Water Treatment Plant 4

WTP 4

January 2009

FINAL

Environmental Commissioning

Water Treatment Plant No. 4

carollo

Engineers...Working Wonders With Water™

2/4/09

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Water Treatment Plant No. 4

TECHNICAL MEMORANDUM
ENVIRONMENTAL COMMISSIONING

FINAL
January 2009

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CITY OF AUSTIN

WATER TREATMENT PLANT NO. 4

TECHNICAL MEMORANDUM
ENVIRONMENTAL COMMISSIONING

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1.0 INTRODUCTION

The Water Treatment Plant No. 4 (WTP 4) facilities, exclusive of the raw water intake, were relocated from the originally planned Bull Creek site to the parcels of land identified in Figure 1. As shown, the Raw Water Pump Station (RWPS) will be constructed on an approximately 11-acre parcel adjacent to the south side of Bullick Hollow Road while the WTP facilities will be constructed on an approximately 92-acre parcel to the south of Bullick Hollow Road and to the west of RR 620.

The Austin City Council directed that the WTP 4 facilities be relocated due to the environmental sensitivities of the Bull Creek site. Table 1 contrasts the original Bull Creek site with the new Bullick Hollow site with respect to environmental considerations.

Table 1 Environmental Comparison of Bull Creek and Bullick Hollow Sites Water Treatment Plant No. 4 City of Austin

Bull Creek	Bullick Hollow
• Jollyville Plateau Salamander (JPS) present on site and nearby downstream • Listed karst invertebrates present • Bird impacts expected • Located in Bull Creek headwaters • Elevated foundations required • Surrounded by BCCP Dedicated Lands and high quality streams • Multiple springs and seeps • No other development planned	• No JPS • No karst invertebrates found on site • Mitigation available for birds or karst invertebrates • Less greenhouse gas emissions • Only small, wet weather streams nearby • No elevated foundations required • Applicable 10A Mitigation land on three sides • Originally planned for intense development

While the new Bullick Hollow site is less environmentally sensitive than the Bull Creek site, the following conditions warrant consideration when designing, constructing, and operating the WTP 4 facilities:

- The WTP facilities are located over the Northern Edwards Aquifer Recharge Zone (per City of Austin maps).
- The RWPS site and a portion of the WTP site are subject to the requirements of a 10A permit issued by the U.S. Fish and Wildlife Service (USFWS) for the Comanche Canyon Development.

- Both the RWPS and the WTP sites are directly adjacent to preserve land established under the 10A permit that is occupied by Golden Cheeked Warblers.
- The sites are in close proximity to springs, rimrocks, and other features that are classified as Critical Environmental Features (CEFs).
- The local karst geology may provide possible habitat for listed karst invertebrate species.
- The sites drain to Cypress Creek, which then flows into Lake Travis.

An Environmental Commissioning (EC) process will be implemented to help protect the nearby environmental resources, sensitive species, and their habitat. In recognition of the reduced environmental sensitivity of the site, the EC process will not establish standards and requirements that are as strict and rigorous as those planned for the Bull Creek site. Instead, the revised EC process will recognize the environmental conditions and sensitivities of the new site while preserving the ability of the Austin Water Utility (AWU) to design, construct, and operate facilities that are capable of ultimately treating and producing up to 300 million gallons of water per day (mgd).

This memorandum summarizes the EC process, the goals that will be targeted through the EC process, the proposed Best Management Practices (BMPs) and mitigation measures that are planned to achieve those goals, and the concept of adaptive management. This memorandum does not address proposed plans for constructing building(s) that achieve Leadership in Energy and Environmental Design (LEED™) at the WTP site or plans for implementing energy efficiency and Greenhouse Gas (GHG) reduction measures. Separate plans will be developed for achieving these elements of the design to meet the intent of Council Resolution 20071129-045, adopted November 29, 2007. (A copy of the resolution is included in Appendix A). These plans will be reviewed and coordinated with the EC process, but not directly administered through the EC process.

1.1 Abbreviations

- AWU — Austin Water Utility
- BCCP — Balcones Canyonlands Conservation Plan
- BCV — Leadership in Energy & Environmental Design
- BMP — Best Management Practices
- CEF — Critical Environmental Feature
- dBA — decibels
- E&S — Erosion and Sedimentation

- EC — Environmental Commissioning
- FS — Flow Instrument
- GCWA — Golden-Cheeked Warbler
- GHG — Greenhouse Gas
- IBC — International Building Code
- IFC — International Fire Code
- IPMP — Integrated Pest Management Plan
- LE — Level Instrument
- LEED™ — Leadership in Energy and Environmental Design
- JPS — Jollyville Plateau Salamander
- mgd — million gallons per day
- MOU — Memorandum of Understanding
- OSHA — Occupational Safety and Health Act
- PCS — Process Control System
- PDT — Project Design Team
- RAM-W™ — Risk Assessment Methodology for Water Utilities
- RWPS — Raw Water Pump Station
- SDO — Site Development Ordinance
- SOP — Standard Operating Procedures
- SPCC — Spill Prevention Control and Countermeasures
- SW3P — Stormwater Pollution Prevention Plan
- TAC — Texas Administrative Code
- UFC — Upflow Clarifier
- USFWS — U.S. Fish and Wildlife Service
- VA — Vulnerability Assessment

- WPDRD — Watershed Protection and Development Review Department
- WTP 4 — Water Treatment Plant No. 4

2.0 ENVIRONMENTAL COMMISSIONING PROCESS SUMMARY

The concept of using an EC process for the WTP 4 project is borrowed from the LEED™ process for sustainable design. Environmental commissioning is intended to be a commissioning process whereby environmental goals are established and an ongoing auditing process is then used to help guide the project design team towards obtaining those goals through project planning, design, construction, and start-up. The process of environmental commissioning will occur throughout the project and involve multiple meetings, reviews, oversight, inspection, permitting, and other tasks.

An EC team will be used to implement the EC process. The EC team will consist of the following:

- EC Team Leader, a staff member from Watershed Protection and Development Review (WPDRD)
- EC Project Coordinator, a staff member from WPDRD
- Austin Water Utility personnel
- Austin Public Works personnel
- EC Support Consultant
- Members of the Project Design Team
- Additional staff from WPDRD

The EC process will require collaborative efforts between the EC team and the project design team throughout all project phases. Given the magnitude and complexity of the project, a key tenant of the collaborative process will be the embedment of EC team personnel in the Design Center to provide for ongoing dialogue, timely evaluations, and facilitated decision making. Regular meetings will be used to involve the larger EC team in ongoing issues, decisions, and documentation.

Through the EC process, the following will also be provided:

- Regular updates to the City of Austin's Environmental Board
- Oversight of the Site Development Ordinance (SDO) process of gaining approval for administrative variances

- Input to the site development permit process required to obtain a permit for construction of the proposed project elements

A revised Memorandum of Understanding (MOU) between AWU and WPDRD will govern the revised EC process and establish the procedures by which it will be implemented. (A copy is included in Appendix B.)

3.0 ENVIRONMENTAL GOALS

The environmental goals established for this project present the nature and level of environmental protection, beyond typical federal, state, and local regulatory requirements that will be targeted. The goals defined by the EC team consist of the following:

- Comply with the November 29, 2007 City Council Resolution *Municipal Building Standards*.
- Achieve the standards of other City of Austin sustainability initiatives, including water conservation, energy efficiency, and watershed protection.
- As feasible within project and site constraints, include green infrastructure and innovative stormwater facilities.
- Minimize the potential for pollutant discharge from the site.
- Minimize the potential for sediment discharges leaving the site.
- Avoid the accidental release of WTP chemicals.
- Avoid the use of fertilizers and pesticides through implementation of an Integrated Pest Management Plan (IPMP).
- Avoid the accidental release of treated water.
- Avoid, reduce, and mitigate the potential for impacts to the adjacent 10A preserve land.
- Control invasive species.
- Optimize dust control during construction to limit offsite impacts.
- Where feasible, incorporate “bird-friendly” techniques when developing building plans.

4.0 PROJECT REQUIREMENTS

In addition to the environmental goals and conditions established for the EC process, treatment and facility requirements will dictate the planning, design, construction, and operation of the WTP 4 facilities. The following requirements must be met and may require adjustment and reconsideration of the EC goals and BMPs as the project progresses:

- *Capacity:* WTP 4 will be designed for an ultimate capacity of 300 mgd, and space needs to be allocated for the facilities necessary to treat and produce this capacity.
- *Layout:* Figures 2 through 6 show the planned facilities for the project. Each facility is necessary for achieving the treatment and production requirements. The final configuration will be established through the design process.
- *Processes:* The WTP 4 facilities will use a lime softening process, similar to AWU's other facilities. The facilities shown on Figure 6 will be required to treat the water using this process. The final overall treatment process will be similar to the preliminary process flow diagrams shown in Figures 7 and 8.
- *Disinfection:* Chemical disinfection using on-site generation of sodium hypochlorite for free chlorination followed by ammonia addition for forming chloramines will be used to achieve disinfection treatment requirements.
- *Regulations:* The WTP 4 facilities will be required to meet a variety of regulations promulgated and enforced by various local, state, and federal agencies. These include treatment requirements (Texas Commission on Environmental Quality), Balcones Canyonlands Conservation Plan (BCCP) permit requirements (US Fish and Wildlife), security requirements (U.S. Department of Homeland Security), risk management (U.S. Environmental Protection Agency), City of Austin requirements, and others. In some cases, regulatory requirements may take precedence over environmental goals. A good example is security, which may require lighting that may not fully achieve goals for minimizing offsite light impacts. When such conflicts occur, possible methods to mitigate the impacts will be explored in detail during the design phase and reviewed with the EC team for inclusion in the final design.
- *Electrical Supply:* An on-site electrical substation is required. The location, size, and other parameters will be established through a planning process with Austin Energy.
- *Site Variances:* The topography and configuration of the sites require variances to the City's code for construction in a critical water quality zone (at the intake), construction on slopes, cut and fill, and impervious cover in order to construct the necessary facilities. The specific variances for these issues will be addressed through the SDO approved for the project.

- A portion of the land on the south side of the WTP site will be preserved for future potential uses by AWU.

5.0 BEST MANAGEMENT PRACTICES (BMPs)

The following paragraphs present proposed Best Management Practices (BMPs) that could potentially be incorporated into the WTP 4 facilities to help achieve the established environmental goals.

5.1 Stormwater Management

5.1.1 Goals and BMPs

The goals and proposed BMPs for the stormwater management facilities are described in the attached report titled "Report on Storm Water Controls Conceptual Design" prepared by TCB and dated December 19, 2008. (A copy is attached in Appendix C.)

5.1.2 Erosion and Sedimentation

The temporary Erosion and Sedimentation (E&S) plan will meet the goals of the upcoming revisions to the City of Austin Environmental Criteria Manual that will include requirements for:

- Phasing, enhanced soil stabilization techniques, and minimization of disturbance
- Changing the design of silt fences from filtration to sedimentation devices; using mulch logs and berms; removing brush berms, tri-dikes, and sandbag berms; and modifying inlet protection
- Confirmation that E&S designers are qualified for scope of E&S design
- Require the contractor to have a certified inspector record with the results of required daily inspections every five days and one day following a rain event of over 1 inch.

5.1.3 Rain Water Harvesting and Other Innovative Controls

Rain watering harvesting and other innovative controls will be implemented to capture a portion of the rain falling on select buildings and structures. The harvesting system will include capture, storage, and pumping for reusing the rainfall for irrigation and possible gray water uses. Figure 9 provides a schematic of the proposed system, the details of which will be developed during Final Design and reviewed through the EC process.

5.1.4 Monitoring

Baseline stream monitoring of the drainage areas downstream of the WTP 4 plant site facilities is proposed. The proposed monitoring may include flow, sediment, habitat characteristics, and other general parameters. The final monitoring plan will be developed

through discussion with the EC team. The intent of the monitoring is to establish existing stream conditions prior to construction activities at the sites. Seasonal sampling is proposed to develop several data points. Ongoing monitoring during construction and then post-construction can be used to monitor the effectiveness of the stormwater management facilities and to develop adaptive measures if necessary. The first round of monitoring will occur once access into the 10A preserve area is secured. All permanent structural controls will be designed to provide for post-construction monitoring of the discharge from the control.

5.2 Spill and Leak Management

WTP 4 will be constructed with the following features:

- *Process Overflow Structures:* Dedicated containment and flow-routing structures will be provided to control overflow (spills) of treated or partially treated water from the process areas.
- *Residuals Storage:* Tanks will be constructed to store thickened residuals prior to dewatering operations. Secondary containment will be constructed around the storage area.
- *Bulk Chemical Storage:* Bulk chemicals that will be stored on site include lime, chlorine (sodium hypochlorite), salt (sodum chloride), ammonia, coagulant, fluoride, polymers, sodium hexametaphosphate, and powdered activated carbon. Secondary containment will be constructed around each storage area.

The following paragraphs summarize the proposed BMPs and relevant performance criteria for achieving spill and leak management from these facilities.

5.2.1 Goals

The goals for controlling spills and leaks at WTP 4 are to minimize the potential of discharging water, chemicals, or other waste streams from process facilities or containment structures to the surrounding environment, recognizing that the facility is within the Edwards geology and Aquifer Recharge Zone, adjacent to 10A preserve land, and within the drainage basin of Cypress Creek and Lake Travis.

5.2.2 Proposed BMPs

The following paragraphs summarize BMPs that are proposed for all phases of the project and the expected performance from implementing these measures.

5.2.2.1 Preliminary and Final Design

A comprehensive plan for controlling, treating, and routing spills and leaks will be developed during the design phase of work. The following list summarizes elements of the proposed design:

- *Overflow Structures:*
  - *BMPs:* Overflow structures will be designed for the pretreatment complex (raw water flume, Upflow Clarifier (UFC), recarbonation), filters, washwater equalization/clarification, thickeners, and clearwells. These facilities are locations where potential overflows could occur. A schematic of the overflow facilities is shown in Figure 10. The overflow components will include weirs set below the wall elevations of the structures to direct overflow into dedicated conveyance components. Additional components will include level and flow instrumentation.
  - *Performance:* Overflow structures will be designed to accommodate the maximum potential flow rate through each facility. This will allow for directed discharge to stormwater facilities.
- *Secondary Containment (Residuals):*
  - *BMPs:* Secondary containment will be designed around the residuals holding tanks to capture potential spills from the tanks. The containment areas will be constructed using concrete. Additionally, provisions will be provided to drain rainwater out of the containment area.
  - *Performance:* The containment volume will be sized to hold the complete volume of a holding tank plus six inches of freeboard.
- *Chemical Containment (Liquids):*
  - *BMPs:* All bulk liquid chemical storage tanks will be surrounded with concrete secondary containment structures. Protective coatings will be applied to concrete containment structures where the chemical to be contained can degrade the concrete structure. Rainfall will be excluded from secondary containment areas either by covering outside containment areas or by locating chemical storage facilities within buildings. Drains will not be installed within the secondary containment areas. Operations staff will be required to pump liquids out of the area and to an approved container or location that is compatible with the nature of the liquid. Buried chemical piping will be enveloped in a secondary containment pipe or channel system to capture any leaks. All applicable regulations governing secondary containment will be followed. Additionally, the International Fire Code (IFC) 2003 and International Building Code (IBC) 2003 requirements for life safety will be designed into the facilities.
  - *Performance:* Secondary containment areas will be sized to contain the full contents of the largest container within the containment area plus a minimum freeboard of six vertical inches or to hold at least 110 percent of the total volume of the container(s), whichever is greater.

- *Spill and Leak Routing:*

  - *BMPs:* Overflow piping or channels will route process overflows (treated or partially treated water) to the stormwater conveyance facilities. Secondary containment around bulk chemical storage will be designed so that any liquid within a containment area can only be pumped out via direct operator intervention. Liquids will be pumped to containers or locations compatible with the nature of liquid being pumped. Hazardous liquids will be collected for offsite disposal at an approved facility. Sensors will be placed within the secondary containment area to alert operators of the presence of liquids within the containment area.

  - *Performance:* The spill and leak control routing facilities will be sized to collect and transport the maximum anticipated spill, leak, or overflow. The BMPs proposed for liquid chemical containment areas will assure that liquid collected within those areas does not overflow the secondary containment and is properly treated and disposed of.

- *Monitoring, Alarms, and Controls:*

  - *BMPs:* Various level (LE) and flow (FS) instruments will be designed into the systems. All instruments will connect to the plant's Process Control System (PCS), where continuous monitoring will occur. Alarms will be programmed into the system to alert operators of spill or leak conditions and to shut down processes if response actions are not taken within certain time parameters. Periodic visual inspections of the facilities will be conducted.

  - *Performance:* These BMPs provide redundant leak control measures to reduce the risk of accidental discharges. Continuous monitoring provides the first level of control. Alarms act as the second level of control in case a monitored parameter moves outside the normal range. Automatic shutdown of plant processes serves as the third level of control by isolating or eliminating the source of a leak or overflow.

- *Stormwater Flow Management*

  - *BMPs:* Stormwater flow will be managed on site to direct all stormwater flow from impervious areas of the site to water quality treatment and detention structures as redundancy for spill containment.

  - *Performance:* Directing all stormwater flow from impervious surfaces to treatment detention structures provides additional containment for point source pollutants, such as spills, and non-point source pollutants, such as minor vehicle leaks.

5.2.2.2 Construction and Start-Up

The Contract Documents will specify requirements for spill and leak prevention and control. The Contractor will be required to follow the approved plan during execution of the work.

City inspectors will be on-site during the construction phase to assure that specified procedures are followed. These will include:

- *Spill Cleanup:*
  - *BMPs:* Provisions will be developed during design and included in the Contract Documents to govern cleanup of materials spilled during construction.
  - *Performance:* The Contract Documents will specify that the entire affected area must be free of spilled material. The Documents will require removal and disposal of any affected material and confirmation sampling to demonstrate that contamination does not exist within any potentially affected material left in place.
- *Chemical Delivery:* Bulk chemicals will not be delivered to the site until secondary containment structures, scrubbing equipment, and associated alarms and controls are constructed and operational.
- *Hydraulic and Pipeline Testing:* All water-bearing structures will be hydraulically tested to verify their integrity to hold water. In general, a structure will be filled with water and must maintain specified water levels for a minimum duration of time. Similarly, all pipelines will be pressure and/or leak tested for specified durations to verify integrity. The hydrostatic leakage rate shall not exceed the rates specified for new potable water lines under 30 Texas Administrative Code (TAC) 290.44. Procedures for discharging the test water will be developed through the EC process.
- *Spill Prevention Control and Countermeasures (SPCC) Requirements:* The Contractor will be required to develop a Spill Prevention, Control and Countermeasures (SPCC) Plan per the amendment to the City's Standard Specifications §1-07.15(1). The goals for the SPCC plan are to minimize the opportunity for spills through pre-planned control measures and to develop pre-established and accepted measures for countering the possible effects from accidental spills.
- *Stormwater Pollution Prevention Plan (SW3P):* A Stormwater Pollution Prevention Plan (SW3P) will be prepared for the site in accordance with state and federal regulations. The plan will contain specific provisions for spill control and prevention including requirements for vehicle refueling, checking of vehicles for leakage, cleanup of spilled materials and storage of chemicals, fuels, and lubricants during construction. The plan also will contain provisions for maintenance and inspection of control facilities and provisions requiring documentation of maintenance and inspection activities.

5.2.2.3 Operations

- *BMPs:* Standard Operating Procedures (SOPs) will be developed (prior to the operations phase) to direct WTP 4 personnel in responding to spill and leak . The redundant systems of level and flow alarms will allow control systems to shut down water, chemical, or gas flow if appropriate responses and actions are not taken prior to discharge offsite. Periodic testing of the systems will be conducted, and standardized maintenance actions will be incorporated into the operating procedures. The SOPs will require removal and disposal of any affected materials from spills and confirmation sampling to demonstrate that contamination does not exist within any potentially affected material left in place. Conducting water quality sampling of any spill or leak discharges to the stormwater management system will be included in the SOPs.

- *Performance:* The SOPs will incorporate proactive measures to reduce and eliminate the potential for accidental spills and leakage, and reactive measures to assure that any events that do occur are handled appropriately to assure protection of human health (for example, plant workers) and the surrounding environment.

5.3 Noise Abatement

Construction and operation activities for WTP 4 could result in increased noise levels at the site and the surrounding area. The proximity of residences and endangered species habitat to active construction areas during the construction phase and to plant process areas during operations is a primary factor in assessing noise impacts on these populations since sound levels typically decrease as the distance from the source increases. Residential populations can be more sensitive to elevated noise levels after normal working hours and during the summer months. Bird species may also be more sensitive to elevated noise levels during critical times of the year. These concerns dictate that noise abatement techniques be developed to limit the effect that noise can have on the surrounding environment. A series of BMPs are proposed to achieve noise abatement. The following paragraphs summarize the proposed BMPs and performance expectations.

5.3.1 Goals

The goals for controlling noise levels are to provide a safe working environment for plant personnel and to minimize adverse impacts to wildlife and residential populations surrounding the plant site.

5.3.2 Proposed BMPs

The following paragraphs summarize BMPs that are proposed for all phases of the project and list performance expectations.

5.3.2.1 Preliminary and Final Design

- *BMPs:* A series of BMPs will be incorporated into the design to achieve noise abatement goals. These BMPs will generally include:
  - If needed, conduct a baseline noise survey to establish background noise levels at the plant site and at potential noise receptors that may be particularly sensitive to increased noise levels.
  - Identify potential noise receptors and locations, including wildlife species and habitat areas, and establish threshold noise levels where negative impacts could potentially occur. Based on City requirements, the threshold for noise at the property boundary of the WTP site is 70 decibels (dBA). Based on the terms of purchase for the raw water pump station site, the threshold for noise at its property boundary is 65 dBA.
  - Consider the location of noise producing equipment when evaluating site layout options, attempting to locate noise-producing equipment at the greatest distance possible from noise-sensitive receptors and directed toward the interior of the plant, where practicable.
  - Based on the approved plant site layout, calculate maximum allowable noise levels at noise source locations (for example, blowers, finished and raw pumps, chemical handling and off-loading equipment, solids handling equipment and other large motors) that will maintain noise levels below threshold impact levels for the sensitive populations established above.
  - Prepare specifications for plant equipment and provide structural controls for noise abatement at each noise source that limit the operating noise levels to maximum allowable levels established above. Specifications will include maximum noise levels at a specified distance from the equipment (typically 85 dB at 3 feet), and will define test conditions under which these measurements are obtained including data that is reported to the engineer for review of criteria compliance. Structural controls for noise abatement may include placement of noise-producing equipment within buildings and providing acoustical treatment within these structures to further attenuate noise levels.
  - Adhere to regulatory guidelines for controlling noise levels including those dictated by the federal Occupational Safety and Health Act (OSHA).
  - Specify that U.S. Fish and Wildlife guidelines be followed during construction to manage activities for avoiding, reducing, and mitigating effects to potential nearby nesting Golden-Cheeked Warbler (GCWA) and Leadership in Energy & Environmental Design (BCV).
  - Design traffic flow patterns to reduce backing-up operations for all trucks and operations vehicles.

- *Performance:* The proposed BMPs have been successfully employed on past projects to achieve noise abatement objectives, and their performance will be verified during construction and operation.

5.3.2.2 Construction and Start-Up

The Contract Documents for construction and start-up will specify requirements for noise abatement measures that the Contractor will be required to follow during execution of the work. City inspectors will be on site during the construction phase to assure that specified procedures are followed. These requirements will include:

- Limit working hours and working days so that noise-producing activities are normally conducted during weekday, daylight hours. For nighttime and weekend work that is unavoidable, the Contractor will be required to adhere to strict noise abatement procedures.
- Require the use of noise attenuation for portable generators for powering lights during nighttime construction activities if necessary.
- Restrict locations where blasting can be used, control noise levels where blasting is permitted, and define acceptable ground wave limits.
- Limit noise levels of certain construction equipment by requiring engines to be equipped with suitable mufflers.
- Restrict the start-up of facility equipment until noise abatement controls (for example, building enclosure, acoustical panels, etc.) are in place.
- Perform sound monitoring to determine if noise generating equipment and noise abatement systems achieve specified limitations.

5.3.2.3 Operations

Standard operating procedures will be developed (prior to the operations phase) to direct WTP 4 personnel in abating noise levels. Such provisions will include keeping doors closed in buildings where noisy equipment is located, and limiting truck traffic (chemical delivery and solids hauling) to normal working hours.

5.4 Light Control

Three general categories of lighting are necessary for operating a water treatment plant: indoor, outdoor/security, and emergency lighting. Indoor lighting is fairly standardized and does not generally impact surrounding areas. Outdoor lighting is required for security along the plant perimeter and task lighting at key areas within the plant site to allow for nighttime operations, which are usually limited in frequency and duration. Stand-by outdoor lighting may also be necessary in the event that nighttime emergency operations or repairs are required. Lighting is also required for nighttime work during construction; however, this type of work will occur infrequently, be temporary in nature, and be restricted through the Contract Documents.

Excessive and uncontrolled plant lighting could potentially impact areas surrounding the plant. While these impacts are largely aesthetic, excessive lighting could also potentially impact sensitive wildlife in the habitat areas near the plant. Proper planning, design, and control of lighting systems can avoid most of these impacts and result in more efficient energy usage. A series of BMPs are proposed to govern the design of plant lighting systems for WTP 4. The following paragraphs summarize the proposed goals and BMPs for light control at WTP 4.

5.4.1 Goals

The goals for lighting systems are to provide adequate lighting for safe plant operations and plant security while avoiding stray, unnecessary, or misdirected light that can have negative aesthetic impacts as well as consume more energy than necessary. Lighting system design will consider applicable energy conservation options.

5.4.2 Proposed BMPs

The following paragraphs summarize BMPs that are proposed for all phases of the project.

5.4.2.1 Preliminary and Final Design

BMPs will be incorporated into design elements of the project to control lighting at WTP 4. These BMPs will generally include:

- Lighting analysis will be conducted during design to identify specific plant operations and security concerns for which lighting will be provided, to develop lighting contours necessary to achieve these identified operations/security lighting requirements while minimizing light impacts, and to identify areas of the plant and neighboring properties most susceptible to impacts from excessive lighting. Stakeholders will have an opportunity to review and comment on lighting during public presentations held throughout the design phase.
- Identify outdoor task lighting that will remain on during normal operations at night and design this lighting for minimal impact to the surrounding area and with greater emphasis on energy efficiency.
- Identify outdoor lighting that can normally be left off and turned on manually only as needed.
- Identify the need for and restrictions for using portable, temporary lighting during construction. Develop plans or guidelines for using lighting to minimize impacts, strategies that limit where such lighting may be used, and strategies for directional deployment of construction lighting to minimize negative impacts.
- Outdoor lighting will be hooded and otherwise directed to areas where the lighting is required rather than allow for diffuse lighting over broad areas.

- The correct wattage will be specified to assure that the proper amount of working lighting is provided while minimizing stray light visible from sensitive areas.

5.4.2.2 Construction and Start-Up

The following procedures and provisions will be in effect during the construction and start-up phases to aid in the control of excessive lighting:

- The contract documents will specify requirements for lighting systems that the Contractor must follow during execution of the work. The Contractor will be required to submit product literature for lighting system components to the engineer and city to verify compliance with contract requirements. The Contractor will be required to follow any restrictions and guidelines on lighting that are developed in the design phase.

- City inspectors will be on site during the construction phase to assure that specified equipment is properly installed and oriented. Additionally, inspectors will review any plans for use of construction lighting to assure they comply with specified guidelines.

- Working hours will be limited so that work during nighttime hours must be specifically requested by the contractor and approved by the city and engineer. This approval process allows the engineer and city to review procedures and limit lighting proposed by the contractor. Advance notice will be provided to nearby residents prior to nighttime operations.

5.4.2.3 Operations

Standard operating procedures will be developed (prior to the operations phase) to inform operations personnel which lighting is to remain on during normal operations at night. This lighting will have been designed specifically and identified for this purpose and to minimize light impacts on the surrounding areas. WTP 4 personnel will be directed to turn off task lighting when not in use to both control light emissions from the facility and to conserve energy.

5.5 Security

WTP 4 will be a critical City facility whose secure operation is important for providing customers with a safe and reliable water supply. In response to the possibility of a terrorist or related attack or activities, multiple security measures have been implemented at existing AWU facilities. The WTP 4 site will be required to achieve the same levels of protection, at a minimum.

Implementing security measures at the WTP 4 site requires careful planning and design to achieve appropriate levels of protection while minimizing impacts to the nearby environment. The following paragraphs describe general security measures to be

incorporated into the site, and lists associated BMPs that could be employed to mitigate impacts.

5.5.1 Security and BMP Goals

Effective access control, intrusion detection, and monitoring are required to secure the WTP 4 site. BMPs will be incorporated into the design to minimize effects on surrounding environmental features and species in a manner that does not compromise the security of the facility.

5.5.2 Proposed Security Measures and BMPs

The following paragraphs summarize security measures, potential BMPs, and performance expectations.

5.5.2.1 Preliminary and Final Design

- *Process:*

  Facility vulnerability will be assessed during design to develop a comprehensive plan for protecting WTP 4 from malevolent and other threats. The assessment will rely on previous City assessments to maintain consistency between facilities and will include the following elements:

  - Characterize and assess potential threats to the facility.
  - Prioritize critical assets of the facility.
  - Develop physical and operating systems for protecting the facility and evaluate the effectiveness of those systems.
  - Perform a risk analysis and determine if calculated risks are acceptable.
  - Modify protection measures as necessary to reduce risks below the acceptable threshold.

  The proposed security measures developed during this process will be reviewed and discussed with the EC team. Comments and requested design modifications will be reviewed and considered. The security measures may potentially be modified to limit effects to the surrounding environment to the extent that the modifications do not create unacceptable security compromises.

- *Security Features and BMPs:*

  Several physical and electronic security features will be designed into the project in collaboration with the EC team. Measures that may be incorporated in the project include physical security features (fencing, landscaping modifications, lighting, gates, etc.) and electronic security features (cameras, access control, monitoring, alarms, etc.).

5.5.2.2 Construction and Start-Up

The Contract Documents will require the Contractor to secure the site with temporary fencing in conjunction with the permanent fencing installed prior to construction. The Contractor will be responsible for site security for the duration of construction. The construction fencing will also serve as a BMP by restricting access of construction personnel and equipment outside the designated limits of construction and routing all construction traffic through the designated construction entrance(s). The proposed location of temporary fencing will be evaluated through the EC process.

5.5.2.3 Operations

Operating procedures related to WTP 4 security will be developed during the engineering and construction phases of the project. These procedures will be evaluated through the EC Process.

5.6 Traffic

The WTP 4 facility must be accessible for operations personnel, approved visitors, deliveries to the plant, and removal of treatment residuals from the plant. Traffic generated by operations personnel and visitors will be most significant during regular business hours and at shift change times on normal working days. Deliveries to the plant site will primarily occur during regular business hours on normal business days. Residuals hauling from the plant site will also primarily occur during these times, however, some traffic may occur on non-business days depending upon plant operations. Construction can generate significant traffic to and from the site due to workers, construction material and equipment delivery, and hauling of excess material and debris from the site.

Important considerations for traffic control include:

- Proximity of the plant to major highway thoroughfares and BCCP infrastructure corridors.
- Gradient, curve radius, and sight distance of roadways leading to the plant, and on-site roadways must be adequate for large vehicles hauling chemicals and residuals.
- Roadways must be accessible 365 days per year under all weather conditions, and must not be subject to flooding or have low water crossings.
- On-site roadways must be provided that facilitate efficient movement of truck traffic to and from delivery and pick-up locations, and passenger vehicle traffic to and from the administration and operations buildings, or designated parking areas
- Separation of truck and passenger vehicle traffic to the extent possible generally results in more efficient and safer traffic flow.

- Adequate parking must be provided for plant personnel and visitors at the administration building.
- Safe and controlled chemical deliveries must be achieved.

5.6.1 Goals

The goals for controlling WTP 4 traffic are to minimize negative impacts on the surrounding environment and community and to provide safe and efficient access to the site for operations personnel, visitors, deliveries, and residuals removal.

5.6.2 Proposed BMPs

The following paragraphs summarize traffic related BMPs that are proposed for all phases of the project.

5.6.2.1 Preliminary and Final Design

BMPs will be incorporated into design elements of the project to control traffic at WTP 4. These BMPs will generally include:

- An updated estimate of chemical delivery and residuals hauling requirements will be prepared during the final design phase to evaluate vehicle routing, roadway design, and loading areas.
- Traffic flow plans will be developed to optimize traffic routing and to provide safe and efficient traffic flow within the plant site. Roads will be designed to minimize backing up for delivery and hauling vehicles.
- Roads will be phased in as possible, and the extent of paving will be optimized to minimize the extent of impervious cover as feasible to reduce stormwater runoff while balancing the use of paving to minimize erosion and sedimentation due to vehicular traffic.
- An evaluation of roadways leading to the site will be conducted to determine a route to the plant that minimizes impacts to the community, whether these roadways are adequate for the anticipated vehicle traffic generated by the water treatment plant, whether these roadways impose significant constraints on plant traffic, and whether any modifications to these roadways should be considered.
- In the development of the site plan and plant roadway layout, consideration will be given to chemical off-loading and residuals loading locations with the goal of minimizing visual and noise impacts.
- Speed limits appropriate for the roadway design and anticipated traffic will be designated for all on-site roadways.

5.6.2.2 Construction and Start-up

The following procedures and provisions are proposed for the construction and start-up phases to aid in reducing traffic impacts:

- Working hours would be limited so that work during nighttime hours must be specifically requested by the contractor and approved by the City and engineer. This approval process allows the engineer and City to review procedures and limit the type of work and resulting traffic that could occur after normal working hours.
- The stormwater pollution prevention plan prepared for construction will require the contractor to implement provisions to limit dirt migrating from the site on vehicles. Measures may include vehicle washing, rock access pads, and others as appropriate.
- Parking during construction will be planned to minimize environmental impacts, including air pollution and erosion. The use of offsite parking will be considered.

5.6.2.3 Operations

Standard operating procedures will be developed (prior to the operations phase) to limit chemical and equipment deliveries to normal business hours on normal business days. This action will tend to reduce traffic during non-business hours when it may have more of a negative impact on surrounding areas. Procedures will also be developed for monitoring leak potential from chemical deliveries and methods of response. WTP 4 personnel will be directed to obey posted speed limits, to instruct delivery and residuals hauling drivers to obey all posted speed limits, and to report all observed violations.

5.7 Critical Environmental Features (CEFs) Protection

5.7.1 Goal

The goals for protecting Critical Environmental Features (CEFs) consist of preserving significant features, avoiding negative impacts, and maintaining the ecological integrity of the critical features.

5.7.2 BMPs

The following steps will be used to protect CEFs around the proposed development areas.

- *Delineate CEFs:* The following CEF surveys have been conducted on the site:

- Investigations on the tracts previously incorporated into the Comanche Canyon Ranch development and documented in the Planned Unit Development application to the City.
- A hydrogeologic report and karst feature survey conducted by Jackson Harper in October 2006 on portions of the WTP site.
- Site investigations performed by David Johns, WPDRD, and others in October and November 2007.
- Investigations performed by SWCA Environmental Consultants and documented in a draft report issued December 12, 2007.

Through these investigations, the CEFs identified in Figure 6 have been established, and the CEF Report included in Appendix D was prepared.

