

FEASIBILITY STUDY REPORT

Project ID: CEEEn_2016CPST_008

by

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A Capstone project submitted to

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**Department of Civil and Environmental Engineering
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Introduction

PROJECT TITLE: Arterial Collector Design & Feasibility Study
PROJECT ID: CEEEn-2016CPST-008
PROJECT SPONSOR: Bluffdale City Engineering
TEAM NAME: Sic Parvis Magna Engineering

This project entails the design of an access road connecting the existing Bluffs Apartments to Loumis Parkway in Bluffdale, Utah. The residents of the apartment complex have requested a second access road to the apartment complex. The city has requested a design of a connector road from Loumis Pkwy and Market St because of the request from the residents. The new roadway design allows the residents to enter the apartment complex from Loumis Pkwy. The location of the proposed road is evaluated. The report consists of the consideration, evaluation, and presentation of two proposed roadway designs for the consideration of the city.

This feasibility study includes all the studies that have been performed for this project. This includes the traffic control device recommendations based on traffic, accident, and sight distance data. These studies are for the safety of the drivers along Loumis Parkway and the new road. The two recommended preliminary road designs are presented along with the feasibility of each roadway. The feasibility of each road is shown through a cost analysis and a construction feasibility analysis.

At the conclusion of this report are the recommendations of the team. These recommendations are based on the safety analysis, cost, and construction feasibility of the proposed roadway.

Site Description

The location of the proposed roadway is located at the Bluffs Apartment complex located on Loumis Pkwy in Bluffdale, UT, shown in Figure 1. Currently, there is an existing service road which acts as an emergency access on the south side of the Bluffs apartments. There is approximately 20' – 50' of elevation difference between Loumis Pkwy and the apartment complex. To the northeast of the Bluffs apartment complex, there are plans for the construction of a shopping center.

Plans for a roundabout north of the Bluffs apartment to allow access to the business center are in progress. The land southwest of the apartment complex is open space, but conversion to a city park is due in the coming months. The land between the apartments and Bangerter Hwy is a detention pond for runoff from the apartment and other runoff collected naturally.



Figure 1: Google map image of the project site

Traffic Study

With the construction of a new road along Loumis Parkway one factor to be evaluated is increased traffic that will occur on the new road and on Loumis Parkway. The increased trafficking is important to know for the design of the pavement structure, and for the feasibility of building a new road. With the construction of the small business center located to the north of the apartment complex, this will generate a significant amount of traffic. Connecting Loumis Parkway to Marketview Dr. will create a route for the shoppers to use to get to the business center. This could negatively affect the ability of the residents to access their homes with ease, because of the large increase in traffic that would occur.

Table 1 contains the daily traffic volume data for Loumis Parkway. The survey was conducted from 2:00 pm on October 13th, 2016 to 4:26 pm on October 21st, 2016. To obtain this data, the city of Bluffdale used axle sensors that used an algorithm set to a setting of factory default axles. This data allowed us to use the daily traffic totals to calculate an average daily traffic count of 1007 vehicles per day.

Table 1: Summary of Total Volume

Traffic Study Data										
Time	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Hourly Total
12:00 AM		7	7	5	8	6	4	4	4	45
1:00 AM		1	5	2	1	1	2	1	4	17
2:00 AM		1	6	3	1	2	1	1	0	15
3:00 AM		5	3	0	3	1	3	4	3	22
4:00 AM		0	1	1	2	0	3	6	2	15
5:00 AM		6	5	3	7	5	6	7	6	45
6:00 AM		26	8	0	35	36	33	30	30	198
7:00 AM		95	16	9	133	123	126	99	83	684
8:00 AM		95	23	19	168	142	155	102	49	753
9:00 AM		47	46	42	65	66	72	57		395
10:00 AM		51	48	27	57	41	37	44		305
11:00 AM		59	50	42	44	56	44	43		338
12:00 PM		55	70	44	61	70	51	61		412
1:00 PM		63	65	71	48	55	63	55		420
2:00 PM	0	68	59	53	80	83	73	78		494
3:00 PM	94	90	63	58	103	105	92	97		702
4:00 PM	146	129	65	81	129	124	132	115		921
5:00 PM	206	208	55	62	187	182	212	207		1319
6:00 PM	121	142	58	36	124	133	103	89		806
7:00 PM	78	71	59	24	55	47	59	52		445
8:00 PM	45	34	35	29	36	37	35	41		292
9:00 PM	27	31	30	12	13	15	33	34		195
10:00 PM	22	25	24	11	16	11	18	11		138
11:00 PM	11	18	24	4	8	5	11	4		85
Daily Total	750	1327	825	638	1384	1346	1368	1242	181	

Average Daily Traffic **1007**

Table 2 contains the estimated Equivalent Single Axle Loads on Loumis Parkway. This data will be used later on when deciding which type of pavement to use in the designs.

Table 2: Estimated Equivalent Single Axle Loads (ESALs)

CLASS	TOTAL VEHICLES	NO. OF AXLES	EALF	ESAL
1	77.00	154	0.001	0.154
2	6169.00	12338	0.004	49.352
3	2055.00	4110	0.004	16.44
4	43.00	86	0.3	25.8
5	613.00	1226	0.17	208.42
6	72.00	216	0.7	151.2
7	23.00	69	0.7	48.3
8	1.00	4	0.7	2.8
9	7.00	35	1.1	38.5
10	1.00	5	1.1	5.5
TOTAL	9061.00	18243.00	4.78	546.47

Table 3 contains the Equivalent Axle Load Factors for the ten different FHWA class types that pass through Loumis Parkway. These EALFs were used to calculate the number of ESALs per class type.

