

# King Countywide 2014 FHWA Grant Program Application

**Important:** Please review the following information before beginning the application.

Definition of a project: For the purposes of this competition, a project must be clearly defined by geographic limits and/or functionality. If a project contains multiple components, the sponsor must clearly indicate how they are logically connected to one another. A project with multiple geographic locations must demonstrate their functional relationship (for example, signal coordination work in various locations tied together through a traffic control center).

Projects that include multiple components or sponsors are allowed to be submitted, but the scope of work, funding amounts and schedules for each individual agency and/or component must be clearly identified at the time of application. If awarded PSRC funds, these projects may be separated into their individual components or lead agency in the regional Transportation Improvement Program. Each individual TIP project will be subject to PSRC's project tracking policies and will be administered according to the scope of work and funding awarded for each. If you have questions please contact Kelly McGourty at (206) 971-3601 or [kmcgourty@psrc.org](mailto:kmcgourty@psrc.org).

Resources: A [resource document](#) has been developed to assist sponsors in completing this online application for the 2014 project selection process. The document summarizes information needed by sponsors to complete applications, as well as provides useful information on various topic areas such as financial constraint and project tracking requirements.

Submitting Applications: The importance of complete and accurate information on every application cannot be overemphasized. The evaluation and scoring of all submitted projects will be based on the answers provided in this application.

All applications must be submitted by **11:59p.m. May 7, 2014**.

## Project Information

**Project Title** Electric Trolley Bus Fleet Replacement

**Transportation 2040 ID#** N/A

The current list of investments that are required to be on the Transportation 2040 Regional Capacity Project List and have a designated ID # can be accessed at Appendix N of the 2014 Transportation 2040 Update, [here](#). If your project is exempt

from this requirement, please enter "N/A." Helpful information on those exempt investments that are considered programmatic in nature or are on local facilities and therefore not required to be on the Project List can be found [here](#).

For assistance or questions regarding these issues, contact Kimberly Scrivner at 206-971-3281 or [kscrivner@psrc.org](mailto:kscrivner@psrc.org).

**Sponsoring Agency** King County

**Co-Sponsoring Agency** -

**Does sponsoring agency have "Certification Acceptance" (CA) status from WSDOT?**

**More information on certification acceptance and a listing of current CA agencies can be found [here](#).**

Yes

No

**If not, which agency will serve as your CA sponsor?**

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## Contact Information

**Project Contact Name** Peter Heffernan

**Project Contact Phone** (206)477-3814

**Project Contact Email** [peter.heffernan@kingcounty.gov](mailto:peter.heffernan@kingcounty.gov)

## Project Description

### Project Scope

**Please describe clearly and concisely the individual components of this project. What will be the specific outcome of this project? What will be built, purchased or provided with this grant request? For example, if this is part of a larger project, please be specific as to what portion on which the grant funds will be used.**

King County Metro's electric trolley bus fleet of 159 coaches is at the end of its useful life and need to be replaced. This request for funds will assist in acquiring 3 - 60ft electric trolley buses that will operate on the existing 70 miles of overhead wire infrastructure. The new trolley buses in addition to begin all electric vehicles will have the ability to operate off wire for short distances, something the existing

electric trolley bus fleet cannot do. The ability to operate off wire will allow Metro to operate around construction sites and blockages in the trolley network. Currently Metro is required to switch to diesel buses in these situations. The need to switch to diesel buses occurred approximately 15-20% of the time on weekends. Weekend service makes accounts for roughly 20% of trolley service.

## **Project Justification, Need, or Purpose**

**Please explain the intent, need or purpose of this project. For example, what is the goal or desired outcome?**

Electric Trolley Buses (ETB) have operated in Seattle for 70 years and have been operating on urban routes in Seattle since the 1940s. They are an integral part of Metro's transit system. They are also the cleanest and quietest buses in our fleet of over 1,459 coaches. Metro operates 14 trolley bus routes on the 70 miles of two-way overhead wire. The ETB system carries over 20 million riders annually between five designated regional growth centers (Seattle CBD, South Lake Union, First Hill/Capitol Hill, Uptown Queen Anne, and University Community) as well as 12 other locally designated centers.

King County Metro needs to replace the existing trolley fleet that is at the end of its useful life. Currently the fleet of 159 ETB consists of 100 – 40ft coaches that were acquired in 2002 and 59 – 60ft articulated coaches that were originally acquired in 1990 as dual power electric/diesel buses to operate in the Downtown Seattle Transit Tunnel and were converted into trolley buses in 2004. The ETB have an outdated electrical systems and some parts that will be difficult to replace once they fail. There is no longer manufacturer support for the existing propulsion systems.

In preparation of this pending fleet replacement in 2010/2011 King County Metro conducted an in-depth, interdisciplinary evaluation of vehicle technology options to determine their relative costs, limitations, and benefits. The study evaluated each technology using the current route structure as a base. After considering multiple factors including environmental considerations such as energy consumption, noise and a life-cycle cost comparison, the evaluation concluded the ETB is the preferred technology to replace the existing fleet. See attached documents to see summary information from the evaluation. Reasons that the ETB technology was preferred over diesel or hybrid technologies include:

- Increased electric service supports Climate Action goals to reduce greenhouse gases. ETB's generate significantly lower GHG emissions and have lower total annual energy consumption.
- Power comes from 100% carbon neutral Seattle City Light. Seattle City Light generates 98 percent of Seattle's electricity from non-GHG emitting sources (hydroelectric, nuclear, wind, and biomass).
- Approximately twice as energy-efficient as internal-combustion buses. Saves hundreds of thousands of gallons of diesel each year
- Quietest transit vehicles available
- Excellent hill climbing ability and acceleration
- Overall environmental comparison favors the electric trolley bus regarding traffic, noise, air quality/climate change, energy, and environmental justice.

The need to switch from an ETB to a diesel buses occurs on one or more trolley bus routes almost every weekend to accommodate construction projects. Obstructions that impede trolley operations generally fall into three categories.

Category 1: Construction work or equipment in the roadway that affects a single intersection or work that affects an entire city block and adjoining intersections. This is the reason for the majority of requests to allow diesel-powered buses. Examples of construction work include utility work to replace or repair an electrical pole or water/gas line break, pothole repairs or concrete panel replacement, rooftop work requiring a crane to be set out in the street, police or fire responses, and vehicle breakdowns.

Category 2: Construction work involving longer street sections that are inaccessible for trolley operation. Examples are asphalt surface grinding and resurfacing, parades, demonstrations, or civil unrest.

Category 3: Long-term construction projects lasting many months or even over a year. Examples include street widening and reconfiguration projects such as the current Mercer Street Project or the Alaskan Way Viaduct project.

Category 1 represents approximately 75 percent of the requests for placing diesel buses on a route. In most cases, these requests could be effectively handled without having replacement diesel buses by an electric trolley that had an alternate propulsion system capable of operating off-wire for up to a mile.

Category 2 represents about 20 percent of the requests. In most cases, the route would have to be serviced with replacement diesel buses, or where possible, the overhead wire can be moved out beyond the obstructed work area. This often is the solution if the work is in the curb lane only.

Category 3 represents 5 percent of the requests and is handled by permanent reroutes for alteration of service delivery due to the long-term nature and effect on transit service.

The full Trolley Bus Evaluation study can be found at [http://metro.kingcounty.gov/up/projects/pdf/Metro\\_TB\\_20110527\\_Final\\_LowRes.pdf](http://metro.kingcounty.gov/up/projects/pdf/Metro_TB_20110527_Final_LowRes.pdf)

## Project Location

### Project Location

**For example, please include street, route or trail name, or other identifiable location.**

various locations in Downtown Seattle, Capital Hill, Lower Queen Anne, University District, Ballard and Rainier Valley

**Please identify the crossroad, milepost or landmark nearest the beginning and end of the project below, if applicable.**

**Crossroad/landmark nearest to the beginning of the project:**

Various Locations

**Crossroad/landmark nearest to the end of the project:**

Various Locations

**Please identify the center(s), regional and local, the project is located in or supports.**

**Refer to PSRC's [centers page](#) for more information on the regional centers.**

Regional growth centers served: Seattle CBD, First Hill/Capital Hill, South Lake Union, Uptown Queen Anne, University District, Ballard and Rainier Valley

## Federal Functional Classification

Roadways must be approved on the federally classified roadway system before projects on it may use federal transportation funds (this includes proposed new facilities), unless the project meets certain exceptions. Resources to identify a facility's functional classification or exceptions to this requirement may be found [here](#).

**Please select the appropriate project category (rural or urban) followed by the corresponding functional classification.**

Not Applicable

## Plan Consistency

**All projects must be consistent with a comprehensive plan that has been certified by PSRC as being consistent with the Growth Management Act, VISION 2040 and Transportation 2040. Projects must be consistent with the comprehensive plan of each jurisdiction in which the project is located. If a comprehensive plan has not been certified, projects located in that jurisdiction may not be included in the Regional TIP. For more information, please refer to [PSRC's Plan Review](#) page or contact Yorik Stevens-Wajda at 206-464-6179**

**Is the project specifically identified in a local comprehensive plan?**

Yes

No

**If yes, indicate 1) plan name 2) relevant section 3) page number.**

The project is included in the adopted King County Metro Six Year budget which is included in the Comprehensive Plan by reference. The ETB replacement project is also consistent with the following goals in the adopted King County Metro Strategic:

- Goal 2: Human Potential. Provide equitable opportunities for people from all areas of King County to access the public transportation system.
- Goal 3: Economic Growth and Built Environment. Encourage vibrant, economically thriving and sustainable communities.
- Goal 4: Environmental Sustainability. Safeguard and enhance King County's natural resources and environment.

**If no, describe how the project is consistent with the applicable local comprehensive plan, including specific local policies and provisions the project supports.**

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## Category Specific Questions

**Select one of the following three criteria categories that best fits your project.**

Regional or Locally Designated Center

NOTE: Once a selection is made, you will be taken to a new page to enter additional information based on the category selected.