- A CEF evaluation of the Raw Water Pump Station was performed with the assistance of WPDRD personnel. A copy of the report is included in Appendix D.
- *Establish Buffer Zones and Setbacks:* Setbacks have been established for the CEFs and are shown on Figure 6. Facilities will be constructed outside of the established setback areas. Chain link fencing will be installed around the majority of CEFs prior to construction. CEF buffers will be left undisturbed in their natural state. Re-vegetation may be considered on a case-by-case basis.
- *Establish Maintenance Plans:* Long-term maintenance plans for the buffer areas will be developed. This will include integrated pest management strategies, prohibiting the use of pesticides and herbicides in buffer areas, as appropriate for Edwards Plateau eco-region.
- *Tunnel Construction:* The tunnels to and from the WTP will be constructed below the Edwards Formation. Access shafts at the end of each tunnel will be used to vertically connect the tunnels with the processes. Voids encountered during excavation of the shafts will be evaluated relative to their groundwater flow potential. The voids will be reviewed through the EC process and procedures to seal voids to prevent unanticipated vertical flow migration through the access shaft will be developed and implemented as needed. Voids shall also be evaluated for presence of endangered species or species of control as governed by the prevailing federal permit of regulation pertinent to any particular site.
- *Void Mitigation:* The City proposed void and water flow mitigation strategies (proposed Section 1.12.0 of the Environmental Criteria Manual, City of Austin Standard Specification Item No. 658S, and Standard Details 658 S-1 through S-7) will be specified for construction. These strategies describe the criteria for notification requirements and guidance for furnishing and installing mitigation measures for voids and water flow anomalies discovered during excavation.

The proposed measures require a geologist or geologist representative to inspect excavation operations within the Edwards Aquifer Recharge Zone or within 500 feet of a spring or seep. Upon observance of a void or water feature, excavation activities will be stopped within 25 feet of the outer edge of the void until the appropriate mitigation strategies are approved. In addition, the applicable USFWS 10A permit conditions for void mitigation will be complied with on the portion of the water treatment plant site and all of the raw water pump station site that is under the jurisdiction of the permit.

The selection of the appropriate void and water flow mitigation measure will be dependent upon:

– The size of the void
– The amount of water flowing and known or potential hydrological connections
– The biological characteristics observed
– The location of the void relative to the location of the facility to be constructed
– The location of the void relative to known karst features

Temporary and permanent mitigation measures are used to protect the void during construction. The Class I temporary protection measures and Class II to V permanent void mitigation measures are described in detail in the proposed standards. The measures will preserve the voids and groundwater flow patterns while maintaining utility integrity and preventing pollution. In general, these techniques require the void to be filled with gravel-type media and sealed in a manner to ensure the natural hydrologic regimes remain intact. A structural engineer will review larger void mitigation measures to confirm suitability and integrity.

Any temporary or permanent void closure plan must be planned, designed, and constructed to ensure protection of habitat for cave dwelling biology. These should consider at a minimum cave atmosphere and nutrient flow.

5.7.2.1 Construction and Start-Up

The following will be implemented:

1. *Blasting:* Blasting activities will be reviewed as part of the EC process to protect karst geology and biology from blast effects. A variance to Section 25-8-363 of the City's Land Development Code may be needed to approve blasting operations in the Edwards formation.
2. *Implement Erosion, Sedimentation, and Storm Water Quality Control*: BMPs for storm water quality management including soil erosion and sedimentation controls will be implemented and checked through out the construction and operational phases to protect karst features. Strategies should be used to protect karst features including but

not limited to routing runoff water from roads and parking areas away from karst features catchment area; Additionally, natural runoff from protected areas should be maintained in a manner at least equivalent to the preconstruction natural condition as well as limiting activities that disturb the natural vegetation within the catchment area; and restricting the use of pesticides, herbicides, fertilizers, and other potentially harmful substances.

5.8 FUGITIVE DUST CONTROL DURING CONSTRUCTION

5.8.1 Goals

The goal for dust control is to maintain the construction areas and surrounding environment relatively free of dust generated during construction activities.

5.8.2 BMPs

Dust control shall be implemented per the City's Standard Specification 220S, Sprinkling for Dust Control, in order to minimize nuisance dust and minimize impacts (on and off site). As part of this requirement, the Contractor shall submit and have a plan approved for achieving dust control during construction. This plan shall be reviewed through the EC process. Additional measures shall be considered as practical.

6.0 ADAPTIVE MANAGEMENT

The BMPs and mitigation strategies discussed herein were developed based on the best information available at the date this document was prepared. As additional monitoring is conducted and more information becomes available, modifications to the BMPs and mitigation strategies may become necessary to assure that the project environmental goals and project requirements can still be achieved. The process of adaptive management will be used to implement changes to the EC process if required. Changes will be discussed and cooperatively developed through the EC process. The general framework that will be used for the adaptive management process includes the following steps:

1. Establish environmental goals and project requirements
2. Document baseline conditions
3. Establish BMPs and mitigation measures
4. Obtain permits and necessary approvals
5. Implement BMPs and mitigation measures for pre- and post-development measures
6. Monitor, review, and evaluate results of BMPs and mitigation measures
7. Modify and improve monitoring plans, BMPS, and mitigation measures as necessary
8. Refine goals and project requirements if required

7.0 SITE DEVELOPMENT ORDINANCE

In May 2008, a site development ordinance (SDO) was approved by Council granting variances from certain code requirements and establishing an administrative process for granting additional variances. The SDO process will be reviewed and coordinated through the EC process. A copy of the draft SDO and associated variance request matrix is included in Appendix E.

8.0 ENVIRONMENTAL COMMISSIONING CHECKLIST

An EC checklist was prepared as a resource to help guide the Project Design Team (PDT) and EC team through the EC process on a facility-by-facility basis. Its purpose is to document collaborative EC efforts that are ongoing through the Final Design phase and to serve as a reminder for the PDT and EC team members of the information and tasks needed to complete the design process. A copy of the EC checklist is included in Appendix F.

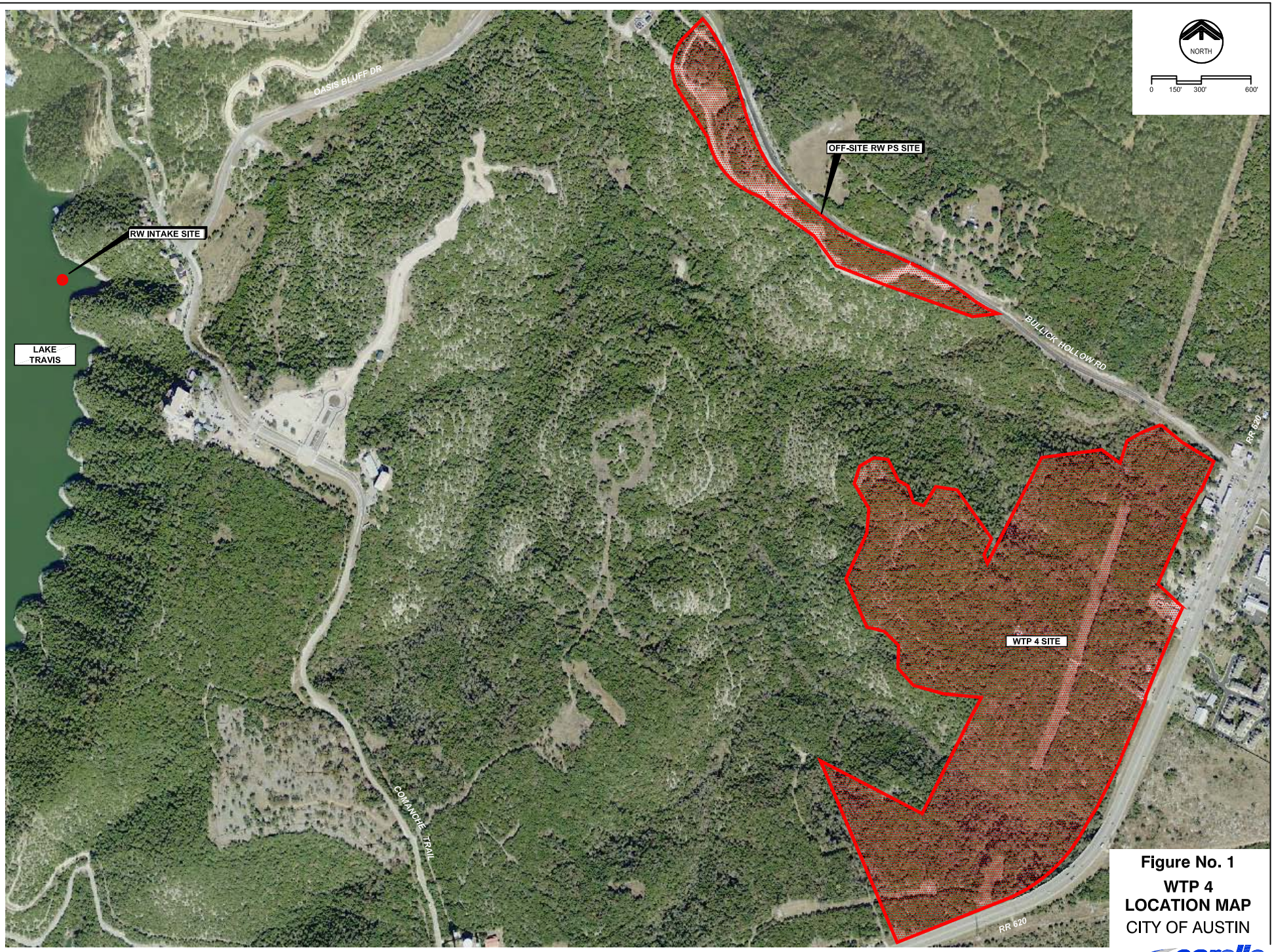

Figure No. 1

WTP 4

LOCATION MAP

CITY OF AUSTIN

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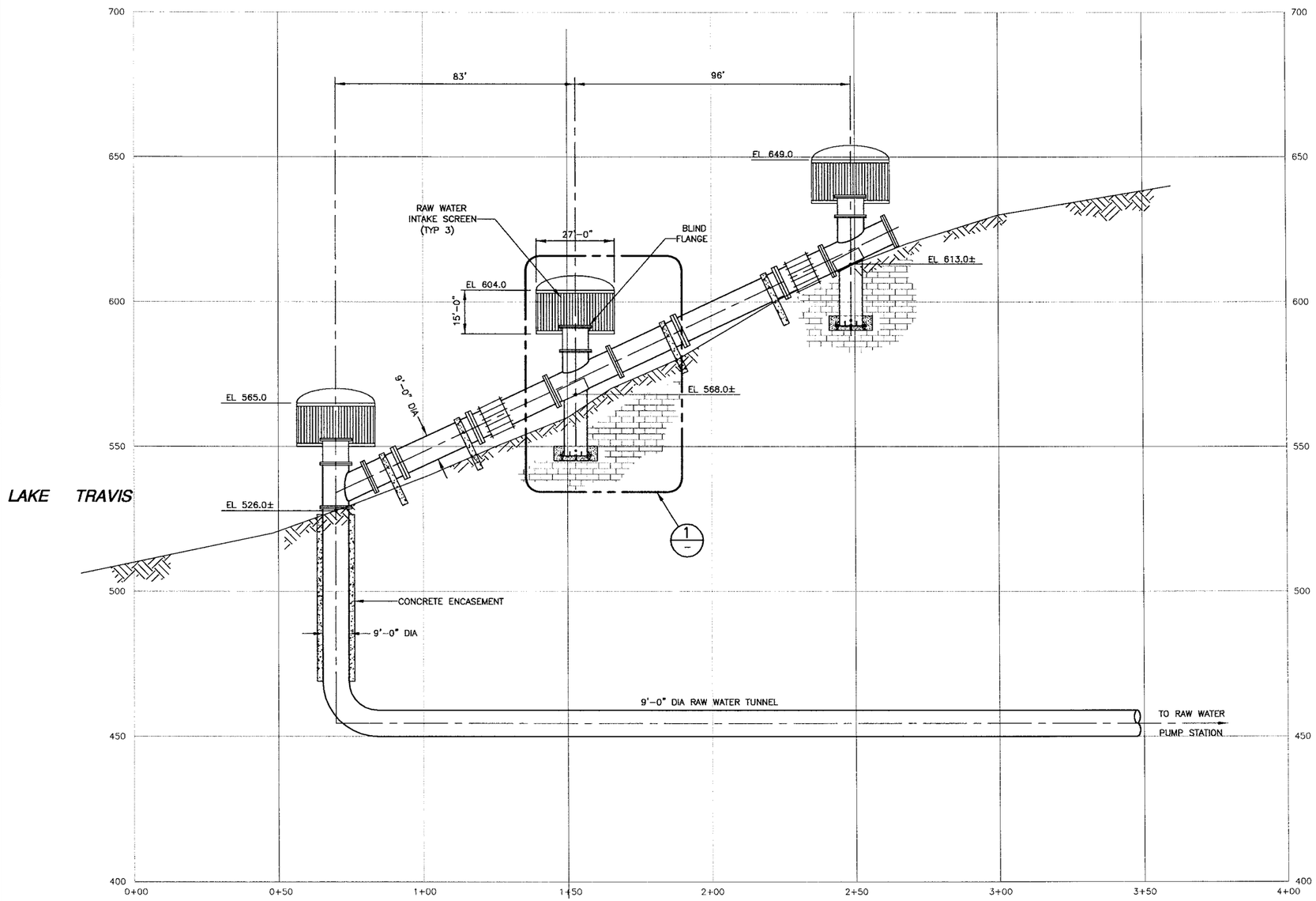
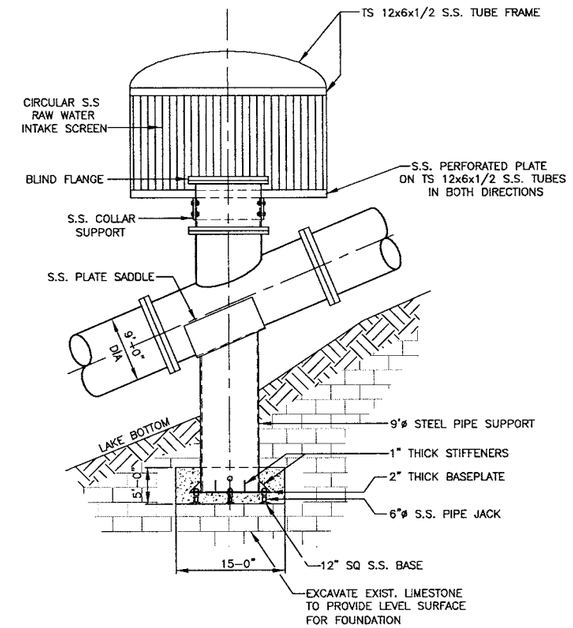
NOTE:

LAKE BOTTOM PROFILE IS BASED ON ELEVATIONS RESULTING FROM SOIL BORING INVESTIGATIONS (REFER TO VOLUME III, APPENDIX A.3.3 FOR GEOTECHNICAL COORDINATION).





DETAIL 1

NTS

SCALE:
HORIZONTAL: 1" = 40'
VERTICAL: 1" = 40'

FIGURE 2
DRAFT - SUBJECT TO CHANGE

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CITY OF AUSTIN, TEXAS
WATER TREATMENT PLANT No. 4

RAW WATER INTAKE
PROFILE

TCB | AECOM

TCB INC.
400 W 15th STREET, #500
AUSTIN, TEXAS 78701
WWW.TCB.AECOM.COM

EXHIBIT No.	JOB No.	DATE:
3.3.2	60021336	JULY 2008

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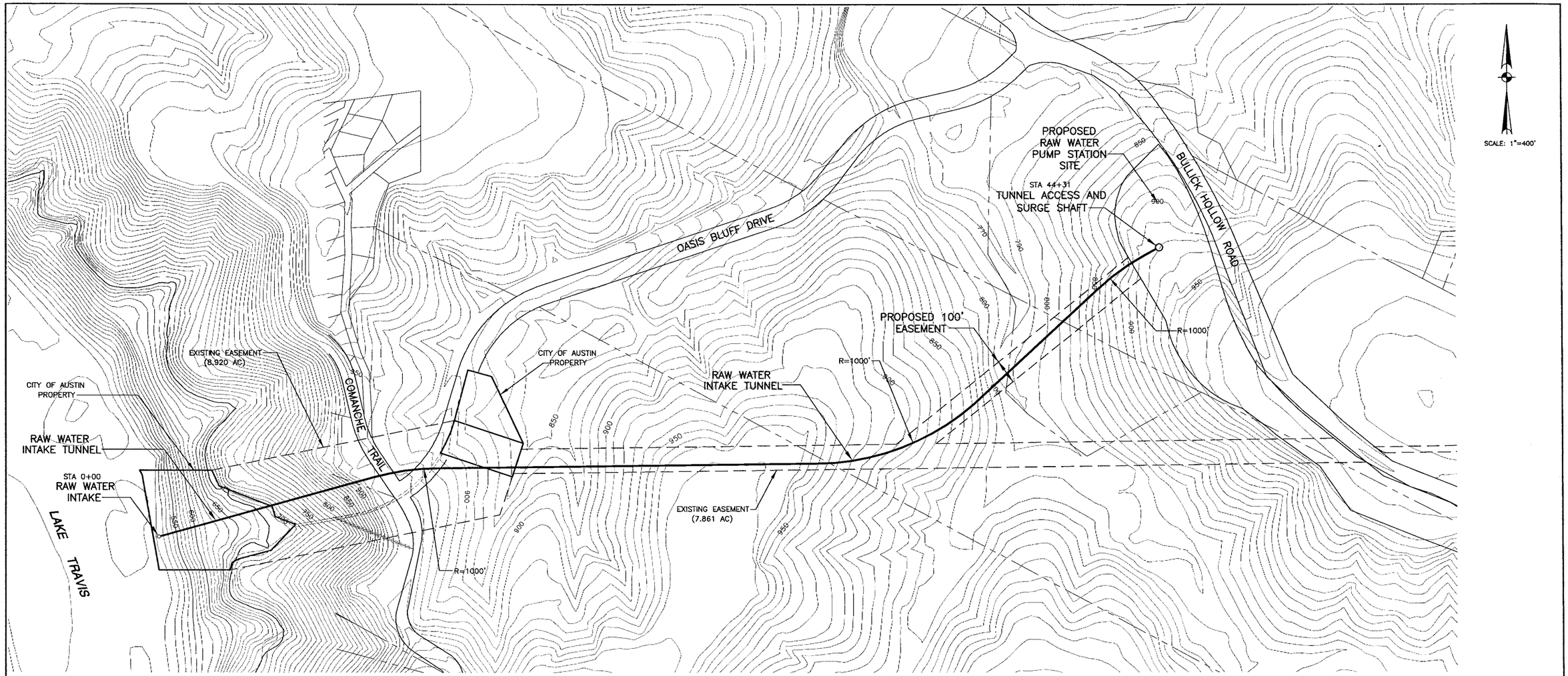

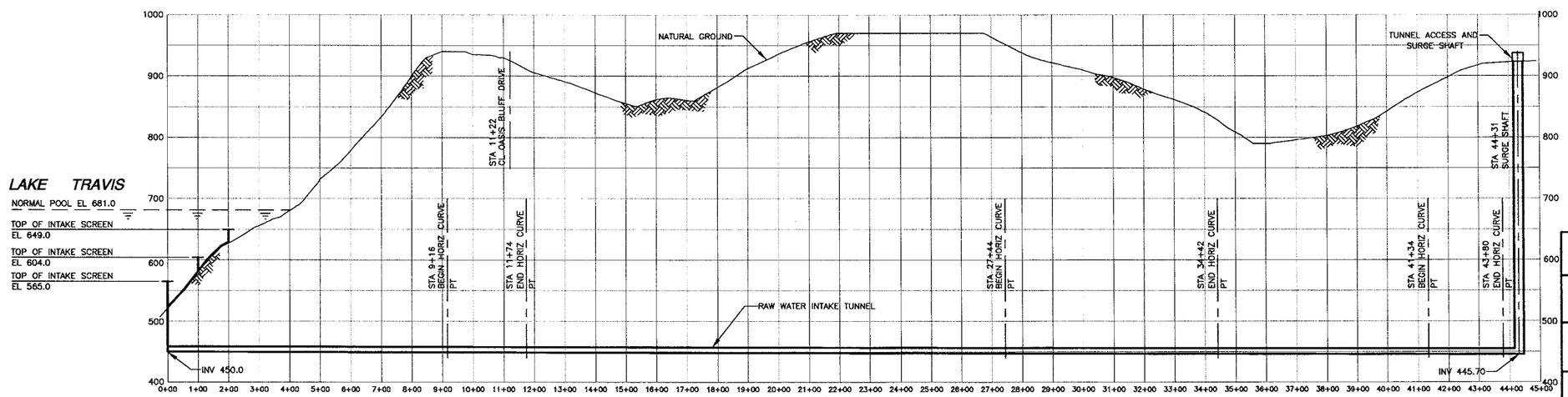

FIGURE 3
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CITY OF AUSTIN, TEXAS
WATER TREATMENT PLANT No. 4

RAW WATER TUNNEL
PLAN AND PROFILE

TCB | AECOM
TCB INC.
400 W 15th STREET, #500
AUSTIN, TEXAS 78701
WWW.TCB.AECOM.COM

EXHIBIT No.	JOB No.	DATE:
3.4.1	60021335	JULY 2008

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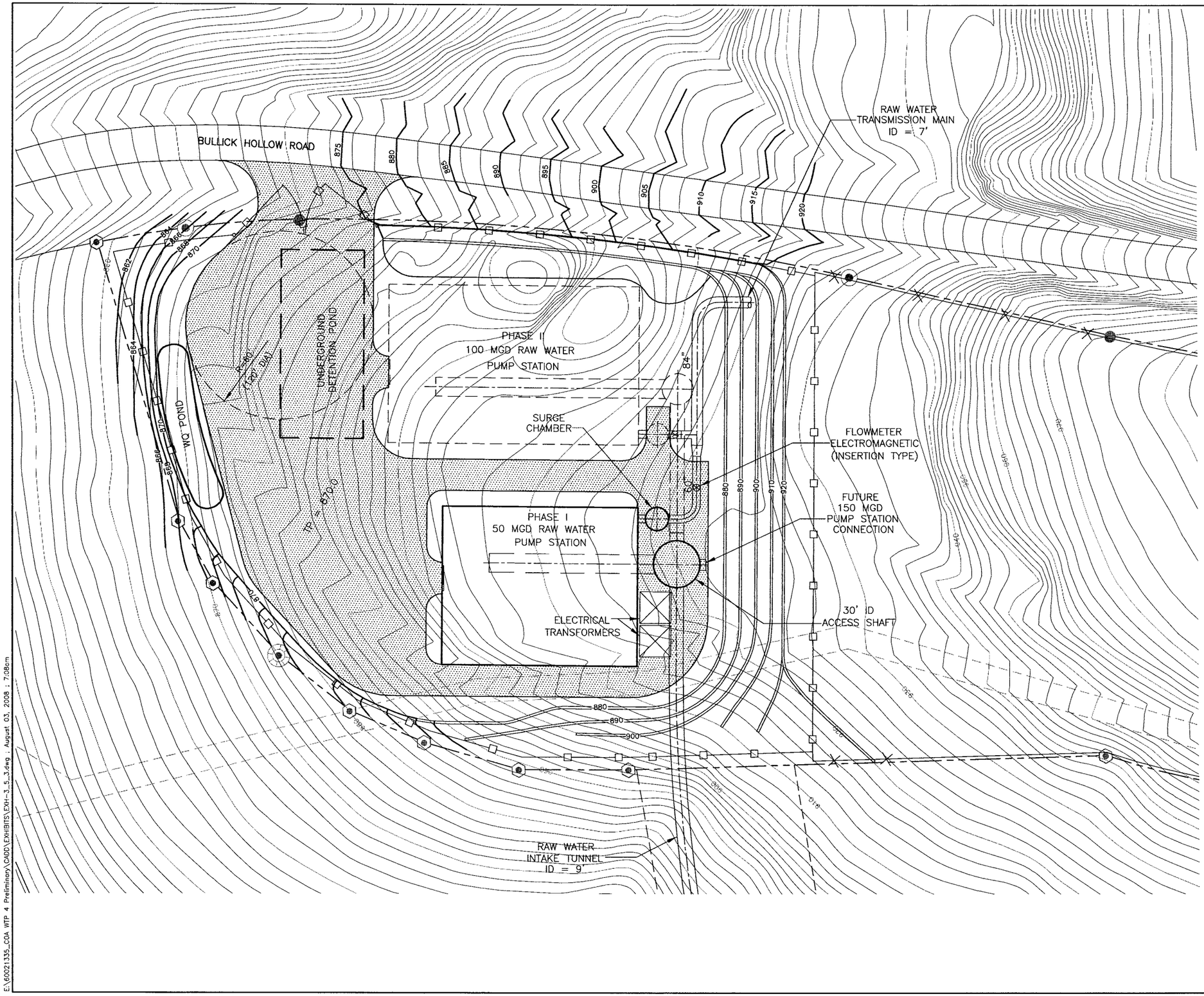

FIGURE 4
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CITY OF AUSTIN, TEXAS
WATER TREATMENT PLANT No. 4

RAW WATER PUMP STATION
SITE PLAN – DETAILS

TCB | AECOM

TCB INC.
400 W 15th STREET, #500
AUSTIN, TEXAS 78701
WWW.TCB.AECOM.COM

EXHIBIT No.	3.5.3	JOB No. 60021335	DATE: JULY 2008

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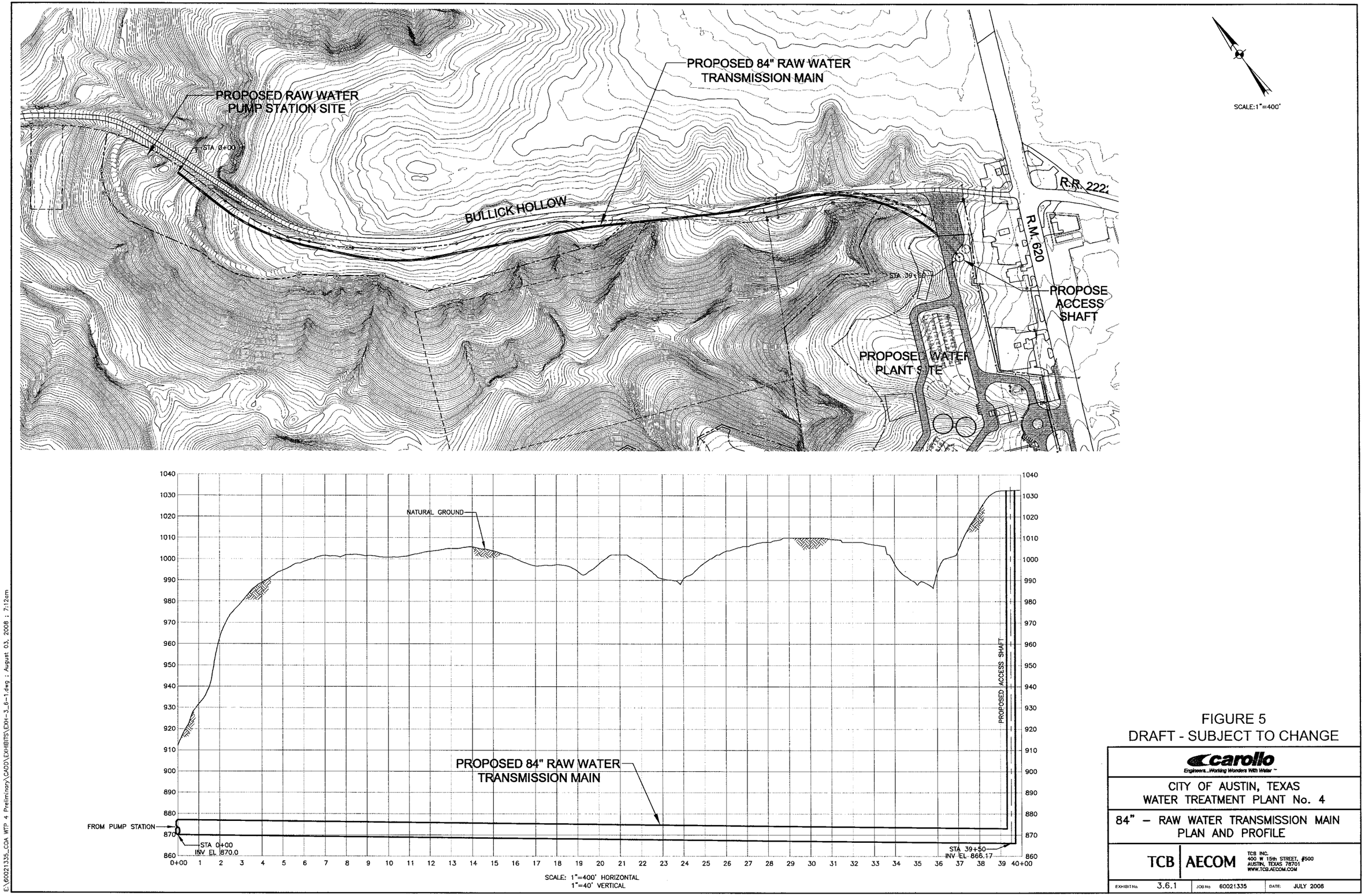

FIGURE 5
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CITY OF AUSTIN, TEXAS
WATER TREATMENT PLANT No. 4

84" – RAW WATER TRANSMISSION MAIN
PLAN AND PROFILE

TCB | AECOM
TCB INC.
400 W 15th STREET, #500
AUSTIN, TEXAS 78701
WWW.TCB.AECOM.COM

EXHIBIT No.	JOB No.	DATE:
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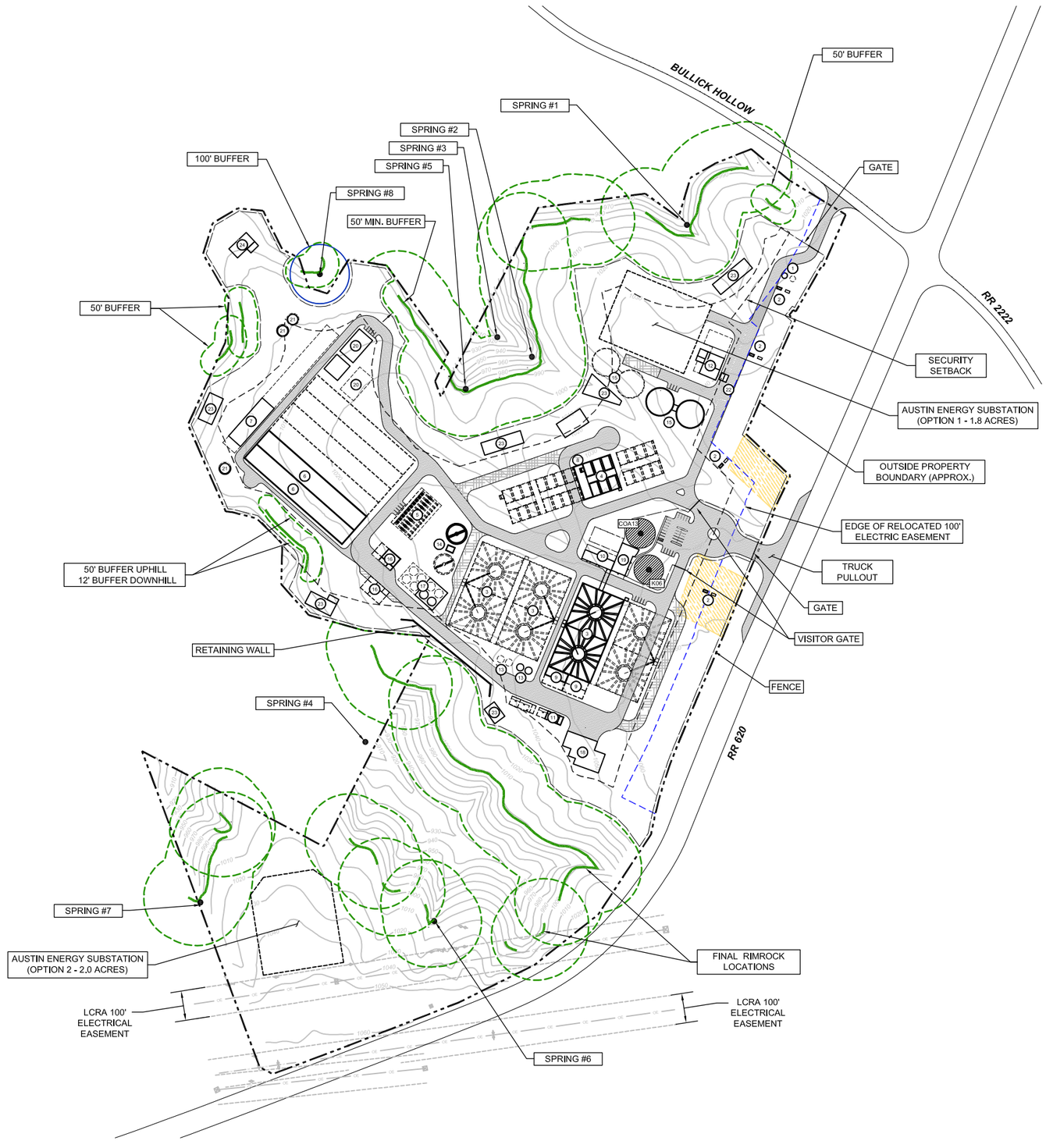

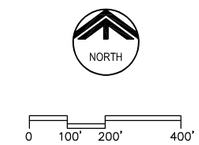

NOTES:
1. APPROXIMATE ACREAGE INSIDE PROPERTY BOUNDARY = 92 ACRES.
2. DASHED LINES REPRESENT FUTURE FACILITIES.
3. CEF, RIMROCKS, AND BUFFERS BASED ON DRAFT CEF STUDY DATED JUNE 2008.
4. SECURITY SETBACK AT 150' ALONG RR 620 AND 82' ALONG PROPERTY BOUNDARIES.
5. FACILITY LAYOUT SUBJECT TO CHANGE THROUGH DESIGN PROCESS.

