City of Ramsey

Preliminary Engineering Report

Sunwood Drive

Ramsey, Minnesota

Project Number RAM11008

Preliminary Engineering Report
for
Sunwood Drive
Ramsey, Minnesota

City Council Meeting Date:	*December 13, 2011*
Project Number:	*RAM11008*
Mayor:	*Bob Ramsey*
Council Members:	*Randy Backous* *David Elvig* *Colin McGlone* *Sarah Strommen* *Jason Tossey* *Jeff Wise*
Administrator:	*Kurt Ulrich*
Public Works Director:	*Brian Olson*
City Engineer:	*Tim Himmer*

I hereby certify that this report was prepared by me or under my direct supervision and that I am duly Licensed Professional Engineer under the laws of the State of Minnesota.

Robert G. Schunicht, P.E.
Date: December 6, 2011 Reg. No. 12105

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Introduction

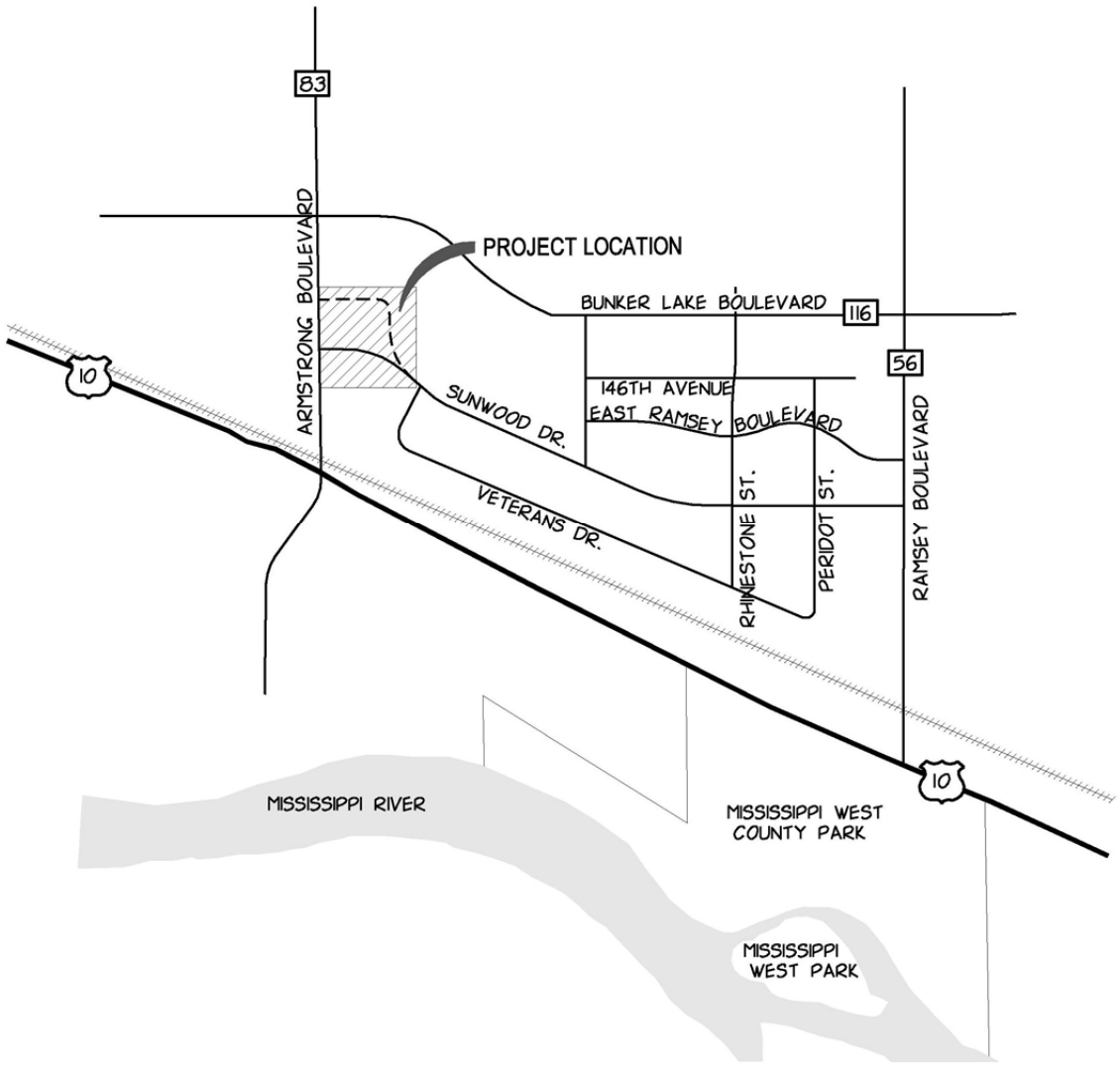
Landform has completed a feasibility study and prepared this Preliminary Engineering Report for the realignment of the western portion of Sunwood Drive.

Sunwood Drive is a collector street than runs in an east/west direction through the southern portion of The COR connecting Ramsey Boulevard to Armstrong Boulevard. The new TH10/Armstrong Interchange creates a substantial grade differential at the current location of the Armstrong/Sunwood intersection. Because of this grade differential, it is necessary to realign Sunwood Drive to a connection point further north along Armstrong Boulevard. Figure 1 shows the location of Sunwood Drive and the needed realignment. Sunwood Drive is also shown on Development Plan 5.03 for The COR, which is reproduced on page 3 (Figure 2). The location of the new Armstrong/Sunwood intersection was determined based on the new Armstrong Boulevard grades, spacing between the intersections on Armstrong Boulevard and maximizing the development potential of the western portion of The COR.

The feasibility study also included an update of traffic generation in The COR based on Development Plan 5.03 and an operational analysis of a roundabout at the intersection of realigned Sunwood Drive and Ramsey Parkway. These studies are presented in the Appendices and summaries are presented in the following section of this Preliminary Engineering Report.

This report coordinates with the work being done by WSB & Associates, Inc. on the new intersection of Armstrong Boulevard and Sunwood Drive. That intersection project is advance construction of a portion of the 10/83 project.

Figure 1: Project Location Map



Design Considerations

Traffic and Roundabout Analysis

Revisioning of The COR resulted in some of the residential land in the western portion of The COR being converted to commercial/retail in order to provide a better balance of land uses and to align the development with the current marketplace. Some additional changes were made in the remainder of the undeveloped areas, including the creation of Lake Ramsey. These changes are reflected in Development Plan 5.03.

As part of this feasibility study, traffic generation forecasts were prepared based on Development Plan 5.03. In addition, this analysis provided traffic forecasts necessary for the design of the realignment of Sunwood Drive. The COR Traffic Generation Report, prepared by Spack Consulting, is presented in Appendix A. The report indicates Development Plan 5.03 will result in a 12.8% increase in traffic at build-out of The COR. A summary of the forecasts is presented in Table 1.

Figure 2: Development Plan 5.03

Table 1: Traffic Forecast Summary

Traffic Forecast Summary (Build-out/2030)	
Item	**Amount (vehicles/day)**
COR Daily Traffic	57,700
COR AM Peak	3,700
COR PM Peak	5,600
North/South Sunwood	9,300
East/West Sunwood	16,500-18,900

The Traffic Generation Report will also be used in the update of The COR's Alternative Urban Areawide Review (AUAR). The report supports the conclusion that the traffic generated by The COR Development Plan 5.03 does not represent a significant change in the AUAR Mitigation Plan and that a comprehensive update of the original RTC Traffic Study is not necessary.

The focal point of the western portion of The COR is the intersection of Sunwood Drive and Ramsey Parkway. This intersection is main entrance from Armstrong Boulevard and distributes the majority of traffic entering The COR from the west. The location of this intersection was established to maximize the development potential of the adjacent area.

Two options were investigated for this intersection. These included a signalized intersection and a roundabout. The results of the investigation are presented in Appendix B in a report by Ourston Roundabout Engineering titled *Operation Analysis-Ramsey Parkway and Sunwood Drive*. The report concludes that a roundabout will function best at this intersection. A roundabout is recommended for the following reasons:

- Better operational performance with lower overall delays
- Improved coordination with the signal on Armstrong Boulevard
- Improved safety through eliminating potential conflict points
- Safer for pedestrians due to reduction in vehicle speeds
- Enhanced aesthetics and opportunity for The COR monumentation provided by the center island
- Environmental benefits provided by the lower traffic delays
- Elimination of traffic signal operation costs

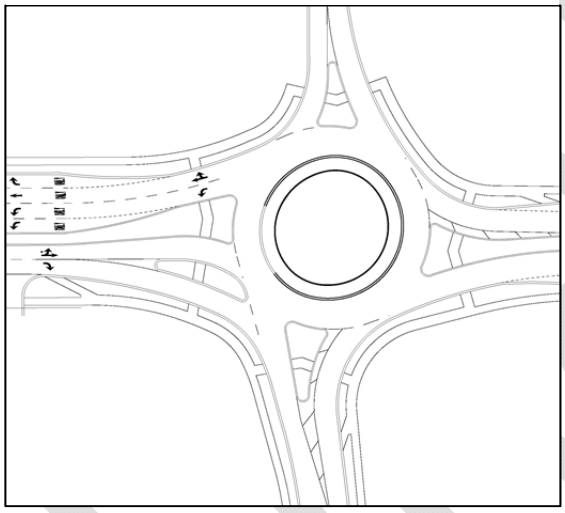
The recommended roundabout design is presented in Figure 3. The design accommodates the build-out traffic forecasts presented in Table 1. The recommended initial roundabout is essentially a single lane facility with two added features to increase capacity and improve coordination with the signal on Armstrong Boulevard. The roundabout features a partial right turn lane, with a yield to traffic in the roundabout, to facilitate traffic turning right onto southbound Sunwood Drive. It also widens for traffic

exiting to the west on Sunwood Drive to facilitate movement into the left turn lanes which is the critical movement through the Armstrong/Sunwood intersection. The roundabout is designed to accommodate 18-wheel truck traffic (WB65).

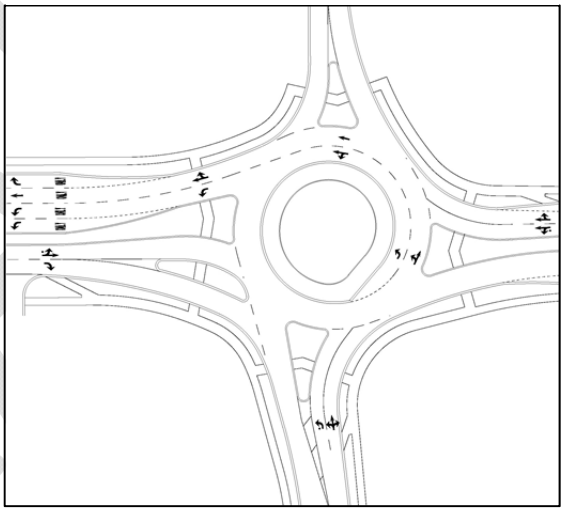
The roundabout was also analyzed to determine its capacity to handle traffic volumes that exceed the projected build-out forecasts. The proposed enhanced single lane roundabout can handle traffic volumes that are 43% greater than the build-out forecasts. The proposed roundabout can also be easily modified to a full two lane roundabout that would be able to accommodate volumes 63% greater than the build-out forecasts. Figure 2 also shows the improvements that would be needed to construct the full two lane roundabout if The COR generates traffic in excess of current projections.

