Rock Creek Employment Center Infrastructure Assessment and Funding Plan



Final Report

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Prepared for:
City of Happy Valley, Oregon

HAPPY VALLEY, OR
EST. 1965

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How to Use This Report

The purpose of this report is to inform property owners and decision-makers within Happy Valley of the key investments necessary to foster growth within the Rock Creek Employment Center. It documents the work that has been completed related to the provision of infrastructure in the area, the costs associated with those needed improvements, and potential future funding options to help meet the needs for development to occur in the Rock Creek Employment Center.

Many of the exhibits shown throughout this document are thumbnails of full-sized exhibits in the appendices. Because of this, if you are viewing this document electronically, click on the "Click Here" button on the exhibits to be taken to the full-sized exhibit in the appendices for additional detail.

Glossary of Terms

There are technical terms used throughout the report. For clarity, these terms are defined below.

Level of Service (LOS) – A measure used to determine how well a transportation facility is operating from a traveler's perspective. A facility's LOS is usually ranked using a six-tier method, A – F, with A representing the best operating conditions and F representing the worst.

Peak Hour Vehicle Trip (PHVT) – Number of vehicle trips during the "peak hours," generally 4pm to 6pm during the weekday.

Rock Creek Employment Center (RCEC) – A 200+ acre region of underdeveloped land in the City of Happy Valley. The RCEC is a planned employment center, meaning that the land has been designated for industrial and employment development.

Scenario A – The transportation study findings & recommendations, necessary infrastructure improvements, a cost estimate, and potential funding strategy for infrastructure within the RCEC if the Sunrise Parkway (see *Sunrise Parkway*) is *not* built.

Scenario B – The transportation study findings & recommendations, necessary infrastructure improvements, a cost estimate, and potential funding strategy for infrastructure within the RCEC if the Sunrise Parkway (see *Sunrise Parkway*) *is* built.

Systems Development Charge (SDC) – A one-time fee charged at the time of development to pay for facilities (such as sewer, water, and transportation improvements) that will experience increased use as a result of the development.

Sunrise Corridor – A corridor that is heavily trafficked by freight traveling between I-5/I-205 and Highway 26. Most of this corridor is comprised of OR 212.

Sunrise Corridor FEIS – An environmental impact assessment conducted by the Oregon Department of Transportation (ODOT) to analyze the Sunrise Corridor project, a large project to improve the east-west freight connection between I-5/I-205 and Highway 26. While the name is similar to "Sunrise Parkway," this report is *not* referencing the Sunrise Corridor FEIS.

Sunrise Gateway Study – A study performed by Clackamas County comprised of proposed changes to the Sunrise Corridor. These proposed changes are outlined in Appendix E and include 1) a new regional connector from SE 122nd Avenue to SE 172nd Avenue (see *Sunrise Parkway)*; 2) improving safety at local connections; and 3) installing improvements to the infrastructure specifically around the Rock Creek Employment Center. This is a *study*, not an adopted plan. The study was used to inform Metro's Get Moving 2020 Plan.

Sunrise Parkway – A four-lane (two in each direction) expressway from SE 122nd Avenue to SE 172nd Avenue. It is the first proposed improvement within the Sunrise Gateway Study, a four-lane expressway providing a connection between SE 122nd Avenue and SE 172nd Avenue.

Transportation Systems Development Charge (TSDC) – A one-time fee charged at the time of development to pay for transportation facilities that will experience increased use as a result of the development.

Transportation System Plan (TSP) – A document outlining a city's transportation system and projects, programs, and policies to meet future needs based on community goals.

Volume/Capacity Ratio (V/C) – A measurement used to define the level of congestion on a roadway by dividing the volume of traffic by the transportation facility's estimated capacity.

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Attachment B – Transportation Study prepared by DKS Associates

Attachment C – Funding Concept Study prepared by FCS GROUP

Attachment D – Sunrise Gateway Study prepared by Clackamas County

Introduction

Project Description

The City of Happy Valley received grant funding ($210,000) from Metro via the 2040 Planning and Development Grant to complete the Rock Creek Employment Center Infrastructure Assessment and Funding Plan. The purpose of the study is to:

1. Develop an infrastructure plan for the area that synthesizes the development goals of the Rock Creek Employment Center (RCEC) plan with the needed infrastructure improvements for the area to develop.
2. Estimate the costs of providing the needed infrastructure.
3. Identify potential funding sources to help realize the plan.

To complete this study, the City of Happy Valley conducted two meetings with a Technical Advisory Committee (TAC) to discuss project goals, feasibility, and design. The TAC consisted of various representatives from the City of Happy Valley, Clackamas County, ODOT, Sunrise Water Authority, DKS Associates (transportation engineers), and HHPR (civil engineers).



Figure 1: Aerial image of the Rock Creek Employment Center highlighted in yellow

The Rock Creek Employment Center

The Rock Creek Employment Center (RCEC) is a 200+ acre region of underdeveloped/vacant land in the City of Happy Valley. The RCEC is a planned employment center, meaning that the

land has been designated for future industrial and employment development. The 200+ acres of land were included in the Portland Metropolitan Area Urban Growth Boundary (UGB) expansion in 2002, and most of it has been subsequently annexed into the city limits of Happy Valley in the following years. To implement the industrial and employment goals, the area was included in the City of Happy Valley's Rock Creek Mixed Employment Comprehensive Plan (2008) and the East Happy Valley Comprehensive Plan (2009).

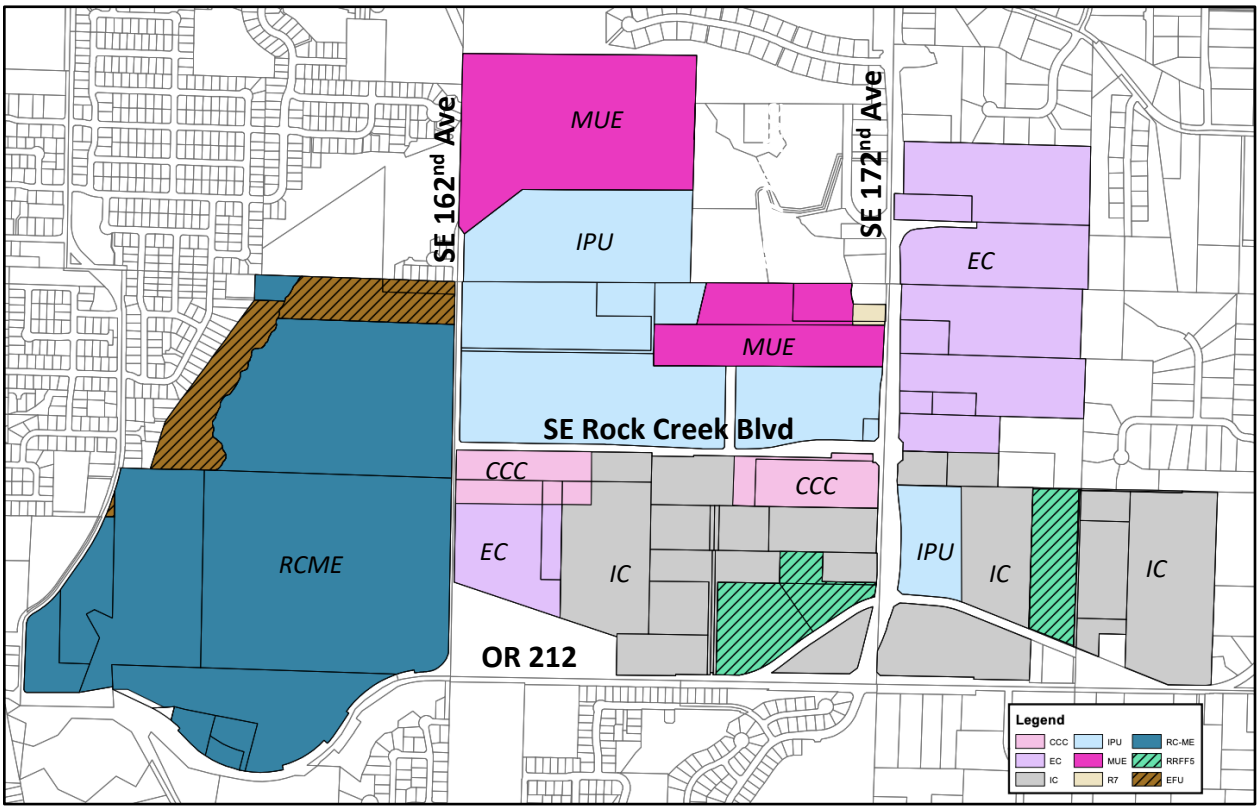


Figure 2: Rock Creek Employment Center zoning map

These two comprehensive plans designate the land uses in the RCEC as illustrated above. The description of those designations are as follows:

- *Mixed Use Employment (MUE)* – The purpose of the MUE zone is to provide for the development of office, employment, and low-density multifamily residential uses. This zone is predominantly located in the central northern portion of the RCEC and comprises approximately 11 percent of the area.

- *Institutional and Public Use (IPU)* – The purpose of the IPU zone is to provide opportunities for institutional uses, such as schools, churches, parks, and governmental facilities. This zone is predominantly located in the central northern portion of the RCEC, adjacent to the MUE zone, and comprises approximately 17 percent of the area.

- *Employment Center (EC)* – The purpose of the EC zone is to provide development opportunities for a mix of employment options, such as business and office parks, light industrial uses, medical offices, and technical/vocational schools. This zone is predominantly located in the northeastern portion of the RCEC and comprises approximately 14 percent of the area.

- *Community Commercial Center (CCC)* – The purpose of the CCC zone is to provide opportunities for a wide range of small businesses, services, and mixed uses for nearby residential developments. This zone is predominantly located in the central portion of the RCEC and comprises approximately three percent of the area.

- *Industrial Campus (IC)* – The purpose of the IC zone is to provide opportunities for a wide range of industrial development, such as medical services, transportation equipment, and green building products and design. This zone is predominantly located in the southern and southeastern portion of the RCEC and comprises approximately 20 percent of the area.

- *Rock Creek Mixed Employment (RCME)* – The purpose of the RCME zone is to provide opportunities for development with high job densities in order to provide stable, family-wage employment. This zone is predominantly located in the southwestern portion of the RCEC and comprises approximately 28 percent of the area.

- In addition to the zones outlined above, there are some individual tax lots in the Rock Creek Employment Center that are still within Clackamas County's jurisdiction (i.e. not yet annexed into Happy Valley's city limits) and therefore have Clackamas County zoning designations. These tax lots comprise the remaining seven percent of land within the RCEC and are designated in the figure above with hash marks.

While the greater RCEC area is largely undeveloped, there are some existing institutional uses in the area that are currently developed or under construction. There are two North Clackamas School District No. 12 (NCSD #12) schools and associated recreational facilities: Adrienne C. Nelson High School, which is currently under construction, and Verne Duncan Elementary School. Vacant land west of the site has also been purchased by NCSD #12 for the siting of a future middle school. Further, the surrounding area is currently developed, or planned to be developed with significant residential development to meet increased housing needs for the region. The need for housing in this study area will only increase as the RCEC is developed with employment opportunities that are likely to draw residents to the area.

Project Need

In its current condition, the existing RCEC infrastructure is not adequate to support the forecasted traffic and utility demands at full build out of the study area. The buildable lands inventory coupled with the high-intensity potential of the industrial and employment land use designations mean that the region needs substantial infrastructure improvements for roadways

and utilities (sanitary sewer, storm water, and domestic water) to meet the forecasted needs. This report provides an analysis of the existing infrastructure needs, recommended transportation and utility improvements, and possible funding sources to meet these needs.

Two Development Scenarios

The RCEC is adjacent to the Sunrise Corridor, which is a corridor that is heavily trafficked by freight traveling between I-5/I-205 and Highway 26. Improvements to this corridor were approved to be implemented in two phases. The first phase was the OR 224 (Milwaukie Expressway), which was part of the Jobs and Transportation Act (JTA) program. This expressway opened in June of 2016 and provided a connection between I-205 and SE 122nd Avenue.

Concurrently, Clackamas County has prepared a study called the Sunrise Gateway Study (**Attachment D**). This study comprises proposed changes to the Sunrise Corridor, such as:

- Providing a regional connector from SE 122nd Avenue to SE 172nd Avenue ("Sunrise Parkway").
- Improving safety at local connections.
- Installing improvements to the infrastructure specifically around the Rock Creek Employment Center.

*When discussing the **Sunrise Parkway** throughout this report, it is referencing the first proposed improvement within the Sunrise Gateway Study, a four-lane expressway providing a connection between SE 122nd Avenue and SE 172nd Avenue.*

The construction of the Sunrise Parkway is dependent upon funding from Metro, which is ultimately voted upon by voters within the Portland Metropolitan Area. This project identified in Metro's Get Moving 2020 ballot measure may go to ballot later this year (2020). If approved, there may be funding available to plan and design the Sunrise Parkway, which, when constructed, would provide future congestion relief for the Sunrise Corridor and take some burden off the existing and future local facilities. In the Metro materials, this project is referred to as "Sunrise/Highway 212". If the bond is not approved, then various improvements to local facilities will need to be implemented to accommodate the expected influx in traffic. Therefore, the RCEC Infrastructure Assessment and Funding Plan assessed two different scenarios, Scenario A and Scenario B, discussed separately throughout this report.

Scenario A

The Sunrise Parkway is *not* constructed, meaning improvements to local facilities are necessary to handle the influx of vehicle traffic.

Scenario B

The Sunrise Parkway *is* constructed and provides future congestion relief, ultimately taking some burden off the existing and proposed facilities.

Studies Already Completed

The findings in this report are conceptual, preliminary, and intended for discussion purposes. The information presented within this report is based on the following three studies that were conducted over the past year. The studies are listed below, followed by a more detailed summary of each one.

- *Transportation Analysis completed by DKS Associates.* This study analyzes the existing and proposed roadway infrastructure options and the forecasted vehicle traffic through 2040.

- *Cost Estimate Memorandum completed by HHPR.* This study analyzes the estimated costs for the infrastructure options, including roads, sewer, stormwater, and water utilities.

- *Funding Concept Study completed by FCS GROUP.* This study uses the cost estimate memorandum to identify the different funding options available to assist in meeting the costs associated with the various improvements needed within the area to catalyze development.

Transportation Analysis

DKS Associates prepared a traffic study (**Attachment B**) for the region to forecast the traffic demand at the build-out of the RCEC through 2040. The study analyzed intersections along OR 212, OR 224, SE 162nd Avenue, SE 172nd Avenue, and SE Rock Creek Boulevard (see *Figure 3: Intersections analyzed for the traffic study*). Traffic generation was calculated based on a combination of factors including zoning, allowed land uses, and background traffic information. The traffic generation was then compared to the intersection performance standards for ODOT and the City of Happy Valley. The ODOT standards applied to any intersection that includes OR 212, and the City of Happy Valley standards are utilized for intersections including local (City of Happy Valley) facilities.



Figure 3: Intersections analyzed for the traffic study

Cost Estimate Memorandum

HHPR prepared planning-level cost estimates for infrastructure costs within the study area. Two cost estimates were prepared, one for Scenario A and one for Scenario B, and each cost estimate is presented in the respective sections elsewhere in this report. Each estimate considered:

- The typical elements of construction associated with each infrastructure type and uses these elements to calculate the unit cost of roadway and improvements on a per-foot basis for each road type.
- Intersection costs, which are additional to the roadway costs, are also estimated at each future location.
- Unit costs for materials such as asphalt paving, pipes, concrete, and rock based on current market condition prices in 2020.

The estimates did not anticipate escalation costs, as they vary based on economic conditions. Future efforts to update the costs could rely on the Consumer Price Index (CPI) for the area as investment decisions are considered in the study area.

The RCEC design team worked with the City of Happy Valley planning staff to review the potential changes to the City's TSP as a result of the changes identified by the Sunrise Gateway

Study. As a result of this change, and based upon DKS's traffic input, this study assumes the following changes will be made to the TSP:

- The extension of SE Rock Creek Boulevard west of SE 162nd Avenue will not be constructed. The elimination of the interchange at the Carver Junction eliminates the need for this roadway.

- SE Rock Creek Boulevard will be downsized from a planned five-lane facility to a three-lane facility.

- One north-south collector road is eliminated south of SE Rock Creek Boulevard and between SE 162nd Avenue and SE Parklane Drive (SE 169th Avenue).

- OR 212 will be widened between the Carver Junction and SE 172nd Avenue by constructing an additional lane in each direction.

The cost estimates are detailed in **Attachment A** and summarized elsewhere in this report with the following assumptions:

1. Cost estimates include the aforementioned changes to the TSP.
2. Costs associated with franchise utilities such as gas, internet, cable and phone, are not included. These improvements will be typically paid for by the service provider or developer and are market driven.
3. Development patterns will require circulation streets (i.e. collectors and arterials) and local streets. The cost estimates only reflect the estimated infrastructure costs for the backbone of the system.

Funding Concept Study

FCS GROUP prepared a report analyzing potential funding options based on the preliminary designs and cost estimates provided by HHPR. The report is attached as **Attachment C.** While there are two different potential funding plans based on Scenario A and Scenario B, they both include different configurations of the general funding options listed below:

- Transportation System Development Charges
- Local Improvement Districts
- Latecomers Districts (reimbursement districts)
- Urban Renewal Districts (tax increment revenues)
- Transportation Utility Charges
- Dedications and Exactions
- Developer Agreements
- Intergovernmental Agreements
- Local Fuel Tax Grants (state or federal)

General Infrastructure Improvements

There are general infrastructure (transportation and utility, such as sewer, stormwater, and domestic water) improvements that will need to be implemented for either of the transportation scenarios. These improvements are outlined below.

Roadway Improvements

There are key roadway improvements that are recommended in both scenarios. These improvements, outlined below, are for the extension of SE 162nd Avenue, improvements to OR 212, and improvements to the SE 162nd Avenue/OR 212 interchange.

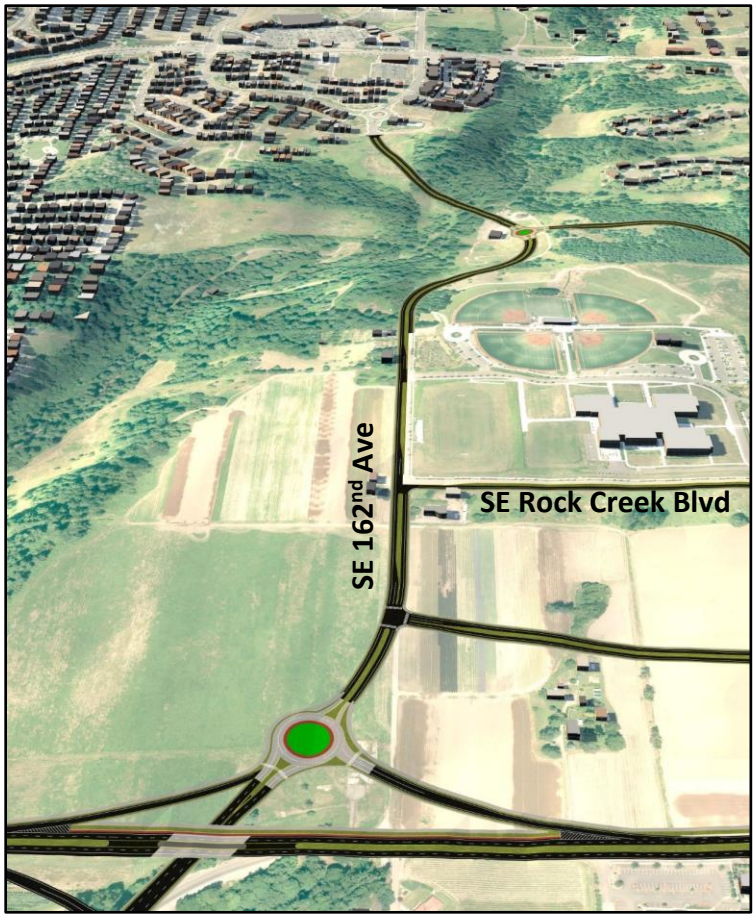


Figure 4: SE 162nd Avenue Extension

SE 162nd Avenue Extension

This improvement can be defined as the construction of the SE 162nd Avenue corridor from a new intersection at OR 212 northward to connect to the existing SE 162nd Avenue north of SE Rock Creek Boulevard at SE Taralon Drive. SE Rock Creek Boulevard would then be constructed to a collector roadway standard. The work would include the following elements.

- New segment of road from OR 212 to SE Rock Creek Boulevard
- Half-street improvements from SE Rock Creek Boulevard north to the limit of the existing roadway along the frontage of Hood View Park
- Extension of roadway north including a new bridge across SE Rock Creek Boulevard to connect to the existing roadway

OR 212 Improvements

Based upon the analysis completed by DKS Associates, in order to facilitate construction of the Rock Creek Employment Center, OR 212 from the Carver Junction to SE 172nd Avenue would require the construction of an additional lane in each direction. OR 212 widening would follow the existing alignment with the exception of a relocated segment at the new SE 162nd Avenue/OR 212 intersection improvement as described below.



Figure 5: One additional lane in each direction along OR 212

SE 162nd Avenue/OR 212 Intersection Improvement

This improvement would include the construction of a new intersection at the extension of SE 162nd Avenue as it connects to OR 212. For this preliminary design, this study proposes the construction of a new roundabout and a partial re-alignment of OR 212 into the roundabout. The design would include:

- A new intersection (roundabout) that would be constructed north of the existing OR 212 alignment and north of the proposed Sunrise Parkway Alignment (if constructed).
- This intersection improvement would be built along the alignment of the SE 162nd Avenue extension as it connects to OR 212.
- The roundabout intersection would be designed to accommodate large trucks similar to other roundabout facilities on ODOT highways.

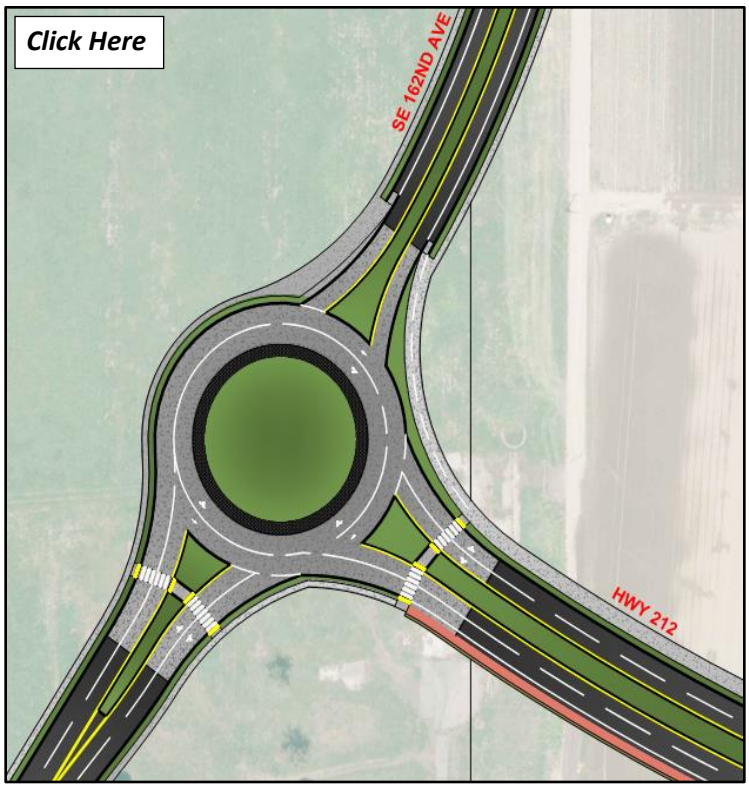


Figure 6: SE 162nd Avenue/OR 212 Intersection Improvements

The benefits of this design include:

- The SE 162nd Avenue/OR 212 roundabout is a stand-alone project that can be constructed with or without the Sunrise Parkway Project and would help relieve congestion at the SE 172nd Avenue intersection.

- The re-aligned portion of Highway 212 can be converted in the future to an off-ramp from the Sunrise Parkway.

- Installation of an off-line roundabout at the SE 162nd Avenue/OR 212 intersection allows construction of the Sunrise Parkway without "throwaway work."

Utility Improvements

Similar to the transportation improvements discussed above, there are key utility improvements that are recommended in both scenarios. The recommended utility improvements include upgrades to the storm sewer, sanitary sewer, and domestic water infrastructure within the RCEC.

Storm Sewer

There is intermittent storm sewer infrastructure within the project area, including existing storm detention and water quality facilities. These are located:

1. At the northwest corner of the SE 172nd Ave/OR 212 interchange
2. West of SE 172nd Ave near Verne A. Duncan Elementary School
3. North of the RCEC project limits along SE 172nd Ave, and east of SE 162nd Ave near Hood View Park. The existing facilities are identified on sheet 4 of the attached plan set (**Attachment A, Appendix A**).

New storm sewer facilities are needed to support development within the RCEC project area to provide adequate stormwater management for the future roadways. Refer to Figure 7 below for an illustration of the proposed improvements. These new storm sewer lines would be located within the following rights of way:

1. OR 212 to the SE 162nd Ave/OR 212 interchange
2. SE 162nd Ave to SE Rock Creek Boulevard
3. SE Parklane Drive
4. SE 162nd Avenue north of Hood View Park
5. The three new collectors (Collector #1, #2, and #3) throughout the study area

Additionally, there are new storm detention and water quality facilities proposed at the OR 212/SE 162nd Ave interchange, SE Parkland Dr/SE 162nd Ave interchange, and west of Collector #1. The proposed facilities are illustrated below and discussed in detail within **Attachment A**.

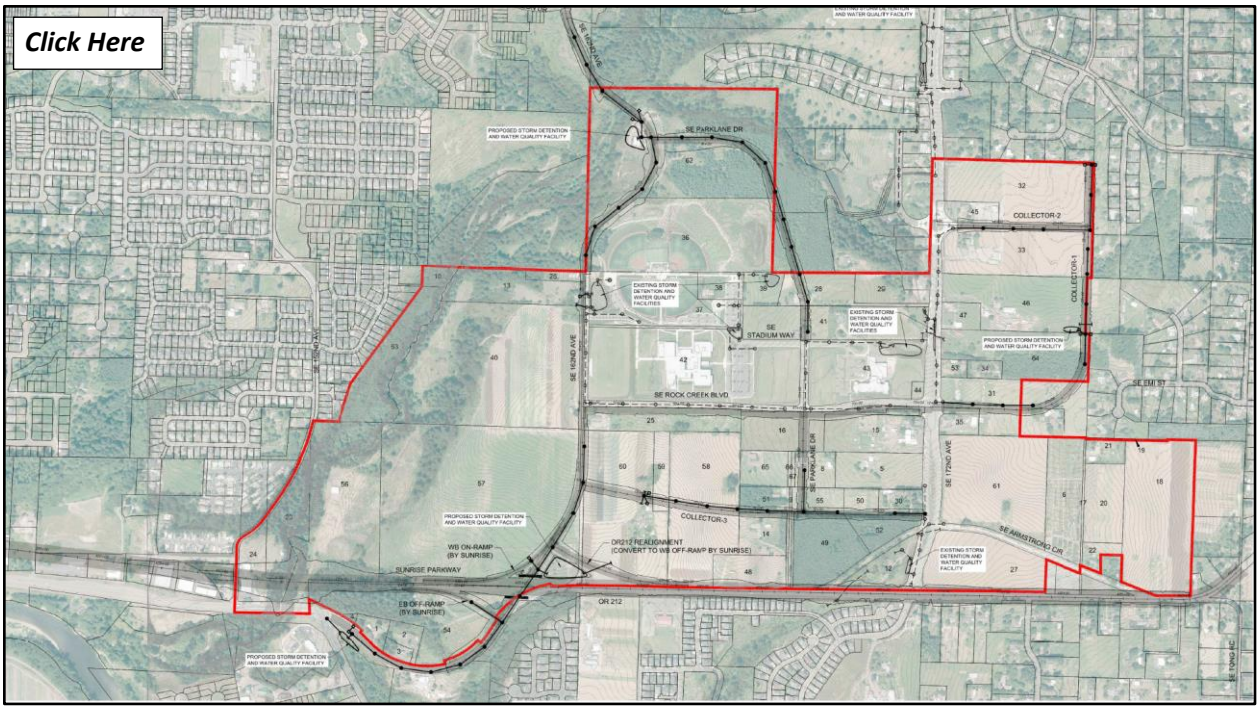


Figure 7: Existing and proposed storm sewer infrastructure

Sanitary Sewer

Existing sanitary sewer service has already been developed in the area but is sporadic and not developed to the extent needed to serve the entire study area. Refer to Figure 8 below for an illustration of the proposed improvements. New sanitary sewer infrastructure would be needed to support future development within the area and has been identified in the following rights-of-way:

1. SE Parklane Drive
2. SE 162nd Avenue
3. SE Armstrong Circle
4. Within Collectors #1 and #3
5. Along the Sunrise Parkway extension, if constructed

The new and existing sanitary sewer facilities are illustrated below and discussed in greater detail in **Attachment A**.

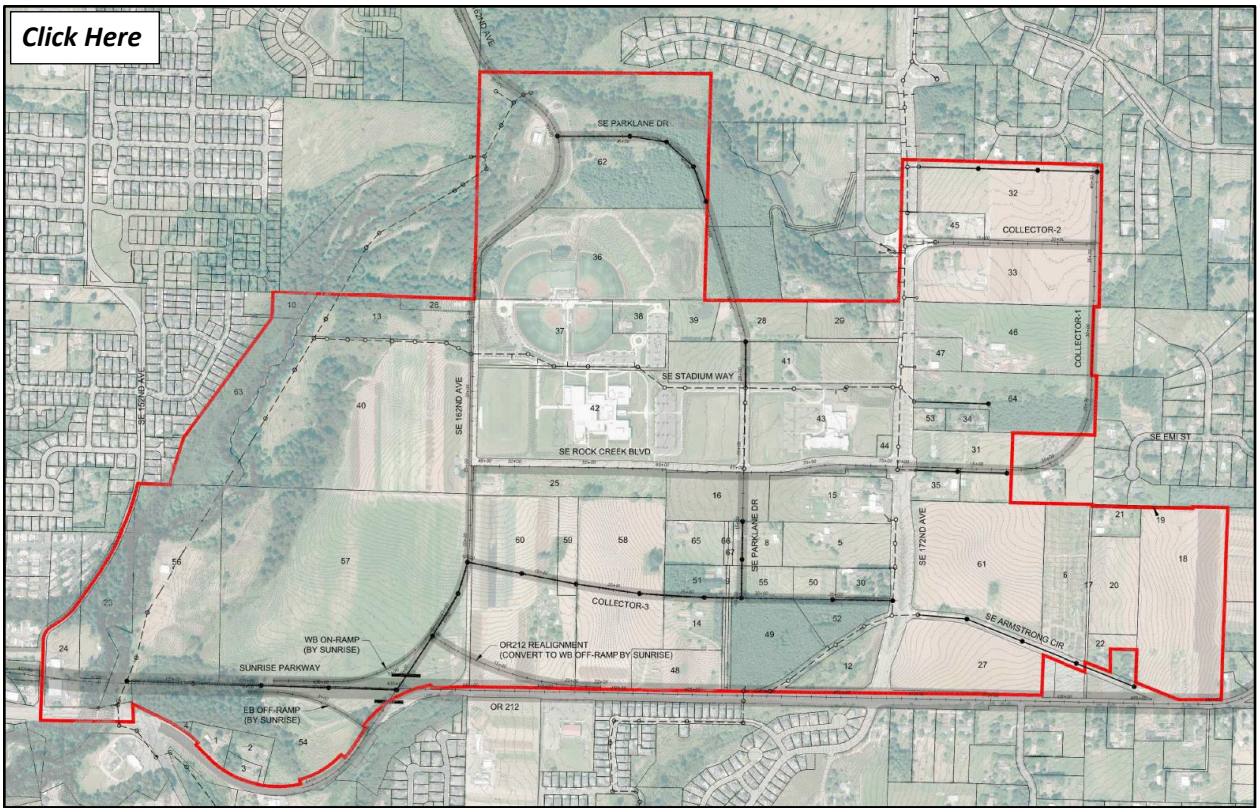


Figure 8: Existing and proposed sanitary sewer infrastructure

Domestic Water

As with the sanitary sewer service, there is existing water service in the area as a result of prior development. New domestic water infrastructure would be needed to support future development in the area. This study assumes that some of the water service would be developed by Sunrise Water Authority (SWA) as part of their Capital Improvement Plan, and the remainder will be constructed as required by development or part of other capital projects. The SWA Water Master Plan illustrates new waterlines along OR 212, the OR 212 realignment, and the southern portion of SE 162nd Avenue. Refer to Figure 9 below for an illustration of the proposed improvements. Additional new water lines would need to be constructed by the City or private development within the following rights-of-way:

1. SE Armstrong Circle
2. SE Parklane Drive
3. At the northern end of SE 162nd Avenue
4. Within Collectors #1 – #3

The new and existing domestic water infrastructure is illustrated in Figure 9 below and is discussed in greater detail within **Attachment A**.

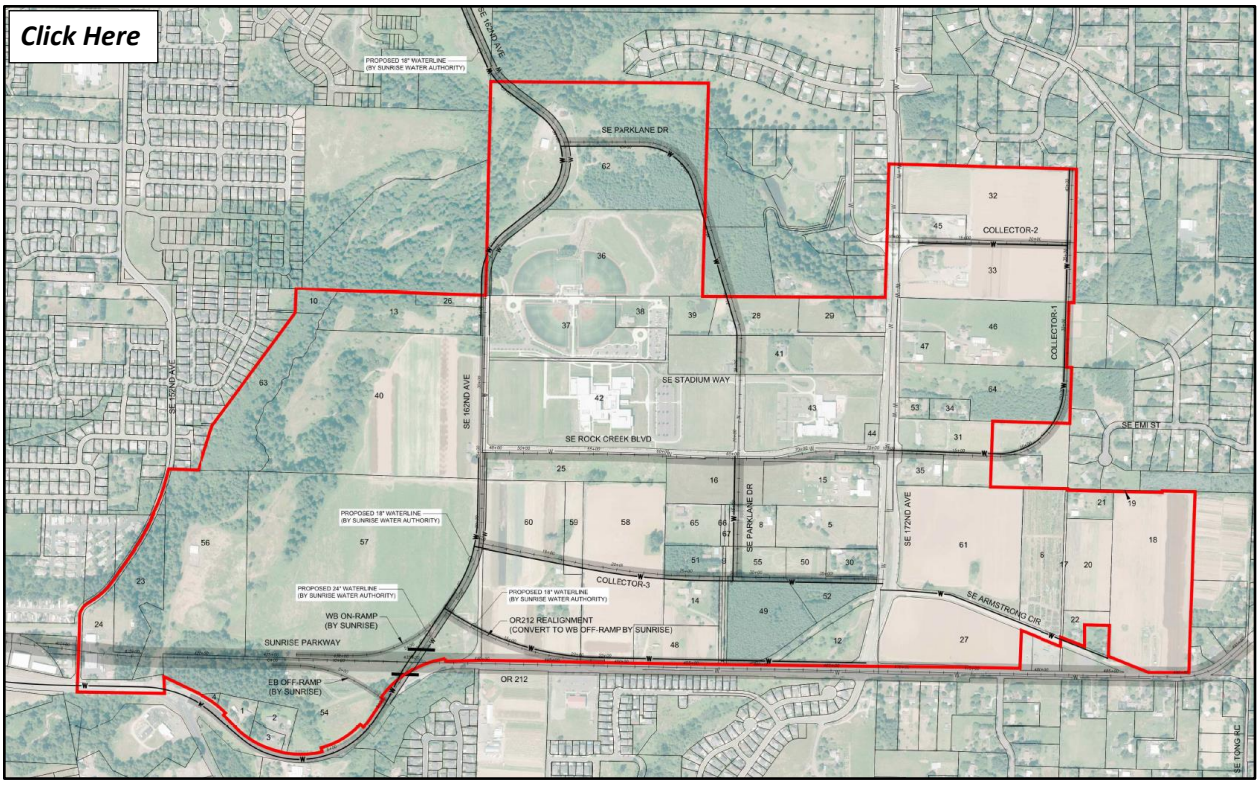


Figure 9: Existing and proposed domestic water infrastructure

Scenario A – No Build of the Sunrise Parkway

Scenario A outlines the transportation study findings & recommendations, necessary infrastructure improvements, a cost estimate, and potential funding strategy for infrastructure within the RCEC if the Sunrise Parkway is ***not*** built.

