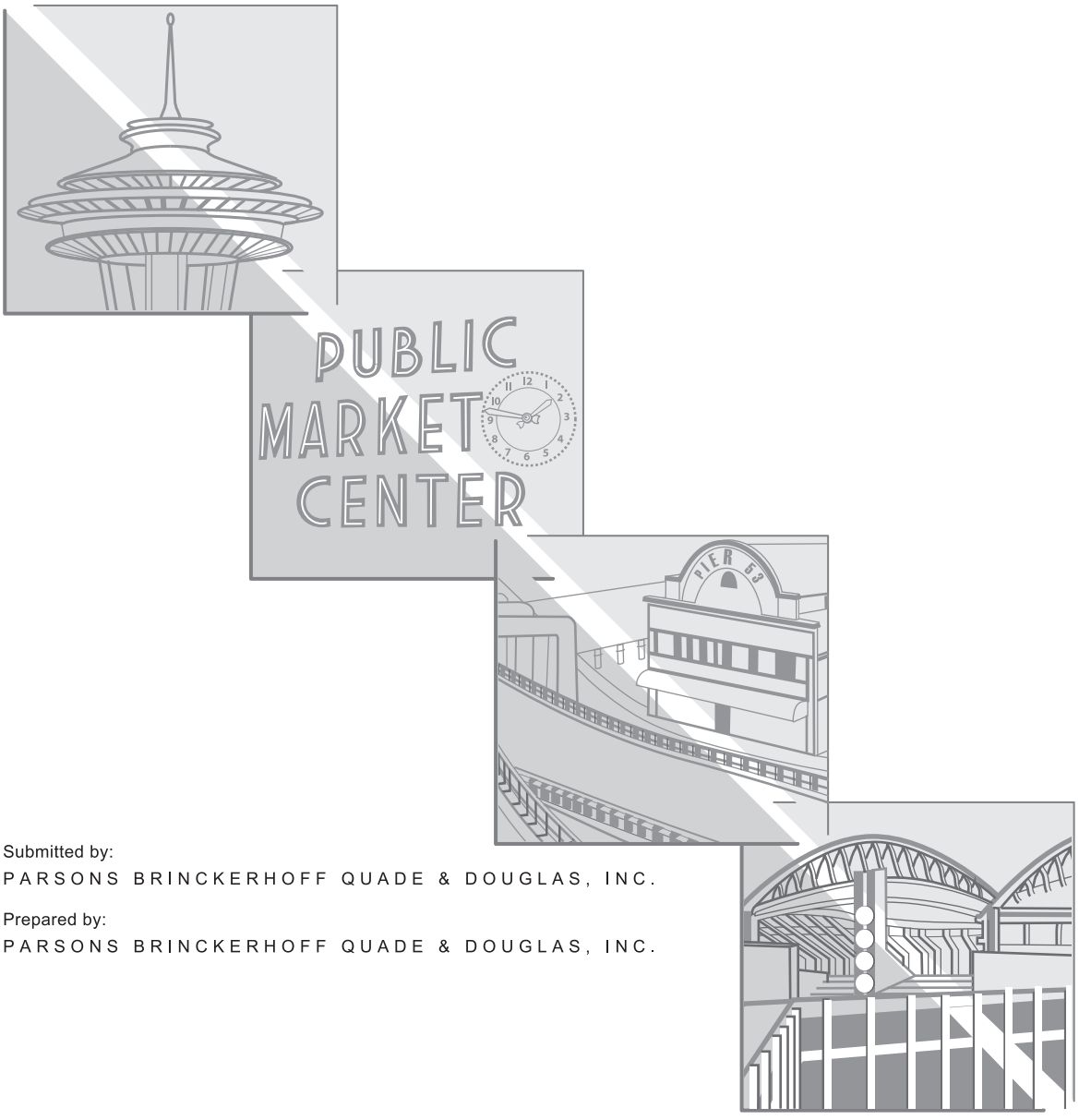
SR 99: ALASKAN WAY VIADUCT & SEAWALL REPLACEMENT PROJECT

Supplemental Draft Environmental Impact Statement

APPENDIX Q

Air Quality Discipline Report



Submitted by:

PARSONS BRINCKERHOFF QUADE & DOUGLAS, INC.

Prepared by:

PARSONS BRINCKERHOFF QUADE & DOUGLAS, INC.

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U.S. Department of Transportation
Federal Highway Administration

Washington State
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City of
Seattle

SR 99: ALASKAN WAY VIADUCT & SEAWALL REPLACEMENT PROJECT

Supplemental Draft EIS
Air Quality Discipline Report

AGREEMENT NO. Y-7888

FHWA-WA-EIS-04-01-DS

Submitted to:

Washington State Department of Transportation
Alaskan Way Viaduct and Seawall Replacement Project Office
999 Third Avenue, Suite 2424
Seattle, WA 98104

The SR 99: Alaskan Way Viaduct & Seawall Replacement Project is a joint effort between the Washington State Department of Transportation (WSDOT), the City of Seattle, and the Federal Highway Administration (FHWA). To conduct this project, WSDOT contracted with:

Parsons Brinckerhoff Quade & Douglas, Inc.
999 Third Avenue, Suite 2200
Seattle, WA 98104

In association with:
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Tom Warne and Associates, LLC
William P. Ott

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ATTACHMENTS

Attachment A Air Quality Intersection Screening

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ACRONYMS

CO	carbon monoxide
EIS	Environmental Impact Statement
FHWA	Federal Highway Administration
IRIS	Integrated Risk Information System
LOS	levels of service
MSAT	mobile source air toxic
NAAQS	National Ambient Air Quality Standards
NB	northbound
ppm	parts per million
SB	southbound
SR	State Route
WSDOT	Washington State Department of Transportation

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PREFACE

The technical appendices present the detailed analyses of existing conditions and predicted effects of each alternative. The results of these analyses are summarized and presented in the main text of the Supplemental Draft Environmental Impact Statement (EIS).

