City of Vaughan

Vaughan Healthcare Precinct

Planting Maintenance Manual - FINAL DRAFT

July 2015

Introduction

The purpose of the document is to outline a maintenance program for public realm designs in the Vaughan Healthcare Precinct, including streetscapes and landscapes.

The public realm design uses an adaptive and successional planting approach to create a designed environment that incorporates and in turn is shaped by the natural systems or ecological functions of the site.

Unlike conventional landscapes that promote a static and highly manicured vision, the expression of the planting is to engage the dynamic qualities urban nature for the Healthcare Precinct.

This Planting Maintenance Manual includes the frameworks and practices required to maintain the public realm planting as resilient green infrastructure in the City.

Key Benefits of Planting Approach:

- Support the health & wellness of patients and visitors with the sensory benefits of urban nature
- Re-invigorate public landscapes with visual intensity and seasonality of urban nature
- Landscape provides places for strolling, places to sit, and seasonal variety in plants through a series of discrete landscapes.
- Design of the planting is informed by local landscape character, land use, programmatic and infrastructural demands
- Dynamic qualities can respond to the desire for flexibility and responsiveness to changing needs and opportunities.
- Lower resource input and maintenance costs in the long term, after the initial establishment period
- Make greater use of native species in naturalistic plant communities
- Ecologically-based plant communities with successional and diverse planting palettes
- Exploit ecological as well as horticultural processes
- Support biodiversity & nature conservation
- Work with specific environmental urban conditions and microclimates
- Filters and slow storm water runoff
- Moderate noise and wind

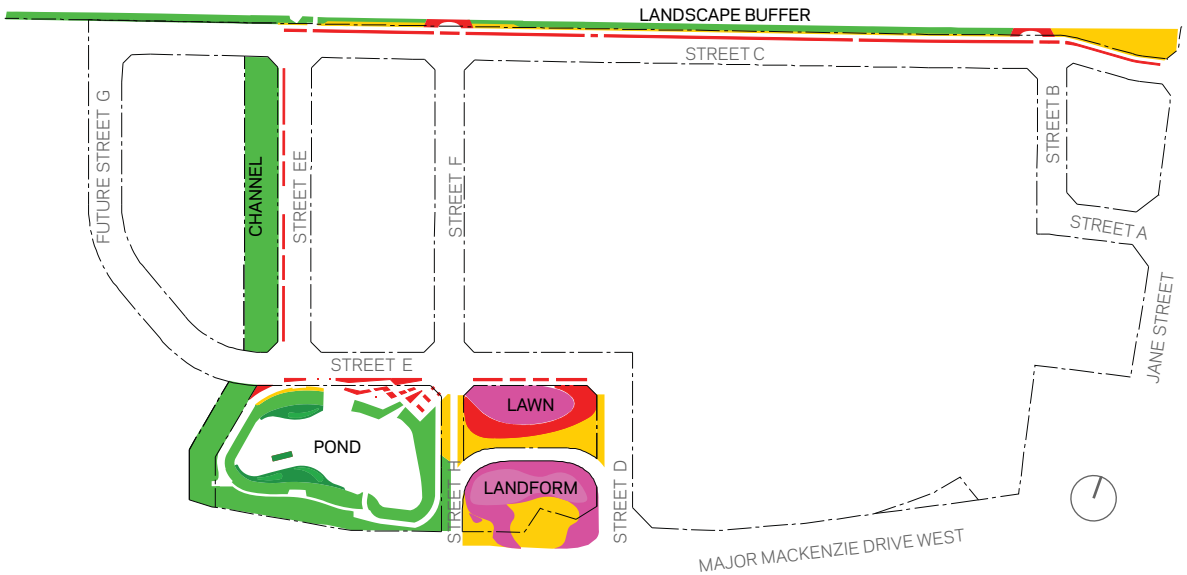
Wetland and Aquatics

Fully Naturalized Areas

Groomed Naturalized Areas

No Mow Areas

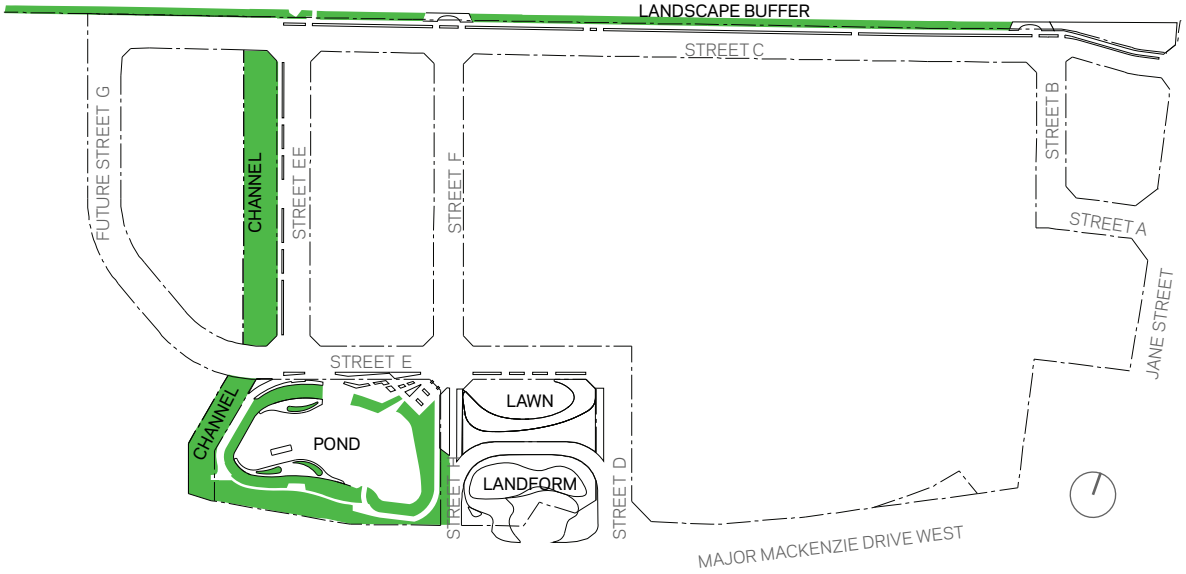
Planting Beds



VHCP Maintenance Ares Key Plan

Naturalized Areas

Fully Naturalized Areas



17,100 SQM NATURALIZED AREA

The Urban Wild; Landscapes which are completely self-managed and maintained.

