4.10 ECONOMICS

This section provides a project-level analysis of potential impacts to economics associated with the Energize Eastside project. The analysis in the Phase 2 Draft EIS addressed the following three topics:

1. Potential loss of property tax revenue, especially to the smallest affected city (Newcastle), due to reduced property values.
2. Potential cost to the community requesting the placement of the 230 kV transmission lines underground as mitigation.
3. Monetary value of lost *ecosystem services* due to reduced tree cover.

The first two components of the analyses (property tax revenue and cost of undergrounding) are not dependent on the segment or route chosen, and the information has not changed since publication of the Phase 2 Draft EIS. Therefore, they are not included in the Final EIS but are incorporated by reference. Comments received on those analyses, and responses from the Partner Cities and the EIS Consultant Team, are included in Chapter 6 and Appendix K. The economic analysis presented in this Final EIS focuses on lost ecosystem services associated with PSE's Proposed Alignment. The assessment of ecosystem services includes the study area used by The Watershed Company (Appendix E-2) to survey existing trees in the existing and new transmission line corridors.

Economic analysis is not a required element for a SEPA EIS; however, SEPA provides discretion to agencies to include economic information in an EIS that could be beneficial to decision makers, such as information related to environmental concerns that may not be readily available elsewhere. The analysis of the value of lost ecosystem services due to reduced tree cover was conducted in response to comments received during the public comment periods for the Phase 1 Draft EIS and the scoping period for the Phase 2 Draft EIS.

Key Changes from the Phase 2 Draft EIS

Impacts associated with property tax revenue in Newcastle and the potential cost to a community requesting placement of a 230 kV transmission line underground have not been revised because the estimates were made using a broad analysis that was not segment-specific. Therefore, the findings still apply to PSE's Proposed Alignment, and this information is not repeated in the Final EIS.

Ecosystem services were analyzed at the segment level; therefore, this Final EIS has been updated to present data related to PSE's Proposed Alignment. Tree removal would be the same as was assessed in the Phase 2 Draft EIS for the Redmond, Bellevue North, and Redmond Segments. However, updated tree removal data were available for a portion of the Bellevue Central Segment, the Bellevue South Segments, and both Newcastle options (see Appendix L). In addition, modifications were made to the model used for the Phase 2 Draft EIS regarding how carbon and structural value are calculated. Therefore, impacts for all segments were reassessed to take into account changes to the model, and the revised tree removal numbers for some segments. The Final EIS presents the potential impacts on ecosystem services that may result from PSE's Proposed Alignment.

4.10.1 Tree Cover Along Transmission Line Corridor

This section has been updated in the Final EIS to present the information related to PSE's Proposed Alignment. No new modeling analysis was conducted for this Final EIS. Individual trees as well as groups of trees provide ecological benefits and environmental values. Trees improve air quality by absorbing CO_2 and potentially harmful gases, such as sulfur dioxide and carbon monoxide, from the air, and releasing oxygen. Trees also store carbon, reduce soil erosion, remove pollutants, and provide food and habitat for birds and other wildlife. The amount of carbon stored in a tree increases as it grows, as does the tree's environmental value. Carbon is stored in the leaves, stems, roots, and other parts of a tree when they absorb CO_2 from the atmosphere and use it to grow. Trees are important for carbon sequestration, because they live a long time and can store their carbon for many years. Each year, an acre of trees absorbs the amount of carbon produced by driving a car for 26,000 miles, and an individual urban tree contains about four times more carbon than individual trees in forests. Some tree species hold higher value than others based on the magnitude of the ecological functions performed; and groups of trees have a higher ecological value than a series of isolated trees, because of the environmental benefits indicated above (ACTrees, 2011).

Methods for Studying the Affected Environment

Ecosystem services are the benefits that the ecosystem provides to humankind. In some cases, these services can be assigned an economic value. For the ecosystem services analysis, trees within each segment of the study area were inventoried by The Watershed Company between March 2015 and July 2016 (The Watershed Company, 2016b). Revised permit-level data were from surveys in 2017, and used for the Bellevue Central Segment, Richards Creek substation, Bellevue South Segment, and Newcastle Options. Data collected during the inventories included the tree species, trunk diameter at breast height, tree height, and health condition. These data were used to model the current ecosystem services value of the trees in each segment using United States Forest Service (USFS) i-Tree Eco software (USFS, 2017), a peer-reviewed software program that provides urban and rural forestry analysis and benefits assessment tools.

To determine the ecosystem services provided by the trees currently in the study area, a statistical model was run for trees surveyed along the existing and new corridors.

