

Table 5.2 Non-Vascular SoCC Detected in the Surveyed Area by CBCL in 2022

Common Name	Scientific Name	SARA / COSEWIC Status	NS ESA	NS S-Rank	# of Sites	# of Specimens*
Lichens						
Blue Felt Lichen	<i>Pectenیا plumbea</i>	SC/SC	V	S3	1**	3
Blistered Tarpaper Lichen	<i>Collema nigrescens</i>	-	-	S3	1	1
Acadian Jellyskin Lichen	<i>Leptogium acadiense</i>	-	-	S3S4	5	29
Birdnest Jellyskin Lichen	<i>Scytinium tenuissimum</i>	-	-	S2S3	1	1
Shaggy Fringed Lichen	<i>Anaptychia palmulata</i>	-	-	S3S4	26	58
Powdered Fringe Lichen	<i>Heterodermia speciosa</i>	-	-	S3S4	11	107
Fringe Lichen	<i>Heterodermia neglecta</i>	-	-	S3S4	1	1
Bryophytes						
Yew-leaved Pocket Moss	<i>Fissidens taxifolius</i>	-	-	S3	1	1
Total:					47	200

*Minimum

** Detected just outside Study Area by CBCL but included here due to previous recent reports within Study Area (Strum Consulting, 2022).

SC= Special Concern

V= Vulnerable

5.2.1 Blue Felt Lichen

Blue Felt Lichen (*Pectenیا plumbea*), is a distinctive large gray-blue foliose lichen with copper-coloured reproductive structures (apothecia) scattered over the upper surface of the thallus and a felty blue-black underside (hypothallus). Blue Felt Lichen is considered intolerant of bright sunlight and grows on mature, coarse-barked trees (particularly Red Maple, White Ash and Yellow Birch in NS) in deciduous or mixed deciduous/coniferous forests where light levels increase during winter months but where there is protective shade in summer (COSEWIC, 2010d). It is most commonly found from 50 cm above ground level up to about 2 m. It tends to be more common in low-lying areas with frequent fog or at higher elevations where there is cloud, or in areas with topographic features that help to trap moisture, such as valleys, swamps, and near watercourses (COSEWIC, 2010). It is very sensitive to acid rain as well as to changes in humidity regimes.

Globally, Blue Felt Lichen is part of the eastern North America-western European lichen species assemblage (Galloway 2008; Hinds and Hinds, 2007; Maass & Yetman 2002). Within Canada, the Blue Felt Lichen is found only in the Atlantic Provinces, and is most frequent in Nova Scotia, where 88 occurrence locations were known as of 2010 (COSEWIC, 2010). This lichen is listed as 'Special Concern' under SARA, as 'Vulnerable' under the NS ESA (2013) and as S3 (or 'Vulnerable') in Nova Scotia by the AC CDC.



Photo 5-5 Blue Felt Lichen (*Pectenium plumbeum*) observed just outside the Study Area.

Blue Felt Lichen was found by CBCL at a single location just beyond the anticipated Project footprint. Strum Consulting has also confirmed this species at two locations within the Study Area (Strum Consulting, 2022). The location discovered by CBCL is depicted on Figure 5.1.

5.2.1 Acadian Jellyskin Lichen

Acadian Jellyskin Lichen (*Leptogium acadiense*) is a foliose jelly lichen that has recently been recognized as a separate species from the Bearded Jellyskin Lichen (*Leptogium saturninum*) (Stone et al., 2016). Apparently endemic to northeastern North America, this jellyskin lichen grows on a variety of tree bark, especially Poplars (*Populus* spp.) and willow, and sometimes on mossy rocks, similar to its 'parent' species *L. saturninum* (Brodo et al., 2001). This species is ranked as S3S4 (or 'Vulnerable' to 'Apparently Secure') in Nova Scotia by the AC CDC.



Photo 5-6 Acadian Jellyskin Lichen (*Leptogium acadense*) observed within the Study Area.

CBCL ecologists detected this species at five locations (supporting an estimated 29 specimens) within the Study Area during the 2022 field surveys. Within the Study Area, most occurrences of this species were noted on American Beech. Locations are depicted on Figure 4.2.

5.2.2 Blistered Tarpaper Lichen

Blistered Tarpaper Lichen (*Collema nigrescens*) is a cyanolichen with conspicuous pustules and often abundant apothecia. It prefers mature Red Maples found in mature treed swamps. It can also be found growing on hardwoods along disturbed forest edges (Hinds & Hinds, 2007). It is ranked S3 ('Vulnerable') in Nova Scotia by the AC CDC.

CBCL ecologists detected a specimen of this species at a single location (Figure 4.2) within the Study Area during the 2022 field surveys.

5.2.1 Powdered Fringe Lichen

Powdered Fringe Lichen (*Heterodermia speciosa*) is a foliose lichen species which can reach a thallus width of about 4 cm. The upper surface is white to cream-colored or brownish to

bluish gray. The lower surface is pale to dark brown, with scattered rhizines. It occurs on sunny but moist rocks or tree trunks in humid conditions. It is widely distributed in subtropical to temperate areas, including much of eastern North America (Nash et al., 2002).



Photo 5-7 Powdered Fringe Lichen (*Heterodermia speciosa*) specimen observed within Study Area.

CBCL ecologists detected this species at 11 locations, supporting an estimated 107 specimens, within the Study Area during the 2022 field surveys. It was typically growing on the trunks of hardwood trees. Locations are depicted on Figure 4.2.

5.2.2 Fringe Lichen

Fringe Lichen (*Heterodermia neglecta*) is a recently-described species of lichen which occurs in mid-elevation mixed-hardwood forests in eastern North America and temperate forests of similar elevation in South Korea (Lendemer et al., 2007). In Canada, it has been documented to occur in Nova Scotia, New Brunswick, Ontario, Quebec, and Newfoundland (NatureServe Explorer, 2023).

Fringe Lichen can be distinguished by its corticolous, foliose gray-to blue-gray or greenish blue thallus. The upper surface of the thallus is corticated, smooth and uneven. The underside of the thallus lacks a cortex and is white with small patches of orange pigment, particularly near the lobe tips. The lobe tips are occasionally frosted in appearance. The lobes are quite flat, rather than ascending, and the lateral lobes are short. As the fungal component known as hyphae age, the underside of the thallus becomes brown, or occasionally dark brown or black, in the centre.



Photo 5-8 Fringe Lichen (*Heterodermia neglecta*) specimen observed within Study Area.

In Nova Scotia, *H. neglecta* is considered a SoCC, as it is listed as ‘Apparently Secure’ to ‘Vulnerable’ (S3S4). CBCL ecologists detected a specimen of this species at a single location within the Study Area during the 2022 field surveys (Figure 4.2).

5.2.3 Birds-nest Jellyskin Lichen

Birds-nest Jellyskin Lichen (*Scytinium tenuissimum*) is a small jelly lichen which typically occurs on sandy soil, often among mosses, but sometimes also on bark or sandstone (Hinds and Hinds, 2007). It is ranked as S2S3 (or ‘Imperiled’ to ‘Vulnerable’) in Nova Scotia by the AC CDC.



Photo 5-9 Birdsnest Jellyskin Lichen (*Scytinium tenuissimum*) observed within the Study Area.

CBCL ecologists detected a specimen of this species at a single location within the Study Area during the 2022 field surveys (Figure 4.2).

5.2.4 Shaggy Fringed Lichen

Shaggy Fringed Lichen (*Anaptychia palmulata*) is a foliose lichen which is endemic to eastern North America and eastern Asia (Esslinger, 2007). It grows on tree bark or occasionally shaded rocks (Brodo et al., 2001; Wong and Brodo, 1990). In Ontario, it is said to grow on maples (*Acer* spp.) and ash (*Fraxinus* spp.) in the southern portion of the province, and on cedar (*Thuja occidentalis*) further north (Lewis and Brinker, 2017). Flenniken (1999) states this species grows in moss-covered habitats near the base of trees and on shaded rocks throughout the eastern US, except along the southern Atlantic and Gulf Coast. Shaggy Fringed Lichen is one of numerous sensitive species considered lost in the Great Lakes region due to the combined effects of air pollution and habitat loss (e.g., Wetmore, 1989; Nelson et al., 2007). It has also been reported as uncommon and potentially declining in New England (Hinds and Hinds, 2007). Shaggy Fringed Lichen is ranked as S3S4 (or 'Vulnerable' to 'Apparently Secure') in Nova Scotia by the AC CDC.



Photo 5-10 Shaggy Fringed Lichen (*Anaptychia palmulata*) observed within the Study Area.

CBCL ecologists detected this species at 26 locations (representing at least 58 specimens) within the Study Area during the 2022 field surveys. This species was found growing predominantly on mature American Beech, but occasionally Red Maple, trunks. Locations are depicted on Figure 4.2.

5.2.5 Yew-leaved Pocket Moss

Yew-leaved pocket moss (*Fissidens taxifolius*) (Photo 5-11) is a medium-sized species of moss belonging to the Pocket Moss Family (Fissidentaceae). Yew-leaved pocket moss has leafy stems about 4-9 mm long that are erect or ascending. Stems are light green to light brown, hairless, and unbranched. Both the upper leaf side and lower leaf side are light green, yellowish green, or dark green. Their two-ranked leaves result in pocket mosses resembling miniature ferns. This species is said to grow on damp, shaded soil, humus, and rocks (FNA, undated). This moss is rarely found on rocks or tree bark, even in moist shaded situations (Illinois Wildflowers, undated).