Table 3: Equivalent Axle Load Factors (EALF)

Vehicle Type	FHWA Class	Flexible EALF
Cars & Motorcycles	1, 2	0.001
Pickups, Panel Vans	3	0.004
Buses	4	0.3
2-axle, 6-tire Singles	5	0.17
3-axle or more Singles	6, 7	0.7
4-axle Combos	8	0.7
5-axle or more Combos	9-11	1.1

Table 4 contains a summary of the maximum non-consecutive 8-hour count for Loumis Parkway. This data will be used in a later report to determine whether or not a signal is warranted for the designed road. This would be used for signal warrant 1 in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) which is the standard for traffic signals in the United States.

Table 4: 8-Hour Maximum Vehicle Count

Hour	# of Vehicles
7:00 AM	133
8:00 AM	168
9:00 AM	65
2:00 PM	80
3:00 PM	103
4:00 PM	129
5:00 PM	187
6:00 PM	124

Table 5 contains a summary of the maximum non-consecutive 4-hour count for Loumis Parkway. This will be used for warrant 2 in accordance with MUTCD.

Table 5: 4-Hour Maximum Vehicle Count

Hour	# of Vehicles
7:00 AM	126
8:00 AM	155
4:00 PM	132
5:00 PM	207

Current conditions for the area don't reflect that there would be a significant increase in traffic along a new road. Loumis Parkway is secluded enough that there aren't many reasons to travel along it. As future development in the regions surrounding occurs the proposed road may experience higher volumes of traffic.

Accident Study

With the introduction of a new road into an existing system, the safety impacts should be considered. The impacts will be considered in this study as well as in future studies done for this project. According to the Manual of Uniform Traffic Control Devices (MUTCD) Section 4C.08 Warrant 7, “The Crash Experience signal warrant conditions are intended for application where the severity and frequency of crashes are the principle reasons to consider installing a traffic control signal.” The contents of this report will include an analysis of related accidents within the area surrounding the proposed location.

The data obtained from crashmapping.utah.gov is summarized in Table 6. Included with the data is the date of the accident, the type of accident, the weather, the location, and if there was an injury or not. The provided data are accidents that have occurred between January 1, 2013 and October 31, 2016, because this is the range of dates the website provides. In the past four years there have been a total of eight accidents and of these accidents, two have resulted in an injury. One of those accidents happened within the apartment complex and does not pertain to Loumis Pkwy.

Table 6: Summary of Crash Data

Date	Event	Collision Type	Weather	Road	Injury
8/12/2013	Other Motor Vehicle in Transport	Rear to Side	Cloudy	Apartment Complex	No Injury
11/17/2014	Other Motor Vehicle in Transport	Head On	Clear	13975 S 1500 W	No Injury
8/26/2015	Tree/Shrubbery		Clear	13920 S 1300 W	No Injury
2/7/2016	Other Motor Vehicle in Transport	Head On	Clear	Apartment Complex	No Injury
2/20/2016	Other Motor Vehicle in Transport	Angle	Clear	13920 S 1300 W	Injury
4/28/2016	Other Motor Vehicle in Transport	Head On	Clear	Apartment Complex	Injury
8/15/2016	Parked Motor Vehicle	Parked Vehicle	Cloudy	14200 S Loumis Pkwy	No Injury
9/20/2016	Bridge Pier or Support		Clear	13800 S 1300 W	No Injury

For a traffic signal warrant to be justified there are three criteria outlined by the MUTCD which must be met before consideration:

1. Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and
2. Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash; and

3. For each of any 8 hours of an average day, the vehicles per hour (vph) given in both of the 80 percent columns of Table 7, for both the major and minor road. These major-street and minor-street volumes used should be the same 8 hours.. On the minor street, the higher volume shall both be required to be on the same approach during each of the 8 hours.

Table 7: MUTCD 8 Hour Vehicular Traffic Count

Condition A—Minimum Vehicular Volume									
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Loumis Pkwy has stripping along the roadway to act as a traffic control device. There are no reports that the current conditions are unsatisfactory nor have they failed in anyway. Under the current conditions the first criteria is not satisfied.

The second criteria require that there are five or more reported accidents within a twelve-month period resulting in a personal injury or property damage. There have been eight crashes in the last four years with only one accident involving personal injury along Loumis Pkwy. Due to the lack of accidents in this region the second criteria is not satisfied.

The last requirement for the traffic signal warrant is for there to be a significant amount of traffic traveling along the road for any 8-hour period of time. With the previous study for this project being the traffic study, the total volume data will be summarized again in Table 1. For this criteria to be met the total vehicles per hour, for both approaches, must be greater than the 80 percent column and first row of numbers found in Table. The requirement in this case is for any given 8-hour period along Loumis Parkway to exceed 400 vehicles per hour. After examination of the data found in Table 1, the volume totals for Monday, Tuesday, Wednesday, and Thursday between 12 and 8 pm the totals exceed 750 vehicles. With the construction of a new access could possibly exceed the required 8-hour amount of 120 vehicles. In this case these criteria is satisfied under the creation of a new access.

This report looks at each of the three required criteria outlined by the MUTCD and whether or not the current conditions meet these criteria. It was found that under current conditions the traffic signal warrant is not warranted under crash experience criteria. Details of each criteria are found in the Results section of this report.

