- The anchors should be 3/8-inch diameter rebar stakes that are 18-inches long.

Installation:

- Lay out the brush berm following the contour as closely as possible.
- The juniper limbs should be cut and hand placed with the vegetated part of the limb in close contact with the ground. Each subsequent branch should overlap the previous branch providing a shingle effect.
- The brush berm should be constructed in lifts with each layer extending the entire length of the berm before the next layer is started.
- A trench should be excavated 6-inches wide and 4-inches deep along the length of the barrier and immediately uphill from the barrier.
- The filter fabric should be cut into lengths sufficient to lay across the barrier from its up-slope base to just beyond its peak. The lengths of filter fabric should be draped across the width of the barrier with the uphill edge placed in the trench and the edges of adjacent pieces overlapping each other. Where joints are necessary, the fabric should be spliced together with a minimum 6-inch overlap and securely sealed.
- The trench should be backfilled and the soil compacted over the filter fabric.
- Set stakes into the ground along the downhill edge of the brush barrier, and anchor the fabric by tying rope from the fabric to the stakes. Drive the rope anchors into the ground at approximately a 45-degree angle to the ground on 6-foot centers.
- Fasten the rope to the anchors and tighten berm securely to the ground with a minimum tension of 50 pounds.
- The height of the brush berm should be a minimum of 24 inches after the securing ropes have been tightened.

Stone Outlet Sediment Traps

A stone outlet sediment trap is an impoundment created by the placement of an earthen and stone embankment to prevent soil and sediment loss from a site. The purpose of a sediment trap is to intercept sediment-laden runoff and trap the sediment in order to protect drainage ways, properties and rights of way below the sediment trap from sedimentation. A sediment trap is usually installed at points of discharge from disturbed areas. The drainage area for a sediment trap is recommended to be less than 5 acres.

Larger areas should be treated using a sediment basin. A sediment trap differs from a sediment basin mainly in the type of discharge structure. The trap should be located to obtain the maximum storage benefit from the terrain, for ease of clean out and disposal of the trapped sediment and to minimize interference with construction activities. The volume of the trap should be at least 3600 cubic feet per acre of drainage area.

Materials:

- All aggregate should be at least 3 inches in diameter and should not exceed a volume of 0.5 cubic foot.
- The geotextile fabric specification should be woven polypropylene, polyethylene or polyamide geotextile, minimum unit weight of 4.5 oz/yd 2, mullen burst strength at least 250 lb/in 2, ultraviolet stability exceeding 70%, and equivalent opening size exceeding 40.

Installation:

- Earth Embankment: Place fill material in layers not more than 8 inches in loose depth. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content of the material. Compact each layer to 95 percent standard proctor density. Do not place material on surfaces that are muddy or frozen. Side slopes for the embankment are to be 3:1. The minimum width of the embankment should be 3 feet.
- A gap is to be left in the embankment in the location where the natural confluence of runoff crosses the embankment line. The gap is to have a width in feet equal to 6 times the drainage area in acres.
- Geotextile Covered Rock Core: A core of filter stone having a minimum height of 1.5 feet and a minimum width at the base of 3 feet should be placed across the opening of the earth embankment and should be covered by geotextile fabric which should extend a minimum distance of 2 feet in either direction from the base of the filter stone core.
- Filter Stone Embankment: Filter stone should be placed over the geotextile and is to have a side slope which matches that of the earth embankment of 3:1 and should cover the geotextile/rock core a minimum of 6 inches when installation is complete. The crest of the outlet should be at least 1 foot below the top of the embankment.

Sediment Basins:

The purpose of a sediment basin is to intercept sediment-laden runoff and trap the sediment in order to protect drainage ways, properties and rights of way below the sediment basin from sedimentation. A sediment basin is usually installed at points of discharge from disturbed areas. The drainage area for a sediment basin is recommended to be less than 100 acres.

Sediment basins are effective for capturing and slowly releasing the runoff from larger disturbed areas thereby allowing sedimentation to take place. A sediment basin can be created where a permanent pond BMP is being constructed. Guidelines for construction of the permanent BMP should be followed, but revegetation, placement of underdrain piping, and installation of sand or other filter media should not be carried out until the site construction phase is complete.

Attachment 4
Description of BMPs

Materials:

- Riser should be corrugated metal or reinforced concrete pipe or box and should have watertight fittings or end to end connections of sections.
- An outlet pipe of corrugated metal or reinforced concrete should be attached to the riser and should have positive flow to a stabilized outlet on the downstream side of the embankment.
- An anti-vortex device and rubbish screen should be attached to the top of the riser and should be made of polyvinyl chloride or corrugated metal.

Basin Design and Construction:

- For common drainage locations that serve an area with ten or more acres disturbed at one time, a sediment basin should provide storage for a volume of runoff from a two-year, 24-hour storm from each disturbed acre drained.
- The basin length to width ratio should be at least 2:1 to improve trapping efficiency. The shape may be attained by excavation or the use of baffles. The lengths should be measured at the elevation of the riser de-watering hole.
- Place fill material in layers not more than 8 inches in loose depth. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content of the material. Compact each layer to 95 percent standard proctor density. Do not place material on surfaces that are muddy or frozen. Side slopes for the embankment should be 3:1 (H:V).
- An emergency spillway should be installed adjacent to the embankment on undisturbed soil and should be sized to carry the full amount of flow generated by a 10-year, 3-hour storm with 1 foot of freeboard less the amount which can be carried by the principal outlet control device.
- The emergency spillway should be lined with riprap as should the swale leading from the spillway to the normal watercourse at the base of the embankment.
- The principal outlet control device should consist of a rigid vertically oriented pipe or box of corrugated metal or reinforced concrete. Attached to this structure should be a horizontal pipe, which should extend through the embankment to the toe of fill to provide a de-watering outlet for the basin.
- An anti-vortex device should be attached to the inlet portion of the principal outlet control device to serve as a rubbish screen.
- A concrete base should be used to anchor the principal outlet control device and should be sized to provide a safety factor of 1.5 (downward forces = 1.5 buoyant forces).
- The basin should include a permanent stake to indicate the sediment level in the pool and marked to indicate when the sediment occupies 50% of the basin volume (not the top of the

stake).

- The top of the riser pipe should remain open and be guarded with a trash rack and anti-vortex device. The top of the riser should be 12 inches below the elevation of the emergency spillway. The riser should be sized to convey the runoff from the 2-year, 3-hour storm when the water surface is at the emergency spillway elevation. For basins with no spillway the riser must be sized to convey the runoff from the 10-yr, 3-hour storm.
- Anti-seep collars should be included when soil conditions or length of service make piping through the backfill a possibility.
- The 48-hour drawdown time will be achieved by using a riser pipe perforated at the point measured from the bottom of the riser pipe equal to ½ the volume of the basin. This is the maximum sediment storage elevation. The size of the perforation may be calculated as follows:

$$Ao = \frac{As \times \sqrt{2h}}{Cd \times 980{,}000}$$

Where:
A_o = Area of the de-watering hole, ft 2
A_s = Surface area of the basin, ft 2
C_d = Coefficient of contraction, approximately 0.6
h = head of water above the hole, ft
Perforating the riser with multiple holes with a combined surface area equal to A_o is acceptable.

Erosion Control Compost

Description: Erosion control compost (ECC) can be used as an aid to control erosion on critical sites during the establishment period of protective vegetation. The most common uses are on steep slopes, swales, diversion dikes, and on tidal or stream banks.

Materials:

New types of erosion control compost are continuously being developed. The Texas Department of Transportation (TxDOT) has established minimum performance standards which must be met for any products seeking to be approved for use within any of TxDOT's construction or maintenance activities. Material used within any TxDOT construction or maintenance activities must meet material specifications in accordance with current TxDOT specifications. TxDOT maintains a website at http://www.txdot.gov/business/contractors_consultants/recycling/compost.htm that provides information on compost specification data.

Attachment 4
Description of BMPs

ECC used for projects not related to TxDOT should also be of quality materials by meeting performance standards and compost specification data. To ensure the quality of compost used as an ECC, products should meet all applicable state and federal regulations, including but not limited to the United States Environmental Protection Agency (USEPA) Code of Federal Regulations (CFR), Title 40, Part 503 Standards for Class A biosolids and Texas Natural Resource Conservation Commission (now named TCEQ) Health and Safety Regulations as defined in the Texas Administration Code (TAC), Chapter 332, and all other relevant requirements for compost products outlined in TAC, Chapter 332. Testing requirements required by the TCEQ are defined in TAC Chapter 332, including Sections §332.71 Sampling and Analysis Requirements for Final Products and §332.72 Final Product Grades. Compost specification data approved by TxDOT are appropriate to use for ensuring the use of quality compost materials or for guidance.

Testing standards are dependent upon the intended use for the compost and ensures product safety, and product performance regarding the product's specific use. The appropriate compost sampling and testing protocols included in the United States Composting Council (USCC) Test Methods for the Examination of Composting and Compost (TMECC) should be conducted on compost products used for ECC to ensure that the products used will not impact public health, safety, and the environment and to promote production and marketing of quality composts that meet analytical standards. TMECC is a laboratory manual that provides protocols for the composting industry and test methods for compost analysis. TMECC provides protocols to sample, monitor, and analyze materials during all stages of the composting process. Numerous parameters that might be of concern in compost can be tested by following protocols or test methods listed in TMECC. TMECC information can be found at http://www.tmecc.org/tmecc/index.html. The USCC Seal of Testing Assurance (STA) program contains information regarding compost STA certification. STA program information can be found at http://tmecc.org/sta/STA_program_description.html.

Installation:

- Install in accordance with current TxDOT specification.
- Use on slopes 3:1 or flatter.
- Apply a 2 inch uniform layer unless otherwise shown on the plans or as directed.
- When rolling is specified, use a light corrugated drum roller.

Mulch and Compost Filter Socks

Description: Mulch and compost filter socks (erosion control logs) are used to intercept and detain sediment laden run-off from unprotected areas. When properly used, mulch and compost filter socks can be highly effective at controlling sediment from disturbed areas. They cause runoff to pond which allows heavier solids to settle. Mulch and compost filter socks are used during the period of construction near the perimeter of a disturbed area to intercept sediment while allowing water to percolate through. The sock should remain in place until the area is permanently stabilized. Mulch and compost filter socks may be installed in construction areas and temporarily moved during the day to allow construction activity provided it is replaced and properly anchored at the end of the day. Mulch and compost filter socks may be seeded to allow for quick vegetative growth and reduction in run-off velocity.

Materials:

New types of mulch and compost filter socks are continuously being developed. The Texas Department of Transportation (TxDOT) has established minimum performance standards which must be met for any products seeking to be approved for use within any of TxDOT's construction or maintenance activities. Mulch and compost filter socks used within any TxDOT construction or maintenance activities must meet material specifications in accordance with TxDOT specification 5049. TxDOT maintains a website at http://www.txdot.gov/business/contractors_consultants/recycling/compost.htm that provides information on compost specification data.

Mulch and compost filter socks used for projects not related to TxDOT should also be of quality materials by meeting performance standards and compost specification data. To ensure the quality of compost used for mulch and compost filter socks, products should meet all applicable state and federal regulations, including but not limited to the United States Environmental Protection Agency (USEPA) Code of Federal Regulations (CFR), Title 40, Part 503 Standards for Class A biosolids and Texas Natural Resource Conservation Commission Health and Safety Regulations as defined in the Texas Administration Code (TAC), Chapter 332, and all other relevant requirements for compost products outlined in TAC, Chapter 332. Testing requirements required by the TCEQ are defined in TAC Chapter 332, including Sections §332.71 Sampling and Analysis Requirements for Final Products and §332.72 Final Product Grades. Compost specification data approved by TxDOT are appropriate to use for ensuring the use of quality compost materials or for guidance.

Testing standards are dependent upon the intended use for the compost and ensures product safety, and product performance regarding the product's specific use. The appropriate compost sampling and testing protocols included in the United States Composting Council (USCC) Test Methods for the Examination of Composting and Compost (TMECC) should be conducted on compost products used for mulch and compost filter socks to ensure that the products used will not impact public health, safety, and the environment and to promote production and marketing of quality composts that meet analytical standards. TMECC is a laboratory manual that provides protocols for the composting industry and test methods for compost analysis. TMECC provides protocols to sample, monitor, and analyze materials during all stages of the composting process. Numerous parameters that might be of concern in compost can be tested by following protocols or test methods listed in TMECC. TMECC information can be found at http://www.tmecc.org/tmecc/index.html. The USCC Seal of Testing Assurance (STA) program contains information regarding compost STA certification. STA program information can be found at http://tmecc.org/sta/STA_program_description.html.

Installation:

- Install in accordance with TxDOT Special Specification 5049.

- Install socks (erosion control logs) near the downstream perimeter of a disturbed area to intercept sediment from sheet flow.

- Secure socks in a method adequate to prevent displacement as a result of normal rain events such that flow is not allowed under the socks.

- Inspect and maintain the socks in good condition (including staking, anchoring, etc.). Maintain the integrity of the control, including keeping the socks free of accumulated silt, debris, etc., until the disturbed area has been adequately stabilized.

POST-CONSTRUCTION TSS CONTROLS

Retention/Irrigation Systems

Description: Retention/irrigation systems refer to the capture of runoff in a holding pond, then use of the captured water for irrigation of appropriate landscape areas. Retention/irrigation systems are characterized by the capture and disposal of runoff without direct release of captured flow to receiving streams. Retention systems exhibit excellent pollutant removal but can require regular, proper maintenance. Collection of roof runoff for subsequent use (rainwater harvesting) also qualifies as a retention/irrigation practice, but should be operated and sized to provide adequate volume. This technology, which emphasizes beneficial use of stormwater runoff, is particularly appropriate for arid regions because of increasing demands on water supplies for agricultural irrigation and urban water supply.

Design Considerations: Retention/irrigation practices achieve 100% removal efficiency of total suspended solids contained within the volume of water captured. Design elements of retention/irrigation systems include runoff storage facility configuration and sizing, pump and wet well system components, basin lining, basin detention time, and physical and operational components of the irrigation system. Retention/irrigation systems are appropriate for large drainage areas with low to moderate slopes. The retention capacity should be sufficient considering the average rainfall event for the area.

Maintenance Requirements: Maintenance requirements for retention/irrigation systems include routine inspections, sediment removal, mowing, debris and litter removal, erosion control, and nuisance control.

Extended Detention Basin

Description: Extended detention facilities are basins that temporarily store a portion of stormwater runoff following a storm event. Extended detention basins are normally used to remove particulate pollutants and to reduce maximum runoff rates associated with development to their pre-development levels. The water quality benefits are the removal of sediment and buoyant materials. Furthermore, nutrients, heavy metals, toxic materials, and oxygen-demanding materials associated with the particles also are removed. The control of the maximum runoff rates serves to protect drainage channels below the device from erosion and to reduce downstream flooding. Although detention facilities designed for flood control have different design requirements than those used for water quality enhancement, it is possible to achieve these two objectives in a single facility.

Design Considerations: Extended detention basins can remove approximately 75% of the total suspended solids contained within the volume of runoff captured in the basin. Design elements of extended detention basins include basin sizing, basin configuration, basin side slopes, basin lining, inlet/outlet structures, and erosion controls. Extended detention basins are appropriate for large drainage areas with low to moderate slopes. The retention capacity should be sufficient considering the average rainfall event for the area.

Maintenance Requirements: Maintenance requirements for extended detention basins include routine inspections, mowing, debris and litter removal, erosion control, structural repairs, nuisance control, and sediment removal.

Vegetative Filter Strips

Description: Filter strips, also known as vegetated buffer strips, are vegetated sections of land similar to grassy swales except they are essentially flat with low slopes, and are designed only to accept runoff as overland sheet flow. They may appear in any vegetated form from grassland to forest, and are designed to intercept upstream flow, lower flow velocity, and spread water out as sheet flow. The dense vegetative cover facilitates conventional pollutant removal through detention, filtration by vegetation, and infiltration.

Filter strips cannot treat high velocity flows, and do not provide enough storage or infiltration to effectively reduce peak discharges to predevelopment levels for design storms. This lack of quantity control favors use in rural or low-density development; however, they can provide water quality benefits even where the impervious cover is as high as 50%. The primary highway application for vegetative filter strips is along rural roadways where runoff that would otherwise discharge directly to a receiving water passes through the filter strip before entering a conveyance system. Properly designed roadway medians and shoulders make effective buffer strips. These devices also can be used on other types of development where land is available and hydraulic conditions are appropriate.

Flat slopes and low to fair permeability of natural subsoil are required for effective performance of filter strips. Although an inexpensive control measure, they are most useful in contributing watershed areas where peak runoff velocities are low as they are unable to treat the high flow velocities typically associated with high impervious cover.

Successful performance of filter strips relies heavily on maintaining shallow unconcentrated flow. To avoid flow channelization and maintain performance, a filter strip should:

- Be equipped with a level spreading device for even distribution of runoff
- Contain dense vegetation with a mix of erosion resistant, soil binding species
- Be graded to a uniform, even and relatively low slope
- Laterally traverse the contributing runoff area

Attachment 4
Description of BMPs

Filter strips can be used upgradient from watercourses, wetlands, or other water bodies along toes and tops of slopes and at outlets of other stormwater management structures. They should be incorporated into street drainage and master drainage planning. The most important criteria for selection and use of this BMP are soils, space, and slope.

Design Considerations: Vegetative filter strips can remove approximately 85% of the total suspended solids contained within the volume of runoff captured. Design elements of vegetative filter strips include uniform, shallow overland flow across the entire filter strip area, hydraulic loading rate, inlet structures, slope, and vegetative cover. The area should be free of gullies or rills which can concentrate flow. Vegetative filter strips are appropriate for small drainage areas with moderate slopes. Other design elements include the following:

- Soils and moisture are adequate to grow relatively dense vegetative stands
- Sufficient space is available
- Slope is less than 12%
- Comparable performance to more expensive structural controls

Maintenance Requirements: Maintenance requirements for vegetative filter strips include pest management, seasonal mowing and lawn care, routine inspections, debris and litter removal, sediment removal, and grass reseeding and mulching.

