

# **INTERSTATE 5 COLUMBIA RIVER CROSSING**

Energy Technical Report



**May 2008**



**TO:** Readers of the CRC Technical Reports  
**FROM:** CRC Project Team  
**SUBJECT:** Differences between CRC DEIS and Technical Reports

The I-5 Columbia River Crossing (CRC) Draft Environmental Impact Statement (DEIS) presents information summarized from numerous technical documents. Most of these documents are discipline-specific technical reports (e.g., archeology, noise and vibration, navigation, etc.). These reports include a detailed explanation of the data gathering and analytical methods used by each discipline team. The methodologies were reviewed by federal, state and local agencies before analysis began. The technical reports are longer and more detailed than the DEIS and should be referred to for information beyond that which is presented in the DEIS. For example, findings summarized in the DEIS are supported by analysis in the technical reports and their appendices.

The DEIS organizes the range of alternatives differently than the technical reports. Although the information contained in the DEIS was derived from the analyses documented in the technical reports, this information is organized differently in the DEIS than in the reports. The following explains these differences. The following details the significant differences between how alternatives are described, terminology, and how impacts are organized in the DEIS and in most technical reports so that readers of the DEIS can understand where to look for information in the technical reports. Some technical reports do not exhibit all these differences from the DEIS.

### Difference #1: Description of Alternatives

The first difference readers of the technical reports are likely to discover is that the full alternatives are packaged differently than in the DEIS. The primary difference is that the DEIS includes all four transit terminus options (Kiggins Bowl, Lincoln, Clark College Minimum Operable Segment (MOS), and Mill Plain MOS) with each build alternative. In contrast, the alternatives in the technical reports assume a single transit terminus:

- Alternatives 2 and 3 both include the Kiggins Bowl terminus
- Alternatives 4 and 5 both include the Lincoln terminus

In the technical reports, the Clark College MOS and Mill Plain MOS are evaluated and discussed from the standpoint of how they would differ from the full-length Kiggins Bowl and Lincoln terminus options.

### Difference #2: Terminology

Several elements of the project alternatives are described using different terms in the DEIS than in the technical reports. The following table shows the major differences in terminology.

<b>DEIS terms</b>	<b>Technical report terms</b>
Kiggins Bowl terminus	I-5 alignment
Lincoln terminus	Vancouver alignment
Efficient transit operations	Standard transit operations
Increased transit operations	Enhanced transit operations

### **Difference #3: Analysis of Alternatives**

The most significant difference between most of the technical reports and the DEIS is how each structures its discussion of impacts of the alternatives. Both the reports and the DEIS introduce long-term effects of the full alternatives first. However, the technical reports then discuss “segment-level options,” “other project elements,” and “system-level choices.” The technical reports used segment-level analyses to focus on specific and consistent geographic regions. This enabled a robust analysis of the choices on Hayden Island, in downtown Vancouver, etc. The system-level analysis allowed for a comparative evaluation of major project components (replacement versus supplemental bridge, light rail versus bus rapid transit, etc). The key findings of these analyses are summarized in the DEIS; they are simply organized in only two general areas: impacts by each full alternative, and impacts of the individual “components” that comprise the alternatives (e.g. transit mode).

### **Difference #4: Updates**

The draft technical reports were largely completed in late 2007. Some data in these reports have been updated since then and are reflected in the DEIS. However, not all changes have been incorporated into the technical reports. The DEIS reflects more recent public and agency input than is included in the technical reports. Some of the options and potential mitigation measures developed after the technical reports were drafted are included in the DEIS, but not in the technical reports. For example, Chapter 5 of the DEIS (Section 4(f) evaluation) includes a range of potential “minimization measures” that are being considered to reduce impacts to historic and public park and recreation resources. These are generally not included in the technical reports. Also, impacts related to the stacked transit/highway bridge (STHB) design for the replacement river crossing are not discussed in the individual technical reports, but are consolidated into a single technical memorandum.



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# Cover Sheet

## Interstate 5 Columbia River Crossing

*Energy Technical Report:*

**Submitted By:**

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# 1 ACRONYMS

Acronym	Description
ADA	Americans with Disabilities Act
ADT	Average Daily Traffic
BMP	Best Management Practice
BNSF	Burlington Northern Santa Fe Railroad
BPA	Bonneville Power Administration
BRT	Bus Rapid Transit
Btu	British Thermal Unit
CAA	Clean Air Act
CAFÉ	Corporate Average Fuel Economy
CEQ	Council on Environmental Quality
CH <sub>4</sub>	Methane
CMAQ	Congestion Mitigation and Air Quality Improvement Program
CO <sub>2</sub>	Carbon dioxide
CO <sub>2</sub> e	Carbon dioxide equivalent
CPU	Clark Public Utilities
CRC	Columbia River Crossing
CTED	Washington State Department of Community, Trade, and Economic Development
C-TRAN	Vancouver area transit service provider
EPA	U.S. Environmental Protection Agency
FHWA	Federal Highway Administration
GHG	Greenhouse Gas
GIS	Geographic Information System
GMA	Growth Management Act
GPS	Global Positioning System
HFC	hydrofluorocarbon
ISTEA	Intermodal Surface Transportation Efficiency Act
kWh	kilowatt hour
LCDC	Land Conservation and Development Commission
LRT	Light Rail Transit
mBtu	million British Thermal Unit
Metro	Portland area metropolitan planning organization
MOS	Minimum Operable Segment
N <sub>2</sub> O	Nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NPCC	Northwest Power and Conservation Council
OAR	Oregon Administrative Rule
ODOE	Oregon Department of Energy
ODOT	Oregon Department of Transportation
OPEC	Organization of Petroleum Exporting Countries
ORT	Open Road Tolling
PFC	perfluorocarbon

<b>Acronym</b>	<b>Description</b>
PGE	Portland General Electric
RCW	Revised Code of Washington
RTC	Regional Transportation Commission – Vancouver area metropolitan planning organization
TDM	Travel Demand Management
TriMet	Portland area transit service provider
TSM	Transportation System Management
USC	U.S. Code
USDOE	U.S. Department of Energy
VMT	Vehicle Miles Traveled
WAC	Washington Administrative Code
WCI	Western Climate Initiative
WSDOT	Washington State Department of Transportation

# 1. Summary

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## 1.1 Introduction

Transportation across the I-5 bridge crossing between Vancouver, Washington and Portland, Oregon consumes energy and emits carbon dioxide (CO<sub>2</sub>) and other greenhouse gases (GHGs). This report estimates the amount of energy that would be required and the amount of GHGs that would be emitted during construction of the project alternatives (referred to as “temporary effects”), as well as the energy consumption and associated GHG emissions resulting from personal and public vehicles operating within the study area (referred to as “long-term effects”).

## 1.2 Description of the Alternatives

The alternatives being considered for the Columbia River Crossing (CRC) project consist of a diverse range of highway, transit and other transportation choices. Some of these choices – such as the number of traffic lanes across the river – could affect transportation performance and have effects throughout the bridge influence area or beyond. These are referred to as “system-level choices.” Other choices – such as whether to run high-capacity transit (HCT) on Washington Street or Washington and Broadway Streets – have little effect beyond the area immediately surrounding that proposed change and no measurable effect on regional performance. These are called “segment-level choices.” This report discusses the effects from both system- and segment-level choices, as well as “full alternatives.” The full alternatives combine system-level and segment-level choices for highway, transit, pedestrian, and bicycle transportation. They are representative examples of how project elements may be combined. Other combinations of specific elements are possible. Analyzing the full alternatives allows us to understand the combined performance and effects that would result from multimodal improvements spanning the bridge influence area.

Following are brief descriptions of the alternatives being evaluated in this report, which include:

- System-level choices,
- Segment-level choices, and
- Full alternatives.

### 1.2.1 System-Level Choices

System-level choices have potentially broad influence on the magnitude and type of benefits and effects produced by this project. These options may influence physical or operational characteristics throughout the project area and can affect transportation and other elements outside the project corridor as well. The system-level choices include:

- River crossing type (replacement or supplemental)
- High-capacity transit mode (bus rapid transit or light rail transit)
- Tolling (no toll, I-5 only, I-5 and I-205, standard toll, higher toll)

This report compares replacement and supplemental river crossing options. A replacement river crossing would remove the existing highway bridge structures across the Columbia River and replace them with three new parallel structures – one for I-5 northbound traffic, another for I-5 southbound traffic, and a third for HCT, bicycles, and pedestrians. A supplemental river crossing would build a new bridge span downstream (west) of the existing I-5 bridge. The new supplemental bridge would carry southbound I-5 traffic and HCT, while the existing I-5 bridge would carry northbound I-5 traffic, bicycles, and pedestrians. The replacement crossing would include three through-lanes and two auxiliary lanes for I-5 traffic in each direction. The supplemental crossing would include three through-lanes and one auxiliary lane in each direction.

Two types of HCT are being considered – bus rapid transit (BRT) and light rail transit (LRT). Both would operate in an exclusive right-of-way through the project area, and are being evaluated for the same alignments and station locations. The HCT mode – LRT or BRT – is evaluated as a system-level choice. Alignment options and station locations are discussed as segment-level choices. BRT would use 60-foot or 80-foot long articulated buses in lanes separated from other traffic. LRT would use one- and two-car trains in an extension of the MAX line that currently ends at the Expo Center in Portland.

Under the efficient operating scenario, LRT trains would run at approximately 7.5 minute headways (the time interval between transit vehicles moving in the same direction on a particular route, either arriving or departing) during the peak periods. BRT would run at headways between 2.5 and 10 minutes depending on the location in the corridor. BRT would need to run at more frequent headways to match the passenger-carrying capacity of the LRT trains. This report also evaluates performance and effects for an increased operations scenario that would double the number of BRT vehicles or the number of LRT trains during the peak periods.

## **1.2.2 Segment-Level Choices**

### **1.2.2.1 Transit Alignments**

The transit alignment choices are organized into three corridor segments. Within each segment the alignment choices can be selected relatively independently of the choices in the other segments. These alignment variations generally do not affect overall system performance but could have important differences in the effects and benefits that occur in each segment. The three segments are:

- Segment A1 – Delta Park to South Vancouver
- Segment A2 – South Vancouver to Mill Plain District
- Segment B – Mill Plain District to North Vancouver

In Segment A1 there are two general transit alignment options - offset from, or adjacent to, I-5. An offset HCT guideway would place HCT approximately 450 to 650 feet west of I-5 on Hayden Island. An adjacent HCT guideway across Hayden Island would locate HCT immediately west of I-5. The alignment of I-5, and thus the alignment of an adjacent HCT guideway, on Hayden Island would vary slightly depending upon the river



crossing and highway alignment, whereas an offset HCT guideway would retain the same station location regardless of the I-5 bridge alignment.

HCT would touch down in downtown Vancouver at Sixth Street and Washington Street with a replacement river crossing. A supplemental crossing would push the touch down location north to Seventh Street. Once in downtown Vancouver, there are two alignment options for HCT – a two-way guideway on Washington Street or a couplet design that would place southbound HCT on Washington Street and northbound HCT on Broadway. Both options would have stations at Seventh Street, 12th Street, and at the Mill Plain Transit Center between 15th and 16th Streets.

From downtown Vancouver, HCT could either continue north on local streets or turn east and then north adjacent to I-5. Continuing north on local streets, HCT could either use a two-way guideway on Broadway or a couplet on Main Street and Broadway. At 29th Street, both of these options would merge to a two-way guideway on Main Street and end at the Lincoln Park and Ride located at the current WSDOT maintenance facility. Once out of downtown Vancouver, transit has two options if connecting to an I-5 alignment: head east on 16th Street and then through a new tunnel under I-5, or head east on McLoughlin Street and then through the existing underpass beneath I-5. With either option HCT would connect with the Clark College Park and Ride on the east side of I-5, then head north along I-5 to about SR 500 where it would cross back over I-5 to end at the Kiggins Bowl Park and Ride.

There is also an option, referred to as the minimum operable segments (MOS), which would end the HCT line at either the Mill Plain station or Clark College. The MOS options provide a lower cost, lower performance alternative in the event that the full length HCT lines could not be funded in a single phase of construction and financing.

### **1.2.2.2 Highway and Bridge Alignments**

This analysis divides the highway and bridge options into two corridor segments, including:

- Segment A – Delta Park to Mill Plain District
- Segment B – Mill Plain District to North Vancouver

Segment A has several independent highway and bridge alignment options. Differences in highway alignment in Segment B are caused by transit alignment, and are not treated as independent options.

The replacement bridge crossing for Segment A would be located downstream (west) of the existing I-5 bridge. At the SR 14 interchange there are two basic configurations being considered. A traditional configuration would use ramps looping around both sides of the mainline to provide direct connection between I-5 and SR 14. A less traditional design could reduce right-of-way requirements by using a “left loop” that would stack both ramps on the west side of the I-5 mainline.

### 1.2.3 Full Alternatives

Full alternatives represent combinations of system-level and segment-level options. These alternatives have been assembled to represent the range of possibilities and total effects at the project and regional levels. Packaging different configurations of highway, transit, river crossing, tolling and other improvements into full alternatives allows project staff to evaluate comprehensive traffic and transit performance, environmental effects and costs.

Exhibit 1-1 summarizes how the options discussed above have been packaged into representative full alternatives.

#### Exhibit 1-1. Full Alternatives

Full Alternative	Packaged Options				
	River Crossing Type	HCT Mode	Northern Transit Alignment	TDM/TSM Type	Tolling Method <sup>a</sup>
1	Existing	None	N/A	Existing	None
2	Replacement	BRT	I-5	Aggressive	Standard Rate
3	Replacement	LRT	I-5	Aggressive	Two options <sup>b</sup>
4	Supplemental	BRT	Vancouver	Very Aggressive	Higher rate
5	Supplemental	LRT	Vancouver	Very Aggressive	Higher rate

<sup>a</sup> In addition to different tolling rates, this report evaluates options that would toll only the I-5 river crossing and options that would toll both the I-5 and the I-205 crossings.

<sup>b</sup> Alternative 3 is evaluated with two different tolling scenarios, tolling and non-tolling.

Modeling software used to assess alternatives' performance does not distinguish between smaller details, such as most segment-level transit alignments. However, the geographic difference between the Vancouver and I-5 transit alignments is substantial enough to warrant including this variable in the model. All alternatives include Transportation Demand Management (TDM) and Transportation System Management (TSM) measures designed to improve efficient use of the transportation network and encourage alternative transportation options to commuters such as carpools, flexible work hours, and telecommuting. Alternatives 4 and 5 assume higher funding levels for some of these measures.

**Alternative 1:** The National Environmental Policy Act (NEPA) requires the evaluation of a No-Build or "No Action" alternative for comparison with the build alternatives. The No-Build analysis includes the same 2030 population and employment projections and the same reasonably foreseeable projects assumed in the build alternatives. It does not include any of the I-5 CRC related improvements. It provides a baseline for comparing the build alternatives, and for understanding what will happen without construction of the I-5 CRC project.

**Alternative 2:** This alternative would replace the existing I-5 bridge with three new bridge structures downstream of the existing bridge. These new bridge structures would carry interstate traffic, BRT, bicycles, and pedestrians. There would be three through-

lanes and two auxiliary lanes for I-5 traffic in each direction. Transit would include a BRT system that would operate in an exclusive guideway from Kiggins Bowl in Vancouver to the Expo Center station in Portland. Express bus service and local and feeder bus service would increase to serve the added transit capacity. BRT buses would turn around at the existing Expo Station in Portland, where riders could transfer to the MAX Yellow Line.

**Alternative 3:** This is similar to Alternative 2 except that LRT would be used instead of BRT. This alternative is analyzed both with a toll collected from vehicles crossing the Columbia River on the new I-5 bridge, and with no toll. LRT would use the same transit alignment and station locations. Transit operations, such as headways, would differ, and LRT would connect with the existing MAX Yellow Line without requiring riders to transfer.

**Alternative 4:** This alternative would retain the existing I-5 bridge structures for northbound Interstate traffic, bicycles, and pedestrians. A new crossing would carry southbound Interstate traffic and BRT. The existing I-5 bridges would be re-striped to provide two lanes on each structure and allow for an outside safety shoulder for disabled vehicles. A new, wider bicycle and pedestrian facility would be cantilevered from the eastern side of the existing northbound (eastern) bridge. A new downstream supplemental bridge would carry four southbound I-5 lanes (three through-lanes and one auxiliary lane) and BRT. BRT buses would turn around at the existing Expo Station in Portland, where riders could transfer to the MAX Yellow Line. Compared to Alternative 2, increased transit service would provide more frequent service. Express bus service and local and feeder bus service would increase to serve the added transit capacity.

**Alternative 5:** This is similar to Alternative 4 except that LRT would be used instead of BRT. LRT would have the same alignment options, and similar station locations and requirements. LRT service would be more frequent (approximately 3.5 minute headways during the peak period) compared to 7.5 minutes with Alternative 3. LRT would connect with the existing MAX Yellow Line without requiring riders to transfer.

### 1.3 Long-Term Effects

The long-term effects, also referred to as the operational effects, of the project alternatives on energy and GHG emissions are the result of interstate personal and public vehicular travel across the I-5 and I-205 bridge crossings between Washington and Oregon.

The analysis methodology for estimating long-term energy use was based on methodologies outlined in the Oregon Energy Manual. GHG emissions were estimated using data provided by the Environmental Protection Agency (EPA). According to the EPA, CO<sub>2</sub> is responsible for approximately 95 percent of the GHGs emitted by vehicles, the remaining five percent is composed of methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride. To provide a better estimate of the total global warming potential (i.e., GHG emissions by vehicles), these remaining gases are converted into CO<sub>2</sub> equivalents (CO<sub>2</sub>e); see Section 2.5.2.4 for

additional detail. For the remainder of this report, GHG emissions and CO<sub>2</sub>e are considered synonymous unless specifically stated otherwise.

The long-term energy and CO<sub>2</sub>e emissions analyses are presented from two perspectives: long-term effects associated with full alternatives and the long-term effects with respect to system-level choices.

### 1.3.1 Full Alternatives

Energy usage and CO<sub>2</sub>e emissions estimates were prepared for the 2030 design year full alternatives, which represent combinations of system-level and segment-level choices. Exhibit 1-2 provides the operational energy consumed in millions of Btu (mBtu) by the full alternatives in 2030, breaks down the total energy consumption into the amount of kilowatt hours and gallons of gasoline and bio/diesel that would be used (i.e. the sum of the kilowatt hours and gallons of fuel used converted into mBtu is equal to the total energy consumed), and the resulting tons CO<sub>2</sub>e emissions.

**Exhibit 1-2. Full Alternatives Summary of Daily Energy Use and CO<sub>2</sub>e Emissions**

Alternative	Energy Consumed (mBtu)	Electricity Consumed (kWh)	Gasoline Consumed (gal)	Bio/Diesel Consumed (gal)	CO <sub>2</sub> e Emissions (tons)
Existing	4,014.4	77,355.3	8,343.0	19,585.2	342.5
Alternative 1	5,384.2	152,628.0	10,661.0	25,536.6	463.3
Alternative 2	5,248.1	152,628.0	9,598.0	25,520.9	452.3
Alternative 3	5,242.3	162,063.3	9,598.0	25,231.8	452.4
Alternative 4	5,729.2	160,645.6	9,622.0	28,790.3	493.7
Alternative 5	5,687.1	172,053.3	9,622.0	28,172.0	490.7

As shown in Exhibit 1-2, Alternative 3 would have the lowest daily consumption of energy and the lowest daily CO<sub>2</sub>e emissions. Alternatives 2 and 3 (with a replacement river crossing) reduce energy consumption and CO<sub>2</sub>e emissions compared to the No-Build Alternative as a result of the reduced travel demand, diversion of personal vehicle trips to public transit with the provision of high-capacity transit, and higher operating speeds across the I-5 and I-205 bridge crossings, which results in improved fuel efficiency.

Alternatives 4 and 5 (with a supplemental bridge river crossing) would also reduce energy consumption and CO<sub>2</sub>e emissions associated with personal automobiles. However, Alternatives 3 and 4 include increased transit VMT to serve the purpose and need of the project, therefore increasing the total energy use and CO<sub>2</sub>e emissions to levels higher than the No-Build Alternative.

Oregon House Bill 3543 and Washington Senate Bill 6001 include state-wide goals to reduce statewide GHG emissions (see Section 2.3.2.6). Although the efforts to carry out the directive in these bills are in preliminary stages, with successful implementation of the reduction goals, future statewide emission levels may still decrease relative to

existing conditions, independent of the build alternatives. All build alternatives would have a relatively small effect on statewide emission levels.

### 1.3.2 System-Level Choices

The full alternatives were disseminated and compared to other similar alternatives so that the effects of one system-level choice (e.g. river crossing type) could be isolated and identified. Because these comparisons of alternatives were broken down to be the same with only one variable (i.e. all system-level choices were the same except for the one choice of interest), the energy use and CO<sub>2</sub>e emissions for some of the comparisons were partial. Therefore, the effects of the system-level choice could only be identified by the relative difference between the alternatives being compared. The long-term effects of system-level choices are summarized in Exhibit 1-3, which show the relative differences in operational energy consumption, the break down into kilowatt hours and gallons of gasoline and bio/diesel, and the resulting differences in CO<sub>2</sub>e emissions.

**Exhibit 1-3. Differences between System-Level Choices of Daily Energy Use and CO<sub>2</sub>e Emissions**

System-Level Choice	Energy Consumed		Electricity Consumed		Gasoline Consumed		Bio/Diesel Consumed		CO <sub>2</sub> e Emissions	
	(mBtu)	(% difference)	(kWh)	(% difference)	(gal)	(% difference)	(gal)	(% difference)	(tons)	(% difference)
Build-Replacement	-506.6	-8.8%	-8,018	-5.0%	-147	-1.5%	-3,343	-11.6%	-43.5	-8.8%
Build-Supplemental	--	--	--	--	--	--	--	--	--	--
BRT	--	--	-9,435	-5.8%	--	--	--	--	-0.1	0.0%
LRT	-5.8	-0.1%	--	--	0	0.0%	-289	-1.1%	--	--
Vancouver Alignment	-27.5	-0.7%	-649	-0.4%	0	0.0%	-182	-0.8%	-2.4	-0.7%
I-5 Alignment	--	--	--	--	--	--	--	--	--	--
Full-Length	--	--	--	--	--	--	--	--	--	--
Clark College MOS	-7.7	-1.4%	-2,262	-1.4%	0	0.0%	0	0.0%	-0.8	-1.4%
Mill Plain MOS	-13.2	-2.4%	-3,854	-2.4%	0	0.0%	0	0.0%	-1.4	-2.4%
No Toll	--	--	--	--	--	--	--	--	--	--
Standard Toll on I-5	-102.0	-1.9%	0	0.0%	-615	-6.0%	-186	-0.7%	-8.5	-1.8%
Standard Toll on I-5 and I-205	-186.2	-3.5%	0	0.0%	-1,256	-12.3%	-220	-0.9%	-15.4	-3.3%

Note: a "--" indicates the highest amount of energy, electricity, fuel consumed, and CO<sub>2</sub>e emitted, a "0" indicates no differences between alternatives, and a negative number indicates the difference (amount less).

Exhibit 1-3 shows how each system-level choice affects operational energy use and CO<sub>2</sub>e emissions. For example, constructing a supplemental bridge would consume the most energy and emit the most CO<sub>2</sub>e, as indicated by the "--", whereas a replacement bridge would use approximately 506.6 mBtu less. Although the effects of system-level choices are relatively minor, the following system-level choices are expected to have the lowest operational energy use and CO<sub>2</sub>e emissions:

- **River Crossing Type** – Replacement bridge
- **HCT Mode** – LRT
- **HCT Alignment** – Vancouver
- **HCT Line Length** – Mill Plain MOS

- **Toll Structure** – Standard Toll on I-5 and I-205 (note: this tolling structure is not included in any of the current build alternatives; of the proposed tolling structures, the Standard Toll on I-5 would have the lowest operational energy use and CO<sub>2</sub>e emissions)

## 1.4 Temporary Effects

The temporary effects of the project alternatives on energy and CO<sub>2</sub>e emissions are solely associated with construction, rather than the operations of the project alternatives.

The analysis methodology for estimating temporary energy use was based on the Caltrans methodology, which relates the amount of energy consumed with the costs of a particular construction activity (e.g. clearing and grading, laying pavement). Energy consumption estimates were converted to gallons of fuel, which were then used to calculate CO<sub>2</sub>e emissions based on EPA emission factors.

The energy and CO<sub>2</sub>e emissions analyses are presented from two perspectives: temporary effects associated with full alternatives and temporary effects relative to system-level choices.

### 1.4.1 Full Alternatives

The amounts of energy consumed and CO<sub>2</sub>e emitted were estimated for the construction of the full alternatives, which represent combinations of system-level and segment-level choices. Exhibit 1-4 summarizes the temporary effects analysis of the full alternatives.

**Exhibit 1-4. Full Alternatives Summary of Construction-Related Energy Use and CO<sub>2</sub>e Emissions**

Alternative	Energy Consumed (mBtu)	CO <sub>2</sub> e Emissions (tons)
<b>Alternative 2</b>		
(with 16th Street Tunnel)	7,055,867.3	590,178.3
(with McLoughlin Tunnel)	6,997,371.9	585,536.1
<b>Alternative 3</b>		
(with 16th Street Tunnel)	7,281,549.3	608,224.0
(with McLoughlin Tunnel)	7,221,671.3	603,472.0
<b>Alternative 4</b>	5,903,553.0	494,010.0
<b>Alternative 5</b>	6,084,733.6	509,171.2

Alternatives 2 and 3 include the I-5 transit alignment. The I-5 alignment would require construction of a new tunnel (16th Street Tunnel) or deepening of an existing tunnel (McLoughlin Tunnel) under I-5. Alternatives 4 and 5, however, assume the Vancouver transit alignment and would not require a tunnel under I-5.

Alternative 4 would require the least amount of energy to construct and would result in the lowest CO<sub>2</sub>e emissions, whereas Alternative 3 (with either tunnel option) would consume the most energy and have the most CO<sub>2</sub>e emissions.

## 1.4.2 System-Level Choices

Full alternatives and modifications of the full alternatives were compared to determine the effects of system-level choices on energy use and CO<sub>2</sub>e emissions during construction. The relative differences resulting from each system-level choice are summarized in Exhibit 1-5.

**Exhibit 1-5. Differences between System-Level Choices of Construction-Related Energy Use and CO<sub>2</sub>e Emissions**

System-Level Choice	Energy Consumed		Gasoline Consumed		Bio/Diesel Consumed		CO <sub>2</sub> e Emissions	
	(mBtu)	(% difference)	(gal)	(% difference)	(gal)	(% difference)	(tons)	(% difference)
Build-Replacement	--	--	--	--	--	--	--	--
Build-Supplemental	-424,198.2	-6.7%	-1,026,484.7	-6.7%	-2,141,009.5	-6.7%	-35,497.0	-6.7%
BRT	-222,814.0	-3.2%	-539,170.5	-3.2%	-1,124,584.9	-3.2%	-18,645.1	-3.2%
LRT	--	--	--	--	--	--	--	--
Vancouver Alignment	-487,306.5	-7.2%	-1,179,195.6	-7.2%	-2,459,529.2	-7.2%	-40,777.9	-7.2%
I-5 Alignment	--	--	--	--	--	--	--	--
Full-Length	--	--	--	--	--	--	--	--
Clark College MOS	-540,375.3	-7.7%	-1,307,612.6	-7.7%	-2,727,377.4	-7.7%	-45,218.7	-7.7%
Mill Plain MOS	-633,285.1	-9.0%	-1,532,438.0	-9.0%	-3,196,311.0	-9.0%	-52,993.4	-9.0%

Note: a "--" indicates the highest amount of energy consumed and CO<sub>2</sub>e emitted, a "0" indicates no differences between alternatives, and a negative number indicates the difference (amount less).

Exhibit 1-5 shows how each system-level choice affects construction-related energy use and CO<sub>2</sub>e emissions. For example, constructing a LRT system would consume the most energy and emit the most CO<sub>2</sub>e, as indicated by the "--", whereas a BRT system would use approximately 222,814 mBtu less. The effects of system-level choices would be relatively small compared to the overall energy consumption and CO<sub>2</sub>e emissions needed to construct any alternative. Although the effects of system-level choices are relatively minor, the following choices are expected to have the lowest construction-related energy use and CO<sub>2</sub>e emissions:

- **River Crossing Type** – Supplemental bridge
- **HCT Mode** – BRT
- **HCT Alignment** – Vancouver
- **HCT Line Length** – Mill Plain MOS

For all alternatives, tolls would be collected using an open road tolling (ORT) technology that allows the collection of tolls without the use of lane-dividing barriers or tolling structures. As a result, this system-level choice would not require any construction activities and therefore would not have any temporary effects on energy use or CO<sub>2</sub>e emissions.

## 1.5 Mitigation

### 1.5.1 Long-Term Effects

Alternatives 2 and 3 are expected to require less operational energy and emit less CO<sub>2</sub>e and Alternatives 4 and 5 are expected to consume more energy and emit more CO<sub>2</sub>e compared to the No-Build Alternative on a daily basis. Because there are no existing regulations that quantitatively limit energy consumption or CO<sub>2</sub>e emissions, no mitigation for long-term effects is necessary for any build alternative. While mitigation is not required by law, other measures may be considered to further reduce energy consumption and/or to reduce or offset CO<sub>2</sub>e emissions.

### 1.5.2 Temporary Effects

While there are no defined mitigation measures for temporary effects to energy use and CO<sub>2</sub>e emissions, other measures could be implemented to reduce the effects of the project. These measures would largely encompass conservation of construction materials and best management practices (BMPs). Such BMPs could include:

- Construction materials reuse and recycling.
- Turning off equipment when not in use to reduce energy consumed during idling.
- Maintaining equipment in good working order to maximize fuel efficiency.
- Routing truck traffic through areas where the number of stops and delay would be minimized, and using off-peak travel times to maximize fuel efficiency.
- Scheduling construction activities during daytime hours or during summer months when daylight hours are the longest to minimize the need for artificial light.
- Implementing emission-control technologies for construction equipment.
- Using ultra low sulfur (for air quality purposes) and biodiesel in construction equipment.



## 2. Methods

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### 2.1 Introduction

This section describes the methodologies that were used to identify potentially substantial adverse and beneficial effects on energy use of the various project alternatives and options. More specifically, this section identifies: the project's study area, guidelines for determining the effects of the project, information and data resources, and the analysis methodologies used to quantify existing and future energy supply and demand.

This section also identifies the methods used to estimate GHG emissions, which are based on petroleum-based fuel and electricity consumption estimates.

### 2.2 Study Area

The study area for the energy analysis is generally consistent with the study area defined in the Traffic Technical Report and includes the I-5 and I-205 bridge crossings between Washington and Oregon. The five-mile segment of I-5 spans eight interchanges, including: State Route 500 (SR 500), Fourth Plain Boulevard, Mill Plain Boulevard, and City Center/SR 14 in Vancouver, Washington; and Hayden Island, Marine Drive, Victory Boulevard, and Columbia Boulevard in Portland, Oregon. The nine-mile segment of I-205 extends across six interchanges, including: SR 500, Mill Plain Boulevard, and SR 14 in Vancouver, Washington; and NE Airport Way, SR 30, and the I-84 interchange in Portland, Oregon.

Within this study area, the effects of the project alternatives on energy consumption could be described differently depending on the element of the project under consideration. For example, the effect on energy of construction could be defined by the geographical limits of the construction area, and the operational effects of the project on energy could be interpreted as the areas used by transit and personal automobiles. However, because the supply and distribution of petroleum (Washington's and Oregon's primary energy source for the transportation sector) is regulated at the state level, a broader study area is more appropriate. Most of the energy supply and demand data have not been disseminated down to the city scale. Therefore, while the analysis is limited to the sections of I-5 and I-205 described above, the implications are generally larger in scope and the study area can broadly be defined at the state levels. Additional detail is provided in Section 2.5, Analysis Methods and Section 4, Affected Environment.

### 2.3 Effects Guidelines

Guidelines for assessing potential energy effects were based on applicable laws and regulations. No federal, state, or local laws quantitatively regulate energy use or GHG emissions, however some policies do relate to energy use and GHG emissions, mainly in terms of conserving energy, providing means to improve the efficiency of energy use,

and long-term GHG emission reduction goals. These policies were considered in terms of the project's consistency with those policies and are discussed in the following section.

### **2.3.1 Federal Laws, Regulations, and Policies**

#### **2.3.1.1 National Environmental Policy Act**

The National Environmental Policy Act (NEPA) (42 USC 4332) requires that federal agencies consider environmental effects before taking actions that could substantially affect the human environment. As interpreted by the Council on Environmental Quality (CEQ), NEPA requires that "environmental consequences" of the proposed project are considered in the decision-making process, including: "energy requirements and conservation potential of various alternatives and mitigation measures." Sec. 1502.15(e).

FHWA Technical Advisory T 6640.8A provides guidance on the preparation of environmental documents including the analysis of energy effects. It states that an environmental impact statement, "...should discuss in general terms the construction and operational energy requirements and conservation potential of the various alternatives under consideration."

#### **2.3.1.2 Title 42 of the United States Code (42 USC 6201, 13401, and 13431)**

The U.S. Energy Policy Conservation Act focuses on energy conservation, reduced reliance on foreign energy sources (mainly petroleum), use of alternative fuels, and increased efficiency in energy use. Policies related to energy include:

- Providing for improved energy efficiency in motor vehicles (42 USC 6201);
- Increasing economic efficiency by meeting future needs for energy services at the lowest cost, by considering technologies that improve the efficiency of energy end use, while conserving energy supplies such as oil (42 USC 13401);
- Reducing the air, water, and other environmental effects (including emissions of greenhouse gases) related to energy production, distribution, transportation, and use by developing an environmentally sustainable energy system (42 USC 13401); and
- Reducing the demand for oil in the transportation sector for all motor vehicles (42 USC 13431).

#### **2.3.1.3 Energy Policy Act of 2005**

The Energy Policy Act of 2005 amended and supersedes several previous energy policy acts including the National Energy Act of 1978 (Public Law 95-619), the Energy Policy and Conservation Act Amendments of 1985 (Public Law 99-58), and the Energy Policy Act of 1992 (Public Law 102-486). The Energy Policy Act of 2005 includes transportation related provisions to:

- Reduce reliance on foreign energy sources (mainly petroleum).
- Increase efficiency in motor vehicles.

- Increase use of recovered mineral content in federally funded projects involving procurement of cement or concrete.

#### **2.3.1.4 Clean Energy Act of 2007**

On December 19, 2007, President Bush signed into law the Clean Energy Act of 2007, which requires in part that automakers boost fleetwide fuel efficiency to 35 miles per gallon by the year 2020. The current Corporate Average Fuel Economy (CAFE) standard for cars, set in 1984, requires manufacturers to achieve an average of 27.5 miles per gallon, while a second CAFE standard requires an average of 22.2 miles per gallon for light trucks such as minivans, sport utility vehicles, and pickups. The new rules require that these standards be increased such that, by 2020, the new cars and light trucks sold each year deliver a combined fleet average of 35 miles per gallon. It's unclear how the phase-in of these new cars will effect the overall fuel efficiency of the fleet mix between now and the project's design year, 2030.

#### **2.3.1.5 Intermodal Surface Transportation Efficiency Act (ISTEA) (PL 102-240)**

The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 was established to maintain and expand the national transportation system. The purpose of the act is *“to develop a National Intermodal Transportation System that is economically efficient, environmentally sound, provides the foundation for the Nation to compete in the global economy and will move people and goods in an energy efficient manner.”*

ISTEA strengthens the metropolitan planning process by giving more emphasis to intermodal planning, coordination with land-use planning and development, and consideration of economic, energy, environmental, and social effects.

When Congress reauthorized ISTEA in 1998 as the Transportation Equity Act for the 21st Century (“TEA-21”) the 20 existing planning factors were streamlined to seven, including the requirement that such plans consider projects and strategies that will “protect and enhance the environment, promote energy conservation and improve quality of life.” 23 USC Section 135 (c)(D).

#### **2.3.1.6 FHWA Technical Advisory T 6640.8A (1987)**

FHWA Technical Advisory T 6640.8A provides guidance on the preparation of environmental documents including the analysis of energy effects. It states that an environmental impact statement, “...should discuss in general terms the construction and operational energy requirements and conservation potential of the various alternatives under consideration.”

### **2.3.2 State Laws, Regulations, and Policies**

#### **2.3.2.1 Western Climate Initiative**

In 2007, the governors of Washington, Oregon, California, Arizona and New Mexico launched the Western Climate Initiative (WCI). WCI requires partners to set an overall regional goal to reduce emissions, develop a market-based, multi-sector mechanism to

help achieve that goal, and participate in a cross-border greenhouse gas registry. As of August 2007, British Columbia, Manitoba, and Utah have also joined the WCI.

On August 22, 2007, members of WCI announced a regional, economy-wide greenhouse gas emissions target of 15 percent below 2005 levels by 2020, or approximately 33 percent below business-as-usual levels. Under the memorandum of understanding developed in February 2007, WCI members agreed to jointly set a regional emissions target, and establish, by August 2008, a market-based system – such as a cap-and-trade program covering multiple economic sectors – to aid in meeting it. The regional target is designed to be consistent with existing targets set by individual member states and does not replace these goals since the WCI target is not as strong as the Oregon state-wide goal, or the regional goals of the Portland Metro area.

### **2.3.2.2 Oregon State Energy Plan**

The Oregon Department of Energy created a State Energy Plan for 2005-2007. It includes an energy action plan with recommendations and goals to help ensure that Oregon has an adequate supply of affordable and reliable energy. Goals related to transportation energy include the following:

- Reduce single-occupancy vehicle commuting.
- Implement Oregon’s Renewable Energy Action Plan (this plan includes long- and short-term goals for electricity generation and transportation fuels).
- Implement strategy for reducing greenhouse gases (this includes emissions from transportation sources).

### **2.3.2.3 Oregon Transportation Plan**

The Oregon Transportation Plan (OTP) is “the overarching policy document among a series of plans that together form the state transportation plan” and “considers all modes of Oregon’s transportation system as a single system and addresses the future needs of Oregon’s airports, bicycle and pedestrian facilities, highways and roadways, pipelines, ports and waterway facilities, public transportation and railroad through 2030 (ODOT 2006a).” The OTP acknowledges the delicate balance between an efficient transportation system and environmental, economic, and community responsibilities. Goal 4 – Sustainability, Policy 4.2 – Energy Supply specifically identifies three strategies that support diversification of energy sources, cleaner energy supply, and practices that increase fuel efficiencies, including:

- **Strategy 4.2.1:** Support efforts to develop a long range plan for moving toward a diversified and cleaner energy supply. Work with federal, state, regional and local jurisdictions and agencies as well as transportation providers, shippers and the general public.
- **Strategy 4.2.2:** Support the conversion of passenger vehicles and public transportation fleets to more fuel-efficient and alternative fuels, especially to those using renewable and cleaner fuels. Review and change the tax credit provisions to encourage these activities as appropriate.

- **Strategy 4.2.3:** Work with federal, state, regional and local jurisdictions and agencies as well as transportation providers, shippers and the general public to develop a contingency plan for fuel shortages affecting passenger and freight transportation (ODOT 2006a).

#### **2.3.2.4 Oregon Highway Plan**

The Oregon Highway Plan defines policies and investment strategies for Oregon's state highway system for the next 20 years and further refines the goals and policies of the Oregon Transportation Plan. Several of these relate to energy use and are similar to those found in the Oregon Transportation Plan. For example, Goal 4 is "to optimize the overall efficiency and utility of the state highway system through the use of alternative modes and travel demand management strategies." Travel demand management (TDM) techniques are discussed under Policy 4.D and these TDM measures have the goals of decreasing energy consumption, congestion, and vehicle miles traveled.

#### **2.3.2.5 Oregon Statewide Planning Goals – (Oregon Administrative Rules Chapter 660 Division 15 [OAR 660-015])**

In 1991, the Land Conservation and Development Commission (LCDC) adopted the Oregon Transportation Planning Rule (TPR) (OAR 660-012-0000). The TPR is responsible for the application of the statewide planning goals to newly incorporated cities, annexation, and urban development on rural lands (OAR 660-015). The core of this program consists of 19 statewide planning goals and two of these goals are applicable to this report: Goal 12, Transportation and Goal 13, Energy Conservation.

##### **2.3.2.5.1 Goal 12 – Transportation (OAR 660-015-0000(12))**

Goal 12 relates to transportation whose purpose is to provide and encourage a safe, convenient and economic transportation system. It states that transportation plans must encourage the conservation of energy. In addition, transportation systems shall to the fullest extent possible, be planned to utilize existing facilities and rights-of-way within the state provided that such use is not inconsistent with the environmental, energy, land-use, economic or social policies of the state.

Section 35 of OAR 660-12 relates to evaluation and selection of transportation system alternatives. It states that "the transportation system shall minimize adverse economic, social, environmental and energy consequences."

##### **2.3.2.5.2 Goal 13 – Energy Conservation (OAR 660-015-0000(13))**

Goal 13 states that land and uses developed on the land shall be managed and controlled so as to maximize the conservation of all forms of energy, based on sound economic principles (OAR 660-015).

#### **2.3.2.6 The Climate Change Integration Act (Oregon House Bill 3543)**

On August 7, 2007, Governor Kulongoski signed the Climate Change Integration Act, (also known as Oregon House Bill 3543), which codifies emission reduction goals

previously proposed by the Governor. The Climate Change Integration Act has three major components.

First, the new law creates greenhouse gas emissions reduction goals. Under HB 3543, Oregon intends to stop growth of GHG emissions by 2010; reduce the emissions 10 percent below 1990 levels by 2020; and achieve a 75 percent reduction below 1990 levels by 2050. Oregon's reduction targets are substantially more aggressive than those adopted by Washington State, which aim to achieve 1990 levels by 2020, and a 50 percent reduction below 1990 levels by 2050.

Second, HB 3543 created the Oregon Global Warming Commission ("Commission"), which is tasked with the responsibility of recommending policies to State and local governments to reduce GHG emissions. The Commission is also responsible for examining the viability of a state-wide or multi-state cap-and-trade program or other market base mechanisms. The Commission is expected promulgate rules to direct agencies on how to regulate and enforce the act. At this time, the law does not require the transportation sector to take any specific actions.

Besides the Climate Change Integration Act, the 2007 Oregon Legislature enacted two other pieces of legislation relating to Climate Change:

- Renewable Energy Standard requiring Oregon's largest utilities to acquire 25 percent of their electricity from new, homegrown renewable energy sources by 2025. Smaller Oregon utilities must meet smaller renewable energy targets of 5 percent or 10 percent of their electricity by 2025. (SB 838, June 6, 2007).
- Renewable Fuel Standard requiring minimum amounts of biodiesel (2 percent) and ethanol (10 percent) to be blended into all diesel and gasoline sold in the state (respectively) once minimum thresholds for in-state production of these renewable fuels are met. (HB 2210, July 3, 2007).

### **2.3.2.7 Washington State Engrossed Substitute Senate Bill 6508**

This legislation requires gasoline sold in the state to contain at least 2 percent ethanol and diesel to contain at least 2 percent biodiesel. It requires state vehicles to use 20 percent biodiesel by the year 2009. This may slightly affect operation fuel consumption because ethanol has a lower energy content, which results in a slight decrease in fuel economy.

### **2.3.2.8 Revised Code of Washington (RCW) 43.21F.015**

Washington State Energy Office's Energy Policy Division receives its statutory guidance from the RCW 43.21F.015 and Title 194 of the Washington Administrative Code (WAC). The relevant energy policies outlined in the RCW are:

- The development and use of a diverse array of energy resources with emphasis on renewable energy resources shall be encouraged;
- The supply of energy must be sufficient to insure the health and economic welfare of its citizens; and

- Energy conservation and elimination of wasteful and uneconomic uses of energy and materials must be encouraged, and this conservation should include, but is not limited to, resource recovery and materials recycling.

#### **2.3.2.9 Washington State Transportation Plan**

The 2007 - 2026 Transportation Plan is the state's blueprint for implementing programs and developing budgets for projects that will be implemented in the future. The plan identifies four policy recommendations that relate to energy, including:

- Increase the efficiency of operating the existing systems and facilities.
- Minimize the use of resources and increase the use of recycled materials.
- Support development and implementation of a state policy on alternative fuel development and use which could include the identification of possible regulatory and tax structures.
- Identify opportunities and strategies for addressing the growing demand for alternative fuels and their benefits to the environment.

The Transportation Plan also specifically acknowledges the role of transportation in climate change and greenhouse gas emissions, and identifies bills passed by legislature that are aimed at reducing greenhouse gas emissions.

#### **2.3.2.10 Washington State Highway System Plan**

The draft 2007 - 2026 Washington State Highway System Plan addresses the state highway system and is an element of Washington's Transportation Plan. The Highway Plan includes a comprehensive assessment of existing and projected 20-year deficiencies on Washington's highway system. One of the goals of the plan is to improve the state's transportation infrastructure to increase operational efficiency. This would also have a positive effect on energy use by reducing demand for petroleum.

#### **2.3.2.11 Washington Transportation Commission Policy**

WSDOT follows two types of policy guidance: Washington Transportation Commission policy and WSDOT policy. The Transportation Commission's Policy Catalog lists several policies relating to environmental protection including the following general policy:

- Minimize and avoid where practical air, water and noise pollution, energy usage, use of hazardous materials, flood impacts, and impacts on wetlands and heritage resources from transportation activities.

Section 6.3.5 of the Policy Catalog relates to use of non-renewable energy resources and its policy is to improve the energy efficiency of the transportation system and reduce the consumption of and dependence upon non-renewable energy resources.

### **2.3.2.12 Washington State Substitute Senate Bill 6001**

On May 3, 2007, Governor Christine Gregoire signed Substitute Senate Bill 6001 (SSB 6001), which generally imposes an emissions performance standard on baseload electric generation and substantial restrictions on the procurement of fossil-fuel-fired baseload generation. More specifically, SSB 6001 adopts reduction targets outlined in Washington State Executive Order 07-02.

### **2.3.2.13 Washington State Executive Order 07-02 and Washington SB 6001**

Washington State originally set a number of GHG emission reduction targets through Executive Order 07-02, issued by Governor Gregoire on February 7, 2007. That order established the following targets for reducing Washington's GHG emissions:

- By January 1, 2020, reduce GHG emissions to 1990 levels,
- By January 1, 2035, reduce emissions to 25 percent below 1990 levels, and
- By January 1, 2050, reduce emissions to the lesser of 50 percent below 1990 levels or 70 percent below the projected annual emissions level for 2050.

On May 3, 2007, the Washington legislature passed Senate Bill 6001, which among other things, adopted the Governor's Climate Change Challenge goals (above) into statute. SB 6001 does not direct how targeted reductions can be achieved. The governor is tasked with developing policy recommendations for the legislature on how the state can achieve the goals adopted by SB 6001.

Governor Gregoire recently formed stakeholder group called the Climate Advisory Team. Through that group, the Governor is to develop policy recommendations to be submitted in the 2008 legislative session to achieve the law's stated goals. These recommendations, though not limited by SB 6001 must, at a minimum, assess 1) market mechanisms (such as a "cap and trade" system), 2) carbon sequestration in forests and geological formations; 3) closure and replacement of the highest GHG emitting power plants at the end of their useful life; 4) utilization of landfill and geothermal gases for electric generation and to reduce methane emissions; and 5) regulatory and tax policies to achieve the Act's emission reduction.

## **2.3.3 Local Laws, Regulations, and Policies**

### **2.3.3.1 Northwest Power and Conservation Council (NPCC) Fifth Northwest Electric Power and Conservation Plan**

The NPCC is a unique organization formed by the states Idaho, Montana, Oregon, and Washington that is authorized by Congress to act as an interstate compact agency. Regional planning, policies, and goals related to electrical supply are coordinated within this group. Some of the main goals and policies of this latest plan include:

- Securing cost-effective conservation measures to minimize electrical use (this policy costs less than construction of new generation sources and provides a hedge against market swings).



### **2.3.3.2 City of Portland Comprehensive Land Use Plan**

The City of Portland Comprehensive Land Use Plan includes a section on energy policy. Policy 7.6 relates to improving the energy efficiency for transportation. Among its objectives are to promote construction of a regional light rail transit system, reduce gas and diesel use by conventional buses, autos, and trucks by increasing fuel efficiency.

### **2.3.3.3 Clark County Comprehensive Plan**

One of the countywide transportation planning policies in the comprehensive plan is to establish a regional transportation system which encourages energy efficiency.

### **2.3.3.4 City of Vancouver**

The City of Vancouver has adopted the Clark County transportation policies, including the goal of encouraging energy efficiency in the regional transportation system, and expounds on these policies with additional detail specific to the City's goals and needs.

### **2.3.3.5 Local Action Plan on Global Warming**

A plan jointly developed and adopted by the City of Portland and Multnomah County in April 2001 that established a goal of reducing GHG emissions to 10 percent below 1990 levels by 2010.

## **2.3.4 Summary of Applicable Regulations**

The estimated energy consumption for operation and construction of the I-5 CRC alternatives will be used to assess how the project meets the policies listed above. There are no regulations per se that set limits on energy use or GHG emissions. Rather, the project should show that energy would be used wisely and that ways to reduce or minimize energy use are considered in project decisions.

## **2.4 Data Collection**

### **2.4.1 General Methods**

Energy supply and demand in Washington and Oregon have been generally characterized by energy supply sources and use sectors. The following sources have provided information on general energy supply and demand: United States Department of Energy/Energy Information Administration, Washington Office of Community, Trade and Economic Development, and the Oregon Department of Energy. For example, existing energy supply and demand was provided by documents such as the *Annual Energy Outlook 2007* (USDOE 2007a), *State of Oregon Energy Plan* (ODOE 2005), and the *Washington 2007 Biennial Energy Report* (CTED 2007). Historical, existing, and future energy demand data from the Energy Information Administration was also used.

In addition to the general resources describing energy supply and demand for Washington and Oregon, more specific data related to fuel consumption rates were obtained from ODOT (1988) and USDOE (2007b), traffic stream composition was obtained from

WSDOT and ODOT vehicle classification count data, and energy consumption for transit vehicles was provided by TriMet and C-TRAN staff (local public transit service providers). Project-specific data was collected from the project team, including construction cost estimates, travel demand forecasts, traffic operations data, and transit operations data.

## 2.5 Analysis Methods

The methodologies used in the energy analysis allow the identification of potential substantial adverse and beneficial effects on energy of the project alternatives in compliance with the National Environmental Policy Act (NEPA), applicable state environmental legislation, and local and state planning and land use policies. The analysis included variations in the type and amount of energy that would be consumed to build and operate the I-5 CRC alternatives. This information was used to determine if shifts in energy usage will occur and how energy used for the project will affect regional energy demand and supply. The energy analysis addresses four primary issues:

- Energy consumed during operation of the I-5 CRC.
- Energy consumed during construction of the I-5 CRC.
- Potential measures to reduce or offset operational and construction effects on energy.
- CO<sub>2</sub> equivalent emissions resulting from use of electricity, gasoline, and diesel.

Because gasoline and diesel are the primary energy sources for the transportation sector, the energy analysis focuses on the supply and demand of energy derived from petroleum-based fuel sources. Unless specifically defined otherwise, references to energy relate to energy originating from crude oil products.

The methodologies used in the energy analysis are intended to reflect the relative energy that would be required for the future without and with the project. Energy analysis methodologies cannot provide a complete or absolute estimate of energy needed for a project because future travel demand forecasts are relative in nature and not absolute. Furthermore, other factors that affect vehicle energy consumption, such as temperature, tire wear, vehicle condition, grades etc., cannot be fully quantified for all vehicles.

The estimated amount of GHG emissions attributable to the project was based on “emission factors” from EPA that identify the amount of CO<sub>2</sub> and other GHGs produced from combusting gasoline or diesel in a motor vehicle. For petroleum-based fuels, the amount of fuel consumed by the project was multiplied by the applicable emission factor to estimate CO<sub>2</sub> emissions, then multiplied by another conversion factor to account for the global warming potential of other GHGs emitted by vehicles. The amount of GHG emissions were estimated for the purpose of comparing alternatives and system-level choices.

### 2.5.1 Significance Thresholds

As described in Section 2.3, Effects Guidelines, there are no regulatory significance thresholds related to energy use or conservation. Instead, substantial effects in energy use would occur if the project alternatives increased demand to the point where the supply of energy (i.e., petroleum reserves) was insufficient to meet existing and future projected demand, or there were an increase in energy use that created concern in meeting the demand for energy.

While many jurisdictions identify the desire to minimize the amount of GHG emissions and have identified long-term goals and reduction targets, there are no regulatory standards that quantifiably limit a project's greenhouse gas emissions.

### 2.5.2 Long-Term Effects Approach

The long-term effects of the project on energy are associated with the "operations" of the facility, which is based on the amount of fuel energy used by automobiles (including personal and freight vehicles) and transit vehicles in the study area. These estimates were calculated using methods from the ODOT Energy Manual.

The long-term effects of the project related to GHG emissions are also associated with operations of the transportation facility. GHG emissions were estimated using EPA methodologies.

#### 2.5.2.1 Personal Automobile Energy Use

The ODOT methodology for estimating operational energy usage by personal automobiles was used in this analysis and accounts for several factors, including: the daily volume of vehicles, length of roadway segment, types of vehicles, average vehicle speed, fuel consumption rates, and the type of fuels used (ODOT 2006). The following equation represents the relationships between these factors, and the general formula for calculating vehicle fuel energy use:

$$E = V \times L \times FCR \times CF$$

Where E = Energy consumed (Btu)

V = Daily volume of traffic (ADT)

L = Length of roadway segment (miles)

FCR = Fuel Consumption Rate (gallons/mile) (based on vehicle type and speed)

CF = Conversion Factor (Btu/gallon) (based on fuel type – gasoline or diesel)

**Note:** Other factors also affect vehicle fuel use and therefore energy consumption such as pavement surface, ambient temperature, roadway curvature, idling time, and number of stop/go cycles at intersections. These factors are not considered in the analysis.

The segment of the I-5 bridge crossing between the SR 14 and Hayden Island interchanges, which is approximately 0.9 miles long, was selected as the study segment. The analysis of I-205 also used a study segment length of 0.9 miles to be consistent with the I-5 analysis. The energy analysis was based on the change in travel demand over

these 0.9 mile segments, as opposed to total vehicle miles traveled (VMT), for the following reasons:

- Travel demand forecasts are relative in nature and emphasis should be put on changes in travel demand as opposed to absolute nominal values,
- The most pronounced change in travel demand, which identifies differences in project alternatives, was the difference across the I-5 and I-205 bridge crossings,
- The differences in total VMT for each alternative were miniscule, therefore not adequately illustrating the effects of each project alternative, and
- Estimating energy consumption as a function of VMT does not appropriately account for the operational benefits (i.e. increased speeds) of the project alternatives, which effects the amount of energy consumed.

Using this approach, the estimates associated with personal automobile use are not intended to be representative of the total or complete amount of energy used or CO<sub>2</sub> emitted by the project. Rather, these estimates should be considered in concert with each other and the value of these estimates lie in their relative differences.

Average daily traffic volumes were obtained from the CRC Traffic Technical Report (CRC Project Team 2008a). These daily traffic volumes were developed as part of the CRC traffic analysis and were based on regional travel demand modeling completed by the local metropolitan planning organizations; Metro (Portland area) and the Regional Transportation Commission (RTC, Vancouver area). Vehicle classification count data along I-5 and I-205 was used to determine the traffic stream composition by vehicle type (automobiles, medium-duty trucks, heavy-duty trucks, and buses; see Appendix A, Traffic Composition). The proportions of these vehicle types were analyzed because of the difference in fuel consumption rates and fuel type used.

Fuel consumption rates over a range of speeds for each vehicle class were based on data obtained by using revised fuel correction factors from Caltrans, as predicted by the Motor Fuel Consumption Model (ODOT 1997) and Table 2.8 of the *EIA Annual Energy Review, 2007 Monthly Energy Review* (USDOE 2007b) (see Appendix B, Fuel Consumption Rates). The ODOT data provided historical fuel consumption rates as well as forecasts out to 2015 for automobiles and heavy trucks. A linear growth rate was derived from these data and used to extrapolate fuel consumption rates out to 2030.

All personal automobiles, light-duty trucks, and motorcycles were assumed to use gasoline, while heavy-duty trucks were assumed to use diesel. The fuel conversion factors vary depending on the fuel type; 123,976 Btu/gallon for gasoline and 138,691 Btu/gallon for diesel (Vadas et. al 2007). Additional detail is provided in Appendix C, Personal Vehicles Operational Analysis.

### **2.5.2.2 Bus Transit Energy Use**

The amount of energy consumed by transit operations was also based on the ODOT methodology for personal automobiles, but used a different variation for the volume input.

Vehicle miles traveled for each bus transit line were provided in the CRC Transit Technical Report (CRC Project Team 2008b). Use of the bus VMT was used to estimate energy consumption, as opposed to change in travel demand across the I-5 and I-205 bridges, for the following reasons:

- The TriMet and C-TRAN transit systems are finite, therefore future projections can be appropriately evaluated on the absolute nominal values in addition to the relative differences,
- Differences in bus VMT between alternatives was more pronounced compared to the differences in VMT for personal passenger vehicles, and
- Effects of operating speed on I-5 and I-205 on bus fuel efficiency was expected to be small since the majority of operating time would be either on local streets or within exclusive rights-of-way.

Dissimilar from the personal automobile energy use and CO<sub>2</sub> emission estimates, where the emphasis should be placed on the relative differences between alternatives, this approach provides complete estimates of energy use and CO<sub>2</sub> emissions associated with the project since the transit system is finite.

Existing bus fuel consumption rates were provided by TriMet (Lehto 2007a) and C-TRAN (Pickering 2007) staff. TriMet also provided historical bus fuel consumption rates, which were used to develop a linear growth rate and extrapolate future 2030 bus fuel efficiency (see Appendix B, Fuel Consumption Rates). Fuel consumption rates varied slightly per bus operator (TriMet or C-TRAN) and by route type (local, express, or BRT).

The fuel conversion factors used were 138,691 Btu/gallon for diesel and 127,259 Btu/gallon for B20 biodiesel (National Biodiesel Board 2007). All future BRT transit lines were assumed to be operated by buses using B20 biodiesel. Additional detail is provided in Appendix D, Transit Operational Analysis.

### 2.5.2.3 Light Rail Transit Energy Use

Energy consumed by operating of the existing light rail line was determined using the same equation used for automobiles, but with slightly different units. This equation is:

$$E = V \times L \times FCR \times CF$$

Where E = Energy consumed (Btu)

V = Daily volume of light rail cars

L = Length of rail segment (miles)

FCR = Fuel Consumption Rate (kWh/mile) (based average operating speed)

CF = Conversion Factor (Btu/kWh)

Future car miles (V x L) traveled were obtained from the Transit Technical Report (CRC Project Team 2008b). The fuel consumption rate for this analysis was based on TriMet records for the MAX light rail system, which averages approximately six kWh/car mile (or 12 kWh/car mile for two-car trains) (Lehto 2007b). The fuel conversion factor for electricity is 3,412 Btu/kWh (USDOE 2005). Similar to bus transit, this methodology for

light rail provides a complete estimate of energy use and CO<sub>2</sub> emissions associated with the project since the transit system is finite.

The amount of energy consumed by each transit line was combined to get the total energy use per day. Additional detail is provided in Appendix D, Transit Operational Analysis.

#### 2.5.2.4 Greenhouse Gas Emissions

Vehicles that use petroleum-based fuel sources emit greenhouse gases, including the six primary greenhouse gases identified by the United Nations Framework Convention on Climate Change: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride. These GHGs could contribute to cumulative effects on global climate change. Emissions of CH<sub>4</sub>, N<sub>2</sub>O, and HFCs from vehicle usage is difficult to quantify, but typically represent roughly five to six percent of the GHG emissions from passenger vehicles, while CO<sub>2</sub> accounts for 94 to 95 percent. As a result, the EPA uses a CO<sub>2</sub> equivalents (CO<sub>2</sub>e) conversion factor for the remaining GHGs emitted to provide a better estimate of the total global warming potential (EPA 2005a). A general equation for estimating CO<sub>2</sub> and CO<sub>2</sub> equivalents (CO<sub>2</sub>e) emissions can be expressed as:

$$EM = FC \times EF \times CDE$$

Where EM = Emissions of CO<sub>2</sub> or CO<sub>2</sub>e (lbs)

FC = Fuel consumed (gallons or kWh)

EF = Emission factor (lbs of CO<sub>2</sub>/gallon or lbs of CO<sub>2</sub>/kWh) (based on fuel type)

CDE = Carbon dioxide equivalents conversion factor (100/95)

The emissions (EM) can be expressed as pounds of CO<sub>2</sub> when strictly referring only to CO<sub>2</sub>, or pounds of CO<sub>2</sub>e if describing the total global warming potential (i.e., accounting for the other five percent of GHGs emitted by vehicles). The data used in this report, such as the emission factors, generally focus on CO<sub>2</sub>, which is later converted to CO<sub>2</sub>e.

The fuel consumed (FC) is the amount of fuel that would be used to operate the facility. The emission factor (EF) is the amount of CO<sub>2</sub> that would be emitted during combustion of a gallon of fuel or the generation of a kWh. The CO<sub>2</sub> to CO<sub>2</sub>e conversion factor (CDE; 100/95) represents the approximate proportions of CO<sub>2</sub> and the other GHGs emitted during fuel combustion.

Based on data from the EPA, the emission factors used in this analysis were 19.4 pounds of CO<sub>2</sub> per one gallon of gasoline and 22.2 pounds for one gallon of diesel (EPA 2005b). The emission factor for biodiesel can vary slightly depending on the blend, but was assumed to be equal to diesel (22.2 lbs of CO<sub>2</sub>/gallon of biodiesel) for this analysis, which is consistent with EPA conclusions that biodiesel emits the same amount of CO<sub>2</sub> compared to diesel (EPA 2002). Although the end-use (tailpipe) CO<sub>2</sub> emissions associated with biodiesel are the same as conventional diesel, there are energy and CO<sub>2</sub> emission savings associated with the harvesting and refinement of biodiesel, however those savings are beyond the scope of this project and are not accounted for in this analysis.

It appears unlikely that a gallon of gasoline, diesel, or biodiesel, which generally weighs around six pounds, could produce 19.2 to 22.2 pounds of CO<sub>2</sub> when burned. However, most of the weight of the CO<sub>2</sub> doesn't come from the fuel itself, but from the oxygen in the air that is used to combust the fuel. When fuel burns, the carbon and hydrogen separate. The hydrogen combines with oxygen to form water (H<sub>2</sub>O), and carbon combines with oxygen to form carbon dioxide (CO<sub>2</sub>). To illustrate and estimate the CO<sub>2</sub> content, the EPA offers the following general equation that can be expressed as:

$$EF = CC \times OF \times MWR$$

Where EF = Emissions factor (lbs of CO<sub>2</sub>/gal) (based on fuel type)

CC = Carbon content (lbs of carbon/gallon) (2,421 grams of carbon per gallon of gasoline and 2,778 grams of carbon per gallon of diesel; converted to lbs/gallon)

OF = Oxidation factor (proportion of oxidized carbon)

MWR = Molecular weight ratio (44/12; ratio of CO<sub>2</sub>/C)

The carbon content (CC) values are the recommended EPA quantities for the amount of carbon in a typical gallon of gasoline or diesel (EPA 2005b). The EPA recommends an oxidation factor (OF) of 0.99, which indicates that 99 percent of the carbon in the fuel is fully oxidized, while 1 percent remains un-oxidized (i.e., about 1 percent forms carbon monoxide, CO, which is not a greenhouse gas). The molecular weight ratio (MWR) is based on the molecular weight of CO<sub>2</sub> (one atom of carbon = 12 plus two atoms of oxygen = 32 [16 each]; total 44) compared to the atomic weight of carbon (carbon = 12).

LRT would use electricity supplied by electrical substations as its energy source. Based on preliminary geographical locations of the substations, 40 percent of the electricity was assumed to be provided by Portland General Electric (PGE) and 60 percent from Clark Public Utilities (CPU).

Of the 40 percent of electricity assumed to come from PGE, 42.0 percent was assumed to be generated from coal and 13.9 percent was assumed from natural gas to be consistent with PGE's breakdown of primary energy sources used to generate electricity (PGE 2007). The remaining 55.9 percent of PGE's energy comes from other sources (e.g. hydropower, nuclear, biomass) that do not emit CO<sub>2</sub> when used to generate electricity.

Of the 60 percent of electricity assumed to be provided by CPU, 28.0 percent was assumed to come from natural gas combustion and seven percent from coal firing. The remaining 65 percent of CPU's electricity is generated from renewable, non-CO<sub>2</sub> emitting sources (e.g. hydropower, nuclear, biomass). These assumptions are consistent with the breakdown of electricity sources according to CPU (CPU 2007).

The generation of electricity from natural gas and coal emits CO<sub>2</sub>. According to the USDOE, approximately 2.095 lbs of CO<sub>2</sub> are emitted to produce 1 kWh of electricity from coal, and 1.321 lbs of CO<sub>2</sub> are emitted to produce 1 kWh of electricity from natural gas (USDOE 2007c). These emission factors were used to estimate the amount of CO<sub>2</sub> emissions associated with the electricity needed to operate LRT. In order to reflect fair representation of operational energy requirements for all modes (e.g. bus, rail, personal

automobiles, trucks), it was necessary to include the amount of energy required to generate electricity even though the end-use of electricity does not emit CO<sub>2</sub>.

Under this approach, it is important to note that the CO<sub>2</sub> emission estimates associated with LRT account for both the generation of electricity and the end-use. Conversely, CO<sub>2</sub> emission estimates for personal and bus transit vehicles are limited to end-use emissions and do not account for the amount of CO<sub>2</sub> emitted during the extraction of crude oil and refinement processes.

### 2.5.3 Temporary Effects Approach

The project's temporary effects on energy supply are solely associated with the construction of the project. The approach for determining energy use during construction was based on an input-output method developed by Caltrans (Caltrans 1983). This method estimates energy requirements using energy factors that were developed for a variety of construction activities (e.g. construction of structures, electrical substations, site work etc.). These energy factors relate project costs with the amount of energy required to manufacture, process, and place construction materials and structures. The general equation for estimating energy consumed during construction can be represented as:

$$E = C \times EF \times DC$$

Where E = Energy consumed (Btu)

C = Cost of a particular construction activity (2007\$)

EF = Energy factor (Btu/1973\$)

DC = Dollar conversion (1973\$/2007\$)

The Caltrans energy factors were based on construction cost estimates in 1973 dollars, therefore the dollar conversion is necessary since the project's cost estimates are in 2007 dollars. Although the construction cost estimates and dollar conversion factor will change depending on the year of construction, the estimated amount of energy consumed will not.

Of the total energy used for construction, 70 percent was assumed to come from diesel and 30 percent from gasoline. Electricity would likely be needed for some construction purposes (e.g. lighting), but would likely be derived from gas/diesel generators. This breakdown of energy sources was used to estimate the gallons of diesel and gasoline needed to construct the project, and was then used to estimate CO<sub>2</sub>e emissions.

The estimated amount of energy consumed by the construction of the project was based on preliminary construction cost estimates. As the project proceeds further into the design process and additional detail becomes available, energy estimates for the construction of the project may need to be updated. Additional information is provided in Appendix E, Construction Analysis.



## **2.5.4 Cumulative Effects Approach**

Cumulative effects may occur when a project's effects are combined with those from past, present, and future projects. They can also result from individually small but collectively substantial actions that occur over a long period of time. The energy analysis relies on information generated from the forecasts of future traffic volumes and operations and LRT/BRT miles traveled. The transportation model takes into account other planned and future projects and the effects of those projects on the various transportation modes, thus capturing cumulative effects (see the Traffic Technical Report, CRC Project Team 2008a). Since the energy analysis uses this information, cumulative effects are included in the analysis.

The project team has addressed the cumulative effects approach in the Cumulative Effects Technical Report (CRC Project Team 2008c). However, a general and qualitative evaluation is provided in this report.

## **2.5.5 Mitigation Measures Approach**

Mitigation measures for the project's effects on energy supply and demand are difficult to identify and evaluate because of two primary reasons:

- There are no existing federal, state, or local regulations that constrain energy use.
- Regulations and guidelines lack specificity as to the definition of an adverse effect that necessitates mitigation.

However, some general measures can be implemented to reduce long-term and short-term energy effects. These same measures would reduce CO<sub>2</sub>e emissions.

### **2.5.5.1 Mitigation Measures for Long-Term Effects**

An auxiliary goal in many transportation projects is to reduce the operational energy consumed in the overall transportation system. If the energy analysis shows that the I-5 CRC alternatives reduce energy consumption as compared to the No-Build Alternative, then mitigation measures would not be required. If energy consumption would not be reduced by one of the build alternatives, then decision-makers must factor this into their evaluation of whether to choose a build alternative and weigh other benefits against the increased use of energy in the transportation system. Other measures that reduce operational energy usage (reduce travel demand, improve operational efficiency, etc.) could also need to be evaluated.

### **2.5.5.2 Mitigation Measures for Temporary Effects**

Measures taken to reduce the energy consumed by the construction of the project would largely encompass conservation of construction materials and best management practices (BMPs). See Section 9.2 for a list of potential BMPs.

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### 3. Coordination

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There have been ongoing coordination efforts between WSDOT, ODOT, and the project team related to the development of the Energy Technical Report. A preliminary baseline report, existing conditions report, and methods and data report for energy were prepared for review by WSDOT and ODOT staff. There has also been close coordination between the energy, traffic, transit, and construction project teams.

As the project progresses forward and the Draft Environment Impact Statement is published, additional coordination efforts will continue with state and local government agencies and organizations.

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## 4. Affected Environment

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### 4.1 Introduction

Because the supply and distribution of petroleum (Washington's and Oregon's primary energy source in general, and especially for the transportation sector) is regulated and distributed at the national and state levels, the affected environment is broadly inclusive of the U.S., Washington, and Oregon. This section provides a brief and general description of:

- The existing use and demand for energy resources in the nation and region.
- The present energy use for transportation.
- The available and forecasted supply of energy.

Because gasoline and diesel are the primary energy sources for the transportation sector, this discussion provides general information on several energy sources, but focuses on the supply and demand of energy derived from petroleum-based fuel sources. Unless specifically defined otherwise, energy use refers to energy originating from crude oil products since energy derived from these sources generally account for over 95 percent of the total energy demand for the transportation sector.

### 4.2 National Energy Supply and Demand

The USDOE prepares annual energy outlook reports with projections into the future (USDOE 2007a). The Annual Energy Outlook analyzes trends in energy supply and demand worldwide with linkages to projected performance of the U.S. economy and future public policy decisions. The most recent report analyzes historical energy use beginning in 1980 and provides supply and demand forecasts to 2030 (USDOE 2007a). Energy supply forecasts are largely based on international oil markets, and national energy demand projections are organized by delivered energy sources and use sectors.

#### 4.2.1 National Energy Supply

The national supply of petroleum largely depends on international factors. The majority of oil suppliers are currently at or near production capacity, with the exception of OPEC, who is the largest contributor to the international supply of petroleum. Since its inception in 1960, OPEC has historically had a substantial role in the international and U.S. petroleum supply. In general, when the world oil price is low (price often tracks supply), OPEC curtails supply, and when the price is high, OPEC increases production.

In 2030, 66 percent of the U.S. petroleum supply is expected to be imported from international oil markets including OPEC members and other countries in the Far East, Caribbean, Europe and North America (other than the U.S.). Of this 66 percent, 37 percent is expected to originate from OPEC suppliers (USDOE 2007a).

Historically, world oil prices have varied considerably and are expected to continue to exhibit high fluctuations as a result of political instability, access restrictions, and a reassessment of OPEC producers' ability to influence prices during periods of volatility. As a result, the 2030 national supply of petroleum could vary substantially depending on world oil prices. Due to global political and economic uncertainties, the USDOE Annual Energy Outlook world oil prices in 2030 were forecasted for three scenarios: "High Price," "Reference Price," and "Low Price" with the cost of oil at 100, 59, and 36 dollars per barrel, respectively (in 2005 dollars). In November 2006 the price of crude oil was about 60 dollars per barrel. One year later it had risen to between 90 and 100 dollars per barrel (2007 dollars). Depending on the world oil prices, the 2030 projections for petroleum imports ranged from 13.4 million barrels per day for the High Price scenario, 17.7 million barrels per day for the Reference Price, and 20.8 million barrels per day for the Low Price scenario. The following discussions on national and local energy supply and demand are based on the Reference Price world oil prices.

#### **4.2.2 National Energy Demand**

The national demand for energy will depend on trends in population, economic activity, energy prices (which are reliant on the factors affecting the national supply described above), and the adoption and implementation of technology. In general, the energy consumption per capita is expected to increase 0.3 percent annually through 2030 primarily as a result of strong economic growth (USDOE 2007a). However, the nation's economy is becoming less reliant on energy as a result of energy efficient technologies and faster growth in less energy-intensive industries.

USDOE's annual energy outlook organizes national energy demand forecasts in 2030 by delivered energy source (liquid fuels/petroleum, natural gas, coal, electricity and renewables) and use sectors (residential, commercial, industrial, and transportation).

According to the USDOE, the delivered energy use from all sources is expected to increase from 100.19 quadrillion Btu in 2005 to 131.16 quadrillion Btu in 2030, equating to annual demand growth rate of 1.1 percent (USDOE 2007d). Energy from liquid fuels and other petroleum products is expected to account for the greatest share of energy demand (approximately 40 percent) with a growth rate of approximately 1 percent. The energy demand from renewable sources is expected to have the highest growth rate (2.2 percent from biomass and 2.6 percent from other sources for a combined growth rate of 2.3 percent), but will continue to account for the smallest overall share of energy demand in 2030 (4.2 percent). Exhibit 4-1 summarizes the national demand for energy in 2005 by energy source with projections out to 2030.

**Exhibit 4-1. National Energy Demand for 2005 and 2030 by Energy Source**

Energy Source	2005 Energy Demand (quadrillion Btu)	2005 Source Share	2030 Energy Demand (quadrillion Btu)	2030 Source Share	Annual Increase (2005-2030)
Liquid Fuels and Other Petroleum <sup>a</sup>	40.61	40.5%	52.17	39.8%	1.0%
Natural Gas	22.63	22.6%	26.89	20.5%	0.7%
Coal	22.87	22.8%	34.14	26.0%	1.6%
Electricity (Nuclear Power)	8.13	8.1%	9.33	7.1%	0.6%
Electricity (Hydropower)	2.71	2.7%	3.09	2.4%	0.5%
Renewable (Biomass) <sup>b</sup>	2.38	2.4%	4.06	3.1%	2.2%
Renewable (Other) <sup>c</sup>	0.76	0.8%	1.44	1.1%	2.6%
Other <sup>d</sup>	0.08	0.1%	0.04	0.0%	-2.6%
<b>Total</b>	100.19	100%	131.16	100%	1.1%

Source: Energy Information Administration, U.S. Department of Energy (USDOE 2007d).

- <sup>a</sup> Includes petroleum-derived fuels and non-petroleum-derived fuels, such as ethanol and biodiesel. Petroleum coke, which is a solid, is included. Also included are natural gas plant liquids, crude oil consumed as a fuel, and liquid hydrogen.
- <sup>b</sup> Includes grid-connected electricity from wood and wood waste, non-electric energy from wood, and biofuels heat and coproducts used in the production of liquid fuels, but excludes the energy content of the liquid fuels.
- <sup>c</sup> Includes grid-connected electricity from landfill gas; municipal solid waste; wind; photovoltaic and solar thermal sources; and non-electric energy from renewable sources, such as active and passive solar systems. Excludes electricity imports using renewable sources and nonmarketed renewable energy.
- <sup>d</sup> Includes net electricity imports and natural gas losses.

In 2005, the highest demand for energy stemmed from the industrial sector, accounting for approximately 32.4 percent of the total energy demand. By 2030, the industrial sector is expected to consume less energy (29.5 percent of the total demand) as a result of efficiency gains and faster growth in less energy-intensive industries (USDOE 2007e).

With a 1.4 percent annual growth rate, the transportation sector, which accounted for the second highest consumer of energy in 2005 at 28.1 percent, is expected to have the highest demand for energy at 29.9 percent in 2030. Of the total amount of energy demand for the transportation sector, approximately 97.4 percent is expected to come from liquid fuels and other petroleum products in 2030. Despite improvements in fuel consumption rates and increasing use of alternative fuel sources (e.g. electric hybrids), the high passenger travel demand and increasing use of trucks for freight transportation (second highest consumer among the travel modes with a 1.8 percent growth rate) is expected to result in an increase in energy demand in the transportation sector (USDOE 2007e). Exhibit 4-2 provides a breakdown of energy use for each sector and source.

## Exhibit 4-2. National Energy Demand for 2005 and 2030 by Energy Sector

Energy Use Sector	2005 Energy Demand (quadrillion Btu)	2005 Sector Share by Source	2030 Energy Demand (quadrillion Btu)	2030 Sector Share by Source	Annual Increase (2005- 2030)
<b>Residential</b>					
Liquid Fuels and Other Petroleum	1.54	7.1%	1.46	5.5%	-0.2%
Natural Gas	4.98	22.9%	5.47	20.5%	0.4%
Coal	0.01	0.1%	0.01	0.0%	-1.2%
Renewable <sup>a</sup>	0.41	1.9%	0.39	1.5%	-0.2%
Electricity	4.66	21.4%	6.47	24.2%	1.3%
Electricity (Related Losses)	10.15	46.6%	12.89	48.3%	1.0%
<b>Residential Total</b>	<b>21.75</b>	<b>100.0%</b>	<b>26.70</b>	<b>100.0%</b>	<b>0.8%</b>
<b>Residential Total (relative to other use sectors)</b>		<b>21.7%</b>		<b>20.4%</b>	
<b>Commercial</b>					
Liquid Fuels and Other Petroleum	0.77	4.3%	0.81	3.1%	0.2%
Natural Gas	3.15	17.6%	4.36	16.5%	1.3%
Coal	0.10	0.6%	0.10	0.4%	-0.1%
Renewable <sup>b</sup>	0.12	0.7%	0.12	0.5%	0.0%
Electricity	4.32	24.2%	7.03	26.6%	2.0%
Electricity (Related Losses)	9.42	52.6%	14.01	52.9%	1.6%
<b>Commercial Total</b>	<b>17.88</b>	<b>100.0%</b>	<b>26.44</b>	<b>100.0%</b>	<b>1.6%</b>
<b>Commercial Total (relative to other use sectors)</b>		<b>17.8%</b>		<b>20.2%</b>	
<b>Industrial<sup>c</sup></b>					
Liquid Fuels and Other Petroleum	9.73	30.0%	10.55	27.2%	0.3%
Natural Gas	7.94	24.5%	10.05	26.0%	0.9%
Coal	2.01	6.2%	2.89	7.5%	1.5%
Renewable (Biofuels Heat and Coproducts)	0.24	0.8%	0.88	2.3%	5.2%
Renewable <sup>d</sup>	1.44	4.4%	2.05	5.3%	1.4%
Electricity	3.48	10.7%	4.09	10.6%	0.6%
Electricity (Related Losses)	7.60	23.4%	8.15	21.1%	0.3%
<b>Industrial Total</b>	<b>32.45</b>	<b>100.0%</b>	<b>38.66</b>	<b>100.0%</b>	<b>0.7%</b>
<b>Industrial Total (relative to other use sectors)</b>		<b>32.4%</b>		<b>29.5%</b>	
<b>Transportation</b>					
Liquid Fuels and Other Petroleum	27.42	97.5%	38.34	97.4%	1.3%
Natural Gas (Pipeline Fuel)	0.58	2.1%	0.79	2.0%	1.3%
Natural Gas (Compressed)	0.03	0.1%	0.12	0.3%	5.5%
Electricity	0.02	0.1%	0.04	0.1%	1.8%
Electricity (Related Losses)	0.05	0.2%	0.08	0.2%	1.5%
<b>Transportation Total</b>	<b>28.11</b>	<b>100.0%</b>	<b>39.37</b>	<b>100.0%</b>	<b>1.4%</b>
<b>Transportation Total (relative to other use sectors)</b>		<b>28.1%</b>		<b>29.9%</b>	

Source: Energy Information Administration, U.S. Department of Energy (USDOE 2007e).

<sup>a</sup> Includes wood used for residential heating, geothermal heat pumps, solar thermal hot water heating, and solar photovoltaic electricity generation.

<sup>b</sup> Includes commercial sector consumption of wood and wood waste, landfill gas, municipal solid waste, and other biomass for combined heat and power.

<sup>c</sup> Includes energy for combined heat and power plants, except those whose primary business is to sell electricity, or electricity and heat, to the public.

<sup>d</sup> Includes consumption of energy produced from hydroelectric, wood and wood waste, municipal solid waste, and other biomass sources.



