



# Intersection Improvements for Route 5/113 at Route 160

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## Introduction

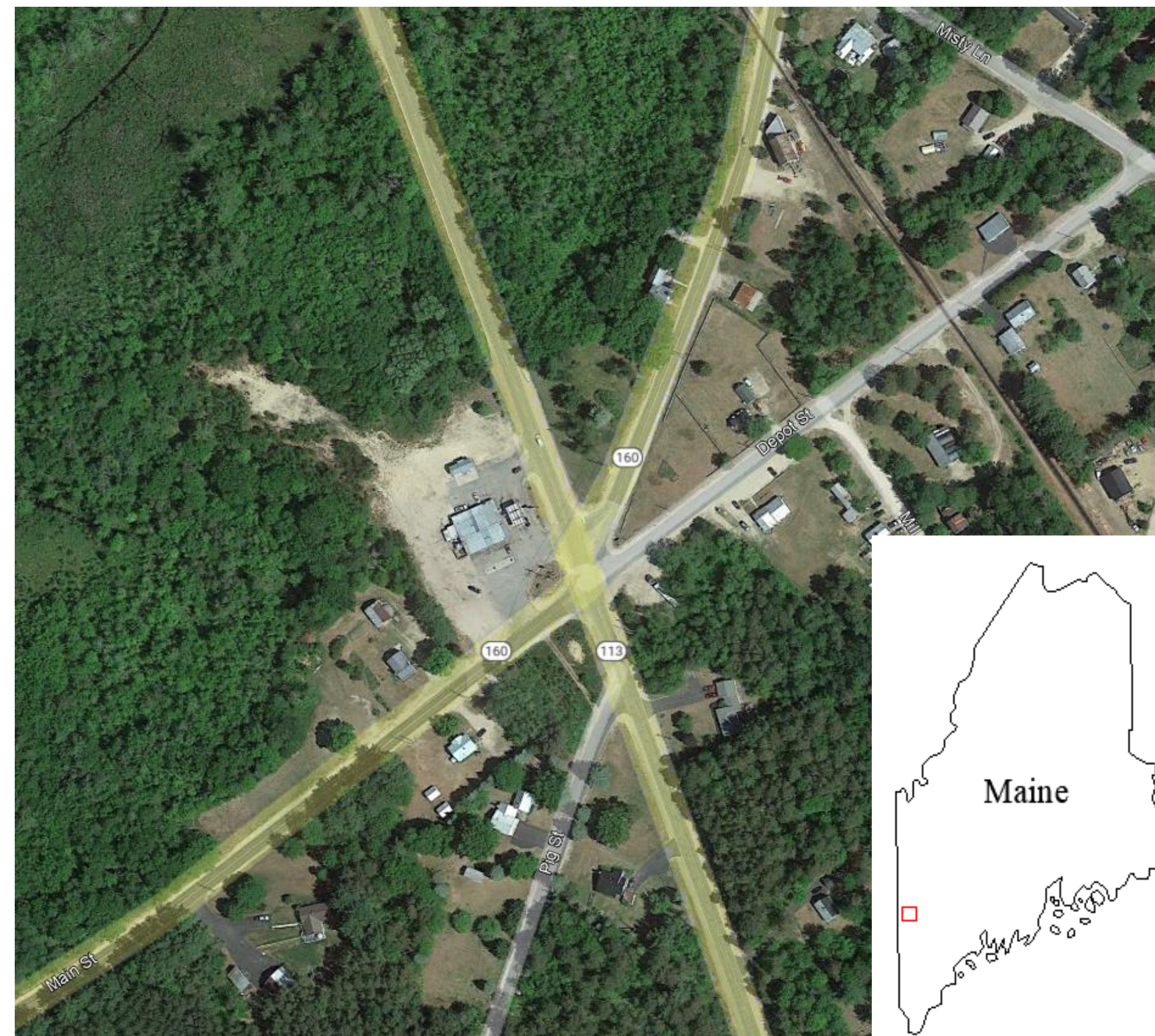
### Overview

- The goal of this project was to redesign an existing intersection in Brownfield, ME to improve its safety and efficiency for both vehicles and pedestrians.

