

# BeltLine Westside Reservoir Park Master Plan Subarea 9

Adopted by the Atlanta City Council on March 16, 2009



Prepared for Atlanta BeltLine, Inc.  
by Pond & Company  
and Carol R. Johnson Associates



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Aerial Photo of Holophrastic Site and Quarry, Looking East

July 2, 2008

# Section 1

## Executive Summary

The BeltLine's Subarea 9, located in northwest Atlanta, is bounded by Donald Lee Hollowell Parkway (south), Marietta Road (north), West Marietta Street (east), and Johnson and Hollywood Roads (west). Westside Reservoir Park is on the western half of Subarea 9, encompassing the Bellwood Quarry property. Bordered on the west, east and south by a Georgia Power transmission corridor and to the west by Proctor Creek, it is adjacent to the Bankhead MARTA station and between Grove Park and Howell Station neighborhoods.

The park master plan is driven by three major factors: citywide parks programming needs as identified by the Department of Parks, Recreation and Cultural Affairs (DPRCA); the input of City residents; and the requirements of the Department of Watershed Management's (DWM) proposed raw water reservoir to be located in the former Bellwood Quarry. These City Departments are working closely with Atlanta BeltLine Inc. to ensure that Westside Reservoir Park serves as a new recreation destination for Atlantans and regional residents alike. Atlanta BeltLine Inc. (ABI), and DPRCA defined the following as goals: developing the park into a citywide destination with a balance of active and passive recreation opportunities; creating a contiguous greenspace by connecting to Grove Park and an expanded Maddox Park; maximizing the potential of the land (topography, vegetation, views, etc.) with minimal intervention; enhancing the inherent natural and scenic resources of the site and making them physically and/or visually accessible to the public; and ensuring public safety in the integration of the DWM proposed facility.

Community involvement is integral to the master planning process. Steering committees and study groups met regularly between July 2007 and August 2008. Feedback was collected from residents in a December 2007 survey and open house meetings.

The master plan for Westside Reservoir Park focuses on five essential program elements: tournament-quality baseball; meadows that follow the existing topography; a skate park and rink on previously developed land known as the "Holophrastic Site"; hiking and mountain biking trails; and an informal outdoor theatre which takes advantages of views of the meadows, reservoir and skyline. Supplementary program items include: multi-use rectilinear fields; basketball courts; an in-line skating/street hockey rink; a disc golf course; paved multi-use trails; a pond with the potential for water activities (paddle boating, radio-controlled model sailing, etc); earth (landform) sculptures and venues for permanent/temporary public art; gardens and botanical trails; an exercise course; and an off-leash dog park. Also proposed are picnic shelters; observation towers and platforms; wildlife viewing areas; interpretive center/stations; food service kiosks and concession structures; and a park operations and storage building. Twenty-six acres of open space, twelve miles of new trails, and seventy-five acres of reforested and existing woodlands complement the program.

In addition to its significant size, the site is extraordinary for its scenic and natural resources: views of Atlanta's skyline; views from and into the quarry; the picturesque quality of Proctor Creek; and acres of woodlands. Visiting Westside Reservoir Park, "Atlanta's Natural Wonder" will be unlike any other experience in the city.



Aerial Photo of Transmission Corridor, Quarry and Meadow Area, Looking West

December 2008

# Section 2

## Project Introduction & Site Assessment

### 2.1 Introduction

Westside Reservoir Park is intended to become no less than one of America's great parks! It will be a source of shared civic pride that cuts across generational, socio-economic, and ethnic boundaries. It will become an icon that is beloved and have a personality all its own. This Park will contribute to the overall identity of Atlanta as a livable city, with an impressive public realm of urban and natural character. Design interventions evolve from the site and program, so the character of the park will be unique to Atlanta and, like Atlanta, both timeless and state of the art.

Condensed into the area of the park are various remarkable and diverse man-made and natural landscapes, both urban and environmental, providing an understanding of the cultural and environmental history of the area. Nowhere else does history, nature, and imagination come together as they do at Westside Reservoir Park.

As the site has been revealed, the community has been heard, and technical problems addressed, extraordinary ideas for programming the park have coalesced around flexible, multi-purpose solutions. Rather than appear as an inflexible object, each design element will transform in use and appearance during different events and different seasons. The finished park will not serve any one entity or objective or scale but, instead, embrace the entire community. All visitors will share a sense of ownership, and feel at ease in the park; all visitors will have the three most basic human needs met: privacy, community, and a connection with nature.

The planned park will work simultaneously at two levels: the first resides in the larger contextual and civic landscape vision; the second is at the level of smaller details, materials, and functional relationships upon which the vision is ultimately made. The master plan sets the standard for the final detail and absolute quality in built work, and incorporates the design of a total maintenance strategy in concert with the physical design. The park will invite public use and enjoyment

and, therefore, must stand up well to the intense use which successful civic landscapes receive.

From the beginning, the park has been planned to be an indivisible part of the larger community. The park master plan is one part of a larger planning effort for the surrounding neighborhoods, the BeltLine and the City of Atlanta. Efforts have been made throughout to integrate the park with citywide greenspace, recreation, and connectivity needs. The master plan has also moved forward in concert with the land use and transportation planning for the approximately 3,000-acre Westside Subarea 9 Redevelopment Plan, which will guide the transition of under-utilized and abandoned industrial land in and around the park to urban mixed uses. All work for the park and the subarea is based on a foundation of recent and current plans which have been undertaken by other City planning efforts. The design team, led by a fully collaborative effort between Pond & Company of Norcross, Georgia and Carol R. Johnson Associates of Boston, Massachusetts, recognizes the philosophical and policy framework for the larger Westside Redevelopment Plans and has incorporated the following goals and objectives in the Plan:

- Create a park that provides recreation facilities to meet both neighborhood and citywide needs
- Alleviate the demand on existing facilities
- Provide a fun, inviting attraction that can be a focal point of BeltLine redevelopment efforts
- Provide safe and inviting access to the park and circulation design within the park for various user groups, including the disability community
- Create a variety of uses and experiences in the park for all ages and user groups, including the disability community
- Preserve and enhance environmental quality
- Develop a park that is sustainable and energy efficient, and as close to self-perpetuating as possible
- Integrate the park facilities into the landscape and natural features of the property
- Provide educational and interpretive opportunities
- Protect existing cultural resources and incorporate art and cultural experiences
- Develop a park that is cost effective to build and maintain
- Develop a park plan that is feasible, constructable and readily permitted

Good design is a joining of layers and patterns of information so that the finished work reads as a colorful, unforgettable, and functional whole. A search for the unique and meaningful characteristics of the site has

let those qualities guide the choices in planning and design. The response has been to allow the unique opportunities and constraints of the site to shape a place that is appropriate to its context, that enriches users' experience, uplifts the spirit, and is embraced by the community.

## 2.2 The BeltLine & Westside Reservoir Park

### The BeltLine

Atlanta has the form of a wheel with a central hub and a series of outer rims connected by spokes. Some of the spokes are roadways, some are railways and some are airways. Today the outer rim takes the form of a perimeter freeway roughly 60 miles in circumference which, built during the 1960's and early 70's, rings the inner city as well as several concentric layers of suburbs. At the intersection of the spokes and the rim, there are concentrations of transportation-related businesses including warehouses, truck lots and industries which rely on interstate distribution. Atlanta, at the turn of the 20th Century, as today, was a hub of mercantilism and transportation. In those earlier days, the rim was a ring of railroads. This ring of railroads, known as the "BeltLine", existed at the outer edge of the city's inner ring suburbs and was characterized as a transition area where merchandise from the city and from the surrounding countryside were consolidated and packaged for delivery and transport. Likewise, goods shipped to the city from outside the state were off-loaded at warehouses located along the BeltLine and transferred for local delivery. Many industries were also located along the BeltLine to take advantage of access to interstate transportation systems.

Changes in transportation technology have created a situation where many of the former BeltLine land uses have moved either to large intermodal rail yards or further out to the freeways and the outer perimeter highway, and much of the BeltLine has fallen into disuse. The BeltLine is physically characterized by a generally broad and level swath of railroad right-of-way varying from about 50 feet in width to upwards of 200 feet in width. In addition, many of the old warehouses and industrial facilities still exist alongside the right-of-way and, by their nature, they tend to be spacious and easily accessible from both the BeltLine and local surface streets. Many of the old facilities are located at or close to the intersections of major arterial highways and the BeltLine. It is these former rail, industrial, and ware-

house zones that form the potential of the BeltLine to provide a wealth of new affordable development and transportation opportunities within the city in locations which are both desirable and accessible.

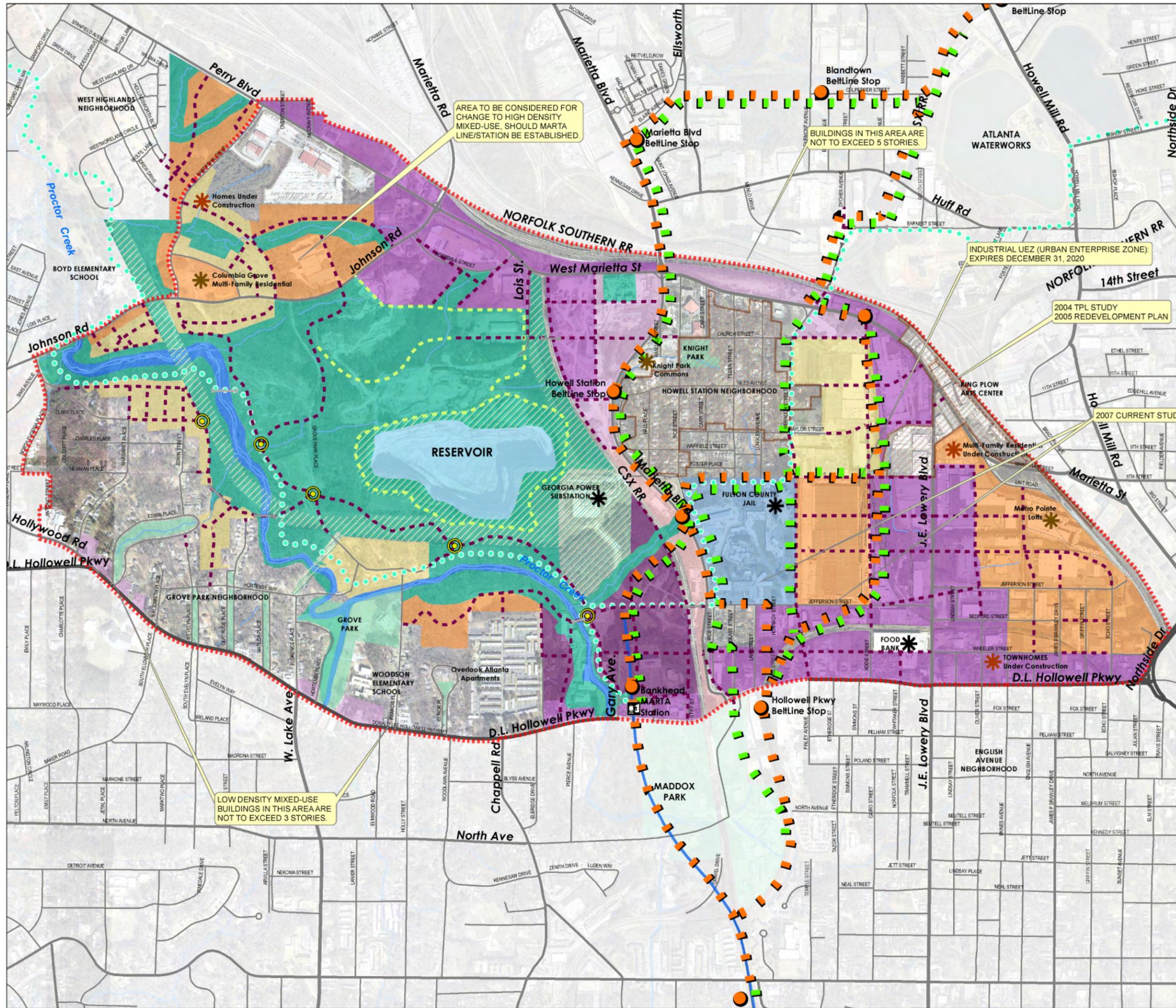
The Atlanta BeltLine (the "BeltLine") is a project conceived of to transform the inner ring of the city's former rail lines into a network of parks, open space, and planned development. The BeltLine concept works to control the growth of the city by "attracting and organizing growth around parks, transit, and trails located in the inner core of Atlanta". The anticipated twenty-five year plan envisions 1200 acres of new greenspace along the BeltLine and thirty-three miles of trail connecting neighborhoods and development areas. The BeltLine Redevelopment Plan intends for this pioneering transit and open space network, located within one half-mile of 100,000 of Atlanta's residents, to engage 49 of Atlanta's neighborhoods and 25% of the current population. (Statistic taken from the Atlanta BeltLine Redevelopment Plan.)

The BeltLine is a circular corridor approximately twenty two miles in length. The corridor is in the form of a loop which transects many wonderful older neighborhoods and commercial districts along the edges of the city's inner ring suburbs. As early planning for the BeltLine took shape, the BeltLine study area was defined as a corridor of varying width, encompassing the main rail corridor, as well as much of the industrial, commercial and residential land where uses were tied to the rail lines. Again, for planning purposes, this ring of varying width was further divided into ten similarly sized sub-areas which are organized around primary natural land features and uses.

Subarea 9 is characterized by a central core of approximately 350 acres of open space, previously



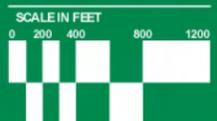
Figure 2-1. Decommissioning of Bellwood Quarry



**BeltLine Subarea 9:**  
UPPER MARIETTA /  
WESTSIDE RESERVOIR PARK

**Concept Plan CV.8**  
SUBAREA MASTER PLAN

- Legend**
- BeltLine Subarea 9
  - Land Use**
  - High Density Mixed-Use
  - Medium Density Mixed-Use (5-9 Stories)
  - Low Density Mixed-Use
  - Medium Density Residential (5-9 Stories)
  - Low Density Residential
  - Low Density Commercial
  - Industrial
  - Proposed Park Space
  - Existing Park Space
  - Reservoir
  - Floodway
  - Utility Corridor
  - Registered Historic District
  - Points of Interest
  - Community Facility
  - Recent Development
  - Under Construction
  - New Routes**
  - BeltLine Transit Route
  - BeltLine Multi-Use Path
  - BeltLine Transit Stops
  - Traffic Circle
  - Bridges
  - Proposed Roadways
  - Park Trails
  - Silver Comet Connector Trail
  - Existing Infrastructure**
  - Principal Arterial
  - Minor Arterial
  - Collector Street
  - Local
  - Railroad
  - MARTA Heavy Rail Station





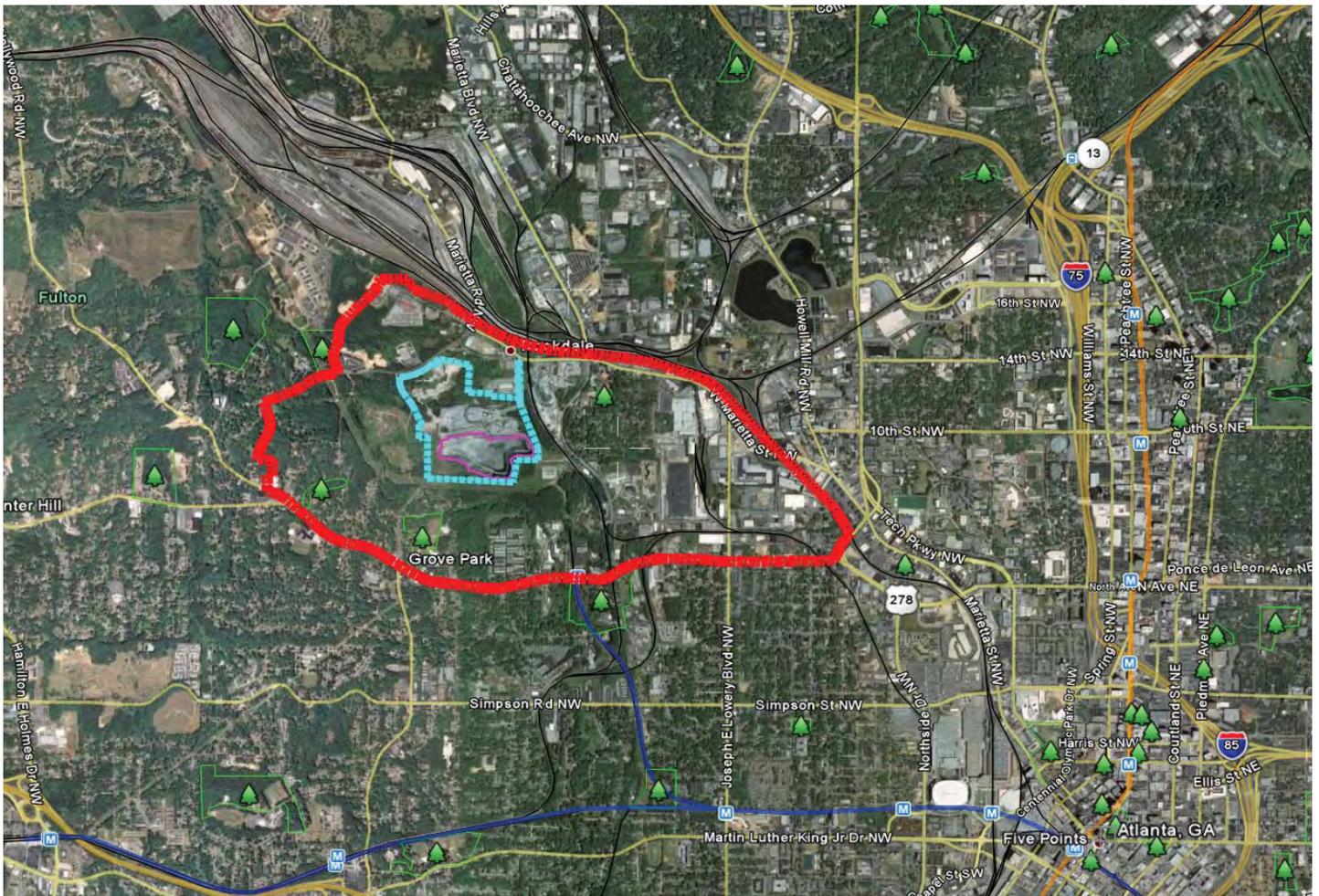


Figure 2-3. Subarea 9 and Westside Reservoir Park in relationship to downtown Atlanta. The red line delineates Subarea 9, the light blue line delineates the existing park properties, and the magenta line delineates the DWM reservoir.

used for granite quarrying, in the form of a large open pit quarry with associated land use activities including staging, processing, manufacturing, reprocessing, and wasting of granite and concrete related waste materials. The waste materials take the form of tailings of overburden (stone and earth removed from the quarry but deemed unsuitable for the intended use) as well several inert-waste landfills filled mostly with reclaimed concrete, reinforcement steel, and stone which has been deemed unsuitable for intended uses. Some of these waste lands are recent and some go back to the early days of the quarry, which was initially begun in the late 1800's. In addition, there is a Georgia Power substation on the southeastern side of the quarry, along with a wide swath of land to the south and west of the quarry provided for the electrical transmission lines and towers which serve the substation. Existing neighborhoods lie along the southern and western edges of the central core while industrial land uses are adjacent on the north. A mix of industrial and residential uses lie to the east. There has been some commercial land use along the northern edge of the quarry lands in the past, but little commercial activity remains directly

adjacent to this land today. The result is a large core of unused open space surrounded by residential and underutilized former industrial land. This core contains the site of the Westside Reservoir Park. (See Figure 2-2 for the Subarea 9 Master Plan.)

## Westside Reservoir Park

The Westside Reservoir Park is located in BeltLine Subarea 9, to the west of Marietta Boulevard. The park is situated between the neighborhoods of Howell Station and Grove Park, and is bordered by Proctor Creek on the south and west. The existing park land encompasses the Bellwood Quarry property, which is accessed off of Lois Road from West Marietta Street, and sits due west of Marietta Boulevard. Lying just within the park to the south and east are the Georgia Power transmission corridors with overhead transmission lines and towers. The anticipated park boundaries extend north to Johnson Road, west to include Proctor Creek, and south to Grove Park. The main body of the park is within one mile of the Bankhead MARTA heavy rail station and will be connected to the station by a linear corridor along

the north side of Proctor Creek. This corridor will contain a parkway road, a multipurpose trail, and a streetcar line which originates at the station and will continue along the Proctor Creek corridor to Johnson Road, then, in a northerly direction to Perry Boulevard and, from there, westward to West Highlands, and, perhaps, beyond. (Figure 2-3 shows downtown Atlanta in the lower right corner of the image. The red outline is Subarea 9, the light blue is the existing park border, and the magenta is the reservoir. The rail yard can be seen just north of the Subarea.)

Within the bounds of the area described above as park property exist some parcels of land that are privately held. Due to their proximity to the park and the intended development of the surrounding landscape, it may be advantageous to more fully incorporate these properties into the park landscape in the future.

## 2.3 Project Team Members

This project was developed by Atlanta BeltLine Inc. (ABI), an affiliate of the Atlanta Development Authority, and the City's Department of Parks, Recreation and Cultural Affairs (DPRCA). Coordination occurred with Department of Watershed Management (DWM) due to the proposed conversion of the Bellwood Quarry into the Bellwood Raw Water Storage Facility, intended to be the secondary source of drinking water for the City of Atlanta.

The design team consisted of Pond & Company (POND), an architectural, engineering and planning consultant based out of Norcross, Georgia and Carol R. Johnson Associates (CRJA), a landscape architecture and environmental planning firm in Boston, Massachusetts. The POND/CRJA team completed the Site Inventory and Analysis, the Transportation Impact Report, and the Land Use Master Plan for Subarea 9, as well as the master planning of the Westside Reservoir Park parcel which is discussed in this report.

Public input was incorporated into the planning process through Study Groups and a Planning Committee, as well as other means. The involvement of the public is discussed further in Section 3. The POND/CRJA design team has participated in the public input process with the ABI team.

## 2.4 Site Inventory and Analysis

A comprehensive inventory and analysis for the entire BeltLine Subarea 9 was completed in October of 2007 and is available. For additional information beyond what is presented below, please see the report, entitled: [Atlanta BeltLine Internal Report Existing Conditions Subarea 9](#).

### Cultural Landscape and Site History

The land now known as Bellwood Quarry has been the site of a mining operation for over 100 years. Mined for granite for roadways and infrastructure, the site had been leased from Fulton County by Vulcan Materials Company from 1998 until 2006. Vulcan Materials ceased quarry mining operations in 2007, following the purchase of the 138-acre site by the City in 2006. Site reclamation, as required by their State Mining Permit, was undertaken by Vulcan in 2008.

A 1949 aerial photograph shows the southern fringe of a residential district occupying land which would include the northern parcels of the Bellwood Quarry site. The Perry Homes housing project was constructed just to the north in 1955. Demolished less than five decades later, it is now home to the West Highlands mixed income residential neighborhood, which will extend south to the border of the park.

### Physical Landscape:

#### Topography, Slopes and Soils

The parkland benefits from a changing north-south terrain that begins with the highest plateau along the north edge, a steeply sloped transition down to the middle level on the northerly rim of the quarry, the quarry itself with north and south rim and bottom elevations of approximately 840, 890, and 640 feet respectively, and a south edge that transitions down to the adjacent Proctor Creek. West to east, the terrain begins low at Proctor Creek along the west edge and gradually ascends to the east.

The topography on the Westside Reservoir Park site has been greatly influenced by the mining operations that have taken place over the last century. As shown in Figure 2-8, prior to the recent decommissioning of the quarry operations, topography ranged from approximate elevation 850 at the northern rim of the quarry to approximate elevation 990 at the concrete manufacturing portion of the site to the north near Johnson Road. To the south, topography ranged from approximate elevation 875 at the southern quarry

rim to approximate elevation 940 to the southwest, and approximate elevation 920 to the southeast. The decommissioning activities have included the removal of spoils piles and stockpiled materials as well as fill operations, leaving the site with less extremes in elevation; the current range is a high of 1000 and a low of 850 feet along the rim, and 640 feet at the bottom of the quarry.

As shown in Figure 2-9, slopes on-site are predominantly in the range of a 0.0-10.0% gradient, with the majority of the landscape considered relatively flat with gradients under 5.0%. There are many small areas of the landscape with gradients greater than 10.0%, and some steep gradients in the 15% to 25% range - predominantly on the former concrete manufacturing site - and some extremely steep gradients above 30% along the quarry rim.

Soils are mapped by the Soil Survey as Urban Land (Ur) meaning that they have been significantly altered and reflect development, which typically includes roadways, buildings, and parking lots; slopes are less than 5.0%. Along Proctor Creek and the other stream corridors, a Grover-Mountain Park soil complex has been characterized. Refer to Figure 2-10.

### Bellwood Quarry

In 2006, the 138-acre Bellwood Quarry open pit granite mine was purchased from Fulton County and Vulcan Materials Company by the City of Atlanta. The quarry, which will be converted into a raw water storage facility, encompasses approximately 45 acres and varies in depths from 250 to 450 feet. When full, the reservoir is anticipated to reach elevation 840.

A Slope Stability Report was completed for the City's Department of Watershed Management in the spring of 2008. (See Appendix H.) The report found that the



Figure 2-4. Bellwood Quarry in March 2008

existing slope conditions highlighted the potential for rock slides, rock falls, and rim instability. Rim instability affects the horizontal distance buffer for public access to the quarry's edge. The report identified areas of concern for rim stability, primarily occurring on the southern rim. Ultimately the report determined that the reservoir, due to these potential threats for rock falls as well as a need to protect the reservoir from potential contamination, would not be suitable for public access. This master plan directly reflect the DWM's plan for the quarry's edge in terms of safety and stability considerations.

## Holophrastic Site

At just under ten acres, the Holophrastic site was acquired by the Department of Parks, Recreation and Cultural Affairs at the end of 2006 with Opportunity Bond Funding. Located adjacent to the Bellwood site and fronting on Lois Street, the Holophrastic site was home to trucking industry uses. A large open air structure is a remnant of that use and should be



Figure 2-5. Aerial View of the Holophrastic Site



Figure 2-6. Existing Structure at the Holophrastic Site

examined for re-use opportunities in support of recreational program elements required for property acquired with Opportunity Bond Funding.

## Georgia Power Transmission Corridors

The transmission corridors are linear portions of the park landscape, ranging from 150 feet to 300 feet wide with informal and meandering vehicular paths. The corridors form portions of the west, south, and east borders of the park. Because of the power lines, no mature trees are present on the corridors and, while the majority of the corridors are made up of meadow plants, there are some patches of woody shrubs. The landscape of the corridors is rolling and sloping.

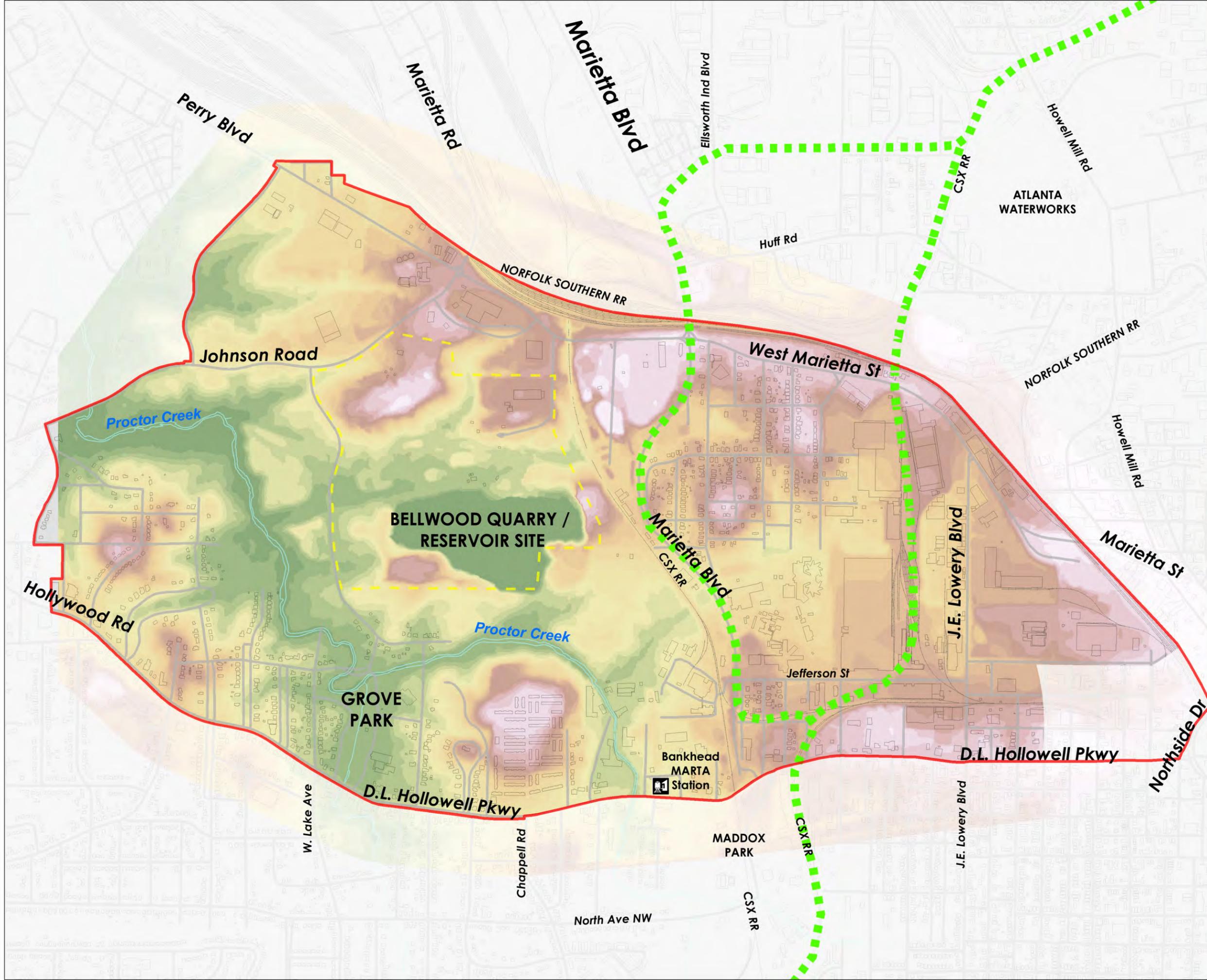


Figure 2-7. Georgia Power Transmission Corridor

## Waterways

Proctor Creek - The majority of the site drains westward into Proctor Creek. The creek is a tributary of the Chattahoochee River and has been classified by the National Wetlands Inventory as a "lower perennial river". A lower perennial river is characterized by slow water velocity, with water flowing throughout the year; a low stream bed gradient and bed substrate that is typically unconsolidated and comprised of sand and mud; and, typically, is associated with an emergent wetland. For the planning of this site, a seventy-five foot riverine buffer has been maintained on both sides of all streams. Proctor Creek offers a beautiful riverine habitat for the park; it can be enhanced for views, interpretation of natural systems, and trail networks.

Two smaller streams on the site have been partially enclosed in pipe. Day-lighting these streams was



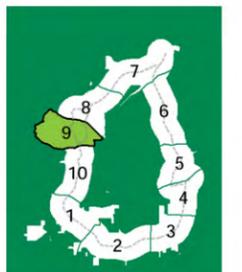
**BeltLine Subarea 9:  
"WESTSIDE"  
RESERVOIR PARK**

**Aerial Basemap  
EXISTING CONDITIONS  
Legend**

- Reservoir Park Site
  - BeltLine SubArea 9
  - Beltline Corridor - Display
  - marta station
  - Railroad
  - Street
  - Building
  - Stream
- Elevation (ft)**
- 161 - 250
  - 251 - 257
  - 258 - 261
  - 262 - 265
  - 266 - 268
  - 269 - 271
  - 272 - 274
  - 275 - 277
  - 278 - 278
  - 279 - 280
  - 281 - 282
  - 283 - 283
  - 284 - 284
  - 285 - 286
  - 287 - 288
  - 289 - 290
  - 291 - 292
  - 293 - 294
  - 295 - 297
  - 298 - 312

Figure 2-8.





**BeltLine Subarea 9:  
"WESTSIDE"  
RESERVOIR PARK**

Aerial Basemap  
EXISTING CONDITIONS

**Legend**

- BeltLine SubArea 9
  - Beltline Corridor - Display
  - marta station
  - Railroads
  - Streets
  - Buildings
  - Streams
- Slopes**
- 0.0 % - 2.5 %
  - 2.5 % - 5 %
  - 5.0 % - 10 %
  - 10 % - 15 %
  - 15 % - 20 %
  - 20 % - 25 %
  - 25 % - 30 %
  - 30 % +

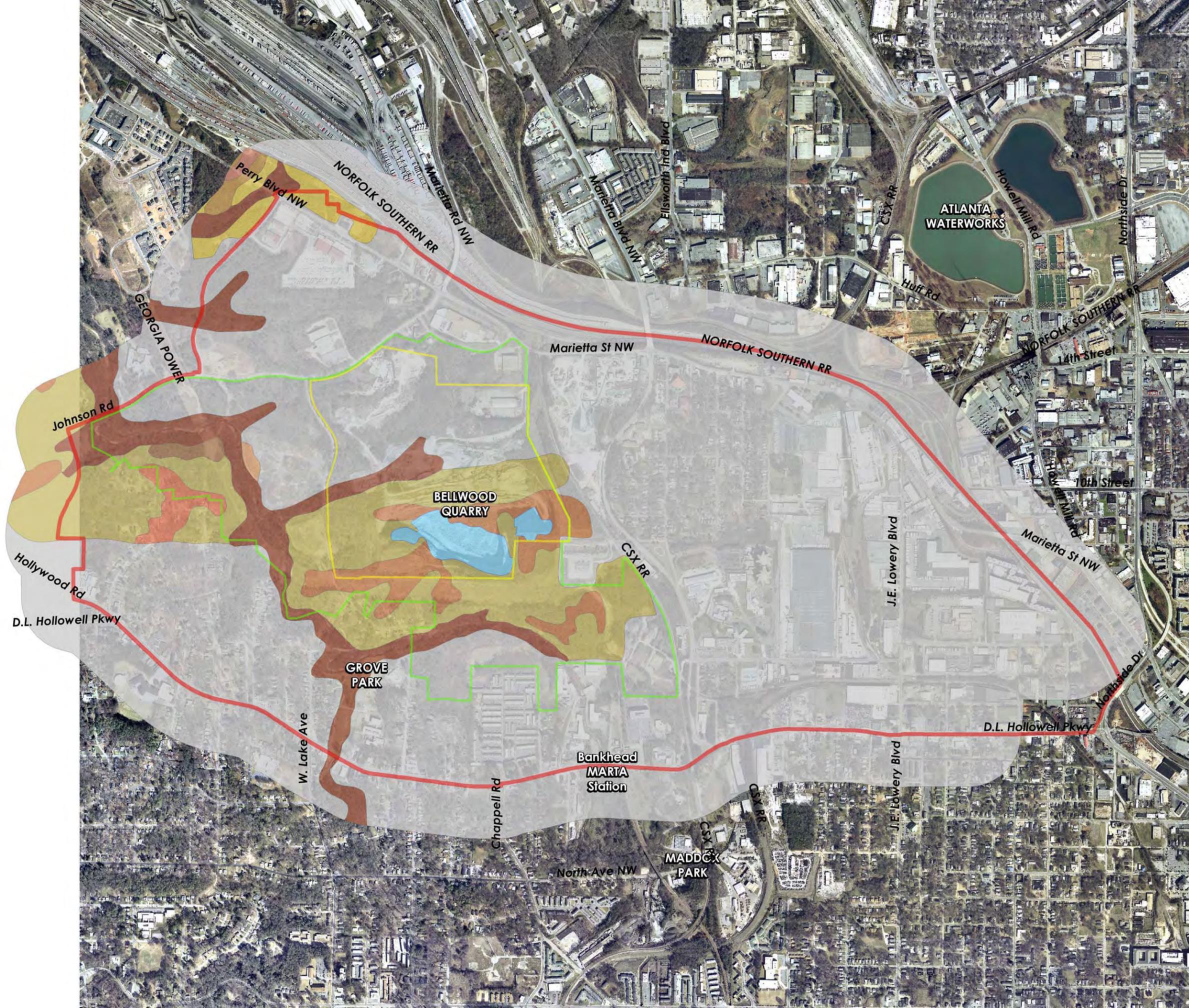


SCALE IN FEET  
0 125 250 500 750



Figure 2-9.





**BeltLine Subarea 9:**  
"WESTSIDE"  
RESERVOIR PARK

**SOIL**  
EXISTING CONDITIONS

- Legend**
- █ Park Detailed Site
  - █ Potential Park
  - █ BeltLine SubArea 9
- SOILS**
- █ Altavista sandyloam
  - █ Appling-Hard labor complex
  - █ Cartecay-Toccoa complex
  - █ Grover-Mountain Park complex
  - █ Rion sandyloam
  - █ Urban land
  - █ Urban land-Altavista complex
  - █ Urban land-Appling-Hard Labor complex
  - █ Urban land-Cecil complex
  - █ Urban land-Rion complex
  - █ Water

Figure 2-10.





Figure 2-11. Proctor Creek Watershed

considered in the master planning process in an effort to feed proposed ponds. One stream flows from below the railroad bed east of the site, west to an open stream bed under tree cover, until it reaches the quarry operations and enters a pipe for 1,500 feet. The second stream flows in a southwesterly direction from a northeast bound of the property, through the Holophrastic site, until it reaches the first stream. At the point of confluence, the streams collect in a basin and then continue to flow to the west until reaching Proctor Creek. (A memo prepared by Atlanta Services Group for the DWM discusses the streams and potential permitting issues, and details flow rates. See Appendix C.) It was ultimately determined that the intermittent flow rates and limited watershed capacity of these streams make day-lighting within the park undesirable.

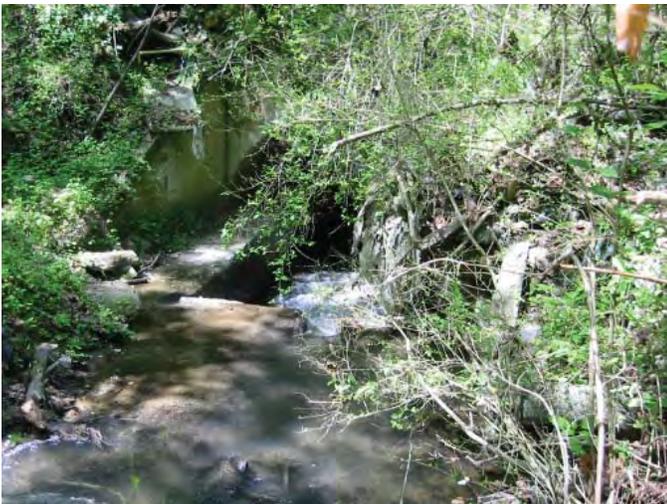


Figure 2-12. One of the Intermittent Streams on Site



Figure 2-13. Invasive Plants on Site - Tableland

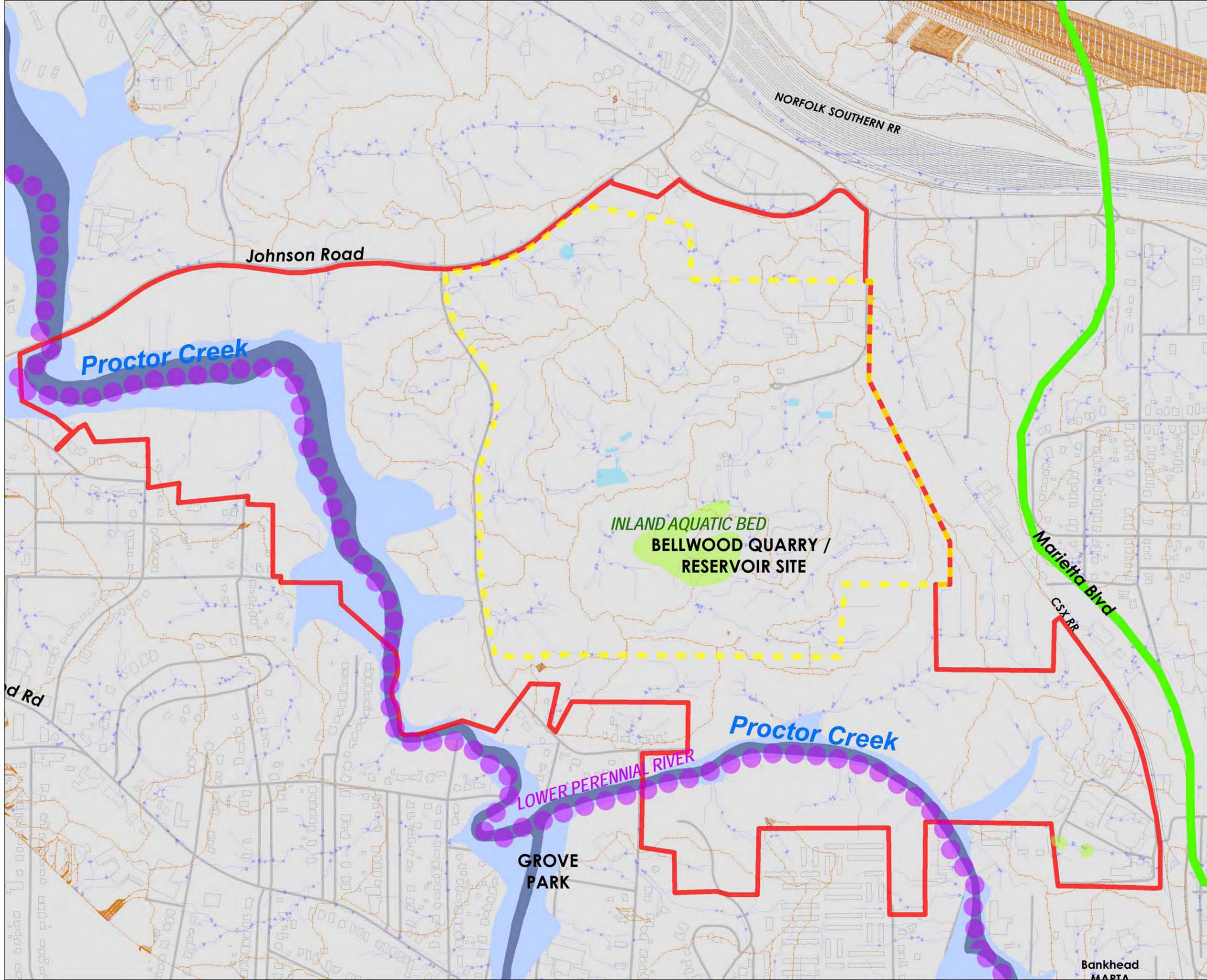
Just over half of the site is tableland, with the remainder being wooded ravine or valley with an intermittent stream. Portions of the site appear to have been filled, especially the ravine slopes.

## Biological Landscape

Existing vegetation varies from old field hardwoods to new growth pine stands within the park, with barren, poorly vegetated landscapes at (recent) development areas. Pine stands exist primarily on steeper slopes and the southern edges of the quarry, where spoil sites were allowed to re-vegetate. There is one plateau field at the southwest edge of the quarry. The former operations area of the quarry was re-graded and seeded in 2008. Invasive plant species are prevalent on site, which is to be expected considering that they typically thrive on disturbed sites. For a more in-depth discussion of invasive species, see the Resource Management discussion in Section 4 of this report.

Natural wildlife habitat areas exist along Proctor Creek, the stream corridors where development was curtailed, and at transmission corridor fringes where vegetation is varied and ecosystems are diverse. Because of the industrial development on the Bellwood Quarry site, wildlife is sparse. There is indication that snakes are present on site (piles of fractured rock and spoils make good habitat) and deer tracks are evident on the south rim.





**BeltLine Subarea 9:  
"WESTSIDE"  
RESERVOIR PARK**

Aerial Basemap  
EXISTING CONDITIONS

**Legend**

- Reservoir Park Site
- Park Master Planning Areas
- BeltLine SubArea 9
- Beltline Corridor - Display
- Water
- Streams
- Depressions
- Ridges
- Flow
- Railroads
- Streets
- Buildings
- National Wetlands Inventory**
- Inland Aquatic Bed
- Lower Perennial River

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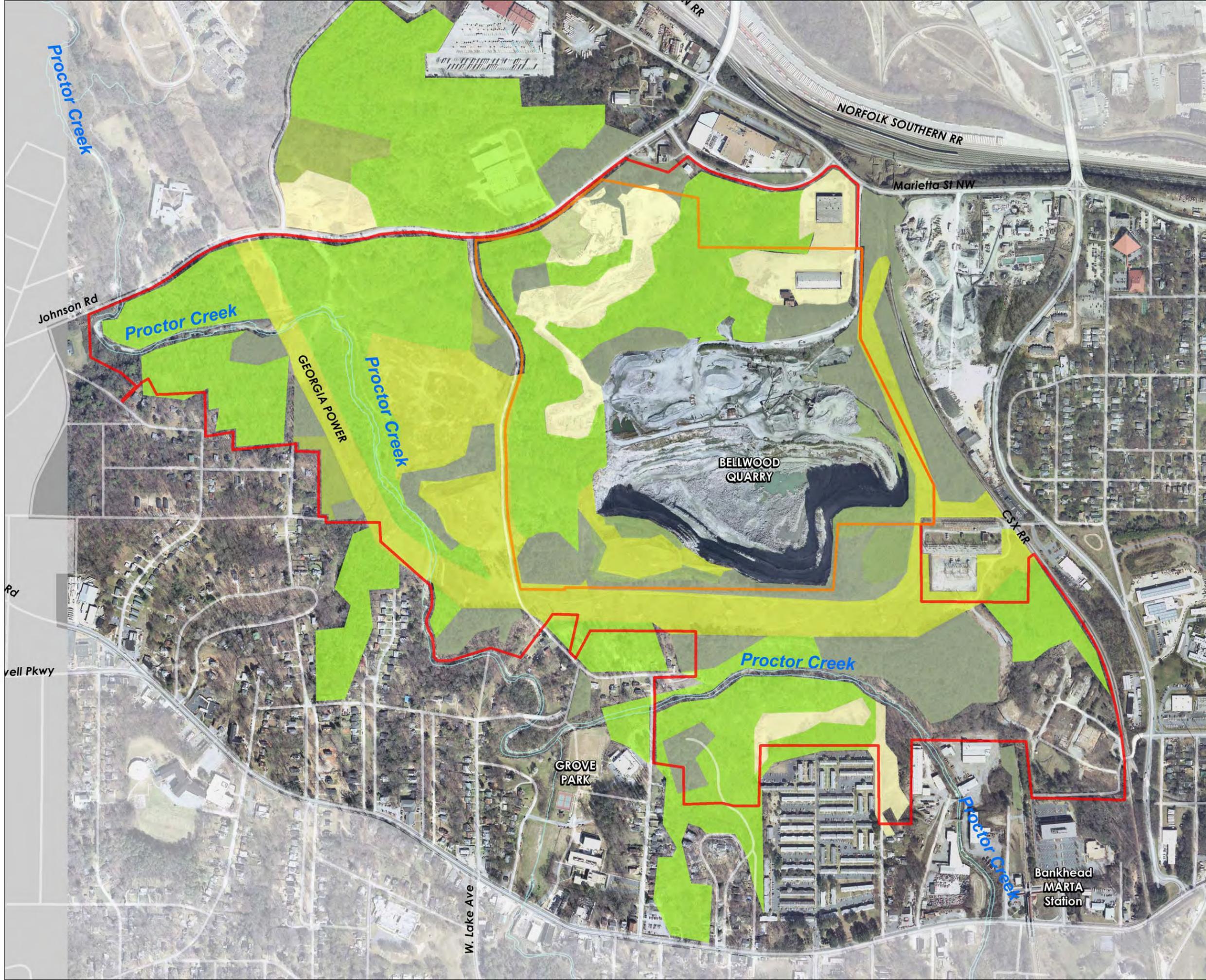
AUG 30, 2007

SCALE IN FEET  
0 125 250 500 750



Figure 2-14.





**BeltLine Subarea 9:  
UPPER MARIETTA/  
WESTSIDE RESERVOIR PARK**

**Aerial Basemap  
EXISTING CONDITIONS**

**Legend**

- Park Site
- Potential Parkspace
- Streets
- Streams
- Existing Vegetation**
- Hardwood
- Pine
- Mixed Hardwood / Pine
- Early Successional / Old Field
- Late Successional / Young Pine
- Field / Maintained Grasses
- Barren



Figure 2-15.



# Section 3 Master Plan Concept Development & Preferred Plan Layout

## 3.1 Master Plan Overview

The master plan for Westside Reservoir Park provides a combination of passive and active recreation, and is driven primarily by three forces: the needs of the city's parks program; the input of the residents as reflected in the multi-layered outreach effort; and the technical and security needs of the Department of Watershed Management's (DWM) Bellwood Quarry Reservoir, intended to be retrofitted into serving as the city's new raw water facility.

### Department of Parks, Recreation and Cultural Affairs (DPRCA)

An important goal of the DPRCA is to transform the Bellwood Quarry and surrounding public lands into a destination park creating a significant attraction that will provide (primarily) the residents of the City of Atlanta a place to recreate together and take advantage of the unique opportunities of the site to draw visitors from a larger regional area.

The DPRCA prepared a list of potential park program elements for the design team to consider in the preparation of the park master plan. Program elements were prioritized based on the following:

1. Existing city needs and deficiencies in parks and outdoor recreational facilities.
2. Public opinion: items repeatedly requested through the project's community engagement process. (If a facility was requested and it currently exists within the park network and is under-utilized, it was either not considered or was ranked as a low priority.)
3. Relationships: potential items were considered in light of those which do or do not exist within Atlanta; and those which support or supplement

other community needs or goals in the realms of the arts, sports, special events or environmental stewardship.

4. Practicality: liability issues, flexibility of programming, and operations and maintenance considerations.
5. Funding: "what is within the realm of even a stretched possibility".
6. Revenue generators: items that have the potential to create revenue or to offset park operation costs.
7. Connections: to existing services, programs, and parks.

The DPRCA Program Element Priorities Worksheet has been included on the following page, Figure 3-2.

## Community Engagement Process

The BeltLine Westside Study Group and the Subarea 9 Planning Committee were the primary mechanisms for public input into the park study. With the formation of the BeltLine, Atlanta City Council established a system for community engagement by creating publically-driven Study Groups.

The Westside Reservoir Park Study Group met as follows:

- August 30, 2007
- October 25, 2007
- November 8, 2007
- April 28, 2008
- June 23, 2008
- August 25, 2008

The Planning Committee met on the following dates:

- July 19, 2007
- November 6, 2007
- December 17, 2007
- January 14, 2008
- May 12, 2008



Figure 3-1. Community Engagement

Figure 3-2. DPRCA Program Element  
Priorities Worksheet

Priority Ranking
5 - Highest
4 - High
3 - Moderate
2 - Low
1 - Very Low
0 - Not Feasible



	Potential Program Element/Facility	Ranking	Public / Private Partnership Required	Operating Community Partner Required	Comment
<b>FIELDS</b>					
10a	Baseball Complex (8 fields)	5			Artificial turf - tournament level, revenue generating
10b	Baseball Complex (6 fields)	5			
10c	Baseball Complex (4 fields)	4			
10d	Baseball Complex (< 4 fields)	3			
10e	Softball	3			
11	Track & Field	3		✓	
12	Football	4			Artificial turf - need also to look at feasibility of multi-use field relationship with 13,14,15,16,17
13a	Soccer - Sr Complex (2 fields +)	4			
13b	Soccer - Sr	3			
14a	Soccer - Jr Complex (2 fields +)	4			
14b	Soccer - Jr	3			
15	Rugby	3			
16	Field Lacrosse	3			
17	Multi-use Field - Disc Golf Size	3			
18	Multi-use Field - Ultimate Frisbee Size	3			
19	Cricket	1			
<b>COURTS &amp; PADS</b>					
20	Lacrosse - Box	2			could use in-line skating/street hockey rink
21	Basketball	4			
22	Volleyball/Badminton	3			
23	Tennis	2			City well supplied
24	Multi-Use Courts/Pads	3			
25	Handball/Raquetball	2			
26	In-Line Skating/Street Hockey Rink	4			
<b>EXTREME SPORTS</b>					
30	Skatepark - Neighborhood (Tertiary) Scale (< 7500 ft <sup>2</sup> )	4			
31	Skatepark Complex - City-wide Scale (>33,000 ft <sup>2</sup> )	5			
32	BMX- type Bike Race Course	3		✓	
33	Rope Course	1	✓		Significant liability concerns - would require strong private sector partner
34	Woodland Obstacle/Orienteering Course	3		✓	
35	Paintball	0	✓		Significant liability concerns - would require strong private sector partner
36	Rock Climbing Wall	2	✓		Significant liability concerns - would require strong private sector partner
37	Bouldering Wall	3			
<b>WATER</b>					
40	Water Theme Park	2	✓		
41	Swimming - Pond	0			Significant liability/health concerns
42	Swimming - Pool	0			No projecting additional pools
43	Spray Pad - Neighborhood Scale	3			New spray pad opening in NPU-J at Center Hill Park in 2008
44	Spray Pad etc - City-wide Scale	3			

45	Kayaking/Paddleboating etc	3	✓		Significant liability concerns - would require strong private sector partner
46	Fishing	3			
	<b>LINEAR</b>				
50	Multi-use Recreational Trail	5			
51	Hiking Trails	5			
52	Mountain Bike Trails	4		✓	
					Suitability for urban environment?? Significant liability concerns - would require strong private sector partner
53	Horseback Riding Trail	1	✓		
54	Life/Exercise Course	5			
55	Disc Golf Course	4		✓	
	<b>MISC</b>				
60	"Amphitheatre"	5			
61	Meadow	5			
62	Picnic Areas with Shelters	5			
					Too land intensive, significant operating concerns - would require strong private sector partner
63	Camping	0	✓		
64	Mini-golf	1	✓		
					Too land intensive, significant operating concerns - would require strong private sector partner
65	Golf Driving Range	0	✓		
66	Archery Range	0	✓		Significant liability concerns - would require strong private sector partner
67	Beach Volleyball	2		✓	
68	Lawn Sports (Bocce, croquet, lawn bowling)	2		✓	
69	Playground (Neighborhood Scale)	5			
70	Boundless Playground	5			
71	Game Tables	5			
					minimum 2 acres, small and large dog divisions opportunity for City-wide draw with obstacle course
72	Off-Leash Dog Park	5		✓	
73	Specialty Garden (Display, Arboretum etc)	3		✓	
74	Community Gardens	4		✓	
75	Sculpture Garden	3		✓	
76	Large Scale Public Art (Landforming etc)	4			
77	Wildlife Viewing Area	4			
90	Petting Zoo/Aquarium/Aviary/Butterfly Pavilion	2	✓		Significant Capital and Operating Resources required
91	Viewing Towers/Lookouts etc	3			Significant Capital and Security Resources required
92	Ferris Wheel, etc.	1	✓		Significant Capital and Operating Resources required
93	Interpretive Stations	4			
94	Interpretive Center	4		✓	Significant Capital and Operating Resources required
95	Community/Recreation Center	0			Not projecting need for additional centers
					Significant Capital and Operating Resources required
96	Museum etc	2	✓		
97	Food Service - Kiosk, Concession	4	✓		
					Significant Capital and Operating Resources required
98	Food Service - Restaurant etc	3	✓		
99	Restrooms	4			Dependant on resourcing
100	Park Office/Maintenance/Storage	4			

- June 9, 2008
- August 11, 2008

In addition, an open house for several BeltLine parks, with a focus on Westside Reservoir Park, was presented to the city's residents on Saturday, May 3, 2008. A BeltLine Network meeting was held in late January 2008.

A citywide survey was initiated on December 21, 2007 and generated over 1000 responses and nearly as many written comments. On other occasions, the design team collected survey information from meeting attendees in order to gather information for potential park program elements. Survey results have been summarized. (Refer to the summary in Appendix A.) Significant findings from the public are discussed below as a part of the master plan evolution.

The community engagement process has been more fully documented in the Plan Recommendations Report for Subarea 9.

## Department of Watershed Management (DWM)

Atlanta's DWM interest in the 138-acre Bellwood Quarry property is to transform the quarry into a 50-acre, 2 billion gallon maximum capacity raw water storage facility to support the water needs of the City of Atlanta. The water is intended to be piped from the Chattahoochee River, approximately four miles to the northwest. The reservoir will hold untreated water which can be discharged, treated at the City's Hemphill water treatment facility, and then supply the city's residents.

Given that the former Bellwood Quarry will become a shared resource to both the park, in terms of its scenic quality, and to the DWM, for its use as a reservoir, it was important to ensure that the needs of the reservoir facility and the needs of the park's program were accommodated and could co-exist as seamlessly as possible. It was essential that the reservoir edge be able to provide recreational use, to allow the spectacular views into the quarry to be seen by park visitors, while still ensuring the security measures necessary for a reservoir.

Design requirements of the reservoir facility include a site with direct access to the reservoir to house the control building and in-take and discharge shafts; this site had to be located within 150 feet of the reservoir edge and include a fifty foot security buffer. Various



Figure 3-3. Perspective Rendering of Edge of Reservoir and Meadows

locations for this site were studied; considerations included impacts to the park, operational requirements due to dramatic grade changes in the pit, orientation to the Chattahoochee River, infrastructure options for transporting water between the river and reservoir, as well as slope stability around the quarry rim.

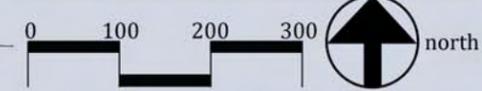
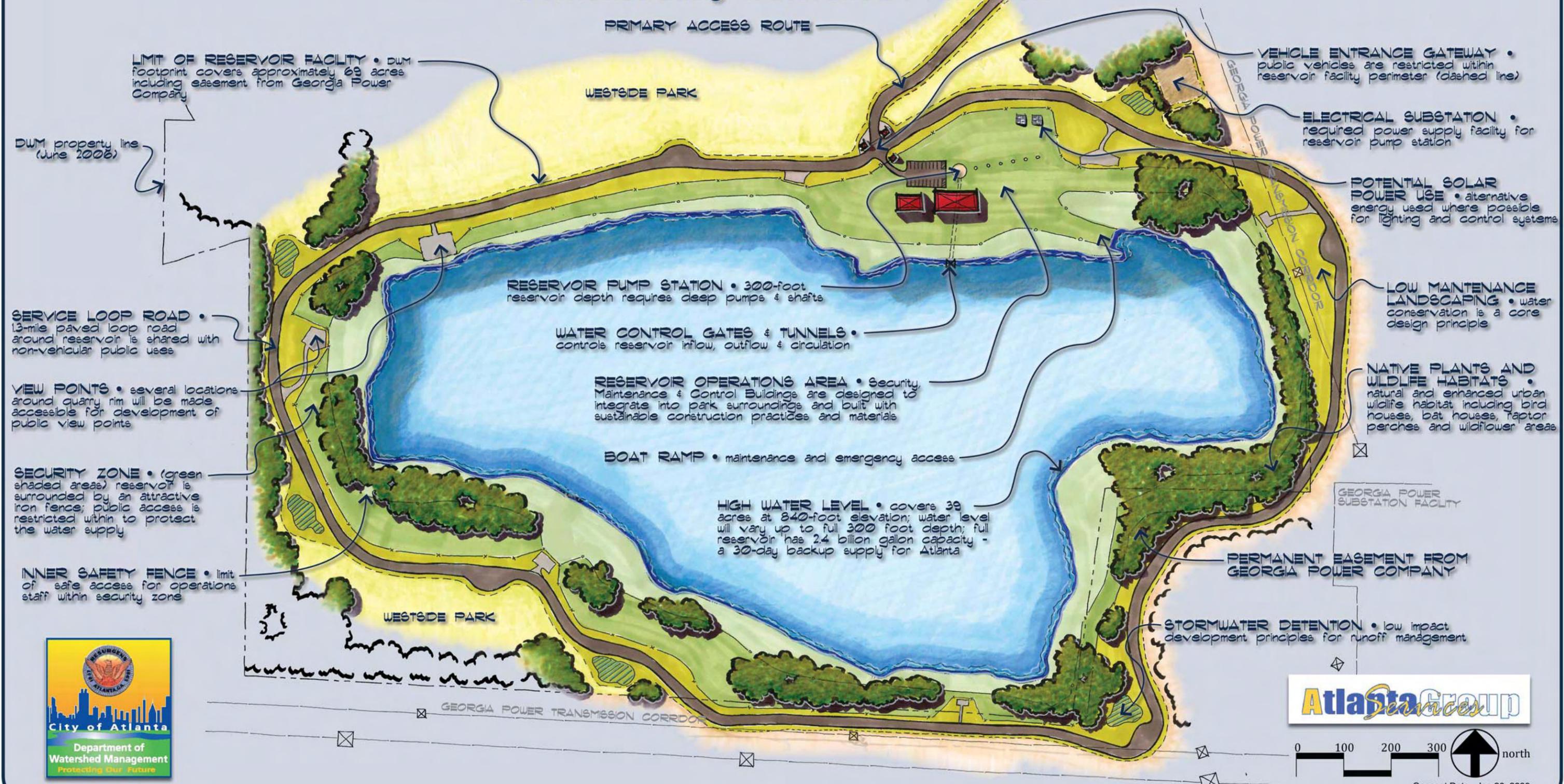
Mitigation for safety and security of the reservoir includes (from reservoir edge moving outward) a no-access safety zone, safety fencing, a zone for DWM staff maintenance access, security fencing, an architectural perimeter fence, a DWM access service road, and a vehicle barrier. This vehicle barrier will be designed to be permeable to pedestrians; the service road will be designed to double as a paved trail for walkers, roller-bladers, runners, and bikers. This 'trail' will have wayside areas located to optimize significant viewing opportunities and provide resting facilities. The vehicle barrier can be designed with a combination of swales and non-traditional fences and bollards, allowing this zone to blend into the aesthetic of the park. Boat access (DWM only) is required for safety/maintenance of the reservoir. The access ramp will utilize the existing access road into the bottom of the quarry from its northeast side, engineered as necessary. Also, opportunities exist for DWM to incorporate interpretation/educational components to teach residents about the impacts of water resources.

On March 20, 2008, a meeting was held on Westside Reservoir Park to discuss the DWM Site Development Concept. In attendance were: ABI, DPRCA, the POND/CRJA team, and DWM. At this meeting, the following concepts for Westside Reservoir Park were collectively agreed upon (as recorded by DWM):

- Safety and security of the public and the water supply reservoir are the first priority.
- Reservoir facility needs will be met, but land use will be kept to the minimum possible.
- Bellwood Quarry Reservoir and Westside Reservoir

# CITY OF ATLANTA BELLWOOD QUARRY RESERVOIR CONCEPTUAL SITE DESIGN PLAN

## Demonstrating Watershed Protection



Concept Date: Jan 20, 2009  
DWM - City of Atlanta, Department of Watershed Management

Figure 3-4.