Constructed Wetlands

Description: Constructed wetlands provide physical, chemical, and biological water quality treatment of stormwater runoff. Physical treatment occurs as a result of decreasing flow velocities in the wetland, and is present in the form of evaporation, sedimentation, adsorption, and/or filtration. Chemical processes include chelation, precipitation, and chemical adsorption. Biological processes include decomposition, plant uptake and removal of nutrients, plus biological transformation and degradation. Hydrology is one of the most influential factors in pollutant removal due to its effects on sedimentation, aeration, biological transformation, and adsorption onto bottom sediments.

The wetland should be designed such that a minimum amount of maintenance is required. The natural surroundings, including such things as the potential energy of a stream or flooding river, should be utilized as much as possible. The wetland should approximate a natural situation and unnatural attributes, such as rectangular shape or rigid channel, should be avoided.

Site considerations should include the water table depth, soil/substrate, and space requirements. Because the wetland must have a source of flow, it is desirable that the water table is at or near the surface. If runoff is the only source of inflow for the wetland, the water level often fluctuates and establishment of vegetation may be difficult. The soil or substrate of an artificial wetland should be loose loam to clay. A perennial baseflow must be present to sustain the artificial wetland. The presence of organic material is often helpful in increasing pollutant removal and retention. A greater amount of space is required for a wetland system than is required for a detention facility treating the same amount of area.

Design Considerations: Constructed wetlands can remove over 90% of the total suspended solids contained within the volume of runoff captured in the wetland. Design elements of constructed wetlands include wetland sizing, wetland configuration, sediment forebay, vegetation, outflow structure, depth of inundation during storm events, depth of micropools, and aeration. Constructed wetlands are appropriate for large drainage areas with low to moderate slopes.

Maintenance Requirements: Maintenance requirements for constructed wetlands include mowing, routine inspections, debris and litter removal, erosion control, nuisance control, structural repairs, sediment removal, harvesting, and maintenance of water levels.

Wet Basins

Description: Wet basins are runoff control facilities that maintain a permanent wet pool and a standing crop of emergent littoral vegetation. These facilities may vary in appearance from natural ponds to enlarged, bermed (manmade) sections of drainage systems and may function as online or offline facilities, although offline configuration is preferable. Offline designs can prevent scour and other damage to the wet pond and minimize costly outflow structure elements needed to accommodate extreme runoff events.

During storm events, runoff inflows displace part or all of the existing basin volume and are retained and treated in the facility until the next storm event. The pollutant removal mechanisms are settling of solids, wetland plant uptake, and microbial degradation. When the wet basin is adequately sized, pollutant removal performance can be excellent, especially for the dissolved fraction. Wet basins also help provide erosion protection for the receiving channel by limiting peak flows during larger storm events. Wet basins are often perceived as a positive aesthetic element in a community and offer significant opportunity for creative pond configuration and landscape design. Participation of an experienced wetland designer is suggested. A significant potential drawback for wet ponds in arid climates is that the contributing watershed for these facilities is often incapable of providing an adequate water supply to maintain the permanent pool, especially during the summer months. Makeup water (i.e., well water or municipal drinking water) is sometimes used to supplement the rainfall/runoff process, especially for wet basin facilities treating watersheds that generate insufficient runoff.

Design Considerations: Wet basins can remove over 90% of the total suspended solids contained within the volume of runoff captured in the basin. Design elements of wet basins include basin sizing, basin configuration, basin side slopes, sediment forebay, inflow and outflow structures, vegetation, depth of permanent pool, aeration, and erosion control. Wet basins are appropriate for large drainage areas with low to moderate slopes.

Maintenance Requirements: Maintenance requirements for wet basins include mowing, routine inspections, debris and litter removal, erosion control, nuisance control, structural repairs, sediment removal, and harvesting.

Attachment 4
Description of BMPs

Grassy Swales

Grassy swales are vegetated channels that convey stormwater and remove pollutants by filtration through grass and infiltration through soil. They require shallow slopes and soils that drain well. Pollutant removal capability is related to channel dimensions, longitudinal slope, and type of vegetation. Optimum design of these components will increase contact time of runoff through the swale and improve pollutant removal rates.

Grassy swales are primarily stormwater conveyance systems. They can provide sufficient control under light to moderate runoff conditions, but their ability to control large storms is limited. Therefore, they are most applicable in low to moderate sloped areas or along highway medians as an alternative to ditches and curb and gutter drainage. Their performance diminishes sharply in highly urbanized settings, and they are generally not effective enough to receive construction stage runoff where high sediment loads can overwhelm the system. Grassy swales can be used as a pretreatment measure for other downstream BMPs, such as extended detention basins. Enhanced grassy swales utilize check dams and wide depressions to increase runoff storage and promote greater settling of pollutants.

Grassy swales can be more aesthetically pleasing than concrete or rock-lined drainage systems and are generally less expensive to construct and maintain. Swales can slightly reduce impervious area and reduce the pollutant accumulation and delivery associated with curbs and gutters. The disadvantages of this technique include the possibility of erosion and channelization over time, and the need for more right-of-way as compared to a storm drain system. When properly constructed, inspected, and maintained, the life expectancy of a swale is estimated to be 20 years.

Design Considerations:

- Comparable performance to wet basins
- Limited to treating a few acres
- Availability of water during dry periods to maintain vegetation
- Sufficient available land area

The suitability of a swale at a site will depend on land use, size of the area serviced, soil type, slope, imperviousness of the contributing watershed, and dimensions and slope of the swale system. In general, swales can be used to serve areas of less than 10 acres, with slopes no greater than 5 %. The seasonal high water table should be at least 4 feet below the surface. Use of natural topographic lows is encouraged, and natural drainage courses should be regarded as significant local resources to be kept in use.

Maintenance Requirements:

Research in the Austin area indicates that vegetated controls are effective at removing pollutants even when dormant. Therefore, irrigation is not required to maintain growth during dry periods, but may be necessary only to prevent the vegetation from dying.

Attachment 4
Description of BMPs

Vegetation Lined Drainage Ditches

Vegetation lined drainage ditches are similar to grassy swales. These drainage ditches are vegetated channels that convey storm water and remove pollutants by filtration through grass and infiltration through soil. They require soils that drain well. Pollutant removal capability is related to channel dimensions, longitudinal slope, and type of vegetation. Optimum design of these components will increase contact time of runoff through the ditch and improve pollutant removal rates. Vegetation lined drainage ditches are primarily storm water conveyance systems. They have vegetation lined in the low flow channel and may include vegetated shelves.

Vegetation in drainage ditches reduces erosion and removes pollutants by lowering water velocity over the soil surface, binding soil particles with roots, and by filtration through grass and infiltration through soil. Vegetation lined drainage ditches can be used where:

• A vegetative lining can provide sufficient stability for the channel grade by increasing maximum permissible velocity

• Slopes are generally less than 5%, with protection from sheer stress as needed through the use of BMPs, such as erosion control blankets

• Site conditions required to establish vegetation, i.e. climate, soils, topography, are present

Design Criteria: The suitability of a vegetation lined drainage ditch at a site will depend on land use, size of the area serviced, soil type, slope, imperviousness of the contributing watershed, and dimensions and slope of the ditch system. The hydraulic capacity of the drainage ditch and other elements such as erosion, siltation, and pollutant removal capability, must be taken into consideration. Use of natural topographic lows is encouraged, and natural drainage courses should be regarded as significant local resources to be kept in use. Other items to consider include the following:

• Capacity, cross-section shape, side slopes, and grade

• Select appropriate native vegetation

• Construct in stable, low areas to conform with the natural drainage system. To reduce erosion potential, design the channel to avoid sharp bends and steep grades.

• Design and build drainage ditches with appropriate scour and erosion protection. Surface water should be able to enter over the vegetated banks without erosion occurring.

• BMPs, such as erosion control blankets, may need to be installed at the time of seeding to provide stability until the vegetation is fully established. It may also be necessary to divert water from the channel until vegetation is established or to line the channel with sod.

• Vegetated ditches must not be subject to sedimentation from disturbed areas.

• Sediment traps may be needed at channel inlets to prevent entry of muddy runoff and channel sedimentation.

- Availability of water during dry periods to maintain vegetation
- Sufficient available land area

Maintenance:

During establishment, vegetation lined drainage ditches should be inspected, repaired, and vegetation reestablished if necessary. After the vegetation has become established, the ditch should be checked periodically to determine if the channel is withstanding flow velocities without damage. Check the ditch for debris, scour, or erosion and immediately make repairs if needed. Check the channel outlet and all road crossings for bank stability and evidence of piping or scour holes and make repairs immediately. Remove all significant sediment accumulations to maintain the designed carrying capacity. Keep the vegetation in a healthy condition at all times, since it is the primary erosion protection for the channel. Vegetation lined drainage ditches should be seasonally maintained by mowing or irrigating, depending on the vegetation selected. The long-term management of ditches as stable, vegetated, "natural" drainage systems with native vegetation buffers is highly recommended due to the inherent stability offered by grasses, shrubs, trees, and other vegetation.

Research in the Austin area indicates that vegetated controls are effective at removing pollutants even when dormant. Therefore, irrigation is not required to maintain growth during dry periods, but may be necessary only to prevent the vegetation from dying.

Sand Filter Systems

The objective of sand filters is to remove sediment and the pollutants from the first flush of pavement and impervious area runoff. The filtration of nutrients, organics, and coliform bacteria is enhanced by a mat of bacterial slime that develops during normal operations. One of the main advantages of sand filters is their adaptability; they can be used on areas with thin soils, high evaporation rates, low-soil infiltration rates, in limited-space areas, and where groundwater is to be protected.

Since their original inception in Austin, Texas, hundreds of intermittent sand filters have been implemented to treat stormwater runoff. There have been numerous alterations or variations in the original design as engineers in other jurisdictions have improved and adapted the technology to meet their specific requirements. Major types include the Austin Sand Filter, the District of Columbia Underground Sand Filter, the Alexandria Dry Vault Sand Filter, the Delaware Sand Filter, and peat-sand filters which are adapted to provide a sorption layer and vegetative cover to various sand filter designs .

Design Considerations:

- Appropriate for space-limited areas

- Applicable in arid climates where wet basins and constructed wetlands are not appropriate
- High TSS removal efficiency

Cost Considerations:

Filtration Systems may require less land than some other BMPs, reducing the land acquisition cost; however the structure itself is one of the more expensive BMPs. In addition, maintenance cost can be substantial.

Erosion Control Compost

Description: Erosion control compost (ECC) can be used as an aid to control erosion on critical sites during the establishment period of protective vegetation. The most common uses are on steep slopes, swales, diversion dikes, and on tidal or stream banks.

Materials:

New types of erosion control compost are continuously being developed. The Texas Department of Transportation (TxDOT) has established minimum performance standards which must be met for any products seeking to be approved for use within any of TxDOT's construction or maintenance activities. Material used within any TxDOT construction or maintenance activities must meet material specifications in accordance with current TxDOT specifications. TxDOT maintains a website at http://www.txdot.gov/business/contractors_consultants/recycling/compost.htm that provides information on compost specification data.

ECC used for projects not related to TxDOT should also be of quality materials by meeting performance standards and compost specification data. To ensure the quality of compost used as an ECC, products should meet all applicable state and federal regulations, including but not limited to the United States Environmental Protection Agency (USEPA) Code of Federal Regulations (CFR), Title 40, Part 503 Standards for Class A biosolids and Texas Natural Resource Conservation Commission (now named TCEQ) Health and Safety Regulations as defined in the Texas Administration Code (TAC), Chapter 332, and all other relevant requirements for compost products outlined in TAC, Chapter 332. Testing requirements required by the TCEQ are defined in TAC Chapter 332, including Sections §332.71 Sampling and Analysis Requirements for Final Products and §332.72 Final Product Grades. Compost specification data approved by TxDOT are appropriate to use for ensuring the use of quality compost materials or for guidance.
Testing standards are dependent upon the intended use for the compost and ensures product safety, and product performance regarding the product's specific use. The appropriate compost sampling and testing protocols included in the United States Composting Council (USCC) Test Methods for the Examination of Composting and Compost (TMECC) should be conducted on compost products used for ECC to ensure that the products used will not impact public health, safety, and the environment and to promote production and marketing of quality composts that meet analytical standards. TMECC is a laboratory manual that provides protocols for the composting industry and test methods for compost analysis. TMECC provides protocols to sample, monitor, and analyze materials during all stages of the composting process. Numerous

parameters that might be of concern in compost can be tested by following protocols or test methods listed in TMECC. TMECC information can be found at http://www.tmecc.org/tmecc/index.html. The USCC Seal of Testing Assurance (STA) program contains information regarding compost STA certification. STA program information can be found at http://tmecc.org/sta/STA_program_description.html.

Installation:

- Install in accordance with current TxDOT specification.
- Use on slopes 3:1 or flatter.
- Apply a 2 inch uniform layer unless otherwise shown on the plans or as directed.
- When rolling is specified, use a light corrugated drum roller.

Mulch and Compost Filter Socks

Description: Mulch and compost filter socks (erosion control logs) are used to intercept and detain sediment laden run-off from unprotected areas. When properly used, mulch and compost filter socks can be highly effective at controlling sediment from disturbed areas. They cause runoff to pond which allows heavier solids to settle. Mulch and compost filter socks are used during the period of construction near the perimeter of a disturbed area to intercept sediment while allowing water to percolate through. The sock should remain in place until the area is permanently stabilized. Mulch and compost filter socks may be installed in construction areas and temporarily moved during the day to allow construction activity provided it is replaced and properly anchored at the end of the day. Mulch and compost filter socks may be seeded to allow for quick vegetative growth and reduction in run-off velocity.

Materials:

New types of mulch and compost filter socks are continuously being developed. The Texas Department of Transportation (TxDOT) has established minimum performance standards which must be met for any products seeking to be approved for use within any of TxDOT's construction or maintenance activities. Mulch and compost filter socks used within any TxDOT construction or maintenance activities must meet material specifications in accordance with TxDOT specification 5049. TxDOT maintains a website at http://www.txdot.gov/business/contractors_consultants/recycling/compost.htm that provides information on compost specification data.

Mulch and compost filter socks used for projects not related to TxDOT should also be of quality materials by meeting performance standards and compost specification data. To ensure the quality of compost used for mulch and compost filter socks, products should meet all applicable state and federal regulations, including but not limited to the United States Environmental Protection Agency (USEPA) Code of Federal Regulations (CFR), Title 40, Part 503 Standards for Class A biosolids and Texas Natural Resource Conservation Commission Health and Safety Regulations as defined in the Texas Administration Code (TAC), Chapter 332, and all other relevant requirements for compost products outlined in TAC, Chapter 332. Testing requirements required by the TCEQ are defined in TAC Chapter 332, including Sections §332.71 Sampling and Analysis Requirements for Final Products and §332.72 Final Product Grades. Compost specification data approved by TxDOT are appropriate to use for ensuring the use of quality compost materials or for guidance.

Testing standards are dependent upon the intended use for the compost and ensures product safety, and product performance regarding the product's specific use. The appropriate compost sampling and testing protocols included in the United States Composting Council (USCC) Test Methods for the Examination of Composting and Compost (TMECC) should be conducted on compost products used for mulch and compost filter socks to ensure that the products used will not impact public health, safety, and the environment and to promote production and marketing of quality composts that meet analytical standards. TMECC is a laboratory manual that provides protocols for the composting industry and test methods for compost analysis. TMECC provides protocols to sample, monitor, and analyze materials during all stages of the composting process. Numerous parameters that might be of concern in compost can be tested by following protocols or test methods listed in TMECC. TMECC information can be found at http://www.tmecc.org/tmecc/index.html. The USCC Seal of Testing Assurance (STA) program contains information regarding compost STA certification. STA program information can be found at http://tmecc.org/sta/STA_program_description.html.

Installation:

- Install in accordance with TxDOT Special Specification 5049.
- Install socks (erosion control logs) near the downstream perimeter of a disturbed area to intercept sediment from sheet flow.
- Secure socks in a method adequate to prevent displacement as a result of normal rain events such that flow is not allowed under the socks.
- Inspect and maintain the socks in good condition (including staking, anchoring, etc.). Maintain the integrity of the control, including keeping the socks free of accumulated silt, debris, etc., until the disturbed area has been adequately stabilized.

Sedimentation Chambers (only to be used when there is no space available for other approved BMP's)

Description: Sedimentation chambers are stormwater treatment structures that can be used when space is limited such as urban settings. These structures are often tied into stormwater drainage systems for treatment of stormwater prior to entering state waters. The water quality benefits are the removal of sediment and buoyant materials. These structures are not designed as a catch basin or detention basin and not typically used for floodwater attenuation.

Design Considerations: Average rainfall and surface area should be considered when following manufacturer's recommendations for chamber sizing and/or number of units needed to achieve effective TSS removal. If properly sized, 50-80% removal of TSS can be expected.

Attachment 4
Description of BMPs

Maintenance Requirements: Maintenance requirements include routine inspections, sediment, debris and litter removal, erosion control and nuisance control.

PERMIT COMPLIANCE CERTIFICATION

U.S. Army Corps of Engineers Project Number:

Permit Number:

Name of Permittee:

Date of Issuance:

Upon completion of the activity authorized by this permit and any mitigation required by the permit, sign this certification and return it to the following address:

Regulatory Branch
CESWF-PER-R
U.S. Army Corps of Engineers
P.O. Box 17300
Fort Worth, Texas 76102-0300

Please note that your permitted activity is subject to a compliance inspection by a U.S. Army Corps of Engineers representative. If you fail to comply with this permit you are subject to permit suspension, modification, or revocation.

