Sudbury-Hudson Transmission Reliability Project and Mass Central Rail Trail Project

Sudbury, Massachusetts

PREPARED FOR

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Stormwater Management Plan Narrative

This Stormwater Management Plan Narrative was prepared to demonstrate compliance with the Town of Sudbury's Stormwater Management By-Law and Regulations. Sections 1.1 through 1.4 describe the proposed Project, stormwater analysis methodology, and existing and proposed drainage conditions. Section 2 describes the Project's compliance with the Massachusetts Stormwater Management Standards, and Section 3 describes the Project's compliance with the additional requirements in the Stormwater Management Bylaw Regulations for the Town of Sudbury.

1.1 Project Description

The overall Project includes completion of a portion of the regional Massachusetts Central Rail Trail ("MCRT") and construction of a portion of a new 115-kilovolt ("kV") underground electric transmission line ("the underground transmission line") within the inactive MBTA right-of-way ("ROW"). The Project stormwater system is designed for the final use as a bike path and includes a stormwater management system that uses vegetated swales with check dams, consistent with DCR's standard design for bike path facilities. The entire Project is approximately 9.0 miles long and is located primarily in the towns of Sudbury and Hudson, with short sections in the Town of Stow and the City of Marlborough (see Figure 1).

The portion of the Project within Sudbury originates at the Sudbury/Hudson town line and follows the MBTA ROW to the Sudbury Substation, located south of Route 20, between Landham Crossing and Goodman's Hill Road. This stormwater narrative addresses the portion of the Project located in the Town of Sudbury.

1.2 Methodology

The rainfall-runoff response of the Site under the existing and proposed conditions was analyzed for storm events with recurrence intervals of 2, 10, 25, and 100 years, with rainfall amounts of 3.2", 4.8", 6.0", and 8.6", respectively, as outlined by the Stormwater Management Bylaw Regulations for the Town of Sudbury. A rainfall depth of one inch (1") was also evaluated. The runoff coefficients and time of concentration for the existing and proposed conditions were determined using the NRCS Technical Release 55 (TR-55) methodology in HydroCAD. The HydroCAD model is based on the NRCS Technical Release 20 (TR-20) Model for Project Formulation Hydrology.

1.3 Existing Drainage Conditions

The Project is located within the MBTA ROW between the Hudson/Sudbury town line and the Sudbury Substation located off of Route 20 in Sudbury. Under existing conditions, a portion of the Project footprint contains the ballast, ties and rails of the inactive railroad, and an area adjacent to the rails is worn down and used as a path by hikers, individuals walking dogs and/or riding horses, mountain bikers, motorized dirt bikers and snowmobilers. In general, the vegetation in the Project area is scattered to moderately dense saplings and young trees, with some localized areas of shrub growth. There are few large mature trees located within the Project's limit of work.

The predominant existing cross section in the Project area consists of the rail line located either on a berm elevated above the adjacent terrain or in areas below adjacent terrain where the rail line was built by excavating into the landscape. In its present condition, the rail line sits on stone ballast and wood ties and occupies a footprint that is approximately 11 feet wide. The steel tracks are still present in most areas.

Figures 2a-2e illustrate the existing drainage patterns within the study area. Under current conditions, the Study Area is divided into 71 drainage areas within Sudbury, which discharge stormwater runoff to 69 Design Points. These Design Points are identified as DP-X.X. The existing drainage areas are delineated based on the overall areas contributing to each design point. The roadways that intersect the ROW were used to create the limits for the five segments and break the Project area into smaller areas for evaluation. The following is a list of the Sudbury segments:

- Segment 5 – From approximately the Sudbury/Hudson Town Limits to Dutton Road
- Segment 6 – From Dutton Road to Peakham Road
- Segment 7 – Peakham Road to Horse Pond Road
- Segment 8 - Horse Pond Road to Union Avenue
- Segment 9/10 – Union Avenue to the eastern Project Limits

Table 1 below provides a summary of the hydrologic data under the existing conditions.

Table 1 Hydrologic Data under the Existing Conditions

Drainage Area	Discharge Location	Design Point	Area (Acres)	Curve Number	Time of Concentration (min)
EX-5.6	Wetland 18	DP-5.6	16.6	30	44.1
EX-5.7	Wetland 19	DP-5.7	9.5	31	63.9
EX-5.8	Wetland 45	DP-5.8	8.7	32	49.3
EX-5.9	Low Point	DP-5.9	4.7	32	28.1
EX-5.10	Low Point	DP-5.10	1.7	31	50.3
EX-5.11	Low Point	DP-5.11	4.6	30	71.5
EX-5.12	Wetland 44	DP-5.12	8.2	47	119.8
EX-5.13	Wetland 44	DP-5.13	34.3	35	217.6
EX-5.14	Wetland 44	DP-5.14	14.0	46	23.1
EX-5.15	Wetland 44	DP-5.15	10.7	41	34.8
EX-5.16	Wetland*	DP-5.16	8.5	50	22.6
EX-5.17	Wetlands 41 & 43 Vernal Pools 11 & 13	DP-5.17	18.5	52	6.4
EX-5.18	Wetland 42 Vernal Pool 12	DP-5.18	10.4	42	75.8
EX-5.19	Wetland 40 Vernal Pool 10	DP-5.19	0.7	35	21.0
EX-5.20	Off Site	DP-5.20	1.1	30	20.3
EX-5.21	Wetland 39 Vernal Pool 9	DP-5.21	5.7	30	28.2
EX-6.1	Low Point	DP-6.1	0.8	39	48.2
EX-6.2	Dutton	DP-6.2	0.7	32	41.6
EX-6.3	Low Point	DP-6.3	0.8	42	15.4
EX-6.4	Low Point	DP-6.4	2.9	50	27.4
EX-6.5	Low Point	DP-6.5	16.9	36	36.0
EX-6.6	Wetlands 36 & 38	DP-6.6	7.2	42	52.6
EX-6.7	Wetland 37	DP-6.7	7.1	39	31.7
EX-6.8	Low Point	DP-6.8	4.9	32	34.1
EX-6.9	Low Point	DP-6.9	0.9	41	17.4
EX-6.10	Low Point	DP-6.10	3.9	44	16.1
EX-6.11	Approximate Vernal Pool/Wetland*	DP-6.11	0.8	33	12.0
EX-6.12	Wetland 35 Vernal Pool 8	DP-6.12	0.6	32	14.2
EX-6.13	Wetland 34	DP-6.13	3.2	52	20.6
EX-6.14	Wetland 33	DP-6.14	5.1	60	30.8

Drainage Area	Discharge Location	Design Point	Area (Acres)	Curve Number	Time of Concentration (min)
EX-6.15	Low Point	DP-6.15	0.1	84	6.0
EX-7.1	Wetland 30	DP-7.1	9.0	56	44.3
EX-7.2	Wetland 32	DP-7.2	2.7	36	25.2
EX-7.3	Low Point	DP-7.3	3.6	41	35.2
EX-7.4	Low Point	DP-7.4	9.0	52	39.3
EX-7.5	Wetland 31	DP-7.5	23.1	52	34.6
EX-7.6	Low Point	DP-7.6	0.9	33	14.1
EX-7.7	Low Point	DP-7.7	0.7	35	11.2
EX-7.8	Low Point	DP-7.8	1.2	35	18.5
EX-7.9	Low Point	DP-7.9	5.7	43	18.2
EX-7.10	Low Point	DP-7.10	0.3	38	21.3
EX-7.11	Low Point	DP-7.11	1.6	45	17.6
EX-7.12	Low Point	DP-7.12	1.2	46	19.3
EX-8.1A	Wetlands 28 & 29	DP-8.1	19.9	56	17.5
EX-8.1B	Wetlands 28 & 29	DP-8.1	0.3	32	36.7
EX-8.2	Wetland 27	DP-8.2	16.2	43	49.4
EX-8.3	Wetland 25	DP-8.3	15.7	54	51.8
EX-8.4	Wetland 26	DP-8.4	1.0	34	30
EX-8.5	Low Point	DP-8.5	4.0	68	24.9
EX-8.6	Wetland 24	DP-8.6	24.8	65	62.4
EX-8.7	Low Point	DP-8.7	0.8	72	17.8
EX-8.8	Low Point	DP-8.8	0.9	74	34.8
EX-8.9	Wetland 24A Vernal Pool 5	DP-8.9	1.0	41	30.3
EX-8.10	Low Point	DP-8.10	3.6	91	14.1
EX-8.11	Wetland*	DP-8.11	0.9	85	8.9
EX-9.1	Station Road	DP-9.1	2.2	87	41.2
EX-10.1	Wetland 18	DP-10.1	1.1	78	19.0
EX-10.2	Wetland 19	DP-10.2	4.2	68	14.0
EX-10.3	Wetland 15	DP-10.3	1.0	78	13.4
EX-10.4	Wetland 16	DP-10.4	4.9	62	25.4
EX-10.5	Wetland 14	DP-10.5	0.8	78	23.4
EX-10.6	Wetland 11	DP-10.6	5.1	49	14.1
EX-10.7	Wetland 13	DP-10.7	1.8	40	62.5
EX-10.8	Wetland 10	DP-10.8	0.9	47	7.3
EX-10.9	Wetland 5 Vernal Pools 2 & 3	DP-10.9	2.8	63	7.6
EX-10.10	Vernal Pool 4	DP-10.10	0.1	78	7.0
EX-10.11	Wetland 5	DP-10.11/13	1.1	52	10.7

Drainage Area	Discharge Location	Design Point	Area (Acres)	Curve Number	Time of Concentration (min)
EX-10.12	Wetland 6	DP-10.12	1.3	51	24.2
EX-10.13	Wetland 5	DP-10.11/13	1.7	73	15.0
EX-10.14	Wetland 3 Vernal Pool 1	DP-10.14	7.0	74	37.1
EX-10.15	Wetland 4	DP-10.15	4.3	42	22.5

*Wetlands without a number designation (e.g., "Wetland") are located outside of the MBTA ROW. These wetlands were not field delineated and are shown as approximate on the plans.

1.4 Proposed Drainage Conditions

Figures 3a-3e illustrate the proposed post-construction drainage conditions for the Project. The study area was divided into 87 drainage areas that discharge stormwater to the 69 existing Design Points. A summary of the hydrologic data under the proposed conditions is provided in Table 2.

Table 2 Hydrologic Data under the Proposed Conditions

Drainage Area	Discharge Location	Design Point	Area (acres)	Curve Number	Time of Concentration (min)
PR-5.6	Wetland 18	DP-5.6	17.4	31	22.8
PR-5.7	Wetland 19	DP-5.7	9.6	30	63.9
PR-5.8A	Wetland 45	DP-5.8	8.0	31	30.8
PR-5.8B	Wetland 45	DP-5.8	0.2	52	11.8
PR-5.9	Low Point	DP-5.9	4.3	30	13.4
PR-5.10	Low Point	DP-5.10	1.6	32	50.3
PR-5.11	Low Point	DP-5.11	4.6	30	71.5
PR-5.12	Wetland 44	DP-5.12	7.9	45	84.9
PR-5.13	Wetland 44	DP-5.13	34.6	35	217.6
PR-5.14A	Wetland 44	DP-5.14	13.7	46	13.2
PR-5.14B	Wetland 44	DP-5.14	0.4	39	6.9
PR-5.15	Wetland 44	DP-5.15	10.5	41	34.8
PR-5.16	Wetland*	DP-5.16	8.6	50	22.6
PR-5.17	Wetlands 41 & 43 Vernal Pools 11 & 13	DP-5.17	18.5	52	6.4
PR-5.18A	Wetland 42 Vernal Pool 12	DP-5.18	10.5	42	75.8
PR-5.18B	Wetland 42 Vernal Pool 12	DP-5.18	0.1	46	6.0
PR-5.19	Wetland 40 Vernal Pool 10	DP-5.19	0.7	31	21.0
PR-5.20	Off Site	DP-5.20	1.2	37	20.3

Drainage Area	Discharge Location	Design Point	Area (acres)	Curve Number	Time of Concentration (min)
PR-5.21	Wetland 39 Vernal Pool 9	DP-5.21	5.6	30	28.2
PR-6.1A	Low Point	DP-6.1	0.1	43	15.7
PR-6.1B	Low Point	DP-6.1	0.6	35	12.0
PR-6.2	Dutton	DP-6.2	1.0	43	24.9
PR-6.3	Low Point	DP-6.3	0.8	42	15.0
PR-6.4	Low Point	DP-6.4	2.8	50	27.4
PR-6.5	Low Point	DP-6.5	16.9	36	36.0
PR-6.6A	Wetlands 36 & 38	DP-6.6	0.6	52	10.7
PR-6.6B	Wetland 36 & 38	DP-6.6	6.6	44	21.7
PR-6.7	Wetland 37	DP-6.7	7.0	38	16.2
PR-6.8	Low Point	DP-6.8	4.9	32	34.1
PR-6.9	Low Point	DP-6.9	0.9	41	17.4
PR-6.10	Low Point	DP-6.10	3.9	44	16.1
PR-6.11	Approximate Vernal Pool/Wetland*	DP-6.11	0.8	33	12.0
PR-6.12	Wetland 35 Vernal Pool 8	DP-6.12	0.6	32	14.2
PR-6.13	Wetland 34	DP-6.13	3.2	52	20.6
PR-6.14	Wetland 33	DP-6.14	5.2	62	12.4
PR-6.15	Low Point	DP-6.15	0.1	84	6.0
PR-7.1A	Wetland 30	DP-7.1	0.2	55	5.3
PR-7.1B	Wetland 30	DP-7.1	8.9	57	44.3
PR-7.2	Wetland 32	DP-7.2	2.6	35	25.2
PR-7.3	Low Point	DP-7.3	3.6	41	35.2
PR-7.4	Low Point	DP-7.4	9.0	52	39.3
PR-7.5	Wetland 31	DP-7.5	23.1	52	34.6
PR-7.6	Low Point	DP-7.6	0.9	41	17.7
PR-7.7	Low Point	DP-7.7	0.6	30	13.3
PR-7.8	Low Point	DP-7.8	1.3	40	30.0
PR-7.9	Low Point	DP-7.9	5.7	43	18.2
PR-7.10	Low Point	DP-7.10	0.3	31	24.1
PR-7.11	Low Point	DP-7.11	1.6	45	17.6
PR-7.12	Low Point	DP-7.12	1.2	46	19.3
PR-8.1A	Wetlands 28 & 29	DP-8.1	19.8	56	17.5
PR-8.1B	Wetlands 28 & 29	DP-8.1	0.3	30	33.1
PR-8.2A	Wetland 27	DP-8.2	14.9	44	49.4
PR-8.2B	Wetland 27	DP-8.2	1.4	35	42.5
PR-8.3A	Wetland 25	DP-8.3	13.4	57	36.5

Drainage Area	Discharge Location	Design Point	Area (acres)	Curve Number	Time of Concentration (min)
PR-8.3B	Wetland 25	DP-8.3	2.2	36	47.7
PR-8.4A	Wetland 26	DP-8.4	0.4	52	14.0
PR-8.4B	Wetland 26	DP-8.4	0.7	46	18.8
PR-8.5A	Low Point	DP-8.5	0.7	50	19.4
PR-8.5B	Low Point	DP-8.5	3.5	77	15.3
PR-8.6	Wetland 24	DP-8.6	24.7	65	62.4
PR-8.7	Low Point	DP-8.7	0.8	75	17.8
PR-8.8	Low Point	DP-8.8	0.9	79	34.8
PR-8.9	Wetland 24A Vernal Pool 5	DP-8.9	0.9	40	30.3
PR-8.10	Low Point	DP-8.10	3.6	91	14.1
PR-8.11	Wetland*	DP-8.11	0.9	85	8.9
PR-9.1	Station Road	DP-9.1	2.2	90	29.7
PR-10.1	Wetland 18	DP-10.1	1.2	80	19.0
PR-10.2	Wetland 19	DP-10.2	4.1	69	14.0
PR-10.3	Wetland 15	DP-10.3	1.0	79	10.1
PR-10.4A	Wetland 16	DP-10.4	1.8	63	11.3
PR-10.4B	Wetland 16	DP-10.4	3.0	63	13.4
PR-10.5	Wetland 14	DP-10.5	0.8	78	23.4
PR-10.6A	Wetland 11	DP-10.6	1.5	35	10.3
PR-10.6B	Wetland 11	DP-10.6	4.5	52	9.9
PR-10.7A	Wetland 13	DP-10.7	0.8	47	17.3
PR-10.7B	Wetland 13	DP-10.7	0.1	79	11.8
PR-10.8	Wetland 10	DP-10.8	0.9	50	7.3
PR-10.9	Wetland 5 Vernal Pools 2 & 3	DP-10.9	2.8	65	7.6
PR-10.10	Vernal Pool 4	DP-10.10	0.1	80	6.0
PR-10.11	Wetland 5	DP-10.11/13	1.1	52	10.7
PR-10.12A	Wetland 6	DP-10.12	0.3	41	12.4
PR-10.12B	Wetland 6	DP-10.12	0.9	58	14.7
PR-10.13A	Wetland 5	DP-10.11/13	1.4	73	6.9
PR-10.13B	Wetland 5	DP-10/11/13	0.4	74	6.0
PR-10.14A	Wetland 3 Vernal Pool 1	DP-10.14	4.1	66	7.5
PR-10.14B	Wetland 3 Vernal Pool 1	DP-10.14	2.9	84	19.4
PR-10.15A	Wetland 4	DP-10.15	4.3	44	20.3
PR-10.15B	Wetland 4	DP-10.15	0.1	50	12.2

