UTILITY INFRASTRUCTURE

ELECTRICAL SYSTEMS

The Master Plan for Electrical Facilities for the UTSA Main Campus reflects the overall growth in plant, infrastructure, and buildings expected through the year 2030. The plan also incorporates the goals set forth in *A Shared Vision UTSA 2016*. The last update to the Campus Master Plan was prepared in year 2004 and incorporated buildings and infrastructure in place at that time. Since the 2004 Master Plan was prepared, there have been significant building additions including the Biotechnology Sciences and Engineering Building, Chaparral Village, and the North Parking Garage. In addition, the Central Campus switchgear has been replaced and upgraded to accommodate the growth in campus demand. Current projects include the Engineering Building II which represents additional load.

All campus feeders originate in the main UTSA electrical substation located on the north side of the Central Campus. The UTSA substation is directly adjacent to the CPS Energy substation that provides power to the campus substation at 13.8 kV nominal. The CPS Energy substation has been recently upgraded to incorporate two new 138 kV to 13.8 kV, 40 MVA rated transformers fed from two CPS Energy distribution circuits. The CPS Energy transformers have an ultimate fan-forced rating of 50 MVA each.

The campus main switchgear was constructed in 2006 and consists of a metal-clad switchgear lineup rated at 2000A at 13.8kV and is configured in a main-tie-main arrangement. The switchgear serves eight loops; six rated at 240A and two loops rated at 300A. This equates to 5.74 MVA per loop and 7.17 MVA respectively. The six 5.74 MVA loops existed prior to 2004. The two 7.17 MVA loops were added to serve loads associated with the Thermal Energy Plant II, Laurel Village, University Center II, and the Engineering Building II project currently in construction. The lineup contains two equipped compartments to allow for future expansion. In its present configuration, the switchgear is sized to accommodate the planned programmed growth of the campus, but some feeders will require modification to accommodate the growth. A new feeder loop is proposed to serve the growth of campus housing. The plan to accommodate the load growth is outlined in detail in the Appendix.

The existing peak load on the system was observed in September 2007 at 15.06 MVA. Peak loading on each loop is summarized in the Appendix Volume. Any additional load planned on the existing loops by design teams on new projects should be evaluated based on the existing loading on the loop pair to confirm the final loading of the circuit. Under no circumstance should the design rating of the cable be exceeded with the loop pair tied together. This is to preserve the redundancy in the loop pair.

The design standard configuration for additions to existing loops should accommodate the 240A capacity of the loop and be constructed of EPR, 15kV rated, 133% MV105 in 6-inch conduits. New loops should be constructed of the same type of cable, 750kCMIL in 6-inch conduits.

The campus is equipped with a 3.5 MW diesel/natural gas-fired generator that provides for backup to equipment located at Thermal Energy Plant I. The generator is currently used to provide for peak shaving during the months from June through September. The generator is not capable of providing backup power to the campus as a whole.

There is currently no electrical infrastructure on UTSA Park West. CPS Energy has distribution circuits in service on both Hausman Road and on Loop 1604, but their ability to provide service to the new structures planned on the property will need to be established by the design teams at each phase of growth in the complex. In order to provide for the phased development of the property, the infrastructure to support future electrical and telecommunications systems must be constructed in a fashion that ultimately mimics the infrastructure at the Central Campus; that infrastructure consists of medium-voltage switchgear and underground duct banks as well as underground telecommunication duct banks with redundancy and diverse entry. These systems will need to support the development of vertical structures, parking facilities, site lighting, and sports lighting planned for the new facilities. The anticipated growth of the athletics complex is outlined in the body of this document as well as in the Appendix, where the anticipated electrical demand is outlined as an aid to the design teams.

PLUMBING SYSTEMS

Domestic Water and Fire

The Main Campus is served from an 8" meter on the west (Babcock Road) and a 10" meter on the south (UTSA Boulevard). A comparison of the existing water service records were reviewed and compared to a projected demand based on expected growth. Between 2004 and the end of 2007 the yearly water usage for the Main Campus increased by approximately 50%.

The year 2008 was an extremely dry year in San Antonio and water usage through October 2008 surpassed the total 2007 usage by 6.3%. This would indicate that irrigation may be a significant user of water. By reviewing fire flow test results for recent projects on the Main Campus, an extrapolation was made to estimate the available volume of water available to the campus with the existing infrastructure in place and attempt to determine if the existing infrastructure was capable of serving the ultimate build out of campus. By using the reported flow results at the residual pressure, this analysis indicates the available water being supplied to the Main Campus by the existing system far exceeds the current or expected future average domestic water demands. Existing water pressure on campus is reported to be low and causing delivery issues. Fire flow tests available for review indicates that static pressures within the system range from the low 70's to the high 50's and the residual pressure drops during the tests were reported to be between 7-12 psi. As the domestic and potential irrigation demand is increased, it may be necessary to implement booster stations to increase the water pressure for adequate service. Operational timing of these systems may be needed to minimize pressure drops within the system during normal operating hours of the campus.

The UTSA Park West Campus will require an entirely new network of on-site piping to deliver domestic and fire protection services to new amenities. There is an existing 30" water main to the south (Hausman Road) that will require tapping and at least one new meter to serve the property.

Irrigation

Currently all UTSA Campuses utilize the domestic and fire lines to serve the landscape irrigation needs. At the time the infrastructure for these campuses was developed, recycled water was not available. Even with the availability of recycled water for landscape irrigation purposes, the cost and practicality to construct a separate irrigation system within the existing campuses that could utilize this resource is impractical.

