AIR QUALITY REPORT

OR8 at Quince Street in Forest Grove
Washington County

Key Number 18003

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Contents

1. Introduction

An Air Quality analysis was conducted for the OR8 at Quince Street Project located in Forest Grove, Oregon. The project will install a southbound right turn lane and is located within the Portland carbon monoxide (CO) maintenance area. The 8 Hour CO concentrations in the opening year (2017) and design year (2037) were predicted to be 2.3 parts per million (ppm) and 1.9 ppm respectively. These concentrations are well below the 8 hour CO National Ambient Air Quality standards (NAAQs) of 9 ppm. The 1 hour CO concentrations for 2017 and 2037 will be 3.0 ppm and 2.5 ppm respectively, which are also well below the 1 hour CO NAAQs of 35 ppm.

The project area Mobile Source Air Toxic (MSAT) emissions are expected to decrease in the future relative to existing conditions.

2. Project Description

The "OR8 at Quince Street (Forest Grove)" project will install a southbound right turn lane on Nehalem Highway (OR47) also known as Quince Street and reconstruct an existing non-standard westbound right turn lane on Tualatin Valley Highway (OR8) also known as Pacific Avenue. The project elements also include but are not limited to the following:

- Replace signal poles and install raised concrete islands (porkchop) at the NW and NE quadrants of the intersection
- Upgrade ADA ramps and sidewalks
- Install bike lanes with detections for the westbound and southbound approaches
- Install a traffic separator on the east approach of OR8 from OR47 to the east side
- Access management

Figure 1 shows the project location and Figure 2 shows the project design and they are located at the end of the report.

3. Traffic Analysis

The traffic data was provided by Oregon Department of Transportation's (ODOT) Region 1 Traffic Section (ODOT, 2015). The traffic data included peak hour operation data for the signalized intersection for opening year (2017) and design year (2037). The worst-case scenario in terms of air quality was selected based on the level of service data (LOS), delay, volume to capacity ratio (V/C) and sum of approaching volumes for opening year 2017 and design year 2037. For design year 2037, PM hour was used for worst-case scenario selection. Table 1 shows the operation traffic data for the Build scenario in 2017 and 2037. Appendix B shows the traffic data for all years for No-Build and Build scenarios. The list of SYNCHRO data used in modeling is included in Appendix B.

Table1. Traffic Summary for OR-8 at Quince Street Project Build Scenario				
Peak Hour	**LOS**[1]	**Delay (sec./veh.)**	**V/C**[2]	**Sum of Approaching Volumes**
2017 AM	C	34.0	0.66	2680
2017 PM	D	47.4	0.90	3930
2037 AM	D	46.2	0.83	3295
2037 PM	E	58.5	1.0	4560

[1] LOS- Level of Service
[2] Volume to Capacity Ratio

4. Existing Air Quality

Portland is a CO maintenance area. Metro is responsible for regional transportation conformity in the Portland area. In accordance with the guidance in the ODOT Air quality Manual (September 2008), a concentration of 2.0 ppm was used as the ambient background concentration in the project area.

The Portland–Vancouver area became "in attainment" for ozone with the revocation of the federal 1-hour ozone standard in June 2005. The area is still subject to the no backsliding provisions of the revised standard but does not require a conformity analysis for ozone. All other pollutants are in attainment.

5. CO Hot Spot Analysis Methodology

A hot spot analysis must demonstrate that the highest build CO concentration is below the CO NAAQs and the project conforms to the State Implementation Plan (SIP) for the Portland Area Carbon Monoxide Maintenance Plan. A SIP is a document that outlines the strategies and emission control measures that show how an area will improve air quality and meet the NAAQs. The hot spot analysis includes determining the vehicular emission rates and then using those emission rates in a dispersion model to predict the highest CO concentration. If the modeled worst case intersection scenario does not cause a violation of the NAAQs, then it is assumed all other project intersection scenarios would also not cause a violation of the NAAQs.

