 Reddish Brown	Sandy Loam	36	10R3/4 Dusky Red	Sandy Clay			
153	Negative								26	10R3/6 Dark Red	Sandy Clay						
154	Negative								36	7.5YR5/4 Brown	Sand	48	10YR5/2 Grayish Brown	Sandy Clay			
155	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
156	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
157	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
158	Not Excavated																
159	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
16	Negative								25	2.5YR5/8 Red	Sandy Clay						
160	Negative								28	10R3/6 Dark Red	Sandy Clay						
161	Negative								29	10R3/4 Dusky Red	Sandy Loam	36	2.5YR4/6 Red	Sandy Clay			
162	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
163	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
164	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
165	Negative								28	10R3/6 Dark Red	Sandy Clay						
166	Negative								28	10R3/6 Dark Red	Sandy Clay						
167	Negative								28	10R3/6 Dark Red	Sandy Clay						
168	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
169	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
17	Negative								24	2.5YR5/4 Reddish Brown	Sandy Loam	33	10R5/8 Red	Sandy Loam			
170	Negative								25	7.5YR5/3 Brown	Sandy Loam	36	7.5YR6/6 Reddish Yellow	Sandy Clay			
171	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
172	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
173	Not Excavated																
174	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
175	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
176	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
177	Negative	31CL177							24	7.5YR5/2 Brown	Sandy Loam	55	2.5YR6/4 Light Reddish Brown	Sandy Loam	70	5YR4/6 Yellowish Red	Sandy Clay
178	Negative	31CL177							18	2.5YR4/3 Reddish Brown	Sandy Loam						
179	Negative	31CL177							36	2.5YR4/3 Reddish Brown	Sandy Loam	48	5YR7/6 Reddish Yellow	Sandy Clay			
18	Negative								27	2.5YR5/4 Reddish Brown	Sandy Loam	35	10R5/8 Red	Sandy Loam			
19	Negative								28	7.5YR6/6 Reddish Yellow	Sandy Loam	38	2.5YR3/2 Dusky Red	Sandy Clay			
2	Negative								26	5YR4/6 Yellowish Red	Sandy Clay						

STP ID	Results	Site ID	N	E	Find Notes	A Bag ID	A CMBS	A Bag Comment	01 CMBS	01 Color	01 Texture	02 CMBS	02 Color	02 Texture	03 CMBS	03 Color	03 Texture
20	Negative								0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
21	Negative								26	2.5YR4/4 Reddish Brown	Sandy Loam	35	5YR5/8 Yellowish Red	Sandy Clay			
22	Negative								0,35	10R3/4 Dusky Red	Sandy Loam	35,45	5YR5/6 Yellowish Red	Sandy Clay			
23	Negative				Charcoal flecking throughout level 1.				28	2.5YR4/4 Reddish Brown	Sandy Loam	35	5YR5/8 Yellowish Red	Sandy Clay			
25	Negative								24	2.5YR4/4 Reddish Brown	Sandy Loam	38	10R4/8 Red	Sandy Clay			
26	Negative								26	2.5YR5/4 Reddish Brown	Sandy Loam	32	10R5/8 Red	Sandy Loam			
27	Not Excavated																
28	Negative								24	2.5YR5/4 Reddish Brown	Sandy Loam	32	10R5/8 Red	Sandy Loam			
29	Negative								28	2.5YR5/4 Reddish Brown	Sandy Loam	38	10R5/8 Red	Sandy Loam			
3	Negative								0,16	2.5YR4/8 Red	Silty Clay	16,26	7.5YR5/6 Strong Brown	Clay			
30	Negative								28	2.5YR5/4 Reddish Brown	Sandy Loam	38	10R5/8 Red	Sandy Loam			
31	Negative								32	2.5YR5/4 Reddish Brown	Sandy Loam	42	10R5/8 Red	Sandy Loam			
32	Negative								0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
33	Negative								0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
34	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
35	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
36	Negative								0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
37	Negative								0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
38	Negative								0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
39	Negative								0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
4	Negative								28	10R3/4 Dusky Red	Sandy Loam	38	5YR6/6 Reddish Yellow	Sandy Clay			
40	Negative								0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
41	Negative								0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
42	Negative								0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
43	Negative								0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
44	Negative								0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
45	Negative								0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
46	Negative								0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
47	Negative								0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
48	Negative								0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
49	Negative								0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
5	Negative								52	2.5YR5/4 Reddish Brown	Sandy Loam	62	5YR4/6 Yellowish Red	Sandy Clay			
50	Negative								28	2.5YR4/4 Reddish Brown	Sandy Loam	38	10R4/8 Red	Sandy Clay			
51	Negative								24	2.5YR4/4 Reddish Brown	Sandy Loam	32	10R4/8 Red	Sandy Clay			
52	Negative								26	2.5YR4/4 Reddish Brown	Sandy Loam	34	10R4/8 Red	Sandy Clay			
53	Negative								25	2.5YR4/4 Reddish Brown	Sandy Loam	34	10R4/8 Red	Sandy Clay			
54	Negative								28	10R4/8 Red	Clay						
55	Negative								25	2.5YR4/4 Reddish Brown	Sandy Loam	36	10R4/8 Red	Sandy Clay			
56	Negative								32	2.5YR5/4 Reddish Brown	Sandy Loam	40	10R5/8 Red	Sandy Loam			
57	Negative								25	10R3/6 Dark Red	Sandy Clay						
58	Negative								28	10R3/6 Dark Red	Sandy Clay						
59	Negative								28	5YR4/3 Reddish Brown	Sandy Loam	38	10R3/2 Dusky Red	Sandy Clay			
6	Negative								0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
60	Negative								28	10R3/6 Dark Red	Sandy Clay						
61	Negative								26	10R3/2 Dusky Red	Sandy Clay						
62	Negative								40	2.5YR5/4 Reddish Brown	Sandy Loam	52	10R5/8 Red	Sandy Loam			
63	Negative								26	10R3/2 Dusky Red	Sandy Clay						