Yew-leaved pocket is widely distributed in North America, South America, and Eurasia (Illinois Wildflowers, undated). The AC CDC ranks Yew-leaved pocket moss as S3 in NS,

meaning it is currently considered ‘Vulnerable’ in the province because of rarity due to restricted range, relatively few populations (often 80 or fewer), recent or widespread declines, or other factors making it vulnerable to extirpation from the province.



Photo 5-11 Yew-leaved pocket moss (*Fissidens taxifolius*) observed within the Study Area.

CBCL ecologists detected this species at a single location within the Study Area during the 2022 field surveys. This location is depicted on Figure 4.2.

5.3 Invasive Species

Many vascular plant species not native to Nova Scotia were detected within the Study Area, however the vast majority of these are considered naturalized and are not currently considered a threat to native ecosystems. One species of some invasive concern was noted and is described in the following subsections. Locations are depicted on Figure 5.1.

5.3.1 Alder Buckthorn

Alder Buckthorn (*Frangula alnus*) is a tall spineless deciduous shrub in the family Rhamnaceae. It is native to Europe and parts of Africa and Asia, though has also been introduced to eastern North America. It is thought to have reached Canada about 100

years ago. The distinctive glossy, ovate, and toothless leaves are arranged alternately on short petioles and have 6–10 pairs of prominently grooved and slightly downy veins. The flowers are small, and star shaped, produced in May to June in clusters of two to ten in the leaf axils. Fruits are small black berries ripening in early autumn. These fruits are readily eaten by birds and small mammals, which then disperse the 2 or 3 seeds present within each berry. Alder Buckthorn grows in wet soils in open woods, scrub, hedgerows and bogs, thriving well in sunlight and moderate shade. It invades forests and grows in the understory in spots with a lot of light, usually where a tree has fallen. Its dense canopy of leaves then shades the soil surface and prevents native seedlings from establishing in these areas (University of New Hampshire, 2019). In NS, it is known to be invasive in swampy forests (Munro et al., 2014).

With the Study Area, Alder Buckthorn was observed in several locations, generally within treed wetlands or riparian zones. Recorded locations are depicted on Figure 5.1.

5.4 Vegetation Community Classification

A total of 11 vegetation community groups and 25 vegetation types (VTs) were identified within the Study Area in 2022. These are listed in Table 5.3.

Table 5.3 Summary of Vegetation Groups and Vegetation Types Identified within the Nuttby Project Area in 2022

Community Type	Vegetation Groups	Vegetation Types (VTs)	Source of Category
Upland Communities	Spruce-Hemlock Forest Group	<ul style="list-style-type: none"> SH5 Red Spruce - Balsam Fir / Schreber’s Moss SH6 Red Spruce - Balsam Fir / Stair-step moss - Sphagnum SH8 Balsam Fir / Wood fern / Schreber’s moss 	Neily et al., 2010
	Mixedwood Forest Group	<ul style="list-style-type: none"> MW1: Red Spruce - Yellow Birch / Evergreen wood fern 	Neily et al., 2010
	Tolerant Hardwood Forest Group	<ul style="list-style-type: none"> TH1a – Sugar Maple / Hay-scented fern TH1b – Yellow Birch / Hay-scented fern TH2 – Sugar Maple / New York fern / Northern Beech fern TH4 Sugar Maple – White ash / Silvery spleenwort – Baneberry TH5 Beech / Sarsaparilla / Leaf litter 	Neily et al., 2010

Community Type	Vegetation Groups	Vegetation Types (VTs)	Source of Category
	Shrubland	<ul style="list-style-type: none"> S5 – Sheep Laurel Inland Heath 	Porter et al., 2020
Wetland Communities	Wet Coniferous Forest Group	<ul style="list-style-type: none"> WC1 – Black Spruce / Cinnamon Fern / Sphagnum WC5 Red Spruce - Balsam Fir / Cinnamon Fern / Sphagnum 	Neily et al., 2010
	Wet Deciduous Forest Group	<ul style="list-style-type: none"> WD2 – Red Maple / Cinnamon Fern / Sphagnum 	Neily et al., 2010
	Forested Swamps	<ul style="list-style-type: none"> FS3 – Northern Hardwood Seepage Forest 	NCNH
	Shrub Swamps	<ul style="list-style-type: none"> SS1 – Alder Alluvial Shrubland SS2 – Alder Seepage Thicket 	NCNH
	Bogs (CNWC)	<ul style="list-style-type: none"> BG1 – Spruce Bog BG2 – Bog Moss Lawn BG3 – Leatherleaf- sheep laurel shrub bog 	MNAP MNAP
		<ul style="list-style-type: none"> BG4 – Sheep Laurel Dwarf Shrub Bog 	
		<ul style="list-style-type: none"> BG5 – Leatherleaf Boggy Fen 	NCNH
	Fens	<ul style="list-style-type: none"> FE1 – Sedge - Heath Fen / Sedge - Leatherleaf Fen Lawn FE2 – Sweetgale Fen / Sweetgale Mixed Shrub Fen 	MNAP
	Marshes	<ul style="list-style-type: none"> MR1 – Meadow Marsh/Cutover Swamp (Disturbed habitat) 	N/A

Three upland forest groups per the NSDNR FEC were identified within the Study Area; 'Spruce-Hemlock' (SH), "Mixedwood" (MW), and 'Tolerant Hardwood' (TH) (Table 5.3). One barrens vegetation group per the NSDNR BENS (Porter et al., 2020) was also identified: 'Shrubland' (S) (Table 5.3). Within these upland groups, a number of VTs were present, and are described below.

General wetland types were introduced and described in Section 4.2. The current section describes different VTs present within the larger wetland classes. Two forested wetland habitats per the NS DNR FEC were identified within the Study Area, these were 'Wet Coniferous' and 'Wet Deciduous' groups. 'Forested Swamp' habitat, as defined by the NCNH was also identified as present. All three of these wetland types also fit within the "Forested Swamp" category of the Canadian Wetland Classification System (CNCS) (National Wetlands Working Group, 1997). Four non-forested CNCS wetland types were also present, and included 'Shrub Swamps', 'Bogs', 'Marshes', and 'Fens'. Within these wetland groups, a number of VTs were present, and are described below.

5.4.1 'Spruce-Hemlock' Forest Group (NSDNR FEC)

The Spruce-Hemlock Forest Group is a mid to late successional group comprising predominantly of Red Spruce, Eastern Hemlock (*Tsuga canadensis*) and White Pine (*Pinus strobus*). Mid-successional stages are typically even-aged and develop into uneven-aged structure as they develop into late successional stages. Within the well-developed canopies, the mid-successional stages usually have a significant Balsam Fir along with Eastern Hemlock, Red Spruce, and White Pine in the overstory, changing to late successional stands of Hemlock and Red Spruce due to these species' longevity.

5.4.1.1 SH5 Red Spruce - Balsam Fir / Schreber's Moss

SH5 Red Spruce - Balsam Fir / Schreber's Moss: This mid-successional Vegetation Type (VT) has abundant red spruce with varying amounts of Balsam Fir. The presence of minor amounts of Red Maple and White Birch usually indicate recent disturbance events, whereas Yellow Birch, White Pine and Hemlock indicate development toward a later successional stage. SH5 is mainly associated with dry to fresh, nutrient poor to medium soils of glacial origin, which are generally medium to coarse textured and often stony. Red Spruce – Balsam Fir / Schreber's moss is a typical Acadian softwood VT found on zonal sites throughout mainland Nova Scotia and parts of Cape Breton. Red Spruce is usually the dominant overstory tree, although Balsam Fir may be abundant in some stands. Both species are often well represented as regeneration in the shrub layer. Hybrid (Red/Black) Spruce can also be found on more marginal sites. Low light availability often reduces the abundance of common woodland flora such as Wild Lily-of-the Valley, Goldthread (*Coptis trifolia*) and Bunchberry. A needle carpet is common under many stands, but coverage by Schreber's Moss (*Pleurozium schreberi*), Stair-step Moss (*Hylocomium splendens*) and Bazzania (*Bazzania trilobata*) can be extensive in some.



Photo 5-12 SH5 Red Spruce - Balsam Fir / Schreber's Moss VT observed within Nuttby II Study Area.

