

Traffic and Safety Improvement at a Busy T-intersection

Introduction

T-intersection of two county roads (Main Street and Side Street) poses **safety hazards** and **traffic delays**. Situation is exacerbated by a **heavily used trail 150 ft east of Main Street**. An adjacent **wetland** also had to be accommodated in the design. A team of five civil engineering seniors worked under the mentorship of two county engineers (a PE and an EIT) and two faculty members (a PE and a PE-PLS) to improve the intersection.



Existing Site Conditions



Project Goal

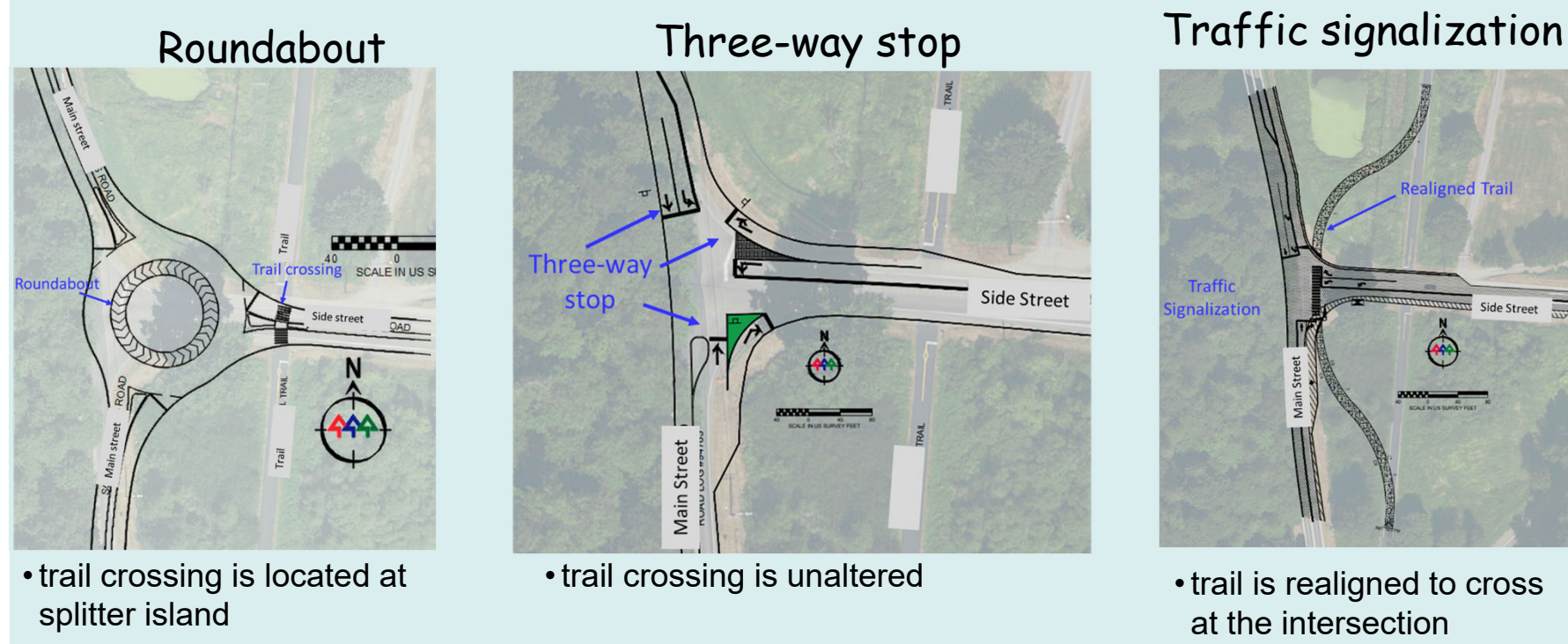
Improve the **Level of Service (LOS¹)** of intersection and **safety of pedestrians and trail users**. Reduce adverse impacts to wetland.
¹Qualitative measure of motor vehicle traffic flow. Ranges from A(best) to F(worst)

Team's Approach

- Brainstorm design options
- Create optional design concepts
- Evaluate options
- Select preferred alternative and take it to 30% design

Developed and Evaluated Alternatives

1. Developed preliminary design for three options:



2. Evaluated the three options and a no-build option based on seven factors & selected preferred alternative.

Cost
Used state bid tabs and historical bid prices to determine construction and maintenance cost.