STP ID	Results	Site ID	N	E	Find Notes	A Bag ID	A CMBS	A Bag Comment	01 CMBS	01 Color	01 Texture	02 CMBS	02 Color	02 Texture	03 CMBS	03 Color	03 Texture
64	Negative								25	2.5YR6/3 Light Reddish Brown	Sandy Loam	38	10R4/3 Weak Red	Sandy Clay			
65	Not Excavated																
66	Not Excavated																
67	Negative								36	2.5YR3/3 Dark Reddish Brown	Sandy Loam	45	2.5YR3/2 Dusky Red	Sandy Clay			
68	Negative								27	2.5YR3/3 Dark Reddish Brown	Sandy Loam	35	2.5YR3/2 Dusky Red	Sandy Clay			
69	Negative								26	2.5YR3/3 Dark Reddish Brown	Sandy Loam	35	2.5YR4/6 Red	Sandy Clay			
7	Negative								28	7.5YR6/6 Reddish Yellow	Sandy Loam	38	2.5YR3/2 Dusky Red	Sandy Clay			
70	Negative								26	7.5YR4/2 Brown	Sandy Loam	35	2.5YR5/4 Reddish Brown	Sandy Clay			
71	Negative								26	10R4/6 Red	Sandy Clay						
72	Negative	31CL176	#	#					25	10R4/6 Red	Sandy Clay						
73	Negative	31CL176	#	#					14	2.5YR4/3 Reddish Brown	Sandy Clay	36	10R3/6 Dark Red	Clay			
74	Negative								32	10R3/3 Dusky Red	Sandy Loam	42	10R3/6 Dark Red	Sandy Clay			
75	Negative								32	2.5YR4/3 Reddish Brown	Sandy Loam	42	10R3/4 Dusky Red	Sandy Clay			
76	Negative								28	2.5YR4/6 Red	Clay						
77	Negative								28	2.5YR6/3 Light Reddish Brown	Sandy Loam	38	10R4/3 Weak Red	Sandy Clay			
78	Negative								24	2.5YR6/3 Light Reddish Brown	Sandy Loam	35	10R4/8 Red	Sandy Clay			
79	Not Excavated																
8	Negative								0,25	10YR5/4 Yellowish Brown	Loamy Sand	25,35	5YR5/6 Yellowish Red	Sandy Clay			
80	Negative								28	2.5YR6/3 Light Reddish Brown	Sandy Loam	40	10R4/8 Red	Sandy Clay			
81	Negative								36	2.5YR4/3 Reddish Brown	Sandy Loam	46	10R4/6 Red	Sandy Clay			
82	Negative								30	2.5YR4/3 Reddish Brown	Sandy Loam	43	10R4/6 Red	Sandy Clay			
83	Negative								28	2.5YR6/3 Light Reddish Brown	Sandy Loam	40	10R4/8 Red	Sandy Clay			
84	Negative								32	5YR4/2 Dark Reddish Gray	Sandy Loam	42	2.5YR6/4 Light Reddish Brown	Sandy Clay			
85	Negative								26	5YR4/4 Reddish Brown	Sandy Loam	36	2.5YR6/4 Light Reddish Brown	Sandy Clay			
86	Not Excavated																
87	Negative								36	5YR4/4 Reddish Brown	Sandy Loam	42	2.5YR6/8 Light Red	Sandy Clay			
88	Negative								35	5YR4/4 Reddish Brown	Sandy Loam	40	2.5YR6/8 Light Red	Sandy Clay			
89	Negative								35	5YR4/4 Reddish Brown	Sandy Loam	40	2.5YR6/8 Light Red	Sandy Clay			
9	Negative								28	2.5YR4/3 Reddish Brown	Sandy Loam	36	10R3/6 Dark Red	Sandy Clay			
90	Negative								22	10YR5/3 Brown	Sandy Loam	36	2.5YR4/6 Red	Sandy Clay			
91	Negative								26	10R3/6 Dark Red	Sandy Clay						
92	Negative								32	10YR5/2 Grayish Brown	Sandy Loam	44	5YR4/6 Yellowish Red	Sandy Clay			
93	Negative								32	10YR5/2 Grayish Brown	Sandy Loam	44	5YR4/6 Yellowish Red	Sandy Clay			
94	Negative								32	10YR5/2 Grayish Brown	Sandy Loam	44	5YR4/6 Yellowish Red	Sandy Clay			
95	Negative								32	10YR5/2 Grayish Brown	Sandy Loam	44	5YR4/6 Yellowish Red	Sandy Clay			
96	Negative								32	10YR5/2 Grayish Brown	Sandy Loam	44	5YR4/6 Yellowish Red	Sandy Clay			
97	Negative								32	10YR5/2 Grayish Brown	Sandy Loam	44	5YR4/6 Yellowish Red	Sandy Clay			
98	Negative								32	10YR5/2 Grayish Brown	Sandy Loam	44	5YR4/6 Yellowish Red	Sandy Clay			

STP ID	Results	Site ID	N	E	Find Notes	A Bag ID	A CMBS	A Bag Comment	01 CMBS	01 Color	01 Texture	02 CMBS	02 Color	02 Texture	03 CMBS	03 Color	03 Texture
99	Negative								32	10YR5/2 Grayish Brown	Sandy Loam	44	5YR4/6 Yellowish Red	Sandy Clay			
SET01 N485E 500	Negative	31CL175	#	#					29	2.5YR4/4 Reddish Brown	Sandy Loam	42	10R4/6 Red	Sandy Clay			
SET01 N500E 515	Negative	31CL175	#	#					25	2.5YR4/4 Reddish Brown	Sandy Loam	36	10R3/6 Dark Red	Sandy Clay			
SET01 N500E 530	Negative	31CL175	#	#					32	2.5YR4/4 Reddish Brown	Sandy Loam	40	10R3/6 Dark Red	Sandy Clay			
SET01 N500N 485	Negative	31CL175	#	#					28	2.5YR4/4 Reddish Brown	Sandy Loam	46	10R3/6 Dark Red	Sandy Clay			
SET01 N515E 470	Negative	31CL175	#	#					29	2.5YR4/4 Reddish Brown	Sandy Loam	42	10R4/6 Red	Sandy Clay			
SET01 N515E 500	Negative	31CL175	#	#					32	2.5YR4/4 Reddish Brown	Sandy Loam	40	10R3/6 Dark Red	Sandy Clay			
SET01 N515E 515	Negative	31CL175	#	#					29	2.5YR4/4 Reddish Brown	Sandy Loam	42	10R4/6 Red	Sandy Clay			
SET01 N515E 530	Negative	31CL175	#	#					32	2.5YR4/4 Reddish Brown	Sandy Loam	40	10R3/6 Dark Red	Sandy Clay			
SET01 N530E 500	Negative	31CL175	#	#					32	2.5YR4/4 Reddish Brown	Sandy Loam	40	10R3/6 Dark Red	Sandy Clay			
SET01 N545E 500	Negative	31CL175	#	#					32	2.5YR4/4 Reddish Brown	Sandy Loam	40	10R3/6 Dark Red	Sandy Clay			
SET02 N470E 500	Negative	31CL176	#	#					0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
SET02 N485E 500	Negative	31CL176	#	#					0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
SET02 N500E 470	Negative	31CL176	#	#					0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
SET02 N500E 500	Positive Historic	31CL176	#	#		2	0,22	1 clear curved glass	0,22	2.5YR3/3 Dark Reddish Brown	Clay Loam	22,32	2.5YR4/8 Red	Silty Clay			
SET02 N515E 485	Negative	31CL176	#	#					0,35	10YR5/4 Yellowish Brown	Loamy Sand	35,45	5YR5/6 Yellowish Red	Sandy Clay			
SET02 N515E 500	Positive Historic	31CL176	#	#		3	0,20	clear container glass, charcoal	0,22	2.5YR3/3 Dark Reddish Brown	Clay Loam	22,32	2.5YR4/8 Red	Silty Clay			

Historic Architecture and Landscapes

HISTORIC ARCHITECTURE AND LANDSCAPES ASSESSMENT OF EFFECTS FORM

This form only pertains to Historic Architecture and Landscapes for this project. It is not valid for Archaeological Resources. You must consult separately with the Archaeology Group.

PROJECT INFORMATION

Project No:	R-4045	***County***:	Cleveland
WBS No.:	34598.1.1	***Document Type***:	CE
Fed. Aid No:	NHF-74(40)	***Funding***:	☐ State ☒ Federal
Federal Permit(s):	☒ Yes ☐ No	***Permit Type(s)***:	USACE

Project Description:
Upgrade the at-grade intersection of US 74 and SR 1168 (Lattimore Rd.) in Mooresboro to an interchange and replace Bridges 48 and 49 on US 74 over Sandy Run Creek. The Area of Potential Effects (APE) is based on the study area provided by the project manager.

SUMMARY OF HISTORIC ARCHITECTURE AND LANDSCAPES REVIEW

Description of review activities, results, and conclusions:
Project area first surveyed in 2002 and HPO concurred that there were two eligible properties in the APE: Mooresboro Historic District (CL0576) and Will McBrayer Farm (CL0122). In 2006 the APE was expanded, and surveys concluded that the Flora Burrus House (CL0803) was also eligible. In 2006, the project alternatives were reviewed and HPO, FHWA, and NCDOT agreed that Alternative 1A would have no effect on any of the eligible properties and Alternative 4A would have an adverse effect on the Mooresboro Historic District. In May 2013 an architectural historian revisited the three eligible properties and confirmed that they remain eligible. In June 2013 work on the project was suspended because the project was placed on hold. The project was reactivated in April 2020 and NCDOT architectural historian indicated that the sites remained eligible, and an effects assessment would be required if the design plans had changed. In May 2022 two new alternatives were shown to the Merger Team at a CP2 meeting. Effects need to be assessed for the three eligible resources.

ASSESSMENT OF EFFECTS

Property Name:	Mooresboro Historic District	***Status***:	DE (Criterion C)
Survey Site No.:	CL0576	***PIN***:	multiple

Effects
☐ No Effect ☒ No Adverse Effect ☐ Adverse Effect

Explanation of Effects Determination:
Alt. 1, 1a, 2, & 2a no ROW required w/in historic district & cross section will remain the same Option 3 for service road no effect
List of Environmental Commitments:

Property Name:	Will McBrayer Farm	***Status***:	DE (Criteria A & C)
Survey Site No.:	CL0122	***PIN***:	

Effects

☒ No Effect ☐ No Adverse Effect ☐ Adverse Effect

Explanation of Effects Determination:

No construction activities w/in or adjacent to history boundary.

