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Alaska Energy Authority, Rural Power System Upgrade, Chitna, Alaska

Design analysis:

The proposed line will connect new generation facilities located at Chitna's Airport to Chitna. Chitna is currently served by generation in Chitna and serves a recently upgraded 7.2/12.5 kV distribution system, that utilizes #2 ACSR primary overhead conductors.

The routing, preferred by the future owner, would allow for good access to the facilities for maintenance. An all-overhead route is possible; however, it would require the installation of expensive structures that are difficult to access and expensive to maintain. A preferred alternative would be to install a mostly overhead circuit following the highway corridor that utilizes buried/submerged cables across Mile 2 Lake and Mile 3 Lake.

The proposed overhead conductor is #2 ACSR, Sparate. It has ampacity sufficient to carry multiples of the current load in Chitna, and its usage will be consistent with the conductors stocked by the future owner.

The proposed buried/submerged cable is a multi-conductor armored cable. Where the cable passes thru the freeze/thaw zone, it will be installed in 4" HDPE conduit. The annular volume between the HDPE and the armored cable may be filled with a non-freezing material to further reduce compression loading of the cable. The boring of the approaches/entrances into the lakes is recommended, and may be required by permitting authorities.

Structures: the structures proposed will be single wood pole structures, at a nominal ruling span of 300'. The minimum pole size recommended is a class 3 pole. The minimum pole height recommended is 40 feet. The use of class 3 and larger poles will enable any unforeseen re-conductoring of the line to a larger conductor. The choice of mostly 40 foot poles would facilitate the addition of telecommunication facilities with little pole-line upgrades required. The choice of 40 foot poles will be less costly than the use of taller poles, and as a recent fiber-optic cable has been installed along the highway corridor, the attachment of telecommunication facilities to the line is less likely. Larger and taller poles will be specified for long spans, large grade variations, and road crossings.

Framing: all poles with utilize 60" span crossbraces and 10' arms. The 10' arms will provide for raptor protection. All conductors will utilize armor rod and manufactured ties, except at deadends. Most tangent poles will be framed

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C1AR, with a pole top pin and the neutral on an offset bracket. Longer spans (375' < span <425') will be framed C1-1AR double pins and the neutral on an offset bracket. The longest spans will be framed C8-1R with all phase conductors deadended on the crossarm and the neutral install 6' down from the crossarm. Two angle structure types are proposed: C1-1ARX and double C7-1R. The C1-1ARX is similar to the C1-1AR with the neutral attached to a swinging clevis attached to an eye-nut installed on a neutral offset bracket. For large angles, C7-1Rs will be installed in both directions and the jumpers will utilize covered conductors. Proposed pole framings are shown on the drawings.

Construction Considerations: the drawings provided indicate the general routing of the new line. Angle points were identified in the field, but due to the heavy foliage, not every pole location could be identified. After receipt of the survey information, 95% drawings indicating precise angle pole locations will be provided along with a set of staking sheets. The 95% drawings and staking sheets will be used for acquiring permits from the State and from the Corporation across whose land parts of the line will cross, to clear the proposed R-O-W. After receipt of permissions to clear, the surveyors will return to Chitna and stake the clearing limits and stake the angle structures locations. After the R-O-W has been cleared, I will stake the intermediary pole locations. I will modify the 95% drawings and staking sheets with any corrections required and provide 100% issued for construction drawings and staking sheets. Rocky soils are anticipated for most of the route. Solid rock is anticipated at several pole locations. It is proposed to require the contractor to have a hydraulic rock breaker on site. It is proposed to define solid rock as: rock not capable of being excavated by a Hitachi EX200 or similarly sized backhoe.

It is proposed to allow two options for the installation of the buried/submerged cable sections: the armored cables will be pulled into conduits previously bored some distance into the lake (below the expected depth of frost), and then laid from a boat to the other side of the lake where they will be pulled into the conduit there, then both conduits would then be purged and sealed or filled. The second option would be to install a float on the end of the bored conduit, such that the lake end of the conduit is held above the water surface. The conduit will be purged of water and both ends sealed. The lake will freeze during winter, with the end of conduit above the water. After the lakes have sufficient ice cover, the contractor will return and pull the cable into the conduit at one end of the lake, and then trench the ice across the frozen lake. The cable will be laid onto the bottom of the lake through the trench. No splices are proposed in the armored cable sections.

One bore of the highway is proposed between Mile 2 Lake and Mile 3 Lake. Installation of a junction box is proposed to connect the two sections of cables.