

**DRAFT ENVIRONMENTAL IMPACT STATEMENT
SR 520 BRIDGE REPLACEMENT AND HOV PROGRAM**

MAY 2010

SR 520 Pontoon Construction Project

Air Quality Technical Memorandum



THE INFORMATION IN THIS REPORT IS ACCURATE; HOWEVER, THE PONTOON CONSTRUCTION PROJECT DRAFT ENVIRONMENTAL IMPACT STATEMENT IS THE SOURCE OF THE MOST CURRENT PROJECT INFORMATION AND ANALYSIS.

SR 520 Pontoon Construction Project Draft Environmental Impact Statement

Air Quality Technical Memorandum

Prepared for
Washington State Department of Transportation
Federal Highway Administration

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May 2010

Contents

Abbreviations and Acronyms	v
1. Introduction	1
Why is air quality considered in an environmental impact statement?	1
What are the key points of this technical memorandum?.....	1
What are the project alternatives?	1
2. Affected Environment	7
What policies or regulations are related to effects on air quality?	7
What air pollutants would the project generate?	7
What standards apply to air quality?	8
What are transportation conformity requirements?	10
How do climate and weather affect air quality?	10
How is air quality measured in the study area?	10
How does air quality compare with current standards in the study area?	12
3. Potential Effects of the Project	14
How were air pollutant emissions during construction activities evaluated?.....	14
How were air pollutant emissions during operation activities evaluated?	16
How were air quality effects from the project evaluated?.....	16
How would construction of the project affect air quality?	17
How would operation of the project affect air quality?.....	18
How would the project affect air quality in the long term?.....	21
How would the alternatives differ in their effects on air quality?	21
4. Mitigation	22
What would WSDOT do to avoid or minimize negative effects?	22
5. References	24

Appendices

- A Characteristics and Health Effects of Pollutants
- B Air Emissions Assumptions and Calculations

Exhibits

- 1 Locations and Conceptual Layouts for Build Alternative Sites
- 2 Summary of Ambient Air Quality Standards in the Study Area
- 3 Central Puget Sound Region Designated Maintenance Areas
- 4 Ambient Criteria Pollutant Concentration Levels Measured from 2004 through 2008 near CTC Facility
- 5 Ambient Criteria Pollutant Concentration Levels Measured from 2004 through 2008 near Grays Harbor

- 6 CTC Facility Emissions for Operations in Tons per Year
- 7 Anderson & Middleton Alternative Emissions for Construction and Operation in Tons per Year
- 8 Aberdeen Log Yard Alternative Emissions for Construction and Operation in Tons per Year
- 9 Maximum Annual Emission Comparison in Grays Harbor by Alternative in Tons per Year
- 10 Maximum Annual Emission Comparison in Tacoma by Alternative in Tons per Year

Abbreviations and Acronyms

§	Section
µg/m ³	microgram(s) per cubic meter
CAA	Clean Air Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CO ₂	carbon dioxide
CTC	Concrete Technology Corporation, Inc.
Draft EIS	Pontoon Construction Project Draft Environmental Impact Statement
Ecology	Washington State Department of Ecology
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
FHWA	Federal Highway Administration
HOV	High-Occupancy Vehicle
LOS	level of service
MSAT	Mobile Source Air Toxic
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO ₂	nitrogen dioxide
NO _x	oxides of nitrogen
ORCAA	Olympic Region Clean Air Agency
PM	particulate matter
PM _{2.5}	particulate matter less than or equal to 2.5 microns in diameter
PM ₁₀	particulate matter less than or equal to 10 microns in diameter
ppm	part(s) per million
PSCAA	Puget Sound Clean Air Agency
PSRC	Puget Sound Regional Council

RCW	Revised Code of Washington
SCAQMD	South Coast Air Quality Management District
SIP	State Implementation Plan
SO ₂	sulfur dioxide
USC	United States Code
VMT	vehicle miles traveled
VOC	volatile organic compound
WAC	Washington Administrative Code
WSDOT	Washington State Department of Transportation

1. Introduction

Why is air quality considered in an environmental impact statement?

Air quality refers to the cleanliness of the atmosphere. Clean air is vital to human health and is a resource protected by federal, state, and local regulations. Pollutants in the air not only can negatively affect humans but can also affect flora, fauna, and physical structures. National Environmental Policy Act (NEPA) regulations require that the effects of a proposed project on air quality be evaluated in an environmental impact statement (EIS).

What are the key points of this technical memorandum?

The Washington State Department of Transportation (WSDOT) proposes building a casting basin facility at one of two sites (Anderson & Middleton Alternative or Aberdeen Log Yard Alternative) in the Grays Harbor area to manufacture large concrete floating bridge pontoons. These pontoons would be built to replace the floating portion of the Evergreen Point Bridge in the event of a catastrophic failure or to support the planned replacement of the bridge. The Concrete Technology Corporation, Inc. (CTC) casting basin in Tacoma would be used primarily to build smaller pontoons while the Grays Harbor casting basin was being built. The CTC facility would be used concurrently with one of the above-mentioned alternatives. The completed pontoons would be moored at approved locations in Grays Harbor and in Puget Sound until needed.

This air quality analysis includes a review of the existing air quality in the region and assessments of project construction and operational effects. The air quality analysts considered local and regional effects.

The report presents the following key findings that resulted from the air quality analysis:

- The project is not expected to cause or contribute to any new violation of the National Ambient Air Quality Standards (NAAQS)
- The project is expected to have a low potential for Mobile Source Air Toxic (MSAT) emissions
- The project meets conformity requirements
- Any air quality effects related to project construction and operation would be temporary and cease after project completion

What are the project alternatives?

The Pontoon Construction Project Draft EIS evaluates two build alternatives that would involve constructing a new casting basin in Grays Harbor and one No Build Alternative. Two waterfront sites in the Grays Harbor area are being evaluated for the new casting basin facility:

- Anderson & Middleton property in Hoquiam
- Aberdeen Log Yard property in Aberdeen

The new Grays Harbor casting basin facility could produce all 33 pontoons needed for this project: 21 longitudinal pontoons (360 feet long by 75 feet wide), 10 supplemental stability pontoons (98 feet long by 60 feet wide), and 2 cross pontoons (240 feet long by 75 feet wide). To expedite pontoon construction, however, each build alternative could include using the existing CTC casting basin facility in Tacoma to build pontoons while the new casting basin facility at Grays Harbor is being constructed. If used, the CTC facility, which has a limited operations area, could build up to three longitudinal pontoons and up to ten supplemental stability pontoons.

What is a casting basin facility?

Pontoons for this project would be built at a casting basin facility. The facility would consist of a casting basin (a large chamber in which pontoons are constructed, see the next text box for a more thorough description) and several supporting facilities, such as a batch plant to produce concrete, access roads, storage and laydown areas, office space for workers, and water treatment facilities.

WSDOT would float most of the completed pontoons built at the new casting basin facility out of the casting basin and tow them to a moorage location in the Grays Harbor area. The last pontoons built would be stored in the casting basin until needed. Any pontoons constructed at the CTC facility would be moored at existing marine berths in Puget Sound.

After the project is completed, the new casting basin would be available to produce additional pontoons needed for the planned Evergreen Point Bridge replacement, a component of the I-5 to Medina: Bridge Replacement and High-Occupancy Vehicle (HOV) Project. Pontoons for other WSDOT bridge replacement projects in the future could also be produced at this facility.

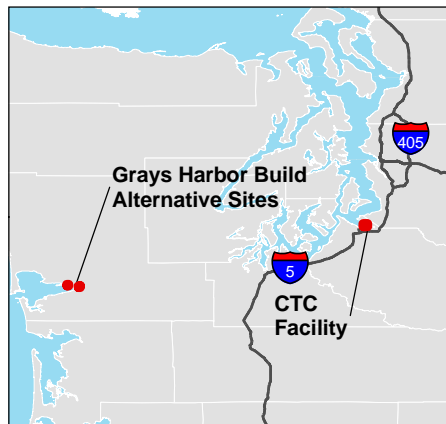
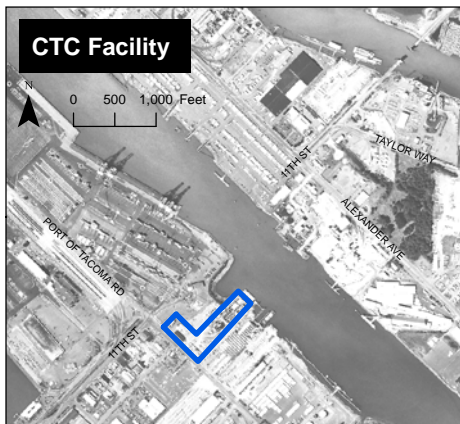
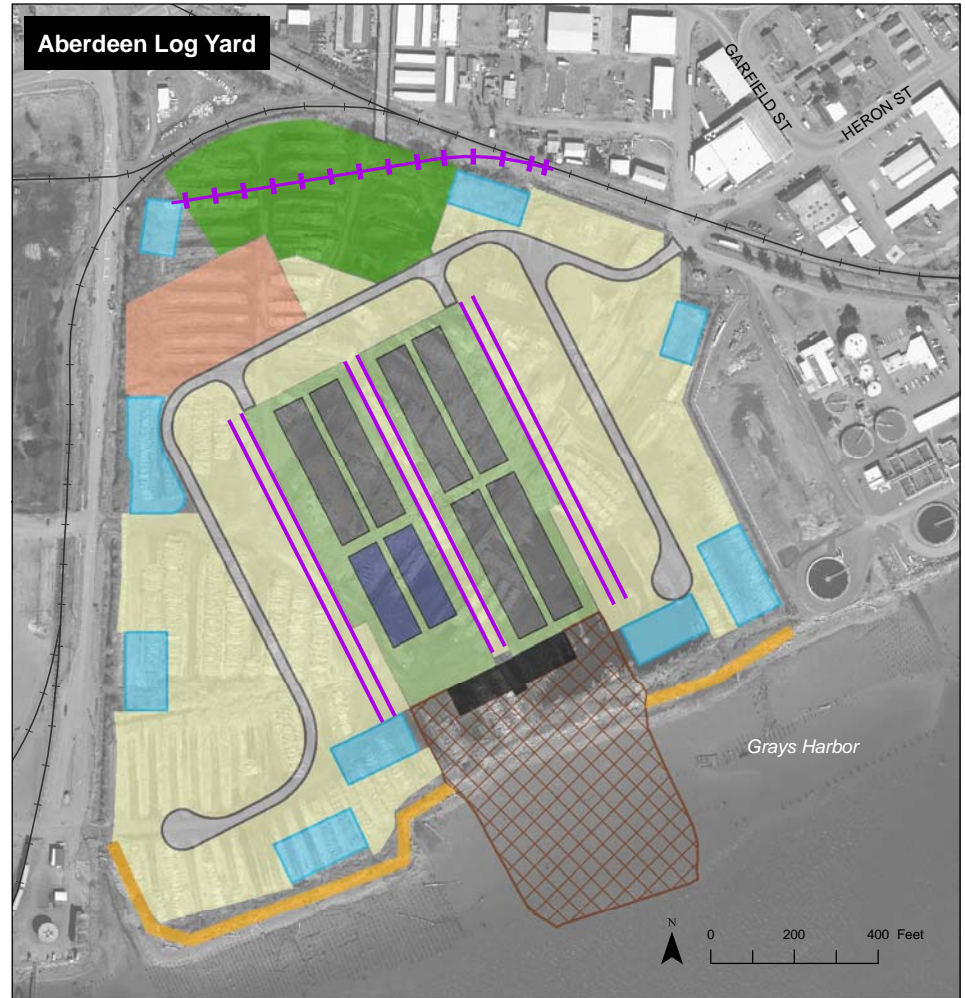
Each alternative is described below. For more details, see the Description of Alternatives and Construction Techniques Discipline Report (WSDOT 2009a), included as Appendix B to the Draft EIS.

Site Descriptions

Anderson & Middleton Alternative

The 105-acre Anderson & Middleton Alternative site is on the north shore of Grays Harbor in Hoquiam, Washington (Exhibit 1). This generally flat property is privately owned and is zoned for industrial use. The site is surrounded by industrial maintenance shop buildings to the west, railroad tracks to the north, and vacant industrial property to the east; a rock berm borders the shoreline. The Anderson & Middleton site has no structures on it except for an existing small office building on the northern edge of the property. The site also has some gravel roads and an asphalt pad remaining from its former use as a log sorting yard. WSDOT would purchase 95 acres of this site for the project, and the casting basin and support facilities would occupy the eastern half of the site, amounting to approximately 55 acres.

Historically this site has been used for lumber industry activities. In the early twentieth century there was a sawmill and other related facilities, such as machine shops and burners, west of what was then an extension of 8th Street. Over the next several decades, fill from harbor dredging and refuse accumulation increased the land area of the site. By the late



- Crane rail
- Proposed rail spur
- Existing railroad
- CTC facility limits
- Cross pontoon
- Longitudinal pontoon
- Water treatment area
- Access road
- Batch plant
- Berm
- Casting basin
- Dry storage and laydown area
- Gate
- Launch channel
- Office and parking

Source: WSDOT (2005, 2006) Aerial Photo, USDA-FSA (2006) Aerial Photo, Grays Harbor County (2006) GIS Data (Roads), Horizontal datum for all layers is State Plane Washington South NAD 83; vertical datum for layers is NAVD88.

Exhibit 1. Locations and Conceptual Layouts for Build Alternative Sites

Pontoon Construction Project



1960s, the former mill structures were all gone. Since then, the site has been used for timber storage.

Aberdeen Log Yard Alternative

The 51-acre Aberdeen Log Yard Alternative site lies on the north shore of Grays Harbor in Aberdeen, Washington, near the mouth of the Chehalis River (Exhibit 1). This generally flat site is zoned industrial and is currently owned and used for log storage by Weyerhaeuser Corporation. There are no structures on the site now but there is a system of unpaved access roads connecting to East Terminal Road to the west and State Street to the northeast.

Immediately west of the site is paved Port of Grays Harbor industrially zoned property, the City of Aberdeen wastewater treatment plant borders the eastern boundary, and the Puget Sound & Pacific Railroad mainline and siding run along the northern boundary of the site. WSDOT would purchase all 51 acres, and the casting basin and support facilities would occupy the entire site.

Two sawmills operated on the site in the last century, but since 1971, the site has been used mostly for log storage. All former sawmill-related structures have been demolished. Between 1971 and 1981, the shoreline was extended to the south through backfilling with sediments dredged from the Chehalis River, accumulated wood waste, and other fill material.

No Build Alternative

For the Pontoon Construction Project, the No Build Alternative is continued existing conditions and uses at all proposed alternative sites. Specifically, this means that WSDOT would not construct or store any pontoons—either at a new Grays Harbor facility or at the existing Tacoma CTC facility—needed to respond to a catastrophic failure of the Evergreen Point Bridge. As a result, any environmental effects resulting from the proposed project activities would not occur.

For this Draft EIS, WSDOT assumes that, if unused by this project, the alternative site properties would continue to be used as they are today: the Aberdeen Log Yard would remain an active log yard, the Anderson & Middleton site would remain largely inactive, and the CTC site would be used as a casting basin for other projects and clients. While either Grays Harbor site could be developed for new uses should this project not occur, the use of these properties has remained unchanged since the 1990s. Potential future uses for these two properties, other than our proposed project, are speculative and therefore not considered under the No Build Alternative.

Key Components of Both Build Alternatives

Both build alternatives would carry out the proposed action by constructing a casting basin in the Grays Harbor area. Use of the existing CTC facility in Tacoma to produce pontoons while the new casting basin is constructed could also occur.

Potential Use of the Existing CTC Casting Basin Facility

The existing CTC facility is adjacent to the Blair Waterway on the eastern edge of Commencement Bay in Tacoma (Exhibit 1). This casting basin is too small to accommodate the timely construction of the pontoons required for the Pontoon Construction Project, but WSDOT could use this facility to supplement pontoon construction at the larger casting basin proposed in the Grays Harbor area. The pontoons manufactured at the CTC facility would most likely be the smaller supplemental stability pontoons.

WSDOT would moor the pontoons built at the CTC facility at existing marine berths in Puget Sound, subject to availability.

Proposed Grays Harbor Casting Basin

The design of the proposed Grays Harbor casting basin would be basically the same at both build alternative sites, with variations depending on site-specific features. (See the Description of Alternatives and Construction Techniques Discipline Report [WSDOT 2009a] for information on the casting basin conceptual design.) The casting basin would be positioned a few hundred feet from the shoreline and partitioned into two separate work areas—called chambers—connected to the water by a single launch channel. The launch channel would consist of an onshore portion excavated between the casting basin and shoreline, a breach in the shoreline berm, and a dredged channel extending offshore to the federal navigation channel in Grays Harbor.

Up to four concrete pontoons could be cast and cured in each of the two chambers of the partitioned casting basin, allowing pontoon construction to be phased for efficiency. That is, while the second chamber is under construction, pontoon construction could be initiated in the first partitioned chamber as soon as it was completed. Two reinforced floating concrete gates leading to each chamber would allow each to be independently flooded and drained, as well as control access to the launch channel.

Constructing a casting basin facility at either Grays Harbor build alternative site would require heavy construction activities to transform the vacant land into an industrial facility. Such activities include, but would not be limited to, the following:

- Grading (leveling) the site and excavating the casting basin
- Pile-driving to install support piles for the casting basin floor
- Paving onsite access roads
- Making multiple truck trips for hauling materials to and from the site
- Dewatering the soils during casting basin construction

All stormwater, process water, and groundwater collected onsite would be handled and treated in accordance with state water quality requirements and discharged to Grays Harbor.

What is a casting basin?

A casting basin is a construction facility built next to a navigable waterway that consists of a concrete slab built deep below ground level and surrounded by high concrete walls. The interior area of the casting basin provides a flat dry space where several pontoons can be constructed side by side at the same time. After the pontoons are completed, the basin is flooded. The basin walls contain the floodwater, allowing the pontoons to float. When the pontoons are floating, a gate is opened and the pontoons are towed from the casting basin into navigable waters.

Project engineers are designing a water supply, distribution, and treatment system for each site to meet state standards.

