Yorkshire Highlands Native Vegetation Stewardship Plan

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Table of Contents

ECO-RESOURCE CONSULTING, INC

Native Vegetation Stewardship Plan for Yorkshire Highlands Residential Development

1.0 OBJECTIVE

The objective of the Native Vegetation Stewardship Plan (NVSP) will be to outline the installation and maintenance of the appropriate native species and nurse crops to establish a functional wetland and three wet pond stormwater systems within two full growing seasons. The Yorkshire Highlands property is located directly east of the East Branch Root River Canal on 50th Road, Yorkville, Wisconsin (Figure 1). The wetland and stormwater systems planted with native vegetation will provide the following benefits:

- Increase stormwater infiltration and ensure hydrologic function.
- Attenuate or uptake available nutrients.
- Increase ecological value and wildlife habitat value, particularly for pollinators.
- Provide flood protection and normalize surface to groundwater interactions.

Eco-Resource Consulting, Inc. (ERC) has been tasked with developing a Native Vegetation Stewardship Plan for Outlot 1. ERC will be contracted to implement this plan as stated. This Outlot is comprised of a total of approximately 60.76 acres figured to the center line of the East Branch of the Root River Canal. Approximately 58.16 acres of this outlot will continue to be utilized for agriculture. Within Outlot 1, the Delineated Wetland Native Seeding Area total is approximately 1.6 acres and the three Wet Pond (north, middle, and south) Native Seeding Area total is approximately 1.0 acres (Figure 1). To successfully implement, manage and protect the prairie planting specified in the Stewardship Plan, the Subdivider, Lot Owners and Owners Association shall provide that the farming operation within the agricultural area identified on the plat within Outlot 1 be done sustainably by using no-till methods and cover crops as reasonably determined and required by the Land Trust. Seno K/RLT Conservancy is tasked with monitoring the agricultural areas as part of their conservation easement responsibilities. The Master Grading Plan (MGP) was developed by *Pinnacle Engineering Group*.

2.0 NATIVE SEED MIXES

It is important to note that a change in hydrology will occur within Outlot 1. Contributing factors to changes in hydrology include the following: increased impervious surfaces (building roads, driveways, homes, turf grass lots, etc.), changes in stormwater vectors via excavation and grading, and aging/failing clay drainage tiles that exist on site. The hydrology alteration presents a challenge for designing seed mixes that will thrive long term. Native seed mixes may require adjustments as project area data is collected and the Master Grading Plan is completed. The change in hydrology will also present challenges for the continued agriculture practices.

ERC Ecologists designed the native seed mixes taking into account the following metrics: soil conditions, hydrologic conditions, project objectives, and project budget. For the delineated wetland and the safety shelf of the wet ponds, a native wetland emergent seed mix is recommended. The side slopes of the wet ponds are recommended to have a rapidly-establishing native slope stabilization mix. The native species selected will offer a long seasonal range of bloom period and a wide range of successional species (early, mid, and late successional) to provide longevity and to maximize species diversity. This will in turn maximize soil stabilization and nutrient uptake/sequestration.

ERC recommends sourcing the native seed from Wisconsin nurseries to ensure that local ecotypes (within 300 miles of the site) of native plants are selected, maximizing the ecological benefit of the restoration. The seed mix tables are listed below. Following are the specifications of the designed native seed mix:

Table 1: Delineated Wetland Emergent Native Seed – Wetland and Safety Shelf

Forbs - Wet to Wet Mesic	
Scientific Name	**Common Name**
Acorus calamus	sweet flag
Alisma subcordatum	mud plantain
Iris virginica	southern blue flag iris
Mimulus ringens	monkey flower
Sagittaria latifolia	common arrowhead
Sparganium eurycarpum	great bur reed
Graminoids	
Calamagrostis canadensis	blue joint grass
Carex hystericina	porcupine sedge
Juncus effusus	common rush
Leersia oryzoides	rice cut grass
Scirpus acutus	hard-stem bulrush
Scirpus atrovirens	dark-green bulrush
Scirpus cyperinus	wool grass
Scirpus fluviatilis	river bulrush
Scirpus pendulus	red bulrush
Scirpus validus	great bulrush
Spartina pectinata	prairie cordgrass