5.1. Emission Model

The Environmental Protection Agency (EPA) approved model MOVES2010b (EPA, 2012) calculates emission factors for a variety of gasoline and diesel fueled roadway vehicles. MOVES2010b accounts for progressively more stringent tailpipe emission standards over the vehicle model years evaluated. The MOVES2010b input files include the applicable climate data, fuel characteristics, local vehicle mix and anti-tampering programs for the project area. Emissions were calculated based on a typical winter day because colder temperatures result in higher CO concentrations. The afternoon hour was selected as the worst-case scenario based on LOS, V/C ratio and vehicle volume. MOVES peak hour 17:00 -17:59 was used to represent the afternoon peak hour of 5:00 to 6:00 p.m. The model was run for 2017 and 2037 for roadway speeds within the project area.

MOVES2010b input files were developed by ODOT using database files provided by Oregon Department of Environmental Quality (ODEQ) and Metro (ODEQ, 2013 and Metro, 2014). The databases from Metro include fuel supply, fuel formulation, inspection and maintenance program and source type age distribution (Metro, 2014). ODEQ provided the meteorology database (ODEQ, 2013). Using the MOVES2010b database provided by Metro ensures consistency between project level and regional conformity analyses. Two project specific databases were developed by ODOT based on the vehicle speeds by link, and also the vehicle type distribution for the project area. Table 2 and 3 summarize the MOVES runspec inputs and MOVES database sources.

Table 2. MOVES Runspec Selections

Input Name	Selection
Scale	Project
Calculation Type	Inventory
Time Span	Hour, analysis year (2017 & 2037), January, weekday, 5:00 - 6:00 p.m.
Geographic Bounds[a]	Oregon, Multnomah County (consistent with Metro regional conformity analysis)
Vehicles/Equipment[a]	Used same vehicle/fuel types used by Metro in regional conformity analysis
Road Types	Urban unrestricted specific to project
Pollutants and Processes[b]	Running exhaust and crankcase running as given in EPA guidance
Input Data Sets[a]	Low Emitting Vehicles (LEV) database provided by Metro
Output	Selected distance traveled and population and grams, miles

Note:

[a] Provided by Metro, June 2014

[b] Using MOVES2014 in Project-level Carbon Monoxide Analyses, March 2015. EPA-420-B-15-028

Table 3. ODOT MOVES Project Level Data Manager Inputs

MOVES Database Name	Data Source
Fuel Supply and Fuel Formulation	MOVES2010b files provided by Metro, June 2014
Meteorology	MOVES2010b provided by DEQ, May 2013
Inspection and Maintenance Coverage	MOVES2010b files provided by Metro, June 2014
Source Type Age Distribution	MOVES2010b files provided by Metro, June 2014
Project Links	Project specific. One link per roadway project speed. The specific roadway length and types will be characterized in dispersion model.
Link Source Type Hour	The link source type data was developed based on the vehicle miles traveled by each vehicle type in the MOVES database for urban unrestricted roadways in Multnomah County.

Using professional judgment, ODOT developed the link and link source type databases. The link database was developed based on the posted vehicle speeds for project roadways in 2017 and design speeds in 2037. The link source type data was developed based on the vehicle miles traveled by each vehicle type in Multnomah County for urban unrestricted roadways.

The emission rates calculated by MOVES2010b are shown in Table 4 and the MOVES2010b input and output file names are listed in Appendix C.

Table 4. CO Emission Rates used in CAL3QHC Modeling

2017		2037	
Speed (mph)	(grams/hour)	Speed (mph)	(grams/hour)
idle	32.55	idle	7.82
	(grams/vehicle-mile)		(grams/vehicle-mile)
25	5.95	22	3.69
35	5.13	32	3.19
40	4.74	37	2.92
45	4.51	42	2.73

5.2. Dispersion Model

The CO project concentrations were calculated using the EPA-approved CAL3QHC dispersion model (version 95221, Environmental Protection Agency (EPA) 1992 and 1995) for the opening year (2017) and the design year (2037). Inputs into the dispersion model include traffic volumes, signal timing, intersection geometry and receptor locations. Traffic information was taken from SYNCHRO files provided by ODOT Traffic Section (ODOT, 2015). CAL3QHC inputs were selected by using the guidance provided in the ODOT Air Quality Manual (ODOT, 2008) and EPA Guideline for Modeling Carbon Monoxide from Roadway Intersections (EPA, 1992). Table 5 summarizes CAL3QHC model inputs.