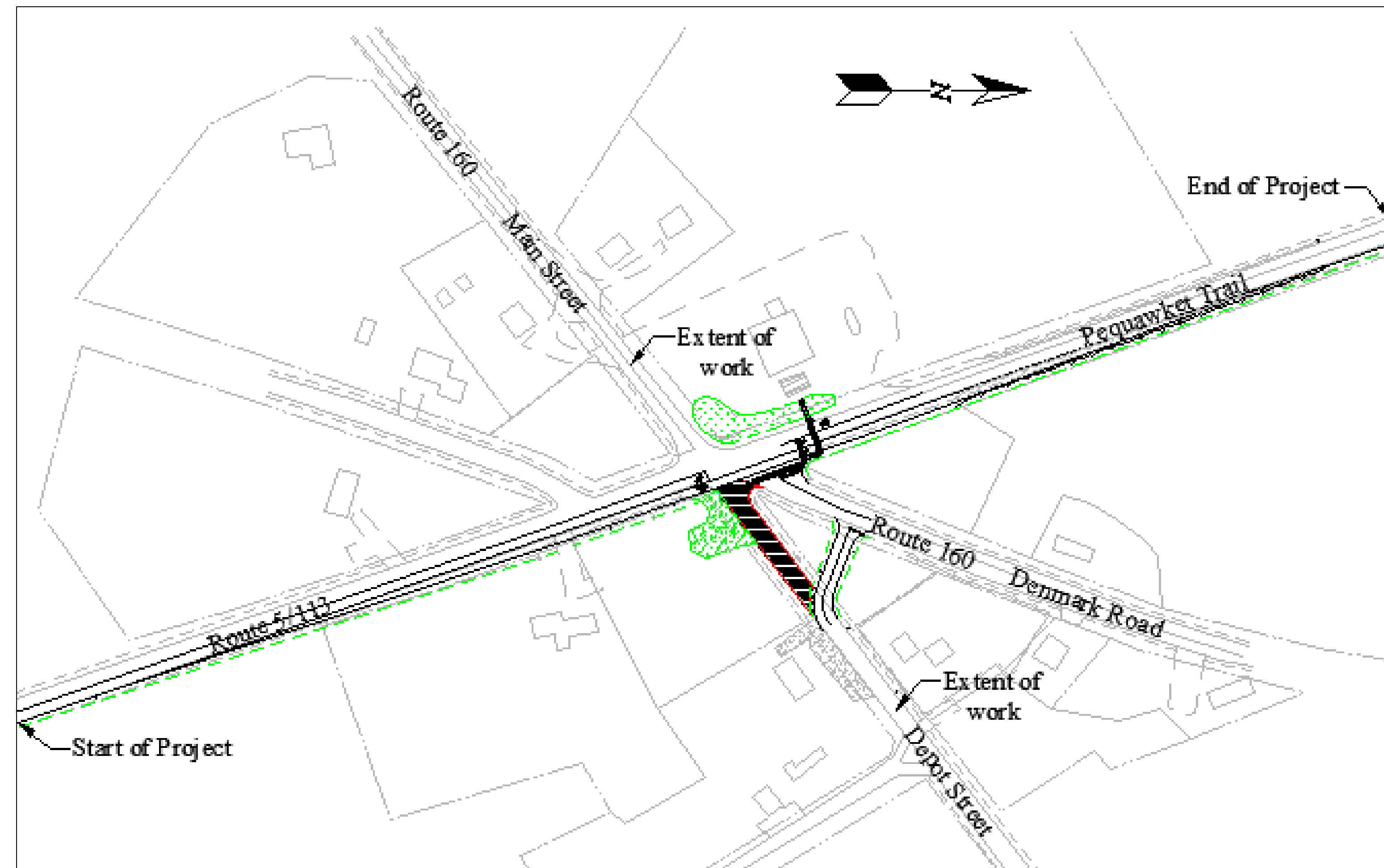
### Scope

- During the first semester, a site visit and traffic analysis were performed that led to several design alternatives being considered.
- During the second semester, one design was chosen through a decision matrix, then drawn in AutoCAD and tested using a Vehicle Tracker software to ensure the overall goal was met.