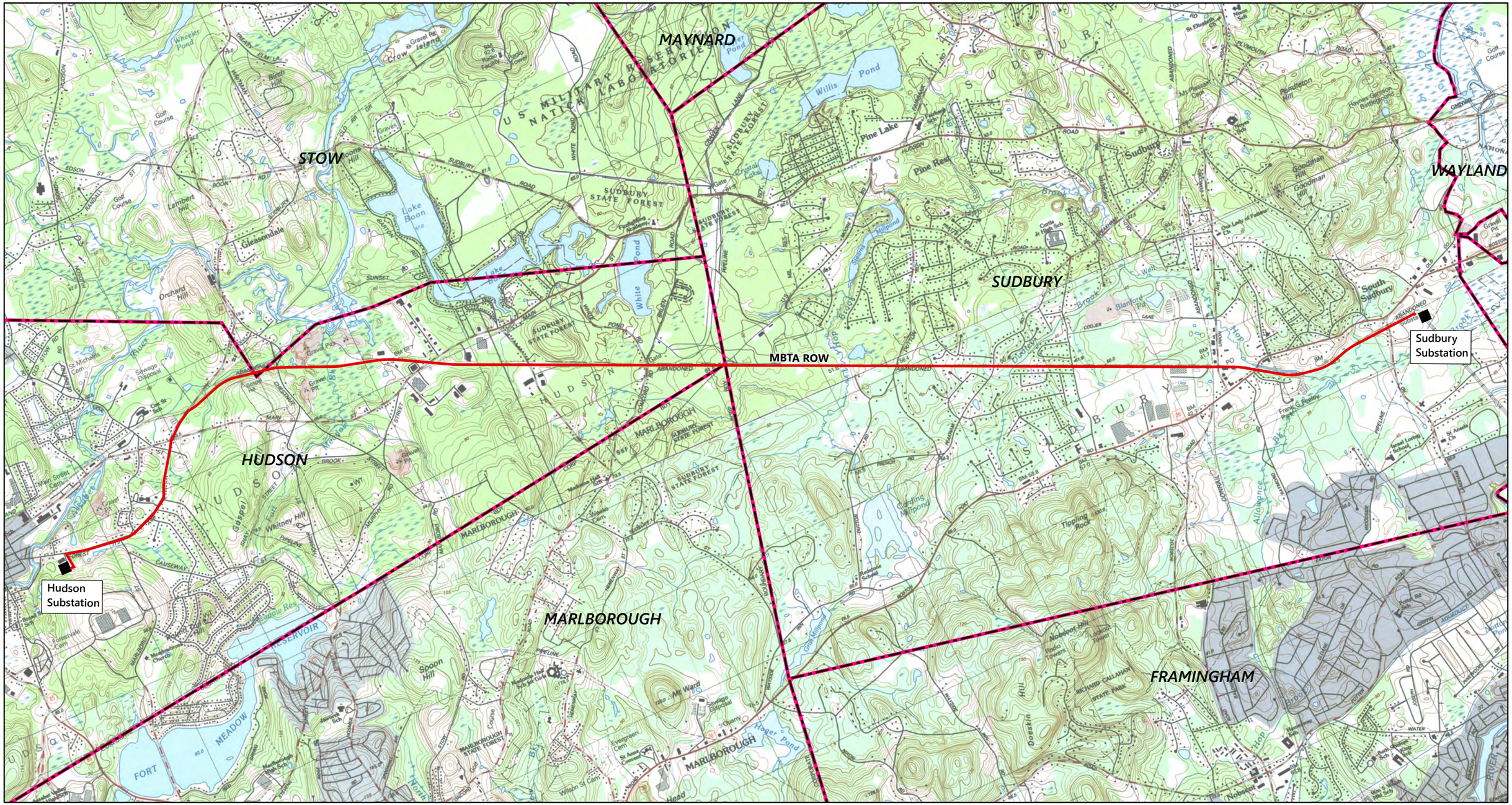
*Wetlands without a number designation (e.g., "Wetland") are located outside of the MBTA ROW. These wetlands were not field delineated and are shown as approximate on the plans.

As per 310 CMR 10.05(6)(m)(6), "Footpaths, bike paths and other paths for pedestrian and/or nonmotorized vehicle access" shall meet the Stormwater Management Standards to the maximum extent practicable. The Project is not considered a Land Use with Higher Pollutant Load ("LUHPPL") and was designed in accordance with MassDEP's Massachusetts Stormwater Handbook (rev. 2008). The design incorporates the use of structural and non-structural Best Management Practices ("BMPs") to mitigate stormwater flows and promote infiltration and recharge, which is consistent with DCR's standard design for all its rail trail facilities. Additionally, existing and proposed flows to vernal pools were analyzed using the TR-20 methodology to confirm that the Project will not adversely affect the hydrologic regime contributing to these resource areas.

The structural BMPs include areas of increased infiltration, which are swales with check dams or basins, and conveyance swales. Check dam locations throughout the areas of increased infiltration were maximized in order to increase detention, treat stormwater, and ensure non-erosive flows. Conveyance swales are also included throughout the Project to help convey stormwater and although they provide benefits, they are not included in the stormwater calculations. The Project also utilizes "impervious disconnection," a non-structural BMP, to provide filtering and infiltration by redirecting stormwater from areas of impervious cover to areas of pervious cover. Although these areas provide benefits, they are also not included in the stormwater calculations for recharge and water quality because they are not considered recharge and treatment BMPs by MassDEP's Stormwater Management Handbook.

HydroCAD uses the SCS Unit Curve Number methodology in order to estimate storm runoff. The determination of runoff curve number depends on the watershed's characteristics including cover type and hydrologic soil group. The complete list of surface soils according to the National Resources Conservation Service ("NRCS") has been included in Appendix C, which includes the classification of on-site soils as Hydrologic Soil Groups ("HSG") A, B, C, and D. Soil groups previously defined by the NRCS as HSG unknown soils were determined by evaluating the NRCS's definition of the map soil unit. The NRCS Soil Resource Report provides guidance on the ability for a soil to infiltrate; this approach is consistent with standard engineering practice. Based on the soil information included in Appendix C, the vast majority of the Site is not considered to be within an area of rapid infiltration (soils with a saturated hydraulic conductivity greater than 2.4 inches per hour) with the exception of soils located near BMP P-6.2. Boring logs used in support of determining hydraulic conductivity for the proposed stormwater structural BMPs have been included in Appendix C.

A hydrologic analysis was performed for each design point shown in Figures 2a-2e and 3a-3e. The runoff from the large contributing areas was only minimally affected by the change in time of concentration (reduction in channel slope along ROW),changes to the curve number (CN) based on the increase impervious area (DCRs MCRT), and changes to the cover type.



Project

Substation Location

Municipal Boundary

EVERSOURCE ENERGY

dcr MASSACHUSETTS DEPARTMENT OF CONSERVATION AND RECREATION

N

Sudbury-Hudson Transmission Reliability and Mass Central Rail Trail Project

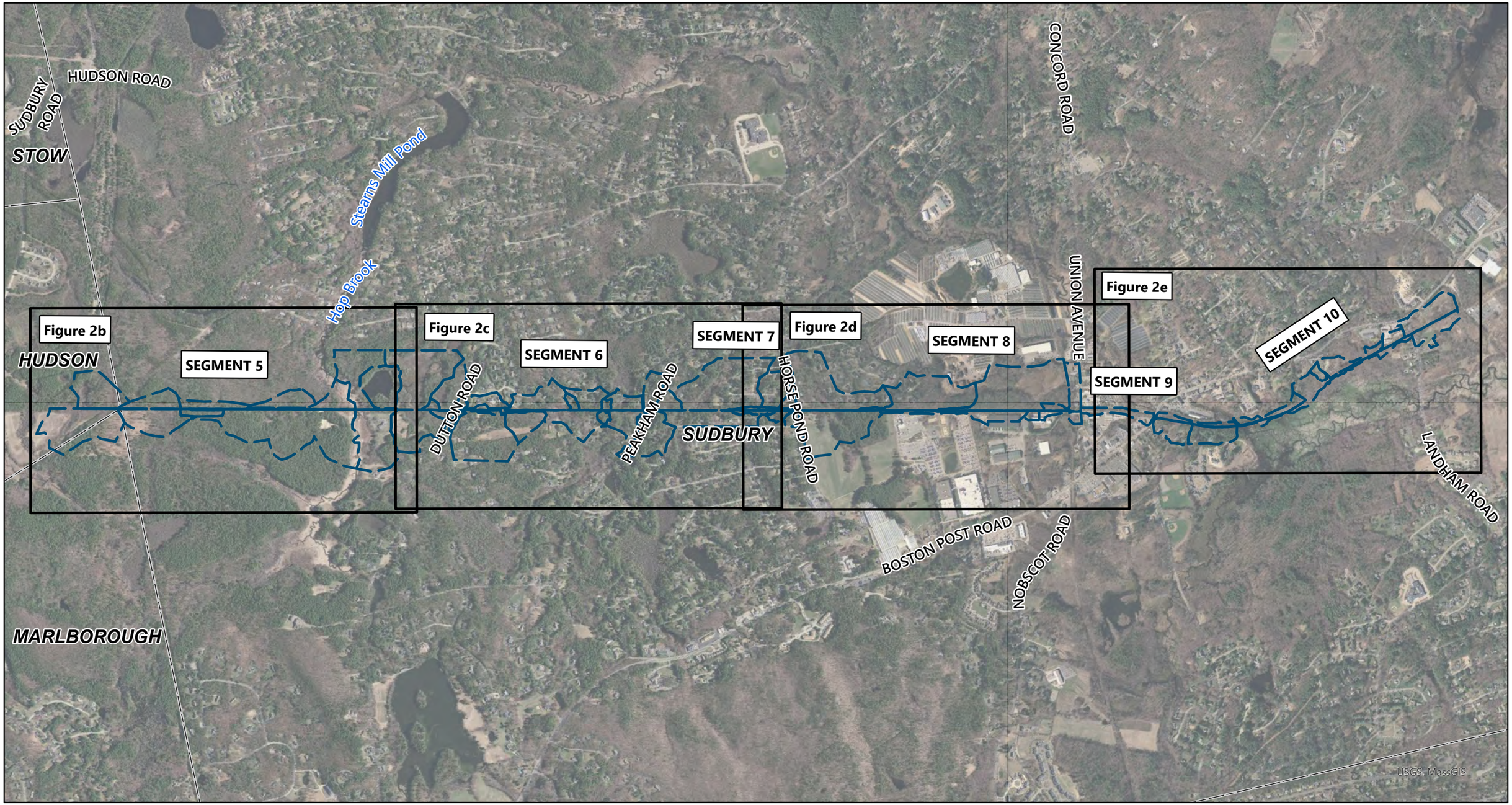
Figure 1: Locus Map (USGS)

Source:
MassGIS, VHB

2/21/2020

0 1,500 3,000 Feet

vhb



Map Boundaries

Existing Drainage Areas

Massachusetts Municipalities

N

Source:
MassGIS, VHB

0 1,500 3,000 Feet

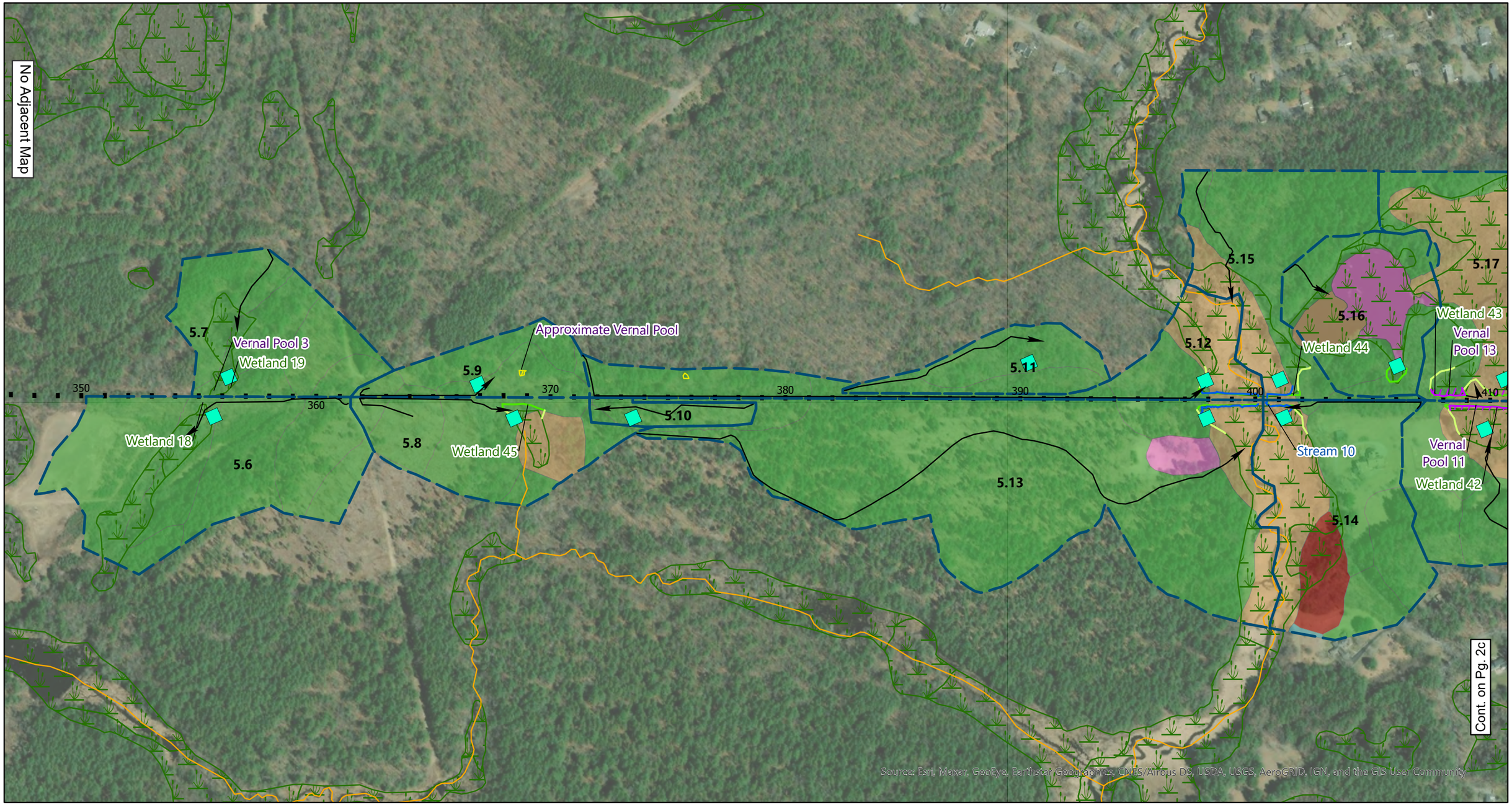
EVERSOURCE ENERGY

Sudbury-Hudson Overall Transmission Reliability Project

Figure 2a: Existing Drainage Areas

Date: 7/7/2020

vhb



MA DFW Coldwater Fisheries Resources

Delineated Top of Bank

Delineated Vernal Pool Edge

Approximate Wetland Edge

Delineated Wetland Edge

Vernal Pool

Approximate Vernal Pool

Approximate Isolated Wetland

Approximate Wetland Resource Areas (From MassGIS)

DEP Approved Zone II

Project Stationing

Massachusetts Municipalities

Design Point

Time of Concentration

Hydraulic Soil Group

A

A/D

B

B/D

D

N

0 400 800 Feet

EVERSOURCE ENERGY

Sudbury-Hudson Transmission Reliability Project

Figure 2b: Existing Drainage Areas

Date: 7/8/2020

Source:
MassGIS, VHB

vhb

Cont. on Pg.2b

Vernal Pool 12
Wetland 41
Vernal Pool 10
Wetland 40
Wetland 43
Vernal Pool 13
Vernal Pool 9
Wetland 39
Stream 9
Vernal Pool 8
Wetland 34
Wetland 37
Wetland 35
Vernal Pool 7
Wetland 31
Wetland 32
Vernal Pool 11
Wetland 42
Wetland 38
Wetland 36
Approximate Vernal Pool
Stream 8
Wetland 33
Wetland 30
Stream 7
DUTTON ROAD
PEAKHAM ROAD

5.17 5.19 5.21 5.20 5.18 6.4 6.1 6.2 6.3 6.5 6.7 6.8 6.9 6.10 6.6 6.11 6.12 6.13 6.14 6.15 7.3 7.2 7.1 7.4 7.5 7.9 7.7 7.6 7.8

410 500 510 520 530 540 550

Cont. on Pg. 2d

- MA DFW Coldwater Fisheries Resources
- Delineated Top of Bank
- Delineated Vernal Pool Edge
- Approximate Wetland Edge
- Delineated Wetland Edge
- Vernal Pool
- Approximate Vernal Pool
- Approximate Isolated Wetland
- Approximate Wetland Resource Areas (From MassGIS)
- DEP Approved Zone II
- Project Stationing
- Massachusetts Municipalities
- Design Point
- Time of Concentration

