Existing Conditions

The site is a shallow emergent marsh and palustrine wetland system that has formed along the edges of an unnamed tributary to Runnins River, between Almedia Street and the confluence with Runnins River (approximately 0.35 mi downstream from the Alemida Street crossing) in the City (City) of East Providence, Rhode Island near the Seekonk, Massachusetts border. Assessment of historic aerial photos from 1939 to 2014 shows this area transitioning from a well-defined stream system with emergent marsh/shrub swamp to its current state: a 6 acre *Phragmites australis* marsh with no defined stream channel and varying densities of this invasive species.

Large scale stream re-location appears to have occurred between 1962 and 1972 associated with the development/commercialization of Almeida Street, as evidenced in aerial photos. Prior to 1988 the wetland portion dominated by *Phragmites* was relegated to an approximately 2 acre area, with significant expansion noted after this time. More recently (between 2011 and 2014), the *Phragmites* has further extended upstream, displacing the native understory in a large area of red maple (*Acer rubrum)* swamp. Now the understory of this red maple swamp is near 100% *Phragmites* cover, appearing to coincide with the visual disappearance of the stream channel on the aerial photos during this same timeframe. Likely, as the stream in-filled with sediment and vegetation, water backed up into this palustrine red maple system which allowed more sediment to settle out and *Phragmites* to expand into these areas. Now this emergent wetland system has 4.25 acres occupied by significant amounts of *Phragmites*, along with other invasive species such as purple loosestrife (*Lythrum salicaria)* in lower densities. Tussocks, smaller areas of high ground, and perimeter wetland areas along the perimeter of the system also have significant populations of other invasives such as Japanese barberry (*Berberis vulgaris)*, Japanese knotweed (*Reynoutria japonica)*, Japanese honeysuckle (*Lonicera japonica)*, Asian bittersweet (*Celastrus orbiculatus)*, and multiflora rose (*Rosa multiflora)* (See attached plant list). More recently (circa 2000) the area occupied by *Phragmites* appears to have started to spread downstream into areas of native emergent marsh. The densest areas of *Phragmites* have no discernable flow channel and are now monotypic stands of *Phragmites* covering 3 acres. The overall areal extent of *Phragmites* throughout the wetland is 8.3 acres (Figure 1).

The overall goal of the project is to substantially reduce the areal coverage and density of *Phragmites australis*, particularly in the areas that have been recently invaded thus slowing and reversing this expansion. A secondary goal is to help re-establish a preferential flow path through the vegetation (through selective vegetation removal) which will help restore positive drainage and sediment transport through the system, helping reduce the potential for future sediment build up and potentially alleviate flooding in the neighborhoods along Marsh Street.

Existing Vegetative Communities

<u>Emergent Marsh:</u> Emergent marsh areas with no or less the 1% cover of *Phragmites*. These areas reflect the vegetative composition and hydrology of the other marsh areas now dominated by *Phragmites* prior to infestation and are the ultimate goal or reference condition of the *Phragmites* control efforts. Hydrology varies from seasonally saturated along the upper and outer edges to inundated (2-4 feet deep) emergent marsh communities in the center, with some open water areas located in the center of the wetland system. For the most part these areas are 60% covered with emergent marsh vegetation with 25% scrub-shrub and emergent shrub wetland cover and 15% forested wetland system along the outer edges. The emergent marsh communities are dominated by broad leaf cattail (*Typha latifolia*) with common inclusions of tussock sedge (*Carex stricta*), bristly sedge (*Carex crinata)*, marsh fern (*Thelypteris palustris*), Canada rush (*Juncus canadensis*), blue vervain (*Verbena hastata*), blue flag iris (*Iris versicolor*), water starwort (*Calitriche sp.*), cinnamon fern (*Osmundastrum cinnamomeum)*, soft rush (*Juncus effuses*), manna grass (*Glyceria canadensis)*, jewelweed (*Impatiens capensis)* and skunk cabbage (*Symplocarpus foetidus)* forming hummock/hollow microtopography. Shrub areas have a similar herbaceous community with winterberry (*Ilex verticillata)*, steeple bush (*Spirea tomentosa)*, meadowsweet (*Spirea alba)*, sweet pepper bush (*Clethra alnifolia)*, speckled alder (*Alnus rugosa)*, and swamp azalea (*Rhododendron viscosum)* also present.