Level of Service (LOS)
Analyzed traffic using software, Synchro®, to ensure LOS ≥ C

Right of Way (ROW) Acquisition
Used Civil 3D drawings to determine extent of ROW acquisition and cost

Environmental Impact
Assessed from earthwork involved, impervious area added, and if critical area (wetland) is impacted.

Options	Level of Service (LOS)		Cost		ROW Acquisition (sq. ft)	Environmental Impact		
	Main Street Northbound	Side Street Southbound	Construction (Million \$)	Maintenance (\$)		Earthwork involved (cu. yd)	Impervious area added (sq. ft)	Any critical area
Round About	A	C	2.9	5,000	7,000	1,700	14,000	yes
Three-way stop	B	C	0.7	1,000	1,000	800	10,000	yes
Traffic Signal	A	A	2.1	25,000	5,000	1,200	10,000	yes
No-Build	N/A	A	0	0	0	0	0	None

Driver Safety
Analyzed potential vehicle-vehicle and vehicle-pedestrian conflict points to maximize safety

Pedestrian Safety
Analyzed driver-trail user interaction due to trail alignment

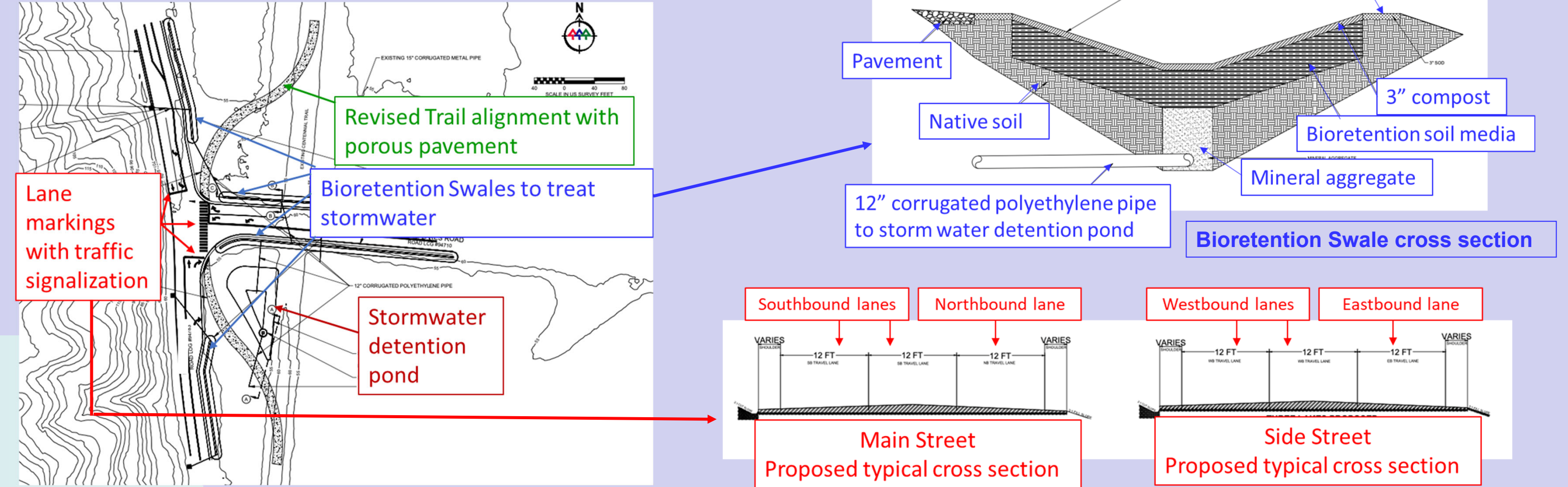
Results compiled into **Decision Matrix** (score 1 (weak); 5 (strong))