Hydraulic Soil Group
- A
- B/D
- D

N

0 400 800 Feet

EVERSOURCE ENERGY

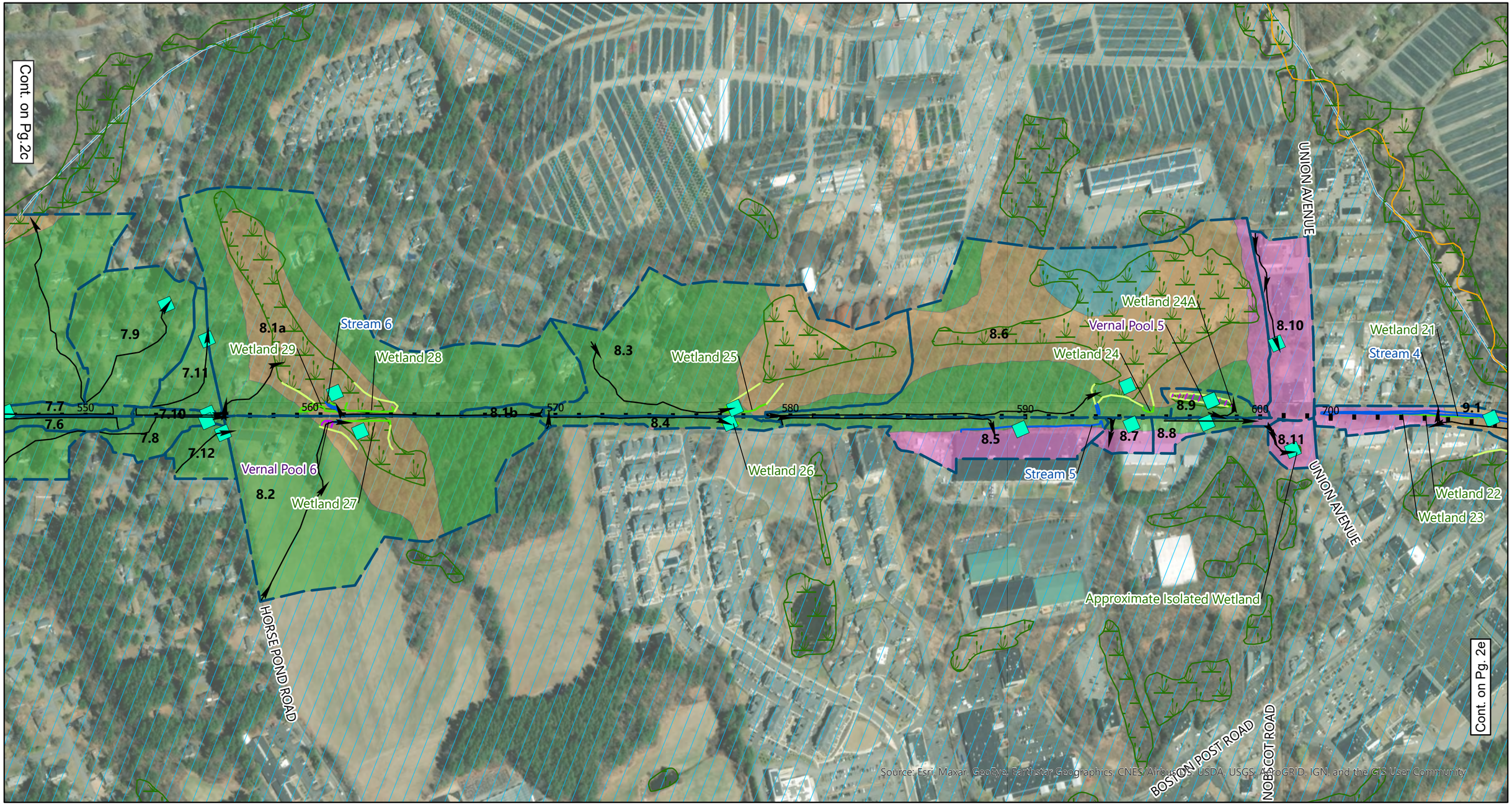
Sudbury-Hudson Transmission Reliability Project

Figure 2c: Existing Drainage Areas

Date: 7/8/2020

Source:
MassGIS, VHB

vhb



MA DFW Coldwater Fisheries Resources

Delineated Top of Bank

Delineated Vernal Pool Edge

Approximate Wetland Edge

Delineated Wetland Edge

Vernal Pool

Approximate Vernal Pool

Approximate Isolated Wetland

Approximate Wetland Resource Areas (From MassGIS)

DEP Approved Zone II

Project Stationing

Massachusetts Municipalities

Design Point

Time of Concentration

Hydraulic Soil Group

A

A/D

B/D

D

N

0 400 800 Feet

EVERSOURCE ENERGY

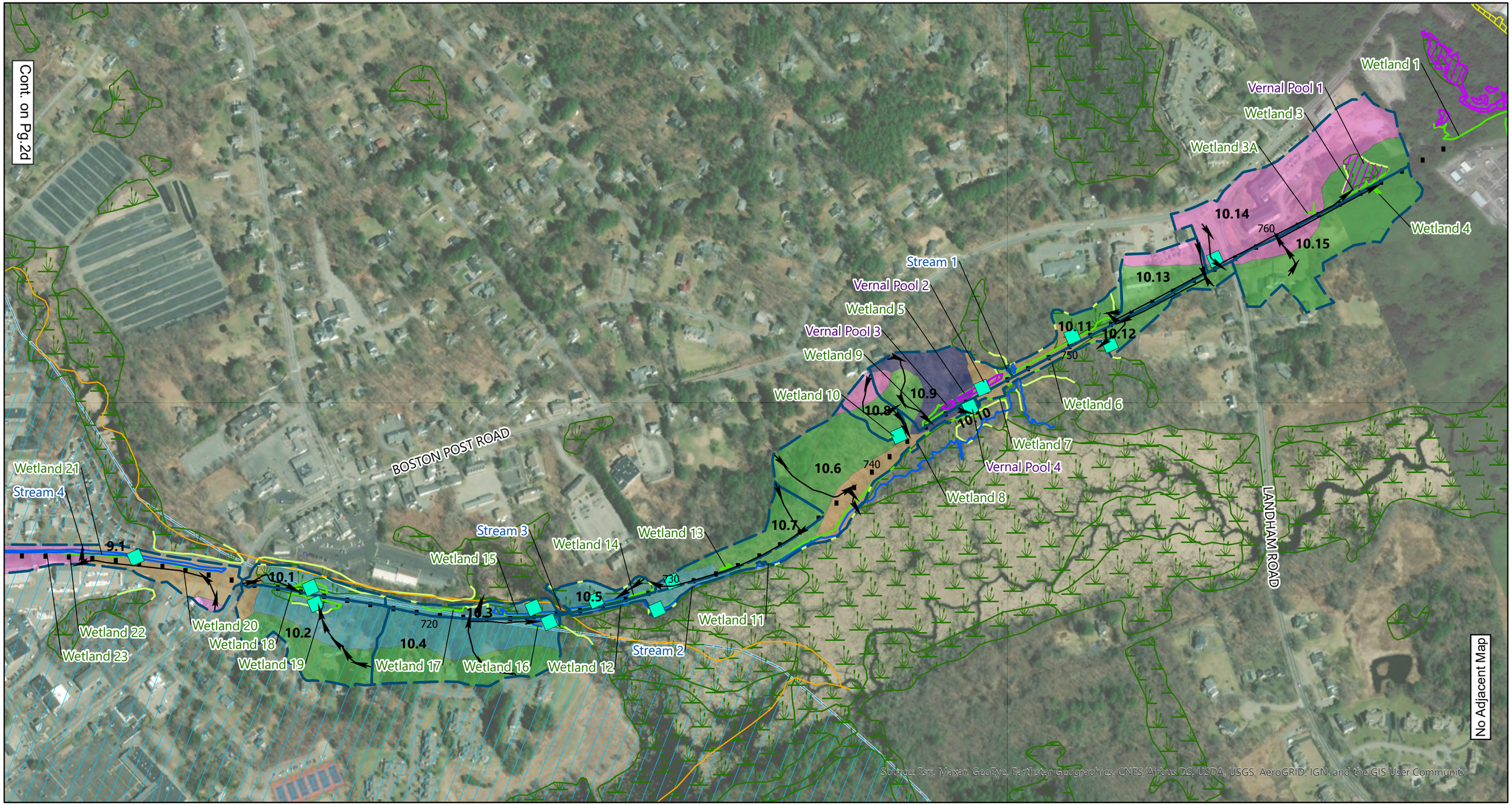
Sudbury-Hudson Transmission Reliability Project

Figure 2d: Existing Drainage Areas

Date: 7/8/2020

Source:
MassGIS, VHB

vhb



MA DFW Coldwater Fisheries Resources

Delineated Top of Bank

Delineated Vernal Pool Edge

Approximate Wetland Edge

Delineated Wetland Edge

Vernal Pool

Approximate Vernal Pool

Approximate Isolated Wetland

Approximate Wetland Resource Areas (From MassGIS)

DEP Approved Zone II

Project Stationing

Massachusetts Municipalities

Design Point

Time of Concentration

Hydraulic Soil Group

- A
- A/D
- B/D
- C
- D

N

0 400 800 Feet

EVERSOURCE ENERGY

Sudbury-Hudson Transmission Reliability Project

Figure 2e: Existing Drainage Areas

Date: 7/8/2020

Source:
MassGIS, VHB

vhb

HUDSON ROAD
SUDBURY ROAD
STOW
Stearns Mill Pond
CONCORD ROAD
Figure 3b
HUDSON
SEGMENT 5
Figure 3c
SEGMENT 6
SEGMENT 7
Figure 3d
SEGMENT 8
Figure 3e
SEGMENT 10
SEGMENT 9
DUTTON ROAD
PEAKHAM ROAD
SUDBURY
HORSE POND ROAD
UNION AVENUE
LANDHAM ROAD
Hop Brook
BOSTON POST ROAD
NOBSCOT ROAD
MARLBOROUGH
USGS, MassGIS

Map Boundaries
Proposed Drainage Areas
Massachusetts Municipalities

N

Source:
MassGIS, VHB

0 1,500 3,000 Feet

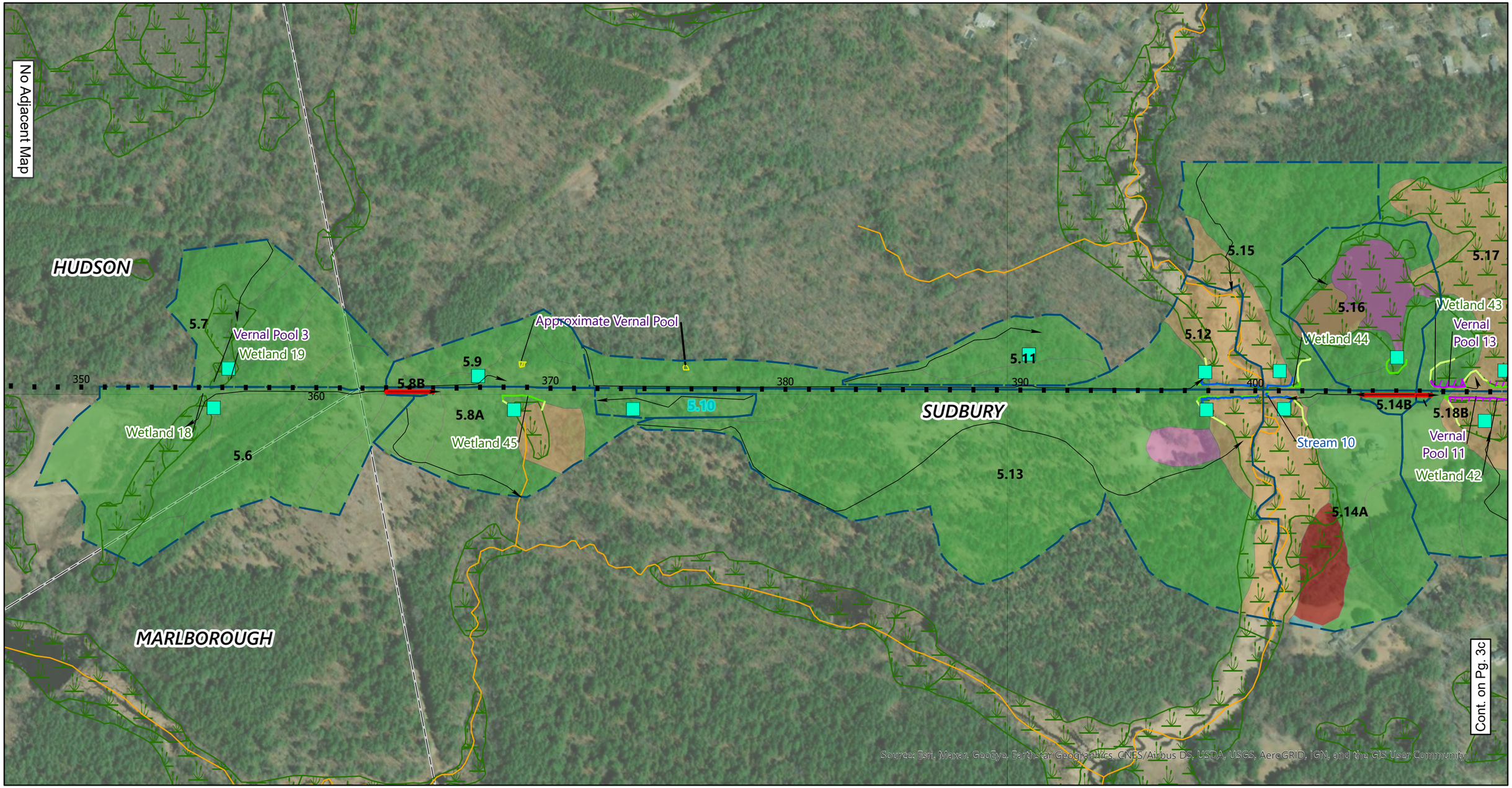
EVERSOURCE ENERGY

Sudbury-Hudson Overall Transmission Reliability Project

Figure 3a: Proposed Drainage Areas

Date: 7/7/2020

vhb



MA DFW Coldwater Fisheries Resources

Delineated Wetland Edge

Approximate Wetland Edge

Delineated Top of Bank

Delineated Vernal Pool Edge

Vernal Pool

Approximate Vernal Pool

Approximate Isolated Wetland

Approximate Wetland Resource Areas (From MassGIS)

DEP Approved Zone II

Project Stationing

Proposed Drainage Areas

Massachusetts Municipalities

Design Point

Time of Concentration

Area of Increased Infiltration

Hydrologic Soil Group

D

A

A/D

B

B/D

C

N

0 400 800 Feet

EVERSOURCE ENERGY

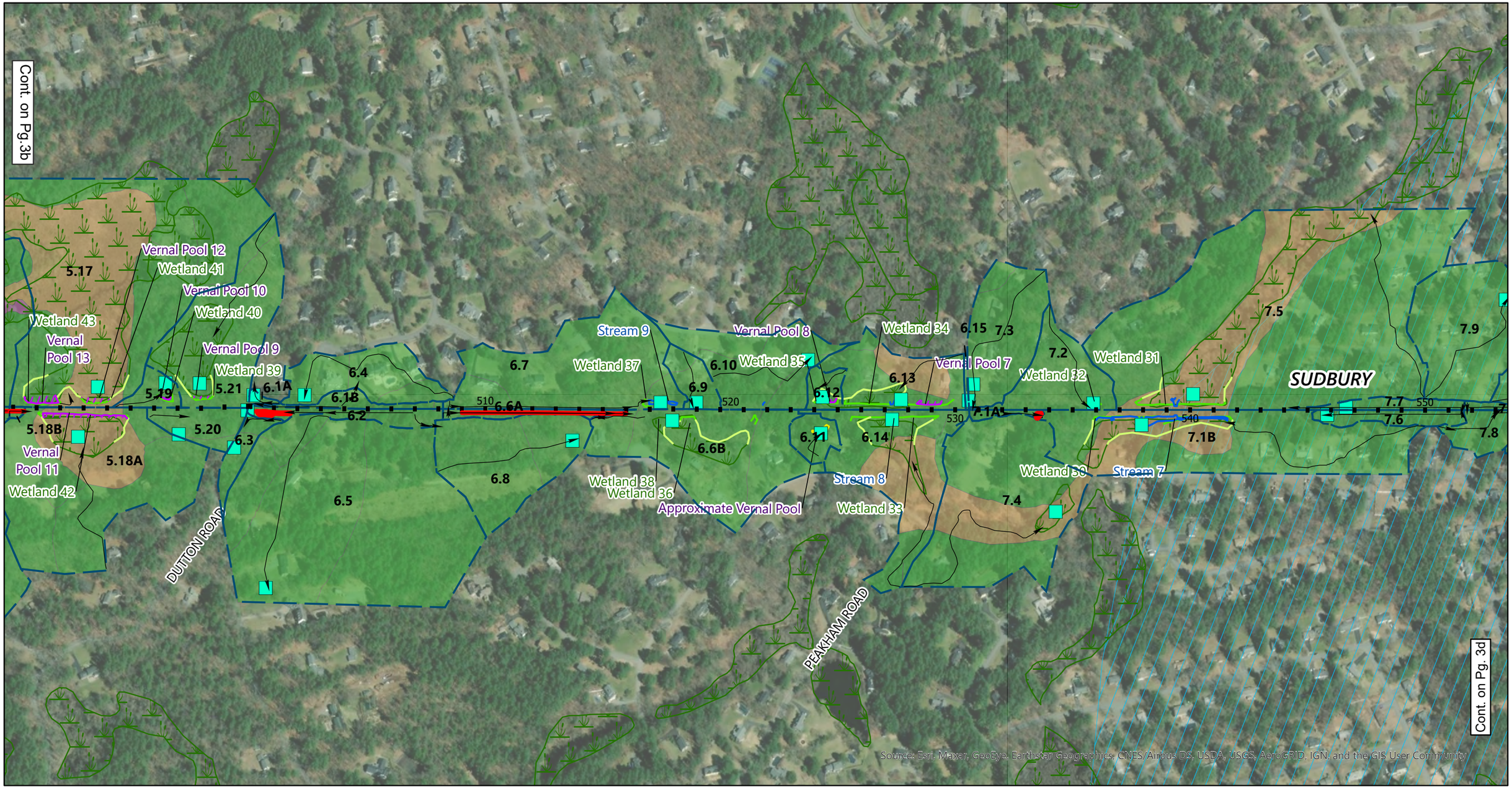
Sudbury-Hudson Transmission Reliability Project