Transportation Study Findings & Recommendations

Scenario A analyzes the 2040 baseline traffic volumes without the construction of the Sunrise Parkway. *Table 1: Future (2040) Baseline Intersection Performance (PM Peak Hour)* shown below and discussed in **Attachment B** illustrates the forecasted delay (in seconds), level of service (LOS), and V/C (volume/capacity ratio) for each of the studied intersections.

As is demonstrated in the table, the expected V/C for the OR 212/OR 224 intersection does not meet the mobility standards, nor do the delay, LOS, or V/C for the SE 162nd Avenue/OR 212 intersection.

Table 1: Future (2040) Baseline Intersection Performance (PM Peak Hour)			
Signalized Intersection	**Delay**	**Level of Service**	**V/C**
OR 212/OR 224	71.0	E	1.23
172nd Avenue/OR 212	35.5	D	0.90
172nd Avenue/Rock Creek Boulevard	8.3	A	0.37
Unsignalized Intersection	**Delay**	**Level of Service**	**V/C**
162nd Avenue/OR 212	12.0/ >1000	B/F	0.05/ >2.00
162nd Avenue/Rock Creek Boulevard	7.4/9.6	A/A	0.01/0.04
Signalized Intersection: Delay = Average Intersection Delay (sec.) LOS = Level of Service V/C = Volume-to-Capacity Ratio Shaded values do not meet standards	Unsignalized Intersection: Delay = Critical Approach Delay (sec.) LOS = Major Street/Minor Street V/C = Critical Volume-to-Capacity Ratio Shaded values do not meet standards		

To mitigate for these service inadequacies, DKS Associates has suggested improvements for the intersections that are not expected to meet the mobility standards at build out of the area. These improvements include:

- **1** – Adding a traffic signal at the SE 162nd Avenue/OR 212 intersection with eastbound and westbound left turn lanes, which would require additional realignment of SE 162nd Avenue and/or OR 212 to meet sight distance. *Note: HHPR is proposing to install a roundabout as an alternative to a signalized intersection at SE 162nd Avenue/OR 212.*

- **2** – Adding a second eastbound right turn lane at the OR 212/OR 224 intersection and widening to include a second southbound receiving lane for 1,000 feet, which would require additional right-of-way from adjacent property owners that may be difficult to construct due to adjacent topography and environmental constraints.

- **3** – Adding a second eastbound left turn lane at the SE 172nd Avenue/OR 212 intersection.[1] *Note: Project I8 in the Happy Valley TSP would install a second southbound right turn lane and a second westbound through lane, but this capacity improvement is not necessary to satisfy the mobility standards.*

[1] Transportation Study prepared by DKS Associates, page 5. See Attachment B.

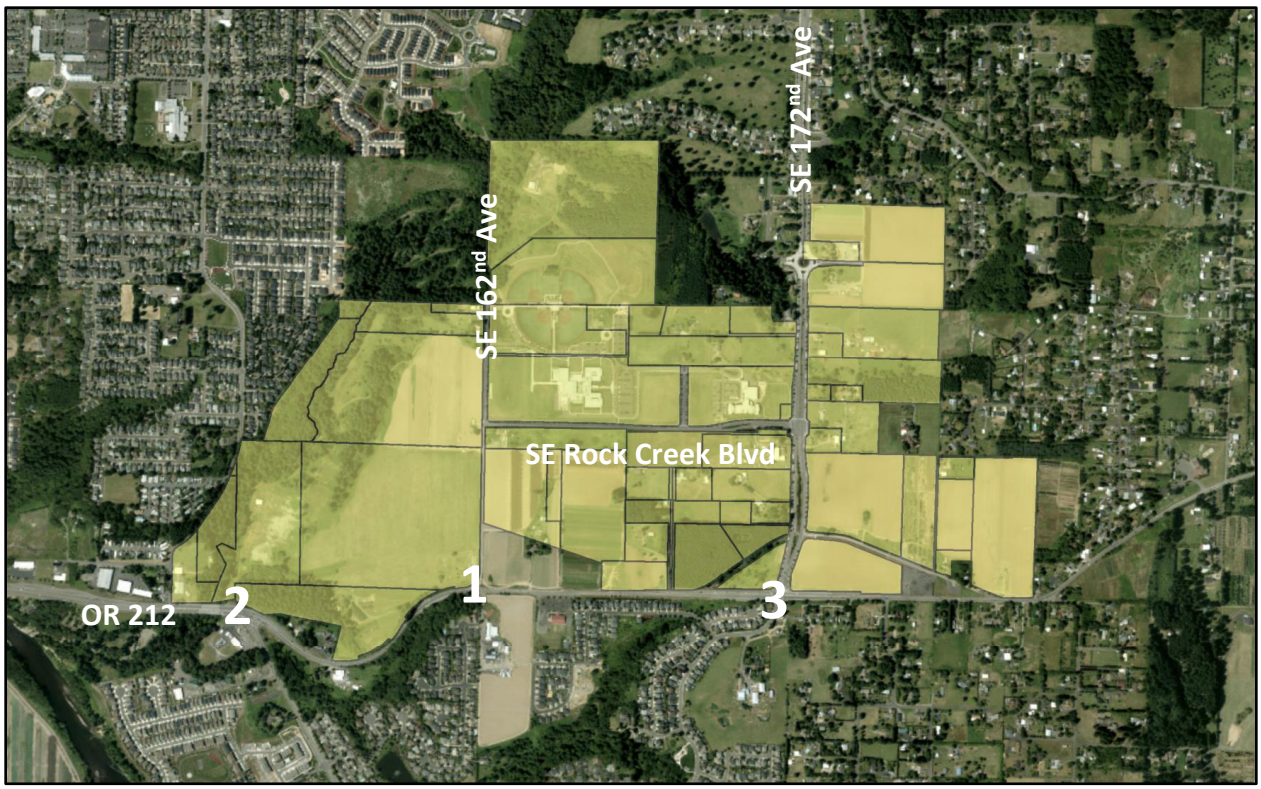


Figure 10: Locations of Recommended Transportation Infrastructure Improvements for Scenario A

Table 2: Future (2040) Baseline Intersection Performance with Recommended Improvements (PM Peak Hour) outlines the forecasted delay, LOS, and V/C for each of the studied intersections **after** the recommended improvements listed above are implemented. With these improvements implemented, the expected V/C for the OR 212/OR 224 intersection satisfies the mobility standards, as do the delay and LOS for the SE 162nd Avenue/OR 212 intersection. However, these improvements do not improve the V/C for the SE 162nd Avenue/OR 212 intersection enough to satisfy the mobility standard.

Table 2: Future (2040) Baseline Intersection Performance with Recommended Improvements			
Signalized Intersection	**Delay**	**Level of Service**	**V/C**
OR 212/OR 224	28.6	C	0.90
162nd Avenue/OR 212	18.1	B	0.93
172nd Avenue/OR 212	26.7	C	0.78
172nd Avenue/Rock Creek Boulevard	7.6	A	0.35
Unsignalized Intersection	**Delay**	**Level of Service**	**V/C**
162nd Avenue/Rock Creek Boulevard	7.4/9.6	A/A	0.01/0.04
Signalized Intersection: Delay = Average Intersection Delay (sec.) LOS = Level of Service V/C = Volume-to-Capacity Ratio Shaded values do not meet standards	Unsignalized Intersection: Delay = Critical Approach Delay (sec.) LOS = Major Street/Minor Street V/C = Critical Volume-to-Capacity Ratio Shaded values do not meet standards		

Necessary Improvements

If the Sunrise Parkway is not built, then improvements will need to be made to the Carver Junction interchange to facilitate the influx of vehicle traffic not facilitated by the Sunrise Parkway. Thus, under Scenario A, the Carver Junction intersection will need to be signalized; a roundabout will not adequately facilitate the projected vehicle traffic. The improvements include added turn lanes, improvements to the intersection's signal, and the widening of OR 212. Figure 10 below illustrates the Carver Junction intersection and can be viewed in detail in Exhibit A of **Attachment A**.



Figure 11: Proposed Carver Junction improvements without the Sunrise Parkway

Potential Funding Option

The cost estimate for the improvements discussed above for Scenario A is based on the 10% design and totals **$93,900,000**. A general breakdown of the costs is included below, and a more detailed cost estimate is included in **Attachment A**.

Table 3: Cost Estimate for Roadway and Utility Improvements Under Scenario A	
Roadway Network Cost Estimate	
SE 162nd Ave Extension (OR 212 to SE Taralon Dr)	$20,900,000
OR 212 Improvements (OR 212/224 Junction to SE 162nd Ave Intersection)	$16,900,000
OR 212 Improvements (SE 162nd Ave Intersection to SE 172nd Ave Intersection)	$6,600,000
OR 212 / SE 162nd Avenue Roundabout	$1,000,000
Other RCEC Roadway Costs	
SE Rock Creek Blvd (SE 162nd Ave to SE 172nd Ave)	$7,500,000
SE Parklane Dr (SE 162nd Ave to Collector #3)	$10,100,000
Collector #1 (SE 172nd Ave to Collector #2)	$9,400,000
Collector #2 (SE 172nd Ave to Collector #1)	$3,300,000
Collector #3 (SE 162nd Ave to SE 172nd Ave)	$8,700,000
Utility Cost Estimate	
Sanitary Sewer within RCEC	$1,900,000
Waterline Improvements within RCEC	$7,000,000
Purple pipe (SE 162nd Ave) within RCEC	$600,000
Total Project Development Cost (10% Design)	**$93,900,000**

The funding strategy for Scenario A includes a mix of regional/state cost sharing and local transportation systems development charges increases to fully fund the recommended infrastructure improvements. This funding option includes a city-wide transportation systems development charges (TSDC) increase from the existing City of Happy Valley TSDC of $9,610 per peak hour vehicle trip (PHVT) to $12,533 per PHVT. Below is a breakdown of the proposed funding option for the needed transportation improvements only.

Table 4: Transportation Funding Assumptions for Scenario A						
	Potential Funding Source					
Roadway Network Improvements	**Regional Cost Share**	**Current City-Wide TSDC Eligible Cost**	**New City-Wide TSDC Eligible Cost**	**District TSDC or Special Assessment**	**URD & Other Funds**	**Total**
SE 162nd Ave Extension (OR 212 to Taralon Dr)	$0	$20,900,000	$0	$0	$0	$20,900,000
Hwy 212 (OR 212/224 to SE 162nd Ave)	$9,724,815	$0	$7,175,185	$0	$0	$16,900,000
Hwy 212 (SE 162nd Ave to SE 172nd Ave)	$3,797,857	$0	$2,802,143	$0	$0	$6,600,000
Hwy 212/SE 162nd Ave Roundabout	$575,433	$0	$424,567	$0	$0	$1,000,000
SE Rock Creek Blvd (SE 162nd Ave to SE 172nd Ave)	$0	$0	$7,500,000	$0	$0	$7,500,000
SE Parklane Dr (SE 162nd to Collector #3)	$0	$0	$10,100,000	$0	$0	$10,100,000
Collector #1 (SE 172nd Ave to Collector #2)	$0	$0	$9,400,000	$0	$0	$9,400,000
Collector #2 (SE 172nd Ave to Collector #1)	$0	$0	$3,300,000	$0	$0	$3,300,000
Collector #3 (SE 162nd Ave to SE 172nd Ave)	$0	$0	$8,700,000	$0	$0	$8,700,000
Total Roadway Network	**$14,098,105**	**$20,900,000**	**$49,401,895**	**$0**	**$0**	**$84,400,000**
			$2,923	*Potential TSDC increase*		
		+	*$9,610*	*Existing TSDC per PHVT*		
		=	***$12,533***	*Total city-wide TSDC after increase (PHVT)*		

Scenario B – Construction of the Sunrise Parkway

Scenario B outlines the transportation study findings & recommendations, necessary infrastructure improvements, a cost estimate, and potential funding strategy for infrastructure within the RCEC if the Sunrise Parkway *is* built.

Transportation Study Findings & Recommendations

The traffic study prepared by DKS Associates (**Attachment B**) also analyzes the 2040 traffic volumes with construction of the Sunrise Parkway. *Table 5: Future (2040) Sunrise Parkway Intersection Performance (PM Peak Hour)* below outlines the forecasted delay (in seconds), level of service (LOS), and V/C (volume/capacity ratio) for each of the studied intersections. As demonstrated in the table, the expected delay, LOS, and V/C for the OR 212/OR 224 intersection do not meet the mobility targets.

Table 5: Future (2040) Sunrise Parkway Intersection Performance (PM Peak Hour)

Signalized Intersection	**Delay**	**Level of Service**	**V/C**
OR 212/OR 224	62.1	E	1.10
172nd Avenue/OR 212	39.8	D	0.93
172nd Avenue/Rock Creek Boulevard	10.2	B	0.40
Unsignalized Intersection	**Delay**	**Level of Service**	**V/C**
162nd Avenue/OR 212	7.3/8.5	A/A	0.03/0.04
162nd Avenue/Rock Creek Boulevard	7.5/9.9	A/A	0.03/0.04
Signalized Intersection: Delay = Average Intersection Delay (sec.) LOS = Level of Service V/C = Volume-to-Capacity Ratio Shaded values do not meet standards	Unsignalized Intersection: Delay = Critical Approach Delay (sec.) LOS = Major Street/Minor Street V/C = Critical Volume-to-Capacity Ratio Shaded values do not meet standards		

To mitigate for these service inadequacies, DKS Associates has suggested improvements for the intersections not expected to meet the mobility standards. These improvements include the following.

- **1** – Adding a second eastbound left turn lane at the SE 172nd Avenue/OR 212 intersection.
- **2** – Reconfiguring the OR 212/OR 224 intersection lanes by converting an eastbound through lane to a second eastbound right turn lane, converting an existing northbound left turn lane to a second southbound receiving lane and widening to include a second southbound receiving lane for 1,000 feet.[2]

[2] Transportation Study prepared by DKS Associates, page 7. See Appendix C.



Figure 12: Locations of Recommended Transportation Infrastructure Improvements for Scenario B

Table 6: Future (2040) Sunrise Parkway Intersection Performance with Recommended Improvements (PM Peak Hour) outlines the delay, LOS, and V/C for each of the study intersections **with** the recommended improvements implemented. When implemented, the expected delay, LOS, and V/C for the OR 212/OR 224 intersection are improved to satisfy the mobility targets for ODOT and the City of Happy Valley.

Table 6: Future (2040) Sunrise Parkway Intersection Performance with Recommended Improvements (PM Peak Hour)			
Signalized Intersection	**Delay**	**Level of Service**	**V/C**
OR 212/OR 224	6.5	A	0.57
172nd Avenue/OR 212	30.8	C	0.83
172nd Avenue/Rock Creek Boulevard	10.2	B	0.40
Unsignalized Intersection	**Delay**	**Level of Service**	**V/C**
162nd Avenue/OR 212	7.3/8.5	A/A	0.03/0.04
162nd Avenue/Rock Creek Boulevard	7.5/9.9	A/A	0.03/0.04
Signalized Intersection: Delay = Average Intersection Delay (sec.) LOS = Level of Service V/C = Volume-to-Capacity Ratio Shaded values do not meet standards	Unsignalized Intersection: Delay = Critical Approach Delay (sec.) LOS = Major Street/Minor Street V/C = Critical Volume-to-Capacity Ratio Shaded values do not meet standards		

Necessary Improvements

If the Sunrise Parkway is built, then it will facilitate enough vehicle traffic to warrant a roundabout at the Carver Junction which results in decreased project costs. Thus, under Scenario B, the Carver Junction intersection could be converted from a signalized intersection to a roundabout. Figure 11 below illustrates the Carver Junction intersection with a roundabout and can be viewed in detail in Exhibit B of **Appendix A**.

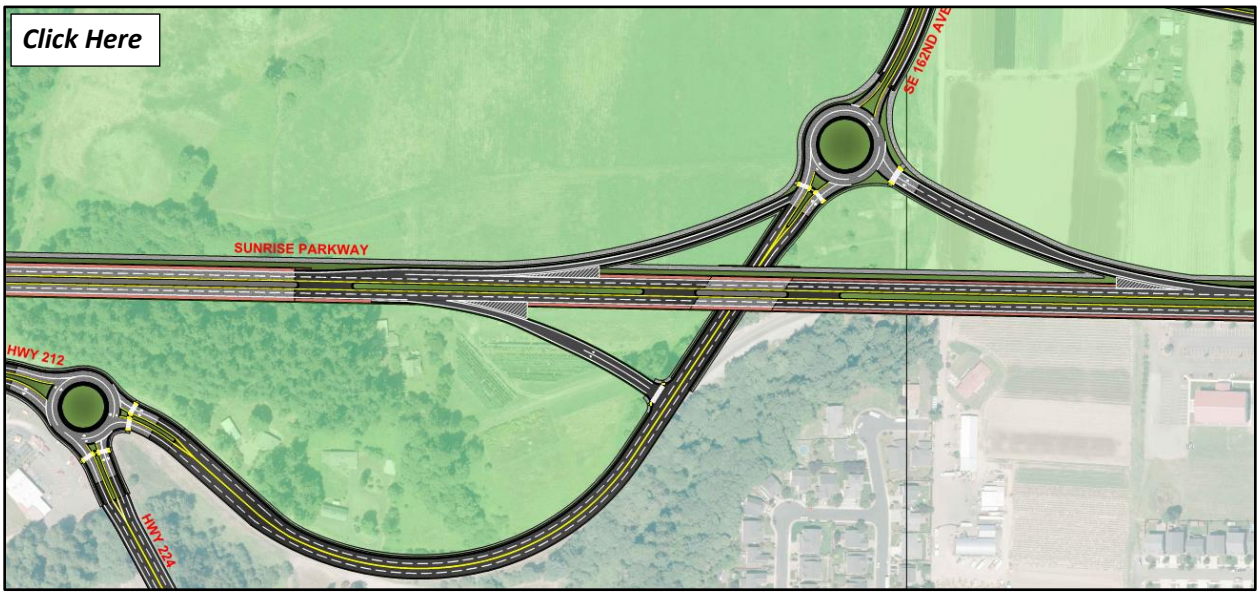


Figure 13: Proposed Carver Junction improvements with the Sunrise Parkway

Potential Funding Option

The cost estimate based on 10% design and construction of the Sunrise Parkway is a cumulative total of **$69,400,000**. A general breakdown of the individual improvement costs is included below. A more detailed cost estimate is provided in **Appendix B**.

Table 7: Cost Estimate for Roadway and Utility Improvements Under Scenario B	
Roadway Network Cost Estimate	
SE 162nd Ave Extension (OR 212 to SE Taralon Dr)	$20,900,000
OR 212 Improvements (OR 212/224 Junction to SE 162nd Ave Intersection)	-
OR 212 Improvements (SE 162nd Ave Intersection to SE 172nd Ave Intersection)	-
OR 212 / SE 162nd Avenue Roundabout	-
Other RCEC Roadway Costs	
SE Rock Creek Blvd (SE 162nd Ave to SE 172nd Ave)	$7,500,000
SE Parklane Dr (SE 162nd Ave to Collector #3)	$10,100,000
Collector #1 (SE 172nd Ave to Collector #2)	$9,400,000
Collector #2 (SE 172nd Ave to Collector #1)	$3,300,000
Collector #3 (SE 162nd Ave to SE 172nd Ave)	$8,700,000
Utility Cost Estimate	
Sanitary Sewer within RCEC	$1,900,000
Waterline Improvements within RCEC	$7,000,000
Purple pipe (SE 162nd Ave) within RCEC	$600,000
Total Project Development Cost (10% Design)	**$69,400,000**

Transportation SDCs Summary

Scenario A
*City of Happy Valley – $12,533/PHVT**
Total – $12,533/PHVT

Scenario B
City of Happy Valley – $11,563/PHVT
RCEC – +$1,685/PHVT
Total – $13,248/PHVT**

**PHVT = Peak hour vehicle trip*

***The increased TSDC would only apply to development within the RCEC. Development in the City of Happy Valley and outside of the RCEC is only subject to the TSDC of $11,563/PHVT.*

The funding strategy for Scenario B assumes 100 percent local funding of the improvements via a mix of transportation system development charges, urban renewal districts, and other special assessments. This funding option includes both a city-wide TSDC increase from the existing City of Happy Valley TSDC of $9,610 per PHVT to $11,563 per PHVT. There is then a proposed special Rock Creek Employment Center assessment of $1,685 per PHVT, bringing the total TSDC in the Rock Creek Employment Center to $13,248 per PHVT. Below is a breakdown of this proposed funding option.

Table 8: Transportation Funding Assumptions for Scenario B						
	Potential Funding Source					
Roadway Network Improvements	**Current City-Wide TSDC Eligible Cost**	**New City-Wide TSDC Eligible Cost**	**Change in TSDC Cost Basis**	**District TSDC or Special Assessment**	**URD & Other Funds**	**Total**
SE 162nd Ave Extension (OR 212 to Taralon Dr)	$20,900,000	$14,900,000	($6,000,000)	$2,000,000	$4,000,000	$20,900,000
Hwy 212 (OR 212/224 to SE 162nd Ave)	$0	$0	$0	$0	$0	$0
Hwy 212 (SE 162nd Ave to SE 172nd Ave)	$0	$0	$0	$0	$0	$0
Hwy 212/SE 162nd Ave Roundabout	$0	$0	$0	$0	$0	$0
SE Rock Creek Blvd (SE 162nd Ave to SE 172nd Ave)	$0	$7,500,000	$7,500,000	$0	$0	$7,500,000
SE Parklane Dr (SE 162nd to Collector #3)	$0	$10,100,000	$10,100,000	$0	$0	$10,100,000
Collector #1 (SE 172nd Ave to Collector #2)	$0	$9,400,000	$9,400,000	$0	$0	$9,400,000
Collector #2 (SE 172nd Ave to Collector #1)	$0	$3,300,000	$3,300,000	$0	$0	$3,300,000
Collector #3 (SE 162nd Ave to SE 172nd Ave)	$0	$8,700,000	$8,700,000	$0	$0	$8,700,000
Total Roadway Network	$0	**$53,900,000**	**$33,000,000**	**$2,000,000**	**$4,000,000**	**$59,900,000**
			$1,953	*Potential TSDC increase*		
		+	*$9,610*	*Existing TSDC per PHVT*		
		=	***$11,563***	*Total city-wide TSDC after increase (PHVT)*		
		+	*$1,685*	*Supplemental Assessment*		
		=	***$13,248***	*Total RCEC Assessment (PHVT)*		

Conclusion and Next Steps

This report summarizes the studies completed to analyze potential build out options for the Rock Creek Employment Center. In addition to the infrastructure improvements recommended with each of the scenarios outlined in this report, the design team has prepared the following recommendations for the transportation infrastructure and TSP.

Transportation Infrastructure Recommendations

The design team recommends that the City begin advocating for the addition of on- and off-ramps called out below in Figure 13 to the Sunrise Parkway with Clackamas County and ODOT as illustrated in the attached plan set (**Appendix A**).

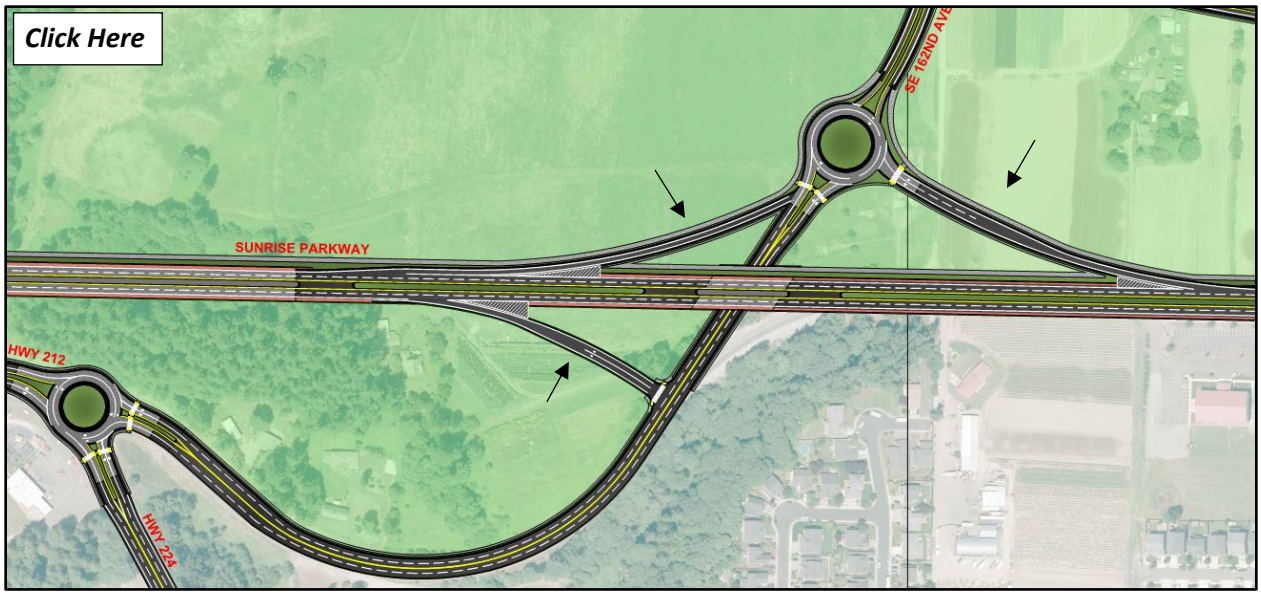


Figure 14: Delineation of on- and off-ramps for OR 212

This improvement is relatively minor in cost when compared to the overall Sunrise Parkway project cost. However, the benefit of the improvement is that it would allow a direct connection to the Sunrise Parkway from the Rock Creek Employment Center as well as to the Carver area. All movements would be accommodated with these ramps similar to a full interchange, with the exception of traffic travelling from the Carver area east toward Damascus. In this case, vehicles would have to travel north to Collector #3, eastbound to SE 172nd Avenue, and then south to the eastbound left turn lane at the SE 172nd Avenue/Highway 212 intersection.

It should be noted that the Sunrise Gateway Study showed a connection to the area south of OR 212 which crosses a large ravine. This proposed roadway connection is outside of the project study area. However, the design team feels that this roadway connection may not be feasible due to cost and environmental impacts. It may be best to serve the undeveloped and existing properties south of OR 212 through the roadway network south of OR 212 as shown on earlier versions of the Sunrise Parkway concepts. We assume that if the Sunrise Parkway is

funded, further refinement will be required, at which point this issue could be reviewed and commented on by the City of Happy Valley.

Recommended Transportation System Plan Amendments

By memorializing the proposed improvements in the TSP, the City of Happy Valley will be in a better position to pursue competitive funding for individual improvements. HHPR and DKS Associates worked with the City of Happy Valley planning staff to determine the following recommended amendments to the City's Transportation System Plan (TSP):

- Removal of the proposed extension of Rock Creek Boulevard west of SE 162nd Avenue. The removal of the interchange at the Carver Junction eliminates the need for this extension.

- Downsize SE Rock Creek Boulevard from a planned five-lane facility to a three-lane facility.

- Elimination of one north-south collector road south of Rock Creek Boulevard between SE 162nd Avenue and SE Parklane Drive (SE 169th Avenue).

The infrastructure and subsequent funding options outlined throughout this report will allow the City of Happy Valley to prioritize funding and capital improvements to catalyze development within the Rock Creek Employment Center. Although they are discussed as a suite of needed improvements, the City and private landowners within the area could implement individual improvements as a whole or incrementally based on local demand.

Attachment A
Cost Estimate Memorandum & 10% Roadway and Utility Infrastructure Plan Set
HHPR

HAP-13

To: **Michael Walter, AICP**
City of Happy Valley Community Development Director

From: Dan Houf, P.E.
Harper Houf Peterson Righellis Inc.

Harper Houf Peterson Righellis Inc.
ENGINEERS ◆ PLANNERS
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PHONE: 503.221.1131 www.hhpr.com FAX: 503.221.1171

Date: March 27, 2020

Re: Rock Creek Employment Center
10% Design and Cost Estimate Submittal (Tasks 5 and 7) - Revised

Harper Houf Peterson Righellis Inc. (HHPR) has completed the preliminary design and cost estimates for the Rock Creek Employment Center Area as outlined in Task 5 and 7 of the Project Deliverables. This memorandum summarizes the design elements for the following elements:

Task 5: Transportation Infrastructure Assessment and Cost Estimates

a) Ten percent preliminary engineering plans and cost estimates for extension of 162nd Ave
b) Ten percent preliminary engineering plans and cost estimates for Highway 212 improvements
c) Ten percent preliminary engineering plans and cost estimates for intersection improvements at 162nd Avenue and Highway 212/224

Task 7: Sanitary Sewer, Storm water and Domestic Water Infrastructure Assessment and Cost Estimates

a) Ten percent preliminary engineering plans for sanitary sewer, stormwater and domestic water services
b) Cost estimates for sanitary sewer, stormwater and domestic water services

Note: The costs for storm sewer have been included in the transportation cost estimate produced under Task 5, as these elements are integral to the creation of impervious surfaces with the new transportation facilities. However, and overall Storm System drawing has been included with the study for a reference.

Methodology and Background: The Rock Creek Employment Center (RCEC) is approximately 200 acres in size and is located within the City of Happy Valley, Oregon. HHPR started the process by preparing a preliminary layout of the area using the City's adopted Transportation System Plan as a basis of design for the roadway network. At the time of the development of the preliminary alignment alternatives, Clackamas County planning was completing a preliminary concept for an alternative design to the Sunrise Corridor FEIS plan. This concept plan is called the Sunrise Parkway Concept plan and shows a preliminary concept that would extend the Sunrise JTA project east to SE 172nd Avenue. The Sunrise Parkway concept does eliminate the proposed interchange at the Carver Junction.

The team for the RCEC attended workshops representing the City of Happy Valley in their partnership with Clackamas County to provide input and ideas related to the conceptual design alternative development of the Sunrise Parkway Conceptual plan. Working through a consultant, the County finalized a preliminary concept plan for the Sunrise Parkway. After discussion with City of

Happy Valley Planning staff, our team developed alternatives and cost estimates for two separate scenarios:

Scenario A – No Build of Sunrise Parkway: The first scenario assumes that the Sunrise Parkway Project is either not funded at all, or not funded in the area of the Rock Creek Employment Center Improvements.

Scenario B – Full Construction of Sunrise Parkway: The second scenario assumes that the Sunrise Parkway Project is fully funded by a 2020 Metro Bond or equivalent funding package to the extent that the project is constructed from SE 172nd Avenue west to the existing Sunrise JTA constructed limits. ***For estimating purposes, it is assumed that the Sunrise Parkway Project would construct the Carver Junction Intersection and Highway 212 and the SE 162nd Avenue Realignment up to new roundabout at the Highway 212/162nd Intersection.***

In either scenario, it is assumed that the interchange at the Carver Junction as shown in the Sunrise Corridor FEIS will not be constructed by Sunrise Parkway Project. The RCEC improvements will be designed and constructed with the assumption that the Sunrise Parkway Project will at least be adopted as a part of the County's TSP in the future.

It should be noted that the configuration of Carver Junction (212/224 Intersection) differs depending on the scenario. In Scenario A – No Build of Sunrise Parkway, DKS has confirmed that a roundabout intersection configuration would not be adequate, and that signal improvements would be necessary along with added turn lanes at this intersection. For Scenario B – Full Construction of Sunrise Parkway, a Roundabout would be adequate as the Sunrise Parkway would reduce traffic at the intersection.

The RCEC design team, including DKS, worked with City of Happy Valley planning staff to review the potential changes to the City's TSP as a result of the changes identified by the Sunrise Parkway Project. As a result of this change, and based upon DKS's traffic input, this study assumes the following changes will be made to the TSP:

- The extension of Rock Creek Boulevard west of SE 162nd will not be constructed. The elimination of the interchange at the Carver Junction eliminates the need for this roadway.
- Rock Creek Boulevard will be downsized from a planned five-lane facility to a three-lane facility.
- One north-south collector road is eliminated south of Rock Creek Boulevard and between SE 162nd Avenue and SE Parklane Drive (SE 169th Avenue).
- The analysis also assumes that a four-lane facility will be constructed along Highway 212 from the Carver Junction east to SE 172nd Avenue. The costs along Highway 212 vary depending upon the two scenarios discussed, as it is assumed that the Sunrise Parkway Project would construct the Highway 212 improvements.

Base Map and Basis of Design: HHPR compiled a base map for the preliminary design work for the Rock Creek Employment Center. The base map was generated in Autocad and utilized existing design files from the SE 172nd Avenue Project, Rock Creek Boulevard Project, Rock Creek Middle School, SE 162nd Avenue, SE Parklane Project, and Hood View Park Project. HHPR designed all of these projects. HHPR supplemented the base drawing files with GIS data and Lidar data. The Autocad files are overlaid on an existing aerial photograph to generate the basemap. HHPR created an existing surface in AutoCad Civil 3D from the available Lidar data to generate preliminary profiles.

10% Design Plans and Exhibits: The following 10% plans have been developed and are included with the report in the Appendix A:

- Roadway Plan (Sheet 1 of 6)
- Roadway Profiles for Sunrise, 162nd and Proposed Ramps (Sheet 2 of 6)
- Roadway Profiles for Rock Creek, Parklane and Collectors (Sheet 3 of 6)
- Storm Sewer Plan (Sheet 4 of 6)
- Sanitary Sewer Plan (Sheet 5 of 6)
- Water Plan (Sheet 6 of 6)

The following Supplemental Exhibits and included in Appendix B:

- Exhibit A - Carver Junction (Highway 212/224) to SE 162nd Avenue Improvement (without Sunrise Parkway)
- Exhibit B - Carver Junction (Highway 212/224) to SE 162nd Avenue Improvement (with Sunrise Parkway) and recommended connections to the Sunrise Parkway
- Exhibit C - Potential SE 162nd/Highway 212 Proposed Roundabout

Description of Key Transportation Elements:

SE 162nd Avenue Extension: This improvement can be defined as the construction of the SE 162nd Avenue Corridor from a new intersection at Highway 212 northward to connect to the existing SE 162nd Avenue north of Rock Creek at Taralon. The roadway would be constructed to a collector roadway standard. The work would include the following elements:

- New Segment of Road from Highway 212 to Rock Creek Boulevard
- Half-street improvements from Rock Creek Boulevard north to the limit of the existing roadway along the Frontage of Hood View Park
- Extension of roadway north including a new bridge across Rock Creek Boulevard to connect to the existing roadway

Highway 212 Improvements: Based upon the analysis completed by DKS Associates, in order to facilitate construction of the Rock Creek Employment Center, Highway 212 from the Carver Junction to SE 172nd would require the construction of two lanes in each direction. As such, the cost estimate accounts for the addition of two additional lanes along this corridor. Highway 212 widening would follow the existing alignment with the exception of a relocated segment at the new SE 162nd Avenue/Highway 212 Intersection Improvement as described below.

SE 162nd/Highway 212 Intersection Improvement: This improvement would include the construction of a new intersection at the extension SE 162nd Avenue as it connects to Highway 212. For this preliminary design, we have proposed the construction of a new roundabout and a partial re-alignment of Highway 212 into the roundabout. The design is based upon the following elements:

- A new intersection (roundabout) would be constructed north of the existing Highway 212 alignment and north of the proposed Sunrise Parkway Alignment.
- This intersection improvement would be built along the alignment of the SE 162nd Avenue extension as it connects to Highway 212.
- The roundabout intersection would be designed to accommodate large trucks similar to other roundabout facilities on ODOT highways.

- The SE 162nd Avenue/Highway 212 Roundabout is a stand-alone project that can be constructed with or without the Sunrise Parkway Project and would help relieve congestion at the SE 172nd Avenue Intersection.
- The re-aligned portion of Highway 212 can be converted in the future to an off-ramp from the Sunrise Parkway.
- Installation of an off-line roundabout allows construction of the Sunrise Parkway without throw away work.

The RCEC design team does recommend adding on and off ramps to the Sunrise Parkway as Illustrated on *Exhibit B.* These recommended changes are relatively minor in cost related to an overall Sunrise Parkway project cost, but does allow connection to the Parkway from the Rock Creek Employment Center as well as the Carver Area. All movements would be accommodated with these ramps similar to a full interchange, with the exception of traffic traveling from the Carver area east to Damascus. In this case, vehicles would have to travel north to Collector-3; eastbound to SE 172nd Avenue and then south to the eastbound left turn lane at the 172nd/Highway 212 Intersection.