## Location



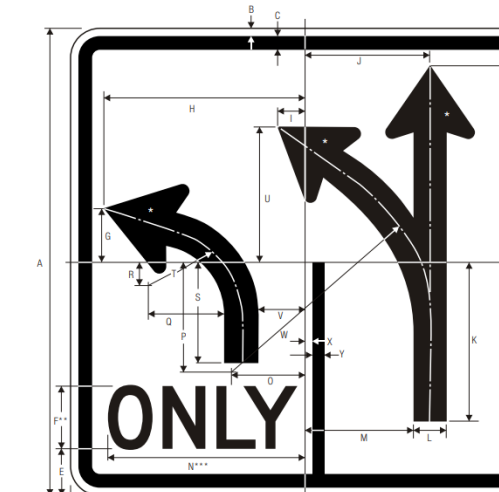
## Final Design: Depot Street Redirection with Route 5/113 Turning Lane



A turning lane on Route 5/113 will be established. The turning lane will increase safety by allowing drivers to remain at a constant speed while others are exiting. This will lead to decreased crashes and increased efficiency of the intersection. Two crosswalks will also be included which causes the speed limit to be reduced from 50 MPH to 40 MPH.

### Turning Lane Tapering Information:

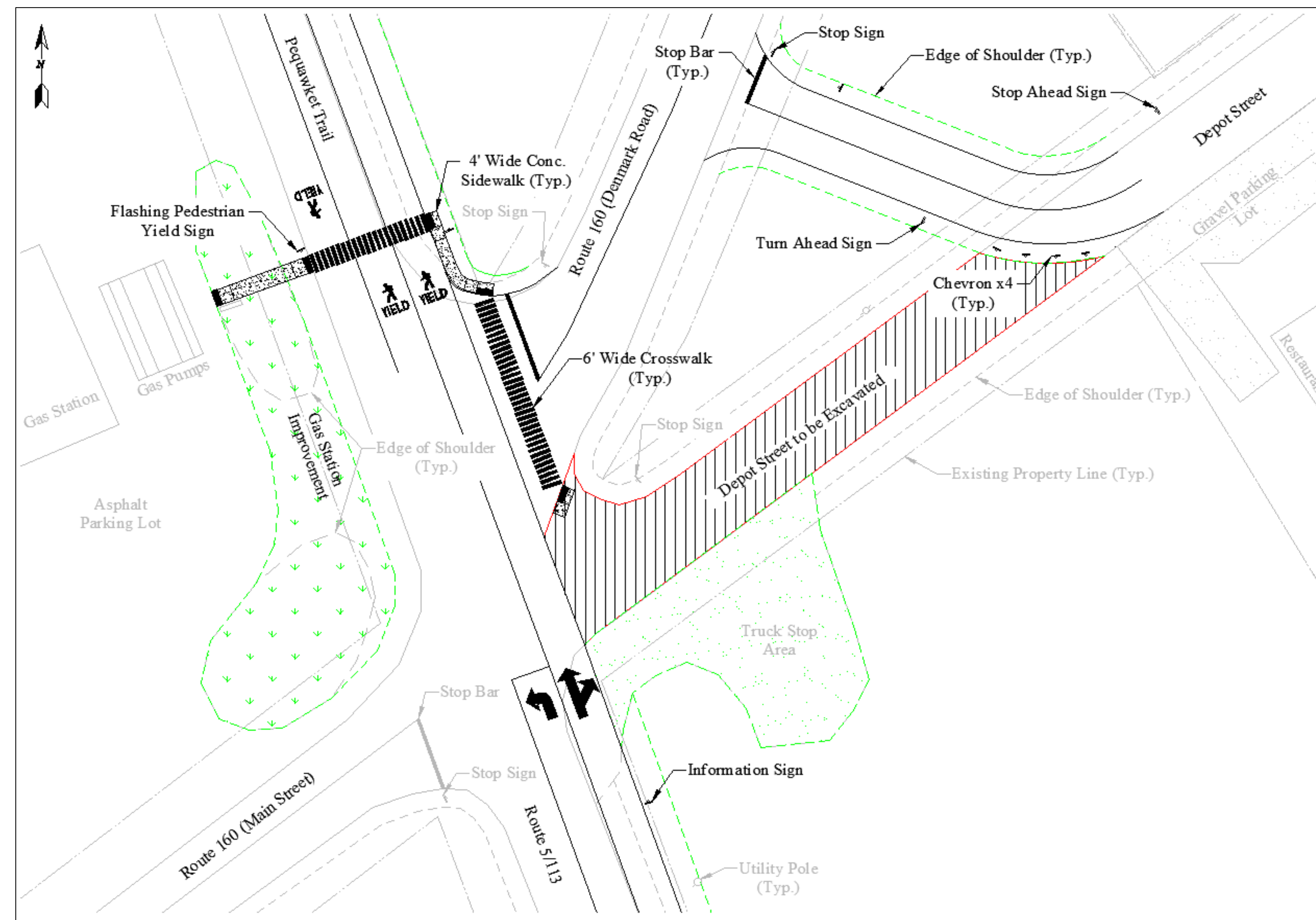
