Appendix A: General Construction and Access
APPENDIX A-1. GENERAL CONSTRUCTION AND ACCESS DESCRIPTION

Note: Information provided by PSE

Construction of transmission lines require pre-construction field surveying, site preparation, construction (i.e., installation of new structures, removal of existing structures), demobilization, and property restoration, which are performed following a relatively standardized sequence.

PSE aims to avoid or minimize impacts where practicable through project design considerations (e.g., pole types and access routes). Along some route segments, PSE has easement rights that outline access agreements for the purpose of maintaining PSE’s existing facilities and/or accessing PSE’s right-of-way (ROW). Depending on the segments chosen for the project, PSE plans to exercise these rights and, if necessary, acquire additional rights for construction of the project. To the extent possible, PSE uses existing or acquires new easement rights to provide access necessary to maintain and/or construct facilities.

TYPICAL CONSTRUCTION SEQUENCING

Construction of a transmission line typically occurs in the following sequence:

1) Pre-construction surveying
   a. Conducting environmental surveys and obtaining geotechnical data by conducting soil borings
   b. Identifying pole locations
   c. Surveying, including ROW and boundary and structure locations (i.e., footings, underground utilities)

2) Site preparation
   a. Staking the ROW, critical areas, and pole locations
   b. Installing temporary erosion control measures
   c. If necessary, constructing access routes to the pole sites and developing installation sites
   d. Brushing, trimming, and clearing of vegetation in the ROW to ensure the safe operation of the line

3) Construction
   a. Installing pole foundations or auger holes for direct embedment
   b. Assembling and erecting the poles
   c. Stringing the conductor and wires
   d. Removing existing structures, if necessary
4) Demobilization and clean up

5) Restoration and re-planting vegetation

The general process for the various types of poles being proposed are essentially the same, except for poles with engineered foundations (e.g., drilled piers), which require additional steps.

The subsequent sections describe specific construction activities in further detail.

**PRE-CONSTRUCTION - IDENTIFYING POLE LOCATIONS**

The placement, or “spotting,” of poles depends on factors such as available ROW width, location of access routes, topography, and obstacle avoidance. In turn, the height, loading, foundation type, and overall size of each structure will be greatly affected by the location of the structures.

The process for the spotting of poles is as follows:

- During the engineering process, PSE will work with individual landowners to adjust pole locations where practicable to reduce impacts for the landowners.
- Proposed pole locations discussed with landowners will represent where poles are generally expected to be located, pending geographical and site-specific environmental review following city or county approval of a route. Unforeseen subsurface obstacles, such as geologic erratics, can cause a pole to be moved up or down the corridor (typically less than 20 feet).

In general, PSE considers the following factors when locating poles:

- **Technical considerations**, including electrical clearances, severe terrain accommodations, structural loading, manufacturability of structures, constructability of the line, and code requirements.
- **Critical areas (e.g., wetlands and streams)** so as to locate poles outside of critical areas and their buffers to the extent possible.
- **Electrical effects** to maintain additional buffers or install mitigation measures when co-located with other facilities (e.g., pipelines).
- **Landowner considerations** by moving poles farther away from residences and/or locating poles on property lines and edges of tree lines.
- **Cost** to provide a cost-effective and feasible design within set parameters.

To reduce the environmental impacts of pole locations, where practicable, PSE will:

- Place new poles in approximately the same location of the existing poles.
- Locate poles near existing accessible routes to minimize construction traffic impacts.
- Avoid placing poles in areas that require significant access disturbance.
- Avoid environmental features by making small adjustments in the route and through careful structure placement.
- Avoid critical areas unless another constraint forces a pole into such areas.
SITE PREPARATION

Vegetation Management and Maintenance

Using the existing transmission line ROW is one of PSE’s preferred routing criteria, as the vegetation in such corridors is already maintained to some degree. This includes selective removal of problem trees from beneath power lines or removal of hazardous trees that may fall into the electrical system as part of regular maintenance on all power line ROW. Proper pruning and discriminating use of growth regulators and herbicides are also among the methods employed. The method selected depends on factors such as location, property use, and access. Growth regulators and herbicides are not commonly used in urban environments.

Emphasis is placed on the removal of large, problem-tree species, especially those that have disease or insect infestation that can result in irreversible decline. Tree removal is especially important where pruning alone cannot achieve safe clearance from power lines.