List of Environmental Commitments:

Property Name:	Flora Burrus House	***Status***:	DE (Criterion C)
Survey Site No.:	CL0803	***PIN***:	

Effects

☐ No Effect ☒ No Adverse Effect ☐ Adverse Effect

Explanation of Effects Determination:

Alt 1, 1a, 2, & 2a
no ROW required w/in historic boundary & cross section the same
Option 3 for service road no effect

List of Environmental Commitments:

FHWA Intends to use the State Historic Preservation Office's concurrence as a basis for a "de minimis" finding for the following properties, pursuant to Section 4(f):

SUPPORT DOCUMENTATION

☒ Map(s) ☐ Previous Survey Info. ☐ Photos ☐ Correspondence ☐ Design Plans

FINDING BY NCDOT AND STATE HISTORIC PRESERVATION OFFICE

Historic Architecture and Landscapes – ASSESSMENT OF EFFECTS

Mary Pope Furr — 7/28/2022

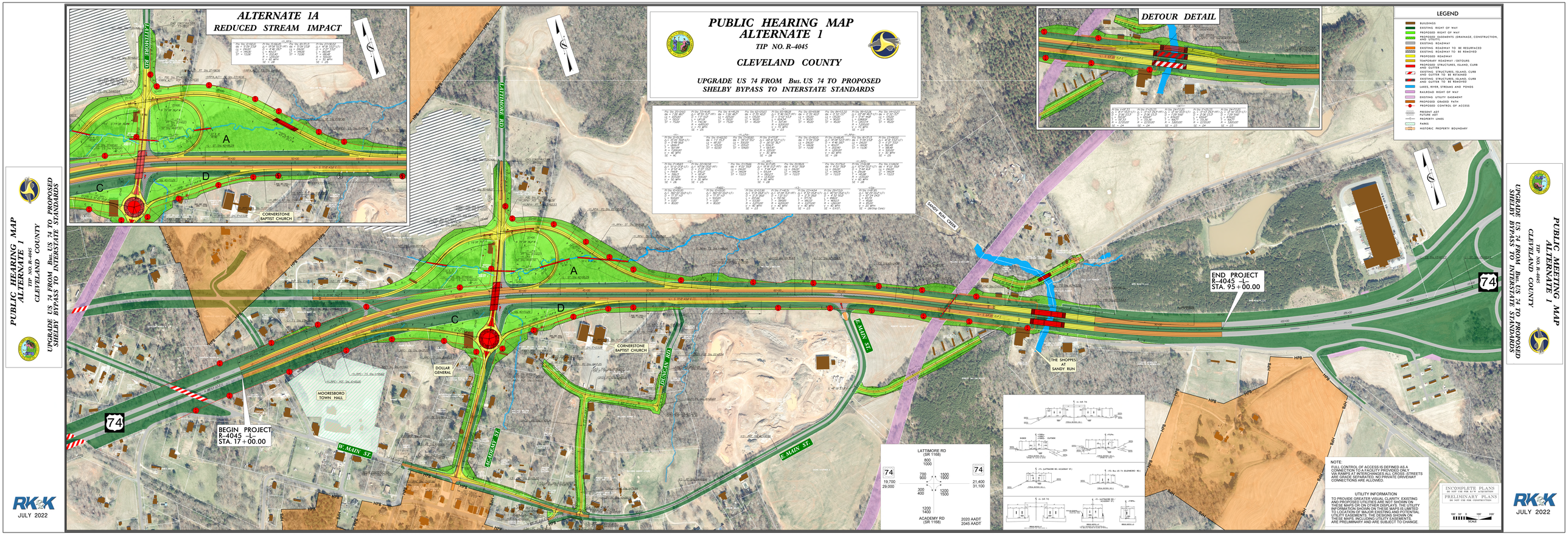
NCDOT Architectural Historian — Date

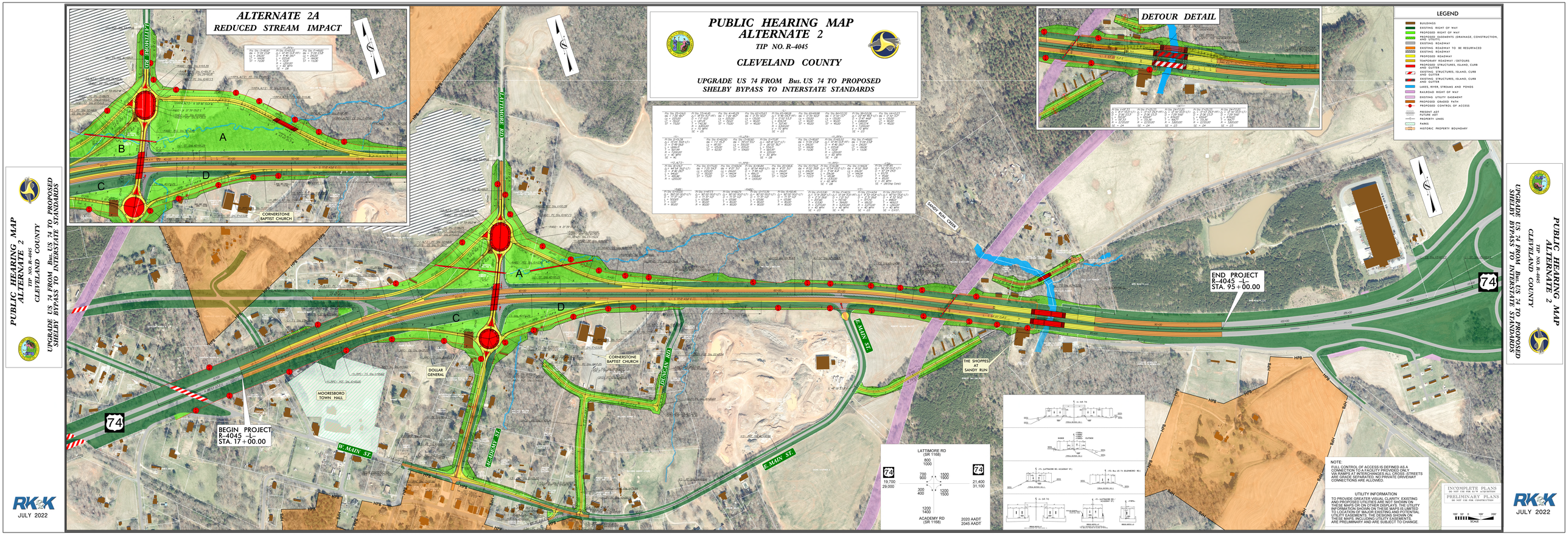
Renee Gledhill-Earley — 7/28/2022

State Historic Preservation Office Representative — Date

7/28/22

Federal Agency Representative — Date


PUBLIC HEARING MAP
ALTERNATE 1
TIP NO. R-4045
CLEVELAND COUNTY
UPGRADE US 74 FROM Bus. US 74 TO PROPOSED SHELBY BYPASS TO INTERSTATE STANDARDS
JULY 2022
ALTERNATE 1A
REDUCED STREAM IMPACT
CORNERSTONE BAPTIST CHURCH
PUBLIC HEARING MAP
ALTERNATE 1
TIP NO. R-4045
CLEVELAND COUNTY
UPGRADE US 74 FROM Bus. US 74 TO PROPOSED SHELBY BYPASS TO INTERSTATE STANDARDS
DETOUR DETAIL
LEGEND
BUILDINGS
EXISTING RIGHT OF WAY
PROPOSED RIGHT OF WAY
PROPOSED EASEMENTS (DRAINAGE, CONSTRUCTION, AND UTILITY)
EXISTING ROADWAY
EXISTING ROADWAY TO BE RESURFACED
EXISTING ROADWAY TO BE REMOVED
PROPOSED ROADWAY
TEMPORARY ROADWAY / DETOURS
PROPOSED STRUCTURES, ISLAND, CURB AND GUTTER
EXISTING STRUCTURES, ISLAND, CURB AND GUTTER TO BE RETAINED
EXISTING STRUCTURES, ISLAND, CURB AND GUTTER TO BE REMOVED
LAKES, RIVER, STREAMS AND PONDS
RAILROAD RIGHT OF WAY
EXISTING UTILITY EASEMENT
PROPOSED GRADED PATH
PROPOSED CONTROL OF ACCESS
PRESENT ADT
DESIGN ADT
PROPERTY LINES
PARKS
HISTORIC PROPERTY BOUNDARY
LATTIMORE RD
CORNERSTONE BAPTIST CHURCH
DOLLAR GENERAL
MOORESBORO TOWN HALL
W. MAIN ST.
E. MAIN ST.
ACADEMY ST.
DIXON RD
SANDY RUN CREEK
THE SHOPPES AT SANDY RUN
BEGIN PROJECT R-4045 -L- STA. 17+00.00
