Engineering Services Proposal

Repair and Rehabilitation of County Road 626 in White Township, NJ

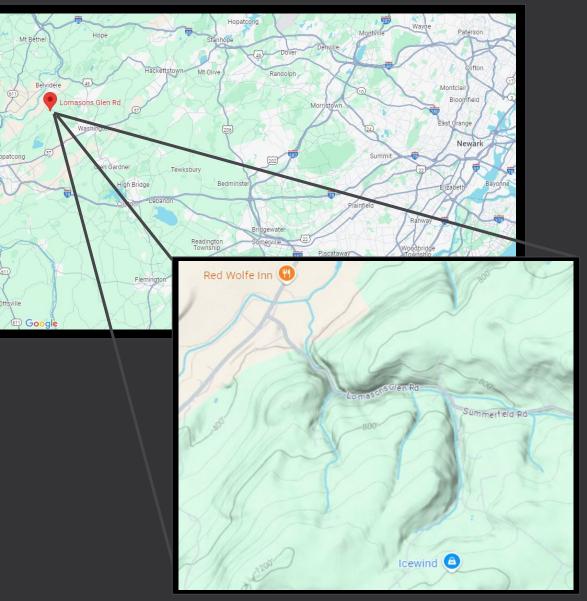


Team Members: Louis Turner (Team Leader), Michael Harrison, Daniel Geissler, and Tony Gonzalez

Advisors: Dr. Michael Horst and Dr. Thomas Brennan

Problem Statement and Background

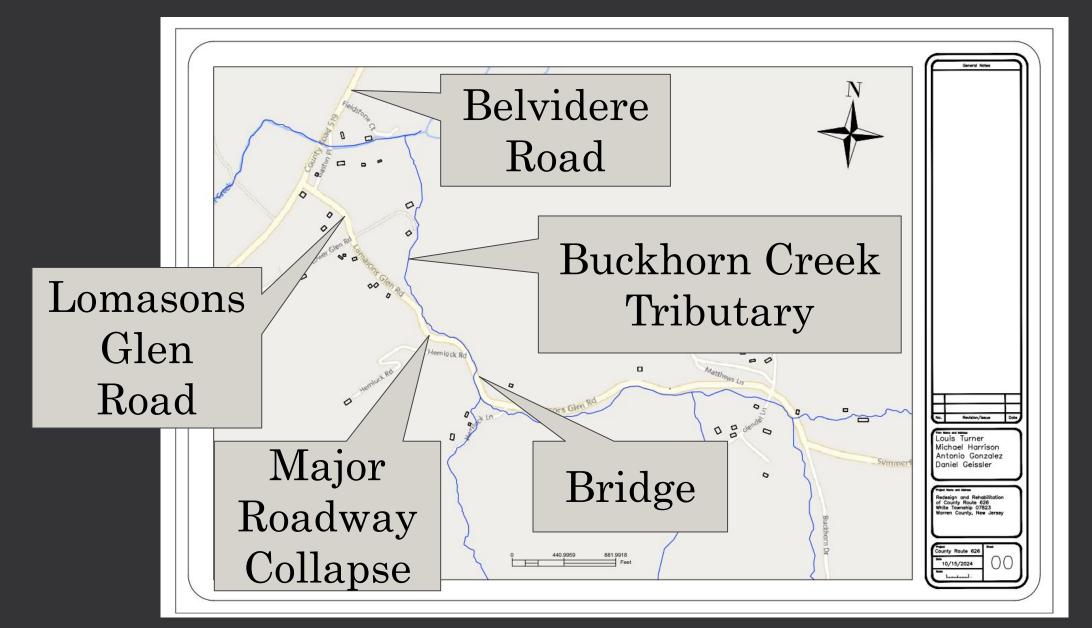
- County Road Route 626/ Lomasons Glen Road in White Township, NJ
- Bridge No. 23073, over Buckhorn Creek Tributary
- Original embankments upstream reinforced with concrete retaining walls
- Superstructure/substructure remained intact during storm event
- Roadway closure since 2022



