Redwood Rd Corridor Expansion

Civil Engineering Capstone
Spring 2024

UVU CIVIL ENGINEERING

UDOT Keeping Utah Moving

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Project Objectives

- Provide UDOT plan sheets that cover the roadway widening, drainage, right-of-way, striping, and signage design.
- Assess existing conditions to analyze multiple widening options.
- Improve street lighting conditions to provide a safer roadway.
- Minimize impacts to public, right-of-way, and environment.

Design Requirements

- Two additional 12 ft traffic lanes.
- Designated East and West bound turn lanes for traffic reduction on Pioneer Crossing.
- Improvements to existing storm drain system.
- Protected left hand turn on 400 N.
- UDOT & other relevant design standards to be used as applicable.
- Environmental Study Impact.
- Storm drainage system analysis, and improvements.

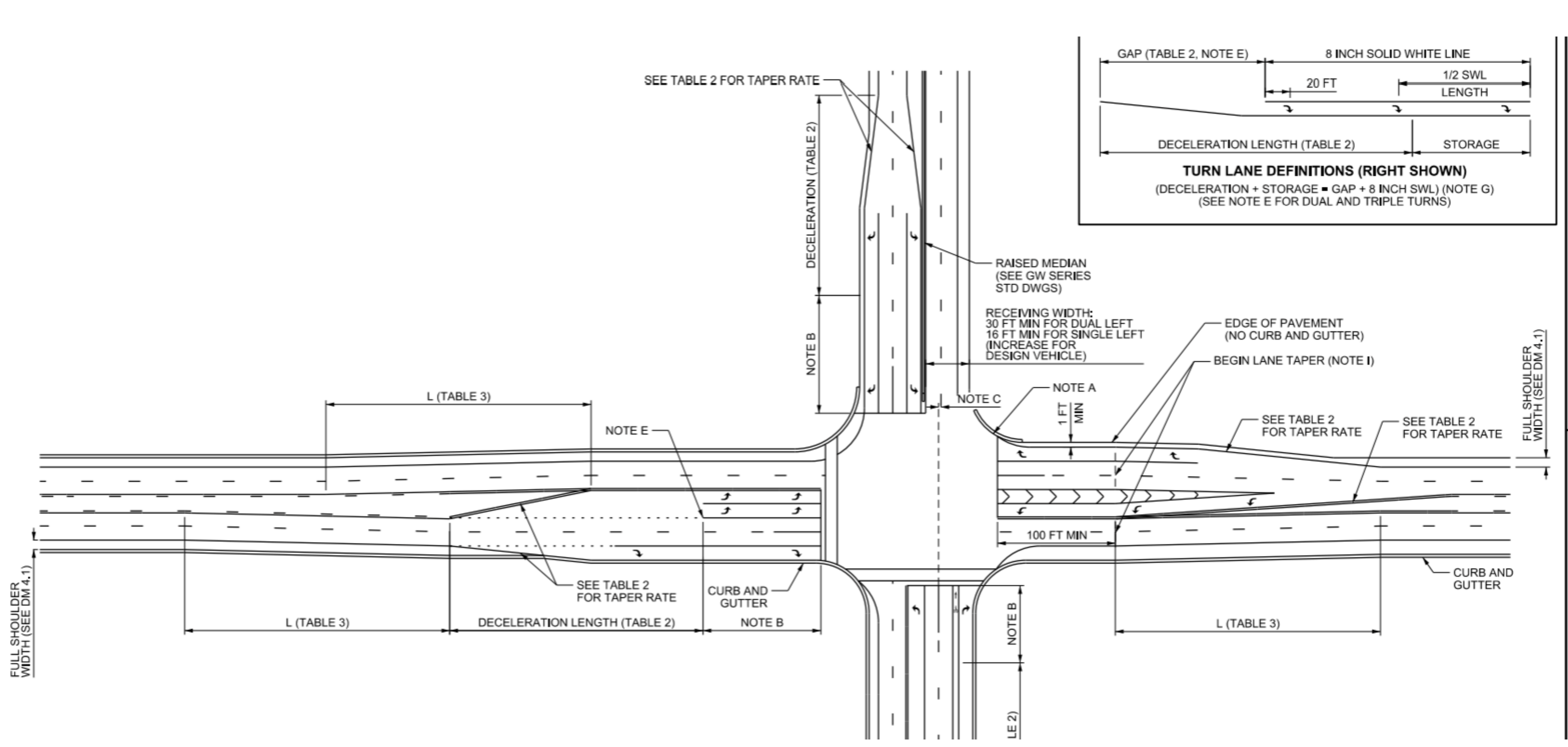
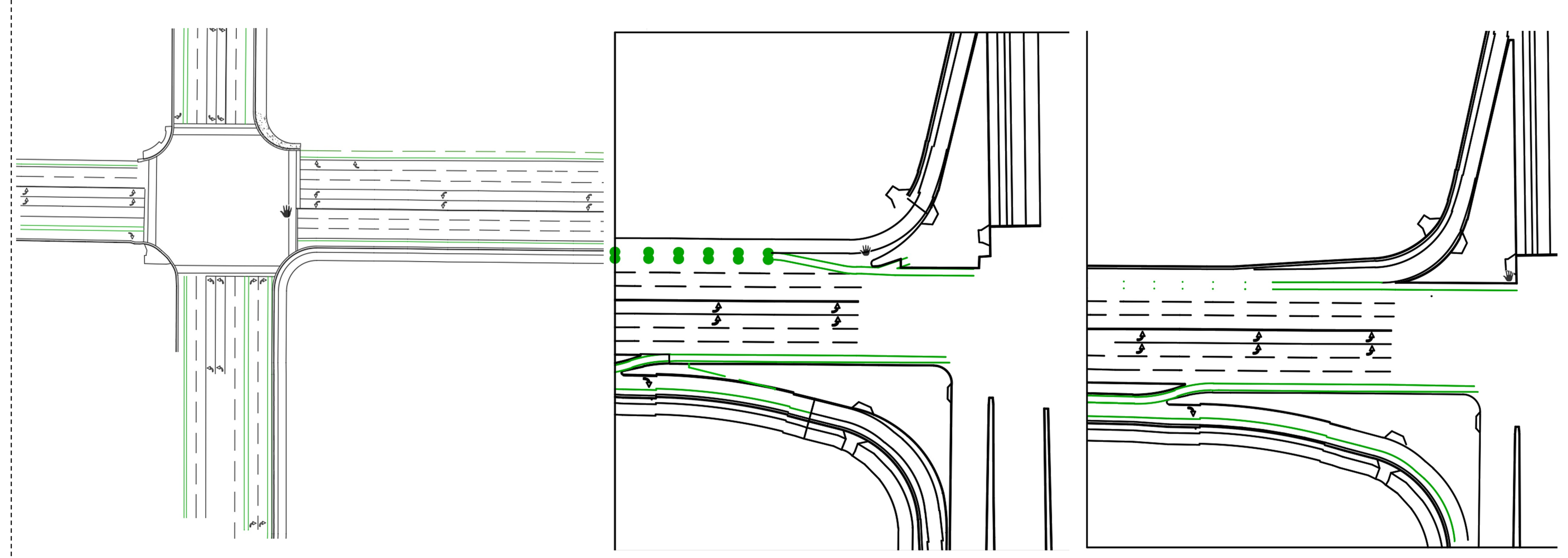


