

PRELIMINARY ENGINEERING REPORT

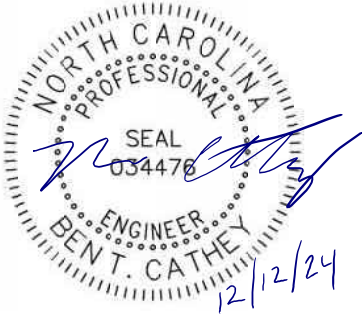
ROSMAN SUPPORT WALL INVESTIGATION

TRANSYLVANIA COUNTY BOARD OF EDUCATION
TRANSYLVANIA COUNTY, NORTH CAROLINA

Ben Cathey, PE



55 Broad Street
Asheville, NC 28801
o: 828.252.0575
f: 828.252.2518



DECEMBER 2024
PROJECT NO. 24.00131

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1.0 PROJECT DESCRIPTION

The project involves a preliminary study of a retaining wall located northeast of the Rosman High School building to assess its stability and determine necessary actions. This assessment is based on observations of noticeable deflection along the retaining wall. Three options are being considered: Option 1 – reinforcing the existing wall with soil nails and shotcrete; Option 2 – removing and replacing the wall; Option 3 – removing the wall and reconfiguring the site. The scope of services for this preliminary assessment includes conducting a site visit with a Geotechnical Engineer to evaluate the condition of the wall, developing schematic layouts and cost estimates for each option, and evaluating these options with the Transylvania County Board of Education to identify the preferred conceptual design.

2.0 EXISTING CONDITIONS

Information provided in the following section is based on an initial site assessment performed by Ben Cathey, PE, with McGill Associates and Jesse R. Jacobson, PE, with Bunnell-Lammons Engineering, Inc. (BLE) on October 30, 2024, and a secondary assessment performed by Khiya Armstrong, PE and Gage Orr, with McGill Associates on December 4, 2024. No design information was available at the time of our assessments. Our understanding of existing site conditions and the conceptual designs provided in this report are based on the Boundary and Topographic Survey dated June 6, 2018, prepared by Ed Holmes & Associates Land Surveyors, PA.

The segmental retaining wall creates a grade separation between the lower parking lot and school building on the southwest and the upper parking lot to the northeast. The wall begins near the amphitheater and continues north for approximately 420 feet, terminating near the old gymnasium building. Wall height varies along the length of the wall, but ranges from a minimum of 4 feet to a maximum of 11 feet. The wall is vertical, with minimal to no positive batter along its length. The most significant deflection, exceeding 4 inches at the top of the wall, was observed about 130 feet south of the north end of the wall.

Efflorescence was noted on the face of the wall in multiple locations and indicates saturated conditions and poor internal drainage behind the wall. Surface runoff from the upper parking lot appears to flow over the top of the wall, with only a small portion of runoff captured by the single catch basin located behind the wall near the center of the upper parking lot.

3.0 ENGINEERING SOLUTIONS FOR CONSIDERATION

While the exact cause of distress along the wall is unknown, corrective action should be taken to address the issue. Three potential solutions are outlined below in the following sections.

3.1 Option 1 – Reinforce the Existing Wall with Soil Nails and Shotcrete

This approach involves reinforcing the existing wall by installing soil nails through it and covering the front with a shotcrete facing. The shotcrete finish will add approximately 6 inches to the wall's thickness, which will slightly extend its face. An example of this application is visually represented in Appendix A-7, Figures 2 and 3. With this approach, additional measures are recommended to improve the drainage of stormwater runoff behind the wall. Removal and replacement of asphalt will be required along a portion of the upper parking lot adjacent to the wall, with the remainder of the parking lot to receive an overlay of asphalt to induce positive drainage. New stormwater pipes and catch basins will be installed and tied into the existing system and a valley curb will be installed between the wall and parking lot to direct stormwater runoff to the catch basins and reduce the amount of runoff flowing over the wall or infiltrating behind it. The existing chain-link fence will be replaced with a pedestrian and vehicular grade barrier for compliance with current design codes. The existing parking layout and traffic pattern will remain for this option. A conceptual design for this approach is provided in Appendix A-1.

3.2 Option 2 - Remove and Replace the Existing Wall

This option involves the complete deconstruction of the existing wall, along with the removal of the reinforced zone, which contains the backfill soil and existing geogrid. A variety of retaining wall types could be considered, with segmental walls being a commonly economical choice. For the purposes of this assessment, a segmental wall with mechanically stabilized earth has been assumed. The existing retaining wall will be demolished. Some of the existing fill may be reused, though further evaluation will be needed to confirm this. A new wall design will be necessary, including adjustments to internal and surface drainage systems. The existing asphalt will be replaced within the upper parking lot and access drive. New stormwater pipes and catch basins will be installed and tied into the existing stormwater conveyance system to reduce the amount of runoff flowing over the wall or infiltrating behind it. The existing chain-link fence will be replaced with a pedestrian and vehicular grade barrier for compliance with current design codes. The parking layout and traffic pattern will be similar to existing conditions with this option. There is a potential to lose parking spaces, but it would be minimal. A conceptual design for this approach is provided in Appendix A-3.