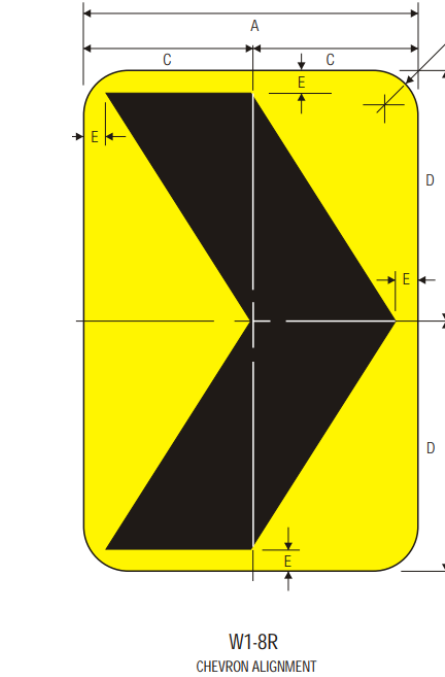
- Reduced Speed Zone Length = 1850'
- Taper Length = 625'
- Reduced Speed Limit = 40 MPH
- Crosswalk Width = 6'
- Optional Speed Radar Sign



For the final design selection, a redirection of Depot Street was established. This was determined to be the best choice by meeting the project goal with minimal disturbance to existing conditions. The redirection will reduce driver confusion leading to fewer crashes. The turning radius was chosen and designed for a Single Unit (SU) box truck.