## Designated Regional or Local Center

**You have selected Designation Regional or Local Center. If this is not the appropriate classification, please go back and change your selection.** In the sections below, please provide complete but concise responses, addressing as many bullet points as possible. The evaluation and scoring of all submitted projects will be based on the answers provided by the sponsor. Refer to the [2014 King Countywide Project Evaluation Criteria](#) for PSRC's FHWA Funds in the King Countywide Call for Projects for guidance, examples, and details on scoring for additional information.

### A1. Regional or Local Center Development

**Please address the following:**

- **Describe how the project will support the existing and planning housing/employment densities in the regional or local center.**
- **Describe how the project will support the development/redevelopment plans and activities of the center. Please provide a citation of the corresponding policies and/or specific project references in a subarea plan or in the comprehensive plan.**
- **Describe how the project will support the establishment of new jobs/businesses or the retention of existing jobs/businesses including those in the industry clusters identified in the adopted Regional Economic Strategy.**

This project will directly benefit and support existing and planned housing and employment in five designated Regional Growth Centers (Seattle CBD, Uptown Queen Anne, First Hill/Capital Hill, University Community, and South Lake Union) and 12 local identified centers.

It will also indirectly benefit the other 12 regional growth centers and four manufacturing industrial centers located within King County. All 12 of these growth centers have transit routes that connect to Downtown Seattle and will benefit due to the ability of transit to operate efficiently through downtown Seattle providing service reliability. The ETB network carries approximately 20% of Metro's weekday riders and over 20 million riders annually resulting in a reduction of congestion on the roadway system and improved speed and reliability of transit service through out King County.

The replacement of the aging fleet with new electric trolley buses will allow King County Metro to continue to provide frequent, reliable, environmentally friendly, and quiet transit service to these five regional centers and three local urban hubs villages and nine local residential urban villages identified in the City of Seattle's Comprehensive plan. The environmental and reduced noise pollution benefits of the ETB's are key factors that will help the regional growth centers meeting their development goals.

The benefits of the electric trolley bus identified in the evaluation that will help to support existing and future housing and employment in the centers include: electric trolley buses offer superior grade-climbing capability and performance compared to a conventional diesel hybrid bus, lower noise pollution - electric trolley buses are on average 5 to 10 decibels lower than diesel powered buses, and electric trolley bus generates significantly lower GHG emissions.

Of particular interest in neighborhoods served by trolley bus routes was the effect of the propulsion technology chosen to replace the existing trolley fleet on property values. Research exists that demonstrates the positive effect of the permanence of infrastructure to positively affect property values. King County Metro's maintains a network of approximately 70 miles of overhead wires and other infrastructure (substations). Investment in the existing trolley system of approximately \$240 million to replace the aging fleet with new electric trolley's clearly demonstrates King County's commitment to the permanence of the trolley network.

The project supports the policies and goal of the City of Seattle's Comprehensive plan to focus growth into designated urban centers and villages, maximize the use of the existing infrastructure, provide a safe and reliable transportation system and meet its mode targets.

The project supports the following policies and goals in the City of Seattle Comprehensive Plan.

#### Urban Village Element

UVG4 Promote densities, mixes of uses, and transportation improvements that support walking, use of public transportation and other transportation demand management (TDM) strategies, especially within urban centers and urban villages.

UVG9 Use limited land resources more efficiently and pursue a development pattern that is more economically sound, by encouraging infill development on vacant and underutilized sites, particularly within urban villages.

UVG10 Maximize the benefit of public investment in infrastructure and services, and deliver those services more equitably by focusing new infrastructure and services, as well as maintenance and improvements to existing infrastructure and services, in areas expecting to see additional growth, and by focusing growth in areas with sufficient infrastructure and services to support that growth.

UV2.5 In areas surrounding major transit hubs, except in industrial zones, allow densities sufficient to take advantage of significant investment in public transportation infrastructure. Use incentive zoning programs and other strategies to help ensure the provision of affordable housing.

UVG31 Concentrate a greater share of employment growth in locations convenient to the city's residential population to promote walking and transit use and reduce the length of work trips.

UVG32 Plan for urban centers to receive the most substantial share of Seattle's growth consistent with their role in shaping the regional growth pattern.

#### Transportation Element

TG9 Provide programs and services to promote transit, bicycling, walking, and carpooling to help reduce car use and SOV trips.

TG10 Accommodate all new trips in downtown with non-SOV modes.

TG14 Increase transit ridership, and thereby reduce use of single-occupant vehicles to reduce

environmental degradation and the societal costs associated with their use.

T20 Work with transit providers to provide transit service that is fast, frequent, and reliable between urban centers and urban villages and that is accessible to most of the city's residences and businesses. Pursue strategies that make transit safe, secure, comfortable, and affordable.

T23 Pursue a citywide local transit system that connects homes and businesses with neighborhood transit facilities.

T24 Work with transit providers to design and operate transit facilities and services to make connections within the transit system and other modes safe and convenient. Integrate transit stops, stations, and hubs into existing communities and business districts to make it easy for people to ride transit and reach local businesses. Minimize negative environmental and economic impacts of transit service and facilities on surrounding areas.

The Trolley bus network will benefit PSRC's identified targeted cluster businesses by making them more accessible to employees and customers with faster, more frequent, and easier to use service that runs all day. The Trolley bus routes serve key regional growth centers and provide connections to manufacturing and urban centers, where some of the targeted industry clusters are located. With the connection through Downtown Seattle, where all five industry clusters are located, access to over 100,000 jobs is provided. The project will also benefit the University of Washington, First Hill, Capital Hill and South Lake Union, a link to life science and information technology job clusters.

## A2. Project's Benefit to the Regional or Local Center

### **Please address the following:**

- **Describe how the project remedies a current or anticipated problem (e.g. congestion, incomplete sidewalk system, inadequate transit service/facilities, modal conflicts and/or the preservation of essential freight movement)?**
- **Describe the user groups that will benefit from the project. User groups may include commuters, residents, commercial users, those groups identified in the President's Order for Environmental Justice, seniors, people with disabilities, and/or areas experiencing high levels of unemployment or chronic underemployment.**

The acquisition of the new electric trolley's to replace the aging fleet of existing buses is logical decision that maintains and improves access to multiple local and regional centers served by the trolley network.

The acquisition of a new electric trolley fleet maximizes the investment already made by Metro and the City of Seattle to build and maintain the trolley overhead wire system and supporting infrastructure.

The new electric trolley bus fleet will remove an existing barrier that affects trolley bus service speed and reliability. The current trolley bus fleet cannot operate off-wire. When a trolley bus needs to detour off-wire to avoid construction activity, traffic incidents, roadway obstructions, special events, and localized

electrical outages a bottle neck occurs. This bottleneck causes roadway congestion and has a negative impact on transit service and general purpose traffic. Currently, when there is need for a detour arises diesel hybrid buses are brought in to provide service.

The new electric trolley buses will be equipped with battery auxiliary power units (APU) capable of providing off-wire power for at least a mile. Based on this coverage area, approximately 90 percent of instances requiring detours and replacement of the zero emission trolley buses by hybrid diesel buses could be accommodated by the new trolley buses equipped with APU's.

An additional benefit of the APU's is that potentially some overhead wiring in maintenance yards could be removed, reducing the cost to maintain and repair the overhead wire network.

This project maintains and improves existing intermodal connections. The trolley network provides connects to several multimodal hubs including: King Street Station, West Lake Center and Colman Dock. The trolley network also provides connections other modes such as Link Light Rail, Ferries (Auto and Passenger Only), Amtrak, Sounder Commuter Rail and Grey Hound. In addition to the linkages that the trolley system makes to other transit modes the 70 mile network of overhead wires makes walking and biking a viable option to access the regional and local centers. King County Metro buses are equipped with bike racks capable of carrying three bikes each.

The new electric trolley vehicles with APU's will improve the reliability of trolley bus service. The ability to operate off-wire for up to one mile will provide the capability to avoid construction activity, traffic incidents, roadway obstructions, special events, and localized electrical outages. This ability will improve travel times and reliability of transit service to and through the centers.

The replacement of trolley fleet will provide a long term, cost efficient solution to the problem that the existing trolley fleet is reaching the end of its useful life and needs to be replaced. Replacing the trolley fleet with electric trolley instead of diesel or hybrid diesel buses will maximize Metro's existing investment in the 70 mile trolley wire overhead and related infrastructure.

The trolley network provides service to most densely populated and largest employment centers in our region. The attributes of the electric trolley bus that will encourage addition ridership include: improved reliability due to the ability to operate off-wire, their superior grade-climbing capability, reduced noise pollution - electric trolley buses are on average 5 to 10 decibels lower than diesel powered buses, and electric trolley produce zero emissions.

The new electric trolley buses will allow for the continuation of the existing service that provides frequent and convenient connects to major destination and linkages between regional and local centers. This high quality service and new buses will attract new riders to transit who have other travel options, this will lead to a reduction in single occupant vehicle use and vehicle miles traveled.

The trolley network that these buses will operate on connects to several multimodal hubs including: King Street Station, West Lake Center and Colman Dock. The trolley network also provides connections other modes such as Link Light Rail, Ferries (Auto and Passenger Only), Amtrak, Sounder Commuter Rail and Grey Hound. In addition to the linkages that the trolley system makes to other transit modes the 70 mile network of overhead wires makes walking and biking a viable option to access the regional and local centers. King County Metro buses are also equipped with bike racks capable of carrying three bikes each.

The project will maintain and improve the ability of users to travel safely to and through the regional and local centers, make connects to several other modes include light rail, commuter rail, ferry, Amtrak, and monorail. The trolley network also provides connections to major regional and local destination such as

sport stadiums, medical facilities, museums, theaters, shopping and universities.

This project will traverse through multiple designated regional growth centers and will help meet the travel needs of variety of users; commuters, students, transit-dependent, shoppers, and those who choose to give up their cars for environmental reasons. This project will also benefit minority and lower income populations as designed in the president's Executive Orders for Environmental Justice by benefiting those within the trolley system service area. The table shows percentage of minority and low income population within 1/4 mile of trolley service.