## 4.3 Washington Energy Supply and Demand

Quantitative petroleum projections have not been prepared by USDOE at the state level. The Washington State Department of Community, Trade and Economic Development (CTED) prepares biennial energy reports, however these reports largely provide quantitative analyses on historical energy trends and limited qualitative assessments of future conditions. Nonetheless, Washington's energy supply and demand closely tracks national trends, from which conclusions can be drawn.

### 4.3.1 Washington Energy Supply

Approximately 90 percent of Washington's current supply of crude oil comes from the Alaska North Slope via the Trans Alaska Pipeline, where it is then barged in from Valdez. Roughly 10 percent of Washington's crude oil comes from the Western Canada Sedimentary Basin in Alberta by means of the Trans Mountain Pipeline. Five refineries in the Puget Sound area then distribute refined petroleum products to Washington and adjacent states, primarily Oregon (ODOE 2000).

Washington's future supply of petroleum is largely dependent on domestic production and reserves, which are both in decline, and subject to political, economic, and infrastructure factors.

Although Washington's primary suppliers of oil are currently located in Alaska and Canada, international political and economic factors could still substantially affect Washington's future supplies. As described above, international and national supplies of crude oil are affected by world oil prices. World oil prices, in turn, are substantially affected by OPEC production, which are subject to the political stability of and relationships with OPEC countries and global economies.

From the infrastructure standpoint, there is concern about the reliability of the Trans Alaska Pipeline due to the harsh climatic environment. A disruption in the transport of crude oil to Washington refineries could have substantial effects on petroleum supplies. In addition to potential challenges with the transport of crude oil, Washington refineries are currently near capacity and regulations prohibit capacity expansion. At both state and national levels, the state of the industry's infrastructure is more likely to cause substantial changes in petroleum supplies compared to international or national political factors.

Despite political and infrastructure concerns, Washington is expected to be able to procure adequate petroleum supplies for the foreseeable future.

### 4.3.2 Washington Energy Demand

According to Washington Department of Community, Trade and Economic Development (CTED), the total demand for all energy sources in Washington has grown by 1.6 percent between 1985 and 2000 (CTED 2007). While the total energy demand in Washington exhibits an increasing trend, the per capita consumption rate is in decline. Notable drops in energy consumption per capita rates occurred from 1973 to 1975, 1979 to 1983, and 1999 to 2002. The drops in the energy consumption per capita rates during these time frames were largely resultant of economic downturns and the shutdown of aluminum

smelters in the industrial sector. For 2004, the total per capita energy consumption was 323.1 million Btu (USDOE 2004).

Washington is the leading hydroelectric power producer in the nation. However, as of 2004, energy derived from petroleum products accounted for the largest single share (42.0 percent) of energy consumed in Washington (USDOE 2004), and is slightly higher than the 2005 national demand of 40.5 percent. Exhibit 4-3 provides a breakdown of Washington's energy use by source.

#### Exhibit 4-3. Washington's Energy Consumption by Source, 2004

State	Coal (Trillion Btu)	Natural Gas (Trillion Btu)	Petroleum (Trillion Btu)	Electricity (Trillion Btu)	Total Per Capita Energy Consumption, 2004 (Million Btu)
Washington	112.5 (37)	268.5 (24)	842.4 (15)	272.9 (16)	323.1
Share	7.5%	17.9%	56.3%	18.2%	
United States	22,465.6	22,901.6	40,592.9	12,106.7	341.5
Share	22.9%	23.4%	41.4%	12.3%	

Source: Energy Information Administration, U.S. Department of Energy (USDOE 2004a).

(XX) Indicates national ranking. A ranking of 1 equates to the highest national consumer, a ranking of 50 equates to the lowest national consumer.

Jet fuel, which is a petroleum-derived product, consumption in Washington is relatively high compared to the national average, due in part to SeaTac International Airport and several large Air Force and Navy bases.

USDOE also provides data for Washington's energy consumption by use sector. In 2005, Washington's transportation sector was responsible for most (70.8 percent) of the total energy consumed in the state, which is slightly higher than the national share of 67.9 percent. Exhibit 4-4 provides a summary of Washington's petroleum-derived energy consumption by use sector.

#### Exhibit 4-4. Washington's Petroleum Consumption by Sector, 2005 (Trillion Btu)

State	Residential	Commercial	Industrial	Transportation	Electric Power <sup>a</sup>	Total
Washington	14.7	8.3	226.9	605.4	0.1	855.3
Share	1.7%	1.0%	26.5%	70.8%	0.0%	
United States	1,454.8	722.1	9,677.7	27,643.6	1,234.5	40,732.7
Share	3.6%	1.8%	23.8%	67.9%	3.0%	

Source: Energy Information Administration, U.S. Department of Energy (USDOE 2004b).

Note: Totals may not equal sum of components due to independent rounding.

<sup>a</sup> Petroleum required during generation of electricity.

While the transportation sector's share of energy used is higher than the national average, the amount of petroleum used in Washington by the commercial (1.0 percent) and residential (1.7 percent) sectors is lower than the national usage (3.6 percent and 1.8 percent, respectively). This difference in the allocation of energy demand may result from

households becoming more energy efficient as a result of building codes and standards, and commercial sector increased productivity, improvements to the efficiency of buildings, lighting, and equipment and shifts away from energy-intensive businesses.

Within the transportation sector, approximately 98.1 percent of the energy consumed in 2004 came from petroleum products. In comparison, in 2005, 96.5 percent of energy consumed by the national transportation sector was from petroleum. Exhibit 4-5 compares the Washington and U.S. energy sources used for the transportation sector.

**Exhibit 4-5. Washington's Transportation Sector Energy Consumption by Source, 2004 (Trillion Btu)**

State	Coal	Natural Gas <sup>a</sup>	Petroleum	Ethanol	Retail Electricity Sales	Electrical System Energy Losses <sup>b</sup>	Total
Washington	0.0	9.2	593.5	1.9	0.1	0.3	605.1
Share	0.0%	1.5%	98.1%	0.3%	0.0%	0.0%	
United States	0.0	607.7	26,914.9	299.3	24.2	23.9	27,900.0
Share	0.0%	2.2%	96.5%	1.1%	0.1%	0.1%	

Source: Energy Information Administration, U.S. Department of Energy (USDOE 2004c).

Note: Totals may not equal sum of components due to independent rounding.

<sup>a</sup> Includes supplemental gaseous fuels. Transportation use of natural gas is gas consumed in the operation.

<sup>b</sup> Incurred in the generation, transmission, and distribution of electricity plus plant use and unaccounted for electrical system energy losses.

Newer vehicles are more fuel-efficient, and it is expected that this trend will continue in the future because of recent government requirements for higher fuel efficiency standards. The promotion of alternative fuel sources for transportation, such as ethanol, biodiesel, compressed natural gas, liquefied petroleum gas, and electricity has also been increasing. For example, there are now several automobile manufacturers that produce hybrid (gas-electric) cars that can achieve almost twice the gasoline mileage of an average passenger automobile and these types of hybrids are becoming more and more popular. Nonetheless, petroleum demand in Washington and the project study area is not expected to slow appreciably because population and vehicle travel continue to increase.

**4.4 Oregon Energy Supply and Demand**

As described above, the USDOE does not prepare quantitative energy forecasts at the state level. However, parallels can be drawn between Oregon's and Washington's future energy supply and demand based on existing similarities of energy usage.

**4.4.1 Oregon Energy Supply**

Oregon imports 100 percent of its petroleum. Approximately 90 percent of Oregon's petroleum comes from Washington refineries via the Olympic Pipeline to Portland and then on to Eugene. The remaining 10 percent is delivered by tanker trucks from California, Idaho, and Utah, with a small portion coming directly from Asia and Canada.

There is some concern over the potential volatility of Oregon’s petroleum supply. The existing Olympic pipeline that delivers the majority of refined products from Washington is in relatively good working order. However, further up the supply chain is the 600-mile Trans Alaska Pipeline that transports crude oil to Valdez, which is then barged into Washington. The Trans Alaska Pipeline operates in a harsh environment, which increases the potential for an accident to upset the flow of crude oil to refineries in Washington. The shipping time from Valdez to Puget Sound is less than 10 days, while shipping from alternative suppliers, such as Asia or the U.S. Gulf Coast, exceeds 30 days. If an accident were to occur and the transport of crude oil through the Trans Alaska Pipeline were interrupted, the supply of refined petroleum products to Oregon from Washington would be seriously affected. Further exacerbating the situation is that there is little storage of petroleum in Oregon and an “air bubble” in the supply chain could result in severe shortages of fuel for as long as a month (ODOE 2000). A recent example of reduced domestic supply was experienced during the 2005 hurricane season, which disrupted supplies from oilfields and refineries in the Gulf of Mexico.

Barring a disruption in the transport of crude oil through the Trans Alaska Pipeline, Washington is expected to provide adequate petroleum supplies to Oregon in the foreseeable future. Nonetheless, ODOE has a contingency plan for problems related to energy supply (ODOE 2005). In the event of shortages, the plan outlines measures to alert the population, as well as ensure that fuel is reserved for use by emergency services such as police, fire, and emergency medical aid. Distribution sites in Oregon maintain some supply stocks of petroleum. However local availability is sensitive to supply, demand, and delivery schedules, and in the past supplies have occasionally been limited.

#### 4.4.2 Oregon Energy Demand

Between 1990 and 1997, Oregon’s petroleum consumption grew by about 8 percent (ODOE 2000). In 2000, approximately 47 percent of Oregon’s energy consumption came from petroleum. Since then, the demand for petroleum has decreased, but still accounts for the largest share of energy consumption at 35.7 percent, which is substantially lower than the national average of 40.5 percent (USDOE 2004). Exhibit 4-6 summarizes Oregon’s energy demand by source.

**Exhibit 4-6. Oregon Energy Consumption by Source, 2004**

State	Coal (Trillion Btu)	Natural Gas (Trillion Btu)	Petroleum (Trillion Btu)	Electricity (Trillion Btu)	Total Per Capita Energy Consumption (Million Btu)
Oregon	36.5 (44)	243.2 (26)	390.8 (32)	155.8 (29)	304.7 (37)
Share	4.4%	29.4%	47.3%	18.9%	
United States	22,465.6	22,901.6	40,592.9	12,106.7	341.5
Share	22.9%	23.4%	41.4%	12.3%	

Source: Energy Information Administration, U.S. Department of Energy (USDOE 2004d).

(XX) Indicates national ranking. A ranking of 1 equates to the highest national consumer, a ranking of 50 equates to the lowest national consumer.

As in Washington, the demand for energy from coal and natural gas in Oregon is substantially lower compared to the national average, but is balanced out by the demand for hydro-electric generated power.

With respect to delivered energy use from petroleum, the transportation sector is responsible for the greatest energy consumption, and this sector demands a substantially higher proportion of petroleum compared to national and Washington sector shares. Exhibit 4-7 shows the breakdown of petroleum-derived energy demand by sector.

**Exhibit 4-7. Oregon Petroleum Consumption by Sector, 2005 (Trillion Btu)**

State	Residential	Commercial	Industrial	Transportation	Electric Power <sup>a</sup>	Total
Oregon	7.0	4.3	57.9	323.0	0.5	392.8
Share	1.8%	1.1%	14.7%	82.2%	0.1%	
United States	1,454.8	722.1	9,677.7	27,643.6	1,234.5	40,732.7
Share	3.6%	1.8%	23.8%	67.9%	3.0%	

Source: Energy Information Administration, U.S. Department of Energy (USDOE 2004e).

Note: Totals may not equal sum of components due to independent rounding.

<sup>a</sup> Petroleum required during generation of electricity.

The breakdown of energy sources used within Oregon’s transportation sector is relatively similar to the nation’s allocation; approximately 95.9 percent of energy used within the transportation sector is supplied by petroleum products. Exhibit 4-8 compares the breakdown of energy sources used in the national and Oregon transportation sectors.

**Exhibit 4-8. Oregon’s Transportation Sector Energy Consumption, 2004 (Trillion Btu)**

State	Coal	Natural Gas <sup>a</sup>	Petroleum	Ethanol	Retail Electricity Sales	Electrical System Energy Losses <sup>b</sup>	Total
Oregon	0.0	10.2	310.5	2.4	0.2	0.4	323.7
Share	0.0%	3.2%	95.9%	0.7%	0.1%	0.1%	
United States	0.0	607.7	26,914.9	299.3	24.2	23.9	27,900.0
Share	0.0%	2.2%	96.5%	1.1%	0.1%	0.1%	

Source: Energy Information Administration, U.S. Department of Energy (USDOE 2004f).

Note: Totals may not equal sum of components due to independent rounding.

<sup>a</sup> Includes supplemental gaseous fuels. Transportation use of natural gas is gas consumed in the operation.

<sup>b</sup> Incurred in the generation, transmission, and distribution of electricity plus plant use and unaccounted for electrical system energy losses.

**4.5 Existing 2005 Bridge Crossing Energy Demand**

Exhibit 4-9 shows the existing 2005 daily energy use for interstate transportation across the I-5 and I-205 bridges.

### Exhibit 4-9. Existing 2005 Daily Energy Consumption and CO<sub>2</sub>e Emissions

Vehicle Type/Roadway	Energy Consumed (mBtu)	Electricity Consumed (kWh)	Gasoline Consumed (gal)	Bio/Diesel <sup>a</sup> Consumed (gal)	CO <sub>2</sub> e Emissions (tons)
<b>I-5<sup>b</sup></b>					
Automobile	476.7	0	3,845	0	39.3
Medium-Duty Truck	6.9	0	56	0	0.6
Heavy-Duty Truck	144.1	0	0	1,039	12.1
Motorcycle	0.9	0	7	0	0.1
<b>I-5 Subtotal</b>	<b>628.6</b>	<b>0</b>	<b>3,908</b>	<b>1,039</b>	<b>52.0</b>
<b>I-205<sup>c</sup></b>					
Automobile	542.8	0	4,379	0	44.7
Medium-Duty Truck	5.9	0	48	0	0.5
Heavy-Duty Truck	84.1	0	0	607	7.1
Motorcycle	1.0	0	8	0	0.1
<b>I-205 Subtotal</b>	<b>633.8</b>	<b>0</b>	<b>4,435</b>	<b>607</b>	<b>52.4</b>
<b>Transit<sup>d</sup></b>					
Conventional Bus	2,488.0	0	0	17,939	209.6
BRT Bus <sup>e</sup>	0.0	0	0	0	0.0
Light Rail	263.9	77,355	0	0	28.4
<b>Transit Subtotal</b>	<b>2,751.9</b>	<b>77,355</b>	<b>0</b>	<b>17,939</b>	<b>238.0</b>
<b>Total</b>	<b>4,014.4</b>	<b>77,355</b>	<b>8,343</b>	<b>19,585</b>	<b>342.5</b>

<sup>a</sup> The chemical composition of biodiesel can vary widely depending on the blend; therefore, the CO<sub>2</sub> content was assumed to be equal to diesel (22.2 lbs of CO<sub>2</sub>/gallon of biodiesel).

<sup>b</sup> This segment of the I-5 bridge crossing extends from SR 14 to Hayden Island and is approximately 0.9 miles long.

<sup>c</sup> This segment of the I-205 bridge crossing is located midspan between SR 14 and NE Airport Way. This segment was selected to be 0.9 miles long to be consistent with the I-5 segment. Consistency between segment lengths, versus the actual length of the bridge crossing, was selected to highlight the differences in energy demand as a function of traffic volumes and speeds, as opposed to roadway length.

<sup>d</sup> This is the system-wide energy demand for transit, inclusive of all transit lines, not just sections of routes crossing I-5 and I-205.

<sup>e</sup> Buses operating along BRT routes were assumed to use B20 biodiesel while conventional diesel buses were assumed to operate along non-BRT routes.

The transit energy use and CO<sub>2</sub>e emissions reported in the above table are higher compared to personal vehicle energy use because the transit estimates were prepared for system-wide transit operations, whereas the personal vehicle energy use estimates focus on a 0.9 mile segment of I-5 and a 0.9 mile segment of I-205 across the Columbia River. Additional detail on the justifications behind this approach is provided in Sections 2.5.2.1 and 2.5.2.2.

Exhibit 4-9 indicates that automobiles account for the majority of operational energy demand compared to all other vehicle types (i.e. medium- and heavy-duty trucks and motorcycles), which is consistent with the traffic stream composition obtained from WSDOT and ODOT vehicle classification count data. According to the count data, automobiles account for 91.1 percent of the traffic stream, 0.9 percent for medium-duty trucks, 7.3 percent heavy-duty trucks, 0.3 percent motorcycles, and 0.4 percent buses. The amount of energy used by each vehicle class, however, is not directly proportional to the vehicle stream composition because of substantially different fuel consumption rates.

The existing 2005 total daily energy demand is approximately 4,014.4 mBtu, which results in CO<sub>2</sub>e emissions of approximately 342.5 tons.

## 5. Long-Term Effects

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The project's long-term effects on energy supply and demand relate to the operations of the affected transportation facilities. The facilities were analyzed with respect to transit and traffic (both personal vehicles and freight trucks) operational use. Facilities affected by transit operations included all existing and future rights-of-way expected to be used by transit. Effects of traffic operations on energy supply and demand were assumed to be captured by the change in travel demand across the I-5 and I-205 crossings. Data associated with transit and traffic operations were provided by the project team.

Long-term effects associated with CO<sub>2</sub>e emissions depend on the amount of energy consumed during the operation of the facility.

### 5.1 How is this section organized?

This chapter describes the long-term effects that would be expected from the I-5 CRC alternatives. The effects are first described for the No-Build Alternative and four full build alternatives. The discussion then transitions to address the effects of Minimum Operable Segments. Finally, the effects of the project are disseminated to identify the effects of system-level choices on energy. This three part approach provides a comprehensive description and comparison of (1) the combination of system-level and segment level choices expressed as four full alternatives (2) full alternatives versus alternatives with Minimum Operable Segments, and (3) discrete system-level choices.

Specific segment-level choices were not analyzed because this level of detail would not be likely to result in substantial differences in the energy consumed by the project.

The operational energy consumed is further broken down by vehicle type. Although different vehicle types utilize different energy sources (e.g. gasoline, diesel, biodiesel, and electricity), daily energy requirements have been normalized to millions of Btu (mBtu), and further broken down into the kilowatt hours (kWh) and gallons of gasoline and diesel that would be consumed for easier referencing. The amount of gasoline and diesel consumed was used to estimate the amount of CO<sub>2</sub>e emissions.

### 5.2 Impacts from Full Alternatives

This section describes the operational effects related to the No-Build Alternative and four full build alternatives. All alternatives assumed the same vehicle mix composition, which is described in Section 4.5, Existing 2005 Bridge Crossing Energy Demand. The differences between alternatives lie in the combinations of highway, river crossing, transit and pedestrian/bicycle alternatives and options covering all of the CRC segments. They represent the range of system-level choices that most affect overall performance, effects and costs. The full alternatives are most useful for understanding the regional effects, performance and total costs associated with the CRC project. Exhibit 1-1, in Section 1, Summary, describes the attributes of the No-Build and four full build alternatives.

**Note:** In the following section regarding effects of the full alternatives, the energy use and CO<sub>2</sub>e emissions associated with transit operations are higher compared to personal vehicles. This is because the transit estimates were prepared for system-wide transit operations, whereas the personal vehicle energy use estimates are focused on a 0.9 mile segment of I-5 and a 0.9 mile segment of I-205 across the Columbia River. Additional detail on the justifications behind this approach is provided in Sections 2.5.2.1 and 2.5.2.2.

### **5.2.1 Alternative 1: No-Build Alternative**

Under the No-Build Alternative, the I-5 bridge crossing would remain as it is today and no major capacity improvements were assumed. Increased transit service, in the form of conventional buses, was included. Additional detail on other planned projects within the greater study area that are separate from the CRC alternatives are described in the Traffic Technical Report (CRC Project Team 2008a).

Exhibit 5-1 compares the daily energy use for the existing 2005 and future 2030 No-Build conditions.

The distribution of traffic between the I-5 and I-205 bridge crossings and traffic stream composition are expected to be similar between the existing and No-Build conditions. By 2030, the total ADT volumes across both bridge crossings are expected to increase from 280,470 vehicles to roughly 394,000 (CRC Project Team 2008a). As a result of increased travel demand and congestion, which reduces fuel efficiency, the No-Build Alternative (5,384.2 mBtu/day) is expected to consume more operational energy compared to the existing conditions (4,014.4 mBtu/day), with the total energy demand being approximately 34.1 percent higher. Similarly, the total CO<sub>2</sub>e emissions are expected to increase from 342.5 tons of CO<sub>2</sub>e/day to 463.3 tons of CO<sub>2</sub>e/day.

### **5.2.2 Alternative 2: Replacement Crossing with BRT and I-5 Standard Toll**

The primary elements of this alternative are:

- Replacement bridges, 10 lanes.
- Tolling: I-5 only flat rate.
- Bus Rapid Transit (BRT) (I-5 full-length alignment).
- TSM/TDM Option 1.

Exhibit 5-2 compares daily energy use associated with the 2030 No-Build Alternative and Alternative 2. As shown, Alternative 2 is expected to consume less energy compared to the No-Build Alternative as result of three primary factors. First, Alternative 2 includes tolling the I-5 crossing, which is expected to decrease interstate travel demand compared to the No-Build Alternative. Second, Alternative 2 provides high-capacity transit that is expected to divert a portion of personal vehicular travel demand to transit. Third, Alternative 2 increases the I-5 bridge capacity, which is expected to increase average speeds and reduce the duration of congested conditions. Since the fuel efficiency of passenger vehicles typically improves as speeds increase (up to approximately free flow conditions), less fuel would be consumed.



**Exhibit 5-1. Existing 2005 and No-Build 2030 Daily Energy Consumption and CO<sub>2</sub>e Emissions**

Vehicle Type/Roadway	Existing, 2005					Alternative 1, 2030				
	Energy Consumed (mBtu)	Electricity Consumed (kWh)	Gasoline Consumed (gal)	Bio/Diesel <sup>a</sup> Consumed (gal)	CO <sub>2</sub> e Emissions (tons)	Energy Consumed (mBtu)	Electricity Consumed (kWh)	Gasoline Consumed (gal)	Bio/Diesel <sup>a</sup> Consumed (gal)	CO <sub>2</sub> e Emissions (tons)
<b>I-5<sup>b</sup></b>										
Automobile	476.7	0	3,845	0	39.3	595.3	0	4,802	0	49.0
Medium-Duty Truck	6.9	0	56	0	0.6	8.5	0	68	0	0.7
Heavy-Duty Truck	144.1	0	0	1,039	12.1	188.6	0	0	1,360	15.9
Motorcycle	0.9	0	7	0	0.1	1.2	0	10	0	0.1
<b>I-5 Subtotal</b>	<b>628.6</b>	<b>0</b>	<b>3,908</b>	<b>1,039</b>	<b>52.0</b>	<b>793.6</b>	<b>0</b>	<b>4,880</b>	<b>1,360</b>	<b>65.7</b>
<b>I-205<sup>c</sup></b>										
Automobile	542.8	0	4,379	0	44.7	707.8	0	5,709	0	58.3
Medium-Duty Truck	5.9	0	48	0	0.5	7.5	0	61	0	0.6
Heavy-Duty Truck	84.1	0	0	607	7.1	115.0	0	0	829	9.7
Motorcycle	1.0	0	8	0	0.1	1.4	0	11	0	0.1
<b>I-205 Subtotal</b>	<b>633.8</b>	<b>0</b>	<b>4,435</b>	<b>607</b>	<b>52.4</b>	<b>831.7</b>	<b>0</b>	<b>5,781</b>	<b>829</b>	<b>68.7</b>
<b>Transit<sup>d</sup></b>										
Conventional Bus	2,488.0	0	0	17,939	209.6	3,238.1	0	0	23,348	272.8
BRT Bus <sup>e</sup>	0.0	0	0	0	0.0	0.0	0	0	0	0.0
Light Rail	263.9	77,355	0	0	28.4	520.8	152,628	0	0	56.1
<b>Transit Subtotal</b>	<b>2,751.9</b>	<b>77,355</b>	<b>0</b>	<b>17,939</b>	<b>238.0</b>	<b>3,758.9</b>	<b>152,628</b>	<b>0</b>	<b>23,348</b>	<b>328.9</b>
<b>Total</b>	<b>4,014.4</b>	<b>77,355</b>	<b>8,343</b>	<b>19,585</b>	<b>342.5</b>	<b>5,384.2</b>	<b>152,628</b>	<b>10,661</b>	<b>25,537</b>	<b>463.3</b>

Note: These estimates do not include the energy required to construct the project. Energy consumed by the construction of the project is discussed in Section 6, Temporary Effects.

<sup>a</sup> The chemical composition of biodiesel can vary widely depending on the blend; therefore, the CO<sub>2</sub> content was assumed to be equal to diesel (22.2 lbs of CO<sub>2</sub>/gallon of biodiesel).

<sup>b</sup> This segment of the I-5 bridge crossing extends from SR 14 to Hayden Island and is approximately 0.9 miles long.

<sup>c</sup> This segment of the I-205 bridge crossing is located midspan between SR 14 and NE Airport Way. This segment was selected to be 0.9 miles long to be consistent with the I-5 segment. Consistency between segment lengths, versus the actual length of the bridge crossing, was selected to highlight the differences in energy demand as a function of traffic volumes and speeds, as opposed to roadway length.

<sup>d</sup> This is the system-wide energy demand for transit, inclusive of all transit lines, not just sections of routes crossing I-5 and I-205.

<sup>e</sup> Buses operating along BRT routes were assumed to use B20 biodiesel while conventional diesel buses were assumed to operate along non-BRT routes.

### Exhibit 5-2. Future 2030 No-Build and Alternative 2 Daily Energy Consumption and CO<sub>2</sub>e Emissions

Vehicle Type/Roadway	Alternative 1, 2030					Alternative 2, 2030				
	Energy Consumed (mBtu)	Electricity Consumed (kWh)	Gasoline Consumed (gal)	Bio/Diesel <sup>a</sup> Consumed (gal)	CO <sub>2</sub> e Emissions (tons)	Energy Consumed (mBtu)	Electricity Consumed (kWh)	Gasoline Consumed (gal)	Bio/Diesel <sup>a</sup> Consumed (gal)	CO <sub>2</sub> e Emissions (tons)
<b>I-5<sup>b</sup></b>										
Automobile	595.3	0	4,802	0	49.0	522.3	0	4,213	0	43.0
Medium-Duty Truck	8.5	0	68	0	0.7	7.2	0	58	0	0.6
Heavy-Duty Truck	188.6	0	0	1,360	15.9	171.9	0	0	1,239	14.5
Motorcycle	1.2	0	10	0	0.1	1.2	0	10	0	0.1
<b>I-5 Subtotal</b>	<b>793.6</b>	<b>0</b>	<b>4,880</b>	<b>1,360</b>	<b>65.7</b>	<b>702.6</b>	<b>0</b>	<b>4,281</b>	<b>1,239</b>	<b>58.2</b>
<b>I-205<sup>c</sup></b>										
Automobile	707.8	0	5,709	0	58.3	651.0	0	5,251	0	53.6
Medium-Duty Truck	7.5	0	61	0	0.6	6.7	0	54	0	0.6
Heavy-Duty Truck	115.0	0	0	829	9.7	109.9	0	0	792	9.3
Motorcycle	1.4	0	11	0	0.1	1.4	0	12	0	0.1
<b>I-205 Subtotal</b>	<b>831.7</b>	<b>0</b>	<b>5,781</b>	<b>829</b>	<b>68.7</b>	<b>769.1</b>	<b>0</b>	<b>5,317</b>	<b>792</b>	<b>63.5</b>
<b>Transit<sup>d</sup></b>										
Conventional Bus	3,238.1	0	0	23,348	272.8	3,231.7	0	0	23,301	272.3
BRT Bus <sup>e</sup>	0.0	0	0	0	0.0	24.0	0	0	189	2.2
Light Rail	520.8	152,628	0	0	56.1	520.8	152,628	0	0	56.1
<b>Transit Subtotal</b>	<b>3,758.9</b>	<b>152,628</b>	<b>0</b>	<b>23,348</b>	<b>328.9</b>	<b>3,776.4</b>	<b>152,628</b>	<b>0</b>	<b>23,490</b>	<b>330.6</b>
<b>Total</b>	<b>5,384.2</b>	<b>152,628</b>	<b>10,661</b>	<b>25,537</b>	<b>463.3</b>	<b>5,248.1</b>	<b>152,628</b>	<b>9,598</b>	<b>25,521</b>	<b>452.3</b>

Note: These estimates do not include the energy required to construct the project. Energy consumed by the construction of the project is discussed in Section 6, Temporary Effects.

<sup>a</sup> The chemical composition of biodiesel can vary widely depending on the blend; therefore, the CO<sub>2</sub> content was assumed to be equal to diesel (22.2 lbs of CO<sub>2</sub>/gallon of biodiesel).

<sup>b</sup> This segment of the I-5 bridge crossing extends from SR 14 to Hayden Island and is approximately 0.9 miles long.

<sup>c</sup> This segment of the I-205 bridge crossing is located midspan between SR 14 and NE Airport Way. This segment was selected to be 0.9 miles long to be consistent with the I-5 segment. Consistency between segment lengths, versus the actual length of the bridge crossing, was selected to highlight the differences in energy demand as a function of traffic volumes and speeds, as opposed to roadway length.

<sup>d</sup> This is the system-wide energy demand for transit, inclusive of all transit lines, not just sections of routes crossing I-5 and I-205.

<sup>e</sup> Buses operating along BRT routes were assumed to use B20 biodiesel while conventional diesel buses were assumed to operate along non-BRT routes.

As a result of these factors, daily operational energy consumed is expected to decrease from 5,384.2 to 5,248.1 mBtu/day, and the corresponding CO<sub>2</sub>e emissions would decrease from 463.3 to 452.3 tons of CO<sub>2</sub>e/day. This represents an approximate 2.6 percent reduction in energy use and 2.4 percent reduction in CO<sub>2</sub>e emissions.

### **5.2.3 Alternative 3: Replacement Crossing with LRT and I-5 Standard Toll**

The primary elements of this alternative are:

- Replacement bridges, 10 lanes.
- Tolling: I-5 only flat rate.
- Light Rail Transit (LRT) (I-5 full-length alignment).
- TSM/TDM Option 1.

A comparison of daily energy use and daily CO<sub>2</sub>e emissions between the No-Build Alternative and Alternative 3 is provided in Exhibit 5-3.

Operational energy consumed by Alternative 3 would be similar to Alternative 2, described above, because Alternative 3 includes the same energy use advantages compared to the No-Build Alternative as Alternative 2, but substitutes LRT for BRT. Compared to the No-Build Alternative, Alternative 3 would require less energy as a result of decreased travel demand (due to tolling), a mode shift from personal vehicle to transit, and increased operating speeds that improve personal vehicle fuel efficiency.

Daily energy requirements would decrease from 5,384.2 mBtu/day (No-Build Alternative) to 5,242.3 Btu/day, which equates to an approximate 2.7 percent reduction in daily energy use. Daily CO<sub>2</sub>e emissions would also decrease by approximately 2.4 percent compared to the No-Build Alternative, from 463.3 tons of CO<sub>2</sub>e/day to 452.4 tons of CO<sub>2</sub>e/day.

### Exhibit 5-3. Future 2030 No-Build and Alternative 3 Daily Energy Consumption and CO<sub>2</sub>e Emissions

Vehicle Type/Roadway	Alternative 1, 2030					Alternative 3, 2030				
	Energy Consumed (mBtu)	Electricity Consumed (kWh)	Gasoline Consumed (gal)	Bio/Diesel <sup>a</sup> Consumed (gal)	CO <sub>2</sub> e Emissions (tons)	Energy Consumed (mBtu)	Electricity Consumed (kWh)	Gasoline Consumed (gal)	Bio/Diesel <sup>a</sup> Consumed (gal)	CO <sub>2</sub> e Emissions (tons)
<b>I-5<sup>b</sup></b>										
Automobile	595.3	0	4,802	0	49.0	522.3	0	4,213	0	43.0
Medium-Duty Truck	8.5	0	68	0	0.7	7.2	0	58	0	0.6
Heavy-Duty Truck	188.6	0	0	1,360	15.9	171.9	0	0	1,239	14.5
Motorcycle	1.2	0	10	0	0.1	1.2	0	10	0	0.1
<b>I-5 Subtotal</b>	<b>793.6</b>	<b>0</b>	<b>4,880</b>	<b>1,360</b>	<b>65.7</b>	<b>702.6</b>	<b>0</b>	<b>4,281</b>	<b>1,239</b>	<b>58.2</b>
<b>I-205<sup>c</sup></b>										
Automobile	707.8	0	5,709	0	58.3	651.0	0	5,251	0	53.6
Medium-Duty Truck	7.5	0	61	0	0.6	6.7	0	54	0	0.6
Heavy-Duty Truck	115.0	0	0	829	9.7	109.9	0	0	792	9.3
Motorcycle	1.4	0	11	0	0.1	1.4	0	12	0	0.1
<b>I-205 Subtotal</b>	<b>831.7</b>	<b>0</b>	<b>5,781</b>	<b>829</b>	<b>68.7</b>	<b>769.1</b>	<b>0</b>	<b>5,317</b>	<b>792</b>	<b>63.5</b>
<b>Transit<sup>d</sup></b>										
Conventional Bus	3,238.1	0	0	23,348	272.8	3,217.7	0	0	23,201	271.1
BRT Bus <sup>e</sup>	0.0	0	0	0	0.0	0.0	0	0	0	0.0
Light Rail	520.8	152,628	0	0	56.1	553.0	162,063	0	0	59.6
<b>Transit Subtotal</b>	<b>3,758.9</b>	<b>152,628</b>	<b>0</b>	<b>23,348</b>	<b>328.9</b>	<b>3,770.7</b>	<b>162,063</b>	<b>0</b>	<b>23,201</b>	<b>330.7</b>
<b>Total</b>	<b>5,384.2</b>	<b>152,628</b>	<b>10,661</b>	<b>25,537</b>	<b>463.3</b>	<b>5,242.3</b>	<b>162,063</b>	<b>9,598</b>	<b>25,232</b>	<b>452.4</b>

Note: These estimates do not include the energy required to construct the project. Energy consumed by the construction of the project is discussed in Section 6, Temporary Effects.

<sup>a</sup> The chemical composition of biodiesel can vary widely depending on the blend; therefore, the CO<sub>2</sub> content was assumed to be equal to diesel (22.2 lbs of CO<sub>2</sub>/gallon of biodiesel).

<sup>b</sup> This segment of the I-5 bridge crossing extends from SR 14 to Hayden Island and is approximately 0.9 miles long.

<sup>c</sup> This segment of the I-205 bridge crossing is located midspan between SR 14 and NE Airport Way. This segment was selected to be 0.9 miles long to be consistent with the I-5 segment. Consistency between segment lengths, versus the actual length of the bridge crossing, was selected to highlight the differences in energy demand as a function of traffic volumes and speeds, as opposed to roadway length.

<sup>d</sup> This is the system-wide energy demand for transit, inclusive of all transit lines, not just sections of routes crossing I-5 and I-205.

<sup>e</sup> Buses operating along BRT routes were assumed to use B20 biodiesel while conventional diesel buses were assumed to operate along non-BRT routes.

#### **5.2.4 Alternative 4: Supplemental Crossing with BRT and I-5 Higher Toll**

The primary elements of this alternative are:

- Supplemental bridges, 8 lanes.
- Tolling: I-5 higher rate.
- Bus Rapid Transit (BRT) (Vancouver full-length alignment) with Increased Transit Operations.
- TSM/TDM Option 2.

Exhibit 5-4 summarizes the daily energy consumption for the No-Build Alternative and Alternative 4.

Unlike the previous alternatives, Alternative 4 is expected to consume more operational energy compared to the No-Build Alternative. Alternative 4 would decrease operational energy use and CO<sub>2</sub>e emissions associated with personal automobiles as a result of decreased interstate personal vehicle travel demand (partially due to tolling), a mode shift from personal vehicles to transit, provision of high-capacity transit (HCT) between Vancouver and Portland, and faster travel speeds that improve fuel efficiency. However, this energy and CO<sub>2</sub>e savings would be outweighed by the amount of energy consumed and CO<sub>2</sub>e emitted by transit. For Alternative 4, transit headways (the time interval between transit vehicles moving in the same direction on a particular route, either arriving or departing) substantially decrease and the daily VMT substantially increases. The overall result is a net increase in energy use and CO<sub>2</sub>e emissions relative to the No-Build. Alternative 4 would increase the amount of daily energy consumed from 5,384.2 mBtu/day (No-Build) to 5,729.2 mBtu/day and 463.3 tons of CO<sub>2</sub>e/day to 493.7 tons of CO<sub>2</sub>e/day; a 6.4 percent increase in energy consumption and a 6.6 percent increase in CO<sub>2</sub>e emissions.

#### **5.2.5 Alternative 5: Supplemental Crossing with LRT and I-5 Higher Toll**

The primary elements of this alternative are:

- Supplemental bridges, 8 lanes.
- Tolling: I-5 higher rate.
- Light Rail Transit (LRT) (Vancouver full length alignment) with Increased Transit Operations.
- TSM/TDM Option 2.

Exhibit 5-5 summarizes daily energy consumption for the No-Build Alternative and Alternative 5. Daily energy use associated with Alternative 5 would be similar to Alternative 4. Compared to the No-Build Alternative, Alternative 5 is expected to increase the daily energy consumption from 5,384.2 mBtu/day to approximately 5,687.1 mBtu/day, which translates to a 5.6 percent increase in daily energy use. Because Alternative 5 would require more energy compared to the No-Build Alternative, the CO<sub>2</sub>e emissions would consequently be higher as well; an expected increase from 463.3 to 490.7 tons of CO<sub>2</sub>e/day, a 5.9 percent increase in CO<sub>2</sub>e emissions. Similar to Alternative 4, Alternative 5 would result in less energy use and CO<sub>2</sub>e emissions for personal vehicles, but the increase in transit VMT would result in net increases in energy consumption and CO<sub>2</sub>e emissions compared to the No-Build Alternative.

**Exhibit 5-4. Future 2030 No-Build and Alternative 4 Daily Energy Consumption and CO<sub>2</sub>e Emissions**

Vehicle Type/Roadway	Alternative 1, 2030					Alternative 4, 2030				
	Energy Consumed (mBtu)	Electricity Consumed (kWh)	Gasoline Consumed (gal)	Bio/Diesel <sup>a</sup> Consumed (gal)	CO <sub>2</sub> e Emissions (tons)	Energy Consumed (mBtu)	Electricity Consumed (kWh)	Gasoline Consumed (gal)	Bio/Diesel <sup>a</sup> Consumed (gal)	CO <sub>2</sub> e Emissions (tons)
<b>I-5<sup>b</sup></b>										
Automobile	595.3	0	4,802	0	49.0	484.1	0	3,905	0	39.9
Medium-Duty Truck	8.5	0	68	0	0.7	6.7	0	54	0	0.6
Heavy-Duty Truck	188.6	0	0	1,360	15.9	159.3	0	0	1,149	13.4
Motorcycle	1.2	0	10	0	0.1	1.1	0	9	0	0.1
<b>I-5 Subtotal</b>	<b>793.6</b>	<b>0</b>	<b>4,880</b>	<b>1,360</b>	<b>65.7</b>	<b>651.2</b>	<b>0</b>	<b>3,968</b>	<b>1,149</b>	<b>53.9</b>
<b>I-205<sup>c</sup></b>										
Automobile	707.8	0	5,709	0	58.3	692.3	0	5,584	0	57.0
Medium-Duty Truck	7.5	0	61	0	0.6	7.2	0	58	0	0.6
Heavy-Duty Truck	115.0	0	0	829	9.7	114.6	0	0	826	9.7
Motorcycle	1.4	0	11	0	0.1	1.5	0	12	0	0.1
<b>I-205 Subtotal</b>	<b>831.7</b>	<b>0</b>	<b>5,781</b>	<b>829</b>	<b>68.7</b>	<b>815.5</b>	<b>0</b>	<b>5,654</b>	<b>826</b>	<b>67.4</b>
<b>Transit<sup>d</sup></b>										
Conventional Bus	3,238.1	0	0	23,348	272.8	3,661.8	0	0	26,402	308.5
BRT Bus <sup>e</sup>	0.0	0	0	0	0.0	52.6	0	0	413	4.8
Light Rail	520.8	152,628	0	0	56.1	548.1	160,646	0	0	59.1
<b>Transit Subtotal</b>	<b>3,758.9</b>	<b>152,628</b>	<b>0</b>	<b>23,348</b>	<b>328.9</b>	<b>4,262.4</b>	<b>160,646</b>	<b>0</b>	<b>26,815</b>	<b>372.4</b>
<b>Total</b>	<b>5,384.2</b>	<b>152,628</b>	<b>10,661</b>	<b>25,537</b>	<b>463.3</b>	<b>5,729.2</b>	<b>160,646</b>	<b>9,622</b>	<b>28,790</b>	<b>493.7</b>

Note: These estimates do not include the energy required to construct the project. Energy consumed by the construction of the project is discussed in Section 6, Temporary Effects.

<sup>a</sup> The chemical composition of biodiesel can vary widely depending on the blend; therefore, the CO<sub>2</sub> content was assumed to be equal to diesel (22.2 lbs of CO<sub>2</sub>/gallon of biodiesel).

<sup>b</sup> This segment of the I-5 bridge crossing extends from SR 14 to Hayden Island and is approximately 0.9 miles long.

<sup>c</sup> This segment of the I-205 bridge crossing is located midspan between SR 14 and NE Airport Way. This segment was selected to be 0.9 miles long to be consistent with the I-5 segment. Consistency between segment lengths, versus the actual length of the bridge crossing, was selected to highlight the differences in energy demand as a function of traffic volumes and speeds, as opposed to roadway length.

<sup>d</sup> This is the system-wide energy demand for transit, inclusive of all transit lines, not just sections of routes crossing I-5 and I-205.

<sup>e</sup> Buses operating along BRT routes were assumed to use B20 biodiesel while conventional diesel buses were assumed to operate along non-BRT routes.

**Exhibit 5-5. Future 2030 No-Build and Alternative 5 Daily Energy Consumption and CO<sub>2</sub>e Emissions**

Vehicle Type/Roadway	Alternative 1, 2030					Alternative 5, 2030				
	Energy Consumed (mBtu)	Electricity Consumed (kWh)	Gasoline Consumed (gal)	Bio/Diesel <sup>a</sup> Consumed (gal)	CO <sub>2</sub> e Emissions (tons)	Energy Consumed (mBtu)	Electricity Consumed (kWh)	Gasoline Consumed (gal)	Bio/Diesel <sup>a</sup> Consumed (gal)	CO <sub>2</sub> e Emissions (tons)
<b>I-5<sup>b</sup></b>										
Automobile	595.3	0	4,802	0	49.0	484.1	0	3,905	0	39.9
Medium-Duty Truck	8.5	0	68	0	0.7	6.7	0	54	0	0.6
Heavy-Duty Truck	188.6	0	0	1,360	15.9	159.3	0	0	1,149	13.4
Motorcycle	1.2	0	10	0	0.1	1.1	0	9	0	0.1
<b>I-5 Subtotal</b>	<b>793.6</b>	<b>0</b>	<b>4,880</b>	<b>1,360</b>	<b>65.7</b>	<b>651.2</b>	<b>0</b>	<b>3,968</b>	<b>1,149</b>	<b>53.9</b>
<b>I-205<sup>c</sup></b>										
Automobile	707.8	0	5,709	0	58.3	692.3	0	5,584	0	57.0
Medium-Duty Truck	7.5	0	61	0	0.6	7.2	0	58	0	0.6
Heavy-Duty Truck	115.0	0	0	829	9.7	114.6	0	0	826	9.7
Motorcycle	1.4	0	11	0	0.1	1.5	0	12	0	0.1
<b>I-205 Subtotal</b>	<b>831.7</b>	<b>0</b>	<b>5,781</b>	<b>829</b>	<b>68.7</b>	<b>815.5</b>	<b>0</b>	<b>5,654</b>	<b>826</b>	<b>67.4</b>
<b>Transit<sup>d</sup></b>										
Conventional Bus	3,238.1	0	0	23,348	272.8	3,633.3	0	0	26,197	306.1
BRT Bus <sup>e</sup>	0.0	0	0	0	0.0	0.0	0	0	0	0.0
Light Rail	520.8	152,628	0	0	56.1	587.0	172,053	0	0	63.3
<b>Transit Subtotal</b>	<b>3,758.9</b>	<b>152,628</b>	<b>0</b>	<b>23,348</b>	<b>328.9</b>	<b>4,220.3</b>	<b>172,053</b>	<b>0</b>	<b>26,197</b>	<b>369.3</b>
<b>Total</b>	<b>5,384.2</b>	<b>152,628</b>	<b>10,661</b>	<b>25,537</b>	<b>463.3</b>	<b>5,687.1</b>	<b>172,053</b>	<b>9,622</b>	<b>28,172</b>	<b>490.7</b>

Note: These estimates do not include the energy required to construct the project. Energy consumed by the construction of the project is discussed in Section 6, Temporary Effects.

<sup>a</sup> The chemical composition of biodiesel can vary widely depending on the blend; therefore, the CO<sub>2</sub> content was assumed to be equal to diesel (22.2 lbs of CO<sub>2</sub>/gallon of biodiesel).

<sup>b</sup> This segment of the I-5 bridge crossing extends from SR 14 to Hayden Island and is approximately 0.9 miles long.

<sup>c</sup> This segment of the I-205 bridge crossing is located midspan between SR 14 and NE Airport Way. This segment was selected to be 0.9 miles long to be consistent with the I-5 segment. Consistency between segment lengths, versus the actual length of the bridge crossing, was selected to highlight the differences in energy demand as a function of traffic volumes and speeds, as opposed to roadway length.

<sup>d</sup> This is the system-wide energy demand for transit, inclusive of all transit lines, not just sections of routes crossing I-5 and I-205.

<sup>e</sup> Buses operating along BRT routes were assumed to use B20 biodiesel while conventional diesel buses were assumed to operate along non-BRT routes.

### **5.3 Impacts from Segment-level Choices**

As described above, the four full alternatives represent combinations of specific highway, river crossing, transit and pedestrian/bicycle alternatives and options covering all of the CRC segments. They represent the range of system-level choices that most affect overall performance, effects and costs.

Options related to transit operations at the segment-level are described in Section 1.2.2, Segment-Level Choices. These segment-level choices include minor differences in alignment and locations of HCT touch downs. These segment-level choices would not affect the overall transit or highway system performance and would therefore not affect operational energy use.

Specific options related to the highway alignment and bridge crossing are described in Section 1.2.2, Segment-Level Choices. These segment-level choices are related to the bridge crossing alignment and the interchange configuration at SR 14. The bridge crossing alignment would not affect the long-term operations of the facility. The interchange configuration at SR 14 would have an effect on traffic operations. However, the change in traffic operations would translate into a negligible effect on daily energy use and would be pragmatically incalculable.

This energy analysis, with respect to traffic operations, is based on the change in daily travel demand across I-5 and I-205, which would not be affected by interchange configuration. Accordingly, the effects of segment-level choices on long-term traffic operations were not analyzed because there would be essentially no differences.

### **5.4 Impacts from Other Project Elements**

As previously described, the full alternatives represent specific combinations of system-level choices and segment-level choices. In addition to these choices and options, two other project elements have been identified that could potentially affect long-term energy use and CO<sub>2e</sub> emissions.

#### **5.4.1 Minimum Operable Segments**

The two options, or minimum operable segments (MOSs), that truncate high-capacity transit operations in Vancouver provide lower cost, yet lower performance, alternatives in the event that the full length HCT lines could not be funded in a single phase of construction and financing. All transit build alternatives could end near Mill Plain between 15th and 16th Streets in Vancouver, which would reduce the HCT line from 4.22 to 2.07 miles. The Clark College MOS would end at the Clark College station and would shorten the HCT line from 4.22 to 2.65 miles. The Clark College MOS is associated with an I-5 HCT alignment and would not apply if the Vancouver HCT alignment is selected. Section 5.5.6 provides additional detail on the long-term effects of MOSs.



## 5.4.2 Transit Maintenance Base Options

With all of the alternatives that include LRT (Alternative 3 and Alternative 5, and potential variations related to the MOSSs), TriMet's existing Ruby Junction Maintenance Base in Gresham would need to be expanded. For Alternatives 2 and 5, which include BRT, C-TRAN's existing maintenance base in east Vancouver would need to be expanded. In either case, expansion of these maintenance bases would not directly affect overall transit system performance, operational energy consumed, or amount of CO<sub>2</sub>e emissions.

Indirectly, expanding either maintenance base would likely require additional electrical energy to operate the facility (e.g. lighting, computer and telephone usage, heating, ventilation, and air conditioning etc.). However, the additional electrical energy consumed by daily operations of the maintenance base expansion would be negligible compared to the energy consumed for transportation. Expanding either maintenance base would not measurably affect long-term CO<sub>2</sub>e emissions.

## 5.5 Impacts from System-Level Choices

The energy and CO<sub>2</sub>e emissions analysis of the full alternatives provides insight on the long-term energy usage for a combined and pre-defined set of system-level choices and segment-level choices.

This discussion disseminates the full alternatives and identifies and isolates long-term (operational) effects on energy use and CO<sub>2</sub>e emissions with respect to individual system-level choices. This analysis was conducted to better understand how specific parts of the multimodal alternatives affect energy and CO<sub>2</sub>e emissions.

**Note:** In the following section regarding effects of system-level choices, the energy use and CO<sub>2</sub>e emissions associated with transit operations are higher compared to personal vehicles. This is because the transit estimates were prepared for system-wide transit operations, whereas the personal vehicle energy use estimates are focused on a 0.9 mile segment of I-5 and a 0.9 mile segment of I-205 across the Columbia River. Additional detail on the justifications behind this approach is provided in Sections 2.5.2.1 and 2.5.2.2.

### 5.5.1 River Crossing Type and Capacity: How does the supplemental crossing compare to the replacement crossing?

To identify effects of the river crossing type, Alternative 2 was compared to a modified version of Alternative 4. This modified version of Alternative 4 changed the tolling structure from the original high toll on I-5 scenario to the standard toll on I-5 scenario to be consistent with Alternative 2. Changing the tolling structure of Alternative 4 was necessary to eliminate the extra variable and isolate effects of the river crossing type.

Additional travel demand forecasts were prepared for the modified version of Alternative 4 and the resulting ADT volumes were the same as Alternative 2. Traffic operational analyses were not prepared for the modified version of Alternative 4 and, as a result, speeds across the I-5 bridge crossing during the daily peak period (5:00 AM to

9:00 PM) were generally assumed to be 10 mph slower compared to the speeds associated with Alternative 2 since the supplemental bridge has lower capacity (8 lanes compared to 10 lanes). Speeds across the I-205 bridge were assumed to be equal between the alternatives since the travel demand and capacity were the same. These assumptions on the travel speeds were based on the recommendations from the project's traffic team (LeProwse 2007). Elements common to both alternatives include:

- Tolling: I-5 only flat rate.
- Bus Rapid Transit (BRT) (full length I-5 alignment).
- TSM/TDM Option 1.

Exhibit 5-6 compares the operational energy consumption and CO<sub>2</sub>e emissions associated with Alternative 2 and the modified version of Alternative 4. As shown in Exhibit 5-6, the replacement bridge is expected to require less energy (9.7 percent reduction) and emit less CO<sub>2</sub>e (9.6 percent) than the supplemental bridge. The reduction in energy use and CO<sub>2</sub>e emissions is partially due to higher speeds across I-5, which is the result of increased capacity, but largely the result of less transit VMT.

### **5.5.2 Transit Mode: How does BRT compare to LRT?**

To identify the effects of HCT mode, the transit model run for Alternative 2 was compared to Alternative 3. Both of these alternatives assume:

- Replacement bridges, 10 lanes.
- Tolling: I-5 only flat rate.
- Full-length.
- TSM/TDM Option 1.

The difference between these alternatives is the HCT mode; Alternative 2 uses BRT for the HCT mode and Alternative 3 uses LRT. LRT and BRT are compared in Exhibit 5-7, which identifies the long-term effects of HCT mode.

As shown in Exhibit 5-7, LRT is expected to consume less energy on a daily basis compared to BRT, however the difference is minor (0.2 percent reduction). Although LRT is expected to consume less energy compared to BRT, the LRT mode is expected to emit slightly more CO<sub>2</sub>e (less than 0.01 percent). This is due to the primary sources of electricity generation from PGE and CPU, which includes coal (emits 2.095 lbs CO<sub>2</sub>/kWh) and natural gas (emits 1.321 lbs CO<sub>2</sub>/kWh).

**Exhibit 5-6. Long-Term Effects of River Crossing Type on Daily Energy Consumption and CO<sub>2</sub>e Emissions**

Vehicle Type/Roadway	Build Replacement with Standard Toll on I-5 (Alternative 2)					Build Supplemental with Standard Toll on I-5 (Alternatives 4, modified)				
	Energy Consumed (mBtu)	Electricity Consumed (kWh)	Gasoline Consumed (gal)	Bio/Diesel <sup>a</sup> Consumed (gal)	CO <sub>2</sub> e Emissions (tons)	Energy Consumed (mBtu)	Electricity Consumed (kWh)	Gasoline Consumed (gal)	Bio/Diesel <sup>a</sup> Consumed (gal)	CO <sub>2</sub> e Emissions (tons)
<b>I-5<sup>b</sup></b>										
Automobile	522.3	0	4,213	0	43.0	540.1	0	4,357	0	44.5
Medium-Duty Truck	7.2	0	58	0	0.6	7.5	0	61	0	0.6
Heavy-Duty Truck	171.9	0	0	1,239	14.5	174.3	0	0	1,257	14.7
Motorcycle	1.2	0	10	0	0.1	1.2	0	10	0	0.1
<b>I-5 Subtotal</b>	<b>702.6</b>	<b>0</b>	<b>4,281</b>	<b>1,239</b>	<b>58.2</b>	<b>723.2</b>	<b>0</b>	<b>4,428</b>	<b>1,257</b>	<b>59.9</b>
<b>I-205<sup>c</sup></b>										
Automobile	651.0	0	5,251	0	53.6	651.0	0	5,251	0	53.6
Medium-Duty Truck	6.7	0	54	0	0.6	6.7	0	54	0	0.6
Heavy-Duty Truck	109.9	0	0	792	9.3	109.9	0	0	792	9.3
Motorcycle	1.4	0	12	0	0.1	1.4	0	12	0	0.1
<b>I-205 Subtotal</b>	<b>769.1</b>	<b>0</b>	<b>5,317</b>	<b>792</b>	<b>63.5</b>	<b>769.1</b>	<b>0</b>	<b>5,317</b>	<b>792</b>	<b>63.5</b>
<b>Transit<sup>d</sup></b>										
Conventional Bus	3,231.7	0	0	23,301	272.3	3,661.8	0	0	26,402	308.5
BRT Bus <sup>e</sup>	24.0	0	0	189	2.2	52.6	0	0	413	4.8
Light Rail	520.8	152,628	0	0	56.1	548.1	160,646	0	0	59.1
<b>Transit Subtotal</b>	<b>3,776.4</b>	<b>152,628</b>	<b>0</b>	<b>23,490</b>	<b>330.6</b>	<b>4,262.4</b>	<b>160,646</b>	<b>0</b>	<b>26,815</b>	<b>372.4</b>
<b>Total</b>	<b>5,248.1</b>	<b>152,628</b>	<b>9,598</b>	<b>25,521</b>	<b>452.3</b>	<b>5,754.7</b>	<b>160,646</b>	<b>9,745</b>	<b>28,864</b>	<b>495.8</b>

Note: These estimates do not include the energy required to construct the project. Energy consumed by the construction of the project is discussed in Section 6, Temporary Effects.

<sup>a</sup> The chemical composition of biodiesel can vary widely depending on the blend; therefore, the CO<sub>2</sub> content was assumed to be equal to diesel (22.2 lbs of CO<sub>2</sub>/gallon of biodiesel).

<sup>b</sup> This segment of the I-5 bridge crossing extends from SR 14 to Hayden Island and is approximately 0.9 miles long.

<sup>c</sup> This segment of the I-205 bridge crossing is located midspan between SR 14 and NE Airport Way. This segment was selected to be 0.9 miles long to be consistent with the I-5 segment. Consistency between segment lengths, versus the actual length of the bridge crossing, was selected to highlight the differences in energy demand as a function of traffic volumes and speeds, as opposed to roadway length.

<sup>d</sup> This is the system-wide energy demand for transit, inclusive of all transit lines, not just sections of routes crossing I-5 and I-205.

<sup>e</sup> Buses operating along BRT routes were assumed to use B20 biodiesel while conventional diesel buses were assumed to operate along non-BRT routes

**Exhibit 5-7. Long-Term Effects of HCT Mode on Daily Energy Consumption and CO<sub>2</sub>e Emissions**

Vehicle Type/Roadway	BRT Mode (Alternative 2)				LRT Mode (Alternative 3)			
	Energy Consumed (mBtu)	Electricity Consumed (kWh)	Bio/Diesel <sup>a</sup> Consumed (gal)	CO <sub>2</sub> e Emissions (tons)	Energy Consumed (mBtu)	Electricity Consumed (kWh)	Bio/Diesel <sup>a</sup> Consumed (gal)	CO <sub>2</sub> e Emissions (tons)
Conventional Bus	3,231.7	0	23,301	272.3	3,217.7	0	23,201	271.1
BRT Bus <sup>b</sup>	24.0	0	189	2.2	0.0	0	0	0.0
Light Rail	520.8	152,628	0	56.1	553.0	162,063	0	59.6
<b>Transit Total</b>	<b>3,776.4</b>	<b>152,628</b>	<b>23,490</b>	<b>330.6</b>	<b>3,770.7</b>	<b>162,063</b>	<b>23,201</b>	<b>330.7</b>

<sup>a</sup> The chemical composition of biodiesel can vary widely depending on the blend; therefore, the CO<sub>2</sub> content was assumed to be equal to diesel (22.2 lbs of CO<sub>2</sub>/gallon of biodiesel).

<sup>b</sup> Buses operating along BRT routes were assumed to use B20 biodiesel while conventional diesel buses were assumed to operate along non-BRT routes.

### **5.5.3 Balance of Transit vs. Highway Investment: Increased Transit System Operations with Aggressive TDM/TSM Measures, and Efficient Transit System Operations with Standard TDM/TSM Measures**

In general, provision of HCT or improved transit operations results in a mode shift from automobiles to transit. While regional travel demand models include parameters that account for parking, transit fares, mobility, etc., other factors, such as accessibility, are more difficult to quantify at the micro level. As such, the mode shift to transit may be conservative.

Travel demand estimates and traffic operational analyses were not conducted at the level of detail that would allow an isolated, quantitative comparison of Increased Transit System operations with aggressive TDM/TSM measures versus Efficient Transit System operations with standard TDM/TSM measures. As a result, a quantitative assessment of these effects on energy use and CO<sub>2e</sub> emissions cannot be provided. Some qualitative findings can be drawn from the traffic and transit analysis that has been completed. The increased transit system operations, which would increase the frequency of BRT vehicles or trains, would slightly increase transit ridership, which could decrease CO<sub>2e</sub> emissions from automobiles. However, any decrease due to reduced auto travel could be offset by increased energy consumed by transit. The Efficient Transit System operations headways are already relatively aggressive, and adding more buses or trains would likely result in little additional benefit to congestion relief compared to energy consumed.

### **5.5.4 Major Transit Alignment: How does the Vancouver alignment compare to the I-5 alignment?**

To identify the effects of the HCT alignment, the transit model run for Alternative 3 was compared to another model run known as T9. Both of these model runs assume:

- Replacement bridges, 10 lanes.
- Tolling: I-5 only flat rate.
- Light Rail Transit (LRT full length).
- TSM/TDM Option 1.

The difference between these model runs is the HCT alignment; Alternative 2 uses LRT along the Vancouver alignment and the T9 model run assumes LRT would operate along the I-5 alignment. These model runs are compared in Exhibit 5-8, which identifies the long-term effects of the HCT alignment system-level choice.

The Vancouver alignment is expected to marginally require less energy on a daily basis compared to the I-5 alignment, with a reduction of approximately 0.7 percent. The operational CO<sub>2e</sub> emissions would also be slightly lower with the Vancouver alignment; approximately 0.7 percent less than the I-5 alignment.

### **5.5.5 Tolling: How do the tolling scenarios compare (No Toll, Standard Toll, or Standard Toll on Both I-5 and I-205)?**

The tolling scenarios included in the full alternatives include a standard toll on I-5 for Alternatives 2 and 3, and a high toll on I-5 for Alternatives 4 and 5. Although the no toll and toll on both I-5 and I-205 scenarios are not included in the full alternatives, travel demand modeling was prepared for these scenarios to determine the effects of tolling.

The primary elements of these three tolling scenarios are:

- Replacement bridges, 10 lanes.
- Bus Rapid Transit (BRT) (I-5 full length alignment).
- TSM/TDM Option 1.

The difference between these scenarios is the tolling structure (No Toll, Standard Toll on I-5, and Standard Toll on Both I-5 and I-205 scenarios). Exhibit 5-9 compares these three tolling scenarios and identifies the long-term effects of different tolling structures on the long-term energy use and CO<sub>2</sub>e emissions.

Exhibit 5-9 indicates that the No Toll scenario would have the highest daily energy use. Compared to the No Toll scenario, the Standard Toll on I-5 scenario would consume approximately 1.9 percent less and the Standard Toll on Both I-5 and I-205 would require approximately 3.6 percent less operational energy. Accordingly, the Standard Toll on I-5 and Standard Toll on Both I-5 and I-205 scenarios would result in roughly 1.9 percent and 3.5 percent less CO<sub>2</sub>e emissions compared to the No Toll scenario. These energy use estimates and CO<sub>2</sub>e emission levels are consistent with the travel demand estimates; 410,000 ADT for No Toll, 391,000 ADT for Standard Toll on I-5, and 366,000 ADT for the Standard Toll on Both I-5 and I-205 tolling scenario (CRC Project Team 2008a).

It should be noted, however, that while the Standard Toll on Both I-5 and I-205 scenario results in the least energy consumption and CO<sub>2</sub>e emissions, this tolling structure is not proposed in any of the build alternatives and was only analyzed to determine the effects of a range of potential tolling structures.

**Exhibit 5-8. Long-Term Effects of HCT Alignment on Daily Energy Consumption and CO<sub>2</sub>e Emissions**

Vehicle Type/Roadway	Vancouver Alignment (Alternative 3)				I-5 Alignment (T9)			
	Energy Consumed (mBtu)	Electricity Consumed (kWh)	Bio/Diesel <sup>a</sup> Consumed (gal)	CO <sub>2</sub> e Emissions (tons)	Energy Consumed (mBtu)	Electricity Consumed (kWh)	Bio/Diesel <sup>a</sup> Consumed (gal)	CO <sub>2</sub> e Emissions (tons)
Conventional Bus	3,217.7	0	23,201	271.1	3,243.0	0	23,383	273.2
BRT Bus <sup>b</sup>	0.0	0	0	0.0	0.0	0	0	0.0
Light Rail	553.0	162,063	0	59.6	555.2	162,713	0	59.8
<b>Transit Total</b>	<b>3,770.7</b>	<b>162,063</b>	<b>23,201</b>	<b>330.7</b>	<b>3,798.2</b>	<b>162,713</b>	<b>23,383</b>	<b>333.0</b>

<sup>a</sup> The chemical composition of biodiesel can vary widely depending on the blend; therefore, the CO<sub>2</sub> content was assumed to be equal to diesel (22.2 lbs of CO<sub>2</sub>/gallon of biodiesel).

<sup>b</sup> Buses operating along BRT routes were assumed to use B20 biodiesel while conventional diesel buses were assumed to operate along non-BRT routes.

**Exhibit 5-9. Long-Term Effects of Tolling on Daily Energy Consumption and CO<sub>2</sub>e Emissions**

Vehicle Type/ Roadway	No Toll on I-5				Standard Toll on I-5 (Alternatives 2 and 3)				Standard Toll on I-5 and I-205			
	Energy Consumed (mBtu)	Gasoline Consumed (gal)	Bio/Diesel <sup>a</sup> Consumed (gal)	CO <sub>2</sub> e Emissions (tons)	Energy Consumed (mBtu)	Gasoline Consumed (gal)	Bio/Diesel <sup>a</sup> Consumed (gal)	CO <sub>2</sub> e Emissions (tons)	Energy Consumed (mBtu)	Gasoline Consumed (gal)	Bio/Diesel <sup>a</sup> Consumed (gal)	CO <sub>2</sub> e Emissions (tons)
<b>I-5<sup>b</sup></b>												
Automobile	616.2	4,970	0	50.7	522.3	4,213	0	43.0	575.1	4,639	0	47.4
Medium-Duty Truck	8.5	69	0	0.7	7.2	58	0	0.6	8.0	64	0	0.7
Heavy-Duty Truck	202.8	0	1,462	17.1	171.9	0	1,239	14.5	189.3	0	1,365	15.9
Motorcycle	1.4	11	0	0.1	1.2	10	0	0.1	1.3	11	0	0.1
<b>I-5 Subtotal</b>	<b>828.9</b>	<b>5,050</b>	<b>1,462</b>	<b>68.6</b>	<b>702.6</b>	<b>4,281</b>	<b>1,239</b>	<b>58.2</b>	<b>773.6</b>	<b>4,714</b>	<b>1,365</b>	<b>64.1</b>
<b>I-205<sup>c</sup></b>												
Automobile	632.2	5,099	0	52.1	651.0	5,251	0	53.6	519.6	4,191	0	42.8
Medium-Duty Truck	6.6	53	0	0.5	6.7	54	0	0.6	5.4	43	0	0.4
Heavy-Duty Truck	104.6	0	755	8.8	109.9	0	792	9.3	87.7	0	632	7.4
Motorcycle	1.3	11	0	0.1	1.4	12	0	0.1	1.1	9	0	0.1
<b>I-205 Subtotal</b>	<b>744.8</b>	<b>5,163</b>	<b>755</b>	<b>61.5</b>	<b>769.1</b>	<b>5,317</b>	<b>792</b>	<b>63.5</b>	<b>613.8</b>	<b>4,243</b>	<b>632</b>	<b>50.7</b>
<b>Transit<sup>d</sup></b>												
Conventional Bus	3,231.7	0	23,301	272.3	3,231.7	0	23,301	272.3	3,231.7	0	23,301	272.3
BRT Bus <sup>e</sup>	24.0	0	189	2.2	24.0	0	189	2.2	24.0	0	189	2.2
Light Rail	520.8	0	0	56.1	520.8	0	0	56.1	520.8	0	0	56.1
<b>Transit Subtotal</b>	<b>3,776.4</b>	<b>0</b>	<b>23,490</b>	<b>330.6</b>	<b>3,776.4</b>	<b>0</b>	<b>23,490</b>	<b>330.6</b>	<b>3,776.4</b>	<b>0</b>	<b>23,490</b>	<b>330.6</b>
<b>Total</b>	<b>5,350.1</b>	<b>10,213</b>	<b>25,707</b>	<b>460.8</b>	<b>5,248.1</b>	<b>9,598</b>	<b>25,521</b>	<b>452.3</b>	<b>5,163.8</b>	<b>8,957</b>	<b>25,487</b>	<b>445.4</b>

Note: These estimates do not include the energy required to construct the project. Energy consumed by the construction of the project is discussed in Section 6, Temporary Effects.

<sup>a</sup> The chemical composition of biodiesel can vary widely depending on the blend; therefore, the CO<sub>2</sub> content was assumed to be equal to diesel (22.2 lbs of CO<sub>2</sub>/gallon of biodiesel).

<sup>b</sup> This segment of the I-5 bridge crossing extends from SR 14 to Hayden Island and is approximately 0.9 miles long.

<sup>c</sup> This segment of the I-205 bridge crossing is located midspan between SR 14 and NE Airport Way. This segment was selected to be 0.9 miles long to be consistent with the I-5 segment. Consistency between segment lengths, versus the actual length of the bridge crossing, was selected to highlight the differences in energy demand as a function of traffic volumes and speeds, as opposed to roadway length.

<sup>d</sup> This is the system-wide energy demand for transit, inclusive of all transit lines, not just sections of routes crossing I-5 and I-205.

<sup>e</sup> Buses operating along BRT routes were assumed to use B20 biodiesel while conventional diesel buses were assumed to operate along non-BRT routes.



### 5.5.6 Transit Project Length: How do the full-length alternatives compare to the shorter length option?

A portion of a full-length alternative (Alternative 3) was compared to the MOSs to identify the effects of shorter HCT transit lines. The Clark College MOS reduces the HCT transit line from 4.22 to 2.65 miles and the Mill Plain MOS shortens the HCT transit line from approximately 4.22 to 2.07 miles.

For the Clark College MOS, the primary elements are:

- Replacement bridges, 10 lanes.
- LRT or BRT.
- I-5 alignment.
- Stops at Clark College.
- TSM/TDM Option 1.

For the Mill Plain MOS, the primary elements are:

- Replacement bridges, 10 lanes.
- LRT or BRT.
- I-5 or Vancouver alignment.
- Stops at Mill Plain station (Between 15th and 16th).
- TSM/TDM Option 1.

Exhibit 5-10 focuses on the energy use and CO<sub>2</sub>e emissions associated with HCT crossing the I-5 bridge, which is the primary variable regarding HCT line length. The full-length alternative would consume more energy and emit more CO<sub>2</sub>e compared to both of the MOSs. The Clark College MOS would require approximately 1.4 percent less energy and 1.4 less CO<sub>2</sub>e emissions. The Mill Plain MOS, which represents the shortest HCT line length, would have the lowest energy use and CO<sub>2</sub>e emissions by approximately 2.4 percent compared to a full-length alternative.

**Exhibit 5-10. Long-Term Effects of HCT Line Length on Daily Energy Consumption and CO<sub>2</sub>e Emissions**

Vehicle Type/Roadway	Alternative 3 (Full-Length)		Alternative 3 (Clark College MOS)		Alternative 3 (Mill Plain MOS)	
	Energy Consumed (mBtu)	CO <sub>2</sub> e Emissions (tons)	Energy Consumed (mBtu)	CO <sub>2</sub> e Emissions (tons)	Energy Consumed (mBtu)	CO <sub>2</sub> e Emissions (tons)
HCT <sup>a</sup>	553.0	59.6	545.2	58.8	539.8	58.2
<b>Transit Total</b>	553.0	59.6	545.2	58.8	539.8	58.2

<sup>a</sup> The HCT line length is independent of HCT mode and either LRT or BRT could be used. The comparisons made above are specifically derived from LRT data.

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## 6. Temporary Effects

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### 6.1 Introduction

The project's temporary effects on energy demand and CO<sub>2</sub>e emissions are solely associated with the construction of the project rather than operation of the project. The energy consumed during construction is considered as a temporary effect because no additional energy would be required after the construction is complete (with the exception of the operations of the facility, which is covered in Section 5, Long-Term Effects).

The energy use estimates for the construction of the project were based on preliminary construction cost estimates. As the project moves forward into the design process and additional detail becomes available, these energy use estimates may need to be updated.

### 6.2 Impacts from Full Alternatives

Exhibit 6-1 provides a comparison of the estimated amounts of energy that would be consumed during the construction of the full alternatives.

Because Alternatives 2 and 3 assume an I-5 HCT alignment, they would have additional energy requirements from constructing a new tunnel near E 16th Street or deepening of an existing tunnel near E McLoughlin Boulevard, which would be necessary to cross under I-5. The additional energy needed to construct these tunnels is not applicable to Alternatives 4 and 5, which assume the Vancouver alignment. The minor differences in tunnel project costs and energy requirements between Alternatives 2 and 3 are the result of the tunnels being constructed for BRT (Alternative 2) or LRT (Alternative 3).

As shown in Exhibit 6-1, Alternative 3 would require the most energy to construct, followed by Alternatives 2 and 5, and Alternative 4 would consume the least. The CO<sub>2</sub>e emissions associated with construction of each of the full alternatives would have the same ranking order as energy use.

Compared to Alternative 3, which consumes the most energy and emits the most CO<sub>2</sub>e, and assuming construction of the 16th Street tunnel, Alternative 2 would require approximately 3.2 percent less energy, Alternative 5 roughly 19.7 percent less, and about 23.3 percent less for Alternative 4. These percentages are also consistent (within 1.0 percent) when comparing energy use assuming construction of the McLoughlin Tunnel. The same pattern and relative percentage differences also hold true for CO<sub>2</sub>e emissions.

### 6.3 Impacts from Segment-Level Choices

Detailed construction cost estimates associated with particular segment-level choices (e.g. interchange configuration) have not been prepared at this time and therefore this analysis does not include the effects of such options. However, effects of segment-level

choices on the total energy consumed and amount of CO<sub>2</sub>e emitted by the construction of the project alternatives would be minor.

## **6.4 Impacts from Other Project Elements**

As previously described, the full alternatives represent specific combinations of system-level choices and segment-level choices. In addition to these choices and options, two other project elements have been identified that would potentially affect short-term energy use and CO<sub>2</sub>e emissions.

### **6.4.1 Minimum Operable Segments**

The Clark College and Mill Plain MOSs provide a lower cost alternative in the event that the full length HCT lines could not be funded in a single phase of construction and financing. The Clark College MOS would shorten the HCT line from 4.22 miles to 2.65 miles, and the Mill Plain MOS would reduce the length of the HCT line from 4.22 miles to 2.07 miles. Additional detail on the temporary effects on energy use and CO<sub>2</sub>e emissions is provided in Section 6.5.6.

### **6.4.2 Transit Maintenance Base Options**

The site location (either TriMet's Ruby Junction Maintenance Base or C-TRAN's maintenance base in east Vancouver) and scale of the maintenance base expansion would determine the amount of energy that would be consumed and CO<sub>2</sub>e that would be emitted during construction. The preferred site location has not yet been determined and construction cost estimates have not been prepared. Accordingly, energy use and CO<sub>2</sub>e emission estimates cannot be provided at this time. However, the amount of energy used and CO<sub>2</sub>e emitted related to maintenance base options would be negligible compared to the overall effects of the project.

## **6.5 Impacts from System-Level Choices**

Analysis of the full alternatives provides estimates on the amount of energy that would be required and the amount of CO<sub>2</sub>e that would be emitted during the construction of a combined and pre-defined set of system-level choices and segment-level choices.

Analysis of the effects of system-level choices on construction energy use and CO<sub>2</sub>e emissions offers additional insight on specific project variables that could be used to derive new estimates associated with different combinations of system-level choices and segment-level choices.

Preliminary construction cost estimates were prepared for a number of variations of each full alternative to allow comparisons with a single variable. Two sets of comparisons were evaluated to increase the confidence level of the identified effects of system-level choices. For each discussion below, the most conservative estimate (i.e. the comparison that results in the largest difference) is identified as the effect of that particular system-level choice. All comparisons were within 1.0 percent of each other.

**Exhibit 6-1. Temporary Effects on Energy Use and CO<sub>2</sub>e Emissions Related to the Construction of the Full Alternatives**

Alternative Construction Element	Alternative 2		Alternative 3		Alternative 4		Alternative 5	
	Energy Consumed (mBtu)	CO <sub>2</sub> e Emissions (tons)	Energy Consumed (mBtu)	CO <sub>2</sub> e Emissions (tons)	Energy Consumed (mBtu)	CO <sub>2</sub> e Emissions (tons)	Energy Consumed (mBtu)	CO <sub>2</sub> e Emissions (tons)
Project Cost (2007\$)	\$2,641,668,596		\$2,781,200,598		\$2,446,698,968		\$2,564,108,066	
South Highway Approach	1,785,754.5	149,432.1	1,785,754.5	149,227.5	1,894,597.4	158,540.1	1,894,597.4	158,540.1
North Highway Approach	1,386,874.2	116,053.8	1,386,874.2	115,894.9	1,024,308.0	85,714.2	1,022,311.9	85,547.2
Columbia River Bridges	2,698,290.6	225,793.3	2,698,290.6	225,484.1	2,349,097.1	196,572.7	2,349,097.1	196,572.7
Transit	1,125,336.9	94,168.3	1,348,181.0	112,661.5	635,550.5	53,182.9	818,727.2	68,511.2
<b>Subtotal</b>	<b>6,996,256.2</b>	<b>585,447.5</b>	<b>7,219,100.3</b>	<b>603,267.9</b>	<b>5,903,553.0</b>	<b>494,010.0</b>	<b>6,084,733.6</b>	<b>509,171.2</b>
16th St Tunnel Project Cost (2007\$)	\$14,662,600		\$15,450,400		\$0		\$0	
16th St Tunnel	59,611.0	4,730.8	62,449.0	4,956.0	0	0	0	0
McLoughlin Tunnel Project Cost (2007\$)	\$383,000		\$787,000		\$0		\$0	
McLoughlin Tunnel	1,115.6	88.5	2,571.0	204.0	0.0	0.0	0.0	0.0
<b>Total (with 16th St Tunnel)</b>	<b>7,055,867.3</b>	<b>590,178.3</b>	<b>7,281,549.3</b>	<b>608,224.0</b>	<b>5,903,553.0</b>	<b>494,010.0</b>	<b>6,084,733.6</b>	<b>509,171.2</b>
<b>Total (with McLoughlin Tunnel)</b>	<b>6,997,371.9</b>	<b>585,536.1</b>	<b>7,221,671.3</b>	<b>603,472.0</b>	<b>5,903,553.0</b>	<b>494,010.0</b>	<b>6,084,733.6</b>	<b>509,171.2</b>

Note: To provide a conservative estimate, Alternatives 2 and 3 are based on construction of a downstream bridge and Alternatives 4 and 5 assume an upstream bridge. However, the difference in energy consumption due to a downstream or upstream bridge alignment is minor.

Note: 70 percent of the required energy is assumed to come from diesel and 30 percent from gasoline.

### 6.5.1 River Crossing Type and Capacity: How does the supplemental crossing compare to the replacement crossing?

Exhibit 6-2 identifies how construction energy use and CO<sub>2</sub>e emissions change with respect to the river crossing type.

#### Exhibit 6-2. Effects of River Crossing Type on Temporary Energy Consumption and CO<sub>2</sub>e Emissions

Alternative Attribute	Alternative 2 vs 4	
	Replace	Supplement
Project Cost (2007\$)	\$2,598,962,352	\$2,446,698,968
Required Energy (mBtu) <sup>a</sup>	6,327,751.2	5,903,553.0
Gasoline Consumed (gal)	15,312,039	14,285,554
Diesel Consumed (gal)	31,937,371	29,796,361
CO <sub>2</sub> e Emissions from Gasoline (tons)	156,344	145,863
CO <sub>2</sub> e Emissions from Diesel (tons)	373,163	348,147
Total CO <sub>2</sub> e Emissions (tons)	529,507	494,010

Alternative Attribute	Alternative 3 vs 5	
	Replace	Supplement
Project Cost (2007\$)	\$2,716,371,450	\$2,564,108,066
Required Energy (mBtu) <sup>a</sup>	6,510,928.0	6,084,733.6
Gasoline Consumed (gal)	15,755,294	14,723,980
Diesel Consumed (gal)	32,861,899	30,710,814
CO <sub>2</sub> e Emissions from Gasoline (tons)	160,870	150,340
CO <sub>2</sub> e Emissions from Diesel (tons)	383,965	358,832
Total CO <sub>2</sub> e Emissions (tons)	544,835	509,171

<sup>a</sup> 70 percent of the required energy is assumed to come from diesel and 30 percent from gasoline.

<sup>b</sup> 40 percent of the electricity is assumed to come from PGE, which derives 42.0 percent of generated electricity from coal and 13.9 percent from natural gas. The remaining 60 percent of electricity is assumed to come from CPU, which receives 28 percent of its electricity from natural gas and 7 percent from coal. Other primary sources used by PGE and CPU to generate electricity do not emit CO<sub>2</sub> (e.g. hydroelectric, nuclear, and biomass).

The comparison of Alternatives 2 and 4 provided the most conservative estimate of the effect of river crossing type. The replacement bridge would result in approximately 7.2 percent more energy consumption and CO<sub>2</sub>e emissions compared to the supplemental bridge for construction.

### 6.5.2 Transit Mode: How does BRT compare to LRT?

Exhibit 6-3 compares the preliminary construction cost estimates of alternatives that include BRT and LRT systems to identify the effect of HCT modes on energy use and CO<sub>2</sub>e emissions during construction.

Both sets of comparisons utilized data for Alternatives 2 and 3, but one set included cost estimates for a downstream bridge while the second set used estimates for an upstream bridge (note: the upstream alignment is no longer being considered for further evaluation,

but was used for this analysis for comparative purposes only). The more conservative comparison indicated that construction energy use and CO<sub>2</sub>e emissions associated with LRT technology are both approximately 3.3 percent higher compared to the BRT.

