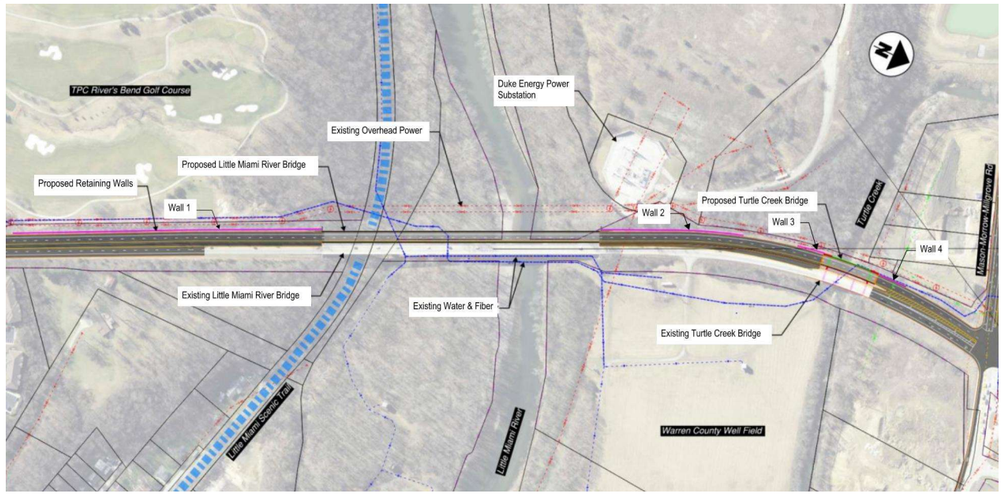
Retaining Wall 2 Justification Study

Introduction

The Warren County TID and Ohio Department of Transportation (ODOT) are looking to implement corridor improvements along SR 48 over the Little Miami River and Turtle Creek in Warren County, Ohio. These improvements are intended to address existing safety and congestion issues by widening the roadway from two lanes to four lanes and constructing two new parallel bridges west of the existing structures over the Little Miami River and Turtle Creek. The preferred alignment alternative, identified through the feasibility and structure type studies performed by Michael Baker International (Michael Baker) as the prime consultant and Burgess and Niple (B&N) as the subconsultant, requires significant roadway widening in an area with steep side slopes, limited right-of-way, environmental constraints associated with the Little Miami Scenic River corridor, and proximity to utilities- both underground and overhead. As a result, retaining walls are a critical component of the project to accommodate the proposed roadway geometry while minimizing right-of-way acquisition, avoiding utility relocations where feasible, and reducing environmental impacts. The retaining walls will be used to support roadway embankments and bridge approach grading along the west side of SR 48 and are essential to achieving the project goals of constructability, maintaining traffic, and reducing impacts to surrounding properties and utilities.

Project Location



[Proposed Project State Route 48 over Little Miami River & Turtle Creek]

Retaining Wall 2 Justification

Retaining Wall 2 is proposed along the west side of State Route 48, north of the Little Miami River and adjacent to the Duke Energy Power Substation. The location of this wall presents several design constraints related to limited available right-of-way and the presence of the Duke Energy overhead power lines. While the new parallel bridge west of the existing SR 48 bridge can be constructed largely within the existing right-of-way, minor additional acquisition is required. As a result, minimizing the construction footprint and avoiding impacts to adjacent infrastructure were key considerations in the selection of an appropriate retaining wall system.

Wall systems requiring full open-cut excavation, such as cast-in-place (CIP) concrete gravity walls and mechanically stabilized earth (MSE) walls, were evaluated but determined to be infeasible. Both systems would require excavation beyond the available right-of-way limits and would result in unacceptable impacts to adjacent utilities and right-of-way limits. With the need to limit excavation behind the wall, a wall system capable of being constructed using top-down methods will be required.

Given the noted constraints, a soldier pile wall with tiebacks is considered the most feasible retaining wall type for this location. Both secant and tangent pile walls were eliminated from consideration due to their costs being significantly greater than soldier pile walls. The soldier pile wall will allow for staged, top-down construction that remains largely within the existing right-of-way, minimizes disturbance to surrounding areas, and avoids conflicts with existing utilities. The soldier pile wall provides the necessary structural capacity to accommodate the proposed wall heights while offering flexibility in construction sequencing and alignment, making it well-suited to the geometric, utility, and right-of-way constraints present at Retaining Wall 2.

Retaining Wall 2 will be a 467’ long wall placed behind a barrier for its full length. The proposed height of the wall will range from 4’ to 18.5’ with an area of 7,375 SF.

The soils in the area are mostly clays and silts with some sand and gravel. The rock line is relatively shallow and roughly follows the slope of the existing terrain behind the wall, making this an ideal location for tie back installation. Rock consists of mostly shale and limestone layers. H-piles will be drilled into the rock to a depth of approximately 8'-10' and holes will be backfilled with concrete. Tie backs will be required for approximately every 10' of exposed wall height.

Cost Analysis

Estimated construction costs for the proposed wall were developed using ODOT's Summary of Contracts and historical bid data from similar projects to establish unit costs for the major wall work items.

There is no anticipated right-of-way acquisition cost for Wall 2.

Not including inflation or contingencies, the approximate cost associated with a heavy soldier pile and lagging wall with a cast-in-place facing is $400/SF. Therefore, the cost estimate for Wall 2 is $2,950,000.

For the wall estimate with the contingency and inflation included, please see project cost estimate.