5.4.1.2 SH6 Red Spruce - Balsam Fir / Stair-step Moss - Sphagnum

SH6 Red Spruce - Balsam Fir / Stair-step Moss - Sphagnum: This mid-successional VT is very similar to SH5 (Red Spruce – Balsam Fir / Schreber's moss), but occurs on moister sites. Tree cover is mainly Red Spruce with varying amounts of Balsam Fir. Typically, minor amounts of Red Maple and White Birch indicate recent disturbance events, whereas Yellow Birch, White Pine and Eastern Hemlock indicate development toward a later successional stage. SH6 is mainly associated with fresh-moist to moist, nutrient medium soils of glacial origin, which are generally medium to coarse textured and often stony. This VT is found throughout mainland Nova Scotia and parts of Cape Breton. Red Spruce - Balsam Fir / Stair-step moss – Sphagnum is a typical Acadian softwood VT found on moist, zonal sites in Nova Scotia. Red Spruce is usually the dominant overstory tree, although Balsam Fir may be abundant in some stands. Both species are usually well represented as regeneration in the shrub layer. Hybrid (Red/Black) spruce can also be found on more marginal sites. Low light availability often reduces the abundance of woodland flora, but moist soils associated with this VT generally support a higher diversity of species than drier Red Spruce types. In more moist sites, herbs like Cinnamon Fern, Creeping Snowberry (*Gaultheria hispidula*), New York Fern (*Parathelypteris noveboracensis*), Interrupted Fern (*Osmunda claytoniana*) and Three-seeded Sedge (*Carex trisperma*) will be present. The bryophyte layer is characterized

by extensive coverage of mainly Stair-step Moss and Schreber's moss, with Sphagnum mosses present in wetter parts of the stand.



Photo 5-13 Example of SH6 Red Spruce - Balsam Fir / Stair-step Moss - Sphagnum vegetation type observed within Study Area.

5.4.1.3 SH8 Balsam Fir / Wood fern / Schreber's Moss

SH8 Balsam Fir / Wood Fern / Schreber's Moss: This early to mid-successional VT has abundant Balsam Fir with minor amounts of other softwood and hardwood species. Due to the short-lived nature of Balsam Fir, this VT is often associated with significant coarse woody debris and/or snags, as well as extensive Balsam Fir regeneration. Balsam Fir / Wood fern / Schreber's Moss usually follows stand-replacing disturbance events such as insect infestation, windthrow or harvesting. SH8 is mainly associated with fresh to moist, nutrient poor to medium soils of glacial origin. These soils are generally medium to coarse textured and often stony. This VT is found throughout mainland Nova Scotia and on the Cape Breton lowlands. Balsam Fir is the dominant overstory tree, with varying amounts of Red Maple, Red Spruce, White Spruce, Black Spruce, White Birch and Yellow Birch (although not usually all found in one stand). Balsam Fir regeneration can be extensive, with Red Maple usually present in lesser amounts. Other shrubs include Mountain Holly, Wild Raisin and American Mountain-Ash (*Sorbus americana*). Typical herb species include Evergreen Wood Fern (*Dryopteris intermedia*), Starflower (*Lysimachia borealis*), Wild Lily-of-the-Valley, Bunchberry, goldthread and Wood Sorrel. The often extensive bryophyte layer is made up

of Schreber's Moss, Stair-step Moss, Wavy Dicranum (*Dicranum scoparium*), Broom Moss, Hypnum Moss (*Hypnum imponens*) and Bazzania.

5.4.2 'Mixedwood' Forest Group (NSDNR FEC)

The Mixedwood Forest Group is an early to late successional group with the predominant tree species varying according to successional stages. Earlier successional stages are dominated by Red Maple, White Birch and Balsam Fir, but they usually contain residuals from past stand-level disturbances. Late successional stages contain Yellow Birch along with Red Spruce or Hemlock. Early and mid-successional stages are usually even-aged whereas late successional stages can develop uneven-aged characteristics due to the longevity of the dominant species.

5.4.2.1 MW1 Red Spruce - Yellow Birch / Evergreen Wood Fern

MW1: Red Spruce - Yellow Birch / Evergreen Wood Fern: This late successional VT has an overstory co-dominated by Red Spruce and Yellow Birch, with lesser and varying amounts of mostly shade-tolerant trees such as Sugar Maple, Hemlock, Beech, Balsam Fir, Red Maple, White Pine and White Ash. MW1 is mainly associated with fresh to fresh-moist, nutrient medium to rich soils of variable texture. Red Spruce - Yellow Birch / Evergreen wood fern is a climax Acadian mixedwood VT that can be found throughout mainland Nova Scotia but is most common in central and eastern sections of the province and along the Bay of Fundy shore. In eastern Nova Scotia, Balsam Fir can take the place of Red Spruce in this VT. The longevity and shade tolerance of the dominant overstory tree species aids in the development of old forest characteristics, maintained by gap disturbances. The shrub layer is moderately developed and includes mainly regenerating trees, Striped Maple and Fly Honeysuckle (*Lonicera canadensis*). Several fern species are common in the well-developed herb layer including Evergreen Wood Fern, New York Fern and Hay-Scented Fern. Wood Sorrel, Wood Aster (*Oclemena acuminata*), Rosy Twisted-stalk, Indian Cucumber Root (*Medeola virginiana*) and some Club-mosses (*Lycopodium* spp., *Dendrolycopodium* spp., etc.) are also common. Bryophyte development varies, with Schreber's moss and Stairstep Moss being the main species. Bazzania can also be common where coarse woody debris has accumulated on the forest floor.



Photo 5-14 MW1 typical vegetation, dominated by Red Spruce (*Picea rubens*), Yellow Birch (*Betula alleghaniensis*) and Evergreen Wood Fern (*Dryopteris intermedia*).

5.4.3 'Tolerant Hardwood' Forest Group (NSDNR FEC)

This vegetation type consists of mid to late successional hardwood species like Sugar Maple, Yellow Birch, American Beech, Red Maple, Ironwood (*Ostrya virginiana*), and White Ash. There is a variety of fern species in the understory along with a diverse shrub layer. Large scale disturbances are a rarity, and as a result these VTs can eventually transform into uneven-aged, old growth forests. The nutrient rich soils promote the growth of many rare plant species in Nova Scotia.

5.4.3.1 TH1a Sugar Maple / Hay-scented Fern

TH1a -Sugar Maple / Hay-scented fern: This late successional VT has an overstory dominated by Sugar Maple, Beech, and Yellow Birch, lesser Red Maple and scattered Red Spruce and White Spruce. Beech is abundant in both the overstory and understory. It occurs on dry sites with nutrient medium to rich soils of glacial origin. This VT is found throughout the province in the Cobequid Hills, North Mountain and Cape Breton Hills ecodistricts, and on the upper slopes of drumlins. However, TH1 is relatively uncommon in the lowland ecodistricts and does not occur in the Atlantic coastal ecoregion. Due to the long-lived and shade-tolerant nature of dominant overstory trees, this VT will develop old

forest characteristics maintained by gap disturbance. Stand level disturbance events are rare, with gaps or small patches usually created by individual tree mortality, wind or ice damage. In this variant, the shrub layer contains regenerating tree species along with Striped Maple, Fly-Honeysuckle and Mountain Maple (*Acer spicatum*). Beech and/or Striped Maple coverage in this layer can sometimes be extensive, strongly out-competing other species. Herb coverage is diverse, but generally dominated by Hay-scented Fern, and Evergreen Wood Fern. Other common species may include rose twisted stalk, Indian Cucumber Root, Wood Sorrel, Drooping Wood Sedge (*Carex arctata*), and Wood Aster. Spring ephemerals may include Carolina Spring-Beauty, Dutchman's-breeches and Trout Lily.



Photo 5-15 TH1a- Sugar Maple / Hay-scented fern vegetation type observed within Study Area.

5.4.3.2 TH1b Yellow Birch / Hay-scented Fern

TH1b – Yellow Birch / Hay-scented Fern: This VT is dominated by Sugar Maple and Yellow Birch in the overstory and is characterized by relatively moist, well-drained soils with medium to rich nutrient content. Within Nova Scotia, this VT is found on the upper slopes of the Cobequid Hills, North Mountain and Cape Breton Hills ecodistricts, making it susceptible to blow down and crown breakage from strong winds. These disturbances, and subsequently gaps in canopy coverage, allow for increased light penetration which promotes the growth and spread of hay-scented fern which dominates the herbaceous

stratum along with Evergreen Wood Fern. The remainder of the herb layer is comprised of a diversity of less abundant species, such as rose twisted stalk, Indian Cucumber Root, Wood Sorrel, Drooping Wood Sedge and Wood Aster. Common spring ephemerals include spring-beauty, Dutchman's-breeches and Yellow Trout Lily. The shrub layer for this VT contains regenerating tree species, primarily Sugar Maple and Yellow Birch, but also Striped Maple, Balsam Fir, Red Maple and Fly-Honeysuckle.



Photo 5-16 TH1b- Yellow Birch / Hay-scented Fern vegetation type observed within Study Area.



Photo 5-17 TH1b- Yellow Birch / Hay-scented fern vegetation type observed within Study Area.

5.4.3.3 TH2 Sugar Maple / New York Fern – Northern Beech Fern

TH2 -Sugar Maple / New York Fern – Northern Beech Fern: Sugar Maple / New York Fern – Northern Beech Fern is dominated by Sugar Maple and Yellow Birch in the overstory and is generally associated with fresh-moist, nutrient medium to rich soils of glacial origin. This VT occurs throughout the province in the Cobequid Hills, North Mountain and Cape Breton Hills ecodistricts and on the upper slopes of drumlins, but is relatively uncommon in lowland ecodistricts, and does not occur in the Atlantic coastal ecoregion. The long-lived and shade-tolerant nature of the dominant overstory trees results in this VT developing old forest characteristics that are maintained by gap disturbance. The ground vegetation community is diverse, but generally dominated by New York fern, Evergreen Wood Fern and Northern Beech Fern (*Phegopteris connectilis*). Rosy Twisted-Stalk, Indian Cucumber Root, Wood Sorrel, Drooping Wood Sedge and Wood Aster are also common. Spring ephemerals may include Spring-Beauty, Dutchman's-Breeches and Yellow Trout Lily. The shrub layer for this VT contains regenerating tree species along with Striped Maple, Fly-Honeysuckle, Beaked Hazelnut and Mountain Maple.