Forested areas along the edge are seasonally saturated and support a red maple overstory with inclusions of green ash (*Fraxinus pennsylvanica)*, eastern cottonwood (*Populus deltoides)*, big tooth aspen (*Populus grandidentata)* and swamp white oak (*Quercus bicolor)*. The understory in these areas is a mixture of native skunk cabbage, tussock sedge, roundleaf greenbriar (*Smilax rotundifolia)*, sensitive fern (*Onoclea sensibilis)*, highbush blueberry (*Vaccinium corymbosum)*, spicebush (*Lindera benzoin)*, winterberry, nannyberry *(Viburnum lentago)* and sweet pepperbush along with a dense, mainly invasive shrub layer comprised of Asian bittersweet, multiflora rose, Japanese knotweed, Japanese Barberry, and Japanese honeysuckle.

Sparse *Phragmites* Marsh Areas: Nearly identical in nature to the emergent marsh area describe above, however *Phragmites* is starting to become established, being a sparse to common occurrence in this area at between 1-20% cover. No areas in this community are completely dominated by *Phragmites*, but it is present within the native vegetative matrix in low densities. These areas have the highest potential of having long term success from the proposed management plan.

Moderate *Phragmites* Marsh Areas: These areas are dominated by *Phragmites*, however the native marsh community remains present and dominates some areas. Overall this area is 50% *Phragmites* and 50% native emergent marsh areas.

Dense *Phragmites* Marsh Areas: These areas have near 90% of the herbaceous community dominated by *Phragmites*, with less than 10% of the native emergent marsh community still present. Few native shrubs and trees were observed, with the shrubs being out competed by the 10-15 foot tall stands of *Phragmites*.

Monotypic *Phragmites* Stands: These areas are now near 95-100% cover of *Phragmites*, completely displacing the native marsh community. These areas have <5% native cover.

Invasive Species Management Plan

Targeted Invasive Species

Primary

- Phragmites (*Phragmites australis*)

Secondary

- Purple Loosestrife (*Lythrum salicaria)*
- Garlic mustard (*Alliaria petiolata*)
- Multiflora Rose (*Rosa multiflora*)
- Japanese Honeysuckle (*Loniceria japonica)*
- Morrow's Honeysuckle (*Lonicera morrowii*)
- Asian Bittersweet (*Celastrus orbiculatus)*
- Japanese Knotweed (*Reynoutria japonica)*

Phase 1A (Figure 2)

Timeframe: June-July 2015

Action:

Establish long term monitoring transects: Four lot term vegetation monitoring transects will be established as shown in Figure 2 and GPS located for reproducibility. At each transect in July-August, vegetation sampling will occur. Each transect will be 15 feet (3 meters) wide. Each plant species found along the transect will be identified

to species level if possible and assigned a percent cover recorded into one of four cover classes as described in Kutcher, 2013.

Create Access Areas: City to cut access paths from Marsh Street and Rockaway Street to *Phragmites* area with brush mowers and hand labor (machetes and chain saws). Most vegetation along these access areas are invasive (knotweed, *Phragmites*, multiflora rose, Morrow's honeysuckle, Japanese honeysuckle and Asian bittersweet). All cut vegetation will be removed and disposed of at a local landfill or burned, but not composted. Access paths shall be 10-15 feet wide to allow future access for implementing other phases of this plan. Sediment and erosion controls will be installed on the downgradient side of these access areas as needed.

