



RICHARD ST. BARBE BAKER AFFORESTATION AREA

CONCEPTUAL PLAN

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WSP CANADA INC.
3330-237, 4 Avenue SW
Calgary, Alberta



TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	Site Overview	1
1.2	Design Program	2
2	PROPOSED IMPROVEMENTS	3
2.1	Buffering Improvements	3
2.2	Human Use Improvements	4
2.2.1	Controlled Site Access	4
2.2.2	Circulation Route & Seating Nodes	6
2.2.3	Off-Leash Dog Park	9
2.2.4	Skills Park	9
2.2.5	Fat Tire & Adaptive Mountain Biking Course	10
2.2.6	Gathering Area	10
2.2.7	Wetland Outlook	10
2.2.8	Communications Programming	11
2.2.9	Site Furniture & Materials	11
2.3	Historical and Cultural Improvements	12
2.4	Restoration/Reclamation Improvements	12
2.4.1	Detailed Baseline Data Collection	15
2.4.2	Ecological Recovery Wheel (ERW)	15
2.4.3	Determining Areas of Prioritization	7
2.4.4	Identification of Restoration Goals and Objectives	7
2.4.5	Restoration Location Selection	7
2.4.6	Preliminary Location	8
2.4.7	Species Selection	8
2.4.8	Determining Planting Methodology and Seeding Rates	9
2.4.9	Plant Material and Seed Source	9
2.4.10	Adaptive Management and Monitoring	13
2.4.11	Restoration Prescription	13
2.4.12	Forest Restoration	14
2.4.13	Wetland Restoration	14
2.5	Ecological Connectivity Improvements	15
2.6	SOMC (Flora and Fauna) Improvements	15



2.7	Stormwater Management.....	17
2.8	Planting Plan.....	18
2.8.1	Utility Corridor Planting.....	18
3	CONSTRUCTION IMPLEMENTATION.....	19
3.1	Standards	19
3.2	Construction Risks & Mitigation Measures	19
3.3	Construction Recommendations	21
3.3.1	Invasive Species Control During Construction.....	21
3.3.2	Site Preparation and Demolition	21
3.3.3	Grading.....	21
3.3.4	Layout.....	21
3.3.5	Planting	21
4	MAINTENANCE	22
4.1	Establishment & Maintenance	22
4.2	Integrated Pest Management Plan (IPM).....	23
5	MONITORING	25
5.1	Wildlife Behaviour Monitoring	25
5.2	Invasive Species Monitoring	28
5.3	Vegetation Composition Monitoring	28
5.4	Environmental Conditioning Monitoring	29
5.5	Human-site Interaction Monitoring.....	29
5.6	Collectively Powered Monitoring Networks	29
5.7	Monitoring For Success	29
6	FINAL ACCEPTANCE & PHASING	32
6.1	Final Acceptance	32
6.2	Phasing.....	32
6.2.1	Phasing of Implementation	32
6.2.2	Cost Estimation	33



BIBLIOGRAPHY 35

TABLES

TABLE 1-1 DESIGN PROGRAM2

TABLE 2-1 BUFFERING IMPROVEMENTS.....3

TABLE 2-2 SITE ACCESS INFRASTRUCTURE.....4

TABLE 2-3 TRAIL DESIGN.....6

TABLE 2-4 OFF-LEASH DOG PARK
INFRASTRUCTURE.....9

TABLE 2-5 SKILLS PARK INFRASTRUCTURE.....9

TABLE 2-6 FAT TIRE AND ADAPTIVE MOUNTAIN
BIKING INFRASTRUCTURE..... 10

TABLE 2-7 GATHERING AREA INFRASTRUCTURE . 10

TABLE 2-8 WETLAND OUTLOOK INFRASTRUCTURE
..... 10

TABLE 2-9 SIGNAGE TYPES..... 11

TABLE 2-10 HISTORICAL & CULTURAL
IMPROVEMENTS..... 12

TABLE 2-11 ECOLOGICAL RESTORATION
PRINCIPLES 12

TABLE 2-12 DESCRIPTION OF KEY ECOSYSTEM
ATTRIBUTES USED TO
CHARACTERIZE THE REFERENCE
ECOSYSTEM, EVALUATE BASELINE
CONDITIONS, SET PROJECT
GOALS, AND MONITOR RECOVERY
ON RESTORATION SITE^(A)2

TABLE 2-13 FIVE STAR ECOLOGICAL RECOVERY
SCALE IN THE CONTEXT OF THE 6
KEY ECOSYSTEM ATTRIBUTES^(A) ...4

**TABLE 2-14 SOCIAL FIVE-STAR SYSTEM FOR
EVALUATING PROGRESS TOWARD
SOCIAL GOALS IN THE
RESTORATION PROGRAM^(A)5**

TABLE 2-15 EXAMPLES OF HIGH PRIORITY
RESTORATION AREAS.....7

TABLE 2-16 POTENTIAL FORBS SPECIES FOR
CONSIDERATION OF POLLINATOR
HABITAT RESTORATION..... 10



TABLE 2-17 POTENTIAL GRAMINOID SPECIES SEED MIX FOR USE IN RESTORATION....	11
TABLE 2-18. POTENTIAL SHRUB AND TREE SPECIES OR USE IN RESTORATION	12
TABLE 2-19. RESTORATION DETAILS – FOREST	14
TABLE 2-20. RESTORATION DETAILS - WETLANDS	14
TABLE 2-21 EXAMPLE RESOURCES FOR THE CREATION OF PHYSICAL IMPROVEMENT FEATURES.....	16
TABLE 2-22. RECOMMENDED UTILITY CORRIDOR SPECIES COMPOSITION.....	18
TABLE 3-1 CONSTRUCTION RISKS & MITIGATION MEASURES.....	19
TABLE 4-1 ESTABLISHMENT & MAINTENANCE	22
TABLE 4-2. CONSIDERATIONS FOR AN EFFECTIVE SITE WIDE INTEGRATED PEST MANAGEMENT PLAN.....	23
TABLE 4-3. CONSIDERATIONS FOR AN INTEGRATED PEST MANAGEMENT PLAN IN RECLAMATION OR RESTORATION AREAS.....	23
TABLE 5-1 WILDLIFE MONITORING AT RSBBA	25
TABLE 5-2 EXISTING WILDLIFE SURVEY PROTOCOLS	26
TABLE 5-2 DETAILED SUCCESS MONITORING	30
TABLE 5-3 POLICY DOCUMENTS AND PERMITS.....	30
TABLE 6-1 CONSTRUCTION PHASING & COST ESTIMATE	34

FIGURES

FIGURE 2-1 CONTINUUM OF RESTORATIVE ACTIVITIES	14
FIGURE 2-2 ECOLOGICAL RECOVERY WHEEL	1
FIGURE 2-3 SOCIAL BENEFITS WHEEL	1
FIGURE 5-1 MEASURES OF SUCCESS FOR SHORT TERM MONITORING	29

1 INTRODUCTION

A Conceptual Plan has been developed to guide future improvements aimed at enhancing the Richard St. Barbe Baker Afforestation Area (RSBBAA; the site), considering both the natural assets and human use. This plan is intended to serve as the foundation for future site improvement planning and design, offering direction on aspects such as infrastructure, planting, and operational maintenance. The Conceptual Plan outlines the design program, proposed improvements, construction implementation, maintenance, monitoring, phasing, and costing. As the name suggests, all recommendations are conceptual only and will require further detailed design studies and approval prior to implementation.

The Conceptual Plan is a continuation of the Richard St. Barbe Baker Afforestation Area Natural Area Management Plan (RSBBAA NAMP) which details the long-term management of the site. The Conceptual Plan is intended to be read in conjunction with the RSBBAA NAMP as it builds upon the recommendations therein.

1.1 Site Overview

The site is a unique forested area located in the southwest of Saskatoon near the Chappell Marsh Conservation Area. The RSBBAA covers approximately 133 hectares (328 acres) and is comprised of a mix of forests, wetlands, and tame grasslands. These natural assets, or communities, are home to a variety of species of management concern, native species, and invasive species. The site currently supports both active and passive recreation, as well as corridors for utilities. Visitors can enjoy hiking/walking along trails, birdwatching, and geocaching. Active uses of the site are supported by a skills bike park, fat-tire winter biking trails, and an off-leash dog park. A full description of the existing features and uses of the site can be found in the NAMP.

1.2 Design Program

A design program has been developed for the site to guide the development of future improvements. A design program is a synthesis of the goals for the site, outlining what should be considered in future planning. As such, the design program considers the goals and targets outlined in the RSBBA NAMP, balancing the Natural Assets and Human Use of the site. The design program (see Error! Reference source not found.) is intended to guide future design decisions, ensuring that all future improvements support either the Natural Assets and/or the responsible Human Use of the site.

The proposed improvements further discussed in Section 2 – Proposed Improvements often have overlap between the Natural Assets and Human Use management of the site. For instance, the proposed circulation route (i.e., trails) not only allows for an engaging experience for visitors, but it also helps to sustain the natural assets by guiding visitors away from known sensitive habitats and species. Regardless of the improvement, it is recommended that the approved designs consider safety, accessibility, and climate change mitigation.

Table 1-1 Design Program

DESIGN PROGRAM		
	NATURAL ASSETS	HUMAN USE
PROGRAM CONSIDERATIONS	<ul style="list-style-type: none"> - Design considers the maintenance or enhancement of the natural assets in support of the Conservation Targets (see RSBBA NAMP). 	<ul style="list-style-type: none"> - Design considers passive recreation and active recreation, opportunities for historical and cultural connection, and opportunities for education and connection to nature. In support of the Human Well-Being Targets (see RSBBA NAMP).
SUPPORTING IMPROVEMENTS	<ul style="list-style-type: none"> - Buffering improvements (along the perimeter and within the site). - Restoration or reclamation improvements. - Ecological connectivity improvements. - Species of Management Concern (SOMC [Flora and Fauna]) improvements. - Stormwater improvements. 	<ul style="list-style-type: none"> - Human Use improvements, such as site access, circulation, destinations, communications programming, and site amenities. - Historical and Cultural improvements.

2 PROPOSED IMPROVEMENTS

The proposed improvements for the site support both the identified natural assets and the Human Use targets. Consequently, the Conceptual Plan focuses on a blend of ecological enhancements and human-use programming. **Figure 1** illustrates the spatial layout of the proposed improvements, adhering to the Management Zones established in the RSBBA NAMP that provide guidance on the appropriate programming in relation to known natural assets. It should be noted that **Figure 1** is conceptual only and intended solely to show possible relationships between features and the proposed programming. Each element of the Conceptual Plan carried forward into future designs must undergo detailed design and approvals prior to implementation.

The Conceptual Plan for the RSBBA includes recommendations for the following site improvements:

- Buffering improvements.
- Human Use Improvements.
- Historical and Cultural Improvements.
- Restoration/Reclamation Enhancements and Improvements.
- Ecological Connectivity Improvements.
- SOMC (Flora & Fauna) Improvements.
- Stormwater Improvements.

COORDINATION

As part of ongoing management and execution of the Conceptual Plan, coordination with, and input on all adjacent land use changes will be critical in the future planning and implementation of the proposed features, particularly the site access improvements and wildlife connectivity conservation. It is recommended that future planning be a collaborative effort between the City of Saskatoon, Meewasin, and adjacent landowners to ensure alignment of proposed and installed infrastructure. It is recommended that future improvements be designed and implemented in collaboration and/or engagement with site users, easement holders, and adjacent landowners.

2.1 BUFFERING IMPROVEMENTS

To mitigate the negative effects of existing incompatible land uses, such as the CN Railway Rail Yard Management site, it is recommended that buffering be installed (**Table 2-1**). In support of “Strategy #3 – Buffering of Adjacent Lands” from the RSBBA NAMP, the following is recommended:

Table 2-1 Buffering Improvements

	FUNCTION & LOCATION	DESCRIPTION
PLANTING	<ul style="list-style-type: none"> - To act as a buffer between the site and incompatible land uses. - Located on site between incompatible land uses, such as along the CN Railway Rail Yard property line. 	<ul style="list-style-type: none"> - Dense clusters of trees planted along the fence line to fill in exposed areas. - Consider a mix of coniferous and deciduous trees and shrubs.

2.2 HUMAN USE IMPROVEMENTS

The RSBBA is an engaging and well-used natural area which currently supports a variety of human uses. Responsible human use is intended to support the passive and recreational uses of the site, while sustaining the identified natural assets. Proposed Human Use improvements adhere to the permitted uses of the site as recommended by the RSBBA NAMP, with a focus on passive and active recreation, education, and connection to nature. In support of “Strategy #11 – Human Use Programming” the following improvements are proposed:

- Controlled site access.
- Circulation route and seating nodes.
- Off-leash dog park.
- Skills park.
- Fat tire and adaptive mountain biking course.
- Gathering area.
- Wetland outlook.
- Communications programming.
- Site furniture and materials.

All proposed infrastructure is intended to limit support the natural assets and Conservation Targets outlined in the RSBBA NAMP. As such, the proposed improvements consider ways in which to minimize disruption to the natural assets identified, incorporate engagement and education of visitors, and allow for sustainable connections to the landscape.

2.2.1 CONTROLLED SITE ACCESS

Controlled site access is proposed to provide protection from illegitimate uses, control access in-and-out of the site, define the boundaries, and assist in wayfinding. It is proposed that the perimeter of the site be fenced on the interior, and accessible from the existing and proposed parking areas. **Table 2-2** describes the proposed infrastructure to support controlled access of the site.

Table 2-2 Site Access Infrastructure

	FUNCTION & LOCATION	DESCRIPTION
SITE ENTRY SIGNAGE	<ul style="list-style-type: none"> – Located at main entry to site and easily visible from road. – To serve as wayfinding, location identification in emergencies, permitted uses, and site branding. 	<ul style="list-style-type: none"> – Refer to Table 2-9 for Site Entry Signage.
LIGHTING	<ul style="list-style-type: none"> – Located in parking lots. – To enhance safety and reduce opportunities for crime. 	<ul style="list-style-type: none"> – Dark-sky compliant lighting to reduce negative effects on wildlife. – Parking lots recommended to be illuminated only during hours when site is permitted to be open.

	FUNCTION & LOCATION	DESCRIPTION
PARKING LOTS	<ul style="list-style-type: none"> - To be located at existing locations. - In future, the City could consider relocating the western most parking lot to the location shown in Figure 1 adjacent to the wetland to mitigate concerns regarding access and safety crossing the CN Railway Rail Yard Management site. Further study (e.g., a traffic study and safety review) is needed to determine the feasibility of relocating the parking lot. The decision should be informed by consultation with site user groups, the Rrural Municipality (RM) of Corman Park, adjacent landowners, and Cedar Villa Estates. Township Rd. 362A is under the ownership and maintenance of the RM of Corman Park. As such, applications for new or expanded approaches into RSBBA via this road would be granted by the RM. 	<ul style="list-style-type: none"> - Quantity of parking spaces and layout to be sufficient for expected volume of visitors. As the dog park parking lot is heavily used, the need for expansion should be considered. A known snake hibernaculum; however, is nearby on the west side and should be avoided. - Consider pull-through for busses at the existing dog-park parking lot. - See "Gates and Blockades" for recommended control measures.
PERIMETER FENCING	<ul style="list-style-type: none"> - To encircle the entire site along the property line. - To visually signify importance of the site and restrict human entry while allowing for permeable wildlife movement. 	<ul style="list-style-type: none"> - Wildlife-friendly (i.e., 3-strand) fencing to allow for permeable movement of wildlife while discouraging human access. - Fence entirety of perimeter to limit disruption to the site, access for vehicles, and access for illegal dumping.
SAFETY FENCING	<ul style="list-style-type: none"> - To protect users from existing CN Railway Rail Yard Management site. 	<ul style="list-style-type: none"> - CN Railway proximity guidelines require a secure chain link fence of minimum 1.83m height along identified CN Railway Right-of-Ways (ROW)s. City to work with CN Railway to determine the final length and location of the fencing, and to determine whether a realignment of the northern pathway and fencing is needed.
GATES & BLOCKADES	<ul style="list-style-type: none"> - Control measures to be located at each entry point. - To restrict vehicular access to maintenance vehicles only, and to allow for pedestrian access. 	<ul style="list-style-type: none"> - Swing gate with lock for maintenance vehicle access. - Pedestrian access fitted with gate or boulders to restrict vehicular access.
BOOT CLEANING STATIONS	<ul style="list-style-type: none"> - To be located at each entry point. - To support invasive species control, and to allow visitors to clean boots of seeds prior to entering and leaving the site. 	<ul style="list-style-type: none"> - Boot brush with signage to educate visitors on the spread of invasive species and preventative measures.
RESTROOM FACILITIES	<ul style="list-style-type: none"> - To be located at the parking lot adjacent to the off-leash dog park. - Potential location at the proposed parking lot adjacent to the wetland. Subject to further study. 	<ul style="list-style-type: none"> - Temporary or permanent restroom facility. - Design to be accessible for a range of user groups. - Should running water be incorporated, a water fountain should be considered. - For safety, consider the potential for locking the facilities to restrict use during certain times of the day or night.
WASTE RECEPTACLES	<ul style="list-style-type: none"> - To be located at each entry point for ease of maintenance. 	<ul style="list-style-type: none"> - Consider wildlife-proof containers. - Size to be sufficient to handle expected volume of visitors. - Design to consider ease of maintenance.

