Elm Fork Athletic Complex
City of Dallas Park and Recreation

Master Plan Report
January 17, 2007

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Executive Summary

The City of Dallas commissioned the Elm Fork Floodplain Management Study targeting the Elm Fork corridor to examine the floodplain for drainage and watershed management. The study also included a recreational amenities plan. The report focused on existing and proposed recreational amenities for the Elm Fork corridor. The studied area includes the east bank and adjacent area of the Elm Fork from the confluence of the Trinity River at SH 183 northward to Royal Lane. The Walnut Hill Landfill area east of Luna Road was also considered as part of the study. The study was completed in 2004.

The development of a premiere soccer facility on the former landfill site will not only provide the City of Dallas with much needed facilities to serve the soccer playing community, it also provides a unique opportunity to implement various environmental initiatives:

- Increases urban park area and trail networks
- Emphasizes sustainable design and storm water quality
- Establishes prime location for reuse water application

The City’s 2002 Parks Long Range Development Plan, The Renaissance Plan, set a goal of being “innovative, interactive, creative, environmentally sensitive, and state-of-the art.” The proposed athletic complex clearly is a model for these progressive goals. Protecting the environment by redeveloping over a closed landfill instead of altering greenspace comes with its challenges. Creating a safe environment for the community that will use the athletic complex requires proper assessment, planning, and ultimately design to address the potential concerns arising from the presence of the landfill.

The environmental conditions resulting from current and past activities on and around the proposed athletic complex properties need to be addressed as part of the properties’ redevelopment from unused former landfill to a state-of-the-art soccer facility. Landfill activities and industrial operations on-site and in the area present potential environmental issues to address for the complex design and development.

Landfill gases, settlement and soil and groundwater contamination are expected environmental challenges for redevelopment over former landfills. An initial investigation of these issues was conducted, and the findings are provided in this report.

The concept for the Elm Fork Athletic complex was to define athletic field areas with new tree masses, to restore native vegetation as much as possible and to connect site facilities with pedestrian circulation paths by using sustainable design principles.

The Landscape Masterplan shows individual proposed trees will line the public streets, access roads and parking lots to visibly outline the fields and to give shade to site users. Additional trees will shade structures and adjacent plazas. The trees are regularly spaced along the roadways and in parking lots but quickly blend into informal spacing away from the vehicular areas.

A goal of the Elm Fork Athletic Complex includes a landscape design based on “sustainable design.” A well-designed sustainable landscape reflects a high level of self-sufficiency. Once established, it should grow and mature virtually on its own — as if nature had planted it. This self-sufficiency can be difficult to attain, however, due to the environmental stresses and artificial conditions placed on plants in urban areas – especially athletic fields.
A sustainable landscape is more than the conscious arrangement of outdoor space for human enjoyment and satisfaction. It is a landscape that uses minimal water, fertilizers, pesticides, labor, and building materials.

As a public sports facility, a large portion of the Elm Fork complex will be dedicated to athletic turf fields which do not lend themselves to self-sufficiency. However, the fields can benefit by the principles of sustainable design to reduce watering and maintenance.

The 160 acres, at I-35 and Walnut Hill Lane, will soon transform a closed landfill into an exciting outdoor recreational area including soccer, hiking, birding, picnic areas and a children’s playground. While these activities are scattered across the entire complex there is a focal point, the championship soccer field, where all activities connect and people can gather together.
I. Introduction

Background/History
The City of Dallas commissioned the Elm Fork Floodplain Management Study targeting the Elm Fork corridor to examine the floodplain for drainage and watershed management. The study also included a recreational amenities plan. The report focused on existing and proposed recreational amenities for the Elm Fork corridor. The studied area includes the east bank and adjacent area of the Elm Fork from the confluence of the Trinity River at SH 183 northward to Royal Lane. The Walnut Hill Landfill area east of Luna Road was also considered as part of the study. The study was completed in 2004.

The 400-acre Walnut Hill Landfill was closed in 1984 and identified by the Elm Fork Floodplain Management Study as a viable area for the development of a large scale sports complex for the City of Dallas. The report suggested that the 'Conceptual L.B. Houston Sports Complex' could potentially be used for a premiere, tournament quality complex for soccer fields, cricket fields, and softball/baseball fields along with parking, picnic facilities and administrative/restroom facilities. Other potential uses included basketball courts, a field house, skate park, jogging trail, off-leash dog areas, playgrounds, and rugby fields.

The development of a premiere soccer facility on the former landfill site will not only provide the City of Dallas with much needed facilities to serve the soccer playing community, it also provides a unique opportunity to implement various environmental initiatives:

- Increases urban park area and trail networks
- Emphasizes sustainable design and storm water quality
- Establishes prime location for reuse water application

Both recreational and environmental opportunities are discussed in greater detail in the following sections of this report.

Project Team

Freese and Nichols, Inc.
Project Management, Environmental Investigations, and Site Planning

WorkArchitecture
Programming, Site Planning & Architecture

Caye Cooke and Associates
Landscape Architecture and Irrigation

LopezGarcia Group
Environmental Investigations
II. Goals

City of Dallas Goals and Objectives

The City of Dallas is pursuing the development of a premiere soccer facility situated on approximately 160 acres bounded by Walnut Hill Lane on the north, Goodnight Lane on the east, DART/BNSF railroad on the south, and Spangler Road on the west. The master plan will incorporate youth and adult soccer fields in a layout that provides; centralized parking that is convenient to all fields, restrooms, concessions, storage facilities, a perimeter nature trail, irrigation system, and a field lighting system. The master plan incorporates feedback from potential user groups and will place an emphasis on environmentally sensitive development of the athletic complex.

Project Approach

The development of a master plan for the proposed Elm Fork Athletic Facility was carried out with the following areas considered carefully: user demand and expectations, existing supply and needs, neighboring municipal facilities, environmental constraints, and management options.

Programming meetings were held with user groups and city staff to provide background for the development of an opportunities and constraints plan as well as preliminary site plans for the development. The input from these meetings was reviewed by the project team and incorporated into a baseline site plan. The project team also visited athletic complexes in neighboring communities and interviewed planning and maintenance staff to further define opportunities to create a premier athletic complex with both maintenance and user groups in mind.

Preliminary environmental investigations and site visits were conducted by the project team in order to develop an opportunities and constraints plan. The opportunities and constraints plan was used to continue to refine the baseline site plan. Both plans were presented to City staff and user groups in a visioning workshop held on December 19, 2005. Key points from the previous programming meetings were reviewed and the floor was opened for discussion related to the updated baseline site plan. Important discussions and decisions made during the visioning workshop are summarized in Section III of this report.
III. Programming

Data Gathering

Data gathering consisted of a variety of actions relevant to the development of the Elm Fork Athletic Facility. Important data gathering activities included:

- Site visits
- Topographic survey
- Research of historical data pertaining to the Walnut Hill Landfill
- Site visits to existing soccer complexes in the DFW area
- Preliminary environmental investigations
- Funding opportunities research

The information obtained during the data gathering phase of master plan development was utilized to develop an opportunities and constraints plan for the site. This plan was instrumental in the development of preliminary layout because it identified both limiting and beneficial physical characteristics of the site as it pertained to the development of a large athletic complex. The areas listed above are discussed in greater detail in Section IV of this report. Summaries of several site visits to local soccer complexes are provided in Appendix A.

User Group Interviews

The project team conducted several meetings with both City staff and representatives of several user groups in the area. The first meeting was held with Mr. Larry Hall of the North Texas Premier Soccer Association (NTPSA). The NTPSA serves a nine county region surrounding the City of Dallas. It registers over 200 adult men's teams, 100 adult women's teams, and 70 adult co-ed teams. The total number of registered players is greater than 5,600. Mr. Hall shared his thoughts of what makes a soccer complex stand out and what should be considered in the development of the master plan. The following list summarizes Mr. Hall's input:

- NTPSA holds two annual tournaments on Memorial Day and Labor Day weekends. The tournaments are typically made up of 75 – 85 teams.
- NTPSA serves nine counties surrounding Dallas.
- NTPSA registers approximately 200 adult men's league teams, 100 adult women's teams, and 70 adult co-ed teams (approximately 5,600 individual registrants).
- NTPSA uses 35 fields each weekend during a season and they are scattered about the metroplex.
- NTPSA is constructing a private soccer complex with 12 fields on 55 acres. The complex has about 900 parking spaces.
- Soccer complex priorities: 1) Must have fields in descent condition, 2) Adequate restrooms within close proximity to the playing fields, and 3) adequate parking.
- Lighted fields should be limited to ¼ of the total number of fields.
- Generally, unlit fields are in better condition than lit fields because they become 24/7 fields unless there is restricted access.
- Fields must have restricted access. Lighted fields and fields without restricted access are damaged by heavy use and limited down time.
Most players do not like artificial turf fields because of frequent injuries and excessive heat.

Larry noted Five Star in The Colony and McKinney at Craig Ranch as two of the best facilities in the area.

Larry stated that maintenance and management plans are a priority for new facilities that want to avoid costly field degradation and repair work.

The project team also met with Mr. Antonio Pecorari, "Tatu", and Mr. Joe Marshall of the Tatu Group. The group has expressed interest in the management of the Elm Fork Athletic Complex. The following list summarizes input received from the Tatu Group:

- Restricted access to the fields is very important.
- Preferably, the majority of the fields should be lighted.
- Fields should be located with sufficient area between each field.
- Fields with goals backing up to each other must have a barrier to reduce interruptions in play.
- Concrete walkways wide enough for maintenance vehicles should connect to all fields.
- Portable bleachers offer flexibility in field scheduling and down time during tournament play.
- Ideally, the majority of the fields should measure 75 yards in width and 120 yards in length. These fields can be split into two small fields for youth play.
- Access for emergency vehicles to each field should be provided.
- Provide adequate garbage disposal in the bench areas and throughout the complex.
- Provide an area to post scores and schedules (4 panels).
- Provide shaded areas for players as well as spectators.
- Provide picnic areas with grills.
- Consider using the facility to host events for the US Youth TopSoccer Program (www.usyouthsoccer.org/programs/20/main.html). "TOPSoccer (The Outreach Program for Soccer) is a community-based training and team placement program for young athletes with disabilities, organized by youth soccer association volunteers. The program is designed to bring the opportunity of learning and playing soccer to any boy or girl, age 8-19, who has a mental or physical disability. Our goal is to enable the thousands of young athletes with disabilities to become valued and successful members of the US YOUTH SOCCER family."
- A centralized building should provide concessions, a first aid station, a meeting room for tournament officials and referees, and a changing room.
- Satellite or mobile concessions should be considered.
- Additional recreational areas could include sand soccer areas that could also be used as volleyball courts. These should be located near picnic areas.

The project team conducted a half-day 'Visioning' meeting with City Staff and user groups to present the two original site schematics. The original schematics are provided in Appendix B. The following items were discussed as items that should be addressed in the final master plan of the complex:

- Will field striping be paint or chalk?
- Finalize maintenance building size. The size as shown is approximately 15,000 SF. It should be significantly larger than the maintenance building at Keist Park.
- Consider connectivity across Wesco Channel. Realign Wesco Channel to connect the facility?
- Determine down time schedule for fields. Coordinate with landscaping and grass choices.
Could an indoor soccer facility be constructed onsite with private funding?
Determine sanitary sewer availability and primary connection points.
Which are more important max size fields or 12 fields?
Are there floodplain issues?
How should the signage be organized? (zones, colors)
What are the methane issues and how can they be addressed?
What are the seating options for the championship field?
How will the fields be prepared?
What size staff is needed to sustain Phase I?
What types of native plants will be used?
How many restrooms, light poles, fixtures per pole?
What will the layout of the pavilion be?
Can walkways double for truck access to light poles?

General feedback and key decisions made in the ‘Visioning’ workshop are summarized below:

- The maintenance building will service the Elm Fork Athletic Complex exclusively.
- Hosting preseason college tournaments is possible.
- Playground areas should be included.
- A Pro Shop should be included.
- Rename ‘pavilion’ on the final master plan.
- Indoor facilities for referees/officials should be provided.
- Field lighting structures should have a maximum height of 70 feet. Musco lighting is preferred.
- Provide a perimeter jogging trail.
- Provide picnic areas.
- Central and satellite restroom facilities should be provided and should be permanent structures.
- Lighting should be provided for all fields.
- ‘Practice Areas’ are not necessary; just provide adequate spacing between fields.
- Provide barriers that are primarily natural: terracing and landscaping.
- Spectator areas should be located on the opposite side of the fields from the team areas.
- Provide a sense of separation between spectators and players.
- The entire perimeter should be fenced and able to be locked at night.
- Perimeter fencing and landscaping should be aesthetically pleasing.
- Fencing between fields should be avoided.
- Plantings between fields should be park like, integrated, and require low maintenance.
- Landscaping should be unique and aesthetically pleasing.
- Barriers should be provided behind the goals to prevent interference on other fields.
- No barrier plantings should be placed on the lower level.
- Fields should be kept big and divided as needed. This flexible layout reduces wear and tear.
- There should be no more than 2% grade on the fields because of player fatigue. Fields should be sloped side to side.
- Goals should be portable and sleaved.
- Different size fields are not preferred because of player’s perception.
- A championship youth field is a luxury item and not needed.
- Maximum field size is an asset.
- In between the fields there should be plenty of room for walkways, gaps for ball shots and seating.
- A grand entrance with a sense of arrival is important.
• Schemes A and B should be combined because pod parking is expensive. More parking should be located, as in Scheme B, south of the creek.
• There should be an architectural theme.
• A contest to name the facility can be run to increase publicity.
• Corporate sponsorship is needed.
• Trails will need additional parking.
• Walnut Hill should be widened to a divided 4 lane road with a traffic light.
• Spangler will need expansion and paving improvements in Phase II.
• 12 fields is the goal to incorporate into Phase I.
• Four open fields are too many for Phase I.
• Open fields should have a gate. The maintenance building can serve as control point.
• 40 parking spaces per field is a good target number.
• Bus access is needed to and thru the site.
• The goal is to have 19 fields.
• A connection along Walnut Hill to Elm Fork trail should be shown on the final master plan.
• Ideas for a name of the park to match a theme should be included in master plan.
• Separation between the ends of fields needs to be large.

The input received from City staff and the user groups was paramount in the development of the final master plan for the complex. There are remaining specifics that relate to maintenance and site characterization that must be considered during the design development phase of the project. Key areas for further study include:

• City maintenance versus private maintenance contracts.
• Roadway improvements for Walnut Hill and Spangler.
• Landfill site characterization and methane management system design.
• Coordination with Elm Fork Flood Protection projects.
• Source of fill material.
IV. Concepts

Community and Environmental Protection

The City’s 2002 Parks Long Range Development Plan, The Renaissance Plan, set a goal of being “innovative, interactive, creative, environmentally sensitive, and state-of-the-art.” The proposed athletic complex clearly is a model for these progressive goals. Protecting the environment by redeveloping over a closed landfill instead of altering greenspace comes with its challenges. Creating a safe environment for the community that will use the athletic complex requires proper assessment, planning, and ultimately design to address the potential concerns arising from the presence of the landfill.

The environmental conditions resulting from current and past activities on and around the proposed athletic complex properties need to be addressed as part of the properties’ redevelopment from unused former landfill to a state-of-the-art soccer facility. Landfill activities and industrial operations on-site and in the area present potential environmental issues to address for the complex design and development.

Landfill gases and soil and groundwater contamination are expected environmental challenges for redevelopment over former landfills. An initial investigation of these issues was conducted, and the findings are provided in this section of the report.

Environmental Setting

The key environmental issues evaluated for this phase of the project were the presence of the former landfill on-site, recent concrete debris stockpiling activities in the project’s Phase II area, and the past and current presence of industrial-related activities in the general area.

Walnut Hill Landfill

The athletic complex is proposed to be located over the former Walnut Hill Landfill, which was operated by the City of Dallas from 1955 until 1980. The waste material in the landfill presents potential environmental issues such as subsurface landfill gas accumulation, soil contamination, and groundwater contamination.

Regulations in place during the time of the landfill’s operation were less stringent than today’s requirements, and as a result, the exact composition and disposal method for the waste material is unknown. Separate landfills for industrial and hazardous waste did not exist at the time Walnut Hill Landfill was in operation, so municipal, industrial, and hazardous waste may all be present in the waste layer.

The landfill was permitted by the State of Texas and closed in 1980 in accordance with applicable rules in place at the time. The landfill waste is covered with a several feet of clayey soil for final cover. This soil cover is intended to protect the public and to minimize environmental contamination by preventing water from infiltrating the waste layer. Properly managed landfills of this type maintain waste in a “dry tomb” state; however, it is normal and expected for waste in a landfill to degrade over time. Landfill gases are generated and subsidence typically occurs as the waste decomposes.
Landfill gases from decomposing waste material must be properly managed to avoid unsafe environments as may occur from the accumulation of flammable or potentially toxic landfill gases. Engineering controls to collect, divert, and treat or destroy these gases are routine for such redevelopment activities.