3.3 Option 3 - Remove the Wall and Reconfigure the Site

This option proposes removing the existing wall and lowering the access road and east parking lot to align with the lower grade of the parking lot currently west of the wall. The eastern parking lot will be re-graded to be near the same grade as the school building and reconfigured to provide connectivity with the lower parking lot. Due to site constraints and significant grade differences between the lower and upper levels of the wall near the refrigeration unit, a retaining wall will

still be required in this area. The wall will be approximately 130 feet long with a maximum height around 8 feet. Connectivity to the existing access drive that travels around the old gymnasium will be removed while connectivity to the lower parking lot will be added. Total parking spaces will be reduced by approximately 24 spaces. New stormwater pipes and catch basins will be installed and tied into the existing stormwater conveyance system. A conceptual design for this approach is provided in Appendix A-5.

3.4 Preliminary Opinion of Probable Cost

An opinion of probable cost was developed for each approach. The costs are “order of magnitude” estimates and should only be used for planning and budgeting purposes. Costs are summarized in **Table 3.4**. See the cost estimate for each approach in Appendix A-2, A-4, and A-6.

Table 3.4 – Opinion of Probable Cost

Opinion of Probable Cost	
Option 1 – Reinforcing the Existing Wall with Soil Nails and Shotcrete	\$ 1,385,480.00
Option 2 - Remove and Replace the Existing Wall	\$ 1,002,720.00
Option 3 - Remove the Wall and Reconfigure the Site	\$ 652,780.00

3.5 Preliminary Project Timeline Estimates

An estimated timeline was developed for each approach that includes elements such as project design, bidding and awarding, and construction of the project. These estimates are subject to variability and should only be used for planning purposes. They are summarized in **Table 3.5** below.

Table 3.5 – Project Timeline Estimates

Project Timeline Estimates			
	<u>Option 1</u>	<u>Option 2</u>	<u>Option 3</u>
Geotechnical Investigation	2 months	N/A	N/A
Design and Permitting	3 months	3 months	3 months
Bidding & Awarding	2 months	2 months	2 months
Construction	3 months	4 months	3 months
Total Time	10 months	9 months	8 months

4.0 CONCLUSIONS AND RECOMMENDATIONS

Implementation of any of the three approaches must consider the comprehensive costs and benefits of each option, available funding, potential disruption during regular school sessions from construction, and future potential use of the school. McGill would be pleased to discuss these options in further detail with the Transylvania County Board of Education and/or other stakeholders to determine which approach may provide the best solution given budget constraints.


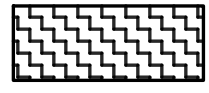

5.0 LIMITATIONS OF REPORT

The information presented in this report is based on preliminary data gathered from initial site visits, along with our experience from similar construction projects. Design and/or construction details for the existing retaining wall were not provided for our use in preparing this report, and limited information is available pertaining to the location and type of existing underground utilities in the vicinity of the retaining wall. The potential approaches outlined in this report and the associated opinions of probable cost were developed at a conceptual design level and may be subject to considerable changes as the preferred design is refined and further details are incorporated.