Percent of Minority and Low income Populations in Census Tracts Containing Trolley Bus Routes Compared to King County Total Population

King County Census Tracts containing Trolley Bus Routes

Total Population 1,737,034 274,206

Minority Population 401,797 99,439

Percent of Total 23.10% 36.30%

Population Below Poverty 142,546 38,039

Percent of Total 38,039 13.90%

## A3. Circulation Within the Regional or Local Center

### Please address the following:

- Describe how the project improves safe & convenient access to major destinations within the center, such as by completing a physical gap or providing an essential link in the transportation network for people and/or goods.
- Describe how the project will improve circulation and enhanced opportunities for active transportation within the center regarding (address each relevant area): walkability, public transit access, public transit speed and reliability, safety & security, bicycle mobility, bicycle facilities, streetscape improvements, traffic calming, etc.
- Describe how the project provides users (e.g. employees, residents, customers) a range of travel modes or provides a “missing” mode.
- If the project has a parking component, describe how it has been designed to be compatible with a pedestrian oriented environment, including any innovative parking management tools.

The replacement of trolley fleet will provide a long term, cost efficient solution to the problem that the existing trolley fleet is reaching the end of its useful life and needs to be replaced. Replacing the trolley fleet with electric trolley instead of diesel or hybrid diesel buses will also maximize the use of the existing 70 mile trolley wire overhead and related infrastructure.

The new electric trolley buses will allow for the continuation of the existing service that provides frequent and convenient connects to major destination and linkages between regional and local centers. This high quality service and new buses will attract new riders to transit who have other travel options, this will lead to a reduction in single occupant vehicle use and vehicle miles traveled.

The new electric trolley buses will improve safety and reduce modal conflicts. The ability to operate off-wire will reduce the conflicts between the modes that occur when the existing trolley bus encounters an obstruction that is unable to bypass. Reduction in unexpected congestion and bottleneck that occurs behind a stuck bus will improve the safety and operation of the roadway network.

In addition to reducing modal conflicts the extensive 70 mile trolley network wires makes walking and biking a viable option to access the regional and local centers. The new fleet of trolley buses will also be equipped with bike racks capable of carrying three bikes each.

## Manufacturing/Industrial Center

**You have selected Manufacturing/Industrial Center. If this is not the appropriate classification, please go back and change your selection.** In the sections below, please provide complete but concise responses, addressing as many bullet points as possible. The evaluation and scoring of all submitted projects will be based on the answers provided by the sponsor. Refer to the [2014 King Countywide Project Evaluation Criteria](#) for PSRC's FHWA Funds in the King Countywide Call for Projects for guidance, examples, and details on scoring for additional information.

## B1. Development and Users Benefit

**Please address the following:**

- Describe how the project will benefit or support the development plans and activities of the manufacturing/industrial center. Please provide a citation of the corresponding policies and/or specific project references in a subarea plan or in the comprehensive plan.
- Describe how the project will support the establishment of new jobs/businesses or the retention of existing jobs/businesses, including those in the industry clusters identified in the adopted Regional Economic Strategy.
- Describe the user groups that will benefit from the project. User groups may include commuters, residents, commercial users, those groups identified in the President's Order for Environmental Justice, seniors, people with disabilities, and/or areas experiencing high levels of unemployment or chronic underemployment.

## B2. Mobility and Accessibility Benefit

### Please address the following:

- Describe how the project provides and/or enhances opportunities for freight movement.
- Describe how the project completes a physical gap, provides an essential link, or removes a barrier in the Freight & Goods component of the Metropolitan Transportation System.
- Describe how the project improves safety and reduces modal conflicts to help achieve a seamless system.
- Describe how the project improves access for one or more modes to major employment sites, including opportunities for active transportation.
- Describe how the project promotes Commute Trip Reduction (CTR) and other TDM opportunities.

## Corridor Serving Center(s)

**You have selected Corridor Serving Center(s). If this is not the appropriate classification, please go back and change your selection.** In the sections below, please provide complete but concise responses, addressing as many bullet points as possible. The evaluation and scoring of all submitted projects will be based on the answers provided by the sponsor. Refer to the [2014 King Countywide Project Evaluation Criteria](#) for PSRC's FHWA Funds in the King Countywide Call for Projects for guidance, examples, and details on scoring for additional information.

## C1. Benefit to Regional, Local, or Manufacturing/Industrial Center

### Please address the following:

- Describe how this project will benefit or support the housing and employment development in a regional or local center(s) and/or employment growth in a manufacturing/industrial center(s). Does it support multiple centers? Please provide a citation of the relevant policies and/or specific project references in a subarea plan or in the comprehensive plan.
- Describe how the project provides or benefits a range of travel modes to users traveling to/from centers, or if it provides a missing mode.

- Describe the user groups that will benefit from the project, including commuters, residents, commercial users, those groups identified in the President's Order for Environmental Justice, seniors, people with disabilities and/or areas experiencing high levels of unemployment or chronic underemployment.
- Describe how the project will support the establishment of new jobs/businesses or the retention of existing jobs/businesses including those in the industry clusters identified in the adopted Regional Economic Strategy.

## C2. System Continuity/Long-Term Benefit and Sustainability

Please address the following:

- Describe how this project supports a long-term strategy to maximize the efficiency of the corridor, including TDM and TSM opportunities. Describe the problem and how this project will remedy it.
- Describe how this project provides a “logical segment” that links to a regional, local, or manufacturing/industrial center.
- Describe how the project fills in a missing link or removes barriers to/from a center.
- Describe how this project will relieve pressure or remove a bottleneck on the transportation system and how this will positively impact overall system performance.
- Describe how this project improves safety and/or reduces modal conflict, and provides opportunities for active transportation.

## Air Quality and Climate Change

**You have not selected a category and these questions were skipped. Please go back and make your selection.**

Additional guidance on the evaluation of air quality and climate change benefits is available [here](#), in addition to the information contained in the [2014 King Countywide FHWA Project Evaluation Criteria](#).

**Please describe how your project will reduce emissions. Include a discussion of the population served by the project (who will benefit, where, and over what time period). Specific questions have been prepared to assist you in responding to this criterion depending on the type of project.**

**Please select all of the elements in the list below that are included in the project's scope of work, and provide the requested information in the text box below.**

- Diesel Particulate Emissions Reduction Projects (e.g. diesel engine retrofits)
- Roadway Capacity (general purpose and high occupancy lanes)
- Transit
- Bicycle/Pedestrian Facilities
- Intelligent Transportation Systems (signalization, etc.)
- Alternative Fuels or Vehicle Technology
- Other

- **Diesel Particulate Emissions Reduction Projects:** Describe the types of vehicles, vessels, engines, duty cycles, etc. being addressed. Describe the emissions vintage of the existing engines, and the number of vehicles to be addressed. Describe how often they are used, where they are used, how much fuel is consumed annually and when the benefits from this project will occur.
- **Roadway Capacity (general purpose and high occupancy lanes):** Describe the roadway and travel conditions before and after the proposed project, including average daily traffic and travel speeds. Describe the potential for multimodal connections, shorter vehicle trips, etc. Describe the transit routes currently using the facility and anticipated in the future. Does this project connect to or expand an existing high occupancy vehicle or business access transit lane system? What is the length of the project and the population served? What source of data indicates the expected conversion of single occupant vehicle trips to transit or carpool?
- **Transit (park-and-ride lots, new or expanded transit service, transit amenities, etc.):** Describe the current transit ridership in the project area. Describe the current transit routes serving the project area, including average trip length. If a park-and-ride lot, how many stalls are being added? Describe how the amenities (or other components of the project) are expected to encourage new transit ridership and shift travel from single occupant vehicles to multimodal options. Describe the population served that will be expected to use the new/improved service. What source of data indicates the expected conversion of single occupant vehicle trips to transit?

- Bicycle/Pedestrian Facilities: Describe the length of the proposed facility, including connections to other nonmotorized facilities and to the larger nonmotorized system. Describe the expected travel shed (i.e., land use and population surrounding the project). Does the facility connect to transit? What is the expected population served, and what source of data indicates the expected conversion of single occupant vehicle trips to this mode?
- Intelligent Transportation Systems: Describe the existing conditions in the area, including level of service, average daily traffic, average speed, etc. Describe how the project is expected to improve traffic flow through improved speeds, reducing idling, reducing accidents, etc. What is the percentage of heavy trucks using the facility? Does the project improve traffic flow for particular modes ( e.g. HOVs) or types of vehicles ( e.g. transit buses or freight trucks)? What are the transit routes along the corridor, and will this project improve transit reliability on the corridor?
- Alternative Fuels or Vehicle Technology: Describe the change in fuel or vehicle technology. How many vehicles are affected? What are the current conditions?
- Other: Describe how your project has the potential to reduce emissions through technology, improved management or other means, e.g. “no idling” signage & enforcement, auxiliary power units to operate heating, cooling & communications equipment, truck stop electrification, etc.

There is several air quality benefits associated with the replacement of the existing ETB with a new fleet of ETB’s coaches. These benefits include the ability to operate off wire which will eliminate the need to run diesel buses to work around roadway construction and blockages in the network and the continuation the use of all electric technology which is 98% environmental efficient unlike fossils fuels. .

In preparation of this fleet replacement an in-depth, interdisciplinary evaluation of propulsion vehicle technology options to determine relative costs, limitations, and benefits was conducted. The two technologies that were considered most viable, hybrid diesel/electric and electric trolley buses were looked at in more detail. The study evaluated these two technologies using the current route structure as a base. The information provided in this study that led to the decision to acquire a new fleet of ETB’s over diesel is below.

**AIR QUALITY/CLIMATE CHANGE/ENERGY** - As part of the Trolley Study an air quality analysis was conducted for volatile organic compounds (VOCs), particulate matter larger than 2.5 microns and smaller than 10 microns (PM10), nitrous oxides (NOx), and carbon dioxide (CO2).

The health risks associated with VOCs primarily relate to respiratory problems, allergic effects, and a variety of acute chronic symptoms; continuous exposure to some VOCs can also cause cancer. PM10 reduces general visibility and also causes respiratory problems, such as asthma, lung inflammation, lung cancer, and premature death. Both VOCs and PM10 also contribute to overall greenhouse gas emission increases. Nitric oxide (NO) and nitrogen dioxide (NO2) are often collectively referred to as nitrous oxides (NOx). NOx is a pre-cursor of nitric acid vapor and related particles, which can damage lung tissue, cause emphysema and bronchitis, and, in severe cases, cause premature death. When NO2 reacts with sunlight, oxygen is separated and forms into ozone (O3), which is also a GHG. NOx also plays a key role in acid rain.