City to cut Phragmites along upper edges of marsh: If ground conditions permit, the City will heavy-mow the *Phragmites* along the upper edges of the marsh, where stable ground exists. This will entail a 10-200 foot wide swath along the southern limits of the marsh, from Marsh Street westward to Rockaway Street (See Figure 2). All cut *Phragmites* will be collected and brought to the City dump trucks and disposed of at a local landfill or burned, but not composted. Any rutting or ground disturbance from mowing operations shall be repaired immediately and seeded if needed. The limit of this cutting will be based on ground conditions at the time of cutting, as much *Phragmites* shall be mowed as possible, without impacting native vegetation and minimize ground disturbance, while keeping in mind that all cut material must be removed from the site within one week of cutting.

Intermittent Channel Crossing: located between Julie and Abbot Streets is an intermittent channel that conveys flow from the south northward to the perennial tributary to Runnins River. If a crossing of this channel occurs, it shall be as located on the plan. This crossing shall consist of 2-4 2x6 timbers laid across the channel. If more substantial crossing material is needed (i.e. timber mats), these area not allowable under this permit. In this event the stream shall not be crossed and the area to the north of the channel accessed via Julien Street while the area south of the intermittent channel accessed via Marsh Street.

Cut path along old flow channel: When site conditions permit (low water), a 10-15 foot wide swath will be hand cut through the center of the *Phragmites* marsh along the centerline of the former flow channel, to aid in water flow through the system. Cutting will occur by hand labor and all cut *Phragmites* will be removed to City dump trucks via hand labor or small tracked machines (bobcats). All cut *Phragmites* will be removed from site and disposed of at a local landfill or burned, but not composted. Vegetation will be removed below the water line, if possible.

<u>Phase 1B (Figure 3)</u>

Timeframe: August-September 2015

Action:

Initial herbicide treatment: The City will contract with a licensed herbicide applicator to treat all areas of *Phragmites*. The monotypic stands of *Phragmites* (3.25 acres) will be sprayed, targeting the entire area. Areas with lesser *Phragmites* cover will be selectively sprayed, with areas of native vegetation left if possible. It is likely that a small tracked amphibious vehicle could be used to access the areas and backpack spraying of wetter or inaccessible areas can occur. It is possible that a second treatment may occur 2-4 weeks after the initial treatment, based on re-growth and effectiveness of the initial application. As part of this treatment, woody stem invasive species in the access areas will also be targeted.

<u>Phase 2 (Figure 4)</u>

Timeframe: August-September 2016

Action:

Follow-up herbicide treatment: City staff will selectively spray re-growth of *Phragmites*, loosestrife, knotweed, and other identified invasive species over all areas marsh treated in 2015. This work will occur via backpack spraying. The access areas will also be re-treated for terrestrial invasive species by backpack spraying.

Vegetation monitoring transects and overall treatment area will be visited in July-August by a wetland scientist to observe and record percent cover and observe the initial success of treatment across the treatment area.

Phase 3 (Figure 4)

Timeframe: August-September 2017

Action:

Maintenance herbicide treatment and restoration: City staff will selectively spray re-growth of Phragmites, loosestrife, knotweed, and other invasive species over all areas marsh treated in 2016. This work will occur via backpack spraying.

Access areas and upper edges of the Phragmites marsh will be seeded with native New England wet mix/conservation wildlife seed mixes (approx. 0.25 acres); marsh areas will be over-seeded with New England wetland seed mix. This seeding will occur after the final 2017 treatment.

Vegetation monitoring plots and overall treatment will be visited in June/July (2017) by a wetland scientist to observe and record percent cover and obese general success of treat across the treatment area.

Post treatment assessment (2018) of the site will be visited by a wetland scientist to will observe and record vegetative cover at each transect and observe the overall Phragmites treatment area. A final report will be made comparing the post treatment effectiveness and make recommendations on follow-up treatments. Assessment of the plant communities will follow Floristic Quality Assessment methods outlined by Kutcher 2013, and used as the basis of comparison of pre-(2015) and post (2017 and 2018) results.