**Exhibit 6-3. Effects of HCT Mode on Temporary Energy Consumption and CO<sub>2</sub>e Emissions**

Alternative Attribute	Alternative 2A vs 3A	
	BRT	LRT
Project Cost (2007\$)	\$2,608,203,402	\$2,732,913,297
Required Energy (mBtu) <sup>a</sup>	6,815,057.7	7,037,871.8
Gasoline Consumed (gal)	16,491,235	17,030,405
Diesel Consumed (gal)	34,396,900	35,521,485
CO <sub>2</sub> e Emissions from Gasoline (tons)	168,384	173,889
CO <sub>2</sub> e Emissions from Diesel (tons)	401,901	415,041
Total CO <sub>2</sub> e Emissions (tons)	570,285	588,930

Alternative Attribute	Alternative 2B vs 3B	
	BRT	LRT
Project Cost (2007\$)	\$2,641,668,596	\$2,781,200,598
Required Energy (mBtu) <sup>a</sup>	6,996,256.2	7,219,100.3
Gasoline Consumed (gal)	16,929,703	17,468,946
Diesel Consumed (gal)	35,311,443	36,436,180
CO <sub>2</sub> e Emissions from Gasoline (tons)	172,861	178,367
CO <sub>2</sub> e Emissions from Diesel (tons)	412,586	425,728
Total CO <sub>2</sub> e Emissions (tons)	585,448	604,095

<sup>a</sup> 70 percent of the required energy is assumed to come from diesel and 30 percent from gasoline.

<sup>b</sup> 40 percent of the electricity is assumed to come from PGE, which derives 42.0 percent of generated electricity from coal and 13.9 percent from natural gas. The remaining 60 percent of electricity is assumed to come from CPU, which receives 28 percent of its electricity from natural gas and 7 percent from coal. Other primary sources used by PGE and CPU to generate electricity do not emit CO<sub>2</sub> (e.g. hydroelectric, nuclear, and biomass).

**6.5.3 Balance of Transit vs. Highway Investment: Increased Transit System Operations with Aggressive TDM/TSM Measures, and Efficient Transit System Operations with Standard TDM/TSM Measures**

These system-level choices would not require substantial, if any, construction activities and therefore do not have any temporary effects on energy use or CO<sub>2</sub>e emissions.

**6.5.4 Major Transit Alignment: How does the Vancouver alignments compare to the I-5 alignments?**

Construction cost estimates for similar alternatives with different alignments were compared to isolate the effect of the HCT alignment on temporary energy use effects and CO<sub>2</sub>e emissions. Based on the comparisons provided in Exhibit 6-4, the I-5 HCT alignments would consume more construction energy and emit more CO<sub>2</sub>e by approximately 7.7 percent, compared to the Vancouver alignments.

### Exhibit 6-4. Effects of HCT Alignment on Temporary Energy Consumption and CO<sub>2</sub>e Emissions

Alternative Attribute	Alternative 2A (Vancouver) vs 2A (I-5)	
	Vancouver	I-5
Project Cost (2007\$)	\$2,598,962,352	\$2,608,203,402
Required Energy (mBtu) <sup>a</sup>	6,327,751.2	6,815,057.7
Gasoline Consumed (gal)	15,312,039	16,491,235
Diesel Consumed (gal)	31,937,371	34,396,900
CO <sub>2</sub> e Emissions from Gasoline (tons)	156,344	168,384
CO <sub>2</sub> e Emissions from Diesel (tons)	373,163	401,901
Total CO <sub>2</sub> e Emissions (tons)	529,507	570,285

Alternative Attribute	Alternative 2B (Vancouver) vs 2B (I-5)	
	Vancouver	I-5
Project Cost (2007\$)	\$2,632,102,718	\$2,641,668,596
Required Energy (mBtu) <sup>a</sup>	6,506,469.8	6,996,256.2
Gasoline Consumed (gal)	15,744,507	16,929,703
Diesel Consumed (gal)	32,839,397	35,311,443
CO <sub>2</sub> e Emissions from Gasoline (tons)	160,760	172,861
CO <sub>2</sub> e Emissions from Diesel (tons)	383,702	412,586
Total CO <sub>2</sub> e Emissions (tons)	544,462	585,448

<sup>a</sup> 70 percent of the required energy is assumed to come from diesel and 30 percent from gasoline.

<sup>b</sup> 40 percent of the electricity is assumed to come from PGE, which derives 42.0 percent of generated electricity from coal and 13.9 percent from natural gas. The remaining 60 percent of electricity is assumed to come from CPU, which receives 28 percent of its electricity from natural gas and 7 percent from coal. Other primary sources used by PGE and CPU to generate electricity do not emit CO<sub>2</sub> (e.g. hydroelectric, nuclear, and biomass).

#### 6.5.5 Tolling: How do the tolling scenarios compare (No Toll, Standard Toll, or Standard Toll on Both I-5 and I-205)

All CRC alternatives presented in this analysis assume open road tolling (ORT) technology that allows the collection of tolls without the use of lane-dividing barriers or tolling structures. As a result, this system-level choice would not require any construction activities and therefore would not have any temporary effects on energy use or CO<sub>2</sub>e emissions.

#### 6.5.6 Transit Project Length: How do the full-length alternatives compare to the shorter length option

The Clark College and Mill Plain MOSs would shorten the HCT transit lines and reduce the amount of necessary construction, and would therefore reduce the amount of energy consumed and CO<sub>2</sub>e emitted during construction. Exhibit 6-5 illustrates the differences in construction energy consumption and CO<sub>2</sub>e emissions when comparing full-length alternatives to MOSs.



**Exhibit 6-5. Effects of the Clark College and Mill Plain MOSs on Temporary Energy Use and CO<sub>2</sub>e Emissions**

Alternative Attribute	Full-Length	Alternative 2	
		Clark College MOS	Mill Plain MOS
Project Cost (2007\$)	\$2,732,913,297	\$2,524,839,817	\$2,462,135,852
Required Energy (mBtu) <sup>a</sup>	7,037,871.8	6,497,496.5	6,404,586.7
Gasoline Consumed (gal)	17,030,405	15,722,793	15,497,967
Diesel Consumed (gal)	35,521,485	32,794,107	32,325,174
CO <sub>2</sub> e Emissions from Gasoline (tons)	173,889	160,538	158,242
CO <sub>2</sub> e Emissions from Diesel (tons)	415,041	383,173	377,694
Total CO <sub>2</sub> e Emissions (tons)	588,930	543,711	535,937

Alternative Attribute	Full-Length	Alternative 3	
		Clark College MOS	Mill Plain MOS
Project Cost (2007\$)	\$2,608,203,402	\$2,444,260,434	\$2,417,655,773
Required Energy (mBtu) <sup>a</sup>	6,815,057.7	6,349,121.4	6,290,356.0
Gasoline Consumed (gal)	16,491,235	15,363,751	15,221,549
Diesel Consumed (gal)	34,396,900	32,045,230	31,748,630
CO <sub>2</sub> e Emissions from Gasoline (tons)	168,384	156,872	155,420
CO <sub>2</sub> e Emissions from Diesel (tons)	401,901	374,423	370,958
Total CO <sub>2</sub> e Emissions (tons)	570,285	531,295	526,378

<sup>a</sup> 70 percent of the required energy is assumed to come from diesel and 30 percent from gasoline.

<sup>b</sup> 40 percent of the electricity is assumed to come from PGE, which derives 42.0 percent of generated electricity from coal and 13.9 percent from natural gas. The remaining 60 percent of electricity is assumed to come from CPU, which receives 28 percent of its electricity from natural gas and 7 percent from coal. Other primary sources used by PGE and CPU to generate electricity do not emit CO<sub>2</sub> (e.g. hydroelectric, nuclear, and biomass).

Compared to the full-length alternative, ending the HCT line at the Clark College MOS would result in a 8.3 percent reduction in energy use and CO<sub>2</sub>e emissions during construction. Because the Mill Plain MOS is the shortest transit line, its effect would be the most pronounced; resulting in a reduction in energy consumption and CO<sub>2</sub>e emissions of approximately 9.9 percent compared to the full-length alternative.

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## 7. Cumulative Effects

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A cumulative effect is the effect on the environment which results from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively substantial actions taking place over a period of time.

The project team has addressed the cumulative effects through a separate technical memorandum. However, a general and qualitative evaluation is provided below.

### 7.1 Introduction

Cumulative effects related to energy use and CO<sub>2</sub>e emissions are partially incorporated into the long-term effects analysis since energy estimates are based on travel demand forecasts and their associated operational efficiency. These travel demand forecasts factor in projected changes in land use patterns, population growth, and other programmed transportation improvements (see the Traffic Technical Report, CRC Project Team 2008a). As a result, the long-term effects analysis is cumulative in nature. Therefore, the following discussion is only applicable to the cumulative effects resulting from the temporary effects, which are associated with construction, of the project on energy use and CO<sub>2</sub>e emissions.

In addition, project-related CO<sub>2</sub>e emissions contribute to other past and reasonably foreseeable future actions world wide that have led to increased GHG emissions and global climate change. The project's contribution to global GHG emissions is miniscule, and its effect on climate change likely immeasurable. However, the collective effect from many small contributions to GHG emissions is recognized as potentially substantial. This issue is discussed in the CRC Cumulative Effects Technical Report (CRC Project Team 2008c).

### 7.2 Cumulative System-wide Effects

As described in Section 4, Affected Environment, energy (especially petroleum) supply, demand, distribution, and regulation is generally evaluated at national and state levels. Exhibit 7-1 compares estimated demand for petroleum needed for construction of the full build alternatives to Washington and Oregon demand for petroleum in 2004.

### Exhibit 7-1. Cumulative Energy Effects of Constructing the Project Alternatives

Alternative Construction Element	Alternative 2	Alternative 3	Alternative 4	Alternative 5
	Energy Consumed (mBtu)	Energy Consumed (mBtu)	Energy Consumed (mBtu)	Energy Consumed (mBtu)
Project Cost (2007\$)	\$2,656,331,196	\$2,796,650,998	\$2,446,698,968	\$2,564,108,066
South Highway Approach	1,785,754.5	1,785,754.5	1,894,597.4	1,894,597.4
North Highway Approach	1,386,874.2	1,386,874.2	1,024,308.0	1,022,311.9
Columbia River Bridges	2,698,290.6	2,698,290.6	2,349,097.1	2,349,097.1
Transit	1,125,336.9	1,348,181.0	635,550.5	818,727.2
16th St Tunnel	59,611.0	62,449.0	0.0	0.0
<b>Total</b>	<b>7,055,867.3</b>	<b>7,281,549.3</b>	<b>5,903,553.0</b>	<b>6,084,733.6</b>
<b>Percent of Regional Demand<sup>a</sup></b>	<b>0.57%</b>	<b>0.59%</b>	<b>0.48%</b>	<b>0.49%</b>

<sup>a</sup> Washington's 2004 demand for petroleum was 842.4 trillion Btu and Oregon's 2004 petroleum demand was 390.8 trillion Btu for a combined demand of approximately 1,233.2 trillion Btu (USDOE 2004a).

As shown in Exhibit 7-1, the energy consumed to construct the build alternatives is minor compared to the total demand for petroleum-derived energy in Washington and Oregon. The most energy-intensive alternative, Alternative 3, would account for approximately 0.59 percent of Washington's and Oregon's 2004 demand. The true cumulative effect of the project can only be determined when including the future energy demand for all construction projects in Washington and Oregon relative to the two-state supply; however this information is not available. Some project's that are currently not completed, but are planned and programmed, can be found in the city's, county's, and/or state's Transportation Improvement Program (TIP) project lists.

The CO<sub>2</sub>e emissions associated with the build alternatives would increase CO<sub>2</sub>e emissions in Washington and Oregon by a miniscule amount. However, if the project's CO<sub>2</sub>e emissions are considered in conjunction with all of Washington's and Oregon's CO<sub>2</sub>e-emitting transportation projects (past, present, and future), the build alternatives would contribute to a cumulative effect.

Oregon House Bill 3543 (see Section 2.3.2.6) includes statewide efforts to reduce GHG emissions. Although the efforts to carry out the directive in this bill are in its preliminary stages, with successful implementation of the reduction goals, future statewide emission levels may still decrease relative to existing conditions, independent of the build alternatives.

## 8. Mitigation for Long-Term Effects

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Operational energy consumption and CO<sub>2</sub>e emissions are projected to increase by 2030 under all scenarios, build and No-Build. All build alternatives include a variety of options that are expected to reduce personal vehicle travel demand and improve the operations of the I-5 bridge crossing compared to No-Build.

Options that help the build alternatives reduce travel demand and improve operations relative to the No-Build alternative include:

- Tolling the I-5 bridge crossing reduces auto trips,
- TDM/TSM measures reduce auto trips,
- Fast and reliable high-capacity transit reduces auto trips,
- Improved bike and pedestrian facilities and connections reduce auto trips, and
- Additional bridge crossing capacity reduces congestion which enables vehicles on the highway to run at more energy efficient speeds and with lower emissions.

Reducing the number of auto trips reduces the amount of operational energy consumed by vehicles and also reduces the amount of CO<sub>2</sub>e emissions. Improving traffic congestion allows vehicles to operate at higher speeds that result in improved fuel efficiency and reduced fuel consumption and CO<sub>2</sub>e emissions.

Due to the reduction in travel demand and operational improvements, Alternatives 2 and 3 would reduce energy consumption and CO<sub>2</sub>e emissions compared to the No-Build Alternative and, therefore, measures to reduce long-term effects would not be warranted.

Although Alternatives 4 and 5 would reduce the amount of operational energy use and CO<sub>2</sub>e emissions associated with personal vehicle travel, as a result of reduced travel demand and operational improvements, both of these alternatives would use more operational energy and emit more CO<sub>2</sub>e compared to the No-Build Alternative as a result of shortened transit headways (the time interval between transit vehicles moving in the same direction on a particular route, either arriving or departing) and higher transit VMT.

There are currently no regulations that quantifiably restrict the amount of energy used or CO<sub>2</sub>e emitted from a project, therefore, mitigation is not required for any build alternatives. However, other potential measures used to offset the project's effects that could be evaluated for all alternatives include:

- Planting CO<sub>2</sub>e-absorbing trees and fauna.
- Creating, funding, and supporting programs that further encourage use of public transit.
- Providing safer and more accessible paths for bicyclist and pedestrians.
- Promoting use of alternative energy in vehicles and machines used in construction.

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## 9. Mitigation for Temporary Effects

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### 9.1 Introduction

Energy used during construction and in the manufacture of construction materials would be irretrievable. However, fossil fuels are not in short supply at this time and their use would not have a substantially adverse effect on the continued availability of these resources.

As described above, there are currently no quantitative restrictions on energy use and existing regulations lack quantifiable standards for assessing effects related to energy consumption and CO<sub>2</sub>e emissions. Therefore, there are no specific measures to reduce the project's temporary effects.

### 9.2 Mitigation Common to All Build Alternatives

Although there are no defined mitigation measures for effects to energy use and CO<sub>2</sub>e emissions, other measures could be implemented to reduce the effects of the project. These measures would largely encompass conservation of construction materials and best management practices (BMPs). Such BMPs could include:

- Construction materials reuse and recycling.
- Encouraging workers to carpool.
- Turning off equipment when not in use to reduce energy consumed during idling.
- Maintaining equipment in good working order to maximize fuel efficiency.
- As practical, routing truck traffic through areas where the number of stops and delay would be minimized, and using off-peak travel times to maximize fuel efficiency.
- As practical, scheduling construction activities or during daytime hours or during summer months when daylight hours are the longest to minimize the need for artificial light.
- As practical, implementing emission-control technologies for construction equipment.
- As practical, using ultra low sulfur (for air quality purposes) and biodiesel in construction equipment.

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## 10. Permits and Approvals

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There are no specific federal, state, or local permits necessary with respect to energy use and CO<sub>2</sub>e emissions. However, the project is subject to review under the applicable regulations described in Section 2.3, Effects Guidelines.

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# APPENDIX A

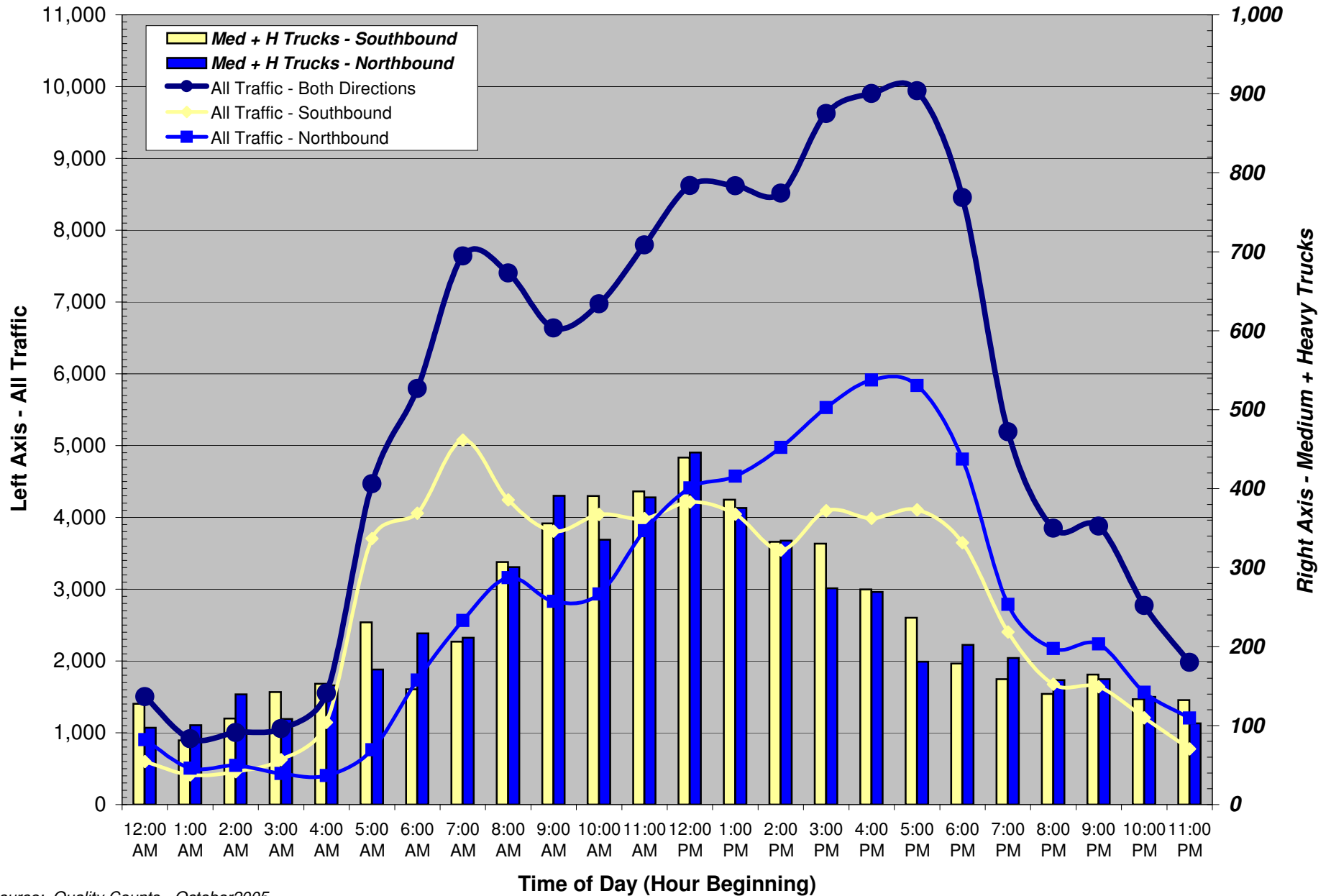
Traffic Composition





## Balanced 24-Hour Traffic Flow Profiles

(Balanced Weekday Volumes along I-5 on the Columbia River Bridge - Oct. 2005)



Source: Quality Counts - October 2005

[Return to Map](#)

		BALANCED VEHICLE CLASSIFICATION VOLUMES ON THE I-5 COLUMBIA RIVER BRIDGE														
Date	Time	Total Volume	Vehicle Classification												B-13	B-14
			B-1 Cycle	B-2 Cars	B-3 2A-4T	B-4 Buses	B-5 2A-SU	B-6 3A-SU	B-7 4A-SU	B-8 4A-ST	B-9 5A-ST	B-10 6A-ST	B-11 5A-MT	B-12 6A-MT		
Weekday	12:00 AM	1,504	3	641	612	6	16	3	0	7	123	31	35	12	14	0
Weekday	1:00 AM	918	0	360	349	6	22	2	2	5	95	27	36	5	9	0
Weekday	2:00 AM	1,002	1	403	335	1	14	15	0	9	136	34	30	12	14	0
Weekday	3:00 AM	1,057	4	362	410	1	29	9	0	7	137	40	29	7	22	0
Weekday	4:00 AM	1,550	13	575	615	7	36	25	0	12	134	58	19	6	49	0
Weekday	5:00 AM	4,469	13	1,961	1,986	18	89	37	0	18	211	54	16	14	52	0
Weekday	6:00 AM	5,793	6	2,789	2,473	34	129	30	0	15	187	74	9	5	44	0
Weekday	7:00 AM	7,641	15	4,119	2,872	50	167	55	1	26	208	76	9	12	31	0
Weekday	8:00 AM	7,404	25	3,537	2,966	47	220	79	7	30	333	93	28	3	34	0
Weekday	9:00 AM	6,637	9	2,825	2,800	30	227	92	28	64	341	129	23	18	51	0
Weekday	10:00 AM	6,975	8	3,119	2,904	17	201	108	20	49	355	131	10	15	38	0
Weekday	11:00 AM	7,796	9	3,227	3,545	22	207	103	25	63	358	148	13	16	61	0
Weekday	12:00 PM	8,622	14	3,708	3,757	29	228	94	28	98	397	166	13	18	71	0
Weekday	1:00 PM	8,618	25	3,871	3,712	16	232	101	10	47	375	133	11	6	78	0
Weekday	2:00 PM	8,517	29	3,828	3,789	25	179	74	21	48	353	115	13	2	41	0
Weekday	3:00 PM	9,623	36	4,244	4,484	46	210	53	2	63	328	114	5	6	34	0
Weekday	4:00 PM	9,902	46	4,720	4,401	57	136	52	0	58	314	67	14	2	34	0
Weekday	5:00 PM	9,941	44	5,014	4,320	52	94	43	0	44	236	62	9	1	23	0
Weekday	6:00 PM	8,456	23	4,291	3,667	26	70	28	0	25	235	63	5	9	16	0
Weekday	7:00 PM	5,193	8	2,760	2,017	15	49	12	6	15	209	57	9	18	18	0
Weekday	8:00 PM	3,850	11	2,080	1,403	15	43	10	1	7	211	36	22	1	9	0
Weekday	9:00 PM	3,878	2	2,169	1,351	10	22	12	1	11	224	25	17	17	16	0
Weekday	10:00 PM	2,773	9	1,607	854	15	18	18	0	11	168	22	22	11	18	0
Weekday	11:00 PM	1,980	2	1,057	665	9	13	11	1	15	106	32	23	14	33	0
<b>Weekday</b>	<b>Total</b>	<b>134,100</b>	<b>356</b>	<b>63,267</b>	<b>56,286</b>	<b>554</b>	<b>2,650</b>	<b>1,067</b>	<b>154</b>	<b>748</b>	<b>5,776</b>	<b>1,787</b>	<b>420</b>	<b>227</b>	<b>809</b>	<b>0</b>

Med Trucks	Heavy Trucks	M + H Trucks
B6-B7	B8-B13	B6-B13
3	221	225
5	177	182
15	234	249
9	242	251
25	279	304
37	365	402
30	333	363
56	362	418
86	522	608
120	627	747
128	598	726
128	658	785
122	763	885
111	650	762
95	572	667
56	549	604
52	490	542
43	374	418
28	353	381
18	326	344
11	287	298
13	311	323
18	252	270
13	222	235
<b>1,220</b>	<b>9,767</b>	<b>10,987</b>

		BALANCED VEHICLE CLASSIFICATION VOLUMES ON THE I-5 COLUMBIA RIVER BRIDGE														
Date	Time	Total Volume	Vehicle Classification												B-13	B-14
			B-1 Cycle	B-2 Cars	B-3 2A-4T	B-4 Buses	B-5 2A-SU	B-6 3A-SU	B-7 4A-SU	B-8 4A-ST	B-9 5A-ST	B-10 6A-ST	B-11 5A-MT	B-12 6A-MT		
Weekday	12:00 AM	100%	0.2%	42.7%	40.7%	0.4%	1.1%	0.2%	0.0%	0.5%	8.2%	2.1%	2.3%	0.8%	0.9%	0.0%
Weekday	1:00 AM	100%	0.0%	39.2%	38.0%	0.6%	2.4%	0.2%	0.2%	0.5%	10.4%	3.0%	4.0%	0.5%	1.0%	0.0%
Weekday	2:00 AM	100%	0.1%	40.2%	33.4%	0.1%	1.4%	1.5%	0.0%	0.9%	13.6%	3.4%	2.9%	1.1%	1.4%	0.0%
Weekday	3:00 AM	100%	0.4%	34.3%	38.8%	0.1%	2.7%	0.9%	0.0%	0.7%	12.9%	3.8%	2.8%	0.6%	2.0%	0.0%
Weekday	4:00 AM	100%	0.8%	37.1%	39.7%	0.4%	2.3%	1.6%	0.0%	0.8%	8.7%	3.8%	1.2%	0.4%	3.1%	0.0%
Weekday	5:00 AM	100%	0.3%	43.9%	44.4%	0.4%	2.0%	0.8%	0.0%	0.4%	4.7%	1.2%	0.4%	0.3%	1.2%	0.0%
Weekday	6:00 AM	100%	0.1%	48.1%	42.7%	0.6%	2.2%	0.5%	0.0%	0.3%	3.2%	1.3%	0.2%	0.1%	0.8%	0.0%
Weekday	7:00 AM	100%	0.2%	53.9%	37.6%	0.7%	2.2%	0.7%	0.0%	0.3%	2.7%	1.0%	0.1%	0.2%	0.4%	0.0%
Weekday	8:00 AM	100%	0.3%	47.8%	40.1%	0.6%	3.0%	1.1%	0.1%	0.4%	4.5%	1.3%	0.4%	0.0%	0.5%	0.0%
Weekday	9:00 AM	100%	0.1%	42.6%	42.2%	0.4%	3.4%	1.4%	0.4%	1.0%	5.1%	1.9%	0.3%	0.3%	0.8%	0.0%
Weekday	10:00 AM	100%	0.1%	44.7%	41.6%	0.2%	2.9%	1.5%	0.3%	0.7%	5.1%	1.9%	0.1%	0.2%	0.5%	0.0%
Weekday	11:00 AM	100%	0.1%	41.4%	45.5%	0.3%	2.7%	1.3%	0.3%	0.8%	4.6%	1.9%	0.2%	0.2%	0.8%	0.0%
Weekday	12:00 PM	100%	0.2%	43.0%	43.6%	0.3%	2.6%	1.1%	0.3%	1.1%	4.6%	1.9%	0.1%	0.2%	0.8%	0.0%
Weekday	1:00 PM	100%	0.3%	44.9%	43.1%	0.2%	2.7%	1.2%	0.1%	0.5%	4.4%	1.5%	0.1%	0.1%	0.9%	0.0%
Weekday	2:00 PM	100%	0.3%	44.9%	44.5%	0.3%	2.1%	0.9%	0.2%	0.6%	4.1%	1.4%	0.1%	0.0%	0.5%	0.0%
Weekday	3:00 PM	100%	0.4%	44.1%	46.6%	0.5%	2.2%	0.6%	0.0%	0.7%	3.4%	1.2%	0.0%	0.1%	0.4%	0.0%
Weekday	4:00 PM	100%	0.5%	47.7%	44.4%	0.6%	1.4%	0.5%	0.0%	0.6%	3.2%	0.7%	0.1%	0.0%	0.3%	0.0%
Weekday	5:00 PM	100%	0.4%	50.4%	43.5%	0.5%	0.9%	0.4%	0.0%	0.4%	2.4%	0.6%	0.1%	0.0%	0.2%	0.0%
Weekday	6:00 PM	100%	0.3%	50.7%	43.4%	0.3%	0.8%	0.3%	0.0%	0.3%	2.8%	0.7%	0.1%	0.1%	0.2%	0.0%
Weekday	7:00 PM	100%	0.2%	53.1%	38.8%	0.3%	0.9%	0.2%	0.1%	0.3%	4.0%	1.1%	0.2%	0.3%	0.3%	0.0%
Weekday	8:00 PM	100%	0.3%	54.0%	36.4%	0.4%	1.1%	0.3%	0.0%	0.2%	5.5%	0.9%	0.6%	0.0%	0.2%	0.0%
Weekday	9:00 PM	100%	0.1%	55.9%	34.8%	0.3%	0.6%	0.3%	0.0%	0.3%	5.8%	0.6%	0.4%	0.4%	0.4%	0.0%
Weekday	10:00 PM	100%	0.3%	58.0%	30.8%	0.5%	0.7%	0.7%	0.0%	0.4%	6.0%	0.8%	0.8%	0.4%	0.6%	0.0%
Weekday	11:00 PM	100%	0.1%	53.4%	33.6%	0.5%	0.6%	0.6%	0.1%	0.7%	5.4%	1.6%	1.2%	0.7%	1.7%	0.0%
<b>Weekday</b>	<b>Total</b>	<b>100%</b>	<b>0.3%</b>	<b>47.2%</b>	<b>42.0%</b>	<b>0.4%</b>	<b>2.0%</b>	<b>0.8%</b>	<b>0.1%</b>	<b>0.6%</b>	<b>4.3%</b>	<b>1.3%</b>	<b>0.3%</b>	<b>0.2%</b>	<b>0.6%</b>	<b>0.0%</b>

- |                        |                          |  |   |
|------------------------|--------------------------|--|---|
| <b>2-Axle Vehicles</b> | <b>Single Unit Truck</b> | <b>Multi-Unit Truck w/<br/>One Trailer</b> | <b>Multi-Unit Truck w/<br/>Two or More Trailers</b> |
| B-1 Motorcycle         | B-6 3 Axles              | B-8 <5 Axles                               | B-11 < 6 Axles                                      |
| B-2 Car                | B-7 4 Axles              | B-9 5 Axles                                | B-12 6 Axles  |
| B-3 Light Pickup       |                          | B-10 >5 Axles                              | B-13 7 Axles  |
| B-4 Bus                |                          |  |   |
| B-5 2 Axles w/ 6 Tires |                          |  |   |



# APPENDIX B

Fuel Consumption Rates



**SOURCE: ODOT. 1988. Fuel Consumption Rate Estimates Obtained by using Revised Fuel Correction Factors from Caltrans as Predicted by the Motor Fuel Consumption Model.**

**Urban Fuel Consumption Rates - AUTOMOBILES (gallons/mile)**

Year	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph
1990	0.051	0.047	0.044	0.042	0.041	0.040	0.039	0.038
1991	0.050	0.046	0.044	0.042	0.040	0.039	0.038	0.037
1992	0.050	0.046	0.043	0.041	0.040	0.038	0.038	0.037
1993	0.049	0.045	0.043	0.041	0.039	0.038	0.037	0.036
1994	0.049	0.045	0.043	0.041	0.039	0.038	0.037	0.036
1995	0.049	0.045	0.042	0.040	0.039	0.038	0.037	0.036
1996	0.048	0.044	0.042	0.040	0.038	0.037	0.036	0.035
1997	0.047	0.044	0.041	0.039	0.038	0.037	0.036	0.035
1998	0.047	0.043	0.041	0.039	0.037	0.036	0.035	0.035
1999	0.047	0.043	0.040	0.038	0.037	0.036	0.035	0.034
2000	0.046	0.042	0.040	0.038	0.037	0.036	0.035	0.034
2001	0.046	0.042	0.040	0.038	0.037	0.036	0.035	0.034
2002	0.046	0.042	0.039	0.038	0.036	0.035	0.034	0.034
2003	0.045	0.042	0.039	0.037	0.036	0.035	0.034	0.033
2004	0.045	0.041	0.039	0.037	0.036	0.035	0.034	0.033
2005	0.045	0.041	0.039	0.037	0.036	0.035	0.034	0.033
2006	0.045	0.041	0.039	0.037	0.036	0.035	0.034	0.033
<b>2007</b>	<b>0.045</b>	<b>0.041</b>	<b>0.039</b>	<b>0.037</b>	<b>0.036</b>	<b>0.035</b>	<b>0.034</b>	<b>0.033</b>
2008	0.045	0.041	0.039	0.037	0.036	0.035	0.034	0.033
2009	0.045	0.041	0.039	0.037	0.035	0.034	0.034	0.033
2010	0.045	0.041	0.039	0.037	0.035	0.034	0.034	0.033
2011	0.044	0.041	0.038	0.037	0.035	0.034	0.033	0.033
2012	0.044	0.041	0.038	0.037	0.035	0.034	0.033	0.033
2013	0.044	0.041	0.038	0.036	0.035	0.034	0.033	0.033
2014	0.044	0.041	0.038	0.036	0.035	0.034	0.033	0.033
2015	0.044	0.041	0.038	0.036	0.035	0.034	0.033	0.032
<b>G-Rate</b>	<b>-0.006</b>	<b>-0.005</b>	<b>-0.006</b>	<b>-0.006</b>	<b>-0.006</b>	<b>-0.006</b>	<b>-0.007</b>	<b>-0.007</b>
2016	0.044	0.041	0.038	0.036	0.035	0.034	0.033	0.032
2017	0.043	0.041	0.038	0.036	0.035	0.034	0.033	0.032
2018	0.043	0.040	0.037	0.035	0.034	0.033	0.032	0.031
2019	0.043	0.040	0.037	0.035	0.034	0.033	0.032	0.031
2020	0.043	0.040	0.037	0.035	0.034	0.033	0.032	0.031
2021	0.042	0.040	0.037	0.035	0.034	0.033	0.032	0.031
2022	0.042	0.039	0.036	0.034	0.033	0.032	0.031	0.030
2023	0.042	0.039	0.036	0.034	0.033	0.032	0.031	0.030
2024	0.042	0.039	0.036	0.034	0.033	0.032	0.031	0.030
2025	0.041	0.039	0.036	0.034	0.033	0.032	0.031	0.030
2026	0.041	0.039	0.036	0.034	0.033	0.032	0.031	0.030
2027	0.041	0.038	0.035	0.033	0.032	0.031	0.030	0.029
2028	0.041	0.038	0.035	0.033	0.032	0.031	0.030	0.029
2029	0.041	0.038	0.035	0.033	0.032	0.031	0.030	0.029
<b>2030</b>	<b>0.040</b>	<b>0.038</b>	<b>0.035</b>	<b>0.033</b>	<b>0.032</b>	<b>0.031</b>	<b>0.030</b>	<b>0.029</b>

**SOURCE: ODOT. 1988. Fuel Consumption Rate Estimates Obtained by using Revised Fuel Correction Factors from Caltrans as Predicted by the Motor Fuel Consumption Model.**

**Urban Fuel Consumption Rates - HEAVY VEHICLES (gallons/mile)**

Year	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph
1990	0.189	0.173	0.162	0.154	0.149	0.141	0.141	0.138
1991	0.186	0.170	0.160	0.152	0.146	0.142	0.138	0.136
1992	0.184	0.168	0.157	0.150	0.144	0.140	0.136	0.134
1993	0.181	0.168	0.155	0.148	0.142	0.138	0.134	0.132
1994	0.178	0.163	0.153	0.146	0.140	0.136	0.132	0.130
1995	0.176	0.161	0.151	0.144	0.138	0.134	0.131	0.129
1996	0.176	0.161	0.151	0.144	0.138	0.134	0.131	0.129
1997	0.173	0.159	0.149	0.142	0.136	0.132	0.129	0.127
1998	0.171	0.157	0.147	0.140	0.135	0.131	0.127	0.125
1999	0.169	0.154	0.145	0.138	0.133	0.129	0.125	0.123
2000	0.169	0.154	0.145	0.138	0.133	0.129	0.125	0.123
2001	0.167	0.152	0.143	0.136	0.131	0.127	0.124	0.122
2002	0.164	0.150	0.141	0.134	0.129	0.125	0.122	0.120
2003	0.164	0.150	0.141	0.134	0.129	0.125	0.122	0.120
2004	0.164	0.150	0.141	0.134	0.129	0.125	0.122	0.120
2005	0.162	0.149	0.139	0.133	0.128	0.124	0.121	0.119
2006	0.162	0.149	0.139	0.133	0.128	0.124	0.121	0.119
<b>2007</b>	<b>0.155</b>	<b>0.142</b>	<b>0.133</b>	<b>0.127</b>	<b>0.122</b>	<b>0.118</b>	<b>0.115</b>	<b>0.113</b>
2008	0.155	0.142	0.133	0.127	0.122	0.118	0.115	0.113
2009	0.155	0.142	0.133	0.127	0.122	0.118	0.115	0.113
2010	0.155	0.142	0.133	0.127	0.122	0.118	0.115	0.113
2011	0.160	0.146	0.137	0.131	0.126	0.122	0.119	0.117
2012	0.160	0.146	0.137	0.131	0.126	0.122	0.119	0.117
2013	0.160	0.146	0.137	0.131	0.126	0.122	0.119	0.117
2014	0.160	0.146	0.137	0.131	0.126	0.122	0.119	0.117
2015	0.160	0.146	0.137	0.131	0.125	0.122	0.119	0.117
<b>G-Rate</b>	<b>-0.007</b>	<b>-0.007</b>	<b>-0.007</b>	<b>-0.006</b>	<b>-0.007</b>	<b>-0.006</b>	<b>-0.007</b>	<b>-0.007</b>
2016	0.159	0.145	0.136	0.130	0.124	0.121	0.118	0.116
2017	0.158	0.144	0.135	0.129	0.123	0.121	0.117	0.115
2018	0.157	0.143	0.134	0.128	0.122	0.120	0.117	0.115
2019	0.156	0.142	0.133	0.128	0.122	0.119	0.116	0.114
2020	0.155	0.141	0.132	0.127	0.121	0.119	0.115	0.113
2021	0.154	0.140	0.132	0.126	0.120	0.118	0.114	0.112
2022	0.153	0.139	0.131	0.125	0.119	0.117	0.113	0.112
2023	0.152	0.138	0.130	0.124	0.118	0.116	0.113	0.111
2024	0.151	0.137	0.129	0.124	0.117	0.116	0.112	0.110
2025	0.150	0.136	0.128	0.123	0.117	0.115	0.111	0.110
2026	0.149	0.135	0.127	0.122	0.116	0.114	0.110	0.109
2027	0.148	0.135	0.126	0.121	0.115	0.114	0.110	0.108
2028	0.147	0.134	0.126	0.120	0.114	0.113	0.109	0.107
2029	0.146	0.133	0.125	0.120	0.113	0.113	0.108	0.107
<b>2030</b>	<b>0.145</b>	<b>0.132</b>	<b>0.124</b>	<b>0.119</b>	<b>0.112</b>	<b>0.112</b>	<b>0.107</b>	<b>0.106</b>

**SOURCE: ODOT. 1988. Fuel Consumption Rate Estimates Obtained by using Revised Fuel Correction Factors from Caltrans as Predicted by the Motor Fuel Consumption Model, December**

**Urban Fuel Consumption Rates - AUTOMOBILES (gallons/mile)**

Year	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph
1990	19.608	21.277	22.727	23.810	24.390	25.000	25.641	26.316
1991	20.000	21.739	22.727	23.810	25.000	25.641	26.316	27.027
1992	20.000	21.739	23.256	24.390	25.000	26.316	26.316	27.027
1993	20.408	22.222	23.256	24.390	25.641	26.316	27.027	27.778
1994	20.408	22.222	23.256	24.390	25.641	26.316	27.027	27.778
1995	20.408	22.222	23.810	25.000	25.641	26.316	27.027	27.778
1996	20.833	22.727	23.810	25.000	26.316	27.027	27.778	28.571
1997	21.277	22.727	24.390	25.641	26.316	27.027	27.778	28.571
1998	21.277	23.256	24.390	25.641	27.027	27.778	28.571	28.571
1999	21.277	23.256	25.000	26.316	27.027	27.778	28.571	29.412
2000	21.739	23.810	25.000	26.316	27.027	27.778	28.571	29.412
2001	21.739	23.810	25.000	26.316	27.027	27.778	28.571	29.412
2002	21.739	23.810	25.641	26.316	27.778	28.571	29.412	29.412
2003	22.222	23.810	25.641	27.027	27.778	28.571	29.412	30.303
2004	22.222	24.390	25.641	27.027	27.778	28.571	29.412	30.303
2005	22.222	24.390	25.641	27.027	27.778	28.571	29.412	30.303
2006	22.222	24.390	25.641	27.027	27.778	28.571	29.412	30.303
<b>2007</b>	<b>22.222</b>	<b>24.390</b>	<b>25.641</b>	<b>27.027</b>	<b>27.778</b>	<b>28.571</b>	<b>29.412</b>	<b>30.303</b>
2008	22.222	24.390	25.641	27.027	27.778	28.571	29.412	30.303
2009	22.222	24.390	25.641	27.027	28.571	29.412	29.412	30.303
2010	22.222	24.390	25.641	27.027	28.571	29.412	29.412	30.303
2011	22.727	24.390	26.316	27.027	28.571	29.412	30.303	30.303
2012	22.727	24.390	26.316	27.027	28.571	29.412	30.303	30.303
2013	22.727	24.390	26.316	27.778	28.571	29.412	30.303	30.303
2014	22.727	24.390	26.316	27.778	28.571	29.412	30.303	30.303
2015	22.727	24.390	26.316	27.778	28.571	29.412	30.303	31.250
<b>G-Rate</b>	<b>0.006</b>	<b>0.005</b>	<b>0.006</b>	<b>0.006</b>	<b>0.006</b>	<b>0.007</b>	<b>0.007</b>	<b>0.007</b>
2016	22.862	24.524	26.471	27.950	28.753	29.604	30.506	31.466
2017	22.997	24.658	26.626	28.122	28.935	29.797	30.711	31.683
2018	23.134	24.793	26.783	28.296	29.119	29.991	30.917	31.901
2019	23.271	24.929	26.940	28.471	29.304	30.187	31.124	32.121
2020	23.408	25.066	27.099	28.648	29.490	30.383	31.333	32.343
2021	23.547	25.203	27.258	28.825	29.677	30.582	31.543	32.566
2022	23.686	25.341	27.419	29.003	29.866	30.781	31.754	32.790
2023	23.827	25.480	27.580	29.182	30.055	30.982	31.967	33.017
2024	23.968	25.619	27.742	29.363	30.246	31.184	32.181	33.244
2025	24.110	25.760	27.905	29.544	30.438	31.387	32.397	33.474
2026	24.253	25.901	28.069	29.727	30.631	31.592	32.614	33.705
2027	24.396	26.043	28.234	29.911	30.826	31.798	32.833	33.937
2028	24.541	26.185	28.400	30.096	31.022	32.005	33.053	34.171
2029	24.686	26.329	28.567	30.282	31.219	32.214	33.275	34.407
<b>2030</b>	<b>24.832</b>	<b>26.473</b>	<b>28.735</b>	<b>30.470</b>	<b>31.417</b>	<b>32.424</b>	<b>33.498</b>	<b>34.644</b>

**SOURCE: ODOT. 1988. Fuel Consumption Rate Estimates Obtained by using Revised Fuel Correction Factors from Caltrans as Predicted by the Motor Fuel Consumption Model, December**

**Urban Fuel Consumption Rates - HEAVY VEHICLES (gallons/mile)**

Year	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph
1990	5.291	5.780	6.173	6.494	6.711	7.092	7.092	7.246
1991	5.376	5.882	6.250	6.579	6.849	7.042	7.246	7.353
1992	5.435	5.952	6.369	6.667	6.944	7.143	7.353	7.463
1993	5.525	5.952	6.452	6.757	7.042	7.246	7.463	7.576
1994	5.618	6.135	6.536	6.835	7.143	7.353	7.576	7.692
1995	5.682	6.211	6.623	6.944	7.246	7.463	7.634	7.752
1996	5.682	6.211	6.623	6.944	7.246	7.463	7.634	7.752
1997	5.780	6.289	6.711	7.042	7.353	7.576	7.752	7.874
1998	5.848	6.369	6.803	7.143	7.407	7.634	7.874	8.000
1999	5.917	6.494	6.897	7.246	7.519	7.752	8.000	8.130
2000	5.917	6.494	6.897	7.246	7.519	7.752	8.000	8.130
2001	5.988	6.579	6.993	7.353	7.634	7.874	8.065	8.197
2002	6.098	6.667	7.092	7.463	7.752	8.000	8.197	8.333
2003	6.098	6.667	7.092	7.463	7.752	8.000	8.197	8.333
2004	6.098	6.667	7.092	7.463	7.752	8.000	8.197	8.333
2005	6.173	6.711	7.194	7.519	7.813	8.065	8.264	8.403
2006	6.173	6.711	7.194	7.519	7.813	8.065	8.264	8.403
<b>2007</b>	<b>6.452</b>	<b>7.042</b>	<b>7.519</b>	<b>7.874</b>	<b>8.197</b>	<b>8.475</b>	<b>8.696</b>	<b>8.850</b>
2008	6.452	7.042	7.519	7.874	8.197	8.475	8.696	8.850
2009	6.452	7.042	7.519	7.874	8.197	8.475	8.696	8.850
2010	6.452	7.042	7.519	7.874	8.197	8.475	8.696	8.850
2011	6.250	6.849	7.299	7.634	7.937	8.197	8.403	8.547
2012	6.250	6.849	7.299	7.634	7.937	8.197	8.403	8.547
2013	6.250	6.849	7.299	7.634	7.937	8.197	8.403	8.547
2014	6.250	6.849	7.299	7.634	7.937	8.197	8.403	8.547
2015	6.250	6.849	7.299	7.634	8.000	8.197	8.403	8.547
<b>G-Rate</b>	<b>0.007</b>	<b>0.007</b>	<b>0.007</b>	<b>0.006</b>	<b>0.007</b>	<b>0.006</b>	<b>0.007</b>	<b>0.007</b>
2016	6.292	6.896	7.348	7.683	8.056	8.244	8.461	8.604
2017	6.334	6.943	7.398	7.733	8.113	8.292	8.518	8.661
2018	6.376	6.990	7.448	7.783	8.170	8.340	8.576	8.718
2019	6.419	7.038	7.498	7.834	8.228	8.389	8.635	8.776
2020	6.462	7.086	7.548	7.885	8.286	8.437	8.693	8.834
2021	6.505	7.134	7.599	7.936	8.344	8.486	8.753	8.892
2022	6.548	7.183	7.650	7.987	8.403	8.536	8.812	8.951
2023	6.592	7.232	7.701	8.039	8.462	8.585	8.872	9.011
2024	6.636	7.281	7.753	8.091	8.522	8.635	8.933	9.070
2025	6.681	7.330	7.805	8.144	8.582	8.685	8.993	9.130
2026	6.725	7.380	7.858	8.197	8.643	8.736	9.055	9.191
2027	6.770	7.431	7.911	8.250	8.704	8.786	9.116	9.252
2028	6.816	7.481	7.964	8.303	8.765	8.837	9.178	9.313
2029	6.861	7.532	8.018	8.357	8.827	8.889	9.241	9.375
<b>2030</b>	<b>6.907</b>	<b>7.583</b>	<b>8.072</b>	<b>8.412</b>	<b>8.889</b>	<b>8.940</b>	<b>9.304</b>	<b>9.437</b>



Posted: September 20, 2007  
 Next Update: Last week of October 2007

Table 2.8. Motor Vehicle Mileage, Fuel Consumption, and Fuel Rate

Table 2.8 Motor Vehicle Mileage, Fuel Consumption, and Fuel Rates, 1949-2005												
Year	Passenger Cars <sup>1</sup>			Vans, Pickup Trucks, and Sport Utility Vehicles <sup>2</sup>			Trucks <sup>3</sup>			All Motor Vehicles <sup>4</sup>		
	Mileage	Fuel Consumption	Fuel Rate	Mileage	Fuel Consumption	Fuel Rate	Mileage	Fuel Consumption	Fuel Rate	Mileage	Fuel Consumption	Fuel Rate
	Miles per Vehicle	Gallons per Vehicle	Miles per Gallon	Miles per Vehicle	Gallons per Vehicle	Miles per Gallon	Miles per vehicle	Gallons per vehicle	Miles per Gallon	Miles per Vehicle	Gallons per Vehicle	Miles per Gallon
1949	9,388	627	15				9,712	1,080	9	9,498	726	13.1
1950	9,060	603	15				10,316	1,229	8.4	9,321	725	12.8
1951	9,186	614	15				10,545	1,242	8.5	9,460	735	12.9
1952	9,360	639	14.7				10,769	1,288	8.4	9,642	762	12.7
1953	9,377	640	14.6				10,963	1,283	8.5	9,684	760	12.7
1954	9,349	641	14.6				10,682	1,281	8.3	9,605	758	12.7
1955	9,447	645	14.6				10,576	1,293	8.2	9,661	761	12.7
1956	9,496	654	14.5				10,511	1,309	8	9,688	771	12.6
1957	9,348	658	14.2				10,774	1,304	8.3	9,609	773	12.4
1958	9,500	670	14.2				10,768	1,303	8.3	9,732	782	12.4
1959	9,615	674	14.3				10,702	1,328	8.1	9,817	789	12.4
1960	9,518	668	14.3				10,693	1,333	8	9,732	784	12.4
1961	9,521	663	14.4				10,537	1,341	7.9	9,708	781	12.4
1962	9,494	662	14.3				10,554	1,337	7.9	9,687	779	12.4
1963	9,587	655	14.6				10,395	1,380	7.5	9,737	780	12.5
1964	9,665	661	14.6				10,408	1,389	7.5	9,805	787	12.5
1965	9,603	661	14.5				10,851	1,387	7.8	9,826	787	12.5
1966	9,733	688	14.1	8,077	833	9.7	12,537	2,250	5.6	9,675	780	12.4
1967	9,849	699	14.1	7,877	801	9.8	12,789	2,294	5.6	9,751	786	12.4
1968	9,922	714	13.9	8,376	849	9.9	12,402	2,240	5.5	9,864	805	12.2
1969	9,921	727	13.6	8,355	851	9.8	13,484	2,459	5.5	9,885	821	12
1970	9,989	737	13.5	8,676	866	10	13,565	2,467	5.5	9,976	830	12
1971	10,097	743	13.6	9,082	888	10.2	14,117	2,519	5.6	10,133	839	12.1
1972	10,171	754	13.5	9,534	922	10.3	14,780	2,657	5.6	10,279	857	12
1973	9,884	737	13.4	9,779	931	10.5	15,370	2,775	5.5	10,099	850	11.9
1974	9,221	677	13.6	9,452	862	11	14,995	2,708	5.5	9,493	788	12
1975	9,309	665	14	9,829	934	10.5	15,167	2,722	5.6	9,627	790	12.2
1976	9,418	681	13.8	10,127	934	10.8	15,438	2,764	5.6	9,774	806	12.1
1977	9,517	676	14.1	10,607	947	11.2	16,700	3,002	5.6	9,978	814	12.3
1978	9,500	665	14.3	10,968	948	11.6	18,045	3,263	5.5	10,077	816	12.4
1979	9,062	620	14.6	10,802	905	11.9	18,502	3,380	5.5	9,722	776	12.5
1980	8,813	551	16	10,437	854	12.2	18,736	3,447	5.4	9,458	712	13.3
1981	8,873	538	16.5	10,244	819	12.5	19,016	3,565	5.3	9,477	697	13.6
1982	9,050	535	16.9	10,278	782	13.5	19,931	3,647	5.5	9,644	686	14.1
1983	9,118	534	17.1	10,497	767	13.7	21,083	3,769	5.6	9,760	686	14.2
1984	9,248	530	17.4	11,151	797	14	22,550	3,967	5.7	10,017	691	14.5
1985	9,419	538	17.5	10,506	735	14.3	20,597	3,570	5.8	10,020	685	14.6
1986	9,464	543	17.4	10,764	738	14.6	22,143	3,821	5.8	10,143	692	14.7
1987	9,720	539	18	11,114	744	14.9	23,349	3,937	5.9	10,453	694	15.1
1988	9,972	531	18.8	11,465	745	15.4	22,485	3,736	6	10,721	688	15.6
1989	10,157	533	19.0	11,676	724	16.1	22,926	3,776	6.1	10,932	688	15.9
1990	10,504	520	20.2	11,902	738	16.1	23,603	3,953	6	11,107	677	16.4
1991	10,571	501	21.1	12,245	721	17	24,229	4,047	6	11,294	669	16.9
1992	10,857	517	21	12,381	717	17.3	25,373	4,210	6	11,558	683	16.9
1993	10,804	527	20.5	12,430	714	17.4	26,262	4,309	6.1	11,595	693	16.7
1994	10,992	531	20.7	12,156	701	17.3	25,838	4,202	6.1	11,683	698	16.7
1995	11,203	530	21.1	12,018	694	17.3	26,514	4,315	6.1	11,793	700	16.8
1996	11,330	534	21.2	11,811	685	17.2	26,092	4,221	6.2	11,813	700	16.9
1997	11,581	539	21.5	12,115	703	17.2	27,032	4,218	6.4	12,107	711	17
1998	11,754	544	21.6	12,173	707	17.2	25,397	4,135	6.1	12,211	721	16.9
1999	11,848	553	21.4	11,957	701	17	26,014	4,352	6	12,206	732	16.7
2000	11,976	547	21.9	11,672	669	17.4	25,617	4,391	5.8	12,164	720	16.9
2001	11,831	534	22.1	11,204	636	17.6	26,602	4,477	5.9	11,887	695	17.1
2002	12,202	555	22	11,364	650	17.5	27,071	4,642	5.8	12,171	719	16.9
2003	12,325	556	22.2	11,287	697	16.2	28,093	4,215	6.7	12,208	718	17
2004	12,460	553	22.5	11,184	690	16.2	27,023	4,057	6.7	12,200	714	17.1
2005*	12,375	541	22.9	11,114	686	16.2	26,272	3,944	6.7	12,084	704	17.2

\*Through 1989, includes motorcycles.

<sup>1</sup>Included in "Trucks."

<sup>2</sup>Includes a small number of trucks with 2 axes and 4 tires, such as step vans.

R=Revised. P=Preliminary.

<sup>3</sup>Single-unit trucks with 2 axes and 6 or more tires, and combination trucks.

Web Page: For related information, see <http://www.fhwa.dot.gov/policy/ohpi/hss/index.htm>.

<sup>4</sup>Includes buses and motorcycles, which are not separately displayed.

Sources: **Passenger Cars, 1990-1994:** U.S. Department of Transportation, Bureau of Transportation Statistics, *National Transportation Statistics 1998*, Table 4-13. **All Other Data:** \*e1949-1994—Federal Highway Administration (FHWA), *Highway Statistics Summary to 1995*, Table VM-201A. \*e1995

Miles Per Gallon Data

TRANSIT FUEL EFFICIENCY

Tri-Met Fleet								
	2000	2001	2002	2003	2004	2005	2006	2007
Jan		4.23	4.51	4.52	4.31	4.76	4.61	4.29
Feb		4.18	4.44	4.40	4.38	4.73	4.59	4.53
Mar	4.30	4.37	4.49	4.41	4.39	4.69	4.63	4.52
Apr	4.44	4.33	4.43	4.40	4.36	4.64	4.59	4.41
May	4.38	4.22	4.40	4.38	4.32	4.59	4.51	
Jun	4.34	4.33	4.40	4.29	4.35	4.59	4.48	
Jul	4.33	4.39	4.28	4.27	4.29	4.49	4.40	
Aug	4.36	4.40	4.35	4.31	4.33	4.51	4.45	
Sep	4.35	4.34	4.37	4.32	4.45	4.56	4.38	
Oct	4.34	4.48	4.44	4.37	4.59	4.63	4.45	
Nov	4.20	4.38	4.53	4.40	4.74	4.68	4.49	
Dec	4.21	4.37	4.53	4.52	4.81	4.69	4.17	

Merlo Fleet								
	2000	2001	2002	2003	2004	2005	2006	2007
Jan		4.37	4.78	4.75	4.50	4.79	4.64	4.35
Feb		4.28	4.59	4.62	4.59	4.72	4.66	4.60
Mar	4.51	4.62	4.59	4.62	4.59	4.74	4.65	4.62
Apr	4.62	4.64	4.62	4.62	4.59	4.71	4.62	4.46
May	4.58	4.40	4.61	4.64	4.64	4.66	4.67	
Jun	4.58	4.50	4.61	4.59	4.67	4.69	4.58	
Jul	4.56	4.58	4.62	4.63	4.67	4.69	4.56	
Aug	4.61	4.62	4.58	4.63	4.65	4.64	4.58	
Sep	4.56	4.55	4.65	4.63	4.68	4.63	4.49	
Oct	4.45	4.84	4.65	4.61	4.66	4.71	4.46	
Nov	4.29	4.60	4.91	4.61	4.79	4.72	4.50	
Dec	4.34	4.51	4.78	4.64	4.82	4.70	4.09	

Center Fleet								
	2000	2001	2002	2003	2004	2005	2006	2007
Jan		4.30	4.53	4.40	4.15	4.75	4.69	4.40
Feb		4.22	4.40	4.36	4.27	4.78	4.64	4.66
Mar	4.34	4.33	4.51	4.32	4.31	4.73	4.73	4.69
Apr	4.56	4.27	4.37	4.31	4.25	4.67	4.70	4.60
May	4.40	4.20	4.31	4.28	4.16	4.62	4.60	
Jun	4.33	4.30	4.31	4.15	4.19	4.60	4.55	
Jul	4.26	4.27	4.16	4.12	4.08	4.46	4.53	
Aug	4.27	4.29	4.28	4.15	4.18	4.46	4.50	
Sep	4.26	4.29	4.34	4.22	4.42	4.59	4.43	
Oct	4.31	4.33	4.39	4.29	4.58	4.68	4.48	
Nov	4.23	4.24	4.47	4.30	4.78	4.77	4.52	
Dec	4.27	4.36	4.40	4.36	4.87	4.78	4.17	

Powell Fleet								
	2000	2001	2002	2003	2004	2005	2006	2007
Jan		4.00	4.25	4.45	4.36	4.73	4.51	4.11
Feb		4.03	4.34	4.30	4.37	4.68	4.49	4.32
Mar	4.08	4.17	4.38	4.33	4.35	4.62	4.51	4.26
Apr	4.18	4.10	4.21	4.34	4.32	4.55	4.46	4.16
May	4.17	4.07	4.32	4.30	4.28	4.51	4.30	
Jun	4.12	4.20	4.32	4.22	4.31	4.50	4.33	
Jul	4.18	4.36	4.11	4.18	4.30	4.41	4.25	
Aug	4.20	4.32	4.21	4.23	4.29	4.47	4.30	
Sep	4.22	4.20	4.17	4.24	4.34	4.48	4.24	
Oct	4.25	4.32	4.29	4.31	4.55	4.53	4.41	
Nov	4.05	4.33	4.33	4.38	4.66	4.54	4.45	
Dec	4.00	4.25	4.44	4.64	4.73	4.58	4.22	

Hybrid Fleet								
	2000	2001	2002	2003	2004	2005	2006	2007
Jan				4.49	4.90	4.38	5.45	5.10
Feb					4.72	4.60	4.68	5.87
Mar					5.12	4.35	5.25	5.20
Apr					4.72	4.44	5.46	5.25
May			3.17		4.92	4.39	5.53	
Jun			3.21		4.87	4.63	5.40	
Jul			4.35		4.67	4.72	4.94	
Aug			5.06	3.81	4.75	4.68	5.05	
Sep			4.33	4.45	4.82	4.64	4.76	
Oct			4.21	5.00	4.55	4.72	4.64	
Nov			4.64	5.10	4.87	4.85	4.74	
Dec			4.34	5.18	4.46	5.10	4.55	
Average			4.16	4.67	4.78	4.62	5.04	5.36
Min	0.00	0.00	3.17	3.81	4.46	4.35	4.55	5.10
Max	0.00	0.00	5.06	5.18	5.12	5.10	5.53	5.87
Range	0.00	0.00	1.89	1.36	0.66	0.75	0.98	0.77
Ave Range	1.13							
L-Rate	0.057							

Merlo+Center+Powell (does not include Hybrid)								
	2000	2001	2002	2003	2004	2005	2006	2007
Jan		4.22	4.52	4.53	4.34	4.76	4.61	4.29
Feb		4.18	4.44	4.43	4.41	4.73	4.60	4.53
Mar	4.31	4.37	4.49	4.42	4.42	4.70	4.63	4.52
Apr	4.45	4.34	4.40	4.42	4.39	4.64	4.59	4.41
May	4.38	4.22	4.41	4.41	4.36	4.60	4.52	
Jun	4.34	4.33	4.41	4.32	4.39	4.60	4.49	
Jul	4.33	4.40	4.30	4.31	4.35	4.52	4.45	
Aug	4.36	4.41	4.36	4.34	4.37	4.52	4.46	
Sep	4.35	4.35	4.39	4.36	4.48	4.57	4.39	
Oct	4.34	4.50	4.44	4.40	4.60	4.64	4.45	
Nov	4.19	4.39	4.57	4.43	4.74	4.68	4.49	
Dec	4.20	4.37	4.54	4.55	4.81	4.69	4.16	
Average	4.33	4.34	4.44	4.41	4.47	4.64	4.49	4.44
Min	4.19	4.18	4.30	4.31	4.34	4.52	4.16	4.29
Max	4.45	4.50	4.57	4.55	4.81	4.76	4.63	4.53
Range	0.26	0.32	0.27	0.24	0.47	0.24	0.47	0.24
Ave Range	0.31							
L-Rate	0.004							

TriMet (Merlo+Center+Powell): 2007 Ave mpg 4.44  
 TriMet (Merlo+Center+Powell): 2030 Ave mpg 4.81

C-TRAN: 2007 Ave mpg 5.00  
 C-TRAN: 2030 Ave mpg 5.42

C-TRAN Hybrid: 2007 Ave mpg 5.36  
 C-TRAN Hybrid: 2030 Ave mpg 5.80

Source: TriMet (10/12/2007 email from Alan Lehto)

Note: Average fuel efficiency for the TriMet fleet is based on the above data. The average fuel efficiency for C-TRAN buses was based on information from C-TRAN (10/07/2007 email from Ed Pickering)

Note: The linear growth rate (denoted as "L-Rate") derived from the TriMet (Merlo, Center, Powell) fleet was used to forecast fuel efficiency for all buses.

Note: The linear growth rate derived from the hybrid data resulted in a substantially higher 2030 average fuel efficiency compared to other buses. Therefore the linear growth rate calculated for the remaining TriMet fleet was used to forecast the 2030 hybrid fuel efficiency.

		Year 2007							Year 2030						
Speed	mpg	mpg	mpg	mpg	mpg	mpg	mpg	mpg	mpg	mpg	mpg	mpg	mpg	mpg	
	Auto	Mtruck	Htruck	Mcycle	TBus	CBus	BRT	Auto	Mtruck	Htruck	Mcycle	TBus	CBus	BRT	
20	22.222	15.485	6.452	50.000	4.280	4.840	4.840	24.832	18.049	6.907	50.000	4.650	5.260	5.260	
25	24.390	16.200	7.042	50.000	4.326	4.886	4.886	26.473	18.937	7.583	50.000	4.696	5.306	5.306	
30	25.641	16.948	7.519	50.000	4.371	4.931	4.931	28.735	19.774	8.072	50.000	4.741	5.351	5.351	
35	27.027	17.731	7.874	50.000	4.417	4.977	4.977	30.470	20.576	8.412	50.000	4.787	5.397	5.397	
40	27.778	18.550	8.197	50.000	4.463	5.023	5.023	31.417	21.803	8.889	50.000	4.833	5.443	5.443	
45	28.571	19.406	8.475	50.000	4.509	5.069	5.069	32.424	22.171	8.940	50.000	4.879	5.489	5.489	
50	29.412	20.303	8.696	50.000	4.554	5.114	5.114	33.498	23.732	9.304	50.000	4.924	5.534	5.534	
55	30.303	21.240	8.850	50.000	4.600	5.160	5.160	34.644	24.724	9.437	50.000	4.970	5.580	5.580	
			0.009		0.046	0.046	0.046					0.046	0.046	0.046	
			L-Rate		L-Rate	L-Rate	L-Rate					L-Rate	L-Rate	L-Rate	

		Year 2007							Year 2030						
Speed	FCR	FCR	FCR	FCR	FCR	FCR	FCR	FCR	FCR	FCR	FCR	FCR	FCR	FCR	
	gal/mi	gal/mi	gal/mi	gal/mi	gal/mi	gal/mi	gal/mi	gal/mi	gal/mi	gal/mi	gal/mi	gal/mi	gal/mi	gal/mi	
	Auto	Mtruck	Htruck	Mcycle	TBus	CBus	BRT	Auto	Mtruck	Htruck	Mcycle	TBus	CBus	BRT	
20	0.045	0.065	0.155	0.020	0.234	0.207	0.207	0.040	0.055	0.145	0.020	0.215	0.190	0.190	
25	0.041	0.062	0.142	0.020	0.231	0.205	0.205	0.038	0.053	0.132	0.020	0.213	0.188	0.188	
30	0.039	0.059	0.133	0.020	0.229	0.203	0.203	0.035	0.051	0.124	0.020	0.211	0.187	0.187	
35	0.037	0.056	0.127	0.020	0.226	0.201	0.201	0.033	0.049	0.119	0.020	0.209	0.185	0.185	
40	0.036	0.054	0.122	0.020	0.224	0.199	0.199	0.032	0.046	0.112	0.020	0.207	0.184	0.184	
45	0.035	0.052	0.118	0.020	0.222	0.197	0.197	0.031	0.045	0.112	0.020	0.205	0.182	0.182	
50	0.034	0.049	0.115	0.020	0.220	0.196	0.196	0.030	0.042	0.107	0.020	0.203	0.181	0.181	
55	0.033	0.047	0.113	0.020	0.217	0.194	0.194	0.029	0.040	0.106	0.020	0.201	0.179	0.179	



# APPENDIX C

Personal Vehicles Operational Analysis



$$E = V \times L \times FCR \times CF$$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segment (miles)

FCR = Fuel Consumption Rate (gallons/mile) (based on speed and vehicle type)

CF = Btu/gal Conversion Factor (based on fuel type – gasoline or diesel)

L

Alternative	Description	Roadway	From	To	Length (miles)	ADT	Vehicle Mix (Share)			
							Auto	Mtruck	Htruck	Mcycle
	<b>Existing</b>	I-5	Hayden Island	SR 14	0.9	134,000	0.911	0.009	0.073	0.003
		I-205	NE Airport Wy	SR 14	0.9	146,470	0.949	0.007	0.039	0.003
1	<b>No Build</b>	I-5	Hayden Island	SR 14	0.9	184,000	0.911	0.009	0.073	0.003
		I-205	NE Airport Wy	SR 14	0.9	210,000	0.949	0.007	0.039	0.003
	<b>Replace-No Toll</b>	I-5	Hayden Island	SR 14	0.9	210,000	0.911	0.009	0.073	0.003
		I-205	NE Airport Wy	SR 14	0.9	200,000	0.949	0.007	0.039	0.003
2, 3	<b>Replace-Standard Toll I-5</b>	I-5	Hayden Island	SR 14	0.9	178,000	0.911	0.009	0.073	0.003
		I-205	NE Airport Wy	SR 14	0.9	213,000	0.949	0.007	0.039	0.003
	<b>Replace-Standard Toll I-5 &amp; I-205</b>	I-5	Hayden Island	SR 14	0.9	196,000	0.911	0.009	0.073	0.003
		I-205	NE Airport Wy	SR 14	0.9	170,000	0.949	0.007	0.039	0.003
4, 5	<b>Supplement-High I-5 Toll</b>	I-5	Hayden Island	SR 14	0.9	165,000	0.911	0.009	0.073	0.003
		I-205	NE Airport Wy	SR 14	0.9	219,000	0.949	0.007	0.039	0.003
	<b>Supplement-Standard I-5 Toll</b>	I-5	Hayden Island	SR 14	0.9	178,000	0.911	0.009	0.073	0.003
		I-205	NE Airport Wy	SR 14	0.9	213,000	0.949	0.007	0.039	0.003

$$E = V \times L \times FCR \times CF$$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segment (mile)

FCR = Fuel Consumption Rate (gallon)

CF = Btu/gal Conversion Factor (base)

Alternative	Description	V				Speed	FCR				CF		Energy Consumed Per Vehicle Class (Btu/day)			
		Vehicle Mix (Daily Volume)					Fuel Consumption Rate Per Vehicle Class (gpm)				Fuel Conversion Factor (Btu/gal)					
		Auto	Mtruck	Htruck	Mcycle		Auto	Mtruck	Htruck	Mcycle	Gasoline	Diesel	Auto	Mtruck	Htruck	Mcycle
	<b>Existing</b>	122,074	1206	9782	402	45	0.035	0.052	0.118	0.020	123,976	138,691	476,728,756	6,933,971	144,078,923	897,090
		139,001	1025	5712	439	50	0.034	0.049	0.115	0.020	123,976	138,691	527,323,312	5,633,145	81,993,010	979,658
1	<b>No Build</b>	167,624	1656	13432	552	45	0.035	0.052	0.118	0.020	123,976	138,691	654,612,620	9,521,273	197,839,716	1,231,826
		199,290	1470	8190	630	45	0.035	0.052	0.118	0.020	123,976	138,691	778,276,077	8,451,855	120,630,381	1,405,888
	<b>Replace-No Toll</b>	191,310	1890	15330	630	55	0.033	0.047	0.113	0.020	123,976	138,691	704,420,102	9,928,446	216,227,729	1,405,888
		189,800	1400	7800	600	55	0.033	0.047	0.113	0.020	123,976	138,691	698,860,151	7,354,404	110,018,023	1,338,941
2, 3	<b>Replace-Standard Toll I-5</b>	162,158	1602	12994	534	55	0.033	0.047	0.113	0.020	123,976	138,691	597,079,896	8,415,540	183,278,742	1,191,657
		202,137	1491	8307	639	55	0.033	0.047	0.113	0.020	123,976	138,691	744,286,060	7,832,441	117,169,194	1,425,972
	<b>Replace-Standard Toll I-5 &amp; I-205</b>	178,556	1764	14308	588	55	0.033	0.047	0.113	0.020	123,976	138,691	657,458,762	9,266,549	201,812,547	1,312,162
		161,330	1190	6630	510	55	0.033	0.047	0.113	0.020	123,976	138,691	594,031,128	6,251,244	93,515,319	1,138,100
4, 5	<b>Supplement-High I-5 Toll</b>	150,315	1485	12045	495	55	0.033	0.047	0.113	0.020	123,976	138,691	553,472,937	7,800,922	169,893,216	1,104,626
		207,831	1533	8541	657	50	0.034	0.049	0.115	0.020	123,976	138,691	788,441,315	8,424,987	122,601,943	1,466,140
	<b>Supplement-Standard I-5 Toll</b>	162,158	1602	12994	534	50	0.034	0.049	0.115	0.020	123,976	138,691	615,173,226	8,804,194	186,522,613	1,191,657
		202,137	1491	8307	639	55	0.033	0.047	0.113	0.020	123,976	138,691	744,286,060	7,832,441	117,169,194	1,425,972



$$E = V \times L \times FCR \times CF$$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segment (mile)

FCR = Fuel Consumption Rate (gallon)

CF = Btu/gal Conversion Factor (base)

E

Alternative	Description	Total Energy Consumed (Btu/day)	Fuel Consumption Per Vehicle Class (gal/day)				Total Fuel Consumption (gal/day)		Emission Factor (lbs CO <sub>2</sub> /gal)		CO <sub>2</sub> Emissions Per Vehicle Class (lbs CO <sub>2</sub> /day)				Total CO <sub>2</sub> Emissions (lbs CO <sub>2</sub> /day)	
			Auto	Mtruck	Htruck	Mcycle	Gasoline	Diesel	Gasoline	Diesel	Auto	Mtruck	Htruck	Mcycle	Gasoline	Diesel
	<b>Existing</b>	6.286E+08	3,845	56	1,039	7	3,908	1,039	19.4	22.2	74,593	1,086	23,066	136	75,815	23,066
		6.159E+08	4,253	45	591	8	4,306	591	19.4	22.2	82,508	873	13,120	155	83,536	13,120
1	<b>No Build</b>	8.632E+08	5,280	77	1,426	10	5,367	1,426	19.4	22.2	102,432	1,494	31,657	194	104,120	31,657
		9.088E+08	6,278	68	870	11	6,357	870	19.4	22.2	121,793	1,319	19,314	213	123,325	19,314
	<b>Replace-No Toll</b>	9.320E+08	5,682	80	1,559	11	5,773	1,559	19.4	22.2	110,231	1,552	34,610	213	111,996	34,610
		8.176E+08	5,637	59	793	11	5,707	793	19.4	22.2	109,358	1,145	17,605	213	110,716	17,605
2, 3	<b>Replace-Standard Toll I-5</b>	7.900E+08	4,816	68	1,321	10	4,894	1,321	19.4	22.2	93,430	1,319	29,326	194	94,943	29,326
		8.707E+08	6,003	63	845	12	6,078	845	19.4	22.2	116,458	1,222	18,759	233	117,913	18,759
	<b>Replace-Standard Toll I-5 &amp; I-205</b>	8.699E+08	5,303	75	1,455	11	5,389	1,455	19.4	22.2	102,878	1,455	32,301	213	104,546	32,301
		6.949E+08	4,792	50	674	9	4,851	674	19.4	22.2	92,965	970	14,963	175	94,110	14,963
4, 5	<b>Supplement-High I-5 Toll</b>	7.323E+08	4,464	63	1,225	9	4,536	1,225	19.4	22.2	86,602	1,222	27,195	175	87,999	27,195
		9.209E+08	6,360	68	884	12	6,440	884	19.4	22.2	123,384	1,319	19,625	233	124,936	19,625
	<b>Supplement-Standard I-5 Toll</b>	8.117E+08	4,962	71	1,345	10	5,043	1,345	19.4	22.2	96,263	1,377	29,859	194	97,834	29,859
		8.707E+08	6,003	63	845	12	6,078	845	19.4	22.2	116,458	1,222	18,759	233	117,913	18,759



# APPENDIX D

Transit Operational Analysis



$$E = V \times L \times FCR \times CF$$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segment (miles)

FCR = Fuel Consumption Rate (gallons/mile) (based on speed and vehicle type)

CF = Btu/gal Conversion Factor (based on fuel type – gasoline or diesel)

Alternative	Transit Group	Energy Type	V*L Daily VMT	FCR Fuel Consumption Rate		
				Electricity (kwh/car mile)	Diesel (gal/mi)	Biodiesel (gal/mi)
Existing Conditions	LRT - Blue Line	Electricity	2,449	12.00		
	LRT - Red Line	Electricity	2,863	12.00		
	LRT - Green Line	Electricity	0			
	LRT - Yellow Line	Electricity	1,134	12.00		
	BRT	Biodiesel	0			
	BRT Lite	Biodiesel	0			
	CTran - I-5	Diesel	1,419		0.19	
	CTran - I-205	Diesel	1,595		0.19	
	CTran - PIR	Diesel	0			
	CTran - Expo	Diesel	0			
	CTran - Lmtd	Diesel	0			
	CTran - Limited	Diesel	0			
	CTran - Express	Diesel	0			
	CTran - Local	Diesel	7,791		0.21	
	TRI-MET - N Portland	Diesel	10,833		0.23	
	TRI-MET - Other	Diesel	56,557		0.23	
	<b>Total</b>					

$E = V \times L \times FCR \times CF$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segmen

FCR = Fuel Consumption Rate (

CF = Btu/gal Conversion Factor

Alternative	Fuel Conversion Factor			Daily Energy Consumed (Btu/day)			Total Energy	Daily Energy Consumed (kwh-gal/day)		
	Electricity (Btu/kwh)	Diesel (Btu/gal)	Biodiesel (Btu/gal)	Electricity	Diesel	Biodiesel	(Btu/day)	Electricity	Diesel	Biodiesel
Existing Conditions	3,412	138,691	127,259	100,261,570	0	0	100,261,570	29,385	0	0
	3,412	138,691	127,259	117,234,280	0	0	117,234,280	34,359	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	46,440,418	0	0	46,440,418	13,611	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	38,151,898	0	38,151,898	0	275	0
	3,412	138,691	127,259	0	42,861,992	0	42,861,992	0	309	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	223,256,520	0	223,256,520	0	1,610	0
	3,412	138,691	127,259	0	351,038,137	0	351,038,137	0	2,531	0
	3,412	138,691	127,259	0	1,832,691,265	0	1,832,691,265	0	13,214	0
<b>Total</b>				<b>263,936,268</b>	<b>2,487,999,812</b>	<b>0</b>	<b>2,751,936,080</b>	<b>77,355</b>	<b>17,939</b>	<b>0</b>

$E = V \times L \times FCR \times CF$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segmen

FCR = Fuel Consumption Rate (

CF = Btu/gal Conversion Factor

Alternative	Daily CO <sub>2</sub> Emissions		
	Electricity (lbs CO <sub>2</sub> /day)	Diesel (lbs CO <sub>2</sub> /day)	Biodiesel (lbs CO <sub>2</sub> /day)
Existing Conditions	31,251	0	0
	36,542	0	0
	0	0	0
	14,475	0	0
	0	0	0
	0	0	0
	0	6,107	0
	0	6,861	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	35,736	0
	0	56,190	0
	0	293,355	0
<b>Total</b>	<b>82,269</b>	<b>398,249</b>	<b>0</b>

$E = V \times L \times FCR \times CF$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segment (miles)

FCR = Fuel Consumption Rate (gallons/mile) (based on speed and vehicle type)

CF = Btu/gal Conversion Factor (based on fuel type – gasoline or diesel)

Alternative	Transit Group	Energy Type	V*L Daily VMT	Fuel Consumption Rate		
				FCR Electricity (kwh/car mile)	FCR Diesel (gal/mi)	FCR Biodiesel (gal/mi)
<b>Alternative 1</b>	LRT - Blue Line	Electricity	6,165	12.00	12.00	12.00
<b>No Build</b>	LRT - Red Line	Electricity	2,847	12.00	12.00	12.00
	LRT - Green Line	Electricity	2,485	12.00	12.00	12.00
	LRT - Yellow Line	Electricity	1,222	12.00	12.00	12.00
	BRT	Biodiesel	0	0.18	0.18	0.18
	BRT Lite	Biodiesel	0	0.19	0.19	0.19
	CTTRAN - I-5	Diesel	0	0.18	0.18	0.18
	CTTRAN - I-205	Diesel	2,410	0.18	0.18	0.18
	CTTRAN - PIR	Diesel	0	0.19	0.19	0.19
	CTTRAN - Expo	Diesel	0	0.19	0.19	0.19
	CTTRAN - Lmtd	Diesel	0	0.19	0.19	0.19
	CTTRAN - Limited	Diesel	182	0.19	0.19	0.19
	CTTRAN - Express	Diesel	2,862	0.18	0.18	0.18
	CTTRAN - Local	Diesel	10,869	0.19	0.19	0.19
	TRI-MET - N Portland	Diesel	13,249	0.22	0.22	0.22
	TRI-MET - Other	Diesel	81,158	0.22	0.22	0.22
	<b>Total</b>					



$E = V \times L \times FCR \times CF$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segmen

FCR = Fuel Consumption Rate (

CF = Btu/gal Conversion Factor

Alternative	Fuel Conversion Factor			Daily Energy Consumed (Btu/day)			Total Energy	Daily Energy Consumed (kwh-gal/day)		
	Electricity (Btu/kwh)	Diesel (Btu/gal)	Biodiesel (Btu/gal)	Electricity	Diesel	Biodiesel	(Btu/day)	Electricity	Diesel	Biodiesel
Alternative 1	3,412	138,691	127,259	252,408,779	0	0	252,408,779	73,977	0	0
No Build	3,412	138,691	127,259	116,582,554	0	0	116,582,554	34,168	0	0
	3,412	138,691	127,259	101,740,173	0	0	101,740,173	29,818	0	0
	3,412	138,691	127,259	50,035,378	0	0	50,035,378	14,665	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	59,912,717	0	59,912,717	0	432	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	4,679,445	0	4,679,445	0	34	0
	3,412	138,691	127,259	0	71,141,046	0	71,141,046	0	513	0
	3,412	138,691	127,259	0	286,585,440	0	286,585,440	0	2,066	0
	3,412	138,691	127,259	0	395,166,343	0	395,166,343	0	2,849	0
	3,412	138,691	127,259	0	2,420,614,306	0	2,420,614,306	0	17,453	0
<b>Total</b>				<b>520,766,883</b>	<b>3,238,099,297</b>	<b>0</b>	<b>3,758,866,181</b>	<b>152,628</b>	<b>23,348</b>	<b>0</b>