**APPENDIX A-1:
OPTION 1 CONCEPTUAL PLAN**

PLAN

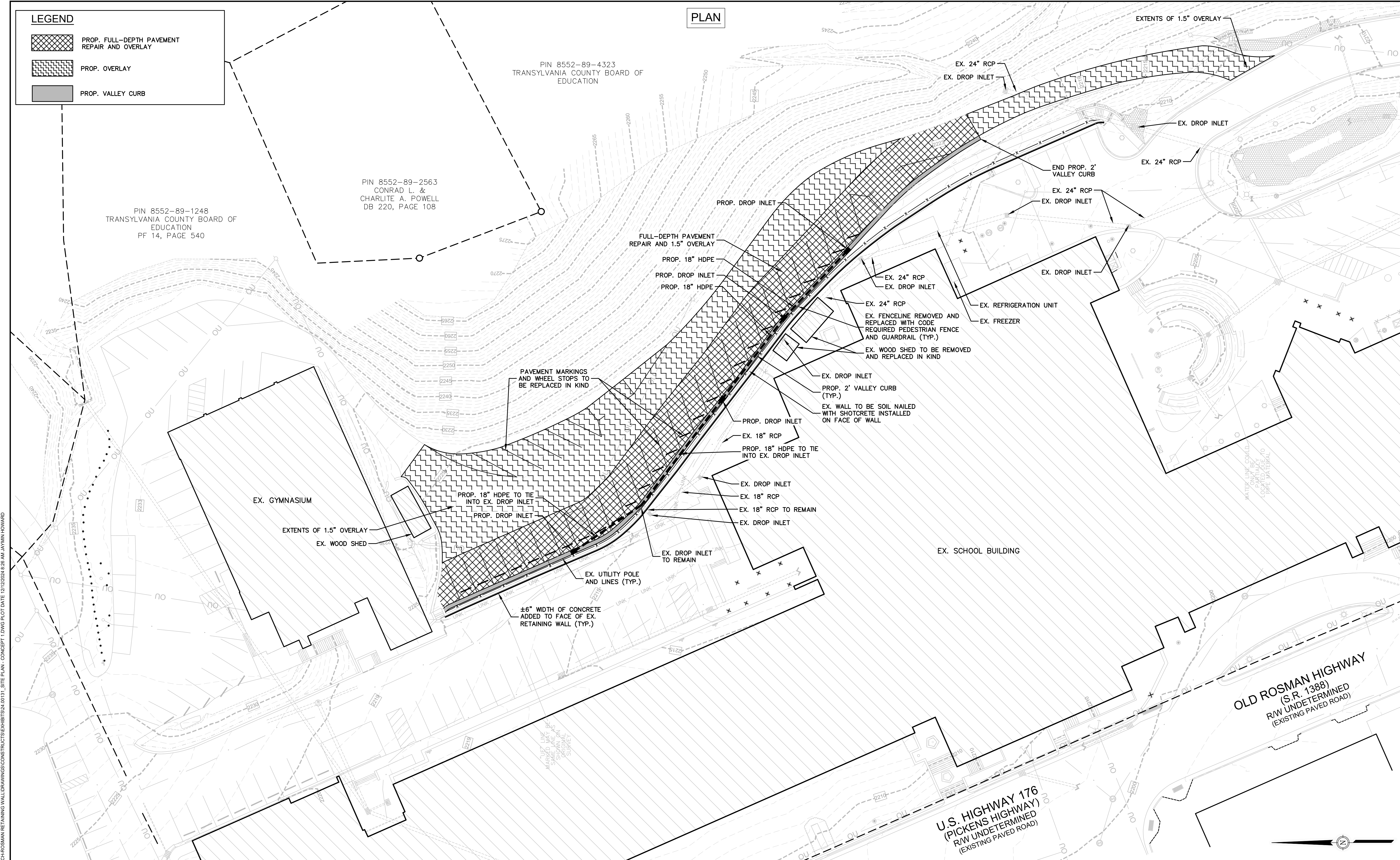
LEGEND

-  PROP. FULL-DEPTH PAVEMENT REPAIR AND OVERLAY
-  PROP. OVERLAY
-  PROP. VALLEY CURB

PIN 8552-89-4323
 TRANSYLVANIA COUNTY BOARD OF
 EDUCATION

PIN 8552-89-2563
 CONRAD L. &
 CHARLITE A. POWELL
 DB 220, PAGE 108

PIN 8552-89-1248
 TRANSYLVANIA COUNTY BOARD OF
 EDUCATION
 PF 14, PAGE 540



P:\2024\0131-TRANSYLVANIA\CONSTRUCTION\DRAWINGS\CONSTRUCT\SITE\HIBTS24.00131_SIT PLAN - CONCEPT 1.DWG PLOT DATE: 12/12/2024 8:26 AM JAYMIN HOWARD

24.00131 - TRANSYLVANIA COUNTY SCHOOLS - REINFORCE THE EXISTING WALL WITH SOIL NAILS AND SHOTCRETE




55 Broad Street
 Asheville, NC 28801
 828.252.0575
 NC Firm License # C-0459
 mcgillassociates.com

PRELIMINARY

NO.	DATE	BY	DESCRIPTION

ROSAMAN SUPPORT WALL INVESTIGATION
**TRANSYLVANIA
 COUNTY SCHOOLS**
 TRANSYLVANIA COUNTY, NORTH CAROLINA



GRAPHIC SCALE DIVISION VALUE = 20 FEET

OFFICE MANAGER MARK CATHEY	DESIGNER JAYMIN HOWARD
PROJECT MANAGER BEN CATHEY	REVIEWER KHIYA ARMSTRONG

CONCEPTUAL SITE PLAN - REINFORCE THE EXISTING WALL WITH SOIL NAILS AND SHOTCRETE	
DATE 12/12/2024	FUNDING # N/A
PROJECT # 24.00131	