I hereby certify that the work authorized by the above referenced permit was completed in accordance with the terms and conditions of the said permit, and required mitigation was completed in accordance with the permit conditions.

____
Signature of Permittee

____
Date

130 ENVIRONMENTAL PARK

APPENDIX IIE
ENDANGERED OR THREATENED SPECIES DOCUMENTATION

HALFF

August 30, 2013
AVO 29520

Mr. Adam Zerrenner
U.S. Fish and Wildlife Service
10711 Burnet Road, Suite 200
Austin TX 78758

Re: Threatened and endangered species assessment for the proposed 130 Environmental Park in Caldwell County, Texas

Dear Mr. Zerrenner:

130 Environmental Park, LLC intends to permit, register and operate a new municipal solid waste facility in northern Caldwell County, Texas. The 130 Environmental Park will include a Type I municipal solid waste landfill and a Type V municipal solid waste transfer station. The site entrance will be located about one-quarter mile north of the intersection of US Highway 183 (US 183) and Farm-to-Market Road 1185 (FM 1185), on the east side of SH 130. The proposed facility is intended to provide waste disposal for the City of Lockhart, Caldwell County, and the surrounding areas.

The USGS Quadrangle Map for "Lockhart North, Texas" shows multiple stream channel segments and on-channel ponds on the property. All are part of the Dry Creek tributary system which flows into Plum Creek approximately five miles south of the property; all are part of the larger San Marcos River tributary system. Site investigations showed that streams on the property are consistent with what is mapped on the USGS map; numerous smaller tributaries not shown on the USGS map were also identified.

Attached is the Texas Parks and Wildlife Department (TPWD) Wildlife Habitat Assessment Program Questionnaire for Threatened and Endangered Species that was submitted to TPWD, with a preliminary site assessment included for listed species.

If you have any questions or require any additional information, please do not hesitate to call at (214) 346-6367.

NO ACTION
Date: 11SEPTEMBER2013
Consultation #: 02ETAU00-2013-TA-0285
Approved by [signature] FOR TS 11SEPT13
Adam Zerrenner, Field Supervisor
U.S. FISH & WILDLIFE SERVICE, AUSTIN, TEXAS

Sincerely,
HALFF ASSOCIATES, INC.

[signature]

Russell Marusak
Environmental Scientist

C: Mr. Kenneth Welch, P.E. – Biggs and Mathews Environmental
Mr. Ernest Kaufmann – 130 Environmental Park, LLC

Texas Pollutant Discharge Elimination System (TPDES) Certification Statement

Mr. Richard A. Hyde, P.E.
Executive Director
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

RE: 130 Environmental Park
TCEQ Permit Application No. MSW 2383

Dear Mr. Hyde:

130 Environmental Park, LLC will obtain Texas Pollutant Discharge Elimination System (TPDES) permit coverage for the 130 Environmental Park in accordance with 30 TAC §330.61(k)(3), prior to commencement of activity regulated under TPDES.

ATTEST:
130 Environmental Park, LLC

Ernest C Kaufmann

Ernest Kaufmann
President and Manager of 130 Environmental Park, LLC

SWORN TO AND SUBSCRIBED BEFORE ME by Ernest Kaufmann on this 25 day of June, 2014, which witness my hand and seal of office.

J. Juanita Cook
Notary Public, State of Georgia

J. Juanita Cook
Printed Name

My Commission Expires: 12/20/14

130 ENVIRONMENTAL PARK

APPENDIX III
CAPITAL AREA COUNCIL OF GOVERNMENTS
DOCUMENTATION

CAPCOG

Capital Area Council of Governments

Solid Waste Advisory Committee (SWAC) | Summary Minutes

9 a.m. Thursday, May 22, 2014
CAPCOG Pecan Room
6800 Burleson Road
Building 310, Suite 165
Austin, TX 78744

Member Attendance

Present (16)

Commissioner Joe Don Dockery, **Chair,** *Burnet County*
Mr. Richard McHale, **Vice Chair,** *City of Austin*
Mr. Adam Mathews, Progressive Waste Solutions, *Private Industry*
Commissioner Tom Muras, *Fayette County*
Mr. Joey Crumley, *Educational Representative*
Mr. Gerry Acuna, *City of Austin*
Mr. Jeff Hauff, *Hays County*
Commissioner Maurice Pitts, *Lee County,* Executive Committee Liaison
Mr. Pete Correa, *Williamson County*
Mr. Steve Jacobs, Waste Management, *Private Industry*
Mr. Jon White, *Travis County*
Ms. Melinda Mallia, *Travis County*
Commissioner Ron Wilson, *Llano County*
Mr. Phillip Merino, *Bastrop County*
Ms. Leah Gibson, *Hays County*
Commissioner Joe Roland, *Caldwell County*

CAPCOG Staff

Ms. Betty Voights, Executive Director
Mr. Mark Sweeney, Director of Regional Services
Ms. Kate Barrett, Administrative Assistant
Mr. Ken May, Solid Waste Program Manager
Mr. Layne Duesterhaus, Regional Environmental Coordinator

Absent (6)

Commissioner Paul Granberg, Blanco County
Dr. Tina Marie Cade, *Citizen/Environmental Representative*
Mr. Jack Ranney, *At-Large Member w/HHW Expertise*
Ms. Yessenia Pena, *Texas Commission on Environmental Quality, Non-voting Member*
Ms. Cheryl Untermeyer, *Texas Commission on Environmental Quality, Non-voting Member*

Call to Order – 9:12 a.m. with a quorum.

1. **Opening Remarks by Commissioner Dockery, Chair**

   Commissioner Dockery welcomed everyone. Ken May went over general hospitality details.

2. **Consider Approval of April 17, 2014 Meeting Minutes**
   Commissioner Dockery, Chair

   Commissioner Dockery requested consideration of the minutes.

   A motion and a second were made to accept the minutes as written. The motion passed unanimously.

3. **Private Industry Vacancy Selection**
   Mr. Ken May, Solid Waste Program Manager

   Mr. May stated that Mr. Brian Chesson of Republic Services was approved by the Executive Committee to serve in one of the two open private industry representative seats, but because Mr. Chesson is no longer employed at Republic Services, he is no longer eligible to serve.

   The two vacancies were open to be filled by the two nominees, Mr. Adam Gregory of Texas Disposal Systems and Mr. Matthew Smith of Hill Country Recycling. A motion and a second were made to accept both nominees. Both nominees were approved unanimously by the SWAC. Each will be recommended to the Executive Committee for consideration to fill the two vacant private industry SWAC seats at the first opportunity and is currently targeted for the August meeting.

4. **Overview of Processes and Procedures for Conformance Review**
   Mr. Ken May, Solid Waste Program Manager

   Mr. May explained the process of reviewing the conformance of the 130 Environmental Park application against the goals and objectives identified in the Regional Solid Waste Management Plan, and reminded the SWAC they had elected to solicit a Conformance Review Subcommittee to peer review the Conformance Review Checklist responses and to make recommendation to the SWAC. Mr. May stated that the decisions of the Conformance Review Subcommittee would be shared later on the agenda, after presentations from both Green Group Holdings and the Environmental Protection in the Interest of Caldwell County (EPICC) group, questions and answers from the SWAC, and public comment.

   No discussion of the conformance review process occurred.

5. **Presentation in support of the proposed 130 Environmental Park, LLC municipal solid waste landfill: Mr. David Green, Vice President, Green Group Holdings (GGH) [30 minutes]**

   Commissioner Dockery asked that questions be held until the question and answer item on the agenda.

Mr. Green, of GGH gave a 30 minute presentation in support of the proposed 130 Environmental Park, LLC municipal solid waste landfill.

6. **Presentation in opposition to the proposed 130 Environmental Park, LLC municipal solid waste landfill: Opposing Party Presentation by Mr. Byron Friedrich, Environmental Protection in the Interest of Caldwell County (EPICC) [30 minutes]**

   Mr. Friedrich, of EPICC gave a 30 minute presentation in opposition to the proposed 130 Environmental Park, LLC municipal solid waste landfill.

7. **Questions and Answers on Agenda Item No.'s 4 & 5**
   Commissioner Dockery, Chair

   Commissioner Dockery called the meeting back to order at 10:28 AM after a 10 minute break. Commissioner Dockery asked that questions only be asked by members of the SWAC during this time, and opened the floor for questions and answers.

   Mr. Pete Correa, Williamson County, asked GGH about the ownership of the property, road maintenance, and where the waste for the landfill will originate.

   Commissioner Pitts, Lee County, asked GGH about their past business dealings with landfills they sold soon after opening, and if the same scenario will void the commitments GGH outlined in their Host Agreement with Caldwell County. Mr. Green GGH, answered that the Turkey Run facility, in Meriwether County, GA, was developed with the intent to sell it, and that after it was permitted it was sold to Waste Management. Mr. Green explained that the Host Agreement offered Caldwell County, like the agreement they had with Meriwether County is, by its terms, binding to any future proprietors of the environmental park property. The Host Agreement also provides that the environmental track record of any future proprietor come under review before purchase.

   Commissioner Muras, Fayette County, asked GGH about the sturdiness of the landfill against back-to-back 100 year storm water events. Mr. Green, GGH, answered they are installing two times the required storm water controls that Texas Commission on Environmental Quality (TCEQ) requires.

   Mr. Jon White, Travis County, asked Green Group Holdings about the need of a development permit from Caldwell County. Mr. Green answered that GGH has already promised compliance with any local development rules and ordinances.

   Mr. Joey Crumley, Educational Representative, asked GGH about the nature of their agreement with Caldwell County to limit the size of their landfill property. Mr. Green answered that in the draft host agreement, it was written that the size of the property never exceed 250 acres. Mr. Crumley also asked about the runoff from the landfill truck wash area and if GGH will ever accept waste from Mexico. Mr. Green answered that the wash area will be part of the general runoff of the site and that GGH does not intend to accept waste from Mexico at this facility.

   Ms. Melinda Mallia, Travis County, asked about GGH measures to control loose trash and runoff. Mr. Green answered that all trucks coming into the site will be required to have tarps covering their load. He also mentioned that mobile and stationary wind screens will be in place to control wind-blow trash, and that workers will be regularly cleaning up trash around the site.

Commissioner Dockery, Chair, Burnet County, asked GGH if the litter abatement measures are listed in the host agreement with Caldwell County. Mr. Green answered yes.

Mr. Jon White, Travis County, asked about enforcement of the host agreement measures in the absence of a capability to carry out the host agreement. Mr. Green answered that GGH will complete measures in the host agreement as soon as possible, and that he is open to ideas on keeping the host agreement in place. Mr. White followed up by asking Mr. Green about the "discretionary language" in the host agreement. Mr. Green assured him that GGH is committed to carrying out the measures in the host agreement. Mr. White asked if Mr. Green could justify a need for this facility. Mr. White explained that GGH's market research justified a $40 million dollar investment in this facility, based on a need for the landfill. Mr. White feels that the data provided by the opposition regarding lack of need for another landfill is "distorted." Mr. Friedrich of EPICC commented that the capacity of the AACOG and CAPCOG regions are considerable, and that there is another landfill being proposed 30 miles south of Lockhart.

Ms. Betty Voights, CAPCOG, asked Mr. Green to address the effects of the landfill runoff on aquifers. Mr. Green assured the SWAC that the site will have a "significant over-design" of storm water runoff capacity and that GGH is conscious of the water flow from the site. Mr. Friedrich of EPICC expressed concerns for the close proximity of the landfill to Plum Creek and that the facility is likely to not withstand rain events for very long.

Commissioner Roland, Caldwell County, asked Mr. Green if any waste will be freighted in by rail. Mr. Green answered no.

Commissioner Pitts, Lee County, asked EPICC if they have tried to make any presentation to the TCEQ. Mr. Friedrich answered that the TCEQ does not typically allow any such presentation to be made.

Mr. Joey Crumley, Educational Representative, asked if Type 4 waste will be accepted at the landfill. Mr. Green answered yes. Mr. Crumley mentioned that the local area will need to rely on the landfill to accept waste generated from disasters.

8. Public Comments pertaining to the proposed landfill from the speaker sign in sheet
Commissioner Dockery, Chair

Commissioner Dockery welcomed those who signed up to give a 3 minute public comment to give their comment at this time.

Public comment was given by six residents of Caldwell County, as well as an attorney for GGH. Five of the six residents of Caldwell County were members of EPICC and voiced opposition to the landfill proposition, the sixth speaker was Commissioner Roland, Caldwell County

At the end of the public comment period, Commissioner Dockery opened item 7 back for GGH to answer a question of how many residences and establishments, within a one mile radius of the proposed landfill, will be affected by the landfill. GGH answered that, according to their studies, 126 residences and 5 commercial establishments will be affected.

Mr. White, Travis County, asked if the one mile measurement was from the boundaries of the property or from the landfill location. Mr. Green answered that the one mile measurement was taken from the boundaries of the property.

Commissioner Muras, Fayette County, asked if GGH would have enough soil capacity on site to provide soil cover for the landfill. Mr. Green answered yes, they will have a positive soil balance.

Mr. Green went on to mention that a "property value protection plan" is available to residents who live within one mile of the footprint of the landfill who decide to sell their property within 10 years of the development of the facility. Mr. White asked if this is provided in the host agreement. Mr. Green answered yes.

9. Review and Consideration of the SWAC Conformance Review Subcommittee Recommendation Mr. Ken May, CAPCOG

Mr. May handed out paper copies of the Conformance Review Subcommittee's recommendations and identified that the Subcommittee's recommendation was unanimous and they recommend the application is in conformance with the Regional Solid Waste Master Plan.

Commissioner Dockery, Chair, read the recommendations and stated different options for approving, disapproving, or tabling the proposal.

Mr. White, Travis County, continued discussion on the proposal by stating that there is a need for the landfill, that both the proponents and the opponents of the proposal made good cases, and that the host agreement needs to be enforced going into the future.

Commissioner Roland and Mr. Correa gave statements of disapproval, explaining definite threats to human health.

Commissioner Dockery, Chair, opened the approval of the proposal to a vote from the SWAC by show of hands.

Nine of the 15 present SWAC members voted to approve the proposal, with three voting against, and three abstaining from a vote.

SWAC members in favor of the proposal were Mr. Joey Crumley, Ms. Leah Gibson, Mr. Jeff Hauff, Mr. Jon White, Ms. Melinda Mallia, Mr. Richard McHale, Mr. Phillip Merino, Commissioner Tom Murras, and Commissioner Maurice Pitts.

SWAC members voting against the proposal were Commissioner Joe Roland, Commissioner Ron Wilson, and Mr. Pete Correa.

SWAC members abstaining from a vote were Mr. Adam Mathews, Mr. Steve Jacobs, and Commissioner Dockery.

Commissioner Dockery, Chair, stated that the SWAC's recommendations will be sent to the Executive Committee for their consideration.

10. Solid Waste Program Implementation Projects Update
Mr. Ken May, CAPCOG

Mr. May stated that the CAPCOG Executive Committee approved the funding for the implementation projects as recommended by the SWAC, with the understanding that there was only funding available for ten of the 14 eligible proposals. The approval and the recommendations are being sent to the TCEQ for their approval. The TCEQ will send their approval or disapproval by July 1st.

11. Other Items of Interest and Next SWAC Meeting Date
Commissioner Dockery, Chair

Mr. May asked Commissioner Pitts to speak on his testimony to the House Appropriations Committee concerning CAPCOG's funding for implementation projects. Commissioner Pitts was thanked for his efforts.

Mr. May mentioned that the recommendations for the new SWAC private industry representatives and the recommendations for the 130 Environmental Park proposal will not reach the Executive Committee until their July or August meeting

Mr. Jeff Hauff, Hays County, mentioned that Texas State University and Hays County partnered for a successful Electronic Waste collection event in April, to which Hays County contributed 13,000 pounds of e-waste.

Mr. May stated that the Solid Waste program is receiving extra monies from the Department of Homeland Security for a development of a Regional Disaster Debris Management Plan.

Commissioner Roland, Caldwell County, thanked the SWAC for their time and consideration of the 130 Environmental Park proposals.

It was decided by the SWAC that the next SWAC meeting will be held on September 11, 2014.

12. Adjourn
Commissioner Dockery, Chair

A motion was made and seconded to adjourn at 11:39 AM.

LOCATION RESTRICTION
CERTIFICATION OF COMPLIANCE
FLOODPLAINS

General Site Information:

Site:	130 Environmental Park
Site Location:	Caldwell County, Texas
TCEQ Permit Application No.:	MSW 2383

Statement of Compliance:

I, Kerry D. Maroney, P.E., certify that the site indicated above will be in compliance with the Floodplains Location Restriction, as stated in 30 TAC §330.547 – Floodplains.

Firm:	Biggs & Mathews, Inc.
Address:	2500 Brook Avenue Wichita Falls, TX 76301
Signature, Seal, and Date	STATE OF TEXAS K.D. MARONEY 44639 LICENSED PROFESSIONAL ENGINEER Biggs & Mathews, Inc. Firm Registration No. F-834 6/25/14

Supporting documentation is referenced in Part II, Section 13.1 – Floodplains; Part II, Appendix IIA – Maps and Drawings, Drawings IIA.11 and IIA.21.