The exponential increase in CO2 emissions from humans and its role in the GHG effect and climate change make CO2 of paramount concern. CO2 accounts for approximately 95 percent of the total global warming potential from vehicle emissions.

In addition to air pollutants, the total energy consumption for each vehicle type was also estimated. For all four air pollutants, emissions from a diesel hybrid fleet would be several orders of magnitude higher compared to a fleet of electric trolley buses. This is because the electricity used to power the trolley system has been and will continue to be obtained from Seattle City Light (SCL), which uses coal and natural gas to generate only 2 percent of its electricity and the remaining 98 percent is generated from non-GHG emitting sources (hydroelectric, wind, nuclear, etc.).

#### Air Quality and Energy Analysis

VOC PM10 NOx CO2e Energy

Hybrid Fleet 0.94 0.54 12.32 6,624.84 86,681.00

Trolley Fleet 0.01 0.07 1.37 304.28 59,710.00

Emissions associated with the diesel hybrid bus fleet option do not include emissions associated with extracting, processing, and transporting petroleum; i.e., these emissions do not account for generation emissions and only represent tail pipe emissions. Generation emissions for diesel fuel-related production and distribution costs are highly variable and difficult to quantify. Conversely, the trolley bus fleet emission estimates account for both generation and tail pipe emissions.

**PUBLIC HEALTH** - The transportation system can affect public health in many ways. Potential effects on public health due to hazardous materials, noise, air quality, and safety were examined. The analysis determined that diesel hybrid buses can be up to 10 decibels louder than trolley buses, with the most notable difference occurring during acceleration and that emissions of air toxics would be substantially higher with diesel hybrid buses than with electric trolley buses.

## Financial Plan & Project Readiness

In this section, sponsors will address questions regarding the PSRC funding request, the total estimated project cost and schedule, and the project's readiness to obligate PSRC funds. Sponsors should be aware of the following information before completing this section:

**Funding Request:** Sponsors may request funding for any single project phase, but requests for multiple phases are limited to preliminary engineering plus the subsequent phase necessary. I.e, a sponsor may request funding for both preliminary engineering and right of way phases or preliminary engineering and construction phases, but not both right of way and construction phases.

**Funding Requirements:** A minimum of 13.5% of local matching funds is required for both Surface Transportation Program (STP) and Congestion Mitigation and Air Quality Improvement Program (CMAQ) funding. The combination of the requested PSRC funds plus all other funding must be adequate to fully fund that phase. Requests that do not result in a phase being fully funded will be considered ineligible for PSRC funding.

**Obligation Requirements:** Per PSRC's project tracking policies, all project phases awarded PSRC funds must obligate by June 1st of the program year selected. For more information, see PSRC's project tracking policies [here](#).

## PSRC Funding Request

Please identify the phase(s) for which PSRC funds are being requested, the funding source, the amount, and expected year of obligation. Confirm the total by pressing the calculate button.

### Funding Source

STP

CMAQ

Phase	Year	\$Amount Requested
Other	2015	\$3,000,000

**Total PSRC Funding Request:** \$3,000,000

## Total Estimated Project Cost and Schedule

In the table below, please provide the total estimated cost and schedule for all phases of the project, from start to finish, and indicate when each phase was, or is planned to be, completed. If a phase is not required for the project, indicate with N/A.

Please include all funding amounts and sources (including the requested PSRC funds) and identify whether they are secure, reasonably expected, or unsecure. **PSRC's definitions and guidance for determining secure and reasonably expected funds may be found [here](#).**

NOTE: If you find that you need more rows than provided in the tables below, please fill out the supplemental project cost spreadsheet available [here](#) and upload in the area below.

[txJWfq6R\\_CW - ETB\\_Supplement-ProjectCostandSchedule.xlsx](#)

## Planning Phase

Please note, the planning phase of a capital project is considered to be part of the preliminary engineering phase. Complete this section only if this project is an independent planning study.

Total Planning Phase Cost: \$0

Actual or estimated date of completion (month and year): -

## Preliminary Engineering/Design Phase

Total Preliminary Engineering/Design Phase Cost: \$0

Actual or estimated date of completion (month and year): -

## Right of Way Phase

Total Right of Way Phase Cost: \$0

Actual or estimated date of completion (month and year): -

## Construction Phase

Total Construction Phase Cost: \$0

Actual or estimated date of completion (month and year): -

## Other Phase

Total Other Phase Cost: \$0

Actual or estimated date of completion (month and year): -

## Project Summary

The calculated total project cost below is based on the entries completed above. Please review for accuracy before proceeding to ensure all funding is reflected.

**Total Estimated Project Cost:** \$0

**Estimated Project Completion Date (month and year):** December 2016

# Financial Documentation

Please provide supporting documentation using the upload function below to demonstrate that all additional funds for the phase(s) for which PSRC funds are being requested are secure or reasonably expected.

[fVZgs4TK\\_Budget\\_Documentation\\_ETB\\_Ordinance\\_17476.pdf](#)

Please describe the secure or reasonably expected funds identified in the supporting documentation. For funds that are reasonably expected, an explanation of procedural steps with milestone dates for completion which will be taken to secure the funds for the project or program should also be included.

For more information, refer to PSRC's [financial constraint guidance](#).

Matching funds are secured. Match will come from local King County funds in the Public Transportation Enterprise Fund – Capital Sub-fund. Biennially, the King County Council adopts a budget that includes line-item budgets for capital projects and programs. The adopted budget also includes a 6-year Capital Improvement Program that reflects anticipated out year appropriations that are funded with anticipated revenue.

# Project Readiness

PSRC recognizes that the complexity of some projects can trigger a variety of prerequisites that must be satisfied before federal funding is typically eligible to be obligated. The questions in this section are designed to identify those requirements and assist sponsors to:

- Identify which obligation prerequisites and milestones apply to their specific project.
- Identify which of these have already been satisfied at time of application.
- Provide an explanation and realistic completion date for all obligation prerequisites and milestones not yet completed.

In the following section, sponsors will be asked a series of questions about the project. Based on these responses, sponsors will be directed to the appropriate set of subsequent questions addressing the project's readiness.

NOTE: Sponsors applying for funds for only planning studies or preliminary engineering/design phases are not required to provide further information for project readiness and will be directed to the next required set of questions.

# Project Readiness

Are you requesting funds for ONLY a planning study or preliminary engineering?

Yes

No

**Is preliminary engineering for the project complete?**

Yes

No

**What was the date of completion (month and year)?**

-

**Have preliminary plans been submitted to WSDOT for approval?**

Yes

No

**When are preliminary plans expected to be complete and approved by WSDOT (month and year)?**

Not applicable

**Are there any other PE/Design milestones associated with the project? Please identify and provide dates of completion. You may also use this space to explain any dates above.**

No

## Project Readiness

**What is the current or anticipated level of environmental documentation under the National Environmental Policy Act (NEPA) for this project?**

Environmental Impact Statement (EIS)

Environmental Assessment (EA)

Documented Categorical Exclusion (DCE)

Categorical Exclusion (CE)

**Has the NEPA documentation been approved?**

Yes

No

**Please provide the date of NEPA approval, or the anticipated date of completion (month and year).**

June 2012

## Project Readiness

**Will right of way be required for the project?**

Yes

No

**How many parcels do you need?**

-

What is the zoning in the project area?

-

Discuss the extent to which your schedule reflects the possibility of condemnation and the actions needed to pursue this.

-

Does your agency have experience in conducting right of way acquisitions of similar size and complexity?

Yes

No

If not, when do you expect a consultant to be selected, under contract, and ready to start (month and year)?

-

In the box below, please identify all relevant right of way milestones, including the current status and estimated completion date of each. For example, these might include:

- True cost estimate of right of way
- Right of way plans (stamped)
- Relocation plan
- Right of way certification
- Right of way acquisition
- Certification audit by Washington State Department of Transportation Right of Way Analyst
- Relocation certification, if applicable

-

## Project Readiness

Are funds being requested for construction?

Yes

No

Do you have an engineer's estimate?

Yes

No

Please upload a copy of your engineer's estimate below.

[Ut90uza6 ETB Cost Estimate.xlsx](#)

Identify the environmental permits needed for the project and when they are scheduled to be acquired.

Not applicable

Are Plans, Specifications & Estimates (PS&E) approved?

Yes

No

**Please provide the date of approval, or the date when PS&E is scheduled to be submitted for approval (month and year).**

Not applicable

**When is the project scheduled to go to ad (month and year)?**

July 2013

## Other Considerations

**Please describe any additional aspects of your project not previously addressed in the application that could be relevant to the final project recommendation and decision-making process. In addition, please describe any innovative components included in your project: these could include design elements, cost saving measures, or other innovations.**

-

## File Submission

**Please provide any additional supporting documents, including maps, through the upload functions below.**

[JUO5CFj8\\_TrolleyNetworkandCenters.jpg](#)

[6iPTo05i\\_KCM\\_2014\\_FTA\\_Trolley\\_Fleet\\_Replacement\\_Documentation.pdf](#)

## Final Review

**Please review all application form questions to ensure you have completed all fields.** An email containing a PDF version of the project application will be sent to the project contact upon submission.

NOTE: Sponsors may update and resubmit information included in the application until the May 7th deadline. After the deadline has passed, the form site will close and sponsors will not have access for revisions.