Subsidence occurs from soil compaction, biological waste degradation, and general settling of waste. Factors impacting the rate and degree of subsidence include waste composition, water infiltration, waste density, and length of time since final closure. Typically, most subsidence has probably already occurred 25 years after landfill closure, although additional subsidence likely takes place for many more years.

Current Onsite Activities
The property on which Phase I of the proposed athletic complex is located is currently owned by the City. No significant activity has occurred on the property since the landfill closed in 1980.

The current owner of the property where Phase II of the proposed athletic complex would be located is a concrete debris recycler. Since 2004, and estimated 700,000 cubic yards of what appears to be construction demolition debris has been placed on the property, raising the surface elevation 25 to 30 feet in many areas. The source of the material is unknown, as is the presence or absence of chemical contamination. Additional environmental investigations on this property are scheduled to proceed in February 2007.

Area Industrial Activity
The proposed athletic complex is located in an area of the City that is generally zoned for commercial and industrial activity. Past and current industrial facilities generally present potential concerns for soil and groundwater contamination on nearby properties, although a review of environmental records in 2000 as part of the Elm Fork Floodplain Study did not identify any off-site properties that appeared to have directly impacted the properties comprising the proposed athletic complex.

Areas of the former landfill are located to the north and east, former gravel pits are located in the vicinity, and small-scale industrial facilities and construction debris recycling operations are located in the area. Gravel mining operations in themselves are not typically sources of concern for environmental contamination. However, fill material was commonly placed in the abandoned pits to bring the property back to grade. Anecdotal evidence for the area indicates that trash, debris, and other waste were placed in the gravel pits along with clean fill dirt.

Environmental Investigations
In the summer of 2005, a limited environmental investigation was conducted to assess soil or groundwater contamination and flammable or toxic landfill gases. Existing records from City, State and Federal files were reviewed and limited on-site sampling and monitoring was conducted.

The purpose of the initial investigation was to assist in identifying major environmental issues, if any, that would significantly affect the planned approach for the athletic complex design. Landfill gases were monitored to identify the need to alter the placement or design of on-site structures. Surface soil contamination was assessed to see if direct contact with existing surface soils presented any environmental health concerns. Groundwater monitoring records were reviewed to identify the presence of significant subsurface
contamination that may migrate off-site or to areas where human contact may occur. To protect the City against liability for any potential contamination caused by the recent on-site concrete debris recycling operation, an additional pre-acquisition environmental investigation has recommended to the City for the L-shaped property.

**Landfill gas**

Approval from the TCEQ is required (30 TAC 330 Subchapter T) before alterations to the surface of a closed landfill may be conducted. A development permit from the TCEQ is required to be obtained before an enclosed structure may be placed over a closed landfill. The purpose of these restrictions is to ensure that landfill gas is properly and safely managed to minimize unsafe flammable or explosive conditions.

In July 2005, subsurface monitoring was conducted to observe the presence, makeup and concentration of landfill gases. Gas samples from the subsurface waste layer of the landfill were collected for Phase I and Phase II areas of the proposed complex.

The chemical composition of the landfill gas is typical of aged fill material. Concentrations of oxygen are less than atmospheric levels, carbon dioxide concentrations are greater than atmospheric levels, and methane is generally present throughout the waste layer in varying concentrations. The makeup and concentrations of gases in the subsurface are typical of decomposing waste material in a confined environment. The continued presence of methane at elevated concentrations indicates that active decomposition of waste material is ongoing.

During the design of the facility, considerations will be taken to manage the presence of methane to prevent an unsafe environment for the facility. Continued decomposition of the waste material presents the potential for surface subsidence, which can cause an uneven ground surface, infrastructure integrity challenges, and continued maintenance issues. Engineering and planning considerations will be taken during the design of the facility to minimize the impact on the athletic complex of continued subsurface waste decomposition.

Sulfur gases, another common degradation byproduct of landfills, have the potential to cause health impacts at elevated concentrations and nuisance odor impacts at low concentrations. Sulfur gases were detected in the subsurface at less that one part per million by volume in one of three samples and was not detected in the other two samples. Various volatile organic compounds (VOCs) were detected in all three landfill gas samples analyzed, but they did not exceed applicable protective concentration levels (Texas Risk Reduction Program – 30 TAC 335, Tier I Residential Protective Concentration Levels). Ammonia concentrations were below detectable limits in all samples.

**Surface soils**

Ten shallow surface soil samples were collected from Phase I and Phase II areas of the proposed athletic complex in the summer of 2005. Samples were analyzed for an array of potential contaminants including heavy metals, polychlorinated biphenyls (PCBs), semi-volatile organic compounds (SVOCs), VOCs, herbicides, and pesticides. In some instances, the detected concentrations of these potential contaminants were slightly higher than conservative protective regulatory concentrations (Texas Risk Reduction Program [TRRP] Tier I Residential protective concentration limits [PCLs]).

Heavy metals were detected in all ten samples collected. Several samples had heavy metals concentrations that slightly exceeded the applicable PCLs for barium and lead. A slightly
elevated concentration of arsenic was detected in one soil sample. No other heavy metals were detected at concentrations exceeding applicable PCLs.

One VOC (acetone) was detected in three samples, but at concentrations below applicable PCLs and is likely due to laboratory contamination. Two SVOCs (fluoranthene and pyrene) were detected in one sample at below applicable PCLs. No PCBs, herbicides, or pesticides were detected in any of the samples.

**Groundwater**

A search was conducted for existing groundwater monitoring data for the area in City and State files. Limited groundwater monitoring data for the Phase II property (the L-shaped property) was located in the City’s files, and a search of TCEQ files identified the same information. No groundwater monitoring records were identified for the Phase I property.

The reviewed groundwater monitoring records were part of an investigation conducted by the property owner in January and October 1999. Samples were collected from three monitoring wells and what appears to be one public water supply well. Information showing the locations of each well was not located.

The samples had been analyzed for heavy metals and VOCs. One heavy metal (barium) and two VOCs (chlorobenzene and methylene chloride) were detected at concentrations slightly above current applicable PCLs; however, the presence of methylene chloride was likely due to laboratory contamination.

Other VOCs that are common components of fuels (ethylbenzene, naphthalene, toluene, and xylenes) were shown to have been detected in some monitoring wells in the 1999 sampling, but these concentrations were below current applicable PCLs.

The isolated presence of elevated concentrations of heavy metals and VOCs in groundwater at the site will likely present nominal risk to users of the proposed athletic complex if proper design and operations approaches are implemented. Potential pathways of exposure to contaminated groundwater may be limited by a variety of approaches, including the use of a pond liner, subsurface geosynthetic liner, or several feet of top cover and the exclusion of groundwater pumping for irrigation or other on-site uses.

The TCEQ, formerly known as the Texas Natural Resource Conservation Commission (TNRCC), appears to have authorized the 1999 proposed development over the landfill without requiring remedial action of the detected concentrations of heavy metals and VOCs in groundwater at the site. It does not appear that the City would currently be required to take remedial action for groundwater at the site under the current remediation rules (TRRP, 30 TAC 335). However, the City may opt to conduct an additional groundwater investigation at the site to document the existing concentrations of heavy metals and VOCs at the site.

**Concrete debris fill on L-shaped property**

The current property owner of the proposed location for Phase II of the athletic complex began accepting construction demolition debris in 2004. Comparison of property surface elevations between 2001 and 2005 indicates that approximately 700,000 cubic yards, or more than 80,000 dump truckloads, of concrete debris and other material have been deposited on the property as part of an apparent concrete recycling operation.
The source or sources of the deposited material is unknown. At the time of this report, an additional environmental investigation of the concrete debris has been recommended and is under consideration by the City. The purpose of the additional sampling investigation would be to conduct a due diligence assessment of the recently placed debris prior to the City taking ownership of the property. The intent of the investigation would be to provide the City liability protection in the event contamination from the concrete debris was identified. Additional investigation has been proposed and is necessary to determine if the material would be suitable for reuse as part of the proposed athletic complex.

If several feet of uncontaminated top cover is placed over the existing demolition debris, and facility operations are developed such to prevent surface exposure to the demolition debris, it is not necessary for additional sampling and analysis be conducted on the material for this project.
Next Steps for Community and Environmental Protection

It is fundamental that this project be designed in a manner that protects the community from unnecessary risk and exposure to environmental hazards. At a minimum, the project will be designed to meet applicable environmental protection requirements. In addition, opportunities to provide an additional layer of protection, such as the placement of a clean fill layer, will be explored.

Additional environmental investigation

Heavy metals in multiple soil samples at concentrations slightly above the most conservative applicable State regulatory action levels were identified on property currently owned by the City and property planned for acquisition. Additional site investigation and/or coordination with the TCEQ is likely necessary to address the soil metals concentrations on City-owned property. Additional soil samples are recommended to be collected on City-owned property:

A) to show that the elevated concentrations detected were anomalies and no remedial action is required;
B) to show that the elevated concentrations detected are similar to background concentrations of the same constituents and no remedial action is required; and/or
C) to identify the specific areas of elevated concentrations so that proper remedial action can be taken.

A due diligence investigation is recommended on the property not currently owned by the City (the L-shaped property) to assess the presence or absence of contamination in the concrete debris if bona fide prospective purchaser liability protection is desired by the City. To be eligible for the bona fide prospective purchaser protection under federal CERCLA rules, the investigation would need to be conducted prior to and within 180 days of the date of property acquisition. A proposed site investigation approach has been submitted to the City and is currently under evaluation by City staff.

To meet the statutory requirements for a bona fide prospective purchaser, the City must meet the requirements set forth in CERCLA sections 101(40) and 107(r). A bona fide prospective purchaser may purchase property with knowledge of contamination after performing all appropriate inquiries and due diligence. Among the requirements, the City would need to provide required discovery or release notices as necessary for the site, exercise care to prevent or limit human, environmental, or natural resources exposure to any released hazardous substance, and not be potentially liable, or affiliated with any other person who is potentially liable, for response costs for releases at the site. Based on these requirements, it does appear that the City would meet the criteria for a bona fide prospective purchaser once the all appropriate inquiry/due diligence was completed for the site.

If bona fide prospective purchaser protection for the L-shaped property is not a goal or priority for the City, no additional sampling is necessary at this time if proper design approaches are implemented to permanently segregate the demolition debris from surface contact and the potential leaching of chemical contaminants.

Landfill gas management permit

A development permit application will be assembled and submitted to the TCEQ as the design of the athletic complex proceeds. The application will contain information such as
the existing monitored concentrations of subsurface landfill gases, the proposed surface development plan, and the proposed landfill gas management plan. The gas management plan may include dissipation vents, collection and treatment systems, vapor barriers, monitoring probes, or other protective features to address the presence of subsurface landfill gas. The landfill gas management plan will be developed based on the results of future site assessment activities that will include additional borings as required by TCEQ to determine the depth of the existing clay cap on the closed landfill.

Clean fill placement
Opportunities to add clean fill dirt to the soccer complex provide additional environmental protection for users of the proposed athletic complex. Additional fill dirt will provide more distance between the ground surface and the existing waste material beyond the final cover already in place. Any low level contamination identified in the final cover would also be covered by clean fill. Finally, additional fill allows for the placement of irrigation piping, gas ventilation, and conduit in the subsurface without impacting the integrity of landfill final cover.
Landfill Redevelopment Considerations

Vacant properties in heavily urbanized areas have become a commodity. Both closed and operating landfills provide municipalities with opportunities to reclaim closed landfills and plan for future uses of active landfills.

There are challenges to the design, development, and operation and maintenance of facilities located on closed landfill sites. Environmental considerations were discussed in detail in the previous section. This section focuses on the design, construction, operation, and maintenance challenges that should be anticipated.

Differential Settlement

Settlement within a closed landfill is caused by multiple mechanisms. These include:

- Compression – settlement of waste material due to weight of material placed above it.
- Biodegradation – settlement due to the decomposition of organic materials over time.
- Physical Creep – settlement due to finer materials filling voids created by all settlement mechanisms.
- Chemical, corrosion, material interaction – settlement due to the corrosion of steel, combustion of organics.
- Consolidation – Settlement due to loss of water from pore spaces in low permeability soil formations. (Leonard and Floom, 2005)

Potential settlement across the site can be estimated based on geotechnical investigations of the site and review of historical tipping data if it is available. The projected settlement across the site is critical for the design of all development on a closed landfill and particularly important for proposed athletic fields. Differential settlement that is not accounted for in the design of the fields can render the fields unusable due to tripping hazards until grading adjustments can be made. Settlement estimates are also critical for the design of structural foundations (buildings, permanent stands, lighting poles), paving, and underground utilities. The placement of fill material on the site may lead to accelerated settlement based on the existing consolidation of the waste material. Ideally, fill material should be placed well in advance of field construction so the rate of settlement can be monitored by field survey measurements over time. Removal and disposal of the waste material and replacement with more stable fill would reduce settlement potential but is not a feasible option due to the associated costs.

The use of an alternative final cap consisting of a composite system including a geogrid mat, an aggregate layer, and a polypropylene liner overlaid with additional fill material and topsoil has been considered to reduce potential settlement of the field areas. It is included as an optional item in the engineer’s opinion of probable cost in this report. This option provides a stiffening layer to the site above the existing clay cap placed at closure in 1982. Predicting the effectiveness of this type of system in reducing settlement of field areas can only be made empirically at this time as it is a relatively new use.

Future Walnut Hill Improvements

Dallas County is proposing significant improvements to Walnut Hill between I-35 and Luna to the West. These improvements include possible alignment modification, elevating the roadway out of the 100-year floodplain, and widening. The improvements are not scheduled to occur before 2011. Based on meetings with Dallas County’s consultant, Dal-
Tech, the anticipated right-of-way for the project is 120 feet. The centerline alignment of the proposed right-of-way is not known but it could potentially affect the layout of the site in terms of field lengths. Should the southern boundary of the right-of-way encroach onto the site, the fields may need to be shortened accordingly. Design of the northern portion of the site including retaining walls, fencing, and screening will be coordinated with the design engineers for the Walnut Hill improvements.

Storm Water and Irrigation Water Management
The control of storm water and irrigation water across the proposed facility must be considered carefully. The upper layer of topsoil and additional fill material must be designed in a manner that allows for optimal contact with turf and planting root systems to reduce the irrigation demand and maximize healthy plant growth. At the same time, adequate drainage from the field surfaces must be maintained to avoid areas of ponding water and to reduce the potential of seepage into the waste layer below the clay cap. The anticipated irrigation requirements and discussion of turf and plant support is provided in the Landscape section of this report.

Adequate field drainage should be provided by grading the upper topsoil and cap layers to provide a minimum slope of 1 percent across all play areas. An alternative cap system using a more permeable layer of soil above either an additional clay layer or preferably a polypropylene liner installed at a slope greater than 1 percent would prevent seepage into the underlying clay and waste layers. This subsurface drainage layer should be designed to discharge into drainage swales or bioswales constructed above the existing cap surface. Bioswales should be designed to improve the water quality of field runoff. The water quality benefits of the bioswales will rely heavily on the design retention time and the plant types selected based on the anticipated pollutant loading. The selection and usage of the most appropriate and environmentally sound fertilizers is critical to maintain the runoff water quality. The type of fertilizer should be determined and used as a critical design factor for the planting selection and sizing of the bioswale areas. Underground storm drainage systems are not proposed for the athletic complex.

The existing alignment of Wesco Channel follows the eastern toe of the landfill area flowing to the south and then along the southern toe of the landfill area flowing to the west. Realignment of Wesco Channel is proposed to improve connectivity of between the field areas, to create better separation from the landfill toe area and the surface water body, and to allow for the construction of a storm water quality pond that will also serve as an irrigation storage pond. The pond will include a vegetative shelf, an impermeable liner, and an engineered outfall structure. The pond is shown to be connected to the relocated Wesco Channel on the Landscape Master Plan. It is important to note that the proposed pond will require modification in the future to hydraulically separate it from the realigned Wesco Channel if it is used to store reuse water for irrigation purposes. The Dallas Water Utilities citywide reuse water plan calls for the use of treated waste water as an irrigation source for city park facilities. Reuse water as an irrigation source is discussed in greater detail in the landscape section of this report.

Buildings
The following requirements from 30 TAC Chapter 330, Subchapter T are related to foundation construction for enclosed structures on a closed MSW landfill. Please refer to Attachment C for a copy of the Subchapter T regulations.
Elm Fork Athletic Complex Master Plan

- A geomembrane or equivalent system with very low gas permeability shall be installed between the slab and the subgrade, and a permeable layer of a minimum thickness of 12 inches, composed of an open-graded, clean aggregate material, shall be installed between the geomembrane and the subgrade.
- A geotextile filter shall be utilized to prevent the introduction of fine soil or other particulate matter into the permeable layer.