2.2.2 CIRCULATION ROUTE & SEATING NODES

The existing circulation route within the RSBBA is extensive and used by multiple user types in all seasons, including walkers, general cyclists, and fat tire bikers. It is recommended to retain the existing layout of the trail system where possible with upgrades for connectivity across the site, and reduction in conflict between user groups (i.e., pedestrians and cyclists). Three trail types have been proposed for the RSBBA: Primary Trail, Secondary Trail, and Tertiary Trail. The following table (**Table 2-3 Trail Design**) provides an overview of the function and considerations for each trail type.

During the future detailed design of the circulation route, it is recommended that the function, environment, safety, and accessibility of each design element be thoroughly evaluated. **Table 2-3 Trail Design** below outlines the recommendations for the individual design considerations related to the proposed trails. These recommendations are based on the City of Saskatoon’s Standard Construction Specifications: Parks (2023) and The Meewasin Trail Study (2014).

Table 2-3 Trail Design

DESIGN CONSIDERATION	GENERAL RECOMMENDATIONS	RECOMMENDATIONS PER TRAIL TYPE
LAYOUT & FUNCTION	<ul style="list-style-type: none"> - Function: Circulation system connects visitors to the adjacent land uses and entry points, guides visitors through the site, and allows for controlled access to points of interest and opportunities for education. - Layout: Proposed layout of trails is conceptual only. The final layout should be determined following a legal land survey of the property line, and location of sensitive species. - Environment: Layout considers the location of sensitive natural features and considers the path which will require the least amount of disruption both during construction and maintenance. - Safety: Circulation system provides a safe route throughout the site, avoiding potential hazards, such as steep topography or water-related hazards. - Accessibility: Provides accessible route for a variety of user groups, including those who utilize mobility devices. 	Primary Trail: <ul style="list-style-type: none"> - Utilizes existing trails where possible, and creation of new trail layout to optimize connectivity. - Guides visitors of all abilities efficiently throughout the site and to connectivity points. - Users: Multi-use trail in all seasons. Walking, biking, on-leash dogs, snow-shoeing, skiing.
		Secondary Trail: <ul style="list-style-type: none"> - Utilizes existing trail system with proposed minor additional connection points. - Provides meandering off-shoots from the Primary Trail for a more immersive experience. - Users: Multi-use trail in all seasons. Walking, biking, on-leash dogs.
		Tertiary Trail: <ul style="list-style-type: none"> - Utilizes existing trail system. - To provide a dedicated course for fat-tire bikers in the winter season. - Trail design to consider the Whistler Trail Standards. - Users: To be used by fat-tire bikers and snow-shoers in winter months, and open to all in the summer months.
SURFACE & MATERIALS	<ul style="list-style-type: none"> - Function: Stable, durable materials of various visual types, which are efficient to maintain. - Environment: Surface materials durable and comfortable to avoid pedestrians going off-trail to avoid unsafe or uncomfortable conditions. Consider materials which would cause 	Primary Trail: <ul style="list-style-type: none"> - Durable material, such as asphalt, crushed gravel, or crusher dust is recommended. - At-grade boardwalks where topography dictates.
		Secondary Trail: <ul style="list-style-type: none"> - Mown or natural surface trails.

DESIGN CONSIDERATION	GENERAL RECOMMENDATIONS	RECOMMENDATIONS PER TRAIL TYPE
	<ul style="list-style-type: none"> minimal disruption to natural processes when constructing and when used. – Safety: Surface materials durable and slip-resistant to avoid slips, trips, and falls. – Accessibility: Surface materials of durable and even material to allow for ease of use. 	<ul style="list-style-type: none"> – At-grade boardwalks where topography dictates. <p>Tertiary Trail:</p> <ul style="list-style-type: none"> – To be determined through consultation with cycling groups.
GRADE	<ul style="list-style-type: none"> – Function: Grade of trail designed to avoid rutting along sides of the routes and provide comfortable experience to avoid volunteer trails. – Environment: Grade of trail limits erosion of trail and encourages users to stay on path. – Safety: Grade of trail designed to allow for adequate drainage of surface to avoid pooling of water or formation of ice (2% cross slope), and comfort of walking (5% maximum slope). – Accessibility: To allow for mobility device accessibility, it is recommended that slopes be kept to 5% or less to meet the Canadian Standards for Accessibility (CSA). 	<p>Primary Trail:</p> <ul style="list-style-type: none"> – Maximum 5% longitudinal slope, minimum 2% cross slope. <p>Secondary Trail:</p> <ul style="list-style-type: none"> – To existing grade, with a recommendation to avoid areas steeper than 5%. <p>Tertiary Trail:</p> <ul style="list-style-type: none"> – To be determined through consultation with cycling groups.
WIDTH	<ul style="list-style-type: none"> – Function: Minimum trail widths should consider the City's Construction Specifications and the Meewasin trail development standards. – Environment: Width wide enough to accommodate two people walking side by side to avoid people walking off-trail. – Safety: Adequate width to allow for users to comfortably pass without conflict. – Accessibility: Adequate width to allow for two mobility devices to pass. 	<p>Primary Trail:</p> <ul style="list-style-type: none"> – 3.0 minimum width. <p>Secondary Trail:</p> <ul style="list-style-type: none"> – 2.0-3.0m minimum depending on the width of the mower deck. <p>Tertiary Trail:</p> <ul style="list-style-type: none"> – To be determined through consultation with cycling groups.
SIGHTLINES & OBSTRUCTIONS	<ul style="list-style-type: none"> – Function: Maintain adequate sightlines to avoid user conflicts and avoid obstructions along the trail. – Environment: Consider growth of vegetation and potential sightline and obstruction conflicts. – Safety: Maintain sightlines around curves, at junctions, and at entrances. Avoid sharp curves along trail system. Keep structures and plant material a minimum of 2.0m from edge of trail with an overhead vegetation clearance of a minimum of 3.0m above the trail surface. – Accessibility: Ensure trail is not obstructed to inhibit accessibility. 	<p>Primary Trail:</p> <ul style="list-style-type: none"> – Adhere to general recommendations (column to the left). <p>Secondary Trail:</p> <ul style="list-style-type: none"> – Adhere to general recommendations (column to the left). <p>Tertiary Trail:</p> <ul style="list-style-type: none"> – Adhere to general recommendations (column to the left).
MAINTENANCE	<ul style="list-style-type: none"> – Function: Regular maintenance of trail system to ensure working order. – Environment: Regular maintenance is encouraged to avoid degradation of trail system and volunteer trail formation for those seeking an alternative route (signage should encourage users to stay on trail). 	<p>Primary Trail:</p> <ul style="list-style-type: none"> – Adhere to general recommendations. <p>Secondary Trail:</p> <ul style="list-style-type: none"> – Adhere to general recommendations. <p>Tertiary Trail:</p>

**DESIGN
CONSIDERATION**

GENERAL RECOMMENDATIONS

RECOMMENDATIONS PER TRAIL TYPE

	<ul style="list-style-type: none"> - Safety: Regular maintenance is encouraged to avoid degradation of trail system, rutting, and hazards. - Accessibility: Regular maintenance is encouraged to avoid degradation of trail system, rutting, and hazards, and barriers. 	<ul style="list-style-type: none"> - Adhere to general recommendations. - Special maintenance for fat-tire bikers.
SITE FURNITURE	<ul style="list-style-type: none"> - Function: Site furniture to support the use of the trail system. - Environment: Field fit to ensure sensitive species are avoided. Adequate areas of rest provided to avoid users creating volunteer areas of rest and unintentionally disturbing sensitive ecosystems. - Safety: Locate areas of rest at a regular frequency to prevent fatigue. Locate furniture at a safe distance from the side of the pathway to avoid conflict. Avoid locating seating nodes in remote areas to avoid crime. - Accessibility: Consider accessible designs for such things as benches and signage. Locate areas of rest at a regular frequency to prevent fatigue. 	<p>Primary Trail: Benches located at existing and proposed locations of interest.</p> <p>Secondary Trail: Benches located at existing and proposed locations of interest.</p> <p>Tertiary Trail: Benches located at existing and proposed locations of interest.</p>
SIGNAGE	<ul style="list-style-type: none"> - Function: To provide wayfinding and information on use of trails. Work with user groups to design new signage. - Environment: Discourage volunteer trail formation through use of proper signage to guide users through the site. - Safety: Install signage at site entrances, and at trail junctions. Signage to clearly indicate location of user, trail system, and location of entrances and emergency gathering areas. - Accessibility: Accessibility enhanced through clear communication of length of pathways to destinations, and notation of which routes are accessible. 	<p>Primary Trail:</p> <ul style="list-style-type: none"> - Wayfinding signage and educational signage located at trail junctions and at areas of interest or ecological importance. <p>Secondary Trail:</p> <ul style="list-style-type: none"> - Wayfinding signage and educational signage located at trail junctions and at areas of interest or ecological importance. <p>Tertiary Trail:</p> <ul style="list-style-type: none"> - Wayfinding signage and educational signage located at trail junctions and at areas of interest or ecological importance.

2.2.3 OFF-LEASH DOG PARK

The existing off-leash dog park is proposed to remain and function as an area for exercise, socialization, and recreation. Infrastructure to support the off-leash dog park includes:

Table 2-4 Off-Leash Dog Park Infrastructure

DESIGN RECOMMENDATIONS	
FENCING	<ul style="list-style-type: none"> - Entirety of off-leash dog park to be fenced. - Fencing to be page-wire or equivalent at a minimum height of 1.5m. - Alignment of fencing is recommended to be slightly altered to allow for trail connection north of the off-leash dog park. Final alignment is subject to engagement with user groups and easement holders.
ACCESS	<ul style="list-style-type: none"> - Access to off-leash dog park to be from the existing parking lot. - Four pedestrian access points are recommended, one on each side of the fencing to allow for multiple exit routes during emergency situations. To be supported by means of self-closing gates which have the ability to open and close in all seasons. - Two access points are recommended along the utility maintenance corridor. To be supported by means of a locked swing gate.
SIGNAGE	<ul style="list-style-type: none"> - "Entering" and "Leaving" off-leash dog park signage to be posted at each entry to remind visitors when to leash their dogs. - Bylaw signage to be posted at each entry as a reminder to pick-up dog waste, and other requirements. - Rules for dog park to be posted at entry to off-leash dog park.
BAG DISPENSERS	<ul style="list-style-type: none"> - Bag dispensers to be located at each pedestrian entry point to encourage responsible use of the site and limit spread of disease. - Waste receptacles to be located in parking lot.
FURNITURE	<ul style="list-style-type: none"> - Boulders or logs to be placed in off-leash dog park for interest and mental stimulation.
BENCHES	<ul style="list-style-type: none"> - Existing benches are recommended to be relocated to elsewhere within the park to encourage pet owners to monitor their dogs.

2.2.4 SKILLS PARK

The existing Skills Park is proposed to remain and function as an area for development of BMX skills, education, and promotion of the sport. It is recommended that future improvements to the Skills Park be developed in conjunction with the input and support of the local Cedar Villa BMX group. In addition, the City intends to work with Cedar Villa BMX group to identify possible site impacts, including light, noise, and erosion, and respective mitigation measures. Infrastructure to support the Skills Parks (**Table 2-5**) includes:

Table 2-5 Skills Park Infrastructure

DESIGN RECOMMENDATIONS	
SPORT-SPECIFIC INFRASTRUCTURE	<ul style="list-style-type: none"> - Work with local skills group to determine the requirements of the sport-specific infrastructure, including such elements as jumps and ramps. - Consider upgrading the infrastructure to improve safety and visual quality of the skills park.
BENCHES	<ul style="list-style-type: none"> - Upgrade existing benches to match the site aesthetic.
SIGNAGE	<ul style="list-style-type: none"> - To be posted at entrance to skills park. - Signage to include information on liability, guidelines for use, emergency contact information, and history of the foundation of the skills park.
SUPPORTING INFRASTRUCTURE	<ul style="list-style-type: none"> - Requirements to be discussed with the local group. - Sustainable and environmentally sensitive infrastructure to be prioritized, particularly regarding lighting. - Consider installing water tanks which can be filled less frequently than existing infrastructure to reduce vehicular traffic through the site. To be determined through future consultation.

2.2.5 FAT TIRE & ADAPTIVE MOUNTAIN BIKING COURSE

To encourage the continued use of the site as a winter fat tire biking destination, and encourage the future use of the site as an adaptive mountain biking destination, the following is recommended:

Table 2-6 Fat Tire and Adaptive Mountain Biking Infrastructure

DESIGN RECOMMENDATIONS	
TRAIL IMPROVEMENTS & SURFACING	<ul style="list-style-type: none"> - To be determined through future consultation with the Fat Tire Group and Adaptive Mountain Biking user groups.
SIGNAGE	<ul style="list-style-type: none"> - Wayfinding trail markers to be installed at each trail junction. - Trail markers to include permitted uses of the trails per season.

2.2.6 GATHERING AREA

A gathering area is proposed to be located to the eastern side of the off-leash dog park in an existing clearing. The function of the gathering area is to provide a space for educational, ceremonial, and other group gatherings.

Infrastructure to support the gathering area includes:

Table 2-7 Gathering Area Infrastructure

DESIGN RECOMMENDATIONS	
LOCATION	<ul style="list-style-type: none"> - Final location to be verified prior to construction to avoid sensitive species and minimal removal of trees.
SEATING	<ul style="list-style-type: none"> - Outdoor classroom or amphitheatre style seating to allow for educational groups to gather. - Accessible benches and picnic tables.
SIGNAGE	<ul style="list-style-type: none"> - Educational signage located at gathering area.

2.2.7 WETLAND OUTLOOK

A wetland outlook in the form of a pier is proposed to provide a viewpoint into the eastern portion of the central wetland to foster a connection to nature. Infrastructure to support the wetland outlook includes:

Table 2-8 Wetland Outlook Infrastructure

DESIGN RECOMMENDATIONS	
LOCATION	<ul style="list-style-type: none"> - Final location to be verified prior to construction to avoid sensitive species and minimal removal of vegetation.
PIER	<ul style="list-style-type: none"> - Consider environmentally sensitive materials in pier design. - Surfacing to be slip-resistant. - Climb-resistant guards to be installed along length of pier for safety.
SEATING	<ul style="list-style-type: none"> - Bench, or benches, to be located on pier to allow for rest and contemplation.
SIGNAGE	<ul style="list-style-type: none"> - Educational signage to posted at strategic location.

2.2.8 COMMUNICATIONS PROGRAMMING

Four types of signage are recommended for the site as part of the communications programming (**Table 2-9**). A comprehensive communications program addresses the need for site recognition, wayfinding, education/interpretation, and rules. It is recommended that as part of detailed design, a communications program be developed to ensure accessibility, site branding, and application of City policies.