Figure 3b: Proposed Drainage Areas

Date: 7/7/2020

Source:
MassGIS, VHB

vhb



MA DFW Coldwater Fisheries Resources

Delineated Wetland Edge

Approximate Wetland Edge

Delineated Top of Bank

Delineated Vernal Pool Edge

Vernal Pool

Approximate Vernal Pool

Approximate Isolated Wetland

Approximate Wetland Resource Areas (From MassGIS)

DEP Approved Zone II

Project Stationing

Proposed Drainage Areas

Massachusetts Municipalities

Design Point

Time of Concentration

Area of Increased Infiltration

Hydrologic Soil Group

D

A

A/D

B

B/D

C

N

0 400 800 Feet

EVERSOURCE ENERGY

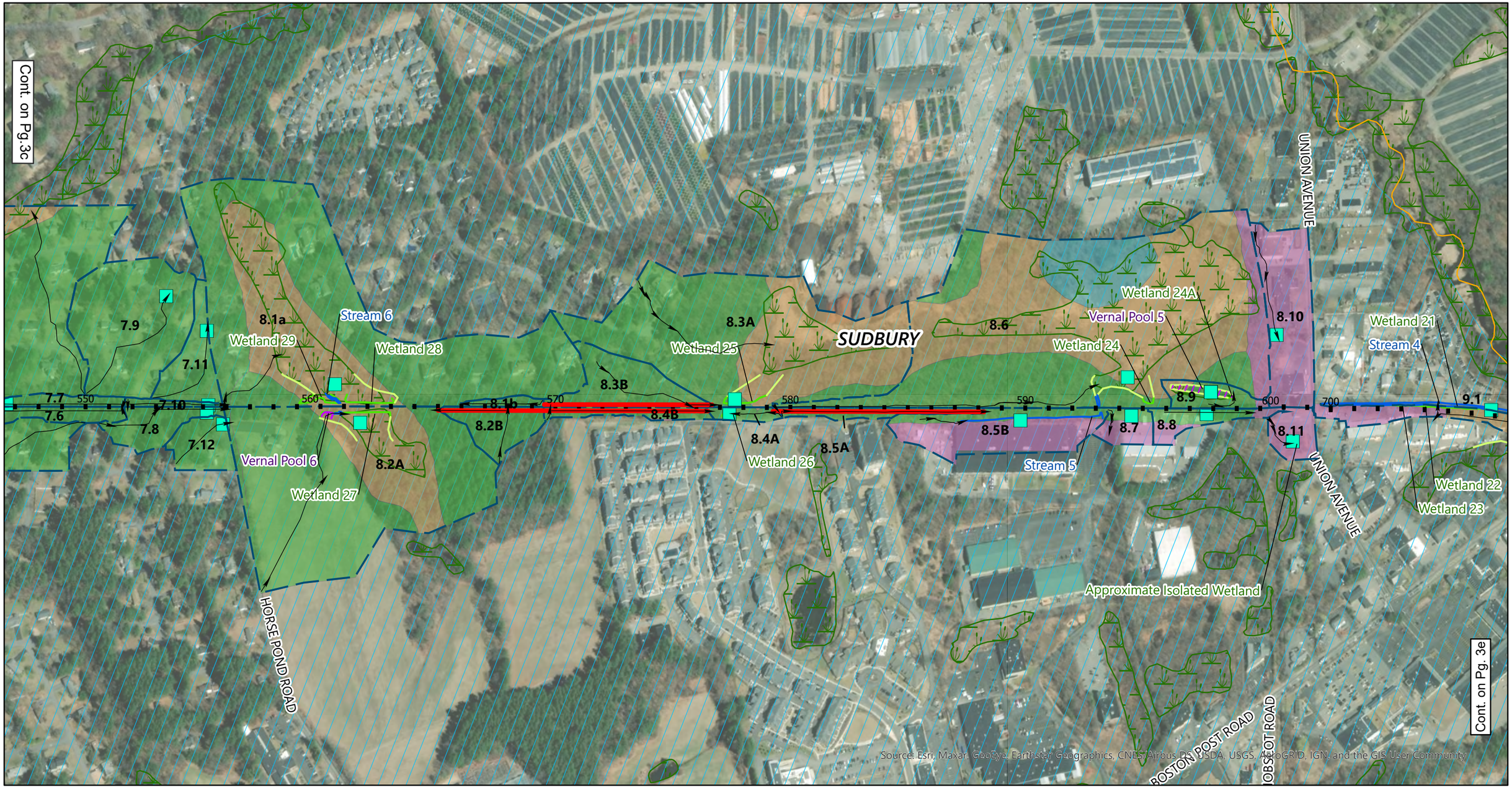
Sudbury-Hudson Transmission Reliability Project

Figure 3c: Proposed Drainage Areas

Date: 7/7/2020

Source:
MassGIS, VHB

vhb



MA DFW Coldwater Fisheries Resources

Delineated Wetland Edge

Approximate Wetland Edge

Delineated Top of Bank

Delineated Vernal Pool Edge

Vernal Pool

Approximate Vernal Pool

Approximate Isolated Wetland

Approximate Wetland Resource Areas (From MassGIS)

DEP Approved Zone II

Project Stationing

Proposed Drainage Areas

Massachusetts Municipalities

Design Point

Time of Concentration

Area of Increased Infiltration

Hydrologic Soil Group

D

A

A/D

B

B/D

C

N

0 400 800 Feet

EVERSOURCE ENERGY

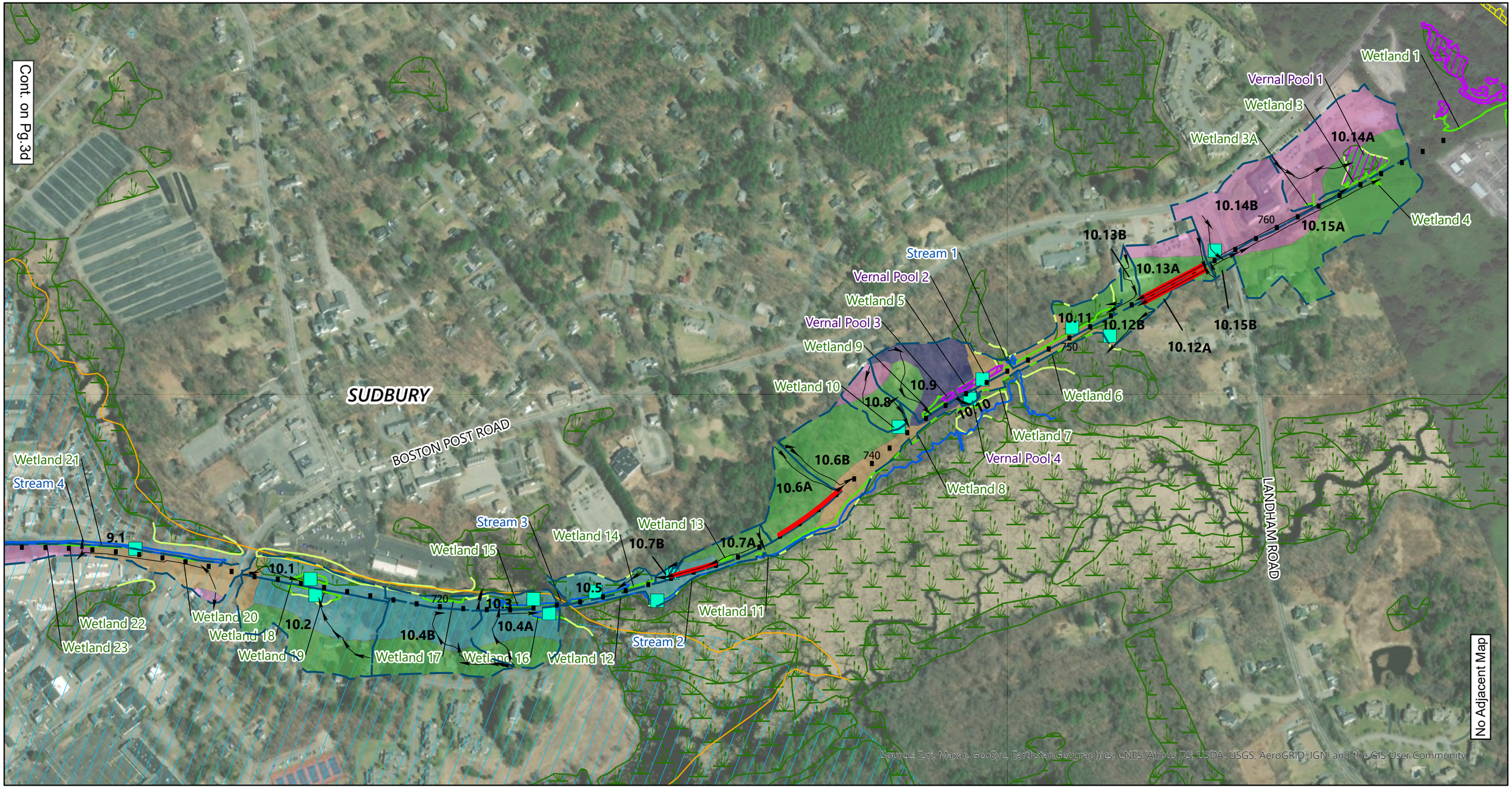
Sudbury-Hudson Transmission Reliability Project

Figure 3d: Proposed Drainage Areas

Date: 7/7/2020

Source: MassGIS, VHB

vhb



MA DFW Coldwater Fisheries Resources

Delineated Wetland Edge

Approximate Wetland Edge

Delineated Top of Bank

Delineated Vernal Pool Edge

Vernal Pool

Approximate Vernal Pool

Approximate Isolated Wetland

Approximate Wetland Resource Areas (From MassGIS)

DEP Approved Zone II

Project Stationing

Proposed Drainage Areas

Massachusetts Municipalities

Design Point

Time of Concentration

Area of Increased Infiltration

Hydrologic Soil Group

D

A

A/D

B

B/D

C

N

0 400 800 Feet

EVERSOURCE ENERGY

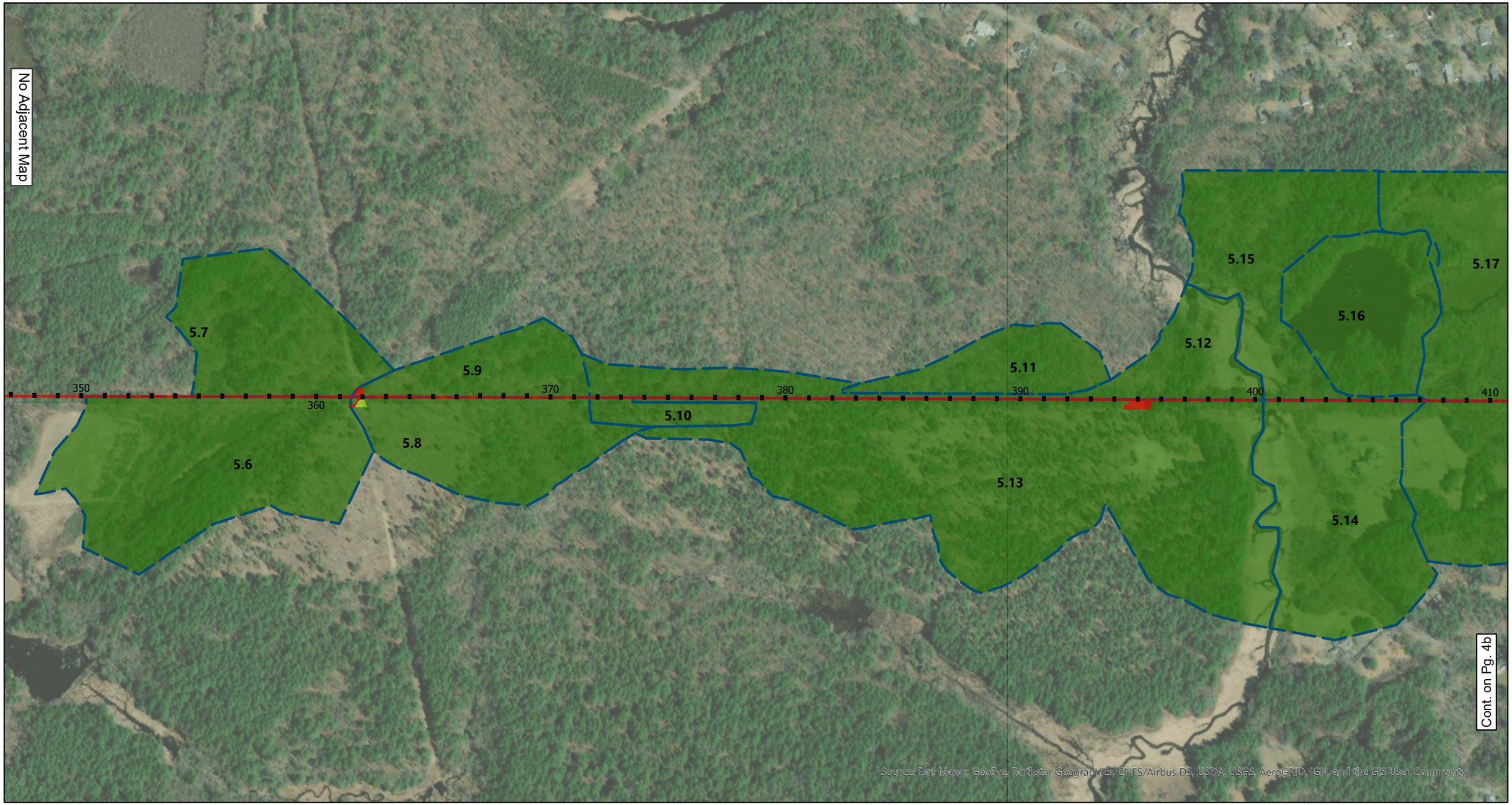
Sudbury-Hudson Transmission Reliability Project

Figure 3e: Proposed Drainage Areas

Date: 7/7/2020

Source: MassGIS, VHB

vhb



Existing Drainage Areas

Massachusetts Municipalities

Project Stationing

Cover Type

- Woods - Good
- Grass - Good
- Gravel Road

Cover Type

- Paved Parking
- Paved Roads with Curb
- Water Surface

Roofs

N

0 400 800 Feet

EVERSOURCE ENERGY

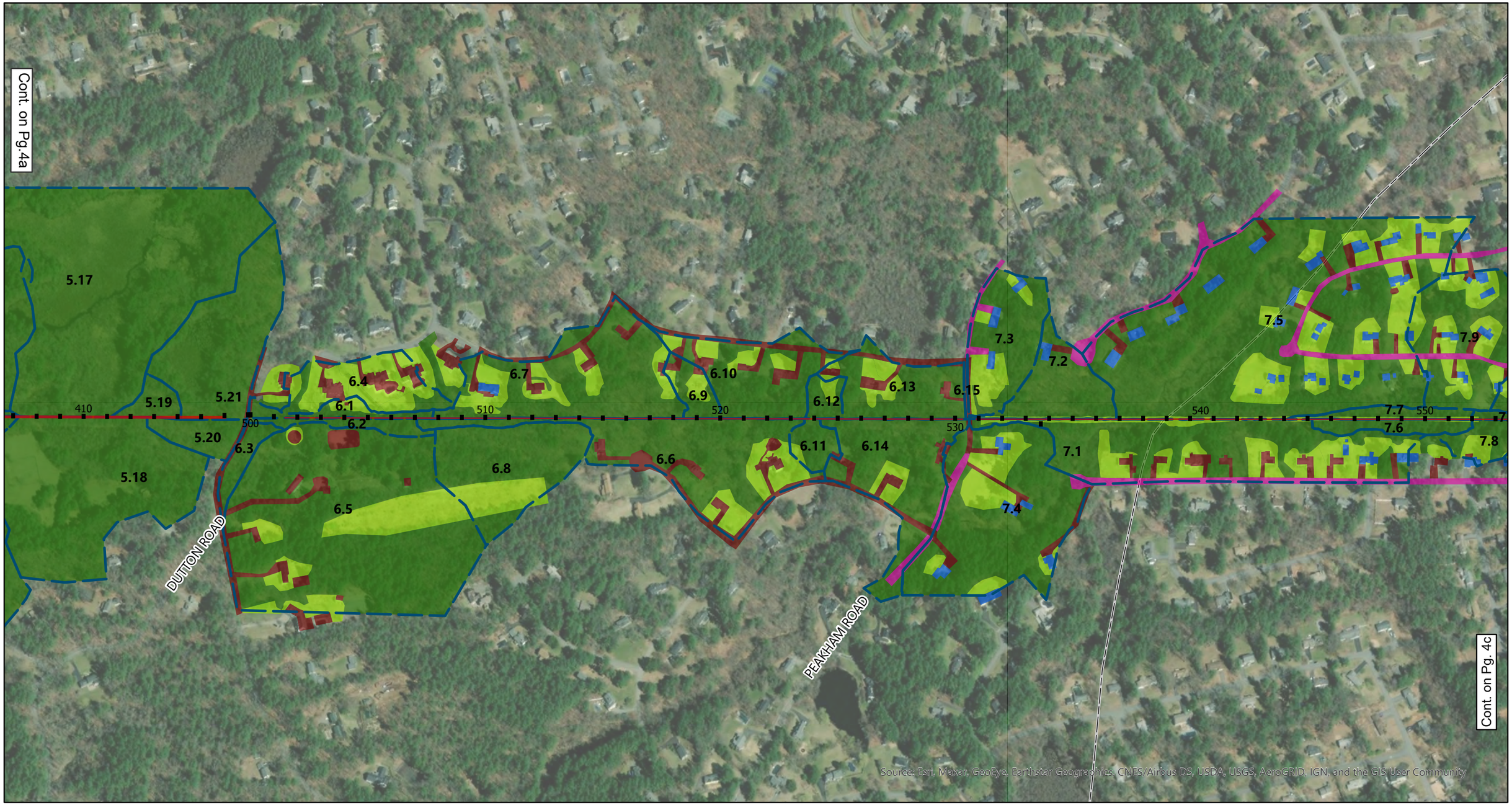
Sudbury-Hudson Transmission Reliability Project