Owner/Operator of Site:

Owner/Operator:	130 Environmental Park, LLC
Address:	132 Riverstone Terrace, Suite 103 Canton, GA 30183
Official's Name and Title:	Ernest Kaufmann, President and Manager of 130 Environmental Park, LLC
Signature:	Ernest C Kaufmann
Date:	6/27/14

LOCATION RESTRICTION
CERTIFICATION OF COMPLIANCE
COASTAL AREAS

General Site Information:

Site: 130 Environmental Park

Site Location: Caldwell County, Texas

TCEQ Permit Application No.: MSW 2383

Statement of Compliance:

I, Kerry D. Maroney, P.E., certify that the site indicated above will be in compliance with the Coastal Areas Location Restriction, as stated in 30 TAC §330.561 – Coastal Areas, because the proposed facility will not be located on a barrier island or peninsula or within 1,000 feet of an area subject to active coastal shoreline erosion.

Firm: Biggs & Mathews, Inc.

Address: 2500 Brook Avenue
Wichita Falls, TX 76301

Signature, Seal, and Date

STATE OF TEXAS
K.D. MARONEY
44639
LICENSED
PROFESSIONAL ENGINEER

6/25/14

Biggs & Mathews, Inc.
Firm Registration No. F-834

Owner/Operator of Site:

Owner/Operator: 130 Environmental Park, LLC

Address: 132 Riverstone Terrace, Suite 103
Canton, GA 30183

Official's Name and Title: Ernest Kaufmann, President and Manager of 130 Environmental Park, LLC

Signature: Ernest C. Kaufmann

Date: 6/25/14

LOCATION RESTRICTION
CERTIFICATION OF COMPLIANCE
TYPE I AND TYPE IV LANDFILL PERMIT ISSUANCE PROHIBITED

General Site Information:

Site:	130 Environmental Park
Site Location:	Caldwell County, Texas
TCEQ Permit Application No.:	MSW 2383

Statement of Compliance:

I, Kerry D. Maroney, P.E., certify that the site indicated above will be in compliance with the Type I and Type IV Landfill Permit Issuance Prohibited Location Restriction, as stated in 30 TAC §330.563 – Type I and Type IV Landfill Permit Issuance Prohibited, because the proposed site is not located in a county that is adjacent to the Gulf of Mexico or a county with a population of more than 3.3 million.

Firm:	Biggs & Mathews, Inc.
Address:	2500 Brook Avenue Wichita Falls, TX 76301
Signature, Seal, and Date	STATE OF TEXAS K.D. MARONEY 44639 LICENSED PROFESSIONAL ENGINEER Biggs & Mathews, Inc. Firm Registration No. F-834 6/25/14

Owner/Operator of Site:

Owner/Operator:	130 Environmental Park, LLC
Address:	132 Riverstone Terrace, Suite 103 Canton, GA 30183
Official's Name and Title:	Ernest Kaufmann, President and Manager of 130 Environmental Park, LLC
Signature:	Ernest C Kaufmann
Date:	6/25/14

130 ENVIRONMENTAL PARK
CALDWELL COUNTY, TEXAS
TCEQ PERMIT APPLICATION NO. MSW 2383

TYPE I PERMIT APPLICATION

PART III – FACILITY INVESTIGATION AND DESIGN

ATTACHMENT B
GENERAL FACILITY DESIGN

Prepared for

130 ENVIRONMENTAL PARK, LLC

February 2014

Revised June 2014

STATE OF TEXAS
GREGORY W. ADAMS
73356
REGISTERED
PROFESSIONAL ENGINEER
6/20/2014

Biggs & Mathews Environmental, Inc
Firm Registration No. F-256

Prepared by

BIGGS & MATHEWS ENVIRONMENTAL
1700 Robert Road, Suite 100 • Mansfield, Texas 76063 • 817-563-1144

TEXAS BOARD OF PROFESSIONAL ENGINEERS
FIRM REGISTRATION NO. F-256

TEXAS BOARD OF PROFESSIONAL GEOSCIENTISTS
FIRM REGISTRATION NO. 50222

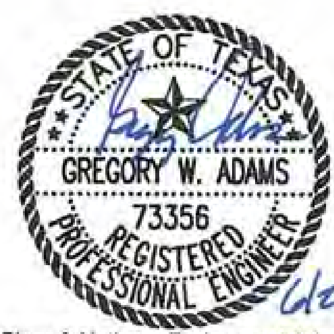
And

BIGGS & MATHEWS, INC.
2500 Brook Avenue • Wichita Falls, Texas 76301 • 940-766-0156

TEXAS BOARD OF PROFESSIONAL ENGINEERS
FIRM REGISTRATION NO. F-834

CONTENTS

APPENDIX B1 – DRAWINGS



6/20/2014

Biggs & Mathews Environmental, Inc.
Firm Registration No. F-256

design and construction are addressed in the liner quality control plan, the leachate and contaminated water management plan, and the final cover quality control plan.

The waste disposal area will be excavated with side slopes no steeper than 4H:1V. The liner system will be constructed following excavation of a new waste disposal area. The proposed liner system for the facility is generally described below with layers listed from top to bottom.

COMPOSITE LINER SYSTEM (TOP TO BOTTOM)
24-inch Soil Protective Cover
Drainage Geocomposite LCS Layer (~~300~~275-mil)
HDPE Geomembrane Liner (60-mil)
24-inch Compacted Clay Liner (≤1 x 10^{-7} cm/sec)

Information regarding materials and construction quality assurance are included in Attachment D7 – Liner Quality Control Plan. Liner system details are included in Attachment D3 – Construction Design Details.

A leachate collection system (LCS) has been designed with a geocomposite drainage layer, leachate collection trenches, and leachate collection sumps to remove leachate from the landfill. The LCS layout and details are shown in Part III, Attachment D3 – Construction Design Details. Design of the LCS is discussed in Part III, Attachment D6 – Leachate and Contaminated Water Management Plan. Information regarding materials and construction quality assurance are included in Part III, Attachment D7 – Liner Quality Control Plan.

The proposed landfill development method for the site is a combination of the area-excavation fill followed by aerial fill to the proposed landfill completion height. Landfill development will generally follow the sequence of development as shown on Drawing B.2, which will be in the order the cells are numbered.

Waste accepted for disposal will be directed to the active working face. Waste will be unloaded within the active working face, spread in layers and thoroughly compacted. Daily cover of waste will be applied to control disease vectors, windblown waste, odors, fires, scavenging, and to promote runoff from the fill area. Daily cover consisting of a minimum of six inches of soil will be placed over wastes at the end of each working day for odor control.

The aerial fill side slopes will not be steeper than 4H:1V, and the aerial fill top slope will be approximately six percent. A composite final cover will be constructed over the entire landfill. As shown in Part III, Attachment D3 – Construction Design Details, the final cover is generally described below with layers from top to bottom.

The large item storage area, when located within the waste disposal footprint will be placed only over areas that have received intermediate cover. Surface water runoff will be diverted around the storage area. Surface water from the large item storage area will be contained by containment and diversion berms consistent with Part III, Attachment D6 – Leachate and Contaminated Water Plan.

Reusable Materials Staging Area

Inert materials such as brick, concrete, etc., and non-inert materials such as asphalt may be stockpiled for use on facility access roads and staging areas or for erosion control in drainage structures. Asphalt will not be used for erosion control in drainage structures. The reusable materials staging area will be located within the waste disposal footprint and will be relocated periodically as the active working face moves. The size of the stockpiles may vary depending on the amount of materials received at any given time. Typical details for the reusable materials staging area are provided on Drawing B.6. Since the brick and concrete materials are inert, runon and runoff from rainfall will not be controlled in a special manner and odor control measures are not required for these materials. Since asphalt is not an inert material, it will be managed in a manner that will prevent runoff of contaminated water, discharge of waste, or the creation of nuisance conditions. These inert and non-inert materials will continuously be reused for site operations, and there is no time limit on the storage of these materials.

Citizen's Convenience Center

A citizen's convenience center for waste drop-off will be located within the site entrance facilities, as shown on Drawings B.2 and B.3. General construction details of the Citizen's Convenience Center are provided on Drawing B.5. Thirty- to forty-cubic yard roll-off containers, as well as containers for recycled goods, may be provided. Containers with waste will be emptied at the active working face at the end of each day. Containers that are empty will be covered with a tarp at the end of the day to prevent rainfall from accumulating inside the containers and to prevent generation of contaminated waters. The control of contaminated water within the roll-off containers will minimize the potential for generating odors within the area. Containers with waste will be emptied at the end of each day, also minimizing the potential for odors. Recycle containers will periodically be transported to an appropriate recycling facility. Large items and white goods may be stored at the citizen's convenience center in steel roll-off containers and will be periodically transported to an appropriate recycling facility.

Used/Scrap Tire Storage Area

130 Environmental Park will not intentionally or knowingly accept whole used or scrap tires for disposal unless processed prior to disposal in a manner acceptable to the executive director. Scrap tires will be accepted from the public or from community clean-up efforts and stored in containers or trailers prior to shipment. Scrap tires identified during landfill operations and generated through maintenance will be accumulated on site by placing them in containers or trailers prior to shipment. The total quantity of tires will not exceed 500 scrap tires (or weight equivalent tire pieces) on the ground, or 2,000 scrap tires in containers. Tire containers will be kept within the facility boundary, near

the active working face, or citizen's convenience center. Manifests will be used for shipment of scrap tires offsite.

Wood Waste Processing Area

The wood waste processing area will be located within the landfill footprint and will process incoming yard trimmings, clean wood materials and vegetative materials, including trees and brush, into wood chips and mulch. The wood chips and mulch will only be used on-site and will be stored in the processing area for a maximum time of 60 days. The wood chips and mulch will be stored in small piles and will be managed to prevent fire, safety, or health hazards in accordance with 30 TAC §330.209(a). The wood waste processing area will not be larger than approximately 125 feet by 100 feet.

Leachate Storage Facility

Primary leachate storage will be provided by the leachate sumps, which will be located within each landfill cell. Leachate and landfill gas condensate will be pumped from the sumps directly into transport trucks or through a dual contained leachate forcemain to the leachate storage facility. The leachate storage facility will be located near the maintenance shop as shown on Drawings ~~D1.2~~ B.2 and B.3 to allow access for transport trucks. General construction details of the leachate storage facility are provided on Drawing B.7. The storage facility will consist of up to two 250,000-gallon storage tanks within a secondary containment structure, which will be installed individually as needed based on leachate generation. The secondary containment structure will provide containment, with 12 inches of freeboard, for volume from one leachate storage tank and precipitation from the 25-year, 24-hour storm event or 110 percent of the volume from one leachate storage tank. Secondary containment volume calculations are provided in Attachment D6, Section 2.3 – Leachate Storage and Appendix D6-D.

Truck Wheel Wash

The truck wheel wash will be located near the scalehouse, as shown on Drawing B.3. The wheel wash is a drive-through structure with a series of metal grates and water nozzles. As vehicles drive across the grates, the nozzles spray the undercarriage and sides with water, and the mud drops through the grates into a settling basin. The accumulated mud will be periodically removed from a settling basin and placed in the active working face. The periodic removal of mud and contaminated water will provide odor controls for the truck wheel wash. The water removed from the system will be treated as contaminated water in accordance with Attachment D6 – Leachate and Contaminated Water Plan.

3 SANITATION

30 TAC §330.63(b)(3)

The solid waste processing and/or storage facilities include the large item storage area, reusable materials staging area, citizen's convenience center, used/scrap tire storage area, wood waste processing area, leachate storage facility, and truck wheel wash. Each of the solid waste processing facilities has been designed to facilitate proper cleaning. Refer to Section 2 – Waste Movement for a discussion of each of the solid waste processing facilities. Operational requirements for each facility are described in Part IV – Site Operating Plan, including a discussion of surface water controls, cleaning facilities, and contaminated water.

Large Item Storage Area

Large items and white goods received are transferred into steel roll-off containers for storage. Each steel roll-off container is tarped to prevent rainfall from accumulating inside the containers. Containers will be cleaned by removing loose material for disposal at the working face and washing down the containers with water. Wash water will be treated as contaminated water and disposed of in accordance with Part III, Attachment D6, Section 3.

Reusable Materials Staging Area

~~Reusable materials received include i~~Inert and non-inert materials ~~to~~ will be stockpiled and reused for site operations. ~~Since these materials are inert, s~~Surface water runon and runoff controls are not required~~,~~ for inert materials such as brick and concrete, but will be required for non-inert materials such as asphalt. ~~and there is no requirement for additional sanitation controls.~~ Stockpiles of non-inert materials will be located in areas with positive drainage away from the stockpiles to prevent runon of surface water. Runoff of contaminated water will be prevented by containment berms as shown on Drawing B.6. Any contaminated water that is collected will be disposed of in accordance with Part III, Attachment D6, Section 3.

Citizen's Convenience Center

The citizen's convenience center will receive municipal solid waste from the public. Any waste received will be loaded into steel roll-off containers. Each container is tarped to prevent rainfall from accumulating inside the containers. Full containers will be disposed of at the working face. Containers will be cleaned as needed by washing down the containers with water. The citizen's convenience center is constructed of reinforced concrete. Should waste materials spill onto the concrete surface, the materials will be picked up and disposed of at the working face. The concrete surfaces will be cleaned as needed by washing down with water. Wash water from the steel roll-off containers or concrete surfaces will be treated as contaminated water and disposed of in accordance with Part III, Attachment D6, Section 3.

Used/Scrap Tire Storage Area

Used/scrap tires received are transferred into containers or trailers for storage. Each container or trailer is tarped to prevent rainfall from accumulating inside. After used/scrap tires are shipped offsite, containers or trailers will be cleaned by removing loose material for disposal at the working face and washing down the containers with water. Wash water will be treated as contaminated water and disposed of in accordance with Part III, Attachment D6, Section 3.

Wood Waste Processing Area

Wood wastes received will be chipped and stockpiled only to be used for site operations. The area will consist of small piles managed to prevent litter and control fire, health hazards and safety in accordance with §330.209(a). There are no water runon and runoff control, or additional sanitation controls required.

Leachate Storage Facility

The leachate storage facility consists of two steel storage tanks in a reinforced concrete containment structure. Leachate storage and disposal will be in accordance with Part III, Attachment D6, Section 2.3 and 2.4. The secondary containment concrete structure will be periodically cleaned by removing loose materials from the concrete surface and disposing of materials at the working face. The concrete surfaces will be cleaned as needed by washing down with water. Wash water will be treated as contaminated water and disposed of in accordance with Part III, Attachment D6, Section 3.

Truck Wheel Wash

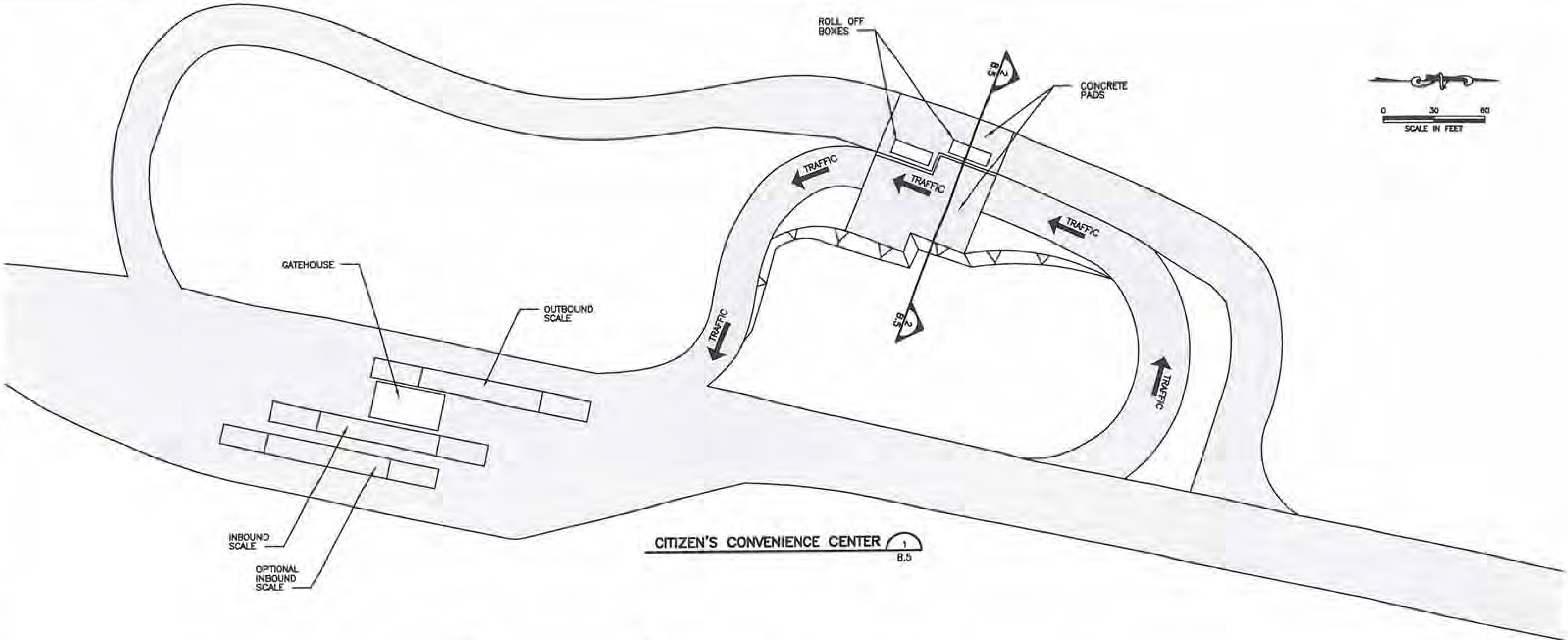
The truck wheel wash is constructed of metal and reinforced concrete. Accumulated mud will be periodically removed from the settling basin for disposal at the working face. The concrete surfaces will be periodically cleaned by washing down with water. Wash water will be considered contaminated water and disposed of in accordance with Part III, Attachment D6, Section 3.