Table 2-9 Signage Types

	FUNCTION & LOCATION	DESCRIPTION
SITE MAP	<ul style="list-style-type: none"> – Function to orient users when arriving to the site and provide context of permissible and prohibited uses. – Preferred location to be at the parking lots. 	<ul style="list-style-type: none"> – Largest in scale than the other signage types. – To include at a minimum the site name, entry location information for emergencies, emergency contact information, site map, hours of use, and permissible and prohibited uses. – Information to be compliant with the City of Saskatoon’s Crime Prevention Through Environmental Design (CPTED) policies.
WAYFINDING POSTS	<ul style="list-style-type: none"> – Function to orient users along the circulation system through the site. – Location to be at trail junctions. 	<ul style="list-style-type: none"> – Small trail markers with trail map and location of user. – Graphics to be a simplified version of the entry maps, with a focus on indicating the circulation system and main destinations in icon format.
EDUCATIONAL SIGNAGE	<ul style="list-style-type: none"> – Function to be focused on educating visitors to the site on topics such as the history and environmental significance of the site. – Location to be at significant historical, cultural, and environmental features. – “Restoration in progress” signage to be considered for locations of proposed planting initiatives. 	<ul style="list-style-type: none"> – As part of signage and communications program, determine which historical, cultural, and environmental features to celebrate.
PROHIBITED USE	<ul style="list-style-type: none"> – Function of signage is to discourage prohibited use of the site. – Location to be at the site entrance and at areas in need of protection. 	<ul style="list-style-type: none"> – Content to discourage prohibited use of the site, such as motorized vehicles, dumping, or access to sensitive areas.

2.2.9 SITE FURNITURE & MATERIALS

Site furniture and materials are recommended to be chosen based on durability, maintenance, aesthetics, sustainability, costs, comfort, accessibility, local availability, and resistance to vandalism and theft. The materials palette is recommended to be complimentary to the natural surroundings, including such elements as natural stone, wood, native plants, and weathered metals. To create cohesion throughout the site, it is recommended that a colour and materials palette is decided upon and utilized throughout the site, upgrading existing infrastructure as required.

2.3 Historical and Cultural Improvements

In support of “Strategy #8 – Historically and Culturally Significant Species & Features Management” the following improvements are proposed:

Table 2-10 Historical & Cultural Improvements

	FUNCTION & LOCATION	INFRASTRUCTURE
EDUCATIONAL SIGNAGE	<ul style="list-style-type: none"> – Educational signage to engage and inform the public on historically and culturally significant topics. – Locate outside adjacent to the historically and culturally significant features. 	<ul style="list-style-type: none"> – Recommended to comply with signage program (Table 2-9) in “Human-Use” improvements.
PLANTING	<ul style="list-style-type: none"> – Inclusion of culturally significant species in restoration/reclamation improvements. 	<ul style="list-style-type: none"> – Will require engagement with Indigenous communities.

2.4 RESTORATION/RECLAMATION IMPROVEMENTS

The RSBBA would benefit greatly from future restoration work. Restoration refers to intentionally returning degraded ecosystems to its original or natural state (definition adapted from Gann et al., 2019). The RSBBA NAMP written by WSP (2023) outlines the restoration feasibility of two locations at the site, the southeastern forest portion of SE 23-36-06 W3M and the large central wetland. In restoration projects, the aim is to rehabilitate the ecological function and native biodiversity of a system as close as possible to pre-disturbance conditions.

With the constant presence of various recreation activities, such as fat-tire biking, skills- and off-leash dog park usage and hiking, the RSBBA suffered ecosystem degradation and habitat fragmentation. Adjacent development projects and city encroachment create further threats as the RSBBA’s margins are continuously disturbed and modified. The Society for Ecological Research (Gann et al., 2019) has identified eight principles for ecological restoration that are listed in the table below.

Table 2-11 Ecological Restoration Principles

PRINCIPLE	HOW IT IS APPLIED
Engages stakeholders	The successful engagement of stakeholders is detailed through the Social Benefits Wheel which focusses on improving social-ecological resilience (see Section 2.4.2 – Ecological Recovery Wheel (ERW)).
Draws on many types of knowledge	The attempt of knowledge enrichment is detailed through the Social Benefits Wheel which focusses on creating new relationships (see Section 2.4.2 – Ecological Recovery Wheel (ERW)). Using the Social Benefits Wheel provides an opportunity to engage with Indigenous communities to have their voices and needs heard. Efforts should be made to incorporate their restoration goals into the restoration process.

PRINCIPLE	HOW IT IS APPLIED
Is informed by native reference ecosystems	The restoration process of the RSBBA is informed and compared to native reference ecosystems that will resemble similar features as the RSBBA. An option for a reference community would be an urban park located in another major city (e.g., Regina) that has human use.
Supports ecosystem recovery processes	The restoration of the wetlands and forests on site will aid in the recovery of ecosystem processes (Principle 4) by creating an overall healthier biodiversity structure that is more resilient to future stresses.
Is assessed against clear goals and objectives	The restoration process will be assessed against clear targets, goals, and objectives which are outlined in the 2023 RSBBA NAMP.
Seeks the highest level of recovery possible	The restoration process, including targets, goals, and objectives, will be evaluated every 10 years ensuring that adaptive management will achieve the highest level of recovery possible. The Ecological Recovery Wheel (Section 2.4.2 – Ecological Recovery Wheel (ERW)) aids in the guidance and tracking of the progress of the ecological restoration projects. Restoration processes can be repeated and intensified until full recovery is achieved. Full recovery is achieved when the two to-be-recovered ecosystem types resemble their reference ecosystems named above.
Gains cumulative value	Once the restoration processes are complete, cumulative benefits are gained. Enhancing wetlands and forests to a healthier state might increase the rate of carbon sequestration by greater production of plant and animal biomass contributing to slowing climate change.
Is part of a continuum of restoration activities	Overall, the restoration of the RSBBA falls within the ecological restoration (partially/fully recovering native ecosystems) category of the restorative continuum (Figure 2-1). The forest and wetlands observed in RSBBA will be ecologically restored to closely resemble their respective reference ecosystems.

Figure 2-1 below shows the restorative continuum created by Society for Ecological Research (Gann et al., 2019) to categorize the restoration type and status goal that the restorable ecosystem will achieve under full recovery.

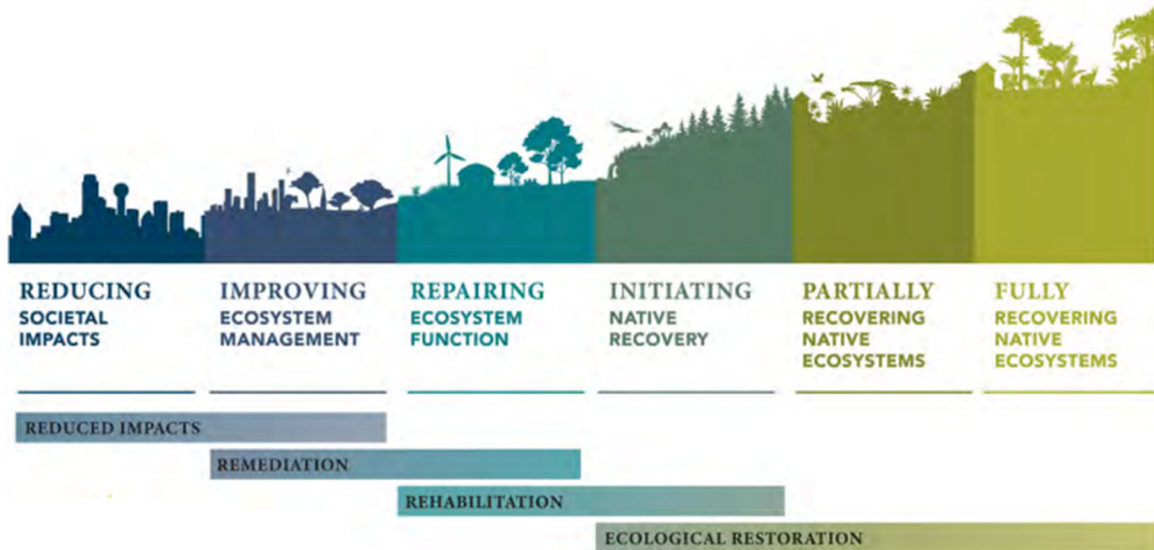


Figure 2-1 Continuum of Restorative Activities

Creating habitats that cater to the wildlife and vegetation specific needs is recommended to enhance wildlife and vegetation populations, ecosystem stability and overall biodiversity health. By conserving and enhancing habitat for wildlife and vegetation, environments conducive to their natural behaviours, reproductive processes, and ecological requirements are created.

A framework for site reclamation and restoration has been created by WSP and detailed in the following sections. The framework includes six primary categories:

- Detailed baseline collection.
- Identification of goals/objectives.
- Site selection.
- Site design.
- Planting materials and seed sourcing.
- Determining species mix composition.
- Planting methodologies.
- Site management and monitoring.

This framework is enhanced by adaptive management principles, which will allow the exploration of alternative ways to meet restoration goals and predict the outcomes of these alternatives based on current knowledge. After implementing the alternatives, the results can be used to adjust restoration practices. Each project identified during the management of the site will require iterative approaches to manage location specific conditions, which should be identified during the detailed baseline collection phase.

2.4.1 DETAILED BASELINE DATA COLLECTION

To undertake appropriate site management, the baseline conditions throughout the site should be recorded in detail prior to the selection and subsequent focus on any reclamation or restoration activities. Appropriate baseline information should also be used to select appropriate sites for either activity.

At a minimum, the data collected will be used to determine species lists, appropriate site management for invasive, noxious, or nuisance weeds, create areas of prioritization for restoration activities, identify available seed sources, and provide a baseline condition to measure success against.

Baseline survey should utilize pre-existing methodologies and be approved by experienced surveyors (for example, Meewasin). A field program should be developed that includes but is not limited to:

- Documentation of invasive, noxious, or nuisance species recording their species, density, distribution, and phenology.
- Inventory general wildlife species and targeted SOMC for spatial distribution, movement and use.
- Complete detailed vegetation inventories of all species (native and non-native) recording cover, indicating dominant species, and identifying areas of bare ground, or accelerated erosion.
- Complete habitat classification for the site using the Saskatchewan Rangeland Ecosystems (Thorpe, 2007) for uplands and Stewart and Kantrud (1971) for wetland habitats.
- Complete condition assessments using Rangeland Health Assessments for Native Grassland and Forests (PCAP, 2008).
- Identification of potential soil contaminants and/or water quality testing.

Data collection should then be compiled to create a master listing or prioritization ranking of specific areas within the site to guide targeting and then the subsequent execution of the various restoration reclamation opportunities. Initial focus should be areas of high prioritization for restoration or reclamation.

For example, areas that may result in a high prioritization may be locations that have a high concentration of native forbs but are at risk of being lost to non-native graminoid species, areas where Species of Management Concern (SOMC) are observed, or areas that have a condition assessed during the Rangeland Health Assessments that have a resulting score of “Healthy with Problems”.

2.4.2 ECOLOGICAL RECOVERY WHEEL (ERW)

The ERW is a structured tool developed by the Society for Ecological Restoration (SER) to guide and track the progress of ecological restoration projects (Gann et al., 2019). It is designed as a visual framework to emphasize that ecological restoration is a dynamic and always-changing process that requires consideration of multiple environmental and anthropogenic factors (**Figure 2-2**).

The ERW presents six attributes with three sub-attributes each to rank the subsections on a five-star scale, where five stars represent an ecosystem being fully recovered (**Figure 2-2**). The “to be restored ecosystem” in this process is compared against a reference ecosystem to make appropriate management decisions. The reference ecosystem resembles a healthy state of restorable ecosystem with the similar succession stages. Definitions of the six categories as well as the five-star system are explained in

Table 2-12 and Table 2-13 respectively.

The ERW also provides the opportunity to track the recovery of the restoration project regarding social benefits on a social five-star scale, or SBW (Figure 2-3 and received.

Table 2-14). The combination of ecological recovery and improvement in social benefits may lead to enhanced social-ecological resilience. Humans benefit from healthy environments, not just based on ecological functions like improved air quality, but on a mental and spiritual level. Engagement with nature can relieve stress and boost physical and mental health. Restoration projects will also benefit Indigenous communities as these nature-based cultures are being reinforced and the Indigenous livelihoods are restored and celebrated (Gann et. al., 2019).

It is important to note that not all attributes of both the ERW and the SBW will apply to every project. The templates, especially the sub-attributes, should be adapted to suit the social and ecological goals of every project.

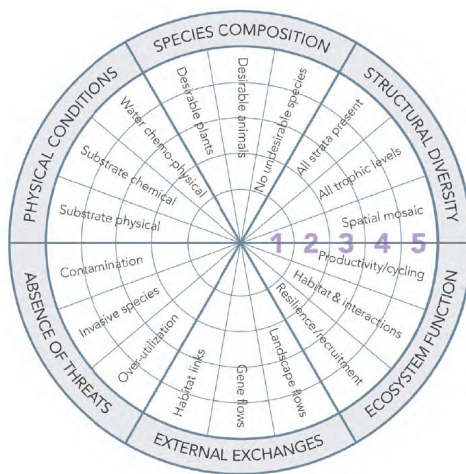


Figure 2-2 Ecological Recovery Wheel

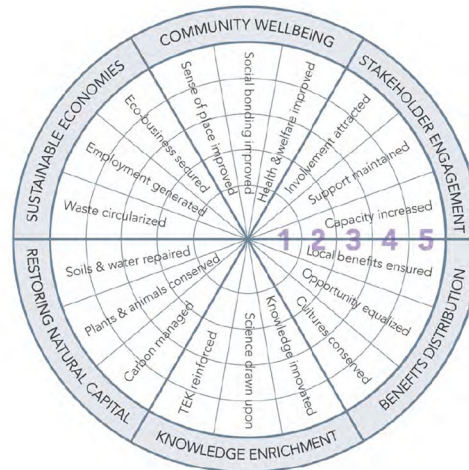


Figure 2-3 Social Benefits Wheel

The ecological site of the ERW is comprised of six key ecosystem attributes (with three sub-attributes each) that, when ranking high, contribute to ecosystem integrity. These six attributes (defined in

Table 2-12) are used to characterize the reference ecosystem, evaluate the baseline conditions of the to be restored ecosystem, set restoration project goals, and monitor the recovery of the restoration site.

Table 2-12 Description of Key Ecosystem Attributes Used to Characterize the Reference Ecosystem, Evaluate Baseline Conditions, Set Project Goals, and Monitor Recovery on Restoration Site^(a)

ATTRIBUTE	DESCRIPTION	SUB-ATTRIBUTES	DEFINITION
Absence of threats	Direct threats to the ecosystem such as overutilization, contamination, or invasive species are absent	Over-utilization	Any form of harvesting or exploitation of an ecosystem beyond its capacity to regenerate those resources. Examples include overfishing, over-clearing, over-grazing, and over-burning.
		Invasive species (external)	Harmful plants and animals that were not originally present within an ecosystem but were directly or indirectly introduced into or spread in the ecosystem as a result of human activities.
		Contamination	Chemical contamination (e.g., over-fertilizing, pesticide spills) or biological contamination (e.g., introduction of invasive species including undesirable pathogens).
Physical conditions	Environmental conditions (including the physical and chemical conditions of soil and water, and topography) required to sustain the target ecosystem are present.	Substrate physical	The physical composition of soil, sand, rock, shell, debris or other medium where organisms grow, and ecosystems develop.
		Substrate chemical	The chemical composition of soil, sand, rock, shell, debris or other medium where organisms grow, and ecosystems develop.
		Water chemo-physical	The physical and chemical makeup of water.
Species composition	Native species characteristic of the appropriate reference ecosystem dominate, whereas undesirable species are managed or absent.	Desirable plants	Plant species from the reference ecosystem (or sometimes nonnative nurse plants) that will enable the native ecosystem to recover. The corollary of desirable plant species is undesirable species, which are often but not exclusively nonnative species.
		Desirable animals	Wildlife species from the reference ecosystem (or sometimes nonnative nurse plants) that will enable the native ecosystem to recover. The corollary of desirable wildlife species is undesirable species, which are often but not exclusively nonnative species.
		No undesirable species	The corollary of desirable plant species. Undesirable species are often but not exclusively nonnative species.
Structural diversity	Appropriate diversity of key structural	All strata present	Vegetation layer or layers in an ecosystem; often referring to vertical layering such as trees, shrubs and herbaceous layers.
		All trophic levels	Stages in food webs (e.g., producers, herbivores, predators, and decomposers).