Figure 4a: Existing Cover Type

Date: 7/13/2020

Source:
MassGIS, VHB

vhb



Existing Drainage Areas

Massachusetts Municipalities

Project Stationing

Cover Type

- Woods - Good
- Grass - Good
- Gravel Road

Cover Type

- Paved Parking
- Paved Roads with Curb
- Water Surface

Roofs

N

0 400 800 Feet

EVERSOURCE ENERGY

Sudbury-Hudson Transmission Reliability Project

Figure 4b: Existing Cover Type

Date: 7/13/2020

Source:
MassGIS, VHB

vhb

Existing Drainage Areas

Massachusetts Municipalities

Project Stationing

Cover Type

- Woods - Good
- Grass - Good
- Gravel Road

Cover Type

- Paved Parking
- Paved Roads with Curb
- Water Surface

Roofs

N

0 400 800 Feet

EVERSOURCE ENERGY

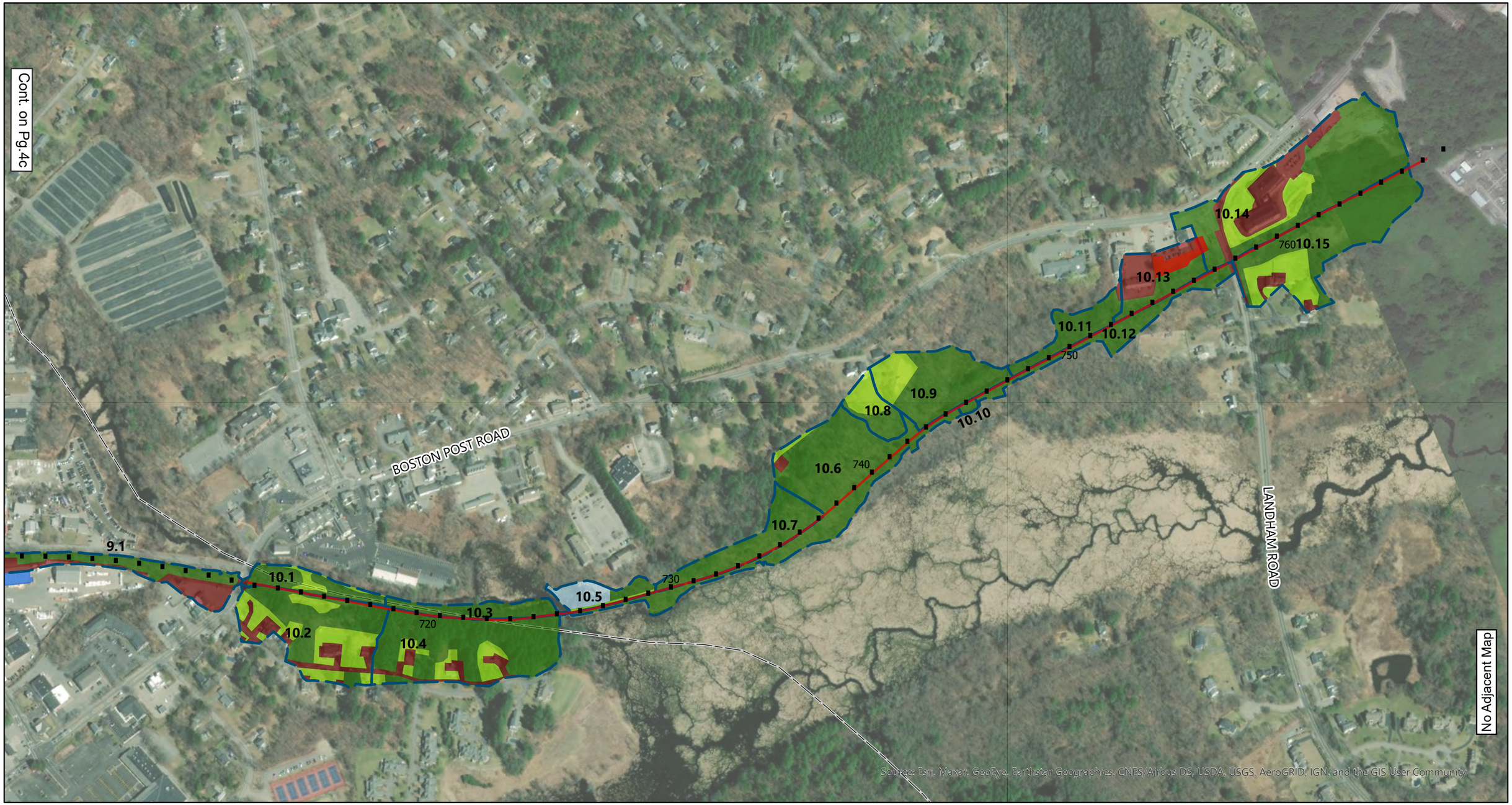
Sudbury-Hudson Transmission Reliability Project

Figure 4c: Existing Cover Type

Date: 7/13/2020

Source:
MassGIS, VHB

vhb



Existing Drainage Areas

Massachusetts Municipalities

Project Stationing

Cover Type

- Woods - Good
- Grass - Good
- Gravel Road

Cover Type

- Paved Parking
- Paved Roads with Curb
- Water Surface

Roofs

N

0 400 800 Feet

EVERSOURCE ENERGY

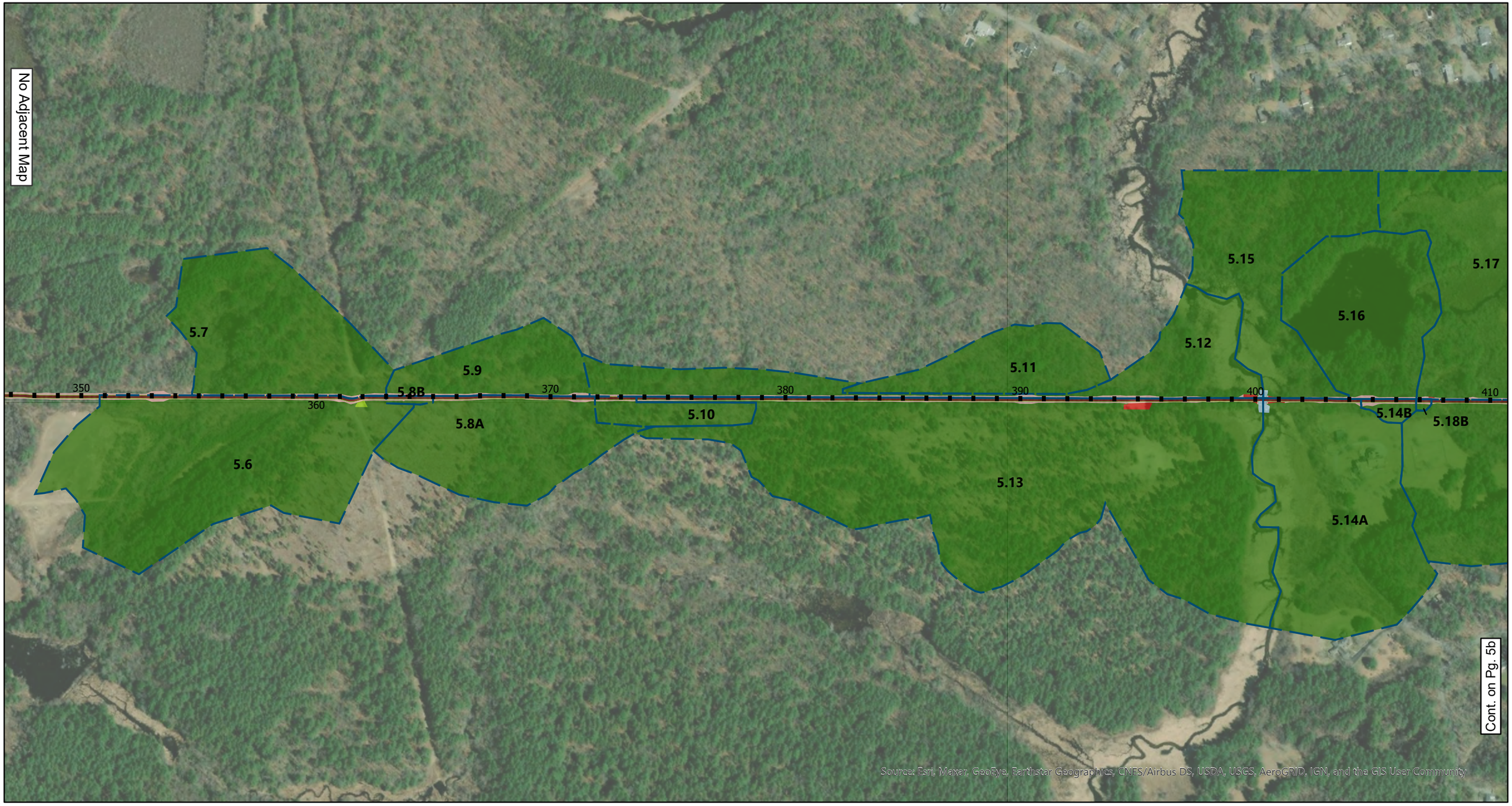
Sudbury-Hudson Transmission Reliability Project

Figure 4d: Existing Cover Type

Date: 7/13/2020

Source:
MassGIS, VHB

vhb



Proposed Drainage Areas

Massachusetts Municipalities

Project Stationing

Cover Type

- Woods - Good
- Grass - Good
- Gravel Road
- Paved Parking
- Paved Roads with Curb
- Meadow Non-Grazed
- Water Surface
- Roofs

N

0 400 800 Feet

EVERSOURCE ENERGY

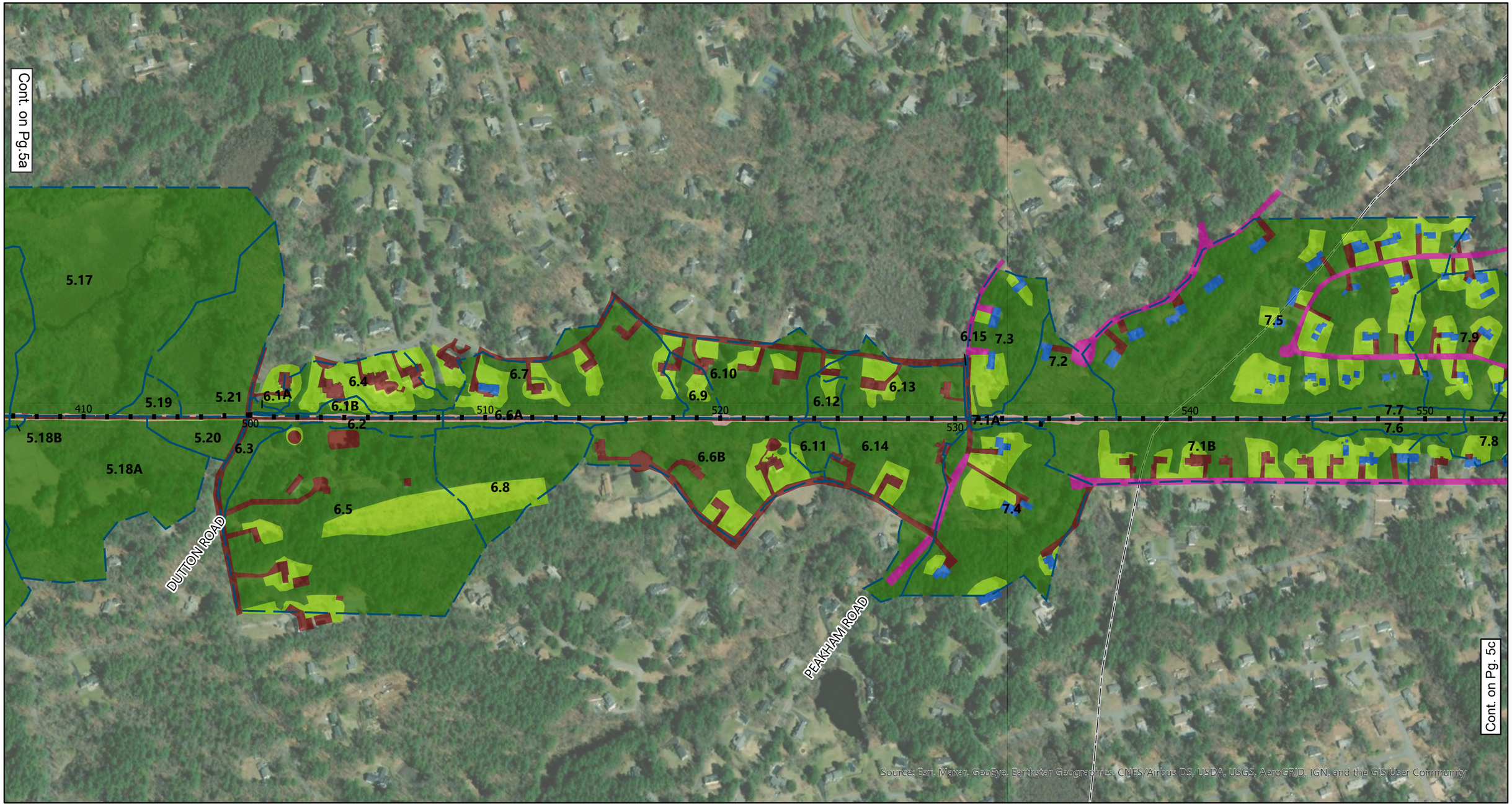
Sudbury-Hudson Transmission Reliability Project

Figure 5a: Proposed Cover Type

Date: 7/13/2020

Source:
MassGIS, VHB

vhb



Proposed Drainage Areas

Massachusetts Municipalities

Project Stationing

Cover Type

Woods - Good

Grass - Good

Gravel Road

Paved Parking

Paved Roads with Curb

Meadow Non-Grazed

Water Surface

Roofs

N

0 400 800 Feet

EVERSOURCE ENERGY

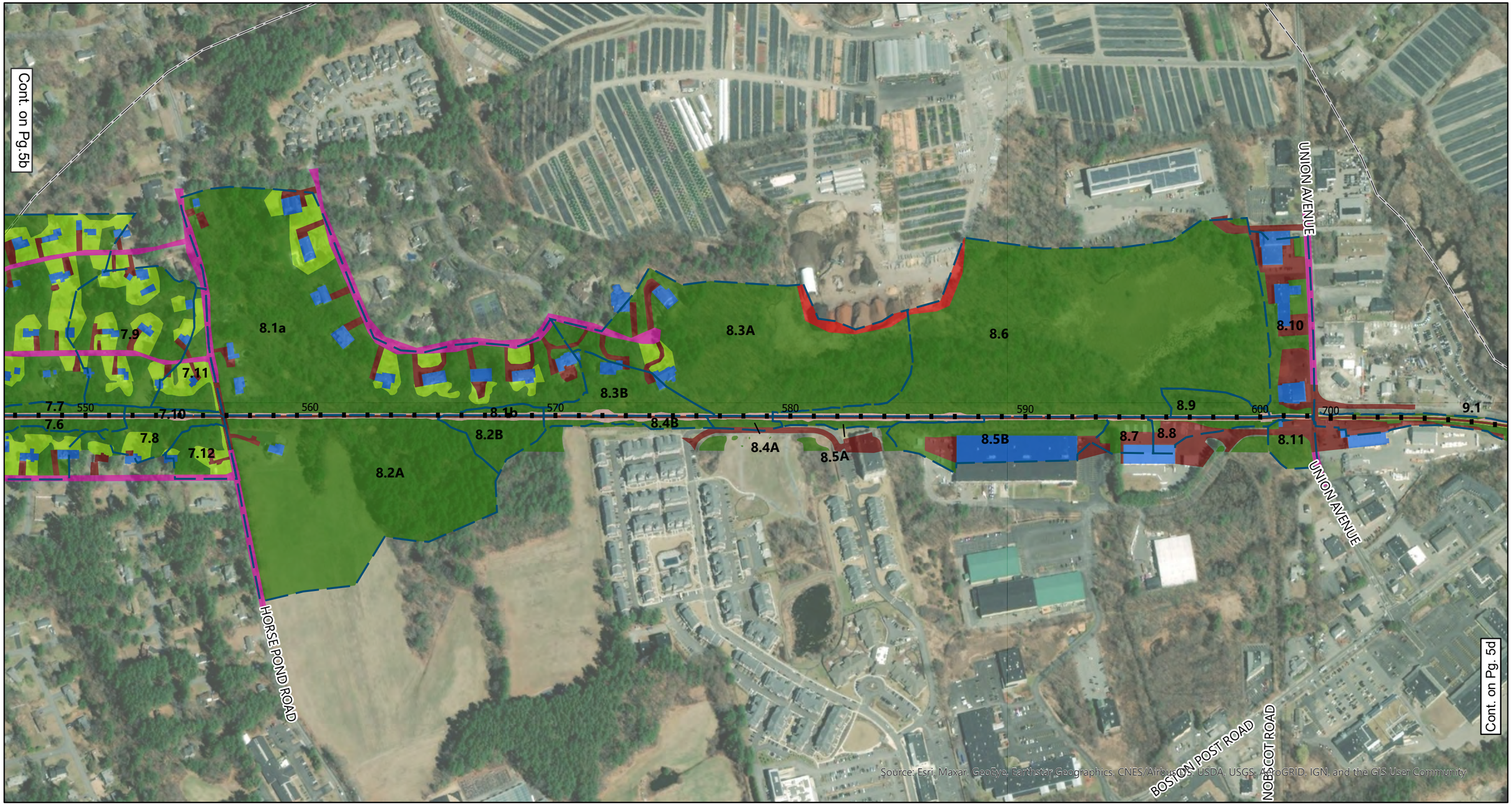
Sudbury-Hudson Transmission Reliability Project