Based on sound design practices but not set forth directly by 30 TAC Chapter 330 Subchapter T, the following amendments to the foundation should also be made:

- Installation of a pier supported foundation versus a slab foundation. Piers would need to be installed to an appropriate depth below the existing waste layer. The piers should be protected similar to the concrete slab to protect from landfill gas migration along the perimeter of each pier support. Based on review of historical boring logs provided in a previously submitted and approved Subchapter T Development Permit application, the depth of the waste layer extends to approximately 25 feet below the existing grade on site at the time the borings were advanced. A copy of the boring logs and the application prepared by others are included as Attachment D.

Utilities

Underground conduits for electrical, sanitary sewer, and water lines will be installed over landfill areas in the proposed athletic complex. All underground conduits should be installed within the confines of the additional fill material placed over the existing clay cap. The following requirements from 30 TAC Chapter 330, Subchapter T are related to underground utility conduits including water and sanitary sewer. Please refer to Attachment C for a copy of the Subchapter T regulations.

- All conduits intended for the transport or carrying of fluids over or within the closed landfill should be double-containment (split casings shall not be used). To the extent possible, all such utilities shall be in fill material placed over the upgraded final cover.

Site Amenities

The 160 acres, at I-35 and Walnut Hill Lane, will soon transform a closed landfill into an exciting outdoor recreational area including soccer, hiking, birding, picnic areas and a children’s playground. While these activities are scattered across the entire complex there is a focal point, the championship soccer field, where all activities connect and people can gather together.

The championship area is split into east and west zones with the pavilion capping the north end. The main pavilion building includes concessions, restrooms, an office and areas for storage. The building itself is wrapped with an interchangeable super graphic, which can be used to display way-finding maps or specific events that are taking place at the complex. The main pavilion building rests under a large translucent tensile fabric canopy supported by a thin steel column grid. On the west side of the championship field is a sprawling grandstand covered by another tensile fabric canopy that suggests speed and movement through its segmented wing shape. The transparency of the wing gives it the perception of being light weight while it provides shade for over 1,500 spectators on the open concourse and stepped seating. The stepped seats are designed to be at field level and are divided by low gabion walls forming landscape elements that segment the seating sections and extend out toward the water.
The east zone includes player seating and warm up areas with private spaces for referees and storage for field equipment. The player area is separated from an upper lawn that is close to parking and allows for more casual picnicking while watching a game.

On the far west side of field and down a natural sloping lawn from the grandstands are open picnic areas under shade trees with a playground easily observed from the seating and picnic areas. All of this sits adjacent to the Wesco pond with diverse plant life and a connection to the site trail system.

In addition to the championship area and equally spaced throughout the site are three smaller pavilions with restroom facilities and supporting storage plus food and beverage vending opportunities. These pavilions offer shade from the sun and a place for meeting before or after playing a game, hiking or just enjoying the outdoors.

Specific attention has been paid to parking and drive circulation. Three entry/exit locations allow for good site control and varying automobile circulation schemes. A total of 1,113 parking spaces have been distributed across the site with each field located no more than 550 feet from a minimum of 40 spaces allowing two soccer teams to park and immediately access their playing area.

A separate entry and parking areas are located on the far west side of the complex. It will be used for accessing trails into the existing forested area of the site that connect the other trails that run throughout the site.

**Architectural Character**

The Walnut Hill and IH-35 area is comprised of light industrial buildings with heavy truck traffic and entertainment complexes. Most buildings are constructed from tilt wall panels and have low sloping roofs. The Elm Fork Athletic Complex will be partially visible from the heavily traveled IH-35 offering an opportunity for visual exposure of the site.

The architectural character proposed intends to establish and reinforce points for gathering. Large canopies create shaded areas where people can meet, purchase concessions and take a break from the various athletic and outdoor activities. The enclosed areas for restrooms and concessions are located under shade structures and are constructed of durable heavy masonry with large graphics reinforcing the various activities on the site. The shade structures are made of recycled steel that is galvanized to eliminate maintenance. The canopy is made of high strength engineered tensile fabric. The thin canopy profiles and the reduction of large scaled buildings help emphasis the idea of movement through the vast open space and focus your attention toward the natural surroundings. At the grand stand the main supports are cast-in-place concrete and tie to the ground with bases constructed with concrete slag gabion walls extending outward to allow terracing and separation between lawn areas. These separations help to create zones for family or group gathering where picnics and barbeques can occur. In addition, the vertical concrete supports offer an identifiable series of objects from the raised freeway and a sense of permanence in an area where most buildings are constructed for only immediate economic benefit.
Facilities

There are three distinct facilities on the site: the Championship Field, three smaller site pavilions and a maintenance facility.

The championship field is comprised of a primary pavilion plus grandstand seating and a player/referee area. The primary pavilion consists of:

- Concession area 600sf
- Concession storage 500sf
- Restrooms 500sf
- General storage 500sf

The facilities listed above are located under a 4,000 square foot fabric and steel shelter.

The grandstand and concourse area provide step seating for over 1,500 spectators and 15,000 square feet of alternate concession area and covered spectator standing. The player/referee area includes benches with sun shading devices and warm up area plus a small building built into the changing grade that includes:

- Referee lounge 200sf
- Field support room 200sf
- Field storage 400sf

The three smaller pavilions located close to fields and parking each include a 3,200 square foot fabric and steel shelter with:

- Restrooms 350sf
- General storage 350sf
- Vending area 100sf

The maintenance facility is located on Goodnight Lane provides for easy delivery of materials and includes:

- Offices (2) 240sf
- Staff open office 450sf
- Staff locker room 450sf
- Staff kitchen 160sf
- Staff restrooms 80sf
- General storage 150sf
- General circulation 200sf
- Electrical 35sf

In addition to the enclosed spaces listed above an additional 6,500 square foot maintenance yard is provided for truck parking and material storage. Some of the materials to be stored are fertilizer, top soil, sand, and fuel. Storage and vehicle maintenance areas will be covered and will comply with applicable storm water quality regulations.
Landscape

Site Analysis and Recommendations

Changing the former Walnut Hill Landfill site to an athletic field complex is a unique opportunity for land reclamation and environmental restoration. Fortunately the landfill is coupled with a wooded tract and bounded by a water supply, Wesco Channel, to enhance the proposed site use. To transform the landfill to a “green” park will require soil preparation, proper plant selection and concentrated maintenance.

The site under study is comprised of three ecosystems; forested floodplain in the southwestern portion of the site, landfill, and channelized stream. Each area is discussed in the following sections.

Forested flood plain in southwestern portion of site:

The existing site contains native trees in a large grove in the southern portion of the site and along Wesco Channel. The western portion off Spangler has been cleared and consists of scattered poplar trees with dense undergrowth of rough dogwood, false grape and poison ivy. Dominant trees in the forest and along the creek include elm, cottonwood, black willow, hackberry, ash, box elder, red cedar, sycamore, oak and pecan. Pockets of dense undergrowth include extensive poison ivy. The area is flat and frequently floods during heavy rains. The master plan proposes developing a nature trail in the grove that will complement the park activities while preserving the trees.
Landfill:
The northern part of the site is comprised of two types of landfill – active and abandoned.

The abandoned landfill has been capped and unused for several years, supporting perennial growth of grasses and wildflowers. Groundsel (small shrub) dots the grassland on the northeastern portion.

The landfill area exists in the northwestern area of the site and has received concrete debris over the past several years. The stockpiled concrete debris is presently being removed by others. Several prickly pear colonies have formed on the northwestern part of the landfill along with scattered elm, ash, locust, hackberry and mesquite. Hackberry trees sprout along the fence lines and cattails line the drainage ditches along Walnut Hill Lane. Approximately 3 to 4 feet of soil will be added to support new turf grass, native grasses, and trees.
Wesco Channel runs along the eastern and southern borders carrying storm drainage of the Elm Fork basin. Young riparian vegetation (primarily elm, ash, cottonwood, black willow and grasses) has grown on the banks of Wesco Channel since its construction. The channel is proposed to be realigned to maximize patron use of the site and to move the channel further from the toe of the landfill slope. Riparian vegetation is proposed to stabilize the banks and to restore the creek environment.

Dallas Landscape Ordinance Requirements

The City of Dallas Landscape ordinance requires site development to provide trees for mitigation of any tree removal and to provide trees and shrubs as required to meet the landscape standards.

Mitigation requirements

Tree removal will occur along Wesco Channel as it is relocated and enlarged for storm detention. Trees that are classified as “protected” by the Dallas Landscape Ordinance that occur on site include elm, ash, locust, cottonwood, sycamore, box elder, red cedar, and oak. These and other protected trees which are 8 inches in caliper or greater require mitigation upon removal on an inch per inch basis. For example, if 40 caliper inches are removed, then 40 caliper inches must be planted (such as twenty 2 inch caliper trees. Unprotected trees to be removed that do not require mitigation include hackberry, mesquite, chinaberry, black willow, red cedar (under 12 inches in caliper), and any “protected” tree under 8 inch caliper.

Since a topographic survey of the site has not been conducted and all the trees have not been identified, tree removal and mitigation estimates are based on site observation. Since the number of “protected” trees tree removal will be minimal on site (estimated at less than 400 caliper inches for Phase 1 and 100 caliper inches for Phase 2), the proposed trees for Phase 1 and Phase 2 will more than mitigate the removed trees.
Landscape Requirements - Phase 1

The city of Dallas landscape ordinance dictates certain mandatory landscaping requirements for new construction in the city. The landscaping proposed for this site is set in response to those requirements.

Site trees - Two-inch (2”) caliper site trees are required for each 4,000 square foot of lot area. Based upon preliminary plan area calculations of the site, the Phase I property is 3,059,365 square feet, thereby requiring 765 trees for the site. These trees are to be provided in the form of parking lot trees, street trees (1/50 LF of frontage), and additional site trees as needed.

Street trees - Street tree requirements dictate one large three-inch (3”) caliper tree for every 50 linear feet of street frontage. Walnut Hill Lane with a length of +- 1406 linear feet length of +- 420 linear feet will require nine (9) street trees which are proposed. Parking stalls are to be no more than 120 feet from a two-inch (2”) caliper tree. Tree species will vary but will be selected from the recommended tree species per the City landscape ordinance.

Design standards - The City landscape ordinance also requires that two design standards must be met for new construction. We recommend the following two design standards since they appear to be the most economical to meet for this site.

1) Pedestrian Facilities:
   The first design standard is met by the publicly accessible outdoor recreational facilities through provision of the soccer fields.

2) Screening Off-Street Parking:
   A second design standard is met by screening off-street parking with large evergreen shrubs which are 3’ height at the time of planting. Seven gallon shrubs are proposed at the new parking lots that face Walnut Hill Lane and Goodnight Lane. Native shrubs will be proposed for the required screening shrubs. Approximately 70 shrubs will be planted to screen parking lots.

A new irrigation system for the planting will be required by the ordinance. We will recommend bubblers/drip system for newly planted trees and screening shrubs.

Landscape Requirements - Phase 2

The city of Dallas landscape ordinance dictates certain mandatory landscaping requirements for new construction in the city. The landscaping proposed for this site is set in response to those requirements.

Site trees - Two-inch (2”) caliper site trees are required for each 4,000 square foot of lot area. Based upon preliminary plan area calculations of the site, the Phase 2 property is 2,758,689 square feet, thereby requiring 690 trees for the site. These trees are to be provided in the form of parking lot trees, street trees (1/50 LF of frontage), and additional site trees as needed. The large amount of existing trees in the woodland area will count towards the required number of site trees. The cost estimate lists 300 site trees to reflect the number of trees indicated on the Landscape Masterplan.

Street trees - Street tree requirements dictate one large three-inch (3”) caliper tree for every 50 linear feet of street frontage. Spangler with a length of +- 1331 linear feet will
require twenty-seven (27) street trees which are proposed. Walnut Hill will require and additional 17 street trees. Parking stalls are to be no more than 120 feet from a two-inch (2") caliper tree. Tree species will vary but will be selected from the recommended tree species per the City landscape ordinance.

Design standards - The City landscape ordinance also requires that two design standards must be met for new construction. We recommend the following two design standards since they appear to be the most economical to meet for this site.

1) Pedestrian Facilities.
   The first design standard is met by the publicly accessible outdoor recreational facilities through provision of the soccer fields.

2) Screening Off-Street Parking.
   A second design standard is met by screening off-street parking with large evergreen shrubs which are 3’ height at the time of planting. Seven gallon shrubs are proposed at the new parking lot that faces Spangler Road. Native shrubs will be proposed for the required screening shrubs. Approximately 30 shrubs will be planted to screen parking lots.

A new irrigation system for the planting will be required by the ordinance. We will recommend bubblers/drip system for newly planted trees and screening shrubs.

Tree Requirements and Placement
As stated above, the Dallas landscape ordinance requires 1 site tree per 4000 square feet which results in 765 trees for Phase 1 and 690 for Phase 2. Existing trees in the southwestern wooded area will count towards existing trees depending on how the site is developed and zoned. These existing 500 to 1500 trees can be credited towards the site tree requirement.

Zoning
If the property is zoned PD or SUP, a landscape plan must be submitted. The landscape plan can show less than 1 tree per 4000 square feet; generally, the ratio of 1 tree per 6000 square feet is acceptable since this ratio is used for industrial lots. This ratio reduces the total of required trees to 510 (Phase 1) and 460 (Phase 2) for a reduced total of 970 trees for the entire site. Again, the existing trees in the wooded area can be used to reduce site tree requirements using the “artificial lot” method described above.

Special Exception
If the wooded area has not been acquired by the Phase 1 development, then the amount of required site trees might be reduced by pursuing a special exception or variance. This process is highly unpredictable due to whoever may be on the Board of Adjustments and the merit of the request.

Placement
The Landscape Masterplan locates trees to shade parking and facilities while providing a buffer between soccer fields and vehicular traffic. Final placement of trees will depend upon the depth of the landfill so that trees do not penetrate the cap. The large, woody tree roots and their primary branches increase in size and grow horizontally. They are predominantly located in the top 6 to 24 inches of the soil and usually do not grow deeper than 3 to 7 feet.
During the final design, tree species will be selected based on soil depth to the landfill cap and placed accordingly.

Sustainable Landscape Design

Besides meeting the City landscape requirements, a goal of the Elm Fork Athletic Complex includes a landscape design based on "sustainable design." A well-designed sustainable landscape reflects a high level of self-sufficiency. Once established, it should grow and mature virtually on its own — as if nature had planted it. This self-sufficiency can be difficult to attain, however, due to the environmental stresses and artificial conditions placed on plants in urban areas – especially athletic fields.

A sustainable landscape is more than the conscious arrangement of outdoor space for human enjoyment and satisfaction. It is a landscape that uses minimal water, fertilizers, pesticides, labor, and building materials.

As a public sports facility, a large portion of the Elm Fork complex will be dedicated to athletic turf fields which do not lend themselves to self-sufficiency. However, the fields can benefit by the principles of sustainable design to reduce watering and maintenance.

Environmental design principles for sustainability of the landscape as identified by U.S. Green Buildings Council include the following.

**Enhancing landscape microclimates** which are accomplished through placement of deciduous trees to shade structures and outdoor gathering areas. These enhancements can lead to lower energy and water use, healthier plants which are capable of resisting diseases and insects with less chemical assistance, and more usable outdoor space.

**Biodiversity** refers to the natural variety of plants, animals, fungi and microorganisms found in all ecosystems. Although the athletic fields will be turf grass monocultures, bioswales and areas of woodland and riparian vegetation will be dedicated to biodiverse plant materials.

The bioswales, woodland and riparian vegetation areas will closely reflect native plant communities enhance biodiversity. Understory/overstory vegetation similar to the layering of plants in a natural forest will occur in the woodland and riparian areas. Biodiversity also assumes plants are placed in conditions and environments where they would naturally grow. Biodiversity on the site also will be increased by:

- installing plants which provide habitat for wildlife and year-round aesthetic interest (See the following plant palette);
- using alternative methods of storm drainage management such as detaining water on-site in bioswales and allowing it to percolate through porous surfaces, or implementing flood control measures along creeks that are sensitive to existing vegetation and habitat; and
- Preserving existing natural areas in urban settings that provide habitat as well as aesthetic or recreational value, such as the woodland in the southwestern portion of the site.

**Reducing resources and minimizing waste** in a landscape is accomplished by choosing plants indigenous to the site and area that require minimal watering, pruning, and chemical
applications. Accepting insects and diseases that are not life-threatening to landscape plants (some leaf feeding or leaf spot is acceptable, for example) is another way to reduce chemical use and other resources. Applying mulch to the soil under plants reduces weed growth that in turn reduces chemical treatments and use of gas-powered trimming equipment. In addition, the mulch improves soil quality over time, minimizing water waste caused by run-off and evaporation.

Soil quality and character significantly affect the growth and health of plants, and should be major considerations in landscape installation. Since a substantial amount of root growth occurs in the top 6-12 inches of soil, the soil quality can significantly enhance the establishment and growing conditions for new plants. Since the Elm Fork complex is a landfill and will necessitate importing new topsoil with sandy loam and compost to provide permeability and nutrients for plant growth.