Figure 3: Initial and Ultimate Roundabout Design (Ourston Roundabout Engineering)

Initial Roundabout Design



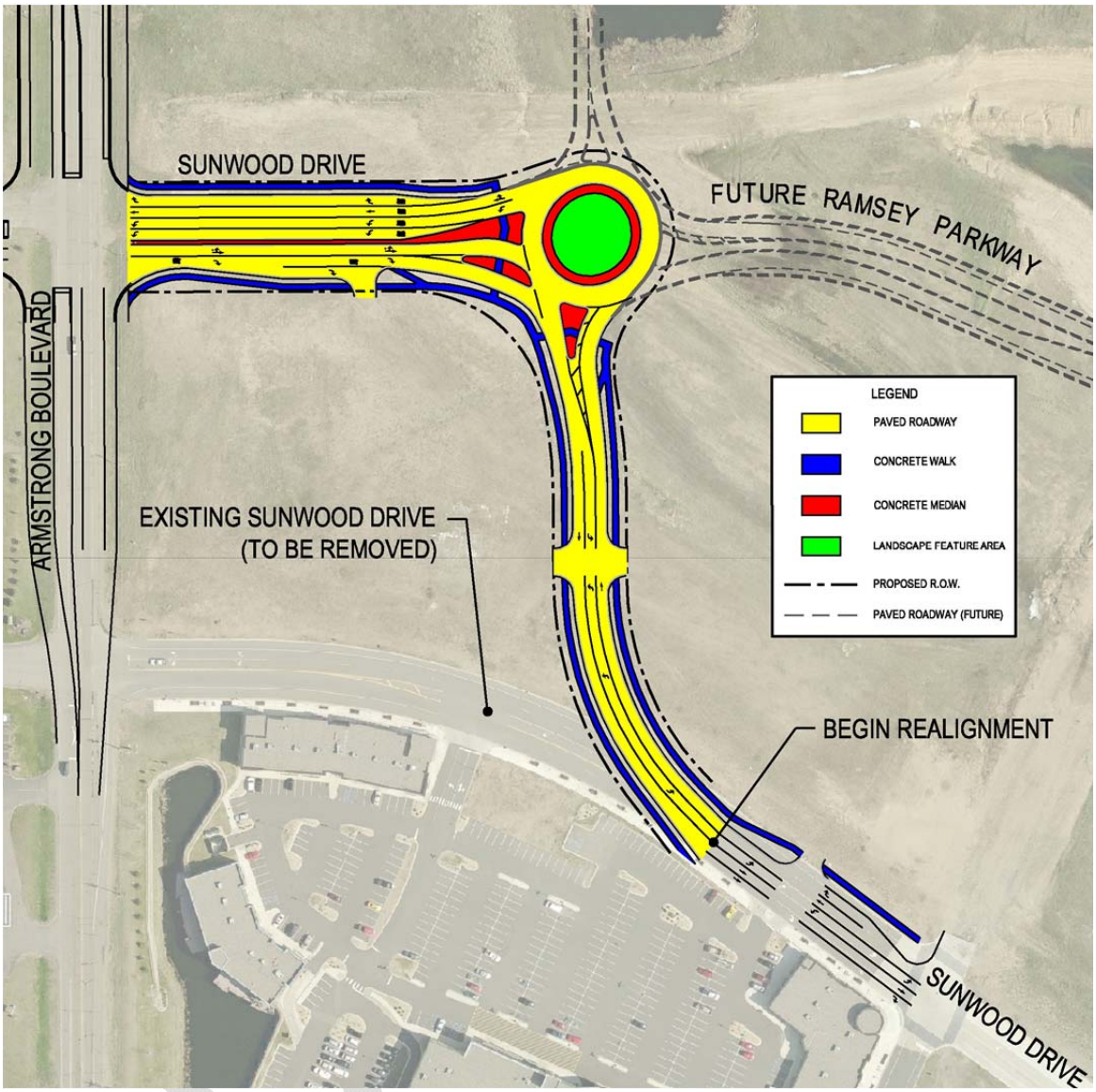
Ultimate Roundabout Design



Sunwood Drive

Sunwood Drive is a Municipal State Aid (MSA) collector street. It runs in an east/west direction through the southern portion of The COR connecting Ramsey Boulevard to Armstrong Boulevard. The current Armstrong/Sunwood intersection needs to be closed because of the grade differential that will be created by the TH10/Armstrong Interchange. The new location for the Armstrong/Sunwood intersection is further north along Armstrong Boulevard near the point where the extension of Ramsey Parkway was originally planned to intersect. The new Armstrong/Sunwood intersection improves the traffic flow on Armstrong Boulevard and into The COR by consolidating traffic at a single, better located intersection than originally proposed in the RTC plans. The proposed realignment of Sunwood Drive is presented in Figure 4.

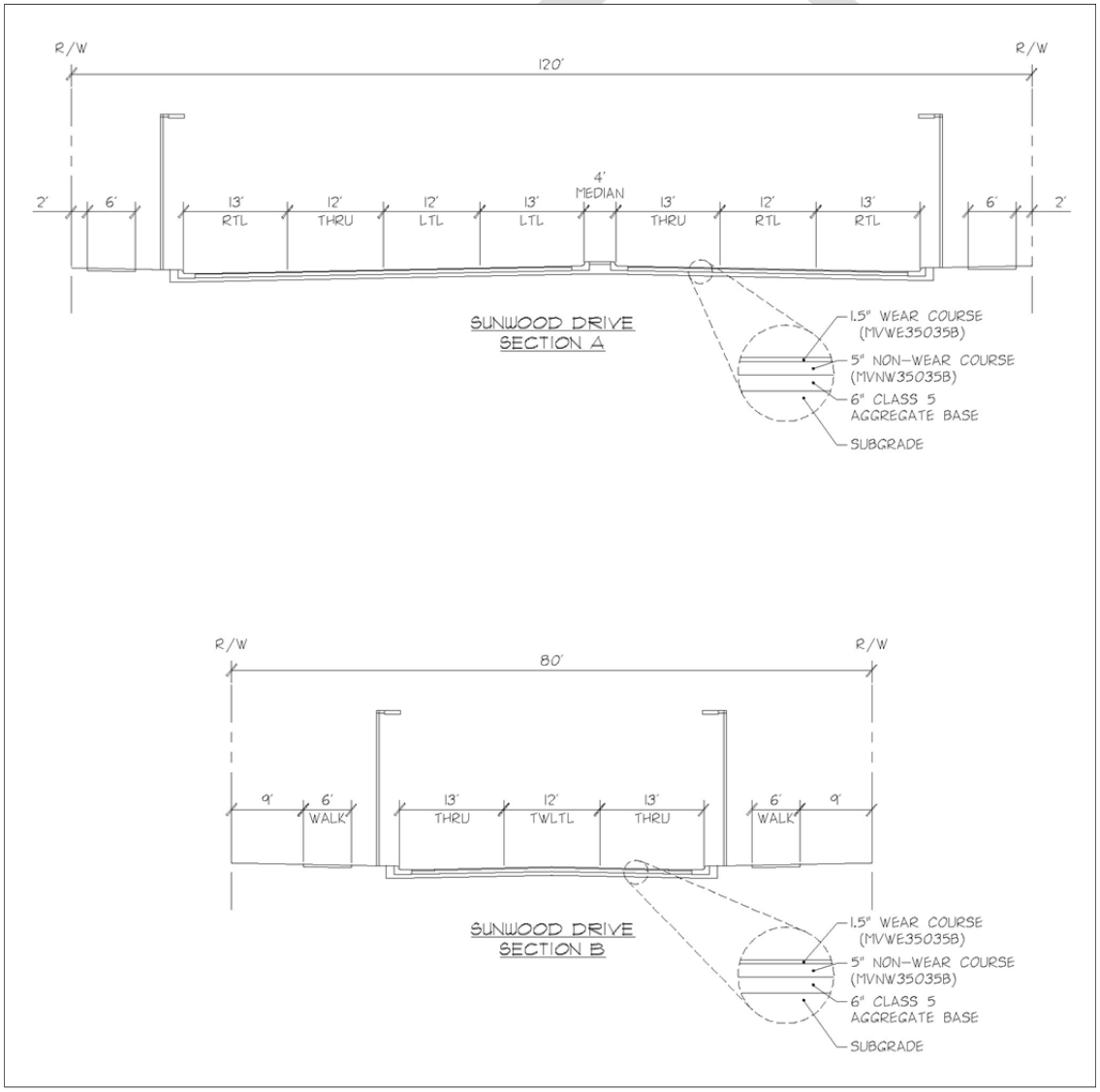
Figure 4: Project Layout Map



Under the proposed realignment, Sunwood Drive turns north at a point approximately 700 feet east of its current intersection with Armstrong Boulevard. Sunwood Drive continues northward to its intersection with the future Ramsey Parkway. At this proposed roundabout intersection Sunwood Drive turns west to connect with Armstrong Boulevard. Improvements to the new Armstrong/Sunwood intersection are described in a separate preliminary engineering report by WSB & Associates, Inc. The preparation of both reports was coordinated to provide an overall plan for the needed improvements.

Existing Sunwood Drive is a hard edged urban section with on street parking, sidewalks adjacent to the curb and store fronts adjacent to the sidewalk. As outlined in The COR Development Plan 5.03, the beginning of the Sunwood realignment marks the transition from hard edged urban to more suburban configurations with off street parking. The roadway sections proposed for the Sunwood realignment reflect that transition. The proposed sections are shown in Figure 5. The traffic volumes on the north/south section of Sunwood Drive are projected to be approximately 10,000 vehicles per day and a two lane roadway with a two way center left turn center lane is proposed. This section will provide an allowance for approximately 50% more capacity beyond the current ultimate projections. The projected traffic volumes on the section of Sunwood Drive between the roundabout and Armstrong Boulevard are approaching 20,000 vehicles per day and a four lane roadway section with right and left turn lanes is proposed.

Figure 5: Typical Sections



The pedestrian friendly design on existing Sunwood Drive is continued with the realigned Sunwood Drive. Sidewalks are proposed on both sides of the roadway connecting to the existing sidewalks and to the new trail along Armstrong Boulevard. Pedestrian crossings are provided through the roundabout. Delaying the construction of the north and east legs of the roundabout is also recommended until the big box site is developed or until Ramsey Parkway is extended. An interim concrete curb is proposed through the unfinished portions of the roundabout, as shown in Figure 4.

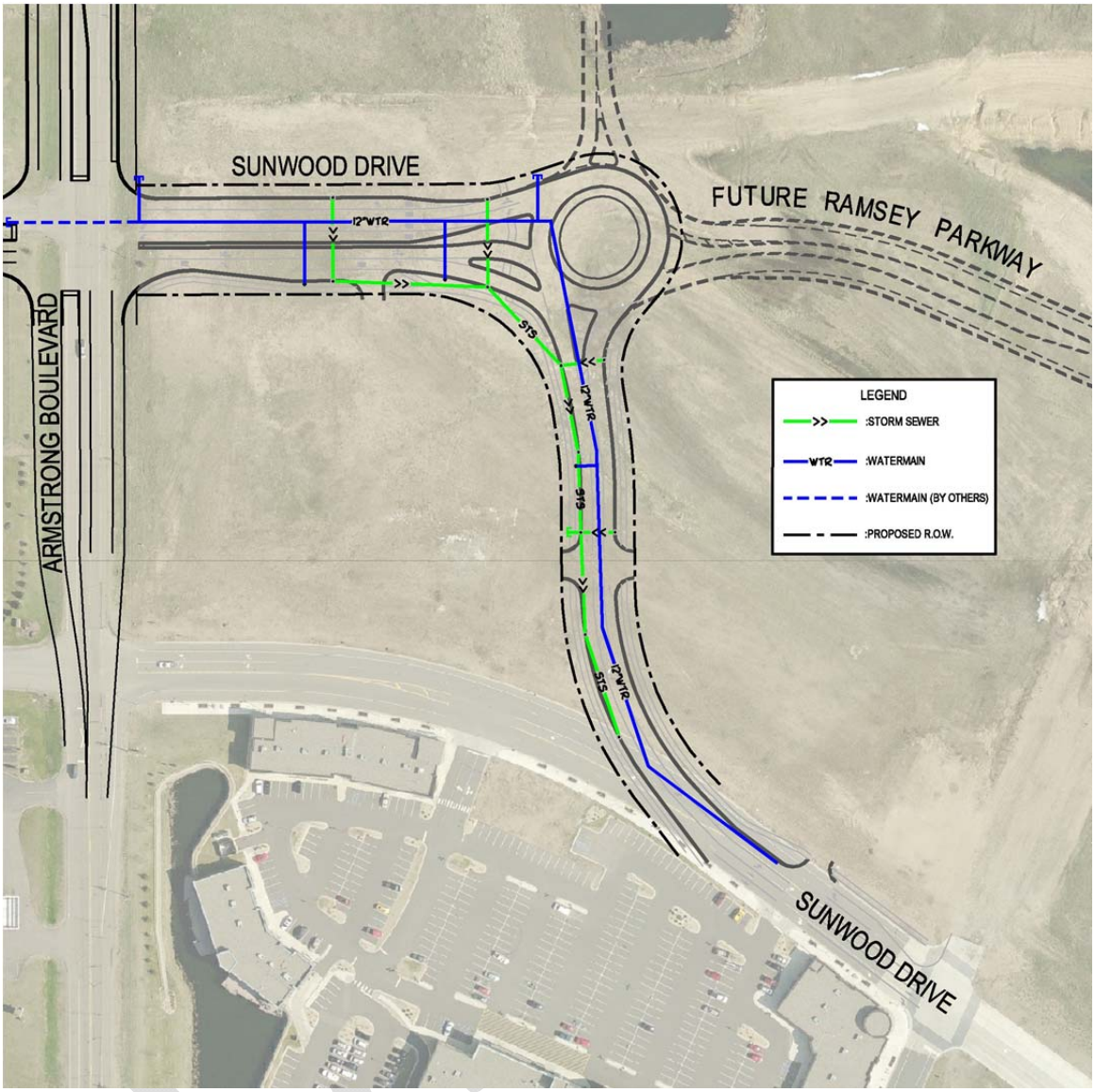
The proposed work also includes demolition of the abandoned portion of Sunwood Drive. Existing street lights and other items will be salvaged and reused to supplement new street lights. The 75-foot street light spacing currently on Sunwood Drive will be maintained. The boulevard will be restored in accordance with the City policy of 4" of topsoil and sod and will be sprinklered. Boulevard trees will be provided at the same spacing on existing Sunwood Drive. The proposed boulevard improvements will present a completed entrance to the western portion of The COR.