The Supplemental Draft EIS appendices are intended to add new information and updated analyses to those provided in the Draft EIS, published in March 2004. Information that has not changed since then is not repeated in these appendices. Therefore, to get a complete understanding of the project area conditions and projected effects, you may wish to refer to the appendices that were published with the Draft EIS. These are included on a CD in the Supplemental Draft EIS. To make it easier to understand where there is new information or analyses, the supplemental appendices present information in the same order as it was presented in the Draft EIS appendices.

The Supplemental Draft EIS and the technical appendices evaluate the effects of three construction plans: the shorter plan, the intermediate plan, and the longer plan. These plans vary in how long SR 99 would be completely closed, in how long the periodic closures may be, and in the total construction duration. For the purposes of the analyses in the technical appendices, two construction plans are evaluated with the Tunnel Alternative and one plan is evaluated with the Elevated Structure Alternative. However, each alternative could be built with any of the three plans. The construction durations and the sequencing would not be the same for a particular construction plan if paired with a different alternative; however, the effects would be within the ranges presented by the analyses.

There are several differences in how the information is presented between the main text of the Supplemental Draft EIS and how it is presented in these appendices. The Supplemental Draft EIS text refers to possible variations within the alternatives as "choices" while these appendices use the term "options." (For example, Reconfigured Whatcom Railyard versus Relocated Whatcom Railyard is referred to as a design choice in the Supplemental Draft EIS and as an option in the appendices.) In either case, the intent is to describe the various configurations that could be selected and the effects for each design.

One design choice in particular is handled very differently between the Supplemental Draft EIS text and the technical appendices. For the Tunnel Alternative in the central waterfront area, there is a choice between a stacked tunnel alignment and a side-by-side tunnel alignment. In the appendices, to simplify the discussion, these two alignments, as well as the Elevated

Structure Alternative, are each paired with a different set of options throughout the corridor and presented as complete sets that are evaluated separately. The Supplemental Draft EIS text communicates this information differently by describing one Tunnel Alternative and one Elevated Structure Alternative and evaluating the effects of the different design choices (or mix-and-match components) separately. While it may appear that there are three alternatives analyzed in the appendices and two in the Supplemental Draft EIS text, there are in fact only two alternatives. Each alternative has many potential components or design choices that can be made throughout the corridor.

The organization of the analysis of the alternatives is also a little different between the main body of the Supplemental Draft EIS and the appendices. In the Supplemental Draft EIS text, we identify two alternatives: a Tunnel Alternative and an Elevated Structure Alternative. The Supplemental Draft EIS text compares these alternatives directly by comparing effects (for example, the effects of both alternatives on water quality are presented together). The appendices present the effects of each alternative separately (for example, all of the effects of the Tunnel Alternative are presented first, followed by all of the effects of the Elevated Structure Alternative). The substance of both discussions is the same. The organization of the Supplemental Draft EIS technical appendices mirrors that of the Draft EIS appendices, allowing you to more easily find comparable information in the Draft EIS appendices.

Chapter 1 SUMMARY

The Alaskan Way Viaduct and Seawall Replacement Project Draft Environmental Impact Statement (EIS) (WSDOT et al. 2004) evaluated construction and operational air quality impacts for five alternatives. This technical report supplements Appendix Q to the Draft EIS and evaluates air quality impacts associated with changes to the alternatives that were subsequently proposed. The updated project alternatives and options analyzed in this report are described in detail in the 2006 Supplemental Draft EIS Appendix B, Alternatives Description and Construction Methods Technical Memorandum.

There are several notable changes in the project since the Draft EIS was issued in March 2004. In December 2004, the lead agencies narrowed the five alternatives down to two—Tunnel and Rebuild. They identified the Tunnel Alternative as the Preferred Alternative and carried the Rebuild Alternative forward for analysis as well. Since that time, engineering and design has been updated and refined for the Tunnel and Rebuild Alternatives. Due to the magnitude of the changes in the design of the Rebuild Alternative (which was developed with elements of both the Rebuild and Aerial Alternatives presented in the Draft EIS), it has been renamed the Elevated Structure Alternative.

The updated Tunnel and Elevated Structure Alternatives differ slightly in their alignments and options when compared to those presented in the Draft EIS. Some options previously being considered are no longer included in the updated alternatives, and new options have been developed.

The updated project alternatives include an extension of the northern limit of the project. The north area of the project now extends to about Comstock Street, about 0.8 mile north of the Battery Street Tunnel.

Traffic conditions in the project area would be affected by changes in both the numbers of vehicles on local roadways and the speeds and levels of congestion on these roadways. Air quality, which is a general term used to describe pollutant levels in the atmosphere, can be affected by these changes. Analysis of air quality impacts in the study area compares predicted future air quality with existing levels and applicable criteria. This report follows the methods and assumptions established in the Air Quality Discipline Report included as Appendix Q to the 2004 Draft EIS.