SHEET
OPT-1


**APPENDIX A-2:
OPTION 1 PRELIMINARY OPINION OF
PROBABLE COST**



PRELIMINARY OPINION OF PROBABLE COST					
OPTION 1 - REINFORCE THE EXISTING WALL WITH SOIL NAILS AND SHOTCRETE					
ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL AMOUNT
CONSTRUCTION COSTS					
1	Mobilization/General Requirements (5%)	LS	1	\$49,600.00	\$49,600.00
2	Soil Nail and Shotcrete Wall Repair (Geotechnical)	SF	5,000	\$135.00	\$675,000.00
3	Decorative Façade for Shotcrete Facing (Geotechnical)	SF	5,000	\$20.00	\$100,000.00
4	Erosion Control	LS	1	\$5,000.00	\$5,000.00
5	Demolition and Disposal	LS	1	\$15,000.00	\$15,000.00
6	Compacted Base Stone - 8" Depth	TN	330	\$30.00	\$9,900.00
7	Ashpalt Pavement Repair - I19.0B Patch 2" Depth	TN	90	\$160.00	\$14,400.00
8	Asphalt Pavement Overlay - Type SF9.5B 1.5" Depth	TN	150	\$160.00	\$24,000.00
9	Valley Gutter	LF	360	\$25.00	\$9,000.00
10	Replace Fence	LF	410	\$40.00	\$16,400.00
11	Guardrail	LF	410	\$100.00	\$41,000.00
12	Drainage Structures	EA	4	\$5,000.00	\$20,000.00
13	Stormwater Pipes - 18" HDPE	LF	210	\$100.00	\$21,000.00
14	Replace Storage Building	EA	2	\$10,000.00	\$20,000.00
15	Wheel Stops	EA	27	\$300.00	\$8,100.00
16	Striping	LS	1	\$2,000.00	\$2,000.00
17	Restoration of Surfaces	LS	1	\$10,000.00	\$10,000.00
CONSTRUCTION TOTALS					
Construction Subtotal					\$1,040,400.00
Contingency (20%)					\$208,080.00
Total Construction Costs					\$1,248,480.00
SOFT COSTS					
Final Design and Permitting					\$40,000.00
Bidding and Award					\$9,500.00
Construction Observation and Contract Administration					\$40,000.00
Soil Nail Repair Design (Geotechnical)					\$10,000.00
Construction and Materials Testing					\$37,500.00
TOTAL ESTIMATED PROJECT COSTS					\$1,385,480.00
NOTES					
<p>1. The ENGINEER maintains no control of labor costs, materials, equipment or services furnished by others, the Contractor(s)' methods for determining prices, or competitive or market conditions. The estimates herein for project and construction costs represent the ENGINEER'S best judgment, and are based on his experience and qualifications as a Professional Engineer who possesses familiarity with the construction industry. The ENGINEER does not guarantee the accuracy of the cost estimates, which may vary from bids or actual project and construction costs.</p> <p>2. Cost estimate is in 2024 dollars and may need to be adjusted for inflation depending on final project schedule.</p> <p>3. Estimate is based on site evaluation and preliminary concepts only.</p>					