130 ENVIRONMENTAL PARK

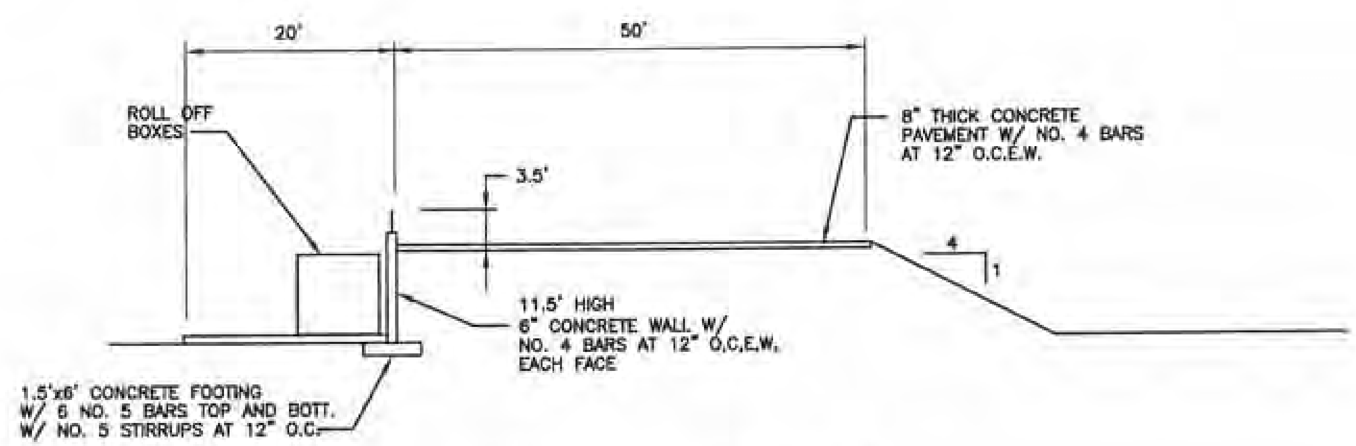
APPENDIX B1

DRAWINGS

CONTENTS



CITIZEN'S CONVENIENCE CENTER 1 B.5



CITIZEN'S CONVENIENCE CENTER SECTION 2 B.5

STATE OF TEXAS
GREGORY W. ADAMS
73356
LICENSED
PROFESSIONAL ENGINEER
6/20/2014

ISSUED FOR PERMITTING PURPOSES ONLY

REVISIONS						
1	8/14	N.O.D. NO. 1 RESPONSE	GLW	GWA	GWA	GWA
REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY

CITIZEN'S CONVENIENCE CENTER

130 ENVIRONMENTAL PARK, LLC
130 ENVIRONMENTAL PARK
TYPE I PERMIT APPLICATION

BIGGS & MATHEWS ENVIRONMENTAL
CONSULTING ENGINEERS
MANSFIELD • WICHITA FALLS
817-563-1144

TBPE FIRM NO. F-256		TBPG FIRM NO. 50222
DSN. GWA	DATE : 12/13	DRAWING
DWN. GLW	SCALE : GRAPHIC	B.5
CHK. GWA	DWG : B5-CCCen.dwg	

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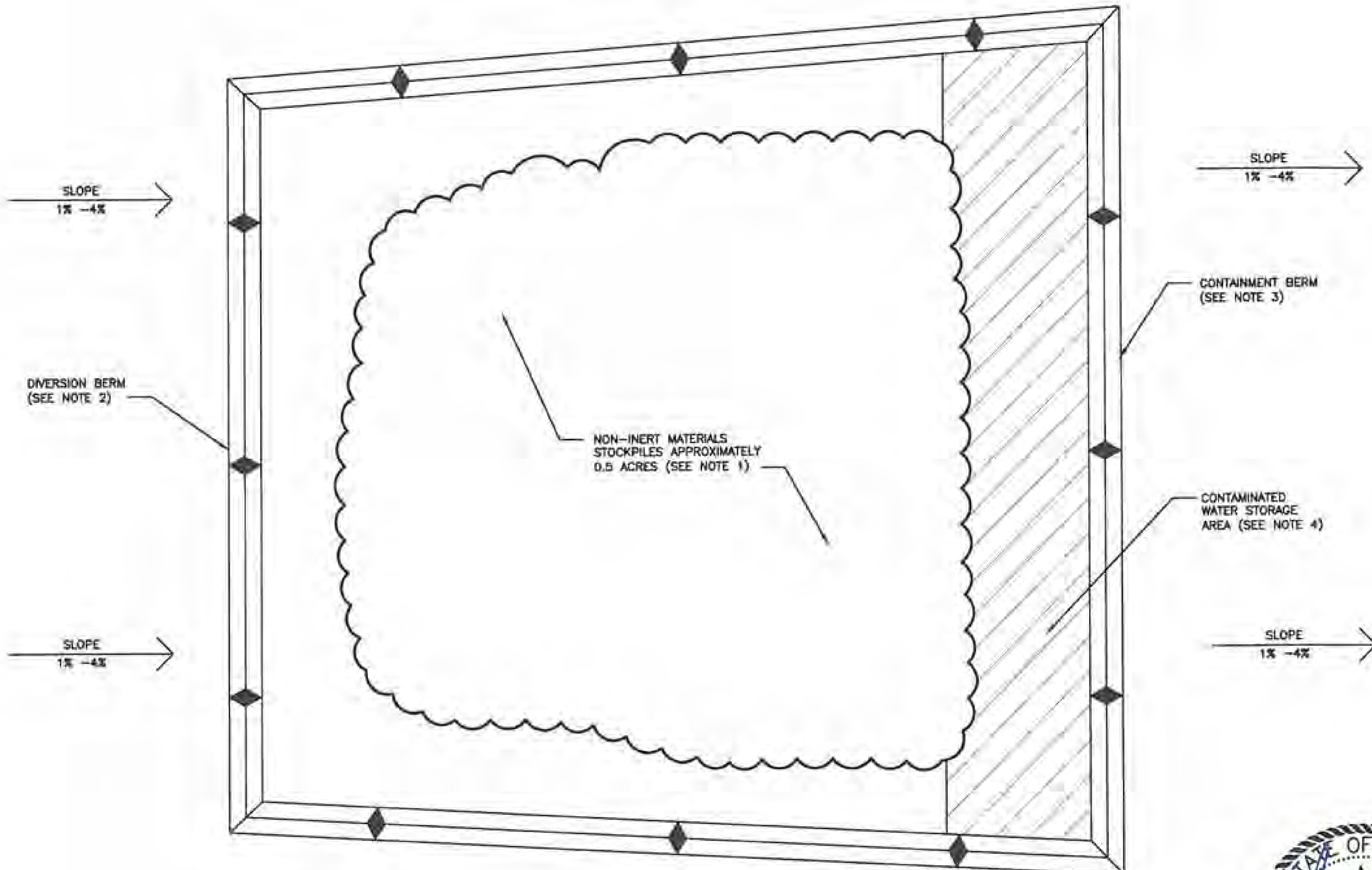

NOTES:

1. INERT (CONCRETE, BRICK, ECT.) AND NON-INERT PAVEMENT AND ASPHALTIC CONCRETE) MATERIALS WILL BE STORED IN STOCKPILES WITHIN LANDFILL DISPOSAL FOOTPRINT. NON-INERT MATERIALS WILL BE STOCKPILED SEPARATELY FROM INERT MATERIALS AND WILL BE PROVIDED WITH RUN ON AND RUN OFF CONTROLS FOR THE 25 YEAR 24 HOUR RAINFALL EVENT.

2. WHEN PRACTICLE NON-INERT MATERIALS WILL BE STOCKPILED IN AREAS WITH POSITIVE DRAINAGE AWAY FROM THE STOCKPILE. WHEN NECESSARY DIVERSION BERMS WILL BE PROVIDED TO DIVERT SURFACE WATER AWAY FOM THE STOCKPILES. DIVERSION BERMS WILL BE CONSTRUCTED OF SOIL. REFER TO PART III, ATTACHMENT D6, APPENDIX D6-C FOR DIVERSION BERM SIZING.

3. CONTAINMENT BERMS WILL BE CONSTRUCTED OF SOIL. REFER TO PART III, ATTACHMENT D6, APPENDIX D6-C FOR CONTAINMENT BERM SIZING.

4. CONTAMINATED WATER STORAGE WILL BE PROVIDED DOWNGRADIENT OF THE NON-INERT MATERIALS STOCKPILES. REFER TO PART III, ATACHMENT D6, APPENDIX D6-C FOR CONTAMINATED WATER AREA SIZING.

NON-INERT MATERIALS STAGING AREA

0 15 30
SCALE IN FEET

STATE OF TEXAS
GREGORY W. ADAMS
73356
LICENSED
PROFESSIONAL ENGINEER

6/20/2014

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REVISIONS						
1	6/14	N.O.D. NO. 1 RESPONSE	GLR	GWA	GWA	GWA
REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY

REUSABLE MATERIALS STAGING AREA

130 ENVIRONMENTAL PARK, LLC
130 ENVIRONMENTAL PARK
TYPE I PERMIT APPLICATION

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MANSFIELD • WICHITA FALLS
817-563-1144

TBPE FIRM NO. F-256		TBPG FIRM NO. 50222
DSN. GWA	DATE : 6/14	DRAWING
DWN. GLR	SCALE : GRAPHIC	B.6
CHK. GWA	DWG : B6-RMSA.dwg	

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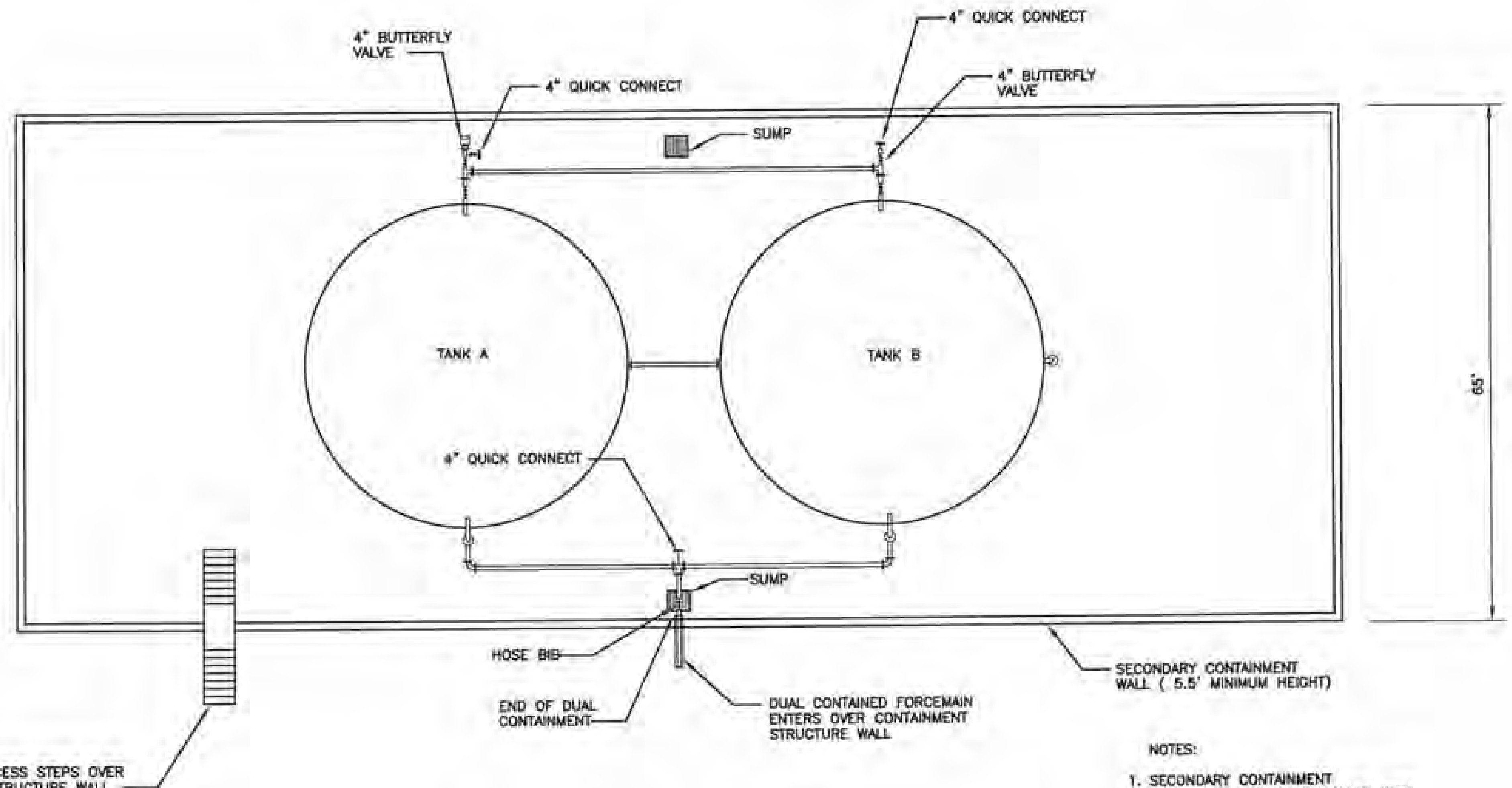
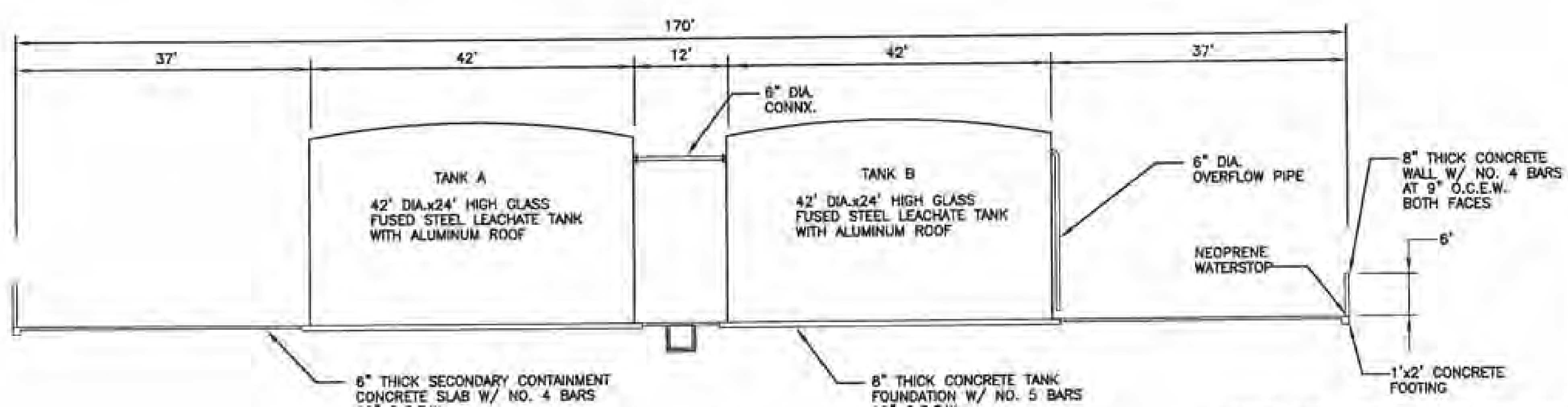


LEACHATE STORAGE FACILITY PLAN

0 10 20
SCALE IN FEET

NOTES:

1. SECONDARY CONTAINMENT STRUCTURE WILL BE INSTALLED WITH TANK A. TANK B MAY BE INSTALLED AT A LATER DATE WHEN NEEDED.
2. STEEL SECONDARY CONTAINMENT STRUCTURE MAY BE USED INSTEAD OF CONCRETE.