Localized carbon monoxide (CO) concentrations were calculated north of the Battery Street Tunnel to include the changes in traffic patterns associated with the Partially Lowered Aurora Option and Lowered Aurora Option. CO is the

pollutant most associated with the localized effects of motor vehicle emissions. The results were compared with the National Ambient Air Quality Standards (NAAQS) established by the Environmental Protection Agency (EPA). The result of this analysis is that despite the change in traffic patterns, estimated future air pollution levels under the updated Tunnel (Preferred) and Elevated Structure Alternatives are all below (within) the NAAQS. CO concentrations in 2030 under the Tunnel and Elevated Structure Alternatives are predicted to be lower than existing conditions due to decreased emissions and controls over emission in future years. This analysis shows that operational impacts would be similar to those in the Draft EIS; therefore, no significant adverse air quality impacts are expected to result from the updated Tunnel and Elevated Structure Alternatives.

Potential air quality impacts that may occur during the temporary construction phase of the project would be similar to those estimated in the Draft EIS. Prior to the Final EIS, a detailed estimate of construction pollutant emissions will be completed.

Chapter 2 METHODOLOGY

The methodology used in the assessment of impacts for air quality is the same as that used in Chapter 4 of the 2004 Draft EIS Appendix Q, Air Quality Discipline Report, with the exception of the analysis sites near congested intersections (see Section 4.2.1 of the 2004 Draft EIS Appendix Q).

2.1 Air Quality Analysis Locations

In the updated Tunnel (Preferred) and Elevated Structure Alternatives, the Partially Lowered Aurora Option would lower SR 99 in a retained cut between the north portal of the Battery Street Tunnel and Republican Street, with roadway improvements and widening up to Aloha Street. Three city streets would connect with two bridges at Thomas and Harrison Streets, and Mercer Street would cross under Aurora Avenue N. Therefore, the traffic patterns would change under the Partially Lowered Aurora Option compared to the configuration evaluated in the 2004 Draft EIS Appendix Q.

The traffic volumes and levels of service (LOS) would be similar in the rest of the study area under both the updated Tunnel and Elevated Structure Alternatives; therefore, no additional analysis locations in the rest of the project area are necessary. Detailed traffic analyses are documented in the 2006 Supplemental Draft EIS Appendix C, Transportation Discipline Report.

To select sites for air quality analysis, analysts ranked the major signalized intersections north of the Battery Street Tunnel (Denny Way to Roy Street) according to traffic volumes and the traffic LOS for the year 2030 with the Partially Lowered Aurora Option. Traffic volumes and LOS would be the same for the updated Tunnel Alternative (with either the stacked or side-by-side tunnel alignment) and the Elevated Structure Alternative. The top three intersections with the highest traffic volume and the top three intersections with the highest average vehicle delay were chosen. Complete intersection ranking data are included in Attachment A of this report. The results of this screening and selection process are presented in Exhibit 2-1. The intersections selected for intersection-level CO modeling are shown in Exhibit 2-2.

Option: Lowered Aurora to Comstock Street

The Lowered Aurora Option for the Tunnel Alternative would reconnect the street grid over SR 99 at Thomas, Harrison, Republican, Mercer, and Roy Streets and would have lower traffic volumes than, and similar LOS to, the Partially Lowered Aurora Option. Therefore, no additional sites were

selected for analysis. Complete intersection traffic volumes and LOS data are included in Attachment A of this report.