Table 2: Wet Pond Side Slopes Stabilization Native Seed Mix

Native Seed Mix Subject to Change with Varying Hydrology

Forbs - Wet Mesic to Dry Mesic	
Scientific Name	**Common Name**
Chamaecrista fasciculata	partridge pea
Echinacea purpurea	purple coneflower
Heliopsis helianthoides	early sunflower
Monarda fistulosa	wild bergamot
Ratibida pinnata	yellow coneflower
Rudbeckia hirta	black-eyed Susan
Rudbeckia subtomentosa	sweet black-eyed Susan
Graminoids - Wet Mesic to Dry Mesic	
Andropogon gerardii	big bluestem
Bouteloua curtipendula	side oats grama
Elymus canadensis	Canada wild rye
Elymus trachycaulus	slender wheatgrass
Elymus virginicus	Virginia wild rye
Panicum virgatum	switchgrass
Schizachyrium scoparium	little bluestem
Sorghastrum nutans	Indian grass

3.0 HERBICIDE SITE PREPARATION

General Herbicide Application Information

Herbicide site preparation for native installations must be conducted with several considerations: timing of the application, height of the vegetation, and the weather. These factors are inextricably linked.

- The timing of the herbicide application is critical. A fall herbicide application will typically occur in September/October. A spring herbicide application will take place when the average vegetation reaches a height of seven to 10 inches.

- The fall herbicide application should take place on a day when no rain is forecasted. While most commercial-grade herbicides are "rain-fast" within 1-2 hours during the growing season, it takes the herbicide longer to be absorbed during the fall or spring due to the plants' slower photosynthetic rate.

- The herbicide application should take place after the morning dew has evaporated. Spraying too early in the morning may result in an ineffective treatment due to excess moisture on vegetation from morning dew.

- The wind speed during the application should be less than 10 mph. Conducting an herbicide application at higher wind speeds can result in herbicide drift, leading to an ineffective treatment and/or damage to non-target/off-site vegetation.

- Relative humidity should not exceed 85% throughout the day of the treatment.

Delineated Wetland Native Seeding Area – 1.6 Acres

The existing wetland will require at least four herbicide applications prior to native seeding operations. The non-native hybrid cattail (*Typha x glauca*) that currently exists in the wetland have extensive, dense root systems which are difficult to eradicate. A custom herbicide blend should be used to ensure mortality of any non-native perennial herbaceous vegetation that is present on the site. Herbicide applications should be conducted using a UTV with a hose and gun implement or a commercial grade backpack sprayer. Due to the wetland hydrology, this will require a WDNR Aquatic Plant Management Permit.

The first application should take place in June/July of Year 1. The second herbicide application should take place in August/September of Year 1. The third application should take place in June/July of Year 2, the fourth herbicide application should take place in August/September Year 2. These herbicide applications will allow the seeded native wetland species an opportunity to establish in the wetland following a dormant (fall/winter) seeding in Year 2.

Wet Pond Side Slopes and Safety Shelves Native Seeding Areas – 1.0 Acres

ERC highly recommends initial seeding and erosion control areas to be seeded in certified weed free annual oats and Canada wildrye (*Elymus canadensis*). Canada wildrye (CWR) is a deep-rooted native cool season grass that when combined with an annual cover crop, will increase soil stabilization, and provide the rapid vegetative cover necessary to stabilize the site. In addition, the use of annual oats and CWR will decrease the necessity for herbicide applications in these areas and provide a stable planting area for the native seed installation. CWR should be procured from a trusted and vetted native seed vendor with a high PLS (Pure Live Seed) rating. If the area is seeded into non-native perennial seed mix, the Wet Ponds will follow the Delineated Wetland Native Seeing Area timeline.