Plant list:

* denotes invasive species

Herbaceous:

Common reed*	*Phragmites australis*
Mugwort	*Artemisia vulgaris*
Bramble	*Rubus spp*
Sensitive fern	*Onoclea sensibilis*
Jewelweed	*Impatiens capensis*
Skunk cabbage	*Symplocarpus foetidus*
Poison ivy	*Toxicodendron radicans*
Water horehound	*Lycopus americanus*
Tall meadow-rue	*Thalictrum pubescens*
Japanese knotweed*	*Reynoutria japonica*
Greenbriar	*Smilax rotundifolia*
Purple loosestrife *	*Lythrum salicaria*
Boneset	*Eupatorium perfoliatum*
Broad leaf cattail	*Typha latifolia*
Bluejoint	*Calamagrostis canadensis*
Arrowhead	*Sagittaria latifolia*
Fringed sedge	*Carex crinita*
Soft-stemmed bulrush	*Schoenoplectus tabernaemontani*
Cinnamon fern	*Osmundastrum cinnamomeum*
Royal fern	*Osmunda spectabilis*
Garlic mustard*	*Alliaria petiolata*
Tussock sedge	*Carex stricta*
Burreed	*Sparganium americanum*
Arrow-arum	*Peltandra virginica*
Pickerelweed	*Pontederia cordata*
Rattlesnake manna grass	*Glyceria canadensis*
Rice cut grass	*Leersia oryzoides*

Shrubs:

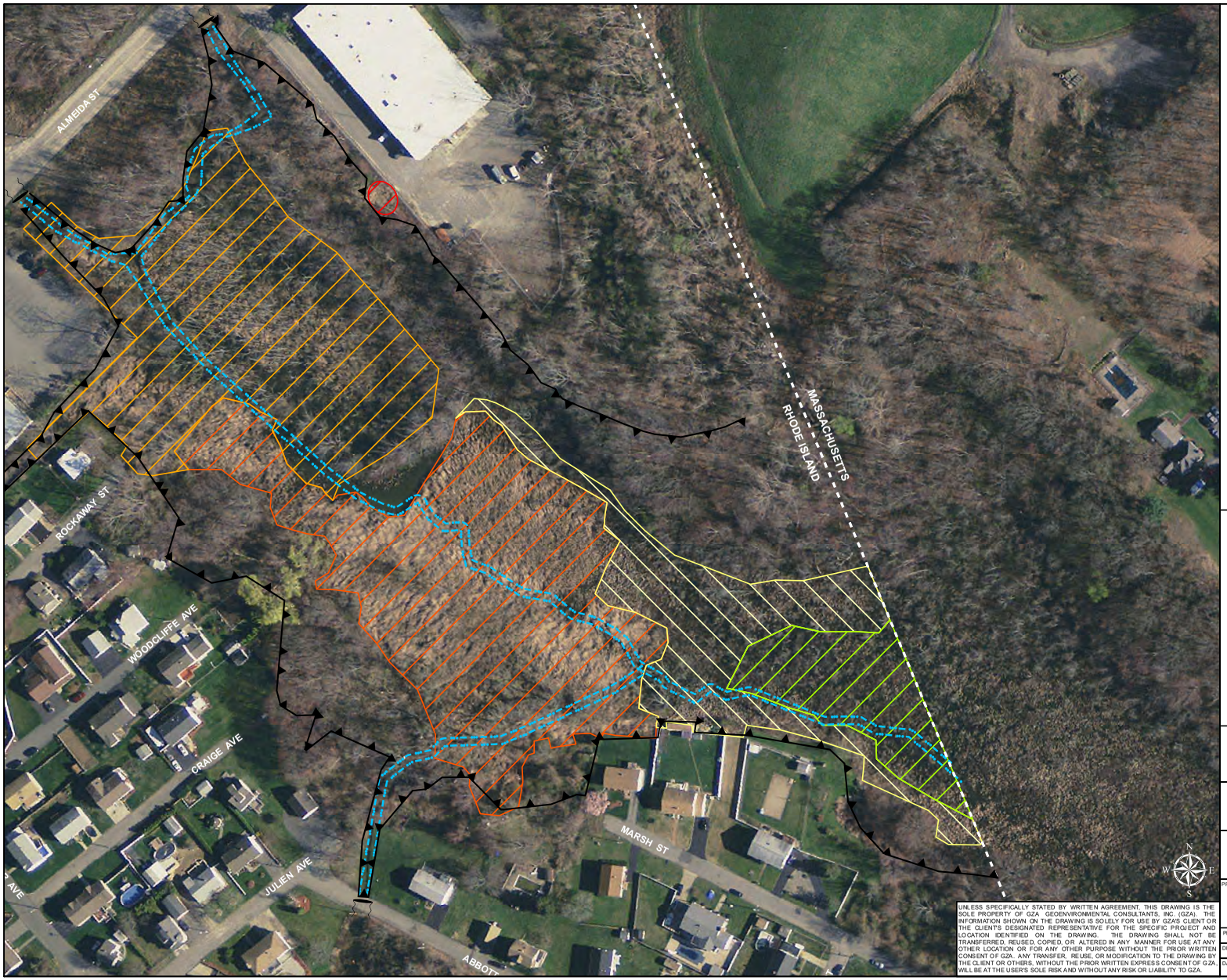
Burning bush*	*Euonymus alatus*
Autumn olive*	*Elaeagnus umbellate*
Multiflora Rose*	*Rosa multiflora*
Speckled alder	*Alnus incana*
Silky dogwood	*Cornus ammomum*
Arrowwood	*Viburnum recognitum*
Smooth sumac	*Rhus glabra*
Glossy buckthorn*	*Frangula alnus*
Buttonbush	*Cephalanthus occidentalis*
Blackberry	*Rubus allegheniensis*
Winterberry	*Ilex verticillata*
Highbush blueberry	*Vaccinium corymbosym*
Japanese barberry*	*Berberis thunbergii*
Morrow's honeysuckle*	*Lonicera morrow*
Japanese honeysuckle*	*Lonicera japonica*