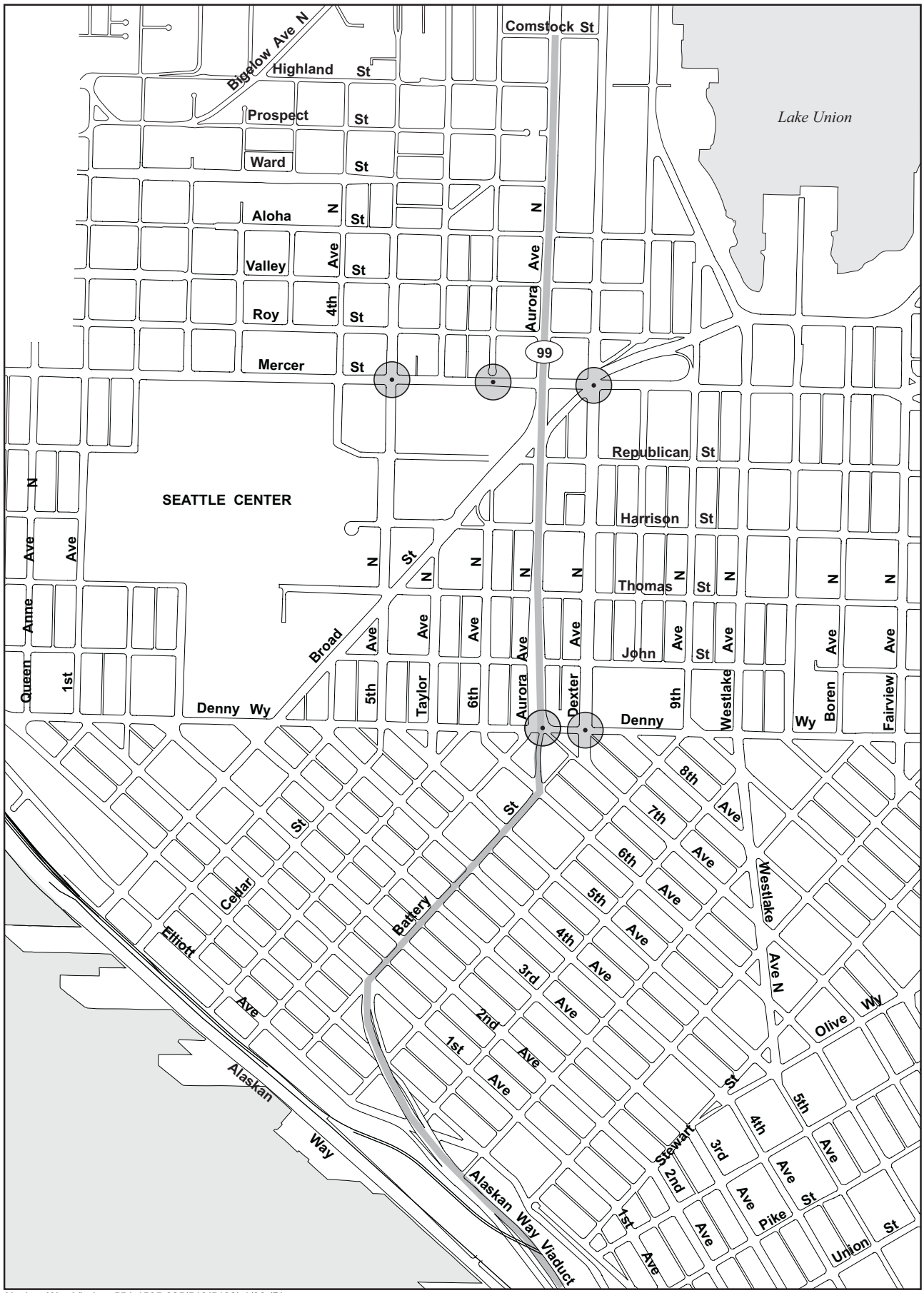
Exhibit 2-1. Intersection Screening Results with Partially Lowered Aurora Option

Intersection		Tunnel (Preferred) and Elevated Structure Alternatives
Street	with Street	North of Battery Street Tunnel
Fifth Avenue N.	Mercer Street	V
Sixth Avenue N.	Mercer Street	V
Dexter Avenue N.	Mercer Street	V and D
NB Aurora Avenue N.	Denny Way	D
Dexter Avenue N.	Denny Way	D

V = Intersection is one of highest three by volume under this alternative.
D = Intersection has one of three longest average delays.
NB = Northbound.

2.2 Mobile Source Air Toxics

The Federal Highway Administration (FHWA) has released interim guidance on Mobile Source Air Toxics (MSATs) analysis in National Environmental Policy Act (NEPA) documents (FHWA 2006). This guidance is interim because MSATs science is still evolving. Currently, EPA has not established regulatory concentration targets for relevant MSAT pollutants appropriate for use in the project development process. This project would replace an existing facility without adding substantial new capacity and it is unlikely to substantially increase MSAT emissions. Therefore, analysts conducted a qualitative assessment of MSAT emissions projection.



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Intersection Modeled for CO Impact

Exhibit 2-2
Intersections Modeled for CO

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Chapter 3 STUDIES AND COORDINATION

The information used in the assessment of impacts for air quality is the same as those described in Chapter 3 of the 2004 Draft EIS Appendix Q, with the exception of the updated information on mobile source air toxics (MSATs).

3.1 Mobile Source Air Toxics

The Clean Air Act identified 188 air toxics, also known as hazardous air pollutants. The Environmental Protection Agency (EPA) has assessed this expansive list of toxics and identified a group of 21 as mobile source air toxics, which are set forth in an EPA final rule, *Control of Emissions of Hazardous Air Pollutants from Mobile Sources (66 FR 17235).* The EPA also extracted a subset of this list of 21 that it now labels as the six priority MSATs. These are *benzene, formaldehyde, acetaldehyde, diesel particulate matter/diesel exhaust organic gases, acrolein, and 1,3-butadiene.*

The EPA issued a Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources (EPA 2001). This rule was issued under the authority in Section 202 of the Clean Air Act. In its rule, EPA examined the impacts of existing and newly promulgated mobile source control programs, including its reformulated gasoline (RFG) program, its national low emission vehicle (NLEV) standards, its Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and its proposed heavy duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements.

The EPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The EPA Integrated Risk Information System (IRIS) is a database of human health effects that may result from exposure to various substances found in the environment. The IRIS database is located at http://www.epa.gov/iris. The following toxicity information for the six prioritized MSATs was taken from the IRIS database *Weight of Evidence Characterization* summaries. This information is taken verbatim from EPA's IRIS database and represents the agency's most current evaluations of the potential hazards and toxicology of these chemicals or mixtures.

- **Benzene** is characterized as a known human carcinogen.
- The potential carcinogenicity of **acrolein** cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure.

- **Formaldehyde** is a probable human carcinogen, based on limited evidence in humans, and sufficient evidence in animals.
- **1,3-butadiene** is characterized as carcinogenic to humans by inhalation.
- **Acetaldehyde** is a probable human carcinogen based on increased incidence of nasal tumors in male and female rats and laryngeal tumors in male and female hamsters after inhalation exposure.
- **Diesel exhaust** is likely to be carcinogenic to humans by inhalation from environmental exposures. Diesel exhaust as reviewed in this document is the combination of diesel particulate matter and diesel exhaust organic gases. Diesel exhaust also represents chronic respiratory effects, possibly the primary noncancer hazard from MSATs. Prolonged exposures may impair pulmonary function and could produce symptoms, such as cough, phlegm, and chronic bronchitis. Exposure relationships have not been developed from these studies.