With the introduction of a new road into an existing system, the safety impacts should be considered to determine if a signal is needed. By the criteria found in the MUTCD Section 4C.08 Warrant 7, the Crash Experience signal warrant conditions are not satisfied under two of the three required criteria, thus the warrant is not satisfied. According to this study, the accidents do not play a role in the need for a traffic signal at the existing intersection. If a new road is constructed, a follow-up study should be performed in the coming years at the new intersection to ensure that accidents have not increased significantly and that they are mitigated correctly.

Traffic Control Device Study

Due to the nature of the proposed road designs, consideration of a traffic control device would be important to the safety of the intersection. Originally, this analysis was for a traffic signal warrant, but due to the lack of data this warrant was modified to be a traffic control device warrant. With the data that the team had, a signal warrant would not have been met with the two criteria that were used. The two criteria were traffic data and accident data. These two parameters do not provide enough evidence for the need of a traffic signal. Thus this report specifically looks at the need for a stop sign instead of a traffic signal.

The placement of stop signs depends entirely on stopping sight distance. If both Loumis Parkway and the new road were on completely level terrain with no sight obstructions, there would be little to no need for any traffic control devices. However, both recommended options contain obstructions that must be taken into consideration. The private road access option that connects Loumis Parkway directly to the apartment complex faces a very large hill on the left, in addition to a blind curve from the main road. The option that connects Loumis Parkway to the shopping center has a view that is obstructed by Bangerter Highway, which is elevated. Figure 1 shows a diagram that illustrates some parameters that are taken into consideration when determining the placement of a traffic control device.

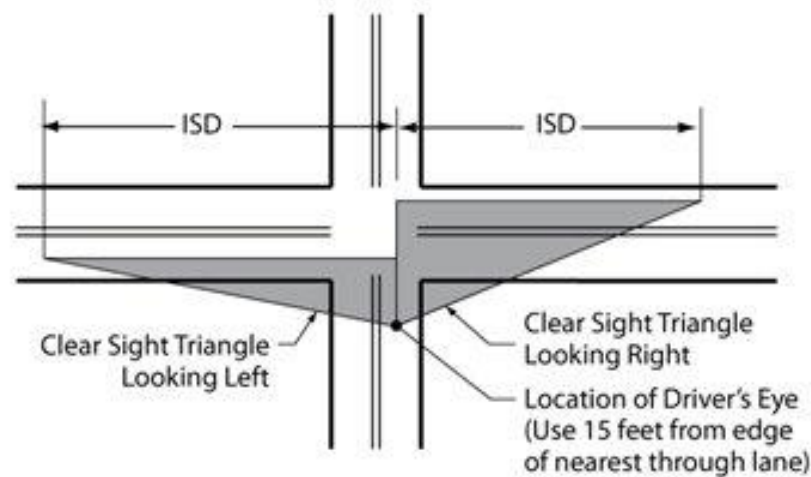


Figure 2: Sight Distance Diagram (U.S. Department of Transportation)

It was estimated that these obstructions would exist roughly 24 feet to the left of the driver on the new road and 20 feet to the right of the driver on Loumis Parkway. After making the proper calculations in accordance with guidelines from AASHTO, it was determined that a stop sign would be required for both new road options. Assuming a reaction time of two seconds for the average driver, the driver on Loumis Parkway would need 133 feet in order to stop in time before they arrived at the intersection. The obstructions make this dangerous without some sort of traffic control device, which is why a stop sign is recommended.

Using sight triangles requirements found in the AASHTO guide manual, it is determined that a stop sign is warranted for the new intersection. The obtained data was sufficient to perform

a traffic control device study, which provided the conclusion that a stop sign would be needed for either of the two roadway designs. Both of the recommended options contain obstructions that reduce stopping sight distance enough to warrant a stop sign.

Preliminary Roadway Design

The design for the first roadway is for the city-requested connector road using the Bluffdale Typical section for a Minor Collector road. The second roadway is a private road design that will create a second access road for the apartment complex. The private road typical section is on the plan and profile sheet PP-2. Figure 4 shows the Minor Collector typical section.

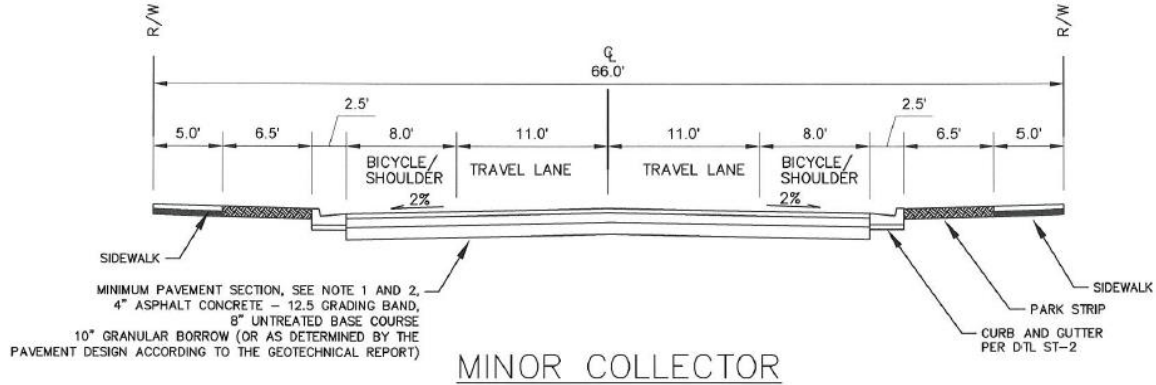


Figure 3: Bluffdale Typical Section

As part of the preliminary road design, a cost analysis is included in this report. The cost analysis uses 2016 unit prices reported to Provo City. For each of the preliminary roadway designs, costs include construction, property acquisition, safety, ease of access, and ease of maintenance. Ease of access costs are opinions of the team designing these roadways. Ease of maintenance cost uses the team's knowledge of road slopes and accessibility of the roadway for snowplows. Construction costs include items such as cubic yards of excavation, cubic yards of fill, tons of asphalt, linear feet of curb and gutter, square feet of sidewalk, traffic, and mobilization.