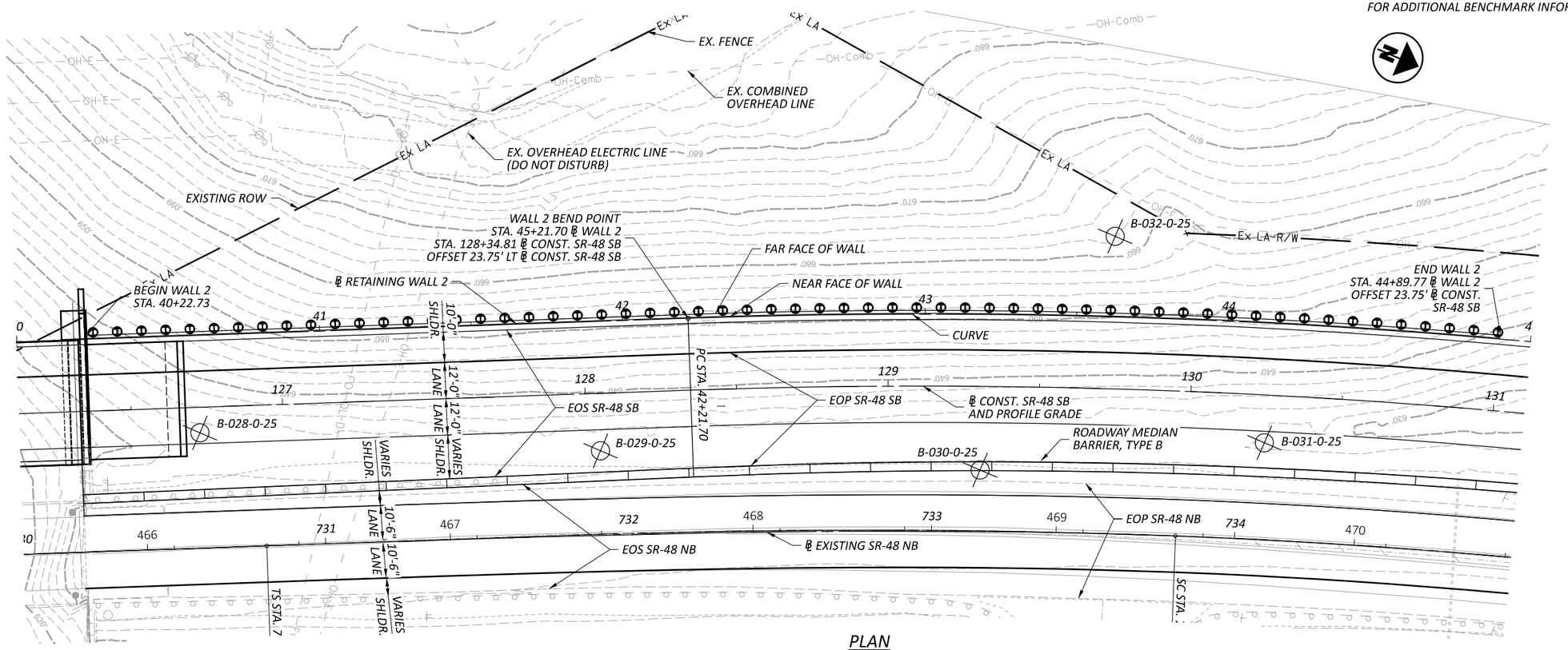
Appendices Index

Appendix A: Plan, Cross Section, and Typical Sections

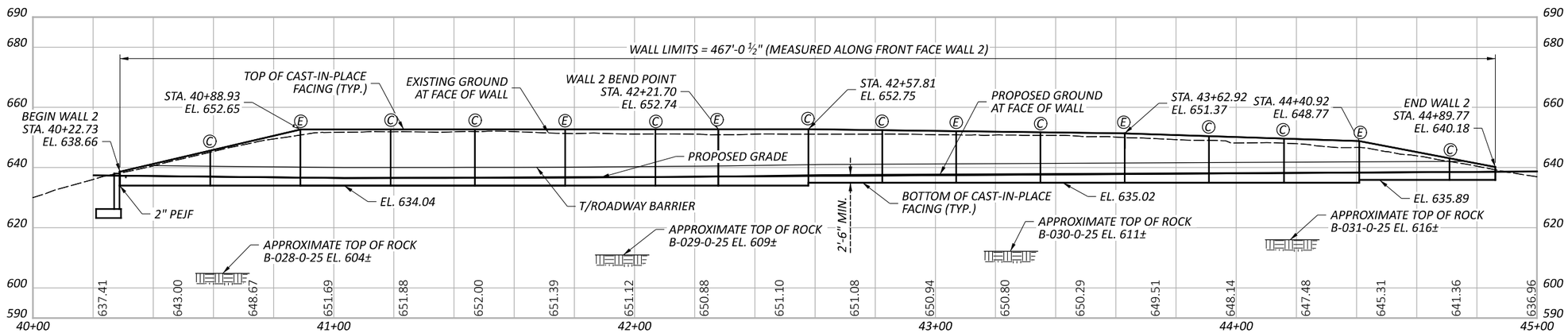
BENCHMARK DATA

BM #1 STA.	,	ELEV.	,	OFFSET	,
BM #2 STA.	,	ELEV.	,	OFFSET	,
BM #3 STA.	,	ELEV.	,	OFFSET	,
BM #4 STA.	,	ELEV.	,	OFFSET	,

FOR ADDITIONAL BENCHMARK INFORMATION, SEE ROADWAY PLAN SHEET.