Figure 5b: Proposed Cover Type

Date: 7/13/2020

Source:
MassGIS, VHB

vhb



Proposed Drainage Areas

Massachusetts Municipalities

Project Stationing

Cover Type

- Woods - Good
- Grass - Good
- Gravel Road
- Paved Parking
- Paved Roads with Curb
- Meadow Non-Grazed
- Water Surface
- Roofs

N

0 400 800 Feet

EVERSOURCE ENERGY

Sudbury-Hudson Transmission Reliability Project

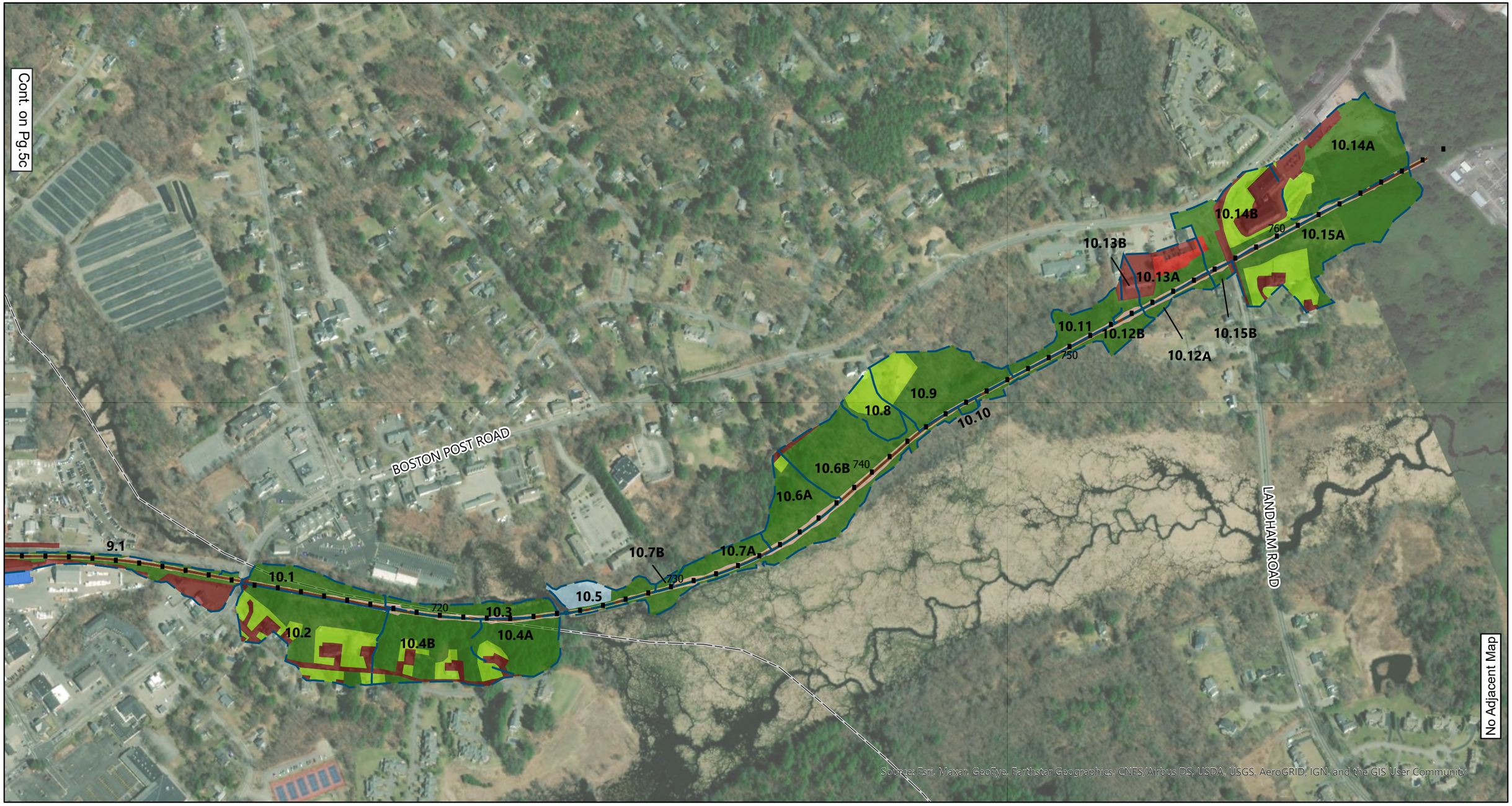
Figure 5c: Proposed Cover Type

Date: 7/13/2020

Source:
MassGIS, VHB

vhb

Cont. on Pg.5c



Proposed Drainage Areas

Massachusetts Municipalities

Project Stationing

Cover Type

- Woods - Good
- Grass - Good
- Gravel Road
- Paved Parking
- Paved Roads with Curb
- Meadow Non-Grazed
- Water Surface
- Roofs

N

0 400 800 Feet

EVERSOURCE ENERGY

Sudbury-Hudson Transmission Reliability Project

Figure 5d: Proposed Cover Type

Date: 7/13/2020

Source:
MassGIS, VHB

vhb

2

Compliance with Massachusetts Stormwater Management Standards

As required by Section 8.0(A)(1) of the Sudbury Bylaw Regulations, and as demonstrated below, the proposed Project complies with the performance standards in the most recent MassDEP Stormwater Management Standards for footpaths, bike paths, and other paths for pedestrians and/or nonmotorized vehicle access. The DEP Checklist for the Stormwater Report is provided in Appendix G.

The stormwater management system was designed for the final condition of the Project, which is a 10-foot-wide paved bike path and incorporates areas of increased infiltration and conveyance swales to promote recharge. Stormwater discharging from the bike path to critical areas (CFRs and Zone IIs) is conveyed to areas of increased infiltration. The characteristics of the areas of increased infiltration most closely match an infiltration basin Best Management Practice ("BMP") because they detain, treat, and infiltrate stormwater. In addition to areas of increased infiltration, conveyance swales are also proposed to convey and treat stormwater. These conveyance swales will provide stormwater detention, infiltration, and treatment. However, although these features provide benefits, this report did not account for the recharge and water quality treatment from these swales because they are not considered recharge and treatment BMPs by MassDEP's Stormwater Management Handbook.

Stormwater from the bike path will also discharge to adjacent vegetated areas where stormwater will naturally infiltrate under the majority of storm events. This approach is referred to as an "impervious area disconnection," which is the redirection of stormwater from impervious cover (i.e., paved bike path) to an area of pervious cover (i.e., vegetated area) to provide filtering and infiltration. This non-structural BMP will provide peak rate attenuation, recharge and water quality treatment. The benefit of this feature is supported by EPA guidance, which notes pollutant and volume reductions from an impervious to pervious area ratio as little as 8:1 with no slope requirements.

The stormwater management design provides stormwater treatment and recharge throughout the Project area and targets additional treatment at critical areas while reducing disturbance to existing vegetation, limiting impacts to buffer zones and resource areas, and providing a manageable system for long-term maintenance. The proposed measures for this Project also exceed what is typically incorporated into rail trail projects, especially since stormwater runoff from bike paths is a limited source of pollutants such as total suspended solids and phosphorus.

Under 310 CMR 10.05(6)(m)6, the Stormwater Management Standards apply to the maximum extent practicable to bike paths. As required by 310 CMR 10.05(6)(o), all reasonable efforts were made to meet Standards 2, 3, 4, and 6. (Standard 5 does not apply.) A complete evaluation was made of possible stormwater management measures including environmentally sensitive site design and low impact development techniques that minimize land disturbance and impervious surfaces, structural stormwater best management practices, pollution prevention, erosion and sedimentation control and proper operation and maintenance of stormwater best management practices; and the highest practicable level of stormwater management is being implemented. The Project fully meets Standards 1, 8, and 9. See below for further descriptions regarding the Project's compliance with each standard.

Standard 1: No New Untreated Discharges or Erosion to Wetlands

The Project fully complies with Standard 1.

The existing drainage patterns will be maintained where feasible and all proposed Project stormwater outlets and conveyances were designed to not cause erosion or scour to wetlands or receiving waters or result in new untreated discharge points. The outlet from the closed drainage system was designed with a flared end section and stone protection to dissipate discharge velocity. Overflows from BMPs that impound stormwater were designed with vegetation to protect down-gradient areas from erosion. Velocities and shear stresses were calculated, and swales were appropriately designed to reduce the potential for erosion, as necessary in accordance with Federal Highway Administration ("FHWA") Hydraulic Engineering Circular Number 15 ("HEC-15"). The 25-year event was used to calculate the effects of erosion and scour throughout the Project in accordance with the Massachusetts Department of Transportation's ("MassDOT") Project Development and Design Guide. Computations and supporting information are provided in Appendix A.

Standard 2: Peak Rate Attenuation

The Project complies with Standard 2 to the maximum extent practicable for the following reasons:

- In order to construct additional structural stormwater BMPs significant earthwork, vegetation removal, and possible impacts to wetland resource areas would be necessary. The design avoided these additional impacts where there would be negligible peak rate attenuation benefits.
- The Project team evaluated several other structural BMP options in order to make all reasonable efforts to fully meet Standard 2. This included a trench along the downslope side of the path and subsurface detention/infiltration beneath the bike path. These were determined to be impractical due to long-term maintenance requirements, additional vegetation removal and wetland impacts, engineering challenges, costs, and negligible benefits in comparison to the proposed stormwater management design.

As outlined in the Stormwater Management Bylaw Regulations for the Town of Sudbury, the rainfall-runoff response of the Site under the existing and proposed conditions was analyzed for storm events with recurrence intervals of 2, 10, 25, and 100 years, with rainfall amounts of 3.2", 4.8", 6.0", and 8.6", respectively. A rainfall depth of one inch was also evaluated, as outlined by the Stormwater Management Bylaw Regulations for the Town of Sudbury. The results of the analysis are summarized in the following bullet points and in Tables 3 to 8 below.

- Five design points exhibit an increase in peak discharge rates between the existing and proposed conditions for the 1-inch storm
- Twenty-three design points exhibit an increase in peak discharge rates between the existing and proposed conditions for the 2-year storm
- Thirty-one design points exhibit increases in peak discharge rates between the existing and proposed conditions in the 10-year storm
- Twenty-two design points exhibit an increase in peak discharge rate between the existing and proposed conditions for the 25-year storm
- Thirty-five design points exhibit an increase in peak discharge rate between existing and proposed conditions for the 100-year storm

The increases in peak rates described above between the existing and proposed conditions are minimal, so the impacts of implementing additional structural stormwater BMPs to decrease the peak flow outweigh the minor benefit gained from adding such measures. The red numbers in Tables 3 through 8 below indicate increases in peak rate attenuation between existing and proposed conditions.

It should also be noted that conveyance swales were not included as detention ponds in the proposed conditions model. Although these swales were not included as detention ponds they will filter and detain stormwater, and include check dams that will detain and infiltrate stormwater which will reduce the peak rate of runoff. If these swales were included in the modeling, peak rates in the proposed conditions would be further reduced from what is presented below.

Design Points with Proposed Structural Stormwater Controls:

The following design points can mitigate peak flows with the use of areas of increased infiltration:

DP-5.8: A one-foot-deep area of increased infiltration is proposed for 200 ft along the edge of the bike path to attenuate the proposed peak flows. This area of increased infiltration is relatively flat and includes additional check dams to promote infiltration above that of a standard swale.

DP-5.14: A one-foot-deep area of increased infiltration is proposed for 250 ft along the edge of the bike path to attenuate the proposed peak flows. This area of increased infiltration is relatively flat and includes additional check dams to promote infiltration above that of a standard swale.

DP-5.18: A one-foot-deep area of increased infiltration is proposed for 85 ft along the edge of the bike path to attenuate the proposed peak flows. This area of increased infiltration is relatively flat and includes additional check dams to promote infiltration above that of a standard swale.

DP-6.2 – An eight to ten-foot wide increased area of infiltration is proposed along the south side of the bike path to mitigate peak flows. This widened area of increased infiltration is in line with a swale that is relatively flat and includes additional check dams to promote infiltration above that of a standard swale prior to discharging into the area of increased infiltration.

DP-6.6: A one-foot-deep area of increased infiltration is proposed for 700 ft along the edge of the bike path to attenuate the proposed peak flows. This area of increased infiltration is relatively flat and includes additional check dams to promote infiltration above that of a standard swale.

DP-7.1: An increased area of infiltration basin is proposed approximately 270 ft from Peakham Road. A catch basin is proposed where the bike path and Peakham Road meet to collect any additional runoff from the Site onto Peakham Road and route the runoff to the area of increased infiltration.

DP-8.2: A one-foot-deep area of increased infiltration is proposed for 450 ft along the edge of the bike path to attenuate the proposed peak flows. This area of increased infiltration is relatively flat and includes additional check dams to promote infiltration above that of a standard swale.

DP-8.3: A one-foot-deep area of increased infiltration is proposed for 725 ft along the edge of the bike path to attenuate the proposed peak flows. This area of increased infiltration is relatively flat and includes additional check dams to promote infiltration above that of a standard swale.

DP-8.4: A one-foot-deep area of increased infiltration is proposed for 700 ft along the edge of the bike path to attenuate the proposed peak flows. This area of increased infiltration is relatively flat and includes additional check dams to promote infiltration above that of a standard swale.

DP-8.5: A one-foot-deep area of increased infiltration is proposed for 900 ft along the edge of the bike path to attenuate the proposed peak flows. This area of increased infiltration is relatively flat and includes additional check dams to promote infiltration above that of a standard swale.

DP-10.6: A one-foot-deep area of increased infiltration is proposed for 350 ft along the edge of the bike path to attenuate the proposed peak flows. This area of increased infiltration is relatively flat and includes additional check dams to promote infiltration above that of a standard swale.

DP-10.7: A one-foot-deep area of increased infiltration is proposed for 200 ft along the edge of the bike path to attenuate the proposed peak flows. This area of increased infiltration is relatively flat and includes additional check dams to promote infiltration above that of a standard swale.

DP-10.12: A one-foot-deep area of increased infiltration is proposed for 300 ft along the edge of the bike path to attenuate the proposed peak flows. This area of increased infiltration is relatively flat and includes additional check dams to promote infiltration above that of a standard swale.

DP-10.13: A one-foot-deep area of increased infiltration is proposed for 300 ft along the edge of the bike path to attenuate the proposed peak flows. This area of increased infiltration is relatively flat and includes additional check dams to promote infiltration above that of a standard swale.

Design Points that Comply with Standard 2 to the Maximum Extent Practicable

Thirty-seven design points that were analyzed comply with Standard 2 to the maximum extent practicable and demonstrated an increase in peak runoff.

The time of concentrations for the sub-catchments with BMPs assumes a "grassed waterway" surface type for the entire length of the areas of increased infiltration and conveyance swales and does not take into account the impact of the check dams. This results in decreased times of concentration under proposed conditions as compared to existing conditions. However, the time of concentration is likely to increase based on flow attenuation and storage behind check dams within the areas if increased infiltration and conveyance swales. Additionally, there are several locations where sub-watersheds were delineated in the proposed conditions but not the existing conditions in order to accurately design conveyance swales and areas of increased infiltration. In these locations the time of concentration was larger in the existing conditions than the proposed conditions which resulted in the modeling estimating larger flows under proposed conditions for areas with little or no impact from the proposed project.

The Project evaluated the impacts of the increased runoff on areas downstream of the project. Several of the design points that had increase in flows (5.6, 5.14, 9.1, 10.4, and 10.6) directly discharge to a larger waterbody (i.e. Hop Brook or a tributary of Hop Brook), in which these increases are negligible in comparison to the peak flow rate of the waterbody. In other locations the Project team reviewed the changes in volume (6.6, 8.3, 8.5, 10.11/10.13, 10.14, and 10.15) and compared that change to available storage volume of the receiving

wetland. This evaluation noted that there would be negligible increases in flood elevations assuming no-infiltration within the wetland.