Figure 1. Example UDOT Standard Intersection Design Drawing

Alternatives

- Two Lanes on West Side
- One Lane on Each Side
- Two Lanes on East Side
- Protected Bike Lane on 400 N using a concrete median.
- Varying lighting methods on the roadway (bulb types & post types).
- Varying Bike routes on intersections.



Comparisons

Ranking Matrix

Project Concept Analysis			
Project	DESIGN 1	DESIGN 2	Ranking Notes
Roadway Design	5	5	Both Designs Meet AASHTO, UDOT, & Saratoga Springs Design Requirements
Traffic Safety	4	5	Design 1 met current standards, Design 2 Added Extra Bike Land Protection
Maintenance	4	3	The extra bike lane curb sections make Design 2 harder to maintain
Environmental	3	4	Design 1 impacts more pervious area, and impacts farmland. Design 2 impacts less
Public Involvement	4	3	Design 2 pushes nearer to the new development increases roadway noise for residents
ROW	2	4	Design 1 uses a signficantly larger amount of ROW aquisition
Cost	3	4	Design 1 costs 8% more
Overall Weighted Rating	25	28	

Street Light Comparison

User Impacts					
Lighting Type	Aesthetics	People	Plants, Animals, Bugs	Maintenance	Cost Benefit
Incandescent	Warm-Yellow Light	Lowest Light Produced	Attracts the Most Bugs	$1000/YR	Low Upfront Cost, High Maintenance Cost
Flourescent	Cool White Light	Second Lowest Light Produced	Attracts Second Most Bugs	$200 - $400/YR	Low Upfront Cost, Lower Maintenance Cost
Solar	White Light	Second Most Light Produced	Similar Attraction to LED's	Dust, Snow, and Moisture Buildup on Solar Panel	High Upfront Cost, No Maintenance Outside of Cleaning
LED w/ Solar Panel	Closest to Natural Light	Most Light Produced	Attacts Least Bugs	Dust, Snow, and Moisture Buildup on Solar Panel	High Upfront Cost, No Maintenance Outside of Cleaning

Material Impact									
Lighting Type	CO2 Impact	Purchase Costs	VOC's	Groundwater Impact	Smog	Lifespan	Efficiency	Pros	Cons
Incandescent	Heat Generation Wastes Energy Producing Light	$750	RMP	None	RMP	250-2000 Hours	10 Lumens/Watt	Low Production Costs	High Heat Output
Flourescent	Less Heat Generation Wasting Less Energy	$850	RMP	None	RMP	10000-20000 Hours	65 Lumens/Watt	Produce Less Heat than Incandescent	Long Tiimes Before Max Brightness is Achieved, Use Mercury, Sensitive to Cold and Wind
Solar	Production Creates CO2 but After Production there is None	$1,500	None	None	None	50000 Hours	125 Lumens/Watt	No Electricity Required	Pricy Initial Investment, Dependent on Sunlight
LED w/ Solar Panel	Production Creates CO2 but After Production there is None	$2,700	None	None	None	60000 Hours	120 Lumens/Watt	Most Closely Mimics Natural Light, Omnidirectional	Pricy Initial Investment, Dependent on Sunlight