PLAN



ELEVATION

NOTES

EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.

SOLDIER PILES AND ANCHORS NOT SHOWN IN THE ELEVATION FOR CLARITY.

WALL ALIGNMENT IS DEFINED ALONG NEAR FACE AND ℄ RETAINING WALL 2.

NOTE TO REVIEWER: FINAL DRAINAGE CALCULATIONS HAVE NOT BEEN PERFORMED. IT IS ASSUMED THAT A DITCH WILL BE REQUIRED AT THE TOP OF THE WALL, BUT IS NOT INCORPORATED INTO THIS LAYOUT. HOWEVER, THE COST OF THE WALL ASSUMES A DITCH AS IT WILL MAKE IT TALLER.

LEGEND

- BORING LOCATION
- Ⓒ CONTRACTION JOINT
- Ⓔ EXPANSION JOINT
- EOP = EDGE OF PAVEMENT
- EOS = EDGE OF SHOULDER

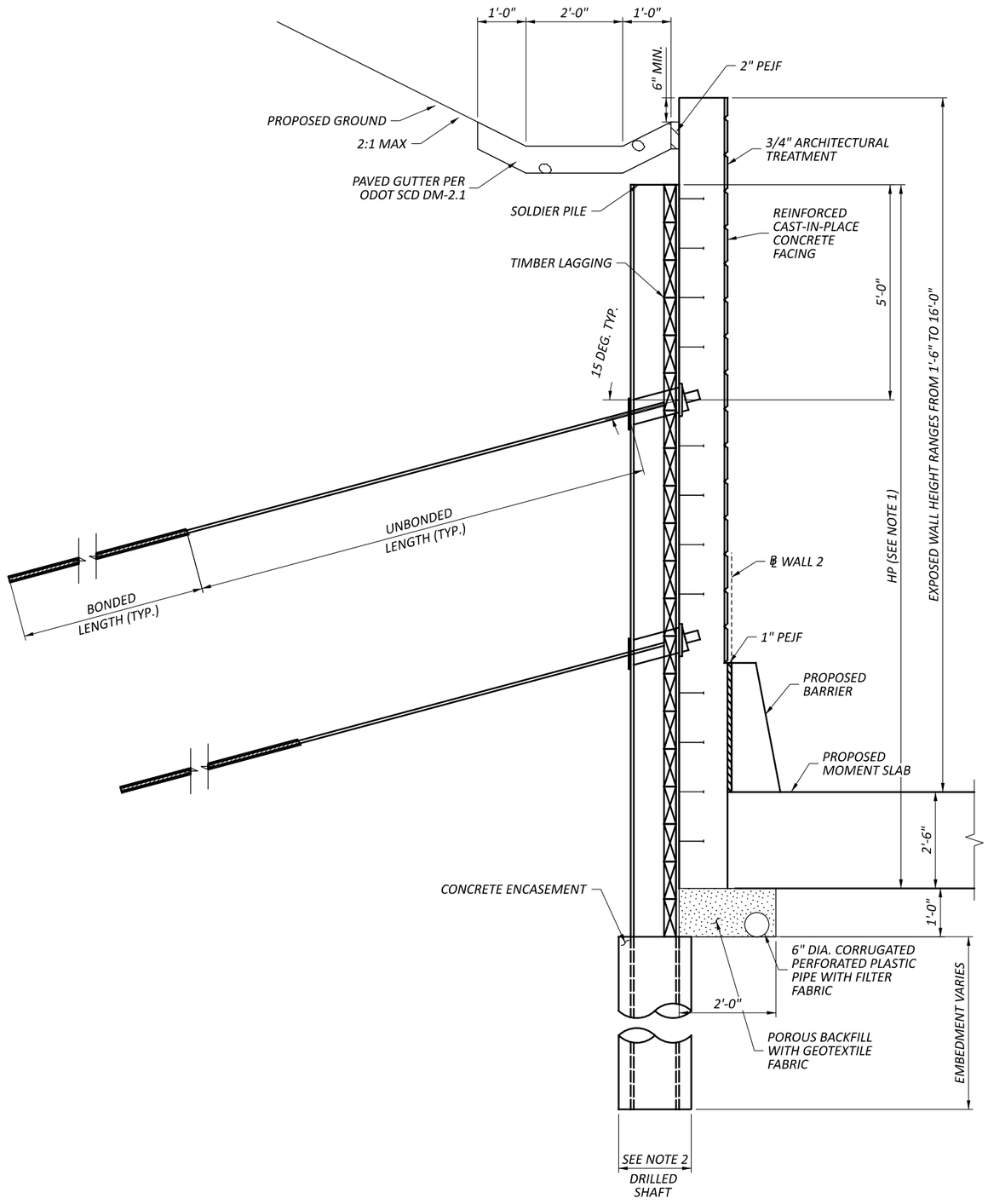
℄ CONST. WALL 2 CURVE DATA

P.I. = STA. 43+61.04
Δ = 7°11'49.2" RT
Dc = 2°35'9.6"
R = 2215.49'
T = 139.33'
L = 278.297'
E = 4.377'

WALL PLAN AND PROFILE
WALL 2
ALONG WEST SIDE OF SR-48

SFN	N/A
DESIGN AGENCY	Michael Baker INTERNATIONAL
DESIGNER	BDC
CHECKER	SRW
REVIEWER	CWL 4/19/26
PROJECT ID	117567
SUBSET	1
TOTAL	2
SHEET	P.1
TOTAL	P.6