Park will share facilities where it is viable to do so.

- The flat area north of the reservoir rim, around the proposed DWM facilities, is recognized as having the highest value for park and public use.

- The DWM reservoir service road will be shared with the public pedestrians, cyclists, and/or park trolley/tour buses. No public vehicular access will be allowed.

- No public reservoir access will be permitted. DWM boat access may be required on occasion for maintenance, clean up, or emergencies.

- A vehicle barrier surrounding the reservoir is critical for security. Design of barrier will vary and be integrated into nature and park aesthetics where possible.

- A minimum 50-foot public exclusion zone will ring the reservoir rim. Exceptions may be evaluated on a case-by-case basis. The buffer distance will increase in areas with slope stability concern or where natural topographic breaks exist.

- An additional safety zone excluding even DWM employee access will be located close to the rim of the reservoir where a substantial fall danger exists.

- Architecture of DWM facilities at reservoir will be designed to integrate into park aesthetics.

- Reservoir control facility and pump shafts will be located on northeast rim at the head of the entrance road to the quarry pit, at the locations shown on the "DWM Site Development Concept" plan from March 20, 2008. The cost/benefit of low-profile or buried facilities will be evaluated and integrated into the facility design where cost/benefit is favorable.

- DWM will continue to evaluate the water quality need for a second facility, the reservoir discharge station, and the northwest corner of the rim.

- DWM will consider an aesthetically pleasing water feature in design of the reservoir if it can be justified from a water quality management and energy cost perspective, and if it can be placed where it does not degrade slope stability.

- The City of Atlanta team agrees that a crossing over the reservoir property is not recommended.

- Park facilities such as the proposed "Overlook Cafe",

ferris wheel, observation tower, rock climbing wall, and pendulum swing may be located near the reservoir but must be located outside the DWM security perimeter. A 1:1 horizontal to vertical offset from the DWM perimeter fence is recommended for park facilities.

- The reservoir perimeter design will facilitate high quality view opportunities from the north rim and at several locations around the reservoir. Practices such as custom grading, tree thinning, aesthetic fence selection, alternative vehicle barriers, etc., will be implemented to improve the view of quarry walls and reservoir from the public access areas.

## 3.2 Master Planning Process

Initial master planning began in July of 2007. The design team introduced the Planning Committee to the intended planning process, schedule, and the background studies that had been produced at that time.

The first Study Group meeting was held in late August in conjunction with the Planning Committee. Presentations by the master planning team to the community provided discussion of the existing site conditions and identified potential opportunities and constraints inherent to the site. This meeting served to vet initial concerns and ideas from the involved community. The design team assembled the community members into small groups to discuss transportation and connectivity issues, the balance between active versus passive recreation programming, the role and condition of Proctor Creek, the role and status of the Bellwood Quarry property, the history of development in the area, and associated concerns. As the Subarea 9 land use planning occurred concurrent with the park master planning, discussions also included identifying land parcels adjacent to the existing parkland already owned by the City that had potential for build-out as either greenspace or development. Parcels were also evaluated as possible park connections to the surrounding neighborhoods and for patterns of vehicular and transit circulation networks.

In late October, the master planning team met again with the Study Group to define the park goals and objectives, and to brainstorm about potential park program elements. The group was mindful of the City's goal to create a park that becomes a citywide attraction, while also serving adjacent neighborhoods. Preliminary public suggestions for park programming included educational and cultural components, such



Figure 3-5. Rendering of Edge of Reservoir and Meadows



Figure 3-6. Rendering of Trails in the Park

as interpreting the history of the area, using the site as a learning tool to discuss the impact of people on the environment, meeting spaces for residents, gaming tables, and a space for community gardening. It was also stated that the park should not encourage the inclusion of all-terrain vehicles (ATVs) or motocross. Initial thoughts on a hierarchy of trails was discussed, and was based on the variety of trail network users. At this meeting, the Southern Off-Road Biking Association (SORBA) recommended establishing mountain biking trails.

November meetings were used to begin review of potential park programming as well as dialogue regarding the park boundaries. Suggestions for planning and programming included the following:

- Locate passive activities toward edges of park near existing neighborhoods
- Create balance of passive and active recreation opportunities
- Separate the active and passive uses
- Create a "nature and culture" park
- Alleviate flooding issues with Proctor Creek
- Utilize the naturalistic quality of the proposed reservoir to create a park with a natural passive experience
- Ensure easy access to the park from public transit
- Establish a balance between the recreation experience and the need for vehicular circulation, parking, etc.

- Establish a park with passive recreation as its core and active uses to the edges
- Preserve the trees in the park
- Ensure adequate (but not too bright) lighting on walking trail and ballfields
- Maintain a balance between greenspace and the recreation facilities by providing open space between playing fields and sports venues, thus ensuring that the environment reads as dominant over recreation

At this time, the community expressed a desire for the following program elements: public art, a velodrome, an outdoor theatre, museums, an aquatics center, recreation centers, trails, a roller hockey rink, and baseball fields. It was requested that horse riding trails not be included in Westside Reservoir Park.

The following month, park discussions were concentrated on the development of park boundaries, and significant to this was potential park entry points and circulation roads. Central to this was the proposal that a new road be constructed on the western and southern sides of the park, essentially forming its boundary. Also discussed was topography - a significant environmental feature - as it will influence where elements are placed within the park. Additionally, a significant conversation debated whether Westside Reservoir Park is intended to be a regional or city park; community members were told that the park plan will be based on the needs of the City.

In January of 2008, the first preliminary plan was presented for debate and reaction. This initial concept (See Figure 3-11) focused on accommodating a comprehensive active recreation program that could satisfy citywide needs.



The plan explored activities such as a water park with wave pools and spray pads; extreme sports such as skate park, ATV trails, and street luge; and traditional active sports venues including baseball

Figure 3-7. Rendering of Softball



Figure 3-8. Rendering of Outdoor Theatre

and softball fields, basketball and tennis courts. Passive recreation components included trail networks, paddleboats, and picnicking. Public art proposals included a sculpture garden, way-finding, and large-scale earth art. Additionally, the scheme proposed a collection of sustainable strategies that directly take advantage of site features (i.e. rock climbing and vertical viewing stations).

Preliminary circulation patterns through the park were presented with a conceptual design reflecting a variety of program opportunities. The plan depicted a vehicular circulation pattern that enters the site in three locations: from Marietta Boulevard (bridged over the CSX rail tracks), from the Grove Park neighborhood, and on Johnson Road. The roads travel near the edge of the quarry rim on three sides (predominantly north and west) with a north-south spine from the Johnson Road entrance near the middle of the site. Additional paved service roads were proposed as a part of the trail network. The developable parkland was divided into five categories: active recreation, passive recreation, extreme sports, a water park, and sustainable strategies, with public art and cultural opportunities incorporated throughout the park. Topography was the dominant factor influencing placement of park program elements; existing site features were matched with program element requirements to minimize additional disturbances to the site. Comments from Planning Committee members suggested that the master plan be less vehicle-oriented with a greater focus on either mass transit (i.e. park trolley) or pedestrian and bicycle-oriented facilities. Initial community feedback suggested that dedicated fields would be preferred over multi-use fields with a plan that focused primarily, but not exclusively, on active recreation.



Figure 3-9. Rendering of the Views into the Reservoir

Also, in January, the citywide park programming survey results were presented to the Study Group. Dominant public recommendations included: hiking and biking trails; disc golf; facilities for skateboarding; leash-free dog areas; unprogrammed passive spaces; a need for safety and security; and opportunities for water play.

Spring of 2008 was devoted to synthesizing the desires of the community, and defining the needs of the DPRCA and requirements of DWM. New plans were developed to reflect an increased level of passive recreation in the park. (See Figures 3-12 and 3-13.) These plans were used to solidify direction on the programming for Westside Reservoir Park. Discussions concluded that five features were significant elements that would shape the park landscape and focus the master plan: recreational hiking and mountain biking trails; unprogrammed open meadows; up to eight 90-foot tournament-quality baseball diamonds (organized so that they create at least one quad); a skate park at the Holophrastic site; and a multi-use outdoor theatre accommodating 200 guests. Also, it was determined that the west and south boundaries of the park would be defined by a combination of a new parkway road and Proctor Creek. (See Program Matrix included in Appendix B.)

At this phase in the design process, ten critical principles were acknowledged and prioritized by the master planning team in an effort to focus the planning process:

1. Define the land use at the perimeter of the park to create new low to medium-rise residential development supporting the existing residential areas on the edge of the park, and thus help populate the park, provide community pride and ownership, and encourage a continual presence aiding security and safety in the new park.

2. Create a definitive park edge condition by using a spine parkway and Proctor Creek as park boundaries in certain areas, thus allowing views into the site from the parkway and enhancing the experience of traveling the roadway.

3. Design obvious park entrances to help orient visitors to the park from adjacent neighborhoods, create physical and visual connections through the adjacent street network, and create one or two ceremonial main entrances.

4. Plan the park in an organic process, where the design emerges from the site. The master plan should be directly informed by the site's history, as well as its physical and biological context.

5. Incorporate prominent site features to help define the public experience within the park, and establish the park as a regional destination.

6. Because of the size and context of the site, park organization will be defined by circulation. The significance of pedestrian, vehicular, transit, and bike circulation and impact on the site were determined as the programming became better defined.

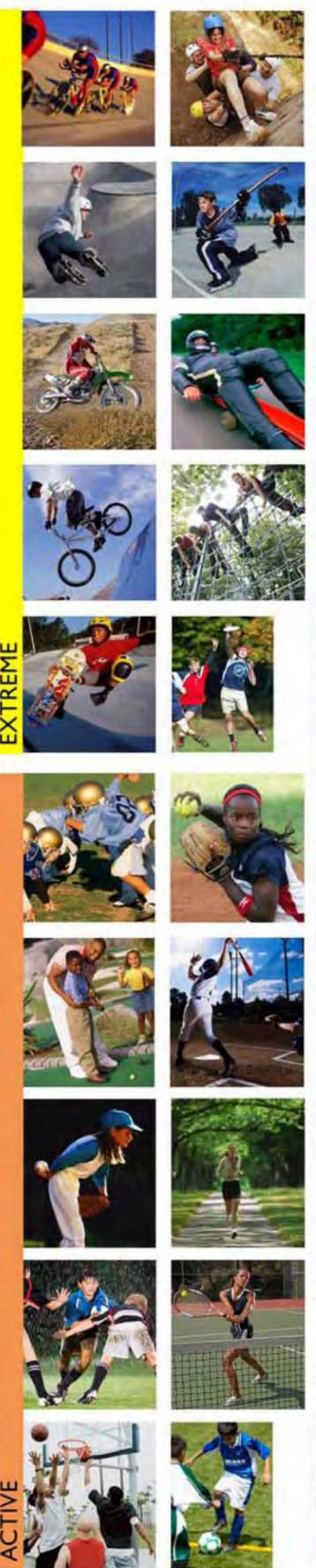
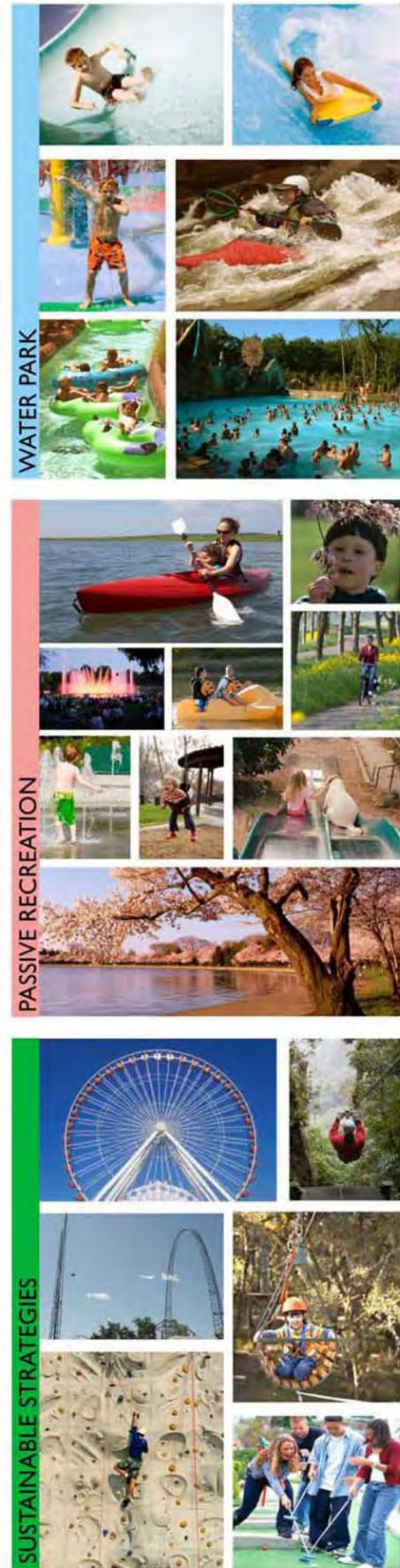
7. Park circulation, as mentioned above, is a characterizing factor for Westside Reservoir Park. In the park design, vehicular circulation is intended to be a passive element in the landscape so that, while it is a significant feature within the park, it will not dominate.

8. Complementary recreation program elements should be located in proximity to one another with pedestrian connections and direct vehicular access from the spine road and parking.

9. Regarding the circulation plan, parking should be



Figure 3-10. Rendering of the Passive and Active Opportunities



**BeltLine**  
Atlanta Connected

**BeltLine Subarea 9: BELLWOOD QUARRY RESERVOIR PARK**

**PARK CONCEPT 1A: Active Recreation Focus**

**LEGEND**

- Beltline Corridor
- Park Site
- Potential Parkspace
- Stream
- Building
- Proposed West South Park Edge
- Main Route with Edge Lines, Walls, Limited Vehicular Access including Service & Emergency Access
- Watershed Service with Limited Bike & Pedestrian Service
- Main Vehicular, Pedestrian & Bicycle Entry
- Proposed Facility (Restrooms, Maintenance)
- Existing Woodlands to Remain
- Proposed Plantings
- Views to be Enhanced
- Neighborhood Gateway Plaza

**CONTOURS**  
 INDEX (100%)  
 INTERMEDIATE (10 ft)

**POND**  
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 404.525.0000

**PARK**  
 Masterplanning  
 January 14, 2008

**SCALE IN FEET**  
 0 100 200 300 400 500

Figure 3-11.





**BeltLine**  
Atlanta Connected

**BeltLine Subarea 9:  
BELLWOOD QUARRY  
RESERVOIR PARK**

**PARK CONCEPT 2:  
Active Recreation Focus**

**Legend**

- BeltLine Corridor
- Park Site
- Potential Parkspace
- Street
- Stream

**CONTOURS**

- INDEX (100 FT)
- INTERMEDIATE (10 FT)

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**PARK Masterplanning**

March 2008

**SCALE IN FEET**  
0 100 200 400 800

Figure 3-12.





**"Meadow Scheme":**

- Creates large open space areas adjacent to wrapping the reservoir. 5 meadows each with individual character. Open park atmosphere - environmental and thoughtful.
- Two Athletics Complexes placed around park reservoir to north & one to south.
- Receives ADA land for more "natural" play - native/seasonal plantings, pedestrian trails - potential for involvement with National History Museum of others at multiple center.
- Provides view direct view into reservoir, Proctor Creek, new pond & to city skyline beyond.

**LEGEND**

- Red line: Bicyclist Accessible Bicycle Lanes + Potential Pedestrian
- Dotted line: Trails (ped + bike)
- Green circle: Existing Trees (Approx.)
- Green square: Proposed Tree Line (Approx.)
- Red arrow: View Sheds



**BeltLine Subarea 9:  
BELLWOOD QUARRY  
RESERVOIR PARK**

**PARK CONCEPT 3:  
Active Recreation Focus**

**Legend**

- BeltLine Corridor
- Park Site
- Potential Parkspace
- Street
- Stream

**CONTOURS**

- INDEX (100 ft)
- INTERMEDIATE (10 ft)

**PARK**  
Masterplanning

March 2008

SCALE IN FEET  
0 100 200 400 600

Figure 3-13.



kept to the perimeter of the park to the extent possible. Parking should be grouped to minimize disturbance to the site and to screen it from the park interior. Also, the design should explore “off peak” use of adjacent private parking facilities.

10. Due to the large scale of the proposed park, construction phasing and opportunities for long-term expansion should be an integral part of the master plan.

Additionally, as part of the master planning workshop process, the team identified an over-arching theme to further define and clarify the design philosophy. The most extraordinary aspect of the site is its scenic and natural resources: views of Atlanta’s skyline; views from and into the quarry; the picturesque quality of Proctor Creek, especially when seen from the upper landfill area; and the acres of woodlands. These qualities, coupled with the sheer size of Westside Reservoir Park compared to other existing parks within the City, led to the realization that visiting this park will be unlike any other experience in the City. Ultimately the theme for the park design became “Atlanta’s Natural Wonder”.

In late April, the Study Group reconvened to discuss park concept alternatives and further define the park program. The master planning team presented the idea of emphasizing the natural and scenic qualities of Westside Reservoir Park and showed images of existing conditions to support the approach. The team also presented the program elements determined essential to the park plan and their basis for this decision. The Study Group was presented with two additional alternatives for park layout. (See Figures 3-18 and 3-19.) Each of these plans included the five essential program elements defined by the master planning team. One plan had a more passive recreation focus with extended meadow and unprogrammed space. The second plan reflected an increased level of active recreation and included court sports, a football field and track, and multi-use fields to support 60-foot Little League softball fields, soccer and practice football fields.

As part of this meeting, comment forms were distributed to the meeting attendees to document program and facility priorities and clarify whether a focus on passive recreation or an active/passive recreation mix was preferred. This survey determined that two-thirds of the involved public preferred passive park program elements over active elements. (See responses, Appendix A.) Out of this process, an additional level of essential program elements was defined including: multi-use rectilinear fields for field hockey, soccer, rugby,

lacrosse, and football; the need for water activities which can be accommodated on the pond; public art focusing on the use of landforms which will be concentrated in the meadow areas; and gardens and botanical trails which will be incorporated into some of the meadow spaces.

In May of 2008, ABI held an open house at City Hall. This meeting reviewed all the proposed parks in the planning process, but focused specifically on the development of Westside Reservoir Park. The open house reviewed the planning process that had been completed, including development of program. Surveys were distributed at this meeting and the returns emphasized the desire for a park plan balanced between active and passive recreation.

Based on these meetings and the public input, the design team developed the next generation of the master plan. At this time, the team determined that a plan with a balance of active and passive recreation space and the increased meadow areas was preferred. This draft master plan was presented at meetings in June along with a proposed trail layout plan and a potential art installation plan. (See Figure 3-20.) The draft master plan included the five original essential program elements, and those additional elements defined as important to the park during the April meetings. Additionally, the draft master plan provided for a nine-hole disc golf course, observation towers and viewing stations, a skate hockey rink and basketball courts, along with support structures such as picnic shelters, concession stands, and press boxes for baseball diamonds. The plan was organized with four park entries and a through-road which followed the closed Grove Park Road alignment, Proctor Creek, and a portion of the Georgia Power transmission corridor to the west and south side of the park. The meadows and passive recreation facilities were concentrated at the core of the park, wrapping the reservoir while the active sports were located further away from the reservoir, but buffered from existing neighborhoods. Trails were woven throughout the park land, with a distinction between paved multi-use, hiking, mountain biking, and an exercise course at the Holophrastic site. The public art plan designated locations for permanent installations including major projects such as the landform art.

Community contribution further defined the role of culture and public art in the park by expressing an interest in botanical gardens, venues for temporary art, films, and large festivals. In response to the trails plan, some residents expressed concern over the competing uses of multi-use trails and the safety of older residents,

while others preferred that trails be more multi-use to conserve space. The public also expressed a desire to see sustainable design solutions in the park, such as “green” buildings and porous pavements. Additional comments included a positive response to the proposed location of the exercise course, the desire to relocate the dog park so it is adjacent to parking, and the preference to include it in an early phase of construction.

From this discussion, a final master plan for Westside Reservoir Park was produced. The plan achieves the primary goals of the stakeholder groups: incorporate the facilities required for the DWM’s raw water storage facilities; include the conscientiously-defined park program synthesized from the input of the community, and the deficiencies and desires that DPRCA recommended be fulfilled; and carefully enhance the scenic qualities and natural resources existing within Westside Reservoir Park. The master plan and associated trails and arts plans were presented to the Study Group and Steering Committee in August of 2008.



Figure 3-15. Green Building



Figure 3-16. Public Landform Art



Figure 3-17. Landform Art



Figure 3-14. Observation Tower



- Legend**
- Park Site
  - Potential Parkspace
  - Stream
  - Park Entry
  - Parking
  - Service Access with Pedestrian Hiking, Biking & Blading Trail
  - Vehicular Access with Separated Pedestrian Trail
  - Vista Point
  - DWM Exclusion Zone

- CONTOURS**
- INDEX (100 FT)
  - INTERMEDIATE (10 FT)

Figure 3-18.





**BeltLine Subarea 9:  
BELLWOOD QUARRY  
RESERVOIR PARK**

**SCHEME B**

- Legend**
- Park Site
  - Potential Parkspace
  - Stream
  - Park Entry
  - Parking
  - Service Access with Pedestrian Hiking, Biking & Blading Trail
  - Vehicular Access with Separated Pedestrian Trail
  - ▲ Vista Point
  - DWM Exclusion Zone

- CONTOURS**
- INDEX (100 ft)
  - INTERMEDIATE (10 ft)

Figure 3-19.





**Beltline Subarea 9:  
WESTSIDE  
RESERVOIR PARK**

**MASTER PLAN**

- Legend**
- Current City Land Ownership
  - Potential Additional Parkland
  - Stream
  - \* Park Entry
  - Parking
  - - - Service Access with Pedestrian Hiking, Biking & Bunting Trail
  - - - Vehicular Access with Separated Pedestrian Trail
  - DWM Exclusion Zone

- CONTOURS**
- INDEX (100 FT)
  - INTERMEDIATE (10 FT)

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**C R J A**  
CONSULTANTS

June 23, 2009

SCALE IN FEET  
1" = 500'



Figure 3-20.



## 3.3 Final Master Plan

### Master Plan Program

The final master plan for Westside Reservoir Park focused on the five essential program elements:

1. 90-foot baseball diamonds;
2. skate park and rink;
3. unprogrammed meadows;
4. hiking and mountain biking trails; and,
5. an outdoor theatre.

These were supplemented by the following additional program items:

- paved multi-use trails;
- multi-use rectilinear fields;
- a pond with the potential of water activities, such as paddle boating or radio-controlled model sailing (no swimming);
- earth sculptures and venues for permanent and temporary public art;
- gardens and botanical trails;
- an exercise course;
- picnic areas with shelters;
- a two-acre off-leash dog park;
- basketball courts;
- a series of observation towers and platforms;
- an in-line skating/street hockey rink;
- disc golf course;
- wildlife viewing areas;
- interpretive center and stations through the park;
- food service, kiosks and concession structures; and,
- a park operations and storage building.

The master plan can be seen at Figure 3-30.

A more detailed description of each program type is included below; a discussion of maintenance and operations for each element is included in Section 4 of this report.

## Passive Recreation Spaces

The main passive recreation areas within the master plan for Westside Reservoir Park are the meadows that wrap the north and west sides of the Bellwood Quarry. The meadows are suggested to be free-flowing spaces with rolling topography. The spaces will be subtly defined into “rooms” using vegetation massing, in-situ structures, and topography. They have been labeled on the plan as the upper meadow – the one furthest east overlooking the DWM reservoir site; the middle meadow; and the lower meadow, adjacent to the pond and the largest of the “rooms”. The western meadow will be defined and shaped by arboretum-style plantings. Lastly, the south meadow will be shaped by the placement of the landform art mounds to frame the views out to the quarry, and carefully buffer views and sound from the adjacent active use recreation areas. The total area of meadow is just over twenty-six (26) acres.

Additional passive recreation space includes the amphitheatre, off-leash dog park, nature study, and bird watching area. (See the discussion below for the trail network.) The amphitheatre is intended to have a naturalistic character and fit subtly into the landscape by being constructed both of granite (presumably from the site) and terraces of lawn. The amphitheatre has been located on the existing hillside which overlooks the meadows on the north side of the reservoir. With this vantage point, spectators will be able to enjoy views of activities on the swath of meadow, the reservoir and, potentially, Atlanta’s skyline beyond.

The off-leash dog park, also natural in its character, should be an open area with fence enclosure. It is planned to be approximately two acres in size and should be outfitted with benches, recycling and waste receptacles, and dog waste bag stations. It should offer areas of shade, water, and some topographic variation for interest and exercise, as well as a designated area for smaller dogs. The dog park should be proximate to parking, and maintenance and operations facilities. It is proposed to be located adjacent to the east park entry off Lois Street.



Figure 3-21. Meadows



Figure 3-22. Amphitheatre



Figure 3-23. Dog Park

Community gardens have been proposed to be located in the Georgia Power transmission corridor. This is a suitable location as the land is already cleared and, with no tree canopy, will be able to provide the minimum of six hours of full sunlight per day that vegetables require. The community garden will require designated plots (though plot sizes may vary) and a method for separating the plots (maybe structures such as siding for raised beds or plant hedges). Other amenities may include a storage shed for tools and equipment, a water source, kiosk for notices and regulations, a children's garden, and a composting site.

The nature study and bird watching areas utilize a variety of ecosystems from woodland edge to open meadow. The natural areas are simple elements that need to have cleared, accessible trails, observation decks, and habitat aids (such as nesting boxes). In addition, plantings may be altered so to enhance ecosystems and habitats, remove invasive species, and supplement existing plantings with native species.

The final master plan allows for unprogrammed spaces in the Georgia Power transmission corridor; development for these areas can be proposed at a later time, as needs are expressed. Within the transmission corridors, certain activities would not be appropriate due to the potential for interference with the transmission lines or the transmission towers; for example, while frisbee or soccer may be allowed, softball or golf would not due to the height that the ball travels.



Figure 3-24. Botanical Garden



Figure 3-25. Community Gardens



Figure 3-26. Bird Watching

## Active Recreation Spaces

Active recreation facilities include ballfields, multi-use rectilinear fields, basketball courts, a hockey rink, and a nine-hole disc golf course.

The ballfields will be 90-foot full-sized, tournament-quality fields with home run fences, spectator seating for 200 people on each field, lighting, dugouts, press boxes (one per two or four fields, depending on layout), and restrooms. As shown on the master plan, the fields are to be arranged so that one group of four fields forms a quad, with three other diamonds located just south of the quad.

The multi-use fields should be sized and striped for field hockey, soccer, rugby, lacrosse, and football; however, each field should be striped for no more than three sports at any time to avoid confusion by players and officials. The fields are sized at 225 feet by 360 feet to fit the intended sports noted above. Fields should be outfitted with the equipment necessary for the proposed sport (field goals for soccer and lacrosse; goals posts for football, etc.), as well as spectator seating for 200 people per each field (visitors and homestand seating), players' benches, and recycling and waste receptacles. Lighting should be considered depending upon the anticipated users and level of programming. Depending upon the level of programming intended, it is recommended that consideration be given to constructing these multi-use fields out of synthetic turf to address climate and recent drought history. Synthetic turf fields allow 24/7/365 use with no down time for seeding, mowing or irrigating as is the case with natural turf.

The disc golf course is designed to be a nine-hole course with each hole between 250 and 300 feet in length. The holes should have a variety of vegetated cover, including all wooded, all open meadow or lawn, and a combination thereof. Topography, too, should be incorporated into the course to add challenge and interest. Tees and basket-style goals will be required for each hole.



Figure 3-27. Baseball



Figure 3-28. Basketball



Figure 3-29. Lacrosse





Court sports on site are limited to the Holophrastic site, and include up to four basketball courts, a street hockey rink, and an in-line skate rink/skate park complex. Basketball courts are typically designed as a bituminous concrete surface with an applied acrylic surfacing to color and stripe. The street hockey rink can be designed either with a concrete surface or bituminous concrete with an acrylic surface similar to that for basketball courts. The street hockey rink should have curbs which allow for the insertion of boards to keep the ball in play. The existing open building structure at the Holophrastic site can be retrofitted for the skate rink, to be used by skateboards, in-line skaters and bikers. It is presumed that with the inclusion of ramps, guardrails around the sides and a resurfacing, this structure will be sound for use.

The skate park can be designed one of two ways: the preferable system is a continuous concrete park that incorporates the structures for tricks integral to the site, or the park can be a concrete surface with prefabricated structures installed on site. Lighting should be incorporated into the Holophrastic site, as these activities will likely attract a high level of use, extending into evening hours. In addition, amenities providing shade, drinking water, and restrooms should be provided, as well as seating areas for resting or spectators.

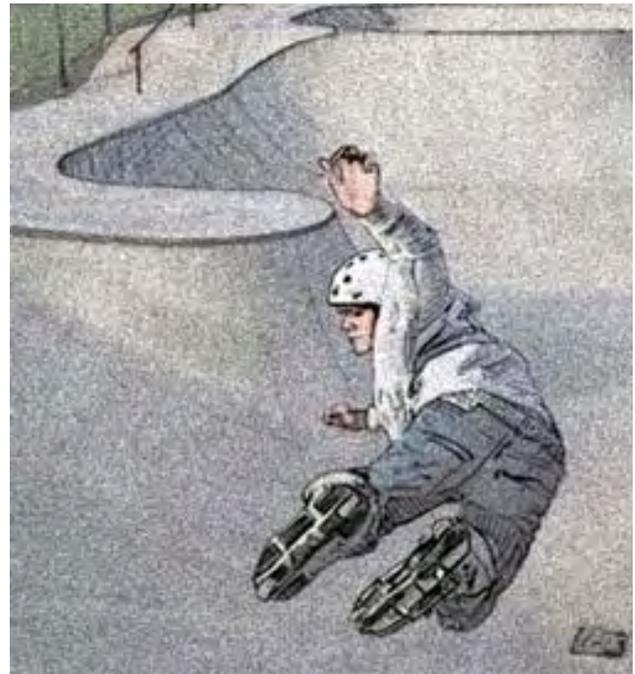


Figure 3-31. Skate Park



Figure 3-32. In-line Hockey



Figure 3-33. Disc Golf

## Trail Network

The proposed trail network has been designed to allow a variety of users to experience Westside Reservoir Park through diverse approaches. Five separate trail types have been allocated:

1. As part of the main circulation pattern for the park, the master plan proposes that bike lanes and sidewalks be part of the street typology. These lanes should be separated from vehicular circulation for safety, and are particularly important for drawing residents from surrounding neighborhoods into the park. The park road network is approximately 2.3 miles long.

2. A striped and paved trail which functions for park maintenance and service vehicles, as well as emergency vehicle access, also provides a stable surface for visitors who roller blade, skate board, and bike, and for those visitors with mobility issues. The multi-use recreation trails should be between 12 - 20 feet wide depending on the location and the anticipated levels of use. These trails connect to some of the public vehicular circulation and are approximately 1.8 miles.

3. Natural surface hiking trails cover 4.1 miles of hiking trails.

4. The exercise loop course, with exercise stations along a narrow, paved course, is designed primarily for seniors. The 6 to 8-foot paved exercise course is approximately 0.6 miles.

5. Natural surface mountain biking trails. The master plan shows 3.2 miles of mountain biking trails.

Overall, the proposed trail network within Westside Reservoir Park creates an additional 12 miles of trails.

All trails should be appropriately signed to designate which users are welcome; the difficulty of trail for hiking and mountain biking trails should be noted. Also, signage should clearly designate advance notice of intersections as a safety precaution. Trail development can be constructed in increments, though complete "loops" are encouraged with any phased installation. In addition, all trails should be located and constructed with a sensitivity to existing resources (i.e. proximity to streams and buffers and potential for erosion of slopes). Alternatives for trail surfaces, width, and slope should all be carefully studied to ensure the design reflects sustainable practices.



Figure 3-34. Shared Use / Striped Trails



Figure 3-35. Designated Bike Lanes



Figure 3-36. Hiking Trails

In several cases, trails that have potentially incompatible users will intersect and overlap. For safety purposes, intersections should happen as infrequently as possible but, when they do occur, they should be designed as perpendicular intersections, and be well signed with warnings. Where trail systems overlap, priority will be given to paved trails, then to hiking trails.

In addition to these trails, pedestrian connections have been made to adjacent neighborhoods, as well as to the Silver Comet Connector Trail. The Silver Comet Connector Trail is a multi-use trail that will connect the existing Silver Comet Trail in Cobb County to the City of Atlanta. The trail is being planned by the PATH Foundation, though the route has not yet been finalized.

The proposed trail network accomplishes the following:

- provides access to all park program elements and features;
- focuses the visitor on the natural and scenic aspects of the park (i.e. the reservoir, Proctor Creek, and the city skyline beyond);
- allows access into and between park entries and perimeter parking areas;
- provides a variety of experiences along the trails (through type of trail and difficulty of trail);
- provides a safe experience for all users by dividing users where appropriate (i.e. separate trails for mountain bikers and for hikers); and,
- allows access to all parts of the site without disrupting or damaging portions of wildlife habitat or natural features.

Ultimately, the trail network should allow for a comprehensive experience providing as many users access to as much of the site as is feasible in a safe and comfortable manner, while emphasizing the natural and scenic qualities of the site. (See Figure 3-41.)



Figure 3-37. Exercise Course



Figure 3-38. Mountain Bike Trails



Figure 3-39. Paved Pedestrian Trails

## Vehicular Circulation

The vehicular circulation system for Westside Reservoir Park, as shown in the master plan, is based on a north-south spine which begins at the north park entry along Johnson Road at the existing Grove Park Place. Currently, Grove Park Place is a paved roadway but, due to its secluded nature, the road and adjacent landscape became an unsafe area, attracting undesirable activity; was it closed from public access.

The proposed park spine road extends into the park from Johnson Road at a point where it will align with the access road of the high-density development area north of Johnson Road. At the north park entry, a vehicular bridge will be needed as the proposed road alignment will cross one of the existing streams, which runs parallel to Johnson Road. The road then curves west around the multi-use fields until wrapping southward around the baseball quad, then wrapping back in a counterclockwise direction around the set of three ballfields and the disc golf course. A second road connects from the proposed single-family neighborhood between Johnson Road and Proctor Creek. This road leisurely follows Proctor Creek and connects to the spine road at a traffic circle where it wraps between the two sets of ballfields. The traffic engineers have recommended including a traffic circle at this location to organize this intersection. While the park spine road continues in a southeast direction, this is the location where the west park entrance accesses the park spine road. Also, a secondary road connects through the Grove Park neighborhood and connects to the spine road by traffic circles at each connection point.

From the east entrance, Lois Street allows direct access to the meadows and amphitheatre, but is intended to only allow through-access for pedestrians, as well as service and emergency vehicles. A short east-west road connects the north entrance to the ballfields and their associated facilities.

To the south of the quarry, the roadway meanders through the transmission corridor to allow glimpses of the park and reservoir, and to reduce speeds. The spine road then curves south to rejoin Proctor Creek and connect to the south entrance with another traffic circle. At this point, the parkway continues south along Proctor Creek to make the connection to the Bankhead MARTA station. Both MARTA and the BeltLine will link the park to the larger transportation network of Atlanta.



Figure 3-40. Parkway

The plan creates multiple connections between the park's road system and the trails. Several connection points are made to the Silver Comet Trail and the park spine road, and all of the major parking areas are connected to the trail network. In addition, the Plan Recommendations Report for Subarea 9 proposes a streetcar line which would traverse the park from the Bankhead MARTA station, moving northward following Proctor Creek on the park spine road until reaching Johnson Road. The Perry Boulevard Streetcar would then continue out of the park to Perry Boulevard.

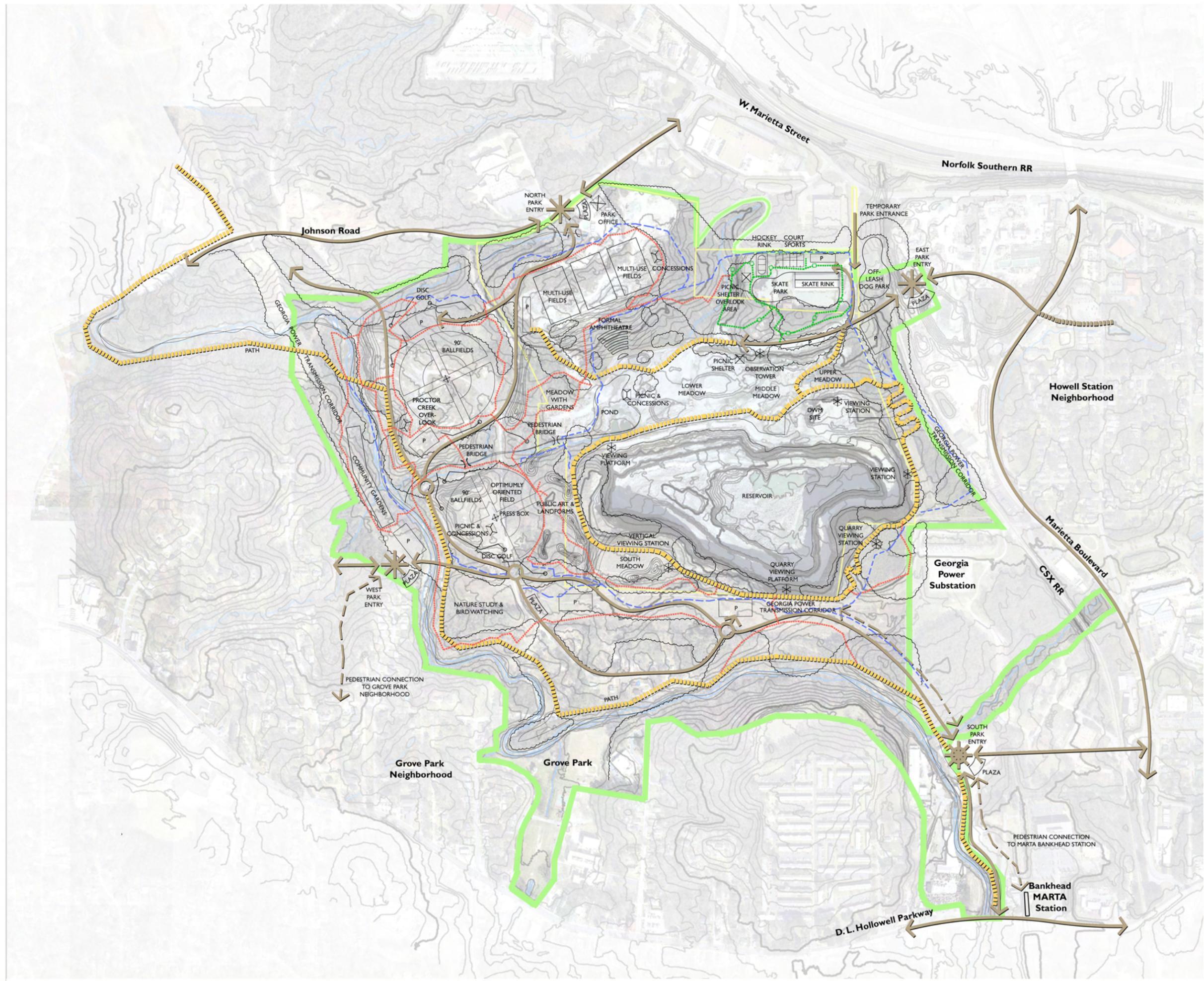
Throughout the park, parking is located along the roadways with perimeter parking in the transmission corridor. The park road system can be seen in both the park master plan, Figure 3-31, and the Subarea master plan, Figure 2-2.

The park spine road is intended to be a low-speed roadway with divided lanes for bicycles and pedestrians. Additional information on the characteristic of the parkway has been included in the Subarea 9 Plan Recommendations Report. The orientation of the parkway will capitalize on the scenic quality of the park by taking advantage of views into meadows, woodlands, the reservoir, and the skyline beyond.

## Park Entries

Where the plan designates "plaza", park entry spaces will include a combination of visual gateway, public art, playgrounds, bathrooms, spray fountains, bike rentals, and a recreation facility. These amenities will be appropriate to support neighborhood-scaled activities for the surrounding community.

Outside the core of the park, these plazas will contain the concentration of public art. Sculptural pieces



**Beltline Subarea 9:  
WESTSIDE  
RESERVOIR PARK**

**Trails Overlay Plan**

- Legend**
- Current City Land Ownership
  - Potential Additional Parkland
  - Stream
  - Park Entry
  - Parking
  - Service Access with Pedestrian Hiking, Biking & Blading Trail
  - Vehicular Access with Separated Pedestrian Trail
  - DWM Exclusion Zone
  - Hiking Trails
  - Mountain Bike Trails
  - Exercise Course
  - Paved Multi-Use Trails

- CONTOURS**
- INDEX (100 ft)
  - INTERMEDIATE (10 ft)

Figure 3-41.



such as public fountains will be featured; they will communicate the history of the site and use the indigenous stone to create a unified design language among the park entries.

In addition, where neighborhoods exist at the edge of the park but are not served by one of the main park entries (where pedestrian connections or trails link surrounding neighborhoods directly to the park, for example), small-scale entry nodes would provide amenities, such as playgrounds or spray pads, for the neighborhood.

## Public Art

Based on the discussions of public art during the BeltLine Subarea 9 master planning process, Westside Reservoir Park focuses on three levels of public art: major projects, minor projects at public plazas, and temporary installations which can be located throughout the park without permanent infrastructure.

Major public art has been proposed in three locations within the park; major art is anticipated to be significant pieces of art that directly engage the site and its features. Proposals have been recommended for locations west of the quarry, where earthen landforms will interact both with the sweeping meadows that wrap the reservoir and with the reservoir itself; here, public art will, potentially, speak to the history of the quarry and the ways in which humankind shapes the land. Toward the eastern edge of the quarry, the master plan proposes another major public art project; this location was selected as it will provide a viewpoint of the meadows and the rock faces on the opposite side of the reservoir. The existing vegetation will create natural framing and backdrops for the art. If created with height, it may also become an iconic landmark for the park, for those visitors coming from the south, particularly from the Bankhead MARTA Station. The third location is on the north side of the quarry where it would be framed by the vegetated slope. This would be in a location that may be seen from select areas around the park, particularly from the southern rim of the quarry. It is anticipated that the major interventions would be permanent art pieces.

At each of the main park entrances, it is recommended that the “gateway” to the park be designed as public art with installations that enhance the gateway and use language that reflects the character of the surrounding neighborhood. These, too, can become iconic way-finding elements of the park. There are four main entries to Westside Reservoir Park; these installations



Figure 3-42. Gateway as Public Art



Figure 3-43. Public Art



Figure 3-44. Landform as Public Art

should be considered permanent.

Throughout the park, temporary installations can be located as funding, interest, and inspiration occurs. Potential sites for these may be at overlooks and picnic pavilions, at main park entries, parking areas, and along trails. Before art or sculptural pieces have been commissioned and installed, large boulders or granite pieces, removed from the quarry site, can be temporarily installed in the proposed intervention locations.

Additional opportunities for public art exist within the future detailed design and implementation of park elements and facilities. Park elements may be designed so as to reflect the work of local craftsman or artists, these may include site furnishings, signage, paving materials, etc. See Figure 3-48, on the following page.

## Georgia Power Transmission Corridors

In the Final Master Plan, the transmission corridors have limited program including low-impact, parking, community gardens, nature study and bird watching areas, and trails. In the future, as new needs arise in the recreation community, these areas may receive additional programming or remain as natural, undeveloped landscape.

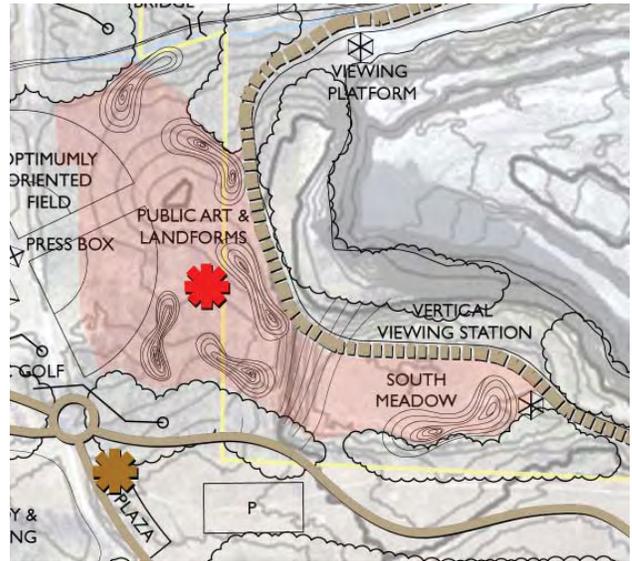


Figure 3-45. Major Art Installation Site 1

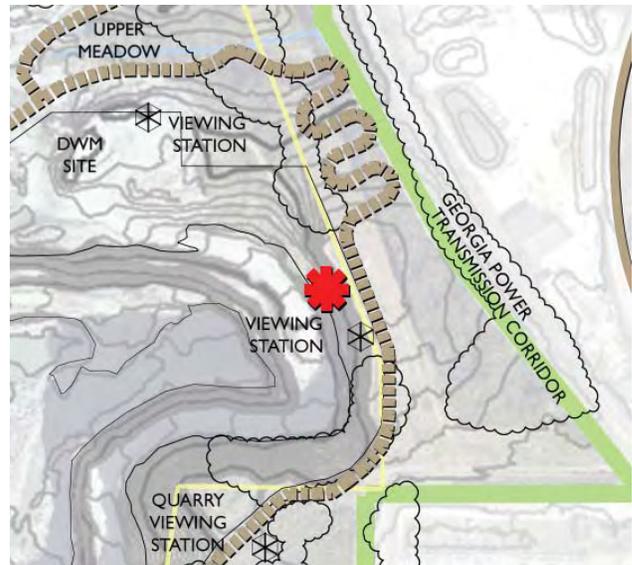
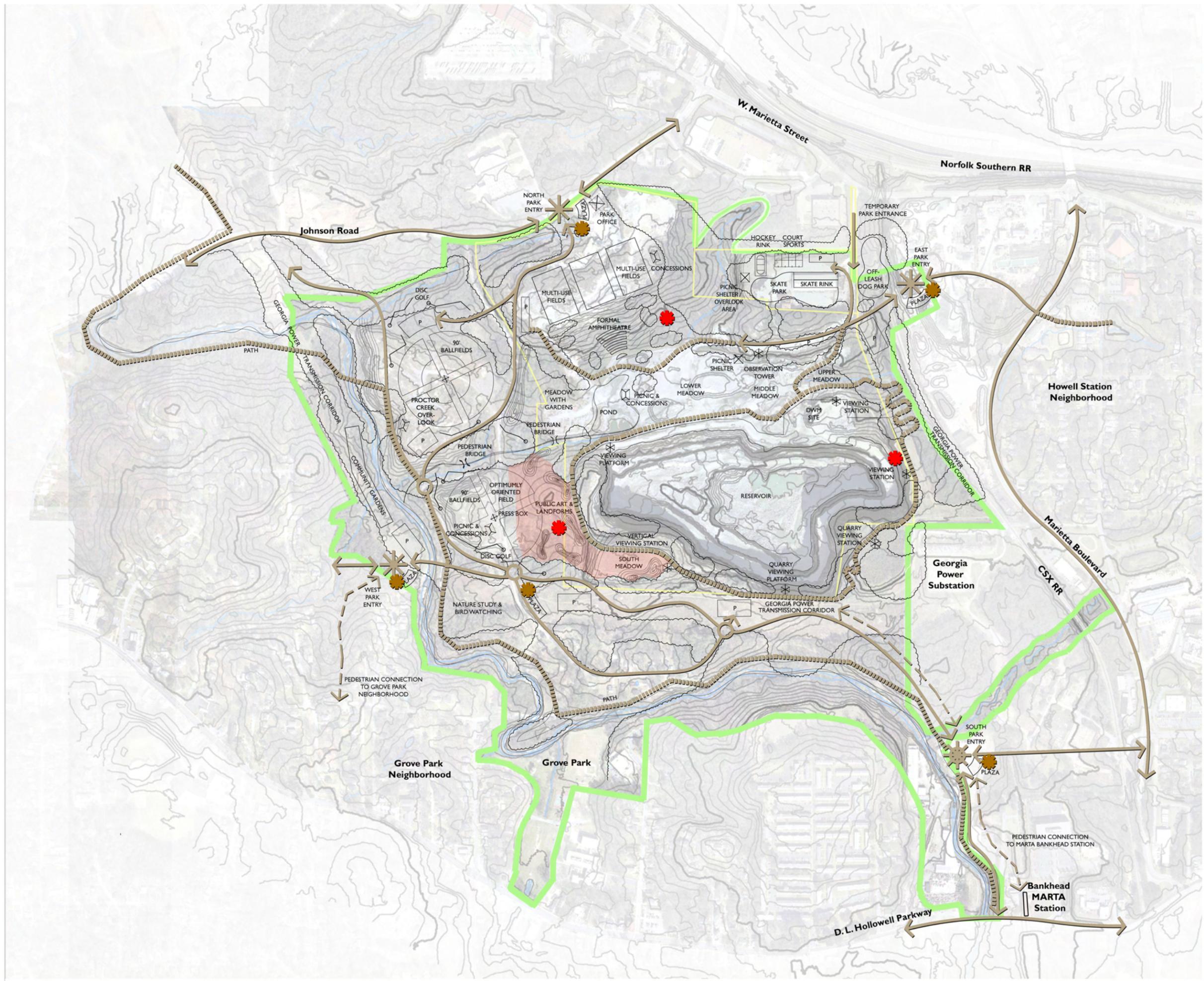


Figure 3-46. Major Art Installation Site 2



Figure 3-47. Major Art Installation Site 3



**Beltline Subarea 9:  
WESTSIDE  
RESERVOIR PARK**

**Public Art & Cultural Opportunities**

- Legend**
- Current City Land Ownership
  - Potential Additional Parkland
  - Stream
  - Park Entry
  - Parking
  - Service Access with Pedestrian Hiking, Biking & Blading Trail
  - Vehicular Access with Separated Pedestrian Trail
  - DWM Exclusion Zone

- Potential Art Interventions**
- Major Public Art (MA)
  - Public Art and Plaza (PA) (Minor)

- CONTOURS**
- INDEX (100 ft)
  - INTERMEDIATE (10 ft)

Figure 3-48.



## Site Structures & Amenities

There are a variety of site structures proposed for Westside Reservoir Park. A collection of picnic pavilions/shelters, concessions, and comfort stations are proposed for locations of a particular scenic character, and adjacent to fields and elements anticipated to have high levels of use, such as the multi-use and baseball fields. These structures may include any combination of open air pavilions with tables for picnicking; they may also include restrooms, food concessions, or grilling stations.

Overlook structures ring the quarry's rim. It is intended that there are two or three different types of overlooks: vertical overlooks such as ferris wheels or climbing towers; cantilevered overlooks which allow for a close look into the reservoir; or, any other style of viewing station that allows park visitors a different perspective of the park and its resources.

The pedestrian bridges should be sized and designed so that they are not intrusive within the park, yet become an aesthetic element. They should accommodate the peak flows of the stream which runs beneath and, at a minimum, permit maintenance vehicles (mowers, gators) to cross without conflicting with pedestrians and bikers.

These proposed amenities are associated with varying levels of cost and maintenance. Site structures like picnic shelters will likely be provided in the initial design of the park. Other elements that exceed funding levels currently in place for the park would not get incorporated until funding levels are increased; these include comfort stations and, with private sector partnerships, the observation tower or ferris wheel.

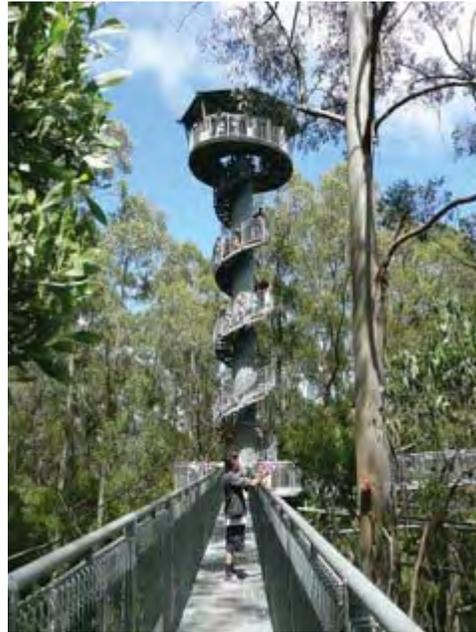


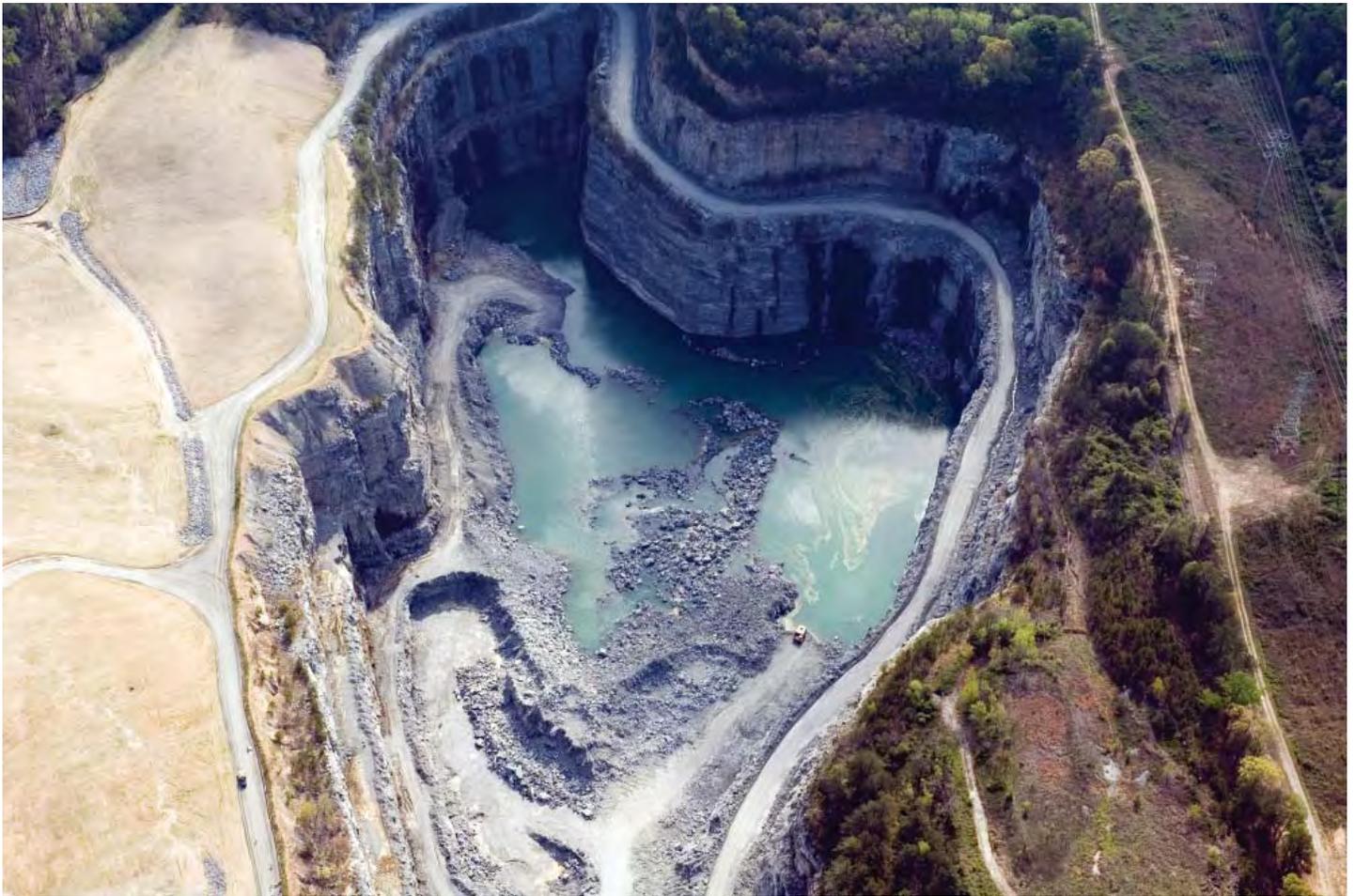
Figure 3-49. Observation Tower



Figure 3-50. Pedestrian Bridge



Figure 3-51. Picnic Shelter



View of the Quarry

November 4, 2008

# Section 4 Maintenance & Operational Planning

## 4.1 Maintenance & Operations Issues

The following section organizes the operational issues that are necessary to consider once the park program elements have been implemented on the site. The information has been broken down in several methods in order to best reflect the anticipated efforts. Not included in this discussion is the infrastructure designed necessary to support the DWM's raw water storage facility, or program elements which may eventually be included in the Georgia Power transmission corridors, other than what is included in the master plan.

### Master Plan Maintenance Quantity Take-offs (approximate)

Acres of athletic field turf	=	22.2 ac
Acres of meadow landscape	=	30.0 ac
Acres of non-athletic field turf	=	38.0 ac
Acres of pond	=	2.1 ac
Acres of parking (assume bituminous concrete)	=	5.0 ac
Acres of court sports (bituminous concrete with acrylic surfacing)	=	2.8 ac
Acres of woodlands	=	110.0 ac
Acres of landform art	=	3.7 ac
Miles of walking/hiking trail	=	4.8 mi
Assume 2.8 mi of natural surface trail		
Assume 1.4 mi of paved trail		
Additional 0.6 paved exercise course		
Miles of mountain biking trail	=	3.3 mi
Assume 2.3 mi of natural surface trail		
Assume 1.0 mi of armored trail		
Miles of paved service road/striped trail	=	2.0 mi
Reservoir ring road	=	1.4 mi*
Miles of Silver Comet Connector Trail	=	2.2 mi
Miles of park roadway within park bounds (2 traffic circles)	=	0.3 mi

Quantity of structures	=	22
Vehicular bridge	=	1
Pedestrian bridges	=	2
Picnic pavilions or concessions	=	4
Press box	=	2
Entry comfort station/recreation center	=	5
Overlook structures	=	7
Park maintenance/storage/office	=	1

\* Likely to be maintained by DWM.

## 4.2 Projected Basic Operations Investment

The three charts on the following pages define the level of maintenance associated with proposed program elements as well as the approximate acreage of each. Figure 4-1 defines the levels of maintenance for the park. Figure 4-2 designates priority maintenance areas for the master plan. The final chart, Figure 4-3, will be useful as the design process advances to ensure an ongoing understanding of maintenance and operation costs associated with proposed facilities.

Figure 4-1. Westside Reservoir Park Maintenance Zones

MAINTENANCE ZONES	MAINTENANCE DESCRIPTION
1 HIGH	High maintenance landscape will include those areas where public health and safety are most likely compromised by poor upkeep of infrastructure, including the athletic fields and irrigation systems, playgrounds and walkways, hiking and mountain bike trails. Park entrance and plaza areas, as well as the public art landforms should receive high maintenance efforts as well.
2 MEDIUM	Medium maintenance would apply to turf areas requiring just weekly mowing, and paved surfaces. The same level of effort should be applied to general landscape areas along major roadways and walkways, around the pond and in small informal gathering areas, such as at picnic areas.
3 LOW	Low levels of landscape maintenance are appropriate for the meadow areas where plants have been selected for drought tolerance and durability. Low maintenance areas are limited to peripheral areas where there is little pedestrian traffic, and in less visible areas between actively used parts of the park and naturalized areas.

Figure 4-2. Master Plan Priority Areas

PRIORITY AREAS		MAINTENANCE ZONES	AREA	UNIT
1	PARK ENTRY PLAZAS & FACILITIES	HIGH	5 TO 8	AC
2	MEADOWS, POND & AMPHITHEATRE	MEDIUM	33	AC
3	BASEBALL FIELDS	HIGH	17	AC
4	MULTI-USE RECTILINEAR FIELDS	HIGH	8	AC
5	HOLOPHRASTIC SITE	HIGH, MEDIUM	14	AC
6	TRAIL NETWORK	HIGH	12	MILES
7	FIELD SURROUNDS, DISC GOLF & DOG PARK	MEDIUM	38	AC
8	PARK STRUCTURES	MEDIUM	22	QTY
9	BOTANICAL AREA & LANDFORM ART	HIGH	9.5	AC

## 4.3 Maintenance Planning

On the following pages, the significant park program elements are listed with a summary of recommended maintenance operations. The lists include tasks which need to be completed on a daily, monthly, seasonal or annual basis, as well as those items which need to be regularly monitored, such as graffiti and litter removal. Following these lists is a series of specifications tailored for the master plan of Westside Reservoir Park. While master plan-level studies do not typically analyze maintenance implications to this level of detail, early consideration is recommended to ensure design direction is balanced with realistic short and long term maintenance planning decisions. See Appendix G for detailed Maintenance Specifications.