Dewatering

WSDOT would install two different dewatering systems to remove groundwater from the casting basin work area at either build alternative site. Before and during casting basin construction, a temporary construction dewatering system would operate at the site. During pontoon-building operations and after the Pontoon Construction Project is completed (but while the site is still maintained by WSDOT), a permanent operation dewatering system would operate.

Operational Support Facilities

To support the use of the casting basin, each build alternative would include onsite operational support facilities such as an access road, a concrete batch plant, large laydown areas, water handling and treatment areas, office space, a rail spur, and a designated parking area for workers.

Pontoon Towing and Moorage

If WSDOT uses the existing CTC facility in Tacoma, it would moor the pontoons built there at existing marine berths in Puget Sound. Using these berths would be subject to availability, but there are several locations in the Puget Sound region that could accommodate this project's needs. The first two cycles of eight pontoons manufactured at the new Grays Harbor casting basin facility would be towed from the casting basin and moored in the Grays Harbor area outside of navigation channels. The last construction cycle of pontoons could be stored in the dry casting basin behind the closed gate.

For the pontoons to be moored in the Grays Harbor area, there are several existing berths that WSDOT could lease for pontoon moorage, if available when needed. In addition, WSDOT has identified another potential moorage location—open water moorage in Grays Harbor. Please see the Description of Alternatives and Construction Techniques Discipline Report (WSDOT 2009a) for more information on these potential moorage locations.

The constructed pontoons would be stored together until they are needed to replace the Evergreen Point Bridge in the event of a catastrophic failure, and they would be identified with navigation lighting in compliance with U.S. Coast Guard requirements.

Construction Schedule

If WSDOT uses the existing CTC facility, pontoon construction would take 2 years there to complete. WSDOT would start site development for the new Grays Harbor casting basin facility about the same time pontoon construction begins at the CTC facility. For the Grays Harbor facility, casting basin construction would take 2 years, as would pontoon construction. In total, overall pontoon project construction would span 4 years.

WSDOT anticipates that it would take approximately 6 to 9 months to complete a pontoon construction cycle at either the existing Tacoma facility or at the new Grays Harbor facility.

The new Grays Harbor facility could produce eight pontoons during one cycle; as a result, two and a half pontoon construction cycles would be required to produce 20 pontoons. At the existing CTC facility, five supplemental stability pontoons could be constructed during each pontoon construction cycle, and one longitudinal pontoon could be constructed during a cycle. As a result, three construction cycles would be needed to produce ten supplemental stability pontoons and one longitudinal pontoon.

2. Affected Environment

What policies or regulations are related to effects on air quality?

Ambient air quality is a function of many factors, including climate, topography, meteorological conditions, and the production of airborne pollutants by natural or artificial sources. Both the federal Clean Air Act (CAA) (Title 42 United States Code [USC] Section 7401 et seq. 1970) and its amendments and the Washington State CAA (Revised Code of Washington [RCW] 70.94) regulate air quality. The U.S. Environmental Protection Agency (EPA), the Washington State Department of Ecology (Ecology), the Olympic Region Clean Air Agency (ORCAA), and the Puget Sound Clean Air Agency (PSCAA) enforce regulations developed to protect air quality in the proposed pontoon construction areas.

EPA delegates authority to manage air quality issues to the states. In Washington state, EPA and Ecology further delegate authority to local air quality agencies. PSCAA has been delegated authority to regulate air quality in Pierce County, where the CTC facility is located. ORCAA has been delegated authority to regulate air quality in Grays Harbor County, where the Anderson & Middleton Alternative and the Aberdeen Log Yard Alternative are located.

What air pollutants would the project generate?

The major airborne pollutants of interest for transportation-related projects are carbon monoxide (CO), particulate matter (PM), volatile organic compounds (VOCs), and oxides of nitrogen (NO_x); these are commonly referred to as criteria pollutants. VOCs are regulated as precursors to ozone under the ozone ambient air quality standard. Federal and state standards regulate these pollutants, along with two other criteria pollutants—sulfur dioxide (SO₂) and lead. Because lead and SO₂ are not pollutants of concern for transportation-related projects, they are not addressed in this analysis. Attachment A describes the characteristics and health effects of the criteria pollutants in further detail.

Motor vehicles emit six pollutants that EPA classifies as priority MSAT emissions: benzene, formaldehyde, acetaldehyde, diesel particulate matter/diesel exhaust organic gases, acrolein, and 1,3-butadiene. The six priority MSAT emissions are included as air toxics because of their known cancer risk, probable cancer risk, and non-cancer health effects such as reproductive and neurological problems. MSAT emissions can also cause other environmental effects, such as damage to plants and animals.

Another substance generated by fuel combustion in motor vehicles is carbon dioxide (CO₂), one of several pollutants classified as a “greenhouse gas.” The accumulation of greenhouse gases has the potential to trap heat within the earth’s atmosphere and is a major concern in terms of climate change effects. CO₂ accounts for more than 80 percent of the greenhouse gases emitted in the United States. While CO₂ is not directly harmful to human health, increasing emissions of CO₂ and other greenhouse gases are expected to result in changes to global temperatures, leading to environmental effects such as rising sea levels and altered weather patterns. Detailed discussions of CO₂ and other greenhouse gas effects are presented in the Energy Technical Memorandum (WSDOT 2009b).

What standards apply to air quality?

Washington is subject to air quality regulations issued by EPA, Ecology, and local air agencies. EPA’s NAAQS sets limits on concentration levels of criteria pollutants. Concentration levels of the criteria pollutants must not exceed the NAAQS over specified time periods. Ecology, ORCAA, and PSCAA monitor air quality in the Olympic region and Puget Sound region for comparing the levels of criteria pollutants found in the atmosphere with the NAAQS.

The NAAQS comprise two sets of standards: the primary standards (which are intended to protect public health) and the secondary standards (which are intended to protect the natural environment). In addition to these standards, Ecology and PSCAA have adopted state and local ambient air quality standards that are equivalent to, or more stringent than, EPA’s NAAQS. Exhibit 2 summarizes the ambient air quality standards applicable in the study area.

What are criteria pollutants?
 Criteria pollutants are the six pollutants for which the EPA has identified and set standards to protect human health under the Clean Air Act: ozone, carbon monoxide, particulate matter, sulfur dioxide, lead, and oxides of nitrogen. Of these, ozone, carbon monoxide, particulate matter, and the oxides of nitrogen are relevant to transportation projects.

What is attainment?
 An area considered to have air quality as good as or better than the NAAQS for a criteria pollutant designated in the Clean Air Act is said to be in attainment. An area can be in attainment for one pollutant but still be in non-attainment for another.

What is a maintenance area?
 A maintenance area is an area that has met the NAAQS for the criteria pollutants designated in the Clean Air Act and is being managed to continue to meet (that is, maintain) the NAAQS.

EXHIBIT 2
 Summary of Ambient Air Quality Standards in the Study Area

Pollutant ^a	Standard	Averaging Period
Nitrogen dioxide	0.053 ppm	Annual
Carbon monoxide	9 ppm	8 hours
	35 ppm	1 hour
Ozone	0.075 ppm	8 hours
Lead	1.5 µg/m ³	Quarterly

EXHIBIT 2

Summary of Ambient Air Quality Standards in the Study Area

Pollutant ^a	Standard	Averaging Period
Sulfur dioxide	0.02 ppm	Annual
	0.10 ppm	24 hours
	0.05 ppm	3 hours
	0.40 ppm	1 hour
Particulate matter (PM ₁₀)	150 µg/m ³	24 hours
Particulate matter (PM _{2.5}) ^b	15 µg/m ³	Annual
	35 µg/m ³	24 hours

Source: EPA (2009a), WAC 173-474-100, and Washington State Standards (RCW 70.94)

^a CO₂ is not currently subject to federal or state ambient air quality standards.

^b The 24-hour PM_{2.5} standard was reduced to 35 µg/m³ from 65 µg/m³ (effective December 17, 2006).

µg/m³ = microgram(s) per cubic meter

PM₁₀ = particulate matter less than or equal to 10 microns in diameter

PM_{2.5} = particulate matter less than or equal to 2.5 microns in diameter

ppm = part(s) per million

The Pontoon Construction Project would build a new casting basin at one of the locations in Grays Harbor County (that is, Hoquiam or Aberdeen). Grays Harbor County is currently in attainment for all criteria pollutants. The existing CTC facility is located in Tacoma within Pierce County. Tacoma Tideflats, where the CTC facility is located, is in attainment/maintenance for CO and PM₁₀. This designation indicates that the area was previously classified as nonattainment but was reclassified because of improvements in air quality and measured concentrations below the standards for these two pollutants. Because of the maintenance classification, the project effects at the CTC facility need to demonstrate compliance with transportation conformity requirements for CO and PM₁₀. Tacoma is in attainment for all other criteria pollutants.

Currently, there are no established standards for MSAT emissions. Ecology conducted a study in the Seattle area to monitor several air toxic compounds in 2000 to 2001. The study indicated that the primary contributors to air toxics are diesel exhaust and wood smoke (Ecology 2001). EPA's ongoing National Air Toxic Assessment indicates that air toxics risk in the Puget Sound area is similar to other major urban areas; major urban areas are in the top 5 percent in the nation for lifetime cumulative cancer risk (EPA 2006). A federal regulation requiring cleaner-burning diesel fuel for off-road diesel engines by 2010 should reduce the diesel exhaust contribution to the area's toxic air pollutants in the near future. Standards for heavy-duty engines and vehicles took effect in 2007, and these should result in diesel particulate emission reductions of 90 percent (Federal Register Vol. 66, No. 12/Thursday, January 18, 2001/Rules and Regulations). As diesel-fueled vehicles are retired and replaced by these low-emission vehicles, additional reductions in risk associated with transportation-related emissions are expected.

What are transportation conformity requirements?

Transportation conformity is an analytical process required for all federally funded transportation projects located in non-attainment or maintenance areas. Under the 1990 CAA Amendments, the U.S. Department of Transportation cannot fund, authorize, or approve federal actions to support programs or projects that do not conform to the State Implementation Plan (SIP) (that is, the state's plan for meeting and maintaining compliance with the NAAQS) for achieving the goals of the CAA. Conformity with the CAA takes place on two levels: first at the regional level and second at the project level. The proposed project must conform at both levels to be approved.

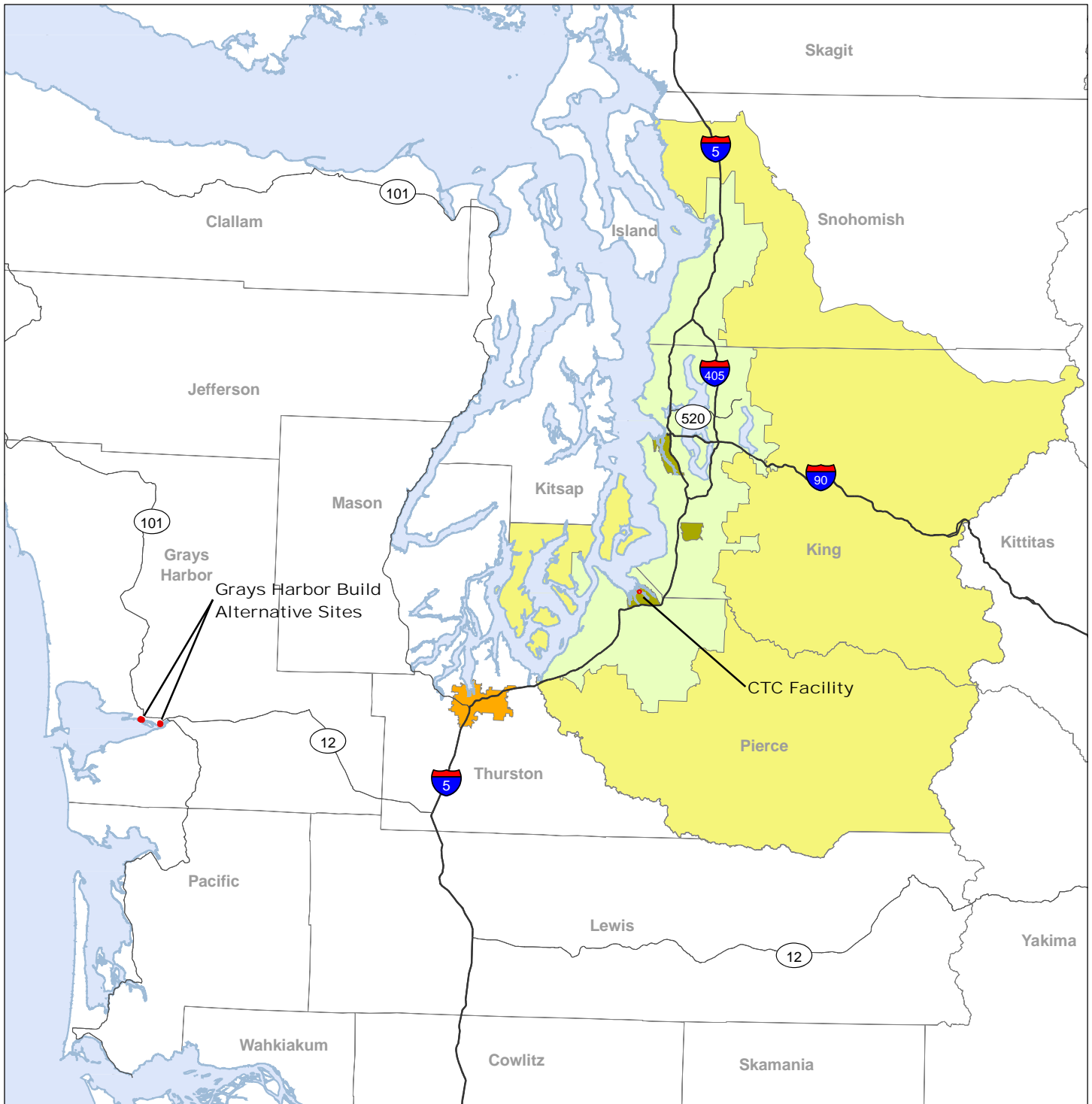
In Washington, transportation projects located in maintenance and nonattainment areas must meet the federal CAA conformity requirements (implemented by EPA regulations 40 CFR Parts 51 and 93) and the Washington CAA (WAC 173-420). The Pontoon Construction Project is subject to the conformity requirements because it is a federally funded transportation program (that is, the State Route 520 Bridge Replacement and HOV Program) and the CTC facility is located in a maintenance area for CO and PM₁₀ (Exhibit 3). In nonattainment and maintenance areas, the federal CAA and the Washington CAA require transportation-related projects to conform with the SIP. Conformity with the SIP means that transportation activities will not produce new air quality violations, worsen existing violations, or delay timely attainment of the NAAQS.

How do climate and weather affect air quality?

Weather directly influences air quality. Important meteorological factors include temperature and sunlight intensity. Temperature inversions, which occur when warmer air overlies cooler air, are associated with higher air pollutant concentrations. During temperature inversions in late fall and winter, particulates and CO from wood stoves and vehicle sources can be trapped close to the ground, which can lead to violations of the local air quality standards or the NAAQS. Ozone formation requires warm weather and direct sunlight. In the Puget Sound area where the CTC facility is located, the highest ozone concentrations occur from mid-May until mid-September, when urban emissions are trapped by temperature inversions that are followed by intense sunlight and high temperatures.

How is air quality measured in the study area?

Air quality analysts coordinated with WSDOT, Puget Sound Regional Council (PSRC), PSCAA, ORCAA, Federal Highway Administration (FHWA), EPA, and Ecology to obtain air quality information and guidance for preferred analysis methodology. Ecology and PSCAA operate air quality monitors to assess the levels of regulated pollutants and verify continued compliance with the NAAQS. Several air pollutant-monitoring stations are located near the project sites. Monitoring data were evaluated for the past 5 years (2004 through 2008). Following is information about the monitoring stations closest to the proposed project sites.



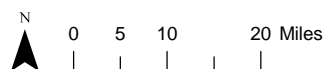
- Areas designated as attainment or unclassified for all criteria pollutants
- Former 1-hour ozone maintenance areas
- Carbon monoxide and former 1-hour ozone maintenance areas
- Particulate matter, carbon monoxide, and former 1-hour ozone maintenance areas
- Particulate matter maintenance areas

Note: The region is in attainment for the new 8-hour ozone and PM2.5 standards. The existing PM10 standard will remain in effect, but the 1-hour ozone standard was revoked as of June 15, 2005.

Source: Ecology (1998) GIS data (Carbon Monoxide, Ozone, and Particulate), Ecology (2001) GIS Data (Shoreline), WSDOT (2004) GIS Data (State Route), WSDOT (1995) GIS Data (County). Horizontal datum for all layers is State Plane Washington South NAD 83; vertical datum for layers is NAVD88.

Exhibit 3. Central Puget Sound Region Designated Maintenance Areas

Pontoon Construction Project



CTC Facility

The stations located at 2301 Alexander Avenue (1 mile east of the CTC facility) and 7802 South L Street (6 miles southwest of the CTC facility) in Tacoma are the closest stations to the CTC facility that measure PM₁₀ and PM_{2.5} concentrations, respectively. The 4103 Beacon Avenue South (Beacon Hill) air monitoring station in Seattle is the closest station to the CTC facility that measures CO, ozone, NO_x, and SO₂. The Beacon Hill station is approximately 20 miles northeast of the CTC facility.

Grays Harbor Build Alternatives

The closest monitoring station to the proposed Anderson & Middleton Alternative and Aberdeen Log Yard Alternative in Grays Harbor is located at 359 North Division, Aberdeen. This station is approximately 2.6 miles east of the Anderson & Middleton site, and it is about half a mile north of the Aberdeen Log Yard. The Aberdeen station measures PM_{2.5} concentrations. Monitoring data for PM₁₀ were obtained from the station located at 1900 College Street SE in Lacey, about 50 miles east of the sites. Because there are no stations close to the two sites that monitor CO, ozone, NO_x, and SO₂ concentrations, the air quality analysts obtained monitoring data for CO from 1101 Pacific Avenue in Tacoma (which is 70 miles from both sites) and for the other three pollutants from 4103 Beacon Avenue South in Seattle (which is 80 miles from both sites).

How does air quality compare with current standards in the study area?

