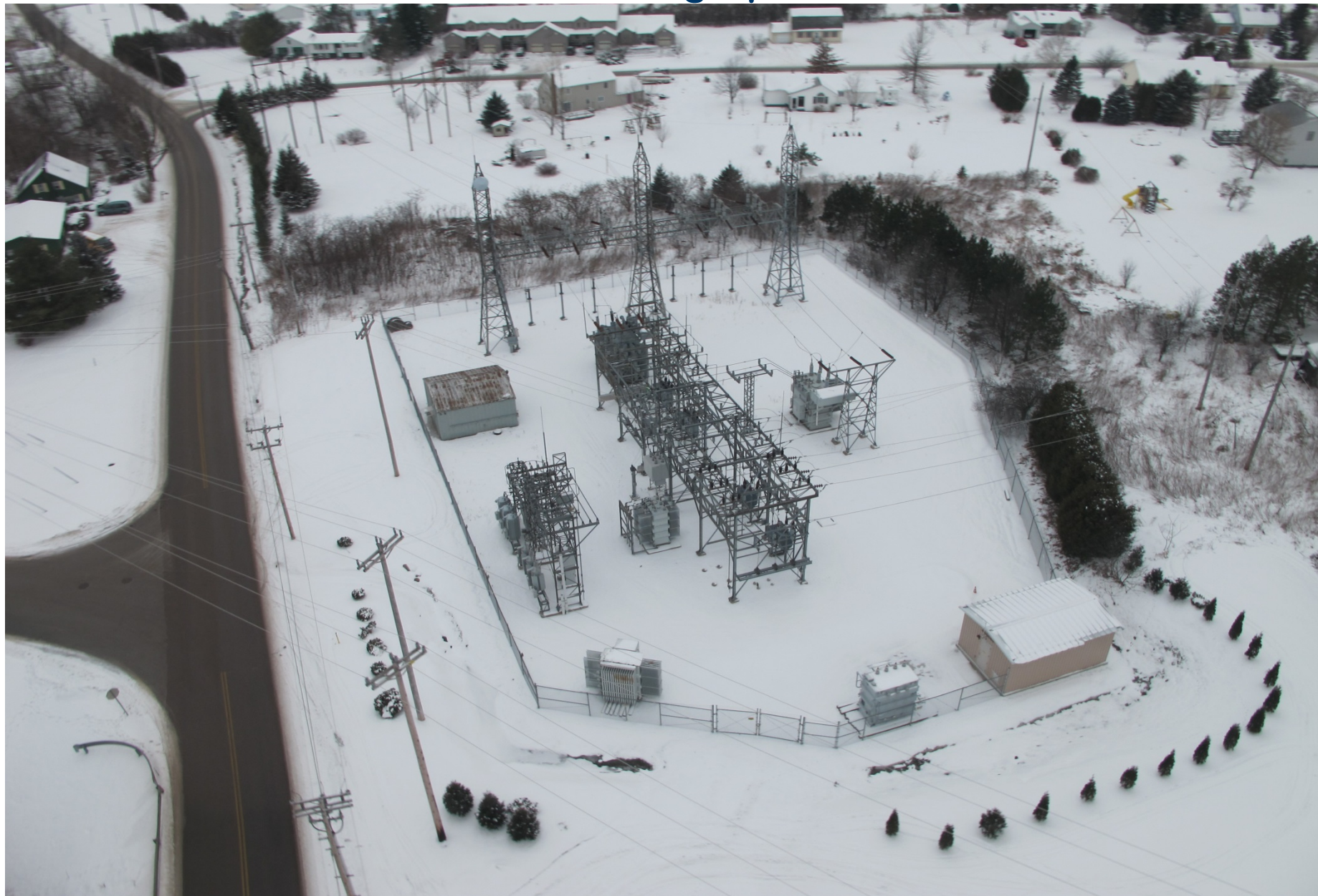


# St Albans Project



Operating Committee  
January 19, 2017

# St Albans Substation – Aerial Photograph



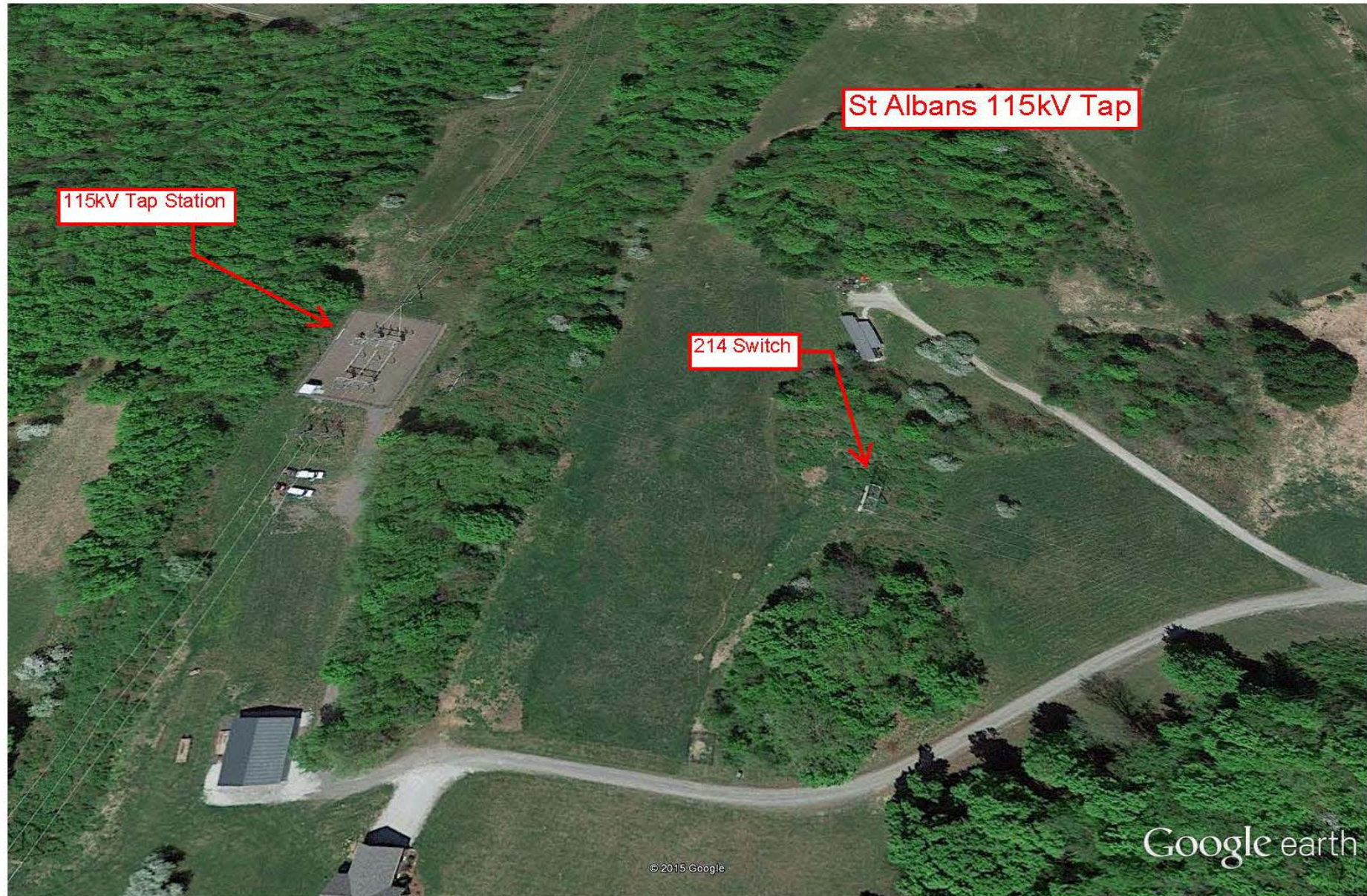


# St Albans Substation – Aerial Photograph





# St Albans Tap Station – Aerial Photograph





# St Albans Project – Scope of Work

## Substation

- New control building
- New protection & controls
- Replace 115kV circuit switcher with 115kV breaker & disconnect
- Replace two (2) 115/34.5kV transformers with one (1) new 115/34.5kV transformer
- Install oil containment system
- Replace 34.5kV OCB with new vacuum breaker
- Install new 115kV & 34.5kV instrument voltage transformers
- New 34.5kV box structure & switches

## Tap Station

- Install new steel structure & motor operated switch inside the station
- Install SCADA RTU

