CUSTOMER UTILITIES
ALTERNATIVE ANALYSIS

Project Name

North Shore Chelan Sub

Project Type

Replacement

Parent Work Order

302921

System Engineer

Jack Nieborsky

Project Manager

John Goodwill

Design Lead

Tom Kelly

Distribution Manager Approval

Signature

3/4/14

Date

NORTH SHORE CHELAN SUBSTATION

Background

Customer growth along SR150 on the north shore of Lake Chelan will overload the existing systems capacity, resulting in out of compliance voltages. Maintenance and offloading constraints will prohibit reliability and quality.

Union Valley Substation and Wapato Substation are currently at 82% capacity and 71% capacity, respectively. There are two developments under construction within the existing system area that have a combined power demand between 7 and 9 MVA, which will push the capacity to 95% and 73% for the Union Valley and Wapato Substations, respectively. These two developments power demand exceeds the average annual growth rate of 1-2% for this area; thus, triggering planning for a new substation under the Distribution Planning Guidelines.

Objective

Build a new substation to provide at least 10 MVA of capacity along SR150, between Chelan and Manson, to accommodate future growth projections. Increase reliability by reducing the length of line and number of protective devices between the source and load. Provide switching options for substations and feeders. Increase maintainability for offloading adjacent stations. Reduce outages and outage time. Provide shorter feeders with less customer load. Reduce stress on existing infrastructure. Reduce safety risks of overloaded power systems.

Scope

Perform Alternative Analysis to determine best option for land purchase considering identified criteria. Recommend property site for purchase. Select property. Budget for land procurement. Procure property.

SUBSTATION SITE ALTERNATIVES

Selection Criteria

- System benefit for load growth distribution
- Land purchase price
- Land availability
- Minimum 1 acre site
- Slope requirements of flat terrain
- Groundwater issues
- Conditional Use Permit
- Environmental permitting considerations
  - Disturbance > 1 Acre
  - Historical

  - Shoreline
  - Flood Zone
  - Wetland
- Site access for mobile sub
- Security of location
- Aesthetics/Public Perception

Site Map

See Map of Selected Sites in Appendix A

SUB SITE EVALUATION SUMMARY									
SELECTION CRITERIA	#1	#2	#3	#4	#5	#6	#7	#8	#9
SYSTEM BENEFIT	4	4	3	3	3	3	4	3	4
LAND AVAILABILITY	3	3	4	4	4	3	3	3	3
LAND PURCHASE PRICE	3	3	3	3	3	4	3	3	3
MIN 1 ACRE	4	4	2	1	4	3	3	4	4
SLOPE	4	3	1	2	3	3	2	4	4
GROUNDWATER	4	4	4	4	4	2	4	4	4
CONDITIONAL USE PERMIT	4	4	2	2	2	3	4	4	4
ENVIRONMENTAL PERMITTING	4	4	4	4	4	3	4	4	4
SITE ACCESS	1	1	4	4	4	4	2	4	3
SECURITY	4	4	4	4	4	4	2	4	3
AESTHETICS/PUBLIC PERCEPTION	4	4	2	1	1	2	4	3	4
RATING	39	38	33	32	36	34	35	40	40

RATING SCALE = 4 (EXCELLENT), 3 (GOOD), 2 (FAIR), AND 1 (POOR)

ROUTE ALTERNATIVES

Selection Criteria

- Distribution
  - Type – overhead (OH) or underground (UG)
  - Length
  - Cost
- Transmission
  - Type– overhead (OH) or underground (UG)
  - Length
  - Cost
- Easements
  - Existing easement but with without coverage for transmission
  - Need new easement

- Lands Permitting
  - County franchise in ROW
  - City franchise in ROW
  - WSDOT
  - USFS
  - WDFW
  - BIA
  - Railroad
- Environmental Permitting
  - Disturbance > 1 Acre
  - Historical
  - Shoreline
  - Flood Zone
  - Wetland
- Aesthetics/Public Perception

Route Maps

See Maps for Substation Site Routes in Appendix B

Route Evaluation

See Route Evaluation Table in Appendix C

ROUTE EVALUATION SUMMARY		
ROUTES	ROUTE COSTS	REQUIREMENTS
1 (AB)	$ 1,180,000	3
2 (AB)	$ 1,388,000	3
3 (AB)	$ 860,000	3
4 (AB)	$ 750,000	2
5 (AB)	$ 560,000	3
6 (ABC)	$ 670,000	5
7 (ABC)	$ 740,000	4
8 (AB)	$ 510,000	1
9 (AB)	$ 1,000,000	3

RECOMMENDED ALTERNATIVE

8 (AB)

JUSTIFICATION

1) Lowest route costs option with highest site rating.

2) Nice large lot with flat slope.

3) Directly under existing transmission.

4) Good location for access of mobile sub and for security.

5) Site is orchard land that is behind subdivision. Views will not be obstructed by the project.