## TOTAL ESTIMATED PROJECT COST AND SCHEDULE

Please fill in as many rows as needed in the tables below, to fully and accurately reflect your

Project Sponsor	King County
Project Title	Electric Trolley Bus Replacement

Phase	Funding Source(s) (i.e. PSRC, state, local, etc.)	Secured / Reasonably Expected / or Unsecured*	Amount
Planning Planning Planning			

Planning TOTAL: \$ -

Estimated Planning Completion Date (month and year): \_\_\_\_\_

Phase	Funding Source(s) (i.e. PSRC, state, local, etc.)	Secured / Reasonably Expected / or Unsecured*	Amount
PE/Design PE/Design PE/Design			

Preliminary Engineering / Design TOTAL: \$ -

Estimated PE/Design Completion Date (month and year): \_\_\_\_\_

Phase	Funding Source(s) (i.e. PSRC, state, local, etc.)	Secured / Reasonably Expected / or Unsecured*	Amount
Right of Way Right of Way Right of Way			

Right of Way TOTAL: \$ -

Estimated ROW Completion Date (month and year): \_\_\_\_\_

Phase	Funding Source(s) (i.e. PSRC, state, local, etc.)	Secured / Reasonably Expected / or Unsecured*	Amount
Construction Construction Construction			

Construction TOTAL \$ -

Estimated Construction Completion Date (month and year): \_\_\_\_\_

Phase	Funding Source(s) (i.e. PSRC, state, local, etc.)	Secured / Reasonably Expected / or Unsecured*	Amount
Other	Local	Secured	\$ 167,464,272
Other	5307	Secured	\$ 16,854,514
Other	5339	Secured	\$ 2,291,241
Other	5337(HIFG)	Secured	\$ 48,955,978
Other	5309(FG)	Secured	\$ 253,762
Other	CMAQ	Secured	\$ 1,180,295
Other	CMAQ	Unsecured	\$ 3,000,000

Other TOTAL: \$ 240,000,062

Dec Estimated Other Completion Date (month and year): 12/1/2016

**TOTAL Estimated Project Cost, All Phases: \$ 240,000,062**  
**Estimated Project Completion Date (month and year): 12/1/2016**

\* Additional information on these categories may be found at <http://www.psrc.org/assets/11214/FinancialConstraintGui>



idance.pdf .



# KING COUNTY

1200 King County Courthouse  
516 Third Avenue  
Seattle, WA 98104

## Signature Report

November 13, 2012

Ordinance 17476

Proposed No. 2012-0391.3

Sponsors McDermott

1 AN ORDINANCE that adopts the 2013 Annual Budget and  
2 makes appropriations for the operation of county agencies  
3 and departments and capital improvements for the fiscal  
4 year beginning January 1, 2013, and ending December 31,  
5 2013; and an ordinance that adopts the 2013/2014  
6 Biennium Budget and makes appropriations for the  
7 operations of various county agencies and departments and  
8 capital improvements for the fiscal biennium beginning  
9 January 1, 2013, and ending December 31, 2014.

10 PREAMBLE:

11 King County continues to face the fiscal challenges created by the Great  
12 Recession. In the last six years, the county has trimmed \$253 million  
13 from its general fund budget. Tough choices were made with those cuts,  
14 but the county's proactive approach toward continuing to reform county  
15 government is reflected in the 2013 Budget. It is a budget that spends  
16 neither our reserves nor our rainy day fund and it maintains the county's  
17 AAA bond rating.

18 The 2013 budget addresses our immediate needs, sets careful priorities,  
19 limits expenditures and makes strategic investments. This budget also

2336 Of the appropriation for CIP project, 1027158, RSD C W overlay, \$10,850 shall  
2337 be expended solely for support of independent oversight on the project to be provided by  
2338 the King County auditor's office.

2339 ER2 EXPENDITURE RESTRICTION:

2340 Of the appropriation for CIP project, 1111819, RSD C W drainage preservation,  
2341 \$10,850 shall be expended solely for support of independent oversight on the project to  
2342 be provided by the King County auditor's office.

2343 SECTION 136. BIENNIAL CAPITAL FUND CAPITAL IMPROVEMENT

2344 PROGRAM - The executive proposed capital budget and program for 2013-2018 is  
2345 incorporated in this ordinance as Attachment H to this ordinance. The executive is  
2346 hereby authorized to execute any utility easements, bill of sale or related documents  
2347 necessary for the provision of utility services to the capital projects described in  
2348 Attachment H to this ordinance, but only if the documents are reviewed and approved by  
2349 the custodial agency, the real estate services division and the prosecuting attorney's  
2350 office. Consistent with the requirements of the Growth Management Act, Attachment H  
2351 to this ordinance was reviewed and evaluated according to the King County  
2352 Comprehensive Plan. Any project slated for bond funding will be reimbursed by bond  
2353 proceeds if the project incurs expenditures before the bonds are sold.

2354 From the several capital improvement project funds for the 2013/2014 biennium  
2355 there are hereby appropriated and authorized to be disbursed the following amounts for  
2356 the specific projects identified in Attachment H to this ordinance.

2357	<b>Fund Fund Name</b>	<b>2013/2014</b>
2358	3151 CONSERVATION FUTURES	\$19,388,077

2359	3380	AIRPORT CONSTRUCTION	\$20,828,293
2360	3392	TITLE III FORESTRY	\$25,000
<b>2361</b>	<b>3641</b>	<b>PUBLIC TRANS CONST-UNREST</b>	<b>\$408,342,572</b>
2362	3673	CRITICAL AREAS MITIGATION	\$5,389,305
2363	3691	TRNSF OF DEVELOPMENT CREDIT PROGRAM	(\$133,505)
2364	3840	FARMLAND AND OPEN SPACE ACQUISITION	\$56,976
2365	3850	RENTON MAINTENANCE FACILITY	\$452,317
2366		<b>TOTAL</b>	<b>\$454,349,036</b>

2367        SECTION 137. ADOPTION OF 2013 GENERAL FUND FINANCIAL PLAN.

2368        The 2013 General Fund Financial Plan as set forth in Attachment I to this ordinance is  
 2369        hereby adopted. Any recommended changes to the adopted plan shall be transmitted by  
 2370        the executive as part of the quarterly management and budget report and shall accompany  
 2371        any request for quarterly supplemental appropriations. Changes to the adopted plan shall  
 2372        not be effective until approved by ordinance.

2373                The General Fund Financial Plan shall also include targets for specific designated  
 2374        reserves that shall be funded with unrestricted, unencumbered and nonappropriated funds  
 2375        as these become available during 2013. Unrestricted, unencumbered and  
 2376        nonappropriated funds in excess of these adopted targets and reserves shall be reflected in  
 2377        the General Fund Financial Plan's undesignated fund balance until additional or amended  
 2378        reserves or targets are adopted by ordinance.

2379                Funds may be appropriated by ordinance from any designated reserve.

2380        SECTION 138. ADOPTION OF 2013 EMERGENCY MEDICAL SERVICES

2381        FUND FINANCIAL PLAN. The 2013 Emergency Medical Services Fund Financial

000003380 - AIRPORT CONSTRUCTION		FY13	FY14	FY15	FY16	FY17	FY18	Total
1028653	AD PAVEMENT REHABILITATION (1028653)	\$727,293	\$288,293	\$288,293	\$38,293	\$38,293	\$288,293	\$1,668,756
1028655	AD RESIDENTIAL NOISE IMPROVE (1028655)	\$8,000,000	\$8,000,000					\$16,000,000
1028657	AD AIRPORT FACILITIES REPAIR (1028657)	\$46,126	\$46,126	\$46,126	\$46,126	\$46,126	\$46,126	\$276,754
1028658	AD AIRPORT REDEVELOPMENT (1028658)	\$6,192,438	\$342,783	\$92,783	\$92,783	\$4,922,783	\$92,783	\$11,736,352
1028659	AD DWMSH CLEAN UP SLIP 4 (1028659)	(\$3,903,873)						(\$3,903,873)
1028661	AD ARFF FACILITY IMPROVEMENT (1028661)	\$11,628	\$11,628	\$11,628	\$11,628	\$11,628	\$11,628	\$69,765
1028662	AD NORTH BOEING FIELD MTCA (1028662)	\$38,166	\$38,510	\$38,510	\$38,510	\$38,510	\$38,510	\$230,715
1028663	AD FIRE TRUCK OVERHAUL (1028663)	\$6,382	\$6,382	\$6,382	\$6,382	\$6,382	\$6,382	\$38,293
1028664	AD MAXIMO UPGRADE (1028664)	\$235,000						\$235,000
1028673	AD CAPITAL PROJECT OVERSIGHT	\$9,785						\$9,785
1028733	AD TAXIWAY A REHABILITATION (1028733)	\$14,215	\$14,215	\$14,215	\$14,215	\$14,215	\$14,215	\$85,290
1028734	AD AIRPORT FLEET (1028734)	\$6,382	\$676,382	\$856,382	\$506,382	\$246,382	\$56,382	\$2,348,293
1028735	AD LOWER DUWAMISH WATERWAY (1028735)	\$12,722	\$12,837	\$12,837	\$12,837	\$12,837	\$12,837	\$76,905
1028736	AD FUEL FARM SECURITY (1028736)	(\$5,124)						(\$5,124)
<b>000003380 - AIRPORT CONSTRUCTION Total</b>		<b>\$11,391,139</b>	<b>\$9,437,154</b>	<b>\$1,367,154</b>	<b>\$767,154</b>	<b>\$5,337,154</b>	<b>\$567,154</b>	<b>\$28,866,910</b>