**E = V x L x FCR x CF**

**E** = Energy in Btu

**V** = Number of Vehicles (ADT)

**L** = Length of Roadway Segmen

**FCR** = Fuel Consumption Rate (

**CF** = Btu/gal Conversion Factor

Alternative	Daily CO <sub>2</sub> Emissions		
	Electricity (lbs CO <sub>2</sub> /day)	Diesel (lbs CO <sub>2</sub> /day)	Biodiesel (lbs CO <sub>2</sub> /day)
Alternative 1	78,676	0	0
No Build	36,339	0	0
	31,712	0	0
	15,596	0	0
	0	0	0
	0	0	0
	0	0	0
	0	9,590	0
	0	0	0
	0	0	0
	0	0	0
	0	749	0
	0	11,387	0
	0	45,873	0
	0	63,254	0
	0	387,463	0
<b>Total</b>	<b>162,323</b>	<b>518,316</b>	<b>0</b>

$$E = V \times L \times FCR \times CF$$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segment (miles)

FCR = Fuel Consumption Rate (gallons/mile) (based on speed and vehicle type)

CF = Btu/gal Conversion Factor (based on fuel type – gasoline or diesel)

Alternative	Transit Group	Energy Type	V*L Daily VMT	FCR Fuel Consumption Rate		
				Electricity (kwh/car mile)	Diesel (gal/mi)	Biodiesel (gal/mi)
<b>Alternative 2</b>	LRT - Blue Line	Electricity	6,165	12.00	12.00	12.00
<b>Build Replacement</b>	LRT - Red Line	Electricity	2,847	12.00	12.00	12.00
<b>with BRT along Vancouver</b>	LRT - Green Line	Electricity	2,485	12.00	12.00	12.00
	LRT - Yellow Line	Electricity	1,222	12.00	12.00	12.00
	BRT	Biodiesel	0	0.18	0.18	0.18
	BRT Lite	Biodiesel	0	0.19	0.19	0.19
	CTran - I-5	Diesel	0	0.18	0.18	0.18
	CTran - I-205	Diesel	2,309	0.18	0.18	0.18
	CTran - PIR	Diesel	0	0.19	0.19	0.19
	CTran - Expo	Diesel	0	0.19	0.19	0.19
	CTran - BRT	Biodiesel	1,052	0.18	0.18	0.18
	CTran - Limited	Diesel	0	0.19	0.19	0.19
	CTran - Express	Diesel	2,137	0.18	0.18	0.18
	CTran - Local	Diesel	11,583	0.19	0.19	0.19
	TRI-MET - N Portland	Diesel	13,249	0.22	0.22	0.22
	TRI-MET - Other	Diesel	81,158	0.22	0.22	0.22
	<b>Total</b>					

$E = V \times L \times FCR \times CF$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segmen

FCR = Fuel Consumption Rate (

CF = Btu/gal Conversion Factor

Alternative	Fuel Conversion Factor			Daily Energy Consumed (Btu/day)			E	Daily Energy Consumed (kwh-gal/day)		
	Electricity (Btu/kwh)	Diesel (Btu/gal)	Biodiesel (Btu/gal)	Electricity	Diesel	Biodiesel	Total Energy (Btu/day)	Electricity	Diesel	Biodiesel
Alternative 2	3,412	138,691	127,259	252,408,779	0	0	252,408,779	73,977	0	0
Build Replacement	3,412	138,691	127,259	116,582,554	0	0	116,582,554	34,168	0	0
with BRT along Vancouver	3,412	138,691	127,259	101,740,173	0	0	101,740,173	29,818	0	0
	3,412	138,691	127,259	50,035,378	0	0	50,035,378	14,665	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	57,390,351	0	57,390,351	0	414	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	23,993,827	23,993,827	0	0	189
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	53,117,008	0	53,117,008	0	383	0
	3,412	138,691	127,259	0	305,400,519	0	305,400,519	0	2,202	0
	3,412	138,691	127,259	0	395,166,343	0	395,166,343	0	2,849	0
	3,412	138,691	127,259	0	2,420,614,306	0	2,420,614,306	0	17,453	0
<b>Total</b>				<b>520,766,883</b>	<b>3,231,688,526</b>	<b>23,993,827</b>	<b>3,776,449,237</b>	<b>152,628</b>	<b>23,301</b>	<b>189</b>

$$E = V \times L \times FCR \times CF$$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segmen

FCR = Fuel Consumption Rate (

CF = Btu/gal Conversion Factor

Alternative	Daily CO <sub>2</sub> Emissions		
	Electricity (lbs CO <sub>2</sub> /day)	Diesel (lbs CO <sub>2</sub> /day)	Biodiesel (lbs CO <sub>2</sub> /day)
Alternative 2	78,676	0	0
Build Replacement	36,339	0	0
with BRT along Vancouver	31,712	0	0
	15,596	0	0
	0	0	0
	0	0	0
	0	0	0
	0	9,186	0
	0	0	0
	0	0	0
	0	0	4,186
	0	0	0
	0	8,502	0
	0	48,885	0
	0	63,254	0
	0	387,463	0
<b>Total</b>	<b>162,323</b>	<b>517,290</b>	<b>4,186</b>

$$E = V \times L \times FCR \times CF$$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segment (miles)

FCR = Fuel Consumption Rate (gallons/mile) (based on speed and vehicle type)

CF = Btu/gal Conversion Factor (based on fuel type – gasoline or diesel)

Alternative	Transit Group	Energy Type	V*L Daily VMT	FCR Fuel Consumption Rate		
				Electricity (kwh/car mile)	Diesel (gal/mi)	Biodiesel (gal/mi)
<b>Alternative 3</b>	LRT - Blue Line	Electricity	6,165	12.00	12.00	12.00
<b>Build Replacement</b>	LRT - Red Line	Electricity	2,847	12.00	12.00	12.00
<b>with LRT along Vancouver</b>	LRT - Green Line	Electricity	2,485	12.00	12.00	12.00
	LRT - Yellow Line	Electricity	2,008	12.00	12.00	12.00
	BRT	Biodiesel	0	0.18	0.18	0.18
	BRT Lite	Biodiesel	0	0.19	0.19	0.19
	CTran - I-5	Diesel	0	0.18	0.18	0.18
	CTran - I-205	Diesel	2,309	0.18	0.18	0.18
	CTran - PIR	Diesel	0	0.19	0.19	0.19
	CTran - Expo	Diesel	0	0.19	0.19	0.19
	CTran - Lmtd	Diesel	290	0.19	0.19	0.19
	CTran - Limited	Diesel	317	0.19	0.19	0.19
	CTran - Express	Diesel	2,134	0.18	0.18	0.18
	CTran - Local	Diesel	11,183	0.19	0.19	0.19
	TRI-MET - N Portland	Diesel	13,286	0.22	0.22	0.22
	TRI-MET - Other	Diesel	80,486	0.22	0.22	0.22
	<b>Total</b>					

$$E = V \times L \times FCR \times CF$$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segmen

FCR = Fuel Consumption Rate (

CF = Btu/gal Conversion Factor

Alternative	Fuel Conversion Factor			Daily Energy Consumed (Btu/day)			E	Daily Energy Consumed (kwh-gal/day)		
	Electricity (Btu/kwh)	Diesel (Btu/gal)	Biodiesel (Btu/gal)	Electricity	Diesel	Biodiesel	Total Energy (Btu/day)	Electricity	Diesel	Biodiesel
Alternative 3	3,412	138,691	127,259	252,408,779	0	0	252,408,779	73,977	0	0
Build Replacement	3,412	138,691	127,259	116,582,554	0	0	116,582,554	34,168	0	0
with LRT along Vancouver	3,412	138,691	127,259	101,740,173	0	0	101,740,173	29,818	0	0
	3,412	138,691	127,259	82,228,359	0	0	82,228,359	24,100	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	57,390,351	0	57,390,351	0	414	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	7,450,323	0	7,450,323	0	54	0
	3,412	138,691	127,259	0	8,136,015	0	8,136,015	0	59	0
	3,412	138,691	127,259	0	53,048,905	0	53,048,905	0	382	0
	3,412	138,691	127,259	0	294,856,987	0	294,856,987	0	2,126	0
	3,412	138,691	127,259	0	396,277,562	0	396,277,562	0	2,857	0
	3,412	138,691	127,259	0	2,400,575,855	0	2,400,575,855	0	17,309	0
<b>Total</b>				<b>552,959,865</b>	<b>3,217,735,997</b>	<b>0</b>	<b>3,770,695,862</b>	<b>162,063</b>	<b>23,201</b>	<b>0</b>

$$E = V \times L \times FCR \times CF$$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segmen

FCR = Fuel Consumption Rate (

CF = Btu/gal Conversion Factor

Alternative	Daily CO <sub>2</sub> Emissions		
	Electricity (lbs CO <sub>2</sub> /day)	Diesel (lbs CO <sub>2</sub> /day)	Biodiesel (lbs CO <sub>2</sub> /day)
Alternative 3	78,676	0	0
Build Replacement	36,339	0	0
with LRT along Vancouver	31,712	0	0
	25,631	0	0
	0	0	0
	0	0	0
	0	0	0
	0	9,186	0
	0	0	0
	0	0	0
	0	1,193	0
	0	1,302	0
	0	8,491	0
	0	47,197	0
	0	63,431	0
	0	384,256	0
<b>Total</b>	<b>172,357</b>	<b>515,057</b>	<b>0</b>



$$E = V \times L \times FCR \times CF$$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segment (miles)

FCR = Fuel Consumption Rate (gallons/mile) (based on speed and vehicle type)

CF = Btu/gal Conversion Factor (based on fuel type – gasoline or diesel)

Alternative	Transit Group	Energy Type	V*L Daily VMT	Fuel Consumption Rate		
				FCR Electricity (kwh/car mile)	FCR Diesel (gal/mi)	FCR Biodiesel (gal/mi)
<b>Alternative 4</b>	LRT - Blue Line	Electricity	6,165	12.00	12.00	12.00
<b>Build Supplemental with BRT along Vancouver</b>	LRT - Red Line	Electricity	2,847	12.00	12.00	12.00
	LRT - Green Line	Electricity	2,485	12.00	12.00	12.00
	LRT - Yellow Line	Electricity	1,890	12.00	12.00	12.00
	BRT	Biodiesel	0	0.18	0.18	0.18
	BRT Lite	Biodiesel	0	0.19	0.19	0.19
	CTran - I-5	Diesel	0	0.18	0.18	0.18
	CTran - I-205	Diesel	3,131	0.18	0.18	0.18
	CTran - PIR	Diesel	0	0.19	0.19	0.19
	CTran - Expo	Diesel	0	0.19	0.19	0.19
	CTran - BRT	Biodiesel	2,305	0.18	0.18	0.18
	CTran - Limited	Diesel	0	0.19	0.19	0.19
	CTran - Express	Diesel	3,773	0.18	0.18	0.18
	CTran - Local	Diesel	21,582	0.19	0.19	0.19
	TRI-MET - N Portland	Diesel	17,453	0.22	0.22	0.22
	TRI-MET - Other	Diesel	80,486	0.22	0.22	0.22
<b>Total</b>						

$E = V \times L \times FCR \times CF$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segmen

FCR = Fuel Consumption Rate (

CF = Btu/gal Conversion Factor

Alternative	Fuel Conversion Factor			Daily Energy Consumed (Btu/day)			E	Daily Energy Consumed (kwh-gal/day)		
	Electricity (Btu/kwh)	Diesel (Btu/gal)	Biodiesel (Btu/gal)	Electricity	Diesel	Biodiesel	Total Energy (Btu/day)	Electricity	Diesel	Biodiesel
Alternative 4	3,412	138,691	127,259	252,408,779	0	0	252,408,779	73,977	0	0
Build Supplemental	3,412	138,691	127,259	116,582,554	0	0	116,582,554	34,168	0	0
with BRT along Vancouver	3,412	138,691	127,259	101,740,173	0	0	101,740,173	29,818	0	0
	3,412	138,691	127,259	77,391,227	0	0	77,391,227	22,682	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	77,813,455	0	77,813,455	0	561	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	52,557,867	52,557,867	0	0	413
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	93,768,615	0	93,768,615	0	676	0
	3,412	138,691	127,259	0	569,052,574	0	569,052,574	0	4,103	0
	3,412	138,691	127,259	0	520,550,437	0	520,550,437	0	3,753	0
	3,412	138,691	127,259	0	2,400,575,855	0	2,400,575,855	0	17,309	0
<b>Total</b>				<b>548,122,733</b>	<b>3,661,760,936</b>	<b>52,557,867</b>	<b>4,262,441,535</b>	<b>160,646</b>	<b>26,402</b>	<b>413</b>

$$E = V \times L \times FCR \times CF$$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segmen

FCR = Fuel Consumption Rate (

CF = Btu/gal Conversion Factor

Alternative	Daily CO <sub>2</sub> Emissions		
	Electricity (lbs CO <sub>2</sub> /day)	Diesel (lbs CO <sub>2</sub> /day)	Biodiesel (lbs CO <sub>2</sub> /day)
Alternative 4	78,676	0	0
Build Supplemental	36,339	0	0
with BRT along Vancouver	31,712	0	0
	24,123	0	0
	0	0	0
	0	0	0
	0	0	0
	0	12,455	0
	0	0	0
	0	0	0
	0	0	9,169
	0	0	0
	0	15,009	0
	0	91,087	0
	0	83,324	0
	0	384,256	0
<b>Total</b>	<b>170,850</b>	<b>586,131</b>	<b>9,169</b>

$E = V \times L \times FCR \times CF$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segment (miles)

FCR = Fuel Consumption Rate (gallons/mile) (based on speed and vehicle type)

CF = Btu/gal Conversion Factor (based on fuel type – gasoline or diesel)

Alternative	Transit Group	Energy Type	V*L Daily VMT	Fuel Consumption Rate		
				FCR Electricity (kwh/car mile)	FCR Diesel (gal/mi)	FCR Biodiesel (gal/mi)
<b>Alternative 5</b>	LRT - Blue Line	Electricity	6,165	12.00	12.00	12.00
<b>Build Supplemental with LRT along Vancouver</b>	LRT - Red Line	Electricity	2,847	12.00	12.00	12.00
	LRT - Green Line	Electricity	2,485	12.00	12.00	12.00
	LRT - Yellow Line	Electricity	2,841	12.00	12.00	12.00
	BRT	Biodiesel	0	0.18	0.18	0.18
	BRT Lite	Biodiesel	0	0.19	0.19	0.19
	CTran - I-5	Diesel	0	0.18	0.18	0.18
	CTran - I-205	Diesel	3,438	0.18	0.18	0.18
	CTran - PIR	Diesel	0	0.19	0.19	0.19
	CTran - Expo	Diesel	0	0.19	0.19	0.19
	CTran - Lmtd	Diesel	435	0.19	0.19	0.19
	CTran - Limited	Diesel	554	0.19	0.19	0.19
	CTran - Express	Diesel	2,983	0.18	0.18	0.18
	CTran - Local	Diesel	20,437	0.19	0.19	0.19
	TRI-MET - N Portland	Diesel	17,061	0.22	0.22	0.22
	TRI-MET - Other	Diesel	80,486	0.22	0.22	0.22
	<b>Total</b>					

$E = V \times L \times FCR \times CF$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segmen

FCR = Fuel Consumption Rate (

CF = Btu/gal Conversion Factor

Alternative	Fuel Conversion Factor			Daily Energy Consumed (Btu/day)			E	Daily Energy Consumed (kwh-gal/day)		
	Electricity (Btu/kwh)	Diesel (Btu/gal)	Biodiesel (Btu/gal)	Electricity	Diesel	Biodiesel	Total Energy (Btu/day)	Electricity	Diesel	Biodiesel
Alternative 5	3,412	138,691	127,259	252,408,779	0	0	252,408,779	73,977	0	0
Build Supplemental	3,412	138,691	127,259	116,582,554	0	0	116,582,554	34,168	0	0
with LRT along Vancouver	3,412	138,691	127,259	101,740,173	0	0	101,740,173	29,818	0	0
	3,412	138,691	127,259	116,314,313	0	0	116,314,313	34,090	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	85,447,252	0	85,447,252	0	616	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	11,175,485	0	11,175,485	0	81	0
	3,412	138,691	127,259	0	14,225,280	0	14,225,280	0	103	0
	3,412	138,691	127,259	0	74,146,821	0	74,146,821	0	535	0
	3,412	138,691	127,259	0	538,856,941	0	538,856,941	0	3,885	0
	3,412	138,691	127,259	0	508,863,629	0	508,863,629	0	3,669	0
	3,412	138,691	127,259	0	2,400,575,855	0	2,400,575,855	0	17,309	0
<b>Total</b>				<b>587,045,819</b>	<b>3,633,291,263</b>	<b>0</b>	<b>4,220,337,081</b>	<b>172,053</b>	<b>26,197</b>	<b>0</b>

$$E = V \times L \times FCR \times CF$$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segmen

FCR = Fuel Consumption Rate (

CF = Btu/gal Conversion Factor

Alternative	Daily CO <sub>2</sub> Emissions		
	Electricity (lbs CO <sub>2</sub> /day)	Diesel (lbs CO <sub>2</sub> /day)	Biodiesel (lbs CO <sub>2</sub> /day)
Alternative 5	78,676	0	0
Build Supplemental	36,339	0	0
with LRT along Vancouver	31,712	0	0
	36,255	0	0
	0	0	0
	0	0	0
	0	0	0
	0	13,677	0
	0	0	0
	0	0	0
	0	1,789	0
	0	2,277	0
	0	11,869	0
	0	86,254	0
	0	81,453	0
	0	384,256	0
<b>Total</b>	<b>182,982</b>	<b>581,574</b>	<b>0</b>

$$E = V \times L \times FCR \times CF$$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segment (miles)

FCR = Fuel Consumption Rate (gallons/mile) (based on speed and vehicle type)

CF = Btu/gal Conversion Factor (based on fuel type – gasoline or diesel)

Alternative	Transit Group	Energy Type	V*L Daily VMT	Fuel Consumption Rate		
				FCR Electricity (kwh/car mile)	FCR Diesel (gal/mi)	FCR Biodiesel (gal/mi)
<b>T9 Build Replacement with LRT on I-5</b>	LRT - Blue Line	Electricity	6,165	12.00	12.00	12.00
	LRT - Red Line	Electricity	2,847	12.00	12.00	12.00
	LRT - Green Line	Electricity	2,485	12.00	12.00	12.00
	LRT - Yellow Line	Electricity	2,062	12.00	12.00	12.00
	BRT	Biodiesel	0	0.18	0.18	0.18
	BRT Lite	Biodiesel	0	0.19	0.19	0.19
	CTran - I-5	Diesel	0	0.18	0.18	0.18
	CTran - I-205	Diesel	2,309	0.18	0.18	0.18
	CTran - PIR	Diesel	0	0.19	0.19	0.19
	CTran - Expo	Diesel	0	0.19	0.19	0.19
	CTran - Lmtd	Diesel	290	0.19	0.19	0.19
	CTran - Limited	Diesel	420	0.19	0.19	0.19
	CTran - Express	Diesel	2,139	0.18	0.18	0.18
	CTran - Local	Diesel	10,513	0.19	0.19	0.19
	TRI-MET - N Portland	Diesel	13,962	0.22	0.22	0.22
	TRI-MET - Other	Diesel	81,158	0.22	0.22	0.22
<b>Total</b>						

$E = V \times L \times FCR \times CF$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segmen

FCR = Fuel Consumption Rate (

CF = Btu/gal Conversion Factor

Alternative	Fuel Conversion Factor			Daily Energy Consumed (Btu/day)			E	Daily Energy Consumed (kwh-gal/day)		
	Electricity (Btu/kwh)	Diesel (Btu/gal)	Biodiesel (Btu/gal)	Electricity	Diesel	Biodiesel	Total Energy (Btu/day)	Electricity	Diesel	Biodiesel
T9	3,412	138,691	127,259	252,408,779	0	0	252,408,779	73,977	0	0
Build Replacement	3,412	138,691	127,259	116,582,554	0	0	116,582,554	34,168	0	0
with LRT on I-5	3,412	138,691	127,259	101,740,173	0	0	101,740,173	29,818	0	0
	3,412	138,691	127,259	84,443,987	0	0	84,443,987	24,749	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	57,390,351	0	57,390,351	0	414	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	0	0	0	0	0	0
	3,412	138,691	127,259	0	7,450,323	0	7,450,323	0	54	0
	3,412	138,691	127,259	0	10,797,876	0	10,797,876	0	78	0
	3,412	138,691	127,259	0	53,166,235	0	53,166,235	0	383	0
	3,412	138,691	127,259	0	277,192,041	0	277,192,041	0	1,999	0
	3,412	138,691	127,259	0	416,430,369	0	416,430,369	0	3,003	0
	3,412	138,691	127,259	0	2,420,614,306	0	2,420,614,306	0	17,453	0
<b>Total</b>				<b>555,175,492</b>	<b>3,243,041,502</b>	<b>0</b>	<b>3,798,216,994</b>	<b>162,713</b>	<b>23,383</b>	<b>0</b>



$$E = V \times L \times FCR \times CF$$

E = Energy in Btu

V = Number of Vehicles (ADT)

L = Length of Roadway Segmen

FCR = Fuel Consumption Rate (

CF = Btu/gal Conversion Factor

Alternative	Daily CO <sub>2</sub> Emissions		
	Electricity (lbs CO <sub>2</sub> /day)	Diesel (lbs CO <sub>2</sub> /day)	Biodiesel (lbs CO <sub>2</sub> /day)
T9	78,676	0	0
Build Replacement	36,339	0	0
with LRT on I-5	31,712	0	0
	26,321	0	0
	0	0	0
	0	0	0
	0	0	0
	0	9,186	0
	0	0	0
	0	0	0
	0	1,193	0
	0	1,728	0
	0	8,510	0
	0	44,370	0
	0	66,657	0
	0	387,463	0
<b>Total</b>	<b>173,048</b>	<b>519,107</b>	<b>0</b>



# APPENDIX E

Construction Analysis



**Source:** *Energy and Transportation Systems*, 1983. State of California Department of Transportation, Division of Engineering Services, Office of Transportation Laboratory.

PRICE INDEX FOR SELECTED  
CALIFORNIA CONSTRUCTION ITEMS

1987=100

Year	Quarter	Quarter Average	Last 12 Months	Annual
1972				30.0
1973				<b>31.2</b>
1974				45.6
1975				46.7
1976				47.7
1977				53.7
1978				62.1
1979				80.1
1980				82.1
1981				90.6
1982				81.3
1983				81.9
1984				93.3
1985				92.7
1986				95.0
1987				100.0
1988				104.4
1989				111.3
1990				113.5
1991				108.2
1992				106.8
1993				113.1
1994				119.0
1995				115.0
1996				119.2
1997				124.8
1998				128.6
1999				139.2
2000				146.2
2001	(1st Quarter)	140.1	137.0	
2001	(2nd Quarter)	141.6	134.8	
2001	(3rd Quarter)	167.5	141.6	
2001	(4th Quarter)	183.3		
(Year)		<b>158.1</b>	<b>137.8</b>	154.1
2002	(1st Quarter)	145.1	157.5	
2002	(2nd Quarter)	129.5	148.4	
2002	(3rd Quarter)	175.5	149.7	
2002	(4th Quarter)	153.7		
(Year)		<b>151.0</b>	<b>151.9</b>	142.2
2003	(1st Quarter)	188.2	143.2	
2003	(2nd Quarter)	158.1	155.6	
2003	(3rd Quarter)	190.7	158.3	
2003	(4th Quarter)	138.2		
(Year)		<b>168.8</b>	<b>152.4</b>	148.6
2004	(1st Quarter)	278.9	155.0	
2004	(2nd Quarter)	213.1	165.7	
2004	(3rd Quarter)	224.8	167.1	
2004	(4th Quarter)	228.9		
(Year)		<b>236.4</b>	<b>162.6</b>	216.2
2005	(1st Quarter)	230.2	214.7	
2005	(2nd Quarter)	266.8	230.0	
2005	(3rd Quarter)	289.3	240.7	
2005	(4th Quarter)	308.1		
(Year)		<b>273.6</b>	<b>228.5</b>	268.3
2006	(1st Quarter)	252.8	243.0	
2006	(2nd Quarter)	386.6	265.4	
2006	(3rd Quarter)	380.3	276.1	
2006	(4th Quarter)	300.1		
(Year)		<b>330.0</b>	<b>261.5</b>	280.6
2007	(1st Quarter)	363.9	335.3	
2007	(2nd Quarter)	401.4	341.2	
		<b>382.7</b>	<b>338.3</b>	<b>360.5</b>

Source: *Energy and Transportation Systems*, 1983. State of California Department of Transportation, Division of Engineering Services, Office of Transportation Laboratory.

**CRC**

**Construction**

Activity	Code	Caltrans Construction Activity	Dollar-to-Energy Factor (Btu/1973\$)	Page
		Track Work	163,000,000,000	E-21
	0		0	
Guideway	1	Track Work	50,100	assumed
Tracks	1	Track Work	50,100	assumed
Walls	2	Structures	50,100	E-22
	3	Overhead Electrical System	21,079	E-25
	4	Electrical Substations	77,000	E-23
Other	5	Signals	21,079	E-25
Systems	6	Stations, Stops and Terminals	50,100	E-26
Stations	6	Stations, Stops and Terminals	50,100	E-26
	7	Parking	61,615	E-26
	8	Maintenance (Shop) Building	50,100	E-27
	9	Maintenance (Storage) Yard	61,615	E-27
	10	Manufacture (auto)	141,000,000	E-30
	11	Manufacture (bus)	1,041,000,000	E-30
	12	Manufacture (LRV)	2,614,000,000	E-30
Sitework	13	Site Work	21,079	assumed
Earthwork	13	Site Work	21,079	assumed
	14	Rural Freeway	119,104	C-49
	15	Rural Conventional Highway	113,596	C-49
	16	Rural Freeway Widen	74,354	C-49
	17	Rural Conventional Highway Widen	80,034	C-49
Pavement	18	Urban Freeway	47,332	C-49
	19	Urban Conventional Highway	43,201	C-49
	20	Urban Freeway Widen	42,340	C-49
	21	Urban Conventional Highway Widen	40,103	C-49
	22	Interchange	120,653	C-49
	23	Blanket	59,552	C-49
	24	Bridge Steel Girder	52,323	C-49
Bridges	25	Bridge Concrete Box Girder	48,364	C-49
	26	Landscape Planting	21,170	C-49
	27	Lighting Signals	20,310	C-49

	1977\$/ Dollar-to-Energy Factor 1973\$	Dollar-to-E	Page
Rural Freeway	69,200 1.721154	119,104	C-49
Rural Conventional Highway	66,000 1.721154	113,596	C-49
Rural Freeway Widen	43,200 1.721154	74,354	C-49
Rural Conventional Highway Widen	46,500 1.721154	80,034	C-49
Urban Freeway	27,500 1.721154	47,332	C-49
Urban Conventional Highway	25,100 1.721154	43,201	C-49
Urban Freeway Widen	24,600 1.721154	42,340	C-49
Urban Conventional Highway Widen	23,300 1.721154	40,103	C-49
Interchange	70,100 1.721154	120,653	C-49
Blanket	34,600 1.721154	59,552	C-49
Bridge Steel Girder	30,400 1.721154	52,323	C-49
Bridge Concrete Box Girder	28,100 1.721154	48,364	C-49
Landscape Planting	12,300 1.721154	21,170	C-49
Lighting Signals	11,800 1.721154	20,310	C-49

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 2 - BRT		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu) Highway	Energy (Btu) Transit	Energy (Btu) Total
	2A - Downstream Bridge							
	Highway	Transit						
<b><i>SOUTH HIGHWAY APPROACH</i></b>								
<b>I-5 MAINLINE</b>								
Pavement	\$8,035,260	\$0	Urban Freeway	47,332	0.0865465	32,915,777,257	0	32,915,777,257
Earthwork	\$1,775,347	\$0	Site Work	21,079	0.0865465	3,238,788,432	0	3,238,788,432
Bridges	\$148,360,710	\$0	Bridge Concrete Box Girder	48,364	0.0865465	620,998,341,768	0	620,998,341,768
Other	\$1,919,400	\$0	Signals	21,079	0.0865465	3,501,586,178	0	3,501,586,178
<b>SUBTOTAL</b>	<b>\$160,090,717</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>								
Pavement	\$258,540	\$0	Urban Freeway	47,332	0.0865465	1,059,087,702	0	1,059,087,702
Earthwork		\$0	Site Work	21,079	0.0865465	0	0	0
Bridges	\$3,529,500	\$0	Bridge Concrete Box Girder	48,364	0.0865465	14,773,545,147	0	14,773,545,147
<b>SUBTOTAL</b>	<b>\$3,788,040</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>VICTORY BLVD INTERCHANGE</b>								
Pavement	\$189,250	\$0	Urban Freeway	47,332	0.0865465	775,246,955	0	775,246,955
<b>SUBTOTAL</b>	<b>\$189,250</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>MARINE DRIVE INTERCHANGE</b>								
Pavement	\$2,966,727	\$0	Urban Freeway	47,332	0.0865465	12,152,951,506	0	12,152,951,506
Earthwork	\$389,894	\$0	Site Work	21,079	0.0865465	711,288,945	0	711,288,945
Bridges	\$215,044,315	\$0	Bridge Concrete Box Girder	48,364	0.0865465	900,118,117,672	0	900,118,117,672
Walls	\$516,000	\$0	Structures	50,100	0.0865465	2,237,364,549	0	2,237,364,549
Other	\$530,000	\$0	Signals	21,079	0.0865465	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$219,446,936</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>HAYDEN ISLAND INTERCHANGE</b>								
Pavement	\$6,429,201	\$0	Urban Freeway	47,332	0.0865465	26,336,689,548	0	26,336,689,548
Earthwork	\$4,774,649	\$0	Site Work	21,079	0.0865465	8,710,453,977	0	8,710,453,977
Bridges	\$52,937,550	\$0	Bridge Concrete Box Girder	48,364	0.0865465	221,582,457,830	0	221,582,457,830
Walls	\$1,094,500	\$0	Structures	50,100	0.0865465	4,745,727,712	0	4,745,727,712
Other	\$530,000	\$0	Signals	21,079	0.0865465	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$65,765,900</b>	<b>\$0</b>		0	0.0865465	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$90,466,507	\$0		0	0.0865465	0	0	0
PROFESSIONAL SERVICES	\$123,844,417	\$0		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$51,110,000	\$0		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$714,701,767</b>	<b>\$0</b>		0	0.0865465	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 2 - BRT							
	2A - Downstream Bridge		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu) Highway	Energy (Btu) Transit	Energy (Btu) Total
	Highway	Transit						
<b>NORTH HIGHWAY APPROACH</b>								
I-5 MAINLINE				0	0.0865465	0	0	0
Pavement	\$21,447,327	\$0	Urban Freeway	47,332	0.0865465	87,857,199,910	0	87,857,199,910
Earthwork	\$5,090,904	\$0	Site Work	21,079	0.0865465	9,287,402,078	0	9,287,402,078
Bridges	\$25,612,303	\$0	Bridge Concrete Box Girder	48,364	0.0865465	107,206,267,014	0	107,206,267,014
Walls	\$3,848,133	\$0	Structures	50,100	0.0865465	16,685,419,293	0	16,685,419,293
Other	\$3,304,082	\$0	Signals	21,079	0.0865465	6,027,678,973	0	6,027,678,973
<b>SUBTOTAL</b>	<b>\$59,302,749</b>	<b>\$0</b>		0	0.0865465	0	0	0
COLLECTOR/DISTRIBUTOR ROADS				0	0.0865465	0	0	0
Pavement	\$3,390,057	\$0	Urban Freeway	47,332	0.0865465	13,887,089,764	0	13,887,089,764
Earthwork	\$2,276,945	\$0	Site Work	21,079	0.0865465	4,153,859,349	0	4,153,859,349
Bridges	\$1,030,594	\$0	Bridge Concrete Box Girder	48,364	0.0865465	4,313,792,222	0	4,313,792,222
Walls	\$2,053,636	\$0	Structures	50,100	0.0865465	8,904,520,123	0	8,904,520,123
<b>SUBTOTAL</b>	<b>\$8,751,232</b>	<b>\$0</b>		0	0.0865465	0	0	0
SR 14 INTERCHANGE				0	0.0865465	0	0	0
Pavement	\$6,039,945	\$0	Urban Freeway	47,332	0.0865465	24,742,133,461	0	24,742,133,461
Earthwork	\$3,658,118	\$0	Site Work	21,079	0.0865465	6,673,551,068	0	6,673,551,068
Bridges	\$43,366,360	\$0	Bridge Concrete Box Girder	48,364	0.0865465	181,520,009,866	0	181,520,009,866
Walls	\$8,813,431	\$0	Structures	50,100	0.0865465	38,214,841,234	0	38,214,841,234
Other	\$573,460	\$0	Signals	21,079	0.0865465	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$62,451,313</b>	<b>\$0</b>		0	0.0865465	0	0	0
EVERGREEN BLVD BRIDGE				0	0.0865465	0	0	0
Pavement	\$306,810	\$0	Urban Freeway	47,332	0.0865465	1,256,820,761	0	1,256,820,761
Earthwork	\$34,069	\$0	Site Work	21,079	0.0865465	62,152,396	0	62,152,396
Bridges	\$8,764,654	\$0	Bridge Concrete Box Girder	48,364	0.0865465	36,686,504,624	0	36,686,504,624
<b>SUBTOTAL</b>	<b>\$9,105,533</b>	<b>\$0</b>		0	0.0865465	0	0	0
MILL PLAIN BLVD INTERCHANGE				0	0.0865465	0	0	0
Pavement	\$3,990,794	\$0	Urban Freeway	47,332	0.0865465	16,347,955,612	0	16,347,955,612
Earthwork	\$3,193,595	\$0	Site Work	21,079	0.0865465	5,826,117,453	0	5,826,117,453
Bridges	\$3,163,162	\$0	Bridge Concrete Box Girder	48,364	0.0865465	13,240,152,372	0	13,240,152,372
Walls	\$837,468	\$0	Structures	50,100	0.0865465	3,631,242,663	0	3,631,242,663
Other	\$573,460	\$0	Signals	21,079	0.0865465	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$11,758,479</b>	<b>\$0</b>		0	0.0865465	0	0	0
4th PLAIN BLVD INTERCHANGE				0	0.0865465	0	0	0
Pavement	\$3,382,758	\$757,065	Urban Freeway	47,332	0.0865465	13,857,189,311	3,101,252,366	16,958,441,677
Earthwork	\$2,613,005	\$321,851	Site Work	21,079	0.0865465	4,766,938,934	587,156,270	5,354,095,204
Bridges	\$50,951,542	\$0	Bridge Concrete Box Girder	48,364	0.0865465	213,269,559,567	0	213,269,559,567
Walls	\$18,694,255	\$0	Structures	50,100	0.0865465	81,057,874,828	0	81,057,874,828
Other	\$573,460	\$0	Signals	21,079	0.0865465	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$76,215,021</b>	<b>\$1,078,915</b>		0	0.0865465	0	0	0
29th STREET & 33rd STREET BRIDGES				0	0.0865465	0	0	0
Pavement	\$288,985	\$0	Urban Freeway	47,332	0.0865465	1,183,802,665	0	1,183,802,665
Earthwork	\$14,210	\$0	Site Work	21,079	0.0865465	25,923,315	0	25,923,315
Bridges	\$11,376,262	\$1,794,129	Bridge Concrete Box Girder	48,364	0.0865465	47,617,995,326	7,509,745,730	55,127,741,056
<b>SUBTOTAL</b>	<b>\$11,679,456</b>	<b>\$1,794,129</b>		0	0.0865465	0	0	0
SR 500 INTERCHANGE				0	0.0865465	0	0	0
Pavement	\$5,148,198	\$0	Urban Freeway	47,332	0.0865465	21,089,167,639	0	21,089,167,639
Earthwork	\$2,834,254	\$0	Site Work	21,079	0.0865465	5,170,566,307	0	5,170,566,307
Bridges	\$45,544,415	\$0	Bridge Concrete Box Girder	48,364	0.0865465	190,636,767,632	0	190,636,767,632
Walls	\$4,758,095	\$0	Structures	50,100	0.0865465	20,630,994,331	0	20,630,994,331
Other	\$573,460	\$0	Signals	21,079	0.0865465	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$58,858,422</b>	<b>\$0</b>		0	0.0865465	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$67,032,822	\$0		0	0.0865465	0	0	0
PROFESSIONAL SERVICES	\$86,066,176	\$0		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$11,580,646	\$0		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$462,801,850</b>	<b>\$2,873,044</b>		0	0.0865465	0	0	0



**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 2 - BRT							
	2A - Downstream Bridge		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu) Highway	Energy (Btu) Transit	Energy (Btu) Total
	Highway	Transit						
<b>COLUMBIA RIVER BRIDGES</b>								
COLU Bridges	\$59,009,741	\$0	Bridge Concrete Box Girder	0	0.0865465	0	0	0
COLU Bridges	\$227,849,194	\$0	Bridge Concrete Box Girder	0	0.0865465	0	0	0
COLU Bridges	\$231,771,450	\$0	Bridge Concrete Box Girder	0	0.0865465	246,999,028,145	0	246,999,028,145
COLU Bridges	\$33,479,852	\$77,455,753	Bridge Concrete Box Girder	0	0.0865465	953,715,925,837	0	953,715,925,837
COLU Bridges			Bridge Concrete Box Girder	0	0.0865465	970,133,439,445	0	970,133,439,445
			Bridge Concrete Box Girder	0	0.0865465	140,137,725,433	324,209,111,494	464,346,836,927
			Bridge Concrete Box Girder	0	0.0865465	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$81,400,064	\$13,638,381		0	0.0865465	0	0	0
PROFESSIONAL SERVICES	\$153,747,419	\$20,965,557		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$24,684,320	\$4,131,432		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$811,942,040</b>	<b>\$116,191,123</b>		0	0.0865465	0	0	0
<b>TRANSIT</b>				0	0.0865465	0	0	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>				0	0.0865465	0	0	0
Guideway	\$21,636,045	\$51,597,043	Track Work	0	0.0865465	93,813,410,986	223,723,633,437	317,537,044,423
Tracks			Track Work	0	0.0865465	0	0	0
Stations	\$0	\$8,527,260	Stations, Stops and Terminals	0	0.0865465	0	36,974,010,128	36,974,010,128
Sitework	\$0	\$2,229,080	Site Work	0	0.0865465	21,079,086,545	0	4,066,539,396
Systems	\$0	\$2,913,650	Stations, Stops and Terminals	0	0.0865465	0	12,633,521,742	12,633,521,742
<b>SUBTOTAL</b>	<b>\$21,636,045</b>	<b>\$65,267,033</b>		0	0.0865465	0	0	0
<b>STATE LINE TO CLARK COLLEGE</b>				0	0.0865465	0	0	0
Guideway			Track Work	0	0.0865465	0	0	0
Tracks			Track Work	0	0.0865465	0	0	0
Stations			Stations, Stops and Terminals	0	0.0865465	0	0	0
Sitework			Site Work	0	0.0865465	21,079,086,545	0	0
Systems			Stations, Stops and Terminals	0	0.0865465	0	0	0
<b>SUBTOTAL</b>				0	0.0865465	0	0	0
<b>CLARK COLLEGE TO END OF PROJECT</b>				0	0.0865465	0	0	0
Guideway			Track Work	0	0.0865465	0	0	0
Tracks			Track Work	0	0.0865465	0	0	0
Stations			Stations, Stops and Terminals	0	0.0865465	0	0	0
Sitework			Site Work	0	0.0865465	21,079,086,545	0	0
Systems			Stations, Stops and Terminals	0	0.0865465	0	0	0
<b>SUBTOTAL</b>				0	0.0865465	0	0	0
<b>STATE LINE TO END OF PROJECT</b>				0	0.0865465	0	0	0
Guideway	\$0	\$6,844,407	Track Work	0	0.0865465	0	29,677,198,599	29,677,198,599
Tracks			Track Work	0	0.0865465	0	0	0
Stations	\$0	\$15,343,366	Stations, Stops and Terminals	0	0.0865465	0	66,528,494,138	66,528,494,138
Sitework	\$0	\$49,545,402	Site Work	0	0.0865465	21,079,086,545	0	90,386,316,216
Systems	\$0	\$17,930,753	Stations, Stops and Terminals	0	0.0865465	0	77,747,345,018	77,747,345,018
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$89,663,928</b>		0	0.0865465	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$0	\$32,443,478		0	0.0865465	0	0	0
SUPPORT FACILITIES AND VEHICLES	\$0	\$132,134,950		0	0.0865465	0	0	0
PROFESSIONAL SERVICES	\$0	\$90,374,904		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$0	\$58,932,190		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$21,636,045</b>	<b>\$468,816,484</b>						<b>6,327,751,223,221</b>
<b>TOTAL MODE COST</b>	<b>\$2,011,081,701</b>	<b>\$587,880,651</b>						
<b>TOTAL PROJECT COST</b>	<b>\$2,598,962,352</b>							

Note: 1. With the exception of the 29th and 33rd Street Bridges, highway costs have not been adjusted to reflect the eilir.

The cost estimates do not include any contingencies for risk or uncertainty.

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (n.gas)	Gasoline		Diesel
<b><i>SOUTH HIGHWAY APPROACH</i></b>											
<b>I-5 MAINLINE</b>											
Pavement	3,412	123,976	138,691	482,353	79,650	154,266	2,095	1,321	19.4	22.2	5,482,906
Earthwork	3,412	123,976	138,691	47,462	7,837	15,179	2,095	1,321	19.4	22.2	539,497
Bridges	3,412	123,976	138,691	9,100,210	1,502,706	2,910,419	2,095	1,321	19.4	22.2	103,442,048
Other	3,412	123,976	138,691	51,313	8,473	16,411	2,095	1,321	19.4	22.2	583,272
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>											
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,691	15,520	2,563	4,964	2,095	1,321	19.4	22.2	176,416
Bridges	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	216,494	35,749	69,239	2,095	1,321	19.4	22.2	2,460,885
<b>VICTORY BLVD INTERCHANGE</b>											
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>MARINE DRIVE INTERCHANGE</b>											
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,691	178,091	29,408	56,957	2,095	1,321	19.4	22.2	2,024,363
Bridges	3,412	123,976	138,691	10,423	1,721	3,334	2,095	1,321	19.4	22.2	118,482
Walls	3,412	123,976	138,691	13,190,477	2,178,127	4,218,563	2,095	1,321	19.4	22.2	149,936,088
Other	3,412	123,976	138,691	32,787	5,414	10,486	2,095	1,321	19.4	22.2	372,686
<b>SUBTOTAL</b>	3,412	123,976	138,691	14,169	2,340	4,531	2,095	1,321	19.4	22.2	161,058
<b>HAYDEN ISLAND INTERCHANGE</b>											
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Bridges	3,412	123,976	138,691	385,942	63,730	123,432	2,095	1,321	19.4	22.2	4,387,002
Walls	3,412	123,976	138,691	127,644	21,078	40,823	2,095	1,321	19.4	22.2	1,450,933
Other	3,412	123,976	138,691	3,247,105	536,190	1,038,486	2,095	1,321	19.4	22.2	36,909,830
<b>SUBTOTAL</b>	3,412	123,976	138,691	69,545	11,484	22,242	2,095	1,321	19.4	22.2	790,514
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>											
PROFESSIONAL SERVICES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (n.gas)	Gasoline		
<b>NORTH HIGHWAY APPROACH</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>I-5 MAINLINE</b>	3,412	123,976	138,691	1,287,474	212,599	411,758	2,095	1,321	19.4	22.2	14,634,707
Pavement	3,412	123,976	138,691	136,099	22,474	43,527	2,095	1,321	19.4	22.2	1,547,038
Earthwork	3,412	123,976	138,691	1,571,018	259,420	502,441	2,095	1,321	19.4	22.2	17,857,754
Bridges	3,412	123,976	138,691	244,511	40,376	78,199	2,095	1,321	19.4	22.2	2,779,354
Walls	3,412	123,976	138,691	88,331	14,586	28,250	2,095	1,321	19.4	22.2	1,004,053
Other	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	203,504	33,604	65,084	2,095	1,321	19.4	22.2	2,313,225
Earthwork	3,412	123,976	138,691	60,871	10,052	19,468	2,095	1,321	19.4	22.2	691,924
Bridges	3,412	123,976	138,691	63,215	10,439	20,217	2,095	1,321	19.4	22.2	718,565
Walls	3,412	123,976	138,691	130,488	21,547	41,733	2,095	1,321	19.4	22.2	1,483,260
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 14 INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	362,575	59,872	115,958	2,095	1,321	19.4	22.2	4,121,391
Earthwork	3,412	123,976	138,691	97,795	16,149	31,277	2,095	1,321	19.4	22.2	1,111,639
Bridges	3,412	123,976	138,691	2,660,024	439,246	850,726	2,095	1,321	19.4	22.2	30,236,476
Walls	3,412	123,976	138,691	560,006	92,473	179,101	2,095	1,321	19.4	22.2	6,365,591
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>EVERGREEN BLVD BRIDGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	18,418	3,041	5,890	2,095	1,321	19.4	22.2	209,353
Earthwork	3,412	123,976	138,691	911	150	291	2,095	1,321	19.4	22.2	10,353
Bridges	3,412	123,976	138,691	537,610	88,775	171,938	2,095	1,321	19.4	22.2	6,111,010
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>MILL PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	239,566	39,559	76,618	2,095	1,321	19.4	22.2	2,723,141
Earthwork	3,412	123,976	138,691	85,377	14,098	27,305	2,095	1,321	19.4	22.2	970,478
Bridges	3,412	123,976	138,691	194,023	32,039	62,052	2,095	1,321	19.4	22.2	2,205,462
Walls	3,412	123,976	138,691	53,213	8,787	17,018	2,095	1,321	19.4	22.2	604,870
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>4th PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	248,512	41,036	79,479	2,095	1,321	19.4	22.2	2,824,832
Earthwork	3,412	123,976	138,691	78,460	12,956	25,093	2,095	1,321	19.4	22.2	891,852
Bridges	3,412	123,976	138,691	3,125,287	516,075	999,526	2,095	1,321	19.4	22.2	35,525,119
Walls	3,412	123,976	138,691	1,187,835	196,146	379,892	2,095	1,321	19.4	22.2	13,502,118
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	17,348	2,865	5,548	2,095	1,321	19.4	22.2	197,190
Earthwork	3,412	123,976	138,691	380	63	121	2,095	1,321	19.4	22.2	4,318
Bridges	3,412	123,976	138,691	807,851	133,399	258,366	2,095	1,321	19.4	22.2	9,182,837
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 500 INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	309,044	51,032	98,838	2,095	1,321	19.4	22.2	3,512,903
Earthwork	3,412	123,976	138,691	75,770	12,512	24,233	2,095	1,321	19.4	22.2	861,281
Bridges	3,412	123,976	138,691	2,793,622	461,307	893,453	2,095	1,321	19.4	22.2	31,755,089
Walls	3,412	123,976	138,691	302,330	49,923	96,691	2,095	1,321	19.4	22.2	3,436,583
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>PROFESSIONAL SERVICES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>RIGHT-OF-WAY</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (n.gas)	Gasoline		
<b>COLUMBIA RIVER BRIDGES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,691	3,619,564	597,694	1,157,605	2,095	1,321	19.4	22.2	41,143,565
COLU Bridges	3,412	123,976	138,691	13,975,907	2,307,824	4,469,759	2,095	1,321	19.4	22.2	158,864,078
COLU Bridges	3,412	123,976	138,691	14,216,492	2,347,551	4,546,703	2,095	1,321	19.4	22.2	161,598,805
COLU Bridges	3,412	123,976	138,691	6,804,614	1,123,637	2,176,244	2,095	1,321	19.4	22.2	77,348,013
COLU Bridges	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TRANSIT</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	4,653,239	768,384	1,488,194	2,095	1,321	19.4	22.2	52,893,349
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	541,823	89,471	173,285	2,095	1,321	19.4	22.2	6,158,901
Sitework	3,412	123,976	138,691	59,592	9,840	19,059	2,095	1,321	19.4	22.2	677,379
Systems	3,412	123,976	138,691	185,134	30,571	59,209	2,095	1,321	19.4	22.2	2,104,414
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO CLARK COLLEGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>CLARK COLLEGE TO END OF PROJECT</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO END OF PROJECT</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	434,894	71,814	139,087	2,095	1,321	19.4	22.2	4,943,443
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	974,919	160,987	311,798	2,095	1,321	19.4	22.2	11,081,904
Sitework	3,412	123,976	138,691	1,324,536	218,719	423,612	2,095	1,321	19.4	22.2	15,055,991
Systems	3,412	123,976	138,691	1,139,322	188,135	364,377	2,095	1,321	19.4	22.2	12,950,670
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
SUPPORT FACILITIES AND VEHICLES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>				<b>92,727,890</b>	<b>15,312,039</b>	<b>29,656,130</b>					<b>0</b>

**TOTAL MODE COST**

**TOTAL PROJECT COST**

Note: 1. With the exception of the 29th and 33rd Street Bridges, highway

The cost estimates do not include any contingencies for risk

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 2 - BRT		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu) Highway	Energy (Btu) Transit	Energy (Btu) Total
	2B - Upstream Bridge							
	Highway	Transit						
<b><i>SOUTH HIGHWAY APPROACH</i></b>								
<b>I-5 MAINLINE</b>								
Pavement	\$7,305,210	\$0	Urban Freeway	47,332	0.0865465	29,925,187,881	0	29,925,187,881
Earthwork	\$1,195,011	\$0	Site Work	21,079	0.0865465	2,180,073,981	0	2,180,073,981
Bridges	\$141,297,830	\$0	Bridge Concrete Box Girder	48,364	0.0865465	591,435,010,829	0	591,435,010,829
Other	\$1,754,200	\$0	Signals	21,079	0.0865465	3,200,209,687	0	3,200,209,687
<b>SUBTOTAL</b>	<b>\$151,552,251</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>								
Pavement	\$258,540	\$0	Urban Freeway	47,332	0.0865465	1,059,087,702	0	1,059,087,702
Earthwork		\$0	Site Work	21,079	0.0865465	0	0	0
Bridges	\$3,547,000	\$0	Bridge Concrete Box Girder	48,364	0.0865465	14,846,795,477	0	14,846,795,477
<b>SUBTOTAL</b>	<b>\$3,805,540</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>VICTORY BLVD INTERCHANGE</b>								
Pavement	\$189,250	\$0	Urban Freeway	47,332	0.0865465	775,246,955	0	775,246,955
<b>SUBTOTAL</b>	<b>\$189,250</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>MARINE DRIVE INTERCHANGE</b>								
Pavement	\$2,832,007	\$0	Urban Freeway	47,332	0.0865465	11,601,082,181	0	11,601,082,181
Earthwork	\$389,894	\$0	Site Work	21,079	0.0865465	711,288,945	0	711,288,945
Bridges	\$210,732,225	\$0	Bridge Concrete Box Girder	48,364	0.0865465	882,068,859,620	0	882,068,859,620
Walls	\$897,000	\$0	Structures	50,100	0.0865465	3,889,372,094	0	3,889,372,094
Other	\$530,000	\$0	Signals	21,079	0.0865465	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$215,381,126</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>HAYDEN ISLAND INTERCHANGE</b>								
Pavement	\$6,341,961	\$0	Urban Freeway	47,332	0.0865465	25,979,318,112	0	25,979,318,112
Earthwork	\$4,875,103	\$0	Site Work	21,079	0.0865465	8,893,713,286	0	8,893,713,286
Bridges	\$49,036,150	\$0	Bridge Concrete Box Girder	48,364	0.0865465	205,252,238,525	0	205,252,238,525
Walls	\$462,000	\$0	Structures	50,100	0.0865465	2,003,221,748	0	2,003,221,748
Other	\$530,000	\$0	Signals	21,079	0.0865465	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$61,245,214</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>								
PROFESSIONAL SERVICES	\$91,341,888	\$0		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$120,273,359	\$0		0	0.0865465	0	0	0
	\$48,210,000	\$0		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$691,998,628</b>	<b>\$0</b>		0	0.0865465	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 2 - BRT		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu)		Energy (Btu) Transit	Energy (Btu) Total		
	2B - Upstream Bridge					Highway	Transit			Highway	Transit
	Highway	Transit									
<b>NORTH HIGHWAY APPROACH</b>				0	0.0865465		0		0		
				0	0.0865465		0		0		
				0	0.0865465		0		0		
				0	0.0865465		0		0		
<b>I-5 MAINLINE</b>				0	0.0865465		0		0		
Pavement	\$21,434,516		\$0 Urban Freeway	47,332	0.0865465	87,804,721,201	0		87,804,721,201		
Earthwork	\$4,642,931		\$0 Site Work	21,079	0.0865465	8,470,159,364	0		8,470,159,364		
Bridges	\$25,612,303		\$0 Bridge Concrete Box Girder	48,364	0.0865465	107,206,267,014	0		107,206,267,014		
Walls	\$3,848,133		\$0 Structures	50,100	0.0865465	16,685,419,293	0		16,685,419,293		
Other	\$3,320,139		\$0 Signals	21,079	0.0865465	6,056,971,747	0		6,056,971,747		
<b>SUBTOTAL</b>	<b>\$58,858,023</b>		<b>\$0</b>	0	0.0865465	0	0		0		
				0	0.0865465		0		0		
				0	0.0865465		0		0		
<b>COLLECTOR/DISTRIBUTOR ROADS</b>				0	0.0865465		0		0		
Pavement	\$3,554,305		\$0 Urban Freeway	47,332	0.0865465	14,559,916,458	0		14,559,916,458		
Earthwork	\$2,061,357		\$0 Site Work	21,079	0.0865465	3,760,560,441	0		3,760,560,441		
Bridges	\$1,030,594		\$0 Bridge Concrete Box Girder	48,364	0.0865465	4,313,792,222	0		4,313,792,222		
Walls	\$4,443,233		\$0 Structures	50,100	0.0865465	19,265,759,686	0		19,265,759,686		
<b>SUBTOTAL</b>	<b>\$11,089,489</b>		<b>\$0</b>	0	0.0865465	0	0		0		
				0	0.0865465		0		0		
				0	0.0865465		0		0		
<b>SR 14 INTERCHANGE</b>				0	0.0865465		0		0		
Pavement	\$6,888,160		\$0 Urban Freeway	47,332	0.0865465	28,216,778,047	0		28,216,778,047		
Earthwork	\$2,289,288		\$0 Site Work	21,079	0.0865465	4,176,377,675	0		4,176,377,675		
Bridges	\$93,154,893		\$0 Bridge Concrete Box Girder	48,364	0.0865465	389,921,522,687	0		389,921,522,687		
Walls	\$663,807		\$0 Structures	50,100	0.0865465	2,878,252,421	0		2,878,252,421		
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0		1,046,170,475		
<b>SUBTOTAL</b>	<b>\$103,569,608</b>		<b>\$0</b>	0	0.0865465	0	0		0		
				0	0.0865465		0		0		
				0	0.0865465		0		0		
<b>EVERGREEN BLVD BRIDGE</b>				0	0.0865465		0		0		
Pavement	\$306,810		\$0 Urban Freeway	47,332	0.0865465	1,256,820,761	0		1,256,820,761		
Earthwork	\$34,069		\$0 Site Work	21,079	0.0865465	62,152,396	0		62,152,396		
Bridges	\$8,764,654		\$0 Bridge Concrete Box Girder	48,364	0.0865465	36,686,504,624	0		36,686,504,624		
<b>SUBTOTAL</b>	<b>\$9,105,533</b>		<b>\$0</b>	0	0.0865465	0	0		0		
				0	0.0865465		0		0		
				0	0.0865465		0		0		
<b>MILL PLAIN BLVD INTERCHANGE</b>				0	0.0865465		0		0		
Pavement	\$3,990,794		\$0 Urban Freeway	47,332	0.0865465	16,347,955,612	0		16,347,955,612		
Earthwork	\$3,441,311		\$0 Site Work	21,079	0.0865465	6,278,027,568	0		6,278,027,568		
Bridges	\$3,163,162		\$0 Bridge Concrete Box Girder	48,364	0.0865465	13,240,152,372	0		13,240,152,372		
Walls	\$1,152,330		\$0 Structures	50,100	0.0865465	4,996,477,308	0		4,996,477,308		
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0		1,046,170,475		
<b>SUBTOTAL</b>	<b>\$12,321,056</b>		<b>\$0</b>	0	0.0865465	0	0		0		
				0	0.0865465		0		0		
				0	0.0865465		0		0		
<b>4th PLAIN BLVD INTERCHANGE</b>				0	0.0865465		0		0		
Pavement	\$3,382,758	\$757,065	Urban Freeway	47,332	0.0865465	13,857,189,311	3,101,252,366		16,958,441,677		
Earthwork	\$2,613,005	\$321,851	Site Work	21,079	0.0865465	4,766,938,934	587,156,270		5,354,095,204		
Bridges	\$50,951,542	\$0	Bridge Concrete Box Girder	48,364	0.0865465	213,269,559,567	0		213,269,559,567		
Walls	\$18,694,255	\$0	Structures	50,100	0.0865465	81,057,874,828	0		81,057,874,828		
Other	\$573,460	\$0	Signals	21,079	0.0865465	1,046,170,475	0		1,046,170,475		
<b>SUBTOTAL</b>	<b>\$76,215,021</b>	<b>\$1,078,915</b>		0	0.0865465	0	0		0		
				0	0.0865465		0		0		
				0	0.0865465		0		0		
<b>29th STREET &amp; 33rd STREET BRIDGES</b>				0	0.0865465		0		0		
Pavement	\$288,985	\$0	Urban Freeway	47,332	0.0865465	1,183,802,665	0		1,183,802,665		
Earthwork	\$14,210	\$0	Site Work	21,079	0.0865465	25,923,315	0		25,923,315		
Bridges	\$11,376,262	\$1,794,129	Bridge Concrete Box Girder	48,364	0.0865465	47,617,995,326	7,509,745,730		55,127,741,056		
<b>SUBTOTAL</b>	<b>\$11,679,456</b>	<b>\$1,794,129</b>		0	0.0865465	0	0		0		
				0	0.0865465		0		0		
				0	0.0865465		0		0		
<b>SR 500 INTERCHANGE</b>				0	0.0865465		0		0		
Pavement	\$5,148,198	\$0	Urban Freeway	47,332	0.0865465	21,089,167,639	0		21,089,167,639		
Earthwork	\$2,834,254	\$0	Site Work	21,079	0.0865465	5,170,566,307	0		5,170,566,307		
Bridges	\$45,544,415	\$0	Bridge Concrete Box Girder	48,364	0.0865465	190,636,767,632	0		190,636,767,632		
Walls	\$4,758,095	\$0	Structures	50,100	0.0865465	20,630,994,331	0		20,630,994,331		
Other	\$573,460	\$0	Signals	21,079	0.0865465	1,046,170,475	0		1,046,170,475		
<b>SUBTOTAL</b>	<b>\$58,858,422</b>	<b>\$0</b>		0	0.0865465	0	0		0		
				0	0.0865465		0		0		
				0	0.0865465		0		0		
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	\$74,870,348	\$0		0	0.0865465	0	0		0		
<b>PROFESSIONAL SERVICES</b>	\$97,376,800	\$0		0	0.0865465	0	0		0		
<b>RIGHT-OF-WAY</b>	\$11,887,934	\$0		0	0.0865465	0	0		0		
				0	0.0865465		0		0		
<b>TOTAL</b>	<b>\$525,831,692</b>	<b>\$2,873,044</b>		0	0.0865465	0	0		0		

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 2 - BRT		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu)		Energy (Btu) Total
	2B - Upstream Bridge					Highway	Transit	
	Highway	Transit						
<b>COLUMBIA RIVER BRIDGES</b>								
COLU Bridges	\$59,009,741	\$0	Bridge Concrete Box Girder	48,364	0.0865465	246,999,028,145	0	246,999,028,145
COLU Bridges	\$234,794,640	\$0	Bridge Concrete Box Girder	48,364	0.0865465	982,787,706,376	0	982,787,706,376
COLU Bridges	\$238,638,773	\$0	Bridge Concrete Box Girder	48,364	0.0865465	998,878,221,469	0	998,878,221,469
COLU Bridges	\$33,858,198	\$78,338,560	Bridge Concrete Box Girder	48,364	0.0865465	141,721,381,664	327,904,309,366	469,625,691,030
COLU Bridges			Bridge Concrete Box Girder	48,364	0.0865465	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$79,703,238	\$10,834,192		0	0.0865465	0	0	0
PROFESSIONAL SERVICES	\$155,794,333	\$21,244,682		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$8,607,120	\$123,348		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$810,406,043</b>	<b>\$110,540,783</b>		0	0.0865465	0	0	0
<b>TRANSIT</b>				0	0.0865465	0	0	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>				0	0.0865465	0	0	0
Guideway	\$21,636,045	\$51,597,043	Track Work	50,100	0.0865465	93,813,410,986	223,723,633,437	317,537,044,423
Tracks			Track Work	50,100	0.0865465	0	0	0
Stations	\$0	\$8,527,260	Stations, Stops and Terminals	50,100	0.0865465	0	36,974,010,128	36,974,010,128
Sitework	\$0	\$2,229,080	Site Work	21,079	0.0865465	0	4,066,539,396	4,066,539,396
Systems	\$0	\$2,913,650	Stations, Stops and Terminals	50,100	0.0865465	0	12,633,521,742	12,633,521,742
<b>SUBTOTAL</b>	<b>\$21,636,045</b>	<b>\$65,267,033</b>		0	0.0865465	0	0	0
<b>STATE LINE TO CLARK COLLEGE</b>				0	0.0865465	0	0	0
Guideway			Track Work	50,100	0.0865465	0	0	0
Tracks			Track Work	50,100	0.0865465	0	0	0
Stations			Stations, Stops and Terminals	50,100	0.0865465	0	0	0
Sitework			Site Work	21,079	0.0865465	0	0	0
Systems			Stations, Stops and Terminals	50,100	0.0865465	0	0	0
<b>SUBTOTAL</b>				0	0.0865465	0	0	0
<b>CLARK COLLEGE TO END OF PROJECT</b>				0	0.0865465	0	0	0
Guideway			Track Work	50,100	0.0865465	0	0	0
Tracks			Track Work	50,100	0.0865465	0	0	0
Stations			Stations, Stops and Terminals	50,100	0.0865465	0	0	0
Sitework			Site Work	21,079	0.0865465	0	0	0
Systems			Stations, Stops and Terminals	50,100	0.0865465	0	0	0
<b>SUBTOTAL</b>				0	0.0865465	0	0	0
<b>STATE LINE TO END OF PROJECT</b>				0	0.0865465	0	0	0
Guideway	\$0	\$6,844,407	Track Work	50,100	0.0865465	0	29,677,198,599	29,677,198,599
Tracks			Track Work	50,100	0.0865465	0	0	0
Stations	\$0	\$15,343,366	Stations, Stops and Terminals	50,100	0.0865465	0	66,528,494,138	66,528,494,138
Sitework	\$0	\$49,545,402	Site Work	21,079	0.0865465	0	90,386,316,216	90,386,316,216
Systems	\$0	\$17,930,753	Stations, Stops and Terminals	50,100	0.0865465	0	77,747,345,018	77,747,345,018
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$89,663,928</b>		0	0.0865465	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$0	\$32,443,478		0	0.0865465	0	0	0
SUPPORT FACILITIES AND VEHICLES	\$0	\$132,134,950		0	0.0865465	0	0	0
PROFESSIONAL SERVICES	\$0	\$90,374,904		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$0	\$58,932,190		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$21,636,045</b>	<b>\$468,816,484</b>						<b>6,506,469,800,393</b>
<b>TOTAL MODE COST</b>	<b>\$2,049,872,408</b>	<b>\$582,230,311</b>						
<b>TOTAL PROJECT COST</b>	<b>\$2,632,102,718</b>							

Note: 1. With the exception of the 29th and 33rd Street Bridges, highway costs have not been adjusted to reflect it

The cost estimates do not include any contingencies for risk or uncertainty.

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub> Emissions (lbs)
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (n.gas)	Gasoline	Diesel	
<b><i>SOUTH HIGHWAY APPROACH</i></b>											
<b>I-5 MAINLINE</b>											
Pavement	3,412	123,976	138,691	438,529	72,414	140,250	2,095	1,321	19.4	22.2	4,984,752
Earthwork	3,412	123,976	138,691	31,947	5,275	10,217	2,095	1,321	19.4	22.2	363,143
Bridges	3,412	123,976	138,691	8,666,984	1,431,168	2,771,865	2,095	1,321	19.4	22.2	98,517,572
Other	3,412	123,976	138,691	46,896	7,744	14,998	2,095	1,321	19.4	22.2	533,071
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	15,520	2,563	4,964	2,095	1,321	19.4	22.2	176,416
Earthwork	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Bridges	3,412	123,976	138,691	217,567	35,927	69,582	2,095	1,321	19.4	22.2	2,473,087
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>VICTORY BLVD INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	11,361	1,876	3,633	2,095	1,321	19.4	22.2	129,136
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>MARINE DRIVE INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	170,004	28,073	54,371	2,095	1,321	19.4	22.2	1,932,436
Earthwork	3,412	123,976	138,691	10,423	1,721	3,334	2,095	1,321	19.4	22.2	118,482
Bridges	3,412	123,976	138,691	12,925,980	2,134,451	4,133,972	2,095	1,321	19.4	22.2	146,929,554
Walls	3,412	123,976	138,691	56,995	9,412	18,228	2,095	1,321	19.4	22.2	647,867
Other	3,412	123,976	138,691	14,169	2,340	4,531	2,095	1,321	19.4	22.2	161,058
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>HAYDEN ISLAND INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	380,705	62,865	121,757	2,095	1,321	19.4	22.2	4,327,474
Earthwork	3,412	123,976	138,691	130,330	21,521	41,682	2,095	1,321	19.4	22.2	1,481,460
Bridges	3,412	123,976	138,691	3,007,800	496,674	961,951	2,095	1,321	19.4	22.2	34,189,644
Walls	3,412	123,976	138,691	29,356	4,847	9,388	2,095	1,321	19.4	22.2	333,684
Other	3,412	123,976	138,691	14,169	2,340	4,531	2,095	1,321	19.4	22.2	161,058
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0



**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub> Emissions (lbs)
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (ngas)	Gasoline	Diesel	
<b>NORTH HIGHWAY APPROACH</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>I-5 MAINLINE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	1,286,705	212,472	411,512	2,095	1,321	19.4	22.2	14,625,965
Earthwork	3,412	123,976	138,691	124,123	20,496	39,697	2,095	1,321	19.4	22.2	1,410,907
Bridges	3,412	123,976	138,691	1,571,018	259,420	502,441	2,095	1,321	19.4	22.2	17,857,754
Walls	3,412	123,976	138,691	244,511	40,376	78,199	2,095	1,321	19.4	22.2	2,779,354
Other	3,412	123,976	138,691	88,760	14,657	28,387	2,095	1,321	19.4	22.2	1,008,933
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUOR ROADS</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	213,363	35,232	68,238	2,095	1,321	19.4	22.2	2,425,300
Earthwork	3,412	123,976	138,691	55,108	9,100	17,625	2,095	1,321	19.4	22.2	626,411
Bridges	3,412	123,976	138,691	63,215	10,439	20,217	2,095	1,321	19.4	22.2	718,565
Walls	3,412	123,976	138,691	282,324	46,620	90,292	2,095	1,321	19.4	22.2	3,209,171
Other	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 14 INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	413,493	68,280	132,243	2,095	1,321	19.4	22.2	4,700,176
Earthwork	3,412	123,976	138,691	61,201	10,106	19,573	2,095	1,321	19.4	22.2	695,675
Bridges	3,412	123,976	138,691	5,713,973	943,541	1,827,436	2,095	1,321	19.4	22.2	64,950,706
Walls	3,412	123,976	138,691	42,178	6,965	13,489	2,095	1,321	19.4	22.2	479,441
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>EVERGREEN BLVD BRIDGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	18,418	3,041	5,890	2,095	1,321	19.4	22.2	209,353
Earthwork	3,412	123,976	138,691	911	150	291	2,095	1,321	19.4	22.2	10,353
Bridges	3,412	123,976	138,691	537,610	88,775	171,938	2,095	1,321	19.4	22.2	6,111,010
Other	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>MILL PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,691	239,566	39,559	76,618	2,095	1,321	19.4	22.2	2,723,141
Bridges	3,412	123,976	138,691	91,999	15,192	29,423	2,095	1,321	19.4	22.2	1,045,755
Walls	3,412	123,976	138,691	194,023	32,039	62,052	2,095	1,321	19.4	22.2	2,205,462
Other	3,412	123,976	138,691	73,219	12,091	23,417	2,095	1,321	19.4	22.2	832,282
<b>SUBTOTAL</b>	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>4th PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	248,512	41,036	79,479	2,095	1,321	19.4	22.2	2,824,832
Earthwork	3,412	123,976	138,691	78,460	12,956	25,093	2,095	1,321	19.4	22.2	891,852
Bridges	3,412	123,976	138,691	3,125,287	516,075	999,526	2,095	1,321	19.4	22.2	35,525,119
Walls	3,412	123,976	138,691	1,187,835	196,146	379,892	2,095	1,321	19.4	22.2	13,502,118
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	17,348	2,865	5,548	2,095	1,321	19.4	22.2	197,190
Earthwork	3,412	123,976	138,691	380	63	121	2,095	1,321	19.4	22.2	4,318
Bridges	3,412	123,976	138,691	807,851	133,399	258,366	2,095	1,321	19.4	22.2	9,182,837
Other	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 500 INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	309,044	51,032	98,838	2,095	1,321	19.4	22.2	3,512,903
Earthwork	3,412	123,976	138,691	75,770	12,512	24,233	2,095	1,321	19.4	22.2	861,281
Bridges	3,412	123,976	138,691	2,793,622	461,307	893,453	2,095	1,321	19.4	22.2	31,755,089
Walls	3,412	123,976	138,691	302,330	49,923	96,691	2,095	1,321	19.4	22.2	3,436,583
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>PROFESSIONAL SERVICES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>RIGHT-OF-WAY</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub> Emissions (lbs)
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (ngas)	Gasoline	Diesel	
<b>COLUMBIA RIVER BRIDGES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,691	3,619,564	597,694	1,157,605	2,095	1,321	19.4	22.2	41,143,565
COLU Bridges	3,412	123,976	138,691	14,401,930	2,378,172	4,606,009	2,095	1,321	19.4	22.2	163,706,675
COLU Bridges	3,412	123,976	138,691	14,637,723	2,417,109	4,681,420	2,095	1,321	19.4	22.2	166,386,933
COLU Bridges	3,412	123,976	138,691	6,881,971	1,136,411	2,200,984	2,095	1,321	19.4	22.2	78,227,332
COLU Bridges	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TRANSIT</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,691	4,653,239	766,384	1,488,194	2,095	1,321	19.4	22.2	52,893,349
Stations	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,691	541,823	89,471	173,285	2,095	1,321	19.4	22.2	6,158,901
Systems	3,412	123,976	138,691	59,592	9,840	19,059	2,095	1,321	19.4	22.2	677,379
<b>SUBTOTAL</b>	3,412	123,976	138,691	185,134	30,571	59,209	2,095	1,321	19.4	22.2	2,104,414
<b>STATE LINE TO CLARK COLLEGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>CLARK COLLEGE TO END OF PROJECT</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO END OF PROJECT</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	434,894	71,814	139,087	2,095	1,321	19.4	22.2	4,943,443
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	974,919	160,987	311,798	2,095	1,321	19.4	22.2	11,081,904
Sitework	3,412	123,976	138,691	1,324,536	218,719	423,612	2,095	1,321	19.4	22.2	15,055,991
Systems	3,412	123,976	138,691	1,139,322	188,135	364,377	2,095	1,321	19.4	22.2	12,950,670
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
SUPPORT FACILITIES AND VEHICLES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	95,346,861	15,744,507	30,493,726					0

**TOTAL MODE COST**

**TOTAL PROJECT COST**

Note: 1. With the exception of the 29th and 33rd Street Bridges, high

The cost estimates do not include any contingencies for risk

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 3 - LRT							
	3A - Downstream Bridge			Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu)		Energy (Btu) Total
	Highway	Transit	Caltrans Construction Activity			Highway	Transit	
<b><i>SOUTH HIGHWAY APPROACH</i></b>								
<b>I-5 MAINLINE</b>								
Pavement	\$8,035,260	\$0	Urban Freeway	47,332	0.0865465	32,915,777,257	0	32,915,777,257
Earthwork	\$1,775,347	\$0	Site Work	21,079	0.0865465	3,238,788,432	0	3,238,788,432
Bridges	\$148,360,710	\$0	Bridge Concrete Box Girder	48,364	0.0865465	620,998,341,768	0	620,998,341,768
Other	\$1,919,400	\$0	Signals	21,079	0.0865465	3,501,586,178	0	3,501,586,178
<b>SUBTOTAL</b>	<b>\$160,090,717</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>								
Pavement	\$258,540	\$0	Urban Freeway	47,332	0.0865465	1,059,087,702	0	1,059,087,702
Earthwork			Site Work	21,079	0.0865465	0	0	0
Bridges	\$3,529,500	\$0	Bridge Concrete Box Girder	48,364	0.0865465	14,773,545,147	0	14,773,545,147
<b>SUBTOTAL</b>	<b>\$3,788,040</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>VICTORY BLVD INTERCHANGE</b>								
Pavement	\$189,250	\$0	Urban Freeway	47,332	0.0865465	775,246,955	0	775,246,955
<b>SUBTOTAL</b>	<b>\$189,250</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>MARINE DRIVE INTERCHANGE</b>								
Pavement	\$2,966,727	\$0	Urban Freeway	47,332	0.0865465	12,152,951,506	0	12,152,951,506
Earthwork	\$389,894	\$0	Site Work	21,079	0.0865465	711,288,945	0	711,288,945
Bridges	\$215,044,315	\$0	Bridge Concrete Box Girder	48,364	0.0865465	900,118,117,672	0	900,118,117,672
Walls	\$516,000	\$0	Structures	50,100	0.0865465	2,237,364,549	0	2,237,364,549
Other	\$530,000	\$0	Signals	21,079	0.0865465	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$219,446,936</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>HAYDEN ISLAND INTERCHANGE</b>								
Pavement	\$6,429,201	\$0	Urban Freeway	47,332	0.0865465	26,336,689,548	0	26,336,689,548
Earthwork	\$4,774,649	\$0	Site Work	21,079	0.0865465	8,710,453,977	0	8,710,453,977
Bridges	\$52,937,550	\$0	Bridge Concrete Box Girder	48,364	0.0865465	221,582,457,830	0	221,582,457,830
Walls	\$1,094,500	\$0	Structures	50,100	0.0865465	4,745,727,712	0	4,745,727,712
Other	\$530,000	\$0	Signals	21,079	0.0865465	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$65,765,900</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>								
PROFESSIONAL SERVICES	\$90,466,507	\$0		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$123,844,417	\$0		0	0.0865465	0	0	0
	\$51,110,000	\$0		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$714,701,767</b>	<b>\$0</b>		0	0.0865465	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 3 - LRT		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu)		Energy (Btu) Transit	Energy (Btu) Total
	3A - Downstream Bridge					Highway	Transit		
	Highway	Transit				Highway	Transit		
<b>NORTH HIGHWAY APPROACH</b>				0	0.0865465		0	0	0
				0	0.0865465		0	0	0
				0	0.0865465		0	0	0
				0	0.0865465		0	0	0
<b>I-5 MAINLINE</b>				0	0.0865465		0	0	0
Pavement	\$21,447,327		\$0 Urban Freeway	47,332	0.0865465	87,857,199,910	0	0	87,857,199,910
Earthwork	\$5,090,904		\$0 Site Work	21,079	0.0865465	9,287,402,078	0	0	9,287,402,078
Bridges	\$25,612,303		\$0 Bridge Concrete Box Girder	48,364	0.0865465	107,206,267,014	0	0	107,206,267,014
Walls	\$3,848,133		\$0 Structures	50,100	0.0865465	16,685,419,293	0	0	16,685,419,293
Other	\$3,304,082		\$0 Signals	21,079	0.0865465	6,027,678,973	0	0	6,027,678,973
<b>SUBTOTAL</b>	<b>\$59,302,749</b>		<b>\$0</b>	0	0.0865465	0	0	0	0
				0	0.0865465		0	0	0
				0	0.0865465		0	0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>				0	0.0865465		0	0	0
Pavement	\$3,390,057		\$0 Urban Freeway	47,332	0.0865465	13,887,089,764	0	0	13,887,089,764
Earthwork	\$2,276,945		\$0 Site Work	21,079	0.0865465	4,153,859,349	0	0	4,153,859,349
Bridges	\$1,030,594		\$0 Bridge Concrete Box Girder	48,364	0.0865465	4,313,792,222	0	0	4,313,792,222
Walls	\$2,053,636		\$0 Structures	50,100	0.0865465	8,904,520,123	0	0	8,904,520,123
<b>SUBTOTAL</b>	<b>\$8,751,232</b>		<b>\$0</b>	0	0.0865465	0	0	0	0
				0	0.0865465		0	0	0
				0	0.0865465		0	0	0
<b>SR 14 INTERCHANGE</b>				0	0.0865465		0	0	0
Pavement	\$6,039,945		\$0 Urban Freeway	47,332	0.0865465	24,742,133,461	0	0	24,742,133,461
Earthwork	\$3,658,118		\$0 Site Work	21,079	0.0865465	6,673,551,068	0	0	6,673,551,068
Bridges	\$43,366,360		\$0 Bridge Concrete Box Girder	48,364	0.0865465	181,520,009,866	0	0	181,520,009,866
Walls	\$8,813,431		\$0 Structures	50,100	0.0865465	38,214,841,234	0	0	38,214,841,234
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$62,451,313</b>		<b>\$0</b>	0	0.0865465	0	0	0	0
				0	0.0865465		0	0	0
				0	0.0865465		0	0	0
<b>EVERGREEN BLVD BRIDGE</b>				0	0.0865465		0	0	0
Pavement	\$306,810		\$0 Urban Freeway	47,332	0.0865465	1,256,820,761	0	0	1,256,820,761
Earthwork	\$34,069		\$0 Site Work	21,079	0.0865465	62,152,396	0	0	62,152,396
Bridges	\$8,764,654		\$0 Bridge Concrete Box Girder	48,364	0.0865465	36,686,504,624	0	0	36,686,504,624
<b>SUBTOTAL</b>	<b>\$9,105,533</b>		<b>\$0</b>	0	0.0865465	0	0	0	0
				0	0.0865465		0	0	0
				0	0.0865465		0	0	0
<b>MILL PLAIN BLVD INTERCHANGE</b>				0	0.0865465		0	0	0
Pavement	\$3,990,794		\$0 Urban Freeway	47,332	0.0865465	16,347,955,612	0	0	16,347,955,612
Earthwork	\$3,193,595		\$0 Site Work	21,079	0.0865465	5,826,117,453	0	0	5,826,117,453
Bridges	\$3,163,162		\$0 Bridge Concrete Box Girder	48,364	0.0865465	13,240,152,372	0	0	13,240,152,372
Walls	\$837,468		\$0 Structures	50,100	0.0865465	3,631,242,663	0	0	3,631,242,663
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$11,758,479</b>		<b>\$0</b>	0	0.0865465	0	0	0	0
				0	0.0865465		0	0	0
				0	0.0865465		0	0	0
<b>4th PLAIN BLVD INTERCHANGE</b>				0	0.0865465		0	0	0
Pavement	\$3,382,758	\$757,065	Urban Freeway	47,332	0.0865465	13,857,189,311	3,101,252,366	0	16,958,441,677
Earthwork	\$2,613,005	\$321,851	Site Work	21,079	0.0865465	4,766,938,934	587,156,270	0	5,354,095,204
Bridges	\$50,951,542	\$0	Bridge Concrete Box Girder	48,364	0.0865465	213,269,559,567	0	0	213,269,559,567
Walls	\$18,694,255	\$0	Structures	50,100	0.0865465	81,057,874,828	0	0	81,057,874,828
Other	\$573,460	\$0	Signals	21,079	0.0865465	1,046,170,475	0	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$76,215,021</b>	<b>\$1,078,915</b>		0	0.0865465	0	0	0	0
				0	0.0865465		0	0	0
				0	0.0865465		0	0	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>				0	0.0865465		0	0	0
Pavement	\$288,985		\$0 Urban Freeway	47,332	0.0865465	1,183,802,665	0	0	1,183,802,665
Earthwork	\$14,210		\$0 Site Work	21,079	0.0865465	25,923,315	0	0	25,923,315
Bridges	\$11,376,262	\$1,794,129	Bridge Concrete Box Girder	48,364	0.0865465	47,617,995,326	7,509,745,730	0	55,127,741,056
<b>SUBTOTAL</b>	<b>\$11,679,456</b>	<b>\$1,794,129</b>		0	0.0865465	0	0	0	0
				0	0.0865465		0	0	0
				0	0.0865465		0	0	0
<b>SR 500 INTERCHANGE</b>				0	0.0865465		0	0	0
Pavement	\$5,148,198		\$0 Urban Freeway	47,332	0.0865465	21,089,167,639	0	0	21,089,167,639
Earthwork	\$2,834,254		\$0 Site Work	21,079	0.0865465	5,170,566,307	0	0	5,170,566,307
Bridges	\$45,544,415		\$0 Bridge Concrete Box Girder	48,364	0.0865465	190,636,767,632	0	0	190,636,767,632
Walls	\$4,758,095		\$0 Structures	50,100	0.0865465	20,630,994,331	0	0	20,630,994,331
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$58,858,422</b>		<b>\$0</b>	0	0.0865465	0	0	0	0
				0	0.0865465		0	0	0
				0	0.0865465		0	0	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	\$67,032,822		\$0	0	0.0865465	0	0	0	0
<b>PROFESSIONAL SERVICES</b>	\$86,066,176		\$0	0	0.0865465	0	0	0	0
<b>RIGHT-OF-WAY</b>	\$11,580,646		\$0	0	0.0865465	0	0	0	0
				0	0.0865465		0	0	0
<b>TOTAL</b>	<b>\$462,801,850</b>	<b>\$2,873,044</b>		0	0.0865465	0	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 3 - LRT		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu)		Energy (Btu) Total
	3A - Downstream Bridge					Highway	Transit	
	Highway	Transit				Highway	Transit	
<b>COLUMBIA RIVER BRIDGES</b>								
COLU Bridges	\$59,009,741	\$0	Bridge Concrete Box Girder	48,364	0.0865465	246,999,028,145	0	246,999,028,145
COLU Bridges	\$227,849,194	\$0	Bridge Concrete Box Girder	48,364	0.0865465	953,715,925,837	0	953,715,925,837
COLU Bridges	\$231,771,450	\$0	Bridge Concrete Box Girder	48,364	0.0865465	970,133,439,445	0	970,133,439,445
COLU Bridges	\$33,479,852	\$77,455,753	Bridge Concrete Box Girder	48,364	0.0865465	140,137,725,433	324,209,111,494	464,346,836,927
COLU Bridges			Bridge Concrete Box Girder	48,364	0.0865465	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$81,400,064	\$13,638,381		0	0.0865465	0	0	0
PROFESSIONAL SERVICES	\$153,747,419	\$20,965,557		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$24,684,320	\$4,131,432		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$ 811,942,040</b>	<b>\$ 116,191,123</b>		0	0.0865465	0	0	0
<b>TRANSIT</b>				0	0.0865465	0	0	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>				0	0.0865465	0	0	0
Guideway	\$21,636,360	\$54,816,414	Track Work	50,100	0.0865465	93,814,776,819	237,682,754,651	331,497,531,470
Tracks	\$0	\$6,161,450	Track Work	50,100	0.0865465	0	26,715,910,469	26,715,910,469
Stations	\$0	\$3,280,000	Stations, Stops and Terminals	50,100	0.0865465	0	14,222,007,212	14,222,007,212
Sitework	\$0	\$338,000	Site Work	21,079	0.0865465	0	616,617,760	616,617,760
Systems	\$0	\$6,978,365	Stations, Stops and Terminals	50,100	0.0865465	0	30,258,035,780	30,258,035,780
<b>SUBTOTAL</b>	<b>\$21,636,360</b>	<b>\$71,574,229</b>		0	0.0865465	0	0	0
<b>STATE LINE TO CLARK COLLEGE</b>				0	0.0865465	0	0	0
Guideway			Track Work	50,100	0.0865465	0	0	0
Tracks			Track Work	50,100	0.0865465	0	0	0
Stations			Stations, Stops and Terminals	50,100	0.0865465	0	0	0
Sitework			Site Work	21,079	0.0865465	0	0	0
Systems			Stations, Stops and Terminals	50,100	0.0865465	0	0	0
<b>SUBTOTAL</b>				0	0.0865465	0	0	0
<b>CLARK COLLEGE TO END OF PROJECT</b>				0	0.0865465	0	0	0
Guideway			Track Work	50,100	0.0865465	0	0	0
Tracks			Track Work	50,100	0.0865465	0	0	0
Stations			Stations, Stops and Terminals	50,100	0.0865465	0	0	0
Sitework			Site Work	21,079	0.0865465	0	0	0
Systems			Stations, Stops and Terminals	50,100	0.0865465	0	0	0
<b>SUBTOTAL</b>				0	0.0865465	0	0	0
<b>STATE LINE TO END OF PROJECT</b>				0	0.0865465	0	0	0
Guideway	\$0	\$16,622,387	Track Work	50,100	0.0865465	0	72,074,302,459	72,074,302,459
Tracks	\$0	\$16,088,550	Track Work	50,100	0.0865465	0	69,759,596,380	69,759,596,380
Stations	\$0	\$15,749,116	Stations, Stops and Terminals	50,100	0.0865465	0	68,287,817,134	68,287,817,134
Sitework	\$0	\$46,785,529	Site Work	21,079	0.0865465	0	85,351,443,154	85,351,443,154
Systems	\$0	\$27,662,492	Stations, Stops and Terminals	50,100	0.0865465	0	119,943,950,879	119,943,950,879
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$122,908,074</b>		0	0.0865465	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$0	\$38,013,125		0	0.0865465	0	0	0
SUPPORT FACILITIES AND VEHICLES	\$0	\$180,788,500		0	0.0865465	0	0	0
PROFESSIONAL SERVICES	\$0	\$112,880,869		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$0	\$60,060,470		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$21,636,360</b>	<b>\$586,225,267</b>						<b>6,510,927,966,258</b>
<b>TOTAL MODE COST</b>	<b>\$2,011,082,016</b>	<b>\$705,289,434</b>						
<b>TOTAL PROJECT COST</b>	<b>\$2,716,371,450</b>							

Note: 1. With the exception of the 29th and 33rd Street Bridges, highway costs have not been adjusted to reflect it

The cost estimates do not include any contingencies for risk or uncertainty.

