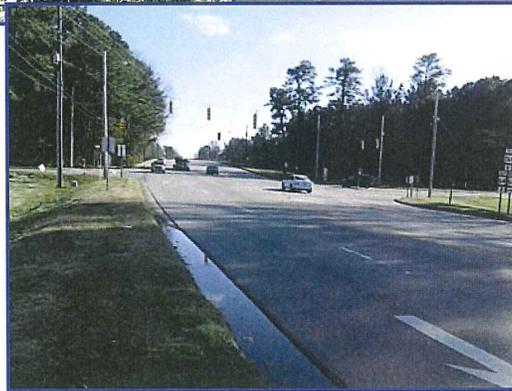


Engineering Report
For
NC 96 (Arendell Avenue)



Prepared For:
Town of Zebulon
1003 N. Arendell Avenue
Zebulon, NC 27597

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Table of Contents

	<u>Page No.</u>
I. Introduction	1
A. Objectives.....	1
B. Project Background	1
II. Existing Conditions	1
A. Roadway Facilities	1
B. Traffic Signals.....	3
C. Right-of-Way	4
D. Development and Land Use	4
E. Traffic Analysis	4
F. Pedestrian Facilities	6
III. Design	7
A. Design Standards	7
B. Proposed Design.....	7
C. Typical Section	9
IV. Complete Streets	9
A. Street Lighting	10
B. Pedestrian Facilities	11
C. Street Furniture	11
D. Transit	13
E. Signage/Wayfinding	13
F. Landscaping	13
G. Traffic Signal Poles and Equipment	14
V. Hydrology and Storm Drainage	17
VI. Utilities	17
VII. Right-of-Way Requirements	17
VIII. Preliminary Construction Costs and Schedule	18
IX. Environmental Screening	19

APPENDICES

Appendix A Preliminary Plan, Profile and Cross Section Sheets

LIST OF FIGURES

<u>Fig No.</u>	<u>Title</u>	<u>Page No.</u>
1	Vicinity Map	2
2	Typical Section	9
3	Aquatic Resources Field Survey Map	21

LIST OF TABLES

<u>Table No.</u>	<u>Title</u>	<u>Page No.</u>
1	2009 Existing Level of Service	5
2	2035 Future Level of Service.....	6
3	Jurisdictional Characteristics of Steams in the Study Area	22
4	Jurisdictional Characteristics Of Wetlands In The Study Area	22
5	Federally Protected Species Listed For Wake County	23

I. Introduction

This Preliminary Engineering Report provides the Town of Zebulon with a plan for roadway improvements along the Arendell Avenue (NC 96) corridor from just north of Riley Hill Road on the north to the US 64/264 ramps on the south. The overall length of the project is approximately 4,400 feet (0.8 miles). See **Figure 1**.

Roadway improvements are needed along this corridor as a result of growth and increased development along the corridor.

A. Objectives

The primary objective of this report is to provide design guidelines and preliminary design plans for this section of Arendell Avenue to make it a gateway entrance into the City of Zebulon.

This Preliminary Engineering Report contains roadway plans that will provide the Town with an overall functional design plan of horizontal and vertical alignments to allow the corridor to be built in segments as development occurs. Design improvements should meet the current and future traffic and safety needs through the year 2035.

B. Project Background

In 2009, Wilbur Smith Associates was commissioned by the Town of Zebulon to develop an access management plan for Arendell Avenue (NC 96). This plan called for safe and efficient access to Arendell Avenue while maintaining the ability of the facility to serve as a regional roadway providing access to the central business district of Zebulon as well as US 64.

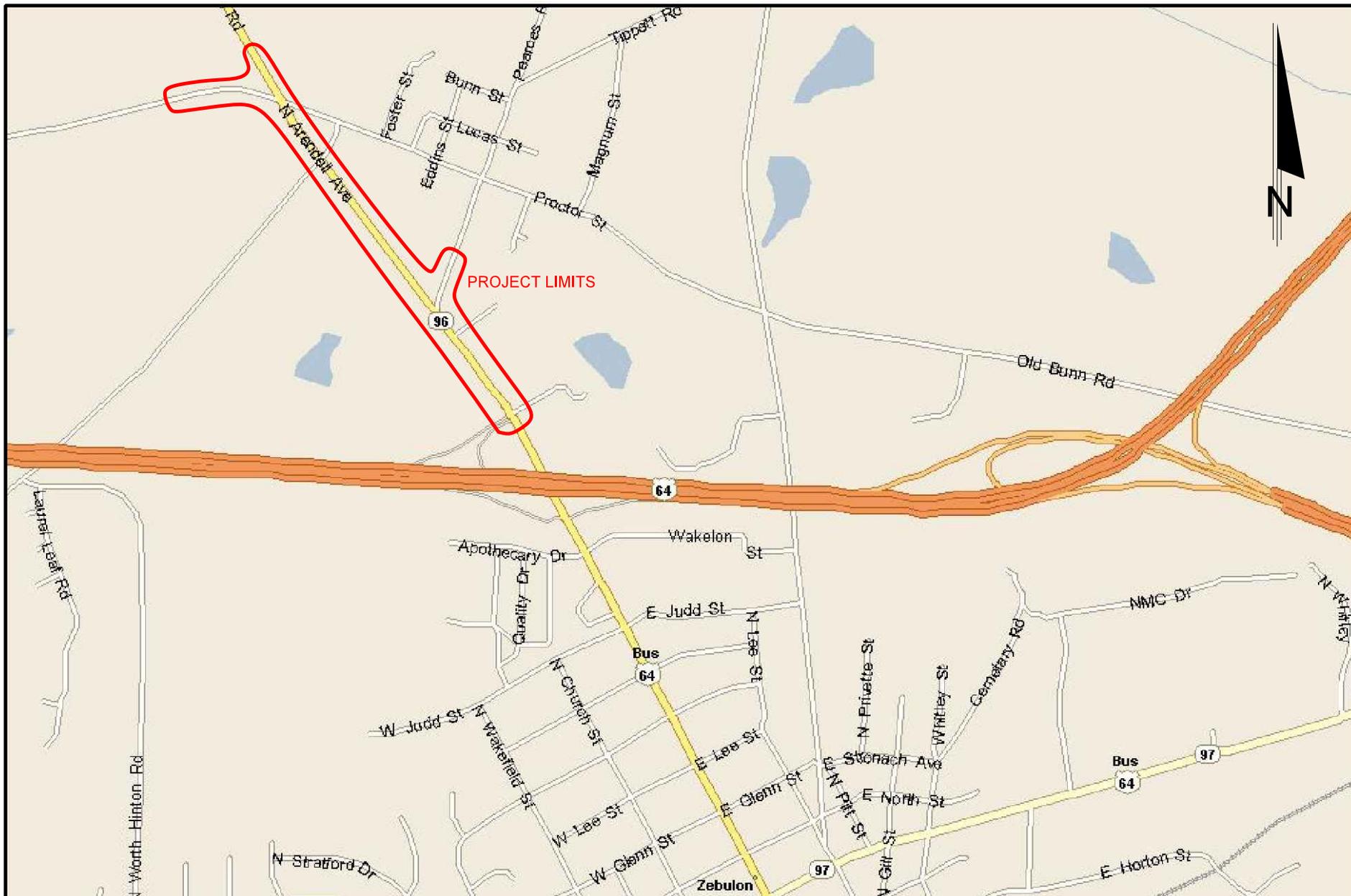
To determine potential options for access management in the study area, WSA developed trip generation estimates for the vacant parcels in the study area, examined the layout of the parcels, and developed several options for roadway alignments that could serve the parcels considering NCDOT, AASHTO, and other requirements and design criteria, as well as input from the Town, NCDOT, landowners in the study area, and the general public. The alternatives had many common elements, primarily the widening of Arendell Avenue to a 4-lane divided facility with sidewalks. This plan also involved the consolidation and sharing of driveways and the relocation of several study area intersections. Additional information can be found in the Final NC 96 (Arendell Avenue) Access Management Plan, dated November 4, 2009

II. Existing Conditions

A. Roadway Facilities

The study area for this report focused on Arendell Avenue from Riley Hill Road/Proctor Street in the north to the US 64 eastbound ramps in the south. Arendell Avenue intersects with Riley Hill Road/Proctor Street, Green Pace Road, Pearces Road, Hendricks Drive and Dogwood Drive/US 64 Ramps.

Arendell Avenue (NC96) consists of a two-lane undivided roadway from north of Riley Hill Road to just south of Green Pace Road where it converts to mainly a three-lane road due to the recent development in the area. The posted speed limit is 35 miles per hour.



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NC 96
ENGINEERING REPORT
ZEBULON, NORTH CAROLINA

VICINITY MAP

FIGURE: 1

SCALE:
NONE

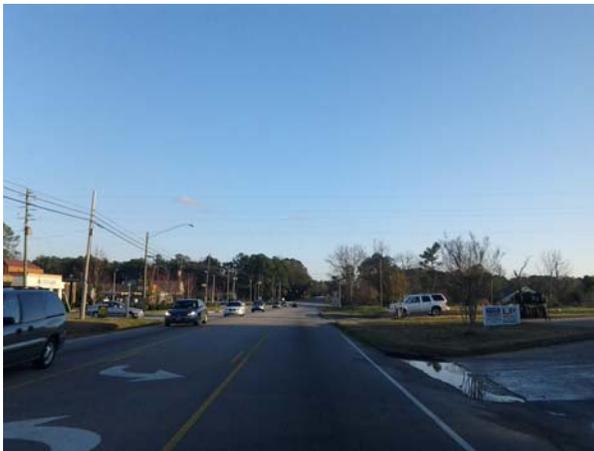
Based on information from the 2009 Access Management Plan, the 2007 Annual Average Daily Traffic (AADT) as counted by the North Carolina Department of Transportation (NCDOT) was 9,500 Vehicles per Day (vpd) north of Pearces Road and 8,200 vpd just south of Hendricks Drive.



*Arendell Avenue south of Proctor Street
looking South*



*Arendell Avenue south of Green Pace Road
looking South*



*Arendell Avenue south of Pearces Road
looking South*



*Arendell Avenue at US 64 Ramps/Dogwood Dr.
looking South*

All intersecting streets consist of two-lane undivided roadways where the pavement widths vary from twenty feet to twenty-four feet with some left turn lanes at the intersection with Arendell Avenue. The Pearces Road and US 64 Ramps/Dogwood Drive are controlled by traffic signals and all other intersections are controlled by stop signs on the minor approaches.

B. Traffic Signals

There are currently two (2) traffic signals located along NC 96 in the project area, one at the intersection of Dogwood Drive/US 64 WB On/Off Ramp and the other at SR 1001 (Pearces Road). Both of these signals are part of the NC 96 Closed Loop System and operate with 2070L controllers.



NC 96 and Pearces Road



NC 96 and Dogwood Drive/US 64 Ramp

C. Right-of-Way

Arendell Avenue has an existing right-of-way of 100 feet. All intersecting streets have an existing right-of-way of approximately 60 feet.

D. Development and Land Use

Development and land use along the project corridor consists mostly of small commercial businesses, gas stations/convenience stores, fast food restaurants and banks. There is a scattered mixture of single family residences, agricultural farms and churches. The 2009 Access Management Plan indicated that large commercial developments were planned west of Arendell Avenue. Currently this development has not taken place but since the 2009 report was issued, some residential dwellings and small commercial buildings have been removed as there are large portions of vacant land where these buildings once stood. A Bojangles restaurant has opened along the Westside of Arendell Avenue, just north of the Pearces Street intersection.

It is also understood that residential growth is expected to occur in the areas north and east of the study area. The Town has planned for a connector/access road that runs parallel to Arendell Avenue between Dogwood Street and Hendricks Drive. This access road will provide for additional developments east of Arendell Avenue between Pearces Road and US 64/264.

Development along Riley Hill Road is expected to be limited due to the future Litter River Reservoir watershed. This watershed will prohibit dense commercial development and will only allow for less dense single family-type development.

E. Traffic Analysis

The 2007 AADT as counted by NCDOT was 9,500 vpd. The CAMPO model indicated that 2035 traffic volumes on Arendell Avenue would be approximately 20,000 vehicles per day. This equates to an annual growth rate of 2.7 percent per year.

Existing Level of Service

The 2009 level of service and overall delay for the study area intersections was determined to operate with reasonable levels of service and delay in the AM and PM peak hours. **Table 1** shows the 2009 existing level of service as determined in the 2009 Access Management Plan.

The Access Management Plan analyzed specific intersections as part of that study, however, it was noted that during data collection and observing traffic along the corridor, several conflicts were observed primarily due to the multiple driveways along the corridor and their interaction with traffic flow along Arendell Avenue. These traffic operations contribute to a higher delay and lower level of safety than those predicted by the traffic analysis models.

Table 1 Zebulon Corridor Study 2009 Existing LOS		
Intersection	Peak Hour	
	AM	PM
US 64/264 Ramp / Arendell Avenue	B (11.9)	B (10.6)
Arendell Avenue / Hendricks Drive	# (0.1) A (0.0) EB C (15.3) WB	# (0.3) A (0.0) EB C (18.8) WB
Arendell Avenue / Pearces Road	B (10.3)	B (10.6)
Arendell Avenue / Green Pace Road	# (3.4) C (14.0) EB C (18.3) WB	# (3.5) C (20.5) EB C (19.5) WB
Arendell Avenue / Proctor Street	# (3.8) C (17.6) EB C (15.5) WB	# (3.5) C (15.8) EB B (14.8) WB
Pearces Road / Proctor Road	# (5.9) C (17.9) NB C (16.4) SB	N/A
# - No letter value assigned by Synchro, only overall intersection delay		

Future Level of Service

The projected future traffic volumes in the CAMPO regional model clearly indicate that Arendell Avenue needs to be a 4-lane facility in 2035. A two-lane undivided facility located in an urban area with between 2 and 4.5 signalized intersections per mile has a capacity of approximately 16,300 vehicles per day. Additionally the Town of Zebulon's thoroughfare plan indicates that Arendell Avenue is planned to be a 4-lane divided facility.

The future level of service and delay are shown in the **Table 2** below:

Table 2 Zebulon Corridor Study 2035 Future LOS		
Intersection	Peak Hour	
	AM	PM
US 64/264 Ramp & Arendell Avenue	D (43.0)	D (35.7)
Hendricks Drive / Arendell Avenue	# (0.6) B (10.3) EBL B (12.2) EBT	# (1.2) B (11.9) EBL B (10.4) EBT
Pearces Road / Arendell Avenue	D (36.0)	C (28.7)
Green Pace Road / Arendell Avenue	B (11.1)	C (24.6)
Riley Hill / Arendell Avenue	# (4.2) D (26.7) EBL	# (3.8) C (19.3) EBL
Proctor Street / Arendell Avenue	# (0.4) B (14.0) WBL	# (0.5) C (19.5) WBL
Pearces Road / Proctor Road	# (5.9) C (17.9) EBR C (16.4) WBL	N/A
No letter value assigned by Synchro, only overall intersection delay		

These tables indicate that the Arendell Avenue as a 4-lane divided facility should operate with a reasonable level of service and delay in 2035 even with the significant growth that is projected for the area. Additionally, conflicts from individual development driveways should also be minimized due to the center median.

F. Pedestrian Facilities

New concrete sidewalks have been added recently as part of the new development occurring in the area, however, there is no connectivity. The existing sidewalk extends along the eastern side of Arendell Avenue from just north of Dogwood Drive to just south of Hendricks Drive.

III. Design

DESIGN INFORMATION

• Typical Section	See Figure 1
• Alignment	See Appendix A
• Year 2007 ADT	9,500 vehicles per day
• Year 2035 ADT (ADT = Avg. daily traffic volumes)	20,000 vehicles per day
• Length	0.8 miles (4,400 feet)
• Proposed Posted Speed	35 miles per hour
• Access Control	Driveways by permit
• Relocates	5 Businesses
• Estimated Construction Cost (not including right-of-way or private utility relocations)	\$4.15 Million
• Permits Required	US Army Corp of Engineers NC Division of Water Quality NCDENR Erosion and Sediment Control

A. Design Standards

The following design guidelines and standards were used in the development of this project:

“North Carolina Department of Transportation Highway Design Branch Roadway Design Manual”, Revision No. 6, 2010

“NCDOT Roadway Standard Drawings”, 2012

“NCDOT Standard Specifications for Roads & Structures”, 2012

“A Policy on Geometric Design of Highways and Streets” American Association of State Highway and Transportation Officials (AASHTO), 2011

“Manual on Uniform Traffic Control Devices for Streets and Highways,” United States Department of Transportation, Federal Highway Administration, 2009

B. Proposed Design

Roadway Improvements

The project will involve widening of Arendell Avenue from a basic two-lane and three-lane roadway to a four-lane divided facility with separate left and right turn lanes at certain intersections. The proposed curb and gutter typical section will include wide outside lanes along each side to accommodate bicycles and sidewalks along both sides of the roadway.

The roadway improvements include shifting the existing Riley Hill Road/Arendell Avenue intersection approximately 300 feet north to create a T-intersection and eliminate the need for a traffic signal at that intersection. Existing Hendricks Drive and Proctor Street have been converted to a right-in/right-out intersection.

The improvements do not include any new driveway access points to Arendell Avenue as all new traffic should be routed to existing side streets or limited based on approval of the NCDOT.

The 2009 access management plan included two options for left turns into new development west of Arendell Avenue in the vicinity of Hendricks Drive and Pearces Road. The proposed improvements include a single northbound left-turn lane into the existing gravel driveway west of Arendell Avenue. If future development or NCDOT requires the access to the development west of Arendell Avenue be relocated to Pearces Road, the median can be removed to accommodate the dual left-turn lanes. Southbound and northbound right-turn lanes have been included at the Pearces Road intersection and gravel driveway.

No driveways should be included between Hendricks Drive and Pearces Road. One median break has been provided between Pearces Road and Green Pace Road as a left over crossing. All access to developments between Pearces Road and Green Pace Road should access Arendell Avenue via Pearces Road or Green Pace Road. Driveways allowing right-in/right-out access should be coordinated with NCDOT.

It should be noted that the 2009 access management plan indicates that driveways to Arendell Avenue should be limited by requiring developers to provide shared driveways and/or access to side streets or future service roads. Future developments should also be required to perform traffic impact analyses to determine the specific lane geometry for the study area intersections, particularly the specific storage requirements for the auxiliary left and right turn lanes. All improvements should be coordinated with NCDOT for final approval. The plans meet minimum NCDOT lane configuration geometry standards and will require additional design and coordination between the developers and NCDOT.