WAR-SR48-7.50



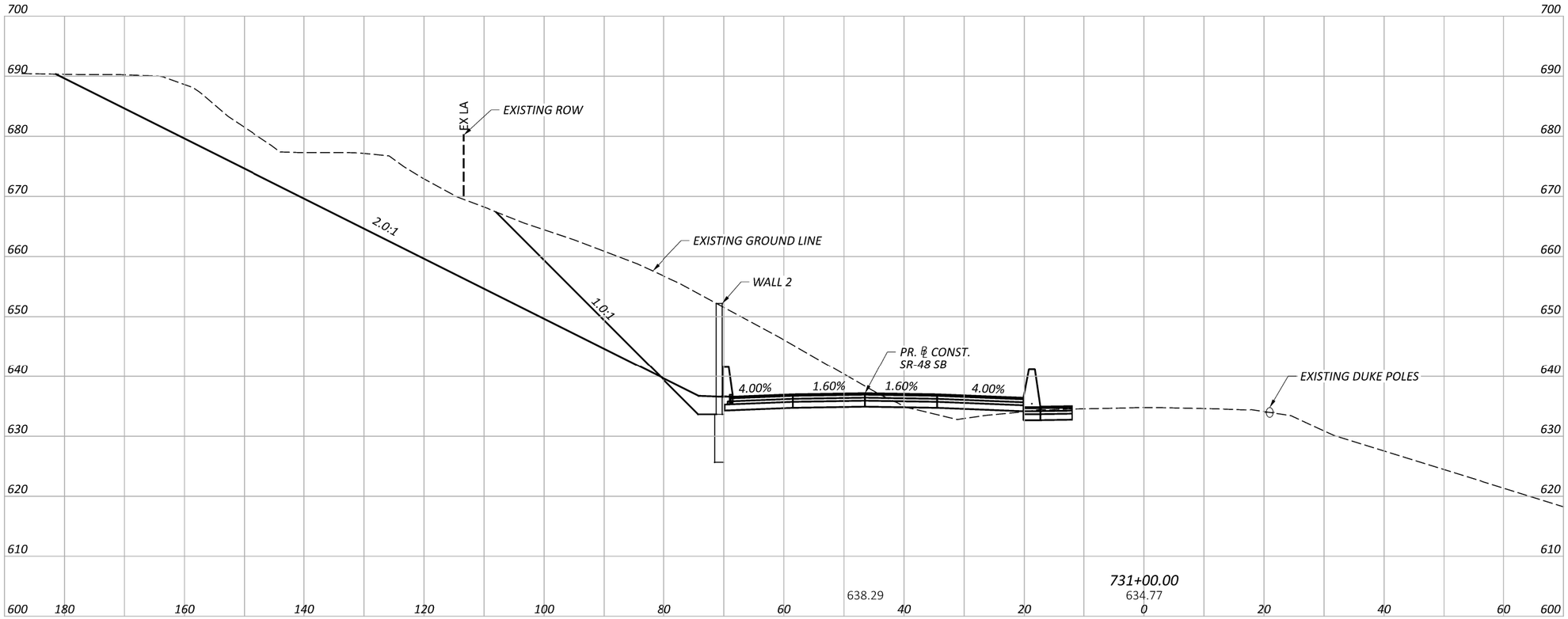
TYPICAL SOLDIER PILE WALL SECTION

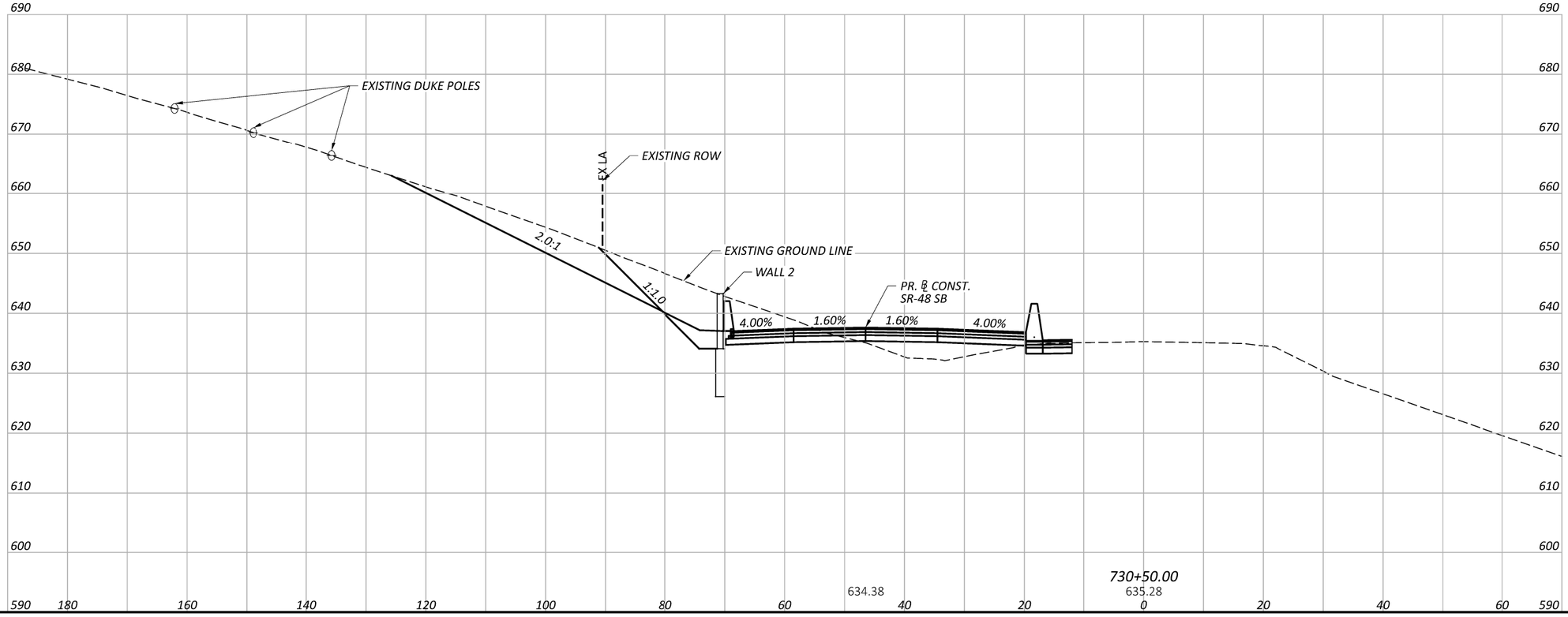
NOTES:

1. PRELIMINARY WALL DESIGN DATA:
   - FOR HP < 12, W14 TO W16 CANTILEVERED (NO TIE BACK).
   - FOR 12' < HP < 20', W14 TO W18, TIED BACK (ONE ROW).
   - FOR HP > 20', W18, TIED BACK (TWO ROWS).
2. PRELIMINARY SHAFT DESIGN DATA:
   - FOR HP < 12, 36" DIAMETER SHAFTS WITH 8 TO 10 FEET OF ROCK SOCKET.
   - FOR HP > 12, 42" IN DIAMETER SHAFTS WITH 8 TO 10 FEET OF ROCK SOCKET.

WALL SECTION AND DETAILS
WALL 2
ALONG WEST SIDE OF SR-48

SFN	N/A
DESIGN AGENCY	Michael Baker INTERNATIONAL
DESIGNER	BDC
CHECKER	SRW
REVIEWER	CWL 4/19/26
PROJECT ID	117567
SUBSET	2
TOTAL	2
SHEET	P.2
TOTAL	P.6





CROSS SECTIONS 1 OF 4
WALL 2

DESIGN AGENCY
Michael Baker INTERNATIONAL

DESIGNER
BDC

REVIEWER
SRW 04/15/26

PROJECT ID
117567

SHEET P.3 TOTAL 6

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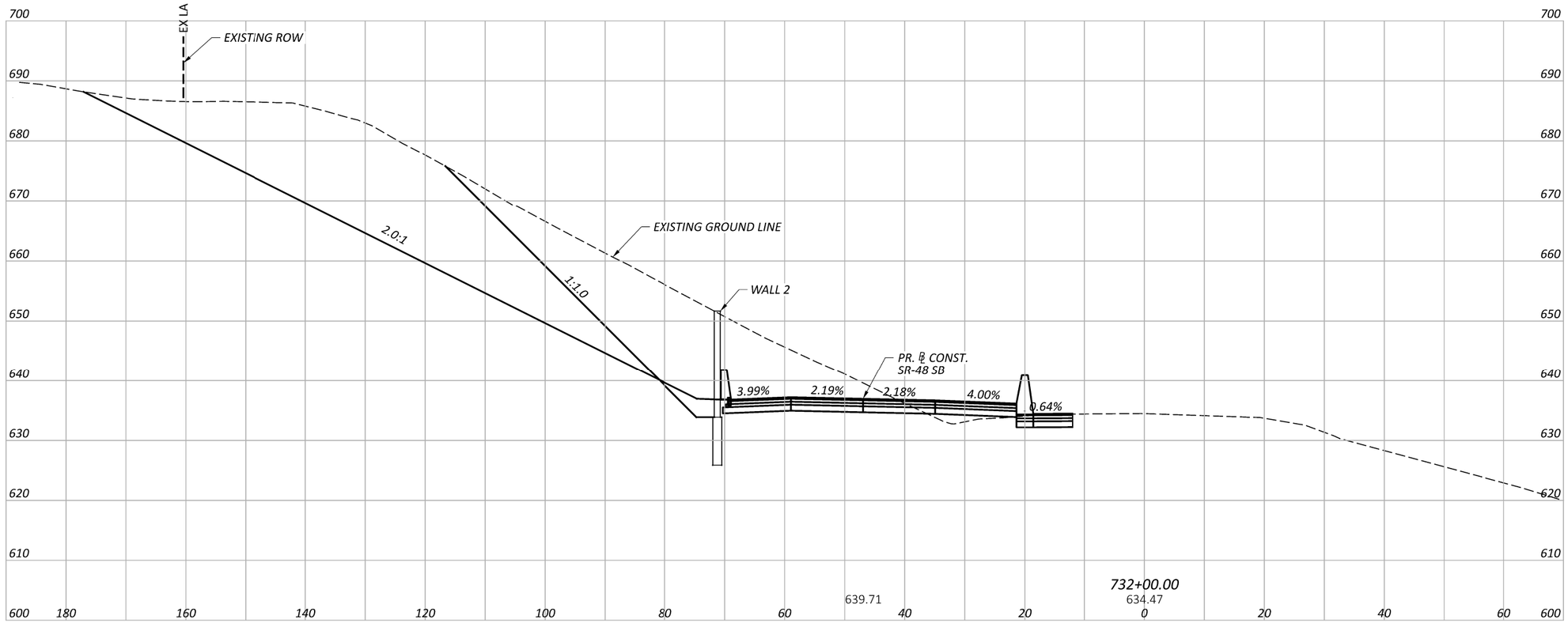
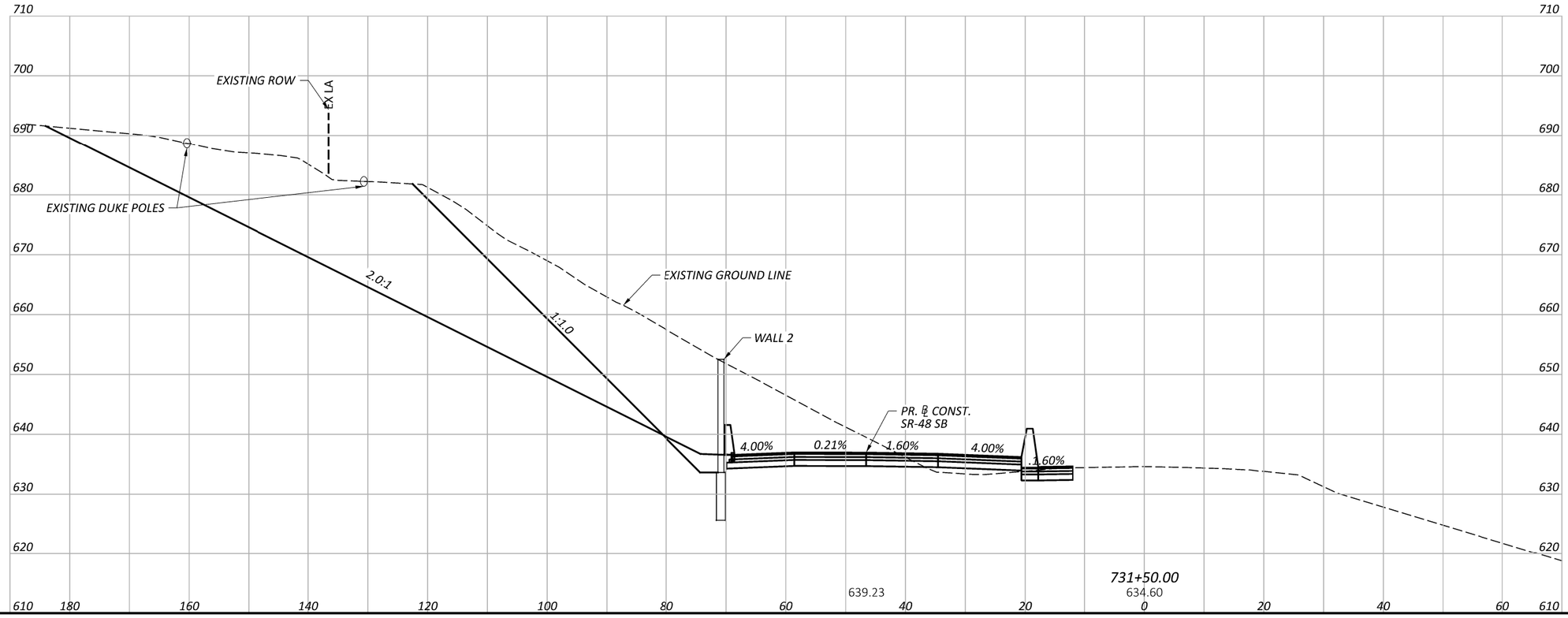




CROSS SECTIONS 2 OF 4
WALL 2

WAR-SR48-7.50

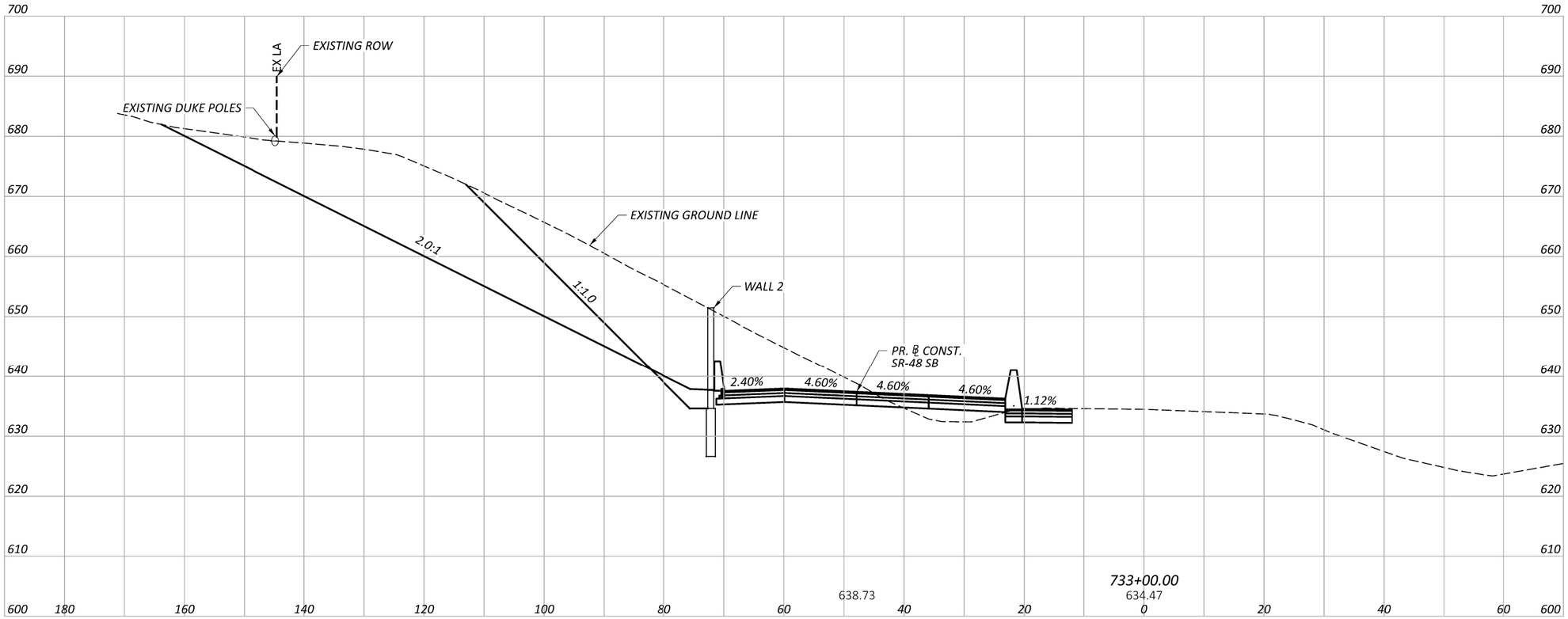
DESIGN AGENCY
Michael Baker INTERNATIONAL