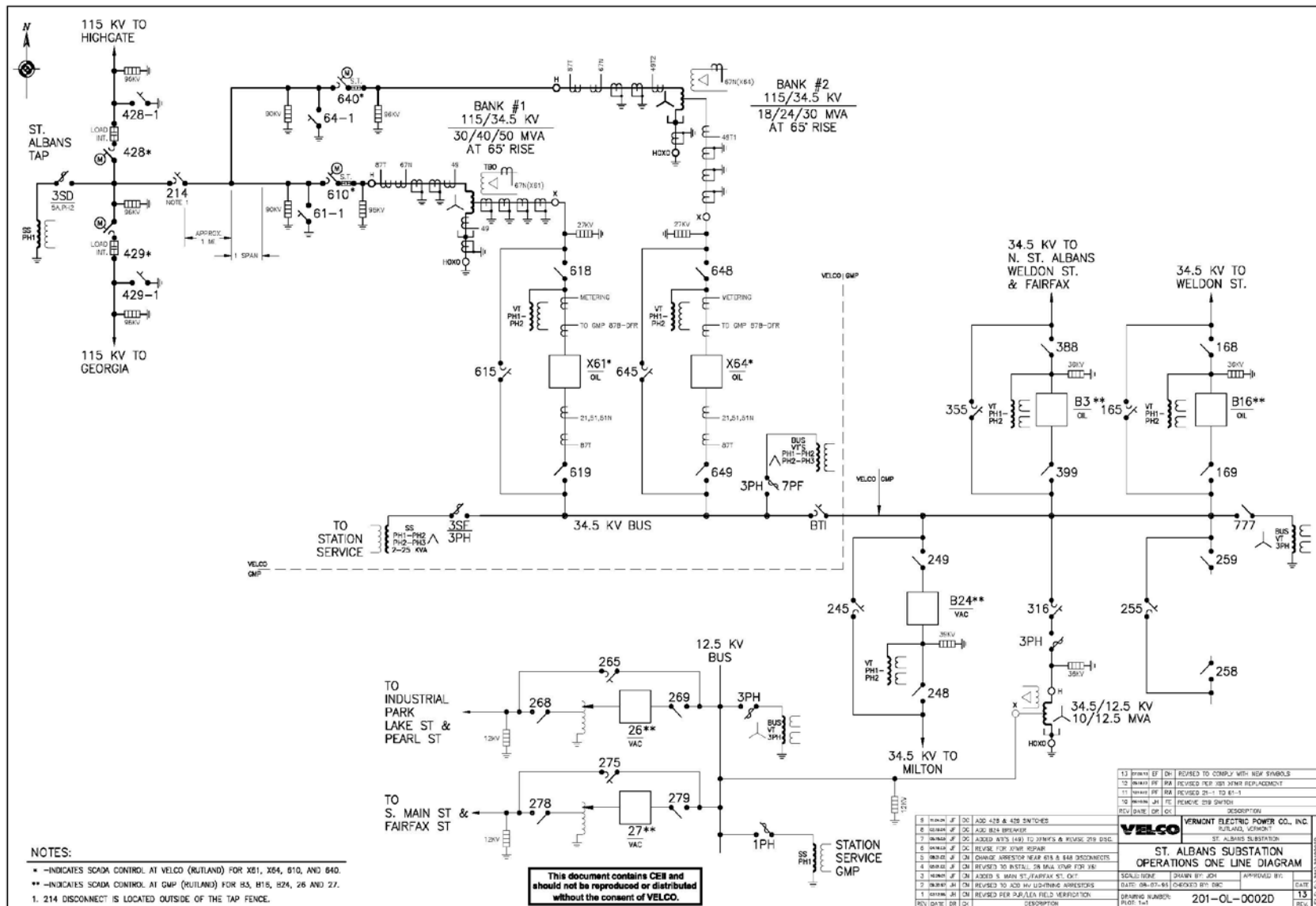
## Tap Line

- Sixteen (16) structures have been evaluated as part of the Structure Condition Improvement Project (SCI). Twelve (12) structures require replacement due to condition
- Five (5) of the structures are also impacted by the work at the Substation and Tap Station
- Remove existing line switch