It should be noted that the Sunrise Parkway Concept Plan did show a connection to the area south of Highway 212 which crosses a large ravine. This proposed roadway connection is outside the limits of the RCEC study area, however, the RCEC team does feel that this roadway connection may not be feasible because of cost and environmental impacts. It may be best to serve the undeveloped and existing properties south of Highway 212 through the roadway network south of Highway 212 as shown on earlier versions of the Sunrise Parkway Concepts. We do assume that if the Sunrise Parkway is funded, there will be a further level of refinement required, and this issue could be reviewed at that time.

Cost Estimate Methodology: HHPR created a planning level cost estimate model to estimate infrastructure costs within the RCEC area on a per foot basis for roadway type. This model estimates typical elements of construction associated with each infrastructure element and then calculates the unit cost of roadway and improvements on a per foot basis from the typical elements of construction for each roadway type. Intersection costs, which are additive to the roadway costs, are also estimated at each future location. Unit costs for each element of construction such as asphalt paving, aggregate base, etc are input based upon current market condition prices in 2020, without escalation factors.

Quantities for each type of roadway element were developed and unit prices were applied to each segment of roadway per the preliminary 10% design. This unit cost approach also includes estimated costs for storm water management, providing a joint trench for utilities and installation of a PGE backbone system (conduits and vaults), street lighting, landscaping, and other miscellaneous features. Right-of-way costs were also estimated for the roadway. Project management, design and construction administration costs were also included as a percentage of the unit cost. Additional costs. Costs at each intersection were then estimated on a lump sum basis, which include cost of additional turn lanes, signals, ADA facilities, additional ROW, etc, to complete cost estimate of the transportation system. A 30% overall contingency was applied to the estimates. Costs for sanitary sewer based upon a unit cost per foot for the specific facility and per the layout generated with the preliminary 10% design. Costs for the water system were provided by Sunrise Water Authority for main line improvements, and estimated on a unit cost basis for collector roads.

Roadway Costs include:

- Roadway construction Including Sidewalks and Bike lanes
- Landscape Improvements
- Street Lighting Improvements
- Storm System Improvements including unit costs for treatment and detention
- Joint Trench and Power Backbone
- Estimated Right of Way Acquisition
- Soft Costs including those associated with agency project management, design, construction management and inspection.

Assumptions:

1. Cost estimates include the changes to the TSP as noted previously.
2. Gas, and Communications system (cable and phone) costs not included. It is assumed that they will be installed on a market driven basis, and the work performed by the private utilities. The joint trench will be available to these utilities if installed concurrently with the roadway.
3. Development patterns will require circulation roadways, local roadways, etc. We have only estimated the back bone system (Appendix A, Sheet 1) for the infrastructure costs.

Storm System Costs: HHPR has prepared a preliminary Storm Sewer System to serve the RCEC. Please refer to Sheet 4 in Appendix A. As previously noted, the costs associated with this system are included in the unit cost analysis of the roadway system as they would be integral to the development of these facilities.

Sanitary Sewer Costs: Based upon the roadway improvements noted, location of existing sanitary sewer, in addition to CCSD#1 master plans, HHPR prepared a preliminary sanitary sewer plan to serve the RCEC. (Appendix A, Sheet 5). For the cost analysis a single per lineal foot unit price for sanitary sewer was used in the estimate.

Water System Costs: Based upon the roadway improvements noted, and input from Sunrise Water Authority (SWA), HHPR prepared a preliminary water system plan to serve the RCEC. (Sheet 6 of the plans included with this report). Sunrise provided the following written input for use in the analysis of the water system:

'Per the Sunrise Water Authority (SWA) Capital Improvement Plan, adopted the SWA Board of Commissioners in December 2017, a proposed 7000 gpm pump station ($3M) will take suction off of Clackamas River Water's SE 152nd reservoir at 152nd and HWY 212. This pump station will bolster the transmission to serve the Rock Creek Industrial area. From the proposed pump station, 4,800 feet of 24-inch main ($1.7M) will be installed along HWY 212 between 152nd Avenue to SE 162nd.

At the intersection of 162nd and HWY 212, 1,500 feet of 18-inch transmission main ($450K) will be extended north to connect HWY 212 to the existing 18-inch main on SE 162nd between Rock Creek Blvd and Falls View Lane and another 2,500 feet of 18-inch transmission main on 162nd ($750K) will be installed on 162nd to connect the existing 18-inch main on Falls View to the existing 18-inch main at SE Taralon Drive. Extending east on HWY 212 between the intersections of 162nd and 172nd, 2,900 feet of 18-inch transmission main ($870K) shall be installed. Please note that waterline infrastructure will be constructed as SDCs are collected through meter sale and in correspondence with roadway improvements, not in advance of roadway improvements. That said, so long as waterline frontage is established to a developing

property, there is adequate water supply to the area and these improvements need not be made sequentially.

Along all industrial corridor roads, 12-inch main shall be installed as frontage improvements are established at the cost of the development. Along mixed use, employment center, community center, institutional public use and residential corridors, 6-inch, 8-inch or 12-inch main shall be installed as frontage improvements are established at the cost of the development'.

Costs provided by Sunrise Water Authority (SWA) associated with serving the RCEC are included in the cost estimate for the Water System Improvements. In additional to these costs, related to the last paragraph of written input from SWA, HHPR has shown new water lines (size to be determined) in all collector roadways to supplement the costs outlined by SWA. The size of the water lines within the collector roadways may vary from 6 inch to 12 inch. In order to provide a comprehensive preliminary cost element for development of the Rock Creek Employment Center (RCEC), HHPR has assigned a lineal foot cost of a typical water line in a collector road assuming that that mains are an average of 8 inch in diameter. A single per lineal foot cost for the water line and all appurtenances for these roadway was used in the estimate. The cost for the purple pipe (potential reclaimed water system) and off-site water costs are estimated separately.

Cost Estimate Summary: The following is a summary of planning level cost estimates to construct the infrastructure for the Rock Creek Employment Area by each segment of roadway.

Scenerio A: Sunrise Parkway No-Build

Roadway Network Cost Estimate		**Estimated Cost**
SE 162nd Ave Extension (OR-212 to Taralon)	$	20,900,000
Hwy 212 Improvements - OR 212/224 Junction to 162nd Intersection	$	16,900,000
Hwy 212 Improvements - 162nd Intersection to SE 172nd Intersection	$	6,600,000
OR 212 / 162nd Roundabout	$	1,000,000
Other RCEC Roadway Costs		
SE Rock Creek Blvd (162nd to 172nd)	$	7,500,000
SE Parklane Dr (162nd to Collector 3)	$	10,100,000
Collector-1 (172nd to Collector-2)	$	9,400,000
Collector-2 (172nd to Collector-1)	$	3,300,000
Collector-3 (162nd to 172nd)	$	8,700,000

Sanitary and Water Cost Estimate		
Sanitary Sewer with RCEC	$	1,900,000
Waterline Improvements withinin RCEC	$	7,000,000
Purple Pipe (162nd) within RCEC	$	600,000
Total Project Development Cost (10% Design)	**$**	**93,900,000**

Scenario B: Sunrise Parkway Build

Roadway Network Cost Estimate		Estimated Cost
SE 162nd Ave Extension (OR-212 to Taralon)	$	20,900,000
Hwy 212 Improvements - OR 212/224 Junction to 162nd Intersection	$	-
Hwy 212 Improvements - 162nd Intersection to SE 172nd Intersection	$	-
OR 212 / 162nd Roundabout	$	-
Other RCEC Roadway Costs		
SE Rock Creek Blvd (162nd to 172nd)	$	7,500,000
SE Parklane Dr (162nd to Collector 3)	$	10,100,000
Collector-1 (172nd to Collector-2)	$	9,400,000
Collector-2 (172nd to Collector-1)	$	3,300,000
Collector-3 (162nd to 172nd)	$	8,700,000

Sanitary and Water Cost Estimate		
Sanitary Sewer within RCEC	$	1,900,000
Waterline Improvements within RCEC	$	7,000,000
Purple Pipe (162nd) within RCEC	$	600,000
Total Project Development Cost (10% Design)	**$**	**69,400,000**

Please refer to Appendix C for further breakdown of the Cost Estimate

Appendix A

- Roadway Plan (Sheet 1 of 6)
- Roadway Profiles for Sunrise, 162nd and Proposed Ramps (Sheet 2 of 6)
- Roadway Profiles for Rock Creek, Parklane and Collectors (Sheet 3 of 6)
- Storm Sewer Plan (Sheet 4 of 6)
- Sanitary Sewer Plan (Sheet 5 of 6)
- Water Plan (Sheet 6 of 6)

Construction Notes

1. ADD SECOND EB LEFT TURN LANE AT ROCK CREEK BLVD/172ND AVE. MODIFY EXISTING TRAFFIC SIGNAL.
2. ADD SECOND EB LEFT TURN LANE AT OR 212/172ND AVE.
3. ADD SECOND EB RIGHT TURN LANE AT OR 212/OR 224 (CARVER JUNCTION) AND WIDEN OR 224 TO INCLUDE A SECOND SB RECEIVING LANE FOR 1,000 FT.
4. ADD TRAFFIC SIGNAL AT ROCK CREEK BLVD/162ND AVE.
5. ADD TRAFFIC SIGNAL AT ROCK CREEK BLVD/PARKLANE DR.
6. ADD TRAFFIC SIGNAL AT OR 212 REALIGNMENT/162ND AVE. PROVIDE DOUBLE WB LEFTS AND DOUBLE NB RIGHTS.
7. ADD 2 LANE ROUNDABOUT.
8. ADD ROUNDABOUT AT 162ND AVE/PARKLANE DR.
9. ADD 2 LANE ROUNDABOUT OR MODIFY EXISTING TRAFFIC SIGNAL.

SE TARALON DR
SE 162ND AVE
SE PARKLANE DR
COLLECTOR-2
COLLECTOR-1
SE 162ND AVE (HALF STREET IMPROVEMENT FROM ROCK CREEK BLVD TO STA. 36+00)
SE STADIUM WAY
SE ROCK CREEK BLVD (HALF STREET IMPROVEMENT FROM 162ND TO 172ND)
SE 152ND AVE
SE 172ND AVE
SE EMI ST
COLLECTOR-3
WB ON-RAMP (BY SUNRISE)
OR212 REALIGNMENT (CONVERT TO WB OFF-RAMP BY SUNRISE)
SUNRISE PARKWAY
SE ARMSTRONG CIR
EB OFF-RAMP (BY SUNRISE)
OR 212
CARVER JUNCTION
OR 224
SE TONG RD

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HAPPY VALLEY, OR EST. 1965

SCALE: 1" = 200'

New Roundabout

New Traffic Signal

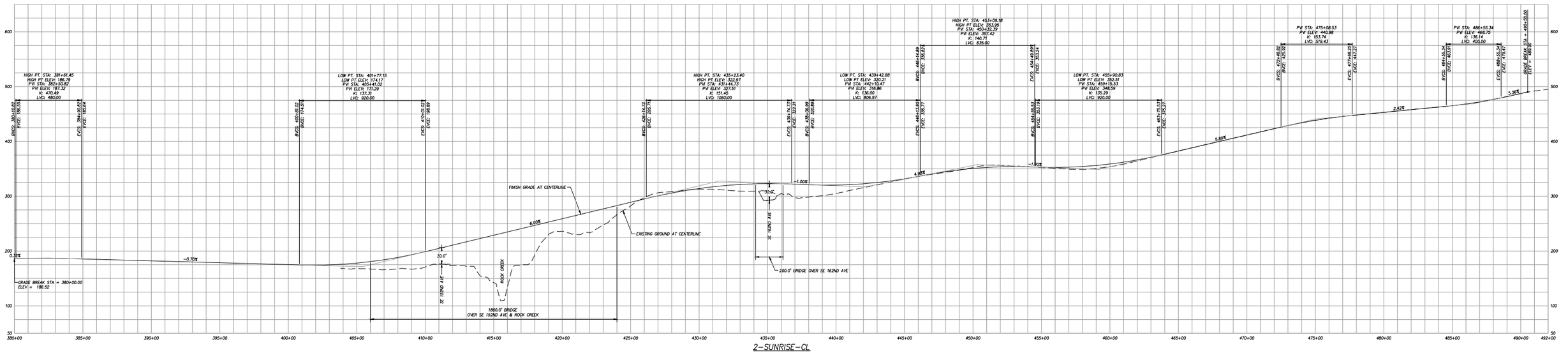
Modify Existing Traffic Signal

X Lane Count For Facility

Roadway Plan
Rock Creek Employment Center

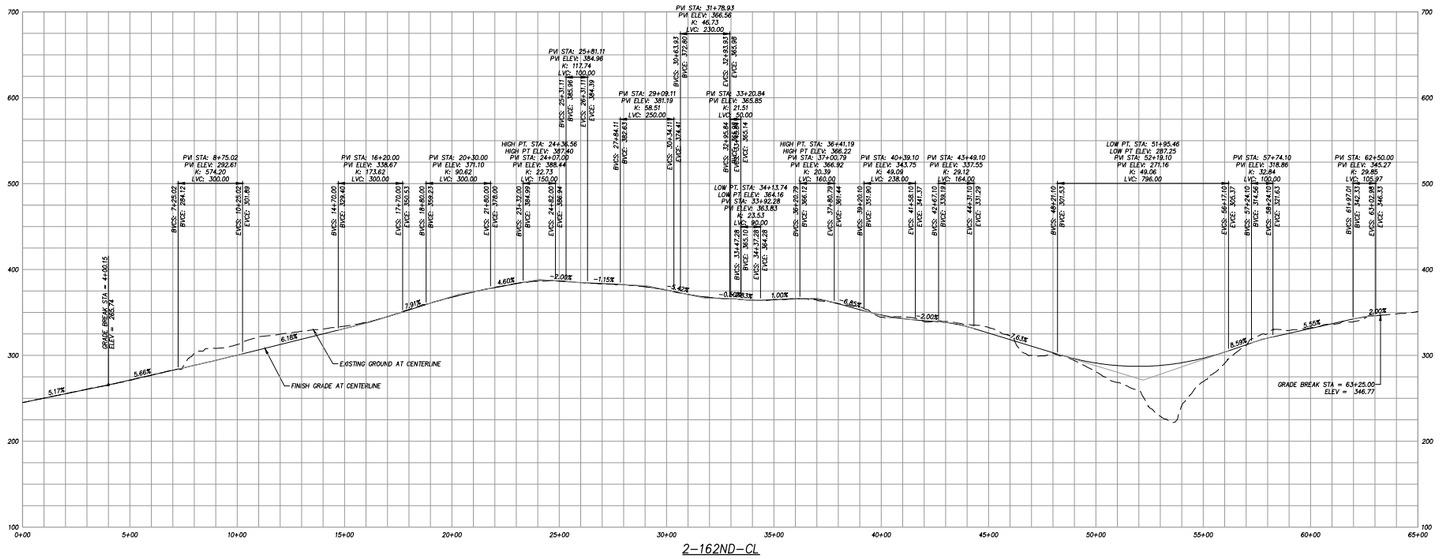
3/25/2020 Preliminary Design - Subject to Change

HAP-13



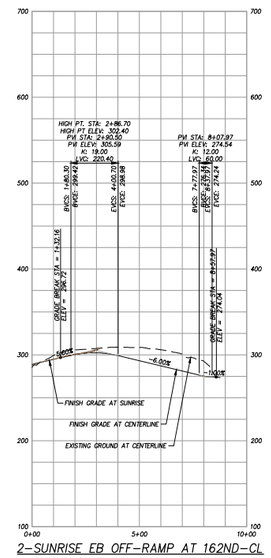
2–SUNRISE–CL

SCALE: 1" = 200' (HORIZ.)
1" = 50' (VERT.)



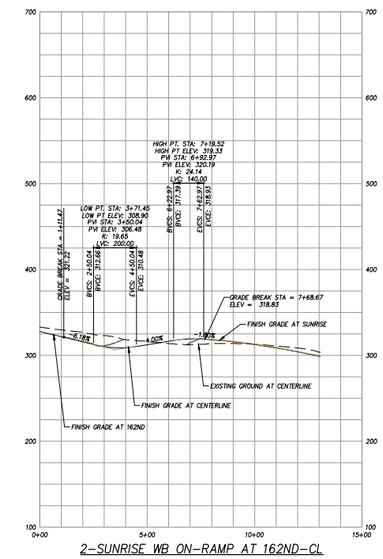
2–162ND–CL

SCALE: 1" = 200' (HORIZ.)
1" = 50' (VERT.)



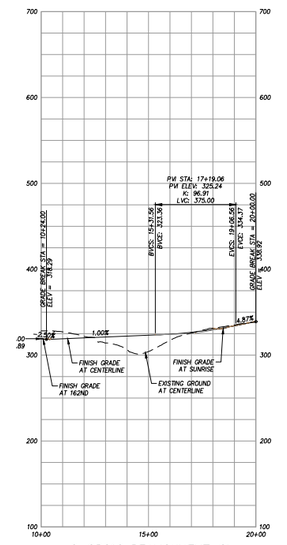
2–SUNRISE EB OFF–RAMP AT 162ND–CL

SCALE: 1" = 200' (HORIZ.)
1" = 50' (VERT.)



2–SUNRISE WB ON–RAMP AT 162ND–CL

SCALE: 1" = 200' (HORIZ.)
1" = 50' (VERT.)



2–OR212 REALIGNMENT–CL
(SUNRISE WB OFF–RAMP)

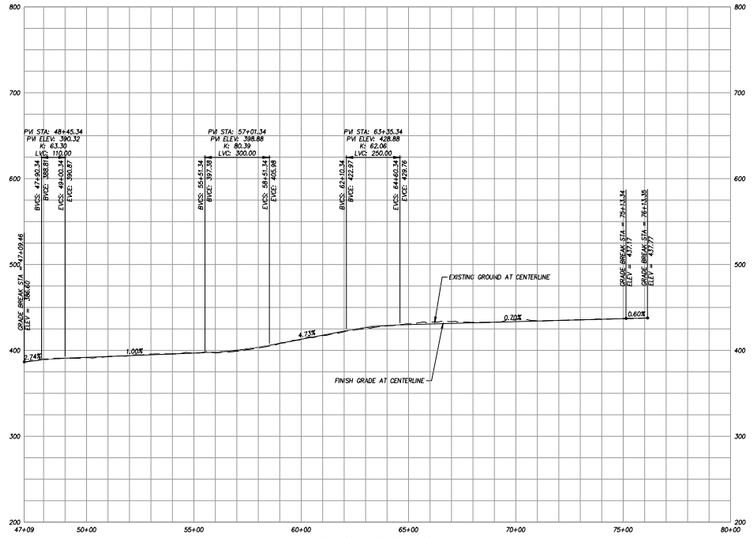
SCALE: 1" = 200' (HORIZ.)
1" = 50' (VERT.)

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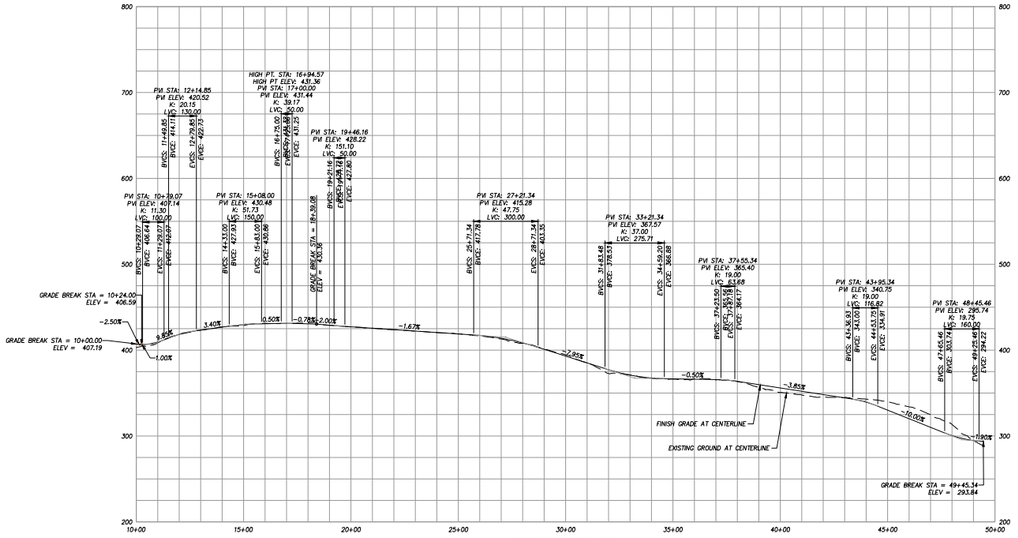
Roadway Profiles (Sunrise, 162nd, Ramps)
Rock Creek Employment Center

3/25/2020 Preliminary Design - Subject to Change



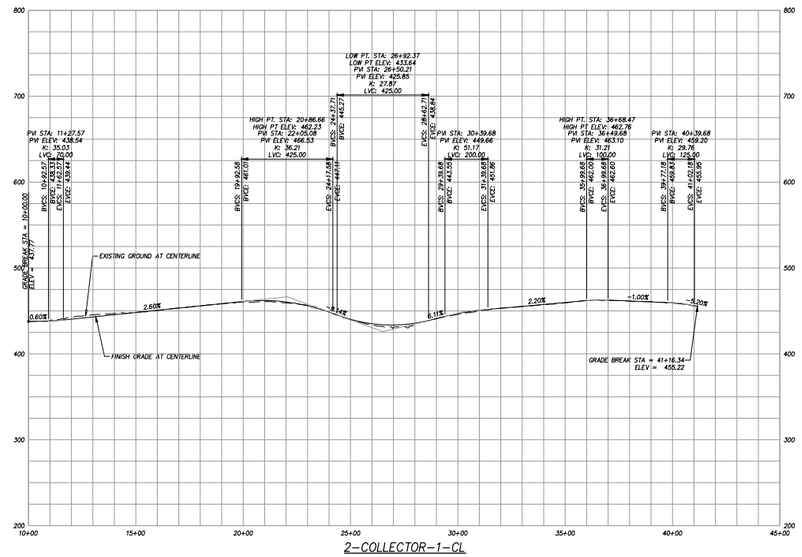
2-ROCK CREEK-CL

SCALE: 1" = 200' (HORIZ.)
1" = 50' (VERT.)



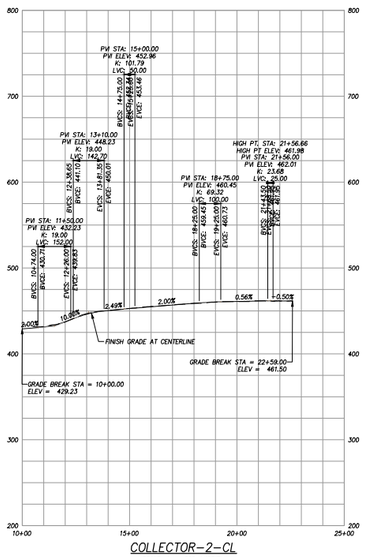
2-PARKLANE-CL

SCALE: 1" = 200' (HORIZ.)
1" = 50' (VERT.)



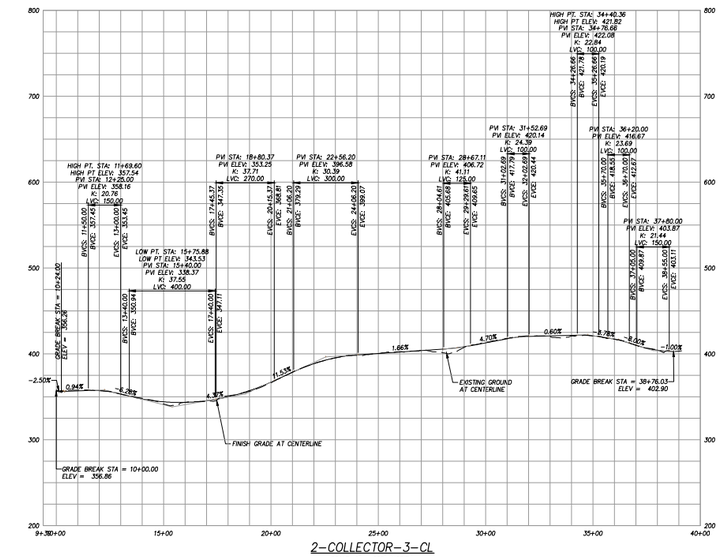
2-COLLECTOR-1-CL

SCALE: 1" = 200' (HORIZ.)
1" = 50' (VERT.)



COLLECTOR-2-CL

SCALE: 1" = 200' (HORIZ.)
1" = 50' (VERT.)



2-COLLECTOR-3-CL

SCALE: 1" = 200' (HORIZ.)
1" = 50' (VERT.)

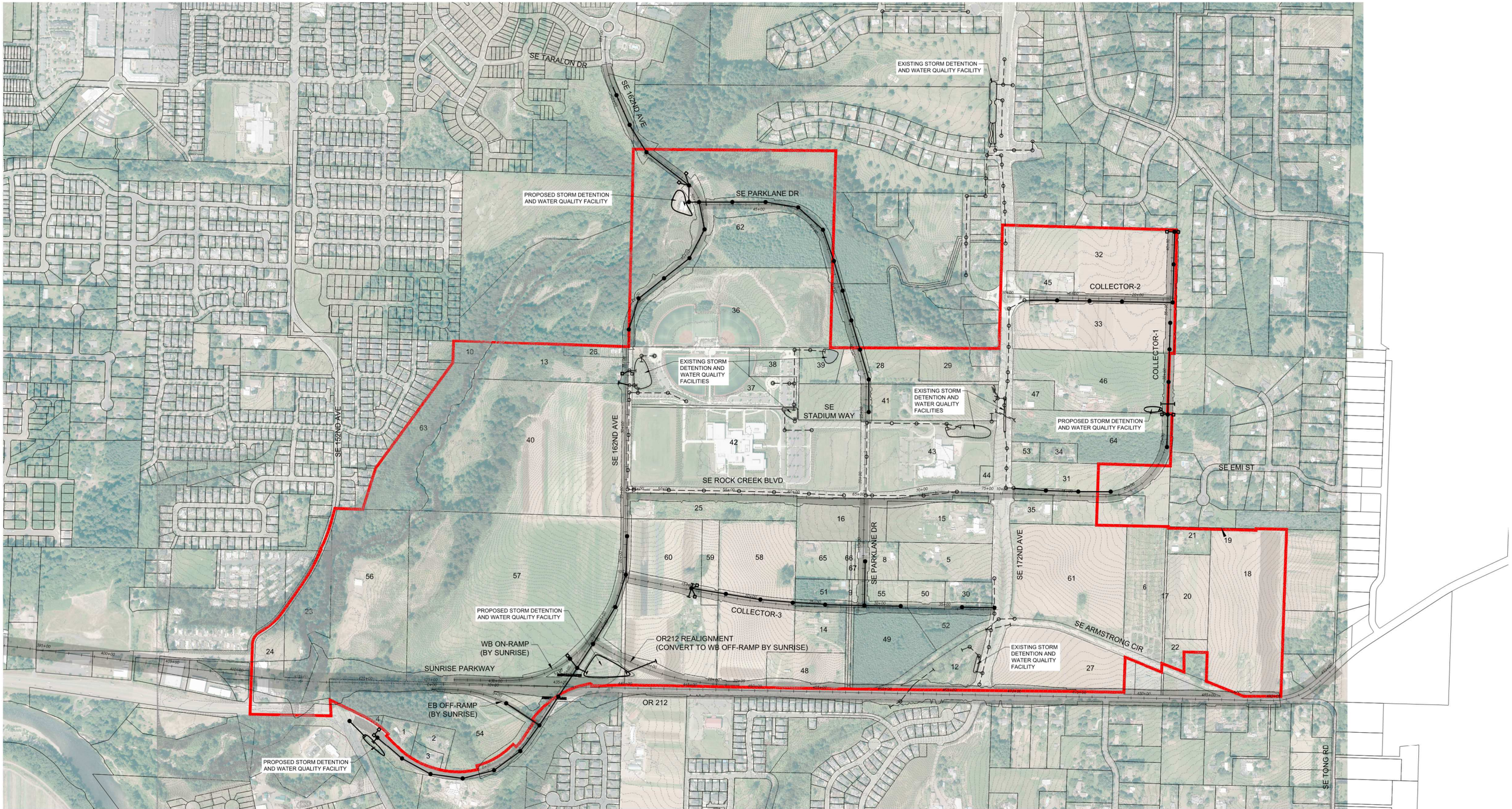
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EST. 1965

Roadway Profiles (Rock Creek, Parklane, Collectors)
Rock Creek Employment Center

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HAPPY VALLEY, OR EST. 1965

N

0 200 400
SCALE: 1" = 200'

New Storm Sewer

Existing Storm Sewer

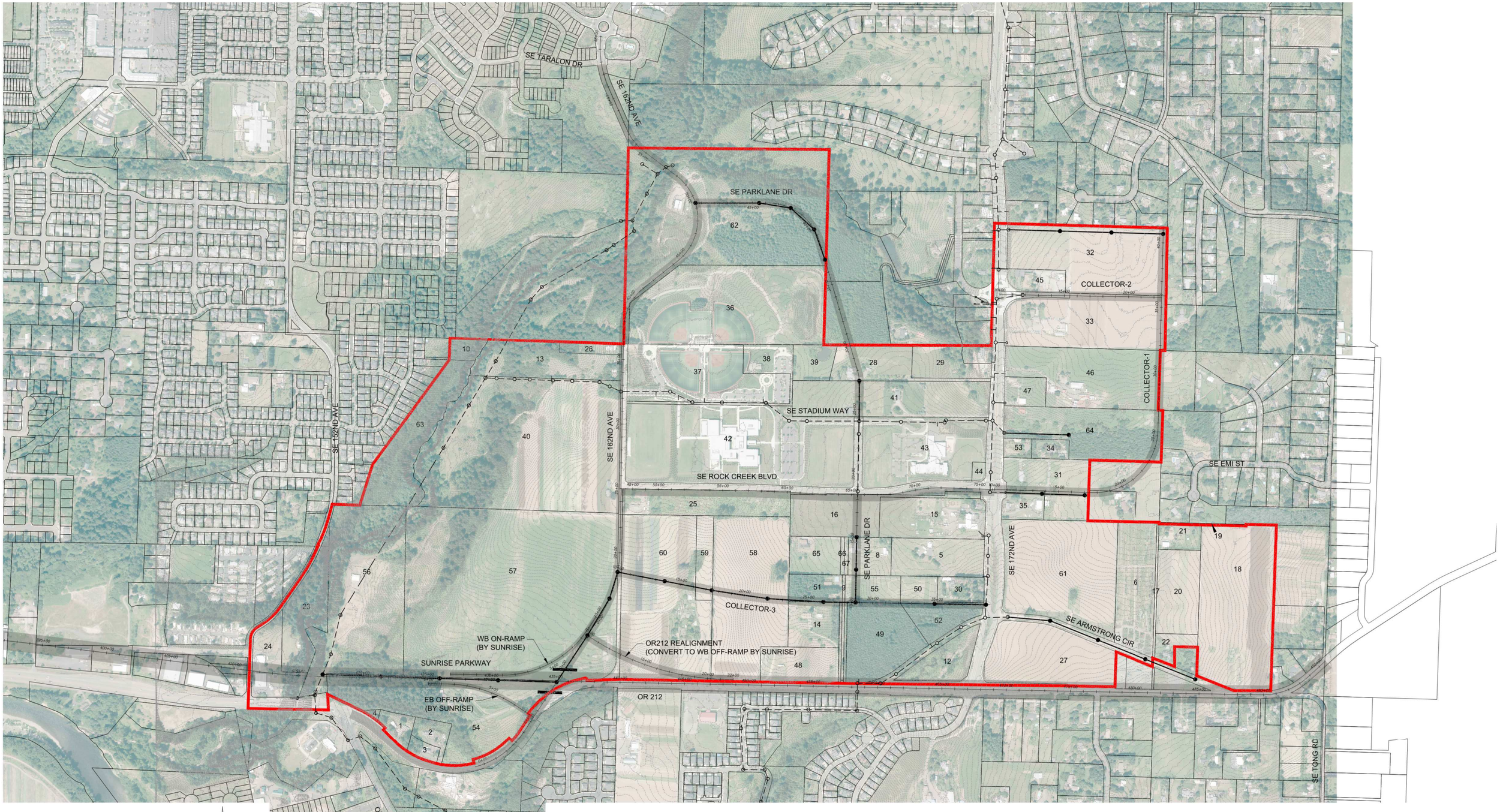
GENERAL NOTE:
IN ADDITION TO THE PROPOSED STORM DETENTION AND WATER QUALITY FACILITIES SHOWN, STORMWATER PLANTERS WILL BE INCORPORATED INTO THE ROADWAY DESIGN FOR ADDED WATER QUALITY IMPROVEMENTS.