Table 5. CAL3QHC Model Inputs	
Meteorological Variables	
Averaging Time	60 minutes
Surface Roughness	175 (office)
Wind Speed	1 meter per second
Wind Angle	0 to 360 degrees in 10-degree increments
Stability Class	4 (D) neutral
Mixing Height	1,000 meters
Ambient Background Concentration	
Portland	2 parts per million
Persistence Factor	0.76
Site Variables	
Receptor Coordinates	10 feet from each traveled roadway on both sides of the street at distances of 10 feet, 82.5 feet (25m) and 164 feet (50 m) from the cross street. Height 6.0 feet

The maximum 1 hour CO concentration for each model run was added to the ambient background CO concentration of 2 ppm as recommended in the ODOT Air Quality Manual, (ODOT, 2008). The 1 hour CO concentrations were converted to the 8 hour concentrations using a persistence factor of 0.76 which was also recommended by the ODOT Manual. These resulting concentrations were compared to the applicable 1 hour and 8 hour CO NAAQs.

6. CO Hot Spot Results

CO concentrations are the same for Build and No-Build scenario since the volumes are the same. In 2017, the highest build concentration occurred in the northeast and southwest quadrants of the intersection. In 2037, the highest concentration occurred at the westbound approach of the intersection. Table 6 summarizes the CAL3QHC modeling results by year and scenario type. The modeled concentrations are well below the 1 hour and 8 hour CO NAAQs for all scenarios and analysis years.

The maximum modeled 1-hour and 8-hour Build concentrations are 3.0 ppm and 2.3 ppm, respectively which will occur in 2017. The CO concentration is well below the NAAQs for the 1 hour and the 8 hour.

Table 6. CO Concentrations for OR8 at Quince Street in Forest Grove					
Scenario	**Analysis Year**	**LOS[1]**	**1 Hour Concentration[2]**	**8 Hour Concentration[2]**	**Location of Highest Conc.**
			(ppm[3])	(ppm[3])	
No Build	2016	C	3.1	2.4	northwest corner
Build	2016	D	3.0	2.3	northeast and southwest quadrants
No Build	2036	D	2.8	2.1	northwest corner
Build	2036	E	2.5	1.9	westbound approach
NAAQS[4] (ppm)			35	9	

Note: Persistence factor of 0.76 was used to convert 1-Hour concentrations to 8-Hour concentrations
[1]LOS – Level of service
[2] Includes background concentration of 2ppm.
[3]PPM- Parts per million
[4]NAAQs – National Ambient Air Quality Standard

7. Construction Activities

During construction CO and particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (PM_{10}) are expected to increase. These increased emissions are due to heavy construction vehicles, lowered traffic speeds and earth excavation. These emissions create temporary impacts on the ambient air quality

7.1 Construction Mitigation

Construction contractors are required to comply with Division 208 of OAR 340, which addresses visible emissions and nuisance requirements. Subsection of OAR 340-208 places limits on fugitive dust that causes a nuisance or violates other regulations. Violations of the regulations can result in enforcement action and fines. The regulation provides that the following reasonable precautions be taken to avoid dust emissions (OAR 340-208, Subsection 210):

- Use of water or chemicals, where possible, for the control of dust in the demolition of existing buildings or structures, construction operations, the grading of roads or the clearing of land;
- Application of asphalt, oil, water, or other suitable chemicals on unpaved roads, materials stockpiles, and other surfaces which can create airborne dusts;
- Full or partial enclosure of materials stockpiled in cases where application of oil, water, or chemicals are not sufficient to prevent particulate matter from becoming airborne;
- Installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials;
- Adequate containment during sandblasting or other similar operations;

- When in motion, always cover open-bodied trucks transporting materials likely to become airborne;
- The prompt removal from paved streets of earth or other material that does or may become airborne.

In addition, contractors are required to comply with ODOT standard specifications Section 290 that has requirements for environmental protection, which include air-pollution control measures. These control measures, which include vehicle and equipment idling limitations, are designed to minimize vehicle track-out and fugitive dust. These measures would be documented in the erosion and sediment control plan that the contractor is required to submit prior to the pre-construction conference. To reduce the impact of construction delays on traffic flow and resultant emissions, road or lane closures should be restricted to non-peak traffic periods when possible.