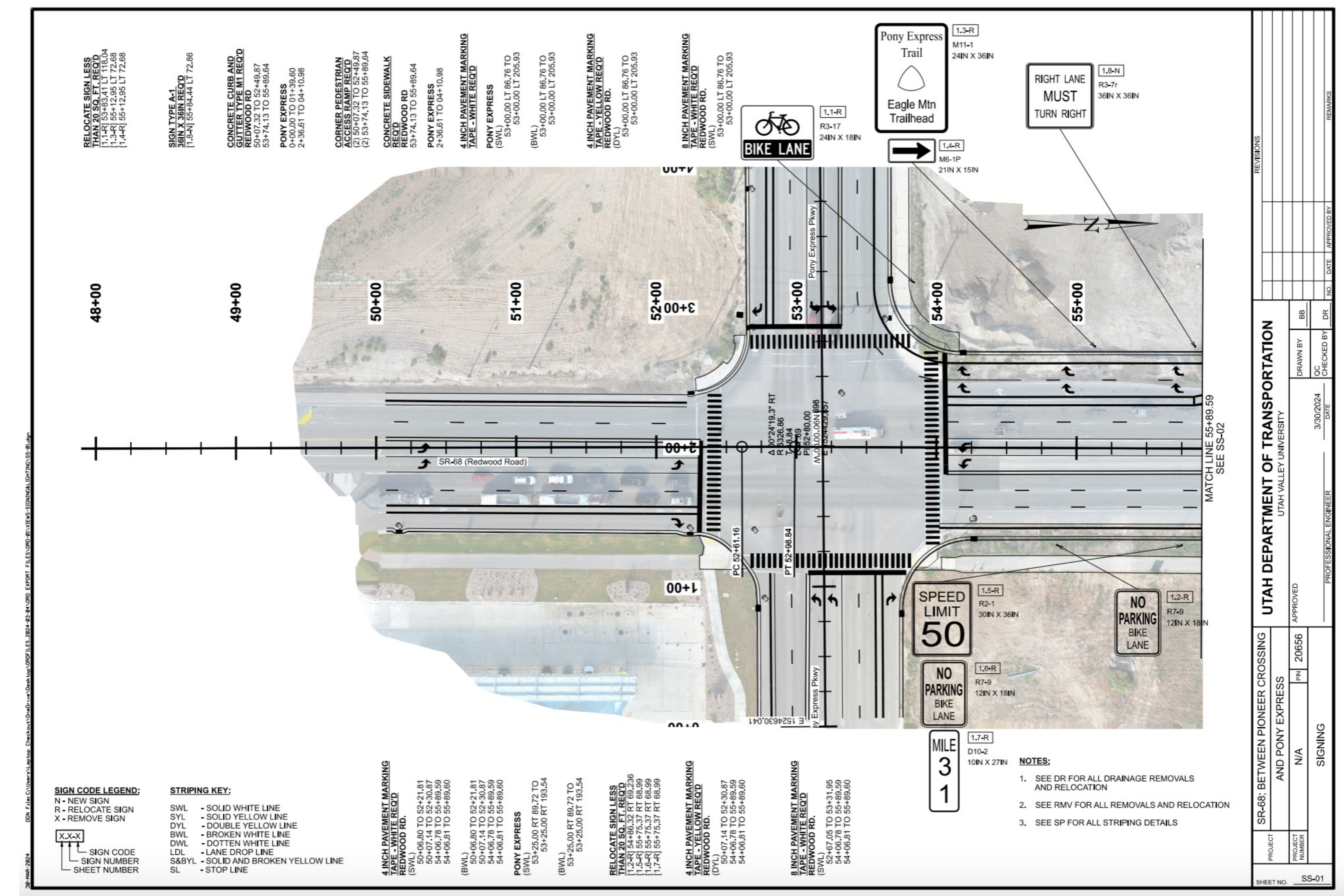


Figure 2. Example Signage Plan Sheet

Recommendations or Lessons

- Geotechnical Report is recommended for formal construction plans.
- Costs decidedly determined the final design choice.
- Ease of Maintenance should influence the design choices.

References or Software and Resources

- APWA Manual of Standard Plans
- NRCS Web Soil Survey
- Policy on Geometric Design of Highways and Streets (AASHTO)
- UDOT Roadway Design Manual
- UDOT Standard Drawings
- Utah County Parcel Map
- REVU Bluebeam
- Bentley Open Roads Designer
- AUTOCAD Civil 3D
- Microsoft Office 365