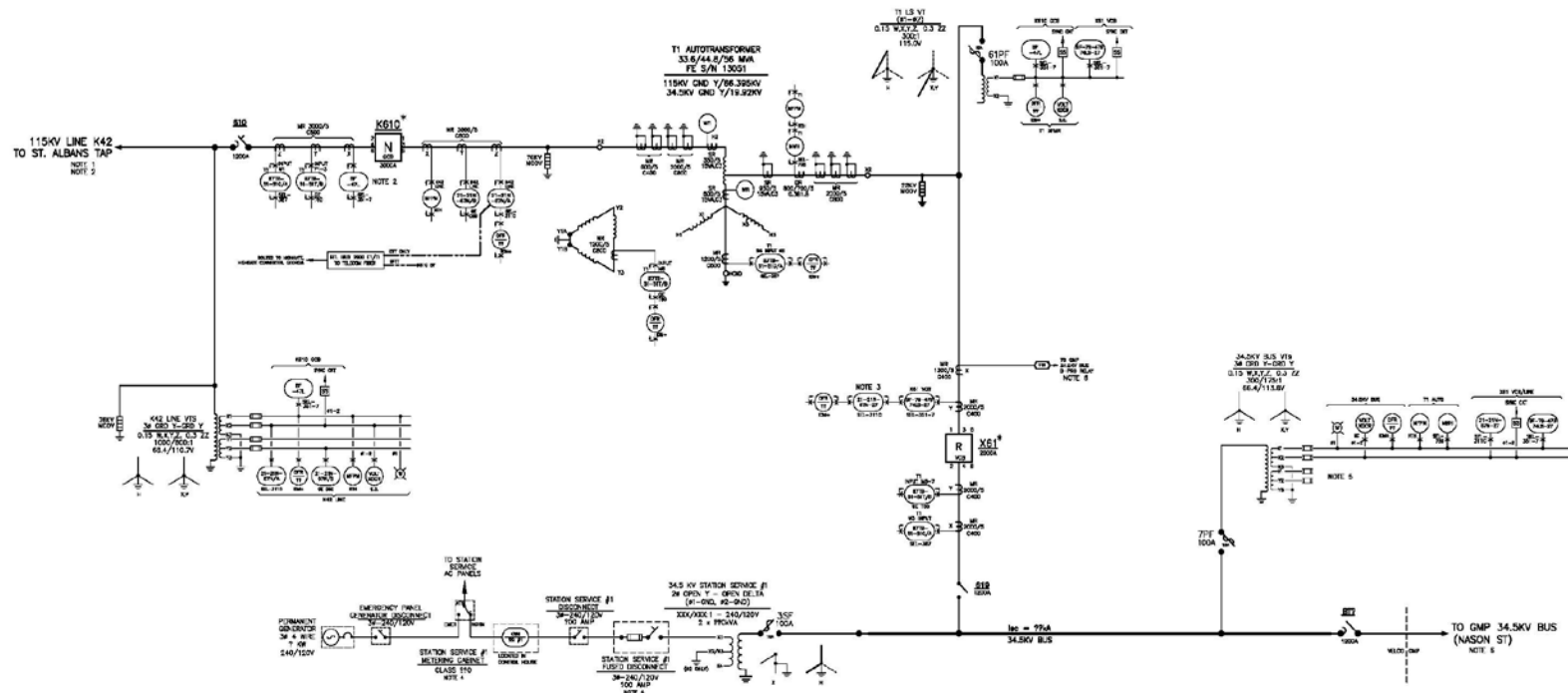
## Coordination of Outages

- Outages of the K42 Line, Tap Station, Tap Line and Substation will be closely coordinated with system constraints and with Green Mountain Power

# St Albans Substation – Existing Substation



# St Albans Substation – Upgraded Substation



- NOTES**
- K42 LINE (115KV) FOLLOWS VELCO STANDARD LINE RELAYS.
    - K42 LINE DTT IS PROVIDED (DVS A DVT) TO PROTECT THE REMOTE LINE TERMINALS AT GEORGETOWN AND TO THE HIGHGATE CONVERTER (BUT NO DTT FROM CONV).
    - DVS DTT IS PROVIDED TO PROTECT THE REMOTE LINE TERMINALS AT HIGHGATE AND GEORGETOWN, AND TO THE HIGHGATE CONVERTER (BUT NO DTT FROM CONV).
    - K42 LINE PROTECTION WORKS THE 401 BREAKER ONLY. THE 401 WILL RECLOSE FOR A LINE TO AUTO (15SEC).
    - THE DEL-3502 AT ST ALBANS TAP TO BE REMOVED AND REPLACED WITH AN ILL. THE OLD DTT INTERLOCK SCHEME WILL BE REMOVED.