OPTIONAL ALTERNATIVES

Alternatives to be considered if scope is not completed with recommended alternative as follows in order of preference:

9 (AB) 1 (AB) 7 (ABC) 2 (AB) 5 (AB) 6(ABC) 4 (AB) 3 (AB)

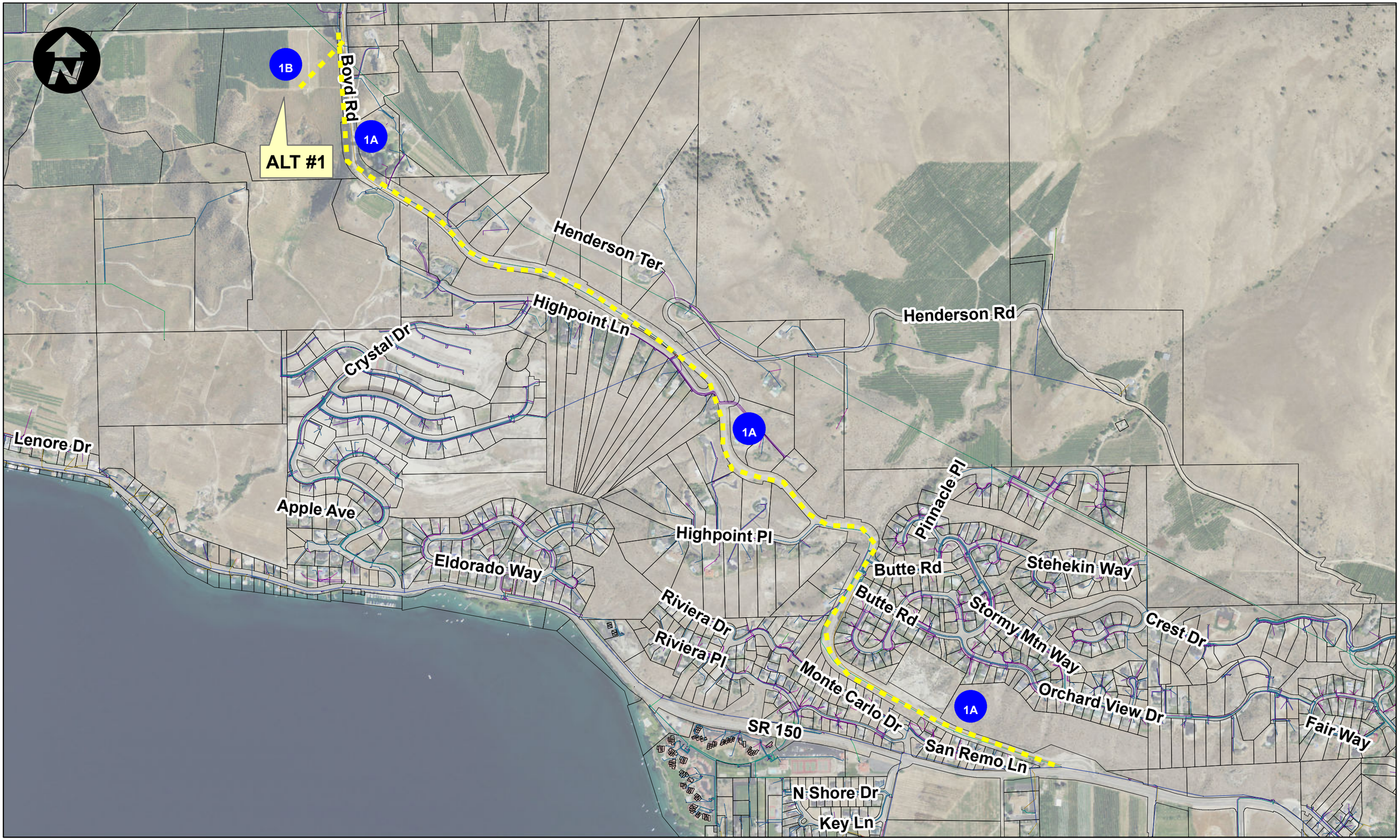