FACILITY LEGEND

1. RW TUNNEL ACCESS SHAFT
2. CHLORINE INJECTION VAULT
3. UPFLOW CLARIFIERS / RECARBONATION
4. FILTERS
5. UV DISINFECTION (FUTURE)
6. CLEARWELLS / CT CONTACT BASINS
7. HIGH SERVICE PUMP STATION
8. ELECTRICAL & BLOWER BUILDING
9. LIME BUILDING
10. CHEMICAL BUILDING
11. AMMONIA BUILDING
12. CHLORINE BUILDING
13. CO_2 STORAGE
14. GRAVITY THICKENERS
15. WASHWATER RECYCLE EQUALIZATION / CLARIFICATION
16. DEWATERING
17. RESIDUALS STORAGE
18. MAINTENANCE BUILDING
19. ADMINISTRATION BUILDING
20. MAIN ELECTRICAL BUILDING
21. FW TUNNEL ACCESS SHAFT
22. SALT STORAGE
23. STORM WATER PONDS

- FENCE
- PAVED AREAS
- FUTURE ROADS
- COA ANNEX PARCEL
- XXX CEF
- ASSUMED EDGE OF RELOCATED ELECTRICAL EASEMENT (100' WIDE)
- FINAL RIMROCK LOCATIONS
- SETBACK FROM RIMROCK LOCATIONS

FIGURE 6
DRAFT - SUBJECT TO CHANGE

WTP 4
CONCEPTUAL SITE PLAN
CITY OF AUSTIN

P/W G:\6460G00\DRAWING-SITE EVALUATIONS\CJOSEPH-OPT 4C

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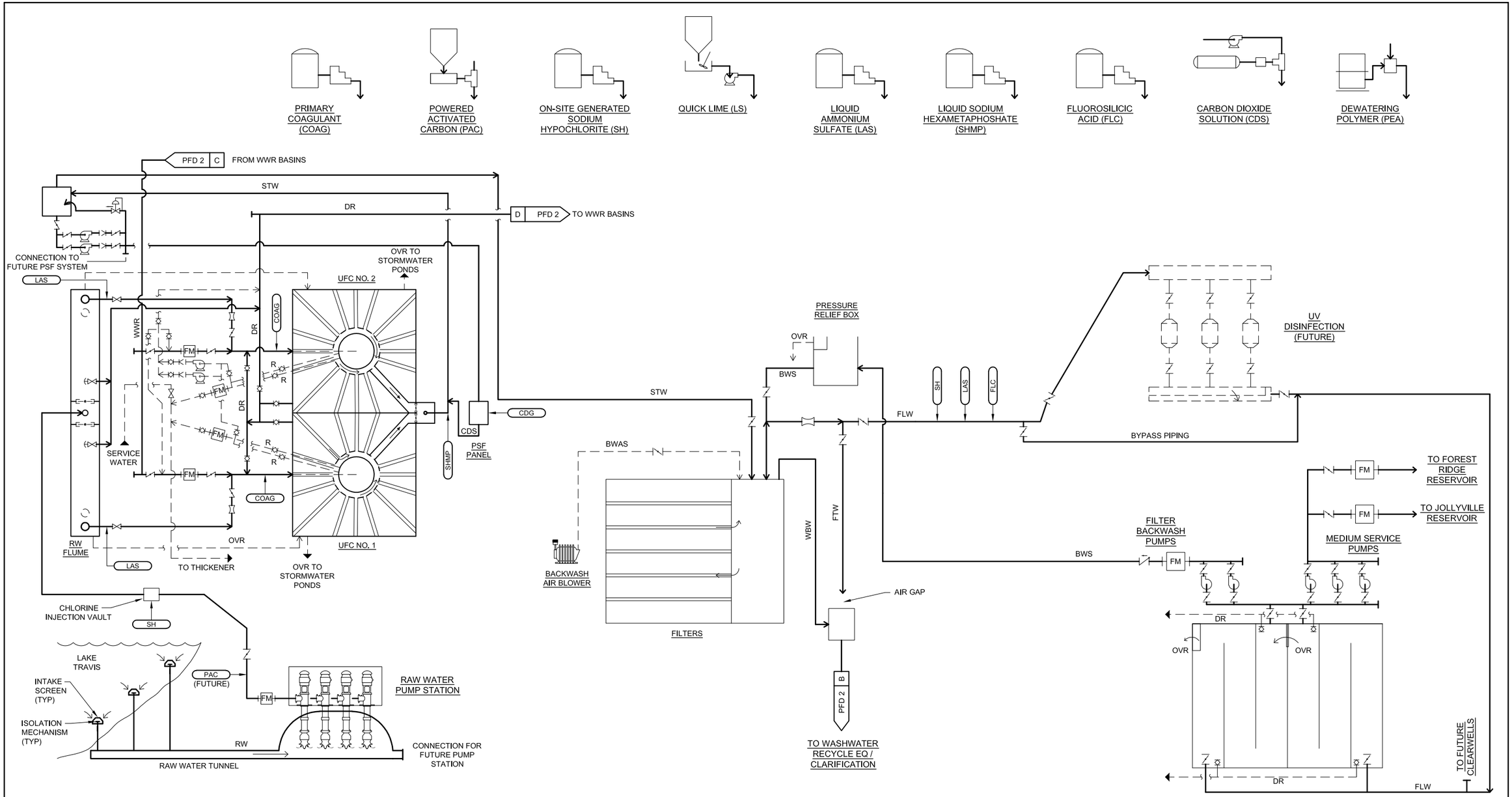

PROCESS ABBRIVIATIONS

BWS	BACKWASH SUPPLY
CEN	CENTRATE
DWR	DEWATERED RESIDUALS
DR	DRAIN
BWAS	BACKWASH AIR SCOUR
FLW	FILTERED WATER
FTW	FILTER-TO-WASTE
OVR	OVERFLOW
PW	POTABLE WATER
RW	RAW WATER
R	RESIDUALS
STW	SETTLED WATER
TR	THICKENED RESIDUALS
WBW	WASTE BACKWASH WATER
WWR	WASHWATER RECYCLE

NOTES:
1. MULTIPLE CHLORINE INJECTION VAULTS WILL BE CONSTRUCTED TO PROVIDE VARIABLE FREE CHLORINE CONTACT TIME.

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Figure No. 7
WTP 4
PROCESS FLOW DIAGRAM
PROCESS WATER STREAM (PFD 1)
CITY OF AUSTIN

C:\pw_working\projectwise\ldietzel\dms30915\LS PFD1 8-13-08 08:19am LDietzel XREFS:

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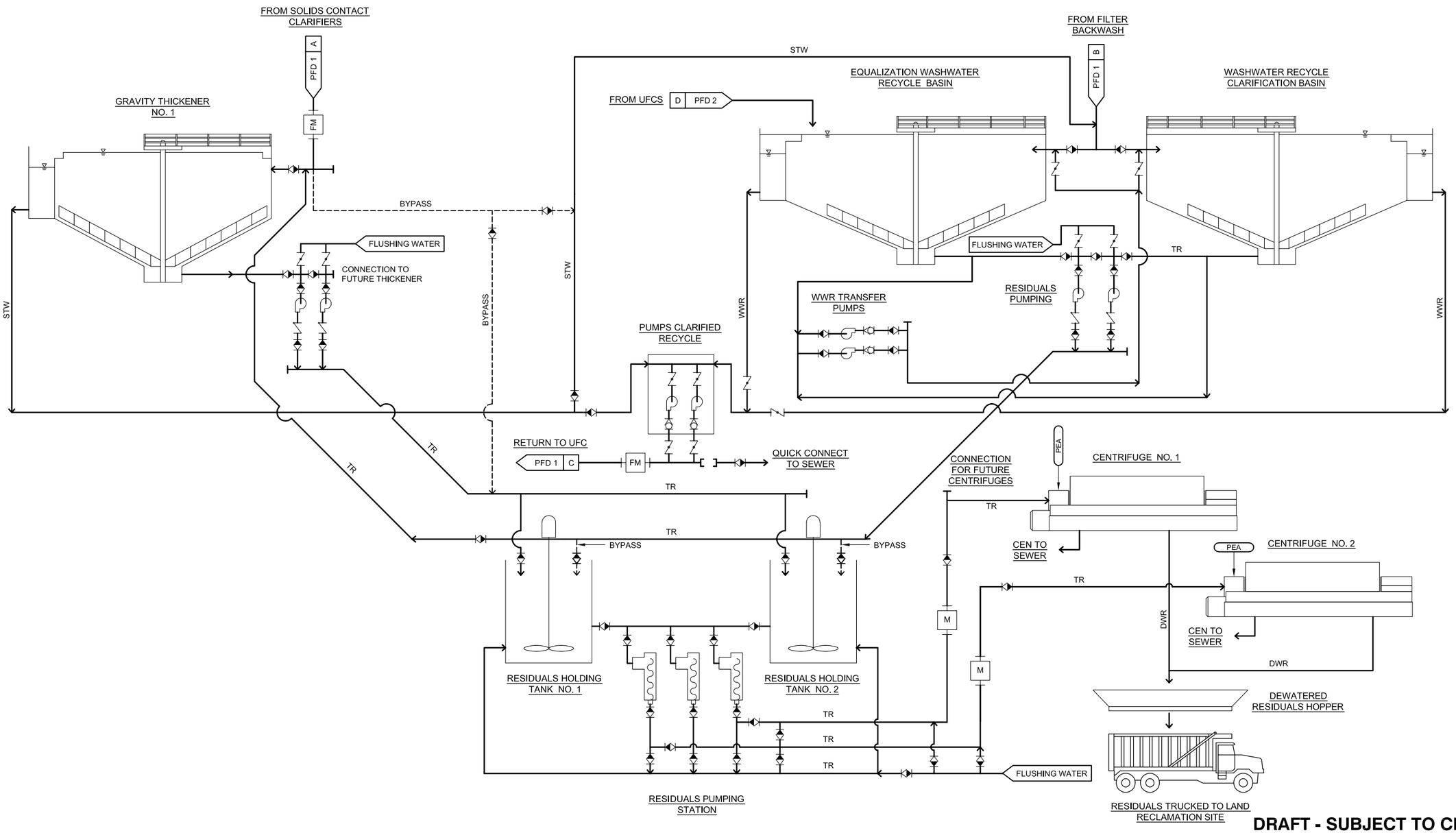

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Figure No. 8
WTP 4
PROCESS FLOW DIAGRAM
SOLIDS AND RECYCLE HANDLING (PFD 2)
CITY OF AUSTIN

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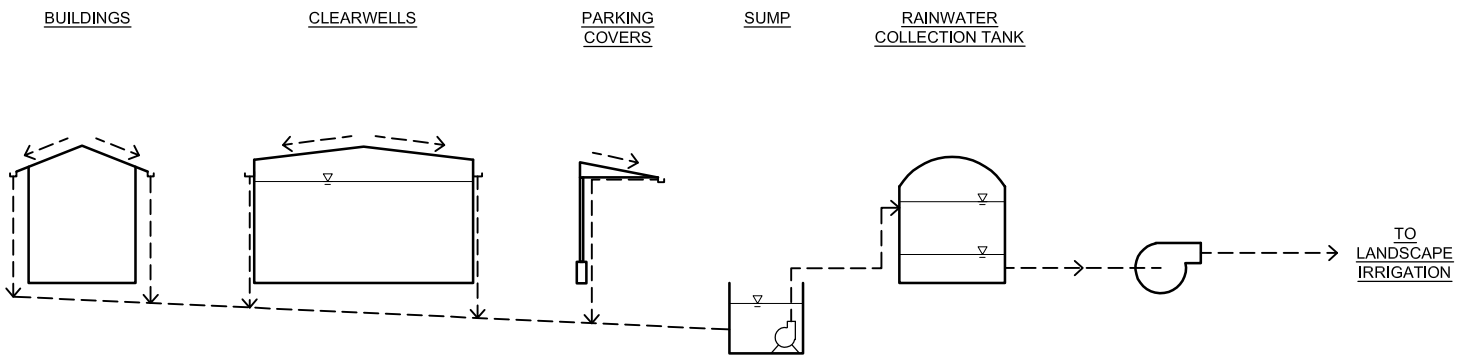

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Figure No. 9
WTP 4
CONCEPTUAL RAIN
WATER HARVESTING SCHEMATIC
CITY OF AUSTIN

NOTES:
1. FINAL RAINWATER COLLECTION AREAS AND VOLUMES TO BE DETERMINED IN PRELIMINARY DESIGN.
2. THE USE OF RAINWATER FOR GREY WATER WILL BE INVESTIGATED.

DRAWING NOT TO SCALE

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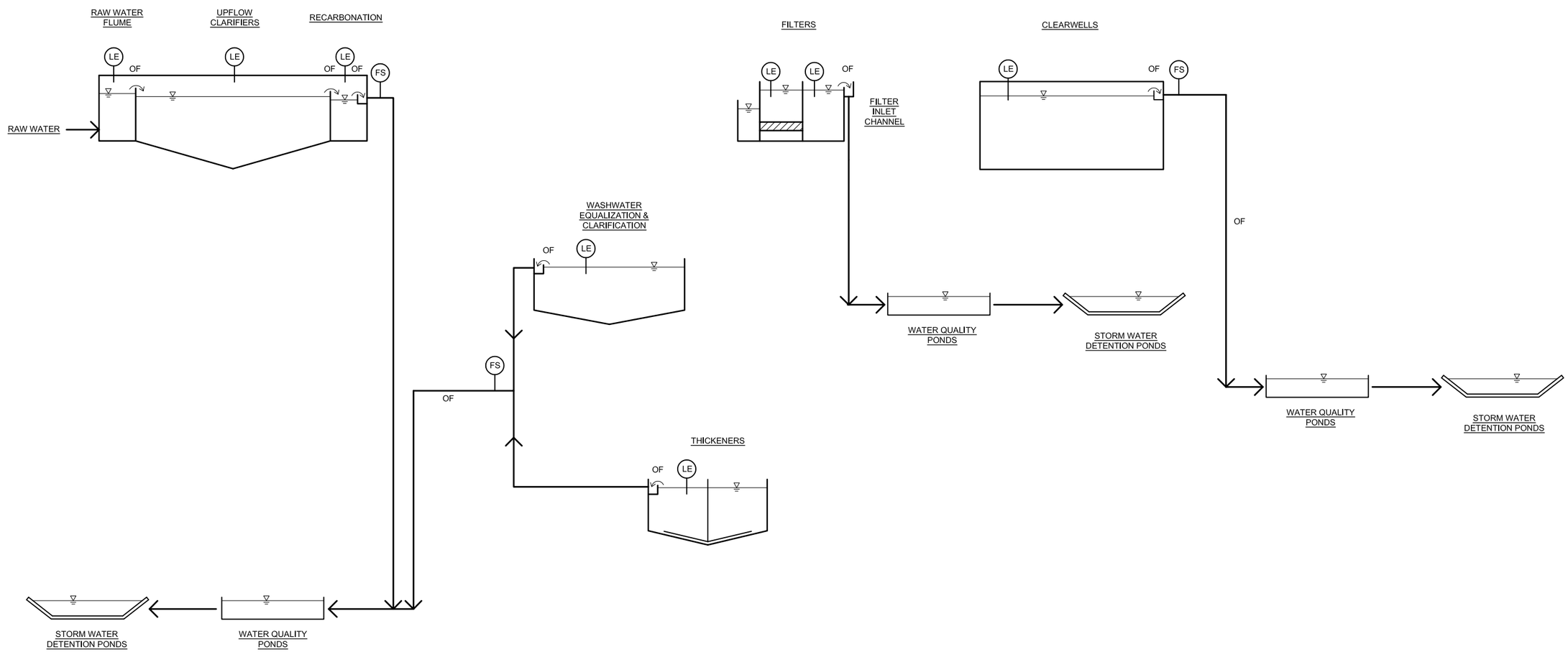

DRAFT - SUBJECT TO CHANGE

LEGEND

OF = OVERFLOW

LE = LEVEL INDICATION

FS = FLOW SWITCH

NOTES:

1. RAW WATER WILL BE CHLORINATED UPSTREAM OF RAW WATER FLUME. AMMONIA WILL BE INJECTED AT END OF CONTACTOR TO FORM CHLORAMINES.
2. HYDRAULIC CONVEYANCE AND OVERFLOW TREATMENT FACILITIES WILL BE SIZED FOR MAXIMUM POTENTIAL OVERFLOW RATE FROM EACH FACILITY.

Figure No. 10
WTP 4
CONCEPTUAL
OVERFLOW SCHEMATIC
CITY OF AUSTIN

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Appendix A

City of Austin LEED Resolution

RESOLUTION NO. 20071129-045

WHEREAS, the City of Austin is recognized as an international leader in sustainable building practices; and

WHEREAS, sustainable building practices conserve energy, water and other natural resources, promote human health and safety, create high-quality and enduring structures, enhance economic value and reduce costs over the life of a building; and

WHEREAS, construction, operation and maintenance of buildings in accordance with the United States Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED™) guidelines promotes these goals; and

WHEREAS, the City of Austin has a resolution number 000608-43 addressing sustainable building practices and requiring LEED™ Silver certification for new construction of municipal buildings; and

WHEREAS, the proposed resolution seeks to clarify and expand upon the sustainable building practices established in resolution number 000608-43, particularly with regard to the operation and maintenance of existing municipal buildings; and

WHEREAS, the City of Austin reaffirms its commitment to community sustainability and to reducing the cost of municipal operations to City taxpayers; **NOW, THEREFORE,**

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF AUSTIN:

The City Council directs the City Manager to take the steps necessary to assure that goals, standards and criteria for achieving the highest optimal outcomes for sustainability in municipal projects are implemented in accordance with this Resolution.

BE IT FURTHER RESOLVED:

That the Council directs the City Manager to:

1. For new municipal buildings and for major renovations and additions, develop criteria to assess and achieve the highest optimal levels of sustainability using the appropriate LEED™ rating tool, with a policy of achieving, at a minimum, LEED™ Silver rating certification for all building projects meeting the following scope and budget criteria:

    a. The scope includes work in each of the five major LEED™ checklist categories of: sustainable sites, water efficiency, energy and atmosphere, materials and resources, and indoor environmental quality, or other such categories as may be added or changed by the USGBC from time to time.

    b. The construction cost of the project is at least $2,000,000.

2. Develop Baseline Sustainability Standards for: energy efficiency, water conservation, water quality and storm water management, construction waste management, and locally sourced materials as defined by Austin Energy Green Building.

3. Develop best-practices design criteria for achieving Baseline Sustainability Standards in projects that do not meet the scope and budget criteria set forth above for new municipal buildings and for major renovations and additions:

   a. Using the LEED™ check list, or an alternative rating system approved by the City Manager, as guidelines for design criteria; and
   b. Meeting or exceeding applicable Baseline Sustainability Standards.

4. For municipal building renovations, additions and interior finish-out projects, develop criteria to assess and achieve the highest optimal levels of sustainability using the appropriate LEED™ rating tool, with a policy of achieving, at a minimum, LEED™ Silver rating certification for all projects meeting the following scope and budget criteria:

   a. The scope includes work in each of the three major LEED™ checklist categories of: energy and atmosphere, materials and resources, and indoor environmental quality,

or other such categories as may be added or changed by the USGBC from time to time.

b. The construction cost of the project is at least $300,000.

5. Develop best-practices design criteria for achieving Baseline Sustainability Standards in projects that do not meet the scope and budget criteria set forth above for renovations, additions and interior finish-out projects:

   a. Using the LEED™ check list, or an alternative rating system approved by the City Manager, as guidelines for design criteria; and

   b. Meeting or exceeding applicable Baseline Sustainability Standards.

6. Develop protocols for achieving the highest optimal levels of sustainability in existing municipal buildings and facilities, including:

   a. Develop and implement policies for whole building operations including cleaning/maintenance, recycling programs, energy-use monitoring and reduction of building energy use in accordance with City of Austin Administrative Bulletin 05-01 (Designation of Energy Manager and Establishment of Energy Efficiency Policy), monitoring and reduction of water and materials use, and improvement of indoor environmental quality.

b. Develop and implement criteria and policies for commissioning and re-commissioning to facilitate optimal performance of the facility throughout the building life.

c. Develop and implement guidelines and policies for sustainability upgrades over time for building operations, systems and minor space use modifications.

d. Develop and implement policies for exterior building site maintenance, including: reduction and elimination of greenhouse gas and ozone-forming emissions associated with landscape equipment and other activities; efficient/optimized use of water and energy; purchasing environmentally preferred products and waste stream management.

e. Provide on-going training for building operations and maintenance staff on achieving and maintaining optimal building performance.

f. Provide on-going training for building users to optimize building performance.

g. Develop purchasing policies and guidelines to facilitate optimal building performance.

h. Require annual reports to Council and City Manager detailing: compliance with operation and maintenance polices, guidelines and criteria; costs and savings associated with compliance; and highlighting policy and budget recommendations for advancement of sustainability goals.

7. Develop and secure staffing and budget resources to fully implement the above policies, including:

   a. Identify and secure funding to support achievement of LEED™ certification and Baseline Sustainability Standards. Implement budget and accounting measures to ensure that lifecycle savings from sustainability measures are incorporated into capital and operation and maintenance budget decision-making processes.
   b. Identify and develop staffing resources to perform all duties necessary for LEED™ certification and for the implementation of Baseline Sustainability Standards in municipal projects. Ensure that staff resources and expertise are sufficient such that consultant services for LEED™ certification and other sustainability priorities are necessary only in exceptional circumstances.
   c. Develop a consultant rotation list for energy modeling while developing staff-level resources and expertise in energy modeling such that, beginning in Fiscal Year 09, consultant services are necessary only in exceptional circumstances.
   d. Identify interdepartmental resources currently working on municipal sustainable building issues and establish clear roles and responsibilities.

8. Establish oversight and communication mechanisms to ensure efficient and comprehensive implementation of the policies outlined above, including:

   a. Establish a standing interdepartmental sustainability working group to develop, review, implement and oversee municipal project best practices.
   b. Establish a review process for municipal projects to ensure a consistent approach to planning and budgeting, including analysis of lifecycle costs.
   c. Develop a public communications plan, including a website to provide information about City building projects, highlight sustainable building achievements and share information regarding best practices and performance results.
   d. Report annually to Council and the City Manager on performance measures and outcomes for achieving the above policies and goals.

9. This resolution replaces and supersedes Resolution No. 000608-43.

ADOPTED: November 29, 2007 **ATTEST:** Yvonne Spence for
Shirley A. Gentry
City Clerk

Appendix B

Memorandum of Understanding

(Memorandum of Understanding to be inserted upon completion)

Appendix C

Report on Stormwater Controls Conceptual Design

REPORT ON STORM WATER CONTROLS CONCEPTUAL DESIGN WATER TREATMENT PLANT No. 4 CITY OF AUSTIN, TRAVIS COUNTY, TEXAS

Prepared for: City of Austin

Prepared by: John Buser, TCB INC.
Reviewed by: Shelby Eckols, TCB INC.

Date: December 19, 2008

INTRODUCTION

This report summarizes the coordination efforts with the City of Austin Watershed Protection and Development Review Department (WPDRD) and the concepts defined for the proposed conceptual design of the water quality and storm water controls for the Water Treatment Plant No. 4 Project.

BACKGROUND

The City of Austin (City) is currently developing a new water treatment plant in north-central Travis County with Lake Travis as the raw water source. The plant will be built in phases, with an initial capacity of 50 Million Gallon per Day (MGD) and an ultimate capacity of 300 MGD. This plant will be the City's fourth water treatment plant and as such, has been named Water Treatment Plant No. 4 (WTP4). Final Design for the facilities began in August 2008. The development of the WTP4 project consists of five basic components: the raw water intake on Lake Travis, the raw water tunnel, the raw water pump station, the raw water transmission main tunnel and the water treatment plant site.

The City had previously selected a site for WTP4 in the environmentally sensitive upper Bull Creek watershed, referred to as the Bull Creek site. With growing concern over the impact of the plant on the Bull Creek watershed, the City relocated WTP4 to the less sensitive Bullick Hollow site. With the relocation of the water treatment plant facilities, a revised water quality and storm water control concept had to be developed.

A series of meetings were conducted during the spring and summer of 2008 with the WPDRD staff, AWU staff, Carollo Engineers, and TCB to develop an acceptable water quality and storm water control concept for the proposed WTP4 facility. After several iterations, the approach outlined in the following paragraphs was determined to be the best approach given the available information, constraints, and goals for the project.

PURPOSE

The purpose of this memorandum is to define the design concepts for the water quality and storm water controls, as agreed in the meetings described above, to be implemented in the final design, permitting and construction of the WTP4 facilities. The site of the WTP4 facilities is located in the Lake Travis Watershed, as defined in the City of Austin's Environmental Criteria Manual (ECM). Title 25 of the Austin City Code forms the basis of design criteria for the water quality and storm water controls on the site. The project goals for storm water management are to:

- Achieve water protection standards that meet or exceed the existing applicable code requirements and City Council mandates.
- Establish a guideline on water quality management, including soil erosion and sedimentation for activities during design, construction, and operation of the proposed project.
- Avoid sensitive features such as springs, continuous flowing stream channels, and karst features.

The following paragraphs describe the proposed approach and application of the water quality and storm water controls to meet the project goals during all phases of the project. The techniques and strategies described below have been used in conjunction with other information and input to develop the conceptual storm water management design.

CONCEPTUAL DESIGN OF STORMWATER FACILITIES

The WTP4 project facilities are separated into two main areas, the raw water pump station site and the water treatment plant site. Another, separate site will be utilized for the raw water intake staging area, but the location of the staging area has not yet been finalized. Construction of the raw water tunnels will occur from within either the pump station site or the water treatment plant site. As such, it is anticipated that the main focus of the water quality and storm water controls, during construction and operation, will be focused on these two sites. To the maximum extent practical, the same general design philosophy will be applied to the raw water intake staging area after its location has been determined. Per City Council resolution, sustainable stormwater management techniques will be employed on site to minimize the impacts of development.

Both the raw water pump station and the water treatment plant site are located within the Lake Travis Watershed. Therefore, Title 25 of the Austin City Code forms the basis for the design criteria of the WTP4 facilities. In accordance with these criteria, any site which exceeds an impervious cover of 20% must provide water quality controls equivalent to sedimentation/filtration. Based on the current site plans for both the raw water pump station and the water treatment plant, both sites will exceed the 20% impervious cover threshold for the full build-out of the facilities. The following paragraphs outline the proposed design concept for both the raw water pump station site and the water treatment plant site.

PRE-DEVELOPMENT SITE CONDITIONS

Knowledge of the appropriate site conditions is essential for designing the proposed systems described herein, specifically related to slope, vegetation, and soil conditions. Although two separate sites are contemplated, both sites contain many of the same features, thus allowing many of the concepts for water quality and storm water control to be duplicated. However, each site has several distinguishing characteristics that must be recognized in the design of the features.

Raw Water Pump Station Site

The raw water pump station is located on the south side of Bullick Hollow Road. The site is currently undeveloped range land. The bulk of the construction will occur below the Edwards Limestone formation, in the Walnut Limestone formation. The site slopes from approximate elevation 1,008 ft-msl to approximate elevation 860 ft-msl. Exhibit **EXH-SF1** indicates the existing slopes on the raw water pump station site. Exhibit **EXH-SF2** represents the existing drainage patterns on the site, and quantifies the existing storm water flows within each basin during the 2, 10, 25, and 100-year storm event. The goal of the permanent water quality and storm water control facilities is to not exceed the existing run-off rate of flow within each of these identified drainage areas.

Water Treatment Plant Site

The water treatment plant is also located on the south side of Bullick Hollow Road and west of RM 620. The site is currently undeveloped range land and within the City of Austin's designated Edwards Aquifer Recharge Zone. The site slopes from approximate elevation 1,068 ft-msl to approximate elevation 860 ft-msl. Exhibit **EXH-SF6** indicates the existing slopes on the water treatment plant site. This site contains several ravines and gulleys that capture storm water run-off and route to the existing preserve area, adjacent to the property. Exhibit **EXH-SF7** represents the existing drainage patterns on the site and quantifies the existing storm water flows within each basin during the 2, 10, 25, and 100-year storm event. The goal of the permanent water quality and storm water control facilities is to not exceed the existing run-off rate of flow within each of these identified drainage areas.

POST-DEVELOPMENT CONDITIONS

On both the raw water pump station site and the water treatment plant site, the facilities will be developed in phases, beginning with Phase 1 which will provide 50-MGD capacity. It is anticipated that both sites will be expanded in future phases to meet the ultimate treatment capacity of 300-MGD. Each expansion would require additional water quality and storm water controls to limit the off-site run-off to the pre-development condition. In order to effectively provide sufficient controls to limit off-site run-off, maintain the ecological integrity of both sites, and minimize the capital cost of the treatment facilities during the Phase I expansion, the controls are to be designed for the 50-MGD facilities. To the extent practical, the layout of the water treatment plant site will follow the low impact development techniques to minimize land disturbance. The grading and drainage will be designed to capture and direct all runoff from the developed areas, excluding open-air tanks/structures, directly to the first stage of the controls, the sedimentation/filtration basin. If a particular storm event exceeds the capture volume, the excess flows will be re-directed to the detention ponds. The detention ponds will provide the required flow reduction for the 2, 10, 25, and 100-year storm events once the sites are developed. Finally, the pond outlets will include outlet structures designed to release the existing flows in a diffused (sheet-flow) manner.

Raw Water Pump Station Site

To meet the goals and objectives for water quality and storm water control on the raw water pump station site, a two phased approach is required. Construction of the raw water pump station entails a large excavation, removing the existing soils from approximate elevation 920 ft-msl to elevation 870 ft-msl. Due to this large excavation, it is impractical to install the permanent water quality and storm water controls prior to construction. Instead, storm water controls will be incorporated into the construction contract to minimize the sedimentation impact downstream of the pump station site. The following controls are anticipated during the initial site excavation:

- The goal of this project is to limit off-site migration of storm water run-off. To the extent practical, dust and sediment will be controlled at the source during construction. The proposed perimeter and interior controls will be designed in accordance with the recommendations for sizing and spacing defined in the City of Austin Environmental Criteria Manual, Section 1.4.
- Storm water run-off from non-disturbed areas will be diverted away from the excavation and into the road side drainage swale along Bullick Hollow Road or follow the natural drainage patterns into the adjacent preserve area. Run-off routed through natural drainage patterns to the adjacent preserve area will not result in adverse impacts to the preserve area.
- The construction documents will require the excavation of the pump station site to slope the excavation into the excavated area, such that all storm water within the disturbed area is directed

into the excavated area. All storm water diverted and concentrated will be handled in a manner to create a non-erosive condition.

- A temporary, self-contained filtration system will be used to remove suspended solids from storm water that is pumped from the excavated area. The effluent from this filtration system will discharge into the road side drainage swale along Bullick Hollow Road.
- After the site has been excavated to the finished grade, and before construction of the pump station and tunnels, the permanent water quality and storm water controls will be installed.

The permanent water quality and storm water controls proposed for the pump station site include a full sedimentation/filtration pond, and underground detention pond. The discharge from both ponds will be routed to the permanent road side swale adjacent to Bullick Hollow Road. Exhibit **EXH-SF3**, **EXH-SF4**, and **EXH-SF5** illustrate the location of the permanent controls and facilities, and outline the anticipated capture volume to meet the water quality requirements of Title 25 of the Austin City Code based on the anticipated impervious cover. The actual water quality volume and storm water run-off flow rate to be captured will be finalized as the design of the permanent facilities progresses. It is anticipated that an underground detention system, similar to the "Storm Chamber" system by CONTECH will be utilized. It is anticipated that underground piping and drainage swales will be utilized to convey storm water run-off from the different site areas to the water quality control.

It is anticipated that both the water quality and storm water controls will be sized for the fully developed raw water pump station site. Constructing the permanent facilities to mitigate the increased storm water run-off flow rate from the fully developed site during the first phase of the project will allow future site expansions to occur without significant disruption to the existing facilities, and minimizes the space required for the permanent facilities on this small site.

Water Treatment Plant Site

The water treatment plant site slopes in a westerly direction and, consequently, storm water flows from the site onto adjacent land that is environmentally sensitive. In order to protect this adjacent property, it was agreed the permanent water quality and storm water controls would be constructed and operational prior to starting the construction of the water treatment plant. To the extent practical, the final drainage patterns from the developed site will mimic the existing drainage patterns found on the undeveloped site. This will allow the permanent water quality and storm water controls to be constructed to receive these natural flow patterns. This will limit the grading and excavation required during the construction of the water treatment plant and facilitates collection of construction storm water in these permanent controls while minimizing the need for land clearing. After the permanent controls are in place, construction of the water treatment plant will begin. The following permanent controls are anticipated at the water treatment plant site. The storm water values included on the attached water treatment plant exhibits are based on the site plans shown on the exhibits. The final site plan is still being developed and some changes have occurred since these calculations were prepared. Once the site plan has been finalized, these calculations will be revised for the final site plan conditions. These controls will function during the construction phase of the project and beyond:

- In addition to the traditional erosion and sedimentation controls, such as silt fence and rock berm, the permanent water quality and storm water controls will be in place during the construction of the treatment plant facilities. To accomplish this, these controls must be constructed prior to major land clearing operations. It is anticipated that a separate construction contract for the construction of the permanent controls will be awarded and construction completed prior to the water treatment plant construction contract. The proposed perimeter and interior controls will be designed in accordance with the recommendations for sizing and spacing defined in the City of Austin Environmental Criteria Manual, Section 1.4.

- Minimal land clearing is anticipated for the construction of the permanent controls. During construction of the permanent controls, storm water runoff from the undisturbed land will be diverted around the construction areas. Exhibit **EXH-SF8** illustrates the anticipated locations of the proposed controls. Several of these controls are located within existing drainage ways. Diversion of upstream run-off in these areas will be accomplished through temporary ponds and pumps, berms, and/or underground piping. Typical temporary controls will be installed to protect downstream areas from storm water run-off from within the excavations, including silt fence, rock berms, and dust and sediment control.
- Water quality controls will consist of full sedimentation/filtration ponds. Exhibit **EXH-SF8** locates the permanent controls on the site and defines the anticipated storm water run-off for the fully developed condition. Exhibit **EXH-SF9** defines the volume of storm water run-off to be collected and treated, in accordance with Title 25 of the Austin City Code.
- The City has requested that the water quality controls be enhanced beyond the proposed structural controls. The final design of the water quality controls is to incorporate "innovative controls" as defined by the City's ECM manual. These innovative controls may consist of vegetative filter strips, rainwater harvesting, capture in open basins, or another control, as defined in Section 1.6.7 of the ECM. It is anticipated that the structural controls will be reduced by up to 25% and this water quality volume will be treated using the listed "innovative" controls. Final selection of the appropriate control will be determined during final design and coordinated with the appropriate City department.
- The storm water controls will consist of above ground detention ponds. Exhibits **EXH-SF8** and **EXH-SF9** illustrate the location, size, and capture volume of the anticipated storm water controls.
- Both the water quality controls and the storm water controls will be sized for the initial phase of the water treatment plant. Accommodations will be provided to expand these controls as additional water treatment facilities are constructed.
- It is anticipated that both underground piping and drainage swales will be utilized to convey storm water run-off to the different water quality control features. Site layout features and facilities will dictate where and to what extent each conveyance option can be utilized.

SUMMARY

Permanent water quality and storm water controls are required at both the raw water pump station site and the water treatment plant site. These permanent controls will meet or exceed the requirements of Title 25 of the Austin City Code, and as defined in the COA ECM manual.

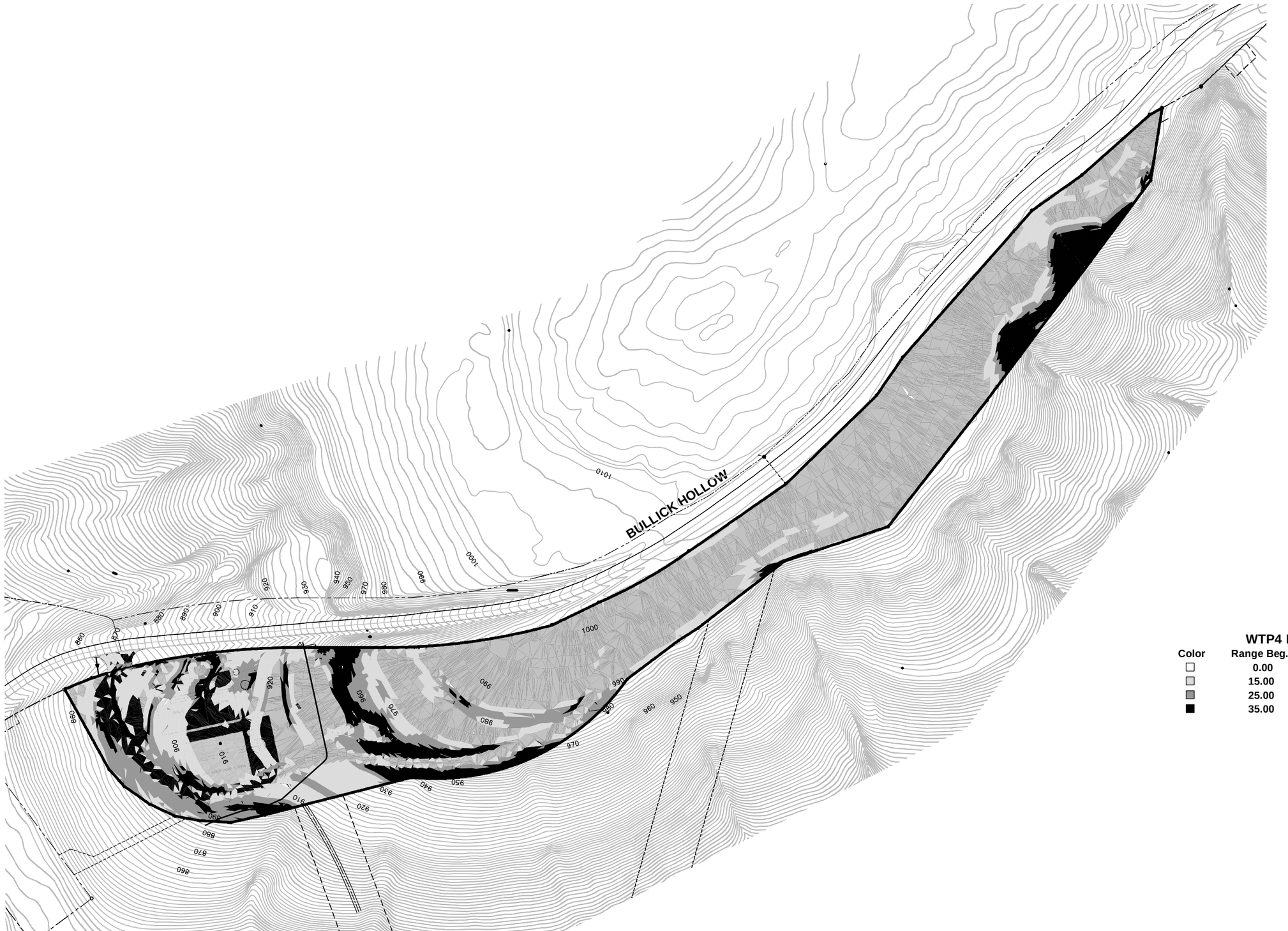
The proposed controls on the pump station site include temporary controls, such as silt fence, rock berms, and temporary pumping equipment and filtration system. Permanent controls include a full sedimentation/filtration pond and underground detention pond, sized for the ultimate build-out of the pump station site.