### 90-Foot Tournament-quality Baseball Diamonds

- Provide inspections of fields pre-season, mid-season and pre-tournament/championship events (3 times yearly, minimum). Provide required maintenance as determined by inspections on each element of field.
- Monitor moisture conditions of irrigation system weekly and repair any deficiencies
- Repair skinned areas and bases to provide safe running surfaces
- Maintain regular mowing and maintenance schedule for turf. Repair and/or replace worn turf areas
- Repair and/or replace damaged fencing caps, posts, fencing mesh, backstop bounce boards, trash receptacles, bike racks and dugout seating
- Monitor and maintain full coverage lighting on fields, replace burnt out light bulbs and replace missing or loose padding at all poles
- Maintain chalk foul lines, batters boxes and other playfield demarcations
- Monitor condition of all site furniture to include benches, trash receptacles, water fountains, and signage. Repair, re-paint or replace damaged site furniture.
- Treat any graffiti within twenty-four hours of discovery
- Provide annual clean-up and daily trash removal
- Provide continued plant maintenance to include mulching, weeding, fertilizing, tree pruning and removal of damaged or diseased plant material

### Multi-use Rectilinear Fields

- Monitor moisture conditions of irrigation system weekly and repair any deficiencies
- Maintain regular mowing and maintenance schedule for turf. Repair and/or replace worn turf areas (natural or synthetic turf)
- Repair and/or replace damaged goal posts, netting, and fencing.
- Monitor and maintain full coverage lighting on fields, replace burnt out light bulbs and replace missing or loose padding at all poles
- Maintain sprayed playfield demarcation lines
- Monitor condition of all site furniture to include benches, trash receptacles, water fountains, bike racks, and signage. Repair, re-paint or replace damaged site furniture.
- Treat any graffiti within twenty-four hours of discovery
- Provide annual clean-up and daily trash removal. Provide continued plant maintenance to include mulching, weeding, fertilizing, tree pruning and removal of damaged or diseased plant material

### Artificial Turf playing Fields (as applicable)

- Groom turf to upright turf 'blades'
- Sweep to remove debris as required - typically once per month
- Top-dress rubber in-fill annually, or as required
- Inspect and clean sub-drain system
- Clean, repair or replace perimeter edging as necessary

### Street Hockey Rink (exterior)

- Repair, re-paint and/or replace damaged backboards, fencing and goal posts/netting.
- Power-wash play surface twice per year and repair any cracks in pavement.
- Monitor and maintain full coverage lighting, replace burnt out light bulbs and replace missing or loose padding at all poles
- Re-paint chipped, worn, cracked or missing court demarcation lines
- Monitor condition of all site furniture to include benches, trash receptacles, water fountains, bike racks, and signage. Repair, re-paint or replace damaged site furniture.
- Treat any graffiti within twenty-four hours of discovery
- Provide annual clean-up and daily trash removal





### Basketball Courts

- Repair and/or replace damaged posts, netting, and fencing
- Power-wash pavement surface twice a year and repair any cracks in pavement
- Monitor and maintain full coverage lighting on courts, replace burnt out light bulbs and replace missing or loose padding at all poles
- Re-paint chipped, worn, cracked or missing court demarcation lines
- Monitor condition of all site furniture to include benches, trash receptacles, water fountains, bike racks, and signage. Repair, re-paint or replace damaged site furniture.
- Treat any graffiti within twenty-four hours of discovery
- Provide annual clean-up and daily trash removal

### Meadows

- Provide watering during establishment period
- Provide low-frequency mowing, aeration of soil, disease & pest control, and re-seeding/sprigging in any worn or bare areas
- Monitor condition of all site furniture to include benches, trash receptacles, water fountains, bike racks, and signage. Repair, re-paint or replace damaged site furniture
- Inspect skate park features (copings, rails, etc.) and repair as necessary
- Treat any graffiti on site furniture within twenty-four hours of discovery
- Inspect for broken glass, granular material and other debris on park features and remove
- Provide annual clean-up and daily trash removal

### Exterior Skate Park & Rink

- Repair any cracks in pavement
- Monitor and maintain full coverage lighting on park, replace burnt out light bulbs and replace missing or loose padding at all poles
- Power-wash pavement surface and concrete structures twice a year and repair any cracks
- Re-paint chipped, worn, cracked or missing rink demarcation lines
- Monitor condition of all site furniture to include benches, trash receptacles, water fountains, bike racks, and signage. Repair, re-paint or replace damaged site furniture.
- Treat any graffiti within twenty-four hours of discovery
- Provide annual clean-up and daily trash removal

### Amphitheatre

- Provide watering during establishment period
- Provide low-frequency mowing, aeration of soil, weed control, fertilizing, disease & pest control, and re-seeding in any worn or bare areas
- Power-wash stone walls once a year, remove any staining or efflorescence, make any necessary repairs to stone and/or mortar
- Monitor condition of all site furniture to include benches, trash receptacles, water fountains, bike racks, and signage. Repair, re-paint or replace damaged site furniture.
- Treat any graffiti on site furniture within 24 hours of discovery
- Provide annual clean-up and daily trash removal

### Neighborhood Playgrounds

- Maintain regular mowing and maintenance schedule for lawn areas. Repair and/or replace worn lawn areas
- Inspect play structures for damaged or worn equipment and components
- Power-wash play equipment decking if necessary, repair, re-paint and/or replace damaged components
- Power-wash safety surfacing twice per year, repair or replace surfacing where necessary to maintain safe, consistent surface
- Power-wash curb twice per year, repair and/or replace damaged pieces
- Monitor condition of all site furniture to include benches, trash receptacles, water fountains, bike racks, and signage. Repair, re-paint or replace damaged site furniture.
- Treat any graffiti within twenty-four hours of discovery
- Provide annual clean-up and daily trash removal
- Provide continued plant maintenance to include mulching, weeding, fertilizing, tree pruning and removal of damaged or diseased plant material

### Disc Golf Course

- Maintain regular mowing and maintenance schedule for turf. Provide aeration of soil, weed control, fertilizing, disease & pest control, and re-seeding in any worn or bare areas
- Repair and/or replace damaged goal posts, netting, and fencing.
- Monitor and maintain full coverage lighting on fields, replace burnt out light bulbs and replace missing or loose padding at all poles
- Maintain sprayed playfield demarcation lines
- Monitor condition of all site furniture to include benches, trash receptacles, water fountains,

bike racks, and signage. Repair, re-paint or replace damaged site furniture.

- Treat any graffiti within twenty-four hours of discovery
- Provide annual clean-up and daily trash removal

#### Parking Lots

- Street sweep driveways and parking areas regularly
- Power-wash pavement, drainage grates and curbing as necessary after special events resulting in excessive soiling/staining, repair and/or seal any cracks in pavement.
- Flush all debris and residue from drainage structures yearly.
- Monitor and maintain full coverage lighting, replace burnt out light bulbs.
- Re-paint any worn or missing pavement striping.
- Monitor condition of all site furniture to include benches, trash receptacles, water fountains, bike racks, and signage. Repair, re-paint or replace damaged site furniture.
- Treat any graffiti within twenty-four hours of discovery
- Provide annual clean-out of catch basin sumps and other drainage structures and daily trash removal
- Monitor condition of sign and pavement markings, replace and re-stripe as necessary
- Provide continued plant maintenance to include mulching, weeding, fertilizing, tree pruning and removal of damaged or diseased plant material

#### Off-leash Dog Park

- Maintain regular mowing and maintenance schedule for turf. Provide aeration of soil, weed control, fertilizing, disease & pest control, and re-seeding in any worn or bare areas
- Monitor condition of fencing and gates; repair/replace as necessary
- Monitor mulch or granular aggregate levels and top up as necessary
- Monitor condition of all site furniture to include benches, trash receptacles, poop n' scoop stations, water fountains, bike racks, fencing, and signage. Repair, re-paint or replace damaged site furniture.
- Treat any graffiti within twenty-four hours of discovery
- Assist with annual clean-up and daily trash removal
- Provide continued plant maintenance to include mulching, weeding, fertilizing, tree pruning and removal of damaged or diseased plant material

#### Mountain Bike Trails

- Continually monitor condition of trails and make necessary repairs to trail surfaces, armoring and rock placement to prevent landslides, rock movement, and erosion
- Repair and/or replace damaged or shifted edge restraints
- Provide continued plant maintenance to prevent underbrush and/or tree limbs from entering into trail zone, remove any fallen plant material that would create a hazard
- Provide annual clean-up and daily trash removal
- Repair, re-paint or replace damaged or missing trail signage

#### Paved Trails/Service Roads

- Weekly monitoring of trail condition; make necessary repairs to pavement surfaces, armoring, railings, bollards, gates, etc.
- Power-wash pavement as necessary following special events resulting in excessive staining or soiling, repair and/or replace cracked or damaged pavement
- Provide continued plant maintenance to prevent underbrush and/or tree limbs from entering into trail zone, remove any fallen plant material that would create a hazard
- Provide annual clean-up and daily trash removal
- Repair, re-paint or replace damaged or missing trail signage
- Clean-out, repair or replace culverts, catch basin or other drainage structures

#### Hiking Trails

- Weekly monitoring of trail conditions; make necessary repairs to trail surfaces, armoring and rock placement to prevent landslides, rock movement and erosion
- Repair and/or replace damaged or shifted edge restraints
- Provide continued plant maintenance to prevent underbrush and/or tree limbs from entering into trail zone, remove any fallen plant material that would create a hazard
- Provide annual clean-up and daily trash removal
- Repair, re-paint or replace damaged or missing trail signage
- Clean-out, repair or replace culverts, catch basin or other drainage structures

### Community Gardens

- Maintain regular mowing and maintenance schedule for lawn areas. Repair and/or replace worn lawn areas
- Monitor condition of all site furniture to include benches, trash receptacles, water fountains, bike racks, and signage. Repair, re-paint or replace damaged site furniture.
- Treat any graffiti within 24 hours of discovery.
- Assist with annual clean-up and daily trash removal

### Landform Art

- Maintain regular, high-frequency mowing and trimming to create and maintain all designated landforms. Provide aeration of soil, weed control, fertilizing, disease & pest control, and re-seeding in any worn or bare areas
- Monitor and maintain irrigation to ensure all heads are working and spray range is on turf only (no over spray or wasted water)
- Monitor condition of all site furniture to include benches, trash receptacles, water fountains, bike racks, and signage. Repair, re-paint or replace damaged site furniture.
- Treat any graffiti within 24 hours of discovery
- Clean-out, repair or replace culverts, catch basin or other drainage structures
- Provide annual clean-up and daily trash removal

### Pond & Streams

- Provide seasonal inspection of water quality
- Monitor and maintain mechanical aeration or circulation systems
- Identify and remove invasive plant species
- Monitor condition of all site furniture to include benches, trash receptacles, water fountains, bike racks, and signage. Repair, re-paint or replace damaged site furniture.
- Treat any graffiti within twenty-four hours of discovery
- Provide annual clean-up and daily trash removal

### Botanical Gardens

- Maintain regular mowing and maintenance schedule for lawn areas. Repair and/or replace worn lawn areas
- Provide continued plant maintenance to include mulching, weeding, fertilizing, tree pruning and removal of damaged or diseased plant material
- Maintain plant tags for legibility and accuracy
- Monitor condition of all site furniture to include benches, trash receptacles, water fountains, bike racks, and signage. Repair, re-paint or replace damaged site furniture

- Treat any graffiti within twenty-four hours of discovery
- Provide annual clean-up and daily trash removal

### Exercise Trail

- Power-wash pavement and exercise equipment and pavement
- Monitor condition of all site furniture to include benches, trash receptacles, water fountains, bike racks, and signage. Repair, re-paint or replace damaged site furniture.
- Treat any graffiti within twenty-four hours of discovery
- Provide annual clean-up and daily trash removal
- Provide continued plant maintenance to include mulching, weeding, fertilizing, tree pruning and removal of damaged or diseased plant material
- Inspect equipment and components; repair or replace as necessary

### Park Structures

- Provide maintenance for all interior services (plumbing, HVAC, mechanical, etc.)
- Provide daily security checks, unlock/lock each building as necessary for designated events or at daily park opening/closing
- Power-wash exterior windows and siding twice per year, re-paint interior surfaces every eight years or as necessary, paint entire exterior every five years, or as needed.
- Power-wash surrounding pavement annually or as necessary, repair any cracks
- Monitor condition of all site furniture to include benches, trash receptacles, water fountains, bike racks, and signage. Repair, re-paint or replace damaged site furniture.
- Treat any graffiti within twenty-four hours of discovery
- Provide annual clean-up and daily trash removal
- Provide continued plant maintenance to include mulching, weeding, fertilizing, tree pruning and removal of damaged or diseased plant material
- Clean gutters, annually or as necessary
- Inspect roofing annually; repair as necessary

## 4.4 Equipment Requirements

### Signage

All signage pieces should follow the same general guidelines: signage should be readily visible from paths and gathering areas; should have text size that is easy to read; should be brightly colored or have high contrast graphics to increase visibility; should be well lit; and should be located at a height consistent with standard eye level (which may vary for vehicle, pedestrian, or bicycle user groups). Signage can follow a number of formats including post-mounted, kiosk style, hanging (from structures), pavement markings (paint) or pavement insets (such as tiles, stamps or metal plaques, etc.), and can be temporary (such as fabric banners or cast lights) or permanent.

Four categories of signage have been identified for use on site: maintenance, way-finding, interpretive and informational. Some are temporary (i.e. during maintenance operations, event information) while other should be posted permanently on park grounds.

#### Regulatory

- "No Admittance, Dept. of Parks & Recreation Only"
- "No Admittance, Dept. of Watershed Management"
- "Only"
- "Temporarily Closed for Maintenance"
- "Please Do Not Walk on Grass"
- "Please Do Not Feed the Waterfowl"
- "No Dogs"
- "Dogs on Leash"
- "Please Pick Up after Your Dog"
- Rules & regulations of park and specific programs or fields
- Open hours for park
- Parking limits (hourly)
- Handicap accessible parking spaces
- "No Parking"
- Park boundary markers



Figure 4-4. Interpretive Trail



Figure 4-5. Shuttle Stop Signage



Figure 4-6. Interpretive Signage



Figure 4-7. Interpretive Way-finding Signage

Informational

- Event signage
- Park entry signage (park and facility identification)
- Recycling notices
- Rules for disc golf or other sports
- Guidelines for community gardens
- Recommended circuit for exercise course

Way-finding

- Trail markers
- Trail maps
- Directional signage for park destinations
- Directional signage for parking
- Trail mileage markers
- Directional signage for public transit

Interpretive

- Cultural interpretation themes
- Botanical garden plant markers
- Interpretative markers for natural resources



Figure 4-9. Way-finding Signage



Figure 4-10. Directional Signage



Figure 4-8. Iconic Gateway Signage



Figure 4-11. Regulatory Signage

## 4.5 Resource Management

### Invasive Plants

The United States National Arboretum characterizes an invasive plant as the following: “An invasive plant has the ability to thrive and spread aggressively outside its natural range. A naturally aggressive plant may be especially invasive when it is introduced to a new habitat. An invasive species that colonizes a new area may gain an ecological edge since the insects, diseases, and foraging animals that naturally keep its growth in check in its native range are not present in its new habitat.” (<http://www.usna.usda.gov/Gardens/invasives.html>; July 2008) Because invasive plants tend to be particularly persistent on recently disturbed sites, it will be of vital importance to protect and remediate Westside Reservoir Park from invasive plants as the site develops over time.

The invasive plant list for the State of Georgia includes the following species:

*Ailanthus altissima* (Tree of Heaven); *Albizia julibrissin* (Mimosa); *Arundo donax* (Giant reed); *Commelina benghalensis* (Tropical Spiderwort); *Elaeagnus umbellata* (Autumn Olive); *Hydrilla verticillata* (Hydrilla); *Imperata cylindrical* (Cogongrass); *Lespedeza bicolor* & *Lespedeza cuneata* (Exotic Lespedezas); *Ligustrum sinense* (Chinese Privet); *Lonicera japonica* (Japanese honeysuckle); *Lygodium japonicum* (Japanese Climbing Fern); *Melia azedarach* (Chinaberry); *Microstegium vimineum* (Nepalese Broomrape); *Orobanche minor* (Small Broomrape); *Phyllostachys aurea* (Golden Bamboo); *Pueraria Montana* (Kudzu); *Salvinia molesta* (Giant Salvinia); *Solanum viarum* (Tropical Soda Apple); *Triadica sebifera* (Tallow Tree); and, *Wisteria sinensis* (Wisteria). (From the Georgia Invasive Species Task



Figure 4-12. Kudzu at the Park

Force; <http://www.gaeppc.org/weeds/>; July 2008)

Likely the most infamous of these invasive plants is Kudzu (*Pueraria montana*). Because the preferred habitat is disturbed areas and forested edges, it will be important to ensure that, after construction is complete, bare soil is immediately vegetated with a cover crop to deter the advance of kudzu. Recommended control procedures for existing infestations include removal by mechanical grubbing. With this process it is important to remove the entire plant root which may extend into soil depths of 10 feet. Alternatively, a method to control the spread of the kudzu - but not eradicate the infestation - is to cut the vines and runners near to the point of emergence at the ground. This process needs to be repeated every two weeks through the season, until first frost. Mechanical removal is most useful for early and small infestations but not large ones due to the labor intensity. Additionally, a number of chemical and herbicidal methods are available to either treat the plant stump after being cut to cause foliar dieback to reduce or eliminate photosynthesis; these techniques can be used in an effort to eradicate larger infestations. (Information from the Southeast Exotic Pest Plant Council's Invasive Plant Manual.) Additional, generalized guidelines for the control of unwanted plants have been included in the Specifications for Maintenance of Plantings and Plant Beds, Section 01140.

Chinese Privet (*Ligustrum sinense*) prefers a habitat of field and forest understory with disturbed soils and full sunlight where it can shade other species. Privet can re-sprout from the stump or roots making it difficult to eradicate and is frequently spread by wildlife eating and dispersing its seeds. Recommended control procedures include mowing once per growing season to eliminate small colonies. Another method of removal is to pull small plants by hand, removing the full root system; it is important to remove the plants before they have seeded to eliminate seed dispersal. Alternatively, a selection of herbicidal controls are available that can be utilized either on a cut stump, foliage, or as a basal application to the plant.

Poison Ivy (*Rhus radicans*) has also been identified as a problem plant on site. Although it is not listed as an invasive species for the State of Georgia, the blistering, itchy rash that it inflicts makes it enough of a nuisance to discuss eradication methods. Poison Ivy tends to colonize uncultivated sites, such as woodlands, stream banks and roadsides; its rootlets can climb vertically as well as spread horizontally. The simplest method of Poison Ivy control is hand pulling or cutting the vine, but this method required pulling the root out

in its entirety or treating the remnant vegetation and re-growth with an herbicide. (<http://ohioline.osu.edu/hyg-fact/1000/1015.html>; January 2009)

## Annual Planting Program

Considering the vast acreage of Westside Reservoir Park, and the proposed phasing plan that will likely take between twelve to twenty years to complete, it is recommended that the implementation plan of Westside Reservoir Park include a long term planting program. A program of annually budgeted tree planting will, in addition to spreading out the resources required for re-vegetating wooded areas of the site over a number of years, also yield a tree population of more varied ages. The program will also ensure that trees lost by development are replaced and allow for complimentary plantings to reinforce future design initiatives and place-making. Ample shade on site will benefit not only visitors to the park but also the climate of Atlanta's metro region. An annual tree planting program can be implemented while maintaining the more than 100 acres of planned open space.

This planting program recommends that each year, independent of the on-going phased development, 350 deciduous trees (1½" – 2½" caliper minimum) and 150 evergreen trees (4 to 6 foot height minimum) be planted. This allows for approximately five (5) trees per acre per year be planted throughout the park's 110 wooded acres in an effort to replace unexpected tree mortality, as well as tree removal planned as a part of standard forest management strategies (for development of ecosystem diversity). Selected tree species should be native and naturalized species. Additional detailed guidelines for the planting program have been included in the Specifications for Maintenance of Plantings and Plant Beds, Section 01140.

## Sustainable Landscapes

Westside Reservoir Park is an amazing example of the natural environments within the City of Atlanta, and the park master plan has been designed to emphasize and enhance the existing resources while also integrating them into a park program of active and passive activity. As the plan is further developed and implemented over the coming years, the natural environment will become an even more precious commodity. A conscious effort to ensure that the park be created with a sustainable approach, in an effort to protect the park's environment and the community, is paramount. Potential strategies include: creating conservation zones within the park in an effort to minimize excess loss of existing woodland;

working to reduce pressure from the community to increase parking on site at the expense of vegetated landscape; increasing trail network and transit networks; maintaining water quality in the man-made pond through best management practices; considering composting of plant waste from maintenance and the community garden; and implementing a systemic recycling program throughout the park.

On-site soils need to be improved to ensure the ability to grow turf, trees, shrubs, etc. and to provide moisture retention capacity, reduce erosion control and siltation. Soils disturbed during the reclamation and decommissioning process should be analyzed and amended with necessary nutrients to create an organic topsoil layer. This process may take a few growing seasons before a topsoil that can support the planting plans is established (i.e. build up of soils over a few years before completing final grading and seeding).

For additional guidelines, see the Sustainable Landscape Guidelines included in Appendix D.

## 4.6 Long-Term Planning

### Revenue Generation

The following chart presents a series of potential revenue generators, utilizing the proposed park program elements. Suggested revenue generators have been listed and then further defined by: type of occurrence; how the events or activities are oriented (whether the programs are focused on sports and exercise, park resources, culture, or fall into a miscellaneous category); and frequency of occurrence. (Frequency of occurrence may be defined as whether the program would likely be a one-time or annual event; a continual event such as an on-going class; or revolving - meaning that the program could be organized at most anytime but not as a continual program.)

The next category defines participation of the three parties likely involved in some effort: ABI, DPRCA or a private party. This presumes that ABI's initial investment may only be as a part of the planning and development process. DPRCA will likely have a role in the coordination and organization of a program, as well as scheduling/permitting for fields and venues, depending upon the program. Private entities may be responsible for a level of event coordination and/or management.

The final category suggests which parties may receive a portion of revenue share.

**Figure 4-12.**  
**Westside Reservoir Park Potential Revenue Generators**

Description	Type of event				Occurrence			Party Involvement			Revenue
	Sports/Exercise Oriented	Resource Oriented	Culture Oriented	Miscellaneous	One-time or annual	Continual	Revolving	ABI	Atlanta Parks & Recreation	Private Entity	Revenue sharing?
Baseball tournament with team entry fees and/or field rental fees	X	X			X			Initial	Permitting &/or Set-up	Set-up &/or Management	ABI/Parks & Rec/ Private
Baseball training camps	X	X			X			Initial	Permitting &/or Set-up	Set-up &/or Management	ABI/Parks & Rec/ Private
Soccer, football, field hockey, rugby, lacrosse training camps on multi-use fields	X	X			X			Initial	Permitting &/or Set-up	Set-up &/or Management	ABI/Parks & Rec/ Private
Mountain bike course races	X	X			X			Initial	Permitting &/or Set-up	Set-up &/or Management	ABI/Parks & Rec/ Private
5k Trail Run/Walks	X				X			Initial	Permitting &/or Set-up	Set-up &/or Management	ABI/Parks & Rec/ Private
Programmed classes with associated fees organized by outside groups	X				X	X				Set-up &/or Management	Parks & Rec/ Private
Organized exercise courses for seniors on exercise course with programming fees	X					X				Set-up &/or Management	Parks & Rec/ Private
Tai chi/yoga on the meadow	X	X				X			Permitting &/or Set-up	Set-up &/or Management	Parks & Rec/ Private
Organized hikes through local nature conservancy; theme-oriented (birding, wildlife, natural resources; age appropriate 2-92)	X	X			X		X		Permitting &/or Set-up	Set-up &/or Management	Parks & Rec/ Private
Films on the green/meadows		X	X		X	X	X	Initial	Permitting &/or Set-up	Set-up &/or Management	ABI/Parks & Rec/ Private
Amphitheatre events/concerts/plays with ticketing		X	X		X	X	X	Initial	Permitting &/or Set-up	Set-up &/or Management	ABI/Parks & Rec/ Private
Festivals on the green with booth (for sales or display) rental		X			X	X	X	Initial	Permitting &/or Set-up	Set-up &/or Management	ABI/Parks & Rec/ Private
Wedding/party permits		X		X		X	X	Initial	Permitting &/or Set-up	Set-up &/or Management	ABI/Parks & Rec/ Private
Boat rentals on the pond	X	X				X		Initial	Permitting &/or Set-up	Set-up &/or Management	ABI/Parks & Rec/ Private
Grilling permits for picnic pavilions		X	X	X		X		Initial	Permitting &/or Set-up	Set-up &/or Management	ABI/Parks & Rec/ Private
Boy scout/girl scout camp outs on meadow		X	X		X				Permitting &/or Set-up	Set-up &/or Management	Parks & Rec/ Private
Farmer's market with booth rental				X		X	X		Permitting &/or Set-up	Set-up &/or Management	Parks & Rec/ Private
Concessions collections – percentage of sold concessions for special event or flat fee for concession stand rental during event			X	X		X	X			Set-up &/or Management	Parks & Rec/ Private
Paid parking for events				X		X	X			Set-up &/or Management	Parks & Rec/ Private



# Section 5 Park Development Planning

## 5.1 Park Development Phasing & Cost Estimate

### Park Development Phasing

For Westside Reservoir Park, it is proposed that the master plan be constructed over five phases as funds become available, as defined further on. The phasing does not include any of the work directly related to the reservoir, as it is assumed that this will be completed by the Department of Watershed Management.

Phasing was determined based on the understanding that the Holophrastic site would be the first area to be developed. This parcel allows for easy access into the park without an initial investment in infrastructure, such as roads and utilities. The second phase will also focus on park areas where large investments in infrastructure will not be necessary, and will extend from the Holophrastic site into the park and around the reservoir, where passive recreation is focused. The later phases focus on program elements that are more dispersed throughout the park site, and require a greater investment of infrastructure and additional land acquisitions. The restoration of Proctor Creek has been included in this report as Phase 5; however, because of its nature, the work associated with Proctor Creek can be implemented independent of other phases.

### Master Plan Cost Estimate

Estimated construction costs for the master plan are included for 'order of magnitude' budgeting purposes. These estimates were prepared in July of 2008 and it is assumed that each successive year may bring increases in both material and labor costs for the items, typically estimated to be 5% annually. To account for unknown site constraints which may present themselves during the construction process, a 20% contingency has been added. Also, a 20% design contingency has been included.

In order to develop the cost estimates, certain assumptions were made. Material quantities were based on a typical layout of program, such as athletic fields, but may vary greatly based on actual existing conditions. Costs for each of the site elements were prepared with the assumption that work will be completed by outside contractors, not City staff or equipment. The involvement of City resources would reduce the overall costs. As Westside Reservoir Park continues to move through the design process and projects are further defined and detailed, and specific site constraints and program needs are better understood, ongoing detailed cost estimates should be prepared.

Cost estimates for each development phase follow; a summary estimate is located at Figure 5-5.

# Phase 1

Holophrastic Site, Dog Park & Temporary Park Entry:  
 The intent of ABI is to have approximately fourteen acres - including the Holophrastic site - open to the public as park space by the end of 2010. This phase includes the skate park and skate rink, street hockey court, basketball courts, a picnic pavilion and overlook, and a parking lot. The area will be overlaid with the proposed exercise course (some of the course is located off of the Holophrastic site). This area will be served by a temporary park entrance from West Marietta Street. It is anticipated that this site will be lighted. Also, included in this phase will be the off-leash dog park with associated parking within the transmission corridor. See Figure 5-1 for extents of Phase 1.

Phase 1 Cost Estimate	
Site Preparation and Demolition	\$ 48,000
Roadways and Parking	\$ 42,000
Four Basketball Courts	\$ 280,000
Hockey Rink	\$ 152,000
Skate Rink	\$ 250,000
Skate Park	\$ 1,000,000
Dog Park	\$ 30,000
Picnic Shelter	\$ 200,000
Exercise Course	\$ 22,000
Lighting & Electrical	\$ 250,000
Fencing	\$ 310,000
Miscellaneous - signage, benches, trash receptacles etc.	\$ 34,000
Plantings	\$ 50,000
Miscellaneous Landscaping - seeding, etc.	\$ 15,000
<b>Subtotal</b>	<b>\$ 2,683,000</b>
20% Design and Construction Contingency	\$ 536,000
20% Design Fees	\$ 644,000
<b>Total</b>	<b>\$3,863,000</b>

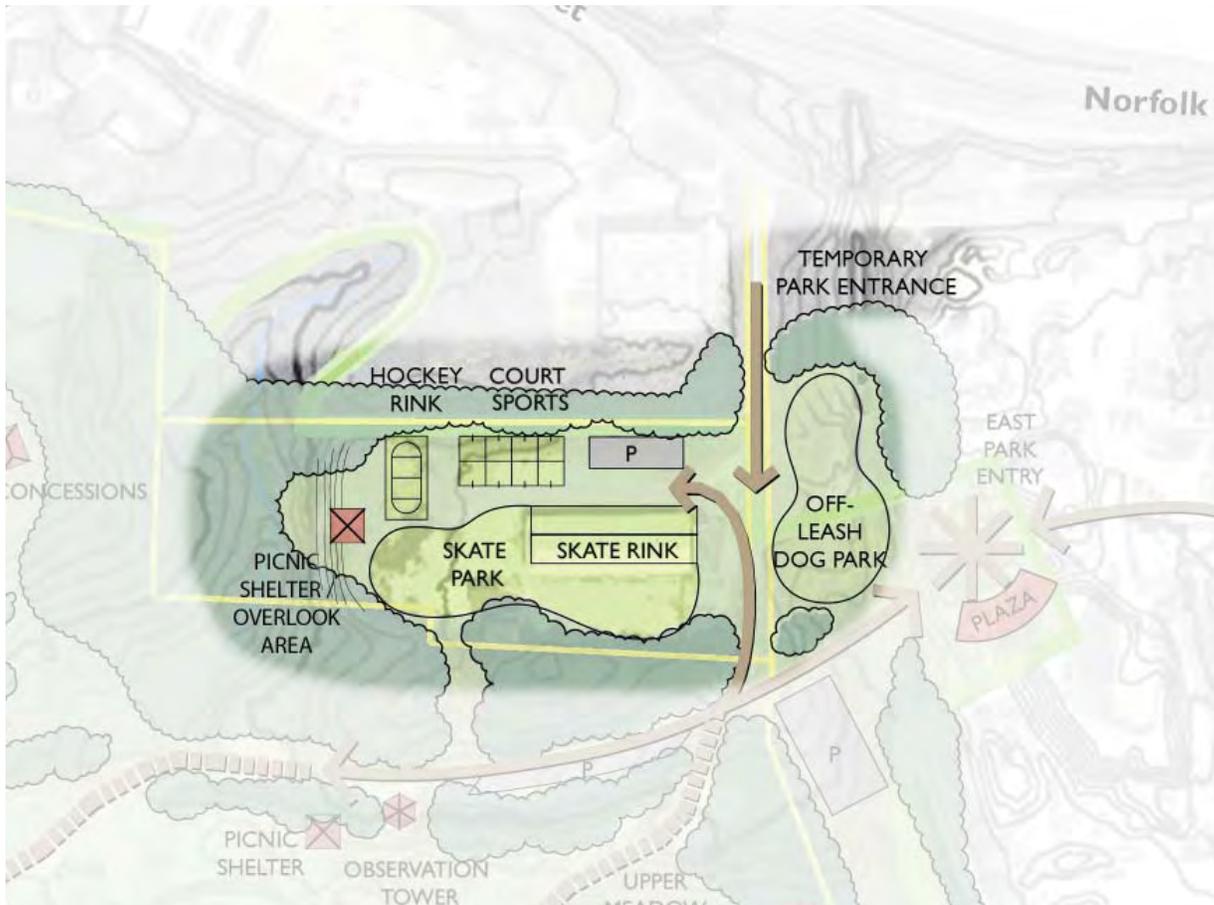


Figure 5-1. Westside Reservoir Park Construction Phase 1 (Not to scale)

## Phase 2

### Meadows and East Park Entry:

Phase Two should include the grading and seeding of the meadows, the pond on the north and west side of the reservoir (not including the landform art), and the main park entry associated with this area. (The park entry at this location will require acquisition property not currently under ABI ownership, as well as a railroad crossing bridge; these will factor into the cost and, potentially, the timing of implementing this phase.) Site infrastructure included in this phase would include two picnic pavilions within the meadows (one on the pond), the pedestrian bridge over the stream within the meadows, the parking, and the roadway just north of the meadows. See Figure 5-2 for extents of Phase 2.

### Phase 2 Cost Estimate

Site Preparation and Demolition	\$ 250,000
Roadways and Parking	\$ 309,000
Biking and Hiking Trails	\$ 42,000
Pond	\$ 300,000
Grading	\$ 125,000
Erosion Control	\$ 150,000
Soil Amendments	\$ 30,000
Park Entry - gateway, plaza, community building, play area, etc.	\$ 475,000
Picnic Shelters/Concessions (2)	\$ 400,000
Pedestrian Bridge	\$ 15,000
Miscellaneous - signage, benches, trash receptacles, etc.	\$ 75,000
Plantings	\$ 50,000
Loaming and Seeding of Meadow	\$ 250,000
<b>Subtotal</b>	<b>\$ 2,471,000</b>
20% Design and Construction Contingency	\$ 494,000
20% Design Fees	\$ 593,000

**Total \$ 3,558,000**



Figure 5-2. Westside Reservoir Park Construction Phase 2 (Not to scale)

## Phase 3

### Athletic Fields & Amphitheatre:

Phase Three of development will focus on the north and west portions of the park. The seven tournament quality baseball fields will be constructed, along with the two multi-use rectilinear fields, the disc golf course, and the amphitheatre on the slope above the meadows. Infrastructure associated with this phase should include the north and west main park entries, the north-south roadway (with bike and pedestrian lanes) which traverses the site, the service road/paved trail that connects the east park entrance to the north entrance, and the associated parking areas. Site structures include the park office at Johnson Road, the press boxes at the ballfields, and concessions and picnic shelters overlooking the amphitheatre, at the baseball quad overlooking Proctor Creek, and adjacent to the rectilinear fields. See Figure 5-3 for extents of Phase 3.



Figure 5-3. Westside Reservoir Park Construction Phase 3 (Not to scale)

<b>Phase 3 Cost Estimate</b>	
Site Preparation and Demolition	\$ 250,000
Roadways and Parking	\$ 1,200,000
Biking and Hiking Trails	\$ 100,000
Park Entries (2) - gateway, plaza, community building, play area, etc.	\$ 950,000
Vehicular Bridge	\$ 500,000
Picnic Shelters/Concessions (3)	\$ 600,000
Press Boxes (2)	\$ 450,000
Tournament Quality Baseball Fields (7)	\$ 3,245,000
Natural Turf Multi-use Fields (3)	\$ 750,000
Synthetic Turf Multi-use Fields (3) - Additional cost	\$ 2,250,000
Disc Golf Course	\$ 190,000
Pedestrian Bridge	\$ 15,000
Miscellaneous - signage, benches, trash receptacles, etc.	\$ 125,000
Plantings	\$ 400,000
Loaming and Seeding of Non-field Areas	\$ 400,000
Electrical and Water Services	\$ 250,000
Grading of Non-field areas	\$ 75,000
Site Lighting	\$ 250,000
<b>Subtotal</b>	<b>\$12,000,000</b>
20% Design and Construction Contingency	\$ 2,400,000
20% Design Fees	\$ 2,880,000
<b>Total</b>	<b>\$17,280,000</b>

## Phase 4

### Final Program Elements in Master Plan:

The remainder of the program elements are included in the fourth phase. This is comprised of the landform art within the meadows, the community gardens within the western transmission corridor, the overlook

areas and public art interventions around the reservoir, interpretive elements throughout the park, and the wildlife viewing areas such as the nature study and bird watching area in the southern transmission corridor. Infrastructure completion includes continuation of the park road from the traffic circle near the west entry to – and including – the south park entry near the Bankhead MARTA station. See Figure 5-4 for extents of Phase 4.

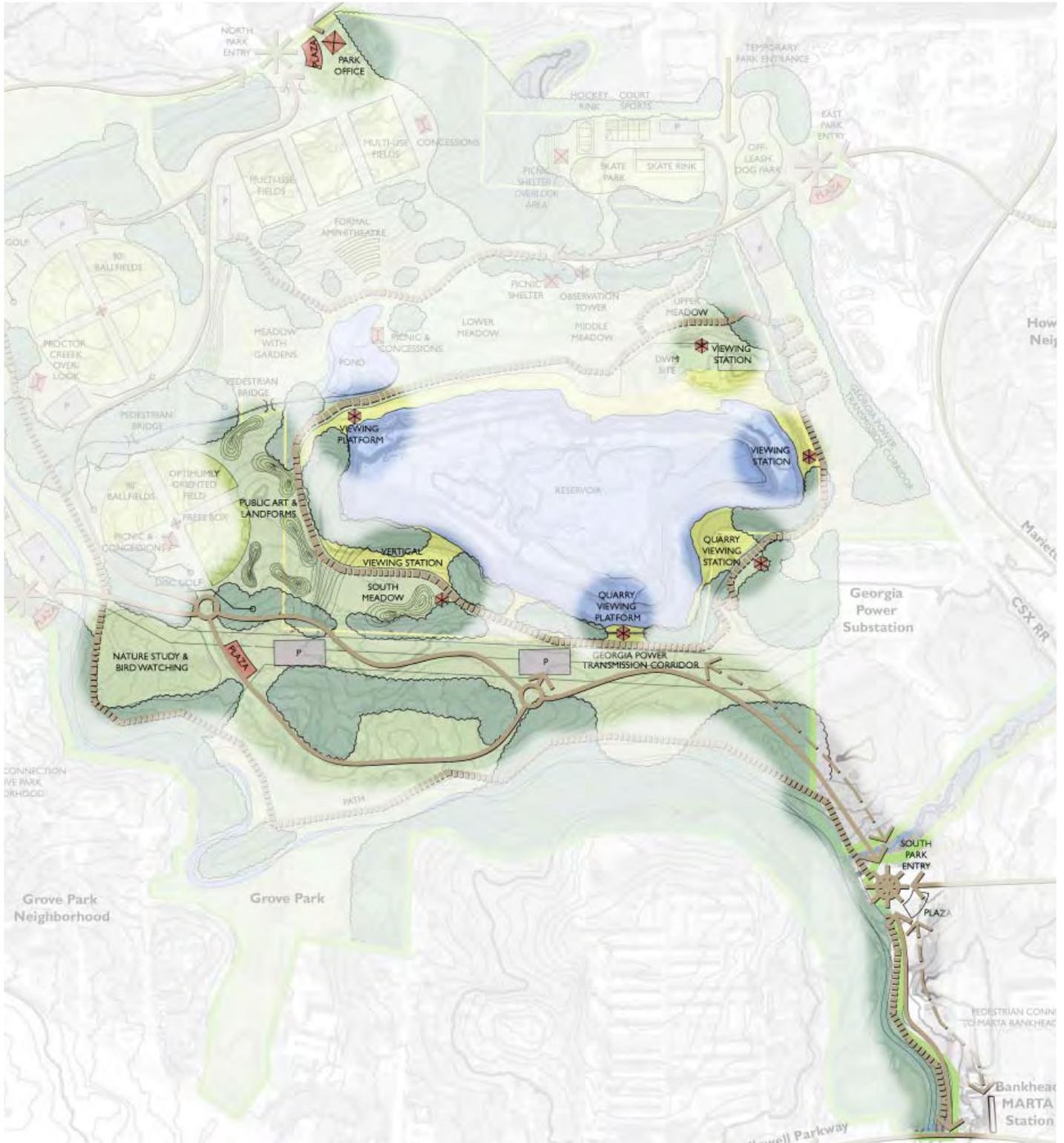


Figure 5-4. Westside Reservoir Park Construction Phase 4 (Not to scale)

Phase 4 Cost Estimate	
Site Preparation and Demolition	\$ 400,000
Roadways and Parking	\$ 1,016,000
Biking and Hiking Trails	\$ 125,000
Park Entry - gateway, plaza, community building, play area, etc.	\$ 475,000
Park Office/ Maintenance Facility	\$ 960,000
Picnic Shelter/Concession	\$ 200,000
Viewing Towers	\$ 960,000
Cantilevered Platform	\$ 200,000
Viewing Overlooks (3)	\$ 150,000
Miscellaneous - signage, benches, trash receptacles, etc.	\$ 75,000
Landforms	\$ 1,175,000
Botanical Area	\$ 500,000
Community Garden	\$ 103,000
Plantings	\$ 250,000
Loaming and Seeding of Bird-watching Meadow	\$ 144,000
Loaming and Seeding of Meadows	\$ 968,000
Subtotal	\$ 7,731,000
20% Design and Construction Contingency	\$ 1,546,000
20% Design Fees	\$ 1,855,000
<b>Total</b>	<b>\$11,132,000</b>

## Phase 5

### Restoration of Proctor Creek:

The restoration of Proctor Creek is a complex task which could vary greatly based on the level of effort and private contribution (including volunteer participation). The estimate below assumes a medium level of restoration including protection of existing vegetation, removal of invasive plants, earthwork to reshape uplands or banks, rip rap, drainage structures, overlooks and pathways, as well as site amenities such as signage and markers, guardrails. Also, planting and seeding have been included to restore disturbed areas. The stretch of Proctor Creek that runs through Westside Reservoir Park is just under 2.5 miles and restoration should include the river's upland floodplain.

(No image, Phase 5.)

Phase 5 Cost Estimate	
Site Preparation and Demolition	\$ 250,000
Earthwork & Grading	\$ 75,000
Drainage Improvements	\$ 60,000
Overlooks & Bank Access	\$ 400,000
Markers & Signage	\$ 75,000
Site Improvements & Amenities	\$ 350,000
Plantings	\$ 225,000
Loaming and Conservation Seeding of Floodplain Areas	\$ 50,000
*Permitting not Included	
Subtotal	\$ 1,435,000
20% Design and Construction Contingency	\$ 287,000
20% Design Fees	\$ 344,000
<b>Total</b>	<b>\$ 2,066,000</b>

# Figure 5-5. Westside Reservoir Park Master Plan Summary Cost Estimate

Phase 1	\$ 3,863,000
Phase 2	\$ 3,558,000
Phase 3	\$17,280,000
Phase 4	\$11,132,000
Phase 5	\$ 2,066,000
<b>Total</b>	<b>\$37,899,000</b>



View of Westside Reservoir Park, looking West

September 7, 2008

# Section 6

## Appendices

- A. Community Engagement Summary & Surveys
- B. Park Program Matrix
- C. Atlanta Services Group Stream Assessment & Environmental Permitting Memo, Bellwood Quarry
- D. Sustainable Landscape Guidelines
- E. Westside Reservoir Park Design Guidelines
- F. Athletic Field Specification
- G. Maintenance Specification
- H. Bellwood Raw Water Storage Facility Slope Stability Report



# Appendix A

# Community Engagement Summary

# & Surveys



# Appendix A Community Engagement Summary & Surveys

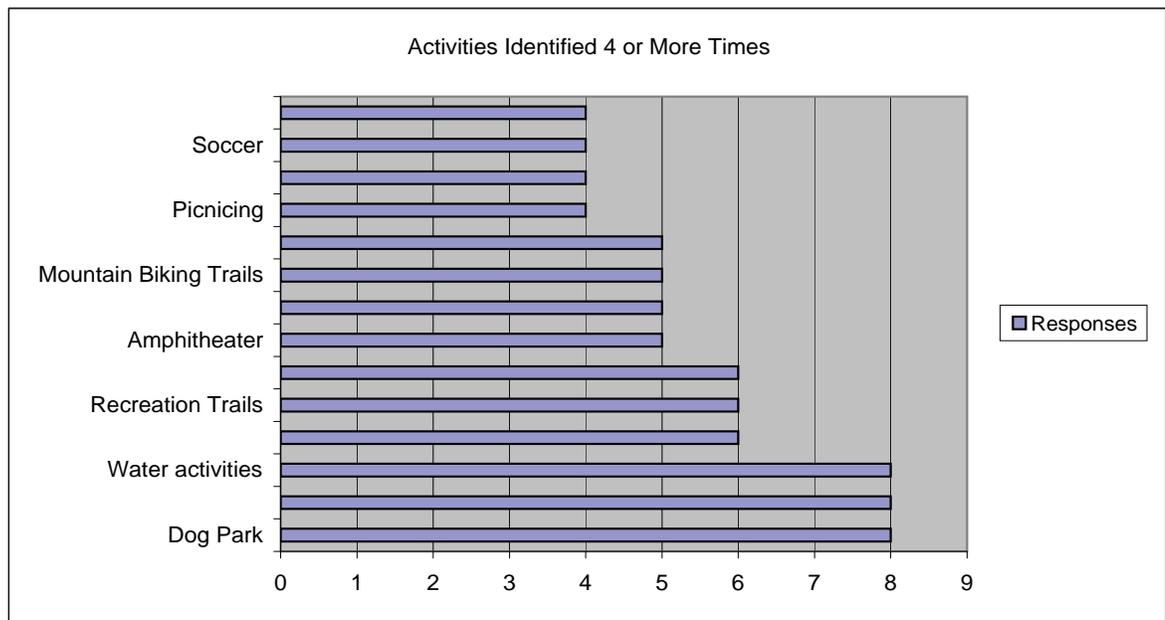
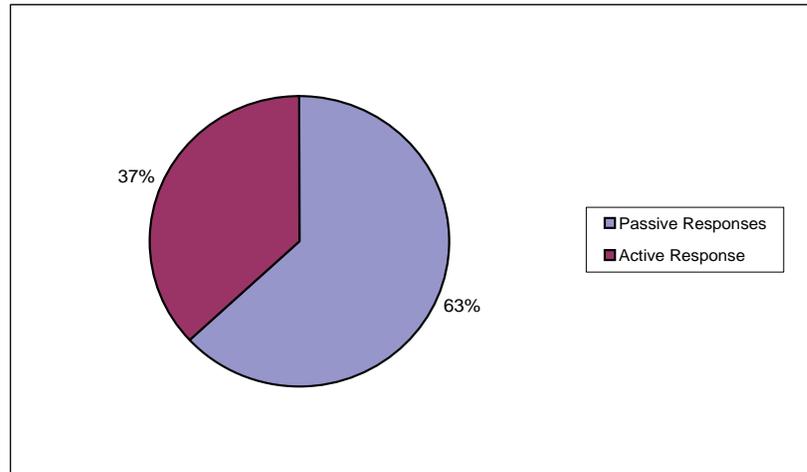
## Summary of Westside Reservoir Park Program Survey

Public Study Group Feedback - April 28, 2008

BeltLine Park Master Plan Open House Meeting - May 3, 2008

### Breakdown of Responses by Active & Passive Priorities :

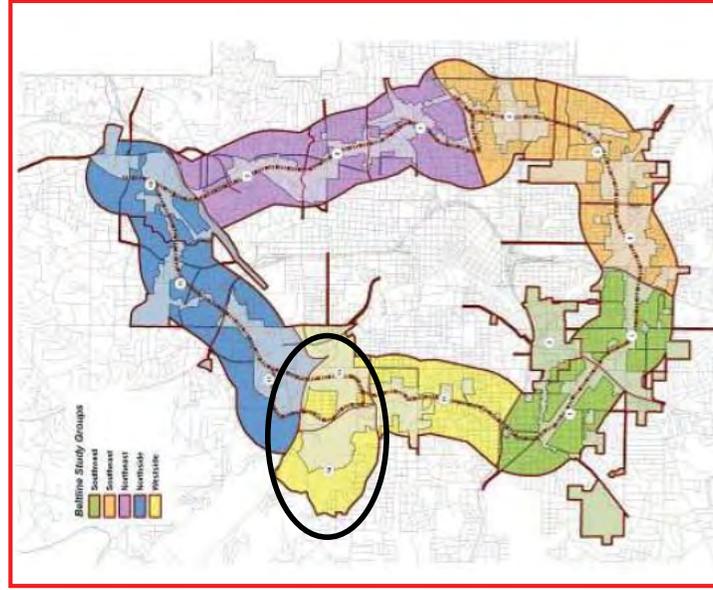
- Passive Responses                      68
- Active Responses                        40



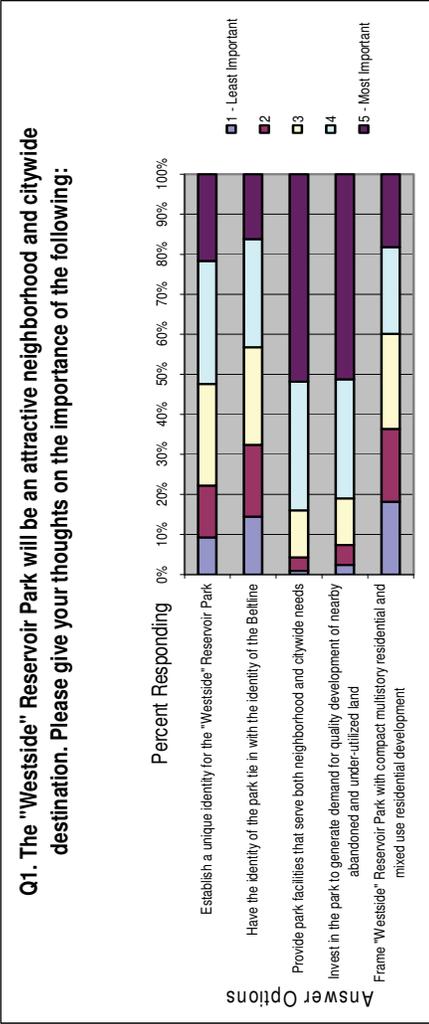
# Atlanta “Westside” Reservoir Park Survey Questions and Summary Charts

Data Collected and sorted by Pond/CRJA

Survey Closed December 21, 2007



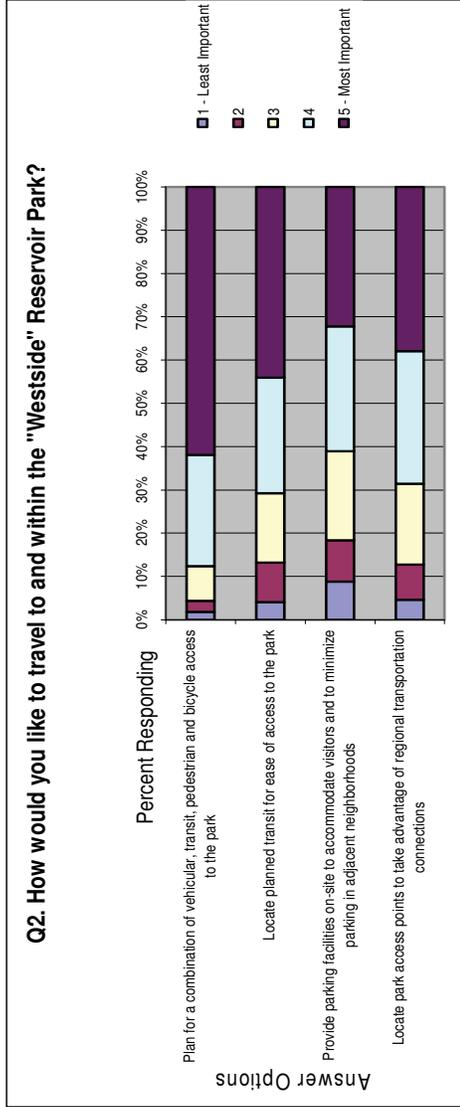
Atlanta "Westside" Reservoir Park Survey Questions and Summary Charts



**Q1. The "Westside" Reservoir Park will be an attractive neighborhood and citywide destination. Please give your thoughts on the importance of the following:**

Answer Options	1 - Least Important	2	3	4	5 - Most Important
Establish a unique identity for the "Westside" Reservoir Park	99	140	272	330	233
Have the identity of the park tie in with the identity of the Beltline	155	194	262	290	175
Provide park facilities that serve both neighborhood and citywide needs	10	36	127	348	560
Invest in the park to generate demand for quality development of nearby abandoned and under-utilized land	26	54	126	322	555
Frame "Westside" Reservoir Park with compact multistory residential and mixed use residential development	196	197	256	233	197

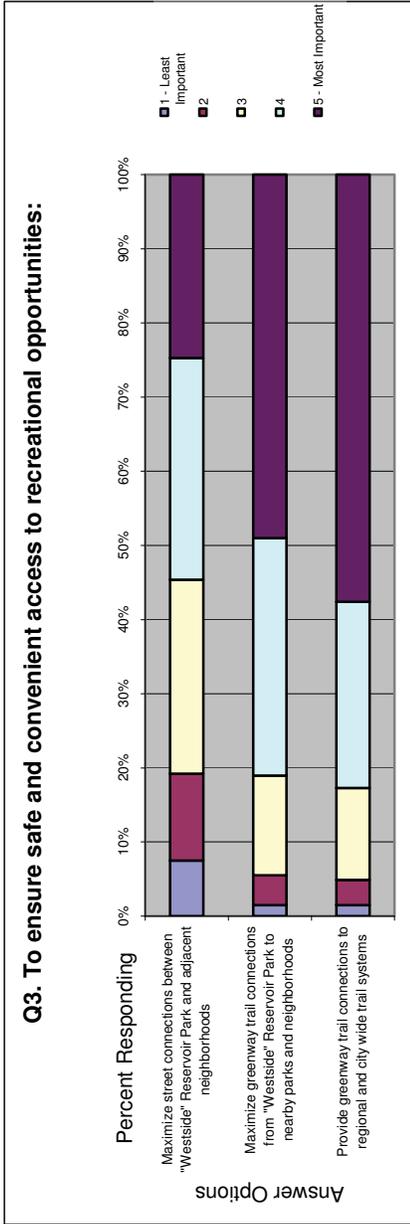
Atlanta "Westside" Reservoir Park Survey Questions and Summary Charts



Q2. How would you like to travel to and within the "Westside" Reservoir Park?

Answer Options	1 - Least Important	2	3	4	5 - Most Important
Plan for a combination of vehicular, transit, pedestrian and bicycle access to the park	19	28	86	276	666
Locate planned transit for ease of access to the park	43	98	172	286	471
Provide parking facilities on-site to accommodate visitors and to minimize parking in adjacent neighborhoods	95	102	221	310	346
Locate park access points to take advantage of regional transportation connections	49	86	199	326	403

Atlanta "Westside" Reservoir Park Survey Questions and Summary Charts

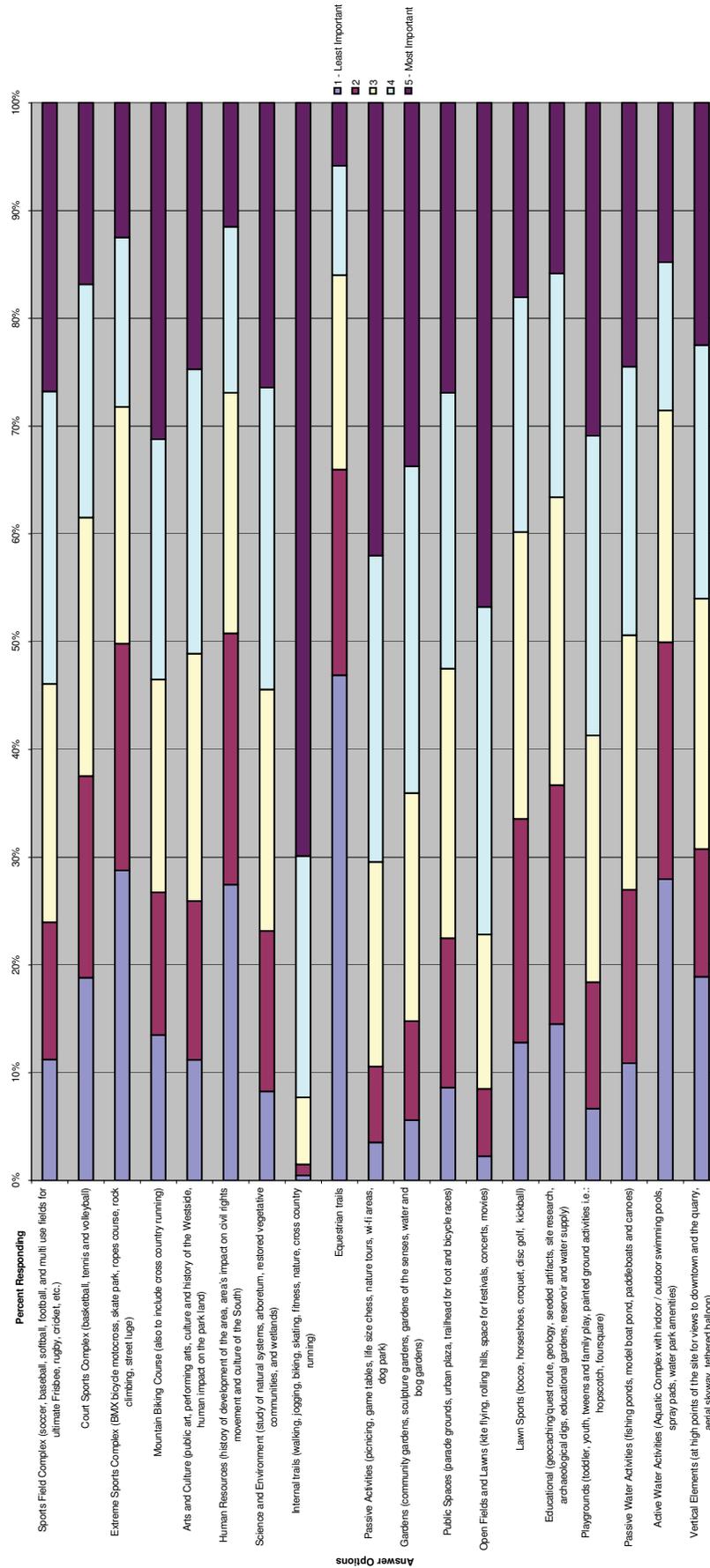


Q3. To ensure safe and convenient access to recreational opportunities:

Answer Options	1 - Least Important	2	3	4	5 - Most Important
Maximize street connections between "Westside" Reservoir Park and adjacent neighborhoods	80	125	279	319	264
Maximize greenway trail connections from "Westside" Reservoir Park to nearby parks and neighborhoods	16	43	143	341	522
Provide greenway trail connections to regional and city wide trail systems	16	36	133	268	616

## Atlanta "Westside" Reservoir Park Survey Questions and Summary Charts

**Q4. Following are several broad categories of park activities which could help the park meet some of the City's active recreation needs. Rate the importance to the following:**



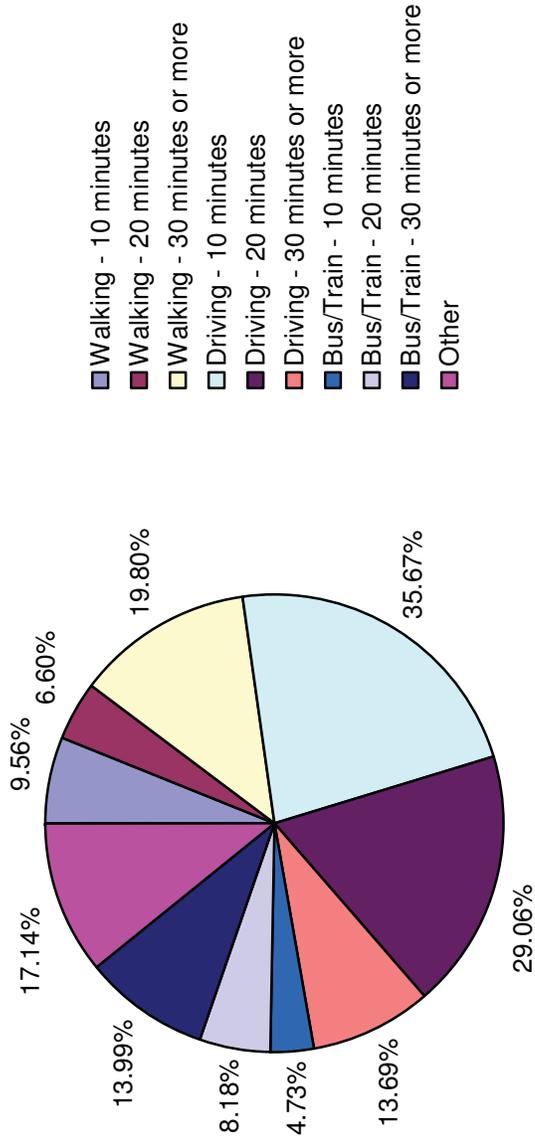
This chart has been split into two pages because of its size. The data table linked to this chart is on the next page.

**Atlanta "Westside" Reservoir Park Survey Questions and Summary Charts**

**Q4. Following are several broad categories of park activities which could help the park meet some of the City's active recreation needs. Rate the importance to the following:**

<b>Answer Options</b>	<b>1 - Least Important</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5 - Most Important</b>
Sports Field Complex (soccer, baseball, softball, football, and multi use fields for ultimate frisbee, rugby, cricket, etc.)	120	136	236	290	286
Court Sports Complex (basketball, tennis and volleyball)	200	199	255	230	179
Extreme Sports Complex (BMX bicycle motocross, skate park, ropes course, rock climbing, street luge)	309	226	236	169	134
Mountain Biking Course (also to include cross country running)	145	142	212	239	335
Arts and Culture (public art, performing arts, culture and history of the Westside, human impact on the park land)	120	158	246	283	265
Human Resources (history of development of the area, area's impact on civil rights movement and culture of the South)	294	250	239	165	123
Science and Environment (study of natural systems, arboretum, restored vegetative communities, and wetlands)	89	160	241	301	284
Internal trails (walking, jogging, biking, skating, fitness, nature, cross country running)	5	11	67	241	752
Equestrian trails	499	203	192	108	62
Passive Activities (picnicking, game tables, life size chess, nature tours, wifi areas, dog park)	38	75	203	304	449
Gardens (community gardens, sculpture gardens, gardens of the senses, water and bog gardens)	60	98	226	324	360
Public Spaces (parade grounds, urban plaza, trailhead for foot and bicycle races)	92	148	267	273	287
Open Fields and Lawns (kite flying, rolling hills, space for festivals, concerts, movies)	24	67	153	325	500
Lawn Sports (bocce, horseshoes, croquet, disc golf, kickball)	137	222	285	233	193
Educational (geocaching/quest route, geology, seeded artifacts, site research, archaeological digs, educational gardens, reservoir and water supply)	155	237	285	222	169
Playgrounds (toddler, youth, tweens and family play, painted ground activities i.e.: hopscotch, foursquare)	71	125	244	296	329
Passive Water Activities (fishing ponds, model boat pond, paddleboats and canoes)	117	173	254	268	263
Active Water Activities (Aquatic Complex with indoor / outdoor swimming pools, spray pads, water park amenities)	299	235	230	147	158
Vertical Elements (at high points of the site for views to downtown and the quarry, aerial skyway, tethered balloon)	201	126	247	250	239

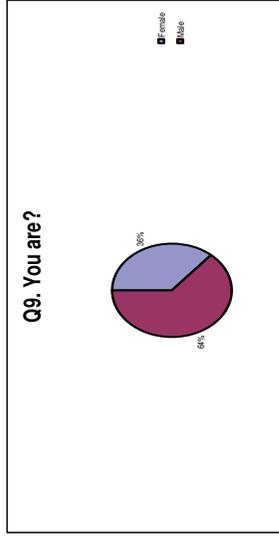
Q8. How long will it take you to get to the new "Westside" Reservoir Park from your home / workplace?



Q8. How long will it take you to get to the new "Westside" Reservoir Park from your home / workplace?

