Lake Chelan Regional Area Planning

Electrical System Reliability

March 13, 2019

Outcomes

Desired Outcome of Presentation:

- Describe PUD long range planning for electrical infrastructure in the Lake Chelan Valley
- Understand the drivers of need for new electrical infrastructure
- Review options for hardening transmission infrastructure against fire risk
- Explain operational constraints for siting a new substation and transmission line
- Community stakeholders provide direct feedback and ask questions

Lessons Learned

Applying **Lessons Learned** when Planning for New Infrastructure:

- Inform early and often
- Identify & weigh options in partnership with community stakeholders
- Proactively plan for immediate and long term needs
- Incorporate community values into planning

Your Input

Your Input Helps Guide the Direction of the PUD

- We want you to weigh in on our recommended approach to fire resiliency plans
- We are seeking input on substation siting & transmission line routes
- Your direct feedback will be shared with PUD Board of Commission
- Your input will be shared with future stakeholder groups & shape future outreach activities

Objectives & Proposed Tactics

PUD *objectives* in Chelan	PUD *tactical* plan in Chelan
Provide reliable utility services	Balance system loads and strengthen failure points
Improve resiliency to fire storms	Harden the transmission systems by replacing wood poles with steel poles over time
Ensure sufficient capacity exists for planned growth	Build a new substation and connecting transmission line within the Chelan Dam vicinity

CHELAN COUNTY
www.chelanpud.org

The Electric Power System

The Electric Power System is divided into generation, transmission, and distribution.

1. Hydro Project
In Chelan County, electrical power is generated at one of the PUD's three hydroelectric projects.

2. Transmission lines.
Transmission lines leave hydro projects and transmission switchyards.

3. Transmission Switchyard
Power moves across large transmission lines to a transmission switchyard where electrical voltage is reduced by transformers.

4. Local Substation
The power then travels along smaller transmission lines to a local substation, where the electrical voltage is reduced to an appropriate level for residential and commercial use.

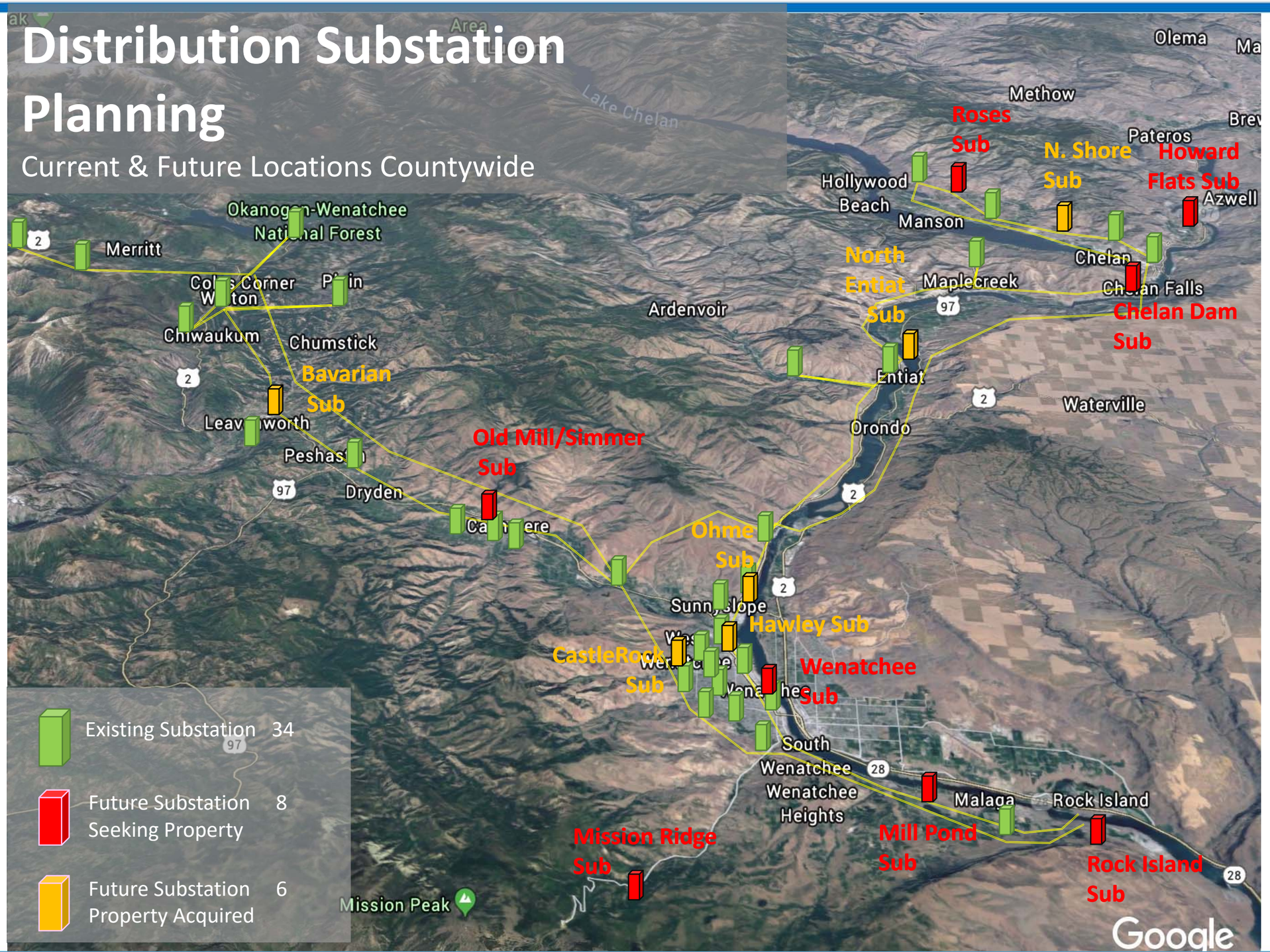
5. Distribution lines
Distribution lines leave local substations and may be overhead or underground depending on the location and situation.