APPENDIX

A

NORTH SHORE CHELAN SUBSTATION SITE ALTERNATIVES MAP

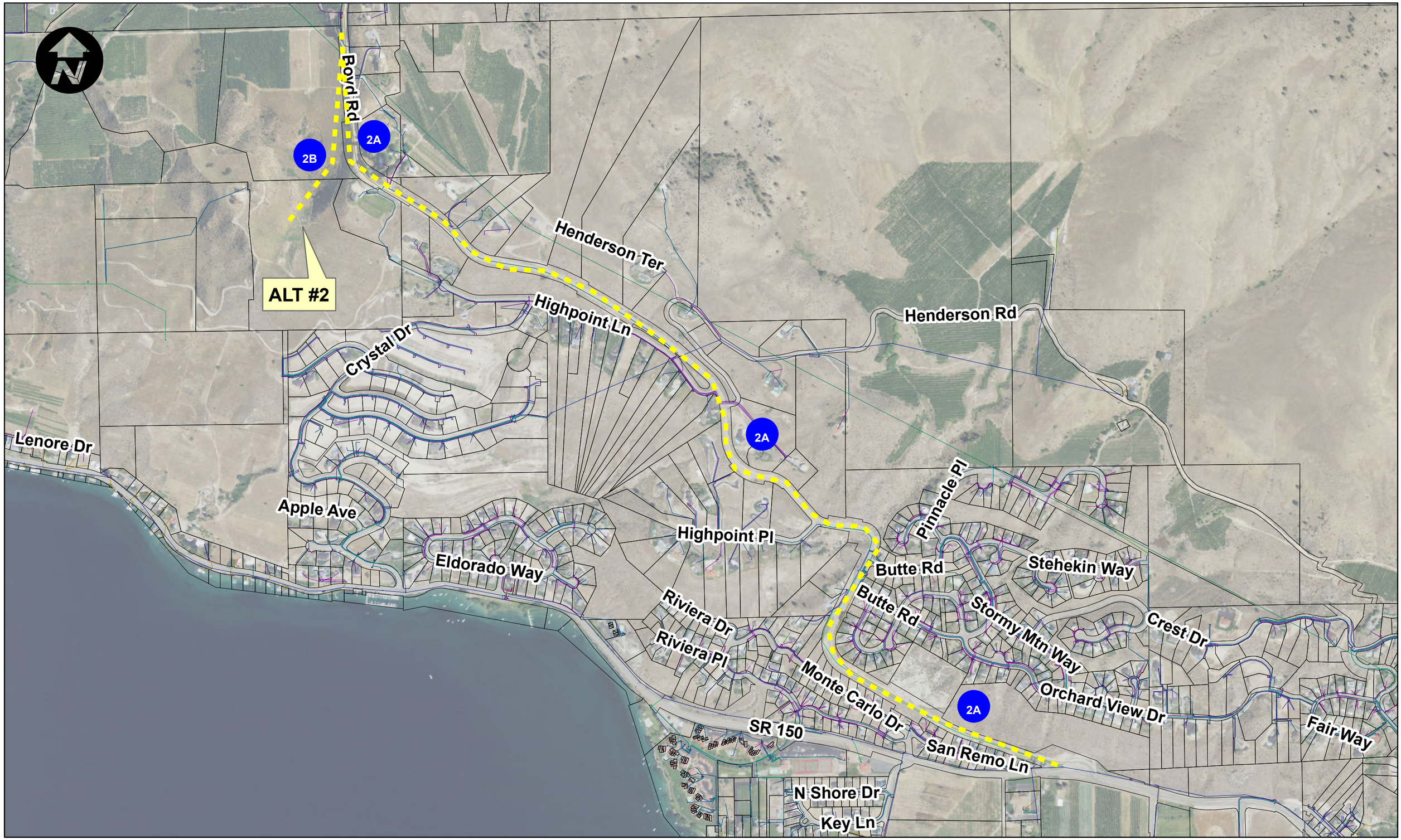
APPENDIX

B



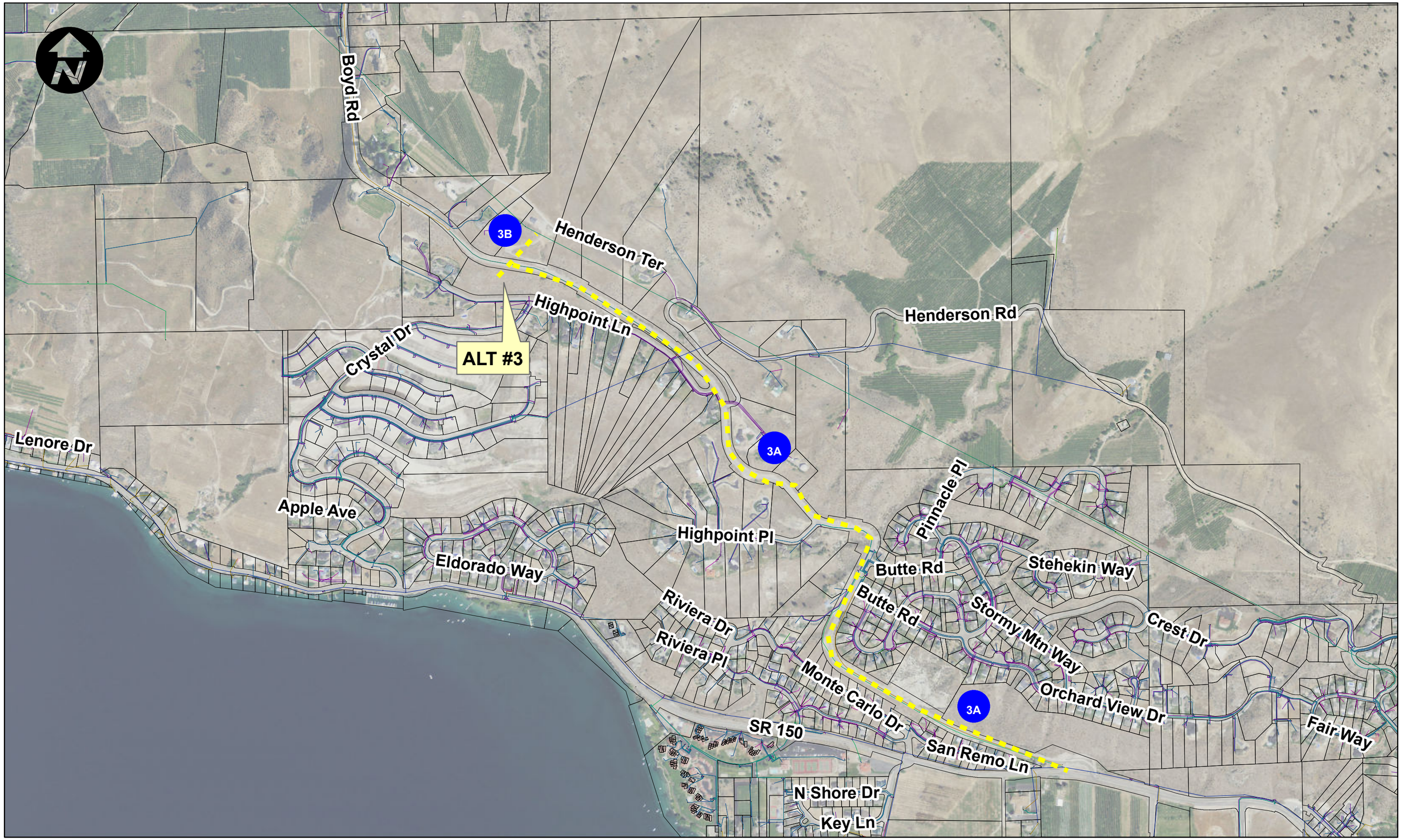
NORTH SHORE CHELAN SUBSTATION
ALTERNATIVE #1 - ROUTES