In total, approximately 5,500 trees were inventoried along PSE's Proposed Alignment and used in the i-Tree model (The Watershed Company, 2016b, 2017). The model identifies the current amount of carbon stored in the trees (based on tree species, diameter of trunk at breast height, and tree height), and the cost of replacing the tree with a similar tree (called the "structural value"). The total *fixed value* of the "forest" (structural value + carbon storage value) within the study area is $6.7 million. This represents the ecosystem services provided by the "forest" at a fixed point in time. Removing all of the study area trees would incur this one-time cost of $6.7 million. The model also identifies the amount of avoided runoff, pollution removal, and gross carbon sequestration on an annual basis using the following methods (USFS, 2017):

- Annual avoided surface runoff is calculated based on rainfall interception by vegetation, specifically the difference between annual runoff with and without vegetation. The model only accounts for the precipitation intercepted by leaves in this analysis. The value of avoided runoff is based on estimated local values from the U.S. Forest Service Community Tree Guide Series (as cited in i-Tree, 2016).

- Pollution removal is calculated for ozone, sulfur dioxide, carbon monoxide, and particulate matter less than 2.5 microns in diameter. Air pollution removal estimates are derived from calculated hourly tree-canopy resistances for ozone, and sulfur and nitrogen dioxides based on a hybrid of big-leaf and multi-layer canopy deposition models. The air pollution removal value is calculated based on local incidence of adverse health effects and national median externality costs.
- Annual carbon sequestration is estimated using the current tree condition and the average diameter growth added to the existing tree diameter to predict the tree diameter and amount of carbon that will be sequestered in the next year. The value is based on estimated carbon values from the U.S. Environmental Protection Agency (2015) and the Interagency Working Group on Social Cost of Carbon (2015).

The total *services value* provided by the "forest" per year (gross carbon sequestration value + avoided runoff value + pollution removal value) is $14,200. The total services value represents ecosystem services calculated on an annual basis and would fluctuate over time, based on tree health, tree mortality, and the planting of replacement trees.

The fixed values and services value/year is the highest for the Redmond Segment. The Bellevue South Segment has 28 percent of all of the trees surveyed, but due to the make-up of tree species, it has 19 percent of the carbon storage value and 21 percent of the structural value. A summary of the current ecological value of the trees within each segment is provided in Table 4.10-1.

4.10.2 Long-term Impacts from Operation of the Project

The methods for analyzing impacts of the project on ecosystem services are the same as what was used for the Phase 2 Draft EIS. They are as follows:

- **Ecosystem Services:** For this analysis, the following ecosystem services associated with tree cover in the project corridor were assigned an economic value (as described below under Ecosystem Services Methods): sequestration (storage) of carbon dioxide, the principal atmospheric greenhouse gas; absorption of air pollutants; and reduction in stormwater runoff and required infrastructure.

No threshold of significance was set for the ecosystem services analysis. The costs of such services are spread widely, including costs for energy, health care, and stormwater management, and not all such costs are borne locally. Cumulative ecosystem service impacts from this and other projects could be significant, but mitigation measures are available to offset or mitigate such impacts.

4.10.2.1 Ecosystem Services Methods

To estimate the loss of ecological services from tree removal proposed by the project, the i-Tree model was run a second time, but with the trees proposed for removal deleted from the data set. The number of trees that could be removed along the corridor is based on a tree database prepared by The Watershed Company for PSE for the Energize Eastside project (The Watershed Company, 2016b) and updated permit-level tree removal data for the Lakeside substation portion of the Bellevue Central Segment, Richards Creek substation, Bellevue South Segment, and Newcastle Segment (both options) (The Watershed Company, 2017). The results include tree removal for the entire corridor including the Richards Creek substation. Tree removal for the Newcastle Segment No Code Variance and Code Variance Options are both shown, although only one of these options would be implemented. Totals are shown for PSE's Preferred Alignment with the No Code Variance and with the Code Variance option.

Table 4.10-1. Current Ecological Value of Trees in the Entire Alignment and in Each Segment