6. Your home or business
Finally, power travels along distribution lines and is converted to a standard voltage through transformers and into the customer's residence or business.

Focus today

Distribution Substation Planning

Current & Future Locations Countywide



Historical

Chelan Regional Capital Infrastructure Investments :

- Chelan Falls Manson 115KV Rbld 1984
- Submarine Cable lake crossing- 1984
- Expanded Manson Sub - 1991
- Chelan Falls to Rocky Reach II - 1998
- Rebuilt Wapato Sub- 2001
- Knapps Coulee 115KV Line 2003
- Second circuit to Howard Flats 2003
- New South Shore Sub 2004
- 2nd Submarine cable 2008
- Expanded Chelan Substation- 2009
- South Shore Feeder Capacity 2013
- McNeil Canyon Transfer Douglas 2015
- North Shore Substation property 2017
- Union Valley Sub rehabilitation 2018

Since 1984 Investments

> $ 30 Million

Lake Chelan Regional Electric Grid

Transmission & Substations

30 Year Vision

Legend

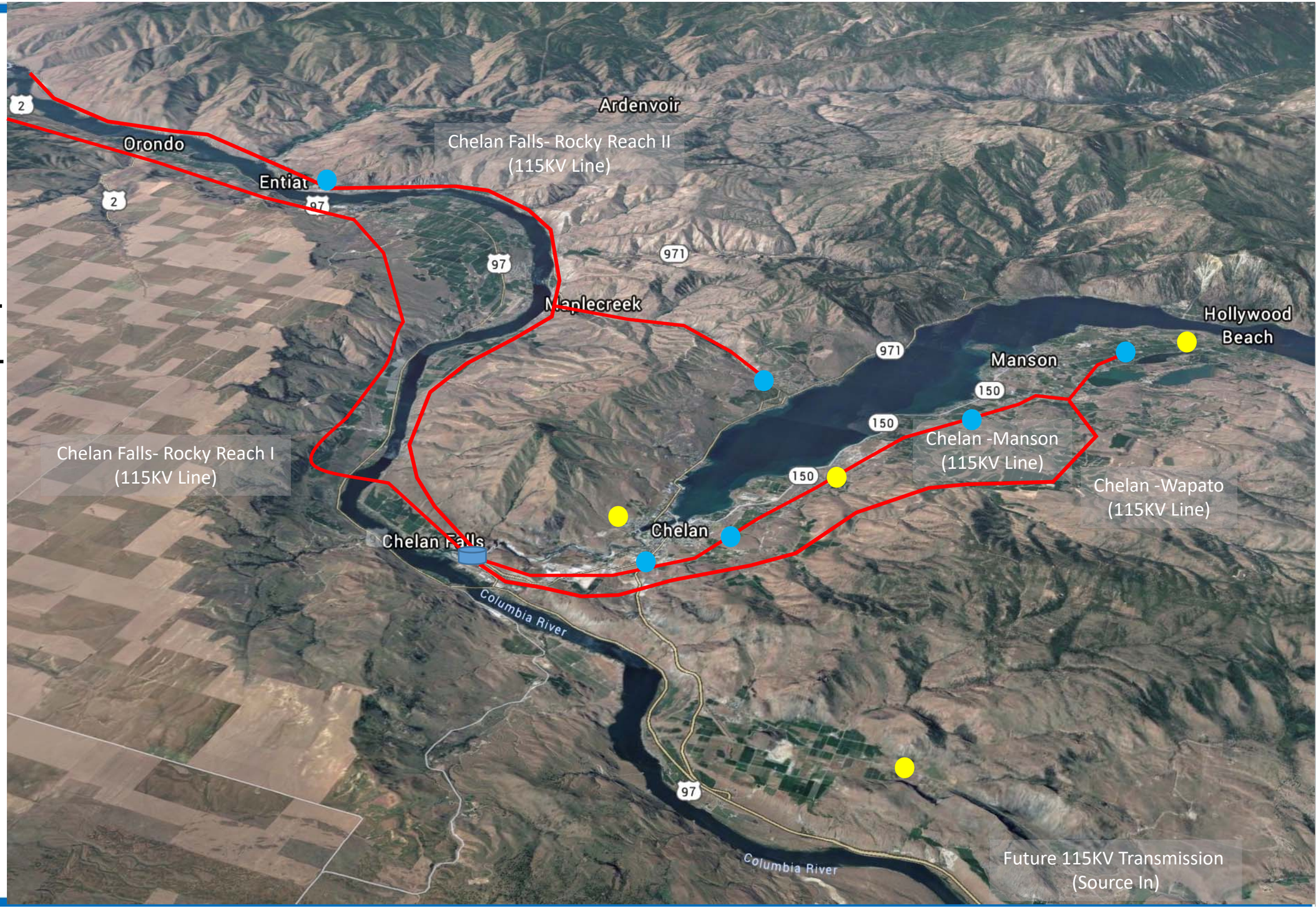
Existing Transmission Line

Existing Substation

Existing Switchyard

Future Substation*

**Note that future substations will require transmission connection not shown on this map*

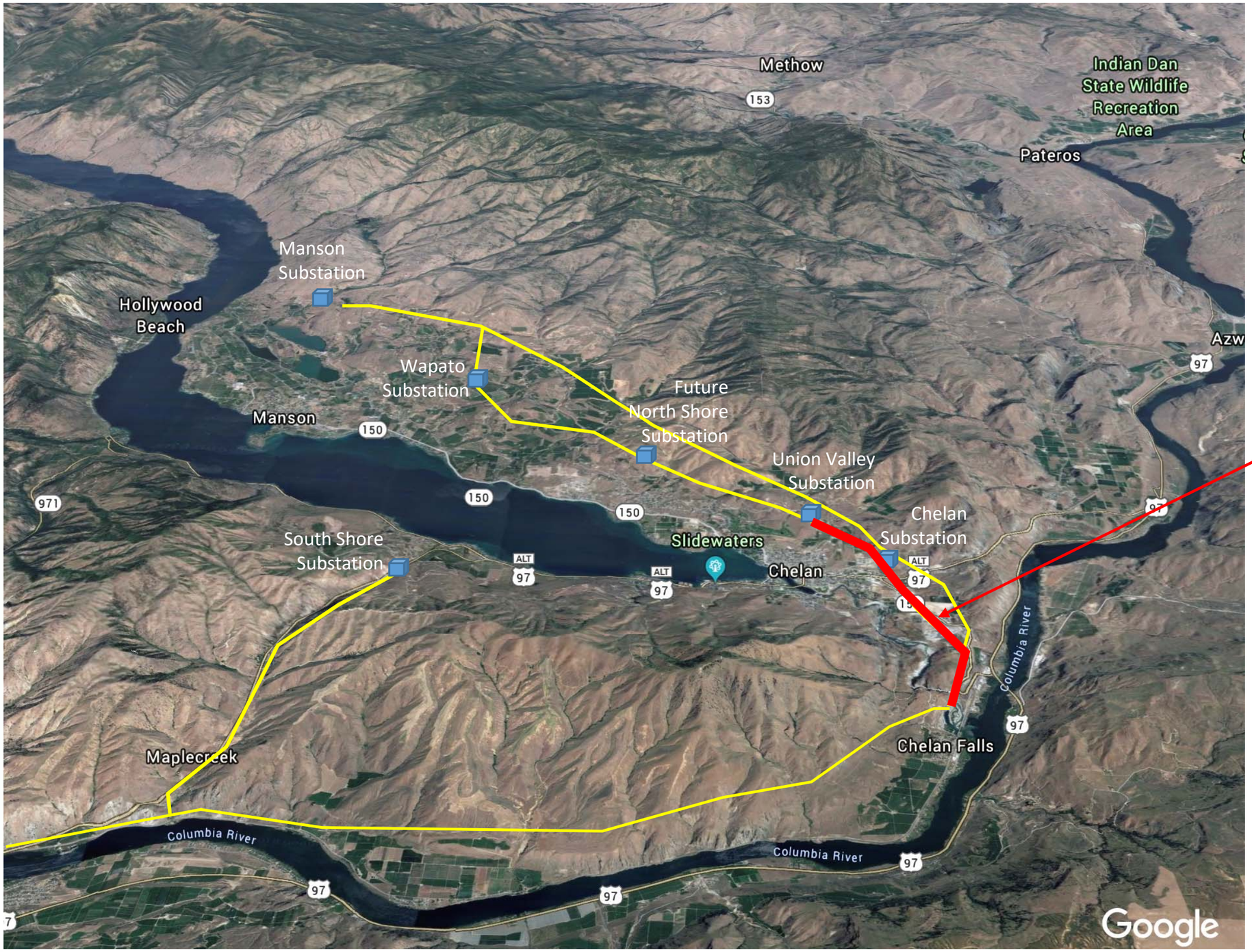


Transmission Fire Hardening

- 2015-2019 Strategic Plan: “Customer-owners were most interested in replacing or rerouting some electric lines to protect against fire and weather risks.”