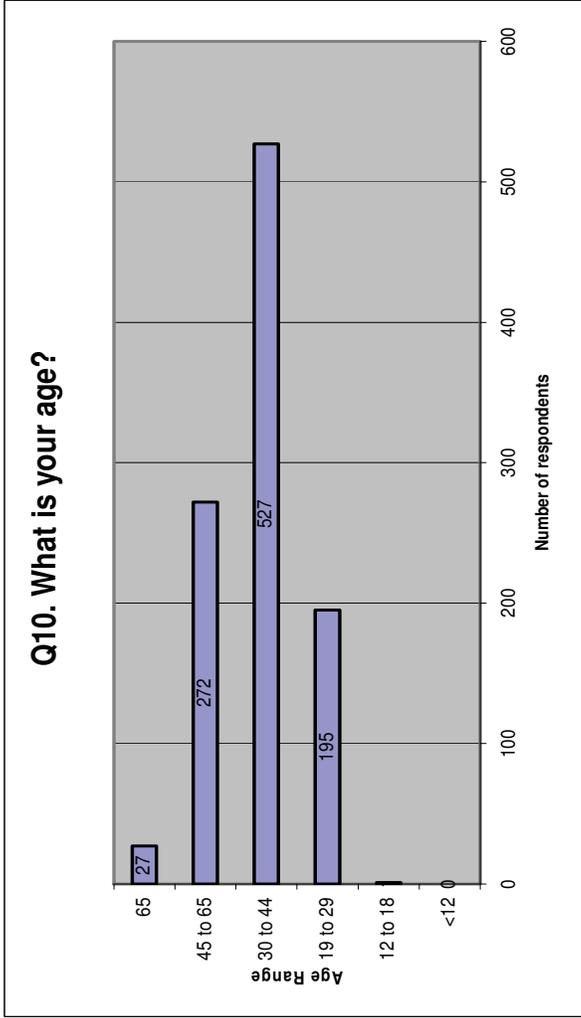
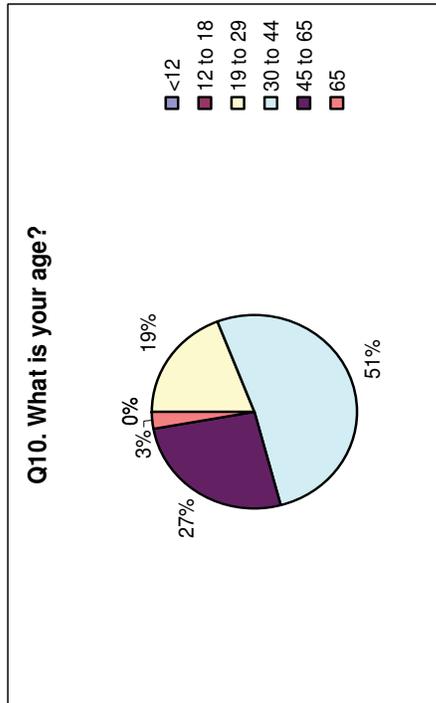
Answer Options	Response Percent
Walking - 10 minutes	9.56%
Walking - 20 minutes	6.60%
Walking - 30 minutes or more	35.67%
Driving - 10 minutes	19.80%
Driving - 20 minutes	13.99%
Driving - 30 minutes or more	29.06%
Bus/Train - 10 minutes	17.14%
Bus/Train - 20 minutes	8.18%
Bus/Train - 30 minutes or more	4.73%
Other	13.69%

**Atlanta "Westside" Reservoir Park Survey Questions and Summary Charts**



**Q9. You are -**

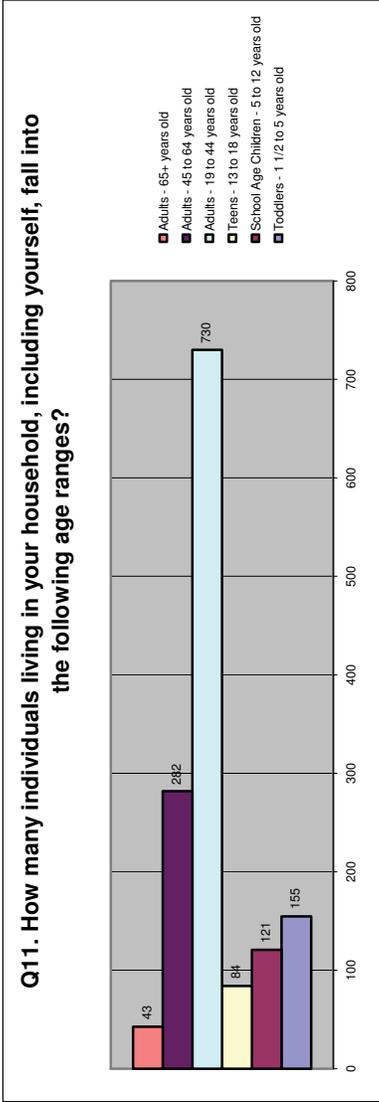
Answer Options	Response Percent
Female	36.46%
Male	63.54%



Q10. What is your age?

Answer Options	Response Percent
<12	0.00%
12 to 18	0.10%
19 to 29	19.10%
30 to 44	51.62%
45 to 65	26.64%
65	2.64%

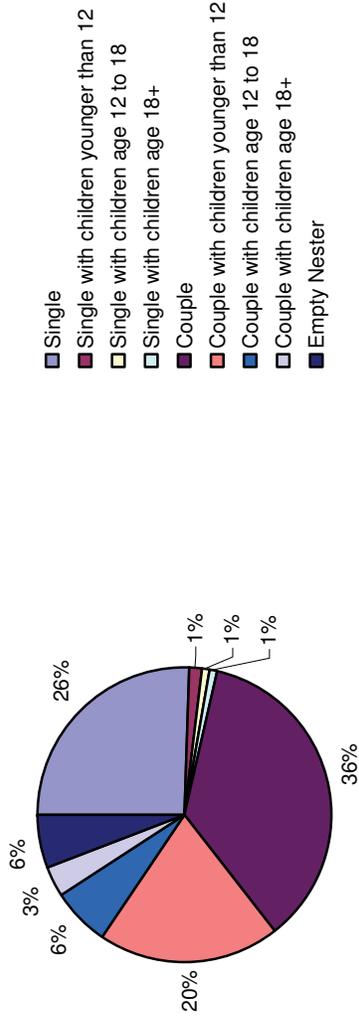
Atlanta "Westside" Reservoir Park Survey Questions and Summary Charts



Q11. How many individuals living in your household, including yourself, fall into the following age ranges?

Answer Options	1	2	3	4	5
Toddlers - 1 1/2 to 5 years old	112	40	3	1	1
School Age Children - 5 to 12 years old	68	44	9	0	1
Teens - 13 to 18 years old	52	26	4	2	0
Adults - 19 to 44 years old	251	440	29	9	3
Adults - 45 to 64 years old	133	149	1	1	0
Adults - 65+ years old	25	18	0	0	0

Q12. Which of the following best describes your household?



Q12. Which of the following best describes your household?

Answer Options	Response Percent
Single	25.67%
Single with children younger than 12	1.29%
Single with children age 12 to 18	0.79%
Single with children age 18+	0.89%
Couple	35.88%
Couple with children younger than 12	20.02%
Couple with children age 12 to 18	6.34%
Couple with children age 18+	3.37%
Empty Nester	5.85%
Comments	

# Appendix B

## Park Program Matrix



# Atlanta Beltline - Bellwood Quarry Reservoir Park

## GIVEN PARK ITEMS

Image	Program Item	Description	Spatial	Acre	Orientation/ Preferred Condition	Grading/ Topography	Access			Parking
							Vehicle	Pedestrian	Bike	
	Baseball Complex	Eight (8) 90-Foot Fields; Minimum 1 Quad of 4 fields	220', 240', 310'	7	north-northeast	Flat	X	X	X	132
	Skateboard Park	Free style, Slalom Run, Snake, Bowls, Half Pipe, Full Pipe	Varies	0.5 to 5	Any	Flat and/or Slight Slope	X	X	X	Medium
	Amphitheatre	Concert, Movie, Play, Performing Arts	Varies	Varies	Graded bowl facing away from late afternoon sun	Quarry as backdrop	X	X	X	1 space per 3 people
	Meadow	To formally accommodate 200 people Picnicking, Sunbathing, Unorganized ball play, Lounging	Varies	Varies	Any	Rolling	X	X	X	1 space per 3 people

## PROPOSED PARK ITEMS

Image	#	Program Item	Description	Spatial	Acre	Orientation/ Preferred Condition	Grading/ Topography	Access			Parking
								Vehicle	Pedestrian	Bike	
		<b>ATHLETIC / ACTIVE SPORT</b> <b>Fields</b>									
	1	Softball		270'	1.32	east/west	Flat	X	X	X	33
	2	Football	Professional Pop Warner	160' x 360'	1.32	north/south	Flat	X	X	X	33-100
	3	Soccer	Championship	225' x 360'	1.86	north/south	Flat	X	X	X	25-100
	4	Soccer	Jr. High	165' x 300'	1.36	north/south	Flat	X	X	X	25
	5	Field Hockey		180' x 300'	1.23	north/south	Flat	X	X	X	25
	6	Rugby, Lacrosse	Multi-Use field	172'x372'	1.46	north/south			X	X	33
	7	Track & field	NCAA	440 yd.		NW/SE	Flat		X	X	50
	8	Multi-Use Field Disc Golf Size		6 acre		Any	Rolling		X	X	20
	9	Multi-Use Ultimate Frisbee/Paintball Size		120yd x 40yd		Any	Varies		X	X	25
		<b>Courts</b>									
	10	Basketball	High School	50'x84', full-court	0.1	north/south	Flat		X	X	6
	11	Volleyball	High School	30'x60'	0.04	north/south	Flat		X	X	6
	12	Tennis	High School	42'x80'	0.08	north/south	Flat		X	X	3
	13	Badminton	Doubles	20'x44'	0.1	north/south	Flat		X	X	3
	14	Multi-Use Courts (Tennis Court sized)	High School	42'x80'	0.08	north/south	Flat		X	X	3
	15	Handball, Raquetball	Three or Four Wall	40'x20'	0.08	north/south	Flat		X	X	6







# **Appendix C**

## **Atlanta Services Group Stream Assessment & Environmental Permitting Memo, Bellwood Quarry**





## MEMORANDUM

Date: March 14, 2008  
To: Ben Jacob, Department of Watershed Management, COA  
From: Brian Estes/Charles Absher, Atlanta Services Group  
Subject: Stream Assessment and Environmental Permitting – Bellwood Quarry

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The purpose of this memo is to evaluate long-term options for the historical stream alignments on the Bellwood Quarry property. In years past, to facilitate rock quarry activities on the property, all flow in the two streams was captured near the up-gradient boundary of the property and piped across the property. Following the decommissioning of the quarry as a mine site there are several options for the long-term fate of the currently piped streams and consist of the following: 1) maintain the streams in pipes across the property, 2) restore the streams to open and free flowing channels, 3) restore streams in combination with the creation of a recreational pond, or 4) pipe additional linear footage of existing streams. These options are discussed in detail beginning on Page 6.

### **Existing Site Conditions**

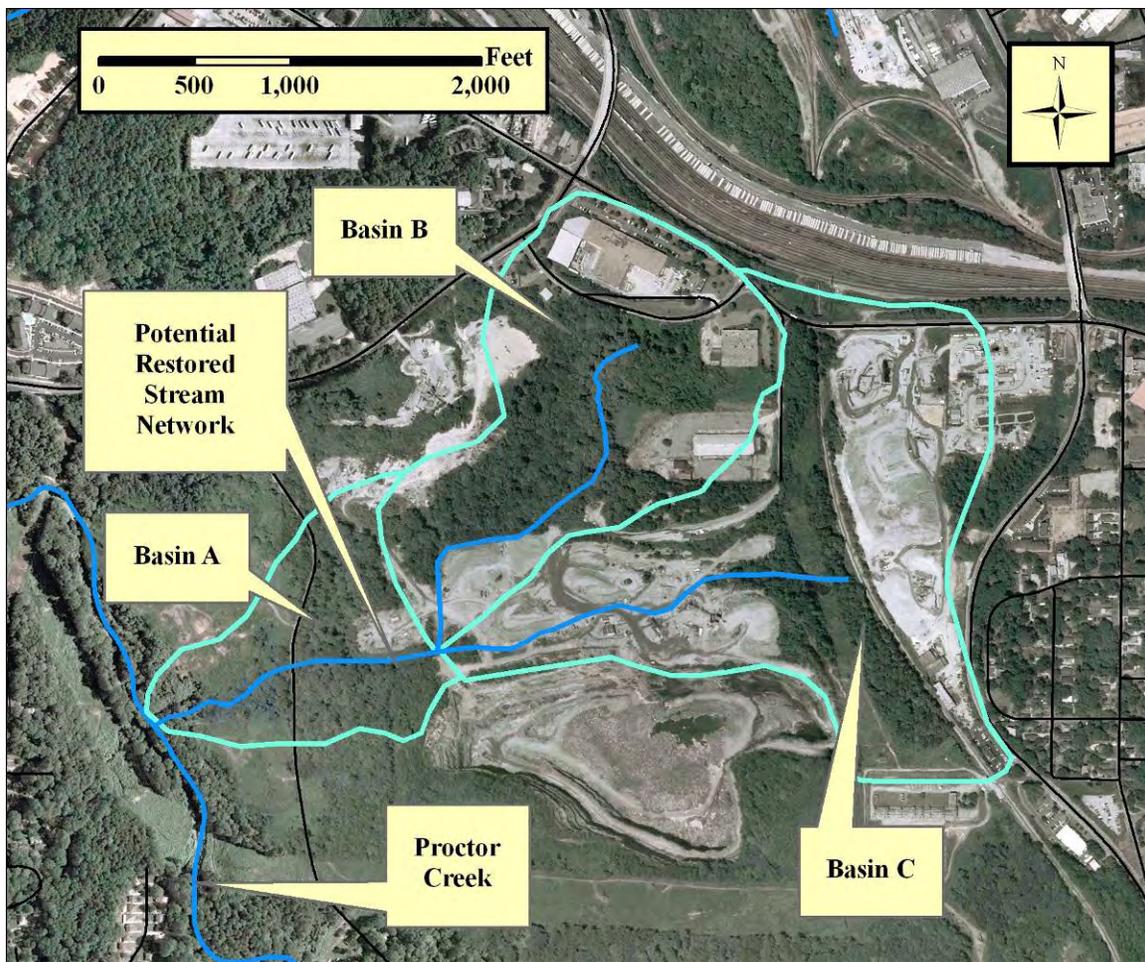
Two streams (Streams 1 and 2) were identified within the project area and consisted of unnamed intermittent tributaries to Proctor Creek (Figure 1). Both streams are currently piped via single barrel concrete culverts, approximately 30 inches in diameter. Stream 1 originates from a culvert beneath a railroad line parallel to the eastern boundary of the project area (Photo 1), flows in an open channel in a westerly direction through a Georgia Power transmission line right-of-way, enters the project area and is piped for an estimated 1,500 linear feet. Stream 1 flows are currently augmented by 600 gallons per minute (1.3 cfs) construction dewatering from an adjacent project, which discharges construction water directly into the stream. The exposed reach of Stream 1 appears to contain natural stream characteristics, based on stream substrate and channel dimensions. However, based on communications with Vulcan personnel, both streams typically flow only during and shortly after precipitation events and are normally dry during drought periods.

Stream 2 enters the site from the northwestern boundary of the project area (Photo 2), flows in a southwesterly direction for several hundred feet, then enters a concrete culvert and is piped for an estimated 800 linear feet (Photo 3) before the confluence with Stream 1. Stream 2 also appears to receive a surface water contribution (based on water color) from an unidentified source, observed during the site visit. Similar to Stream 1, it appears that Stream 2 exhibits natural stream characteristics above the piped stream reach, based on substrate and channel

dimensions. The confluence of Streams 1 and 2 occurs in the western portion of the project area (Photo 4) and then flow off-site in a westerly direction prior to the confluence with Proctor Creek. Based on site data, the current depths of the stream culverts is about 10 feet to 15 feet below ground surface. Sanitary sewer lines parallel both streams; existing locations and other utilities within the project area are presented in Figure 1 (attached).

### Basin Drainage Areas

The following figure illustrates a potential restored stream network on the site. Three stream reaches and three drainage basins have been identified based on current available data. The drainage areas for the basins are 86.3 acres, 60.5 acres, and 175.3 acres for Basin C, Basin B, and combined Basins ABC, respectively. Note that the quarry pit has not been included in any of these calculations since it would continue to be isolated from surface runoff in adjacent restored stream areas.

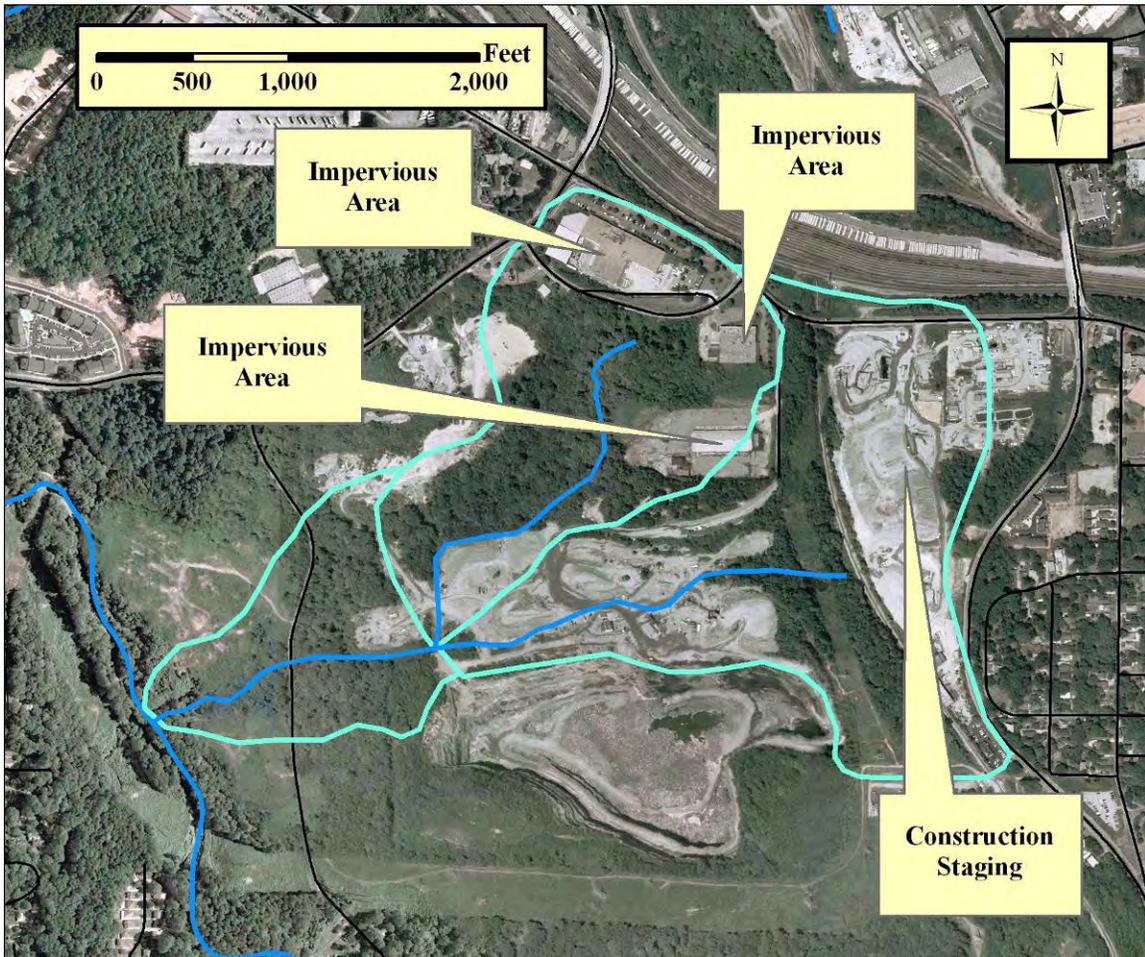


### **Basin Characteristics**

The land use within the basins is currently dominated by the area previously used for quarry related surface operations. This is generally a pervious land surface consisting of crushed granite, and vegetated areas with a mix of small trees and heavy brush. This creates a relatively high potential for stormwater infiltration, thus limiting the amount of stormwater runoff that might typically be generated from urbanized watersheds. Basin B has the highest estimated existing impervious area at approximately 28%. This comes primarily from the industrial area to the north. This area also has a relatively extensive stormwater collection system that contributes flow in Basin B. It has also been assumed that the quarry maintenance areas have impervious areas associated with either concrete paving or heavily compacted crushed granite.

The impervious area in Basin C has been estimated at 2%. This is almost exclusively related to quarry maintenance areas. The tunnel construction staging area in the east portion of the basin has been assumed to have a surface of crushed stone, with a high potential for infiltration. This area is also isolated from the remainder of the basin by the railroad running north/south and stormwater would be metered through the railroad culverts. In addition, the construction spoil piles help to reduce stormwater runoff through absorption.

The total impervious area for the combined Basins ABC is approximately 11%, coming almost exclusively from Basin B.



**Typical Flood Flows**

The USGS urban regression equations for this region were used to calculate potential flood flows given that current impervious percentages remain relatively constant. The following tables list the results.

*Flood Flows in Cubic Feet per Second*

Basin	2Yr	5Yr	10Yr	25Yr	50Yr	100Yr	200Yr	500Yr
C	47.9	86.9	115.2	148.8	182.7	215.1	255.1	299.8
B	83.9	134.1	156.4	196.9	230.1	263.8	305.8	340.9
ABC	136.4	223.8	270.6	343.8	405.0	468.6	542.5	616.3

*Flood Flows in Gallons per Minute*

Basin	2Yr	5Yr	10Yr	25Yr	50Yr	100Yr	200Yr	500Yr
C	21,544	39,042	51,769	66,899	82,130	96,658	114,641	134,737
B	37,696	60,294	70,315	88,498	103,427	118,552	137,432	153,219
ABC	61,313	100,597	121,627	154,516	182,042	210,621	243,850	276,989

**Typical Annual Average Flows**

The publication “U. S. Geological Survey, Water Resource Investigations, Open-File Report 82-557, Storage Requirements for Georgia Streams” contains mapping that indicates average annual flows across the State of Georgia based on drainage area. In the project area it is shown as 1.3 cubic feet per second per square mile of drainage. This results in 0.2 cfs (79 gpm), 0.1 cfs (55 gpm), and 0.4 cfs (160 gpm) for Basins C, B, and ABC, respectively.

**Typical Low Flows**

The publication “Low-Flow Profiles of the Upper Chattahoochee River and Tributaries in Georgia” published by the USGS in 1989 contained estimates of 7Q10 flows including Proctor Creek in Fulton County. The 7Q10 is the average flow over a 7-day period that would correspond to a 10-Year drought. At its most upstream point, Proctor Creek is shown to have a 7Q10 of 0.67 cfs for a 10.7 square mile drainage area. If we extrapolate that to the three basins within the project this comes to 0.008 cfs (3.8 gpm), 0.006 cfs (2.7 gpm), and 0.017 cfs (7.7 gpm) for Basins C, B, and ABC, respectively. These potential 7Q10 flows are so minimal that they indicate the streams would probably go dry during times of extended drought. This was confirmed by Vulcan personnel that both streams have periodically gone dry.

**Water Quality**

Proctor Creek is found on the State’s 303(d) list as water quality impaired due to fecal coliform. The State surmises that the bacterial pollution is generated by urban runoff and combined sewer overflow. There is a TMDL in place for Proctor Creek that requires a 97% reduction in fecal coliform loading. Obviously, the CSO tunnel projects should reduce substantially the fecal coliform load to Atlanta area streams, Proctor Creek included. However, the water quality benefit specifically from a stream restoration effort in the project area would have a limited impact to the overall Proctor Creek environment. Any flow entering Proctor Creek from the project area should be much cleaner than flow in Proctor Creek, but the size of the project

drainage area is much smaller than the Proctor Creek drainage, and therefore could produce only a minimal improvement.

In order for flow from the project area to remain relatively clean, there are several stormwater management issues that would have to be addressed. Currently in Basin B, there is a large portion of the flow coming from industrial areas to the north. There is the potential for floatables and other pollution coming from these areas into the restored stream reaches. A management plan for addressing this should be part of any restoration effort. In addition, the construction staging area will not be used for this purpose in the future. The management plan should also address the potential for new development to effect water quality within the restored stream reaches.

### **Stream Restoration Alternatives**

Four possible options regarding on-site streams within the Bellwood facility were evaluated and are presented below:

#### *Option 1 – No Action Alternative*

This option would consist of taking no action regarding restoration of on-site streams. Existing conditions of streams would remain as currently observed and no restoration of piped streams would occur within the project area. Other proposed development associated with the project (recreational park) would not likely require U.S. Army Corps of Engineers (USACE) permitting or stream buffer variances, if no modifications or discharges of dredged/fill material to existing waters of the U.S. or disturbance of buffers occurred. Any modifications or discharges of fill material to on-site streams, wetlands, or open water areas (ponds) would potentially require USACE coordination and/or permitting and a stream buffer variance.

#### *Option 2 – Restoration of on-site streams*

Restoration of Streams 1 and/or 2 within the project area would consist of day-lighting (exposing) the piped stream reaches and returning these reaches to a stable stream form, emulating a typical, more natural stream. Specific restoration activities would consist of removing the existing culverts and excavating a “new” stream channel. This channel would consist of an appropriately sized stream channel with stream dimension, pattern and profile characteristics restored, based on a suitable stream reference reach condition. Instream habitat structures (e.g., rock cross-vanes, root wads) would be utilized to enhance and restore aquatic functions of the streams. Stream restoration methods would follow Rosgen stream restoration/natural channel design techniques. Major components of a stream restoration project consist of a geomorphic assessment and classification of the existing stream reaches,

establishment of a suitable stream reference reach, hydrologic and hydraulic modeling, sediment transport analysis, design development, construction estimates, and environmental permitting.

Current stream restoration costs (including design and construction) for urban streams averages \$200 to \$250 per linear foot; although, this cost can be highly variable. With approximately 2,300 linear feet of stream reach piped within the project area, it is estimated that restoration costs of both streams would range from \$460,000 to \$575,000. However, existing infrastructure (i.e., sanitary sewerline / public water supply line) adjacent to Stream 1 could increase estimated values, due to relocation expense.

### *Option 3 – Stream Restoration / Creation of Recreational Pond*

Similar to Option 2, this option would consist of day-lighting (exposing) the piped stream reaches of Streams 1 and 2, and creating a small recreational pond as a park amenity. This pond could be utilized for activities such as fishing, wildlife viewing, and as an interpretive natural area. The feature could be sited near the existing confluence of the streams, slightly north of the former retention pond area. Stream reaches would be returned to a stable stream form, emulating a natural stream. Specific restoration activities would consist of removing the existing culverts, excavating a “new” meandering stream channel, and construction of a small pond via the impoundment of Streams 1 and 2.

### *Option 4 – Piping additional stream reaches*

Option 4 would consist of piping additional stream reaches within the project area, upstream and/or downstream of the existing piped stream reaches. This option would maximize the recreational park development within the project area. Option 4 could potentially qualify for a USACE Nationwide Permit 42 (recreational facilities) if impacts do not exceed 300 linear feet of stream channel. This NWP does not authorize projects that require the use of herbicides, insecticides, fertilizers and/or other similar potentially toxic or hazardous materials, unless effective containment or barriers are implemented and fully maintained for the duration of the project, to prevent contamination from entering waters of the United States. A Pre-construction Notification (PCN) must be submitted for this NWP in accordance with General Condition 27. Piping of more than 100 linear feet of stream channel will require compensatory mitigation. If impacts exceed 300 linear feet an Individual Permit (IP) would likely be required for this option.

## **Environmental Permitting**

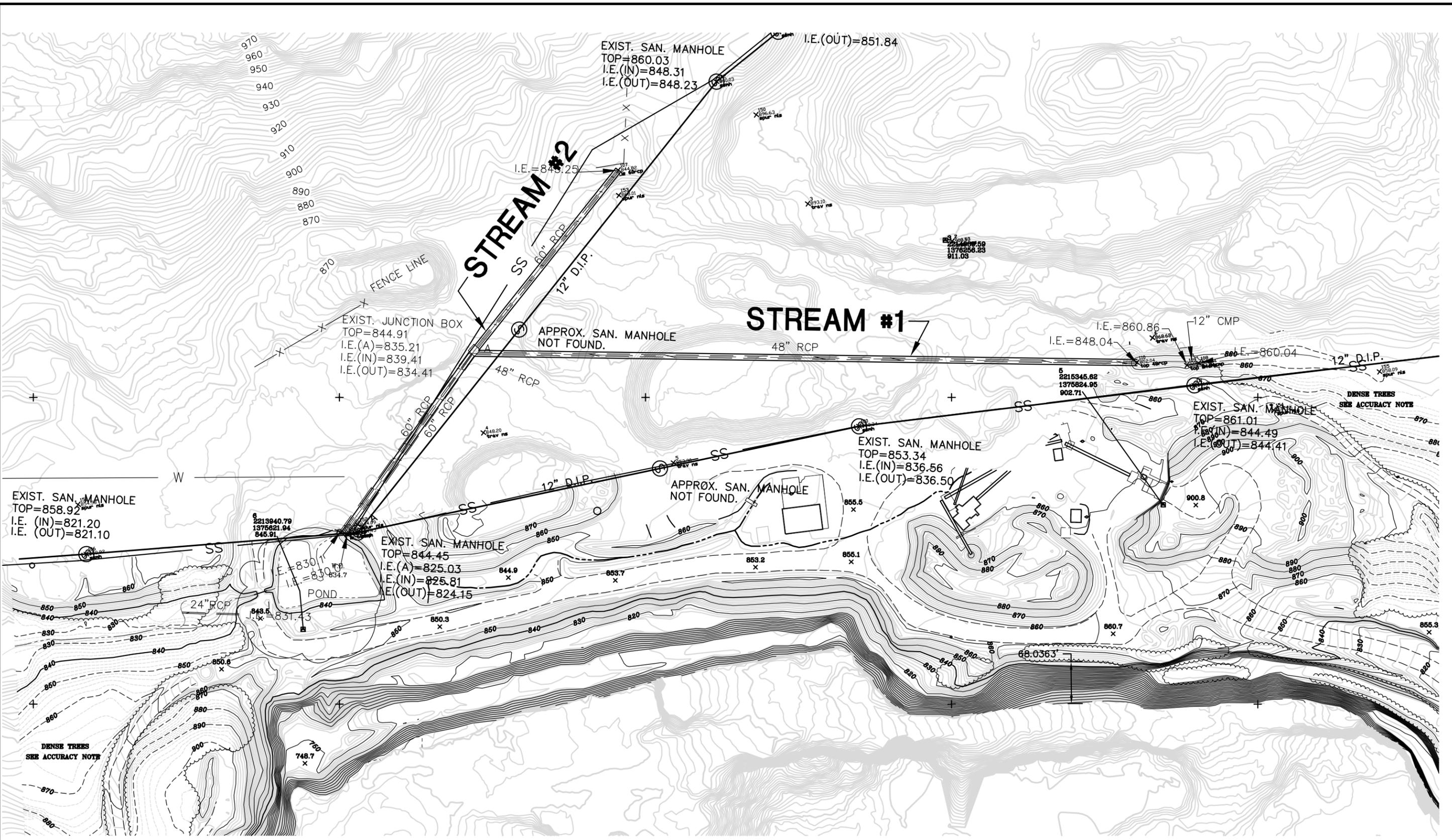
The USACE regulates waters of the U.S. (e.g., streams, wetlands) and requires permitting prior to the placement of dredged or fill material within these waters. Applicable USACE permits required to conduct any stream restoration activities (Options 2 or 3) within the project area would consist of a Nationwide Permit (NWP) 27 (Aquatic Habitat Restoration, Establishment,

and Enhancement Activities). To qualify for this NWP, restoration activities must result in net increases in aquatic resource functions and services. This NWP does not allow the conversion of streams to another aquatic habitat type or stream channelization/relocation. A Pre-construction Notification (PCN) must be submitted for this NWP and it must clearly document the existing conditions of the stream. Option 4 would consist of piping additional stream reaches within the project area. This activity may qualify for a NWP 42 (recreational facilities) if impacts do not exceed 300 linear feet of streambed. Nationwide permits can typically be obtained within 45 days of submitting a complete application. Any proposed activities not qualifying for NWP 27 or NWP 42 may require a USACE Individual Permit (IP). This permit process is longer (6 to 12 months) than the NWP process and is subject to public notice and comment.

Other environmental permits applicable to the proposed options would consist of a GDNR – Environmental Protection Division (EPD) stream buffer variance and a City of Atlanta buffer variance. The EPD requires a minimum 25-foot vegetated buffer along all state waters (non-trout waters). Any land disturbing activities within this buffer requires obtaining a Stream Buffer Variance from the EPD, which typically require 3 to 6 months to obtain.

### **Summary**

Due to the intermittent flow regime of Streams 1 and 2, the significant temporary hydrologic contribution (600 gpm) of an adjacent construction project, typical annual average and low flow data for the watershed, limited watershed size, and the expense of urban stream restoration, there appear to be limited viable opportunities for stream restoration within the Bellwood facility. Base flows in Streams 1 and 2 are minimal and these streams would likely be dry during much of the summer months, at the height of park visitation. Additionally, the creation of a successful park amenity such as a recreational pond may not be feasible based on the hydrologic/hydraulic characteristics of the streams and watershed. Therefore, it is our opinion that stream restoration and/or the creation of a recreational pond would not likely be successful without flow augmentation from the future Bellwood Raw Water Storage Facility.



 <b>JORDAN JONES &amp; GOULDING</b>	BELLWOOD RAW WATER STORAGE FACILITY	DATE : MARCH 2008 SCALE : 1" = 150' JOB NO.: 02061.825
	EXISTING STREAMS AND UTILITIES LOCATIONS	FIGURE 1 OF 1





**Photo 1. Stream 1 culvert below railroad line**



**Photo 2. Stream 2 above project area**



**Photo 3. Stream 2 culvert**



**Photo 4. Confluence of Streams 1 and 2**

# Appendix D

## Sustainable Landscape Guidelines



# Appendix D

## Sustainable Landscape Guidelines

Westside Reservoir Park is a repository of natural and environmental resources—resources that benefit the environment and the community both visually and ecologically. Unless they are conducted in a sustainable manner, development and construction activities, though necessary, are often destructive and can harm the environmental integrity and aesthetic appeal of the natural landscape and the essential integrity and character of the site. The guidelines in this section of the Westside Reservoir Park Landscape Master Plan provide a framework for future development that supports the social and ecological environment of Atlanta's community while ensuring environmental sustainability.

The goals for sustainable design are not separate and discrete from each other or from the goals of creating successful spaces for human interaction. On the contrary, they are interdependent, requiring a holistic approach to planning and design, and success ultimately depends on collaborative efforts and a multi-pronged implementation. This holistic approach is particularly critical during the feasibility phase of any project, where alternatives are evaluated and the optimal solution is defined. The following strategies serve as a guiding framework for implementing the goals of environmental sustainability within Westside Reservoir Park.

### Land Conservation

To preserve the remaining natural character of the Bellwood Quarry site, key natural landscape components of the site should be protected through the establishment of preservation/conservation zones, where construction would be excluded, in as far as judiciously possible.

The landscape structure of the site comprises three components—the remnant woodland, the riverine wetlands, and the built component. The wetlands and wooded areas are integral to preserving the hydrology of the site. In addition to creating spaces that support Atlanta's community, the designed landscape within

the built component should minimize erosion and sediment transport, excessive drainage, and excessive heat and glare.

A comprehensive study should be undertaken to assess and make recommendations for best management practices for stormwater management.

### Land Conservation Guidelines

- Preserve Proctor Creek and the smaller streams. Development in these areas would impede the ecologic and hydrologic functions of the wetlands.
- Preserve the structural and ecological integrity of the wooded areas along the periphery of the wetlands as they provide micro-habitat and act as buffers against noise and pollution from surrounding roads and parking lots.
- Reduce energy and space used for transportation development by providing multiple modes, such as bike trails and pedestrian paths, and by the planning and organization of parking areas to encourage the efficient use of parking lots and promote walking between facilities.
- Design and implement a recycling and composting program within the park to conserve and enhance resources; locate in an area that will not degrade the existing landscape.

### Hydrology

The hydrologic resources of the site present a strong case for careful attention to site planning, construction practices, and maintenance protocol. The steep topography promotes rapid surface run-off toward the creeks, streams and reservoir. These conditions offer a high potential for groundwater pollution, requiring the use of non-polluting fertilizers and the implementation of landscape and vegetative measures for bio-filtration of potentially harmful materials such as roadway salt.

### Guidelines for Protection of Hydrology

- Maximize the recharge, reduce run-off rates, and reduce peak discharge loads from impervious surfaces such as roofs, parking areas, roads, and pedestrian paving to minimize the potential for the flooding of downstream areas.
- Maximize the recharge potential of the stormwater system through a combination of vegetated swales and porous paving and by a reduction of the amount of impervious surfaces.
- Maximize the decontamination from parking areas by intercepting run-off with the use of vegetated recharge and bio-filtration strips before draining into natural systems.

- Maintain adequate vegetative cover on the banks and sides of roads to facilitate runoff filtration and to reduce runoff volumes, rates, and velocities.
  - Reduce steepness and length of slopes with the installation of retention devices where necessary and stabilize plantings of hardy trees, shrubs, and ground covers.
  - Protect steep slopes and erosion-prone areas by maintaining an adequate vegetative cover at all times, in the form of grasses, ground covers, and shrubs.
  - Encourage sheet flow over planted areas to avoid gully formation and subsequent erosion. Intercept sheet flow and concentrated flow prior to entering ponds and sensitive areas with filtration systems such as vegetative swales.
  - Minimize the collection of drainage in pipes by replacing existing piped drainage with sustainable alternatives as far upstream as possible.
  - Create vegetative swales where channel flow is required, employing a combination of vegetated swales and bio-retention strips, with native moisture-tolerant species.
  - Consider green roofs on new construction to reduce total runoff volumes from the roof, allow for evapotranspiration through plants, and reduce heating and cooling costs. Where green roofs are not feasible due to insufficient structural capacity, install unobtrusive roof-top harvesting measures to collect stormwater for irrigation and for other non-potable uses, reducing dependence on the municipal water supply.
  - Where possible, increase green space and minimize the amount of hard pavement. Minimize vehicular pavements and limit width of pedestrian plazas and walkways required for anticipated traffic volumes. Consider parking decks to reduce the total paved acreage dedicated to parking cars.
  - Where irrigation is installed, schedule required irrigation to occur during times of low evaporation rates to minimize irrigation requirements. Equip irrigation system with rain-sensitive gauges to avoid irrigation during rain events.
  - Minimize pollution by fertilizers and reduce dependence on fertilizers by promoting use of non-polluting fertilizers where necessary. Use native plants and plants adapted to site conditions to reduce dependence on irrigation and fertilizers.
- overall stormwater management plan.
- Conduct demolition and renovation work in accordance with standard practices to prevent leaching of hazardous construction materials.
  - Clear only areas essential for construction, physically marking the limits of disturbance, particularly in vegetated areas and slopes.
  - Schedule construction projects so that clearing and grading are done during the time of minimum erosion potential. Minimize the area of bare soil exposed at one time by implementing phased grading.
  - Protect steep slopes, drainage swales and erosion-prone areas from construction activities. Use silt fencing or mulch dams for protection from erosion and to control the sediment load into natural systems. Intercept runoff above disturbed slopes and convey into a permanent channel or storm drain.
  - Use construction fencing to prevent dumping and trespassing on drainage channels, swales, and slopes that would cause channel blockage and undue compaction. Place construction fencing at the break of slope.
  - Stockpile topsoil and reapply during re-vegetation. Cover and stabilize topsoil and store away from natural drainage paths.
  - Stabilize disturbed slopes by seeding and mulching immediately after finish grading with grasses until final landscape installation.
  - Use hydro-seeding or fiber mats to ensure rapid stabilization of steep slopes.
  - Clearly indicate which erosion control measures are temporary and which are permanent. Temporary measures are to be removed prior to landscape installation.

## Existing Vegetation

It is recommended that the larger woodland areas on the site be preserved and protected, both to maintain the landscape character of the site and for environmental and ecological benefits, such as noise abatement, pollution abatement, microclimatic improvements, and habitat provision. It is recommended that specific value judgments be made on a case-by-case method before any new construction is allowed to displace mature healthy trees.

The quality of the woodlands varies in its value as a natural resource and wildlife habitat. Some of the woodlands reflect the diversity of a healthy ecosystem with all of the layers of woodland represented -

### Guidelines for Construction Practices

- Implement measures to reduce erosion and sediment load from construction activities, such as silt fencing/mulch dams or logs, sediment traps, vegetated buffer strips, etc., based on an

canopy, understory, and an herb and fern layer. The health and value as a wildlife habitat of some of the woodlands are compromised by the growth of invasive plants.

#### Existing Vegetation Guidelines

- Ensure that invasive exotics are not introduced into the environment, since most invasive plants are extremely competitive and are harmful to native plant regeneration.
  - Remove invasive plants from existing woodlands and natural areas according to environmentally accepted practices.
- Avoid fertilizer use on slopes, swales and other planted areas that drain directly into the natural surface and groundwater systems.

## New Vegetation

Westside Reservoir Park is rich in natural features that render it an exceptional public facility. With that in mind, it is especially appropriate that the plant species selected for the site promote biodiversity. In addition, it is also important from the standpoint of sustainable landscape practices—adaptability to climate, reduced maintenance costs, reduced water consumption, and improved wildlife habitat—that species are native or naturalized and well suited to the existing ecosystem.

#### General New Vegetation Guidelines

- Choose native plants and seed mixes or plants adapted to local conditions over lawns and exotic plants, as they have lower fertilizer and water requirements.
- Install new irrigation systems with rain-sensitive gauges to avoid irrigation during rain events.
- Restrict fertilizer use to identified areas where initial vegetation establishment is problematic and requires the use of fertilizers.

#### Guidelines for New Tree Planting

- Select native species as much as possible for reasons of sustainability and the success of the tree plantings within the park.
- Locate deciduous canopy trees near buildings and in built areas to provide shade and microclimatic benefits, such as increased humidity through transpiration from leaf surfaces, reduced ambient temperatures in summer, and sunlight penetration in winter.
- Locate trees to mitigate the glare from the building surfaces. Although the buildings facades may be light colored and not have a high absorption rate, the high reflection from the light surfaces can

cause visual discomfort. Trees will serve to absorb radiation and the reflected light.

- Use evergreen trees for their effectiveness in screening winter winds. Restrict their use along the south-facing walls of buildings due to their screening of winter sun.
- Avoid the planting of monocultures to minimize the spread of species-related disease. Where the unity of a space or axis will be determined by the selection of the tree species, it is recommended that a single species predominate, but the plantings should be interrupted by a different species of a similar form.
- Provide a tree guide with tree labels to identify specimen trees. The trails offer opportunities to showcase special plants or ecosystems and make the trails more informative. Specimen plants in the botanical gardens should also be labeled.

#### Guidelines for Lawns and Meadows

- Limit the planting of turf to highly used and highly visible areas
- In less intensively used open areas, consider planting of native species that maintain a lower height with only semi-annual mowing.
- Provide staff training and extend the use of Integrated Pest Management (IPM) throughout the site to minimize the impact of turf on the environment.
- Provide mow strips at building edges to facilitate maintenance and mowing as well as to protect the building face from maintenance operations.

#### Guidelines for Other Planting

- Use shrubs judiciously due to the higher amounts of maintenance that they require.
- Limit the growth of vines on buildings due to the increased maintenance that they can require.
- Limit the use of flower beds and flower pots to well-defined gathering areas to minimize maintenance costs.



# Appendix E

## Westside Reservoir Park

### Design Guidelines





## Current Standard (by PathEcos)

Pond & Company, Inc. in association with Carol R. Johnson Associates, Inc.

November 02, 2007



## Study 1

Pond & Company, Inc. in association with Carol R. Johnson Associates, Inc.





November, 2007

## Primary Bench

PATH/ECOS



Manufacturer :Landscapeforms (Michigan)

Model :AUSTIN

Material :Aluminum

Finishes : Polyester Powder Coat

## Primary Trash Bin



Pond & Company, Inc. in association with Carol R. Johnson Associates, Inc.

November, 2007



Manufacturer : Conceptual Site Furnishings(Michigan)

Model : URBANE

Material : Stainless Steel with Spun Metal Top

Finishes : Polyester Powder Coat

## Primary Trash Bin

PATH/ECOS



November, 2007



Manufacturer : MWH MetallwerkHelmstadt, (Germany/JSA)

Model : D400

Material : Stainless steel with Coat Aluminum

Finishes : powder Coat

## Primary Bollard

Pond & Company, Inc. in association with Carol R. Johnson Associates, Inc.



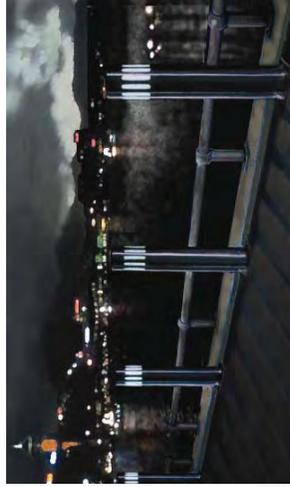
Optional cap

Manufacturer : Cal Pipe (California)

Model : SSL 6040

Material : Stainless Steel

Finishes : Polished Finish





November, 2007

## Primary Bollard

PATH/ECOS



Manufacturer : HESS (Germany/USA)

Model : TORO

Material : Galvanized Steel

Finishes : Powder Coat

## Primary Drinking Fountain



November, 2007

Pond & Company, Inc. in association with Carol R. Johnson Associates, Inc.



Manufacturer : Escofet (Spain/USA)

Model : CARMEL

Material : Stainless Steel

Aluminum Cast Iron Basin

Reinforced Cast Stone Base

Finishes : Silver Grey Powder Coat

## Primary Drinking Fountain

PATH/ECOS



November, 2007



Manufacturer :Haws (Nevada)

Model :3380

Material : Galvanized Steel

Stainless Steel Bowl

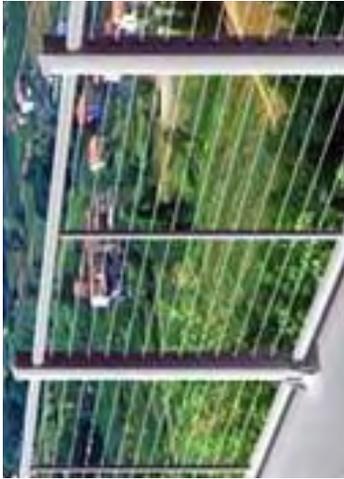
Finishes : Powder Coated & Galvanized Finish

## Primary Railing



November, 2007

Pond & Company, Inc. in association with Carol R. Johnson Associates, Inc.



Manufacturer : Railing Works (Alabama)

Model : Cable Railing

Material : Aluminum Post

Stainless Steel Cable

Finishes : Polyester Powder Coat



# Appendix F

# Athletic Field Specifications



# Appendix F Athletic Field Specifications

## Section 1 Baseball & Softball Fields

### Field Layout

The optimum orientation for all ball fields is to layout the fields so that a line running from home plate, through the pitcher's mound, towards second base would be oriented north-northeast. This ensures that the batter is not facing into the sun.

Field layout plans for 90-foot diamond baseball, 60-foot diamond baseball, and softball (with a skinned infield) are included in this section. (See Figures F-1 and F-2.) Also included is a sketch depicting two options for skinned infields, see Figure F-3. In these options, the alternative to the right is the preferred option and includes a warning track (recommended to be 10 feet wide for softball fields, 15 feet for baseball. The clay infield can be expanded to include the dugouts/players' benches if ADA accessibility is not required. (A minimum of one dugout per ballfield, or per park if one park has multiple ballfields, is recommended to be accessible. See ADA Regulations for clarification.) Where ADA is required a compacted stone dust surface may be used, and can be extended to the warning strip as desired. A detail for the skinned infield cross-section have been.

### Field Grading/Drainage

Surface drainage for each of the three types of ball fields is relatively the same with minor exceptions. What is most significant in determining the surface flow of stormwater is determined by existing site conditions and ensuring that water does not flow across the field of play.

Three alternatives for the grading of baseball/softball outfields have been included in this section. The first (Figure F-4) is the preferred alternative for the grading ballfields creates a crown in the

inner outfield from second base, while still allowing the home run fence to be sited at a constant elevation. (Elevations are defined in feet.) The second option (Figure F-5) crowns the outfield with a ridge line running from second base to centerfield. The benefit of this design is that it removes runoff more directly from the field of play. However, the layout creates a significant difference in elevation from right and left fields to centerfield. The final, and least preferable, option (Figure F6) the outfield slopes away from the infield at 1%. While this improves the drainage and conditions for the outfield, it creates a three foot difference in elevation from infield play to the homerun fence.

Diagrams depicting grading for the infields have also been provided. The first (Figure F-7) infield is an appropriate option to remove water from the infield area, without having stormwater travel across the turf and onto the clay. While this method may work to remove water, it has the tendency to increase the movement of the clay particles with the water, thereby amplifying the development of lips on the edges where clay meets turf. This may not be as much of a problem on baseball fields, particularly 60-foot diamonds, but softball fields with skinned infields, this will likely create a significant maintenance problem. The second diagram (Figure F-8) is better suited for skinned softball infields, as well as baseball fields. The crowning of the infield allows the area to drain and appears as though the pitcher's mound is elevated, while actually allowing both it, and home plate, to be at a level and consistent elevation as is recommended for softball.

Finally, a blow-up of the traditional grading of the pitcher's mound is included, see Figure F-9. The mound is nine feet in diameter, with the leading edge of the pitcher's rubber being located 18" behind the center of the mound.

(The included diamond layout diagrams were provided by Sports Fields: A manual for Design and Construction Maintenance, by Jim Puhalla, et al, published by Ann Arbor Press, Chelsea, Michigan, 1999.)

# College / High School Baseball Field Dimensions

## LEGEND

- BASE LINES
- - - GRASS LINES
- WHITE LINES

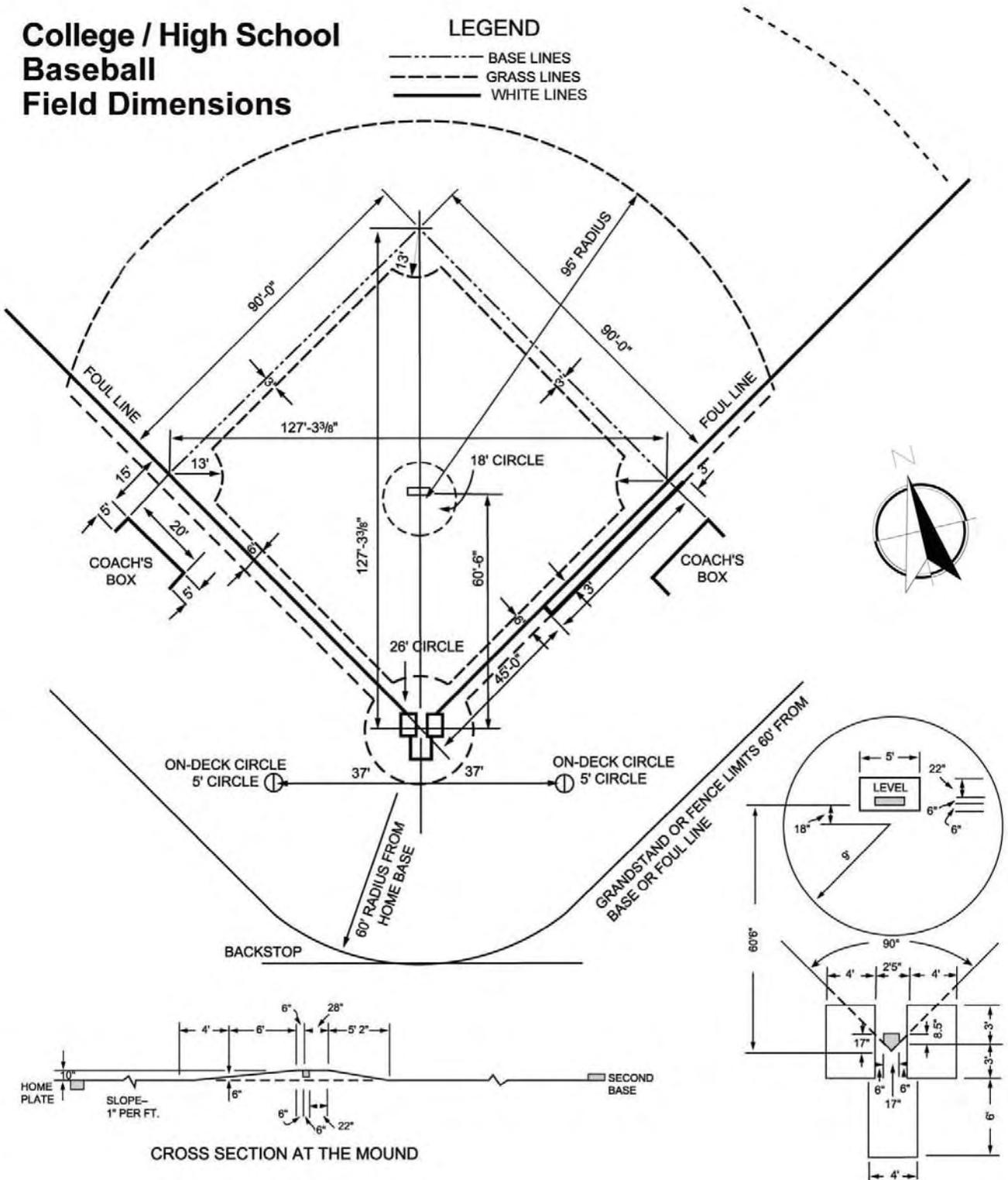


Figure F-1.



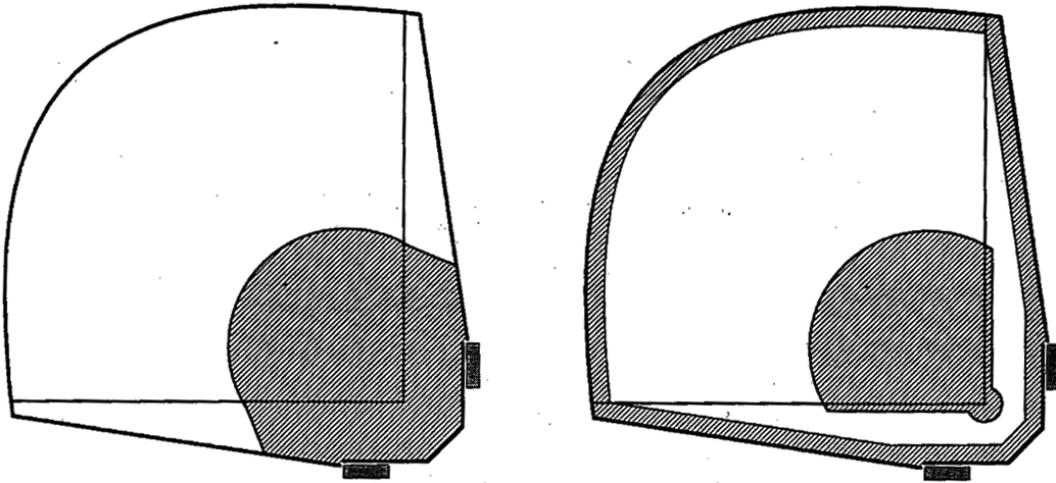


Figure F-3. These diagrams (above) depict two alternatives for a skinned infield, which are traditional to softball fields. In the second diagram, the warning track is extended around the backstop. If this is constructed with compacted stone dust and the dugouts are connects as shown, the dugouts may be considered accessible.

### Appurtenances

The following appurtenances should be included with baseball/softball fields:

1. Baseball/Softball Backstop
2. Foul Poles
3. Outfield fence and safety padding

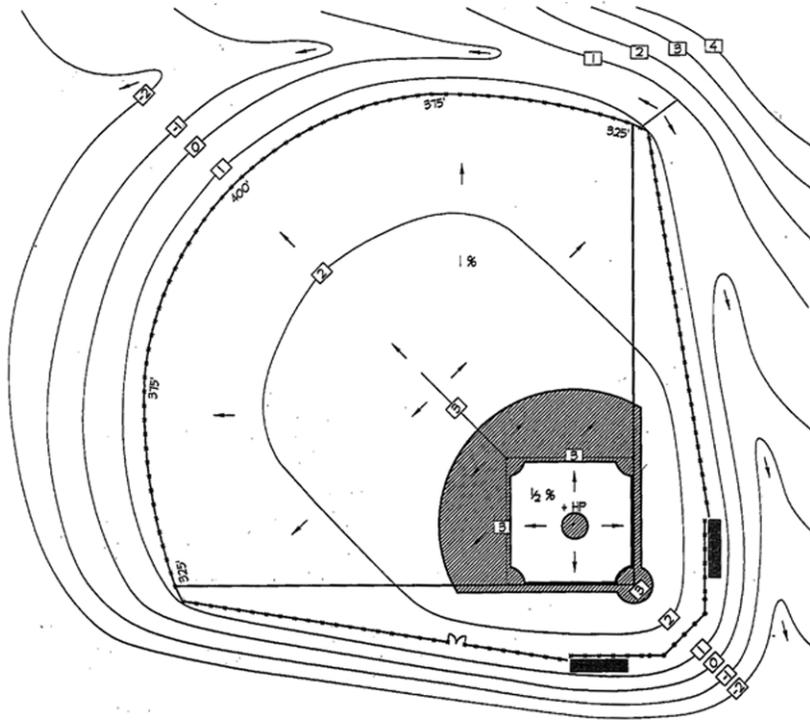


Figure F-4. Preferred option for the grading of ballfields. Elevations defined in feet.

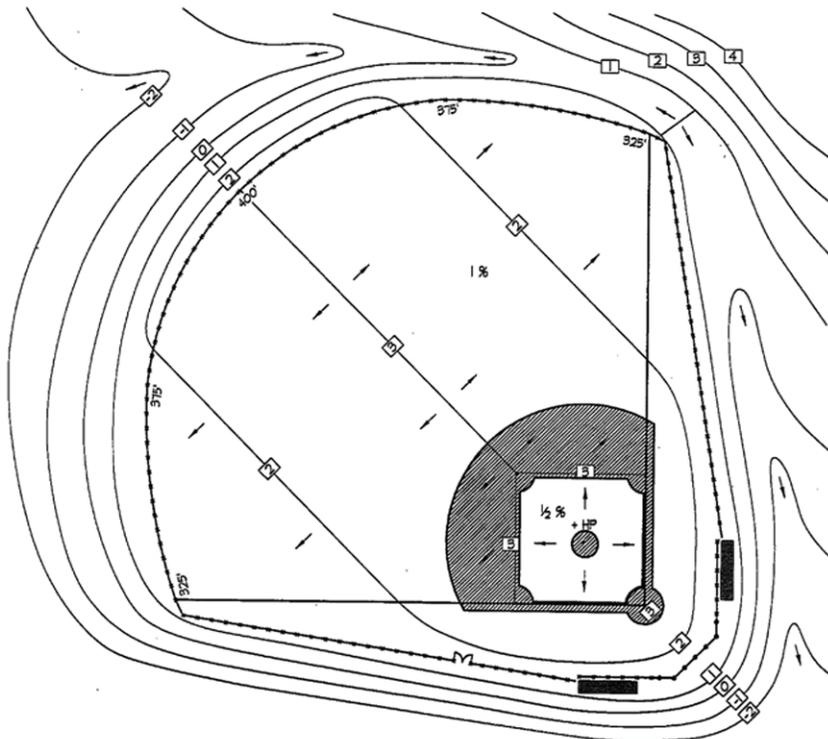


Figure F-5. Secondary option for the grading of ballfields.

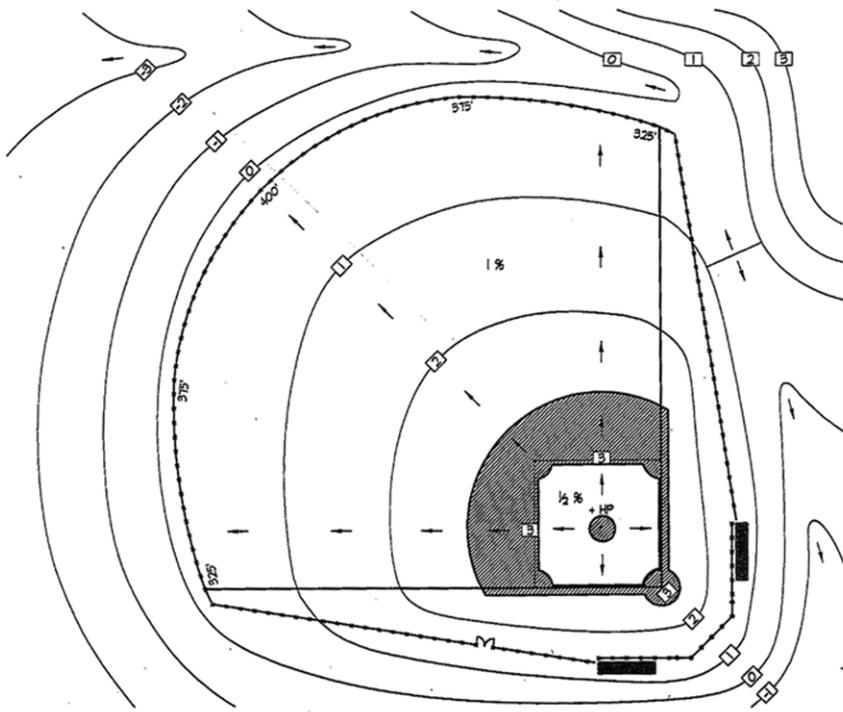


Figure F-6. An additional alternate for the grading of ballfields.

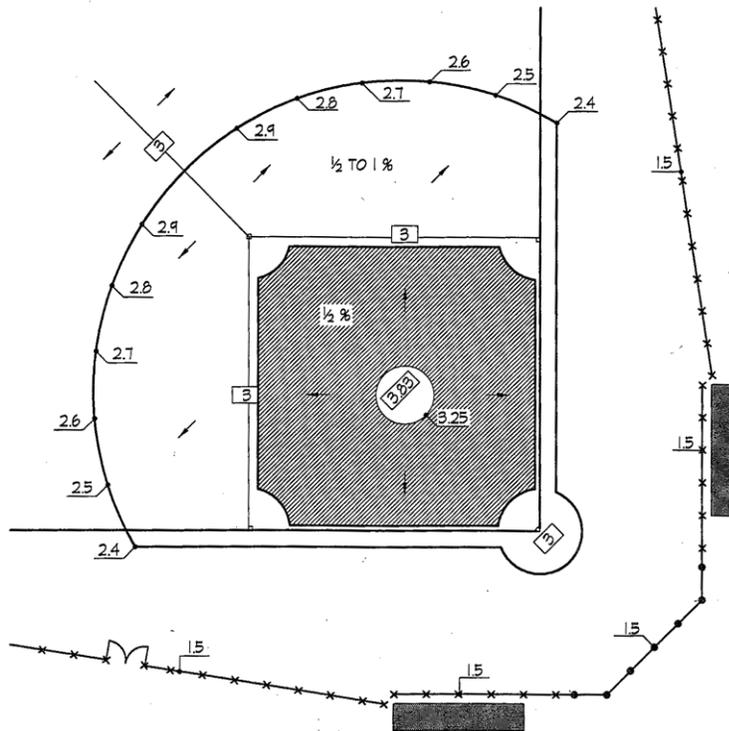


Figure F-7. Recommended grading plan for baseball infields.