ATTRIBUTE	DESCRIPTION	SUB-ATTRIBUTES	DEFINITION
	components, including demographic stages, trophic levels, vegetation strata and spatial habitat diversity are present.	Spatial mosaic	The spatial structure of ecosystem components (in vertical or horizontal plane) that arises due to differences in substrate, topography, hydrology, vegetation, disturbance regimes, or other factors.
Ecosystem function	Appropriate levels of growth and productivity, nutrient cycling, decomposition, species interactions, and rates of disturbance.	Productivity, cycling etc.	Productivity: the rate of generation of biomass from the growth and reproduction of plants and animals. Cycling: The transfer (between parts of an ecosystem) of resources such as water, carbon, nitrogen, and other elements that are fundamental to all other ecosystem functions.
		Habitat interactions	Accessible habitat or the amount of habitat that can be reached from a focal habitat patch (Eigenbrod, Hecnar, & Fahrig, 2008).
		Resilience, recruitment etc.	Ecosystem resilience: The degree, manner, and pace of recovery of ecosystem properties after natural or human disturbance. In plant and animal communities this property is highly dependent on adaptations by individual species to disturbances or stresses experienced during the species' evolution. Social-ecological resilience: the capacity of a complex social-ecological system to absorb disturbance and reorganize while undergoing change such that it retains similar function, structure, identity, and feedback. It is a measure of the extent to which a complex social-ecological system can adapt and persist in the face of threats and stresses. Recruitment: Production of a subsequent generation of organisms. This is measured not by numbers of new organisms alone (e.g., not every hatchling or seedling) but by the number that develop as independent individuals in the population.
External exchanges	The ecosystem is appropriately integrated into its larger landscape or aquatic context through abiotic and biotic flows and exchanges.	Landscape flows	Exchanges that occur at a level larger than individual ecosystems or sites (including within aquatic environments) and including flows of energy, water, fire and genetic material. Exchanges are facilitated by habitat linkages.
		Gene flow	Exchange of genetic material between individual organisms that maintains the genetic diversity of a species' population. In nature, gene flow can be limited by lack of dispersal vectors and by topographic barriers such as mountains and rivers. In fragmented landscapes it can be limited by the separation of remnant habitats. Gene flow between introduced and native populations can have negative impacts, such as outbreeding depression.
		Habitat links	An element that comprises the possibility of dispersal between two habitat patches. A link may correspond to a physical corridor, or it may symbolise the potential of an organism to directly disperse between two habitat patches through favorable land cover (Saura & Rubio, 2010).

Table 2-13 below describes the state of the ecosystem to be restored against the state of the reference ecosystem. The lower the resemblance between the two ecosystems, the lower the star count. The explanations of the different levels will give an idea on how the different key ecosystem attributes need to be improved to receive a higher star count, which intern represent a healthier restoration score.

Table 2-13 Five Star Ecological Recovery Scale in the Context of the 6 Key Ecosystem Attributes^(a)

ATTRIBUTE	*	**	***	****	*****
Absence of threats	Some direct degradation drivers (e.g., overharvesting, overgrazing, active contamination) absent and conservation status secured, but others remain high in number and degree.	Direct degradation drivers (including, e.g., sources of invasive low but some may species, absence of remain intermediate in appropriate natural degree. disturbances) intermediate in number and degree.	Number of direct degradation drivers low but some may remain intermediate in degree.	Direct degradation drivers, both external and on-site, low in number and degree.	Threats from direct degradation drivers minimal or effectively absent.
Physical conditions	Most physical and chemical properties of properties of the site's substrates and hydrology (e.g., soil structure, nutrients, pH, salinity, hydrological conditions) still highly dissimilar to reference ecosystem but some showing improved similarity.	Physical and chemical Physical and chemical substrates and hydrology, remain at low similarity levels relative to reference ecosystem but capable of supporting some biota of reference ecosystem.	Physical and chemical properties of substrates and hydrology stabilized within intermediate range of reference ecosystem and capable of supporting growth and development of many characteristic native biota.	Physical and chemical conditions of substrates and hydrology within high range of reference ecosystem and suitable for ongoing growth and recruitment of most characteristic native biota.	Physical and chemical conditions of substrates and hydrology very highly similar to that of the reference ecosystem with evidence they can indefinitely sustain all characteristic species and processes.
Species composition	Some colonizing native species present (e.g., approx. 2% of the reference ecosystem). Very high levels of nonnative invasive or undesirable species.	A small subset of characteristic native species present (e.g., approx. 10% of the reference ecosystem) across site. High to moderate levels of nonnative invasive or undesirable species.	A subset of key native species present (e.g., approx. 25% of the reference ecosystem) over substantial proportions across the site. Moderate to low levels of nonnative invasive or undesirable species.	Substantial diversity of characteristic native species and genes present (e.g., approx. 60% of the reference ecosystem) across site and representing a wide diversity of functional groups. Low to very low levels of nonnative invasive or undesirable species.	High diversity of characteristic native species and genes present (e.g., >80% of the reference ecosystem), with high similarity to the reference ecosystem and high potential for colonization of more native species over time. Very low to nil invasive or undesirable species.

ATTRIBUTE	*	**	***	****	*****
Structural diversity	One horizontal stratum of the reference present but spatial patterning and community trophic complexity still largely dissimilar to reference ecosystem.	More than one stratum of the reference present but some similarity of spatial patterning and trophic complexity, relative to reference ecosystem.	Most strata of the reference present and intermediate similarity substantial similarity of trophic complexity relative to reference ecosystem.	All strata of the reference present and substantial similarity of spatial patterning and trophic complexity relative to reference ecosystem.	All strata present and spatial patterning and trophic complexity high. Further complexity and spatial patterning able to self organize to highly resemble the reference ecosystem.
Ecosystem function	Processes and functions (e.g., water and nutrient cycling, habitat provision, appropriate disturbance regimes and resilience) are at a very foundational stage only, compared to the reference ecosystem.	Low numbers and levels of physical and biological processes and functions, relative to the reference ecosystem (incl. plant decomposition, soil processes), are present.	Intermediate numbers and levels of physical and biological processes and functions, relative the reference ecosystem (incl. reproduction and dispersal) are present.	Substantial levels of physical and biological processes and functions, relative to the reference ecosystem (including return of appropriate disturbance regimes) are present.	All functions and processes (including appropriate disturbance regimes) are on a secure trajectory towards the levels of the reference and are showing evidence of being sustained.
External exchanges	Positive exchanges flows with surrounding environment (e.g., of species, genes, water, fire) in place for only very low numbers of species and processes.	Positive exchanges with surrounding environment in place for a few characteristic species and processes.	Positive exchanges between site and surrounding environment in place for intermediate levels of characteristic species and processes.	Positive exchanges with surrounding environment in place for most characteristic species and processes and likely to be sustained.	Evidence that exchanges with the surrounding environment are highly similar to the reference for all species and processes and likely to be sustained.

a) Source: Gann et al., 2019

The social five-star system is **received**.

Table 2-14 below describes the state of the restoration project. The lower the star-count, the more work that needs to be completed to achieve a high social resilience score. The definitions of the different levels give input on how higher scores can be received.

Table 2-14 Social five-star system for evaluating progress toward social goals in the restoration program^(a)

ATTRIBUTE	*	**	***	****	*****
Stakeholder engagement	Stakeholders identified Key stakeholders and made aware of project and its rationale. Ongoing	Key Stakeholders supportive and involved in project planning phase	Number of stakeholders, support, and involvement increasing at start of implementation phase	Number of stakeholders, support, and involvement consolidating throughout implementation phase	Number of stakeholders, support, and involvement optimal, and self-management and

ATTRIBUTE	*	**	***	****	*****
	communication strategy prepared.				succession arrangements are on place
Benefits distribution	Benefits to local communities negotiated, ensuring equitable opportunities and reinforcement of traditional cultural relationships to the Site	Benefits to local communities starting and equitable opportunities maintained. Traditional cultural elements integrated, as appropriate, into project planning	Benefits to locals at an intermediate level and equitable opportunities maintained. Any traditional cultural elements well secured within project implementation	Benefits to locals at a high level and equitable opportunities maintained. Substantial integration of any traditional cultural elements, increasing reconciliation prospects	Benefits to locals and equitable opportunities very high, with optimal integration of any traditional cultural elements, substantially contributing to reconciliation and social justice
Knowledge enrichment	Relevant sources of existing knowledge identified and mechanisms for generating new knowledge selected	Relevant sources of existing knowledge (and potential for new knowledge) informing project planning and monitoring design	Implementation phase making use of all relevant knowledge, stakeholder feedback, and early project results	Implementation enriched by all relevant knowledge as well as from trial and error arising from the project itself; results analyzed and reported	Implementation enriched by all relevant knowledge and results from the project disseminated widely including to others with similar projects
Natural capital	Land and water management systems to reduce overharvesting and restore and conserve natural capital being put in place on site	Land and water management systems resulting in low level recovery and conservation of natural capital of the site	Land and water management systems resulting in intermediate level recovery and conservation of natural capital (including improved carbon budget)	Land and water management systems resulting in high level recovery and conservation of natural capital (including carbon neutral status)	Land and water management systems resulting in very high level of recovery and conservation of natural capital (including carbon positive status)
Sustainable economies	Sustainable business and employment models (applicable to the project or ancillary businesses) planned	Sustainable business and employment models commenced	Sustainable business and employment models in testing phase	Trials of Sustainable business and employment models showing success	Sustainable business and employment models with strong levels of success
Community wellbeing	Core participants identifying as stewards and likely improving social bonding and sense of place	All participants identifying and likely benefiting from improved social bonding and sense of place	Many stakeholders likely benefiting from improved social bonding, sense of place, and return of ecosystem services including recreation	Most stakeholders likely benefiting from increased social bonding, sense of place, and return of ecosystem services including recreation	Public identification of the site as having wellbeing benefits from local participation and return of ecosystem services including recreation

a) Source: Gann et al., 2019

2.4.3 DETERMINING AREAS OF PRIORITIZATION

Data collection should be used to prioritize restoration activities. Examples of high priority restoration areas may include but are not limited to:

Table 2-15 Examples of High Priority Restoration Areas

CONSIDERATION	RATIONALE	EXAMPLE LOCATION
Forest Health Assessments Scores	Areas that are assessed as “Unhealthy” can be prioritized so they do not continue to deteriorate. Without management or some level of intervention, they are likely to decline in condition from threats such as invasive, noxious, or nuisance weeds.	Forest Health Assessment Plot 5 and Plot 6, located within the afforested area in the southern portion of SE 23-36-06 W3M were assessed during the Blairmore Natural Area Screening Report prepared by EDI in 2022. Both received a Health Assessment Score of ‘Unhealthy’. This location was selected because of the level of detail available, and its suitability as a restoration location. The community is comprised of afforested trees including green ash, Siberian elm, and blue spruce with an understory of smooth brome grass, Canada thistle, and common caragana. The score was also lowered by the absence of forest vegetative layers (e.g., tall shrub).
Large Central Wetland	Sites left unmanaged will have a deleterious effect on the surrounding ecological core by increasing the density and distribution of noxious, nuisance, and invasive species.	The large central wetland provides an opportunity for restoration. This location was selected because of the level of detail available, and its suitability as a restoration location.

2.4.4 IDENTIFICATION OF RESTORATION GOALS AND OBJECTIVES

Goals and objectives should be determined based on available funding, long term planning, stakeholder input, and ecological needs of the local environment. These guiding principles are subject to change based on inputs from baseline data collection available funding or changes to local land use. In addition, if additional lands are secured, priority for effort of restoration or reclamation may change over time and the priority rankings should be renewed regularly.

Two initial goals for restoration have been identified to improve and enhance the site thus far:

- 1 Forest Restoration:** Improve the areas of poor or fair health and increase overall native species cover.
- 2 Wetland Restoration:** Improve or enhance all existing wetlands on site.

2.4.5 RESTORATION LOCATION SELECTION

Location selection for restoration or reclamation activities should be based on areas of prioritization, (see Section 4.1 – Establishment and Maintenance) created from inputs obtained during ongoing baseline surveys/monitoring and stakeholder inputs. Preliminary location selection may be identified during the conceptual plan stage; however, determination of the final location and size of the restoration/reclamation extent should be completed at the detailed design stage. Considerations for location selection may include:

- Site access:
 - If the planting requires watering (such as for shrubs/trees or live stakes) consider equipment, watering sources, and frequency of use.
 - Public accessibility and the potential for pedestrian traffic may influence germination success.

- Ensure that the size of the location is suitable for the size of equipment required. For example – can materials be brought in (such as chemical sprayers) and brought out (such as vegetative material removed during mowing) without degrading the habitat. If drill seeding, is there adequate space for the tractor to turn around and enter/exit the location.
- Site features:
 - SOMC or natural site features may be in the location that can be enhanced and should be considered when developing the restoration/reclamation plan(s).
 - Accelerated erosion or bare soil may be present and could require specialized management approaches.
- Weedy species¹:
 - Targeted restoration/reclamation area(s) could be dominated by problematic species that require multi-year management approaches, which will hinder the success of plantings.
 - Dominance of broadleaf, graminoid, or woody invasive species generally require increasing levels of effort and budget to eradicate. Funding to undertake the restoration/reclamation plan(s) should consider the financial inputs, required to reduce the prevalence of these species.

2.4.6 PRELIMINARY LOCATION

Preliminary locations have been identified for the RSBBA during the development of the Conceptual Plan (**Figure 1**). These locations represent the complete opportunities for improvements based on available data; however, these areas will require refinement to determine the targeted location for restoration or reclamation. Targeted locations to be determined through detailed design based on the recommendations listed above.

2.4.7 SPECIES SELECTION

Careful consideration should be taken in determining the most appropriate flora species to be used per each restoration/reclamation location identified. Species should be considered on a multitude of criteria including but not limited to:

- Species native to the area.
- Cultural and historical significance.
- Species appropriate to the site conditions.
- Timing of flowering.
- Local seed sourcing.
- Seed availability.
- Expected lifespan.
- Wildlife benefits.
- Height, spread, and growth behaviour.
- Species specific maintenance.
- Flowering time.
- Key species indicative of modal community.

Seed certificates should be obtained for graminoid or forb species purchased from vendors, to determine seeding rates, overall viability, and to ensure that the seed is clean from noxious or nuisance weeds. Locally sourced or wild

¹ See RSBBA Natural Area Management Plan (2023) for a list of the noxious or nuisance weeds observed on site.

collected seeds should be a priority and the plan timeframe should attempt to consider wildlife seed collection(s). All sourced material should be from areas clean from potential weed pollution. A species list should be approved by an appropriate party, which may be Meewasin, the City, or an external stakeholder.

2.4.8 DETERMINING PLANTING METHODOLOGY AND SEEDING RATES

Determining if forbs or grasses should be established using live plugs or seed will depend on availability, access for maintenance, budget, species survivorship, and project requirements (such as emergency erosion protection). Additionally, the scale or size of the location will dictate the most appropriate seeding methods utilized:

Drill/Mechanical Seeding: Preferred methodology if equipment can access the site. Appropriate for grass seed, wetland seed, and some forb species. This method is most suited for reclamation activities where bare ground is prevalent, or vegetative competition is very low. In areas of pre-existing vegetation this may not be applicable.

Broadcast Seeding: In areas where site access prevents equipment, broadcast seeding with hand-seeders will likely be the best method. Broadcast seeding will require site preparation to expose bare soil for seeds to adhere to. It is more challenging to ensure seeds are buried at an appropriate depth using this method, however in the case of some small-seeded forbs (such as goldenrods [*Solidago sp.*], or pussytoes [*Antennaria sp.*] this is the best method as they are best seeded onto the soil surface.

Hydroseeding: In areas where access for drill seeding is limited, where topography is steep, or where there are large areas in need of seeding. Hydroseeding will require site preparation and is not recommended where pre-existing vegetation is present.