A new entrance will be provided to the Coborn's site and the right in only intersection on the east end of that site will be converted to a full intersection. The new entrance is not included in this project.

Water Main

The proposed utility improvements are shown on Figure 6. A 12" water main currently runs on Sunwood Drive terminating on the west side of Armstrong Boulevard. This main will remain in place to serve the area west of Armstrong Boulevard. Ramsey's Water Plan proposes a 12" water main on Armstrong Boulevard. This main will be installed on the realigned Sunwood Drive and extended through the new Armstrong/Sunwood intersection to provide looped water service to the area west of Armstrong Boulevard. Water services will be extended to the commercial area between Sunwood Drive and Armstrong Boulevard. A 24" watermain currently exists in the southeast quadrant of the Armstrong/Bunker intersection. Connection to and extension of the watermain is not recommended at the present time, pending the update of the City's Water Plan and the development of the big box site. A water service will be provided to the roundabout center island and for the boulevard sprinklering.

Figure 6: Utilities Map



Sanitary Sewer

No sanitary improvements are required as part of the Sunwood Drive realignment. Sanitary service to the commercial area will be provided by internal extension of existing sanitary sewer.

Storm Water Management

Trunk storm water management facilities including water quality treatment, storm water storage and storm sewers were previously installed as part of the original Ramsey Town Center (RTC) development. This project includes the construction of storm sewer along the realigned Sunwood Drive connecting to the existing trunk storm sewer on the east end of the project. Storm sewer services will be extended into the commercial area between Sunwood Drive and Armstrong Boulevard.

Cost Estimates

Cost estimates for the proposed improvements are presented in Appendix C. The estimates include construction, a 10% allowance for contingencies and a 20% allowance for indirect costs including design, construction administration, construction staking and observation, record drawings and administration. A summary of the cost estimates is presented in Table 2.

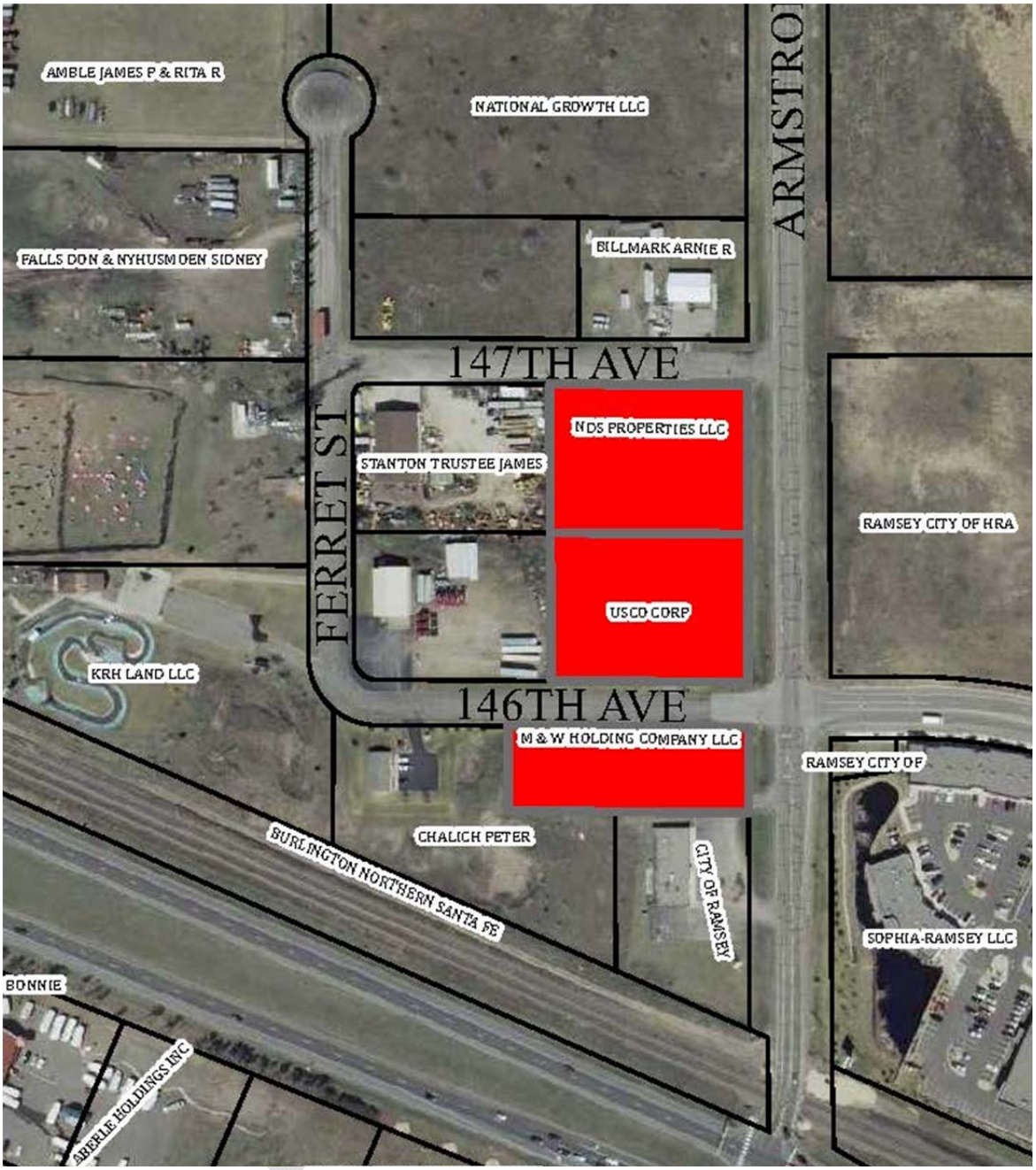
Table 2: Total Estimates Costs

Total Estimates Costs	
Item	**Estimated Total Costs**
Sunwood Drive	$1,151,000
Water Main	$131,000
Storm Sewer	$87,000
Total	**$1,369,000**

Property Acquisition

The realignment of Armstrong Boulevard in anticipation of the overpass requires the acquisition of additional right of way. There are five properties immediately affected by the proposed project, all requiring some acquisition depending on the ultimate configuration. These properties are showed on Figure 7.

Figure 7: Property Acquisition



The five properties include:

Table 3: Parcel Exhibit

Parcel Exhibit		
PID	**Owner**	**Current Use**
28-230005	The City of Ramsey HRA	Vacant/Undeveloped
29-140014	The City of Ramsey	Vacant/Demolished c-store
29-140013	M&W Holding Company	Wiser Choice Liquor
29-140010	USCO Corp	Pavement Operation
29-140009	NDS Properties, LLC	Vacant industrial

Table 4: Current Assessed Value

PID	Current Assessed Value
28-230005	N/A
29-140014	N/A
29-140013	$392,100
29-140010	$298,900
29-140009	$684,800

Acquisition strategies vary with small deviations in the proposed design, but generally consist of a cost/benefit evaluation of considering a partial taking versus a complete taking. In 20XX, the City of Ramsey evaluated five of the subject properties as part of an eminent domain action that was ultimately abandoned. Prior to cessation of those efforts, however, environmental assessments and appraisals were completed in an attempt to determine value. The table below outlines the valuations from the 20XX effort.

Table 5: Appraised Property Value

PID	200X Appraised Property Value
28-230005	N/A
29-140014	N/A
29-140013	$xxx
29-140010	$xxx
29-140009	$xxx

As of the date of this report, the real estate market has seen considerable depreciation. Commercial property values have seen declines ranging from 10% – 40% across the metro, and many would argue that it is impossible to set accurate values today due to the dramatic decline in buyers as well as the volatility of comparable value assessments due to an abundance of bank owned property. Based on these current market conditions, it would be considered advantageous to the project to consider an earlier,

more aggressive acquisition strategy with willing sellers as opposed to waiting for the commencement of the Armstrong Boulevard project and a likely rebound in the market.

Adding to the complexity of the evaluation is the desire of the HRA, as master developers of The COR, to proceed with the proposed realignment of Sunwood Drive to its ultimate location ahead of the commencement of the Armstrong Interchange. This is driven by a number of factors, most notably the desire to continue to advance the Armstrong Interchange project by completing the construction north of the actual interchange thus reducing the scope of the interchange project and increasing the likelihood of commencement. Secondly, the realignment of Armstrong to its final location provides certainty for the adjacent properties both east and west of Armstrong. Certainty in their access provides a greater likelihood of economic development and redevelopment that is necessary in the area.

For these reasons, it is our recommendation that the City and HRA consider the acquisition of the affected parcels and proceed with the project as outlined.

Affected Parcels

PID 29-140014 – Oasis Market. - A total acquisition of this property is required in any viable interchange option. In 20XX, the City acquired and eventually demolished the Oasis Market in anticipation of the proposed project. There are no additional actions recommended for this parcel.

PID 29-140013 – M&W Holding Company, LLC. - A total acquisition of this property is also required in any of the options currently considered in the environmental review process. This property has seen a negative effect from the closure of the adjacent convenience store and is the only remaining retail property west of Armstrong. The owner has a desire to relocate and should be considered a willing seller. Because the Armstrong Interchange will require a total acquisition of the property, and because the proposed reconfiguration of the Sunwood/Armstrong intersection will likely result in a reduction of access to this property, it is recommended that the City consider a complete acquisition of this property at the present time.

PID 29-140010 – USCO Corp. – Of the five parcels, this property is least affected by the proposed project. Access to this industrial use could be reasonably provided via 147th Street, Ferret Street NW and then 146th Street to the existing driveway. A small strip taking and a small retaining wall would be required to accommodate the proposed roadway design. This property, however, is not currently the highest and best use of what will ultimately be a retail node in the community. An assembly effort for redevelopment of this area is likely to occur in the near future. For these reasons, it is recommended that the City evaluate the cost of a strip taking vs. a complete taking and consider the latter in an effort to facilitate redevelopment.

PID 29-140009 – NDS Properties, LLC. – A partial taking to facilitate the proposed construction could be considered for this property, however, it would likely require considerable property along both the north and east sides of the property and the demolition of one of the two existing buildings, as well as a considerable modification to its access. For this reason, it is recommended that the City evaluate both the partial and complete takings options, but we believe it will be more efficient to take the property completely. There are no active uses on this property at the time of this report.

PID 28-230005 – HRA Property – Depending on the final alignment chosen, a small strip taking of HRA land in The COR may be necessary to facilitate the design. Because this property is owned by the HRA, it is assumed for this report that the City will resolve any valuation issues internally.

The HRA has authorized the commencement of current appraisals on the three properties west of Armstrong Boulevard. For the purposes of this report, we will use the values from the 20XX appraisals, with the understanding that the actual acquisition costs, and accordingly project costs, will be considerably less.

Acquisition Strategy 1 – Partial Takings

This option assumes the proposed project can be completed with the complete acquisition PID XX, but only the partial acquisition of right-of-way from the remaining three parcels necessary to complete the project. The existing property owners would retain ownership of the remainder of the property, and reasonable access would be provided.

Table 6: Partial Takings Costs

Parcel	Sq. Ft. Acquired	Cost
PID XX	XX,XXX	$XXX,XXX
PID XX	XX,XXX	$XXX,XXX
PID XX	XX,XXX	$XXX,XXX
TOTAL	**xxxx**	**$XXX,XXX**

Acquisition Strategy 2 – Complete Takings

This option assumes the all four affected parcels would be acquired completely through a process involving a willing buyer and seller. The cost of acquisition may include relocation, which adds considerable cost to the project, but the excess property could be sold after project completion to facilitate redevelopment and those values are shown as a recovered cost in this option.

Table 7: Full Acquisition Cost

Parcel	Acquisition Cost	Relocation Cost	Total
PID XX	XX,XXX	$XXX,XXX	$x,xxx,xxx
PID XX	XX,XXX	$XXX,XXX	$x,xxx,xxx
PID XX	XX,XXX	$XXX,XXX	$x,xxx,xxx
TOTAL	**$X,XXX,XXX**	**$XXX,XXX**	**$x,xxx,xxx**

Table 8: Exceess Property

Excess Property		
Parcel	**Remaining Property (sq. ft.)**	**Approximate Value**
PID XX	XX,XXX	$XXX,XXX
PID XX	XX,XXX	$XXX,XXX
PID XX	XX,XXX	$XXX,XXX
TOTAL	**XX,XXX**	**$XXX,XXX**

For the purposes of this study, the net costs of Acquisition Strategy 2 (acquisition cost minus excess property value) will be used as the project costs. After the completion of the current appraisals, and the initial efforts in approaching the affected property owners, this approach should be re-evaluated and adjusted as necessary to minimize project costs.