END PROJECT R-4045 -L- STA. 95+00.00
74
LATTIMORE RD (SR 1168)
ACADEMY RD (SR 1168)
2030 AADT
2045 AADT
19,700
29,000
21,400
31,100
NOTE:
FULL CONTROL OF ACCESS IS DEFINED AS A CONNECTION TO A FACILITY PROVIDED ONLY VIA GRADE SEPARATIONS AT ALL CROSS-STREETS AND SIMPLY TERMINATED NO PRIVATE DRIVEWAY CONNECTIONS ARE ALLOWED
UTILITY INFORMATION
TO PROVIDE GREATER VISUAL CLARITY, EXISTING AND PROPOSED UTILITIES ARE NOT SHOWN ON THESE MAPS OR ON OTHER DISPLAYS. THE UTILITY INFORMATION SHOWN ON THESE MAPS IS LIMITED TO LOCATION OF MAJOR EXISTING AND POTENTIAL UTILITY EASEMENTS. ALL UTILITY INFORMATION ON THESE MAPS, INCLUDING UTILITY EASEMENTS, ARE PRELIMINARY AND ARE SUBJECT TO CHANGE.
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION
SCALE
RK&K
JULY 2022


PUBLIC HEARING MAP
ALTERNATE 2
TIP NO. R-4045
CLEVELAND COUNTY
UPGRADE US 74 FROM Bus. US 74 TO PROPOSED SHELBY BYPASS TO INTERSTATE STANDARDS
ALTERNATE 2A
REDUCED STREAM IMPACT
DETOUR DETAIL
LEGEND
BUILDINGS
EXISTING RIGHT OF WAY
PROPOSED RIGHT OF WAY
PROPOSED EASEMENTS (DRAINAGE, CONSTRUCTION, AND UTILITY)
EXISTING ROADWAY
EXISTING ROADWAY TO BE RESURFACED
EXISTING ROADWAY
PROPOSED ROADWAY
TEMPORARY ROADWAY / DETOURS
EXISTING STRUCTURES, ISLAND, CURB AND GUTTER
EXISTING STRUCTURES, ISLAND, CURB AND GUTTER
EXISTING STRUCTURES, ISLAND, CURB AND GUTTER
LAKES, RIVER, STREAMS AND PONDS
RAILROAD, RIGHT OF WAY
EXISTING UTILITY EASEMENT
PROPOSED GRADED PATH
PROPOSED CONTROL OF ACCESS
PRESENT ADT
DESIGN ADT
PROPERTY LINES
PARKS
HISTORIC PROPERTY BOUNDARY
LATTIMORE RD
LATTIMORE RD (SR 1168)
ACADEMY RD
ACADEMY RD (SR 1168)
E. MAIN ST.
DIXON RD
SANDY RUN CREEK
CORNERSTONE BAPTIST CHURCH
DOLLAR GENERAL
MOORESBORO TOWN HALL
THE SHOPPES AT SANDY RUN
BEGIN PROJECT R-4045 -L- STA. 17+00.00
END PROJECT R-4045 -L- STA. 95+00.00
74
A
B
C
D
2030 AADT
2045 AADT
19,700
29,000
21,400
31,100
NOTE:
FULL CONTROL OF ACCESS IS DEFINED AS A CONNECTION TO A FACILITY PROVIDED ONLY VIA GRADE SEPARATIONS AT ALL CROSS-STREETS AND RAMPS. TERMINATED NO PRIVATE DRIVEWAY CONNECTIONS ARE ALLOWED
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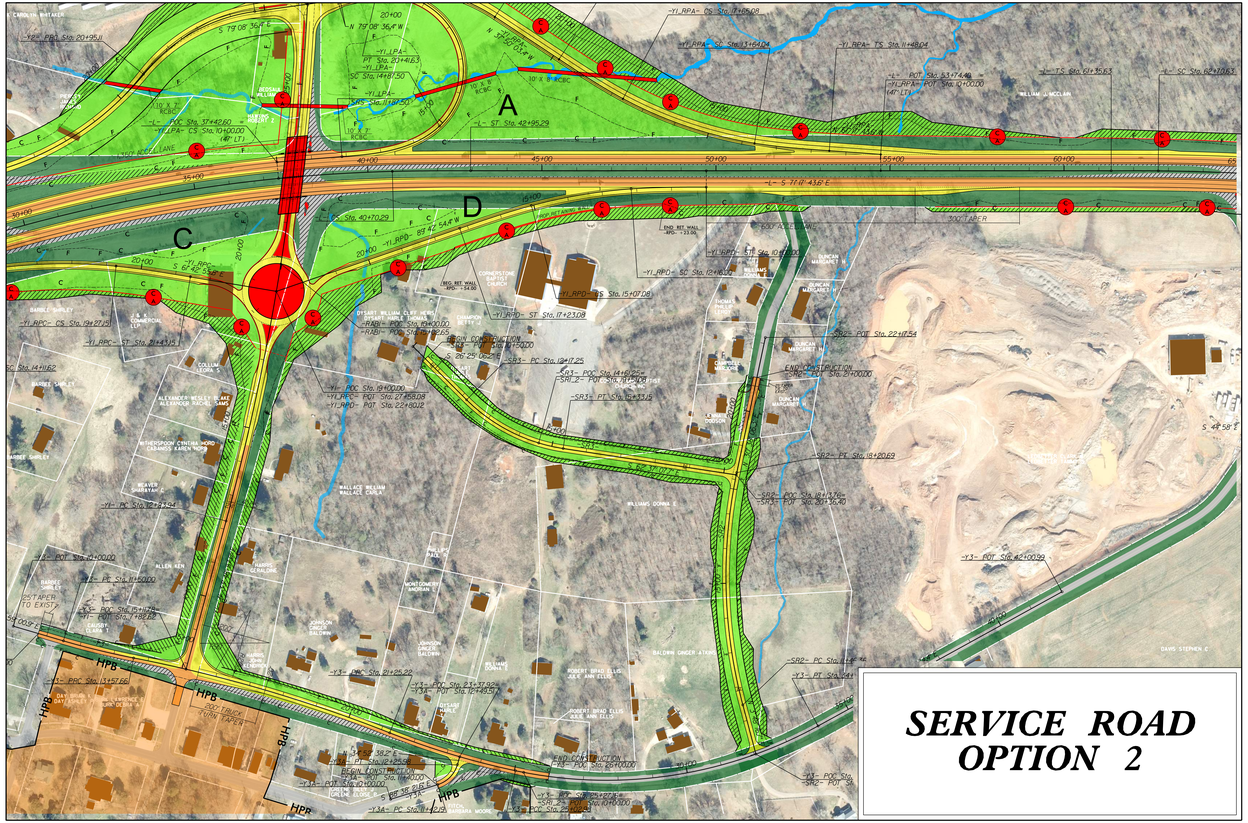
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION
SCALE
RK&K
JULY 2022