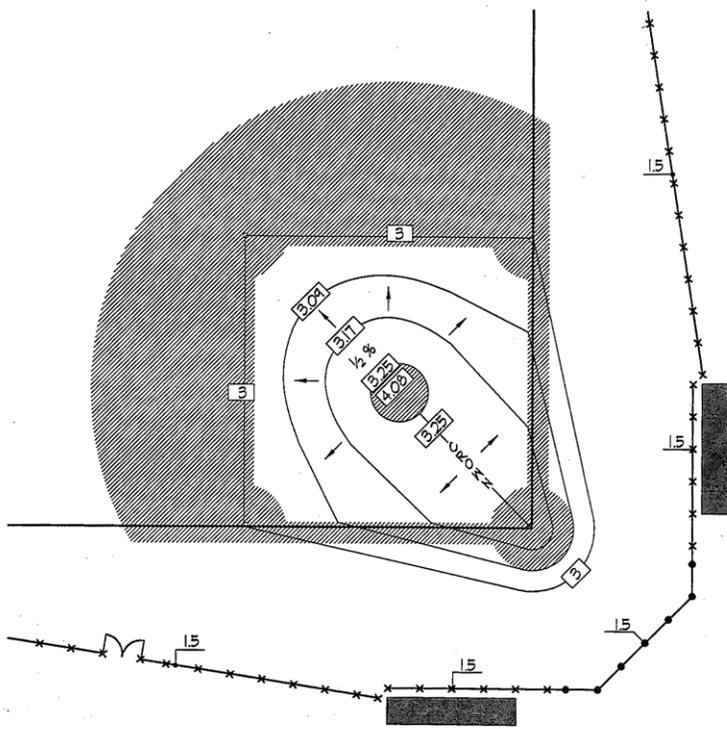


Figure F-8. Recommended grading plan for softball fields with a skinned infield.

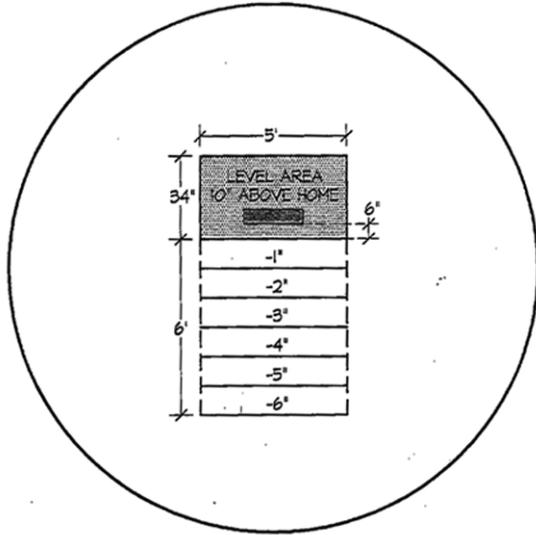


Figure F-9. Blow-up of the traditional grading of the pitcher's mound for baseball fields.

Diagrams provided by Sports Fields: A Manual for Design and Construction Maintenance.

## Section 2 Rectilinear Athletic Fields

### Field Layout

Orientation for each of the athletic fields included in this section is the same: rectilinear fields are to be laid out with the long axis directed north-south. This ensures a relatively fair playing field for both teams, and keeps goals areas directed away from the more challenging directions.

Layout plans for soccer, lacrosse, and field hockey are included in section. (See Figures F-10, F-11, F-12 respectively.) These plans are based on the National Federation for State High School Associations (NFHS) sports field layouts.

### Field Grading/Drainage

Typically rectilinear fields are pitched in one direction with a gradient of 1.0-1.5%. Two common grading layouts are used with rectilinear sports: crowned fields (Figure F-13), and planar layouts with a sideline to sideline design (see Figure F-14). Crowned fields tend to be preferred as to allow adequate slope for drainage, while maintaining a balanced field of play. The crowned field may create wet areas outside of the field area where the grades may flatten out which can challenge footing in the sidelines which is an essential area of play in many sports, particularly soccer, as well as for spectators.

Grading fields with a pitch in one direction from end to end is efficient in moving stormwater off the field of play, but it can create a difference in elevation from one sideline to the other of over three feet (with soccer fields) which can be awkward for ball roll and playability. Oftentimes, due to the existing conditions of the landscape, this option may be more cost effective. The sloped field may also create greater demand on subsurface drainage due to the fact that the low side of the field will receive the runoff from the entire field. When designing a multi-use rectilinear field, care must be taken in the grading to encompass the greatest dimensions of overlapping fields, typically end zone to end zone in football, and sideline to sideline in soccer.

The diagrams included in this binder show each of these conceptual grading layouts. All elevations are defined in feet.

### Appurtenances

The following appurtenances should be included:

1. Portable soccer goals
2. Semi-permanent soccer goals
3. Semi-permanent football goal posts
4. Goal post protector pads
5. Field hockey goals
6. Lacrosse goals

# Regulation Soccer Field Dimensions

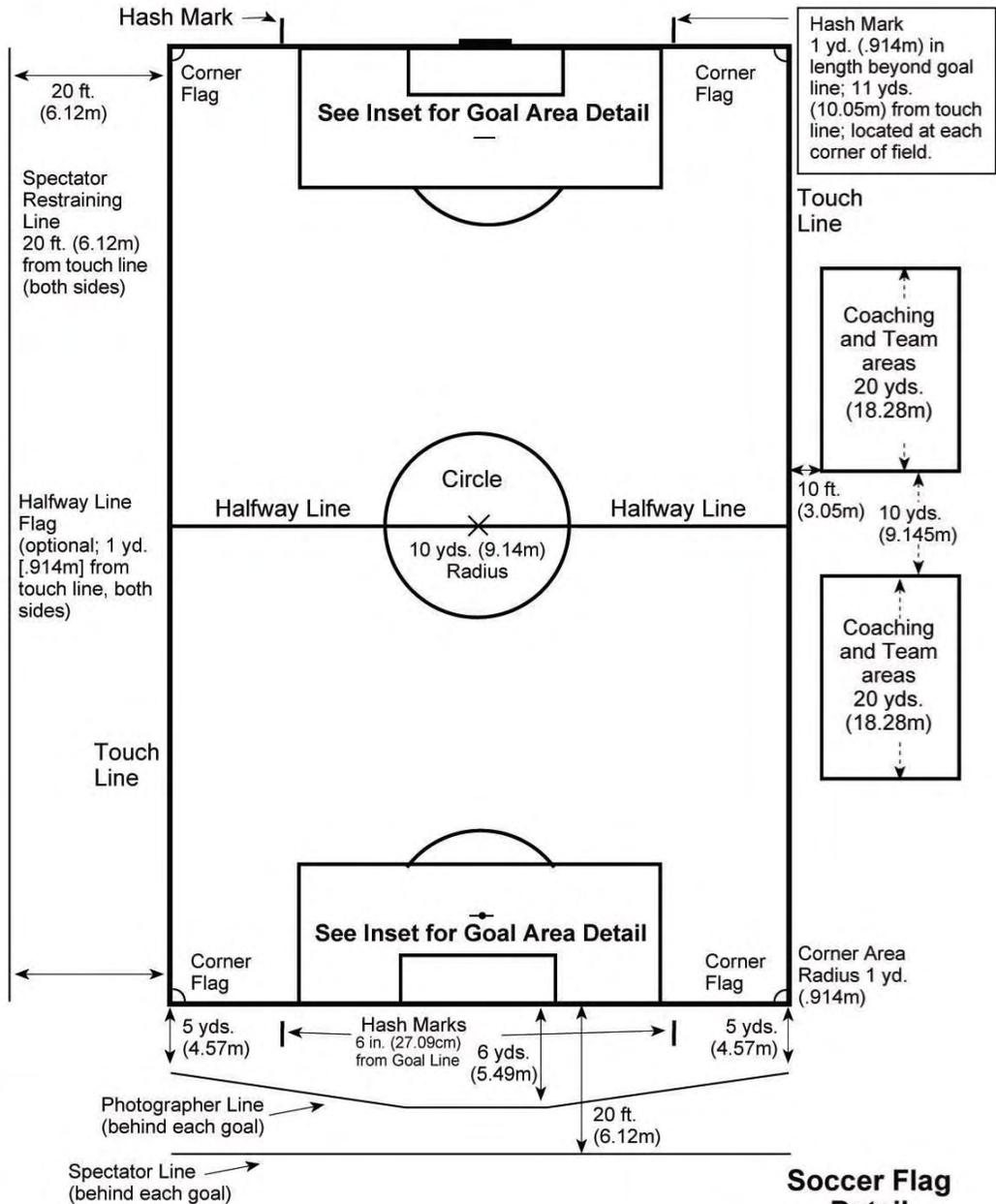
## Field Dimensions

### SECTION 1.

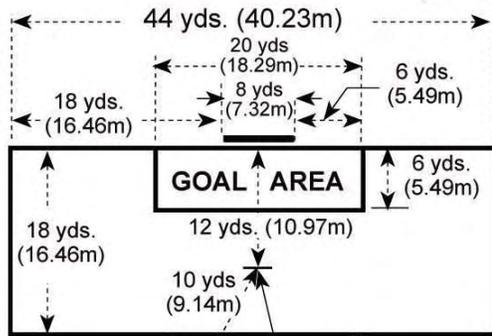
- a. The field of play shall be rectangular, the width of which shall not exceed the length.
- b. The width shall not be more than 80 yards [73.15m] nor less than 65 yards [59.44m] and the length shall not be more than 120 yards [109.73m] nor less than 110 yards [100.58m]; however, fields of less than minimal dimensions may be used by prior written mutual consent of the competing institutions. The optimum size is 75 yards [68.58m] by 120 yards [109.73m].

Facilities constructed after September 1995 must be a minimum of 70 yards [64.01m] in width by 115 yards [105.15m] in length.

Note: For marking purposes, the measurement of any line interfacing with any other line must be taken from the outside of the line to the outside of the other line.

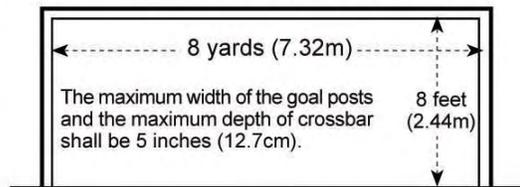


## Goal Area Detail



Penalty Kick Line 2 ft. (60.96cm) or Spot 9" Dia. (22.86cm)

## Soccer Goal Detail



## Soccer Flag Detail

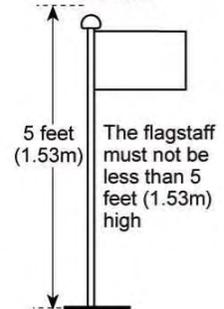


Figure F-10.

# Lacrosse Field Dimensions

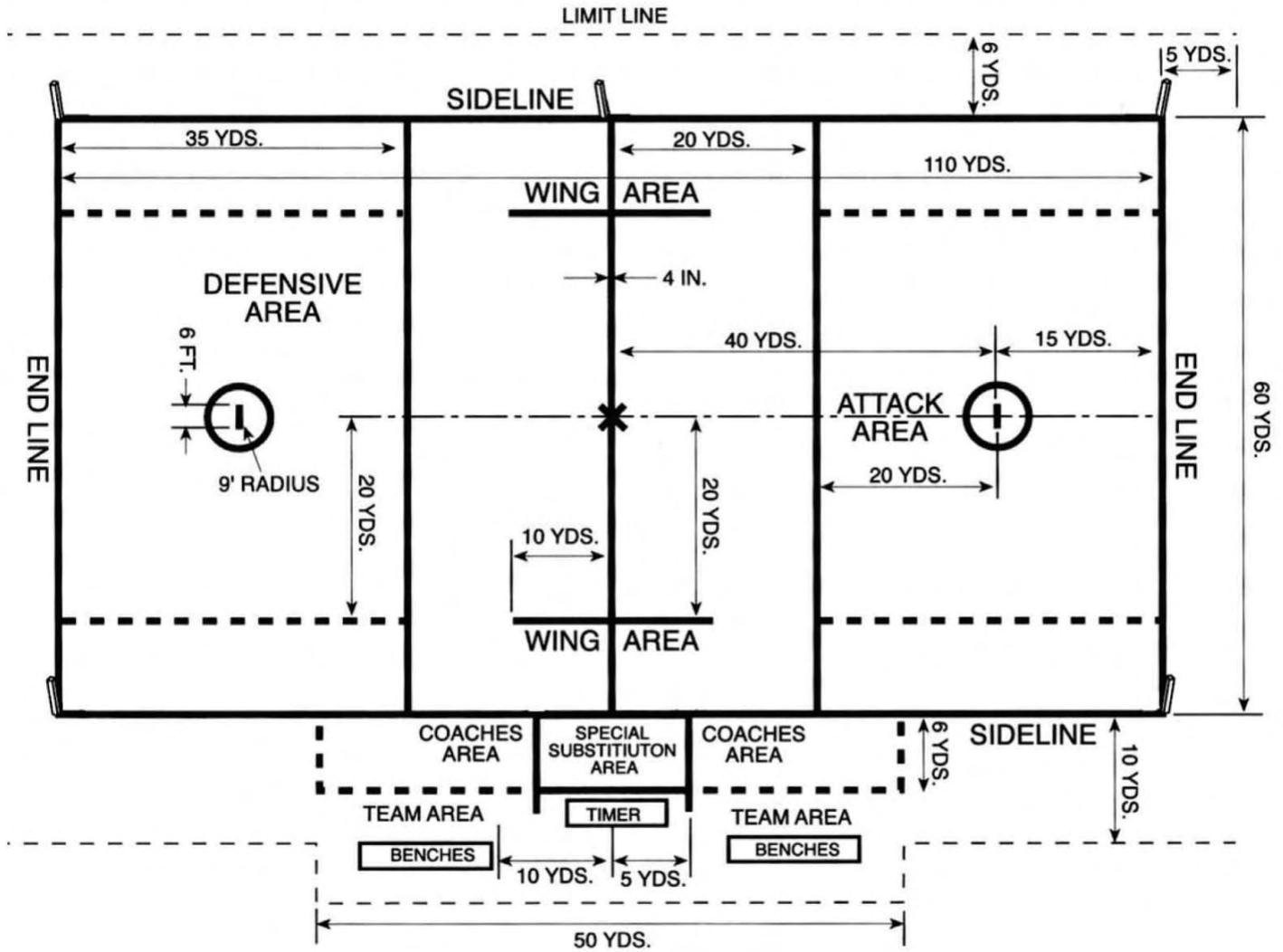


Figure F-11.

# Field Hockey Field Dimensions

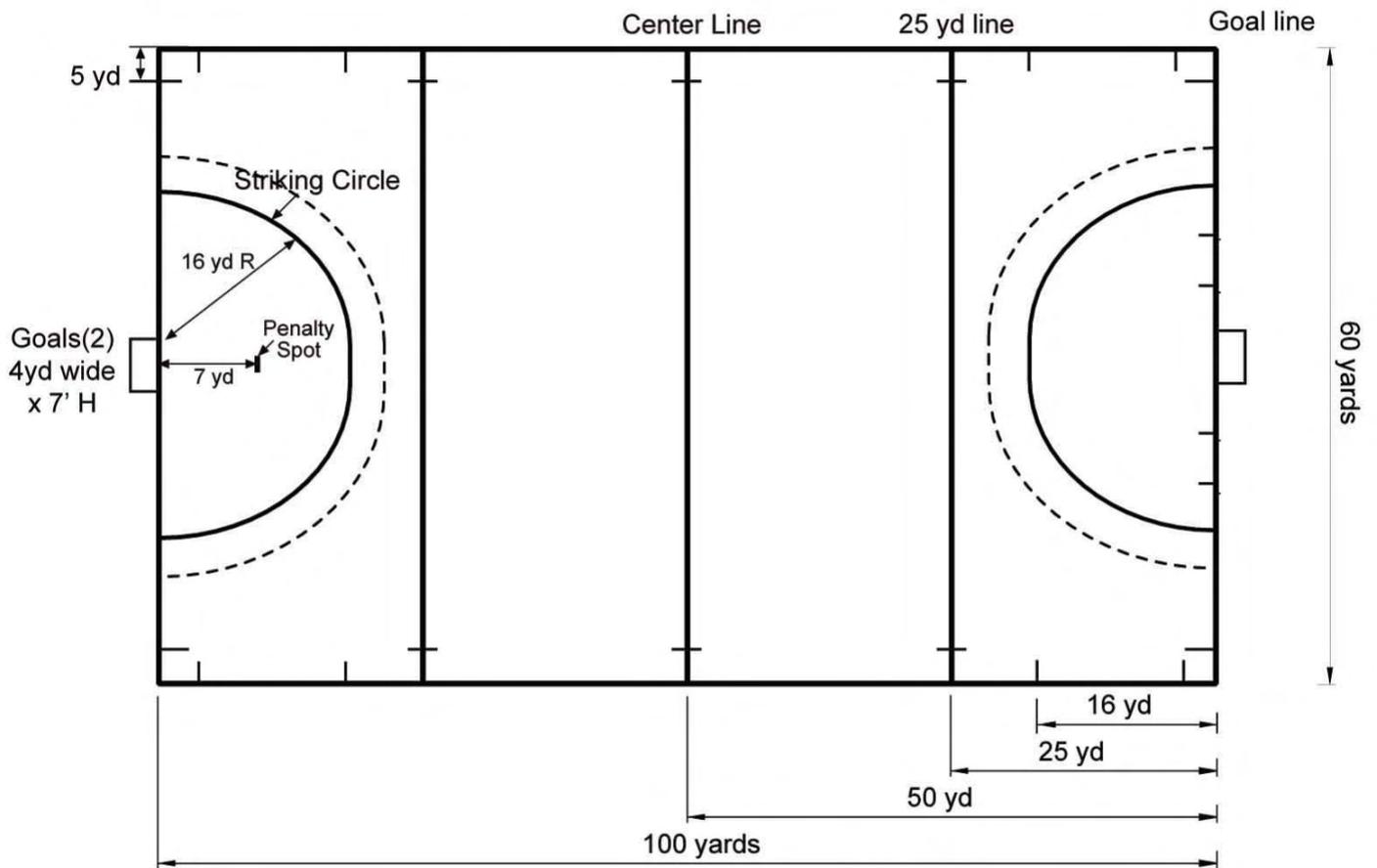


Figure F-12.

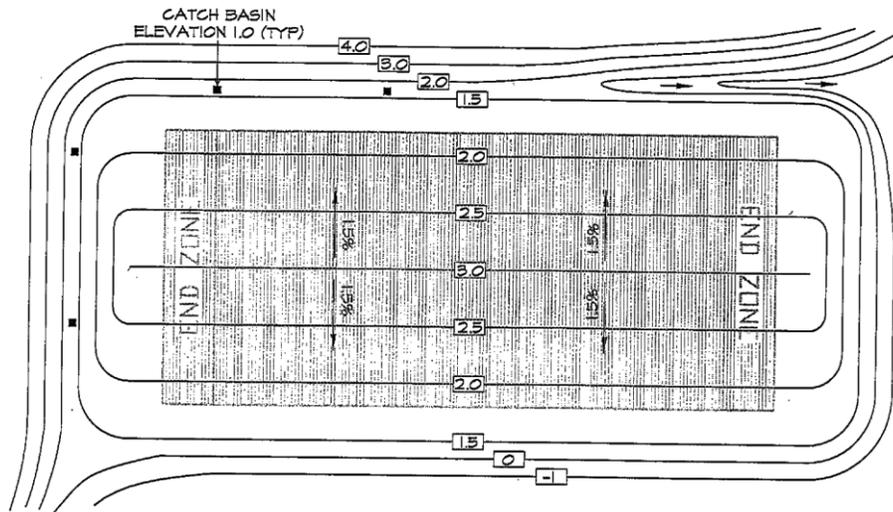


Figure F-13. Grading alternatives for a rectilinear athletic field with a crown, also called a hog-back. All elevations are defined in feet.

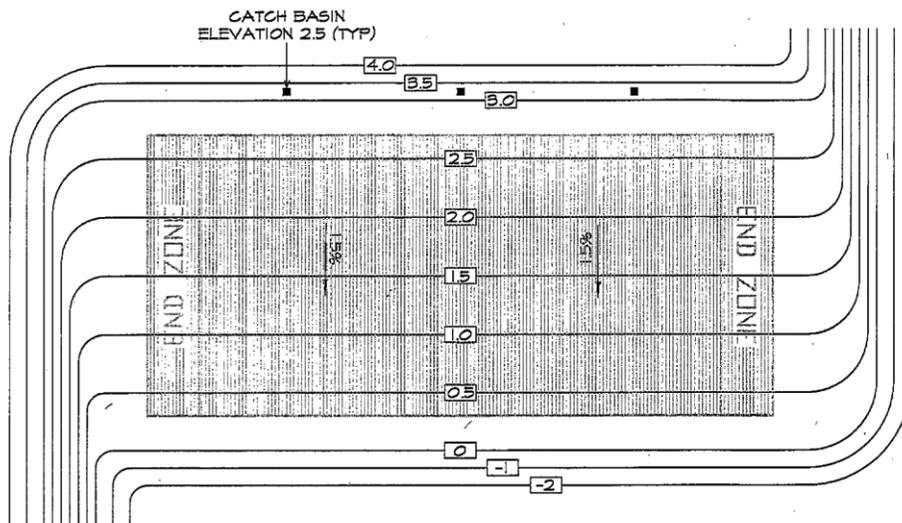


Figure F-14. Alternative for a rectilinear athletic field with a consistent slope in one direction.

Diagrams provided by [Sports Fields: A Manual for Design and Construction Maintenance](#).

# Appendix H

## Outline Specifications for Maintenance & Infrastructure



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## **SECTION 00001 - INTRODUCTION**

The following outline specifications describe routine work activities required to maintain a park that includes woods, meadow, water bodies, and turf landscape and associated infrastructure of pavilions, out buildings, shelters, irrigation, fences and gates, trails, walkways, roadways and parking lots, playgrounds, and community gardens.

The specifications that follow are not final documents suitable for distribution and utilization. These are abbreviated specifications that describe levels of commitment in resources, time, money, and staffing, required to maintain a public landscape in a manner that protects capital investment and provides long-term, safe public access. These outline specifications are the basis for the estimate of yearly maintenance costs.

These outline specifications have been developed assuming a model of outsourcing all tasks to a maintenance contractor selected through a public solicitation and bid process.

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## **SECTION 01000 - GENERAL REQUIREMENTS**

### **PART 1 - GENERAL**

#### **1.01 REFERENCES**

- A. The General Documents, including all Special Conditions, shall be provided by the City, and shall be included in and made part of this Section.
- B. Examine all drawings and all other Sections of the Maintenance Specifications for requirements therein affecting the work of this trade.

#### **1.02 SCOPE**

- A. The work of this Contract consists of furnishing all labor and materials necessary to provide the services specified herein, including the following:
  - 1. General Cleanup
  - 2. Trash Removal
  - 3. Graffiti Control
  - 4. Rodent Control
  - 5. Repainting and Touch-Up Painting
  - 6. Maintenance of Pavements, Trails, and Walks
  - 7. Maintenance of Site Improvements and Site Furnishings
  - 8. Maintenance of Drainage Systems
  - 9. Maintenance of Site Lighting
  - 10. Maintenance of Irrigation Systems
  - 11. Maintenance of Turf and Meadows
  - 12. Maintenance of Planting and Plant Beds
  - 13. Maintenance of Baseball Diamonds and Associated Areas

#### **1.03 RELATED WORK UNDER OTHER SECTIONS**

- A. The following items of related work are specified in separate sections of these Maintenance Specifications:
  - 1. 01010, General Cleanup
  - 2. 01020, Trash Removal
  - 3. 01040, Graffiti Control
  - 4. 01050, Rodent Control
  - 5. 01060, Repainting And Touch-Up Painting
  - 6. 01070, Maintenance of Pavements, Trails, and Walks
  - 7. 01080, Maintenance of Site Improvements and Site Furnishings
  - 9. 01090, Maintenance of Drainage Systems
  - 10. 01100, Maintenance of Site Lighting
  - 11. 01120, Maintenance of Irrigation Systems
  - 12. 01130, Maintenance of Turf and Meadows
  - 13. 01140, Maintenance of Planting and Plant Beds

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14. 01150, Maintenance of Baseball Diamonds and Associated Areas

1.04 MAINTENANCE SCHEDULE

- A. Prepare a Maintenance Schedule that indicates the planned date of each maintenance operation included in this Contract. Work shall not commence until the City's Representative has approved the Maintenance Schedule.

1.05 INITIAL SITE MEETING

- A. On the first business day of the contract period, the Maintenance Staff and the City's Representative shall have a meeting to review project scope and to determine the condition of all site features within the Limit of Work. The Maintenance Staff shall be responsible for initiating and arranging this meeting.

1.06 SEASONAL SITE MEETINGS

- A. Two times per year, on or before the 1<sup>st</sup> day of May and the 15<sup>th</sup> day of August, the City's Representative, the Maintenance Staff and the Maintenance Contractors, and all maintenance subcontractors shall meet at the Park to inspect the Work that is being performed, and to propose any changes to the maintenance practices or schedule described herein. The Maintenance Contractor shall be responsible for coordinating these meetings.

1.07 ADDITIONAL SITE MEETINGS

- A. At the request of the City's Representative, the Maintenance Contractor and any relevant subcontractors of the Maintenance Contractor shall meet at the Park to inspect the Work that is being performed, to discuss any problems that may have occurred and to make any changes to the current maintenance practices that may be required. These meetings will be performed on dates specified by the City's Representative, to a maximum of three meetings per year, and shall be provided at no additional expense to the City.

1.08 PROGRESS REPORTS

- A. Submit a written progress report to the City's Representative describing the conditions of the Park, the Work completed during the payment period, problems encountered, materials used on the site in performing such work, and recommendations for future work.

1.09 PROTECTION OF ENVIRONMENT

- A. Definitions of pollutants
  1. Sediment: Soil and other debris that has been eroded and transported by runoff water.
  2. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from industrial, commercial and agricultural operations and from community activities.

3. Rubbish: A variety of combustible and non-combustible wastes such as, but not limited to, paper, plastic, metallic and plastic containers and cans, boxes, glass, crockery, metal lumber scrap, and bones.
  4. Debris: Includes both combustible and noncombustible wastes, such as leaves, and tree trimmings, ashes, and waste materials that result from construction or maintenance and repair work.
  5. Chemical Waste: Includes petroleum products, bituminous materials, salts, acids, alkali's, herbicides, pesticides, organic chemicals, and inorganic wastes.
  6. Sanitary Wastes
    - a. Sewage: That which is considered as domestic sanitary sewage. Human and animal waste.
    - b. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food and food by-products.
- B. All sediment soil, debris, rubbish, chemical waste, sanitary waste and solid waste material generated by maintenance operations shall be disposed of legally off-site on the day these materials are generated.
- C. Chemical Handling and Emergency Spill Plan
1. All chemical mixing and handling must be within a contained area.
  2. Equipment and materials for containing an accidental spill must be kept available.
  3. Contaminated materials must be disposed of properly and in accordance with state laws.
  4. Chemical spills must be reported to the City's Representative immediately.
  5. Reports of chemical spills must specify the estimated volume spilled, the estimated volume recovered, the location of the incident, the actions taken in response to the spill, and the time and date of all incidents and activities.
  6. See individual sections of this contract for other restrictions on the use of chemicals.
- D. Protection Of Air Resources:
1. Keep construction activities under surveillance, management and control to minimize pollution of air resources. No burning will be permitted on the site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State and Federal emission and performance laws and standards. Maintain ambient air quality standards set by the Environmental Protection Agency, for those construction operations and activities specified.
    - a. Particulates: Dust particles, aerosols, and gaseous by-products from all construction and maintenance activities, processing, and preparation of materials, such as from asphalt batch plants, shall be controlled at all times, including weekends, holidays, and hours when work is not in progress.
    - b. Particulate Control: Maintain all excavations, stockpiles, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinkling with water is permissible to control particulates in the work area.

- c. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and Commonwealth allowable limits.
- d. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.

E. Noise Control

1. The Maintenance Contractor shall minimize construction related noise. Noise producing work shall be performed in less sensitive hours of the day, or as directed by the City. Maintain noise at or below the decibel levels and within the time periods specified.

- a. Repetitive, high level impact noise will be permitted only between 7:00 a.m. and 8:00 p.m. weekdays, or as otherwise permitted by local ordinance, or as directed by the City. Repetitive impact noises shall not exceed the following dB limitations:

<u>Time Duration of Impact Noise</u>	<u>Sound Level in dB</u>
More than 12 minutes in any hour	70
Less than 30 seconds of any hour	85
Less than three minutes of any hour	80
Less than 12 minutes of any hour	75

2. The Maintenance Contractor shall provide all necessary equipment or sound-deadening devices, and shall take all practicable noise abatement measures that are necessary to comply with the requirements of this contract, consisting of, but not limited to the following:

- a. Maximum permissible construction equipment noise levels at 50 feet (dBA):

Front Loaders	75	Jack Hammers	75
Backhoes	75	Compressors	75
Lawn Mowers	75	Pneumatic Tools	80
Tractors	75	Saws	75
Chain Saws	80	Vibrators	75
Trucks	75	Generators	75

- b. Efficient silencers on air intakes for equipment.
  - c. Efficient intake and exhaust mufflers on internal combustion engines that are maintained to have equipment perform below noise levels specified.
  - d. Conduct truck loading, unloading and hauling operations so that noise is kept to a minimum.
3. If directed by the City while work is being performed above 55 dBA noise level, measure sound level for noise exposure due to the construction or

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maintenance work. Measure noise exposure at the property line or 50 feet from the noise source, whichever is greater. Measure the sound levels on the A weighing network of a General Purpose sound level meter at slow response. Submit the recorded information to the City noting any problems and the alternatives for mitigating actions.

END OF SECTION

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## **ITEM 01010 – GENERAL CLEANUP**

### PART 1 - GENERAL

#### 1.01 SCOPE

- A. The Work of this Section consists of furnishing all labor and materials necessary to provide the services specified herein, including:
  - 1. Removal of litter, trash, garbage and miscellaneous debris from the entire site, including but not limited to paved areas, public street gutters, play grounds, baseball fields, multi-use athletic fields, street hockey rink, basketball courts, meadows, skate park and rinks, amphitheatre, playgrounds, disc golf course, parking lots, dog park, trails and walks, community gardens, pond margin, all park structures, site furnishings, fountains, miscellaneous lawns and planting beds.
  - 2. Removal of fallen leaves from the entire site except forest areas, meadows and water bodies.
  - 3. Sweeping of pavements.
  - 4. Spring clean up.
  - 5. Control invasive plant material.

#### 1.02 RELATED WORK UNDER OTHER SECTIONS

- A. The following items of related work are specified in separate sections of these Maintenance Specifications:
  - 1. 01000 General Requirements
  - 2. 01020 Trash Removal
  - 3. 01040 Graffiti Control
  - 4. 01050 Rodent Control
  - 5. 01060 Repainting and Touch-Up Painting
  - 6. 01070 Maintenance of Pavements, Trails and Walks
  - 7. 01080 Maintenance of Site Improvements and Site Furnishings
  - 8. 01090 Maintenance of Drainage Systems
  - 9. 01100 Maintenance of Site Lighting
  - 10. 01120 Maintenance of Irrigation Systems
  - 11. 01130 Maintenance of Turf and Meadows
  - 12. 01140 Maintenance of Planting and Plant Beds
  - 13. 01150, Maintenance of Baseball Diamonds and Associated Areas

#### 1.03 USE OF VEHICLES AND MACHINERY ON SITE

- A. No leaf-blowers or other power machinery shall be used on the site at any time on weekends.
- B. Refer to Section 01000, General Requirements, for other restrictions on the use of vehicles and machinery on site.

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PART 2 - PRODUCTS

NONE

PART 3 - EXECUTION

3.01 YEARLY CLEANUP

- A. Schedule: Perform yearly cleanup from mid-February through March, but no later than the last week in March.
- B. Remove all litter, trash, garbage, leaves, branches, and miscellaneous debris under the work of this Item from parking lots, trails, walkways, tree rings, plant beds, buildings and structures, and all turf areas. No material shall be blown onto any motor vehicles, walks or buildings.
- C. Work of removal of debris from walks and all turf areas of the site shall occur on days with a relatively calm wind and completely dry
- D. Dispose of all sand, litter, leaves, branches, and miscellaneous debris collected during spring cleanup activities off site in a legal manner. Disposal shall occur at the end of each day of work. Do not store debris on site overnight.
- E. Remove all sand, broken branches, fallen leaves, litter, and debris from all tree rings, shrub beds, ground cover beds, and flower beds. Do not remove bark mulch from beds.
- I. Cleanup Parking Lots and Roadways:
  - 1. Schedule:
    - a. Sweeping up debris during the first two weeks in February.

3.02 LITTER REMOVAL

- A. Remove and dispose of litter by hand (including but not limited to dog feces, twigs and branches fallen or broken from trees and shrubs, trash, garbage, debris and general refuse) from entire site, including but not limited to paved areas, public street gutters, play grounds, baseball fields, multi-use athletic fields, street hockey rink, basketball courts, meadows, skate park and rinks, amphitheatre, playgrounds, disc golf course, parking lots, dog park, trails and walks, community gardens, pond margin, all park structures, site furnishings, fountains, miscellaneous lawns and planting beds, and as requested by the City's Representative.
- B. The Maintenance Contractor personnel shall not damage plants while picking up litter.
- C. During the season when lawns are being mowed, remove and dispose of litter before each mowing.

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- D. Collect dog feces in a small plastic bag, close bag with a knot or twist tie and dispose of bag in trash receptacle.
- E. Except for dog feces, trash receptacles throughout the site shall not be used for disposal of collected litter, debris or other waste materials generated by maintenance activities.

### 3.03 PAVEMENT SWEEPING

- A. Sweep all parking lots and walkways and dispose of sweepings every week of the year and more as needed to keep pedestrian areas free of debris.

### 3.04 LEAF REMOVAL

- A. Once each February during the Spring Clean Up, the Maintenance Contractor shall rake and remove all fallen leaves from athletic fields, lawns and plant beds.
- B. Leaves shall be raked and removed one day per week from October 15 until November 15 and then 2 days per week until December 1.

### 3.05 CONTROL OF INVASIVE PLANTS

- A. Control and management of invasive upland, wetland and aquatic plant material shall be based upon information developed by INVASIVE.ORG, a joint project of the University of Georgia's Bugwood Network, USDA Forest service and the USDA APHIS PPQ, and found on <http://www.invasive.org/eastern/biocontrol/>
- B. CD-ROM of this website is available from the USDA Forest Service in Morgantown, West Virginia (304) 285-1566. Secure CD-ROM, print out all pages, including visual images of all invasive and noxious plants and bind in a Master Note Book for ongoing reference.
- C. Inspect uplands forest and meadow, edge conditions between the two, margins of parking lots and all trail edges, wetlands, water bodies and edges of water bodies in the months of May and August for invasive plant colonies.
- D. When invasive species are identified within the limits of the Park, record their location using GPS coordinates and on a plan of the Park. Maintain a log of location, date of inspection and discovery of invasive plants, controls applied and outcome of control treatments on a yearly basis.
- E. Utilize recommendations from For each species, a menu of control options is presented, including mechanical treatments, specific herbicide prescriptions, and, for selected species, recent advances in biological control.
- F. Web sites of Interest

**Invasive and Exotic Species of North America**  
<http://www.invasive.org/>

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**USDA Animal and Plant Health Inspection Service's Federal Noxious Weed Program**

<http://www.aphis.usda.gov/ppq/weeds/>

**National Agricultural Pest Information System**

<http://www.ceris.purdue.edu/napis/>

**National Invasive Species Information Center**

<http://www.invasivespeciesinfo.gov/>

**Southeast Exotic Plant Pest Council**

<http://www.se-eppc.org/>

**Weeds Gone Wild: Alien Plant Invaders of Natural Areas**

<http://www.nps.gov/plants/alien/>

**Invasive Plant Atlas of New England**

<http://invasives.eeb.uconn.edu/ipane/>

**Connecticut Invasive Plant Working Group**

<http://www.hort.uconn.edu/cipwg/>

**Federal Interagency Committee for the Management of Noxious and Exotic Weeds**

<http://ficmnew.fws.gov/>

**Wildland Invasive Species Team - The Nature Conservancy**

<http://tncweeds.ucdavis.edu/>

**USDA NRCS PLANTS Database**

<http://plants.usda.gov/>

**Missouri Vegetation Management Manual**

<http://www.conservation.state.mo.us/nathis/exotic/vegman/vegman.pdf>

**Ecology and Management of Invasive Plants Program, Cornell University**

<http://www.invasiveplants.net/>

**INVADERS Database System**

<http://invader.dbs.umt.edu/>

**USDA APHIS PPQ - Center for Plant Health Science and Technology**

<http://www.cphst.org>

**North American Plant Protection Organization's (NAPPO) Phytosanitary Alert System**

<http://www.pestalert.org/>

**Bureau of Land Management Weeds Website**

<http://www.blm.gov/weeds/>

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**Florida Exotic Plant Pest Council**

<http://www.fleppc.org/>

**University of Florida, Center for Aquatic and Invasive Plants**

<http://aquat1.ifas.ufl.edu/welcome.html>

**U.S. Geological Survey Invasive Plants**

[http://www.usgs.gov/invasive\\_species/plw/](http://www.usgs.gov/invasive_species/plw/)

**Harmful Non-Indigenous Species in the United States**

[http://www.wws.princeton.edu/~ota/disk1/1993/9325\\_n.html](http://www.wws.princeton.edu/~ota/disk1/1993/9325_n.html)

**Invasive plants: changing the landscape of America**

<https://www.denix.osd.mil/denix/Public/ES-Programs/Conservation/Invasive/intro.html>

**Global Invasive Species Database**

<http://www.issg.org/database/welcome/>

END OF SECTION

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## **SECTION 01020 - TRASH REMOVAL**

### PART 1 - GENERAL

#### 1.01 SCOPE

- A. The work of this Section consists of furnishing all labor and materials necessary to provide the services specified herein, including:
  - 1. Removal and disposal of trash from trash receptacles

#### 1.02 RELATED WORK UNDER OTHER SECTIONS

- A. The following items of related work are specified in separate sections of these Maintenance Specifications:
  - 1. 01000 General Requirements
  - 2. 01010 General Cleanup
  - 3. 01040 Graffiti Control
  - 4. 01050 Rodent Control
  - 5. 01060 Repainting and Touch-Up Painting
  - 6. 01070 Maintenance of Pavements, Trails and Walkways
  - 7. 01080 Maintenance of Site Improvements and Site Furnishings
  - 8. 01090 Maintenance of Drainage Systems
  - 9. 01100 Maintenance of Site Lighting
  - 10. 01120 Maintenance of Irrigation Systems
  - 11. 01130 Maintenance of Turf and Meadows
  - 12. 01140 Maintenance of Planting and Plant Beds
  - 13. 01150, Maintenance of Baseball Diamonds and Associated Areas

### PART 2 - PRODUCTS

#### 2.01 TRASH BAGS

- A. Trash bags shall be extruded polyethylene, heavy-duty, industrial-quality, premium bags designed to hold heavy and wet material. The polyethylene film shall be puncture resistant. Seams shall be heat sealed to prevent leaking. Bags shall be waterproof. Bags shall be sized to accommodate trash receptacle liner with sufficient height to fold over top of liner for securing by trashcan bands.
- B. Trash receptacle bands shall be 0.25-inch size elastic bands and shall be sized to accommodate trash receptacle liner.

### PART 3 - EXECUTION

#### 3.01 TRASH REMOVAL

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- A. Empty receptacles as late in the day as possible to help avoid attracting rodents at night.
- B. The scope of this work shall include removal of trash that may have fallen from the trash receptacle and is lying in its immediate vicinity.
- C. Remove trash receptacle bags and immediately replace with new bags before disposing of full trash bag.

END OF SECTION

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## **SECTION 01040- GRAFFITI CONTROL**

### PART 1 - GENERAL

#### 1.01 SCOPE

- A. The work of this Section consists of furnishing all labor and materials necessary to provide the services specified herein, including:
  - 1. Removal of graffiti from surfaces within the site, including but not limited to pavements, paved areas, play areas, site furnishings, fountains, and structures.

#### 1.02 RELATED WORK UNDER OTHER SECTIONS

- A. The following items of related work are specified in separate sections of these Maintenance Specifications:
  - 1. 01000 General Requirements
  - 2. 01010 General Cleanup
  - 3. 01020 Trash Removal
  - 4. 01050 Rodent Control
  - 5. 01060 Repainting and Touch-Up Painting
  - 6. 01070 Maintenance of Pavements, Trails and Walkways
  - 7. 01080 Maintenance of Site Improvements and Site Furnishings
  - 8. 01090 Maintenance of Drainage Systems
  - 9. 01100 Maintenance of Site Lighting
  - 10. 01120 Maintenance of Irrigation Systems
  - 11. 01130 Maintenance of Turf and Meadows
  - 12. 01140 Maintenance of Planting and Plant Beds
  - 13. 01150, Maintenance of Baseball Diamonds and Associated Areas

#### 1.03 SAMPLES AND SUBMITTALS

- A. Prior to ordering the below listed materials, submit representative submittals and samples of the following materials to the City's Representative. Do not order materials until City's Representative's approval has been obtained. Delivered materials shall closely match the approved samples.
- B. Submittals: Provide manufacturer's literature, including Material Safety Data Sheets, for any of the following to be used:
  - 1. Cleaning Materials
  - 2. Graffiti Removal Materials

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## PART 2 - PRODUCTS

### 2.01 GRAFFITI REMOVAL AGENT

- A. Graffiti removal agent shall be “Goof-Off,” “Goof-Off 2” or “The Ultimate Goo Remover”, as determined appropriate by and as manufactured by a Division of the Valspar Corporation, 1191 Wheeling Road, Wheeling, IL 60090, Phone 1-800-345-4530, [www.goof-off.com](http://www.goof-off.com).
- B. Graffiti removal agent shall be one of the following three products as manufactured by PROSOCO, Inc. 3741 Greenway Circle, Lawrence, KS 66046, 800-255-4255:
  - 1. Sure Klean Fast Acting Stripper
  - 2. Sure Klean Heavy Duty Stripper
  - 3. Defacer Eraser Graffiti Wipe

## PART 3 - EXECUTION

### 3.01 INSPECTION FOR GRAFFITI

- A. Report graffiti to the City’s Representative immediately and proceed with removal only upon direction by the City’s Representative.

### 3.02 EMERGENCY RESPONSE TO GRAFFITI

- A. Treat graffiti as specified below within 24 hours of its discovery. Instruct all employees, agents, and subcontractors to report graffiti to the City’s Representative immediately.
- B. Record each incidence of graffiti, including the date and time it was reported, the date and time it was corrected, and the nature of the correction for inclusion in the monthly maintenance report.

### 3.03 GRAFFITI REMOVAL

- A. Remove graffiti from pavement by pressure washing at a minimum pressure of 2000 psi. Prevent runoff or splashing from pavement onto lawns or planted areas. If water containing soap or solvent is accidentally splashed onto lawns or planted areas, soak those areas and all affected foliage immediately with clean water. Do not pressure wash cracked pavement. Wash on a day when the temperature is not forecasted to go below freezing within the next six hours, and when snow or ice is not present on site. If pressure washing fails to remove graffiti completely, use “Goof-Off” or PROSOCO products according to manufacturer’s instructions.
- B. Remove graffiti from painted pavement using a stiff bristle broom or brush.

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- C. Remove graffiti from site furnishings, furniture, walls, structures, pavements, light poles, fencing and railings, stairs and railings, architecture and all other site improvements using the recommended PROSOCO, Inc. product. Follow manufacturer's instructions for use. After graffiti is removed, apply a thin application of microcrystalline wax ('butcher's wax') by brush on a warm day as per manufacturer's recommendations.

#### 3.04 PAINTING

- A. In the event that graffiti removal is incomplete, not effective or paint surface is damaged during graffiti removal, graffiti shall be painted in accordance with the requirements of Section 01060 of this Specification.

END OF SECTION

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## **SECTION 01050 - RODENT CONTROL**

### PART 1 - GENERAL

#### 1.01 SCOPE

- A. The Work of this Section consists of furnishing all labor and materials necessary to provide control of rodent populations, as directed by the City's Representative.

#### 1.03 RELATED WORK UNDER OTHER SECTIONS

- A. The following items of related work are specified in separate sections of these Maintenance Specifications:
  - 1. 01000 General Requirements
  - 2. 01010 General Cleanup
  - 3. 01020 Trash Removal
  - 4. 01040 Graffiti Control
  - 5. 01060 Repainting and Touch-Up Painting
  - 6. 01070 Maintenance of Pavements, Trails and Walkways
  - 7. 01080 Maintenance of Site Improvements and Site Furnishings
  - 8. 01090 Maintenance of Drainage Systems
  - 9. 01100 Maintenance of Site Lighting
  - 10. 01120 Maintenance of Irrigation Systems
  - 11. 01130 Maintenance of Turf and Meadows
  - 12. 01140 Maintenance of Planting and Plant Beds
  - 13. 01150, Maintenance of Baseball Diamonds and Associated Areas

### PART 2 - PRODUCTS

#### 2.01 HARDWARE CLOTH

- A. Hardware cloth for the control of vermin shall be galvanized, one-half inch steel woven-cloth.

### PART 3 - EXECUTION

#### 3.01 RODENT CONTROL

- A. Maintenance Staff shall not perform any rodent control operations unless directed to do so by the City's Representative in writing.
- B. For the control of rats: hire a reputable pest control operator if and when sanitation and other methods fail.
- C. For the control of mice, moles, voles, rabbits, muskrats or other vermin:

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1. Identify damage to plant material.
  2. Identify specific vermin thought to be causing damage to plant material.
  3. On plant material that is deemed likely to survive damage by vermin, apply specified hardware cloth three layers thick for a height of 18 inches around the trunk or stem of the plant. Encase the trunks or stems of plants to avoid exposing root flares. Bury bottom of the hardware cloth to a depth of 2 inches below soil surface. Do not cut roots while burying hardware cloth.
  4. For multi-stemmed plants encircle the entire group of trunks or stems and follow the directions described in this Section.
  5. If plants are deemed to be damaged beyond recovery, remove and discard plants in accordance with the requirements of the Contract.
- D. Rodent control shall not girdle or in any way damage the trunks or root systems of trees and shrubs.
- E. Legally dispose of all material and debris generated during rodent control operations off site.

END OF SECTION

## **SECTION 01060 - REPAINTING AND TOUCH-UP PAINTING**

### PART 1 - GENERAL

#### 1.01 SCOPE

- A. The Work of this Section consists of furnishing all labor and materials necessary to provide the services specified herein, including:
  - 1. Touch-up painting of metal surfaces, wood surfaces and bituminous concrete surfaces.
  - 2. Graffiti cover up painting of metal surfaces, wood surfaces and bituminous concrete surfaces.

#### 1.02 RELATED WORK UNDER OTHER SECTIONS

- A. The following items of related work are specified in separate sections of these Maintenance Specifications:
  - 1. 01000 General Requirements
  - 2. 01010 General Cleanup
  - 3. 01020 Trash Removal
  - 4. 01040 Graffiti Control
  - 5. 01050 Rodent Control
  - 6. 01070 Maintenance of Pavements, Trails and Walkways
  - 7. 01080 Maintenance of Site Improvements and Site Furnishings
  - 8. 01090 Maintenance of Drainage Systems
  - 9. 01100 Maintenance of Site Lighting
  - 10. 01120 Maintenance of Irrigation Systems
  - 11. 01130 Maintenance of Turf and Meadows
  - 12. 01140 Maintenance of Planting and Plant Beds
  - 13. 01150, Maintenance of Baseball Diamonds and Associated Areas

#### 1.03 PROJECT CONDITIONS

- A. Field Touch Up:
  - 1. Outdoor Temperature and Conditions: Air and surface temperature shall be between 50 degrees Fahrenheit and 90 degrees Fahrenheit. Surfaces shall be dry within limits of finish system manufacturer.
  - 2. Do not paint exterior surfaces while surfaces are exposed to the hot sun, are moist or wet.

#### 1.04 STORAGE AND USE OF MATERIALS

- A. Touch-up materials brought to the site shall be stored in an approved location in manufacturer's original sealed containers, bearing the manufacturer's standard label,

indicating type and color. Materials shall be delivered in sufficient quantities in advance of the time needed in order that work will not be delayed in any way.

- B. All touch-up materials shall be stored in designated spaces in fully sealed containers, outside the building, preferably in exterior storage shed, well ventilated, and with a minimum ambient temperature of 45 degrees Fahrenheit, in a manner that meets the requirements of applicable codes and fire regulations. When not in use, such spaces shall be kept locked and inaccessible to those not employed under the work of this Contract. Oily rags and waste must be removed from the building every night, and under no circumstances will be allowed to accumulate. Each space containing stored paint materials shall be provided with UL labeled fire extinguisher of suitable type, class, and capacity.
- C. Do not use building sanitary system for mixing or disposal of refuse material. Carry water to mixing sites and dump waste material in a refuse receptacle.

## PART 2 - PRODUCTS

- 2.01 PRIMER FOR BARE STEEL
- 2.02 INTERMEDIATE COAT FOR BARE STEEL
- 2.03 FINISH COAT FOR BARE STEEL
- 2.04 PRIMER FOR GALVANIZED STEEL SURFACES
- 2.05 PAINT COATINGS FOR GALVANIZED STEEL SURFACES
- 2.06 COATINGS FOR WOOD
- 2.07 COATINGS FOR ASPHALT SURFACE REPAIR

## PART 3 - EXECUTION

- 3.01 GENERAL REQUIREMENTS
  - A. Touch up painting shall be performed only under the weather conditions deemed acceptable by the manufacturer. Provide product literature to the City's Representative describing the temperature, humidity and precipitation limits of specific products for review and approval by the City's Representative.
- 3.02 TOUCH-UP PAINTING OF METAL SURFACES
  - A. Touch up peeling paint and bare spots on metal components of site furnishings, light fixtures, railings, play equipment, and signs once per year in April.

- B. Prepare all painted metal surfaces before applying paint. Painted metal surfaces. All rust, scale, dirt, grease, concrete splatter and other foreign material on connections, bolts, nuts and around field welds shall be completely removed by power tool cleaning per SSPC-SP 11. Areas cleaned to SSPC-SP 11 shall have a 1-3 mil profile and must be primed prior to rusting. All debris generated from cleaning operations must be contained and properly disposed of.
- C. Painting metal surfaces:
  - 1. The topcoat material for field touch-up painting and additional field topcoat application shall be from the same lot and batch. Paint for touch up of metal items may be reused in successive years provided that the shelf life has not expired. The materials used for the field primer, intermediate and final coats must be compatible with the original paint system.
  - 2. At damaged areas that extend back to the steel surface (such as scratches, gouges or nicks), the entire paint system shall be locally applied after power tool cleaning to bare metal in accordance with SSPC-SP 11. The coating system adjacent to the damage shall be feathered back to increase the surface area for touch up painting. The area cleaned to SSPC-SP 11 shall be primed with a zinc-rich primer before rustback occurs. Application of the zinc-rich primer shall be in accordance with the coating manufacturers written instructions. The specified intermediate and topcoats shall be reapplied in accordance with the manufacturers written instructions.
  - 3. At damaged areas that extend back only to the prime or intermediate coat, the area shall have the topcoat applied. Application of the touch-up materials in these damaged areas shall be performed by brush only.
- D. Tarps shall be used to collect all surface preparation debris. The Contractor shall be responsible for disposing of all removed materials, including tarps.
- E. Take great care to avoid spills of water or solvents used on site. Legally dispose of all wastewater and solvents off site. Do not dump materials out on site, in plant beds, or in catch basins.
- F. Maintenance Contractor personnel shall not spill or drip paint inside tree pits, planting beds or in lawn areas.

### 3.03 TOUCH-UP PAINTING OF WOOD SURFACES

- A. Remove peeling paint by pressure washing at a minimum pressure of 2000 psi. Surface must be clean, dry, and in sound condition. Remove all oil, dust, grease, dirt, loose paint, and other foreign material to ensure adequate adhesion. Wash on a day when the temperature is not forecasted to go below 40 degrees Fahrenheit within the next 6 hours, and when snow or ice is not present on site.
  - 1. Bare wood: Surface must be clean, dry, and sound. If pressure washed let bare wood surfaces dry overnight. Paint as soon as possible. No painting should be done immediately after a rain or during foggy weather. Knots and pitch streaks must be scraped, sanded and spot primed. All nail holes or small openings must

be properly caulked. Sand to remove any loose or deteriorated surface wood and to obtain a proper surface profile.

2. Previously Painted Surfaces: If in sound condition, clean the surface of all foreign material. Smooth, hard or glossy coatings and surfaces shall be dulled by abrading the surface. Apply a test area, allowing paint to dry one week before testing adhesion. If adhesion is poor, or if this product attacks the previous finish, removal of the previous coating may be necessary. If paint is peeling or badly weathered, clean surface to sound substrate and treat as a new surface as above.

- B. Repaint painted wood components of site furnishings, every two years in April.
- C. Paint wood surfaces and painted wood surfaces with a minimum of two coats of the specified paint to achieve a total mil thickness of 5.0 to 6.0 mils dft. Paint shall be applied at rates and as specified by the manufacturer. Paint the entire wood structure of the site furniture item. Do not paint isolated areas unless directed to do so by the City's Representative.
- D. Environmental constraints: Temperature: 40 degrees Fahrenheit minimum, 120 degrees Fahrenheit maximum (air, surface, and material). At least 5 degrees Fahrenheit above dew point. Relative humidity: 85 percent maximum.
- E. Tarps shall be used to collect all surface preparation debris. The Contractor shall be responsible for disposing of all removed materials, including tarps.
- F. Take great care to avoid spills of water or solvents used on site. Legally dispose of all wastewater and solvents off site. Do not dump materials out on site, in plant beds, or in catch basins.
- G. Maintenance Contractor personnel shall not spill or drip paint inside tree pits, planting beds or in lawn areas.

### 3.04 RESTORING COLOR SEAL COAT ON PAVEMENT SURFACES

- A. Staff must notify the City's Representative of all applications, 48 hours prior to installation.
- B. The surface to be coated shall be inspected and made sure to be free of grease, oil, dust, dirt and other foreign matter before starting work.
- C. Existing painted asphalt surfaces shall be cleaned using a stiff bristle broom and gas powered blower or water based pressure spray unit capable of generating 2500 psi at the nozzle tip, to remove all dirt and debris.
- D. Application shall proceed only if the surface is dry and clean and the temperature is at least 50 degrees Fahrenheit and rising, and the surface temperature is not in excess of one hundred 40 degrees Fahrenheit. Do not apply coatings when rain is imminent.

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- E. Each coat in this system must dry completely before next application. Between each coat, inspect entire surface. Any defects should be repaired. Scrape surface to remove any lumps, and broom or blow off all loose matter.
- F. Apply new color coats to match layout of existing colors. Apply acrylic paint in accordance with the manufacturers instructions.

### 3.05 PAINTING OVER GRAFFITI

- A. If graffiti on painted site furniture, light poles, and other painted features cannot be effectively removed as provided for under the work of Section 01040, or if such removal would damage the original painted finish, paint over graffiti to match original paint color and type.
- B. Prepare surfaces before applying paint: Remove peeling paint by pressure washing at a minimum pressure of 2000 psi. Wash grease, oil, mildew, moss, or loose dirt or paint chips from surfaces. Lightly sand glossy surfaces. Dry the surface. Wash on a day when the temperature is not forecasted to go below freezing within the next six hours, and when snow or ice is not present on site.
- C. Prepare surfaces, prime and paint in accordance with the requirements of this Section.
- D. Paint according to manufacturer's instructions. Match existing paint type and color.
- E. Take great care to avoid spills of water or solvents used on site. Dispose of all wastewater and solvents off site. Do not dump any materials out on site, in plant beds, or in catch basins.
- F. Take great care not to spill or drip paint inside tree pits.

END OF SECTION

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## **ITEM 01070 - MAINTENANCE OF PAVEMENTS, TRAILS AND WALKWAYS**

### **PART 1 - GENERAL**

#### **1.01 SCOPE**

- A. The work of this Section consists of furnishing all labor and materials necessary to provide the services specified herein, including:
  - 1. Cleaning of pavements
  - 2. Inspection and reporting of condition of all pavements and curbing
  - 3. Reporting of damage, failure, and/or wear of pavements, curbing, site improvements
  - 4. Correction of damage, failure, and wear of pavements and curbing
  - 5. Stabilize soil and prevent erosion
  - 6. Maintenance of all walking and hiking trails
  
- B Pavements, trails and walkways in the Park include the following:
  - 1. Concrete paving
  - 2. Bituminous concrete
  - 3. Stabilized hiking trails
  - 4. Play area and playground rubber safety surface
  - 5. Precast and cast-in-place concrete landscape curbing
  - 6. Granite landscape curbing
  - 7. Mountain bike trails

#### **1.02 RELATED WORK UNDER OTHER SECTIONS**

- A. The following items of related work are specified in separate sections of these Maintenance Specifications:
  - 1. 01000 General Requirements
  - 2. 01010 General Cleanup
  - 3. 01020 Trash Removal
  - 4. 01040 Graffiti Control
  - 5. 01050 Rodent Control
  - 6. 01060 Repainting and Touch-Up Painting
  - 7. 01080 Maintenance of Site Improvements and Site Furniture
  - 8. 01090 Maintenance of Drainage Systems
  - 9. 01100 Maintenance of Site Lighting
  - 10. 01120 Maintenance of Irrigation Systems
  - 11. 01130 Maintenance of Turf and Meadows
  - 12. 01140 Maintenance of Planting and Plant Beds
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## PART 2 - PRODUCTS

- 2.01 CONCRETE PAVEMENT
- 2.02 BITUMINOUS CONCRETE PAVEMENT
- 2.03 PRECAST CONCRETE PAVERS
- 2.04 PLAY AREA RUBBER SAFETY SURFACE
- 2.05 PRECAST AND CAST-IN-PLACE LANDSCAPE CURB
- 2.06 GRANITE LANDSCAPE CURB
- 2.07 MOUNTAIN BIKE ARMORING

## PART 3 - EXECUTION

### 3.01 INSPECTION

- A. Inspect parking lots, roadways, pedestrian walkways, skate park and rink, playground surfaces, street hockey rink, basketball courts, paved trails and pavements in and around all structures in all locations, twice per year, in March and in October to determine maintenance needs.
  - 1. Prepare written report for review and approval of the City's Representative describing areas of pavement and curbing that show wear, cracking, graffiti, edge spauling, erosion and other degradation due to nature or man-made causes.
- B. Inspect mountain bike trails monthly to determine maintenance needs.
  - 1. Prepare written report for review and approval of the City's Representative describing erosion and decline of mountain bike trails.

### 3.02 WASHING OF PAVEMENT AND CURB SURFACES

- A. Wash on a day when the temperature is not forecasted to go below 40 degrees Fahrenheit within the next 12 hours, and when snow or ice is not present on site.
- B. Direct water used in washing pavements, site improvements, and site furnishings towards drain inlets. Keep water away from lawn and plant beds. If water containing soap or solvent is accidentally splashed onto lawns or planted areas, soak those areas and all affected foliage immediately with clean water.

### 3.03 MAINTENANCE OF CONCRETE PAVEMENT

- A. Twice per year, in April and November: Clean parking lot pavement and select designated pedestrian walkways by pressure washing at a minimum pressure of 2000 psi.
- B. Twice per year, in May and September, and upon report of unsatisfactory appearance or performance, make any adjustments, repairs or replacements necessary to ensure that:
  - 1. All pavement is free of cracks, heaving, and subsidence.
  - 2. All pavement edges are continuous and intact.
- C. Paving mix, equipment, methods of mixing and placing, and precautions to be observed as to weather, condition of base and the like, shall meet the requirements of ACI 316R.
- D. Repair cracks in concrete pavement up to 1/8 inch wide using approved caulk. Use an air compressor to clean and dry all cracks before repairing, taking great care to remove all moisture, dirt, plant material, and loose debris. Repair immediately after cleaning and drying. Follow manufacturer's directions for preparing and applying caulking material, taking careful note of acceptable temperature range for application and hardening and curing time.
- E. For cracks in concrete pavement greater than 1/8 inch wide, precede as follows:
  - 1. Sawcut around crack to the full depth of the concrete, establishing an opening in the concrete that is no less than 12 inches wide.
  - 2. Remove pavement to full depth of concrete.
  - 3. Coat exposed existing vertical faces of concrete with approved bonding agent in accordance with manufacturer's instructions.
  - 4. Paving mix, equipment, methods of mixing and placing, and precautions to be observed as to weather, condition of base and the like, shall meet the requirements of ACI 316R.
  - 5. Insert expansion joint material as required to continue any preexisting line of expansion joint.
  - 6. Place ready mix concrete into sawcut void, screed level with adjacent existing horizontal concrete surfaces. Provide tooled joints between new and existing pavements. Provide score lines as required to reconnect existing score lines.

### 3.04 MAINTENANCE OF BITUMINOUS CONCRETE PAVEMENT

- A. Twice per year, in April and November: Pressure wash designated pavement at a minimum pressure of 2000 psi. Remove all oil, dust, grease, dirt, and other foreign

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material to ensure adequate adhesion. Wash on a day when the temperature is not forecasted to go below 40 degrees Fahrenheit within the next 12 hours, and when snow or ice is not present on site.

- B. Twice per year, in May and September, and upon report of unsatisfactory appearance or performance, inspect for the following items. Inspect during or immediately after rainfall so that any subsidence or slumping will be apparent:
  - 1. The pavement is free of cracks, heaving, puddles, and subsidence.
  - 2. All edges are continuous and intact.
- C. If cracking appears to be caused by tree roots, saw cut the pavement neatly around the cracked area. Remove all pavement from within the saw cut area, saw cutting carefully to avoid all tree roots found. After cutting and removing the pavement and base provide new pavement to match existing.
  - 1. The goal of crack repair where tree roots have heaved soil is to repair the pavement without damage to the tree root.
- D. Using a compressor to blow out soil and debris, remove all plants, weeds or grasses that are growing up through pavement or in cracks in pavement. Blow out cracks to a minimum depth of 0.75 inches.
- E. Seal cracks up to 1/8 inch wide using approved caulk joint sealer. Use an air compressor to clean and dry all cracks before sealing, taking great care to remove all moisture, dirt, plant material, and loose debris. After cleaning and drying, seal immediately using approved caulk sealer. Follow manufacturer's directions for applying sealer, taking careful note of acceptable temperature range for application.
- F. For cracks greater than 1/8 inch wide, saw cut around crack to create a repair trench no less than 4 inches wide but at a minimum an area sufficient to allow a clean placement of new bituminous concrete. Remove pavement to full depth of bituminous concrete, and patch with new bituminous concrete level with surrounding material.
- G. Report heaving, subsidence, and puddles to the Owner's Representative.