Major Roadway Collapses



Site Plan Overview

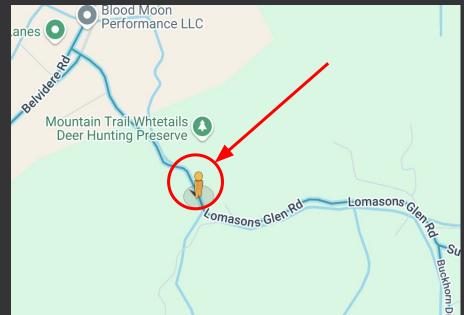


Bridge Existing Conditions

- Steep sloped terrain and horizontal curves
- Substructure is in satisfactory condition

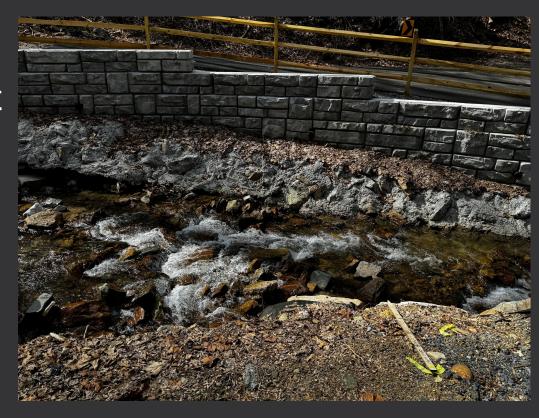






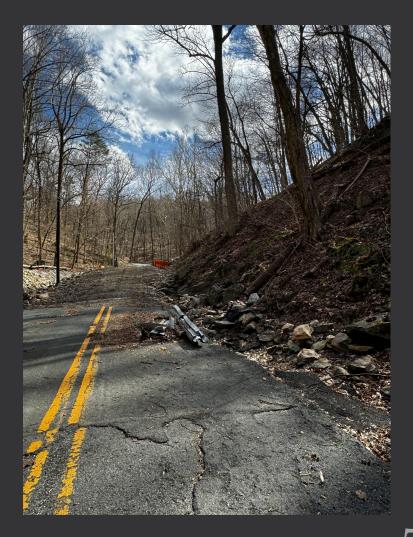
Design Requirements

- Water Resources:
 - Typical Culvert Design
 - Rectangular Culvert, Arch Culvert
- Embankment Design
 - Assess possible sloped embankments
 - Levee wall system or gabion baskets
- Transportation:
 Traffic Model



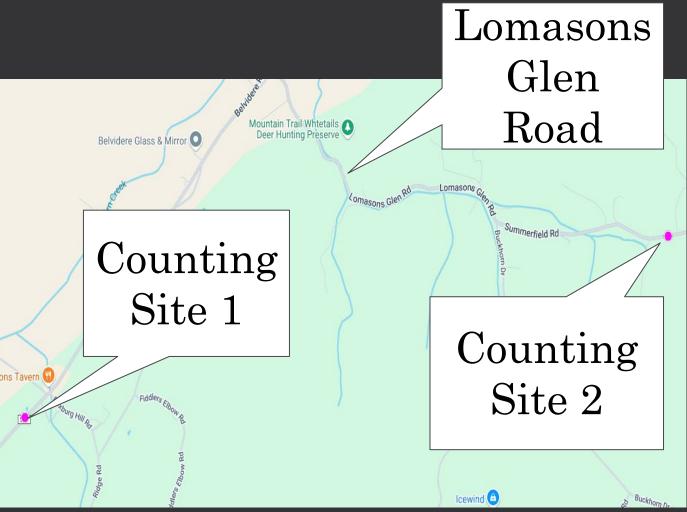
Realistic Constraints

- Economic
- Environmental & Sustainability
 - Renewable Resources, Low
 Energy, and Maintenance
- Construction (QA/VE)
- Ethical & Legal
- Social & Political