Trimming, natural pruning techniques, or directional trimming will be used if proper line clearances can be achieved. Directional trimming concentrates on removing limbs and branches where the tree would normally shed them and direct future growth out and away from the electrical wires. While a newly pruned tree might look different to some, natural pruning is designed to protect the health of the tree. It minimizes re-growth and reduces trimming costs.

Directional trimming is the recommended method of the International Society of Arboriculture (ISA), American National Standards Institute (ANSI), and the National Arbor Day Foundation.

Both tree removal and natural pruning would be performed by specially trained contract crews. Upon completing of tree work, the crews would clean up the site and any wood that is cut would be left on site in pieces of manageable size at the property owner’s request or taken off site.

Guidelines for 230 KV Lines

Vegetation within a utility corridor that has transmission line(s) with an operational voltage of more than 200 kV must be managed in compliance with federal requirements. The fines/penalties associated with having a power outage caused by vegetation can be substantial. To ensure compliance with the North American Electric Reliability Corporation (NERC) standard, PSE allows vegetation with a mature height of no greater than 15 feet within the wire zone. For evaluation purposes, the same vegetation requirement was applied to the managed ROW zone. The area outside of the managed ROW, but still within the legal ROW, is subject to select clearing of trees that pose a risk of damaging the line.

The wire zone is the area measured 10 feet away from the outermost conductor(s) in a static position, whereas the managed ROW zone is the area that extends roughly 16 feet from the outside of the transmission wires in their static position.

The vegetation impact assessment used GIS analysis to evaluate the tree inventory data and the preliminary transmission line design to assess the number of trees that would likely require removal within a specific route.
**Guidelines for 115 kV Lines**

Some of the alternatives for the Energize Eastside project include rebuilding or relocating 115 kV lines. NERC vegetation standards do not apply to PSE’s 115 kV transmission or distribution line rights-of-way; however, in general, PSE will remove trees that mature at a height of greater than 25 feet near 115 kV lines. It should be noted that, some trees within the corridor or along roadways with a height of greater than 25 feet, may be allowed to remain in the wire zone if they can be pruned in a manner that allows sufficient clearance from the lines.

**Access**

Use of existing access routes is preferred as that is typically the best way to minimize impacts. When a project entails replacement of an existing transmission line, such as Energize Eastside, efforts are made to identify the existing or historic access routes. During initial construction of the transmission line, access routes are established along the corridor. As an area develops and structures are built along the corridor, some of the original access points are no longer viable and new ones need to be established to replace or maintain existing transmission line equipment.

Access to each structure location is identified in the field with a preference to those areas that require the least amount of improvement (e.g., use of existing roads or trails). The field-identified access routes are mapped using handheld GPS units. The GPS data are imported into the surveyed route maps for reference. Each route will be assessed on site with the affected property owners to gather site-specific limitations and if necessary, identify improvement and restoration details.

Along the corridor, the access and pole locations are identified by the land surveyor and engineering team. As necessary, the access to each pole location is improved or created. Preliminary access routes for construction and maintenance are shown on figures at the end of this appendix, by segment.

The typical width of access roads is 20 feet.

**Utility Locates and Civil Work**

As required by state law, utility locates are performed prior to ground-disturbing activities. Appropriate temporary erosion control measures may be installed prior to and during work activities. Initial vegetation management activities then commence, removing those species that are incompatible with the safe operation of the transmission line. If civil work is required to establish either a temporary or permanent construction area, that work typically takes place following vegetation removal.

A work area with an approximate radius of 50 feet around the new pole location would be typical. This area would provide a safe working space for placing equipment, vehicles, and materials.

**CONSTRUCTION**

PSE will work to restore property impacted by construction to its previous or an improved state, as practical and required under applicable law. PSE will mitigate in-kind when restoration is not possible, as required by applicable law. PSE will comply with local codes related to construction noise. PSE will work with property owners to minimize impacts during construction as much as practicable.
Pole Installation

Each steel pole will be installed either by direct embedment or placed on a drilled pier foundation. (Based on design and construction limitations, other foundation types may be utilized as well.) The type of foundation that will be used to support the poles will depend on the structural loading, structural strength of the soil, and site accessibility. In areas near co-located underground utilities, such as the Olympic pipeline system, the proposed pole design and location is reviewed with BP, the pipeline operator. As appropriate, BP’s general construction procedures will be followed when construction activities take place in the area of the Olympic pipeline system, which includes on-site inspection.