Effective sustainable design also incorporates recycled materials (on site compost, paving materials, mulches, building materials, etc.). Composting can be designed into this facility to capture grass clippings, food waste, and other vegetative matter.

Refer to Appendix C, “LEED Credits and Sustainable Design,” for possible LEED credits that could be achieved on the site.

**Landscape Concept**

The concept for the Elm Fork Athletic complex was to define athletic field areas with new tree masses, to restore native vegetation as much as possible and to connect site facilities with pedestrian circulation paths by using sustainable design principles.

The Landscape Masterplan shows individual proposed trees will line the public streets, access roads and parking lots to visibly outline the fields and to give shade to site users. Additional trees will shade structures and adjacent plazas. The trees are regularly spaced along the roadways and in parking lots but quickly blend into informal spacing away from the vehicular areas.

Proposed native vegetation stands will serve to stabilize the creek bank, buffer adjacent land uses and accent bioswales. The Landscape Masterplan indicates planting to restore native riparian vegetation along relocated Wesco Channel and the detention pond. Stands of native woodlands are recommended in Phase 1 and Phase 2 to provide natural vegetative buffers against adjacent land uses. Phase 2 shows a large woodland area in the northwest corner of the site to screen concrete recycling operation. Costs may be reduced by planting liner or saplings in January since they require less water. These trees will be able to survive on rain water, unless there is a severe drought during the first year of establishment.

The number of trees shown on the Landscape Masterplan meets the highest demands of the landscape ordinance and creates a park-like atmosphere. Even if the ordinance requirement for two inch caliper trees is reduced through the use of the "artificial lot”, then it is recommended that all the trees be installed per the plan for windbreaks, shade and aesthetics.

Bioswales are indicated on the plan and will be formed to capture storm water drainage from the soccer fields. Bioswales will be seeded and planted with native grasses and perennials to that tolerate wet soils.
The trees for the proposed woodland and riparian restoration areas will be planted as saplings so that they can grow without dependence on the irrigation system. The saplings will require an initial watering upon planting and possible supplemental waterings if drought occurs. Other proposed plants for the woodland and riparian restoration will be seeded from commercially available seeds and seed mixes of native grasses and wildflowers.

The existing woodland in the southwest corner of the site will be retained to serve as a passive recreation area with nature trails. A mulch trail will serve the cleared portion of the site; a boardwalk will be needed in the eastern two-thirds of the woodland due to frequent flooding. The Lanscape Masterplan shows an overlook accessible by trail on the northern edge of the woodland (and in the raised landfill area) for bird watching.

**Pedestrian circulation**

A trail system links the soccer fields to the parking lots, concession areas, playground and nature trail in the southwestern woodland area. The site trail system could be linked to the City and County Trail System by an extension west along Walnut Hill Lane to connect to the proposed Elm Fork Primary Trail along Luna Road.

A soft surface trail system of decomposed granite is proposed for the landfill area to service the soccer fields. Decomposed granite compacts to a hard surface, yet is flexible and easy to repair in case of settling in the landfill. We also recommend using decomposed and/or crushed granite in the parking lot medians due to high pedestrian traffic and to reduce water and maintenance costs. The granites can be seeded with sedum to soften the area with its foliage. Crushed concrete is available locally and, due to its large aggregate size, may be used as a base for the crushed/decomposed granite. We recommend a minimum 2-1/2 inches topping of crushed or decomposed granite to provide a walkable surface if crushed concrete is used as a base material.

A concrete path will be constructed along Wesco Channel since it is not in the landfill and will be subject to periodic inundation. This path will serve for site circulation or as a nature trail along Wesco Channel.

Trails will link the southwestern woodlands to the soccer area. The woodlands can be explored via soft surface trails and raised boardwalks in low areas. An overlook is proposed at the south edge of Phase 2 soccer fields to view migratory birds that use the Elm Fork woodlands.

**Plant Palette**

The following plant palette of native plant materials is recommended for the athletic complex. Due to the soil depth of about four feet above the landfill cap, we recommend trees with shallow roots. The riparian and bioswale areas that occasionally flood or where the soil is wet or heavy also require shallow rooted trees. These surface roots can get oxygen (necessary for trees to manufacture food) as soon as the soil starts to dry out.

**Shallow rooted trees for landfill:**
Cottonwood (*Populus deltoides*)
Hackberry/Sugarberry (*Celtis laevigata*)
Red Maple (Acer rubrum)
Ash (Fraxinus spp.)
Sweetgum (Liquidambar styraciflua)
Tuliptree (Liriodendron tulipifera)
Red oak (Quercus shumardii)
Live oak (Quercus virginiana)
Honey Locust (Gleditsia)
Black Willow (Salix nigra)
American elm (Ulmus americana)
Cedar Elm (Ulmus crassifolia)
Waxmyrtle (Myrica cerifera)
Eastern Red Cedar (Juniperus virginiana)
Yaupon Holly (Ilex vomitoria)
Rusty Blackhaw Viburnum (Viburnum rufidulum)
Eve’s Necklace (Sophora affinis)
Texas Pistachio (Pistacia texana)
Possumhaw (Ilex decidua)
Desert Willow (Chilopsis linearis)
Groundsel (Baccharis halimifolia)

Riparian trees:
Cottonwood (Populus deltoides)
Hackberry/Sugarberry (Celtis laevigata)
Red Maple (Acer rubrum)
Box elder (Acer negundo)
Ash (Fraxinus spp.)
Catalpa (Catalpa bignonioides)
Pecan (Carya illinoensis)
Sweetgum (Liquidambar styraciflua),
Tuliptree (Liriodendron tulipifera),
Red oak (Quercus shumardii),
Willows (Salix spp.) and
American elm (Ulmus americana)
Cedar Elm (Ulmus crassifolia)
Black Locust (Robinia pseudocacia)
Honey Locust (Gleditsia triacanthos)
Soapberry (Sapindus drummondii)
Sumac (Rhus spp.)
Waxmyrtle (Myrica cerifera)
Eastern Red Cedar (Juniperus virginiana)
Creek Plum (Prunus spp.)
Possumhaw (Ilex decidua)
Redbud (Cercis canadensis)
Groundsel (Baccharis halimifolia)

Bioswale Grasses and Vegetation:
Green Sprangletop (Leptochloa dubia)
Prairie Wildrye (Elymus canadensis)
Eastern Gamagrass (Tripsacum dactyloides)
Switchgrass (Panicum virgatum)
Big Bluestem (Andropogon gerardii)
Buttonbush (Cephalanthus occidentalis)
White- topped Sedge (*Dichromemana colorata*)
Spike rush (*Eleocharis spp.*)
Cutleaf Daisy (*Engelmannia pinnatifida*)
Swamp Sunflower (*Helianthus angustifolius*)
Lizard tail (*Saururus cernuus*)
Pickerel Weed (*Pontederia cordata*)

**Woodland Grasses and Wildflowers:**
Blue Grama (*Bouteloua gracilis*)
Buffalograss (*Buchloe dactyloides*)
Sideoats Grama (*Bouteloua curtipendula*)
Prairie Wildrye (*Elymus canadensis*)
Inland Sea Oats (*Chasmanthium latifolium*)
Purple Coneflower (*Echinacea purpurea*)
Lanceleaf Coreopsis (*Coreopsis lanceolata*)
Drummond Phlox (*Phlox drummondii*)
Obedient Plant (*Physostegia intermedia*)
Western Ironweed (*Vernonia baldwinii*)
Cutleaf Daisy (*Engelmannia pinnatifida*)
Pigeonberry (*Rivina humilis*)
Tall Aster (*Aster praealtus*)
Butterfly Weed (*Asclepias tuberosa*)
Standing Cypress (*Ipomopsis rubra*)

**Riparian Woodland Grasses and Wildflowers:**
Switchgrass (*Panicum virgatum*)
Blue Grama (*Bouteloua gracilis*)
Green Sprangletop (*Leptochloa dubia*)
Indiangrass (*Sorghastrum nutans*)
Little Bluestem (*Schizachyrium scoparium*)
Prairie Wildrye (*Elymus canadensis*)
Sand Dropseed (*Sporobolus cryptandrus*)
Sand Lovegrass (*Eragrostic trichodes*)
Sideoats Grama (*Bouteloua curtipendula*)
Cutleaf Daisy (*Engelmannia pinnatifida*)
Goldenrod (*Solidago altissima*)

**Turf grass for Championship field**
Tifway Bermudagrass (*Cynodon dactylon cv.*)

**Turf in sport field/regular mowing area**
Common Bermudagrass (*Cynodon dactylon*)

*Refer to Appendix D for Turfgrass recommendations by Dr. James MacAfee, Texas A & M University.*
Turf outside sport field/regular mowing area and irrigation area
Blue Grama (*Bouteloua gracilis*)
Buffalograss (*Buchloe dactyloides*)

Irrigation

The Landscape Masterplan proposes a large irrigation pond that could initially be supplied by a combination of Wesco Channel, wells installed in non-landfill areas, and supplemented by potable municipal water sources. The irrigation pond will serve as the primary source for site irrigation. This site is also a prime candidate for the application of reuse water as source to maintain an adequate supply of irrigation water. Reuse water is non-potable, treated effluent from a municipal waste water treatment plant. The potential application of reuse water for irrigation and other purposes at the proposed complex is discussed in greater detail below.

A new irrigation system for the planting will be required by the landscape ordinance and in order to establish the new plants. We recommend drip system to the newly planted trees, screening shrubs and special planting areas (e.g. entry area and main concession). Due to probable soil settlement, irrigation pipe will be limited on the landfill section and “water cannons” are proposed. Although they require less underground piping, “water cannons” (or “hose reel traveling irrigators”) are much more labor intensive and not as efficient in distribution and usage. More water is lost due to evaporation during the distribution process and the distribution process takes more time as compared to traditional underground system using rotary heads.

Fields that lie outside the landfill, where settlement is not a problem, will receive a traditional underground irrigation system with rotary heads to water the fields. Drip emitters/bubblers will water trees and planting beds to minimize water loss.

Reuse Water

The City of Dallas has recently completed a city-wide reuse water master plan in an effort to identify primary end users of treated effluent from existing waste water treatment plants and future satellite treatment plants that will serve areas with substantial reuse water demand. Irrigation water demands are extremely high in the metroplex. Ongoing drought conditions have depleted critical water supply sources and have resulted in the implementation of stringent water restrictions. Drought conditions coupled with ever increasing demand due to the rapid growth in the area has put water supplies at a premium. The rapid growth has also significantly increased the generation of waste water.

The City of Dallas has recognized the need to conserve and extend water supplies. Water reclamation and reuse has been identified as a vital requirement to allow the City to sustain the rapid development and expand conservation initiatives. The proposed athletic complex is a prime candidate to utilize reuse water for non-potable applications. Potential uses of reclaimed water at the proposed complex include:

- Irrigation water supply.
- Stream augmentation.
- Creation, restoration, and/or enhancement of wetland systems.
- Flush water supply for restroom facilities.
Each potential use is subject to water quality standards established by the US EPA and additional restrictions enforced by the Texas Commission of Environmental Quality. Detailed discussion of these standards and restrictions is beyond the scope of this report. More intensive descriptions of these standards can be found in the EPA document titled “2004 Guidelines for Water Reuse” and the TCEQ Chapter 210 of Title 30 of the Texas Administrative Code (TAC).

Presently there is no source of reuse water available to the proposed site. Conducting a reuse plant feasibility study in consent with the design phase of the athletic complex is recommended. Reuse water has been documented as a more beneficial irrigation source for athletic turf management than potable and surface water sources. Public opinion of the application of reuse water for irrigation purposes is currently positive. The study would provide a great opportunity for the city to determine a feasible option to further enhance water conservation strategies.

Recently, the City of Dallas has implemented utilization of reuse water to irrigate the Cedar Crest Golf Course. This initiative and those to be implemented in the future will reduce potable water demand on municipal potable sources and help reduce treatment plant discharge quantities.

**Municipal Potable Water Supply**

Another source for water supply is the municipal water system accessible from Walnut Hill Lane, Goodnight Lane, and Manana Drive. City Water pressure is adequate in the area with high record of 90 psi by city of Dallas Water Utilities. Municipal water will probably be needed during the establishment period during Phase 1 and Phase 2 and during the maintenance period when the pond volume will not support the fields due to drought.

**Phase 1** - Phase 1 will require 2- 4” Irrigation Water meters with 2- 4” Double Check Detectors to service the site installed in below grade vaults. A booster pump will be needed to operate the water cannons (100 psi). The proposed water meters and pump will be located along Walnut Hill Lane.

**Phase 2** - Phase 2 also will require 2- 4” Irrigation Water meters with 2- 4” Double Check Detectors installed in below grade vaults to service the rest of the site. A booster pump will be needed to operate the water cannons (100 psi). The proposed water meters and pump will be located along Walnut Hill Lane.

**Surface Water Supply, Groundwater Supply and Irrigation Storage**

The master plan proposes to create a large storage pond for irrigation. Prior to the implementation of reuse water as a supply source the pond is proposed to be in-line with Wesco Channel and will be supplied by surface water from the channel and local storm water run-off. It may also be supplied by wells depending on the potential for wells in this area to provide adequate supply and compliance with water rights regulations. The Elm Fork is also a potential supply source that would require a distribution system and would be subject to stringent water rights permitting and regulations. Given the distance to the Elm Fork, the permitting requirements, and the future reuse water supply potential, this is not considered to be a likely source.

The storage pond would be subject to state, local, and federal environmental permitting requirements initially. At the time when reuse water is to be stored in the pond it must be
modified to be hydraulically separate from Wesco Channel to prevent discharge of reuse water into the watercourse subject to State and Federal Guidelines.

The required distribution system for the storage pond is described below.

Water distribution from the irrigation pond will require 4-15 horse power in-line pump system. The irrigation pump will be sized for both phases of development. Phase 2 will be connected to Phase 1 booster pump by 8” piped tie-in connection.

**Irrigation Water Demand**

Irrigation water demand is presented for two different scenarios – the “establishment period” to germinate and promote growth for seeded, sprigged or sodded fields. Grass requires about 3-1/2 inches of water/rainfall per week for grass to be thoroughly rooted and established. The following calculations are based on delivering 3-1/2 inches of water to an athletic field each week to simulate rainfall. Large soccer fields will require 130,900 gallons per week and small soccer fields will require 57,750 gallons per week to obtain 3-1/2 inch saturation. Each field must be watered twice a day with about ¼ inch of water each application. Establishment periods range from two to four weeks and will vary with seasons and evaporative rates.

The "maintenance period," which commences after establishment, reduces water to provide about 1 to inch per week (including rainfall). Rates during the summer periods may require 1-1/2 inches per week (including rainfall). The following calculations are based on delivering one inch of water to an athletic field each week to simulate 1 to 1-1/2 inch of rainfall. Large soccer fields will require 37,400 to 56,000 gallons per week and small soccer fields require 16,500 to 25,000 gallons per week to obtain 1 to 1-1/2 inch saturation. Each field must be watered at least once per week. An 8 hour watering window will allow two fields to be watered each night.

**Phase 1 - Establishment Period**
765 trees, landscape beds
6 large field areas using water cannon
2 large and 5 small field areas using rotary heads
1,355,000 Total irrigation demand in gallons per week

**Phase 1 - Maintenance Period**
765 trees, landscape beds
6 large field areas using water cannon
2 large and 5 small field areas using rotary heads
388,000 to 582,000 Total irrigation demand in gallons per week

**Phase 2 - Establishment Period**
344 trees, landscape beds
8 large and 1 small field areas using water cannon
1,115,000 Total irrigation demand in gallons per week

**Phase 2 - Maintenance Period**
344 trees, landscape beds
8 large and 1 small field areas using water cannon
325,000 to 487,500 Total irrigation demand in gallons per week
If Phase 1 and Phase 2 are installed or completely repaired simultaneously, then the weekly water demand estimate to establish for 16 large fields and 6 small fields follows.

**Total for Phase 1 and 2 Establishment Period – 2,470,000 gallons per week.**
Average weekly water demand for both Phase 1 and Phase 2 (16 large fields and 6 small fields) follows.

**Total for Phase 1 and 2 Maintenance Period – 713,000 to 1,069,500 gallons per week.**

**Irrigation System Components for Landfill Areas**
The Irrigation Concept Plan in Appendix E shows water meters, pumps and mainline to service water cannons for fields in the landfill area. Approximately eight (8) - 4” pvc connections are needed to supply the Phase 1 and eleven (11) - 4” pvc connections for Phase 2 water cannons.

**Piping** – Mainline piping will be minimized in quantity to reduce damage by settlement from the landfill. Mainline pipe will require expansion joints and will be buried in trenches backfilled with sand to allow for landfill movement.

**Water Cannons** – Water cannons (or Hose reel traveling irrigators) are currently used at Breckenridge Park in Richardson (See Appendix D). To effectively water the fields, a water cannon should be specified with a hose reel extending at least 1,150’. Two cannons will be needed for Phase 1 and two more for Phase 2. Sprays extend 100 feet in radius from the cannon. Each cannon requires 100 psi for operation to spray 227 gallons per minute. Since a cannon produces a one inch water saturation rate per 102 feet of reel, it will take about 11 hours to complete one cycle. The list cost of OSMIS Travelor (Model R3-33\1150T) is $21,995 each.