CTC Facility

Concentrations of the monitored PM₁₀, CO, NO_x, ozone, and SO₂ for all applicable averaging time periods and for annual PM_{2.5} have been below the NAAQS for the last 5 years, as shown in Exhibit 4. The maximum 24-hour average PM_{2.5} concentrations exceeded the new NAAQS of 35 micrograms per cubic meter (µg/m³) at the Tacoma monitoring station, as determined by the 3-year average of the 98th percentile concentrations. The region is currently designated attainment for PM_{2.5}.

Grays Harbor Build Alternatives

Exhibit 5 provides monitored PM₁₀, PM_{2.5}, and CO concentrations from stations close to Grays Harbor. Because monitoring data for ozone, NO_x, and SO₂ are not available for Grays Harbor County, they are not included in Exhibit 5. Information from the closest monitoring stations for these pollutants (4103 Beacon Avenue South in Seattle) is included in Exhibit 4. All monitoring concentrations for the Grays Harbor sites have been below the NAAQS for the last 5 years.

EXHIBIT 4

Ambient Criteria Pollutant Concentration Levels Measured from 2004 through 2008 near CTC Facility

Monitoring Location	Parameter	Maximum Concentration					Ambient Air Quality Standard
		2004	2005	2006	2007	2008	
Particulate matter (PM₁₀)							
2301 Alexander Avenue, Tacoma	24-hour average (µg/m ³)	–	50	60	64	–	150
Particulate matter (PM_{2.5})							
7802 South L Street, Tacoma	Annual arithmetic mean (µg/m ³) ^a	10.89	11.5	9.55	9.67	9.64	15
	24-hour average (µg/m ³) ^b	43.7	40.5	42.7	45.3	31.7	35
Carbon monoxide							
4103 Beacon Avenue South, Seattle	8-hour average (ppm)	1.8	1.9	1.5	1	0.9	9
	1-hour average (ppm)	2.7	2.7	2.3	1.4	1.4	35
Ozone							
4103 Beacon Avenue South, Seattle	8-hour average (ppm)	0.058	0.049	–	0.05	0.052	0.075
Nitrogen dioxide							
4103 Beacon Avenue South, Seattle	Annual average (ppm)	0.018	0.018	0.018	–	–	0.05
Sulfur dioxide							
4103 Beacon Avenue South, Seattle	Annual average (ppm)	0.003	0.004	–	0.002	0.001	0.02
	24-Hour average (ppm)	0.019	0.014	–	0.007	0.011	0.1
	3-Hour average (ppm)	0.045	0.028	–	0.028	0.03	0.05
	1-Hour average (ppm)	0.06	0.044	–	0.039	0.073	0.4

Source: EPA (2009b).

All concentrations are maximum per averaging period, unless otherwise noted.

“–” : data not available

^a Arithmetic mean of 24-hour values for the year. This value, rounded to the nearest 0.1 microgram, should not exceed the level of the annual standard (15.0 µg/m³).^b Values are the 98th percentile of 24-hour average concentrations for the year. NAAQS is exceeded when the 3-year average of these values is greater than 35 µg/m³.µg/m³ = microgram(s) per cubic meterPM₁₀ = particulate matter less than or equal to 10 microns in diameterPM_{2.5} = particulate matter less than or equal to 2.5 microns in diameter

ppm = part(s) per million

EXHIBIT 5

Ambient Criteria Pollutant Concentration Levels Measured from 2004 through 2008 near Grays Harbor

Monitoring Location	Parameter	Maximum Concentration					NAAQS
		2004	2005	2006	2007	2008	
Particulate Matter (PM₁₀)							
1900 College Street SE, Lacey	24-hour average ($\mu\text{g}/\text{m}^3$)	40	32	41	–	–	150
Particulate Matter (PM_{2.5})							
359 North Division, Aberdeen	Annual arithmetic mean ($\mu\text{g}/\text{m}^3$)	8.18	–	–	–	–	15
	24-hour average ($\mu\text{g}/\text{m}^3$) ^a	12.3	–	–	–	–	35
Carbon Monoxide							
1101 Pacific Avenue, Tacoma	8-hour average (ppm)	5	4.6	2.3	–	–	9
	1-hour average (ppm)	7	6.6	4.1	–	–	35

Source: EPA (2009b)

All concentrations are maximum per averaging period, unless otherwise noted.

“–”: data not available

^a Values are the 98th percentile of 24-hour average concentrations for the year. NAAQS is exceeded when the 3-year average of these values is greater than $35 \mu\text{g}/\text{m}^3$. $\mu\text{g}/\text{m}^3$ = microgram(s) per cubic meter

NAAQAS = National Ambient Air Quality Standards

PM₁₀ = particulate matter less than or equal to 10 microns in diameterPM_{2.5} = particulate matter less than or equal to 2.5 microns in diameter

ppm = part(s) per million

3. Potential Effects of the Project

Air quality analysts used the most current FHWA and WSDOT guidance to evaluate effects the project would have on air quality during project construction and operation, as described below.

How did WSDOT evaluate air pollutant emissions during construction activities?

During the casting basin construction, onsite operation of heavy-duty construction equipment would generate exhaust emissions containing pollutants such as CO, NO_x, VOCs, SO₂, PM₁₀, and PM_{2.5}. Earth-moving activities would generate emissions of PM₁₀ and PM_{2.5} as fugitive dust. Offsite vehicle trips made by employees and supply trucks to and from the sites would generate additional vehicle exhaust emissions. Asphalt paving would be a source of VOC emissions. The air quality analysts quantified construction emissions for each construction year of 2010, 2011, and 2012 for the build alternatives based upon conceptual construction

details (activities, areas, sequencing, and schedule). The following subsections present the methodology used for estimating air emissions during construction.

Particulate Matter

Particulate matter emission sources are primarily associated with soil disturbance and include, but are not limited to, the following:

- Demolition
- Excavation
- Grading
- Material handling
- Paved and unpaved road-entrained dusts
- Stockpiling

Fugitive dust emissions that would be caused by surface disturbance within the construction site were estimated using an uncontrolled PM₁₀ emission factor of 20 pounds per acre per day. This factor is consistent with model inputs recommended in the California Air Resources Board's Urbemis 2007 model. It was assumed that the disturbed areas would be watered at least twice a day, which would reduce fugitive dust emissions from the construction sites by 50 percent. The maximum disturbed area was assumed to be 12 acres per day throughout the entire construction period. PM_{2.5} emissions were calculated following the methodology recommended by the South Coast Air Quality Management District (SCAQMD) and using the PM_{2.5} fraction of PM₁₀ (SCAQMD 2006). The actual fugitive dust emissions are expected to be less than those presented in this report because the high groundwater levels at the pontoon construction sites cause inherently damp soil conditions throughout the year.

Fugitive dust emissions from the concrete batch plant were estimated using methodology suggested by the Bay Area Air Quality Management District's Permit Handbook (2008). Particulate emissions from the batch plant operation and storage piles were based on estimates of project concrete volumes.

Vehicle and Equipment Exhaust

Off-road construction equipment emission factors of CO, NO_x, VOCs, SO_x, and PM₁₀ were calculated using the EPA NONROAD program. (NONROAD2005 is an EPA model designed to predict emissions from various nonroad equipment categories. Industrial marine vehicle emission factors are not included in NONROAD.) Tugboat emission factors were obtained from the EPA's Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data (EPA 2000). Pollutant emissions were calculated based on equipment horsepower, hours of operation, utilization, and engine load.

Exhaust emission factors of haul trucks and worker commute vehicles were estimated using EPA's MOBILE6.2 model. Model output is in units of grams per vehicle miles traveled (VMT). VMT for haul trucks and worker commute vehicles was estimated based on the number of truck trips and workers and on the estimated round-trip distances for the vehicles.

Attachment B provides a detailed list of assumptions used to calculate vehicle and equipment exhaust.

Asphalt Paving

Paving the parking area would result in VOC emissions. The default emission factor of 2.62 pounds per acre in Urbemis 2007 was used to calculate VOC emissions for a 5-acre parking area.

Other Emission Sources

Project construction would include additional activities that are not as easily quantified as the activities previously discussed. For example, slash disposal and burning would contribute to particulate matter emissions and asphalt paving would emit odorous compounds.

How did WSDOT evaluate air pollutant emissions during pontoon-building operations?

Project operation at the CTC facility and the Grays Harbor site would involve the construction of pontoons at the casting basins. The air quality analysts used the same methodologies as those for construction activities to evaluate air pollutant emissions from project operations. Annual emissions of criteria pollutants were calculated for each year of operation. Pontoon construction (that is, project operation) at the CTC facility would occur in 2010 and 2011. Operations at the Anderson & Middleton Alternative or the Aberdeen Log Yard Alternative would occur in 2011, 2012, and 2013. Exhibits 6, 7, and 8 present estimates of total emissions by year.

How did WSDOT evaluate air quality effects from the project?

The project would result in potential air quality effects during construction and operations. The air quality analysts evaluated air quality effects during project construction and operation at both regional and local levels.

Transportation Conformity

Because the Grays Harbor sites are in an attainment area, no project-level conformity analysis would be needed and conformity would not apply.

Project operation at the CTC facility would not affect local traffic volumes and, therefore, would not result in any of the following occurrences:

- Causing or contributing to any new violation of any NAAQS in any area
- Increasing the frequency or severity of any existing violation of any NAAQS in any area
- Delaying timely attainment of any NAAQS or any required interim emissions reductions or other milestones in any area

Because it would be built with transportation funds, the project would also be exempt from general conformity, as confirmed by EPA Region 10 (Wayne Elson, State and Tribal Air

Programs Unit, EPA Region 10, Seattle, Washington. April 30, 2009. Personal communication). PSRC (Kimberly Scrivner, Associate Planner, PSRC, Seattle, Washington. July 13, 2009. Personal communication) has confirmed that the project does not need to be in the Regional Transportation Plan or the Transportation Improvement Plan.

Mobile Source Air Toxics

In accordance with the WSDOT Environmental Procedures Manual (WSDOT 2008), an analysis of MSAT emissions is required. MSAT emissions are air toxics that are emitted from highway vehicles and nonroad equipment. The air quality analysts addressed effects from MSAT emissions according to current FHWA Interim Guidance on Air Toxic Analysis in NEPA Documents (FHWA 2006). Currently, there are no established criteria for determining when MSAT emissions should be considered substantial. For the purpose of the MSAT effect evaluation, the FHWA has identified three levels of analyses depending on a project's specific circumstances and potential MSAT effects:

1. No analysis for projects with no potential for meaningful MSAT effects
2. Qualitative analysis for projects with a low potential for MSAT effects
3. Quantitative analysis to differentiate alternatives for projects with a higher potential for MSAT effects

Operation of the CTC facility for the Pontoon Construction Project would be considered a continuation of operation of the existing facility. Therefore, no emission increase of MSAT emissions would be expected from CTC facility operation. Consequently, according to FHWA guidance, MSAT analysis is not required for the CTC facility.

MSAT emissions would increase during the new casting basin construction and operation in Grays Harbor. Both build alternatives would cause substantial change to vehicle volume and increase the volume of diesel vehicle trips near the project site. Therefore, a qualitative analysis for the new casting basin in Grays Harbor was included in this report.

How would construction of the casting basin air quality?

Construction emissions come from equipment used during site preparation and casting basin construction. These activities would involve the use of diesel- and gasoline-powered equipment that generates emissions of criteria pollutants such as CO, NO_x, VOCs, SO₂, PM₁₀, and PM_{2.5}. Emissions of NO_x and VOCs would contribute to the formation of ozone, and NO_x could contribute to the formation of PM_{2.5}. The following subsections present emissions and air quality effects associated with construction of each build alternative.

Because the project build alternatives are expected to meet regional conformity requirements, they would not cause substantial regional effects to air quality. Any local effects that might occur during construction would be temporary, because construction would last about 2 years.

CTC Facility

No construction activities would occur at the CTC facility; therefore, emissions would not increase due to construction.

Anderson & Middleton Alternative

Air quality analysts calculated emissions from the Anderson & Middleton Alternative for each year of construction based on the assumption that construction would begin in 2010 and continue through the beginning of 2012 and assumed begin and end dates for each phase of construction. Exhibit 7 summarizes estimated annual emissions of criteria pollutants at the Anderson & Middleton Alternative.

Aberdeen Log Yard Alternative

Air quality analysts calculated emissions from the Aberdeen Log Yard Alternative for each year of construction, based on assumptions regarding when construction would begin and end for each construction phase. Exhibit 8 of this report provides a summary of the estimated annual emissions of criteria pollutants at the Aberdeen Log Yard Alternative. Air emissions due to construction at the Aberdeen Log Yard Alternative would be slightly higher than at the Anderson & Middleton Alternative because more haul truck trips would be required for casting basin construction.

No Build Alternative

Under the No Build Alternative, no project construction activities would occur at any of the sites and effects on air quality would not be expected.

How would pontoon-building operations affect air quality?

Operational effects for the Pontoon Construction Project are those anticipated during construction of pontoons at both the new casting basin and the CTC facility. Emission sources during operation would be similar to those during the construction phase of the project. These emission sources would include equipment and vehicle exhaust and operation of the concrete batch plant.

Regional Effects

As with project construction, the conforming Regional Transportation Plan and Transportation Improvement Program include operation of the Pontoon Construction Project (that is, construction of pontoons). Operation of the casting basins would only last about 1 year at the CTC facility and less than 2 years at the Grays Harbor sites. Therefore, any effects would be temporary. The air quality analysts estimated annual emissions from construction and operation, as shown in Exhibits 6, 7, and 8. Because the Pontoon Construction Project would be a temporary source, there are no regulatory criteria for determining if these emissions would be substantial.

Construction and operation of the project at either site might require an onsite concrete batch plant, which would need to obtain an air permit from the local air agency (that is, from PSCAA or ORCAA).

The following subsections present the regional effects specific to each project site. The emissions presented for each project site are not directly comparable to the NAAQS. No emissions thresholds for this type of project have been established.

CTC Facility

Analysts calculated air pollutant emissions for each year of operation at the CTC facility based on assumptions regarding the project schedule and the volume of production anticipated for each year. Exhibit 6 summarizes the estimated annual emissions of criteria pollutants at the CTC facility.

EXHIBIT 6

CTC Facility Emissions for Operations in Tons per Year

Year	Oxides of Nitrogen	Carbon Monoxide	Sulfur Dioxide	Volatile Organic Compound	Particulate Matter (PM ₁₀)	Particulate Matter (PM _{2.5})
2010 Operation	56	27	7.2	4.7	3.7	3.5
2011 Operation	39	20	4.8	3.1	2.6	2.4

Anderson & Middleton Alternative

Analysts calculated air pollutant emissions for each year of construction and operation at the Anderson & Middleton Alternative based on assumptions regarding pontoon construction activities and the schedule. Operation (that is, pontoon construction) would begin in one completed casting chamber while construction of the second casting chamber continued. Exhibit 7 summarizes the estimated annual emissions of criteria pollutants at the Anderson & Middleton Alternative.

EXHIBIT 7

Anderson & Middleton Alternative Emissions for Construction and Operation in Tons per Year

Year	Oxides of Nitrogen	Carbon Monoxide	Sulfur Dioxide	Volatile Organic Compound	Particulate Matter (PM ₁₀)	Particulate Matter (PM _{2.5})
2010 Construction	160	71	28	11	26	15
2011 Construction	325	149	51	26	51	32
2011 Operation	4.9	3.1	0.65	0.43	0.34	0.32
2011 Total	330	152	53	26	51	32
2012 Construction	0.86	1.6	0.13	0.11	2.0	0.47
2012 Operation	157	78	21	13	12	11
2012 Total	158	80	21	13	14	11
2013 Operation	47	23	6.1	3.8	3.8	3.6

Aberdeen Log Yard Alternative

Analysts calculated air pollutant emissions for each year of construction and operation at the Aberdeen Log Yard Alternative based on assumptions regarding pontoon construction activities and the schedule. Operation (that is, pontoon construction) would begin in one completed casting chamber while construction of the second chamber continued. Exhibit 8 summarizes the estimated annual emissions of criteria pollutants at the Aberdeen Log Yard Alternative.

EXHIBIT 8

Aberdeen Log Yard Alternative Emissions for Construction and Operation in Tons per Year

Year	Oxides of Nitrogen	Carbon Monoxide	Sulfur Dioxide	Volatile Organic Compound	Particulate Matter (PM ₁₀)	Particulate Matter (PM _{2.5})
2010 Construction	175	74	28	12	26	15
2011 Construction	331	150	51	26	51	32
2011 Operation	4.9	3.1	0.65	0.43	0.34	0.32
2011 Total	336	153	52	26	51	32
2012 Construction	0.86	1.6	0.13	0.11	2.0	0.47
2012 Operation	157	78	21	13	12	11
2012 Total	158	80	21	13	14	11
2013 Operation	47	23	6.1	3.8	3.8	3.6

No Build Alternative

Under the No Build Alternative, no pontoons would be constructed for this project. The Anderson & Middleton and Aberdeen Log Yard alternatives would not operate. The CTC facility graving dock would continue its current operations, which includes construction of various floating concrete structures.

Local Effects

Pontoon construction at the CTC facility would result in CO and PM₁₀ emissions from vehicles, off-road equipment, and fugitive dust. However, because operation of the CTC facility for the 2 years of pontoon construction would be a continuation of existing site operations, it would result in no increase in traffic or diesel vehicles. Site operation would be temporary, lasting for less than 2 years.

Air quality analysts considered the effects of changes in traffic in the vicinity of project sites. Increased truck traffic and worker commutes could affect traffic volume and delays at signalized intersections, which could increase air emissions from vehicle exhaust. Near the CTC facility, where the Pontoon Construction Project would just be a continuation of normal facility operation, traffic volume would not increase at intersections. Therefore, no increase in air emissions due to vehicle exhaust would be expected.

For the Grays Harbor facilities, the increased volume of haul truck traffic and worker commutes would affect the level of service (LOS) at intersections in the study area. For the years of analysis (2010 through 2013), the LOS would be a level of C or better at all signalized intersections. It is not anticipated that intersections that would operate at LOS C or better would cause a violation of air quality standards. Therefore, it is not anticipated that the temporary increase in on-road vehicle emissions due to the project would cause a violation of air quality standards.