Chapter 4 AFFECTED ENVIRONMENT

The affected environment discussed in this report is the same as discussed in Chapter 5 of the 2004 Draft EIS Appendix Q, with the exception of updated information on the CO concentrations near congested intersections north of the Battery Street Tunnel.

4.1 Estimated Existing Air Pollutant Conditions

4.1.1 CO Concentrations Near Congested Intersections

Worst-case CO concentrations were estimated in parts per million (ppm) at five intersections, as presented in Exhibit 4-1. The maximum estimated 1-hour CO concentrations from vehicle emissions for existing conditions range between 9.7 and 11.4 ppm, and the maximum estimated 8-hour CO concentrations range between 7.1 and 8.3 ppm, all of which are below NAAQS.

Exhibit 4-1. Modeled Existing CO Concentrations

Intersection		Modeled 2002 CO Concentrations (ppm)	
Street	with Street	1-Hour Average[1]	8-Hour Average[2]
Fifth Avenue N.	Mercer Street	10.2	7.5
Sixth Avenue N.	Mercer Street	N/A	N/A
Dexter Avenue N.	Mercer Street	11.4	8.3
NB Aurora Avenue N.	Denny Way	9.7	7.1
Dexter Avenue N.	Denny Way	10.5	7.7

N/A = Not currently signalized.

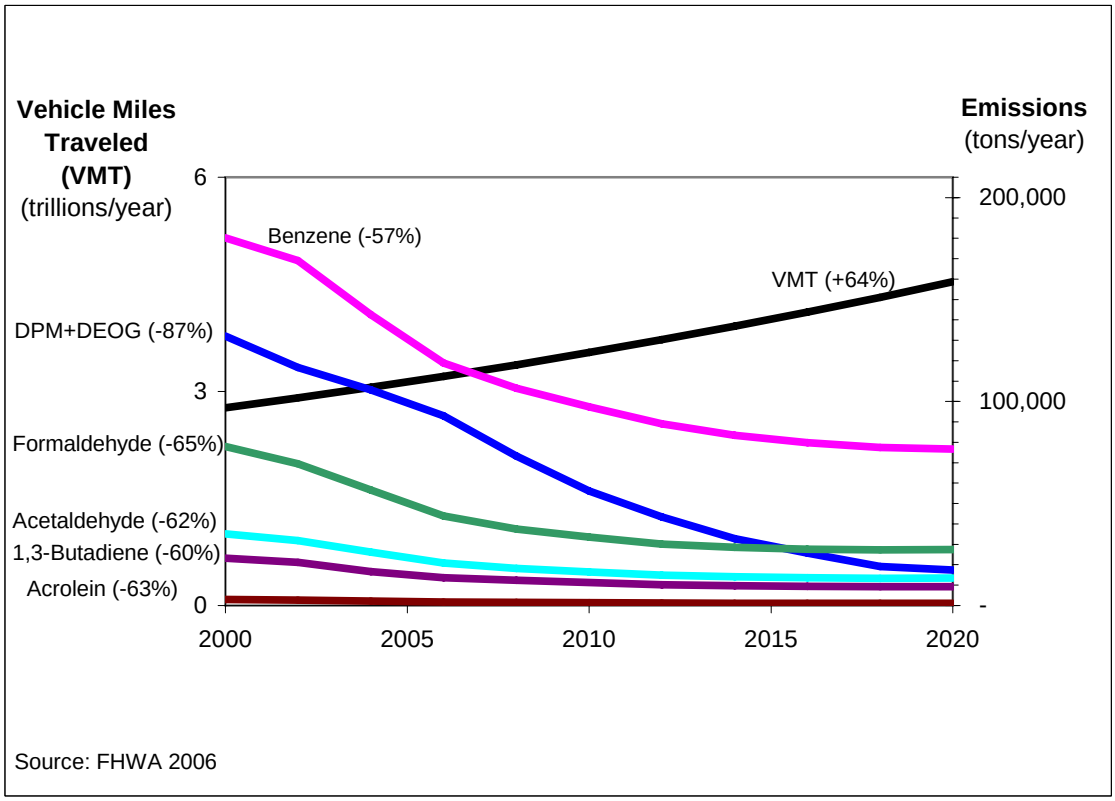
[1] The 1-hour average NAAQS for CO is 35 ppm.

[2] The 8-hour average NAAQS for CO is 9 ppm.

4.1.2 Mobile Source Air Toxics

The EPA has issued a number of regulations that will dramatically decrease MSATs through cleaner fuels and cleaner engines. Between 2000 and 2020, FHWA projects that even with a 64 percent increase in vehicle miles traveled (VMT), these programs will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 57 percent to 65 percent, and will reduce on-highway diesel PM emissions by 87 percent, as shown in Exhibit 4-2.

Exhibit 4-2. Mobile Source Air Toxic Emission Trends



Source: FHWA 2006

Chapter 5 OPERATIONAL IMPACTS AND BENEFITS

Operational impacts of the updated Tunnel (Preferred) and Elevated Structure Alternatives are the same as discussed in Chapter 6 of the 2004 Draft EIS Appendix Q, with the exception of updated information on the following areas.

