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Civil & Construction Engineering

CAPSTONE

14600 S TRANSPORTATION CORRIDOR STUDY
PROJECT ID: CEEN_CPST_012

by

Mickelson & Co
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A Capstone Project Draft Report

Submitted to

Addison Mitton
Bluffdale City

Department of Civil and Construction Engineering
Brigham Young University

April 10, 2023

Executive Summary

PROJECT TITLE: 14600 S TRANSPORTATION CORRIDOR STUDY
PROJECT ID: CEEN_CPST_012
PROJECT SPONSOR: Bluffdale City
TEAM NAME: Mickelson & Co.

This project provides a corridor study on 14600 S from S. Redwood Road east until the road reaches the train tracks. This corridor study assesses the roads current demand and design as well as anticipating the future needs of the road. The study considers the Level of Service of the road, cost analysis of different options, pedestrian impact, environmental impact and drainage plan. It includes typical cross-sections of different options.

The result of the study is our recommendation of leaving the lanes of the road as presently constituted and adding a sidewalk and biking lane (utilizing the existing shoulder where possible to limit widening the road) along the length of the corridor. Additionally, we recommend a future study to determine if a four-way signalized intersection at S1690W would improve the level of service for the S1690W southbound approaching traffic.

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Introduction

The purpose of this corridor study is to evaluate 14600 S from Redwood Road going east until the road reaches the train tracks signalized intersection. The intent is to see measure the existing level of service (LOS) and the LOS in future years. We intend to maintain a LOS C or better through the year 2040. Included are possible cross sections with corresponding cost analysis, a pedestrian study, and note on existing/ proposed drainage and wetlands. We recommend that we keep the road as is and reevaluate it in several years because our model (using the program Vissim) indicated that at the worst part of the road would be LOS C in 2040.

Schedule

10/17/22	Capstone Kickoff Dinner
11/21	Statement of Work
1/17/23	Meeting with Dr. Greg Macfarlane
2/7	Meeting with Addison Mitton (Bluffdale City)
2/14	Meeting with Dr. Greg Macfarlane
3/7	All data collection (traffic intersection counts) completed
3/14	Meeting with Dr. Greg Macfarlane
3/21	Meeting with Addison Mitton (Bluffdale City)
3/27	Cross sections drafted
3/29	Vissim Model Completed
4/5	Poster finished for presentation to undergraduate seminar
4/10	Draft Corridor study completed
4/13	Presentation in Undergraduate ASCE Seminar
4/17	Power Point completed for client presentation
4/19	Final Corridor study completed and sent to client
4/17	Capstone Closing Dinner
TBD	Presentation to Bluffdale City

Assumptions & Limitations

Due to the assignment being during the Fall/Winter, we are assuming that our results will be the same throughout the whole year. This is unlikely considering the pedestrian and cyclist counts we got are significantly lower than those that are expected during the summer months.

We gathered turn counts during peak hour (5-6 PM on separate weekdays). These results are likely not valid for weekends and may vary throughout the year. We also had to assume there is similar traffic on each weekday.

The traffic growth rate was calculated using the projections on the Wasatch Front Regional Council website and could be inaccurate.

The signal timings used in the Vissim model were created by our team and may not accurately represent the actual timings of the signals. This would affect the overall accuracy of the Vissim model and could affect the Level of Service analysis.

Many aspects of the cost estimate are based on the prices of a wide range of other projects mixed with some calculations done using UDOT's cost estimator tool. For exact estimates and bids, a much more precise calculation process is required than we were able to provide in this study.

Design, Analysis & Results

Pedestrian Study:

The pedestrian study consisted of one member of our team visiting the site and counting pedestrians and cyclists at both the S Redwood intersection and the Jordan River Parkway Trail Crossing. As addressed in the assumptions and limitations section the counts were completed in the winter and so the gathered numbers of cyclists and pedestrians at both locations was zero. Additionally, W14600S does not have a dedicated bike lane and only portions of the road have sidewalks.

For the pedestrians in the Vissim model certain assumptions were made and they will be explained here. the Vissim model of the current road (2023), we assumed that the pedestrian traffic on the Jordan River trail crossing would be 20 pedestrians per hour. For the crosswalks at the S Redwood intersection, we assumed zero pedestrians per hour because it is a major road and there are no nearby businesses, parks, or other attractions that would draw pedestrians. Additionally, W14600S does not have a dedicated bike lane or consistent shoulders and only portions of the road have sidewalks, so all pedestrian and cycling traffic on this road was ignored for Vissim modeling. For the 2030 and 2040 forecast Vissim models, the growth rate found for the vehicular traffic (explained in the level of service analysis) was applied to the 2023 pedestrian and cyclist counts to find the corresponding forecasted counts.

The Vissim models show no traffic or level of service issues for W14600S with the Jordan River Trail pedestrian crossing, however there are some serious safety concerns. The Vissim model used a “conflict zone” priority rule that simulated a yield sign. This means that the cars would yield if and only if they would otherwise hit pedestrians in the crosswalk and continue at full speed otherwise. This meant that sometimes cars would drive through the crosswalk at full speed narrowly missing the pedestrians (there were never any vehicle-pedestrian collisions).

Our current recommendation is to complete another pedestrian study in the summer to verify that the numbers used in this study were accurate. Depending on the results of this study (get similar or greater pedestrian counts) and if a safety issue is identified, we recommend an additional study investigating the effectiveness of current traffic control devices at the Jordan River trail crossing. Additionally, adding a bike lane and sidewalk on each side of the road would be a good option, budget permitting (see Cost Analysis).

Level of Service (LOS):

The Level of Service (LOS) analysis was completed in Vissim, and a summary of the complete data set is available in Appendix C. Here is a brief summary of the results.