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub> Emissions (lbs)
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (n.gas)	Gasoline	Diesel	
<b><i>SOUTH HIGHWAY APPROACH</i></b>											
<b>I-5 MAINLINE</b>											
Pavement	3,412	123,976	138,691	482,353	79,650	154,266	2,095	1,321	19.4	22.2	5,482,906
Earthwork	3,412	123,976	138,691	47,462	7,837	15,179	2,095	1,321	19.4	22.2	539,497
Bridges	3,412	123,976	138,691	9,100,210	1,502,706	2,910,419	2,095	1,321	19.4	22.2	103,442,048
Other	3,412	123,976	138,691	51,313	8,473	16,411	2,095	1,321	19.4	22.2	583,272
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	15,520	2,563	4,964	2,095	1,321	19.4	22.2	176,416
Earthwork	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Bridges	3,412	123,976	138,691	216,494	35,749	69,239	2,095	1,321	19.4	22.2	2,460,885
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>VICTORY BLVD INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	11,361	1,876	3,633	2,095	1,321	19.4	22.2	129,136
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>MARINE DRIVE INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	178,091	29,408	56,957	2,095	1,321	19.4	22.2	2,024,363
Earthwork	3,412	123,976	138,691	10,423	1,721	3,334	2,095	1,321	19.4	22.2	118,482
Bridges	3,412	123,976	138,691	13,190,477	2,178,127	4,218,563	2,095	1,321	19.4	22.2	149,936,088
Walls	3,412	123,976	138,691	32,787	5,414	10,486	2,095	1,321	19.4	22.2	372,686
Other	3,412	123,976	138,691	14,169	2,340	4,531	2,095	1,321	19.4	22.2	161,058
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>HAYDEN ISLAND INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	385,942	63,730	123,432	2,095	1,321	19.4	22.2	4,387,002
Earthwork	3,412	123,976	138,691	127,644	21,078	40,823	2,095	1,321	19.4	22.2	1,450,933
Bridges	3,412	123,976	138,691	3,247,105	536,190	1,038,486	2,095	1,321	19.4	22.2	36,909,830
Walls	3,412	123,976	138,691	69,545	11,484	22,242	2,095	1,321	19.4	22.2	790,514
Other	3,412	123,976	138,691	14,169	2,340	4,531	2,095	1,321	19.4	22.2	161,058
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>PROFESSIONAL SERVICES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>RIGHT-OF-WAY</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub> Emissions (lbs)
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (ngas)	Gasoline	Diesel	
<b>NORTH HIGHWAY APPROACH</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>I-5 MAINLINE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	1,287,474	212,599	411,758	2,095	1,321	19.4	22.2	14,634,707
Earthwork	3,412	123,976	138,691	136,099	22,474	43,527	2,095	1,321	19.4	22.2	1,547,038
Bridges	3,412	123,976	138,691	1,571,018	259,420	502,441	2,095	1,321	19.4	22.2	17,857,754
Walls	3,412	123,976	138,691	244,511	40,376	78,199	2,095	1,321	19.4	22.2	2,779,354
Other	3,412	123,976	138,691	88,331	14,586	28,250	2,095	1,321	19.4	22.2	1,004,053
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUOR ROADS</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	203,504	33,604	65,084	2,095	1,321	19.4	22.2	2,313,225
Earthwork	3,412	123,976	138,691	60,871	10,052	19,468	2,095	1,321	19.4	22.2	691,924
Bridges	3,412	123,976	138,691	63,215	10,439	20,217	2,095	1,321	19.4	22.2	718,565
Walls	3,412	123,976	138,691	130,488	21,547	41,733	2,095	1,321	19.4	22.2	1,483,260
Other	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 14 INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	362,575	59,872	115,958	2,095	1,321	19.4	22.2	4,121,391
Earthwork	3,412	123,976	138,691	97,795	16,149	31,277	2,095	1,321	19.4	22.2	1,111,639
Bridges	3,412	123,976	138,691	2,660,024	439,246	850,726	2,095	1,321	19.4	22.2	30,236,476
Walls	3,412	123,976	138,691	560,006	92,473	179,101	2,095	1,321	19.4	22.2	6,365,591
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>EVERGREEN BLVD BRIDGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	18,418	3,041	5,890	2,095	1,321	19.4	22.2	209,353
Earthwork	3,412	123,976	138,691	911	150	291	2,095	1,321	19.4	22.2	10,353
Bridges	3,412	123,976	138,691	537,610	88,775	171,938	2,095	1,321	19.4	22.2	6,111,010
Other	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>MILL PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	239,566	39,559	76,618	2,095	1,321	19.4	22.2	2,723,141
Earthwork	3,412	123,976	138,691	85,377	14,098	27,305	2,095	1,321	19.4	22.2	970,478
Bridges	3,412	123,976	138,691	194,023	32,039	62,052	2,095	1,321	19.4	22.2	2,205,462
Walls	3,412	123,976	138,691	53,213	8,787	17,018	2,095	1,321	19.4	22.2	604,870
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>4th PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	248,512	41,036	79,479	2,095	1,321	19.4	22.2	2,824,832
Earthwork	3,412	123,976	138,691	78,460	12,956	25,093	2,095	1,321	19.4	22.2	891,852
Bridges	3,412	123,976	138,691	3,125,287	516,075	999,526	2,095	1,321	19.4	22.2	35,525,119
Walls	3,412	123,976	138,691	1,187,835	196,146	379,892	2,095	1,321	19.4	22.2	13,502,118
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	17,348	2,865	5,548	2,095	1,321	19.4	22.2	197,190
Earthwork	3,412	123,976	138,691	380	63	121	2,095	1,321	19.4	22.2	4,318
Bridges	3,412	123,976	138,691	807,851	133,399	258,366	2,095	1,321	19.4	22.2	9,182,837
Other	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 500 INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	309,044	51,032	98,838	2,095	1,321	19.4	22.2	3,512,903
Earthwork	3,412	123,976	138,691	75,770	12,512	24,233	2,095	1,321	19.4	22.2	861,281
Bridges	3,412	123,976	138,691	2,793,622	461,307	893,453	2,095	1,321	19.4	22.2	31,755,089
Walls	3,412	123,976	138,691	302,330	49,923	96,691	2,095	1,321	19.4	22.2	3,436,583
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>PROFESSIONAL SERVICES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>RIGHT-OF-WAY</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub> Emissions (lbs)
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (n.gas)	Gasoline	Diesel	
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLUMBIA RIVER BRIDGES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,691	3,619,564	597,694	1,157,605	2,095	1,321	19.4	22.2	41,143,565
COLU Bridges	3,412	123,976	138,691	13,975,907	2,307,824	4,469,759	2,095	1,321	19.4	22.2	158,864,078
COLU Bridges	3,412	123,976	138,691	14,216,492	2,347,551	4,546,703	2,095	1,321	19.4	22.2	161,598,805
COLU Bridges	3,412	123,976	138,691	6,804,614	1,123,637	2,176,244	2,095	1,321	19.4	22.2	77,348,013
COLU Bridges	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TRANSIT</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	4,857,818	802,165	1,553,822	2,095	1,321	19.4	22.2	55,218,801
Tracks	3,412	123,976	138,691	391,499	64,648	125,209	2,095	1,321	19.4	22.2	4,450,171
Stations	3,412	123,976	138,691	208,412	34,415	66,654	2,095	1,321	19.4	22.2	2,369,014
Sitework	3,412	123,976	138,691	9,036	1,492	2,890	2,095	1,321	19.4	22.2	102,712
Systems	3,412	123,976	138,691	443,406	73,219	141,810	2,095	1,321	19.4	22.2	5,040,196
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO CLARK COLLEGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>CLARK COLLEGE TO END OF PROJECT</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO END OF PROJECT</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	1,056,188	174,407	337,789	2,095	1,321	19.4	22.2	12,005,690
Tracks	3,412	123,976	138,691	1,022,268	168,806	326,941	2,095	1,321	19.4	22.2	11,620,120
Stations	3,412	123,976	138,691	1,000,701	165,244	320,043	2,095	1,321	19.4	22.2	11,374,961
Sitework	3,412	123,976	138,691	1,250,754	206,535	400,015	2,095	1,321	19.4	22.2	14,217,314
Systems	3,412	123,976	138,691	1,757,678	290,243	562,139	2,095	1,321	19.4	22.2	19,979,519
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
SUPPORT FACILITIES AND VEHICLES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	95,412,192	15,755,294	30,514,620					0

**TOTAL MODE COST**

**TOTAL PROJECT COST**

Note: 1. With the exception of the 29th and 33rd Street Bridges, high

The cost estimates do not include any contingencies for risk



**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 3 - LRT		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu) Highway	Energy (Btu) Transit	Energy (Btu) Total
	3B - Upstream Bridge							
	Highway	Transit						
<b><i>SOUTH HIGHWAY APPROACH</i></b>								
<b>I-5 MAINLINE</b>								
Pavement	\$7,305,210	\$0	Urban Freeway	47.332	0.086546	29,925,187,881	0	29,925,187,881
Earthwork	\$1,195,011	\$0	Site Work	21.079	0.086546	2,180,073,981	0	2,180,073,981
Bridges	\$141,297,830	\$0	Bridge Concrete Box Girder	48,364	0.086546	591,435,010,829	0	591,435,010,829
Other	\$1,754,200	\$0	Signals	21,079	0.086546	3,200,209,687	0	3,200,209,687
<b>SUBTOTAL</b>	<b>\$151,552,251</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>								
Pavement	\$258,540	\$0	Urban Freeway	47.332	0.086546	1,059,087,702	0	1,059,087,702
Earthwork		\$0	Site Work	21.079	0.086546	0	0	0
Bridges	\$3,547,000	\$0	Bridge Concrete Box Girder	48,364	0.086546	14,846,795,477	0	14,846,795,477
<b>SUBTOTAL</b>	<b>\$3,805,540</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>VICTORY BLVD INTERCHANGE</b>								
Pavement	\$189,250	\$0	Urban Freeway	47.332	0.086546	775,246,955	0	775,246,955
<b>SUBTOTAL</b>	<b>\$189,250</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>MARINE DRIVE INTERCHANGE</b>								
Pavement	\$2,832,007	\$0	Urban Freeway	47.332	0.086546	11,601,082,181	0	11,601,082,181
Earthwork	\$389,894	\$0	Site Work	21.079	0.086546	711,288,945	0	711,288,945
Bridges	\$210,732,225	\$0	Bridge Concrete Box Girder	48,364	0.086546	882,068,859,620	0	882,068,859,620
Walls	\$897,000	\$0	Structures	50,100	0.086546	3,889,372,094	0	3,889,372,094
Other	\$530,000	\$0	Signals	21,079	0.086546	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$215,381,126</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>HAYDEN ISLAND INTERCHANGE</b>								
Pavement	\$6,341,961	\$0	Urban Freeway	47.332	0.086546	25,979,318,112	0	25,979,318,112
Earthwork	\$4,875,103	\$0	Site Work	21.079	0.086546	8,893,713,286	0	8,893,713,286
Bridges	\$49,036,150	\$0	Bridge Concrete Box Girder	48,364	0.086546	205,252,238,525	0	205,252,238,525
Walls	\$462,000	\$0	Structures	50,100	0.086546	2,003,221,748	0	2,003,221,748
Other	\$530,000	\$0	Signals	21,079	0.086546	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$61,245,214</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>								
PROFESSIONAL SERVICES	\$91,341,888	\$0		0	0.086546	0	0	0
RIGHT-OF-WAY	\$120,273,359	\$0		0	0.086546	0	0	0
	\$48,210,000	\$0		0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$691,998,628</b>	<b>\$0</b>		0	0.086546	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 3 - LRT							Energy (Btu) Total	
	3B - Upstream Bridge			Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu)			
	Highway	Transit	Caltrans Construction Activity			Highway	Transit		
<b>NORTH HIGHWAY APPROACH</b>				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>I-5 MAINLINE</b>				0	0	0.086546	0	0	0
Pavement	\$21,434,516		\$0 Urban Freeway	47,332	0.086546	87,804,721,201	0	0	87,804,721,201
Earthwork	\$4,642,931		\$0 Site Work	21,079	0.086546	8,470,159,364	0	0	8,470,159,364
Bridges	\$25,612,303		\$0 Bridge Concrete Box Girder	48,364	0.086546	107,206,267,014	0	0	107,206,267,014
Walls	\$3,848,133		\$0 Structures	50,100	0.086546	16,685,419,293	0	0	16,685,419,293
Other	\$3,320,139		\$0 Signals	21,079	0.086546	6,056,971,747	0	0	6,056,971,747
<b>SUBTOTAL</b>	<b>\$58,858,023</b>	<b>\$0</b>		0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>COLLECTOR/DISTRIBUOR ROADS</b>				0	0	0.086546	0	0	0
Pavement	\$3,554,305		\$0 Urban Freeway	47,332	0.086546	14,559,916,458	0	0	14,559,916,458
Earthwork	\$2,061,357		\$0 Site Work	21,079	0.086546	3,760,560,441	0	0	3,760,560,441
Bridges	\$1,030,594		\$0 Bridge Concrete Box Girder	48,364	0.086546	4,313,792,222	0	0	4,313,792,222
Walls	\$4,443,233		\$0 Structures	50,100	0.086546	19,265,759,686	0	0	19,265,759,686
<b>SUBTOTAL</b>	<b>\$11,089,489</b>	<b>\$0</b>		0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>SR 14 INTERCHANGE</b>				0	0	0.086546	0	0	0
Pavement	\$6,888,160		\$0 Urban Freeway	47,332	0.086546	28,216,778,047	0	0	28,216,778,047
Earthwork	\$2,289,288		\$0 Site Work	21,079	0.086546	4,176,377,675	0	0	4,176,377,675
Bridges	\$93,154,893		\$0 Bridge Concrete Box Girder	48,364	0.086546	389,921,522,687	0	0	389,921,522,687
Walls	\$663,807		\$0 Structures	50,100	0.086546	2,878,252,421	0	0	2,878,252,421
Other	\$573,460		\$0 Signals	21,079	0.086546	1,046,170,475	0	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$103,569,608</b>	<b>\$0</b>		0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>EVERGREEN BLVD BRIDGE</b>				0	0	0.086546	0	0	0
Pavement	\$306,810		\$0 Urban Freeway	47,332	0.086546	1,256,820,761	0	0	1,256,820,761
Earthwork	\$34,069		\$0 Site Work	21,079	0.086546	62,152,396	0	0	62,152,396
Bridges	\$8,764,654		\$0 Bridge Concrete Box Girder	48,364	0.086546	36,686,504,624	0	0	36,686,504,624
<b>SUBTOTAL</b>	<b>\$9,105,533</b>	<b>\$0</b>		0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>MILL PLAIN BLVD INTERCHANGE</b>				0	0	0.086546	0	0	0
Pavement	\$3,990,794		\$0 Urban Freeway	47,332	0.086546	16,347,955,612	0	0	16,347,955,612
Earthwork	\$3,441,311		\$0 Site Work	21,079	0.086546	6,278,027,568	0	0	6,278,027,568
Bridges	\$3,163,162		\$0 Bridge Concrete Box Girder	48,364	0.086546	13,240,152,372	0	0	13,240,152,372
Walls	\$1,152,330		\$0 Structures	50,100	0.086546	4,996,477,308	0	0	4,996,477,308
Other	\$573,460		\$0 Signals	21,079	0.086546	1,046,170,475	0	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$12,321,056</b>	<b>\$0</b>		0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>4th PLAIN BLVD INTERCHANGE</b>				0	0	0.086546	0	0	0
Pavement	\$3,382,758	\$757,065	Urban Freeway	47,332	0.086546	13,857,189,311	3,101,252,366	0	16,958,441,677
Earthwork	\$2,613,005	\$321,851	Site Work	21,079	0.086546	4,766,938,934	587,156,270	0	5,354,095,204
Bridges	\$50,951,542	\$0	Bridge Concrete Box Girder	48,364	0.086546	213,269,559,567	0	0	213,269,559,567
Walls	\$18,694,255	\$0	Structures	50,100	0.086546	81,057,874,828	0	0	81,057,874,828
Other	\$573,460	\$0	Signals	21,079	0.086546	1,046,170,475	0	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$76,215,021</b>	<b>\$1,078,915</b>		0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>				0	0	0.086546	0	0	0
Pavement	\$288,985		\$0 Urban Freeway	47,332	0.086546	1,183,802,665	0	0	1,183,802,665
Earthwork	\$14,210		\$0 Site Work	21,079	0.086546	25,923,315	0	0	25,923,315
Bridges	\$11,376,262	\$1,794,129	Bridge Concrete Box Girder	48,364	0.086546	47,617,995,326	7,509,745,730	0	55,127,741,056
<b>SUBTOTAL</b>	<b>\$11,679,456</b>	<b>\$1,794,129</b>		0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>SR 500 INTERCHANGE</b>				0	0	0.086546	0	0	0
Pavement	\$5,148,198		\$0 Urban Freeway	47,332	0.086546	21,089,167,639	0	0	21,089,167,639
Earthwork	\$2,834,254		\$0 Site Work	21,079	0.086546	5,170,566,307	0	0	5,170,566,307
Bridges	\$45,544,415		\$0 Bridge Concrete Box Girder	48,364	0.086546	190,636,767,632	0	0	190,636,767,632
Walls	\$4,758,095		\$0 Structures	50,100	0.086546	20,630,994,331	0	0	20,630,994,331
Other	\$573,460		\$0 Signals	21,079	0.086546	1,046,170,475	0	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$58,858,422</b>	<b>\$0</b>		0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	\$74,870,348	\$0		0	0	0.086546	0	0	0
<b>PROFESSIONAL SERVICES</b>	\$97,376,800	\$0		0	0	0.086546	0	0	0
<b>RIGHT-OF-WAY</b>	\$11,887,934	\$0		0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$525,831,692</b>	<b>\$2,873,044</b>		0	0	0.086546	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 3 - LRT		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu)		Energy (Btu) Total
	3B - Upstream Bridge					Highway	Transit	
	Highway	Transit						
<b>COLUMBIA RIVER BRIDGES</b>								
COLU Bridges	\$59,009,741	\$0	Bridge Concrete Box Girder	48,364	0.086546	246,999,028,145	0	246,999,028,145
COLU Bridges	\$234,794,640	\$0	Bridge Concrete Box Girder	48,364	0.086546	982,787,706,376	0	982,787,706,376
COLU Bridges	\$238,638,773	\$0	Bridge Concrete Box Girder	48,364	0.086546	998,878,221,469	0	998,878,221,469
COLU Bridges	\$33,858,198	\$78,338,560	Bridge Concrete Box Girder	48,364	0.086546	141,721,381,664	327,904,309,366	469,625,691,030
COLU Bridges			Bridge Concrete Box Girder	48,364	0.086546	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$79,703,238	\$10,834,192		0	0.086546	0	0	0
PROFESSIONAL SERVICES	\$155,794,333	\$21,244,682		0	0.086546	0	0	0
RIGHT-OF-WAY	\$8,607,120	\$123,348		0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$810,406,043</b>	<b>\$110,540,783</b>		0	0.086546	0	0	0
<b>TRANSIT</b>				0	0.086546	0	0	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>				0	0.086546	0	0	0
Guideway	\$21,636,360	\$54,816,414	Track Work	50,100	0.086546	93,814,776,819	237,682,754,651	331,497,531,470
Tracks	\$0	\$5,161,450	Track Work	50,100	0.086546	0	26,715,910,469	26,715,910,469
Stations	\$0	\$3,280,000	Stations, Stops and Terminals	50,100	0.086546	0	14,222,007,212	14,222,007,212
Sitework	\$0	\$338,000	Site Work	21,079	0.086546	0	616,617,760	616,617,760
Systems	\$0	\$6,978,365	Stations, Stops and Terminals	50,100	0.086546	0	30,258,035,780	30,258,035,780
<b>SUBTOTAL</b>	<b>\$21,636,360</b>	<b>\$71,574,229</b>		0	0.086546	0	0	0
<b>STATE LINE TO CLARK COLLEGE</b>				0	0.086546	0	0	0
Guideway			Track Work	50,100	0.086546	0	0	0
Tracks			Track Work	50,100	0.086546	0	0	0
Stations			Stations, Stops and Terminals	50,100	0.086546	0	0	0
Sitework			Site Work	21,079	0.086546	0	0	0
Systems			Stations, Stops and Terminals	50,100	0.086546	0	0	0
<b>SUBTOTAL</b>				0	0.086546	0	0	0
<b>CLARK COLLEGE TO END OF PROJECT</b>				0	0.086546	0	0	0
Guideway			Track Work	50,100	0.086546	0	0	0
Tracks			Track Work	50,100	0.086546	0	0	0
Stations			Stations, Stops and Terminals	50,100	0.086546	0	0	0
Sitework			Site Work	21,079	0.086546	0	0	0
Systems			Stations, Stops and Terminals	50,100	0.086546	0	0	0
<b>SUBTOTAL</b>				0	0.086546	0	0	0
<b>STATE LINE TO END OF PROJECT</b>				0	0.086546	0	0	0
Guideway	\$0	\$16,622,387	Track Work	50,100	0.086546	0	72,074,302,459	72,074,302,459
Tracks	\$0	\$16,088,550	Track Work	50,100	0.086546	0	69,759,596,380	69,759,596,380
Stations	\$0	\$15,749,116	Stations, Stops and Terminals	50,100	0.086546	0	68,287,817,134	68,287,817,134
Sitework	\$0	\$46,785,529	Site Work	21,079	0.086546	0	85,351,443,154	85,351,443,154
Systems	\$0	\$27,662,492	Stations, Stops and Terminals	50,100	0.086546	0	119,943,950,879	119,943,950,879
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$122,908,074</b>		0	0.086546	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$0	\$38,013,125		0	0.086546	0	0	0
SUPPORT FACILITIES AND VEHICLES	\$0	\$180,788,500		0	0.086546	0	0	0
PROFESSIONAL SERVICES	\$0	\$112,880,869		0	0.086546	0	0	0
RIGHT-OF-WAY	\$0	\$60,060,470		0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$21,636,360</b>	<b>\$586,225,267</b>						<b>6,689,646,543,430</b>
<b>TOTAL MODE COST</b>	<b>\$2,049,872,723</b>	<b>\$699,639,094</b>						
<b>TOTAL PROJECT COST</b>	<b>\$2,749,511,816</b>							

Note: 1. With the exception of the 29th and 33rd Street Bridges, highway costs have not been adjusted to reflect it

The cost estimates do not include any contingencies for risk or uncertainty.

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub> Emissions (lbs)
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (n.gas)	Gasoline	Diesel	
<b><i>SOUTH HIGHWAY APPROACH</i></b>											
<b>I-5 MAINLINE</b>											
Pavement	3,412	123,976	138,691	438,529	72,414	140,250	2,095	1,321	19.4	22.2	4,984,752
Earthwork	3,412	123,976	138,691	31,947	5,275	10,217	2,095	1,321	19.4	22.2	363,143
Bridges	3,412	123,976	138,691	8,666,984	1,431,168	2,771,865	2,095	1,321	19.4	22.2	98,517,572
Other	3,412	123,976	138,691	46,896	7,744	14,998	2,095	1,321	19.4	22.2	533,071
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>											
Pavement	3,412	123,976	138,691	15,520	2,563	4,964	2,095	1,321	19.4	22.2	176,416
Earthwork	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Bridges	3,412	123,976	138,691	217,567	35,927	69,582	2,095	1,321	19.4	22.2	2,473,087
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>VICTORY BLVD INTERCHANGE</b>											
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	11,361	1,876	3,633	2,095	1,321	19.4	22.2	129,136
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>MARINE DRIVE INTERCHANGE</b>											
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,691	170,004	28,073	54,371	2,095	1,321	19.4	22.2	1,932,436
Bridges	3,412	123,976	138,691	10,423	1,721	3,334	2,095	1,321	19.4	22.2	118,482
Walls	3,412	123,976	138,691	12,925,980	2,134,451	4,133,972	2,095	1,321	19.4	22.2	146,929,554
Other	3,412	123,976	138,691	56,995	9,412	18,228	2,095	1,321	19.4	22.2	647,867
	3,412	123,976	138,691	14,169	2,340	4,531	2,095	1,321	19.4	22.2	161,058
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>HAYDEN ISLAND INTERCHANGE</b>											
Pavement	3,412	123,976	138,691	380,705	62,865	121,757	2,095	1,321	19.4	22.2	4,327,474
Earthwork	3,412	123,976	138,691	130,330	21,521	41,682	2,095	1,321	19.4	22.2	1,481,460
Bridges	3,412	123,976	138,691	3,007,800	496,674	961,951	2,095	1,321	19.4	22.2	34,189,644
Walls	3,412	123,976	138,691	29,356	4,847	9,388	2,095	1,321	19.4	22.2	333,684
Other	3,412	123,976	138,691	14,169	2,340	4,531	2,095	1,321	19.4	22.2	161,058
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>											
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>PROFESSIONAL SERVICES</b>											
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>RIGHT-OF-WAY</b>											
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (ngas)	Diesel		
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4		
<b>NORTH HIGHWAY APPROACH</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>I-5 MAINLINE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	1,286,705	212,472	411,512	2,095	1,321	19.4	22.2	14,625,965
Earthwork	3,412	123,976	138,691	124,123	20,496	39,697	2,095	1,321	19.4	22.2	1,410,907
Bridges	3,412	123,976	138,691	1,571,018	259,420	502,441	2,095	1,321	19.4	22.2	17,857,754
Walls	3,412	123,976	138,691	244,511	40,376	78,199	2,095	1,321	19.4	22.2	2,779,354
Other	3,412	123,976	138,691	88,760	14,657	28,387	2,095	1,321	19.4	22.2	1,008,933
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUOR ROADS</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	213,363	35,232	68,238	2,095	1,321	19.4	22.2	2,425,300
Earthwork	3,412	123,976	138,691	55,108	9,100	17,625	2,095	1,321	19.4	22.2	626,411
Bridges	3,412	123,976	138,691	63,215	10,439	20,217	2,095	1,321	19.4	22.2	718,565
Walls	3,412	123,976	138,691	282,324	46,520	90,292	2,095	1,321	19.4	22.2	3,209,171
Other	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 14 INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	413,493	68,280	132,243	2,095	1,321	19.4	22.2	4,700,176
Earthwork	3,412	123,976	138,691	61,201	10,106	19,573	2,095	1,321	19.4	22.2	695,675
Bridges	3,412	123,976	138,691	5,713,973	943,541	1,827,436	2,095	1,321	19.4	22.2	64,950,706
Walls	3,412	123,976	138,691	42,178	6,965	13,489	2,095	1,321	19.4	22.2	479,441
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>EVERGREEN BLVD BRIDGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	18,418	3,041	5,890	2,095	1,321	19.4	22.2	209,353
Earthwork	3,412	123,976	138,691	911	150	291	2,095	1,321	19.4	22.2	10,353
Bridges	3,412	123,976	138,691	537,610	88,775	171,938	2,095	1,321	19.4	22.2	6,111,010
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>MILL PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,691	239,566	39,559	76,618	2,095	1,321	19.4	22.2	2,723,141
Bridges	3,412	123,976	138,691	91,989	15,192	29,423	2,095	1,321	19.4	22.2	1,045,755
Walls	3,412	123,976	138,691	194,023	32,039	62,052	2,095	1,321	19.4	22.2	2,205,462
Other	3,412	123,976	138,691	73,219	12,091	23,417	2,095	1,321	19.4	22.2	832,282
<b>SUBTOTAL</b>	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>4th PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	248,512	41,036	79,479	2,095	1,321	19.4	22.2	2,824,832
Earthwork	3,412	123,976	138,691	78,460	12,956	25,093	2,095	1,321	19.4	22.2	891,852
Bridges	3,412	123,976	138,691	3,125,287	516,075	999,526	2,095	1,321	19.4	22.2	35,525,119
Walls	3,412	123,976	138,691	1,187,835	196,146	379,892	2,095	1,321	19.4	22.2	13,502,118
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	17,348	2,865	5,548	2,095	1,321	19.4	22.2	197,190
Earthwork	3,412	123,976	138,691	380	63	121	2,095	1,321	19.4	22.2	4,318
Bridges	3,412	123,976	138,691	807,851	133,399	258,366	2,095	1,321	19.4	22.2	9,182,837
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 500 INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	309,044	51,032	98,838	2,095	1,321	19.4	22.2	3,512,903
Earthwork	3,412	123,976	138,691	75,770	12,512	24,233	2,095	1,321	19.4	22.2	861,281
Bridges	3,412	123,976	138,691	2,793,622	461,307	893,453	2,095	1,321	19.4	22.2	31,755,089
Walls	3,412	123,976	138,691	302,330	49,923	96,691	2,095	1,321	19.4	22.2	3,436,583
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>PROFESSIONAL SERVICES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>RIGHT-OF-WAY</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (n.gas)	Gasoline		Diesel
<b>COLUMBIA RIVER BRIDGES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,691	3,619,564	597,694	1,157,605	2,095	1,321	19.4	22.2	41,143,565
COLU Bridges	3,412	123,976	138,691	14,401,930	2,378,172	4,606,009	2,095	1,321	19.4	22.2	163,706,675
COLU Bridges	3,412	123,976	138,691	14,637,723	2,417,109	4,681,420	2,095	1,321	19.4	22.2	166,386,933
COLU Bridges	3,412	123,976	138,691	6,881,971	1,136,411	2,200,984	2,095	1,321	19.4	22.2	78,227,332
COLU Bridges	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TRANSIT</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,691	4,857,818	802,165	1,553,622	2,095	1,321	19.4	22.2	55,218,801
Stations	3,412	123,976	138,691	391,499	64,648	125,209	2,095	1,321	19.4	22.2	4,450,171
Sitework	3,412	123,976	138,691	208,412	34,415	66,654	2,095	1,321	19.4	22.2	2,369,014
Systems	3,412	123,976	138,691	9,036	1,492	2,890	2,095	1,321	19.4	22.2	102,712
<b>SUBTOTAL</b>	3,412	123,976	138,691	443,406	73,219	141,810	2,095	1,321	19.4	22.2	5,040,196
<b>STATE LINE TO CLARK COLLEGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>CLARK COLLEGE TO END OF PROJECT</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO END OF PROJECT</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	1,056,188	174,407	337,789	2,095	1,321	19.4	22.2	12,005,690
Tracks	3,412	123,976	138,691	1,022,268	168,806	326,941	2,095	1,321	19.4	22.2	11,620,120
Stations	3,412	123,976	138,691	1,000,701	165,244	320,043	2,095	1,321	19.4	22.2	11,374,961
Sitework	3,412	123,976	138,691	1,250,754	206,535	400,015	2,095	1,321	19.4	22.2	14,217,314
Systems	3,412	123,976	138,691	1,757,678	290,243	562,139	2,095	1,321	19.4	22.2	19,979,519
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
SUPPORT FACILITIES AND VEHICLES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	98,031,163	16,187,762	31,352,216					0

**TOTAL MODE COST**

**TOTAL PROJECT COST**

Note: 1. With the exception of the 29th and 33rd Street Bridges, high

The cost estimates do not include any contingencies for risk

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 4 - BRT Downstream Bridge		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu) Highway	Energy (Btu) Transit	Energy (Btu) Total
	Highway	Transit						
<b><i>SOUTH HIGHWAY APPROACH</i></b>								
<b>I-5 MAINLINE</b>								
Pavement	\$7,920,780	\$0	Urban Freeway	47,332	0.086546	32,446,819,416	0	32,446,819,416
Earthwork	\$5,116,442	\$0	Site Work	21,079	0.086546	9,333,991,136	0	9,333,991,136
Bridges	\$130,142,750	\$0	Bridge Concrete Box Girder	48,364	0.086546	544,742,822,700	0	544,742,822,700
Other	\$1,932,000	\$0	Signals	21,079	0.086546	3,524,572,520	0	3,524,572,520
<b>SUBTOTAL</b>	<b>\$145,111,972</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>								
Pavement	\$258,540	\$0	Urban Freeway	47,332	0.086546	1,059,087,702	0	1,059,087,702
Earthwork	\$392,040	\$0	Site Work	21,079	0.086546	715,203,629	0	715,203,629
Bridges	\$3,529,500	\$0	Bridge Concrete Box Girder	48,364	0.086546	14,773,545,147	0	14,773,545,147
<b>SUBTOTAL</b>	<b>\$4,180,080</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>VICTORY BLVD INTERCHANGE</b>								
Pavement	\$189,250	\$0	Urban Freeway	47,332	0.086546	775,246,955	0	775,246,955
<b>SUBTOTAL</b>	<b>\$189,250</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>MARINE DRIVE INTERCHANGE</b>								
Pavement	\$3,010,690	\$0	Urban Freeway	47,332	0.086546	12,333,042,295	0	12,333,042,295
Earthwork	\$600,300	\$0	Site Work	21,079	0.086546	1,095,135,033	0	1,095,135,033
Bridges	\$240,889,765	\$0	Bridge Concrete Box Girder	48,364	0.086546	1,008,300,274,472	0	1,008,300,274,472
Walls	\$318,000	\$0	Structures	50,100	0.086546	1,378,840,943	0	1,378,840,943
Other	\$530,000	\$0	Signals	21,079	0.086546	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$245,348,755</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>HAYDEN ISLAND INTERCHANGE</b>								
Pavement	\$6,542,860	\$0	Urban Freeway	47,332	0.086546	26,802,284,230	0	26,802,284,230
Earthwork	\$3,564,770	\$0	Site Work	21,079	0.086546	6,503,255,892	0	6,503,255,892
Bridges	\$54,288,780	\$0	Bridge Concrete Box Girder	48,364	0.086546	227,238,346,032	0	227,238,346,032
Walls	\$378,500	\$0	Structures	50,100	0.086546	1,641,167,601	0	1,641,167,601
Other	\$530,000	\$0	Signals	21,079	0.086546	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$65,304,910</b>	<b>\$0</b>		0	0.086546	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$92,826,321	\$0		0	0.086546	0	0	0
PROFESSIONAL SERVICES	\$126,751,483	\$0		0	0.086546	0	0	0
RIGHT-OF-WAY	\$67,200,000	\$0		0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$746,912,771</b>	<b>\$0</b>		0	0.086546	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 4 - BRT Downstream Bridge		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu)		Energy (Btu) Total
	Highway	Transit				Highway	Transit	
<b>NORTH HIGHWAY APPROACH</b>				0	0.086546		0	0
				0	0.086546		0	0
				0	0.086546		0	0
				0	0.086546		0	0
<b>I-5 MAINLINE</b>				0	0.086546		0	0
Pavement	\$19,362,839		\$0 Urban Freeway	47,332	0.086546	79,318,266,811	0	79,318,266,811
Earthwork	\$4,506,730		\$0 Site Work	21,079	0.086546	8,221,685,980	0	8,221,685,980
Bridges	\$15,821,978		\$0 Bridge Concrete Box Girder	48,364	0.086546	66,226,576,951	0	66,226,576,951
Walls	\$318,649		\$0 Structures	50,100	0.086546	1,381,654,993	0	1,381,654,993
Other	\$4,021,188		\$0 Signals	21,079	0.086546	7,335,905,283	0	7,335,905,283
<b>SUBTOTAL</b>	<b>\$44,031,384</b>	<b>\$0</b>		0	0.086546	0	0	0
				0	0.086546		0	0
				0	0.086546		0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>				0	0.086546		0	0
Pavement	\$4,599,485		\$0 Urban Freeway	47,332	0.086546	18,841,407,901	0	18,841,407,901
Earthwork	\$990,313		\$0 Site Work	21,079	0.086546	1,806,641,663	0	1,806,641,663
Bridges	\$1,030,594		\$0 Bridge Concrete Box Girder	48,364	0.086546	4,313,792,222	0	4,313,792,222
Walls	\$5,304,505		\$0 Structures	50,100	0.086546	23,000,215,966	0	23,000,215,966
<b>SUBTOTAL</b>	<b>\$11,924,897</b>	<b>\$0</b>		0	0.086546	0	0	0
				0	0.086546		0	0
				0	0.086546		0	0
<b>SR 14 INTERCHANGE</b>				0	0.086546		0	0
Pavement	\$4,927,150		\$0 Urban Freeway	47,332	0.086546	20,183,661,696	0	20,183,661,696
Earthwork	\$664,655		\$0 Site Work	21,079	0.086546	1,212,539,215	0	1,212,539,215
Bridges	\$33,898,205		\$0 Bridge Concrete Box Girder	48,364	0.086546	141,888,841,261	0	141,888,841,261
Walls	\$1,127,985		\$0 Structures	50,100	0.086546	4,890,917,928	0	4,890,917,928
Other	\$573,460		\$0 Signals	21,079	0.086546	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$41,191,455</b>	<b>\$0</b>		0	0.086546	0	0	0
				0	0.086546		0	0
				0	0.086546		0	0
<b>EVERGREEN BLVD BRIDGE</b>				0	0.086546		0	0
Pavement	\$288,146		\$0 Urban Freeway	47,332	0.086546	1,180,367,615	0	1,180,367,615
Earthwork	\$364,555		\$0 Site Work	21,079	0.086546	665,062,414	0	665,062,414
Bridges	\$5,840,528		\$0 Bridge Concrete Box Girder	48,364	0.086546	24,446,890,817	0	24,446,890,817
<b>SUBTOTAL</b>	<b>\$6,493,229</b>	<b>\$0</b>		0	0.086546	0	0	0
				0	0.086546		0	0
				0	0.086546		0	0
<b>MILL PLAIN BLVD INTERCHANGE</b>				0	0.086546		0	0
Pavement	\$6,403,805		\$0 Urban Freeway	47,332	0.086546	26,232,657,338	0	26,232,657,338
Earthwork	\$4,973,701		\$0 Site Work	21,079	0.086546	9,073,586,546	0	9,073,586,546
Bridges	\$1,094,173		\$0 Bridge Concrete Box Girder	48,364	0.086546	4,579,914,103	0	4,579,914,103
Walls	\$10,481,334		\$0 Structures	50,100	0.086546	45,446,831,629	0	45,446,831,629
Other	\$573,460		\$0 Signals	21,079	0.086546	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$22,432,300</b>	<b>\$0</b>		0	0.086546	0	0	0
				0	0.086546		0	0
				0	0.086546		0	0
<b>4th PLAIN BLVD INTERCHANGE</b>				0	0.086546		0	0
Pavement	\$6,930,216	\$729,982	Urban Freeway	47,332	0.086546	28,389,058,026	2,990,311,311	31,379,369,337
Earthwork	\$2,995,304	\$383,966	Site Work	21,079	0.086546	5,464,371,442	700,474,298	6,164,845,740
Bridges	\$44,817,414	\$0	Bridge Concrete Box Girder	48,364	0.086546	187,593,734,568	0	187,593,734,568
Walls	\$8,685,214	\$0	Structures	50,100	0.086546	37,658,895,167	0	37,658,895,167
Other	\$573,460	\$0	Signals	21,079	0.086546	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$64,001,608</b>	<b>\$1,113,948</b>		0	0.086546	0	0	0
				0	0.086546		0	0
				0	0.086546		0	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>				0	0.086546		0	0
Pavement	\$412,171		\$0 Urban Freeway	47,332	0.086546	1,688,422,685	0	1,688,422,685
Earthwork	\$259,511		\$0 Site Work	21,079	0.086546	473,429,644	0	473,429,644
Bridges	\$11,274,727		\$0 Bridge Concrete Box Girder	48,364	0.086546	47,192,997,413	0	47,192,997,413
<b>SUBTOTAL</b>	<b>\$11,946,409</b>	<b>\$0</b>		0	0.086546	0	0	0
				0	0.086546		0	0
				0	0.086546		0	0
<b>SR 500 INTERCHANGE</b>				0	0.086546		0	0
Pavement	\$5,413,555		\$0 Urban Freeway	47,332	0.086546	22,176,178,555	0	22,176,178,555
Earthwork	\$3,223,533		\$0 Site Work	21,079	0.086546	5,880,733,474	0	5,880,733,474
Bridges	\$41,525,494		\$0 Bridge Concrete Box Girder	48,364	0.086546	173,814,635,568	0	173,814,635,568
Walls	\$3,656,078		\$0 Structures	50,100	0.086546	15,852,673,075	0	15,852,673,075
Other	\$573,460		\$0 Signals	21,079	0.086546	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$54,392,120</b>	<b>\$0</b>		0	0.086546	0	0	0
				0	0.086546		0	0
				0	0.086546		0	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	\$55,968,760	\$0		0	0.086546	0	0	0
<b>PROFESSIONAL SERVICES</b>	\$74,069,144	\$0		0	0.086546	0	0	0
<b>RIGHT-OF-WAY</b>	\$5,565,808	\$0		0	0.086546	0	0	0
				0	0.086546		0	0
<b>TOTAL</b>	<b>\$392,017,115</b>	<b>\$1,113,948</b>		0	0.086546	0	0	0



**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 4 - BRT Downstream Bridge			Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu)		Energy (Btu) Total
	Highway	Transit	Caltrans Construction Activity			Highway	Transit	
<b>COLUMBIA RIVER BRIDGES</b>				0	0.086546			0
COLU Bridges	\$296,457,709	\$0	Bridge Concrete Box Girder	48,364	0.086546	1,240,892,859,662	0	1,240,892,859,662
COLU Bridges			Bridge Concrete Box Girder	48,364	0.086546	0	0	0
COLU Bridges			Bridge Concrete Box Girder	48,364	0.086546	0	0	0
COLU Bridges			Bridge Concrete Box Girder	48,364	0.086546	0	0	0
COLU Bridges	\$203,596,921	\$61,160,583	Bridge Concrete Box Girder	48,364	0.086546	852,202,381,813	256,001,879,304	1,108,204,261,117
NON-DISTRIBUTED CONSTRUCTION COSTS	\$72,859,921	\$12,541,016		0	0.086546	0	0	0
PROFESSIONAL SERVICES	\$138,648,887	\$18,906,666		0	0.086546	0	0	0
RIGHT-OF-WAY	\$10,133,570	\$1,897,332		0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$721,697,008</b>	<b>\$94,505,597</b>		0	0.086546	0	0	0
<b>TRANSIT</b>				0	0.086546	0	0	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>				0	0.086546	0	0	0
Guideway	\$21,636,045	\$51,597,043	Track Work	50,100	0.086546	93,813,410,986	223,723,633,437	317,537,044,423
Tracks			Track Work	50,100	0.086546	0	0	0
Stations	\$0	\$8,527,260	Stations, Stops and Terminals	50,100	0.086546	0	36,974,010,128	36,974,010,128
Sitework	\$0	\$2,229,080	Site Work	21,079	0.086546	0	4,066,539,396	4,066,539,396
Systems	\$0	\$2,913,650	Stations, Stops and Terminals	50,100	0.086546	0	12,633,521,742	12,633,521,742
<b>SUBTOTAL</b>	<b>\$21,636,045</b>	<b>\$65,267,033</b>		0	0.086546	0	0	0
<b>STATE LINE TO CLARK COLLEGE</b>				0	0.086546	0	0	0
Guideway			Track Work	50,100	0.086546	0	0	0
Tracks			Track Work	50,100	0.086546	0	0	0
Stations			Stations, Stops and Terminals	50,100	0.086546	0	0	0
Sitework			Site Work	21,079	0.086546	0	0	0
Systems			Stations, Stops and Terminals	50,100	0.086546	0	0	0
<b>SUBTOTAL</b>				0	0.086546	0	0	0
<b>CLARK COLLEGE TO END OF PROJECT</b>				0	0.086546	0	0	0
Guideway			Track Work	50,100	0.086546	0	0	0
Tracks			Track Work	50,100	0.086546	0	0	0
Stations			Stations, Stops and Terminals	50,100	0.086546	0	0	0
Sitework			Site Work	21,079	0.086546	0	0	0
Systems			Stations, Stops and Terminals	50,100	0.086546	0	0	0
<b>SUBTOTAL</b>				0	0.086546	0	0	0
<b>STATE LINE TO END OF PROJECT</b>				0	0.086546	0	0	0
Guideway	\$0	\$6,844,407	Track Work	50,100	0.086546	0	29,677,198,599	29,677,198,599
Tracks			Track Work	50,100	0.086546	0	0	0
Stations	\$0	\$15,343,366	Stations, Stops and Terminals	50,100	0.086546	0	66,528,494,138	66,528,494,138
Sitework	\$0	\$49,545,402	Site Work	21,079	0.086546	0	90,386,316,216	90,386,316,216
Systems	\$0	\$17,930,753	Stations, Stops and Terminals	50,100	0.086546	0	77,747,345,018	77,747,345,018
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$89,663,928</b>		0	0.086546	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$0	\$32,443,478		0	0.086546	0	0	0
SUPPORT FACILITIES AND VEHICLES	\$0	\$132,134,950		0	0.086546	0	0	0
PROFESSIONAL SERVICES	\$0	\$90,374,904		0	0.086546	0	0	0
RIGHT-OF-WAY	\$0	\$58,932,190		0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$21,636,045</b>	<b>\$468,816,484</b>						<b>5,903,553,013,272</b>
<b>TOTAL MODE COST</b>	<b>\$1,882,262,939</b>	<b>\$564,436,029</b>						
<b>TOTAL PROJECT COST</b>	<b>\$2,446,698,968</b>							

Note: 1. With the exception of the 29th and 33rd Street Bridges, highway costs have not been adjusted to reflect it

The cost estimates do not include any contingencies for risk or uncertainty.

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub>
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (coal)	Gasoline	Diesel	Emissions (lbs)
<b><i>SOUTH HIGHWAY APPROACH</i></b>											
<b>I-5 MAINLINE</b>											
Pavement	3,412	123,976	138,691	475,481	78,516	152,068	2,095	1,321	19.4	22.2	5,404,790
Earthwork	3,412	123,976	138,691	136,782	22,587	43,745	2,095	1,321	19.4	22.2	1,554,798
Bridges	3,412	123,976	138,691	7,982,749	1,318,181	2,553,034	2,095	1,321	19.4	22.2	90,739,877
Other	3,412	123,976	138,691	51,650	8,529	16,519	2,095	1,321	19.4	22.2	587,101
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>											
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,691	15,520	2,563	4,964	2,095	1,321	19.4	22.2	176,416
Bridges	3,412	123,976	138,691	10,481	1,731	3,352	2,095	1,321	19.4	22.2	119,134
<b>SUBTOTAL</b>	3,412	123,976	138,691	216,494	35,749	69,239	2,095	1,321	19.4	22.2	2,460,885
<b>VICTORY BLVD INTERCHANGE</b>											
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	11,361	1,876	3,633	2,095	1,321	19.4	22.2	129,136
<b>MARINE DRIVE INTERCHANGE</b>											
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,691	180,730	29,844	57,801	2,095	1,321	19.4	22.2	2,054,362
Bridges	3,412	123,976	138,691	16,048	2,650	5,133	2,095	1,321	19.4	22.2	182,421
Walls	3,412	123,976	138,691	14,775,795	2,439,908	4,725,578	2,095	1,321	19.4	22.2	167,956,400
Other	3,412	123,976	138,691	20,206	3,337	6,462	2,095	1,321	19.4	22.2	229,679
<b>SUBTOTAL</b>	3,412	123,976	138,691	14,169	2,340	4,531	2,095	1,321	19.4	22.2	161,058
<b>HAYDEN ISLAND INTERCHANGE</b>											
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,691	392,765	64,857	125,614	2,095	1,321	19.4	22.2	4,464,558
Bridges	3,412	123,976	138,691	95,300	15,737	30,479	2,095	1,321	19.4	22.2	1,083,272
Walls	3,412	123,976	138,691	3,329,987	549,877	1,064,993	2,095	1,321	19.4	22.2	37,851,953
Other	3,412	123,976	138,691	24,050	3,971	7,692	2,095	1,321	19.4	22.2	273,376
<b>SUBTOTAL</b>	3,412	123,976	138,691	14,169	2,340	4,531	2,095	1,321	19.4	22.2	161,058
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>											
PROFESSIONAL SERVICES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (coal)	Gasoline		
<b>NORTH HIGHWAY APPROACH</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>I-5 MAINLINE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	1,162,343	191,936	371,739	2,095	1,321	19.4	22.2	13,212,344
Earthwork	3,412	123,976	138,691	120,482	19,895	38,532	2,095	1,321	19.4	22.2	1,369,517
Bridges	3,412	123,976	138,691	970,495	160,257	310,383	2,095	1,321	19.4	22.2	11,031,612
Walls	3,412	123,976	138,691	20,247	3,343	6,475	2,095	1,321	19.4	22.2	230,148
Other	3,412	123,976	138,691	107,502	17,752	34,381	2,095	1,321	19.4	22.2	1,221,970
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUOR ROADS</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	276,105	45,593	88,304	2,095	1,321	19.4	22.2	3,138,485
Earthwork	3,412	123,976	138,691	26,475	4,372	8,467	2,095	1,321	19.4	22.2	300,939
Bridges	3,412	123,976	138,691	63,215	10,439	20,217	2,095	1,321	19.4	22.2	718,565
Walls	3,412	123,976	138,691	337,049	55,656	107,795	2,095	1,321	19.4	22.2	3,831,233
Other	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 14 INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	295,775	48,841	94,594	2,095	1,321	19.4	22.2	3,362,069
Earthwork	3,412	123,976	138,691	17,769	2,934	5,683	2,095	1,321	19.4	22.2	201,977
Bridges	3,412	123,976	138,691	2,079,262	343,346	664,987	2,095	1,321	19.4	22.2	23,634,962
Walls	3,412	123,976	138,691	71,672	11,835	22,922	2,095	1,321	19.4	22.2	814,699
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>EVERGREEN BLVD BRIDGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	17,297	2,856	5,532	2,095	1,321	19.4	22.2	196,618
Earthwork	3,412	123,976	138,691	9,746	1,609	3,117	2,095	1,321	19.4	22.2	110,782
Bridges	3,412	123,976	138,691	358,249	59,157	114,575	2,095	1,321	19.4	22.2	4,072,211
Other	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>MILL PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,691	384,418	63,478	122,944	2,095	1,321	19.4	22.2	4,369,673
Bridges	3,412	123,976	138,691	132,966	21,956	42,525	2,095	1,321	19.4	22.2	1,511,422
Walls	3,412	123,976	138,691	67,115	11,083	21,465	2,095	1,321	19.4	22.2	762,894
Other	3,412	123,976	138,691	665,985	109,973	212,995	2,095	1,321	19.4	22.2	7,570,251
<b>SUBTOTAL</b>	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>4th PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	459,838	75,933	147,065	2,095	1,321	19.4	22.2	5,226,981
Earthwork	3,412	123,976	138,691	90,341	14,918	28,893	2,095	1,321	19.4	22.2	1,026,902
Bridges	3,412	123,976	138,691	2,749,029	453,944	879,191	2,095	1,321	19.4	22.2	31,248,200
Walls	3,412	123,976	138,691	551,860	91,128	176,495	2,095	1,321	19.4	22.2	6,272,985
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,691	24,742	4,086	7,913	2,095	1,321	19.4	22.2	281,247
Bridges	3,412	123,976	138,691	6,938	1,146	2,219	2,095	1,321	19.4	22.2	78,861
Other	3,412	123,976	138,691	691,574	114,199	221,178	2,095	1,321	19.4	22.2	7,861,117
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 500 INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	324,973	53,662	103,933	2,095	1,321	19.4	22.2	3,693,970
Earthwork	3,412	123,976	138,691	86,177	14,230	27,561	2,095	1,321	19.4	22.2	979,576
Bridges	3,412	123,976	138,691	2,547,108	420,601	814,613	2,095	1,321	19.4	22.2	28,952,963
Walls	3,412	123,976	138,691	232,308	38,361	74,296	2,095	1,321	19.4	22.2	2,640,640
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>PROFESSIONAL SERVICES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>RIGHT-OF-WAY</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (coal)	Gasoline		
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLUMBIA RIVER BRIDGES</b>											
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,691	18,184,245	3,002,741	5,815,665	2,095	1,321	19.4	22.2	206,700,229
COLU Bridges	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,691	16,239,805	2,681,658	5,193,796	2,095	1,321	19.4	22.2	184,597,786
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>											
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TRANSIT</b>											
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>											
Guideway	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,691	4,653,239	766,384	1,488,194	2,095	1,321	19.4	22.2	52,893,349
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	541,823	89,471	173,285	2,095	1,321	19.4	22.2	6,158,901
Sitework	3,412	123,976	138,691	59,592	9,840	19,059	2,095	1,321	19.4	22.2	677,379
Systems	3,412	123,976	138,691	185,134	30,571	59,209	2,095	1,321	19.4	22.2	2,104,414
<b>SUBTOTAL</b>											
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO CLARK COLLEGE</b>											
Guideway	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>											
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>CLARK COLLEGE TO END OF PROJECT</b>											
Guideway	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>											
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO END OF PROJECT</b>											
Guideway	3,412	123,976	138,691	434,894	71,814	139,087	2,095	1,321	19.4	22.2	4,943,443
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	974,919	160,987	311,798	2,095	1,321	19.4	22.2	11,081,904
Sitework	3,412	123,976	138,691	1,324,536	218,719	423,612	2,095	1,321	19.4	22.2	15,055,991
Systems	3,412	123,976	138,691	1,139,322	188,135	364,377	2,095	1,321	19.4	22.2	12,950,670
<b>SUBTOTAL</b>											
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
SUPPORT FACILITIES AND VEHICLES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	86,511,621	14,285,554	27,668,050					0
<b>TOTAL</b>											
<b>TOTAL MODE COST</b>											
<b>TOTAL PROJECT COST</b>											

Note: 1. With the exception of the 29th and 33rd Street Bridges, high

The cost estimates do not include any contingencies for risk

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 5 - LRT Downstream Bridge			Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu) Highway	Energy (Btu) Transit	Energy (Btu) Total
	Highway	Transit	Caltrans Construction Activity					
<b><i>SOUTH HIGHWAY APPROACH</i></b>								
<b>I-5 MAINLINE</b>								
Pavement	\$7,920,780	\$0	Urban Freeway	47,332	0.086546	32,446,819,416	0	32,446,819,416
Earthwork	\$5,116,442	\$0	Site Work	21,079	0.086546	9,333,991,136	0	9,333,991,136
Bridges	\$130,142,750	\$0	Bridge Concrete Box Girder	48,364	0.086546	544,742,822,700	0	544,742,822,700
Other	\$1,932,000	\$0	Signals	21,079	0.086546	3,524,572,520	0	3,524,572,520
<b>SUBTOTAL</b>	<b>\$145,111,972</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>								
Pavement	\$258,540	\$0	Urban Freeway	47,332	0.086546	1,059,087,702	0	1,059,087,702
Earthwork	\$392,040	\$0	Site Work	21,079	0.086546	715,203,629	0	715,203,629
Bridges	\$3,529,500	\$0	Bridge Concrete Box Girder	48,364	0.086546	14,773,545,147	0	14,773,545,147
<b>SUBTOTAL</b>	<b>\$4,180,080</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>VICTORY BLVD INTERCHANGE</b>								
Pavement	\$189,250	\$0	Urban Freeway	47,332	0.086546	775,246,955	0	775,246,955
<b>SUBTOTAL</b>	<b>\$189,250</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>MARINE DRIVE INTERCHANGE</b>								
Pavement	\$3,010,690	\$0	Urban Freeway	47,332	0.086546	12,333,042,295	0	12,333,042,295
Earthwork	\$600,300	\$0	Site Work	21,079	0.086546	1,095,135,033	0	1,095,135,033
Bridges	\$240,889,765	\$0	Bridge Concrete Box Girder	48,364	0.086546	1,008,300,274,472	0	1,008,300,274,472
Walls	\$318,000	\$0	Structures	50,100	0.086546	1,378,840,943	0	1,378,840,943
Other	\$530,000	\$0	Signals	21,079	0.086546	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$245,348,755</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>HAYDEN ISLAND INTERCHANGE</b>								
Pavement	\$6,542,860	\$0	Urban Freeway	47,332	0.086546	26,802,284,230	0	26,802,284,230
Earthwork	\$3,564,770	\$0	Site Work	21,079	0.086546	6,503,255,892	0	6,503,255,892
Bridges	\$54,288,780	\$0	Bridge Concrete Box Girder	48,364	0.086546	227,238,346,032	0	227,238,346,032
Walls	\$378,500	\$0	Structures	50,100	0.086546	1,641,167,601	0	1,641,167,601
Other	\$530,000	\$0	Signals	21,079	0.086546	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$65,304,910</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>								
	\$92,826,321	\$0		0	0.086546	0	0	0
<b>PROFESSIONAL SERVICES</b>								
	\$126,751,483	\$0		0	0.086546	0	0	0
<b>RIGHT-OF-WAY</b>								
	\$67,200,000	\$0		0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$746,912,771</b>	<b>\$0</b>		0	0.086546	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 5 - LRT Downstream Bridge		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu)		Energy (Btu) Transit	Energy (Btu) Total
	Highway	Transit				Highway	Transit		
<b>NORTH HIGHWAY APPROACH</b>				0	0	0.086546		0	0
				0	0	0.086546		0	0
				0	0	0.086546		0	0
				0	0	0.086546		0	0
<b>I-5 MAINLINE</b>				0	0	0.086546		0	0
Pavement	\$19,362,839		\$0 Urban Freeway	47,332	0.086546	79,318,266,811	0	79,318,266,811	
Earthwork	\$4,506,730		\$0 Site Work	21,079	0.086546	8,221,685,980	0	8,221,685,980	
Bridges	\$15,821,978		\$0 Bridge Concrete Box Girder	48,364	0.086546	66,226,576,951	0	66,226,576,951	
Walls	\$318,649		\$0 Structures	50,100	0.086546	1,381,654,993	0	1,381,654,993	
Other	\$4,021,188		\$0 Signals	21,079	0.086546	7,335,905,283	0	7,335,905,283	
<b>SUBTOTAL</b>	<b>\$44,031,384</b>		<b>\$0</b>	0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>				0	0	0.086546		0	0
Pavement	\$4,599,485		\$0 Urban Freeway	47,332	0.086546	18,841,407,901	0	18,841,407,901	
Earthwork	\$990,313		\$0 Site Work	21,079	0.086546	1,806,641,663	0	1,806,641,663	
Bridges	\$1,030,594		\$0 Bridge Concrete Box Girder	48,364	0.086546	4,313,792,222	0	4,313,792,222	
Walls	\$5,304,505		\$0 Structures	50,100	0.086546	23,000,215,966	0	23,000,215,966	
<b>SUBTOTAL</b>	<b>\$11,924,897</b>		<b>\$0</b>	0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>SR 14 INTERCHANGE</b>				0	0	0.086546		0	0
Pavement	\$4,927,150		\$0 Urban Freeway	47,332	0.086546	20,183,661,696	0	20,183,661,696	
Earthwork	\$664,655		\$0 Site Work	21,079	0.086546	1,212,539,215	0	1,212,539,215	
Bridges	\$33,898,205		\$0 Bridge Concrete Box Girder	48,364	0.086546	141,888,841,261	0	141,888,841,261	
Walls	\$1,127,985		\$0 Structures	50,100	0.086546	4,890,917,928	0	4,890,917,928	
Other	\$573,460		\$0 Signals	21,079	0.086546	1,046,170,475	0	1,046,170,475	
<b>SUBTOTAL</b>	<b>\$41,191,455</b>		<b>\$0</b>	0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>EVERGREEN BLVD BRIDGE</b>				0	0	0.086546		0	0
Pavement	\$288,146		\$0 Urban Freeway	47,332	0.086546	1,180,367,615	0	1,180,367,615	
Earthwork	\$364,555		\$0 Site Work	21,079	0.086546	665,062,414	0	665,062,414	
Bridges	\$5,840,528		\$0 Bridge Concrete Box Girder	48,364	0.086546	24,446,890,817	0	24,446,890,817	
<b>SUBTOTAL</b>	<b>\$6,493,229</b>		<b>\$0</b>	0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>MILL PLAIN BLVD INTERCHANGE</b>				0	0	0.086546		0	0
Pavement	\$6,403,805		\$0 Urban Freeway	47,332	0.086546	26,232,657,338	0	26,232,657,338	
Earthwork	\$3,879,528		\$0 Site Work	21,079	0.086546	7,077,473,541	0	7,077,473,541	
Bridges	\$1,094,173		\$0 Bridge Concrete Box Girder	48,364	0.086546	4,579,914,103	0	4,579,914,103	
Walls	\$10,481,334		\$0 Structures	50,100	0.086546	45,446,831,629	0	45,446,831,629	
Other	\$573,460		\$0 Signals	21,079	0.086546	1,046,170,475	0	1,046,170,475	
<b>SUBTOTAL</b>	<b>\$22,432,300</b>		<b>\$0</b>	0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>4th PLAIN BLVD INTERCHANGE</b>				0	0	0.086546		0	0
Pavement	\$6,930,216	\$729,982	Urban Freeway	47,332	0.086546	28,389,058,026	2,990,311,311	31,379,369,337	
Earthwork	\$2,995,304	\$383,966	Site Work	21,079	0.086546	5,464,371,442	700,474,298	6,164,845,740	
Bridges	\$44,817,414	\$0	Bridge Concrete Box Girder	48,364	0.086546	187,593,734,568	0	187,593,734,568	
Walls	\$8,685,214	\$0	Structures	50,100	0.086546	37,658,895,167	0	37,658,895,167	
Other	\$573,460	\$0	Signals	21,079	0.086546	1,046,170,475	0	1,046,170,475	
<b>SUBTOTAL</b>	<b>\$64,001,608</b>	<b>\$1,113,948</b>		0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>				0	0	0.086546		0	0
Pavement	\$412,171		\$0 Urban Freeway	47,332	0.086546	1,688,422,685	0	1,688,422,685	
Earthwork	\$259,511		\$0 Site Work	21,079	0.086546	473,429,644	0	473,429,644	
Bridges	\$11,274,727		\$0 Bridge Concrete Box Girder	48,364	0.086546	47,192,997,413	0	47,192,997,413	
<b>SUBTOTAL</b>	<b>\$11,946,409</b>		<b>\$0</b>	0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>SR 500 INTERCHANGE</b>				0	0	0.086546		0	0
Pavement	\$5,413,555		\$0 Urban Freeway	47,332	0.086546	22,176,178,555	0	22,176,178,555	
Earthwork	\$3,223,533		\$0 Site Work	21,079	0.086546	5,880,733,474	0	5,880,733,474	
Bridges	\$41,525,494		\$0 Bridge Concrete Box Girder	48,364	0.086546	173,814,635,568	0	173,814,635,568	
Walls	\$3,656,078		\$0 Structures	50,100	0.086546	15,852,673,075	0	15,852,673,075	
Other	\$573,460		\$0 Signals	21,079	0.086546	1,046,170,475	0	1,046,170,475	
<b>SUBTOTAL</b>	<b>\$54,392,120</b>		<b>\$0</b>	0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	\$55,968,760		\$0	0	0	0.086546	0	0	0
<b>PROFESSIONAL SERVICES</b>	\$74,069,144		\$0	0	0	0.086546	0	0	0
<b>RIGHT-OF-WAY</b>	\$5,565,808		\$0	0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$392,017,115</b>	<b>\$1,113,948</b>		0	0	0.086546	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 5 - LRT Downstream Bridge			Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu)		Energy (Btu) Total
	Highway	Transit	Caltrans Construction Activity			Highway	Transit	
<b>COLUMBIA RIVER BRIDGES</b>				0	0.086546			0
COLU Bridges	\$296,457,709	\$0	Bridge Concrete Box Girder	48,364	0.086546	1,240,892,859,662	0	1,240,892,859,662
COLU Bridges			Bridge Concrete Box Girder	48,364	0.086546	0	0	0
COLU Bridges			Bridge Concrete Box Girder	48,364	0.086546	0	0	0
COLU Bridges			Bridge Concrete Box Girder	48,364	0.086546	0	0	0
COLU Bridges	\$203,596,921	\$61,160,583	Bridge Concrete Box Girder	48,364	0.086546	852,202,381,813	256,001,879,304	1,108,204,261,117
NON-DISTRIBUTED CONSTRUCTION COSTS	\$72,859,921	\$12,541,016		0	0.086546	0	0	0
PROFESSIONAL SERVICES	\$138,648,887	\$18,906,666		0	0.086546	0	0	0
RIGHT-OF-WAY	\$10,133,570	\$1,897,332		0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$721,697,008</b>	<b>\$94,505,597</b>		0	0.086546	0	0	0
<b>TRANSIT</b>				0	0.086546	0	0	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>				0	0.086546	0	0	0
Guideway	\$21,636,360	\$54,816,414	Track Work	50,100	0.086546	93,814,776,819	237,682,754,651	331,497,531,470
Tracks	\$0	\$6,161,450	Track Work	50,100	0.086546	0	26,715,910,469	26,715,910,469
Stations	\$0	\$3,280,000	Stations, Stops and Terminals	50,100	0.086546	0	14,222,007,212	14,222,007,212
Sitework	\$0	\$338,000	Site Work	21,079	0.086546	0	616,617,760	616,617,760
Systems	\$0	\$6,978,365	Stations, Stops and Terminals	50,100	0.086546	0	30,258,035,780	30,258,035,780
<b>SUBTOTAL</b>	<b>\$21,636,360</b>	<b>\$71,574,229</b>		0	0.086546	0	0	0
<b>STATE LINE TO CLARK COLLEGE</b>				0	0.086546	0	0	0
Guideway			Track Work	50,100	0.086546	0	0	0
Tracks			Track Work	50,100	0.086546	0	0	0
Stations			Stations, Stops and Terminals	50,100	0.086546	0	0	0
Sitework			Site Work	21,079	0.086546	0	0	0
Systems			Stations, Stops and Terminals	50,100	0.086546	0	0	0
<b>SUBTOTAL</b>				0	0.086546	0	0	0
<b>CLARK COLLEGE TO END OF PROJECT</b>				0	0.086546	0	0	0
Guideway			Track Work	50,100	0.086546	0	0	0
Tracks			Track Work	50,100	0.086546	0	0	0
Stations			Stations, Stops and Terminals	50,100	0.086546	0	0	0
Sitework			Site Work	21,079	0.086546	0	0	0
Systems			Stations, Stops and Terminals	50,100	0.086546	0	0	0
<b>SUBTOTAL</b>				0	0.086546	0	0	0
<b>STATE LINE TO END OF PROJECT</b>				0	0.086546	0	0	0
Guideway	\$0	\$16,622,387	Track Work	50,100	0.086546	0	72,074,302,459	72,074,302,459
Tracks	\$0	\$16,088,550	Track Work	50,100	0.086546	0	69,759,596,380	69,759,596,380
Stations	\$0	\$15,749,116	Stations, Stops and Terminals	50,100	0.086546	0	68,287,817,134	68,287,817,134
Sitework	\$0	\$46,785,529	Site Work	21,079	0.086546	0	85,351,443,154	85,351,443,154
Systems	\$0	\$27,662,492	Stations, Stops and Terminals	50,100	0.086546	0	119,943,950,879	119,943,950,879
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$122,908,074</b>		0	0.086546	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$0	\$38,013,125		0	0.086546	0	0	0
SUPPORT FACILITIES AND VEHICLES	\$0	\$180,788,500		0	0.086546	0	0	0
PROFESSIONAL SERVICES	\$0	\$112,880,869		0	0.086546	0	0	0
RIGHT-OF-WAY	\$0	\$60,060,470		0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$21,636,360</b>	<b>\$586,225,267</b>						<b>6,084,733,643,304</b>
<b>TOTAL MODE COST</b>	<b>\$1,882,263,254</b>	<b>\$681,844,812</b>						
<b>TOTAL PROJECT COST</b>	<b>\$2,564,108,066</b>							

Note: 1. With the exception of the 29th and 33rd Street Bridges, highway costs have not been adjusted to reflect it

The cost estimates do not include any contingencies for risk or uncertainty.