Establishment = 2 full growing seasons

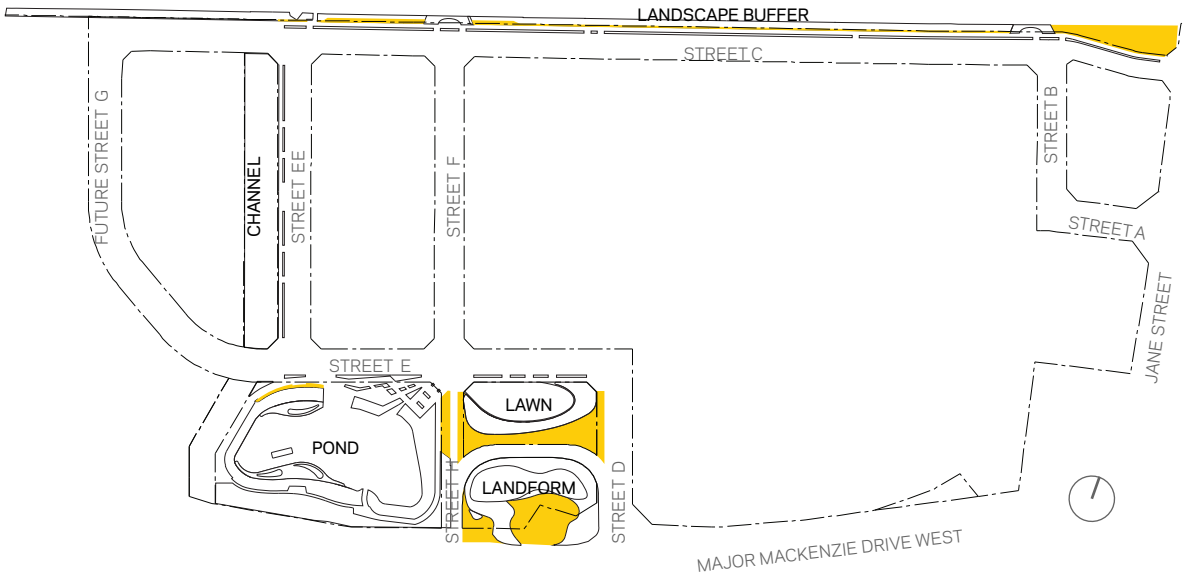
During this time plant material is under full warranty and should be replanted/ reseeded these areas as needed. Monthly monitoring schedule is required to actively manage for invasive species, pests, and disease.These areas should be deeply watered during periods of summer drought.

Ongoing Maintenance = 2 years +

No Maintenance anticipated after establishment period. Follow the CoV standard level of care for naturalized areas (ie path clearing, hazard pruning, beaver damage, etc). No irrigation is required

Naturalized Areas

Groomed Naturalized Areas



7,890 SQM GROOMED AREAS

Areas of the Urban Wild which interface with the public and therefore require periodic maintenance to increase the access and safety as well as protect these vulnerable areas from urban stress (salt, compaction,etc)

Establishment = 2 full growing seasons

During this time plant material is under full warranty and should be replanted/ reseeded these areas as needed. Monthly monitoring schedule is required to actively manage for invasive species, pests, and disease. These areas should be mown in the spring and deeply watered during periods of summer drought.

Ongoing Maintenance = 2 years +

Refrain from over-grooming these areas; they are not intended to look 'tidy'. Mowing should take place once a year and any bare areas should be overseeded. Follow the CoV standard level of care for trees + shrubs. Replace plants, as needed (including bulbs). These areas should be deeply watered in periods of extended drought.

Naturalized Areas

Establishment Period

Introduction

The Naturalized Areas contain the majority of plants in the precinct. Whenever needed, tree species should be replaced as specified to maintain continuous canopy coverage, emulating natural woodland density Vegetative structure is multi-layered and includes:

- Canopy trees for shade, wind breaks, spatial structure and habitat value.
- Shrubs + Understory trees for scale, seasonality, food and wildlife niche value
- Evergreens for winter interest and structure
- Self-seeding perennial wild flowers for detail and seasonal interest.

Establishment Period

An annual monitoring schedule should be developed to ensure that the newly planted material survives and fulfills the intended ecological function. Hydro-seeded areas should be monitored to ensure adequate vegetative coverage.

The Maintenance Contractor should make periodic inspections of the composted surface for effectiveness and shall immediately correct all deficiencies.

Any spotty growth (or damage cause by rainfall washout) should be repaired with the specified upland or wetland seed mix.

Disturbance should be minimized as much as possible. These areas should not be used for equipment storage, vehicle turning points, or working easements.

Moisture levels should maintained enough to sustain healthy growth of plant material. This may require periodic watering during dry periods.

Note that water connections will not be accessible from the precinct's naturalized areas. It shall be the responsibility of the contractor to monitor and perform irrigation by water tanker/ trucks or other temporary irrigation strategy approved by the city. Deep watering, rather than frequent watering is preferred.

The woodlands are planted in a rich sandy loam that encourages healthy soil ecology, nutrient cycling and water retention. The health of the soil will be telegraphed into the health of the wider ecosystem so annual testing and augmentation of this resource is of utmost importance.

Groundcover debris (leaves primarily) should be left (unless otherwise noted) encourage re-seeding, soil protection and habitat nesting.

All plants in these areas should be allowed to retain the natural plant form without shaping or shearing. Shrubs will eventually grow into each other to create large massings.

Naturalized trees should be pruned only to remove hazards from the canopy. Hazard pruning consists of removal of large dead wood, large broken branches that are hanging in the tree, branches that have broken and are supported by an adjacent tree, etc.

Bulbs in naturalized areas should be monitored to ensure persistance. An annual field inspection shall be required following the flowering season to determine if replenishment is required. Additional bulbs should be replanted, as necessary, to account for frost heaving, erosion or varmints

For the establishment period, nauturalized plantings are inspected once upon completion of the installation, and then monthly (during growing season) for the next two years. Monitoring should include documentation, and removal of diseased specimens and invasive species.

Naturalized Areas

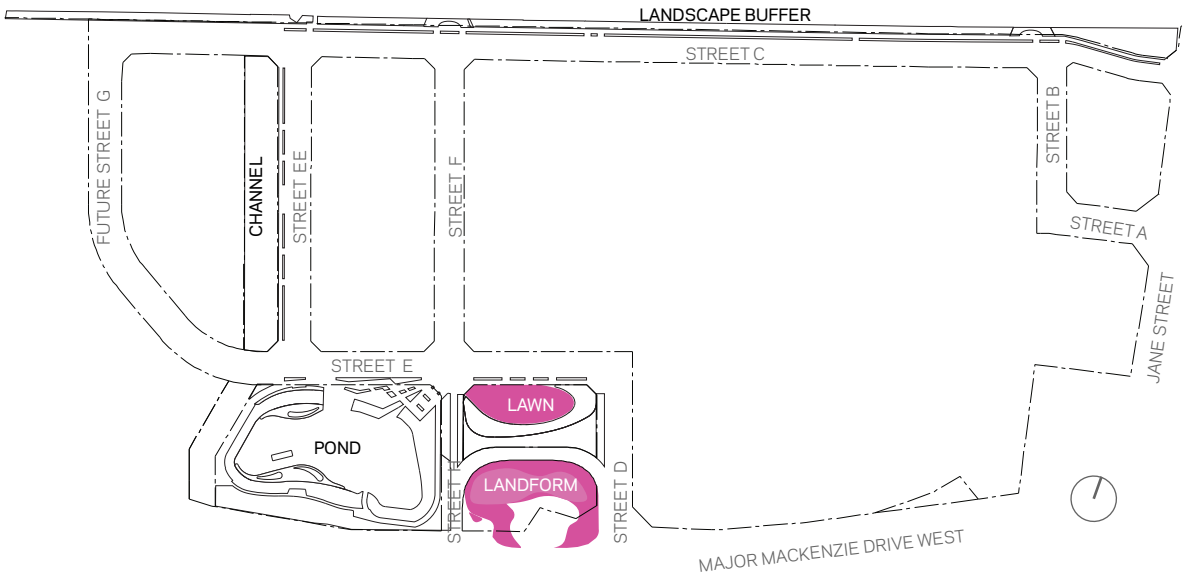
Post-Establishment Basic Maintenance Tasks