5.1 Tunnel Alternative (Preferred Alternative)

5.1.1 CO Concentrations Near Congested Intersections

CO concentrations near congested intersections for the updated Tunnel Alternative (with either the stacked or side-by-side tunnel alignment) are similar to concentrations for the Tunnel Alternative in the Draft EIS (Section 6.1.1), with the exception of updated information on intersections north of the Battery Street Tunnel.

CO concentrations in 2030 under the Tunnel and Elevated Structure Alternatives are predicted to be lower than existing conditions because of reductions in vehicle emissions as newer vehicles replace older, more polluting vehicles. No exceedances of the 1-hour average NAAQS for CO of 35 ppm were predicted at any location under the Tunnel and Elevated Structure Alternatives in 2030 (Exhibit 5-1). Similarly, no exceedances of the 8-hour average NAAQS for CO of 9 ppm were predicted for 2030 (Exhibit 5-2). Worst-case 1-hour average CO concentrations were predicted to range between 5.5 and 7.9 ppm, while 8-hour average CO concentrations were predicted to range between 4.1 and 5.8 ppm.

Exhibit 5-1. Predicted 2030 1-Hour Average Intersection CO Concentrations

Intersection		CO Concentration (ppm)
Street	with Street	Tunnel (Preferred) and Elevated Structure Alternatives
Fifth Avenue N.	Mercer Street	7.4
Sixth Avenue N.	Mercer Street	6.1
Dexter Avenue N.	Mercer Street	7.9
Aurora Avenue N.	Denny Way	6.0
Dexter Avenue N.	Denny Way	5.5

The 1-hour average NAAQS for CO is 35 ppm.

Exhibit 5-2. Predicted 2030 8-Hour Average Intersection CO Concentrations

Intersection		CO Concentration (ppm)
Street	with Street	Tunnel (Preferred) and Elevated Structure Alternatives
Fifth Avenue N.	Mercer Street	5.5
Sixth Avenue N.	Mercer Street	4.5
Dexter Avenue N.	Mercer Street	5.8
Aurora Avenue N.	Denny Way	4.5
Dexter Avenue N.	Denny Way	4.1

The 8-hour average NAAQS for CO is 9 ppm.

5.1.2 Mobile Source Air Toxics

For the Tunnel Alternative, the amount of MSATs emitted would be proportional to the vehicle miles traveled (VMT). Because the estimated VMT under each of the Alternatives are nearly the same, it is expected there would be no appreciable difference in overall MSAT emissions between the Tunnel and No Build Alternatives. Also, regardless of the alternative chosen, emissions will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce MSAT emissions by 57 to 87 percent between 2000 and 2020. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

5.1.3 Tunnel Ventilation Building Analysis – Stacked Tunnel Alignment

The vent building locations would move slightly within the SR 99 right-of-way but would not be substantially different from the locations described for the Tunnel Alternative in Section 6.5.4 of the 2004 Draft EIS Appendix Q. Therefore, the impacts would be similar to those analyzed in Section 6.5.4 of the Draft EIS Appendix Q.

A new vent building has been proposed for the Battery Street Tunnel, located near Fourth Avenue and Battery Street. This vent building would be used during normal operations to introduce air into the tunnel and not to extract pollution. The vent building would extract pollution only during emergency operations. Therefore, no change to ordinary operations is anticipated, and the air quality analysis would be similar to that for the Tunnel Alternative in Section 6.5.4 of the 2004 Draft EIS Appendix Q.

5.1.4 Tunnel Alternative Options

Operational air quality impacts for the updated Tunnel Alternative options would be the same as those for the Tunnel Alternative described in Section 5.1.1 of this report, with the exception of the following areas.

Option: Lowered Aurora to Comstock Street

The Lowered Aurora Option would have lower traffic volumes and similar LOS to the Partially Lowered Aurora Option. The Lowered Aurora Option would therefore be similar to the Partially Lowered Aurora Option to Aloha Street analyzed in Section 5.1.1 of this report and is not anticipated to have a substantial effect on air quality.

Option: Side-by-Side Tunnel – Vent Building Analysis

The vent building impacts would be the same as those for the Tunnel Alternative in Section 6.5.4 of the 2004 Draft EIS Appendix Q.

5.2 Elevated Structure Alternative

Operational air quality impacts for the Elevated Structure Alternative would be similar to those for the updated Tunnel Alternative described in Sections 5.1.1 and 5.1.2 of this report.

5.3 Project Benefits

Project benefits would be similar to those described in Section 6.7 of the 2004 Draft EIS Appendix Q.

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Chapter 6 CONSTRUCTION IMPACTS

Air quality impacts of the updated Tunnel (Preferred) and Elevated Structure Alternatives during construction are the same as discussed in Chapter 7 of the 2004 Draft EIS Appendix Q, with the exception of the additional construction related to lowering Aurora Avenue N. north of the Battery Street Tunnel.

6.1 Tunnel Alternative (Preferred Alternative)

With both the shorter construction plan and the intermediate construction plan, the Partially Lowered Aurora Option would require excavation and paving activities similar to those described in the Construction Impacts, Section 7.3, of the 2004 Draft EIS Appendix Q.

Construction air quality impacts for the updated Tunnel Alternative in the rest of the project area would be similar to those discussed for the Tunnel Alternative in Section 7.3.4 of the 2004 Draft EIS Appendix Q.