5.4.3.4 TH4 Sugar Maple - White Ash / Silvery Spleenwort - Baneberry

TH4 Sugar Maple - White ash / Silvery spleenwort – Baneberry: This late successional VT has an overstory dominated by Sugar Maple, White Ash and Yellow Birch. TH4 is the richest upland hardwood VT in Nova Scotia and, excluding floodplain forests, has the most diverse

suite of understory plants. Due to the long-lived and shade-tolerant nature of dominant overstory trees, this VT will develop old forest characteristics which are maintained by gap disturbance. Sugar Maple – White Ash / Silvery Spleenwort – Baneberry is one of several Acadian hardwood VTs found on zonal sites throughout Nova Scotia. TH4 is found on fresh-moist to moist, nutrient rich soils associated with seepage sites. These sites often occur where slope angle decreases as in toe slope positions and mid-slope benches. This VT is typically associated with (and found embedded within) larger tracts of TH1 and TH2 matrix forest. TH4 is mainly found in the Cobequid Hills, North Mountain and Cape Breton Hills ecodistricts.

Sugar Maple is the dominant overstory tree with lesser amounts of White Ash and Yellow Birch. Scattered ironwood (when present) is typically found in the lower canopy or high shrub layer. The shrub layer is dominated by regenerating hardwood (mainly Sugar Maple) along with Fly-Honeysuckle, Striped Maple, Mountain Maple and Beaked Hazelnut. Alternate-Leaved Dogwood (*Cornus alternifolia*), if present, is diagnostic of this VT. Spring ephemerals may include spring-beauty, Dutchman's-breeches and Yellow Trout Lily. The bryophyte layer is poorly developed, with moss cover generally restricted to tree trunks, stones and downed woody material.

5.4.3.5 TH5 Beech / Sarsaparilla / Leaf litter (NSDNR FEC)

TH5 Beech / Sarsaparilla / Leaf litter: This late successional VT has an overstory dominated by Beech that can sometimes dominate the shrub layer. Other than Beech, below canopy ground cover is typically sparse, aside from leaf litter on the forest floor. Prior to the introduction of Beech bark canker, the long-lived and shade-tolerant nature of Beech allowed this ecosystem to develop old forest characteristics maintained by gap disturbance. However, Beech / Sarsaparilla / Leaf litter is now relatively uncommon in the province.

Beech is the dominant overstory tree, with minor amounts of Sugar Maple, Red Maple and Yellow Birch. Species diversity and coverage in the shrub and herb layers are typically very low – a condition likely related to the phytotoxicity (toxicity to plants) of Beech litter leachate. Some shrub and herb cover can be found under mixed species portions of the canopy. Understory species include regenerating trees, Striped Maple, Sarsaparilla (*Aralia nudicaulis*) and a variety of ferns. As in other tolerant hardwood VTs, the bryophyte layer is poorly developed, with moss cover generally restricted to tree trunks, stones and downed woody material.

TH5 is found on dry to fresh, nutrient-medium soils derived from glacial till or colluvium. This VT is mainly found in hilly topography associated with the Nova Scotia Uplands ecoregion and the North Mountain and South Mountain ecodistricts. It can also occur on the crests of drumlins.

5.4.4 Shrublands (NS BEC)

Barrens are a type of ecosystem which develop in areas with harsh climactic or soil conditions and low shrub-dominated vegetation communities (Porter et al., 2020). Many barrens in NS have been classified according to the *Barrens Ecosystems in Nova Scotia: Classification of Heathlands and Related Plant Communities* (Porter et al., 2020). These vegetation communities mainly consist of species belonging to the heath (Ericaceae) or heath-like Crowberry (Empetraceae) families, which are often referred to as ericaceous shrubs. Common ericaceous shrub species of dry barren habitats in NS include Sheep Laurel (*Kalmia angustifolia*), Late Lowbush Blueberry (*Vaccinium angustifolium*), Black Huckleberry (*Gaylussacia baccata*), and Rhodora (*Rhododendron canadense*).

A single barren vegetation group, Shrubland, was documented within the Study Area, where it was represented by a single vegetation type. This is described in the following subsection.

5.4.4.1 S5 Sheep Laurel Inland Heath (BENS)

This vegetation type is a type of shrub barren which is dominated by Sheep Laurel (*Kalmia angustifolia*) on inland barrens occurring over surficial deposits of glacial till or sand. Indicator species include Sheep Laurel, frequently with lesser amounts of Rhodora and Wild Raisin frequently occur. Eastern Teaberry (*Gaultheria procumbens*) and Lowbush Blueberry are also frequently present, as are the taller Bristly Dewberry (*Rubus hispidus*) and Black Chokeberry (*Aronia melanocarpa*). Black Spruce and Eastern White Pine are the most common tree species encountered within the association (though not likely to be tree-sized). Bracken Fern (*Pteridium aquilinum*) is frequent and abundant. Grey Reindeer Lichen (*Cladonia rangiferina*) and Reindeer Lichen (*Cladonia arbuscula* ssp. *squarrosa*) both commonly occur, but do not generally provide more than 5% cover (Porter et al., 2020). Wavy-leaved Broom Moss (*Dicranum polysetum*) is frequently encountered.

5.4.5 'Wet Coniferous' Forest Group (NSDNR FEC)

The VTs associated with the 'Wet Coniferous' forest group develop in areas with very high water tables, or with surface water present. Black spruce, tamarack, and Balsam Fir are the most common tree species in these VTs. Vegetation in the shrub and herb layer is often ericaceous species with high tolerances with water and poor soils. These VTs may arise from various types of disturbances such as fluctuating water levels, windthrow, insects, and disease.

5.4.5.1 WC1 - Black Spruce / Cinnamon Fern / Sphagnum

WC1 - Black Spruce / Cinnamon Fern / Sphagnum: This VT is typically associated with moist to wet sites that are nutrient poor. Within this study area, this VT is dominated in the tree stratum by Black Spruce, with lesser amounts of Balsam Fir. The understory supports high herbaceous cover with low to medium levels of woody species. Vascular plants within the understory include Cinnamon Fern, Mountain Holly, Creeping Snowberry, goldthread, and

Three-Seeded Sedge. The underlying substrate for ground vegetation is dominated by *Sphagnum* moss in most locations.



Photo 5-18 Example of WC1 - Black Spruce / Cinnamon Fern / Sphagnum vegetation type observed within the Study Area.

5.4.5.2 WC5 Red Spruce - Balsam Fir / Cinnamon Fern / Sphagnum

Red Spruce – Balsam Fir/ Cinnamon Fern / Sphagnum forest is found on soils with reduced rooting potential and relatively low nutrient availability, but sites are generally more productive than those supporting wet Black Spruce forests (e.g., WC1 and WC2). It is a low-elevation ecosystem characterized by Red Spruce dominance and high Sphagnum moss cover. The Red Spruce – Balsam Fir/ Cinnamon Fern / Sphagnum forest VT is found on lowland plains and gently rolling uplands. It is common on moderately exposed flats, depressions and in lower and toe positions of gentle slopes; aspect of the slope is variable. Soils are usually derived from fine to moderately textured glacial tills with low to moderate nutrient availability. Peat accumulation can be high, and while some stands grow on organic soil, most are on gleyed or heavily mottled mineral deposits. Sites are slightly to moderately mounded and generally have more microtopography than other wet coniferous forests in Nova Scotia. This VT is found throughout Nova Scotia, but is more common in the Eastern and Western ecoregions of the mainland.

The evergreen canopy is dominated by Red Spruce with lesser but frequent Balsam Fir. Few other tree species are frequent in the canopy, but it is well developed with moderate to high crown closure. Woody shrub and herbaceous cover is low to moderate. Forest plants common to wet forest (e.g., Cinnamon Fern) are present, but few species are prominent. Sphagnum mosses largely dominate the dense bryophyte layer.



Photo 5-19 Example of WC5 Red Spruce - Balsam Fir / Cinnamon Fern / Sphagnum vegetation type observed within the Study Area.

5.4.6 'Wet Deciduous' Forest Group (NSDNR FEC)

This wet forest is dominated by species such as Red Maple and White Ash and may include mixed wood forest with Balsam Fir. VT in this group is associated with moderate to high nutrient content. Regenerating tree species are dominant in the shrub layer. The herb layer is well-developed herb layer includes many fern and sedge species.

5.4.6.1 WD2 – Red Maple / Cinnamon Fern / Sphagnum

WD2 – Red Maple / Cinnamon Fern / Sphagnum: This VT is a widespread maple swamp-type found throughout the province. It is characterized by a relatively high percentage cover of deciduous tree species, most typically Red Maple. Shrub stratum is typically moderate cover, but species poor, and may include regeneration of overstory species as well as other shrubs such as Speckled Alder (*Alnus incana*), Winterberry, and Wild Raisin.