Maintenance Tasks For Naturalized Areas		
Month	Task	Notes
SPRING	Clear Pathways	Cut back plant material which impedes on any cycleways, access path, and/or seating areas
**NOTE: We do not recommend mowing naturalized areas.*		

Maintenance Tasks For Groomed Naturalized Areas		
Month	Task	Notes
WINTER	Tree + Shrub Pruning	Prune according to CoV Forestry standards.
	Coppice Small Shrubs	Coppice *Cotinus* and *Rhus typhina* 6" from ground
SPRING-SUMMER- AUTUMN	Monitoring	Monthly monitoring for tree and shrub health. Treat any infestations. Dead / damaged trees should be removed and replaced in accordance with CoV standard tree planting details. New trees should be fitted with gator bags and carrefully monitored.
SPRING	Mow Meadows	Mow area down to 4" with a mulching mower in mid spring
	Test Soil & Apply Amendments	Test for nutrients, salts, NO3, NH4, pH, organic content, and CEC. Agronomic soil test for chemical analysis, soil textural analysis, fertility analysis. Test for soil biology, active and dormant bacteria, active and dormant fungi, predators, nematodes, active:dormant ratios, and available nitrogen. Formulate and apply liquid biological amendments from soil biology tests (likely bacterial tea)
	Repair Winter Damge	Aerate and reseed any bare areas, water until areas have re-established
SUMMER	Watering	Water during periods of extended drought. Watering should be infrequent but deep.
AUTUMN	Supplement Existing Bulbs	Augment existing *Muscari River* along the Multiuse Path to maintain impactful spring blooms

No Mow Areas / Landform

No Mow Turfgrass



6,250 SQM NO MOW AREAS

Areas of the precinct which are sodded with a blend of no-mow fescue grasses for slope stabilization and as a turf lawn alternative.

Establishment = 3 full growing seasons

During this time all plant material is under full warranty and should be re-planted/ re-seeded / re-staked as needed. Do not mow. During the growing season, a regular weekly schedule is required to monitor irrigation levels and overall turf health (coverage, weed infiltration, erosion, drainage etc.)The 1 meter lifts (2:1 slopes) of the terraced landform may require additional reinforcing during the establishment period. These slopes should be monitored carefully; any signs of erosion should be addressed immediately.

Ongoing Maintenance = 3 years +

Once the no-mow areas are fully established and stabilized, only earthwork grass cover requires regular weekly monitoring. For all other areas, turf and soil health may be monitored and repaired (dethatched, replaced, aerated, augmented) twice a year. Weekly irrigation may continue to be necessary for some areas (ie the landform), other areas may go on a reduced schedule. Irrigation schedule should be responsive; water only enough to prevent summer dormancy.

Introduction

Three fundamentals lie at the heart of holistic earthworks preservation strategy:

1 Establish and/or perpetuate continuous vegetative cover to stabilize and protect the soil from weather and environmental factors that may cause erosion.

2 Eliminate maintenance-related interventions that may disrupt the vegetative cover. There should be minimal human or mechanical intervention; Mowing, if any, should be infrequent.

3 Minimize destructive natural disturbances, such as tree windthrow, burrowing animals, or invasive exotic species.

The Major Mackenzie gateway earthwork is Well-protected with a healthy, continuous carpet of grasses that is free of woody species. Bare spots, gouges from careless maintenance practices, animal burrows, and invasive exotic vegetation, which potentially threaten landform, should be avoided.

The quality and sustainability of the erosion-controlling grass cover is key to earthworks protection. Sustainable level of cover should have minimal bare spots (areas of exposed soil are less than 3″x 3″) with a high proportion of fescues, bluegrass and other native grass / forbs.

No Mow Areas / Landform

Establishment Period

Watering

It is important to keep grass cover uniformly moist during the full establishment period.

While a temporary hose and sprinkler system are typically recommended, understand an onsite hose bibb water source will not be provided. The contractor will be responsible for bringing all source water shall to the site by tank truck or other city approved means

Given the fact that water hookups will not be available to the consultant, we recommend the contractor identify an appropriate alternate strategy to ensure irrigation needs are met. Note that irrigation needs may be relatively intense during summer heat. Reliable and deep watering is expected during the first two summer seasons.

Mowing and Staking:

Mowing is generally not recommended for fescue turf as it encourages weed growth. The landform should be left unmown to form a thick root system and dense cover to stabilize and protect from erosion. If woody seedlings or invasive weeds appear to be taking root, turf may be mowed once during late spring (early to mid-June), when seed heads appear. Ensure mower is set at tallest setting for the least damage to turf.

Removal of the stakes is recommended by the beginning of the second growing season once the root systems have fully established. Wood stakes must be completely removed and disposed of off-site. Any damages or patching that is required will be completed after the stake removal

The contractor must immediately address (within 72hours) any signs of erosion, slope failure, or wash out during storm events. Additional erosion control blankets, turf mats, staking or planting mesh to to be installed on an ongoing basis to ensure the integrity of proposed slopes.

Due to the specialized maintenance associated with the terraced landform, 1-2 secured hose bibs will be made available at Block 16 specifically for turf grass irrigation. (Final connection locations to be determined).

The terraced landform should be carefully monitored to ensure correct levels of irrigation. Any automated watering (on a fixed schedule) should be checked and adjusted periodically to confirm grass is not over or under irrigated.

De-Thatching

Fine fescues tend to develop a thatch layer near the soil surface over time. Thatch is composed of dead grass that does not completely decompose. It can smother the growth of new grass shoots, reducing the density of the lawn and creating “dead” spots. The thatch layer also tends to retain moisture at the ground level, which can encourage the growth of fungal diseases.

If thatch builds up to the point where dead grass is visible and the grass begins to thin out, the lawn should be de-thatched.

De-thatching can be accomplished using a mechanical de-thatcher or power rake, or by hand using a de-thatching rake.

While mechanical de-thatching (such as power raking) may be used on flat terraced areas , side slopes are limited to manual de-thatching methods (ie hand rakes).

Set mechanical de-thatchers to a depth where they lift the thatch without digging up the soil. If the thatch is particularly thick, the de-thatcher will need to be set deeper, and care should be taken to minimize soils disturbance as much as possible.

The thatch should be raked out of the lawn and removed for compost. If open soil is visible following de-thatching, the affected areas should then be over-seeded with either of the following lawn mixes:

- Prairie Nursery “No Mow Lawn Mix”
- Wildflower Farm “ Eco Lawn Mix”

Timing is very important. Cool season fescue lawns should be de-thatched in mid-spring after the grass has greened up and begun active growth. De-thatching in early spring before the lawn begins to grow tends to encourage weeds.

To control weed growth, selective cutting may be done in early june to remove any weed heads or flowering stalks. Hand held electric mowers (such as weed whips) are prefer over combustion engines, as these engines are heavy to operate and can flood on steep slopes.