Preliminary design plans with horizontal and vertical alignments and cross sections are provided in **Appendix A**. The Town of Zebulon should provide these plans to developers to ensure that as development occurs along the corridor, sections of Arendell Avenue can be built separately and will ultimately tie together and function as a complete corridor and be consistent with the Towns long range plans.

Traffic Signal Improvements

All new traffic signals and improvements to existing traffic signals shall continue to use 2070L controllers with Econolite Oasis software and be incorporated into the NC 96 Closed Loop System. New signal installations should use McCain 332 cabinets placed such that visibility for turning vehicles is not hindered. A future signal modification will be required at the intersection of NC 96 and Pearces Road which will involve the addition of a fourth leg into a proposed mixed use development. An additional signal will be required at the intersection of NC 96 and Green Pace Road. The intersection of NC 96 and Green Pace Road should be monitored in the future and be placed under signal control once it meets the needed signal warrants.

Signal heads shall be L.E.D. and ultimately use the 4 section Flashing Yellow Arrow signal head for any protected/permissive left turn movements. Pedestrian signal heads should be the L.E.D. countdown heads with suitable pedestrian push buttons placed in accordance with the latest Manual of Uniform Traffic Control Devices (MUTCD). Signal poles shall be metal strain poles with or without mast arms, designed for zone 4 wind speeds (90mph). Union Metal Corporation and Valmont Industries both make NCDOT approved metal poles and mast arms which can be galvanized, painted, or powder coated. When timing the existing and proposed signals,

coordination will be particularly critical due to the proposed spacing of signalized intersections and should be designed for 35 MPH. This will ensure safe and efficient progression of vehicles to and from the downtown Zebulon area.

C. Typical Sections

The proposed roadway section will consist of a 4-lane divided, curb and gutter facility with a 16-foot wide median, 12-foot wide inside lanes and 14-foot wide outside lanes to accommodate bicycle access. Sidewalks will be provided on both sides of the roadway with curb ramps at intersections and driveways providing ADA accessibility along the corridor. Limited driveway access and channelized left turns will be provided along Arendell Avenue requiring shared driveways and access to the side streets. **Figure 2** below shows a typical section of the proposed improvements.

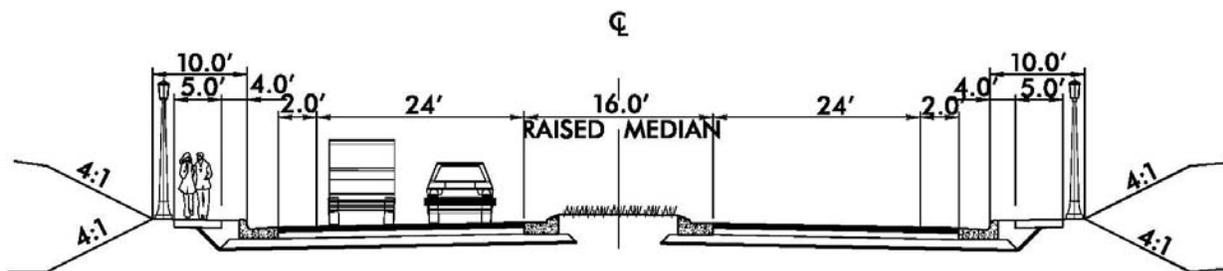


Figure 2
Typical Section

IV. Complete Streets

“Complete streets” refers to the concept that streets are designed and operated to enable safe access for all users, including pedestrians, bicyclists, motorists, and transit users of all ages and abilities. Complete streets policies are meant to ensure that transportation agencies routinely design and operate the entire right-of-way to enable safe access for all users. A key element of livable communities is a safe and convenient place for people to walk and bike as part of their daily activities. These facilities have to feel safe for all its users.

The Town should require that pedestrian-oriented streets be designed to provide a pleasant environment for walking including shade trees; plantings; benches, trash receptacles, news racks, street and pedestrian-scaled lighting, wayfinding signage; integrated transit shelters and even public art. Amenities such as these would make Arendell Avenue a complete streets corridor and improve mobility along the corridor. This project should improve the region’s quality of life by connecting people and places with reliable, safe, and easy-to-use travel choices that reduce congestion and energy use, save money, and promote sustainability, healthier lifestyles, and a more environmentally responsible community.

A. Street Lighting

Street lighting design is seen as an important element to maintaining safety and quality of life. These issues go beyond the amount of light produced and include minimizing light pollution, enhancing the urban environment during the day by use of decorative poles and fixtures and at night by the provision of pedestrian level light, deterring undesirable or illegal activities, increasing safety, restricting unwanted light onto private property and minimizing glare, power consumption, cost and visual impacts, both day and night.

Lighting technology has evolved tremendously in recent years. There are now more light sources, fixtures, poles and materials available. There is also much interest in the use of decorative light poles with underground wiring along with a recognition of street lighting as an important daytime as well as evening urban design element. The existing town lighting standard as shown below should be used along the corridor if the Town would like to tie this corridor to downtown Zebulon. Below are a few different types of street lighting that the Town may consider if they would like a different look to this corridor.



Existing lighting fixture in downtown Zebulon



Sample Street Lighting Fixtures



Sample Street Lighting Fixtures and Poles

B. Pedestrian Facilities

Walking is our most basic form of transportation. Pedestrian travel is involved in every trip we make and is the basis for all other transportation modes. Pedestrian facilities are vital for accessibility, health and well-being, social equity, and economic development. The Town should develop a cohesive pedestrian network of public sidewalks and street crossings to make walking a convenient and safe way to travel.

The proposed improvements include a five-foot wide sidewalk along both sides of Arendell Avenue to provide accessibility throughout the corridor to accommodate pedestrians including the disabled. The sidewalk is located four-feet from the back of curb with curb ramps at all intersections and driveways providing ADA accessibility. The proposed sidewalks and curb ramps should be designed and constructed in accordance with NCDOT Standards.

C. Street Furniture

Street furniture can help to improve the aesthetic quality of a streetscape and the quality of life for pedestrian and transit riders. It can help create plaza areas for meetings and gatherings to add character as well as create environments for community interaction. There are many styles of furniture that include benches, bike racks, trash receptacles, planters, landscaping and shelters. A single style of streetscape furnishing should be used to bring consistency and identity to the corridor and should be of high quality, durable material to minimize maintenance. A few examples are shown below:



Sample Street Furniture



Sample Street Furniture

D. Transit

With increased development along the Arendell Avenue corridor, transit planning should be implemented to provide an alternative mode of transportation for workers as well as patrons to the businesses. Depending on the size and type of development, the Town should require transit stops to be included within the development. The Town may want to develop a policy to include transit along major corridors in Town.



Sample Bus Shelters

E. Signage/Wayfinding

The Town should include new wayfinding signs along Arendell Avenue since it will serve as gateway into the Town from the North. The Town could standardize these signs for use along other corridors in the Town.

F. Landscaping

Landscaping and streetscape can be used to improve both the aesthetics and the travel experience on the Town's streets. The planning of landscaped medians, curbside planter strips, and gateway features can enhance the City's commercial and neighborhood corridors. Landscape areas should be an integral part of the site stormwater management strategy, through rain gardens, bioswales and street planters. All landscape elements should provide for and reinforce the function of each specific space: vehicular-oriented streets, pedestrian-oriented

streets, other pedestrian spaces, areas that frame views and vistas, stormwater management and wildlife habitat.

Rows of trees should appropriately parallel and reinforce the street corridor. The use of a variety of types, sizes and species, however, is encouraged to emphasize different micro-climates, roadway intersections, walkway locations, and other functional variations. Shrubs and understory or small flowering trees should be used, along with flower beds and planters, to provide seasonal color, visual emphasis and a comfortable scale for human interaction.

Utilize native and adapted vegetation that are climate-tolerant to the area and applicable to sustainable design.



Sample Street Landscaping

G. Traffic Signal Poles and Equipment

Downtown Zebulon currently has made improvements to some intersections by upgrading to traffic signal mast arms. Below is a picture of the existing mast arm traffic system used in downtown along with some additional styles of traffic signal poles and pedestrian signals. Traffic signal housing and visors are also shown. The controller and signal cabinets that should be used for this project include a 2070 controller and a McCain 332 Signal Cabinet for compatibility with the current existing system on NC 96.



Existing traffic signal in downtown Zebulon



Signal and Pedestrian Heads



Signal Poles and Mast Arms



Traffic Signal Housings and Visors

2070 Controllers by Naztec Inc. and McCain Traffic Supply



McCain 332 Signal Cabinet



V. Hydrology and Storm Drainage

Preliminary hydrology analysis indicates the project corridor generally drains away from Arendell Avenue. Arendell Avenue currently drains via roadside ditches in the northern portion of the corridor and a mixture of storm drainage systems and roadside ditches towards the south. Newer development has constructed storm drainage systems roughly between Hendricks Drive and Dogwood Drive. Four cross drain pipes carry stormwater from the east to the west under Arendell Avenue. An 18-inch pipe under Arendell Avenue ties to a 24-inch outfall pipe in a ditch just north of the US 64 Ramp near the State Employees Credit Union. Dual 24-inch pipes cross under Arendell Avenue just north of Pearces Road and drains to a small ditch and wetland area to the west. Further north, an 18-inch pipe crosses Arendell Avenue just south of Green Pace Road and daylights into a swale that drains to the west and another 18-inch pipe drains from east to west north of Riley Hill Road.

The proposed roadway improvements will consist of curb and gutter and a closed storm drainage system. The existing roadside ditches will be eliminated to the extent practical where curb and gutter is placed. The roadway north of Riley Hill Road consists of a shoulder section to transition back to the existing roadway section and roadside ditches will also be used to transition to the existing ditch sections.

A preliminary storm drainage system has been designed and shown on the preliminary plans. However, a more detailed design should be performed as development occurs. The storm drainage system should be designed to handle the increased development that is occurring in the area or each development should be required to provide stormwater management measures to limit the amount of storm water draining towards the roadway to meet the predevelopment conditions.

VI. Utilities

The existing corridor consists of overhead electrical and communication lines. It is recommended that these utilities be relocated underground to remove the clutter along the corridor. All new primary electrical, telephone, fiber optic and cable distribution lines installed to serve development shall be placed underground within the entire development adjacent to Arendell Avenue. When installing street lighting, all electrical cables should be installed underground as well.

Water and sanitary sewer utilities along the corridor will require adjustment to manholes and valves and require fire hydrants to be relocated. It does not appear at this time that vertical adjustment will be required to the water or sanitary sewer lines. However with the construction of a new storm drainage system, this should be verified with subsurface utility exploration during the final design phase.

VII. Right-of-Way Requirements

Additional right-of-way will be required for the realignment of Riley Hill Road. A 60-foot right-of-way should be adequate. Additional right-of-way will be required at the intersections of Proctor Street on the southeast corner to accommodate the new right turn lane. To accommodate the southbound right-turn lane at Green Pace Road, additional right-of-way will be required. New right-of-way should be set one foot (1') from the outside edge of the new sidewalk. Additional

right-of-way will be required in the four quadrants of the Green Pace Road intersection to accommodate the new radii for the intersection, sidewalks and future traffic signal poles. Similarly, additional right-of-way will be required at the Pearces Road and Hendricks Drive intersections to accommodate a southbound right-turn lane and dual north bound left turn lanes into the future development to the west of Arendell Avenue and a north bound right turn lane onto Pearces Road. This new right-of-way should be set one foot (1') from the outside edge of the new sidewalk.

Temporary construction easements will also be required along the entire corridor to allow the contractor to construct the fill/cut slopes outside of the new roadway to tie back to existing grades. These temporary construction easements are typically set ten feet (10') outside of the slope stake limit lines. In wetland areas, this is typically reduced to five feet (5') to minimize the impacts to the wetland areas.

Permanent drainage easements will be required at the ends of all cross drain pipes and outfall pipes. These are typically thirty feet (30') wide and extend twenty feet (20') from the end of the drainage pipe to allow for future maintenance on the storm drainage system.

Additional utility easements may also be required due to the fact that the existing electrical, telephone and cable lines will be impacted by construction. Coordination will be required with each private utility company during the final design of the project.

Preliminary right-of-way, permanent drainage easements and temporary construction easements are shown on the plan sheets in Appendix A.

VIII. Preliminary Construction Costs and Schedule

A. Preliminary Construction Costs

Preliminary construction costs were developed based on the preliminary plans shown in Appendix A. The preliminary construction costs are approximately \$4.15 million for improvements to approximately 4,400 feet of Arendell Avenue. These costs do not include right-of-way or any private utility relocation. The cost per linear foot of the roadway improvements is approximately \$945.00, which equates to approximately \$475.00 per linear foot for each property owner along the corridor.

B. Schedule

It is hard to determine an exact schedule for the construction of this project as it is understood that the development will control when portions of the roadway improvements will take place.

It should be noted that the project could be constructed in stages. The section from US 64 to Pearces Road could be constructed as one portion as the extra northbound lane could function as a right-turn lane and drop off as the road tapers back to the existing section north of the intersection. As indicated above, the dual northbound left-turn lanes could be constructed at Hendricks Drive or at a new western leg of Pearces Road depending on how development occurs in the area.

The relocation of Riley Hill Road can occur at an time. It should be noted that the island/median should be constructed at Proctor Street with the relocation of Riley Hill Road to allow the intersection to function properly as planned.

IX. Environmental Screening

Existing Wetlands



A. INTRODUCTION

The Town of Zebulon is undertaking a functional corridor study for Highway 96 North from Highway 64/264 to Riley Hill Road in Wake County. The following Environmental Screening Report assesses the existing environmental conditions, natural resources, and potential impacts, and potential minimization/mitigation measures associated with the functional design.

B. METHODOLOGY AND QUALIFICATIONS

All work was conducted consistent with standard procedures on similar NCDOT studies and projects. Field work for the Environmental Screening was conducted on September 27 and November 8, 2011. The Environmental Screening included field survey of the project corridor, and identification of jurisdictional areas. Jurisdictional areas have not been verified by the U.S. Army Corps of Engineers (USACE) or the North Carolina Division of Water Quality (NCDWQ). The principal investigator contributing to this document was:

Principal

Investigator: Benjamin R. Laseter

Education: Ph.D. Wildlife Ecology and Management, 2004

Experience: Senior Biologist / Project Manager, Fish and Wildlife Associates, Inc., 2004-Present

Graduate Research and Teaching Assistant, University of Georgia / University of Memphis, 1996-2004

Responsibilities: Wetland and stream identification, mapping, natural communities assessment, T/E species assessment, background information review, document preparation

C. EXISTING ENVIRONMENTAL CONDITIONS

The study area lies in the piedmont physiographic region of North Carolina. Topography in the project vicinity is comprised of gently rolling hills with narrow, level floodplains along streams. Elevations in the study area range from 300 to 350 ft. above sea level. Land use in the project vicinity consists primarily of agriculture, interspersed with residential development along roadways and forestland along stream corridors. See **Figure 3**.

C.1 *Water Resources*

Water resources in the study area are part of the Upper Neuse River and Contentnea Creek basins [U.S. Geological Survey (USGS) Hydrologic Units 03020201 and 03020203, respectively]. Streams and wetlands within the project area are discussed under **Jurisdictional Issues** below.

C.2 *Terrestrial Resources*

The project area is limited to a relatively narrow corridor adjacent to existing NC 96. Almost all of the terrestrial resources within the project area have been disturbed; few mature trees remain. Terrestrial communities within the project area are best described as "Maintained/Disturbed".

Terrestrial communities in the study area may be impacted by project construction as a result of grading and paving of portions of the study area. Due to the disturbed nature of the terrestrial community within the project area, detrimental impacts to this community will likely be negligible.

D. JURISDICTIONAL ISSUES

D.1 *Clean Water Act Waters of the U.S.*

Water resources in the study area are part of the Upper Neuse River and Contentnea Creek basins [U.S. Geological Survey (USGS) Hydrologic Units 03020201 and 03020203, respectively].

Four streams were investigated during field surveys for the environmental screening. Classification, approximate impact length, Hydrologic Unit, and buffer rule applicability are included in **Table 3**.

Figure 3
Aquatic Resources Field Survey Map



Table 3
Jurisdictional Characteristics Of Streams In The Study Area

Map ID	Approximate Impact Length (ft.)	Classification	USGS Hydrologic Unit	River Basin Buffer
Stream 1	40	Ephemeral	03020203	Not Subject
Stream 2	0	Intermittent	03020203	Subject
Stream 3	45	Intermittent	03020201	Subject
Stream 4	0	Intermittent	03020201	Subject

Four wetlands were investigated during field surveys for the environmental screening. Classification, approximate impact acreage, hydrologic classification, and Hydrologic Unit are included in **Table 4**.

Table 4
Jurisdictional Characteristics Of Wetlands In The Study Area

Map ID	Approximate Impact Area (ac.)	Hydrologic Classification	USGS Hydrologic Unit
Wetland A	0	Non-riparian	03020203
Wetland B	0	Non-riparian	03020203
Wetland C	0.006	Riparian	03020201
Wetland D	0.023	Riparian	03020201

D.2 Clean Water Act Permits

Based on the current design for the NC 96 corridor, impacts will likely be necessary to Stream 3 and Stream 4. A Nationwide Permit (NWP) 14 will likely be applicable. The USACE holds the final discretion as to what permit will be required to authorize project construction. A Section 401 Water Quality Certification (WQC) Number 3820 from the NCDWQ will also be required.

D.3 N.C. River Basin Buffer Rules

Streamside riparian zones within the study area are protected under provisions of the Neuse River Buffer Rules administered by NCDWQ. Streams S2, S3, and S4 within the project area are subject to buffer rule protection.

D.4 Endangered Species Act Protected Species

As of September 22, 2010 the United States Fish and Wildlife (USFWS) lists four federally protected species for Wake County. Each species is listed in **Table 5**, along with a Biological Conclusion rendered based on survey results in the project area. During formulation of the Biological Conclusion for each species, habitat requirements for each species were based on the current best available information from referenced literature and/or USFWS. A review of the North Carolina Natural Heritage Program Database (accessed September 23, 2011) indicates that, of the four federally protected species listed for Wake County, only the Dwarf-wedgemussel is known to occur within 2 miles of the project area.