**Drip Emitters** – Drip emitters and flexible pipe are recommended for trees and landscape areas.

**Irrigation System Components for Non-Landfill Areas**

**Piping** – The Irrigation Concept Plan indicates large mainline distribution throughout the site using 6” and 8” diameter pipe. These large pipes will require C-900 pvc (bell and gasket connection), concrete thrust blocks at deflection points, 36” trench depth and soil cover along with 2” sand cushion. In addition each field will require its own looped smaller mainline (Schedule 40 pvc) with solvent weld connection, concrete thrust blocks at deflection points, 24” trench depth and soil cover with 2” sand cushion.

**Irrigation Heads** – Rotor heads recommended for Soccer Fields are Hunter commercially rated 1-40 rotor series

**Drip Emitters** – Bubblers or drip emitters are recommended for trees and landscape areas.

**Controller** – The recommended controller (or clock) for the facility is Hunter ACC. The controller is indicated on the plans centrally located in the complex at the concession pavilion. The controller is expandable for both phases and will provide the following performance data.
1. Elimination of water waste and damage from broken sprinklers and pipes through real-time flow monitoring (when used with Hunter flow sensor): Learns flow by station and responds to incorrect or abnormal flow by shutting off zone and alerting the user.

2. Modular, versatile design for easy expansion: Provides easy addition of stations (expands from 12 to 42 stations in six station increments) and simplified inventory management.

3. Total programming flexibility: Six fully independent programs and four custom manual programs, to suit even the most complex landscapes.

4. Maximum day scheduling choices for each program: Users can select days of the week, odd/even dates, even ‘skip’ days.

5. Non-volatile, 100-year memory for added convenience: Retains program data and time/date settings during power outages.

6. Management of multiple water sources: ACC has two programmable pump starts/master valve outputs by station.

7. Cycle and soak capability by station: Run times divisible into repeat cycles to minimize runoff.

8. Remote control compatibility: Accommodates ICR remote control with no wiring necessary.


10. ‘No water’ window programming (unique to standalone units): User defines hours when no watering is allowed; will override any user-set programs that enter that time frame, accommodates local water restrictions.

The controller links to a weather station which calculates evapotranspiration rate (ET) for the local microclimate and increases watering efficiency, thus saving water and money. This feature enables the controller to trigger protective watering when extreme conditions threaten by combing ET information with each zone’s particular plant, soil, sun, and sprinkler data.

The controller location is indicated in the main concession area.
V. Implementation

Engineer’s Opinion of Probable Cost

The engineer’s opinion of probable cost for both phase one and phase two of the Elm Fork Athletic Complex is provided in Appendix F. The estimated costs for imported fill which accounts for a substantial amount of the total cost are preliminary in nature. A definite source of fill material has not been determined at the time of this master plan report. Two options to reduce the cost of importing fill material are being reviewed at this time. Those options are to import fill from the future Elm Fork Flood Protection projects located just south of the Elm Fork Athletic Complex and importing fill from an upcoming Trinity River Authority pipeline project along the west bank of the Elm Fork. It is assumed for estimating purposes that 200,000 cubic yards of fill material will be stockpiled on site after being transported from Elm Fork Flood Protection construction activities near California Crossing and Wildwood Drive.

Construction costs will also need to be adjusted after a complete site characterization study has been performed on the landfill areas of the project. After this site assessment is completed, expected settlement, methane generation rates, integrity of existing clay cap, and depth to the waste layer will be known across the site allowing for more accurate design and construction cost estimates.

Funding

Funding for phase one of the Elm Fork Athletic Complex is provided by 2003 City of Dallas Bond funds that was set aside for the Trinity River Group projects. Preliminary estimates for the design and construction of phase one to include 18 soccer fields and the required land acquisition totaled $6,000,000. Additional funding will be sought through other sources including; Texas Parks and Wildlife Outdoor Recreation grants, private management contracts, and 2006 bonds. Other funding sources may include onsite advertising and naming rights for the complex.

Grant Application

The Texas Parks and Wildlife Department, Texas Recreation and Parks Account offers the Outdoor Recreation Grant Program. Applications for this grant are accepted on July 31st. The amount of funding available to the TRPA was reduced from $20 million in 2002 to $5.6 million for the current fiscal year. The maximum funding request in the Outdoor Program has been reduced from $500,000 to $400,000. The program provides 50% matching grant funds to acquire and develop parkland or to renovate existing public recreation areas. Projects awarded the Outdoor Recreation Grant must be completed within 3 years of the date of award.

Development areas within the proposed Elm Fork Athletic complex that are eligible for funding include:

- **Soccer fields:** including, but not limited to site preparation/grading, lighting, fencing, irrigation, turf establishment, bleachers, goals, scoreboards, and scorers booths.
- **Picnic Facilities:** including, but not limited to pavilions, tables, shelters, grills, concrete pads, area lighting, and trash receptacles.
- **Playgrounds:** including, but not limited to surfacing, borders, equipment, benches, and lighting.
- **Trails:** including, but not limited to jogging and exercise trails, nature and hiking trails, observation stations, boardwalks, interpretive and directional signage, sidewalks and barrier free access ways to other areas/facilities.
- **Beautification:** including, but not limited to landscaping, erosion controls, dredging/restoration of water bodies, fountains, and gazebos.
- **Recreational Support Facilities:** including, but not limited to park roads, parking, fencing, utilities, irrigation, small maintenance structures, restrooms, signs, trash receptacles, service buildings with restroom, concession, storage, maintenance areas, drinking fountains, sidewalks, ramps, bleachers, scoreboards, and security/area lighting.
Elm Fork Athletic Complex
Master Plan Report – Appendices

January 17, 2007

workarchitecture

Freese and Nichols

CAYE COOK & ASSOCIATES
APPENDIX A

SITE VISIT SUMMARIES
Craig Ranch Soccer Complex

Location:

The Craig Ranch soccer complex is located at Highway 121 and Alma Road, in McKinney, Texas. The soccer complex is east of the Craig Ranch Ballfields Complex, and north of Highway 121.

Playing Fields

This newly built soccer complex, and contains thirteen (13) soccer fields, all of which meet the Federation Internationale de Football Association (FIFA) dimension standards. The play fields are approximately sixty nine (69) yards wide and one hundred seventeen (117) yards long. The existing fields are in excellent condition. Grass covering is lush and green, and is well kept by a maintenance staff. Each field is equipped with an irrigation system, with irrigation control valves located a few feet from the spectators’ zone.

There are three types of fields within the soccer complex, fields without a scoreboard, fields with a scoreboard, and the Championship Field. The majority of the fields do not possess scoreboards (fields # 1, 2, 5-12). Fields # 1 and 2 are in the southeast quadrant, and fields # 5 through 12 border the north and east quadrant of the soccer complex. Fields # 3 and 4 contain a digital scoreboard, and are located southwest of the complex. Both of these field types contain two small fixed aluminum three-row bleachers, two per field. The Championship Field is located in the center of the complex. The field is surrounded by a fence and contains two large aluminum ten-row bleachers and a scoreboard. Each soccer field is equipped with two movable square tube soccer goals without nets. Lighting is also available for each field. There are four light pole locations on every field, each containing twelve (12) lamps, or twenty-four (24) for double sided poles.

Parking

Ample parking is available within the soccer complex. There are 4 concrete paved parking areas, one small lot between field 2 and 3, one medium size between field 4 and 5, another medium size between field 8 and 9, and a large lot east of the Championship Field. An approximate total of 940 parking spaces are available, with handicap parking spaces in each lot.

Amenities

Amenities are limited in the soccer complex. There is a building northwest of Championship Field that houses a restroom facility and concession stand. Four roofed gazebos with picnic tables are located throughout the complex. A jogging trail begins at the southern entrance and passes by a small pond with a fountain.
Kiest Park

**Location:**

Kiest Park is located in southern Dallas, west of the Marvin D. Love Freeway and W. Kiest Boulevard intersection. The park is encompassed by South Hampton Road to its west, Perryton Drive to its north, Rugged Drive to its east, and W. Kiest Boulevard to its south.

**Playing Fields**

Kiest park contains tennis courts, basketball courts, a newly built softball complex, and 12 soccer fields. The soccer fields are numbered from nine (9) to twenty (20) and vary in sizes. The smallest is approximately 60’x 90’ and range up to the large professional size. The field conditions are generally poor and lack of sufficient grass coverage on the majority of the playing fields. In general, the soccer fields are positioned concentrated towards the east (fields #9-17) and south (fields #18-20) of Kiest Park. The soccer goals are fixed, steel square tubing, and lack netting. Approximately two (2) small wooden bleachers are located near each soccer field. Only three of the soccer fields (#18, 19, 20) are lighted and of the three, only field #20 is irrigated.

**Parking**

Parking spaces are generally available within close proximity to the fields. There are two lots that can accommodate twenty-two (22) and seventy-eight (78) passenger vehicles respectively. These two lots are not striped, paved in asphalt, and are in normal to poor condition. They are separated from the field and road by means of two-foot high wooden posts. Additional parking is located along the western side of the road be means of a twenty (20) foot gravel buffer zone, and extends from the northern entrance of the soccer portion of the park to the entrance from Rugged Road. The parking may be sufficient for two to three fields in use, but will not be able to accommodate more than 6 concurrent games, even with remote parking.

**Amenities**

Kiest Park’s amenities include restrooms, a recreation center, two playgrounds, and jogging/scenic trails. There are nine (9) portable restroom facilities located near the paved parking lots, and a stationary facility is located near the W. Kiest Blvd. entrance, southwest of the park. The recreation building is located south of the park, and has a paved parking lot that may accommodate approximately 80 vehicles. The two playgrounds are located southwest and north of the park. Each playground consists of coated metal and plastic materials, and has a sand and dirt ground surface. The jogging trail runs from the north to the south of the park, where it becomes a scenic trail near the southern memorial park. The softball complex in the center of the park contains concessions; it is available only during major softball events.
The Colony Five Star Complex

Location:

The Colony Five Star Complex is a newly built 80 acre recreation site that is located east of Blair Oaks, west of Paige Road, south of Arbor Glen, and north of Memorial Drive in The Colony, Texas.

Playing Field

The Colony Five Star Complex houses six lighted soccer fields, one unlighted and one light football field, five lighted small baseball fields, and two lighted large baseball fields. The existing soccer fields are in excellent conditions and are all equipped with an irrigation system. Fields are maintained by landscapers on a weekly basis. The soccer fields are generally located in the northern section of the complex, and are positioned in pairs of two. Four fields are located at the northern border, and the pairs are separated by the two football fields, and the restroom building. The last pair of soccer fields is located south of the restroom, and north of the large baseball fields. The baseball section and soccer/football section of the plaza will each have a spectator shade picnic seating area. Each field has two sections of shaded, three-row aluminum bleachers. Soccer goals are circular aluminum pipe tubes that may be relocated, with extra goals of varying sizes in reserve. Each field has a set of six 85 foot tall field lights that have seven lamps on each side.

Parking

The complex has a total of three main concrete paved and striped parking lots, with 396 parking spaces designated for the football and soccer fields, and 398 parking spaces designated for baseball.

Amenities

There are two restroom and concessions buildings located in the Five Star Complex. One is located by the baseball fields, and one north by the soccer and football fields. There are also three Shade Pavilions, two in the baseball plaza, and one in the soccer/football plaza. A 1.5 mile concrete hike/bike trail meanders the perimeter of the complex, and will connect to the future site east of Paige Road. A small maintenance facility enclosed by a screen fence is located in the northeast corner of the site. Also among the Complex’s amenities are two plastic fabricated playgrounds, one at the soccer and football section, and one centered in the baseball complex.
APPENDIX B

ORIGINAL DESIGN SCHEMATICS
APPENDIX C

LEED CREDITS AND SUSTAINABLE DESIGN
LEED credits that could be achieved at Elm Fork Athletic Complex:

- SS Credit 7.1 (1 possible point) – Landscape & exterior design to reduce heat islands, non-roof surfaces

- WE Credit 1.1 (1 possible point) – Water efficient landscaping, 50% reduction

SS Credit 7.1 (1 possible point) – Landscape & exterior design to reduce heat islands, non-roof surfaces can be met in tandem with the paving design mix of highly reflective aggregates and cement. High albedo materials should cover at least 30% of the non-roof impervious surfaces on the site.

WE Credit 1.1 (1 possible point) – Water efficient landscaping, 50% reduction could be met by using high efficiency irrigation equipment OR by using captured rain water to supplement the potable water irrigation system OR by demonstrating that potable water consumption is reduced by 50% due to use of native, low water plants, gravel and mulch beds.

There is a possibility of achieving another LEED credit under “Innovation” for utilizing the felled trees. Since a number of trees will be felled, we propose that they be shredded and chipped on site to meet TXDOT criteria for mulch additive. The shredded tree mulch would then be mixed with TXDOT approved compost which is available from the Cities of Plano and Mesquite. The compost mix is then applied onto freshly graded surfaces at a specified depth for erosion control (which has been approved by EPA). The compost mix can be blown into tubes (or socks) to stop erosion at the base of slopes. This technique has been widely used in the nation and is now being adopted and proven on many TXDOT and other projects. The compost/mulch application helps restore the soil and hastens seed germination and establishment much more quickly and efficiently than hydromulching/hydroseeding. The seed requires less watering for germination in the compost mix than in hydromulch mix. In addition, the compost/mulch mix requires less maintenance than silt fencing and can be reused on the site at the time of seeding. Grass seed is blended with the compost/mulch mix, then pneumatically blown or mechanically broadcast onto the erosion control compost mix.
The diagrams below illustrate how sustainable design principles can be implemented in a typical landscape.

1. Windbreaks and shelterbelts conserve energy, provide food and shelter for wildlife, screen unwanted views, filter dust and noise, and create microclimates which benefit plant health.
2. Berms (gradually sloped mounds of soil) help define landscape spaces by creating sloping "walls" along pathways or between different areas, elevate plants for better visibility, and improve drainage and growing conditions for plants in poor soil.
3. Native grasses tolerate a wide variety of conditions, provide food and cover for wildlife and offer year-round visual interest.
4. Groundcover plants used on steep slopes eliminate dangerous turf mowing conditions, lessen precipitation runoff and soil erosion, and provide additional visual interest and biodiversity.
5. Grouping similar plants into masses creates a stronger visual impact and interest in the landscape, copies natural plant community structure, and produces stronger edges in the landscape which are important for both aesthetics and habitat.
6. Selectively use higher maintenance turf grasses in areas of high visibility, access and use.
7. Use lower maintenance turf grasses and prairie or adapted grasses in areas of low use and access (not necessarily low visibility).
8. Use organic mulch in all planting beds to increase soil water retention, reduce weeds, visually strengthen bed lines through the color and texture contrast between the mulch and turf, minimize short-term swings in soil temperatures, and enhance soil structure and organic matter content.
9. A properly designed, installed and calibrated irrigation system minimizes uneven or wasteful water application.
10. Group plants with similar water needs to avoid over or under watering.
11. Use drip irrigation for shrub beds and other beds to minimize water waste.
12. Properly select plants for the conditions in which they are placed (example: sun and wind exposure, soil type and soil moisture conditions). Properly selected plants will ensure a healthy landscape with minimal need for chemicals or additional management.
13. Landscape “vertically” as nature does. Placing small plants and groundcovers under small trees under large trees enhances both visual and biological diversity.
14. Creating wildlife habitat draws birds and other animals, which add to the aesthetics of the landscape and offer biological control of unwanted insects.
15. Composting garden waste and applying the resulting organic matter in the landscape improves growing conditions and recycles valuable resources.
16. Using recycled and/or local-source building materials (plastic lumber, prairie fieldstone, etc.) can help develop markets for recycled products, lessen product and installation costs and visually tie developed landscapes to the character of natural landscapes.
17. Manipulating microclimates by using overhead vines, shade structures and trees enhances the livability of outdoor spaces.
18. Raised beds improve access to plants, make it easier to manage the soil, and improve growing conditions by increasing soil aeration and drainage.
19. Where feasible, use plantings to connect developed landscapes with natural landscape areas. These integrated landscapes are considered more environmentally valuable than small, scattered areas of vegetation.
APPENDIX D

SOCCER FIELD MAINTENANCE
Turfgrass Recommendations

Source: Dr. James McAfee, Associate Professor and Extension Specialist, Turfgrass Management, Texas A&M University

Given a low level of maintenance, common bermudagrass will be your best bet for the soccer fields. While buffalograss will have better drought tolerance, it will not hold up to the traffic associated with soccer.

If the fields are established from sod, I would recommend using Tifway 419. However, this variety requires more water and mowing and maybe practical for use only at the championship field.