4.0 INSTALLATION

Wet-Mesic Native Seed - Stormwater Basin Side Slopes and Safety Shelf

Installation of the cover crop and native seed will be installed by ERC in conjunction with the stormwater wet pond construction. Due to the slope of the seeding area within the wet pond, the native seed should be broadcasted using a portable hand broadcaster in the fall/winter (dormant seeding) following the completion of the Master Grading Plan. As stated previously in this NVSP, this method can only be accomplished without herbicide applications if annual cover crop combined with Canada wildrye is utilized in the initial erosion control seeding operations outlined in the Master Grading Plan. If a perennial non-native seed mix is used in the initial planting, this site preparation and native installation will follow the Delineated Wetland timeline. Native seed installation will be broadcast seeding in either the fall (Year 1) or spring (Year 2).

Erosion Control Product Installation

Typically, erosion control product is installed immediately following the broadcast seeding of the native species. Installation of erosion control products should be executed by experienced personnel or trained professionals. ERC recommends using double net straw erosion control

matting. This is classified as a "Type I Class B" erosion control mat product. Erosion control product must be installed per the manufacturer's specifications. The most critical aspect of proper erosion control mat placement is the soil surface preparation and the stapling alignment/spacing. Due to the proposed timing of grading completion, ERC may recommend using an erosion control polymer product to alleviate soil erosion until native seeding can occur.

Delineated Wetland Emergent Native Seed – Delineated Wetland

Installation of native seed will be installed by ERC. Due to the hydrology within the delineated wetland, the native seed should be hand broadcasted using a portable hand broadcaster in the fall/winter (dormant seeding) following the completion of the herbicide operations described in Section 3.0 of the NVSP.

5.0 FIRST YEAR MAINTENANCE

A new native seeding must be mowed several times the first growing season, depending upon precipitation frequency and soil moisture levels. Nothing is more critical to the long-term success of a native seeding than first year mowing maintenance. First year mowing is critical for two primary reasons: to reduce *weed competition* and to ensure *sunlight infiltration* to native seedlings.

Maintenance Mowing Specifications

First year mowing must be conducted with three considerations: timing of mowing, frequency of mowing, and height of mowing. These three factors are inextricably linked.

- Each time the *average height* of the vegetation in the new native planting reaches twelve (12) to fourteen (14) inches, it must be mowed down to a height of six (6) to eight (8) inches. Ideally, no more than six (6) inches of total vegetative growth is cut during any single mowing event, and the plantings are NEVER mowed lower than six (6) inches from ground level during the first season.

- Should the average height of the planting exceed fourteen (14) inches when it is cut, mowing must be completed in multiple stages, with a total cutting depth NEVER exceeding six (6) inches for any single pass to avoid thatch build-up.

- If more than six (6) inches (on average) of vegetation is cut during any single mowing event, the density of thatch (cut vegetation remaining on the ground) will negatively impact the young native seedlings by shading them out and reducing light infiltration during a critical stage of development. This thatch must be removed to prevent stunting and/or mortality in low-growing native seedlings.

The timing, frequency, and total effort (hours) expended for first year mowing maintenance will primarily be a function of precipitation. More frequent rainfall events will result in the need for more frequent mowing events. Considering average precipitation in Wisconsin, four to five mowing events may have to be conducted in the first season.

Non-Target Plant Competition

In the context of a new native prairie planting, a non-target species (weed) is any plant that aversely effects the germination, development, and/or establishment of native species that were components of the installed native seed mixes. Weeds can be native or non-native, annual, biennial, or perennial plant species that were *not* a component of the native seed mixes installed on the units.

The first two seasons are a critical period with a new native planting, as native plants develop very extensive root systems slowly over the first several growing seasons. In subsequent seasons, certain weed species will present less of a concern to the overall vigor, quality, and longevity of a native prairie re-construction. Annual weeds, for example, are typically less of a risk to the native planting than biennial or perennial species.

Regardless of cropping history, or the extent of site preparation and weed control conducted on the planting units prior to seeding, non-target (weeds) species can establish through two natural dispersion processes: *seed bank expression* and *transport vectors*. These natural functions serve to fill the niche of a non-vegetated, exposed soil surface area.

Seed Bank Expression

Non-target species can become established through seed bank expression. The “seed bank” is the stored, viable seed component that exists within the soil produced from earlier generations of these plants. Typically, perennial species comprise the most significant portions of the seed bank as their seeds remain viable in the seed bank much longer than annual or biennial species. Even the slightest soil surface scarification or disturbance can bring these viable seeds close

enough to the soil surface to obtain enough moisture and heat (the two inputs required for seed germination) to germinate and become established.