Live Planting: This is applicable only for areas where watering the materials is possible. In the case of willow plantings, using a waterjet stinger (or other similar equipment) requires a water source (which may be the adjacent wetland), and frequency of watering is highly dependent on the seasonal conditions. For shrub or tree plantings, this is likely the only suitable method as growing these species from seed requires a significant time dedication. For plugs or potted plants, this endeavour can be costly and may require frequent maintenance (for example, watering on site may need to occur every 3 or 4 days for the duration of the first growing season).

Seeding rates for the methodologies should be determined based off of local conditions and best practices determined by stakeholder input or referencing existing guides. For example, Restoring Canadas Native Prairies, A Practical Manual (Collicut, Morgan & Thompson, 1995) suggests the following:

- Drill seeding should be completed at an ideal rate of 15 lbs PLS/ac (pure live seed per acre).
- Broadcast seeding should be completed at double the drill seeding rate (30 lbs/ac).
- Hydroseeding should be completed at 50 kg/ha.
- The final composition should be approximately 75% grasses, and 25% forbs.

2.4.9 PLANT MATERIAL AND SEED SOURCE

Plant material for each type of restoration goal is recommended to be considered based on multiple criteria. The final mix should be a diverse combination of native species which reflects the natural habitat community identified during the baseline data collection phase. Seed or plant material sourcing should be as local as possible, which may include seed harvesting events from established prairies within proximity to the site as indicated in the MVRMP (Mewasin 2017). This will ensure local genetics to the general area are maintained, increasing resiliency to disease and pests, as well as providing an increased opportunity for success for germinating plants. As surrounding land use changes, either through commercial, residential, or industrial development, or land purchase and an increased

acquisition of grasslands are acquired, this plan should be revisited as targeted species for restoration may shift over time.

Potential native species to consider have been provided in **Table 2-16**, **Table 2-17**, and **Table 2-18**. These mixes were determined based off of species documented on site from the Blairmore Natural Areas Screening Report and community guides for Saskatchewan (Thorpe, 2007) once detailed habitat mapping has occurred (see section 4.1 – Establishment and Maintenance) modal species that represent the appropriate community should be included in the composition. Percentages of composition should be determined based off of seed availability, viability of germination, size of seed, and desired final representation of species.

For the purpose of concept planning, species are split into habitat types: Forest (closed canopy areas), Wetland (areas immediately surrounding or within wetland boundaries) and Utility Corridor (open canopy areas), This list is not exhaustive, and only provides some of the general considerations and benefits for species selection. Wetland species most appropriate for riparian restoration/reclamation should be determined following baseline inventories, referencing Stewart and Kantrud (1971) to identify modal species for the wetland zones identified.

Table 2-16 Potential Forbs Species for Consideration of Pollinator Habitat Restoration

COMMON NAME	SCIENTIFIC NAME	COMMENTS (A) (B)	RESTORATION OPPORTUNITY
Bergamot	<i>Monarda fistulosa</i>	Partially shade tolerant, bird (specifically hummingbird) and butterfly attractant, deer resistant, culturally significant.	Utility corridor
Black-eyed Susan	<i>Rudbeckia hirta</i>	Quick to establish from seed, short lived perennial, bird and butterfly attractant.	Forest and Utility Corridor
Canada anemone	<i>Anemone canadensis</i>	Early flowering, shade tolerant species.	Forest and Wetland
Canada mint	<i>Mentha arvensis</i>	Competitive native forb, culturally significant.	Forest and Wetland
Cut-leaved anemone	<i>Anemone multifida</i>	Early flowering shade tolerant species, best propagated through seed.	Forest and Wetland
Giant hyssop	<i>Agastache foeniculum</i>	Hummingbird and butterfly attractant, special value to native bees, very easy to start from seed.	Forest and Utility Corridor
Harebell	<i>Campanula rotundifolia</i>	Long lasting flowering species, ideal for growing on rocky dry sites.	Forest
Heart-leaved alexanders	<i>Zizia aptera</i>	Tolerant of shade and moist soils.	Forest, Wetland, and Utility Corridor
Long fruited anemone	<i>Anemone cylindrica</i>	Perennial, open woods and meadows.	Forest and Utility Corridor
Low goldenrod	<i>Solidago missouriensis</i>	Low growing goldenrod that thrives in sandy or gravelly soils.	Forest and Utility Corridor
Purple prairie clover	<i>Dalea purpurea</i>	Deer resistant, butterfly attractant, long lived perennial.	Utility Corridor
Many flowered aster	<i>Symphotrichum ericoides</i>	Easily establishes, local seed source available, tolerant of mesic soils.	Forest and Wetland
Meadow blazing star	<i>Liatrix ligulistylis</i>	Perennial with conspicuous flowers, special value to native bees.	Utility Corridor

COMMON NAME	SCIENTIFIC NAME	COMMENTS (A) (B)	RESTORATION OPPORTUNITY
Northern bedstraw	<i>Galium boreale</i>	Partially shade tolerant, culturally significant, propagation by rhizome cuttings or greenhouse sowings.	Forest and Wetland
Prairie coneflower	<i>Ratibida columnifera</i>	Quick to establish, short lived, but easily reseeds.	Forest
Smooth blue aster	<i>Symphyotrichum laeve</i>	Quick to establish, bee and butterfly attractant.	Forest
Whorled milkweed	<i>Asclepias verticillata</i>	Larval host to monarch butterflies, shade tolerant.	Forest
Yarrow	<i>Achillea millefolium</i>	Perennial, propagation from seed, partially shade tolerant.	Forest and Utility Corridor

Source: (a) Minnesota Wildflowers 2006-2023 (b) The Ladybird Johnson Wildflower Center n.d.

Table 2-17 Potential Graminoid Species Seed Mix for Use in Restoration

COMMON NAME	SCIENTIFIC NAME	COMMENTS	RESTORATION OPPORTUNITY
American slough grass	<i>Beckmannia syzigachne</i>	Mesic, cool season, short-lived bunchgrass.	Wetland
Awned wheatgrass	<i>Elymus trachycaulus</i>	Deer resistant, bird attractant, good forage value, short-lived perennial.	Forest and Utility Corridor
Baltic rush	<i>Juncus balticus</i>	Suitable for low lying areas.	Wetland
Blue grama	<i>Bouteloua gracilis</i>	Low growing bunchgrass, larval host to skipper (<i>Oarisma</i> , <i>Hesperia</i> , <i>Polites</i> and <i>Amblyscrites</i>) species.	Utility Corridor
Blue-joint wheatgrass	<i>Calamagrostis canadensis</i>	Long-lived perennial, partially shade-resistant, best propagated from seed.	Forest and Wetland
Canada wildrye	<i>Elymus canadensis</i>	Partially shade tolerant, bird and small mammal and butterfly attractant, deer resistant.	Forest and Wetland
Fowl bluegrass	<i>Poa palustris</i>	Excellent seedling vigour, good for erosion control, perennial, partially shade tolerant bunchgrass.	Wetland
Green needlegrass	<i>Nasella viridula</i>	Important food source for avian species, and typical component of mixedgrass or fescue prairies.	Utility Corridor
June grass	<i>Koeleria macrantha</i>	Partially shade tolerant, prefers sandy or rocky soils, wildlife attractant, low grass and cool season bunchgrass.	Forest and Utility Corridor
Northern wheatgrass (Streamside wildrye)	<i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>	Long-lived perennial, early succession species as it established quickly, erosion control.	Forest and Utility Corridor
Purple oatgrass	<i>Schizachne purpurascens</i>	Shade tolerant bunchgrass, suitable for moist forest conditions.	Forest
Plains rough fescue	<i>Festuca hallii</i>	Perennial, important forage for deer, slow growing from seed but once established it persists, ranked S3 (Vulnerable) by NatureServe, critical component of mixed grass prairie.	Utility Corridor

COMMON NAME	SCIENTIFIC NAME	COMMENTS	RESTORATION OPPORTUNITY
Tufted hairgrass	<i>Deschampsia cespitosa</i>	Perennial, partially shade tolerant, bird attractant, larval host to skipper species.	Wetland

Source: (a) Minnesota Wildflowers 2006-2023 (b) The Ladybird Johnson Wildflower Center n.d.

Table 2-18. Potential Shrub and Tree Species or Use in Restoration

COMMON NAME	SCIENTIFIC NAME	COMMENTS	RESTORATION OPPORTUNITY
Balsam poplar	<i>Populus balsamifera</i>	Partially shade tolerant, bee and bird and butterfly attractant, culturally significant.	Forest and Wetland
Bebbs willow	<i>Salix bebbiana</i>	Short lived but fast-growing riparian species. Larval host to the mourning cloak (<i>Nymphalis antiopa</i>) and viceroy (<i>Limenitis archippus</i>).	Wetland
Chokecherry	<i>Prunus virginiana</i>	Culturally significant species, important wildlife resource.	Forest
Eastern cottonwood	<i>Populus deltoides</i>	Large canopy tree tolerant of sun and shade, prefers moist conditions. Culturally significant species, that also has numerous wildlife benefits and is resistant to browsing from ungulates.	Forest and Wetland
Green ash	<i>Fraxinus pennsylvanica</i>	Large canopy tree, tolerant of partial sun.	Forest
Highbush cranberry	<i>Viburnum opulus var. Americanum</i>	Early flowering species, tolerant of wet soils, important wildlife food source.	Forest
Manitoba maple	<i>Acer negundo</i>	Hardy and fast growing, tolerant of a variety of site conditions.	Forest and Wetland
Red-osier dogwood	<i>Cornus sericea</i>	Important wildlife resource, tolerant of a variety of site conditions.	Forest and Wetland
Sandbar willow	<i>Salix interior</i>	Riparian species documented on site, important for erosion control and easily planted through cuttings from local population.	Wetland
Saskatoon	<i>Amelanchier alnifolia</i>	Culturally significant species, important wildlife food resource.	Forest
Trembling aspen	<i>Populus tremuloides</i>	Partially shade tolerant, birds and butterfly and mammal attractant.	Forest
Western snowberry	<i>Symphoricarpos occidentalis</i>	Bird (especially hummingbird, songbird and gamebird) and small mammal attractant, special value to native bees.	Utility Corridor
Wolf willow	<i>Elaeagnus commutata</i>	Culturally significant species that is long lived and drought resistant.	Forest

Source: (a) Minnesota Wildflowers 2006-2023 (b) The Ladybird Johnson Wildflower Center n.d.

MVRMP (Mewasin 2017) identifies key steps on how to incorporate local seed into restoration or reclamation projects and has articulated very useful management recommendations to implement these strategies across the valley. In addition, the Northeast Swale Resource Management Plan (MVA, 2013) has been successful in

implementing strategies identified by Meewasin, consideration of the steps suggested and possible consultation with target personnel executing both management plans should be considered at the detailed design stage.

2.4.10 ADAPTIVE MANAGEMENT AND MONITORING

Any restoration or reclamation project must include an adaptive maintenance strategy based on inputs received through targeted and ongoing monitoring. The frequency and survey types used to gain inputs will vary greatly depending on the site conditions and specific goals identified for that restoration/reclamation project. For restoration projects, comparison to the baseline data is imperative to measure success, and reclamation will require setting objectives (e.g., regulatory or stakeholder driven) to measure against. Overall, all reclamation/restoration projects executed should consider two monitoring scales, short term and long term:

Short term: Monitors the progress of activities within a target location and guides adaptive management decisions until milestone successes are reached. These are frequent surveys ideally occurring bi-weekly and may be less intense than long term surveys. These may include but are not limited to:

- Weed surveys, intended to guide the greater site and/or manage a project focused integrated pest management plan (IPM).
- Germination success, to identify areas that require replacement seeding or plantings.
- Browsing and animal use of the site.
- Anthropogenic influences on site.
- Accelerated erosion.

Management recommendations should be made and implemented based off of field findings. For example, if browsing from ungulates or small mammals is observed on woody vegetation, consider caging the individual plants or fencing off the area.

Long term: This will monitor the overall trajectory of success of a project and detect changes over time. Frequency is to be determined based upon pre-existing protocols in consultation with qualified experts (such as Meewasin, select City departments or other invited stakeholders). These surveys may include but are not limited to:

- Permanent and temporary sample plot data collection methodologies.
- Rangeland Health Condition Assessments.
- Wetland classification and annual boundary delineation.
- Thatch assessments.
- Noxious and Nuisance weed inventories and mapping.
- Habitat mapping.
- Photologs.
- Prescribed burn monitoring.

2.4.11 RESTORATION PRESCRIPTION

Considerations for each of the two proposed site enhancement types is provided below (**Table 2-19** and **Table 2-20**). These considerations are intended to provide an outline of expected effort and applicable variables that will

need to be thoughtfully addressed to ensure success while maintaining room to be adaptable based ongoing data collection/monitoring.

2.4.12 FOREST RESTORATION

Forest restoration should enhance the native biodiversity of the area, which will require intensive management of existing non-native noxious or nuisance species.

Table 2-19. Restoration Details – Forest

LOCATION	<ul style="list-style-type: none"> - Areas of existing modified and native forest, and areas of potential expansion. - Restoration vs reclamation areas disturbed. - Spacing, min trees/square metre. - Shrub vs mature spacing.
Planning	<ul style="list-style-type: none"> - Annual events? - Caliper trees.
GOAL	<ul style="list-style-type: none"> - Establish healthy forest dominated by native species, reduce fragmentation, enhance the edge conditions, and improve the structure of the forest.
PREPARATION	<ul style="list-style-type: none"> - Delineate area of proposed forest extents. - Determine if trails should be closed and reclaimed. Prepare trails for reclamation by means of scarification and weed control. - Control weeds by means of herbicide application. - Targeted caragana removal as per the MVRMP (MVA, 2017).
PLANTING	<ul style="list-style-type: none"> - Infill planting: Decrease fragmentation of forest by strategic plantings in bare areas. - Edge planting: Protect the interior of the forest from weed species and light by planting the edge with low-growing trees, shrubs, and pioneer species. - Caragana replacement planting: Replace areas of removed caragana with mix or native and site-specific species. - Seed using appropriate method to site conditions, i.e., hydroseed, drill seed, or mechanically broadcast. - Plant mix of shrubs and trees to diversify vegetation cover. - Plant upland or mesic mix based on existing site conditions.
ESTABLISHMENT ACTIVITIES	<ul style="list-style-type: none"> - Water to establish seed and plants. - Protect plants during establishment period. - Overseed and replace plants as required. - Control weeds per IPM plan.
PERFORMANCE MEASUREMENT	<ul style="list-style-type: none"> - Native grass (seed) established by end of three years post-construction or with agreed upon cover and timeline with COS. - 80% of plants survived by end of three years post-construction or agreed upon survival rate. - See IPM plan(s) for weed species targets.

2.4.13 WETLAND RESTORATION

Wetland enhancement should focus on improving wildlife habitat and promoting native species diversity.

Table 2-20. Restoration Details - Wetlands

LOCATION	<ul style="list-style-type: none"> - Existing wetlands on site and their associated zones.
GOAL	<ul style="list-style-type: none"> - Increase species diversity, provide wildlife habitat, and maintain erosion control.
PREPARATION	<ul style="list-style-type: none"> - Complete detailed species inventory of existing native and non-native species. - Control weeds in areas adjacent to the restoration area to prevent pollution.

	<ul style="list-style-type: none"> – Control weeds through hand pulling, prescribed burns, and/or chemical treatment (as identified in the IPM species specific plan or by Meewasin).
PLANTING	<ul style="list-style-type: none"> – Drill seed or mechanically broadcast seed mix (as conditions allow). – Plant riparian zone with wetland plant mix. – Install live plantings of willows.
ESTABLISHMENT ACTIVITIES	<ul style="list-style-type: none"> – Control weeds per IPM plan. – Overseed and replace plants as required during the establishment period. – Install temporary fencing to prevent browsing on plant material.
PERFORMANCE MEASUREMENT	<ul style="list-style-type: none"> – Native plants established by end of three years post project initiation. – See IPM plan for weed species targets.

2.5 ECOLOGICAL CONNECTIVITY IMPROVEMENTS

Ecological connectivity in an area is achieved when both inter- and intra-connectivity are addressed. In the RSBBA interconnectivity is reduced due to encroachment of the City on all sides. Intra-connectivity is negatively affected by trail systems and parking areas. To improve ecological connectivity and avoid genetic isolation, steps of the framework below should be followed to accommodate ecological connectivity of the RSBBA across highway 7 to George Genereux Park and across Township Road 362A to Chappell Marsh Conservation Area.