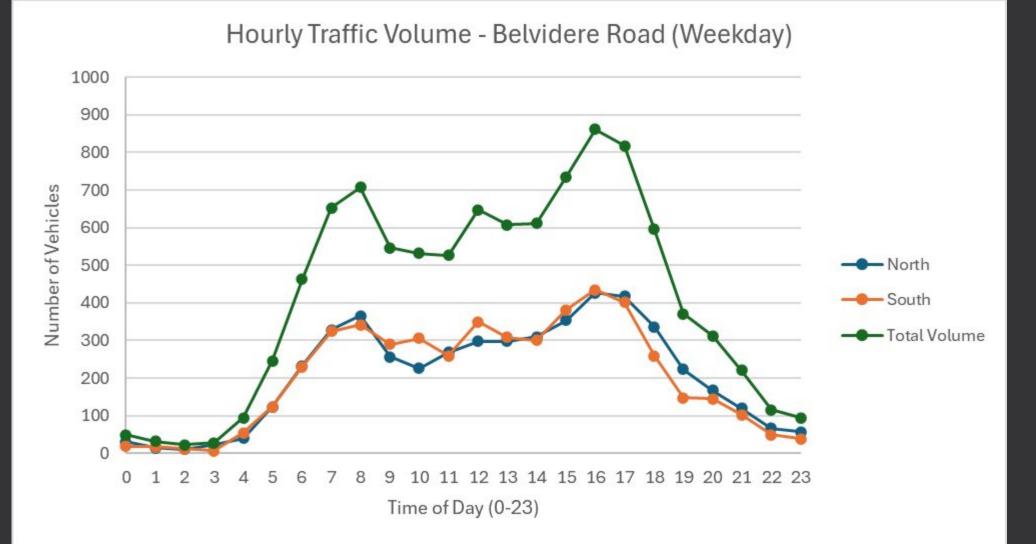


Design Constraints (Transportation)

• NJDOT Traffic Counting Sites • 862 Peak Traffic Hour Vehicles at Site 1 • 24 Peak Traffic Hour iptons Tavern 😗 Vehicles at Site 2

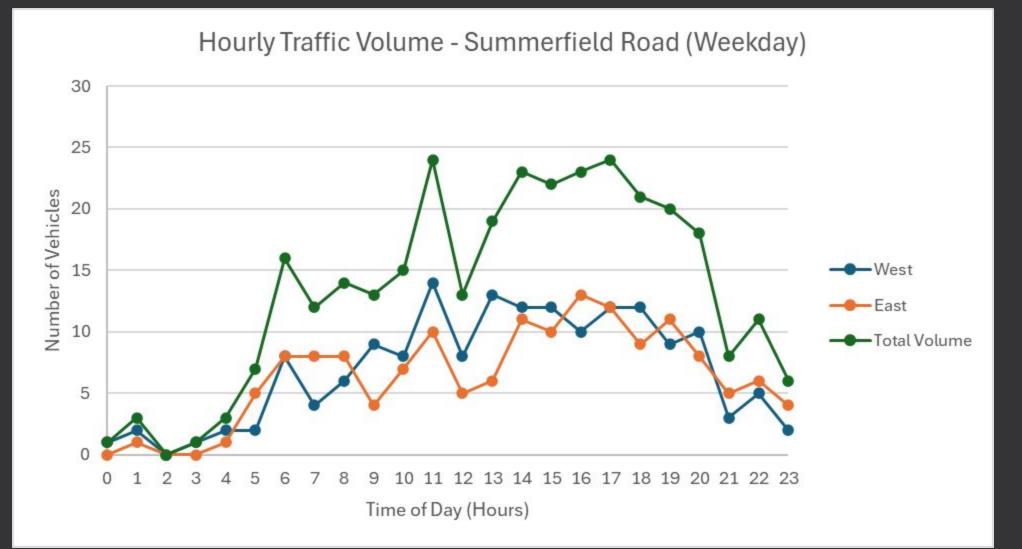


Traffic Count Graph: Belvidere Road (Site 1)