A
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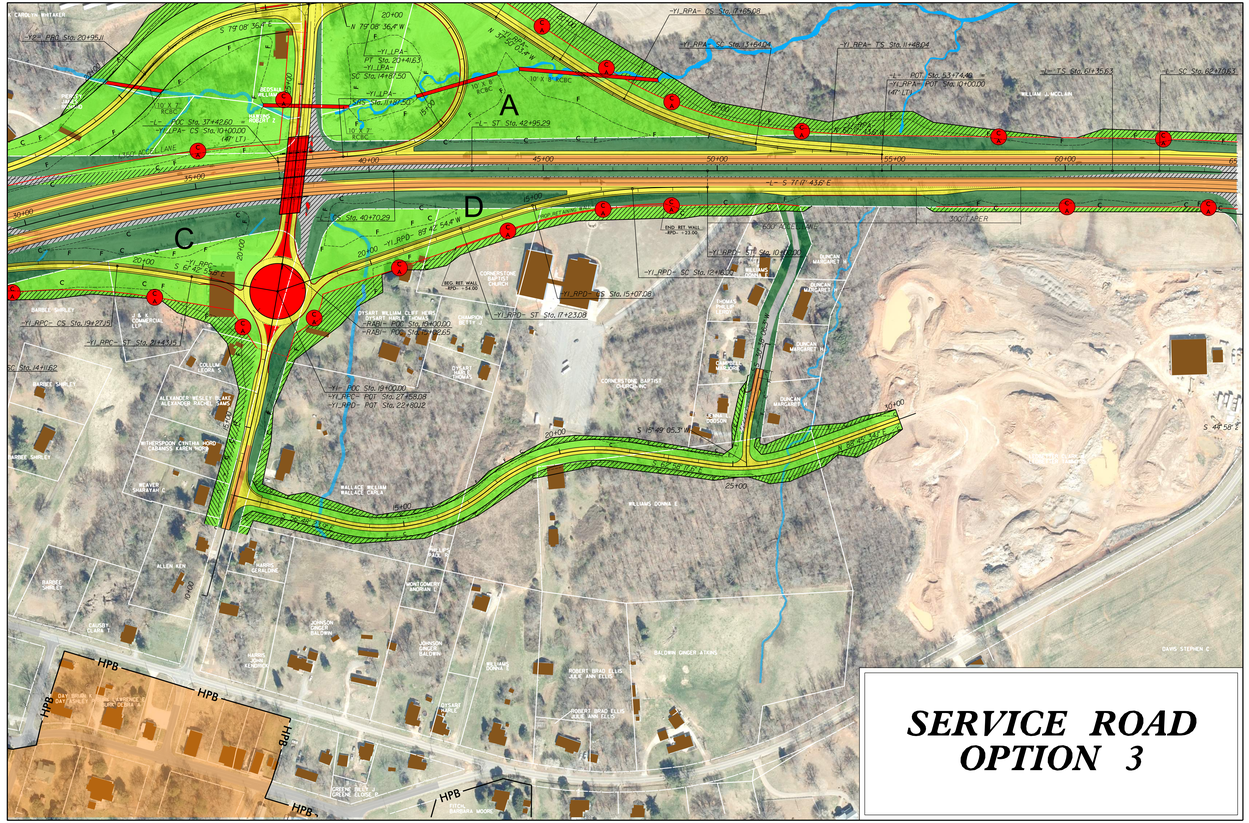
SERVICE ROAD
OPTION 2


A
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D
HPB
HPB
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HPB
SERVICE ROAD
OPTION 3

Tribal Coordination

Catawba Indian Nation
Tribal Historic Preservation Office
1536 Tom Steven Road
Rock Hill, South Carolina 29730

Office 803-328-2427
Fax 803-328-5791

May 18, 2021

Attention: Bryan K. Sowell
NC Department of Transportation
P.O. Box 47
Shelby, NC 28151

Re. THPO #	TCNS #	Project Description
2021-193-103		US 74 from Ellenboro Road to east of the bridges over Sandy Run Creek as projects R-4045 and BR-0012

Dear Mr. Sowell,

The Catawba have no immediate concerns with regard to traditional cultural properties, sacred sites or Native American archaeological sites within the boundaries of the proposed project areas. **However, the Catawba are to be notified if Native American artifacts and / or human remains are located during the ground disturbance phase of this project.**

If you have questions please contact Caitlin Rogers at 803-328-2427 ext. 226, or e-mail Caitlin.Rogers@catawba.com.

Sincerely,

Caitlin Rogers for

Wenonah G. Haire
Tribal Historic Preservation Officer

NEPA/ Merger Documents

Meeting Notes from the Interagency 4B Hydraulic Design Review Meeting
State Project 34598.2.2 and 67012.3.1 (R-4045 and BR-0012) in Cleveland County
F.A. Project: NHF-74 (4) for R-4045 no F.A. Project # for BR-0012
Meeting Date: March 14, 2024
Minutes Date: March 27, 2024

Team Members:
Crystal Amschler*, USACOE (Team Chair)
Anne Holland-Youngman* US FWS
David McHenry*, NC WRC
Donnie Brew*, FHWA
Mary Beth Plummer*, NCDWR
Susan Locklear*, NCDWR (Stormwater)
Tori Dellinger*, Gaston-Lincon NPO

Merger Team Members not Present:
Amanetta Sommerville, US EPA
Chris Southerly, NCDNR – OSA
Luan Cao, NCDNR
Renee Gledhill-Earley, NC-SHPO

*****Denotes attended via Teams

Additional Attendees:
Alec Yang, Summit
Andrew Nottingham*, MI Engineering
Anne Schley*, NCDOT Division 12
Bethany Taylor*, WRA
Brandon Bonner*, NCDOT Training Program (ADU)
Brandon Johnson, Summit
Bryan Sowell*, NCDOT Division 12
Doug Saunders, WRA
Jared Gray*, NCDOT Biological Surveys
Jason Patskoski, Three Oaks Engineering
Jeff Lomax, WRA
Jeff Lu, WRA
Jeff Wyatt*, NCDOT Division 12
Jim Mason, Three Oaks Engineering
Jon Nance, NCDOT Alternative Delivery Unit
Leon Andy Hussey, NCDOT Alternative Delivery Unit
Marissa Cox*, NCDOT Environmental Policy
Mateen Alinaghian*, NCDOT Utilities
Matt Haney, NCDOT BSG
Megan Pitts*, WRA
Michael Turchy*, NCDOT ECAP
Michelle Berry*, NCDOT Hydraulics
Mike Sanderson, NCDOT Environmental Policy
Morgan Wetherford, NCDOT Environmental Policy
Nancy Oberle, Three Oaks Engineering
Patrick Jones*, SAM
Randi Gates*, City of Gastonia
Robert Schwartz, Three Oaks Engineering*
John Jamison, NCDOT Environmental Policy
Spencer Merritt, Summit
Talley Smith*, ES Wagner
Tamara Njegovan, NCDOT Alternative Delivery Unit
Todd Lapham*, NCDOT Alternative Delivery Unit
Tom Watson, ES Wagner
William Pace*, SAM
William Tillitt*, WRA

Project Overview:

The 4B meeting for R-4045/BR-0012 was held on March 14, 2024 at 1:00 pm in person at NCDOT Century Center and virtually via Teams. Jason Patskoski (Three Oaks) led the 4B discussion. The meeting started with an overview of the project and outlining the firms responsible for each section. The Project Commitments (green sheets) from the CE document were summarized.

4B Plan Review

There were several revisions to the 4B plans from the distributed 4B plans. The revised 4B plans were presented and hard copies were provided to the in-person attendees. Each sheet was presented to discuss the jurisdictional sites, proposed roadway, and proposed hydraulic design. Below is a summary of the discussion on each sheet in red.

Title Sheet/General:

- Susan Locklear (NC DWR) requested confirmation that their comments were received.
- It was confirmed that the comments were received. A summary of the comments and response to the comments is provided within these minutes in green.

Sheets 1 – 2A-6

- Title and Typical sheets
- 4B Discussion: No Comments

Sheet 4:

- US 74 -L- Begin Construction – Sta. 22+50
- No steams or wetland areas
- 4B Discussion: No Comments

Sheet 5:

- Ellenboro Road -Y2-
  - -Y2- crosses Unnamed Tributary to Sandy Run Creek (SB).
  - The proposed crossing is a 60-inch RCP buried 1.0 foot with an embedded rip rap outlet pad in the channel on the downstream end.
  - 4B Discussion: There was no direct discussion on this crossing. Crystal Amschler (USACOE) had a general comment about making sure pipe/culvert widths matched the existing stream widths
  -
- Lattimore Road -Y1-
  - -Y1- crosses Unnamed Tributary to Sandy Run Creek (SB)
  - The proposed crossing is a 78-inch structurally designed pipe buried 1.0 with an inlet and an outlet channel to align the pipe with the upstream and downstream channels.
  - 4B Discussion: David McHenry (NC WRC) asked if the pipe would be directionally drilled. ES Wagner confirmed the pipe was planned to be open cut. David McHenry asked how long Lattimore Road would be closed, and a maximum of 1 year of road closure was confirmed. Later in the meeting, David McHenry asked why the proposed crossing differed from the box culvert in the previous plans. Jason Patskoski (Three Oaks) described that the USGS regression equations had been updated after the previous plans had been made, and the difference in peak flow was the reason for the size change.