  - SINCE THE K42 LINE DTT SYSTEM TRIPS HIGH SPEED FOR FAULTS IN THE 11.5KV MINDING ALL 11.5KV AUTO TRIPS SHOULD TRIP WITHIN THE 18 CURRENT AND LOW CURRENT OF SCHEMES FOR THE K42 BREAKER. THIS ENSURES WE CAN DETECT A FAILED BREAKER EVEN IF THE K42 LINE TRIPS HIGH SPEED (WHICH REMOVES ALL FAULT CURRENT).
  - THE DEL-3502 PROVIDES SHOCK PROTECTION FOR 34.5KV FAULTS WITH A FAILED 34.5KV BUS RELAY, ON A FAILED 34.5KV BUS LINE RELAY, OR A FAILED 34.5KV BUS BREAKER. (THIS PROTECTION WILL BE PROVIDED ON THE 401 BREAKER).
  - STATION SERVICE DISTRIBUTION EQUIPMENT SHALL BE DESIGNED AND SPECIFIED BY THE ARCHITECT/ENGINEER.
  - 34.5KV BUS BUS VTS AT NASON STREET DO THEY DO NOT REQUIRE VOLTAGE FROM THE 34.5KV BUS VTS.
  - REVIEW TO GMP ONLINE DIAGRAM (NASON STREET). THE C'S CONNECT TO EXISTING GMP 34.5KV RELAY AT NASON ST. NO PROTECTION CHANGES ARE EXPECTED AT GMP NASON ST - ADD FROM INTERFACED WITH NEW 34.5KV VTS AND PROTECTION.
  - DEL-351 RELAYS TO PROVIDE BREAKER VOLTAGE PHASE ANGLE DIFFERENCE VIA DVS.
  - LINE RELAYS TO PROVIDE RELAY TARGETS OVER DVS.
  - FUTURE CONSIDERATION FOR CANNON BANK.
  - \* INDICATES SOLAR CONTROL AT VELCO (BYPLAND).