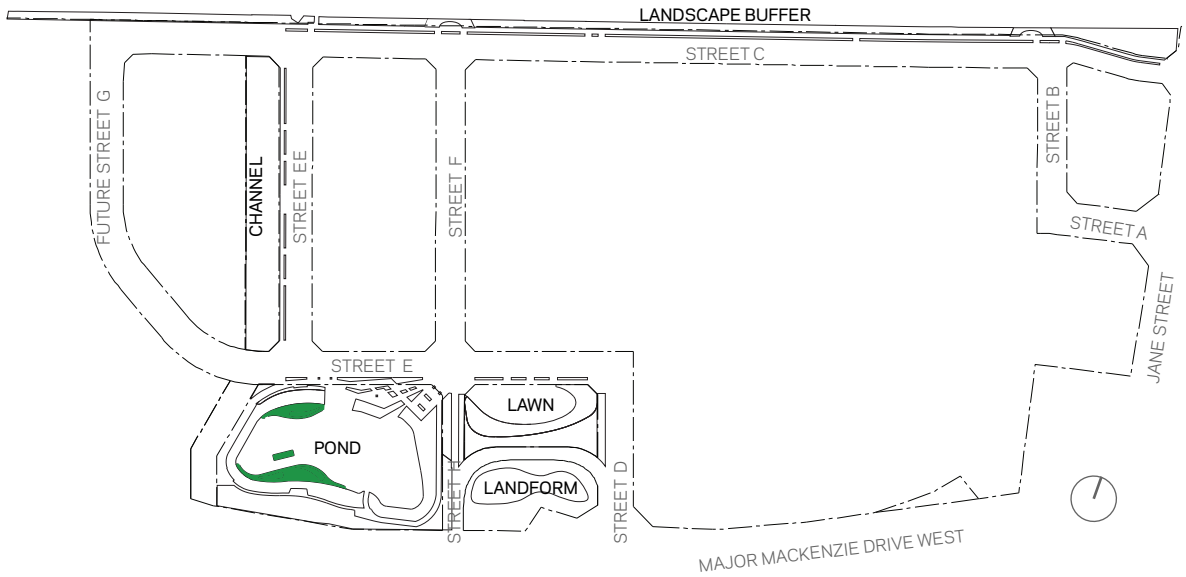
No Mow Areas / Landform

Post-Establishment Basic Maintenance Tasks

Maintenance Tasks For No-Mow Areas		
Month	Task	Notes
ALL YEAR	Monitoring	Biweekly / monthly monitoring of landform grass coverage and stabilization issues
WINTER	Dormant De-thatch, only as needed	Grasses may be close-mowed right down to the ground in late November, (or when night temperatures reach below 0). This cleans away the year's growth and remove the mat layer. All clippings should be bagged and removed.
SPRING	Spring De-thatch, only as needed	With a rake or comb, manually de-thatch areas which appear dead/ dying. Liberally overseed. Monitor and water periodically until the area has re-established
SPRING-SUMMER- AUTUMN	Watering	Deeply water during periods of drought or at the first signs of dormancy.
SUMMER	Weeding	Selective cutting of weed heads and flowering stalks in June
SUMMER	Test Soils	Test for nutrients, salts, NO3, NH4, pH, organic content, and CEC. Agronomic soil test for chemical analysis, soil textural analysis, fertility analysis. Test for soil biology, active and dormant bacteria, active and dormant fungi, predators, nematodes, active:dormant ratios, and available nitrogen.
AUTUMN	Aerate Soils	A machine may be used to remove plugs of soil from the lawn. The resulting holes may then filled with a lighter material, such as a sand.
AUTUMN	Overseed, as needed	Overseed open areas that result from any summer damage (animals, construction activities, heavy traffic, or disease)
AUTUMN	Apply Soil Amendments, as needed	Formulate and apply soil amendments from soil biology tests (likely bacterial tea) We do not recommend using any fertilizers. However pH Phosphorus, Potassium, or pH adjustments may be useful. Biological soil amendments (like bacterial tea) should also be considered.
**NOTE: In order to maintain the integrity of the steep slopes, proactive maintenace is required for all no-mow turf at Block16 landform. We recommend the City institute a regular monitoring regime so pre-emptive measure may be taken to combat any major erosion or stabilization issues.*		

Wetland & Aquatics

Stormwater Management Pond



1090 SQM WETLANDS

70sqm Floating Treatment Wetland and 1020sqm Emergent Vegeation along pond's shoreline shelf.

Establishment = 2 full growing seasons

Wetland plantings is under full warranty and should be replanted, as needed. A monthly monitoring and remediation strategy is required to actively manage for invasive species, pests, and disease during the growing season.These areas should be deeply watered during periods of summer drought.

Ongoing Maintenance = 2 years +

For pond edges, no maintenance is required apart from remediating major shoreline disruptions (such erosion, beaver damage). In this case, woody shoreline material and emergent vegetation should be immediately reintroduced.

The floating treatment wetland should be accessed every spring for an annual clean-up (including invasive removals, thinning, and replanting as needed. In addition, a monthly monitoring strategy is required to respondto major damage threatening island integrity (geese, buoyancy, drought issues etc). The island should be deeply watered during periods of summer drought.

Introduction

The aquatic plantings are a defining element of the precinct's stormwater ponds.

The pond plantings should support a diverse ecology, offering a unique set of circumstances that attracts migratory birds, water-loving mammals, herbivores, insects, and reptiles.

To house, shelter, and feed this diverse wildlife, there is a fresh-water variety of aquatic, emergent, sedge-grass plants and upland shrubs.

The pond system is dynamic; plant composition is expected to migrate to response to various environmental, flooding, and/or dredging activity.

Wetland Planting Structure:

Shrubs are dense at marsh edge to prevent nuisance water fowl (such as geese) from nesting in water and feeding on broadleaf plants, as well as and animals from creating disturbance that will allow invasive plants to establish.

Emergents (such as bulrush) protect the perimeter of the ponds, create valuable aquatic habitat, filter water and help to shade out problematic algae blooms

Pond engineering and should be maintained according 'Pond Operations and Maintenance Manual' (Cole Engineering 2014).

Once pond ecology becomes established, Woody debris and boulders may be introduced to provide shelter for wetland wildlife.

Wetland & Aquatics

Establishment Period - Pond Edges

Provisions must be made to re-establish plantings and re-seed grass cover after damaged by sediment accumulation, storm water flow, dredging activities or other causes. Plants may require additional watering, physical support, mulching, weed removal, or replanting during the first two years.

Invasive, or nuisance species should be removed minimum twice a year (spring and fall). Cattails are particularly problematic to eradicate. They propagate through rhizomes; additional roots may be sent out horizontally, quickly resulting in new plants. Be aware that digging the rhizomes up by hand is time- and labor-intensive, and generally works best if the cattail stand is very young. For this reason, SWM Ponds should be continuously monitored for new cattail growth.

Young cattails in standing water are not firmly established and are generally easy to pull by hand. Look for cattails growing 6 inches or less above the surface of the water. Reach under the water to the base of the plant, grasp the stem firmly and pull out the stem and as much of the roots as possible. Plant identification is very important for this operation since it is difficult in the beginning to distinguish between non-native + natives.

Manual removal for more mature plants is most effective if you dig out the rhizomes, with a shovel or hand trowel. Be sure to dig down below the root system; pulling cattails out of the ground will not kill the root system.

Dispose the cattails offsite and replant with native bulrush or other approved planting.

While Invasive species removal will initially be a labor intensive, this task should diminish as the native plant community fills in.

The banks of the pond should not be mown, under any circumstance. Pond edge planting should be left to grow tall. This ensures the shoreline is stabilized from wave and wind actions, while providing multiple ecosystems functions, including food and shelter for wildlife. Tall plantings will also serve to discourage overgrazing by nuisance wildlife, such as geese.