In combination with the cost estimate is a construction feasibility analysis comparing economic and environmental impacts caused during construction of the proposed designs.

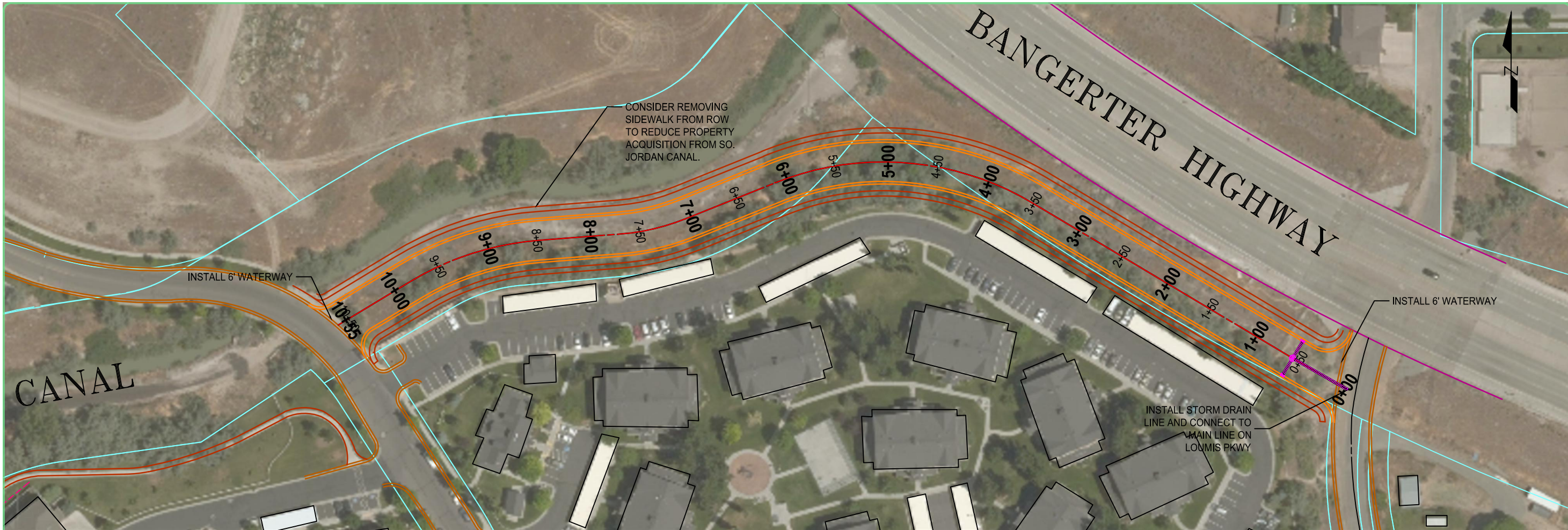
Design One

The first design is located along the north side of the apartment complex between the existing apartment buildings and Bangerter Highway. The proposed road would begin on Loumis Pkwy, just south of the Bangerter Highway overpass, and would wind around the complex to connect with the existing entrance road. The roadway would stay on the south side of the existing South Jordan Canal to avoid having to pipe the canal and build a bridge structure. The proposed roadway is outside of the apartment complex to avoid conflict with existing parking structures and roadways.

The purpose of this roadway is to appease the city's request to have a connection road between Loumis Parkway and Market St. Using this design would eliminate the use of the city's new park. This would allow for a larger park area, which the residents of the apartment complex and the community would appreciate. The design allows for the proposed communities to the southeast of the Bluffs Apartment complex to access the proposed business district with ease. The downside of this is a large amount of traffic along this new road. Loumis Pkwy is a two-lane road with minimum shoulder space and no room for designated or shared turn lanes. The introduction of a new connection road would create delay problems and accident risks along Loumis Pkwy due to the demand the new roadway would experience. The location of the road is adjacent to an overpass and a curve on Loumis Pkwy, which has potential hazard issues.

The plan and profile sheet for design one are on sheet PP-1. The designed roadway was created to minimize the removal amount of native material currently on the site. With the proposed alignment, the cut and fill volumes are almost equal to one another. This reduces the amount of material required for granular borrow to a small amount because the soil onsite can be used. This design feature reduces the cost for the roadway. The proposed typical section for the roadway has 66 feet of right-of-way. There are many ways to alter this design to save money and to reduce the amount of property acquisition. Removing the park-strip and the sidewalk would reduce the right-of-way to 43 feet. This would help improve the geometric design of the road and reduce the cost of construction.

Reducing the required fill allows the slope of the design to be at an 8.51 percent grade from Loumis Pkwy to the curve of the design. The slope has a gradual transition to a 0.5 percent grade, which is sufficient to remove water from the remainder of the roadway and carry it to Loumis Pkwy. The removal of the detention basin and the construction of an impermeable surface would require some type of drainage device. The design is to install inlets at the end of the new roadway before it reaches Loumis Pkwy and connect into a storm drain main running along Loumis Pkwy. Another drainage structure is a waterway at both ends of the new road to ensure that Market St and Loumis Pkwy have continuous flow.