LEACHATE STORAGE FACILITY SECTION

0 10 20
SCALE IN FEET

STATE OF TEXAS
GREGORY W. ADAMS
73356
LICENSED PROFESSIONAL ENGINEER
6/20/2014

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1	6/14	M.O.D. NO. 1 RESPONSE	GLW	GWA	GWA	GWA
REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY

LEACHATE STORAGE FACILITY

130 ENVIRONMENTAL PARK, LLC
130 ENVIRONMENTAL PARK
TYPE I PERMIT APPLICATION

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CONSULTING ENGINEERS
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TBPE FIRM NO. F-256 | TBPG FIRM NO. 50222

DSN. GWA | DATE : 6/14
DWN. GLW | SCALE : GRAPHIC
CHK. GWA | DWG : D3.4_5-LeaDet.dwg

DRAWING B.7

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130 ENVIRONMENTAL PARK
CALDWELL COUNTY, TEXAS
TCEQ PERMIT NO. MSW 2383

TYPE I PERMIT APPLICATION

PART III – FACILITY INVESTIGATION AND DESIGN

ATTACHMENT C
FACILITY SURFACE WATER DRAINAGE REPORT

6-25-14

STATE OF TEXAS
T. Traw
103707
LICENSED
PROFESSIONAL ENGINEER

Biggs & Mathews, Inc.
Firm Registration No. F-834

Prepared for

130 ENVIRONMENTAL PARK, LLC

February 2014

Revised June 2014

Prepared by

BIGGS & MATHEWS ENVIRONMENTAL
1700 Robert Road, Suite 100 • Mansfield, Texas 76063 • 817-563-1144

TEXAS BOARD OF PROFESSIONAL ENGINEERS
FIRM REGISTRATION NO. F-256

TEXAS BOARD OF PROFESSIONAL GEOSCIENTISTS
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And

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TEXAS BOARD OF PROFESSIONAL ENGINEERS
FIRM REGISTRATION NO. F-834

CONTENTS

6-25-14

STATE OF TEXAS
T. Traw
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Biggs & Mathews, Inc.
Firm Registration No. F-834

130 ENVIRONMENTAL PARK
CALDWELL COUNTY, TEXAS
TCEQ PERMIT APPLICATION NO. MSW 2383

TYPE I PERMIT APPLICATION

PART III – FACILITY INVESTIGATION AND DESIGN

ATTACHMENT C1
DRAINAGE ANALYSIS AND DESIGN

Prepared for

130 ENVIRONMETNAL PARK, LLC

February 2014

Revised June 2014

6-25-14

STATE OF TEXAS
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6-25-14

STATE OF TEXAS
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PROFESSIONAL ENGINEER

Biggs & Mathews, Inc.
Firm Registration No. F-834

130 Environmental Park

Table 2 - Postdeveloped Conditions Drainage Analysis Summary

Comparison Point	25-Year Peak Discharge (cfs)	25-Year Volume (ac-ft)	Peak Velocity (fps)	Runon/ Runoff	Drainage Areas
CP1	8.0	0.7	0.33	Runoff	P1
CP2	1205.3	358.2	3.09	Runon	OS2, P1
CP3	706.2	201.8	2.65	Runon	OS3
CP4	170.0	39.0	3.16	Runon	OS4
CP5	257.5	59.4	2.48	Runoff	OS4, P3
CP6	~~2038.6~~ 2033.6	676.0	~~3.88~~ 3.87	Runoff	OS2, OS3, P1, P2, P2A, Pond 1A, Pond 3A, Pond 4A
CP7	141.8	61.8	2.32	Runoff	Pond 2A, P4
CP8	327.2	53.3	4.64	Runoff	Pond 5A, Pond 6A, Pond 7A, P5
CP9	795.7	156.7	4.78	Runoff	OS5
CP10	117.5	15.4	4.03	Runoff	OS6
CP11	293.6	53.5	4.09	Runoff	OS7
CP12	~~230.9~~ 231.0	2554.5	2.05	Runoff	OS1, OS2, OS3, OS4, OS8, OS9, OS10, OS11, OS12, OS13, OS14, OS15, OS16, OS17, P1, P2, P2A, P3, P4, P5, Pond 1A, Pond 2A, Pond 3A, Pond 4A, Pond 5A, Pond 6A, Pond 7A

7 EXISTING/POSTDEVELOPMENT COMPARISON

30 TAC §330.63(c)(1)(D)(iii) and §330.305(a)

Consistent with 30 TAC §330.63(c)(1)(D)(iii) and §330.305(a), the proposed facility development will not adversely alter existing drainage patterns. Refer to Appendix C1-A for a summary of the existing conditions, postdeveloped conditions, and a comparison of the peak flow rate, volume, and velocity for each comparison point evaluated. Comparisons are provided for the 25-year and 100-year, 24-hour rainfall events. The comparison points established in the existing condition evaluation remain unchanged in the postdeveloped condition.

At CP1, a permit boundary discharge point, the peak discharge, runoff volume, and peak velocity are reduced as a result of facility development. However, these changes are not adverse alterations of existing drainage patterns because: (1) In both the existing and postdeveloped conditions, the discharge from CP1 enters a small drainage ditch along the south side of Homannville Trail right-of-way that flows to the west and includes culverts for driveways on adjacent properties. The referenced reductions at CP1 will improve drainage conditions in this ditch. (2) After approximately 375 linear feet, this roadside ditch drains into an excavated, but otherwise unimproved, larger drainage ditch that flows generally to the southwest and west from the corner where Homannville Trail turns nearly north. A large portion of the flow in this ditch originates in offsite drainage areas to the north and northeast, along and across Homannville Trail. The referenced reductions at CP1 will be insignificant through this port of the natural drainage. (3) Near a northwest corner of the 130 Environmental Park site, this ditch turns to the south and is joined by a drainageway for runoff from the largest portion of the 2,883-acre off-site drainage area OS2 (for comparison, the area of existing conditions on-site drainage area A1, from which flows at CP1 originate, is approximately 10.2 acres). The referenced reductions at CP1 will be insignificant through this portion of the natural drainage. (4) Approximately 900 feet south of the above-referenced northwest corner of the 130 Environmental Park site, this drainageway flows onto the site. It then flows generally to the south, exiting the permit boundary at CP6, where the postdevelopment 25-year peak flow rate and volume are within 4% of the existing conditions values.

Development of the 130 Environmental Park Landfill will result in minor changes in 25-year peak discharge and volume at comparison points CP5, CP6, CP7, and CP8 (all of which are permit boundary discharge points), but none of these changes will be an adverse alteration of the existing drainage patterns. Each of these points is in a drainage channel and discharges from each point will flow into SCS Reservoir Site 21. The discharge from the reservoir enters the Dry Creek channel and flows south to a culvert under FM 1185. The 25-year storm peak discharge rate at this culvert (CP12) will be essentially unchanged from the existing conditions to the postdeveloped condition (230.9 cfs to 231.0 cfs). The runoff volume at CP12 will increase slightly (approximately 1.2%, from 2524.1 acre feet to 2554.5 acre feet) and that volume release will be distributed over a relatively long time period and, therefore, will not result in an adverse alteration of existing drainage patterns.

At CP5 the peak discharge will increase from 255.5 cfs to 257.5 cfs, a change of less than 0.8%, and at CP6 the peak discharge will decrease from 2121.3 cfs to 2033.6 cfs, a change of approximately 4%. At CP5, the runoff volume will increase from 58.5 acre-feet to 59.4 acre-feet, a change of only 1.5%, and at CP6, the runoff volume will increase from 659.3 acre-feet to 676.0 acre-feet, a change of less than 2.5%. CP5 and CP6 are located in channels of unnamed tributaries on the west side of the 130 Environmental Park site. These tributaries merge approximately 350 feet south of the permit boundary and flow into SCS Reservoir Site 21. CP5 and CP6 are both located within the 100-year floodplain, as are the tributaries that flow from them in to the SCS reservoir site. The slight decreases in peak flow rates and CP5 and CP6, and in the stream channels between them and the reservoir site will not result in an adverse alteration of existing drainage patterns. The slight increases in runoff volumes at and below CP5 and CP6 will occur in stream channels and within the reservoir site, all of which are located within the 100-year floodplain, will not reduce total streamflows or increase the 100-year flood water surface elevation. The changes at CP5 and CP6 will not result in adverse alterations of existing drainage patterns.

At CP7 the 25-year storm peak discharge will decrease from 243.4 cfs to 141.8 cfs, a reduction of approximately 42%, and at CP8 the peak discharge will decrease from 372.4 cfs to 327.2 cfs, a reduction of approximately 12.1%. At CP7, the 25-year storm runoff volume will increase from 38.5 acre-feet to 61.8 acre-feet, an increase of approximately 60.5%, and at CP8 the runoff volume will decrease from 63.8 acre-feet to 53.3 acre-feet, a decrease of approximately 16.5%. CP7 and CP8 are both located within the 100-year floodplain of SCS Reservoir Site 21, in the eastern portion of the site. The reductions in peak flow rates at CP7 and CP8 will not result in adverse alterations of existing drainage patterns. The 25-year storm runoff volume will increase at CP7; however, because the peak discharge rate will be reduced and the runoff volume will be distributed over a longer time period, that increase will not result in an adverse alteration of existing drainage patterns. And, while the 25-year storm runoff volume will increase at CP7 and decrease at CP8 (a net increase of 12.8 acre feet, approximately 12.5%), these changes will not reduce total streamflows or increase the 100-year flood water surface elevation. The changes at CP7 and CP8 will not result in adverse alterations of existing drainage patterns.

Drawing C1-A-2 – Existing Condition Runoff Summary: This drawing depicts the existing locations (comparison points) where surface water enters or exits the facility and property boundaries. Each comparison point is shown on the drawing and the peak flow rate and runoff volume is provided in the summary table for each comparison point.

Drawing C1-A-4 – Postdeveloped Runoff Summary: This drawing depicts the locations (comparison points) where surface water enters or exits the facility and property boundaries. Each comparison is shown on the drawing and the peak flow rate and runoff volume is provided in the summary table for each comparison point.

A table comparing the existing condition runoff summary and the postdeveloped runoff summary is provided on page C1-A-5. The existing condition and postdeveloped peak flow rate, runoff volume, and velocity at each comparison point for both the 25- and 100-year, 24-hour rainfall event is provided. The difference, if any, between the existing and postdeveloped runoff results is also provided in the table.

Conclusion

Because: (1) the postdevelopment stormwater discharge points are consistent with the existing site configuration, and (2) development of the 130 Environmental Park Landfill will not adversely alter peak flow rates, velocities, or runoff volumes, ~~Given that: (1) drainage from the permit boundary and/or property boundary does not adversely alter the peak flow rates, velocities, or runoff volumes at the facility and property boundaries and receiving channelsand (2) the stormwater discharge outfalls are consistent with the existing site configuration, it is concluded that~~ the proposed landfill development will not adversely alter existing drainage patterns consistent with §330.305(a).

130 ENVIRONMENTAL PARK

ATTACHMENT C1

APPENDIX C1-A

EXISTING/POSTDEVELOPMENT COMPARISON

6-25-14

STATE OF TEXAS
T. Traw
103797
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PROFESSIONAL ENGINEER

Biggs & Mathews, Inc.
Firm Registration No. F-834

Includes pages C1-A-1 through C1-A-5

CONTENTS

6-25-14

STATE OF TEXAS
T. Traw
103797
LICENSED
PROFESSIONAL ENGINEER

Biggs & Mathews, Inc.
Firm Registration No. F-834

NOTES:

1. CONTOURS AND ELEVATIONS WITHIN THE PROPERTY BOUNDARY PROVIDED BY DALLAS AERIAL SERVICE FROM AERIAL PHOTOGRAPHY FLOWN MAY 13, 2013. HORIZONTAL DATUM IS TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE (NAD 83). ELEVATIONS ARE RELATIVE TO NAVD88 – GEOID 12A.
2. ROADWAYS IN THE IMMEDIATE VICINITY OF THE SITE TAKEN FROM TNRIS AERIAL PHOTOGRAPHY FLOWN JUNE 11, 2012. HORIZONTAL DATUM IS TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE (NAD 83).
3. CONTOURS AND ELEVATIONS OUTSIDE THE PROPERTY BOUNDARY PROVIDED BY CAPCOG HORIZONTAL DATUM IS TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE (NAD 83).

0 500 1000
SCALE IN FEET

LEGEND

PROPERTY BOUNDARY
FACILTY BOUNDARY
EXISTING CONTOUR
N 13,900,000 STATE PLANE GRID
DRAINAGE AREA BOUNDARY
PRIMARY REACH
SECONDARY REACH
A1 DRAINAGE AREA DESIGNATION
CP1 COMPARISON POINT
FLOW DIRECTION
POND OUTLETS

Postdeveloped Runoff Summary					
Comparison Point	25-Year Peak Discharge (cfs)	25-Year Volume (ac-ft.)	100-Year Peak Discharge (cfs)	100-Year Volume (ac-ft.)	Type of Flow
CP1	8.0	0.7	11.2	0.9	Runoff
CP2	1205.3	358.2	1777.7	532.4	Runon
CP3	706.2	201.8	1028.7	296.9	Runon
CP4	170.0	39.0	252.0	58.3	Runon
CP5	257.5	59.4	379.6	88.3	Runoff
CP6	2033.6	676.0	2976.1	997.2	Runoff
CP7	141.8	61.8	206.8	88.8	Runoff
CP8	327.2	53.3	454.7	77.5	Runoff
CP9	795.7	156.7	1149.3	229.4	Runoff
CP10	117.5	15.4	171.4	22.8	Runoff
CP11	293.6	53.5	431.5	79.6	Runoff
CP12	231.0	2554.5	904.4	3760.5	Runoff

6-25-14

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REVISIONS						
2	6/14	NOD No. 2	MNG	TLT	TLT	TLT
REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY

POSTDEVELOPED RUNOFF SUMMARY

130 ENVIRONMENTAL PARK, LLC
130 ENVIRONMENTAL PARK

BIGGS & MATHEWS ENVIRONMENTAL
CONSULTING ENGINEERS
MANSFIELD • WICHITA FALLS
817-563-1144

TBPE FIRM NO. F-256 & F-834 | TBPG FIRM NO. 50222

DSN. TLT | DATE : 2/14
DWN. MNG | SCALE : GRAPHIC
CHK. TLT | DWG : C1-A-3.DWG

DRAWING C1-A-4

130 Environmental Park
Existing/Postdeveloped Drainage Analysis Summary

Boundary	Comparison Point	25-Year Peak Discharge (CFS)			100-Year Peak Discharge (CFS)		
		Existing	Post-Developed	Difference	Existing	Post-Developed	Difference
Facility Boundary	CP1	37.9	8.0	-29.9	56.3	11.2	-45.1
	CP2	1214.1	1205.3	-8.8	1789.6	1777.7	-11.9
	CP3	706.2	706.2	0.0	1028.7	1028.7	0.0
	CP4	170.0	170.0	0.0	252.0	252.0	0.0
	CP5	255.5	257.5	2.0	379.5	379.6	0.1
	CP6	2121.3	~~2036.6~~ 2033.6	~~-82.7~~ -87.7	3123.5	~~2986.6~~ 2976.1	~~-136.9~~ -147.4
	CP7	243.4	141.8	-101.6	359.8	206.8	-153.0
	CP8	372.4	327.2	-45.2	550.5	454.7	-95.8
Property Boundary	CP9	795.7	795.7	0.0	1149.3	1149.3	0.0
	CP10	117.5	117.5	0.0	171.4	171.4	0.0
	CP11	293.6	293.6	0.0	431.5	431.5	0.0
	CP12	230.9	~~230.9~~231.0	~~0.0~~0.1	974.1	~~904.3~~904.4	~~-69.8~~ -69.7

130 Environmental Park
Existing/Postdeveloped Volume Summary

Boundary	Comparison Point	25-Year Volume (Ac-ft)			100-Year Volume (Ac-ft)		
		Existing	Post-Developed	Difference	Existing	Post-Developed	Difference
Facility Boundary	CP1	4.3	0.7	-3.6	6.4	0.9	-5.5
	CP2	361.8	358.2	-3.6	537.9	532.4	-5.5
	CP3	201.8	201.8	0.0	296.9	296.9	0.0
	CP4	39.0	39.0	0.0	58.3	58.3	0.0
	CP5	58.5	59.4	0.9	87.3	88.3	1.0
	CP6	659.3	676.0	16.7	977.9	997.2	19.3
	CP7	38.5	61.8	23.3	57.5	88.8	31.3
	CP8	63.8	53.3	-10.5	95.4	77.5	-17.9
Property Boundary	CP9	156.7	156.7	0.0	229.4	229.4	0.0
	CP10	15.4	15.4	0.0	22.8	22.8	0.0
	CP11	53.5	53.5	0.0	79.6	79.6	0.0
	CP12	2524.1	2554.5	30.4	3726.8	3760.5	33.7

130 Environmental Park
Existing/Postdeveloped Velocity Summary

Boundary	Comparison Point	25-Year Velocity (fps)			100-Year Velocity (fps)		
		Existing	Post-Developed	Difference	Existing	Post-Developed	Difference
Facility Boundary	CP1	0.6	0.3	-0.3	0.7	0.4	-0.4
	CP2	3.1	3.1	0.0	3.4	3.4	0.0
	CP3	2.7	2.7	0.0	2.9	2.9	0.0
	CP4	3.2	3.2	0.0	3.5	3.5	0.0
	CP5	2.5	2.5	0.0	2.7	2.7	0.0
	CP6	3.9	3.9	0.0	4.3	4.3	0.0
	CP7	2.7	2.3	-0.3	2.9	2.5	-0.4
	CP8	4.8	4.6	-0.2	5.3	5.0	-0.3
Property Boundary	CP9	4.8	4.8	0.0	5.3	5.3	0.0
	CP10	4.0	4.0	0.0	4.4	4.4	0.0
	CP11	4.1	4.1	0.0	4.5	4.5	0.0
	CP12	2.1	2.1	0.0	3.0	2.9	-0.1

130 ENVIRONMENTAL PARK

ATTACHMENT C1

APPENDIX C1-B

EXISTING CONDITION HYDROLOGIC CALCULATIONS

6-25-14

STATE OF TEXAS
T. Traw
103797
LICENSED
PROFESSIONAL ENGINEER

Biggs & Mathews, Inc.
Firm Registration No. F-834

Includes pages C1-B-1 through C1-B-33

CONTENTS

6-25-14

STATE OF TEXAS
T. Traw
103797
LICENSED
PROFESSIONAL ENGINEER

Biggs & Mathews, Inc.
Firm Registration No. F-834

Project: 130 Environmental Park Simulation Run: Existng 100yr 24hr SCS

Start of Run: 01Jan2014, 00:00 Basin Model: Existing
End of Run: 04Jan2014, 00:00 Meteorologic Model: 100 yr 24hr (SCS)
Compute Time: 22Jan2014, 10:43:21 Control Specifications: 72 hr

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
A1	0.016	56.3	01Jan2014, 12:17	6.4
A2	0.351	766.5	01Jan2014, 12:44	143.1
A3	0.070	152.9	01Jan2014, 12:45	29.0
A4	0.141	359.8	01Jan2014, 12:34	57.5
A5	0.234	550.5	01Jan2014, 12:39	95.4
CP1	0.016	56.3	01Jan2014, 12:17	6.4
CP10	0.054	171.4	01Jan2014, 12:23	22.8
CP11	0.192	431.5	01Jan2014, 12:43	79.6
CP12	8.815	974.1	01Jan2014, 20:14	1488.5
CP2	1.298	1789.6	01Jan2014, 13:30	537.9
CP3	0.693	1028.7	01Jan2014, 13:25	296.9
CP4	0.143	252.0	01Jan2014, 13:02	58.3
CP5	0.213	379.5	01Jan2014, 12:59	87.3
CP6	2.342	3123.5	01Jan2014, 13:33	977.9
CP7	0.141	359.8	01Jan2014, 12:34	57.5
CP7 Reach	0.141	359.7	01Jan2014, 12:34	57.5
CP8	0.234	550.5	01Jan2014, 12:39	95.4
CP8 Reach	0.234	550.3	01Jan2014, 12:39	95.4
CP9	0.527	1149.3	01Jan2014, 12:48	229.4
Dry Creek	4.827	5653.8	01Jan2014, 13:52	2029.7
Dry Creek U.S.	4.827	5654.1	01Jan2014, 13:49	2029.7
J-2	1.991	2816.0	01Jan2014, 13:33	834.9
J-3	2.555	3427.1	01Jan2014, 13:30	1065.3
OS1	4.504	5467.9	01Jan2014, 13:51	1898.7
OS10	0.037	132.2	01Jan2014, 12:18	15.6
OS11	0.048	138.5	01Jan2014, 12:28	19.9

