Technical Memorandum

Date:	August 20, 2021
Project:	Chehalis River Basin Flood Damage Reduction Project
To:	Chehalis Basin Flood Control Zone District
From:	HDR Aaron Winter; Jasper Dohrendorf, PE.
Subject:	FRE Site Temporary and Permanent Power

1.0 Introduction and Purpose

The Draft Environmental Impact Statements (EISs) prepared by the Washington Department of Ecology (Ecology; pursuant to the State Environmental Policy Act) and the U.S. Army Corps of Engineers (pursuant to the National Environmental Policy Act) evaluate anticipated impacts associated with construction and operation of a proposed Flood Retention Only - Expandable (FRE) facility (i.e., the Chehalis River Basin Flood Damage Reduction Project [proposed project]) in the Chehalis Basin, Washington State. The Chehalis Basin Flood Control Zone District (District) is the project proponent. To inform development of the Final EISs, Ecology and the U.S. Army Corps of Engineers (USACE) has requested additional information regarding the assumptions for power requirements to the FRE facility site. This technical memo analyzes the power requirements and options for the for the FRE facility. Electrical power will be required during construction and for permanent facility operation.

1.1 Assumptions

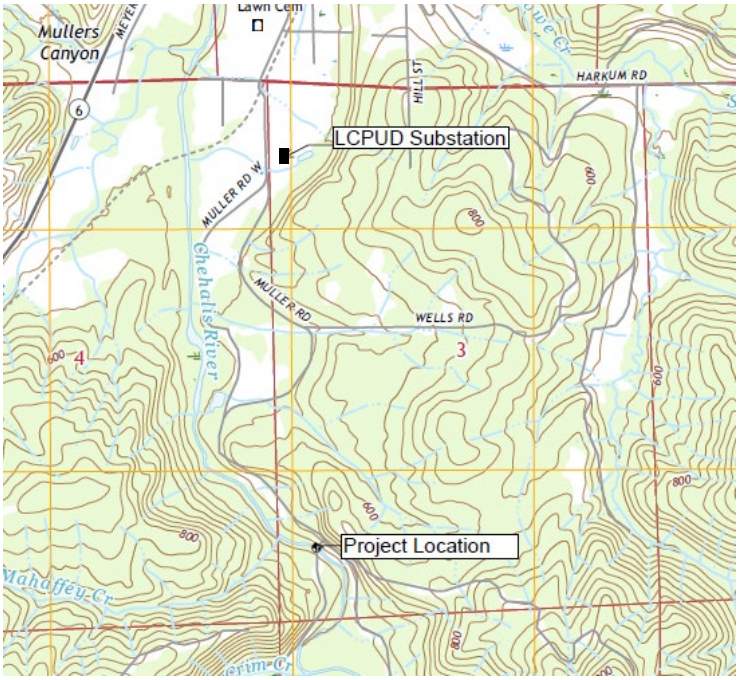
The following assumptions were made in memo preparation:

- Lewis County Public Utility District (LCPUD) will be the electric utility.
- FRE will not be a power generating facility.
- Temporary three-phase transformers larger than 300 kilovolt amperes (kVA) will be padmounted.
- All permanent power will be padmounted.
- Overhead road crossings are to be avoided.
- Temporary service may be required in multiple locations. The two primary locations are:
  - Office/security area
  - Roller-compacted concrete plant
- Permanent power will be required in two locations:
  - Sorting facility electrical/mechanical room
  - Base of the facility near the pump intakes
- Distribution voltage will be 12.47Y/7.2 kilovolts (kV).
- Bulk electric system can support the additional loads.
- No transmission improvements are required at this time.

1.2 Existing Facilities

The LCPUD substation supplies power to the area with a single, 115-12.47Y/7.2 kV, 15/20/25 megavolt amperes (MVA) transformer located approximately 1.2 road miles north of the project site. Two feeders exit the westside of the substation and run north and south along Muller Road. A double circuit appears to run north towards Pe Ell, and a single circuit appears to run south. No existing medium voltage (12.47Y/7.2 kV) electrical infrastructure exists on the west side of Chehalis River. The approximate location of LCPUD substation is shown in Figure 1.