Transport Vectors

Annual (and some biennial and perennial) weed species are introduced into a new native planting through several environmental vectors. These can include wind, water, and wildlife. Well-managed mowing maintenance during the first two seasons of a new native seeding prevent weeds from proliferating in the planting area by cutting them before they produce seed. Repeated mowing forces weeds to continually expend their energy reserves toward seed production. These energy reserves are eventually exhausted as the growing season comes to an end, if continuously mowed throughout the season.

Sunlight Infiltration

Native seedlings grow down before they grow up. Established native prairie plants have very complex root systems that can exceed fifteen (15) feet in depth below the soil surface. This root development occurs over the first three to ten years after seeding, depending upon the growth rates of the individual species. During the first and second years of development, top-growth (stems, leaves, and reproductive structures) is limited for most native plants. Some native plants only grow a few inches tall during the first growing season.

Due to this delayed top-growth, stunting or mortality can result if the natives are shaded out by competing weeds in close proximity, or by cut thatch (to be discussed in the following section) left to lie on the surface following poorly-timed cutting. Late blooming species (warm season grasses for example) may not germinate at all if light cannot reach the soil surface to warm the soil and trigger seed germination.

6.0 SECOND YEAR MAINTENANCE

Maintenance Mowing Specifications

Provided the first-year mowing maintenance was well-managed, the second-year mowing maintenance will require less effort and resources. In the second season of a new native seeding, the vegetation should be allowed to put on more top growth. During this time, a mower must be utilized that can be raised to a height of twelve (12) to fourteen (14) inches from ground level.

- Each time the *average height* of the vegetation in the new native planting reaches twenty-four (24) to twenty-six (26) inches, it must be mowed to a height of twelve (12) to fourteen (14) inches. Ideally, no more than twelve (12) inches of total vegetative growth is cut during any single mowing event, and the plantings are NEVER mowed lower than twelve (12) inches from ground level during the second season.

- Should the average height of the planting exceed twenty-six (26) inches when it is cut, mowing must be completed in multiple stages, with a total cutting depth NEVER exceeding twelve (12) inches to avoid build-up of thatch.

- If more than twelve (12) inches (on average) of vegetation is cut during any single mowing event, the density of thatch (cut vegetation remaining on the ground) will negatively impact the young native seedlings by shading them out and reducing light infiltration during a critical stage of development. This thatch must be removed to prevent stunting and/or mortality in low-growing native seedlings.

The timing, frequency, and total effort (hours) expended for second year mowing maintenance will primarily be a function of precipitation. More frequent rainfall events will result in the need for more frequent mowing events. Considering average precipitation, two (2) to four (4) mowing events will have to be conducted in the second season.

Non-Target Vegetation

Some non-target species (weeds) are also considered "invasive species". Within the restoration community, any non-native plant is considered an issue that may need to be dealt with. Certainly, some invasive species represent a greater threat to native prairie restorations than others. This justifies the need for a skilled restoration ecologist and/or botanist to monitor a new native planting. Ecologists can make positive species identifications at any stage of vegetative growth. If this information is relayed quickly and reliably, land managers can eradicate threatening invasive species before they become dominant in areas of the restoration and degrade the functionality and floristic quality of the site.

It is normal for some invasive species to become representative in the second season of a newly seeded prairie reconstruction. Many of the invasive species that become established in young native plantings are biennials such as yellow or white sweet clover (*Melilotus sp.)*, common burdock (*Arctium minus*), Queen Anne's lace (*Daucus carota*), wild parsnip (*Pastinaca sativa*), and biennial thistles (*Cirsium sp*.). Biennial species present as ground-form "rosettes" in the first year and produce large volumes of highly viable seed in the second year. For this reason, well-

managed second year mowing to prevent biennial weed seed production can be a critical factor affecting the quality of the restored prairie.