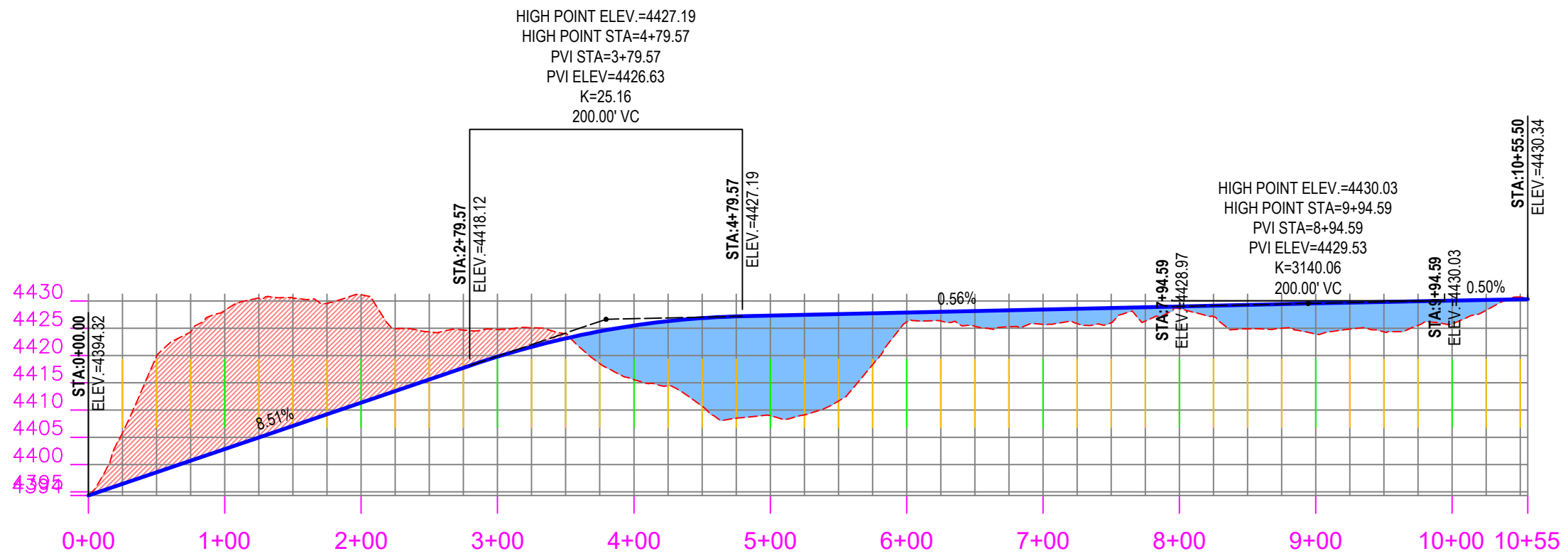


SIC PARVIS MAGNA
GREATNESS FROM SMALL BEGINNINGS

REMARKS

1.

Scale 1:100



LOUMIS PKWAY
Jan 2017

Design One

Engineering File Number:

Drawing: PP-1

Sheet: 1 of 1

Cost Analysis

An important aspect of road design is the cost of construction and maintenance. Because the City of Bluffdale will build this proposed road, money is a critical point, as the funds are from taxpayers. Table 8 is a summary of construction costs of Design 1, based on 2016 unit costs.

Table 1: Engineer's Estimate for Design One

Design Road One					
Engineer's Estimate					
<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Total</u>
A-1	Traffic Control	Lump	1	\$29,000.00	\$29,000.00
A-2	Mobilization and Demobilization	Lump	1	\$29,000.00	\$29,000.00
A-3	Bituminous Concrete Pavement , AC-10-DM 3/4"	Ton	1024	\$60.00	\$61,446.00
A-4	Untreated Base Course - Grade 3/4	CY	1100	\$55.00	\$60,500.00
A-5	Roadway Excavation	CY	426	\$35.00	\$14,924.26
A-6	Granular Borrow (Required Need)	CY	425	\$40.00	\$17,007.41
A-7	Concrete Curb and Gutter, Type E	LF	2170	\$21.00	\$45,570.00
A-8	Concrete Sidewalk, 4" Thick	SF	10570	\$4.53	\$47,882.10
A-9	6' Waterway - 9" Thick	Foot	120	\$43.00	\$5,160.00
A-10	Cast Iron Detectable Warning Panel	SF	96	\$70.00	\$6,720.00
A-11	Landscape	SF	13722	\$2.25	\$30,873.38
A-12	12" Crosswalk & Stop Bar Marking Paint	Foot	38	\$1.05	\$39.90
A-13	Pavement Marking Paint - White	Gallon	6.5	\$21.00	\$136.50
A-14	Pavement Marking Paint - Yellow	Gallon	6.5	\$21.00	\$136.50
A-15	18 Inch - RCP Storm Drain, Class III	LF	100.0	\$115.23	\$11,523.00
A-16	Single Catch Basin	Each	2.0	\$1,594.80	\$3,189.60
A-17	60 Inch Dia. Storm Drain Manhole	Each	1	\$4,829.80	\$4,829.80
A-18	Land Acquisition - So. Jordan Canal	AC	0.8	\$90,000.00	\$75,621.90
A-19	Land Acquisition - Bluffs Apartment	AC	0.3	\$90,000.00	\$22,758.26
Total					\$466,318.61

The estimate for the preliminary design is roughly \$466,000. This could increase with additional storm drain inlets and manholes along the roadway. One variable is the property acquisition from So. Jordan Canal and the Bluffs Apartments. The price used for the estimate is \$90,000, but the typical prices can range from \$75,000-\$150,000 per acre. This could greatly affect the cost of the project if the So. Jordan Canal and Bluffs Apartments charge the maximum price. If the price for the property is \$150,000, the total cost increases to \$531,000.