Establishment Period - Wetland Island

For the first 30 days, the plants should be kept continuously damp until the roots grow down below the waterline. The plants should not dry out, this may mean watering up the three times per week, during hot weather. The island should be fully saturated with each watering

The waterline of the island should also be monitored closely. If rocks have been used to weigh down the island, they should be removed after a week or two, as plant fill in and saturate the structure.

Herbaceous wetland plants on the floating wetland island are to be maintained on the same schedule as pond edge wetlands (including periodic removal of invasive species). While island plantings should be allowed to grow natural and wild, plant material should be thinned out if the center of the island begins to die back, the island becomes overgrown and threatens to topple.

Under no circumstances should chemicals such as algaecides, pesticides, or fertilizers be used on the island. Use of chemicals can kill beneficial microbes that the islands rely on, affecting their buoyancy and filtration efficancy.

In order to minimize damage to perimeter wetland edges, the main (and only) access point to the island should be from the spillway. The floating island may be accessed one of two ways:

To access from the shoreline, anchors may be pulled and the island may be carefully guided to the spillway area. Island must be repositioned and correctly re-anchored after maintenance is complete.

Otherwise, a small boat may be launched from the spillway to access the island directly. As plant materials fill in, the island can be easily support the full weight of several crew members walking. Because this option does not require re-anchoring the island, it is the preferred method of maintenance access.

The wetland island should be maintained in strict accordance with manufacturer's specifications. For any questions, concerns, or clarifications about the maintenance, contact BioHaven directly at 1-866-249-0976.

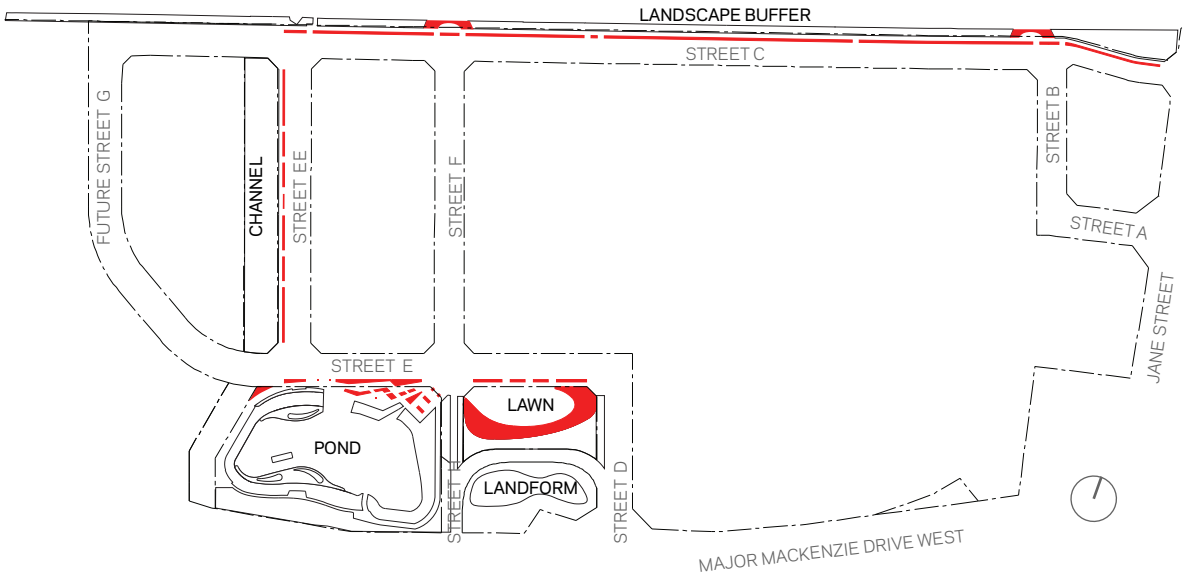
Wetland & Aquatics

Post-Establishment Basic Maintenance Tasks

Maintenance Tasks For Floating Wetland		
Month	Task	Notes
ALL YEAR	Monitoring	Monthly monitoring for any major damage
SPRING	Spring Clean Up	Remove excess organic matter and debris. Cut back Perrenials. Remove invasive and woody seedlings which threaten long term structure of island. All holes should be immediately filled with new plants to protect from further weed intrusion. Water new plants regularly until established.
SUMMER	Watering	Deeply water the island during periods of drought.

Planting Beds

Mixed Shrubs,Grass, Perrenial Beds



3,550 SQM PLANTING BEDS

These beds should be maintained with a clear understanding for the 'ungroomed' aesthetic intent. Maintenance which aggressively thins-out, mulches, or otherwise prevents spontaneous propagation is not desirable.

Establishment = 3 full growing seasons

Establishing resilient, drought tolerant plantings are crucial to the sustainability of these beds for the long term. A consistently thoughtful, proactive approach to maintenance is required in the first 2- 3 years. Spring cleanup should include clearing debris, lightly mulching (50mm shredded leaf litter or natural pine bark) and replanting of any bare areas. Soils should be tested +augmented, as needed.

Weekly, or bi-weekly maintenance is required during the growing season to monitor for drought, disease, pests, and remove invasives. Trees should be fitted with slow release watering bags. Hand water beds only when needed. Watering should be infrequent but deep. Proceed with post-establishment maintenance ONLY once beds are fully mature.

Ongoing Maintenance = 3 years +

Planting beds should be cleared every spring. Perennial's should be cut back, weeded, watered, lightly mulched, and replanted, if needed. Soils should be tested and augmented. Shrubs and trees should be maintained the CoV standard level of care for streetscapes. In the summer, beds should be deeply watered during periods of drought. Refrain from over-clearing beds in the fall, remove decaying/ diseases plant material and excessive leaf litter clogging drains. Refrain from over-grooming these areas; they are not intended to look 'tidy'.

Planting Beds

Post-Establishment Basic Maintenance Tasks

Maintenance Tasks For Mixed Planting Beds		
Month	Task	Notes
WINTER	Tree + Shrub Pruning	Prune according to CoV Forestry standards. Prune only to remove rubbing or damaged branches. Never shear shrubs. Leave natural shape. Grouped plants should be pruned together, never as individuals. Do not prune *Fothergilla* shrubs
SPRING-SUMMER- AUTUMN	Monitoring	Monthly monitoring. Record and review planting bed composition and condition. Identify species, plant density, and overall bed health. Treat any infestation or diseases. Dead / damaged trees should be removed and replaced in accordance with CoV standard tree planting details. New trees should be fitted with gator bags and carrefully monitored.
SPRING-SUMMER- AUTUMN	Watering	Irrigate during periods of drought. Watering should be infrequent but deep.
SPRING	Test Soil & Apply Amendments	Test for nutrients, salts, NO3, NH4, pH, organic content, and CEC. Agronomic soil test for chemical analysis, soil textural analysis, fertility analysis. Test for soil biology, active and dormant bacteria, active and dormant fungi, predators, nematodes, active:dormant ratios, and available nitrogen. Formulate and apply liquid biological amendments from soil biology tests (likely bacterial tea)
SPRING	Spring Clean up	Cut back perrenials and grasses. All exposed soils (or open holes in planting) should be filled with new plants. Water new plantings until established. If it wasn't done in the fall, clean out plant beds of leaves. Use a mulching mower to shred leaves and respread 25-50mm around plant crowns. Be sure to apply before liquid biological amendments
SPRING	Remove + Replace Invasives*	Remove woody seedlings and agressive weeds which threaten long term structure of bed. Schedule for 1-2 times in the late spring
AUTUMN	Fall Clean Up	Remove any leaf litter or debris which threatens to clog drains. Inspect aeration system and clean if necessary. Shred leaves and respread on plant beds. Cut back any rotting (slimy) plant material but keep tall grasses and seed heads standing over winter.