### 3.05 MAINTENANCE OF PLAY AREA RUBBER SAFETY SURFACE

- A. Twice per year, in April and November: Pressure wash pavement at a minimum pressure of 2000 psi.
- B. Twice per year, in May and September, and upon report of unsatisfactory appearance or performance, inspect for the following items. Inspect during or immediately after rainfall so that any subsidence or slumping will be apparent:
  - 1. The pavement is free of cracks, heaving, puddles, and subsidence.

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1. All edges are continuous and intact.

### 3.06 MAINTENANCE OF CURB

- A. Twice per year, in April and November: Clean exposed surfaces of curbing by pressure washing at a minimum pressure of 2000 psi.

### 3.07 MAINTENANCE OF GRANITE LANDSCAPE CURB

- A. Twice per year, in April and November: Clean exposed surfaces of granite landscape curbing by pressure washing at a minimum pressure of 2000 psi.

### 3.08 TRAIL MAINTENANCE - GENERAL

- A. Trail maintenance includes a wide variety of activities designed to maintain the trail tread and buffer environment in its original or intended condition. Typically, trail maintenance activities include on-going restoration of the trail tread (such as filling eroded sections, restoring outslopes), removal of debris (branches, garbage), repair of facilities (replacement of bridge or boardwalk decking, benches, picnic tables) and the control of vegetation (brushing, clearing, removal of dead limbs).

- B. The maintenance guidelines are presented under the following sub-headings:

1. Planning maintenance activities.
2. Maintaining drainage.
3. Maintaining the trail tread.
4. Maintaining trail structures and facilities.
5. Restoring the trail environment.

- C. Planning Maintenance Activities

1. Create a maintenance plan during trail design and construction .  
A maintenance plan for the trail was developed as the trail was designed and constructed. See the initial trail inventory document, completed before the trail was open for public use, which should be used to finalize the planned maintenance activities.
2. Trail maintenance includes many things, but primarily it involves making trail inspections, restoring trail treads, removal of debris, controlling vegetation, and repair of various facilities within the general limits of the trail system.
3. Protect species that are at risk. Work closely with state agencies and non-profit organizations responsible for protecting species that are of special concern, threatened or endangered. The timing, extent, methods and materials of all

maintenance activities that may influence protected flora and fauna must be carefully considered and approved by all relevant organizations.

4. Complete maintenance work promptly. Virtually all major trail repair projects start out as small maintenance tasks. Plan maintenance activities so that the work is completed promptly, before small problems grow into major concerns. If major work is required on the trail, provide that information to trail users so that the more difficult trail conditions in the interim do not affect the social sustainability of the trail.
5. Organize work so that the maintenance activities for each trail section are completed as quickly as possible.
6. Plan for and provide an alternative to a closed trail. If a trail or trail segment is to be closed, either temporarily or permanently, establish an alternate route available for use before the trail section is closed. Use trail information sources to educate users about the reason for the closure, the location of the alternate route and any changes to trail use.
7. Complete regular trail inspections and evaluations. Routine inspections should be completed at twice yearly, in late February and early October. Inspect the trail immediately after any moderate or large rain event. Ensure evaluation personnel are properly trained and knowledgeable about the needs of all permitted trail users. Base each evaluation on the results of previous assessments.

#### D. Maintaining Drainage

1. Plan maintenance work to match the natural drainage patterns. When trail maintenance activities are being planned and completed, design them so that the trail drainage matches the natural drainage patterns of the environment as closely as possible. Even trails that were not designed for sustainability can often be significantly improved through a series of planned maintenance work that re-establishes natural sheet drainage.
2. Inspect and maintain drainage structures frequently. Drainage structures are used on trails that do not preserve the natural sheet drainage patterns of the environment. When drainage patterns are altered, there is an increased risk of erosion and deposition around the drainage structure. Monitor all drainage structures frequently and clear debris and repair the source of the erosion or deposition as quickly as possible.

#### E. Maintaining the Trail Tread

1. Maintain the tread outslope. Outslope of the trail tread, so that sheet drainage flows naturally across and off the tread, is critically important for environmental sustainability. Mechanical compaction of the tread to the required outslope and regular monitoring and removal of material if a berm develops at the edge of the tread will prevent water, and therefore erosion, from occurring along the tread.

2. Remove obstructions from the trail tread. Obstructions are items in the tread that could cause a trail user to trip or lose their balance. Maintain the trail tread so that it is free from rocks, ruts, or sharply irregular surfaces so that trail users do not have to concentrate all of their attention on negotiating the tread. The social sustainability and safety of the trail is enhanced if trail users, especially children, can safely negotiate the trail even when the primary focus of their attention is the trail environment.
3. Clear vegetation from the trail tread corridor and buffer zone. Leafy vegetation should be removed from the trail tread corridor as well as from the buffer zone on each side and above the tread. For a hiking only trail, the buffer zone should be at least 0.3 m on each side and at least 0.5 m above the tread corridor. Vegetation that hangs in the way of trail users may be broken or stripped in a way that damages its health. The weight of rain or snow can put at risk vegetation that was well clear of the trail during maintenance work. Prune to the collar of any branch or stem to provide a clear, natural looking corridor for trail users.

#### F. Maintaining Trail Structures and Facilities

1. Regularly inspect and maintain trail structures and facilities. Prompt maintenance of trail structures and facilities is essential not only for safety and liability, but also to maintain a high-quality public image. Monitor all structures and facilities on a regular basis. Make small surface repairs promptly and remove or replace structures or facilities with significant damage.
2. Remove litter and repair vandalism promptly. Remove all litter and repair all vandalism as quickly as possible. Litter or vandalism damages the social sustainability of a trail because it makes the trail look like "no one cares".

#### G. Restoring the Trail Environment

1. Utilize material removed from the trail in other areas. Soil and other materials removed from the trail in one location should be retained and used in areas that require tread repair or structures that require fill. Removal of the material from the trail environment or dispersion of excess material within the environment should be a tactic of last resort.
2. Disguise removed vegetation. Make the effort to dispose of debris properly. Each cut branch should be touching the ground to encourage decomposition. Conceal debris by dragging branches under and around shrubs. Do not randomly toss debris into the surrounding environment or create piles of brush. If debris cannot be properly distributed through the environment, remove it for composting in an appropriate location.
3. Repair environmental damage from trail use. Monitor the environment around the trail regularly to identify unanticipated negative impacts that may result from trail use (or inappropriate trail use). The risk of damage is highest for trails that were not initially designed for sustainability. Be sure to identify the underlying cause of the damage before developing plans for repair. Carefully plan to restore the

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damage through seeding, planting or transplanting vegetation. Re-design or close severely damaged trails as required.

### 3.09 TRAIL MAINTENANCE BASICS

- A. Detect and fix problems while they're small. Nearly every major problem on a trail was, at one time, a small problem that went uncorrected.
- B. It is essential that trail maintenance be considered as just one part of the overall trail management program.
- C. The best practices for trail maintenance include the following steps:
  - 1. Completing trail inspections and evaluations.
  - 2. Establishing a maintenance plan for the trail.
  - 3. Maintaining proper drainage.
  - 4. Maintaining the trail tread.
  - 5. Maintaining trail vegetation.
  - 6. Maintaining trail structures and facilities.

### 3.10 INSPECTION AND EVALUATION

- A. For existing trails, the most important factor affecting trail maintenance is the completion of regular maintenance evaluations and trail inspections . A maintenance evaluation is a formal inspection that requires a complete walk through of the entire trail. Trail inspections can be done by combining the information gathered through informal walks along the trail with feedback provided by trail users . The purpose of the inspection or evaluation is to:
  - 1. Identify the features and facilities that are found throughout the trail.
  - 2. Specify the current condition of the features and facilities.
  - 3. Detail the work required to bring them up to, or maintain them at the intended standard.
- B. Perform inspections at least once per year.
- C. Results retained along with other records for the trail. Document not only the trail tread, but the entire trail corridor and all associated structures (e.g., bridges) and facilities (e.g., parking, washrooms).

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- D. Regular monitoring of the on-trail conditions, structures and facilities provides the data needed to identify required maintenance work in a timely and cost-effective manner.
- E. Assess in crews of two people
- F. Use GPS recorder integrated with a GIS mapping system
- G. Uses the same terminology, for trail features and required actions, as well as the same units of measurement. Consistency in all aspects of the trail inventory process will make it much easier to use the inspection/evaluation results to develop an effective trail maintenance plan.
- H. Each maintenance survey should be based on the results from a previous assessment . A copy of the assessment results (detailed log of the previous trail conditions) should be carried during the assessment
- I. To plan and conduct formal maintenance evaluations , consider these key points:
  - 1. Schedule at least one formal maintenance evaluation each year.
  - 2. Ensure that the trail inspector performing the evaluation has the required skill, knowledge, qualifications and expertise. Formal knowledge of trail construction techniques, be skilled at recognizing current and potential maintenance issues and be capable of conducting an impartial examination of the trail. Ensure he has knowledge of the trail's design and construction. Inspection of wood structures must be completed by a structural engineer
- J. To plan and conduct informal trail inspections, consider the following key points:
  - 1. Identify an inspection coordinator
  - 2. Complete less formal inspections regularly throughout the season(s) of use
  - 3. Public comments received by emails, letters, telephone calls, etc. should be reviewed
  - 4. Trail inspections should be completed after any severe weather event ,
- K. Timing the Trail Inspection or Evaluation
  - 1. Overall inspection shall be performed twice per year as specified.
  - 2. Evaluate and inspect trails after major storm events.

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- L. Be sure to investigate and document the source of the problem
- M. When assessing water problems on the trail, the most important questions to ask are:
  - 1. Where and what is the source of the water?
  - 2. Where is the water going?
  - 3. How can I keep or quickly get the water off the trail?

### 3.11 CLOSING A TRAIL SEGMENT TEMPORARILY

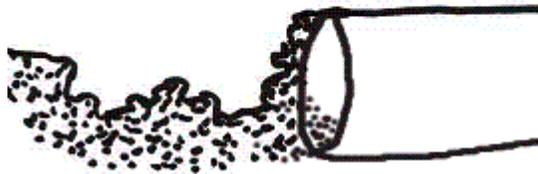
- A. When a trail or trail segment must be closed temporarily :
  - 1. Erect barrier(s) at all access point(s) for the trail.
  - 2. Provide information at each barrier about why the trail has been closed, when it is expected to re-open and who to contact for additional information.
  - 3. Provide an alternate route if the route is safe and appropriate for both trail users and the environment and all needed permissions have been obtained.

### 3.12 MAINTAINING PROPER TRAIL DRAINAGE

- A. Restoring the Tread Outslope: Maintaining the desired outslope of the trail tread is the "first order of business" in the maintenance of trails with natural surfaces. It is the simplest, but most important and most labour-intensive trail maintenance task.
- B. To restore the tread outslope:
  - 1. Remove vegetation from the berm.
  - 2. Till the berm and tread to loosen the material.
  - 3. Move the material to the uphill side of the tread.
  - 4. Compact the material.
  - 5. Repeat tread shaping and compaction.
  - 6. Remove remaining berm material.
  - 7. Encourage vegetation in the buffer zones beside the tread.

### 3.13 MAINTAINING DRAINAGE STRUCTURE FUNCTION

- A. The drainage structures needed for a curvilinear trail are only those that serve to separate the trail tread from natural drainage channels
- B. To maintain drainage structures, including culverts, swales, and trenches:
  - 1. Inspect the drainage structure for evidence of erosion or deposition in or near the drainage structure. Also check for signs that the drainage structure has changed position



- 2. Determine the source of the problem. Follow the "trail" of the water flow to determine the cause of the erosion or the source of the deposits. Repair the source of the problem. Stabilizing the trail environment so that water does not reposition materials. The source of the erosion or deposition must be identified and repaired before the drainage structure itself is maintained.
- 3. Maintenance efforts should be focused on returning water flow within the trail environment to the natural drainage pattern.
- 4. Clear the drainage structure.
- 5. Ensure that the drainage structure is properly positioned.
- 6. Stabilize the banks around the drainage structure.
- 7. Repair the tread over a closed drainage structure.

### 3.14 MAINTAINING THE TRAIL TREAD: SOLID SURFACES

- A. The maintenance of solid trail surfaces is a function of three key factors:
  - 1. Durability of the material used.
  - 2. Impact of occasional frost and cycles of freeze-thaw on the position and base of support for the tread material.
  - 3. Impact of environmental influences (e.g., sun, precipitation) on the material.

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### 3.15 CONCRETE AND ASPHALT TRAIL SURFACES

- A. Small cracks (less than 0.4 inch) should be joint sealed as soon as possible to prevent moisture from reaching the base foundation. Small gaps in the surface or degradation of the original tread surface should be repaired using concrete patching compound.
  - 1. Remove any loose material from the damaged area using a stiff wire brush.
  - 2. Use a mallet and chisel to shape the edges of the crack so that they are "undercut"
  - 3. Clean the area to be patched with a cleaning agent that will remove dust and other concrete particles.
  - 4. Apply the sealer or patching compound to the crack according to the manufacturer's instructions. Be careful to ensure that the required temperature will be maintained throughout the time needed for the material to dry and cure.
- B. Remove trip hazards
- C. Repair Cracks and Holes in Asphalt

### 3.16 WOODEN TREAD STRUCTURES

- A. In general, the maintenance issues related to trail treads made of wood fall within these categories:
  - 1. Deterioration of the wood from environmental factors (e.g., sun, rain).
  - 2. Loose, raised or missing hardware (e.g., nails, screws, bolts).
  - 3. Erosion of adjacent natural trail surfaces.
- B. Shifting of the support structure (e.g., due to frost, erosion or water flow).
- C. Frequent inspections should be completed during the first year after construction to identify and repair any warped or loose pieces of wooden tread structures.
- D. Replace Cracked, Rotten or Damaged Wood:
  - 1. Any wood pieces that are damaged or show signs of rot should be removed and replaced.
  - 2. Today pressure treated wood is typically created with chemicals such as amine copper quat ( ACQ ) or copper azole ( CA ).

- E. It is essential that rotting support structures be removed and replaced.
- F. Remove all of the decking, remove the damaged support, install a new support and then replace the decking
- G. Replacing or Repositioning Hardware
  - 1. All hardware used for trail structures should be galvanized so that the hardware does not rust or deteriorate with exposure to the natural elements.
  - 2. Whenever possible, secure bolts with locking nuts or recess hardware into the wood surface and cover the ends of the screws or nails with wood plugs or putty. Camouflaged hardware is aesthetically pleasing and decreases the risk of vandalism or loss.
  - 3. Galvanized, Ardox nails are less likely to lift because the wood fibres tend to cling to the spiral curves of the nail.
- H. Transitioning to Adjacent Surfaces
- I. Wooden trail treads must be carefully constructed so that access onto and off of the wood surface is free of steps or tripping hazards.

### 3.17 MAINTAINING THE TRAIL TREAD: STONE DUST SURFACES

- A. The maintenance needed to ensure an appropriate tread surface will vary tremendously, depending on the type of pieced surface material used and the permitted users on the trail. Trail surfaces constructed with mechanically crushed rock with a variety of piece sizes are usually less costly to maintain. The key to minimizing maintenance is to ensure that there is adequate soil moisture content for cohesion and that the pieces are mechanically compacted during construction.
- B. To fill a depression in the trail tread :
  - 1. Till tread to loosen the existing material.
  - 2. Place additional material into the damaged area.
  - 3. Compact the material. Use mechanical compactors (e.g., vibratory plate) to solidly compact the material.
  - 4. Repeat addition, shaping and compaction of tread material. Continue to add material to the repair area, shape it and then compact the material in 10 cm (4 inches) layers until the repaired area is level with the surrounding tread and the desired tread surface slope is restored.

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### 3.18 MAINTAINING TRAIL VEGETATION

- A. Trimming and Removing Vegetation
- B. Leafy vegetation should be cleared, not just from the trail tread, but also from an additional buffer zone on either side and above the trail corridor.
- C. When openings in the foliage are only large enough for the trail user, the surrounding foliage will obstruct the vision of trail users travelling downhill or around a bend.
- D. Maintain the trail environment so that it appears as natural as possible.
- E. It is best to maintain vegetation in the spring. Additional maintenance may be required in the summer (if vegetation grows quickly) or fall (if the trail will be used during the winter months).
- F. Monitor the growth of new plants to ensure they are not stunted or delayed relative to normal growth conditions.
- G. Never fell trees or operate a chainsaw alone . Always get help.
- H. Watch out for "hazard trees"
- I. There are three basic elements for brushing or pruning trail vegetation in a manner that is most compatible with the natural environment.
  - 1. Carefully consider what vegetation needs to be cleared.
  - 2. Prune to the collar of any branch or stem.
  - 3. Properly place and conceal debris.

### 3.19 SIGN MAINTENANCE

- A. Cleaning , especially for signs close to roads, because dirt and grime can be detrimental to the quality and longevity of the sign.
- B. Trimming of encroaching foliage , done as necessary depending on the local environmental conditions.
- C. Replacement of signs can be very frequent, depending on the type of trail and surrounding environment. A detailed sign inventory, which includes GPS data and a trail map for the sign location, exact dimensions for the sign and mounting hardware as well as the sign panel content, can make the replacement of damaged signs a simple task.

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### 3.20 LITTER AND VANDALISM

- A. All litter, no matter how small, needs to be removed
- B. Vandalism or graffiti should be removed or repaired as quickly as possible

### 3.21 MAINTENANCE OF MOUNTAIN BIKE TRAILS

- A. Mountain bike trails within the Park include rails through meadow, woods landforms, hills and flat areas. Trails passing through flat areas with slopes less than 3 percent have been stabilized under the preceding construction projects using soil cements (see construction specifications). Trails in sloped terrain (>3%) have been designed to avoid erosion and provide challenge to mountain bikers.
- B. Mountain bikes will compact soil, spin away rocks, kill supporting roots and the protecting living veneer of duff. Coupled with natural erosion will dramatically change a mountain bike trail from a narrow, consolidated trail to a wide, washed out rutted trail in a very short time frame. To avoid damage to trails, a variety of design systems have been utilized. These include the following:
  - 1. Natural grade reversal at tops of steep slopes to prevent water from moving onto trail and causing erosion.
  - 2. Steeps, rock slabs and faces allowing trail to run steeply downhill without causing erosion. Outruns designed of durable rock facing and gradual slope transition to prevent heavy braking.
  - 3. Rock gardens. Routes along the trail system the move through concentrated fields of boulders and large rocks, designed to appear natural but also the easiest route through an area, limiting choice to staying on the trail, avoiding trail widening and shortcuts.
  - 4. Armoring. large rocks to "pave" a trail and prevent erosion. Some trails are armored with stone to escape year-round mud. Rocks will have been buried at least ½ depth into grade.
  - 5. Contour Challenges and Drop-offs. Utilizing short drop-offs with boulders, drop-offs are six to 12 inch steps along trails set in bike length series to accommodate grade change.
  - 6. Armoring. used to harden the trail tread against user-caused erosion
- C. General Rules
  - 1 Be Safe. Close off trail during repair operations utilizing saw-horses and orange caution tape. Wear hardhats, eye protection, gloves and steel-toed boots. Lift without injury. Communicate with people around you. Keep hands well away from any rock being shifted by pry bars. Skidding a rock is safer than rolling it.

Tumbling rocks almost never stop where you want them to - it is best to slide them in a controlled manner.

2. Choose Good Rocks. Select angular rocks that have flat sides and square edges for repair work. The best are rectangular, shaped like a toaster. The exact size and shape will depend on the armoring technique used during construction.
3. Transport Stone by wheelbarrow only. Do not access trails using four wheel drive machinery.
4. Remove Organic Material. Remove organic material and leaf litter that collects on trails.

#### D. Repair of Armoring

1. Repair from the bottom up. Isolate dislodged stone, remove and then stabilize the lower stones, moving upward until trail is fully stabilized.
2. Check Anchors. The first "keystone" in an armored trail section plays a crucial role in anchoring everything in place. While the anchor rock is large and designed to be immobile once set anchors can become loose.
3. Checking the Tread. Ensure all rocks touch one another. Lock loose rocks in place with new stones. Use smaller angular rocks as wedges to fill gaps. Without mortar, friction and gravity must hold the rocks together.
4. Break the Joints. Avoid directly aligning joints because they will weaken the structure. Minimize lengthwise gaps that run parallel to the trail that might catch a bicycle wheel.
5. Check Tie Stones. Check tie stones place every four to six feet.
6. Fill the Gaps. Fill the gaps with small rocks, stone dust, gravel or sand. Pack the fill in tightly using hand tools.
7. Compact. Compact repair surfacing material in layers while slightly wet. Use mechanical compactor is the best tool for this key step.
8. Check Edge Restraints. To avoid spreading of the trail in outside curves, edger stone, logs and boards have been installed. Check restraints periodically and repair as required.
9. Continue to Evaluate Trail Flow. Smooth flow is vital on trails for cyclists. Mountain bikers love the rhythm of a trail where one turn blends into the next, and the trail surface is somewhat predictable. A trail with good flow helps minimize erosion, user conflict, and safety concerns. Strive for a subtle transition into the armored section. Confirm smooth flow

END OF SECTION

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## **ITEM 01080 - MAINTENANCE OF SITE IMPROVEMENTS AND SITE FURNISHINGS**

### **PART 1 - GENERAL**

#### **1.01 SCOPE**

- A. The work of this Section consists of furnishing all labor and materials necessary to provide the services specified herein, including:
  - 1. Cleaning of site improvements and site furnishings
  - 2. Inspection and reporting of condition of all site improvements, site furnishings, community garden edging and fencing elements.
  - 3. Reporting of damage, failure, and/or wear of site improvements and site furnishings
  - 4. Correction of damage, failure, and wear of site improvements and site furnishings.

#### **1.02 RELATED WORK UNDER OTHER SECTIONS**

- A. The following items of related work are specified in separate sections of these Maintenance Specifications:
  - 1. 01000 General Requirements
  - 2. 01010 General Cleanup
  - 3. 01020 Trash Removal
  - 4. 01040 Graffiti Control
  - 5. 01050 Rodent Control
  - 6. 01060 Repainting and Touch-Up Painting
  - 7. 01070 Maintenance of Pavements, Trails and Walkways
  - 8. 01090 Maintenance of Drainage Systems
  - 9. 01100 Maintenance of Site Lighting
  - 10. 01120 Maintenance of Irrigation Systems
  - 11. 01130 Maintenance of Turf and Meadows
  - 12. 01140 Maintenance of Planting and Plant Beds
  - 13. 01150, Maintenance of Baseball Diamonds and Associated Areas

### **PART 2 - PRODUCTS**

2.01 PARK BENCH

2.02 PICNIC TABLE

2.03 CHESS TABLE

2.04 TRASH RECEPTACLE

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- 2.05 WATER BUBBLER
- 2.06 BIKE RACK
- 2.07 STONE SITE IMPROVEMENTS
- 2.09 PROJECT SIGNAGE
- 2.10 REINFORCED CONCRETE STRUCTURES
- 2.11 BOLLARD
- 2.12 HANDRAILS, ORNAMENTAL FENCES AND GATES
- 2.13 PLAY EQUIPMENT
- 2.14 COMMUNITY GARDENS

### PART 3 - EXECUTION

#### 3.01 WASHING

- A. Wash on a day when the temperature is not forecasted to go below 60 degrees Fahrenheit within the next 12 hours.
- B. Direct water used in washing site improvements and site furnishings towards drain inlets. Keep water away from lawn and plant beds. If water containing soap or solvent is accidentally splashed onto lawns or planted areas, soak those areas and all affected foliage immediately with clean water.

#### 3.02 MAINTENANCE OF PARK BENCHES

- A. Twice per year, in April and November: Pressure wash all exposed surfaces at a minimum pressure of 2000 psi. Adjust pressure as required to clean off residue and undesirable coatings while preserving the integrity of the paint coatings.
- B. Monthly: Wash all exposed surfaces with mild detergent and medium bristle brush.
- C. Twice per year, in April and November, and upon report of unsatisfactory appearance or performance, make any adjustments, repairs or replacements necessary to ensure that:
  - 1. All components are undamaged and securely attached.
  - 2. The bench installation is secure, firm, and plumb.

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- D. Report damaged bench component to the City's Representative immediately.
- E. Report graffiti on benches to the City's Representative immediately and proceed with removal only upon direction by the City's Representative. Graffiti removal shall be as specified and paid for under the work of Section GRAFFITI REMOVAL of this Specification.
- F. Report need for repainting to the City's Representative immediately upon determination and proceed with repainting only upon direction of City's Representative. Repainting shall be as specified and paid for under the work of Section REPAINTING AND TOUCH-UP PAINTING, of this Specification.

### 3.03 MAINTENANCE OF PICNIC TABLES

- A. Twice per year, in April and November: Pressure wash all exposed surfaces at a minimum pressure of 2000 psi. Adjust pressure as required to clean off residue and undesirable coatings while preserving the integrity of the paint coatings.
- B. Monthly: Wash all exposed surfaces with mild detergent and medium bristle brush.
- C. Twice per year, in April and November, and upon report of unsatisfactory appearance or performance, make any adjustments, repairs or replacements necessary to ensure that:
  - 1. All components are undamaged and securely attached.
  - 2. The picnic table installation is secure, firm, and plumb.
- D. Report damaged picnic table components to the City's Representative immediately.
- E. Report graffiti on picnic tables to the City's Representative immediately and proceed with removal only upon direction by the City's Representative. Graffiti removal shall be as specified and paid for under the work of Section GRAFFITI REMOVAL of this Specification.
- F. Report need for repainting the picnic tables to the City's Representative immediately upon determination and proceed with repainting only upon direction of City's Representative. Repainting shall be as specified and paid for under the work of Section REPAINTING AND TOUCH-UP PAINTING, of this Specification.
- G. Report the need to replace picnic table timbers. Replace timbers only when directed to do so by the City's Representative.

### 3.04 MAINTENANCE OF CHESS TABLES

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- A. Twice per year, in April and November: Pressure wash all exposed surfaces at a minimum pressure of 2000 psi. Adjust pressure as required to clean off residue and undesirable coatings while preserving the integrity of all surfaces and coatings.
- B. Monthly: Wash all exposed surfaces with mild detergent and medium bristle brush.
- C. Twice per year, in April and November, and upon report of unsatisfactory appearance or performance, make any adjustments, repairs or replacements necessary to ensure that:
  - 1. All components are undamaged and securely attached.
  - 2. The chess table installation is secure, firm, and plumb.
- D. Report damaged chess table components to the City's Representative immediately.
- E. Report graffiti on chess tables to the City's Representative immediately and proceed with removal only upon direction by the City's Representative. Graffiti removal shall be as specified and paid for under the work of Section GRAFFITI REMOVAL of this Specification.
- F. Report need for repainting of chess tables to the City's Representative immediately upon determination and proceed with repainting only upon direction of City's Representative. Repainting shall be as specified and paid for under the work of Section REPAINTING AND TOUCH-UP PAINTING, of this Specification.
- G. At the City's Representative's direction replace chess tables.

### 3.05 MAINTENANCE OF TRASH RECEPTACLES

- A. Twice per year, in April and November: Pressure wash interior and exterior surfaces of all trash receptacles at a minimum pressure of 2000 psi. Adjust pressure as required to clean off residue and undesirable coatings while preserving the integrity of the existing paint system.
- B. Monthly: Wash all exposed surfaces with mild detergent and medium bristle brush.
- C. Twice per year, in April and November, and upon report of unsatisfactory appearance or performance, make any adjustments, repairs or replacements necessary to ensure that:
  - 1. All components are undamaged and securely attached.
  - 2. All hardware is tightly fastened.
  - 3. The liner is free of cracks, chips, or tears.
  - 4. The liner can be removed easily by maintenance workers.
  - 5. All locks are operational.

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- D. Correct unsatisfactory conditions by repairing, replacing, or reinstalling damaged components or the entire item, as required.
- E. All repairs and re-installation shall comply with the specifications for the original item and its installation.
- F. Report graffiti on trash receptacles to the City's Representative immediately and proceed with removal only upon direction by the City's Representative. Graffiti removal shall be as specified and paid for under the work of Section GRAFFITI REMOVAL of this Specification.

### 3.06 MAINTENANCE OF WATER BUBBLER

- A. Twice per year, in April and November: Pressure wash all exposed surfaces at a minimum pressure of 2000 psi. Adjust pressure as required to clean off residue and undesirable coatings while preserving the integrity of the paint coating system of the water bubbler.
- B. Twice per year, in April and November, and upon report of unsatisfactory appearance or performance, make any adjustments, repairs or replacements necessary to ensure that:
  - 1. All components are undamaged and securely attached.
  - 2. Water bubbler is functioning properly.
  - 3. Water bubbler installation is secure, firm, and plumb.
- C. Report damaged water bubbler components to the City's Representative immediately.
- D. Report graffiti on water bubblers to the City's Representative immediately and proceed with removal only upon direction by the City's Representative. Graffiti removal shall be as specified and paid for under the work of Section GRAFFITI REMOVAL of this Specification.
- E. Report need for repainting of coated surfaces of the water bubbler to the City's Representative immediately upon determination and proceed with repainting only upon direction of City's Representative. Repainting shall be as specified and paid for under the work of Section REPAINTING AND TOUCH-UP PAINTING, of this Specification.

### 3.07 MAINTENANCE OF BIKE RACK

- A. Twice per year, in April and November: Pressure wash all exposed surfaces of all bike racks at a minimum pressure of 2000 psi. Adjust pressure as required to clean off residue and undesirable coatings while preserving the integrity of the paint coatings.
- B. Monthly: Wash all exposed surfaces with mild detergent and medium bristle brush.

- C. Twice per year, in April and November, and upon report of unsatisfactory appearance or performance, make any adjustments, repairs or replacements necessary to ensure that:
  - 1. All bike rack components are undamaged and securely attached.
- D. Report damaged bike racks to the City's Representative immediately.
- E. Report graffiti on bike racks to the City's Representative immediately and proceed with removal only upon direction by the City's Representative. Graffiti removal shall be as specified and paid for under the work of Section GRAFFITI REMOVAL of this Specification.
- F. Report need for repainting of bike racks to the City's Representative immediately upon determination and proceed with repainting only upon direction of City's Representative. Repainting shall be as specified and paid for under the work of Section REPAINTING AND TOUCH-UP PAINTING, of this Specification.

### 3.08 MAINTENANCE OF STONE SITE IMPROVEMENTS

- A. Once per year, in April: Pressure wash all exposed surfaces. Remove any staining and efflorescence.
- B. Twice per year, in April and November, and upon report of unsatisfactory appearance or performance, make any adjustments, repairs or replacements necessary to ensure that:
  - 1. All components are undamaged and securely attached.
  - 2. Mortar is in good condition
  - 3. Site furnishings are secure, firm, and plumb.
- C. Remove chipped, cracked, or eroded, mortar with a small cold chisel and hammer. Avoid excessive force that will remove sound mortar as well as loose mortar. Once the deteriorated mortar is removed, clean joints of dust and particles with a blast of water from a nozzle. Allow to dry thoroughly; inspect and repeat if necessary.
- D. Mortar Bedding and Jointing
  - 1. Wet granite unit joint surfaces thoroughly before re-pointing such that the surfaces of the granite and the existing sound mortar are damp, but not wet. For granite surfaces that are soiled, clean bedding and exposed surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
  - 2. Re-point and fill all holes and cracks in existing and new mortar joints with additional fresh mortar; do not merely spread adjacent mortar over defect or use dead mortar dropping. Do all pointing while mortar is still soft and plastic. If

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hardened, chisel defect out and refill solidly with fresh additional mortar and tool as specified.

3. Joints: Tooled, concave or match existing joint pattern.
4. The color of mortar shall be strictly controlled to assure uniformity of color through the work.
5. All cement materials and aggregates shall be mixed at least 3 minutes in the mixer with the minimum amount of water required to produce a workable consistency. Hand mixing shall not be used unless specifically approved.
6. Mortar that has begun to set or which is not used within 2-1/2 hours after initial mixing shall be discarded. Mortar that has stiffened due to evaporation within the 2-1/2 hour period shall be re-tempered to restore its workability. Re-tempering mortar that has partially hardened without additional cement aggregate or water, will not be permitted.

- E. Replace all sealant joints with approved sealant.
- F. Correct unsatisfactory conditions by repairing, replacing, or reinstalling damaged components or the entire item, as required.
- G. All repairs and re-installation shall comply with the specifications for the original item and its installation.

### 3.09 MAINTENANCE OF PROJECT SIGNAGE

- A. Twice per year, in April and November: Pressure wash all exposed surfaces of all signs at a minimum pressure of 2000 psi. Adjust pressure as required to clean off residue and undesirable coatings while preserving the integrity of the signs' paint coatings.
- B. Twice per year, in April and November, and upon report of unsatisfactory appearance of signs, make any adjustments, repairs or replacements necessary to ensure that:
  1. All sign components are undamaged and securely attached.
- C. Report damaged signs to the City's Representative immediately.
- D. Report graffiti on signs to the City's Representative immediately and proceed with removal only upon direction by the City's Representative. Graffiti removal shall be as specified and paid for under the work of Section GRAFFITI REMOVAL of this Specification.
- E. Replace signs as directed by the City's Representative.

### 3.10 MAINTENANCE OF REINFORCED CONCRETE STRUCTURES

- A. Twice per year, in April and November: Pressure wash all exposed surfaces of concrete structures a minimum pressure of 2000 psi.

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- B. Twice per year, in April and November, and upon report of unsatisfactory appearance of concrete structures, inspect concrete structures to determine structural stability of structures, including soundness of exterior surfaces.
- D. Report damaged or deteriorating concrete structures to the City's Representative immediately.
- E. Report graffiti on concrete structures to the City's Representative immediately and proceed with removal only upon direction by the City's Representative. Graffiti removal shall be as specified and paid for under the work of Section GRAFFITI REMOVAL of this Specification.

### 3.11 MAINTENANCE OF BOLLARDS

- A. Twice per year, in April and November: Pressure wash all exposed surfaces of all steel bollards and chains at a minimum pressure of 2000 psi. Adjust pressure as required to clean off residue and undesirable coatings while preserving the integrity of the paint coatings.
- B. Monthly: Wash all exposed surfaces with mild detergent and medium bristle brush.
- C. Twice per year, in April and November, and upon report of unsatisfactory appearance or performance, make any adjustments, repairs or replacements necessary to ensure that:
  - 1. All components are undamaged and securely attached.
  - 2. The removable bollard functions in the desired manner.
  - 3. Padlocks of removable bollards continue to operate properly.
- D. Report damaged removable bollard components to the City's Representative immediately.
- E. Report graffiti on removable bollards to the City's Representative immediately and proceed with removal only upon direction by the City's Representative. Graffiti removal shall be as specified and paid for under the work of Section GRAFFITI REMOVAL of this Specification.
- F. Report need for repainting of removable bollards to the City's Representative immediately upon determination and proceed with repainting only upon direction of City's Representative. Repainting shall be as specified and paid for under the work of Section REPAINTING AND TOUCH-UP PAINTING, of this Specification.

### 3.12 MAINTENANCE OF HANDRAILS, ORNAMENTAL FENCES AND GATES

- A. Twice per year, in April and November: Pressure wash all exposed surfaces.

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- B. Twice per year, in April and November, and upon report of unsatisfactory appearance or performance, make any adjustments, repairs or replacements necessary to ensure that:
  - 1. All components are undamaged and securely attached.
  - 2. All hardware is tightly fastened.
- C. Correct unsatisfactory conditions by replacing entire item, as required.
- D. All repairs and re-installation shall comply with the specifications for the original item and its installation.
- E. Report graffiti on handrails, ornamental fences and gates to the City's Representative immediately and proceed with removal only upon direction by the City's Representative. Graffiti removal shall be as specified and paid for under the work of Section GRAFFITI REMOVAL of this Specification.
- F. Report need for repainting of handrails, ornamental fences, and gates to the City's Representative immediately upon determination and proceed with repainting only upon direction of City's Representative. Repainting shall be as specified and paid for under the work of Section REPAINTING AND TOUCH-UP PAINTING, of this Specification.

### 3.13 MAINTENANCE OF PLAY EQUIPMENT

- A. Twice per year, in April and November: Pressure wash all exposed surfaces.
- B. Twice per year, in April and November, and upon report of unsatisfactory appearance of playground equipment, make any adjustments, repairs or replacements necessary to ensure that:
  - 1. All components are undamaged and securely attached.
  - 2. All hardware is tightly fastened.
- C. Report damaged play equipment to the City's Representative immediately.
- D. Report graffiti on play equipment to the City's Representative immediately and proceed with removal only upon direction by the City's Representative. Graffiti removal shall be as specified and paid for under the work of Section GRAFFITI REMOVAL of this Specification.
- E. Report need for repainting of playground equipment to the City's Representative immediately upon determination and proceed with repainting only upon direction of City's Representative. Repainting shall be as specified and paid for under the work of Section REPAINTING AND TOUCH-UP PAINTING, of this Specification.

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3.14 MAINTENANCE OF COMMUNITY GARDEN ELEMENTS

- A. Inspect two times per year, in April and November, and upon report of unsatisfactory appearance, edging, fences, gates, raised planters and compost bins in the community garden.
- B. In general, the maintenance issues related to wood components in the community garden falls within these parameters:
  - 1. Deterioration of the wood from environmental factors (e.g., sun, rain).
  - 2. Loose, raised or missing hardware (e.g., nails, screws, bolts).
- C. Replace Cracked, Rotten or Damaged Wood:
  - 1. Any wood pieces that are damaged or show signs of rot should be removed and replaced.
  - 2. Replace rotted pressure treated wood with timbers of equal size, pressure treated with amine copper quat ( ACQ ) or copper azole ( CA ).
- D. Replacing or Repositioning Hardware
  - 1. Secure bolts and reset nails with hardware of equal quality and size when new.
- E. Stain all wood elements every other year in accordance with the requirements of Section 01060 of this Specification.

END OF SECTION

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## **ITEM 01090 - MAINTENANCE OF DRAINAGE SYSTEMS**

### **PART 1 - GENERAL**

#### **1.01 SCOPE**

- A. The work of this Section consists of furnishing all labor and materials necessary to provide the services specified herein, including:
1. Cleaning, cleanout, and repair of drainage system components, including but not limited to catch basins, oil separators, drainage manholes, and pipes
  2. Cleanout and repair of water and aeration sumps
  3. Cleanout of drainage gutters and swales.
  4. Emergency cleanout and repair of non-functioning drainage components.

#### **1.03 RELATED WORK UNDER OTHER SECTIONS**

- A. The following items of related work are specified in separate sections of these Maintenance Specifications:
1. 01000 General Requirements
  2. 01010 General Cleanup
  3. 01020 Trash Removal
  4. 01040 Graffiti Control
  5. 01050 Rodent Control
  6. 01060 Repainting and Touch-Up Painting
  7. 01070 Maintenance of Pavements, Trails and Walkways
  8. 01080 Maintenance of Site Improvements and Site Furnishings
  9. 01100 Maintenance of Site Lighting
  10. 01120 Maintenance of Irrigation Systems
  11. 01130 Maintenance of Turf and Meadow
  12. 01140 Maintenance of Planting and Plant Beds
  13. 01150, Maintenance of Baseball Diamonds and Associated Areas

### **PART 2 - PRODUCTS**

#### **2.01 NOT INCLUDED**

### **PART 3 - EXECUTION**

#### **3.01 MAINTENANCE OF CATCH BASINS AND OIL SEPARATORS**

- A. Pressure wash grate. Direct water towards drain inlets. Wash on a day when the rain is not forecast.

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- B. Empty and clean the oil separator. Remove all debris and residue that has accumulated over the preceding year. Clean sumps, hoods, and any holding chambers and flush clean with potable water.
- C. Take great care in handling and disposal of oil and other materials removed from catch basins and oil separators. See "Protection of Environment." Legally dispose of contents of catch basins and oil separators off site.
- D. Remove any accumulated debris and make any adjustments, repairs or replacements necessary to ensure that:
  - 1. All components are undamaged and securely attached.
  - 2. All hardware is tightly fastened.
  - 3. All catch basins and oil separators are free of debris.
  - 4. All grates and frames are secure, firm, and flush with surrounding pavement.
  - 5. All moveable elements can be operated easily by maintenance workers.
- E. After cleaning each drainage structure, spray paint a small, yellow spot on one corner of the structure.
- F. All repairs and re-installation shall comply with the specifications for the original item and its installation.

### 3.02 MAINTENANCE OF DRAINAGE MANHOLES

- A. Power wash grate. Wash on a day when the rain is not forecast.
- B. Remove any accumulated debris and make any adjustments, repairs or replacements necessary to ensure that:
  - 1. All components are undamaged and securely attached.
  - 2. All hardware is tightly fastened.
  - 3. The manhole is free of debris and water flows freely through channel.
  - 4. All grates, manhole covers, and frames are secure, firm, and flush with surrounding pavement.
- C. All repairs and re-installation shall comply with the specifications for the original item and its installation.
- D. After cleaning each drainage structure, spray paint a small, yellow spot on one corner of the structure.

### 3.03 MAINTENANCE OF WATER SUMPS

- A. Visually inspect sumps, using flashlight if necessary to determine whether debris, dirt, grass clippings, or other foreign material is present. If foreign material is detected during inspection, remove grate and remove all foreign material by hand.

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3.04 MAINTENANCE OF GUTTERS

- A. Inspect all curb gutters and drainage swales each week and remove all debris and vegetation obstructing the flow of water. The work of this operation shall be included and shall be paid for under the work of Section 01020, General Cleanup, of this Specification.

3.05 EMERGENCY MAINTENANCE OF DRAINAGE SYSTEM

- A. If the drainage system is reported to be functioning improperly or inadequately, inspect the site within 6 hours of the report to determine the cause of the malfunction.
- B. Upon determining the cause of the malfunction, immediately contact the City's Representative to notify him/her of the nature of the malfunction, the appropriate steps to correct it, and the cost of those steps and of any practical alternatives.
- C. Correct the malfunction immediately upon the approval of the City's Representative.
- D. The Maintenance Contractor shall be responsible to provide all necessary materials and parts for correction of malfunctions, to dispose of any removed parts, material, or debris off-site, and to restore the surrounding area, including damage caused by the malfunction and damage caused by the repair process.

END OF SECTION

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## **SECTION 01100 - MAINTENANCE OF SITE LIGHTING**

### **PART 1 - GENERAL**

#### **1.01 SCOPE**

- A. The Work of this Section consists of furnishing all labor and materials necessary to provide maintenance of structural, optical, electrical, and electronic components of the lighting system, including but not limited to:
  - 1. Inspections, maintenance, repair and replacement of lighting components, including but not limited to luminaires and ballasts, electrical hand holes and manholes.

#### **1.03 RELATED WORK UNDER OTHER SECTIONS**

- A. The following items of related work are specified in separate sections of these Maintenance Specifications:
  - 1. 01000 General Requirements
  - 2. 01010 General Cleanup
  - 3. 01020 Trash Removal
  - 4. 01040 Graffiti Control
  - 5. 01050 Rodent Control
  - 6. 01060 Repainting and Touch-Up Painting
  - 7. 01070 Maintenance of Pavements, Trails and Walkways
  - 8. 01080 Maintenance of Site Improvements and Site Furnishings
  - 9. 01090 Maintenance of Drainage Systems
  - 10. 01120 Maintenance of Irrigation Systems
  - 11. 01130 Maintenance of Turf and Meadows
  - 12. 01140 Maintenance of Planting and Plant Beds
  - 13. 01150, Maintenance of Baseball Diamonds and Associated Areas

### **PART 2 - PRODUCTS**

#### **2.01 REPLACEMENT PARTS**

- A. Replacement parts for all components of site lighting shall be identical to the original parts that were installed at the time of construction. A list of all parts will be made available to the Maintenance Contractor prior to the start of work.
- B. See the construction bid documents for a clear description of specified lighting systems. Bid documents include the following:

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PART 3 - EXECUTION

3.01 EMERGENCY RESPONSE

- A. Provide maintenance services, materials, and equipment as follows:
  - 1. For major failures the response time shall be no more than 24 hours. Major failures are defined as those failures that affect 10 percent or more of the lights in the site lighting system.
  - 2. For minor failures the response time shall be no more than 4 days. Minor failures are defined as those failures that affect fewer than 10 percent of the lights in the site lighting system.
- B. All emergency maintenance services, including those made necessary by vandalism or other damage, will be paid for as an Additional Service using the Unit Prices submitted in the Bid Proposal and will not be included in the Base Bid price.

3.02 MAINTENANCE OF LIGHTING SYSTEMS

- A. Clean all exposed optical surfaces and remove any debris from the interior of lighting components.
- B. Remove any accumulated debris and make any adjustments, repairs or replacements necessary to ensure that:
  - 1. Conduit, junction boxes, and fixtures are free of deterioration and dirt.
  - 2. Timer and control panel are functioning properly to time lighting operation.
  - 3. All components are undamaged and securely attached.
  - 4. All hardware is tightly fastened.
  - 5. All lights are operating properly.
  - 6. All optical components, including lenses, reflectors, and clear enclosures, are clean.
  - 7. All frames and lids are secure, firm, and flush with surrounding pavement.
  - 8. Illumination and access to lights are not blocked by vegetation.
  - 9. All moveable elements can be moved easily by maintenance workers.
- C. All repairs and re-installation shall comply with the specifications for the original item and its installation.
- D. See City's Representative for direction regarding any vegetation blocking illumination or access to lights. Remove or prune vegetation only as directed by City's Representative.

END OF SECTION

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## **SECTION 01120 - MAINTENANCE OF IRRIGATION SYSTEMS**

### **PART 1 – GENERAL**

#### **1.01 SCOPE**

- A. The work of this Section consists of furnishing all labor and materials necessary to provide the services specified herein, including but not limited to:
  - 1. Initial site visit and plan
  - 2. Operation of irrigation systems.
  - 3. Synchronization of controllers/time clocks
  - 4. Annual spring start-up.
  - 5. Annual winterization
  - 6. Communication with lawn maintenance and planting maintenance contractors
  - 7. Monthly inspection and maintenance.
  - 8. Emergency repairs due to non-functioning irrigation components

#### **1.02 EQUIPMENT REQUIRED**

- A. The Maintenance Contractor shall submit a list of all equipment and operating instructions, to be used, to the City prior to commencing work.
  - 1. A wire tracer capable of locating wiring and valve solenoids through a headphone tracing system.
  - 2. A system components analyzer to determine if valves are in good of bad working order, solenoids are operating properly, wiring system is properly intact and controller outputs are adequate.
  - 3. A faultfinder capable of locating wire breaks and shorts.
  - 4. Two (2) 0-160 psi pressure gages with associated attachments to read pressures on:
    - a. pop up spray sprinklers
    - b. rotary sprinklers
    - c. quick coupling valves
    - d. backflow prevention devices
  - 5. A standard volt/ohm meter for measuring voltages, currents, and electrical resistances.
  - 6. Soil moisture sensing system.
  - 7. A tow behind air compressor capable of generating up to 125 cubic feet of air per minute at a pressure of up to 80 psi.
  - 8. Necessary equipment for the general repair and replacement of irrigation systems components including the following minimum spare parts shall be considered part of this base bid:

- a. Quantity 8, small spray sprinkler heads complete. An assortment of spray nozzles indicative of those installed on the project site and replacement screens shall be considered incidental to the work.
- b. Quantity 4, medium size rotary sprinkler heads, Hunter I-20 sprinklers, with adjustable arcs and associated nozzles. An assortment of spray nozzles indicative of those installed on the project site and replacement screens shall be considered incidental to the work.
- c. Quantity 4, large size rotary sprinkler heads, Hunter I-40 sprinklers, with adjustable arcs and associated nozzles. An assortment of spray nozzles indicative of those installed on the project site and replacement screens shall be considered incidental to the work.
- d. Quantity 1, for each size used on the project, 24v irrigation electric control valves, and valve repair components including, solenoids, springs, etc, sized for units actually installed in the field.
- e. Quantity 1, for each size used on the project, valve boxes complete with bolt down covers for units actually installed in the field.
- f. Quantity 2, for each size used on the project, valve boxes bolt down covers for units actually installed in the field.
- h. Quantity 2, quick coupling valves for units actually installed in the field.
- i. Quantity 2, valve keys with 1"x1" swivel hose ells for quick coupling valves for units actually installed in the field.
- j. Quantity 2, solid-state alternating current resistance portable bridge meter.  
Quantity 4, related sub-surface soil moisture sensor stations.
- k. Quantity 2, flow sensor devices, for units actually installed in the field.
- l. Miscellaneous plumbing tools, electrical tools, digging tools
- m. Miscellaneous irrigation repair components including wires, clamps, splice kits, copper, PVC, and polyethylene pipe repair kits, rises assemble repair and replacements including both swing joint and "funny pipe" assemblies.

### 1.03 RELATED WORK UNDER OTHER SECTIONS

- A. The following items of related work are specified in separate sections of these Maintenance Specifications:

- 1. 01000 General Requirements
- 2. 01010 General Cleanup
- 3. 01020 Trash Removal
- 4. 01040 Graffiti Control
- 5. 01050 Rodent Control
- 6. 01060 Repainting and Touch-Up Painting
- 7. 01070 Maintenance of Pavements, Trails and Walkways
- 8. 01080 Maintenance of Site Improvements and Site Furnishings
- 9. 01090 Maintenance of Drainage Systems
- 10. 01100 Maintenance of Lighting Systems
- 11. 01130 Maintenance of Turf and Meadows
- 12. 01140 Maintenance of Planting and Plant Beds
- 13. 01150, Maintenance of Baseball Diamonds and Associated Areas

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#### 1.04 SAMPLES AND SUBMITTALS

- A. Prior to ordering the below listed materials, submit representative submittals and samples of the following materials to the City's Representative. Do not order materials until City's Representative's approval has been obtained. Delivered materials shall closely match the approved samples.
- B. All chemicals and materials proposed for use on the project shall be approved for use by the Environmental Protection Agency, the Commonwealth of Massachusetts Agricultural Department, and other agencies having jurisdiction over the site area.
- C. Provide to the City's Representative all Material Safety Data Sheets for all chemicals and materials proposed for use on the project.
- D. Submittals: Provide manufacturer's literature for any of the following to be used:
  - 1. Replacement Parts and Filters.
  - 2. Cleaning Materials.
  - 3. Glues and Adhesives.
- E. Submit samples for any of the following to be used:
  - 1. Loam.
  - 2. Crushed Stone.
  - 3. Sand.

#### PART 2 – PRODUCTS

- 2.01 IRRIGATION REPAIR MATERIALS
- 2.02 PVC IRRIGATION PIPE AND FITTINGS
- 2.03 PVC IRRIGATION PIPE AND FITTINGS
- 2.04 SPRINKLERS
- 2.05 SPRINKLER RISER ASSEMBLIES
- 2.06 ELECTRIC CONTROL VALVES AND BOXES

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- 2.07 CONTROLLER
- 2.08 WIRE
- 2.09 ISOLATION BALL VALVES
- 2.10 PRESSURE REGULATORS
- 2.11 QUICK COUPLING VALVES
- 2.12 FLOW SENSORS
- 2.13 RAIN SHUT OFF
- 2.14 MOISTURE CONTROL SENSORS
- 2.15 BOOSTER PUMP

### PART 3 – EXECUTION

#### 3.01 INITIAL INSTRUCTION

- A. The Irrigation Maintenance Contractor and Irrigation Installation Subcontractor shall attend up to eight hours of on-site instruction to the City in the operation of the installed irrigation system, at a time and date to be determined by the City's Representative.
- B. Prepare a plan showing each of the electric zone valves, the precipitation rates for each zone, and the time required to obtain the application rates and frequency rates stated below.
- C. Synchronize Controllers/ time clocks.

#### 3.02 APPLICATION RATE AND FREQUENCY

- A. The Irrigation System should be programmed so that no areas are watered before midnight and after 6:30 am.
- B. The contractor shall create a numbered hierarchy of most critical to least critical zones to be irrigated in relation to park use and pedestrian use.
- D. The Irrigation System shall be programmed to supplement natural rainfall with sufficient water to provide the following minimum quantities of water for the duration of the season of operation unless otherwise directed by the City's Representative in these areas:
  - 1. Athletic Field Turf – 1.25" per week in equal applications.

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### 3.03 SEASON OF OPERATION

- A. The Irrigation System shall be operational from March 15 to November 15 of each year, unless otherwise directed by the City's Representative.

### 3.04 ANNUAL SPRING START-UP

- A. The Maintenance Contractor shall be responsible for annual start-up of the irrigation system in the spring.
- B. Spring start-up shall occur on or around March 15th or as directed by City's Representative.
- C. Close any drain valves associated with winterization.
- D. Booster Pumping System: Before starting the system in the spring, check for the following:
  - 1. Check for cracks in the casing due to frost damage.
  - 2. Ensure that the impeller rotates freely.
  - 3. Ensure proper direction of rotation of pump.
  - 4. Adjust packing.
  - 5. Check for worn bearings.
  - 6. Lubricate pump and check oil levels.
  - 7. Ensure pump is secured to platform.
  - 8. Ensure shafts are aligned.
  - 9. Check condition of belts, chains and couplings.
  - 10. Check for cavitations, is pump starved of water?
- E. Open the front cover of the irrigation clock, find the battery and replace. Test to make certain clock maintains proper electrical ground.
- H. Activate each zone on system timer and check for winter damage. Check mainline and valves for breaks or leaks.
  - 1. Check each zone in accordance with flow sensor devices. Excessive flow indicates a broken head/s or a broken pipe. Low flow indicates damaged heads not functioning or a damaged valve.
  - 2. If a valve sticks opens and will not close, open valve box and manually close valve by turning the throttle control valve located on top of valve. Wait a minute and reopen valve. Occasionally dirt or debris can cause a valve to stay open. If valve continues not to operate properly, remove and replace.
  - 3. If a valve fails to turn on, check electrical connections at valve and controller. Check solenoid. If valve continues not to operate properly, remove and replace.

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- I. Check heads to assure their proper orientation and height. Adjust spray patterns of all heads to provide complete and adequate coverage of areas to be watered, and to prevent pavement areas from receiving unnecessary watering.
- J. Check electrical and plumbing systems to assure their proper operation.
- K. Observe the operation of one complete cycle. Review the condition of automatic and manual features of the irrigation system. Set the time clock for the new season.
- L. Report any unsatisfactory performance of the controller system to the City's Representative in writing.

### 3.05 ANNUAL WINTERIZATION

- A. Winterization shall occur on or around November 1st or as directed by the City's Representative.
- B. Shut off the irrigation water supply ball/gate valve in the [water room].
- D. Attach the air compressor hose to the blow out connection provided on the irrigation water supply line in the water room on the lower level.
- C. Blow out each zone on the irrigation system.
- D. Open each quick coupling valve in the system to evacuate the main line, one at a time for a minimum period of two minutes, or until all the water has been removed.
- E. Leave open the irrigator water supply drain located in the water supply room.
- F. Pump System: At the end of the season, winterize the pump and check the following:
  - 1. Drain the pump.
  - 2. Check for a worn impeller.
  - 3. Check the packing and replace if brittle.
  - 4. Check lubricants and top up.

### 3.06 EMERGENCY RESPONSE

- A. The Maintenance Contractor shall be prepared to service the system by providing labor and repair equipment at the request of the City's Representative as follows:
  - 1. For major failures the response time shall be no more than four (4) hours. Major failures are defined as those failures that render two or more zones inoperable, i.e. a mainline break, clock failure, wiring failure.

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2. For minor failures the response time shall be no more than twenty-four (24) hours. Minor failures are defined as those failures that render one or less zones inoperable.

3.07 COMMUNICATION WITH LAWN MAINTENANCE AND PLANTING  
MAINTENANCE SUBCONTRACTORS

- A. It is the responsibility of the Maintenance Contractor to communicate with any subcontractor or City Staff engaged for maintenance of lawns, plantings and plant beds, or other maintenance in the event of a shut down of over twenty-four (24) hours in the irrigation system.
- B. It is the responsibility of the Maintenance Contractor to coordinate the work of subcontractors to assure that any necessary adjustments are made to the quantity of water or spray coverage of heads.

3.08 MAINTENANCE PROCEDURES

- A. The Maintenance Contractor shall be responsible for the following items on a monthly basis during the season of operation:
  1. Perform required maintenance and notify City's Representative.
  2. Inspect sprinkler heads to assure their proper operation and to check for vandalism. Head spray patterns shall be adjusted if required to provide complete and adequate coverage of the areas to be watered or as directed by the Maintenance Contractor or the City's Representative.
  3. Clean sprinkler heads and trim grass around heads.
  4. In addition to required irrigations systems maintenance, inspect site for lawn, tree rings, and plant beds that appear over-watered or conversely, areas that are desiccated due to insufficient coverage or application rates.
  5. Report any problems to the City's Representative immediately.
  6. Correct unsatisfactory conditions by repairing, replacing, or reinstalling damaged components or the entire item, as required.
  7. All repairs and re-installation shall comply with the specifications for the original item and its installation.
  8. Read and monitor soil moisture sensors. Adjust controller accordingly.
  9. Read and monitor flow control system.
  10. Inspect backflow preventer for unusual water discharges. Immediately report problems to the City's Representative.
- B. During the course of maintenance work the following incidental activities shall be included within the Maintenance Contractor's responsibilities without additional compensation:
  1. Cleaning out of irrigation valve boxes as required to facilitate access to irrigation valves and equipment.
  2. Clean/ clear plugged sprinkler nozzles and filter screens.

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3. Correct part circle patterns that cause spray or runoff onto paved areas or structures. Keep heads properly aligned, leveled and rotating.
4. Inspect/ clean/ clear sticking electric zone valves. Reprogramming of the controller to meet watering needs as directed.
5. Irrigation components damaged by maintenance activities shall be replaced at no additional cost to the City.

### 3.09 GENERAL REPAIRS

- A. It is the responsibility of the Maintenance Contractor to maintain the system in operable condition, as shown on the Drawings. The Maintenance Contractor shall also be responsible for ensuring that the manufacturer's printed instructions and recommendations are closely followed.
  1. If at any time any item or part of the system is not properly functioning, or is not as intended, it is the responsibility of the Maintenance Contractor to bring this to the attention of the City's Representative to ensure that the necessary repairs and changes can be made to bring the system to an operable and acceptable condition. The Maintenance Contractor shall install the replacements parts with the approval of the City, unless covered by a one-year guarantee. The cost of all repairs shall be borne by the City, unless there has been some negligence on the part of the Maintenance Contractor.
  2. All replacement parts and equipment shall be by the same manufacturer as the originally installed materials.
- B. At all times, any areas undergoing repairs or adjustments shall be kept separate from pedestrians by a barrier. Existing landscaping, paving, structures, walls, footings, etc. shall be protected from damage at all times. Any inadvertent damage to the work of another trade shall be reported at once. All trenches and excavations must be marked and protected to prevent pedestrians from entering excavated areas. Protection shall include barriers around and plywood covers over excavations. No overnight excavations will be allowed.
- C. Installation of pipe and fittings:
  1. Pipe shall be installed by trenching.
  2. Piping shall be "snaked" in trench to allow for expansion and contraction. Cut plastic pipe with handsaw or pipe-cutting tool, removing all burrs at cut ends. All pipe cuts are to be square and true. Make all solvent-weld joints in strict accordance with manufacturer's recommendations. Valve wiring shall be laid in same trench as piping.
  3. In installing all pipelines the contractor shall route the pipe outside the drip line of trees as much as possible to prevent damage to tree roots.
  4. The Maintenance Contractor shall maintain an updated 'As-Built' Irrigation plan showing all changes made to the irrigation system as approved by the City.

D. Wiring installation:

1. Multiple wire bundles shall be cinched together at maximum 24" centers using plastic cable cinches and shall be laid beside, and at the same invert as, the main irrigation line. Sufficient slack for expansion and contraction shall be maintained and wiring shall at no point be installed tightly. Provide an additional 8" to 12" slack at all changes of direction. Wiring in valve boxes shall be a sufficient length to allow the valve solenoid, splice, and all connections to be brought above grade for servicing. This additional slack shall be coiled for neatness in the valve box.
2. Service wiring in connection with drawings and local codes for 24-volt service. All wiring splices shall be properly waterproofed using method and materials as approved.
3. The Maintenance Contractor to maintain a complete updated wiring diagram showing wire routing for the connections between the controllers, moisture control panel, and remote control system on a plan approved by the City.

E. Moisture sensor installation:

1. Moisture sensors shall be installed per manufacturer's recommendations and instructions. The sensors shall be buried consistent with the root zone of the material being watered.
2. Contractor shall locate buried sensors within 2'-3' of plastic valve boxes.
3. Installation shall be in accordance with manufacturer's recommended installation standards.
4. Contractor shall maintain and monitor buried sensors wired to the valve box using the solid-state alternating current resistance portable bridge. Testing shall be conducted and monitored on at least a monthly basis. Adjust controller-watering schedule in accordance with findings of soil moisture sensors.
5. Contractor shall install sub-surface soil moisture sensor stations in remote locations as approved by City's Representative.

F. Sleeving installation

1. Sleeving shall be used wherever wire or piping is going under a non-soil area. No cutting and patching will be permitted.

G. Sprinkler installation

1. All sprinklers shall be mounted on swing joint pipe risers. Minimum swing pipe length - 12"; maximum -18".
2. Adjust sprinkler zone pressure with flow-control on valve.

H. Clean up

1. Upon completion of all installation work, the Maintenance Contractor shall remove all leftover materials and equipment and legally dispose of them off site.

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Site shall be left in as neat and clean a condition as when the irrigation maintenance was begun.