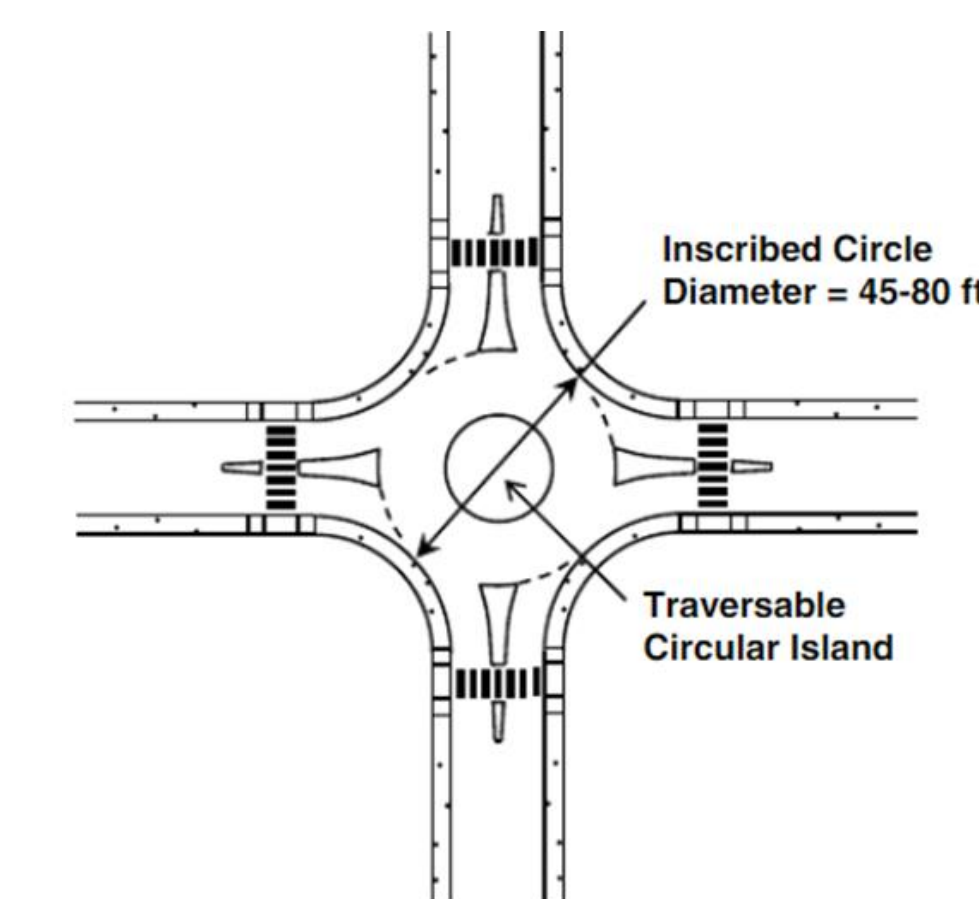
### Depot Street Information:

- Total Pavement = 3200 S.F.
- Shoulder Width = 6'
- Centerline Radius = 51'
- Inner Radius = 38'
- Outer Radius = 69'
- Speed Limit = 30 MPH