Right-of-way and Easement Vacation

The realignment of Sunwood Drive will necessitate a re-platting of the project area. This process will include the vacation of existing right-of-way associated with the current alignment, as well as easements for drainage and utility purposes. Several new easements will be dedicated through this process to accommodate utilities that will remain in place after realignment.

The HRA anticipates working with Solomon, the owner of existing grocery-anchored center, to improve and account for access modification associated with this project. Options considered include access through HRA property to their existing full access on Sunwood, as well as improvements to the existing right-in/right-out access to the east.

Project Financing

(To Be Provided in a Separate Document)

Project Schedule

Table 9: Project Schedule

Task	Completion Date
Order Feasibility Study	July 26, 2011
Accept Feasibility Study and Order Plans and Specifications	January 10, 2012
Approve Plans, Specifications and Order Advertisement for Bids	April 2012
Receive Bids	May 2012
Begin Construction	June 2012
Substantial Completion	September 2012
Final Completion	November 2012

Summary and Conclusions

The realignment of Sunwood Drive is necessary to accommodate the grade changes on Armstrong Boulevard associated with the new TH10/Armstrong Interchange. The work outlined in this report is consistent with Development Plan 5.03 of The COR. The proposed roadway improvements meet Municipal State Aid standards. The provision of a roundabout at the Sunwood/Ramsey Parkway intersection provides better management of the projected ultimate traffic and also provides flexibility should those projections be exceeded.

The costs associated with the proposed improvements are presented in the Appendices and summarized in the Cost Estimates section. It is our professional opinion that the benefits derived from this project exceed the associated costs. The work is cost effective and feasible from an engineering standpoint.

Appendix A: Traffic Generation Memo

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Technical Memorandum

To: Bob Schunicht, P.E., Landform
From: Mike Spack, P.E., P.T.O.E.
Date: September 2, 2011
Re: The COR Traffic Generation in Ramsey, MN

Per your request, this technical memorandum provides traffic generation forecasts for Development Plan 5.03 of The COR along with traffic forecasts necessary to design the proposed roundabout at Ramsey Parkway and Sunwood Drive.

Traffic Forecast Results

Build out of The COR is forecast to generate approximately 3,700 vehicles in the a.m. peak hour, 5,600 vehicles in the p.m. peak hour, and 57,700 vehicles per day. The build out (2030) forecasts needed to design the roundabout at the Ramsey Parkway/Sunwood Drive intersection are shown in Figure 1 (a.m. peak hour turning movement volumes), Figure 2 (p.m. peak hour turning movement volumes), and Figure 3 (daily traffic volumes). The traffic forecasts are based on the methodology discussed in the next section.

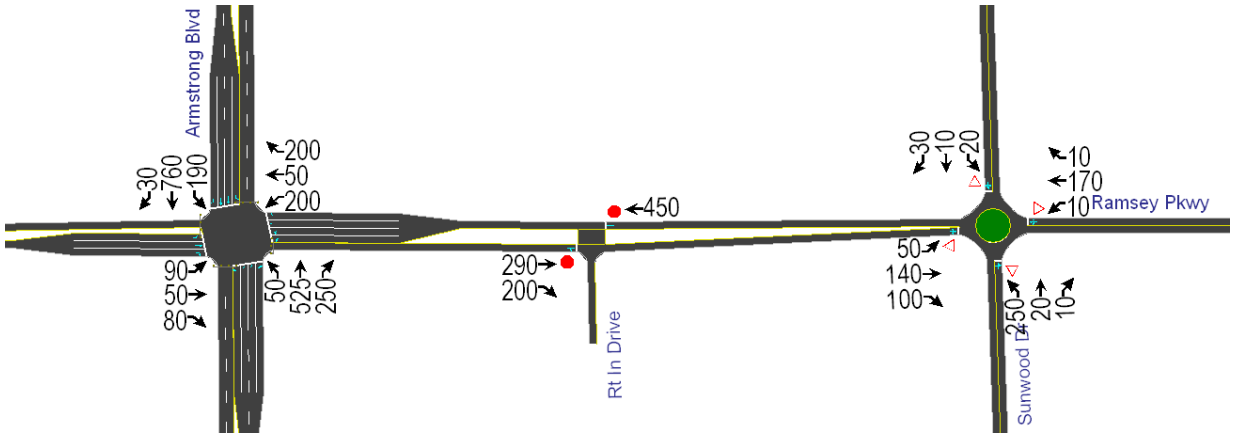

Figure 1 – Build Out A.M. Peak Hour Turning Movement Volumes

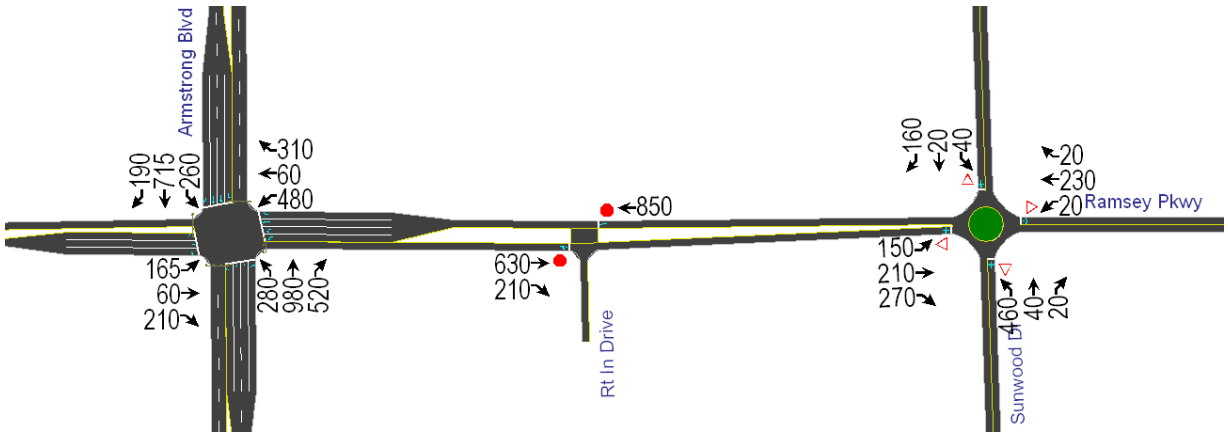

Figure 2 – Build Out P.M. Peak Hour Turning Movement Volumes

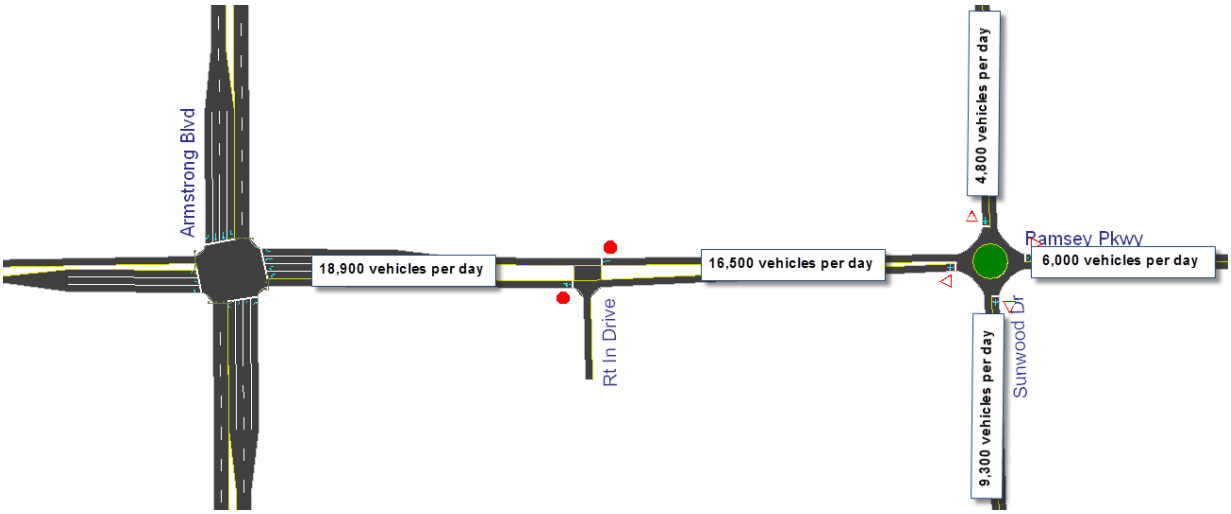

Figure 3 – Build Out Daily Traffic Volumes

Traffic Forecast Methodology

Landform provided details for The COR, including the Traffic Analysis Zones (TAZs) shown in Figure 4 and individual land uses/square footages per TAZ as shown in Table 1. A trip generation analysis was performed for The COR based on the methods and average rates published in the Institute of Transportation Engineers' (ITE) *Trip Generation Manual, 8th Edition*. Based on data in the Institute of Transportation Engineers (ITE) *Trip Generation Handbook, 2nd Edition*, a 20% reduction was applied to the trips generated by the development to account for internal, multi-purpose trips. The resultant trip generation per TAZ as well as totals for the whole development is shown in Table 1.

WSB & Associates prepared 2030 turning movement volume forecasts for the Armstrong Boulevard/Ramsey Parkway intersection in the *US 10 at Armstrong Boulevard Traffic Operations Memo.* The volumes entering/exiting The COR at the intersection were based on the March 24, 2003 *Ramsey Town Center Traffic Analysis* (The COR's previously proposed development plan). The *Ramsey Town Center Traffic Analysis* calculated the development will generate 51,186 vehicles per day whereas The COR is forecast to generate 57,739 vehicles per day. Since The COR is forecast to generate 12.8% more traffic than the Ramsey Town Center, the 2030 turning movement volumes entering/exiting The COR in the *US 10 at Armstrong Boulevard Traffic Operations Memo* were factored up by 12.8%. The resultant turning movement volumes for the Armstrong Boulevard/Ramsey Parkway intersection are shown in Figures 1 and 2.

The turning movement volume forecasts in Figures 1 and 2 for the Ramsey Parkway/Right-In Access intersection and the Ramsey Parkway/Sunwood Drive intersection were prepared by distributing the peak hour traffic volumes from Table 1 per the trip distribution percentages contained in the March 24, 2003 *Ramsey Town Center Traffic Analysis*.

According to Table 41 from *NCHRP Report 365 – Travel Estimation Techniques for Urban Planning*, 8.95% of the daily traffic volumes would be expected to use the roadway network through The COR in the p.m. peak hour. The p.m. peak hour volumes from Figure 2 were factored by this ratio (11.17 x p.m. peak hour volume = daily traffic volume) to develop the daily traffic volumes shown in Figure 3.