Invasive species that pose the largest threat to new native restorations are true perennials, like the reestablished native plants themselves. Representative perennial invasive species may be Canada thistle (*Cirsium arvense*), reed canary grass (*Phalaris arundinacea*), and crown vetch (*Securigera varia*). These perennial invasive species propagate vegetatively (below the soil surface) and through seed production. For these reasons, they are difficult to control with mowing alone, regardless of the timing of the mowing.

Another significant threat to a young native prairie restoration can come from opportunistic, early-successional native plants. An example of this type of species is Canada goldenrod (*Solidago canadensis*). Canada goldenrod, though a native plant to the Midwest, can threaten the floristic quality and diversity of a native prairie reconstruction. This aggressive plant can displace more conservative, higher quality native plants, particularly if not controlled in the first two seasons.

7.0 LONG TERM MANAGEMENT

Prescribed Fire

The most important tool for long-term management of a prairie restoration is the judicious use of prescribed fire. Native prairie plants evolved with fire and require it to reach their full potential. In addition, invasive woody and herbaceous plants are typically not fire-dependent species and prescribed burns will continue to set back succession and maintain a healthy native graminoid and wildflower plant community.

ERC recommends burning native grasslands (prairie restorations) every three to five years, depending upon the density and types of woody species that encroach into the grassland area and the objective of the landowner. Burns can be conducted in spring (April/May) or fall (October/November). Continued spring burns can encourage native warm season grass growth and late spring burns can reduce vigor of native forbs (wildflowers). Fall burns tend to encourage the recovery and vigor of native forbs over the native grasses the following growing season.

Prescribed fire operations should be planned and executed by experienced personnel or trained professionals. ERC recommends engaging Prescribed Fire Contractors who are equipped, trained, and insured to plan and execute prescribed prairie burns.

Mowing established stands of native vegetation can be conducted if the use of prescribed fire is not practical. However, mowing established stands of native grasses/forbs can negatively impact the native vegetation if cut thatch is left on the ground. Thatch must be removed or the cooling effect from the shade this thatch creates will create soil conditions conducive to non-native/invasive cool season grasses and invasive broadleaved weeds.

8.0 MONITORING

ERC recommends conducting monitoring and reporting on the new native plantings during the growing seasons following the installation. A qualitative meander survey should be conducted to monitor the vegetation density and species richness throughout the project. Monitoring reports will outline recommendations for adjustments in management strategies in order to accelerate native plant establishment. This is the foundation of Adaptive Management. Additional monitoring events will ensure native plantings will remain vibrant and healthy and can help inform any shifts in management that should be completed to prevent invasive species dominating the plantings. ERC will conduct, at minimum, one vegetation monitoring event in year 2.

The goals of a perennial prairie restoration are to have at least 50% native species density and no areas greater than a square meter that are un-vegetated after the first growing season. Goals of the second growing season will be a native species density of 65% with no un-vegetated areas.

Following the monitoring events, supplemental and/or interseeding may be recommended as a continued management technique.

9.0 FIVE YEAR SITE PREPARATION, INSTALLATION, MAINTENANCE AND MONITORING PLAN

Year 1

June/July: First Herbicide Application – Wetland

July (Assumed Grading Completion): Install Annual Oats/Canada Wild Rye with Erosion Control Product – Wet ponds (North, Middle, South)

August/September: Second Herbicide Application – Wetland

November/December: Dormant Broadcast Native Seed Installation - Wet ponds (North, Middle, South)

Year 2

June/July/August/September: Maintenance Mowing (2 events) –Wet ponds

June/July: Third Herbicide Application – Wetland

July/August: Monitoring Event – Wet ponds

-***Vegetation Survey conducted with summary report of the status of native vegetation and recommended actions.***

August/September: Fourth Herbicide Application (Final Application) – Wetland

November/December: Dormant Broadcast Native Seed Installation – Wetland

Year 3

June/July/August/September: Maintenance Mowing (2 events) – All Areas

(Optional) July/August: Monitoring Event – All Areas

-***Vegetation Survey conducted with summary report of the status of native vegetation and recommended actions.***

Year 4

June/July/August/September: Wetland Maintenance (2 events) – Wetland
-Hand pulling, spot herbicide, and spot mowing.