**Table 5
Federally Protected Species Listed For Wake County**

Scientific Name	Common Name	Federal Status	Habitat Present	Biological Conclusion
<i>Haliaeetus leucocephalus</i>	Bald Eagle	BGPA	No	No Effect
<i>Picoides borealis</i>	Red cockaded woodpecker	E	No	No Effect
<i>Alasmadonta heterodon</i>	Dwarf-wedge mussel	E	No	No Effect
<i>Rhus michauxii</i>	Michaux's sumac	E	Yes	MA-NLAA

E - Endangered

T - Threatened

BGPA – protected under the Bald and Golden Eagle Protection Act

MA-NLAA – May Affect-Not Likely to Adversely Affect

Appendix A

Preliminary Roadway

**Plans, Profiles
&
Cross Sections**

See Sheet 1-A For Index of Sheets

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

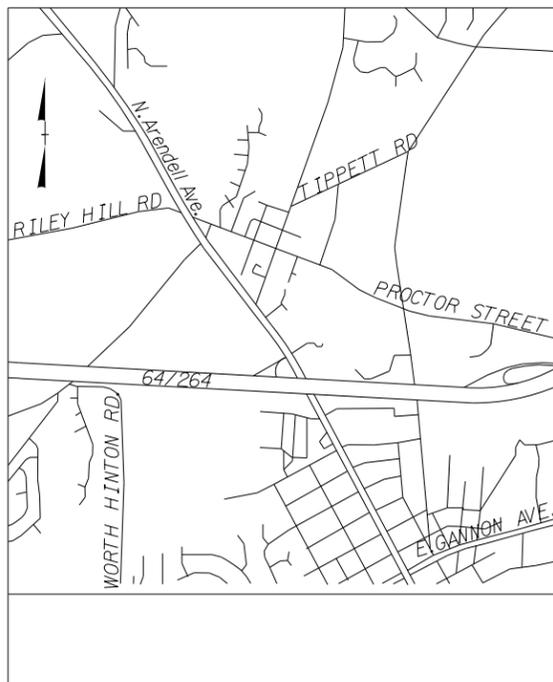
TOWN OF ZEBULON

**LOCATION: NC HIGHWAY 96 ROAD WIDENING PROJECT
FOR THE TOWN OF ZEBULON**

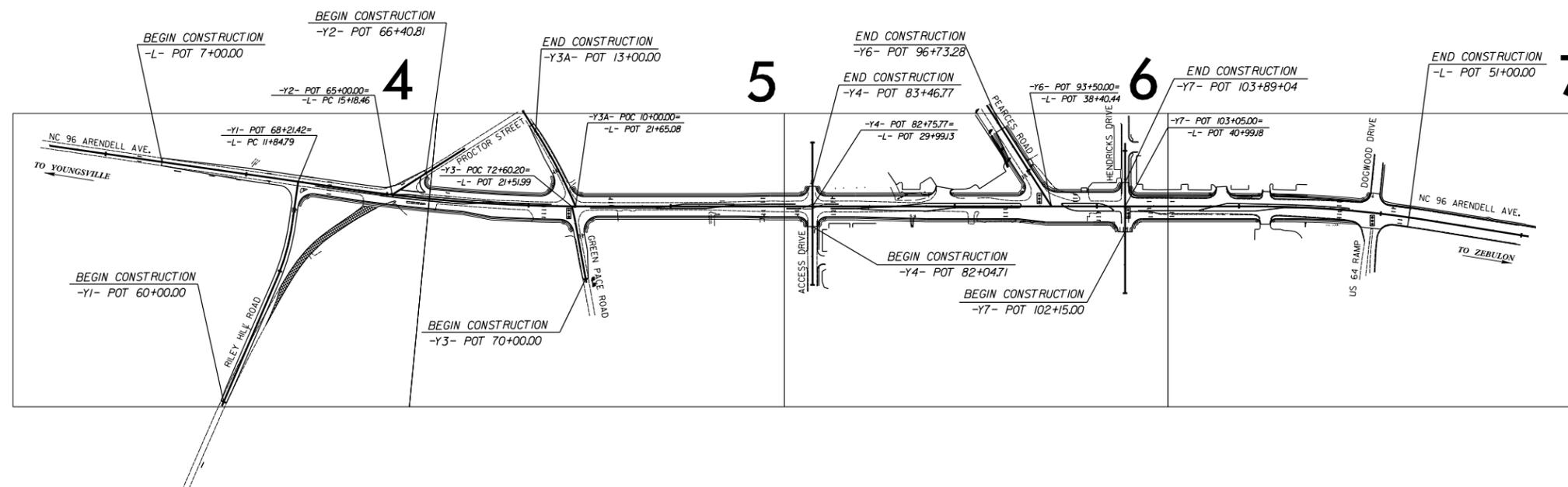
FROM US 64/264 RAMP TO RILEY HILL RD

**TYPE OF WORK: GRADING, DRAINAGE, ASPHALT PAVING,
CONCRETE CURB AND GUTTERS AND SIDEWALKS,
AND TRAFFIC SIGNALS**

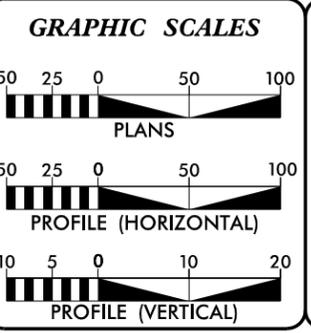
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N.C.		1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	



TIP PROJECT:



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



DESIGN DATA

ADT 2009 =	17,000
ADT 2035 =	29,600
DHV =	10 %
D =	60 %
T =	8 % *
V =	40 MPH
* TTST	5% DUAL 3%
FUNC CLASS =	MINOR ARTERIAL

PROJECT LENGTH

LENGTH OF ROADWAY = 0.833 miles

CDM Smith
2012 STANDARD SPECIFICATIONS

Prepared in the Office of:
421 Fayetteville Street, Suite 1303
RALEIGH, N.C. 27601
NC LICENSE NO. F-1255

RIGHT OF WAY DATE: _____

LETTING DATE: _____

TRE DUGAL, P.E.
PROJECT ENGINEER

J. MATTHEW PICKENS, P.E.
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: _____ P.E.

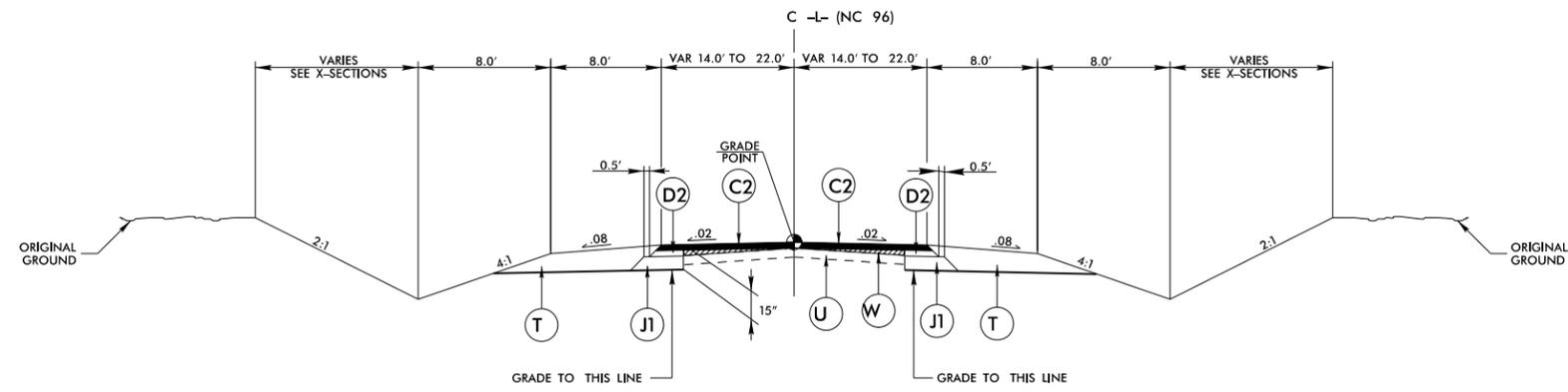
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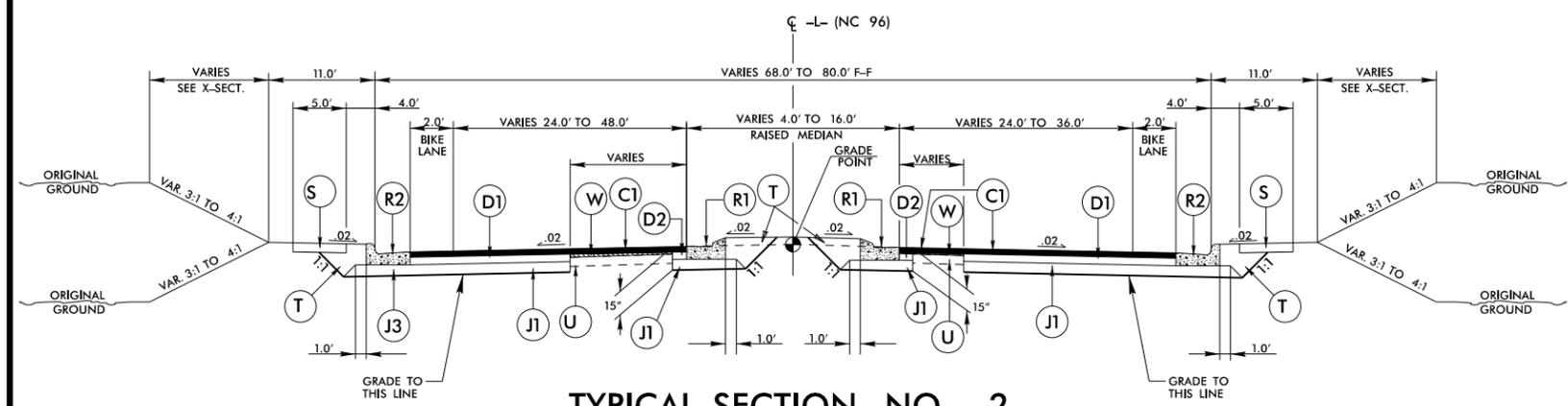
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CONTRACT:



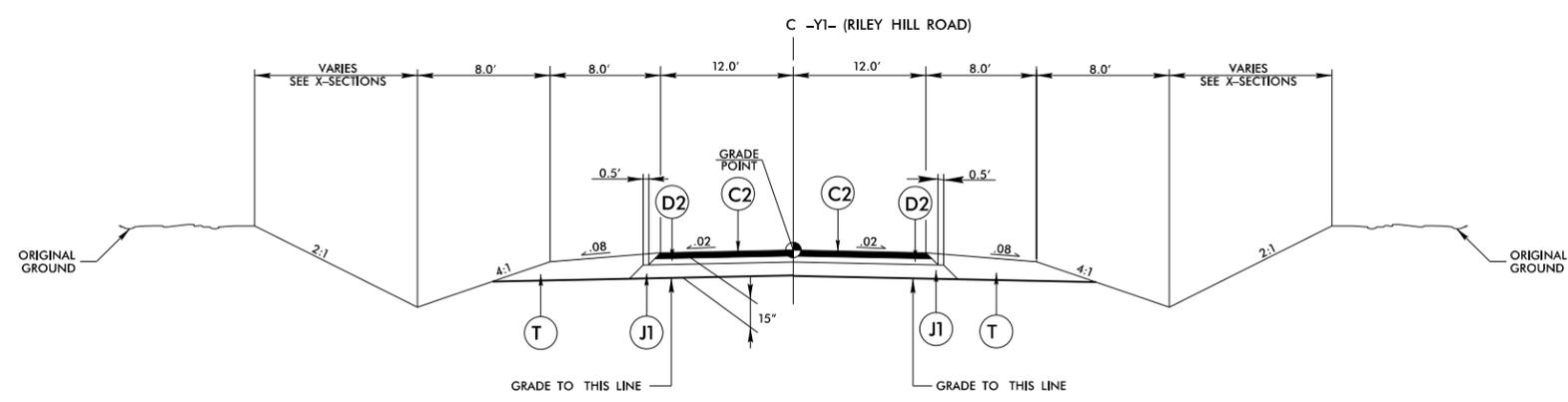
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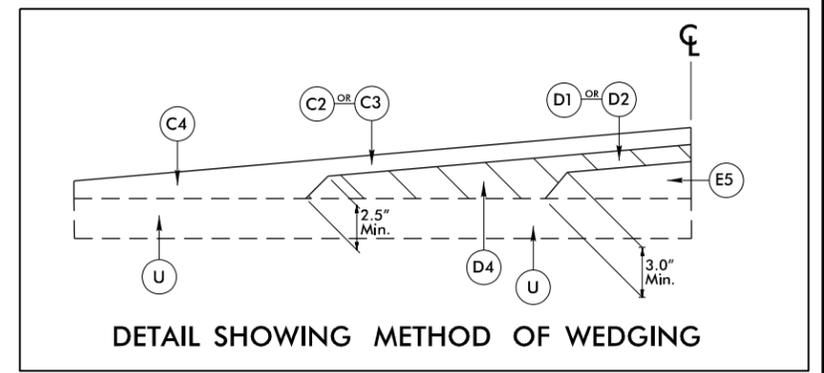
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TYPICAL SECTION NO. 3

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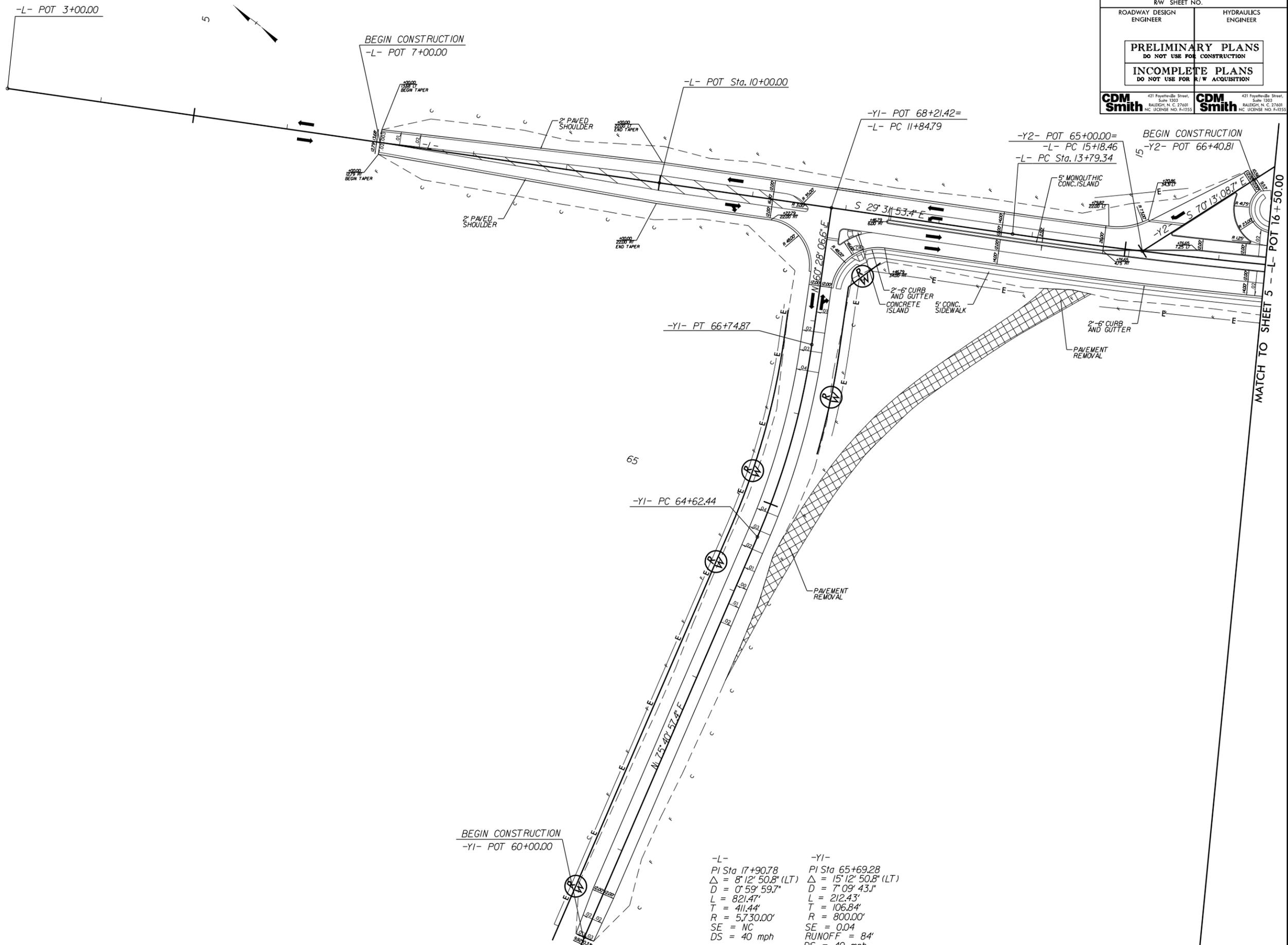
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C1	PROP. APPROX. 3" ASPHALT CONC. SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 168 LBS/SY IN EACH OF TWO LAYERS.
C2	PROP. VAR. DEPTH ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 112 LBS/SY PER 1" DEPTH TO BE PLACED IN LAYERS NOT TO EXCEED 2" IN DEPTH.
D1	PROP. APPROX. 4" ASPHALT CONC. INTERMEDIATE COURSE, TYPE I19.0B, AT AN AVERAGE RATE OF 456 LBS/SY.
D2	PROP. APPROX. 4" ASPHALT CONC. INTERMEDIATE COURSE, TYPE I19.0C AT AN AVERAGE RATE OF 456 LBS/SY.
E1	PROP. APPROX. 5.5" ASPHALT CONC. BASE COURSE, TYPE B25.0B, AT AN AVERAGE RATE OF 627 LBS/SY.
E2	PROP. APPROX. 4" ASPHALT CONC. BASE COURSE, TYPE B25.0C, AT AN AVERAGE RATE OF 456 LBS/SY.
J1	PROP. 8" AGGREGATE BASE COURSE.
R1	1'-6" CONCRETE CURB AND GUTTER.
R2	2'-6" CONCRETE CURB AND GUTTER.
R6	5" MONOLITHIC CONCRETE MEDIAN
S	4" CONCRETE SIDEWALK.
T	EARTH MATERIAL.
U	EXISTING PAVEMENT.
W	VARIABLE DEPTH ASPHALT PAVEMENT. (SEE STANDARD WEDGING DETAIL SHEET No. 2)