Herbaceous layer diversity is also characteristically low, but may be of relatively high cover; Cinnamon Fern frequently dominates. Occasional species may include New York fern, Three-Seeded Sedge, Sensitive Fern, Dwarf Red Raspberry (*Rubus pubescens*), Violets (*Viola* spp.), Sarsaparilla and numerous others.



Photo 5-20 Example of WD2 – Red Maple / Cinnamon Fern / Sphagnum vegetation type observed within the Study Area.

5.4.7 Forested Swamps (FS) (NCNH)

The NSDNR FEC groups “Wet Coniferous Forest” and Wet Deciduous Forest” are both types of forested swamps, and were described earlier in this document, This section is focused on forested swamps documented on the Study Area that do not fit into the NSDNR FEC forest groups, but were determined by CBCL to be sufficiently mature and distinct to include here.

5.4.7.1 Northern Hardwood Seepage Forest (NCNH adapted)

Northern Hardwood Seepage Forest: This hardwood forest community, which has been adapted from the NCNH, is typically associated with poorly to very poorly drained soils that are semi-rich in nutrient content. Commonly occurring on lower mountain slopes with seep openings or seepage runs; the community is characterized by both upland and wetland plant species. Canopy species include tree species such as Sugar Maple, Yellow Birch, and, to a lesser extent, Balsam Fir and Red Spruce. The shrub layer can include Red Raspberry (*Rubus idaeus*), Red Elderberry (*Sambucus racemosa*), Hobblebush, Striped Maple,

and Speckled Alder. The herb layer is often diverse, containing species such as Slender Manna-Grass (*Glyceria melicaria*), spotted jewelweed (*Impatiens capensis*), Lady Fern, Dwarf Red Raspberry, Nodding Sedge (*Carex gynandra*), Rough Sedge (*Carex scabrata*), Mountain Wood Fern (*Dryopteris campyloptera*), Tall Meadow-Rue (*Thalictrum pubescens*), Sensitive Fern, Bluebead Lily (*Clintonia borealis*), Zigzag Goldenrod (*Solidago flexicaulis*), Red Baneberry (*Actaea rubra*), White Baneberry (*Actaea pachypoda*), Northern Beech Fern, Evergreen Wood Fern, Spotted Joe-Pye-Weed (*Eutrochium maculatum*), Grassleaf Goldenrod (*Euthamia graminifolia*), Bluejoint, and White Turtlehead (*Chelone glabra*).



Photo 5-21 Example of FS3 - Northern Hardwood Seepage Forest vegetation type within the Study Area.

5.4.8 Shrub Swamps (SS)

Swamps are defined in detail in Section 4.2.1. Shrub Swamps are generally classified according to shrub height, with low shrub swamps consisting of woody vegetation less than 2 m in height, and tall shrub swamps dominated by woody vegetation over that height. Several shrub swamp VTs were noted to occur within the Study Area, many of which were a combination of types. The main shrub swamp types encountered within the Nuttby Study Area were:

- ▶ SS1 - Alder Alluvial Shrubland (NCNH adapted)
- ▶ SS2 - Alder Seepage Thicket (NCNH adapted)

Each of these VTs are described below.

5.4.8.1 SS1 - Alder Alluvial Shrubland (NCNH adapted)

SS1 - Alder Alluvial Shrubland (NCNH adapted): These shrublands are dominated primarily by Speckled Alder. Abundance and composition of other woody species and herbs varies depending on the energy of the riparian system, becoming progressively denser and diverse in the fine textured silt soils of lower-energy floodplains. Alders are highly competitive in these environments, given both their flood tolerance and their habit to bend (rather than to break or uproot) during peak flows. While often occurring as a relatively narrow band (frequently <10 m wide) along watercourses, these communities may also occupy broader areas lateral to their associated watercourse, where topography allows. Alder's nitrogen-fixing ability, which provides nitrogen in the nutrient-poor, coarse substrate (typically gravel, cobble, sand and minor silt), affords additional competitive advantage of this species over other species. Red Maple and American Elm (*Ulmus americana*) may occur sparsely in tree form. Common associates in the shrub stratum may include Red Osier Dogwood (*Cornus sericea*) and various species of Willow. Herbaceous associates may include Bluejoint, Goldenrods (*Solidago* spp.), Tall white aster (*Doellingeria umbellata*), Ostrich Fern (*Matteucia struthiopteris*), Swamp Candles (*Lysimachia terrestris*), Virgin's Bower (*Clematis virginiana*), Sensitive Fern, and Tall Meadow Rue; Two-Leaved Toothwort (*Cardamine diphylla*) may be present on richer sites. Depending on level of disturbance, exotic weeds like coltsfoot (*Tussilago farfara*) may be present. Bryophytes are typically absent from this community.



Photo 5-22 Example of SS1- Alder Alluvial Shrubland vegetation type within the Study Area.

5.4.8.2 SS2 - Alder Seepage Thicket (NCNH adapted)

SS2 - Alder Seepage Thicket (NCNH adapted): This is a tall shrub swamp community that typically occurs in nutrient-enriched depressions and in areas of groundwater influence. Speckled alders are the dominant shrub species, with other species occasionally present including winterberry (*Ilex canadensis*) and meadowsweet (*Spiraea alba*). The herbaceous layer can be diverse, on account of the minerotrophic conditions. Characteristic herbaceous layer species include bluejoint, Manna-Grasses, Jewelweed, Sensitive Fern, Cinnamon Fern, Crested Shield Fern (*Dryopteris cristata*), Nodding Sedge, and Fringed Sedge (*Carex crinita*). Bryophytes are conspicuously absent in many sites. These sites are typically saturated at least seasonally and may contain a variety of soils ranging from mineral to organic.



Photo 5-23 Example of SS2- Alder Seepage Thicket vegetation type within the Study Area.

5.4.9 Bogs (BG)

The hydrology, hydric soil conditions, and typical vegetation of Bogs are described in Section 4.2.2. This section describes the bog VTs identified within the Study Area. Note the bog vegetation communities have not been described for NS, so descriptions have been sourced from classification systems developed for similar regions, such as Maine (MNAP) and New Hampshire (NCNH).

Several types of bog VTs were noted to occur within the Nuttby Study Area and some were a combination of types. The main bog VTs encountered within the Nuttby Study Area were:

- ▶ BG1: Spruce Bog (adapted from MNAP)
- ▶ BG2: Bog Moss Lawn (MNAP)
- ▶ BG3: Leatherleaf - sheep laurel shrub bog (MNAP)
- ▶ BG4: Sheep Laurel Dwarf Shrub Bog (MNAP)
- ▶ BG5: Leatherleaf Boggy Fen (MNAP)

Each of these bog VTs are described, and site photos provided when available, in the following subsections.

5.4.9.1 Spruce Bog (adapted from MNAP)

The Spruce Bog VT is a type of open canopy peatland characterized by Black Spruce and/or Tamarack trees over typical bog vegetation of heath shrubs, graminoids, and peat mosses. The canopy closure is usually 20-50% and occasionally ranges up to 85%. Black Spruce is usually dominant, but in some cases Tamarack (or rarely fir) may be more abundant. (CBCL ecologists noted that within the Study Area, Red Spruce appears to have taken over the ecological niche usually filled by Black Spruce in most of the province). Red Maple may be a component in somewhat more minerotrophic portions, and White Pine may occur on hummocks. The shrub layer, including small trees, is usually well developed (>30% cover). Labrador tea and Three-Seeded Sedge are characteristic species. The bryoid layer has close to 100% cover and is dominated by peat mosses; sparse reindeer lichens may occur. This VT is characteristic of nutrient poor or highly acidic peatlands (pH 4.2-5.2) at relatively low elevations. These bogs may occur as part of fens, and are standard constituents of raised (ombrotrophic) bogs. Sheep Laurel Dwarf Shrub Bogs and Leatherleaf Boggy Fens often occur adjacent to Black Spruce bogs, and share many shrub and herb species but are considerably more open (<20% canopy cover).



Photo 5-24 Example of Spruce Bog VT in background, adjacent to Bog Moss Lawn VT within Study Area.

5.4.9.2 Bog Moss Lawn (MNAP)

Bog Moss Lawn /Mossy Bog Mat (MNAP): The Bog Moss Lawn vegetation type, as defined by MNAP, is a type of bog community dominated by very low vegetation, mostly mosses, growing in very saturated peatland conditions. The bryophyte layer is the most obvious component of this peatland type. A dense and usually very wet layer of peat mosses contributes most of the cover. Low herbs and stunted shrubs are often scattered across the moss lawn, but usually form <25% cover overall. Characteristic vascular plant species include Leatherleaf (*Chamaedaphne calyculata*), Bog Rosemary (*Andromeda polifolia*), Horned Bladderwort (*Utricularia cornuta*), Small Cranberry (*Vaccinium oxycoccos*), and White Beakrush (*Rhynchospora alba*). The most typical bryophyte in NS is Toothed Peatmoss (*Sphagnum cuspidatum*). Bog Moss Lawn VT occurs within raised bogs and fens, typically in the wettest areas such as bog pools, boggy pond margins, and water tracks. They may form extensive areas on the higher areas of raised bogs. The substrate is highly acidic (pH ~ 4.0).



Photo 5-25 Example of Bog Moss Lawn vegetation type within the Study Area.