**APPENDIX A-3:
OPTION 2 CONCEPTUAL PLAN**

LEGEND

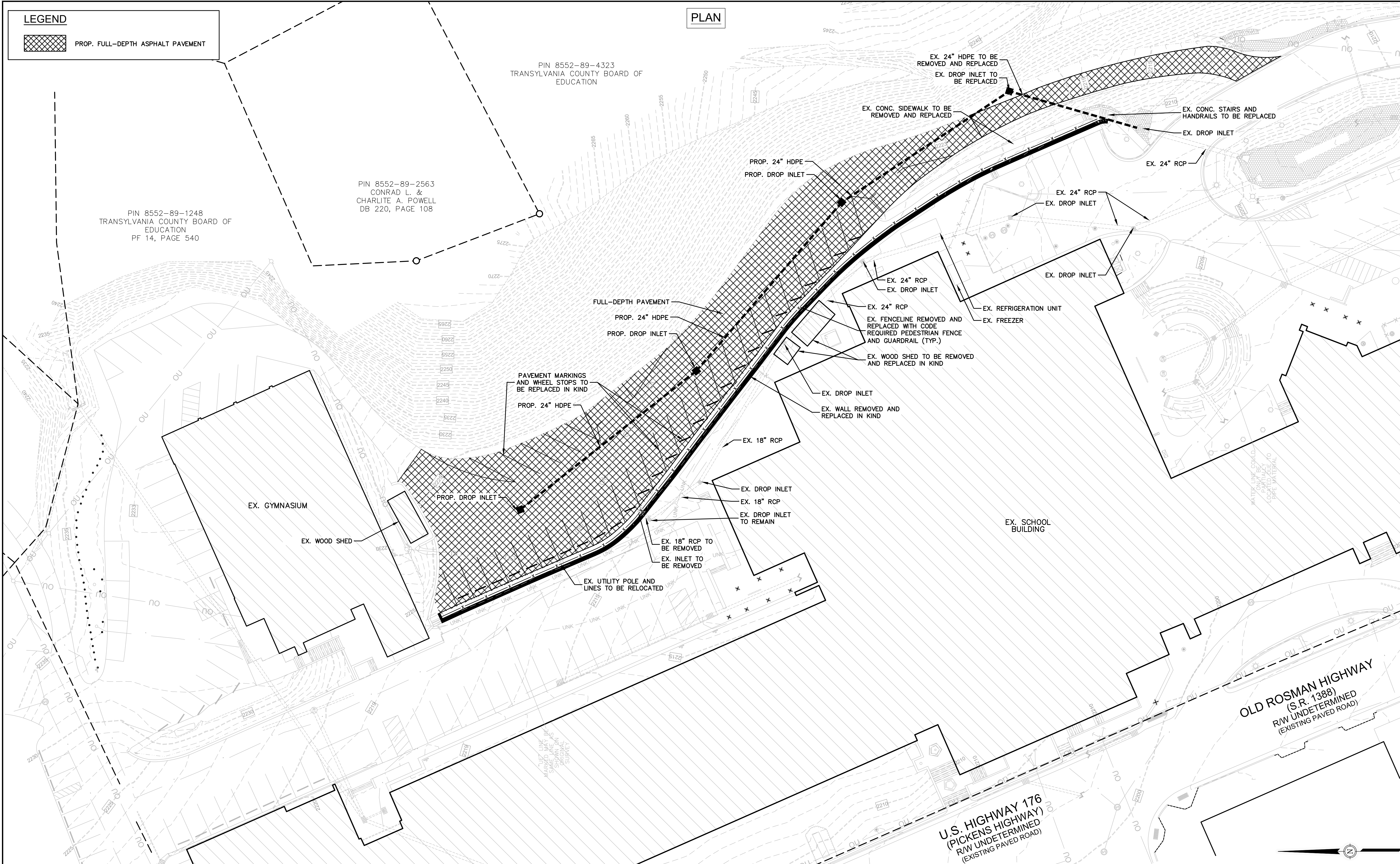
 PROP. FULL-DEPTH ASPHALT PAVEMENT

PLAN

PIN 8552-89-4323
 TRANSYLVANIA COUNTY BOARD OF
 EDUCATION

PIN 8552-89-2563
 CONRAD L. &
 CHARLITE A. POWELL
 DB 220, PAGE 108

PIN 8552-89-1248
 TRANSYLVANIA COUNTY BOARD OF
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 PF 14, PAGE 540



P:\2024\0131-TRANSYLVANIA\SCHROSMAN RETAINING WALL\DRAWINGS\CONSTRUCT\SITE\H1TS24.00131_SITE PLAN - CONCEPT 2.DWG PLOT DATE: 12/12/2024 8:29 AM JAYMIN HOWARD

24.00131 - TRANSYLVANIA COUNTY SCHOOLS - REMOVE AND REPLACE THE EXISTING WALL



55 Broad Street
 Asheville, NC 28801
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 NC Firm License # C-0459
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PRELIMINARY