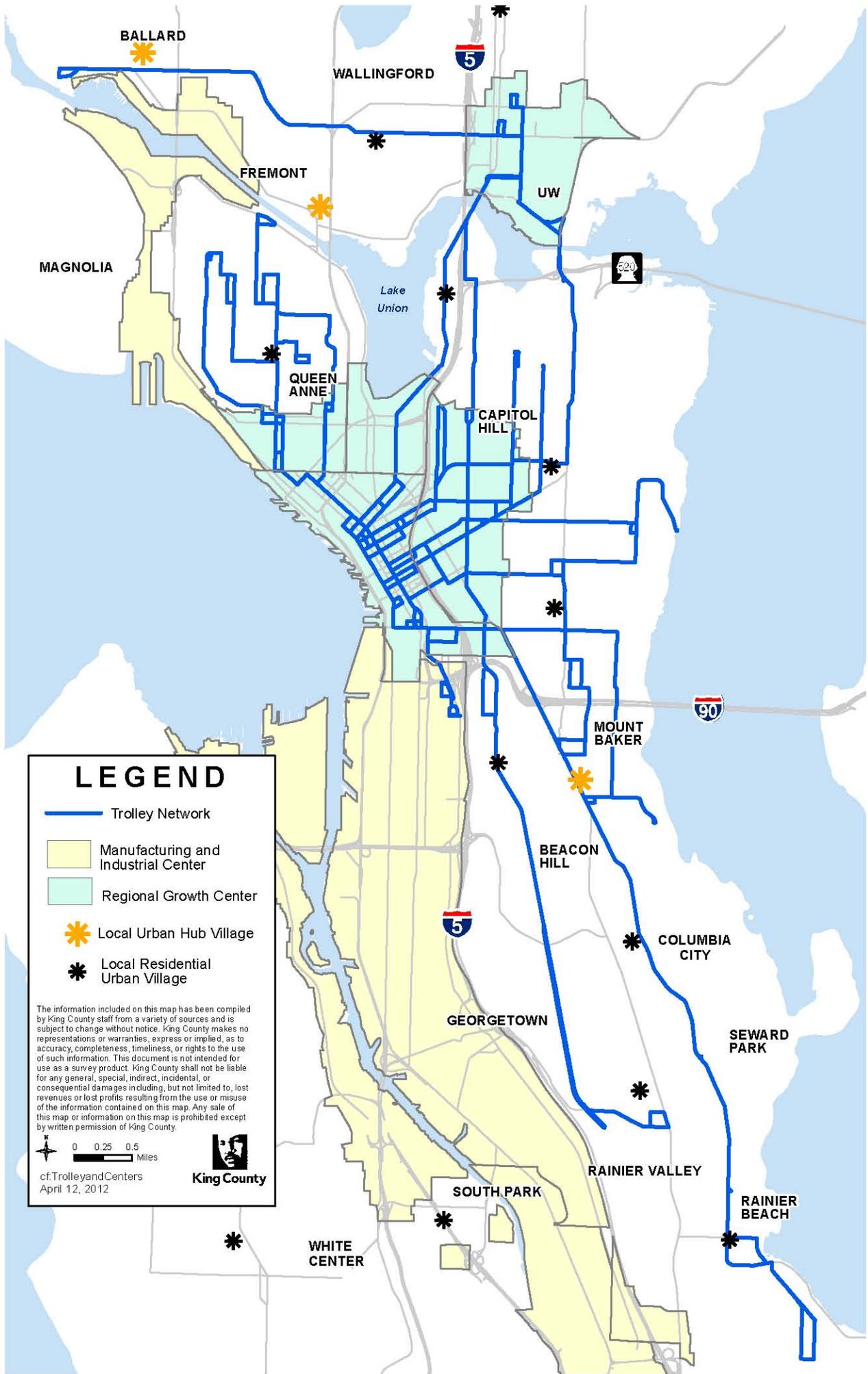
000003392 - TITLE III FORESTRY		FY13	FY14	FY15	FY16	FY17	FY18	Total
1116275	TITLE III Forestry Finance Chg (1116275)	\$25,000						\$25,000
<b>000003392 - TITLE III FORESTRY</b>		<b>\$25,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$25,000</b>

000003641 - PUBLIC TRANS CONST-UNREST		FY13	FY14	FY15	FY16	FY17	FY18	Total
1028616	TD ARTS CONTRIBUTION (1028616)	\$24,291						\$24,291
1028617	TD REGIONAL SIGNAL PRIORITY (1028617)	(\$417,000)						(\$417,000)
1028619	TD PROPERTY LEASES BUDGET (1028619)	\$0		\$629,362	\$639,253	\$649,370	\$660,461	\$2,578,446
1028620	TD TRANSIT ORIENTED DEVELOP (1028620)	\$90,221	\$255,000	\$255,000	\$255,000	\$255,000	\$255,000	\$1,365,221
1028621	TD ATLANTIC CENTRAL EXPANSION (1028621)	(\$1,117,872)						(\$1,117,872)
1028629	TD REAL TIME SYS INVESTMENTS (1028629)	\$0	(\$1,200,000)					(\$1,200,000)
1028636	TD BUS VAPOR CLASS ADJ PEDALS (1028636)	\$0				\$25,617	\$120,181	\$145,798
1028645	TD BURIEN TOD GARAGE (1028645)	(\$298,413)						(\$298,413)
1028666	TD TROLLEY EXT TO LIGHT RAIL (1028666)	(\$711,257)						(\$711,257)
1028716	TD RADIO AVL REPLACEMENT (1028716)	\$0						\$0
1028717	TD SMART GROWTH AMENITIES (1028717)	\$0	(\$23,901)					(\$23,901)
1028718	TD NON REV VEHICLE REPLACEMENT (1028718)	\$2,409,889	\$1,653,701	\$1,540,381	\$1,321,344	\$2,776,160	\$2,958,270	\$12,659,745
1028723	TD BUS 40FT MB08 1 HYBRID (1028723)	\$35,035,875	(\$553,875)	\$374,929	\$85,212,165			\$120,069,094
1028727	TD DSTT WMD DETECTION (1028727)	\$52,365						\$52,365
1028770	TD SYSTEM BRT CORRIDOR (1028770)	\$6,936,414		\$2,687,119	\$948,756			\$10,572,289
1028773	TD RAPIDRIDE PASS FAC GEN (1028773)	\$5,787,118	\$67,029					\$5,854,147
1028777	TD SIGNAGE REPLACEMENT (1028777)	\$264,175	\$970,637	\$1,004,620	\$1,254,602			\$3,494,034
1028793	TD ADA VAN PURCHASES (1028793)	\$2,860,708	\$3,144,936	\$2,859,776	\$2,530,268	\$4,860,338	\$4,242,562	\$20,498,588
1028813	TD SOUND TRANSIT OBS REIMB (1028813)	(\$261,918)						(\$261,918)
1028816	TD BUS 60FT MB06 2 HYBRID (1028816)	\$141,967	\$4,085,861		\$108,692,889	\$112,497,140	\$45,409,470	\$270,827,327
1028827	TD CAPITAL PROJECT OVERSIGHT	\$43,902						\$43,902
1028828	TD VEHICLE CHARGING STATIONS (1028828)	\$0						\$0
1028829	TD AC OPERATIONS BUILDING (1028829)	(\$1,629,660)						(\$1,629,660)
1028830	TD TRANSIT PRIORITY IMPROVEMET (1028830)	\$404,486	\$528,325	\$916,890	\$1,013,573	\$1,052,152	\$1,088,977	\$5,004,403

000003641 - PUBLIC TRANS CONST-UNREST cont.		FY14	FY15	FY16	FY17	FY18	Total	
1028832	TD ON DEMAND BIKE LOCKER PGRM (1028832)	\$0					\$0	
1028854	TD VANPOOL VEHICLE PURCHASE (1028854)	\$7,113,669	\$5,319,000	\$7,537,000	\$2,154,000	\$3,820,000	\$10,409,000	\$36,352,669
1111768	TD RT 48 ELECTRIFICATION (1111768)	(\$498,000)		\$1,567,376	\$2,272,769	\$7,350,407	\$4,683,619	\$15,376,171
1111769	TD WAREHOUSE REPLACEMENT (1111769)	\$94,708	\$121,017	\$550,937	\$1,873,254	\$3,027,426		\$5,667,342
1111771	TD RADIO ALASKAN WAY TUNNEL (1111771)	\$77,569		\$288,116	\$1,959,034			\$2,324,719
1111785	TD CUSTOMER INFO SYS PLATFORM (1111785)	\$2,897,800			\$640,490	\$615,942		\$4,154,232
1111789	TD ORCA VENDING MACHINES (1111789)	\$154,408						\$154,408
1111971	TD BATTERY DOMINANT BUS (1111971)	\$0						\$0
1111973	TD BRICKYARD P&R EXPANSION (1111973)	(\$47,519)						(\$47,519)
1111975	TD RT 120 TRANSIT IMPROVEMENTS (1111975)	\$0						\$0
1111982	TD REGIONAL ORCA ENHANCEMENTS (1111982)	\$0						\$0
1111984	TD LAKE FOREST PARK P&R (1111984)	(\$50,000)						(\$50,000)
1111985	TD E KING CO TRANSIT IMP (1111985)	(\$17,554)						(\$17,554)
1111989	TD BURIEEN TRANSIT CENTER (1111989)	(\$7,653)						(\$7,653)
1111993	TD FIBER REPLACEMENT (1111993)	(\$276,866)						(\$276,866)
1112002	TD FH 2009 CCTV OnBoard Buses2 (1112002)	(\$1,141,040)						(\$1,141,040)
1112007	TD DATA INFRASTRUCTURE REPL (1112007)	\$191,396	\$141,081	\$130,000				\$462,477
1112014	TD RYERSON BASE RENOVATIONS (1112014)	(\$99,664)						(\$99,664)
1112016	TD SE CONNECTOR FACILITIES (1112016)	\$0						\$0
1112018	TD OBS 27 FT BUS (1112018)	(\$751,270)						(\$751,270)
1114074	TD 60 FT TROLLEY (1114074)	\$95,778,210	\$454,894	\$114,752				\$96,347,856
1114075	TD 40 FT TROLLEY (1114075)	\$142,642,383	\$281,054	\$610,000	\$118,769			\$143,652,206
1115954	TDC TRANSIT ASSET MAINT BUDGET (1115954)	\$20,587,096	\$4,271,986	\$15,522,959	\$15,113,079	\$16,851,556	\$19,446,819	\$91,793,495
1116014	TD IS PRESERVATION BUDGET (1116014)	\$285,000	\$355,610	\$658,000	\$985,000	\$572,000	\$565,000	\$3,420,610
1116015	TD TOH, SHELTER, EQUIP BUDGET (1116015)	\$2,776,615	\$3,073,796	\$2,974,380	\$3,278,483	\$3,186,230	\$3,497,748	\$18,787,252
1116036	TD CAPITAL OUTLAY BUDGET (1116036)	\$195,634	\$189,358	\$172,128	\$178,153	\$184,388	\$190,842	\$1,110,503
1116057	TD NORTHGATE TOD BUDGET (1116057)	\$840,016	\$10,150,000				\$1,650,000	\$12,640,016
1116070	TD SR 520 UPA BUDGET (1116070)	\$0	(\$2,977,104)					(\$2,977,104)
1116071	TD OP FACILITY IMP BUDGET (1116071)	\$2,764,819	\$2,999,121	\$2,048,454	\$1,528,976	\$1,156,242	\$1,218,684	\$11,716,296
1116072	TD BUS ZONE SAFETY BUDGET (1116072)	\$413,649	\$1,248,140	\$421,902	\$440,058	\$455,461	\$471,402	\$3,450,612
1116073	TD SHELTERS & LIGHTING (1116073)	\$1,775,546	\$840,475	\$1,905,236	\$2,005,799	\$2,076,002	\$2,148,661	\$10,751,719
1116107	TD RIDE FREE AREA BUDGET (1116107)	(\$300,000)						(\$300,000)
1116112	TD TROLLEY MOD BUDGET (1116112)	\$1,188,496	\$1,899,527	\$994,727	\$180,735	\$187,061	\$509,219	\$4,959,765
1116236	TD RIDER INFO SYSTEMS BUDGET (1116236)	\$0	(\$664,419)					(\$664,419)
1116743	TD RT 101 TRANSIT CORRIDOR IMP (1116743)	\$531,000	\$1,400,098					\$1,931,098
1116745	TD 3RD AVE IMPROVEMENTS (1116745)	\$8,797,500						\$8,797,500
1116746	TD RELACE LEGACY TSP EQUIPMENT (1116746)	\$866,670	\$551,160					\$1,417,830
1116755	TD RAPIDRIDE BIKE FACILITIES (1116755)	\$495,900	\$150,300					\$646,200
1116893	TD HASTUS EPM (1116893)	\$0	\$228,880					\$228,880
1116944	TD ORCA SELF SERVICE KIOSK (1116944)	\$222,264	\$3,092,736					\$3,315,000
1117069	TD 35 FT HYBRID BUS (1117069)	\$258,122	\$18,368,254	\$114,752				\$18,741,128
1117191	TD RYERSON BASE LIFT REPL (1117191)	\$1,059,325	\$7,631,887	\$372,819				\$9,064,031
1111770	TD CIP CONTINGENCY	\$1,000,000						\$1,000,000
1111783	TD HASTUS UPGRADE	\$723,793						\$723,793
1111786	TD FACILITY MASTER PLAN	\$130,697						\$130,697
<b>000003641 - PUBLIC TRANS CONST-UNREST Total</b>		<b>\$340,288,009</b>	<b>\$68,054,563</b>	<b>\$46,251,615</b>	<b>\$234,596,449</b>	<b>\$161,598,492</b>	<b>\$99,525,916</b>	<b>\$950,315,044</b>