Figure 4 - Traffic Analyis Zones

Table 1 - Land Uses and Traffic Generation

							AM Peak			PM Peak			Daily
Zone/Block	Code	Land Use	Dwelling Units	Sq. ft.	Park Area[1] (sq. ft.)	ITE Code[2]	Total	In	Out	Total	In	Out	Total
1a	3	Retail		11,882		820	10	6	4	35	17	18	408
1b	3	Retail		9,022		820	7	4	3	27	13	14	310
1c	3	Supermarket		62,396		850	179	109	70	524	267	257	5103
1d	3	Retail		13,283		820	11	6	4	40	19	20	456
1e	3	Retail		7,300		820	6	4	2	22	11	11	251
2a	3	Retail		5,248		820	4	3	2	16	8	8	180
2b	3	Retail		39,000		820	31	19	12	116	57	59	1340
2c	2	Daycare Center		10,320		565	101	54	48	103	48	55	654
2d	1	Senior Housing - Assisted Living	84			254	9	6	3	15	7	8	179
3a	1	Luxury Apartments / Townhomes	230			220	94	19	75	114	74	40	1224
3a	3	Retail		67,085		820	54	33	21	200	98	102	2305
3b	2	Government Office Building		49,107		730	231	194	37	48	15	33	2708
3c	0	Park & Ride (Northstar)[3]											
4a	2	Clinic		50,092		720	92	73	19	139	37	101	1448
4b	3	Sit Down Restaurant		9,037		931	6	3	3	54	36	18	650
4c	3	Hotel[4]		24,900		310	14	9	6	15	8	7	209
4d	3	Convention Center[5]		110,000		310	34	20	13	35	19	17	490
5a	2	Office		17,598		710	22	19	3	21	4	17	155
5b	2	Business Park		93,871		770	107	90	17	97	22	75	958
6a	2	School		44,827		520	186	104	82	43	20	24	553
6b	3	Retail		13,070		820	10	6	4	39	19	20	449
6c	3	Retail		17,987		820	14	9	6	54	26	27	618
6d	3	Retail		17,987		820	14	9	6	54	26	27	618
7a	2	Charter School[6]		50,511		534	468	258	211	264	129	135	1405
7b	2	Medical Office		33,374		720	61	49	13	92	25	67	965
7c	3	Retail		24,780		820	20	12	8	74	36	38	851
8a	0	City Park w/ Lake			430,000								
8b	2	General Office		43,584		710	54	48	6	52	9	43	384
8c	2	General Office		43,584		710	54	48	6	52	9	43	384
9a	0	City Park w/ Lake			171,445								
9b	1	Apartments	95			220	39	8	31	47	31	16	505
9c	2	Recreational Community Center		107,556		495	139	85	54	125	46	79	1969
9d	2	General Office		59,696		710	74	65	9	71	12	59	526
9e	2	General Office		42,765		710	53	47	6	51	9	42	377
9f	2	General Office		59,208		710	73	65	9	71	12	59	522
10a	0	City Park			3,500								
10b	2	General Office		8,400		710	10	9	1	10	2	8	74
10b	3	Specialty Retail		4,200		820	3	2	1	13	6	6	144
10c	2	General Office		40,800		710	51	45	6	49	8	40	359
10c	1	Apartments	120			220	49	10	39	60	39	21	638
10d	2	General Office		11,500		710	14	13	2	14	2	11	101
10d	3	Specialty Retail		11,500		820	9	6	4	34	17	18	395
10e	2	General Office		8,500		710	11	9	1	10	2	8	75
10e	3	Specialty Retail		4,250		820	3	2	1	13	6	6	146
10f	2	General Office		11,900		710	15	13	2	14	2	12	105
10f	3	Specialty Retail		8,500		820	7	4	3	25	12	13	292
10f	1	Apartments	14			220	6	1	5	7	5	2	74
10g	3	Specialty Retail		7,600		820	6	4	2	23	11	12	261
10g	2	General Office		7,600		710	9	8	1	9	2	8	67
10g	1	Apartments	18			220	7	1	6	9	6	3	96
10h	3	Specialty Retail		6,300		820	5	3	2	19	9	10	216
10i	3	Specialty Retail		6,100		820	5	3	2	18	9	9	210
10i	2	General Office		6,100		710	8	7	1	7	1	6	54
10i	1	Apartments	26			220	11	2	8	13	8	5	138
11a	3	Specialty Retail		17,000		820	14	8	5	51	25	26	584
11a	1	Apartments	89			220	36	7	29	44	29	15	473
11b	2	General Office		11,000		710	14	12	2	13	2	11	97
11b	1	Apartments	13			220	5	1	4	6	4	2	69
11c	2	General Office		20,700		710	26	23	3	25	4	20	182
11d	2	General Office		10,700		710	13	12	2	13	2	11	94
11d	3	Specialty Retail		10,700		820	9	5	3	32	16	16	368
11e	2	General Office		5,900		710	7	6	1	7	1	6	52
11e	3	Specialty Retail		11,800		820	9	6	4	35	17	18	405
11e	1	Apartments	14			220	6	1	5	7	5	2	74
11f	3	Specialty Retail		11,800		820	9	6	4	35	17	18	405
11f	2	General Office		5,900		710	7	6	1	7	1	6	52
11f	1	Apartments	14			220	6	1	5	7	5	2	74
11g	0	City Park			82,804								
12a	3	Sit Down Restaurant		23,355		931	15	8	8	140	94	46	1681
12b	3	Sit Down Restaurant		8,805		931	6	3	3	53	35	17	634
12c	3	Movie Theater[7]		74,071		444	0	0	0	225	144	81	1733
13a	3	Retail		19,200		820	15	9	6	57	28	29	660
13b	3	Retail		16,664		820	13	8	5	50	24	25	572
14a	3	Gas Station w/Convenience Store[8]		5,000		945	317	162	155	388	194	194	1563
14b	3	Retail		10,628		820	9	5	3	32	16	16	365
14c	3	Fast Food Restaurant w/Drive-Through		4,800		934	190	97	93	129	67	62	1905
15	3	Shopping Center		135,986		820	109	66	42	406	199	207	4671
16	3	Retail		94,960		820	76	46	30	283	139	145	3262

Table 1 - Land Uses and Traffic Generation

							AM Peak			PM Peak			Daily
Zone/Block	Code	Land Use	Dwelling Units	Sq. ft.	Park Area[1] (sq. ft.)	ITE Code[2]	Total	In	Out	Total	In	Out	Total
17a	3	Sit Down Restaurant		6,000		931	4	2	2	36	24	12	432
17b	3	Sit Down Restaurant		5,470		931	4	2	2	33	22	11	394
17c	3	Sit Down Restaurant		5,470		931	4	2	2	33	22	11	394
17d	0	City Park w/ Lake			480,000								
18a	1	Condos	80			230	28	5	23	33	22	11	372
18b	1	Condos	69			230	24	4	20	29	19	9	321
18c	1	Condos	48			230	17	3	14	20	13	7	223
18d	1	Townhomes	32			230	11	2	9	13	9	4	149
19a	1	Townhomes	52			230	18	3	15	22	14	7	242
19b	1	Single Family - Detached	14			210	8	2	6	11	7	4	107
19c	1	Townhomes	31			230	11	2	9	13	9	4	144
20a	1	Townhomes	42			230	15	3	12	17	12	6	195
20b	1	Single Family - Detached	14			210	8	2	6	11	7	4	107
20c	1	Townhomes	28			230	10	2	8	12	8	4	130
21a	1	Townhomes	77			230	27	5	22	32	21	11	358
21b	1	Townhomes	90			230	32	5	26	37	25	12	418
22a	1	Single Family - Detached	23			210	14	3	10	19	12	7	176
22b	1	Townhomes	72			230	25	4	21	30	20	10	335
23a	1	Single Family - Detached	44			210	26	7	20	36	22	13	337
23b	1	Single Family - Detached	19			210	11	3	9	15	10	6	145
24a	1	Single Family - Detached	7			210	4	1	3	6	4	2	54
24b	0	City Park w/ Lake & Amphitheater			320,000								
24c	1	Single Family - Detached	17			210	10	3	8	14	9	5	130
Total			1,476	1,798,229	1,487,749		3,726	2,186	1,540	5,571	2,696	2,875	57,739

Residential Total (Code 1)	1,476	0			569	116	453	699	454	245	7,489
Office Total (Code 2)	0	855,093			1,903	1,360	543	1,406	427	979	14,319
Retail Total (Code 3)	0	943,136			1,255	710	544	3,467	1,815	1,651	35,930
	1,476	1,798,229			3,726	2,186	1,540	5,571	2,696	2,875	57,739

Notes:

[1] Due to the minimal amount of traffic generated by parks, they were not considered traffic generators in the original study. Likewise, parks are not considered traffic generators in this forecast.

[2] The trip generation was based on the methods and average rates published in the *Institute of Transportation Engineers (ITE) Trip Generation Manual, 8th Edition*.

[3] The traffic generated by the park and ride was included in the analysis of the original study, however the unspecified volumes were added directly to the intersection traffic assignment instead of being listed with the other trip generation numbers. Accordingly, the traffic volumes generated by the park and ride facitiliy are not considered with the rest of the generated traffic in this forecast.

[4] The number of dwelling units (DU) for the hotel was obtained by proportioning the proposed hotel to the hotel in the original study via the their respective footprints. The hotel was modeled as having 32 rooms.

[5] Currently, there is no data for traffic volumes generated by Convention Centers. The Convention Center was modeled as a 75-unit Hotel (310).

[6] Currently, there is no data for daily traffic volumes generated by 534 - Private School (K-8). For public elementary, junior high, and high schools, the ratio of the total daily traffic to the A.M. peak hour traffic is approximately 3.0. The total daily traffic generated by the charter school was calculated by multiplying the A.M. peak hour traffic by a factor of 3.0.

[7] Due to the lack of data for the proposed theater type (445 - Multiplex Movie Theater), the daily and P.M. peak hour trips generated by the theater were obtained by scaling up the figures found in the original study using the theaters' respective footprints.

[8] Due to the lack of data for total weekday trips generated by 945 - Gas Station w/Convenience Store using square footage, the total weekday trips were calculated using the number of fueling positions. Based on the typical size of gas stations currently being constructed, it was assumed that new gas station will have 12 fueling positions.

The forecasts reflect a 20% reduction for internal, multi-purpose trips.

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Appendix B: Operational Analysis Memo

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Ourston Roundabout Engineering

TECHNICAL MEMORANDUM

PREPARED FOR:	Robert Schunicht – Landform
PREPARED BY: **Q/C and Q/A**	Jedidiah Munroe, Ourston Roundabout Engineering, Inc. Mark Lenters, Ourston Roundabout Engineering, Inc.
PROJECT NUMBER	ORE 11-958
DATE:	December 1, 2011
SUBJECT:	Operational Analysis Ramsey Parkway & Sunwood Drive Ramsey, Minnesota

PURPOSE

An operational analysis was completed for the proposed roundabout at Ramsey Parkway and Sunwood Drive located in the COR development project in Ramsey, Minnesota. The analysis also assessed possible queue spillbacks from the proposed roundabout to the signal at Armstrong Boulevard and Sunwood Drive. There is approximately 440 feet of queue storage between the signalized intersection and the proposed roundabout intersection. We understand that the queue space associated with the signal operations has been analyzed and the space requirements associated with the traffic signal control have been fulfilled by others to a satisfactory conclusion. We have also designed and analyzed an initial and potential ultimate roundabout lane configuration for the City's consideration.

OPERATIONAL ANALYSIS METHODOLOGY

Based on the AM and PM peak hourly traffic forecasts, the capacity of the roundabout intersection was analyzed using ARCADY roundabout design and capacity analysis software. ARCADY (Assessment of Roundabout Capacity and Delay) is a program based on U.K. empirical research into geometry-capacity relationships. Two features that ARCADY provides is its ability take into account horizontal geometric design sensitivity and its ability to be calibrated to the recent NCHRP Report 572 (Roundabouts in the United States, 2007) roundabout capacity model.

The ARCADY analysis was calibrated to the NCHRP Report 572 empirical results, which indicate a reasonable 10% capacity reduction. The findings on capacity performance for U.S. roundabouts to date suggest that a reduction in the capacity modeling is appropriate pending the availability of more at-capacity data to improve the confidence of modeling roundabouts. Some single lane roundabouts are performing better than expected, but this may not be the case everywhere in the U.S., especially in areas where few roundabouts exist.

The results represent the most probable capacity of the roundabout and employ capacity measures of level of service, delay and queuing, consistent with typical unsignalized capacity analysis methodologies (Highway Capacity Manual, 2010). The combination of using ARCADY with calibration allows for consideration of the U.S. data obtained by NCHRP.

Analysis of residual capacity for future traffic growth was also performed for the intersection. Residual capacity is expressed as the percentage increase in total entering traffic beyond the existing turning counts that would result in any individual leg operating at LOS E (delay greater than 35 seconds). Increases in traffic flow were assumed to occur equally on all legs until one leg reached LOS E.

The 2030 AM and PM peak hourly traffic forecasts prepared by Spack Consulting, as illustrated in Figure 1, were used for this analysis.

OPERATIONAL ANALYSIS RESULTS

Ramsey Parkway and Sunwood Drive (ARCADY Analysis)

LOS for proposed initial roundabout configuration

The operational analysis was performed with the traffic forecasts provided for the interim lane configuration shown in Figure 2. The overall intersection levels of service and anticipated delay with a break down by approach are listed in Table 1.

Table 1. Ramsey Parkway & Sunwood Drive – Proposed Initial Lane Configuration

Peak Hour	Analysis Condition	Overall Intersection Level of Service		Average Delay By Approach							
				SB - Driveway		EB - Sunwood Dr.		NB - Sunwood Dr.		WB - Ramsey Pkwy	
		Level of Service	Average Delay	Level of Service	Average Delay	Level of Service	Average Delay	Level of Service	Average Delay	Level of Service	Average Delay
AM	Calibrated	A	4.4	A	4.2	A	3.8	A	4.7	A	4.6
PM	Calibrated	A	6.9	A	6.6	A	4.7	A	8.5	A	6.8

LOS Source: 2010 Highway Capacity Manual - Unsignalized Intersections *Delay in Seconds*

The eastbound Sunwood Drive predicted 95th percentile queue is 1 vehicles (20 feet) in the PM peak period.

The residual capacity for the AM and PM peak hours is also listed below.

AM: NB congests with a **159%** increase in traffic growth above the 2030 traffic volumes.