Mobile Source Air Toxic Effects

The Pontoon Construction Project is not expected to substantially change the vehicle mix and traffic volume in the vicinity of the CTC facility during project operation. Therefore, the analysts assumed that the MSAT emission increase due to on-road vehicle travel would be negligible compared to existing conditions. In addition, any MSAT emissions during project operation would be temporary, lasting for less than 2 years (until the pontoons were constructed and shipped offsite).

MSAT emissions from operations at the Anderson & Middleton and Aberdeen Log Yard alternatives would increase because additional truck traffic would haul materials to and from the project site. This increase would be temporary and last for a maximum of 4 years at either site. MSAT emissions are primarily of concern over long-term exposure periods because they include pollutants with suspected chronic cancer effects. Therefore, MSAT emissions associated with the project operation would not be expected to have substantial effects on air quality. There are currently no MSAT emissions standards.

How would the project affect air quality in the long term?

Operation of the casting basins in Grays Harbor would stop after all the pontoons were constructed and delivered. Any effects related to project construction and operation would be temporary and would be eliminated when the project was finished in 2013. Therefore, no long-term effects to air quality would be expected.

A discussion of long-term air quality concerns is included in the Indirect and Cumulative Effects Analysis Technical Memorandum (WSDOT 2009c).

How would the alternatives compare in their effects on air quality?

The project has two build alternatives and one No Build Alternative. Each build alternative includes the use of the existing CTC facility in Tacoma and construction of a new casting basin facility. In terms of effects to air quality, the only difference between the two build alternatives is the location of the new casting basin. The two alternative sites—Anderson & Middleton and Aberdeen Log Yard—are located within 2 miles of each other in the Grays Harbor area. The two build alternatives vary only by the number of truck trips to each site that would be required during construction. The Aberdeen Log Yard Alternative would require more material hauling during construction because of additional earthwork necessary to prepare the site for construction. All other construction activities and operation activities

are considered equivalent. The slightly higher vehicle emissions for the Aberdeen Log Yard Alternative would not result in a substantial difference between the two alternatives in terms of effects to air quality.

Exhibits 9 and 10 summarize the effects of each alternative. For comparison purposes, the exhibits present a maximum year of emissions. Although CTC facility operations would occur simultaneously with activities at the Anderson & Middleton and the Aberdeen Log Yard sites, the emissions would not be additive. Therefore, emission estimates for the two locations are presented in separate exhibits. The No Build Alternative assumes that no Grays Harbor facility would be built and that the CTC facility would continue its current operations.

EXHIBIT 9

Maximum Annual Emission Comparison in Grays Harbor by Alternative in Tons per Year

Alternative	Oxides of Nitrogen	Carbon Monoxide	Sulfur Dioxide	Volatile Organic Compound	Particulate Matter (PM ₁₀)	Particulate Matter (PM _{2.5})
No Build	0	0	0	0	0	0
Anderson & Middleton	330	152	53	26	51	32
Aberdeen Log Yard	336	153	52	26	51	32

EXHIBIT 10

Maximum Annual Emission Comparison in Tacoma by Alternative in Tons per Year

Alternative	Oxides of Nitrogen	Carbon Monoxide	Sulfur Dioxide	Volatile Organic Compound	Particulate Matter (PM ₁₀)	Particulate Matter (PM _{2.5})
No Build ^a	56	27	7.2	4.7	3.7	3.5
Anderson & Middleton	56	27	7.2	4.7	3.7	3.5
Aberdeen Log Yard	56	27	7.2	4.7	3.7	3.5

^a The No Build Alternative assumes current CTC facility operations would be the same as estimated pontoon construction operations.

4. Mitigation

What measures would WSDOT propose to avoid or minimize negative effects?

A substantial adverse air quality effect is defined as a violation of the NAAQS or any activity that results in a public nuisance through the generation of dust or odor. Construction and operation of the project are not expected to cause substantial effects on air quality.

Temporary effects on air quality might occur during the pontoon project construction and operation activities. State law requires construction site owners and/or operators to take

reasonable precautions to prevent fugitive dust from becoming airborne. Fugitive dust may become airborne during demolition, material transport, grading, and driving of vehicles and machinery on and off the site, as well as through wind events. Controlling fugitive dust emissions might require some of the following actions:

- Spraying exposed soil with water or other suppressants to reduce emissions of PM₁₀ and increase deposition of particulate matter
- Using phased development to keep disturbed areas to a minimum
- Using wind fencing to reduce disturbance to soils
- Minimizing dust emissions during transport of fill material or soil by wetting them down or by making sure that the trucks have adequate freeboard (that is, the space from the top of the material to the top of the truck bed)
- Promptly cleaning up spills of transported material on public roads
- Scheduling work tasks to minimize disruption of the existing vehicle traffic on streets
- Restricting traffic on the site to reduce soil upheaval and the transport of material to roadways
- Locating construction equipment and truck staging areas as far away from sensitive receptors (such as residences, hospitals, and schools) as practical and considering potential effects on other resources
- Providing wheel washers to remove particulate matter that would otherwise be carried offsite by vehicles to decrease deposition of particulate matter on area roadways
- Covering truck beds, dirt, gravel, and debris piles, as needed, to reduce dust and wind-blown debris

Emissions of PM₁₀, VOCs, NO_x, SO₂, and CO would be minimized whenever reasonable and possible. These emissions primarily result from construction equipment. Therefore, machinery engines and exhaust systems would be kept in good mechanical condition to minimize exhaust emissions. In addition, odors would be minimized by covering loads of hot asphalt.

Federal regulations have been adopted that require the use of ultra-low-sulfur diesel fuel in on-road trucks. These regulations will require the use of ultra low-sulfur diesel fuel for construction equipment by 2010 and the reduction of sulfur content of diesel fuel from its current level of 500 parts per million (ppm) to 15 ppm—a 97 percent reduction. In addition, these regulations will result in a decrease in both SO₂ and PM emissions from these engines. WSDOT would encourage contractors to reduce idling time of equipment and vehicles and to use newer construction equipment or equipment with add-on emission controls.

Operation of the project may require an onsite concrete batching facility. Such a facility would need to obtain an air permit from the local air agency (that is, from PSCAA or ORCAA) and would install required air pollution control equipment to operate in compliance with applicable regulations. The concrete batching facility would operate according to permit conditions, which would serve to minimize air quality effects.

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ATTACHMENT A

Characteristics and Health Effects of Pollutants

Characteristics and Health Effects of Pollutants

These descriptions are from FHWA's Transportation Conformity: A Basic Guide for State and Local Officials (2005), Appendix A: Health Effects of Pollutants.

Ozone

Ozone often irritates the eyes, impairs the lungs, and aggravates respiratory problems. Ozone can cause chest pain, coughing, nausea, pulmonary congestion, and possible long-term lung damage. Nitrogen oxides (NO_x) and volatile organic compounds (VOCs) are precursors to ozone formation.

Volatile Organic Compounds (VOCs)

VOCs come from vehicle exhaust, paint thinners, solvents and other petroleum-based products. VOCs and nitrogen oxides react in the presence of sunlight to form ozone. Ozone irritates the eyes, impairs the lungs, and aggravates respiratory problems. A number of exhaust VOCs are also toxic, with the potential to cause cancer.

Nitrogen Oxides (NO_x)

Under the high pressure and temperature conditions in an engine, nitrogen and oxygen atoms in the air react to form various nitrogen oxides, collectively known as NO_x. NO_x, like hydrocarbons, is a precursor to the formation of ozone and also contributes to the formation of acid rain. NO_x impacts the respiratory system, causing a high incidence of acute respiratory diseases. Pre-school children are especially at risk. NO_x also degrades visibility due to its brownish color and its conversion to nitrate particles.

Carbon Monoxide (CO)

Carbon monoxide is a product of incomplete combustion and occurs when carbon in the fuel is partially oxidized rather than fully oxidized to carbon dioxide (CO₂). Carbon monoxide reduces the flow of oxygen in the bloodstream and is particularly dangerous to persons with heart disease. Exposure to carbon monoxide can impair visual perception, manual dexterity, learning ability, and performance of complex tasks.

Particulate Matter (PM)

These are tiny particles of dust that cause irritation and damage to the respiratory system which can result in difficulty breathing, induce bronchitis and aggravate existing respiratory disease. Exposure to particles may more dramatically impact individuals with chronic pulmonary or cardiovascular disease, people with influenza or asthma, and children and elderly persons. Particles may aggravate breathing difficulties, damage lung tissue, alter the body's defense against foreign materials, and can lead to premature mortality. There are two

PM standards: PM-10 and PM-2.5. PM-10 refers to particles with a diameter of 10 microns (μm) or less, and PM-2.5 refers to particles with a diameter of 2.5 microns or less. As a comparison, an average grain of table salt is 100 μm in diameter.

ATTACHMENT B

Air Emissions Assumptions and Calculations

Appendix B. Air Emissions Assumptions and Calculations

Summary of Project Emissions

Anderson-Middleton Alternative

Grays Harbor Site Construction Emissions (ton/yr)	NOx	CO	SO2	VOC	PM10 (Total)	PM2.5 (Total)
Total 2010 Emissions	756	313	157	54	79	69
Total 2011 Emissions	581	416	102	77	93	77
Total 2012 Emissions	0.48	1.0	0.073	0.070	1.5	0.35

CTC Pontoon Construction Emissions (ton/yr)	NOx	CO	SO2	VOC	PM10 (Total)	PM2.5 (Total)
Total 2010 Emissions	31	15	4.0	2.6	2.1	1.9
Total 2011 Emissions	22	12	2.6	1.8	1.5	1.4

Grays Harbor Pontoon Construction Emissions (ton/yr)	NOx	CO	SO2	VOC	PM10 (Total)	PM2.5 (Total)
Total 2011 Emissions	2.7	1.8	0.36	0.24	0.19	0.18
Total 2012 Emissions	87	45	12	7.3	6.7	6.2
Total 2013 Emissions	25	13	3.4	2.1	2.1	2.0

Appendix B. Air Emissions Assumptions and Calculations

construction schedule chart reference info:

Task	Start Date	Calendar Days	Work Days	End Date
PC20: Mobilization	5/24/2010	12	10	6/5/2010
PC78: Haul Road, Hot Mix Asphalt	6/5/2010	10	9	6/15/2010
PC11: Clearing and Grubbing	5/29/2010	19	16	6/17/2010
PC82: Install Temporary Wells	6/5/2010	48	41	7/23/2010
PC134: Dewatering	6/17/2010	42	36	7/29/2010
PC113: Rock Berm	6/17/2010	54	46	8/10/2010
PC106: Railroad Spur	7/29/2010	35	30	9/2/2010
PC125: Batch Plant	8/26/2010	26	22	9/21/2010
PC98: Roadway Excavation	7/29/2010	37	32	9/4/2010
PC109: Storm Sewer Installation	8/10/2010	29	25	9/8/2010
PC120: Sanitary Sewer Installation	9/4/2010	7	6	9/11/2010
PC150: Test Sanitary Sewer	9/11/2010	3	3	9/14/2010
PC100: Test Storm Sewer	9/8/2010	9	8	9/17/2010
PC91: Water Line (service)	9/17/2010	4	3	9/21/2010
PC92: Water Line (Temp Fire Suppression)	9/21/2010	6	5	9/27/2010
PC123: Surfacing Access Rd, CSBC Basin 1	7/11/2011	14	12	7/25/2011
PC116: Surfacing Access Rd, CSBC Basin 2	11/16/2011	16	14	12/2/2011
PC144: Surfacing Parking Lot, CSBC	11/16/2011	20	17	12/6/2011
PC135: Surfacing Laydown Area, CSBC	11/16/2011	28	24	12/14/2011
PC86: Basin Excavation	6/29/2010	48	41	8/16/2010
PC90: Drive Piles	7/28/2010	182	130	1/26/2011
PC37: Prepare Subgrade	12/2/2010	62	44	2/2/2011
PC88: Permanent Dewatering System, Horiz Pipe	1/4/2011	29	21	2/2/2011
PC81: Construct Grade Beams/Pedestals	1/3/2011	66	47	3/10/2011
PC52: Construct Slab	3/11/2011	41	29	4/21/2011
PC103: Construct Walls	4/21/2011	25	18	5/16/2011
PC115: Drive Crane Rail Piles	5/16/2011	47	34	7/2/2011
PC124: Backfill Walls	5/23/2011	49	35	7/11/2011
PC99: Permanent Dewatering System, Vert Pipe	7/5/2011	6	5	7/11/2011
PC96: Construct Crane Rail Beams	6/21/2011	36	26	7/27/2011
PC67: Install Cranes	7/27/2011	29	21	8/25/2011
PC149: Gate Substructure Piles	7/28/2010	14	10	8/11/2010
PC140: Gate Substructure Sill	1/26/2011	48	34	3/15/2011
PC121: Gate Jamb	3/15/2011	23	16	4/7/2011
PC142: Gate- Basin 1	4/7/2011	71	51	6/17/2011
PC84: Basin Excavation	8/16/2010	40	34	9/25/2010
PC68: Drive Piles	1/26/2011	152	109	6/27/2011
PC95: Prepare Subgrade	5/11/2011	55	39	7/5/2011
PC76: Permanent Dewatering System, Horiz Pipe	6/6/2011	29	21	7/5/2011
PC69: Construct Grade Beams/Pedestals	6/10/2011	60	43	8/9/2011
PC70: Construct Slab	8/16/2011	36	26	9/21/2011
PC61: Construct Walls	9/21/2011	22	16	10/13/2011
PC83: Drive Crane Rail Piles	8/19/2011	83	59	11/10/2011
PC72: Backfill Walls	10/5/2011	42	30	11/16/2011
PC57: Permanent Dewatering System, Vert Pipe	11/9/2011	7	6	11/16/2011
PC94: Construct Crane Rail Beams	11/2/2011	62	44	1/3/2012
PC105: Install Cranes	1/3/2012	30	21	2/2/2012
PC77: Gate Substructure Piles	9/14/2010	14	10	9/28/2010
PC108: Gate Substructure Sill	6/27/2011	47	34	8/13/2011
PC119: Gate Jamb	8/13/2011	25	18	9/7/2011
PC110: Gate- Basin 2	9/7/2011	35	25	10/12/2011
PC93: Surfacing Basin 1 Ramps, CSBC	7/5/2011	6	5	7/11/2011
PC42: Water Line (Permanent Fire Suppression)	9/17/2011	47	40	11/3/2011
PC80: Storm Sewer Installation	10/6/2011	28	24	11/3/2011
PC79: Underground Vaults with Sump	10/22/2011	12	10	11/3/2011
PC71: Test Storm Sewer	11/3/2011	9	8	11/12/2011
PC114: Surfacing Basin 2 Ramps, CSBC	11/9/2011	7	6	11/16/2011
PC132: Excavate Channel	10/5/2011	42	36	11/16/2011
PC153: Place Channel Rip-Rap & Breach Channel	11/3/2011	27	23	11/30/2011
A4960: Dolphin Construction & Installation	10/5/2011	73	63	12/17/2011

Appendix B. Air Emissions Assumptions and Calculations

Worker Commute/Truck Trip Emissions

	Workers On Site	Commute Round Trip Distance (mi)	Total Truck Round Trips	Truck Round Trip Distance (mi)
Grays Harbor Site Construction	250	6	74,700	100
CTC Pontoon Construction	250	6	5,500	20
Grays Harbor Pontoon Construction	500	6	11,000	100

Truck Trips were based on an email from J Slavicek (3/13/2009). CTC materials and workers assumed to be 50% of that required for Grays Harbor

Assumes work occurs six days per week

Vehicle Emission Factors (g/mi)						
Calendar Year	NOx	CO	Sox	VOC	PM10	PM2.5
2010 Emission Factors	0.729	16.477	0.008	0.673	0.025	0.011
2011 Emission Factors	0.666	15.740	0.008	0.620	0.025	0.011
2012 Emission Factors	0.610	15.022	0.008	0.564	0.025	0.011
2013 Emission Factors	0.555	14.468	0.008	0.526	0.025	0.011

These emission factors represent a weighted average of light duty gas vehicles and light duty gas trucks 1 and 2 with average speed of 45 mph

Grays Harbor Site Construction Worker Trip Emissions (tpy)							
Calendar Year	Days worked	NOx	CO	Sox	VOC	PM10	PM2.5
2010 Emission Factors	221	0.266	6.02	0.0029	0.246	0.009	0.0042
2011 Emission Factors	365	0.440	9.94	0.0047	0.406	0.015	0.0069
2012 Emission Factors	32	0.039	0.87	0.0004	0.036	0.001	0.0006
CTC Pontoon Construction Worker Trip Emissions (tpy)							
Calendar Year	Days worked	NOx	CO	Sox	VOC	PM10	PM2.5
2010 Emission Factors	200	0.2410	5.45	0.0026	0.2224	0.0083	0.0038
2011 Emission Factors	180	0.2169	4.90	0.0023	0.2002	0.0074	0.0034
Grays Harbor Site Construction Worker Trip Emissions (tpy)							
Calendar Year	Days worked	NOx	CO	Sox	VOC	PM10	PM2.5
2011 Emission Factors	18	0.040	0.94	0.0005	0.037	0.0015	0.0007
2012 Emission Factors	365	0.804	19.00	0.0095	0.749	0.0300	0.0137
2013 Emission Factors	115	0.253	5.99	0.0030	0.236	0.0095	0.0043

Appendix B. Air Emissions Assumptions and Calculations

Truck Emission Factors (g/mi)							
Calendar Year	NOx	CO	Sox	VOC	PM10	PM2.5	
2010 Emission Factors	6.494	1.237	0.013	0.293	0.216	0.175	
2011 Emission Factors	5.588	1.076	0.013	0.277	0.193	0.154	
2012 Emission Factors	4.819	0.938	0.013	0.256	0.169	0.132	
2013 Emission Factors	4.167	0.717	0.013	0.245	0.152	0.116	

Grays Harbor Site Construction Worker Trip Emissions (tpy)							
Calendar Year	Truck Trips	NOx	CO	Sox	VOC	PM10	PM2.5
2010 Emission Factors	32,406	23.20	4.42	0.047	1.05	0.77	0.63
2011 Emission Factors	42,294	30.28	5.77	0.062	1.37	1.01	0.82

CTC Pontoon Construction Worker Trip Emissions (tpy)							
Calendar Year	Truck Trips	NOx	CO	Sox	VOC	PM10	PM2.5
2010 Emission Factors	2,900	0.42	0.079	0.0008	0.019	0.014	0.011
2011 Emission Factors	2,600	0.37	0.071	0.0008	0.017	0.012	0.010

Grays Harbor Site Construction Worker Trip Emissions (tpy)							
Calendar Year	Truck Trips	NOx	CO	Sox	VOC	PM10	PM2.5
2012 Emission Factors	8,000	4.2	0.83	0.012	0.226	0.149	0.116
2013 Emission Factors	3,000	1.6	0.31	0.0044	0.085	0.056	0.043

Truck trips scaled based on days of activity per year

Grays Harbor Construction Site Disturbance Fugitive Dust Emissions

	PM10 lb/acre day	Acres worked	Days worked	Emissions Reduction Factor- Dust Control	PM10 Emissions (tpy)	PM2.5 Emissions (tpy)
2010 Emissions	20	45	221	0.61	10.3428	2.171988
2011 Emissions	20	45	365	0.61	17.082	3.58722
2012 Emissions	20	45	32	0.61	1.4976	0.314496

Days worked based on construction schedule

It is assumed that a maximum of 12 acres could be worked at a given time

EF from URBEMIS 2007 9.2.2

PM2.5 from fugitive dust assumed to be 21% of PM10

Grays Harbor Site Construction Parking Lot Paving Emissions

	VOC lb/acre	Parking Area (ft ²)	Parking Area (acres)	VOC Emissions (lb)
2010 Emissions	2.62	225000	5.17	13.5

Emission Factor from URBEMIS 2007 9.2.2

Parking area taken from project description.