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coelectricity (n.gr	Gasoline	Diesel		
<b><i>SOUTH HIGHWAY APPROACH</i></b>											
<b>I-5 MAINLINE</b>											
Pavement	3,412	123,976	138,691	475,481	78,516	152,068	2,095	1,321	19.4	22.2	5,404,790
Earthwork	3,412	123,976	138,691	136,782	22,587	43,745	2,095	1,321	19.4	22.2	1,554,798
Bridges	3,412	123,976	138,691	7,982,749	1,318,181	2,553,034	2,095	1,321	19.4	22.2	90,739,877
Other	3,412	123,976	138,691	51,650	8,529	16,519	2,095	1,321	19.4	22.2	587,101
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>											
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,691	15,520	2,563	4,964	2,095	1,321	19.4	22.2	176,416
Bridges	3,412	123,976	138,691	10,481	1,731	3,352	2,095	1,321	19.4	22.2	119,134
<b>SUBTOTAL</b>	3,412	123,976	138,691	216,494	35,749	69,239	2,095	1,321	19.4	22.2	2,460,885
<b>VICTORY BLVD INTERCHANGE</b>											
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	11,361	1,876	3,633	2,095	1,321	19.4	22.2	129,136
<b>MARINE DRIVE INTERCHANGE</b>											
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,691	180,730	29,844	57,801	2,095	1,321	19.4	22.2	2,054,362
Bridges	3,412	123,976	138,691	16,048	2,650	5,133	2,095	1,321	19.4	22.2	182,421
Walls	3,412	123,976	138,691	14,775,795	2,439,908	4,725,578	2,095	1,321	19.4	22.2	167,956,400
Other	3,412	123,976	138,691	20,206	3,337	6,462	2,095	1,321	19.4	22.2	229,679
<b>SUBTOTAL</b>	3,412	123,976	138,691	14,169	2,340	4,531	2,095	1,321	19.4	22.2	161,058
<b>HAYDEN ISLAND INTERCHANGE</b>											
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,691	392,765	64,857	125,614	2,095	1,321	19.4	22.2	4,464,558
Bridges	3,412	123,976	138,691	95,300	15,737	30,479	2,095	1,321	19.4	22.2	1,083,272
Walls	3,412	123,976	138,691	3,329,987	549,877	1,064,993	2,095	1,321	19.4	22.2	37,851,953
Other	3,412	123,976	138,691	24,050	3,971	7,692	2,095	1,321	19.4	22.2	273,376
<b>SUBTOTAL</b>	3,412	123,976	138,691	14,169	2,340	4,531	2,095	1,321	19.4	22.2	161,058
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>											
PROFESSIONAL SERVICES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0



**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub> Emissions (lbs)
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	lectricity (coacricty (n.gr Gasoline Diesel				
							Electricity	Gasoline	Diesel	Electricity	
<b>NORTH HIGHWAY APPROACH</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>I-5 MAINLINE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	1,162,343	191,936	371,739	2,095	1,321	19.4	22.2	13,212,344
Earthwork	3,412	123,976	138,691	120,482	19,895	38,532	2,095	1,321	19.4	22.2	1,369,517
Bridges	3,412	123,976	138,691	970,495	160,257	310,383	2,095	1,321	19.4	22.2	11,031,612
Walls	3,412	123,976	138,691	20,247	3,343	6,475	2,095	1,321	19.4	22.2	230,148
Other	3,412	123,976	138,691	107,502	17,752	34,381	2,095	1,321	19.4	22.2	1,221,970
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUOR ROADS</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	276,105	45,593	88,304	2,095	1,321	19.4	22.2	3,138,485
Earthwork	3,412	123,976	138,691	26,475	4,372	8,467	2,095	1,321	19.4	22.2	300,939
Bridges	3,412	123,976	138,691	63,215	10,439	20,217	2,095	1,321	19.4	22.2	718,565
Walls	3,412	123,976	138,691	337,049	55,656	107,795	2,095	1,321	19.4	22.2	3,631,233
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 14 INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	295,775	48,841	94,594	2,095	1,321	19.4	22.2	3,362,069
Earthwork	3,412	123,976	138,691	17,769	2,934	5,683	2,095	1,321	19.4	22.2	201,977
Bridges	3,412	123,976	138,691	2,079,262	343,346	664,987	2,095	1,321	19.4	22.2	23,634,962
Walls	3,412	123,976	138,691	71,672	11,835	22,922	2,095	1,321	19.4	22.2	814,699
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>EVERGREEN BLVD BRIDGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	17,297	2,856	5,532	2,095	1,321	19.4	22.2	196,618
Earthwork	3,412	123,976	138,691	9,746	1,609	3,117	2,095	1,321	19.4	22.2	110,782
Bridges	3,412	123,976	138,691	358,249	59,157	114,575	2,095	1,321	19.4	22.2	4,072,211
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>MILL PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,691	384,418	63,478	122,944	2,095	1,321	19.4	22.2	4,369,673
Bridges	3,412	123,976	138,691	103,714	17,126	33,170	2,095	1,321	19.4	22.2	1,178,922
Walls	3,412	123,976	138,691	67,115	11,083	21,465	2,095	1,321	19.4	22.2	762,894
Other	3,412	123,976	138,691	665,985	109,973	212,995	2,095	1,321	19.4	22.2	7,570,251
<b>SUBTOTAL</b>	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>4th PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	459,838	75,933	147,065	2,095	1,321	19.4	22.2	5,226,981
Earthwork	3,412	123,976	138,691	90,341	14,918	28,893	2,095	1,321	19.4	22.2	1,026,902
Bridges	3,412	123,976	138,691	2,749,029	453,944	879,191	2,095	1,321	19.4	22.2	31,248,200
Walls	3,412	123,976	138,691	551,860	91,128	176,495	2,095	1,321	19.4	22.2	6,272,985
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	24,742	4,086	7,913	2,095	1,321	19.4	22.2	281,247
Earthwork	3,412	123,976	138,691	6,938	1,146	2,219	2,095	1,321	19.4	22.2	78,861
Bridges	3,412	123,976	138,691	691,574	114,199	221,178	2,095	1,321	19.4	22.2	7,861,117
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 500 INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	324,973	53,662	103,933	2,095	1,321	19.4	22.2	3,693,970
Earthwork	3,412	123,976	138,691	86,177	14,230	27,561	2,095	1,321	19.4	22.2	979,576
Bridges	3,412	123,976	138,691	2,547,108	420,601	814,613	2,095	1,321	19.4	22.2	28,952,963
Walls	3,412	123,976	138,691	232,308	38,361	74,296	2,095	1,321	19.4	22.2	2,640,640
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>PROFESSIONAL SERVICES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>RIGHT-OF-WAY</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub> Emissions (lbs)
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coelectricity (n.gr	Gasoline	Diesel		
<b>COLUMBIA RIVER BRIDGES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,691	18,184,245	3,002,741	5,815,665	2,095	1,321	19.4	22.2	206,700,229
COLU Bridges	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,691	16,239,805	2,681,658	5,193,796	2,095	1,321	19.4	22.2	184,597,786
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TRANSIT</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	4,857,818	802,165	1,553,622	2,095	1,321	19.4	22.2	55,218,801
Tracks	3,412	123,976	138,691	391,499	64,648	125,209	2,095	1,321	19.4	22.2	4,450,171
Stations	3,412	123,976	138,691	208,412	34,415	66,654	2,095	1,321	19.4	22.2	2,369,014
Stitework	3,412	123,976	138,691	9,036	1,492	2,890	2,095	1,321	19.4	22.2	102,712
Systems	3,412	123,976	138,691	443,406	73,219	141,810	2,095	1,321	19.4	22.2	5,040,196
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO CLARK COLLEGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stitework	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>CLARK COLLEGE TO END OF PROJECT</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stitework	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO END OF PROJECT</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	1,056,188	174,407	337,789	2,095	1,321	19.4	22.2	12,005,690
Tracks	3,412	123,976	138,691	1,022,268	168,806	326,941	2,095	1,321	19.4	22.2	11,620,120
Stations	3,412	123,976	138,691	1,000,701	165,244	320,043	2,095	1,321	19.4	22.2	11,374,961
Stitework	3,412	123,976	138,691	1,250,754	206,535	400,015	2,095	1,321	19.4	22.2	14,217,314
Systems	3,412	123,976	138,691	1,757,678	290,243	562,139	2,095	1,321	19.4	22.2	19,979,519
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
SUPPORT FACILITIES AND VEHICLES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	<b>89,166,671</b>	<b>14,723,980</b>	<b>28,517,185</b>	2,095	1,321	19.4	22.2	94,830,449

Note: 1. With the exception of the 29th and 33rd Street Bridges, high

The cost estimates do not include any contingencies for risk

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 2 - BRT							
	2A - Downstream Bridge			Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu)		Energy (Btu) Total
	Highway	Transit	Caltrans Construction Activity			Highway	Transit	
<b><i>SOUTH HIGHWAY APPROACH</i></b>								
<b>I-5 MAINLINE</b>								
Pavement	\$8,035,260		\$0 Urban Freeway	47,332	0.086546	32,915,777,257	0	32,915,777,257
Earthwork	\$1,775,347		\$0 Site Work	21,079	0.086546	3,238,788,432	0	3,238,788,432
Bridges	\$148,360,710		\$0 Bridge Concrete Box Girder	48,364	0.086546	620,998,341,768	0	620,998,341,768
Other	\$1,919,400		\$0 Signals	21,079	0.086546	3,501,586,178	0	3,501,586,178
<b>SUBTOTAL</b>	<b>\$160,090,717</b>		<b>\$0</b>	0	0.086546	0	0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>								
Pavement	\$258,540		\$0 Urban Freeway	47,332	0.086546	1,059,087,702	0	1,059,087,702
Earthwork			\$0 Site Work	21,079	0.086546	0	0	0
Bridges	\$3,529,500		\$0 Bridge Concrete Box Girder	48,364	0.086546	14,773,545,147	0	14,773,545,147
<b>SUBTOTAL</b>	<b>\$3,788,040</b>		<b>\$0</b>	0	0.086546	0	0	0
<b>VICTORY BLVD INTERCHANGE</b>								
Pavement	\$189,250		\$0 Urban Freeway	47,332	0.086546	775,246,955	0	775,246,955
<b>SUBTOTAL</b>	<b>\$189,250</b>		<b>\$0</b>	0	0.086546	0	0	0
<b>MARINE DRIVE INTERCHANGE</b>								
Pavement	\$2,966,727		\$0 Urban Freeway	47,332	0.086546	12,152,951,506	0	12,152,951,506
Earthwork	\$389,894		\$0 Site Work	21,079	0.086546	711,288,945	0	711,288,945
Bridges	\$215,044,315		\$0 Bridge Concrete Box Girder	48,364	0.086546	900,118,117,672	0	900,118,117,672
Walls	\$516,000		\$0 Structures	50,100	0.086546	2,237,364,549	0	2,237,364,549
Other	\$530,000		\$0 Signals	21,079	0.086546	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$219,446,936</b>		<b>\$0</b>	0	0.086546	0	0	0
<b>HAYDEN ISLAND INTERCHANGE</b>								
Pavement	\$6,429,201		\$0 Urban Freeway	47,332	0.086546	26,336,689,548	0	26,336,689,548
Earthwork	\$4,774,649		\$0 Site Work	21,079	0.086546	8,710,453,977	0	8,710,453,977
Bridges	\$52,937,550		\$0 Bridge Concrete Box Girder	48,364	0.086546	221,582,457,830	0	221,582,457,830
Walls	\$1,094,500		\$0 Structures	50,100	0.086546	4,745,727,712	0	4,745,727,712
Other	\$530,000		\$0 Signals	21,079	0.086546	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$65,765,900</b>		<b>\$0</b>	0	0.086546	0	0	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>								
PROFESSIONAL SERVICES	\$90,466,507		\$0	0	0.086546	0	0	0
RIGHT-OF-WAY	\$123,844,417		\$0	0	0.086546	0	0	0
	\$51,110,000		\$0	0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$714,701,767</b>		<b>\$0</b>	0	0.086546	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 2 - BRT							
	2A - Downstream Bridge			Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu)		Energy (Btu) Total
	Highway	Transit	Caltrans Construction Activity			Highway	Transit	
<b>NORTH HIGHWAY APPROACH</b>				0	0.086546	0	0	0
				0	0.086546	0	0	0
				0	0.086546	0	0	0
				0	0.086546	0	0	0
<b>I-5 MAINLINE</b>				0	0.086546	0	0	0
Pavement	\$21,447,327		\$0 Urban Freeway	47,332	0.086546	87,857,199,910	0	87,857,199,910
Earthwork	\$5,090,904		\$0 Site Work	21,079	0.086546	9,287,402,078	0	9,287,402,078
Bridges	\$25,612,303		\$0 Bridge Concrete Box Girder	48,364	0.086546	107,206,267,014	0	107,206,267,014
Walls	\$3,848,133		\$0 Structures	50,100	0.086546	16,685,419,293	0	16,685,419,293
Other	\$3,304,082		\$0 Signals	21,079	0.086546	6,027,678,973	0	6,027,678,973
<b>SUBTOTAL</b>	<b>\$59,302,749</b>		<b>\$0</b>	0	0.086546	0	0	0
				0	0.086546	0	0	0
				0	0.086546	0	0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>				0	0.086546	0	0	0
Pavement	\$3,390,057		\$0 Urban Freeway	47,332	0.086546	13,887,089,764	0	13,887,089,764
Earthwork	\$2,276,945		\$0 Site Work	21,079	0.086546	4,153,859,349	0	4,153,859,349
Bridges	\$1,030,594		\$0 Bridge Concrete Box Girder	48,364	0.086546	4,313,792,222	0	4,313,792,222
Walls	\$2,053,636		\$0 Structures	50,100	0.086546	8,904,520,123	0	8,904,520,123
<b>SUBTOTAL</b>	<b>\$8,751,232</b>		<b>\$0</b>	0	0.086546	0	0	0
				0	0.086546	0	0	0
				0	0.086546	0	0	0
<b>SR 14 INTERCHANGE</b>				0	0.086546	0	0	0
Pavement	\$6,039,945		\$0 Urban Freeway	47,332	0.086546	24,742,133,461	0	24,742,133,461
Earthwork	\$3,658,118		\$0 Site Work	21,079	0.086546	6,673,551,068	0	6,673,551,068
Bridges	\$43,366,360		\$0 Bridge Concrete Box Girder	48,364	0.086546	181,520,009,866	0	181,520,009,866
Walls	\$8,813,431		\$0 Structures	50,100	0.086546	38,214,841,234	0	38,214,841,234
Other	\$573,460		\$0 Signals	21,079	0.086546	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$62,451,313</b>		<b>\$0</b>	0	0.086546	0	0	0
				0	0.086546	0	0	0
				0	0.086546	0	0	0
<b>EVERGREEN BLVD BRIDGE</b>				0	0.086546	0	0	0
Pavement	\$306,810		\$0 Urban Freeway	47,332	0.086546	1,256,820,761	0	1,256,820,761
Earthwork	\$34,069		\$0 Site Work	21,079	0.086546	62,152,396	0	62,152,396
Bridges	\$8,764,654		\$0 Bridge Concrete Box Girder	48,364	0.086546	36,686,504,624	0	36,686,504,624
<b>SUBTOTAL</b>	<b>\$9,105,533</b>		<b>\$0</b>	0	0.086546	0	0	0
				0	0.086546	0	0	0
				0	0.086546	0	0	0
<b>MILL PLAIN BLVD INTERCHANGE</b>				0	0.086546	0	0	0
Pavement	\$3,990,794		\$0 Urban Freeway	47,332	0.086546	16,347,955,612	0	16,347,955,612
Earthwork	\$3,193,595		\$0 Site Work	21,079	0.086546	5,826,117,453	0	5,826,117,453
Bridges	\$3,163,162		\$0 Bridge Concrete Box Girder	48,364	0.086546	13,240,152,372	0	13,240,152,372
Walls	\$837,468		\$0 Structures	50,100	0.086546	3,631,242,663	0	3,631,242,663
Other	\$573,460		\$0 Signals	21,079	0.086546	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$11,758,479</b>		<b>\$0</b>	0	0.086546	0	0	0
				0	0.086546	0	0	0
				0	0.086546	0	0	0
<b>4th PLAIN BLVD INTERCHANGE</b>				0	0.086546	0	0	0
Pavement	\$3,382,758	\$757,065	Urban Freeway	47,332	0.086546	13,857,189,311	3,101,252,366	16,958,441,677
Earthwork	\$2,613,005	\$321,851	Site Work	21,079	0.086546	4,766,938,934	587,156,270	5,354,095,204
Bridges	\$50,951,542	\$0	Bridge Concrete Box Girder	48,364	0.086546	213,269,559,567	0	213,269,559,567
Walls	\$18,694,255	\$0	Structures	50,100	0.086546	81,057,874,828	0	81,057,874,828
Other	\$573,460	\$0	Signals	21,079	0.086546	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$76,215,021</b>	<b>\$1,078,915</b>		0	0.086546	0	0	0
				0	0.086546	0	0	0
				0	0.086546	0	0	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>				0	0.086546	0	0	0
Pavement	\$288,985	\$0	Urban Freeway	47,332	0.086546	1,183,802,665	0	1,183,802,665
Earthwork	\$14,210	\$0	Site Work	21,079	0.086546	25,923,315	0	25,923,315
Bridges	\$11,376,262	\$1,794,129	Bridge Concrete Box Girder	48,364	0.086546	47,617,995,326	7,509,745,730	55,127,741,056
<b>SUBTOTAL</b>	<b>\$11,679,456</b>	<b>\$1,794,129</b>		0	0.086546	0	0	0
				0	0.086546	0	0	0
				0	0.086546	0	0	0
<b>SR 500 INTERCHANGE</b>				0	0.086546	0	0	0
Pavement	\$5,148,198	\$0	Urban Freeway	47,332	0.086546	21,089,167,639	0	21,089,167,639
Earthwork	\$2,834,254	\$0	Site Work	21,079	0.086546	5,170,566,307	0	5,170,566,307
Bridges	\$45,544,415	\$0	Bridge Concrete Box Girder	48,364	0.086546	190,636,767,632	0	190,636,767,632
Walls	\$4,758,095	\$0	Structures	50,100	0.086546	20,630,994,331	0	20,630,994,331
Other	\$573,460	\$0	Signals	21,079	0.086546	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$58,858,422</b>	<b>\$0</b>		0	0.086546	0	0	0
				0	0.086546	0	0	0
				0	0.086546	0	0	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	\$67,032,822	\$0		0	0.086546	0	0	0
<b>PROFESSIONAL SERVICES</b>	\$86,066,176	\$0		0	0.086546	0	0	0
<b>RIGHT-OF-WAY</b>	\$11,580,646	\$0		0	0.086546	0	0	0
				0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$462,801,850</b>	<b>\$2,873,044</b>		0	0.086546	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 2 - BRT			Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu)		Energy (Btu) Total
	2A - Downstream Bridge					Highway	Transit	
	Highway	Transit	Caltrans Construction Activity			Highway	Transit	
<b>COLUMBIA RIVER BRIDGES</b>				0	0.086546			0
COLU Bridges	\$59,009,741	\$0	Bridge Concrete Box Girder	48,364	0.086546	246,999,028,145	0	246,999,028,145
COLU Bridges	\$227,849,194	\$0	Bridge Concrete Box Girder	48,364	0.086546	953,715,925,837	0	953,715,925,837
COLU Bridges	\$231,771,450	\$0	Bridge Concrete Box Girder	48,364	0.086546	970,133,439,445	0	970,133,439,445
COLU Bridges	\$33,479,852	\$77,455,753	Bridge Concrete Box Girder	48,364	0.086546	140,137,725,433	324,209,111,494	464,346,836,927
COLU Bridges			Bridge Concrete Box Girder	48,364	0.086546		0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$81,400,064	\$13,638,381		0	0.086546	0	0	0
PROFESSIONAL SERVICES	\$153,747,419	\$20,965,557		0	0.086546	0	0	0
RIGHT-OF-WAY	\$24,684,320	\$4,131,432		0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$811,942,040</b>	<b>\$116,191,123</b>		0	0.086546	0	0	0
<b>TRANSIT</b>				0	0.086546	0	0	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>				0	0.086546	0	0	0
Guideway	\$21,817,866	\$51,722,572	Track Work	50,100	0.086546	94,601,782,807	224,267,924,396	318,869,707,203
Tracks			Track Work	50,100	0.086546		0	0
Stations	\$0	\$8,527,260	Stations, Stops and Terminals	50,100	0.086546	0	36,974,010,128	36,974,010,128
Sitework	\$0	\$2,229,080	Site Work	21,079	0.086546	0	4,066,539,396	4,066,539,396
Systems	\$0	\$3,417,055	Stations, Stops and Terminals	50,100	0.086546	0	14,816,274,651	14,816,274,651
<b>SUBTOTAL</b>	<b>\$21,817,866</b>	<b>\$65,895,967</b>		0	0.086546	0	0	0
<b>STATE LINE TO CLARK COLLEGE</b>				0	0.086546	0	0	0
Guideway	\$0	\$7,827,107	Track Work	50,100	0.086546	0	33,938,161,607	33,938,161,607
Tracks			Track Work	50,100	0.086546	0	0	0
Stations	\$0	\$34,003,962	Stations, Stops and Terminals	50,100	0.086546	0	147,440,424,914	147,440,424,914
Sitework	\$0	\$24,675,161	Site Work	21,079	0.086546	0	45,015,215,367	45,015,215,367
Systems	\$0	\$12,211,182	Stations, Stops and Terminals	50,100	0.086546	0	52,947,412,001	52,947,412,001
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$78,717,412</b>		0	0.086546	0	0	0
<b>CLARK COLLEGE TO END OF PROJECT</b>				0	0.086546	0	0	0
Guideway	\$0	\$60,596,496	Track Work	50,100	0.086546	0	262,745,060,677	262,745,060,677
Tracks			Track Work	50,100	0.086546	0	0	0
Stations	\$0	\$37,007,899	Stations, Stops and Terminals	50,100	0.086546	0	160,465,429,622	160,465,429,622
Sitework	\$0	\$15,695,059	Site Work	21,079	0.086546	0	28,632,698,945	28,632,698,945
Systems	\$0	\$3,908,244	Stations, Stops and Terminals	50,100	0.086546	0	16,946,057,130	16,946,057,130
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$117,207,698</b>		0	0.086546	0	0	0
<b>STATE LINE TO END OF PROJECT</b>				0	0.086546	0	0	0
Guideway			Track Work	50,100	0.086546	0	0	0
Tracks			Track Work	50,100	0.086546	0	0	0
Stations			Stations, Stops and Terminals	50,100	0.086546	0	0	0
Sitework			Site Work	21,079	0.086546	0	0	0
Systems			Stations, Stops and Terminals	50,100	0.086546	0	0	0
<b>SUBTOTAL</b>				0	0.086546	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$82,000	\$46,478,806		0	0.086546	0	0	0
SUPPORT FACILITIES AND VEHICLES	\$0	\$42,993,300		0	0.086546	0	0	0
PROFESSIONAL SERVICES	\$0	\$98,066,332		0	0.086546	0	0	0
RIGHT-OF-WAY	\$754,000	\$27,680,198		0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$22,653,866</b>	<b>\$477,039,712</b>						<b>6,815,057,745,202</b>
<b>TOTAL MODE COST</b>	<b>\$2,012,099,522</b>	<b>\$596,103,880</b>				16th Street Tunnel, Add:	59,611,040,491	
						<b>Total (w/16th Tunnel):</b>	<b>6,874,668,785,693</b>	
<b>TOTAL PROJECT COST</b>	<b>\$2,608,203,402</b>					McLoughlin Tunnel, Add:	1,115,648,215	
						<b>Total (w/McLoughlin Tunnel):</b>	<b>6,816,173,393,417</b>	

Note: 1. With the exception of the 29th and 33rd Street Bridges, highway costs have not been adjusted to reflect it

The cost estimates do not include any contingencies for risk or uncertainty.

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coelectricity (n.g)	Gasoline	Diesel		
<b><i>SOUTH HIGHWAY APPROACH</i></b>											
<b>I-5 MAINLINE</b>											
Pavement	3,412	123,976	138,691	482,353	79,650	154,266	2,095	1,321	19.4	22.2	5,482,906
Earthwork	3,412	123,976	138,691	47,462	7,837	15,179	2,095	1,321	19.4	22.2	539,497
Bridges	3,412	123,976	138,691	9,100,210	1,502,706	2,910,419	2,095	1,321	19.4	22.2	103,442,048
Other	3,412	123,976	138,691	51,313	8,473	16,411	2,095	1,321	19.4	22.2	583,272
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>											
Pavement	3,412	123,976	138,691	15,520	2,563	4,964	2,095	1,321	19.4	22.2	176,416
Earthwork	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Bridges	3,412	123,976	138,691	216,494	35,749	69,239	2,095	1,321	19.4	22.2	2,460,885
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>VICTORY BLVD INTERCHANGE</b>											
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	11,361	1,876	3,633	2,095	1,321	19.4	22.2	129,136
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>MARINE DRIVE INTERCHANGE</b>											
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,691	178,091	29,408	56,957	2,095	1,321	19.4	22.2	2,024,363
Bridges	3,412	123,976	138,691	10,423	1,721	3,334	2,095	1,321	19.4	22.2	118,482
Walls	3,412	123,976	138,691	13,190,477	2,178,127	4,218,563	2,095	1,321	19.4	22.2	149,936,088
Other	3,412	123,976	138,691	32,787	5,414	10,486	2,095	1,321	19.4	22.2	372,686
	3,412	123,976	138,691	14,169	2,340	4,531	2,095	1,321	19.4	22.2	161,058
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>HAYDEN ISLAND INTERCHANGE</b>											
Pavement	3,412	123,976	138,691	385,942	63,730	123,432	2,095	1,321	19.4	22.2	4,387,002
Earthwork	3,412	123,976	138,691	127,644	21,078	40,823	2,095	1,321	19.4	22.2	1,450,933
Bridges	3,412	123,976	138,691	3,247,105	536,190	1,038,486	2,095	1,321	19.4	22.2	36,909,830
Walls	3,412	123,976	138,691	69,545	11,484	22,242	2,095	1,321	19.4	22.2	790,514
Other	3,412	123,976	138,691	14,169	2,340	4,531	2,095	1,321	19.4	22.2	161,058
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>											
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>PROFESSIONAL SERVICES</b>											
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>RIGHT-OF-WAY</b>											
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)				Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel		
<b>NORTH HIGHWAY APPROACH</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>I-5 MAINLINE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	1,287,474	212,599	411,758	2,095	1,321	19.4	22.2	14,634,707
Earthwork	3,412	123,976	138,691	136,099	22,474	43,527	2,095	1,321	19.4	22.2	1,547,038
Bridges	3,412	123,976	138,691	1,571,018	259,420	502,441	2,095	1,321	19.4	22.2	17,857,754
Walls	3,412	123,976	138,691	244,511	40,376	78,199	2,095	1,321	19.4	22.2	2,779,354
Other	3,412	123,976	138,691	88,331	14,586	28,250	2,095	1,321	19.4	22.2	1,004,053
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	203,504	33,604	65,084	2,095	1,321	19.4	22.2	2,313,225
Earthwork	3,412	123,976	138,691	60,871	10,052	19,468	2,095	1,321	19.4	22.2	691,924
Bridges	3,412	123,976	138,691	63,215	10,439	20,217	2,095	1,321	19.4	22.2	718,565
Walls	3,412	123,976	138,691	130,488	21,547	41,733	2,095	1,321	19.4	22.2	1,483,260
Other	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 14 INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	362,575	59,872	115,958	2,095	1,321	19.4	22.2	4,121,391
Earthwork	3,412	123,976	138,691	97,795	16,149	31,277	2,095	1,321	19.4	22.2	1,111,639
Bridges	3,412	123,976	138,691	2,660,024	439,246	850,726	2,095	1,321	19.4	22.2	30,236,476
Walls	3,412	123,976	138,691	560,006	92,473	179,101	2,095	1,321	19.4	22.2	6,365,591
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>EVERGREEN BLVD BRIDGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	18,418	3,041	5,890	2,095	1,321	19.4	22.2	209,353
Earthwork	3,412	123,976	138,691	911	150	291	2,095	1,321	19.4	22.2	10,353
Bridges	3,412	123,976	138,691	537,610	88,775	171,938	2,095	1,321	19.4	22.2	6,111,010
Other	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>MILL PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,691	239,566	39,559	76,618	2,095	1,321	19.4	22.2	2,723,141
Bridges	3,412	123,976	138,691	85,377	14,098	27,305	2,095	1,321	19.4	22.2	970,478
Walls	3,412	123,976	138,691	194,023	32,039	62,052	2,095	1,321	19.4	22.2	2,205,462
Other	3,412	123,976	138,691	53,213	8,787	17,018	2,095	1,321	19.4	22.2	604,870
<b>SUBTOTAL</b>	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>4th PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	248,512	41,036	79,479	2,095	1,321	19.4	22.2	2,824,832
Earthwork	3,412	123,976	138,691	78,460	12,956	25,093	2,095	1,321	19.4	22.2	891,852
Bridges	3,412	123,976	138,691	3,125,287	516,075	999,526	2,095	1,321	19.4	22.2	35,525,119
Walls	3,412	123,976	138,691	1,187,835	196,146	379,892	2,095	1,321	19.4	22.2	13,502,118
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,691	17,348	2,865	5,548	2,095	1,321	19.4	22.2	197,190
Bridges	3,412	123,976	138,691	380	63	121	2,095	1,321	19.4	22.2	4,318
Other	3,412	123,976	138,691	807,851	133,399	258,366	2,095	1,321	19.4	22.2	9,182,837
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 500 INTERCHANGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	309,044	51,032	98,838	2,095	1,321	19.4	22.2	3,512,903
Earthwork	3,412	123,976	138,691	75,770	12,512	24,233	2,095	1,321	19.4	22.2	861,281
Bridges	3,412	123,976	138,691	2,793,622	461,307	893,453	2,095	1,321	19.4	22.2	31,755,089
Walls	3,412	123,976	138,691	302,330	49,923	96,691	2,095	1,321	19.4	22.2	3,436,583
Other	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>PROFESSIONAL SERVICES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>RIGHT-OF-WAY</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)				Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coelectricity (n.g)	Gasoline	Diesel		
<b>COLUMBIA RIVER BRIDGES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
COLL Bridges	3,412	123,976	138,691	3,619,564	597,694	1,157,605	2,095	1,321	19.4	22.2	41,143,565
COLL Bridges	3,412	123,976	138,691	13,975,907	2,307,824	4,469,759	2,095	1,321	19.4	22.2	158,864,078
COLL Bridges	3,412	123,976	138,691	14,216,492	2,347,551	4,546,703	2,095	1,321	19.4	22.2	161,598,805
COLL Bridges	3,412	123,976	138,691	6,804,614	1,123,637	2,176,244	2,095	1,321	19.4	22.2	77,348,013
COLL Bridges	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
COLL Bridges	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TRANSIT</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	4,672,768	771,608	1,494,440	2,095	1,321	19.4	22.2	53,115,336
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	541,823	89,471	173,285	2,095	1,321	19.4	22.2	6,158,901
Sitework	3,412	123,976	138,691	59,592	9,840	19,059	2,095	1,321	19.4	22.2	677,379
Systems	3,412	123,976	138,691	217,120	35,853	69,439	2,095	1,321	19.4	22.2	2,468,003
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO CLARK COLLEGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	497,335	82,124	159,057	2,095	1,321	19.4	22.2	5,653,208
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	2,160,616	356,780	691,006	2,095	1,321	19.4	22.2	24,559,711
Sitework	3,412	123,976	138,691	659,660	108,929	210,972	2,095	1,321	19.4	22.2	7,498,355
Systems	3,412	123,976	138,691	775,900	128,123	248,147	2,095	1,321	19.4	22.2	8,819,651
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>CLARK COLLEGE TO END OF PROJECT</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	3,850,309	635,797	1,231,401	2,095	1,321	19.4	22.2	43,766,441
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	2,351,486	388,298	752,050	2,095	1,321	19.4	22.2	26,729,335
Sitework	3,412	123,976	138,691	419,588	69,286	134,192	2,095	1,321	19.4	22.2	4,769,457
Systems	3,412	123,976	138,691	248,330	41,006	79,421	2,095	1,321	19.4	22.2	2,822,769
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO END OF PROJECT</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
SUPPORT FACILITIES AND VEHICLES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>					<b>16,491,235</b>	<b>31,939,978</b>					
<b>TOTAL MODE COST</b>	3,412	123,976	138,691	873,550	144,248	279,378	2,095	1,321	19.4	22.2	9,929,637
<b>TOTAL PROJECT COST</b>	3,412	123,976	138,691	16,349	2,700	5,229	2,095	1,321	19.4	22.2	185,838

Note: 1. With the exception of the 29th and 33rd Street Bridges, high

The cost estimates do not include any contingencies for risk



**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 2 - BRT 2A - Downstream Bridge Mill District MOS <sup>1</sup>		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu) Highway	Energy (Btu) Transit	Energy (Btu) Total
	Highway	Transit						
<b><i>SOUTH HIGHWAY APPROACH</i></b>								
<b>I-5 MAINLINE</b>								
Pavement	\$8,035,260	\$0	Urban Freeway	47.332	0.0865465	32,915,777,257	0	32,915,777,257
Earthwork	\$1,775,347	\$0	Site Work	21.079	0.0865465	3,238,788,432	0	3,238,788,432
Bridges	\$148,360,710	\$0	Bridge Concrete Box Girder	48.364	0.0865465	620,998,341,768	0	620,998,341,768
Other	\$1,919,400	\$0	Signals	21.079	0.0865465	3,501,586,178	0	3,501,586,178
<b>SUBTOTAL</b>	<b>\$160,090,717</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>								
Pavement	\$258,540	\$0	Urban Freeway	47.332	0.0865465	1,059,087,702	0	1,059,087,702
Earthwork		\$0	Site Work	21.079	0.0865465	0	0	0
Bridges	\$3,529,500	\$0	Bridge Concrete Box Girder	48.364	0.0865465	14,773,545,147	0	14,773,545,147
<b>SUBTOTAL</b>	<b>\$3,788,040</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>VICTORY BLVD INTERCHANGE</b>								
Pavement	\$189,250	\$0	Urban Freeway	47.332	0.0865465	775,246,955	0	775,246,955
<b>SUBTOTAL</b>	<b>\$189,250</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>MARINE DRIVE INTERCHANGE</b>								
Pavement	\$2,966,727	\$0	Urban Freeway	47.332	0.0865465	12,152,951,506	0	12,152,951,506
Earthwork	\$389,894	\$0	Site Work	21.079	0.0865465	711,288,945	0	711,288,945
Bridges	\$215,044,315	\$0	Bridge Concrete Box Girder	48.364	0.0865465	900,118,117,672	0	900,118,117,672
Walls	\$516,000	\$0	Structures	50.100	0.0865465	2,237,364,549	0	2,237,364,549
Other	\$530,000	\$0	Signals	21.079	0.0865465	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$219,446,936</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>HAYDEN ISLAND INTERCHANGE</b>								
Pavement	\$6,429,201	\$0	Urban Freeway	47.332	0.0865465	26,336,689,548	0	26,336,689,548
Earthwork	\$4,774,649	\$0	Site Work	21.079	0.0865465	8,710,453,977	0	8,710,453,977
Bridges	\$52,937,550	\$0	Bridge Concrete Box Girder	48.364	0.0865465	221,582,457,830	0	221,582,457,830
Walls	\$1,094,500	\$0	Structures	50.100	0.0865465	4,745,727,712	0	4,745,727,712
Other	\$530,000	\$0	Signals	21.079	0.0865465	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$65,765,900</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>								
PROFESSIONAL SERVICES	\$90,466,507	\$0		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$123,844,417	\$0		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$714,701,767</b>	<b>\$0</b>		0	0.0865465	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 2 - BRT 2A - Downstream Bridge		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu)		Energy (Btu) Transit	Energy (Btu) Total
	Mill District MOS <sup>1</sup>					Highway	Transit		
	Highway	Transit							
<b>NORTH HIGHWAY APPROACH</b>				0	0.0865465		0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>I-5 MAINLINE</b>				0	0.0865465		0		0
Pavement	\$21,447,327		\$0 Urban Freeway	47,332	0.0865465	87,857,199,910	0		87,857,199,910
Earthwork	\$5,090,904		\$0 Site Work	21,079	0.0865465	9,287,402,078	0		9,287,402,078
Bridges	\$25,612,303		\$0 Bridge Concrete Box Girder	48,364	0.0865465	107,206,267,014	0		107,206,267,014
Walls	\$3,848,133		\$0 Structures	50,100	0.0865465	16,685,419,293	0		16,685,419,293
Other	\$3,304,082		\$0 Signals	21,079	0.0865465	6,027,678,973	0		6,027,678,973
<b>SUBTOTAL</b>	<b>\$59,302,749</b>		<b>\$0</b>	0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>				0	0.0865465		0		0
Pavement	\$3,390,057		\$0 Urban Freeway	47,332	0.0865465	13,887,089,764	0		13,887,089,764
Earthwork	\$2,276,945		\$0 Site Work	21,079	0.0865465	4,153,859,349	0		4,153,859,349
Bridges	\$1,030,594		\$0 Bridge Concrete Box Girder	48,364	0.0865465	4,313,792,222	0		4,313,792,222
Walls	\$2,053,636		\$0 Structures	50,100	0.0865465	8,904,520,123	0		8,904,520,123
<b>SUBTOTAL</b>	<b>\$8,751,232</b>		<b>\$0</b>	0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>SR 14 INTERCHANGE</b>				0	0.0865465		0		0
Pavement	\$6,039,945		\$0 Urban Freeway	47,332	0.0865465	24,742,133,461	0		24,742,133,461
Earthwork	\$3,658,118		\$0 Site Work	21,079	0.0865465	6,673,551,068	0		6,673,551,068
Bridges	\$43,366,360		\$0 Bridge Concrete Box Girder	48,364	0.0865465	181,520,009,866	0		181,520,009,866
Walls	\$8,813,431		\$0 Structures	50,100	0.0865465	38,214,841,234	0		38,214,841,234
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0		1,046,170,475
<b>SUBTOTAL</b>	<b>\$62,451,313</b>		<b>\$0</b>	0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>EVERGREEN BLVD BRIDGE</b>				0	0.0865465		0		0
Pavement	\$306,810		\$0 Urban Freeway	47,332	0.0865465	1,256,820,761	0		1,256,820,761
Earthwork	\$34,069		\$0 Site Work	21,079	0.0865465	62,152,396	0		62,152,396
Bridges	\$8,764,654		\$0 Bridge Concrete Box Girder	48,364	0.0865465	36,686,504,624	0		36,686,504,624
<b>SUBTOTAL</b>	<b>\$9,105,533</b>		<b>\$0</b>	0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>MILL PLAIN BLVD INTERCHANGE</b>				0	0.0865465		0		0
Pavement	\$3,990,794		\$0 Urban Freeway	47,332	0.0865465	16,347,955,612	0		16,347,955,612
Earthwork	\$3,193,595		\$0 Site Work	21,079	0.0865465	5,826,117,453	0		5,826,117,453
Bridges	\$3,163,162		\$0 Bridge Concrete Box Girder	48,364	0.0865465	13,240,152,372	0		13,240,152,372
Walls	\$837,468		\$0 Structures	50,100	0.0865465	3,631,242,663	0		3,631,242,663
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0		1,046,170,475
<b>SUBTOTAL</b>	<b>\$11,758,479</b>		<b>\$0</b>	0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>4th PLAIN BLVD INTERCHANGE</b>				0	0.0865465		0		0
Pavement	\$3,382,758		\$0 Urban Freeway	47,332	0.0865465	13,857,189,311	0		13,857,189,311
Earthwork	\$2,613,005		\$0 Site Work	21,079	0.0865465	4,766,938,934	0		4,766,938,934
Bridges	\$50,951,542		\$0 Bridge Concrete Box Girder	48,364	0.0865465	213,269,559,567	0		213,269,559,567
Walls	\$18,694,255		\$0 Structures	50,100	0.0865465	81,057,874,828	0		81,057,874,828
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0		1,046,170,475
<b>SUBTOTAL</b>	<b>\$76,215,021</b>		<b>\$0</b>	0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>				0	0.0865465		0		0
Pavement	\$412,171		\$0 Urban Freeway	47,332	0.0865465	1,688,422,685	0		1,688,422,685
Earthwork	\$259,511		\$0 Site Work	21,079	0.0865465	473,429,644	0		473,429,644
Bridges	\$11,274,727		\$0 Bridge Concrete Box Girder	48,364	0.0865465	47,192,997,413	0		47,192,997,413
<b>SUBTOTAL</b>	<b>\$11,946,409</b>		<b>\$0</b>	0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>SR 500 INTERCHANGE</b>				0	0.0865465		0		0
Pavement	\$5,148,198		\$0 Urban Freeway	47,332	0.0865465	21,089,167,639	0		21,089,167,639
Earthwork	\$2,834,254		\$0 Site Work	21,079	0.0865465	5,170,566,307	0		5,170,566,307
Bridges	\$45,544,415		\$0 Bridge Concrete Box Girder	48,364	0.0865465	190,636,767,632	0		190,636,767,632
Walls	\$4,758,095		\$0 Structures	50,100	0.0865465	20,630,994,331	0		20,630,994,331
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0		1,046,170,475
<b>SUBTOTAL</b>	<b>\$58,858,422</b>		<b>\$0</b>	0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	\$66,535,308		\$0	0	0.0865465	0	0		0
<b>PROFESSIONAL SERVICES</b>	\$85,383,383		\$0	0	0.0865465	0	0		0
<b>RIGHT-OF-WAY</b>	\$11,580,646		\$0	0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>TOTAL</b>	<b>\$461,888,495</b>		<b>\$0</b>	0	0.0865465	0	0		0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 2 - BRT 2A - Downstream Bridge			Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu)		Energy (Btu) Total	
	Mill District MOS <sup>1</sup>					Highway	Transit		Total
	Highway	Transit	Caltrans Construction Activity						
<b>COLUMBIA RIVER BRIDGES</b>				0	0.0865465			0	
COLU Bridges	\$59,009,741	\$0	Bridge Concrete Box Girder	48,364	0.0865465	246,999,028,145	0	246,999,028,145	
COLU Bridges	\$227,849,194	\$0	Bridge Concrete Box Girder	48,364	0.0865465	953,715,925,837	0	953,715,925,837	
COLU Bridges	\$231,771,450	\$0	Bridge Concrete Box Girder	48,364	0.0865465	970,133,439,445	0	970,133,439,445	
COLU Bridges	\$33,479,852	\$77,455,753	Bridge Concrete Box Girder	48,364	0.0865465	140,137,725,433	324,209,111,494	464,346,836,927	
COLU Bridges			Bridge Concrete Box Girder	48,364	0.0865465		0	0	
NON-DISTRIBUTED CONSTRUCTION COSTS	\$81,400,064	\$13,638,381		0	0.0865465		0	0	
PROFESSIONAL SERVICES	\$153,747,419	\$20,965,557		0	0.0865465		0	0	
RIGHT-OF-WAY	\$24,684,320	\$4,131,432		0	0.0865465		0	0	
<b>TOTAL</b>	<b>\$811,942,040</b>	<b>\$116,191,123</b>		0	0.0865465		0	0	
<b>TRANSIT</b>				0	0.0865465		0	0	
<b>BEGINNING OF PROJECT TO STATE LINE</b>				0	0.0865465		0	0	
Guideway	\$21,817,866	\$51,722,572	Track Work	50,100	0.0865465	94,601,782,807	224,267,924,396	318,869,707,203	
Tracks			Track Work	50,100	0.0865465		0	0	
Stations	\$0	\$8,527,260	Stations, Stops and Terminals	50,100	0.0865465		36,974,010,128	36,974,010,128	
Sitework	\$0	\$2,229,080	Site Work	21,079	0.0865465		4,066,539,396	4,066,539,396	
Systems	\$0	\$3,417,055	Stations, Stops and Terminals	50,100	0.0865465		14,816,274,651	14,816,274,651	
<b>SUBTOTAL</b>	<b>\$21,817,866</b>	<b>\$65,895,967</b>		0	0.0865465		0	0	
<b>STATE LINE TO CLARK COLLEGE</b>				0	0.0865465		0	0	
Guideway			Track Work	50,100	0.0865465		0	0	
Tracks			Track Work	50,100	0.0865465		0	0	
Stations			Stations, Stops and Terminals	50,100	0.0865465		0	0	
Sitework			Site Work	21,079	0.0865465		0	0	
Systems			Stations, Stops and Terminals	50,100	0.0865465		0	0	
<b>SUBTOTAL</b>				0	0.0865465		0	0	
<b>CLARK COLLEGE TO END OF PROJECT</b>				0	0.0865465		0	0	
Guideway			Track Work	50,100	0.0865465		0	0	
Tracks			Track Work	50,100	0.0865465		0	0	
Stations			Stations, Stops and Terminals	50,100	0.0865465		0	0	
Sitework			Site Work	21,079	0.0865465		0	0	
Systems			Stations, Stops and Terminals	50,100	0.0865465		0	0	
<b>SUBTOTAL</b>				0	0.0865465		0	0	
<b>STATE LINE TO END OF PROJECT</b>				0	0.0865465		0	0	
Guideway	\$0	\$2,820,046	Track Work	50,100	0.0865465		12,227,656,069	12,227,656,069	
Tracks			Track Work	50,100	0.0865465		0	0	
Stations	\$0	\$28,928,980	Stations, Stops and Terminals	50,100	0.0865465		125,435,415,305	125,435,415,305	
Sitework	\$0	\$33,193,087	Site Work	21,079	0.0865465		60,554,577,603	60,554,577,603	
Systems	\$0	\$8,275,439	Stations, Stops and Terminals	50,100	0.0865465		35,882,119,687	35,882,119,687	
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$73,217,552</b>		0	0.0865465		0	0	
NON-DISTRIBUTED CONSTRUCTION COSTS	\$82,000	\$30,526,824		0	0.0865465		0	0	
SUPPORT FACILITIES AND VEHICLES	\$0	\$42,993,300		0	0.0865465		0	0	
PROFESSIONAL SERVICES	\$0	\$64,788,042		0	0.0865465		0	0	
RIGHT-OF-WAY	\$754,000	\$12,856,798		0	0.0865465		0	0	
<b>TOTAL</b>	<b>\$22,653,866</b>	<b>\$290,278,483</b>						<b>6,290,356,027,673</b>	
<b>TOTAL MODE COST</b>	<b>\$2,011,186,167</b>	<b>\$406,469,606</b>							
<b>TOTAL PROJECT COST</b>		<b>\$2,417,655,773</b>							

Note: 1. With the exception of the 29th and 33rd Street Bridges, highway costs have not been adjusted to reflect it

The cost estimates do not include any contingencies for risk or uncertainty.

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coefficient)	Gasoline (n.g)	Diesel		
<b><i>SOUTH HIGHWAY APPROACH</i></b>											
<b>I-5 MAINLINE</b>											
Pavement	3,412	123,976	138,961	482,353	79,650	153,966	2.095	1.321	19.4	22.2	5,476,252
Earthwork	3,412	123,976	138,961	47,462	7,837	15,150	2.095	1.321	19.4	22.2	538,843
Bridges	3,412	123,976	138,961	9,100,210	1,502,706	2,904,764	2.095	1.321	19.4	22.2	103,316,509
Other	3,412	123,976	138,961	51,313	8,473	16,379	2.095	1.321	19.4	22.2	582,565
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>											
Pavement	3,412	123,976	138,961	15,520	2,563	4,954	2.095	1.321	19.4	22.2	176,202
Earthwork	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
Bridges	3,412	123,976	138,961	216,494	35,749	69,104	2.095	1.321	19.4	22.2	2,457,899
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>VICTORY BLVD INTERCHANGE</b>											
Pavement	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
Other	3,412	123,976	138,961	11,361	1,876	3,626	2.095	1.321	19.4	22.2	128,979
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>MARINE DRIVE INTERCHANGE</b>											
Pavement	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
Earthwork	3,412	123,976	138,961	178,091	29,408	56,846	2.095	1.321	19.4	22.2	2,021,906
Bridges	3,412	123,976	138,961	10,423	1,721	3,327	2.095	1.321	19.4	22.2	118,338
Walls	3,412	123,976	138,961	13,190,477	2,178,127	4,210,367	2.095	1.321	19.4	22.2	149,754,123
Other	3,412	123,976	138,961	32,787	5,414	10,465	2.095	1.321	19.4	22.2	372,234
<b>SUBTOTAL</b>	3,412	123,976	138,961	14,169	2,340	4,523	2.095	1.321	19.4	22.2	160,862
<b>HAYDEN ISLAND INTERCHANGE</b>											
Pavement	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
Earthwork	3,412	123,976	138,961	385,942	63,730	123,192	2.095	1.321	19.4	22.2	4,381,678
Bridges	3,412	123,976	138,961	127,644	21,078	40,744	2.095	1.321	19.4	22.2	1,449,172
Walls	3,412	123,976	138,961	3,247,105	536,190	1,036,468	2.095	1.321	19.4	22.2	36,865,036
Other	3,412	123,976	138,961	69,545	11,484	22,198	2.095	1.321	19.4	22.2	789,554
<b>SUBTOTAL</b>	3,412	123,976	138,961	14,169	2,340	4,523	2.095	1.321	19.4	22.2	160,862
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>											
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub> Emissions (lbs)
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				
							Electricity (coelectricity (n.gr	Gasoline	Diesel		
<b>NORTH HIGHWAY APPROACH</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>I-5 MAINLINE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	1,287,474	212,599	410,958	2,095	1,321	19.4	22.2	14,616,946
Earthwork	3,412	123,976	138,961	136,099	22,474	43,442	2,095	1,321	19.4	22.2	1,545,160
Bridges	3,412	123,976	138,961	1,571,018	259,420	501,465	2,095	1,321	19.4	22.2	17,836,082
Walls	3,412	123,976	138,961	244,511	40,376	78,047	2,095	1,321	19.4	22.2	2,775,980
Other	3,412	123,976	138,961	88,331	14,586	28,195	2,095	1,321	19.4	22.2	1,002,835
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUOR ROADS</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	203,504	33,604	64,958	2,095	1,321	19.4	22.2	2,310,418
Earthwork	3,412	123,976	138,961	60,871	10,052	19,430	2,095	1,321	19.4	22.2	691,084
Bridges	3,412	123,976	138,961	63,215	10,439	20,178	2,095	1,321	19.4	22.2	717,693
Walls	3,412	123,976	138,961	130,488	21,547	41,652	2,095	1,321	19.4	22.2	1,481,460
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 14 INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	362,575	59,872	115,733	2,095	1,321	19.4	22.2	4,116,389
Earthwork	3,412	123,976	138,961	97,795	16,149	31,216	2,095	1,321	19.4	22.2	1,110,290
Bridges	3,412	123,976	138,961	2,660,024	439,246	849,073	2,095	1,321	19.4	22.2	30,199,781
Walls	3,412	123,976	138,961	560,006	92,473	178,753	2,095	1,321	19.4	22.2	6,357,866
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1,321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>EVERGREEN BLVD BRIDGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	18,418	3,041	5,879	2,095	1,321	19.4	22.2	209,099
Earthwork	3,412	123,976	138,961	911	150	291	2,095	1,321	19.4	22.2	10,340
Bridges	3,412	123,976	138,961	537,610	88,775	171,604	2,095	1,321	19.4	22.2	6,103,594
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>MILL PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,961	239,566	39,559	76,469	2,095	1,321	19.4	22.2	2,719,836
Bridges	3,412	123,976	138,961	85,377	14,098	27,252	2,095	1,321	19.4	22.2	969,301
Walls	3,412	123,976	138,961	194,023	32,039	61,932	2,095	1,321	19.4	22.2	2,202,786
Other	3,412	123,976	138,961	53,213	8,787	16,985	2,095	1,321	19.4	22.2	604,136
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1,321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>4th PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	203,065	33,532	64,818	2,095	1,321	19.4	22.2	2,305,443
Earthwork	3,412	123,976	138,961	69,855	11,535	22,298	2,095	1,321	19.4	22.2	793,083
Bridges	3,412	123,976	138,961	3,125,287	516,075	997,584	2,095	1,321	19.4	22.2	35,482,005
Walls	3,412	123,976	138,961	1,187,835	196,146	379,154	2,095	1,321	19.4	22.2	13,485,731
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1,321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	24,742	4,086	7,898	2,095	1,321	19.4	22.2	280,906
Earthwork	3,412	123,976	138,961	6,938	1,146	2,215	2,095	1,321	19.4	22.2	78,765
Bridges	3,412	123,976	138,961	691,574	114,199	220,749	2,095	1,321	19.4	22.2	7,851,576
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 500 INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	309,044	51,032	98,646	2,095	1,321	19.4	22.2	3,508,639
Earthwork	3,412	123,976	138,961	75,770	12,512	24,186	2,095	1,321	19.4	22.2	860,236
Bridges	3,412	123,976	138,961	2,793,622	461,307	891,717	2,095	1,321	19.4	22.2	31,716,551
Walls	3,412	123,976	138,961	302,330	49,923	96,503	2,095	1,321	19.4	22.2	3,432,412
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1,321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>PROFESSIONAL SERVICES</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>RIGHT-OF-WAY</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub> Emissions (lbs)
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coelectricity (n.gr	Gasoline	Diesel		
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	
<b>COLUMBIA RIVER BRIDGES</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,961	3,619,564	597,694	1,155,356	2,095	1,321	19.4	22.2	41,093,632
COLU Bridges	3,412	123,976	138,961	13,975,907	2,307,824	4,461,074	2,095	1,321	19.4	22.2	158,671,278
COLU Bridges	3,412	123,976	138,961	14,216,492	2,347,551	4,537,868	2,095	1,321	19.4	22.2	161,402,686
COLU Bridges	3,412	123,976	138,961	6,804,614	1,123,637	2,172,015	2,095	1,321	19.4	22.2	77,254,142
COLU Bridges	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TRANSIT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,961	4,672,768	771,608	1,491,536	2,095	1,321	19.4	22.2	53,050,874
Stations	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,961	541,823	89,471	172,949	2,095	1,321	19.4	22.2	6,151,427
Systems	3,412	123,976	138,961	59,592	9,840	19,022	2,095	1,321	19.4	22.2	676,557
<b>SUBTOTAL</b>	3,412	123,976	138,961	217,120	35,853	69,304	2,095	1,321	19.4	22.2	2,465,008
<b>STATE LINE TO CLARK COLLEGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>CLARK COLLEGE TO END OF PROJECT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO END OF PROJECT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	179,186	29,589	57,196	2,095	1,321	19.4	22.2	2,034,335
Tracks	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,961	1,838,151	303,532	586,733	2,095	1,321	19.4	22.2	20,868,895
Sitework	3,412	123,976	138,961	887,377	146,531	283,248	2,095	1,321	19.4	22.2	10,074,564
Systems	3,412	123,976	138,961	525,822	86,828	167,841	2,095	1,321	19.4	22.2	5,969,767
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
SUPPORT FACILITIES AND VEHICLES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	15,221,549	29,423,589	2,095	1,321	19.4	22.2	0

**TOTAL MODE COST**

**TOTAL PROJECT COST**

Note: 1. With the exception of the 29th and 33rd Street Bridges, high

The cost estimates do not include any contingencies for risk

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 2 - BRT 2A - Downstream Bridge Clark College MOS <sup>1</sup>		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu) Highway	Energy (Btu) Transit	Energy (Btu) Total
	Highway	Transit						
<b><i>SOUTH HIGHWAY APPROACH</i></b>								
<b>I-5 MAINLINE</b>								
Pavement	\$8,035,260	\$0	Urban Freeway	47,332	0.086546	32,915,777,257	0	32,915,777,257
Earthwork	\$1,775,347	\$0	Site Work	21,079	0.086546	3,238,788,432	0	3,238,788,432
Bridges	\$148,360,710	\$0	Bridge Concrete Box Girder	48,364	0.086546	620,998,341,768	0	620,998,341,768
Other	\$1,919,400	\$0	Signals	21,079	0.086546	3,501,586,178	0	3,501,586,178
<b>SUBTOTAL</b>	<b>\$160,090,717</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>								
Pavement	\$258,540	\$0	Urban Freeway	47,332	0.086546	1,059,087,702	0	1,059,087,702
Earthwork		\$0	Site Work	21,079	0.086546	0	0	0
Bridges	\$3,529,500	\$0	Bridge Concrete Box Girder	48,364	0.086546	14,773,545,147	0	14,773,545,147
<b>SUBTOTAL</b>	<b>\$3,788,040</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>VICTORY BLVD INTERCHANGE</b>								
Pavement	\$189,250	\$0	Urban Freeway	47,332	0.086546	775,246,955	0	775,246,955
<b>SUBTOTAL</b>	<b>\$189,250</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>MARINE DRIVE INTERCHANGE</b>								
Pavement	\$2,966,727	\$0	Urban Freeway	47,332	0.086546	12,152,951,506	0	12,152,951,506
Earthwork	\$389,894	\$0	Site Work	21,079	0.086546	711,288,945	0	711,288,945
Bridges	\$215,044,315	\$0	Bridge Concrete Box Girder	48,364	0.086546	900,118,117,672	0	900,118,117,672
Walls	\$516,000	\$0	Structures	50,100	0.086546	2,237,364,549	0	2,237,364,549
Other	\$530,000	\$0	Signals	21,079	0.086546	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$219,446,936</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>HAYDEN ISLAND INTERCHANGE</b>								
Pavement	\$6,429,201	\$0	Urban Freeway	47,332	0.086546	26,336,689,548	0	26,336,689,548
Earthwork	\$4,774,649	\$0	Site Work	21,079	0.086546	8,710,453,977	0	8,710,453,977
Bridges	\$52,937,550	\$0	Bridge Concrete Box Girder	48,364	0.086546	221,582,457,830	0	221,582,457,830
Walls	\$1,094,500	\$0	Structures	50,100	0.086546	4,745,727,712	0	4,745,727,712
Other	\$530,000	\$0	Signals	21,079	0.086546	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$65,765,900</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>								
PROFESSIONAL SERVICES	\$90,466,507	\$0		0	0.086546	0	0	0
RIGHT-OF-WAY	\$123,844,417	\$0		0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$714,701,767</b>	<b>\$0</b>		0	0.086546	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 2 - BRT		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu)		Energy (Btu) Total
	2A - Downstream Bridge					Highway	Transit	
	Clark College MOS <sup>1</sup>							
<b>NORTH HIGHWAY APPROACH</b>				0	0.086546	0	0	0
				0	0.086546	0	0	0
				0	0.086546	0	0	0
				0	0.086546	0	0	0
<b>I-5 MAINLINE</b>				0	0.086546	0	0	0
Pavement	\$21,447,327		\$0 Urban Freeway	47,332	0.086546	87,857,199,910	0	87,857,199,910
Earthwork	\$5,090,904		\$0 Site Work	21,079	0.086546	9,287,402,078	0	9,287,402,078
Bridges	\$25,612,303		\$0 Bridge Concrete Box Girder	48,364	0.086546	107,206,267,014	0	107,206,267,014
Walls	\$3,848,133		\$0 Structures	50,100	0.086546	16,685,419,293	0	16,685,419,293
Other	\$3,304,082		\$0 Signals	21,079	0.086546	6,027,678,973	0	6,027,678,973
<b>SUBTOTAL</b>	<b>\$59,302,749</b>		<b>\$0</b>	0	0.086546	0	0	0
				0	0.086546	0	0	0
				0	0.086546	0	0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>				0	0.086546	0	0	0
Pavement	\$3,390,057		\$0 Urban Freeway	47,332	0.086546	13,887,089,764	0	13,887,089,764
Earthwork	\$2,276,945		\$0 Site Work	21,079	0.086546	4,153,859,349	0	4,153,859,349
Bridges	\$1,030,594		\$0 Bridge Concrete Box Girder	48,364	0.086546	4,313,792,222	0	4,313,792,222
Walls	\$2,053,636		\$0 Structures	50,100	0.086546	8,904,520,123	0	8,904,520,123
<b>SUBTOTAL</b>	<b>\$8,751,232</b>		<b>\$0</b>	0	0.086546	0	0	0
				0	0.086546	0	0	0
				0	0.086546	0	0	0
<b>SR 14 INTERCHANGE</b>				0	0.086546	0	0	0
Pavement	\$6,039,945		\$0 Urban Freeway	47,332	0.086546	24,742,133,461	0	24,742,133,461
Earthwork	\$3,658,118		\$0 Site Work	21,079	0.086546	6,673,551,068	0	6,673,551,068
Bridges	\$43,366,360		\$0 Bridge Concrete Box Girder	48,364	0.086546	181,520,009,866	0	181,520,009,866
Walls	\$8,813,431		\$0 Structures	50,100	0.086546	38,214,841,234	0	38,214,841,234
Other	\$573,460		\$0 Signals	21,079	0.086546	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$62,451,313</b>		<b>\$0</b>	0	0.086546	0	0	0
				0	0.086546	0	0	0
				0	0.086546	0	0	0
<b>EVERGREEN BLVD BRIDGE</b>				0	0.086546	0	0	0
Pavement	\$306,810		\$0 Urban Freeway	47,332	0.086546	1,256,820,761	0	1,256,820,761
Earthwork	\$34,069		\$0 Site Work	21,079	0.086546	62,152,396	0	62,152,396
Bridges	\$8,764,654		\$0 Bridge Concrete Box Girder	48,364	0.086546	36,686,504,624	0	36,686,504,624
<b>SUBTOTAL</b>	<b>\$9,105,533</b>		<b>\$0</b>	0	0.086546	0	0	0
				0	0.086546	0	0	0
				0	0.086546	0	0	0
<b>MILL PLAIN BLVD INTERCHANGE</b>				0	0.086546	0	0	0
Pavement	\$3,990,794		\$0 Urban Freeway	47,332	0.086546	16,347,955,612	0	16,347,955,612
Earthwork	\$3,193,595		\$0 Site Work	21,079	0.086546	5,826,117,453	0	5,826,117,453
Bridges	\$3,163,162		\$0 Bridge Concrete Box Girder	48,364	0.086546	13,240,152,372	0	13,240,152,372
Walls	\$837,468		\$0 Structures	50,100	0.086546	3,631,242,663	0	3,631,242,663
Other	\$573,460		\$0 Signals	21,079	0.086546	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$11,758,479</b>		<b>\$0</b>	0	0.086546	0	0	0
				0	0.086546	0	0	0
				0	0.086546	0	0	0
<b>4th PLAIN BLVD INTERCHANGE</b>				0	0.086546	0	0	0
Pavement	\$3,382,758	\$757,065	Urban Freeway	47,332	0.086546	13,857,189,311	3,101,252,366	16,958,441,677
Earthwork	\$2,613,005	\$321,851	Site Work	21,079	0.086546	4,766,938,934	587,156,270	5,354,095,204
Bridges	\$50,951,542	\$0	Bridge Concrete Box Girder	48,364	0.086546	213,269,559,567	0	213,269,559,567
Walls	\$18,694,255	\$0	Structures	50,100	0.086546	81,057,874,828	0	81,057,874,828
Other	\$573,460	\$0	Signals	21,079	0.086546	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$76,215,021</b>	<b>\$1,078,915</b>		0	0.086546	0	0	0
				0	0.086546	0	0	0
				0	0.086546	0	0	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>				0	0.086546	0	0	0
Pavement	\$412,171		\$0 Urban Freeway	47,332	0.086546	1,688,422,685	0	1,688,422,685
Earthwork	\$259,511		\$0 Site Work	21,079	0.086546	473,429,644	0	473,429,644
Bridges	\$11,274,727		\$0 Bridge Concrete Box Girder	48,364	0.086546	47,192,997,413	0	47,192,997,413
<b>SUBTOTAL</b>	<b>\$11,946,409</b>	<b>\$0</b>		0	0.086546	0	0	0
				0	0.086546	0	0	0
				0	0.086546	0	0	0
<b>SR 500 INTERCHANGE</b>				0	0.086546	0	0	0
Pavement	\$5,148,198		\$0 Urban Freeway	47,332	0.086546	21,089,167,639	0	21,089,167,639
Earthwork	\$2,834,254		\$0 Site Work	21,079	0.086546	5,170,566,307	0	5,170,566,307
Bridges	\$45,544,415		\$0 Bridge Concrete Box Girder	48,364	0.086546	190,636,767,632	0	190,636,767,632
Walls	\$4,758,095		\$0 Structures	50,100	0.086546	20,630,994,331	0	20,630,994,331
Other	\$573,460		\$0 Signals	21,079	0.086546	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$58,858,422</b>	<b>\$0</b>		0	0.086546	0	0	0
				0	0.086546	0	0	0
				0	0.086546	0	0	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	\$66,772,669	\$0		0	0.086546	0	0	0
<b>PROFESSIONAL SERVICES</b>	\$85,672,963	\$0		0	0.086546	0	0	0
<b>RIGHT-OF-WAY</b>	\$11,580,646	\$0		0	0.086546	0	0	0
				0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$462,415,437</b>	<b>\$1,078,915</b>		0	0.086546	0	0	0



**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 2 - BRT 2A - Downstream Bridge Clark College MOS <sup>1</sup>			Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu)		Energy (Btu) Total
	Highway	Transit	Caltrans Construction Activity			Highway	Transit	
<b>COLUMBIA RIVER BRIDGES</b>				0	0.086546			0
COLU Bridges	\$59,009,741	\$0	Bridge Concrete Box Girder	48,364	0.086546	246,999,028,145	0	246,999,028,145
COLU Bridges	\$227,849,194	\$0	Bridge Concrete Box Girder	48,364	0.086546	953,715,925,837	0	953,715,925,837
COLU Bridges	\$231,771,450	\$0	Bridge Concrete Box Girder	48,364	0.086546	970,133,439,445	0	970,133,439,445
COLU Bridges	\$33,479,852	\$77,455,753	Bridge Concrete Box Girder	48,364	0.086546	140,137,725,433	324,209,111,494	464,346,836,927
COLU Bridges			Bridge Concrete Box Girder	48,364	0.086546	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$81,400,064	\$13,638,381		0	0.086546	0	0	0
PROFESSIONAL SERVICES	\$153,747,419	\$20,965,557		0	0.086546	0	0	0
RIGHT-OF-WAY	\$24,684,320	\$4,131,432		0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$811,942,040</b>	<b>\$116,191,123</b>		0	0.086546	0	0	0
<b>TRANSIT</b>				0	0.086546	0	0	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>				0	0.086546	0	0	0
Guideway	\$21,817,866	\$51,722,572	Track Work	50,100	0.086546	94,601,782,807	224,267,924,396	318,869,707,203
Tracks			Track Work	50,100	0.086546	0	0	0
Stations	\$0	\$8,527,260	Stations, Stops and Terminals	50,100	0.086546	0	36,974,010,128	36,974,010,128
Sitework	\$0	\$2,229,080	Site Work	21,079	0.086546	0	4,066,539,396	4,066,539,396
Systems	\$0	\$3,417,055	Stations, Stops and Terminals	50,100	0.086546	0	14,816,274,651	14,816,274,651
<b>SUBTOTAL</b>	<b>\$21,817,866</b>	<b>\$65,895,967</b>		0	0.086546	0	0	0
<b>STATE LINE TO CLARK COLLEGE</b>				0	0.086546	0	0	0
Guideway			Track Work	50,100	0.086546	0	0	0
Tracks			Track Work	50,100	0.086546	0	0	0
Stations			Stations, Stops and Terminals	50,100	0.086546	0	0	0
Sitework			Site Work	21,079	0.086546	0	0	0
Systems			Stations, Stops and Terminals	50,100	0.086546	0	0	0
<b>SUBTOTAL</b>				0	0.086546	0	0	0
<b>CLARK COLLEGE TO END OF PROJECT</b>				0	0.086546	0	0	0
Guideway			Track Work	50,100	0.086546	0	0	0
Tracks			Track Work	50,100	0.086546	0	0	0
Stations			Stations, Stops and Terminals	50,100	0.086546	0	0	0
Sitework			Site Work	21,079	0.086546	0	0	0
Systems			Stations, Stops and Terminals	50,100	0.086546	0	0	0
<b>SUBTOTAL</b>				0	0.086546	0	0	0
<b>STATE LINE TO END OF PROJECT</b>				0	0.086546	0	0	0
Guideway	\$0	\$7,827,107	Track Work	50,100	0.086546	0	33,938,161,607	33,938,161,607
Tracks			Track Work	50,100	0.086546	0	0	0
Stations	\$0	\$34,003,962	Stations, Stops and Terminals	50,100	0.086546	0	147,440,424,914	147,440,424,914
Sitework	\$0	\$30,066,540	Site Work	21,079	0.086546	0	54,850,777,217	54,850,777,217
Systems	\$0	\$12,211,182	Stations, Stops and Terminals	50,100	0.086546	0	52,947,412,001	52,947,412,001
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$84,108,791</b>		0	0.086546	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$82,000	\$31,942,685		0	0.086546	0	0	0
SUPPORT FACILITIES AND VEHICLES	\$0	\$42,993,300		0	0.086546	0	0	0
PROFESSIONAL SERVICES	\$0	\$67,741,746		0	0.086546	0	0	0
RIGHT-OF-WAY	\$754,000	\$22,594,798		0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$22,653,866</b>	<b>\$315,277,286</b>						<b>6,349,121,443,384</b>
<b>TOTAL MODE COST</b>	<b>\$2,011,713,110</b>	<b>\$432,547,324</b>				16th Street Tunnel, Add:		59,611,040,491
						<b>Total (w/16th Tunnel):</b>		<b>6,408,732,483,875</b>
<b>TOTAL PROJECT COST</b>	<b>\$2,444,260,434</b>					McLoughlin Tunnel, Add:		1,115,648,215
						<b>Total (w/McLoughlin Tunnel):</b>		<b>6,350,237,091,599</b>

Note: 1. With the exception of the 29th and 33rd Street Bridges, highway costs have not been adjusted to reflect it

The cost estimates do not include any contingencies for risk or uncertainty.

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub> Emissions (lbs)
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (n.gas)	Gasoline	Diesel	
<b><i>SOUTH HIGHWAY APPROACH</i></b>											
<b>I-5 MAINLINE</b>											
Pavement	3,412	123,976	138,961	482,353	79,650	153,966	2,095	1,321	19.4	22.2	5,476,252
Earthwork	3,412	123,976	138,961	47,462	7,837	15,150	2,095	1,321	19.4	22.2	538,843
Bridges	3,412	123,976	138,961	9,100,210	1,502,706	2,904,764	2,095	1,321	19.4	22.2	103,316,509
Other	3,412	123,976	138,961	51,313	8,473	16,379	2,095	1,321	19.4	22.2	582,565
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	15,520	2,563	4,954	2,095	1,321	19.4	22.2	176,202
Earthwork	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Bridges	3,412	123,976	138,961	216,494	35,749	69,104	2,095	1,321	19.4	22.2	2,457,899
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>VICTORY BLVD INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	11,361	1,876	3,626	2,095	1,321	19.4	22.2	128,979
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>MARINE DRIVE INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	178,091	29,408	56,846	2,095	1,321	19.4	22.2	2,021,906
Earthwork	3,412	123,976	138,961	10,423	1,721	3,327	2,095	1,321	19.4	22.2	118,338
Bridges	3,412	123,976	138,961	13,190,477	2,178,127	4,210,367	2,095	1,321	19.4	22.2	149,754,123
Walls	3,412	123,976	138,961	32,787	5,414	10,465	2,095	1,321	19.4	22.2	372,234
Other	3,412	123,976	138,961	14,169	2,340	4,523	2,095	1,321	19.4	22.2	160,862
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>HAYDEN ISLAND INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	385,942	63,730	123,192	2,095	1,321	19.4	22.2	4,381,678
Earthwork	3,412	123,976	138,961	127,644	21,078	40,744	2,095	1,321	19.4	22.2	1,449,172
Bridges	3,412	123,976	138,961	3,247,105	536,190	1,036,468	2,095	1,321	19.4	22.2	36,865,036
Walls	3,412	123,976	138,961	69,545	11,484	22,198	2,095	1,321	19.4	22.2	789,554
Other	3,412	123,976	138,961	14,169	2,340	4,523	2,095	1,321	19.4	22.2	160,862
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>PROFESSIONAL SERVICES</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>RIGHT-OF-WAY</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (n.gas)	Gasoline		
<b>NORTH HIGHWAY APPROACH</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>I-5 MAINLINE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	1,287,474	212,599	410,958	2,095	1,321	19.4	22.2	14,616,946
Earthwork	3,412	123,976	138,961	136,099	22,474	43,442	2,095	1,321	19.4	22.2	1,545,160
Bridges	3,412	123,976	138,961	1,571,018	259,420	501,465	2,095	1,321	19.4	22.2	17,836,082
Walls	3,412	123,976	138,961	244,511	40,376	78,047	2,095	1,321	19.4	22.2	2,775,980
Other	3,412	123,976	138,961	88,331	14,586	28,195	2,095	1,321	19.4	22.2	1,002,835
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUOR ROADS</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	203,504	33,604	64,958	2,095	1,321	19.4	22.2	2,310,418
Earthwork	3,412	123,976	138,961	60,871	10,052	19,430	2,095	1,321	19.4	22.2	691,084
Bridges	3,412	123,976	138,961	63,215	10,439	20,178	2,095	1,321	19.4	22.2	717,693
Walls	3,412	123,976	138,961	130,488	21,547	41,652	2,095	1,321	19.4	22.2	1,481,460
Other	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 14 INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	362,575	59,872	115,733	2,095	1,321	19.4	22.2	4,116,389
Earthwork	3,412	123,976	138,961	97,795	16,149	31,216	2,095	1,321	19.4	22.2	1,110,290
Bridges	3,412	123,976	138,961	2,660,024	439,246	849,073	2,095	1,321	19.4	22.2	30,199,781
Walls	3,412	123,976	138,961	560,006	92,473	178,753	2,095	1,321	19.4	22.2	6,357,866
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1,321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>EVERGREEN BLVD BRIDGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	18,418	3,041	5,879	2,095	1,321	19.4	22.2	209,099
Earthwork	3,412	123,976	138,961	911	150	291	2,095	1,321	19.4	22.2	10,340
Bridges	3,412	123,976	138,961	537,610	88,775	171,604	2,095	1,321	19.4	22.2	6,103,594
Other	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>MILL PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	239,566	39,559	76,469	2,095	1,321	19.4	22.2	2,719,836
Earthwork	3,412	123,976	138,961	85,377	14,098	27,252	2,095	1,321	19.4	22.2	969,301
Bridges	3,412	123,976	138,961	194,023	32,039	61,932	2,095	1,321	19.4	22.2	2,202,786
Walls	3,412	123,976	138,961	53,213	8,787	16,985	2,095	1,321	19.4	22.2	604,136
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1,321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>4th PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	248,512	41,036	79,324	2,095	1,321	19.4	22.2	2,821,404
Earthwork	3,412	123,976	138,961	78,460	12,956	25,044	2,095	1,321	19.4	22.2	890,770
Bridges	3,412	123,976	138,961	3,125,287	516,075	997,584	2,095	1,321	19.4	22.2	35,482,005
Walls	3,412	123,976	138,961	1,187,835	196,146	379,154	2,095	1,321	19.4	22.2	13,485,731
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1,321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	24,742	4,086	7,898	2,095	1,321	19.4	22.2	280,906
Earthwork	3,412	123,976	138,961	6,938	1,146	2,215	2,095	1,321	19.4	22.2	78,765
Bridges	3,412	123,976	138,961	691,574	114,199	220,749	2,095	1,321	19.4	22.2	7,851,576
Other	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 500 INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	309,044	51,032	98,646	2,095	1,321	19.4	22.2	3,508,639
Earthwork	3,412	123,976	138,961	75,770	12,512	24,186	2,095	1,321	19.4	22.2	860,236
Bridges	3,412	123,976	138,961	2,793,622	461,307	891,717	2,095	1,321	19.4	22.2	31,716,551
Walls	3,412	123,976	138,961	302,330	49,923	96,503	2,095	1,321	19.4	22.2	3,432,412
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1,321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>PROFESSIONAL SERVICES</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>RIGHT-OF-WAY</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (n.gas)	Gasoline		
<b>COLUMBIA RIVER BRIDGES</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,961	3,619,564	597,694	1,155,356	2,095	1,321	19.4	22.2	41,093,632
COLU Bridges	3,412	123,976	138,961	13,975,907	2,307,824	4,461,074	2,095	1,321	19.4	22.2	158,671,278
COLU Bridges	3,412	123,976	138,961	14,216,492	2,347,551	4,537,868	2,095	1,321	19.4	22.2	161,402,686
COLU Bridges	3,412	123,976	138,961	6,804,614	1,123,637	2,172,015	2,095	1,321	19.4	22.2	77,254,142
COLU Bridges	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TRANSIT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	4,672,768	771,608	1,491,536	2,095	1,321	19.4	22.2	53,050,874
Tracks	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,961	541,823	89,471	172,949	2,095	1,321	19.4	22.2	6,151,427
Sitework	3,412	123,976	138,961	59,592	9,840	19,022	2,095	1,321	19.4	22.2	676,557
Systems	3,412	123,976	138,961	217,120	35,853	69,304	2,095	1,321	19.4	22.2	2,465,008
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO CLARK COLLEGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>CLARK COLLEGE TO END OF PROJECT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO END OF PROJECT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	497,335	82,124	158,748	2,095	1,321	19.4	22.2	5,646,347
Tracks	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,961	2,160,616	356,780	689,663	2,095	1,321	19.4	22.2	24,529,904
Sitework	3,412	123,976	138,961	803,792	132,729	256,568	2,095	1,321	19.4	22.2	9,125,613
Systems	3,412	123,976	138,961	775,900	128,123	247,665	2,095	1,321	19.4	22.2	8,808,947
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
SUPPORT FACILITIES AND VEHICLES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>					<b>15,363,751</b>	<b>29,698,469</b>					
<b>TOTAL MODE COST</b>	3,412	123,976	138,961	873,550	144,248	278,835	2,095	1,321	19.4	22.2	9,917,586
<b>TOTAL PROJECT COST</b>	3,412	123,976	138,961	16,349	2,700	5,219	2,095	1,321	19.4	22.2	185,612

Note: 1. With the exception of the 29th and 33rd Street Bridges, high

The cost estimates do not include any contingencies for risk

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 2 - BRT		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu) Highway	Energy (Btu) Transit	Energy (Btu) Total
	2B - Upstream Bridge							
	Highway	Transit						
<b><i>SOUTH HIGHWAY APPROACH</i></b>								
<b>I-5 MAINLINE</b>								
Pavement	\$7,305,210	\$0	Urban Freeway	47,332	0.0865465	29,925,187,881	0	29,925,187,881
Earthwork	\$1,195,011	\$0	Site Work	21,079	0.0865465	2,180,073,981	0	2,180,073,981
Bridges	\$141,297,830	\$0	Bridge Concrete Box Girder	48,364	0.0865465	591,435,010,829	0	591,435,010,829
Other	\$1,754,200	\$0	Signals	21,079	0.0865465	3,200,209,687	0	3,200,209,687
<b>SUBTOTAL</b>	<b>\$151,552,251</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>								
Pavement	\$258,540	\$0	Urban Freeway	47,332	0.0865465	1,059,087,702	0	1,059,087,702
Earthwork		\$0	Site Work	21,079	0.0865465	0	0	0
Bridges	\$3,547,000	\$0	Bridge Concrete Box Girder	48,364	0.0865465	14,846,795,477	0	14,846,795,477
<b>SUBTOTAL</b>	<b>\$3,805,540</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>VICTORY BLVD INTERCHANGE</b>								
Pavement	\$189,250	\$0	Urban Freeway	47,332	0.0865465	775,246,955	0	775,246,955
<b>SUBTOTAL</b>	<b>\$189,250</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>MARINE DRIVE INTERCHANGE</b>								
Pavement	\$2,832,007	\$0	Urban Freeway	47,332	0.0865465	11,601,082,181	0	11,601,082,181
Earthwork	\$389,894	\$0	Site Work	21,079	0.0865465	711,288,945	0	711,288,945
Bridges	\$210,732,225	\$0	Bridge Concrete Box Girder	48,364	0.0865465	882,068,859,620	0	882,068,859,620
Walls	\$897,000	\$0	Structures	50,100	0.0865465	3,889,372,094	0	3,889,372,094
Other	\$530,000	\$0	Signals	21,079	0.0865465	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$215,381,126</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>HAYDEN ISLAND INTERCHANGE</b>								
Pavement	\$6,341,961	\$0	Urban Freeway	47,332	0.0865465	25,979,318,112	0	25,979,318,112
Earthwork	\$4,875,103	\$0	Site Work	21,079	0.0865465	8,893,713,286	0	8,893,713,286
Bridges	\$49,036,150	\$0	Bridge Concrete Box Girder	48,364	0.0865465	205,252,238,525	0	205,252,238,525
Walls	\$462,000	\$0	Structures	50,100	0.0865465	2,003,221,748	0	2,003,221,748
Other	\$530,000	\$0	Signals	21,079	0.0865465	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$61,245,214</b>	<b>\$0</b>		0	0.0865465	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$91,341,888	\$0		0	0.0865465	0	0	0
PROFESSIONAL SERVICES	\$120,273,359	\$0		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$48,210,000	\$0		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$691,998,628</b>	<b>\$0</b>		0	0.0865465	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 2 - BRT							
	2B - Upstream Bridge			Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu)		Energy (Btu) Total
	Highway	Transit	Caltrans Construction Activity			Highway	Transit	
<b>NORTH HIGHWAY APPROACH</b>				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
<b>I-5 MAINLINE</b>				0	0.0865465	0	0	0
Pavement	\$21,434,516		\$0 Urban Freeway	47,332	0.0865465	87,804,721,201	0	87,804,721,201
Earthwork	\$4,642,931		\$0 Site Work	21,079	0.0865465	8,470,159,364	0	8,470,159,364
Bridges	\$25,612,303		\$0 Bridge Concrete Box Girder	48,364	0.0865465	107,206,267,014	0	107,206,267,014
Walls	\$3,848,133		\$0 Structures	50,100	0.0865465	16,685,419,293	0	16,685,419,293
Other	\$3,320,139		\$0 Signals	21,079	0.0865465	6,056,971,747	0	6,056,971,747
<b>SUBTOTAL</b>	<b>\$58,858,023</b>	<b>\$0</b>		0	0.0865465	0	0	0
				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
<b>COLLECTOR/DISTRIBUOR ROADS</b>				0	0.0865465	0	0	0
Pavement	\$3,554,305		\$0 Urban Freeway	47,332	0.0865465	14,559,916,458	0	14,559,916,458
Earthwork	\$2,061,357		\$0 Site Work	21,079	0.0865465	3,760,560,441	0	3,760,560,441
Bridges	\$1,030,594		\$0 Bridge Concrete Box Girder	48,364	0.0865465	4,313,792,222	0	4,313,792,222
Walls	\$4,443,233		\$0 Structures	50,100	0.0865465	19,265,759,686	0	19,265,759,686
<b>SUBTOTAL</b>	<b>\$11,089,489</b>	<b>\$0</b>		0	0.0865465	0	0	0
				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
<b>SR 14 INTERCHANGE</b>				0	0.0865465	0	0	0
Pavement	\$6,888,160		\$0 Urban Freeway	47,332	0.0865465	28,216,778,047	0	28,216,778,047
Earthwork	\$2,289,288		\$0 Site Work	21,079	0.0865465	4,176,377,675	0	4,176,377,675
Bridges	\$93,154,893		\$0 Bridge Concrete Box Girder	48,364	0.0865465	389,921,522,687	0	389,921,522,687
Walls	\$663,807		\$0 Structures	50,100	0.0865465	2,878,252,421	0	2,878,252,421
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$103,569,608</b>	<b>\$0</b>		0	0.0865465	0	0	0
				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
<b>EVERGREEN BLVD BRIDGE</b>				0	0.0865465	0	0	0
Pavement	\$306,810		\$0 Urban Freeway	47,332	0.0865465	1,256,820,761	0	1,256,820,761
Earthwork	\$34,069		\$0 Site Work	21,079	0.0865465	62,152,396	0	62,152,396
Bridges	\$8,764,654		\$0 Bridge Concrete Box Girder	48,364	0.0865465	36,686,504,624	0	36,686,504,624
<b>SUBTOTAL</b>	<b>\$9,105,533</b>	<b>\$0</b>		0	0.0865465	0	0	0
				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
<b>MILL PLAIN BLVD INTERCHANGE</b>				0	0.0865465	0	0	0
Pavement	\$3,990,794		\$0 Urban Freeway	47,332	0.0865465	16,347,955,612	0	16,347,955,612
Earthwork	\$3,441,311		\$0 Site Work	21,079	0.0865465	6,278,027,568	0	6,278,027,568
Bridges	\$3,163,162		\$0 Bridge Concrete Box Girder	48,364	0.0865465	13,240,152,372	0	13,240,152,372
Walls	\$1,152,330		\$0 Structures	50,100	0.0865465	4,996,477,308	0	4,996,477,308
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$12,321,056</b>	<b>\$0</b>		0	0.0865465	0	0	0
				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
<b>4th PLAIN BLVD INTERCHANGE</b>				0	0.0865465	0	0	0
Pavement	\$3,382,758	\$757,065	Urban Freeway	47,332	0.0865465	13,857,189,311	3,101,252,366	16,958,441,677
Earthwork	\$2,613,005	\$321,851	Site Work	21,079	0.0865465	4,766,938,934	587,156,270	5,354,095,204
Bridges	\$50,951,542	\$0	Bridge Concrete Box Girder	48,364	0.0865465	213,269,559,567	0	213,269,559,567
Walls	\$18,694,255	\$0	Structures	50,100	0.0865465	81,057,874,828	0	81,057,874,828
Other	\$573,460	\$0	Signals	21,079	0.0865465	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$76,215,021</b>	<b>\$1,078,915</b>		0	0.0865465	0	0	0
				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>				0	0.0865465	0	0	0
Pavement	\$288,985	\$0	Urban Freeway	47,332	0.0865465	1,183,802,665	0	1,183,802,665
Earthwork	\$14,210	\$0	Site Work	21,079	0.0865465	25,923,315	0	25,923,315
Bridges	\$11,376,262	\$1,794,129	Bridge Concrete Box Girder	48,364	0.0865465	47,617,995,326	7,509,745,730	55,127,741,056
<b>SUBTOTAL</b>	<b>\$11,679,456</b>	<b>\$1,794,129</b>		0	0.0865465	0	0	0
				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
<b>SR 500 INTERCHANGE</b>				0	0.0865465	0	0	0
Pavement	\$5,148,198	\$0	Urban Freeway	47,332	0.0865465	21,089,167,639	0	21,089,167,639
Earthwork	\$2,834,254	\$0	Site Work	21,079	0.0865465	5,170,566,307	0	5,170,566,307
Bridges	\$45,544,415	\$0	Bridge Concrete Box Girder	48,364	0.0865465	190,636,767,632	0	190,636,767,632
Walls	\$4,758,095	\$0	Structures	50,100	0.0865465	20,630,994,331	0	20,630,994,331
Other	\$573,460	\$0	Signals	21,079	0.0865465	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$58,858,422</b>	<b>\$0</b>		0	0.0865465	0	0	0
				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	\$74,870,348	\$0		0	0.0865465	0	0	0
<b>PROFESSIONAL SERVICES</b>	\$97,376,800	\$0		0	0.0865465	0	0	0
<b>RIGHT-OF-WAY</b>	\$11,887,934	\$0		0	0.0865465	0	0	0
				0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$525,831,692</b>	<b>\$2,873,044</b>		0	0.0865465	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 2 - BRT		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu)		Energy (Btu) Total
	2B - Upstream Bridge					Highway	Transit	
	Highway	Transit						
<b>COLUMBIA RIVER BRIDGES</b>				0	0.0865465		0	0
COLU Bridges	\$59,009,741	\$0	Bridge Concrete Box Girder	48,364	0.0865465	246,999,028,145	0	246,999,028,145
COLU Bridges	\$234,794,640	\$0	Bridge Concrete Box Girder	48,364	0.0865465	982,787,706,376	0	982,787,706,376
COLU Bridges	\$238,638,773	\$0	Bridge Concrete Box Girder	48,364	0.0865465	998,878,221,469	0	998,878,221,469
COLU Bridges	\$33,858,198	\$78,338,560	Bridge Concrete Box Girder	48,364	0.0865465	141,721,381,664	327,904,309,366	469,625,691,030
COLU Bridges			Bridge Concrete Box Girder	48,364	0.0865465		0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$79,703,238	\$10,834,192		0	0.0865465		0	0
PROFESSIONAL SERVICES	\$155,794,333	\$21,244,682		0	0.0865465		0	0
RIGHT-OF-WAY	\$8,607,120	\$123,348		0	0.0865465		0	0
<b>TOTAL</b>	<b>\$810,406,043</b>	<b>\$110,540,783</b>		0	0.0865465		0	0
<b>TRANSIT</b>				0	0.0865465		0	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>				0	0.0865465		0	0
Guideway	\$21,807,006	\$51,808,343	Track Work	50,100	0.0865465	94,554,694,088	224,639,825,548	319,194,519,636
Tracks			Track Work	50,100	0.0865465		0	0
Stations	\$0	\$8,527,260	Stations, Stops and Terminals	50,100	0.0865465		36,974,010,128	36,974,010,128
Sitework	\$0	\$2,229,080	Site Work	21,079	0.0865465		4,066,539,396	4,066,539,396
Systems	\$0	\$3,507,325	Stations, Stops and Terminals	50,100	0.0865465		15,207,683,368	15,207,683,368
<b>SUBTOTAL</b>	<b>\$21,807,006</b>	<b>\$66,072,008</b>		0	0.0865465		0	0
<b>STATE LINE TO CLARK COLLEGE</b>				0	0.0865465		0	0
Guideway	\$0	\$7,827,285	Track Work	50,100	0.0865465		33,938,935,709	33,938,935,709
Tracks			Track Work	50,100	0.0865465		0	0
Stations	\$0	\$34,003,962	Stations, Stops and Terminals	50,100	0.0865465		147,440,424,914	147,440,424,914
Sitework	\$0	\$24,675,161	Site Work	21,079	0.0865465		45,015,215,367	45,015,215,367
Systems	\$0	\$12,212,009	Stations, Stops and Terminals	50,100	0.0865465		52,951,001,020	52,951,001,020
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$78,718,418</b>		0	0.0865465		0	0
<b>CLARK COLLEGE TO END OF PROJECT</b>				0	0.0865465		0	0
Guideway	\$0	\$60,596,496	Track Work	50,100	0.0865465		262,745,060,677	262,745,060,677
Tracks			Track Work	50,100	0.0865465		0	0
Stations	\$0	\$37,413,649	Stations, Stops and Terminals	50,100	0.0865465		162,224,752,618	162,224,752,618
Sitework	\$0	\$15,695,059	Site Work	21,079	0.0865465		28,632,698,945	28,632,698,945
Systems	\$0	\$3,908,244	Stations, Stops and Terminals	50,100	0.0865465		16,946,057,130	16,946,057,130
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$117,613,448</b>		0	0.0865465		0	0
<b>STATE LINE TO END OF PROJECT</b>				0	0.0865465		0	0
Guideway			Track Work	50,100	0.0865465		0	0
Tracks			Track Work	50,100	0.0865465		0	0
Stations			Stations, Stops and Terminals	50,100	0.0865465		0	0
Sitework			Site Work	21,079	0.0865465		0	0
Systems			Stations, Stops and Terminals	50,100	0.0865465		0	0
<b>SUBTOTAL</b>				0	0.0865465		0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$63,000	\$47,756,375		0	0.0865465		0	0
SUPPORT FACILITIES AND VEHICLES	\$0	\$42,993,300		0	0.0865465		0	0
PROFESSIONAL SERVICES	\$0	\$98,505,653		0	0.0865465		0	0
RIGHT-OF-WAY	\$1,080,000	\$25,409,198		0	0.0865465		0	0
<b>TOTAL</b>	<b>\$22,950,006</b>	<b>\$477,068,400</b>						<b>6,996,256,229,641</b>
<b>TOTAL MODE COST</b>	<b>\$2,051,186,369</b>	<b>\$590,482,227</b>				16th Street Tunnel, Add:	59,611,040,491	
						<b>Total (w/16th Tunnel):</b>		<b>7,055,867,270,132</b>
<b>TOTAL PROJECT COST</b>	<b>\$2,641,668,596</b>					McLoughlin Tunnel, Add:	1,115,648,215	
						<b>Total (w/McLoughlin Tunnel):</b>		<b>6,997,371,877,856</b>

Note: 1. With the exception of the 29th and 33rd Street Bridges, highway costs have not been adjusted to reflect it

The cost estimates do not include any contingencies for risk or uncertainty.