8. MSAT

The purpose of this project is to install a southbound right turn lane on Quince Street and reconstruct an existing non-standard westbound right turn lane on OR8. This project will have no meaningful impacts on traffic volumes or vehicle mix as the 2037 Average Annual Daily Traffic (AADT) for Build and No-Build scenarios are identical for all approach lanes. The highest 2037 AADT of 37,700 vehicles occurs on OR8 eastbound approach. This project has been determined to generate minimal air quality impacts for Clean Air Act Amendments (CAAA) criteria pollutants and has not been linked with any special MSAT concerns. As such, this project will not result in changes in traffic volumes, vehicle mix, basic project location, or any other factor that would cause an increase in MSAT impacts of the project from that of the No-Build scenario. Therefore, this project is exempt from analysis based on the Federal Highway Agency's (FHWA) Interim Guidance on Mobile Source Air Toxics Analysis in National Environmental Policy Act Documents, dated December 6, 2012. (FHWA, 2012)

Finally, EPA regulations for vehicle engines and fuels will cause overall MSAT emissions to decline significantly over the next several decades. Based on regulations now in effect, an analysis of national trends with EPA's MOVES2010b model forecasts a combined reduction of 80 percent in the total annual emission rate for the priority MSAT from 2010 to 2050 while vehicle-miles of travel are projected to increase by 100 percent. This will both reduce the background level of MSAT as well as the possibility of even minor increases in MSAT emissions from this project.

9. Project-Level Conformity Determination

A project level hot spot analysis predicted that at the closest receptor, the 8 hour CO concentration will be well below the NAAQs in 2017 (opening year) and 2037 (design year).

The proposed project is fiscally constrained and is in the 2014 Regional Transportation Plan (RTP) and Metro's financially constrained Air Quality Conformity Determination for the amended 2015-2018 Metropolitan Transportation Improvement Program (MTIP) which were both adopted on July 17, 2014. The air quality conformity finding for RTP and MTIP was issued by FHWA and Federal Transit Administration (FTA) on May 20, 2015. The design concept and scope of the proposed project in this report is consistent with the project description in the RTP, the MTIP and the assumptions in the Metro's regional emissions analysis. Appendix A contains project documentation from the amended State Transportation Improvement Program (STIP).

The project will be in conformance with SIP for the Portland Area Carbon Monoxide Maintenance Plan (ODEQ, 2004) and the project will not:

- Cause or contribute to any new violations of any standard,
- Increase the frequency or severity of any existing violation or any standard, or
- Delay timely attainment of any transportation control measures (TCM).

The project area Mobile Source Air Toxic emissions are expected to decrease in the future relative to existing conditions.

10. References

Environmental Protection Agency. U.S. Code of Federal Regulations. 40 CFR Part 93, Subpart A. "*Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Developed, Funded or Approved Under Title 23 U.S.C. or the Federal Transit Laws*."

Environmental Protection Agency, "*Guideline for Modeling Carbon Monoxide from Roadway Intersections*, EPA-454/R-82-005", November 1992.

Environmental Protection Agency. "*User's Guide to CAL3QHC Version 2.0.*" EPA 454-R-92-006R. 1995.

Environmental Protection Agency. "*Using MOVES in Project- Level Carbon Monoxide Analysis.*" EPA-420-B-10-041. March, 2015.

Federal Highway Administration. FHWA, 2012. "*Interim Guidance on Air Toxic Analysis in NEPA Documents*." Memorandum from Cynthia J. Burbank, Associate Administrator for Planning, Environment and Realty. December 6, 2012.

Metro, 2014. MOVES2010b database files from Metro Regional Conformity Analysis performed in 2014. June, 2014.

Oregon Department of Environmental Quality. Oregon Administrative Rules, Division 252. "*Transportation Conformity*".

ODEQ, 2004. Oregon Department of Environmental Quality. "*Portland Area Carbon Monoxide Maintenance Plan, State Implementation Plan, Volume 2, Section 4.58*". December 10, 2004.