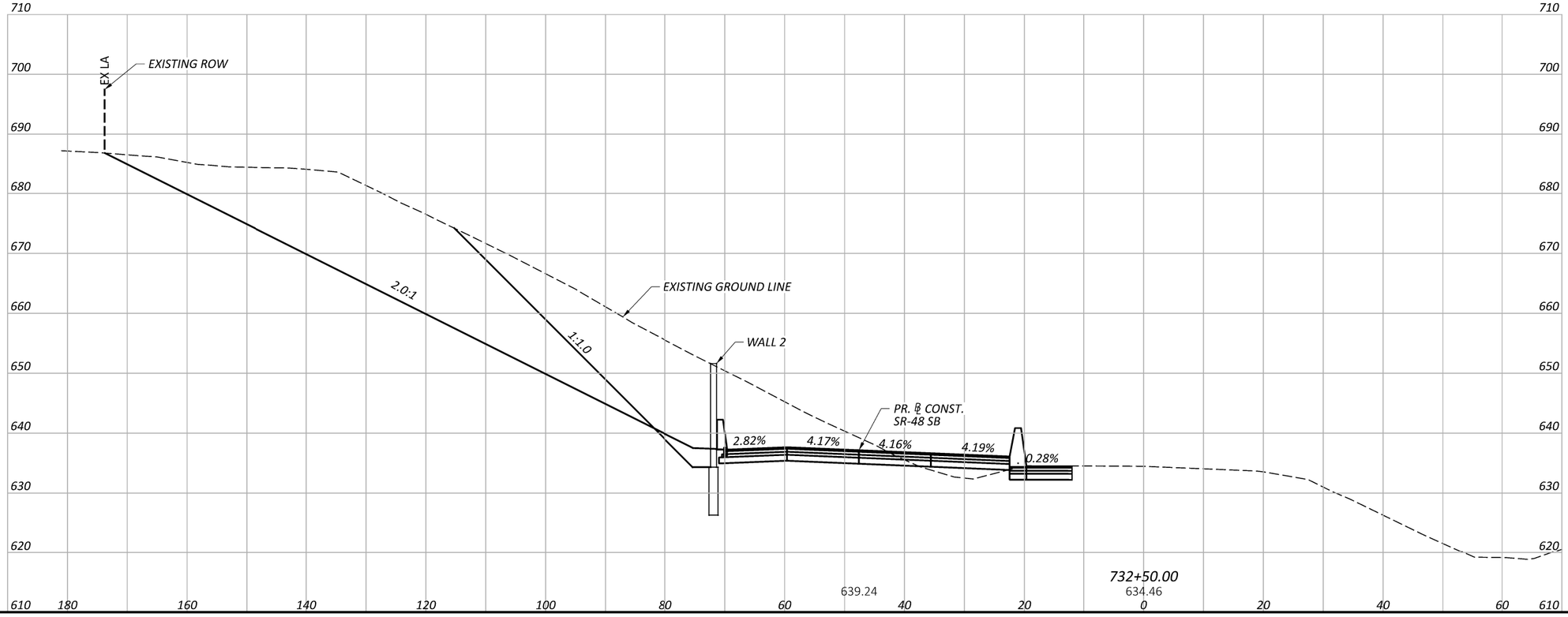
DESIGNER
BDC

REVIEWER
SRW 04/15/26

PROJECT ID
117567

SHEET P.4 TOTAL 6





CROSS SECTIONS 3 OF 4
WALL 2

WAR-SR48-7.50

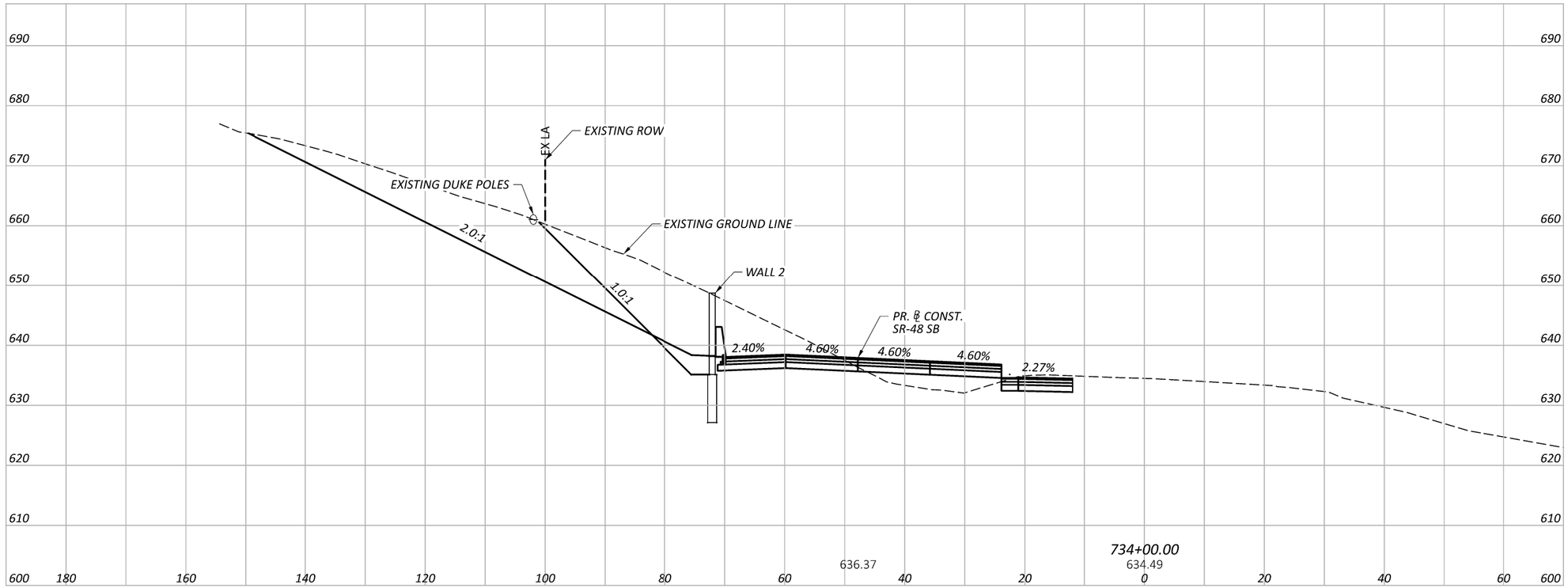
DESIGN AGENCY
Michael Baker INTERNATIONAL