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub> Emissions (lbs)
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (n.gas)	Gasoline	Diesel	
<b><i>SOUTH HIGHWAY APPROACH</i></b>											
<b>I-5 MAINLINE</b>											
Pavement	3,412	123,976	138,691	438,529	72,414	140,250	2,095	1,321	19.4	22.2	4,984,752
Earthwork	3,412	123,976	138,691	31,947	5,275	10,217	2,095	1,321	19.4	22.2	363,143
Bridges	3,412	123,976	138,691	8,666,984	1,431,168	2,771,865	2,095	1,321	19.4	22.2	98,517,572
Other	3,412	123,976	138,691	46,896	7,744	14,998	2,095	1,321	19.4	22.2	533,071
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>											
Pavement	3,412	123,976	138,691	15,520	2,563	4,964	2,095	1,321	19.4	22.2	176,416
Earthwork	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Bridges	3,412	123,976	138,691	217,567	35,927	69,582	2,095	1,321	19.4	22.2	2,473,087
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>VICTORY BLVD INTERCHANGE</b>											
Pavement	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	11,361	1,876	3,633	2,095	1,321	19.4	22.2	129,136
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>MARINE DRIVE INTERCHANGE</b>											
Pavement	3,412	123,976	138,691	170,004	28,073	54,371	2,095	1,321	19.4	22.2	1,932,436
Earthwork	3,412	123,976	138,691	10,423	1,721	3,334	2,095	1,321	19.4	22.2	118,482
Bridges	3,412	123,976	138,691	12,925,980	2,134,451	4,133,972	2,095	1,321	19.4	22.2	146,929,554
Walls	3,412	123,976	138,691	56,995	9,412	18,228	2,095	1,321	19.4	22.2	647,867
Other	3,412	123,976	138,691	14,169	2,340	4,531	2,095	1,321	19.4	22.2	161,058
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>HAYDEN ISLAND INTERCHANGE</b>											
Pavement	3,412	123,976	138,691	380,705	62,865	121,757	2,095	1,321	19.4	22.2	4,327,474
Earthwork	3,412	123,976	138,691	130,330	21,521	41,682	2,095	1,321	19.4	22.2	1,481,460
Bridges	3,412	123,976	138,691	3,007,800	496,674	961,951	2,095	1,321	19.4	22.2	34,189,644
Walls	3,412	123,976	138,691	29,356	4,847	9,388	2,095	1,321	19.4	22.2	333,684
Other	3,412	123,976	138,691	14,169	2,340	4,531	2,095	1,321	19.4	22.2	161,058
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>											
PROFESSIONAL SERVICES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0



**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (n.gas)	Gasoline		Diesel
<b>NORTH HIGHWAY APPROACH</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>I-5 MAINLINE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	1,286,705	212,472	411,512	2,095	1,321	19.4	22.2	14,625,965
Earthwork	3,412	123,976	138,691	124,123	20,496	39,697	2,095	1,321	19.4	22.2	1,410,907
Bridges	3,412	123,976	138,691	1,571,018	259,420	502,441	2,095	1,321	19.4	22.2	17,857,754
Walls	3,412	123,976	138,691	244,511	40,376	78,199	2,095	1,321	19.4	22.2	2,779,354
Other	3,412	123,976	138,691	88,760	14,657	28,387	2,095	1,321	19.4	22.2	1,008,933
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,691	213,363	35,232	68,238	2,095	1,321	19.4	22.2	2,425,300
Earthwork	3,412	123,976	138,691	55,108	9,100	17,625	2,095	1,321	19.4	22.2	626,411
Bridges	3,412	123,976	138,691	63,215	10,439	20,217	2,095	1,321	19.4	22.2	718,565
Walls	3,412	123,976	138,691	282,324	46,520	90,292	2,095	1,321	19.4	22.2	3,209,171
Other	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 14 INTERCHANGE</b>	3,412	123,976	138,691	413,493	68,280	132,243	2,095	1,321	19.4	22.2	4,700,176
	3,412	123,976	138,691	61,201	10,106	19,573	2,095	1,321	19.4	22.2	695,675
Pavement	3,412	123,976	138,691	5,713,973	943,541	1,827,436	2,095	1,321	19.4	22.2	64,950,706
Earthwork	3,412	123,976	138,691	42,178	6,965	13,489	2,095	1,321	19.4	22.2	479,441
Bridges	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
Walls	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Other	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>EVERGREEN BLVD BRIDGE</b>	3,412	123,976	138,691	18,418	3,041	5,890	2,095	1,321	19.4	22.2	209,353
	3,412	123,976	138,691	911	150	291	2,095	1,321	19.4	22.2	10,353
Pavement	3,412	123,976	138,691	537,610	88,775	171,938	2,095	1,321	19.4	22.2	6,111,010
Earthwork	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Bridges	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Other	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>MILL PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,691	239,566	39,559	76,618	2,095	1,321	19.4	22.2	2,723,141
	3,412	123,976	138,691	91,999	15,192	29,423	2,095	1,321	19.4	22.2	1,045,755
Pavement	3,412	123,976	138,691	194,023	32,039	62,052	2,095	1,321	19.4	22.2	2,205,462
Earthwork	3,412	123,976	138,691	73,219	12,091	23,417	2,095	1,321	19.4	22.2	832,282
Bridges	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
Walls	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Other	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>4th PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,691	248,512	41,036	79,479	2,095	1,321	19.4	22.2	2,824,832
	3,412	123,976	138,691	78,460	12,956	25,093	2,095	1,321	19.4	22.2	891,852
Pavement	3,412	123,976	138,691	3,125,287	516,075	999,526	2,095	1,321	19.4	22.2	35,525,119
Earthwork	3,412	123,976	138,691	1,187,835	196,146	379,892	2,095	1,321	19.4	22.2	13,502,118
Bridges	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
Walls	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Other	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>	3,412	123,976	138,691	17,348	2,865	5,548	2,095	1,321	19.4	22.2	197,190
	3,412	123,976	138,691	380	63	121	2,095	1,321	19.4	22.2	4,318
Pavement	3,412	123,976	138,691	807,851	133,399	258,366	2,095	1,321	19.4	22.2	9,182,837
Earthwork	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Bridges	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Other	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 500 INTERCHANGE</b>	3,412	123,976	138,691	309,044	51,032	98,838	2,095	1,321	19.4	22.2	3,512,903
	3,412	123,976	138,691	75,770	12,512	24,233	2,095	1,321	19.4	22.2	861,281
Pavement	3,412	123,976	138,691	2,793,622	461,307	893,453	2,095	1,321	19.4	22.2	31,755,089
Earthwork	3,412	123,976	138,691	302,330	49,923	96,691	2,095	1,321	19.4	22.2	3,436,583
Bridges	3,412	123,976	138,691	15,331	2,532	4,903	2,095	1,321	19.4	22.2	174,265
Walls	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Other	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>PROFESSIONAL SERVICES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>RIGHT-OF-WAY</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (n.gas)	Gasoline		Diesel
<b>COLUMBIA RIVER BRIDGES</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,691	3,619,564	597,694	1,157,605	2,095	1,321	19.4	22.2	41,143,565
COLU Bridges	3,412	123,976	138,691	14,401,930	2,378,172	4,606,009	2,095	1,321	19.4	22.2	163,706,675
COLU Bridges	3,412	123,976	138,691	14,637,723	2,417,109	4,681,420	2,095	1,321	19.4	22.2	166,386,933
COLU Bridges	3,412	123,976	138,691	6,881,971	1,136,411	2,200,984	2,095	1,321	19.4	22.2	78,227,332
COLU Bridges	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TRANSIT</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	4,677,528	772,394	1,495,962	2,095	1,321	19.4	22.2	53,169,441
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	541,823	89,471	173,285	2,095	1,321	19.4	22.2	6,158,901
Sitework	3,412	123,976	138,691	59,592	9,840	19,059	2,095	1,321	19.4	22.2	677,379
Systems	3,412	123,976	138,691	222,856	36,800	71,274	2,095	1,321	19.4	22.2	2,533,201
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO CLARK COLLEGE</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	497,347	82,126	159,061	2,095	1,321	19.4	22.2	5,653,337
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	2,160,616	356,780	691,006	2,095	1,321	19.4	22.2	24,559,711
Sitework	3,412	123,976	138,691	659,660	108,929	210,972	2,095	1,321	19.4	22.2	7,498,355
Systems	3,412	123,976	138,691	775,953	128,132	248,164	2,095	1,321	19.4	22.2	8,820,249
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>CLARK COLLEGE TO END OF PROJECT</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	3,850,309	635,797	1,231,401	2,095	1,321	19.4	22.2	43,766,441
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	2,377,268	392,555	760,295	2,095	1,321	19.4	22.2	27,022,392
Sitework	3,412	123,976	138,691	419,588	69,286	134,192	2,095	1,321	19.4	22.2	4,769,457
Systems	3,412	123,976	138,691	248,330	41,006	79,421	2,095	1,321	19.4	22.2	2,822,769
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO END OF PROJECT</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
SUPPORT FACILITIES AND VEHICLES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,691	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>					<b>16,929,703</b>	<b>32,789,197</b>					
	3,412	123,976	138,961	873,550	144,248	278,835	2,095	1,321	19.4	22.2	9,917,586
<b>TOTAL MODE COST</b>											
	3,412	123,976	138,961	16,349	2,700	5,219	2,095	1,321	19.4	22.2	185,612
<b>TOTAL PROJECT COST</b>											

Note: 1. With the exception of the 29th and 33rd Street Bridges, high

The cost estimates do not include any contingencies for risk

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 3 - LRT							
	3A - Downstream Bridge			Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu) Highway	Energy (Btu) Transit	Energy (Btu) Total
	Highway	Transit	Caltrans Construction Activity					
<b><i>SOUTH HIGHWAY APPROACH</i></b>								
<b>I-5 MAINLINE</b>								
Pavement	\$8,035,260		\$0 Urban Freeway	47,332	0.0865465	32,915,777,257	0	32,915,777,257
Earthwork	\$1,775,347		\$0 Site Work	21,079	0.0865465	3,238,788,432	0	3,238,788,432
Bridges	\$148,360,710		\$0 Bridge Concrete Box Girder	48,364	0.0865465	620,998,341,768	0	620,998,341,768
Other	\$1,919,400		\$0 Signals	21,079	0.0865465	3,501,586,178	0	3,501,586,178
<b>SUBTOTAL</b>	<b>\$160,090,717</b>		<b>\$0</b>	<b>0</b>	<b>0.0865465</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>COLLECTOR/DISTRIBUTOR ROADS</b>								
Pavement	\$258,540		\$0 Urban Freeway	47,332	0.0865465	1,059,087,702	0	1,059,087,702
Earthwork			\$0 Site Work	21,079	0.0865465	0	0	0
Bridges	\$3,529,500		\$0 Bridge Concrete Box Girder	48,364	0.0865465	14,773,545,147	0	14,773,545,147
<b>SUBTOTAL</b>	<b>\$3,788,040</b>		<b>\$0</b>	<b>0</b>	<b>0.0865465</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>VICTORY BLVD INTERCHANGE</b>								
Pavement	\$189,250		\$0 Urban Freeway	47,332	0.0865465	775,246,955	0	775,246,955
<b>SUBTOTAL</b>	<b>\$189,250</b>		<b>\$0</b>	<b>0</b>	<b>0.0865465</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>MARINE DRIVE INTERCHANGE</b>								
Pavement	\$2,966,727		\$0 Urban Freeway	47,332	0.0865465	12,152,951,506	0	12,152,951,506
Earthwork	\$389,894		\$0 Site Work	21,079	0.0865465	711,288,945	0	711,288,945
Bridges	\$215,044,315		\$0 Bridge Concrete Box Girder	48,364	0.0865465	900,118,117,672	0	900,118,117,672
Walls	\$516,000		\$0 Structures	50,100	0.0865465	2,237,364,549	0	2,237,364,549
Other	\$530,000		\$0 Signals	21,079	0.0865465	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$219,446,936</b>		<b>\$0</b>	<b>0</b>	<b>0.0865465</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>HAYDEN ISLAND INTERCHANGE</b>								
Pavement	\$6,429,201		\$0 Urban Freeway	47,332	0.0865465	26,336,689,548	0	26,336,689,548
Earthwork	\$4,774,649		\$0 Site Work	21,079	0.0865465	8,710,453,977	0	8,710,453,977
Bridges	\$52,937,550		\$0 Bridge Concrete Box Girder	48,364	0.0865465	221,582,457,830	0	221,582,457,830
Walls	\$1,094,500		\$0 Structures	50,100	0.0865465	4,745,727,712	0	4,745,727,712
Other	\$530,000		\$0 Signals	21,079	0.0865465	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$65,765,900</b>		<b>\$0</b>	<b>0</b>	<b>0.0865465</b>	<b>0</b>	<b>0</b>	<b>0</b>
NON-DISTRIBUTED CONSTRUCTION COSTS	\$90,466,507		\$0	0	0.0865465	0	0	0
PROFESSIONAL SERVICES	\$123,844,417		\$0	0	0.0865465	0	0	0
RIGHT-OF-WAY	\$51,110,000		\$0	0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$714,701,767</b>		<b>\$0</b>	<b>0</b>	<b>0.0865465</b>	<b>0</b>	<b>0</b>	<b>0</b>

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 3 - LRT		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu)		Energy (Btu) Transit	Energy (Btu) Total
	3A - Downstream Bridge					Highway	Transit		
	Highway	Transit				Highway	Transit		
<b>NORTH HIGHWAY APPROACH</b>				0	0.0865465		0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>I-5 MAINLINE</b>				0	0.0865465		0		0
Pavement	\$21,447,327		\$0 Urban Freeway	47,332	0.0865465	87,857,199,910	0		87,857,199,910
Earthwork	\$5,090,904		\$0 Site Work	21,079	0.0865465	9,287,402,078	0		9,287,402,078
Bridges	\$25,612,303		\$0 Bridge Concrete Box Girder	48,364	0.0865465	107,206,267,014	0		107,206,267,014
Walls	\$3,848,133		\$0 Structures	50,100	0.0865465	16,685,419,293	0		16,685,419,293
Other	\$3,304,082		\$0 Signals	21,079	0.0865465	6,027,678,973	0		6,027,678,973
<b>SUBTOTAL</b>	<b>\$59,302,749</b>		<b>\$0</b>	0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>				0	0.0865465		0		0
Pavement	\$3,390,057		\$0 Urban Freeway	47,332	0.0865465	13,887,089,764	0		13,887,089,764
Earthwork	\$2,276,945		\$0 Site Work	21,079	0.0865465	4,153,859,349	0		4,153,859,349
Bridges	\$1,030,594		\$0 Bridge Concrete Box Girder	48,364	0.0865465	4,313,792,222	0		4,313,792,222
Walls	\$2,053,636		\$0 Structures	50,100	0.0865465	8,904,520,123	0		8,904,520,123
<b>SUBTOTAL</b>	<b>\$8,751,232</b>		<b>\$0</b>	0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>SR 14 INTERCHANGE</b>				0	0.0865465		0		0
Pavement	\$6,039,945		\$0 Urban Freeway	47,332	0.0865465	24,742,133,461	0		24,742,133,461
Earthwork	\$3,658,118		\$0 Site Work	21,079	0.0865465	6,673,551,068	0		6,673,551,068
Bridges	\$43,366,360		\$0 Bridge Concrete Box Girder	48,364	0.0865465	181,520,009,866	0		181,520,009,866
Walls	\$8,813,431		\$0 Structures	50,100	0.0865465	38,214,841,234	0		38,214,841,234
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0		1,046,170,475
<b>SUBTOTAL</b>	<b>\$62,451,313</b>		<b>\$0</b>	0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>EVERGREEN BLVD BRIDGE</b>				0	0.0865465		0		0
Pavement	\$306,810		\$0 Urban Freeway	47,332	0.0865465	1,256,820,761	0		1,256,820,761
Earthwork	\$34,069		\$0 Site Work	21,079	0.0865465	62,152,396	0		62,152,396
Bridges	\$8,764,654		\$0 Bridge Concrete Box Girder	48,364	0.0865465	36,686,504,624	0		36,686,504,624
<b>SUBTOTAL</b>	<b>\$9,105,533</b>		<b>\$0</b>	0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>MILL PLAIN BLVD INTERCHANGE</b>				0	0.0865465		0		0
Pavement	\$3,990,794		\$0 Urban Freeway	47,332	0.0865465	16,347,955,612	0		16,347,955,612
Earthwork	\$3,193,595		\$0 Site Work	21,079	0.0865465	5,826,117,453	0		5,826,117,453
Bridges	\$3,163,162		\$0 Bridge Concrete Box Girder	48,364	0.0865465	13,240,152,372	0		13,240,152,372
Walls	\$837,468		\$0 Structures	50,100	0.0865465	3,631,242,663	0		3,631,242,663
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0		1,046,170,475
<b>SUBTOTAL</b>	<b>\$11,758,479</b>		<b>\$0</b>	0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>4th PLAIN BLVD INTERCHANGE</b>				0	0.0865465		0		0
Pavement	\$3,382,758	\$757,065	Urban Freeway	47,332	0.0865465	13,857,189,311	3,101,252,366		16,958,441,677
Earthwork	\$2,613,005	\$321,851	Site Work	21,079	0.0865465	4,766,938,934	587,156,270		5,354,095,204
Bridges	\$50,951,542	\$0	Bridge Concrete Box Girder	48,364	0.0865465	213,269,559,567	0		213,269,559,567
Walls	\$18,694,255	\$0	Structures	50,100	0.0865465	81,057,874,828	0		81,057,874,828
Other	\$573,460	\$0	Signals	21,079	0.0865465	1,046,170,475	0		1,046,170,475
<b>SUBTOTAL</b>	<b>\$76,215,021</b>	<b>\$1,078,915</b>		0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>				0	0.0865465		0		0
Pavement	\$288,985	\$0	Urban Freeway	47,332	0.0865465	1,183,802,665	0		1,183,802,665
Earthwork	\$14,210	\$0	Site Work	21,079	0.0865465	25,923,315	0		25,923,315
Bridges	\$11,376,262	\$1,794,129	Bridge Concrete Box Girder	48,364	0.0865465	47,617,995,326	7,509,745,730		55,127,741,056
<b>SUBTOTAL</b>	<b>\$11,679,456</b>	<b>\$1,794,129</b>		0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>SR 500 INTERCHANGE</b>				0	0.0865465		0		0
Pavement	\$5,148,198	\$0	Urban Freeway	47,332	0.0865465	21,089,167,639	0		21,089,167,639
Earthwork	\$2,834,254	\$0	Site Work	21,079	0.0865465	5,170,566,307	0		5,170,566,307
Bridges	\$45,544,415	\$0	Bridge Concrete Box Girder	48,364	0.0865465	190,636,767,632	0		190,636,767,632
Walls	\$4,758,095	\$0	Structures	50,100	0.0865465	20,630,994,331	0		20,630,994,331
Other	\$573,460	\$0	Signals	21,079	0.0865465	1,046,170,475	0		1,046,170,475
<b>SUBTOTAL</b>	<b>\$58,858,422</b>	<b>\$0</b>		0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	\$67,032,822	\$0		0	0.0865465	0	0		0
<b>PROFESSIONAL SERVICES</b>	\$86,066,176	\$0		0	0.0865465	0	0		0
<b>RIGHT-OF-WAY</b>	\$11,580,646	\$0		0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>TOTAL</b>	<b>\$462,801,850</b>	<b>\$2,873,044</b>		0	0.0865465	0	0		0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 3 - LRT			Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu)		Energy (Btu) Total
	3A - Downstream Bridge					Highway	Transit	
	Highway	Transit	Caltrans Construction Activity			Highway	Transit	
<b>COLUMBIA RIVER BRIDGES</b>				0	0.0865465			0
COLU Bridges	\$59,009,741	\$0	Bridge Concrete Box Girder	48,364	0.0865465	246,999,028,145	0	246,999,028,145
COLU Bridges	\$227,849,194	\$0	Bridge Concrete Box Girder	48,364	0.0865465	953,715,925,837	0	953,715,925,837
COLU Bridges	\$231,771,450	\$0	Bridge Concrete Box Girder	48,364	0.0865465	970,133,439,445	0	970,133,439,445
COLU Bridges	\$33,479,852	\$77,455,753	Bridge Concrete Box Girder	48,364	0.0865465	140,137,725,433	324,209,111,494	464,346,836,927
COLU Bridges			Bridge Concrete Box Girder	48,364	0.0865465		0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$81,400,064	\$13,638,381		0	0.0865465		0	0
PROFESSIONAL SERVICES	\$153,747,419	\$20,965,557		0	0.0865465		0	0
RIGHT-OF-WAY	\$24,684,320	\$4,131,432		0	0.0865465		0	0
<b>TOTAL</b>	<b>\$ 811,942,040</b>	<b>\$ 116,191,123</b>		0	0.0865465		0	0
<b>TRANSIT</b>				0	0.0865465		0	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>				0	0.0865465		0	0
Guideway	\$21,815,388	\$54,906,686	Track Work	50,100	0.0865465	94,591,038,254	238,074,172,040	332,665,210,294
Tracks	\$0	\$6,140,655	Track Work	50,100	0.0865465	0	26,625,743,810	26,625,743,810
Stations	\$0	\$3,280,000	Stations, Stops and Terminals	50,100	0.0865465	0	14,222,007,212	14,222,007,212
Sitework	\$0	\$338,000	Site Work	21,079	0.0865465	0	616,617,760	616,617,760
Systems	\$0	\$6,955,962	Stations, Stops and Terminals	50,100	0.0865465	0	30,160,894,701	30,160,894,701
<b>SUBTOTAL</b>	<b>\$21,815,388</b>	<b>\$71,621,303</b>		0	0.0865465		0	0
<b>STATE LINE TO CLARK COLLEGE</b>				0	0.0865465		0	0
Guideway	\$0	\$14,496,674	Track Work	50,100	0.0865465	0	62,857,256,199	62,857,256,199
Tracks	\$0	\$11,409,317	Track Work	50,100	0.0865465	0	49,470,544,066	49,470,544,066
Stations	\$0	\$34,003,962	Stations, Stops and Terminals	50,100	0.0865465	0	147,440,424,914	147,440,424,914
Sitework	\$0	\$25,570,646	Site Work	21,079	0.0865465	0	46,648,859,911	46,648,859,911
Systems	\$0	\$20,856,945	Stations, Stops and Terminals	50,100	0.0865465	0	90,435,248,507	90,435,248,507
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$106,337,543</b>		0	0.0865465		0	0
<b>CLARK COLLEGE TO END OF PROJECT</b>				0	0.0865465		0	0
Guideway	\$0	\$63,347,886	Track Work	50,100	0.0865465	0	274,675,029,912	274,675,029,912
Tracks	\$0	\$7,055,381	Track Work	50,100	0.0865465	0	30,591,976,184	30,591,976,184
Stations	\$0	\$37,413,649	Stations, Stops and Terminals	50,100	0.0865465	0	162,224,752,618	162,224,752,618
Sitework	\$0	\$15,695,059	Site Work	21,079	0.0865465	0	28,632,698,945	28,632,698,945
Systems	\$0	\$11,163,281	Stations, Stops and Terminals	50,100	0.0865465	0	48,403,737,516	48,403,737,516
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$134,675,257</b>		0	0.0865465		0	0
<b>STATE LINE TO END OF PROJECT</b>				0	0.0865465		0	0
Guideway			Track Work	50,100	0.0865465	0	0	0
Tracks			Track Work	50,100	0.0865465	0	0	0
Stations			Stations, Stops and Terminals	50,100	0.0865465	0	0	0
Sitework			Site Work	21,079	0.0865465	0	0	0
Systems			Stations, Stops and Terminals	50,100	0.0865465	0	0	0
<b>SUBTOTAL</b>				0	0.0865465		0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$82,000	\$58,115,615		0	0.0865465		0	0
SUPPORT FACILITIES AND VEHICLES	\$0	\$82,863,600		0	0.0865465		0	0
PROFESSIONAL SERVICES	\$0	\$122,622,569		0	0.0865465		0	0
RIGHT-OF-WAY	\$754,000	\$25,516,198		0	0.0865465		0	0
<b>TOTAL</b>	<b>\$22,651,388</b>	<b>\$601,752,086</b>						<b>7,037,871,756,110</b>
<b>TOTAL MODE COST</b>	<b>\$2,012,097,044</b>	<b>\$720,816,253</b>				16th Street Tunnel, Add:	62,448,989,712	
						<b>Total (w/16th Tunnel):</b>	<b>7,100,320,745,822</b>	
<b>TOTAL PROJECT COST</b>	<b>\$2,732,913,297</b>					McLoughlin Tunnel, Add:	2,571,006,790	
						<b>Total (w/McLoughlin Tunnel):</b>	<b>7,040,442,762,900</b>	

Note: 1. With the exception of the 29th and 33rd Street Bridges, highway costs have not been adjusted to reflect it

The cost estimates do not include any contingencies for risk or uncertainty.

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coelectricity n.gr)	Gasoline	Diesel		
<b><i>SOUTH HIGHWAY APPROACH</i></b>											
<b>I-5 MAINLINE</b>											
Pavement	3,412	123,976	138,961	482,353	79,650	153,966	2,095	1,321	19.4	22.2	5,476,252
Earthwork	3,412	123,976	138,961	47,462	7,837	15,150	2,095	1,321	19.4	22.2	538,843
Bridges	3,412	123,976	138,961	9,100,210	1,502,706	2,904,764	2,095	1,321	19.4	22.2	103,316,509
Other	3,412	123,976	138,961	51,313	8,473	16,379	2,095	1,321	19.4	22.2	582,565
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>											
Pavement	3,412	123,976	138,961	15,520	2,563	4,954	2,095	1,321	19.4	22.2	176,202
Earthwork	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Bridges	3,412	123,976	138,961	216,494	35,749	69,104	2,095	1,321	19.4	22.2	2,457,899
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>VICTORY BLVD INTERCHANGE</b>											
Pavement	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	11,361	1,876	3,626	2,095	1,321	19.4	22.2	128,979
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>MARINE DRIVE INTERCHANGE</b>											
Pavement	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,961	178,091	29,408	56,846	2,095	1,321	19.4	22.2	2,021,906
Bridges	3,412	123,976	138,961	10,423	1,721	3,327	2,095	1,321	19.4	22.2	118,338
Walls	3,412	123,976	138,961	13,190,477	2,178,127	4,210,367	2,095	1,321	19.4	22.2	149,754,123
Other	3,412	123,976	138,961	32,787	5,414	10,465	2,095	1,321	19.4	22.2	372,234
	3,412	123,976	138,961	14,169	2,340	4,523	2,095	1,321	19.4	22.2	160,862
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>HAYDEN ISLAND INTERCHANGE</b>											
Pavement	3,412	123,976	138,961	385,942	63,730	123,192	2,095	1,321	19.4	22.2	4,381,678
Earthwork	3,412	123,976	138,961	127,644	21,078	40,744	2,095	1,321	19.4	22.2	1,449,172
Bridges	3,412	123,976	138,961	3,247,105	536,190	1,036,468	2,095	1,321	19.4	22.2	36,865,036
Walls	3,412	123,976	138,961	69,545	11,484	22,198	2,095	1,321	19.4	22.2	789,554
Other	3,412	123,976	138,961	14,169	2,340	4,523	2,095	1,321	19.4	22.2	160,862
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>											
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coelectricity)	Gasoline	Diesel		
<i><b>NORTH HIGHWAY APPROACH</b></i>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>I-5 MAINLINE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	1,287,474	212,599	410,958	2,095	1,321	19.4	22.2	14,616,946
Earthwork	3,412	123,976	138,961	136,099	22,474	43,442	2,095	1,321	19.4	22.2	1,545,160
Bridges	3,412	123,976	138,961	1,571,018	259,420	501,465	2,095	1,321	19.4	22.2	17,836,082
Walls	3,412	123,976	138,961	244,511	40,376	78,047	2,095	1,321	19.4	22.2	2,775,980
Other	3,412	123,976	138,961	88,331	14,586	28,195	2,095	1,321	19.4	22.2	1,002,835
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUOR ROADS</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	203,504	33,604	64,958	2,095	1,321	19.4	22.2	2,310,418
Earthwork	3,412	123,976	138,961	60,871	10,052	19,430	2,095	1,321	19.4	22.2	691,084
Bridges	3,412	123,976	138,961	63,215	10,439	20,178	2,095	1,321	19.4	22.2	717,693
Walls	3,412	123,976	138,961	130,488	21,547	41,652	2,095	1,321	19.4	22.2	1,481,460
Other	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 14 INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	362,575	59,872	115,733	2,095	1,321	19.4	22.2	4,116,989
Earthwork	3,412	123,976	138,961	97,795	16,149	31,216	2,095	1,321	19.4	22.2	1,110,290
Bridges	3,412	123,976	138,961	2,660,024	439,246	849,073	2,095	1,321	19.4	22.2	30,199,781
Walls	3,412	123,976	138,961	560,006	92,473	178,753	2,095	1,321	19.4	22.2	6,357,866
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1,321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>EVERGREEN BLVD BRIDGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	18,418	3,041	5,879	2,095	1,321	19.4	22.2	209,099
Earthwork	3,412	123,976	138,961	911	150	291	2,095	1,321	19.4	22.2	10,340
Bridges	3,412	123,976	138,961	537,610	88,775	171,604	2,095	1,321	19.4	22.2	6,103,594
Other	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>MILL PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	239,566	39,559	76,469	2,095	1,321	19.4	22.2	2,719,836
Earthwork	3,412	123,976	138,961	85,377	14,098	27,252	2,095	1,321	19.4	22.2	969,301
Bridges	3,412	123,976	138,961	194,023	32,039	61,932	2,095	1,321	19.4	22.2	2,202,786
Walls	3,412	123,976	138,961	53,213	8,787	16,985	2,095	1,321	19.4	22.2	604,136
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1,321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>4th PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	248,512	41,036	79,324	2,095	1,321	19.4	22.2	2,821,404
Earthwork	3,412	123,976	138,961	78,460	12,956	25,044	2,095	1,321	19.4	22.2	890,770
Bridges	3,412	123,976	138,961	3,125,287	516,075	997,584	2,095	1,321	19.4	22.2	35,482,005
Walls	3,412	123,976	138,961	1,187,835	196,146	379,154	2,095	1,321	19.4	22.2	13,485,731
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1,321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	17,348	2,865	5,537	2,095	1,321	19.4	22.2	196,951
Earthwork	3,412	123,976	138,961	390	63	121	2,095	1,321	19.4	22.2	4,313
Bridges	3,412	123,976	138,961	807,851	133,399	257,864	2,095	1,321	19.4	22.2	9,171,692
Other	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 500 INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	309,044	51,032	98,646	2,095	1,321	19.4	22.2	3,508,639
Earthwork	3,412	123,976	138,961	75,770	12,512	24,186	2,095	1,321	19.4	22.2	860,236
Bridges	3,412	123,976	138,961	2,793,622	461,307	891,717	2,095	1,321	19.4	22.2	31,716,551
Walls	3,412	123,976	138,961	302,330	49,923	96,503	2,095	1,321	19.4	22.2	3,432,412
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1,321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>PROFESSIONAL SERVICES</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>RIGHT-OF-WAY</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub> Emissions (lbs)
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coelectricity (n.gr Gasoline	Diesel			
<b>COLUMBIA RIVER BRIDGES</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
COLL Bridges	3,412	123,976	138,961	3,619,564	597,694	1,155,356	2,095	1,321	19.4	22.2	41,093,632
COLL Bridges	3,412	123,976	138,961	13,975,907	2,307,824	4,461,074	2,095	1,321	19.4	22.2	158,671,278
COLL Bridges	3,412	123,976	138,961	14,216,492	2,347,551	4,537,868	2,095	1,321	19.4	22.2	161,402,686
COLL Bridges	3,412	123,976	138,961	6,804,614	1,123,637	2,172,015	2,095	1,321	19.4	22.2	77,254,142
COLL Bridges	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
COLL Bridges	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TRANSIT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	4,874,930	804,991	1,556,065	2,095	1,321	19.4	22.2	55,346,055
Tracks	3,412	123,976	138,961	390,178	64,430	124,544	2,095	1,321	19.4	22.2	4,429,769
Stations	3,412	123,976	138,961	208,412	34,415	66,524	2,095	1,321	19.4	22.2	2,366,139
Sitework	3,412	123,976	138,961	9,036	1,492	2,884	2,095	1,321	19.4	22.2	102,588
Systems	3,412	123,976	138,961	441,983	72,984	141,080	2,095	1,321	19.4	22.2	5,017,917
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO CLARK COLLEGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	921,120	152,103	294,019	2,095	1,321	19.4	22.2	10,457,664
Tracks	3,412	123,976	138,961	724,949	119,710	231,402	2,095	1,321	19.4	22.2	8,230,495
Stations	3,412	123,976	138,961	2,160,616	356,780	689,663	2,095	1,321	19.4	22.2	24,529,904
Sitework	3,412	123,976	138,961	683,600	112,882	218,203	2,095	1,321	19.4	22.2	7,761,047
Systems	3,412	123,976	138,961	1,325,253	218,837	423,017	2,095	1,321	19.4	22.2	15,045,860
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>CLARK COLLEGE TO END OF PROJECT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	4,025,132	664,665	1,284,812	2,095	1,321	19.4	22.2	45,696,134
Tracks	3,412	123,976	138,961	448,300	74,027	143,096	2,095	1,321	19.4	22.2	5,089,637
Stations	3,412	123,976	138,961	2,377,268	392,555	758,818	2,095	1,321	19.4	22.2	26,989,597
Sitework	3,412	123,976	138,961	419,588	69,286	133,931	2,095	1,321	19.4	22.2	4,763,669
Systems	3,412	123,976	138,961	709,316	117,128	226,412	2,095	1,321	19.4	22.2	8,053,009
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO END OF PROJECT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
SUPPORT FACILITIES AND VEHICLES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	915,138	151,116	292,110	2,095	1,321	19.4	22.2	10,389,740
<b>TOTAL MODE COST</b>											
	3,412	123,976	138,961	37,676	6,221	12,026	2,095	1,321	19.4	22.2	427,743
<b>TOTAL PROJECT COST</b>											

Note: 1. With the exception of the 29th and 33rd Street Bridges, high

The cost estimates do not include any contingencies for risk



**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 3 - LRT 3A - Downstream Bridge Mill District MOS <sup>1</sup>		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu) Highway	Energy (Btu) Transit	Energy (Btu) Total
	Highway	Transit						
<b><i>SOUTH HIGHWAY APPROACH</i></b>								
<b>I-5 MAINLINE</b>								
Pavement	\$8,035,260	\$0	Urban Freeway	47,332	0.0865465	32,915,777,257	0	32,915,777,257
Earthwork	\$1,775,347	\$0	Site Work	21,079	0.0865465	3,238,788,432	0	3,238,788,432
Bridges	\$148,360,710	\$0	Bridge Concrete Box Girder	48,364	0.0865465	620,998,341,768	0	620,998,341,768
Other	\$1,919,400	\$0	Signals	21,079	0.0865465	3,501,586,178	0	3,501,586,178
<b>SUBTOTAL</b>	<b>\$160,090,717</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>								
Pavement	\$258,540	\$0	Urban Freeway	47,332	0.0865465	1,059,087,702	0	1,059,087,702
Earthwork		\$0	Site Work	21,079	0.0865465	0	0	0
Bridges	\$3,529,500	\$0	Bridge Concrete Box Girder	48,364	0.0865465	14,773,545,147	0	14,773,545,147
<b>SUBTOTAL</b>	<b>\$3,788,040</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>VICTORY BLVD INTERCHANGE</b>								
Pavement	\$189,250	\$0	Urban Freeway	47,332	0.0865465	775,246,955	0	775,246,955
<b>SUBTOTAL</b>	<b>\$189,250</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>MARINE DRIVE INTERCHANGE</b>								
Pavement	\$2,966,727	\$0	Urban Freeway	47,332	0.0865465	12,152,951,506	0	12,152,951,506
Earthwork	\$389,894	\$0	Site Work	21,079	0.0865465	711,288,945	0	711,288,945
Bridges	\$215,044,315	\$0	Bridge Concrete Box Girder	48,364	0.0865465	900,118,117,672	0	900,118,117,672
Walls	\$516,000	\$0	Structures	50,100	0.0865465	2,237,364,549	0	2,237,364,549
Other	\$530,000	\$0	Signals	21,079	0.0865465	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$219,446,936</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>HAYDEN ISLAND INTERCHANGE</b>								
Pavement	\$6,429,201	\$0	Urban Freeway	47,332	0.0865465	26,336,689,548	0	26,336,689,548
Earthwork	\$4,774,649	\$0	Site Work	21,079	0.0865465	8,710,453,977	0	8,710,453,977
Bridges	\$52,937,550	\$0	Bridge Concrete Box Girder	48,364	0.0865465	221,582,457,830	0	221,582,457,830
Walls	\$1,094,500	\$0	Structures	50,100	0.0865465	4,745,727,712	0	4,745,727,712
Other	\$530,000	\$0	Signals	21,079	0.0865465	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$65,765,900</b>	<b>\$0</b>		0	0.0865465	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$90,466,507	\$0		0	0.0865465	0	0	0
PROFESSIONAL SERVICES	\$123,844,417	\$0		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$51,110,000	\$0		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$714,701,767</b>	<b>\$0</b>		0	0.0865465	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 3 - LRT 3A - Downstream Bridge Mill District MOS'		Caltrans Construction Activity	Energy Factor	1973\$/	Energy (Btu)	Energy (Btu)	Energy (Btu)
	Highway	Transit		(Btu/1973\$)	2007\$	Highway	Transit	Total
<b>NORTH HIGHWAY APPROACH</b>				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
<b>I-5 MAINLINE</b>				0	0.0865465	0	0	0
Pavement	\$21,447,327		\$0 Urban Freeway	47,332	0.0865465	87,857,199,910	0	87,857,199,910
Earthwork	\$5,090,904		\$0 Site Work	21,079	0.0865465	9,287,402,078	0	9,287,402,078
Bridges	\$25,612,303		\$0 Bridge Concrete Box Girder	48,364	0.0865465	107,206,267,014	0	107,206,267,014
Walls	\$3,848,133		\$0 Structures	50,100	0.0865465	16,685,419,293	0	16,685,419,293
Other	\$3,304,082		\$0 Signals	21,079	0.0865465	6,027,678,973	0	6,027,678,973
<b>SUBTOTAL</b>	<b>\$59,302,749</b>	<b>\$0</b>		0	0.0865465	0	0	0
				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
<b>COLLECTOR/DISTRIBUOR ROADS</b>				0	0.0865465	0	0	0
Pavement	\$3,390,057		\$0 Urban Freeway	47,332	0.0865465	13,887,089,764	0	13,887,089,764
Earthwork	\$2,276,945		\$0 Site Work	21,079	0.0865465	4,153,859,349	0	4,153,859,349
Bridges	\$1,030,594		\$0 Bridge Concrete Box Girder	48,364	0.0865465	4,313,792,222	0	4,313,792,222
Walls	\$2,053,636		\$0 Structures	50,100	0.0865465	8,904,520,123	0	8,904,520,123
<b>SUBTOTAL</b>	<b>\$8,751,232</b>	<b>\$0</b>		0	0.0865465	0	0	0
				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
<b>SR 14 INTERCHANGE</b>				0	0.0865465	0	0	0
Pavement	\$6,039,945		\$0 Urban Freeway	47,332	0.0865465	24,742,133,461	0	24,742,133,461
Earthwork	\$3,658,118		\$0 Site Work	21,079	0.0865465	6,673,551,068	0	6,673,551,068
Bridges	\$43,366,360		\$0 Bridge Concrete Box Girder	48,364	0.0865465	181,520,009,866	0	181,520,009,866
Walls	\$8,813,431		\$0 Structures	50,100	0.0865465	38,214,841,234	0	38,214,841,234
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$62,451,313</b>	<b>\$0</b>		0	0.0865465	0	0	0
				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
<b>EVERGREEN BLVD BRIDGE</b>				0	0.0865465	0	0	0
Pavement	\$306,810		\$0 Urban Freeway	47,332	0.0865465	1,256,820,761	0	1,256,820,761
Earthwork	\$34,069		\$0 Site Work	21,079	0.0865465	62,152,396	0	62,152,396
Bridges	\$8,764,654		\$0 Bridge Concrete Box Girder	48,364	0.0865465	36,686,504,624	0	36,686,504,624
<b>SUBTOTAL</b>	<b>\$9,105,533</b>	<b>\$0</b>		0	0.0865465	0	0	0
				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
<b>MILL PLAIN BLVD INTERCHANGE</b>				0	0.0865465	0	0	0
Pavement	\$3,990,794		\$0 Urban Freeway	47,332	0.0865465	16,347,955,612	0	16,347,955,612
Earthwork	\$3,193,595		\$0 Site Work	21,079	0.0865465	5,826,117,453	0	5,826,117,453
Bridges	\$3,163,162		\$0 Bridge Concrete Box Girder	48,364	0.0865465	13,240,152,372	0	13,240,152,372
Walls	\$837,468		\$0 Structures	50,100	0.0865465	3,631,242,663	0	3,631,242,663
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$11,758,479</b>	<b>\$0</b>		0	0.0865465	0	0	0
				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
<b>4th PLAIN BLVD INTERCHANGE</b>				0	0.0865465	0	0	0
Pavement	\$3,382,758		\$0 Urban Freeway	47,332	0.0865465	13,857,189,311	0	13,857,189,311
Earthwork	\$2,613,005		\$0 Site Work	21,079	0.0865465	4,766,938,934	0	4,766,938,934
Bridges	\$50,951,542		\$0 Bridge Concrete Box Girder	48,364	0.0865465	213,269,559,567	0	213,269,559,567
Walls	\$18,694,255		\$0 Structures	50,100	0.0865465	81,057,874,828	0	81,057,874,828
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$76,215,021</b>	<b>\$0</b>		0	0.0865465	0	0	0
				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>				0	0.0865465	0	0	0
Pavement	\$412,171		\$0 Urban Freeway	47,332	0.0865465	1,688,422,685	0	1,688,422,685
Earthwork	\$259,511		\$0 Site Work	21,079	0.0865465	473,429,644	0	473,429,644
Bridges	\$11,274,727		\$0 Bridge Concrete Box Girder	48,364	0.0865465	47,192,997,413	0	47,192,997,413
<b>SUBTOTAL</b>	<b>\$11,946,409</b>	<b>\$0</b>		0	0.0865465	0	0	0
				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
<b>SR 500 INTERCHANGE</b>				0	0.0865465	0	0	0
Pavement	\$5,148,198		\$0 Urban Freeway	47,332	0.0865465	21,089,167,639	0	21,089,167,639
Earthwork	\$2,834,254		\$0 Site Work	21,079	0.0865465	5,170,566,307	0	5,170,566,307
Bridges	\$45,544,415		\$0 Bridge Concrete Box Girder	48,364	0.0865465	190,636,767,632	0	190,636,767,632
Walls	\$4,758,095		\$0 Structures	50,100	0.0865465	20,630,994,331	0	20,630,994,331
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$58,858,422</b>	<b>\$0</b>		0	0.0865465	0	0	0
				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	\$66,425,592		\$0	0	0.0865465	0	0	0
<b>PROFESSIONAL SERVICES</b>	\$85,359,245		\$0	0	0.0865465	0	0	0
<b>RIGHT-OF-WAY</b>	\$11,580,646		\$0	0	0.0865465	0	0	0
				0	0.0865465	0	0	0
				0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$461,754,642</b>	<b>\$0</b>		0	0.0865465	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 3 - LRT 3A - Downstream Bridge Mill District MOS <sup>1</sup>		Caltrans Construction Activity	Energy Factor	1973\$/	Energy (Btu)	Energy (Btu)	Energy (Btu)
	Highway	Transit		(Btu/1973\$)	2007\$	Highway	Transit	Total
<b>COLUMBIA RIVER BRIDGES</b>				0	0.0865465	0	0	0
COLU Bridges	\$59,009,741	\$0	Bridge Concrete Box Girder	48,364	0.0865465	246,999,028,145	0	246,999,028,145
COLU Bridges	\$227,849,194	\$0	Bridge Concrete Box Girder	48,364	0.0865465	953,715,925,837	0	953,715,925,837
COLU Bridges	\$231,771,450	\$0	Bridge Concrete Box Girder	48,364	0.0865465	970,133,439,445	0	970,133,439,445
COLU Bridges	\$33,479,852	\$77,455,753	Bridge Concrete Box Girder	48,364	0.0865465	140,137,725,433	324,209,111,494	464,346,836,927
COLU Bridges			Bridge Concrete Box Girder	48,364	0.0865465	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$81,400,064	\$13,638,381		0	0.0865465	0	0	0
PROFESSIONAL SERVICES	\$153,747,419	\$20,965,557		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$24,684,320	\$4,131,432		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$ 811,942,040</b>	<b>\$ 116,191,123</b>		0	0.0865465	0	0	0
<b>TRANSIT</b>				0	0.0865465	0	0	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>				0	0.0865465	0	0	0
Guideway	\$21,815,388	\$54,906,686	Track Work	50,100	0.0865465	94,591,038,254	238,074,172,040	332,665,210,294
Tracks	\$0	\$6,140,655	Track Work	50,100	0.0865465	0	26,625,743,810	26,625,743,810
Stations	\$0	\$3,280,000	Stations, Stops and Terminals	50,100	0.0865465	0	14,222,007,212	14,222,007,212
Sitework	\$0	\$338,000	Site Work	21,079	0.0865465	0	616,617,760	616,617,760
Systems	\$0	\$6,955,962	Stations, Stops and Terminals	50,100	0.0865465	0	30,160,894,701	30,160,894,701
<b>SUBTOTAL</b>	<b>\$21,815,388</b>	<b>\$71,621,303</b>		0	0.0865465	0	0	0
<b>STATE LINE TO CLARK COLLEGE</b>				0	0.0865465	0	0	0
Guideway			Track Work	50,100	0.0865465	0	0	0
Tracks			Track Work	50,100	0.0865465	0	0	0
Stations			Stations, Stops and Terminals	50,100	0.0865465	0	0	0
Sitework			Site Work	21,079	0.0865465	0	0	0
Systems			Stations, Stops and Terminals	50,100	0.0865465	0	0	0
<b>SUBTOTAL</b>				0	0.0865465	0	0	0
<b>CLARK COLLEGE TO END OF PROJECT</b>				0	0.0865465	0	0	0
Guideway			Track Work	50,100	0.0865465	0	0	0
Tracks			Track Work	50,100	0.0865465	0	0	0
Stations			Stations, Stops and Terminals	50,100	0.0865465	0	0	0
Sitework			Site Work	21,079	0.0865465	0	0	0
Systems			Stations, Stops and Terminals	50,100	0.0865465	0	0	0
<b>SUBTOTAL</b>				0	0.0865465	0	0	0
<b>STATE LINE TO END OF PROJECT</b>				0	0.0865465	0	0	0
Guideway	\$0	\$7,188,156	Track Work	50,100	0.0865465	0	31,167,682,967	31,167,682,967
Tracks	\$0	\$8,060,824	Track Work	50,100	0.0865465	0	34,951,555,110	34,951,555,110
Stations	\$0	\$29,074,422	Stations, Stops and Terminals	50,100	0.0865465	0	126,066,048,590	126,066,048,590
Sitework	\$0	\$33,078,395	Site Work	21,079	0.0865465	0	60,345,343,508	60,345,343,508
Systems	\$0	\$15,275,869	Stations, Stops and Terminals	50,100	0.0865465	0	66,235,831,072	66,235,831,072
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$92,677,667</b>		0	0.0865465	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$82,000	\$36,093,290		0	0.0865465	0	0	0
SUPPORT FACILITIES AND VEHICLES	\$0	\$49,968,000		0	0.0865465	0	0	0
PROFESSIONAL SERVICES	\$0	\$73,841,835		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$754,000	\$10,692,798		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$22,651,388</b>	<b>\$334,894,892</b>						<b>6,404,586,662,655</b>
<b>TOTAL MODE COST</b>	<b>\$2,011,049,837</b>	<b>\$451,086,015</b>						
<b>TOTAL PROJECT COST</b>	<b>\$2,462,135,852</b>							

Note: 1. With the exception of the 29th and 33rd Street Bridges, highway costs have not been adjusted to reflect the

The cost estimates do not include any contingencies for risk or uncertainty.

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub>
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (n.gas)	Gasoline	Diesel	Emissions (lbs)
<b><i>SOUTH HIGHWAY APPROACH</i></b>											
<b>I-5 MAINLINE</b>											
Pavement	3,412	123,976	138,961	482,353	79,650	153,966	2,095	1,321	19.4	22.2	5,476,252
Earthwork	3,412	123,976	138,961	47,462	7,837	15,150	2,095	1,321	19.4	22.2	538,843
Bridges	3,412	123,976	138,961	9,100,210	1,502,706	2,904,764	2,095	1,321	19.4	22.2	103,316,509
Other	3,412	123,976	138,961	51,313	8,473	16,379	2,095	1,321	19.4	22.2	582,565
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>											
Pavement	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,961	15,520	2,563	4,954	2,095	1,321	19.4	22.2	176,202
Bridges	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	216,494	35,749	69,104	2,095	1,321	19.4	22.2	2,457,899
<b>VICTORY BLVD INTERCHANGE</b>											
Pavement	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Bridges	3,412	123,976	138,961	11,361	1,876	3,626	2,095	1,321	19.4	22.2	128,979
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>MARINE DRIVE INTERCHANGE</b>											
Pavement	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,961	178,091	29,408	56,846	2,095	1,321	19.4	22.2	2,021,906
Bridges	3,412	123,976	138,961	10,423	1,721	3,327	2,095	1,321	19.4	22.2	118,338
Walls	3,412	123,976	138,961	13,190,477	2,178,127	4,210,367	2,095	1,321	19.4	22.2	149,754,123
Other	3,412	123,976	138,961	32,787	5,414	10,465	2,095	1,321	19.4	22.2	372,234
<b>SUBTOTAL</b>	3,412	123,976	138,961	14,169	2,340	4,523	2,095	1,321	19.4	22.2	160,862
<b>HAYDEN ISLAND INTERCHANGE</b>											
Pavement	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,961	385,942	63,730	123,192	2,095	1,321	19.4	22.2	4,381,678
Bridges	3,412	123,976	138,961	127,644	21,078	40,744	2,095	1,321	19.4	22.2	1,449,172
Walls	3,412	123,976	138,961	3,247,105	536,190	1,036,468	2,095	1,321	19.4	22.2	36,865,036
Other	3,412	123,976	138,961	69,545	11,484	22,198	2,095	1,321	19.4	22.2	789,554
<b>SUBTOTAL</b>	3,412	123,976	138,961	14,169	2,340	4,523	2,095	1,321	19.4	22.2	160,862
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>											
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub>
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (n.gas)	Gasoline	Diesel	Emissions
											(lbs)
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>NORTH HIGHWAY APPROACH</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>I-5 MAINLINE</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	1,287,474	212,599	410,958	2.095	1.321	19.4	22.2	14,616,946
Earthwork	3,412	123,976	138,961	136,099	22,474	43,442	2.095	1.321	19.4	22.2	1,545,160
Bridges	3,412	123,976	138,961	1,571,018	259,420	501,465	2.095	1.321	19.4	22.2	17,836,082
Walls	3,412	123,976	138,961	244,511	40,376	78,047	2.095	1.321	19.4	22.2	2,775,980
Other	3,412	123,976	138,961	88,331	14,586	28,195	2.095	1.321	19.4	22.2	1,002,835
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUOR ROADS</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	203,504	33,604	64,958	2.095	1.321	19.4	22.2	2,310,418
Earthwork	3,412	123,976	138,961	60,871	10,052	19,430	2.095	1.321	19.4	22.2	691,084
Bridges	3,412	123,976	138,961	63,215	10,439	20,178	2.095	1.321	19.4	22.2	717,693
Walls	3,412	123,976	138,961	130,488	21,547	41,652	2.095	1.321	19.4	22.2	1,481,460
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>SR 14 INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	362,575	59,872	115,733	2.095	1.321	19.4	22.2	4,116,389
Earthwork	3,412	123,976	138,961	97,795	16,149	31,216	2.095	1.321	19.4	22.2	1,110,290
Bridges	3,412	123,976	138,961	2,660,024	439,246	849,073	2.095	1.321	19.4	22.2	30,199,781
Walls	3,412	123,976	138,961	560,006	92,473	178,753	2.095	1.321	19.4	22.2	6,357,866
Other	3,412	123,976	138,961	15,331	2,532	4,894	2.095	1.321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>EVERGREEN BLVD BRIDGE</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	18,418	3,041	5,879	2.095	1.321	19.4	22.2	209,099
Earthwork	3,412	123,976	138,961	911	150	291	2.095	1.321	19.4	22.2	10,340
Bridges	3,412	123,976	138,961	537,610	88,775	171,604	2.095	1.321	19.4	22.2	6,103,594
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>MILL PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	239,566	39,559	76,469	2.095	1.321	19.4	22.2	2,719,836
Earthwork	3,412	123,976	138,961	85,377	14,098	27,252	2.095	1.321	19.4	22.2	969,301
Bridges	3,412	123,976	138,961	194,023	32,039	61,932	2.095	1.321	19.4	22.2	2,202,786
Walls	3,412	123,976	138,961	53,213	8,787	16,985	2.095	1.321	19.4	22.2	604,136
Other	3,412	123,976	138,961	15,331	2,532	4,894	2.095	1.321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>4th PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	203,065	33,532	64,818	2.095	1.321	19.4	22.2	2,305,443
Earthwork	3,412	123,976	138,961	69,855	11,535	22,298	2.095	1.321	19.4	22.2	793,083
Bridges	3,412	123,976	138,961	3,125,287	516,075	997,584	2.095	1.321	19.4	22.2	35,482,005
Walls	3,412	123,976	138,961	1,187,835	196,146	379,154	2.095	1.321	19.4	22.2	13,485,731
Other	3,412	123,976	138,961	15,331	2,532	4,894	2.095	1.321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	24,742	4,086	7,898	2.095	1.321	19.4	22.2	280,906
Earthwork	3,412	123,976	138,961	6,938	1,146	2,215	2.095	1.321	19.4	22.2	78,765
Bridges	3,412	123,976	138,961	691,574	114,199	220,749	2.095	1.321	19.4	22.2	7,851,576
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>SR 500 INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	309,044	51,032	98,646	2.095	1.321	19.4	22.2	3,508,639
Earthwork	3,412	123,976	138,961	75,770	12,512	24,186	2.095	1.321	19.4	22.2	860,236
Bridges	3,412	123,976	138,961	2,793,622	461,307	891,717	2.095	1.321	19.4	22.2	31,716,551
Walls	3,412	123,976	138,961	302,330	49,923	96,503	2.095	1.321	19.4	22.2	3,432,412
Other	3,412	123,976	138,961	15,331	2,532	4,894	2.095	1.321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>PROFESSIONAL SERVICES</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>RIGHT-OF-WAY</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub>
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (n.gas)	Gasoline	Diesel	Emissions
											(lbs)
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLUMBIA RIVER BRIDGES</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
COLL Bridges	3,412	123,976	138,961	3,619,564	597,694	1,155,356	2,095	1,321	19.4	22.2	41,093,632
COLL Bridges	3,412	123,976	138,961	13,975,907	2,307,824	4,461,074	2,095	1,321	19.4	22.2	158,671,278
COLL Bridges	3,412	123,976	138,961	14,216,492	2,347,551	4,537,868	2,095	1,321	19.4	22.2	161,402,686
COLL Bridges	3,412	123,976	138,961	6,804,614	1,123,637	2,172,015	2,095	1,321	19.4	22.2	77,254,142
COLL Bridges	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TRANSIT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	4,874,930	804,991	1,556,065	2,095	1,321	19.4	22.2	55,346,055
Tracks	3,412	123,976	138,961	390,178	64,430	124,544	2,095	1,321	19.4	22.2	4,429,769
Stations	3,412	123,976	138,961	208,412	34,415	66,524	2,095	1,321	19.4	22.2	2,366,139
Sitework	3,412	123,976	138,961	9,036	1,492	2,884	2,095	1,321	19.4	22.2	102,588
Systems	3,412	123,976	138,961	441,983	72,984	141,080	2,095	1,321	19.4	22.2	5,017,917
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO CLARK COLLEGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>CLARK COLLEGE TO END OF PROJECT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO END OF PROJECT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	456,736	75,420	145,789	2,095	1,321	19.4	22.2	5,185,418
Tracks	3,412	123,976	138,961	512,186	84,577	163,488	2,095	1,321	19.4	22.2	5,814,947
Stations	3,412	123,976	138,961	1,847,392	305,058	589,683	2,095	1,321	19.4	22.2	20,973,815
Sitework	3,412	123,976	138,961	884,310	146,025	282,270	2,095	1,321	19.4	22.2	10,039,753
Systems	3,412	123,976	138,961	970,631	160,279	309,823	2,095	1,321	19.4	22.2	11,019,763
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
SUPPORT FACILITIES AND VEHICLES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	15,497,967	29,957,911	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	15,497,967	29,957,911	2,095	1,321	19.4	22.2	0

**TOTAL MODE COST**

**TOTAL PROJECT COST**

Note: 1. With the exception of the 29th and 33rd Street Bridges, highw

The cost estimates do not include any contingencies for risk

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 3 - LRT 3A - Downstream Bridge Clark College MOS <sup>1</sup>		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu) Highway	Energy (Btu) Transit	Energy (Btu) Total
	Highway	Transit						
<b><i>SOUTH HIGHWAY APPROACH</i></b>								
<b>I-5 MAINLINE</b>								
Pavement	\$8,035,260	\$0	Urban Freeway	47.332	0.086546	32,915,777,257	0	32,915,777,257
Earthwork	\$1,775,347	\$0	Site Work	21.079	0.086546	3,238,788,432	0	3,238,788,432
Bridges	\$148,360,710	\$0	Bridge Concrete Box Girder	48,364	0.086546	620,998,341,768	0	620,998,341,768
Other	\$1,919,400	\$0	Signals	21,079	0.086546	3,501,586,178	0	3,501,586,178
<b>SUBTOTAL</b>	<b>\$160,090,717</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>								
Pavement	\$258,540	\$0	Urban Freeway	47.332	0.086546	1,059,087,702	0	1,059,087,702
Earthwork		\$0	Site Work	21.079	0.086546	0	0	0
Bridges	\$3,529,500	\$0	Bridge Concrete Box Girder	48,364	0.086546	14,773,545,147	0	14,773,545,147
<b>SUBTOTAL</b>	<b>\$3,788,040</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>VICTORY BLVD INTERCHANGE</b>								
Pavement	\$189,250	\$0	Urban Freeway	47.332	0.086546	775,246,955	0	775,246,955
<b>SUBTOTAL</b>	<b>\$189,250</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>MARINE DRIVE INTERCHANGE</b>								
Pavement	\$2,966,727	\$0	Urban Freeway	47.332	0.086546	12,152,951,506	0	12,152,951,506
Earthwork	\$389,894	\$0	Site Work	21.079	0.086546	711,288,945	0	711,288,945
Bridges	\$215,044,315	\$0	Bridge Concrete Box Girder	48,364	0.086546	900,118,117,672	0	900,118,117,672
Walls	\$516,000	\$0	Structures	50,100	0.086546	2,237,364,549	0	2,237,364,549
Other	\$530,000	\$0	Signals	21,079	0.086546	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$219,446,936</b>	<b>\$0</b>		0	0.086546	0	0	0
<b>HAYDEN ISLAND INTERCHANGE</b>								
Pavement	\$6,429,201	\$0	Urban Freeway	47.332	0.086546	26,336,689,548	0	26,336,689,548
Earthwork	\$4,774,649	\$0	Site Work	21.079	0.086546	8,710,453,977	0	8,710,453,977
Bridges	\$52,937,550	\$0	Bridge Concrete Box Girder	48,364	0.086546	221,582,457,830	0	221,582,457,830
Walls	\$1,094,500	\$0	Structures	50,100	0.086546	4,745,727,712	0	4,745,727,712
Other	\$530,000	\$0	Signals	21,079	0.086546	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$65,765,900</b>	<b>\$0</b>		0	0.086546	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$90,466,507	\$0		0	0.086546	0	0	0
PROFESSIONAL SERVICES	\$123,844,417	\$0		0	0.086546	0	0	0
RIGHT-OF-WAY	\$51,110,000	\$0		0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$714,701,767</b>	<b>\$0</b>		0	0.086546	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 3 - LRT 3A - Downstream Bridge Clark College MOS <sup>1</sup>		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu)		Energy (Btu) Transit	Energy (Btu) Total
	Highway	Transit				Highway	Transit		
<b>NORTH HIGHWAY APPROACH</b>				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>I-5 MAINLINE</b>				0	0	0.086546	0	0	0
Pavement	\$21,447,327		\$0 Urban Freeway	47,332	0.086546	87,857,199,910	0	0	87,857,199,910
Earthwork	\$5,090,904		\$0 Site Work	21,079	0.086546	9,287,402,078	0	0	9,287,402,078
Bridges	\$25,612,303		\$0 Bridge Concrete Box Girder	48,364	0.086546	107,206,267,014	0	0	107,206,267,014
Walls	\$3,848,133		\$0 Structures	50,100	0.086546	16,685,419,293	0	0	16,685,419,293
Other	\$3,304,082		\$0 Signals	21,079	0.086546	6,027,678,973	0	0	6,027,678,973
<b>SUBTOTAL</b>	<b>\$59,302,749</b>		<b>\$0</b>	0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>				0	0	0.086546	0	0	0
Pavement	\$3,390,057		\$0 Urban Freeway	47,332	0.086546	13,887,089,764	0	0	13,887,089,764
Earthwork	\$2,276,945		\$0 Site Work	21,079	0.086546	4,153,859,349	0	0	4,153,859,349
Bridges	\$1,030,594		\$0 Bridge Concrete Box Girder	48,364	0.086546	4,313,792,222	0	0	4,313,792,222
Walls	\$2,053,636		\$0 Structures	50,100	0.086546	8,904,520,123	0	0	8,904,520,123
<b>SUBTOTAL</b>	<b>\$8,751,232</b>		<b>\$0</b>	0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>SR 14 INTERCHANGE</b>				0	0	0.086546	0	0	0
Pavement	\$6,039,945		\$0 Urban Freeway	47,332	0.086546	24,742,133,461	0	0	24,742,133,461
Earthwork	\$3,658,118		\$0 Site Work	21,079	0.086546	6,673,551,068	0	0	6,673,551,068
Bridges	\$43,366,360		\$0 Bridge Concrete Box Girder	48,364	0.086546	181,520,009,866	0	0	181,520,009,866
Walls	\$8,813,431		\$0 Structures	50,100	0.086546	38,214,841,234	0	0	38,214,841,234
Other	\$573,460		\$0 Signals	21,079	0.086546	1,046,170,475	0	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$62,451,313</b>		<b>\$0</b>	0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>EVERGREEN BLVD BRIDGE</b>				0	0	0.086546	0	0	0
Pavement	\$306,810		\$0 Urban Freeway	47,332	0.086546	1,256,820,761	0	0	1,256,820,761
Earthwork	\$34,069		\$0 Site Work	21,079	0.086546	62,152,396	0	0	62,152,396
Bridges	\$8,764,654		\$0 Bridge Concrete Box Girder	48,364	0.086546	36,686,504,624	0	0	36,686,504,624
<b>SUBTOTAL</b>	<b>\$9,105,533</b>		<b>\$0</b>	0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>MILL PLAIN BLVD INTERCHANGE</b>				0	0	0.086546	0	0	0
Pavement	\$3,990,794		\$0 Urban Freeway	47,332	0.086546	16,347,955,612	0	0	16,347,955,612
Earthwork	\$3,193,595		\$0 Site Work	21,079	0.086546	5,826,117,453	0	0	5,826,117,453
Bridges	\$3,163,162		\$0 Bridge Concrete Box Girder	48,364	0.086546	13,240,152,372	0	0	13,240,152,372
Walls	\$837,468		\$0 Structures	50,100	0.086546	3,631,242,663	0	0	3,631,242,663
Other	\$573,460		\$0 Signals	21,079	0.086546	1,046,170,475	0	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$11,758,479</b>		<b>\$0</b>	0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>4th PLAIN BLVD INTERCHANGE</b>				0	0	0.086546	0	0	0
Pavement	\$3,382,758	\$757,065	Urban Freeway	47,332	0.086546	13,857,189,311	3,101,252,366	0	16,958,441,677
Earthwork	\$2,613,005	\$321,851	Site Work	21,079	0.086546	4,766,938,934	587,156,270	0	5,354,095,204
Bridges	\$50,951,542	\$0	Bridge Concrete Box Girder	48,364	0.086546	213,269,559,567	0	0	213,269,559,567
Walls	\$18,694,255	\$0	Structures	50,100	0.086546	81,057,874,828	0	0	81,057,874,828
Other	\$573,460	\$0	Signals	21,079	0.086546	1,046,170,475	0	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$76,215,021</b>	<b>\$1,078,915</b>		0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>				0	0	0.086546	0	0	0
Pavement	\$412,171		\$0 Urban Freeway	47,332	0.086546	1,688,422,685	0	0	1,688,422,685
Earthwork	\$259,511		\$0 Site Work	21,079	0.086546	473,429,644	0	0	473,429,644
Bridges	\$11,274,727		\$0 Bridge Concrete Box Girder	48,364	0.086546	47,192,997,413	0	0	47,192,997,413
<b>SUBTOTAL</b>	<b>\$11,946,409</b>	<b>\$0</b>		0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>SR 500 INTERCHANGE</b>				0	0	0.086546	0	0	0
Pavement	\$5,148,198		\$0 Urban Freeway	47,332	0.086546	21,089,167,639	0	0	21,089,167,639
Earthwork	\$2,834,254		\$0 Site Work	21,079	0.086546	5,170,566,307	0	0	5,170,566,307
Bridges	\$45,544,415		\$0 Bridge Concrete Box Girder	48,364	0.086546	190,636,767,632	0	0	190,636,767,632
Walls	\$4,758,095		\$0 Structures	50,100	0.086546	20,630,994,331	0	0	20,630,994,331
Other	\$573,460		\$0 Signals	21,079	0.086546	1,046,170,475	0	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$58,858,422</b>	<b>\$0</b>		0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	\$66,772,669	\$0		0	0	0.086546	0	0	0
<b>PROFESSIONAL SERVICES</b>	\$85,672,963	\$0		0	0	0.086546	0	0	0
<b>RIGHT-OF-WAY</b>	\$11,580,646	\$0		0	0	0.086546	0	0	0
				0	0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$462,415,437</b>	<b>\$1,078,915</b>		0	0	0.086546	0	0	0



**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 3 - LRT 3A - Downstream Bridge			Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu)		Energy (Btu) Total
	Clark College MOS <sup>1</sup>					Highway	Transit	
	Highway	Transit	Caltrans Construction Activity			Highway	Transit	
<b>COLUMBIA RIVER BRIDGES</b>				0	0.086546			0
COLU Bridges	\$59,009,741	\$0	Bridge Concrete Box Girder	48,364	0.086546	246,999,028,145	0	246,999,028,145
COLU Bridges	\$227,849,194	\$0	Bridge Concrete Box Girder	48,364	0.086546	953,715,925,837	0	953,715,925,837
COLU Bridges	\$231,771,450	\$0	Bridge Concrete Box Girder	48,364	0.086546	970,133,439,445	0	970,133,439,445
COLU Bridges	\$33,479,852	\$77,455,753	Bridge Concrete Box Girder	48,364	0.086546	140,137,725,433	324,209,111,494	464,346,836,927
COLU Bridges			Bridge Concrete Box Girder	48,364	0.086546	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$81,400,064	\$13,638,381		0	0.086546	0	0	0
PROFESSIONAL SERVICES	\$153,747,419	\$20,965,557		0	0.086546	0	0	0
RIGHT-OF-WAY	\$24,684,320	\$4,131,432		0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$ 811,942,040</b>	<b>\$ 116,191,123</b>		0	0.086546	0	0	0
<b>TRANSIT</b>				0	0.086546	0	0	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>				0	0.086546	0	0	0
Guideway	\$21,815,388	\$54,906,686	Track Work	50,100	0.086546	94,591,038,254	238,074,172,040	332,665,210,294
Tracks	\$0	\$5,140,655	Track Work	50,100	0.086546	0	26,625,743,810	26,625,743,810
Stations	\$0	\$3,280,000	Stations, Stops and Terminals	50,100	0.086546	0	14,222,007,212	14,222,007,212
Sitework	\$0	\$338,000	Site Work	21,079	0.086546	0	616,617,760	616,617,760
Systems	\$0	\$6,955,962	Stations, Stops and Terminals	50,100	0.086546	0	30,160,894,701	30,160,894,701
<b>SUBTOTAL</b>	<b>\$21,815,388</b>	<b>\$71,621,303</b>		0	0.086546	0	0	0
<b>STATE LINE TO CLARK COLLEGE</b>				0	0.086546	0	0	0
Guideway			Track Work	50,100	0.086546	0	0	0
Tracks			Track Work	50,100	0.086546	0	0	0
Stations			Stations, Stops and Terminals	50,100	0.086546	0	0	0
Sitework			Site Work	21,079	0.086546	0	0	0
Systems			Stations, Stops and Terminals	50,100	0.086546	0	0	0
<b>SUBTOTAL</b>				0	0.086546	0	0	0
<b>CLARK COLLEGE TO END OF PROJECT</b>				0	0.086546	0	0	0
Guideway			Track Work	50,100	0.086546	0	0	0
Tracks			Track Work	50,100	0.086546	0	0	0
Stations			Stations, Stops and Terminals	50,100	0.086546	0	0	0
Sitework			Site Work	21,079	0.086546	0	0	0
Systems			Stations, Stops and Terminals	50,100	0.086546	0	0	0
<b>SUBTOTAL</b>				0	0.086546	0	0	0
<b>STATE LINE TO END OF PROJECT</b>				0	0.086546	0	0	0
Guideway	\$0	\$14,496,674	Track Work	50,100	0.086546	0	62,857,256,199	62,857,256,199
Tracks	\$0	\$11,409,317	Track Work	50,100	0.086546	0	49,470,544,066	49,470,544,066
Stations	\$0	\$34,003,962	Stations, Stops and Terminals	50,100	0.086546	0	147,440,424,914	147,440,424,914
Sitework	\$0	\$31,674,609	Site Work	21,079	0.086546	0	57,784,397,141	57,784,397,141
Systems	\$0	\$20,856,945	Stations, Stops and Terminals	50,100	0.086546	0	90,435,248,507	90,435,248,507
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$112,441,506</b>		0	0.086546	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$82,000	\$41,401,347		0	0.086546	0	0	0
SUPPORT FACILITIES AND VEHICLES	\$0	\$66,207,600		0	0.086546	0	0	0
PROFESSIONAL SERVICES	\$0	\$83,756,594		0	0.086546	0	0	0
RIGHT-OF-WAY	\$754,000	\$20,430,798		0	0.086546	0	0	0
<b>TOTAL</b>	<b>\$22,651,388</b>	<b>\$395,859,148</b>						<b>6,497,496,480,871</b>
<b>TOTAL MODE COST</b>	<b>\$2,011,710,632</b>	<b>\$513,129,186</b>				16th Street Tunnel, Add:		62,448,989,712
						<b>Total (w/16th Tunnel):</b>		<b>6,559,945,470,583</b>
<b>TOTAL PROJECT COST</b>	<b>\$2,524,839,817</b>					McLoughlin Tunnel, Add:		2,571,006,790
						<b>Total (w/McLoughlin Tunnel):</b>		<b>6,500,067,487,661</b>

Note: 1. With the exception of the 29th and 33rd Street Bridges, highway costs have not been adjusted to reflect it

The cost estimates do not include any contingencies for risk or uncertainty.