As previously noted the project evaluated additional structural stormwater BMPs, however the construction impacts (tree clearing, earthwork, etc. in and near wetland resources) for implementing additional structural BMPs to mitigate these increases would outweigh the minor benefit gained from adding such measures.

The computations and supporting information for the hydrologic model are provided in Appendix B.

Table 3 Peak Discharge Rates (cfs) – Segment 5

	Design Storms				
Design Point	**1-inch**	**2-year**	**10-year**	**25-year**	**100-year**
DP-5.6					
Existing	0.0	0.0	0.0	0.2	2.1
Proposed	0.2	0.6	0.9	1.1	3.6
DP-5.7					
Existing	0.0	0.0	0.0	0.1	1.0
Proposed	0.0	0.0	0.0	0.1	1.0
DP-5.8					
Existing	0.0	0.0	0.0	0.2	1.3
Proposed	0.1	0.3	0.6	0.7	1.7
DP-5.9					
Existing	0.0	0.0	0.0	0.1	1.2
Proposed	0.0	0.0	0.0	0.1	0.8
DP-5.10					
Existing	0.0	0.0	0.0	0.0	0.2
Proposed	0.0	0.1	0.1	0.1	0.3
DP-5.11					
Existing	0.0	0.0	0.0	0.0	0.2
Proposed	0.0	0.0	0.0	0.0	0.2
DP-5.12					
Existing	0.0	0.1	0.8	1.7	4.6
Proposed	0.0	0.1	0.8	1.9	5.2
DP-5.13					
Existing	0.0	0.0	0.4	1.2	5.0
Proposed	0.1	0.4	0.6	1.3	5.1

	Design Storms				
Design Point	1-inch	2-year	10-year	25-year	100-year
DP-5.14[1]					
Existing	0.0	0.1	3.0	7.2	20.1
Proposed	0.1	0.3	3.7	9.0	25.2
DP-5.15					
Existing	0.0	0.0	0.7	2.4	8.7
Proposed	0.0	0.0	0.7	2.3	8.5
DP-5.16					
Existing	0.0	0.2	3.2	6.6	15.7
Proposed	0.0	0.2	3.2	6.6	15.8
DP-5.17					
Existing	0.0	1.2	13.1	25.7	58.0
Proposed	0.0	1.2	13.1	25.7	57.9
DP-5.18					
Existing	0.0	0.0	0.6	1.8	5.9
Proposed	0.0	0.1	0.8	2.0	6.2
DP-5.19					
Existing	0.0	0.0	0.0	0.0	0.3
Proposed	0.0	0.0	0.0	0.0	0.1
DP-5.20					
Existing	0.0	0.0	0.0	0.0	0.2
Proposed	0.1	0.3	0.4	0.5	0.8
DP-5.21					
Existing	0.0	0.0	0.0	0.1	0.8
Proposed	0.0	0.0	0.1	0.1	0.9

Table 4 Peak Discharge Rates (cfs) – Segment 6

	Design Storms				
Design Point	1-inch	2-year	10-year	25-year	100-year
DP-6.1					
Existing	0.0	0.0	0.0	0.1	0.4
Proposed	0.0	0.0	0.0	0.1	0.5
DP-6.2					
Existing	0.0	0.0	0.0	0.0	0.2
Proposed	0.0	0.0	0.0	0.2	1.0
DP-6.3					

[1] The increase in peak rates at this design point is a result of breaking out watersheds into two parts (area that goes to the BMP and area that goes directly to the design point) in proposed condition but not existing conditions. This resulted in time of concentrations being reduced under proposed conditions and larger peak rates.

	Design Storms				
Design Point	**1-inch**	**2-year**	**10-year**	**25-year**	**100-year**
Existing	0.0	0.0	0.1	0.3	0.9
Proposed	0.0	0.0	0.1	0.3	0.9
DP-6.4					
Existing	0.0	0.1	1.0	2.0	4.8
Proposed	0.0	0.1	1.0	2.0	4.8
DP-6.5					
Existing	0.0	0.0	0.3	1.2	7.5
Proposed	0.0	0.0	0.3	1.2	7.5
DP-6.6[1]					
Existing	0.0	0.0	0.5	1.5	5.0
Proposed	0.0	0.0	1.1	3.1	9.4
DP-6.7					
Existing	0.0	0.0	0.2	1.1	4.9
Proposed	0.0	0.0	0.2	1.1	5.4
DP-6.8					
Existing	0.0	0.0	0.0	0.1	1.1
Proposed	0.0	0.0	0.0	0.1	1.1
DP-6.9					
Existing	0.0	0.0	0.1	0.2	1.0
Proposed	0.0	0.0	0.1	0.2	0.9
DP-6.10					
Existing	0.0	0.0	0.7	1.7	5.6
Proposed	0.0	0.0	0.6	1.7	5.5
DP-6.11					
Existing	0.0	0.0	0.0	0.0	0.3
Proposed	0.0	0.0	0.0	0.0	0.3
DP-6.12					
Existing	0.0	0.0	0.0	0.0	0.2
Proposed	0.0	0.0	0.0	0.0	0.2
DP-6.13					
Existing	0.0	0.2	1.6	3.0	6.7
Proposed	0.0	0.2	1.5	2.9	6.7
DP-6.14					
Existing	0.0	1.0	4.1	6.6	12.5
Proposed	0.0	1.3	4.7	7.3	13.5
DP-6.15					
Existing	0.0	0.2	0.3	0.4	0.6
Proposed	0.0	0.2	0.3	0.4	0.6

Table 5 Peak Discharge Rates (cfs) – Segment 7

	Design Storms				
Design Point	1-inch	2-year	10-year	25-year	100-year
DP-7.1					
Existing	0.0	0.8	4.5	7.8	15.9
Proposed	0.0	1.0	4.9	8.3	16.5
DP-7.2					
Existing	0.0	0.0	0.0	0.2	1.4
Proposed	0.0	0.0	0.0	0.1	1.2
DP-7.3					
Existing	0.0	0.0	0.2	0.8	2.9
Proposed	0.0	0.0	0.2	0.8	2.9
DP-7.4					
Existing	0.0	0.4	3.3	6.3	14.1
Proposed	0.0	0.4	3.3	6.3	14.1
DP-7.5					
Existing	0.0	1.0	9.2	17.4	38.9
Proposed	0.0	1.0	9.2	17.4	38.8
DP-7.6					
Existing	0.0	0.0	0.0	0.0	0.0
Proposed	0.0	0.0	0.0	0.0	0.0
DP-7.7					
Existing	0.0	0.0	0.0	0.1	0.4
Proposed	0.0	0.0	0.0	0.0	0.1
DP-7.8					
Existing	0.0	0.0	0.0	0.0	0.5
Proposed	0.0	0.0	0.0	0.2	1.0
DP-7.9					
Existing	0.0	0.0	0.8	2.1	7.2
Proposed	0.0	0.0	0.8	2.1	7.2
DP-7.10					
Existing	0.0	0.0	0.0	0.0	0.2
Proposed	0.0	0.0	0.0	0.0	0.1
DP-7.11					
Existing	0.0	0.0	0.3	0.8	2.3
Proposed	0.0	0.0	0.3	0.8	2.3
DP-7.12					
Existing	0.0	0.0	0.3	0.7	1.9
Proposed	0.0	0.0	0.3	0.7	1.9

Table 6 Peak Discharge Rates (cfs) – Segment 8

	Design Storms				
Design Point	1-inch	2-year	10-year	25-year	100-year
DP-8.1					
Existing	0.0	2.6	15.0	26.1	53.4
Proposed	0.0	2.6	14.9	26.0	53.2
DP-8.2					
Existing	0.0	0.1	1.4	4.0	12.9
Proposed	0.0	0.1	1.6	4.3	12.9
DP-8.3[1]					
Existing	0.0	0.9	6.1	11.0	23.4
Proposed	0.0	1.6	8.1	13.6	27.3
DP-8.4					
Existing	0.0	0.0	0.0	0.0	0.4
Proposed	0.0	0.0	0.3	0.7	1.9
DP-8.5[1]					
Existing	0.0	2.0	5.4	7.9	13.6
Proposed	0.0	3.8	8.3	11.2	17.6
DP-8.6					
Existing	0.0	5.9	18.2	27.4	49.0
Proposed	0.0	5.8	18.1	27.3	48.7
DP-8.7					
Existing	0.0	0.1	1.1	1.9	3.2
Proposed	0.0	0.1	1.2	2.7	3.7
DP-8.8					
Existing	0.0	0.6	1.3	1.8	3.0
Proposed	0.0	0.8	1.7	2.3	3.5
DP-8.9					
Existing	0.0	0.0	0.1	0.2	0.8
Proposed	0.0	0.0	0.0	0.2	0.7
DP-8.10					
Existing	0.0	7.4	12.6	15.9	24.4
Proposed	0.0	7.2	12.4	15.6	23.2
DP-8.11					
Existing	0.0	1.7	3.2	4.1	6.1
Proposed	0.0	1.8	3.4	4.4	6.4

Table 7 Peak Discharge Rates (cfs) – Segment 9

	Design Storms				
Design Point	1-inch	2-year	10-year	25-year	100-year
DP-9.1					
Existing	0.2	2.5	4.5	5.8	8.5
Proposed	0.4	3.3	5.7	7.2	10.3

Table 8 Peak Discharge Rates (cfs) – Segment 10

	Design Storms				
Design Point	1-inch	2-year	10-year	25-year	100-year
DP-10.1					
Existing	0.0	1.1	2.4	3.3	5.1
Proposed	0.0	1.4	2.9	3.9	5.9
DP-10.2					
Existing	0.0	2.6	7.2	10.6	18.1
Proposed	0.0	2.7	7.3	10.6	18.0
DP-10.3					
Existing	0.0	1.2	2.6	3.4	5.4
Proposed	0.0	1.4	2.9	3.9	6.0
DP-10.4					
Existing	0.0	1.3	4.8	7.5	13.8
Proposed	0.0	1.9	6.7	10.3	18.8
DP-10.5					
Existing	0.0	0.8	1.7	2.3	3.6
Proposed	0.0	0.8	1.7	2.3	3.6
DP-10.6[1]					
Existing	0.0	0.1	1.9	4.3	10.7
Proposed	0.0	0.3	2.8	5.5	12.4
DP-10.7					
Existing	0.0	0.0	0.1	0.2	1.0
Proposed	0.0	0.1	0.3	0.7	1.8
DP-10.8					
Existing	0.0	0.0	0.3	0.8	2.1
Proposed	0.0	0.0	0.5	1.0	2.5
DP-10.9					
Existing	0.0	1.3	4.6	7.1	12.9
Proposed	0.0	1.6	5.1	7.7	13.7
DP-10.10					
Existing	0.0	0.1	0.3	0.4	0.6
Proposed	0.0	0.1	0.3	0.4	0.6

	Design Storms				
Design Point	1-inch	2-year	10-year	25-year	100-year
DP-10.11&10.13					
Existing	0.0	1.5	4.2	6.3	11.1
Proposed	0.0	1.8	4.9	7.4	12.9
DP-10.12					
Existing	0.0	0.0	0.5	1.1	2.4
Proposed	0.0	0.2	0.8	1.3	2.6
DP-10.14					
Existing	0.0	4.4	10.2	14.1	22.9
Proposed	0.2	5.9	13.5	19.0	31.2
DP-10.15					
Existing	0.0	0.0	0.4	1.3	4.5
Proposed	0.0	0.0	0.7	1.9	5.8

Per the Sudbury Stormwater Bylaws, total volume of discharge was calculated as part of the analysis. The red numbers in Tables 9 through 14 below indicate increases in peak rate attenuation between existing and proposed conditions.

Table 9 Discharge Volumes (af) – Segment 5

	Design Storms				
Design Point	1-inch	2-year	10-year	25-year	100-year
DP-5.6					
Existing	0	0	0.011	0.136	0.787
Proposed	0.018	0.072	0.125	0.280	1.004
DP-5.7					
Existing	0	0	0.006	0.077	0.447
Proposed	0	0	0.006	0.079	0.454
DP-5.8					
Existing	0	0	0.013	0.096	0.475
Proposed	0.010	0.042	0.077	0.155	0.507
DP-5.9					
Existing	0	0	0.013	0.066	0.287
Proposed	0	0	0.003	0.035	0.205
DP-5.10					
Existing	0	0	0.003	0.018	0.090
Proposed	0.003	0.010	0.018	0.033	0.103
DP-5.11					
Existing	0	0	0	0	0.075
Proposed	0	0	0	0	0.075

	Design Storms				
Design Point	1-inch	2-year	10-year	25-year	100-year
DP-5.12					
Existing	0.001	0.053	0.362	0.664	1.487
Proposed	0.001	0.041	0.317	0.594	1.360
DP-5.13					
Existing	0.002	0.006	0.285	0.870	2.927
Proposed	0.042	0.162	0.461	1.034	3.053
DP-5.14					
Existing	0.002	0.091	0.621	1.140	2.555
Proposed	0.008	0.113	0.646	1.161	2.568
DP-5.15					
Existing	0.001	0.015	0.271	0.571	1.459
Proposed	0.001	0.014	0.265	0.560	1.432
DP-5.16					
Existing	0	0.107	0.523	0.896	1.869
Proposed	0	0.108	0.528	0.905	1.889
DP-5.17					
Existing	0	0.305	1.306	2.175	4.396
Proposed	0	0.304	1.304	2.171	4.388
DP-5.18					
Existing	0	0.018	0.295	0.606	1.511
Proposed	0.008	0.050	0.528	0.666	1.590
DP-5.19					
Existing	0	0	0.006	0.017	0.059
Proposed	0	0	0.001	0.007	0.035
DP-5.20					
Existing	0	0	0.001	0.009	0.053
Proposed	0.009	0.034	0.054	0.075	0.144
DP-5.21					
Existing	0	0	0.004	0.046	0.269
Proposed	0.001	0.005	0.011	0.055	0.276

Table 10 Discharge Volumes (af) – Segment 6

	Design Storms				
Design Point	1-inch	2-year	10-year	25-year	100-year
DP-6.1					
Existing	0	0	0.015	0.034	0.094
Proposed	0	0	0.008	0.022	0.067

	Design Storms				
Design Point	1-inch	2-year	10-year	25-year	100-year
DP-6.2					
Existing	0	0	0.002	0.010	0.045
Proposed	0	0	0	0.014	0.090
DP-6.3					
Existing	0	0.001	0.022	0.045	0.113
Proposed	0	0.001	0.021	0.043	0.108
DP-6.4					
Existing	0	0.036	0.176	0.301	0.628
Proposed	0	0.036	0.176	0.301	0.628
DP-6.5					
Existing	0	0	0.173	0.491	1.567
Proposed	0	0	0.173	0.491	1.567
DP-6.6					
Existing	0	0.012	0.202	0.415	1.035
Proposed	0	0.023	0.253	0.497	1.179
DP-6.7					
Existing	0	0.001	0.131	0.304	0.840
Proposed	0	0	0.109	0.267	0.768
DP-6.8					
Existing	0	0	0.013	0.069	0.303
Proposed	0	0	0.013	0.069	0.303
DP-6.9					
Existing	0	0.001	0.022	0.048	0.122
Proposed	0	0.001	0.022	0.047	0.121
DP-6.10					
Existing	0	0.014	0.140	0.271	0.639
Proposed	0	0.014	0.139	0.270	0.636
DP-6.11					
Existing	0	0	0.003	0.014	0.055
Proposed	0	0	0.003	0.014	0.053
DP-6.12					
Existing	0	0	0.002	0.009	0.037
Proposed	0	0	0.002	0.008	0.037
DP-6.13					
Existing	0	0.053	0.227	0.377	0.762
Proposed	0	0.052	0.224	0.372	0.752
DP-6.14					
Existing	0	0.190	0.576	0.878	1.605
Proposed	0	0.226	0.646	0.968	1.733

	Design Storms				
Design Point	1-inch	2-year	10-year	25-year	100-year
DP-6.15					
Existing	0.001	0.012	0.022	0.030	0.045
Proposed	0.001	0.012	0.022	0.029	0.044

Table 11 Discharge Volumes (af) – Segment 7

	Design Storms				
Design Point	1-inch	2-year	10-year	25-year	100-year
DP-7.1					
Existing	0	0.234	0.821	1.302	2.492
Proposed	0	0.257	0.875	1.376	2.605
DP-7.2					
Existing	0	0	0.027	0.077	0.247
Proposed	0	0	0.021	0.066	0.222
DP-7.3					
Existing	0	0.004	0.090	0.192	0.494
Proposed	0	0.004	0.090	0.192	0.494
DP-7.4					
Existing	0	0.148	0.634	1.055	2.132
Proposed	0	0.148	0.633	1.054	2.132
DP-7.5					
Existing	0	0.381	1.635	2.722	5.503
Proposed	0	0.380	1.631	2.715	5.488
DP-7.6					
Existing	0	0	0	0	0
Proposed	0	0	0	0	0.008
DP-7.7					
Existing	0	0	0.006	0.018	0.063
Proposed	0	0	0	0.005	0.031
DP-7.8					
Existing	0	0	0	0.018	0.090
Proposed	0	0	0.015	0.049	0.150
DP-7.9					
Existing	0	0.014	0.183	0.364	0.881
Proposed	0	0.014	0.183	0.364	0.881
DP-7.10					
Existing	0	0	0.004	0.010	0.029
Proposed	0	0	0	0.003	0.014