Very little information exists that details how animals are moving around and through the site. Prior to undertaking any work that may result in a connectivity impact, the following steps should be considered:

- Step 1: Collect Baseline Data.
- Step 2: Identify areas of high use.
- Step 3: Implementation.
- Step 4: Monitoring.

To maintain and enhance overall ecological connectivity, a general framework has been prepared (Ecological Connectivity Memo [ECM] provided in RSBBA Natural Area Management Plan) and should be considered when undertaking work within and adjacent to the site. A summary has been provided below.

2.6 SOMC (FLORA AND FAUNA) IMPROVEMENTS

In support of “Strategy #7 – SOMC (Flora & Fauna) Management” and in conjunction with Section 2.4 – Restoration/ Reclamation Improvements and in Section 2.5 – Ecological Connectivity Improvements, examples of targeted physical features that can be incorporated to enhance the SOMC Conservation Target are presented here. Some ideas for physical improvement features include badger or prairie dog burrow creations, native wildflower plantings, snag creations, vernal pool (temporary pools that form in forested habitats in the spring) creations, bird and bat house installations.

The most cost-efficient upgrade would be building and hanging bird and bat houses in key locations throughout the site. This could attract certain SOMC fauna species to settle in the area or will provide shelter for already existing populations of known SOMC (e.g., bank swallow, barn swallow, horned grebe). **Table 2-21** below gives some example resources to support the construction and subsequent installation of bird and bat houses.

Creating snags and vernal pools will enhance the habitat quality of cavity-nesting birds, bats and insects, and amphibians and invertebrates respectively. Leaving standing dead trees or intentionally creating snags create structures essential for the lifecycle of many forest species. Vernal pools can provide breeding habitat for amphibians, like the northern leopard frog and the western tiger salamander. **Table 2-21** below gives some example resources to support the creation of snags and vernal pools.

Table 2-21 Example Resources for the Creation of Physical Improvement Features

TYPE	DOCUMENT NAME	DETAILS	REFERENCE
Songbird House	Bird Houses for Songbirds	Provides details on nest box dimensions for certain songbird species and how to construct them	Armstrong, J. 2020. Bird Houses for Songbirds. Extension – Alabama A&M & Auburn Universities. Accessed November 2023 at: https://www.aces.edu/wp-content/uploads/2018/08/ANR-0550.REV_.2.pdf .
Waterfowl Box	Nest Box Guide for Waterfowl	Provides details on waterfowl and other occupants of nest boxes, and how to construct, install, and maintain a nest box	Ducks Unlimited Canada. 2008. Nest Box Guide for Waterfowl – Alberta Addition. Accessed November 2023 at: https://crca.ca/wp-content/uploads/PDFs/reports-publications/DU_NestboxGuide.pdf .
	Build a Wood Duck Box	Provides a step-by-step guide on how to construct a wood duck box (and others)	Ducks Unlimited Canada. 2020a. Build a Wood Duck Box. Accessed November 2023 at: https://www.ducks.org/conservation/waterfowl-research-science/build-a-wood-duck-box .
	Installing your Wood Duck Box	Provides details on preferred installation locations of boxes and how to maintain them	Duck Unlimited Canada. 2020b. Installing your Wood Duck Box. Accessed November 2023 at: https://www.ducks.org/conservation/waterfowl-research-science/installing-your-wood-duck-box .
Bat House	Build a Bat House	Provides details on installation location requirements and step by step guide for constructing a bat house	The National Wildlife Federate. N. d. Build a Bat House. Accessed November 2023 at: https://www.nwf.org/Garden-For-Wildlife/Cover/Build-a-Bat-House.aspx
Swallow Nest	Swallow Bird House: The Best Type & How to Build One	Provides a step-by-step guide on how to construct swallow nests	Summerville, T. 2023. Swallow Bird House: The Best Type & How to Build One. Songbird Hub. Accessed November 2023 at: https://songbirdhub.com/swallow-bird-house/
Snag Creation	Snags – The Wildlife Trees	Provides general information about snags, which wildlife uses snags, what makes a tree a good snag, how to create a snag from life trees, how to relocate snags, and what hazards and management is involved.	Washington Department of Fish & Wildlife. 2023. Snags – The Wildlife Tree. Dead wood brings new life. Accessed November 2023 at: https://wdfw.wa.gov/species-habitats/living/snags#resources .
	Create a Snag	Provides information on why to leave snags standing n a forest and how to create one from a life tree.	Crowell, N. 2022. Create a Snag – Give old Trees New Life. Accessed November 2023 at: https://s3.wp.wsu.edu/uploads/sites/2073/2022/02/Cre-ate-a-Snag.pdf .
Vernal Pool Creation	Creating Successful Vernal Ponds: A Literature Review and Advice for Practitioners	Provides in-depth explanations on the importance of vernal ponds, and how to plan and construct a vernal pond including supply and budget needs.	Calhoun, A. J. K., Arrigoni, J., Hunter Jr., M. L., Richter C. 2014. Creating Successful Vernal Pools: A Literature Review and Advice for Practitioners. Publications.16. Accessed November 2023 at: https://digitalcommons.library.umaine.edu/cgi/viewcontent.cgi?article=1031&context=mitchellcenter_pubs .
	A Guide to Creating Vernal Ponds	Provides a literature review on which factors need to be considered when creating a vernal pool	Biebighauser T. R., n.d. A Guide to Creating Vernal Ponds: all Information you need to build and maintain an ephemeral wetland. Published by the USDA Forest

TYPE	DOCUMENT NAME	DETAILS	REFERENCE
		including hydrology, hydro-geomorphic setting, vegetation, soil, slope, and landscape setting.	Service in cooperation with Ducks Unlimited Inc. and Izaak Walton League of America, Accessed November 2023 at: https://www.nyfoa.org/application/files/3514/7948/6007/GuidetoCreateVernPonds.pdf .
SAR Registry	Species Assessments	Provides species specific details on biology, threats, habitat preferences, conservation measures, and recovery strategies.	Government of Canada. 2023. Species Search – Species at Risk Public Registry. Accessed November 2023 at: https://species-registry.canada.ca/index-en.html#/species?sortBy=commonNameSort&sortDirection=asc&pageSize=10 .

If establishment and persistence of other fauna and flora species is desired, the Species at Risk (SAR) public registry (Government of Canada, 2023) provides the mean of searching target species and explaining their habitat requirements and possible options for supporting their conservation. As SOMC are listed under SARA and COSEWIC legislation, sufficient information should be available on the public registry website. Additionally, restoration techniques targeting flora species is also provided in sections 2.4.4 – Identification of Restoration Goals and Objectives to 2.4.11 – Restoration Prescription.

Targeting the recruitment, establishment, and retainment of SOMC on site, can come with several challenges, which include but are not limited to:

- Installed features (e.g., bird houses) might be designed and intended to serve a targeted SOMC; however, non-SOMC species might end up occupying them.
- Insufficient data on SOMC population size, distribution, and ecological requirements, and uncertainty on threats or effective conservation measures might hinder improving habitat and conserving the target SOMC.
- Lack of resources, including financial means, expertise, or manpower, can limit the implementation of certain improvement structures.

Vegetation specific challenges lay in some species biology. Populations naturally fluctuate annually based on seasonal conditions, responding to hydrology and temperature. Seed dormancy in native plants is a complex and ever evolving area of study, as many seeds require stratification to break dormancy (such as prairie clovers) and they may reside in the soil for many years before erupting.

2.7 STORMWATER MANAGEMENT

Stormwater management within the RSBBA is proposed to include an evaluation of the existing hydrology and selection of water quality and quantity targets. for the Chappell Complex. While no changes are recommended at this time, the establishment of clear targets is critical to ensuring that future development will not compromise wetland function. **Appendix D** outlines a framework for evaluating the predevelopment hydrology and ensuring that any future changes within the contributing catchment area support ongoing ecological health of the natural area.

2.8 PLANTING PLAN

Planting within the RSBBA is anticipated to be concentrated around restoration and reclamation activities (see Section 4 – Maintenance), with the exception of the utility corridor planting. Any planting efforts within or directly adjacent to the RSBBA are recommended to include only native, site-specific plants, with a focus on naturalization and biodiversity.

2.8.1 UTILITY CORRIDOR PLANTING

Utility corridor planting is recommended to focus on improving biodiversity and increasing pollinator habitat while adhering the guidelines and recommendations of the various utility organizations. The planting design is intended to focus on increasing native grasses and forbs, and pollinator attractants. All work within the utility easements shall conform to applicable easement holder.

It is recommended to use the Saskatchewan Guidelines for Use of Native Plants in Roadside Revegetation Field Guide (2008) Moist Mixed Prairie (Zone 2) Seed mix (**Table 2-22**):

Table 2-22. Recommended Utility Corridor Species Composition

COMMON NAME	SCIENTIFIC NAME	PERCENT OF MIX
Blue grama	<i>Bouteloua gracilis</i>	10
Junegrass	<i>Koeleria macrantha</i>	10
Northern wheatgrass	<i>Elymus lanceolatus</i>	20
Plains rough fescue	<i>Festuca hallii</i>	15
Sandbergs bluegrass	<i>Poa secunda ssp. secunda</i>	10
Western porcupine grass	<i>Hesperostipa curtiseta</i>	15
Western wheatgrass	<i>Pascopyrum smithii</i>	20

Table 2-16 provides a list of forb species that may be include in addition to the graminoid species listed above.

3 CONSTRUCTION IMPLEMENTATION

3.1 Standards

All construction shall adhere to the applicable standards and guidelines, including:

- Province of Saskatchewan’s Environmental Management and Protection Act (2010).
- City of Saskatoon’s Contractor Environmental Guidelines (2019).
- City of Saskatoon’s Design and Development Standards Manual (Version 15).
- City of Saskatoon’s Standard Construction Specifications: Parks (2023).

3.2 Construction Risks & Mitigation Measures

To minimize negative impacts to the site during construction, it is advised that the following mitigation measures be considered.

Table 3-1 Construction Risks & Mitigation Measures

RISK	MITIGATION MEASURE
Disruption to existing vegetation or vegetation communities.	<ul style="list-style-type: none"> – Stake limits of work prior to construction. – Conduct a pre-construction rare plant survey. Should rare plant species be observed, a qualified biologist should be consulted for appropriate mitigation measures. – Prepare and enforce a tree protection plan within and adjacent to areas of construction that is in accordance with the City’s forthcoming Tree Protection Policy and Bylaw. – Field fit all infrastructure to avoid damaging vegetation, maintaining recommended offsets.
Disruption to wildlife habitat, movement, and mortality.	<ul style="list-style-type: none"> – Stake limits of work prior to construction. – Conduct a pre-construction wildlife sweep to protect sensitive wildlife features protected under The Wildlife Act (1998). Complete prior to clearing of vegetation during the sensitive wildlife period for nesting and rearing young, between April 15 to August 31. Site-specific wildlife features (e.g., nests, burrows, leks, dens) observed within the project area must be buffered by applicable setbacks and timing restrictions to minimize effects to sensitive wildlife and habitat features. – Additional wildlife and wildlife feature mitigations may be required if wildlife or wildlife features are observed during construction. All wildlife observations made during construction should be reported to a qualified biologist. The biologist will recommend mitigations depending on the species, as needed. – During the construction/operation phases of development, all wildlife attractants (e.g., petroleum products, human food, recyclable drink containers and garbage) should be secured in wildlife proof containers to discourage wildlife issues. – During construction, work activities should be limited to normal working hours and avoid work during the most wildlife-active portions of the day (e.g., dawn and dusk) to promote a gradual habituation to land use changes proposed. – Contractors should use down shielded lights for any lighting that may be required during construction to minimize light pollution and negative effects on the local wildlife. – Minimize disturbances to the smallest area possible to maintain connectivity between natural features to promote continued wildlife passage/use. – Field fit all infrastructure to avoid damaging wildlife habitat, maintaining recommended offsets.
Negative impact to water quality.	<ul style="list-style-type: none"> – Install effective erosion and sediment control measures before starting work to prevent sediment from entering the water body. – Should work be required within the waterbodies, timing shall respect sensitive species.

RISK	MITIGATION MEASURE
Disruption to native soils and erosion.	<ul style="list-style-type: none"> - Limit movement of heavy equipment and vehicles during wet conditions to reduce damage to substrates. - Schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation (consider winter construction, especially in wetland areas). - Adhere to erosion and sedimentation control plan.
Introduction of invasive species.	<ul style="list-style-type: none"> - Material, equipment and machinery should arrive at the site washed, free of fluid leaks and clean of foreign materials (i.e., invasive species and noxious weeds).
Spills.	<ul style="list-style-type: none"> - Wash, refuel and service machinery and store fuel and other materials for the machinery at least 100m away from waterbodies, if possible. Should 100m not be possible, proper containment measures will need to be in place to prevent deleterious substances from entering the water. - Fueling stations must be isolated in case of spills. - An emergency spill kit shall be kept within the project area at all times. - A contingency plan in the case of sediment release and fuel or oil spills should be developed that includes procedures for containment, absorption, removal and reporting.
Disturbance to historical or archaeological features.	<ul style="list-style-type: none"> - Identify and protect historically and culturally significant features throughout construction.
Overhead and underground utilities.	<ul style="list-style-type: none"> - All offsets to utilities to be maintained and the applicable organization contacted prior to excavation. - Permits and permissions to be obtained from applicable utility company prior to construction. - SaskPower: <ul style="list-style-type: none"> - Easements shall not be impacted. - SaskPower crews must be able to traverse up and down the rights of way if needed. - No swales should be installed across the rights of way or within them without prior written consent. - No fencing should be put across or along the easement, without prior written consent. - Fencing or gates that are installed along or across easement require prior written consent and may require grounding. - If elevations are proposed to change within the easement, this will require prior written consent. - TransGas: <ul style="list-style-type: none"> - Any work affecting the easement will require a Facility Crossing Permit. - No ground disturbance, pits, wells, foundations, pavement or buildings, or other structure are permitted on, over, or through the right-of-way without the approval of TransGas. - As a condition of its consent to working within or crossing the easement, TransGas will require that the developer install and maintain snow fence along both sides of the TransGas right of way for the entire duration of the development, to protect against inadvertent vehicular or equipment access and pipeline damage. - Maintain required offsets to utilities.

3.3 Construction Recommendations

The following is recommended to be considered during the detailed design and implementation of the proposed improvements.

3.3.1 *INVASIVE SPECIES CONTROL DURING CONSTRUCTION*

During construction, the contractor shall limit the spread of weeds, ensuring tools, vehicles, and clothing is free of weed species. Construction activities and disturbance shall be limited to avoid disruption of soil and seed banks. Overall activities should follow a project specific IPM plan developed in general compliance with Meewasin and the RSBBA NAMP.

3.3.2 *SITE PREPARATION AND DEMOLITION*

All site preparation, including tree protection to adhere to City of Saskatoon Standard Construction Specifications: Parks (2023). Ensure erosion and sedimentation controls are in place prior to and throughout construction per the City of Saskatoon's Contractor Environmental Guidelines (2019).

3.3.3 *GRADING*

All grading to adhere to City of Saskatoon Standard Construction Specifications: Parks (2023). Grading activities are not proposed for the RSBBA, apart from minor grade adjustments for trails. Trails to be field fit to the topography, with any required grading matching that of the existing conditions so as to cause minor disturbance. Should grading be required in the future, it is recommended that the original topography be retained and designed so as not to cause disturbance to hydrological regimes.

3.3.4 *LAYOUT*

Layout and installation of trails, hardscape, site furniture, and structures to be verified on site prior to construction and field fit to limit disturbance. Detailed design is required to provide installation instructions and product/material selection.

3.3.5 *PLANTING*

Final location of planting to be verified on site and field fit as required. It is recommended that a detailed design be prepared for all planting, including plant quantities, plant material sizes, source of plants, and plant and seed installation details.