- -Y1- embankment has fill on Wetland WE east of -Y1-
- The -Y1- alignment is located west of the existing alignment and the slopes were steepened to minimize fill in the wetland area.
- 4B Discussion: No Comments

- US 74 Westbound On-Ramp (-Y1LPA-)
  - -Y1LPA- crosses Unnamed Tributary to Sandy Run Creek (SB).
  - The proposed crossing is an 8'x7' RCBC buried 1.0 foot with an inlet and an outlet channel to align the culvert with the upstream and downstream channels.
  - 4B Discussion: David McHenry (NC WRC) asked if there were sills on the Box Culvert. Jason Patskoski (Three Oaks) confirmed there would be 2 sills and 2 baffles. David McHenry (NC WRC) recommended backfilling the culvert with rip rap and lining the top with native material.
  - -Y1LPA- Fill slopes are outside Wetland area WF and Stream SB top of bank
  - 4B Discussion: No Comments
- US 74 Westbound Off-Ramp (-Y1RPA-)
  - -Y1LPA- crosses Unnamed Tributary to Sandy Run Creek (SB).
  - The proposed crossing is a 120' single span 54" FIB. There are no anticipated jurisdictional impacts.
  - 4B Discussion: No Comments
  - In Quadrant A, Wetland area WG and Stream SE will not be impacted.
  - 4B Discussion: No Comments
- US 74 -L- and US 74 Eastbound Off-Ramp (-Y1RPC-) Interchange Quadrant C
  - -L- and -Y1RCP- fill over Unnamed Tributary to Sandy Run Creek (SD) south of US 74.
  - -L- and -Y1- fill over Unnamed Tributary to Sandy Run Creek (SF) both north and south of US 74.
  - There is currently a portion of drainage on -Y2- that crosses -L- from the north side of -L- to Stream SD which crosses -L- a second time flowing north. The proposed drainage design will convey this runoff along -Y2- to Stream SB. Runoff contributing to both streams will be conveyed under -Y1RPC- via at 60" RCP. Runoff contributing to both streams will be conveyed under -L- via a 60" steel jack and bored pipe which will outlet to Stream SD. The two pipes will be connected with a channel. Neither pipe will be buried since all of the upstream jurisdictional areas will be impacted.
  - 4B Discussion: Crystal Amschler (USACOE) asked that since the streams south of 74 would have a total loss, the intent was to mitigate at 2:1. This was confirmed by the design team. Crystal Amschler (USACOE) voiced concern of the -Y1RPC- pipe being 90 degrees from the -Y1RPC- ditch since the ditch may become a stream. It was confirmed that the entire stream south of US 74 was being filled in, the -Y1RPC- ditch picks up drainage upstream of the jurisdictional areas, and a portion of the drainage was being directed directly to Stream SB along -Y2-. After discussion, it was agreed that the 90 degree turn would not be a concern and the pipes did not need to be buried.
  - 4B Plan Comments: Susan Locklear (NC DWR) asked if a portion of an existing 15" pipe at Stream SD should be removed to avoid conflict with the proposed 60" pipe. Response: Any portion of the 15" pipe that is in conflict will be removed during bore and jack and the remaining pipe filled and plugged with flowable fill.
- US 74 -L- and US 74 Eastbound On-Ramp (-Y1RPD-) Interchange Quadrant D
  - -L- and -Y1RPD- cross Unnamed Tributary to Sandy Run Creek (SG)
  - Stream SG is intermittent south of US 74 and perennial north of US 74
  - The proposed -Y1RPD- crossing is a 60" RCP buried 1.0 foot with an embedded rip rap outlet pad.
  - The proposed -L- crossing is a 66" steel jack and bored pipe buried 1.0 with a junction box to align the pipe with the upstream and downstream channels. The proposed outlet has a rip rap pad

which is outside the channel bed.

- 4B Discussion: Crystal Amschler (USACOE) commented the preference would be to not have bends in the pipes of a stream. Jason Patskoski (Three Oaks) presented an alternative which proposed the two pipes in a straight line from the upstream end of -Y1RPD- to the downstream end of -L- with the two pipes being connected with a new channel. This alternative would remove all flow from the existing stream between the two alignments. Crystal Amschler (USACOE)commented this alternative was the preferable. Additionally, the preference would be to have the stream daylighted to an open channel maintaining the width and depth of the existing. It was noted that a high level of restoration was not needed, but the channel should recreate the quality of the existing stream to the greatest extent possible.
- 4B Comments: Susan Locklear (NC DWR) asked if there was an opportunity to add discharge to promote more infiltration in quadrants C and D. Response: Summit has revised the network outlets to promote more infiltration in the ditches along quadrants C and D.

Sheet 6:

- US 74 -L- Sta. 50+00 to Sta. 63+00
  - -L- crosses Unnamed Tributary to Sandy Run Creek (SC)
  - There is an existing Dwarf Flowered Heartleaf population south of US 74 along Stream SC
  - The proposed -L- Crossing is retaining an extending the existing 48" RCP and installing a 54" steel jack and bored pipe parallel to the existing pipe per the RFP and Greensheet commitments.
  - Based on field reconnaissance, the Dwarf Flowered Heartleaf population is still present in the surveyed boundaries.
  - 4B Discussion: No Comments

Sheet 7:

- US 74 -L- Sta. 63+00 to 76+00
- No jurisdictional features
- 4B Discussion: No Comments

Sheet 8:

- US 74 -L- Sta. 76+00 to 89+00
- -L- crosses Sandy Run Creek
- The proposed crossings are dual 230-foot long, 2-span (1@110', 1@120') 63" FIB bridges with the multiuse path grading under the bridges on the western side.
- 4B Discussion: David McHenry (NC WRC) asked if all the rock plating proposed was shown on the drawings. This was confirmed by Douglas Saunders (WRA).
- 4B Comments: Susan Locklear (NC DWR) noted the potential impacts to a property south of US 74, east of Sandy Run Creek and asked how much flow is being added to the system. Response: Increase in runoff is very minimal, less than 1.5% as proposed is essentially matching existing. Pipe is being replaced due to RFP requirement that any existing CMP pipe crossing -L- be replaced with RCP.

Sheet 9:

- US 74 -L- Sta. 76+00 to End Construction
- No jurisdictional features
- 4B Discussion: No Comments

Sheet 10:

- Lattimore Road -Y1- Begin Construction to Sta. 18+50
- -SR1- Begin Construction to Sta. 13+00
- No jurisdictional features
- 4B Discussion: No Comments

Sheet 11:

- Lattimore Road -Y1- Sta. 33+50 to End Construction
- No jurisdictional features
- 4B Discussion: No Comments

Sheet 12:

- -SR1- Sta. 13+00 to Sta. 22+50
- No jurisdictional features
- 4B Discussion: No Comments

Sheet 13:

- -SR1- Sta. 22+50 to End Construction
- -SR1- Crosses Unnamed Tributary to Sandy Run Creek (SC). The stream is intermittent in this area
- The proposed crossing is a 60" RCP buried 1.0 foot with an embedded rip rap outlet pad in the channel.
- The proposed roadway embankment fills in a portion of Wetland Area WC but avoids Wetland Area WB.
- 4B Discussion: Susan Locklear (NC DWR) had asked why 1.5:1 fill slopes were not utilized on -SR1- in comments on the pSMP. Jason Patskoski (Three Oaks) noted that 1.5:1 slopes were not permitted on this road per NCDOT RFP. Susan Locklear (NC DWR) commented on the 4B plans asking if there was an opportunity to discharge south of the road and west of Stream SC to promote infiltration. Jason Patskoski (Three Oaks) noted there was an opportunity for this, but the configuration proposed would result in runoff crossing -SR1- twice. It was agreed that runoff would be maximized without having runoff crossing the road twice.
- 4B Comments: Susan Locklear (NC DWR) also commented in the 4B plans asking if there was an opportunity to discharge on flatter terrain north of -SR1- and west of Stream SC. Summit has removed the crosspipe connecting the system on -SR1- and discharge the southern network to the proposed ditch. Summit will move the northern system outlet north of -SR1- to flatter terrain.