- As a result of the Strategic Plan, the PUD conducted a fire risk assessment of the PUD’s high voltage electrical transmission system that was completed in 2017.
- The Chelan service area was included in the top 3 areas that could benefit the most from fire hardening.
- The 2015 Chelan fire burned through both transmission lines that serve the Lake Chelan Valley.
- Power was out for over 36 hours while crews restored the first line, and the second line took 11 days.

Transmission Fire Hardening

- The recommendation is to replace existing wood transmission poles to steel.
- Steel poles reduce the frequency and duration of fire-related transmission outages because fires will burn past them.
- The new steel poles would be constructed in the same alignment and in the same general location as existing poles.
- Some poles may be slightly taller.
- The photo to the left is an example of a steel pole replacement.

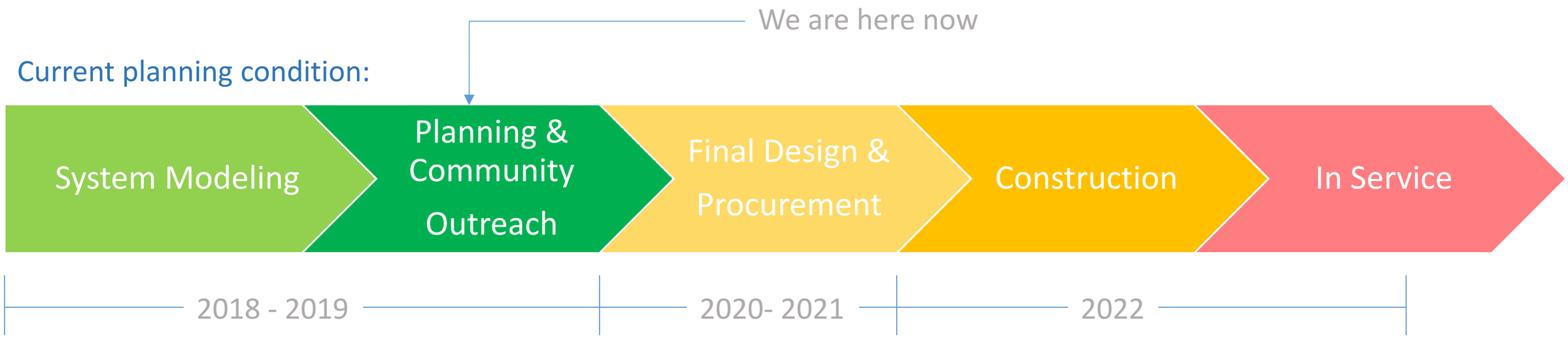


Potential transmission line section for conversion to steel poles

(From Chelan Falls to Union Valley)

Timeline For Replacing Transmission Line Wood Poles with Steel

(Chelan Falls – Manson 115KV - from CF to Union Valley)



Chelan Dam Substation

Why do we need a new substation in Chelan?