DETAIL SHOWING METHOD OF WEDGING

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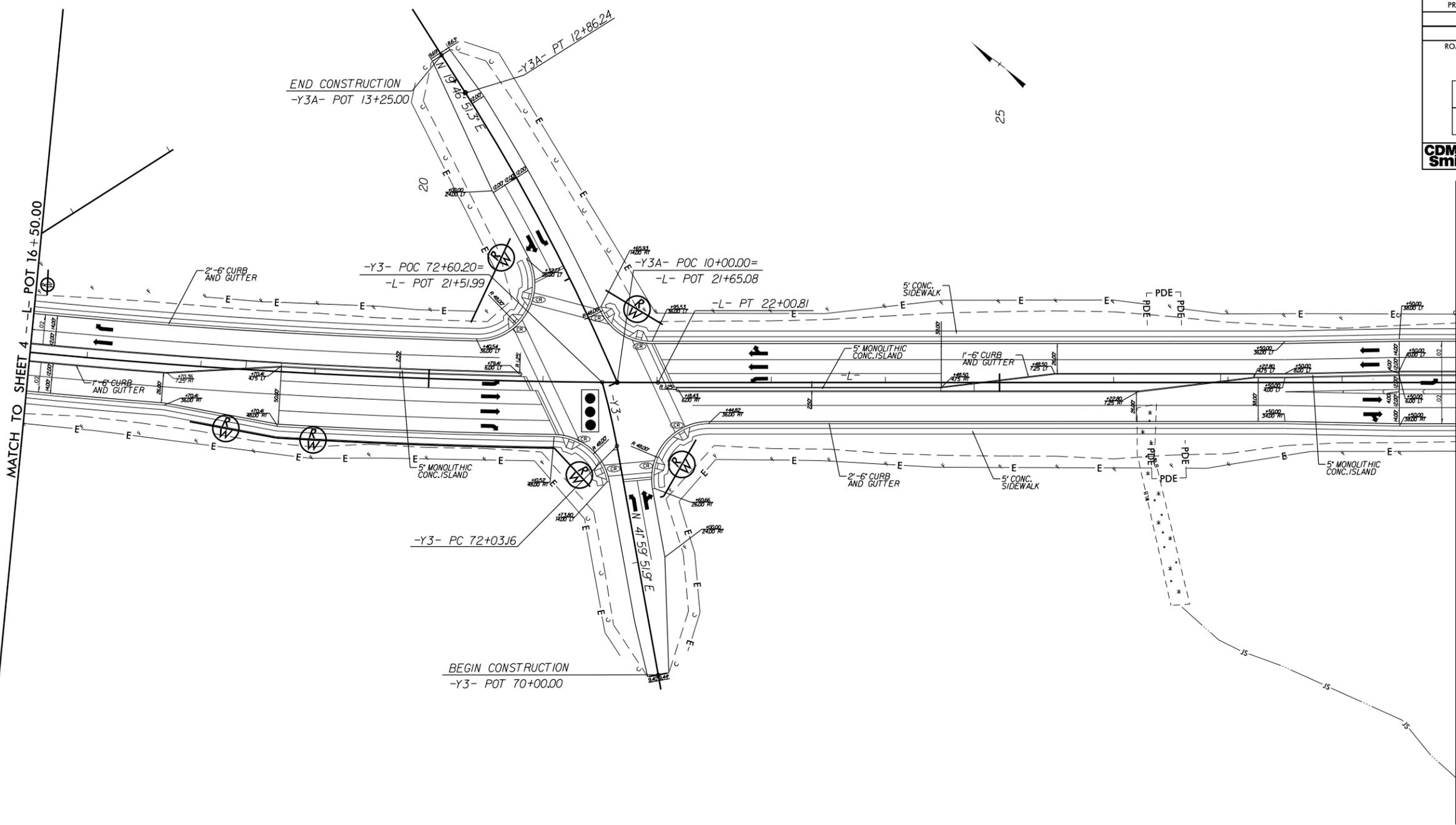
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CDM Smith <small>421 Fayetteville Street, Suite 1303, Raleigh, N. C. 27601, NC LICENSE NO. F-1255</small>	CDM Smith <small>421 Fayetteville Street, Suite 1303, Raleigh, N. C. 27601, NC LICENSE NO. F-1255</small>



-L-
 PI Sta 17+90.78
 Δ = 8° 12' 50.8" (LT)
 D = 0° 59' 59.7"
 L = 821.43'
 T = 411.44'
 R = 5,730.00'
 SE = NC
 DS = 40 mph

-Y1-
 PI Sta 65+69.28
 Δ = 15° 12' 50.8" (LT)
 D = 7° 09' 43.1"
 L = 212.43'
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 SE = 0.04
 RUNOFF = 84'
 DS = 40 mph

PROJECT REFERENCE NO.	SHEET NO.
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CDM Smith 421 Fayetteville Street, Suite 1303 RALEIGH, N. C. 27601 NC LICENSE NO. F-1255	CDM Smith 421 Fayetteville Street, Suite 1303 RALEIGH, N. C. 27601 NC LICENSE NO. F-1255



MATCH TO SHEET 4 -- L- POT 16+50.00

MATCH TO SHEET 6 -- L- POT 29+00.00

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D = 0' 59' 59.7"	D = 9' 32' 57.5"	D = 3' 19' 10.7"
L = 821.47'	L = 211.71'	L = 286.24'
T = 411.44'	T = 106.97'	T = 143.45'
R = 5,730.00'	R = 600.00'	R = 1,725.97'
SE = NC		
DS = 40 mph		

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CDM Smith 421 Fayetteville Street, Suite 1303 RALEIGH, N. C. 27601 NC LICENSE NO. F-1255	CDM Smith 421 Fayetteville Street, Suite 1303 RALEIGH, N. C. 27601 NC LICENSE NO. F-1255



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CDM Smith
421 Fayetteville Street,
Suite 1303
RALEIGH, N. C. 27601
NC LICENSE NO. F-1255

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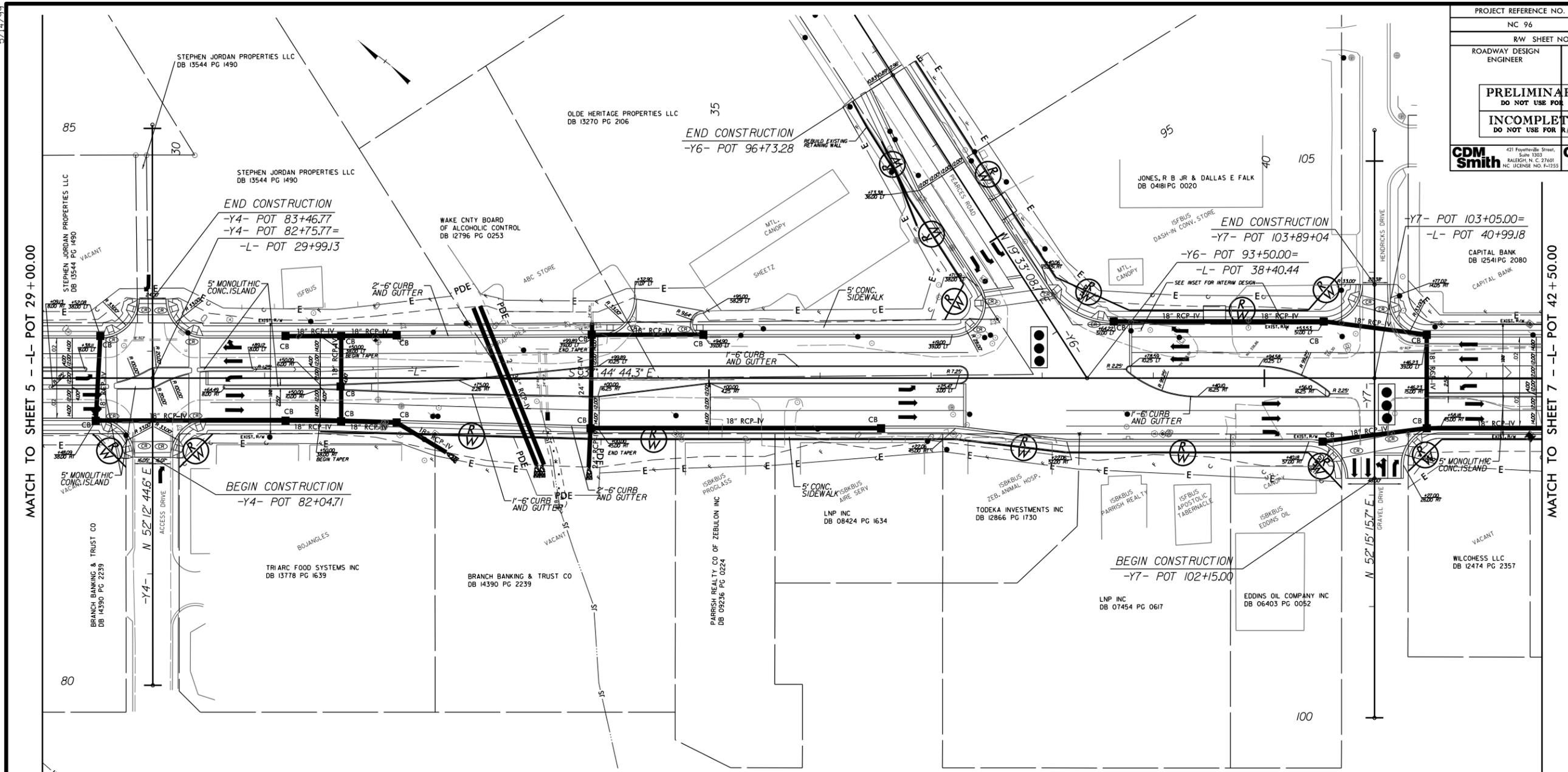
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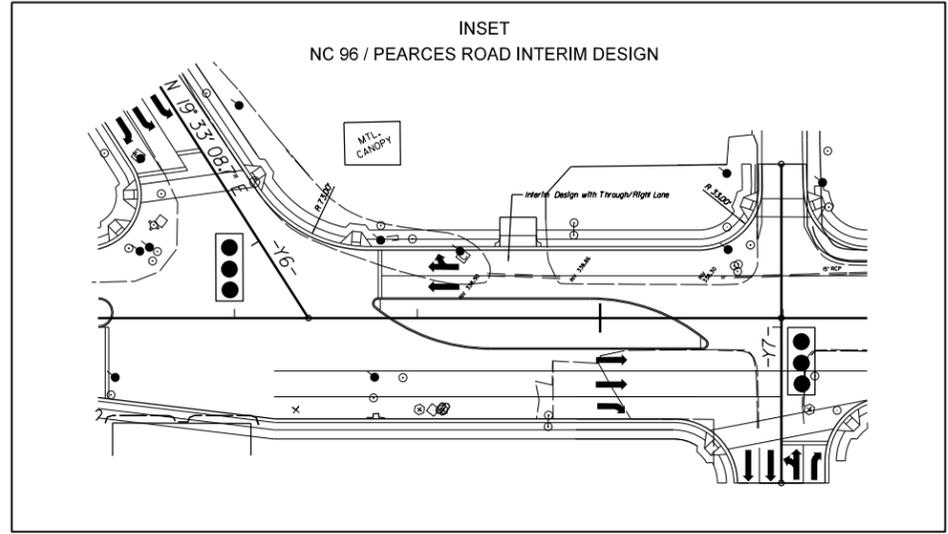
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MATCH TO SHEET 7 --L- POT 42+50.00