The permanent water quality and storm water controls for the water treatment plant site will be constructed prior to any land clearing activities for the water treatment facilities, with the exception of nominal clearing activities that will be performed for construction of a perimeter fence. During construction of the permanent controls, temporary controls and diversion of natural run-off, in accordance with the City's requirements, will be employed to minimize erosion and sedimentation of excavated areas. The permanent controls at the water treatment plant site include full sedimentation/filtration ponds and detention ponds.

In addition to the sedimentation/filtration ponds, additional, "innovative" controls will be employed to capture and treat up to 25% of the required water quality volume. "Innovative" controls are defined in

Section 1.6.7 of the COA ECM manual, and the appropriate controls will be selected during final design depending on feasibility and cost. In addition, operation and maintenance guidelines will be submitted to the Utility for inclusion into the plant's Operation and Maintenance Manual. These guidelines will be incorporated in the overall maintenance manuals, equivalent to the O&M materials for each piece of treatment equipment.

The proposed water quality and storm water controls meet or exceed the existing standards for the Lake Travis Watershed and maintain and protect the ecological integrity of the adjacent preserve area.



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WTP4 RWPS SLOPE RANGE TABLE

Color	Range Beg.	Range End	Percent(%)	Area(sf)
□	0.00	15.00	60.5	322374.08
▒	15.00	25.00	18.8	100244.28
▓	25.00	35.00	10.6	56617.06
■	35.00	10000.00	10.1	53564.15

SITE PLAN RELEASE SHEET ____ OF ____

FILE NUMBER: _____ EXPIRATION DATE: _____

CASE NUMBER: _____ APPLICATION DATE: _____

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APPROVED BY CITY COUNCIL ON: _____

UNDER SECTION _____ OF CHAPTER _____ OF THE AUSTIN CITY CODE

_____

SIGNING FOR WATERSHED PROTECTION AND DEVELOPMENT REVIEW DEPARTMENT

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REV 1 _____ CORRECTION 1 _____

REV 2 _____ CORRECTION 2 _____

REV 3 _____ CORRECTION 3 _____

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REV	DATE	BY	DESCRIPTION

DESIGNED: JNB
DRAWN: PW
CHECKED: SGE
DATE: APRIL–08

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CITY OF AUSTIN

WATER TREATMENT PLANT 4 - CONTRACT No. 1

RAW WATER PUMP STATION – STORMWATER FACILITIES

SLOPE MAP

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
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JOB NO. 6460G.00
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SHEET NO.

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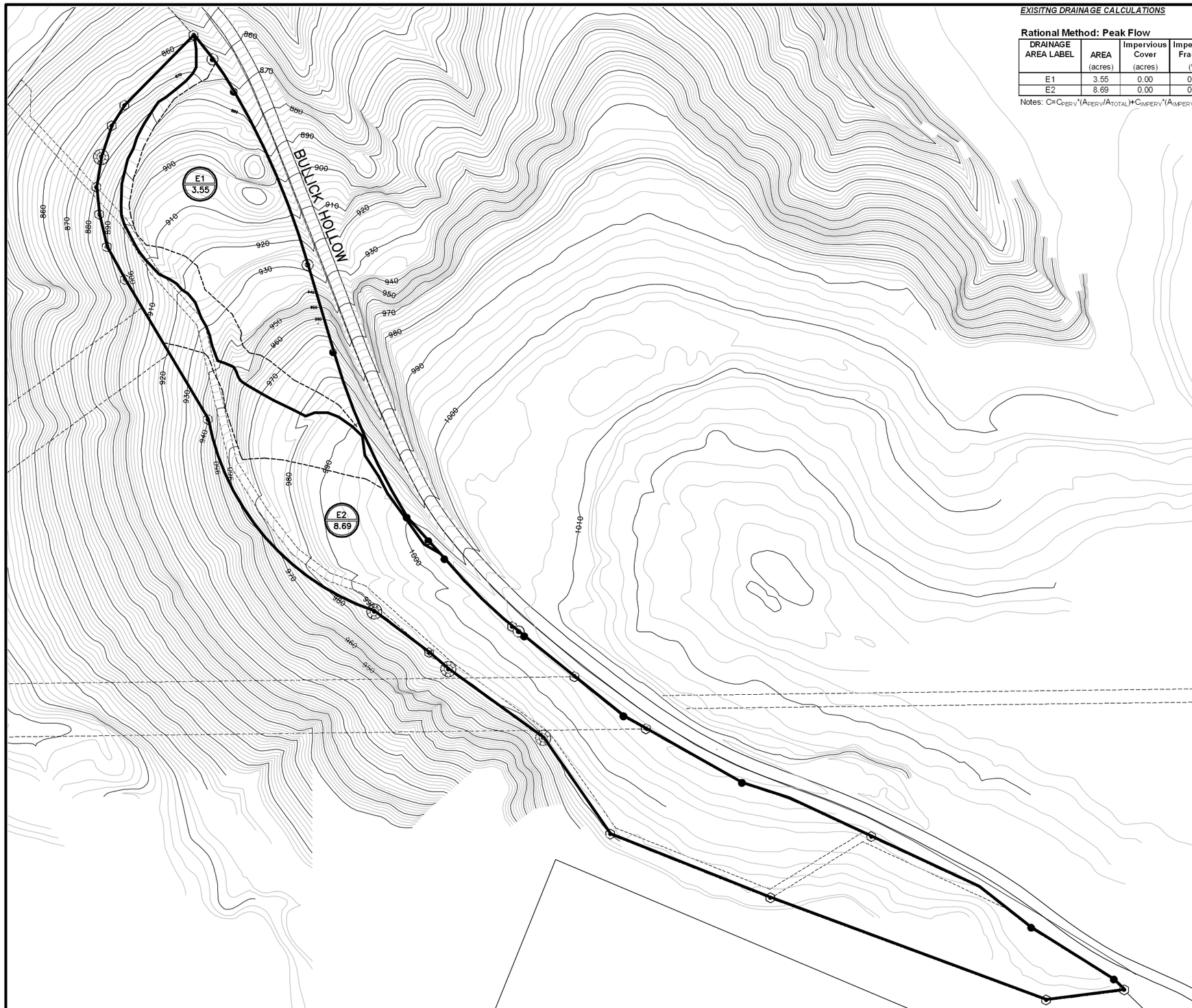

EXISITNG DRAINAGE CALCULATIONS

Rational Method: Peak Flow

DRAINAGE AREA LABEL	AREA (acres)	Impervious Cover (acres)	Impervious Fraction (%)	C 2yr	C 10yr	C 25yr	C 100yr	Tc (min)	I 2yr (in/hr)	I 10yr (in/hr)	I 25yr (in/hr)	I 100yr (in/hr)	Q 2yr (cfs)	Q 10yr (cfs)	Q 25yr (cfs)	Q 100yr (cfs)
E1	3.55	0.00	0.00	0.35	0.41	0.45	0.52	10.25	4.58	6.83	8.12	10.31	5.7	9.9	13.0	19.0
E2	8.69	0.00	0.00	0.35	0.41	0.45	0.52	6.12	5.45	8.12	9.59	11.98	16.6	28.9	37.5	54.1

Notes: $C=C_{PERV}*(A_{PERV}/A_{TOTAL})+C_{IMPERV}*(A_{IMPERV}/A_{TOTAL})$; $I=a/(Tc+b)^c$; $Q=C*I*A$

SCALE: 1"=100'

LEGEND

PROPERTY BOUNDARY

EXISTING DRAINAGE AREA BOUNDARY

OVERLAND FLOW Tc PATH

E1 / 3.55 — DRAINAGE AREA LABEL

SITE PLAN RELEASE SHEET ____ OF ____

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REV 2 ____ CORRECTION 2 ____

REV 3 ____ CORRECTION 3 ____

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CITY OF AUSTIN

WATER TREATMENT PLANT 4 - CONTRACT No. 1

RAW WATER PUMP STATION – STORMWATER FACILITIES

EXISTING DRAINAGE PLAN

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

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IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 6460G.00

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SHEET NO.

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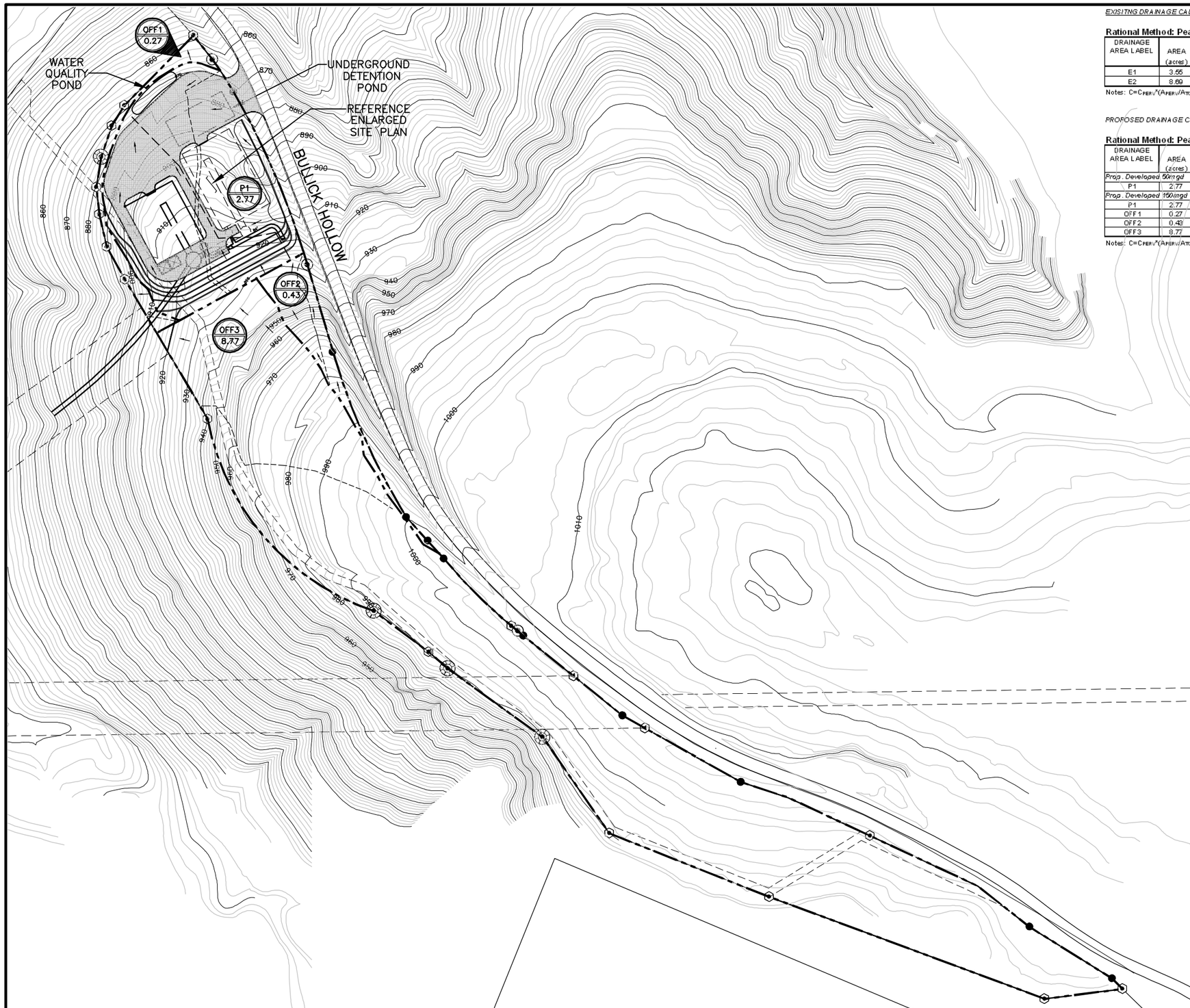

EXISITNG DRAINAGE CALCULATIONS

Rational Method: Peak Flow

DRAINAGE AREA LABEL	AREA (acres)	Impervious Cover (acres)	Impervious Fraction (%)	C 2yr	C 10yr	C 25yr	C 100yr	Tc (min)	I 2yr (in/hr)	I 10yr (in/hr)	I 25yr (in/hr)	I 100yr (in/hr)	Q 2yr (cfs)	Q 10yr (cfs)	Q 25yr (cfs)	Q 100yr (cfs)
E1	3.55	0.00	0.00	0.35	0.41	0.45	0.52	10.25	4.58	6.83	8.12	10.31	5.7	9.9	13.0	19.0
E2	8.69	0.00	0.00	0.35	0.41	0.45	0.52	6.12	5.46	8.12	9.59	11.98	16.6	28.9	37.5	54.1

Notes: $C = C_{PERV}*(A_{PERV}/A_{TOTAL}) + C_{IMPERV}*(A_{IMPERV}/A_{TOTAL})$; $I = a/(Tc+b)^c$; $Q = C*I*A$

PROPOSED DRAINAGE CALCULATIONS

Rational Method: Peak Flow

DRAINAGE AREA LABEL	AREA (acres)	Impervious Cover (acres)	Impervious Fraction (%)	C 2yr	C 10yr	C 25yr	C 100yr	Tc (min)	I 2yr (in/hr)	I 10yr (in/hr)	I 25yr (in/hr)	I 100yr (in/hr)	Q 2yr (cfs)	Q 10yr (cfs)	Q 25yr (cfs)	Q 100yr (cfs)
Prop. Developed 50mgd																
P1	2.77	1.33	48.0%	0.65	0.68	0.70	0.74	5.00	5.76	8.57	10.11	12.54	10.3	16.1	19.6	25.6
Prop. Developed 150mgd																
P1	2.77	1.70	61.4%	0.73	0.75	0.77	0.80	5.00	5.76	8.57	10.11	12.54	11.6	17.9	21.5	27.7
OFF1	0.27	0.00	0.00	0.35	0.41	0.45	0.52	5.00	5.76	8.57	10.11	12.54	0.54	0.95	1.23	1.76
OFF2	0.43	0.00	0.00	0.35	0.41	0.45	0.52	5.00	5.76	8.57	10.11	12.54	0.87	1.51	1.96	2.81
OFF3	8.77	0.00	0.00	0.35	0.41	0.45	0.52	5.58	5.59	8.33	9.84	12.25	17.17	29.95	38.83	55.85

Notes: $C = C_{PERV}*(A_{PERV}/A_{TOTAL}) + C_{IMPERV}*(A_{IMPERV}/A_{TOTAL})$; $I = a/(Tc+b)^c$; $Q = C*I*A$

SCALE: 1"=100'

LEGEND

- PROPERTY BOUNDARY
- PROPOSED DRAINAGE AREA BOUNDARY
- OVERLAND FLOW Tc PATH
- CHANNEL FLOW Tc PATH
- P1 / 2.77 — AREA No. / ACREAGE — DRAINAGE AREA LABEL

SITE PLAN RELEASE SHEET ____ OF ____

FILE NUMBER: _____ EXPIRATION DATE: _____

CASE NUMBER: _____ APPLICATION DATE: _____

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REV 1 _____ CORRECTION 1 _____
REV 2 _____ CORRECTION 2 _____
REV 3 _____ CORRECTION 3 _____

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REV	DATE	BY	DESCRIPTION

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DRAWN: PW
CHECKED: SGE
DATE: APRIL–08

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CITY OF AUSTIN

WATER TREATMENT PLANT 4 - CONTRACT No. 1

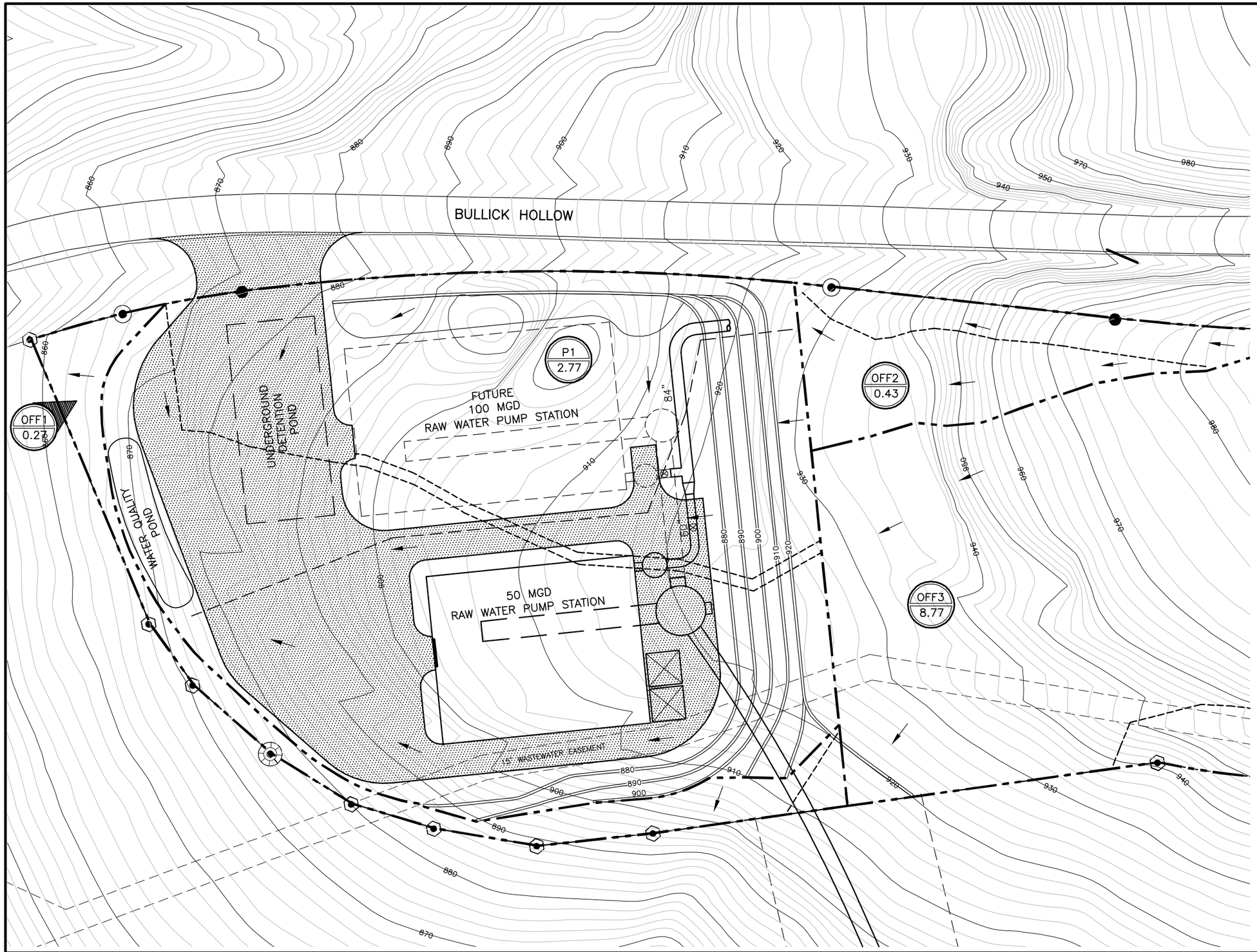
RAW WATER PUMP STATION – STORMWATER FACILITIES

PROPOSED OVERALL DRAINAGE PLAN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 — 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 6460G.00
DRAWING NO EXH–SF3
SHEET NO.

FILENAME: Last Saved By: 5-27-08 08:58am E:\60021335_COA WTP 4 Preliminary\CADD\EXHIBITS\EXH-SF3 XREFS: jX-oi_streets; X-RWPS; RWPS-SURVEY1; 6460G00_TBRW



SCALE: 1"=30'

LEGEND

- PROPERTY BOUNDARY
- PROPOSED DRAINAGE AREA BOUNDARY
- OVERLAND FLOW Tc PATH
- CHANNEL FLOW Tc PATH
- P1 / 2.77 — AREA No. / ACREAGE — DRAINAGE AREA LABEL

SITE PLAN RELEASE SHEET ____ OF ____

FILE NUMBER: _____ EXPIRATION DATE: _____

CASE NUMBER: _____ APPLICATION DATE: _____

REVIEWED FOR GENERAL COMPLIANCE ON: _____

APPROVED BY PLANNING COMMISSION ON: _____

APPROVED BY CITY COUNCIL ON: _____

UNDER SECTION _____ OF CHAPTER _____ OF THE AUSTIN CITY CODE

_____

SIGNING FOR WATERSHED PROTECTION AND DEVELOPMENT REVIEW DEPARTMENT
RELEASED FOR:
GENERAL COMPLIANCE: _____ ZONING: _____
REV 1 _____ CORRECTION 1 _____
REV 2 _____ CORRECTION 2 _____
REV 3 _____ CORRECTION 3 _____

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REV	DATE	BY	DESCRIPTION

DESIGNED	JNB
DRAWN	PW
CHECKED	SGE
DATE	APRIL–08

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CITY OF AUSTIN

WATER TREATMENT PLANT 4 - CONTRACT No. 1

RAW WATER PUMP STATION – STORMWATER FACILITIES

ENLARGED SITE PLAN
PROPOSED DRAINAGE PLAN

VERIFY SCALES
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JOB NO. 6460G.00

DRAWING NO EXH–SF4

SHEET NO.

FILENAME: Last Saved By: 5-12-08 10:32am E:\60021335_COA WTP 4 Preliminary\CADD\EXHIBITS\EXH-SF4 XREFS: jX-ol_streets; X-RWPS; RWPS-SURVEY1; 6460G00_TBRW

PROPOSED FACILITIES: Raw Water Pump Station **150MGD PHASE**

TABLE Q-1: NET SITE AREA

	Area (sf)	Area (ac)		
Total gross site area =	532,826	12.23		
Site Deductions:	Area (sf)	Area (ac)		
Critical water quality zone (CWQZ) =	0	0		
Water quality transition zone (WQTZ) =	0	0		
Wastewater irrigation areas =	0	0		
Deduction subtotal =	0	0		
Upland area (Gross area - Deduction total) =	532,826	12.23		
Net Site Area Calculation:	Area (sf)	Area (ac)	NSA Factor	Net Slope Area (ac.)
Area of Uplands with Slopes 0-15% =	322,374	7.40	100%	7.40
Area of Uplands with Slopes 15-25% =	100,244	2.30	40%	0.92
Area of Uplands with Slopes 25-35% =	56,617	1.30	20%	0.26
Net Site Area (subtotal) =				8.58

TABLE Q-2: IMPERVIOUS COVER

Allowable Impervious Cover: (Water Supply Rural Watershed)		
Impervious cover allowed at 0% x WQTZ Area =	0	Acres
Impervious cover allowed at 20% x NSA Area =	1.72	Acres
Deductions for perimeter roadway =	-0.67	Acres
Transfer of Development Intensity =	0	Acres
Total Allowable Impervious Cover =	1.04	Acres
Allowable Impervious Cover Breakdown by Slope Category		
Total acreage 15-25% = 2.3 Acres x 10% =	0.23	
Proposed Total Impervious Cover:		
Impervious Cover in Perimeter Roadway =	0.67	Acres
Impervious cover in WQTZ =	0	Acres
Existing Impervious cover in Uplands Zone =	0	Acres
Impervious cover in Uplands Zone =	1.71	Acres
Total impervious cover =	2.39	Acres
% IC of NSA =	27.83	%

Proposed Impervious Cover on Slopes (300MGD Phase Raw Water Pump Station)

		Building I.C.		Driveway / Roadway I.C.	
Slope Category	Slope Area (ac.)	Area (ac.)	% of Slope Area	Area (ac.)	% of Slope Area
0-15%	7.401	0.343	4.64%	0.390	5.26%
15-25%	2.301	0.252	10.95%	0.276	11.99%
25-35%	1.300	0.069	5.30%	0.240	18.44%
Over 35%	1.230	0.046	3.73%	0.099	8.05%
Total Site Area	12.231				

RAW WATER PUMP STATION

	150MGD	50MGD
Site Characteristics		
Gross Site Area (ac.)	12.23	12.23
Drainage Area (ac.)	2.77	2.77
Impervious Cover Area (ac.)	1.70	1.33
Impervious Cover of GSA (%)	13.9%	10.9%
Impervious Cover of Drainage Area (%)	61.4%	48.0%
Water Quality Volume Sizing		
Required Capture Depth (in)	0.50	0.50
Design Capture Depth (in.)	0.50	0.50
Water Quality Volume (cf)	5,028	5,028
Pond Depth (ft)	5.00	0.00
Pond Length (ft)	50.00	0.00
Pond Width (ft)	20.11	0.00
Preliminary Detention Volume Sizing[1]		
Rainfall Depth 100yr (in)	10.2	10.2
Rainfall Runoff Coefficient	0.80	0.74
Runoff Volume V_r (ac.ft.)	1.87	1.73
SCS Coefficient C_0	0.682	0.682
SCS Coefficient C_1	-1.43	-1.43
SCS Coefficient C_2	1.64	1.64
SCS Coefficient C_3	-0.804	-0.804
Pre-Developed Peak Flow, q_0 (cfs)	17.39	17.39
Developed Peak Flow, q_i (cfs)	27.67	25.58
Storage Volume, V_s (ac.ft.)	0.43	0.37
Storage Volume, V_s (cf)	18,896	16,240

[1] Detention volume approximated using SCS TR-55 method

SITE PLAN RELEASE SHEET ____ OF ____
FILE NUMBER: ____ EXPIRATION DATE: ____
CASE NUMBER: ____ APPLICATION DATE: ____
REVIEWED FOR GENERAL COMPLIANCE ON: ____
APPROVED BY PLANNING COMMISSION ON: ____
APPROVED BY CITY COUNCIL ON: ____
UNDER SECTION ____ OF CHAPTER ____ OF THE AUSTIN CITY CODE
____
SIGNING FOR WATERSHED PROTECTION AND DEVELOPMENT REVIEW DEPARTMENT
RELEASED FOR:
GENERAL COMPLIANCE: ____ ZONING: ____
REV 1 ____ CORRECTION 1 ____
REV 2 ____ CORRECTION 2 ____
REV 3 ____ CORRECTION 3 ____
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REV	DATE	BY	DESCRIPTION

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CHECKED SGE
DATE APRIL–08

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WATER TREATMENT PLANT 4 - CONTRACT No. 1
RAW WATER PUMP STATION – STORMWATER FACILITIES
WATER QUALITY CALCULATIONS AND IMPERVIOUS COVER CALCULATIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
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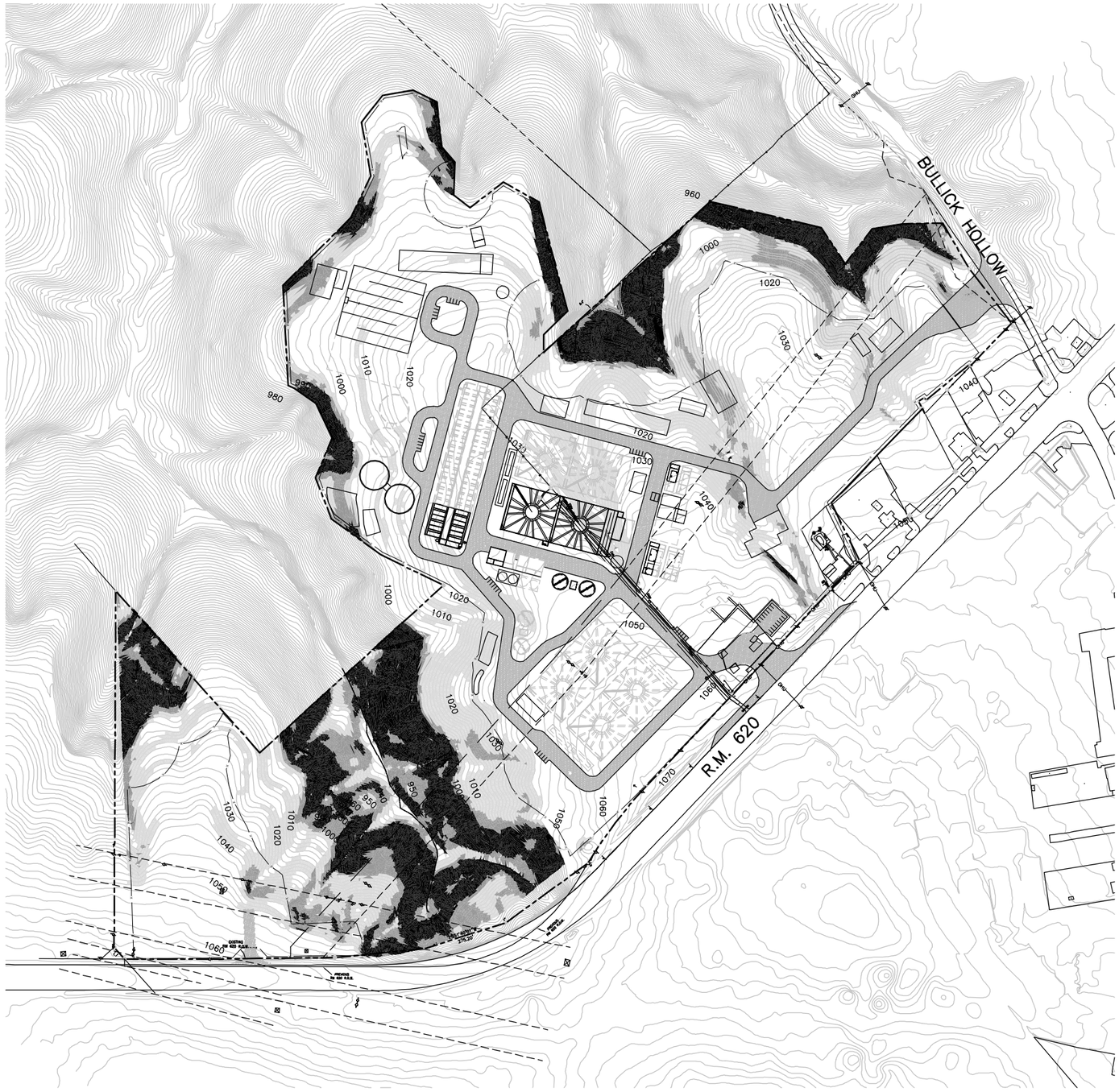
JOB NO. 6460G.00
DRAWING NO EXH–SF5
SHEET NO.

FILENAME: Last Saved By: 5-12-08 10:35am E:\60021335_COA WTP 4 Preliminary\CADD\EXHIBITS\EXH-SF5 XREFS: 6460G00_TBRW



SCALE: 1"=200'

LEGEND

WTP No. 4 SITE SLOPE RANGE TABLE

Color	Range Beg.	Range End	Site Area(%)	Area(sf)
	0.00%	15.00%	59.2	2372256.37
	15.00%	25.00%	19.9	796535.93
	25.00%	35.00%	7.5	301928.94
	35.00%	10000.00%	13.4	536469.67

PROPERTY BOUNDARY

SITE PLAN RELEASE SHEET ____ OF ____

FILE NUMBER: _____ EXPIRATION DATE: _____

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CITY OF AUSTIN

WATER TREATMENT PLANT 4 - CONTRACT No. 1

WATER TREATMENT PLANT No. 4 – STORMWATER FACILITIES

SLOPE MAP

VERIFY SCALES
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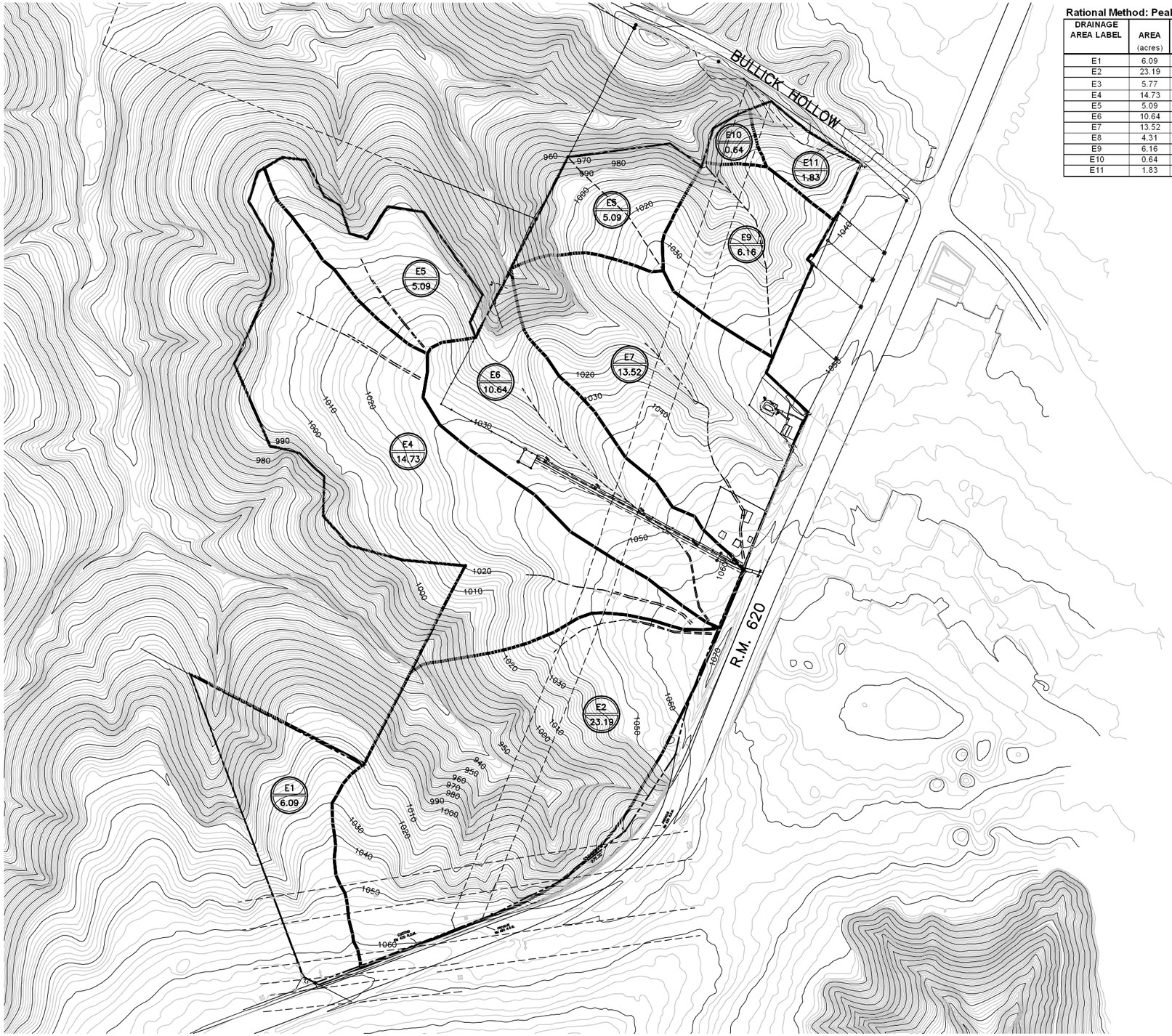
JOB NO. 6460G.00
DRAWING NO EXH–SF6
SHEET NO.