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
OS12	0.101	220.6	01Jan2014, 12:45	41.9
OS13	0.325	1926.7	01Jan2014, 12:05	176.1
OS14	0.078	177.7	01Jan2014, 12:43	32.9
OS15	0.070	141.0	01Jan2014, 12:52	29.0
OS16	0.521	928.4	01Jan2014, 13:01	212.4
OS17	0.089	223.8	01Jan2014, 12:34	35.7
OS2	1.282	1775.3	01Jan2014, 13:30	531.5
OS3	0.693	1028.7	01Jan2014, 13:25	296.9
OS4	0.143	252.0	01Jan2014, 13:02	58.3
OS5	0.527	1149.3	01Jan2014, 12:48	229.4
OS6	0.054	171.4	01Jan2014, 12:23	22.8
OS7	0.192	431.5	01Jan2014, 12:43	79.6
OS8	0.045	147.4	01Jan2014, 12:21	18.7
OS9	0.067	170.5	01Jan2014, 12:35	27.8
Reach-1	0.016	56.2	01Jan2014, 12:33	6.4
Reach-1A	0.016	56.1	01Jan2014, 12:42	6.4
Reach-2	0.693	1028.5	01Jan2014, 13:31	296.9
Reach-3	1.298	1789.2	01Jan2014, 13:35	537.9
Reach-4	1.991	2815.3	01Jan2014, 13:40	834.8
Reach-5	2.342	3123.4	01Jan2014, 13:34	977.9
Reach-6	0.213	379.4	01Jan2014, 13:04	87.3
Reach-7	0.143	251.8	01Jan2014, 13:09	58.3
Reach-8	2.555	3427.0	01Jan2014, 13:32	1065.3
Site 21	8.737	967.1	01Jan2014, 20:15	1455.6

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130 ENVIRONMENTAL PARK

ATTACHMENT C1

APPENDIX C1-C

POSTDEVELOPMENT HYDROLOGIC CALCULATIONS

6-25-14

STATE OF TEXAS
T. Traw
103797
LICENSED
PROFESSIONAL ENGINEER

Biggs & Mathews, Inc.
Firm Registration No. F-834

Includes pages C1-C-1 through C1-C-38

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6-25-14

STATE OF TEXAS
T. Traw
103797
LICENSED
PROFESSIONAL ENGINEER

Biggs & Mathews, Inc.
Firm Registration No. F-834

LEGEND

PROPERTY BOUNDARY
FACILITY BOUNDARY
EXISTING CONTOUR
STATE PLANE GRID
DRAINAGE AREA BOUNDARY
PRIMARY REACH
SECONDARY REACH
A1 DRAINAGE AREA DESIGNATION
CP1 COMPARISON POINT
FLOW DIRECTION
POND OUTLETS

0 500 1000
SCALE IN FEET

Postdeveloped Runoff Summary					
Comparison Point	25-Year Peak Discharge (cfs)	25-Year Volume (ac-ft.)	100-Year Peak Discharge (cfs)	100-Year Volume (ac-ft.)	Type of Flow
CP1	8	0.7	11.2	0.9	Runoff
CP2	1205.3	358.2	1777.7	532.4	Runon
CP3	706.2	201.8	1028.7	296.9	Runon
CP4	170	39	252	58.3	Runon
CP5	257.5	59.4	379.6	88.3	Runoff
CP6	2033.6	676	2976.1	997.2	Runoff
CP7	141.8	61.8	206.8	88.8	Runoff
CP8	327.2	53.3	454.7	77.5	Runoff
CP9	795.7	156.7	1149.3	229.4	Runoff
CP10	117.5	15.4	171.4	22.8	Runoff
CP11	293.6	53.5	431.5	79.6	Runoff
CP12	231	2554.5	904.4	3760.5	Runoff

NOTES:

1. CONTOURS AND ELEVATIONS WITHIN THE PROPERTY BOUNDARY PROVIDED BY DALLAS AERIAL SERVICE FROM AERIAL PHOTOGRAPHY FLOWN MAY 13, 2013. HORIZONTAL DATUM IS TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE (NAD 83). ELEVATIONS ARE RELATIVE TO NAVD88 – GEOID 12A.
2. ROADWAYS IN THE IMMEDIATE VICINITY OF THE SITE TAKEN FROM TNRIS AERIAL PHOTOGRAPHY FLOWN JUNE 11, 2012. HORIZONTAL DATUM IS TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE (NAD 83).
3. CONTOURS AND ELEVATIONS OUTSIDE THE PROPERTY BOUNDARY PROVIDED BY CAPCOG. HORIZONTAL DATUM IS TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE (NAD 83).

6-25-14

STATE OF TEXAS
T. Traw
103797
LICENSED
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REVISIONS							
2	5/14	NOD No. 2	MNG	TLT	TLT	TLT	
REV.	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY	

POSTDEVELOPED RUNOFF SUMMARY

130 ENVIRONMENTAL PARK, LLC
130 ENVIRONMENTAL PARK

BIGGS & MATHEWS ENVIRONMENTAL
CONSULTING ENGINEERS
MANSFIELD • WICHITA FALLS
817-563-1144

TBPE FIRM NO. F-256 & F-834 | TBPG FIRM NO. 50222

DSN. TLT | DATE : 2/14 | DRAWING
DWN. MNG | SCALE : GRAPHIC | C1-C-7
CHK. TLT | DWG : C1-C-1.DWG

130 Environmental Park
Pond Data for HEC-HMS
Pond 2

Reservoir	
Description:	
Downstream:	CP7
Method:	Outflow Structures
Storage Method:	Elevation-Area
Elev-Area Function:	Pond 2 Elev Area
Initial Condition:	Inflow=Outflow
Main Tailwater:	Assume None
Auxillary:	CP8
Time Step Method:	Automatic Adaption
Outlets:	1
Spillways:	1
Dam Tops:	0
Pumps:	0
Dam Break:	No
Dam Seepage:	No
Release:	No
Evaporation:	No

Outlet		
Method:	Culvert Outlet	
Direction:	Main	
Number Barrels:	1	
Solution Method:	Automatic	
Shape:	Circular	
Chart:	Concrete Pipe Culvert	
Scale:	Groove end entrance, pipe projecting from fill	
Length:	320	ft
Diameter:	1.25	ft
Inlet Elevation:	520	ft
Entrance Coefficient:	0.5	
Outlet Elevation:	519	ft
Exit Coefficient:	1	
Manning's n:	0.013	

Spillway	
Method:	Broad-Crested Spillway
Direction:	Auxillary
Elevation:	530 ft
Length:	70 ft
Coefficient:	2.62
Gates:	0

Paired Data
Elevation Storage Functions
Outflow Structures

Elevation (ft)	Area (ac)	Volume (ac-ft)
520	4.08	0.00
521	4.32	4.20
522	4.55	8.64
523	4.80	13.31
524	5.05	18.24
525	5.30	23.41
526	5.55	28.84
527	5.87	34.55
528	6.18	40.57
529	6.55	46.94
530	6.92	53.68
531	7.33	60.80
532	7.74	68.34

130 Environmental Park
Pond Data for HEC-HMS
Pond 4

Reservoir	
Description:	
Downstream:	J-2
Method:	Outflow Structures
Storage Method:	Elevation-Area
Elev-Area Function:	Pond 4 Elev Area
Initial Condition:	Inflow=Outflow
Main Tailwater:	Assume None
Auxillary:	--None--
Time Step Method:	Automatic Adaption
Outlets:	1
Spillways:	1
Dam Tops:	0
Pumps:	0
Dam Break:	No
Dam Seepage:	No
Release:	No
Evaporation:	No

Spillway	
Method:	Broad-Crested Spillway
Direction:	Main
Elevation:	549 ft
Length:	30 ft
Coefficient:	2.62
Gates:	0

Paired Data
Elevation Storage Functions
Inflow=Outflow

Elevation (ft)	Area (ac)	Volume (ac-ft)
545.75	1.78	0.00
546	1.99	0.47
548	2.55	5.01
550	3.13	10.70
551	3.43	13.98

Outlet		
Method:	Culvert Outlet	
Direction:	Main	
Number Barrels:	4	
Solution Method:	Automatic	
Shape:	Circular	
Chart:	Concrete Pipe Culvert	
Scale:	Groove end entrance, pipe projecting from fill	
Length:	75	ft
Diameter:	3	ft
Inlet Elevation:	545.75	ft
Entrance Coefficient:	0.5	
Outlet Elevation:	545	ft
Exit Coefficient:	1	
Manning's n:	0.013	

130 Environmental Park
Pond Data for HEC-HMS
Pond 6

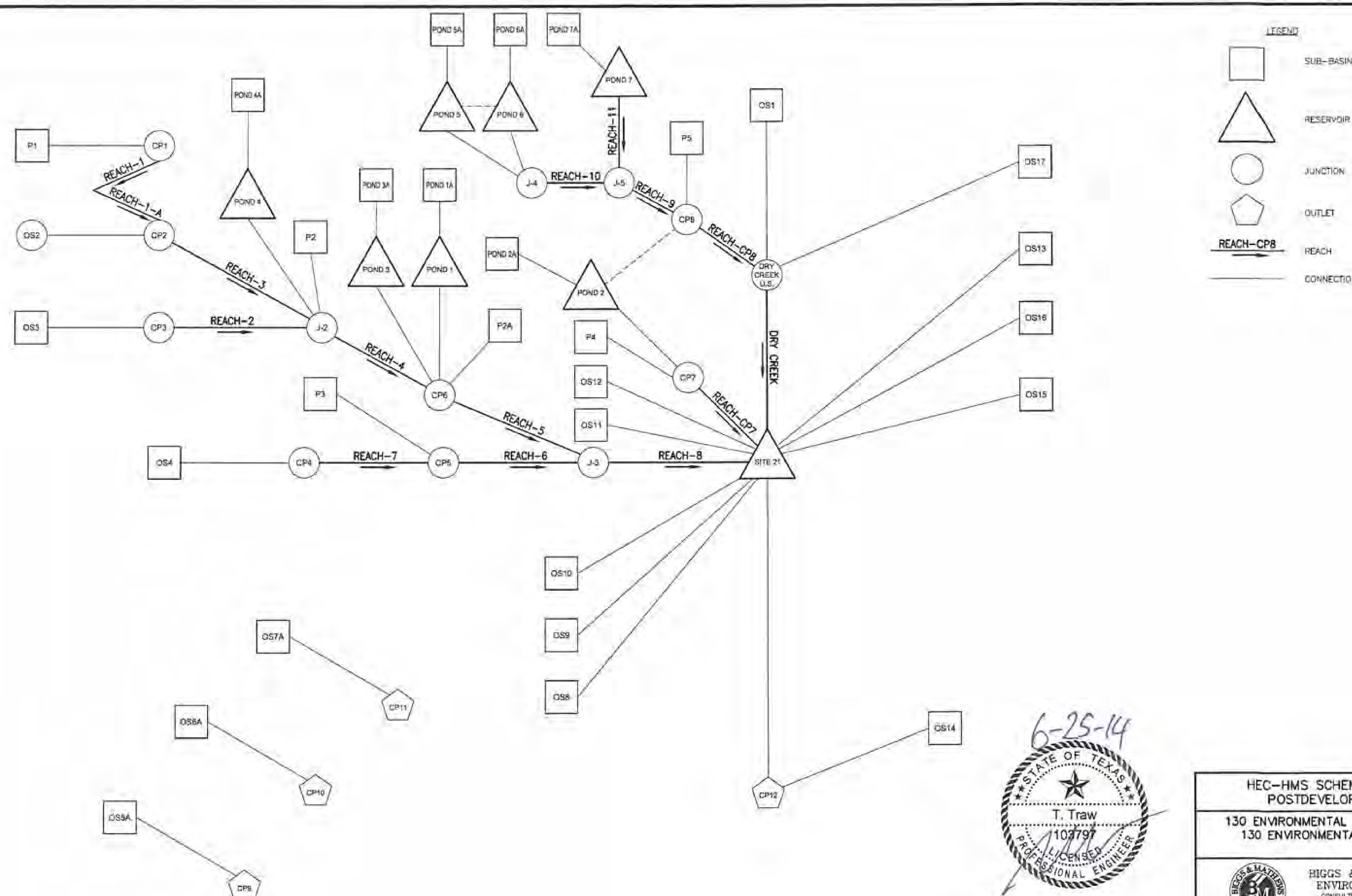
Reservoir	
Description:	
Downstream:	J-4
Method:	Outflow Structures
Storage Method:	Elevation-Area
Elev-Area Function:	Pond 6 Elev Area
Initial Condition:	Inflow=Outflow
Main Tailwater:	Assume None
Auxiliary:	--None--
Time Step Method:	Automatic Adaption
Outlets:	1
Spillways:	1
Dam Tops:	0
Pumps:	0
Dam Break:	No
Dam Seepage:	No
Release:	No
Evaporation:	No

Spillway	
Method:	Broad-Crested Spillway
Direction:	Main
Elevation:	556.25 ft
Length:	10 ft
Coefficient:	2.62
Gates:	0

Paired Data
Elevation Storage Functions
Pond 6 Elev Area

Elevation (ft)	Area (ac)	Volume (ac-ft)
554	0.32	0.00
555	0.41	0.37
556	0.51	0.83
557	0.61	1.39
558	0.72	2.05
559	0.81	2.82
560	0.91	3.68

Outlet		
Method:	Culvert Outlet	
Direction:	Main	
Number Barrels:	1	
Solution Method:	Automatic	
Shape:	Circular	
Chart:	Concrete Pipe Culvert	
Scale:	Groove end entrance, pipe projecting from fill	
Length:	70	ft
Diameter:	1	ft
Inlet Elevation:	554	ft
Entrance Coefficient:	0.5	
Outlet Elevation:	553	ft
Exit Coefficient:	1	
Manning's n:	0.013	



6-25-14

STATE OF TEXAS
T. Traw
103797
LICENSED
PROFESSIONAL ENGINEER

ISSUED FOR PERMITTING PURPOSES ONLY

REVISIONS						
2	6/14	NOD No. 2	MNG	TLT	TLT	TLT
REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY

HEC-HMS SCHEMATICS POSTDEVELOPED

130 ENVIRONMENTAL PARK, LLC
130 ENVIRONMENTAL PARK

BIGGS & MATHEWS ENVIRONMENTAL
CONSULTING ENGINEERS
MANSFIELD • WICHITA FALLS
817-563-1144

TBPE FIRM NO. F-256 & F-834		TBPG FIRM NO. 50222
DSN. TLT	DATE : 2/14	DRAWING
DWN. MNG	SCALE : GRAPHIC	C1-C-23
CHK. TLT	DWG : C1-C-1DWG	

Project: 130 Environmental Park Simulation Run: Post 25yr 24hr SCS

Start of Run: 01Jan2014, 00:00
End of Run: 04Jan2014, 00:00
Compute Time: 11Jun2014, 10:42:57

Basin Model: Post Developed
Meteorologic Model: 25 yr 24hr (SCS)
Control Specifications: 72 hr

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
CP1	0.002	8.0	01Jan2014, 12:05	0.7
CP10	0.054	117.5	01Jan2014, 12:23	15.4
CP11	0.192	293.6	01Jan2014, 12:44	53.5
CP12	8.816	231.0	01Jan2014, 12:45	696.1
CP2	1.284	1205.3	01Jan2014, 13:31	358.2
CP3	0.693	706.2	01Jan2014, 13:26	201.8
CP4	0.143	170.0	01Jan2014, 13:03	39.0
CP5	0.213	257.5	01Jan2014, 13:08	59.4
CP6	2.350	2033.6	01Jan2014, 13:41	670.9
CP7	0.193	141.8	01Jan2014, 12:10	50.6
CP8	0.175	327.2	01Jan2014, 12:30	53.3
CP9	0.527	795.7	01Jan2014, 12:49	156.7
Dry Creek	4.768	3817.6	01Jan2014, 13:55	1360.8
Dry Creek U.S.	4.768	3817.8	01Jan2014, 13:52	1360.8
J-2	2.113	1966.6	01Jan2014, 13:34	601.8
J-3	2.563	2240.7	01Jan2014, 13:38	730.3
J-4	0.017	10.0	01Jan2014, 12:32	5.8
J-5	0.078	160.3	01Jan2014, 12:17	26.2
OS1	4.504	3725.1	01Jan2014, 13:53	1283.8
OS10	0.037	90.7	01Jan2014, 12:18	10.5
OS11	0.048	94.4	01Jan2014, 12:28	13.4
OS12	0.101	150.1	01Jan2014, 12:46	28.2
OS13	0.325	1424.9	01Jan2014, 12:05	129.3
OS14	0.078	121.7	01Jan2014, 12:44	22.2
OS15	0.070	95.9	01Jan2014, 12:52	19.5
OS16	0.521	626.6	01Jan2014, 13:02	142.1