NO.	DATE	BY	DESCRIPTION

ROSAMAN SUPPORT WALL INVESTIGATION
**TRANSYLVANIA
 COUNTY SCHOOLS**
 TRANSYLVANIA COUNTY, NORTH CAROLINA

20 0 10 20 40
 GRAPHIC SCALE DIVISION VALUE = 20 FEET

OFFICE MANAGER MARK CATHEY	DESIGNER JAYMIN HOWARD
PROJECT MANAGER BEN CATHEY	REVIEWER KHIYA ARMSTRONG

CONCEPTUAL SITE PLAN - REMOVE AND REPLACE THE EXISTING WALL	
DATE 12/12/2024	FUNDING # N/A
PROJECT # 24.00131	

SHEET
OPT-2

**APPENDIX A-4:
OPTION 2 PRELIMINARY OPINION OF
PROBABLE COST**



PRELIMINARY OPINION OF PROBABLE COST					
OPTION 2 - REMOVE AND REPLACE THE EXISTING WALL					
ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL AMOUNT
CONSTRUCTION COSTS					
1	Mobilization/General Requirements (5%)	LS	1	\$34,500.00	\$34,500.00
2	Modular Block Retaining Wall (Geotechnical)	SF	5,000	\$50.00	\$250,000.00
3	Erosion Control	LS	1	\$8,000.00	\$8,000.00
4	Demolition and Disposal	LS	1	\$35,000.00	\$35,000.00
5	Earthwork	CY	3,500	\$35.00	\$122,500.00
6	Fine Grading	LS	1	\$7,500.00	\$7,500.00
7	Compacted Base Stone - 8" Depth	TN	800	\$30.00	\$24,000.00
8	Asphalt Pavement Surface Course - Type SF9.5B 2" Depth	TN	190	\$165.00	\$31,400.00
9	Replace Fence	LF	410	\$40.00	\$16,400.00
10	Guardrail	LF	410	\$100.00	\$41,000.00
11	Sidewalk	SF	600	\$8.00	\$4,800.00
12	Concrete Stairs and Handrails	EA	3	\$6,000.00	\$18,000.00
13	Drainage Structures	EA	4	\$5,000.00	\$20,000.00
14	Stormwater Pipes - 24" HDPE	LF	380	\$130.00	\$49,400.00
15	Utility Conflicts and Relocation	LS	1	\$20,000.00	\$20,000.00
16	Wheel Stops	EA	27	\$300.00	\$8,100.00
17	Replace Storage Building	EA	2	\$10,000.00	\$20,000.00
18	Striping	LS	1	\$2,000.00	\$2,000.00
19	Restoration of Surfaces	LS	1	\$10,000.00	\$10,000.00
CONSTRUCTION TOTALS					
Construction Subtotal					\$722,600.00
Contingency (20%)					\$144,520.00
Total Construction Costs					\$867,120.00
SOFT COSTS					
Final Design and Permitting					\$40,000.00
Bidding and Award					\$9,500.00
Construction Observation and Contract Administration					\$50,000.00
Modular Block Retaining Wall Design (Geotechnical)					\$10,000.00
Construction and Materials Testing					\$26,100.00
TOTAL ESTIMATED PROJECT COSTS					\$1,002,720.00
NOTES					
<p>1. The ENGINEER maintains no control of labor costs, materials, equipment or services furnished by others, the Contractor(s)' methods for determining prices, or competitive or market conditions. The estimates herein for project and construction costs represent the ENGINEER'S best judgment, and are based on his experience and qualifications as a Professional Engineer who possesses familiarity with the construction industry. The ENGINEER does not guarantee the accuracy of the cost estimates, which may vary from bids or actual project and construction costs.</p> <p>2. Cost estimate is in 2024 dollars and may need to be adjusted for inflation depending on final project schedule.</p> <p>3. Estimate is based on site evaluation and preliminary concepts only.</p>					

**APPENDIX A-5:
OPTION 3 CONCEPTUAL PLAN**

LEGEND

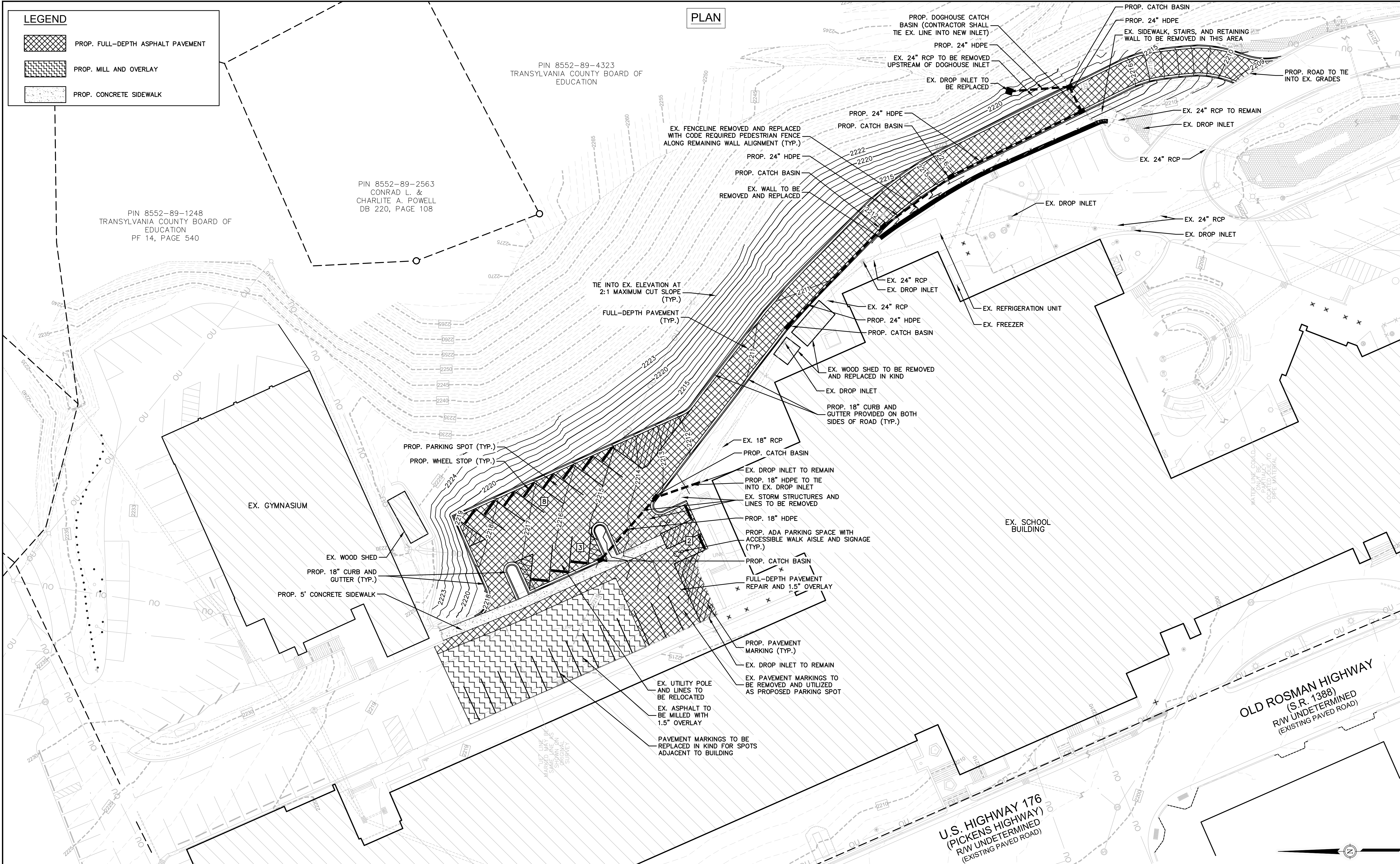
- PROP. FULL-DEPTH ASPHALT PAVEMENT
- PROP. MILL AND OVERLAY
- PROP. CONCRETE SIDEWALK