6.1.1 Tunnel Alternative Options

The Lowered Aurora Option would require excavation and paving activities similar to those described in the Construction Impacts, Section 7.3, of the 2004 Draft EIS Appendix Q.

Construction air quality impacts for the options for the updated Tunnel Alternative in the rest of the project area would be similar to those discussed for the Tunnel Alternative in Section 7.3.4 of the 2004 Draft EIS Appendix Q.

6.2 Elevated Structure Alternative

Partially lowering Aurora Avenue N. for the Elevated Structure Alternative (the longer construction plan) would have similar construction impacts as for the updated Tunnel Alternative in Section 6.1 of this report.

Construction impacts for the Elevated Structure Alternative in the rest of the project area would be similar to those discussed for the Rebuild and Aerial Alternatives (Sections 7.3.2 and 7.3.3) of the 2004 Draft EIS Appendix Q.

6.2.1 Elevated Structure Alternative Options

Construction impacts for the option to relocate Whatcom Railyard in the south section would be similar to those discussed for the Rebuild and Aerial Alternatives (Sections 7.3.2 and 7.3.3) of the 2004 Draft EIS Appendix Q.

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Chapter 7 SECONDARY AND CUMULATIVE IMPACTS

Secondary and cumulative impacts would be the same as those described in Chapter 8 of the 2004 Draft EIS Appendix Q. The Seattle Monorail Green Line, listed as a cumulative impact project in the 2004 Draft EIS, is no longer going to be constructed. However, its removal will not alter the air quality analysis in this Supplemental Draft EIS.

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Chapter 8 OPERATIONAL MITIGATION

Operational mitigation measures would be similar to those described in Section 9.1 of the 2004 Draft EIS Appendix Q.

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Chapter 9 CONSTRUCTION MITIGATION

Construction mitigation measures would be similar to those described in Section 9.2 of the 2004 Draft EIS Appendix Q.

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Chapter 10 REFERENCES

References are the same as those in Chapter 11 of the 2004 Draft EIS Appendix Q with the additional references below.

FHWA (Federal Highway Administration). 2006. Interim Guidance on Air Toxics Analysis in NEPA Documents. U.S. Department of Transportation, Federal Highway Administration, Washington D.C.

WSDOT (Washington State Department of Transportation), City of Seattle, and U.S. Department of Transportation, Federal Highway Administration. 2004. SR 99: Alaskan Way Viaduct & Seawall Replacement Project Draft Environmental Impact Statement. Washington State Department of Transportation, Urban Corridors Office, Seattle, Washington.

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ATTACHMENT A

Air Quality Intersection Screening

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AIR QUALITY INTERSECTION SCREENING

Exhibit A-1. Tunnel and Elevated Structure Alternative Partially Lowered Aurora Ranking by Volume

Volume Rank	Intersection	Volume	Delay
1	**Mercer Street & Dexter Avenue N.**	**5550**	**33**
2	**Mercer Street & Fifth Avenue N.**	**4526**	**29**
3	**Mercer Street & Sixth Avenue N.**	**4525**	**15**
4	Denny Way & Aurora Avenue N. NB	3970	48
5	Denny Way & Broad Street	3875	20
6	Mercer Street & Taylor Avenue N.	3725	2
7	Denny Way & Dexter Avenue N.	3724	49
8	Harrison Street & Dexter Avenue N.	2887	11
9	Roy Street & Dexter Avenue N.	2800	27
10	Denny Way & Aurora Avenue N. SB	2700	29
11	Thomas Street & Broad Street	2623	16
12	Denny Way & Fourth Avenue N.	2520	7
13	Harrison Street & Fifth Avenue N.	2416	6
14	Denny Way & Sixth Avenue N.	2385	13
15	Denny Way & Fifth Avenue N.	2384	9
16	Republican Street & Dexter Avenue N.	2335	9
17	Roy Street & Fifth Avenue N.	2326	19
18	Thomas Street & Dexter Avenue N.	2223	9
19	Fourth Avenue N. & Broad Street	1850	1
20	Roy Street & Sixth Avenue N.	1724	8
21	John Street & Dexter Avenue N.	1636	5
22	Harrison Street & Sixth Avenue N.	1610	10
23	Roy Street & SB Roy off-ramp	1600	0
24	Roy Street & NB Roy off-ramp	1500	0
25	Thomas Street & Sixth Avenue N.	1259	5
26	Roy Street & Taylor Avenue	975	1
27	Republican Street & Sixth Avenue N.	675	0
28	Republican Street & NB Republican off-ramp	600	0
29	John Street & Sixth Avenue N.	565	0
30	Taylor Avenue N. & Fifth Avenue N.	343	0

Results of ranking by volume for all intersections under this alternative (see Section 4.2 in the 2004 Draft EIS Appendix Q for intersection ranking methodology).
Bolded intersections were selected under this ranking.
NB = northbound, SB = southbound

Exhibit A-2. Tunnel and Elevated Structure Alternative Partially Lowered Aurora Ranking by Delay