### Cost Estimate Electric Trolley Buses

	<b>60 Ft trolley</b>	<b>40 Ft trolley</b>
<b>Base Price</b>	\$ 1,241,500	\$ 872,639
On Coach options & freight*	\$ 93,366	\$ 71,008
Sub-Total	\$ 1,334,866	\$ 943,647
Tax	\$ 130,817	\$ 92,478
<i>Sub-Total Coach</i>	<i>\$ 1,465,683</i>	<i>\$ 1,036,125</i>
<b>Planning/Analysis</b>		
FP Staff	\$ 6,890	\$ 6,890
Inspection	\$ 22,109	\$ 18,958
<b>In-Service Prep</b>		\$ -
Training, Tech Pubs	\$ 7,901	\$ 7,901
Special Tools, based on bus w/o tax	\$ 4,886	\$ 4,064
cost to install, OBS, Radio, Smt Cd legacy	\$ 3,000	\$ 3,000
<i>Sub-Total Options</i>	<i>\$ 15,787</i>	<i>\$ 14,965</i>
Contingency on base price, options and sales tax	\$ 73,284	\$ 51,806
<b>Total</b>	<b>\$ 1,583,753</b>	<b>\$ 1,128,744</b>



## LEGEND

- Trolley Network
- Manufacturing and Industrial Center
- Regional Growth Center
- ★ Local Urban Hub Village
- ✱ Local Residential Urban Village

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0 0.25 0.5 Miles

**King County**

cf. Trolley and Centers  
April 12, 2012

# King County Metro Electric Trolley Replacement Project



We'll Get You There

## Replacing the trolley buses

*Metro's electric trolley bus fleet is scheduled to begin replacement in September 2014.* Before purchasing new buses, an in-depth, interdisciplinary evaluation of vehicle options to determine relative costs, limitations, and benefits was conducted. The study evaluated each technology using the current route structure as a base. The findings from this evaluation will inform the technology decision for replacement of the trolley buses.

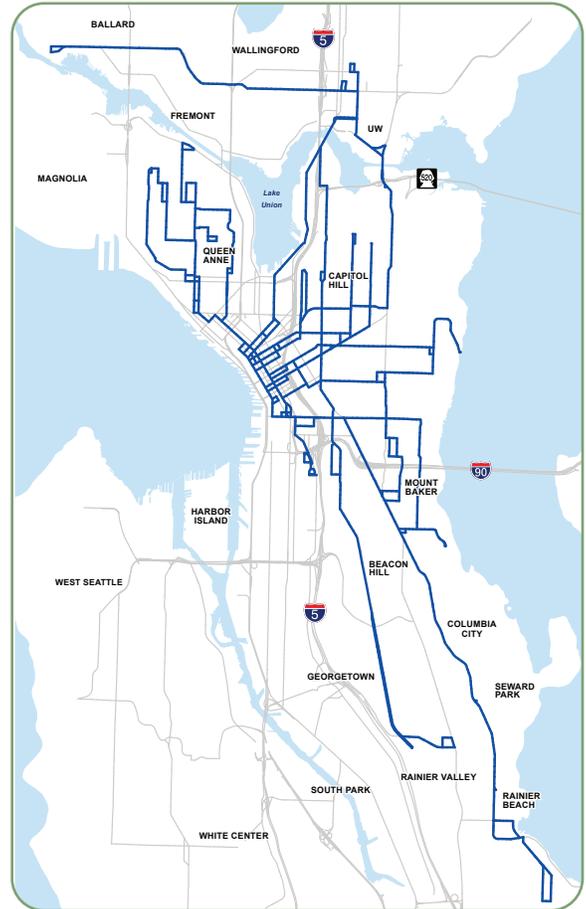
## King County Metro's trolley bus network

*The 14 trolley bus routes carry 20% of Metro's weekday riders on 159 trolley buses.* The routes have 70 miles of two-way overhead wire. Currently, there are five trolley bus systems in the US: Seattle, San Francisco, Dayton, Philadelphia, and Boston.

## Why the trolley buses need replacement

*Metro's 159 electric trolley buses are reaching the end of their useful lives.* The buses have outdated electrical systems, cracked frames, and some parts that are difficult to replace once they fail. There is no longer manufacturer support for the existing propulsion system.

Trolley Bus Service Area in Seattle



## Diesel Hybrid and Electric Trolley Buses were Evaluated

### Diesel Hybrid Bus



Transmission would be modified to travel on the steep hills in Seattle, which would limit the bus' top speed on level grades.

### Electric Trolley Bus



To increase the flexibility, an auxiliary power unit (APU) would be added for off-wire travel. The study evaluated both diesel and electric APUs.

The following bus technologies were removed from evaluation:

- Diesel** Less fuel efficient  
Greater environmental impact than diesel hybrids
- Electric Battery** Not commercially available  
Reduced travel range
- Compressed Natural Gas** High costs  
Greater environmental impact than diesel hybrids
- Hydrogen Fuel Cell** Not commercially available  
High costs  
Reduced travel range  
Reduced reliability

# Environmental Comparison

Environmental components are an important consideration for selecting the appropriate bus technology. After the King County Council selects the preferred fleet replacement option in the 2012-2013 biennial budget, King County Metro staff will determine if a more detailed environmental review is necessary.

*The chart below shows why the environmental findings favor the electric trolley bus over the diesel hybrid technology. Electric trolley buses perform better on steep grades, are quieter, have lower greenhouse gas emissions and consume less energy on a yearly basis.*

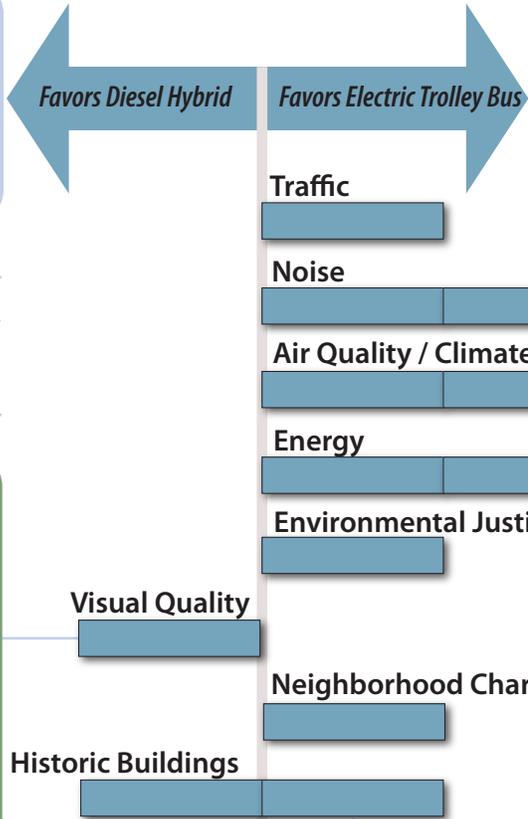
## Diesel Hybrid



## Electric Trolley Bus with Auxiliary Power Unit



- KEY**
- Favors bus technology
  - Greatly favors bus technology
  - Similar benefit or impact for both bus technologies



Traffic

Noise

Air Quality / Climate Change

Energy

Environmental Justice

Visual Quality

Neighborhood Character

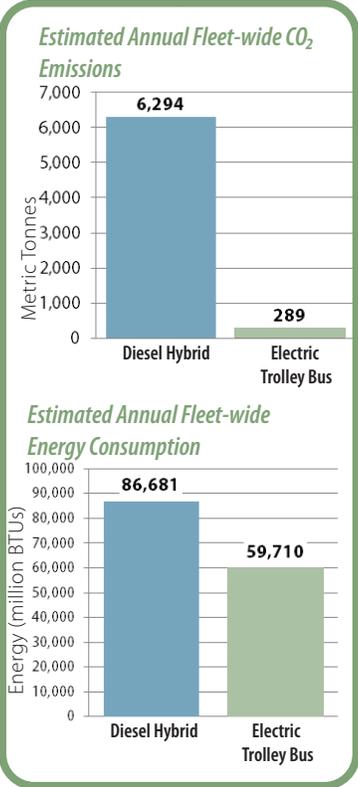
Historic Buildings



Removal of overhead trolley wires improves the visual quality (the impact of the removal varies by location). Keeping the trolley wires has the greatest impact in view corridors and residential neighborhoods.