Figure 1. LCPUD Substation Location



2.0 Discussion

Temporary power would be required at several locations and for an operating gravel pit with a rock crusher having an expected total demand of 5,000 kVA. Specific equipment location and size is dependent on final mobile construction equipment location.

Permanent power would be required for general facility operations. FRE's permanent power requirements were not available when this memo was prepared. An estimated load of 2,500 kVA was used for calculation purposes.

Anticipated permanent power locations are shown in Figure 2.

Figure 2. Anticipated Permanent Service Locations

2.1 Temporary Power

Rock-crushing equipment is expected to be near the project site. Because the additional load of 5,000 kVA is approximately one-third of the total substation base capacity, the substation likely does not have sufficient capacity or ability to support the full 5,000 kVA demand load. A minimum conductor size of 4/0 American Wire Gauge (AWG) aluminum conductor steel reinforced (ACSR) overhead, or equivalent ampacity underground cable, would be required to supply the temporary load. The existing conductor south of the substation is likely not large enough to support the required demand load.

2.2 Permanent Power

The completed facility would require power for pumps, motors, lighting, SCADA, and other miscellaneous loads. The substation may have sufficient capacity or ability to support the estimated 2,500 kVA demand load. A minimum conductor size of 1/0 ACSR overhead, or equivalent ampacity underground cable, would be required to supply the required load. The existing conductor is likely not large enough to support the required demand load.

2.3 Construction

While typically overhead is more economical, the terrain, routing, and foliage may eliminate the advantages of using overhead construction. Overhead lines require regular right-of-way clearing and are prone to outages from downed trees. While all construction would adhere to clearance standards, underground construction would eliminate potential clearance issues for large construction equipment. Underground construction is less susceptible to temporary outages and wildfire damage.

Where feasible, underground construction is recommended. Temporary construction may consist of overhead lines if routing can avoid potential interference with construction traffic.

2.4 Option 1 – Use Existing 12.47Y/7.2 kV Electrical Distribution System

Option 1 assumes the existing 12.47Y/7.2 kV electrical distribution system has the capacity to supply the additional loads and consists of locating and tying into the existing 12.47Y/7.2 kV distribution system with minimal infrastructure improvements. Temporary power to the gravel pit would be provided using the existing infrastructure at the water tower and constructing a new overhead line on the north side of the existing road to the gravel pit operation location. As gravel pit operations typically require a large (500 kVA or larger) three-phase padmounted transformer, a run of underground conductor would also be installed. A single-phase service for the Office/Security area would riser down and cross the road underground to the required location. The Office/Security area would likely require a small (15 kVA), single-phase transformer.

Distribution for the permanent service would utilize the existing infrastructure at the pump house located below the water tower.

Option 1 would require construction of approximately:

- 0.2 mile three-phase overhead 4/0 AWG ACSR conductor
- 0.1 mile three-phase underground 500 kcmil aluminum (AL) cable
- 0.15 mile single-phase underground 1/0 AWG AL cable

Option 1, shown in Figure 3, is not recommended until a more detailed review of existing infrastructure is performed, and permanent power requirements finalized. A voltage dip (flicker) analysis was not performed, and large motor starts would likely affect existing consumers with this option.

Figure 3. Option 1

2.5 Option 2 – Rebuild Existing Electrical Distribution Infrastructure from Substation

Option 2 would rebuild the existing electrical distribution infrastructure from the substation. A three-phase 500 thousands of circular mils (kcmil; minimum) conductor underground line or three-phase, 4/0 AWG ACSR overhead line would be needed to support the temporary and permanent loads. To minimize road closures due to utility construction, underground construction from the Weyerhaeuser equipment yard, directly up to the existing water tower is recommended.