FILENAME: Last Saved By: 5-12-08 11:17am E:\60021335_COA WTP 4 Preliminary\CADD\EXHIBITS\EXH-SF6 XREFS: X-WP4STRUCTURES; jX-ol_streets; 6460G00_TBWP; X-WP4-BOUNDARY overall-air-photo;



EXISITNG DRAINAGE CALCULATIONS

Rational Method: Peak Flow

DRAINAGE AREA LABEL	AREA (acres)	Impervious Cover (acres)	Impervious Fraction (%)	C 2yr	C 10yr	C 25yr	C 100yr	Tc (min)	I 2yr (in/hr)	I 10yr (in/hr)	I 25yr (in/hr)	I 100yr (in/hr)	Q 2yr (cfs)	Q 10yr (cfs)	Q 25yr (cfs)	Q 100yr (cfs)
E1	6.09	0.00	0.0%	0.35	0.41	0.45	0.52	13.28	4.11	6.15	7.32	9.39	8.8	15.3	20.1	29.7
E2	23.19	0.00	0.0%	0.35	0.41	0.45	0.52	10.42	4.54	6.79	8.07	10.25	36.9	64.5	84.2	123.6
E3	5.77	0.00	0.0%	0.35	0.41	0.45	0.52	15.02	3.88	5.82	6.94	8.93	7.8	13.8	18.0	26.8
E4	14.73	0.00	0.0%	0.35	0.41	0.45	0.52	12.13	4.27	6.39	7.60	9.71	22.0	38.6	50.4	74.4
E5	5.09	0.00	0.0%	0.35	0.41	0.45	0.52	6.87	5.26	7.84	9.28	11.63	9.4	16.4	21.3	30.8
E6	10.64	0.00	0.0%	0.35	0.41	0.45	0.52	15.85	3.79	5.67	6.78	8.73	14.1	24.8	32.4	48.3
E7	13.52	0.00	0.0%	0.35	0.41	0.45	0.52	15.07	3.88	5.81	6.93	8.92	18.3	32.2	42.2	62.7
E8	4.31	0.00	0.0%	0.35	0.41	0.45	0.52	6.38	5.38	8.02	9.48	11.86	8.1	14.2	18.4	26.6
E9	6.16	0.00	0.0%	0.35	0.41	0.45	0.52	7.31	5.16	7.69	9.11	11.43	11.1	19.4	25.2	36.6
E10	0.64	0.00	0.0%	0.35	0.41	0.45	0.52	5.00	5.76	8.57	10.11	12.54	1.3	2.2	2.9	4.2
E11	1.83	0.00	0.0%	0.35	0.41	0.45	0.52	5.63	5.58	8.31	9.82	12.22	3.6	6.2	8.1	11.6

SCALE: 1"=200'

LEGEND

EXISTING DRAINAGE AREA BOUNDARY

PROPERTY BOUNDARY

OVERLAND FLOW TO Tc PATH

E11 / 1.93 — AREA No. / ACREAGE — DRAINAGE AREA LABEL

SITE PLAN RELEASE SHEET ____ OF ____

FILE NUMBER: _____ EXPIRATION DATE: _____

CASE NUMBER: _____ APPLICATION DATE: _____

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REV	DATE	BY	DESCRIPTION

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WATER TREATMENT PLANT 4 - CONTRACT No. 1

WATER TREATMENT PLANT No. 4 – STORMWATER FACILITIES

EXISTING DRAINAGE PLAN

VERIFY SCALES
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JOB NO. 6460G.00
DRAWING NO EXH–SF7
SHEET NO.

FILENAME: Last Saved By: 5-27-08 11:00am E:\60021335_COA WTP 4 Preliminary\CADD\EXHIBITS\EXH-SF7 XREFS: ppi_wtp4_cont; 6460G00_TBWP; X-WP4-BOUNDARY overall-air-photo;

PROPOSED DRAINAGE CALCULATIONS

Rational Method: Peak Flow

DRAINAGE AREA LABEL	AREA (acres)	Impervious Cover (acres)	Impervious Fraction (%)	C 2yr	C 10yr	C 25yr	C 100yr	Tc (min)	I 2yr (in/hr)	I 10yr (in/hr)	I 25yr (in/hr)	I 100yr (in/hr)	Q 2yr (cfs)	Q 10yr (cfs)	Q 25yr (cfs)	Q 100yr (cfs)
Prop. Developed 300mgd																
P1	2.83	0.92	32.5%	0.55	0.59	0.62	0.67	5.00	5.76	8.57	10.11	12.54	9.0	14.4	17.7	23.7
P2	7.94	2.39	30.1%	0.54	0.58	0.61	0.66	5.00	5.76	8.57	10.11	12.54	24.5	39.4	48.7	65.3
P3	4.20	2.90	68.9%	0.78	0.80	0.81	0.83	5.00	5.76	8.57	10.11	12.54	18.8	28.6	34.3	43.7
P4	1.67	0.42	24.9%	0.50	0.55	0.58	0.63	5.00	5.76	8.57	10.11	12.54	4.8	7.9	9.8	13.2
P5	10.62	3.53	33.2%	0.56	0.60	0.62	0.67	5.11	5.72	8.52	10.06	12.49	33.8	53.9	66.5	88.8
P6	7.84	2.62	33.5%	0.56	0.60	0.62	0.67	8.64	4.88	7.27	8.63	10.89	21.3	34.1	42.2	57.3
P7	4.92	2.10	42.7%	0.61	0.65	0.67	0.71	5.00	5.76	8.57	10.11	12.54	17.4	27.4	33.4	44.0
Prop. Developed 50mgd																
P1	2.83	0.81	28.6%	0.53	0.57	0.60	0.65	5.00	5.76	8.57	10.11	12.54	8.6	13.8	17.1	23.0
P2	7.94	2.07	26.0%	0.51	0.56	0.59	0.64	5.00	5.76	8.57	10.11	12.54	23.4	37.8	47.0	63.5
P3	4.20	1.94	46.2%	0.64	0.67	0.69	0.73	5.00	5.76	8.57	10.11	12.54	15.4	24.1	29.3	38.3
P4	1.67	0.42	24.9%	0.50	0.55	0.58	0.63	5.00	5.76	8.57	10.11	12.54	4.8	7.9	9.8	13.2
P5	10.62	3.05	28.8%	0.53	0.57	0.60	0.65	5.11	5.72	8.52	10.06	12.49	32.1	51.7	64.0	86.1
P6	7.84	1.30	16.5%	0.45	0.50	0.54	0.59	8.64	4.88	7.27	8.63	10.89	17.3	28.7	36.3	50.8
P7	4.92	0.96	19.4%	0.47	0.52	0.55	0.61	5.00	5.76	8.57	10.11	12.54	13.3	21.9	27.4	37.5

Notes: $C=C_{PERV}*(A_{PERV}/A_{TOTAL})+C_{IMPERV}*(A_{IMPERV}/A_{TOTAL})$; I=a/(Tc+b)^c; Q=C*I*A

SCALE: 1"=200'

LEGEND

- PROPERTY BOUNDARY
- PROPOSED DRAINAGE AREA BOUNDARY
- OVERLAND FLOW Tc PATH
- P5 / 10.62 — AREA No. / ACREAGE — DRAINAGE AREA LABEL
- RIM ROCK

SITE PLAN RELEASE SHEET ____ OF ____

FILE NUMBER: _____ EXPIRATION DATE: _____

CASE NUMBER: _____ APPLICATION DATE: _____

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RELEASED FOR:

GENERAL COMPLIANCE: _____ ZONING: _____

REV 1 _____ CORRECTION 1 _____

REV 2 _____ CORRECTION 2 _____

REV 3 _____ CORRECTION 3 _____

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WATER TREATMENT PLANT 4 - CONTRACT No. 1

WATER TREATMENT PLANT No. 4 – STORMWATER FACILITIES

PROPOSED DRAINAGE PLAN

VERIFY SCALES
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JOB NO. 6460G.00
DRAWING NO EXH–SF8
SHEET NO.

FILENAME: Last Saved By: 5-12-08 11:26am E:\60021335_COA WTP 4 Preliminary\CADD\EXHIBITS\EXH-SF8 XREFS: ppi_wtp4_cont; X-WP4STRUCTURES; X-WP4-BOUNDARY; 6460G00_TBWP overall-air-photo;

PROPOSED FACILITIES **50MGD PHASE**

TABLE Q-1: NET SITE AREA

	Area (sf)	Area (ac)		
Total gross site area =	4,007,190	91.99		
Site Deductions:	Area (sf)	Area (ac)		
Critical water quality zone (CWQZ) =	0	0		
Water quality transition zone (WQTZ) =	0	0		
Wastewater irrigation areas =	0	0		
Deduction subtotal =	0	0		
Upland area (Gross area - Deduction total) =	4,007,190	91.99		
Net Site Area Calculation:	Area (sf)	Area (ac)	NSA Factor	Net Slope Area (ac.)
Area of Uplands with Slopes 0-15% =	2,372,256	54.46	100%	54.46
Area of Uplands with Slopes 15-25% =	796,536	18.29	40%	7.31
Area of Uplands with Slopes 25-35% =	301,929	6.93	20%	1.39
Net Site Area (subtotal) =				63.16

TABLE Q-2: IMPERVIOUS COVER

Allowable Impervious Cover: (Water Supply Rural Watershed)		
Impervious cover allowed at 0% x WQTZ Area =	0	Acres
Impervious cover allowed at 20% x NSA Area =	12.63	Acres
Deductions for perimeter roadway =	-2.81	Acres
Transfer of Development Intensity =	0	Acres
Total Allowable Impervious Cover =	9.82	Acres
Allowable Impervious Cover Breakdown by Slope Category		
Total acreage 15-25% = 18.29 Acres x 10% =	1.83	
Proposed Total Impervious Cover:		
Impervious Cover in Perimeter Roadway =	2.81	Acres
Impervious cover in WQTZ =	0	Acres
Existing Impervious cover in Uplands Zone =	0	Acres
Impervious cover in Uplands Zone =	13.19	Acres
Total impervious cover =	16.00	Acres
% IC of NSA =	25.33	%

Proposed Impervious Cover on Slopes (50MGD Plant Phase)

		Building I.C.		Driveway / Roadway I.C.	
Slope Category	Slope Area (ac.)	Area (ac.)	% of Slope Area	Area (ac.)	% of Slope Area
0-15%	54.460	4.118	7.56%	6.402	11.76%
15-25%	18.286	0.648	3.55%	1.156	6.32%
25-35%	6.931	0.020	0.29%	0.139	2.01%
Over 35%	12.316	0.001	0.01%	0.019	0.16%
Total Site Area	91.992				

PROPOSED FACILITIES **300MGD PHASE**

TABLE Q-1: NET SITE AREA

	Area (sf)	Area (ac)		
Total gross site area =	4,007,190	91.99		
Site Deductions:	Area (sf)	Area (ac)		
Critical water quality zone (CWQZ) =	0	0		
Water quality transition zone (WQTZ) =	0	0		
Wastewater irrigation areas =	0	0		
Deduction subtotal =	0	0		
Upland area (Gross area - Deduction total) =	4,007,190	91.99		
Net Site Area Calculation:	Area (sf)	Area (ac)	NSA Factor	Net Slope Area (ac.)
Area of Uplands with Slopes 0-15% =	2,372,256	54.46	100%	54.46
Area of Uplands with Slopes 15-25% =	796,536	18.29	40%	7.31
Area of Uplands with Slopes 25-35% =	301,929	6.93	20%	1.39
Net Site Area (subtotal) =				63.16

TABLE Q-2: IMPERVIOUS COVER

Allowable Impervious Cover: (Water Supply Rural Watershed)		
Impervious cover allowed at 0% x WQTZ Area =	0	Acres
Impervious cover allowed at 20% x NSA Area =	12.63	Acres
Deductions for Perimeter Roadway =	-2.81	Acres
Transfer of Development Intensity =	0	Acres
Total Allowable Impervious Cover =	9.82	Acres
Allowable Impervious Cover Breakdown by Slope Category		
Total acreage 15-25% = 18.29 Acres x 10% =	1.83	
Proposed Total Impervious Cover:		
Impervious Cover in Perimeter Roadway =	2.81	Acres
Impervious Cover in WQTZ =	0	Acres
Existing Impervious Cover in Uplands Zone =	0	Acres
Proposed Impervious Cover in Uplands Zone =	22.82	Acres
Total impervious cover =	25.63	Acres
% IC of NSA =	40.57	%

Proposed Impervious Cover on Slopes (300MGD Plant Phase)

		Building I.C.		Driveway / Roadway I.C.	
Slope Category	Slope Area (ac.)	Area (ac.)	% of Slope Area	Area (ac.)	% of Slope Area
0-15%	54.460	12.489	22.93%	6.402	11.76%
15-25%	18.286	1.843	10.08%	1.156	6.32%
25-35%	6.931	0.083	1.20%	0.139	2.01%
Over 35%	12.316	0.00'	0.01%	0.019	0.16%
Total Site Area	91.992				

	POND 1 (P1)		POND 2 (P2)		PCND 3 (P3)		POND 4 (P4)		POND 5 (P5)		POND 6 (P6)		POND 7 (P7)	
	300MGD	50MGD	300MGD	50MGD	300MGD	50MGD	300MGD	50MGD	300MGD	50MGD	300MGD	50MGD	300MGD	50MGD
Site Characteristics														
Gross Site Area (ac.)	91.99	91.99	91.99	91.99	91.99	91.99	91.99	91.99	91.99	91.99	91.99	91.99	91.99	91.99
GSA Impervious Cover (ac.)	25.63	16.00	25.63	16.00	25.63	16.00	25.63	16.00	25.63	16.00	25.63	16.00	25.63	16.00
Impervious Cover of GSA (%)	27.9%	17.4%	27.9%	17.4%	27.9%	17.4%	27.9%	17.4%	27.9%	17.4%	27.9%	17.4%	27.9%	17.4%
Drainage Area (ac.)	2.83	2.83	7.94	7.94	4.20	4.20	1.67	1.67	10.62	10.62	7.84	7.84	4.92	4.92
Impervious Cover Area (ac.)	0.92	0.81	2.39	2.07	2.90	1.94	0.42	0.42	3.53	3.05	2.62	1.30	2.10	0.96
Impervious Cover of Drainage Area (%)	32.5%	28.6%	30.1%	26.0%	68.9%	46.2%	24.9%	24.9%	33.2%	28.8%	33.5%	16.5%	42.7%	19.4%
Water Quality Volume Sizing														
Required Capture Depth (in)	0.58	0.50	0.58	0.50	0.58	0.50	0.58	0.50	0.58	0.50	0.58	0.50	0.58	0.50
Design Capture Depth (in.)	0.58	0.50	0.58	0.50	0.58	0.50	0.58	0.50	0.58	0.50	0.58	0.50	0.58	0.50
Water Quality Volume (cf)	5,944	5,136	16,676	14,411	8,821	7,623	3,507	3,031	22,304	19,275	16,466	14,230	10,333	8,930
Preliminary Detention Volume Sizing[1]														
Rainfall Depth 100yr (in)	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2
Rainfall Runoff Coefficient	0.67	0.65	0.66	0.64	0.83	0.73	0.63	0.63	0.67	0.65	0.67	0.59	0.71	0.61
Runoff Volume V_r (ac.ft.)	1.60	1.56	4.42	4.30	2.96	2.60	0.90	0.90	6.04	5.86	4.47	3.96	2.98	2.54
SCS Coefficient C_0	0.682	0.682	0.682	0.682	0.682	0.682	0.682	0.682	0.682	0.682	0.682	0.682	0.682	0.682
SCS Coefficient C_1	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43
SCS Coefficient C_2	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64
SCS Coefficient C_3	-0.804	-0.804	-0.804	-0.804	-0.804	-0.804	-0.804	-0.804	-0.804	-0.804	-0.804	-0.804	-0.804	-0.804
Pre-Developed Peak Flow, q_0 (cfs)	13.56	13.56	41.29	41.29	23.81	23.81	10.26	10.26	48.54	48.54	38.70	38.70	29.10	29.10
Developed Peak Flow, q_i (cfs)	23.66	23.04	65.29	63.46	43.74	38.35	13.24	13.24	88.78	86.10	57.28	50.77	43.96	37.49
Storage Volume, V_s (ac.ft.)	0.40	0.38	1.02	0.96	0.77	0.61	0.17	0.17	1.57	1.48	0.97	0.75	0.66	0.47
Storage Volume, V_s (cf)	17,443	16,625	44,355	42,026	33,544	26,473	7,214	7,214	68,183	64,604	42,148	32,573	28,651	20,381

[1] Detention volume approximated using SCS TR-55 method

SITE PLAN RELEASE SHEET ____ OF ____
FILE NUMBER: _____ EXPIRATION DATE: _____
CASE NUMBER: _____ APPLICATION DATE: _____
REVIEWED FOR GENERAL COMPLIANCE ON: _____
APPROVED BY PLANNING COMMISSION ON: _____
APPROVED BY CITY COUNCIL ON: _____
UNDER SECTION _____ OF CHAPTER _____ OF THE AUSTIN CITY CODE
_____
SIGNING FOR WATERSHED PROTECTION AND DEVELOPMENT REVIEW DEPARTMENT
RELEASED FOR:
GENERAL COMPLIANCE: _____ ZONING: _____
REV 1 _____ CORRECTION 1 _____
REV 2 _____ CORRECTION 2 _____
REV 3 _____ CORRECTION 3 _____
RELEASE OF THIS APPLICATION DOES NOT CONSTITUTE A VERIFICATION OF ALL DATA, INFORMATION AND CALCULATIONS SUPPLIED BY THE APPLICANT. THE ENGINEER OF RECORD IS SOLELY RESPONSIBLE FOR THE COMPLETENESS, ACCURACY AND ADEQUACY OF THEIR SUBMITTAL, WHETHER OR NOT THE APPLICATION IS REVIEWED FOR CODE COMPLIANCE BY CITY ENGINEERS.

REV	DATE	BY	DESCRIPTION

DESIGNED JNB
DRAWN PW
CHECKED SGE
DATE APRIL–08

TCB | AECOM
TCB INC.
400 WEST 15th STREET, SUITE 500
AUSTIN, TEXAS 78701
WWW.TCB.AECOM.COM

carollo engineers

CITY OF AUSTIN

WATER TREATMENT PLANT 4 - CONTRACT No. 1
WATER TREATMENT PLANT No. 4 – STORMWATER FACILITIES
WATER QUALITY CALCULATIONS AND IMPERVIOUS COVER CALCULATIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 6460G.00
DRAWING NO EXH–SF9
SHEET NO.

FILENAME: Last Saved By: 5-12-08 11:30am E:\60021335_COA WTP 4 Preliminary\CADD\EXHIBITS\EXH-SF9 XREFS: 6460G00_TBWP

Appendix D

CEF Reports

TCB

400 West 15th Street, Suite 500, Austin, Texas 78701

T 512.472.4519 F 512.472.7519 www.tcb.aecom.com

CRITICAL ENVIRONMENTAL FEATURE STUDY
WATER TREATMENT PLANT No. 4 - SITE 34
CITY OF AUSTIN, TRAVIS COUNTY, TEXAS

Prepared for:
Carollo Engineers

Prepared by: Douglas E. Zarker, P.G.
TCB INC.

June 2008

1.0 INTRODUCTION

This draft memorandum summarizes the results of a Critical Environmental Feature (CEF) Survey conducted on a 92-acre parcel of undeveloped land located near Lake Travis. The CEF Survey was conducted by City staff from the Watershed Protection and Development Review Department (WPDRD) of the City of Austin (COA). The survey was necessary to identify certain environmental features that may be affected by the proposed Water Treatment Plant No. 4 (WTP 4).

1.1 PURPOSE

A CEF survey is typically prepared to fulfill the requirements of Title XXV of the City of Austin Land Development Code (§25-8-121). The code requires that an Environmental Assessment be submitted to the Director of the Watershed Protection Department for proposed development over a karst aquifer. Among other requirements, the Environmental Assessment must identify CEFs on the proposed site. Within the Code, CEFs are defined as:

> "features that are of critical importance to the protection of environmental resources, and include bluffs, canyon rimrocks, caves, sinkholes, springs, and wetlands."

The COA Land Development Code (LDC) states that, "drainage patterns for proposed development must be designed to protect critical environmental features from the effects of runoff from developed areas, and to maintain catchment areas of recharge features in a natural state." The Code further prescribes that a buffer zone be established around each critical environmental feature. For bluffs, canyon rimrocks, springs and wetlands the width of the buffer zone or setback is typically 150 feet, although this distance can be modified by WPDRD if granted an administrative variance to reduce the setback. Caves and sinkholes are defined as point recharge features and are therefore subject to a buffer zone that is established at the outer edge or footprint of the feature (§25-8-1 and §25-8-281). For most point recharge features, the buffer zone width is 150 feet but may extend up to 300 feet or may be as small as 50 feet. The width is determined by the size of the underground footprint of the point recharge feature; the area, slope and vegetative cover within the catchment basin; proximity to or location within a creekbed; and the proposed land use occurring upslope or adjacent to a cave or sinkhole. Within the buffer zone, construction and wastewater disposal or irrigation is prohibited and natural vegetative cover must be retained.

The purpose of the survey was to locate CEFs (caves, sinkholes, springs, bluffs, canyon rimrock, and wetlands) within the boundaries of the proposed water treatment plant site. Information for this memorandum was developed from field investigations performed by COA staff, a review of available geological reports and maps, and from previous geologic assessments and field studies performed by others. Wetland areas were preliminarily identified by review of the National Wetlands Inventory Map (Jollyville Quadrangle), available aerial photographs, and field observations.

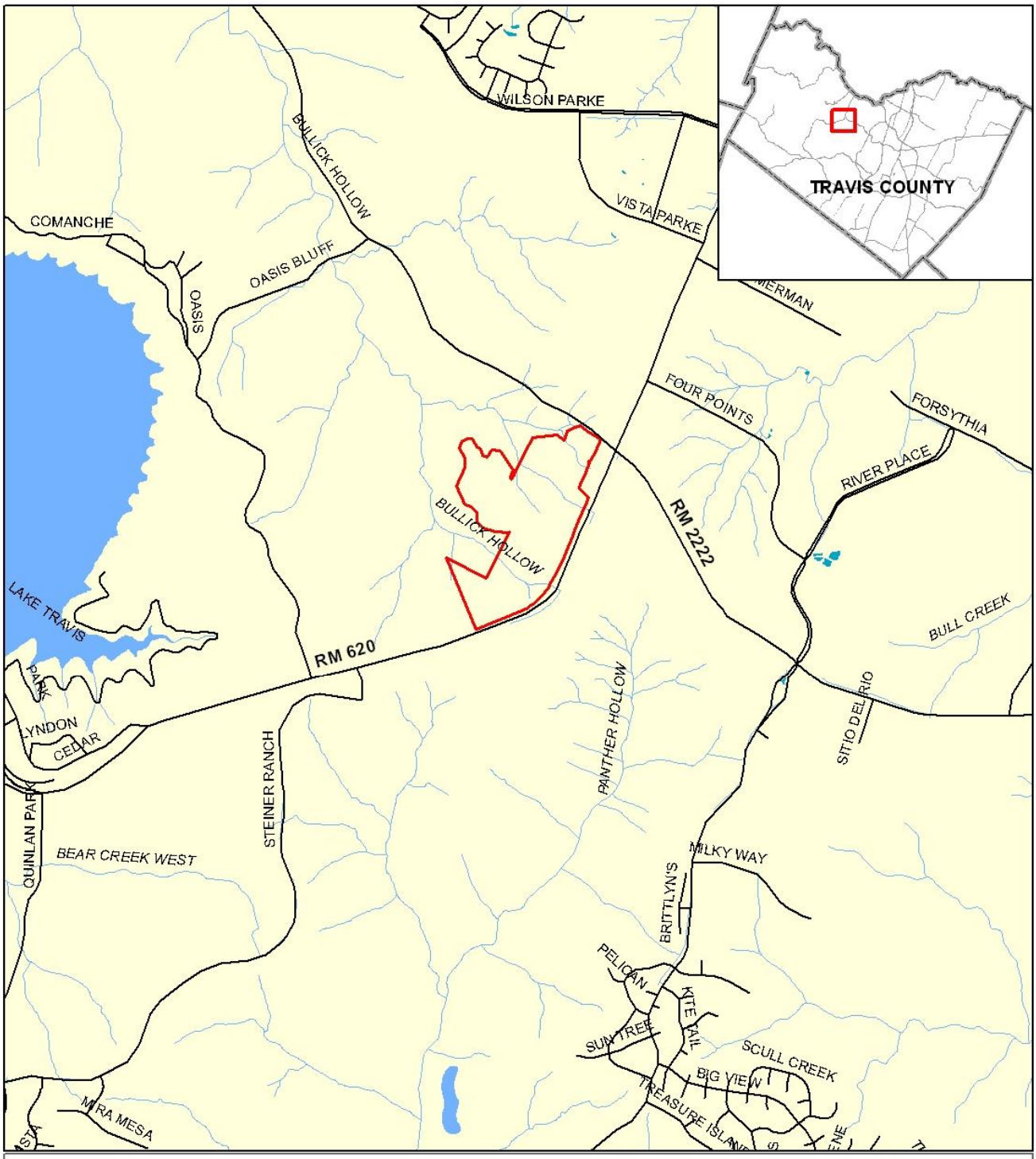
1.2 BACKGROUND INFORMATION

The City of Austin is proposing to build a water treatment plant in western Travis County near Lake Travis. The proposed water treatment plant site (the "Site") is located near the southwest corner of the intersection of RM 620 and Bullick Hollow Road. The Site consists of a 92-acre (approximate) parcel of undeveloped land (*Figures 1 - 3*).

The Site is situated along the western edge of the Jollyville Plateau, a relatively flat limestone terrain that has been incised by narrow, steep-sided canyons. Surface geologic units mapped on the Site consist of marine sediments deposited during the Lower Cretaceous period. Most of the bedrock units observed at the Site consist of limestone and related carbonate rocks, including dolomite, argillaceous limestone and marl. According to the *Geologic Map of the Austin Area, Texas* (Garner and Young 1976), GIS data and our field observations, two geologic formations are mapped on the Site. They are, from oldest to youngest, the Walnut Formation and the Edwards Limestone. The Edwards Formation outcrops over a majority of the Site on the uplands and higher elevations with the underlying Walnut outcropping in the upper ends of the steep drainageways that traverse the Site.

The majority of the Site is situated atop a plateau or ridge that slopes gently to the west-northwest and is located entirely within the Lake Travis watershed. There are three main canyons or ephemeral drainageways that traverse the Site, generally draining the Site from southeast to northwest *(Figure 2*). Ground surface elevations at the Site range from a topographic high of approximately 1,070 feet on the east central portion to a low of about 900 feet above mean sea level (msl), indicating a total relief of approximately 170 feet. The highest elevation is located on the upland area near the central portion of the Site and the lower elevations are located where the steep canyons drain the Site along its western boundaries (*Figures 2* and *4*). Surface water runoff from the Site travels as sheet flow during rain events toward these steep drainages, flowing offsite to the west-northwest, into unnamed tributaries that individually flow into Bullick Hollow Creek. Bullick Hollow Creek is the main receptor of surface water runoff in the area and drains northwesterly and eventually empties into Lake Travis (Colorado River) located less than two miles to the northwest (Lake Travis watershed).

The soils on the Site are generally thin and rocky. According to the *Soil Survey of Travis County*, soils of both the Brackett and the Tarrant series are mapped across the Site. Tarrant soils are mapped across the majority of the Site at the higher elevations and consist of shallow to very shallow, well drained, stony, clayey soils overlying limestone. Slopes range from zero to two percent at the higher elevations and from five to 12 percent along complex slopes (SCS 1974). Brackett soils are mapped at the lower elevations of the Site along the steep breaks of the canyons with slopes ranging from 15 to 20 percent. In general, soils that formed on the outcrop of the Edwards Formation mapped across the upland area of the Site are typically composed of dark brown, grayish brown, and reddish brown, silty to clayey loams. These soils developed from limestone and marl that comprise the geologic units of the Edwards Formation.



N
W E
S

Feet
0 500 1,000 2,000 3,000 4,000

Legend

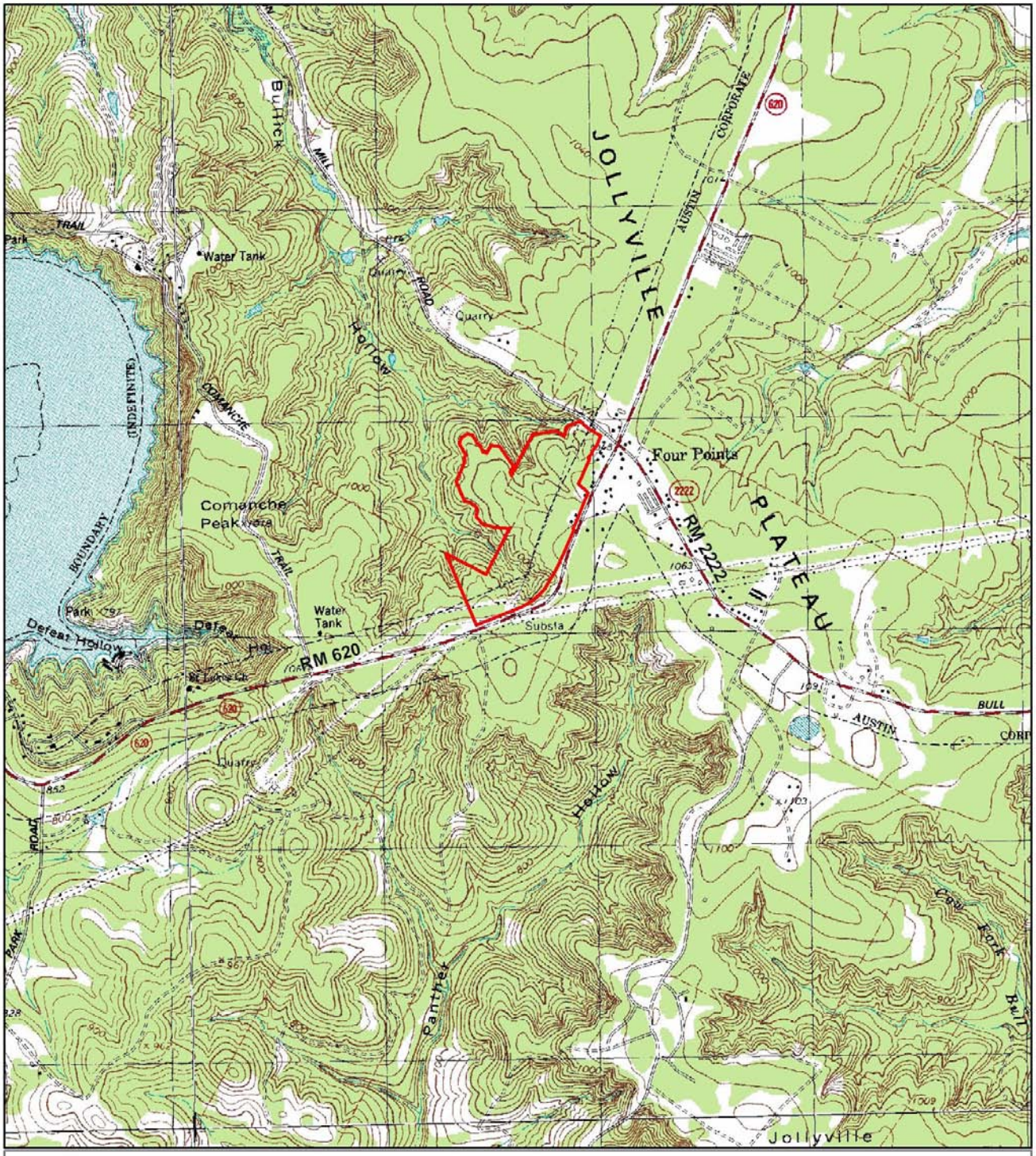
Site Boundary

FIGURE 1

LOCATION MAP

WTP4 STUDY SITE
AUSTIN, TEXAS

Note: TCB does not warrant the accuracy of this map, either to scale, accuracy, or completeness. Source: City of Austin (roads and site boundary).



N
W E
S

Feet
0 500 1,000 2,000 3,000 4,000

Legend

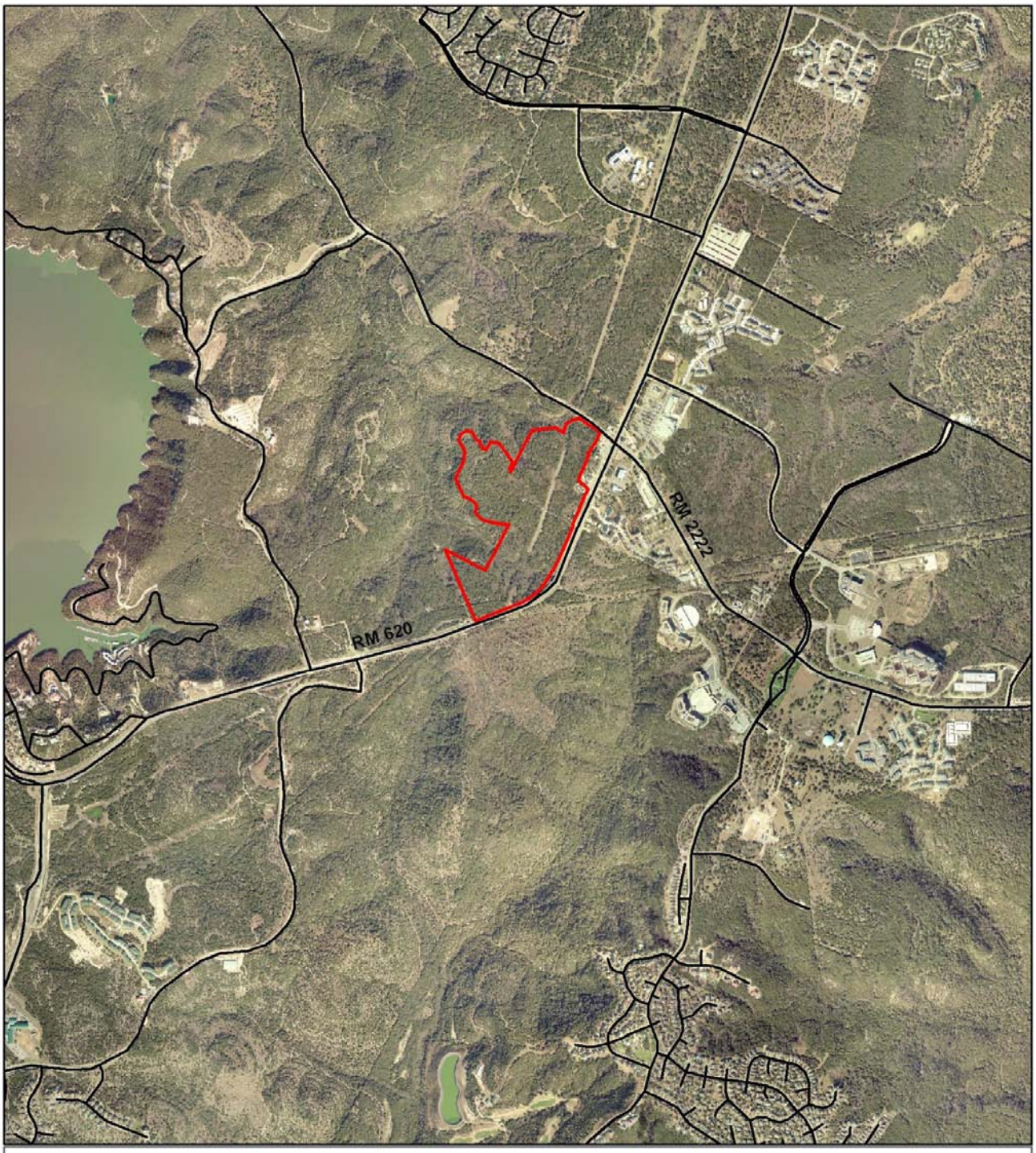
Site Boundary

FIGURE 2

TOPOGRAPHIC MAP

WTP4 STUDY SITE
AUSTIN, TEXAS

Note: TCB does not warrant the accuracy of this map, either to scale, accuracy, or completeness. Source: City of Austin (roads and site boundary) and TNRIS (USGS Jollyville quad).



N
W E
S

Legend

Site Boundary

Feet
0 500 1,000 2,000 3,000 4,000

FIGURE 3

AERIAL MAP

WTP4 STUDY SITE
AUSTIN, TEXAS

Note: TCB does not warrant the accuracy of this map, either to scale, accuracy, or completeness. Source: City of Austin (aerial imagery dated 2003 and site boundary).