The hole for the transmission pole is typically initiated using a vacuum excavator (typically called a Vactor truck), which is one of the least invasive methods of excavation. If soil conditions allow, the entire hole could be excavated using a Vactor truck; however, it may be necessary to use traditional auger equipment to achieve the necessary depth. Typical hole diameter is approximately 18 inches greater than the diameter of the base of the pole. Generally, the depth of the hole will be 10 percent of the pole height plus 4 feet.

In areas of soft soils, a steel casing may be used during drilling to hold the excavation open, after which the steel casing would be cut below grade and backfilled upon completion.

For direct embed poles, the base section of the pole is installed in the hole and the annulus filled with select backfill. When backfill must be imported, material is obtained from commercial sources.

For poles that require drilled pier foundations, the hole is advanced in the same manner as that for the direct embed poles. Reinforced-steel anchor bolt and rebar cages are then installed in the excavation. These cages are inserted in the holes prior to pouring concrete and are designed to strengthen the structural integrity of the foundations and are delivered to the structure site via flatbed truck. The excavated holes containing the reinforcing anchor bolt cages would be filled with concrete and be left to cure for 28 days.

To construct the actual steel structure, two methods of assembly can be used, the first of which is to assemble the poles, braces, cross arms, hardware, and insulators on the ground. A crane is then used to set the fully framed structure by placing the poles in the excavated holes or on the drilled pier foundation. Alternatively, aerial framing can be used by setting the first pole section in the ground or on the foundation, and subsequently adding the remaining sections and equipment via a crane. It may be more efficient and less disruptive to adjacent property owners in some locations to use a helicopter to install poles. This is identified as a mitigation measure in Section 5.1.3 of the Final EIS.

Stringing

Installation of the conductor, shield wire, and communication fiber on the transmission line support structures is called stringing. The first step of wire stringing would be to install insulators (if not already installed on the structures during ground assembly) and stringing pulleys, which are temporarily attached to the lower portion of the insulators at each transmission line support structure to allow conductors to be pulled along the line. When an existing transmission line is being replaced, the new poles will be installed and the existing wires could be transferred to them from the existing poles that will be removed. This is done so that the existing conductor can be used to pull in the new conductor in a more efficient manner. In some instances, where the existing conductor is not suitable to pull in the new wire, a rope (called a sock line) may be used.
Once the existing conductors have been transferred to the stringing sheaves, they would be attached to the new conductors and used to pull them through the sheaves into their final location. Pulling the lines may be accomplished by attaching them to a specialized wire stringing vehicle. Following the initial stringing operation, pulling and sagging of the line would be required to achieve the correct tension of the transmission lines between support structures. After the new lines have been set, the existing poles and old conductors are then removed.

Where a sock line is needed, workers would need to carry the line from pole to pole, requiring access to properties between poles. It may be more efficient and less disruptive to adjacent property owners in some locations to use a helicopter to string the sock line. This is identified as a mitigation measure in Section 5.1.3 of the Final EIS.

Pulling and tensioning sites are expected to be required approximately every 2 miles along the corridor. Equipment at sites required for pulling and tensioning activities would include tractors and trailers with spooled reels that hold the conductors and trucks with the tensioning equipment. To the extent practicable, pulling and tensioning sites would be located within the existing corridor.

Depending on topography, minor grading may be required at some sites to create level pads for equipment. Finally, the tension and sag of conductors and wires would be fine-tuned, stringing sheaves would be removed, and the conductors would be permanently attached to the insulators at the support structures.

**Removal of Existing Poles and Lines**

The existing 115 kV poles are expected to temporarily remain during and after construction of the 230 kV system to support the existing conductors and dedicated fiber optic line. The existing fiber optic line will need to stay in service throughout construction as it is used for substation controls. Once the new fiber optic (OPGW) lines are installed, the old fiber optic lines and poles can be removed. PSE expects that the old poles would be removed any time from a couple of days to a few months after the construction of the new lines. Some of the existing poles have joint tenant utilities, typically telecommunications. These are not owned by PSE and will need to be relocated by their respective owners. In those situations, the existing poles would remain until the joint facilities are relocated. This is typically a 90-day process; however, it can take longer depending on joint facility crew availability.