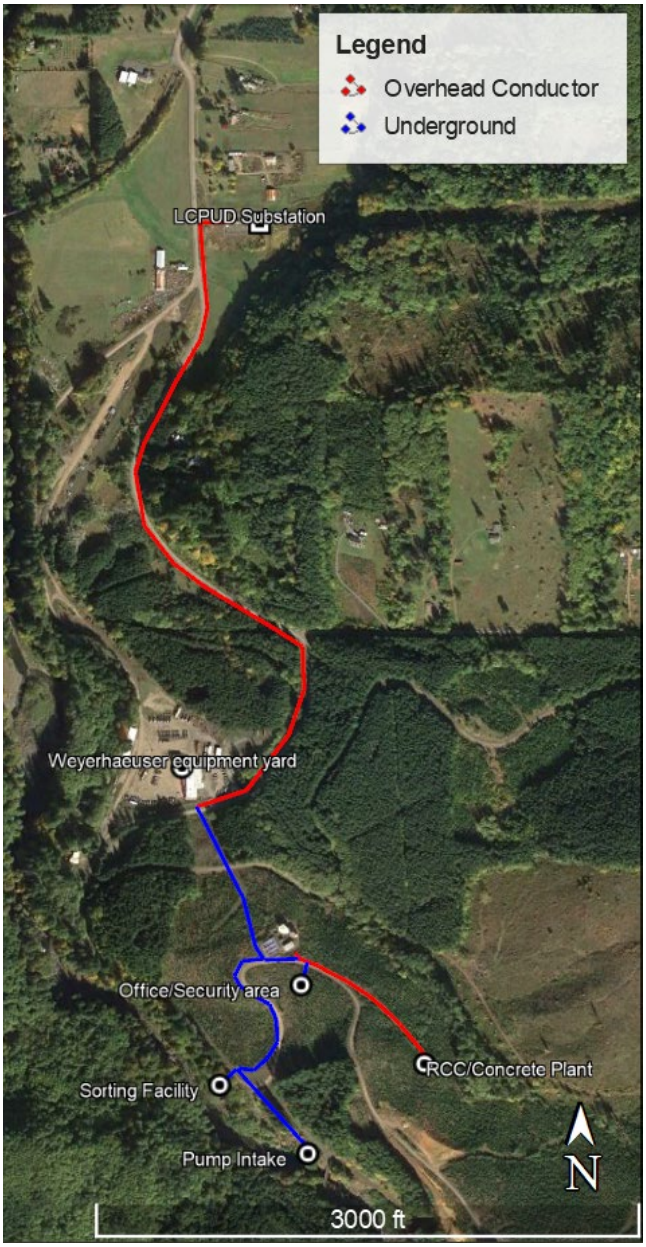
Distribution for the permanent service would tie into the temporary feeder near the water tower, follow the road south and feed the required padmount transformers.

Option 2 would require construction of approximately:

- 0.2 mile new overhead 4/0 AWG ACSR
- 0.23 mile new underground 500 kcmil
- 0.33 mile new 1/0 AWG AL cable
- 0.8 mile 4/0 AWG ACSR conductor rebuild

Option 2, shown in Figure 4, would be highly contingent on LCPUD substation and feeder capacity. A voltage dip (flicker) analysis was not performed, and large motor starts will likely impact existing consumers with this option.