Table 1: Vissim Calculated LOS for Roads and Intersections

Average Level of Service			
Intersection/Road	Level of Service (LOS)		
	2023	2030	2040
S Redwood Intersection	C	C	C
S1690W Intersection	A	A	A
Jordan Trail Intersection	A	A	A
Spring View Intersection	A	A	A
Track Intersection	B	B	B
W14600S Road	A	A	A

We created a Vissim model of the W14600S road shown in the images below starting at the S Redwood intersection and ending at the train track crossing. The traffic information came from traffic turning counts at S Redwood, S1690W, Spring View Pkwy, and the train track crossing intersections. See Appendix C for exact input numbers.

The model itself utilizes various assumptions that will be discussed here. Our group was unable to get the signal timing data for the S Redwood intersection and so we programed our own signal timing. We also assumed pedestrian traffic as described in the "Pedestrian Study" section. Additionally, we generated the signal timing for the intersection located at the train tracks by ourselves.

We edited the model to account for the growth rate in traffic on the road. Using the Utah Statewide Annual Average Traffic (AADT) – Historic & Forecast tool located on the Wasatch Front Regional Council's website we determined that the average growth rate for the model should be 0.0209.

We encountered some issues with the model and the vehicle's decision-making AI at the S Redwood intersection. Vehicles were attempting to merge into the turn lane and would block traffic. To remedy this, we separated the turn lanes from the through lanes thus forcing all the vehicles to start in the correct lanes instead of randomly changing lanes to reach their desired lane. This model is described as "fixed" results in the appendix and was used in creating recommendations and summary tables.

Table 2: Areas of Concern (Unacceptable LOS)

Areas of Concern			
Road	Level of Service (LOS)		
	2023	2030	2040
S Redwood SB to W14600S EB	E	F	F
W146000S WB to S Redwood NB	B	C	D
W146000S WB to S Redwood SB	E	E	F
S1690W SB to W14600S EB	C	C	D
S1690W SB to W14600S WB	B	C	D

The table above shows a handful of road links that have unacceptable levels of service. The left-hand turn lane from the S Redwood south bound to W14600S east bound and both turn actions on W146000S west bound to S Redwood are showing levels of service of D or worse at some point. This failure in level of service is likely a result of poor signal timings for the S Redwood intersection and could probably be remedied through optimization of the intersection signal timing.

The final area of concern is the S1690W south bound turning traffic. This issue isn't urgent, as it occurs only in the 2040 projections. However, a possible solution that should be further investigated could be to create a four-way signalized intersection at W14600S and S1690W. This could improve the level of service for both turning actions and would likely not drastically decrease the level of service for W14600S (LOS A).

The results of the Vissim model Level of Service analysis support a recommendation to make no major changes to the road. This analysis and corresponding recommendation are subject to change if any assumptions made were incorrect. Additionally, this study didn't address any safety concerns, or traffic growth not accounted for on the WFRC website.

Typical Cross Sections:

The typical cross sections for our proposed corridor were created by following the general format found in the publicly available cross sections on the City of Bluffdale official website. They were drafted in AutoCAD 2023, and the dimensions reflect the recommendation that we must not make any major changes to the road for the next project planning stage. This would include keeping the 12 ft travel lanes in each direction and maintaining the 4 ft shoulders on both sides to be used as biking lanes connecting with the ongoing project involving the railroad and overpass at the East end of our corridor. As requested, we also have typical cross sections representing completing the sidewalks on both sides of the road, and another showing an increased width to the shoulders for greater clearance in the bike lanes. These cross sections are shown in the following figures.