0 625 1,250 2,500 3,750 5,000 Feet



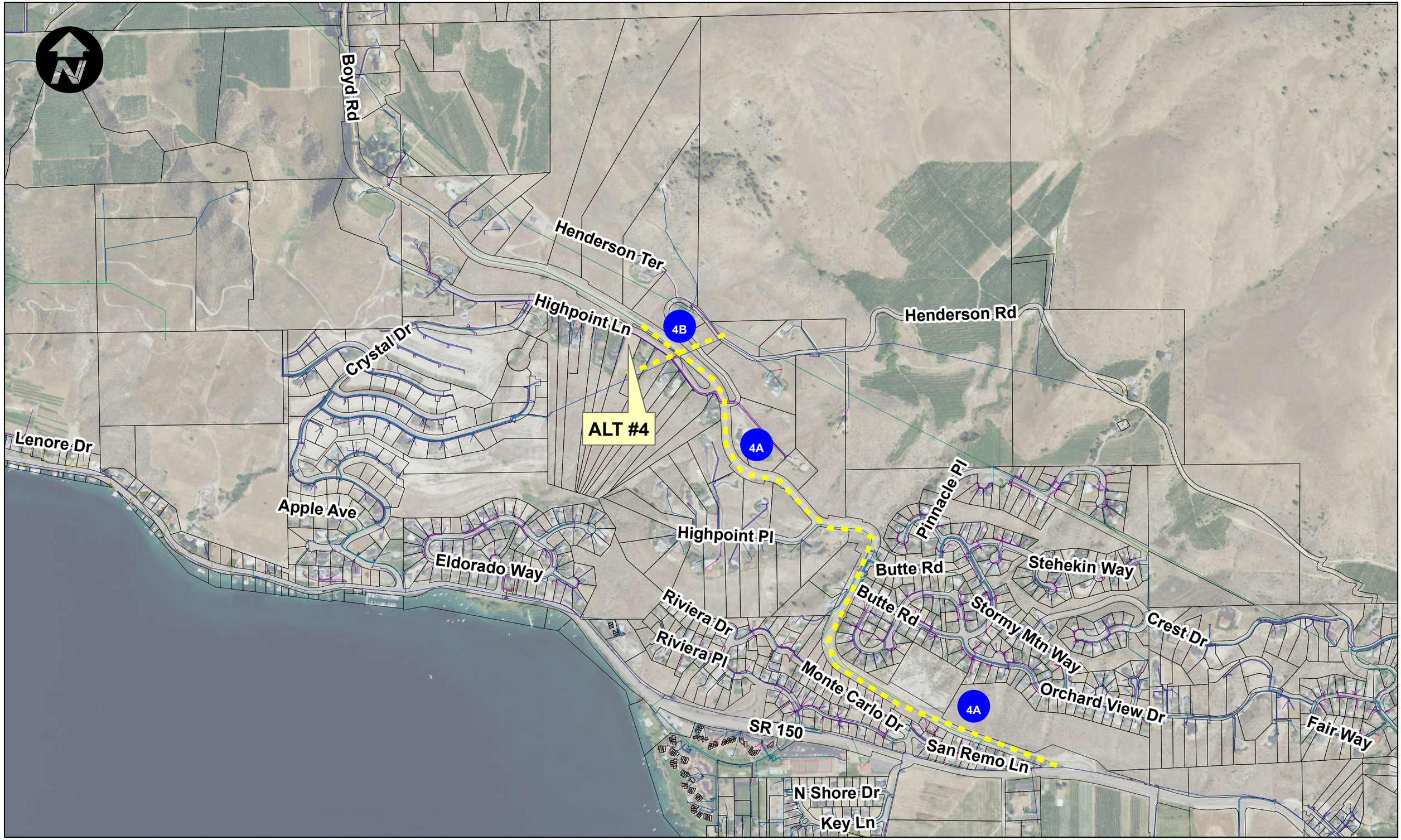
NORTH SHORE CHELAN SUBSTATION
ALTERNATIVE #2 - ROUTES