	Design Storms				
Design Point	1-inch	2-year	10-year	25-year	100-year
DP-7.11					
Existing	0	0.007	0.063	0.118	0.273
Proposed	0	0.007	0.063	0.118	0.273
DP-7.12					
Existing	0	0.007	0.054	0.100	0.224
Proposed	0	0.007	0.054	0.100	0.224

Table 12 Discharge Volumes (af) – Segment 8

	Design Storms				
Design Point	1-inch	2-year	10-year	25-year	100-year
DP-8.1					
Existing	0	0.517	1.813	2.878	5.518
Proposed	0	0.514	1.805	2.864	5.489
DP-8.2					
Existing	0	0.041	0.515	1.027	2.487
Proposed	0	0.053	0.532	1.043	2.524
DP-8.3					
Existing	0	0.330	1.269	2.059	4.046
Proposed	0	0.385	1.298	2.055	4.009
DP-8.4					
Existing	0	0	0.006	0.022	0.079
Proposed	0	0.010	0.058	0.102	0.220
DP-8.5					
Existing	0	0.261	0.646	0.927	1.571
Proposed	0.014	0.371	0.793	1.104	1.803
DP-8.6					
Existing	0	1.345	3.561	5.216	9.076
Proposed	0	1.338	3.542	5.189	9.028
DP-8.7					
Existing	0	0.024	0.105	0.162	0.291
Proposed	0	0.029	0.116	0.177	0.312
DP-8.8					
Existing	0.002	0.081	0.179	0.248	0.401
Proposed	0.005	0.110	0.225	0.303	0.474
DP-8.9					
Existing	0	0.001	0.024	0.051	0.132
Proposed	0	0	0.020	0.045	0.119

	Design Storms				
Design Point	1-inch	2-year	10-year	25-year	100-year
DP-8.10					
Existing	0	0.551	1.074	1.408	2.115
Proposed	0	0.538	1.052	1.380	2.074
DP-8.11					
Existing	0.013	0.135	0.253	0.331	0.497
Proposed	0.013	0.143	0.268	0.350	0.526

Table 13 Discharge Volumes (af) – Segment 9

	Design Storms				
Design Point	1-inch	2-year	10-year	25-year	100-year
DP-9.1					
Existing	0.041	0.369	0.675	0.873	1.296
Proposed	0.059	0.417	0.732	0.934	1.363

Table 14 Discharge Volumes (af) – Segment 10

	Design Storms				
Design Point	1-inch	2-year	10-year	25-year	100-year
DP-10.1					
Existing	0.005	0.120	0.250	0.338	0.532
Proposed	0.008	0.148	0.298	0.399	0.619
DP-10.2					
Existing	0	0.276	0.683	0.980	1.661
Proposed	0.001	0.284	0.689	0.983	1.652
DP-10.3					
Existing	0.005	0.111	0.230	0.310	0.488
Proposed	0.006	0.116	0.237	0.319	0.498
DP-10.4					
Existing	0	0.212	0.607	0.909	1.628
Proposed	0	0.228	0.636	0.945	1.676
DP-10.5					
Existing	0	0.094	0.195	0.264	0.415
Proposed	0.004	0.094	0.195	0.264	0.415
DP-10.6[1]					
Existing	0	0.055	0.290	0.505	1.072
Proposed	0	0.074	0.317	0.527	1.122

	Design Storms				
Design Point	1-inch	2-year	10-year	25-year	100-year
DP-10.7					
Existing	0	0.001	0.039	0.086	0.229
Proposed	0	0.010	0.052	0.094	0.193
DP-10.8					
Existing	0	0.007	0.043	0.078	0.172
Proposed	0	0.011	0.055	0.091	0.197
DP-10.9					
Existing	0	0.133	0.370	0.550	0.975
Proposed	0	0.153	0.405	0.593	1.031
DP-10.10					
Existing	0	0.009	0.020	0.026	0.042
Proposed	0.001	0.010	0.021	0.028	0.043
DP-10.11&10.13					
Existing	0.002	0.169	0.419	0.604	1.037
Proposed	0.001	0.131	0.377	0.560	0.989
DP-10.12					
Existing	0	0.019	0.086	0.145	0.297
Proposed	0	0.027	0.087	0.135	0.267
DP-10.14					
Existing	0.014	0.643	1.423	1.968	3.182
Proposed	0.037	0.665	1.426	1.958	3.150
DP-10.15					
Existing	0	0.007	0.121	0.248	0.619
Proposed	0	0.017	0.161	0.311	0.729

Standard 3: Stormwater Recharge

The Project complies with Standard 3 to the maximum extent practicable.

A combination of structural and non-structural stormwater BMPs are used to meet Standard 3 to the maximum extent practicable. Along portions of the Project located in critical areas, structural stormwater BMPs are proposed to promote recharge. These areas of increased infiltration are basins or swales with check dams spaced to achieve the most effective recharge based on the longitudinal slope of the swale.

Additionally, stormwater from the bike path will discharge to the adjacent vegetated areas where stormwater will naturally infiltrate under the majority of storm events. This approach is a non-structural stormwater BMP known as impervious area disconnection, which redirects stormwater from areas of impervious cover to areas of pervious cover. This non-structural BMP provides stormwater recharge, and although DEP protocols do not provide credit for this feature, EPA guidance notes pollutant and volume reductions from this BMP type.

As noted previously, the Project evaluated whether additional structural stormwater BMPs would be practicable in order to more closely approximate annual recharge from pre-construction conditions. However, these BMPs would require additional impacts to existing vegetation and wetland resources and are impractical due to maintenance requirements and costs and would have provided minor improvement over the currently proposed stormwater management design.

The recharge calculations for the proposed structural stormwater BMPs (areas of increased infiltration) are provided in Table 15. The provided recharge calculations do not include the potential recharge volume from the conveyance swales or the non-structural stormwater BMP which are not considered recharge BMPs by MassDEP's Stormwater Management Handbook.

Table 15 Summary of Recharge Calculations

Infiltration BMP	Provided Recharge Volume (cf)
P-5.8B	226
P-5.14B	191
P-5.18B	46
P-6.2	473
P-6.6A	413
P-7.1	104
P-8.2B	578
P-8.3B	1,262
P-8.4B	578
P-8.5A	816
P-10.6A	653
P-10.7A	198
P-10.12A	258
P-10.13A	320
Total Recharge Provided	6,116
Total Recharge Required	8,971
Total Recharge Required (with Capture Area Adjustment)	21,121

The soil evaluation, computations, and supporting information are provided in Appendix C.

Standard 4: Water Quality

The Project complies with Standard 4 to the maximum extent practicable.

As described above, the Project is proposing structural and non-structural stormwater BMPs to provide stormwater treatment, detention, and infiltration that will provide water quality treatment.

As noted previously, the Project completed an evaluation of additional structural stormwater BMPs. These BMPs were determined to be impractical due to long-term maintenance

requirements, additional impacts to vegetated areas and wetland resources, engineering challenges, costs, and negligible benefits in comparison to proposed stormwater management design. From a water quality perspective, this conclusion considered that the bike paths do not have a source of contaminants to the path surface, and therefore little to no contaminants will be washed off the path surface by stormwater runoff (see the Standard 5 discussion below). Other than in emergency situations, vehicular access along the path is limited to bi-weekly mowing over the shoulder by DCR, annual mowing of the duct bank, inspections by Eversource approximately once every three years, and other maintenance as needed by both Eversource and DCR. The path will not be plowed or treated in the winter. Thus, the Project will not have a significant impact on water quality.

However, the Project will implement areas of increased infiltration with check dams along portions of the path to improve water quality. In addition, the Project proposes:

- One area where the area of increased infiltration will be widened to create a greater infiltration area;
- One area where an area of increased infiltration basin will be added to mitigate flows onto the roadway; and
- Twelve areas where areas of increased infiltration were added to provide treatment of the water quality volume to the maximum extent practicable.

Per the Massachusetts Stormwater Standards, BMPs within and draining to critical areas should calculate the water quality volume based on 1-inch of runoff while BMPs outside of these resource areas shall be calculated using the 0.5-inch runoff. While the majority of the BMPs are within the critical areas of a Zone II Wellhead Protection Area ("WPA") or a Coldwater Fishery Resource, six BMPs do fall outside of these resource areas (P-6.2, P-6.6, P-10. 7, P-10.6, P-10.7, P-10.12, and P-10.13.). Additionally, the Stormwater Management Bylaw Regulations for the Town of Sudbury require that the water quality volume for sizing of BMPs shall be based on the one-inch runoff volume. In order to meet by Sudbury Stormwater Bylaws and conservatively comply with the Massachusetts Stormwater Standards, the water quality volume was calculated using a one-inch rainfall depth across the impervious area of the entire project.

The water quality volume calculations for the proposed structural stormwater BMPs (areas of increased infiltration) are provided in Table 16. The provided recharge calculations do not include the potential treatment volume from the conveyance swales or the non-structural stormwater BMP which are not considered treatment BMPs by MassDEP's Stormwater Management Handbook.

Table 16 Summary of Water Quality Volume Calculations

Treatment BMP	Provided Water Quality Volume (cf)
P-5.8B	226
P-5.14B	191
P-5.18B	46
P-6.2	473
P-6.6A	413
P-7.1	104

Treatment BMP	Provided Water Quality Volume (cf)
P-8.2B	578
P-8.3B	1,262
P-8.4B	578
P-8.5A	816
P-10.6A	653
P-10.7A	198
P-10.12A	258
P-10.13A	320
Total Water Quality Volume Provided	6,116
Total Water Quality Volume Required	18,847

Computations and supporting information are provided in Appendix D.

Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

This standard does not apply. The Project's end use will be a bike path, which is not considered a LUHPPL.

Standard 6: Critical Areas

The Project complies with Standard 6 to the maximum extent practicable. The Project is proposing structural and non-structural stormwater BMPs to provide stormwater treatment, detention, and infiltration to the proposed bike path and avoid impacts to critical areas.

The Project passes through one Zone II Wellhead Protection Area ("WPA") and a Coldwater Fishery Resource, which are considered critical areas. Although the Project avoids work within vernal pools (which qualify as Outstanding Resource Waters ("ORWs")) or vernal pool habitat, there are eight vernal pools within the ROW in Sudbury. The potential stormwater impacts (peak discharge rates and volume) to these resources were evaluated in Standard 2 above.

In critical areas, the Stormwater Management Standards require that at least 44% of the total suspended solids ("TSS") be removed prior to discharge into an infiltration structure. This requirement would typically require multiple pretreatment practices in series. The Stormwater Handbook identifies several acceptable stormwater treatment BMPs for critical areas, including bioretention areas, sand or organic filters, and infiltration basins, trenches, or subsurface structures. The Stormwater Management Standards also require that BMPs be set back 100 feet from vernal pools and that all infiltrating BMPs be located at least 50 feet from any surface water including wetlands, which limits the available space for such features within this linear corridor. As noted previously in the report the Project evaluated additional structural stormwater BMPs These BMPs were determined to be impractical due to long-term maintenance requirements, additional impacts to vegetated areas and wetlands, engineering challenges, and negligible benefits in comparison to proposed stormwater management design.

The proposed measures also exceed what is typically incorporated into rail trail projects, especially since stormwater runoff from bike paths is a limited source of pollutants such as total suspended solids and phosphorus.

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the Maximum Extent Practicable

As required under Standard 7, the Project is designed to comply with Stormwater Management Standards 2, 3, 4, and 6 to the maximum extent practicable. (Standard 5 does not apply).

Please refer to the discussion above for each of these Standards for the applicable computations and supporting information.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Controls

The Project fully complies with Standard 8. As required, the proposed erosion and sedimentation controls are shown on the Project plans. The Project will disturb more than one acre of land; thus, coverage under the Environmental Protection Agency ("EPA") National Pollutant Discharge Elimination System ("NPDES") Construction General Permit is required. Under this permit, a Stormwater Pollution Prevention Plan ("SWPPP") will be developed and submitted before land disturbance begins. Drafts of Eversource and DCR's SWPPP manuals are attached with this report in Appendix E.

Standard 9: Operation and Maintenance Plan

The Project fully complies with this standard. A draft Long-Term Operation and Maintenance (O&M) Plan for the stormwater management system is provided in Appendix F.

Standard 10: Prohibition of Illicit Discharges

This standard does not apply. There is no sanitary sewer infrastructure known to exist on-site. The stormwater management system has been designed in compliance with current standards. Once the Project is constructed a finalized and signed illicit discharge statement will be provided.

3

Additional Municipal Rules and Regulations

As demonstrated below, the proposed Project complies with the Design and Performance Criteria identified in Section 8.0.A parts 3, 4, and 5 of the Stormwater Management Bylaw Regulations for the Town of Sudbury.

3A. Environmentally Sensitive Site Design

The Project preserves the existing natural hydrologic conditions with respect to the ground and surface water to the maximum extent feasible. The design limits the amount of vegetation clearing and earthwork though the corridor. The Project uses vegetated shoulders and conveyance swales with check dams to promote infiltration and recharge to maintain the existing drainage patterns.

3B. Low Impact Development

The Project incorporates Low Impact Design where feasible including conveyance swales, areas of increased infiltration, impervious area disconnect, and low impact sustainable landscaping such as combined herbaceous/woody seed mix along the bike path. These design elements provide treatment while also preserving the existing landscape as much as possible.

3C. Limiting Contaminants and Pollution - Best Management Practices (BMPs)

The Project will be used by pedestrians and bicyclists, which will not contribute significant contaminants to the path surfaces. Other than in emergency situations, vehicular access along the path will be limited to bi-weekly mowing over the shoulder by DCR, annual mowing of the duct bank, inspections by Eversource approximately once every three years, and other periodic maintenance as needed by both Eversource and DCR. The path will not be plowed and/or treated in the winter. The proposed measures exceed what is typically incorporated into rail trail projects, especially since stormwater runoff from bike paths is a limited source of pollutants such as total suspended solids and phosphorus.

The Project was designed to include the use of areas of increased infiltration and conveyance swales along portions of the project to promote infiltration and recharge, consistent with DCR's standard design for all its rail trail facilities. In addition, the Project proposes:

- One area where the area of increased infiltration will be widened to create a greater infiltration area
- One area where an increased area of infiltration basin will be added to mitigate flows onto the roadway
- Twelve additional areas where areas of increased infiltration were added.

These areas of increased infiltration have additional check dams that were placed to maximize infiltration above that of a standard conveyance swale and provide treatment of the water quality volume to the maximum extent practicable.

3D. Water Quality Volume

The Sudbury Stormwater Regulations require that water quality volume for sizing of BMPs shall be based on 1-inch of runoff from the net new impervious area. This requirement was met.

3E. Methodology

The hydrologic analysis for the existing and proposed conditions, as previously described, was determined using HydroCAD modeling software which is based on the NRCS Technical Release 20 and 55 (TR-20 and TR-55) methodology.

3F. Design Storms: 1-inch, 2-, 10-, 25-, and 100-year

The rainfall-runoff response of the Site under the existing and proposed conditions was analyzed for storm events with recurrence intervals of 2, 10, 25, and 100 years, with rainfall amounts of 3.2", 4.8", 6.0", and 8.6", respectively, as outlined by the Stormwater Management Bylaw Regulations for the Town of Sudbury. A rainfall depth of one inch (1") was also evaluated, as outlined by the Stormwater Management Bylaw Regulations

for the Town of Sudbury. The results of the analysis, as summarized in Tables 3 to 8, are found in the above Section 2, Standard 2.

3G. Pre and Post Sub-Watershed

The Site was analyzed for the pre and post development, at designated design control points.

3H. Land Area for Existing and Proposed Conditions

The Site was analyzed using the same land area for the existing and proposed conditions per Section 8.0.A.3.h of the Sudbury Stormwater By-Law Regulations.

3I. Total Volume of Discharge and Peak Rates

The total volume of discharge and peak rates were calculated and are documented in the discussion of MassDEP Standard 2 in this report.

3J. Redevelopment Standards

Under this section of the Bylaw Regulations the Project must be designed in accordance with the redevelopment checklist provided in the latest Massachusetts Stormwater Handbook. The checklist provides additional details on compliance with the Stormwater Management Standards and specifically the standards that redevelopment projects are required to meet to the maximum extent practicable. The Project complies with the redevelopment checklist; see discussion of compliance with Standard 7 in Chapter 2 above.

4. Water Reuse/Water Conservation

This standard is not applicable as this Project does not include any buildings and irrigation is not proposed.

5. Landscape Design

The Project will restore all disturbed areas outside the 10-foot-wide MCRT using a native seed mix with a focus on developing herbaceous and low-growing woody vegetation over the two-foot shoulders and the duct bank (a 5-foot area). In addition, any areas outside of the 19-foot-wide maintained corridor (which includes the 10-foot paved MCRT, two 2-foot shoulders, and 5-foot area over the duct bank) will be allowed to naturally revegetate with herbaceous and taller woody vegetation.

Appendix A – Standard 1 Computations and Supporting Information

Appendix C – Standard 3 Computations and Supporting Information

Appendix D – Standard 4 Computations and Supporting Information

Appendix E – Standard 8 Supporting Information (Draft SWPPPs Manual)

Appendix F – Standard 9 Supporting Information (Operation and Maintenance Manual)

Appendix G – DEP Checklist for Stormwater Report