Storm Sewer Plan
Rock Creek Employment Center

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HAPPY VALLEY, OR
EST. 1965

N

0 200 400
SCALE: 1" = 200'

New Sanitary Sewer

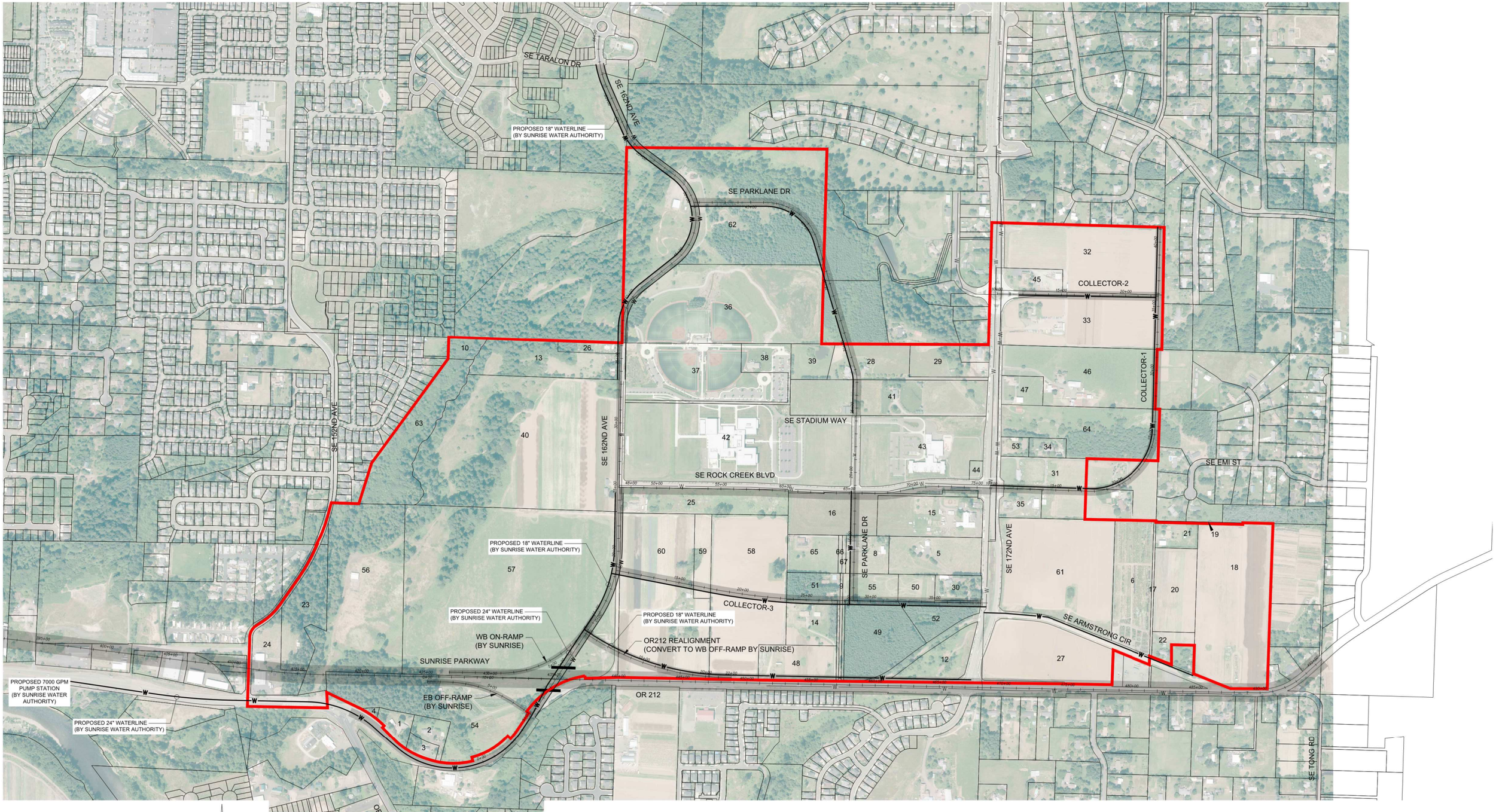
Existing Sanitary Sewer

Sanitary Sewer Plan
Rock Creek Employment Center

3/25/2020 Preliminary Design - Subject to Change

HAP-13

5 of 6



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HAPPY VALLEY, OR EST. 1965

N

0 200 400
SCALE: 1" = 200'

New Water Line

New Purple Pipe

Existing Water Line

Water Plan
Rock Creek Employment Center

3/25/2020 Preliminary Design - Subject to Change

HAP-13

6 of 6

Appendix B

- Exhibit A - Carver Junction (Highway 212/224) to SE 162nd Avenue Improvement (without Sunrise Parkway)
- Exhibit B - Carver Junction (Highway 212/224) to SE 162nd Avenue Improvement (with Sunrise Parkway) and recommended connections to the Sunrise Parkway
- Exhibit C - Potential SE 162nd/Highway 212 Proposed Roundabout

P:\HAP (City of Happy Valley)\HAP-13 (Rock Creek Employment)\HAP13-DWGS\EXHIBITS\ HAP13-EXHIBT A-SIGNALIZED INTERSECTION.dwg

EXHIBIT A

LEGEND:

ROCK CREEK EMPLOYMENT CENTER AREA OF FOCUS

N

0 50 100 200

SCALE: 1" =200'



DATE	NO.	DESCRIPTION

R E V I S I O N S

DESIGNED: HHPR
DRAWN: HHPR
CHECKED: DSH
DATE: 03/24/2020

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EXHIBIT A - CARVER JUNCTION (WITHOUT SUNRISE PARKWAY)

HAPPY VALLEY, OR

SHEET NO. A

JOB NO. HAP-13

P:\HAP (City of Happy Valley)\HAP-13 (Rock Creek Employment)\HAP13-DWGS\EXHIBITS\HAP13-PHASE 2_ROUNDABOUTS.dwg

EXHIBIT B

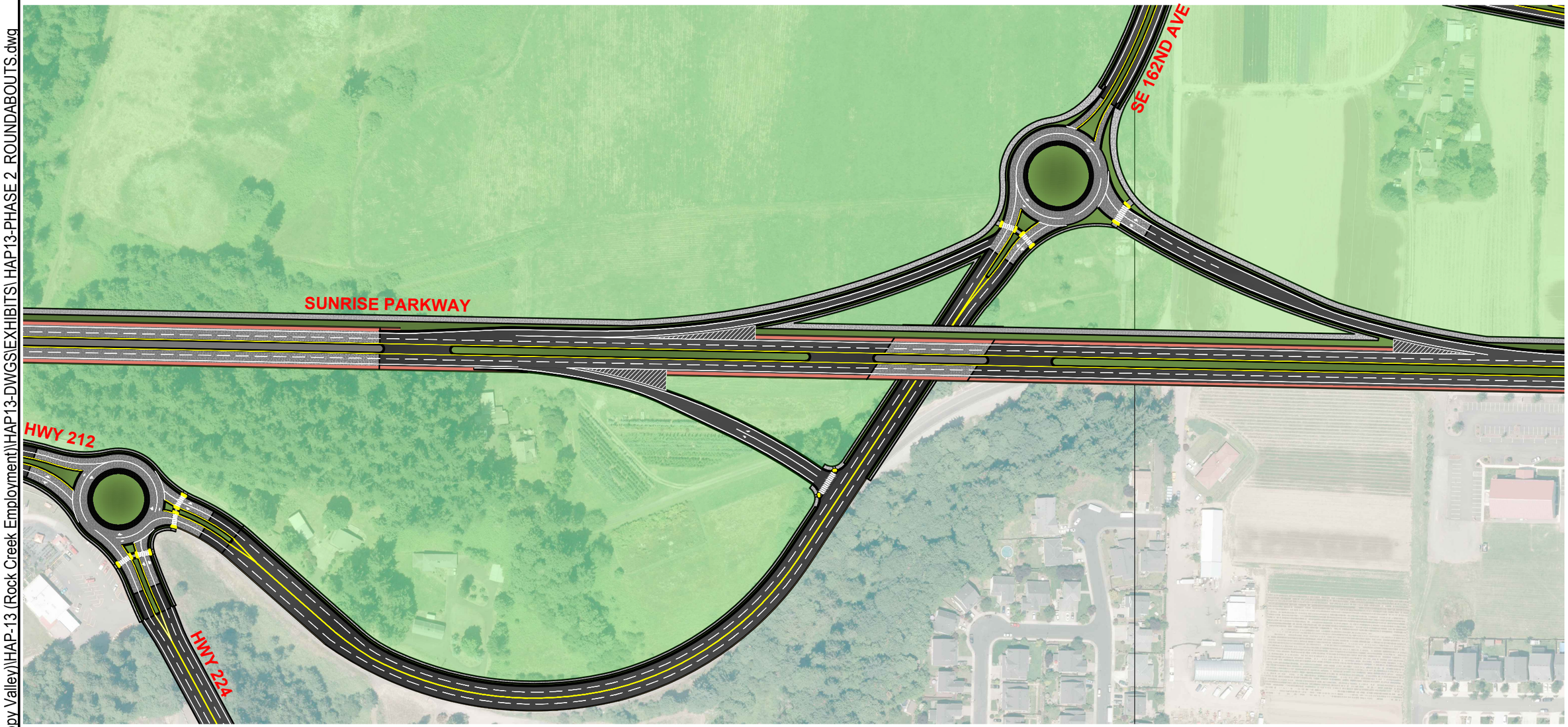
LEGEND:

ROCK CREEK EMPLOYMENT CENTER AREA OF FOCUS

N

0 50 100 200

SCALE: 1" =200'



DATE	NO.	DESCRIPTION

REVISIONS

DESIGNED: HHPR
DRAWN: HHPR
CHECKED: DSH
DATE: 01/27/2020

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EXHIBIT B - CARVER JUNCTION (WITH SUNRISE PARKWAY)

HAPPY VALLEY, OR

SHEET NO. B

JOB NO. HAP-13

P:\HAP (City of Happy Valley)\HAP-13 (Rock Creek Employment)\HAP13-DWGS\EXHIBITS\ HAP13-ROUNDABOUT_PHASE 1_212-162ND.dwg



0 20 40 80
SCALE: 1" = 80'

EXHIBIT C

DATE	NO.	DESCRIPTION

REVISIONS

DESIGNED: HHPR
DRAWN: HHPR
CHECKED: DSH
DATE: 01/27/2020

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EXHIBIT C - SE 162ND / HWY 212 ROUNDABOUT

HAPPY VALLEY, OR

SHEET NO. C

JOB NO. HAP-13

Appendix C

- Summary of Cost Estimates

Rock Creek Employment Center

Conceptual 10% Design / Estimate - Summary

Job No. HAP-13

Date: March 27, 2020

Scenario A: Sunrise Parkway No-Build

Roadway Network Cost Estimate		Estimated Cost
SE 162nd Ave Extension (OR-212 to Taralon)	$	20,900,000
Hwy 212 Improvements - OR 212/224 Junction to 162nd Intersection	$	16,900,000
Hwy 212 Improvements - 162nd Intersection to SE 172nd Intersection	$	6,600,000
OR 212 / 162nd Roundabout	$	1,000,000
Other RCEC Roadway Costs		
SE Rock Creek Blvd (162nd to 172nd)	$	7,500,000
SE Parklane Dr (162nd to Collector 3)	$	10,100,000
Collector-1 (172nd to Collector-2)	$	9,400,000
Collector-2 (172nd to Collector-1)	$	3,300,000
Collector-3 (162nd to 172nd)	$	8,700,000

Sanitary and Water Cost Estimate		
Sanitary Sewer with RCEC	$	1,900,000
Waterline Improvements within RCEC	$	7,000,000
Purple Pipe (162nd) within RCEC	$	600,000

Total Project Development Cost (10% Design) $ 93,900,000

Rock Creek Employment Center

Conceptual 10% Design / Estimate - Summary

Job No. HAP-13

Date: March 27, 2020

Scenario B: Sunrise Parkway Build

Roadway Network Cost Estimate		Estimated Cost
SE 162nd Ave Extension (OR-212 to Taralon)	$	20,900,000
Hwy 212 Improvements - OR 212/224 Junction to 162nd Intersection	$	-
Hwy 212 Improvements - 162nd Intersection to SE 172nd Intersection	$	-
OR 212 / 162nd Roundabout	$	-
Other RCEC Roadway Costs		
SE Rock Creek Blvd (162nd to 172nd)	$	7,500,000
SE Parklane Dr (162nd to Collector 3)	$	10,100,000
Collector-1 (172nd to Collector-2)	$	9,400,000
Collector-2 (172nd to Collector-1)	$	3,300,000
Collector-3 (162nd to 172nd)	$	8,700,000

Sanitary and Water Cost Estimate		
Sanitary Sewer with RCEC	$	1,900,000
Waterline Improvements within RCEC	$	7,000,000
Purple Pipe (162nd) within RCEC	$	600,000

Total Project Development Cost (10% Design) $ 69,400,000

Rock Creek Employment Center

Conceptual 10% Design / Estimate - Summary

Job No. HAP-13

Date: March 27, 2020

Major Street Segments	Estimated Cost
OR212 Realignment	$ 7,400,000
OR212 Widening (West)	$ 7,500,000
OR212 Widening (East)	$ 5,800,000
SE 162nd Ave (OR-212 to Taralon)	$ 20,300,000
SE Rock Creek Blvd (162nd to 172nd)	$ 5,900,000
SE Parklane Dr (162nd to Collector 3)	$ 10,100,000
Collector-1 (172nd to Collector-2)	$ 9,400,000
Collector-2 (172nd to Collector-1)	$ 3,300,000
Collector-3 (162nd to 172nd)	$ 8,700,000

Major Intersections/Structures	Estimated Cost
OR 212 / OR 224 Intersection	$ 2,000,000
OR 212 / 162nd (New Signal or Roundabout)	$ 1,000,000
SE 162nd / SE Rock Creek Blvd (New Signal)	$ 600,000
SE 162nd / SE Parklane (New Roundabout)	$ 600,000
SE Rock Creek Blvd / SE Parklane (New Signal)	$ 600,000
SE Rock Creek Blvd / SE 172nd Ave (Modified Signal)	$ 400,000
OR 212 / SE 172nd Ave (Modified Signal)	$ 800,000

Other	Section Cost
Sanitary Sewer	$ 1,900,000
Waterline	$ 7,000,000
Purple Pipe (162nd)	$ 600,000

Total Project Development Cost (10%) $ 93,900,000

Rock Creek Employment Center

Conceptual 10% Design / Estimate - Summary

Job No. HAP-13

Date: March 27, 2020

Global Cost Assumptions			
Construction Cost Contingency	%	30%	
Contractor LS Incidental	%	15%	(Mob, TPDT, EC, RSO, Staking, etc.)
Capital Project Mgmt. (design & const.)		10.0%	
Design Engineering		10.0%	
Design Survey		1.5%	
Public Involvement		0.5%	
Const. Engineering Support		6.0%	
Inspection		5.0%	

Roadwork				Assumptions
Bridge Substructure	SQFT	$	300.00	
Concrete Curb & Gutter	FOOT	$	23.00	
Concrete Curb (Median)	FOOT	$	6.00	
Sidewalk	SQFT	$	4.50	
Concrete Median (Paving)	SQFT	$	20.00	excludes curb
Asphalt Mixture	TON	$	85.00	
Aggregate Base	CUYD	$	60.00	
Geotextile Fabric	SQYD	$	1.00	
Earthwork	CUYD	$	28.00	
Topsoil	CUYD	$	45.00	
Bark Mulch (3" depth)	CUYD	$	60.00	
Groundcovers	SQFT	$	15.00	At 12" OC spacing, approx. 1/SF
Street Trees	EACH	$	650.00	
Root Barrier	FOOT	$	10.00	
Irrigation	SQFT	$	4.00	
Storm Main (24" dia)	FOOT	$	125.00	
Storm Lateral (12" dia)	FOOT	$	90.00	
Storm Manhole (48" dia)	EACH	$	5,000.00	
Storm Catch Basin	EACH	$	3,000.00	
Water Quality & Detention	SQFT	$	20.00	using 6% of imp. Area
Sanitary Main (12" dia)	FOOT	$	150.00	no laterals - to be installed with development
Sanitary Manhole (48" dia)	EACH	$	8,000.00	
Water Main (18" DI)	FOOT	$	225.00	
Water Main (8" DI)	FOOT	$	110.00	
Fire Hydrants (w/ lat & fittings)	EACH	$	10,000.00	
Purple Pipe (12" PVC)	FOOT	$	100.00	
Streetlights (incl conduit)	EACH	$	4,000.00	
Joint Trench	FOOT	$	40.00	
Underground Power (vaults)	EACH	$	12,000.00	
Underground Power (conduit)	FOOT	$	10.00	

Right-of-Way				
Right-of-Way (SF)	SQFT	$	6.00	Roughly based upon Tax Lot Assessement
Easement (SF)	SQFT	$	2.00	

Rock Creek Employment Center
Conceptual 10% Design / Estimate
Roadway Section Analysis
Date: March 27, 2020
Date: January 31, 2020

Major Intersections

Includes extra width for turn lanes, signals, interconnect, ROW, ADA ramps, ped buttons, etc.

	Intersection	OR 212 / OR 224 Roundabout	OR 212 / 162nd (New Signal or Roundabout)	SE 162nd / SE Rock Creek Blvd (New Signal)	SE 162nd / SE Parklane (New Roundabout)	SE Rock Creek Blvd / SE Parklane (New Signal)	SE Rock Creek Blvd / SE 172nd Ave (Modified Signal)	OR 212 / SE 172nd Ave (Modified Signal)
Construction Cost								
	LS Base Cost:	$ 1,000,000	$ 500,000	$ 300,000	$ 300,000	$ 300,000	$ 200,000	$ 400,000
30%	Const. Contingency:	$ 300,000	$ 150,000	$ 90,000	$ 90,000	$ 90,000	$ 60,000	$ 120,000
	Construction Subtotal:	$ 1,300,000	$ 650,000	$ 390,000	$ 390,000	$ 390,000	$ 260,000	$ 520,000
15%	Construction Incidentals:	$ 195,000	$ 97,500	$ 58,500	$ 58,500	$ 58,500	$ 39,000	$ 78,000
	Total Construction Cost	**$ 1,495,000**	**$ 747,500**	**$ 448,500**	**$ 448,500**	**$ 448,500**	**$ 299,000**	**$ 598,000**
Professional Services (Design & Construction)								
10%	Cap. Proj Mgmt. (des & con)	$ 149,500	$ 74,750	$ 44,850	$ 44,850	$ 44,850	$ 29,900	$ 59,800
10%	Design Engineering	$ 149,500	$ 74,750	$ 44,850	$ 44,850	$ 44,850	$ 29,900	$ 59,800
2%	Design Survey	$ 22,425	$ 11,213	$ 6,728	$ 6,728	$ 6,728	$ 4,485	$ 8,970
1%	Public Involvement	$ 7,475	$ 3,738	$ 2,243	$ 2,243	$ 2,243	$ 1,495	$ 2,990
6%	Const. Engineering Support	$ 89,700	$ 44,850	$ 26,910	$ 26,910	$ 26,910	$ 17,940	$ 35,880
5%	Inspection	$ 74,750	$ 37,375	$ 22,425	$ 22,425	$ 22,425	$ 14,950	$ 29,900
	Total Professional Services	**$ 493,350**	**$ 246,675**	**$ 148,005**	**$ 148,005**	**$ 148,005**	**$ 98,670**	**$ 197,340**
Right-of-Way								
	Extra R/W at Intersections							
	Total R/W Services	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
	Total Intersection Cost	**$ 1,988,350**	**$ 994,175**	**$ 596,505**	**$ 596,505**	**$ 596,505**	**$ 397,670**	**$ 795,340**

Rock Creek Employment Center
Conceptual 10% Design / Estimate
Roadway Section Analysis
Job No. HAP-13
Date: March 27, 2020

Road Section: OR 212 Realignment

Typical Road Section	
Asphalt	8
Agg. Base	14

Road Section Data Entry:

Segment	Begin STA	End STA	Length (ft)	Road		Right of Way		Public Utility Easements	
				Width (ft)	Area (sf)	Width (ft)	Area (sf)	Width (ft)	Area (sf)
	varies	varies	1,960	74.0	145,040	103.0	201,880	16.0	31,360
			-		-		-		-
			-		-		-		-
			-		-		-		-
			1,960		145,040		201,880		31,360

Roadway Section Costs (Volume)

	Area (sf)	Depth (ft)	Volume (CY)	Wt (Ton)	Unit Price	Total
Asphalt (Ton)	117,600	0.67	2,903.70	6,155.85	$ 85.00	$ 523,247
Aggregate Base	123,480	1.17	5,335.56		$ 60.00	$ 320,133
Earthwork	233,240	2.83	24,475.80		$ 28.00	$ 685,322

Roadway Section Costs (Area)

	Width (ft)	Length (ft)	Area (sf)	Unit Price	Total
Concrete Median		1,960	-	$ 20.00	$ -
Planted Median	14.00	1,960	27,440	$ 21.22	$ 582,338
Sidewalk	14.00	1,960	27,440	$ 4.50	$ 123,480
Landscape Strip	14.00	1,960	27,440	$ 21.22	
Geotextile Fabric	-	-	123,480	$ 1.00	$ 123,480
W.Q. & Detention			8,702	$ 20.00	$ 174,048

Roadway Section Costs (Length)

	Length (ft)	No. of Times	Total Length	Unit Price	Total
Curb & Gutter	1,960	2	3,920	$ 23.00	$ 90,160
Median Curb	1,960	2	3,920	$ 6.00	$ 23,520
Street Trees	1,960	3	5,880	$ 25.00	$ 147,000
Street Lights	1,960	2	3,920	$ 40.00	$ 156,800
Storm System	1,960	1	1,960	$ 213.30	$ 418,068
Joint Trench + PGE	1,960	1	1,960	$ 110.00	$ 215,600
				Combined Items Subtotal:	$ 3,583,197
Contingency			30%		$ 1,074,959
				Construction Subtotal:	**$ 4,658,156**
Construction Incidentals			15%		$ 698,723
				Total Construction Cost	**$ 5,356,879**

Professional Services (Design & Construction)

Capital Project Mgmt. (design & construction)	10.0%	$ 535,688
Design Engineering	10.0%	$ 535,688
Design Survey	1.5%	$ 80,353
Public Involvement	0.5%	$ 26,784
Const. Engineering Support	6.0%	$ 321,413
Inspection	5.0%	$ 267,844
Professional Services Total:		**$ 1,232,082**

Right-of-Way

	Area (sf)	Reduce %	Area (sf)	Unit Price	Total
Right-of-Way	201,880	33%	135,260	$ 6.00	$ 811,558
PUE's	31,360	33%	21,011	$ 2.00	$ 42,022
				Right-of-Way Subtotal	**$ 853,580**

Total Project Cost: $ 7,442,542

Rock Creek Employment Center
Conceptual 10% Design / Estimate
Roadway Section Analysis

Job No. HAP-13
Date: March 27, 2020

Road Section: OR212 Widening (West)

Typical Road Section	
Asphalt	8
Agg. Base	14

Road Section Data Entry:

Segment	Begin STA	End STA	Length (ft)	Road		Right of Way		Public Utility Easements	
				Width (ft)	Area (sf)	Width (ft)	Area (sf)	Width (ft)	Area (sf)
Carver Junc. to EB ramp	varies	varies	3,000	38.0	114,000	50.0	150,000	8.0	24,000
			-		-		-		-
			-		-		-		-
			-		-		-		-
			3,000		114,000		150,000		24,000

Roadway Section Costs (Volume)

	Area (sf)	Depth (ft)	Volume (CY)	Wt (Ton)	Unit Price	Total
Asphalt (Ton)	72,000	0.67	1,777.78	3,768.89	$ 85.00	$ 320,356
Aggregate Base	81,000	1.17	3,500.00		$ 60.00	$ 210,000
Earthwork	174,000	2.83	18,259.26		$ 28.00	$ 511,259

Roadway Section Costs (Area)

	Width (ft)	Length (ft)	Area (sf)	Unit Price	Total
Concrete Median		3,000	-	$ 20.00	$ -
Planted Median	14.00	3,000	42,000	$ 21.22	$ 891,333
Sidewalk	7.00	3,000	21,000	$ 4.50	$ 94,500
Landscape Strip	7.00	3,000	21,000	$ 21.22	
Geotextile Fabric	-	-	81,000	$ 1.00	$ 81,000
W.Q. & Detention			5,580	$ 20.00	$ 111,600

Roadway Section Costs (Length)

	Length (ft)	No. of Times	Total Length	Unit Price	Total
Curb & Gutter	3,000	2	6,000	$ 23.00	$ 138,000
Median Curb (planters)	3,000	2	6,000	$ 6.00	$ 36,000
Street Trees	3,000	2	6,000	$ 25.00	$ 150,000
Street Lights	3,000	1	3,000	$ 40.00	$ 120,000
Storm System	3,000	1	3,000	$ 197.10	$ 591,300
Joint Trench + PGE	3,000	1	3,000	$ 110.00	$ 330,000
				Combined Items Subtotal:	$ 3,585,348
Contingency			30%		$ 1,075,604
				Construction Subtotal:	**$ 4,660,953**
Construction Incidentals			15%		$ 699,143
				Total Construction Cost	**$ 5,360,095**

Professional Services (Design & Construction)

Capital Project Mgmt. (design & construction)	10.0%	$ 536,010
Design Engineering	10.0%	$ 536,010
Design Survey	1.5%	$ 80,401
Public Involvement	0.5%	$ 26,800
Const. Engineering Support	6.0%	$ 321,606
Inspection	5.0%	$ 268,005
	Professional Services Total:	**$ 1,232,822**

Right-of-Way

	Area (sf)	Reduce %	Area (sf)	Unit Price	Total
Right-of-Way	150,000		150,000	$ 6.00	$ 900,000
PUE's	24,000		24,000	$ 2.00	$ 48,000
				Right-of-Way Subtotal	**$ 948,000**

Total Project Cost: $ 7,540,917

Rock Creek Employment Center
Conceptual 10% Design / Estimate
Roadway Section Analysis

Job No. HAP-13
Date: March 27, 2020

Road Section: OR212 Widening (East)

Typical Road Section	
Asphalt	8
Agg. Base	14

Road Section Data Entry:

Segment	Begin STA	End STA	Length (ft)	Road		Right of Way		Public Utility Easements	
				Width (ft)	Area (sf)	Width (ft)	Area (sf)	Width (ft)	Area (sf)
WB Offramp to 172nd	varies	varies	2,500	38.0	95,000	50.0	125,000	8.0	20,000
			-		-		-		-
			-		-		-		-
			-		-		-		-
			2,500		95,000		125,000		20,000

Roadway Section Costs (Volume)

	Area (sf)	Depth (ft)	Volume (CY)	Wt (Ton)	Unit Price	Total
Asphalt (Ton)	60,000	0.67	1,481.48	3,140.74	$ 85.00	$ 266,963
Aggregate Base	67,500	1.17	2,916.67		$ 60.00	$ 175,000
Earthwork	145,000	2.83	15,216.05		$ 28.00	$ 426,049

Roadway Section Costs (Area)

	Width (ft)	Length (ft)	Area (sf)	Unit Price	Total
Concrete Median		2,500	-	$ 20.00	$ -
Planted Median	14.00	2,500	35,000	$ 21.22	$ 742,778
Sidewalk	7.00	2,500	17,500	$ 4.50	$ 78,750
Landscape Strip	7.00	2,500	17,500	$ 21.22	
Geotextile Fabric	-	-	67,500	$ 1.00	$ 67,500
W.Q. & Detention			4,650	$ 20.00	$ 93,000

Roadway Section Costs (Length)

	Length (ft)	No. of Times	Total Length	Unit Price	Total
Curb & Gutter	2,500	2	5,000	$ 23.00	$ 115,000
Median Curb (planters)	2,500	2	5,000	$ 6.00	$ 30,000
Street Trees	2,500	2	5,000	$ 25.00	$ 125,000
Street Lights	2,500	1	2,500	$ 40.00	$ 100,000
Storm System	2,500	1	2,500	$ 197.10	$ 492,750
Joint Trench + PGE	2,500	1	2,500	$ 110.00	$ 275,000

Combined Items Subtotal:	$	2,987,790
Contingency 30%	$	896,337
Construction Subtotal:	**$**	**3,884,127**
Construction Incidentals 15%	$	582,619
Total Construction Cost	**$**	**4,466,746**

Professional Services (Design & Construction)

Capital Project Mgmt. (design & construction) 10.0%	$	446,675
Design Engineering 10.0%	$	446,675
Design Survey 1.5%	$	67,001
Public Involvement 0.5%	$	22,334
Const. Engineering Support 6.0%	$	268,005
Inspection 5.0%	$	223,337
Professional Services Total:	**$**	**1,027,352**

Right-of-Way

	Area (sf)	Reduce %	Area (sf)	Unit Price	Total
Right-of-Way	125,000	67%	41,250	$ 6.00	$ 247,500
PUE's	20,000	67%	6,600	$ 2.00	$ 13,200
				Right-of-Way Subtotal	**$ 260,700**

Total Project Cost: $ 5,754,798

Rock Creek Employment Center
Conceptual 10% Design / Estimate
Roadway Section Analysis
Job No. HAP-13
Date: March 27, 2020

Road Section: 162nd Ave - OR 212 to Taralon (full width sections)

Typical Road Section	
Asphalt	8
Agg. Base	12

Road Section Data Entry:

Segment	Begin STA	End STA	Length (ft)	Road		Right of Way		Public Utility Easements	
				Width (ft)	Area (sf)	Width (ft)	Area (sf)	Width (ft)	Area (sf)
full width sections	varies	varies	3,511	48.0	168,528	69.0	242,259	16.0	56,176
			-		-		-		-
			-		-		-		-
			-		-		-		-
			3,511		168,528		242,259		56,176

Roadway Section Costs (Volume)

	Area (sf)	Depth (ft)	Volume (CY)	Wt (Ton)	Unit Price	Total
Asphalt (Ton)	126,396	0.67	3,120.89	6,616.28	$ 85.00	$ 562,384
Aggregate Base	136,929	1.00	5,071.44		$ 60.00	$ 304,287
Earthwork	298,435	2.67	29,475.06		$ 28.00	$ 825,302

Roadway Section Costs (Area)

	Width (ft)	Length (ft)	Area (sf)	Unit Price	Total
Bridge Substructure	50.00	350	17,500	$ 300.00	$ 5,250,000
Concrete Median		3,511	-	$ 20.00	$ -
Planted Median	12.00	3,511	42,132	$ 21.22	$ 894,135
Sidewalk	10.00	3,511	35,110	$ 4.50	$ 157,995
Landscape Strip	10.00	3,511	35,110	$ 21.22	
Geotextile Fabric	-	-	136,929	$ 1.00	$ 136,929
W.Q. & Detention			9,690	$ 20.00	$ 193,807

Roadway Section Costs (Length)

	Length (ft)	No. of Times	Total Length	Unit Price	Total
Curb & Gutter	3,511	2	7,022	$ 23.00	$ 161,506
Median Curb (planters)	3,511	2	7,022	$ 6.00	$ 42,132
Street Trees	3,511	3	10,533	$ 25.00	$ 263,325
Street Lights	3,511	2	7,022	$ 40.00	$ 280,880
Storm System	3,511	1	3,511	$ 201.60	$ 707,818
Joint Trench + PGE	3,511	1	3,511	$ 110.00	$ 386,210

Combined Items Subtotal:		$ 10,166,709
Contingency	30%	$ 3,050,013
Construction Subtotal:		**$ 13,216,722**
Construction Incidentals	15%	$ 1,982,508
Total Construction Cost		**$ 15,199,230**

Professional Services (Design & Construction)

Capital Project Mgmt. (design & construction)	10.0%	$ 1,519,923
Design Engineering	10.0%	$ 1,519,923
Design Survey	1.5%	$ 227,988
Public Involvement	0.5%	$ 75,996
Const. Engineering Support	6.0%	$ 911,954
Inspection	5.0%	$ 759,962
Professional Services Total:		**$ 3,495,823**

Right-of-Way

	Area (sf)	Reduce %	Area (sf)	Unit Price	Total
Right-of-Way	242,259		242,259	$ 6.00	$ 1,453,554
PUE's	56,176		56,176	$ 2.00	$ 112,352
				Right-of-Way Subtotal	**$ 1,565,906**

Total Project Cost: $ 20,260,959

Rock Creek Employment Center
Conceptual 10% Design / Estimate
Roadway Section Analysis

Job No. HAP-13
Date: March 27, 2020

Road Section: 162nd Ave Half Street

Typical Road Section	
Asphalt	8
Agg. Base	12

Road Section Data Entry:

Segment	Begin STA	End STA	Length (ft)	Road		Right of Way		Public Utility Easements	
				Width (ft)	Area (sf)	Width (ft)	Area (sf)	Width (ft)	Area (sf)
Half Street Section	2499	3621	1,122	24.0	26,928	34.5	38,709	8.0	8,976
			-		-		-		-
			-		-		-		-
			-		-		-		-
			1,122		26,928		38,709		8,976

Roadway Section Costs (Volume)

	Area (sf)	Depth (ft)	Volume (CY)	Wt (Ton)	Unit Price	Total
Asphalt (Ton)	13,464	0.67	332.44	704.78	$ 85.00	$ 59,906
Aggregate Base	16,830	1.00	623.33		$ 60.00	$ 37,400
Earthwork	47,685	2.67	4,709.63		$ 28.00	$ 131,870

Roadway Section Costs (Area)

	Width (ft)	Length (ft)	Area (sf)	Unit Price	Total
Concrete Median		1,122	-	$ 20.00	$ -
Planted Median	12.00	1,122	13,464	$ 21.22	$ 285,736
Sidewalk	5.00	1,122	5,610	$ 4.50	$ 25,245
Landscape Strip	5.00	1,122	5,610	$ 21.22	
Geotextile Fabric	-	-	16,830	$ 1.00	$ 16,830
W.Q. & Detention			1,144	$ 20.00	$ 22,889

Roadway Section Costs (Length)

	Length (ft)	No. of Times	Total Length	Unit Price	Total
Curb & Gutter	1,122	2	2,244	$ 23.00	$ 51,612
Median Curb (planters)	1,122	2	2,244	$ 6.00	$ 13,464
Street Trees	1,122	2	2,244	$ 25.00	$ 56,100
Street Lights	1,122	1	1,122	$ 40.00	$ 44,880
Storm System	1,122	1	1,122	$ 190.80	$ 214,078
Joint Trench + PGE	1,122	1	1,122	$ 110.00	$ 123,420
				Combined Items Subtotal:	$ 1,083,430
Contingency			30%		$ 325,029
				Construction Subtotal:	**$ 1,408,458**
Construction Incidentals			15%		$ 211,269
				Total Construction Cost	**$ 1,619,727**

Professional Services (Design & Construction)

Capital Project Mgmt. (design & construction)	10.0%	$ 161,973
Design Engineering	10.0%	$ 161,973
Design Survey	1.5%	$ 24,296
Public Involvement	0.5%	$ 8,099
Const. Engineering Support	6.0%	$ 97,184
Inspection	5.0%	$ 80,986
	Professional Services Total:	**$ 372,537**

Right-of-Way

	Area (sf)	Reduce %	Area (sf)	Unit Price	Total
Right-of-Way	38,709		38,709	$ 6.00	$ 232,254
PUE's	8,976		8,976	$ 2.00	$ 17,952
				Right-of-Way Subtotal	**$ 250,206**

Total Project Cost: $ 2,242,470

Rock Creek Employment Center
Conceptual 10% Design / Estimate
Roadway Section Analysis

Job No. HAP-13
Date: March 27, 2020

Road Section: Rock Creek Blvd. - 162nd to 172nd

Typical Road Section	
Asphalt	8
Agg. Base	14

Road Section Data Entry:

Segment	Begin STA	End STA	Length (ft)	Road		Right of Way		Public Utility Easements	
				Width (ft)	Area (sf)	Width (ft)	Area (sf)	Width (ft)	Area (sf)
162nd - 172nd	4709	7613	2,904	24.0	69,696	34.5	100,188	8.0	23,232
			-		-		-		-
			-		-		-		-
			-		-		-		-
			2,904		69,696		100,188		23,232

Roadway Section Costs (Volume)

	Area (sf)	Depth (ft)	Volume (CY)	Wt (Ton)	Unit Price	Total
Asphalt (Ton)	34,848	0.67	860.44	1,824.14	$ 85.00	$ 155,052
Aggregate Base	43,560	1.17	1,882.22		$ 60.00	$ 112,933
Earthwork	123,420	2.83	12,951.48		$ 28.00	$ 362,641

Roadway Section Costs (Area)

	Width (ft)	Length (ft)	Area (sf)	Unit Price	Total
Concrete Median		2,904	-	$ 20.00	$ -
Planted Median	12.00	2,904	34,848	$ 21.22	$ 739,552
Sidewalk	5.00	2,904	14,520	$ 4.50	$ 65,340
Landscape Strip	5.00	2,904	14,520	$ 21.22	
Geotextile Fabric	-	-	43,560	$ 1.00	$ 43,560
W.Q. & Detention			2,962	$ 20.00	$ 59,242

Roadway Section Costs (Length)

	Length (ft)	No. of Times	Total Length	Unit Price	Total
Curb & Gutter	2,904	2	5,808	$ 23.00	$ 133,584
Median Curb (planters)	2,904	2	5,808	$ 6.00	$ 34,848
Street Trees	2,904	2	5,808	$ 25.00	$ 145,200
Street Lights	2,904	1	2,904	$ 40.00	$ 116,160
Storm System	2,904	1	2,904	$ 190.80	$ 554,083
Joint Trench + PGE	2,904	1	2,904	$ 110.00	$ 319,440
				Combined Items Subtotal:	$ 2,841,636
Contingency			30%		$ 852,491
				Construction Subtotal:	**$ 3,694,126**
Construction Incidentals			15%		$ 554,119
				Total Construction Cost	**$ 4,248,245**

Professional Services (Design & Construction)

Capital Project Mgmt. (design & construction)	10.0%	$ 424,825
Design Engineering	10.0%	$ 424,825
Design Survey	1.5%	$ 63,724
Public Involvement	0.5%	$ 21,241
Const. Engineering Support	6.0%	$ 254,895
Inspection	5.0%	$ 212,412
	Professional Services Total:	**$ 977,096**

Right-of-Way

	Area (sf)	Reduce %	Area (sf)	Unit Price	Total
Right-of-Way	100,188		100,188	$ 6.00	$ 601,128
PUE's	23,232		23,232	$ 2.00	$ 46,464
				Right-of-Way Subtotal	**$ 647,592**

Total Project Cost: $ 5,872,934

Rock Creek Employment Center
Conceptual 10% Design / Estimate
Roadway Section Analysis

Job No. HAP-13
Date: March 27, 2020

Road Section: ParkLane - 162nd to Collector 3

Typical Road Section	
Asphalt	8
Agg. Base	12

Road Section Data Entry:

Segment	Begin STA	End STA	Length (ft)	Road		Right of Way		Public Utility Easements	
				Width (ft)	Area (sf)	Width (ft)	Area (sf)	Width (ft)	Area (sf)
	varies	varies	3,358	48.0	161,184	69.0	231,702	16.0	53,728
			-		-		-		-
			-		-		-		-
			-		-		-		-
			3,358		161,184		231,702		53,728

Roadway Section Costs (Volume)