PM: NB congests with a **39%** increase in traffic growth above the 2030 traffic volumes.

The ARCADY operational analysis data is documented in Appendix A, pages A.1.1 thru A.1.3

LOS for potential ultimate roundabout configuration

The operational analysis was performed with the traffic forecasts provided for the ultimate lane configuration shown in Figure 3. The overall intersection levels of service and anticipated delay with a break down by approach are listed in Table2.

Table 2. Ramsey Parkway & Sunwood Drive – Potential Ultimate Lane Configuration

Peak Hour	Analysis Condition	Overall Intersection Level of Service		Average Delay By Approach							
				SB - Driveway		EB - Sunwood Dr.		NB - Sunwood Dr.		WB - Ramsey Pkwy	
		Level of Service	Average Delay	Level of Service	Average Delay	Level of Service	Average Delay	Level of Service	Average Delay	Level of Service	Average Delay
AM	Calibrated	A	3.3	A	4.2	A	3.8	A	3.0	A	2.9
PM	Calibrated	A	4.7	A	6.6	A	4.7	A	4.2	A	3.9

LOS Source: 2010 Highway Capacity Manual - Unsignalized Intersections *Delay in Seconds*

The residual capacity for the AM and PM peak hours is also listed below.

AM: SB congests with a **232%** increase in traffic growth above the 2030 traffic volumes.

PM: SB congests with a **63%** increase in traffic growth above the 2030 traffic volumes.

The ARCADY operational analysis data is documented in Appendix B, pages B.1.1 thru B.1.3

Discussion of Proposed Roundabout Lane Configuration

The roundabout would operate within acceptable ranges of congestion as a single lane roundabout. But, to maintain the proposed eastbound two lanes, an eastbound partial right turn bypass lane should be used to facilitate dropping a lane at the roundabout, see Figure 2.

The roundabout can also be expanded inward into the central island, with minimal rework, to create a multilane roundabout with a northbound double left and two westbound thru lanes. The ultimate lane configuration has the ability to handle any potential increases in traffic from the forecasted volumes.

DISCUSSION AND CONCLUSIONS

The results of the ARCADY analysis of the proposed roundabout show a LOS A for the two peak periods for the interim roundabout design, and has the ability to expand to a multilane roundabout in the future.

Typically, when a roundabout is close to a traffic signal, the impacts to the signal are negligible, while the roundabout can be impacted by queue spillback from the signal. The impacts to the Ramsey Parkway and Sunwood Drive intersection will be infrequent but the roundabout is better suited to reduce the effects of the closely spaced intersections, for the following reasons:

- If the Ramsey Parkway and Sunwood Drive intersection were traffic signal controlled, it would likely have the same cycle length as the Armstrong Boulevard traffic signal, assuming they both have to operate as one system due to being closely spaced. Using the same cycle length for the Ramsey Parkway intersection imposes timings that may not be ideal for the traffic patterns at the intersection. Additional operational impacts to the Ramsey Parkway intersection are likely due to the inflexibility of signal timings.

- The roundabout intersection will have slower entering and circulating speeds. This will reduce the impact of queue spill back from Armstrong Boulevard. The roundabout has greater flexibility in responding to traffic demands as compared to a traffic signal constrained by timings that suit the adjacent intersection.

- With the slow entry speeds and good visibility in the roundabout drivers will be able adjust and leave gaps for the entering drivers if occasionally the westbound queue spills back to the roundabout.

Additional benefits of having the roundabout are improved safety, less restrictions to nearby access, pedestrian accommodation and added capacity as compared to stop control.

Figure 1: 2030 AM and PM Peak Hourly Forecasts for Ramsey Parkway and Sunwood Drive

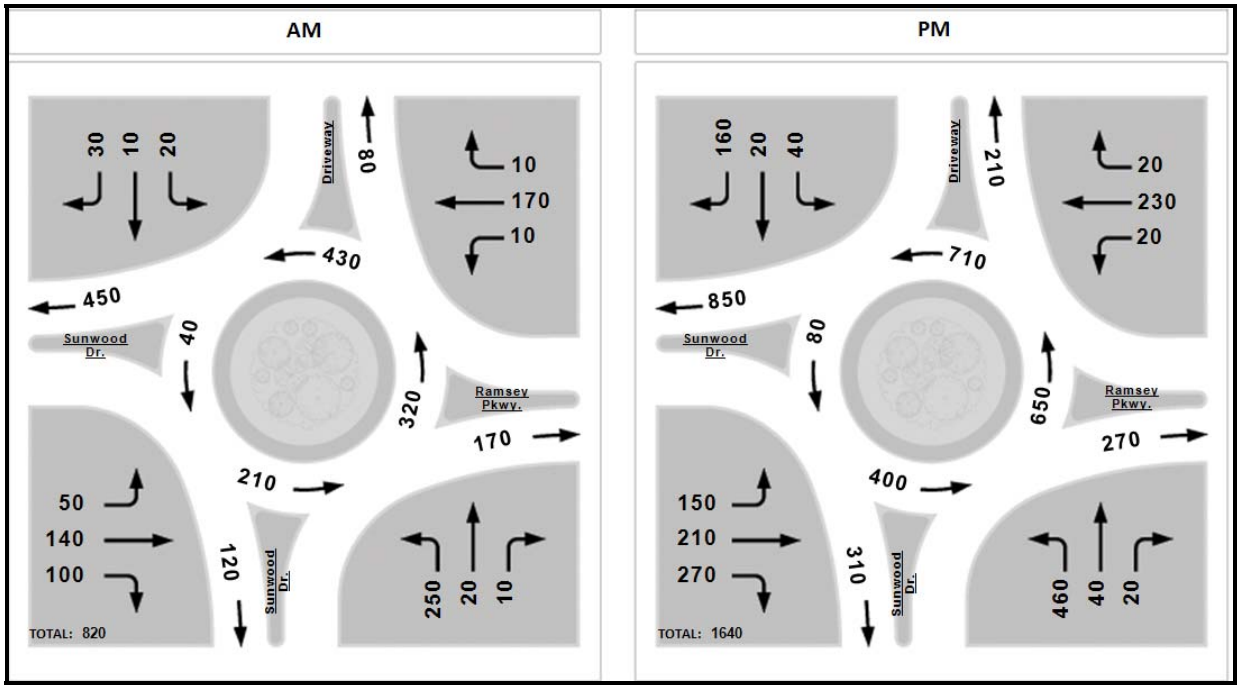


Figure 2: Proposed Initial Roundabout Configuration

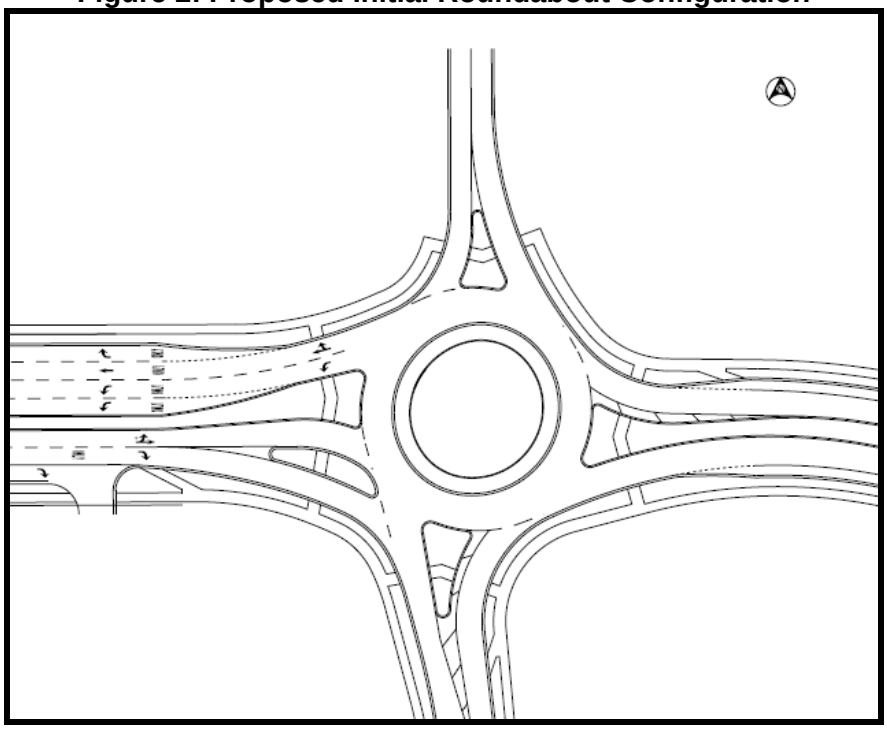
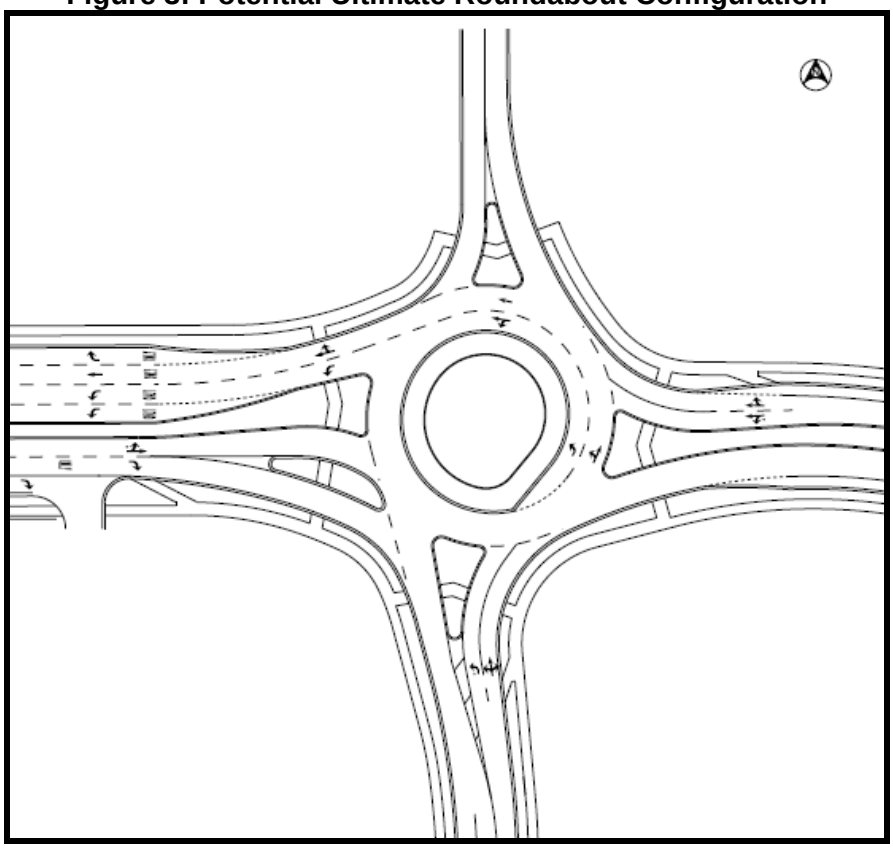