1.3 CONDUCT OF STUDY

As mentioned previously, the CEF Survey was accomplished by COA staff and others. The initial karst feature survey was conducted in October 2006 by Jackson Harper, P.G., for a separate landowner and several karst features and CEFs were identified at that time. The COA later initiated a new CEF survey of the Site in November 2007. Other karst investigations conducted at the Site included the excavation and assessment of eight karst features to determine the presence of suitable habitat for the endangered karst invertebrates. This work was conducted by SWCA Environmental Consultants, Inc. (SWCA) and a draft report of the findings was issued on December 12, 2007. Based on the results of the COA's CEF Survey and SWCA's additional study, it was determined that two of the karst features identified on the Site met the criteria of a sinkhole (COA13 and K06). Further information regarding these two karst features and the other CEFs identified on the Site by the COA is summarized in *Table 1* below.

Since the prescribed width of buffer zones or setbacks for canyon rimrocks can be up to 150 feet, a walking survey of these areas was also included in the scope of services because of their close proximity to the Site boundary and proposed improvements. This rimrock survey was conducted by Mr. David Johns with WPDRD and Mr. Doug Zarker with TCB on February 8, March 3 and March 12, 2008. The purpose of the survey was to identify rimrock areas on the western and southwestern portions of the Site and to flag the "begin point" and "end point" for each section of rimrock identified. These rimrock areas, as well as the other previously identified CEFs on the Site were later surveyed with greater accuracy by Macias and Associates, Inc. (M&A) on March 17, March 19, March 26, April 2 and April 8, 2008.

1.4 SUMMARY OF FINDINGS

The information below is based upon data provided to us from the COA and from the rimrock survey data compiled by David Johns and Doug Zarker. A total of 11 CEFs have been identified on the Site or immediately adjacent to the Site as summarized in *Table 1* below.

Table 1
Summary of Critical Environmental Features
City of Austin Water Treatment Plant No. 4 – Site 34

Feature ID	Description	CEF Type	Recommended Buffer
Canyon Rimrock *	Located along incised drainages along the approx. 1,000' contour.	Canyon Rimrock	Variable
K06	Sinkhole - solution cavity approximately 5 feet deep by one foot wide by one foot deep, with 45 foot diameter catchment basin.	Sinkhole/ point recharge feature	50 feet
COA13	Sinkhole - originally 15 feet long by six feet wide.	Sinkhole/ point recharge feature	50 feet
Spring -1	Spring No. 1	Spring	150 feet
Spring - 2	Spring No. 2	Spring	150 feet
Spring - 3	Spring No. 3	Spring	150 feet
Spring - 4	Spring No. 4	Spring	150 Feet
Spring - 5	Spring No. 5	Spring	150 Feet
Spring - 6	Spring No. 6	Spring	150 Feet
Spring - 7 **	Spring No. 7	Spring	150 feet
Spring - 8**	Spring No. 8	Spring	100 feet

Notes:

***** - Multiple locations - See Fig. 4 for locations. Rimrock buffer widths for different areas varies based on assessment by WPDRD staff.

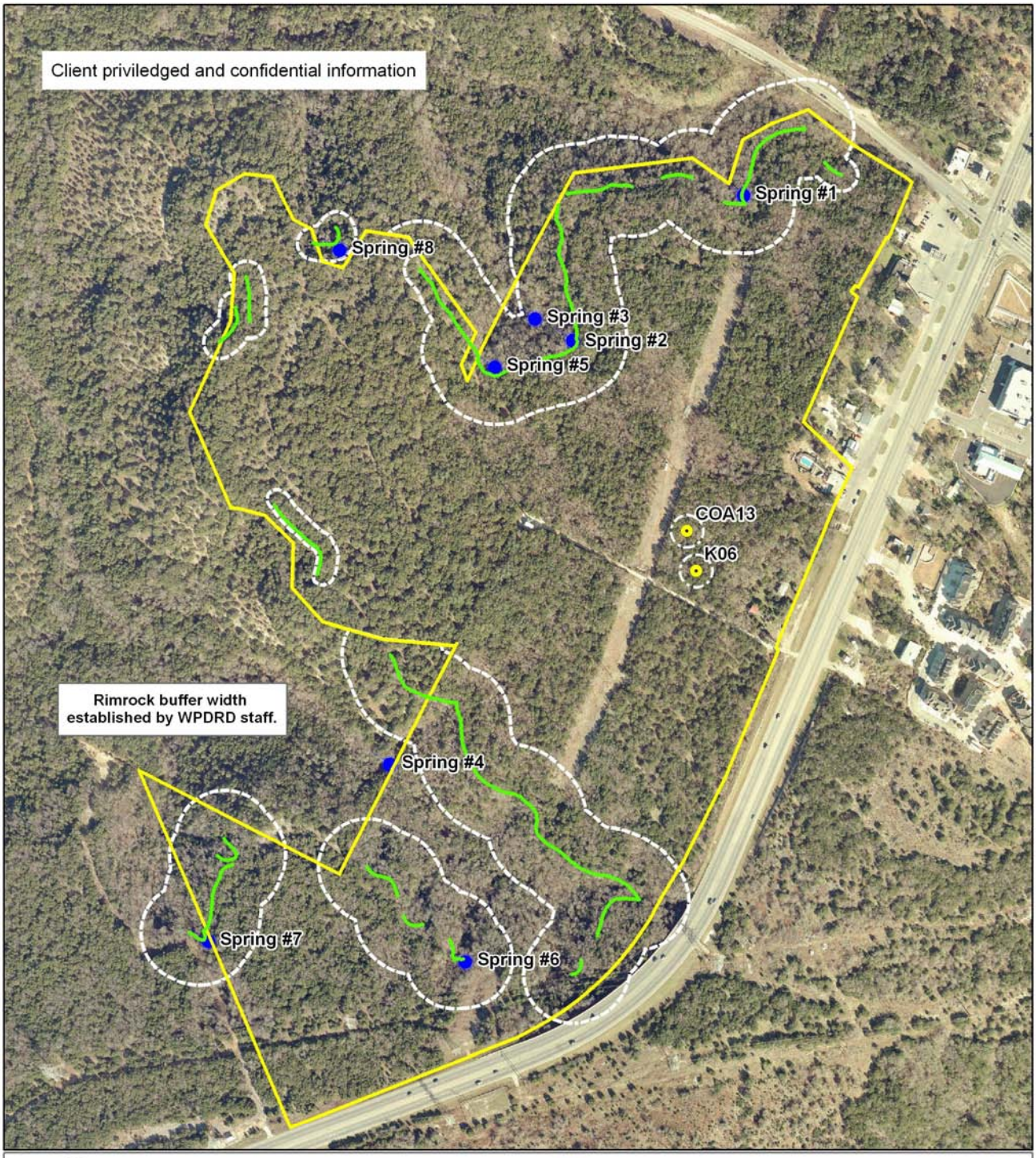
** Spring Nos. 7 & 8 located offsite, but within 150 feet of property boundary.

A map showing the approximate location of the CEFs identified on the Site is provided in *Figure 4* and selected photographs are provided in *Appendix A*. Written descriptions of the CEFs identified on the Site are provided below.

1.4.1 Bluffs and Canyon Rimrocks

Outcrops of the Edwards Limestone were observed across the uplands area of the Site and at the upper end of the incised drainages on the Site. Steep cliff faces composed of the Edwards and Walnut Formations were observed both within and outside of the boundaries of the Site where a sharp drop in elevation was encountered while traversing the ephemeral drainageways or canyons that drain the property. Random measurements of the thickness of the cliff face in these areas ranged from about four feet to about 25 feet thick and the gradient was noted to be near vertical.

According to the City of Austin's Land Development Code, a bluff is defined as "an abrupt vertical change in topography of more than 40 feet with an average slope steeper than four feet of rise for one foot of horizontal travel (400 percent or 76 degrees)." On the basis of this information, no bluffs were observed. Canyon rimrock, however, is defined as "limited to a rimrock with a rock substrate that: (a) has a gradient that exceeds 60 percent for a vertical distance of a least four feet; and (b) is exposed for a least 50 feet horizontally along the rim of the canyon." On the basis of this information, the steep cliff faces observed in some areas of the drainages that traverse the Site meet the definition of "canyon rimrock" and they are therefore classified as a CEF.



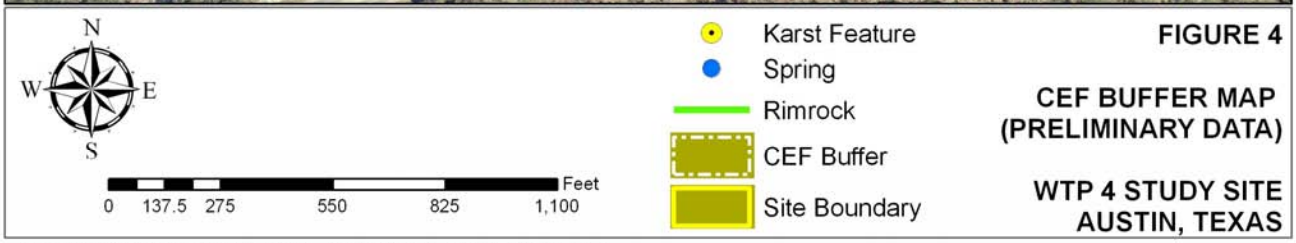


FIGURE 4

CEF BUFFER MAP (PRELIMINARY DATA)

WTP 4 STUDY SITE AUSTIN, TEXAS

Note: TCB does not warrant the accuracy of this map, either to scale, accuracy, or completeness.
Source: COA (aerial imagery dated 2006, and contours) and M&A (GPS karst features, rimrock and spring locations).

A total of 17 separate canyon rimrock areas were mapped on the Site and general vicinity (*Figure 4*). One of these rimrock areas, located on the northeast corner of the Site, was determined to be man-made and therefore not warranted for protection. According to the LDC, the width of a buffer zone (for a feature other than a cave or sinkhole) is typically 150 feet from the edge of a CEF, although this distance can be modified by WPDRD if granted an administrative variance to reduce the setback. The buffer width or setback established for each of the 16 canyon rimrock areas was determined by WPDRD staff. Smaller setbacks of less than 150 feet were deemed appropriate by WPDRD staff for some of the canyon rimrock areas and were reduced accordingly. *Figure 4* provides an exhibit showing the established buffer width prescribed for each of the canyon rimrock areas on the Site.

1.4.2 Caves and Sinkholes

As previously discussed, the Edwards Formation outcrops over a majority of the Site on the uplands and at the higher elevations. The Edwards Formation is composed primarily of carbonate rocks such as limestone and dolomite that weather by a process known as dissolution. This erosional process contributes to the "honeycombed" and cavernous nature of the Edwards forming what is called "karst" topography. When this type of formation is exposed at the surface it allows relatively rapid infiltration of rainfall and surface runoff providing recharge to the underlying aquifer.

During the course of the CEF Survey conducted by COA Staff and others at the Site, a total of 17 potential karst features were identified on the Site. Of these 17 potential karst features, additional assessment was recommended and performed for several of the features. Based on the results of the additional study, two of the features were classified as sinkholes (COA13 and K06). On the basis of this information, these two features were therefore also classified as CEFs. None of the remaining features were classified as caves, sinkholes or CEFs. Caves and sinkholes on the Jollyville Plateau are of exceptional importance because of the biological fauna they potentially harbor, several of which have been found to contain karst invertebrates listed as endangered by the U.S. Fish and Wildlife Service (USFWS 2006). No endangered karst invertebrates, however, were identified in the two sinkholes.

As mentioned previously, the LDC requires that a buffer zone be established at the outer edge or footprint of point recharge features such as caves and sinkholes (LDC, Sections §25-8-121 and §25-8-281). The width is determined by the size of the underground footprint of the point recharge feature; the area, slope and vegetative cover within the catchment; proximity to or location within a creek bed; and the proposed land use occurring upslope or adjacent to the cave or sinkhole (LDC and Pope 2000). The width of the buffers for the two point recharge features or CEFs identified on the Site, COA13 and K06, was determined by WPDRD. The width of the buffer required for the two features was determined to be 50 feet. The remaining potential karst features identified during the surveys were determined not to be CEFs (caves or sinkholes) and therefore do not require a buffer. The location of the two CEFs (COA13 and K06) and the projected 50 foot buffer around each is provided in *Figure 4.*

Several caves are mapped within the general site vicinity, however, none of these caves are located within 150 feet of the property boundary of the Site.

1.4.3 Springs

Six ephemeral springs were noted during the COA's field reconnaissance on the Site, with very minor seepage noted (*Appendix A*). Two additional springs were noted offsite (Spring No. 7 and Spring No. 8), but within 150 feet from the site boundary. The location of these eight springs (Spring Nos. 1 - 8) and the projected setback for each is presented in *Figure 4*. The springs were observed in the steep, incised drainages on the Site and generally emanate at the contact between the Edwards Limestone and underlying Walnut Formation. The Walnut Formation is less permeable than the Edwards above, and the clay-rich limestone acts as a confining unit or hydrologic barrier, preventing further downward percolation of groundwater (Woodruff 1985). The presence of moss-covered rocks and ferns observed in these areas indicate they are generally active for long periods of time, but the lack of seepage, apparently indicates that there is very little water storage in the bedrock at the Site.

According to the City of Austin's LDC, a spring is defined as a CEF. On the basis of this information, the eight springs are each classified as a CEF.

1.4.4 Wetlands

Review of the National Wetlands Inventory Map of the Jollyville, Texas Quadrangle, review of available aerial photography and our field observations did not reveal or identify any wetlands on or in the immediate vicinity of the Site.

1.5 CONCLUSIONS

The findings of the CEF Survey conducted at the Site and the prescribed width of a buffer zone determined for each CEF are summarized as follows:

- **Bluffs**: None identified on Site or within 150 feet of Site boundary.
- **Canyon Rimrock**: A total of 16 separate canyon rimrock areas were identified and mapped above several of the drainageways that traverse the Site, generally at an elevation of approximately 1,000 feet msl. A buffer width or setback of 150 feet was established around the majority of these rimrock areas. Smaller setbacks around selected rimrock areas were deemed appropriate by WPDRD staff and the setbacks were reduced accordingly.
- **Springs**: Six springs identified on Site and two springs offsite (within 150 feet): Spring Nos. 1 - 7: 150 foot buffer for each, Spring No. 8: 100 foot buffer.
- **Caves and Sinkholes**: Two sinkholes (COA13 and K06) were identified on the Site. Both have been prescribed a buffer width of 50 feet by WPDRD. No caves were identified on the Site or within 150 feet of the Site.
- **Wetlands**: None identified on Site or within 150 feet of Site boundary.

1.6 QUALIFICATIONS

Should additional information regarding any actual or potential geologic or environmental conditions at the site be discovered that differs from that presented within this memorandum, TCB should be notified so that a review of the information can be conducted. TCB reserves the right to revise this memorandum based upon the review of additional information provided after the date of issuance of this memorandum.

1.7 REFERENCES

Barnes, V.E. 1974. Austin Sheet: The University of Texas at Austin, Bureau of Economic Geology, *Geologic Atlas of Texas*, scale 1:250,000.

Brune, Gunnar, and Duffin, G.L., 1983, *Occurrence, Availability, and Quality of Ground Water in Travis County, Texas: Texas Department of Water Resources, Report 276, 219 p.*

City of Austin. Land Development Code. 2008. Title 25, Land Development. Chapter 25-8, Environment, Subchapter A, Water Quality. Austin, Texas. Reviewed on-line: http://www.amlegal.com/austin_nxt/gateway.dll?f=templates$fn=default.htm$3.0 (accessed March 2008).

City of Austin. Environmental Criteria Manual. 2008. Section 1 – Water Quality Management. Austin, Texas. Reviewed on-line: http://www.amlegal.com/austin_nxt2/gateway.dll?f=templates&fn=default.htm&vid=amlegal:austin_environment (accessed March 2008).

De La Garza, L., and Slagle, D., 1988. *Recharge Zone of the Northern Edwards Aquifer Near Austin, Texas,* Base Map from USGS 1:24,000 quadrangle maps, scale 1:48,000.

Garner, L.E., and K.P. Young., 1976. *Environmental Geology of the Austin Area: An Aid to Urban Planning*, The University of Texas at Austin, Bureau of Economic Geology, Report of Investigations No. 86, 39 p.

Pope, S., 2000. Post-Development Assessment of Point Recharge Feature Protective Buffers, Austin, Texas. Obtained on-line: http://www.nwqmc.org/2000proceeding/papers/pap_pope.pdf (accessed October 2006).

Snyder, Fred, De LA Garza, Laura and C.M. Woodruff, *The Cityscape-Geology, Construction and Materials, and Environment in Austin, Texas, Guidebook 9*, Austin Geological Society, Austin, Texas, 1986, 78 p.

Soil Conservation Service (SCS) 1974. *Soil Survey of Travis County, Texas*.

U.S. Fish and Wildlife Service (USFWS). 1993. National Wetlands Inventory USGS Topographic Map, 7.5-minute Series, *Jollyville, Texas*. 1987.

U.S. Fish and Wildlife Service (USFWS). 2006. *United States Fish and Wildlife Service, Section 10(a)(1)(A) Scientific Permit Requirements for Conducting Presence/Absence Surveys for Endangered Karst Invertebrates in Central Texas*, dated March 8, 2006. Austin Field Office, U.S. Fish and Wildlife Service, 21 pp.

U.S. Geological Survey (USGS) Topographic Map, 7.5-minute Series, *Jollyville, Texas*. 1987.

Woodruff, C.M. Jr., Snyder, Fred, De LA Garza, Laura and Slade, Raymond M. Jr., *Edwards Aquifer-Northern Segment, Travis, Williamson and Bell Counties, Texas, Guidebook 8*, Austin Geological Society, Austin, Texas, 1985, 104 p.

APPENDICES

Appendix A

Photograph No. 1 – This photograph shows a typical view of mapping rimrock on southern area of the Site.

Photograph No. 2 – This photograph shows a typical view of Spring No. 4 located near western boundary.

Photograph No. 3 – This photograph shows a typical view of Spring No. 5 with rimrock above.

Photograph No. 4 – This photograph shows a typical view of Spring No. 7 located offsite near southern boundary.

AECOM

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CRITICAL ENVIRONMENTAL FEATURE STUDY
WATER TREATMENT PLANT No. 4 – RAW WATER PUMP STATION SITE
CITY OF AUSTIN, TRAVIS COUNTY, TEXAS

Prepared for:
Carollo Engineers

Prepared by: Douglas E. Zarker, P.G
AECOM INC.

January 2009

1.0 INTRODUCTION

The Raw Water Pump Station Site consists of a 12.05 acre tract of undeveloped land located near Lake Travis in Austin, Texas. Previous environmental studies, including a Karst Terrain Survey and Critical Environmental Feature (CEF) Survey, were previously conducted on the site when it was part of the 446-acre Comanche Canyon Ranch. In 2001, the U.S. Fish and Wildlife Service (USFWS) issued a Section 10(a) or Incidental Take Permit for the development of 110 acres of the 446-acre Comanche Canyon Ranch. The 110 acres was limited to four developable tracts around the periphery of the ranch, including the subject property, with the remaining acreage preserved in perpetuity within the Comanche Canyon Ranch Preserve.

This memorandum summarizes the results of the CEF Survey that was previously conducted by others in 2001. The CEF survey was conducted on the four developable tracts and surrounding 400 feet of each developable tract boundary, including the subject site. Additional assessment limited to the findings of the previous CEF survey for the site was conducted by City of Austin (COA) and AECOM staff during two separate visits to the site in September 2008. The additional assessment was necessary to confirm the location of several previously mapped CEFs and to determine if they may be affected by the proposed development of the Water Treatment Plant No. 4 (WTP 4) Raw Water Pump Station Site.

1.1 PURPOSE

A CEF survey is typically prepared to fulfill the requirements of Title XXV of the City of Austin Land Development Code (§25-8-121). The code requires that an Environmental Assessment be submitted to the Director of the Watershed Protection Department for proposed development over a karst aquifer. Among other requirements, the Environmental Assessment must identify CEFs on the proposed site. Within the Code, CEFs are defined as:

> "features that are of critical importance to the protection of environmental resources, and include bluffs, canyon rimrocks, caves, sinkholes, springs, and wetlands."

The COA Land Development Code (LDC) states that, "drainage patterns for proposed development must be designed to protect critical environmental features from the effects of runoff from developed areas, and to maintain catchment areas of recharge features in a natural state." The Code further prescribes that a buffer zone be established around each critical environmental feature. For bluffs, canyon rimrocks, springs and wetlands the width of the buffer zone or setback is typically 150 feet, although this distance

can be modified by the COA's Watershed Protection Development Review Department (WPDRD) if granted an administrative variance to reduce the setback. Within the buffer zone, construction and wastewater disposal or irrigation is prohibited and natural vegetative cover must be retained. Caves and sinkholes are defined as point recharge features and are therefore subject to a buffer zone that is established at the outer edge or footprint of the feature (§25-8-1 and §25-8-281). No caves or sinkholes were previously identified on the property.

The purpose of our assessment was to confirm the location of CEFs previously identified within the boundaries of the proposed raw water pump station site. Information for this memorandum was developed from recent field investigations performed by WPDRD and AECOM staff, a review of available geological reports and maps, and from the previous karst terrain and CEF surveys performed by others. Wetland areas were preliminarily identified by review of the National Wetlands Inventory Map (Jollyville Quadrangle), available aerial photographs, and field observations. Bluffs, canyon rimrock areas and springs were identified by the review of the previous environmental reports prepared by others, topographic maps and elevation data, available aerial photographs and our field observations.

1.2 BACKGROUND INFORMATION

The City of Austin is proposing to build a raw water pump station site in conjunction with a new water treatment plant in western Travis County near Lake Travis. The proposed raw water pump station site (the "Site") is located near the southeast corner of the intersection of Bullick Hollow Road and Oasis Bluff Drive. The Site consists of a 12.05-acre parcel of undeveloped land (*Figures 1 - 3*).

The Site is situated along the western edge of the Jollyville Plateau, a relatively flat limestone terrain that has been incised by narrow, steep-sided canyons. Surface geologic units mapped on the Site consist of marine sediments deposited during the Lower Cretaceous period. Most of the bedrock units observed at the Site consist of limestone and related carbonate rocks, including dolomite, argillaceous limestone and marl. According to the *Geologic Map of the Austin Area, Texas* (Garner and Young 1976), GIS data and our field observations, three geologic formations are mapped on the Site. They are, from oldest to youngest, the Glen Rose Formation, the Walnut Formation and the Edwards Limestone. The Edwards Formation generally outcrops across a majority of the Site at the higher elevations on the eastern-southeastern half of the Site, with the underlying Walnut and Glen Rose Formation outcropping across the remaining portion of the Site at the lower elevations located on the north-northwestern half.

The majority of the Site is situated atop a plateau or ridge that slopes in two general directions, to the west-northwest downwards toward Oasis Bluff Drive and to the south-southeast downwards toward steeper gradients found along the southeastern boundary (*Figure 2*). Ground surface elevations at the Site range from a topographic high of approximately 1,008 feet to a low of about 858 feet above mean sea level (msl), indicating a total relief of approximately 150 feet. The highest elevation is located near the central portion of the Site and the lower elevations are located at the northwest corner of the Site adjacent to Bullick Hollow Road and where the steep canyons drain the Site along its southern and southeastern boundaries. Surface water runoff from the Site travels as sheet flow during rain events toward these steep drainages, flowing offsite either to the west or to the south, into unnamed tributaries that individually flow into Bullick Hollow Creek. Bullick Hollow Creek is the main receptor of surface water runoff in the area and drains northwesterly and eventually empties into Lake Travis (Colorado River) located less than two miles to the northwest (Lake Travis watershed).

The soils on the Site are generally thin and rocky. According to the *Soil Survey of Travis County*, *Texas*, soils of both the Brackett and Tarrant series are mapped across the Site. Brackett soils are mapped across the majority of the site at the lower elevations along the steep breaks of the canyons with slopes ranging from about 15 to 20 percent. The remainder of the project site is mapped as Tarrant soils which consist of shallow to very shallow, well drained, stony, clayey soils overlying limestone. Slopes range from zero to two percent at the higher elevations and from about five to 12 percent along complex slopes (SCS 1974).

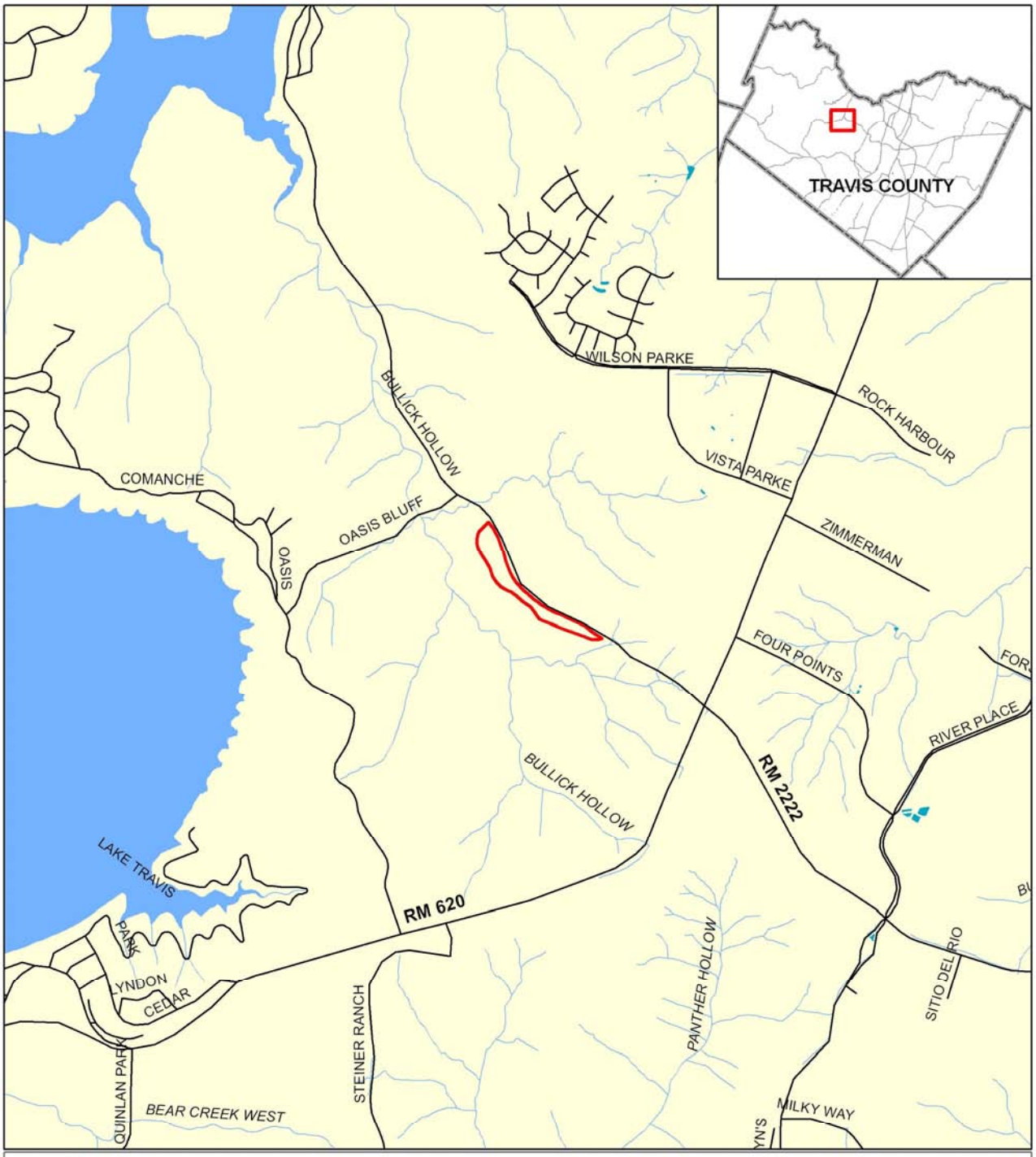


FIGURE 1

PROJECT SITE LOCATION MAP

WTP4 PUMP STATION SITE
AUSTIN, TEXAS

Note: AECOM does not warrant the accuracy of this map, either to scale, accuracy, or completeness. Source: City of Austin (roads and site boundary).

N
W E
S

Feet
0 1,000 2,000 4,000

Legend

Site Boundary

FIGURE 2

TOPOGRAPHIC MAP

WTP 4 PUMP STATION SITE
AUSTIN, TEXAS

Note: AECOM does not warrant the accuracy of this map, either to scale, accuracy, or completeness. Source: TNRIS USGS Topographic Map, Jolleyville Quadrangle.

N
W E
S

0 500 1,000 2,000 3,000 4,000 Feet

Legend

Pump Station Boundary

Roads

FIGURE 3

SITE AERIAL PHOTOGRAPH

WTP4 PUMP STATION SITE
AUSTIN, TEXAS

Note: AECOM does not warrant the accuracy of this map, either to scale, accuracy, or completeness. Source: City of Austin (aerial imagery dated 2003 and site boundary).

1.3 CONDUCT OF STUDY

As mentioned above, a CEF Survey and a Karst Terrain Survey were previously conducted at the Site by other environmental consulting firms when it was part of the 446-acre Comanche Canyon Ranch. The CEF Survey was performed by Athabasca Consulting, Inc. in February 2001 and the Karst Terrain Survey was conducted by SWCA in 1999. No karst features or CEFs were identified on the Site at that time, although one feature, a spring was identified within 150 feet of the Site boundary.

Additional assessment limited to the original findings of the CEF Survey was conducted by WPDRD and AECOM staff during two separate site visits to the Site in September 2008. Since the prescribed width of buffer zones or setbacks for springs can be up to 150 feet, a walking survey for this area of the Site was performed to locate and flag the previously identified spring (F-48) and to review the general geologic setting in the area. During our site visit, it was determined that canyon rimrock was also located on this portion of the Site, above the spring. This canyon rimrock area, as well as one other canyon rimrock area, were flagged with survey tape, identifying a "begin point" and "end point" for each section of rimrock identified. These canyon rimrock areas, as well as the spring previously identified adjacent to the Site were later surveyed with greater accuracy by Macias and Associates, Inc. on October 8, 2008. Further information regarding the CEFs identified on the Site is summarized in *Table 1* below.

1.4 SUMMARY OF FINDINGS

The information below is based upon data provided to us from the COA and from the rimrock survey data compiled during our assessment. A total of five separate CEFs were identified on the Site or immediately adjacent to the Site as summarized in *Table 1* below. The recommended buffer widths or setbacks were determined by WPDRD staff.

Table 1
Summary of Critical Environmental Features
City of Austin Water Treatment Plant No. 4 – Pump Station

Feature ID	Description	CEF Type	Recommended Buffer *
Rimrock Area 1 (RR-1)	Located onsite along the approx. 980' contour on south-southeast side.	Canyon Rimrock	150
Rimrock Area 2 (RR-2)	Located offsite along the approx. 980' contour along the south side.	Canyon Rimrock	50
Spring/Seep	Spring/Seep identified below RR-1	Spring	150
Spring No. F-48 **	Previously identified Spring	Spring	150
Spring No. F-50 ***	Previously identified Spring	Spring	150

Notes: * The recommended buffers extend into areas that contain existing roads and utilities. Additional improvements are planned within the disturbed areas.

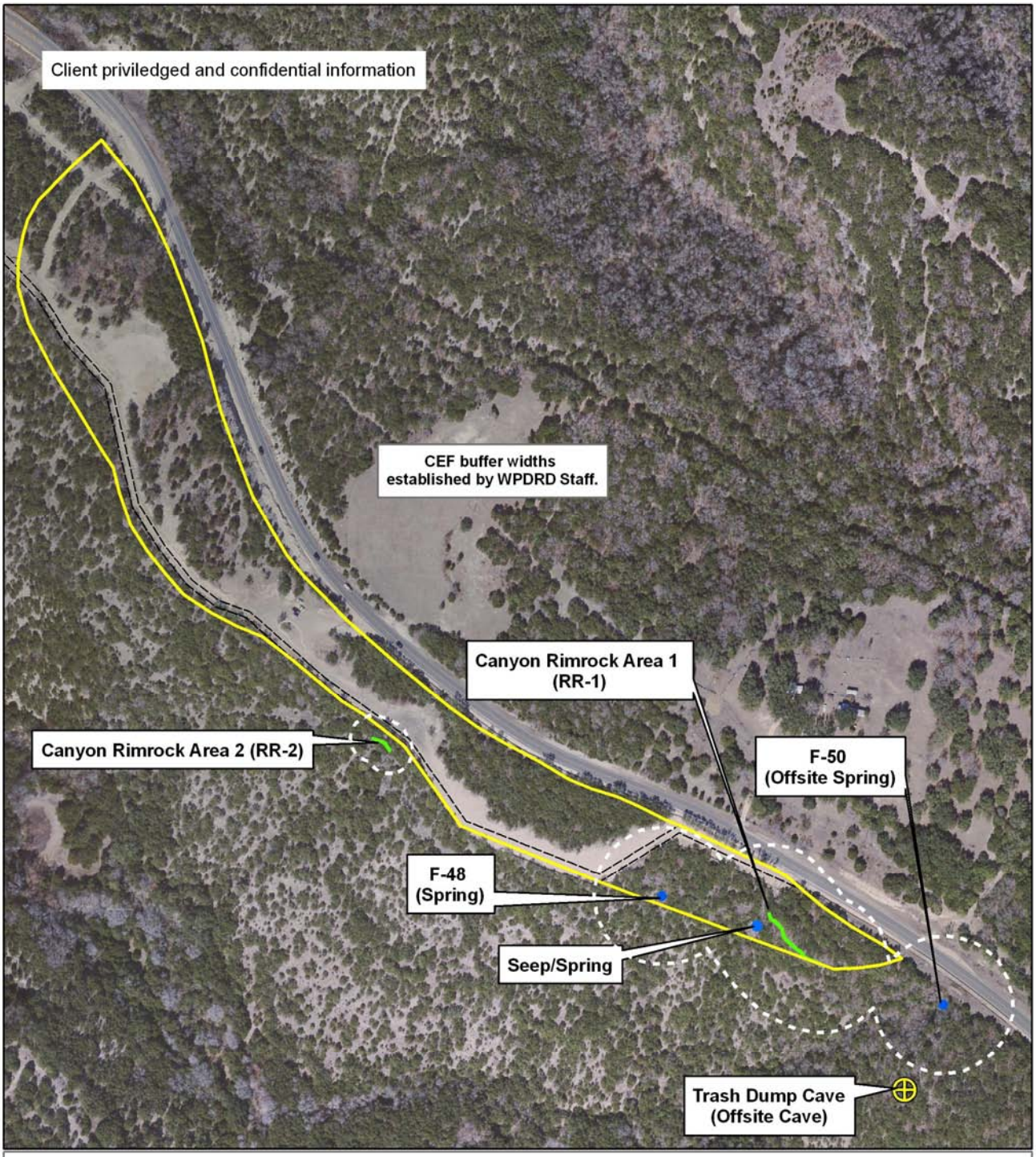
** Spring No. F-48 was previously identified offsite, but is currently surveyed within the Site boundary

*** Spring No. F-50 was previously identified offsite, approximately 140 feet to the southeast.

A map showing the approximate location of the CEFs identified on the Site is provided in *Figure 4* and selected photographs are provided in *Appendix A*. Written descriptions of the CEFs identified on the Site are provided below.

1.4.1 Bluffs and Canyon Rimrocks

Outcrops of the Edwards Limestone were observed across the uplands area of the Site. Steep cliff faces composed of the Edwards and Walnut Formations were observed within the boundaries of the Site where a sharp drop in elevation was encountered above the ephemeral drainageway or canyon that drains the Site near the south-southeastern boundary. Random measurements of the thickness of the cliff face in this area ranged from about four feet to about 15 feet thick and the gradient was noted to be near vertical.