Segment	Acres	No. of Trees*	Carbon Storage		Structural Value	Total Fixed Value	Gross Carbon Sequestration		Avoided Runoff		Pollution Removal		Total Services Value/ Year
			Ton	$			Ton/yr	$/yr	ft3/yr	$/yr	Ton/yr	$/yr	
Richards Creek Substation	8.4	429	147	19,106	1,070,711	**$1,089,817**	3.2	415	12,720	850	0.08	715	**$1,980**
Redmond	24.2	776	139	18,093	1,523,134	**$1,541,227**	3.8	493	21,721	1,452	0.14	1,382	**$3,327**
Bellevue North	27.2	733	61	7,946	776,477	**$784,423**	2.2	289	10,304	688	0.07	656	**$1,633**
Bellevue Central	33.9	811	90	11,663	901,329	**$912,992**	3.2	424	12,916	863	0.09	726	**$2,013**
Bellevue South	40.0	1,400	126	16,354	1,426,799	**$1,443,153**	4.3	568	20,347	1,360	0.13	1,144	**$3,072**
Newcastle - No Code Variance	18.2	366	27	3,562	298,187	**$301,749**	1.1	151	4,446	297	0.03	250	**$698**
Newcastle – Code Variance	18.2	365	27	3,561	298,143	**$301,704**	1.1	151	4,441	296	0.03	249	**$697**
Renton	48.5	499	67	8,725	692,464	**$701,189**	2.3	297	9,053	605	0.06	576	**$1,478**
Total (No Code Variance)	200.4	5,014	657	85,449	6,689,101	**$6,774,550**	20.1	2,637	91,507	6,115	0.60	5,449	**$14,201**
Total (Code Variance)	200.4	5,013	657	85,448	6,689,057	**$6,774,505**	20.1	2,637	91,502	6,114	0.60	5,448	**$14,199**

*The number of trees varies slightly from those reported in other sections of the EIS because i-Tree only reports trees with recorded dbh values and tree species known by the model. Trees omitted as part of this analysis are considered to have low ecological value and therefore their omission does not impact the findings.

4.10.2.2 Tree Cover Along Transmission Line Corridor

This assessment provides the same information presented in the Phase 2 Draft EIS, but has been revised to focus on PSE's Proposed Alignment. PSE's Proposed Alignment would require tree removal along the existing corridor and at the Richards Creek substation site. The loss of tree cover means the natural environment of the study area would be less able to reduce air pollutants, reduce stormwater runoff, and sequester carbon dioxide. Potential loss of ecosystem value is described in Table 4.10-2. Under PSE's Proposed Alignment, the following would occur:

- The project corridor would lose 410 tons of carbon stored in trees, and a loss of 13.3 tons of carbon sequestered per year.
- The project corridor would lose its ability to remove 0.43 ton of air pollutants annually, valued at $3,967 per year.
- Without tree canopy to reduce stormwater runoff volume, the municipalities within the study area must manage an additional 65,216 cubic feet of stormwater per year, valued at $4,358 per year.

The City of Bellevue conducted an ecosystem services analysis city-wide based on 2007 tree canopy information (American Forests, 2008). In 2007, the City of Bellevue had an overall tree canopy of 36 percent. The ecosystem services provided by Bellevue's tree canopy in 2007 is summarized below to provide context by which to measure the scale of the impact to ecosystem services under PSE's Proposed Alignment:

- Bellevue's tree canopy stored 332,000 tons of carbon in trees, and sequestered 2,582 tons of carbon per year.
- Bellevue's tree canopy removed 344 tons of pollutants annually at a value of $1.55 million per year.
- Bellevue's tree canopy provided 62 million cubic feet in stormwater detention services per year, valued at $123 million.

The total ecosystem services lost as a result of PSE's Proposed Alignment, when compared to Bellevue alone would constitute less than 0.2 percent of the services provided by urban tree cover, which is not considered to be a large amount. Based on this comparison, ecosystem services are not expected to be significantly impacted by the project.

4.10.3 Mitigation Measures

Mitigation for economic impacts from a project is not required under SEPA; however, potential mitigation measures for tree removal are identified in Section 4.4.6, and include the following (among others):

- Replace trees removed for the project based on tree protection ordinances and critical areas regulations in each jurisdiction; some of these trees would likely be planted off-site or, in the case of the City of Newcastle, mitigated by paying into an in-lieu fee program. Replacement may be based on cross-sectional diameter of trees removed, or on habitat functions lost due to tree removal, depending on applicable regulations.

Table 4.10-2. Loss of Ecological Value

Scenario	# of Trees Removed	Loss of Carbon Storage		Loss of Structural Value ($)	Total Loss of Fixed Value ($)	Loss of Gross Carbon Sequestration		Loss of Avoided Runoff		Loss of Pollution Removal		Total Loss of Services Value/ Year ($)
		Ton	$			Ton/ yr	$/yr	ft/yr	$/yr	Ton/yr	$/yr	
Variance	3,554	409	53,166	4,378,400	**$4,431,566**	13.3	1,741	65,216	4,358	0.43	3,967	**$10,066**
No Variance	3,546	410	53,178	4,375,088	**$4,428,266**	13.3	1,739	65,148	4,354	0.43	3,964	**$10,057**