	Area (sf)	Depth (ft)	Volume (CY)	Wt (Ton)	Unit Price	Total
Asphalt (Ton)	120,888	0.67	2,984.89	6,327.96	$ 85.00	$ 537,877
Aggregate Base	130,962	1.00	4,850.44		$ 60.00	$ 291,027
Earthwork	285,430	2.67	28,190.62		$ 28.00	$ 789,337

Roadway Section Costs (Area)

	Width (ft)	Length (ft)	Area (sf)	Unit Price	Total
Concrete Median		3,358	-	$ 20.00	$ -
Planted Median	12.00	3,358	40,296	$ 21.22	$ 855,171
Sidewalk	10.00	3,358	33,580	$ 4.50	$ 151,110
Landscape Strip	10.00	3,358	33,580	$ 21.22	
Geotextile Fabric	-	-	130,962	$ 1.00	$ 130,962
W.Q. & Detention			9,268	$ 20.00	$ 185,362

Roadway Section Costs (Length)

	Length (ft)	No. of Times	Total Length	Unit Price	Total
Curb & Gutter	3,358	2	6,716	$ 23.00	$ 154,468
Median Curb (planters)	3,358	2	6,716	$ 6.00	$ 40,296
Street Trees	3,358	3	10,074	$ 25.00	$ 251,850
Street Lights	3,358	2	6,716	$ 40.00	$ 268,640
Storm System	3,358	1	3,358	$ 201.60	$ 676,973
Joint Trench + PGE	3,358	1	3,358	$ 110.00	$ 369,380
				Combined Items Subtotal:	$ 4,702,452
Contingency			30%		$ 1,410,736
				Construction Subtotal:	**$ 6,113,188**
Construction Incidentals			15%		$ 916,978
				Total Construction Cost	**$ 7,030,166**

Professional Services (Design & Construction)

Capital Project Mgmt. (design & construction)	10.0%	$ 703,017
Design Engineering	10.0%	$ 703,017
Design Survey	1.5%	$ 105,452
Public Involvement	0.5%	$ 35,151
Const. Engineering Support	6.0%	$ 421,810
Inspection	5.0%	$ 351,508
	Professional Services Total:	**$ 1,616,938**

Right-of-Way

	Area (sf)	Reduce %	Area (sf)	Unit Price	Total
Right-of-Way	231,702		231,702	$ 6.00	$ 1,390,212
PUE's	53,728		53,728	$ 2.00	$ 107,456
				Right-of-Way Subtotal	**$ 1,497,668**

Total Project Cost: $ 10,144,772

Rock Creek Employment Center
Conceptual 10% Design / Estimate
Roadway Section Analysis

Job No. HAP-13
Date: March 27, 2020

Road Section: Collector 1 - 172nd to Collector 3

Typical Road Section	
Asphalt	8
Agg. Base	12

Road Section Data Entry:

Segment	Begin STA	End STA	Length (ft)	Road		Right of Way		Public Utility Easements	
				Width (ft)	Area (sf)	Width (ft)	Area (sf)	Width (ft)	Area (sf)
	1000	4116	3,116	48.0	149,568	69.0	215,004	16.0	49,856
			-		-		-		-
			-		-		-		-
			-		-		-		-
			3,116		149,568		215,004		49,856

Roadway Section Costs (Volume)

	Area (sf)	Depth (ft)	Volume (CY)	Wt (Ton)	Unit Price	Total
Asphalt (Ton)	112,176	0.67	2,769.78	5,871.93	$ 85.00	$ 499,114
Aggregate Base	121,524	1.00	4,500.89		$ 60.00	$ 270,053
Earthwork	264,860	2.67	26,159.01		$ 28.00	$ 732,452

Roadway Section Costs (Area)

	Width (ft)	Length (ft)	Area (sf)	Unit Price	Total
Concrete Median		3,116	-	$ 20.00	$ -
Planted Median	12.00	3,116	37,392	$ 21.22	$ 793,541
Sidewalk	10.00	3,116	31,160	$ 4.50	$ 140,220
Landscape Strip	10.00	3,116	31,160	$ 21.22	
Geotextile Fabric	-	-	121,524	$ 1.00	$ 121,524
W.Q. & Detention			8,600	$ 20.00	$ 172,003

Roadway Section Costs (Length)

	Length (ft)	No. of Times	Total Length	Unit Price	Total
Curb & Gutter	3,116	2	6,232	$ 23.00	$ 143,336
Median Curb (planters)	3,116	2	6,232	$ 6.00	$ 37,392
Street Trees	3,116	3	9,348	$ 25.00	$ 233,700
Street Lights	3,116	2	6,232	$ 40.00	$ 249,280
Storm System	3,116	1	3,116	$ 201.60	$ 628,186
Joint Trench + PGE	3,116	1	3,116	$ 110.00	$ 342,760

Combined Items Subtotal:	$	4,363,562
Contingency 30%	$	1,309,069
Construction Subtotal:	**$**	**5,672,630**
Construction Incidentals 15%	$	850,895
Total Construction Cost	**$**	**6,523,525**

Professional Services (Design & Construction)

Capital Project Mgmt. (design & construction) 10.0%	$	652,352
Design Engineering 10.0%	$	652,352
Design Survey 1.5%	$	97,853
Public Involvement 0.5%	$	32,618
Const. Engineering Support 6.0%	$	391,411
Inspection 5.0%	$	326,176
Professional Services Total:	**$**	**1,500,411**

Right-of-Way

	Area (sf)	Reduce %	Area (sf)	Unit Price	Total
Right-of-Way	215,004		215,004	$ 6.00	$ 1,290,024
PUE's	49,856		49,856	$ 2.00	$ 99,712
				Right-of-Way Subtotal	**$ 1,389,736**

Total Project Cost: $ 9,413,672

Rock Creek Employment Center
Conceptual 10% Design / Estimate
Roadway Section Analysis

Job No. HAP-13
Date: March 27, 2020

Road Section: Collector 2 - 172nd to Collector 1

Typical Road Section	
Asphalt	8
Agg. Base	12

Road Section Data Entry:

Segment	Begin STA	End STA	Length (ft)	Road		Right of Way		Public Utility Easements	
				Width (ft)	Area (sf)	Width (ft)	Area (sf)	Width (ft)	Area (sf)
	1164	2259	1,095	48.0	52,560	69.0	75,555	16.0	17,520
			-		-		-		-
			-		-		-		-
			-		-		-		-
			1,095		52,560		75,555		17,520

Roadway Section Costs (Volume)

	Area (sf)	Depth (ft)	Volume (CY)	Wt (Ton)	Unit Price	Total
Asphalt (Ton)	39,420	0.67	973.33	2,063.47	$ 85.00	$ 175,395
Aggregate Base	42,705	1.00	1,581.67		$ 60.00	$ 94,900
Earthwork	93,075	2.67	9,192.59		$ 28.00	$ 257,393

Roadway Section Costs (Area)

	Width (ft)	Length (ft)	Area (sf)	Unit Price	Total
Concrete Median		1,095	-	$ 20.00	$ -
Planted Median	12.00	1,095	13,140	$ 21.22	$ 278,860
Sidewalk	10.00	1,095	10,950	$ 4.50	$ 49,275
Landscape Strip	10.00	1,095	10,950	$ 21.22	
Geotextile Fabric	-	-	42,705	$ 1.00	$ 42,705
W.Q. & Detention			3,022	$ 20.00	$ 60,444

Roadway Section Costs (Length)

	Length (ft)	No. of Times	Total Length	Unit Price	Total
Curb & Gutter	1,095	2	2,190	$ 23.00	$ 50,370
Median Curb (planters)	1,095	2	2,190	$ 6.00	$ 13,140
Street Trees	1,095	3	3,285	$ 25.00	$ 82,125
Street Lights	1,095	2	2,190	$ 40.00	$ 87,600
Storm System	1,095	1	1,095	$ 201.60	$ 220,752
Joint Trench + PGE	1,095	1	1,095	$ 110.00	$ 120,450
				Combined Items Subtotal:	$ 1,533,408
Contingency			30%		$ 460,022
				Construction Subtotal:	**$ 1,993,431**
Construction Incidentals			15%		$ 299,015
				Total Construction Cost	**$ 2,292,445**

Professional Services (Design & Construction)

Capital Project Mgmt. (design & construction)	10.0%	$ 229,245
Design Engineering	10.0%	$ 229,245
Design Survey	1.5%	$ 34,387
Public Involvement	0.5%	$ 11,462
Const. Engineering Support	6.0%	$ 137,547
Inspection	5.0%	$ 114,622
	Professional Services Total:	**$ 527,262**

Right-of-Way

	Area (sf)	Reduce %	Area (sf)	Unit Price	Total
Right-of-Way	75,555		75,555	$ 6.00	$ 453,330
PUE's	17,520		17,520	$ 2.00	$ 35,040
				Right-of-Way Subtotal	**$ 488,370**

Total Project Cost: $ 3,308,078

Rock Creek Employment Center
Conceptual 10% Design / Estimate
Roadway Section Analysis

Job No. HAP-13
Date: March 27, 2020

Road Section: Collector 3 - 162nd to 172nd

Typical Road Section	
Asphalt	8
Agg. Base	12

Road Section Data Entry:

Segment	Begin STA	End STA	Length (ft)	Road		Right of Way		Public Utility Easements	
				Width (ft)	Area (sf)	Width (ft)	Area (sf)	Width (ft)	Area (sf)
	1000	3876	2,876	48.0	138,048	69.0	198,444	16.0	46,016
			-		-		-		-
			-		-		-		-
			-		-		-		-
			2,876		138,048		198,444		46,016

Roadway Section Costs (Volume)

	Area (sf)	Depth (ft)	Volume (CY)	Wt (Ton)	Unit Price	Total
Asphalt (Ton)	103,536	0.67	2,556.44	5,419.66	$ 85.00	$ 460,671
Aggregate Base	112,164	1.00	4,154.22		$ 60.00	$ 249,253
Earthwork	244,460	2.67	24,144.20		$ 28.00	$ 676,038

Roadway Section Costs (Area)

	Width (ft)	Length (ft)	Area (sf)	Unit Price	Total
Concrete Median		2,876	-	$ 20.00	$ -
Planted Median	12.00	2,876	34,512	$ 21.22	$ 732,421
Sidewalk	10.00	2,876	28,760	$ 4.50	$ 129,420
Landscape Strip	10.00	2,876	28,760	$ 21.22	
Geotextile Fabric	-	-	112,164	$ 1.00	$ 112,164
W.Q. & Detention			7,938	$ 20.00	$ 158,755

Roadway Section Costs (Length)

	Length (ft)	No. of Times	Total Length	Unit Price	Total
Curb & Gutter	2,876	2	5,752	$ 23.00	$ 132,296
Median Curb (planters)	2,876	2	5,752	$ 6.00	$ 34,512
Street Trees	2,876	3	8,628	$ 25.00	$ 215,700
Street Lights	2,876	2	5,752	$ 40.00	$ 230,080
Storm System	2,876	1	2,876	$ 201.60	$ 579,802
Joint Trench + PGE	2,876	1	2,876	$ 110.00	$ 316,360
				Combined Items Subtotal:	$ 4,027,472
Contingency			30%		$ 1,208,242
				Construction Subtotal:	**$ 5,235,714**
Construction Incidentals			15%		$ 785,357
				Total Construction Cost	**$ 6,021,071**

Professional Services (Design & Construction)

Capital Project Mgmt. (design & construction)	10.0%	$ 602,107
Design Engineering	10.0%	$ 602,107
Design Survey	1.5%	$ 90,316
Public Involvement	0.5%	$ 30,105
Const. Engineering Support	6.0%	$ 361,264
Inspection	5.0%	$ 301,054
	Professional Services Total:	**$ 1,384,846**

Right-of-Way

	Area (sf)	Reduce %	Area (sf)	Unit Price	Total
Right-of-Way	198,444		198,444	$ 6.00	$ 1,190,664
PUE's	46,016		46,016	$ 2.00	$ 92,032
				Right-of-Way Subtotal	**$ 1,282,696**

Total Project Cost: $ 8,688,613

Sanitary System

Unit Prices:		
	8" PVC	$ 150.00
	48" MH	$ 8,000.00

	8" PVC	48" MH		Subtotal	Total Cost
Sunrise Alignment	1,818	5		$ 312,700	$ 312,700
162nd	984	3		$ 171,600	$ 171,600
Parklane (South)	311	2		$ 62,650	$ 62,650
Parklane (North)	1,238	6		$ 233,700	$ 233,700
Collector 1	614	2		$ 108,100	$ 108,100
Collector 3 (West)	2,377	5		$ 396,550	$ 396,550
Collector 3 (East)	400	2		$ 76,000	$ 76,000
Armstrong Circle	1,549	4		$ 264,350	$ 264,350
Easterly Conn. to RC2	500	1		$ 83,000	$ 83,000
NE Conn. to 172nd	1,205	3		$ 204,750	$ 204,750
		33			

Total Sanitary System **$1,913,400**

Domestic Water System

Unit Prices:

6"-12" Ductile Iron Pipe	$ 110.00
Hydrants (incl. laterals)	$ 10,000.00

Assume 1 per 500' (roundup)

				40%	
	8" DI	Hydrants	Subtotal	Fittings	Total Cost
Parklane (South)	884	2	$ 117,240	$ 46,896	$ 164,136
Parklane (North)	2,455	5	$ 320,050	$ 128,020	$ 448,070
Collector 1	3,094	7	$ 410,340	$ 164,136	$ 574,476
Collector 2	1,098	3	$ 150,780	$ 60,312	$ 211,092
Collector 3	2,939	6	$ 383,290	$ 153,316	$ 536,606
Armstrong Circle	1,719	4	$ 229,090	$ 91,636	$ 320,726

	Length		
7000 GPM Pump Station	N/A	$ 3,000,000	Costs/Quantities provided by SWA
24" DI Hwy 212, 152nd to 162nd	4,800	$ 1,700,000	Costs/Quantities provided by SWA
18" DI 162nd, 212 to Rock Creek	1,500	$ 450,000	Costs/Quantities provided by SWA
18" DI 162nd, Falls View to Taralon	2,500	$ 750,000	Costs/Quantities provided by SWA

Total Domestic Water System **$6,955,106**

Purple Pipe Water System

Unit Prices:		
	12" PVC	$ 100.00

				20%	
	PP PVC			Subtotal	Fittings	Total Cost
162nd (South)	1,931			$ 193,100	$ 38,620	$ 231,720
162nd (North)	2,951			$ 295,100	$ 59,020	$ 354,120
Parklane (South)				$ -	$ -	$ -
Parklane (North)				$ -	$ -	$ -
Collector 1				$ -	$ -	$ -
Collector 3				$ -	$ -	$ -
Armstrong Circle				$ -	$ -	$ -

Total Purple Pipe Water System **$585,840**

Attachment B
Transportation Study
DKS Associates

720 SW Washington St
Suite 500
Portland, OR 97205
dksassociates.com

FINAL MEMORANDUM

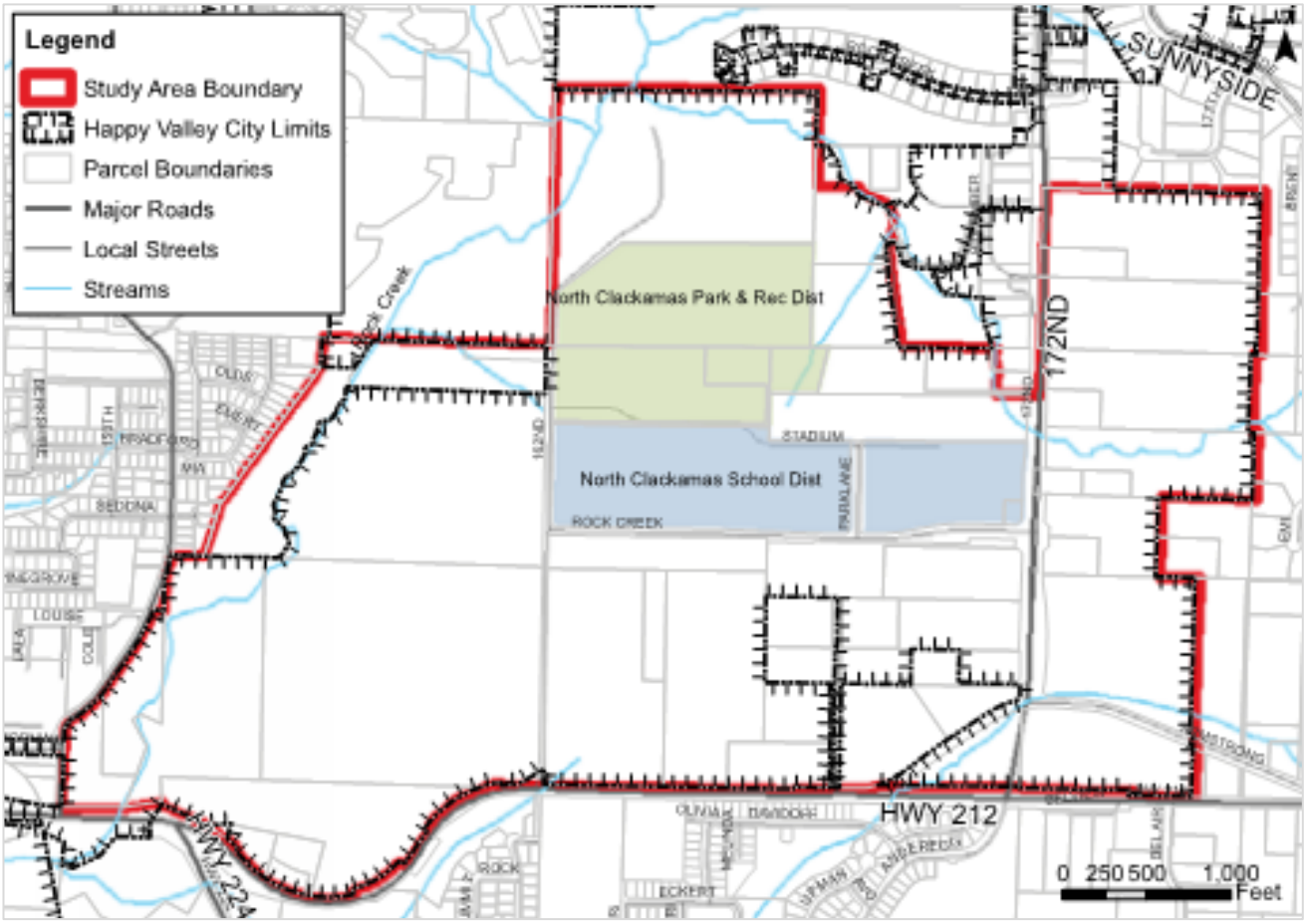
DATE: June 24, 2020

TO: Michael Walter, City of Happy Valley
Dan Houf, HHPR

FROM: Reah Flisakowski, Rochelle Starrett | DKS

SUBJECT: Rock Creek Employment Plan Traffic Study P# 19126-000

This memorandum summarizes the future transportation operating conditions and system needs for the Rock Creek Employment Center planning area in Happy Valley, Oregon. The project study area is generally bounded by OR 212 to the south, 177th Avenue to the east, Rock Creek to the west and Hood View Park to the north. The study area boundary is shown in red in the figure below. Currently, the area serves two public schools, a regional park, rural residential uses and agriculture uses. There is a significant amount of vacant land that is planned primarily for employment development.



FUTURE TRAFFIC VOLUMES

Future year 2040 operating conditions were conducted for the study intersections listed below. These locations were selected to capture potential infrastructure needs in the study area.

- OR 212/OR 224
- OR 212/162nd Avenue
- OR 212/172nd Avenue
- 162nd Avenue/Rock Creek Boulevard
- 172nd Avenue/Rock Creek Boulevard

Traffic volume forecasts were developed for the year 2040 using Metro travel demand models that were updated and refined for the Clackamas County Sunrise Parkway project. The modeled scenarios are described below.

2040 Baseline Scenario - included the following Metro RTP (2018 Regional Transportation Plan) and Happy Valley TSP projects:

- Widen/construct 162nd Avenue to three lanes, between OR 212 and Clatsop Street (RTP 10037, 10040, 10041 and TSP W9, R3, R4)
- Widen Rock Creek Boulevard to five lanes, between 162nd Avenue and 172nd Avenue (TSP W11)
- Widen 172nd Avenue to five lanes, between Sunnyside Road and 172nd-190th Connection (TSP W2)
- Widen 172nd Avenue to three lanes, between 172nd-190th Connection and Cheldelin Road (TSP W3)
- Construct 172nd-190th Connection as five lane facility, between 172nd Avenue and 190th Avenue (RTP 12071 and TSP R7)
- Widen Foster Road to three lanes, County line to 172nd-190th Connection Road (RTP 10035, not financially constrained)

2040 Sunrise Parkway Scenario – added the extension of the existing Sunrise corridor as a two-lane expressway between 122nd Avenue and 172nd Avenue.

Additional local level connectivity refinements were made to both 2040 models for the Rock Creek Employment Center planning area to support the development of future study intersection volumes. The 2040 Sunrise Parkway scenario model was modified to remove the proposed interchange at 172nd Avenue and return the existing at-grade OR 212/172nd Avenue intersection. Model volumes were post-processed to estimate future traffic volumes at the study intersections consistent with NCHRP 765 methodology. Future volume forecasts for both scenarios are provided in the appendix.

MOBILITY TARGETS

Intersection mobility targets are used to asses if roadway facilities are adequate to handle the expected traffic volumes. The following mobility targets apply within the Rock Creek Employment Center planning area:

- **ODOT State Highways (OR 212)**
  - Intersections located on OR 212 must operate at or below a volume to capacity (v/c) ratio of 0.99 during the first and second hours of peak travel times.[1] ODOT does not apply a standard to the intersection level of service (LOS).
- **City of Happy Valley Facilities**
  - Signalized intersections must operate at LOS D or better and a v/c ratio less than or equal to 0.90 during the peak hour. Individual movements must operate at LOS E or better and a v/c ratio less than or equal to 1.00 during the peak hour.
  - Roundabout intersections must operate at LOS D or better during the peak hour. Each approach must operate at LOS E or better and a v/c ratio less than or equal to 0.85.
  - All unsignalized two-way stop control intersections must operate at LOS E or better for all side street approaches during the peak hour.
  - All unsignalized all-way stop controlled intersections must operate at LOS D or better during the peak hour.

[1] Oregon Highway Plan, Table 7: Volume to Capacity Ratio Targets within Portland Metropolitan Region, Corridors.

FUTURE BASELINE SCENARIO OPERATIONS

The 2040 Baseline scenario volumes were used to evaluate study intersection operations for the PM peak hour and evaluate necessary capacity improvements prior to construction of the Sunrise Parkway project. The analysis was based on the Highway Capacity Manual[2] (HCM) 2000 methodology for signalized and HCM 6th Edition methodology for unsignalized intersections. The 2040 Baseline intersection operations are summarized below in Table 1. Detailed intersection operations are provided in the appendix. While Rock Creek Boulevard was modelled as a five-lane facility (consistent with the Happy Valley TSP), estimated future traffic volumes indicate a three-lane facility would be more appropriately sized for future demand.

Table 1: 2040 Baseline Intersection Performance (PM Peak Hour)

Signalized Intersection	Delay	Level of Service	V/C
OR 212/OR 224	71.0	E	1.23
172nd Avenue/OR 212	35.5	D	0.90
172nd Avenue/Rock Creek Boulevard	8.3	A	0.37
Unsignalized Intersection	**Delay**	**Level of Service**	**V/C**
162nd Avenue/OR 212	12.0/ >1000	B/F	0.05/ >2.00
162nd Avenue/Rock Creek Boulevard	7.4/9.5	A/A	0.01/0.04
Signalized Intersection: Delay = Average Intersection Delay (sec.) LOS = Level of Service V/C = Volume-to-Capacity Ratio Shaded values do not meet standards	Unsignalized Intersection: Delay = Critical Approach Delay (sec.) LOS = Major Street/Minor Street V/C = Critical Volume-to-Capacity Ratio Shaded values do not meet standards		

The intersections of OR 212/OR 224 and 162nd Avenue/OR 212 are expected to exceed their ODOT mobility targets. The 172nd Avenue/OR 212 intersection is expected to approach, but not exceed, its mobility target for the City of Happy Valley.

[2] 2000 Highway Capacity Manual, Transportation Research Board, Washington DC, 2000. 2010 Highway Capacity Manual, Transportation Research Board, Washington DC, 2010.

The following improvements were evaluated to meet mobility standards and improve future intersection operations for the 2040 Baseline scenario:

- Add a traffic signal or multi-lane roundabout at 162nd Avenue/OR 212 and realign 162nd Avenue and/or OR 212 to meet sight distance requirements.
- Add a second eastbound right turn lane at OR 212/OR 224 and widen intersection to include a second southbound receiving lane for approximately 1,000-feet. This would require additional right-of-way from adjacent property owners which may be challenging due to adjacent topography and environmental constraints.
- Add a second eastbound left turn lane at 172nd Avenue/OR 212. Note: Happy Valley TSP Project I8 would install a second southbound right turn lane and a second westbound through lane, but this capacity improvement was not needed to meet standards.

Traffic operations for the 2040 Baseline scenario with these recommended improvements are summarized in Table 2. Detailed traffic operations are provided in the appendix. The mobility standards for ODOT and the City of Happy Valley are met at all study intersections.

Table 2: 2040 Baseline Intersection Performance with Recommended Improvements (PM Peak Hour)

Signalized Intersection	Delay	Level of Service	V/C
OR 212/OR 224	28.6	C	0.89
162nd Avenue/OR 212	21.1	C	0.64
172nd Avenue/OR 212	26.7	C	0.78
172nd Avenue/Rock Creek Boulevard	7.6	A	0.35
Unsignalized Intersection	**Delay**	**Level of Service**	**V/C**
162nd Avenue/Rock Creek Boulevard	7.4/9.5	A/A	0.01/0.04
Signalized Intersection: Delay = Average Intersection Delay (sec.) LOS = Level of Service V/C = Volume-to-Capacity Ratio Shaded values do not meet standards	Unsignalized Intersection: Delay = Critical Approach Delay (sec.) LOS = Major Street/Minor Street V/C = Critical Volume-to-Capacity Ratio Shaded values do not meet standards		

The OR 212/OR 224 intersection was evaluated with multi-lane roundabout control. Intersection operations during the future PM peak hour for various signal and multi-lane roundabout configurations are summarized in Table 3. A standard two-lane roundabout would significantly exceed ODOT's mobility target by 2040. However, adding dual eastbound right-turn slip lanes and modifying the approach geometry to allow for dual northbound left-turn lanes would improve the intersection operations. Even with an expanded intersection footprint, ODOT's mobility standard would be exceeded by 2040.

Table 3: 2040 Baseline Intersection Performance at OR 212/OR 224 (PM Peak Hour)

Scenario	Delay	Level of Service	V/C
Signal with Existing Geometry	71.0	E	1.23
Signal with Recommended Improvements*	28.6	C	0.89
Two-Lane Roundabout	142.3	F	1.45
Two-Lane Roundabout with Recommended Improvements**	33.9	D	1.08

*Add second eastbound right-turn lane and second southbound receiving lane for approximately 1,000-ft
**Add dual eastbound right-turn slip lanes and dual northbound left-turn lanes

Additional analysis of the OR 212/OR 224 intersection with multi-lane roundabout control was conducted to test 2040 AM peak hour volumes as shown in Table 4. Detailed intersection operations are provided in the appendix. The intersection serves high westbound and northbound volumes due to typical morning commute routes (rural to urban areas for employment). Roundabout operations, both with and without capacity improvements, significantly exceeds ODOT's mobility target by 2040 during the AM peak hour. High northbound left-turn demand and high westbound through demand directly conflict in the roundabout which would result in congestion and high vehicle delays. Conversely, the PM peak hour would have a high eastbound through and right turn demand as residents return from the urban to rural areas, which can be accommodated through the addition of eastbound right turn slip lanes.

Table 4: 2040 Baseline Intersection Performance at OR-212/OR-224 (AM Peak Hour)

Scenario	Delay	Level of Service	V/C
Two-Lane Roundabout	139.0	F	1.64
Two-Lane Roundabout with Capacity Improvements*	168.7	F	1.82

*Add dual eastbound right-turn slip lanes and dual northbound left-turn lanes

FUTURE SUNRISE PARKWAY SCENARIO OPERATIONS

This scenario evaluated 2040 study intersection operations during the PM peak hour with construction of the Sunrise Parkway project to assess any changes from planned regional capacity improvements. The intersection operations are summarized in Table 5. Detailed intersection operations are provided in the appendix. Due to the reconfiguration of the OR 212/OR 224 intersection as part of the Sunrise Parkway project, the signal phasing at this location was modified to better represent future signal operations. Similar to the 2040 Baseline scenario, Rock Creek Boulevard was modelled as a five-lane facility, however estimated future traffic volumes indicate a three-lane facility would be more appropriately sized.

Table 5: 2040 Sunrise Parkway Intersection Performance (PM Peak Hour)

Signalized Intersection	Delay	Level of Service	V/C
OR 212/OR 224	62.1	E	1.10
172nd Avenue/OR 212	39.8	D	0.93
172nd Avenue/Rock Creek Boulevard	10.2	B	0.40
Unsignalized Intersection	**Delay**	**Level of Service**	**V/C**
162nd Avenue/OR 212	7.3/8.5	A/A	0.03/0.04
162nd Avenue/Rock Creek Boulevard	7.5/9.9	A/A	0.03/0.04
Signalized Intersection: Delay = Average Intersection Delay (sec.) LOS = Level of Service V/C = Volume-to-Capacity Ratio Shaded values do not meet standards	Unsignalized Intersection: Delay = Critical Approach Delay (sec.) LOS = Major Street/Minor Street V/C = Critical Volume-to-Capacity Ratio Shaded values do not meet standards		

Only the OR 212/OR 224 intersection would exceed the ODOT mobility target in 2040. The 172nd Avenue/OR 212 intersection would marginally exceed its mobility target for the City of Happy Valley in 2040. The Sunrise Parkway project would largely alleviate future traffic demand and congestion on OR 212. However, there would still be a high PM peak hour demand for eastbound right turns (over 1,500 vehicles per hour) and northbound left turns.

Since through traffic demand on OR 212 would be significantly reduced with construction of the Sunrise Parkway project, fewer through traffic lanes on OR 212 would be needed. There would be opportunity to repurpose some through lanes to a dual right turn lane with minimal right-of-way impacts.

The following mitigations were identified, in addition to the Sunrise Parkway project, to meet mobility standards for ODOT and the City of Happy Valley and improve overall operations:

- Add a second eastbound left turn lane at 172nd Avenue/OR 212.
- Reconfigure OR 212/OR 224 intersection lanes - convert an eastbound through lane to a second eastbound right turn lane, convert an existing northbound left turn lane to a second southbound receiving lane and widen to include a second southbound receiving lane for 1,000-feet.

Traffic operations for the 2040 Sunrise Parkway scenario with recommended improvements are summarized in Table 6, and detailed traffic operations are provided in the appendix. The mobility standards for ODOT and the City of Happy Valley are met at all study intersections.

Table 6: 2040 Sunrise Parkway Intersection Performance with Recommended Improvements (PM Peak Hour)

Signalized Intersection	Delay	Level of Service	V/C
OR 212/OR 224	6.5	A	0.57
172nd Avenue/OR 212	30.8	C	0.83
172nd Avenue/Rock Creek Boulevard	10.2	B	0.40
Unsignalized Intersection	**Delay**	**Level of Service**	**V/C**
162nd Avenue/OR 212	7.3/8.5	A/A	0.03/0.04
162nd Avenue/Rock Creek Boulevard	7.5/9.9	A/A	0.03/0.04
Signalized Intersection: Delay = Average Intersection Delay (sec.) LOS = Level of Service V/C = Volume-to-Capacity Ratio Shaded values do not meet standards	Unsignalized Intersection: Delay = Critical Approach Delay (sec.) LOS = Major Street/Minor Street V/C = Critical Volume-to-Capacity Ratio Shaded values do not meet standards		

As traffic volumes increase along the OR 212 and OR 224 corridors, traffic operations will continue to degrade without further improvements. While the Sunrise Parkway project is expected to significantly alleviate traffic demand and congestion on OR 212, the funding and timing for construction of the project is unknown.

PREFERRED IMPROVEMENT PLAN

With consideration of the 2040 operating conditions prior to construction of the Sunrise Parkway project, a preferred short-term roadway plan was developed for the Rock Creek area. The objective is to provide improvements to support local development in the short-term while limiting potential impacts to the planned Sunrise Parkway project alignment. The preferred Rock Creek Employment Plan includes the transportation improvements identified through this analysis and regional planned trails.