Sheet 14:

- -SR4- Begin Construction to End Construction
- No jurisdictional features
- 4B Discussion: No Comments

Profile Sheets:

- 4B Discussion: Chrystal Amschler (USACOE) asked if culvert cross-sections would be provide at 4C. Jason Patskoski (Three Oaks) confirmed they would be. Chrystal Amschler (USACOE) requested site numbers be included on profiles at 4C.

Additional Discussion:

- 4B Discussion: Chrystal Amschler (USACOE) asked if we could verify commitments made in previous CP meetings have been adhered to. She read off several commitments and Jason Patskoski (Three Oaks) verified they had been incorporated.

- After reviewing the Greensheet commitment for the Dwarf Flowered Heartleaf, it was noted that there is a commitment to build a retaining wall along US 74 to avoid direct impacts to the dwarf flowered heartleaf to eliminate the need for tree clearing and construction equipment access. The proposed design adheres to the Greensheet commitment and does not propose any construction/disturbance beyond the existing EBL slope limits avoiding direct impacts to the Dwarf Flowered Heartleaf. The proposed design shifts the EBL EOP thru lane 46' north of the existing EBL allowing the Ramp D acceleration lane to be constructed inside the current existing fill of EBL without the need for a wall. NCDOT recommended removal of the wall since the proposed design satisfied the commitment. NCDOT's original preliminary design proposed Ramp D 12' acceleration lane and 15' shoulder be constructed south of existing EBL right edge of pavement requiring a retaining wall to avoid impact to the Dwarf Flowered Heartleaf. The proposed design outside shoulder point is approximately 60' shifted northward of the NCDOT's preliminary outside shoulder point.

No further comments.

Action Items:

- Three Oaks – Develop meeting summary and distribute to attendees
- Three Oaks – Send preliminary impact totals to attendees
- WRA and Summit – Revise Stream SG crossing of -Y1RPD- and -L- to the alternative discussed

Meeting adjourned.

Meeting Notes from the Interagency 4C Permit Drawing Review Meeting
State Project 34598.2.2 and 67012.3.1 (R-4045 and BR-0012) in Cleveland County
F.A. Project: NHF-74 (4) for R-4045 no F.A. Project # for BR-0012
Meeting Date: June 20, 2024
Minutes Date: July 10, 2024

Team Members:
Crystal Amschler*, USACOE (Team Chair)
Anne Holland-Youngman* US FWS
David McHenry*, NC WRC
Donnie Brew*, FHWA
Mary Beth Plummer*, NCDWR
Tori Dellinger*, Gaston-Lincon NPO

Merger Team Members not Present:
Amanetta Sommerville, US EPA
Chris Southerly, NCDNR – OSA
Luan Cao, NCDNR
Susan Locklear, NCDWR (Stormwater)
Renee Gledhill-Earley, NC-SHPO

*****Denotes attended via Teams

Additional Attendees:
Alec Yang, Summit
Andrew Nottingham*, MI Engineering
Anne Schley*, NCDOT Division 12
Bethany Taylor*, WRA
Brandon Johnson*, Summit
Bryan Sowell*, NCDOT Division 12
Christine Farrell, NCDOT EPU
Doug Saunders*, WRA
Erin Cheely* NCDOT Environmental
Emily Richards, NCDOT OCR
Jason Patskoski, Three Oaks Engineering
Jeff Lomax, WRA
Jeff Lu, WRA
Jeff Wyatt*, NCDOT Division 12
Jim Mason, Three Oaks Engineering
Jon Nance, NCDOT Alternative Delivery Unit
Leon Andy Hussey, NCDOT Alternative Delivery Unit
Marissa Cox*, NCDOT Environmental Policy
McKenna Holloway, Three Oaks
Michelle Berry*, NCDOT Hydraulics
Mike Sanderson, NCDOT Environmental Policy
Nancy Oberle, Three Oaks Engineering
Patrick Hartnett, Summit
Patrick Jones*, SAM
Robert Schwartz, Three Oaks Engineering*
Talley Smith, ES Wagner

Project Overview:

The 4C meeting for R-4045/BR-0012 was held on June 20, 2024 at 1:00 pm in person at NCDOT Century Center and virtually via Teams. Jason Patskoski (Three Oaks) led the 4C discussion. The meeting started with an overview of the project and outlining the firms responsible for each section. The Project Commitments (green sheets) from the CE document and the minutes from the 4B Meeting were summarized.

Permit Drawings Review

Jason Patskoski (Three Oaks) reviewed the Project Commitments (green sheets) from the CE document, the minutes from the 4B Meeting, Stormwater Management Plan and Permit Drawings. Below is a summary of the information provided and discussion on each sheet in red. Follow up to the discussion is in green.

Project Commitments and 4B Meeting Minutes:

- Jason Patskoski (Three Oaks) provided a summary of the two documents. He noted that one of the Greensheet commitments was the installation of a retaining wall along US 74 to avoid direct impacts to the dwarf flowered heartleaf to eliminate the need for tree clearing and construction equipment access. Jason summarized the 4B minutes saying the retaining wall was not needed to avoid impacting the dwarf flowered heartleaf and that the dwarf flowered heartleaf would not be impacted with the design.
- 4C Discussion: No Comments

Stormwater Management Plan:

- 4C Discussion: No Comments

Permit Drawing Sheet 1

- Permit Drawing Sheet 1 is the title sheet.
- It was noted that the clearing method from the project was Method III which is 10 feet outside the slope stakes or to the easement, whichever is closer. It was discussed that this clearing method will impact some of the wetland areas, and these can be discussed on the later sheets.
- 4C Discussion: No Comments

Permit Drawing Sheets 2 - 3:

- Permit Drawing Sheets 2 – 3 show the drainage details.
- 4C Discussion: David McHenry (NC WRC) asked form confirmation that the pipe/culvert rip-rap outlet pads in jurisdictional streams would be embedded. This was confirmed.

Permit Drawing Sheets 4 – 5:

- Permit Drawing Sheets 4 – 5 include Sites 1 – 10.
- It was noted that each site had an enlargement and detailed discussions could take place when reviewing the enlargement.
- 4C Discussion: No Comments

Permit Drawing Sheet 6:

- Permit Drawing Sheet 6 includes Site 1 Unnamed Tributary to Sandy Run Creek (SD).
- The portion of stream south of US 74 is being filled over by -L- and -Y1RCP-. North of US 74, the stream impacts include the rip-rap outlet pad for the 60” jack and bored pipe, bank stabilization, and temporary

impacts for construction. It was noted that the jurisdictional features south of US 74 begin where the impacts are shown.

- 4C Discussion: No Comments

Permit Drawing Sheet 7:

- Permit Drawing Sheet 7 includes Site 2 Unnamed Tributary to Sandy Run Creek (SB) and Site 3 Unnamed Tributary to Sandy Run Creek (SF).
- Site 2 is being impacted by the 60" RCP buried 1.0 foot -Y2- crossing which includes the pipe, the rip-rap outlet pad, bank stabilization, and temporary impacts for construction. It was noted that erosion control comments were received which may extend the stream impacts.
- Site 3 is being filled over by the -Y1- fill slope. It was noted that this is a total take.
- 4C Discussion: Crystal Amschler (USACOE) mentioned that at 4B it was agreed that the pipe widths would match the channel and asked for confirmation that this was considered in the design. This was confirmed.