- Energy use in the Lake Chelan Valley has grown 3 to 5 times higher than in other areas of the county since 2015
- The existing substations serving this area are nearing capacity
- We are looking for community input as we find a location for the substation and transmission line in southeast Chelan, near the Chelan Dam
- The new substation will meet increased demand while maintaining reliable electrical service

Current

Electrical System Projection (2020)

KEY

Sub

Distribution Feeder

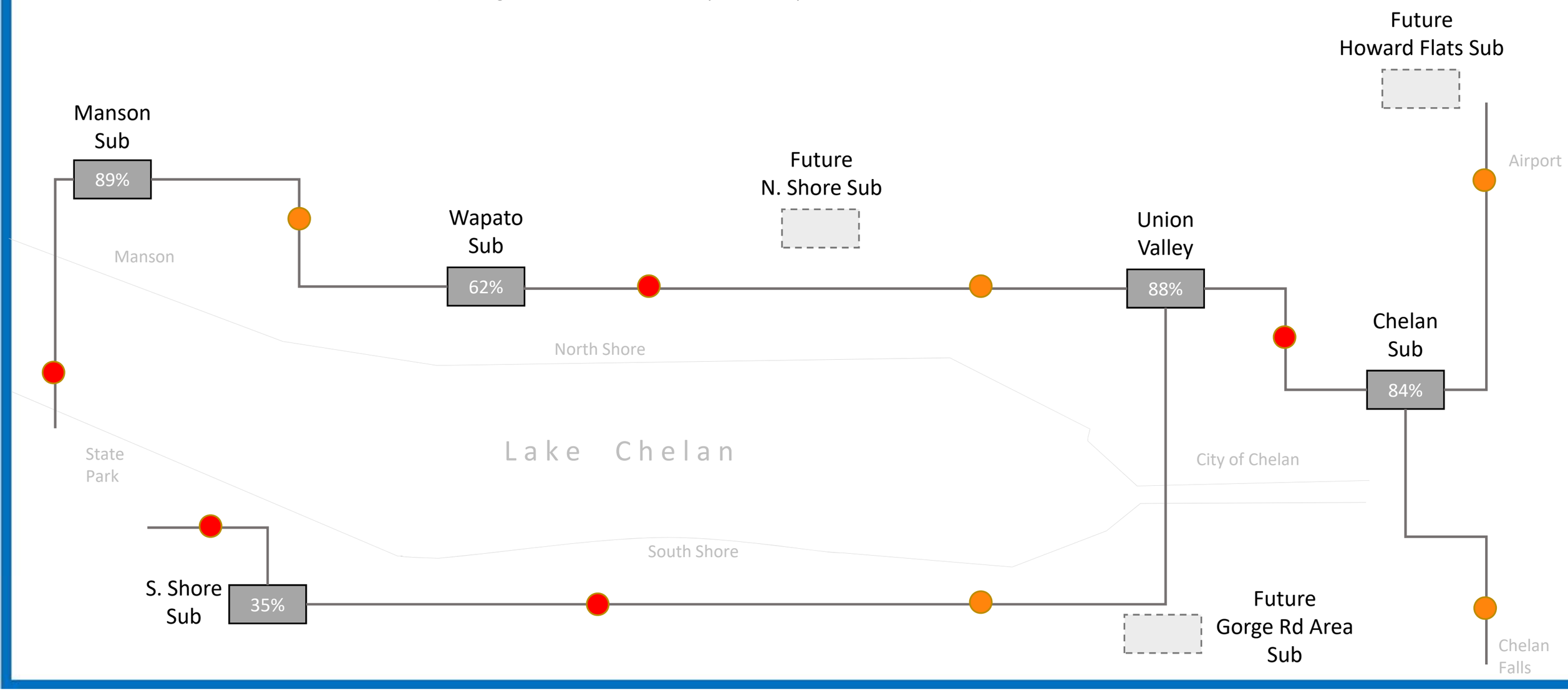
Below 70%

Above 70%

Above 80%

Lake Chelan Area Planning

(Loading condition above 80% requires new planned construction)



Future State

Electrical System

KEY

Sub

Distribution Feeder

Below 70%

Above 70%

Above 80%

Lake Chelan Area Planning

(Loading condition above 80% requires new planned construction)