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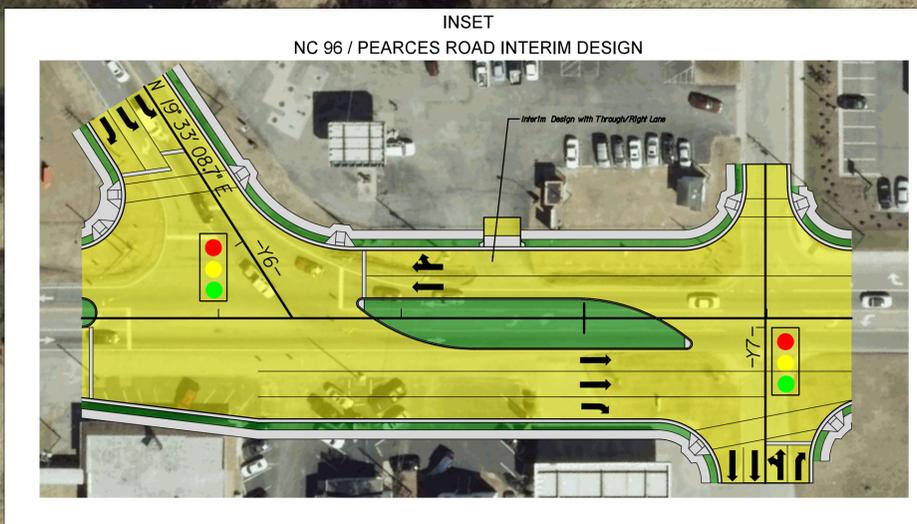
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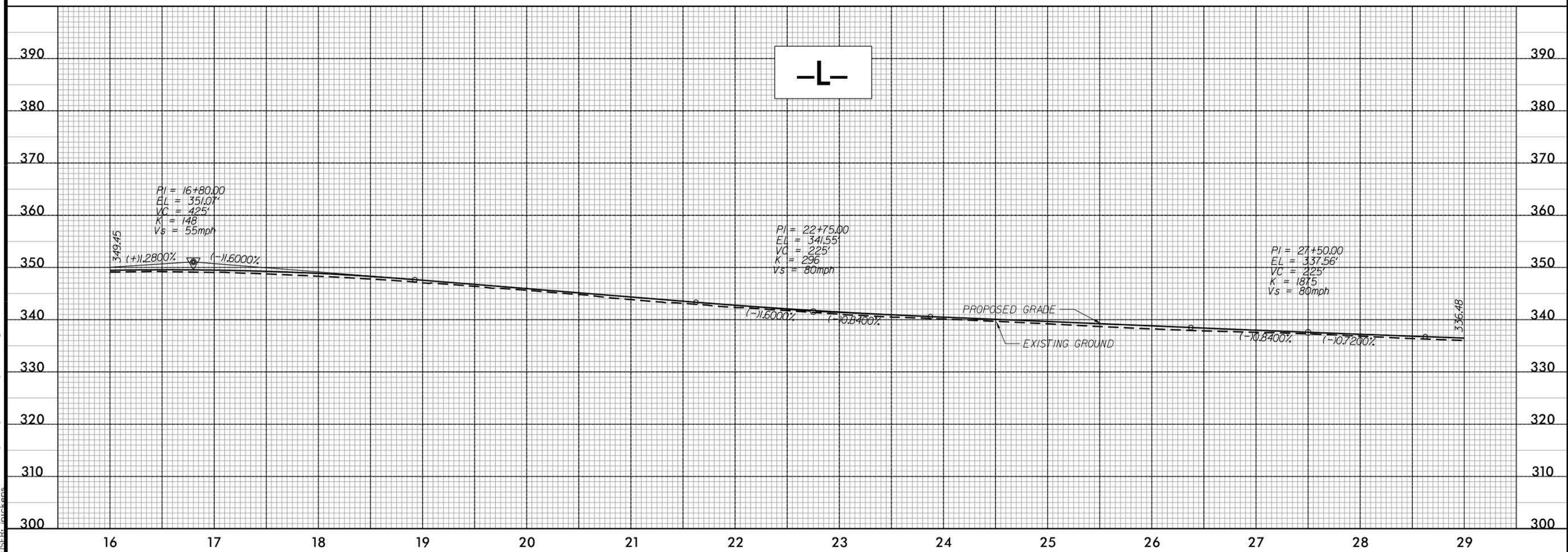
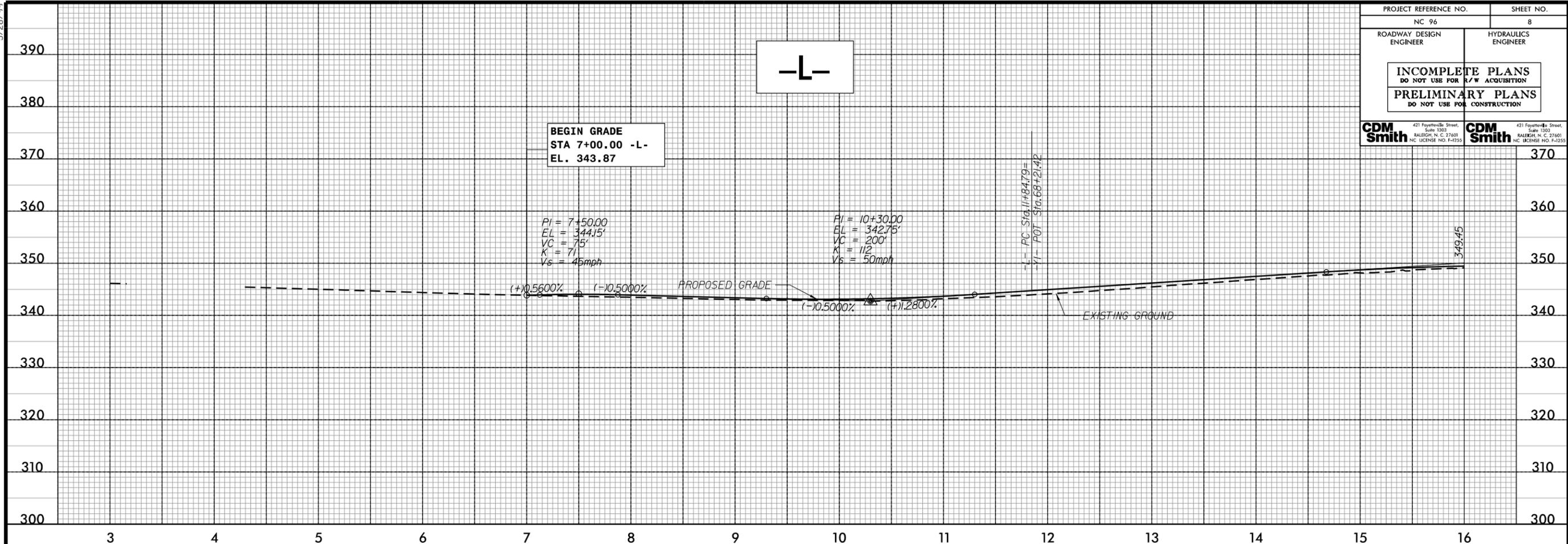
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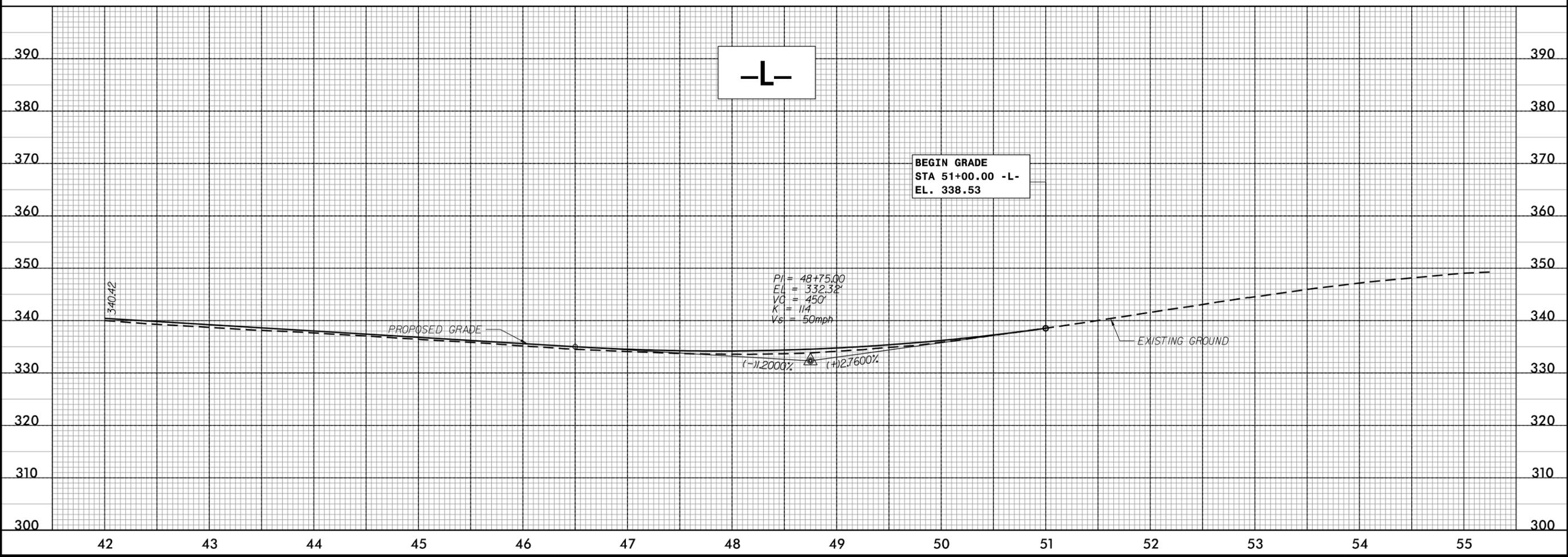
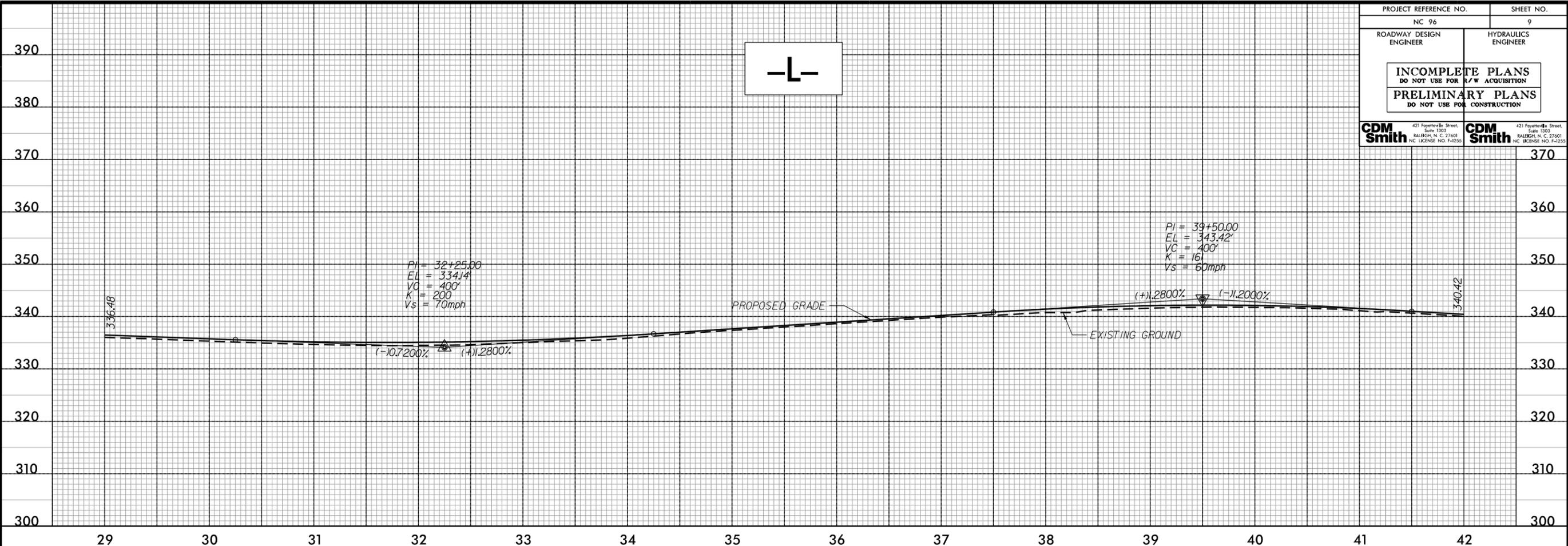
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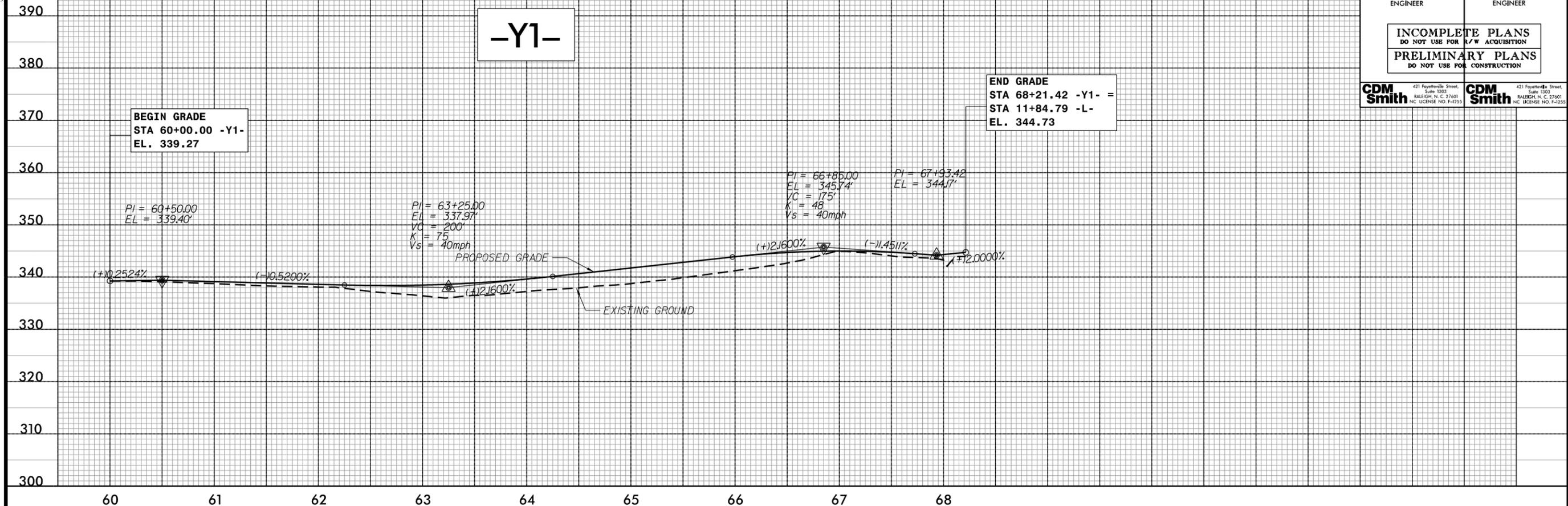
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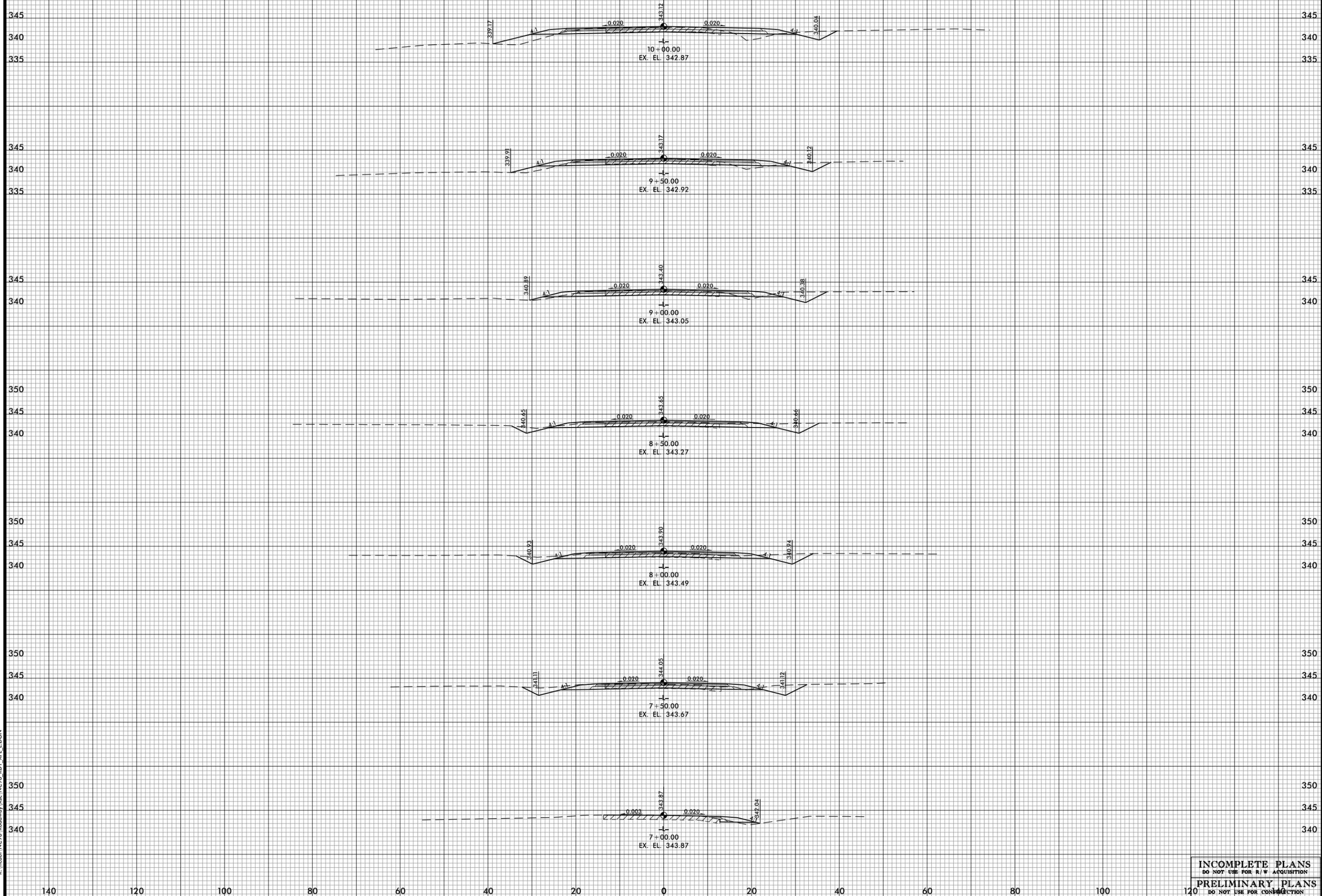
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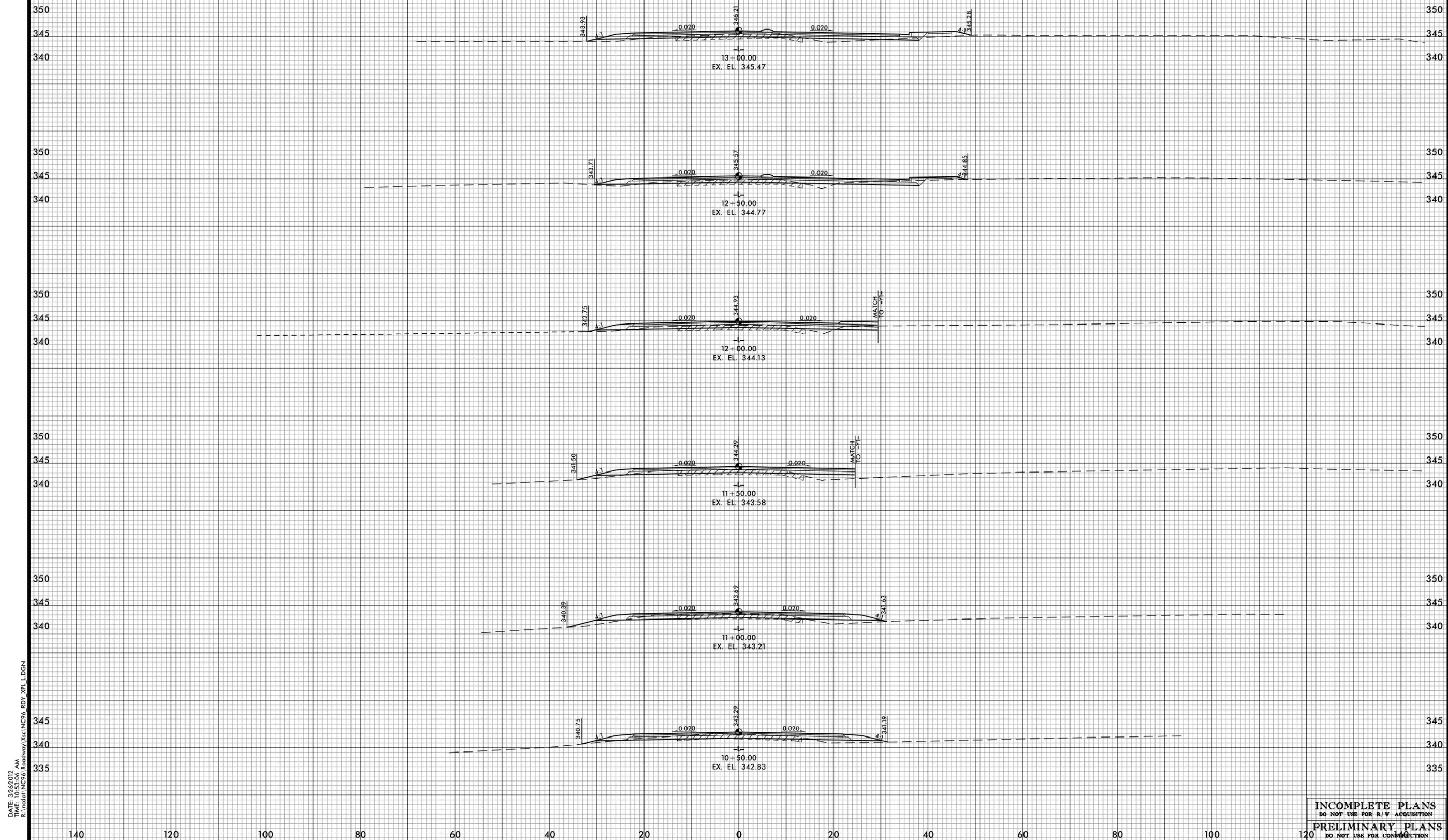