Permit Drawing Sheet 8:

- Permit Drawing Sheet 8 includes Site 4 Wetland WE, Site 5 Unnamed Tributary to Sandy Run Creek (SB), and Site 7 Wetland WF.
- Site 4 is being impacted by the -Y1- fill slope and clearing for Method III. The -Y1- alignment is being shifted away from the wetland area from the existing alignment and 1:5:1 slopes are being utilized.
- Site 5 is being impacted by the 78" RCP buried 1.0 foot -Y2- crossing which includes the pipe, the proposed channel, the rip-rap outlet pad, bank stabilization, and temporary impacts for construction.
- Site 7 is being impacted by the clearing for -Y1LPA-, but this will change based on the discussion.
- It was noted that impacts to Sites 6 and 8 are on this enlargement but are shown in detail on subsequent sheets.
- 4C Discussion: Crystal Amschler (USACOE) asked if there was any way to minimize the impacts to Wetland WE. Jason Patskoski (Three Oaks) suggested changing all clearing to hand clearing and bringing in the clearing limits as much as possible. Tally Smith (ES Wagner) agreed with this approach as long as they had enough room to install the silt fence. There was a brief clarification of the inlet channel being used to align the pipe with the stream. It was agreed that the clearing would be brought in closer to the fill slope to avoid impacting Wetland WF (Site 7).

Permit Drawing Sheet 9

- Permit Drawing Sheet 9 includes Site 6 Unnamed Tributary to Sandy Run Creek (SG).
- Site 6 is being impacted by the 60" RCP buried 1.0 foot -Y1RPD- Crossing and the 66" Steel pipe buried 1.0 -L- crossing. There will be a new proposed open channel between the two pipes. The impacts include filling in the existing channel in Quadrant D, the rip-rap outlet pad, bank stabilization, and temporary impacts for construction.
- Jason Patskoski (Three Oaks) explained the pipe configuration was discussed at 4B, and the proposed alternative was agreed upon. He also noted that the jurisdictional feature begins at the impacts shown south of Ramp D.
- 4C Discussion: Crystal Amschler (USACOE) asked why the Ramp D pipe was longer than what was shown in the 4B alternative and asked if the channel could be longer. She also asked how the length of this channel compared to length of open channel in the other alternative. Jason Patskoski (Three Oaks) explained that the skew and slope of the pipe and are determining the length of the Ramp D pipe. He noted that this alternative has less open channel than the other alternative, but the other alternative required a junction box within the -L- cross pipe to align with the upstream and downstream channels. After discussion, it was agreed the proposed pipe configuration was preferable.

Permit Drawing Sheet 10

- Permit Drawing Sheet 10 includes Site 8 Unnamed Tributary to Sandy Run Creek (SB).
- Site 8 is being impacted by the 8'x6' RCBC buried 1.0 foot -Y1LPA- Crossing The impacts the culvert, the inlet and outlet channels, bank stabilization, and temporary impacts for construction.
- It was noted that the culvert would be backfilled with rip-rap to ensure the material stayed in place which was a comment in the 4B meeting.
- 4C Discussion: No Comments

Permit Drawing Sheet 11:

- Permit Drawing Sheet 11 includes Site 9 Unnamed Tributary to Sandy Run Creek (SB) and Site 10 Unnamed Tributary to Sandy Run Creek (SE).
- Site 9 is being impacted by rip-rap at embankment at 3 locations and banks stabilization at an existing scoured out area at the bank. It was noted that there were no impacts due to the proposed -Y1RPA- bridge.
- A proposed waterline crossing will also be crossing Site 9. The crossing will be directionally drilled and not result in any stream impacts.
- Site 10 is being impacted by rip-rap at embankment for a clean water diversion that will be used during construction. After construction the clean water diversion will be removed, but the rip-rap at embankment will be left to ensure the bank remains stable.
- 4C Discussion: David McHenry (NC WRC) asked if the clearing limits were to the easement and why the easement was so far out. Jason Patskoski (Three Oaks) explained that the waterline was being located outside the proposed roadside ditch, and the clean water diversion needed to be located north of the waterline. He presented the initial erosion control plan submittal showing the clean water diversion tie in point. David McHenry (NC WRC) asked if clearing would be to the top of bank. Jason Patskoski (Three Oaks) said the clearing would be minimal, but some clearing may be needed for erosion control measures. Crystal Amschler (USACOE) asked for clarification about the temporary impacts from the clean water diversion. Jason Patskoski (Three Oaks) clarified that there will be permanent impacts due to the location of the outlet and the need for stabilization along the outlet of the embankment.

Permit Drawing Sheet 12:

- Site 1 profile along pipe view.
- 4C Discussion: No Comments

Permit Drawing Sheet 13:

- Site 2 profile along pipe view.
- 4C Discussion: No Comments

Permit Drawing Sheet 14:

- Site 4 cross-section view.
- 4C Discussion: No Comments

Permit Drawing Sheet 15:

- Site 5 profile along pipe view
- 4C Discussion: David McHenry (NC WRC) asked for clarification about the pipe slope compared to the existing slope. Jason Patskoski (Three Oaks) confirmed that the slopes are comparable to the existing ground slope.

Permit Drawing Sheet 16:

- Site 6 profile along pipe view
- 4C Discussion: Crystal Amschler (USACOE) expressed some concern about the steepness of the pipe creating a head cut resulting in sediment downstream. She asked that since the entire jurisdictional feature above the Ramp D pipe was being impacted, did the Ramp D pipe need to be buried. David McHenry (NC WRC) said the pipe did not need to be buried for fish passage. Jason Patskoski (Three Oaks) asked if not burying the pipe and reducing the size would lengthen the pipe. It was agreed that either option would work, but that if the pipe would be lengthened, the preference would be to keep the current design.
- After the meeting, it was confirmed that not burying the pipe would shorten the pipe, so the proposed Ramp D pipe will be a 54" not buried.

Permit Drawing Sheet 17:

- Site 7 cross-section view
- 4C Discussion: No Comments

Permit Drawing Sheet 18:

- Site 8 profile along culvert view
- 4C Discussion: No Comments

Permit Drawing Sheet 19:

- Site bridge profile view
- 4C Discussion: No Comments

Permit Drawing Sheets 20 – 22:

- Permit Drawing Sheets 20 - 22 include Site 11 Unnamed Tributary to Sandy Run Creek (SC).
- Site 11 is being impacted by the extension of the existing 48-inch pipe under -L-, the rip rap pad, and temporary impacts for construction. It was noted that the 48-inch pipe extension and the new 54-inch pipe were a greensheet commitment.
- 4C Discussion: Crystal Amschler (USACOE) asked if the 48-inch pipe would be the low flow pipe and if the extension was going to be buried. Jeffrey Lu (WRA) said the existing 48-inch is not buried so the extension is not proposed to be buried. This was agreed upon.

Permit Drawing Sheets 23 – 25:

- Permit Drawing Sheets 23 – 25 include Site 12 Sandy Run Creek.
- Site 12 is being impacted by rip-rap at embankment for a closed drainage system.
- 4C Discussion: It was confirmed the large channel being diverted into the closed drainage system is not jurisdictional. David McHenry (NC WRC) asked if the clearing would be to the top of bank at the easement north of the bridge. Jason Patskoski (Three Oaks), said the easement was for a skimmer basin and that clearing would be minimized.

Permit Drawing Sheets 26 – 29:

- Permit Drawing Sheets 26 – 30 include Site 13 Unnamed Tributary to Sand Run Creek (SC) and two Wetland areas (WB and WC).
- The Site 13 stream is being impacted by the 60-inch RCP buried 1.0 foot -SR1- crossing, the rip-rap outlet pad, rip-rap at embankment, and temporary impacts for construction.
- Wetland WC is being impacted by the 2:1 fill slope and clearing. It was noted that the RFQ did not allow for 1.5:1 slopes to be utilized in this area.

- 4C Discussion: Jason Patskoski (Three Oaks) stated any clearing would be revised to hand clearing and the clearing limits would be reduced as much as practicable.

Permit Drawing Sheet 30:

- Permit Drawing Sheet 30 is the impact summary sheet.
- Jason Patskoski (Three Oaks) explained how some sites were denoted into 'a', 'b', and 'c' sections to denote stream impacts due to the pipe/culvert, embedded rip-rap in the channel, and bank stabilization.
- 4C Discussion: Jim Mason (Three Oaks) asked if the embedded rip-rap pipe outlet could have a lower mitigation ratio given there was no loss of water. Crystal Amschler (USACOE) said if the contours of the stream were maintained and the rip-rap was embedded, it would not be considered a loss, so no mitigation would be required. It was also confirmed this would be an individual permit.

No further comments.

Action Items:

- Three Oaks – Develop meeting summary and distribute to attendees

Meeting adjourned.