Street Network

- Realign OR 212 to the north to create a new intersection at 162nd Avenue
- Widen 162nd Avenue to 3-lanes between OR 212 and north terminus
- Extend 162nd Avenue as a 3-lane facility between north terminus and Taralon development, includes bridge of Rock Creek
- Widen Rock Creek Boulevard to 3-lanes between 162nd and 172nd Avenue
- Construct new 3-lane east-west facility, south of Rock Creek Boulevard between 162nd and 172nd Avenue
- Construct Parklane Drive as a 3-lane facility between Rock Creek Blvd and new 3-lane east-west facility to the south
- Construct Parklane Drive as a 3-lane facility between Stadium Way and 162nd Avenue
- Construct Rock Creek Boulevard as a 3-lane facility between 172nd and 177th Avenue
- Construct 177th Avenue as a 3-lane facility between Rock Creek Boulevard and north study area boundary
- Construct Big Timber Court as a 3-lane facility between 172nd Avenue and east study area boundary

Intersections

- Add a second eastbound left turn lane at Rock Creek Boulevard/172nd Avenue
- Add a second eastbound left turn lane at OR 212/172nd Avenue
- At OR 212/OR 224, add a second eastbound right turn lane and widen OR 224 to include a second southbound receiving lane for 1,000-feet
- Add a traffic signal (or roundabout) at Rock Creek Boulevard/162nd Avenue
- Add a traffic signal (or roundabout) at Rock Creek Boulevard/Parklane Drive
- Add a multi-lane roundabout at OR 212 (realignment)/162nd Avenue
- Add a roundabout at 162nd Avenue/Parklane Drive

Trails

- Build segment of East Mount Scott-Scouters Mountain Loop Trail - along Rock Creek between 162nd Avenue and OR 212
- Build Sunrise Corridor Trail – along new Sunrise Parkway Phase 2 corridor

APPENDIX



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1335	1355	370	880	605	180
Future Volume (vph)	1335	1355	370	880	605	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1568	1805	3406	3335	1599
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1568	1805	3406	3335	1599
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	1391	1411	385	917	630	188
RTOR Reduction (vph)	0	14	0	0	0	66
Lane Group Flow (vph)	1391	1397	385	917	630	122
Heavy Vehicles (%)	2%	3%	0%	6%	5%	1%
Turn Type	NA	custom	Prot	NA	Prot	Perm
Protected Phases	2	2 8	1	6	8	
Permitted Phases		2				8
Actuated Green, G (s)	68.0	91.0	21.0	93.0	19.0	19.0
Effective Green, g (s)	68.0	91.0	21.0	93.0	19.0	19.0
Actuated g/C Ratio	0.57	0.76	0.18	0.78	0.16	0.16
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2005	1189	315	2639	528	253
v/s Ratio Prot	0.39	c0.89	c0.21	0.27	0.19	
v/s Ratio Perm						0.08
v/c Ratio	0.69	1.18	1.22	0.35	1.19	0.48
Uniform Delay, d1	18.6	14.5	49.5	4.2	50.5	46.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.1	87.9	125.1	0.1	104.5	1.5
Delay (s)	19.6	102.4	174.6	4.2	155.0	47.5
Level of Service	B	F	F	A	F	D
Approach Delay (s)	61.3			54.6	130.3	
Approach LOS	E			D	F	

Intersection Summary			
HCM 2000 Control Delay	71.0	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	111.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	24.7

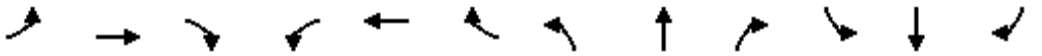
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕		↰	↱	
Traffic Vol, veh/h	25	1490	0	0	1200	25	0	0	20	25	0	60
Future Vol, veh/h	25	1490	0	0	1200	25	0	0	20	25	0	60
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	26	1568	0	0	1263	26	0	0	21	26	0	63

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1289	0	0	1568	0	0	2928	2909	1568	2907	2896	1276
Stage 1	-	-	-	-	-	-	1620	1620	-	1276	1276	-
Stage 2	-	-	-	-	-	-	1308	1289	-	1631	1620	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	538	-	-	421	-	-	9	16	137	~ 10	16	204
Stage 1	-	-	-	-	-	-	130	162	-	205	238	-
Stage 2	-	-	-	-	-	-	196	234	-	128	162	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	538	-	-	421	-	-	4	10	137	~ 6	10	204
Mov Cap-2 Maneuver	-	-	-	-	-	-	4	10	-	~ 6	10	-
Stage 1	-	-	-	-	-	-	81	101	-	128	238	-
Stage 2	-	-	-	-	-	-	135	234	-	68	101	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	36	$ 814.2
HCM LOS			E	F

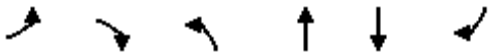
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	137	538	-	-	421	-	-	6	204
HCM Lane V/C Ratio	0.154	0.049	-	-	-	-	-	4.386	0.31
HCM Control Delay (s)	36	12	0	-	0	-	-	$ 2695.2	30.4
HCM Lane LOS	E	B	A	-	A	-	-	F	D
HCM 95th %tile Q(veh)	0.5	0.2	-	-	0	-	-	4.7	1.3

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	375	1065	100	10	780	85	40	40	10	150	95	390
Future Volume (vph)	375	1065	100	10	780	85	40	40	10	150	95	390
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1752	3405		1583	1792	1524	1752	1841		1770	1845	1495
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.65	1.00		0.72	1.00	1.00
Satd. Flow (perm)	1752	3405		1583	1792	1524	1203	1841		1346	1845	1495
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	395	1121	105	11	821	89	42	42	11	158	100	411
RTOR Reduction (vph)	0	4	0	0	0	48	0	9	0	0	0	321
Lane Group Flow (vph)	395	1222	0	11	821	41	42	44	0	158	100	90
Heavy Vehicles (%)	3%	5%	1%	14%	6%	6%	3%	0%	0%	2%	3%	8%
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases						6	8			4		4
Actuated Green, G (s)	25.2	71.7		1.0	47.5	47.5	19.1	19.1		17.9	17.9	17.9
Effective Green, g (s)	25.7	74.2		1.5	50.0	50.0	20.1	20.1		20.1	20.1	20.1
Actuated g/C Ratio	0.24	0.69		0.01	0.46	0.46	0.19	0.19		0.19	0.19	0.19
Clearance Time (s)	4.5	6.5		4.5	6.5	6.5	5.0	5.0		6.2	6.2	6.2
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4	2.5	2.5		2.5	2.5	2.5
Lane Grp Cap (vph)	417	2343		22	831	706	224	343		250	344	278
v/s Ratio Prot	c0.23	0.36		0.01	c0.46			0.02			0.05	
v/s Ratio Perm						0.03	0.03			c0.12		0.06
v/c Ratio	0.95	0.52		0.50	0.99	0.06	0.19	0.13		0.63	0.29	0.32
Uniform Delay, d1	40.4	8.2		52.8	28.6	15.9	37.0	36.5		40.4	37.7	38.0
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	30.5	0.5		10.0	28.2	0.1	0.3	0.1		4.5	0.3	0.5
Delay (s)	70.9	8.6		62.8	56.8	16.0	37.3	36.7		44.9	38.1	38.4
Level of Service	E	A		E	E	B	D	D		D	D	D
Approach Delay (s)		23.8			52.9			36.9			39.9	
Approach LOS		C			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	35.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	107.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	105	105	75	440	490	135
Future Volume (vph)	105	105	75	440	490	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	5.4	5.4	5.4
Lane Util. Factor	1.00	1.00	0.97	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1719	1429	3242	3539	3471	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1719	1429	3242	3539	3471	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	111	111	79	463	516	142
RTOR Reduction (vph)	0	92	0	0	0	86
Lane Group Flow (vph)	111	19	79	463	516	56
Heavy Vehicles (%)	5%	13%	8%	2%	4%	2%
Turn Type	Prot	Perm	Prot	NA	NA	Perm
Protected Phases	8		1	6	2	
Permitted Phases		8				2
Actuated Green, G (s)	6.9	6.9	3.5	23.1	15.6	15.6
Effective Green, g (s)	6.9	6.9	3.5	23.1	15.6	15.6
Actuated g/C Ratio	0.18	0.18	0.09	0.59	0.40	0.40
Clearance Time (s)	4.0	4.0	4.0	5.4	5.4	5.4
Vehicle Extension (s)	2.3	2.3	2.3	1.0	1.0	1.0
Lane Grp Cap (vph)	301	250	287	2074	1374	626
v/s Ratio Prot	c0.06		0.02	c0.13	c0.15	
v/s Ratio Perm		0.01				0.04
v/c Ratio	0.37	0.08	0.28	0.22	0.38	0.09
Uniform Delay, d1	14.3	13.6	16.8	3.9	8.4	7.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.1	0.3	0.0	0.1	0.0
Delay (s)	14.8	13.7	17.1	3.9	8.5	7.5
Level of Service	B	B	B	A	A	A
Approach Delay (s)	14.2			5.8	8.3	
Approach LOS	B			A	A	

Intersection Summary			
HCM 2000 Control Delay	8.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	39.4	Sum of lost time (s)	13.4
Intersection Capacity Utilization	33.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	3.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	20	40	60	20	10	50
Future Vol, veh/h	20	40	60	20	10	50
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	100	0	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	42	63	21	11	53

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	149	74	0	0	84	0
Stage 1	74	-	-	-	-	-
Stage 2	75	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	843	988	-	-	1513	-
Stage 1	949	-	-	-	-	-
Stage 2	948	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	837	988	-	-	1513	-
Mov Cap-2 Maneuver	813	-	-	-	-	-
Stage 1	949	-	-	-	-	-
Stage 2	941	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	1.2
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	813	988	1513	-
HCM Lane V/C Ratio	-	-	0.026	0.043	0.007	-
HCM Control Delay (s)	-	-	9.5	8.8	7.4	-
HCM Lane LOS	-	-	A	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0.1	0	-



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1335	1355	370	880	605	180
Future Volume (vph)	1335	1355	370	880	605	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	0.88	1.00	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	2760	1805	3406	3335	1599
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	2760	1805	3406	3335	1599
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	1391	1411	385	917	630	188
RTOR Reduction (vph)	0	82	0	0	0	65
Lane Group Flow (vph)	1391	1329	385	917	630	123
Heavy Vehicles (%)	2%	3%	0%	6%	5%	1%
Turn Type	NA	custom	Prot	NA	Prot	Perm
Protected Phases	2	2 8	1	6	8	
Permitted Phases		2				8
Actuated Green, G (s)	52.3	81.3	28.0	84.3	25.0	25.0
Effective Green, g (s)	52.3	81.3	28.0	84.3	25.0	25.0
Actuated g/C Ratio	0.45	0.69	0.24	0.72	0.21	0.21
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1577	1912	430	2447	710	340
v/s Ratio Prot	c0.39	0.48	c0.21	0.27	c0.19	
v/s Ratio Perm						0.08
v/c Ratio	0.88	0.70	0.90	0.37	0.89	0.36
Uniform Delay, d1	29.7	10.7	43.2	6.4	44.8	39.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.2	1.1	20.5	0.1	12.9	0.7
Delay (s)	35.9	11.8	63.8	6.4	57.6	40.0
Level of Service	D	B	E	A	E	D
Approach Delay (s)	23.7			23.4	53.6	
Approach LOS	C			C	D	

Intersection Summary			
HCM 2000 Control Delay	28.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	117.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	84.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

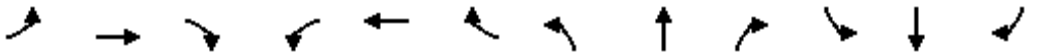
Intersection	
Int Delay, s/veh	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1515	0	0	1260	0	20
Future Vol, veh/h	1515	0	0	1260	0	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1595	0	0	1326	0	21

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1595	0	-	1595
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.12	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.218	-	-	3.318
Pot Cap-1 Maneuver	-	-	411	-	0	132
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	411	-	-	132
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

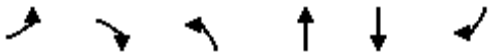
Approach	EB	WB	NB
HCM Control Delay, s	0	0	37.4
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	132	-	-	411	-
HCM Lane V/C Ratio	0.159	-	-	-	-
HCM Control Delay (s)	37.4	-	-	0	-
HCM Lane LOS	E	-	-	A	-
HCM 95th %tile Q(veh)	0.5	-	-	0	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	375	1065	100	10	780	85	40	40	10	150	95	390
Future Volume (vph)	375	1065	100	10	780	85	40	40	10	150	95	390
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.95		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3400	3405		1583	1792	1524	1752	1841		1770	1845	1495
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.66	1.00		0.72	1.00	1.00
Satd. Flow (perm)	3400	3405		1583	1792	1524	1213	1841		1346	1845	1495
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	395	1121	105	11	821	89	42	42	11	158	100	411
RTOR Reduction (vph)	0	4	0	0	0	43	0	9	0	0	0	248
Lane Group Flow (vph)	395	1222	0	11	821	46	42	44	0	158	100	163
Heavy Vehicles (%)	3%	5%	1%	14%	6%	6%	3%	0%	0%	2%	3%	8%
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases						6	8			4		4
Actuated Green, G (s)	18.3	69.6		1.0	52.3	52.3	19.5	19.5		18.3	18.3	18.3
Effective Green, g (s)	18.8	72.1		1.5	54.8	54.8	20.5	20.5		20.5	20.5	20.5
Actuated g/C Ratio	0.18	0.68		0.01	0.52	0.52	0.19	0.19		0.19	0.19	0.19
Clearance Time (s)	4.5	6.5		4.5	6.5	6.5	5.0	5.0		6.2	6.2	6.2
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4	2.5	2.5		2.5	2.5	2.5
Lane Grp Cap (vph)	602	2313		22	925	787	234	355		260	356	288
v/s Ratio Prot	c0.12	0.36		0.01	c0.46			0.02			0.05	
v/s Ratio Perm						0.03	0.03			c0.12		0.11
v/c Ratio	0.66	0.53		0.50	0.89	0.06	0.18	0.12		0.61	0.28	0.57
Uniform Delay, d1	40.6	8.5		51.9	22.9	12.8	35.8	35.4		39.1	36.5	38.8
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.2	0.5		10.0	11.2	0.1	0.3	0.1		3.4	0.3	2.1
Delay (s)	42.8	9.0		62.0	34.1	12.9	36.0	35.5		42.5	36.8	40.9
Level of Service	D	A		E	C	B	D	D		D	D	D
Approach Delay (s)		17.2			32.4			35.7			40.6	
Approach LOS		B			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	26.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	106.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	80.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	105	105	75	440	490	135
Future Volume (vph)	105	105	75	440	490	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.97	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1719	1429	3242	3539	3471	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1719	1429	3242	3539	3471	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	111	111	79	463	516	142
RTOR Reduction (vph)	0	92	0	0	0	81
Lane Group Flow (vph)	111	19	79	463	516	61
Heavy Vehicles (%)	5%	13%	8%	2%	4%	2%
Turn Type	Prot	Perm	Prot	NA	NA	Perm
Protected Phases	8		1	6	2	
Permitted Phases		8				2
Actuated Green, G (s)	6.9	6.9	3.5	23.1	15.6	15.6
Effective Green, g (s)	6.9	6.9	3.5	24.5	17.0	17.0
Actuated g/C Ratio	0.18	0.18	0.09	0.62	0.43	0.43
Clearance Time (s)	4.0	4.0	4.0	5.4	5.4	5.4
Vehicle Extension (s)	2.3	2.3	2.3	1.0	1.0	1.0
Lane Grp Cap (vph)	301	250	287	2200	1497	683
v/s Ratio Prot	c0.06		0.02	c0.13	c0.15	
v/s Ratio Perm		0.01				0.04
v/c Ratio	0.37	0.08	0.28	0.21	0.34	0.09
Uniform Delay, d1	14.3	13.6	16.8	3.2	7.5	6.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.1	0.3	0.0	0.1	0.0
Delay (s)	14.8	13.7	17.1	3.3	7.5	6.6
Level of Service	B	B	B	A	A	A
Approach Delay (s)	14.2			5.3	7.3	
Approach LOS	B			A	A	

Intersection Summary			
HCM 2000 Control Delay	7.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	39.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	32.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	3.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	20	40	60	20	10	50
Future Vol, veh/h	20	40	60	20	10	50
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	100	0	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	42	63	21	11	53

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	149	74	0	0	84	0
Stage 1	74	-	-	-	-	-
Stage 2	75	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	843	988	-	-	1513	-
Stage 1	949	-	-	-	-	-
Stage 2	948	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	837	988	-	-	1513	-
Mov Cap-2 Maneuver	813	-	-	-	-	-
Stage 1	949	-	-	-	-	-
Stage 2	941	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	1.2
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	813	988	1513	-
HCM Lane V/C Ratio	-	-	0.026	0.043	0.007	-
HCM Control Delay (s)	-	-	9.5	8.8	7.4	-
HCM Lane LOS	-	-	A	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0.1	0	-



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	1200	25	25	1510	25	60
Future Volume (vph)	1200	25	25	1510	25	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	6.0	4.0	4.0
Lane Util. Factor	0.97		0.95	0.95	1.00	1.00
Frt	1.00		0.85	0.85	1.00	1.00
Flt Protected	0.95		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3435		1513	1504	1770	1863
Flt Permitted	0.95		1.00	1.00	0.95	1.00
Satd. Flow (perm)	3435		1513	1504	1770	1863
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1263	26	26	1589	26	63
RTOR Reduction (vph)	1	0	562	63	0	0
Lane Group Flow (vph)	1288	0	243	747	26	63
Turn Type	Prot		NA	pt+ov	Prot	NA
Protected Phases	8		2	2 8	1	6
Permitted Phases						
Actuated Green, G (s)	69.0		31.4	106.4	3.6	41.0
Effective Green, g (s)	71.0		33.4	106.4	3.6	41.0
Actuated g/C Ratio	0.59		0.28	0.89	0.03	0.34
Clearance Time (s)	6.0		6.0		4.0	4.0
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	2032		421	1333	53	636
v/s Ratio Prot	c0.37		0.16	c0.50	c0.01	0.03
v/s Ratio Perm						
v/c Ratio	0.63		0.58	0.56	0.49	0.10
Uniform Delay, d1	16.0		37.2	1.5	57.3	26.9
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.5		5.7	1.7	7.0	0.1
Delay (s)	17.5		42.9	3.2	64.3	27.0
Level of Service	B		D	A	E	C
Approach Delay (s)	17.5		23.0			37.9
Approach LOS	B		C			D

Intersection Summary			
HCM 2000 Control Delay	21.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	74.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

MOVEMENT SUMMARY

Site: 101 [OR-212/162nd Ave]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: OR-212												
8	T1	26	2.0	0.595	9.4	LOS A	5.2	132.0	0.21	0.07	0.21	34.2
18	R2	1589	2.0	0.595	9.4	LOS A	5.2	132.0	0.21	0.07	0.21	37.6
Approach		1616	2.0	0.595	9.4	LOS A	5.2	132.0	0.21	0.07	0.21	37.5
East: OR-212												
1	L2	1263	2.0	0.475	7.4	LOS A	3.3	83.2	0.17	0.06	0.17	36.7
16	R2	26	2.0	0.475	7.4	LOS A	3.3	83.2	0.17	0.06	0.17	31.9
Approach		1289	2.0	0.475	7.4	LOS A	3.3	83.2	0.17	0.06	0.17	36.6
North: 162nd Ave												
7	L2	26	2.0	0.192	10.5	LOS B	0.6	16.2	0.71	0.71	0.71	32.4
4	T1	63	2.0	0.192	10.5	LOS B	0.6	16.2	0.71	0.71	0.71	32.5
Approach		89	2.0	0.192	10.5	LOS B	0.6	16.2	0.71	0.71	0.71	32.5
All Vehicles		2995	2.0	0.595	8.6	LOS A	5.2	132.0	0.21	0.08	0.21	36.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 101 [OR-212/OR-224 2040 PM Two-Lane Roundabout]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: OR-224												
3	L2	630	5.0	1.095	92.2	LOS F	32.8	853.2	1.00	2.56	6.67	15.1
18	R2	188	1.0	0.354	12.2	LOS B	1.5	37.7	0.70	0.75	0.88	32.7
Approach		818	4.1	1.095	73.9	LOS F	32.8	853.2	0.93	2.14	5.34	17.1
East: OR-212												
1	L2	385	0.0	0.818	25.0	LOS D	12.7	324.1	0.94	1.36	2.26	27.5
6	T1	917	6.0	0.818	25.6	LOS D	12.7	324.1	0.92	1.36	2.27	27.5
Approach		1302	4.2	0.818	25.5	LOS D	12.7	324.1	0.92	1.36	2.26	27.5
West: OR-212/OR-224												
2	T1	1391	2.0	1.419	208.7	LOS F	160.3	4071.7	1.00	4.64	10.59	8.6
12	R2	1411	3.0	1.454	224.2	LOS F	169.5	4340.2	1.00	4.83	11.06	7.9
Approach		2802	2.5	1.454	216.5	LOS F	169.5	4340.2	1.00	4.74	10.83	8.3
All Vehicles		4922	3.2	1.454	142.3	LOS F	169.5	4340.2	0.97	3.41	7.65	11.4

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 101 [OR-212/OR-224 2040 PM Two-Lane Roundabout with Reccommended Improvements]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: OR-224												
3	L2	630	5.0	1.075	102.2	LOS F	21.4	549.5	1.00	2.13	5.63	14.2
18	R2	188	1.0	1.075	97.7	LOS F	21.4	549.5	1.00	2.19	5.83	14.5
Approach		818	4.1	1.075	101.2	LOS F	21.4	549.5	1.00	2.14	5.68	14.2
East: OR-212												
1	L2	385	0.0	0.848	29.7	LOS D	13.5	344.9	0.94	1.43	2.49	26.0
6	T1	917	6.0	0.848	28.9	LOS D	13.7	359.1	0.92	1.43	2.50	26.5
Approach		1302	4.2	0.848	29.1	LOS D	13.7	359.1	0.93	1.43	2.50	26.3
West: OR-212/OR-224												
2	T1	1391	2.0	0.714	15.6	LOS C	10.4	264.6	0.80	1.00	1.46	32.1
12	R2	1411	3.0	0.792	17.3	LOS C	15.1	387.1	0.83	1.08	1.61	30.1
Approach		2802	2.5	0.792	16.5	LOS C	15.1	387.1	0.81	1.04	1.54	31.1
All Vehicles		4922	3.2	1.075	33.9	LOS D	21.4	549.5	0.87	1.33	2.48	24.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 101 [OR-212/OR-224 2040 AM Two-Lane Roundabout]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: OR-224												
3	L2	1224	5.0	1.641	309.9	LOS F	167.0	4343.0	1.00	5.86	16.70	6.3
18	R2	161	7.0	0.243	8.4	LOS A	0.9	23.4	0.60	0.60	0.60	33.8
Approach		1385	5.2	1.641	274.9	LOS F	167.0	4343.0	0.95	5.25	14.83	6.9
East: OR-212												
1	L2	234	8.0	1.171	115.5	LOS F	51.9	1366.8	1.00	3.13	8.12	13.2
6	T1	1291	6.0	1.171	115.3	LOS F	52.2	1367.6	1.00	3.13	8.12	13.3
Approach		1525	6.3	1.171	115.3	LOS F	52.2	1367.6	1.00	3.13	8.12	13.3
West: OR-212/OR-224												
2	T1	630	11.0	0.583	11.0	LOS B	3.5	95.4	0.53	0.40	0.53	33.2
12	R2	558	18.0	0.574	11.3	LOS B	3.1	88.2	0.51	0.38	0.51	31.1
Approach		1188	14.3	0.583	11.1	LOS B	3.5	95.4	0.52	0.39	0.52	32.2
All Vehicles		4098	8.3	1.641	139.0	LOS F	167.0	4343.0	0.85	3.05	8.19	11.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 101 [OR-212/OR-224 2040 AM Two-Lane Roundabout with Recommended Improvements]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: OR-224												
3	L2	1224	5.0	0.976	52.3	LOS F	24.5	638.9	1.00	1.96	4.13	20.3
18	R2	161	7.0	0.976	50.9	LOS F	24.5	638.9	1.00	1.98	4.17	20.2
Approach		1385	5.2	0.976	52.2	LOS F	24.5	638.9	1.00	1.96	4.14	20.3
East: OR-212												
1	L2	234	8.0	1.821	403.5	LOS F	109.6	2884.8	1.00	4.91	16.51	5.0
6	T1	1291	6.0	1.821	400.9	LOS F	125.8	3294.9	1.00	5.21	17.58	5.0
Approach		1525	6.3	1.821	401.3	LOS F	125.8	3294.9	1.00	5.16	17.42	5.0
West: OR-212/OR-224												
2	T1	630	11.0	0.283	5.9	LOS A	1.2	33.7	0.31	0.18	0.31	35.9
12	R2	558	18.0	0.288	6.0	LOS A	1.2	33.5	0.30	0.17	0.30	33.5
Approach		1188	14.3	0.288	5.9	LOS A	1.2	33.7	0.30	0.18	0.30	34.7
All Vehicles		4098	8.3	1.821	168.7	LOS F	125.8	3294.9	0.80	2.64	7.97	10.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	40	1640	10	45	680	10
Future Volume (vph)	40	1640	10	45	680	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1568	1805	3406	3335	1599
Flt Permitted	1.00	1.00	0.73	1.00	0.95	1.00
Satd. Flow (perm)	3539	1568	1384	3406	3335	1599
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	42	1708	10	47	708	10
RTOR Reduction (vph)	0	134	0	0	0	1
Lane Group Flow (vph)	42	1574	10	47	708	9
Heavy Vehicles (%)	2%	3%	0%	6%	5%	1%
Turn Type	NA	custom	Perm	NA	Prot	Perm
Protected Phases	2	4		6	8	
Permitted Phases			6			8
Actuated Green, G (s)	7.0	96.0	7.0	7.0	96.0	96.0
Effective Green, g (s)	7.0	96.0	7.0	7.0	96.0	96.0
Actuated g/C Ratio	0.06	0.86	0.06	0.06	0.86	0.86
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	223	1356	87	214	2884	1382
v/s Ratio Prot	0.01	c1.00		c0.01	0.21	
v/s Ratio Perm			0.01			0.01
v/c Ratio	0.19	1.16	0.11	0.22	0.25	0.01
Uniform Delay, d1	49.3	7.5	49.1	49.4	1.3	1.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	80.9	0.6	0.5	0.0	0.0
Delay (s)	49.7	88.4	49.7	49.9	1.3	1.0
Level of Service	D	F	D	D	A	A
Approach Delay (s)	87.5			49.9	1.3	
Approach LOS	F			D	A	

Intersection Summary			
HCM 2000 Control Delay	62.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	111.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	111.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

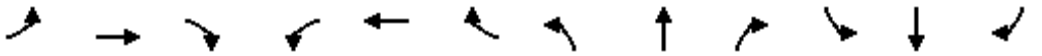
Intersection	
Int Delay, s/veh	6.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕		↰	↕	
Traffic Vol, veh/h	40	5	0	0	5	5	0	0	0	0	0	45
Future Vol, veh/h	40	5	0	0	5	5	0	0	0	0	0	45
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	42	5	0	0	5	5	0	0	0	0	0	47

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	10	0	0	5	0	0	120	99	5	97	97	8
Stage 1	-	-	-	-	-	-	89	89	-	8	8	-
Stage 2	-	-	-	-	-	-	31	10	-	89	89	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1610	-	-	1616	-	-	855	791	1078	885	793	1074
Stage 1	-	-	-	-	-	-	918	821	-	1013	889	-
Stage 2	-	-	-	-	-	-	986	887	-	918	821	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1610	-	-	1616	-	-	801	770	1078	867	772	1074
Mov Cap-2 Maneuver	-	-	-	-	-	-	801	770	-	867	772	-
Stage 1	-	-	-	-	-	-	894	800	-	987	889	-
Stage 2	-	-	-	-	-	-	943	887	-	894	800	-

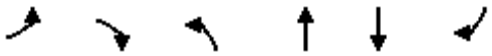
Approach	EB	WB	NB	SB
HCM Control Delay, s	6.5	0	0	8.5
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	-	1610	-	-	1616	-	-	-	1074
HCM Lane V/C Ratio	-	0.026	-	-	-	-	-	-	0.044
HCM Control Delay (s)	0	7.3	0	-	0	-	-	0	8.5
HCM Lane LOS	A	A	A	-	A	-	-	A	A
HCM 95th %tile Q(veh)	-	0.1	-	-	0	-	-	-	0.1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	360	1125	105	10	780	90	60	60	15	190	120	460
Future Volume (vph)	360	1125	105	10	780	90	60	60	15	190	120	460
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1752	3405		1583	1792	1524	1752	1842		1770	1845	1495
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.60	1.00		0.70	1.00	1.00
Satd. Flow (perm)	1752	3405		1583	1792	1524	1115	1842		1313	1845	1495
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	379	1184	111	11	821	95	63	63	16	200	126	484
RTOR Reduction (vph)	0	4	0	0	0	53	0	9	0	0	0	309
Lane Group Flow (vph)	379	1291	0	11	821	42	63	70	0	200	126	175
Heavy Vehicles (%)	3%	5%	1%	14%	6%	6%	3%	0%	0%	2%	3%	8%
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases						6	8			4		4
Actuated Green, G (s)	25.3	71.8		1.0	47.5	47.5	23.6	23.6		22.4	22.4	22.4
Effective Green, g (s)	25.8	74.3		1.5	50.0	50.0	24.6	24.6		24.6	24.6	24.6
Actuated g/C Ratio	0.23	0.66		0.01	0.44	0.44	0.22	0.22		0.22	0.22	0.22
Clearance Time (s)	4.5	6.5		4.5	6.5	6.5	5.0	5.0		6.2	6.2	6.2
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4	2.5	2.5		2.5	2.5	2.5
Lane Grp Cap (vph)	402	2250		21	797	677	244	403		287	403	327
v/s Ratio Prot	c0.22	0.38		0.01	c0.46			0.04			0.07	
v/s Ratio Perm						0.03	0.06			c0.15		0.12
v/c Ratio	0.94	0.57		0.52	1.03	0.06	0.26	0.17		0.70	0.31	0.54
Uniform Delay, d1	42.6	10.4		55.1	31.2	17.8	36.3	35.7		40.5	36.8	38.9
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	30.4	0.6		14.3	39.8	0.1	0.4	0.2		6.6	0.3	1.3
Delay (s)	73.0	11.0		69.4	71.0	17.9	36.8	35.8		47.1	37.1	40.2
Level of Service	E	B		E	E	B	D	D		D	D	D
Approach Delay (s)		25.1			65.6			36.2			41.4	
Approach LOS		C			E			D			D	

Intersection Summary			
HCM 2000 Control Delay	39.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	112.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	88.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	125	155	90	445	585	165
Future Volume (vph)	125	155	90	445	585	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	5.4	5.4	5.4
Lane Util. Factor	1.00	1.00	0.97	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1719	1429	3242	3539	3471	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1719	1429	3242	3539	3471	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	132	163	95	468	616	174
RTOR Reduction (vph)	0	129	0	0	0	105
Lane Group Flow (vph)	132	34	95	468	616	69
Heavy Vehicles (%)	5%	13%	8%	2%	4%	2%
Turn Type	Prot	Perm	Prot	NA	NA	Perm
Protected Phases	8		1	6	2	
Permitted Phases		8				2
Actuated Green, G (s)	9.9	9.9	5.4	28.3	18.9	18.9
Effective Green, g (s)	9.9	9.9	5.4	28.3	18.9	18.9
Actuated g/C Ratio	0.21	0.21	0.11	0.59	0.40	0.40
Clearance Time (s)	4.0	4.0	4.0	5.4	5.4	5.4
Vehicle Extension (s)	2.3	2.3	2.3	1.0	1.0	1.0
Lane Grp Cap (vph)	357	297	367	2104	1378	628
v/s Ratio Prot	c0.08		0.03	c0.13	c0.18	
v/s Ratio Perm		0.02				0.04
v/c Ratio	0.37	0.11	0.26	0.22	0.45	0.11
Uniform Delay, d1	16.2	15.3	19.3	4.5	10.5	9.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.1	0.2	0.0	0.1	0.0
Delay (s)	16.6	15.4	19.5	4.5	10.6	9.1
Level of Service	B	B	B	A	B	A
Approach Delay (s)	15.9			7.1	10.3	
Approach LOS	B			A	B	

Intersection Summary			
HCM 2000 Control Delay	10.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	47.6	Sum of lost time (s)	13.4
Intersection Capacity Utilization	37.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	4.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	30	40	60	40	40	15
Future Vol, veh/h	30	40	60	40	40	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	100	0	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	32	42	63	42	42	16

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	184	84	0	0	105	0
Stage 1	84	-	-	-	-	-
Stage 2	100	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	805	975	-	-	1486	-
Stage 1	939	-	-	-	-	-
Stage 2	924	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	782	975	-	-	1486	-
Mov Cap-2 Maneuver	766	-	-	-	-	-
Stage 1	913	-	-	-	-	-
Stage 2	924	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.3	0	5.4
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	766	975	1486	-
HCM Lane V/C Ratio	-	-	0.041	0.043	0.028	-
HCM Control Delay (s)	-	-	9.9	8.9	7.5	-
HCM Lane LOS	-	-	A	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0.1	0.1	-



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	40	1640	10	45	680	10
Future Volume (vph)	40	1640	10	45	680	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.88	1.00	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	2760	1805	3406	1719	1599
Flt Permitted	1.00	1.00	0.73	1.00	0.95	1.00
Satd. Flow (perm)	1863	2760	1386	3406	1719	1599
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	42	1708	10	47	708	10
RTOR Reduction (vph)	0	731	0	0	0	4
Lane Group Flow (vph)	42	977	10	47	708	6
Heavy Vehicles (%)	2%	3%	0%	6%	5%	1%
Turn Type	NA	custom	Perm	NA	Prot	Perm
Protected Phases	2	4		6	8	
Permitted Phases			6			8
Actuated Green, G (s)	6.6	19.5	6.6	6.6	19.5	19.5
Effective Green, g (s)	6.6	19.5	6.6	6.6	19.5	19.5
Actuated g/C Ratio	0.19	0.57	0.19	0.19	0.57	0.57
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	360	1578	268	659	983	914
v/s Ratio Prot	c0.02	0.35		0.01	c0.41	
v/s Ratio Perm			0.01			0.00
v/c Ratio	0.12	0.62	0.04	0.07	0.72	0.01
Uniform Delay, d1	11.3	4.8	11.2	11.2	5.3	3.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.7	0.1	0.0	2.6	0.0
Delay (s)	11.5	5.6	11.2	11.3	7.9	3.1
Level of Service	B	A	B	B	A	A
Approach Delay (s)	5.7			11.3	7.9	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	6.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	34.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

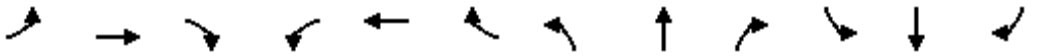
Intersection	
Int Delay, s/veh	6.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕		↰	↱	
Traffic Vol, veh/h	40	5	0	0	5	5	0	0	0	0	0	45
Future Vol, veh/h	40	5	0	0	5	5	0	0	0	0	0	45
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	42	5	0	0	5	5	0	0	0	0	0	47

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	10	0	0	5	0	0	120	99	5	97	97	8
Stage 1	-	-	-	-	-	-	89	89	-	8	8	-
Stage 2	-	-	-	-	-	-	31	10	-	89	89	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1610	-	-	1616	-	-	855	791	1078	885	793	1074
Stage 1	-	-	-	-	-	-	918	821	-	1013	889	-
Stage 2	-	-	-	-	-	-	986	887	-	918	821	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1610	-	-	1616	-	-	801	770	1078	867	772	1074
Mov Cap-2 Maneuver	-	-	-	-	-	-	801	770	-	867	772	-
Stage 1	-	-	-	-	-	-	894	800	-	987	889	-
Stage 2	-	-	-	-	-	-	943	887	-	894	800	-

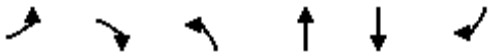
Approach	EB	WB	NB	SB
HCM Control Delay, s	6.5	0	0	8.5
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	-	1610	-	-	1616	-	-	-	1074
HCM Lane V/C Ratio	-	0.026	-	-	-	-	-	-	0.044
HCM Control Delay (s)	0	7.3	0	-	0	-	-	0	8.5
HCM Lane LOS	A	A	A	-	A	-	-	A	A
HCM 95th %tile Q(veh)	-	0.1	-	-	0	-	-	-	0.1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	360	1125	105	10	780	90	60	60	15	190	120	460
Future Volume (vph)	360	1125	105	10	780	90	60	60	15	190	120	460
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.95		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3400	3405		1583	1792	1524	1752	1842		1770	1845	1495
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.61	1.00		0.71	1.00	1.00
Satd. Flow (perm)	3400	3405		1583	1792	1524	1127	1842		1314	1845	1495
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	379	1184	111	11	821	95	63	63	16	200	126	484
RTOR Reduction (vph)	0	5	0	0	0	48	0	8	0	0	0	231
Lane Group Flow (vph)	379	1290	0	11	821	47	63	71	0	200	126	253
Heavy Vehicles (%)	3%	5%	1%	14%	6%	6%	3%	0%	0%	2%	3%	8%
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases						6	8			4		4
Actuated Green, G (s)	17.8	69.5		1.0	52.7	52.7	24.2	24.2		23.0	23.0	23.0
Effective Green, g (s)	18.3	72.0		1.5	55.2	55.2	25.2	25.2		25.2	25.2	25.2
Actuated g/C Ratio	0.17	0.65		0.01	0.50	0.50	0.23	0.23		0.23	0.23	0.23
Clearance Time (s)	4.5	6.5		4.5	6.5	6.5	5.0	5.0		6.2	6.2	6.2
Vehicle Extension (s)	2.3	5.4		2.3	5.4	5.4	2.5	2.5		2.5	2.5	2.5
Lane Grp Cap (vph)	562	2214		21	893	759	256	419		299	420	340
v/s Ratio Prot	c0.11	0.38		0.01	c0.46			0.04			0.07	
v/s Ratio Perm						0.03	0.06			0.15		c0.17
v/c Ratio	0.67	0.58		0.52	0.92	0.06	0.25	0.17		0.67	0.30	0.74
Uniform Delay, d1	43.4	10.9		54.2	25.7	14.4	35.0	34.3		38.9	35.4	39.8
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.7	0.7		14.3	15.0	0.1	0.4	0.1		5.0	0.3	8.1
Delay (s)	46.1	11.6		68.5	40.7	14.4	35.3	34.5		44.0	35.7	47.9
Level of Service	D	B		E	D	B	D	C		D	D	D
Approach Delay (s)		19.4			38.4			34.9			45.0	
Approach LOS		B			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	30.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	110.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	125	155	90	445	585	165
Future Volume (vph)	125	155	90	445	585	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	5.4	5.4	5.4
Lane Util. Factor	1.00	1.00	0.97	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1719	1429	3242	3539	3471	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1719	1429	3242	3539	3471	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	132	163	95	468	616	174
RTOR Reduction (vph)	0	129	0	0	0	105
Lane Group Flow (vph)	132	34	95	468	616	69
Heavy Vehicles (%)	5%	13%	8%	2%	4%	2%
Turn Type	Prot	Perm	Prot	NA	NA	Perm
Protected Phases	8		1	6	2	
Permitted Phases		8				2
Actuated Green, G (s)	9.9	9.9	5.4	28.3	18.9	18.9
Effective Green, g (s)	9.9	9.9	5.4	28.3	18.9	18.9
Actuated g/C Ratio	0.21	0.21	0.11	0.59	0.40	0.40
Clearance Time (s)	4.0	4.0	4.0	5.4	5.4	5.4
Vehicle Extension (s)	2.3	2.3	2.3	1.0	1.0	1.0
Lane Grp Cap (vph)	357	297	367	2104	1378	628
v/s Ratio Prot	c0.08		0.03	c0.13	c0.18	
v/s Ratio Perm		0.02				0.04
v/c Ratio	0.37	0.11	0.26	0.22	0.45	0.11
Uniform Delay, d1	16.2	15.3	19.3	4.5	10.5	9.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.1	0.2	0.0	0.1	0.0
Delay (s)	16.6	15.4	19.5	4.5	10.6	9.1
Level of Service	B	B	B	A	B	A
Approach Delay (s)	15.9			7.1	10.3	
Approach LOS	B			A	B	

Intersection Summary			
HCM 2000 Control Delay	10.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	47.6	Sum of lost time (s)	13.4
Intersection Capacity Utilization	37.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	4.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	30	40	60	40	40	15
Future Vol, veh/h	30	40	60	40	40	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	100	0	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	32	42	63	42	42	16

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	184	84	0	0	105	0
Stage 1	84	-	-	-	-	-
Stage 2	100	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	805	975	-	-	1486	-
Stage 1	939	-	-	-	-	-
Stage 2	924	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	782	975	-	-	1486	-
Mov Cap-2 Maneuver	766	-	-	-	-	-
Stage 1	913	-	-	-	-	-
Stage 2	924	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.3	0	5.4
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	766	975	1486	-
HCM Lane V/C Ratio	-	-	0.041	0.043	0.028	-
HCM Control Delay (s)	-	-	9.9	8.9	7.5	-
HCM Lane LOS	-	-	A	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0.1	0.1	-

Attachment C
Funding Concept Study
FCS Group

Happy Valley, Oregon

Rock Creek Employment Center Transportation and Infrastructure Funding Strategy

April 13, 2020

Prepared by:

FCS GROUP

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SECTION I: INTRODUCTION

A. PURPOSE

With over 200 acres, the Rock Creek Employment Center (RCEC) is one of the largest planned employment centers in the Metro region. In order to accommodate new development, significant investment in public facilities is required. This report identifies potential funding and financing options that may be used to fully fund the roadway network and the sanitary sewer, storm water and domestic water infrastructure required to meet growth requirements for the study area. This report is intended to supplement the reports by Harper Houf Peterson Rhigellis, Inc (HHPR) and DKS Associates as they relate to forecasted infrastructure needs and costs for the area.