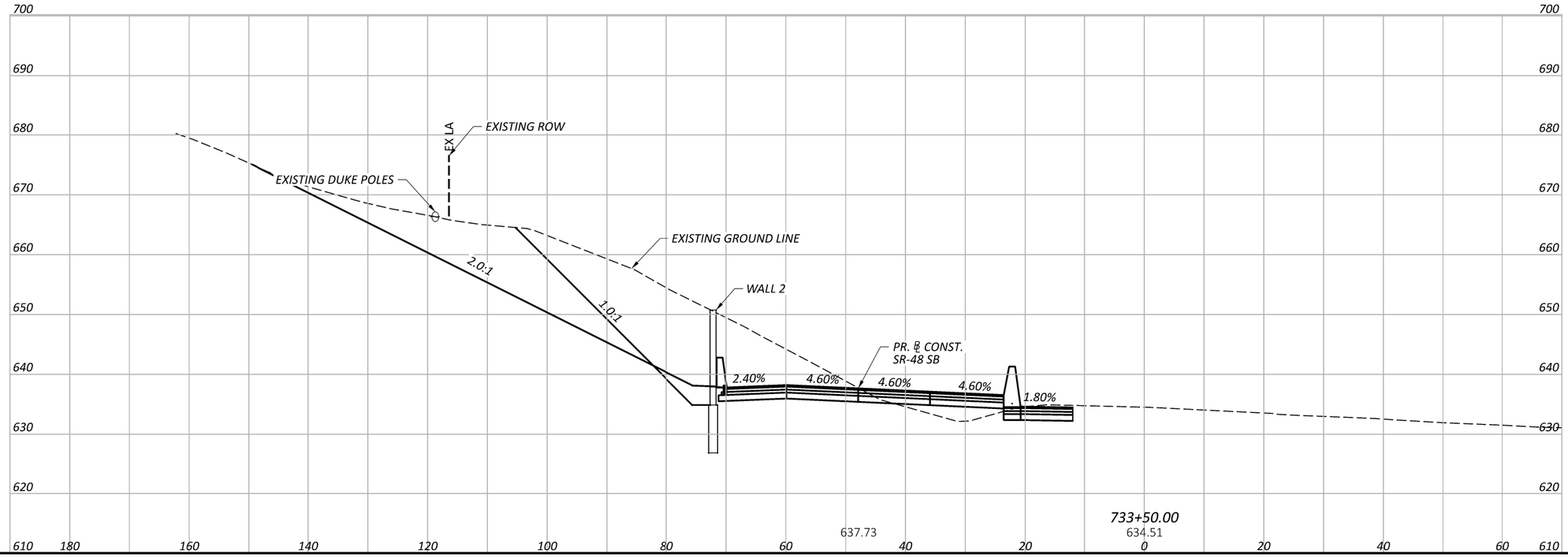
DESIGNER
BDC

REVIEWER
SRW 4/15/26

PROJECT ID
117567

SHEET P.5 TOTAL 6





CROSS SECTIONS 4 OF 4
WALL 2

WAR-SR48-7.50

DESIGN AGENCY
Michael Baker INTERNATIONAL

DESIGNER
BDC

REVIEWER
SRW 4/15/26

PROJECT ID
117567

SHEET P.6 | TOTAL 6