5.4.9.3 Leatherleaf-Sheep Laurel Shrub Bog (MNAP)

Leatherleaf-sheep laurel shrub bogs, as defined in the MNAP, are a type of dwarf heath shrub bog. These bogs or poor fens are oligotrophic to weakly minerotrophic and dominated by a dense cover of dwarf- to medium-height heath shrubs. The total floral diversity is low and there is an absence or very low abundance of tall shrubs and trees.

Small hummocks and hollows on the ground surface are common. Surface water pH is frequently <4. Shrubs average 0.52 m in height and form a relatively dense cover (35–50%) compared to other peatland communities. Leatherleaf is the dominant shrub, with lesser quantities of Sheep Laurel (*Kalmia angustifolia*) and sometimes Rhodora. Red Bogmoss (*Sphagnum capillifolium*) is a diagnostic species, which typically occurs on hummocks. Other abundant peat mosses include *Sphagnum magellanicum* and *S. rubellum*, while *S. angustifolium* is occasional. *Polytrichum strictum* is common on hummocks. Scattered individuals of Black Spruce may occur at some sites.



Photo 5-26 Example of Leatherleaf- Sheep Laurel shrub bog VT within the Study Area.

5.4.9.4 Sheep Laurel Dwarf Shrub Bog (MNAP)

A dense layer of dwarf heath shrubs dominates this common open peatland community. Stunted and scattered Black Spruce and Tamarack trees form <25% cover. Heath shrubs carpet the hummocks and hollows of the peat substrate; sheep laurel or rhodora are typically dominant. Sedges contribute little cover (usually <15%, occasionally 20-25%); the most common is Tufted Cottongrass (*Eriophorum vaginatum*), whose bright white tufts decorate the bog vegetation early in the summer. Insectivorous plants such as Pitcher Plant (*Sarracenia purpurea*) and sundews (*Drosera* spp.) can be quite numerous. The ground surface is covered by a spongy carpet of peat mosses. The floristic composition varies depending upon bog morphology and nutrient availability. This type occurs within raised

portions of peatlands, where ombrotrophic conditions prevail (plant growth is raised above the water table, and virtually all nutrients come from precipitation). Although standing water may not be visible, the peat is commonly saturated with water throughout most of the year. The substrate is highly acidic, with pH 3.9-4.6.



Photo 5-27 Example of Sheep Laurel Dwarf Shrub Bog observed within Study Area.

5.4.10 Fens (FE)

The hydrology, hydric soil conditions, and typical vegetation of Fens are described in Section 4.2. This section describes the fen VTs identified within the Study Area. Note that fen vegetation communities have not been described for NS, so descriptions are based on similar habitats from other, similar regions, such as Maine and New Hampshire.

Two types of fen VTs were noted to occur within the Study Area, as follows:

- ▶ FE1: Sedge - Heath Fen / Sedge - Leatherleaf Fen Lawn (NCNH)
- ▶ FE2: Sweetgale Fen / Sweetgale Mixed Shrub Fen (MNAP)

Each of these fen VTs are described, and site photos provided when available, in the following subsections.

5.4.10.1 FE1: Sedge - Heath Fen (NCNH)

This open peatland type is dominated by a layer of mixed dwarf heath shrubs and sedges. Small Tamaracks, rarely tree sized, are often scattered across the surface but contribute little cover. Leatherleaf, Sweetgale (*Myrica gale*), or Bog Rosemary may be the dominant shrub, and shrub cover is generally 20-40%. Sedges contribute 20-70% cover. Narrow-leaved Cottongrass (*Eriophorum angustifolium*), Few-seeded Sedge (*Carex oligosperma*), and Michaux's Sedge (*Carex michauxiana*) are typical dominants. Pitcher plants are usually present. The ground layer is a carpet of peat mosses, often with tracings of Large Cranberry (*Vaccinium macrocarpon*) running across the surface. This type occurs in open peatlands, often in areas transitional from raised bog (ombrotrophic) to fen (minerotrophic) conditions. Sites are typically acidic (pH 4.0-5.4) but sometimes circumneutral. Peat substrate is saturated to the surface, or nearly so. Open peatland vegetation consists of sedges and dwarf shrubs (Leatherleaf, Bog Rosemary, Sweetgale). Sedge cover typically exceeds shrub cover.



Photo 5-28 Example of Sedge-Heath Fen VT observed within the Study Area.

5.4.10.2 FE2: Sweetgale Fen (MNAP)

The Sweetgale Fen VT consists of a mixture of shrubs, typically about 1 m high (generally taller than bog shrubs, but shorter than most alder thickets), is dominated by Sweetgale, Leatherleaf, and Steeplebush (*Spiraea tomentosa*) or Meadowsweet (*Spiraea alba*). Speckled Alder is usually present but not dominant. Graminoids, typically Slender Sedge

(*Carex lasiocarpa*), Tussock Sedge (*Carex stricta*), and/or Bluejoint, are usually mixed with the shrubs but are less abundant (averaging around 20% cover). Where shrubs are dense, herb cover is very limited. The bryoid layer is usually very minor; when present it is dominated by peat mosses. These basin wetlands occur either as part of larger peatlands bordering open water or in impounded areas with peat or muck soils (such as beaver flowages). Slow-moving open water usually borders this vegetation. The substrate consists of seasonally to semi-permanently flooded organic material. This type has a dominance of medium-height shrubs of Sweetgale, Meadowsweet, and Leatherleaf. Graminoids are present but subordinate to shrubs. Sites occur on saturated or flooded organic soils.



Photo 5-29 Sweetgale Fen VT observed within Study Area.

5.4.11 Marshes/ Disturbed Wetlands

Marshes are defined in detail in Section 4.2.1. This section describes the marsh VTs identified within the Study Area. Note that the majority of marsh habitat noted was present within disturbed wetland areas, Road development, ground disturbance, and clearing of forested/vegetated areas can all contribute to the formation and/or growth of wetlands. Examples of disturbed wetlands are common within the Study Area, generally along roadsides or in previously cleared forest areas. The typical disturbed wetland noted within the Study Area is described below.

5.4.11.1 Meadow Marshes / Cutover Swamps

Meadow marshes and/or cutover swamps areas are cleared forested areas in which wetland conditions have developed, or have evidently transitioned from one type of wetland to another. In some cases, the previously forested area may be a forested wetland, while in other examples the wetland conditions may have developed as a result of hydrological changes caused ground disturbance/rutting and/or the creation of logging roads. The soil surface is generally carpeted in Sphagnum mosses, and a thin peat layer is usually present. Soils tend to be thin, and the bedrock tends to be close to the surface. These wetlands tend to be dominated by graminoid species, particularly Woolgrass (*Scirpus cyperinus*) and support sparse to moderate shrub and sapling communities. Shrub tend to be dominated by ericaceous shrubs such as Sheep Laurel, Leatherleaf, and Black Huckleberry. Common tree species include Red Maple and Eastern Tamarack saplings. Evidence of ground disturbance, in the form of old logging vehicle ruts, is often present.



Photo 5-30 Example of typical cutover swamp/meadow marsh occurring in previously logged area within the Study Area.

5.4.12 Disturbed Upland Habitats

As the Study Area occurs within a forested area subject to heavy forestry operations, disturbed areas are common. A network of gravel roads and work areas has developed which enable access to much of the uplands. A variety of disturbed upland habitats occur within the Study Area. These are described in the following sections.

5.4.12.1 Clearcuts

Areas which have been recently subjected to forestry activities (clearcuts) are also common. These areas are typically treeless, with small saplings of both coniferous and deciduous tree species present. Shrubs such as Red Raspberry and Blackberry tend to be common, while common herbaceous species include various sedges and common roadside species. Soils tend to be moss covered, except in areas of very recent ground disturbance. Logging ruts are usually prominent.

5.4.12.2 Regeneration Areas

Areas which have been previously cleared by forestry operations now exist in various stages of regeneration ('regen'). Areas of regenerating hardwoods, softwoods, and mixedwood are all present. Hardwood regen areas are generally dominated by young Tolerant Hardwoods such as Sugar Maple or Yellow Birch trees, with Beech also abundant in some areas. The shrub layer tends to be sparse, while the ground vegetation layer is less developed than in more mature VTs. Coniferous/softwood regen areas are generally dominated by young Red Spruce and Balsam Fir saplings, which are very dense in some areas. The undergrowth consists of very young conifers, often with scattered sedges and ferns. Mosses tend to carpet the soil surface, with Sphagnum more common in wetter areas. Mixedwood regen areas are a combination of the previous regen types.

As these habitats are not yet mature, it is not possible at this time to assign them to more specific VTs, as the NS FEC guide is intended to classify mature forest habitats.



Photo 5-31 Example of TH regen area in (in this case dominated by Yellow Birch) common within the Study Area.

5.4.12.3 Plantations

As much of the Study Area is subject to heavy forestry operations, areas of coniferous plantations are common. These generally consist of evenly-spaced stands of Red Spruce or Black Spruce trees of similar age. Small areas of Norway Spruce (a forestry species not indigenous to NS) were also noted. The shrub community in these areas is typically poorly developed, and the ground vegetation community is also quite sparse, consisting of species common in coniferous forest, such as Wild Lily of the Valley and wood ferns. Evidence of thinning of less favourable/younger regenerating species is often present (Photo 5-32).