Figure 4. Option 2



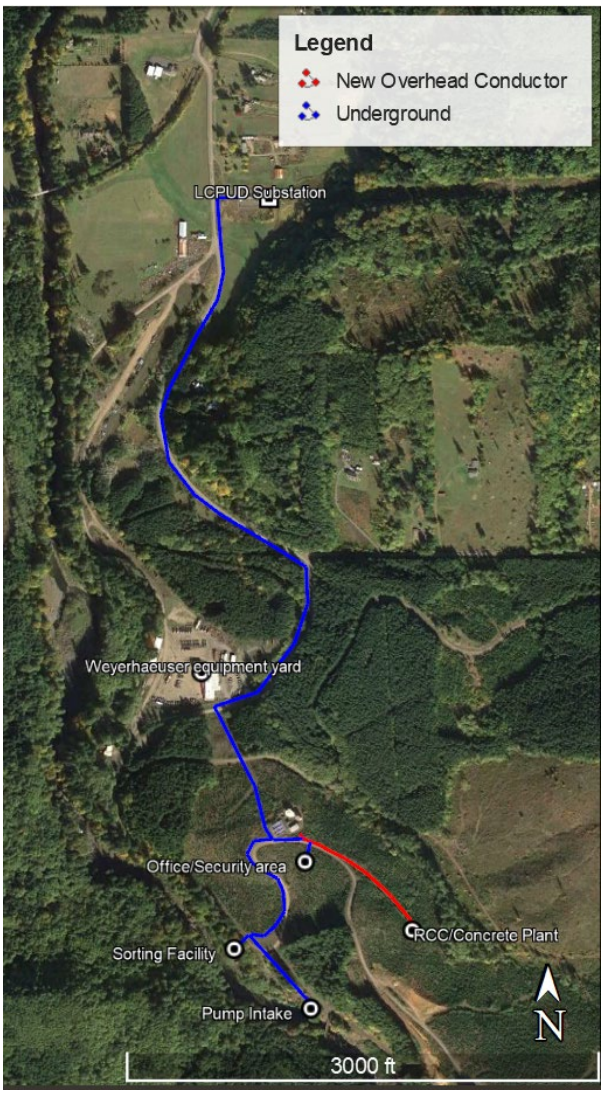
2.6 Option 3 – New Underground Dedicated Feeder

Option 3 would construct a new underground dedicated feeder from the existing substation to the project site. The new line would be separate from the existing distribution line. A dedicated feed would reduce motor starting impact to existing LCPUD customers, while increasing FRE reliability. A dedicated feeder has the advantage of a protective device (fuses/relaying) scheme specific to FRE's power requirements. To reduce permitting costs and potential right-of-way issues, sharing the existing route is recommended.

Option 3 would require construction of:

- Additional feeder bay and protective device equipment in substation fence.
- Additional voltage regulators may be required.
- 1.17 mile new underground 500 AL cable.
- 0.33 mile new 1/0 AL cable
- 0.2 mile new overhead 4/0 ACSR conductor

Figure 5. Option 3



2.7 Option 4 – Increased Substation Capacity with Transformer

Option 4 would increase the existing substation's capacity by either replacing the existing substation transformer or adding a transformer to the substation yard. Because the permeant power requirements are less than the temporary power requirements, a temporary mobile substation may be an alternative; however, the long construction period (5 to 7 years) may eliminate a mobile substation as a viable option. Option 4 might be required in addition to the other options.

3.0 Conclusions

LCPUD coordination is required for further analysis. Verification of substation size and voltage, as well as peak loading (existing and future) information will be required to determine substation improvements. A voltage drop, flicker, and conductor loading analysis is required to determine the improvements to the existing distribution system. System mapping or site walk-through also is required to determine best potential tie in points, routing, and identification of other potential obstacles (e.g., culverts, creeks, topographical hazards). All options are highly dependent on LCPUD's existing infrastructure and input.

- **Option 1** is unlikely to be viable due to the rural nature of the existing infrastructure.
- **Option 2** is likely the most cost-effective solution for LCPUD. Additional substation work (Option 4) may be required depending on LCPUD input. Because Option 2 does not require construction of a dedicated feed, transformer replacement would be favored over installing a second transformer.
- **Option 3** has a higher cost with potential long payback period. This option may be viable depending on funding and service agreements.

Since Option 2 is the likely the most cost-effective for the electric utility (LCPUD), the District proposes to advance this option as the preferred option for further coordination and development discussions with LCPUD. Subsequently Option 2 should be considered for further analysis in the development of the Final EISs by Ecology and USACE.