Options	Traffic Collision Reduction	Non-motorized improvements	Traffic Operations	Construction cost	Maintenance cost	ROW Acquisition	Environmental Impact	Total
Round About	5	1	4	1	3	1	1	16
Three way stop	4	1	1	4	4	5	5	24
Traffic Signal	5	5	3	3	2	4	4	26
No-Build	1	1	1	5	5	5	5	23

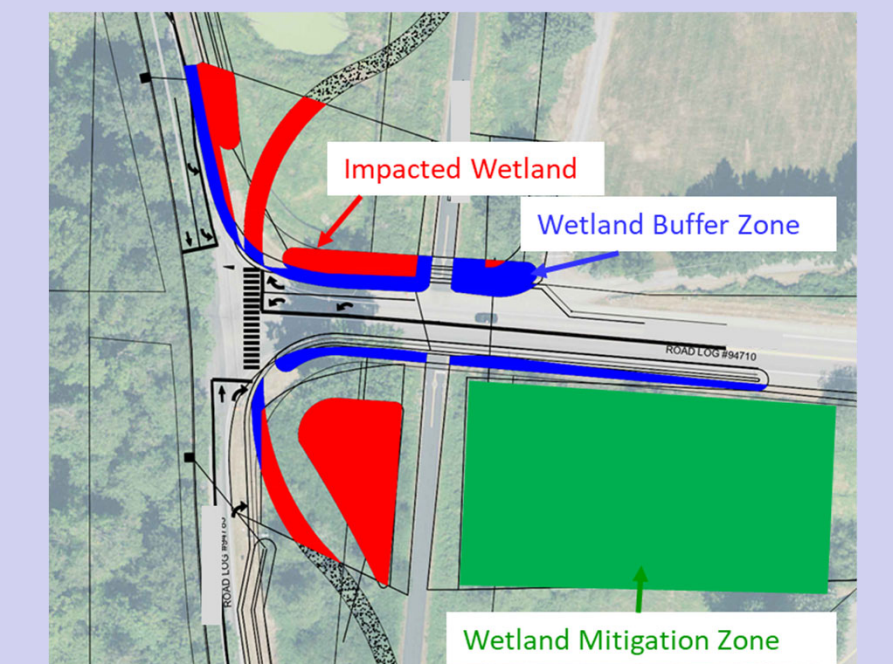
Preferred alternative

30% Design of Preferred Alternative - Traffic Signalization

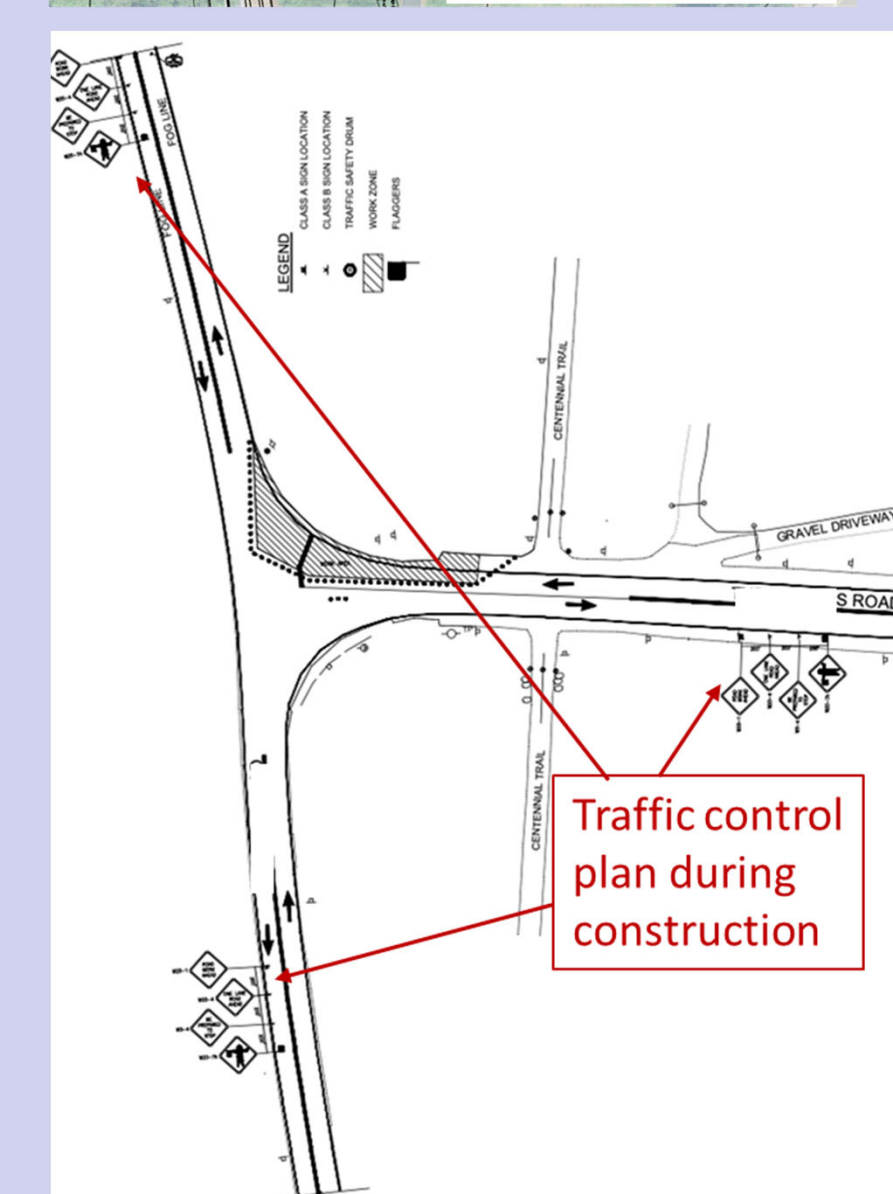
1. Team performed traffic warrant analysis to confirm **intersection merits traffic signal**. Designed **revised lane configurations and stormwater system**. Prepared professional quality engineering drawings (some excerpts of drawings are shown below).



2. Surrounding wetland was impacted by construction. The team dedicated a parcel of land south of Side Street for **wetland mitigation**. Action included removal of invasive plants such as black berry, planting of native species such as salmon berry and thimble berry, adding willows and woody debris which would encourage small, native animal species to return.



3. Team developed a **traffic control plan** to implement during construction. This included the signage, location of flaggers and marking of work zone (excerpt of west bound lane work zone shown on right).



4. Team came up with a **preliminary cost estimate** for the preferred alternative.

Construction Estimate*	\$1,426,000
Right-of-Way Acquisition	\$112,000
Preliminary Engineering	\$285,000
Construction Engineering	\$214,000
Total Project Cost	\$2,037,000

* Construction Estimate includes site preparation, grading, drainage, surfacing and asphalt placement, lane striping, erosion control, roadside restoration, and temporary traffic control