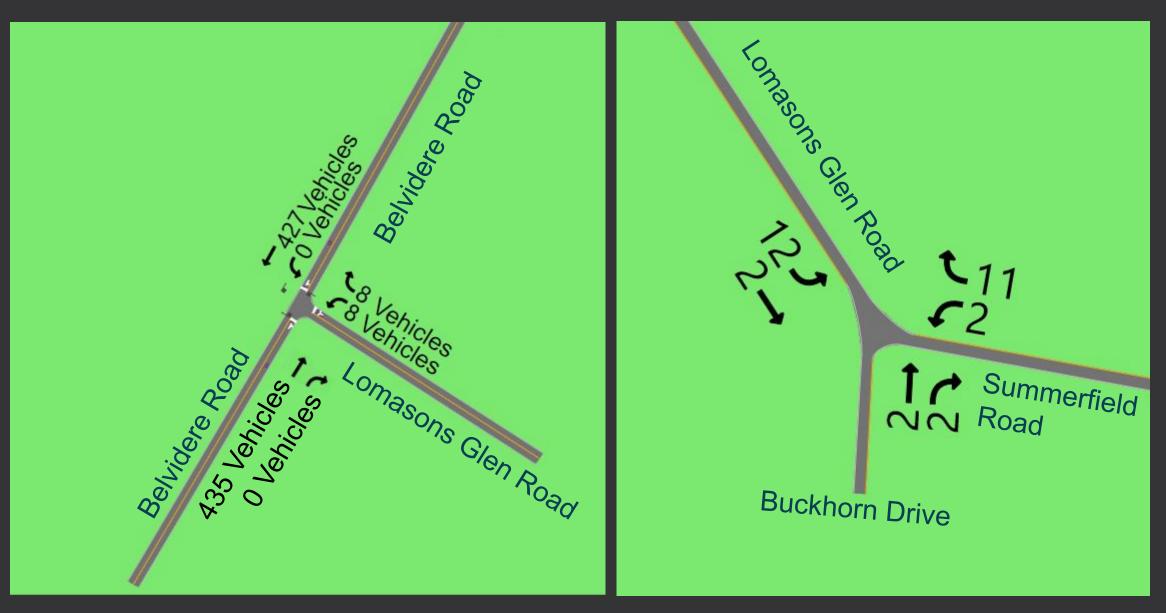


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Traffic Count Graph: Summerfield Road (Site 2)