Future
Howard Flats Sub

Manson
Sub
89%

Future
N. Shore Sub
50%

Wapato
Sub
62%

Union
Valley
60%

Chelan
Sub
60%

Airport

Manson

North Shore

Lake Chelan

State
Park

City of Chelan

South Shore

S. Shore
Sub
35%

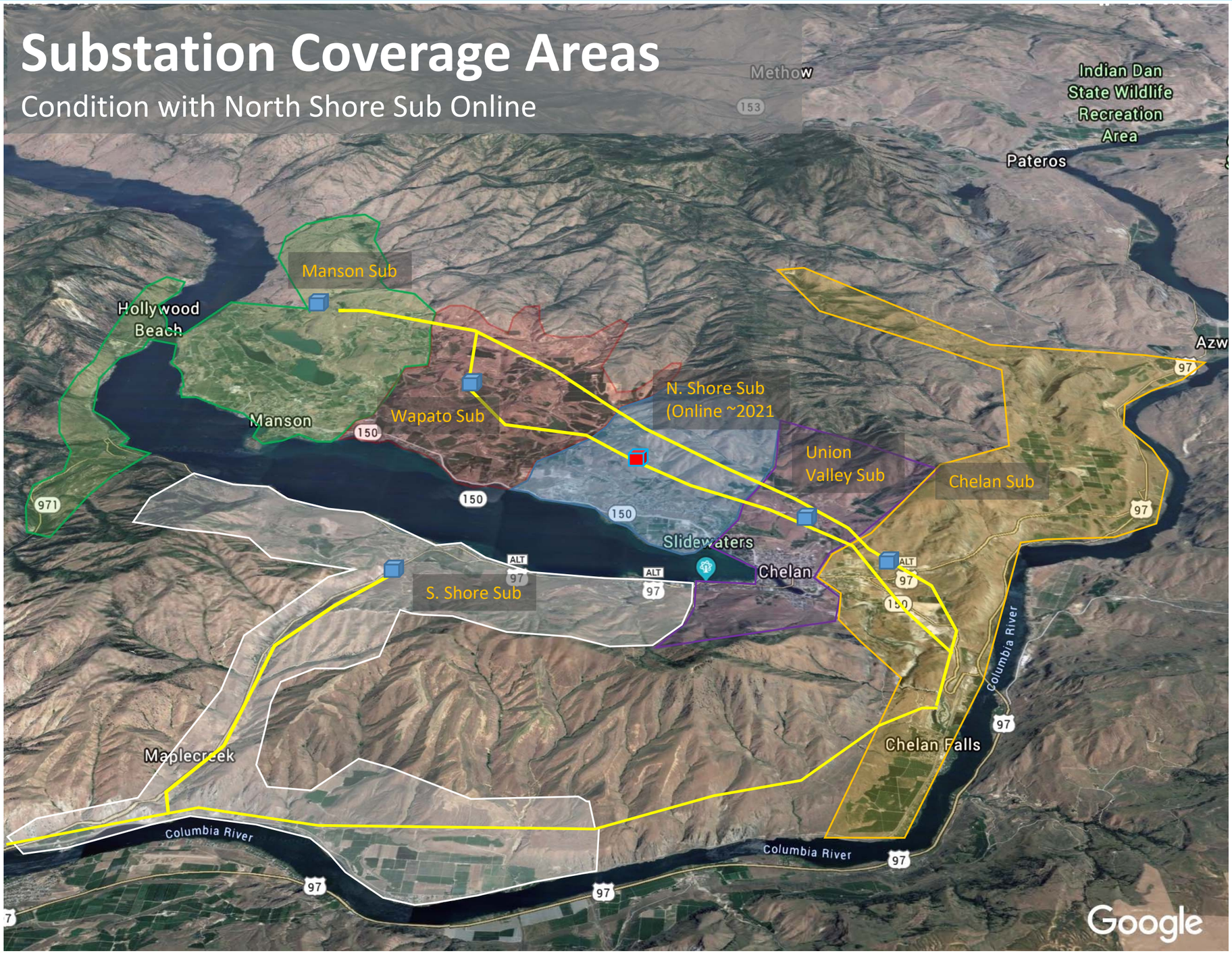
50%

Future
Gorge Rd Area
Sub

Chelan
Falls

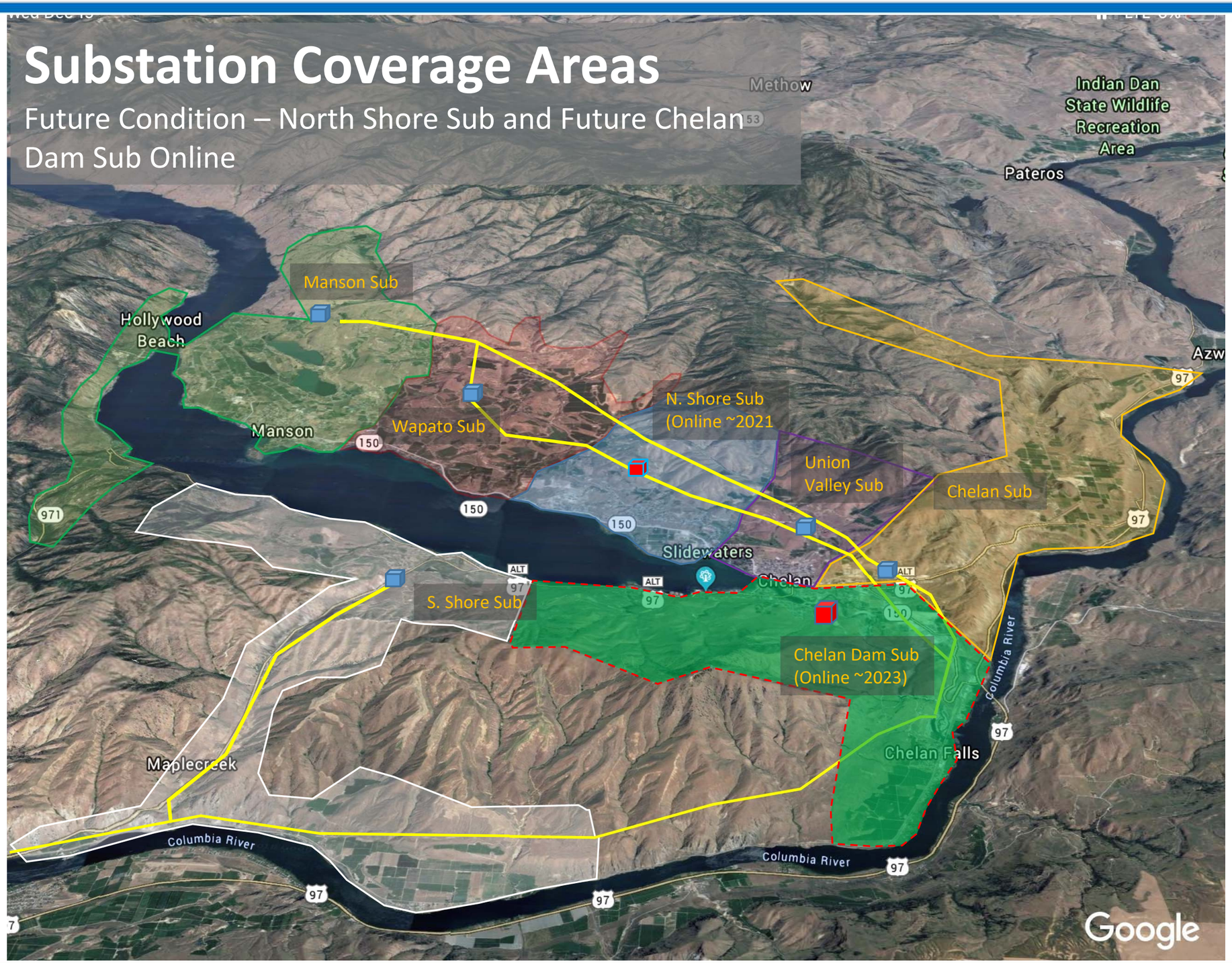
Substation Coverage Areas

Condition with North Shore Sub Online



Substation Coverage Areas

Future Condition – North Shore Sub and Future Chelan Dam Sub Online



Similar Substation Planned

Feasibility Categories
Substation & Transmission Locations

- Functional
- Safe
- Reliable
- Cost effective
- Accessible
- Standardized components
- Maintainable
- Expandable
- Compatible to environment
- Community supported