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coelectricity (n.g.	Gasoline	Diesel		
<b><i>SOUTH HIGHWAY APPROACH</i></b>											
<b>I-5 MAINLINE</b>											
Pavement	3,412	123,976	138,961	482,353	79,650	153,966	2,095	1,321	19.4	22.2	5,476,252
Earthwork	3,412	123,976	138,961	47,462	7,837	15,150	2,095	1,321	19.4	22.2	538,843
Bridges	3,412	123,976	138,961	9,100,210	1,502,706	2,904,764	2,095	1,321	19.4	22.2	103,316,509
Other	3,412	123,976	138,961	51,313	8,473	16,379	2,095	1,321	19.4	22.2	582,565
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>											
Pavement	3,412	123,976	138,961	15,520	2,563	4,954	2,095	1,321	19.4	22.2	176,202
Earthwork	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Bridges	3,412	123,976	138,961	216,494	35,749	69,104	2,095	1,321	19.4	22.2	2,457,899
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>VICTORY BLVD INTERCHANGE</b>											
Pavement	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	11,361	1,876	3,626	2,095	1,321	19.4	22.2	128,979
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>MARINE DRIVE INTERCHANGE</b>											
Pavement	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,961	178,091	29,408	56,846	2,095	1,321	19.4	22.2	2,021,906
Bridges	3,412	123,976	138,961	10,423	1,721	3,327	2,095	1,321	19.4	22.2	118,338
Walls	3,412	123,976	138,961	13,190,477	2,178,127	4,210,367	2,095	1,321	19.4	22.2	149,754,123
Other	3,412	123,976	138,961	32,787	5,414	10,465	2,095	1,321	19.4	22.2	372,234
	3,412	123,976	138,961	14,169	2,340	4,523	2,095	1,321	19.4	22.2	160,862
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>HAYDEN ISLAND INTERCHANGE</b>											
Pavement	3,412	123,976	138,961	385,942	63,730	123,192	2,095	1,321	19.4	22.2	4,381,678
Earthwork	3,412	123,976	138,961	127,644	21,078	40,744	2,095	1,321	19.4	22.2	1,449,172
Bridges	3,412	123,976	138,961	3,247,105	536,190	1,036,468	2,095	1,321	19.4	22.2	36,865,036
Walls	3,412	123,976	138,961	69,545	11,484	22,198	2,095	1,321	19.4	22.2	789,554
Other	3,412	123,976	138,961	14,169	2,340	4,523	2,095	1,321	19.4	22.2	160,862
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>											
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub>
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coelectricity (n.g	Gasoline	Diesel		Emissions
											(lbs)
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>NORTH HIGHWAY APPROACH</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>I-5 MAINLINE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	1,287,474	212,599	410,958	2,095	1,321	19.4	22.2	14,616,946
Earthwork	3,412	123,976	138,961	136,099	22,474	43,442	2,095	1,321	19.4	22.2	1,545,160
Bridges	3,412	123,976	138,961	1,571,018	259,420	501,465	2,095	1,321	19.4	22.2	17,836,082
Walls	3,412	123,976	138,961	244,511	40,376	78,047	2,095	1,321	19.4	22.2	2,775,980
Other	3,412	123,976	138,961	88,331	14,586	28,195	2,095	1,321	19.4	22.2	1,002,835
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUOR ROADS</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	203,504	33,604	64,958	2,095	1,321	19.4	22.2	2,310,418
Earthwork	3,412	123,976	138,961	60,871	10,052	19,430	2,095	1,321	19.4	22.2	691,084
Bridges	3,412	123,976	138,961	63,215	10,439	20,178	2,095	1,321	19.4	22.2	717,693
Walls	3,412	123,976	138,961	130,488	21,547	41,652	2,095	1,321	19.4	22.2	1,481,460
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 14 INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	362,575	59,872	115,733	2,095	1,321	19.4	22.2	4,116,389
Earthwork	3,412	123,976	138,961	97,795	16,149	31,216	2,095	1,321	19.4	22.2	1,110,290
Bridges	3,412	123,976	138,961	2,660,024	439,246	849,073	2,095	1,321	19.4	22.2	30,199,781
Walls	3,412	123,976	138,961	560,006	92,473	178,753	2,095	1,321	19.4	22.2	6,357,866
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1,321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>EVERGREEN BLVD BRIDGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	18,418	3,041	5,879	2,095	1,321	19.4	22.2	209,099
Earthwork	3,412	123,976	138,961	911	150	291	2,095	1,321	19.4	22.2	10,340
Bridges	3,412	123,976	138,961	537,610	88,775	171,604	2,095	1,321	19.4	22.2	6,103,594
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>MILL PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	239,566	39,559	76,469	2,095	1,321	19.4	22.2	2,719,836
Earthwork	3,412	123,976	138,961	85,377	14,098	27,252	2,095	1,321	19.4	22.2	969,301
Bridges	3,412	123,976	138,961	194,023	32,039	61,932	2,095	1,321	19.4	22.2	2,202,786
Walls	3,412	123,976	138,961	53,213	8,787	16,985	2,095	1,321	19.4	22.2	604,136
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1,321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>4th PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	248,512	41,036	79,324	2,095	1,321	19.4	22.2	2,821,404
Earthwork	3,412	123,976	138,961	78,460	12,956	25,044	2,095	1,321	19.4	22.2	890,770
Bridges	3,412	123,976	138,961	3,125,287	516,075	997,584	2,095	1,321	19.4	22.2	35,482,005
Walls	3,412	123,976	138,961	1,187,835	196,146	379,154	2,095	1,321	19.4	22.2	13,485,731
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1,321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	24,742	4,086	7,898	2,095	1,321	19.4	22.2	280,906
Earthwork	3,412	123,976	138,961	6,838	1,146	2,215	2,095	1,321	19.4	22.2	78,765
Bridges	3,412	123,976	138,961	691,574	114,199	220,749	2,095	1,321	19.4	22.2	7,851,576
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 500 INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	309,044	51,032	98,646	2,095	1,321	19.4	22.2	3,508,639
Earthwork	3,412	123,976	138,961	75,770	12,512	24,186	2,095	1,321	19.4	22.2	860,236
Bridges	3,412	123,976	138,961	2,793,622	461,307	891,717	2,095	1,321	19.4	22.2	31,716,551
Walls	3,412	123,976	138,961	302,330	49,923	96,503	2,095	1,321	19.4	22.2	3,432,412
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1,321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>PROFESSIONAL SERVICES</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>RIGHT-OF-WAY</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub> Emissions (lbs)
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coelectricity (n.g.	Gasoline	Diesel		
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	
<b>COLUMBIA RIVER BRIDGES</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,961	3,619,564	597,694	1,155,356	2,095	1,321	19.4	22.2	41,093,632
COLU Bridges	3,412	123,976	138,961	13,975,907	2,307,824	4,461,074	2,095	1,321	19.4	22.2	158,671,278
COLU Bridges	3,412	123,976	138,961	14,216,492	2,347,551	4,537,868	2,095	1,321	19.4	22.2	161,402,686
COLU Bridges	3,412	123,976	138,961	6,804,614	1,123,637	2,172,015	2,095	1,321	19.4	22.2	77,254,142
COLU Bridges	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TRANSIT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	4,874,930	804,991	1,556,065	2,095	1,321	19.4	22.2	55,346,055
Tracks	3,412	123,976	138,961	390,179	64,430	124,544	2,095	1,321	19.4	22.2	4,429,769
Stations	3,412	123,976	138,961	208,412	34,415	66,524	2,095	1,321	19.4	22.2	2,366,139
Sitework	3,412	123,976	138,961	9,036	1,492	2,884	2,095	1,321	19.4	22.2	102,588
Systems	3,412	123,976	138,961	441,983	72,984	141,080	2,095	1,321	19.4	22.2	5,017,917
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO CLARK COLLEGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>CLARK COLLEGE TO END OF PROJECT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO END OF PROJECT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	921,120	152,103	294,019	2,095	1,321	19.4	22.2	10,457,664
Tracks	3,412	123,976	138,961	724,949	119,710	231,402	2,095	1,321	19.4	22.2	8,230,495
Stations	3,412	123,976	138,961	2,160,616	356,780	689,663	2,095	1,321	19.4	22.2	24,529,904
Sitework	3,412	123,976	138,961	846,782	139,828	270,291	2,095	1,321	19.4	22.2	9,613,685
Systems	3,412	123,976	138,961	1,325,253	218,837	423,017	2,095	1,321	19.4	22.2	15,045,860
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
SUPPORT FACILITIES AND VEHICLES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	15,722,793	30,392,504	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	915,138	151,116	292,110	2,095	1,321	19.4	22.2	10,389,740
<b>TOTAL MODE COST</b>	3,412	123,976	138,961	37,676	6,221	12,026	2,095	1,321	19.4	22.2	427,743
<b>TOTAL PROJECT COST</b>	3,412	123,976	138,961	37,676	6,221	12,026	2,095	1,321	19.4	22.2	427,743

Note: 1. With the exception of the 29th and 33rd Street Bridges, high

The cost estimates do not include any contingencies for risk

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 3 - LRT		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu) Highway	Energy (Btu) Transit	Energy (Btu) Total
	3B - Upstream Bridge							
	Highway	Transit						
<b><i>SOUTH HIGHWAY APPROACH</i></b>								
<b>I-5 MAINLINE</b>								
Pavement	\$7,305,210	\$0	Urban Freeway	47,332	0.0865465	29,925,187,881	0	29,925,187,881
Earthwork	\$1,195,011	\$0	Site Work	21,079	0.0865465	2,180,073,981	0	2,180,073,981
Bridges	\$141,297,830	\$0	Bridge Concrete Box Girder	48,364	0.0865465	591,435,010,829	0	591,435,010,829
Other	\$1,754,200	\$0	Signals	21,079	0.0865465	3,200,209,687	0	3,200,209,687
<b>SUBTOTAL</b>	<b>\$151,552,251</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>								
Pavement	\$258,540	\$0	Urban Freeway	47,332	0.0865465	1,059,087,702	0	1,059,087,702
Earthwork		\$0	Site Work	21,079	0.0865465	0	0	0
Bridges	\$3,547,000	\$0	Bridge Concrete Box Girder	48,364	0.0865465	14,846,795,477	0	14,846,795,477
<b>SUBTOTAL</b>	<b>\$3,805,540</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>VICTORY BLVD INTERCHANGE</b>								
Pavement	\$189,250	\$0	Urban Freeway	47,332	0.0865465	775,246,955	0	775,246,955
<b>SUBTOTAL</b>	<b>\$189,250</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>MARINE DRIVE INTERCHANGE</b>								
Pavement	\$2,832,007	\$0	Urban Freeway	47,332	0.0865465	11,601,082,181	0	11,601,082,181
Earthwork	\$389,894	\$0	Site Work	21,079	0.0865465	711,288,945	0	711,288,945
Bridges	\$210,732,225	\$0	Bridge Concrete Box Girder	48,364	0.0865465	882,068,859,620	0	882,068,859,620
Walls	\$897,000	\$0	Structures	50,100	0.0865465	3,889,372,094	0	3,889,372,094
Other	\$530,000	\$0	Signals	21,079	0.0865465	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$215,381,126</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>HAYDEN ISLAND INTERCHANGE</b>								
Pavement	\$6,341,961	\$0	Urban Freeway	47,332	0.0865465	25,979,318,112	0	25,979,318,112
Earthwork	\$4,875,103	\$0	Site Work	21,079	0.0865465	8,893,713,286	0	8,893,713,286
Bridges	\$49,036,150	\$0	Bridge Concrete Box Girder	48,364	0.0865465	205,252,238,525	0	205,252,238,525
Walls	\$462,000	\$0	Structures	50,100	0.0865465	2,003,221,748	0	2,003,221,748
Other	\$530,000	\$0	Signals	21,079	0.0865465	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$61,245,214</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>								
PROFESSIONAL SERVICES	\$91,341,888	\$0		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$120,273,359	\$0		0	0.0865465	0	0	0
	\$48,210,000	\$0		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$691,998,628</b>	<b>\$0</b>		0	0.0865465	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 3 - LRT		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu)		Energy (Btu) Total
	3B - Upstream Bridge					Highway	Transit	
	Highway	Transit						
<b>NORTH HIGHWAY APPROACH</b>				0	0.0865465		0	0
				0	0.0865465		0	0
				0	0.0865465		0	0
				0	0.0865465		0	0
<b>I-5 MAINLINE</b>				0	0.0865465		0	0
Pavement	\$21,434,516		\$0 Urban Freeway	47,332	0.0865465	87,804,721,201	0	87,804,721,201
Earthwork	\$4,642,931		\$0 Site Work	21,079	0.0865465	8,470,159,364	0	8,470,159,364
Bridges	\$25,612,303		\$0 Bridge Concrete Box Girder	48,364	0.0865465	107,206,267,014	0	107,206,267,014
Walls	\$3,848,133		\$0 Structures	50,100	0.0865465	16,685,419,293	0	16,685,419,293
Other	\$3,320,139		\$0 Signals	21,079	0.0865465	6,056,971,747	0	6,056,971,747
<b>SUBTOTAL</b>	<b>\$58,858,023</b>		<b>\$0</b>	0	0.0865465	0	0	0
				0	0.0865465		0	0
				0	0.0865465		0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>				0	0.0865465		0	0
Pavement	\$3,554,305		\$0 Urban Freeway	47,332	0.0865465	14,559,916,458	0	14,559,916,458
Earthwork	\$2,061,357		\$0 Site Work	21,079	0.0865465	3,760,560,441	0	3,760,560,441
Bridges	\$1,030,594		\$0 Bridge Concrete Box Girder	48,364	0.0865465	4,313,792,222	0	4,313,792,222
Walls	\$4,443,233		\$0 Structures	50,100	0.0865465	19,265,759,686	0	19,265,759,686
<b>SUBTOTAL</b>	<b>\$11,089,489</b>		<b>\$0</b>	0	0.0865465	0	0	0
				0	0.0865465		0	0
				0	0.0865465		0	0
<b>SR 14 INTERCHANGE</b>				0	0.0865465		0	0
Pavement	\$6,888,160		\$0 Urban Freeway	47,332	0.0865465	28,216,778,047	0	28,216,778,047
Earthwork	\$2,289,288		\$0 Site Work	21,079	0.0865465	4,176,377,675	0	4,176,377,675
Bridges	\$93,154,893		\$0 Bridge Concrete Box Girder	48,364	0.0865465	389,921,522,687	0	389,921,522,687
Walls	\$663,807		\$0 Structures	50,100	0.0865465	2,878,252,421	0	2,878,252,421
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$103,569,608</b>		<b>\$0</b>	0	0.0865465	0	0	0
				0	0.0865465		0	0
				0	0.0865465		0	0
<b>EVERGREEN BLVD BRIDGE</b>				0	0.0865465		0	0
Pavement	\$306,810		\$0 Urban Freeway	47,332	0.0865465	1,256,820,761	0	1,256,820,761
Earthwork	\$34,069		\$0 Site Work	21,079	0.0865465	62,152,396	0	62,152,396
Bridges	\$8,764,654		\$0 Bridge Concrete Box Girder	48,364	0.0865465	36,686,504,624	0	36,686,504,624
<b>SUBTOTAL</b>	<b>\$9,105,533</b>		<b>\$0</b>	0	0.0865465	0	0	0
				0	0.0865465		0	0
				0	0.0865465		0	0
<b>MILL PLAIN BLVD INTERCHANGE</b>				0	0.0865465		0	0
Pavement	\$3,990,794		\$0 Urban Freeway	47,332	0.0865465	16,347,955,612	0	16,347,955,612
Earthwork	\$3,441,311		\$0 Site Work	21,079	0.0865465	6,278,027,568	0	6,278,027,568
Bridges	\$3,163,162		\$0 Bridge Concrete Box Girder	48,364	0.0865465	13,240,152,372	0	13,240,152,372
Walls	\$1,152,330		\$0 Structures	50,100	0.0865465	4,996,477,308	0	4,996,477,308
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$12,321,056</b>		<b>\$0</b>	0	0.0865465	0	0	0
				0	0.0865465		0	0
				0	0.0865465		0	0
<b>4th PLAIN BLVD INTERCHANGE</b>				0	0.0865465		0	0
Pavement	\$3,382,758	\$757,065	Urban Freeway	47,332	0.0865465	13,857,189,311	3,101,252,366	16,958,441,677
Earthwork	\$2,613,005	\$321,851	Site Work	21,079	0.0865465	4,766,938,934	587,156,270	5,354,095,204
Bridges	\$50,951,542	\$0	Bridge Concrete Box Girder	48,364	0.0865465	213,269,559,567	0	213,269,559,567
Walls	\$18,694,255	\$0	Structures	50,100	0.0865465	81,057,874,828	0	81,057,874,828
Other	\$573,460	\$0	Signals	21,079	0.0865465	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$76,215,021</b>	<b>\$1,078,915</b>		0	0.0865465	0	0	0
				0	0.0865465		0	0
				0	0.0865465		0	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>				0	0.0865465		0	0
Pavement	\$288,985	\$0	Urban Freeway	47,332	0.0865465	1,183,802,665	0	1,183,802,665
Earthwork	\$14,210	\$0	Site Work	21,079	0.0865465	25,923,315	0	25,923,315
Bridges	\$11,376,262	\$1,794,129	Bridge Concrete Box Girder	48,364	0.0865465	47,617,995,326	7,509,745,730	55,127,741,056
<b>SUBTOTAL</b>	<b>\$11,679,456</b>	<b>\$1,794,129</b>		0	0.0865465	0	0	0
				0	0.0865465		0	0
				0	0.0865465		0	0
<b>SR 500 INTERCHANGE</b>				0	0.0865465		0	0
Pavement	\$5,148,198	\$0	Urban Freeway	47,332	0.0865465	21,089,167,639	0	21,089,167,639
Earthwork	\$2,834,254	\$0	Site Work	21,079	0.0865465	5,170,566,307	0	5,170,566,307
Bridges	\$45,544,415	\$0	Bridge Concrete Box Girder	48,364	0.0865465	190,636,767,632	0	190,636,767,632
Walls	\$4,758,095	\$0	Structures	50,100	0.0865465	20,630,994,331	0	20,630,994,331
Other	\$573,460	\$0	Signals	21,079	0.0865465	1,046,170,475	0	1,046,170,475
<b>SUBTOTAL</b>	<b>\$58,858,422</b>	<b>\$0</b>		0	0.0865465	0	0	0
				0	0.0865465		0	0
				0	0.0865465		0	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	\$74,870,348	\$0		0	0.0865465	0	0	0
<b>PROFESSIONAL SERVICES</b>	\$97,376,800	\$0		0	0.0865465	0	0	0
<b>RIGHT-OF-WAY</b>	\$11,887,934	\$0		0	0.0865465	0	0	0
				0	0.0865465		0	0
<b>TOTAL</b>	<b>\$525,831,692</b>	<b>\$2,873,044</b>		0	0.0865465	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 3 - LRT			Energy Factor (Btu/1973\$)	1973/ 2007\$	Energy (Btu)		Energy (Btu) Total
	3B - Upstream Bridge					Highway	Transit	
	Highway	Transit	Caltrans Construction Activity			Highway	Transit	
<b>COLUMBIA RIVER BRIDGES</b>				0	0.0865465	0	0	0
COLU Bridges	\$59,009,741	\$0	Bridge Concrete Box Girder	48,364	0.0865465	246,999,028,145	0	246,999,028,145
COLU Bridges	\$234,794,640	\$0	Bridge Concrete Box Girder	48,364	0.0865465	982,787,706,376	0	982,787,706,376
COLU Bridges	\$238,638,773	\$0	Bridge Concrete Box Girder	48,364	0.0865465	998,878,221,469	0	998,878,221,469
COLU Bridges	\$33,858,198	\$78,338,560	Bridge Concrete Box Girder	48,364	0.0865465	141,721,381,664	327,904,309,366	469,625,691,030
COLU Bridges			Bridge Concrete Box Girder	48,364	0.0865465	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$79,703,238	\$10,834,192		0	0.0865465	0	0	0
PROFESSIONAL SERVICES	\$155,794,333	\$21,244,682		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$8,607,120	\$123,348		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$810,406,043</b>	<b>\$110,540,783</b>		0	0.0865465	0	0	0
<b>TRANSIT</b>				0	0.0865465	0	0	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>				0	0.0865465	0	0	0
Guideway	\$21,807,006	\$55,057,528	Track Work	50,100	0.0865465	94,554,694,088	238,728,219,604	333,282,913,692
Tracks	\$0	\$6,361,455	Track Work	50,100	0.0865465	0	27,583,127,710	27,583,127,710
Stations	\$0	\$3,280,000	Stations, Stops and Terminals	50,100	0.0865465	0	14,222,007,212	14,222,007,212
Sitework	\$0	\$338,000	Site Work	21,079	0.0865465	0	616,617,760	616,617,760
Systems	\$0	\$7,163,475	Stations, Stops and Terminals	50,100	0.0865465	0	31,060,668,632	31,060,668,632
<b>SUBTOTAL</b>	<b>\$21,807,006</b>	<b>\$72,200,458</b>		0	0.0865465	0	0	0
<b>STATE LINE TO CLARK COLLEGE</b>				0	0.0865465	0	0	0
Guideway	\$0	\$14,498,979	Track Work	50,100	0.0865465	0	62,867,249,153	62,867,249,153
Tracks	\$0	\$11,412,303	Track Work	50,100	0.0865465	0	49,483,492,683	49,483,492,683
Stations	\$0	\$34,003,962	Stations, Stops and Terminals	50,100	0.0865465	0	147,440,424,914	147,440,424,914
Sitework	\$0	\$25,570,646	Site Work	21,079	0.0865465	0	46,648,859,911	46,648,859,911
Systems	\$0	\$20,859,752	Stations, Stops and Terminals	50,100	0.0865465	0	90,447,423,022	90,447,423,022
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$106,345,642</b>		0	0.0865465	0	0	0
<b>CLARK COLLEGE TO END OF PROJECT</b>				0	0.0865465	0	0	0
Guideway	\$0	\$63,347,886	Track Work	50,100	0.0865465	0	274,675,029,912	274,675,029,912
Tracks	\$0	\$7,055,381	Track Work	50,100	0.0865465	0	30,591,976,184	30,591,976,184
Stations	\$0	\$37,413,649	Stations, Stops and Terminals	50,100	0.0865465	0	162,224,752,618	162,224,752,618
Sitework	\$0	\$15,695,059	Site Work	21,079	0.0865465	0	28,632,698,945	28,632,698,945
Systems	\$0	\$11,163,281	Stations, Stops and Terminals	50,100	0.0865465	0	48,403,737,516	48,403,737,516
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$134,675,257</b>		0	0.0865465	0	0	0
<b>STATE LINE TO END OF PROJECT</b>				0	0.0865465	0	0	0
Guideway			Track Work	50,100	0.0865465	0	0	0
Tracks			Track Work	50,100	0.0865465	0	0	0
Stations			Stations, Stops and Terminals	50,100	0.0865465	0	0	0
Sitework			Site Work	21,079	0.0865465	0	0	0
Systems			Stations, Stops and Terminals	50,100	0.0865465	0	0	0
<b>SUBTOTAL</b>				0	0.0865465	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$63,000	\$59,394,086		0	0.0865465	0	0	0
SUPPORT FACILITIES AND VEHICLES	\$0	\$94,809,075		0	0.0865465	0	0	0
PROFESSIONAL SERVICES	\$0	\$125,930,686		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$1,080,000	\$23,245,198		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$22,950,006</b>	<b>\$616,600,402</b>						<b>7,219,100,310,597</b>
<b>TOTAL MODE COST</b>	<b>\$2,051,186,369</b>	<b>\$730,014,229</b>				16th Street Tunnel, Add:	62,448,989,712	
						Total (w/16th Tunnel):		7,281,549,300,309
<b>TOTAL PROJECT COST</b>	<b>\$2,781,200,598</b>					McLoughlin Tunnel, Add:	2,571,006,790	
						Total (w/McLoughlin Tunnel):		7,221,671,317,387

Note: 1. With the exception of the 29th and 33rd Street Bridges, highway costs have not been adjusted to reflect it

The cost estimates do not include any contingencies for risk or uncertainty.

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coelectricity (n.g)	Gasoline	Diesel		
<b><i>SOUTH HIGHWAY APPROACH</i></b>											
<b>I-5 MAINLINE</b>											
Pavement	3,412	123,976	138,961	438,529	72,414	139,977	2,095	1,321	19.4	22.2	4,978,702
Earthwork	3,412	123,976	138,961	31,947	5,275	10,197	2,095	1,321	19.4	22.2	362,702
Bridges	3,412	123,976	138,961	8,666,984	1,431,168	2,766,479	2,095	1,321	19.4	22.2	98,398,010
Other	3,412	123,976	138,961	46,896	7,744	14,969	2,095	1,321	19.4	22.2	532,424
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>											
Pavement	3,412	123,976	138,961	15,520	2,563	4,954	2,095	1,321	19.4	22.2	176,202
Earthwork	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Bridges	3,412	123,976	138,961	217,567	35,927	69,447	2,095	1,321	19.4	22.2	2,470,086
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>VICTORY BLVD INTERCHANGE</b>											
Pavement	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	11,361	1,876	3,626	2,095	1,321	19.4	22.2	128,979
<b>MARINE DRIVE INTERCHANGE</b>											
Pavement	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,961	170,004	28,073	54,265	2,095	1,321	19.4	22.2	1,990,091
Bridges	3,412	123,976	138,961	10,423	1,721	3,327	2,095	1,321	19.4	22.2	118,338
Walls	3,412	123,976	138,961	12,925,980	2,134,451	4,125,940	2,095	1,321	19.4	22.2	146,751,238
Other	3,412	123,976	138,961	56,995	9,412	18,193	2,095	1,321	19.4	22.2	647,081
<b>SUBTOTAL</b>	3,412	123,976	138,961	14,169	2,340	4,523	2,095	1,321	19.4	22.2	160,862
<b>HAYDEN ISLAND INTERCHANGE</b>											
Pavement	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,961	380,705	62,865	121,520	2,095	1,321	19.4	22.2	4,322,222
Bridges	3,412	123,976	138,961	130,330	21,521	41,601	2,095	1,321	19.4	22.2	1,479,662
Walls	3,412	123,976	138,961	3,007,800	496,674	960,082	2,095	1,321	19.4	22.2	34,148,150
Other	3,412	123,976	138,961	29,356	4,847	9,370	2,095	1,321	19.4	22.2	333,279
<b>SUBTOTAL</b>	3,412	123,976	138,961	14,169	2,340	4,523	2,095	1,321	19.4	22.2	160,862
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>											
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0



**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coelectricity)	Gasoline	Diesel		
<b>NORTH HIGHWAY APPROACH</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>I-5 MAINLINE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	1,286,705	212,472	410,713	2,095	1,321	19.4	22.2	14,608,215
Earthwork	3,412	123,976	138,961	124,123	20,496	39,620	2,095	1,321	19.4	22.2	1,409,194
Bridges	3,412	123,976	138,961	1,571,018	259,420	501,465	2,095	1,321	19.4	22.2	17,836,082
Walls	3,412	123,976	138,961	244,511	40,376	78,047	2,095	1,321	19.4	22.2	2,775,980
Other	3,412	123,976	138,961	88,760	14,657	28,332	2,095	1,321	19.4	22.2	1,007,708
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUOR ROADS</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	213,363	35,232	68,105	2,095	1,321	19.4	22.2	2,422,357
Earthwork	3,412	123,976	138,961	55,108	9,100	17,590	2,095	1,321	19.4	22.2	625,651
Bridges	3,412	123,976	138,961	63,215	10,439	20,178	2,095	1,321	19.4	22.2	717,693
Walls	3,412	123,976	138,961	282,324	46,620	90,117	2,095	1,321	19.4	22.2	3,205,276
Other	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 14 INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	413,493	68,280	131,986	2,095	1,321	19.4	22.2	4,694,471
Earthwork	3,412	123,976	138,961	61,201	10,106	19,535	2,095	1,321	19.4	22.2	694,831
Bridges	3,412	123,976	138,961	5,713,973	943,541	1,823,886	2,095	1,321	19.4	22.2	64,871,881
Walls	3,412	123,976	138,961	42,178	6,965	13,463	2,095	1,321	19.4	22.2	478,860
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1,321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>EVERGREEN BLVD BRIDGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	18,418	3,041	5,879	2,095	1,321	19.4	22.2	209,099
Earthwork	3,412	123,976	138,961	911	150	291	2,095	1,321	19.4	22.2	10,340
Bridges	3,412	123,976	138,961	537,610	88,775	171,604	2,095	1,321	19.4	22.2	6,103,594
Other	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>MILL PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	61,201	39,559	76,469	2,095	1,321	19.4	22.2	2,719,836
Earthwork	3,412	123,976	138,961	91,999	15,192	29,366	2,095	1,321	19.4	22.2	1,044,486
Bridges	3,412	123,976	138,961	194,023	32,039	61,932	2,095	1,321	19.4	22.2	2,202,786
Walls	3,412	123,976	138,961	73,219	12,091	23,371	2,095	1,321	19.4	22.2	831,272
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1,321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>4th PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	248,512	41,036	79,324	2,095	1,321	19.4	22.2	2,821,404
Earthwork	3,412	123,976	138,961	78,460	12,956	25,044	2,095	1,321	19.4	22.2	890,770
Bridges	3,412	123,976	138,961	3,125,287	516,075	997,584	2,095	1,321	19.4	22.2	35,482,005
Walls	3,412	123,976	138,961	1,187,835	196,146	379,154	2,095	1,321	19.4	22.2	13,485,731
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1,321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	17,348	2,865	5,537	2,095	1,321	19.4	22.2	196,951
Earthwork	3,412	123,976	138,961	390	63	121	2,095	1,321	19.4	22.2	4,313
Bridges	3,412	123,976	138,961	807,851	133,399	257,864	2,095	1,321	19.4	22.2	9,171,692
Other	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SR 500 INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Pavement	3,412	123,976	138,961	309,044	51,032	98,646	2,095	1,321	19.4	22.2	3,508,639
Earthwork	3,412	123,976	138,961	75,770	12,512	24,186	2,095	1,321	19.4	22.2	860,236
Bridges	3,412	123,976	138,961	2,793,622	461,307	891,717	2,095	1,321	19.4	22.2	31,716,551
Walls	3,412	123,976	138,961	302,330	49,923	96,503	2,095	1,321	19.4	22.2	3,432,412
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1,321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>PROFESSIONAL SERVICES</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>RIGHT-OF-WAY</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coelectricity)	Gasoline	Diesel		
<b>COLUMBIA RIVER BRIDGES</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
COLL Bridges	3,412	123,976	138,961	3,619,564	597,694	1,155,356	2,095	1,321	19.4	22.2	41,093,632
COLL Bridges	3,412	123,976	138,961	14,401,930	2,378,172	4,597,060	2,095	1,321	19.4	22.2	163,507,997
COLL Bridges	3,412	123,976	138,961	14,637,723	2,417,109	4,672,324	2,095	1,321	19.4	22.2	166,185,002
COLL Bridges	3,412	123,976	138,961	6,881,971	1,136,411	2,196,708	2,095	1,321	19.4	22.2	78,132,394
COLL Bridges	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
COLL Bridges	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TRANSIT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	4,883,982	806,486	1,558,955	2,095	1,321	19.4	22.2	55,448,823
Tracks	3,412	123,976	138,961	404,208	66,746	129,022	2,095	1,321	19.4	22.2	4,588,050
Stations	3,412	123,976	138,961	208,412	34,415	66,524	2,095	1,321	19.4	22.2	2,366,139
Sitework	3,412	123,976	138,961	9,036	1,492	2,884	2,095	1,321	19.4	22.2	102,588
Systems	3,412	123,976	138,961	455,168	75,161	145,288	2,095	1,321	19.4	22.2	5,167,614
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO CLARK COLLEGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	921,267	152,128	294,066	2,095	1,321	19.4	22.2	10,459,327
Tracks	3,412	123,976	138,961	725,139	119,741	231,463	2,095	1,321	19.4	22.2	8,232,650
Stations	3,412	123,976	138,961	2,160,616	356,780	689,663	2,095	1,321	19.4	22.2	24,529,904
Sitework	3,412	123,976	138,961	683,600	112,882	218,203	2,095	1,321	19.4	22.2	7,761,047
Systems	3,412	123,976	138,961	1,325,431	218,867	423,074	2,095	1,321	19.4	22.2	15,047,886
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>CLARK COLLEGE TO END OF PROJECT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	4,025,132	664,685	1,294,812	2,095	1,321	19.4	22.2	45,898,134
Tracks	3,412	123,976	138,961	448,300	74,027	143,096	2,095	1,321	19.4	22.2	5,080,637
Stations	3,412	123,976	138,961	2,377,268	392,555	758,818	2,095	1,321	19.4	22.2	26,889,597
Sitework	3,412	123,976	138,961	419,588	69,286	133,931	2,095	1,321	19.4	22.2	4,763,669
Systems	3,412	123,976	138,961	709,316	117,128	226,412	2,095	1,321	19.4	22.2	8,053,009
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO END OF PROJECT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
SUPPORT FACILITIES AND VEHICLES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>					<b>17,468,946</b>	<b>33,767,857</b>					
	3,412	123,976	138,961	915,138	151,116	292,110	2,095	1,321	19.4	22.2	10,389,740
<b>TOTAL MODE COST</b>											
	3,412	123,976	138,961	37,676	6,221	12,026	2,095	1,321	19.4	22.2	427,743
<b>TOTAL PROJECT COST</b>											

Note: 1. With the exception of the 29th and 33rd Street Bridges, high

The cost estimates do not include any contingencies for risk

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 4 - BRT Downstream Bridge		Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu) Highway	Energy (Btu) Transit	Energy (Btu) Total	
	Highway	Transit						
<b><i>SOUTH HIGHWAY APPROACH</i></b>								
<b>I-5 MAINLINE</b>								
Pavement	\$7,920,780	\$0	Urban Freeway	47,332	0.0865465	32,446,819,416	0	32,446,819,416
Earthwork	\$5,116,442	\$0	Site Work	21,079	0.0865465	9,333,991,136	0	9,333,991,136
Bridges	\$130,142,750	\$0	Bridge Concrete Box Girder	48,364	0.0865465	544,742,822,700	0	544,742,822,700
Other	\$1,932,000	\$0	Signals	21,079	0.0865465	3,524,572,520	0	3,524,572,520
<b>SUBTOTAL</b>	<b>\$145,111,972</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>								
Pavement	\$258,540	\$0	Urban Freeway	47,332	0.0865465	1,059,087,702	0	1,059,087,702
Earthwork	\$392,040	\$0	Site Work	21,079	0.0865465	715,203,629	0	715,203,629
Bridges	\$3,529,500	\$0	Bridge Concrete Box Girder	48,364	0.0865465	14,773,545,147	0	14,773,545,147
<b>SUBTOTAL</b>	<b>\$4,180,080</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>VICTORY BLVD INTERCHANGE</b>								
Pavement	\$189,250	\$0	Urban Freeway	47,332	0.0865465	775,246,955	0	775,246,955
<b>SUBTOTAL</b>	<b>\$189,250</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>MARINE DRIVE INTERCHANGE</b>								
Pavement	\$3,010,690	\$0	Urban Freeway	47,332	0.0865465	12,333,042,295	0	12,333,042,295
Earthwork	\$600,300	\$0	Site Work	21,079	0.0865465	1,095,135,033	0	1,095,135,033
Bridges	\$240,889,765	\$0	Bridge Concrete Box Girder	48,364	0.0865465	1,008,300,274,472	0	1,008,300,274,472
Walls	\$318,000	\$0	Structures	50,100	0.0865465	1,378,840,943	0	1,378,840,943
Other	\$530,000	\$0	Signals	21,079	0.0865465	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$245,348,755</b>	<b>\$0</b>		0	0.0865465	0	0	0
<b>HAYDEN ISLAND INTERCHANGE</b>								
Pavement	\$6,542,860	\$0	Urban Freeway	47,332	0.0865465	26,802,284,230	0	26,802,284,230
Earthwork	\$3,564,770	\$0	Site Work	21,079	0.0865465	6,503,255,892	0	6,503,255,892
Bridges	\$54,288,780	\$0	Bridge Concrete Box Girder	48,364	0.0865465	227,238,346,032	0	227,238,346,032
Walls	\$378,500	\$0	Structures	50,100	0.0865465	1,641,167,601	0	1,641,167,601
Other	\$530,000	\$0	Signals	21,079	0.0865465	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$65,304,910</b>	<b>\$0</b>		0	0.0865465	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$92,826,321	\$0		0	0.0865465	0	0	0
PROFESSIONAL SERVICES	\$126,751,483	\$0		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$67,200,000	\$0		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$746,912,771</b>	<b>\$0</b>		0	0.0865465	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 4 - BRT Downstream Bridge				Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu)		Energy (Btu)	
	Highway	Transit	Caltrans Construction Activity				Highway	Transit	Total	
<b>NORTH HIGHWAY APPROACH</b>					0	0.0865465	0	0	0	0
					0	0.0865465	0	0	0	0
					0	0.0865465	0	0	0	0
					0	0.0865465	0	0	0	0
<b>I-5 MAINLINE</b>					0	0.0865465	0	0	0	0
Pavement	\$19,362,839		\$0 Urban Freeway		47,332	0.0865465	79,318,266,811	0		79,318,266,811
Earthwork	\$4,506,730		\$0 Site Work		21,079	0.0865465	8,221,685,980	0		8,221,685,980
Bridges	\$15,821,978		\$0 Bridge Concrete Box Girder		48,364	0.0865465	66,226,576,951	0		66,226,576,951
Walls	\$318,649		\$0 Structures		50,100	0.0865465	1,381,654,993	0		1,381,654,993
Other	\$4,021,188		\$0 Signals		21,079	0.0865465	7,335,905,283	0		7,335,905,283
<b>SUBTOTAL</b>	<b>\$44,031,384</b>		<b>\$0</b>		0	0.0865465	0	0	0	0
					0	0.0865465	0	0	0	0
					0	0.0865465	0	0	0	0
<b>COLLECTOR/DISTRIBUOR ROADS</b>					0	0.0865465	0	0	0	0
Pavement	\$4,599,485		\$0 Urban Freeway		47,332	0.0865465	18,841,407,901	0		18,841,407,901
Earthwork	\$990,313		\$0 Site Work		21,079	0.0865465	1,806,641,663	0		1,806,641,663
Bridges	\$1,030,594		\$0 Bridge Concrete Box Girder		48,364	0.0865465	4,313,792,222	0		4,313,792,222
Walls	\$5,304,505		\$0 Structures		50,100	0.0865465	23,000,215,966	0		23,000,215,966
<b>SUBTOTAL</b>	<b>\$11,924,897</b>		<b>\$0</b>		0	0.0865465	0	0	0	0
					0	0.0865465	0	0	0	0
					0	0.0865465	0	0	0	0
<b>SR 14 INTERCHANGE</b>					0	0.0865465	0	0	0	0
Pavement	\$4,927,150		\$0 Urban Freeway		47,332	0.0865465	20,183,661,696	0		20,183,661,696
Earthwork	\$664,655		\$0 Site Work		21,079	0.0865465	1,212,539,215	0		1,212,539,215
Bridges	\$33,898,205		\$0 Bridge Concrete Box Girder		48,364	0.0865465	141,888,841,261	0		141,888,841,261
Walls	\$1,127,985		\$0 Structures		50,100	0.0865465	4,890,917,928	0		4,890,917,928
Other	\$573,460		\$0 Signals		21,079	0.0865465	1,046,170,475	0		1,046,170,475
<b>SUBTOTAL</b>	<b>\$41,191,455</b>		<b>\$0</b>		0	0.0865465	0	0	0	0
					0	0.0865465	0	0	0	0
					0	0.0865465	0	0	0	0
<b>EVERGREEN BLVD BRIDGE</b>					0	0.0865465	0	0	0	0
Pavement	\$288,146		\$0 Urban Freeway		47,332	0.0865465	1,180,367,615	0		1,180,367,615
Earthwork	\$364,555		\$0 Site Work		21,079	0.0865465	665,062,414	0		665,062,414
Bridges	\$5,840,528		\$0 Bridge Concrete Box Girder		48,364	0.0865465	24,446,890,817	0		24,446,890,817
<b>SUBTOTAL</b>	<b>\$6,493,229</b>		<b>\$0</b>		0	0.0865465	0	0	0	0
					0	0.0865465	0	0	0	0
					0	0.0865465	0	0	0	0
<b>MILL PLAIN BLVD INTERCHANGE</b>					0	0.0865465	0	0	0	0
Pavement	\$6,403,805		\$0 Urban Freeway		47,332	0.0865465	26,232,657,338	0		26,232,657,338
Earthwork	\$4,973,701		\$0 Site Work		21,079	0.0865465	9,073,586,546	0		9,073,586,546
Bridges	\$1,094,173		\$0 Bridge Concrete Box Girder		48,364	0.0865465	4,579,914,103	0		4,579,914,103
Walls	\$10,481,334		\$0 Structures		50,100	0.0865465	45,446,831,629	0		45,446,831,629
Other	\$573,460		\$0 Signals		21,079	0.0865465	1,046,170,475	0		1,046,170,475
<b>SUBTOTAL</b>	<b>\$22,432,300</b>		<b>\$0</b>		0	0.0865465	0	0	0	0
					0	0.0865465	0	0	0	0
					0	0.0865465	0	0	0	0
<b>4th PLAIN BLVD INTERCHANGE</b>					0	0.0865465	0	0	0	0
Pavement	\$6,930,216	\$729,982	\$0 Urban Freeway		47,332	0.0865465	28,389,058,026	2,990,311,311		31,379,369,337
Earthwork	\$2,995,304	\$383,966	\$0 Site Work		21,079	0.0865465	5,464,371,442	700,474,298		6,164,845,740
Bridges	\$44,817,414		\$0 Bridge Concrete Box Girder		48,364	0.0865465	187,593,734,568	0		187,593,734,568
Walls	\$8,685,214		\$0 Structures		50,100	0.0865465	37,658,895,167	0		37,658,895,167
Other	\$573,460		\$0 Signals		21,079	0.0865465	1,046,170,475	0		1,046,170,475
<b>SUBTOTAL</b>	<b>\$64,001,608</b>	<b>\$1,113,948</b>			0	0.0865465	0	0	0	0
					0	0.0865465	0	0	0	0
					0	0.0865465	0	0	0	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>					0	0.0865465	0	0	0	0
Pavement	\$412,171		\$0 Urban Freeway		47,332	0.0865465	1,688,422,685	0		1,688,422,685
Earthwork	\$259,511		\$0 Site Work		21,079	0.0865465	473,429,644	0		473,429,644
Bridges	\$11,274,727		\$0 Bridge Concrete Box Girder		48,364	0.0865465	47,192,997,413	0		47,192,997,413
<b>SUBTOTAL</b>	<b>\$11,946,409</b>		<b>\$0</b>		0	0.0865465	0	0	0	0
					0	0.0865465	0	0	0	0
					0	0.0865465	0	0	0	0
<b>SR 500 INTERCHANGE</b>					0	0.0865465	0	0	0	0
Pavement	\$5,413,555		\$0 Urban Freeway		47,332	0.0865465	22,176,178,555	0		22,176,178,555
Earthwork	\$3,223,533		\$0 Site Work		21,079	0.0865465	5,880,733,474	0		5,880,733,474
Bridges	\$41,525,494		\$0 Bridge Concrete Box Girder		48,364	0.0865465	173,814,635,568	0		173,814,635,568
Walls	\$3,656,078		\$0 Structures		50,100	0.0865465	15,852,673,075	0		15,852,673,075
Other	\$573,460		\$0 Signals		21,079	0.0865465	1,046,170,475	0		1,046,170,475
<b>SUBTOTAL</b>	<b>\$54,392,120</b>		<b>\$0</b>		0	0.0865465	0	0	0	0
					0	0.0865465	0	0	0	0
					0	0.0865465	0	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$55,968,760		\$0		0	0.0865465	0	0	0	0
PROFESSIONAL SERVICES	\$74,069,144		\$0		0	0.0865465	0	0	0	0
RIGHT-OF-WAY	\$5,565,808		\$0		0	0.0865465	0	0	0	0
					0	0.0865465	0	0	0	0
<b>TOTAL</b>	<b>\$392,017,115</b>	<b>\$1,113,948</b>			0	0.0865465	0	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 4 - BRT Downstream Bridge		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu)		Energy (Btu) Total
	Highway	Transit				Highway	Transit	
<b>COLUMBIA RIVER BRIDGES</b>								
COLU Bridges	\$296,457,709	\$0	Bridge Concrete Box Girder	48,364	0.0865465	1,240,892,859,662	0	1,240,892,859,662
COLU Bridges			Bridge Concrete Box Girder	48,364	0.0865465	0	0	0
COLU Bridges			Bridge Concrete Box Girder	48,364	0.0865465	0	0	0
COLU Bridges			Bridge Concrete Box Girder	48,364	0.0865465	0	0	0
COLU Bridges	\$203,596,921	\$61,160,583	Bridge Concrete Box Girder	48,364	0.0865465	852,202,381,813	256,001,879,304	1,108,204,261,117
NON-DISTRIBUTED CONSTRUCTION COSTS	\$72,859,921	\$12,541,016		0	0.0865465	0	0	0
PROFESSIONAL SERVICES	\$138,648,887	\$18,906,666		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$10,133,570	\$1,897,332		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$721,697,008</b>	<b>\$94,505,597</b>		0	0.0865465	0	0	0
<b>TRANSIT</b>				0	0.0865465	0	0	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>				0	0.0865465	0	0	0
Guideway	\$21,817,866	\$51,722,572	Track Work	50,100	0.0865465	94,601,782,807	224,267,924,396	318,869,707,203
Tracks			Track Work	50,100	0.0865465	0	0	0
Stations	\$0	\$8,527,260	Stations, Stops and Terminals	50,100	0.0865465	0	36,974,010,128	36,974,010,128
Sitework	\$0	\$2,229,080	Site Work	21,079	0.0865465	0	4,066,539,396	4,066,539,396
Systems	\$0	\$3,417,055	Stations, Stops and Terminals	50,100	0.0865465	0	14,816,274,651	14,816,274,651
<b>SUBTOTAL</b>	<b>\$21,817,866</b>	<b>\$65,895,967</b>		0	0.0865465	0	0	0
<b>STATE LINE TO CLARK COLLEGE</b>				0	0.0865465	0	0	0
Guideway	\$0	\$7,827,107	Track Work	50,100	0.0865465	0	33,938,161,607	33,938,161,607
Tracks			Track Work	50,100	0.0865465	0	0	0
Stations	\$0	\$34,003,962	Stations, Stops and Terminals	50,100	0.0865465	0	147,440,424,914	147,440,424,914
Sitework	\$0	\$24,675,161	Site Work	21,079	0.0865465	0	45,015,215,367	45,015,215,367
Systems	\$0	\$12,211,182	Stations, Stops and Terminals	50,100	0.0865465	0	52,947,412,001	52,947,412,001
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$78,717,412</b>		0	0.0865465	0	0	0
<b>CLARK COLLEGE TO END OF PROJECT</b>				0	0.0865465	0	0	0
Guideway	\$0	\$60,596,496	Track Work	50,100	0.0865465	0	262,745,060,677	262,745,060,677
Tracks			Track Work	50,100	0.0865465	0	0	0
Stations	\$0	\$37,007,899	Stations, Stops and Terminals	50,100	0.0865465	0	160,465,429,622	160,465,429,622
Sitework	\$0	\$15,695,059	Site Work	21,079	0.0865465	0	28,632,698,945	28,632,698,945
Systems	\$0	\$3,908,244	Stations, Stops and Terminals	50,100	0.0865465	0	16,946,057,130	16,946,057,130
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$117,207,698</b>		0	0.0865465	0	0	0
<b>STATE LINE TO END OF PROJECT</b>				0	0.0865465	0	0	0
Guideway			Track Work	50,100	0.0865465	0	0	0
Tracks			Track Work	50,100	0.0865465	0	0	0
Stations			Stations, Stops and Terminals	50,100	0.0865465	0	0	0
Sitework			Site Work	21,079	0.0865465	0	0	0
Systems			Stations, Stops and Terminals	50,100	0.0865465	0	0	0
<b>SUBTOTAL</b>				0	0.0865465	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$82,000	\$46,478,806		0	0.0865465	0	0	0
SUPPORT FACILITIES AND VEHICLES	\$0	\$42,993,300		0	0.0865465	0	0	0
PROFESSIONAL SERVICES	\$0	\$98,066,332		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$754,000	\$27,680,198		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$22,653,866</b>	<b>\$477,039,712</b>						<b>6,390,859,535,253</b>
<b>TOTAL MODE COST</b>	<b>\$1,883,280,760</b>	<b>\$572,659,258</b>					16th Street Tunnel, Add:	59,611,040,491
							<b>Total (w/16th Tunnel):</b>	<b>6,450,470,575,744</b>
<b>TOTAL PROJECT COST</b>	<b>\$2,455,940,018</b>						McLoughlin Tunnel, Add:	1,115,648,215
							<b>Total (w/McLoughlin Tunnel):</b>	<b>6,391,975,183,468</b>

Note: 1. With the exception of the 29th and 33rd Street Bridges, highway costs have not been adjusted to reflect the

The cost estimates do not include any contingencies for risk or uncertainty.

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub>
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (n.gas)	Gasoline	Diesel	Emissions (lbs)
<b><i>SOUTH HIGHWAY APPROACH</i></b>											
<b>I-5 MAINLINE</b>											
Pavement	3,412	123,976	138,961	475,481	78,516	151,772	2,095	1,321	19.4	22.2	5,398,230
Earthwork	3,412	123,976	138,961	136,782	22,587	43,660	2,095	1,321	19.4	22.2	1,552,911
Bridges	3,412	123,976	138,961	7,982,749	1,318,181	2,548,073	2,095	1,321	19.4	22.2	90,629,754
Other	3,412	123,976	138,961	51,650	8,529	16,486	2,095	1,321	19.4	22.2	586,389
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>											
Pavement	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,961	15,520	2,563	4,954	2,095	1,321	19.4	22.2	176,202
Bridges	3,412	123,976	138,961	10,481	1,731	3,345	2,095	1,321	19.4	22.2	118,990
<b>SUBTOTAL</b>	3,412	123,976	138,961	216,494	35,749	69,104	2,095	1,321	19.4	22.2	2,457,899
<b>VICTORY BLVD INTERCHANGE</b>											
Pavement	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	11,361	1,876	3,626	2,095	1,321	19.4	22.2	128,979
<b>MARINE DRIVE INTERCHANGE</b>											
Pavement	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Bridges	3,412	123,976	138,961	180,730	29,844	57,689	2,095	1,321	19.4	22.2	2,051,868
Walls	3,412	123,976	138,961	16,048	2,650	5,123	2,095	1,321	19.4	22.2	182,199
Other	3,412	123,976	138,961	14,775,795	2,439,908	4,716,397	2,095	1,321	19.4	22.2	167,752,565
<b>SUBTOTAL</b>	3,412	123,976	138,961	20,206	3,337	6,450	2,095	1,321	19.4	22.2	229,400
<b>HAYDEN ISLAND INTERCHANGE</b>											
Pavement	3,412	123,976	138,961	14,169	2,340	4,523	2,095	1,321	19.4	22.2	160,862
Earthwork	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Bridges	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Walls	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Other	3,412	123,976	138,961	392,765	64,857	125,370	2,095	1,321	19.4	22.2	4,459,140
<b>SUBTOTAL</b>	3,412	123,976	138,961	95,300	15,737	30,419	2,095	1,321	19.4	22.2	1,081,957
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>											
PROFESSIONAL SERVICES	3,412	123,976	138,961	3,329,987	549,877	1,062,924	2,095	1,321	19.4	22.2	37,806,015
RIGHT-OF-WAY	3,412	123,976	138,961	24,050	3,971	7,677	2,095	1,321	19.4	22.2	273,044
<b>TOTAL</b>	3,412	123,976	138,961	14,169	2,340	4,523	2,095	1,321	19.4	22.2	160,862
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub>
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (n.gas)	Gasoline	Diesel	Emissions
											(lbs)
<b>NORTH HIGHWAY APPROACH</b>	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
<b>I-5 MAINLINE</b>	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	1,162,343	191,936	371,017	2,095	1.321	19.4	22.2	13,196,310
Earthwork	3,412	123,976	138,961	120,482	19,895	38,458	2,095	1.321	19.4	22.2	1,367,855
Bridges	3,412	123,976	138,961	970,495	160,257	309,780	2,095	1.321	19.4	22.2	11,018,224
Walls	3,412	123,976	138,961	20,247	3,343	6,463	2,095	1.321	19.4	22.2	229,868
Other	3,412	123,976	138,961	107,502	17,752	34,314	2,095	1.321	19.4	22.2	1,220,487
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUOR ROADS</b>	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	276,105	45,593	88,132	2,095	1.321	19.4	22.2	3,134,676
Earthwork	3,412	123,976	138,961	26,475	4,372	8,451	2,095	1.321	19.4	22.2	300,574
Bridges	3,412	123,976	138,961	63,215	10,439	20,178	2,095	1.321	19.4	22.2	717,693
Walls	3,412	123,976	138,961	337,049	55,656	107,585	2,095	1.321	19.4	22.2	3,826,584
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
<b>SR 14 INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	295,775	48,841	94,411	2,095	1.321	19.4	22.2	3,357,989
Earthwork	3,412	123,976	138,961	17,769	2,934	5,672	2,095	1.321	19.4	22.2	201,732
Bridges	3,412	123,976	138,961	2,079,262	343,346	663,695	2,095	1.321	19.4	22.2	23,606,278
Walls	3,412	123,976	138,961	71,672	11,835	22,878	2,095	1.321	19.4	22.2	813,710
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1.321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
<b>EVERGREEN BLVD BRIDGE</b>	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	17,297	2,856	5,521	2,095	1.321	19.4	22.2	196,380
Earthwork	3,412	123,976	138,961	9,746	1,609	3,111	2,095	1.321	19.4	22.2	110,648
Bridges	3,412	123,976	138,961	358,249	59,157	114,352	2,095	1.321	19.4	22.2	4,067,269
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
<b>MILL PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	384,418	63,478	122,705	2,095	1.321	19.4	22.2	4,364,370
Earthwork	3,412	123,976	138,961	132,966	21,956	42,442	2,095	1.321	19.4	22.2	1,509,587
Bridges	3,412	123,976	138,961	67,115	11,083	21,423	2,095	1.321	19.4	22.2	761,968
Walls	3,412	123,976	138,961	665,985	109,973	212,581	2,095	1.321	19.4	22.2	7,561,064
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1.321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
<b>4th PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	459,838	75,933	146,779	2,095	1.321	19.4	22.2	5,220,637
Earthwork	3,412	123,976	138,961	90,341	14,918	28,837	2,095	1.321	19.4	22.2	1,025,655
Bridges	3,412	123,976	138,961	2,749,029	453,944	877,483	2,095	1.321	19.4	22.2	31,210,276
Walls	3,412	123,976	138,961	551,860	91,128	176,152	2,095	1.321	19.4	22.2	6,265,372
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1.321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	24,742	4,086	7,898	2,095	1.321	19.4	22.2	280,906
Earthwork	3,412	123,976	138,961	6,938	1,146	2,215	2,095	1.321	19.4	22.2	78,765
Bridges	3,412	123,976	138,961	691,574	114,199	220,749	2,095	1.321	19.4	22.2	7,851,576
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
<b>SR 500 INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	324,973	53,662	103,731	2,095	1.321	19.4	22.2	3,689,487
Earthwork	3,412	123,976	138,961	86,177	14,230	27,508	2,095	1.321	19.4	22.2	978,387
Bridges	3,412	123,976	138,961	2,547,108	420,601	813,030	2,095	1.321	19.4	22.2	28,917,825
Walls	3,412	123,976	138,961	232,308	38,361	74,152	2,095	1.321	19.4	22.2	2,637,435
Other	3,412	123,976	138,961	15,331	2,532	4,894	2,095	1.321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
<b>PROFESSIONAL SERVICES</b>	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
<b>RIGHT-OF-WAY</b>	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1.321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)				CO <sub>2</sub>
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coal)	Electricity (n.gas)	Gasoline	Diesel	Emissions
											(lbs)
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLUMBIA RIVER BRIDGES</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,961	18,184,245	3,002,741	5,804,365	2,095	1,321	19.4	22.2	206,449,373
COLU Bridges	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
COLU Bridges	3,412	123,976	138,961	16,239,805	2,681,658	5,183,705	2,095	1,321	19.4	22.2	184,373,754
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TRANSIT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	4,672,768	771,608	1,491,536	2,095	1,321	19.4	22.2	53,050,874
Tracks	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,961	541,823	89,471	172,949	2,095	1,321	19.4	22.2	6,151,427
Sitework	3,412	123,976	138,961	59,592	9,840	19,022	2,095	1,321	19.4	22.2	676,557
Systems	3,412	123,976	138,961	217,120	35,853	69,304	2,095	1,321	19.4	22.2	2,465,008
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO CLARK COLLEGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	497,335	82,124	158,748	2,095	1,321	19.4	22.2	5,646,347
Tracks	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,961	2,160,616	356,780	689,663	2,095	1,321	19.4	22.2	24,529,904
Sitework	3,412	123,976	138,961	659,660	108,929	210,562	2,095	1,321	19.4	22.2	7,489,255
Systems	3,412	123,976	138,961	775,900	128,123	247,665	2,095	1,321	19.4	22.2	8,808,947
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>CLARK COLLEGE TO END OF PROJECT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	3,850,309	635,797	1,229,009	2,095	1,321	19.4	22.2	43,713,325
Tracks	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,961	2,351,486	388,298	750,589	2,095	1,321	19.4	22.2	26,696,896
Sitework	3,412	123,976	138,961	419,588	69,286	133,931	2,095	1,321	19.4	22.2	4,763,669
Systems	3,412	123,976	138,961	248,330	41,006	79,266	2,095	1,321	19.4	22.2	2,819,343
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>STATE LINE TO END OF PROJECT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Guideway	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Tracks	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Stations	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Sitework	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Systems	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
SUPPORT FACILITIES AND VEHICLES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	873,550	144,248	278,835	2,095	1,321	19.4	22.2	9,917,586
<b>TOTAL MODE COST</b>	3,412	123,976	138,961	16,349	2,700	5,219	2,095	1,321	19.4	22.2	185,612
<b>TOTAL PROJECT COST</b>	3,412	123,976	138,961	16,349	2,700	5,219	2,095	1,321	19.4	22.2	185,612

Note: 1. With the exception of the 29th and 33rd Street Bridges, highw

The cost estimates do not include any contingencies for risk



**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 5 - LRT Downstream Bridge		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu) Highway	Energy (Btu) Transit	Energy (Btu) Total
	Highway	Transit						
<b><i>SOUTH HIGHWAY APPROACH</i></b>								
<b>I-5 MAINLINE</b>								
Pavement	\$7,920,780		\$0 Urban Freeway	47,332	0.0865465	32,446,819,416	0	32,446,819,416
Earthwork	\$5,116,442		\$0 Site Work	21,079	0.0865465	9,333,991,136	0	9,333,991,136
Bridges	\$130,142,750		\$0 Bridge Concrete Box Girder	48,364	0.0865465	544,742,822,700	0	544,742,822,700
Other	\$1,932,000		\$0 Signals	21,079	0.0865465	3,524,572,520	0	3,524,572,520
<b>SUBTOTAL</b>	<b>\$145,111,972</b>		<b>\$0</b>	0	0.0865465	0	0	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>								
Pavement	\$258,540		\$0 Urban Freeway	47,332	0.0865465	1,059,087,702	0	1,059,087,702
Earthwork	\$392,040		\$0 Site Work	21,079	0.0865465	715,203,629	0	715,203,629
Bridges	\$3,529,500		\$0 Bridge Concrete Box Girder	48,364	0.0865465	14,773,545,147	0	14,773,545,147
<b>SUBTOTAL</b>	<b>\$4,180,080</b>		<b>\$0</b>	0	0.0865465	0	0	0
<b>VICTORY BLVD INTERCHANGE</b>								
Pavement	\$189,250		\$0 Urban Freeway	47,332	0.0865465	775,246,955	0	775,246,955
<b>SUBTOTAL</b>	<b>\$189,250</b>		<b>\$0</b>	0	0.0865465	0	0	0
<b>MARINE DRIVE INTERCHANGE</b>								
Pavement	\$3,010,690		\$0 Urban Freeway	47,332	0.0865465	12,333,042,295	0	12,333,042,295
Earthwork	\$600,300		\$0 Site Work	21,079	0.0865465	1,095,135,033	0	1,095,135,033
Bridges	\$240,889,765		\$0 Bridge Concrete Box Girder	48,364	0.0865465	1,008,300,274,472	0	1,008,300,274,472
Walls	\$318,000		\$0 Structures	50,100	0.0865465	1,378,840,943	0	1,378,840,943
Other	\$530,000		\$0 Signals	21,079	0.0865465	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$245,348,755</b>		<b>\$0</b>	0	0.0865465	0	0	0
<b>HAYDEN ISLAND INTERCHANGE</b>								
Pavement	\$6,542,860		\$0 Urban Freeway	47,332	0.0865465	26,802,284,230	0	26,802,284,230
Earthwork	\$3,564,770		\$0 Site Work	21,079	0.0865465	6,503,255,892	0	6,503,255,892
Bridges	\$54,288,780		\$0 Bridge Concrete Box Girder	48,364	0.0865465	227,238,346,032	0	227,238,346,032
Walls	\$378,500		\$0 Structures	50,100	0.0865465	1,641,167,601	0	1,641,167,601
Other	\$530,000		\$0 Signals	21,079	0.0865465	966,885,836	0	966,885,836
<b>SUBTOTAL</b>	<b>\$65,304,910</b>		<b>\$0</b>	0	0.0865465	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$92,826,321		\$0	0	0.0865465	0	0	0
PROFESSIONAL SERVICES	\$126,751,483		\$0	0	0.0865465	0	0	0
RIGHT-OF-WAY	\$67,200,000		\$0	0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$746,912,771</b>		<b>\$0</b>	0	0.0865465	0	0	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 5 - LRT Downstream Bridge		Caltrans Construction Activity	Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu)		Energy (Btu) Transit	Energy (Btu) Total
	Highway	Transit				Highway	Transit		
<b>NORTH HIGHWAY APPROACH</b>				0	0.0865465		0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>I-5 MAINLINE</b>				0	0.0865465		0		0
Pavement	\$19,362,839		\$0 Urban Freeway	47,332	0.0865465	79,318,266,811	0		79,318,266,811
Earthwork	\$4,506,730		\$0 Site Work	21,079	0.0865465	8,221,685,980	0		8,221,685,980
Bridges	\$15,821,978		\$0 Bridge Concrete Box Girder	48,364	0.0865465	66,226,576,951	0		66,226,576,951
Walls	\$318,649		\$0 Structures	50,100	0.0865465	1,381,654,993	0		1,381,654,993
Other	\$4,021,188		\$0 Signals	21,079	0.0865465	7,335,905,283	0		7,335,905,283
<b>SUBTOTAL</b>	<b>\$44,031,384</b>		<b>\$0</b>	0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>				0	0.0865465		0		0
Pavement	\$4,599,485		\$0 Urban Freeway	47,332	0.0865465	18,841,407,901	0		18,841,407,901
Earthwork	\$990,313		\$0 Site Work	21,079	0.0865465	1,806,641,663	0		1,806,641,663
Bridges	\$1,030,594		\$0 Bridge Concrete Box Girder	48,364	0.0865465	4,313,792,222	0		4,313,792,222
Walls	\$5,304,505		\$0 Structures	50,100	0.0865465	23,000,215,966	0		23,000,215,966
<b>SUBTOTAL</b>	<b>\$11,924,897</b>		<b>\$0</b>	0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>SR 14 INTERCHANGE</b>				0	0.0865465		0		0
Pavement	\$4,927,150		\$0 Urban Freeway	47,332	0.0865465	20,183,661,696	0		20,183,661,696
Earthwork	\$664,655		\$0 Site Work	21,079	0.0865465	1,212,539,215	0		1,212,539,215
Bridges	\$33,898,205		\$0 Bridge Concrete Box Girder	48,364	0.0865465	141,888,841,261	0		141,888,841,261
Walls	\$1,127,985		\$0 Structures	50,100	0.0865465	4,890,917,928	0		4,890,917,928
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0		1,046,170,475
<b>SUBTOTAL</b>	<b>\$41,191,455</b>		<b>\$0</b>	0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>EVERGREEN BLVD BRIDGE</b>				0	0.0865465		0		0
Pavement	\$288,146		\$0 Urban Freeway	47,332	0.0865465	1,180,367,615	0		1,180,367,615
Earthwork	\$364,555		\$0 Site Work	21,079	0.0865465	665,062,414	0		665,062,414
Bridges	\$5,840,528		\$0 Bridge Concrete Box Girder	48,364	0.0865465	24,446,890,817	0		24,446,890,817
<b>SUBTOTAL</b>	<b>\$6,493,229</b>		<b>\$0</b>	0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>MILL PLAIN BLVD INTERCHANGE</b>				0	0.0865465		0		0
Pavement	\$6,403,805		\$0 Urban Freeway	47,332	0.0865465	26,232,657,338	0		26,232,657,338
Earthwork	\$3,879,528		\$0 Site Work	21,079	0.0865465	7,077,473,541	0		7,077,473,541
Bridges	\$1,094,173		\$0 Bridge Concrete Box Girder	48,364	0.0865465	4,579,914,103	0		4,579,914,103
Walls	\$10,481,334		\$0 Structures	50,100	0.0865465	45,446,831,629	0		45,446,831,629
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0		1,046,170,475
<b>SUBTOTAL</b>	<b>\$22,432,300</b>		<b>\$0</b>	0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>4th PLAIN BLVD INTERCHANGE</b>				0	0.0865465		0		0
Pavement	\$6,930,216	\$729,982	Urban Freeway	47,332	0.0865465	28,389,058,026	2,990,311,311		31,379,369,337
Earthwork	\$2,995,304	\$383,966	Site Work	21,079	0.0865465	5,464,371,442	700,474,298		6,164,845,740
Bridges	\$44,817,414		Bridge Concrete Box Girder	48,364	0.0865465	187,593,734,568	0		187,593,734,568
Walls	\$8,685,214		Structures	50,100	0.0865465	37,658,895,167	0		37,658,895,167
Other	\$573,460		Signals	21,079	0.0865465	1,046,170,475	0		1,046,170,475
<b>SUBTOTAL</b>	<b>\$64,001,608</b>	<b>\$1,113,948</b>		0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>				0	0.0865465		0		0
Pavement	\$412,171		\$0 Urban Freeway	47,332	0.0865465	1,688,422,685	0		1,688,422,685
Earthwork	\$259,511		\$0 Site Work	21,079	0.0865465	473,429,644	0		473,429,644
Bridges	\$11,274,727		\$0 Bridge Concrete Box Girder	48,364	0.0865465	47,192,997,413	0		47,192,997,413
<b>SUBTOTAL</b>	<b>\$11,946,409</b>		<b>\$0</b>	0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>SR 500 INTERCHANGE</b>				0	0.0865465		0		0
Pavement	\$5,413,555		\$0 Urban Freeway	47,332	0.0865465	22,176,178,555	0		22,176,178,555
Earthwork	\$3,223,533		\$0 Site Work	21,079	0.0865465	5,880,733,474	0		5,880,733,474
Bridges	\$41,525,494		\$0 Bridge Concrete Box Girder	48,364	0.0865465	173,814,635,568	0		173,814,635,568
Walls	\$3,656,078		\$0 Structures	50,100	0.0865465	15,852,673,075	0		15,852,673,075
Other	\$573,460		\$0 Signals	21,079	0.0865465	1,046,170,475	0		1,046,170,475
<b>SUBTOTAL</b>	<b>\$54,392,120</b>		<b>\$0</b>	0	0.0865465	0	0		0
				0	0.0865465		0		0
				0	0.0865465		0		0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	\$55,968,760		\$0	0	0.0865465	0	0		0
<b>PROFESSIONAL SERVICES</b>	\$74,069,144		\$0	0	0.0865465	0	0		0
<b>RIGHT-OF-WAY</b>	\$5,565,808		\$0	0	0.0865465	0	0		0
				0	0.0865465		0		0
<b>TOTAL</b>	<b>\$392,017,115</b>	<b>\$1,113,948</b>		0	0.0865465	0	0		0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	ALTERNATIVE 5 - LRT Downstream Bridge			Energy Factor (Btu/1973\$)	1973\$/ 2007\$	Energy (Btu)		Energy (Btu) Total
	Highway	Transit	Caltrans Construction Activity			Highway	Transit	
<b>COLUMBIA RIVER BRIDGES</b>				0	0.0865465			0
COLU Bridges	\$296,457,709	\$0	Bridge Concrete Box Girder	48,364	0.0865465	1,240,892,859,662	0	1,240,892,859,662
COLU Bridges			Bridge Concrete Box Girder	48,364	0.0865465	0	0	0
COLU Bridges			Bridge Concrete Box Girder	48,364	0.0865465	0	0	0
COLU Bridges			Bridge Concrete Box Girder	48,364	0.0865465	0	0	0
COLU Bridges	\$203,596,921	\$61,160,583	Bridge Concrete Box Girder	48,364	0.0865465	852,202,381,813	256,001,879,304	1,108,204,261,117
NON-DISTRIBUTED CONSTRUCTION COSTS	\$72,859,921	\$12,541,016		0	0.0865465	0	0	0
PROFESSIONAL SERVICES	\$138,648,887	\$18,906,666		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$10,133,570	\$1,897,332		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$721,697,008</b>	<b>\$94,505,597</b>		0	0.0865465	0	0	0
<b>TRANSIT</b>				0	0.0865465	0	0	0
<b>BEGINNING OF PROJECT TO STATE LINE</b>				0	0.0865465	0	0	0
Guideway	\$21,815,388	\$54,906,696	Track Work	50,100	0.0865465	94,591,038,254	238,074,172,040	332,665,210,294
Tracks	\$0	\$6,140,655	Track Work	50,100	0.0865465	0	26,625,743,810	26,625,743,810
Stations	\$0	\$3,280,000	Stations, Stops and Terminals	50,100	0.0865465	0	14,222,007,212	14,222,007,212
Sitework	\$0	\$338,000	Site Work	21,079	0.0865465	0	616,617,760	616,617,760
Systems	\$0	\$6,955,962	Stations, Stops and Terminals	50,100	0.0865465	0	30,160,894,701	30,160,894,701
<b>SUBTOTAL</b>	<b>\$21,815,388</b>	<b>\$71,621,303</b>		0	0.0865465	0	0	0
<b>STATE LINE TO CLARK COLLEGE</b>				0	0.0865465	0	0	0
Guideway	\$0	\$14,496,674	Track Work	50,100	0.0865465	0	62,857,256,199	62,857,256,199
Tracks	\$0	\$11,409,317	Track Work	50,100	0.0865465	0	49,470,544,066	49,470,544,066
Stations	\$0	\$34,003,962	Stations, Stops and Terminals	50,100	0.0865465	0	147,440,424,914	147,440,424,914
Sitework	\$0	\$25,570,646	Site Work	21,079	0.0865465	0	46,648,859,911	46,648,859,911
Systems	\$0	\$20,856,945	Stations, Stops and Terminals	50,100	0.0865465	0	90,435,248,507	90,435,248,507
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$106,337,543</b>		0	0.0865465	0	0	0
<b>CLARK COLLEGE TO END OF PROJECT</b>				0	0.0865465	0	0	0
Guideway	\$0	\$63,347,896	Track Work	50,100	0.0865465	0	274,675,029,912	274,675,029,912
Tracks	\$0	\$7,055,381	Track Work	50,100	0.0865465	0	30,591,976,184	30,591,976,184
Stations	\$0	\$37,413,649	Stations, Stops and Terminals	50,100	0.0865465	0	162,224,752,618	162,224,752,618
Sitework	\$0	\$15,695,059	Site Work	21,079	0.0865465	0	28,632,698,945	28,632,698,945
Systems	\$0	\$11,163,281	Stations, Stops and Terminals	50,100	0.0865465	0	48,403,737,516	48,403,737,516
<b>SUBTOTAL</b>	<b>\$0</b>	<b>\$134,675,257</b>		0	0.0865465	0	0	0
<b>STATE LINE TO END OF PROJECT</b>				0	0.0865465	0	0	0
Guideway			Track Work	50,100	0.0865465	0	0	0
Tracks			Track Work	50,100	0.0865465	0	0	0
Stations			Stations, Stops and Terminals	50,100	0.0865465	0	0	0
Sitework			Site Work	21,079	0.0865465	0	0	0
Systems			Stations, Stops and Terminals	50,100	0.0865465	0	0	0
<b>SUBTOTAL</b>				0	0.0865465	0	0	0
NON-DISTRIBUTED CONSTRUCTION COSTS	\$82,000	\$58,115,615		0	0.0865465	0	0	0
SUPPORT FACILITIES AND VEHICLES	\$0	\$82,863,600		0	0.0865465	0	0	0
PROFESSIONAL SERVICES	\$0	\$122,622,569		0	0.0865465	0	0	0
RIGHT-OF-WAY	\$754,000	\$25,516,198		0	0.0865465	0	0	0
<b>TOTAL</b>	<b>\$22,651,388</b>	<b>\$601,752,086</b>						<b>6,611,677,433,156</b>
<b>TOTAL MODE COST</b>	<b>\$1,883,278,282</b>	<b>\$697,371,631</b>				16th Street Tunnel, Add:	62,448,989,712	<b>6,674,126,422,868</b>
<b>TOTAL PROJECT COST</b>	<b>\$2,580,649,913</b>					McLoughlin Tunnel, Add:	2,571,006,790	<b>6,614,248,439,946</b>

Note: 1. With the exception of the 29th and 33rd Street Bridges, highway costs have not been adjusted to reflect it

The cost estimates do not include any contingencies for risk or uncertainty.

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub> Emissions (lbs)	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coelectricity n.gr)	Gasoline	Diesel		
<b><i>SOUTH HIGHWAY APPROACH</i></b>											
<b>I-5 MAINLINE</b>											
Pavement	3,412	123,976	138,961	475,481	78,516	151,772	2,095	1,321	19.4	22.2	5,398,230
Earthwork	3,412	123,976	138,961	136,782	22,587	43,660	2,095	1,321	19.4	22.2	1,552,911
Bridges	3,412	123,976	138,961	7,982,749	1,318,181	2,548,073	2,095	1,321	19.4	22.2	90,629,754
Other	3,412	123,976	138,961	51,650	8,529	16,486	2,095	1,321	19.4	22.2	586,389
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>											
Pavement	3,412	123,976	138,961	15,520	2,563	4,954	2,095	1,321	19.4	22.2	176,202
Earthwork	3,412	123,976	138,961	10,481	1,731	3,345	2,095	1,321	19.4	22.2	118,990
Bridges	3,412	123,976	138,961	216,494	35,749	69,104	2,095	1,321	19.4	22.2	2,457,899
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>VICTORY BLVD INTERCHANGE</b>											
Pavement	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	11,361	1,876	3,626	2,095	1,321	19.4	22.2	128,979
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>MARINE DRIVE INTERCHANGE</b>											
Pavement	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
Earthwork	3,412	123,976	138,961	180,730	29,844	57,689	2,095	1,321	19.4	22.2	2,051,868
Bridges	3,412	123,976	138,961	16,048	2,650	5,123	2,095	1,321	19.4	22.2	182,199
Walls	3,412	123,976	138,961	14,775,795	2,439,908	4,716,397	2,095	1,321	19.4	22.2	167,752,565
Other	3,412	123,976	138,961	20,206	3,337	6,450	2,095	1,321	19.4	22.2	229,400
	3,412	123,976	138,961	14,169	2,340	4,523	2,095	1,321	19.4	22.2	160,862
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>HAYDEN ISLAND INTERCHANGE</b>											
Pavement	3,412	123,976	138,961	392,765	64,857	125,370	2,095	1,321	19.4	22.2	4,459,140
Earthwork	3,412	123,976	138,961	95,300	15,737	30,419	2,095	1,321	19.4	22.2	1,081,957
Bridges	3,412	123,976	138,961	3,329,987	549,877	1,062,924	2,095	1,321	19.4	22.2	37,806,015
Walls	3,412	123,976	138,961	24,050	3,971	7,677	2,095	1,321	19.4	22.2	273,044
Other	3,412	123,976	138,961	14,169	2,340	4,523	2,095	1,321	19.4	22.2	160,862
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>											
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub>	
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coelectricity (n.gr	Gasoline	Diesel	Emissions	
										(lbs)	
<b>NORTH HIGHWAY APPROACH</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>I-5 MAINLINE</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	1,162,343	191,936	371,017	2.095	1.321	19.4	22.2	13,196,310
Earthwork	3,412	123,976	138,961	120,482	19,895	38,458	2.095	1.321	19.4	22.2	1,367,855
Bridges	3,412	123,976	138,961	970,495	160,257	309,780	2.095	1.321	19.4	22.2	11,018,224
Walls	3,412	123,976	138,961	20,247	3,343	6,463	2.095	1.321	19.4	22.2	229,868
Other	3,412	123,976	138,961	107,502	17,752	34,314	2.095	1.321	19.4	22.2	1,220,487
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>COLLECTOR/DISTRIBUTOR ROADS</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	276,105	45,593	88,132	2.095	1.321	19.4	22.2	3,134,676
Earthwork	3,412	123,976	138,961	26,475	4,372	8,451	2.095	1.321	19.4	22.2	300,574
Bridges	3,412	123,976	138,961	63,215	10,439	20,178	2.095	1.321	19.4	22.2	717,693
Walls	3,412	123,976	138,961	337,049	55,656	107,585	2.095	1.321	19.4	22.2	3,826,584
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>SR 14 INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	295,775	48,841	94,411	2.095	1.321	19.4	22.2	3,357,989
Earthwork	3,412	123,976	138,961	17,769	2,934	5,672	2.095	1.321	19.4	22.2	201,732
Bridges	3,412	123,976	138,961	2,079,262	343,346	663,695	2.095	1.321	19.4	22.2	23,606,278
Walls	3,412	123,976	138,961	71,672	11,835	22,878	2.095	1.321	19.4	22.2	813,710
Other	3,412	123,976	138,961	15,331	2,532	4,894	2.095	1.321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>EVERGREEN BLVD BRIDGE</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	17,297	2,856	5,521	2.095	1.321	19.4	22.2	196,380
Earthwork	3,412	123,976	138,961	9,746	1,609	3,111	2.095	1.321	19.4	22.2	110,648
Bridges	3,412	123,976	138,961	358,249	59,157	114,352	2.095	1.321	19.4	22.2	4,067,269
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>MILL PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	394,418	63,478	122,705	2.095	1.321	19.4	22.2	4,364,370
Earthwork	3,412	123,976	138,961	103,714	17,126	33,105	2.095	1.321	19.4	22.2	1,177,491
Bridges	3,412	123,976	138,961	67,115	11,083	21,423	2.095	1.321	19.4	22.2	761,968
Walls	3,412	123,976	138,961	665,985	109,973	212,581	2.095	1.321	19.4	22.2	7,561,064
Other	3,412	123,976	138,961	15,331	2,532	4,894	2.095	1.321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>4th PLAIN BLVD INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	459,838	75,933	146,779	2.095	1.321	19.4	22.2	5,220,637
Earthwork	3,412	123,976	138,961	90,341	14,918	28,837	2.095	1.321	19.4	22.2	1,025,655
Bridges	3,412	123,976	138,961	2,749,029	453,944	877,483	2.095	1.321	19.4	22.2	31,210,276
Walls	3,412	123,976	138,961	551,860	91,128	176,152	2.095	1.321	19.4	22.2	6,265,372
Other	3,412	123,976	138,961	15,331	2,532	4,894	2.095	1.321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>29th STREET &amp; 33rd STREET BRIDGES</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	24,742	4,086	7,998	2.095	1.321	19.4	22.2	280,906
Earthwork	3,412	123,976	138,961	6,938	1,146	2,215	2.095	1.321	19.4	22.2	78,765
Bridges	3,412	123,976	138,961	691,574	114,199	220,749	2.095	1.321	19.4	22.2	7,851,576
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>SR 500 INTERCHANGE</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
Pavement	3,412	123,976	138,961	324,973	53,662	103,731	2.095	1.321	19.4	22.2	3,689,487
Earthwork	3,412	123,976	138,961	86,177	14,230	27,508	2.095	1.321	19.4	22.2	978,387
Bridges	3,412	123,976	138,961	2,547,108	420,601	813,030	2.095	1.321	19.4	22.2	28,917,825
Walls	3,412	123,976	138,961	232,308	38,361	74,152	2.095	1.321	19.4	22.2	2,637,435
Other	3,412	123,976	138,961	15,331	2,532	4,894	2.095	1.321	19.4	22.2	174,053
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>NON-DISTRIBUTED CONSTRUCTION COSTS</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2.095	1.321	19.4	22.2	0

**BASE COST ESTIMATE - ROLLUP**

DESCRIPTION	Fuel Conversion Factor (Btu/kwh-gal)			Fuel Consumption (kwh-gal)			Emission Factor (lbs CO <sub>2</sub> /kwh-gal)			CO <sub>2</sub>		
	Electricity	Gasoline	Diesel	Electricity	Gasoline	Diesel	Electricity (coelectricity n.gr)	Gasoline	Diesel	Emissions (lbs)		
<b>COLUMBIA RIVER BRIDGES</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
COLU Bridges	3,412	123,976	138,961	18,184,245	3,002,741	5,804,365	2,095	1,321	19.4	22.2	206,449,373	
COLU Bridges	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
COLU Bridges	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
COLU Bridges	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
COLU Bridges	3,412	123,976	138,961	16,239,805	2,681,658	5,183,705	2,095	1,321	19.4	22.2	184,373,754	
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
<b>TOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
<b>TRANSIT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
<b>BEGINNING OF PROJECT TO STATE LINE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
Guideway	3,412	123,976	138,961	4,874,930	804,991	1,556,065	2,095	1,321	19.4	22.2	55,348,055	
Tracks	3,412	123,976	138,961	390,178	64,430	124,544	2,095	1,321	19.4	22.2	4,429,769	
Stations	3,412	123,976	138,961	208,412	34,415	66,524	2,095	1,321	19.4	22.2	2,366,139	
Sitework	3,412	123,976	138,961	9,036	1,492	2,884	2,095	1,321	19.4	22.2	102,588	
Systems	3,412	123,976	138,961	441,983	72,984	141,080	2,095	1,321	19.4	22.2	5,017,917	
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
<b>STATE LINE TO CLARK COLLEGE</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
Guideway	3,412	123,976	138,961	921,120	152,103	294,019	2,095	1,321	19.4	22.2	10,457,664	
Tracks	3,412	123,976	138,961	724,949	119,710	231,402	2,095	1,321	19.4	22.2	8,230,495	
Stations	3,412	123,976	138,961	2,160,616	356,780	689,663	2,095	1,321	19.4	22.2	24,529,904	
Sitework	3,412	123,976	138,961	683,600	112,882	218,203	2,095	1,321	19.4	22.2	7,761,047	
Systems	3,412	123,976	138,961	1,325,253	218,837	423,017	2,095	1,321	19.4	22.2	15,045,860	
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
<b>CLARK COLLEGE TO END OF PROJECT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
Guideway	3,412	123,976	138,961	4,025,132	664,665	1,284,812	2,095	1,321	19.4	22.2	45,698,134	
Tracks	3,412	123,976	138,961	448,300	74,027	143,096	2,095	1,321	19.4	22.2	5,089,637	
Stations	3,412	123,976	138,961	2,377,268	392,555	758,819	2,095	1,321	19.4	22.2	26,989,597	
Sitework	3,412	123,976	138,961	419,588	69,286	133,931	2,095	1,321	19.4	22.2	4,763,669	
Systems	3,412	123,976	138,961	709,316	117,128	226,412	2,095	1,321	19.4	22.2	8,053,009	
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
<b>STATE LINE TO END OF PROJECT</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
Guideway	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
Tracks	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
Stations	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
Sitework	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
Systems	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
<b>SUBTOTAL</b>	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
NON-DISTRIBUTED CONSTRUCTION COSTS	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
SUPPORT FACILITIES AND VEHICLES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
PROFESSIONAL SERVICES	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
RIGHT-OF-WAY	3,412	123,976	138,961	0	0	0	2,095	1,321	19.4	22.2	0	
<b>TOTAL</b>					<b>15,999,090</b>	<b>30,926,593</b>	2,095	1,321				0
<b>TOTAL MODE COST</b>		123,976	138,961		151,116	292,110			19.4	22.2	9,416,474	
<b>TOTAL PROJECT COST</b>		123,976	138,961		6,221	12,026			19.4	22.2	387,674	

Note: 1. With the exception of the 29th and 33rd Street Bridges, high

The cost estimates do not include any contingencies for risk