**Demobilization and Restoration**

Construction sites, staging areas, material storage yards, and access roads would be kept in an orderly condition throughout the construction period. Disturbed areas not required for access roads and maintenance areas around structures would be restored and revegetated, as agreed to with the property owner or land management agency.
APPENDIX A-2. PRELIMINARY CONSTRUCTION ACCESS ROUTES AND PROPOSED POLE LOCATIONS

On the following maps, locations of preliminary construction access routes are based on a single dataset provided by PSE in August 2017 and do not reflect coordination with individual property owners (PSE, 2017, specifically data layer titled Proposed_Access_Route_v2). Locations of proposed pole locations are based on several datasets provided by PSE in 2017, depending on segment (including files titled energize eastside non-variance (4-1 to RIC)_plan strs only_rev p and North_8-3-17.dxf and South_8-3-17.dxf).

Interactive maps of the latest data showing proposed pole locations and surveyed trees are also available on the internet (www.energizeeastsideeis.org/), allowing the user to zoom into site-specific locations. Specific pole locations may be refined as PSE completes its final design during the permitting process.
Preliminary Construction Access Routes Prior to Property Owner Consultation and Proposed Pole Locations – Redmond Segment
Preliminary Construction Access Routes Prior to Property Owner Consultation and Proposed Pole Locations – Bellevue North Segment
Preliminary Construction Access Routes Prior to Property Owner Consultation and Proposed Pole Locations – Bellevue Central Segment
Preliminary Construction Access Routes Prior to Property Owner Consultation and Proposed Pole Locations– Bellevue South Segment
Preliminary Construction Access Routes Prior to Property Owner Consultation and Proposed Pole Locations—Newcastle Segment
Preliminary Construction Access Routes Prior to Property Owner Consultation and Proposed Pole Locations—Renton Segment
APPENDIX A-3. INFORMATION FROM PSE ON HELICOPTER USE
Questions Related to Potential Helicopter Use for Energize Eastside
October 26, 2017

1. What are the specific locations where PSE would consider helicopter use for pole installation?

Response: It is difficult to assess the specific locations where a helicopter might be used to set poles. Some of the areas in Somerset are possible candidate locations because of the complex terrain in the area. It is important to note that using a helicopter is typically the last option utilized by a contractor due to costs and additional FAA permitting in congested areas. If another option is available, it would be utilized first, but if all options are exhausted the helicopter option would remain as the only/best choice.

Additionally, where access along the corridor is difficult, a helicopter could be used in the stringing of the conductor process by pulling the “sock line” through the travelers that are temporarily attached to the poles. The new conductor is then attached to the sock line and the conductor is then pulled into place. The use of pulling in the sock line, would be more likely in the southern portion of the project.

2. How would the construction process be different from using cranes in these locations (specific steps, durations)?

Response: In general, the construction technique used to construct a transmission line structure using a crane or a helicopter is the same except for setting of the pole. Traditional construction uses a crane, which must have a flat solid area to setup. In those pole locations where foundations are required, the bolt cage is lowered into the hole with the crane prior to pouring of the concrete. Helicopters can also be used to lower in the bolt cage. When the poles are set, the pole sections are picked up by the crane and placed into the hole, with the subsequent pole sections being set on top of one another. If a helicopter is used, then the pole is typically constructed off site and the entire structure is then flown into its final location where it is lowered into the hole. Therefore, it is anticipated that construction duration when helicopters where used could be shorter than traditional construction methods.

3. Would the use of helicopters affect the number of trees to be removed, either increasing or decreasing the number?

Response: In general, the use of helicopters is not expected to substantially change the number of trees that may need to be removed or trimmed. It is expected that the difference would entail fewer trees would be affected with the use of helicopters since some of the trees affected trees associated with corridor access could remain.

4. What measures would PSE use to notify people of helicopter construction (how large an area, how much advance notice, options for timing, alternate accommodations)?

Response: If helicopters were used, PSE and their contractor would comply with the local and FAA congested air permit conditions and notification requirements1. As these are specialty helicopters and work techniques, the work would likely be scheduled weeks in advance. The public notice and awareness outreach would be flexible and could be communicated in advance.