- Minimized aesthetic impacts
- Coexistent with other land use
- Resilient to Fire
- Permissible
- Future redundant capable
- Constructible
- Clear Zone, Right-of-way impacts

Types of power lines

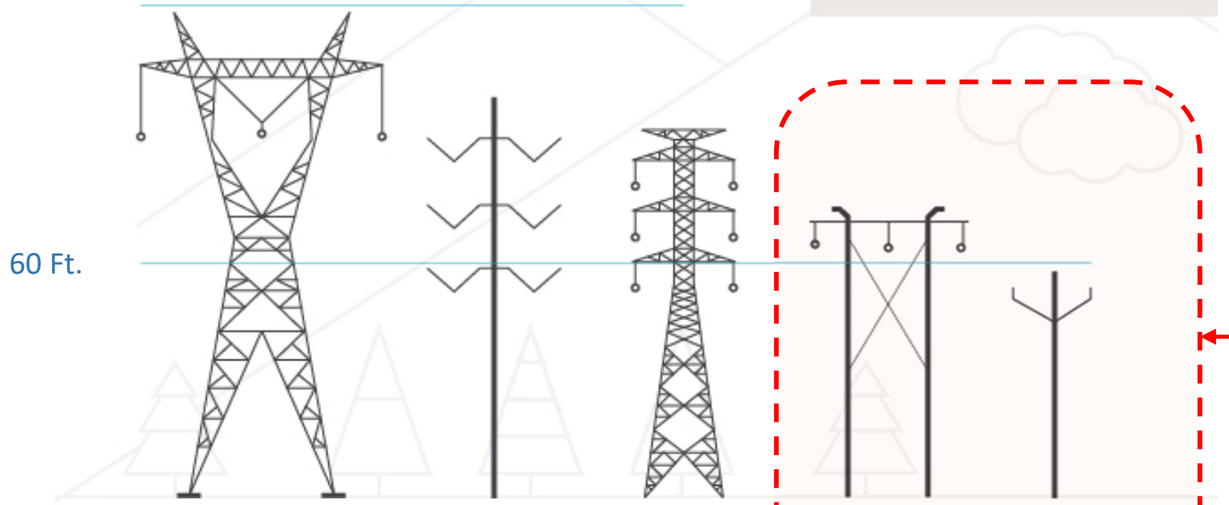
We rely on a system of transmission towers and power lines to carry the electricity produced at our hydro electric plants to the neighborhoods, homes and businesses in the County

Transmission lines

Transmission lines are the big, high voltage power lines that bring electricity from where it's made at our generating stations to substations near communities

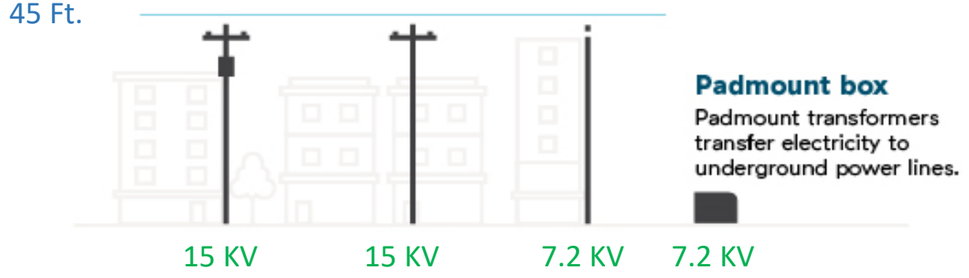
What's a kV?

kV stands for kilovolt, which is a unit of potential energy. One kV is equal to 1,000 volts.