Photo 5-32 Example of coniferous plantation area common within the Study Area, showing evidence of thinning.

6 Results: Project Ecological Land Classification

As mentioned previously, the P-ELC is primarily a GIS-based mapping tool to assist NSPI in conducting specific habitat analysis in support of future Environmental Assessment applications. The data itself is best suited for usage within a desktop GIS setting where the data set can be queried to extract specific habitat parameters; as such, the P-ELC outputs are provided as a digital deliverable in GIS format, as indicated in Table 6.1.

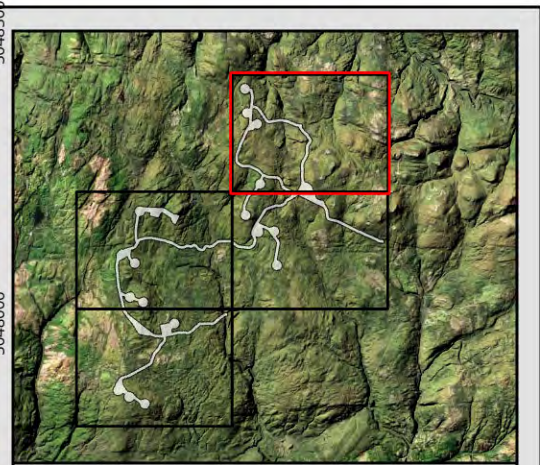
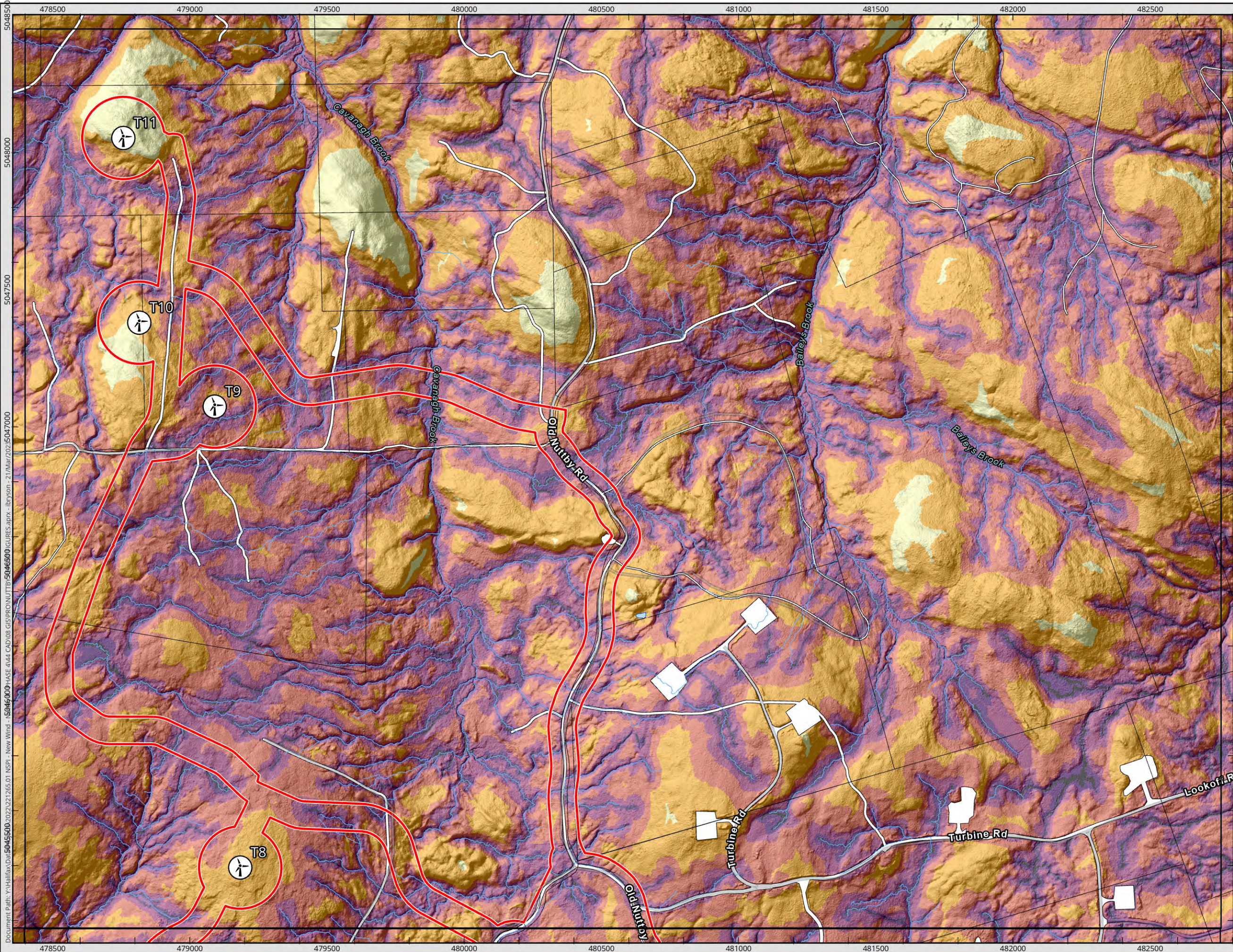
Table 6.1 Summary of P-ELC GIS Deliverables

Layer Name	Description	Format
FINAL OUTPUTS		
NR_PELC	Raster version of P-ELC	Raster, 1m resolution
NR_PELC_Polygon_A1 NR_PELC_Polygon_A2 NR_PELC_Polygon_A3 . . NR_PELC_Polygon_F4 NR_PELC_Polygon_F5 NR_PELC_Polygon_F6	Polygon version of P-ELC, provided in 2 km x 2 km grids	Polygon Feature Class
NR_PELC_CODES		Table
SUPPORTING DATA		
NR_DTW_1ha	Depth to Water (DTW) model results	Raster, 1m resolution
NR_DTW_RC	Reclassified DTW results	Raster, 1m resolution
NR_CHM	Canopy Height Model (CHM) results	Raster, 1m resolution
NR_CHM_RC	Reclassified CHM results	Raster, 1m resolution
NR_LC	Classified Landcover Image	Raster, 1m resolution
NR_NDVI	Normalized Differential Vegetation Index (NDVI)	Raster, 1m resolution
NR_PELC_DOMAIN	Analytical extent for P-ELC	Polygon Feature Class
NR_PELC_Grid_2km	Gridding scheme for P-ELC Polygons	Polygon Feature Class

A series of maps illustrating the P-ELC component layers are provided as indicated below:

- ▶ Depth to Water Component: Figure 6.1, Figure 6.2, Figure 6.3 and Figure 6.4
- ▶ Canopy Height Component: Figure 6.5, Figure 6.6, Figure 6.7 and Figure 6.8
- ▶ Landcover Component: Figure 6.9, Figure 6.10, Figure 6.11 and Figure 6.12

A figure illustrating the 2 km grid used for the P-ELC Polygons is provided in Figure 6.13.



- Proposed Turbine Location
 - Study Area (Phase 4)
 - Property Boundaries
 - Provincially Mapped Waterbodies
 - DTW Water Flow Path (Min 1 ha CA)
- Depth to Water (DTW) Reclassification
- 100
 - 200
 - 300
 - 400
 - 500
 - 600



NUTTBY RIDGE WIND Vegetation & Wetlands

P-ELC Component Overview Depth to Water Reclassification (Page 1 of 4)