PLAN

PIN 8552-89-4323
 TRANSYLVANIA COUNTY BOARD OF
 EDUCATION

PIN 8552-89-1248
 TRANSYLVANIA COUNTY BOARD OF
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 PF 14, PAGE 540

PIN 8552-89-2563
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 DB 220, PAGE 108



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24.00131 TRANSYLVANIA COUNTY SCHOOLS REMOVE THE WALL AND RECONFIGURE THE SITE

55 Broad Street
 Asheville, NC 28801
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PRELIMINARY

NO.	DATE	BY	DESCRIPTION

ROSMAN SUPPORT WALL INVESTIGATION
**TRANSYLVANIA
 COUNTY SCHOOLS**
 TRANSYLVANIA COUNTY, NORTH CAROLINA

GRAPHIC SCALE DIVISION VALUE = 20 FEET

OFFICE MANAGER MARK CATHEY	DESIGNER JAYMIN HOWARD
PROJECT MANAGER BEN CATHEY	REVIEWER KHIYA ARMSTRONG

CONCEPTUAL SITE PLAN - REMOVE THE WALL AND RECONFIGURE THE SITE	
DATE 12/12/2024	FUNDING # N/A
PROJECT # 24.00131	

SHEET
OPT-3

**APPENDIX A-6:
OPTION 3 PRELIMINARY OPINION OF
PROBABLE COST**



PRELIMINARY OPINION OF PROBABLE COST					
OPTION 3 - REMOVE THE WALL AND RECONFIGURE THE SITE					
ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL AMOUNT
CONSTRUCTION COSTS					
1	Mobilization/General Requirements (5%)	LS	1	\$20,700.00	\$20,700.00
2	Modular Block Retaining Wall (Geotechnical)	SF	780	\$50.00	\$39,000.00
3	Erosion Control	LS	1	\$10,000.00	\$10,000.00
4	Demolition and Disposal	LS	1	\$40,000.00	\$40,000.00
5	Earthwork	CY	4,350	\$20.00	\$87,000.00
6	Fine Grading	LS	1	\$7,500.00	\$7,500.00
7	Milling	LS	1	\$3,000.00	\$3,000.00
8	Adjust Existing Manhole/Inlet to Grade	EA	2	\$1,000.00	\$2,000.00
9	Compacted Base Stone - 8" Depth	TN	500	\$30.00	\$15,000.00
10	Asphalt Pavement Surface Course - Type SF9.5B 2" Depth	TN	135	\$165.00	\$22,300.00
11	Asphalt Pavement Repair - I19.0B Patch 2" Depth	TN	30	\$160.00	\$4,800.00
12	Asphalt Pavement Overlay - Type SF9.5B 1.5" Depth	TN	55	\$160.00	\$8,800.00
13	Curb & Gutter	LF	1,050	\$25.00	\$26,300.00
14	Drainage Structures	EA	8	\$5,000.00	\$40,000.00
15	Stormwater Pipes - 18" HDPE	LF	70	\$100.00	\$7,000.00
16	Stormwater Pipes - 24" HDPE	LF	285	\$130.00	\$37,100.00
17	Utility Conflicts and Relocation	LS	1	\$20,000.00	\$20,000.00
18	Wheel Stops	EA	13	\$300.00	\$3,900.00
19	Replace Storage Building	EA	2	\$10,000.00	\$20,000.00
20	Striping	LS	1	\$4,000.00	\$4,000.00
21	Restoration of Surfaces	LS	1	\$15,000.00	\$15,000.00
CONSTRUCTION TOTALS					
Construction Subtotal					\$433,400.00
Contingency (20%)					\$86,680.00
Total Construction Costs					\$520,080.00
SOFT COSTS					
Final Design and Permitting					\$60,000.00
Bidding and Award					\$9,500.00
Construction Observation and Contract Administration					\$40,000.00
Modular Block Retaining Wall Design (Geotechnical)					\$7,500.00
Construction and Materials Testing					\$15,700.00
TOTAL ESTIMATED PROJECT COSTS					\$652,780.00
NOTES					
<p>1. The ENGINEER maintains no control of labor costs, materials, equipment or services furnished by others, the Contractor(s)' methods for determining prices, or competitive or market conditions. The estimates herein for project and construction costs represent the ENGINEER'S best judgment, and are based on his experience and qualifications as a Professional Engineer who possesses familiarity with the construction industry. The ENGINEER does not guarantee the accuracy of the cost estimates, which may vary from bids or actual project and construction costs.</p> <p>2. Cost estimate is in 2024 dollars and may need to be adjusted for inflation depending on final project schedule.</p> <p>3. Estimate is based on site evaluation and preliminary concepts only.</p>					