Distribution lines

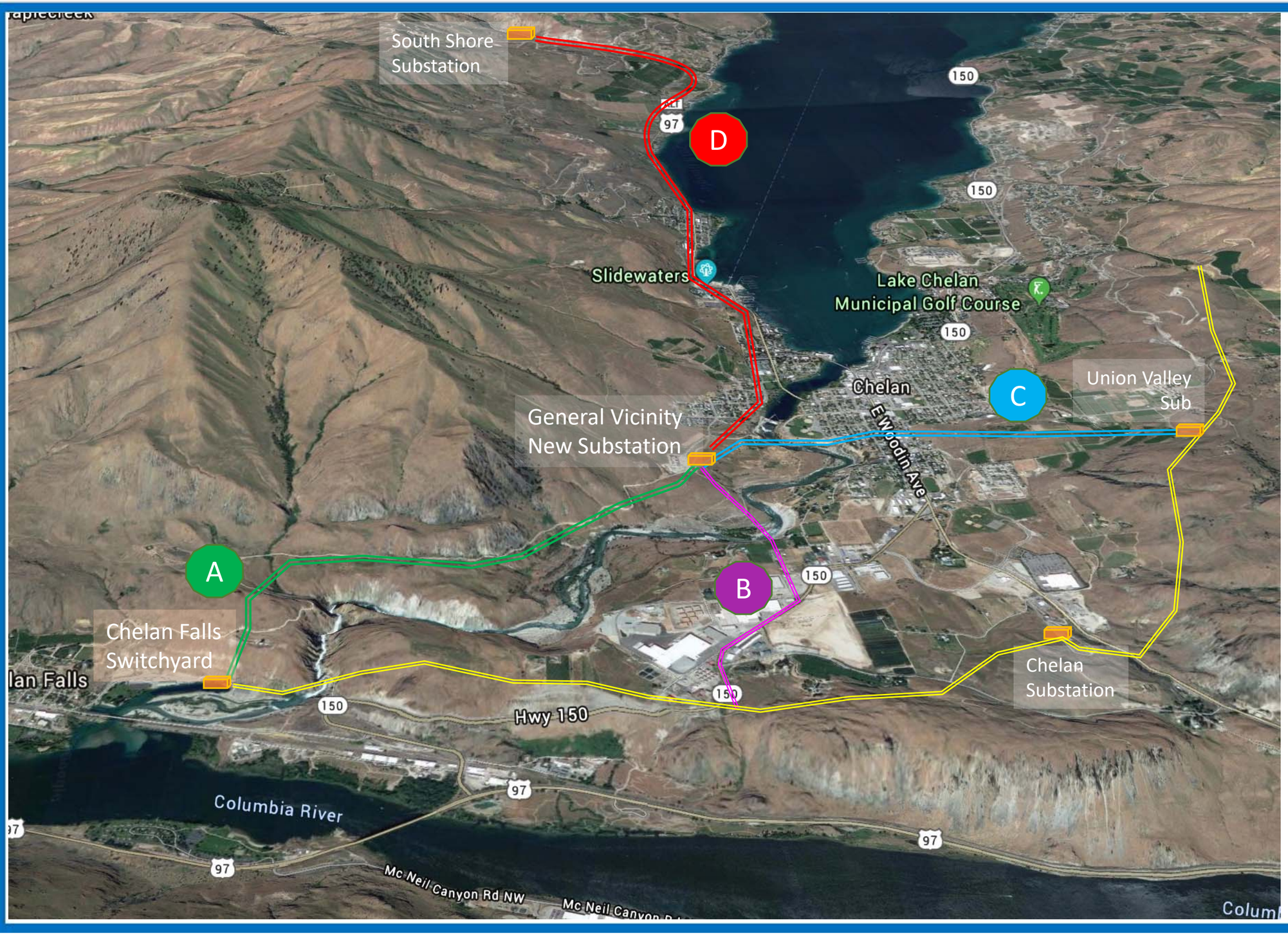
Distribution lines are the smaller, lower voltage lines that carry electricity from the substation to your home or business.



Padmount box

Padmount transformers transfer electricity to underground power lines.

Transmission Line structures
Similar to these will be required



Existing
Transmission Line

Optional Transmission Routes

A

Chelan Falls Powerhouse → Gorge Road → Chelan Dam vicinity

B

Tap Chelan – Wapato Transmission line → Highway 150 → Cross Gorge → Chelan Dam vicinity

C

Tap Chelan – Wapato Transmission line → Robinson Street → Cross Gorge → Chelan Dam vicinity

D

Tap RR #2 Line → Knapp's Coulee → South shore of lake → Chelan Dam vicinity **(MAY NOT BE FEASIBLE)**

Operational Pros and Cons of Alternatives

	A Gorge Road	B SR 150	C Robinson St	D South shore
PROS	Lowest estimated construction costs Shortest distance Highest reliability PUD owns property	Area is zoned industrial/commercial	Uses some existing right-of-way Uses existing distribution corridor	Uses some existing right-of-way Uses existing distribution corridor Highly accessible Less susceptible to fire
CONS	Permitting challenges	Permitting challenges Private property easements Challenging river crossing High estimated construction costs	Private property easements Challenging river crossing Through portion of downtown area	Private property easements Permitting challenges MAY NOT BE TECHNICALLY FEASIBLE