1 http://fsims.faa.gov/WDocs/8700.1%20G%20P%20Handbk/Volume%202/2_102_00.htm
Questions Related to Potential Helicopter Use for Energize Eastside
October 26, 2017

5. Is there any information about how PSE would allow or limit use of helicopters by your contractors?

Response: PSE will review and approve the contractor’s work plan prior to construction. PSE’s experience with best construction practices and desire to minimize the impacts to the homeowners/public would be used to review all construction methods prior to work being authorized. The use of helicopters requires additional coordination and typically is more expensive; therefore, solid justification is necessary for their use. This often includes minimizing land disturbance that may be necessary to access pole locations, thereby reducing traditional access and associated restoration costs.
Questions for PSE on Energize Eastside Final EIS - Helicopter Use

December 18, 2017

1. Is it correct to say that use of helicopters would only be used to reduce impacts related to site clearing and grading (such as in steep topography, or heavily vegetated areas) for construction access, and for reducing the need to cross properties while pulling the sock line (such as in densely developed or heavily vegetated areas)?

Response: Reducing construction impacts through smaller/fewer access roads, reduced overall project duration/time installing a pole or foundation, and more efficiently pulling in the sock line are all reasons to use a helicopter.

2. It appears that construction equipment would still have to reach a pole site to bore a hole, even if the pole was going to be set by helicopter, so is it accurate to say that the impact potentially avoided by use of helicopters for setting poles would be the clearing and grading related to crane access?

Response: The potential impact created through eliminating clearing and grading necessary for crane access is a benefit of helicopter use. The size of the access road could be reduced due to smaller equipment needed at the pole location if more of the work can be done with a helicopter.

3. Are there areas along the alignment that you can confirm would not likely require helicopter use?

Response: Pole locations which are adjacent to roads or parking lots are less likely to need helicopter work for installing the pole. These locations might still benefit from pulling the sock line with a helicopter to reduce construction times and impacts to customer yards/landscaping etc.

4. Are there any circumstances where you know FAA rules would not allow helicopter use?

Response: Not at this time. PSE will follow all applicable FAA regulations in the use of helicopter. The FAA has numerous safety rules and procedures, all of which have to be followed by the helicopter operator. Permit application and advance notification are required prior to lifting work being conducted. A “congested air” permit would be required due to the location of the job. The FAA could deny the permit.

5. If a helicopter is being used, how would the concrete be poured? Would the helicopter carry the concrete?

Response: It is not anticipated that concrete will be brought in by helicopter for this project. A standard concrete truck or a pumper truck could be used to pour the foundation even if a helicopter is used to set the pole.
6. How long does it take per pole to place a foundation bolt cage, pour a foundation, and place a pole with the use of a helicopter?

Response: The process typically takes 1-3 days - steps are: 1) rebar placement; 2) bolt cage install and leveling etc.; and 3) concrete placement and finish work.

7. How long does it take to place a direct embed pole with the use of a helicopter?

Response: Basically just the time to fly from loading zone (LZ) to pole hole, lower the pole into place, align and plumb the pole, and then start back fill work to secure pole position. This typically takes around 30 to 60 minutes per section of pole. The additional sections of the poles would take less time each as they would just be lowered and secured onto the previous section.

8. How long does it take for a helicopter to pull a sock line from pole to pole?

Response: Typically, it takes around 30 seconds to 2 minutes to carry the sock line between poles with the span distance being the primary factor in determining the time necessary. Catching the “fly door” on the traveler with the sock line at each structure is as quick as 5-20 seconds based on weather conditions and other factors. Passing the “needle” at Dead End structures is a 1-5 minute operation.
APPENDIX A-4. ESA TECHNICAL MEMORANDUM
ON HELICOPTER NOISE FROM POWERLINE
STRINGING AND POLE INSTALLATION
Technical memorandum

date        January 16, 2018

to          Reema Shakra, Project Manager

cc          Mark Johnson, Project Director

from        Chris Sanchez, Senior Technical Associate

subject     Helicopter Noise from the Installation of Transmission Poles and Lines

In response to your e-mail, this memorandum responds to your request for impact analysis of noise from transmission pole/line installations using helicopters. The following is a synopsis of potential noise impacts and how they may apply to elements of the Energize Eastside Project. ESA estimated the 1-hour equivalent sound level (Hourly Leq) values that would be associated with pole/line installations as well as landing zone areas.