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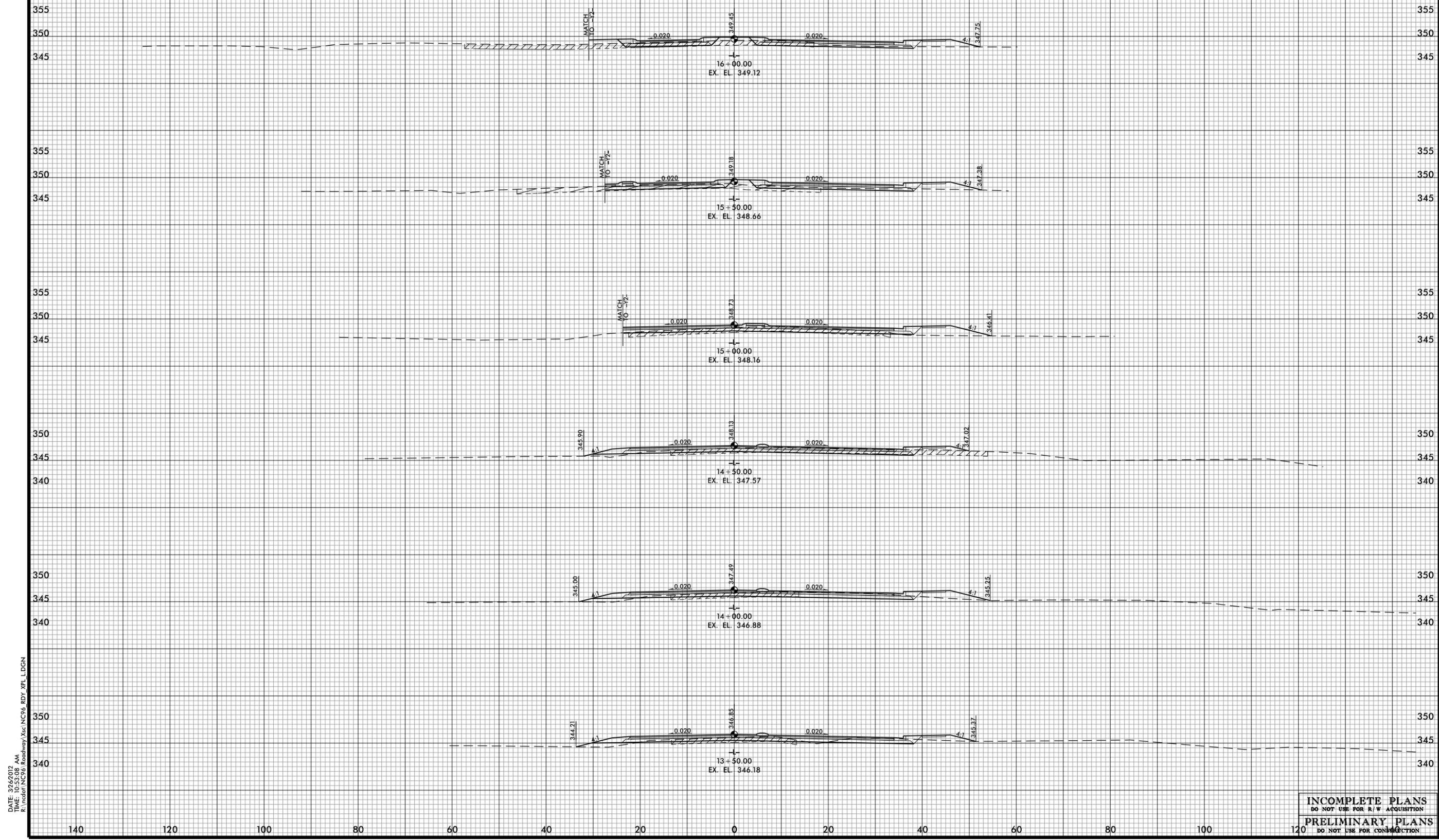
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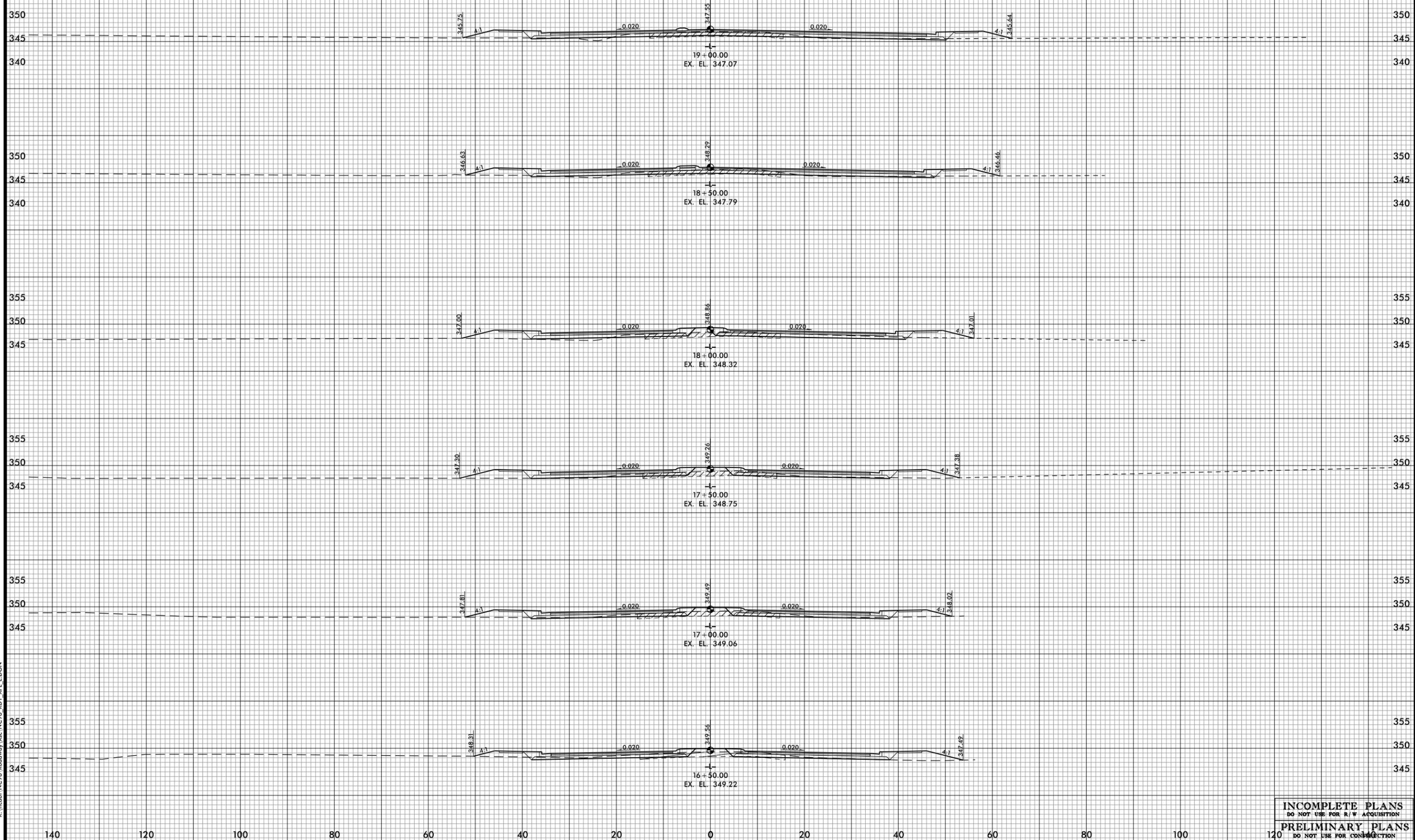
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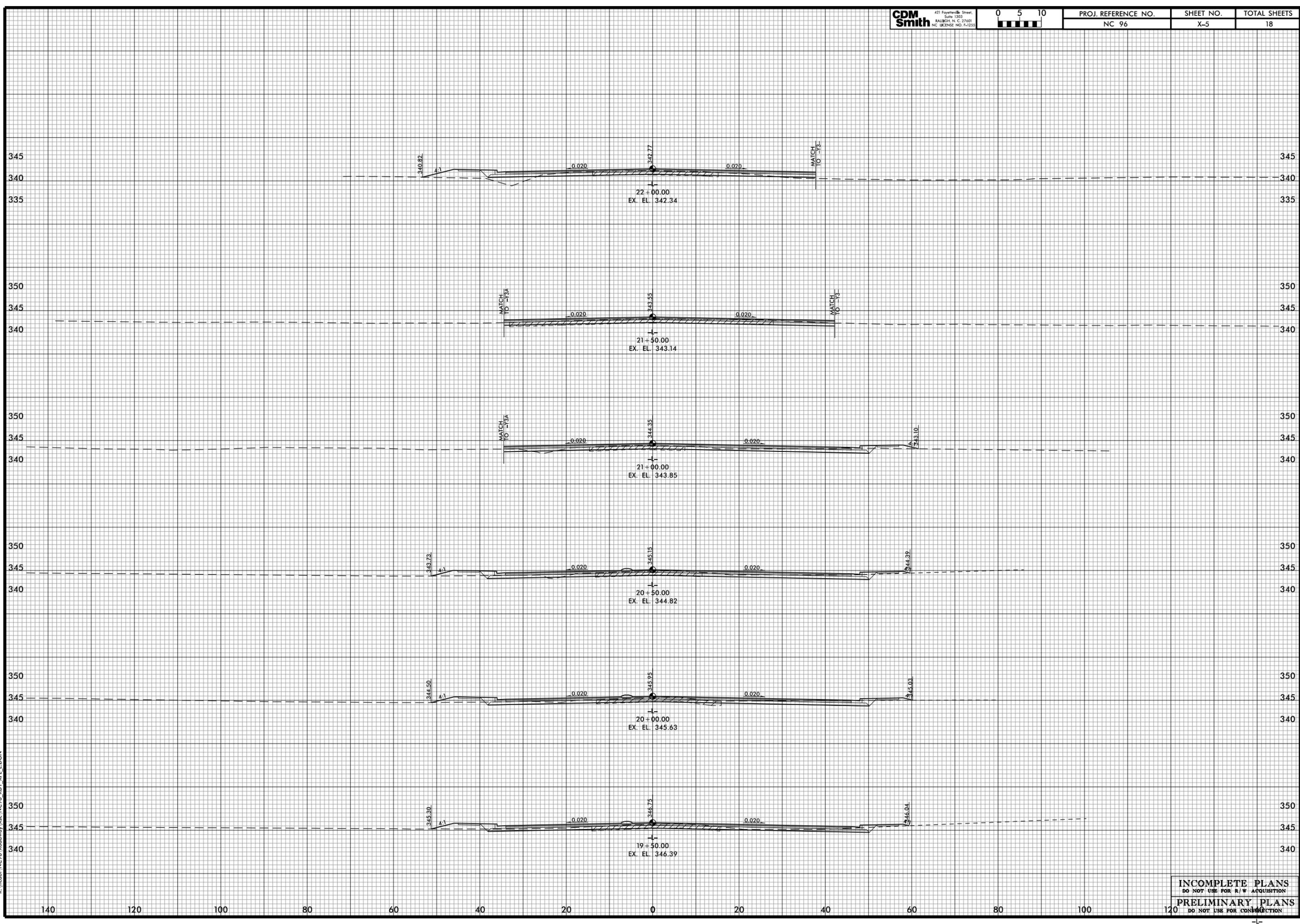
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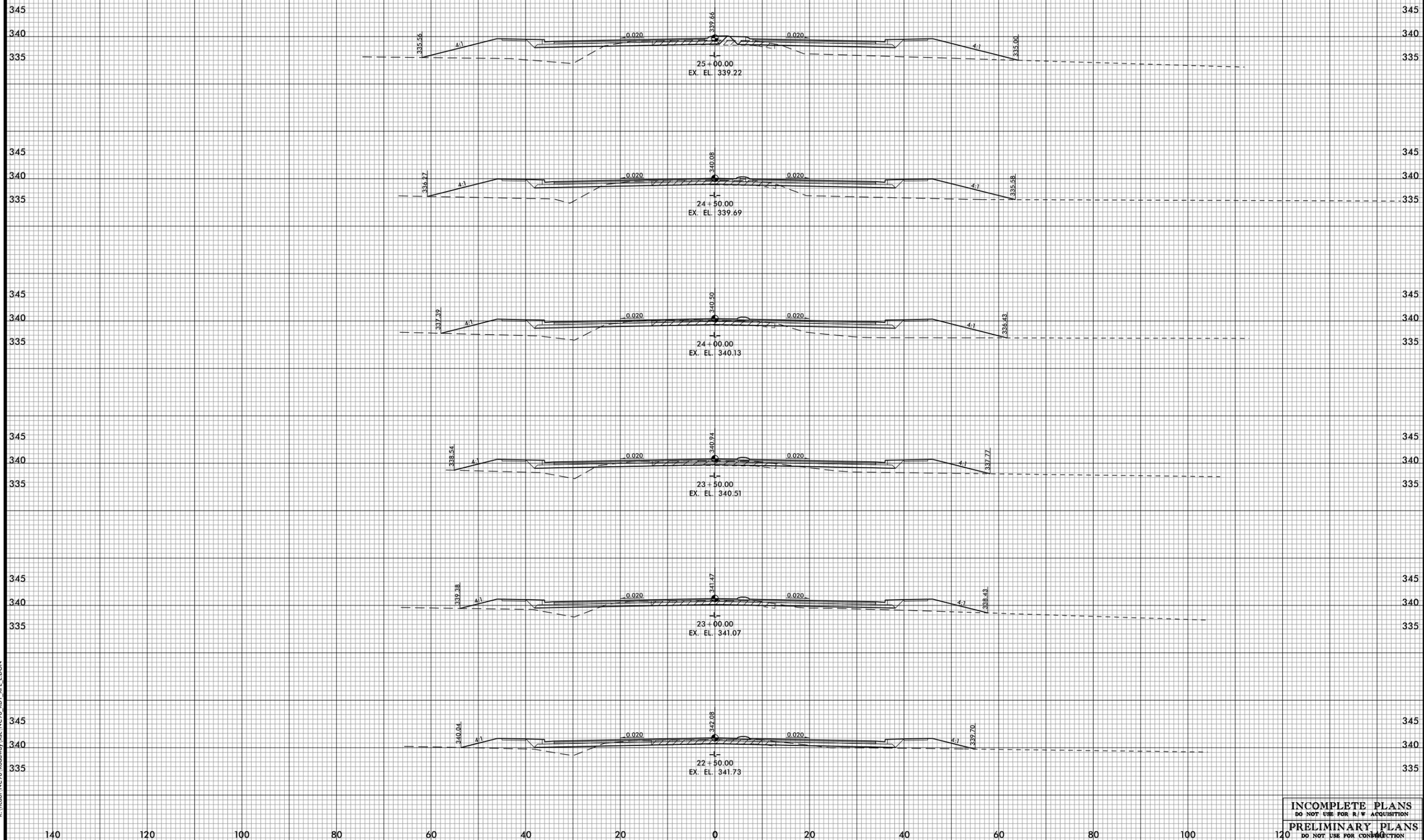


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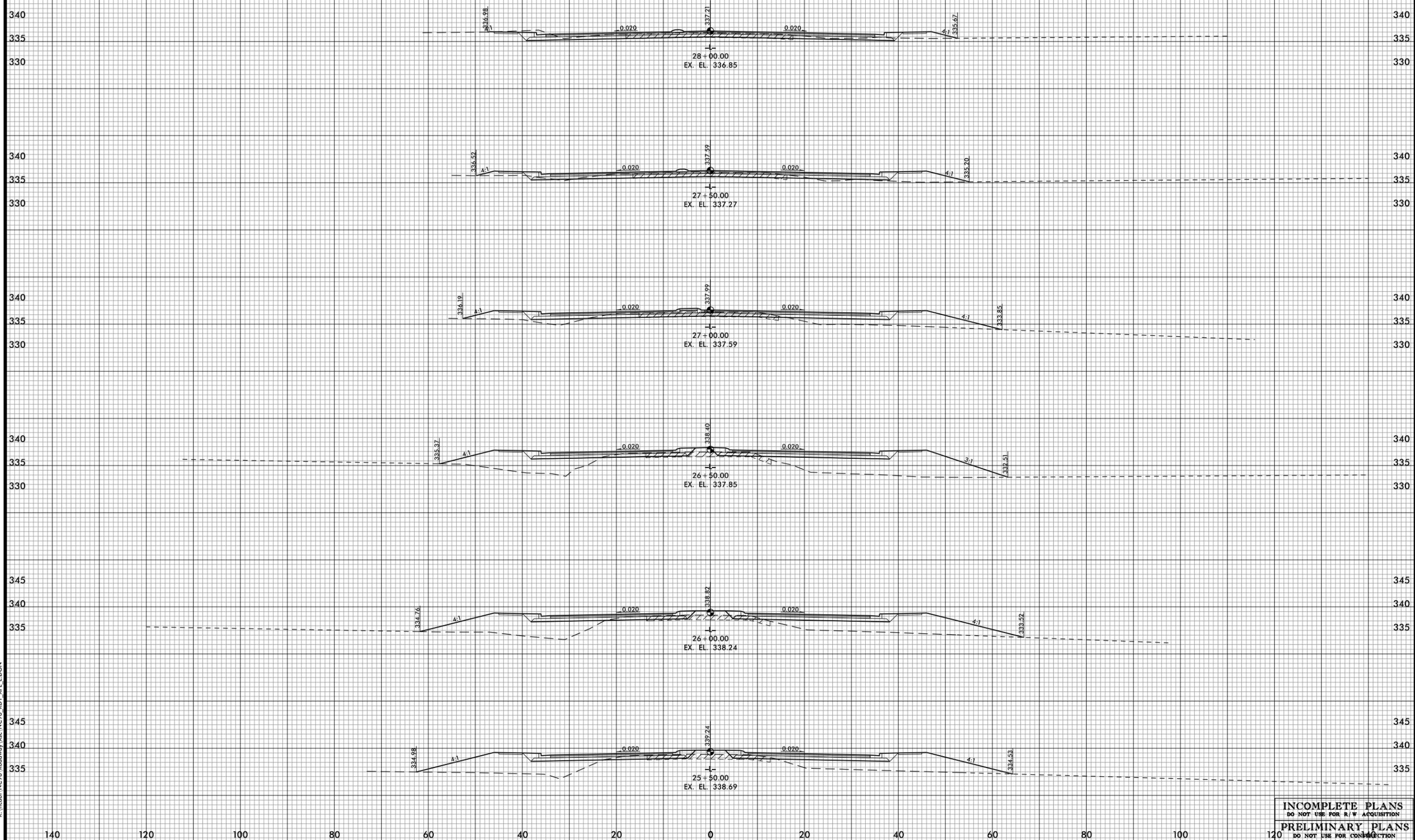
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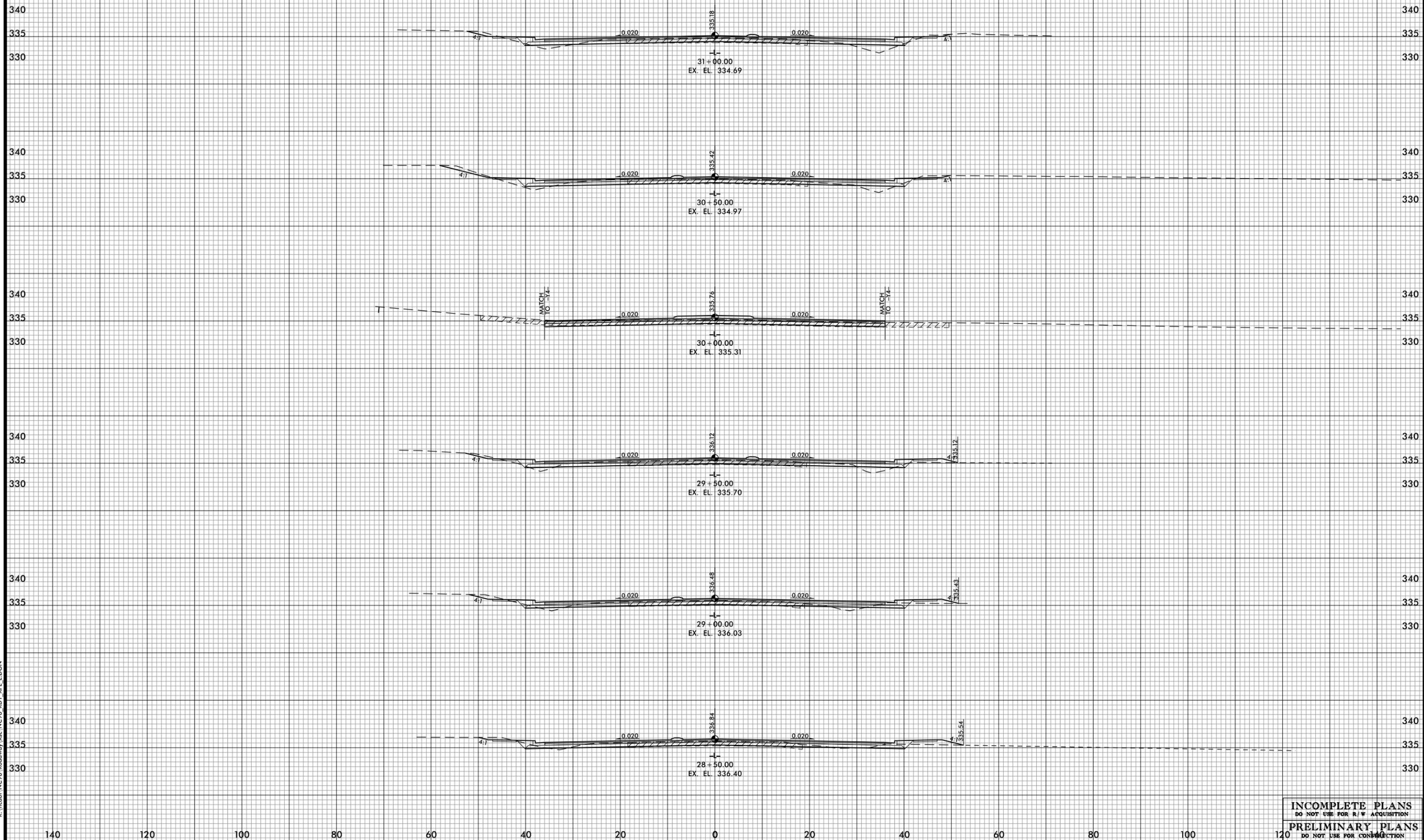
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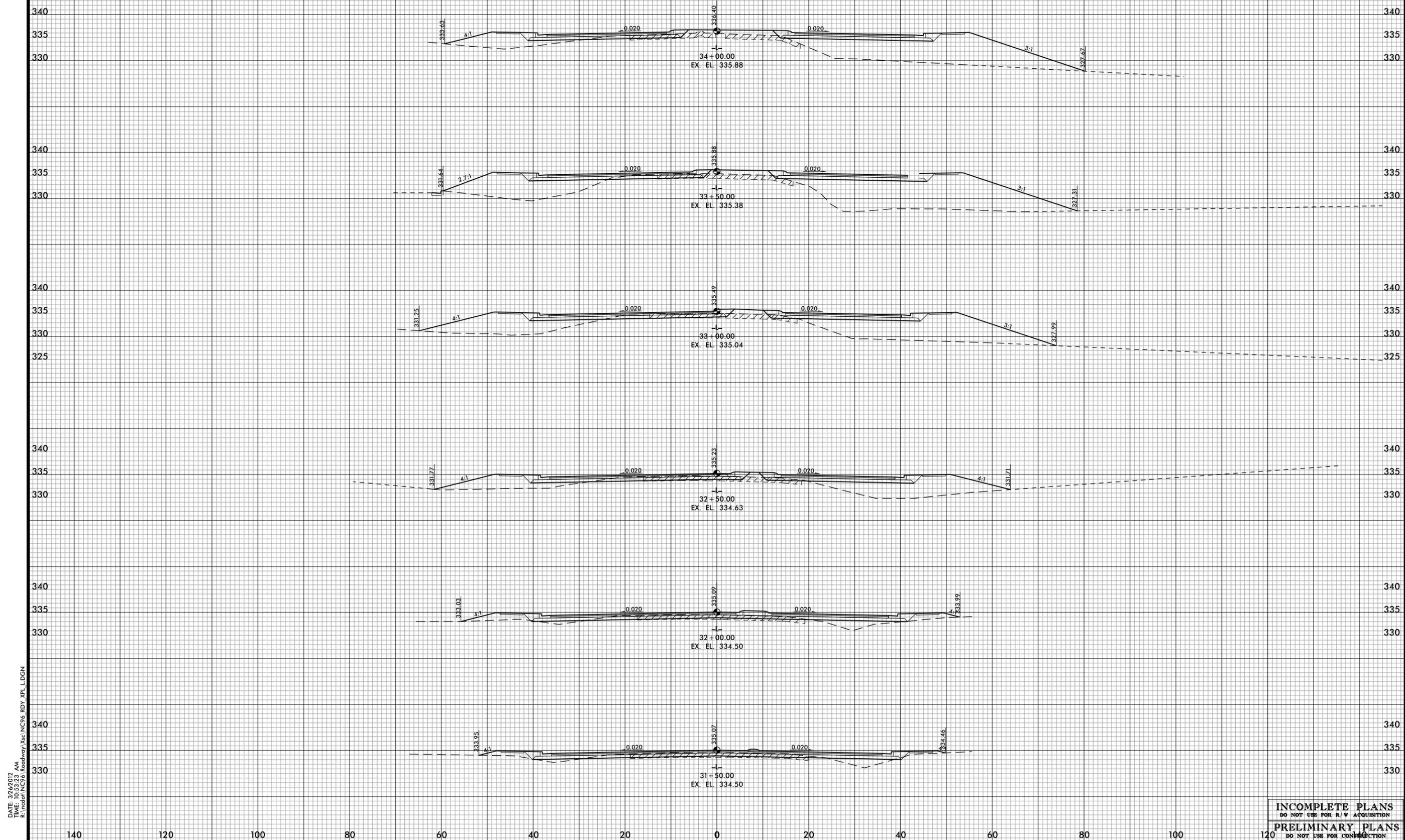