**NOTE: this suggested maintanence regime is suitable ONLY for perrenial meadow beds which are fully mature, having been established for at least 2-3 years. This maintenace is appropriate for plant communities which have established a balance with one another: they are diverse, self-renewing, resistant to invasion by weeds, healthy, and fill the available bed area fully. This is only possible after 2-3 years of intensive, proactive maintenance, sympathetic replanting, and ongoing monitoring.*

**NOTE: due to the nature of the intermingled plant beds, some foreign or weedy plants are expected and acceptable. The beds are expected to be have a dynamic structure which should leave room for spontaneous self-seeding. The composition of the beds is expected to change over time, through competition and environmenatl pressures. For this reason, prudent judgement should be used with removal of any 'weeds'. The aim is not neccessarily to maintain a traditional 'tidy' perrenial bed. In fact, it is quite prefeable for these beds to*

Planting Beds

Establishment Period

Introduction

Perennial plantings include all tall grasses, herbaceous perennials and mixed shrubs beds in Precinct Streetscapess, gardens and planters areas. Refer to the VHCP Landscape and Streetscape Developement Concepts

VHCP's grass plantings are a special and unique component the VHCP's public realm; these mixed meadows are rich in diversity and changing scenery. More than any other part of the precinct, grasses, thistles, and wildflowers marks the seasons with their fast-growing structure, billowy seed heads, fall foliage, and knobby winter stems.

While bringing a unique character to the landscape, they landscapes expand the ecological diversity of the precinct. The diverse matrix of native grasses, wildflowers, and woody hedgerows are home to a wide range of animals, insects, and birds that are infrequently seen in Vaughan's more groomed urban settings.

Perrenial matrix plantings are dynamic systems that adjust to changes in competition, microclimates, moisture and nutrients cycles. Species movement is expected and encouraged.

Establishment Period

For the first 2-3 years, beds should be carefully monitored and maintained to specified standards in order establish plant for long term drought resistance +_resiliency.

Note: *An established plant is one that is fully rooted, adapted, and growing in the native soil. For perennials and grasses, the Establishment Period is typically two full growing seasons, from the time of installation. An established planting requires dramatically less water, less weeding, and less overall care than a new planting.*

Watering

Plants should be well-watered the first 2 growing seasons after planting. A flexible watering regime during establishment will help plants develop a good root system and allow them to withstand extended periods of drought at full maturity.

Beds should be watered on a flexible schedule, only when plants have fully dried out. Probe the soil and determine if the top 10cm is dry before proceeding,.

Early morning is the best time to water. Water deeply - a general rule of thumb is to provide 1 – 2" depth of water per week in the summer; and every 2 weeks in the fall/spring. A rain gauge may be used to determine how much water is being applied

Note that although watering will need to occur up to twice a week during summer heat, water hookups are not available to contractor and should be factored into overall maintenance strategy and costs.

Fertilizer should not be used in any of the precinct planting beds. The selected plantings require very low levels of fertility.

Mulching / Weeding

Mulching should only be in the spring, while herbaceous plants have yet to fill out the beds. Care should be taken not to mulch over the crowns of perennials; mulch around them instead.

Apart from the spring cleanup, mulching should be kept to an absolute minimum for a number of reasons. These perennial beds are required to self-sow to sustain themselves. Mulch will prevent seeds from getting in contact with the soil to germinate. Biennials will never reappear, and perennials (even shrubs and trees) are prevented from naturally sowing themselves, as they would in a wild condition.

As an alternate to mulch, plants should be packed tightly together to conserve soil moisture, retard weed growth and moderate soil temperatures. Specified spacing (200 – 300mm on center, average) should sufficiently shade and crowd out weeds even within the first growing season.

Monitor beds biweekly between April and October during the 2 years establishment period to keep a handle on weed penetration.

Once the perennials completely filled in (ie 'no bare ground') the beds are protected from weed establishment and the soils below remain cooler and moist. Under these conditions (typically mid-late summer), weeding maintenance is drastically reduced.

If perennial garden density appears insufficient, open disturbed soils will allow for weed germination.

In this case, it is the contractor's responsibilty to remove weedy species and infill with new plants. Good judgement should be used in determining replacement species and varieties. New plants should be reviewed by a horticulturalist for suitability to the bed's plant community, growing conditions, and overall Precinct planting strategy.

Planting Beds

An approved grass seed mixture may be broadcasted over beds to kickstart the natural sowing process and inhibit weed competition.

Spring Cutting

An spring cleanup of the perennial gardens is recommended over a fall cleanup schedule, for a number of reasons.

Stripping a garden bare in the fall will expose bare soils to full sunlight for a significant amount of time. This will allow weed seeds an upper hand in germination. (many weed seeds are very cold hardy and will germinate in late fall and in very early spring)

Allowing garden to stand over the winter helps to limit light to weedy species, insulates soils and root crown from freezing winter temperatures.

Selective cutting back in autumn may be required to remove tender plants which are molding, or show signs of fungal issues.

Spring cut back should be timed around the end of March onwards.

- For delicate herbaceous plants, a knife, shears or secateurs shoul be used to cut stems close to the 'crown' or dormant top of the plant, avoiding the removal of new shoots
- Heavier grasses may be cut back with a hedge trimmer or a weed eater, using a steel blade rather than the nylon line. Be careful not to cut cool season grasses back too far, as they can be damaged beyond repair. Leave approximately 1/3 of last year's growth in place. It will quickly be hidden by the new growth.
- Evergreen perennials may either shoot from the base or from branching points higher up the old shoots. Where growth arises purely from the base, cut the old stems back entirely to within a few centimetres of the ground, leaving the new shoots open to light and air. Where growth arises higher up, simply shorten the old stems, cutting to just above a healthy leaf, branch or bud
- Tidy up the base plants, removing debris, and then mulch, as necessary

Care should be taken to avoid damaging new shoot growth, particularly if caught out by earlier-than-expected growth of perennials in spring. In these cases, rather than cutting out new growth, merely tidy up the plants by pulling out dead stems.

In very wet winters, the soil can be too wet to access plants without compacting soggy soil. Rather than damaging the soil, it is best to wait until it is drier in spring; and then tidy up the plants by pulling out dead stems. Where soils are prone to heavy waterlogging and damage, carry out cutting back in autumn.

Grass / Perrenial Replanting

The Maintenance contractor should expect 10- 15% of perrenial plant material will need replanting over the first two years. This is only an estimate, but is typical for even the most successful planting installations.

The first spring after initial installation is critical for replanting as it helps secure the long term health of the gardens. Some minor replanting at the second and third anniversaries will help ensure that lush, full plantings continue.

Trees

Tree canopies should be encouraged to knit together over time. Branches at sidewalks should be pruned up to at least 2.25 m to prevent obstructions to pedestrians.