Appendix B. Air Emissions Assumptions and Calculations

Calculations for concrete batch plant fugitive emissions based on http://www.baaqmd.gov/pmt/handbook/rev02/permit_handbook.htm, 5. Source-Specific Guidance
 Changes based on Data Needs Spreadsheet

Composition of Concrete

Material	lb/yd	ton/yd
Coarse Aggregate	1200	0.600
Sand	1428	0.714
Cement	491	0.246
Cement Supplement	73	0.037
Water	20	0.010
Total Concrete	3212	1.6060

Emissions from Concrete Batching
 *water spray efficiency 70%

Process	lb/ton	controlled lb/ton	lb/yard concrete
Aggregate delivery to ground storage*	0.0033	0.00231	0.00139
Sand delivery to ground storage*	0.00099	0.000693	0.00049
Aggregate transfer to conveyors*	0.0033	0.00231	0.00139
Sand transfer to conveyor*	0.00099	0.000693	0.00049
Aggregate transfer to elevated storage*	0.0033	0.00231	0.00139
Sand transfer to elevated storage*	0.00099	0.000693	0.00049
Cement delivery to Silo (controlled)		0.00034	0.00008
Cement supplement delivery to silo (controlled)		0.0049	0.00018
Weigh hopper loading*	0.0024	0.00168	0.00221
Central Mix loading (controlled)		0.0048	0.00135
PM10 Emissions from Concrete Batching			0.00947

Emissions from Storage Piles

Emission Factor of Storage Piles (lb/acre/day)	1.7
Area of Storage Piles (acres) =	0.14
PM10 Emissions from Storage Piles (lb/day) =	0.238

assume half the acreage is for storage piles

	Grays Harbor Site Construction	CTC Pontoon Construction	Grays Harbor Pontoon Construction
Quantity of Concrete Produced (total yards)	56000	49500	99000
Quantity of Concrete Produced 2010 (yards)	0	26235	0
Quantity of Concrete Produced 2011 (yards)	56000	23265	1891
Quantity of Concrete Produced 2012 (yards)	0	0	75884
Quantity of Concrete Produced 2013 (yards)	0	0	21226

Value is based on total 4,500 cubic yards per pontoon.

Values based on construction schedule

2010 PM10 Emissions (tpy)	0.012	0.148	0.000
2011 PM10 Emissions (tpy)	0.306	0.132	0.011
2012 PM10 Emissions (tpy)	0.000	0.000	0.403
2013 PM10 Emissions (tpy)	0.000	0.000	0.114

*Assumed concrete material storage on site will begin 9/21/2010 at Grays Harbor and 6/14/2010 at CTC
 Assumed concrete material storage on site will cease at completion of final pontoon phase at each site*

Equipment List	No.	Equipment Use Duration (days)	Horsepower	Utilization	Load Factor	NOx EF (g/hp-hr)	CO EF (g/hp-hr)	SO2 EF (g/hp-hr)	VOC EF (g/hp-hr)	PM10 EF (g/hp-hr)	PM2.5 EF (g/hp-hr)	NOx (tons)	CO (tons)	SO2 (tons)	VOC (tons)	PM10 (tons)	PM2.5 (tons)
CTC Site Mobilization 5/18/2010 - 6/14/2010																	
Mobile Track-mounted Cranes	2	22	150	75%	50%	4.29	1.03	0.74	0.33	0.30	0.29	0.12	0.03	0.02	0.01	0.01	0.01
Forklifts	2	22	50	50%	40%	4.67	2.28	0.83	0.35	0.47	0.46	0.02	0.01	0.00	0.00	0.00	0.00
Cycle 1 CTC Pontoon Component Construction 6/14/2010 - 12/31/2010																	
Mobile Track-mounted Cranes	3	159	150	85%	90%	4.29	1.03	0.74	0.33	0.30	0.29	2.59	0.62	0.45	0.20	0.18	0.18
Concrete Pumps	3	159	350	75%	90%	5.81	2.00	0.74	0.54	0.45	0.44	7.22	2.48	0.92	0.67	0.56	0.54
Forklifts	3	159	50	75%	75%	4.67	2.28	0.83	0.35	0.47	0.46	0.69	0.34	0.12	0.05	0.07	0.07
Concrete Mixer Trucks	8	159	350	75%	90%	6.08	1.94	0.74	0.44	0.34	0.33	20.13	6.44	2.46	1.44	1.14	1.11
Cycle 1 CTC Pontoon Component Construction 1/1/2011 - 1/31/2011																	
Mobile Track-mounted Cranes	3	26	150	85%	90%	4.00	1.00	0.74	0.31	0.29	0.29	0.40	0.10	0.07	0.03	0.03	0.03
Concrete Pumps	3	26	350	75%	90%	5.59	1.88	0.74	0.51	0.43	0.42	1.14	0.38	0.15	0.10	0.09	0.08
Forklifts	3	26	50	75%	75%	4.67	2.09	0.83	0.33	0.43	0.42	0.11	0.05	0.02	0.01	0.01	0.01
Concrete Mixer Trucks	8	26	350	75%	90%	5.74	1.80	0.73	0.41	0.36	0.35	3.11	0.97	0.40	0.22	0.19	0.19
Cycle 1 CTC Pontoon Float Out 1/31/2011 - 2/7/2011																	
Forklifts	3	6	50	50%	75%	4.67	2.09	0.83	0.33	0.43	0.42	0.02	0.01	0.00	0.00	0.00	0.00
Floating Derrick/Plant	2	6	750	85%	50%	6.12	2.61	0.74	0.48	0.47	0.45	0.26	0.11	0.03	0.02	0.02	0.02
Tug Boat	4	6	1000	100%	50%	4.51	1.52	0.00	0.25	0.21	0.20	0.60	0.20	0.00	0.03	0.03	0.03
Cycle 2 CTC Pontoon Component Construction 2/7/2011 - 6/30/2011																	
Forklifts	3	121	50	75%	75%	4.67	2.09	0.83	0.33	0.43	0.42	0.53	0.24	0.09	0.04	0.05	0.05
Concrete Mixer Trucks	8	121	350	75%	90%	5.74	1.80	0.73	0.41	0.36	0.35	14.48	4.53	1.84	1.03	0.90	0.87
Cycle 2 CTC Pontoon Float Out 6/30/2011 - 7/8/2011																	
Forklifts	3	6	50	50%	75%	4.67	2.09	0.83	0.33	0.43	0.42	0.02	0.01	0.00	0.00	0.00	0.00
Floating Derrick/Plant	2	6	750	85%	50%	6.12	2.61	0.74	0.48	0.47	0.45	0.26	0.11	0.03	0.02	0.02	0.02
Tug Boat	4	6	1000	100%	50%	4.51	1.52	0.00	0.25	0.21	0.20	0.60	0.20	0.00	0.03	0.03	0.03

* Tugboat Emissions factors using Tug Transit EF from operations emissions estimates (EPA420-R-00-002)

Equipment List	No.	Equipment Use Duration (days)	Horsepower	Utilization	Load Factor	NOx EF (g/hp-hr)	CO EF (g/hp-hr)	SO2 EF (g/hp-hr)	VOC EF (g/hp-hr)	PM10 EF (g/hp-hr)	PM2.5 EF (g/hp-hr)	NOx (tons)	CO (tons)	SO2 (tons)	VOC (tons)	PM10 (tons)	PM2.5 (tons)
SITE PREPARATION																	
Mobilization (05/24/2010-06/05/2010)																	
Forklifts	1	10	50	50%	40%	4.67	2.28	0.83	0.35	0.47	0.46	0.01	0.00	0.00	0.00	0.00	0.00
Haul Road Hot Mix Asphalt (06/05/2010-06/15/2010)																	
Dump Trucks with Pup Trailers	44	8	385	85%	90%	3.35	1.45	0.75	0.19	0.27	0.26	3.83	1.66	0.86	0.22	0.30	0.29
Self-propelled Compactors	2	8	75	90%	90%	4.79	3.83	0.83	0.53	0.61	0.59	0.05	0.04	0.01	0.01	0.01	0.01
Clearing and Grubbing (05/29/2010-06/17/2010)																	
Dump Trucks with Pup Trailers	227	15	385	85%	90%	3.35	1.45	0.75	0.19	0.27	0.26	37.00	16.06	8.30	2.10	2.94	2.85
Bulldozers	264	15	580	85%	90%	3.76	1.46	0.75	0.31	0.37	0.36	72.81	28.21	14.53	6.05	7.25	7.03
Backhoes	2	15	75	50%	50%	6.19	6.99	0.97	1.45	1.14	1.10	0.04	0.04	0.01	0.01	0.01	0.01
Excavators	3	15	150	75%	50%	3.55	1.43	0.75	0.30	0.37	0.36	0.10	0.04	0.02	0.01	0.01	0.01
Motor Graders	1	15	150	50%	40%	3.73	1.45	0.75	0.31	0.37	0.36	0.02	0.01	0.00	0.00	0.00	0.00
Forklifts	1	15	50	25%	30%	4.67	2.28	0.83	0.35	0.47	0.46	0.00	0.00	0.00	0.00	0.00	0.00
Install Temporary Wells (06/05/2010-07/23/2010)																	
Mobile Track-mounted Cranes	1	40	150	60%	50%	4.29	1.03	0.74	0.33	0.30	0.29	0.09	0.02	0.01	0.01	0.01	0.01
Track-mounted Hammer to Drive We	2	40	150	60%	75%	6.46	1.56	0.74	0.43	0.32	0.31	0.38	0.09	0.04	0.03	0.02	0.02
Dump Trucks with Pup Trailers	2	40	385	75%	90%	3.35	1.45	0.75	0.19	0.27	0.26	0.77	0.33	0.17	0.04	0.06	0.06
Excavators	1	40	150	50%	50%	3.55	1.43	0.75	0.30	0.37	0.36	0.06	0.02	0.01	0.00	0.01	0.01
Forklifts	1	40	50	25%	50%	4.67	2.28	0.83	0.35	0.47	0.46	0.01	0.01	0.00	0.00	0.00	0.00
Dewatering (06/17/2010-07/29/2010)																	
Submersible Pumps	2	35	50	25%	75%	5.34	2.67	0.82	0.74	0.56	0.54	0.04	0.02	0.01	0.01	0.00	0.00
Trash and/or Sump Pumps	2	35	50	25%	75%	5.34	2.67	0.82	0.74	0.56	0.54	0.04	0.02	0.01	0.01	0.00	0.00
Diesel-powered Generators	2	35	50	29%	100%	4.79	3.83	0.83	0.53	0.61	0.59	0.05	0.04	0.01	0.01	0.01	0.01
Rock Berm (06/17/2010-08/10/2010)																	
Dump Trucks with Pup Trailers	4	45	385	85%	90%	3.35	1.45	0.75	0.19	0.27	0.26	1.96	0.85	0.44	0.11	0.16	0.15
Bulldozers	1	45	250	25%	35%	3.76	1.46	0.75	0.31	0.37	0.36	0.04	0.02	0.01	0.00	0.00	0.00
Excavators	2	45	150	90%	50%	3.55	1.43	0.75	0.30	0.37	0.36	0.24	0.10	0.05	0.02	0.02	0.02
Concrete Batch Plant (08/26/2010-09/21/2010)																	
Mobile Track-mounted Cranes	1	21	150	75%	50%	4.29	1.03	0.74	0.33	0.30	0.29	0.06	0.01	0.01	0.00	0.00	0.00
Track-mounted Hammer for Pile Driv	1	21	150	75%	75%	6.46	1.56	0.74	0.43	0.32	0.31	0.13	0.03	0.01	0.01	0.01	0.01
Dump Trucks with Pup Trailers	1	21	385	85%	90%	3.35	1.45	0.75	0.19	0.27	0.26	0.23	0.10	0.05	0.01	0.02	0.02
Concrete Mixer Trucks	3	21	350	85%	90%	6.08	1.94	0.74	0.44	0.34	0.33	1.13	0.36	0.14	0.08	0.06	0.06
Concrete Pumps	1	21	150	40%	75%	5.81	2.00	0.74	0.54	0.45	0.44	0.06	0.02	0.01	0.01	0.00	0.00
Bulldozers	1	21	250	25%	35%	3.76	1.46	0.75	0.31	0.37	0.36	0.02	0.01	0.00	0.00	0.00	0.00
Backhoes	1	21	75	50%	50%	6.19	6.99	0.97	1.45	1.14	1.10	0.03	0.03	0.00	0.01	0.00	0.00
Excavators	1	21	150	25%	50%	3.55	1.43	0.75	0.30	0.37	0.36	0.02	0.01	0.00	0.00	0.00	0.00
Motor Graders	1	21	150	25%	25%	3.73	1.45	0.75	0.31	0.37	0.36	0.01	0.00	0.00	0.00	0.00	0.00
Self-propelled Compactors	1	21	75	25%	90%	4.79	3.83	0.83	0.53	0.61	0.59	0.02	0.01	0.00	0.00	0.00	0.00
Diesel-powered Generators	1	21	50	48%	100%	4.79	3.83	0.83	0.53	0.61	0.59	0.03	0.02	0.00	0.00	0.00	0.00
Forklifts	1	21	50	75%	75%	4.67	2.28	0.83	0.35	0.47	0.46	0.03	0.01	0.01	0.00	0.00	0.00
CIVIL CONSTRUCTION																	
Roadway Excavation (7/29/2010-09/04/2010)																	
Dump Trucks with Pup Trailers	64	32	385	85%	90%	3.35	1.45	0.75	0.19	0.27	0.26	22.26	9.66	4.99	1.26	1.77	1.71
Bulldozers	65	32	580	85%	90%	3.76	1.46	0.75	0.31	0.37	0.36	38.24	14.82	7.63	3.18	3.81	3.69
Excavators	2	32	150	75%	75%	3.55	1.43	0.75	0.30	0.37	0.36	0.21	0.08	0.04	0.02	0.02	0.02
Motor Graders	1	32	150	75%	75%	3.73	1.45	0.75	0.31	0.37	0.36	0.11	0.04	0.02	0.01	0.01	0.01
Self-propelled Compactors	2	32	75	50%	90%	4.79	3.83	0.83	0.53	0.61	0.59	0.11	0.09	0.02	0.01	0.01	0.01