**APPENDIX A-7:
RECORD OF SITE VISIT – LIMITED RETAINING
WALL ASSESSMENT DATED NOVEMBER 11,
2024, PROVIDED BY BUNNELL-LAMMONS
ENGINEERING, INC. (BLE)**

November 11, 2024

Mr. Ben Cathey, P.E.
McGill Associates
55 Broad Street
Asheville, North Carolina 28801

Subject: **RECORD OF SITE VISIT**
 Limited Retaining Wall Assessment
 Rosman High School
 Rosman, North Carolina
 BLE Project Number 24-24400

Dear Mr. Cathey:

Bunnell-Lammons Engineering, Inc. (BLE) is pleased to present this letter summarizing our on-site observations and limited assessment of the Rosman High School retaining wall. Our services were provided in accordance with BLE's Work Authorization Sheet dated 11/4/24. Project information for this report is based on a site visit by Mr. Jesse R. Jacobson, P.E. on October 30, 2024.

PROJECT INFORMATION

A segmental retaining wall east of Rosman High School is exhibiting signs of distress. The wall is approximately 420-foot long, terminates at the gymnasium to the north and near the amphitheater to the south. The wall varies in height but reaches a maximum height of roughly 11 feet, creating the grade change between the school/lower parking lot and an upper parking lot. The wall is vertical, initially built without any positive batter. The surface runoff from the upper parking lot is generally directed towards the wall, and although there is one catch basin within the area of interest, it does not appear that a significant amount of surface runoff is collected by the basin, but rather flows over the top of the wall. Significant efflorescence is present on the wall face, indicating saturated conditions and a poor internal drainage system behind the wall face. Significant deflection was noted roughly 130 feet south of the north end of the wall. Using a plumb bob and level, it is estimated that the area of worst deflection is over 4 inches out over the toe of the wall at the top (see Figure 1). No design information was available at the time of the visit. No information regarding proximity of utilities behind the wall was available, outside of the visible storm inlet.

ASSESSMENT

The existing segmental retaining wall east of the building has excessively deflected, and requires correction. The exact cause of distress is not known, as no information regarding the design was available and no detailed exploration had been performed. However, given the magnitude of deflection, correction is needed.

Three options were discussed during our site visit on October 30, as follows:

- **Remove and replace the existing wall.** This would involve deconstructing the wall and grid, and removing the reinforced zone backfill (the soil containing the existing geogrid). Any number of retaining wall types could be considered, though segmental walls are often the most economical. It is conceivable that the blocks could be salvaged for re-use, but new grid would be needed. It is also likely that some of the fill could be re-used, though additional evaluation would be needed. It is not known what utilities exist behind the wall that would also require removal and replacement. A new wall would need to be designed, and the design should also include changes to the internal and surface drainage detailing.
- **Reinforce the existing wall in-place with soil nails.** This option involves installing soil nails through the existing wall then covering the front of the wall with a shotcrete facing. One advantage of this option is that no excavation would be needed behind the existing wall. One item of note is that the shotcrete finish will be +/- 6 inches thick, extending the face slightly outward from its existing location. See Figure 2 for an example of the repair approach.
- **Permanently remove the wall and reconfigure the east parking area.** This option would involve removing the wall and lowering the east parking area to match the lower west parking area. The slope east of the upper parking area would be continued down to match the lower grade. It appears some parking spaces would be lost. This approach is to be further evaluated by McGill.

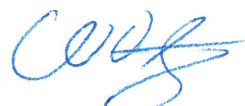
CLOSING

We appreciate the opportunity to provide our professional geotechnical services on this project. If you have any questions regarding this letter, please do not hesitate to call us.

Sincerely,
NC FIRM REGISTRATION # C-1538
BUNNELL-LAMMONS ENGINEERING, INC.


 Jesse R. Jacobson, P.E.
 Director of Technical Services
 NC Registration #030938




 Colm O'Doherty, P.E.
 Project Engineer
 NC Registration #050976

Attachments: Photos 1 - 3

Figure 1: Existing Deflected Retaining Wall East of School



Figure 2: Example of Soil Nail Stabilization of MSE Wall



Figure 3: Example of Soil Nail Stabilization of MSE Wall