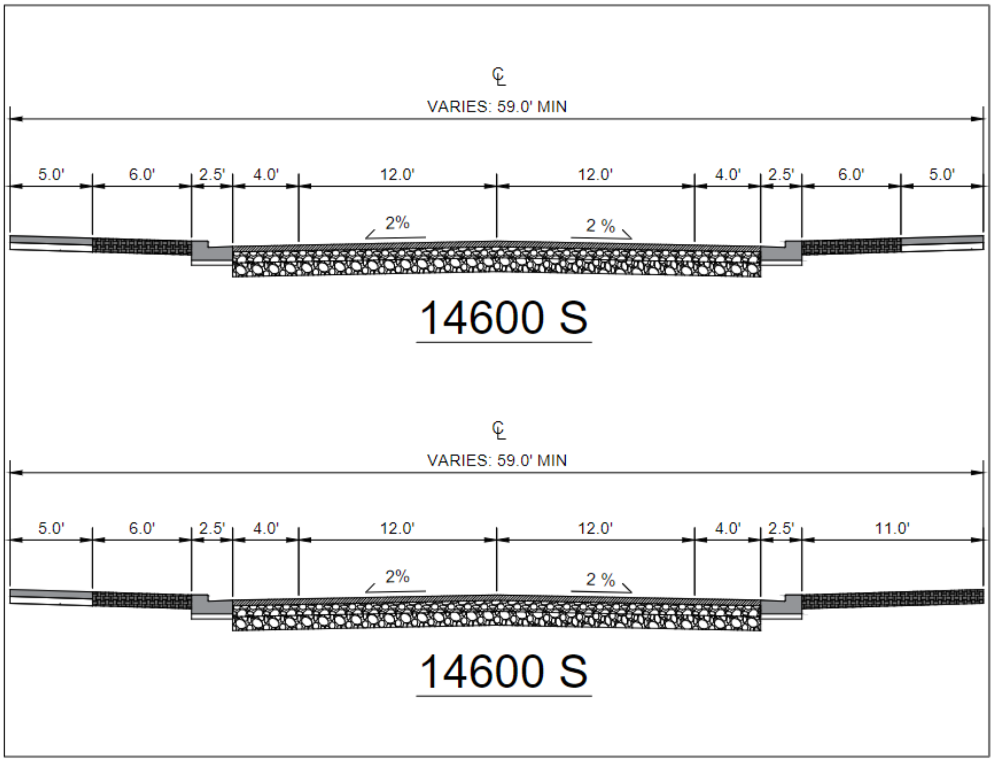

Figure 1: *Existing Cross Section*

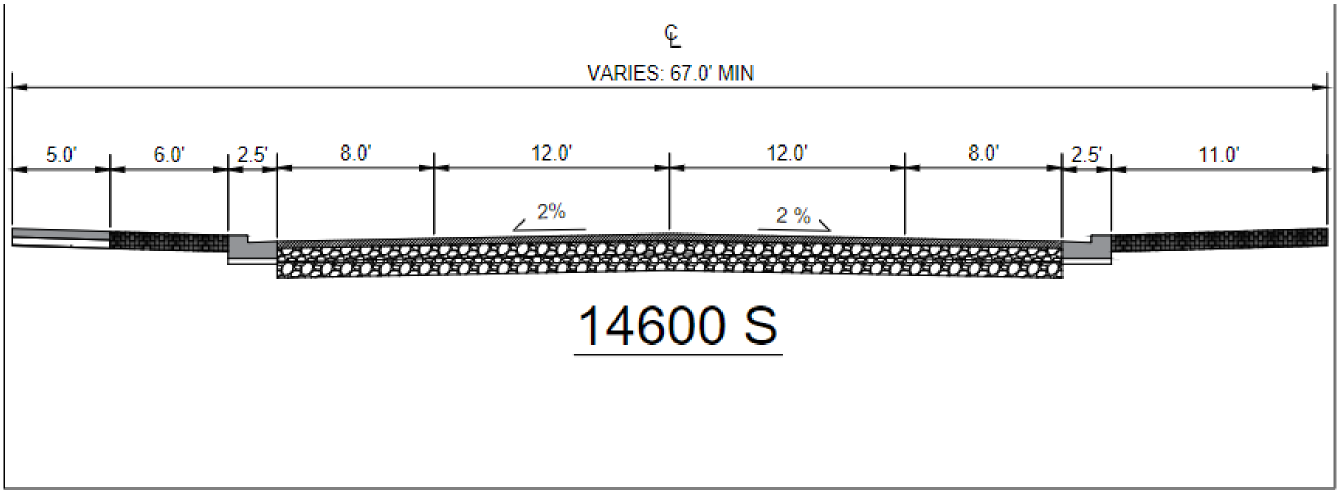

Figure 2: *Proposed Cross Section With Increased Shoulder Width for Bike Lane*

Cost Analysis:

The cost analysis for this project includes accounting for the cost associated with several different aspects of the construction process, namely cost of material, land, labor and user cost among other things. In trying to gauge an accurate prediction of how much this project would cost we decided the best indicator was past projects of similar scope. We found these projects by looking at the past and current State Transportation Improvement Plan (STIP). Based on the actual cost of projects done in 2019 in Millcreek as well as various other sidewalk addition projects included in the 2023 STIP, extending the sidewalk along the south side of W 14600 S will cost approximately $900,000. Extending the sidewalk along both sides of the road will increase the cost to approximately $2,100,000. The cost of widening the road to accommodate bike lanes while keeping the shoulders and lanes as presently constituted would increase the cost drastically based purely on material and land acquisition, not to mention problems with running into the wetlands. If bike lanes are to be added it makes the most sense from a cost standpoint to repurpose the existing shoulders into bike lanes. This would include the cost of repainting the lines and extending the shoulders in certain places to ensure the four-foot-wide bike lane for the duration of the entire corridor.

Figure 3: Example Cost Analysis Comparative to this Study

Drainage:

Figure 4: *Elevation Countours Over Area of Study*

As can be seen in **Figure 3**, the surface of the corridor is relatively level other than near the intersection with Redwood Road. The storm-drain over that section of road drains to the East into the Jordan River. Any runoff on the East side of the river will flow West also discharging into the Jordan River. This is in accordance with the City of Bluffdale Stormwater Management Plan 2020. Due to the large channel size of Jordan River, any additional runoff excess due to a change in cross section is not expected to require additional storm water detention. Any changes to inlet/outlet locations are not required for any recommended changes to corridor cross section.

Wetlands:

Figure 5: *Map of Wetland in the Area of Study (National Wetlands Inventory)*

Table 3: Wetlands Information

NWI Code:	Description:
R2UBH	Riverine habitat (Jordan River)
Rp1SS6	Forested/Shrub Riparian
PEM1A	Freshwater Emergent Wetland
PEM1C	Freshwater Emergent Wetland
R4SBCx	Riverine habitat (canals)
PUBFx	Freshwater Pond (excavated)

There are several types of wetlands along the corridor. They are classified are all riparian/riverine habitats and exact details can be found by using the National Wetlands Inventory Code provided in **Table 4**. For future extensive construction care will be needed to preserve wetlands and will require approval from the proper channels.

Related Issues

Other issues not included in this report but may be of concern are (but not limited too):

- Pollution impacts resulting from increasing traffic volumes.
- Crosswalk safety of adding an additional lane (ie visibility issues of having a 5-lane roadway and not being able to see past a car waiting for a pedestrian to cross)
- How this corridor performs in reference to other corridors (for more information see Bluffdale Transportation Plan 2020).
- How this corridor serves UDOT's master plan as a minor arterial.
- Support from current residents
- Large scale environmental impact

Lessons Learned

- Bring a coat when doing traffic counts in February!
- There are many criteria to consider when making large scale infrastructure decisions. Because of the complexity of the problem, there may not be a clear cut "correct" answer.
- Communication with your team/client is essential to make a project a success.
- There are often several different ways to go about making decisions on a project. The most important thing is using trustworthy resources and being able to explain your reasoning and process for how you arrived at your conclusions.

Conclusions

The pedestrian study demonstrated that the current pedestrian and cyclist infrastructure is inadequate. The road doesn't have continuous sidewalks on both sides so therefore it is difficult to use as a pedestrian and it doesn't adhere to ADA standards. The road does not have consistent shoulders and so cyclists would have to use the road, which with a 35-mph speed limit could be dangerous and lead to traffic issues.

The level of service (LOS) analysis showed that the corridor has and will maintain a LOS of grade C or better until 2040. Additionally, the major areas of concern in the S Redwood intersection are strongly influenced by our assumptions and should be verified before any major decisions are made based on those results.