Equipment List	No.	Equipment Use Duration (days)	Horsepower	Utilization	Load Factor	NOx EF (g/hp-hr)	CO EF (g/hp-hr)	SO2 EF (g/hp-hr)	VOC EF (g/hp-hr)	PM10 EF (g/hp-hr)	PM2.5 EF (g/hp-hr)	NOx (tons)	CO (tons)	SO2 (tons)	VOC (tons)	PM10 (tons)	PM2.5 (tons)
Storm Sewer Installation (08/10/2010-09/08/2010)																	
Trash and/or Sump Pumps	2	24	50	25%	75%	5.34	2.67	0.82	0.74	0.56	0.54	0.03	0.01	0.00	0.00	0.00	0.00
Dump Trucks with Pup Trailers	2	24	385	50%	90%	3.35	1.45	0.75	0.19	0.27	0.26	0.31	0.13	0.07	0.02	0.02	0.02
Bulldozers	1	24	150	75%	75%	3.76	1.46	0.75	0.31	0.37	0.36	0.08	0.03	0.02	0.01	0.01	0.01
Excavators	2	24	150	75%	75%	3.55	1.43	0.75	0.30	0.37	0.36	0.16	0.06	0.03	0.01	0.02	0.02
Self-propelled Compactors	1	24	75	25%	90%	4.79	3.83	0.83	0.53	0.61	0.59	0.02	0.02	0.00	0.00	0.00	0.00
Forklifts	1	24	50	75%	50%	4.67	2.28	0.83	0.35	0.47	0.46	0.02	0.01	0.00	0.00	0.00	0.00
Sanitary Sewer Installation (09/04/2010-09/11/2010)																	
Trash and/or Sump Pumps	1	5	50	75%	75%	5.34	2.67	0.82	0.74	0.56	0.54	0.01	0.00	0.00	0.00	0.00	0.00
Dump Trucks with Pup Trailers	1	5	385	50%	90%	3.35	1.45	0.75	0.19	0.27	0.26	0.03	0.01	0.01	0.00	0.00	0.00
Bulldozers	1	5	150	25%	75%	3.76	1.46	0.75	0.31	0.37	0.36	0.01	0.00	0.00	0.00	0.00	0.00
Excavators	1	5	150	75%	75%	3.55	1.43	0.75	0.30	0.37	0.36	0.02	0.01	0.00	0.00	0.00	0.00
Forklifts	1	5	50	75%	50%	4.67	2.28	0.83	0.35	0.47	0.46	0.00	0.00	0.00	0.00	0.00	0.00
Water Line (Service) (09/17/2010-09/21/2010)																	
Trash and/or Sump Pumps	1	3	50	25%	75%	5.34	2.67	0.82	0.74	0.56	0.54	0.00	0.00	0.00	0.00	0.00	0.00
Dump Trucks with Pup Trailers	1	3	385	50%	90%	3.35	1.45	0.75	0.19	0.27	0.26	0.02	0.01	0.00	0.00	0.00	0.00
Excavators	1	3	150	75%	75%	3.55	1.43	0.75	0.30	0.37	0.36	0.01	0.00	0.00	0.00	0.00	0.00
Water Line (Temporary Fire Suppression) (09/21/2010-09/27/2010)																	
Trash and/or Sump Pumps	1	5	50	25%	75%	5.34	2.67	0.82	0.74	0.56	0.54	0.00	0.00	0.00	0.00	0.00	0.00
Dump Trucks with Pup Trailers	1	5	385	50%	90%	3.35	1.45	0.75	0.19	0.27	0.26	0.03	0.01	0.01	0.00	0.00	0.00
Excavators	1	5	150	75%	75%	3.55	1.43	0.75	0.30	0.37	0.36	0.02	0.01	0.00	0.00	0.00	0.00
BASIN #1 CONSTRUCTION																	
Basin Excavation (06/29/2010-08/16/2010)																	
Trash and/or Sump Pumps	2	40	50	85%	90%	5.34	2.67	0.82	0.74	0.56	0.54	0.18	0.09	0.03	0.02	0.02	0.02
Dump Trucks with Pup Trailers	293	40	385	85%	90%	3.35	1.45	0.75	0.19	0.27	0.26	127.37	55.27	28.56	7.23	10.10	9.80
Bulldozers	2	40	150	50%	75%	3.76	1.46	0.75	0.31	0.37	0.36	0.19	0.07	0.04	0.02	0.02	0.02
Excavators	1009	40	150	75%	75%	3.55	1.43	0.75	0.30	0.37	0.36	133.11	53.55	28.16	11.20	13.92	13.50
Motor Graders	1	40	150	50%	50%	3.73	1.45	0.75	0.31	0.37	0.36	0.06	0.02	0.01	0.01	0.01	0.01
Self-propelled Compactors	1	40	75	75%	75%	4.79	3.83	0.83	0.53	0.61	0.59	0.09	0.07	0.02	0.01	0.01	0.01
Diesel-powered Generators	2	40	50	100%	100%	4.79	3.83	0.83	0.53	0.61	0.59	0.21	0.17	0.04	0.02	0.03	0.03
Drive Piles (07/28/2010-12/31/2011)																	
Trash and/or Sump Pumps	2	144	50	85%	90%	5.34	2.67	0.82	0.74	0.56	0.54	0.65	0.32	0.10	0.09	0.07	0.07
Track-mounted Hammer for Pile Driv	4	144	150	85%	90%	6.46	1.56	0.74	0.43	0.32	0.31	4.70	1.14	0.54	0.32	0.23	0.23
Bulldozers	1	144	150	50%	25%	3.76	1.46	0.75	0.31	0.37	0.36	0.11	0.04	0.02	0.01	0.01	0.01
Motor Graders	1	144	150	50%	50%	3.73	1.45	0.75	0.31	0.37	0.36	0.22	0.09	0.04	0.02	0.02	0.02
Self-propelled Compactors	1	144	75	50%	75%	4.79	3.83	0.83	0.53	0.61	0.59	0.21	0.17	0.04	0.02	0.03	0.03
Diesel-powered Generators	2	144	50	71%	100%	4.79	3.83	0.83	0.53	0.61	0.59	0.54	0.43	0.09	0.06	0.07	0.07
Forklifts	2	144	50	50%	75%	4.67	2.28	0.83	0.35	0.47	0.46	0.28	0.14	0.05	0.02	0.03	0.03
Prepare Subgrade (12/02/2010-12/31/2011)																	
Trash and/or Sump Pumps	2	45	50	50%	90%	5.34	2.67	0.82	0.74	0.56	0.54	0.12	0.06	0.02	0.02	0.01	0.01
Dump Trucks with Pup Trailers	15	45	385	85%	90%	3.35	1.45	0.75	0.19	0.27	0.26	7.34	3.18	1.64	0.42	0.58	0.56
Bulldozers	2	45	150	75%	75%	3.76	1.46	0.75	0.31	0.37	0.36	0.31	0.12	0.06	0.03	0.03	0.03
Excavators	2	45	150	85%	90%	3.55	1.43	0.75	0.30	0.37	0.36	0.40	0.16	0.09	0.03	0.04	0.04
Motor Graders	1	45	150	85%	85%	3.73	1.45	0.75	0.31	0.37	0.36	0.20	0.08	0.04	0.02	0.02	0.02
Self-propelled Compactors	2	45	75	75%	75%	4.79	3.83	0.83	0.53	0.61	0.59	0.20	0.16	0.03	0.02	0.03	0.02
Diesel-powered Generators	2	45	50	32%	100%	4.79	3.83	0.83	0.53	0.61	0.59	0.08	0.06	0.01	0.01	0.01	0.01

Equipment List	No.	Equipment Use Duration (days)	Horsepower	Utilization	Load Factor	NOx EF (g/hp-hr)	CO EF (g/hp-hr)	SO2 EF (g/hp-hr)	VOC EF (g/hp-hr)	PM10 EF (g/hp-hr)	PM2.5 EF (g/hp-hr)	NOx (tons)	CO (tons)	SO2 (tons)	VOC (tons)	PM10 (tons)	PM2.5 (tons)
GATE FOR BASIN 1																	
Gate Substructure Piles (07/28/2010-08/11/2010)																	
Trash and/or Sump Pumps	2	12	50	85%	90%	5.34	2.67	0.82	0.74	0.56	0.54	0.05	0.03	0.01	0.01	0.01	0.01
Track-mounted Hammer for Pile Driv	1	12	150	85%	90%	6.46	1.56	0.74	0.43	0.32	0.31	0.10	0.02	0.01	0.01	0.00	0.00
Diesel-powered Generators	1	12	50	83%	100%	4.79	3.83	0.83	0.53	0.61	0.59	0.03	0.02	0.00	0.00	0.00	0.00
BASIN #2 CONSTRUCTION																	
Basin Excavation (08/16/2010-09/25/2010)																	
Trash and/or Sump Pumps	2	34	50	85%	90%	5.34	2.67	0.82	0.74	0.56	0.54	0.15	0.08	0.02	0.02	0.02	0.02
Dump Trucks with Pup Trailers	290	34	385	85%	90%	3.35	1.45	0.75	0.19	0.27	0.26	107.15	46.50	24.03	6.08	8.50	8.25
Bulldozers	2	34	150	50%	75%	3.76	1.46	0.75	0.31	0.37	0.36	0.16	0.06	0.03	0.01	0.02	0.02
Excavators	996	34	165	85%	90%	3.55	1.43	0.75	0.30	0.37	0.36	167.09	67.22	35.35	14.06	17.47	16.95
Motor Graders	1	34	150	75%	75%	3.73	1.45	0.75	0.31	0.37	0.36	0.12	0.05	0.02	0.01	0.01	0.01
Self-propelled Compactors	1	34	75	75%	75%	4.79	3.83	0.83	0.53	0.61	0.59	0.08	0.06	0.01	0.01	0.01	0.01
Diesel-powered Generators	2	34	50	100%	100%	4.79	3.83	0.83	0.53	0.61	0.59	0.18	0.14	0.03	0.02	0.02	0.02
GATE FOR BASIN 2																	
Gate Substructure Piles (09/14/2010-09/28/2010)																	
Trash and/or Sump Pumps	2	12	50	85%	90%	5.34	2.67	0.82	0.74	0.56	0.54	0.05	0.03	0.01	0.01	0.01	0.01
Track-mounted Hammer for Pile Driv	1	12	150	85%	90%	6.46	1.56	0.74	0.43	0.32	0.31	0.10	0.02	0.01	0.01	0.00	0.00
Diesel-powered Generators	2	12	50	83%	100%	4.79	3.83	0.83	0.53	0.61	0.59	0.05	0.04	0.01	0.01	0.01	0.01
CIVIL CONSTRUCTION (BASIN PERIMETER)																	
TOTALS:												732.86	302.90	156.80	53.12	67.98	65.94

Notes:
 * Tugboat Emissions factors using Tug Transit EF from operations emissions estimates (EPA420-R-00-002)
 Assumed 10 hour days

Equipment List	No.	Equipment Use Duration (days)	Horsepower	Utilization	Load Factor	NOx EF (g/hp-hr)	CO EF (g/hp-hr)	SO2 EF (g/hp-hr)	VOC EF (g/hp-hr)	PM10 EF (g/hp-hr)	PM2.5 EF (g/hp-hr)	NOx (tons)	CO (tons)	SO2 (tons)	VOC (tons)	PM10 (tons)	PM2.5 (tons)
CIVIL CONSTRUCTION																	
Surfacing Access Road - CSBS Basin 1 (07/11/2011-07/25/2011)																	
Dump Trucks with Pup Trailers	5	12	385	85%	90%	2.97	1.27	0.72	0.18	0.35	0.34	0.58	0.25	0.14	0.04	0.07	0.07
Motor Graders	8	12	259	85%	90%	3.46	1.44	0.75	0.29	0.38	0.36	0.73	0.30	0.16	0.06	0.08	0.08
Self-propelled Compactors	5	12	401	85%	90%	4.56	3.64	0.83	0.48	0.56	0.55	0.93	0.74	0.17	0.10	0.11	0.11
Surfacing Access Road - CSBS Basin 2 (11/16/2011-12/02/2011)																	
Dump Trucks with Pup Trailers	5	12	385	85%	90%	2.97	1.27	0.72	0.18	0.35	0.34	0.58	0.25	0.14	0.04	0.07	0.07
Motor Graders	8	12	259	85%	90%	3.46	1.44	0.75	0.29	0.38	0.36	0.73	0.30	0.16	0.06	0.08	0.08
Self-propelled Compactors	5	12	401	85%	90%	4.56	3.64	0.83	0.48	0.56	0.55	0.93	0.74	0.17	0.10	0.11	0.11
Surfacing Parking Lot - CSBC (11/16/2011-12/06/2011)																	
Dump Trucks with Pup Trailers	15	15	385	85%	90%	2.97	1.27	0.72	0.18	0.35	0.34	2.17	0.93	0.53	0.13	0.26	0.25
Motor Graders	23	15	259	85%	90%	3.46	1.44	0.75	0.29	0.38	0.36	2.61	1.08	0.57	0.22	0.28	0.27
Self-propelled Compactors	13	15	401	85%	90%	4.56	3.64	0.83	0.48	0.56	0.55	3.01	2.40	0.55	0.31	0.37	0.36
Surfacing Laydown Area - CSBC (11/16/2011-12/14/2011)																	
Dump Trucks with Pup Trailers	122	22	385	85%	90%	2.97	1.27	0.72	0.18	0.35	0.34	25.92	11.10	6.28	1.59	3.06	2.97
Motor Graders	186	22	259	85%	90%	3.46	1.44	0.75	0.29	0.38	0.36	30.95	12.83	6.70	2.59	3.36	3.26
Self-propelled Compactors	108	22	401	85%	90%	4.56	3.64	0.83	0.48	0.56	0.55	36.66	29.25	6.69	3.83	4.53	4.40
BASIN #1 CONSTRUCTION																	
Drive Piles (1/1/2011-01/26-2011)																	
Trash and/or Sump Pumps	2	26	50	85%	90%	5.24	2.48	0.82	0.66	0.52	0.51	0.11	0.05	0.02	0.01	0.01	0.01
Track-mounted Hammer for Pile Drive	4	26	150	85%	90%	6.09	1.41	0.73	0.41	0.35	0.34	0.80	0.19	0.10	0.05	0.05	0.04
Bulldozers	1	26	150	50%	25%	3.49	1.44	0.75	0.29	0.38	0.36	0.02	0.01	0.00	0.00	0.00	0.00
Motor Graders	1	26	150	50%	50%	3.46	1.44	0.75	0.29	0.38	0.36	0.04	0.02	0.01	0.00	0.00	0.00
Self-propelled Compactors	1	26	75	50%	75%	4.56	3.64	0.83	0.48	0.56	0.55	0.04	0.03	0.01	0.00	0.00	0.00
Diesel-powered Generators	2	26	50	71%	10%	4.56	3.64	0.83	0.48	0.56	0.55	0.01	0.01	0.00	0.00	0.00	0.00
Forklifts	2	26	50	50%	75%	4.67	2.09	0.83	0.33	0.43	0.42	0.05	0.02	0.01	0.00	0.00	0.00
Prepare Subgrade (1/1/2011-02/02/2011)																	
Trash and/or Sump Pumps	2	33	50	50%	90%	5.24	2.48	0.82	0.66	0.52	0.51	0.09	0.04	0.01	0.01	0.01	0.01
Dump Trucks with Pup Trailers	15	33	385	85%	90%	2.97	1.27	0.72	0.18	0.35	0.34	4.78	2.05	1.16	0.29	0.56	0.55
Bulldozers	2	33	150	75%	75%	3.49	1.44	0.75	0.29	0.38	0.36	0.21	0.09	0.05	0.02	0.02	0.02
Excavators	2	33	150	85%	90%	3.32	1.43	0.75	0.28	0.38	0.37	0.28	0.12	0.06	0.02	0.03	0.03
Motor Graders	1	33	150	85%	85%	3.46	1.44	0.75	0.29	0.38	0.36	0.14	0.06	0.03	0.01	0.01	0.01
Self-propelled Compactors	2	33	75	75%	75%	4.56	3.64	0.83	0.48	0.56	0.55	0.14	0.11	0.03	0.01	0.02	0.02
Diesel-powered Generators	2	33	50	32%	10%							0.00	0.00	0.00	0.00	0.00	0.00
Permanent Dewatering System, Horiz Pipe (01/04/2011-02/02/2011)																	
Trash and/or Sump Pumps	2	24	50	50%	90%	5.24	2.48	0.82	0.66	0.52	0.51	0.06	0.03	0.01	0.01	0.01	0.01
Bulldozers	1	24	150	50%	75%	3.49	1.44	0.75	0.29	0.38	0.36	0.05	0.02	0.01	0.00	0.01	0.01
Excavators	2	24	150	85%	90%	3.32	1.43	0.75	0.28	0.38	0.37	0.20	0.09	0.05	0.02	0.02	0.02
Diesel-powered Generators	2	24	50	83%	10%							0.00	0.00	0.00	0.00	0.00	0.00
Forklifts	1	24	50	75%	50%	4.67	2.09	0.83	0.33	0.43	0.42	0.02	0.01	0.00	0.00	0.00	0.00
Construct Grade Beams/Pedestals (01/03/2011-03/10/2011)																	
Mobile Track-mounted Cranes	2	55	150	50%	50%	4.00	1.00	0.74	0.31	0.29	0.29	0.18	0.05	0.03	0.01	0.01	0.01
Concrete Mixer Trucks	2	55	350	85%	90%	5.74	1.80	0.73	0.41	0.36	0.35	1.86	0.58	0.24	0.13	0.12	0.11
Concrete Pumps	2	55	350	75%	75%	5.59	1.88	0.74	0.51	0.43	0.42	1.34	0.45	0.18	0.12	0.10	0.10
Backhoes	2	55	75	75%	50%	5.93	6.64	0.97	1.34	1.08	1.04	0.20	0.23	0.03	0.05	0.04	0.04
Diesel-powered Generators	2	55	50	9%	10%							0.00	0.00	0.00	0.00	0.00	0.00
Forklifts	2	55	50	75%	50%	4.67	2.09	0.83	0.33	0.43	0.42	0.11	0.05	0.02	0.01	0.01	0.01