0 625 1,250 2,500 3,750 5,000 Feet



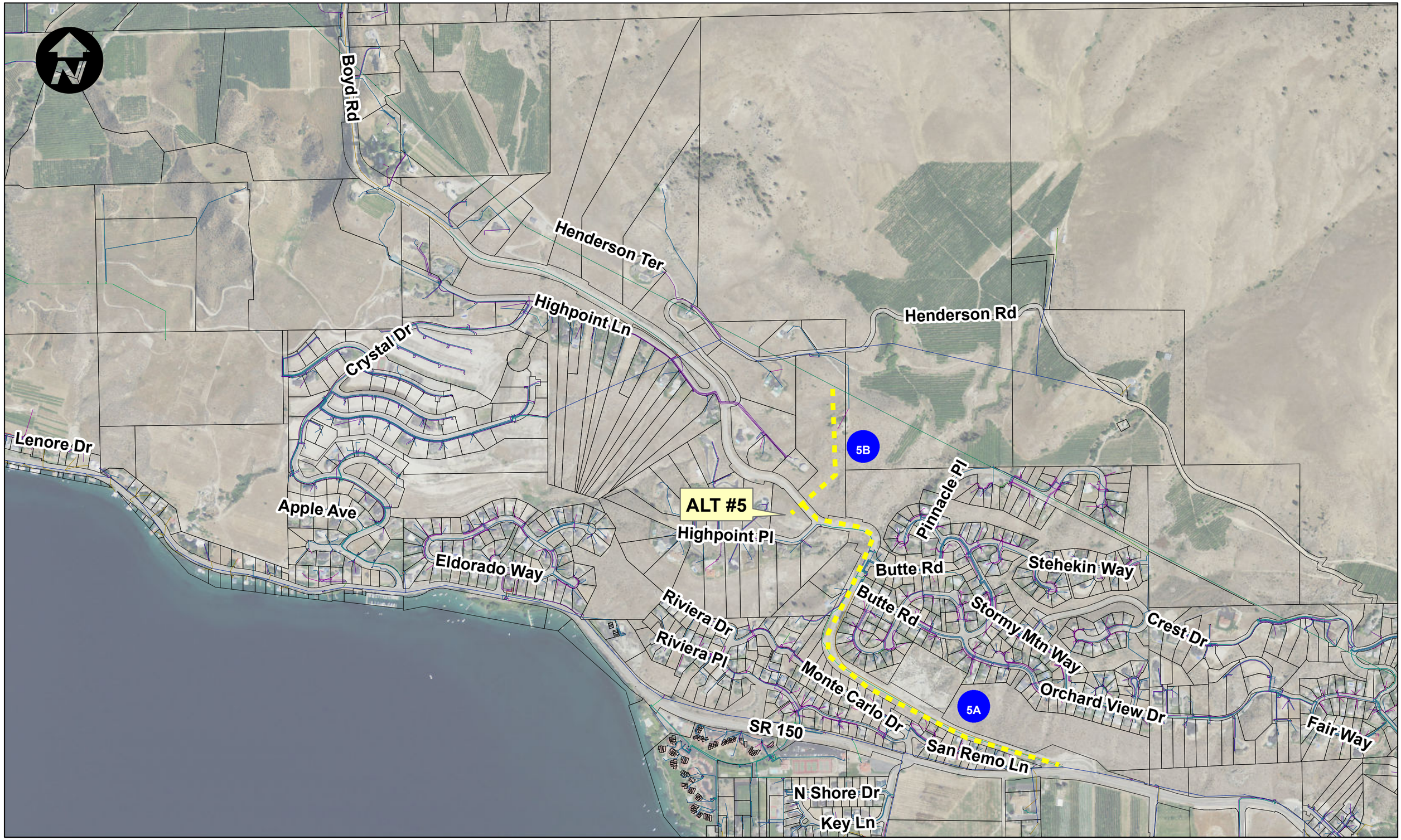
NORTH SHORE CHELAN SUBSTATION
ALTERNATIVE #3 - ROUTES