Our cross-section research showed us two possible cross sections to choose from. The primary option has four-foot shoulders, and the other has eight-foot shoulders.

The cost analysis was a comparison of our project to another similar project and gave us general estimates of the cost. We determined that the cost of adding lanes or extending the shoulder to the eight-foot option would be prohibitively expensive primarily due to the land acquisition cost.

The drainage study revealed that the existing drainage system (the Jordan River) would be sufficient for any recommendations we made, and therefore had little influence on our final decision for our recommendation.

The wetlands study allowed us to pinpoint all possible corridor expansion conflict areas. For most of the corridor the wetlands will not influence decision making, but for certain portions on the south side of the corridor it would become an issue. Expanding the road to two lanes in each direction or even adding eight-foot shoulders would require communication with the appropriate environmental and government groups.

The combination of these studies and their corresponding results allowed us to reach the recommendation presented in the following section.

Recommendations

Our team's recommendation is to add a four-foot-wide bike lane and sidewalk (detailed in cross-sections) to each side of the existing road. We would utilize the existing shoulder of the road as the bike lane where possible and purchase and add to the road where there is insufficient space. Additionally, we recommend a follow-up study of the Jordan River Trail crossing to determine if the current traffic control device is sufficient to ensure pedestrian safety.

The Level of Service analysis showed no imminent need for major road improvements. Therefore, we suggest the road stay as it is currently except for some minor adjustments. Additionally, in five to ten years we recommend another corridor study, and a revision of our current recommendations based on the results. We recommend that the S Redwood intersection signal timing is optimized to mitigate the concern areas listed in the Level of Service Analysis. Additionally, we recommend that the addition of a four-way signalized intersection at S1690W be thoroughly studied in the suggested future corridor study. We believe that the addition of a traffic control device at this intersection could improve the level of service for the S1690W southbound turning actions.

Once a specific plan for improvement of the corridor is made, a more in-depth cost analysis utilizing Bluffdale's costs (projections based off their other recent projects) of these suggested changes will be required to get more precise cost predictions. We also recommend that assumptions be verified and corrected if so required to improve the accuracy of this corridor study.

Appendix A: Resumes

Trevor Mickelson

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SKILLS

- AutoCAD
- Microsoft Excel
- Revit
- Calculating Shear and Gravity Loads

WORK EXPERIENCE

Structural Engineering Intern York Engineering March 2022 - Present
- Engineer residential homes
- Works directly under several Professional Engineers
- Writes correction letters when specified plans are not met or when unforeseen problems arise.

Head Tutor Wasatch Tutors September 2020 – March 2022
- Training and supervising a team of tutors
- Working one on one with a wide range of age and capability in students
- Working with customers who come in with concerns or scheduling issues.

EDUCATION AND TRAINING

High School Diploma Lone Peak High School | Highland, UT, United States | 2016
Three years of College Experience Brigham Young University Provo UT, United States

VOLUNTEER EXPERIENCE

LDS Service Mission in Singapore/Malaysia
- Served as a missionary for 2 years (June 2016-June 2018)
- Worked hard and efficiently everyday
- Set goals and made specific plans to achieve them
- Evaluated performance and found ways to improve
- Managed responsibilities independently
- Developed the ability to work well with people from different backgrounds

Robert W Mickelson

169 Wymount Terrace, UT 84604801-636-0872 robertwmickelson@gmail.com

Education

Brigham Young University, BS Civil-Engineering April. 2023

- Engineering Drafting and Surveying w/AutoCAD & Revit (*100+hrs*)
- Computational Methods w/*emphasis* on Excel and VBA Programming (*100+hrs*)
- Global Leadership w/*emphasis* on Team Development

Employment

Wasatch Tutors ***Lead Tutor*** July 2019 – Present

- Set plans and expectations with students to achieve defined goals by a specific time (*ie offered exam days*)
- Created and developed Wasatch Tutors lesson plans, review worksheets, and practice tests to help prepare students for exams and college entrance exams
- Led team meetings for tutors
- Reviewed and assisted tutors with developing and improving effective teaching techniques.

The Church of Jesus Christ of Latter-Day Saints,
Volunteer/Missionary in Bangkok, Thailand July 2016 – July 2018

- Learned and taught in Thai language
- Led other missionaries in daily activities
- Initiated, facilitated, and moderated classroom discussions.
- Taught beginning and advanced writing and communication classes.

Domino's Pizza, ***Assistant Manager*** Dec. 2018 – June 2019

- Managed inventory supply, orders, and expiration in a time and cost effective manner.
- Oversaw employees training and quality of performance
- Handled customer complaints and satisfaction through positive interaction

Other Skills/Certifications/Experience

ASCE Member – Coordinated, and prepared for ASCE social events, 2021

Joseph Wells

josephwells@studentbody.byu.edu | (719) 466-9768 | www.linkedin.com/in/joseph-wells-byu

Education

BS, Civil and Environmental Engineering Aug 2018 – Dec 2023
Brigham Young University – Provo Utah

- 3.85 GPA

Relevant Course Work

Engineering Drafting with CAD Apps

- Designed 3D model of a basic home using Autodesk Revit

Structural Analysis

- Built a program in python to calculate force in each member of a frame based upon external loading.

Professional Experience

Police Technician May 2021 – Present
Brigham Young University – Provo, UT

- Manage and troubleshoot over 2500 security cameras to maintain student safety on campus
- Collaborate with and solve technological problems for individuals of varying technological literacy to increase workplace productivity
- Created and update a digital database of over 90 computers and corresponding monitors to maintain functional and modern workstations for department employees

Fire Alarm Inspector June 2020 – August 2020
Meridian Fire and Security LLC. – Denver, CO May 2019 – July 2019

- Inspected all elements of fire response systems including; detectors, alarms, sprinklers, and fire extinguishers to verify functionality and ensure tenant safety
- Wrote detailed reports in Microsoft office programs to inform employer and customer of the condition of fire response system to ensure compliance with local code

Skills and Activities

- Programs: Microsoft Office, Civil 3D and Revit, Arc GIS Pro
- Computer Languages: VBA and Python
- Spanish: Intermediate Fluency
- Eagle Scout

Volunteer Experience

Full Time Representative July 2019 – April 2020
The Church of Jesus Christ of Latter-day Saints – Barranquilla, Colombia

- Communicated in Spanish 10-12 hours per day to build relationships with local people
- Set and achieved goals based off key indicators on a weekly basis to increase effectivity.
- Organized and participated in regular service projects to help local people.