If planting from seed, then you could use one of the common types such as Sultan. I wouldn't recommend the Sahara because it has trouble holding good color in our high pH soils. If you seed one of the common Bermuda types or plant a common sod, then the maintenance will be somewhat lower.

However, keep in mind, if the city wants to keep grass on their soccer fields, then they will need to fertilize, mow, irrigate and aerify the fields. If they do this correctly, then the difference between hybrid (Tifway) and common is not that great.

Unfortunately, if the level of maintenance is low, then it will be difficult to maintain a good stand of grass on the soccer fields. As you increase the amount of activity, you also need to increase the level of maintenance for the fields. This is why so many city parks have a difficult time keeping grass on their athletic fields.

In my opinion, perennial ryegrass is the best cool season grass for overseeding sports fields in the south. It will hold up to traffic better than the annual ryegrass and does not grow vertically so fast in the spring like the annual ryegrass, which makes it easier to mow in the spring months.

Outlined below is a basic maintenance program for common bermudagrass soccer fields.

1. Fertilization:
   a. fertilize four times per year.
   b. apply 1.0 lb. nitrogen per 1,000 sq.ft. per application using a complete fertilizer such as 28-3-10 or similar analysis.
   c. fertilize in April, June, August and late September to early October
   d. if fields are overseeded for winter play, then apply nitrogen fertilizer only in November to early December and again in late February to early March. Again, apply 1.0 lb. nitrogen per 1,000 sq.ft.

2. Mowing:
   a. mow the fields at 1.0 to 1.5 inch height.
   b. if mowing at 1.0 inch, mow three times per week and at 1.5 inch height mow twice per week.
3. Irrigation:
   a. apply approximately 1.0 inch of supplemental irrigation per week in spring and fall if adequate rainfall does not occur.
   b. in summer months, apply 1.5 to 1.75 inches of supplemental irrigation if adequate rainfall does not occur.

4. Aerification:
   a. compaction is a major problem on sports fields, especially fields built on our native clay soils.
   b. aerify the fields at least three to four times per year to control soil compaction. The more often, the better.
   c. late spring through summer months will be the best time to aerify. Use or soccer season will probably dictate how often and when the fields can be aerified.

5. Soil
   You will need to use a good sandy loam topsoil for the fields. I would recommend at least 6 inches of topsoil over the capped landfill. Also, it will be important to provide at least a 1 to 1.5% grade on the fields for surface runoff of excess water.
Soccer Field Maintenance and Management
Summary of article by Jim Puhalla, President, Sportscape International, Inc.

- Start with a soil test. Know what fertilization is necessary.
- Careful, regular inspections of fields. Once play begins, you should do a field inspection once or twice a week.
- Keep mower blades sharpened.
- Site Visits - Don't forget to walk around the field sometimes during or just after a hard rain, so you can see (and feel) for yourself how the turf is draining.
- Check for weeds in the parts of the field that get the most traffic.
- Fertilization. A maintenance program includes very aggressive fertilization, especially in the spring.
- Aeration and Topdressing. That means you can aerate the field to help the turf stay healthy. We like to use a spiker with 6" curved blades, run over the turf in 2 directions. If you topdress the field with sand, you'll smooth the divots created by the spiker, and help keep the surface as even as possible.
- Overseeding. Overseeding helps to fill in the thin spots, and keeps your field looking much better year-round.
- Mowing. We recommend mowing twice a week at a height of about 1" from May through September.
- Watering. Generally, most fields need to be watered every 3 days or so from June through September, and as needed the rest of the year to keep the soil moist.
- Weed Control. You can use a post-emergence herbicide with MSMA and 2,4-D for spot-treatment of weed problems beginning in June, but don't use any herbicides when the temperatures are very hot or very dry.

Website with tips on soccer maintenance -

http://www.soccerhelp.com/Soccer_Field_Maintenance.shtml
Personal interviews regarding soccer field maintenance.

Summary of conversations with:
Ron Smith, Plano, TX  972-941-7277, rons@plano.gov
Kevin Murray, Frisco, TX  972-941-7265
Bill Staw, Frisco, TX  972-335-5517

- Plano - no activity on Monday and Friday to let fields rest and provide time for maintenance. Allow six games per field on weekday and maximum of 12 games per field on weekend. Water heavily on Thursday so fields will be ready for weekend.
- Weed control and fertilization 5 times per year.
- Seed to establish, sod or to repair. Common Bermuda, GN3 (Gregg Norman#3), '419' Tiff.
- Russell Creek Park, 25 fields on 80-90 acres, cost is $7,500 per field, per year for maintenance.
- Mow March-October, once per week, twice per week in summer, litter crew once per week, hired an outside firm to outline the fields.
- Plano uses a shared maintenance field not on site, roving crews. Another small field (5 fields) has its own storage shed for the fields.
- Do not overseed for winter.
- Pre emergent late winter, MSMA in summer.
- Use common Bermuda or 419 hybrid.
- Aerate 2-3 times per year.
- Cost effective to have no trees and 1 BIG mower. Any time there is a concrete curb, need a maintenance employee with a trimmer and smaller mowers.
- Recommends fencing of athletic fields, and no lighting to prevent fields from being used at night.
- Requires two employees to keep players off fields on days fields are “resting”.
- Cost depends on level of care.
Roger Scott, Assistant Director of Planning, Richardson, TX.
972-744-4300 or roger.scott@cor.gov

The City of Richardson developed Breckenridge Park over a landfill and the following maintenance challenges were noted:

- The ground is not stable due to settling, when methane gas pockets release, a void is created and the ground sinks. The ground also settles when refrigerators and large appliances rust and disintegrate and leave pockets. The decomposition of grass clippings also leaves voids that appear on the surface of the fields.
- Due to ongoing settlement the City must re-grade the site on a regular basis at a cost of $40,000 per year.
- After re-grading, there is an additional cost of seeding and irrigating to start a new turf. That cost is from $10,000 to 20,000 per year.
- Citizens are unhappy with the playing fields condition year round.
- Watering is needed to establish new turf. As water seeps into the landfill, it becomes a problem in that decomposition takes place more slowly with a landfill full of water.
- The methane vents provided for the methane gas to escape into the atmosphere must be designed around.
- Gravel parking is required for developing over a landfill.

This Richardson park was built on a landfill and encompasses 417.13 acres on North Brand Road. Its facilities include:

- 3 pavilions
- 29 picnic tables
- 11 benches
- 12 soccer fields
- Playground equipment
- 10 acre lake
- 4.5 miles of trails
- Restrooms
- Open area
General Information
The turf grass on the soccer fields is common Bermuda with the exception of the Championship field which is Greg Norman #3. Irrigation is provided by a water source on site as well as use of the City water supply. A schedule of general maintenance and fertilization is kept.
Soccer fields at Breckenridge Park.
Unstable Soccer Fields

The ground is not stable due to settling, when methane gas pockets release, a void is created and the ground sinks. The ground also settles when refrigerators and large appliances rust and disintegrate and leave pockets. The decomposition of grass clippings also leaves voids that appear on the surface of the fields. Therefore, the soil needs constant grading and seeding and watering to establish new turf.

Ground movement, which is often times a sudden shift, presents a risk for players on the field. As a result of this movement, soccer fields are often not open for play due to the need for repairs.

A full-time maintenance worker is employed at the fields to monitor irrigation and ground level changes.

Soccer fields with variation of grade of up to 2
Unstable Parking Lots

Gravel parking is required for developing over a landfill. The gravel parking areas also experience a great deal of shifting in the soil. This leads to areas of water accumulation and unusable parking as well as unattractive parking.
Irrigation of Soccer Fields

The installation of an underground irrigation system for the soccer fields was not possible because of possible interference with the protective clay cap over the landfill. An above ground irrigation system is used consisting of four water canons that draw from on site water as well as from the City water supply.

These water canons require a great deal of attention from park maintenance personnel in order to position the water canons to ensure proper coverage of the fields and to manually turn the system on and off. They are also subject to vandalism.

Watering is needed to establish new turf and maintain existing. As water seeps into the landfill, it becomes a problem in that decomposition takes place more slowly with a landfill full of water. The presence of water in the landfill also leads to possible contamination of the surrounding water supply.
Lighting

Affordable lighting was not readily available. Again, due to the inability to penetrate the clay cap of the landfill with concrete footings, pole lights were not used. This limits play time and practice time on the soccer fields.

Gas Vents

- Gas vents were placed around the perimeter of the landfill. These methane tubes are provided for the methane gas to escape into the atmosphere must be designed around.

Trees

Trees are irrigated by water trucks and gator bags due to the fact that there is no underground irrigation system. A majority of these trees are dead or dying.
Fresh Kills Landfill Restoration, New York

Fresh Kills Landfill is located on the western shore of Staten Island. Approximately half the 2,200-acre landfill is composed of four mounds, or sections, identified as 1/9, 2/8, 3/4 and 6/7 which range in height from 90 feet to approximately 225 feet. These mounds are the result of more than 50 years of land filling, primarily household waste. Two of the four mounds are fully capped and closed; the other two are being prepared for final capping and closure. Fresh Kills is a highly engineered site, with numerous systems put in place to protect public health and environmental safety. However, roughly half the site has never been filled with garbage or was filled more than twenty years ago. These flatter areas and open waterways host everything from landfill infrastructure and roadways to intact wetlands and wildlife habitats. The potential exists for these areas, and eventually, the mounds themselves, to support broader and more active uses. With effective preparation now, the city can, over time, transform this controversial site into an important asset for Staten Island, the city and the region.

Before dumping began, Fresh Kills Landfill was much like the rest of northwest Staten Island. That is, most of the landfill was a salt or intertidal marsh. The topography was low-lying, with a subsoil of clay and soils of sand and silt. The remainder of the area was originally farmland, either actively farmed, or abandoned and in stages of succession.

Although Fresh Kills Landfill is not a wholly natural environment, the site has developed its own unique ecology. Today, even with four large landfill mounds on the site, forests, tidal wetlands, and freshwater wetlands still exist. One of the fundamentals of nature, adaptation, is demonstrated in the evolution of these natural features in an unnatural context.

Perhaps most representative of nature's ability to adjust to man's presence is the Isle of Meadows. Located at the mouth of the Fresh Kills Estuary, the Isle of Meadows was first harvested for its salt hay. The island then served as a repository for spoils from channel-dredging operations. Most importantly, it now serves as a source of ideal materials for herons constructing nests.

The potential value of this site is increased by the fact that the Fresh Kills Estuary lies on the Atlantic Flyway. The Flyway is a path used each spring and fall by many bird species as they migrate to the north and south. The Fresh Kills Estuary, designated by New York State as a Significant Coastal Fish and Wildlife Habitat, is one of the largest tidal wetland ecosystems in the region.
The Sustainable Establishment of Woodland on Landfill Sites - Results of a Ten-year Study

By Danielle Sinnett (U.K.)

Background

Vegetation establishment is often key to the restoration of a landfill. Previously landfills were not thought suitable for tree planting due to concerns over:

- roots penetrating through an engineered cap
  - water ingress
  - escape of gas
- root systems being shallow
  - increased risk of windthrow
- poor tree survival and performance

Potential for woodland establishment

A DoE report *The Potential for Woodland Establishment on Landfill Sites* evaluated (Dobson & Moffat, 1993):

- tree survival and health
- ability of roots to penetrate cap
- ability of roots to cause desiccation cracking of a clay cap
- risk from windthrow

Concluded that there was potential, but:

- landfills should be engineered to a suitable standard
- clay landfill cap must be well compacted (BD 1.8gcm$^{-3}$)
  - there should be sufficient soil thickness (1.5 m)

Tree establishment on landfill sites

This study aimed to support or modify the recommendations put forward by Dobson & Moffat (1993). The objectives of the research were:

- To establish woodland plots on five modern containment landfill sites to order to assess their performance
- To examine soil moisture contents in clay soils under mature woodland and grassland in order to predict the physical behavior of a clay cap under mature woodland
- To examine the interaction of tree roots and capping strategies in order to assess the potential risk from root penetration
Tree performance on landfills - Tree planting

The experimental sites were set up using forestry best practice as follows:

- Eight tree species
- Planting design was fully replicated with four blocks
- Bare rooted transplants were used, except poplar (cuttings) and Corsican pine and Leyland cypress (cell grown)
- Planted with 1.5 m spacing
- Protected from animal browsing
- Weed growth controlled

Tree performance on landfills - Methods

The following measurements were taken:

- Tree height at planting
- Condition and survival of trees assessed annually in July
- Tree height (growth increment) recorded during dormant season
  - annually between 1994 and 1999
  - every two years between 2000 and 2003
  - except Beech Farm where recorded annually until 2001
- Foliar nutrient levels

Tree performance on landfills - Nutrition results

- In 1998 three out of the 37 species and site combinations had an optimal nutrient supply
- During 1999 a nitrogen fertilizer (as urea) was added
- In 2001 four out of 37 species and site combinations had an optimal nutrient supply
- Phosphorus and potassium generally optimal under whitebeam, sycamore, white poplar, cherry and ash
- Corsican pine deficient in phosphorus and potassium at most sites
- Oak and beech have slight to moderate deficiencies in potassium

Tree performance on landfills - Summary

- Tree survival rates show clear differences in early years
- White poplar, whitebeam and ash have the highest survival rates
- Tree growth variable in early years
- First three years critical in determining survival
- Drought is an important limiting factor at restored landfill sites
- Deficiency in nitrogen and phosphorus may explain decline in growth since 1999
- Survival and growth rates highlight the need for good species selection
- The most successful species are white poplar, ash, maple, Italian alder, whitebeam, Corsican pine and beech
- The most unsuccessful species are sycamore and hybrid larch
- Climate change scenarios (Hulme et al., 2002) make it more difficult to be certain about the choice of species
Impact of tree rooting on cap integrity - Objectives

This work focused on the tree performance and root growth at one containment landfill in order to identify:

• The effects of different depths of soil cover on tree performance
• The effects of different depths of soil cover on tree rooting
• The rooting behavior of different species
• The key factors influencing or preventing root penetration and extension into the clay cap

Impact of tree rooting on cap integrity - Rooting method

The site assessments took place in 1997 and 2002, transect lines were surveyed at three positions on each ridge to examine root systems:

• Trenches were excavated within 15 cm of the tree stem
• Position of the roots in the profile were mapped and the root diameters were recorded using callipers
• Where the roots penetrated into the cap, material was dug away to reveal the end of the root

Impact of tree rooting on cap integrity - Rooting results

• The number of roots recorded in 2002 was significantly higher than in 1997
• There was no relationship between the number of roots penetrating into the cap and total root count
• Total count per tree of roots reaching the soil / cap interface was < 20
• Number of roots reaching the soil / cap interface is not related to the total number of roots
• The roots were heavily concentrated in upper 0.5 m where cap is shallow

Impact of tree rooting on cap integrity - Cap composition method

In order to characterize the composition of the soil forming material and clay cap:

• In 1997 and 2002 samples of the clay cap material were collected for bulk density determination
• In 2002 samples of the soil forming material were collected for bulk density determination
• In 2002 samples were taken from the clay cap and the soil / cap interface for macro and micromorphological analysis
  – carried out by Nottingham University

Impact of tree rooting on cap integrity - Bulk density results

• Cover soil bulk density increased with depth
• Almost all soil cover conforms to specification for restoration of disturbed land to a forestry after use (Moffat and McNeill, 1994)
• The cap material was characterized as a clay loam with localized pockets of sandy silt loam (20% sand)
• In 1997 the cap had a mean moisture content of 12% and a mean dry bulk density of 1.99 gcm⁻³
• In 2002 the cap had a bulk density of 1.66 - 2.09 gcm⁻³
Impact of tree rooting on cap integrity - Summary

- Less than 1% of observed roots had entered the landfill cap in 2002
- Italian alder and sycamore roots penetrated the cap most frequently
- Number of roots entering the cap decreases with cap depth
- Bulk density of cap did not meet current recommendations
- Cap material with adequate clay content and bulk density appeared to resist rooting
- Soil / cap interface is critical in prevention of root penetration

The sustainable establishment of woodland on landfill sites

This work supports the recommendations put forward in The Potential for Woodland Establishment on Landfill Sites that landfill are suitable for tree establishment that:

- Geological cap material should be selected with care
- Clay caps should have a bulk density of 1.8gc㎡
- At least 1.5 m of soil cover material over a mineral cap
- The soil cover should be loose, uncompacted and rootable
- The soil should have sufficient aeration, water content, nutrient levels and an appropriate pH to support growth
- Species should be selected based on site conditions
APPENDIX E