C

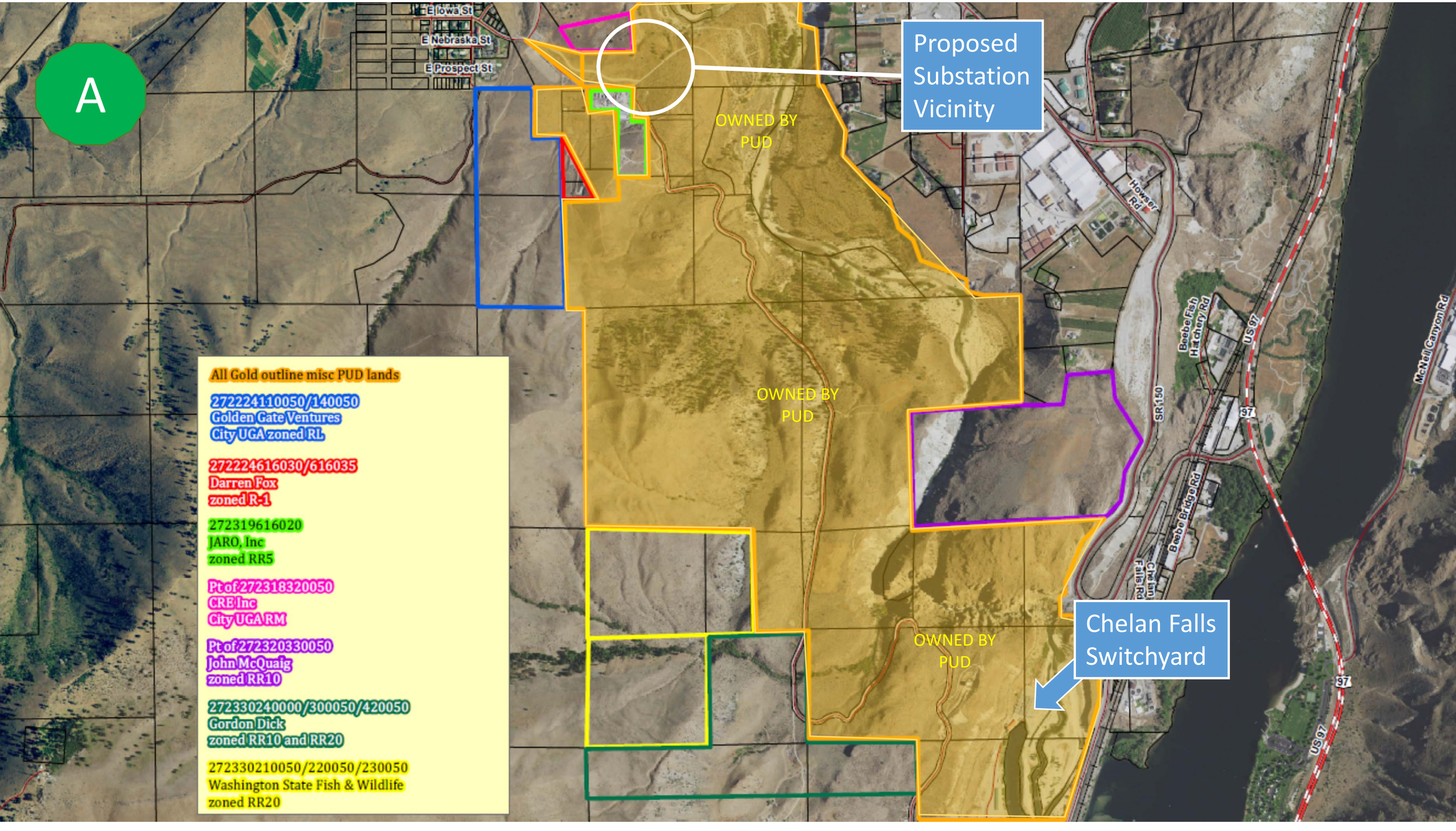

Sub Site
Vicinity
Chelan River
Chelan River
Chelan
River Park
Webster Av
Lake Chelan
Historical Society
Chelan Riverwalk Park
Local Myt
Ser
E Joh
E Chelan A
Apple Inn
Apple Cup Cafe
One Wines
E Woodin Ave
E Woodin Ave
E Johnson Ave
Greentree Rd
N Clifford St
N Wilson St
N Wilson St
S Navarre St
N Navarre St
Sanders St
N Bradley St
E Chelan Ave
N Sanders St
E Nixon Ave
Lake Chelan
Community Hospital
E Gibson Ave
E Highland
Union Valley
Sub
N Bradley St
N Bradley St
Short Rd
Google

B


Beebe
Columbia River
Tap
Transmission
Line
Beebe
Bridge Park
Columbia River
Chelan River
Sub Site
Vicinity

A


Verizon LTE
5:10 PM
56%
97
Chelan Falls
Chelan Falls
Chelan River
Sub site Vicinity
Chelan River
150
ALT 97
150
2D
E Woodin Ave
One Wines
Google
Google
47°51'11"N 119°59'53"W 1 mi


A
E Iowa St
E Nebraska St
E Prospect St
Proposed Substation Vicinity
OWNED BY PUD
OWNED BY PUD
OWNED BY PUD
Howser Rd
Beebe Fish Hatchery Rd
US 97
SR150
Beebe Bridge Rd
Chelan Falls Switchyard
McNeil Canyon Rd
All Gold outline misc PUD lands
272224110050/140050
Golden Gate Ventures
City UGA zoned RL
272224616030/616035
Darren Fox
zoned R-1
272319616020
JARO, Inc
zoned RR5
Pt of 272318320050
CRE Inc
City UGA RM
Pt of 272320330050
John McQuaig
zoned RR10
272330240000/300050/420050
Gordon Dick
zoned RR10 and RR20
272330210050/220050/230050
Washington State Fish & Wildlife
zoned RR20

A


Chelan
E Woodin Ave
W Woodin Ave
Webster Ave
Slidewaters
Columbia River
McNeil Canyon Rd
New Substation
Vicinity
Trail Alliance
Proposed Trail
Potential Route
115KV Transmission
Hwy 150
Mc Neil Canyon Rd NW
Chelan Falls
Switchyard
Columbia River
Beebe
Bridge Park

Timeline For New Substation & New Connecting Transmission Line

We are here now

Current planning condition:

System Modeling	Planning & Community Outreach	Property Acquisition & Permitting	Design	Construction	In Service

2018 - 2019 | 2020 | 2021 | 2022 - 2023

Planned Activities in 2019:

- Optimize feasibility analysis for alternative substation locations — Q1
- Optimize a **set** of alternatives for transmission sources to new substation — Q1
- Bring community stakeholders together to: — Q1-Q2
    - Identify with the challenge and options
    - Solicit input from community and interest groups
    - Seek alignment on a selection process
    - Seek alignment on fire hardening recommendation
- Refine a plan & report back to Board of Commission: — Q2

Questions?

More info:

www.chelanpud.org/chelandamsubstation

www.chelanpud.org/firehardening