Equipment List	No.	Equipment Use Duration (days)	Horsepower	Utilization	Load Factor	NOx EF (g/hp-hr)	CO EF (g/hp-hr)	SO2 EF (g/hp-hr)	VOC EF (g/hp-hr)	PM10 EF (g/hp-hr)	PM2.5 EF (g/hp-hr)	NOx (tons)	CO (tons)	SO2 (tons)	VOC (tons)	PM10 (tons)	PM2.5 (tons)
Construct Slab (03/11/2011-04/21/2011)																	
Concrete Mixer Trucks	37	35	350	85%	90%	5.74	1.80	0.73	0.41	0.36	0.35	21.95	6.87	2.79	1.56	1.36	1.32
Concrete Pumps	2	35	350	75%	75%	5.59	1.88	0.74	0.51	0.43	0.42	0.85	0.29	0.11	0.08	0.07	0.06
Diesel-powered Generators	2	35	50	86%	10%							0.00	0.00	0.00	0.00	0.00	0.00
Forklifts	2	35	50	75%	50%	4.67	2.09	0.83	0.33	0.43	0.42	0.07	0.03	0.01	0.00	0.01	0.01
Construct Walls (04/21/2011-05/16/2011)																	
Concrete Mixer Trucks	18	21	350	85%	90%	5.74	1.80	0.73	0.41	0.36	0.35	6.41	2.00	0.82	0.46	0.40	0.39
Concrete Pumps	2	21	350	75%	75%	5.59	1.88	0.74	0.51	0.43	0.42	0.51	0.17	0.07	0.05	0.04	0.04
Diesel-powered Generators	2	21	50	95%	10%							0.00	0.00	0.00	0.00	0.00	0.00
Forklifts	2	21	50	75%	50%	4.67	2.09	0.83	0.33	0.43	0.42	0.04	0.02	0.01	0.00	0.00	0.00
Drive Crane Rail Piles (05/16/2011-07/02-2011)																	
Trash and/or Sump Pumps	2	40	50	85%	90%	5.24	2.48	0.82	0.66	0.52	0.51	0.18	0.08	0.03	0.02	0.02	0.02
Track-mounted Hammer for Pile Drive	2	40	150	85%	90%	6.09	1.41	0.73	0.41	0.35	0.34	0.62	0.14	0.07	0.04	0.04	0.03
Bulldozers	1	40	150	50%	25%	3.49	1.44	0.75	0.29	0.38	0.36	0.03	0.01	0.01	0.00	0.00	0.00
Motor Graders	1	40	150	25%	25%	3.46	1.44	0.75	0.29	0.38	0.36	0.01	0.01	0.00	0.00	0.00	0.00
Diesel-powered Generators	2	40	50	75%	10%							0.00	0.00	0.00	0.00	0.00	0.00
Forklifts	2	40	50	50%	75%	4.67	2.09	0.83	0.33	0.43	0.42	0.08	0.03	0.01	0.01	0.01	0.01
Backfill Walls (05/23/2011-07/11/2011)																	
Dump Trucks with Pup Trailers	73	40	385	85%	90%	2.97	1.27	0.72	0.18	0.35	0.34	28.20	12.07	6.84	1.73	3.33	3.23
Bulldozers	2	40	150	75%	75%	3.49	1.44	0.75	0.29	0.38	0.36	0.26	0.11	0.06	0.02	0.03	0.03
Self-propelled Compactors	2	40	75	75%	75%	4.56	3.64	0.83	0.48	0.56	0.55	0.17	0.14	0.03	0.02	0.02	0.02
Permanent Dewatering System, Vert Pipe (07/05/2011-07/11/2011)																	
Mobile Track-mounted Cranes	1	5	150	75%	50%	4.00	1.00	0.74	0.31	0.29	0.29	0.01	0.00	0.00	0.00	0.00	0.00
Forklifts	1	5	50	75%	50%	4.67	2.09	0.83	0.33	0.43	0.42	0.00	0.00	0.00	0.00	0.00	0.00
Construct Crane Rail Beams (06/21/2011-07/27/2011)																	
Concrete Mixer Trucks	4	30	350	85%	90%	5.74	1.80	0.73	0.41	0.36	0.35	2.03	0.64	0.26	0.14	0.13	0.12
Concrete Pumps	1	30	350	75%	75%	5.59	1.88	0.74	0.51	0.43	0.42	0.36	0.12	0.05	0.03	0.03	0.03
Backhoes	1	30	75	50%	50%	5.93	6.64	0.97	1.34	1.08	1.04	0.04	0.04	0.01	0.01	0.01	0.01
Diesel-powered Generators	2	30	50	67%	10%							0.00	0.00	0.00	0.00	0.00	0.00
Forklifts	2	30	50	50%	50%	4.67	2.09	0.83	0.33	0.43	0.42	0.04	0.02	0.01	0.00	0.00	0.00
Install Cranes (07/27/2011-08/25/2011)																	
Mobile Track-mounted Cranes	2	25	150	75%	75%	4.00	1.00	0.74	0.31	0.29	0.29	0.19	0.05	0.03	0.01	0.01	0.01
Diesel-powered Generators	2	25	50	80%	10%							0.00	0.00	0.00	0.00	0.00	0.00
Forklifts	2	25	50	50%	50%	4.67	2.09	0.83	0.33	0.43	0.42	0.03	0.01	0.01	0.00	0.00	0.00
GATE FOR BASIN 1																	
Gate Substructure Sill (01/26/2011-06/27/2011)																	
Mobile Track-mounted Cranes	1	40	150	75%	50%	4.00	1.00	0.74	0.31	0.29	0.29	0.10	0.02	0.02	0.01	0.01	0.01
Trash and/or Sump Pumps	1	40	50	85%	90%	5.24	2.48	0.82	0.66	0.52	0.51	0.09	0.04	0.01	0.01	0.01	0.01
Concrete Mixer Trucks	2	40	350	85%	90%	5.74	1.80	0.73	0.41	0.36	0.35	1.36	0.42	0.17	0.10	0.08	0.08
Concrete Pumps	1	40	350	75%	75%	5.59	1.88	0.74	0.51	0.43	0.42	0.49	0.16	0.06	0.04	0.04	0.04
Backhoes	1	40	75	75%	50%	5.93	6.64	0.97	1.34	1.08	1.04	0.07	0.08	0.01	0.02	0.01	0.01
Diesel-powered Generators	1	40	50	75%	10%							0.00	0.00	0.00	0.00	0.00	0.00
Forklifts	1	40	50	75%	50%	4.67	2.09	0.83	0.33	0.43	0.42	0.04	0.02	0.01	0.00	0.00	0.00
Gate Jamb (03/15/2011-04/07/2011)																	
Mobile Track-mounted Cranes	1	20	150	50%	50%	4.00	1.00	0.74	0.31	0.29	0.29	0.03	0.01	0.01	0.00	0.00	0.00
Trash and/or Sump Pumps	1	20	50	85%	90%	5.24	2.48	0.82	0.66	0.52	0.51	0.04	0.02	0.01	0.01	0.00	0.00

Equipment List	No.	Equipment Use Duration (days)	Horsepower	Utilization	Load Factor	NOx EF (g/hp-hr)	CO EF (g/hp-hr)	SO2 EF (g/hp-hr)	VOC EF (g/hp-hr)	PM10 EF (g/hp-hr)	PM2.5 EF (g/hp-hr)	NOx (tons)	CO (tons)	SO2 (tons)	VOC (tons)	PM10 (tons)	PM2.5 (tons)
Concrete Mixer Trucks	2	20	350	85%	90%	5.74	1.80	0.73	0.41	0.36	0.35	0.68	0.21	0.09	0.05	0.04	0.04
Concrete Pumps	1	20	350	75%	75%	5.59	1.88	0.74	0.51	0.43	0.42	0.24	0.08	0.03	0.02	0.02	0.02
Diesel-powered Generators	1	20	50	100%	10%	4.19	3.21	0.81	0.40	0.55	0.54	0.00	0.00	0.00	0.00	0.00	0.00
Forklifts	1	20	50	75%	50%	4.67	2.09	0.83	0.33	0.43	0.42	0.02	0.01	0.00	0.00	0.00	0.00
BASIN #2 CONSTRUCTION																	
Drive Piles (1/26/2011-06/27/2011)																	
Trash and/or Sump Pumps	2	128	50	85%	90%	5.24	2.48	0.82	0.66	0.52	0.51	0.57	0.27	0.09	0.07	0.06	0.05
Track-mounted Hammer for Pile Drive	4	128	150	85%	90%	6.09	1.41	0.73	0.41	0.35	0.34	3.94	0.91	0.47	0.27	0.23	0.22
Bulldozers	1	128	150	50%	25%	3.49	1.44	0.75	0.29	0.38	0.36	0.09	0.04	0.02	0.01	0.01	0.01
Motor Graders	1	128	150	50%	50%	3.46	1.44	0.75	0.29	0.38	0.36	0.18	0.08	0.04	0.02	0.02	0.02
Self-propelled Compactors	1	128	75	50%	75%	4.56	3.64	0.83	0.48	0.56	0.55	0.18	0.14	0.03	0.02	0.02	0.02
Diesel-powered Generators	2	128	50	78%	10%	4.56	3.64	0.83	0.48	0.56	0.55	0.05	0.04	0.01	0.01	0.01	0.01
Forklifts	2	128	50	50%	75%	4.67	2.09	0.83	0.33	0.43	0.42	0.25	0.11	0.04	0.02	0.02	0.02
Prepare Subgrade (05/11/2011-07/05/2011)																	
Trash and/or Sump Pumps	2	45	50	50%	90%	5.24	2.48	0.82	0.66	0.52	0.51	0.12	0.06	0.02	0.01	0.01	0.01
Dump Trucks with Pup Trailers	15	45	385	85%	90%	2.97	1.27	0.72	0.18	0.35	0.34	6.52	2.79	1.58	0.40	0.77	0.75
Bulldozers	2	45	150	75%	75%	3.49	1.44	0.75	0.29	0.38	0.36	0.29	0.12	0.06	0.02	0.03	0.03
Excavators	2	45	150	85%	90%	3.32	1.43	0.75	0.28	0.38	0.37	0.38	0.16	0.09	0.03	0.04	0.04
Motor Graders	1	45	150	85%	85%	3.46	1.44	0.75	0.29	0.38	0.36	0.19	0.08	0.04	0.02	0.02	0.02
Self-propelled Compactors	2	45	75	75%	75%	4.56	3.64	0.83	0.48	0.56	0.55	0.19	0.15	0.03	0.02	0.02	0.02
Diesel-powered Generators	2	45	50	56%	10%	4.19	3.21	0.81	0.40	0.55	0.54	0.01	0.01	0.00	0.00	0.00	0.00
Permanent Dewatering System, Horiz Pipe (06/06/2011-07/05/2011)																	
Trash and/or Sump Pumps	2	24	50	50%	90%	5.24	2.48	0.82	0.66	0.52	0.51	0.06	0.03	0.01	0.01	0.01	0.01
Bulldozers	1	24	150	50%	75%	3.49	1.44	0.75	0.29	0.38	0.36	0.05	0.02	0.01	0.00	0.01	0.01
Excavators	2	24	150	85%	90%	3.32	1.43	0.75	0.28	0.38	0.37	0.20	0.09	0.05	0.02	0.02	0.02
Diesel-powered Generators	2	24	50	83%	10%	4.56	3.64	0.83	0.48	0.56	0.55	0.01	0.01	0.00	0.00	0.00	0.00
Forklifts	1	24	50	75%	50%	4.67	2.09	0.83	0.33	0.43	0.42	0.02	0.01	0.00	0.00	0.00	0.00
Construct Grade Beams/Pedestals (06/10/2011-08/09/2011)																	
Mobile Track-mounted Cranes	2	50	150	50%	50%	4.00	1.00	0.74	0.31	0.29	0.29	0.17	0.04	0.03	0.01	0.01	0.01
Concrete Mixer Trucks	2	50	350	85%	90%	5.74	1.80	0.73	0.41	0.36	0.35	1.69	0.53	0.22	0.12	0.11	0.10
Concrete Pumps	2	50	350	75%	75%	5.59	1.88	0.74	0.51	0.43	0.42	1.21	0.41	0.16	0.11	0.09	0.09
Backhoes	2	50	75	75%	50%	5.93	6.64	0.97	1.34	1.08	1.04	0.18	0.21	0.03	0.04	0.03	0.03
Diesel-powered Generators	2	50	50	10%	10%	4.56	3.64	0.83	0.48	0.56	0.55	0.00	0.00	0.00	0.00	0.00	0.00
Forklifts	2	50	50	75%	50%	4.67	2.09	0.83	0.33	0.43	0.42	0.10	0.04	0.02	0.01	0.01	0.01
Construct Slab (08/16/2011-09/21/2011)																	
Concrete Mixer Trucks	38	30	350	85%	90%	5.74	1.80	0.73	0.41	0.36	0.35	19.32	6.05	2.46	1.37	1.20	1.16
Concrete Pumps	2	30	350	75%	75%	5.59	1.88	0.74	0.51	0.43	0.42	0.73	0.24	0.10	0.07	0.06	0.05
Diesel-powered Generators	2	30	50	92%	10%	4.56	3.64	0.83	0.48	0.56	0.55	0.01	0.01	0.00	0.00	0.00	0.00
Forklifts	2	30	50	75%	50%	4.67	2.09	0.83	0.33	0.43	0.42	0.06	0.03	0.01	0.00	0.01	0.01
Construct Walls (09/21/2011-10/13/2011)																	
Concrete Mixer Trucks	18	19	350	85%	90%	5.74	1.80	0.73	0.41	0.36	0.35	5.80	1.81	0.74	0.41	0.36	0.35
Concrete Pumps	2	19	350	75%	75%	5.59	1.88	0.74	0.51	0.43	0.42	0.46	0.16	0.06	0.04	0.04	0.03
Diesel-powered Generators	2	19	50	100%	10%	4.56	3.64	0.83	0.48	0.56	0.55	0.01	0.01	0.00	0.00	0.00	0.00
Forklifts	2	19	50	75%	50%	4.67	2.09	0.83	0.33	0.43	0.42	0.04	0.02	0.01	0.00	0.00	0.00
Drive Crane Rail Piles (08/19/2011-11/10/2011)																	
Trash and/or Sump Pumps	2	70	50	85%	90%	5.24	2.48	0.82	0.66	0.52	0.51	0.31	0.15	0.05	0.04	0.03	0.03

Equipment List	No.	Equipment Use Duration (days)	Horsepower	Utilization	Load Factor	NOx EF (g/hp-hr)	CO EF (g/hp-hr)	SO2 EF (g/hp-hr)	VOC EF (g/hp-hr)	PM10 EF (g/hp-hr)	PM2.5 EF (g/hp-hr)	NOx (tons)	CO (tons)	SO2 (tons)	VOC (tons)	PM10 (tons)	PM2.5 (tons)
Track-mounted Hammer for Pile Drive	2	70	150	85%	90%	6.09	1.41	0.73	0.41	0.35	0.34	1.08	0.25	0.13	0.07	0.06	0.06
Bulldozers	1	70	150	50%	25%	3.49	1.44	0.75	0.29	0.38	0.36	0.05	0.02	0.01	0.00	0.01	0.01
Motor Graders	1	70	150	25%	25%	3.46	1.44	0.75	0.29	0.38	0.36	0.03	0.01	0.01	0.00	0.00	0.00
Diesel-powered Generators	2	70	50	71%	10%	4.56	3.64	0.83	0.48	0.56	0.55	0.03	0.02	0.00	0.00	0.00	0.00
Forklifts	2	70	50	50%	75%	4.67	2.09	0.83	0.33	0.43	0.42	0.14	0.06	0.02	0.01	0.01	0.01
Backfill Walls (10/05/2011-11/16/2011)																	
Dump Trucks with Pup Trailers	56	35	385	85%	90%	2.97	1.27	0.72	0.18	0.35	0.34	18.93	8.10	4.59	1.16	2.23	2.17
Bulldozers	2	35	150	75%	75%	3.49	1.44	0.75	0.29	0.38	0.36	0.23	0.09	0.05	0.02	0.02	0.02
Self-propelled Compactors	2	35	75	75%	75%	4.56	3.64	0.83	0.48	0.56	0.55	0.15	0.12	0.03	0.02	0.02	0.02
Permanent Dewatering System, Vert Pipe (11/09/2011-11/16/2011)																	
Mobile Track-mounted Cranes	1	5	150	75%	50%	4.00	1.00	0.74	0.31	0.29	0.29	0.01	0.00	0.00	0.00	0.00	0.00
Forklifts	1	5	50	50%	50%	4.67	2.09	0.83	0.33	0.43	0.42	0.00	0.00	0.00	0.00	0.00	0.00
Construct Crane Rail Beams (11/02/2011-12/31/2011)																	
Concrete Mixer Trucks	4	39	350	85%	90%	5.74	1.80	0.73	0.41	0.36	0.35	2.64	0.83	0.34	0.19	0.16	0.16
Concrete Pumps	1	39	350	75%	75%	5.59	1.88	0.74	0.51	0.43	0.42	0.47	0.16	0.06	0.04	0.04	0.04
Backhoes	1	39	75	50%	50%	5.93	6.64	0.97	1.34	1.08	1.04	0.05	0.05	0.01	0.01	0.01	0.01
Diesel-powered Generators	2	39	50	100%	10%	4.56	3.64	0.83	0.48	0.56	0.55	0.02	0.02	0.00	0.00	0.00	0.00
Forklifts	2	39	50	50%	50%	4.67	2.09	0.83	0.33	0.43	0.42	0.05	0.02	0.01	0.00	0.00	0.00
GATE FOR BASIN 2																	
Gate Substructure Sill (06/27/2011-08/13/2011)																	
Mobile Track-mounted Cranes	1	40	150	75%	50%	4.00	1.00	0.74	0.31	0.29	0.29	0.10	0.02	0.02	0.01	0.01	0.01
Trash and/or Sump Pumps	1	40	50	85%	90%	5.24	2.48	0.82	0.66	0.52	0.51	0.09	0.04	0.01	0.01	0.01	0.01
Concrete Mixer Trucks	2	40	350	85%	90%	5.74	1.80	0.73	0.41	0.36	0.35	1.36	0.42	0.17	0.10	0.08	0.08
Concrete Pumps	1	40	350	75%	75%	5.59	1.88	0.74	0.51	0.43	0.42	0.49	0.16	0.06	0.04	0.04	0.04
Backhoes	1	40	75	75%	50%	5.93	6.64	0.97	1.34	1.08	1.04	0.07	0.08	0.01	0.02	0.01	0.01
Diesel-powered Generators	1	40	50	75%	10%	4.56	3.64	0.83	0.48	0.56	0.55	0.01	0.01	0.00	0.00	0.00	0.00
Gate Jamb (08/13/2011-09/07/2011)																	
Mobile Track-mounted Cranes	1	20	150	50%	50%	4.00	1.00	0.74	0.31	0.29	0.29	0.03	0.01	0.01	0.00	0.00	0.00
Trash and/or Sump Pumps	1	20	50	85%	90%	5.24	2.48	0.82	0.66	0.52	0.51	0.04	0.02	0.01	0.01	0.00	0.00
Concrete Mixer Trucks	2	20	350	85%	90%	5.74	1.80	0.73	0.41	0.36	0.35	0.68	0.21	0.09	0.05	0.04	0.04
Concrete Pumps	1	20	350	75%	75%	5.59	1.88	0.74	0.51	0.43	0.42	0.24	0.08	0.03	0.02	0.02	0.02
Diesel-powered Generators	1	20	50	100%	10%	4.56	3.64	0.83	0.48	0.56	0.55	0.01	0.00	0.00	0.00	0.00	0.00
Forklifts	1	20	50	75%	50%	4.67	2.09	0.83	0.33	0.43	0.42	0.02	0.01	0.00	0.00	0.00	0.00
CIVIL CONSTRUCTION (BASIN PERIMETER)																	
Surfacing Basin 1 Ramp, CSBC (07/05/2011-07/11/2011)																	
Dump Trucks with Pup Trailers	4	5	385	85%	90%	2.97	1.27	0.72	0.18	0.35	0.34	0.19	0.08	0.05	0.01	0.02	0.02
Motor Graders	6	5	259	85%	90%	3.46	1.44	0.75	0.29	0.38	0.36	0.23	0.09	0.05	0.02	0.02	0.02
Self-propelled Compactors	4	5	401	85%	90%	4.56	3.64	0.83	0.48	0.56	0.55	0.31	0.25	0.06	0.03	0.04	0.04
Water Line (Permanent Fire Suppression) (09/17/2011-11/03/2011)																	
Trash and/or Sump Pumps	1	40	50	25%	75%	5.24	2.48	0.82	0.66	0.52	0.51	0.02	0.01	0.00	0.00	0.00	0.00
Dump Trucks with Pup Trailers	1	40	385	50%	90%	2.97	1.27	0.72	0.18	0.35	0.34	0.23	0.10	0.06	0.01	0.03	0.03
Excavators	1	40	150	75%	75%	3.32	1.43	0.75	0.28	0.38	0.37	0.12	0.05	0.03	0.01	0.01	0.01
Storm Sewer Installation (10/06/2011-11/03/2011)																	
Trash and/or Sump Pumps	2	24	50	50%	90%	5.24	2.48	0.82	0.66	0.52	0.51	0.06	0.03	0.01	0.01	0.01	0.01
Dump Trucks with Pup Trailers	2	24	385	75%	90%	2.97	1.27	0.72	0.18	0.35	0.34	0.41	0.18	0.10	0.03	0.05	0.05
Bulldozers	1	24	150	50%	50%	3.49	1.44	0.75	0.29	0.38	0.36	0.03	0.01	0.01	0.00	0.00	0.00