ODEQ, 2013. MOVES2010b Meteorological data for Portland area. May, 2013.

ODOT, 2008. "*Oregon Department of Transportation Air Quality Manual*" September, 2008.

ODOT, 2015. "*Multiple email correspondence between Thanh Tran and Natalie Liljenwall regarding traffic data needed for air quality analysis*".

Figure 1. Project Location Map

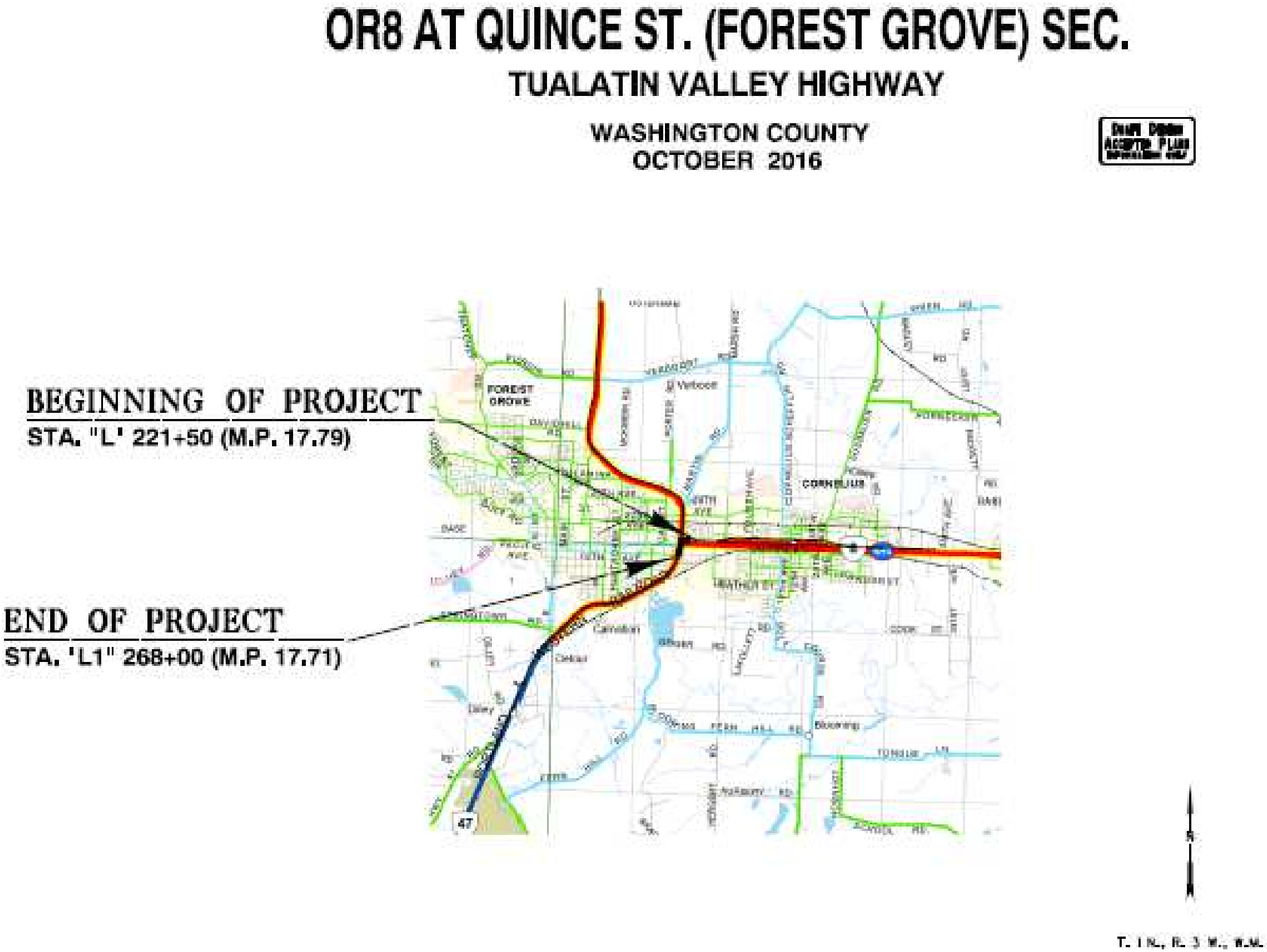
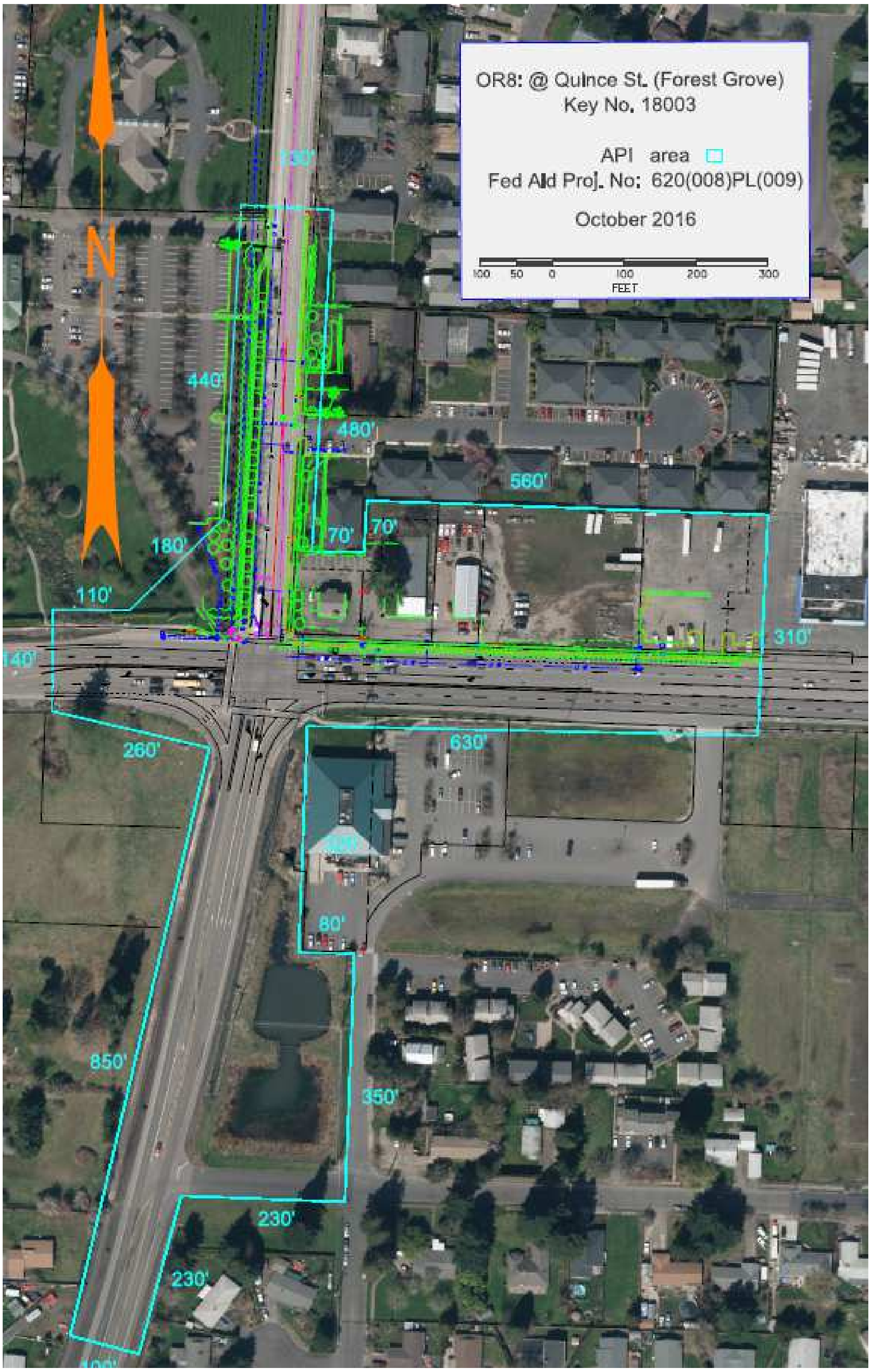