(Optional) July/August: Monitoring Event – All Areas
-***Vegetation Survey conducted with summary report of the status of native vegetation and recommended actions.***

Year 5

(Optional) April/May: Prescribed Fire (beneficial to native warm season grasses and forbs)

(Optional) October/November: Prescribed Fire (beneficial to native warm season forbs)

10.0 OPINION OF PROBABLE COST

Note: If ERC is contracted to conduct the following items, there will also be a Project Management Task encompassing all communication, permit acquisition, and project coordination (~$2000.00).

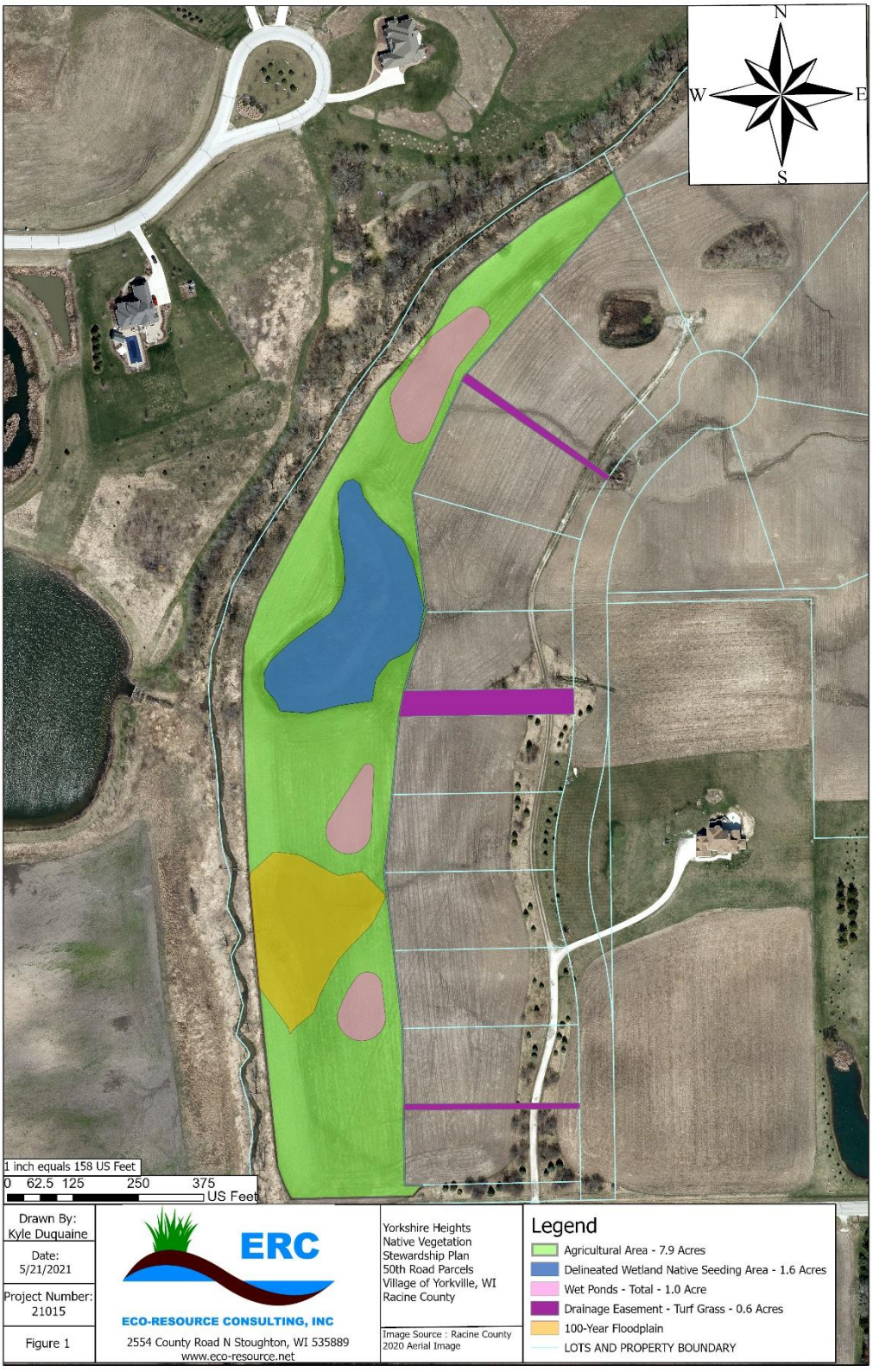
Total Cost (Including Optional Items)