Delay Rank	Intersection	Volume	Delay
1	**Denny Way & Dexter Avenue N.**	**3724**	**49**
2	**Denny Way & Aurora Avenue N. NB**	**3970**	**48**
3	**Mercer Street & Dexter Avenue N.**	**5550**	**33**
4	Mercer Street & Fifth Avenue N.	4526	29
5	Denny Way & Aurora Avenue N. SB	2700	29
6	Roy Street & Dexter Avenue N.	2800	27
7	Denny Way & Broad Street	3875	20
8	Roy Street & Fifth Avenue N.	2326	19
9	Thomas Street & Broad Street	2623	16
10	Mercer Street & Sixth Avenue N.	4525	15
11	Denny Way & Sixth Avenue N.	2385	13
12	Harrison Street & Dexter Avenue N.	2887	11
13	Denny Way & Fifth Avenue N.	2384	9
14	Republican Street & Dexter Avenue N.	2335	9
15	Thomas Street & Dexter Avenue N.	2223	9
16	Roy Street & Sixth Avenue N.	1724	8
17	Denny Way & Fourth Avenue N.	2520	7
18	Harrison Street & Fifth Avenue N.	2416	6
19	Mercer Street & Taylor Avenue N.	3725	2
20	Fourth Avenue N. & Broad Street	1850	1

Results of ranking by delay for the 20 highest-volume intersections under this alternative (see Section 4.2 in the 2004 Draft EIS Appendix Q for intersection ranking methodology).

Bolded intersections were selected under this ranking.

NB = northbound, SB = southbound

Exhibit A-3. Tunnel and Elevated Structure Alternative Lowered Aurora Ranking by Volume

Volume Rank	Intersection	Volume	Delay
1	Mercer Street & Dexter Avenue N.*	4804	17
2	Mercer Street & Fifth Avenue N.*	4449	50
3	Mercer Street & Sixth Avenue N.*	4349	21
4	Denny Way & Broad Street	3970	22
5	Denny Way & Dexter Avenue N.*	3704	51
6	Denny Way & Aurora Avenue N. NB*	3695	42
7	Mercer Street & Taylor Avenue N.	3599	6
8	Republican Street & Dexter Avenue N.	2973	20
9	Thomas Street & Broad Street	2805	27
10	Denny Way & Aurora Avenue N. SB	2715	41
11	Denny Way & Fourth Avenue N.	2634	10
12	Denny Way & Aurora Avenue N. NB	2575	0
13	Denny Way & Sixth Avenue N.	2534	18
14	Harrison Street & Fifth Avenue N.	2510	10
15	Roy Street & Fifth Avenue N.	2337	24
16	Harrison Street & Dexter Ave	2275	14
17	Roy Street & Dexter Avenue	2177	17
18	Denny Way & Fifth Avenue N.	2144	10
19	Thomas Street & Dexter Avenue	1910	8
20	Harrison Street & Sixth Avenue N.	1900	17
21	Fourth Avenue & Broad Street	1900	2
22	Republican Street & Aurora Avenue N. NB	1850	0
23	Aurora Avenue NB & WB RT to NB 99	1750	0
24	Republican Street & Sixth Avenue N.	1550	13
25	John Street & Dexter Avenue	1535	11
26	Roy Street & Sixth Avenue N.	1512	10
27	Republican Street & Republican NB Off	1350	8
28	Republican Street & Aurora Avenue N. SB	1250	0
29	Roy Street & Aurora Avenue N. SB On-Ramp	1249	0
30	Roy Street & Aurora Avenue SB Off-Ramp	1075	13
31	Roy Street & Taylor Avenue N.	905	5
32	Taylor Avenue N. & Fifth Avenue N.	343	0

Results of ranking by volume for all intersections under this alternative (see Section 4.2 in the 2004 Draft EIS Appendix Q for intersection ranking methodology).
*Intersection selected for analysis under the Partially Lowered Aurora Option.
NB = northbound, SB = southbound

Exhibit A-4. Tunnel and Elevated Structure Alternative Lowered Aurora Ranking by Delay

Delay Rank	Intersection	Volume	Delay
1	Denny Way & Dexter Avenue N.*	3704	51
2	Mercer Street & Fifth Avenue N.*	4449	50
3	Denny Way & Aurora Avenue N. NB*	3695	42
4	Denny Way & Aurora Avenue N. SB	2715	41
5	Thomas Street & Broad Street	2805	27
6	Roy Street & Fifth Avenue N.	2337	24
7	Denny Way & Broad Street	3970	22
8	Mercer Street & Sixth Avenue N.*	4349	21
9	Republican Street & Dexter Avenue N.	2973	20
10	Denny Way & Sixth Avenue N.	2534	18
11	Mercer Street & Dexter Avenue N.*	4804	17
12	Roy Street & Dexter Avenue	2177	17
13	Harrison Street & Sixth Avenue N.	1900	17
14	Harrison Street & Dexter Avenue	2275	14
15	Harrison Street & Fifth Avenue N.	2510	10
16	Denny Way & Fourth Avenue N.	2634	10
17	Denny Way & Fifth Avenue N.	2144	10
18	Thomas Street & Dexter Avenue	1910	8
19	Mercer Street & Taylor Avenue N.	3599	6
20	Denny Way & Aurora Avenue N. NB	2575	0

Results of ranking by delay for the 20 highest-volume intersections under this alternative (see Section 4.2 in the 2004 Draft EIS Appendix Q for intersection ranking methodology).

*Intersection selected for analysis under the Partially Lowered Aurora Option

NB = northbound, SB = southbound

ATTACHMENT B

Air Quality Modeling Files

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ATTACHMENT B AIR QUALITY MODELING FILES

The detailed modeling files are available upon request.

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