Figure 3: Potential Ultimate Roundabout Configuration



APPENDIX A

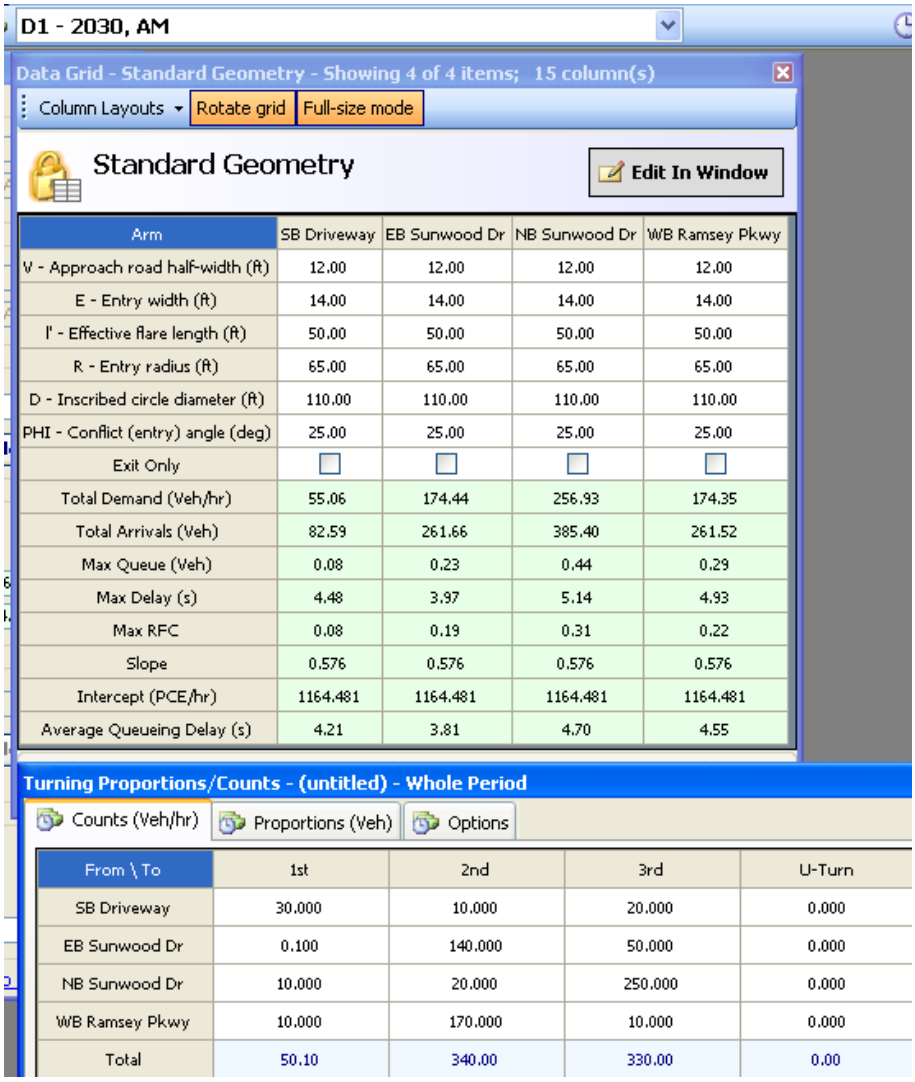
Ramsey, Minnesota

Ramsey Parkway and Sunwood Drive

Proposed Initial Roundabout Configuration

Operational Analysis

2030 – AM Peak Hour Forecasts



D1 - 2030, AM

Data Grid - Standard Geometry - Showing 4 of 4 items; 15 column(s)

Column Layouts | Rotate grid | Full-size mode

Standard Geometry — Edit In Window

Arm	SB Driveway	EB Sunwood Dr	NB Sunwood Dr	WB Ramsey Pkwy
V - Approach road half-width (ft)	12.00	12.00	12.00	12.00
E - Entry width (ft)	14.00	14.00	14.00	14.00
l' - Effective flare length (ft)	50.00	50.00	50.00	50.00
R - Entry radius (ft)	65.00	65.00	65.00	65.00
D - Inscribed circle diameter (ft)	110.00	110.00	110.00	110.00
PHI - Conflict (entry) angle (deg)	25.00	25.00	25.00	25.00
Exit Only	☐	☐	☐	☐
Total Demand (Veh/hr)	55.06	174.44	256.93	174.35
Total Arrivals (Veh)	82.59	261.66	385.40	261.52
Max Queue (Veh)	0.08	0.23	0.44	0.29
Max Delay (s)	4.48	3.97	5.14	4.93
Max RFC	0.08	0.19	0.31	0.22
Slope	0.576	0.576	0.576	0.576
Intercept (PCE/hr)	1164.481	1164.481	1164.481	1164.481
Average Queueing Delay (s)	4.21	3.81	4.70	4.55

Turning Proportions/Counts - (untitled) - Whole Period

Counts (Veh/hr) | Proportions (Veh) | Options

From \ To	1st	2nd	3rd	U-Turn
SB Driveway	30.000	10.000	20.000	0.000
EB Sunwood Dr	0.100	140.000	50.000	0.000
NB Sunwood Dr	10.000	20.000	250.000	0.000
WB Ramsey Pkwy	10.000	170.000	10.000	0.000
Total	50.10	340.00	330.00	0.00

Operational Analysis

2030 – PM Peak Hour Forecasts

D2 - 2030, PM

Data Grid - Standard Geometry - Showing 4 of 4 items; 15 column(s)

Column Layouts | Rotate grid | Full-size mode

Standard Geometry — Edit In Window

Arm	SB Driveway	EB Sunwood Dr	NB Sunwood Dr	WB Ramsey Pkwy
V - Approach road half-width (ft)	12.00	12.00	12.00	12.00
E - Entry width (ft)	14.00	14.00	14.00	14.00
l' - Effective flare length (ft)	50.00	50.00	50.00	50.00
R - Entry radius (ft)	65.00	65.00	65.00	65.00
D - Inscribed circle diameter (ft)	110.00	110.00	110.00	110.00
PHI - Conflict (entry) angle (deg)	25.00	25.00	25.00	25.00
Exit Only	☐	☐	☐	☐
Total Demand (Veh/hr)	201.88	330.59	477.16	247.76
Total Arrivals (Veh)	302.81	495.89	715.74	371.64
Max Queue (Veh)	0.54	0.57	1.78	0.68
Max Delay (s)	8.02	5.18	11.40	8.33
Max RFC	0.35	0.36	0.64	0.41
Slope	0.576	0.576	0.576	0.576
Intercept (PCE/hr)	1164.481	1164.481	1164.481	1164.481
Average Queueing Delay (s)	6.63	4.73	8.53	6.82

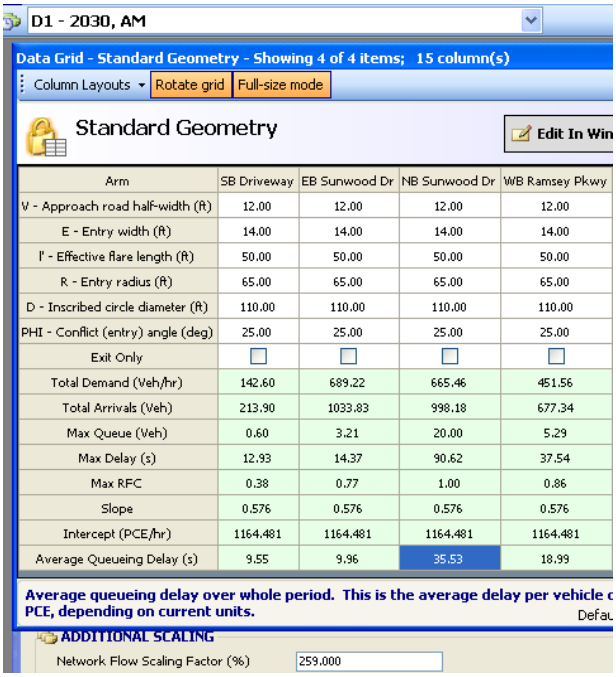
Turning Proportions/Counts - (untitled) - Whole Period

Counts (Veh/hr) | Proportions (Veh) | Options

From \ To	1st	2nd	3rd	U-Turn
SB Driveway	160.000	20.000	40.000	0.000
EB Sunwood Dr	0.270	210.000	150.000	0.000
NB Sunwood Dr	20.000	40.000	460.000	0.000
WB Ramsey Pkwy	20.000	230.000	20.000	0.000
Total	200.27	500.00	670.00	0.00

Operational Analysis

2030 – AM Peak Hour Forecasts
NB is starting to congest with a traffic increase of **159%**



D1 - 2030, AM

Data Grid - Standard Geometry - Showing 4 of 4 items; 15 column(s)

Column Layouts | Rotate grid | Full-size mode

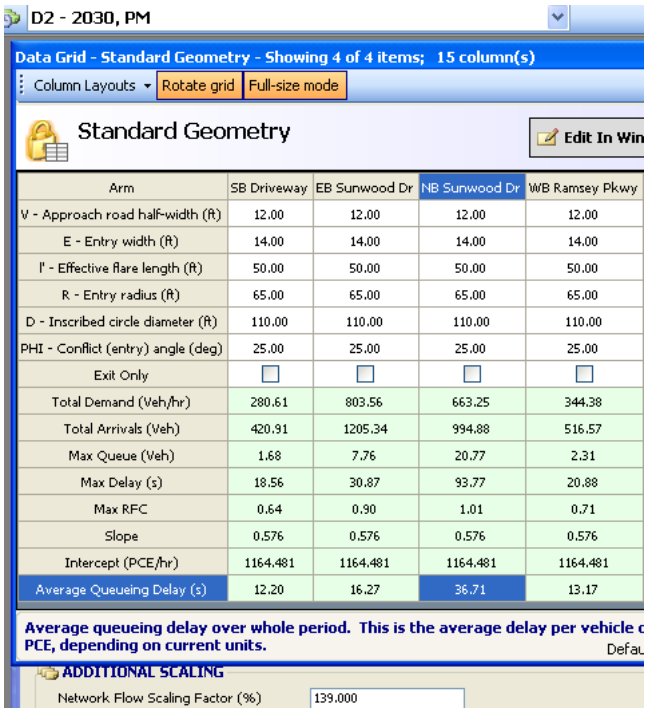
Standard Geometry — Edit In Win

Arm	SB Driveway	EB Sunwood Dr	NB Sunwood Dr	WB Ramsey Pkwy
V - Approach road half-width (ft)	12.00	12.00	12.00	12.00
E - Entry width (ft)	14.00	14.00	14.00	14.00
l' - Effective flare length (ft)	50.00	50.00	50.00	50.00
R - Entry radius (ft)	65.00	65.00	65.00	65.00
D - Inscribed circle diameter (ft)	110.00	110.00	110.00	110.00
PHI - Conflict (entry) angle (deg)	25.00	25.00	25.00	25.00
Exit Only	☐	☐	☐	☐
Total Demand (Veh/hr)	142.60	689.22	665.46	451.56
Total Arrivals (Veh)	213.90	1033.83	998.18	677.34
Max Queue (Veh)	0.60	3.21	20.00	5.29
Max Delay (s)	12.93	14.37	90.62	37.54
Max RFC	0.38	0.77	1.00	0.86
Slope	0.576	0.576	0.576	0.576
Intercept (PCE/hr)	1164.481	1164.481	1164.481	1164.481
Average Queueing Delay (s)	9.55	9.96	35.53	18.99

Average queueing delay over whole period. This is the average delay per vehicle c
PCE, depending on current units. Defau

ADDITIONAL SCALING
Network Flow Scaling Factor (%) 259.000

2030 – AM Peak Hour Forecasts
NB is starting to congest with a traffic increase of **39%**



D2 - 2030, PM

Data Grid - Standard Geometry - Showing 4 of 4 items; 15 column(s)

Column Layouts | Rotate grid | Full-size mode

Standard Geometry — Edit In Win

Arm	SB Driveway	EB Sunwood Dr	NB Sunwood Dr	WB Ramsey Pkwy
V - Approach road half-width (ft)	12.00	12.00	12.00	12.00
E - Entry width (ft)	14.00	14.00	14.00	14.00
l' - Effective flare length (ft)	50.00	50.00	50.00	50.00
R - Entry radius (ft)	65.00	65.00	65.00	65.00
D - Inscribed circle diameter (ft)	110.00	110.00	110.00	110.00
PHI - Conflict (entry) angle (deg)	25.00	25.00	25.00	25.00
Exit Only	☐	☐	☐	☐
Total Demand (Veh/hr)	280.61	803.56	663.25	344.38
Total Arrivals (Veh)	420.91	1205.34	994.88	516.57
Max Queue (Veh)	1.68	7.76	20.77	2.31
Max Delay (s)	18.56	30.87	93.77	20.88
Max RFC	0.64	0.90	1.01	0.71
Slope	0.576	0.576	0.576	0.576
Intercept (PCE/hr)	1164.481	1164.481	1164.481	1164.481
Average Queueing Delay (s)	12.20	16.27	36.71	13.17

Average queueing delay over whole period. This is the average delay per vehicle c
PCE, depending on current units. Defau

ADDITIONAL SCALING
Network Flow Scaling Factor (%) 139.000

APPENDIX B

Ramsey, Minnesota

Ramsey Parkway and Sunwood Drive

Potential Ultimate Roundabout Configuration

Operational Analysis

2030 – AM Peak Hour Forecasts

D1 - 2030, AM

Data Grid - Standard Geometry - Showing 4 of 4 items; 15 column(s)

Column Layouts | Rotate grid | Full-size mode

Standard Geometry — Edit In Window

Arm	SB Driveway	EB Sunwood Dr	NB Sunwood Dr	WB Ramsey Pkwy
V - Approach road half-width (ft)	12.00	12.00	12.00	12.00
E - Entry width (ft)	14.00	14.00	26.00	26.00
l' - Effective flare length (ft)	50.00	50.00	50.00	50.00
R - Entry radius (ft)	65.00	65.00	65.00	65.00
D - Inscribed circle diameter (ft)	110.00	110.00	110.00	110.00
PHI - Conflict (entry) angle (deg)	25.00	25.00	25.00	25.00
Exit Only	☐	☐	☐	☐
Total Demand (Veh/hr)	55.06	174.44	256.93	174.35
Total Arrivals (Veh)	82.59	261.66	385.40	261.52
Max Queue (Veh)	0.08	0.23	0.27	0.18
Max Delay (s)	4.48	3.97	3.16	3.11
Max RFC	0.08	0.19	0.21	0.15
Slope	0.576	0.576	0.683	0.683
Intercept (PCE/hr)	1164.481	1164.481	1638.424	1638.424
Average Queueing Delay (s)	4.21	3.81	2.97	2.94