0 625 1,250 2,500 3,750 5,000 Feet



NORTH SHORE CHELAN SUBSTATION
ALTERNATIVE #4 - ROUTES

0 625 1,250 2,500 3,750 5,000 Feet



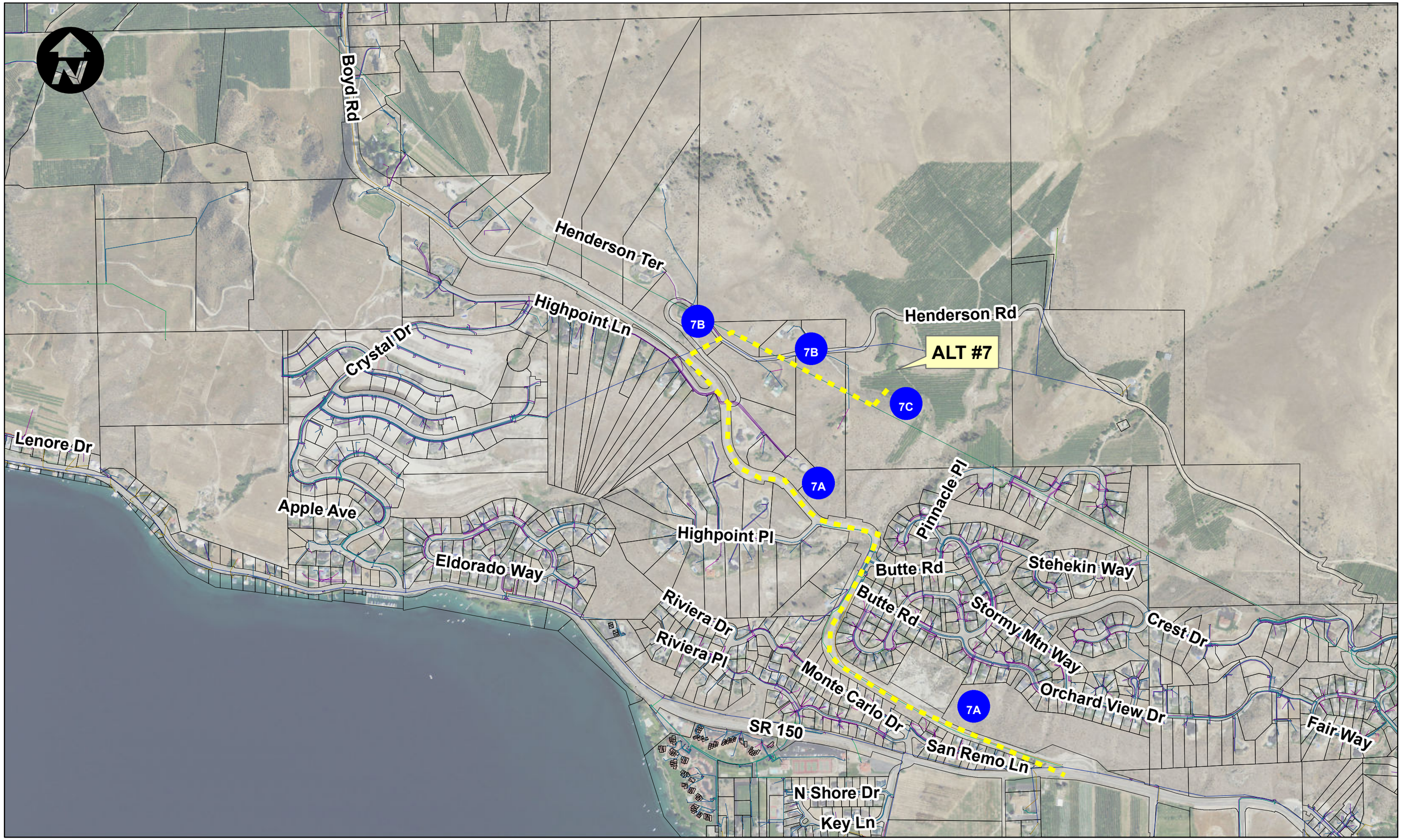
NORTH SHORE CHELAN SUBSTATION
ALTERNATIVE #5 - ROUTES