IRRIGATION CONCEPTUAL DESIGN SCHEMATIC
APPENDIX F

ENGINEER’S OPINION OF PROBABLE COST
# Opinion of Probable Construction Cost

**Elm Fork Athletic Facility**  
**Phase 1**  

City of Dallas Park and Recreation Department

Freese and Nichols, Inc.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Unit Price</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Mobilization</td>
<td>LS</td>
<td>1</td>
<td>$100,000.00</td>
<td>$100,000</td>
</tr>
<tr>
<td>2</td>
<td>Clear and Grub</td>
<td>AC</td>
<td>65</td>
<td>$500.00</td>
<td>$32,500</td>
</tr>
<tr>
<td>3</td>
<td>Place filltops</td>
<td>CY</td>
<td>200,000</td>
<td>$7.50</td>
<td>$1,500,000</td>
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<tr>
<td>4</td>
<td>Balanced Cut/Fill Wesco Resloation and Irrigation Pond</td>
<td>CY</td>
<td>105,118</td>
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<td>5</td>
<td>Topsoil treatment for turf areas</td>
<td>SY</td>
<td>69,000</td>
<td>$2.00</td>
<td>$138,000</td>
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<tr>
<td>6</td>
<td>Fine grading for bioswales</td>
<td>LF</td>
<td>100</td>
<td>$35.00</td>
<td>$3,500</td>
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<tr>
<td>7</td>
<td>Place optional drainage layer for Championship Field</td>
<td>SY</td>
<td>8,625</td>
<td>$12.00</td>
<td>$103,500</td>
</tr>
<tr>
<td>8</td>
<td>Retaining Walls (3' - 3')</td>
<td>LF</td>
<td>800</td>
<td>$15.00</td>
<td>$12,000</td>
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<tr>
<td>9</td>
<td>Temporary Construction Entrances</td>
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<td>2</td>
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<tr>
<td>10</td>
<td>12&quot; Sand Layer for Pond</td>
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<td>$2.00</td>
<td>$15,000</td>
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<tr>
<td>11</td>
<td>40 mil PVC liner for Pond</td>
<td>SF</td>
<td>223,000</td>
<td>$0.50</td>
<td>$111,500</td>
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<td>12</td>
<td>Biaxial Geogrid Reinforcement (Playing Field Areas Only)</td>
<td>SY</td>
<td>83,500</td>
<td>$2.50</td>
<td>$208,750</td>
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<tr>
<td>13</td>
<td>Silt Fence</td>
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<td>3,500</td>
<td>$2.50</td>
<td>$8,750</td>
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<tr>
<td>14</td>
<td>Temporary Rock Check Dams</td>
<td>EA</td>
<td>4</td>
<td>$5,000.00</td>
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**Utilities/Irrigation**

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<tr>
<th>Item</th>
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<tbody>
<tr>
<td>15</td>
<td>Encased 6&quot; Sanitary Sewer</td>
<td>LF</td>
<td>2,800</td>
<td>$6.00</td>
<td>$16,800</td>
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<tr>
<td>16</td>
<td>Encased 4&quot; PVC (Potable Water)</td>
<td>LF</td>
<td>1,000</td>
<td>$5.50</td>
<td>$5,500</td>
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<tr>
<td>17</td>
<td>Irrigation System (pipes, pumps, sprinkler heads, control)</td>
<td>LS</td>
<td>1</td>
<td>$370,000.00</td>
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**Storm Drainage**

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<th>Total</th>
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<tbody>
<tr>
<td>18</td>
<td>(3) 8' x 8' RCP @ Wesco</td>
<td>LF</td>
<td>300</td>
<td>$325.00</td>
<td>$97,500</td>
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<tr>
<td>19</td>
<td>Stabilized shoulder for irrigation/valley quality pond</td>
<td>LS</td>
<td>1</td>
<td>$150,000.00</td>
<td>$150,000</td>
</tr>
<tr>
<td>20</td>
<td>12&quot; HDPE</td>
<td>LF</td>
<td>200</td>
<td>$9.00</td>
<td>$1,800</td>
</tr>
<tr>
<td>21</td>
<td>Wingwalls (8)</td>
<td>EA</td>
<td>4</td>
<td>$8,500.00</td>
<td>$34,000</td>
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<tr>
<td>22</td>
<td>Rip Rap Protection</td>
<td>CY</td>
<td>1,000</td>
<td>$200.00</td>
<td>$200,000</td>
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<tr>
<td>23</td>
<td>Place optional drainage layer for Championship Field</td>
<td>SY</td>
<td>9,025</td>
<td>$12.00</td>
<td>$108,300</td>
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**Paving/Walkways/Trails**

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<tr>
<th>Item</th>
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<tr>
<td>24</td>
<td>Gravel paving</td>
<td>SF</td>
<td>319,257</td>
<td>$2.50</td>
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<tr>
<td>25</td>
<td>Driveway Connections</td>
<td>EA</td>
<td>2</td>
<td>$8,000.00</td>
<td>$16,000</td>
</tr>
<tr>
<td>26</td>
<td>Prepare subgrade for concrete paving to maintenance building</td>
<td>SF</td>
<td>35,000</td>
<td>$10.00</td>
<td>$350,000</td>
</tr>
<tr>
<td>27</td>
<td>Concrete paving to maintenance building</td>
<td>SF</td>
<td>35,000</td>
<td>$6.00</td>
<td>$210,000</td>
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<tr>
<td>28</td>
<td>Demolition/haul-off/disposal of existing concrete paving</td>
<td>SY</td>
<td>8,277</td>
<td>$7.50</td>
<td>$64,778</td>
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<tr>
<td>29</td>
<td>Barcodes, Traffic Control, Signage</td>
<td>LS</td>
<td>1</td>
<td>$10,000.00</td>
<td>$10,000</td>
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<tr>
<td>30</td>
<td>Place crushed stone for Trails/Walkways (5 wide)</td>
<td>SF</td>
<td>69,040</td>
<td>$2.50</td>
<td>$172,600</td>
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<tr>
<td>31</td>
<td>Parking Curbs</td>
<td>EA</td>
<td>652</td>
<td>$22.50</td>
<td>$14,625</td>
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<tr>
<td>32</td>
<td>Concrete sidewalk in flood plain (6 wide)</td>
<td>SF</td>
<td>20,350</td>
<td>$5.00</td>
<td>$101,650</td>
</tr>
<tr>
<td>33</td>
<td>Crushed gravel in parking medians</td>
<td>CY</td>
<td>570</td>
<td>$45.00</td>
<td>$25,650</td>
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**Buildings/Permanent Stands/Soccer Equipment**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
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<tr>
<td>34</td>
<td>Championship Area Seating</td>
<td>SF</td>
<td>20,000</td>
<td>$20.00</td>
<td>$400,000</td>
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<tr>
<td>35</td>
<td>Roof structure</td>
<td>SF</td>
<td>20,000</td>
<td>$35.00</td>
<td>$700,000</td>
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<tr>
<td>36</td>
<td>Roof fabric</td>
<td>SF</td>
<td>20,000</td>
<td>$30.00</td>
<td>$600,000</td>
</tr>
<tr>
<td>37</td>
<td>Championship Primary Pavilion</td>
<td>SF</td>
<td>8,000</td>
<td>$100.00</td>
<td>$800,000</td>
</tr>
<tr>
<td>38</td>
<td>Roof</td>
<td>SF</td>
<td>8,000</td>
<td>$100.00</td>
<td>$800,000</td>
</tr>
<tr>
<td>39</td>
<td>Championship Area Player/Referee Pavilion</td>
<td>SF</td>
<td>800</td>
<td>$150.00</td>
<td>$120,000</td>
</tr>
<tr>
<td>40</td>
<td>Site retaining walls</td>
<td>LF</td>
<td>500</td>
<td>$100.00</td>
<td>$50,000</td>
</tr>
<tr>
<td>41</td>
<td>Player sideline shelter</td>
<td>SF</td>
<td>600</td>
<td>$45.00</td>
<td>$27,000</td>
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<tr>
<td>42</td>
<td>Site Pavilion 1</td>
<td>SF</td>
<td>1,100</td>
<td>$180.00</td>
<td>$198,000</td>
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<tr>
<td>43</td>
<td>Roof</td>
<td>SF</td>
<td>3,200</td>
<td>$100.00</td>
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<tr>
<td>44</td>
<td>Maintenance facility</td>
<td>SF</td>
<td>3,800</td>
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<td>$570,000</td>
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<tr>
<td>45</td>
<td>Yard</td>
<td>SF</td>
<td>6,000</td>
<td>$10.00</td>
<td>$60,000</td>
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**Miscellaneous Soccer Items**

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<tr>
<th>Item</th>
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<th>Quantity</th>
<th>Unit Price</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>47</td>
<td>Youth Sized Soccer Goals (Moveable)</td>
<td>EA</td>
<td>16</td>
<td>$1,600.00</td>
<td>$25,600</td>
</tr>
<tr>
<td>48</td>
<td>Regulation Street Soccer Goals (Moveable, Aluminum)</td>
<td>EA</td>
<td>10</td>
<td>$2,000.00</td>
<td>$20,000</td>
</tr>
<tr>
<td>49</td>
<td>Heavy Duty Aluminum Bleachers (Seat 56 each)</td>
<td>EA</td>
<td>5</td>
<td>$2,000.00</td>
<td>$10,000</td>
</tr>
<tr>
<td>50</td>
<td>Scoreboard for Championship Field</td>
<td>EA</td>
<td>1</td>
<td>$35,000.00</td>
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[NTO03172 T:\Final Report\Elm Fork Athletic Complex Cost Estimate Jan 07, cost estimate Phase 1]
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<th>Item</th>
<th>Description</th>
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<tr>
<td>51</td>
<td>Galvanized steel fence, 8' height, along Walnut Hill Lane</td>
<td>LF</td>
<td>1,500</td>
<td>$80.00</td>
<td>$120,000.00</td>
</tr>
<tr>
<td>52</td>
<td>Galvanized gate, motorized at entry</td>
<td>LF</td>
<td>60</td>
<td>$100.00</td>
<td>$6,000.00</td>
</tr>
<tr>
<td>53</td>
<td>6' Chain link fence, vinyl coated @ maintenance area</td>
<td>LF</td>
<td>2,000</td>
<td>$25.00</td>
<td>$50,000.00</td>
</tr>
<tr>
<td>54</td>
<td>2 Chain link gates, vinyl coated, motorized @ maintenance area</td>
<td>LF</td>
<td>90</td>
<td>$40.00</td>
<td>$3,600.00</td>
</tr>
<tr>
<td>55</td>
<td>Temporary 6' chain link fence</td>
<td>LF</td>
<td>1,500</td>
<td>$20.00</td>
<td>$30,000.00</td>
</tr>
</tbody>
</table>

**LANDSCAPING AND TURF**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Units</th>
<th>Quantity</th>
<th>Unit Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>3' caliber steel trees</td>
<td>EA</td>
<td>37</td>
<td>$500.00</td>
<td>$18,500.00</td>
</tr>
<tr>
<td>57</td>
<td>2' caliber site trees</td>
<td>EA</td>
<td>728</td>
<td>$350.00</td>
<td>$254,800.00</td>
</tr>
<tr>
<td>58</td>
<td>Saplings in woodland/riparian areas</td>
<td>EA</td>
<td>1,480</td>
<td>$25.00</td>
<td>$37,000.00</td>
</tr>
<tr>
<td>59</td>
<td>Seed mix for riparian, woodland and bioswale vegetation</td>
<td>SF</td>
<td>993.500</td>
<td>$3.00</td>
<td>$2,975.00</td>
</tr>
<tr>
<td>60</td>
<td>Buffer area - seeded with buffalograss, blue grama</td>
<td>SF</td>
<td>702.500</td>
<td>$0.15</td>
<td>$105.375</td>
</tr>
<tr>
<td>61</td>
<td>Turf for Soccer field sprigged</td>
<td>SF</td>
<td>1,213.000</td>
<td>$0.20</td>
<td>$242,600.00</td>
</tr>
<tr>
<td>62</td>
<td>Willdflower/native grass along Walnut Hill</td>
<td>SF</td>
<td>50.000</td>
<td>$0.20</td>
<td>$10,000.00</td>
</tr>
<tr>
<td>63</td>
<td>Soil/compost mix, 3 inch depth for grass</td>
<td>CY</td>
<td>24,200</td>
<td>$3.00</td>
<td>$72,600.00</td>
</tr>
<tr>
<td>64</td>
<td>Soil/compost mix for trees</td>
<td>CY</td>
<td>250</td>
<td>$35.00</td>
<td>$8,750.00</td>
</tr>
<tr>
<td>65</td>
<td>Landscaping at main concession</td>
<td>LS</td>
<td>1</td>
<td>$15,000.00</td>
<td>$15,000.00</td>
</tr>
</tbody>
</table>

**METHANE COLLECTION AND VENTING**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Units</th>
<th>Quantity</th>
<th>Unit Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>66</td>
<td>6&quot; Steel PVC Methane Collection Wells (10' Depth)</td>
<td>EA</td>
<td>12</td>
<td>$1,500.00</td>
<td>$18,000.00</td>
</tr>
<tr>
<td>67</td>
<td>6&quot; PVC</td>
<td>LF</td>
<td>4,000</td>
<td>$3.00</td>
<td>$12,000.00</td>
</tr>
<tr>
<td>68</td>
<td>6&quot; Stainless Steel Vent</td>
<td>EA</td>
<td>2</td>
<td>$15,000.00</td>
<td>$30,000.00</td>
</tr>
<tr>
<td>69</td>
<td>Foundation Venting for Structures (8% of Landfill Area Building Costs)</td>
<td>LS</td>
<td>1</td>
<td>$59,000.00</td>
<td>$59,000.00</td>
</tr>
</tbody>
</table>

**LIGHTING/ELECTRICAL**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Units</th>
<th>Quantity</th>
<th>Unit Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>Lighting System for 7 Fields</td>
<td>LS</td>
<td>1</td>
<td>$1,500,000</td>
<td>$1,500,000</td>
</tr>
</tbody>
</table>

**MISCELLANEOUS SITE AMENITIES**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Units</th>
<th>Quantity</th>
<th>Unit Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>71</td>
<td>Entry Sign @ Walnut Hill</td>
<td>EA</td>
<td>1</td>
<td>$30,000.00</td>
<td>$30,000.00</td>
</tr>
<tr>
<td>72</td>
<td>Entry sign @ Goodnight Lane</td>
<td>EA</td>
<td>1</td>
<td>$5,000.00</td>
<td>$5,000.00</td>
</tr>
<tr>
<td>73</td>
<td>Signage with rules</td>
<td>EA</td>
<td>9</td>
<td>$3,000.00</td>
<td>$27,000.00</td>
</tr>
<tr>
<td>74</td>
<td>Directional signs</td>
<td>EA</td>
<td>3</td>
<td>$3,000.00</td>
<td>$9,000.00</td>
</tr>
<tr>
<td>75</td>
<td>Supergraphic for Screening</td>
<td>EA</td>
<td>2</td>
<td>$12,500.00</td>
<td>$25,000.00</td>
</tr>
</tbody>
</table>

**ENGINEERING DESIGN AND REUSE STUDY, ENVIRONMENTAL PERMITTING, AND LAND ACQUISITION**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Units</th>
<th>Quantity</th>
<th>Unit Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>76</td>
<td>Engineering Design and Reuse Study</td>
<td>LS</td>
<td>1</td>
<td>$800,000.00</td>
<td>$800,000.00</td>
</tr>
<tr>
<td>77</td>
<td>Environmental Permitting (Credits, 1990 LF Disturbed)</td>
<td>LS</td>
<td>1</td>
<td>$900,000.00</td>
<td>$900,000.00</td>
</tr>
</tbody>
</table>

Subtotal Design and Construction: $14,570,789

19% Contingency

PROJECT TOTAL: $16,756,384

* Reuse water distribution costs are not estimated.
## EARTHWORK/GRADING/EROSION CONTROL

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Unit Price</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mobilization</td>
<td>LS</td>
<td>1</td>
<td>$100,000.00</td>
<td>$100,000.00</td>
</tr>
<tr>
<td>2</td>
<td>Clear and Grub</td>
<td>AC</td>
<td>38</td>
<td>$500.00</td>
<td>$19,000.00</td>
</tr>
<tr>
<td>3</td>
<td>Place fill/topsoil **</td>
<td>CY</td>
<td>190,000</td>
<td>$7.50</td>
<td>$1,425,000.00</td>
</tr>
<tr>
<td>4</td>
<td>Excavate/Haul/Dispose of concrete debris (optional)</td>
<td>CY</td>
<td>500,000</td>
<td>$2.50</td>
<td>$1,250,000.00</td>
</tr>
<tr>
<td>5</td>
<td>Topsoil treatment for turf areas</td>
<td>SY</td>
<td>69,000</td>
<td>$2.00</td>
<td>$138,000.00</td>
</tr>
<tr>
<td>6</td>
<td>Fine grading for bioswales</td>
<td>LF</td>
<td>100</td>
<td>$35.00</td>
<td>$3,500.00</td>
</tr>
<tr>
<td>7</td>
<td>Retaining Walls (0' - 3')</td>
<td>LF</td>
<td>650</td>
<td>$15.00</td>
<td>$9,750.00</td>
</tr>
<tr>
<td>8</td>
<td>Temporary Construction Entrances</td>
<td>EA</td>
<td>1</td>
<td>$8,000.00</td>
<td>$8,000.00</td>
</tr>
<tr>
<td>9</td>
<td>Biaxial Geogrid Reinforcement (Playing Field Areas Only)</td>
<td>SY</td>
<td>86,000</td>
<td>$2.50</td>
<td>$215,000.00</td>
</tr>
<tr>
<td>10</td>
<td>Silt Fence</td>
<td>LF</td>
<td>3,500</td>
<td>$2.50</td>
<td>$8,750.00</td>
</tr>
</tbody>
</table>