Woody vines:

Asian bittersweet*	*Celastrus orbiculatus*
Riverbank grape	*Vitis riparia*
Virginia creeper	*Parthenocissus quinquefolia*

Trees:

Red maple	*Acer rubrum*
Ash-leaf maple	*Acer negundo*
Catalpa	*Catalpa speciosa*
Weeping willow	*Salix babylonica*
Red oak	*Quercus rubra*
Swamp White Oak	*Quercus bicolor*
American elm	*Ulmus Americana*
Green ash	*Fraxinus pensylvanica*
Eastern Cottonwood	*Populus deltoides*
Big-tooth aspen	*Populus grandidentat*



Legend

- Wetland Line (outer-most limit)
- Est. Historic Flow Path
- Culvert (observed)

Est. Invasive Species Densities

- Sparse Phragmites
- Moderate Phragmites
- Dense Phragmites with Red Maple Overstory
- Dense Phragmites- Monotypic

1) BASE MAP: 2013 COLOR ORTHOPHOTOGRAPHY PRODUCED BY USGS EARTH RESOURCES OBSERVATION AND SCIENCE CENTER, SIOUX CITY, SD. DOWNLOADED FROM THE OFFICE OF GEOGRAPHIC INFORMATION (MASSGIS), COMMONWEALTH OF MASSACHUSETTS, MASSIT.

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RUNNINS RIVER
INVASIVE SPECIES REMOVAL PLAN

OVERALL PHRAGMITES EXTENT

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Engineers and Scientists
www.gza.com

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145 TAUNTON AVE
EAST PROVIDENCE, RI 02914