Removal of anchor bolts and overhead wires may impact historic structures.

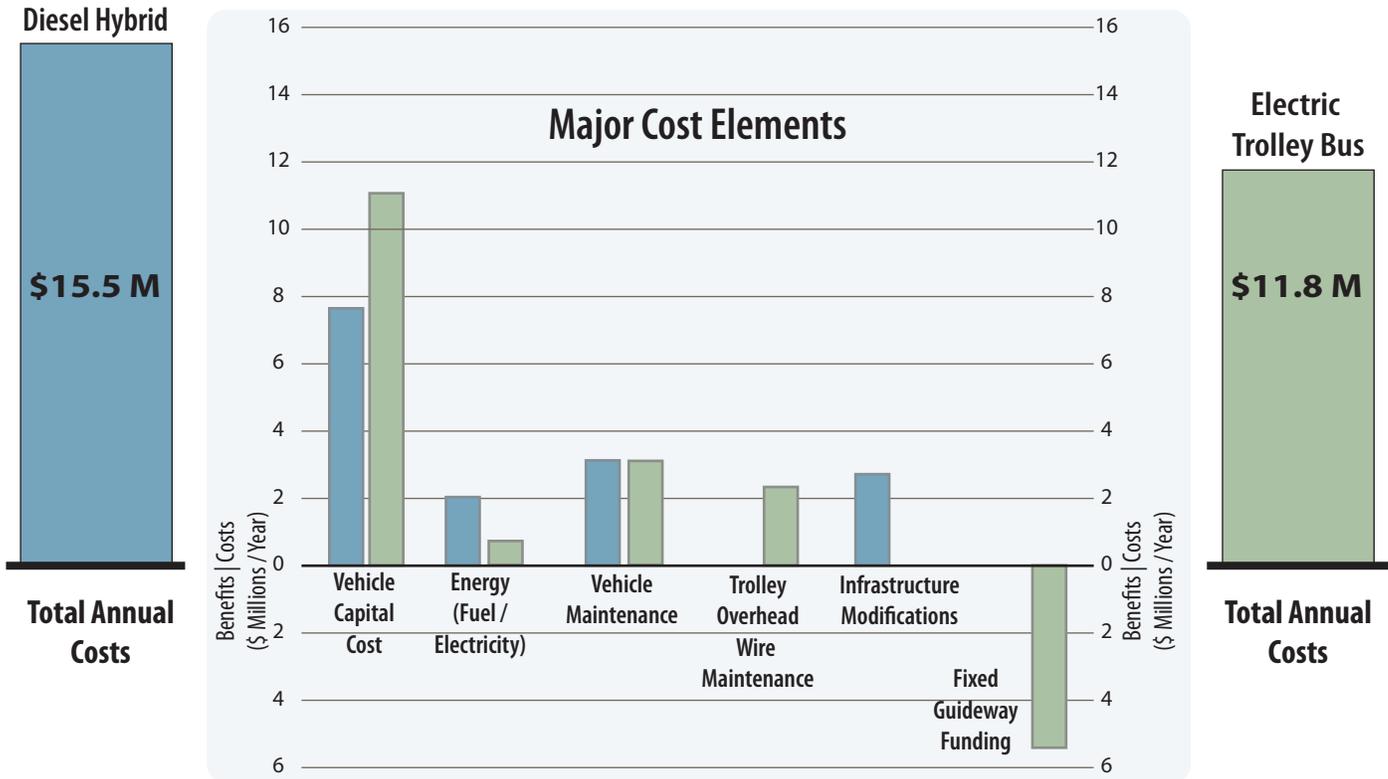


The electric trolley bus has significantly lower greenhouse gas emissions and a lower total annual energy consumption. Seattle City Light generates 98% of Seattle's electricity from non-greenhouse gas (GHG) emitting sources (hydroelectric, nuclear, wind, and biomass).

# Life-Cycle Cost Comparison

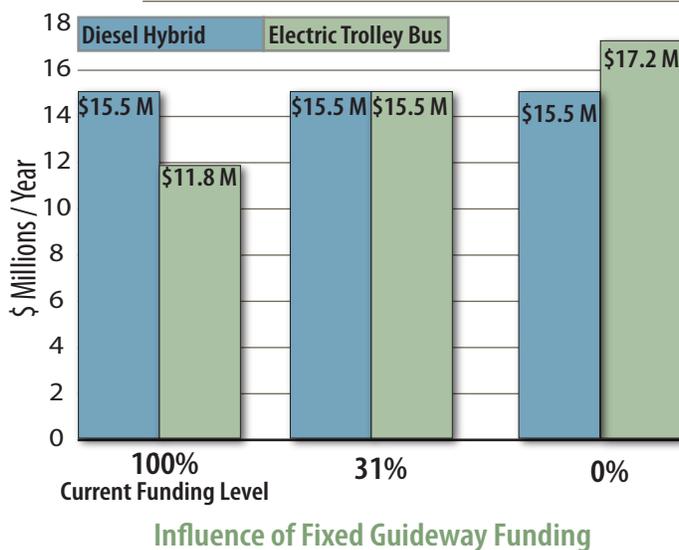
A life-cycle cost comparison is used to evaluate the full capital and operating costs of each bus technology. Because the estimated life-span of the electric trolley bus (15-years) and diesel hybrid (12 years) are different, the costs were annualized and discounted to today's dollars to provide a valid comparison.

## Annualized Life-Cycle Cost Comparison Scenario



An important component of the cost comparison between diesel hybrid and electric trolley bus is the level of the Federal Transit Administration (FTA) fixed guideway funding. The level of fixed guideway funding would have to drop to 31% of current funding levels before the diesel hybrid bus technology would have a cost advantage.

### 31% or more of current grant funding, makes electric trolley bus more cost-effective



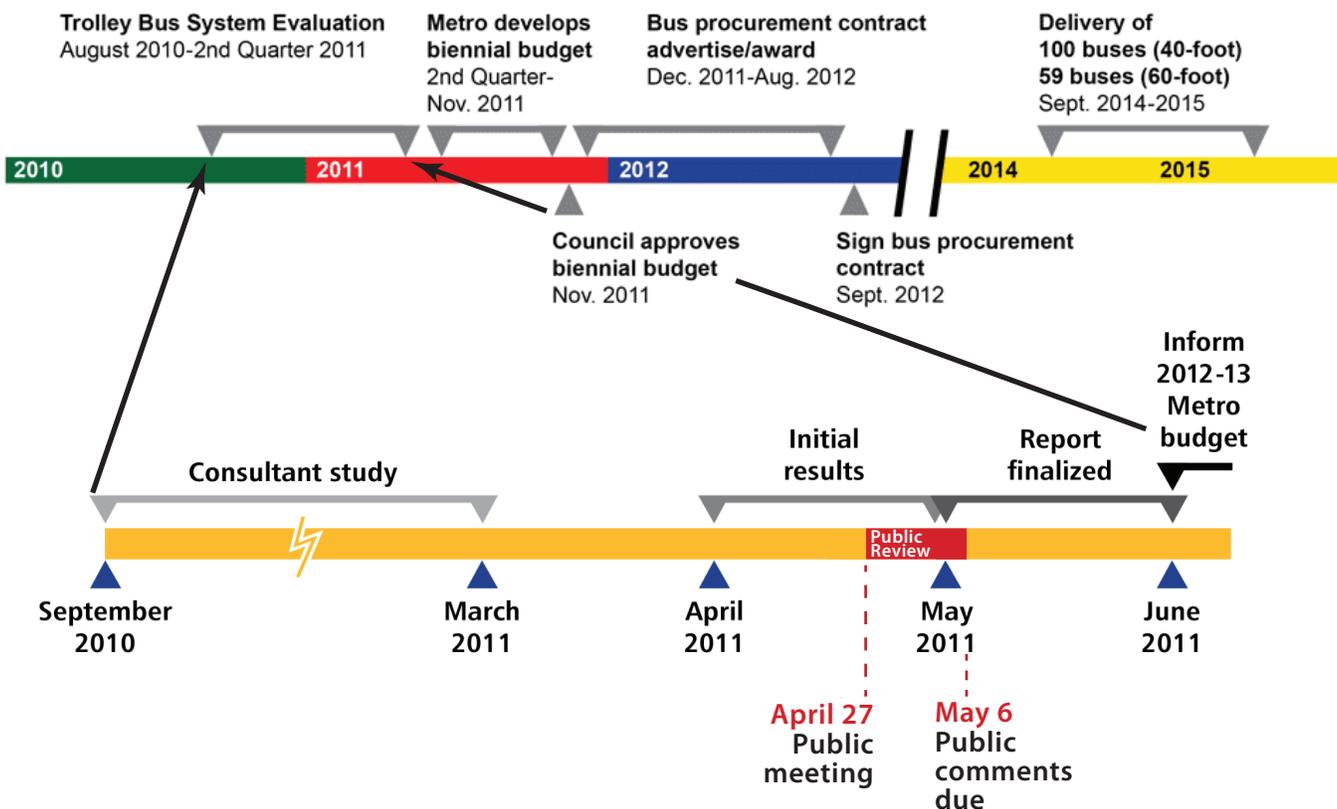
*With the current Federal Transit Administration's (FTA) funding, the electric trolley bus option is \$3.7 million less per year.*

## Preliminary Findings Favor Electric Trolley Bus

- ✓ More cost-effective based on reasonable federal fixed guideway funding scenarios
- ✓ Reduced climate and energy impacts
- ✓ Favored by environmental comparison



## Next Steps



## Contact Us

If you have any feedback on the preliminary findings or want to learn more about the project, please contact:

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**Project Website:**  
[www.kingcounty.gov/TrolleyEvaluation](http://www.kingcounty.gov/TrolleyEvaluation)