Equipment List	No.	Equipment Use Duration (days)	Horsepower	Utilization	Load Factor	NOx EF (g/hp-hr)	CO EF (g/hp-hr)	SO2 EF (g/hp-hr)	VOC EF (g/hp-hr)	PM10 EF (g/hp-hr)	PM2.5 EF (g/hp-hr)	NOx (tons)	CO (tons)	SO2 (tons)	VOC (tons)	PM10 (tons)	PM2.5 (tons)
Excavators	2	24	150	75%	75%	3.32	1.43	0.75	0.28	0.38	0.37	0.15	0.06	0.03	0.01	0.02	0.02
Underground Vaults with Sump (10/22/2011-11/03/2011)																	
Mobile Track-mounted Cranes	1	10	150	50%	75%	4.00	1.00	0.74	0.31	0.29	0.29	0.02	0.01	0.00	0.00	0.00	0.00
Trash and/or Sump Pumps	2	10	50	75%	90%	5.24	2.48	0.82	0.66	0.52	0.51	0.04	0.02	0.01	0.00	0.00	0.00
Dump Trucks with Pup Trailers	2	10	385	50%	90%	2.97	1.27	0.72	0.18	0.35	0.34	0.11	0.05	0.03	0.01	0.01	0.01
Bulldozers	1	10	150	50%	50%	3.49	1.44	0.75	0.29	0.38	0.36	0.01	0.01	0.00	0.00	0.00	0.00
Excavators	2	10	150	75%	75%	3.32	1.43	0.75	0.28	0.38	0.37	0.06	0.03	0.01	0.01	0.01	0.01
Diesel-powered Generators	1	10	50	100%	10%	4.56	3.64	0.83	0.48	0.56	0.55	0.00	0.00	0.00	0.00	0.00	0.00
Surfacing Basin 2 Ramps, CSBC (11/09/2011-11/16/2011)																	
Dump Trucks with Pup Trailers	4	5	385	85%	90%	2.97	1.27	0.72	0.18	0.35	0.34	0.19	0.08	0.05	0.01	0.02	0.02
Motor Graders	6	5	259	85%	90%	3.46	1.44	0.75	0.29	0.38	0.36	0.23	0.09	0.05	0.02	0.02	0.02
Self-propelled Compactors	4	5	401	85%	90%	4.56	3.64	0.83	0.48	0.56	0.55	0.31	0.25	0.06	0.03	0.04	0.04
CHANNEL CONSTRUCTION																	
Excavate Channel (10/05/2011-11/16/2011)																	
Dump Trucks with Pup Trailers	155	35	385	85%	90%	2.97	1.27	0.72	0.18	0.35	0.34	52.39	22.43	12.70	3.21	6.18	5.99
Backhoes	973	35	124	85%	90%	5.93	6.64	0.97	1.34	1.08	1.04	211.01	236.52	34.49	47.74	38.34	37.19
Excavators	2	35	150	85%	90%	3.32	1.43	0.75	0.28	0.38	0.37	0.29	0.13	0.07	0.02	0.03	0.03
Floating Derrick/Plant	1	35	750	85%	50%	6.12	2.61	0.74	0.48	0.47	0.45	0.75	0.32	0.09	0.06	0.06	0.06
Tug Boat	1	35	1500	50%	50%	4.51	1.52	0.00	0.25	0.21	0.20	0.65	0.22	0.00	0.04	0.03	0.03
Place Channel Rip-Rap & Breach Channel (11/03/2011-11/30/2011)																	
Dump Trucks with Pup Trailers	47	20	385	85%	90%	2.97	1.27	0.72	0.18	0.35	0.34	9.08	3.89	2.20	0.56	1.07	1.04
Backhoes	146	20	124	85%	90%	5.93	6.64	0.97	1.34	1.08	1.04	18.09	20.28	2.96	4.09	3.29	3.19
Excavators	2	20	150	85%	50%	3.32	1.43	0.75	0.28	0.38	0.37	0.09	0.04	0.02	0.01	0.01	0.01
Floating Derrick/Plant	1	20	750	50%	50%	6.12	2.61	0.74	0.48	0.47	0.45	0.25	0.11	0.03	0.02	0.02	0.02
Tug Boat	1	20	1500	25%	50%	4.51	1.52	0.00	0.25	0.21	0.20	0.19	0.06	0.00	0.01	0.01	0.01
NEAR SHORE MOORING DOLPHIN																	
Dolphin Construction & Installation (10/05/2011-12/17/2011)																	
Floating Derrick/Plant	1	60	750	85%	95%	6.12	2.61	0.74	0.48	0.47	0.45	2.45	1.04	0.29	0.19	0.19	0.18
Tug Boat	1	60	1500	25%	50%	4.51	1.52	0.00	0.25	0.21	0.20	0.56	0.19	0.00	0.03	0.03	0.03
TOTALS:												550.70	400.67	101.55	75.48	74.77	72.53

Notes:
 * Tugboat Emissions factors using Tug Transit EF from operations emissions estimates (EPA420-R-00-002)

Equipment List	No.	Equipment Use Duration (days)	Horsepower	Utilization	Load Factor	NOx EF (g/hp-hr)	CO EF (g/hp-hr)	SO2 EF (g/hp-hr)	VOC EF (g/hp-hr)	PM10 EF (g/hp-hr)	PM2.5 EF (g/hp-hr)	NOx (tons)	CO (tons)	SO2 (tons)	VOC (tons)	PM10 (tons)	PM2.5 (tons)
BASIN #2 CONSTRUCTION																	
Construct Crane Rail Beams (1/1/2012-01/03/2012)																	
Concrete Mixer Trucks	4	3	350	85%	90%	5.42	1.66	0.72	0.38	0.37	0.36	0.19	0.06	0.03	0.01	0.01	0.01
Concrete Pumps	1	3	350	75%	75%	5.32	1.73	0.73	0.48	0.44	0.43	0.03	0.01	0.00	0.00	0.00	0.00
Backhoes	1	3	75	50%	50%	5.68	6.30	0.97	1.24	1.02	0.99	0.00	0.00	0.00	0.00	0.00	0.00
Diesel-powered Generators	2	3	50	100%	10%	4.37	3.50	0.83	0.44	0.53	0.51	0.00	0.00	0.00	0.00	0.00	0.00
Forklifts	2	3	50	50%	50%	4.69	1.96	0.83	0.32	0.40	0.39	0.00	0.00	0.00	0.00	0.00	0.00
Install Cranes (01/03/2012-02/02/2012)																	
Mobile Track-mounted Cranes	2	25	150	75%	75%	3.63	0.90	0.72	0.29	0.35	0.33	0.17	0.04	0.03	0.01	0.02	0.02
Diesel-powered Generators	2	25	50	80%	10%	4.37	3.50	0.83	0.44	0.53	0.51	0.01	0.01	0.00	0.00	0.00	0.00
Forklifts	2	25	50	50%	50%	4.69	1.96	0.83	0.32	0.40	0.39	0.03	0.01	0.01	0.00	0.00	0.00
TOTALS:												0.45	0.14	0.07	0.03	0.04	0.04

Notes:
 * Tugboat Emissions factors using Tug Transit EF from operations emissions estimates (EPA420-R-00-002)

Equipment List	No.	Equipment Use Duration (days)	Horsepower	Utilization	Load Factor	NOx EF (g/hp-hr)	CO EF (g/hp-hr)	SO2 EF (g/hp-hr)	VOC EF (g/hp-hr)	PM10 EF (g/hp-hr)	PM2.5 EF (g/hp-hr)	NOx (tons)	CO (tons)	SO2 (tons)	VOC (tons)	PM10 (tons)	PM2.5 (tons)
Phase 1 (6 Pontoons) (12/14/2011-12/31/2011)																	
Mobile Track-mounted Cranes	4	16	150	85%	50%	4.00	1.00	0.74	0.31	0.29	0.29	0.18	0.05	0.03	0.01	0.01	0.01
Concrete Pumps	3	16	350	75%	90%	5.59	1.88	0.74	0.51	0.43	0.42	0.70	0.24	0.09	0.06	0.05	0.05
Forklifts	4	16	50	75%	50%	4.67	2.09	0.83	0.33	0.43	0.42	0.06	0.03	0.01	0.00	0.01	0.01
Concrete Mixer Trucks	11	16	350	50%	90%	5.74	1.80	0.73	0.41	0.36	0.35	1.75	0.55	0.22	0.12	0.11	0.11
TOTALS:												2.70	0.86	0.36	0.21	0.18	0.18

* Tugboat Emissions factors using Tug Transit EF from operations emissions estimates (EPA420-R-00-002)

Equipment List	No.	Equipment Use Duration (days)	Horsepower	Utilization	Load Factor	NOx EF (g/hp-hr)	CO EF (g/hp-hr)	SO2 EF (g/hp-hr)	VOC EF (g/hp-hr)	PM10 EF (g/hp-hr)	PM2.5 EF (g/hp-hr)	NOx (tons)	CO (tons)	SO2 (tons)	VOC (tons)	PM10 (tons)	PM2.5 (tons)
Phase 1 (6 Pontoons) (01/01/2012-9/01/2012)																	
Mobile Track-mounted Cranes	4	198	150	85%	50%	3.63	0.90	0.72	0.29	0.35	0.33	2.02	0.50	0.40	0.16	0.19	0.19
Concrete Pumps	3	198	350	75%	90%	5.32	1.73	0.73	0.48	0.44	0.43	8.23	2.68	1.13	0.74	0.68	0.66
Forklifts	4	198	50	75%	50%	4.69	1.96	0.83	0.32	0.40	0.39	0.77	0.32	0.14	0.05	0.07	0.06
Concrete Mixer Trucks	11	198	350	50%	90%	5.42	1.66	0.72	0.38	0.37	0.36	20.50	6.26	2.72	1.44	1.40	1.35
Phase 1 Pontoon Float Out (9/04/2012-9/10/2012)																	
Mobile Track-mounted Cranes	4	6	150	85%	50%	3.63	0.90	0.72	0.29	0.35	0.33	0.06	0.02	0.01	0.00	0.01	0.01
Forklifts	4	6	50	75%	50%	4.69	1.96	0.83	0.32	0.40	0.39	0.02	0.01	0.00	0.00	0.00	0.00
Floating Derrick/Plant	2	6	750	85%	50%	5.82	2.38	0.72	0.46	0.49	0.47	0.25	0.10	0.03	0.02	0.02	0.02
Tug Boat	6	6	1000	100%		4.51	1.52	0.00	0.25	0.21	0.20	0.00	0.00	0.00	0.00	0.00	0.00
Phase 2 (5 Pontoons) (02/02/2012-10/12/2012)																	
Mobile Track-mounted Cranes	4	214	150	85%	50%	3.63	0.90	0.72	0.29	0.35	0.33	2.18	0.54	0.43	0.17	0.21	0.20
Concrete Pumps	3	214	350	75%	90%	5.32	1.73	0.73	0.48	0.44	0.43	8.89	2.89	1.22	0.80	0.73	0.71
Forklifts	4	214	50	75%	50%	4.69	1.96	0.83	0.32	0.40	0.39	0.83	0.35	0.15	0.06	0.07	0.07
Concrete Mixer Trucks	9	214	350	50%	90%	5.42	1.66	0.72	0.38	0.37	0.36	18.13	5.54	2.41	1.28	1.23	1.20
Phase 2 Pontoon Float Out (10/13/2012-10/19/2012)																	
Mobile Track-mounted Cranes	4	6	150	85%	50%	3.63	0.90	0.72	0.29	0.35	0.33	0.06	0.02	0.01	0.00	0.01	0.01
Forklifts	4	6	50	75%	50%	4.69	1.96	0.83	0.32	0.40	0.39	0.02	0.01	0.00	0.00	0.00	0.00
Floating Derrick/Plant	2	6	750	85%	50%	5.82	2.38	0.72	0.46	0.49	0.47	0.25	0.10	0.03	0.02	0.02	0.02
Tug Boat	5	6	1000	100%		4.51	1.52	0.00	0.25	0.21	0.20	0.00	0.00	0.00	0.00	0.00	0.00
Phase 3 (6 Pontoons) (9/11/2012-12/31/2012)																	
Mobile Track-mounted Cranes	4	74	150	85%	50%	3.63	0.90	0.72	0.29	0.35	0.33	0.75	0.19	0.15	0.06	0.07	0.07
Concrete Pumps	3	74	350	75%	90%	5.32	1.73	0.73	0.48	0.44	0.43	3.08	1.00	0.42	0.28	0.25	0.25
Forklifts	4	74	50	75%	50%	4.69	1.96	0.83	0.32	0.40	0.39	0.29	0.12	0.05	0.02	0.02	0.02
Concrete Mixer Trucks	11	74	350	50%	90%	5.42	1.66	0.72	0.38	0.37	0.36	7.66	2.34	1.02	0.54	0.52	0.51
Phase 4 (5 Pontoons) (10/20/2012-12/31/2012)																	
Mobile Track-mounted Cranes	4	60	150	85%	50%	3.63	0.90	0.72	0.29	0.35	0.33	0.61	0.15	0.12	0.05	0.06	0.06
Concrete Pumps	3	60	350	75%	90%	5.32	1.73	0.73	0.48	0.44	0.43	2.49	0.81	0.34	0.22	0.21	0.20
Forklifts	4	60	50	75%	50%	4.69	1.96	0.83	0.32	0.40	0.39	0.23	0.10	0.04	0.02	0.02	0.02
Concrete Mixer Trucks	9	60	350	50%	90%	5.42	1.66	0.72	0.38	0.37	0.36	5.08	1.55	0.68	0.36	0.35	0.34
TOTALS:												82.41	25.60	11.52	6.28	6.13	5.95

* Tugboat Emissions factors using Tug Transit EF from operations emissions estimates (EPA420-R-00-002)

Equipment List	No.	Equipment Use Duration (days)	Horsepower	Utilization	Load Factor	NOx EF (g/hp-hr)	CO EF (g/hp-hr)	SO2 EF (g/hp-hr)	VOC EF (g/hp-hr)	PM10 EF (g/hp-hr)	PM2.5 EF (g/hp-hr)	NOx (tons)	CO (tons)	SO2 (tons)	VOC (tons)	PM10 (tons)	PM2.5 (tons)
Phase 3 (6 Pontoons) (01/01/2013-3/18/2013)																	
Mobile Track-mounted Cranes	4	74	150	85%	50%	3.28	0.81	0.70	0.26	0.39	0.38	0.68	0.17	0.15	0.05	0.08	0.08
Concrete Pumps	3	74	350	75%	90%	5.06	1.60	0.72	0.45	0.45	0.44	2.92	0.92	0.42	0.26	0.26	0.25
Forklifts	4	74	50	75%	50%	4.45	1.65	0.80	0.29	0.47	0.45	0.27	0.10	0.05	0.02	0.03	0.03
Concrete Mixer Trucks	11	74	350	50%	90%	5.12	1.53	0.71	0.36	0.38	0.37	7.24	2.16	1.00	0.51	0.54	0.53
Phase 3 Pontoon Float Out (3/19/2013-3/25/2013)																	
Mobile Track-mounted Cranes	4	6	150	85%	50%	3.28	0.81	0.70	0.26	0.39	0.38	0.06	0.01	0.01	0.00	0.01	0.01
Forklifts	4	6	50	75%	50%	4.45	1.65	0.80	0.29	0.47	0.45	0.02	0.01	0.00	0.00	0.00	0.00
Floating Derrick/Plant	2	6	750	85%	50%	5.54	2.17	0.71	0.44	0.51	0.49	0.23	0.09	0.03	0.02	0.02	0.02
Tug Boat	6	6	1000	100%		4.51	1.52	0.00	0.25	0.21	0.20	0.00	0.00	0.00	0.00	0.00	0.00
Phase 4 (5 Pontoons) (01/01/2013-04/26/2013)																	
Mobile Track-mounted Cranes	4	88	150	85%	50%	3.28	0.81	0.70	0.26	0.39	0.38	0.81	0.20	0.17	0.07	0.10	0.09
Concrete Pumps	3	88	350	75%	90%	5.06	1.60	0.72	0.45	0.45	0.44	3.48	1.10	0.49	0.31	0.31	0.30
Forklifts	4	88	50	75%	50%	4.45	1.65	0.80	0.29	0.47	0.45	0.32	0.12	0.06	0.02	0.03	0.03
Concrete Mixer Trucks	9	88	350	50%	90%	5.12	1.53	0.71	0.36	0.38	0.37	7.05	2.10	0.98	0.49	0.53	0.51
Phase 4 Pontoon Float Out (04/27/2013-05/03/2013)																	
Mobile Track-mounted Cranes	4	6	150	85%	50%	3.28	0.81	0.70	0.26	0.39	0.38	0.06	0.01	0.01	0.00	0.01	0.01
Forklifts	4	6	50	75%	50%	4.45	1.65	0.80	0.29	0.47	0.45	0.02	0.01	0.00	0.00	0.00	0.00
Floating Derrick/Plant	2	6	750	85%	50%	5.54	2.17	0.71	0.44	0.51	0.49	0.23	0.09	0.03	0.02	0.02	0.02
Tug Boat	5	6	1000	100%		4.51	1.52	0.00	0.25	0.21	0.20	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS:												23.39	7.10	3.41	1.77	1.94	1.89

* Tugboat Emissions factors using Tug Transit EF from operations emissions estimates (EPA420-R-00-002)