Public Health, Safety, Welfare Awareness

Improving driver, pedestrian and trail user safety and welfare was primary goal of project.

Preservation of wetland, and stormwater disposal brought awareness to public safety and welfare.

Knowledge and Skills Gained

Engineering & Technical Skills

- Developed working knowledge of several **Federal, State and County design guidelines, codes, specifications**.
- Used a transportation **engineering software** and a **drafting software**.
- Prepared students to enter the transportation engineering profession.

Professional Skills

- Developed **Oral presentations** to class, professional engineers on department advisory board, county & to local professional society meeting.
- Honed **technical writing** skills through proposal, progress and final reports, and emails.
- **Project management and leadership** skills: prepared agenda, ran meetings, followed up on action items; managed schedules, budgets; learned to work as a team in-person and in virtual settings.

Transportation Engineering for Roadway Design

Drafting for Engineering Drawings

Multi-disciplinary Nature of Project

Cost Estimating, Construction

Water Resources for storm water design

Environmental Engineering for wetland mitigation

Two faculty members supervised team (a PE and a PE-PLS)

Two engineers from County mentored team (PE and EIT)

Team presented to Department Advisory Board members (8 PEs & a Scientist)

Team competed at local engineering contest (5 PEs as judges)

County engineers, managers, construction personnel provided feedback on oral presentations; a drafter from the county provided guidance on preparing professional quality drawings.