Turning Proportions/Counts - (untitled) - Whole Period

Counts (Veh/hr) | Proportions (Veh) | Options

From \ To	1st	2nd	3rd	U-Turn
SB Driveway	30.000	10.000	20.000	0.000
EB Sunwood Dr	0.100	140.000	50.000	0.000
NB Sunwood Dr	10.000	20.000	250.000	0.000
WB Ramsey Pkwy	10.000	170.000	10.000	0.000
Total	50.10	340.00	330.00	0.00

Operational Analysis

2030 – PM Peak Hour Forecasts

D2 - 2030, PM

Data Grid - Standard Geometry - Showing 4 of 4 items; 15 column(s)

Column Layouts | Rotate grid | Full-size mode

Standard Geometry — Edit In Window

Arm	SB Driveway	EB Sunwood Dr	NB Sunwood Dr	WB Ramsey Pkwy
V - Approach road half-width (ft)	12.00	12.00	12.00	12.00
E - Entry width (ft)	14.00	14.00	26.00	26.00
l' - Effective flare length (ft)	50.00	50.00	50.00	50.00
R - Entry radius (ft)	65.00	65.00	65.00	65.00
D - Inscribed circle diameter (ft)	110.00	110.00	110.00	110.00
PHI - Conflict (entry) angle (deg)	25.00	25.00	25.00	25.00
Exit Only	☐	☐	☐	☐
Total Demand (Veh/hr)	201.88	330.59	477.16	247.76
Total Arrivals (Veh)	302.81	495.89	715.74	371.64
Max Queue (Veh)	0.54	0.57	0.78	0.36
Max Delay (s)	8.02	5.18	4.91	4.39
Max RFC	0.35	0.36	0.44	0.27
Slope	0.576	0.576	0.683	0.683
Intercept (PCE/hr)	1164.481	1164.481	1638.424	1638.424
Average Queueing Delay (s)	6.63	4.73	4.22	3.87

Turning Proportions/Counts - (untitled) - Whole Period

Counts (Veh/hr) | Proportions (Veh) | Options

From \ To	1st	2nd	3rd	U-Turn
SB Driveway	160.000	20.000	40.000	0.000
EB Sunwood Dr	0.270	210.000	150.000	0.000
NB Sunwood Dr	20.000	40.000	460.000	0.000
WB Ramsey Pkwy	20.000	230.000	20.000	0.000
Total	200.27	500.00	670.00	0.00

Operational Analysis

2030 – AM Peak Hour Forecasts
NB is starting to congest with a traffic increase of **232%**

D1 - 2030, AM

Data Grid - Standard Geometry - Showing 4 of 4 items; 15 column(s)

Column Layouts | Rotate grid | Full-size mode

Standard Geometry — Edit In Window

Arm	SB Driveway	EB Sunwood Dr	NB Sunwood Dr	WB Ramsey Pkwy
V - Approach road half-width (ft)	12.00	12.00	12.00	12.00
E - Entry width (ft)	14.00	14.00	26.00	26.00
l' - Effective flare length (ft)	50.00	50.00	50.00	50.00
R - Entry radius (ft)	65.00	65.00	65.00	65.00
D - Inscribed circle diameter (ft)	110.00	110.00	110.00	110.00
PHI - Conflict (entry) angle (deg)	25.00	25.00	25.00	25.00
Exit Only	☐	☐	☐	☐
Total Demand (Veh/hr)	182.79	579.14	853.02	578.83
Total Arrivals (Veh)	274.18	868.71	1279.53	868.25
Max Queue (Veh)	5.58	1.87	11.89	5.21
Max Delay (s)	98.34	9.86	44.54	28.66
Max RFC	0.91	0.66	0.94	0.85
Slope	0.576	0.576	0.683	0.683
Intercept (PCE/hr)	1164.481	1164.481	1638.424	1638.424
Average Queueing Delay (s)	34.83	7.70	18.70	14.05

ADDITIONAL SCALING
Network Flow Scaling Factor (%) 332.000

2030 – AM Peak Hour Forecasts
SB is starting to congest with a traffic increase of **63%**

D2 - 2030, PM

Data Grid - Standard Geometry - Showing 4 of 4 items; 15 column(s)

Column Layouts | Rotate grid | Full-size mode

Standard Geometry — Edit In Window

Arm	SB Driveway	EB Sunwood Dr	NB Sunwood Dr	WB Ramsey Pkwy
V - Approach road half-width (ft)	12.00	12.00	12.00	12.00
E - Entry width (ft)	14.00	14.00	26.00	26.00
l' - Effective flare length (ft)	50.00	50.00	50.00	50.00
R - Entry radius (ft)	65.00	65.00	65.00	65.00
D - Inscribed circle diameter (ft)	110.00	110.00	110.00	110.00
PHI - Conflict (entry) angle (deg)	25.00	25.00	25.00	25.00
Exit Only	☐	☐	☐	☐
Total Demand (Veh/hr)	329.06	538.86	777.77	403.84
Total Arrivals (Veh)	493.59	808.29	1166.66	605.77
Max Queue (Veh)	10.45	1.54	4.76	1.46
Max Delay (s)	98.71	8.68	19.17	11.05
Max RFC	0.97	0.61	0.84	0.60
Slope	0.576	0.576	0.683	0.683
Intercept (PCE/hr)	1164.481	1164.481	1638.424	1638.424
Average Queueing Delay (s)	36.23	7.02	10.88	7.60

Network Flow Scaling Factor (%) 163.000

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Appendix C: Cost Estimates

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Street Work Cost Estimates

Project: Sunwood Drive Realignment

Ramsey, MN

THE COR
RAMSEY, MINNESOTA

LANDFORM
From Site to Finish

Item No.	Item	Units	Quantity	Unit Price	Total Price
2011.601	Construction Surveying	LUMP SUM	1	$10,000.00	$10,000.00
2021.501	Mobilization	LUMP SUM	1	$50,000.00	$50,000.00
2031.501	Field Office Type-D Modified	EACH	1	$8,000.00	$8,000.00
2101.511	Clearing & Grubbing	ACRE	2	$4,000.00	$8,000.00
2104.501	Remove B618 Curb & Gutter	LF	1578	$4.00	$6,312.00
2104.509	Remove Sign Type A	EACH	2	$40.00	$80.00
2104.523	Salvage Light Standard Base	EACH	12	$3,500.00	$42,000.00
2104.505	Remove Bituminous Pavement	SY	5585	$3.00	$16,755.00
2104.513	Sawing Bituminous Pavement (Full Depth)	LF	151	$2.75	$415.25
2105.501	Common Excavation	CY	19950	$4.50	$89,775.00
2105.507	Subgrade Excavation	CY	1050	$6.00	$6,300.00
2105.526	Select Topsoil Borrow	CY	375	$16.00	$6,000.00
2123.610	Vacuum Truck and Foreman	HOUR	20	$150.00	$3,000.00
2123.610	Tractor Mounted Backhoe	HOUR	20	$110.00	$2,200.00
2123.610	Street Sweeper (With Pickup Broom)	HOUR	20	$120.00	$2,400.00
2211.503	Aggregate Base Class 5	TON	2385	$15.00	$35,775.00
2360.501	Type SP 12.5 Wearing Course Mixture (3, C)	TON	641	$65.00	$41,665.00
2360.502	Type SP 12.5 Non-Wearing Course Mixture (3, B)	TON	2141	$63.00	$134,883.00
2401.516	Raised Median Concrete (3Y46)	SF	7374	$6.00	$44,244.00
2503.601	Irrigation System	LUMP SUM	1	$9,800.00	$9,800.00
2521.501	4" Concrete Walk	SF	14217	$3.50	$49,759.50
2531.501	Concrete Curb & Gutter B612	LF	153	$10.00	$1,530.00
2531.501	Concrete Curb & Gutter B618	LF	3973	$11.40	$45,292.20
2531.501	Surmountable Curb	LF	342	$10.00	$3,420.00
2531.618	Truncated Domes	SF	200	$60.00	$12,000.00
2545.509	Lighting Unit	EACH	15	$7,500.00	$112,500.00
2563.601	Traffic Control	LUMP SUM	1	$20,000.00	$20,000.00
2564.537	Install Sign Type D	EACH	12	$175.00	$2,100.00
2571.502	Deciduous Tree 2.5" Cal B & B	EACH	27	$250.00	$6,750.00
2573.502	Silt Fence, Type Machine Sliced	LF	2500	$3.25	$8,125.00
2575.501	Seeding	ACRE	0.51	$300.00	$153.00
2575.502	Seed Mixture 250	POUND	100	$3.50	$350.00
2575.505	Sodding Type Salt Resistant	SY	3135.000	3.250	10188.750
N/A	Landscape Feature	EACH	1	$50,000.00	$50,000.00
2582.501	Pavement Message (Thru Arrow) Poly Pref - GR IN	EACH	11	$450.00	$4,950.00
2582.501	Pavement Message (Left Arrow) Poly Pref - GR IN	EACH	14	$450.00	$6,300.00
2582.501	Pavement Message (Right Arrow) Poly Pref - GR IN	EACH	8	$450.00	$3,600.00
2582.501	Pavement Message ("ONLY") Poly Pref - GR IN	EACH	6	$450.00	$2,700.00
2582.502	4" Double Solid Line, Yellow Epoxy	LF	1231	$0.70	$861.70
2582.502	4" Solid Line, White Epoxy	LF	1758	$0.35	$615.30
2582.502	4" Solid Line, Yellow Epoxy	LF	294	$0.35	$102.90
2582.502	4" Broken Line, White Epoxy	LF	574	$0.30	$172.20
2582.502	24" Stop Line, White Epoxy	LF	100	$7.00	$700.00
2582.503	Crosswalk Marking - Epoxy	SF	900	$6.00	$5,400.00
					$865,174.80

10% Contingency:	$86,517.48
Subtotal:	**$951,692.28**

21% Indirect Costs:	$199,855.38
Street Work Estimated Cost:	**$1,151,547.66**

Watermain Cost Estimates

Project: Sunwood Drive Realignment

Ramsey, MN

Item No.	Item	Units	Quantity	Unit Price	Total Price
2504.602	6" Gate Valve & Box	EACH	5	$1,200.00	$6,000.00
2504.602	12" Gate Valve & Box	EACH	3	$2,500.00	$7,500.00
2504.602	Hydrant	EACH	3	$3,300.00	$9,900.00
2504.603	6" DI Watermain, Class 52	LF	90	$45.00	$4,050.00
2506.501	12" DI Watermain, Class 52	LF	1400	$50.00	$70,000.00
2504.602	Connect To Existing Watermain	EACH	1	$850.00	$850.00
					$98,300.00

10% Contingency:	$9,830.00
Subtotal:	**$108,130.00**

21% Indirect Costs:	$22,707.30
Watermain Estimated Cost:	**$130,837.30**

Storm Sewer Cost Estimates

Project: Sunwood Drive Realignment

Ramsey, MN

Item No.	Item	Units	Quantity	Unit Price	Total Price
2104.509	Remove Storm Sewer Structure	EACH	1	$500.00	$500.00
2503.541	15" RC Pipe Sewer DES 3006 CL V	LF	274	$27.00	$7,398.00
2503.541	18" RC Pipe Sewer DES 3006 CL III	LF	287	$28.00	$8,036.00
2503.541	21" RC Pipe Sewer DES 3006 CL III	LF	184	$32.00	$5,888.00
2503.541	24" RC Pipe Sewer DES 3006 CL III	LF	30	$38.00	$1,140.00
2503.541	27" RC Pipe Sewer DES 3006 CL III	LF	231	$45.00	$10,395.00
2503.602	Connect To Existing Storm Sewer	EACH	1	$500.00	$500.00
2506.501	48" Diameter Catch Basin Neenah Casting R-3067	EACH	10	$1,500.00	$15,000.00
2506.501	Catch Basin Neenah Casting R-3067 - Special	EACH	1	$12,000.00	$12,000.00
2573.530	Storm Drain Inlet Protection Type C	EACH	12	$350.00	$4,200.00
					$65,057.00

10% Contingency:	$6,505.70
Subtotal:	**$71,562.70**

21% Indirect Costs:	$15,028.17
Storm Sewer Estimated Cost:	**$86,590.87**

Summary	Total Price
Street Work Estimated Cost:	$1,151,547.66
Watermain Estimated Cost:	$130,837.30
Storm Sewer Estimated Cost:	$86,590.87
Total Estimated Cost:	**$1,368,975.83**