Another aspect of the cost analysis is the long-term maintenance of the road. This would include snow removal in the winter and surface treatments in the coming years. The snow removal would be important because of the slope of the road. The slope of the road would allow the snowplows to access the road without any issues. Overall, the cost of snow removal would fall in with the existing snow removal plan. Long-term maintenance would require the surface treatment every 7-10 years to keep the road in working condition. These costs would come from

the pavement management program and would fall into the yearly scheduled road rehabilitation projects.

Overall, the costs of this road are in the medium range for a new roadway. Of all the connection roads that could be constructed from Loumis Pkwy and Market St, this is the least expensive and least invasive option. The geometric design of the roadway provides a safe and reliable path of access.

Construction Feasibility

Considering the economic and environmental effects of this new roadway determines the overall feasibility of this design. With the construction of this roadway through a detention pond, an environmental study is required. The reduction of 1.1 acres of open space, which has landscaping, will have negative effects on the environment. Along with the reduction of open space, the construction of the roadway close to the canal would pose some issues. With an average of 6-8 feet of distance from the sidewalk to the edge of the canal, this could be an issue for the retaining banks and health of the canal. The pollutants emitted from vehicles, snow removal, surface treatments, and construction could get in to the canal and pollute the water.

The residents of the apartment complex have requested an access road, but not a through street for a couple of reasons. The first reason is the apartment complex is a quiet area, which is appealing to the residents. With a major roadway cutting through the area, the noise levels would increase, causing a reduction in appeal. Another reason is the seclusion of the apartment complex. The residents might prefer little to no outside traffic coming in or around the apartment complex. Adding a large road would diminish the seclusion, whereas a private access road would still maintain the quiet atmosphere.

The two economic impacts are the increase of revenue generated by the shopping center by providing a quicker route and the lowering of property value in the apartment complex. A faster route will not affect the economic value that greatly. Loumis Parkway provides access to Redwood road and in turn, a connection to Market St. The route cutting through the property around the apartment complex reduces the time of travel by very little. The value of property allows better improvements to be built in the future, which in turn brings greater revenue.

Design Two

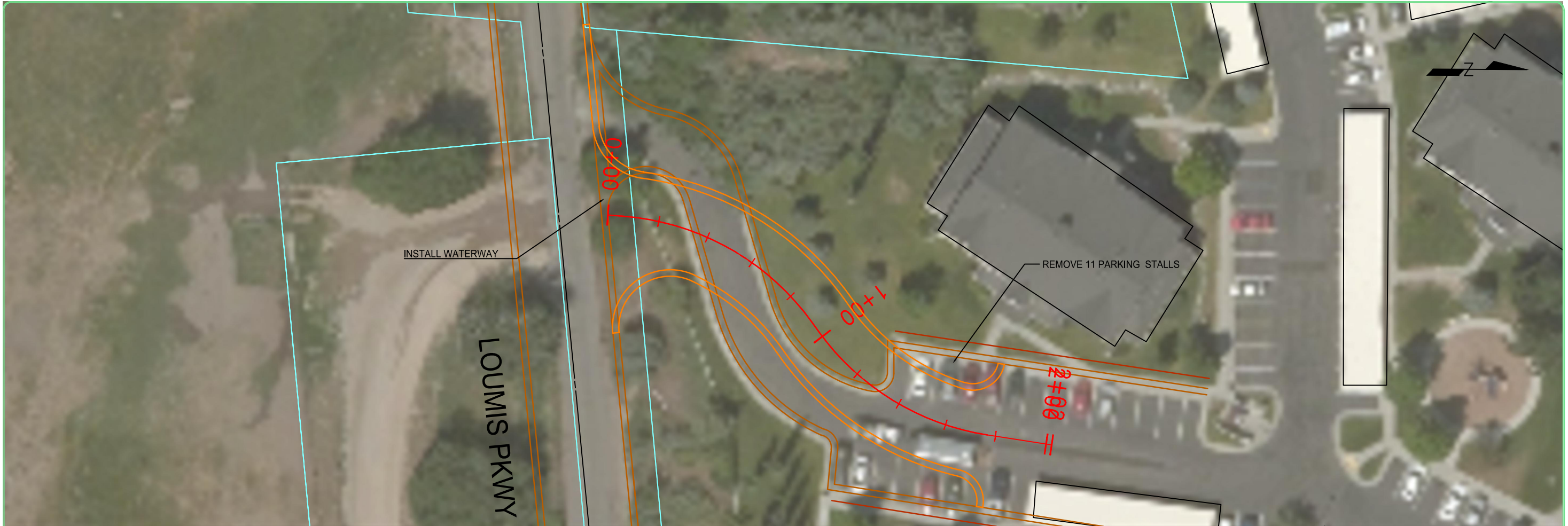
Many locations along the south side of the complex were evaluated for the second access road design. However, it was decided that the best design would be to realign and widen the existing service road. The problem with the existing service road is that it does not provide enough sight distance for the vehicles trying to exit the apartment complex onto Loumis Pkwy. Redesigning this road would provide adequate sight distance for the curve and would fulfill the request of having a road connecting the apartment complex to Loumis Pkwy. Realigning the intersection also removes the critical hazard points that exist along the first curve of the service road by providing a better turn radius, entrance and exit paths, and facilities.