Clinton Childers

9876 Gairlock Circle | South Jordan, Utah | (385)-231-6736 | crchilders444@gmail.com

Education

Bachelors, Civil Engineering, Brigham Young University, Provo, UT, April 2023

- 3.82 GPA
- Regent's Exemplary Scholarship

Experience

Teaching Assistant, Brigham Young University, Provo, Utah, August 2021-Present

- Organized course materials for economics, fluid mechanics, and content about sustainable infrastructure
- Graded and gave feedback to assist in the learning process of over 150 students.

Sales Floor Associate, Walmart, Orem, Utah, July 2020- August 2021

- Assisted with customer needs
- Worked in various departments collaborating with many different teams
- Provided training to several new associates

Hydroseeder, Summit Seeding, West Jordan, Utah, Oct 2019 – July 2020

- Operated and helped maintain machinery
- Frequently interacted with clients and other teams in construction environments

Volunteer Representative, The Church of Jesus Christ of Latter-day Saints, Mexico City, Mexico, October 2017- October 2019

- Provided leadership, development, and training for other volunteer representatives
- Gave10 hours of service daily, assisting others in their physical, spiritual, and emotional needs

Sanitation Specialist, Jordan School District, South Jordan, Utah, 2015- June 2017

- Worked in a team to maintain hygienic integrity of a local elementary school
- Trained several new team members

Miscellaneous

- Eagle Scout, which included leading a team of over 20 people in the renovations of a small building
- Member of ASCE

Skills

Computer

- Proficient in Microsoft Office, including VBA programing

Technical:

- Experience in AutoCAD, Civil 3D, and Revit
- Basic programming in Python and R languages

Foreign Language:

- Fluent in Spanish

Appendix B: References

https://wfrc.org/Programs/TransportationImprovementProgram/2020_2025ProjectPresentations/2019SLAreaTAPProjectPresentation.pdf

https://udot.utah.gov/connect/about-us/commission/stip/

https://www.utah.gov/pmn/files/626567.pdf

https://wfrc.org/traffic-volume-map/

Appendix C: Vissim Model Data

2023 Vissim Traffic Input Numbers

Road Name	Volume of Vehicles (Vehicles per hour, 15 minute intervals)			
	0-15	15-30	30-45	45-60
S Redwood SB	2176	2220	2168	2128
S Redwood NB	1456	1532	1384	1444
S1690W SB	140	164	128	136
S1690W NB	12	20	4	12
Spring View Pkwy SB	12	0	60	8
W14600S EB at Railroad Tracks	400	444	356	396
Pedestrians at Jordan Trail	20	20	20	20

2030 Vissim Traffic Input Numbers

Road Name	Volume of Vehicles (Vehicles per hour, 15 minute intervals)			
	0-15	15-30	30-45	45-60
S Redwood SB	2515	2566	2506	2460
S Redwood NB	1683	1771	1600	1669
S1690W SB	162	190	148	157
S1690W NB	14	23	5	14
Spring View Pkwy SB	14	0	69	9
W14600S EB at Railroad Tracks	462	513	411	458
Pedestrians at Jordan Trail	23	23	23	23

2040 Vissim Traffic Input Numbers

Road Name	Volume of Vehicles (Vehicles per hour, 15 minute intervals)			
	0-15	15-30	30-45	45-60
S Redwood SB	3093	3155	3082	3025
S Redwood NB	2070	2178	1967	2052
S1690W SB	199	233	182	193
S1690W NB	17	28	6	17
Spring View Pkwy SB	17	0	85	11
W14600S EB at Railroad Tracks	569	631	506	563
Pedestrians at Jordan Trail	28	28	28	28

Vissim Mode Results:

Current (2023) Vissim Model Results, (10 runs for 4500s)			
MOVEMENT	Vehicles	LOS Value	VEHDELAY
101-1: S Redwood NB entering@1845.3-4: S Redwood NB exiting@155.8	1178	3	26.56
101-1: S Redwood NB entering@1845.3-7: W14600S EB 1@111.3	50	2	11.98
101-3: S Redwood SB entering@542.8-5: S Redwood SB exiting@150.3	1599	2	15.03
101-3: S Redwood SB entering@542.8-7: W14600S EB 1@111.3	266	5	58.88
101-15: W14600S WB 1 RT@109.2-4: S Redwood NB exiting@155.8	191	3	21.82
101-16: W14600S WB 1 LT@111.6-5: S Redwood SB exiting@150.3	87	5	64.81
101	3371	3	24.09
102-7: W14600S EB 1@545.0-8: W14600S EB 2@196.7	303	1	0.84
102-7: W14600S EB 1@545.0-24: S1690W SB exiting@126.4	9	1	0.6
102-13: W14600S EB 1 LT@3.8-26: S1690W NB exiting@129.3	2	1	3.22
102-18: W14600S WB 2@291.1-17: W14600S WB 1@140.5	228	1	2.46
102-18: W14600S WB 2@291.1-24: S1690W SB exiting@126.4	4	1	5.11
102-18: W14600S WB 2@291.1-26: S1690W NB exiting@129.3	123	1	1.7
102-25: S1690W NB entering@209.2-8: W14600S EB 2@196.7	6	1	1.8
102-25: S1690W NB entering@209.2-17: W14600S WB 1@140.5	3	1	4.87
102-25: S1690W NB entering@209.2-26: S1690W NB exiting@129.3	0		
102-27: S1690W SB entering@177.2-8: W14600S EB 2@196.7	75	2	13.34
102-27: S1690W SB entering@177.2-17: W14600S WB 1@140.5	50	2	10.97
102-27: S1690W SB entering@177.2-24: S1690W SB exiting@126.4	0		
102	804	1	3.31
103-10: W14600S EB 4@1115.6-11: W14600S EB 5@48.6	379	1	1.23
103-22: W14600S WB 5@1291.0-21: W14600S EB 4@62.5	362	1	1.18
103-34: Jordan River Trail SB entering@86.3-35: Jordan River Trail SB exiting@49.1	16	1	0
103	757	1	1.18
104-11: W14600S EB 5@1199.8-12: W14600S EB 6@101.7	316	1	1.39
104-14: W14600S EB 5 LT@27.3-32: Spring View NB exiting@116.9	59	1	2.73
104-23: W14600S WB 6@915.4-22: W14600S WB 5@139.8	349	1	1.38
104-23: W14600S WB 6@915.4-32: Spring View NB exiting@116.9	7	1	1.14
104-33: Spring View SB entering@215.8-12: W14600S EB 6@101.7	0		
104-33: Spring View SB entering@215.8-22: W14600S WB 5@139.8	17	1	6.92
104	748	1	1.61
105-12: W14600S EB 6@924.4-10044: 6-Tracks WB@150.0	313	2	18.97
105-10043: Tracks-6 EB@43.0-23: W14600S WB 6@98.1	358	1	9.94
105	671	2	14.13