ISSUED FOR REVIEW ONLY

60	10/10/10	REMOVED 34.5KV DISCONNECT 5
61	10/10/10	IN VA RELEASE FOR DESIGN
62	10/10/10	REMOVED 34.5KV DISCONNECT 5
63	10/10/10	REMOVED 34.5KV DISCONNECT 5
64	10/10/10	REMOVED 34.5KV DISCONNECT 5
65	10/10/10	REMOVED 34.5KV DISCONNECT 5
66	10/10/10	REMOVED 34.5KV DISCONNECT 5
67	10/10/10	REMOVED 34.5KV DISCONNECT 5
68	10/10/10	REMOVED 34.5KV DISCONNECT 5
69	10/10/10	REMOVED 34.5KV DISCONNECT 5
70	10/10/10	REMOVED 34.5KV DISCONNECT 5
71	10/10/10	REMOVED 34.5KV DISCONNECT 5
72	10/10/10	REMOVED 34.5KV DISCONNECT 5
73	10/10/10	REMOVED 34.5KV DISCONNECT 5
74	10/10/10	REMOVED 34.5KV DISCONNECT 5
75	10/10/10	REMOVED 34.5KV DISCONNECT 5
76	10/10/10	REMOVED 34.5KV DISCONNECT 5
77	10/10/10	REMOVED 34.5KV DISCONNECT 5
78	10/10/10	REMOVED 34.5KV DISCONNECT 5
79	10/10/10	REMOVED 34.5KV DISCONNECT 5
80	10/10/10	REMOVED 34.5KV DISCONNECT 5

6	10/10/10	AC	1	RENAME 25-1 DISCONNECT TO 61-1
7	10/10/10	AC	1	CONFORMING TO OFFICE MAINS
8	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
9	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
10	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
11	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
12	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
13	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
14	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
15	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
16	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
17	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
18	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
19	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
20	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
21	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
22	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
23	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
24	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
25	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
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30	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
31	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
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37	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
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43	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
44	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
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46	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
47	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
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49	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
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51	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
52	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
53	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
54	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
55	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
56	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
57	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
58	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
59	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
60	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
61	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
62	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
63	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
64	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
65	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
66	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
67	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
68	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
69	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
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81	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
82	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
83	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
84	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
85	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
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87	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
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89	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
90	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
91	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
92	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
93	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
94	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
95	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
96	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
97	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
98	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
99	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE
100	10/10/10	AC	1	REMOVED FOR 34.5KV BUS UPGRADE



# St Albans Substation – Transformer Evaluation

The St Albans area is anticipating industrial load growth in the next 2-3 years. Therefore, the existing 18/24/30 MVA and 30/40/50 MVA transformers will be replaced with a single 33.6/44.8/56 MVA transformer.

## **33.6/44.8/56 MVA Transformer**

- Manufactured in 2013 by Fortune Electric and presently stored at New Haven Substation as a Spare.
- The transformer will meet anticipated load growth in St Albans for the foreseeable future
- A new 115/34.5kV Spare transformer will be purchased in 2018

## **30/40/50 MVA Transformer**

- Remanufactured in 2010 by Southwest Electric and installed at St Albans in 2013
- The transformer will be installed at Essex to replace the 1963 vintage X10

## **18/24/30 MVA Transformer**

- Manufactured in 2002 by Delta Star and installed at St Albans in 2003
- The transformer will be installed at Vergennes to replace the 1957 vintage T2



# St Albans Project – Next Steps

## Project Schedule

- Q1-Q4 2017 - Engineering
- Q3 2017 – PSB Filing
- Q2-Q4 2018 – Construction
- Schedules can be refined since the design engineer will be awarded in January 2017

## Preliminary Project Estimate

- Substation - \$4.3M
- Tap Station - \$500k
- Tap Line - \$300k
- Filing grade estimates can be developed since the scopes are now better defined