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## **SECTION 01130 - MAINTENANCE OF TURF AREAS**

### **PART 1 - GENERAL**

#### **1.01 SCOPE**

- A. The Work of this Section consists of furnishing all labor and materials necessary to provide the services specified herein, including but not limited to:

1. Mowing and trimming of turf.
2. Edging of plant beds.
3. Monitoring of irrigation.
4. Soil test.
5. Application of fertilizer.
6. Pre-emergent crabgrass control.
7. Weed control treatment.
8. Disease and pest control treatment.
9. Aeration.
10. De-thatching.
11. Overseeding

#### **1.02 RELATED WORK UNDER OTHER SECTIONS**

- A. The following items of related work are specified in separate sections of these Maintenance Specifications:

1. 01000 General Requirements
2. 01010 General Cleanup
3. 01020 Trash Removal
4. 01040 Graffiti Control
5. 01050 Rodent Control
6. 01060 Repainting and Touch-Up Painting
7. 01070 Maintenance of Pavements, Trails and Walkways
8. 01080 Maintenance of Site Improvements and Site Furnishings
9. 01090 Maintenance of Drainage Systems
10. 01100 Maintenance of Site Lighting
11. 01120 Maintenance of Irrigation Systems
12. 01140 Maintenance of Planting and Plant Beds
13. 01150 Maintenance of Baseball Diamonds and Associated Areas

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#### 1.04 SOIL TESTING

- A. For turf maintenance purposes, during the month of April, take samples from each baseball field and multi-use field. Each sample shall be a composite soil sample made up of cores from a minimum of 6 different areas within each field.
- B. The samples shall be collected in the following manner:
  - 1. Using a soil probe, take cores from the top 6 to 8 inches of the soils to be sampled. Soil probes shall be steel tube sampling probes specifically designed for coring to 19 inch depths or greater, with solid steel shafts and T shaped handles. Oakfield Soil Samplers or approved equal.
  - 2. Contractor shall place these soil cores into a large, clean plastic container and mix thoroughly. Contractor shall take one cup of soil mixture and dry it at room temperature (do not dry samples in an oven or on a stove or radiator). Once soil is dry, place the soil in sandwich size zip-type plastic bag and close it tightly. Label each sample on the outside of the bag, identifying the source of the sample.
- C. Contractor shall deliver all samples to testing laboratories via overnight courier and shall have the testing report sent directly to the City's Representative. Perform all tests for gradation, organic content, soil chemistry and pH by Soil Testing Laboratory, University of Georgia, 2400 College Station Road, Athens, Georgia. Testing reports shall include the following tests and recommendations. Contractor shall deliver samples to testing laboratories and shall have the testing report sent directly to the City's Representative from the Soil Testing Laboratory.
- D. All tests shall be performed in accordance with the current standards of the Association of Official Analytical Chemists. Testing reports shall include the following tests and recommendations.
  - 1. Mechanical gradation (sieve analysis)
  - 2. Percent of organics
  - 3. Chemical analysis
  - 4. Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary, and for additives necessary to accomplish turf work as specified.
- E. All soil used for turf repair shall be tested prior to bringing soil on-site.

#### PART 2 - PRODUCTS

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- 2.01 FERTILIZER
- 2.02 LIMESTONE
- 2.03 ACIDULANT
- 2.04 ORGANIC MATTER
- 2.05 CRAB GRASS CONTROL
- 2.06 LOAM
- 2.07 SOD
- 2.08 SEED
- 2.09 TURF PROTECTION
- 2.10 WATER AND WATERING EQUIPMENT

PART 3 - EXECUTION

- 3.01 IRRIGATION MONITORING AND WATERING
  - A. Monitor moisture conditions within athletic turf areas to ensure that adequate moisture levels are maintained. Each week during the specified mowing season, inspect the turf to monitor moisture conditions within turf areas.
  - B. In the event that the irrigation system is providing inadequate or excessive water coverage in any turf areas the Maintenance Contractor shall correct this condition immediately and report this condition in writing to the City's Representative within 24 hours of discovery.
  - C. If, for any period of time, the irrigation system is unable to provide adequate water coverage, the Maintenance Contractor shall manually provide enough water to maintain the turf in a healthy condition until the irrigation system is restored. The Maintenance Contractor shall provide all watering equipment.
  - D. See Section 01120, MAINTENANCE OF IRRIGATION SYSTEM, for a full description of this work. The cost of monitoring moisture conditions within turf areas shall be carried in the base bid costs for mowing as specified and paid for under the work of this Section of the Specification.
- 3.02 COORDINATION WITH OTHER CONTRACTORS

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- A. The Maintenance Contractor shall be responsible for communicating any information concerning Turf Maintenance to the Irrigation Maintenance Contractor, Landscape Maintenance Contractor or Arborist that may effect the responsibilities of those contractors.

### 3.03 PROTECTION OF ADJACENT SURFACES

- A. When applying any lime, fertilizer or other be careful to confine the applications to the turf surface. Any application that falls on walks, walls, plant bed surfaces shall be cleaned off immediately.

### 3.04 FERTILIZING

- A. The work of fertilizing shall be performed as described below by grass species.
- B. Apply the fertilizer only when the grass is dry.
- C. Apply fertilizer as indicated by soil test results and in accordance with the following schedules. Nitrogen shall be applied at 1 lbs. per 1,000 SF. Phosphorus and potassium shall be applied in accordance with the recommend rates per the soil test results.
- D. All chemical applications shall be applied by licensed applicators and in accordance with current State and Federal Regulations.
- E. Fertilizer shall be evenly distributed. Turn the fertilizer spreader off when making sharp turns to avoid high concentrations of fertilizer.
- F. Temporarily store, mix and load fertilizer on parking lot or roadway pavement areas. If fertilizer spills, sweep up fertilizer immediately and dispose of the fertilizer off site at the end of the day in a legal manner.
- G. Do not fertilize or contaminate waterfront areas. Do no mixing or loading of fertilizer within 25 feet of a catch basin.

### 3.05 CRABGRASS CONTROL

- A. Pre-emergent crabgrass control shall occur as described below by species.
  - 1. Spring application of crabgrass pre-emergent herbicide shall be with products containing Siduron if spring seeding is anticipated. Application rates shall be as recommended by the manufacturer.
  - 2. If spring seeding is not anticipated, apply benefin/triflualin at rates recommended by the manufacturer. Application of benefin/triflualin will prevent grass seed

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germination. Fall seeding of grass seed may proceed after spring application of this pre-emergent herbicides.

- B. Post yellow wire flats at all entries stating that pesticides have been applied. Time application so that flags can be removed no later than 24 hours after chemical application. Schedule application to avoid weekend and holiday use by the public.

### 3.06 WEED CONTROL

- A. The work of weed control shall occur as described below for species.
- B. In paved areas, the control of weeds shall include the physical removal of weeds by hand-pulling or using a hand tool and the spot application of an approved, fast-acting herbicide to weeds less than two inches in height.
- C. Keep turf areas weed free: If the weed population comprises more than 5 percent of plant growth physically removal weeds by hand-pulling or using a hand tool. Also permitted will be the spot application of an approved, fast-acting herbicide provided that surrounding turf is not injured.
- D. Do not damage trees, shrubs, ground cover, perennials, and annuals by overspraying any application of herbicides to turf areas.
- E. If the weed population comprises more than 5% of plant growth, broadcast herbicide treatments shall be applied beyond the scheduled treatment noted herein. Herbicides selected shall be based on the weed species present and the target sprayed according to manufacturer's recommendations.
- F. Do not commence weed control treatment without approval of the City's Representative.
- G. Applications of all herbicide treatments shall be done in a manner that does not restrict public access to the turf areas.
- H. All herbicides shall be applied by a licensed applicator and in accordance with Massachusetts State regulations.
- I. Post yellow wire flats at all entries stating that pesticides have been applied. Time application so that flags can be removed no later than 24 hours after chemical application. Schedule application to avoid weekend and holiday use by the public.

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### 3.07 DISEASE AND PEST CONTROL

- A. The work of identifying disease and pest vectors shall occur during each week from the start of the first week in April through to last week of November.
- B. Submit a written strategy of the Integrated Pest Management Program (IPM) to be employed. Submit strategy prior to applying herbicides, insecticides, fungicides, and rodenticide. Accompanying this declaration shall be a description of the IPM system, including, but not limited to a list of key pests for the plant species of the Project, the schedule of visual checks for pest presence, population densities, and damage.
- C. The work required to correct disease or pest infestations shall occur immediately after the identification of the disease or pest and may occur throughout the turf season, the first week in April through the last week of November.
- D. During the maintenance period, any decline in the condition of turf areas shall require the Maintenance Contractor to take immediate action to 1) notify the City's Representative of the potential problems and 2) undertake corrections. If required, the Maintenance Contractor shall engage a professional agronomist or contact UMASS at the following internet address: <http://www.umassturf.org> or call Dr. Gail Schumann at 413-545-3413. Agronomist shall inspect turf areas and identify turf maintenance problems and recommend corrective measures. The Maintenance Contractor shall submit samples of the damaged turf for laboratory diagnosis if the problem cannot be identified by visual means. The Maintenance Contractor shall apply insecticides and/or other pesticides to the turf only when necessary and as recommended by the Agronomist or laboratory.
- E. The Maintenance Contractor shall be diligent in routinely inspecting the turf for any disease, and pest control problems. When any problem is present at a level that requires treatment, the Maintenance Contractor shall choose the appropriate chemical that is the least environmentally hazardous and shall apply it at the lowest rate necessary to be effective. Any application shall be target sprayed on only those areas requiring treatment. The Maintenance Contractor shall check for efficacy of treatment and reapply if required.
- F. All chemicals shall be applied by a licensed applicator and in accordance with Massachusetts State regulations.
- G. Areas receiving applications of all disease and pest control treatments shall be clearly marked with appropriate flags and signs that indicate the presence of chemicals having been applied that could be dangerous.
- H. Do not commence pesticide and/or fungicide treatments without written approval of the City's Representative.

### 3.08 AERATION

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- A. All turf areas shall be aerated as described below by species. Do not aerate when turf areas are wet. Conversely, do not aerate when turf areas are dry.
- B. Aerate turf areas using core machines that utilize a hollow tine or spoon to remove the soil core. Do not use solid spikes or solid tines. Tines shall be located no less than 3 inches on center. Depth of penetration of cores should be a minimum of 3 inches. Rake up cores or drag a steel mat to break them up. Core aerate the soil repeatedly until core holes are approximately 2 inches apart.

3.09 DE-THATCHING

- A. De-thatching shall occur as described below by species.
- B. The goal of de-thatching turf areas shall be to remove excessive thatch which inhibits water infiltration and promotes the volatilization of nitrogen fertilizers.
- C. If the level of thatch build up in the turf has accumulated over 1/2 inch and is affecting the health of the turf, it may be necessary to de-thatch the turf. Examine fertilizer practices that might be contributing of thatch build up.
- D. Machine for de-thatching shall be a vertical mower that uses metal blades to slice through the thatch, thinning the thatch out and bringing it to the surface. Set blades deep enough to get just under the thatch layer and not cut into the root system. Test blade depth in a small inconspicuous area. If de-thatching activity begins to rip up the turf from the soil surface, adjust the depth of blade penetration. If adjustment of blade depth does not prevent ripping sod from the soil surface, then stop with work immediately.
- E. Dispose of all material and debris generated during the de-thatching operation. Dispose of material and debris off site in a legal manner.
- F. Do not commence de-thatching without approval of the City’s Representative.

3.10 TURF CULTURE BY SPECIES

<b>BERMUDA GRASS</b>	January	Februar	March	April	May	June	July	August	Septem	Octobe	Novem	Decem
Fertilizer				X		X			X			
Aeration					X	X	X					
Seeding New Lawn					X	X						

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Overseeding										X		
Sodding					X	X	X					
Weed Control												
Spring Pre-Emergent			X									
Grassy weed Post Emergent					X	X						
Winter Pre-Emergent									X			

<b>CENTIPEDE-GRASS</b>	January	February	March	April	May	June	July	August	September	October	November	December
Fertilizer					X		X					
Aeration					X	X	X					
Seeding New Lawn						X						
Overseeding												
Sodding					X	X	X					
Weed Control												
Spring Pre-Emergent		X	X									
Grassy weed Post Emergent					X	X						
Winter Pre-Emergent									X			

<b>TALL FESCUE</b>	Janu	Febr	Marc	April	May	June	July	Aug	Sept	Octo	Nov	Dece
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Fertilizer		X		X					X		X	
Aeration				X						X		
Seeding New Lawn										X		
Overseeding			X							X		
Sodding	X	X	X							X	X	X
Weed Control												
Spring Pre-Emergent		X	X									
Grassy weed Post Emergent					X	X						
Winter Pre-Emergent									X			

<b>ST AUGUSTINE GRASS</b>	January	February	March	April	May	June	July	August	September	October	November	December
Fertilizer					X	X		X	X			
Aeration					X	X						
Sodding					X	X	X					
Weed Control												
Spring Pre-Emergent		X	X									
Broad Leaf Post Emergent	X	X			X	X	X	X	X	X	X	X
Winter Pre-Emergent									X			

<b>ZOYSIA-GRASS</b>	January	February	March	April	May	June	July	August	September	October	November	December

Fertilizer					X			X				
Aeration					X							
Seeding New Lawn					X	X						
Overseeding												
Sodding					X	X	X					
Weed Control												
Spring Pre-Emergent		X	X									
Grassy weed Post Emergent					X	X						
Winter Pre-Emergent								X				

3.11 TURF REPAIR - EMERGENCY RESPONSE

- A. Provide maintenance services, materials, and equipment from April 1 through November 15 within the following response times:
  - 1. For fencing of damaged turf areas the response time shall be no more than 24 hours.
  - 2. For repair of damaged turf areas the response time shall be no more than 4 days.
  
- B. Areas of turf that require repair due to overuse, vandalism, etc., as directed by the City's Representative shall be treated according to the following procedures:
  - 1. Fence off the affected area using snow fencing. Check the fenced area every 24 hours and adjust stakes and fencing as needed.
  - 2. Remove dead or damaged sod and dispose of materials off-site.
  - 3. Provide, place, grade and compact additional screened sandy loam as necessary to replace soil removed with the dead or damaged sod in order that the new sod will be flush with adjacent turf areas and will provide positive surface drainage. The screened loam shall be the same texture as the soil on site.
  - 4. Place specified sod in parallel strips with staggered joints and neat alignment.
  - 5. Provide protective fencing, water regularly, and maintain intensively until a well-knit and vigorous stand of sodded turf has been established.
  - 6. If seasonal conditions prevent placement of loam and establishment of turf, provide temporary cover to prevent erosion, using organic erosion control mat.

3.12 OVERSEEDING

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- A. Over-seeding shall occur as described below by species.
- B. The Maintenance Contractor shall overseed using a slice seeding technique.
- C. Provide protective fencing, water regularly and maintain intensively until new seed has become well established and infills existing turf to satisfaction of City's Representative.

### 3.13 TURF EDGING

- A. Plant beds shall be edged one time during the year. The first edging shall occur during the first week in March.. Schedule edging to avoid conflict with pedestrians.
- B. The goal of edging shall be to redefine the line between the grass and shrub bed, pavement and curbs.
- C. Edging shall occur under the supervision of the City's Representative.
- D. Edging shall be performed using a hand tools or a mechanical edging machine. The workman shall carry a whetstone to be used frequently to maintain the sharpness of the blade. All edging cuts shall be vertical.
- E. Edging cuts at curbs, walkways, and landscape edges shall be made at the edge of curb, pavement or landscape edge. Depth of edging cut shall be minimum 2 inches below curb, steel edge, or pavement grade.
- F. Edging cuts at shrub beds and flowerbeds shall be to the full depth of the root zone of the turf. When edging the plant bed, the bark mulch shall be pulled back from the edge.
- G. Edges shall be even, unbroken lines, smooth and true.
- H. After edging, pull out the grass and grass roots. Do not mix grass or grass roots into the mulch of tree rings and plant beds. Dispose of all debris generated during edging legally off site.

### 3.14 TRIMMING TURF EDGES

- A. Trimming shall occur each week of the year.
- B. At each mowing, all grass edges including plant bed edges, at sidewalks, curbs, walls, light posts or other vertical elements in turf areas shall be trimmed. Trimming tools shall be freshly sharpened. Trimming tools shall be approved by the City's Representative.

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- C. In the event that plant materials in the plant bed are spreading into the turf area, the turf beneath and around the plant shall be clipped by hand using hand clippers and root saws as needed. Care shall be taken not to damage the plant in the process.
- D. Trimmers or herbicide shall NOT be used around trees, shrubs, or groundcover because of potential damage to the bark.
- E. Trim and clean up debris from trimming operation on the same day as mowing. Leave small, inconspicuous amounts (as determined by the City's Representative) of grass clippings on turf to maintain soil organic content.
- F. The cost of trimming shall be included in the Base Bid of the Bid Proposal.

### 3.15 MOWING

- A. Mowing frequency: Turf should be mowed as necessary, not according to a preset schedule. Turfgrasses grow at different rates depending on weather, management, and species. A basic recommendation is to remove no more than one-third of the grass blade at any one mowing. For example, Kentucky bluegrass being maintained at a two-inch height should be mowed when it reaches three inches. This "one-third rule" will help maintain maximum turf root growth. Removing more than one-third of the grass blades may cause root growth to cease while the leaves and shoots are regrowing. This practice can be especially destructive if practiced continuously over a period of successive mowings. Roots may not have a chance to fully develop and the plants will thus be more susceptible to environmental and management stresses. Maintenance of healthy, growing turf root systems should be a primary consideration of any turf management program.
- B. Other mowing recommendations Occasionally, personal schedules or weather conditions prevent turf mowing when it is needed. If this occurs, attempt to mow using the one-third rule. If turf is six inches tall, and the desired height is two inches, the first mowing should be at four inches, or at the highest setting nearest to four inches. Several days later, mow again by reducing the mowing height using the one-third rule. This mowing should be lower than four inches in height. Continue this pattern until turf is adjusted to the proper height.
- C. Two other basic mowing recommendations are to maintain mower blade sharpness, and to mow when grass is dry. Dull blades tear turf leaving a ragged appearance. In addition, turf water loss and the incidence of turf diseases can be greater from ragged leaf edges than from cleanly cut grass leaves. Thus, cleanly cut turf generally looks better and is often healthier than turf with torn leaves. Also, mow when turf is dry. Wet turf may clog the mower or form clumpy masses on the turf's surface.
- D. Mowing pattern: Frequent and close mowing in the same direction or pattern can cause the turf shoots to lean in the direction of cut causing grain to develop. On closely clipped turf, such as a golf course putting green, grain is undesirable because it can

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alter the path of a putted ball. By altering the mowing pattern with each mowing, the turf shoots tend to grow more upright which reduces grain. In addition, altering the mowing pattern changes the position of the mower wheels or rollers at each mowing which can reduce excessive wear in the same location.

E. Schedule:

1. Mow athletic fields are designated for High Frequency Mowing and shall be mown once every 7 days or more as required by growth rates throughout the year following the 1/3 rule noted above. Mowing frequency shall be scheduled so as to maintain a neat, trim appearance.

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2. Mow turf areas designated for Medium Frequency Mowing, on a seven to twelve day basis in accordance with the 1/3 rule above.
  3. Mow meadow areas as Very Low Frequency Mowing, once. Mowing shall occur in late autumn, after November 14, to ensure that all seeds have been produced and dropped.
  4. Mowing shall be scheduled to avoid conflict with pedestrians at employee arrival and departure times at the beginning and end of the day.
- F. Before mowing, all debris, leaves, paper, and trash that have accumulated shall be picked up and legally disposed of from the property.
- G. The turf areas shall be mowed with a sharp and well-adjusted reel mower.
- H. Leave clippings on turf. If for some reason more than half the height of the turf has been removed, rake up and dispose of turf clippings. Sweep up clippings on pavements, plant beds and adjacent surfaces and dispose of them legally off-site.
- I. Care shall be taken not to damage trees, plant material, irrigation heads, buildings, curbs, etc. when mowing. The Maintenance Contractor shall repair any damage caused by the mowing operation at no cost to the City. All damages shall be reported to the City's Representative regardless of cause.
- J. Replace all grass "crowned" or "scalped" by the mowing operation with new sod at no additional cost to the City.
- K. Do not mow during rainstorms or when turf areas are wet. Wet clippings shall be collected from the turf areas and disposed of legally off site.

### 3.16 PROVIDE CREW FOR MISCELLANEOUS LANDSCAPE MAINTENANCE WORK

- A. Perform miscellaneous landscape maintenance unless directed to do so by the City.
- B. Schedule:
  1. Miscellaneous crew work shall be performed as directed by City.
- C. Dispose of all material and debris generated during miscellaneous landscape maintenance operations. Dispose of material and debris off site in a legal manner.
- D. The work of miscellaneous landscape maintenance shall include performing miscellaneous work not otherwise described within this Contract.
- E. Under this Item of work provide one foreman, two laborers and one truck for one day of miscellaneous landscape maintenance work as directed by City.

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END OF SECTION

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## **SECTION 01140 - MAINTENANCE OF PLANTING AND PLANT BEDS**

### **PART 1 - GENERAL**

#### **1.01 SCOPE**

- A. The Work of this Section consists of furnishing all labor and materials necessary to provide the services specified herein, including but not limited to:
1. Annual tree planting program.
  2. Application of fertilizer and soil amendments to support the health and growth of trees, shrubs, vines, groundcovers, perennials, and ornamental grasses.
  3. Disease and Pest Management for trees, shrubs, vines, groundcovers, perennials, and ornamental grasses.
  4. Preparation of two (2) Disease and Pest Control reports per year.
  5. Pruning of trees, shrubs, vines, and ground covers.
  6. Annual cutting back of perennials and ornamental grasses.
  7. Removal and replacement of dead, insect-infected, and diseased plants.  
Replacement of plant materials
  8. Weeding of plant beds.
  9. Removal / Adjustment of Tree Stakes and Cables

#### **1.02 RELATED WORK UNDER OTHER SECTIONS**

- A. The following items of related work are specified in separate sections of these Maintenance Specifications:
1. 01000 General Requirements
  2. 01010 General Cleanup
  3. 01020 Trash Removal
  4. 01040 Graffiti Control
  5. 01050 Rodent Control
  6. 01060 Repainting and Touch-Up Painting
  7. 01070 Maintenance of Pavements
  8. 01080 Maintenance of Site Improvements and Site Furnishings
  9. 01090 Maintenance of Drainage Systems
  10. 01100 Maintenance of Site Lighting
  11. 01120 Maintenance of Irrigation Systems
  12. 01130 Maintenance of Turf and Meadows
  13. 01150 Maintenance of Baseball Diamonds and Associated Areas

#### **1.03 SOIL TESTING, SOIL TESTING REPORT, AND FERTILIZATION PLAN**

- A. Soil testing, soil testing report, and fertilization plan shall be as specified in Section 01130, Lawns, of this Specification, except that the soil sampling shall be taken to a depth of 8 to 10 inches.

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- B. Submit a Fertilization Plan to the City's Representative by April 1st of each year.
- C. The Fertilization Plan shall include for each planting area and type, including but not limited to perennial beds, shrub plantings, and trees, the following information:
  - 1. A summary of the soil conditions and options for improving them based upon current soil test results.
  - 2. A detailed schedule for fertilization for the remaining current year.
  - 3. A detailed description of the fertilizer or amendment composition, quantity, and application method recommended at each planting type and/or area of the site.

## PART 2 - PRODUCTS

- 2.01 FERTILIZER AND SOIL AMENDMENTS
- 2.02 LIMESTONE AND ACIDULANTS
- 2.03 HERBICIDE
- 2.04 PESTICIDE
- 2.05 BARK MULCH
- 2.06 STANDARDS FOR PLANTINGS
- 2.07 ROOT SYSTEMS FOR ALL PLANTS
- 2.08 PLANTING SOILS
- 2.09 SOIL ADDITIVES FOR REPLACEMENT PLANTINGS

## PART 3 - EXECUTION

- 3.01 EMERGENCY RESPONSE
  - A. The Maintenance Contractor shall provide emergency response throughout the year.
  - B. Inspect the Park for tree damage, runoff, sedimentation, and erosion, within 24 hours of a request by the City's Representative and within 24 hours of any storm producing high winds, unusually heavy rainfall.

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- C. If damage has created conditions that potentially threaten the safety of people or property, impede the normal function of the site or surrounding areas, or are unsightly, contact the City's Representative to notify him/her of the damage and recommend steps that should be taken to correct it.
- D. Immediately correct any conditions that pose an immediate threat to public health, safety, welfare, and property, or the use of the site and the surrounding areas. If damage to trees or emergency tree work has caused cosmetic or unsightly conditions that do not threaten public health, safety, welfare, and property, contact the City's Representative to arrange a meeting on site, and upon the City's Representative's authorization shall promptly correct such unsightly conditions.
- E. Tree work to correct non-emergency conditions or cosmetic and unsightly conditions shall include all means necessary to correct such conditions, including removal of branches, temporary cabling, removals, and any associated clean-up work, including grubbing and grinding of roots and legal disposal of trees and any other damaged items.
- F. Do not remove any trees, except uprooted trees and trees whose removal is the only feasible way to correct a potential, imminent, or immediate threat to safety or property, without the authorization of the City's Representative.
- G. Removed trees and portions of trees shall become property of the Maintenance Contractor.

### 3.02 TREE PRUNING

- A. The work of yearly tree pruning maintenance, including deciduous and evergreen trees, shall occur prior to bud break and leafing out.
- B. Contact the City's Representative at least one week prior to any scheduled pruning to arrange an on-site review of recommendations for pruning.
- C. Trees shall be pruned by an approved Certified Arborist at the direction of the City's Representative.
- D. Pruning Standards for Trees:
  - 1. The goal of pruning trees shall be to remove deadwood that creates hazards to public health and safety.
  - 2. All pruning must be done in compliance with American National Standards Institute Z133 and A300 standards.
  - 3. Prior to the start of work all trees to be pruned shall be inspected by the Certified Arborist. Any unusual safety or tree health concerns must be recorded and presented to the City's Representative.
  - 4. All pruning cuts shall be made according to ANSI A300 section 5.2.5. No stubs shall be left on branches or stems nor shall flush cuts be made, the

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branch collar shall be left intact. Severed limbs shall be removed before the end of the workday. Wound dressing shall not be applied.

- E. Dispose of all material and debris generated during the pruning operation. Dispose of material and debris off site in a legal manner.
- F. Report the following conditions.
  - 1. The presence of any disease, fungus, decayed trunk or branches, split crotches or branches, cracks, or other structural weakness.
  - 2. Old pruning injuries that are not closing properly and where the callus growth is not already completely established.
  - 3. Damage to trees and shrubs by weather, vehicles, vandalism or other manner.
  - 4. Equipment that will damage the bark and cambium layer should not be used on or in the tree or shrub.
- G. Climbing spurs shall not be used for pruning operations on live trees. Sharp tools shall be used so that clean cuts will be made at all times.
- H. All cut branches and limbs shall be removed from the crown of the plant upon completion of the pruning.

### 3.03 PRUNING OF SHRUBS

- A. The work of cleaning out dead limbs, branches, and stems from shrubs shall occur prior to bud break and leafing out.
- B. Flowering shrubs shall be pruned and thinned as soon after flowering as possible.
- C. Formal hedges shall be pruned as required to maintain their sheared appearance but no later than the second seek in November.
- D. Immediately after rhododendrons complete flowering, carefully remove flower heads by hand.
- E. Pruning Standards for Shrubs:

1. Thinning is the process of removing entire branches thus reducing the density of branches in the interior of a shrub or tree. Thin out largest and oldest stems or branches of shrubs each year. Slower growing shrubs like lilac and spirea should have 1/5 of their stems removed every year. Faster growing shrubs like forsythia shall have 1/3 of their stems removed yearly.
2. When shrubs are growing in a formal hedge, shear hedge to maintain a form where the width of the base is greater than the width of the top. Set guide stakes and strings to establish level.
3. When shrubs are growing in an informal mass, prune shrubs so that they grow together to form shrub masses. Do not shear shrubs when they are growing in an informal mass, but hand prune individual stems with a slanting cut 1/4 inch above leaf bud. Reduce the height of shrubs by cutting out some of the longer growth.
4. Prune to prevent shrubs from encroaching on walkways. Prune shrubs adjacent to walkways minimally to prevent branches from encroaching above the walkways and to prevent the need for later removals of large branches to achieve this goal. Do not remove entire portions of the shrub.
5. All pruning shall be done manually with a sharp pair of scissor-blade pruning shears. Anvil-blade shears or electric tools will not be permitted.
6. Cuts shall always be made just above an outward facing bud, shoot or opposite buds so the natural habit of the shrub is preserved.
7. Do not prune at the end of summer.
8. Pruning shall be done in a manner that promotes the shrub to grow in a form characteristic of its species.
9. Rhododendrons: Snap off spent flower, taking care not to damage new growth developing directly beneath the flower truss.
10. Remove all branches or branch laterals which lie on the ground, are broken, diseased or dead. 10. Low growing shrubs shall be pruned for shape and to remove dead material.
11. When a shrub becomes leggy, head back branches or stems by making a slanting cut 1/4 inch above a healthy bud.

F. All pruning shall be performed by a certified arborist and in accordance with ANSI A300-Part 1 2001 Pruning standards.

G. Prior to the start of any shrub pruning, the Maintenance Contractor shall contact the City's Representative to arrange an on-site review of the Maintenance Contractor's recommendations for pruning shrubs.

H. All cut material shall be legally disposed of off site.

### 3.03 FERTILIZATION FOR TREES AND SHRUBS - GENERAL

A. Fertilize and amend soil according to the compositions, quantities, and application methods recommended by the most recent Fertilization Plan. Submit fertilizer calculations to the City's Representative for approval before beginning fertilization.

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- B. Fertilize trees and shrubs based upon soil test results.
- C. When applying any fertilizer or soil amendment, take great care to confine the application to the plant bed only, and shall immediately remove any material that falls on lawns, pavements, walls, or other site improvements.
- D. Do not use fertilizers containing nitrogen on stressed, sick, recently transplanted, or construction-damaged plants. Do not fertilize plants with abnormally small leaves or few buds, or trees with scale, borers, or other sucking insects.

### 3.04 FERTILIZING TREES

- A. Fertilize trees during the second 2 weeks of February.
- B. Fertilization of designated trees shall be by soil injection of liquid fertilizer. The fertilizer shall be mixed with water and injected into the soil under pressure using a hydraulic sprayer and a feeding needle.
  - 1. Fertilizer shall be compliant with ANSI A300 standards.
  - 2. The fertilizer label specifying the guaranteed analysis, amount of water insoluble nitrogen (WIN) and salt index shall be submitted to the City's Representative. The nutrient ration (N:P:K) shall be 4:1:1, 3:1:1 or 3:1:2. WIN number shall be between 50 to 75 percent. Salt index shall be less than 50.
  - 3. Application rate shall be based on nitrogen content. Nitrogen shall be applied at a rate of 3 pounds per 1000 square feet for mature and recently transplanted trees and shrubs. To promote growth the nitrogen rate on immature trees and young, established shrubs shall be 6 pounds per 1000 square feet with in the plant's dripline. Application rates shall be adjusted based upon soil test results.
- C. Sprayer pressure shall be set to 100-200 psi.
- D. Injection points shall be spaced 3 feet on center beneath the dripline of the tree. Place the first band of injections approximately 1/4 the distance from the trunk to the edge of the dripline. Successive bands shall be spaced 3 feet apart out to one to three feet beyond the edge of the dripline.
- E. The feeding needle shall be inserted nine to 12 inches into the soil. Rotate the feeding needle by 90 degrees during the injection process to ensure distribution of the fertilizer in all directions.
- F. The liquid fertilizer shall be a suspension grade fertilizer designed to be mixed and applied in water using a high volume hydraulic sprayer. The liquid fertilizer shall meet the nutrient requirements based upon soil testing.

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- G. Mixing rates shall be as recommended by the Manufacturer. Strong mechanical agitation shall be applied to maintain suspension.

### 3.05 CONTROL OF PESTS AND DISEASE

- A. Monitor all trees and shrubs on a weekly basis for the appearance of pests and disease or damage to plants by pests and disease throughout the year.
- B. Assume responsibility for disease and pest control of all woody and herbaceous/perennial plantings, including trees, shrubs, vines, groundcovers, perennials, ornamental grasses, and bulbs.
- C. At the beginning of the maintenance year notify the City's Representative of the dates of the weekly inspections so that the City's Representative attend the inspections and accompany him/her on site.
- D. Submit for the City's Representative's approval a treatment plan for each tree or shrub affected by a specific pest or disease before treating or cutting any part of the tree, with the exception of removing dead wood. The treatment plan shall describe intended methods of eliminating the problem or maintaining it at a level that does not affect the health and vigor of the plant or cause unsightly disfigurement to the plant. The treatment plan should consider mechanical, biological, and chemical control methods. Chemical methods shall be used only if effective cultural, mechanical and biological methods are unavailable.
- E. When it is necessary to use an insect or disease control, the product shall be applied directly wherever possible, and "spot" sprayed only as necessary. Do not spray areas where infestations or disease have not been identified unless label indicates phophylaxis and risk of infection is likely due to stress, proximity, weather, etc.
- F. If spraying is necessary, it shall be performed only between 4 a.m. and 7 a.m., and only on calm days when rainfall and/or windy conditions are not anticipated. Prior to spraying, inspect the park for the presence of visitors, including the indigent and homeless. Request that any such visitors depart for the duration of chemical application.
- G. In the unlikely event that a severe pest or disease problem is encountered in perennial or annual planting, the prudent and most effective method of controlling the problem will be to remove the infected plants and all plants of the same species within the bed

### 3.06 CONTROL OF WEEDS

- A. Any plant of a species not shown in the construction document Planting Plan, and any plant growing outside of the area where it was originally planted, shall be considered a weed and shall be removed. Weeds include specific types of trees, shrubs, vines, perennials, biennials, bulbs, grasses, and annuals. Weeds

shall be removed from all areas of the park, including all mulched areas, planted areas, shrub and tree plantings, lawns, pavement, and other site areas and improvements.

- B. Identify and hand remove all weeds 8 times each year, once during the third week of March, April, May, June, July, August, September and October. After each weeding, the park must be entirely free of weeds, including newly-germinated weeds. If in doubt about whether specific plants are weeds, he/she shall engage the services of a horticulturalist as necessary at his/her own cost to advise.
- C. Remove the entire weed plant including all roots using a long-handled fork-like tool. Do not leave any root in the soil. Do not use a weed-whacker or string trimmer to control weeds. If weed is in flower or seed at the time of weeding, avoid letting seeds fall into planting beds. Dispose of weeds off site. Do not use public trash receptacles for disposing of weeds.
- D. Control weeds too large or deeply rooted to remove completely by hand using herbicide. Apply herbicide using a wick applicator. Do not spray herbicide. Apply herbicide at the rates recommended by the manufacturer for the specific season and type of use. Clearly indicated on the expanded label of the herbicide shall be the crop and weed for which the herbicide has been developed.
- E. Prior to application of any herbicide, the Maintenance Contractor shall review the types of plants to be treated with the City's Representative. Any trees, shrubs or other plants not to be treated shall be identified and marked by the Maintenance Contractor. The Maintenance Contractor shall notify the City's Representative of the schedule for applying herbicides at least one week in advance.
- F. All applications of herbicides shall be performed in accordance with the regulations of the State of Georgia and in accordance with the manufacturer's recommendations.
- G. Pursuant to 333 CMR 11.00, herbicides shall not be applied on or within 10 feet of standing or flowing surface water. Within 10 and 100 feet of standing or flowing surface water, herbicides may be applied only when 12 months have elapsed between applications, and if low pressure foliar or stem techniques are used.
- H. All spraying shall be performed using hand-held equipment in weather conditions as recommended by the manufacturer.
- I. Application rates and solutions shall be as recommended by the manufacturer for the purpose of the application.
- J. Cut surface treatments:

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1. Herbicide shall be applied to all cut surfaces of weedy tree and shrub stumps as described herein.
2. Application shall be by hand-held equipment and at rates and with additives as recommended by the manufacturer.
3. Application shall be made after snow melts but before plant growth starts unless superceded by full, expanded label of herbicide.

K. Foliar treatments:

1. Three or more applications of herbicide may be needed to control poison ivy, Mexican bamboo, bittersweet, sprouts from cut vegetation and tree stumps, and other plants as directed by the City's Representative.
2. Provide additional applications as required to achieve 100% control.
3. Application shall be made selectively by hand-held equipment and at rates as recommended by the manufacturer.
4. Applications shall be made between up to September 30.

- L. When applying any herbicide, the Maintenance Contractor shall take great care to confine the application to the plant bed only, and shall immediately remove any material that falls on lawns, pavements, walls, or other site improvements.

3.07 EDGING OF TREE RINGS AND MULCH BEDS

- A. Edge tree rings three times during the year: during the first 2 weeks of March; during the last 2 weeks of May; and during the last week of September and the first 2 weeks of October.
- B. Dispose of all material and debris generated during the edging operation. Dispose of material and debris off site in a legal manner.
- C. The goal of edging shall be to redefine the line between the grass and tree rings or plant beds. Edges shall be even, unbroken lines, smooth and true.
- D. All tree rings and plant beds shall be mechanically edged to prevent turf encroachment.
- E. All edging cuts shall be vertical.
- F. Edging cuts at tree rings shall be to the full depth of the root zone of the turf but special care shall be taken to avoid cutting tree roots.
- G. Edge tree rings of flowering deciduous trees 3 feet from the trunk of the tree.
- H. Edge tree rings of deciduous shade trees 4 feet from the trunk of the tree.
- I. Edge tree rings of evergreen trees 6 inches from the drip line of the tree.
- J. Tree rings shall be round.

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- K. After edging, pull out the grass and the grass roots. Dispose of grass and grass roots after edging activity.
- L. Do not mix grass or grass roots into the mulch of tree rings and beds.

### 3.08 MULCHING

- A. Every year, renew mulch as follows:
  - 1. During the third week of March, after herbaceous plant materials have been cut to the ground but before spring-flowering bulbs begin to emerge: replenish mulch in perennial and ornamental grass beds.
  - 2. During the first week in November, replenish mulch in shrub and tree plantings after final leaf removal.
- B. During the second week of March, using a rigid steel tine rate, rake the upper one inch of all mulch to break up the surface and turn over upper particles. Raking shall not redistribute mulch or disturb roots. Any weeds in the mulch shall be removed by hand during raking.
- C. During the third week of November after complete leaf fall, maintain distribution of mulch in all mulched areas as follows:
  - 1. Pull mulch back from the root flares of trees and shrubs.
  - 2. Rake away and redistribute or add and spread mulch to ensure that mulch beds are consistently 2 to 3 inches in depth.
  - 3. Maintain a mulch collar of 3-foot radius from the trunk of flowering deciduous trees, 4-foot radius from the trunk of deciduous shade trees, and minimum 6-inches from the drip line of evergreen trees. Mulch trees to protect trees from mechanical damage by mowers and edgers.
- D. Remove all debris before applying mulch.
- E. If area to be mulched is free of existing mulch, break up compacted soil to a depth of one inch with a hand rake before applying mulch. Do not dig mulch into soil.
- F. Keep mulch from the root flares of the trunks of trees and shrubs.
- G. Take great care not to apply mulch deeper than specified.
- H. Mulch neatly and to original edges of mulch areas, maintaining a clean edge.
- I. In groundcover beds, shake or sweep the plants free of newly-applied mulch so that it sinks between the plants. Remove any mulch from paved surfaces, lawn, and foliage of plants.

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### 3.09 CUTTING BACK OF PERENNIALS AND ORNAMENTAL GRASSES

- A. The Maintenance Contractor shall cut perennial plantings and ornamental grasses back by hand once per year during the third week of November.
  - 1. Cut all herbaceous perennial plants back to a height of no greater than 2 inches above ground level, ensuring that the buds of the next years growth are not damaged.
  - 2. Cut all ornamental grasses back to a height of no greater than 6 inches above ground level, ensuring that buds of next years growth are not damaged.

### 3.10 TREE REMOVAL

- A. Remove trees anytime they become a threat to public health and safety.
- B. Dispose of all material and debris generated during tree removal operation. Dispose of material and debris off site in a legal manner.
- C. Tree removal work shall include the felling of the trees in such a way as to not injure trees to be saved, utility lines and poles, buildings, lawns, plantings and pavement. Tree removal also shall include the satisfactory disposal of all tree trunks, branches, stumps and vegetative debris produced through the tree removal operation.
- D. Protection of public health, safety, and welfare shall be of the greatest importance during tree removal operations. Install traffic control devices as necessary to prevent injury to the public. If tree removal operations require dropping the tree over parking lots, roadways, sidewalks or plaza spaces, the entire area shall be blocked off from pedestrian and vehicular access. Only after securing the area shall tree removal operations proceed.
- E. Repair all damage to pavement surfaces and all lawn areas cause by tree removal operations.

### 3.11 REMOVAL AND REPLACEMENT OF PLANTS

- A. The City's Representative shall review the condition of all plantings during the Initial Site Meeting and each Seasonal Site Meeting to be held during the second week of April of each year. At or following each Seasonal Site Meeting, the City's Representative will designate which plants shall be replaced due to their dead or otherwise unsatisfactory condition. The Maintenance Contractor shall not proceed with such work without authorization. Upon authorization by the City's Representative, the Contractor shall remove and replace plants as promptly as possible within the appropriate planting season for each plant.

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- B. Remove all designated plants completely, including roots, and any leaves or other fallen parts of the plant. Observe any precautions necessary to prevent the spread of any disease from the plant being removed, including sterilization of tools used to cut a diseased plant. Large shrubs and trees shall not be removed with a chain and backhoe (or other vehicle) because the root systems of plants become fused and the roots of adjacent plants can be irreparably damaged.
- C. As soon as possible after plant removal, but during the appropriate season for planting, furnish and install plants of the same species, variety, and size as those removed, unless replacement with an alternate planting type is requested in writing by the City's Representative. If the alternate planting proposed exceeds the cost of replacing the original planting in kind, the Contractor will inform the City's Representative of the cost difference in writing, and will not order the designated plants until he/she receives direction from the City's Representative.
- D. Scope of replacement planting:
  - 1. Planting of new trees and shrubs shall include providing new plant material, transporting plants to the site, digging plant pits, soil preparation, planting, disposal of unsuitable soils, watering and maintenance.

### 3.12 PLANTING

- A. Scope of annual native tree planting:
  - 1. Plant 350 deciduous trees, 1 ½" – 2" caliper, annually and 150 evergreen trees, 6 foot height, annually, in locations as directed by the City's Representative.
  - 2. Genera of deciduous and evergreen trees shall be as follows with species selected by the City's Representative.
    - Deciduous Genera: Acer, Carpinus, Celtis, Cercis, Diospyros, Fagus, Fraxinus, Gleditsia, Halesia, Liquidambar, Liriodendron, Nyssa, Ostrya, Oxydendrum, Quercus, Taxodium, Ulmus
    - Evergreen Genera: Ilex, Juniperus, Magnolia, Persea, Pinus, Quercus, Sabal
- B. Planting Seasons:
  - 1. October 1 through February 1 and as appropriate by Genus and species for designated latitude and local conditions.
- C. Planting operations:

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1. Excavate pit if necessary to provide proper depth for root balls. If new root balls are shallower than pit, fill to proper level and compact fill to prevent later settling of plants.
  - a. Diameter of plant pits shall be 6 feet greater than root ball diameter for trees and two feet greater for shrubs. Depth of plant pits shall be 18 inches for trees and 12 inches for shrubs.
  - b. If, in the opinion of the City's Representative, existing soils are too compact and proximity of adjacent plantings permit, widen the plant pit to sizes directed by the City's Representative.
2. Protect plantings, pavements, and site improvements and features during work. The Maintenance Contractor assumes responsibility for any damage caused by planting operations.
3. Provide all planting backfill required to depths shown. Loam shall be as specified in Section 01130, Maintenance of Lawns.
4. Set plants plumb and straight and at such a level that after settlement, the flare of the plant will be above the surrounding finished grade. Raise the tree as necessary should the tree be installed or settle such that the root crown is below finish grade. Do not break the root ball. Adjust plant location, orientation and level to the City's Representative's satisfaction. Plant trees with the same orientation to north as where they originally grew and as marked to reduce trunk damage from sunscald.
5. When plants are set, compact planting backfill around bases of balls to fill voids. When balled and burlapped plants are set, remove burlap and ropes or wires from around the stem of the plant and from the top surface of the root ball. Remove wire baskets to a depth of 4 inches below surface grade. Thoroughly compact and water planting backfill around balls. Immediately after plant pit is backfilled, form a shallow basin slightly larger than pit with a ridge of soil to facilitate and contain watering.

D. Watering:

1. All plants shall be flooded with water twice within the first 24 hours of the time of planting, the first watering to be during planting. In the event that the irrigation system is not functioning, all newly installed plants shall be watered at least twice each week during the maintenance period. At each watering the soil around each tree or shrub shall be thoroughly saturated. If sufficient moisture is retained in the soil, as determined by the City's Representative, the required watering may be reduced. Trees will require a minimum of 10 gallons of water each.
2. In the event that irrigation water is not available, the Maintenance Contractor shall provide all water for watering plantings. Water shall be suitable for irrigation and free from ingredients harmful to plant life. The Maintenance Contractor shall furnish hose and all other watering equipment required for the Work.

E. Initial maintenance:

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1. All new plantings shall be maintained as described in this Section, and shall receive the following maintenance in addition during the first thirty days after planting:
2. Soil moisture levels for all plants shall be checked at least twice per week. Test for moisture with an approved device. Submit moisture level monitoring plan showing locations and depths for City's Representative's review. If water levels are not satisfactory, inform the City's Representative immediately.
3. Inspect stakes, if used, weekly. Keep stakes neat in appearance, and guys tightened and repaired.
4. Plants that die during the maintenance period shall be replaced as directed by the City's Representative.

### 3.13 ESTABLISHMENT PERIOD FOR PLANTINGS

- A. Upon completion of any replacement plantings, it is the Maintenance Contractor's responsibility to arrange an on-site meeting with the City's Representative for the inspection and acceptance of the replacement plantings.
- B. All plants installed by the Maintenance Contractor shall be guaranteed by the Maintenance Contractor for not less than one full year from the City's Representative's acceptance of the replacement plantings.
- C. At the end of the one-year establishment period, or at any time during that period, any plant that is missing, dead, not true to name or size as specified, or not in satisfactory growth, as determined by the City's Representative, shall be replaced. At the end of the one year establishment period, each plant shall show at least 75 percent healthy growth and shall have the natural character of its species.
- D. All areas damaged or disturbed by replacement operations shall be fully restored to their original condition.
- E. Remove and dispose of all guys, wires, rubber hose sections, and stakes off site at the end of the guarantee period or prior to that at the discretion of the City's Representative.

END OF SECTION

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## **SECTION 01150 - MAINTENANCE OF BASEBALL DIAMONDS & ASSOCIATED AREAS**

### PART 1 - GENERAL

#### 1.01 SCOPE

- A. The Work of this Section consists of furnishing all labor and materials necessary to provide the services specified herein, including but not limited to:
  - 1. Thrice yearly inspections of facilities and surfacing as noted herein.
  - 2. Soil augmentation at pitcher's mound, batter's box, catcher's box and infield skin and base lines.
  - 2. General repair, replacement and restoration of all unsafe conditions as noted herein.

#### 1.02 RELATED WORK UNDER OTHER SECTIONS

- A. The following items of related work are specified in separate sections of these Maintenance Specifications:
  - 1 01000 General Requirements
  - 2. 01010 General Cleanup
  - 3. 01020 Trash Removal
  - 4. 01040 Graffiti Control
  - 5. 01050 Rodent Control
  - 6. 01060 Repainting and Touch-Up Painting
  - 7. 01070 Maintenance of Pavements, Trails and Walkways
  - 8. 01080 Maintenance of Site Improvements and Site Furnishings
  - 9. 01090 Maintenance of Drainage Systems
  - 10. 01100 Maintenance of Site Lighting
  - 11. 01120 Maintenance of Irrigation Systems
  - 12. 01130 Maintenance of Turf and Meadows
  - 13. 01140 Maintenance of Planting and Plant Beds

### PART 2 - PRODUCTS

#### 2.01 SKIN MIXES

- A. The mix used to build the pitcher's landing areas, batter's boxes, and catcher's box shall be a commercial product designed specifically for use in baseball field soil replacement maintenance and upkeep. It shall have a significant concentration of clay to provide the necessary stability to resist degradation from increased traffic, having approximately 40% sand, 20% silt, and 40% clay. The mix shall be thoroughly integrated such that individual components are evenly distributed throughout the material.

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- B. The infield material for skinned areas, including infield and base lines, shall be a top quality commercial product designed specifically for use in baseball field soil replacement maintenance and upkeep. When placed and properly compacted, the infield skin shall be moist and firm, not hard and baked dry. To achieve firmness, the infield mix should not be too sandy. Approval of infield mix shall be based upon trials on one designated field and judged for stability, firmness, compactability, color match, and tendency to create lips at the infield skin/turf interface. The infield mix shall be approximately 60% sand, 20% silt, 20% clay base mix (sandy clay loam to sandy loam), the silt and clay giving the mix firmness while avoiding problems with compaction and hardness.
- C. Soils shall be free of coarse sands, gravels, cobbles and stones (particles greater than 0.5 mm).

2.02 BASES, PLATES AND RUBBERS

2.03 LIGHTING

2.04 FENCING

2.05 TURF

2.06 GRANDSTANDS, BLEACHERS AND SEATING

### PART 3 - EXECUTION

3.01 INSPECTIONS

- A. Provide inspections pre-season, mid-season and pre-tournaments/championships events (minimum 3 times yearly):
  - 1. Soils of pitcher's mounds, batter's and catcher's boxes, base lines and infield skinned areas, and bull pen areas.
  - 2. Grass playing surfaces.
  - 3. Bases and anchoring devices.
  - 4. Fencing, including backstop, outfield fence and all fencing in and around the infield.
  - 5. Dugouts.
  - 6. Lighting.
  - 7. Spectator Areas, including seating areas, bleachers, and grandstands.

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### 3.02 IRRIGATION MONITORING AND WATERING

- A. Monitor moisture conditions of pitcher's mounds, catcher's and batter's boxes, skinned infield and base lines to ensure that adequate moisture levels are maintained. Each week, inspect the locations and spray pattern of all irrigation heads to ensure suitable moisture levels of skinned areas noted herein.
- B. In the event that the irrigation system is providing inadequate or excessive water coverage correct this condition immediately and report this condition in writing to the City's Representative within 24 hours of discovery.
- C. If, for any period of time, the irrigation system is unable to provide adequate water coverage, manually provide enough water to maintain safe skinned areas, especially slide zones along base lines and bases. Provide all watering equipment.
- D. Identify sprinkler heads, drainage grates, valve boxes and the like, located in the field areas, that are above grade or have sharp edges or unsafe protrusions. Repair in accordance with the requirements of Section 01120, IRRIGATION, of this Specification.

### 3.03 SKINNED AREAS

- A. Soils of pitcher's mounds, batter's and catcher's boxes, base lines and infield skinned areas, and bull pen areas.
  - 1. Skinned areas of the diamond, including pitcher's mounds, batter's and catcher's boxes, base lines and infield skinned areas, and bull pen areas, receiving heavy usage and showing wear, holes and uneven surfaces shall be repaired using the approved soil mixes. Fill, compact and evenly distribute new soil mixes to re-establish lines and grades of all areas. Re-grade and drag infield areas showing low spots, holes and wear lines. Wet spots and puddles shall be eliminated. Build up soil at lips between skinned areas and turf. Reposition rubbers and bases, fill as required to re-establish grades and firm conditions.
  - 2. Re-grade and drag warning track and foul areas. Maintain width of 10 feet and edge turf as required to maintain width. Weed and remove vegetation other than turf.

### 3.04 GRASS PLAYING SURFACES

- A. In accordance with the requirements of Section 01130, TURF AND MEADOWS:

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1. Identify all areas of turf that show signs of wear, including bare spots where hard soil surfaces are exposed; dips and holes creating an unsafe running surface; areas that are too wet or drain poorly, which creates an unsafe running surface; uneven turf where texture, density or height of the grass creates an unsafe running surface that is not uniform; areas of thatch causing lumpy and unsafe running conditions; weedy vegetation other than permanent turf-type grass species; animal mounds and tunnels; tire ruts.
2. Make repairs to turf areas in accordance with the requirements of Section 01130, TURF AND MEADOWS, of this Specification.

### 3.05 BASES AND ANCHORING DEVICES

- A. Replace all bases which have coverings that are ripped or gouged.
- B. Where base framework or hardware is loose or damaged, replace with new base.
- C. Reset or remove and replace all base ground stakes that protrude above surface grade, out of alignment or not level with running surface, not firmly secured, improperly installed.
- D. Home plate and pitcher's rubber: Where surfaces of plates are not level with adjacent skinned area reset and regrade. Where the corners of the plate have turned upward remove and replace the plate. Where the surfaces and edges of the plate have become uneven, irregular or worn, replace the plate.

### 3.06 FENCING

- A. Fencing, including backstop, outfield fence and all fencing in and around the infield:
  1. Fence posts: reset posts that have become loose or were improperly set in the ground, intrude into the playing area, have proven to be a hazard to players.
  2. Dome caps of fence posts: Verify all dome caps are in place; remove and reset as required to ensure full coverage of all pipe ends.
  3. Concrete footings: Verify concrete footings are covered by turf. Remove and replace all concrete footings that extend above ground except where soil has eroded around footings, in which case replace soil.
  4. Fencing: Reattach fence mesh that has become loose. Replace fence ties and secure mesh.

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5. Gaps under fencing: Where soil has dropped out from under fencing, replace soil and re-establish turf. Where soil and turf are intact but fence has risen to create gaps at bottom of fence that create unsafe conditions, trespass or allow balls to penetrate, reset fence mesh to proper position.
6. Knuckle down selvages: Where knuckle down selvages protrude above the top rail of the fence, reset fencing.
7. Where mesh has become loose, broken, has unraveled, ends exposed or any unsafe condition, repair or otherwise replace.
8. Gates: Where gates are difficult to open or show signs of problems with hinges and latches, repair or otherwise replace.
9. Backstops: In all cases as noted above, repair or replace fence mesh. Close gaps in fencing by splicing in new mesh or otherwise re-sewing and repairing mesh.
10. Back stop bounce boards that have become worn shall be replaced. Nails and bolts that are exposed and unsafe shall be made right by replacement or repair. Repaint boards that have wood exposed.

### 3.07 DUGOUTS

- A. Fencing: as required herein.
- B. Benches: repaint all exposed wood. Replace bench slats that are broken, splintered, bent or damaged. Secure replacement parts to prevent further damage.
- C. Trash receptacles: having become loose or insecure, reset and make secure. Remove and replace if damaged, bent or broken.

### 3.08 LIGHTING

- A. Inspect light distribution onto field. To be performed by qualified personnel in accordance with applicable standards. Re-focus, re-direct and otherwise re-position lighting system for full and complete coverage.
- B. Replace light bulbs that have burned out.
- C. All poles where padding has become loose or has been lost to theft and vandalism, replace padding.

### 3.09 SPECTATOR AREAS, INCLUDING SEATING AREAS, BLEACHERS, AND GRANDSTANDS

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- A. Tighten nuts and bolts where seats and planks are loose.
- B. Tighten, remove and replace, or repair to safe condition all handrails on steps and walkways and protective guard railings on side and backs of bleachers and grandstands.
- C. End caps on planks and railings: reset or replace as required to create a safe condition.
- D. Walking surfaces shall be safe, even and accessible by the elderly and handicapped.
- E. Steps shall be safe, even and accessible.
- F. Wooden seats and planks: where worn or splintered sand smooth and repaint. If minor sanding and repainting is deemed insufficient then remove and replace seating and planks with new material equal to existing.
- G. Grandstands – General: Where there are vertical or horizontal gaps between adjacent units that create an unsafe condition, cordon off and repair.
- H. Grandstand – General: Where there are hazardous protrusions, edges or pinch points, cordon off and repair.

END OF SECTION



# Appendix H

## Bellwood Raw Water Storage Facility

### Slope Stability Report



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## Section 7

# Geotechnical Investigation and Evaluation

### 7.1 Objectives

The objectives of the geotechnical investigation and evaluation were to;

- evaluate if there were large-scale stability issues of the quarry highwalls that would pose a significant risk to the feasibility of using the quarry as a reservoir,
- evaluate if stability issues would have an effect on the design of structures for the reservoir, and
- present options for addressing potential stability issues.

### 7.2 Summary

ASG completed a geotechnical evaluation for large-scale stability of the quarry highwalls. One area was identified as having potential large-scale stability concerns. Five options were presented to address the potential stability concerns of this area. The two preferred options are; scaling (removing loose rock) and additional evaluation of this area to reduce the uncertainty of the extent and potential costs, and remove the area by blasting. Rockfall hazards were identified throughout the quarry. Rockfall mitigation measures including scaling are recommended to reduce rockfall hazard. The work to address the potential large-scale stability issue and rockfall hazard should be completed prior to construction work in the quarry. In order to remove this work from the critical path of the project, this work could be completed during final design and/or prior to the main construction activities for the reservoir.

### 7.3 Introduction

Bellwood Quarry is approximately 300 feet to 400 feet deep below the ground surface. The quarry walls, also known as highwalls, are primarily comprised of rock slopes that have been created by blasting to remove rock for aggregate.

For this PER, ASG performed a geotechnical investigation and evaluation that was focused on the large-scale stability of the rock slopes at Bellwood Quarry. For the purposes of this study, “large-scale stability” refers to stability issues that include significant portions of the quarry walls and would pose a significant risk to the feasibility and operation of a reservoir. The following sections present the geotechnical investigation and large-scale slope stability evaluation completed by ASG as well as the conclusions and recommendations of this study.

Detailed evaluation of the soil and weathered rock slopes was beyond the scope of this study. However, observations of the soil and weathered rock slopes made during this study were used for recommendations regarding setback distances as discussed in subsection 7.8.4. Based on discussion with DWM, ASG understands that the quarry highwalls will not be accessible to the public or to City personnel during operation of Bellwood Quarry Reservoir.

## **7.4 Geotechnical Investigation**

### **7.4.1 Methods**

The geotechnical investigation was conducted between July, 2007 and April, 2008 and included review of existing data as well as collection of site specific data. The main focus of the geologic investigation was to look for geologic features that could result in large-scale stability issues as described above. The main work completed for the investigation included the following;

- review of regional geologic maps,
- review of geological data collected during design and construction of the West Area CSO tunnels located approximately 700 feet east of Bellwood Quarry,
- review of exploration drilling data provided by Vulcan Materials Company (Vulcan),
- discussions with Vulcan staff regarding past quarry highwall stability,
- field geologic mapping in the quarry and around the top of the quarry,
- site visit with rock slope expert Mr. Duncan Wyllie of Wyllie Norrish Rock Engineers, Ltd., and
- photogeologic mapping of portions of the quarry highwalls.

Due to the height of the quarry highwalls and safety concerns, access to the quarry highwalls for the investigation was limited to areas along the access road and quarry bottom. Most of the orientation observations of the geologic structures were made using photogeologic mapping. Photogeologic mapping is a relatively new technique that uses spatially oriented digital stereophotos to determine the location and orientation of geologic features. This allows the orientation and location of geologic features to be determined without having to access the feature.

### **7.4.2 Results**

Bellwood Quarry is located in the Piedmont Physiographic Province. The Piedmont consists primarily of metamorphic and igneous rocks that have undergone a complex history of deformation and fracturing. Throughout the Piedmont, bedrock is typically covered with residual soil and weathered rock to depths of 100 ft or more.

Gneiss is the predominant rock type at Bellwood Quarry. Bedrock at Bellwood Quarry is generally fresh and strong. The bedrock is overlain by weathered rock and residual soil ranging up to approximately 50 feet thick around the highwall crest.

Linear topographic depressions known as lineaments occur throughout the Piedmont. Lineaments were of interest for this study because they can represent the surface expression of highly fractured and/or deeply weathered rock, which could be associated with stability concerns. Approximate locations of the three lineaments (A, B, and C) closest to Bellwood Quarry are shown in Figure 7-1. No ground conditions that could be correlated directly to these lineaments were observed in the Bellwood Quarry highwalls, or in the boring logs provided by Vulcan.

The geologic investigation identified several large geologic structures and patterns of fractures in the rock mass. The location and orientation of the geologic structures are presented in Appendix 7. The results of the geotechnical investigation were used in the stability evaluation discussed in Section 7.5.

Bellwood Quarry is located in an area of generally low levels of seismic activity. Historical data compiled by the USGS Earthquake Hazards Program (USGS, 2008) indicates that earthquake-induced shaking is likely to occur infrequently at Bellwood Quarry Reservoir. Additional information regarding the seismic levels is included in Appendix 7.

## **7.5 Rock Slope Stability Evaluation**

ASG evaluated the large-scale stability of the highwalls considering the potential rock slope instability modes shown in Figure 7-2. Discussion of the large-scale slope stability evaluation is presented in subsections 7.5.1 through 7.5.3. ASG also made observations regarding smaller scale stability issues that are discussed in Section 7.7. Additional details about the slope stability evaluations are presented in Appendix 7.

### **7.5.1 Experience with Comparable Rock Slopes**

Rock slope heights at Bellwood Quarry are not uncommon in the quarrying and mining industries. Databases of slope height versus slope angle indicate numerous examples of stable steep slopes in gneiss, having slope angles in the 75° to 85° range and heights ranging from approximately 300 ft to approximately 3,000 ft (Sjöberg, 2000).

ASG is aware of two Georgia rock quarries that have had large-scale slope stability problems. In both of these cases, the slope stability problems were structurally-controlled. Extensive discontinuities intersected to form large blocks that were oriented so that they were able to slide into the quarry. In each of the two cases mentioned, the area had stability problems that were apparent prior to the development of the large scale slide.

### 7.5.2 Circular Stability

Circular slides are movement of an essentially coherent block or blocks of rock along an arc-shaped sliding surface as shown on Figure 7-2. Strong, fresh rock slopes are not typically affected by large-scale, deep-seated circular slides, unless the rock mass is cut by ubiquitous, closely-spaced fractures (Wyllie and Mah (2004), and Hoek (2007)). ASG did not observe this type of unfavorable condition for circular stability in the Bellwood Quarry highwalls. However, the potential for circular instability was considered as part of the geotechnical evaluation because the consequences of circular instability could be significant.

Circular stability was evaluated for seven cross sections around the quarry, shown on Figure 7-1. These seven cross sections were selected to consider a range of cross-sectional geometry and to evaluate locations where circular instability could have especially significant consequences. Figure 7-3 shows an example cross section from the south-east portion of the quarry wall.

Circular stability was evaluated using two-dimensional limit equilibrium analyses, and finite element method analyses using the shear strength reduction technique. Screening-level analyses were performed using the limit equilibrium analysis software to evaluate whether more detailed study of potential earthquake shaking effects on circular stability were required.

Rock slope stability is affected by water pressures within the highwall. The water pressures within the highwall depend upon the reservoir drawdown rate and the response of the rock mass to the water level changes. Due to heterogeneity of the rock mass, the response of the rock mass to water level changes is difficult to predict accurately. Consequently, the analyses included a range of water levels, from full pool to full drawdown.

The circular slope stability analyses confirmed that circular sliding is not a significant mode of instability for the highwalls. Additional details of these analyses are included in Appendix 7.