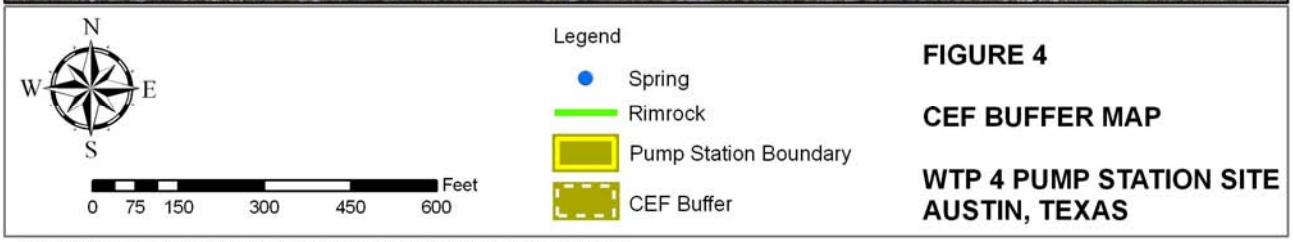


FIGURE 4

CEF BUFFER MAP

WTP 4 PUMP STATION SITE
AUSTIN, TEXAS

Note: AECOM does not warrant the accuracy of this map, either to scale, accuracy, or completeness.
Source: COA (aerial imagery dated 2006, and contours) and Macias & Assoc. (GPS karst features, rimrock and spring locations).

According to the City of Austin's Land Development Code, a bluff is defined as "an abrupt vertical change in topography of more than 40 feet with an average slope steeper than four feet of rise for one foot of horizontal travel (400 percent or 76 degrees)." On the basis of this information, no bluffs were observed on the Site. Canyon rimrock, however, is defined as "limited to a rimrock with a rock substrate that: (a) has a gradient that exceeds 60 percent for a vertical distance of a least four feet; and (b) is exposed for a least 50 feet horizontally along the rim of the canyon." On the basis of this information, the steep cliff faces observed in some areas above the drainages adjacent to the Site meet the definition of "canyon rimrock" and they are therefore classified as a CEF.

A total of two separate canyon rimrock areas were mapped on the Site or immediately adjacent to the Site (*Figure 4*). According to the LDC, the width of a buffer zone (for a feature other than a cave or sinkhole) is typically 150 feet from the edge of a CEF, although this distance can be modified by WPDRD if granted an administrative variance to reduce the setback. The buffer width or setback established for each canyon rimrock area was determined by WPDRD staff. Similar to the main water treatment plant site nearby, smaller setbacks of less than 150 feet were deemed appropriate by WPDRD staff for the canyon rimrock areas. *Figure 4* provides an exhibit showing the location and recommended buffer for the two canyon rimrock areas identified on the Site.

1.4.2 Caves and Sinkholes

As previously discussed, the Edwards Formation outcrops on the upland areas and at the higher elevations on the Site. The Edwards Formation is composed primarily of carbonate rocks such as limestone and dolomite that weather by a process known as dissolution. This erosional process contributes to the "honeycombed" and cavernous nature of the Edwards forming what is called "karst" topography. When this type of formation is exposed at the surface it allows relatively rapid infiltration of rainfall and surface runoff providing recharge to the underlying aquifer.

During the course of the Karst Terrain Survey and the CEF Survey previously conducted by others at the Site, no potential karst features or caves or sinkholes were identified on the Site.

One cave is mapped within the general site vicinity, however, the cave is mapped beyond 150 feet from the property boundary (*Figure 4)*. The name of the cave is Trash Dump Cave.

1.4.3 Springs

Two ephemeral springs were noted onsite during our field reconnaissance, with very minor seepage noted (*Figure 4* and *Appendix A*). One additional spring was noted offsite (Spring No. F-50), but located within 150 feet of the site boundary.

The two onsite springs were observed within the upper reaches of the steep, incised drainages located along the southern boundary of the Site. No groundwater flow was observed from either of the two features at the time of our survey, but dark discoloration and evidence of light-colored travertine deposits were noted in these areas. Spring-flow generally emanates at the contact between the Edwards Limestone and underlying Walnut Formation. The Walnut Formation is less permeable than the Edwards above, and the clay-rich limestone acts as a confining unit or hydrologic barrier, preventing further downward percolation of groundwater (Woodruff 1985). The presence of moss-covered rocks and ferns observed in these areas indicate they are generally active for long periods of time, but the lack of seepage, apparently indicates that there is very little water storage in the bedrock at the Site.

According to the City of Austin's LDC, a spring is defined as a CEF. On the basis of this information, the two springs are each classified as a CEF. A setback of 150 feet was prescribed by WPRDR staff for the two springs identified. In addition, WPDRD assigned a 150 foot setback for the offsite spring (Spring No. F-50). The location and recommended buffer of the two springs and the offsite spring is presented in *Figure 4*.

1.4.4 Wetlands

Review of the National Wetlands Inventory Map of the Jollyville, Texas Quadrangle, review of available aerial photography and our field observations did not reveal or identify any wetlands on or in the immediate vicinity of the Site.

1.5 CONCLUSIONS

The findings of the CEF Survey conducted at the Site and the prescribed width of a buffer zone determined for each CEF are summarized as follows:

- **Bluffs**: None identified on Site or within 150 feet of Site boundary.
- **Canyon Rimrock**: A total of two separate canyon rimrock areas were identified and mapped above the steep drainageway adjacent to the Site, generally at an elevation of approximately 980 feet msl. The buffer width or setback requirements were determined by WPDRD staff.
- **Springs**: Two springs identified onsite and one spring identified offsite (within 150 feet): The buffer width or setback requirements were determined by WPDRD staff.
- **Caves and Sinkholes**: No caves or sinkholes were reported on the Site or within 150 feet of the Site.
- **Wetlands**: None identified on the Site or within 150 feet of Site boundary.

1.6 QUALIFICATIONS

Should additional information regarding any actual or potential geologic or environmental conditions at the site be discovered that differs from that presented within this memorandum, AECOM should be notified so that a review of the information can be conducted. AECOM reserves the right to revise this memorandum based upon the review of additional information provided after the date of issuance of this memorandum.

1.7 REFERENCES

Barnes, V.E. 1974. Austin Sheet: The University of Texas at Austin, Bureau of Economic Geology, *Geologic Atlas of Texas*, scale 1:250,000.

Brune, Gunnar, and Duffin, G.L., 1983, *Occurrence, Availability, and Quality of Ground Water in Travis County, Texas: Texas Department of Water Resources, Report 276, 219 p.*

City of Austin. Land Development Code. 2008. Title 25, Land Development. Chapter 25-8, Environment, Subchapter A, Water Quality. Austin, Texas. Reviewed on-line: http://www.amlegal.com/austin_nxt/gateway.dll?f=templates$fn=default.htm$3.0 (accessed March 2008).

City of Austin. Environmental Criteria Manual. 2008. Section 1 – Water Quality Management. Austin, Texas. Reviewed on-line: http://www.amlegal.com/austin_nxt2/gateway.dll?f=templates&fn=default.htm&vid=amlegal:austin_environment (accessed March 2008).

De La Garza, L., and Slagle, D., 1988. *Recharge Zone of the Northern Edwards Aquifer Near Austin, Texas,* Base Map from USGS 1:24,000 quadrangle maps, scale 1:48,000.
Garner, L.E., and K.P. Young., 1976. *Environmental Geology of the Austin Area: An Aid to Urban Planning*, The University of Texas at Austin, Bureau of Economic Geology, Report of Investigations No. 86, 39 p.

Pope, S., 2000. Post-Development Assessment of Point Recharge Feature Protective Buffers, Austin, Texas. Obtained on-line: http://www.nwqmc.org/2000proceeding/papers/pap_pope.pdf (accessed October 2006).

Snyder, Fred, De LA Garza, Laura and C.M. Woodruff, *The Cityscape-Geology, Construction and Materials, and Environment in Austin, Texas, Guidebook 9*, Austin Geological Society, Austin, Texas, 1986, 78 p.

Soil Conservation Service (SCS) 1974. *Soil Survey of Travis County, Texas*.

U.S. Fish and Wildlife Service (USFWS). 1993. National Wetlands Inventory USGS Topographic Map, 7.5-minute Series, *Jollyville, Texas*. 1987.

U.S. Fish and Wildlife Service (USFWS). 2006. *United States Fish and Wildlife Service, Section 10(a)(1)(A) Scientific Permit Requirements for Conducting Presence/Absence Surveys for Endangered Karst Invertebrates in Central Texas*, dated March 8, 2006. Austin Field Office, U.S. Fish and Wildlife Service, 21 pp.

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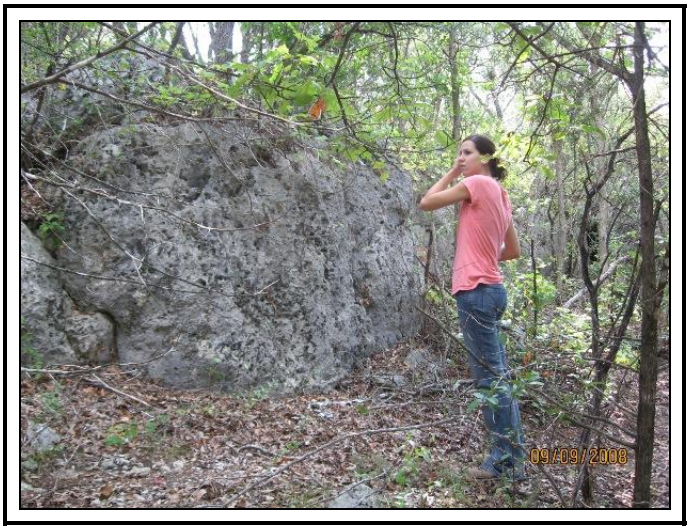
Woodruff, C.M. Jr., Snyder, Fred, De LA Garza, Laura and Slade, Raymond M. Jr., *Edwards Aquifer-Northern Segment, Travis, Williamson and Bell Counties, Texas, Guidebook 8*, Austin Geological Society, Austin, Texas, 1985, 104 p.

APPENDICES

Appendix A

Photograph No. 1 – This photograph shows a typical view of the north-northwest portion of the Raw Water Pump Station Site.



Photograph No. 2 – This photograph shows a typical view of canyon rimrock area RR-1 noted on the south-southeast portion of the Site.

Photograph No. 3 – This photograph shows another typical view of canyon rimrock area RR-1 noted on the south-southeast portion of the Site.

Photograph No. 4 – This photograph shows a typical view of the previously identified Spring No. F-48 located on-site near southern-southeastern boundary.

Appendix E

Site Development Ordinance and Variance Request Matrix

ORDINANCE NO. 20080515-035

AN ORDINANCE GRANTING VARIANCES FROM CITY CODE SECTIONS 25-8-452 AND 25-8-454; AND ESTABLISHING AN ADMINISTRATIVE VARIANCE PROCESS FROM CITY CODE SECTIONS 25-8-301, 25-8-302, 25-8-341, AND 25-8-342 FOR DEVELOPMENT OF WATER TREATMENT PLANT NUMBER 4.

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF AUSTIN:

PART 1. In this ordinance:

(A) DIRECTOR means the director of the Watershed Protection and Development Review Department.

(B) WTP4 SITES means the sites for the Water Treatment Plant Number 4 plant, the raw water intake facility, and the pump station.

(C) PLANT SITE means the area of land used for Water Treatment Plant Number 4, as described in attached Exhibit A.

(D) RAW WATER SITE means the area of land used for the raw water intake facility to serve Water Treatment Plant Number 4, as described in attached Exhibit B.

(E) PUMP SITE means the area of land used for the raw water pump station to serve Water Treatment Plant Number 4, as described in attached Exhibit C.

PART 2. The variances granted in this ordinance and the administrative variance process established in this ordinance become effective only after the City Attorney files in the Travis County Official Public Records a document restricting from development, except that appropriate for conservation purposes, the property known as the Bull Creek site, as shown in Exhibit D. The document will not impair the ability of the City to transfer ownership of the site in the future, will be subject to existing easements, and will allow the construction, maintenance, repair, and replacement of transmission and distribution lines necessary to serve WTP4 sites only if the transmission and distribution lines are located at least 20 feet below the base of the Edwards Formation with no surface disturbance during construction, maintenance, repair or replacement activities.

PART 3. A variance is granted from City Code section 25-8-452 (*Critical Water Quality Zone*) for the Raw Water Site to allow construction of the raw water intake facility in the critical water quality zone.

PART 4. Variances are granted from City Code section 25-8-454(D) (*Uplands Zone*) to provide:

(1) for the Plant Site, impervious cover may exceed 20 percent, but may not exceed 50 percent net site area; at least 25 percent of the Plant Site must be retained in or restored to its natural state to serve as a contiguous buffer to receive overland drainage; and

(2) for the Pump Site, impervious cover may exceed 20 percent, but may not exceed 50 percent net site area; at least 25 percent of the Pump Site must be retained in or restored to its natural state to serve as a contiguous buffer to receive overland drainage.

PART 5. An administrative variance process is established allowing the director to grant variances from certain City Code provisions for WTP4 sites. The director may grant variances from:

(A) Section 25-8-301 *(Construction of a Roadway or Driveway)*, to allow construction of driveways on slopes greater than 15 percent on the Plant Site;

(B) Section 25-8-302 *(Construction of a Building or Parking Area)*, to allow construction of a building or parking structure on slopes greater than 25 percent and to allow a parking area on slopes greater than 15 percent on the Plant Site and the Pump Site;

(C) Section 25-8-341 *(Cut Requirements)*, to allow:

(1) cuts to exceed four feet but not to exceed 30 feet of depth on the Plant Site; and

(2) cuts to exceed four feet, but not to exceed 60 feet of depth on the Pump Site; and

(D) Section 25-8-342 *(Fill Requirements)*, to allow:

(1) fill to exceed four feet but not to exceed 40 feet of depth on the Plant Site; and

(2) fill to exceed four feet, but not to exceed 10 feet of depth on the Pump Site.

PART 6. The director may grant a variance under this ordinance if the director determines that:

(A) the variance is the minimum departure from current code necessary to achieve the project's needs.

(B) the variance minimizes, to the extent possible, any harmful consequences to the environment.

(C) compliance with the code provision imposes an unacceptable engineering or financial impact to the project.

(D) to the extent possible, mitigation is provided that reduces the impact of the proposed variance and meets the intent of the code provision; and to assist in this determination, the director shall consider the Variance Request Evaluation Criteria table approved by Environmental Board Resolution EB 111407 on November 14, 2007; and

(E) granting the variance will result in water quality that is at least equal to the water quality achievable without the variance.

PART 7. The director shall prepare written findings to support the grant or denial of a variance request within 30 days under this ordinance and shall notify the Environmental Board of each variance granted. The director shall submit a quarterly report to Council and the Environmental Board that includes:

(A) A list of variances granted under this ordinance and their respective findings;

(B) the construction status of WTP4 sites granted a variance under this ordinance; and

(C) the status of the review and permitting process for all WTP4 related projects.

PART 8. An interested party or the Environmental Board may appeal a decision by the director under this ordinance to the City Manager. The provisions of City Code Chapter 25-1, Article 7, Division 1 (*Appeals*) establish the process for appeals under this ordinance.

PART 9. This ordinance takes effect on the later of the following:

(A) May 26, 2008, or

(B) the date the Austin City Council adopts an amendment to Ordinance No. 040129-43 as necessary to apply the variances and variance process established in this ordinance to WTP 4 sites located within the Comanche Canyon Ranch Planned Unit Development.

PASSED AND APPROVED

May 15, 2008 § Will Wynn
Mayor

APPROVED: David Allan Smith
City Attorney

ATTEST: Shirley A. Gentry
City Clerk

EXHIBIT A

PLANT SITE

The area of land used for Water Treatment Plant Number 4

Three tracts of land more particularly described as:

Tract 1 being 20.357 acres of land out of the S.T. Bullock Survey No. 76, Abstract No. 2624 and the Riordan Survey No. 76, Abstract No. 2618, in Travis County, Texas and more particularly described in the following field notes.

Tract 2 being 40.43 acres of land out of the Luis Fritz Survey No. 291, Abstract 280, in Travis County, Texas and more particularly described in the following field notes.

Tract 3 being 36.20 acres of land out of the Alexander Dunlap Survey No. 805, Abstract 224, Travis County, Texas SAVE AND EXCEPT the 4.2 acre tract of land out of the Alexander Dunlap Survey No. 805, Abstract 224, Travis County, Texas and more particularly described in the following field notes.

MACIAS & ASSOCIATES, L.P.
LAND SURVEYORS

EXHIBIT "A"
Tract 1

DHD Ventures, LTD
To
The City of Austin
December 30, 2007

LEGAL DESCRIPTION

OF A 20.357 ACRE (886,753 SQUARE FOOT) TRACT OF LAND OUT OF THE S T. BULLOCK SURVEY NO. 76, ABSTRACT NO. 2624 AND THE RIORDAN SURVEY NO. 76, ABSTRACT NO 2618 IN TRAVIS COUNTY, TEXAS. SAID 20 357 ACRE TRACT ALSO BEING OUT OF THE REMAINING PORTION OF THE 312.76 ACRE TRACT CONVEYED TO ROBERT H. THERIOT BY DEED DATED JANUARY 9, 1998 BY INSTRUMENT OF RECORD IN VOLUME 13294, PAGE 1317 OF THE REAL PROPERTY RECORDS OF TRAVIS COUNTY, TEXAS AS SHOWN ON THE ACCOMPANYING SKETCH AND DESCRIBED BY METES AND BOUNDS AS FOLLOWS:

POINT OF BEGINNING, at a ½" iron rod found on the south line of a 34 85 acre tract of land conveyed to MCPMT, LTD by instrument of record in volume 4286, page 749, deed records of Travis County Texas, the northwest corner of a 42 00 acre tract conveyed to John E. and John M Joseph, Trustees, by instrument of record in volume 11175, page 150 in the real property records of Travis County, Texas, an exterior corner of the remaining Theriot 312 76 acre tract, the northeast corner of a Cellular Antenna Site Lease and a corner of this tract,

THENCE, S27°03'26"W 465.17 feet with an east line of this tract and a west line of the 42.00 acre tract to a ½" iron rod with a "McAngus Surveying" cap,

THENCE, traversing through the 312 76 acre tract the following twenty three (23) courses;

1 N84°42'32"W, 223 30 feet to a ½" iron rod with a "McAngus Surveying" cap found,

2 N74°35'48"W, 195.30 feet to a magnetic nail found,

3 N41°52'08"W, 140 24 feet to a ½" iron rod with a "McAngus Surveying" cap found;

4. N01°32'12"E, 138 23 feet to a ½" iron rod with a "McAngus Surveying" cap found,

5 N45°46'37"W, 121 84 feet to a cotton spindle found,

6. N75°44'45"W, 84.61 feet to a ½" iron rod with a "Macias" plastic cap set,

7 N84°38'28"W, 21 74 feet to a magnetic nail found,

8 N23°30'46"W, 320 56 feet to a ½" iron rod with a "McAngus Surveying" cap found;

9 N24°20'57"E, 307 36 feet to a ½" iron rod with a "McAngus Surveying" cap found,

5410 South 1st Street • Austin, Texas 78745 • (512) 442-7875 • Fax (512) 442-7876 • e-mail carmelo macias@macsurv com

10 N04°34'51"E, 147 37 feet to a ½" iron rod with a "McAngus Surveying" cap found,

11 N30°19'35"W, 173 45 feet to a cotton spindle found,

12 N17°11'21"E, 109 07 feet to cotton spindle found,

13 N59°12'38"E, 99 88 feet to a ½" iron rod with a "McAngus Surveying" cap found,

14 S84°11'23"E, 85.38 feet to a ½" iron rod with a "McAngus Surveying" cap found;

15 S26°32'09"E, 145 69 feet to a ½" iron rod with a "McAngus Surveying" cap found,

16 S62°32'21"E, 63 66 feet to a ½" iron rod with a "McAngus Surveying" cap found,

17. S18°20'44"E, 105 92 feet to a ½" iron rod with a "McAngus Surveying" cap found,

18 S72°31'09"E, 65 93 feet to a cotton spindle found,

19 N31°45'27"E, 134 99 feet to a ½" iron rod with a "Macias" plastic cap set,

20 S81°21'46"E, 130.92 feet to a ½" iron rod with a "McAngus Surveying" cap found,

21 S35°19'41"E, 360 36 feet to a ½" iron rod with a "Macias" plastic cap set,

22 S24°41'57"W, 107 79 feet to a ½" iron rod with a "McAngus Surveying" cap found,

23 S20°38'53"E, 56 50 feet to a ½" iron rod with a "McAngus Surveying" cap found on an east line of this tract and the west line of said 34 85 acre tract,

THENCE, with the east line of this tract and the west line of said 34 85 acre tract, S27°12'10"W, 266 14 feet to a ½" iron rod found for a corner;

THENCE, S61°46'47"E, 337 29 feet to the POINT OF BEGINNING and containing 20 357 Acres (886,753 SQUARE FEET) of land

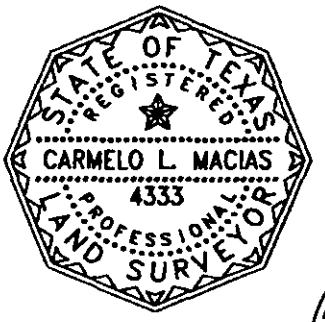
BEARING BASIS NOTE

All bearings described herein are based upon the Texas State Plane Coordinates System, NAD 83 (1986) South Central Zone

THE STATE OF TEXAS §
§ KNOW ALL MEN BY THESE PRESENTS:
COUNTY OF TRAVIS §

That I, Carmelo Lettere Macias, a Registered Professional Land Surveyor, do hereby state that the above description is true and correct to the best of my knowledge and belief and that the property described herein was determined by a survey made on the ground under my direction and supervision.

WITNESS MY HAND AND SEAL at Austin, Travis County, Texas, this 30th day of December, 2007, A.D



Macias & Associates, L P
5410 South 1st Street
Austin, Texas 78745
512-442-7875

Carmelo L. Macias
Carmelo L Macias
Registered Professional Land Surveyor
No. 4333 – State of Texas

REFERENCES
Austin Grid No M 33
TCAD PARCEL ID NO. 01-51371-0101
Volume 13294, Page 1317

MACIAS & ASSOCIATES, L.P., PROJECT NO. 425-01-07

J. jobs/ctw/20AcreTract

CD NOTES REVIEWED
by JOHN MOORE Date 1-15-2008
Engineering Support Section
Department of Public Works
& Transportation

Tract 2

DESCRIPTION

BEING A 40.43 TRACT OF LAND SITUATED IN THE LOUIS FRITZ SURVEY NUMBER 291, ABSTRACT NUMBER 280 AND THE M.W. RIORDAN SURVEY NUMBER 74, ABSTRACT NUMBER 2629 IN TRAVIS COUNTY, TEXAS, BEING ALL OF THE REMAINDER OF THAT 42.00 ACRE TRACT OF LAND AS DESCRIBED IN A DEED TO JOHN JOSEPH & JOHN M. JOSEPH, TRUSTEES, RECORDED IN VOLUME 9483, PAGE 726, REAL PROPERTY RECORDS OF TRAVIS COUNTY, TEXAS (R.P.R.T.C.T.). SAID 40.43 ACRE TRACT BEING MORE FULLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS:

BEGINNING at a 3/4-inch iron pipe found for the southeast corner of a call 0.8697 acre tract described in a deed to MCPMT, Ltd., as recorded in Document No. 2003087287 and Document No 2003087288, Official Public Records of Travis county, Texas, (O.P.R.T.C.T.) and to Daphene Clarke, recorded in Volume 13249, Page 2981 (R.P.R.T.C.T.), being the northeast corner of the said 42.00 acre tract and being in the west right-of-way line of Ranch to Market Road 620 (R.M. 620), for the northeast corner of the herein described tract;

THENCE with said west right-of-way line common with the east line of the said 42.00 acre tract for the following two (2) courses and distances:

1. **S 22°33'55" W** for a distance of **398.88** feet to a 1-inch iron rod found for the Point of Curvature of a non-tangent curve to the left,

2. Along said non-tangent curve to the left, passing through a central angle of **12°05'15"** to a 1-inch iron rod found for the Point of Non-tangency, said curve having a radius of **1479.26** feet, an arc length of **312.08** feet, and a long chord bearing **S 16°29'56" W** for a distance of **311.50** feet,

THENCE with the west line of a called 1.581 acre tract (Parcel 52A) to the State of Texas, described in Cause No. 2244 recorded under Document No. 1999071544 (O.P.R.T.C.T.), common with the east line of the remainder of said 42.00 acre tract for the following five (5) courses and distances:

1. **S 33°22'59" W** for a distance of **324.42** feet to a 1-inch iron rod found for angle point,

2. **S 51°40'01" W** for a distance of **275.20** feet to a 1/2-inch iron rod found for angle point,

3. **S 63°39'43" W** for a distance of **286.08** feet to a 1/2-inch iron rod with cap found for angle point,

4. **S 68°39'23" W** for a distance of **399.90** feet to a cotton gin spindle set for angle point,

5. **S 69°23'24" W** for a distance of **273.29** feet to a 1/2-inch iron rod with cap found for the southeast corner of the said 42.00 acre tract, and of the herein described tract,

THENCE with the south line of the said 42.00 acre tract, common with the north line of a called 1751 865 acre tract described in a deed to the City of Austin recorded in Volume 11848, Page 1718 (R.P.R.T.C.T), **N 62°28'52" W** for a distance of **49.82** feet to a 3/4 inch iron pipe found for the southwest corner of the said 42.00 acre tract, also being an easterly corner of a call 393.1037 acre tract described in a deed to The Commanche Trail Conservation Fund, recorded in Volume 11960, Page 1074 (R.P.R.T.C.T.), same being the southwest corner of the herein described tract;

THENCE with the southwest line of the said 42.00 acre tract common with a northeast line of the said 393.1037 acre tract, **N 20°25'32" W** for a distance of **1140.76** feet to a 1/2-inch iron rod found on a southerly line of a call 273 933 acre tract described in a deed to Robert H. Theriot, recorded in Volume 13294, Page 1317 (R.P.R.T.C.T), being a corner of the said 393.1037 acre tract and being the west corner of the said 42.00 acre tract, and of the herein described tract,

THENCE with the southerly line of the said 273.933 acre tract common with a northerly line of the said 42.00 acre tract, **S 62°20'58" E** for a distance of **693.55** feet to an "X" found scribed in rock for the southeast corner of the said 273.933 acre tract, being an interior ell corner of the said 42.00 acre tract and of the herein described tract;

THENCE with the west line of the said 42.00 acre tract, common with the east line of the said 273.933 acre tract, **N 26°59'52" E** passing at a distance of 794.50 feet, and to the left 0.48 feet, a 1/2-inch iron rod with cap stamped "McAngus" found, for a total distance of **1210.75** feet to a 1/2-inch iron rod with cap found for the southwest corner of a Cellular Antenna Lease Site, recorded in Volume 9382, Page 661 (R.P.R.T C.T.), for an exterior ell corner of the herein described tract, from which a 3/4 inch iron pipe found on the south line of a 34.85 acre tract described in a deed to MCPMT, Ltd. recorded under Document No. 2003087287 (O.P.R.T.C T.), bears N 26°59'10" E, a distance of 50.01 feet, said iron pipe being called in said Volume 11175, Page 150 (R.P.R.T.C.T.), as marking the north corner of the said Louis Fritz Survey and the east corner of the D.J. Riordan Survey No 76, Abstract 2618, and being on the south line of the Alex Dunlap Survey No. 805, Abstract No. 224;

THENCE with the south line of the said Cellular Antenna Lease Site common with a northerly line of the said 42.00 acre tract, **S 61°48'00" E** for a distance of **50.02** feet to a 1/2-inch iron rod found for the southeast corner of said Lease Site, being an interior ell corner of the said 42.00 acre tract and of the herein described tract;

THENCE with the east line of said Lease Site, common with the west line of the said 42.00 acre tract, **N 26°59'05" E** for a distance of **49.97** feet to a 1/2-inch iron rod found on the south line of the said 34.85 acre tract for the northeast corner of said Lease Site being the northwest corner of the said 42.00 acre tract and of the herein described tract;

THENCE with the south line of the said 34.85 acre tract and the said 0.8697 acre tract, common with the north line of the said 42.00 acre tract, **S 61°47'49" E** for a distance of **830.77** feet to the **POINT OF BEGINNING** and containing 40.43 acres of land, more or less.

Bearing Basis: The Texas Coordinate System Central Zone NAD 83

I David Paul Carr a duly Registered Professional Land Surveyor in the State of Texas do hereby certify that the foregoing description is based on a on the ground survey performed by Carter & Burgess in April of 2006 under my direction and supervision and that it is true and correct to the best of my belief.

David Paul Carr RPLS
Texas Registered Professional Land Surveyor
No. 3997

12/21/07
Date

STATE OF TEXAS
REGISTERED
DAVID PAUL CARR
3997
PROFESSIONAL
LAND SURVEYOR

FOR NOTED REVIEWED
By JOHN MOORE Date 1-15-2008
Engineering Support Section
Department of Public Works
and Transportation

36 20 Acres
MCPMT, LTD. et. Al
PD06-052
Tract 3

Travis County, Texas

DESCRIPTION

BEING A 36 20 ACRE TRACT OF LAND SITUATED IN THE ALEXANDER DUNLAP SURVEY NUMBER 805, ABSTRACT NUMBER 224 IN TRAVIS COUNTY, TEXAS, BEING ALL OF THE REMAINDER OF THAT 34.85 ACRE TRACT OF LAND AS DESCRIBED IN A DEED TO MCPMT, LTD , (TRACT 3), 99% INTEREST IN UNDIVIDED 1/2 INTEREST, RECORDED IN DOCUMENT NO 2003087287 AND 1% INTEREST IN UNDIVIDED 1/2 INTEREST RECORDED IN DOCUMENT NO 2003087288, OFFICIAL PUBLIC RECORDS OF TRAVIS COUNTY, TEXAS, AND TO DAPHENE H SCHULZE, TRUSTEE, UNDIVIDED 1/2 INTEREST, BY CAUSE NO. 11580 PROBATE COURT OF TRAVIS COUNTY, TEXAS AND RECORDED IN VOLUME 9335, PAGE 128 REAL PROPERTY RECORDS OF TRAVIS COUNTY TEXAS ALL OF THAT 0.8697 ACRE TRACT OF LAND AS DESCRIBED IN A DEED TO MCPMT, LTD , (TRACT 6) 99% INTEREST IN UNDIVIDED 1/2 INTEREST, RECORDED IN DOCUMENT NO 2003087287 AND 1% INTEREST IN UNDIVIDED 1/2 INTEREST IN DOCUMENT NO 2003087288, OFFICIAL PUBLIC RECORDS OF TRAVIS COUNTY, TEXAS, AND TO DAPHENE CLARKE, UNDIVIDED 1/2 INTEREST, RECORDED IN VOLUME 13249, PAGE 2981 REAL PROPERTY RECORDS OF TRAVIS COUNTY, TEXAS, ALL OF THAT 0 50 ACRE TRACT OF LAND AS DESCRIBED IN A DEED TO MCPMT, LTD (TRACT 2) 99% INTEREST RECORDED IN DOCUMENT NO. 2003087287 AND 1% INTEREST IN DOCUMENT NO 2003087288, OFFICIAL PUBLIC RECORDS OF TRAVIS COUNTY, TEXAS, AND UNDIVIDED 1/2 INTREST OF A 20 FOOT ROADWAY AS DESCRIBED IN A DEED TO MONTANDON COMMUNITY PROPERTY MANAGEMENT TRUST, RECORDED IN VOLUME 12273, PAGE 97 REAL PROPERTY RECORDS OF TRAVIS COUNTY, TEXAS, SAID 36 20 ACRE TRACT BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS.