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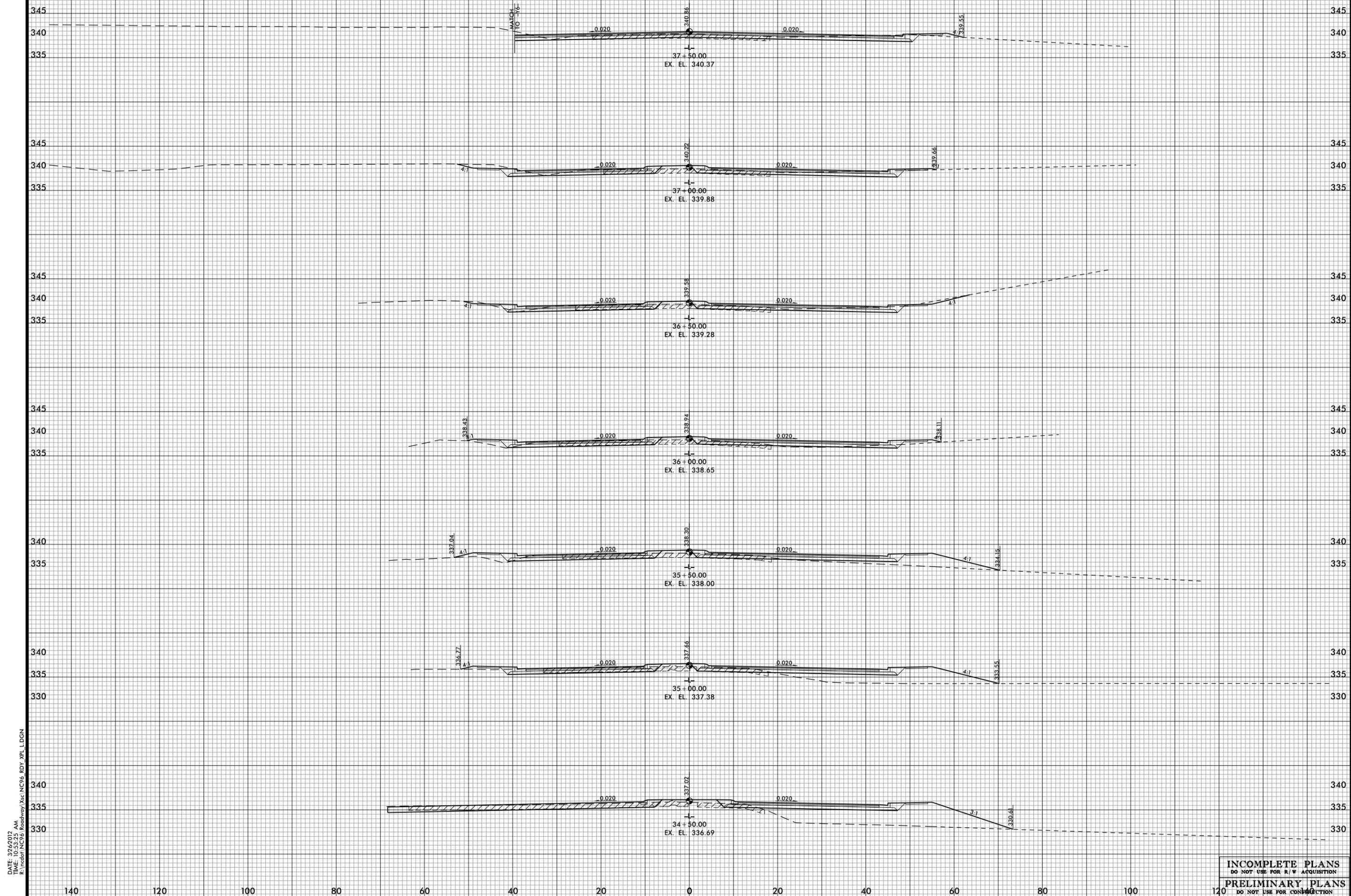


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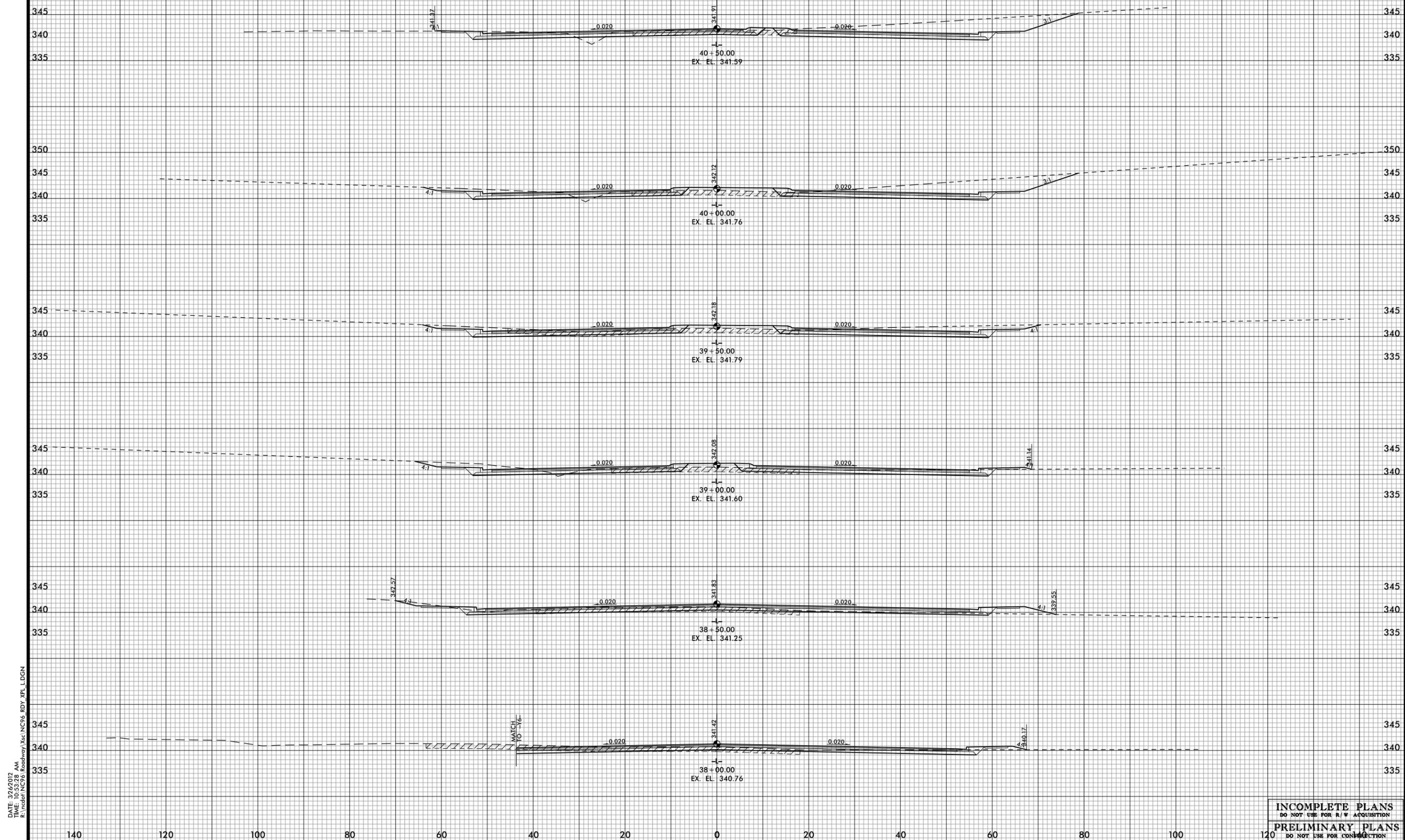
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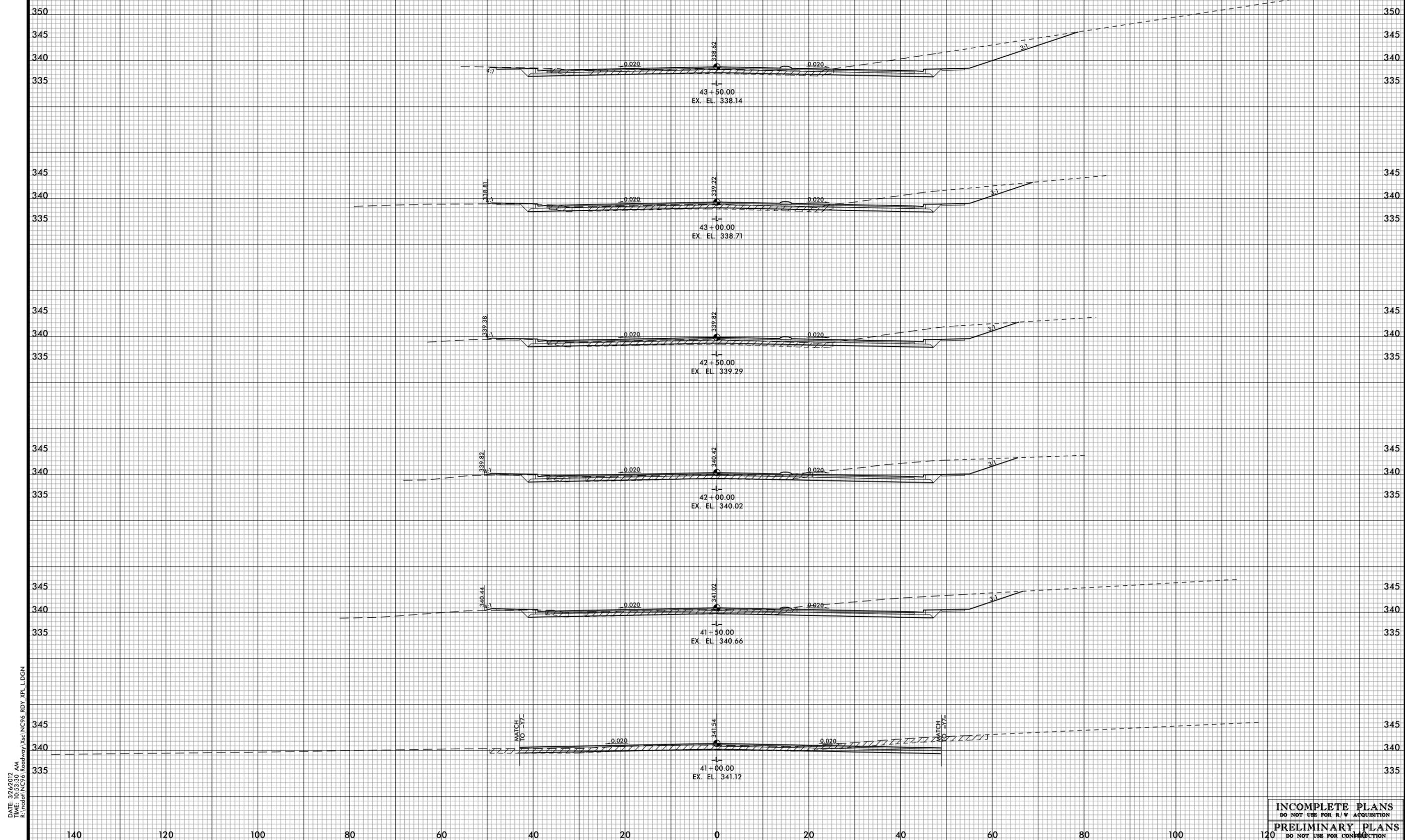
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DO NOT USE FOR CONSTRUCTION



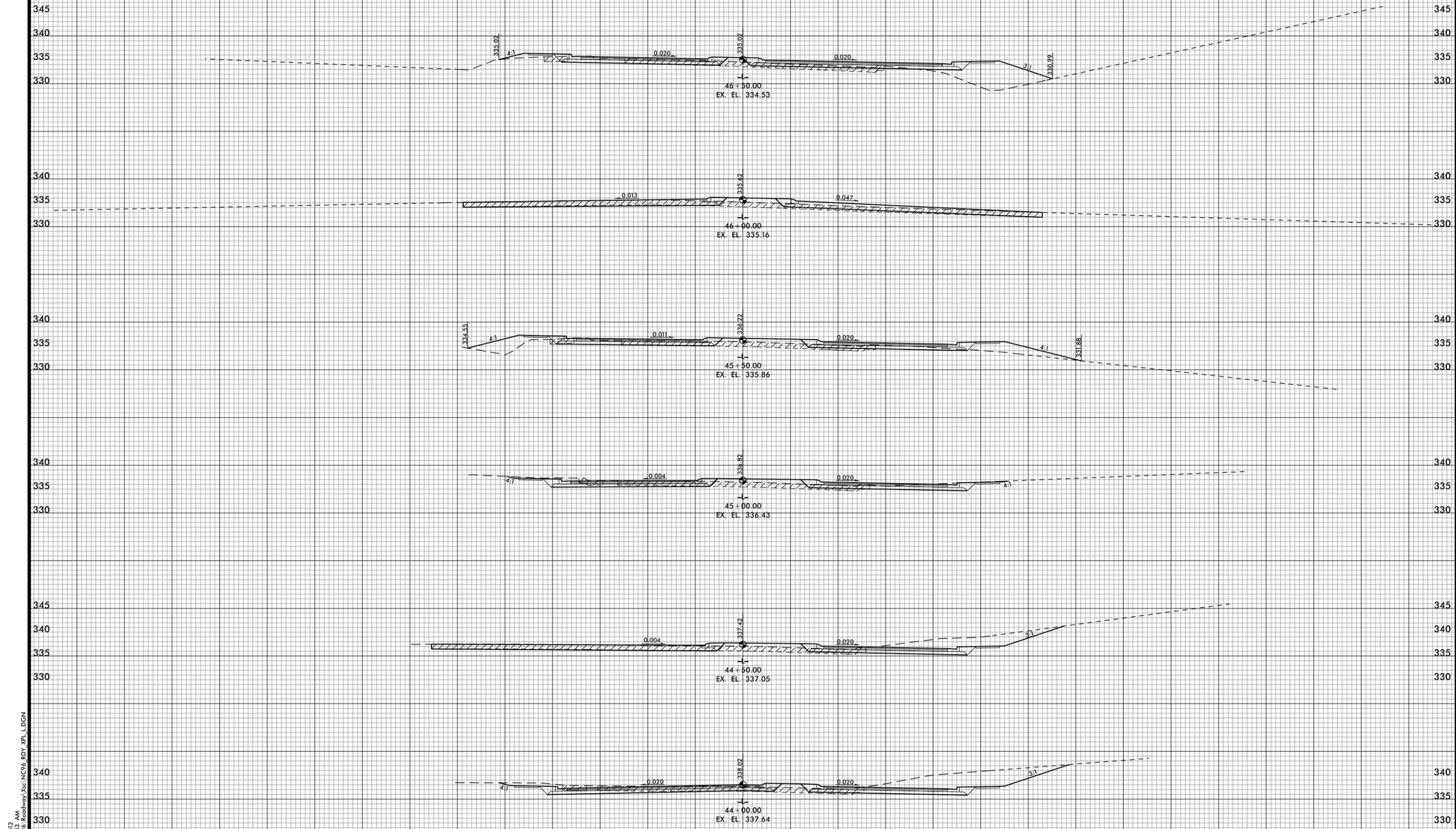
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DO NOT USE FOR CONSTRUCTION