Synchro Model Existing Condition

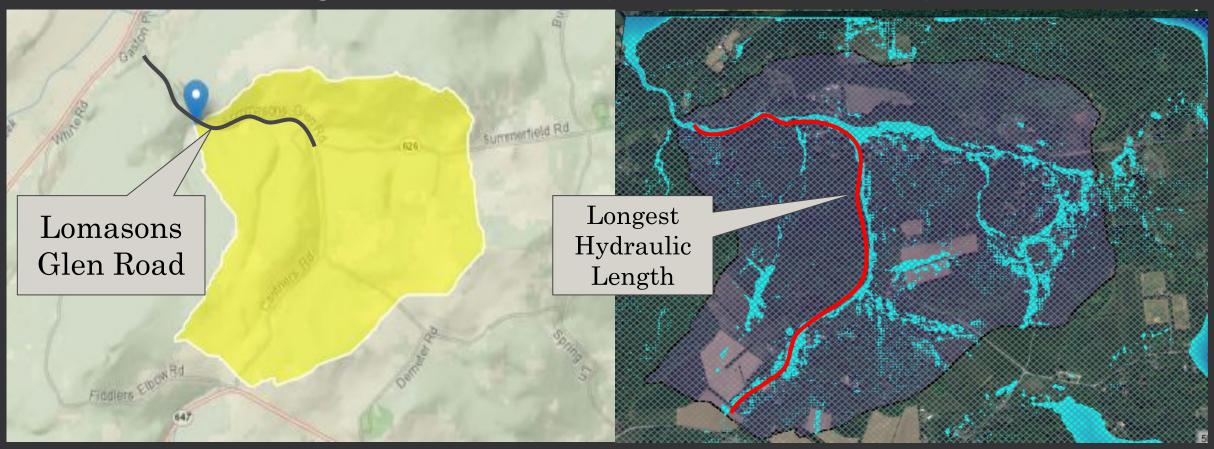


Geometric Design Constraint



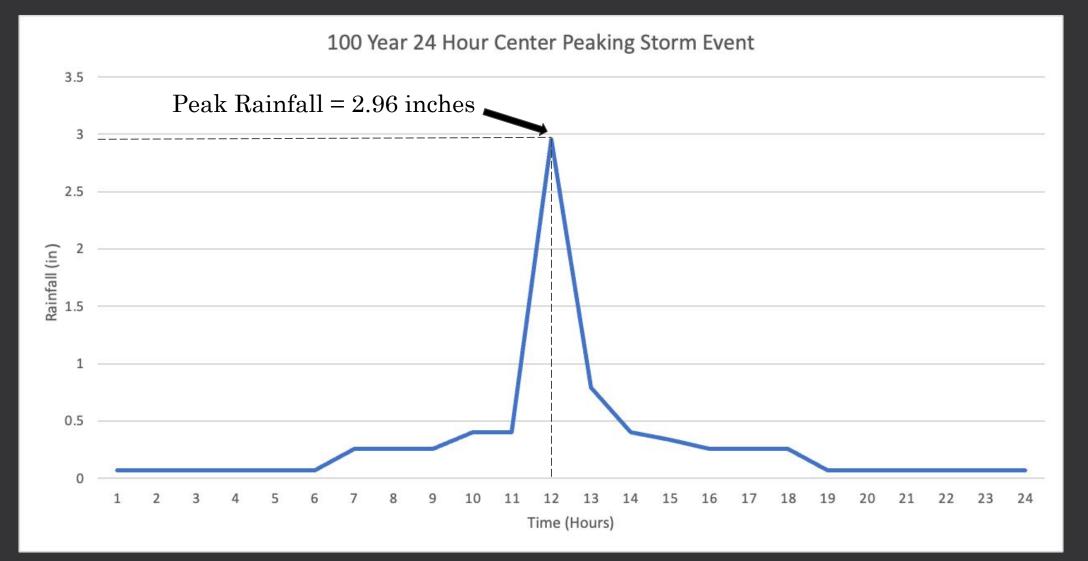
• Pedestrian and Bicyclist Signage

Design Constraints (Water Resources)



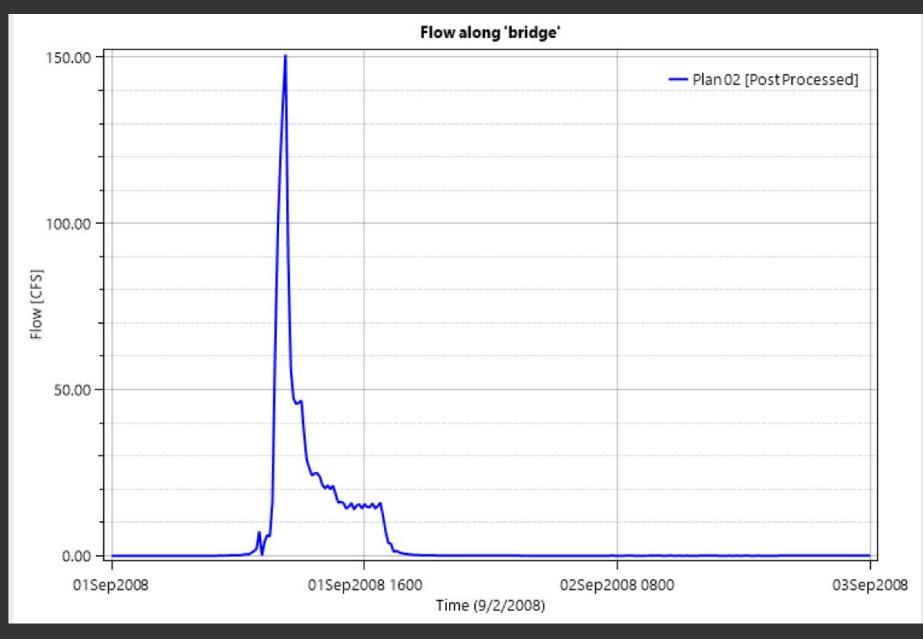
- Delineated Watershed Area = 1.32 sq. mi
- Longest Hydraulic Length = 9370 ft
- Average Land Slope = 21.52 %