It is assumed that the pole installation would be conducted using a heavy duty helicopter, such as CH47D Chinook, and line installation would be conducted using a light duty helicopter, such as Hughes 500D. The Federal Aviation Administration’s (FAA) Aviation Environmental Design Tool version 2d (AEDT 2d) includes a set of data called Noise-Power-Distance (NPD) data for both helicopters. NPD data includes A-weighted maximum noise levels (LAMAX) for hovering operations at the distances from 200 feet to 25,000 feet. For this study, the following are used as a reference noise level for helicopter activities:

- CH47D – 86 dBA LAMAX at 200 feet
- H500D – 80 dBA LAMAX at 200 feet

These maximum noise levels were then used to estimate average hourly noise levels associated with helicopter construction activity. For pole installation, it was assumed that a CH47D helicopter would be hovering at one location for the entire hour. For line installation, it was assumed that the H500D helicopter operating time would be approximately 15 minutes per hour at tubular steel pole (TSP) sites during sock line stringing. At the landing zone, it was assumed that helicopters would take 15 minutes per hour related to helicopter landing and takeoff. For both pole and line installation, it was assumed that the helicopter would hover approximately 250 feet above the ground. Based on the above assumptions, following hourly Leq levels will be used:

- CH47D Hovering – 86 dBA Hourly Leq at 200 feet
- CH47D at Landing Zone – 80 dBA Hourly Leq at 200 feet
- H500D Hovering and at Landing Zone – 74 dBA Hourly Leq at 200 feet
As shown in Table 1, Construction Noise Levels at Sensitive Receptor Locations, hourly average helicopter noise levels associated with these construction activities at the closest sensitive receptor locations would range from 69 dBA to 82 dBA for helicopter activities at a lateral distance of 200 to 350 feet.

For the Energize Eastside Project, a mitigation measure to avoid some non-noise related impacts would involve the use of helicopters for pole installation and line stringing. At some locations, sensitive receptors could be as close as 15 feet laterally from the proposed alignment. Consequently, noise levels at immediately adjacent receptors to pole installation and line stringing would essentially be the same as the reference noise level at a height of 200 feet. Assuming that helicopter landing zones would have a 350-foot buffer from the nearest sensitive receptor, noise levels at such receptors would be the same as predicted in Table 1, below.

Most cities in the project area have a noise ordinance that limits the hours of construction activity but do not establish a quantitative noise standard. As an example, under the Bellevue City Code (BCC), noise emanating from construction sites is prohibited outside of the hours of 7 a.m. to 6 p.m. Monday through Friday, and 9 a.m. to 6 p.m. on Saturdays. No construction site noise is permitted on Sundays and legal holidays. If after-hours sounds from a construction site are clearly audible across a real property boundary or at least 75 feet from their source, it will be considered a noise disturbance (BCC 9.18.040.A.4). Additionally, sounds created by the repair or installation of essential utility services and streets are exempt from the restrictions of the noise ordinance (BCC 9.18.020.B.2) as are sounds originating from aircraft in flight (BCC 9.18.020.A.6).

Consequently, while helicopter noise would likely be clearly audible at the nearest receptors it would still be consistent with the restrictions of local noise ordinances and would be temporary in nature as construction activities would take less than three days to complete at any given location, with the exception of activities at the helicopter landing zones.

### Table 1
**Construction Noise Levels at Sensitive Receptor Locations**

<table>
<thead>
<tr>
<th>Construction Noise Source</th>
<th>Distance to Closest Sensitive Receptor</th>
<th>Hourly Leq at Closest Sensitive Receptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH47D – Pole Installation$^b$</td>
<td>320 feet</td>
<td>82 dBA</td>
</tr>
<tr>
<td>H500D – Line Installation$^c$</td>
<td>320 feet</td>
<td>70 dBA</td>
</tr>
<tr>
<td>CH47D at Landing Zone$^d$</td>
<td>350 feet</td>
<td>75 dBA</td>
</tr>
<tr>
<td>H500D at Landing Zone$^d$</td>
<td>350 feet</td>
<td>69 dBA</td>
</tr>
</tbody>
</table>

$^a$ Direct distances between a helicopter and a receptor based on the hovering height of 250 feet and horizontal distance to a receptor of 200 feet with the assumption of 6 dB noise propagation rate per doubling the distance.

$^b$ Helicopter Hourly Leq values near pole installation are calculated assuming the helicopter would hover above the site at an elevation of approximately 250 feet above the ground surface for an hour.

$^c$ Helicopter Hourly Leq values near TSP locations are calculated assuming the helicopter would hover above the site at an elevation of approximately 250 feet above the ground surface for up to 15 minutes per hour.

$^d$ Helicopter Hourly Leq values are calculated assuming the helicopter would operate in the immediate vicinity of the helicopter landing zone for up to 15 minutes per hour.

**SOURCE:** ESA, 2018