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
OS17	0.089	150.5	01Jan2014, 12:35	23.7
OS2	1.282	1203.4	01Jan2014, 13:31	357.5
OS3	0.693	706.2	01Jan2014, 13:26	201.8
OS4	0.143	170.0	01Jan2014, 13:03	39.0
OS5	0.527	795.7	01Jan2014, 12:49	156.7
OS6	0.054	117.5	01Jan2014, 12:23	15.4
OS7	0.192	293.6	01Jan2014, 12:44	53.5
OS8	0.045	100.5	01Jan2014, 12:21	12.6
OS9	0.067	116.1	01Jan2014, 12:35	18.7
P1	0.002	8.0	01Jan2014, 12:05	0.7
P2	0.065	160.6	01Jan2014, 12:17	18.1
P2A	0.118	282.0	01Jan2014, 12:19	33.6
P3	0.070	89.5	01Jan2014, 13:01	20.4
P4	0.045	135.1	01Jan2014, 12:10	12.3
P5	0.097	173.9	01Jan2014, 12:33	27.1
Pond 1	0.050	32.8	01Jan2014, 12:35	16.8
Pond 1A	0.050	205.6	01Jan2014, 12:05	17.0
Pond 2	0.148	9.2	01Jan2014, 20:22	38.3
Pond 2A	0.148	523.6	01Jan2014, 12:09	49.5
Pond 3	0.069	4.5	01Jan2014, 19:54	18.7
Pond 3A	0.069	280.5	01Jan2014, 12:05	23.5
Pond 4	0.071	130.1	01Jan2014, 12:17	23.7
Pond 4A	0.071	285.3	01Jan2014, 12:05	23.8
Pond 5	0.014	6.8	01Jan2014, 12:46	4.7
Pond 5A	0.014	56.9	01Jan2014, 12:05	4.7
Pond 6	0.003	3.2	01Jan2014, 12:28	1.1
Pond 6A	0.003	13.0	01Jan2014, 12:05	1.1
Pond 7	0.061	152.2	01Jan2014, 12:14	20.4
Pond 7A	0.061	237.8	01Jan2014, 12:06	20.4
Reach-1	0.002	7.9	01Jan2014, 12:33	0.7
Reach-10	0.017	10.0	01Jan2014, 12:41	5.8

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Reach-11	0.061	152.1	01Jan2014, 12:16	20.4
Reach-1A	0.002	7.8	01Jan2014, 12:48	0.7
Reach-2	0.693	706.1	01Jan2014, 13:32	201.8
Reach-3	1.284	1205.1	01Jan2014, 13:37	358.2
Reach-4	2.113	1966.1	01Jan2014, 13:41	601.8
Reach-5	2.350	2033.5	01Jan2014, 13:42	670.9
Reach-6	0.213	257.4	01Jan2014, 13:12	59.4
Reach-7	0.143	169.9	01Jan2014, 13:11	39.0
Reach-8	2.563	2240.5	01Jan2014, 13:40	730.2
Reach-9	0.078	160.1	01Jan2014, 12:23	26.2
Reach-CP7	0.193	141.7	01Jan2014, 12:10	50.6
Reach-CP8	0.175	327.1	01Jan2014, 12:30	53.3
Site 21	8.738	135.6	02Jan2014, 02:31	673.8

Project: 130 Environmental Park Simulation Run: Post 100yr 24hr SCS

Start of Run: 01Jan2014, 00:00 Basin Model: Post Developed
End of Run: 04Jan2014, 00:00 Meteorologic Model: 100 yr 24hr (SCS)
Compute Time: 11Jun2014, 10:47:27 Control Specifications: 72 hr

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
CP1	0.002	11.2	01Jan2014, 12:05	0.9
CP10	0.054	171.4	01Jan2014, 12:23	22.8
CP11	0.192	431.5	01Jan2014, 12:43	79.6
CP12	8.816	904.4	01Jan2014, 20:42	1453.3
CP2	1.284	1777.7	01Jan2014, 13:30	532.5
CP3	0.693	1028.7	01Jan2014, 13:25	296.9
CP4	0.143	252.0	01Jan2014, 13:02	58.3
CP5	0.213	379.6	01Jan2014, 13:06	88.3
CP6	2.350	2976.1	01Jan2014, 13:39	986.8
CP7	0.193	206.8	01Jan2014, 12:09	63.8
CP8	0.175	454.7	01Jan2014, 12:26	82.6
CP9	0.527	1149.3	01Jan2014, 12:48	229.4
Dry Creek	4.768	5599.6	01Jan2014, 13:53	2017.0
Dry Creek U.S.	4.768	5599.9	01Jan2014, 13:50	2017.0
J-2	2.113	2882.2	01Jan2014, 13:32	890.1
J-3	2.563	3284.3	01Jan2014, 13:35	1075.1
J-4	0.017	12.4	01Jan2014, 12:52	8.2
J-5	0.078	222.0	01Jan2014, 12:16	37.2
OS1	4.504	5467.9	01Jan2014, 13:51	1898.7
OS10	0.037	132.2	01Jan2014, 12:18	15.6
OS11	0.048	138.5	01Jan2014, 12:28	19.9
OS12	0.101	220.6	01Jan2014, 12:45	41.9
OS13	0.325	1926.7	01Jan2014, 12:05	176.1
OS14	0.078	177.7	01Jan2014, 12:43	32.9
OS15	0.070	141.0	01Jan2014, 12:52	29.0
OS16	0.521	928.4	01Jan2014, 13:01	212.4

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
OS17	0.089	223.8	01Jan2014, 12:34	35.7
OS2	1.282	1775.3	01Jan2014, 13:30	531.5
OS3	0.693	1028.7	01Jan2014, 13:25	296.9
OS4	0.143	252.0	01Jan2014, 13:02	58.3
OS5	0.527	1149.3	01Jan2014, 12:48	229.4
OS6	0.054	171.4	01Jan2014, 12:23	22.8
OS7	0.192	431.5	01Jan2014, 12:43	79.6
OS8	0.045	147.4	01Jan2014, 12:21	18.7
OS9	0.067	170.5	01Jan2014, 12:35	27.8
P1	0.002	11.2	01Jan2014, 12:05	0.9
P2	0.065	235.4	01Jan2014, 12:17	27.0
P2A	0.118	411.1	01Jan2014, 12:19	49.7
P3	0.070	130.1	01Jan2014, 13:01	30.0
P4	0.045	199.0	01Jan2014, 12:09	18.3
P5	0.097	255.4	01Jan2014, 12:33	40.2
Pond 1	0.050	53.0	01Jan2014, 12:32	23.9
Pond 1A	0.050	285.1	01Jan2014, 12:05	24.1
Pond 2	0.148	10.4	01Jan2014, 15:58	45.5
Pond 2A	0.148	730.4	01Jan2014, 12:09	70.5
Pond 3	0.069	5.3	01Jan2014, 21:15	23.2
Pond 3A	0.069	389.3	01Jan2014, 12:05	33.3
Pond 4	0.071	210.8	01Jan2014, 12:14	33.8
Pond 4A	0.071	397.6	01Jan2014, 12:05	33.8
Pond 5	0.014	7.7	01Jan2014, 12:32	6.1
Pond 5A	0.014	79.2	01Jan2014, 12:05	6.7
Pond 6	0.003	4.9	01Jan2014, 13:08	2.1
Pond 6A	0.003	17.7	01Jan2014, 12:05	1.6
Pond 7	0.061	212.3	01Jan2014, 12:14	29.0
Pond 7A	0.061	331.5	01Jan2014, 12:06	29.0
Reach-1	0.002	11.2	01Jan2014, 12:30	0.9
Reach-10	0.017	12.4	01Jan2014, 13:01	8.2

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Reach-11	0.061	212.0	01Jan2014, 12:16	29.0
Reach-1A	0.002	11.0	01Jan2014, 12:44	0.9
Reach-2	0.693	1028.5	01Jan2014, 13:31	296.9
Reach-3	1.284	1777.3	01Jan2014, 13:35	532.5
Reach-4	2.113	2881.7	01Jan2014, 13:39	890.1
Reach-5	2.350	2976.0	01Jan2014, 13:40	986.8
Reach-6	0.213	379.6	01Jan2014, 13:11	88.3
Reach-7	0.143	251.8	01Jan2014, 13:09	58.3
Reach-8	2.563	3284.2	01Jan2014, 13:37	1075.0
Reach-9	0.078	221.7	01Jan2014, 12:22	37.2
Reach-CP7	0.193	206.8	01Jan2014, 12:10	63.8
Reach-CP8	0.175	454.7	01Jan2014, 12:27	82.6
Site 21	8.738	897.7	01Jan2014, 20:43	1420.4

Post-Developed Runoff Summary					
Comparison Point	25-Year Peak Discharge (cfs)	25-Year Volume (ac-ft.)	100-Year Peak Discharge (cfs)	100-Year Volume (ac-ft.)	Type of Flow
CP1	8	0.7	11.2	0.9	Runoff
CP2	1205.3	358.2	1777.7	532.5	Runon
CP3	706.2	201.8	1028.7	296.9	Runon
CP4	170	39	252	58.3	Runon
CP5	257.5	59.4	379.6	88.3	Runoff
CP6	~~2038.6~~ 2033.6	670.9	~~2986.6~~ 2976.1	986.8	Runoff
CP7	138.7	36	203.2	46.2	Runoff
CP8	318	58.1	507.6	87.5	Runoff
CP9	795.7	156.7	1149.3	229.4	Runoff
CP10	117.5	15.4	171.4	22.8	Runoff
CP11	293.6	53.5	431.5	79.6	Runoff
CP12	231	696	903	1449.4	Runoff

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Post-Developed Condition 25-Year Velocity Calculations at Comparison Points

Required: Determine the 25-year flow depths and velocities at each comparison point.

Method: Calculate the flow depths and velocities using Manning's Equation.

Solution: Manning's Equation, Q = 1.486 * R^(2/3) * S^(1/2) * A / n, was used to calculate the flow depth and velocity. See page C1-B-31 for example calculations.

		Velocity Calculations						
Comparison Point	Q (cfs)	Width[1] (ft)	Bottom Slope[2] (%)	Side Slopes[3] (h:v)	Manning's n	Depth (ft)	Velocity (fps)	Shear Stress (psf)
CP1	8.0	500	2.90	0.0	0.100	**0.05**	**0.33**	**0.09**
CP2	1205.3	6	0.35	8.0	0.065	**6.61**	**3.09**	**1.44**
CP3	706.2	13	0.70	25.0	0.065	**3.02**	**2.65**	**1.32**
CP4	170.0	7	1.60	10.0	0.065	**2.00**	**3.16**	**1.99**
CP5	257.5	1	1.30	30.0	0.065	**1.84**	**2.48**	**1.50**
CP6	2033.6	7	0.52	10.0	0.065	**6.90**	**3.87**	**2.24**
CP7	141.8	1	2.10	20.0	0.085	**1.73**	**2.32**	**2.26**
CP8	327.2	4	1.60	4.0	0.065	**3.73**	**4.64**	**3.72**
CP9*	795.7	20	1.30	6.0	0.065	**3.86**	**4.78**	**3.13**
CP10*	117.5	3	2.80	6.0	0.065	**1.97**	**4.03**	**3.44**
CP11*	293.6	12	1.40	4.5	0.065	**2.88**	**4.09**	**2.51**
CP12*	231.0	10	0.20	3.0	0.065	**4.68**	**2.05**	**0.58**

Notes:

1. Comparison points where surface water runoff enters or exits the permit or property boundaries in established natural or constructed channels; width refers to the bottom width of the channel.
   Comparison points where surface water runoff enters or exits the permit or property boundaries as sheet flow or not well established channels; width refers to the sheet flow width.
2. For channels, bottom slope is the slope of the channel bottom where surface water enters or exits the permit or property boundaries.
   For sheet flow, bottom slope is the slope of the ground where surface water enters or exits the permit or property boundaries.
3. For channels, side slope is the average side slope of the channel where surface water enters or exits the permit or propery boundaries.
   For sheet flow, there are no side slopes and are represented by "0" in this table.

* Comparison points where surface water runoff enters or exits the property boundary at a culvert, the velocity is calculated downstream of the culvert.

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Post-Developed Condition 100-Year Velocity Calculations at Comparison Points

Required: Determine the 100-year flow depths and velocities at each comparison point.

Method: Calculate the flow depths and velocities using Manning's Equation.

Solution: Manning's Equation, Q = 1.486 * R^(2/3) * S^(1/2) * A / n, was used to calculate the flow depth and velocity. See page C1-B-31 for example calculations.

		Velocity Calculations						
Comparison Point	Q (cfs)	Width[1] (ft)	Bottom Slope[2] (%)	Side Slopes[3] (h:v)	Manning's n	Depth (ft)	Velocity (fps)	Shear Stress (psf)
CP1	11.2	500	2.90	0.0	0.100	**0.06**	**0.38**	**0.11**
CP2	1777.7	6	0.35	8.0	0.065	**7.71**	**3.41**	**1.68**
CP3	1028.7	13	0.70	25.0	0.065	**3.51**	**2.91**	**1.53**
CP4	252.0	7	1.60	10.0	0.065	**2.36**	**3.49**	**2.36**
CP5	379.6	1	1.30	30.0	0.065	**2.13**	**2.74**	**1.73**
CP6	2976.1	7	0.52	10.0	0.065	**8.01**	**4.26**	**2.60**
CP7	206.8	1	2.10	20.0	0.085	**1.99**	**2.54**	**2.61**
CP8	454.7	4	1.60	4.0	0.065	**4.28**	**5.04**	**4.27**
CP9*	1149.3	20	1.30	6.0	0.065	**4.59**	**5.27**	**3.72**
CP10*	171.4	3	2.80	6.0	0.065	**2.30**	**4.43**	**4.02**
CP11*	431.5	12	1.40	4.5	0.065	**3.45**	**4.53**	**3.02**
CP12*	904.3	10	0.20	3.0	0.065	**8.65**	**2.91**	**1.08**

Notes:

1. Comparison points where surface water runoff enters or exits the permit or property boundaries in established natural or constructed channels; width refers to the bottom width of the channel.
   Comparison points where surface water runoff enters or exits the permit or property boundaries as sheet flow or not well established channels; width refers to the sheet flow width.
2. For channels, bottom slope is the slope of the channel bottom where surface water enters or exits the permit or property boundaries.
   For sheet flow, bottom slope is the slope of the ground where surface water enters or exits the permit or property boundaries.
3. For channels, side slope is the average side slope of the channel where surface water enters or exits the permit or propery boundaries.
   For sheet flow, there are no side slopes and are represented by "0" in this table.

* Comparison points where surface water runoff enters or exits the property boundary at a culvert, the velocity is calculated downstream of the culvert.

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Example Velocity Calculation at Comparison Point

Required: Determine the depths and velocities at each comparison point

Method: Calculate the flow depths and velocities using Manning's Equation.

Solution: Manning's Equation was used to calculate the flow depth and velocity.

Given: Comparison Point 6 and the 25-year, 24-hour flow rate are used for this example.

Comparison Point	Q (cfs)	Width (ft)	Bottom Slope (%)	Side Slopes (h:v)	Manning's n	Depth (ft)	Velocity (fps)	Shear Stress (psf)
CP6	2033.6	7	0.52	10.0	0.065	6.90	3.87	**2.24**

Given Values
Q = Flow rate
W = Bottom width of flow
S = Bottom slope
SS = Side slope
n = Manning's roughness coefficient

Calculated Values
D = Depth of Flow
V = Flow Velocity
Flow Area (A) = (W+SS*D)*D
Wetted Perimeter (WP) = W+2*(D^2+(SS*D)^2)^(0.5)
Hydraulic Radius (R) = A/WP

Manning's Equation
Calculated Flow Rate (Q) = 1.486*R^(2/3)*S^(1/2)*A/n

Depth was varied until the correct flow rate obtained.

Assume D = 4.0000 ft
A = 188.00 sf
WP = 87.40 ft
R = 2.1511
Calculated Q = 516.5 cfs

Assume D = 6.9100 ft
A = 525.85 sf
WP = 145.89 ft
R = 3.6045
Calculated Q = 2038.0 cfs

The calculated flow rate matches the given flow rate.

Calculate flow velocity.
Flow Velocity (V) = Q/A
V = 3.88 fps

Shear stress was calculated for erosion control purposes.
Shear Stress = 62.4*D*S/100
Shear Stress = 2.24 psf

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Table 2 - Postdeveloped Conditions Drainage Analysis Summary

Comparison Point	25-Year Peak Discharge (cfs)	25-Year Volume (ac-ft)	Peak Velocity (fps)	Runon/ Runoff	Drainage Areas
CP1	8.0	0.7	0.33	Runoff	P1
CP2	1205.3	358.2	3.09	Runon	OS2, P1
CP3	706.2	201.8	2.65	Runon	OS3
CP4	170.0	39.0	3.16	Runon	OS4
CP5	257.5	59.4	2.48	Runoff	OS4, P3
CP6	~~2038.6~~ 2033.6	676.0	~~3.88~~ 3.87	Runoff	OS2, OS3, P1, P2, P2A, Pond 1A, Pond 3A, Pond 4A
CP7	141.8	61.8	2.32	Runoff	Pond 2A, P4
CP8	327.2	53.3	4.64	Runoff	Pond 5A, Pond 6A, Pond 7A, P5
CP9	795.7	156.7	4.78	Runoff	OS5
CP10	117.5	15.4	4.03	Runoff	OS6
CP11	293.6	53.5	4.09	Runoff	OS7
CP12	~~230.9~~ 231.0	2554.5	2.05	Runoff	OS1, OS2, OS3, OS4, OS8, OS9, OS10, OS11, OS12, OS13, OS14, OS15, OS16, OS17, P1, P2, P2A, P3, P4, P5, Pond 1A, Pond 2A, Pond 3A, Pond 4A, Pond 5A, Pond 6A, Pond 7A