This road design is for a private road, which requires the speed limit to be lower than normal streets. This creates a safe access road that individuals would use at lower speeds to access the apartment complex. This would also maintain the quiet environment of the Bluffs Apartments and provide a second access to the residents.

One safety measure is to provide a W2-2 warning sign on the north side of the curve of Loumis Pkwy that warns drivers of a side road ahead. This will help regulate traffic traveling south along Loumis Pkwy by creating awareness to help prevent potential crashes from happening. Other signs needed along Loumis Pkwy are regulatory speed limit signs, as there are currently only two along Loumis Pkwy. The first speed limit sign is at the intersection of Loumis Pkwy and Redwood road. The other speed limit sign is located one mile north of the intersection of Loumis Pkwy and Jordan Basin Ln. An increased number of speed limit signs would help alleviate issues for the new access road.

The plan and profile sheet for design two are on sheet PP-2. The designed roadway provides access while minimizing the cost of a new road. The existing service road has provided an area that has proper grading along the hillside. This is the best location to build a new road because the majority of the required grading is existing grading. The proposed typical section for the roadway has 36 feet of right-of-way. This length is quite a bit smaller than the Bluffdale Typical Section for a residential road, which is 52-55' wide. According to the Bluffdale City Code Title 11, Chapter 16, Section 17, "the subdivision requirements of providing right of way for a minimum of one-half ($1/2$) width of a standard street, plus ten feet (10'), consistent with the city's subdivision ordinance requirements." Using this definition, the right-of-way design for the private road is 36 feet wide. The right-of-way does not include a park strip or sidewalk in order to provide wider travel lanes. The corrected right-of-way and the realignment also provide better access for emergency vehicles with increased turned radii and wider pavement.

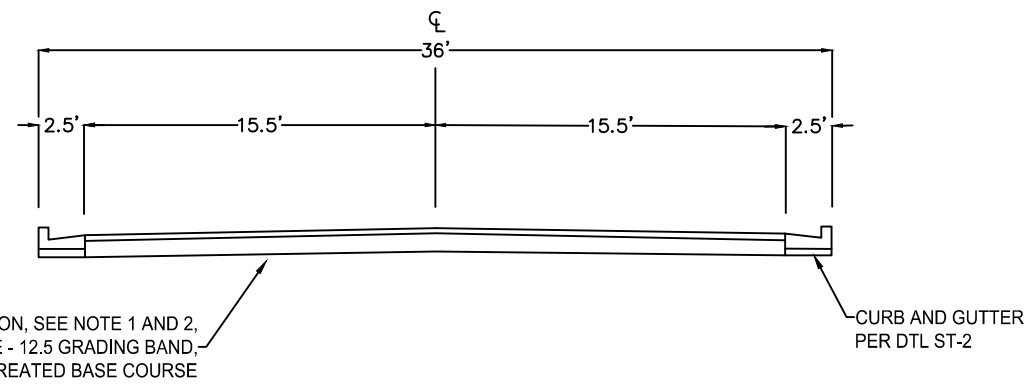
The roadway design has a maximum slope of 10.22%, which is adequate for a private road. The short nature of the road does not require the construction of a storm drain system, and the designed roadway drainage plan flows to the existing inlet boxes along Loumis Pkwy.



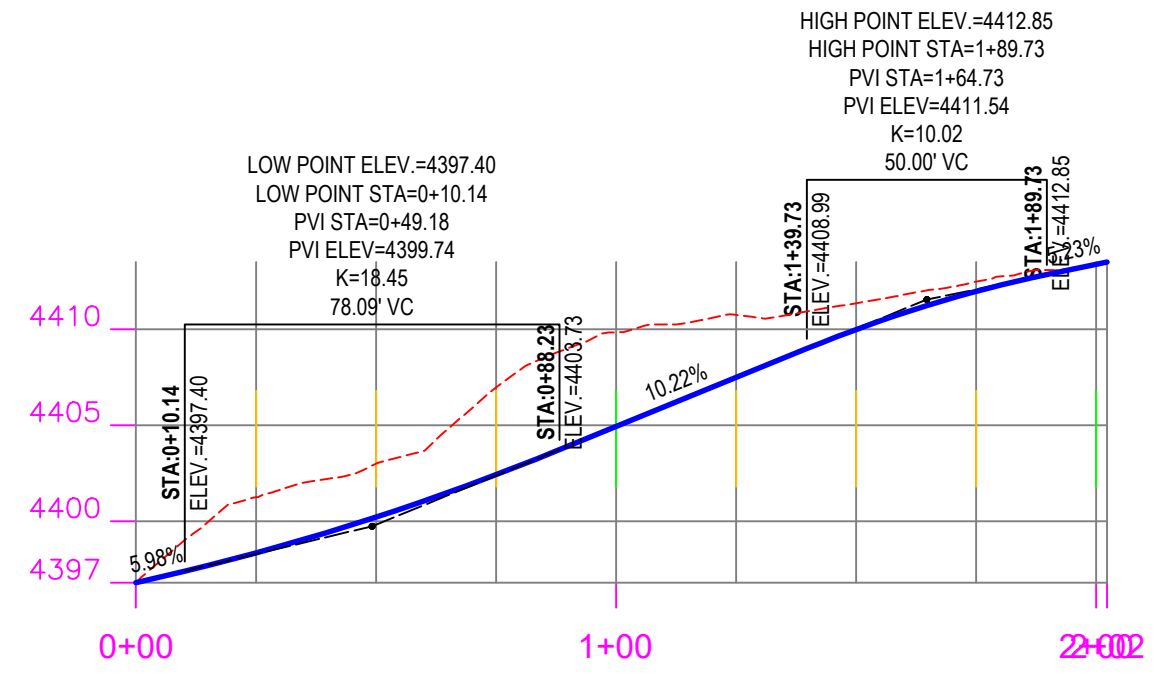
SIC PARVIS MAGNA
GREATNESS FROM SMALL BEGINNINGS

REMARKS
1.