Rainfall Data



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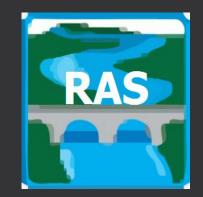
Hydrograph



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Modern Engineering Tools

- Water Resources
 - Softwares: USGS Streamstats, NWS PFDS, HEC-RAS
 - Watershed Area, HEC-RAS river model
- Transportation
 - Softwares: Synchro, Microsoft Excel
- AutoCAD Civil 3D Imperial
 Orafting Drawings and Design





Applicable Standards, Specifications and Codes

- NJDOT Roadway Design Manual
- Manual on Uniform Traffic Control Devices Version 11 (MUTCD)
- ITE Trip Generation Manual
- Green Book (2018)



Scour Protection Alternatives

Option 1 - Concrete Levee Walls Option 2

- Rip Rap

Option 3

- Gabion Baskets





Alternative Culvert Designs



- Arch

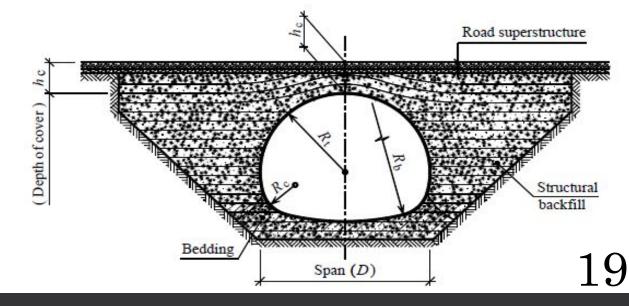
Option 2

- Closed Bottom Rectangular

Option 3

- Open Bottom Rectangular

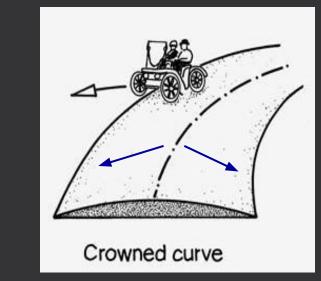


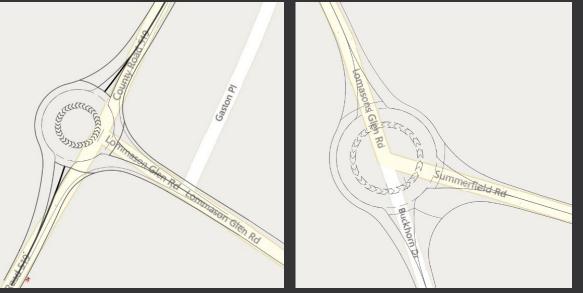


Alternative Transportation Designs

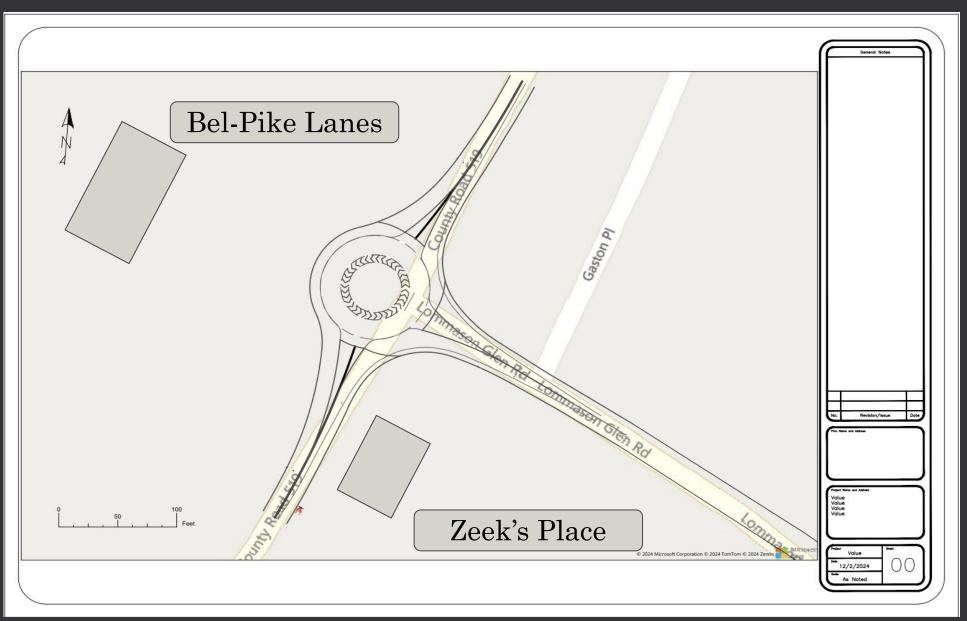
Transportation

- Crowned Roadway
- Roundabouts:
 - Lomason's Glen Road and Belvidere Road
 Buckhorn Drive, Summerfield Road, and Lomason's Glen Road





Belvidere Road & Lomasons Glen Road