B. WORK COMPLETED

FCS GROUP assisted the project team comprised of City of Happy Valley Public Works and Economic and Community Development staff, HHPR, and DKS Associates with compiling and evaluating the following information:

- Current and future land use assumptions and forecasted employment and housing growth for the study area;
- Roadway and infrastructure capital costs; and
- Identification and evaluation of potential funding strategies.

C. REPORT FRAMEWORK

This report documents findings and recommendations, which are presented in the following sections.

- **Funding Framework**. This section describes the study area and summarizes the required public facility requirements.
- **Funding Options**. This section includes a summary and preliminary analysis of potential funding techniques that are available to fund the local public share of major capital facilities.
- **Recommendations**. This section identifies near-term actions that the City of Happy Valley can take to implement the recommended funding strategy.

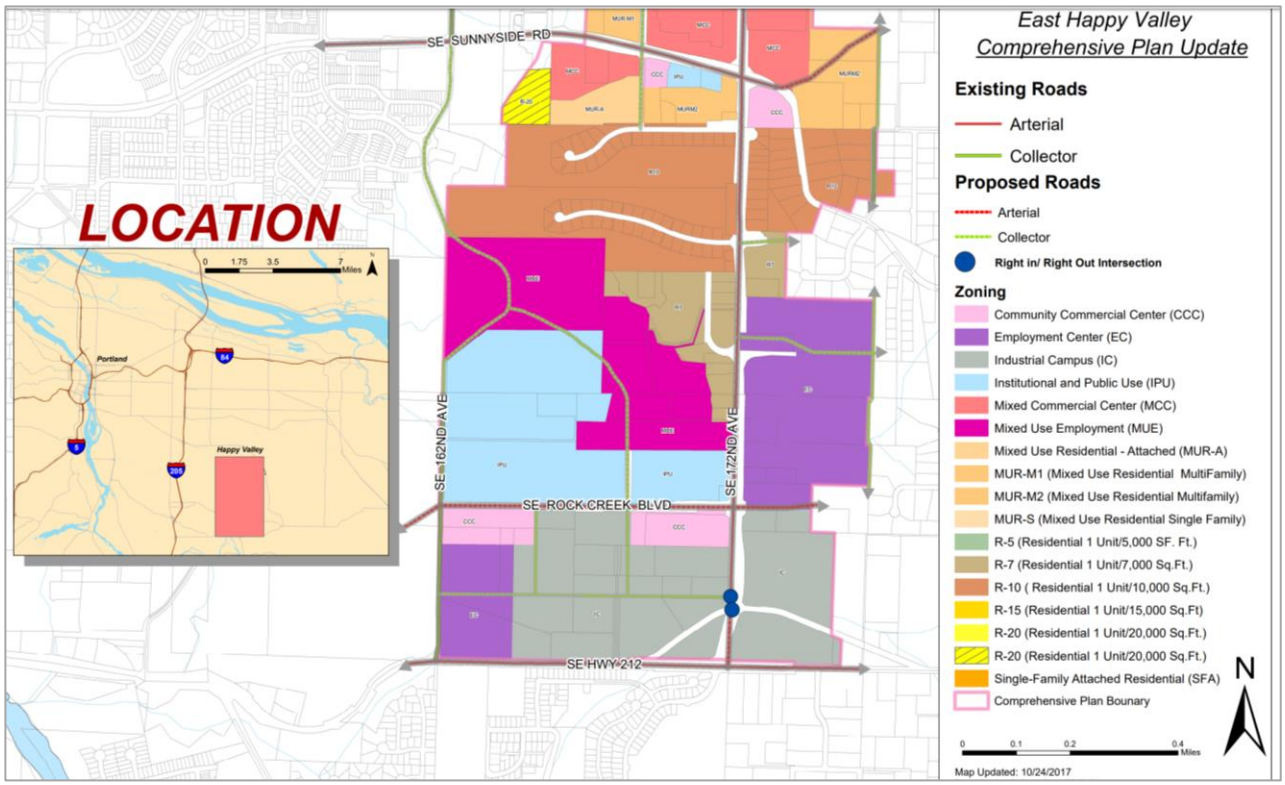
SECTION II: FUNDING FRAMEWORK

This section describes the land use growth forecast assumptions and the transportation and infrastructure requirements for the RCEC study area.

A. PROJECT AREA DESCRIPTION

Happy Valley and Clackamas County have conducted numerous planning, land use and transportation studies in advance of annexation and development of the RCEC over the past two decades. The RCEC is a subarea within the East Happy Valley Comprehensive Plan District (see **Exhibit 1**). Designated zone classifications include: Institutional and Public Use, Employment Center, Mixed Use Employment, Industrial Campus, and Community Commercial Center.

Exhibit 1: East Happy Valley Land Use Zoning



The RCEC includes some of the region's largest remaining vacant industrial and employment center sites. Current uses within the area include two North Clackamas School District No. 12 (NCSD#12) schools and sports fields: Adrienne C. Nelson High School (currently under construction) and Verne Duncan Elementary School. Adjacent land to the west has also been purchased for a future potential middle school site. Approximately half of the RCEC area is vacant or partially vacant at this time.

Existing and future development will benefit from the planned network of roads as well as sanitary sewer, storm water and domestic water infrastructure facilities. Roadway and infrastructure improvements will provide safe and efficient access for existing uses and enhance the marketability and development potential of the area.

To better understand the development potential of the RCEC and adjacent developable lands, FCS GROUP reviewed regional growth forecasts as represented by Metro traffic analysis zones (TAZs).

The Metro Regional Transportation Plan (RTP) and the current Happy Valley Transportation System Plan (TSP) assume that the study area (represented by traffic analysis zones 794, 798 and 799) will add approximately 915 households (dwellings) and 906 net new jobs over the 2015-2040 time frame (**Exhibit 2**).

Exhibit 2 Projected Households and Employment in the RCEC Area

TAZ	Location	2015 HH	2040 HH	HH Change Proj.	2015 Employment	2040 Employment	Employment Change (Proj.)
794	RCEC	6	31	25	*	379	379
798	RCEC	12	216	204	115	465	350
799	North Carver	1,094	1,780	686	139	316	177
	Total	**1,112**	**2,027**	**915**	**254**	**1,160**	**906**

Notes:

** Denotes data suppressed due to confidentiality restrictions.*

TAZ = traffic analysis zone.

Source: Metro Scenario 1610, William 2 forecast, adopted by Metro Council in 2016.

Additional housing and jobs will eventually create more traffic. For this study, it is assumed that there will be 10 average daily vehicle trips (ADT) per new household (dwelling) and three ADT trips per employee. It is also assumed that 10% of the ADT will occur during the peak "rush hour". As shown in **Exhibit 3,** based on these assumptions, at full buildout the study area would generate approximately 11,868 net new vehicle trips at buildout. By applying a peak-hour trip factor, these net new trips equate to 1,187 peak-hour vehicle trips (PHVT). It is anticipated that many of these net new trips will utilize the planned transportation and pathway network that has been identified as part of this study.

Exhibit 3 Projected Net New Vehicle Trips in RCEC Benefit Area

TAZ	Location	Net new HH Trips	Net new Emp. Trips	Proj. Total Trips (ADT)*	Net New Peak-hour Trips**
794	RCEC	250	1,137	1,387	139
798	RCEC	2,040	1,050	3,090	309
799	North Carver	6,860	531	7,391	739
	Total	**9,150**	**2,718**	**11,868**	**1,187**

Notes:

** Assumes average of 10 trips per household and 3 trips per job.*

*** Assumes 10% peak-hour factor.*

TAZ = traffic analysis zone. ADT = average daily vehicle trip.

B. TRANSPORTATION NETWORK

Prior Transportation System Development Charge Project Assumptions

The adopted Happy Valley Transportation System Development Charge (TSDC) Methodology Report (November 2017) assumes that traffic in the City will increase by 16,900 peak-hour trip-ends over a 20-year time frame.

As shown in **Exhibit 4**, the adopted TSDC capital project list currently includes medium and long term transportation projects within the RCEC study area. The largest planned project includes the 162nd Ave. extension (with a new bridge over Rock Creek) at an estimated cost of $19.6 million.

Exhibit 4: Existing RCEC Area TSDC Transportation Improvements

TSDC Project #	Description	Timing	TSDC Original Cost (2017 $)	Auto Costs	Pedestrian Costs	Bike Costs	Growth Share Total	Growth Share Total ($)
I4	Add second EB turn lane at Rock Creek BLVD/172nd Ave	Medium	$ 200,000	$ 200,000	$ -	$ -	100%	$ 200,000
I7	Add traffic signal at Rock Creek Blvd/162nd Ave	Medium	$ 1,000,000	$ 1,000,000	$ -	$ -	100%	1,000,000
I7	Add traffic signal at Rock Creek Blvd/162nd Ave	Medium	$ 1,000,000	$ 1,000,000	$ -	$ -	100%	1,000,000
R16	Rock Creek Blvd. West Extension	Medium	$ 2,600,000	$ 1,318,841	$ 828,986	$ 452,173	100%	2,600,000
R17	Rock Creek Blvd. East Extension	Medium	$ 2,800,000	$ 1,420,290	$ 892,754	$ 486,956	100%	2,800,000
R4	SE 162 Ave Extension (OR-212 to Taralon/157th Ave.)	Long	$ 19,600,000	$ 9,942,029	$ 6,249,275	$ 3,408,696	100%	$ 19,600,000
	Total		**$ 27,200,000**	**$ 14,881,160**	**$ 7,971,015**	**$ 4,347,825**		**$ 27,200,000**

Source: Happy Valley Transportation System Development Charge Methodology Report, Nov. 2017.

RCEC Transportation and Infrastructure Requirements

Based on the projected amount of development, DKS Associates identified the collector and arterial roadway network that is required to handle future trip growth and mobility requirements. HHPR prepared cost estimates for the planned roadway network under two scenarios.

- Scenario A: Transportation Network without the Sunrise Corridor Extension
- Scenario B: Transportation Network with the Sunrise Corridor Extension

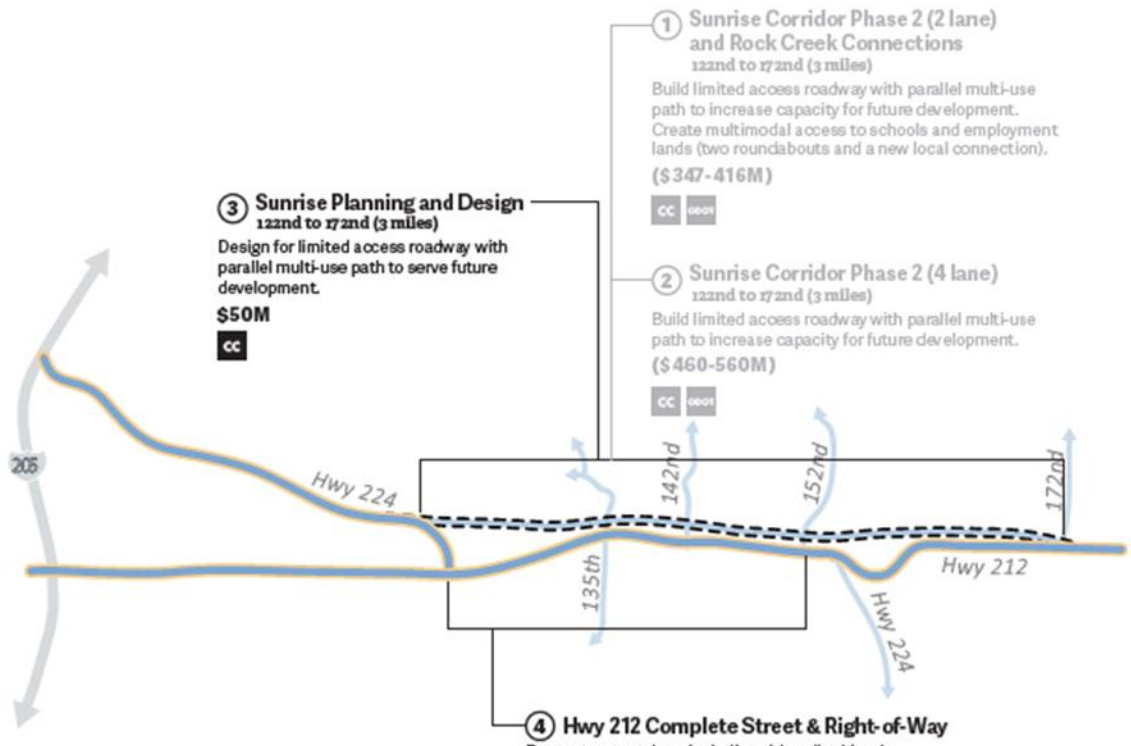
The Sunrise Corridor refers to the timing of a planned three-mile extension of the roadway between 122nd Avenue and 172nd Avenue. For additional supporting information, please refer to the following Metro 2020 Transportation Tier 1 Corridor Investment Task Force Summary; and the HHPR Transportation and Infrastructure Cost Memorandum dated March 27, 2020.

TASK FORCE RECOMMENDATION: TIER 1 CORRIDOR INVESTMENT PROFILE

Hwy 212/Sunrise Corridor

Highway 212 and the Sunrise Corridor connect future residential and employment areas to existing job centers near I-205. The potential future connection is intended to provide access to jobs and affordable housing in Clackamas County and serve as an alternative connection from the future Clackamas-to-Columbia corridor to I-205. The corridor supports freight movement to US 26, provides connections to recreation areas, and is an important bicycle connector. There were **48** serious injuries and fatalities on this corridor between 2007-2017. **32%** of this corridor is in an equity focus area.





2020 TRANSPORTATION FUNDING MEASURE
20061

Metro 10

Scenario A: Network without Sunrise Extension

If the Sunrise Corridor is not extended to 172nd Avenue, the planned collector and arterial network to address future growth would require nine separate roadway improvements with an estimated capital cost of $84.4 million (**Exhibit 5**).

DKS Associates performed supplemental traffic analysis to determine how the planned transportation improvements would address local (City/County) vs. Regional (Metro/State) capacity requirements With Scenario A, the supplemental traffic analysis indicates that the three Highway 212 improvements would address regional capacity needs (58%) more than local requirements (42%) based on future trip shares (see **Appendix A**). If this proportional share is used as a proxy for allocating cost responsibilities, the total cost of constructing the transportation network would be approximately $70.3 million for local agencies and $14.1 million for regional agencies (**Exhibit 5**).

In addition to these roadway improvements, local sanitary sewer, waterline and recycled water (purple pipe) improvements are estimated to cost $9.5 million. While the sanitary sewer and water improvements are expected to be 100 percent funded through SDCs, most roadway improvements do not have dedicated sources of funding.

Exhibit 5

Potential TSDC Capital Project List: Scenario A without Sunrise Corridor

Roadway Network	Total Cost	Proportional Share %		Proportional Share $	
		Local	Regional	Local	Regional
SE 162nd Ave. Extension (OR 212 to Taralon)	$20,900,000	100%	0%	$20,900,000	$0
Hwy 212 Improvements (OR 212/224 Jct. to 162nd)	$16,900,000	42%	58%	$7,175,185	$9,724,815
Hwy 212 Improvements (162nd to 172nd)	$6,600,000	42%	58%	$2,802,143	$3,797,857
Hwy 212/ 162nd Roundabout	$1,000,000	42%	58%	$424,567	$575,433
SE Rock Creek Blvd (162nd to 172nd)	$7,500,000	100%	0%	$7,500,000	$0
SE Parklane Dr. (162nd to Collector 3)	$10,100,000	100%	0%	$10,100,000	$0
Collector-1 (172nd to Collector-2)	$9,400,000	100%	0%	$9,400,000	$0
Collector-2 (172nd to Collector-1)	$3,300,000	100%	0%	$3,300,000	$0
Collector-3 (162nd to 172nd)	$8,700,000	100%	0%	$8,700,000	$0
Subtotal Roadway Network	**$84,400,000**			**$70,301,895**	**$14,098,105**
Sanitary and Water Cost Estimate					
Sanitary Sewer with RCEC	$1,900,000	100%	0%	$1,900,000	$0
Waterline Improvements within RCEC	$7,000,000	100%	0%	$7,000,000	$0
Purple Pipe (162nd) within RCEC	$600,000	100%	0%	$600,000	$0
Subtotal Sanitary and Water	**$9,500,000**			**$9,500,000**	**$0**
Total	**$93,900,000**			**$79,801,895**	**$14,098,105**

Source: Cost estimates based on HHPR RCEC Memorandum, March 27, 2020;

Proportional share analysis by DKS Associates, based on Metro 2040 demand models developed for Sunrise Gateway project.

Scenario B: Network with Sunrise Extension

With the Sunrise Corridor extension, the need for Highway 212 improvements would be alleviated. Under Scenario B, six separate local transportation elements would be required at a total cost of $59.9 million. Since the Sunrise Corridor would address regional capacity requirements, the transportation projects required in this scenario would be needed to address local capacity only **(Exhibit 6**).

As with Scenario A, in addition to these roadway improvements, local sanitary sewer, waterline and recycled water (purple pipe) improvements are estimated to cost $9.5 million.

Exhibit 6

Captial Cost Assumptions, Scenario B with Sunrise Corridor

Roadway Network	Total Cost	Proportional Share %		Proportional Share $	
		Local	Regional	Local	Regional*
SE 162nd Ave. Extension (OR 212 to Taralon)	$20,900,000	100%	0%	$20,900,000	$0
Hwy 212 Improvements (OR 212/224 Jct. to 162nd)	n/a				
Hwy 212 Improvements (162nd to 172nd)	n/a				
OR 212/ 162nd Roundabout	n/a				
SE Rock Creek Blvd (162nd to 172nd)	$7,500,000	100%	0%	$7,500,000	$0
SE Parklane Dr. (162nd to Collector 3)	$10,100,000	100%	0%	$10,100,000	$0
Collector-1 (172nd to Collector-2)	$9,400,000	100%	0%	$9,400,000	$0
Collector-2 (172nd to Collector-1)	$3,300,000	100%	0%	$3,300,000	$0
Collector-3 (162nd to 172nd)	$8,700,000	100%	0%	$8,700,000	$0
Subtotal Roadway Network	**$59,900,000**			**$59,900,000**	**$0**
Sanitary and Water Cost Estimate					
Sanitary Sewer with RCEC	$1,900,000	100%	0%	$1,900,000	$0
Waterline Improvements within RCEC	$7,000,000	100%	0%	$7,000,000	$0
Purple Pipe (162nd) within RCEC	$600,000	100%	0%	$600,000	$0
Subtotal Sanitary and Water	**$9,500,000**			**$9,500,000**	**$0**
Total	**$69,400,000**			**$69,400,000**	**$0**

*Source: Cost estimates based on HHPR RCEC Memorandum, March 27, 2020; * excludes Sunrise Corridor.*

proportional share analysis by DKS Associates, based on Metro 2040 demand models developed for Sunrise Gateway project.

C. SANITARY SEWER, STORM WATER AND WATER SYSTEM

The planned sanitary sewer and water infrastructure improvements would be the same under both scenarios. Local sanitary sewer, waterline and recycled water (purple pipe) improvements are estimated to cost $9.5 million. Please refer to the HHPR Memorandum dated March 27, 2020 for additional detail.

The Sunrise Water Authority (SWA) is the designated utility provider for water system improvements and has provided input that have been included with the HHPR estimates shown above. According to SWA, the costs for the water system for mainline and pump station improvements are to be recovered by system development charge and connection charge revenues. Water distribution lines (at or below 12-inch diameter) are expected to be installed as frontage improvements are established at the cost of the development.

Clackamas County Water Environmental Services (WES) is responsible for providing sanitary sewer disposal, treatment and operations, as well as managing watershed health and quality for its service areas. A portion of the Rock Creek sanitary sewer interceptor line is already in place and the current WES Capital Improvement Program anticipates extension of this interceptor northward by approximately 2,000 feet over the next 5 years. According to Clackamas WES, the current sanitary sewer SDCs and connection charges in Zone 2 are adequate for funding planned interceptor extensions. Developers are responsible for constructing connections (less than 12-inch diameter) to the interceptor system at their expense. Depending upon the distance required to connect, developers can potentially get partially reimbursed through formation of a local reimbursement district.

FUNDING ANALYSIS

This section of the report identifies current and potential local funding techniques that are available to Happy Valley to fund planned transportation improvements.

A. FUNDING AND FINANCING OPTIONS

Funding options used most frequently in Oregon include:

- Transportation System Development Charges
- Local Improvement District
- Latecomers District (aka. Reimbursement District)
- Urban Renewal District (tax increment revenues)
- Transportation Utility Charges
- Dedications and Exactions
- Developer Agreements
- Intergovernmental Agreements
- Local Fuel Taxes
- Grants (state or federal)

These funding resources are often combined to fund specific capital improvements (through pay-as-you-go funding) or to cover annual debt financing costs. As shown in **Exhibit 7**, there are limitations that determine how monies can be used, and there are advantages and disadvantages with each funding technique.

The City may desire to advance finance a transportation project using various means or intermediary resources. Most common forms of debt financing include:

- Private bank loans
- Limited General Obligation Bonds (non-voter-approved full faith and credit bonds)
- General Obligation Bonds (voter approved bonds, secured by property taxes)
- State loans (e.g., Oregon Special Public Works Fund)

The preferred mix of funding and financing requires careful consideration of the project phasing so that public facilities can be provided in a manner that is generally concurrent with development activity.

Exhibit 7 Summary of Local Capital Project Funding and Financing Techniques

Technique	Considerations					
	Funding or Financing	Area of Benefit	Lead	Capital Funding Level	Advantages	Disadvantages
Transportation TSDCs (city-wide)	Funding	Citywide	City Council	$$$	Existing citywide TSDC can be updated to include RCEC projects	RCEC projects may not have priority over other city projects. SDC revenue lags behind improvement needs.
Supplemental TSDCs (RCEC)	Funding	RCEC	City Council	$$	New District TSDC could dedicate funds to RCEC	SDC revenue lags behind improvement needs
Local Improvement Dist.	Funding	RCEC	City Council with consent from property owners	$	Addresses specific capital improvements; stable income streams; equitable allocation results in support by affected prop. owners; low risk from city perspective	Leins on property may encumber land transactions; LIDs still require advance financing from city or developer
Reimbursement District	Funding	RCEC	City Council with consent from property owners	$	Like LID but no stable income stream. No liens on properties garners support from land owners	Requires advance financing to pay for capital facilities without stable revenue stream
Urban Renewal District (URD)	May be Both	RCEC	URA, City Council	$$	New URD can generate funds as development occurs; can be used as a funding match	Tax increment revenues lag behind development
Property Easement Dedications	In kind	Project Specific	City Council & Developer	$	Developer provides easements for future projects as a condition of approval; can be SDC eligible	City must construct capital improvements
Dedications and Exactions	In kind	Project Specific	City Council & Developer	$	Developer constructs roads to city standard as a condition of approval; may include dedications or exactions; or provisions where investment is 100% credit eligible	Usually limited to subdivisions or major developments
Development Agreement (with special assessment)	Funding	Project and Area Specific	City Council & Developer	$$	Developer or City provides advance financing for specific improvements not on TSDC project list, which may be 100% credit eligible	Risk of non performance by developers
Intergovernmental Cost Sharing Agreements	Funding	Project Specific	City, County, Metro & ODOT	$$	Project-specific non-local funding source	High legal costs (documents) and multi-agency political complications
Local Fuel Taxes	Funding	Citywide	City Council & Voters	$	Flexible funding source for capital or maintenance	Usually requires public vote. Very limited capital funding potential
Grants	Funding	Project Specific	City Council & Affected Agencies	$	Project-specific non-local funding source	Grants are usually very competitive with limited funding availability
General Obligation Bonds (voter approved)	Financing	Project Specific	City Voters	$$$	Project-specific funding source with dedicated source of stable revenue (property tax). Limited risk to City	Public voter referendum has admin cost to City with no guaranteed approval
Full Faith & Credit Bonds (councilmatic)	Financing	Project Specific	City Council	$$	Project-specific funding source if dedicated revenues are committed.	Encumbers City debt capacity
Bank Loans	Financing	Project Specific	City Council	$$	Project-specific funding source	Interest rates are higher than Bond issues
State Bank Loans	Financing	Project Specific	City Council and State	$$	Project-specific funding source of up to $10M	Interest rates are higher than private bank loans.

Relative Funding Potential: $ low; $$ Medium; $$$ High.

Transportation System Development Charge (TSDC)

Oregon Revised Statutes (ORS) 223.297 to 223.314 authorize local governments to establish system development charges (SDCs) as one-time fees on new development usually paid at the time of building permit issuance. SDCs are intended to recover a fair share of the capital improvements, including the cost of existing and planned facilities that provide capacity to serve future growth. Public facilities are required to be a "qualified public improvement" per ORS 223.309, and governments must have an ordinance or resolution that establishes or modifies an improvement fee and provides credit against such fee for the construction of a qualified public improvement.

The City of Happy Valley current TSDC for FY 2019/20 is $9,610 per PHVT (per single family detached home). As indicate in Appendix B, SDCs vary by development type.

As indicated in **Exhibit 8**, based on the current TSDC, future development within the study area is expected to generate approximately $11.4 million (at buildout) before credits or discounts are applied. In light of the COVID-19 global pandemic, a lower growth rate that results in 50% buildout over 20 years would result in approximately $5.7 million in TSDC revenues. The City can dedicate these revenues to any eligible qualified public improvement.

Exhibit 8: Potential TSDC Revenues, RCEC Benefit Area (TAZs 794, 798 and 799)

TAZ	Location	Net new HH Trips	Net new Emp. Trips	Proj. Total Trips (ADT)*	Net New Peak-hour Trips**	Gross TSDC Revenues at full bulidout***	Gross TSDC Revenues at 50% bulidout
794	RCEC	250	1,137	1,387	139	$1,332,907	$666,454
798	RCEC	2,040	1,050	3,090	309	$2,969,490	$1,484,745
799	North Carver	6,860	531	7,391	739	$7,102,438	$3,551,219
	Total	**9,150**	**2,718**	**11,868**	**1,187**	**$11,404,835**	**$5,702,418**

Notes:

** Assumes average of 10 trips per household and 3 trips per job.*

*** Assumes 10% peak-hour factor.*

**** Based on $9,610 TSDC per peak hour trip; amounts shown are before credits or discounts.*

TAZ = traffic analysis zone. ADT = average daily vehicle trip.

Since this study includes planned transportation collector facility improvements that have not yet been formally adopted as part of the TSDC Methodology Report, it is recommended that the City update its TSDC capital project list and methodology report to reflect these study findings.

The City has the four main TSDC options to consider.

- **Option 1 Amend TSDC Project List**: requires adoption of a resolution with amendment to the TSDC Capital Project List to reflect additional RCEC projects listed in **Exhibit 9**.
- **Option 2 Revise/Adopt new Citywide TSDC Methodology**: by adding the local share of capital projects which have not yet been included in the City's existing TSDC Capital Projects List, this option could result in a TSDC Eligible Cost Basis increase of at least $49.4 million. If the citywide projected "growth trip ends" remains at the level assumed by the 2017 TSDC Methodology Report (16,900 PHVT), this option would result in an increase in the citywide TSDC by approximately $2,923 per peak-hour vehicle trip (PHVT). Since current TSDC rates are $9,610 per PHVT, TSDCs would increase to approximately $12,533 per PHVT.

- **Option 3 Create a RCEC TSDC Overlay District**: this option could result in a TSDC Eligible Cost Basis increase of at least $49.4 million. If the growth in RCEC District projected "growth trip ends" is as estimated in the current TSDC Methodology Report (1,187 PHVT at buildout), this option would result in a new District TSDC of $41,617 per PHVT. Since current TSDC rates are $9,610 per PHVT, future development in the RCEC would be charged over $51,000 per PHVT. This policy is not recommended as it would result in the highest TSDC in Oregon and would inadvertently cause a moratorium on future development.
- **Option 4, Hybrid Methodology with New Overlay District**: by adding selected projects on the Citywide TSDC Project List and placing other on a RCEC District TSDC Project List, the City could increase the citywide TSDC by an established rate (e.g., $2,000 per PHVT within the City) and create a special RCEC TSDC overlay rate (e.g., supplemental $3,000 per PHVT within the District) which would generate revenues for specific projects within the RCEC. This policy is not recommended as it would still result in a very high TSDC within the RCEC of approximately $14,610 per PHVT which could inadvertently preempt development feasibility.

It is recommended that the City pursue Option 2, which would increase the citywide TSDC by up to approximately $12,533 per PHVT. This would put Happy Valley's TSDCs slightly higher than Sherwood ($11,144) but below Wilsonville ($13,357) and Lake Oswego ($15,460).

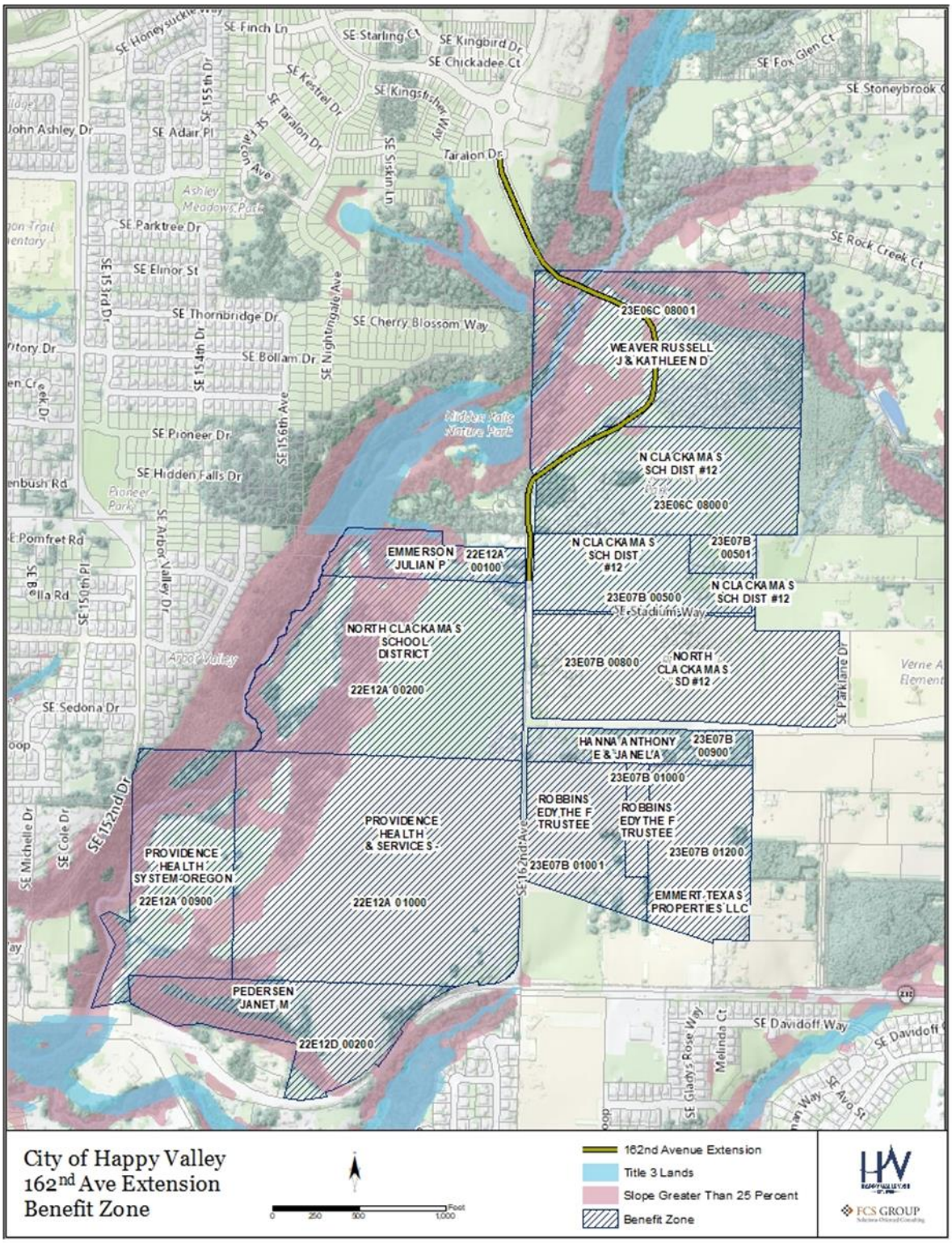
Local Improvement Districts (LIDs)

Cities in Oregon have the statutory authority to establish local improvement districts (LIDs) and levy special assessments on the benefited property to pay for improvements. These assessments are payable in annual installments for up to 30 years. LIDs are used for capital improvement projects that benefit numerous large tenants and/or private property owners. Please refer to Chapter 3.12 of the Happy Valley Code for additional information pertaining to LID Assessments.

The primary advantage of LIDs from the City's perspective is the ability to obtain a consistent level of revenue early in the development process. A LID charge, if transferable, can also provide property owners with a certain degree of financial flexibility compared to SDCs. Financial intermediaries such as banks now view LIDs as a more reliable funding source than others (such as SDCs) and are more apt to provide loans based on future LID revenue streams.

Happy Valley has successfully implemented LIDs in the past, as shown in the following case study. A 2019 study by FCS GROUP for the City of Happy Valley determined that for every $1M in LID assessments, affected property owners in RCEC Zone A (**Exhibit 9**), would be assessed approximately $5,000 per acre (one time charge). If paid monthly over 15 years, this $1M LID assessment would equate to approximately $43 per acre for each property within Zone A.

Exhibit 9 RCEC Zone A Potential Benefit Area



Latecomer Agreements or Reimbursement Districts

Similar to LIDs, cities or developers can negotiate arrangements to get reimbursed for providing upfront capital improvements. The party that advances the financing is then partially reimbursed as new land use development approvals are granted within the district over a period that usually extends up to 10 years. With reimbursement districts, there is no lien on property and no guarantee that future revenues will be as steady and reliable as in the case with a LID or property tax assessments.

Urban Renewal District (URD)

The City of Happy Valley recently adopted an urban renewal district (URD) within East Happy Valley. The URD project list has several transportation projects as part of its capital improvement program, including the 162nd Avenue South (extension) project at a cost of $18.64 million.[1] The URD plan assumes that $3.0 million of that project would be funded using TSDCs and the remainder through a mix of URD and other revenue sources.