Ensure trunk protection collars and tree stakes are maintained in good condition Periodically check guys and stakes of trees and shrubs to ensure proper anchorage. Keep turn buckles on guyed plant material tight. If rubber hoses damage plants, place in another position at the trunk to prevent damage. All tree supports shall be removed or left in place at the end of the warranty period as directed by the City

All precinct trees should be watered immediately upon installation and then twice a week for the first 3 weeks after planting

Thereafter, watering shall be done biweekly between May and October or as frequently as necessary (compensating appropriately for weather) to sustain vigorous plant growth. Tree gator watering system may be used, as approved by the city, and in strict accordance with manufacturer specification.

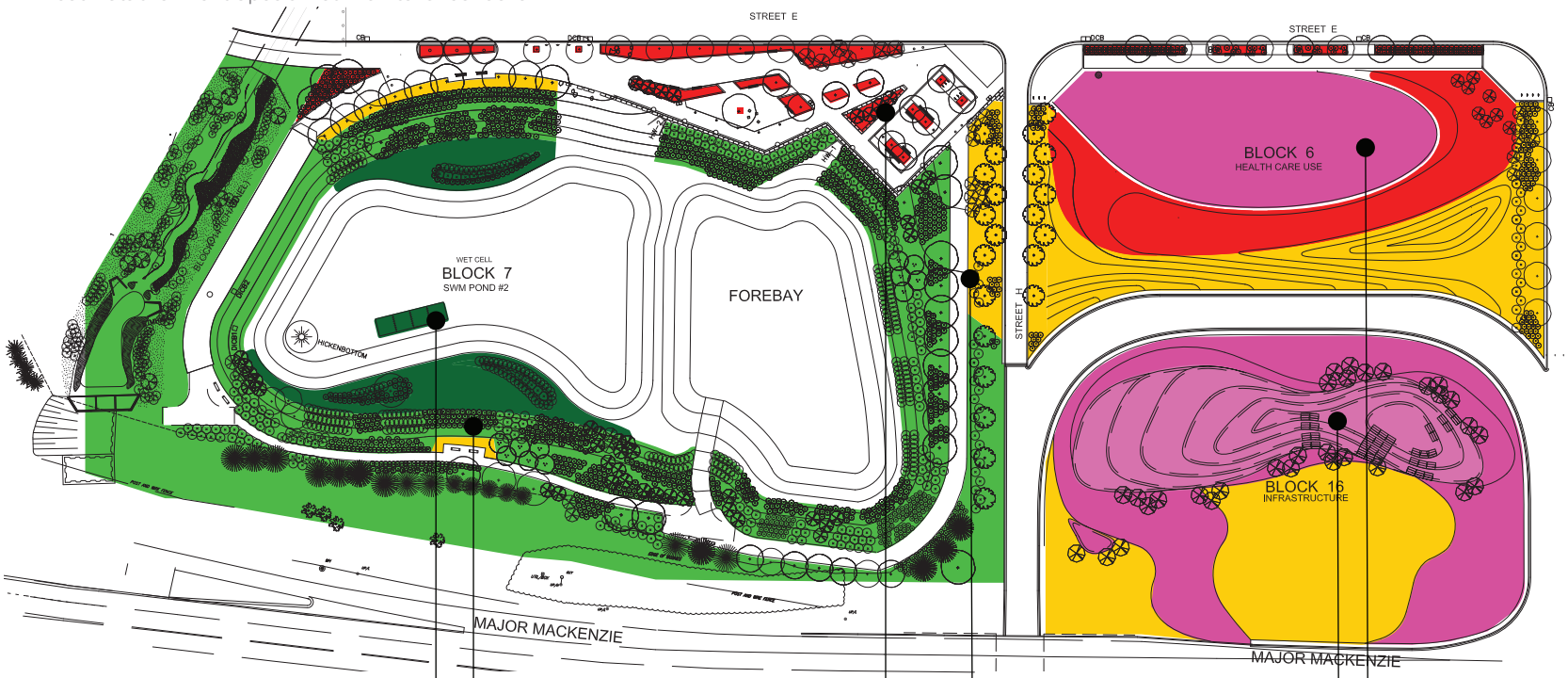
The final watering for all trees, regardless of when planted, that shall be completed after temperatures fall below freezing to ensure adequate moisture in root zone at freeze-up.

Monitoring

Beds should be monitored annually by a professional horticulturist for overall health and sustainability. Recommendations should be made based on individual plant health, including growth requirements, pest and disease controls.

Planting Plans

Post-Establishment Specialized Maintenance Tasks



FLOATING TREATMENT ISLAND

- Actively manage island for invasive species (including wild-life)

- Consider community stewardship, participation or associating educational outreach associated with maintenance and operations activity

NATURALIZED POND AREA

- Cut back vegetation which extends over the pond access route, pedestrian trail, and seating/viewing areas.

- Monitor for any potential damage which may affect the planting's role in stability and functionality of pond. Refer to SWM Pond Maintenance Manual.

OVERLOOK PLANTING BEDS

- Avoid pruning *Betulus* in late winter or early spring. Refrain from over-pruning *Amelanchier*. Maintain as large multistem shrubs.

- Consider adding more bulbs to grass beds if underwhelming spring appearance. As tree canopy closes in, sun-loving grasses may be replaced with shade-tolerant sedges and wood ferns

- When possible, refrain from piling snow on beds during the winter

- Periodically clear debris+ litter out of beds. Service waste receptacles

-Monitor cable tension of overlook guardrail. Tightened cable rope taut.

STREET H ACCESS

- Monitor if any spontaneous path crossings become prevalent.

-Consider adding a layer of crushed stone to formalize a pedestrian connection between Street H and the Pond Access Route

TEMPORARY TURF AREA

- Lawn area is no-mow. However, with intensification of the precinct, the fescue turf may experience unsustainable levels of traffic. In this case, consider replacing with traditional turf grass. Maintenance (mowing) regime should be adjusted accordingly.