4 MAINTENANCE

Ongoing maintenance of the site will be required for the long-term health and functionality of the site. Maintenance refers to such elements as the establishment of planting efforts, upkeep of built infrastructure, and ongoing control of invasive vegetation species. Recommendations for maintenance of the proposed improvements and invasive species control is described below.

4.1 Establishment & Maintenance

All maintenance should adhere to the City of Saskatoon Standard Construction Specifications: Parks (2023). Recommendations for the maintenance of the proposed improvements are described in Table 4-1. A detailed maintenance plan is recommended to be developed as part of the detailed design for each of the proposed improvements and monitored as part of the overall management of the site.

Table 4-1 Establishment & Maintenance

ESTABLISHMENT & MAINTENANCE ACTIVITIES	
Restoration & Planting Areas	<ul style="list-style-type: none"> - During the establishment period, water newly planted areas per restoration plan. Frequency of watering and source of water to be determined through detailed design. It is recommended that the Contractor submit a watering plan to be approved by the City prior to construction. - During the establishment period, monitor plant and seed mortality. Contractor to replace plants or overseed as required to meet the target success rates per the restoration plan. - During the establishment period, contractor to protect plants during the maintenance period to protect against third-party damage. Temporary fencing and signage is recommended to deter access to restoration and planting areas. - Monitor for invasive species and control as required. See project specific IPM Plan(s).
Site Furniture & Infrastructure (Fencing, Signage, Pier, Boardwalks, Gates, Benches)	<ul style="list-style-type: none"> - Ensure all site furniture and infrastructure is built to specification prior to issuing FAC. - During the maintenance period, Contractor to monitor and repair as required. - Post-FAC, City to monitor and repair as required. - A yearly inventory is recommended to note damage and required repairs. - Waste receptacles and restroom facilities to be frequently maintained to ensure cleanliness.
Mown Pathways	<ul style="list-style-type: none"> - Mow trails at frequent intervals to maintain a height of grass less than 50 to 75mm in height along the pathway. - Repair rutting as required. - Monitor for safety and hazards.
Trails	<ul style="list-style-type: none"> - Trails dedicated for fat tire biking to be maintained as part of the User Agreement. - Multi-use trails to be maintained yearly to repair rutting and other damage.
Waste & Damage	<ul style="list-style-type: none"> - Monitor for damage to site and illegal dumping. - Weekly maintenance of the site is recommended, as well as a spring and fall clean-up to remove waste and debris. - Regular waste disposal per the City of Saskatoon Standard Construction Specifications: Parks (2023).
Invasive Species Control	<ul style="list-style-type: none"> - Control per project specific IPM Plan(s).

4.2 Integrated Pest Management Plan (IPM)

The IPM plan is intended to be an adaptive plan for the long-term control of invasive vegetation species. All weeds are to be controlled in accordance with Saskatchewan’s *Weed Control Act* (2010). A general IPM needs to be developed and implemented for use across the entire site, and subsequently adapted and upgraded for each of the restoration or reclamation activities undertaken. **Table 4-2** and **Error! Reference source not found.** outline key considerations for a successful IPM site wide, and within areas of reclamation or restoration. Species specific management strategies that can support a successful IPM can be found within the MVRMP.

The frequency and effort for IPM within the reclaimed or restored areas should be higher than for the site wide plan. Germination success is highly dependent on weedy species prevalence, and if weeds are unmanaged the chances of a successful planting will be low.

Table 4-2. Considerations for an Effective Site Wide Integrated Pest Management Plan

Target Weeds	<ul style="list-style-type: none"> – All prohibited noxious and nuisance weeds as listed under the Weed Control Act (2010).
Mapping	<ul style="list-style-type: none"> – Complete a detailed inventory of all invasive species (e.g., heat map), prohibited noxious, and nuisance weeds throughout entire extent of the site. This documentation should include the spread, cover estimate, phenology, and distribution by species. – Annual monitoring should include weed mapping once per year with a record of IPM strategies implemented. If target locations are under management pre and post weed mapping should be considered within the growing season to determine success and guide frequency/effort. – Maintain record of species, location, and density for comparisons between seasons/years.
Monitoring	<ul style="list-style-type: none"> – Complete a detailed inventory of all invasive species, prohibited noxious, and nuisance weeds throughout entire extent of the site. – Annual monitoring to include weed mapping updates once per year with a record of IWM strategies implemented. – Maintain record of species, location, and density.
Performance Measurement	<ul style="list-style-type: none"> – Develop species specific measure of success for all documented weed species (for example, a 25% reduction in the overall cover of common wormwood [<i>Artemisia absinthium</i>]) within a three-year timeline. – Effort and timeline should be targeted at highest priority areas. – Refer to Meewasin for species specific targets.
Timing	<ul style="list-style-type: none"> – TBD based off of baseline inventory information and level of infestation.
Types of Control	<ul style="list-style-type: none"> – Mechanical: This may include mowing, hand pulling, or material extraction. – Chemical: This may include the use of herbicides. – Cultural: This may include prescribed burning and planting of native species.

Table 4-3. Considerations for an Integrated Pest Management Plan in Reclamation or Restoration Areas

Target Weeds	<ul style="list-style-type: none"> – All prohibited noxious and noxious weeds as listed under the Weed Control Act (2010).
Mapping	<ul style="list-style-type: none"> – Prior to any construction, complete a detailed inventory of all invasive species, prohibited noxious, and nuisance weeds throughout entire extent of the site. This documentation should include the spread, cover estimate, phenology, and distribution across the site. – Annual monitoring Perform weed mapping once per year with a record of IWM strategies implemented. – Maintain record of species, location, and density.

Performance Measurement	<ul style="list-style-type: none"> - TBD on a species-specific scale, based off of the MVRMP.
Importation & Storage of Material	<ul style="list-style-type: none"> - Ensure any materials, such as topsoil is weed free prior to entering site. - Should topsoil be stockpiled, perform weed control as required.
Timing	<ul style="list-style-type: none"> - Weekly inspections (year 1-2) and maintenance as required. - Bi-weekly inspections (year 3) and maintenance as required.
Types of Control	<ul style="list-style-type: none"> - Mechanical: This may include mowing, hand pulling, or material extraction. - Chemical: This may include the use of herbicides. - Cultural: This may include prescribed burning, and planting of native species.

5 MONITORING

Ongoing mapping, monitoring, and adaptive management is recommended for project success. Monitoring is recommended to record all observations and management activities so that future managers will be able to learn from the past, avoid repeating mistakes, evaluate the effects of management, and plan future management based on the record. Future monitoring programs implemented should reference the Meewasin Valley-wide Monitoring Framework (2021) for specific monitoring objectives and methodologies. . Legislation and policy can dictate monitoring initiatives Error! Reference source not found. and Error! Reference source not found. outline requirements.

A monitoring framework should be integrative, adaptive, and updated regularly with relevant findings as per Objective 1 in the Action Plan Summary **Table 5.5.6**. The intended purpose is to measure the status of targets and inform ongoing and future management.

The Meewasin Valley-Wide Monitoring Framework (2021) identifies functional categories for monitoring listed below:

- Wildlife Behaviour Monitoring.
- Invasive Species Monitoring.
- Vegetation Composition Monitoring.
- Environmental Conditioning Monitoring.
- Human-site Interaction Monitoring.
- Collectively Powered Monitoring Networks.

5.1 WILDLIFE BEHAVIOUR MONITORING

This type of monitoring includes any data collection effort that is relevant to understanding general wildlife behaviour, movement patterns, presence, abundance, and survivorship (MVA, 2021). **Table 5-1** provides a breakdown of monitoring initiatives that may be undertaken at the site, with examples of focus areas for study. However, this list is not exhaustive and should new information from other monitoring initiatives or projects be undertaken on site (such as the installation of new benches, paths, or boardwalks) the effects on wildlife should be studied, with special consideration to SOMC or other species protected under legislation (such as the *Migratory Bird Convention Act* and associated regulations). Existing survey protocols for wildlife are listed below in **Table 5-2**.

Table 5-1 Wildlife Monitoring at RSBBA

MONITORING INITIATIVE	EXAMPLES OF FOCUSED STUDY AREAS FOR RSBBA
Wildlife interactions with infrastructure	- Major barriers that likely inhibit wildlife movement across the RSBBA include the trail system, parking lots, and the skills park. The interaction between these features and wildlife movement should be assessed to understand how best to facilitate wildlife movement across these roads.

MONITORING INITIATIVE

EXAMPLES OF FOCUSED STUDY AREAS FOR RSBBA

<p>Presence and abundance of specific wildlife species</p>	<ul style="list-style-type: none"> – SOMC identified as having a high likelihood of detection in the baseline summary (Northern leopard frog (<i>Lithobates pipiens</i>), Western tiger salamander (<i>Ambystoma macortium</i>)) should be surveyed for, to determine if they are on site. – Confirmed SOMC (bank swallow (<i>Riparia riparia</i>), barn swallow (<i>Hirundo rustica</i>), common nighthawk (<i>Chordeiles minor</i>), horned grebe (<i>Podiceps auratus</i>), lesser yellowlegs (<i>Tringa flacipes</i>)) should be detailed further and investigated for population abundance and distribution.
<p>Locations of important wildlife habitat</p>	<ul style="list-style-type: none"> – Documentation of the northern leopard frog (<i>Lithobates pipiens</i>) population locations should be conducted.
<p>Landscape fragmentation and movement corridors</p>	<ul style="list-style-type: none"> – Parking lots within the RSBBA and surrounding roads (e.g., Highway 7) create landscape fragmentation and impede with wildlife movement. There is study potential here to identify the significance of these barriers, and to create mitigation solutions to improve connectivity. – Wildlife monitoring completed by EDI (2022) showed that wildlife predominately moved through RSBBA in a north-south direction. Further detailed monitoring should be implemented to determine highly used travel paths.
<p>Heightened activity period documentation (breeding and migration)</p>	<ul style="list-style-type: none"> – Consider completing breeding bird surveys and amphibian surveys as per the methodology provided in protocols listed in Table 5-2. – Migratory bird counts for waterfowl could be considered as this would enhance the value of the wetlands on site, and potentially identify additional SOMC.

Table 5-2 Existing Wildlife Survey Protocols

TYPE	SURVEY NAME	CITATION
<p>Amphibian and Reptile</p>	<p>Amphibian Auditory Survey Protocol</p>	<p>Government of Saskatchewan. 2020. Species Detection Survey Protocol: 1.0 Amphibian Auditory Surveys. April 2020. Saskatchewan Ministry of Environment, Fish, Wildlife and Lands Branch, Regina, Saskatchewan, Canada.</p>
	<p>Amphibian Visual Survey Protocol</p>	<p>Government of Saskatchewan. 2020. Species Detection Survey Protocol: 2.0 Amphibian Visual Surveys. January 2020. Saskatchewan Ministry of Environment, Fish, Wildlife and Lands Branch, Regina, Saskatchewan, Canada.</p>
	<p>Greater Short-horned Lizard Survey Protocol</p>	<p>Government of Saskatchewan. 2020. Species Detection Survey Protocol: 3.0 Greater Short-horned Lizard Surveys. January 2020. Saskatchewan Ministry of Environment, Fish, Wildlife and Lands Branch, Regina, Saskatchewan, Canada.</p>
	<p>Snake Hibernacula Survey Protocol</p>	<p>Government of Saskatchewan. 2020. Species Detection Survey Protocol: 4.0 Snake Hibernacula Surveys. January 2020. Saskatchewan Ministry of Environment, Fish, Wildlife and Lands Branch, Regina, Saskatchewan, Canada.</p>

TYPE	SURVEY NAME	CITATION
Birds	Burrowing Owl Survey Protocol	Government of Saskatchewan. 2020. Species Detection Survey Protocol: 5.0 Burrowing Owl Survey Protocol. April 2020. Saskatchewan Ministry of Environment, Fish, Wildlife and Lands Branch, Regina, Saskatchewan, Canada.
	Short-eared Owl Survey Protocol	Government of Saskatchewan. 2020. Species Detection Survey Protocol: 6.0 Short-eared Owl Surveys. April 2020. Saskatchewan Ministry of Environment, Fish, Wildlife and Lands Branch, Regina, Saskatchewan, Canada.
	Grassland Birds Survey Protocol	Government of Saskatchewan. 2020. Species Detection Survey Protocol: 9.0 Grassland Birds Surveys. April 2020. Saskatchewan Ministry of Environment, Fish, Wildlife and Lands Branch, Regina, Saskatchewan, Canada.
	Forest Birds Survey Protocol	Government of Saskatchewan. 2020. Species Detection Survey Protocol: 10.0 Forest Birds Surveys. April 2020. Saskatchewan Ministry of Environment, Fish, Wildlife and Lands Branch, Regina, Saskatchewan, Canada.
	Sharp-tailed Grouse Survey Protocol	Government of Saskatchewan. 2020. Species Detection Survey Protocol: 11.0 Sharp-tailed Grouse Surveys. April 2020. Saskatchewan Ministry of Environment, Fish, Wildlife and Lands Branch, Regina, Saskatchewan, Canada.
	Western Grebe Survey Protocol	Government of Saskatchewan. 2020. Species Detection Survey Protocol: 11.0 Sharp-tailed Grouse Surveys. April 2020. Saskatchewan Ministry of Environment, Fish, Wildlife and Lands Branch, Regina, Saskatchewan, Canada.
	Piping Plover Survey Protocols	Government of Saskatchewan. 2020. Species Detection Survey Protocol: 11.0 Sharp-tailed Grouse Surveys. April 2020. Saskatchewan Ministry of Environment, Fish, Wildlife and Lands Branch, Regina, Saskatchewan, Canada.
	Yellow Rail Survey Protocols	Government of Saskatchewan. 2020. Species Detection Survey Protocol: 11.0 Sharp-tailed Grouse Surveys. April 2020. Saskatchewan Ministry of Environment, Fish, Wildlife and Lands Branch, Regina, Saskatchewan, Canada.
	Common Nighthawk Survey Protocol	Government of Saskatchewan. 2020. Species Detection Survey Protocol: 15.0 Common Nighthawk Surveys. April 2020. Saskatchewan Ministry of Environment, Fish, Wildlife and Lands Branch, Regina, Saskatchewan, Canada.

TYPE	SURVEY NAME	CITATION
Mammals	Bats (Sensitive Species Inventory Guidelines)	Government of Alberta. 2012. Integrated Standards and Guidelines, enhanced Approval Process. Sustainable Resource Development, Lands Division. Edmonton, AB. [Online] https://open.alberta.ca/dataset/93d8a251-4a9a-428f-ad99-7484c6ebabe0/resource/f4024e81-b835-4a50-8fb1-5b31d9726b84/download/2013-sensitivespeciesinventoryguidelines-apr18.pdf . Accessed October 18, 2023.
	Swift Fox Survey Protocol	Saskatchewan Ministry of Environment. 2014. Swift Fox Survey Protocol. Fish and Wildlife Branch Technical Report No. 2014-17. 3211 Albert Street, Regina, Saskatchewan. 10pp.
	Ord's Kangaroo Rat Survey Protocol	Saskatchewan Ministry of Environment. 2014. Ord's Kangaroo Rat Survey Protocol. Fish and Wildlife Branch Technical Report No. 2014-18. 3211 Albert Street, Regina, Saskatchewan. 7 pp.
	Snow Track Survey Protocol	Saskatchewan Ministry of Environment. 2014. Snow Track Survey Protocol. Fish and Wildlife Branch Technical Report No. 2014-19. 3211 Albert Street, Regina, Saskatchewan. 8pp.

5.2 INVASIVE SPECIES MONITORING

Monitoring of invasive species involves initiatives to chronicle the occurrence, abundance, spread, and concentration of invasive species. This includes targeted efforts to locate, document, and control populations of particularly aggressive or problematic non-native species. This monitoring category informs invasive species control and other integrated resource management intervention strategies (MVA, 2021).

During the biophysical baseline review conducted as part the NAMP identified three nuisance and 16 noxious weeds and many invasive species have been detected. The IPM plan framework in the Conceptual Plan details the development and implementation for site wide IPM. Key strategies for site wide monitoring include but are not limited to:

- Completing a detailed inventory of all invasive species, prohibited noxious, and nuisance weeds throughout entire extent of the site. This would include documenting the density and distribution of each species and providing input on their effects to native vegetation.
- Annual monitoring to include weed mapping updates once per year with a record of IWM strategies implemented.
- Maintaining a record of species, location, and density.