## UTILITIES/IRRIGATION

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Unit Price</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>6&quot; Sanitary Sewer</td>
<td>LF</td>
<td>1,000</td>
<td>$4.00</td>
<td>$4,000.00</td>
</tr>
<tr>
<td>11</td>
<td>4&quot; PVC (Potable Water)</td>
<td>LF</td>
<td>1,000</td>
<td>$3.50</td>
<td>$3,500.00</td>
</tr>
<tr>
<td>12</td>
<td>Irrigation System (pipes, pumps, sprinkler heads, control)</td>
<td>LS</td>
<td>1</td>
<td>$140,000.00</td>
<td>$140,000.00</td>
</tr>
</tbody>
</table>

## STORM DRAINAGE

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Unit Price</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>12&quot; HDPE</td>
<td>LF</td>
<td>200</td>
<td>$9.00</td>
<td>$1,800.00</td>
</tr>
</tbody>
</table>

## PAVING/WALKWAYS/TRAILS

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Unit Price</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Gravel paving</td>
<td>SF</td>
<td>231,793</td>
<td>$2.50</td>
<td>$579,483</td>
</tr>
<tr>
<td>15</td>
<td>Driveway Connections</td>
<td>EA</td>
<td>2</td>
<td>$8,000.00</td>
<td>$16,000.00</td>
</tr>
<tr>
<td>16</td>
<td>Barricades, Traffic Control, Signage</td>
<td>LS</td>
<td>1</td>
<td>$10,000.00</td>
<td>$10,000.00</td>
</tr>
<tr>
<td>17</td>
<td>Place crushed stone for Trails/Walkways (6' wide walkways)</td>
<td>SF</td>
<td>59,360</td>
<td>$2.00</td>
<td>$118,720.00</td>
</tr>
<tr>
<td>18</td>
<td>Parking Curbs</td>
<td>EA</td>
<td>482</td>
<td>$22.50</td>
<td>$10,845.00</td>
</tr>
<tr>
<td>19</td>
<td>Board walk in nature trail (6' wide walkway)</td>
<td>SF</td>
<td>10,200</td>
<td>$12.00</td>
<td>$122,400.00</td>
</tr>
<tr>
<td>20</td>
<td>Mulch trail in nature area (6' wide walkway)</td>
<td>SF</td>
<td>9,600</td>
<td>$1.00</td>
<td>$9,600.00</td>
</tr>
</tbody>
</table>

## BUILDINGS/PERMANENT STANDS/SOCCER EQUIPMENT

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Unit Price</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Site Pavilion 2</td>
<td>SF</td>
<td>1,100</td>
<td>$180.00</td>
<td>$198,000.00</td>
</tr>
<tr>
<td>22</td>
<td>Roof</td>
<td>SF</td>
<td>3,200</td>
<td>$100.00</td>
<td>$320,000.00</td>
</tr>
<tr>
<td>23</td>
<td>Site Pavilion 3</td>
<td>SF</td>
<td>1,100</td>
<td>$180.00</td>
<td>$198,000.00</td>
</tr>
<tr>
<td>24</td>
<td>Roof</td>
<td>SF</td>
<td>3,200</td>
<td>$100.00</td>
<td>$320,000.00</td>
</tr>
</tbody>
</table>

## Miscellaneous Soccer Items

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Unit Price</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>Youth Sized Soccer Goals (Moveable)</td>
<td>EA</td>
<td>2</td>
<td>$1,600.00</td>
<td>$3,200.00</td>
</tr>
<tr>
<td>26</td>
<td>Regulation Sized Soccer Goals (Moveable, Aluminum)</td>
<td>EA</td>
<td>16</td>
<td>$2,000.00</td>
<td>$32,000.00</td>
</tr>
<tr>
<td>27</td>
<td>Heavy Duty Aluminum Bleachers (Seat 55 each)</td>
<td>EA</td>
<td>4</td>
<td>$2,500.00</td>
<td>$10,000.00</td>
</tr>
<tr>
<td>PERIMETER FENCING AND GATES</td>
<td>LF</td>
<td>$80.00</td>
<td>$64,000.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-----</td>
<td>--------</td>
<td>------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28 Galvanized steel fence, 6' height, along Walnut Hill Lane</td>
<td>800</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29 6' Chain link fence, vinyl coated @ along west property lines</td>
<td>2,450</td>
<td>$25.00</td>
<td>$61,250.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 2 Chain link gates, vinyl coated, motorized @ maintenance area</td>
<td>80</td>
<td>$40.00</td>
<td>$3,200.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31 Remove temporary 6' chain link fence</td>
<td>1,500</td>
<td>$5.00</td>
<td>$7,500.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LANDSCAPING AND TURF</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>32 3&quot; caliper street trees</td>
<td>EA</td>
<td>44</td>
<td>$500.00</td>
</tr>
<tr>
<td>33 2&quot; caliper site trees</td>
<td>EA</td>
<td>300</td>
<td>$350.00</td>
</tr>
<tr>
<td>34 Saplings in woodland/riparian areas</td>
<td>EA</td>
<td>1,290</td>
<td>$25.00</td>
</tr>
<tr>
<td>35 Seed mix for riparian, woodland and bioswale vegetation</td>
<td>SF</td>
<td>513,700</td>
<td>0.20</td>
</tr>
<tr>
<td>36 Buffer area - seeded with buffalograss, blue grama</td>
<td>SF</td>
<td>240,000</td>
<td>0.15</td>
</tr>
<tr>
<td>37 Turf for Soccer field, sprigged</td>
<td>SF</td>
<td>985,250</td>
<td>0.20</td>
</tr>
<tr>
<td>38 Wiffower/native grass along Walnut Hill</td>
<td>SF</td>
<td>32,800</td>
<td>0.20</td>
</tr>
<tr>
<td>39 Soil/compost mix, 3 inch depth for grass</td>
<td>CY</td>
<td>16,450</td>
<td>35.00</td>
</tr>
<tr>
<td>40 Soil/compost mix for trees</td>
<td>CY</td>
<td>100</td>
<td>35.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>METHANE COLLECTION AND VENTING</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>41 6&quot; Slotted PVC Methane Collection Wells (10' Depth)</td>
<td>EA</td>
<td>9</td>
<td>$1,500.00</td>
</tr>
<tr>
<td>42 6&quot; PVC</td>
<td>LF</td>
<td>2,700</td>
<td>3.00</td>
</tr>
<tr>
<td>43 6&quot; Stainless Steel Vent</td>
<td>EA</td>
<td>1</td>
<td>$15,000.00</td>
</tr>
<tr>
<td>44 Foundation Venting for Structures (8% of Landfill Area Building Costs)</td>
<td>LS</td>
<td>1</td>
<td>$31,680.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LIGHTING/ELECTRICAL</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>45 Lighting System for 5 Fields (3 mounted on Phase 1 poles)</td>
<td>LS</td>
<td>1</td>
<td>$225,000.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MISCELLANEOUS SITE AMENITIES</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>46 Overlook</td>
<td>EA</td>
<td>1</td>
<td>$30,000.00</td>
</tr>
<tr>
<td>47 Entry sign @ Spangler Road</td>
<td>EA</td>
<td>1</td>
<td>$5,000.00</td>
</tr>
<tr>
<td>48 Signage with rules</td>
<td>EA</td>
<td>3</td>
<td>$3,000.00</td>
</tr>
<tr>
<td>49 Directional signs</td>
<td>EA</td>
<td>2</td>
<td>$3,000.00</td>
</tr>
<tr>
<td>50 Entry sign @ Nature area with rules</td>
<td>EA</td>
<td>1</td>
<td>$5,000.00</td>
</tr>
<tr>
<td>51 Informational signs on nature trail</td>
<td>EA</td>
<td>10</td>
<td>$1,500.00</td>
</tr>
</tbody>
</table>

| ENGINEERING DESIGN, ENVIRONMENTAL PERMITTING, AND LAND ACQUISITION |     |        |            |
|=================================================================|-----|--------|------------|
| 52 Engineering Design                                           | LS  | 1     | $500,000.00 | $500,000.00 |
| 53 Environmental Permitting                                    | LS  | 1     | $100,000.00 | $100,000.00 |
| 54 Land Acquisition                                             | LS  | 1     | $200,000.00 | $200,000.00 |

Subtotal Design and Construction: $7,654,628
15% Contingency: $1,148,194

PROJECT TOTAL: $8,802,822

* Reuse water distribution costs are not estimated.
APPENDIX G

PRESENTATION SLIDES
The City of Dallas is pursuing the development of a premiere soccer facility situated on approximately 160 acres bounded by Walnut Hill Lane on the north, Goodnight Lane on the east, DART/BNSF railroad on the south, and Spangler Road on the west. The master plan incorporates youth and adult soccer fields in a layout that provides; centralized parking that is convenient to all fields, restrooms, concessions, storage facilities, a perimeter nature trail, irrigation system, and a field lighting system.
EFAC is situated on approximately 160 acres just south of Walnut Hill Lane with access available from IH35. Approximately 15 minutes from downtown Dallas the site is along the Elm Fork corridor on the former Walnut Hill Landfill.

IH35 & Walnut Hill Lane
site analysis

The site is comprised of three ecosystems; forested floodplain, landfill, and channelized stream.

existing conditions.
phasing diagram

Three phases are proposed:

**Phase 1** will consist of:
- 13 total playing fields (8 adult & 5 youth)
- the championship field
- a Main Pavilion with restroom, concession and storage.
- 1 smaller pavilion providing restrooms and vending.
- 2 gated entry/exit points
- 660 parking spaces distributed across site
- an on site maintenance facility
- an irrigation pond along Wesco channel
- approximately 1.5 miles of walking paths

**Phase 2A** will complete the playing fields with:
- 9 playing fields (8 adult & 1 youth) making a total complex of 22 fields
- 2 smaller pavilions with restrooms and vending
- the addition of a 3rd entry/exit point
- 530 parking spaces bring the total parking count to 1,190 spaces or 54 spaces per field
- approximately 1.6 miles of additional walking paths

**Phase 2B** will complete the development with:
- a trailhead pavilion with 46 parking spaces
- 0.3 mile accessible nature trail
- 0.5 mile additional nature trails connecting to other walking paths on site bringing total paths to almost 4 miles

phase 1, 2A, & 2B
**Program**
- 22 playing fields (16 adult & 6 youth)
- championship field
- 1,200 parking spaces close to fields
- amenity buildings scattered across site
- maintenance facility with easy access to Goodnight Lane

**Circulation**
- separated pedestrian and vehicle paths
- approximately 4 miles of paths and trails throughout site
- 3 entry/exit points for easy traffic management
Riparian trees:
- Box elder (Acer negundo)
- Catalpa (Catalpa bignonioides)
- Pecan (Carya illinoensis)
- Willows (Salix spp.) and
- Black Locust (Robinia pseudacacia)
- Honey Locust (Gleditsia triacanthos)
- Soapberry (Sapindus drummondii)
- Sumac (Rhus spp.)
- Waxmyrtle (Myrica cerifera)
- Eastern Red Cedar (Juniperus virginiana)
- Creek Plum (Prunus spp.)

**Bioswale Grasses and Vegetation:**
- Green Sprangletop (Leptochloa dubia)
- Prairie Wildrye (Elymus canadensis)
- Eastern Gamagrass (Tripsacum dactyloides)
- Switchgrass (Panicum virgatum)
- Big Bluestem (Andropogon gerardii)
- Buttonbush (Cephalanthus occidentalis)
- White-topped Sedge (Dickromemiana colorata)
- Spike rush (Eleocharis spp.)
- Cutleaf Daisy (Engelmannia pinnatifida)
- Swamp Sunflower (Helianthus angustifolius)
- Lizard tail (Saururus cernuus)

**Turf grass for fields**
- Bermudagrass (Cynodon dactylon cv.)
- Tif Bermudagrass (Cynodon dactylon cv.)- championship

**Turf between fields**
- Common Bermudagrass (Cynodon dactylon)

**Turf outside regular mowing area**
- Blue Grama (Bouteloua gracilis)
- Buffalograss (Buchloe dactyloides)

**Shallow rooted trees for landfill:**
- Cottonwood (Populus deltoides)
- Hackberry/Sugarberry (Celtis laevigata)
- Red Maple (Acer rubrum)
- Ash (Fraxinus spp.)
- Sweetgum (Liquidambar styraciflua)
- Tuliptree (Liriodendron tulipifera)
- Red oak (Quercus shumardii)
- Live oak (Quercus virginiana)
- Honey Locust (Gleditsia)
- Black Willow (Salix nigra)
- Cedar Elm (Ulmus crassifolia)

**Woodland Grasses and Wildflowers:**
- Blue Grama (Bouteloua gracilis)
- Buffalograss (Buchloe dactyloides)
- Sideoats Grama (Bouteloua curtipendula)
- Prairie Wildrye (Elymus canadensis)
- Inland Sea Oats (Chasmanthium latifolium)
- Purple Coneflower (Echinacea purpurea)
- Lanceleaf Coreopsis (Coreopsis lanceolata)
- Drummond Phlox (Phlox drummondii)
- obedient Plant (Physostegia intermedia)
- Western Ironweed (Vernonia baldwinii)
- Cutleaf Daisy (Engelmannia pinnatifida)

**Riparian Woodland Grasses and Wildflowers:**
- Switchgrass (Panicum virgatum)
- Blue Grama (Bouteloua gracilis)
- Green Sprangletop (Leptochloa dubia)
- Indiangrass (Sorghastrum nutans)
- Little Bluestem (Schizachyrium scoparium)
- Prairie Wildrye (Elymus canadensis)
- Sand Dropseed (Sporobolus cryptandrus)
- Sand Lovegrass (Eragrostis trichodes)
- Sideoats Grama (Bouteloua curtipendula)
- Cutleaf Daisy (Engelmannia pinnatifida)
- Goldenrod (Solidago altissima)

**Partial list**
The Master Plan shows individual proposed trees will line the public streets, access roads and parking lots to visibly outline the fields and to give shade to site users.

Additional trees will shade structures and adjacent plazas. The trees are regularly spaced along the roadways and in parking lots but quickly blend into informal spacing away from the vehicular areas. We recommend using decomposed and crushed granite in the parking lot medians due to high pedestrian traffic and to reduce watering and maintenance costs.

Proposed native vegetation stands will serve to stabilize the creek bank, buffer adjacent land uses and accent bioswales. The master landscape plan indicates planting to restore native riparian vegetation along relocated Wesco Channel and the detention pond. Stands of native woodlands are recommended in Phase 1 and Phase 2 to provide natural vegetative buffers against adjacent land uses. Phase 2 shows a large woodland/grassland area in the northwest corner of the site to screen concrete recycling operation.

Bioswales are indicated on the plan and will be formed to capture storm water drainage from the soccer fields. Bioswales will be seeded and planted with native grasses and perennials to that tolerate wet soils.
The primary focus of the Elm Fork Athletic complex is to provide outdoor recreation including soccer, hiking, birding, picnic areas and a children's playground.
A total of 4 miles of hard and soft path trails throughout the 160 acres will link to the Dallas City and Dallas County Trail networks via the Elm Fork Trinity Trail and a trail extension along Walnut Hill Lane to Luna Road.
The focal point of the complex, the championship soccer field, is where all activities connect and people can gather under a large pavilion. The main pavilion includes concessions, restrooms and areas for storage.

Main Pavilion:
- 10,000sf covered area
- concession facility
- restroom facility
- storage

The championship area is split into east and west zones. The west side includes a sprawling grandstand with both covered step seating for over 1,500 spectators and an open concourse where additional concession or group gathering takes place. Further west and down a natural sloping lawn from the grandstands are open picnic areas under shade trees with a playground easily observed from the seating and picnic areas. All of this sits adjacent to the Wesco pond with diverse plant life and a connection to the site trail system. The east zone includes player seating and warm up areas with private spaces for referees and storage for field equipment. The player area is separated from an upper lawn seating area that is close to parking and allows for more casual picnicking while watching a game.

Competitive Play Area:
- 24,000sf covered open concourse and seating
- seating steps
- lawn seating
- separated player seating
- player warm up area
- referee area
- field storage

Other Amenities:
- youth playground viewable from open concourse
- picnic areas
championship field

activity
In addition to the championship area and equally spaced throughout the site are three shade pavilions with restroom facilities and supporting storage plus food and beverage vending opportunities. These pavilions offer shade from the sun and a place for meeting before or after playing a game, hiking or just enjoying the outdoors.

Shade Pavilion
- 4,800sf of covered area
- restrooms
- vending or remote concessions
- storage