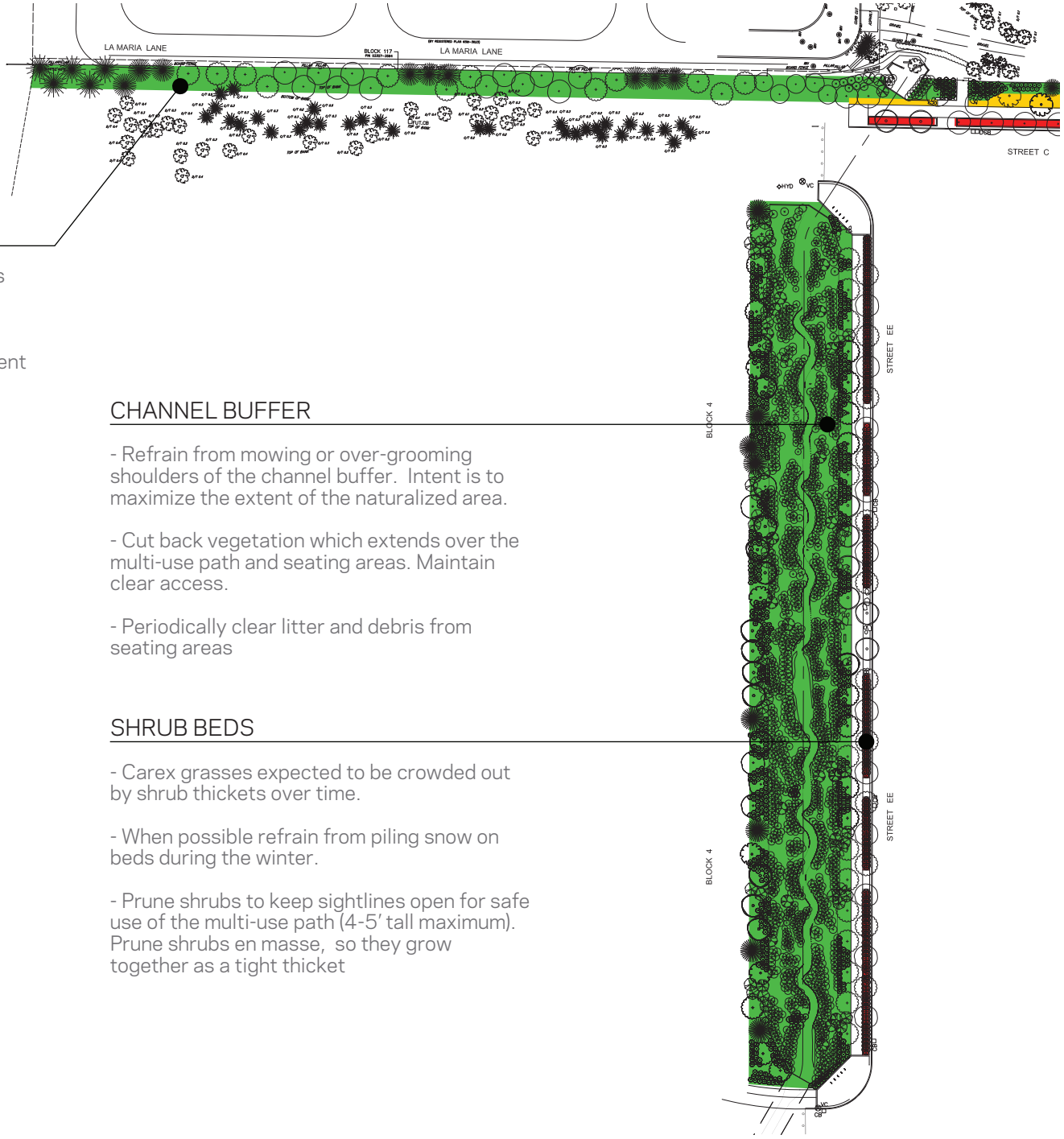
LANDFORM

- Public Works to consider securing bank of appropriate grass seed mix to quickly respond to immediate coverage issues

- Monitor for any potential damage and offer preemptive management solutions to maintain the integrity of the landform slopes

Planting Plans

Post-Establishment Specialized Maintenance Tasks



PHASE 2 TREE PLANTING

- Currently there is no direct access to this planting area. Minimize disturbance to existing berms, ditches and vegetation.

- This area should not be used for equipment storage, vehicle turning points, or working easements.

CHANNEL BUFFER

- Refrain from mowing or over-grooming shoulders of the channel buffer. Intent is to maximize the extent of the naturalized area.

- Cut back vegetation which extends over the multi-use path and seating areas. Maintain clear access.

- Periodically clear litter and debris from seating areas

SHRUB BEDS

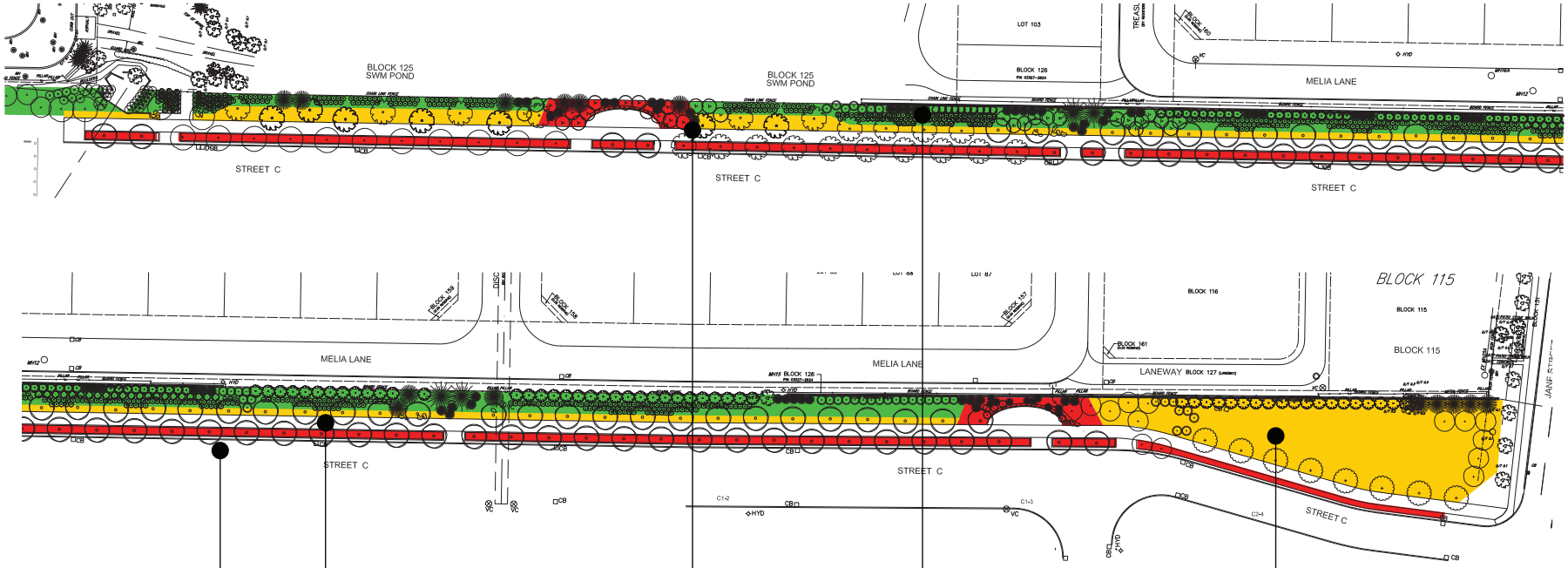
- Carex grasses expected to be crowded out by shrub thickets over time.

- When possible refrain from piling snow on beds during the winter.

- Prune shrubs to keep sightlines open for safe use of the multi-use path (4-5' tall maximum). Prune shrubs en masse, so they grow together as a tight thicket

Planting Plans

Post-Establishment Specialized Maintenance Tasks



STREET C TREES

- Avoid pruning *Acer* trees in late winter or spring.

GROOMED BUFFER EDGE

- 3m wide mowed / groomed strip alongside cycle path.

-Take care mowing around habitat boulders and tree trunks

- Consider replenishing *Muscari* bulbs every 3-4 years is for maximum effect.

- Time spring mow early enough to avoid damage to ground nesting animals

SEATING NODES

- Prune *Hamamelis* after flowering in the spring

- Periodically clear debris and service waste+ recycle receptacles

NATURALIZED HEDGEROW

- Damaged areas of the hedgerow may need to be replanted periodically to ensure appropriate screening between Hospital and Neighbourhood.

MIXED MEADOW

- Mow once in spring and remove all cuttings as well all *Quercus* leaf litter.

-Coppice 8 *Cotinus coggygria*; consider introducing additional groups of 2-3 over time

- Limit trampling during maintenance

- Monitor if any path crossings become prevalent. Consider adding a layer of crushed stone to formalize desire lines.

- Consider replenishing existing bulbs every 3-4 years is for maximum effect. *Allium tanguticum* 'summer beauty' and *Allium sphaerocephalon*