Scale 1:40



PRIVATE ROAD



LOUMRIS PKWAY
Jan 2017
Private Road One

Engineering File Number:
-

Drawing: PP-2
Sheet: 1 of 1

Cost Analysis

An important aspect of road design is the cost of construction and maintenance. The City of Bluffdale will build this proposed road, so money is a critical point because the funds are from taxpayers. Table 9 is a summary of construction costs of the private road, based on 2016 unit costs.

Table 1: Engineer’s Estimate for Private Road One

Private Road One					
Engineer's Estimate					
<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Total</u>
B-1	Traffic Control	Lump	1	\$29,000.00	\$29,000.00
B-2	Mobilization and Demobilization	Lump	1	\$29,000.00	\$29,000.00
B-3	Remove Concrete Curb and Gutter	LF	462	\$6.29	\$2,905.98
B-5	Remove Asphalt Concrete Pavement	SY	722	\$9.37	\$6,767.22
B-6	Bituminous Concrete Pavement , AC-10-DM 3/4"	Ton	153	\$60.00	\$9,158.00
B-7	Untreated Base Course - Grade 3/4	CY	149	\$55.00	\$8,182.10
B-8	Roadway Excavation	CY	223	\$35.00	\$7,810.19
B-9	Granular Borrow (Required Need)	CY	425	\$40.00	\$17,007.41
B-10	6' Waterway - 9" Thick	Foot	80	\$43.00	\$3,440.00
B-11	Concrete Curb and Gutter, Type E	LF	425	\$21.00	\$8,925.00
B-12	Landscape	SF	425	\$2.25	\$956.25
B-13	12" Crosswalk & Stop Bar Marking Paint	Foot	16	\$1.05	\$16.28
B-14	Pavement Marking Paint - White	Gallon	3.0	\$21.00	\$63.00
B-15	Land Acquisition - Bluffs Apartment	AC	0.1	\$90,000.00	\$13,016.53
Total					\$136,247.95

The estimate for the preliminary design of our second proposed roadway is roughly \$136,000. This could increase with additional storm drain inlets and manholes along the roadway. As can be seen from comparing Table 1 to Table 2, the preliminary cost of design two is 31% of the first design. This is a large amount of money saved and would still provide the access requested by the residence.

Another aspect of the cost analysis is the long-term maintenance of the road. This would include snow removal in the winter and surface treatments in the coming years. The road is a private road, which means that the city would not oversee the maintenance and snow removal of the road. These costs would be at the expense of the owner of the apartment contract, which will save money for the city in the long term.

Overall, the costs of this road design are low for a new road, even though there is a substantial amount of money up front. Creating an access road at any other location will have large costs associated with it due to slope stability issues. The realignment of the roadway has the greatest benefits, saves the most money, and fulfills the request of the residents.

Construction Feasibility

The economic and environmental impacts of this new roadway can be evaluated to determine the overall feasibility of this design. An environmental study is not required for this design because the only impact to the environment is the removal of an existing road. The impacts would be the same before and after construction. With the private road having a lower speed limit, there would be very little traffic cutting through the complex. This would make mitigation of noise and excessive speeding less difficult.

Economic impacts would be minimal for this project because the conditions after the construction would closely model the existing conditions. The access road would not change the current access to the shopping center, which would neither increase nor decrease the economic value.

Recommendations

The purpose of this project is to design an access road connecting the existing Bluffs Apartments to Loumis Parkway in Bluffdale, Utah. The residents of the apartment complex have requested a second access road to the apartment complex. The city has requested a design of a connector road from Loumis Pkwy and Market St. The new roadway design allows the residents to enter the apartment complex from Loumis Pkwy.

Through the duration of the analysis and design process, it has been decided that Design Two, the private road, is the optimal design. Three reasons why this design is the optimal design are low cost, feasibility, and it meets the needs of the residents. The request for this new roadway originated from the residents of the apartment complex, which is why this design has greater appeal. It provides quick access from Loumis Pkwy for the residents, and provides little access to individuals cutting through to save travel time.

Compared to the other cost estimates done for this report, the cost for the private road is a fraction of the cost associated with the other designs. Saving money for higher priority projects by building a smaller road for the Bluffs is an efficient and effective method.

Finally, with two access points to the apartment complex, the residents have better accessibility from day to day and in emergencies. Constructing a major road that connects to the existing access of the apartment complex only accomplishes a connection road, but does not provide another access road to the apartment complex.

Along with the new roadway the results of this study reflect that a stop sign would be needed for the new intersection.

References

American Association of State Highway and Transportation Officials (2011). *A policy on Geometric Design of Highways and Streets*, 6th Ed.

Federal Highway Administration (2009). *Manual on Uniform Traffic Control Devices*, Rev. 1 and 2.