BEGINNING at a 3/4 inch iron pipe found on the southeast corner of said 0 8697 acre tract, being the northeast corner of that 42 00 acre tract of land as described in a deed to John E & John M Joseph, trustees, recorded in Volume 11175, Page 150, Real Property Records of Travis County, Texas and being the west right-of-way line of Ranch to Market Road 620 (R M 620), for the southeast corner of the herein described tract;

THENCE, leaving the said west right-of-way line of R M. 620, with the south lines of said 0 8697 acre tract and said 34 85 acre tract common with the north lines of said 42.00 acre tract, a Cellular Antenna Lease Site, recorded in Volume 9382, Page 661, Real Property Records of Travis County, Texas, and of a call 273 933 acre tract described in a deed to Robert H Theriot, recorded in Volume 13294, Page 1317, Real Property Records of Travis County, Texas **N 61°47'43" W**, passing at a distance of 176 84 feet the southwest corner of said 0 8697 acre tract, from which a 3/4 inch iron rod found bears N 20°17'27" E, a distance of 0 21 feet, and from which a PK nail with shiner found bears N 25°02'22" E a distance of 1 75 feet, passing at a distance of 830 77 feet a 1/2 inch iron rod found at the northeast corner of said Cellular Antenna Site Lease, passing at a distance of 880 78 feet a 3/4 inch iron pipe found at the northwest corner of said Cellular Antenna Lease Site, in all a total distance of **1218.10** feet to a 1/2 inch iron rod found at the interior ell corner of said 273 933 acre tract, southwest corner of said 34 85 acre tract, and of the herein described tract,

THENCE, with the west line of said 34 85 acre tract common with the east lines of said 273 933 acre tract and of a call 30 00 acre tract as described in a deed to Brownstone Gallery, Inc , recorded in Document No 2002076479, Official Public Records of Travis County Texas, **N 27°11'12" E**, passing at a distance of 266 11 feet an iron rod found with cap stamped McAngus, passing at a distance of 738.34 feet and to the left 0 30 feet an iron rod found with cap stamped McAngus for the southeast corner of said 30 00 acre tract, passing at a distance of 1499 80 feet a 1/2 inch iron rod found for the northeast corner of said 30 00 acre tract, in all a total distance of **1512 51** feet to a iron rod found with cap stamped C-A RPLS#2988 in the the

south right-of-way line of Bullick Hollow, and being the northwest corner of said 34 85 acre tract, and of the herein described tract

THENCE, with the north line of said 34.85 acre tract common with the said south right-of-way line of Bullick Hollow, the following two (2) courses

1 **S 66°06'34" E**, a distance of **321.24** feet to a iron rod found with cap stamped C-A RPLS#2988,

2. **S 55°17'19" E**, a distance of **107.66** feet to a 5/8 inch iron rod found,

THENCE, with the south line of a call 0 16 acre tract, same being the south right-of-way line of Bullick Hollow as described in a deed to Travis County recorded in Volume 12949, Page 1296 Real Property Records of Travis County, Texas, the following two (2) courses

1 **S 50°49'21" E**, a distance of **294 84** feet to a iron rod set with cap stamped Carter Burgess,

2 **S 58°44'13" E**, a distance of **220.44** feet to a 5/8 inch iron rod found in the west line of that call 0 96 acre tract as described in a deed to Hal H Bell, recorded in Volume 2457 Page 522, Deed Records of Travis County, Texas, being the southeast corner of the said 0 16 acre tract and the northeast corner of the herein described tract,

THENCE, with a easterly line of said 34 85 acre tract common with the west line of said 0 96 acre tract, **S 23°25'05" W**, a distance of **192.03** feet to a 5/8 inch iron rod found, at an exterior ell corner of said 34 85 acre tract, being the southwest corner of said 0 96 acre tract the northwest corner of Lot 1, Block A, of Speedy Stop 209, a subdivision, recorded in Document No 200300329, Official Public Records of Travis County, Texas, and also being the northeast corner of that 0.088 acre tract (Tract 2) as described in a deed to Michael G Haggerty, recorded in Volume 12203, Page 1595, Real Property Records of Travis County, Texas,

THENCE, with a easterly line of said 34.85 acre tract common with the northerly, westerly and southerly line of said 0 088 acre tract, the following five (5) courses

1 **N 48°43'59" W** a distance of **5.55** feet to a 5/8 inch iron rod found;

2 **S 29°41'47" W**, a distance of **178 37** feet to a 3/4 inch iron rod found;

3. **N 62°11'07" W**, a distance of **10.33** feet to a 5/8 inch iron rod found,

4 **S 36°34'07" W**, a distance of **21.83** feet to a 3/4 inch iron rod found and;

5. **S 49°43'48" E**, a distance of **26.30** feet to a 3/4 inch iron pipe found, at an exterior ell corner of said 34 85 acre tract, and also being the northwest corner of a call 1 028 acre tract as described in a deed to River City Real Estate, PLLC, recorded in Volume 13282, Page 2552 Real Property Records of Travis County, Texas,

THENCE, with a easterly line of said 34 85 acre tract common with the west line of said 1 028 acre tract, **S 23°41'25" W**, a distance of **208.49** feet to a 5/8 inch iron rod found being an angle point of said 34 85 acre tract, being the southwest corner of said 1.028 acre tract and also being the northwest corner of a call 0.970 acre tract as described in a deed to Tracy Collins, recorded in Document No. 2005108470, Official Public Records of Travis County, Texas,

THENCE, with a easterly line of said 34 85 acre tract common with the west line of said 0 970 acre tract, **S 23°01'37" W**, a distance of **210.69** feet to a 1/2 inch iron rod found, being the southwest corner of said 0 970 acre tract and also being the northwest corner of said 20 foot roadway,

THENCE, with the north line of said 20 foot roadway common with the south line of said 0 970 acre tract, **S 46°47'04" E**, a distance of **205.54** feet to a calculated point being the southeast corner of said 0 970 acre tract, and also being the said west right-of-way line R.M 620, from which a 1/2 inch iron rod found bears S 46°47 04" E, a distance of 0 28 feet, and from which a TxDot Type II monument found bears distance of **215 57** feet along the arc of a curve to the right, having a central angle of **04°14'15"**, a radius of **2914.79** feet and a chord bearing **N 27°18'58" E**, a distance of **215.52** feet,

THENCE, with the west right-of-way line of R M 620 and the arc of a curve to the left, an arc distance of **21.33** feet, having a central angle of **00°25'09"**, a radius of **2914.79** feet and a chord bearing **S 24°59'16" W**, a distance of **21 33** feet to a 1/2 inch iron rod found at the northeast corner of said 0 50 acre tract and being on the south line of said 20 foot roadway,

THENCE, with the east line of said 0 50 acre tract, **S 25°19'51" W**, a distance of **109.07** feet to a iron rod set with cap stamped Carter Burgess, at the southeast corner of said 0 50 acre tract being a southerly line of said 34.85 acre tract,

THENCE, with said southerly line of the 34 85 acre tract, **S 46°52'42" E** a distance of **3.30** feet to 1/2 inch iron rod found on the arc of a curve to the left on the said west right-of-way line of R M 620 and being a east line of said 34 85 acre tract,

THENCE, with the west right-of-way line R.M 620, common with the east lines of said 34 85 acre tract and said 0.8697 acre tract, the following two (2) courses

1. With the said arc of the curve to the left an arc distance of **14 33** feet, having a central angle of **00°16'54"**, a radius of **2914.79** feet and a chord bearing **S 22°28'22" W**, a distance of **14.33** feet,

2. **S 22°27'56" W**, passing at a distance of 235.53 feet the northeast corner of said 0 8697, and also being an exterior ell corner of said 34 85 acre tract, in all a total distance of **446.76** feet to the **POINT OF BEGINNING** and containing 36 20 acres of land, more or less

Bearing Basis: The Texas Coordinate System Central Zone Nad 83

I David Paul Carr a duly Registered Professional Land Surveyor in the State of Texas do hereby certify that the foregoing description is based on a on the ground survey performed by Carter & Burgess In September of 2006 under my direction and supervision and that It is true and correct to the best of my belief

David Paul Carr RPLS
Texas Registered Professional Land Surveyor
No. 3997

STATE OF TEXAS
REGISTERED
DAVID PAUL CARR
3997
PROFESSIONAL
LAND SURVEYOR

Nov 7, 2006
Date

JOHN MOORE 1-15-2008

MACIAS & ASSOCIATES, L.P.
LAND SURVEYORS

MCPMT, LTD, AND
DAPHENE H. SCHULZE, TRUSTEE
To
CITY OF AUSTIN
(Save & Except Tract)
January 14, 2008

LEGAL DESCRIPTION

DESCRIPTION OF A 4.200 ACRE (182,942 SQUARE FOOT) TRACT OF LAND OUT OF THE ALEXANDER DUNLAP SURVEY NO. 805, ABSTRACT NO. 224, TRAVIS COUNTY, TEXAS, BEING OUT OF A 34.85 ACRE TRACT REFERRED TO AS "TRACT 3" IN TWO GENERAL WARRANTY DEEDS DATED MARCH 26, 2003 TO MCPMT, LTD., 99% INTEREST IN AN UNDIVIDED 1/2 INTEREST RECORDED IN DOCUMENT NO. 2003087287 AND 1% INTEREST IN AN UNDIVIDED 1/2 INTEREST RECORDED IN DOCUMENT NO. 2003087288, AND TO DAPHENE H. SCHULZE, TRUSTEE, AN UNDIVIDED 1/2 INTEREST BY CAUSE NO. 11580, PROBATE COURT RECORDS OF TRAVIS COUNTY, TEXAS, RECORDED IN VOLUME 9335, PAGE 128, REAL PROPERTY RECORDS OF TRAVIS COUNTY, TEXAS; SAID 4.200 ACRE (182,942 SQUARE FOOT) TRACT AS SHOWN ON THE ACCOMPANYING SKETCH, BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS:

BEGINNING at a 1/2" iron rod with plastic cap stamped "CA INC RPLS #2988" found having Texas State Plane Coordinate (Central Zone, NAD83(CORS), U.S. Feet, Combined Scale Factor 1.00011) values of N=10,119,929.31, E=3,077,071.15, on the south right-of-way line of Bullick Hollow Road, a varying width right-of-way, at the northwest corner of said 34.85 acre tract, for the northwest corner of this tract;

THENCE, Southeasterly, with the south right-of-way line of Bullick Hollow Road and the north line of said 34.85 acre tract, the following three (3) courses:

1) S 66°05'48" E, a distance of 321.30 feet to a 1/2" iron rod with plastic cap stamped "CA INC RPLS #2988" found for an angle point;

2) S 55°19'51" E, a distance of 107.67 feet to a 5/8" iron rod found for an angle point;

3) S 50°47'47" E, a distance of 125.23 feet to a 1/2" iron rod with plastic cap stamped "MACIAS & ASSOC." set on the east line of a 100-foot wide electric transmission and distribution line easement recorded in Volume 1793, Page 392, Deed Records of Travis County, Texas, for the northeast corner of this tract, from said point, a 5/8" iron rod found at the northeast corner of said 34.85 acre tract, bears S 50°47'47" E, 169.50 feet, and S 58°42'39" E, 220.36 feet;

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www.maciasworld.com

THENCE, across said 34.85 acre tract, the following five (5) courses:

1) S 68°17'24" W, across said 100-foot wide electric transmission and distribution line easement, a distance of 129.90 feet to a 1/2" iron rod with plastic cap stamped "MACIAS & ASSOC." set on the west line of said 100-foot wide electric transmission and distribution line easement, for an angle point;

2) S 59°54'48" W, a distance of 97.08 feet to a 1/2" iron rod with plastic cap stamped "MACIAS & ASSOC." set for an angle point;

3) S 16°55'48" W, a distance of 141.23 feet to a 1/2" iron rod with plastic cap stamped "MACIAS & ASSOC." set for an angle point;

4) N 54°04'31" W, a distance of 138.72 feet to a 1/2" iron rod with plastic cap stamped "MACIAS & ASSOC." set for an angle point;

5) S 82°28'40" W, a distance of 365 09 feet to a 1/2" iron rod with plastic cap stamped "MACIAS & ASSOC." set on the west line of said 34.85 acre tract and on the east line of a 30.000 acre tract described in a deed dated December 31, 2001 to Brownstone Gallery, Inc., recorded in Document No. 2002076479, Official Public Records of Travis County, Texas, for the southwest corner of this tract, from said point, a 1/2" iron rod found at the southwest corner of said 34.85 acre tract, bears S 27°10'55" W, 985.66 feet;

THENCE, N 27°10'55" E, with the west line of said 34.85 acre tract and the east line of said 30.000 acre tract, at 514.32 feet, pass a 1/2" iron rod found at the northeast corner of said 30.000 acre tract, and continuing a total distance of 527.03 feet to the **POINT OF BEGINNING** and containing 4.200 acres (182,942 square feet) of land.

BEARING BASIS NOTE

The bearings described herein are Texas State Plane Grid Bearings, (Central Zone, NAD83 (CORS) Combined Scale Factor 1.00011). Project control points were established from reference station "AUS5CORS" having coordinate values of N=10,086,515.89, E=3,109,682.46 and "D-34-3001" having coordinate values of N=10,119,492.92, E=3,083,253.38.

THE STATE OF TEXAS §
§ KNOW ALL MEN BY THESE PRESENTS:
COUNTY OF TRAVIS §

That I, Gregorio Lopez, Jr., a Registered Professional Land Surveyor, do hereby state that the above description is true and correct to the best of my knowledge and belief and that the property described herein was determined by a survey made on the ground under my direction and supervision.

WITNESS MY HAND AND SEAL at Austin, Travis County, Texas, this 14th day of January, 2008, A.D.

Macias & Associates, L.P.
5410 South 1st Street
Austin, Texas 78745
512-442-7875

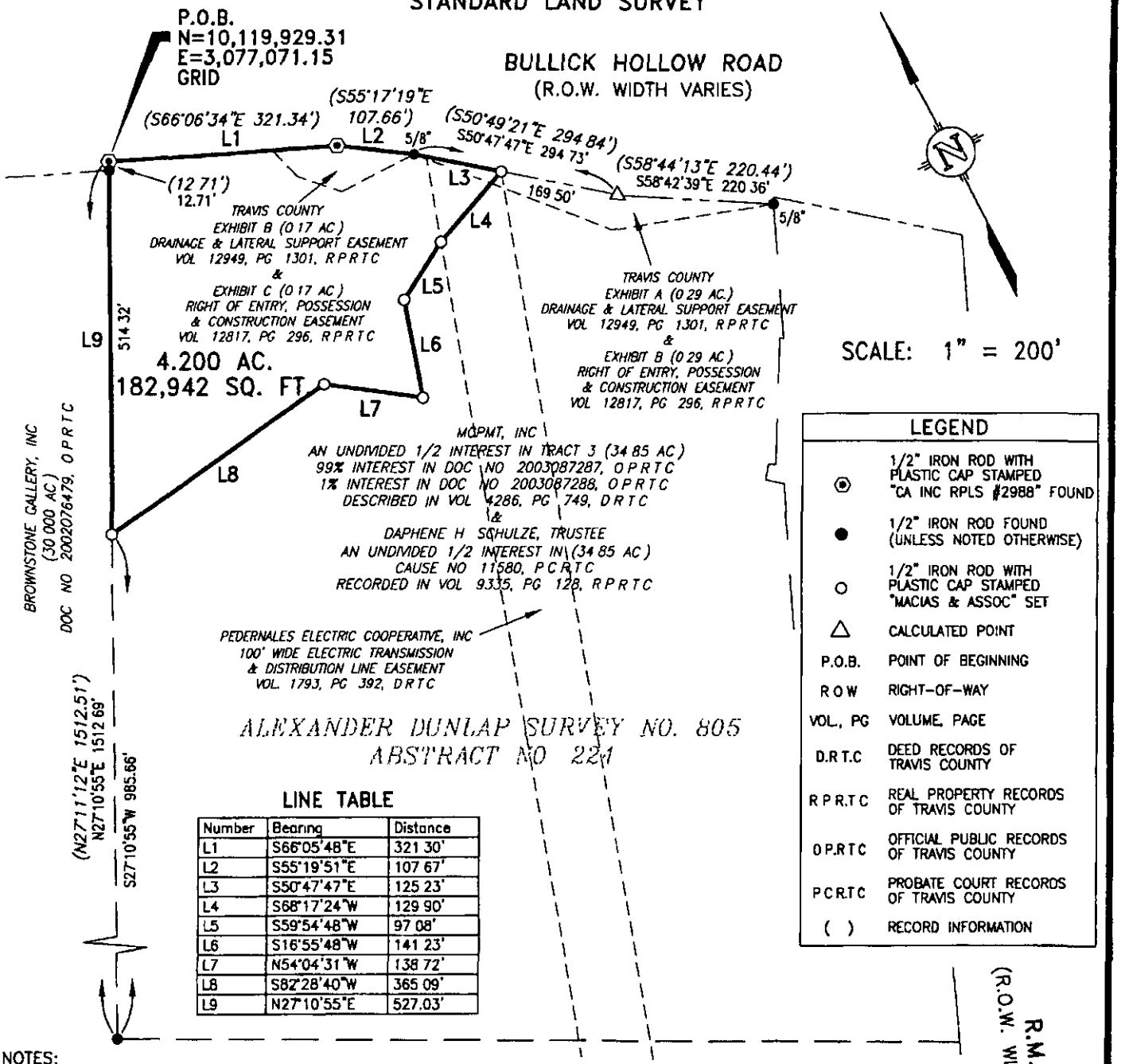
Gregorio Lopez, Jr.
Registered Professional Land Surveyor
No. 5272 – State of Texas

REFERENCES
MAPSCO 2003 462X
Austin Grid No. MC-34
TCAD PARCEL ID NO. 01-5634-0301
MACIAS & ASSOCIATES, L.P., PROJECT NO. 317-08-08

NOTES REVIEWED
By JOHN MOORE Date 1-15-2008
Engineering Support Section
Department of Public Works
& Transportation

SKETCH TO ACCOMPANY LEGAL DESCRIPTION

"STANDARD LAND SURVEY"



LEGEND

⊛	1/2" IRON ROD WITH PLASTIC CAP STAMPED "CA INC RPLS #2988" FOUND
●	1/2" IRON ROD FOUND (UNLESS NOTED OTHERWISE)
○	1/2" IRON ROD WITH PLASTIC CAP STAMPED "MACIAS & ASSOC" SET
△	CALCULATED POINT
P.O.B.	POINT OF BEGINNING
R.O.W.	RIGHT-OF-WAY
VOL., PG.	VOLUME, PAGE
D.R.T.C.	DEED RECORDS OF TRAVIS COUNTY
R.P.R.T.C.	REAL PROPERTY RECORDS OF TRAVIS COUNTY
O.P.R.T.C.	OFFICIAL PUBLIC RECORDS OF TRAVIS COUNTY
P.C.R.T.C.	PROBATE COURT RECORDS OF TRAVIS COUNTY
( )	RECORD INFORMATION

LINE TABLE

Number	Bearing	Distance
L1	S66°05'48"E	321.30'
L2	S55°19'51"E	107.67'
L3	S50°47'47"E	125.23'
L4	S68°17'24"W	129.90'
L5	S59°54'48"W	97.08'
L6	S16°55'48"W	141.23'
L7	N54°04'31"W	138.72'
L8	S82°28'40"W	365.09'
L9	N27°10'55"E	527.03'

NOTES:

1) THIS SURVEY WAS PERFORMED WITHOUT THE BENEFIT OF A TITLE REPORT. RECORD INFORMATION ON THIS DRAWING IS BASED ON A PUBLIC RECORDS SEARCH BY THE SURVEYOR AND MAY NOT INCLUDE ALL EASEMENTS OR INSTRUMENTS PERTAINING TO THIS PROPERTY

2) THE COORDINATES AND BEARINGS SHOWN HEREON ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE, NAD83(CORS), COMBINED SCALE FACTOR = 1.00011) THE COORDINATES WERE ESTABLISHED BY GPS STATIC OBSERVATION FROM REFERENCE STATION "AUS5CORS" HAVING COORDINATE VALUES OF N=10,086,515.89, E=3,109,682.48 AND "D-34-3001" HAVING COORDINATE VALUES OF N=10,119,492.92, E=3,083,253.38. ALL DISTANCES SHOWN ARE SURFACE DISTANCES

DATE	1-11-08
DRAWN BY	G.L.
MAI JOB NO.	317-08-08
REFERENCE	F.B. 491 & 492

J:\JOBS\CAROLLO\TWTP\3170808\DWG\31708-1.DWG

Gregorio Lopez, Jr. Jan. 14, 2008

Gregorio Lopez, Jr. Date

Registered Professional Land Surveyor

No. 5272 – State of Texas

MACIAS & ASSOCIATES, L.P.

LAND SURVEYORS

5410 SOUTH 1ST STREET

AUSTIN, TEXAS 78745 PH (512)442-7875

FAX (512)442-7876 EMAIL: MACIASURVEY@EARTHLINK.NET

EXHIBIT B

RAW WATER SITE

The area of land used for the raw water intake facility to serve Water Treatment Plant Number 4

4.28 acres of land out of the D&W RAILROAD COMPANY SURVEY No. 76 in Travis County, Texas and more fully described in the field notes that follow.

Exhibit B

Job. # 857009
Intake Site

October 2, 1985

State of Texas
County of Travis

Tract 4

FIELDNOTES FOR A 4.28 ACRE TRACT OUT OF THE D & W RAILROAD COMPANY SURVEY NO. 76 IN TRAVIS COUNTY, TEXAS, AND BEING OUT OF THAT CERTAIN 528.85 ACRE TRACT OF LAND CONVEYED BY HOWELL H. FINCH TO ROBERT H. THERIOT IN A WARRANTY DEED DATED NOVEMBER 18, 1980, AND RECORDED IN VOLUME 7185, PAGES 2295-2302, DEED RECORDS OF TRAVIS COUNTY, TEXAS; SAID 4.28 ACRE TRACT COMPRISING A PORTION OF LAKE TRAVIS AND BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS, AS FOLLOWS, TO WIT:

Commencing at an iron rod by a fence corner post found to mark the south corner of said D & W Railroad Company Survey No. 76 for the south corner of said 528.85 acre tract; thence North 62°29'43" West, along the southwest line of said Survey No. 76, with the southwest line of said 528.85 acre tract, 5,653.38 feet to an iron pipe found on or about the 715 foot contour line (N.G.V.D. datum) of Lake Travis for a corner of said 528.85 acre tract; thence continuing with said southwest line, North 63°37'43" West 433.29 feet to a point, now under the water of Lake Travis on the bank of the Colorado River for the lower west corner of said 528.85 acre tract;

Thence North 10°14'43" West, along the west line of said 528.85 acre tract, with the bank of the Colorado River, now under the water of Lake Travis, 216.14 feet to a submerged point for the southwest corner and "POINT OF BEGINNING" of this survey;

Thence continuing with the west line of said 528.85 acre tract being the bank of the Colorado River, North 10°14'43" West 427.36 feet to a point for a corner of said 528.85 acre tract and a submerged corner of this survey;

Thence continuing with said west line of the 528.85 acre tract, North 28°48'43" West 22.20 feet to a point for the northwest submerged corner of this survey;

Thence leaving the west line of said 528.85 acre tract, due East 297.16 feet to a point on the 700.00 foot contour line of Lake Travis (contour line based on N.G.V.D. datum) for the northeast corner of this survey from which corner a 5/8 inch iron rod set on said 700.00 foot contour line bears North 23°35'00" West 53.98 feet;

Thence with said 700.00 foot contour line, South 23°35'00" East 70.63 feet to a 60d nail set for a corner of this survey;

Thence South 68°59'13" East, along the 700.00 foot contour line, based on N.G.V.D. datum, at 90.65 feet a brass disc monument set bears North 21°00'47" East 5.18 feet, in all a total distance of 234.35 feet to a point for a corner of this survey;

Thence South 16°51'02" East, with said contour line, 42.89 feet to a 5/8 inch iron rod set for a corner of this survey;

Thence South 69°20'03" East, along the 700.00 foot contour line, 90.23 feet to a 5/8 inch iron rod set for the most east corner of this survey;

Thence continuing with said contour line, South 43°28'36" West, at 51.11 feet a brass disc monument set bears North 46°31'24" West 23.91 feet, in all a total distance of 147.06 feet to a 5/8 inch iron rod set for a corner of this survey;

Thence South 75°15'27" West, with said contour line, 137.13 feet to a 5/8 inch iron rod set for a corner of this survey;

Thence South 63°11'53" West, along the 700.00 foot contour line (N.G.V.D. datum) at 14.43 feet another brass disc monument set bears North 26°48'07" West 18.40 feet, in all a total distance of 31.57 feet to a 5/8 inch iron rod set for a corner of this survey;

Thence with said contour line, South 14°26'53" West 32.00 feet to a point for a corner of this survey;

Thence South 10°04'27" East, along the 700.00 foot contour line of Lake Travis, based on N.G.V.D. datum, 32.00 feet to a point for the southeast corner of this survey from which corner a cotton spindle set on said contour line bears South 10°04'27" East 32.80 feet;

Thence leaving the abovementioned contour line, due West 289.97 feet to the "POINT OF BEGINNING".

Surveyed on the ground by S.A. Garza Engineers, Inc., 401 West 29th Street, Austin, Texas 78705, from field data recorded in Field Book No.140 ,183 and 189.

Stephen Earl Cobb 10/3/85
Date

Stephen Earl Cobb
Registered Public Surveyor
No. 4297

STATE OF TEXAS
STEPHEN EARL COBB
REGISTERED PUBLIC SURVEYOR

EXHIBIT C

PUMP SITE

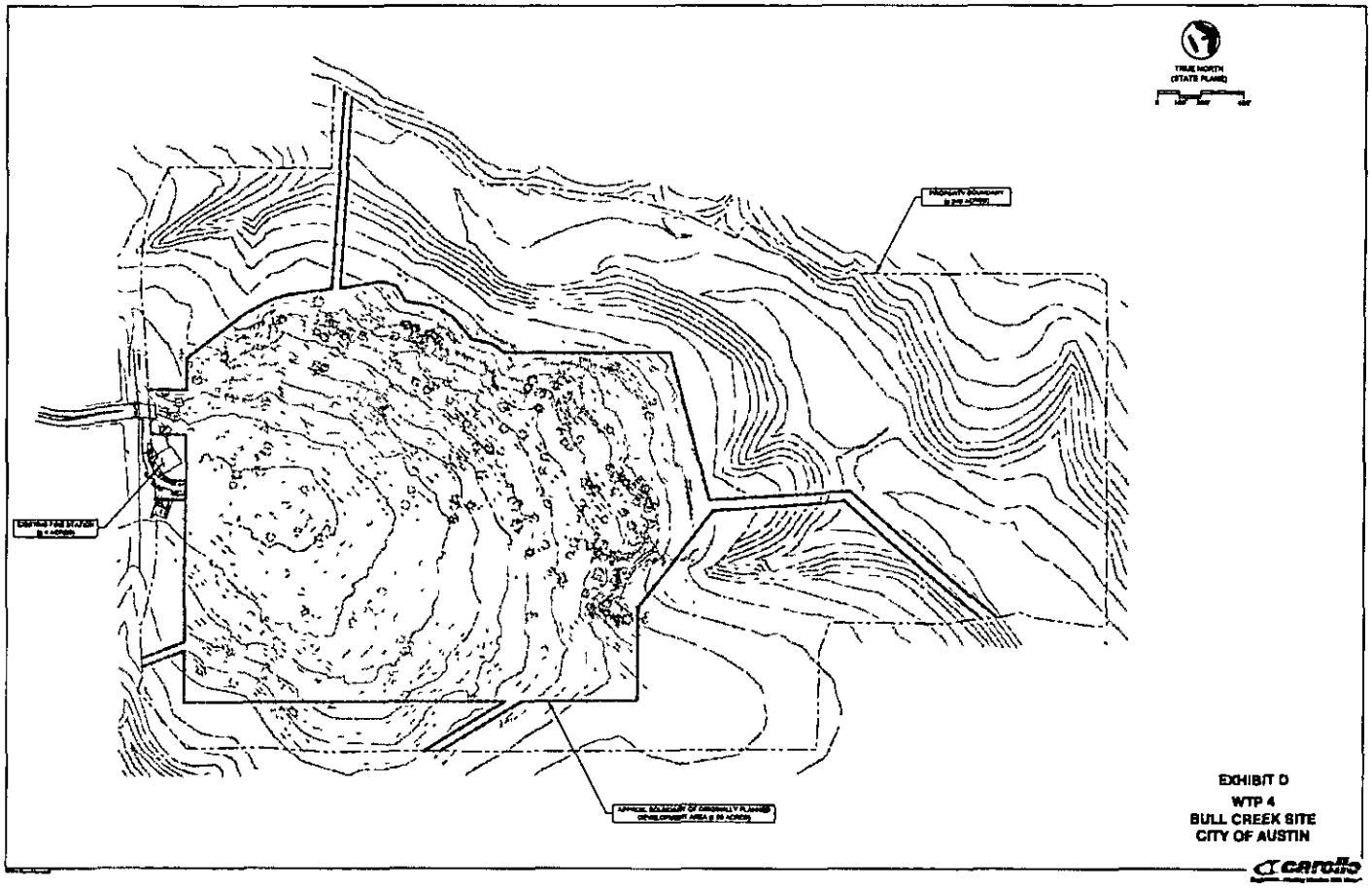
The area of land used for the raw water pump station to serve Water Treatment Plant Number 4

BEING Lots 40, 41, 42, Block B, COMANCHE CANYON RANCH AREA THREE, a Subdivision in Travis County, Texas, according to the map or plat thereof recoded under Plat Document No. 200600184, Official Public Records of Travis County, Texas.

EXHIBIT D

BULL CREEK SITE

Being approximately 102 acres out of Lot One, W.T.P. No 4 SUBDIVISION, a subdivision in Travis County, Texas, according to the map or plat thereof recorded under Volume 86 Pages 190D through 191B of the Official Public Records of Travis County, Texas and as illustrated in the sketch following.


TRUE NORTH
(STATE PLANE)
EXHIBIT D
WTP 4
BULL CREEK SITE
CITY OF AUSTIN
carollo

Common Variance Requests & Logical Methods for their Evaluation

Variance Request	Requirements	Intent	Mitigation Measures	Typical Examples
1. Cut & Fill	a) Max. 4 feet cut & fill allowed (except unlimited under buildings or within ROW). b) Must restore & stabilize cut & fill areas. c) Up to 8-ft. administrative variance allowed in DDZ if not located on a slope gradient >15% or <100 feet of classified waterway. d) Administrative variances given for stormwater facilities (e.g., flood & WQ structural controls).	a) Maintain slope stability. b) Prevent loss of site character. c) Minimize site disturbance. d) Protect surface & groundwater quality by minimizing sediment discharges.	a) Structural containment (retaining walls). b) Restoration & revegetation. c) Terracing. d) Minimum setback from significant features. e) Limit depth and/or height. f) Reduce IC (e.g., reduced parking). g) Enhanced erosion & sedimentation controls (see below for more detail). h) Reduced footprint of disturbance. i) Preserve trees and/or natural areas not already required to preserve. j) Meet Landscaping Ordinance for projects in the ETJ.	Roadways, driveways, parking, level building slab, floodplain & drainage modifications.
2. Construction on Steep Slopes	a) No roadway or driveway on slope >15% unless necessary for primary access to >2 acres with gradient of <15% or building sites for at least 5 residential units. b) No buildings/parking structures on slope >25% or parking areas on slope >15%. c) Building/parking structure OK on slope 15-25% if terraced, vegetation restored, <10% footprint on slopes >15%.	a) Maintain slope stability. b) Protect fragile environments. c) Prevent concentration of runoff. d) Reduce erosion & sedimentation.	a) Structural containment (retaining walls). b) Restoration & revegetation. c) Terracing. d) Enhanced erosion & sedimentation controls: - Place temporary erosion basins off-line unless designed as a dam (i.e., not located in natural draws/channels). - Require site plan to phase clearing & grading, with temporary stabilization. - Require spoils to be hauled off-site or stored away from concentrated flow. - Require more robust perimeter controls (e.g. filter fabric-encased gabions); superior to silt fencing. e) Preserve trees and/or natural areas not already required to preserve. f) Meet Landscaping Ordinance for projects in the ETJ.	Similar to cut & fill (e.g., buildings, parking); more common in western watersheds with steep slopes.
3. Stream Buffers (CWQZ & WQTZ)	a) CWQZ: dev't prohibited (except fences, parks, trails, docks, etc.). Utility lines may cross CWQZ (Director approval needed in BSZ). Street crossings in CWQZ limited (except Urban wsheds). Limits vary with wshed (e.g., BSZ, WS Rural) & waterway classification (major, intermed., minor). No variances to CWQZ in BSZ (SOS). b) WQTZ: 30% IC allowed in Suburban & 18% in WS Sub. wsheds: few variances requested. In BSZ & WS Rural wsheds, WQTZ same as CWQZ (except SFR OK if min. lot size 2 ac. & max. density 1 unit/3 ac.); WQTZ variances possible in BSZ (is	a) Keep development out of harm's way. b) Preserve function & character of riparian zones. c) Filter pollutants (esp. effective in undisturbed land in riparian soils).	a) Grant public access easement for public trail. b) Headwaters protection (buffer & protect smaller streams not protected by current code). c) Native landscaping (Grow Green plant list, Integrated Pest Management plan, waste-water or stormwater irrigation limits). d) Reduce NSA IC. e) Ensure infiltration volume is maintained (compensate on other areas of site for lost buffers). f) Erosion Hazard Zone (technical setback defined by erosive potential of channel). g) Preserve trees and/or natural areas not already required to preserve. h) Meet Landscaping Ordinance for projects in the ETJ.	CWQZ variances occasional for driveway crossings or encroachments to allow "reasonable use", utility lines, reduction of floodplain area, redirect drainage ways. Very few WQTZ variances requested (except in BSZ).

Common Variance Requests & Logical Methods for their Evaluation

Variance Request	Requirements	Intent	Mitigation Measures	Typical Examples
4. CEF Setbacks	a) CEFs include: bluffs, canyon rimrocks, caves, sinkholes, springs, & wetlands. b) Protected by 150-300 ft. buffer; must be protected from runoff through drainage patterns and/or special controls. SFR lots may not include or be within 50 ft. of CEF. c) Administrative variances are allowed if all characteristics of the CEF are preserved. d) Wetlands may be mitigated.	a) Preserve biologic, hydrogeologic, & aesthetic integrity of unique environmental features.	a) Increased CEF setbacks on another part of the site (e.g., linear stream setbacks where CWQZ does not exist). b) Stormwater attenuation: slow or divert runoff around feature. c) Off-site CEF protection. d) Native landscaping (Grow Green plant list, IPM plan, irrigation limits). e) Prohibit underground storage tanks or require tertiary containment. f) Constructed wetlands (e.g., wet prairie with 609S plants in detention pond) or wet pond to replace lost wetlands. g) Headwaters protection (buffer & protect smaller streams not protected by current code) or increased CWQZ. h) Preserve trees and/or natural areas not already required to preserve. i) Meet Landscaping Ordinance for projects in the ETJ.	Driveways, utility lines, drainage modifications.
5. Impervious Cover (IC); **Density;** **Net Site Area (NSA)**	a) Net site area IC & density limits for all wshed classifications except Urban. b) Urban wsheds use zoning IC limits only. c) IC allowed in WQTZ for Suburban wsheds (30%) and WS Suburban (18%). d) Variances not allowed for SOS IC limits. e) Boundary street IC deductions in all but Urban wsheds (impact greatest in WS wsheds); IC deducted from site if road IC higher than site IC limit.	a) Minimize runoff & maximize infiltration to protect quality & quantity of surface & groundwater. b) Limits established based on sensitivity of watershed and impact on drinking water. c) Conserve open space.	a) Increase capacity/size and/or upgrade type of structural controls (esp. innovative Low Impact Development controls). [ECM 1.6.7] b) Acquire off-site lands to mitigate overall IC. c) Treat previously untreated off-site areas. d) Prohibit harmful land uses (e.g., service stations, auto repair, etc.). e) Increased creek setbacks. f) Native landscaping (Grow Green plant list, IPM plan, irrigation limits). g) Porous pedestrian/bike surfaces. h) Porous pavement for net additional IC (non-recharge ONLY). i) Clustered IC with undisturbed soils/vegetation. j) Increased creek buffers and headwaters protections. k) Preserve trees and/or natural areas not already required to preserve. l) Meet Landscaping Ordinance for projects in the ETJ.	Increased amount of impervious cover or density; boundary street impacts; sites with little or no NSA.

Common Variance Requests & Logical Methods for their Evaluation

Appropriateness (Findings of Fact)

Findings for Land Commission Variances:

(1) The requirement will deprive the applicant of a privilege or the safety of property given to owners of other similarly situated property with approximately contemporaneous development;

(2) The variance:

(a) is not based on a condition caused by the method chosen by the applicant to develop the property, unless the development method provides greater overall environmental protection than is achievable without the variance;

(b) is the minimum change necessary to avoid the deprivation of a privilege given to other property owners and to allow a reasonable use of the property; and

(c) does not create a significant probability of harmful environmental consequences; and

(3) Development with the variance will result in water quality that is at least equal to the water quality achievable without the variance.

Additional Findings for Stream Buffers:

(4) The requirement for which a variance is requested prevents a reasonable, economic use of the entire property; and

(5) The variance is the minimum change necessary to allow a reasonable, economic use of the entire property.

Glossary

BSZ	Barton Springs Zone	**NSA**	Net Site Area
CEFs	Criticial Environmental Features	**ROW**	Right-of-Way
CWQZ	Critical Water Quality Zone	**SFR**	Single-Family Residential
DDZ	Desired Development Zone	**SOS**	Save Our Springs water quality ordinance
Dev't	Development	**WQ**	Water Quality
ETJ	5-mile Extra-Territorial Jurisdiction	**WQTZ**	Water Quality Transition Zone
IC	Impervious Cover	**WS Rural**	Water Supply Rural watersheds
IPM	Integrated Pest Management	**WS Suburban**	Water Supply Suburban watersheds
MFR	Multifamily Residential	**Wshed**	Watershed

Appendix F

Environmental Commissioning Checklist

Environmental Commissioning Checklist

Facility ID: _____

Design Team Facility Lead: _____

The following list is intended to guide the Project Design Team (PDT) and Environmental Commissioning (EC) Team through the EC Process for design of Water Treatment Plant No. 4 (WTP 4) facilities. Its purpose is to document collaborative EC efforts that are ongoing throughout the Final Design Phase and to serve as a reminder for the PDT and EC Team members of the information and tasks needed to complete the design process. The PDT Facility Lead is responsible for completing the tasks in the following checklist, initialing the checklist when a task is completed, and reviewing the checklist with the appropriate EC Team representative on a regular basis. The EC Team Representative is responsible for reviewing the checklist with the PDT Facility Lead, participating in key activities where required, and initialing when an EC-related task is complete. The current version of this document, complete with attachments, shall be posted to ProjectWise®, and the original copy with attachments shall be stored in the project files in the Design Center. Where requirements do not apply to this facility, enter "NA."

Environmental Commissioning Checklist		
Preliminary and Final Design Activity	**PDT Lead**	**EC Representative**
A. Submit and review Draft Preliminary Design Report		
B. Review goals, BMPs, and mitigation measures in Environmental Commissioning Technical Memorandum (December 2008 version) as related to facility design		
C. Summarize Materials of Construction		
i. List key products & materials to be used in facility		
ii. Estimate approximate quantities		
iii. Provide MSDS for hazardous materials		
iv. Estimate potential discharge volumes/concentrations of hazardous materials		
D. Provide qualitative summary of potential construction effects to environment (surface water, underground features/habitat, air quality, noise, light, flora, species of concern)		

Environmental Commissioning Checklist		
Preliminary and Final Design Activity	**PDT Lead**	**EC Representative**
E. Provide qualitative summary of potential operational impacts to environment (surface water, underground features/habitat, air quality, noise, light, flora, species of concern)		
F. Review permit/code requirements (including Site Development Ordinance) and summarize expected variances		
G. Review project sustainability guidelines. If applicable, summarize incorporation of guidelines into facility design		
H. Review Variance Request Matrix (see Appendix E of EC Technical Memorandum) and develop mitigation measures for proposed variances. Review measures with EC Rep (Note: this will occur as part of Permit Team review for those items related to Site Development Permit)		
I. If needed, summarize additional mitigation measures to be implemented during construction and/or operations. Review with EC Rep		
J. Submit and review 30% Design Package		
K. Submit and review 60% Design Package		
L. Submit and review construction sequencing and controls specifications		
M. Identify adaptive management opportunities for facility in needed		
N. Submit and review 95% Design Package		
Notes: 1. If an activity is not applicable to facility, write “NA” in acknowledgement cells. 2. Task completion may not occur sequentially.		