Task	Task Description (Updated 2.7.22)	Proposed	Year	Area
1	Seed Mixes & Polymer	$3,125.00	Year 1	Wet Ponds, Wetland
2	Herbicide Site Prep (2 Events)	$2,200.00	Year 1	Wetland
3	Cover Crop & Polymer Installation	$725.00	Year 1	Wetponds
4	Site Preparation Mowing	$1,225.00	Year 1	Wetponds
5	Dormant Seed Wetponds & ECM Install	$10,500.00	Year 1	Wet Ponds
6	Herbicide Site Prep (2 events)	$2,200.00	Year 2	Wetland
7	Maintenance Mowing (2 Events)	$3,500.00	Year 2	Wet Ponds
8	Broadcast Native Seed Installation - Delineated Wetland	$725.00	Year 2	Wetland
9	Monitoring & Reporting - Required	$1,700.00	Year 3	Wet Ponds, Wetland
10	Wetland Maintenance (2 Events)	$1,650.00	Year 3	Wetland
11	Wetland Maintenance (2 Events)	$1,650.00	Year 4	Wetland
12	Monitoring & Reporting - Optional	$1,700.00	Year 3	Wet Ponds, Wetland
13	Monitoring & Reporting - Optional	$1,700.00	Year 4	Wet Ponds, Wetland
14	Prescribed Fire - Optional	$5,000.00	Year 5	Wet Ponds, Wetland
	Sub-total	**$37,600.00**		
	Racine Tax 5.1%	**$1,917.60**		
	Total	**$39,517.60**		

Total Cost (Excluding Optional Items)

Task	Task Description (Updated 2.7.22)	Proposed	Year	Area
1	Seed Mixes & Polymer	$3,125.00	Year 1	Wet Ponds, Wetland
2	Herbicide Site Prep (2 Events)	$2,200.00	Year 1	Wetland
3	Cover Crop & Polymer Installation	$725.00	Year 1	Wetponds
4	Site Preparation Mowing	$1,225.00	Year 1	Wetponds
5	Dormant Seed Wetponds & ECM Install	$10,500.00	Year 1	Wet Ponds
6	Herbicide Site Prep (2 events)	$2,200.00	Year 2	Wetland
7	Maintenance Mowing (2 Events)	$3,500.00	Year 2	Wet Ponds
8	Broadcast Native Seed Installation - Delineated Wetland	$725.00	Year 2	Wetland
9	Monitoring & Reporting - Required	$1,700.00	Year 3	Wet Ponds, Wetland
10	Wetland Maintenance (2 Events)	$1,650.00	Year 3	Wetland
11	Wetland Maintenance (2 Events)	$1,650.00	Year 4	Wetland
12	Monitoring & Reporting - Optional	NA	Year 3	Wet Ponds, Wetland
13	Monitoring & Reporting - Optional	NA	Year 4	Wet Ponds, Wetland
14	Prescribed Fire - Optional	NA	Year 5	Wet Ponds, Wetland
	Sub-total	**$29,200.00**		
	Racine Tax 5.1%	**$1,489.20**		
	Total	**$30,689.20**		

11.0 FIGURE 1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Kyle Duquaine
Date:
5/21/2021
Project Number:
21015
Figure 1
ERC
ECO-RESOURCE CONSULTING, INC
2554 County Road N Stoughton, WI 535889
www.eco-resource.net
Yorkshire Heights
Native Vegetation
Stewardship Plan
50th Road Parcels
Village of Yorkville, WI
Racine County
Image Source : Racine County
2020 Aerial Image
Legend
Agricultural Area - 7.9 Acres
Delineated Wetland Native Seeding Area - 1.6 Acres
Wet Ponds - Total - 1.0 Acre
Drainage Easement - Turf Grass - 0.6 Acres
100-Year Floodplain
LOTS AND PROPERTY BOUNDARY