Intersection of Lomasons Glen Road and Belvidere Road



Lomasons Glen Road, Summerfield Road, & Buckhorn Drive

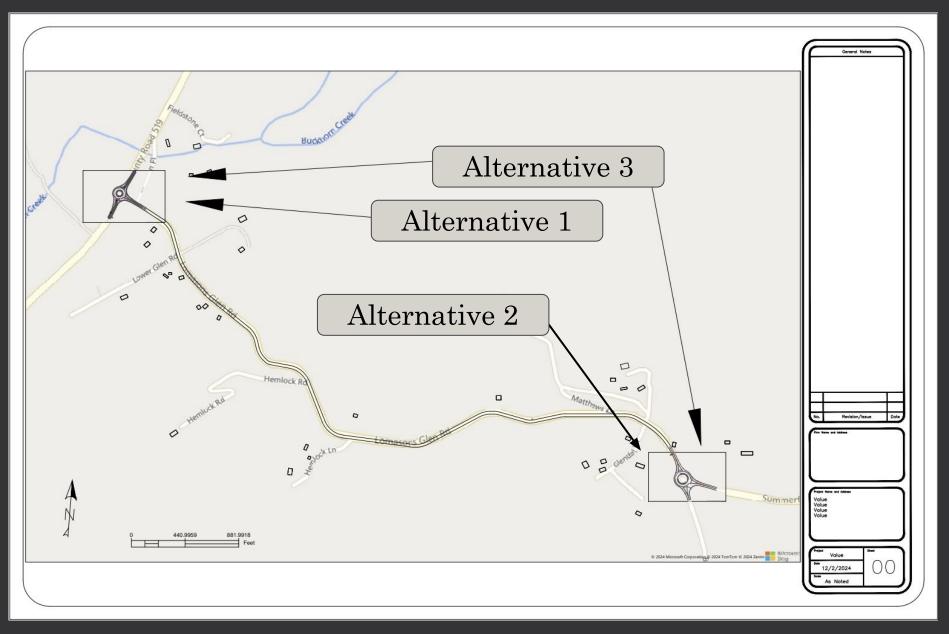


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Intersection of Summerfield Road, Lomasons Glen Road, and Buckhorn Drive



Roundabout Locations



Proposed Design Selection Matrices

Scour Prevention								
Туре	Constraints	Weight	Concrete Levee	Gabion	RipRap			
Environmental	Floodplain Management	5	4	2	1			
Economical	Cost	4	2	3	4			
Sustainability	Recycling of Materials	3	1	2	2			
Constructability	Ease of Construction	2	2	3	4			
	Total		41	34	35			
Culvert Design								
Туре	Constraints	Weight	Natural Bottom Bridge	Rectangular Box Culvert	Pipe Arch			
Water Resources Design	Stream Stability / Design Flood	5	4	3	3			
Environmental	Water Quality/Ecological Safety	4	3	3	1			
Economical	Cost	3	2	2	3			
Construction	Land Use / Construction Practices	2	3	2	3			
	Total		41	35	36			
		Traffic Design						
Туре	Constraints	Weight	Belvidere Rd. & Lomasons Glen	Buckhorn Roundabout	Both Intersections			
Ethical	Safety	5	1	1	3			
Environmental	Resources	4	3	3	2			
Economical	Cost	3	2	2	1			
Sustainable	Construction	2	2	2	1			
	Total		27	27	28			