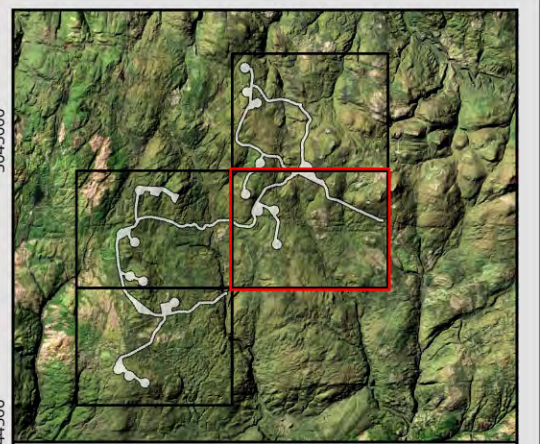
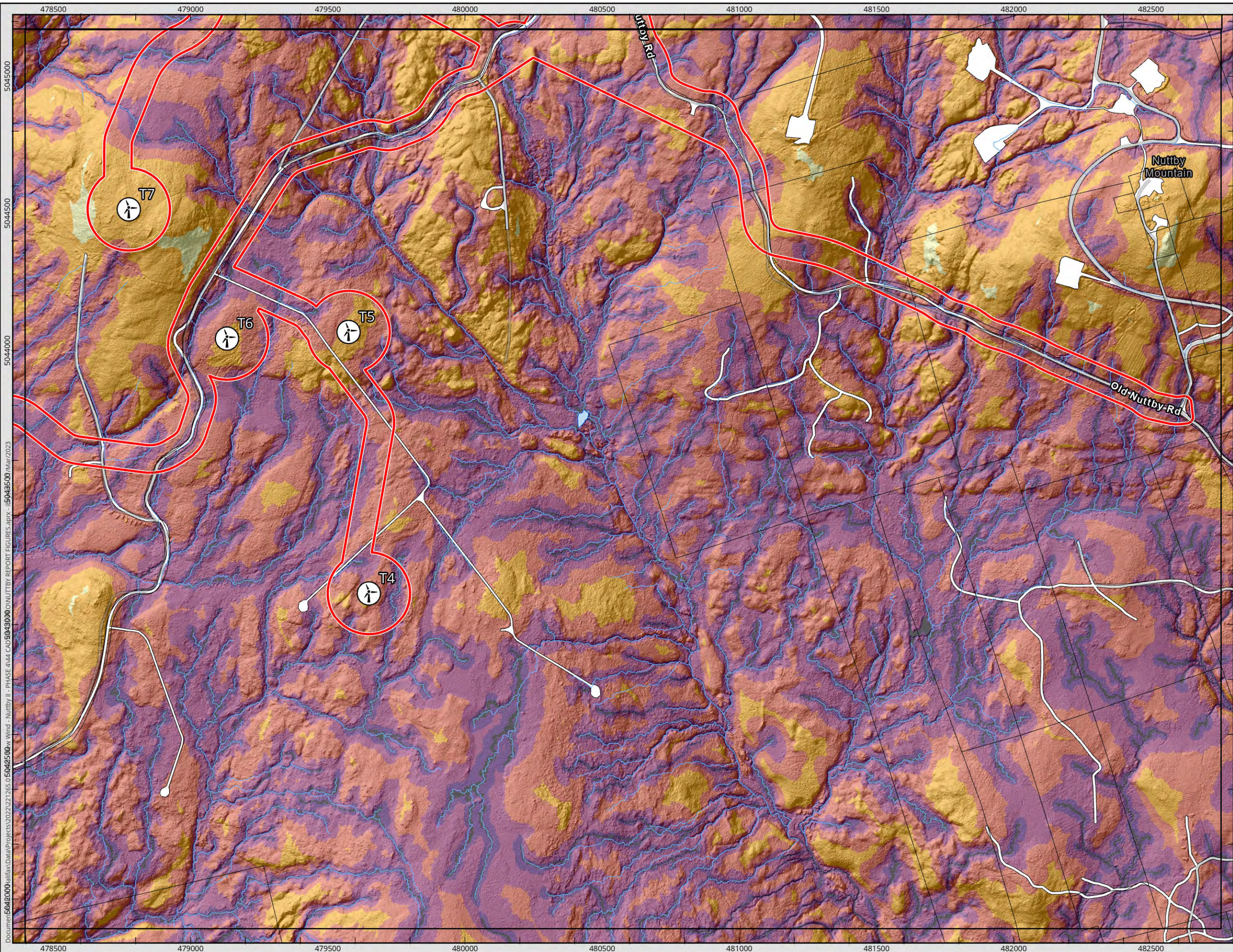
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NOTES:

Contour interval = 1 m

SCALE: 1:13,000 Coordinate System: NAD 1983 CSRS UTM Zone 20N
Units: Meter

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- Proposed Turbine Location
 - Study Area (Phase 4)
 - Property Boundaries
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 - DTW Water Flow Path (Min 1 ha CA)
- Depth to Water (DTW) Reclassification
- 100
 - 200
 - 300
 - 400
 - 500
 - 600



NUTTBY RIDGE WIND
Vegetation & Wetlands

P-ELC Component Overview
Depth to Water Reclassification
 (Page 3 of 4)

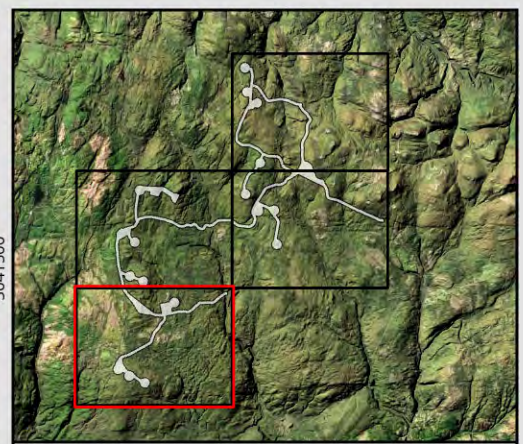
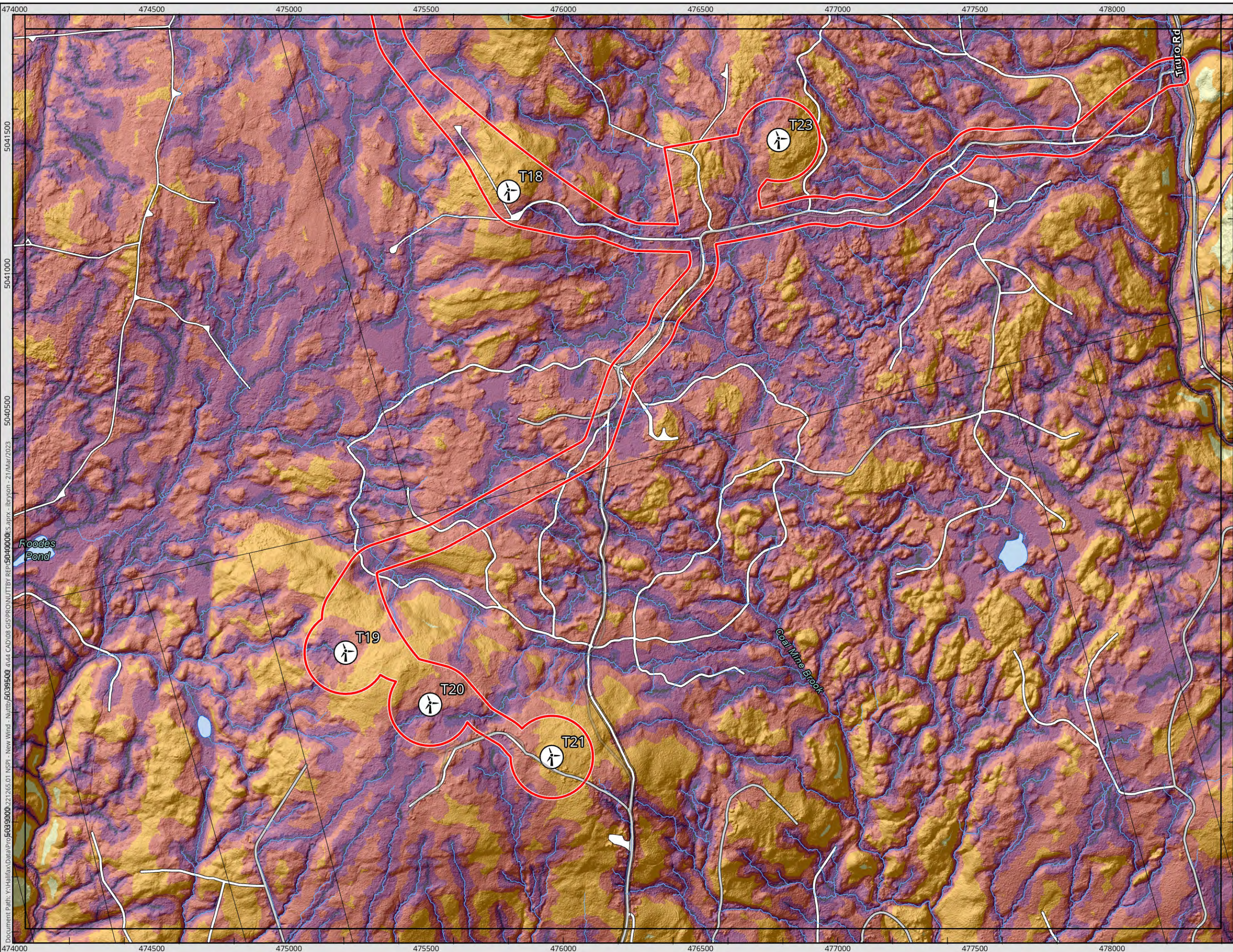
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







NOTES:

Contour interval = 1 m

SCALE: 1:13,000 Coordinate System: NAD 1983 CSRS UTM Zone 20N
 Units: Meter

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-  Proposed Turbine Location
 -  Study Area (Phase 4)
 -  Property Boundaries
 -  Provincially Mapped Waterbodies
 -  DTW Water Flow Path (Min 1 ha CA)
- Depth to Water (DTW) Reclassification
-  100
 -  200
 -  300
 -  400
 -  500
 -  600

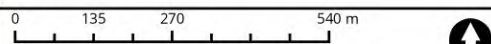


**NUTTBY RIDGE WIND
Vegetation & Wetlands**


**P-ELC Component Overview
Depth to Water Reclassification
(Page 4 of 4)**

DATE: 2023-03-21	PROJ N°: 221265.01	FIGURE: 6-4
DRAWN BY: IB	CHECKED BY: BC	APPROVED: LH

NOTES:
Contour interval = 1 m



SCALE: 1:13,000 Coordinate System: NAD 1983 CSRS UTM Zone 20N
Units: Meter



Document Path: Y:\Halifax\Darwin\Projects\221265.01 NSPI - New Wind - Nuttby\5039500-4\44 CAD\08 GIS\PROJ\NUTTBY REP\5041000ES.aprx - Ibrayson - 21/Mar/2023