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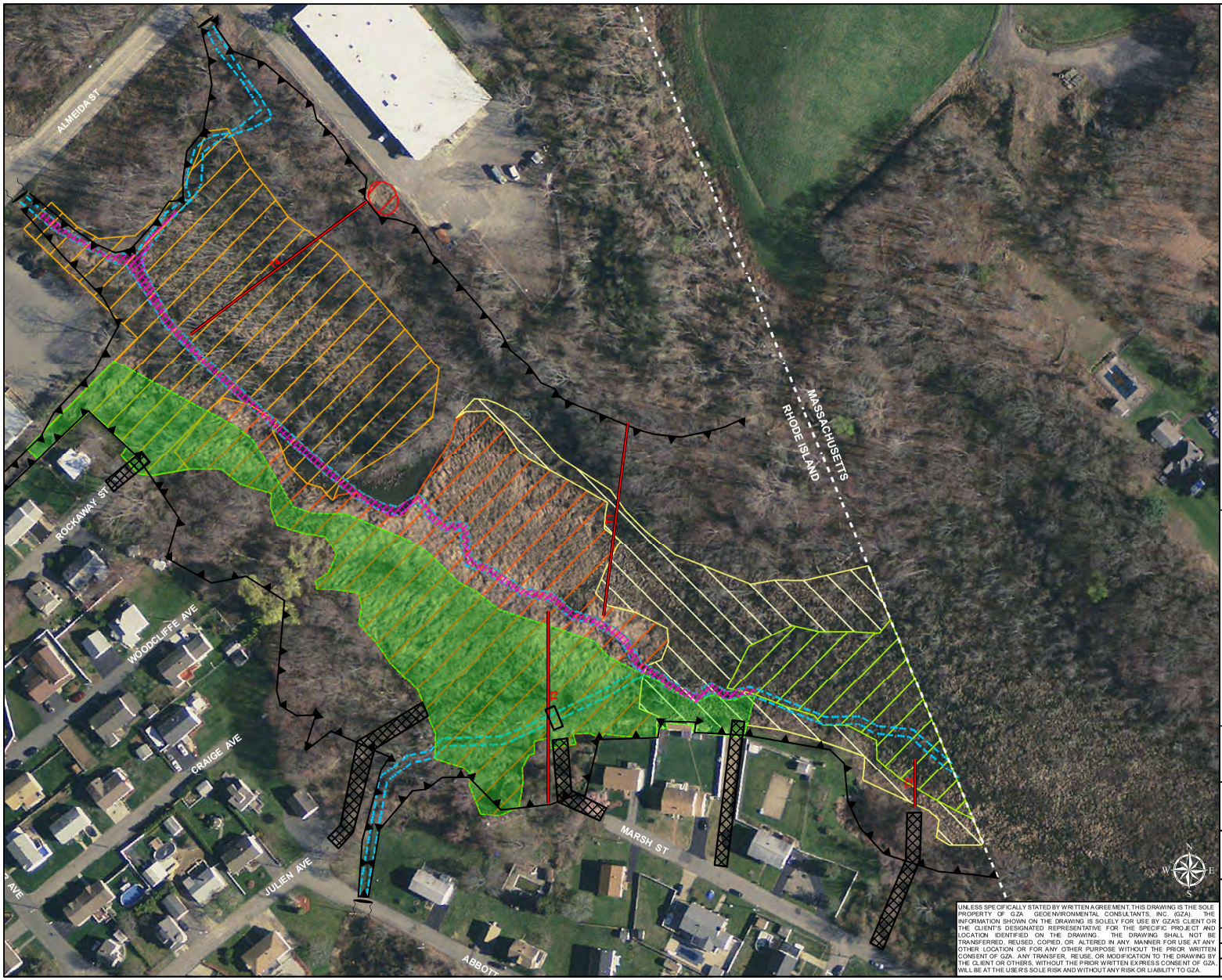

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Est. Invasive Species Densities

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- Moderate Phragmites
- Dense Phragmites with Red Maple Overstory
- Dense Phragmites- Monotypic

Proposed Phase 1A Activities

- Phase 1A Proposed Access Areas
- Potential Crossing Location
- Phase 1A - Mowing Area
- Hand-Cut and Remove Along the Est. Historic Stream Channel
- Proposed Vegetation Monitoring Transects