In many cases, URD funds are combined with other local funding sources to leverage non-local grants or loans to pay for needed infrastructure improvements. This could include capital facilities, land/right-of-way acquisition, and loans or grants.

Exactions and Dedications

An exaction is a requirement that an owner give up a property right, such as extra right-of-way, as a condition of approval of a land use decision. Local governments have the power to impose exactions based on zoning and regulatory powers they possess. An exaction is constitutional if it complies with the "rough proportionality" and "nexus" measures, which were established in landmark cases (Dolan v. City of Tigard, Nollan v. California Coastal Commission) which requires:

- The exaction must advance a legitimate state (public) interest;
- The exaction must have an "essential nexus" to the state interest; and
- The exaction is "roughly proportional" to the impacts of the development being considered.

Dedications pertain to capital facility improvements that developers are required to construct, and in-turn dedicate to the public for its use and/or ownership. On occasion, exactions and dedications can be used in combination, such as the requirement that a developer dedicate additional right of way and construct a public sidewalk along a roadway fronting their property when "major" improvements to the property are made.

The laws are always evolving, so local governments must carefully implement exactions and dedications to avoid legal pitfalls. First, exactions should be founded on the same general police power that underlies all zoning: the authority to protect the health, safety or welfare of the public. Second, is the need for clarity and reasonableness. As such, local governments may not establish conditions that it knows are impossible to meet or that have no rational basis in fact.

Exactions and dedications are typically applied to "local neighborhood facilities" such as minor streets and sidewalks that are directly related to a property being developed or improved. As such,

[1] The cost estimate for 162nd Ave. that was included in the URD Plan was a planning level estimate that is now being refined.

major public facilities, such as collector roads and water/sewer mains and pump stations are better addressed (and funded) using one or more of the other funding techniques described herein.

Utility Rates and Surcharges

Utility rates are a common way to raise local revenues for required infrastructure facilities and operations. They require approval and adoption by the service district and must meet state and local regulations. Utility rates are paid for by customers within the service area and typically are included in monthly or bi-monthly utility bills for other services. In addition to a "base rate", the utility may also assess a local rate surcharge for water and sanitary sewer services.

Currently, the City of Happy Valley does not charge a transportation utility and the Sunrise Water Authority and Clackamas WES do not typically have a surcharge on water or sewer bills. However, should the City proceed with the adoption of a transportation utility fee, that revenue could generate additional roadway maintenance funds that in-turn "free up" other funding that could be pledged towards future capital projects.

Intergovernmental Agreements

Just as cities have urban growth management agreements between cities, counties and utility providers to guide how potential annexation areas are to be served, governments can also adopt cost-sharing or "full funding" agreements for specific projects. In such instances, multiple government entities may agree to coordinate project delivery through an agreement and commit to funding and maintaining identified project elements.

As noted in the analysis of Scenario A, in light of the expected regional (Metro and ODOT) capacity benefits that would result once improvements are made to Highway 212/224, there is an opportunity to explore an intergovernmental agreement that would orchestrate design and also allocate costs for construction. Each entity would be responsible for contributing their portion of the project cost through whichever means they determine to be the most feasible and prudent.

Developer Agreements

A development agreement is a contract between a local jurisdiction and a person who owns or controls property within the jurisdiction, detailing the obligations of both parties and specifying the standards and conditions that will govern development of the property.

A Development Agreement typically provides assurances to the City and to the developer that the land use regulations that apply will not change during the term of the agreement. Agreements usually identify provisions for reservation or dedication of land for public purposes; responsibilities for providing infrastructure and services; and construction expenditure provisions for public facility investments.

Key provisions of development agreements typically include:

- Voluntary Agreements between private and public entities
- Usually entails private dedication of ROW and/or public facilities in exchange for development entitlements
- Private construction of street (to public standards) and limited operation and maintenance (O&M) for a defined period of time.
- Non-remonstrance towards adoption of existing or future fees and charges

- Developer may agree to provide advance financing for a portion of the project and request formation of a LID or Latecomers charge for a share of costs they incur
- Vested rights (time of performance)
- Security bond
- Flexibility (minor and major amendments to the agreement)

Various forms of annexation and development agreements have been utilized by Oregon cities, including Hillsboro and Wilsonville for urbanizing areas (South Hillsboro and Frog Pond West). In these cases, local ordinances were adopted to clearly identify the benefit district; public facility improvements; capital costs; and funding techniques that will be applied to those locations, such as SDC overlays, LIDs and special assessments.

The City already requires non-remonstrance agreements (waiving rights to oppose a future formation of a Reimbursement District or Local Improvement District) from property owners that desire to be annexed into the City.

Debt Financing

The City of Happy Valley may incur debt to pay for capital facilities, such as streets and other "public" projects deemed to have a community benefit. The most typical forms of financing public infrastructure are through bonds or bank loans. Bonds are a common means of financing projects whose benefits are not confined to a single local district.

Limited General Obligation Bonds or full faith and credit bonds do not require voter approval and they are not subject to debt service coverage requirements. However, like revenue bonds, an ongoing source of revenue would need to be pledged to protect the City's general fund from added risk.

B. EVALUATION OF FUNDING TECHNIQUES

An evaluation of funding options was conducted to ascertain the relative merits of the potential funding measures identified above. The primary evaluation criteria used for this study are described below.

Capital Funding Amount Raised

Each funding technique has the potential of increasing revenue to the City that can be used to fund or finance construction of public facilities. In some cases, such as with the use of impact fees and Road Improvement Districts, the funds generated can only be used for eligible capital projects. In other cases, such as with utility rates, the funds can be used for operations or capital improvements. In general, the broader the assessment area (e.g., citywide assessment vs. special district), the greater the potential revenue. A score of 1 (low) to 5 (high) was assigned to each funding technique based on the anticipated level of funds it would generate.

Ease of Implementation

Ease of Implementation refers to the process and administrative cost required to implement the funding technique identified. Some funding sources, such as utility rates and SDCs do not require public votes to enact and therefore are relatively easier to implement than funding sources that require a public vote or legal formation steps (such as a new limited G.O Bond or LIDs). A score of 1

(low) to 5 (high) was assigned to each funding scenario, based on the relative ease of implementation to enact the relevant funding options.

Administration Costs

The cost to the City of Happy Valley of implementing and administering a new funding technique is an important consideration, which can result in short-term and long-term cost considerations. In general, augmenting an existing funding technique, such as a utility surcharge increase, is typically less costly than creating and maintaining a new funding technique, such as a new citywide impact fee or transportation benefit district. A score of 1 (low) to 5 (high) was assigned based on the anticipated level of administrative costs and staff time that would be required.

Risk to City

The level of risk associated with any funding technique is another important criterion. While each type of revenue technique being discussed will have some level of risk, the ability to allocate revenues to capital needs can provide the City with flexibility to address important needs as they arise. For example, utility fees are far more flexible than impact fees in how they can be used to address capital needs in a timely and consistent manner. Risk levels tend to increase if the reliability of funds diminishes during an economic downtown. Funding sources, such as SDCs and Urban Renewal Districts, do not generate revenue in a predictable manner and have major restrictions on how those funds can be used. In comparison, LIDs and Limited G.O. Bonds tend to be far more reliable and can be targeted to locally defined projects or programs. A score of 1 (low) to 5 (high) was assigned to each funding technique based on how reliable (predictable) revenue should be in the future.

Citywide Equity

Equity is defined herein as the equitable distribution between the cost to rate/fee payers and where the funds are to be spent. A score was assigned to each funding scenario ranging from low cost/risk (1) to high cost/risk (5).

C. PRELIMINARY RECOMMENDATIONS

A total score was computed for each funding technique based on the number of "$'s" assigned to each criteria. The total score was then used to rank each funding scenario. Based on the results shown in **Exhibit 10**, the funding techniques with the highest scores are recommended for additional consideration:

- Right-of-way dedications
- Intergovernmental cost sharing agreement for Highway 212 improvements (e.g., City/ODOT)
- Transportation System Development Charge (citywide)
- Supplemental Transportation System Development Charge (District)
- Urban Renewal District, Tax Increment Financing (for 162nd Ave., bridge)
- Developer/Annexation Agreement with Special Assessment (for 162nd Ave. bridge)
- Transportation Utility Fee (citywide)

Exhibit 10 Evaluation of Selected Funding Techniques

Funding Tool	Facilities Targeted	Evaluation Considerations							
		Area of Benefit	Approval Body	Capital Funding Raised	Ease of Imple-mentation	Low Admin. Costs	Low Risk to City	Positive Citywide Equity	Total Score
ROW Dedications	Transportation, Water, Storm, Sewer	Project Specific	City Council & Prop. Owners	$	$$$$	$$$$	$$$$$	$$$$$	23
Intergovernmental Agreement with cost sharing (City/ODOT)	Transportation	Project Specific	City Council & ODOT	$$$	$	$$$	$$$$$	$$$$$	17
Sytem Development Charge (city wide)	Transportation	Citywide	City Council	$$$	$$$$	$$$$	$$$	$$$	17
Sytem Development Charge (district)	Transportation	District	City Council	$	$$$$	$$$$	$$$	$$$$$	16
Urban Renewal District (tax increment financing)	Transportation	District	Urban Renewal Authority	$$	$$$	$$$	$$	$$$$$	15
Utility Fee	Transportation, Stormwater	Citywide	City Council	$	$$	$$	$$$$$	$$$$$	15
Developer Agreements with special assessment	Transportation	Project or Area Specific	City Council & property owners/developers	$	$$$	$$$	$$	$$$$$	14
Local Improvement District	Transportation	District	City Council & Prop. Owners	$	$$	$$	$$$	$$$$$	13
Reimbursement Districts or Late Comers Charge	Transportation, Sewer, Stormwater	District	City Council & Prop. Owners	$	$$$	$$	$	$$$$	11
Local Fuel Tax	Transportation	Citywide	City Council	$	$	$$$	$$	$	10

Legend:

+ least positive

+++++ most positive

SECTION IV: RECOMMENDATIONS

A. CONCEPTUAL FUNDING STRATEGIES

The recommended funding strategy varies by improvement scenario. The funding strategy for Scenario A, without the Sunrise Corridor recommends a mix of regional/state cost sharing and local TSDC increases to fully fund the recommended transportation improvements. Scenario B, with the Sunrise Corridor assumes 100% local funding through a mix of TSDC, URD and other special assessments (**Exhibit 11**).

These conceptual funding scenarios assume the local citywide TSDCs increase from their current level of $9,610 per PHVT by approximately $2,923 with Scenario A and by $3,189 with Scenario B. This would result in citywide TSDCs ranging from $10,802 to $11,068. This would put Happy Valley's TSDCs slightly below Sherwood ($11,144), and well below Wilsonville ($13,357) and Lake Oswego ($15,460).

Under Scenario B without the Sunrise Corridor extension, the addition of the 162nd Avenue bridge and extension would increase the local transportation costs by approximately $10.5 million relative to Scenario A. To help keep TSDCs in line with other jurisdictions, additional local funding resources are recommended, including use of urban renewals funds as well as special assessments within the RCEC. These special assessments could be in the form of a supplemental TSDCs, LID or special assessment (through a districtwide development agreement).

The result of this funding scenario would be a citywide TSDC of approximately $11,068 and a supplemental assessment within the RCEC special district (includes TAZs 794, 7987, 799) that equates to approximately $1,685 per PHVT. For comparison purposes, the special assessments included within the South Hillsboro and Frog Pond West Wilsonville subdistricts range from $12,000 to $14,000 per PHVT.

B. NEXT STEPS

The findings and recommendations provided in this report are for informational and discussion purposes only. As findings are shared with city officials, property owners, and other interested stakeholders, Happy Valley staff can make informed decisions about the likelihood and timing of any potential funding technique.

It is recommended that city staff consider the following actions to further refine this funding strategy:

1. Obtain input from Metro, Clackamas County and ODOT representatives regarding the potential for regional cost sharing for Highway 212/224 improvements;
2. Involve city officials and property owners to ascertain local funding preferences;
3. Implement a citywide TSDC methodology update and amendments to the capital project list of eligible improvements;
4. Continue to pursue other local funding sources, such as transportation utility fees and urban renewal funding to be used as a match for leveraging non-local grants.
5. Coordination with Sunrise Water Authority and Clackamas WES regarding the timing of sanitary sewer and water improvements.

Exhibit 12: Conceptual Funding Strategy

Scenario A, without Sunrise Corridor (TSDC update with regional cost sharing)

Transportation Funding Assumptions, Scenario A without Sunrise Corridor

Roadway Network	Potential Funding Source: Regional Cost Share	Current Citywide TSDC eligible cost*	New Citywide TSDC eligible cost	District TSDC or Special Assessment	URD & Other Funds	Total
SE 162nd Ave. Extension (OR 212 to Taralon)		$20,900,000		$0	$0	$20,900,000
Hwy 212 Improvements (OR 212/224 Jct. to 162nd)	$9,724,815		$7,175,185	$0	$0	$16,900,000
Hwy 212 Improvements (162nd to 172nd)	$3,797,857		$2,802,143	$0	$0	$6,600,000
Hwy 212/ 162nd Roundabout	$575,433		$424,567	$0	$0	$1,000,000
SE Rock Creek Blvd (162nd to 172nd)			$7,500,000	$0	$0	$7,500,000
SE Parklane Dr. (162nd to Collector 3)			$10,100,000	$0	$0	$10,100,000
Collector-1 (172nd to Collector-2)			$9,400,000	$0	$0	$9,400,000
Collector-2 (172nd to Collector-1)			$3,300,000	$0	$0	$3,300,000
Collector-3 (162nd to 172nd)			$8,700,000	$0	$0	$8,700,000
Total Roadway Network	**$14,098,105**	**$20,900,000**	**$49,401,895**	**$0**	**$0**	**$84,400,000**

$2,923	Potential TSDC increase
$9,610	Existing TSDC per PHVT
$12,533	**Total citywide TSDC after increase (PHVT)**

**reflects current Happy Valley TSDC methodology, capital costs adjusted to 2020 dollars.*

Scenario B, with Sunrise Corridor (TSDC update with LID and URD funding)

Transportation Funding Assumptions, Scenario B with Sunrise Corridor

Roadway Network	Potential Funding Source: Current Citywide TSDC eligible cost*	New Citywide TSDC eligible cost	Change in TSDC cost basis	District TSDC or Special Assessment	URD & Other Funds	Total Project Cost
SE 162nd Ave. Extension (OR 212 to Taralon)	$20,900,000	$14,900,000	($6,000,000)	$2,000,000	$4,000,000	$20,900,000
Hwy 212 Improvements (OR 212/224 Jct. to 162nd)		$0	$0	$0	$0	$0
Hwy 212 Improvements (162nd to 172nd)		$0	$0	$0	$0	$0
Hwy 212/ 162nd Roundabout		$0	$0	$0	$0	$0
SE Rock Creek Blvd (162nd to 172nd)		$7,500,000	$7,500,000	$0	$0	$7,500,000
SE Parklane Dr. (162nd to Collector 3)		$10,100,000	$10,100,000	$0	$0	$10,100,000
Collector-1 (172nd to Collector-2)		$9,400,000	$9,400,000	$0	$0	$9,400,000
Collector-2 (172nd to Collector-1)		$3,300,000	$3,300,000	$0	$0	$3,300,000
Collector-3 (162nd to 172nd)		$8,700,000	$8,700,000	$0	$0	$8,700,000
Total Roadway Network		**$53,900,000**	**$33,000,000**	**$2,000,000**	**$4,000,000**	**$59,900,000**

$1,953	Potential TSDC increase
$9,610	Existing TSDC per PHVT
$11,563	**Total Citywide TSDC after increase**
$1,685	Supplemental Assessment
$13,248	**Total RCEC Assessment per PHVT**

APPENDIX A: PROPORTIONAL SHARE ANALYSIS

Proportionate Share Analysis

Segment	Direction	Scenario A, w/o Sunrise Corridor			Scenario B, with Sunrise Corridor	
		% HV Trips	% Regional Trips		% HV Trips	% Regional Trips
OR-212 (east of OR-224)	EB	41%	59%		100%	0%
OR-212 (east of OR-224)	WB	44%	56%		100%	0%
Average		***42%***	***58%***		***100%***	***0%***
OR-212 (west of OR-224)	EB	52%	48%		57%	43%
OR-212 (west of OR-224)	WB	52%	48%		56%	44%
Average		***52%***	***48%***		***57%***	***43%***
162nd (Rock Creek and OR-212)	NB	100%	0%		100%	0%
162nd (Rock Creek and OR-212)	SB	100%	0%		100%	0%
Average		***100%***	***0%***		***100%***	***0%***
162nd (north of Rock Creek)	NB	100%	0%		100%	0%
162nd (north of Rock Creek)	SB	100%	0%		100%	0%
Average		***100%***	***0%***		***100%***	***0%***
``	EB	100%	0%		100%	0%
Rock Creek Blvd. (162nd and 172nd)	WB	100%	0%		100%	0%
Average		***100%***	***0%***		***100%***	***0%***
172nd (Rock Creek and OR-212)	NB	62%	38%		52%	48%
172nd (Rock Creek and OR-212)	SB	68%	32%		58%	42%
Average		***65%***	***35%***		***55%***	***45%***
172nd (north of Rock Creek)	NB	67%	33%		53%	47%
172nd (north of Rock Creek)	SB	69%	31%		56%	44%
Average		***68%***	***32%***		***55%***	***45%***

Source: DKS Associates.

Analysis based on Metro 2040 demand models developed for Sunrise Gateway project

APPENDIX B: HAPPY VALLEY SDC RATES

Happy Valley TSDC Fee Schedule			
Fiscal Year (July 1st - June 30th)			**2019-20**
CCI = Construction Cost Index for Seattle by ENR each month & year			**5.20%**
Land Use Category	**Units**	**ITE Codes**	**2019-20**
Transit Parking	Parking Space	90, 93	$5,959
Industrial/Manufacturing/Warehouse	1,000 Gross Sq. Ft.	110,120,130,140,150,151,170	$5,478
Single-Family Detached Housing	Dwelling Unit	210	$9,610
Apartment	Dwelling Unit	220	$5,959
Residential Condo/Townhouse	Dwelling Unit	230	$4,997
Mobile Home in Park	Space	240	$5,670
Assisted Living	Beds	254,620	$2,113
Senior Housing	Dwelling Unit	251,253,255	$2,067
Hotel/Motel	Room	310,320	$5,766
Parks	Acre	411,412	$865
Campground/RV Park	Site	416	$2,594
Marina	Berths	420	$1,826
Golf Course	Holes	430	$28,061
Golf Driving Range	Tee/Drive Position	432	$12,013
Recreation Community Center	1,000 Gross Sq. Ft.	435,495	$26,331
Bowling Alley	Bowling Lanes	437	$14,510
Movie Theater	Movie Screens	443,444,445	$131,081
Casino/Video Lottery Establishment	1,000 Gross Sq. Ft.	473	$129,063
Soccer Complex	Field	488	$170,097
Racquet/Tennis Club	Court	491	$32,193
Health/Fitness Club	1,000 Gross Sq. Ft.	492	$33,924
Military Base	Employees	501	$3,748
Education	Student	520,522,530,536,540,550	$1,402
Church	1,000 Gross Sq. Ft.	560	$5,286
Day Care	Student	565	$3,425
Library	1,000 Gross Sq. Ft.	590	$70,154
Hospital	Beds	610	$13,647
Medical-Dental	1,000 Gross Sq. Ft.	720,630	$34,307
Office	1,000 Gross Sq. Ft.	710,714,715,730,750,760,770	$13,534
State Motor Vehicles Department	1,000 Gross Sq. Ft.	731	$164,234
Post Office	1,000 Gross Sq. Ft.	732	$89,494
Building & Hardware	1,000 Gross Sq. Ft.	812,816	$28,428
Free-Standing Discount Store	1,000 Gross Sq. Ft.	813,815	$19,428
Nursery	1,000 Gross Sq. Ft.	817,818	$42,628
Factory Outlet Center	1,000 Gross Sq. Ft.	823	$14,524
Automobile Sales	1,000 Gross Sq. Ft.	841	$16,617
Automobile Parts Sales	1,000 Gross Sq. Ft.	843	$32,756
Tire Stores	1,000 Gross Sq. Ft.	848,849	$21,658
Supermarket	1,000 Gross Sq. Ft.	850,854	$23,687
Convenience Market	1,000 Gross Sq. Ft.	851,852	$158,816
Shopping/Retail	1,000 GSF Lease Area	820,826,862,863,867	$15,725
Pharmacy	1,000 Gross Sq. Ft.	880,881	$31,415
Furniture Store	1,000 Gross Sq. Ft.	890	$2,032
Bank	1,000 Gross Sq. Ft.	911,912	$91,075
Restaurants	1,000 Gross Sq. Ft.	925,931,932	$25,108
Fast Food	1,000 Gross Sq. Ft.	933,934	$105,184
Coffee/Donut Shop	1,000 Gross Sq. Ft.	936,937	$45,244
Quick Lubrication Veh. Shop	Service Positions	941	$28,928
Automobile Care Center	1,000 Gross Sq. Ft.	942	$17,335
Service Stations	Fueling positions	853,944,945,946	$22,060
(1) Based on PM Peak Hour Trips			
(2) Includes compliance cost			
TSDC Rate for Self storage calculate at $1450 per 1,000 Gross Square Feet (Per MDW)			

APPENDIX C: LID CASE STUDIES

HAPPY VALLEY 152ND MISTY DRIVE LID

In 2003, as Happy Valley emerged as the second fastest growing city in Oregon, the Rock Creek urban reserve was slated to absorb significant residential growth in the City. The owners of the land, along with officials from Happy Valley and Clackamas County, identified the need for a new major street to serve the influx of new homes and residents. Most of the project's cost was paid with system development charges; however, the anticipated $8 million road had a $1.44 million funding gap. After analyzing the project, consultants, property owners and city officials agreed that a local improvement district (LID) would be the best solution.

The project paved a three-lane road complete with landscaped medians, pedestrian crossings, sidewalks, and bike lanes



Figure 1 –Pedestrian Improvements on SE 152th Ave.

Finance Facts

- Total Project Cost: **$8,000,000**
  - LID assessment: **$1.444 million**
  - Happy Valley and Clackamas County Joint Transportation System Development Charge: **$4.7 million**
  - Clackamas County Countywide Transportation System Development Charge: **$1.3 million**
  - City of Happy Valley: **$500,000**
- LID boundary included 272 buildable acres and 27 affected properties
- **Cost to properties: $3,460 to $318,607**

	2003	2015
Total Assessed Value in Benefit Area (2015 $)	$88 million	$345 million

PROPERTY ASSESSMENT FORMULA

Engineers organized properties into zones based upon adjacency to improvements. **Zones A** and **B** were those properties that shared frontage with the new roadway. **Zone C** were those properties within the benefit district and adjacent to Zone A/B properties. 75% of total LID cost ($1,083,000) was assessed to zones A & B while the remaining 25% ($361,000) was assessed to zone C properties. Those totals were dispersed among the properties in the zones based upon their share of their zone's anticipated future AV.



Figure 2 – LID Project Area

SOUTH HILLSBORO LID

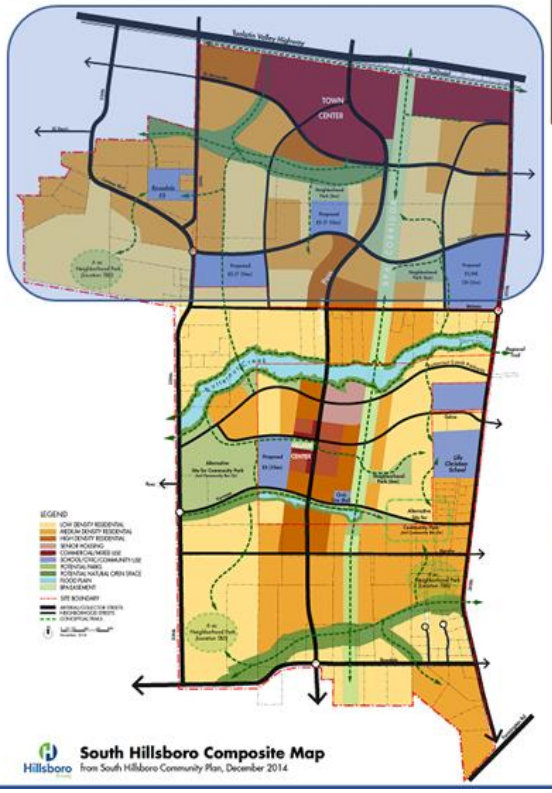
In order to provide services for over 20,000 people in the new South Hillsboro master planned neighborhood, the City of Hillsboro adopted a funding strategy that focused on transportation and parks.

Over 95 projects, including 3 bridges, were identified in the transportation funding strategy at a cost of $301M. Primary funding sources will include: $93M in SDCs (31%); Washington County/ODOT ($97M or 32%); and developer contributions using dedications ($28.8M or 9.6%) and a transportation **LID ($24.8M or 8.2% of total cost), which was adopted in 2017.**

Formation of the LID was a requirement prior to commitment of any City funding, The City led the LID formation process. After lengthy discussion and consultation, four transportation projects were identified in the LID with a combined cost of of $24.8 million. The four LID projects include:

1. Cornelis Pass Road - extend the road from Tualatin Valley Highway.
2. Cornelius Pass Road – widen the road from Frances to Tualatin Valley Highway.
3. Kinnaman at 198th Avenue - realign and signalize.
4. Tualatin Valley at Cornelius Pass Road – westbound right turn lane.

LID Area highlighted in blue



Project Facts

- LID Project Cost: **$24,800,000**
- The LID was well received by property owners and developers since the assessments can be transferable to builders as separate lot assessments, and liens would typically be paid in full prior to issuance of home mortgages.
- LID boundary includes first phase of South Hillsboro development. The LID assessment formulae takes into account future net new average daily vehicle trip forecasts for each tax lot based on its projected number of equivalent dwelling units.
- Property owners in the LID receive a discounted transportation SDC charge as a result of joining the LID. The SDC reduction would phase out over 6 years depending upon the rate of development absorption.



Attachment D
Sunrise Gateway Study
Clackamas County

SUNRISE GATEWAY CORRIDOR / HWY 212

A transformative community investment to implement the Metro 2040 Growth Concept

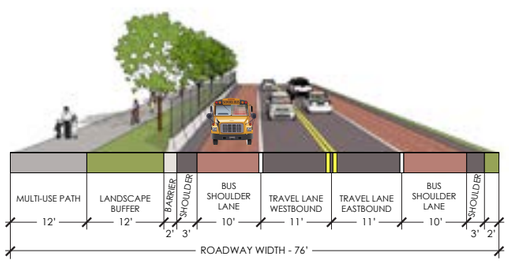
Contact
Jamie Stasny, Regional Transportation and Land Use Policy Coordinator
jstasny@clackamas.us | 503-742-4339
www.clackamas.us/transportation/t2020

Metro T2020 desired outcomes

Clackamas County, ODOT, and the City of Happy Valley have worked together to develop the Sunrise Gateway Corridor package to address the evolving economic, housing, safety, alternative modal and operational needs and to ensure the corridor provides the desired T2020 outcomes.

- Improves safety
- Prioritizes support for communities of color
- Reduces congestion
- Increases access, especially for people of color
- Supports resiliency
- Supports economic growth and system connectivity
- Protects clean air and reduces carbon emissions
- Is regional in nature
- Leverages housing, open space investments

Sunrise Gateway Corridor proposed design cross section



Bus on shoulder (additional right of way reserved for two possible Bus Only/HOV lanes)

Highway 212 transforms into an Urban Arterial – Complete Street



Critical for current residents and the future of our region

The 13,400 residents in the Sunrise Gateway Corridor are underserved and need safe connections and multi-modal options.

Improves Safety: With 42,900 average daily trips, Highway 212 has segments in the top 10% of ODOT's safety priority ranking system. The Sunrise Gateway Corridor improvements will increase the safety of these high crash intersections.

Creates multi-use connections: Unique opportunity to establish a world-class on- and off-road trail system

- Support the regional Mt. Scott/Scouters Mt. Trail Loop Master Plan that would connect the Springwater Corridor to the Clackamas River and Industrial Area (162 miles of proposed new trails within 5 miles of the Sunrise Gateway Corridor)
- Protected multi-use path from the Clackamas Town Center to 172nd Avenue

Supports Housing Affordability: Happy Valley is taking steps to create access to housing in a broad range of income levels:

- New urban renewal district will dedicate 7% for affordable housing projects.
- Missing middle housing, including multi-family, attached single-family and cottage clusters, are encouraged through zoning designations and incentives.

Opens Access to New Jobs and Housing: By 2040, this corridor is projected to have over 14,000 new jobs and 14,000 additional housing units (approximately an additional 43,000 people).

Provides a Parkway: This project will create new connections and transform Hwy 212 from a dangerous state highway into a safer corridor that connects people to jobs and accommodates additional housing. The improvements will create a complete transportation network with new multi-modal connections, safety and access improvements.

- Two-lane parkway (40-45 mph) with a separated multi-use path
- Multi-modal options
  - Current residents will have alternative modal options to access their public schools, regional parks, public transit, employment, etc. without driving
  - Transition existing Hwy 212/224 to an Urban Arterial - Complete Street with improved bike/pedestrian facilities

Clackamas to Columbia (C2C): The Sunrise Gateway and C2C provide the necessary multi-modal corridors to service the undeveloped southeast area of the Metro UGB.

Supports Metro's 2040 Growth Concept: Happy Valley cannot implement the growth concept without having the transportation infrastructure to address the existing mobility barriers in this corridor.

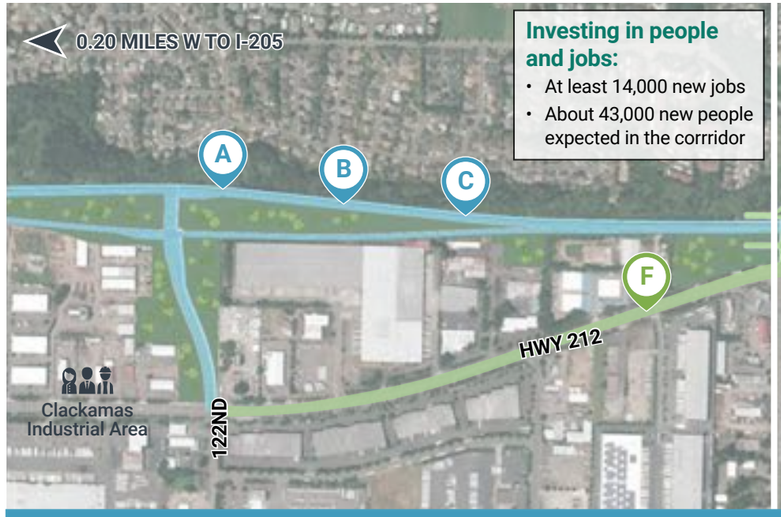
Climate Smart Project: The proposed Sunrise/212 Concept will reduce greenhouse gasses by .1 ton during the daily 5 to 6 p.m. peak hour. This decrease is attributed to a reduction in congestion and the addition of mode options.

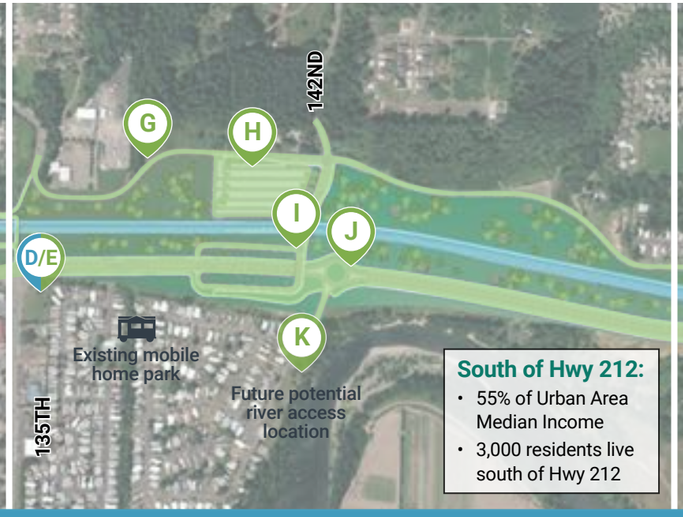


Regional connector project: 122nd Ave to 172nd Ave
Improving regional connections (shown in blue)

Safety and local connections project
Increasing safe local access and mode options

Rock Creek employment area connections project
Closing service gaps and planning for growth







Regional connector project: 122nd Ave to 172nd Ave

Improving regional connections (shown in blue)

- Design: $51 million
- Construction: $186 million (additional two lanes: $20 million)
- Right of way: $70 million

Total: $327 million

Safety and local connections project

Increasing safe local access and mode options

- Design: $9 million
- Construction: $49 million
- Right of way: $72 million

Total: $130 million

*This project would be built first

Rock Creek employment area connections project

Closing service gaps and planning for growth

- Design: $2 million
- Construction: $10 million*
- Right of way: $8 million

Total: $20 million

*Cannot be built until other two projects are complete

Total project: $477 million

- Total design: $62 million
- Total construction: $265 million
- Total right of way: $150 million

By providing better regional connectivity, the Sunrise Gateway Corridor will **decrease congestion** by keeping our residents moving. Construction of this project will reduce trips on existing Hwy 212 to allow full conversion to an urban arterial.

The proposed design will be transit ready including **bus on shoulder** and some potential locations for park and rides.

This project will include: (cross section on front side)

A: **2-lane** section with right of way reserved for two possible Bus Only/ HOV lanes from 122nd Ave to 172nd Ave

B: **Separated** multiuse path

C: **Bus on shoulder**

D: **Build** new pedestrian bike bridge

Why two roads? Not enough space!

Sunrise separates trips to meet multiple user needs:

- **Regional traffic:** Moves to the new regional connector, fewer conflicts will reduce congestion and increase safety (road shown in blue).
- **Local traffic:** Stays on Hwy 212 and redesigned local roads. Fewer cars and the addition of safe pedestrian and bike facilities will make walking and biking viable mode options. These changes will contribute to community-building and improved livability (roads shown in green).

By **optimizing local connections**, this project will increase safety and transform a significant portion of Hwy 212 from a dangerous state highway to a safer, slower corridor with new mode options including protected bike lanes and pedestrian facilities. We aim to improve the quality of life of residents by enhancing access, slowing speeds and reducing congestion.

This project will include:

E: **Signal modification** to reflect rerouting of 135th

F: **Convert** Hwy 212 from 122nd Ave to 135th Ave to urban arterial complete street

G: **New local connections** consolidate intersections

H: **Transit readiness** including right of way for potential future park and ride location

I: **Grade-separated** intersection to reduce congestion and improve safety with overpass allowing bicycles and pedestrians to cross without needing to stop at signals

J: **Rebuild section** of Hwy 212 from 135th Ave to 152nd Ave including a roundabout to reduce speeds and improve access to mobile home park. New section will include protected bike and pedestrian amenities where currently there are none.

K: **Potential amenities access**, including possible waterfront park

L: **New pedestrian connection** to provide safe access under Hwy 212 to Rock Creek and Verne Duncan schools

Safety will increase by reducing speeds and improving sight distance for regional trips.

This project will also create multimodal access to schools and employment lands, especially for the areas south of Hwy 212.

This project will include:

M: **Roundabout** at Rock Creek Junction to reduce speed, reduce congestion and improve safety

N: **New local connection** with underpass to allow safe access under Hwy 212 to Rock Creek and Verne Duncan schools

O: **Roundabout** to access Rock Creek Blvd

P: **Starting point** of Clackamas to Columbia (C2C) corridor north to Gresham

Metro T2020 desired outcomes	Full corridor (all projects)	Regional	Safety	Rock Creek
Improves safety	☀	☀	☀	☀
Prioritizes support for communities of color	☀	○	☀	○
Increases access, especially for people of color	☀	○	☀	○
Supports resiliency	☀	☀	☀	○
Supports economic growth and system connectivity	☀	☀	◐	☀
Protects clean air and reduces carbon emissions	☀	☀	◐	◒
Is regional in nature	☀	☀	◐	☀
Leverages housing, open space investments	☀	☀	◐	○
Reduces congestion	☀	☀	◐	☀

11/12/2019