A European buckthorn (*Rhamnus cathartica*) Control Program has been developed by Meewasin (MVA, 2023). Where possible, pre-existing monitoring and management strategies should be adopted to cohesively monitor the success of IWM strategies. As other programs are developed in the future, they should also be incorporated, as per Objective 6.1 and 15.1 – Invasive and Undesirable Species Management and Maintenance and Monitoring Programming from the Action Plan Summary.

5.3 VEGETATION COMPOSITION MONITORING

General vegetation species monitoring assesses the abundance, presence, and composition of vegetation in plant communities. Mapping and documentation of native, rare, and at-risk plant species to inform conservation

management efforts and development strategies should be emphasized (MVA, 2021) and follow the Species Detection Survey Protocol: 20.0 Vascular Plant. February 2021 Update (Government of Saskatchewan, 2021).

This could include undertaking an inventory of naturalized species (e.g., caragana, and scotch pine [*Pinus sylvestris*]) that were historically introduced to the RSBBA to refine the understanding of natural feature health and guide future replacement (e.g., replace with native flora to Saskatoon) and long-term restoration/enhancement goals.

5.4 ENVIRONMENTAL CONDITIONING MONITORING

Initiatives within this category relate to the status of an environmental variable or natural feature that can be used to build datasets and form hypotheses about larger climatic trends within a system or area of interest. Efforts within this category include the study and documentation of pollutants and other variables that indicate adverse compositional changes linked to human behaviour, infrastructure development, and climate change (MVA, 2021).

5.5 HUMAN-SITE INTERACTION MONITORING

Collection of information that relates to human activities, access, and interactions with the site and site infrastructure. This information is important for identifying accessibility issues, demands for infrastructure development, cultural and historical significance, and threats that human activity poses to the natural environment. This category includes mechanisms for capturing, reporting, and documenting human activities (MVA, 2021).

5.6 COLLECTIVELY POWERED MONITORING NETWORKS

This category includes major partnership fueled, information-generating projects, which produce monitoring data such as large scale (national, regional, and provincial) data collection efforts, Citizen Science networks and publicly sourced databases. The data gathered from these networks should inform many of the categories summarized in the above sections (MVA, 2021).

5.7 MONITORING FOR SUCCESS

As illustrated in the Error! Reference source not found., monitoring is a linear progression following defined pathways; and provides a workflow of potential steps and considerations for a project completed on site. This workflow is not exhaustive, and there may be additional steps required.

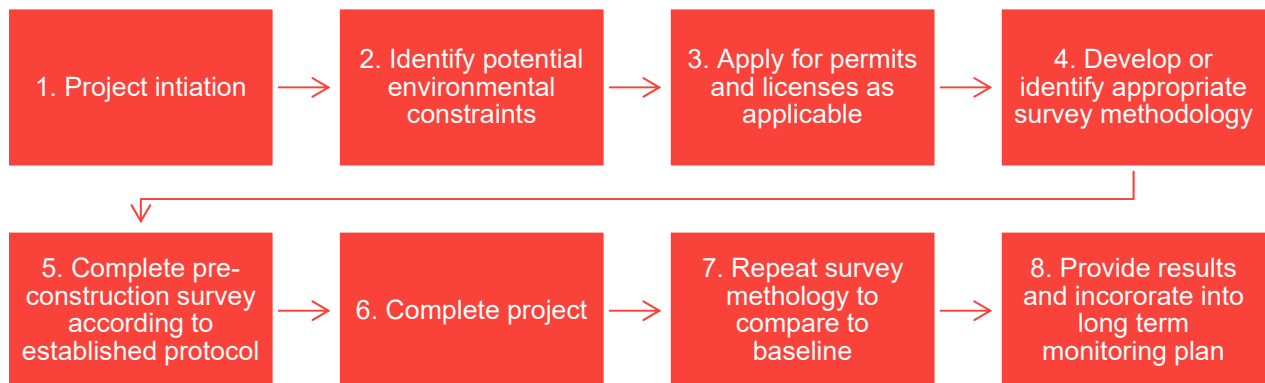


Figure 5-1 Measures of Success for Short Term Monitoring

Table 5-3 Detailed Success Monitoring

STEP	SITE SPECIFIC CONSIDERATION
1. Project Initiation	<ul style="list-style-type: none"> – Example: Boardwalk installation to enhance the viewing experience at a wetland.
2. Identify Potential Environmental Constraints	<ul style="list-style-type: none"> – Potential habitat destruction. – Potential damage to vegetative SOMC. – Potential for reduced wildlife movement. – Potential for impacts to water quality. – Potential for pollutants or contaminants to spill into soil or waterbody. – Potential disruption to breeding birds, breeding amphibians, or migratory species.
3. Apply for Permits and Licenses as Applicable	<ul style="list-style-type: none"> – Submit an application to conduct an Environmental Impact Assessment (EIA). – Submit an Environmental Impact Statement (EIS) to the Ministry of Environment. – See Table 5- for Policy Documents.
4. Develop or Identify Appropriate Survey Methodology	<ul style="list-style-type: none"> – A list of available survey methodologies is available in from the Government of Saskatchewan Species Detection Survey Protocols (SDSPs) website and Table 5-2
5. Complete Pre-construction Survey	<ul style="list-style-type: none"> – Following the established protocol, complete baseline surveys.
6. Complete the Project	<ul style="list-style-type: none"> – Follow Environmental Best Practices for Erosion and Sediment Control (Saskatchewan Ministry of Highways and Infrastructure 2012) . – Follow established City of Saskatoon Contractor Environmental Guidelines (COS 2019).
7. Repeat Surveys	<ul style="list-style-type: none"> – Following the established protocol, complete post construction surveys.
8. Provide Results and Incorporate into Long Term Monitoring Plan	<ul style="list-style-type: none"> – Identify any changes from pre-construction condition. – Make raw data available for integration into a complete data set.

Table 5-4 Policy Documents and Permits

NAME	DETAILS	CITATION
Amphibian Salvage Checklist	Submit this Checklist to apply to have Amphibian Salvage included in or added to a Species Detection Research Permit.	Government of Saskatchewan. 2020. Amphibian Salvage Checklist. August 2020. Saskatchewan Ministry of Environment, Fish, Wildlife and Lands Branch, Regina, Saskatchewan, Canada.
Amphibian Salvage Policy	This document outlines the policy and procedures pertaining to amphibian salvage in Saskatchewan.	Government of Saskatchewan. 2020. Amphibian Salvage Policy. Accessed November 2023 at: https://publications.saskatchewan.ca/#/products/107478_
Research Permit – Bird Banding Application	This application is for individuals wanting to obtain a permit to band birds protected under The Wildlife Act, 1998. A federal banding permit is a pre-requisite.	Government of Saskatchewan. 2016. Research Permit Application – Bird Banding. Accessed November 2023 at: https://publications.saskatchewan.ca/#/products/69794_
Saskatchewan Activity Restriction Guidelines for Sensitive Species	These guidelines outline restricted activity periods and distance setbacks for rare and sensitive species to assist	Government of Saskatchewan. 2017. Saskatchewan Activity Restrictions for Sensitive Species. Accessed

	proponents in minimizing impacts to rare and sensitive species and habitats.	November 2023 at: https://publications.saskatchewan.ca/#/products/79241 .
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6 FINAL ACCEPTANCE & PHASING

6.1 Final Acceptance

Acceptance of construction to adhere to the City of Saskatoon Standard Construction Specifications: Parks (2023) processes, including attainment of the following milestones: Substantial Completion Certificate (SCC), Construction Completion Certificate (CCC), and Final Acceptance Certificate (FAC).

As the work is intended to be completed in multiple phases under separate contracts, parameters for successful final acceptance will vary. In general, parameters for final acceptance should adhere to the minimum:

- All built work is completed and in working order.
- All defects and deficiencies have been addressed.
- Restoration and planting target rates have been achieved.
- All invasive species target rates, if any, have been achieved.
- Any damage caused during construction has been repaired.

6.2 Phasing

Recommendations regarding the proposed phasing and an estimation of construction costs has been included to support the proposed improvements within the Conceptual Plan. The following sub-sections describe the intended use of the recommended phasing and cost estimation.

6.2.1 PHASING OF IMPLEMENTATION

Guidance on the phased implementation of the proposed improvements is provided to suggest when elements of the Conceptual Plan could be implemented in a logical manner. Phasing is categorized into two phases: Phase 1 (short-term) and Phase 2 (mid-term to long-term). These timeframes align with the recommendations within the NAMP regarding the order in which Actions would be most effective for meeting individual Objectives.

Error! Reference source not found. outlines the proposed improvements to be implemented in each phase. The recommended phasing should be reviewed per the recommendations of the NAMP and adjusted as required. Prioritization of items should be based on further studies to determine the most effective use of resources and funds.

6.2.2 COST ESTIMATION

Estimated costing has been prepared to allow for a high-level understanding of the costs associated with the construction of the proposed improvements (see Error! Reference source not found.). Assumptions and exclusions include:

- Costs provided are estimates only. The estimate refers only to the costs for typical construction of the proposed features within the site, including supply, handling, and installation of materials.
- Estimated costs do not include:
 - Any pre-construction activities, such as, but not limited to: baseline studies and/or inventories, testing, surveys, engagement, consulting fees, detailed design, and/or approvals.
 - Any general requirements, such as, but not limited to: permits, insurance, mobilization & demobilization, testing, approvals, and/or disposal of materials.
 - Any post-construction activities, such as, but not limited to: establishment of plant material, long-term maintenance of the site (e.g. controlled burns, waste removal), and/or IPM.
 - Any proposed infrastructure which is located outside of the boundary of the site.
- Estimated costs include a 30% contingency upon the subtotal to account for variations in estimated costs.
- Unit prices are estimations only and have been derived from recent projects similar in scale.
- Assumptions on materials and quantities have been made solely to provide a high-level understanding of the future scope of the work. Additional analysis and costing will be required in the future. The cost estimate does not in any way reflect a construction ready approach or recommendations.
- Estimated costs are subject to change based on a number of factors, such as, but not limited to: timing; local market conditions; aspects and complexity of future design and construction programs; and regulatory requirements.
- A square metre price has been provided for restoration and utility planting efforts based upon the following assumptions:
 - Restoration assumes plugs at a density of 1 per square metre, and hand-broadcast seeding. Utility planting assumes hand-broadcast seeding. Costs do not include weed control, site preparation, wildlife deterrent fencing, soil amendments, soil testing, mulch, or other future potential design decisions. These assumptions are intended for the purposes of conceptual cost estimation only and should not reflect the final design approach.
 - This unit price is a conceptual estimation only and should be verified and broken out per individual item (e.g. trees, shrubs, seeding, etc.). As designs can vary considerably due to such variables as availability of plant material, species, size, planting densities, and seeding methods, this unit price is intended to be a high-level estimation only.
- The quantities within the cost estimate are estimated at 50% of the total area identified in the Conceptual Plan (Figure 1). 50% is an estimate only and does not refer to the exact extent of restoration or reclamation that may be required in the future. Further studies and detailed designs will be required to determine the final extent of future work.

Table 6-1 Construction Phasing & Cost Estimate

ITEM NO.	DESCRIPTION OF WORK	REMARKS	UNIT	QUANTITY	UNIT RATE	EXTENDED AMOUNT
Phase 1: Short-Term						
1.0	Perimeter Fencing		LM	3,178.00	\$50.00	\$158,900.00
2.0	Primary Trail	Assumes 3m wide crusher dust trail.	M2	22,335.00	\$35.00	\$781,725.00
3.0	Secondary Trail	Assumes minor improvements to existing trail.	LM	18,114.00	\$5.00	\$90,570.00
4.0	Tertiary Trail	Assumes minor improvements to existing trail.	LM	7,068.00	\$5.00	\$35,340.00
5.0	Gate		EA	5.00	\$2,000.00	\$10,000.00
6.0	Off-Leash Dog Park	Including relocation of fencing and infrastructure improvements.	LS	1.00	\$50,000.00	\$50,000.00
7.0	Signage - Site Map		EA	5.00	\$15,000.00	\$75,000.00
8.0	Signage - Wayfinding Posts		EA	20.00	\$1,500.00	\$30,000.00
9.0	Signage - Educational	Quantity is an estimate only.	EA	5.00	\$3,000.00	\$15,000.00
10.0	Signage - Prohibited Use	Quantity is an estimate only.	EA	5.00	\$500.00	\$2,500.00
11.0	Waste Receptacle		EA	5.00	\$3,500.00	\$17,500.00
12.0	Bench		EA	8.00	\$3,500.00	\$28,000.00
13.0	Forest Restoration	Assumes 50% of the total restoration area.	M2	517,588.00	\$15.00	\$7,763,820.00
14.0	Wetland Restoration	Assumes 50% of the total restoration area.	M2	42,730.50	\$15.00	\$640,957.50
15.0	Utility Corridor Planting	Assumes 50% of the total planting area.	M2	79,821.00	\$10.00	\$798,210.00
Phase 2: Mid-Term to Long-Term						
16.0	Safety Fencing	Final length to be determined with CN Rail.	LM	4,080.00	\$50.00	\$204,000.00
17.0	Skills Park	Assumes upgrades to benches, signage, and sport specific infrastructure. Estimate is placeholder only.	LS	1.00	\$100,000.00	\$100,000.00
18.0	Gathering Area		LS	1.00	\$20,000.00	\$20,000.00
19.0	Wetland Outlook		LS	1.00	\$100,000.00	\$100,000.00
20.0	Restroom Facilities		EA	2.00	\$75,000.00	\$150,000.00
21.0	Parking Lot Upgrades	Upgrades to SE and Central parking lots.	LS	1.00	\$50,000.00	\$50,000.00
22.0	Proposed Road and Parking Lot	Assumes materials only, not land acquisition. Subject to future design and studies.	LS	1.00	\$155,000.00	\$155,000.00
<i>Subtotal:</i>						\$11,276,522.50
<i>30% Contingency</i>						\$3,382,956.75
Total Estimated Project Cost:						\$14,659,479.25

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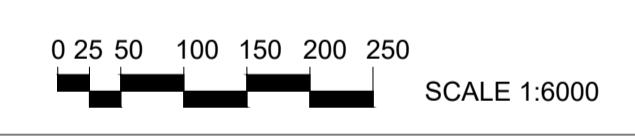
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- LEGEND:**
- SITE BOUNDARY
 - EXISTING CONTOUR (0.5M INTERVAL)
 - EXISTING ROAD
 - PROPOSED ROAD (P2)
 - PRIMARY TRAIL (P1)
 - SECONDARY TRAIL (P1)
 - TERTIARY TRAIL (P1)
 - BOARDWALK (P1; P2 WETLAND OUTLOOK)
 - EXISTING EXTERNAL TRAIL
 - PERIMETER FENCE (P1)
 - OFF-LEASH DOG PARK FENCE (P1)
 - SAFETY FENCE (P2)
 - ← SITE ACCESS
 - P PARKING AREA (P1)
 - G GATHERING AREA (P2)
 - B SEATING (P1)
 - W WASHROOM FACILITIES (P2)
 - FOREST RESTORATION AREA (P1)
 - WETLAND RESTORATION AREA (P1)
 - UTILITY CORRIDOR PLANTING AREA (P1)

NOTES:

- PLAN IS CONCEPTUAL ONLY AND NOT FOR CONSTRUCTION.
- P1 REFERS TO PHASE 1 OF PROPOSED IMPLEMENTATION.
- P2 REFERS TO PHASE 2 OF PROPOSED IMPLEMENTATION.



CONSULTANT:

CLIENT:

PROJECT TITLE:
**RICHARD ST. BARBE BAKER
 AFFORESTATION AREA**
 SASKATOON, SASKATCHEWAN

DRAWING TITLE:
CONCEPTUAL PLAN

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 C:\Users\lucy17872\OneDrive\Documents\2024\10-28\10-28-2024_Serial_Site_and_Plan_21_Berke Baker Afforestation Area - Project\External\03_Technical\03_Landscape Architecture\01_Concept Design\05_Sheets\05B-CONCEPT PLAN.dwg