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RUNNINS RIVER
INVASIVE SPECIES REMOVAL PLAN

PHASE 1A

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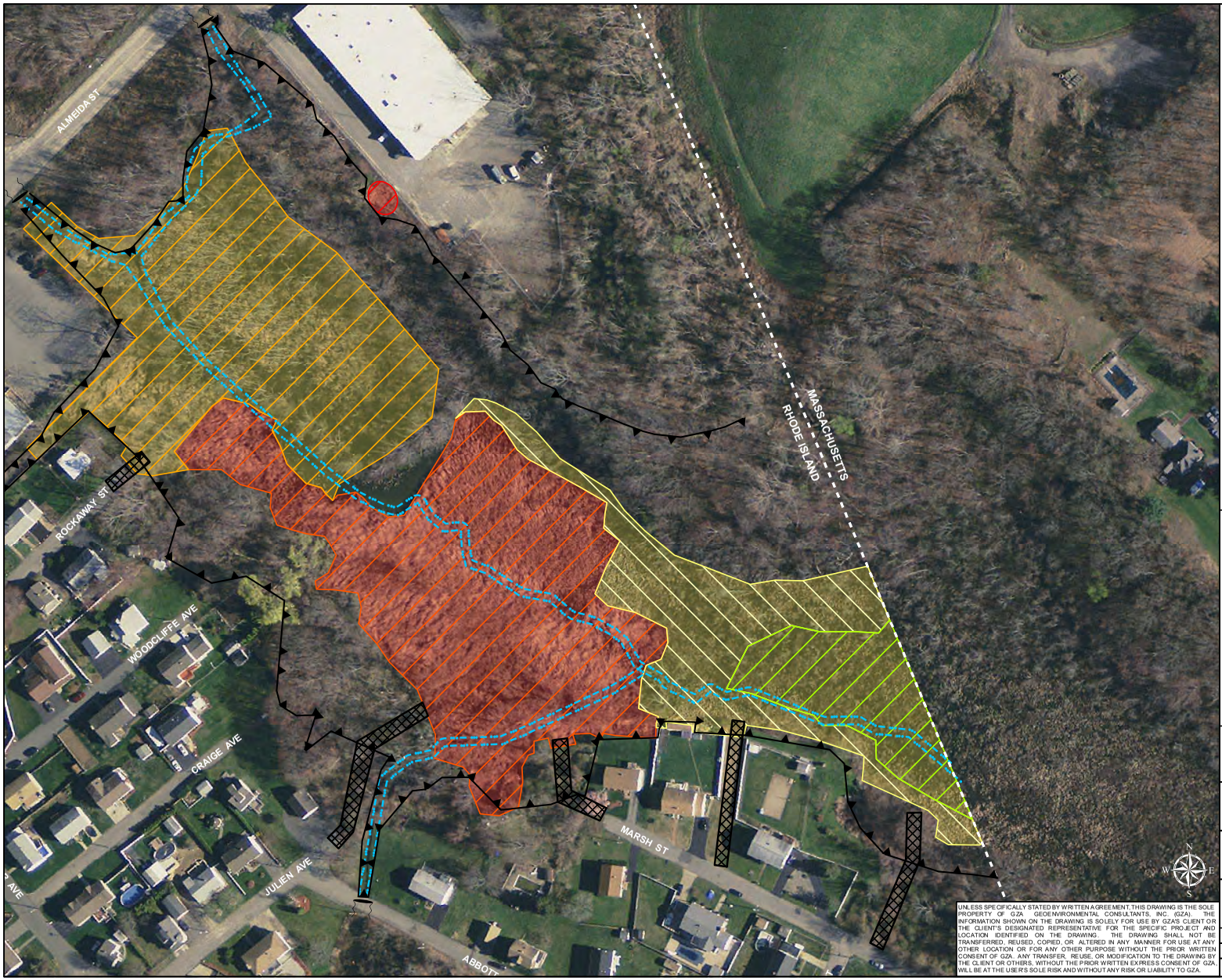

Legend

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Est. Invasive Species Densities

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- Moderate Phragmites
- Dense Phragmites with Red Maple Overstory
- Dense Phragmites- Monotypic

Proposed Phase 1B Activities

- Phase 1B Proposed Access Areas
- Herbicide Application Selective
- Herbicide Application All