Figure 2. Design Drawing



Appendix A - Amended STIP, 2015-2018

Name:	**OR8 AT QUINCE ST. (FOREST GROVE) SEC**			**Key:**	**18003**
				Region:	1
Highway:	TUALATIN VALLEY HIGHWAY	**ACT:**	REGION 1 ACT		
Route:	OR 8	**MPO:**	Metro		
Mile points:	17.89 to 17.90	**Applicant:**	CITY OF FOREST GROVE		
Length:	0.01	**Status:**	Construction Scheduled to Begin		
Description:	Construct a standard right-turn lane from westbound OR 8 (Pacific Avenue) to northbound OR 47 and a standard right-turn lane from southbound OR 47 (Quince Street) to westbound Pacific Avenue.	**Work Type:**	SAFETY		

Approved STIP Amounts

	Planning	Preliminary Engineering	Right of Way	Utility Relocation	Construction	Other	Total STIP Amount
Phase Total:	**$176,000**	**$368,723**	**$860,000**	**$700,000**	**$2,308,800**		**$4,392,523**

Current Project Estimate

	Planning		Preliminary Engineering		Right of Way		Utility Relocation		Construction		Other	Project Total
Year:	2013		2015		2015		2015		2016			
Phase Total:		**$221,841**		**$91,000**		**$860,000**		**$700,000**		**$2,308,800**		**$4,171,641**
First Fund:	STP-U	$199,058	STP-U	$81,654	STP-URBANIZED-200K	$701,331	STP	$538,380	STP	$1,741,628		
Match:		$22,783		$9,346		$80,270		$61,620		$199,337		
Second Fund:					NHS	$61,374	STP-U	$89,730	STATE	$367,835		
Match:						$7,025		$10,270				

Amendment No: 15-18-095 **Approval Date:** 07/07/2015

Requested Action: Change the project name, work description and correct rounding. Combine K19246 adding $2,609,364 Enhance and $367,835 Local funds and slip CN to 2016.

AMENDED

Footnote: Enhance funding from K19264 combined into this project.

Appendix B -Traffic Data

Table B – Operation Traffic Data

OR8 at OR47 (Quince Street)								
	Opening Year 2017 No-Build		**Opening Year 2017 Build**		**Year 2037 No-Build**		**Year 2037 Build**	
	AM	**PM**	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
Sum of approaching volumes or (Total Entering Volume), vph	2680	3930	2680	3930	3295	4560	3295	4560
Level of Service (LOS)	C	E	C	D	D	F	D	E
Intersection Delay (seconds)	34.9	59.2	34.0	47.4	48.3	99.0	46.2	58.5
Volume to Capacity Ratio (V/C)	0.69	1.00	0.66	0.90	0.85	1.14	0.83	0.96

Snychro pdf files available on request:

- 2017 PM No-Build
- 2017 PM Build
- 2037 PM No-Build
- 2037 PM Build

Appendix C – List of Modeling Files

Electronic copies of modeling files are available on request from Region 1 Environmental Section.

A. MOVES2010b database files.
    a. Fuelformulation_OR.csv (Metro, 2014)
    b. FuelSupply_2012+_OR.csv (Metro, 2014)
    c. IMCoverage_2017_OR.csv & IMCoverage_2037_OR.csv (Metro, 2014)
    d. Links.xls (ODOT)
    e. Linksourcetype.xls (ODOT)
    f. Multnomah_meterology_input.xls (Oregon DEQ, 2013)
    g. sourceTypeAgeDistribution_2017_OR.csv (Metro)
    h. Low Emission Vehicles- Lev_or_in (Metro, 2015)

B. MOVEs 2010B runspecs:
    a. Quince17.mrs
    b. Quince37.mrs

C. MOVES 2010 B Output
    a. Co_emissionfactors17.csv
    b. Co-emissionfactors37.csv

D. CAL3QHC Input Files
    a. Quince17b.in2
    b. Quince17nb.in2
    c. Quince37b.in2
    d. Quince37nb.in2

E. CAL3QHC Output Files
    a. Quince17b.ou2
    b. Quince17nb.ou2
    c. Quince37b.ou2
    d. Quince37nb.ou2