2030 Vissim Model Results, (10 runs for 4500s)			
MOVEMENT	Vehicles	LOS Value	VEHDELAY
101-1: S Redwood NB entering@1845.3-4: S Redwood NB exiting@155.8	1763	3	32.85
101-1: S Redwood NB entering@1845.3-7: W14600S EB 1@111.3	71	2	17.58
101-3: S Redwood SB entering@542.8-5: S Redwood SB exiting@150.3	2361	1	9.49
101-3: S Redwood SB entering@542.8-7: W14600S EB 1@111.3	284	3	25.88
101-15: W14600S WB 1 RT@109.2-4: S Redwood NB exiting@155.8	133	5	71.67
101-16: W14600S WB 1 LT@111.6-5: S Redwood SB exiting@150.3	368	6	138.8
101	4978	3	30.09
102-7: W14600S EB 1@545.0-8: W14600S EB 2@196.7	420	1	0.98
102-7: W14600S EB 1@545.0-24: S1690W SB exiting@126.4	12	1	0.62
102-13: W14600S EB 1 LT@3.8-26: S1690W NB exiting@129.3	5	1	4.99
102-18: W14600S WB 2@291.1-17: W14600S WB 1@140.5	339	1	4.54
102-18: W14600S WB 2@291.1-24: S1690W SB exiting@126.4	6	1	6.83
102-18: W14600S WB 2@291.1-26: S1690W NB exiting@129.3	183	1	2.56
102-25: S1690W NB entering@209.2-8: W14600S EB 2@196.7	10	1	3.59
102-25: S1690W NB entering@209.2-17: W14600S WB 1@140.5	6	2	10.53
102-25: S1690W NB entering@209.2-26: S1690W NB exiting@129.3	0		
102-27: S1690W SB entering@177.2-8: W14600S EB 2@196.7	109	3	20.33
102-27: S1690W SB entering@177.2-17: W14600S WB 1@140.5	74	3	15.96
102-27: S1690W SB entering@177.2-24: S1690W SB exiting@126.4	0		
102	1163	1	5.18
103-10: W14600S EB 4@1115.6-11: W14600S EB 5@48.6	535	1	1.45
103-22: W14600S WB 5@1291.0-21: W14600S EB 4@62.5	535	1	1.53
103-34: Jordan River Trail SB entering@86.3-35: Jordan River Trail SB exiting@49.1	26	1	0
103	1096	1	1.46
104-11: W14600S EB 5@1199.8-12: W14600S EB 6@101.7	449	1	1.5
104-14: W14600S EB 5 LT@27.3-32: Spring View NB exiting@116.9	82	1	2.89
104-23: W14600S WB 6@915.4-22: W14600S WB 5@139.8	516	1	1.82
104-23: W14600S WB 6@915.4-32: Spring View NB exiting@116.9	11	1	1.53
104-33: Spring View SB entering@215.8-12: W14600S EB 6@101.7	0		
104-33: Spring View SB entering@215.8-22: W14600S WB 5@139.8	25	1	6.49
104	1084	1	1.87
105-12: W14600S EB 6@924.4-10044: 6-Tracks WB@150.0	446	3	20.92
105-10043: Tracks-6 EB@43.0-23: W14600S WB 6@98.1	528	2	11.11
105	974	2	15.58