Fall Budget

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	Dr. Horst	Dr. Brennan	Louis Turner	Michael Harrison	Antonio Gonzalez	Daniel Geissler
Task	Water Resources Director	Transportation Director	Project Engineer/Team Leader	Project Engineer	Project Engineer	Project Engineer
	Academic Advisor	Academic Advisor	Level II Engineer	Level Engineer	Level I Engineer	Level I Engineer
Site Visit	0	0	2	0	0	0
Research	15	10	20	20	20	20
Proposal Presentation	1	1	5	5	5	5
Plan Drafting	0	1	1	1	2	3
Alt Design Research	0	0	4	4	4	4
Constraint Analysis	1	1	2	2	2	2
Quarterly Report	1	1	3	3	3	3
Engineering Services Presentation	1	1	2	3	2	2
Engineering Services Report	1	1	4	4	4	4
Total Hours	20	16	43	42	42	43
Hourly Rate	\$80.00	\$80.00	\$35.00	\$30.00	\$30.00	\$30.00
Salaries	\$1,600.00	\$1,280.00	\$1,505.00	\$1,260.00	\$1,260.00	\$1,290.00
				Wages Cost		\$8,195.00
					2	
				Overhead	150%	\$12,292.50
				Fixed Fee	10%	\$2,048.75
				Direct Cost		\$0.00
				Total		\$23,000

Fall Semester Gantt Chart

Task Name	Duration	Start	Finish	
Task tydnic	Duration	Start	cinisii s	September 2024 October 2024 November 2024 December 2024 19 22 25 28 31 3 6 9 12 15 18 21 24 27 30 2 5 8 11 14 17 20 23 26 29 2 5 8 11 14 17 20 23 26 29 2 5 8 11 14 17 20 23 26 29 2 5 8 11 14 17 20 23 26 29 2 5 8 11 14 17 20 23 26 29 2 5 8 11 14 17 20 23 26 29 2 5 8 11 14 17 20 23 26 29 2 5 8 11 14 17 20 23 26 29 2
Total Project				
Fall Semester	78 days	Mon 8/26/24	Wed 12/11/24	
Start	0 days	Mon 8/26/24	Mon 8/26/24	8/26
Research	15 days	Mon 8/26/24	Fri 9/13/24	, Martin and
Site Visit	1 day	Mon 8/26/24	Mon 8/26/24	Yus
Site Location Plans	7 days	Mon 8/26/24	Tue 9/3/24	
Problem Statement & Background Presentation	5 days	Wed 8/28/24	Tue 9/3/24	
First Presentation	0 days	Tue 9/3/24	Tue 9/3/24	9/3
Initial Website	5 days	Wed 9/4/24	Tue 9/10/24	
Alternative Design Research	26 days	Wed 9/11/24	Wed 10/16/24	ř
Realistic & Design Constraint Analysis	10 days	Wed 9/11/24	Tue 9/24/24	
Alternative Designs & Constraints Presentation	16 days	Wed 9/25/24	Wed 10/16/24	
Quarterly Report	6 days	Wed 10/16/24	Wed 10/23/24	
Report 1	0 days	Wed 10/23/24	Wed 10/23/24	10/23
Optimal Design Selection	5 days	Thu 10/24/24	Wed 10/30/24	
Abstract	10 days	Thu 10/31/24	Wed 11/13/24	ř.
Estimate of Engineering Costs & Schedule	14 days	Thu 11/14/24	Tue 12/3/24	ř
Engineering Services Proposal Presentation	11 days	Wed 11/20/24	Wed 12/4/24	
Fall Presentation	0 days	Wed 12/4/24	Wed 12/4/24	12/4
Final Website	26 days	Wed 10/30/24	Wed 12/4/24	- A
Final Fall Report	36 days	Wed 10/23/24	Wed 12/11/24	
Fall Semester Complete	0 days	Wed 12/11/24	Wed 12/11/24	* 12/11

Thank you.

Questions?