0 625 1,250 2,500 3,750 5,000 Feet

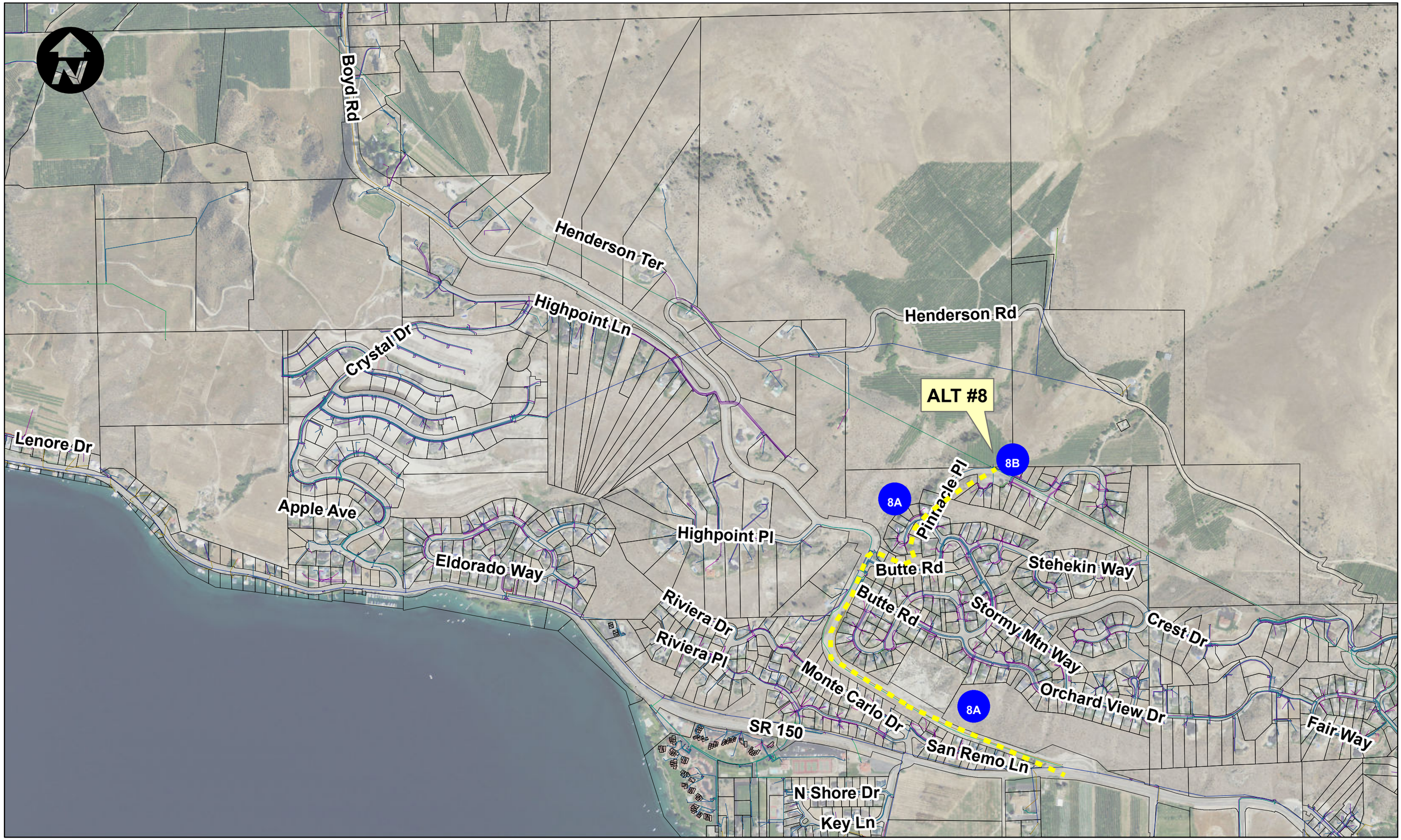
Boyd Rd
Henderson Ter
Highpoint Ln
Crystal Dr
Henderson Rd
Lenore Dr
Apple Ave
Eldorado Way
Highpoint Pl
6C
Pinnacle Pl
Butte Rd
Stehekin Way
6B
Butte Rd
Stormy Mtn Way
Crest Dr
Riviera Dr
Riviera Pl
ALT #6
Monte Carlo Dr
Orchard View Dr
6A
SR 150
San Remo Ln
Fair Way
N Shore Dr
Key Ln