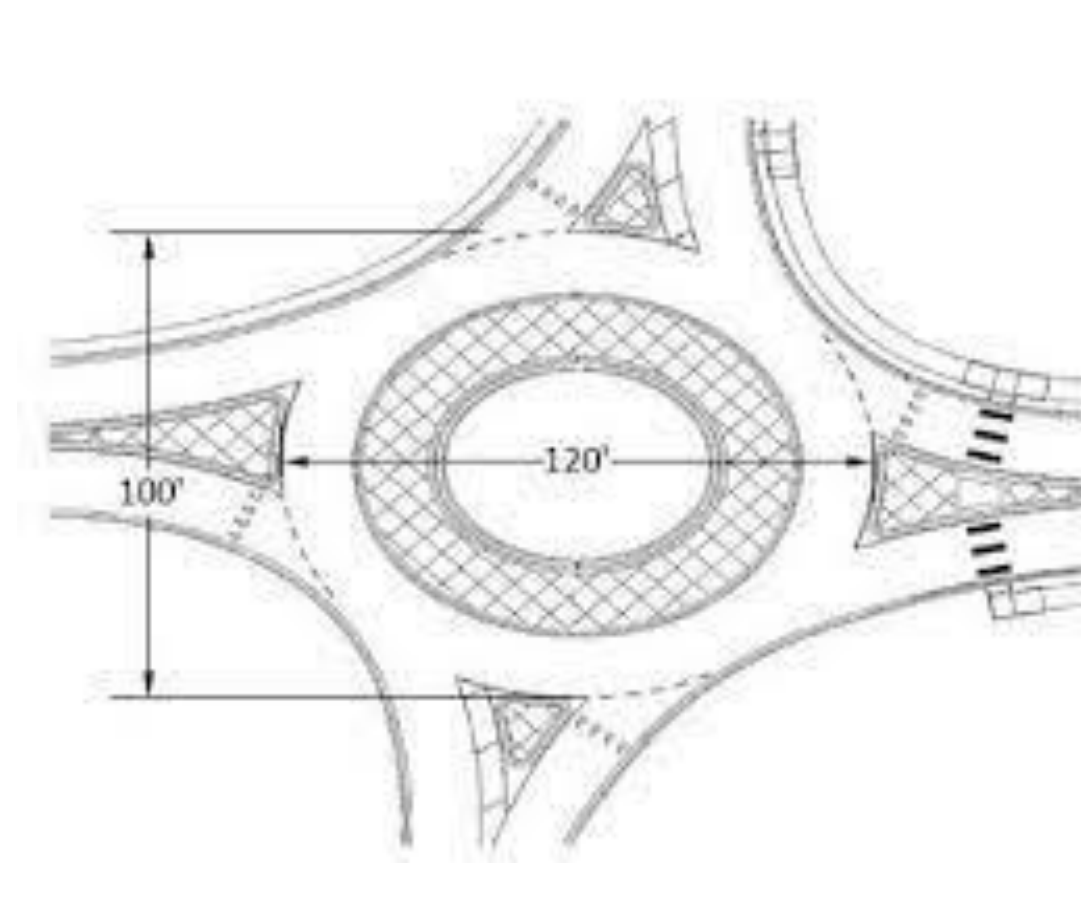


## Alternative Design Ideas

### Mini Roundabout



### Non-Circular Roundabout



### Traffic Lights



### Turning Lanes



## Cost Estimate

Item No.	Item Description	Unit	Calculated Quantity	Unit Price	Cost
201.11	Clearing and Grubbing	A	0.36102	31250	11281.88
203.20	Common Excavation	CY	1221.2	31.25	38162.50
203.21	Rock Excavation	CY	61.06	231.25	14120.13
202.20	Removing Pavement Surface	SY	4306.6	6.875	29607.88
205.11	Fine Grading	SF	21913	2.5	54782.50
304.15	Base Layer Gravel/Sand	CY	1006.3	37.5	37736.25
403.21	Hot Mix Asphalt, Machine Method, 3/4" Binder Mix	TON	147.88	128.75	19039.55
403.21	Hot Mix Asphalt, Machine Method, 3/8" Surface Mix	TON	259.98	275	71494.50
409.15	Asphalt Emulsion for Tack Coat	GAL	190.13	15	2851.95
606.13	31" W-Beam Guardrail- Mid-Way Splice - Single Faced	LF	500	56.25	28125.00
606.13	Guardrail Terminal End Single Rail	EA	2	5000	10000.00
607.16	Privacy Fencing	LF	243.7	15	3655.50
608.10	Reinforced Concrete Sidewalk	SY	37.4	162.5	6077.50
652.00	Maintenance of Traffic (Drums, Cones, Signs, Traffic Control)	UNIT	-	-	25284.64
202.12	Sawcut Bituminous Pavement	LF	209	31.25	6531.25
627.78	Retroreflective Paint Pavement Marking 4" Line	LF	5793.5	0.375	2172.56
627.18	Retroreflective Paint Pavement Marking 18" Line	LF	906	8.75	7927.50
627.41	Retroreflective Paint Pavement Marking, Symbol or Word	SF	67.3	8.75	588.88
718.00	Traffic Sign Type B	SF	76	225	17100.00
615.00	Turf Establishment with Mulch, Tackifiers, and Loam	CY	235	162.5	38187.50
656.75	Temporary Soil Erosion and Water Pollution Control	LS	-	6250	6250.00
639.04	Field Office Type C	MON	4	25000	100000.00
659.10	Mobilization (10%)	UNIT	-	-	50569.28
				<b>Total</b>	<b>581546.734</b>