2040 Vissim Model Results, (10 runs for 4500s)			
MOVEMENT	Vehicles	LOS Value	VEHDELAY
101-1: S Redwood NB entering@1845.3-4: S Redwood NB exiting@155.8	2365	4	39.77
101-1: S Redwood NB entering@1845.3-7: W14600S EB 1@111.3	93	3	33.04
101-3: S Redwood SB entering@542.8-5: S Redwood SB exiting@150.3	2533	1	8.53
101-3: S Redwood SB entering@542.8-7: W14600S EB 1@111.3	380	4	43.9
101-15: W14600S WB 1 RT@109.2-4: S Redwood NB exiting@155.8	181	6	82.31
101-16: W14600S WB 1 LT@111.6-5: S Redwood SB exiting@150.3	372	6	201.62
101	5923	4	38.06
102-7: W14600S EB 1@545.0-8: W14600S EB 2@196.7	445	1	1.1
102-7: W14600S EB 1@545.0-24: S1690W SB exiting@126.4	13	1	0.69
102-13: W14600S EB 1 LT@3.8-26: S1690W NB exiting@129.3	6	1	6.31
102-18: W14600S WB 2@291.1-17: W14600S WB 1@140.5	455	1	5.31
102-18: W14600S WB 2@291.1-24: S1690W SB exiting@126.4	7	2	8.36
102-18: W14600S WB 2@291.1-26: S1690W NB exiting@129.3	248	1	2.93
102-25: S1690W NB entering@209.2-8: W14600S EB 2@196.7	13	1	3.35
102-25: S1690W NB entering@209.2-17: W14600S WB 1@140.5	7	2	11.07
102-25: S1690W NB entering@209.2-26: S1690W NB exiting@129.3	0		
102-27: S1690W SB entering@177.2-8: W14600S EB 2@196.7	151	4	30.42
102-27: S1690W SB entering@177.2-17: W14600S WB 1@140.5	102	4	28.1
102-27: S1690W SB entering@177.2-24: S1690W SB exiting@126.4	0		
102	1446	1	7.83
103-10: W14600S EB 4@1115.6-11: W14600S EB 5@48.6	604	1	1.6
103-22: W14600S WB 5@1291.0-21: W14600S EB 4@62.5	716	1	1.71
103-34: Jordan River Trail SB entering@86.3-35: Jordan River Trail SB exiting@49.1	36	1	0
103	1357	1	1.62
104-11: W14600S EB 5@1199.8-12: W14600S EB 6@101.7	508	1	1.6
104-14: W14600S EB 5 LT@27.3-32: Spring View NB exiting@116.9	94	1	3.41
104-23: W14600S WB 6@915.4-22: W14600S WB 5@139.8	691	1	2.04
104-23: W14600S WB 6@915.4-32: Spring View NB exiting@116.9	15	1	1.76
104-33: Spring View SB entering@215.8-12: W14600S EB 6@101.7	0		
104-33: Spring View SB entering@215.8-22: W14600S WB 5@139.8	33	1	7.82
104	1341	1	2.11
105-12: W14600S EB 6@924.4-10044: 6-Tracks WB@150.0	507	3	21.75
105-10043: Tracks-6 EB@43.0-23: W14600S WB 6@98.1	707	2	11.92
105	1213	2	16.02

Current (2023) "Fixed" Vissim Model Results, (10 runs for 4500s)			
MOVEMENT	Vehicles	LOS Value	VEHDELAY
101-1: S Redwood NB entering@854.7-4: S Redwood NB exiting@155.8	1699	3	29.69
101-28: S Redwood NB RT@858.6-7: W14600S EB 1@111.3	69	1	3.87
101-3: S Redwood SB entering@1233.3-5: S Redwood SB exiting@150.3	2327	1	9.76
101-1035: S Redwood SB Entering@920.4-7: W14600S EB 1@111.3	364	5	71.85
101-15: W14600S WB 1 RT@109.2-4: S Redwood NB exiting@155.8	269	2	19.26
101-16: W14600S WB 1 LT@111.6-5: S Redwood SB exiting@150.3	130	5	76.18
101	4858	3	23.67
102-7: W14600S EB 1@545.0-8: W14600S EB 2@196.7	415	1	1.01
102-7: W14600S EB 1@545.0-24: S1690W SB exiting@126.4	12	1	0.64
102-13: W14600S EB 1 LT@3.8-26: S1690W NB exiting@129.3	5	1	4.5
102-18: W14600S WB 2@291.1-17: W14600S WB 1@140.5	322	1	3.85
102-18: W14600S WB 2@291.1-24: S1690W SB exiting@126.4	5	1	4.68
102-18: W14600S WB 2@291.1-26: S1690W NB exiting@129.3	173	1	2.19
102-25: S1690W NB entering@209.2-8: W14600S EB 2@196.7	10	1	4.35
102-25: S1690W NB entering@209.2-17: W14600S WB 1@140.5	5	2	11.87
102-25: S1690W NB entering@209.2-26: S1690W NB exiting@129.3	0		
102-27: S1690W SB entering@177.2-8: W14600S EB 2@196.7	105	3	14.87
102-27: S1690W SB entering@177.2-17: W14600S WB 1@140.5	73	2	12.58
102-27: S1690W SB entering@177.2-24: S1690W SB exiting@126.4	0		
102	1126	1	4.15
103-10: W14600S EB 4@1115.6-11: W14600S EB 5@48.6	526	1	1.64
103-22: W14600S WB 5@1291.0-21: W14600S EB 4@62.5	506	1	1.36
103-34: Jordan River Trail SB entering@86.3-35: Jordan River Trail SB exiting@49.1	36	1	0
103	1068	1	1.45
104-11: W14600S EB 5@1199.8-12: W14600S EB 6@101.7	441	1	1.57
104-14: W14600S EB 5 LT@27.3-32: Spring View NB exiting@116.9	82	1	2.56
104-23: W14600S WB 6@915.4-22: W14600S WB 5@139.8	487	1	1.68
104-23: W14600S WB 6@915.4-32: Spring View NB exiting@116.9	10	1	1.35
104-33: Spring View SB entering@215.8-12: W14600S EB 6@101.7	0		
104-33: Spring View SB entering@215.8-22: W14600S WB 5@139.8	25	1	6.49
104	1045	1	1.81
105-12: W14600S EB 6@924.4-10044: 6-Tracks WB@150.0	440	3	20.98
105-10043: Tracks-6 EB@43.0-23: W14600S WB 6@98.1	497	2	10.67
105	937	2	15.5