NORTH SHORE CHELAN SUBSTATION
ALTERNATIVE #6 - ROUTES

0 625 1,250 2,500 3,750 5,000 Feet

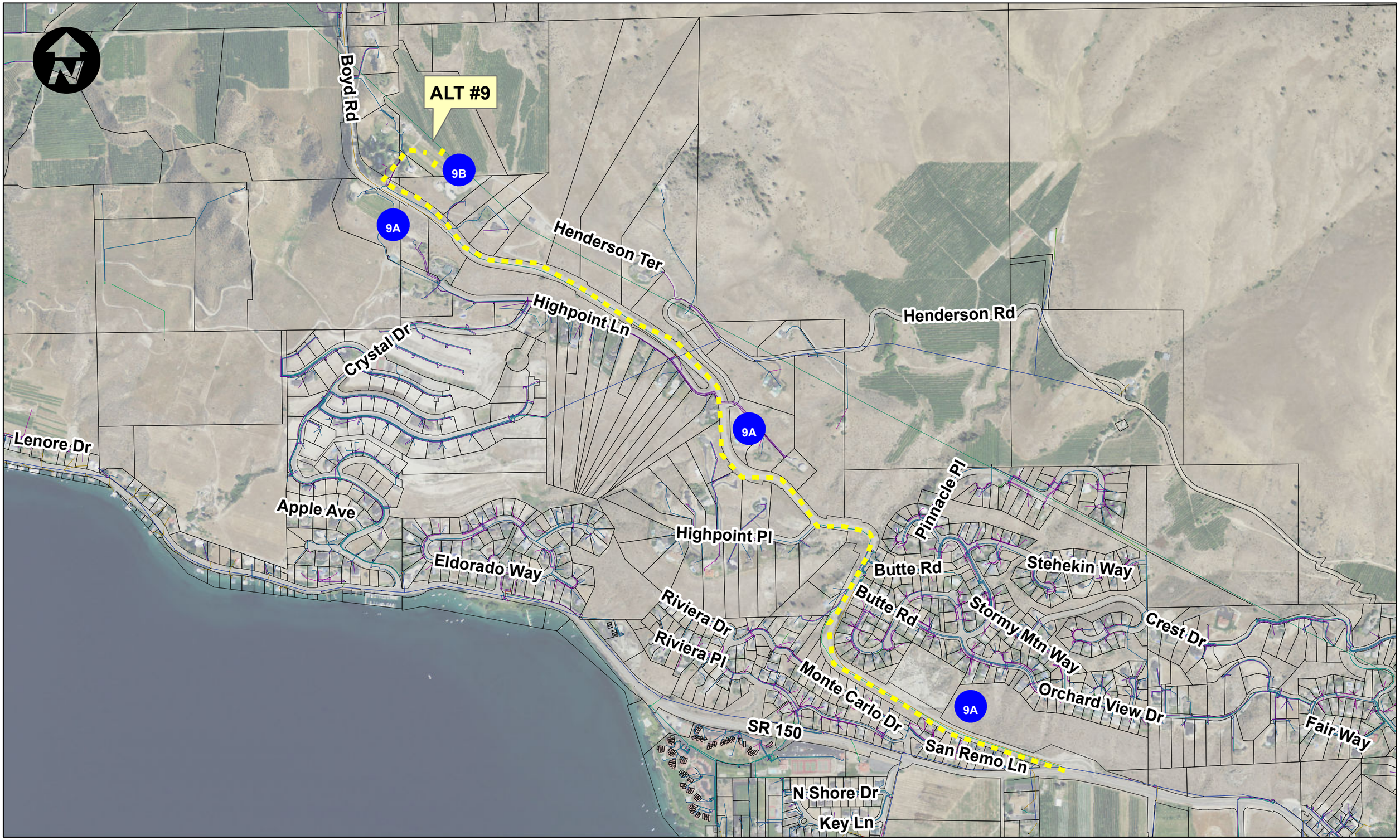


NORTH SHORE CHELAN SUBSTATION
ALTERNATIVE #7 - ROUTES



NORTH SHORE CHELAN SUBSTATION
ALTERNATIVE #8 - ROUTES

0 625 1,250 2,500 3,750 5,000 Feet



NORTH SHORE CHELAN SUBSTATION
ALTERNATIVE #9 - ROUTES

0 625 1,250 2,500 3,750 5,000 Feet

APPENDIX

C

NORTH SHORE CHELAN SUBSTATION - ROUTE EVALUATION TABLE																				
SELECTION CRITERIA	SITE #1 ROUTES		SITE #2 ROUTES		SITE #3 ROUTES		SITE #4 ROUTES		SITE #5 ROUTES		SITE #6 ROUTES			SITE #7 ROUTES			SITE #8 ROUTES		SITE #9 ROUTES	
	1A	1B	2A	2B	3A	3B	4A	4B	5A	5B	6A	6B	6C	7A	7B	7C	8A	8B	9A	9B
DISTRIBUTION TYPE	UG	OH	UG	OH	UG		UG		UG		UG			UG	OH		UG		UG	
DISTRIBUTION LENGTH (FT)	11,000	500	11,000	1,800	7,800		6,500		4,200		1,500			6,000	2,000		5,000		9,900	
DISTRIBUTION COST	$ 1,100,000	$ 30,000	$ 1,100,000	$ 108,000	$ 780,000		$ 650,000		$ 420,000		$ 150,000			$ 600,000	$ 120,000		$ 500,000		$ 990,000	
TRANSMISSION TYPE		OH		OH		OH		OH		OH		UG	OH			OH		OH		OH
TRANSMISSION LENGTH (FT)		500		1,800		800		1,000		1,400		2,000	1,200			200		100		100
TRANSMISSION COST		$ 50,000		$ 180,000		$ 80,000		$ 100,000		$ 140,000		$ 400,000	$ 120,000			$ 20,000		$ 10,000		$ 10,000
ROUTE COSTS	$ 1,100,000	$ 80,000	$ 1,100,000	$ 288,000	$ 780,000	$ 80,000	$ 650,000	$ 100,000	$ 420,000	$ 140,000	$ 150,000	$ 400,000	$ 120,000	$ 600,000	$ 120,000	$ 20,000	$ 500,000	$ 10,000	$ 990,000	$ 10,000
EASEMENTS		X		X		X		X		X			X			X			X	X
COUNTY	X		X																	
CITY					X		X		X		X	X		X	X		X		X	
WSDOT																				
USFS																				
WDFW																				
BIA																				
RAILROAD																				
DISTURBANCE > 1 ACRE		X		X									X			X				
HISTORICAL																				
200 FT SHORELINE																				
FLOOD ZONE																				
WETLAND																				
AESTHETICS/PUBLIC PERCEPTION						X				X			X							
ROUTE REQUIREMENTS	1	2	1	2	1	2	1	1	1	2	1	1	3	1	1	2	1	0	2	1

X = REQUIRED