### 7.5.3 Structurally-Controlled Stability

For rock slopes comprised of strong rock masses, structurally-controlled slides are the most common mode of instability. Structural instability occurs as a result of sliding along existing zones of weakness in the rock mass. These zones are discontinuities in the rock mass such as shear zones and fractures. The three basic mechanisms for structurally-controlled instability are plane sliding, wedge sliding, and toppling as shown in Figure 7-2. Plane sliding may occur when a discontinuity dips out of a rock slope at an angle that is shallower than the face of the rock slope. Wedge sliding can occur when two or more discontinuities intersect to form an unstable wedge. For a wedge to slide, the line of intersection must dip out of the slope at an angle shallower than the slope angle. Toppling may develop when a rock mass contains multiple parallel, steeply dipping discontinuities that are oriented nearly parallel to the face of the rock slope.

Six areas of interest for evaluation of large scale, structurally-controlled stability were identified during site visits by ASG and Mr. Duncan Wyllie, a rock slope expert retained by ASG. Locations

of the six areas of interest are shown on Figure 7-1. Photographs showing each area are included on Figures 7-4 through 7-10. ASG evaluated the potential for large-scale structurally-controlled instability at the six areas of interest, considering the orientations, locations, persistence, and ranges of possible surface characteristics of fractures. Details of the evaluation are presented in Appendix 7.

Based on ASG's evaluation, Area 1, the highwall "nose," has the potential for large-scale stability concerns. The potential stability concerns identified at Area 1 do not adversely affect the feasibility of using Bellwood Quarry as a reservoir. However, the potential stability concerns could present a risk to structures and personnel. Area 1 is further discussed in Section 7.6. Based on this evaluation, Areas 2, 3, 4, 5, and 6 do not have significant potential for large-scale stability concerns. However, Areas 2, 3, 4, 5, and 6 have potential stability concerns that include rockfall and localized wedge instability discussed further in Section 7.7.

## **7.6 Evaluation of Area 1 and Remedial Options**

### **7.6.1 Evaluation**

Area 1 has been referred to as the "nose" because it sticks out into the quarry. For the purpose of this report, the nose area has been divided into the upper and lower nose to refer to the two potential sliding masses, one above an existing bench and one below the bench, as shown on Figures 7-11 and 7-12. During the geotechnical investigation, steeply dipping fracture surfaces that "daylight" in the quarry wall were identified in this area. The concern with the steeply dipping fracture surfaces is that planar sliding, as shown on Figure 7-2, could occur on the fracture surfaces.

ASG observed portions of the upper nose to have open fractures and broken rock along the edges of the potential sliding surface where it is exposed on the side of the slope as shown in Figure 7-4. Due to limited accessibility of the area, ASG was only able to observe limited areas of the fracture surface along a narrow bench. Consequently, the extent of the fracture zone could not be determined by field observations. The lower nose was not accessible during the current investigation. However, observations made from the access road and the photogeologic mapping results were used to evaluate the orientation and extent of the fracture surface. The observations indicate that blocks of rock have detached from the sliding surface on the lower nose. These blocks could have come loose during blasting or subsequently during operation of the quarry.

In order to evaluate the potential extent of the stability concerns and size of the potential slide areas for the upper and lower nose, the observed orientation of the fracture surfaces were projected to where they would "daylight" on the slope. The projected location and extent of the sliding masses are shown on Figures 7-11 and 7-12. For the upper nose, the block is projected to be about 70 feet high and 250 feet wide, and extend about 25 feet behind the top of the slope. For the lower nose, the block is projected to be about 80 feet high and 250 feet wide and extend about 30 feet back from the edge of the 850 bench.

Both the upper nose and lower nose have likely been exposed at least 10 years and possibly longer based on ASG's understanding of the quarry excavation history. The fracture surfaces are likely not continuous behind the blocks because if they were continuous the slide would likely have occurred. Based on the fact that the areas have been exposed for several years and the fractures are currently not likely continuous, in the short term, these areas do not likely present a significant risk. The main concern is that over time the stability of the slope will be degraded due to exposure to physical and chemical weathering, rainfall, freeze/thaw cycles, and temperature variations. In addition, the lower nose area is below the maximum reservoir level and will be subjected to water level fluctuations resulting from reservoir operation. Consequently, the risk could increase with time due to slope degradation.

Potential consequences of a slide in this area include:

- safety concerns from falling rock,
- blocking the quarry access road,
- undermining the soil above the rock slide area creating additional stability concerns,
- sliding of the overlying, weathered rock and soil onto the bench and/or into the reservoir, and
- exposing additional potentially unstable ground behind the sliding surface, creating additional stability concerns, and

In summary, both the upper and lower nose have the potential for planar sliding. These areas have likely been exposed for a number of years and no signs of large-scale sliding were observed in the current geotechnical investigation. However, due to limited access, the slope conditions could not be evaluated in detail. Consequently, there still is uncertainty regarding the extent and condition of the fracture surfaces. The stability of the upper and lower nose areas could decrease with time due to exposure to weathering conditions and varying water levels.

### **7.6.2 Options for Area 1**

ASG prepared five options that address the potential risk from a slide in the nose area. The options are presented in this section along with an opinion of the probable construction cost for each option. The objective of this section is to provide information to the City for selecting one of these options. Recommendations are presented in Section 7.8.

The five options include;

1. monitoring the area for potential movement,
2. scaling (removing loose rock by hand methods or mechanical means) and evaluating the condition of the fractures zone further,

3. removing the upper nose by blasting and monitoring the lower nose,
4. removing the upper nose by blasting and supporting the lower nose with rock bolts, and
5. removing both the upper and lower nose by blasting.

A summary of these options and the advantages and disadvantages of each along with the estimate of probable construction costs is presented in Table 7-1. Figure 7-12 illustrates the five options.

Option 1 involves monitoring the area using specialized survey techniques and/or visual observations in order to provide a warning of movement and the onset of sliding. For this option, survey prisms would be installed on the rock face and these would be monitored by an automated, dedicated survey instrument, or periodic manual surveys. Depending upon the behavior observed with the monitoring, the monitoring frequency could be decreased or decreased with time.

Option 2 consists of scaling (removing loose rock) the upper and lower nose area and evaluating the potential slide areas in more detail after scaling operation. This requires men working off of ropes to access the rock face and remove the loose rock. The scaling will reduce the risk of rockfalls. With the potential for rockfall reduced, the areas can be accessed using ropes, and the additional evaluation of these areas could be completed. The additional information obtained may provide a reduction in the uncertainty regarding the extent and nature of the fracture zones. This would allow a better evaluation of the risk and cost of potential remedial options for the areas.

Option 3 includes removing the upper nose and monitoring the lower nose similar to Option 1. Based on the conditions observed during the current geotechnical investigation, the upper nose is more fractured and appears to pose a greater risk as compared to the lower nose. The upper nose would be removed by blasting and the soil zone will need to be graded to a stable configuration. This option will involve removing trees and grading above the area to be removed as shown on Figure 7-12.

Option 4 includes removing the upper nose and supporting the lower nose area with rock bolts. As noted above in Option 3, the upper nose removal would require grading of the soil and tree removal. The rock bolts would be installed by specialized drills either suspended by ropes or by cranes. A preliminary rock bolt pattern was estimated for preparing the cost for this estimate. However, depending upon the conditions encountered during the performance of the work, this estimate could change.

Option 5 includes removal of both the upper and lower nose areas. The areas would be removed by blasting and the final slope configuration is expected to be similar to that shown on Figure 7-12. The access for blasting will difficult a crane may be required for getting the drills and operators to the work area.

**Table 7-1  
Summary of Options for Area 1  
Bellwood Quarry Reservoir**

Option	Pros	Cons	Opinion of Probable Construction Cost <sup>2</sup>
1 Monitor-Upper and Lower Nose <sup>1</sup>	<ul style="list-style-type: none"> <li>• Relatively low cost.</li> <li>• May reduce risks to safety of personnel working in quarry by giving advance warning of slide</li> </ul>	<ul style="list-style-type: none"> <li>• Does not significantly reduce risks to reservoir infrastructure since potential slide material still in place</li> <li>• There may be limited warning time depending upon rate of movement of slide</li> <li>• If movement of slide starts during construction, a delay may result from suspension of work due to movement of slide and/or removal of slide material.</li> <li>• Remedial measures may be difficult to complete if movement of slide material starts.</li> </ul>	Installation of Instrumentation \$85,000 Annual Monitoring \$35,000
2 Scale Upper and Lower Nose and Evaluate Conditions further during scaling, then implement mitigation measures based on findings	<ul style="list-style-type: none"> <li>• Moderate cost for scaling</li> <li>• Scaling will provide significant reduction in rockfall risk</li> <li>• Additional evaluation may determine that additional remedial measures are not required</li> <li>• Improves ability to implement cost effective mitigation measures</li> </ul>	<ul style="list-style-type: none"> <li>• Final remedial measure design, if needed, cannot be completed until scaling is completed.</li> <li>• Chance that additional evaluation will not yield information that allows better determination of potential slide area.</li> <li>• Multiple Contractors and/or mobilizations may be required depending upon remedial measure selected, if needed</li> </ul>	\$290,000

**Table 7-1  
Summary of Options for Area 1  
Bellwood Quarry Reservoir**

Option	Pros	Cons	Opinion of Probable Construction Cost <sup>2</sup>
<p>3 Remove Upper Nose by blasting &amp; Monitor Lower Nose</p>	<ul style="list-style-type: none"> <li>• Moderate cost for removal of upper nose and monitoring</li> <li>• Moderate to significant reduction in risk since potential upper slide area is removed</li> </ul>	<ul style="list-style-type: none"> <li>• Some risk to reservoir infrastructure since potential slide material in lower nose still in place</li> <li>• There may be limited warning time depending upon rate of movement of slide in lower nose</li> <li>• If movement of lower nose starts during construction, a delay may result from suspension of work due to movement of slide and/or removal of slide material.</li> <li>• Remedial measures may be difficult to complete if lower nose slide movement has started</li> <li>• Conditions in slope exposed by removal could have stability issues that were not apparent during preliminary engineering phase.</li> </ul>	<p>\$870,000</p>
<p>4 Remove Upper Nose by blasting &amp; Support Lower Nose with rock bolts</p>	<ul style="list-style-type: none"> <li>• Significant reduction in risk since potential slide material is removed or supported.</li> <li>• Extent of potential slide surface may be better defined during rock bolt installation</li> </ul>	<ul style="list-style-type: none"> <li>• Relatively high cost</li> <li>• Conditions in slope exposed by removal could have stability issues that were not apparent during preliminary engineering phase.</li> <li>• Extensive rock bolting to reduce risks may not be needed, if extent of fractures are less than inferred based on preliminary engineering-level investigations.</li> </ul>	<p>\$2,100,000</p>

**Table 7-1**  
**Summary of Options for Area 1**  
**Bellwood Quarry Reservoir**

Option	Pros	Cons	Opinion of Probable Construction Cost <sup>2</sup>
5 Remove Upper and Lower Nose by blasting	<ul style="list-style-type: none"> <li>• Significant reduction in risk from potential slide since slide material is removed</li> </ul>	<ul style="list-style-type: none"> <li>• Moderate to high cost</li> <li>• Drilling and blasting access will be difficult</li> <li>• Conditions behind potential slide zone are unknown. Additionally stability concerns could result from removal of current slide material</li> </ul>	\$1,400,000

Notes

1. Alternative 1 refers to real-time monitoring using automated, autonomous electronic monitoring equipment.
2. Costs presented are 2008 dollars
3. Costs include 30% contingency

The work required for Options 1 through 5 is specialized work that needs to be completed by highly specialized contractors. The opinions of probable cost presented in Table 7-1 for comparison of the options were developed based on discussions and e-mail correspondence with specialty contractors that perform this work. Due to the specialty nature of the work and limited information about the conditions in the nose area, the opinions of probable cost for each option can vary in relation to each other based on the actual conditions that are encountered.

## **7.7 Rockfall and Slide Hazards**

### **7.7.1 Hazards**

During ASG's geotechnical investigation, ASG observed slope stability hazards throughout the quarry that are not large-scale stability concerns; however, these hazards pose a risk to structures and personnel. The hazards include small to mid-size wedge and planar slides as well as rockfalls. In general, the size of the slides and rockfalls can range from golf ball size up to rock blocks with dimensions as large as about 50 feet. Rockfalls are sudden falls of blocks of rock from vertical or near vertical slopes involving single or multiple blocks. The rock may move down slope by falling, bouncing or rolling. Rockfalls may impact protrusions on the slope that propel the rock out away from the rock slope. In addition, rockfalls may travel horizontally for a significant distance after impacting the ground surface. Rockfalls can occur suddenly with little warning. Rockfalls can be caused by several natural processes including rain, climatic changes, and freeze thaw cycles. Slides can also be caused by the natural processes noted above. A slide may show some evidence of movement prior releasing from the slope. However, due to the height of the quarry walls, it is unlikely that the signs would be visible. Depending upon the location of the slide, the slide material can behave like a rockfall as it falls to the bottom of the quarry.

ASG observed several locations around the quarry walls that have the potential for rockfall. Several of these areas appear to be the result of blast damage to the rock mass during quarry excavation. Blast damage creates open fractures that are irregularly oriented that can result in overhangs and areas of loose rock. The photograph in Figure 7-13 shows an area with rockfall potential resulting from blast damage to the rock mass.

ASG personnel witnessed rockfalls occur while on site during the geotechnical investigation. As noted previously, Vulcan constructed berms along the access road in several locations to help contain rockfalls.

The risk from rockfalls is considered to be the greatest during construction because the existing quarry access road will have to be used for access for construction activities in the quarry. As noted previously, several areas along the access road have had rockfalls in the past and several locations on the highwall have a high potential for rockfall in the future.

### 7.7.2 Remedial Options

Options for reducing risks from rockfalls include:

- “scaling” the highwall (removing loose blocks from the highwall),
- installing draped wire mesh on the highwall to contain and prevent rockfalls,
- installing rock bolts and other support measures to support potential loose blocks,
- installing catchment ditches and/or rock fall barriers at the base of the highwall, and
- implementing operational controls, such as repositioning traffic routes to avoid the most likely fall areas and ceasing operations during periods of heavy rain.

A benefit of installing rockfall mitigation measures before or during reservoir construction is that they would also help reduce the risk of rockfalls during reservoir operation.

## 7.8 Conclusions and Recommendations

ASG evaluated the large-scale stability of the quarry highwalls. One area, Area 1, was identified to have the potential for large-scale stability concerns. Rockfall and smaller scale stability concerns were also identified in the quarry during the course of the work. ASG’s recommendations regarding these concerns are presented in subsections 7.8.1 and 7.8.2. Additional recommendations related to geotechnics are discussed in subsections 7.8.3 through 7.8.6.

### 7.8.1 Area 1

Based on the summary of the options provided in Table 7-1, Option 2 and Option 5 are the preferred options for Area 1. Option 1 and 3 are less preferred and Option 4 is not recommended due to the higher cost.

Option 2 has a relatively low initial cost, provides some reduction in rockfall risk, and allows the potential slide areas to be further evaluated. The additional evaluation may reduce the uncertainty about the extent and nature of the potential slide area. This would allow a better evaluation of the risk and the cost of potential remedial measures that may be required. Option 2 may not be the final work required depending upon the results of additional evaluation. Option 5 includes removing the upper and lower nose area. The main advantage of Option 5 is that this option has the greatest reduction in risk as the slide areas are removed. However, as noted previously, at this point in the project, there is the uncertainty regarding the extent of the potential slide areas.

The work for the selected option should be completed before the main construction contract is awarded since if scaling and/or blasting is required, the access road will not be able to be used during the work due to rockfall hazards. In addition, any structures completed prior to blasting

or scaling near the work areas could be damaged. In order to take this work off the critical path of the project, the work could be completed as a separate contract during final design and/or prior to the main construction work.

### **7.8.2 Rockfall Hazards**

ASG recommends that the quarry highwalls be scaled along the access road at the locations shown on Figure 7-14. During the scaling, the areas should be evaluated for further rockfall mitigation measures. Scaling and evaluation of additional rockfall measures should also be completed at the location of specific structures (i.e. intake structures or tunnel portals) determined during final design.

The installation of rockfall mitigation measures should be completed prior to any construction work in the quarry as described in subsection 7.8.1. In order to take this work off the critical path of the project, the work could be completed under a separate contract during the final design and/or prior to award of the main construction contract.

### **7.8.3 Location-Specific Evaluations**

Location-specific evaluations of highwall stability should be conducted as part of final design at locations where structures (such as tunnel portals and shafts) are planned adjacent to the highwall crest, or in the bottom of the quarry.

### **7.8.4 Minimum Setback**

Deterioration of the highwall may occur over time through local sliding (known as “raveling”), during normal reservoir operation. Raveling of the soil and weathered rock near the crest of the highwall could pose a risk to nearby personnel and structures. Raveling may propagate rapidly and without warning.

Possible approaches for dealing with raveling include:

- leave as-is, and avoid construction or access nearby, and,
- construct engineered slope stabilization measures.

Routine monitoring, described in sub-section 7.8.6, should be employed to reduce risks associated with potential raveling.

ASG recommends an exclusion zone extending from the highwall crest to distances of 30 feet to 100 feet behind the highwall crest, because of the potential for raveling. Additional allowance should be made for potential instability at highwall overhangs. Within the exclusion zone, routine access should be limited and there should be no construction without further, detailed geotechnical evaluation, because of the possibility of undercutting of the crest caused by raveling. Figure 7-15 shows the recommended exclusion zone location. ASG’s

recommendations regarding the location of the proposed security fence, shown in Section 9, have been developed considering the recommended exclusion zone location.

### **7.8.5 Minimum Shaft Setback**

ASG recommends that any shafts constructed from surface at Bellwood Quarry Reservoir be set back a minimum of 150 feet from the crest of the main quarry highwall. The 150-foot setback is recommended to provide an appropriate safety buffer to allow for construction activities and traffic between the shaft and the highwall crest. Additional allowance should be made for potential instability at highwall overhangs depending upon the slope geometry at the location of the shaft.

If the City plans to construct structures near the highwall crest, or plans to allow access within the minimum security perimeter, ASG recommends that more detailed study of weathered rock and residual soil stability conditions be performed in these specific areas.

### **7.8.6 Inspection and Monitoring**

The condition of the slopes at Bellwood Quarry Reservoir may deteriorate with time due to exposure to weather conditions and to water level fluctuations. Consequently, a systematic slope stability inspection and monitoring program should be developed for Bellwood Quarry Reservoir. The objective of inspection and monitoring program is to detect signs of stability deterioration in time to take appropriate action to mitigate potential adverse effects. Systematic inspection and monitoring would be consistent with similar programs employed by owners of dams and other critical infrastructure. The inspection, instrumentation and monitoring programs will be developed during final design. However, for planning purposes, the major components of the inspection and monitoring program should include;

- daily observations by site personnel of crest area, quarry highwalls and critical structures for signs of instability or recent rockfall,
- periodic photographs of the highwall from fixed locations, and
- periodic site visits by an engineering geologist or geotechnical engineer to review the highwall stability, rockfall concerns, and crest stability; the engineering geologist or geotechnical engineer should have experience with rock slope stability and rockfall issues for slopes with similar size as the Bellwood Quarry slopes.

The site visits by the engineering geologist or geotechnical engineer are expected to include visual observations of the slopes and review of past and current photographs of the slope to detect potential changes. During the first few years, the site visits would be more frequent (i.e. quarterly) and depending upon the conditions observed the frequency of the site visits could be reduced. Depending upon the remedial options selected, as noted above, the monitoring could include slope monitoring by periodic surveying, reading of geotechnical slope instrumentation, and piezometers.

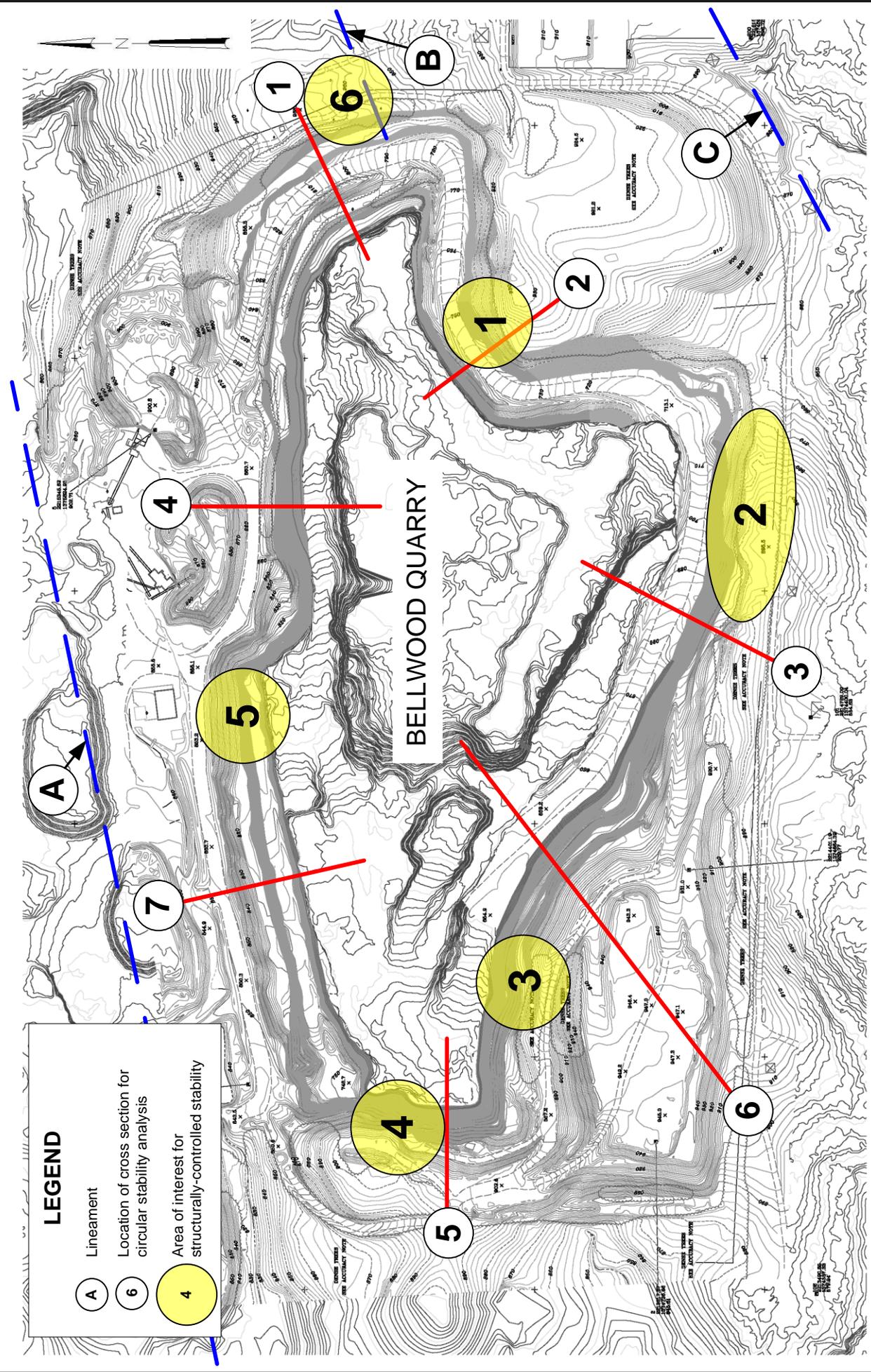
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**LEGEND**

- Lineament
- Location of cross section for circular stability analysis
- Area of interest for structurally-controlled stability

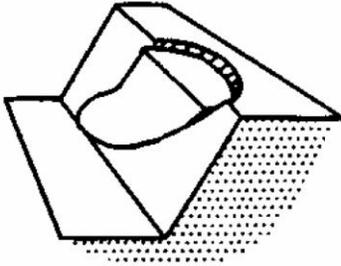
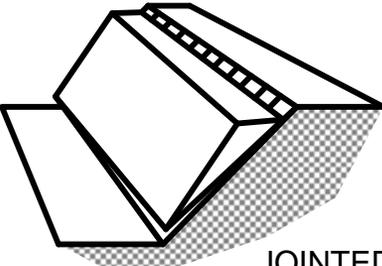
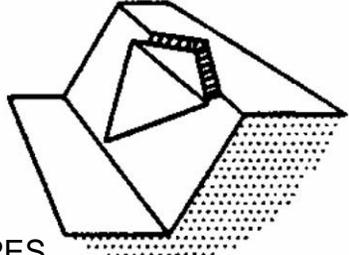
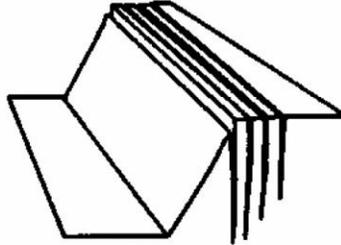
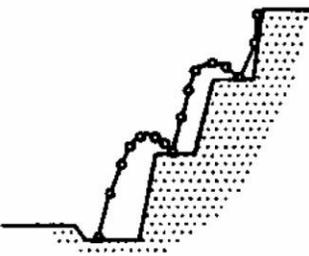
DATE: SEPT 2008  
 SCALE: NTS  
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**BELLWOOD QUARRY RESERVOIR**  
**GEOTECHNICAL EVALUATION:**  
**SITE OVERVIEW**



FIGURE: 7-1

# Potential Rock Slope Instability Modes Investigated for Bellwood Reservoir

POTENTIAL INSTABILITY MODE	STRUCTURES OF INTEREST
CIRCULAR SLIDING	 <p style="text-align: center;">SOIL OR HEAVILY JOINTED ROCK SLOPES</p>
PLANAR OR WEDGE SLIDING	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>PLANAR</p>  </div> <div style="text-align: center;"> <p>WEDGE</p>  </div> </div> <p style="text-align: center;">JOINTED ROCK SLOPES</p>
TOPPLING	 <p style="text-align: center;">VERTICALLY JOINTED ROCK SLOPES</p>
ROCKFALLS	 <p style="text-align: center;">LOOSE BOULDERS ON ROCK SLOPES</p>

Modified after Hoek, E. (2007)

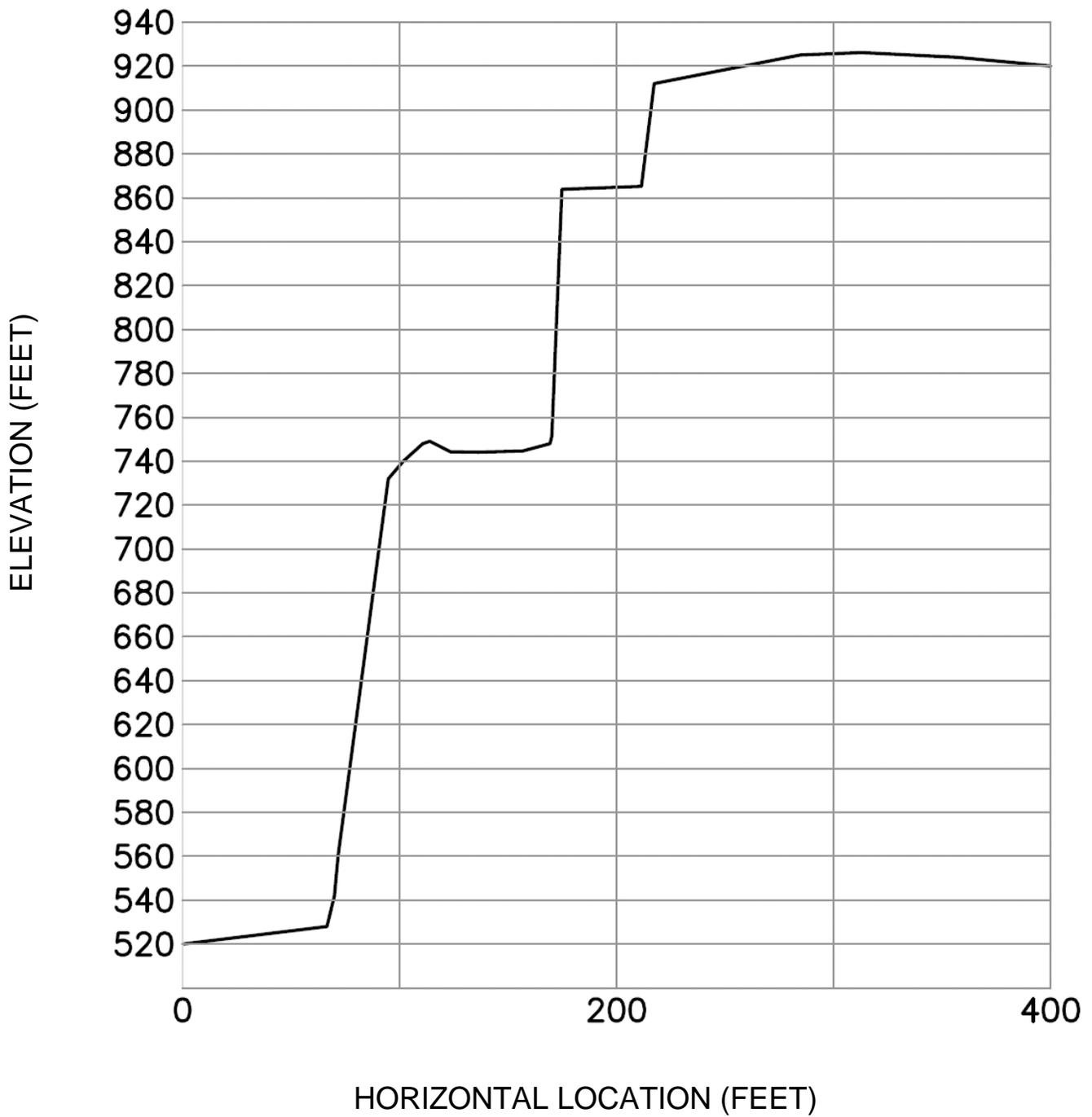


BELLWOOD QUARRY RESERVOIR

POTENTIAL ROCK SLOPE  
INSTABILITY MODES

DATE: SEPT 2008  
SCALE: NTS  
JOB NO. 02061.825

FIGURE: 7-2



**CROSS SECTION #2**

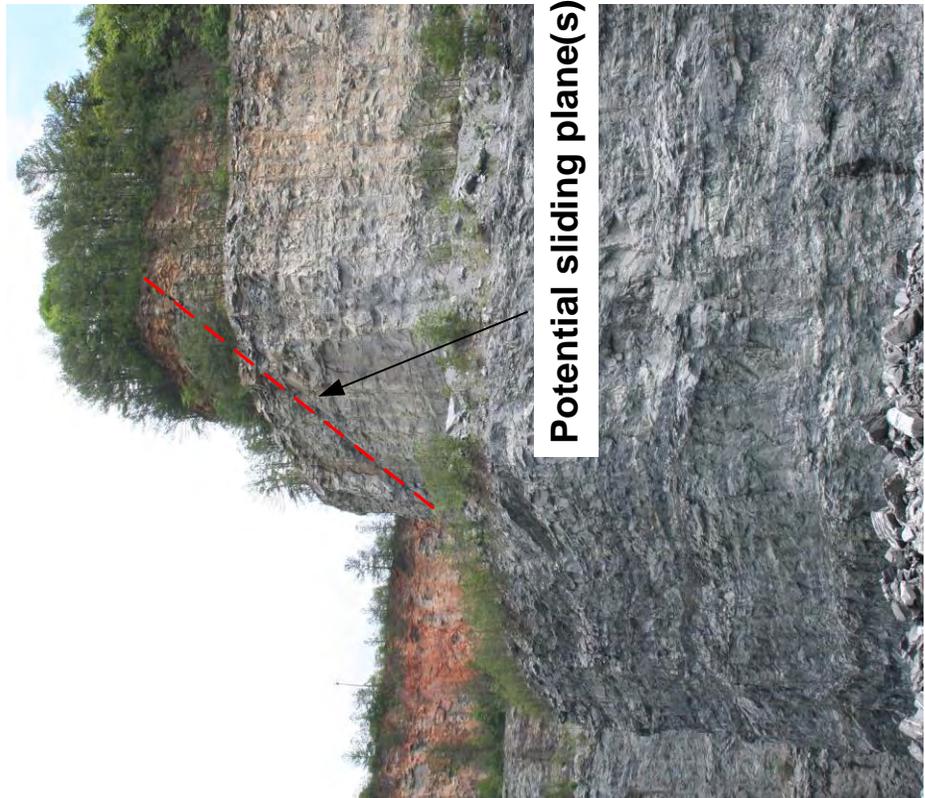


BELLWOOD QUARRY RESERVOIR

TYPICAL SLOPE CROSS SECTION

DATE: SEPT 2008  
 SCALE: NTS  
 JOB NO. 02061.825

FIGURE: 7-3



**NOSE LOCATION OVERVIEW**



**VIEW ABOVE QUARRY ACCESS ROAD**



BELLWOOD QUARRY RESERVOIR  
 AREA OF INTEREST 1  
 SOUTHEAST NOSE

DATE: SEPT 2008  
 SCALE: NTS  
 JOB NO. 02061.825  
 FIGURE: 7-4

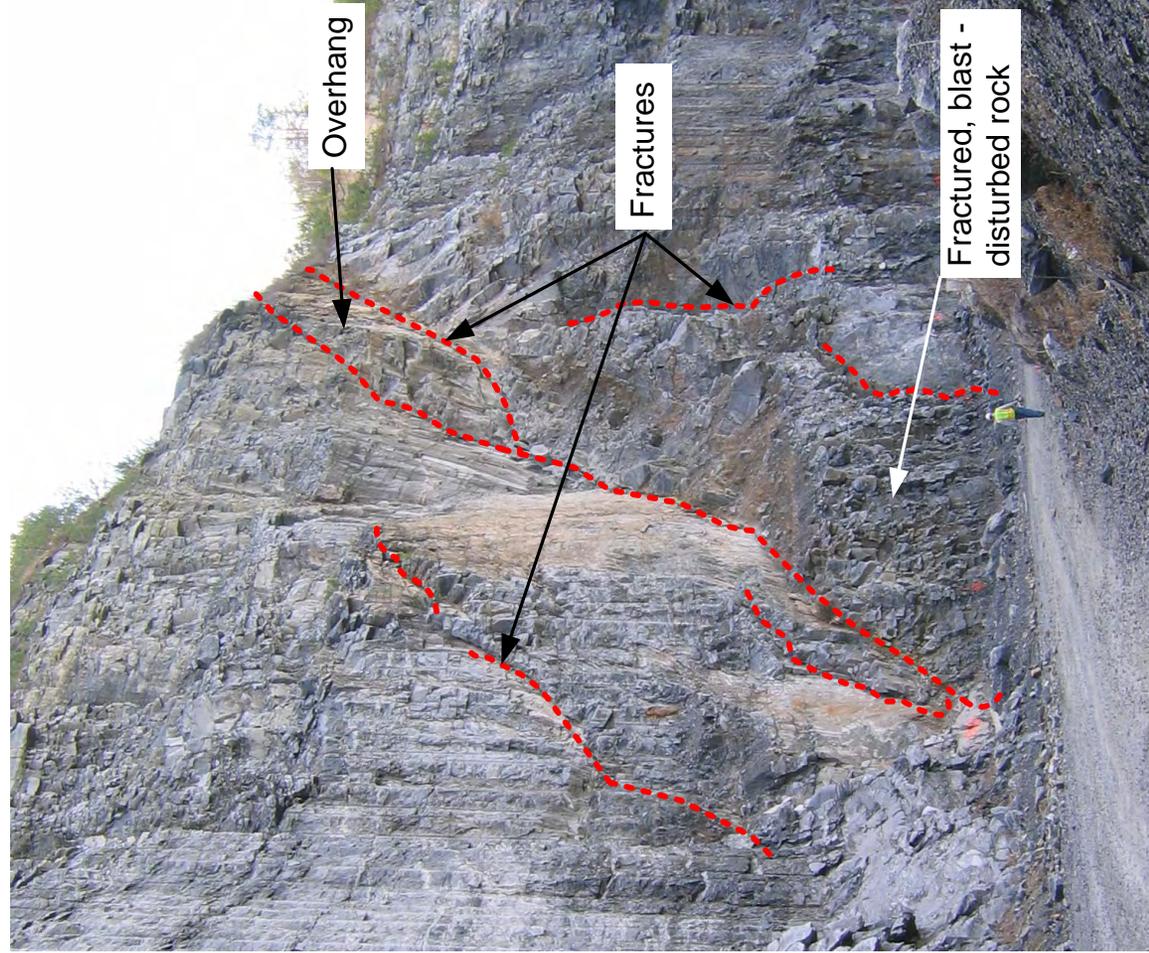


DATE: SEPT 2008  
SCALE: NTS  
JOB NO. 02061.825

FIGURE: 7-5

BELLWOOD QUARRY RESERVOIR  
AREA OF INTEREST 2  
SOUTH HIGHWALL – OVERVIEW





BELLWOOD QUARRY RESERVOIR

AREA OF INTEREST 2 – SOUTH HIGHWALL  
VIEWED LOOKING WEST



DATE: SEPT 2008  
SCALE: NTS  
JOB NO. 02061.825

FIGURE: 7-6



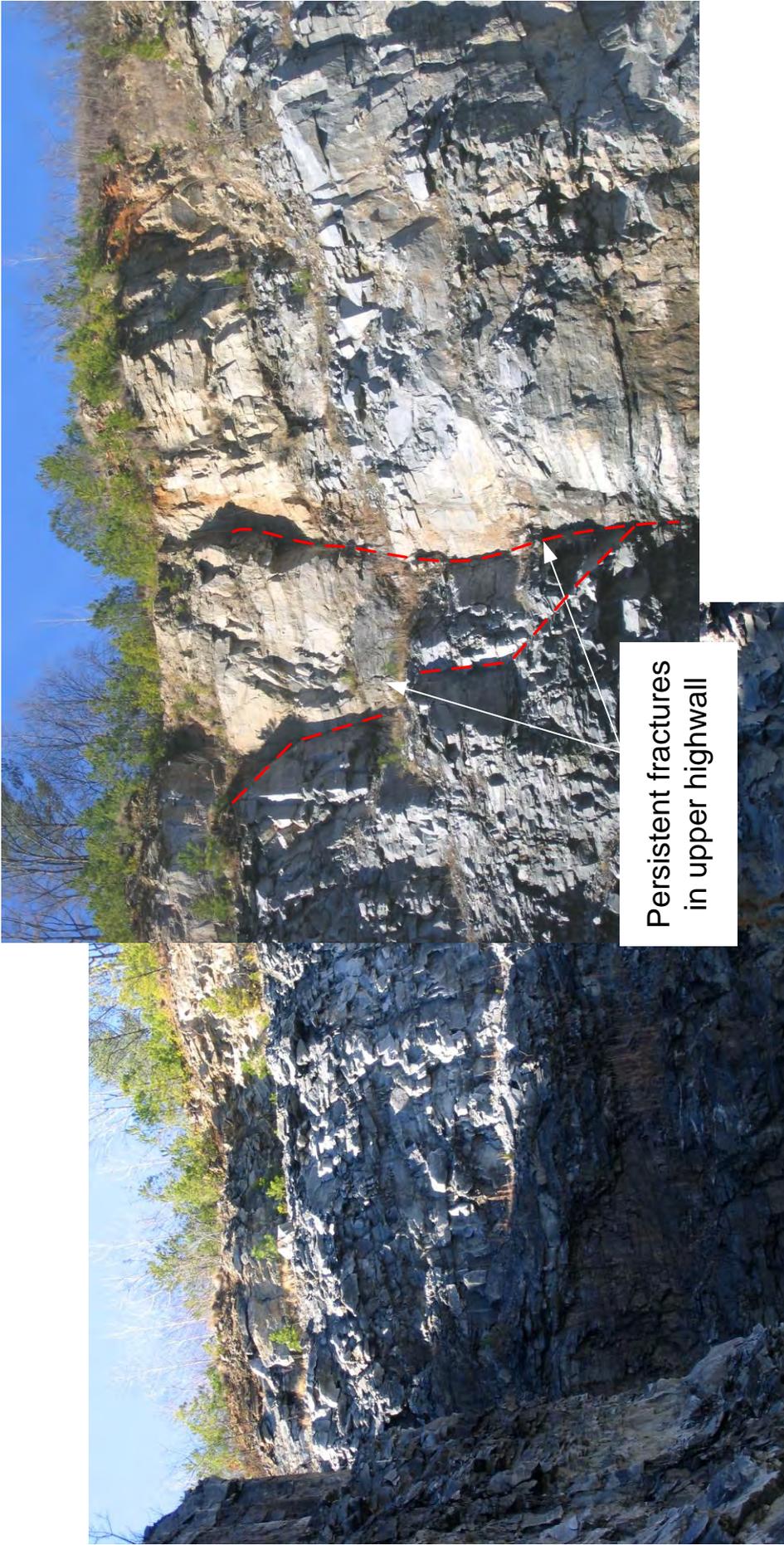
Steeply dipping fractures



BELLWOOD QUARRY RESERVOIR  
AREA OF INTEREST 3  
SOUTHWEST HIGHWALL

DATE: SEPT 2008  
SCALE NTS  
JOB NO. 02061.825

FIGURE: 7-7



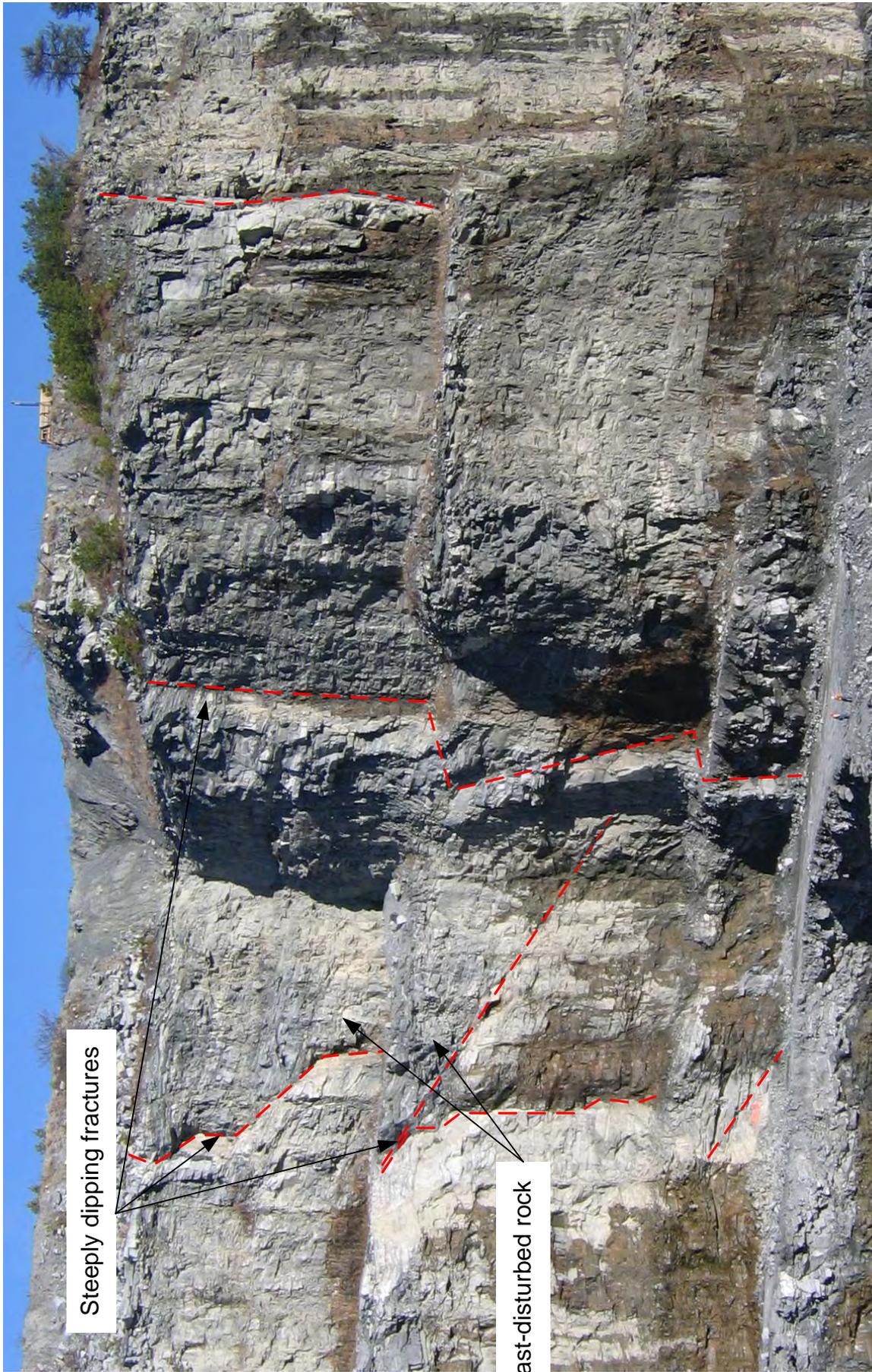
Persistent fractures  
in upper highwall



BELLWOOD QUARRY RESERVOIR  
AREA OF INTEREST 4  
WEST HIGHWALL

DATE: SEPT 2008  
SCALE NTS  
JOB NO. 02061.825

FIGURE: 7-8



Steeply dipping fractures

Blast-disturbed rock

DATE: SEPT 2008  
SCALE: NTS  
JOB NO. 02061.825  
FIGURE: 7-9

BELLWOOD QUARRY RESERVOIR  
AREA OF INTEREST 5  
NORTH-CENTRAL HIGHWALL





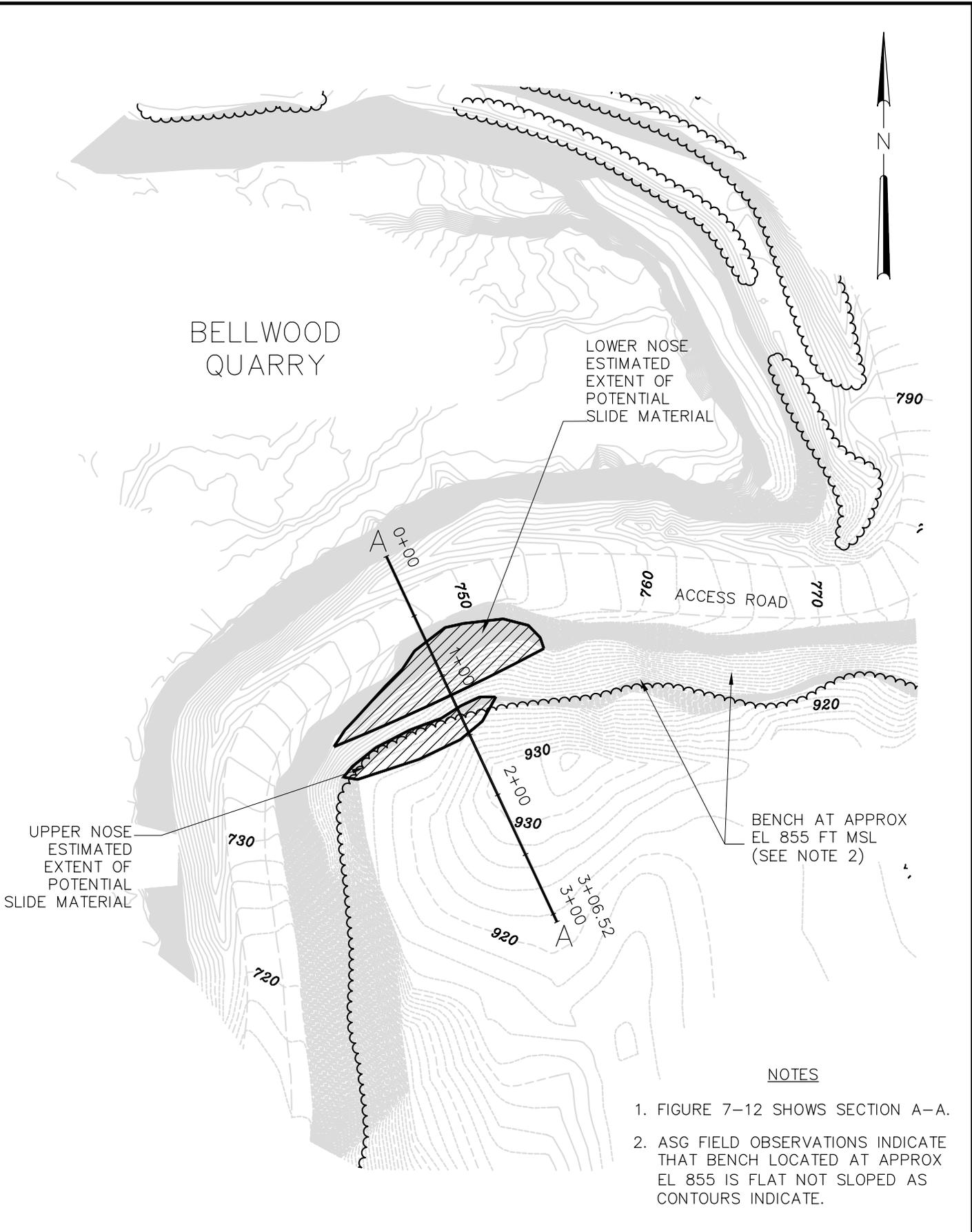
Steeply dipping fractures



BELLWOOD QUARRY RESERVOIR  
AREA OF INTEREST 6  
EAST HIGHWALL

DATE: SEPT 2008  
SCALE: NTS  
JOB NO. 02061.825

FIGURE: 7-10



NOTES

1. FIGURE 7-12 SHOWS SECTION A-A.
2. ASG FIELD OBSERVATIONS INDICATE THAT BENCH LOCATED AT APPROX EL 855 IS FLAT NOT SLOPED AS CONTOURS INDICATE.

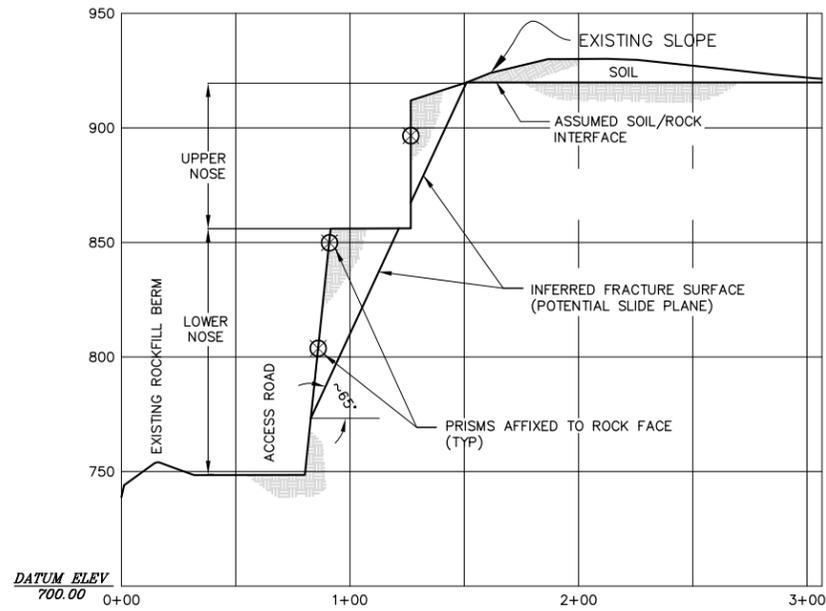
**BELLWOOD QUARRY RESERVOIR**

**AREA 1 – PLAN VIEW**

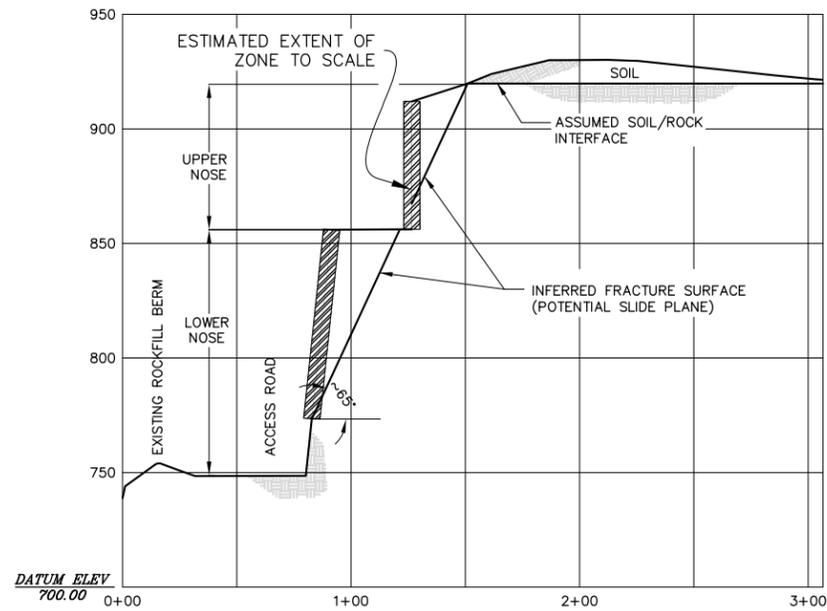
DATE : SEPTEMBER 2008  
 SCALE : 1"=100'  
 JOB NO.: 02061.825

FIGURE 7-11

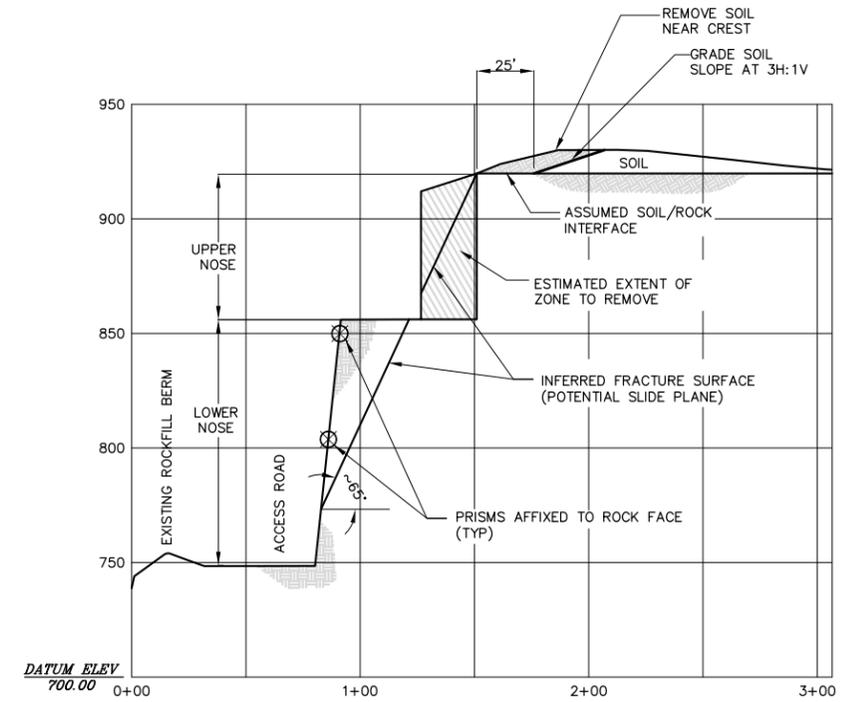




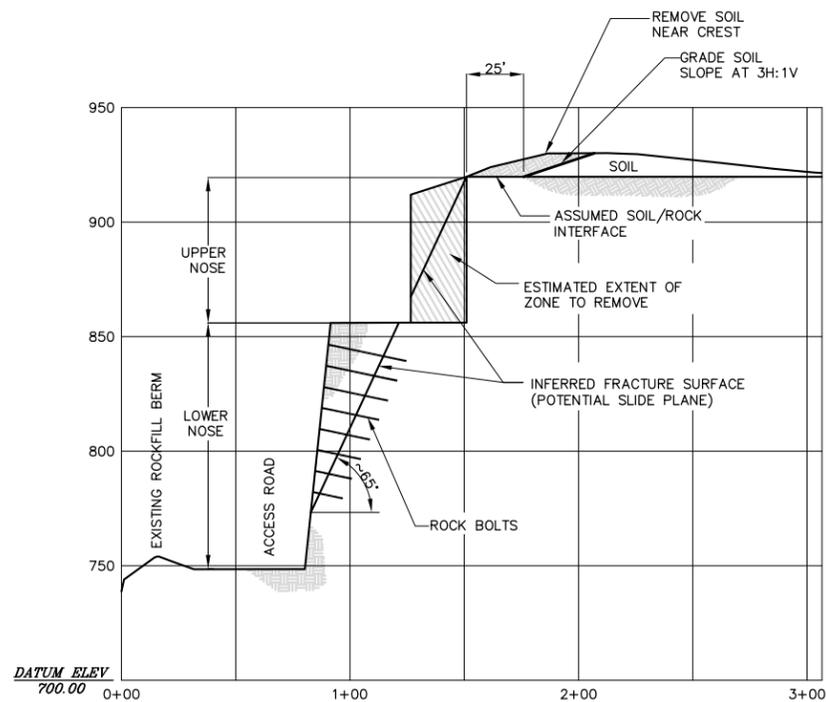
**OPTION 1-MONITOR ONLY**



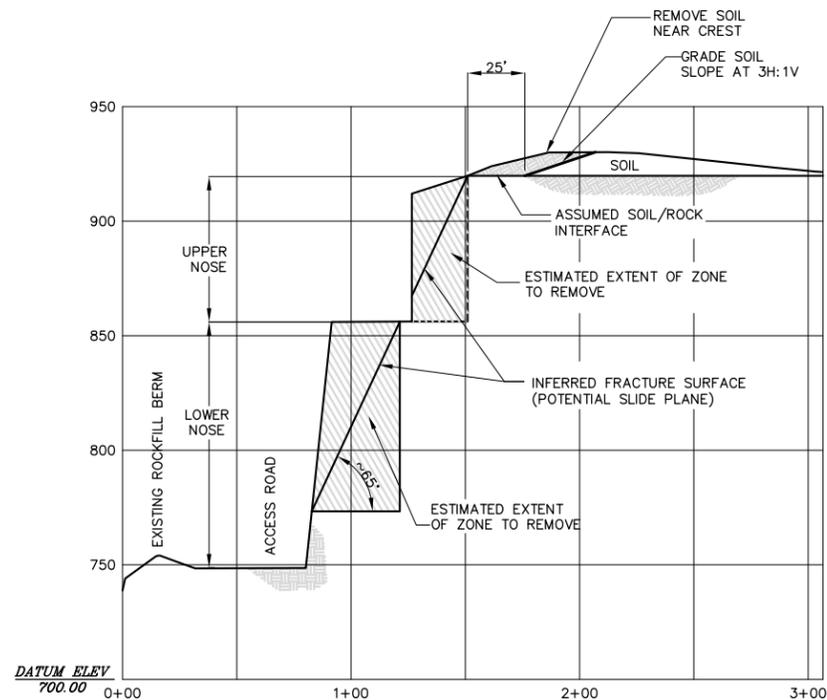
**OPTION 2-SCALE NOSE AND  
EVALUATE CONDITIONS FURTHER**



**OPTION 3-REMOVE UPPER NOSE  
AND MONITOR LOWER NOSE**



**OPTION 4-REMOVE UPPER NOSE  
AND ROCK BOLT LOWER NOSE**



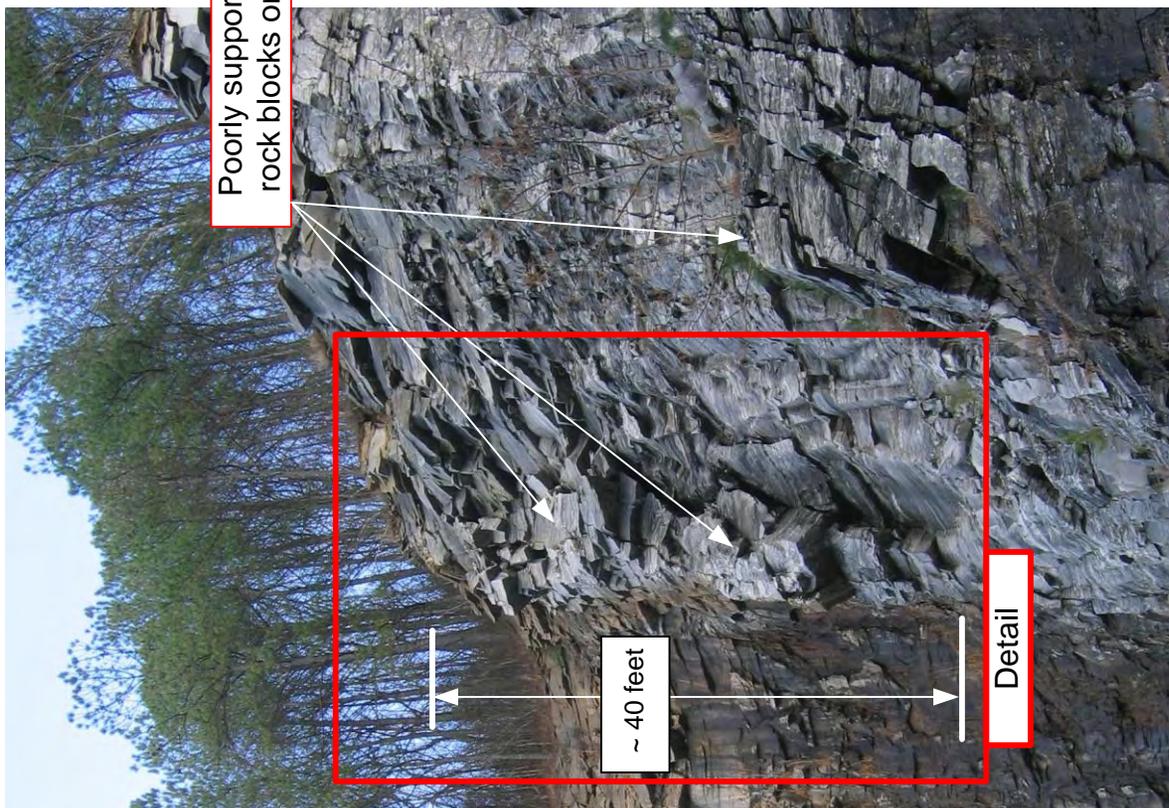
**OPTION 5- REMOVE UPPER NOSE  
AND REMOVE LOWER NOSE**

NOTES:

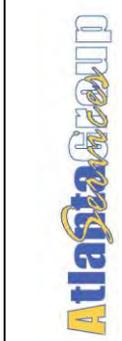
- 1) SECTION A-A SHOWN ON FIGURE 7-11

	<b>BELLWOOD QUARRY RESERVIOR</b>	DATE : SEPTEMBER 2008 SCALE : 1"=80' JOB NO.: 02061.825
	AREA 1 OPTIONS	FIGURE 7-12





Detail: side view of loose rock "chimney" visible in overview photo



BELLWOOD QUARRY RESERVOIR  
 REPRESENTATIVE  
 ROCK FALL HAZARDS

DATE: SEPT 2008  
 SCALE: NTS  
 JOB NO. 02061.825

FIGURE: 7-13