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RUNNINS RIVER
INVASIVE SPECIES REMOVAL PLAN

PHASE 1B - HERBICIDE TREATMENT

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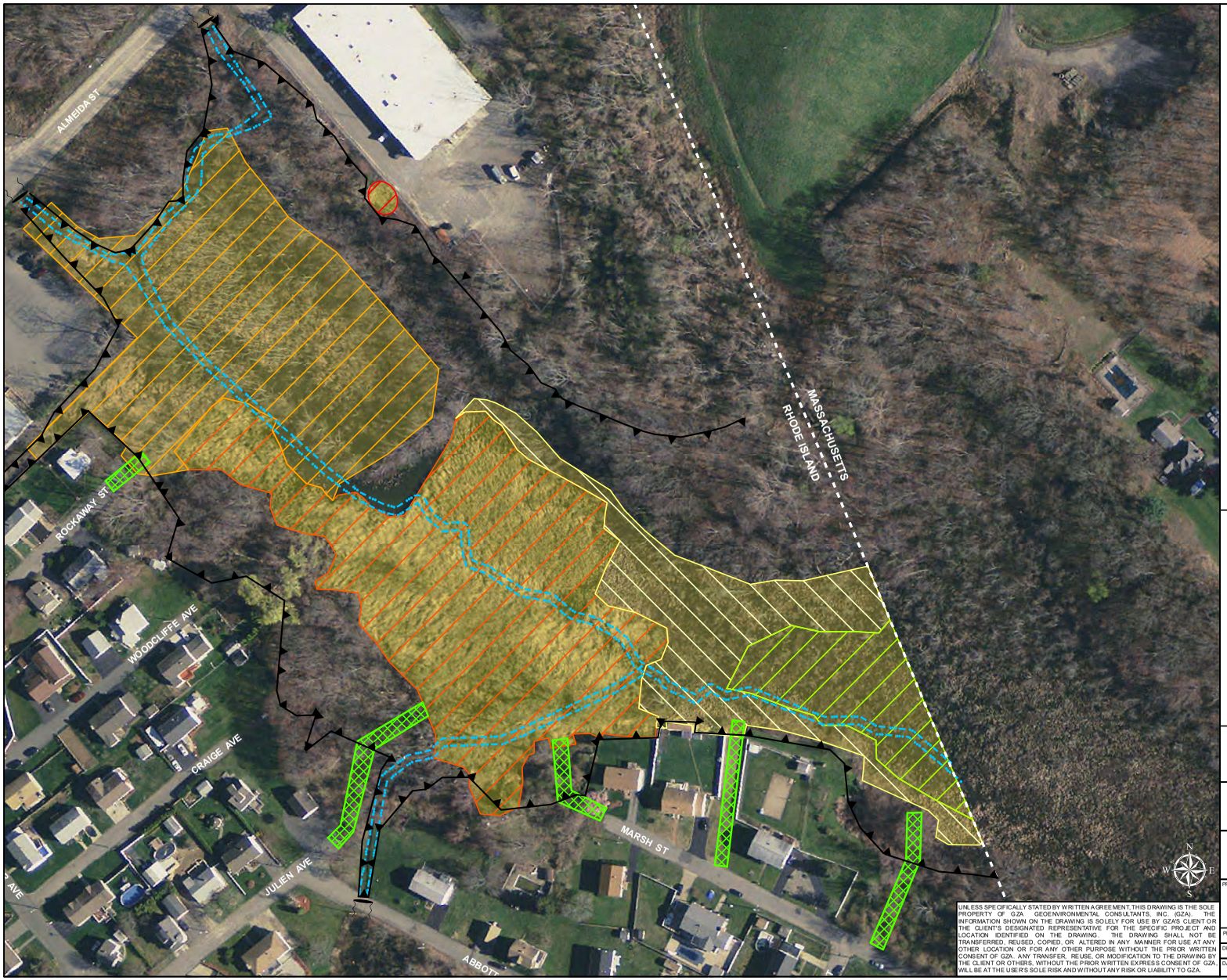

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Proposed Phase 2 Activities

- Herbicide Application Selective

Proposed Phase 3 Activities

- Restoration of Access Areas

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RUNNINS RIVER
INVASIVE SPECIES REMOVAL PLAN

PHASE 2 & PHASE 3

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