2030 "Fixed" Vissim Model Results, (10 runs for 4500s)			
MOVEMENT	Vehicles	LOS Value	VEHDELAY
101-1: S Redwood NB entering@854.7-4: S Redwood NB exiting@155.8	1958	3	29.75
101-28: S Redwood NB RT@858.6-7: W14600S EB 1@111.3	80	1	5.38
101-3: S Redwood SB entering@1233.3-5: S Redwood SB exiting@150.3	2679	2	10.22
101-1035: S Redwood SB Entering@920.4-7: W14600S EB 1@111.3	395	6	144.36
101-15: W14600S WB 1 RT@109.2-4: S Redwood NB exiting@155.8	312	3	27.34
101-16: W14600S WB 1 LT@111.6-5: S Redwood SB exiting@150.3	149	5	73.02
101	5572	3	29.19
102-7: W14600S EB 1@545.0-8: W14600S EB 2@196.7	455	1	1.11
102-7: W14600S EB 1@545.0-24: S1690W SB exiting@126.4	13	1	0.67
102-13: W14600S EB 1 LT@3.8-26: S1690W NB exiting@129.3	6	1	5.43
102-18: W14600S WB 2@291.1-17: W14600S WB 1@140.5	374	1	4.43
102-18: W14600S WB 2@291.1-24: S1690W SB exiting@126.4	6	1	6.39
102-18: W14600S WB 2@291.1-26: S1690W NB exiting@129.3	200	1	2.51
102-25: S1690W NB entering@209.2-8: W14600S EB 2@196.7	11	1	2.96
102-25: S1690W NB entering@209.2-17: W14600S WB 1@140.5	7	2	12.13
102-25: S1690W NB entering@209.2-26: S1690W NB exiting@129.3	0		
102-27: S1690W SB entering@177.2-8: W14600S EB 2@196.7	121	3	20.55
102-27: S1690W SB entering@177.2-17: W14600S WB 1@140.5	82	3	16.15
102-27: S1690W SB entering@177.2-24: S1690W SB exiting@126.4	0		
102	1273	1	5.22
103-10: W14600S EB 4@1115.6-11: W14600S EB 5@48.6	583	1	1.66
103-22: W14600S WB 5@1291.0-21: W14600S EB 4@62.5	587	1	1.51
103-34: Jordan River Trail SB entering@86.3-35: Jordan River Trail SB exiting@49.1	36	1	0
103	1206	1	1.54
104-11: W14600S EB 5@1199.8-12: W14600S EB 6@101.7	490	1	1.64
104-14: W14600S EB 5 LT@27.3-32: Spring View NB exiting@116.9	90	1	2.96
104-23: W14600S WB 6@915.4-22: W14600S WB 5@139.8	566	1	1.81
104-23: W14600S WB 6@915.4-32: Spring View NB exiting@116.9	12	1	1.67
104-33: Spring View SB entering@215.8-12: W14600S EB 6@101.7	0		
104-33: Spring View SB entering@215.8-22: W14600S WB 5@139.8	27	1	6.82
104	1185	1	1.94
105-12: W14600S EB 6@924.4-10044: 6-Tracks WB@150.0	488	3	21.84
105-10043: Tracks-6 EB@43.0-23: W14600S WB 6@98.1	578	2	11.23
105	1067	2	16.09

2040 "Fixed" Vissim Model Results, (10 runs for 4500s)			
MOVEMENT	Vehicles	LOS Value	VEHDELAY
101-1: S Redwood NB entering@1591.0-4: S Redwood NB exiting@155.8	2383	3	29.35
101-28: S Redwood NB RT@1593.0-7: W14600S EB 1@111.3	98	1	5.87
101-3: S Redwood SB entering@1577.2-5: S Redwood SB exiting@150.3	3284	2	10.66
101-1035: S Redwood SB Entering@1572.6-7: W14600S EB 1@111.3	376	6	206.24
101-15: W14600S WB 1 RT@109.2-4: S Redwood NB exiting@155.8	380	4	45.22
101-16: W14600S WB 1 LT@111.6-5: S Redwood SB exiting@150.3	181	6	84.77
101	6702	3	32.16
102-7: W14600S EB 1@545.0-8: W14600S EB 2@196.7	454	1	1.17
102-7: W14600S EB 1@545.0-24: S1690W SB exiting@126.4	13	1	0.67
102-13: W14600S EB 1 LT@3.8-26: S1690W NB exiting@129.3	6	1	8.38
102-18: W14600S WB 2@291.1-17: W14600S WB 1@140.5	455	1	5.35
102-18: W14600S WB 2@291.1-24: S1690W SB exiting@126.4	7	2	8.8
102-18: W14600S WB 2@291.1-26: S1690W NB exiting@129.3	248	1	2.92
102-25: S1690W NB entering@209.2-8: W14600S EB 2@196.7	13	1	3.45
102-25: S1690W NB entering@209.2-17: W14600S WB 1@140.5	7	2	11.43
102-25: S1690W NB entering@209.2-26: S1690W NB exiting@129.3	0		
102-27: S1690W SB entering@177.2-8: W14600S EB 2@196.7	151	4	32.4
102-27: S1690W SB entering@177.2-17: W14600S WB 1@140.5	102	4	29.72
102-27: S1690W SB entering@177.2-24: S1690W SB exiting@126.4	0		
102	1455	1	8.14
103-10: W14600S EB 4@1115.6-11: W14600S EB 5@48.6	613	1	1.66
103-22: W14600S WB 5@1291.0-21: W14600S EB 4@62.5	716	1	1.71
103-34: Jordan River Trail SB entering@86.3-35: Jordan River Trail SB exiting@49.1	36	1	0
103	1366	1	1.64
104-11: W14600S EB 5@1199.8-12: W14600S EB 6@101.7	515	1	1.63
104-14: W14600S EB 5 LT@27.3-32: Spring View NB exiting@116.9	96	1	3.48
104-23: W14600S WB 6@915.4-22: W14600S WB 5@139.8	691	1	2.06
104-23: W14600S WB 6@915.4-32: Spring View NB exiting@116.9	15	1	1.85
104-33: Spring View SB entering@215.8-12: W14600S EB 6@101.7	0		
104-33: Spring View SB entering@215.8-22: W14600S WB 5@139.8	33	1	7.87
104	1350	1	2.14
105-12: W14600S EB 6@924.4-10044: 6-Tracks WB@150.0	514	3	22.8
105-10043: Tracks-6 EB@43.0-23: W14600S WB 6@98.1	707	2	11.92
105	1220	2	16.5

LOS KEY	
Value	Letter
1	A
2	B
3	C
4	D
5	E
6	F