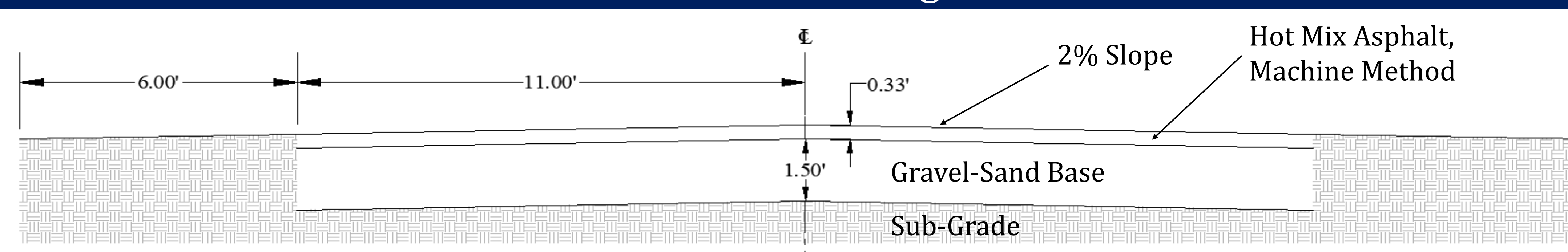
The estimates above are gathered from MaineDOT bid archives, selecting reasonable prices based on contractor rates from similar projects in 2023. The estimated total cost for this project is \$581,546.73

## Decision Matrix

Category	Weight (%)	Decision Matrix					Turning Lane + Redirection Combination
		Mini Roundabout	Non-Circular Roundabout	Traffic Light	Turning Lanes	Depot Street Redirection	
Safe Intersection Movements	24	9.7	9.7	10.0	8.9	9.0	9.3
Pedestrian Safety	24	6.4	6.4	7.0	6.0	6.4	6.5
Traffic Flow	18	8.2	8.2	3.0	8.5	9.6	9.1
Speed Reduction	15	8.5	8.5	7.0	8.0	6.0	8.0
Cost	8	3.5	2.6	5.3	5.2	7.1	6.8
Property Impacts	7	7.8	7.2	9.6	7.6	7.5	8.1
Time of Construction	4	3.2	3.2	3.8	5.0	6.1	6.0
Weighted Sum		7.6	7.5	6.9	7.5	7.7	8.0

The decision matrix allows for different categories based on the project goals; the chart above represents the best alternative when looking at the most important parts of the project. This matrix concludes that the selected design alternative will be the most beneficial option for the town of Brownfield, ME.

## Pavement Design



- Average Annual Daily Traffic (AADT) range from 1700 to 5000 vehicles within the intersection
- Equivalent Single Axle Loads (ESALs) range from just 44,348 to 565,000 on the most heavily trafficked road
- By NRCS Web Soil Survey, Type 1 subgrade
- The travel lane thickness of hot mix asphalt (HMA) and base aggregate thicknesses needed to support future traffic loads for this are 4" HMA and an 18" subbase with a 20-year design life

## Acknowledgements

Project Sponsor: Jordan Pike, PE  
HEB Engineers, Inc.  
Project Advisor: Dr. Eshan Dave  
University of New Hampshire

## References

- MaineDOT Guidelines on Crosswalks and Standard Details
- AASHTO Green Book Turning Radius
- 11<sup>th</sup> Edition Manual on Uniform Traffic Control Devices For Streets and Highways.
- MaineDOT Pavement Guide