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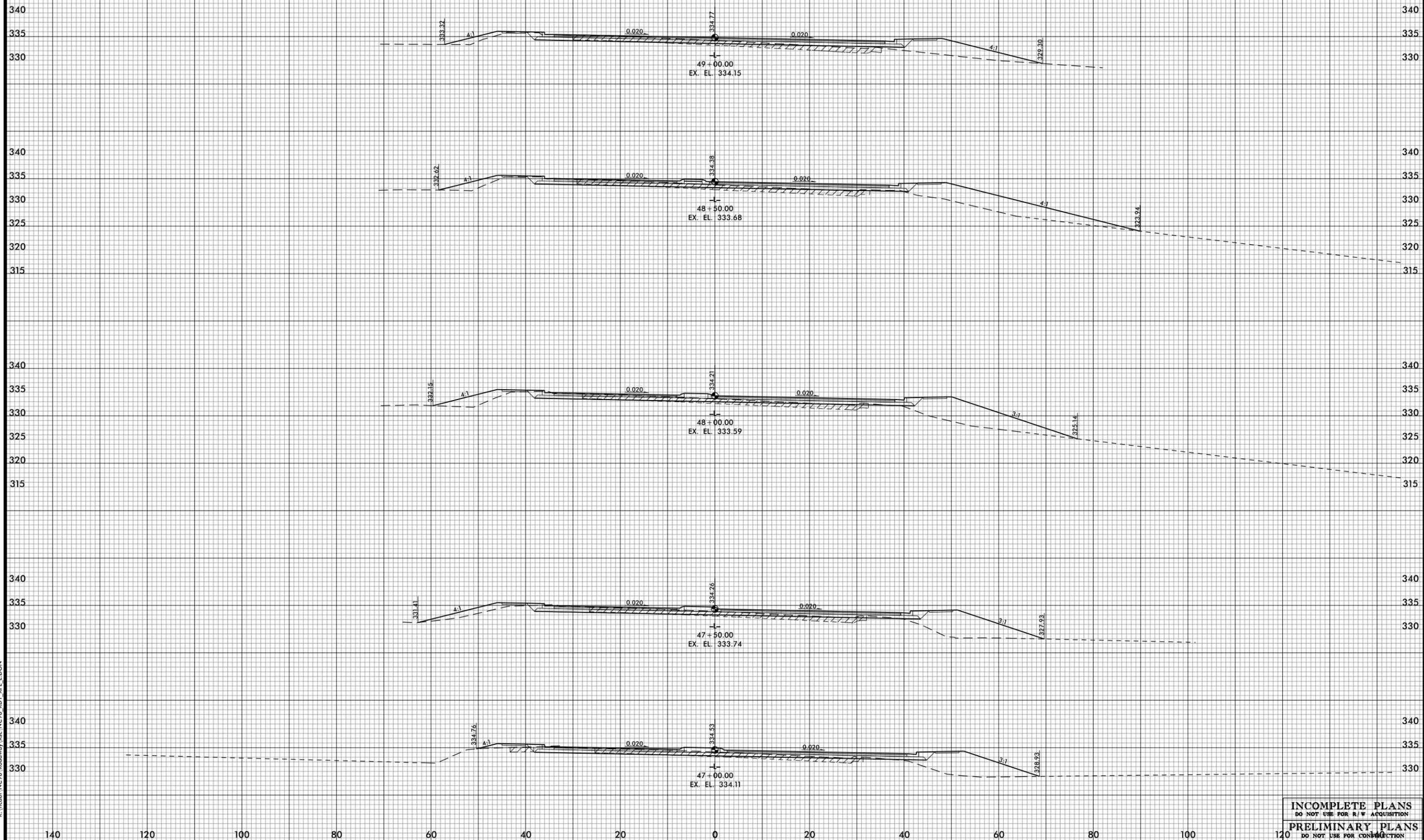


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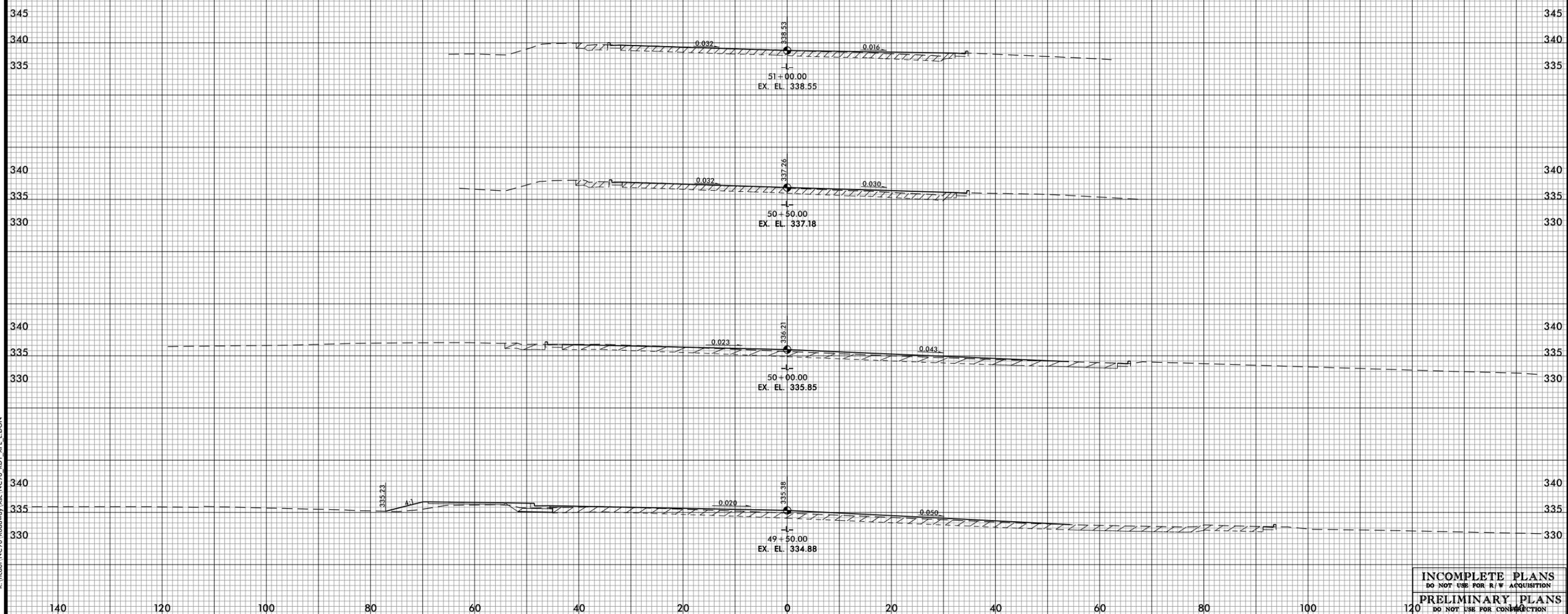
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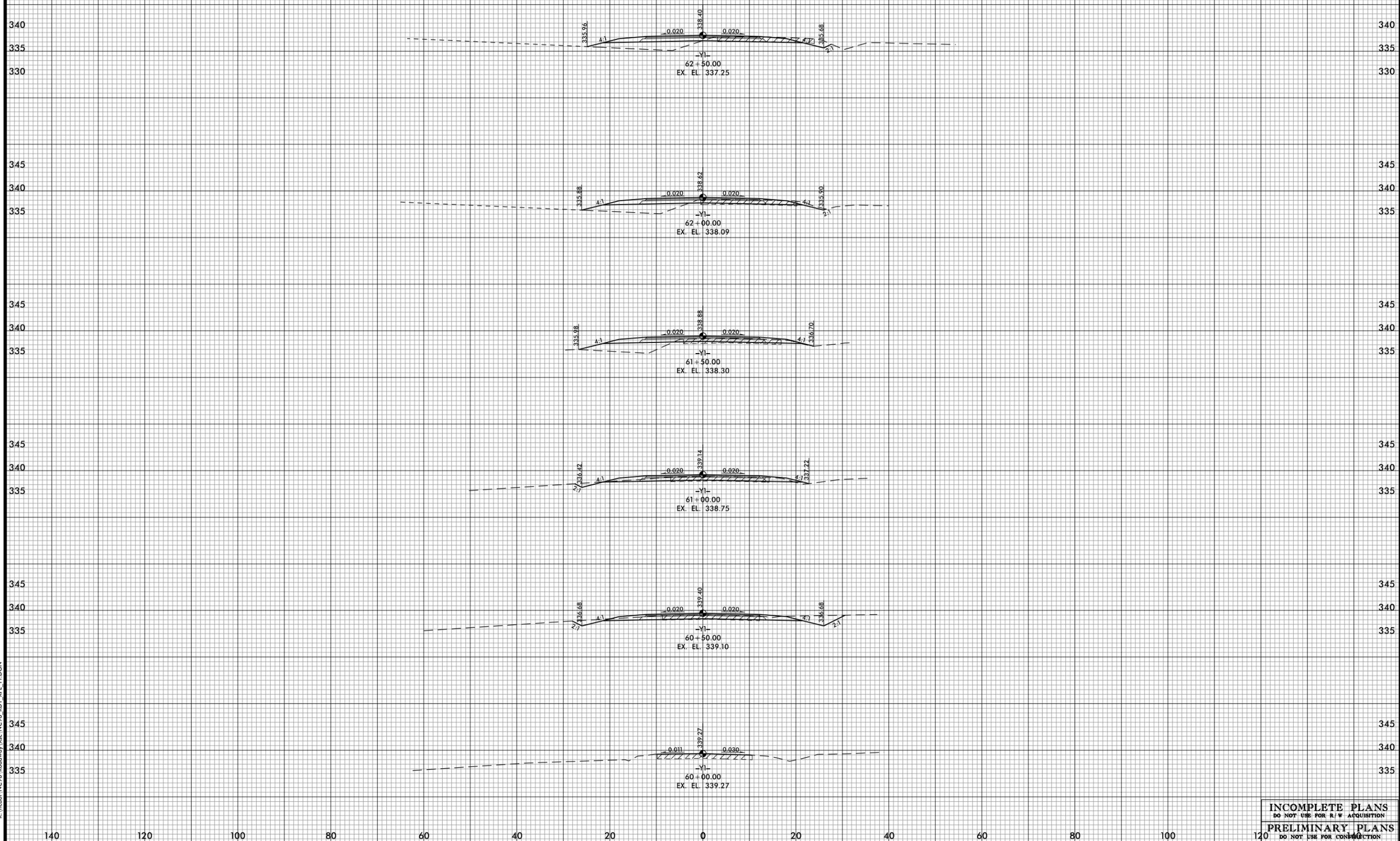
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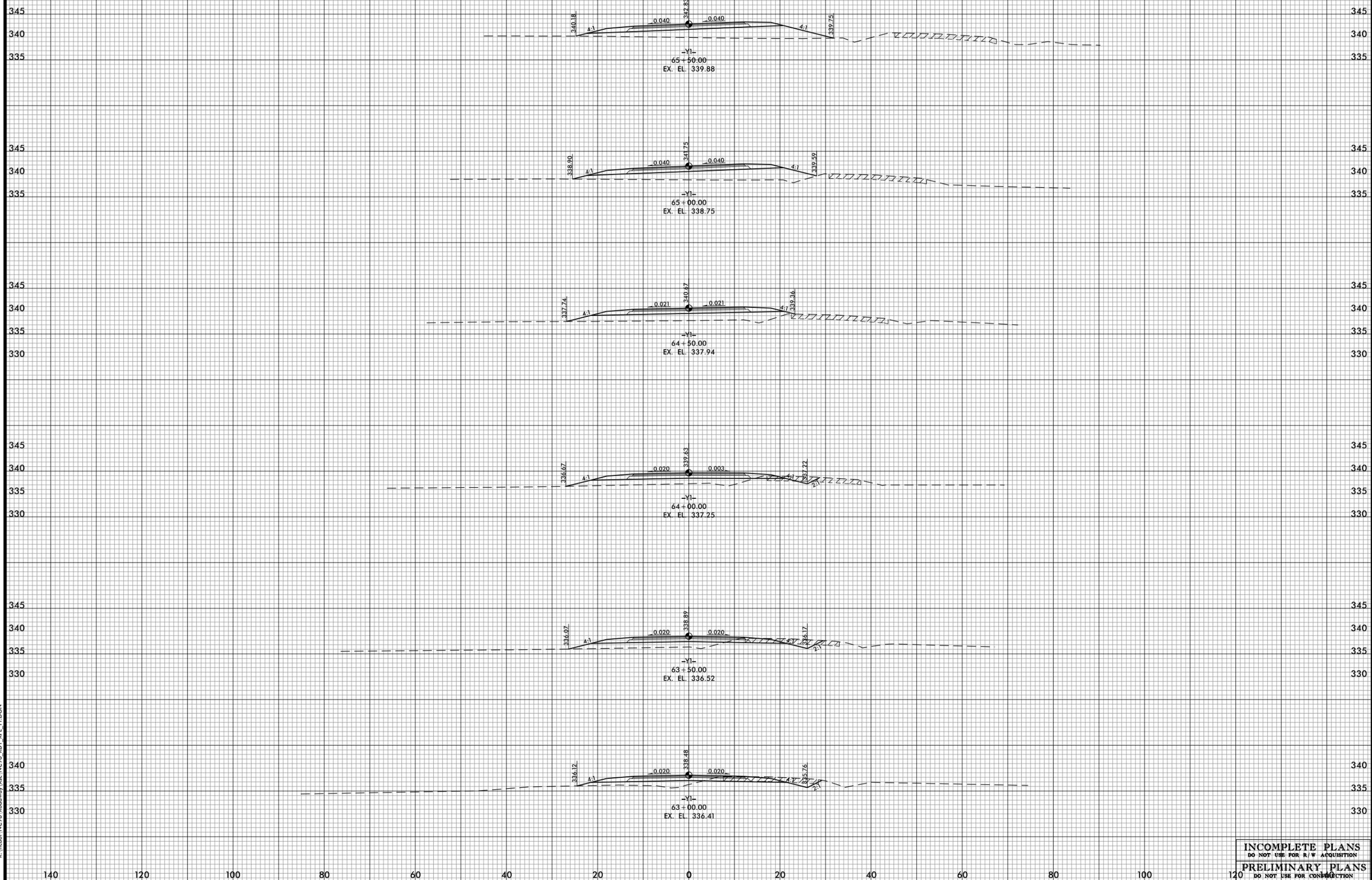


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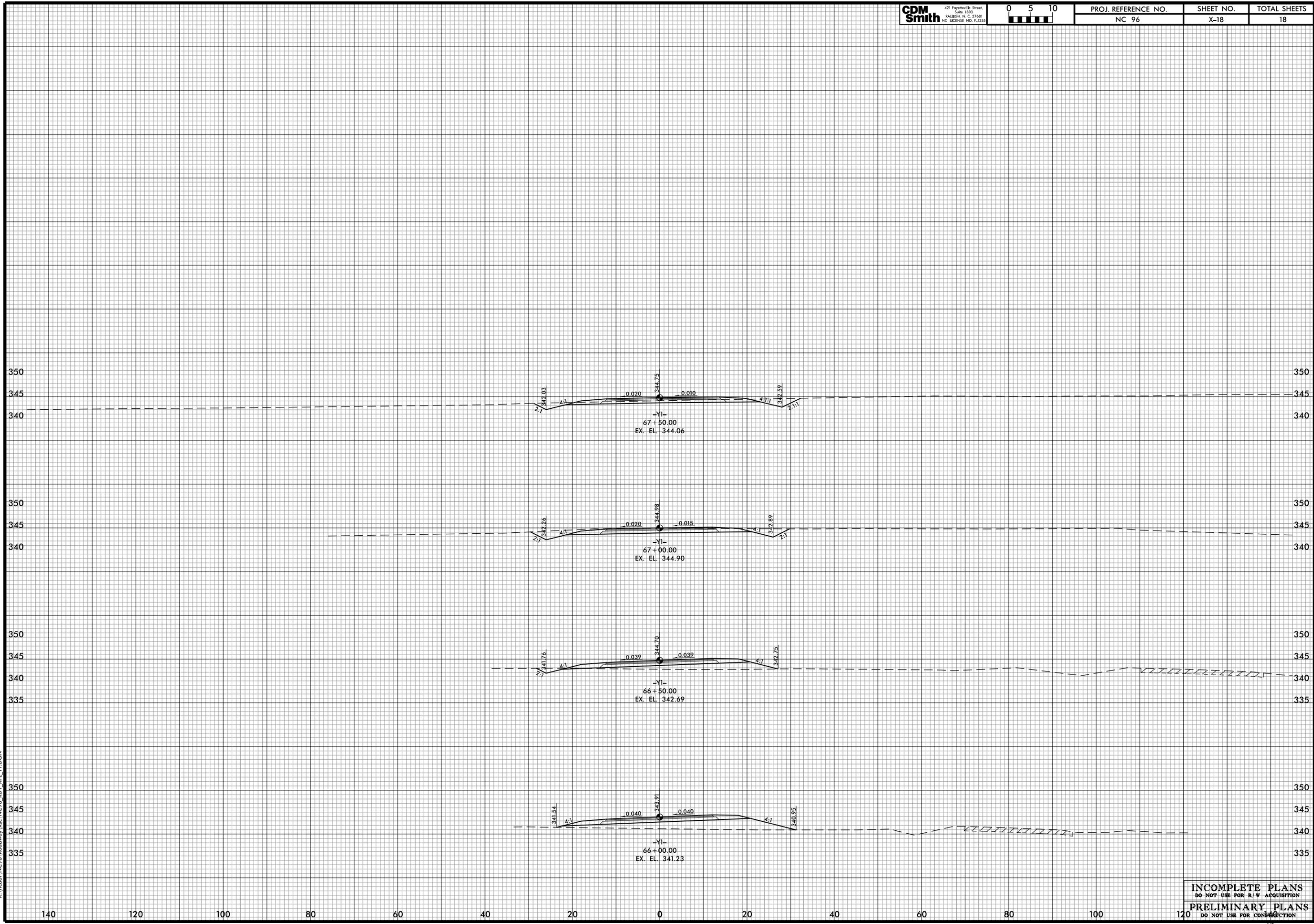
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