Any irrigation system for UTSA Park West will require new installation. Recycled water is not currently available at UTSA Park West and future plans to provide the service in the area are unknown. Irrigation at UTSA Park West will more than likely come from domestic and fire lines installed to serve new facilities.

Sanitary Sewer

The Main Campus is currently served by two sanitary sewer outfall locations. The northwest portion of campus is served by a 12" line that outfalls into a 24" line maintained by the San Antonio Water System (SAWS) along Babcock road. This line was installed to relieve some of the burden that was being put on the Central Campus system. This system is expected to have sufficient capacity for the geographical area it serves. The Central Campus system ultimately out-

falls into a 21" line maintained by SAWS. Flow studies of the existing sanitary sewer system were performed at several points of interest in the Central Campus watershed in early 2005. This study identified a significant inflow and infiltration condition during wet weather. The average dry weather flow rates for the monitored locations reported 0.14 million gallons per day (mgd) and 0.71 mgd during wet weather. The reported Average Peak Measured Used Pipe Capacity was 48%. Over the past few years, upgrades to the central campus system have been made at key locations to accommodate the expected development within this area of campus. Future growth will require some additional sanitary sewer infrastructure to be installed that connects into the existing system. These improvements are shown in the Appendix.

UTSA Park West is undeveloped and will require an all-new sanitary sewer system. There is an existing 15" sewer line that parallels Huesta Creek and divides the site into a northern and southern half. There is a 12" main to the northeast and a 10" main to the south (Hausman Road). Because the site naturally drains toward the center (Huesta Creek), it makes sense to drain the sewage in the same direction.

Storm Drain

The UTSA Central Campus and UTSA Park West have drainage tributaries that traverse through their properties. The limits of the 100-year storm event or flood plain have been identified along these tributaries to demarcate the limits of future development around these areas of potential flooding. The existing storm drainage systems within the Central Campus have historically performed satisfactorily and appear to be adequate for current conditions and future growth of the campus. New storm drain systems at Park West should be designed to utilize the natural tributary (Huesta Creek) as best as possible. The need for underground systems can be limited (or eliminated) with proper planning. The increase in flow to the existing channel will most likely require improvements to the channel to prevent erosion.

NATURAL GAS SYSTEM

Natural gas for the UTSA Central Campus is provided from CPS Energy mains running parallel to Loop 1604 and extended into the campus. Adequate gas is available for expansion. Buildings which will not have steam provided by a central energy plant will require natural gas to generate domestic hot water. Estimated increase in demand for domestic water heating is 50,000 cubic feet per hour.

Natural gas for UTSA Park West will be provided from CPS Energy mains running parallel to Hausman Road and extended into the campus. There is also an existing 16" gas main on the west side along Loop 1604 frontage road that can potentially serve the proposed campus. Adequate gas is available for expansion. Buildings which will not have steam provided by a central energy plant will require natural gas to generate domestic hot water. Estimated increase in gas demand for domestic water heating is 11,000 cubic feet per hour. The estimated demand will be greater if the commercial development scheduled for Phase 5 is residential in lieu of mercantile.

MECHANICAL SYSTEMS

Thermal Energy Plant 1 is located on the northwest corner of the UTSA Main Campus's Academic Core and provides chilled water for cooling and steam for heating and domestic hot water. The plant has five chillers with a total capacity of 9500 tons and firm capacity of 6500 tons. The plant also has two steam boilers with a capacity of 60,000 pounds per hour (lb/h). One of the boilers has been modified to reduce its capacity to 30,000 lb/h, bringing the total capacity to 90,000 lb/h and a firm capacity of 30,000 lb/h.

Thermal Energy Plant 2 is located on the south side of campus and provides chilled water for cooling and hot water for heating. Thermal Energy Plant 2 chilled water is connected to the Central Campus distribution loop through the 16" lines extended as part of the Biotechnology Sciences and Engineering Building project. The plant currently has two chillers with a total capacity of 2880 tons and firm capacity of 1250 tons. Thermal Energy Plant 2 has been designed for future installation of 4 chillers, 6 total for an actual capacity of 9020 tons and a firm capacity of 7390 tons.

The plant also has two hot water boilers with a total capacity of 1200 boiler horsepower (bhp) and a firm capacity of 400 bhp. One additional 800 bhp boiler can be installed, 3 total for an actual capacity of 2000 bhp and a firm capacity of 1200 bhp.

Phases 1 and 2 of the Campus Master Plan will add approximately 7000 tons of chilled water load and approximately 66,000 lb/h of steam, or the hot water equivalent, of heating load. Distribution to new buildings should be designed to allow any current and future Thermal Energy Plant to provide cooling and heating water or steam.

Redistributing thermal loads from one plant to the other will enable the existing thermal energy plants to provide chilled and hot water or steam to Phase 1 and 2 proposed buildings in the Academic Core of Central Campus. New buildings in West Campus will have stand-alone systems until a future thermal energy plant is built at the inception of Phase 3.

Phases 3 and 4 of the Campus Master Plan will add approximately 26,000 tons of chilled water load and approximately 190,000 lb/h of steam, or the hot water equivalent, of heating load. A new thermal energy plant will be constructed on the western portion of campus that will provide chilled water and hot water to existing buildings in West Campus and new buildings throughout the campus.

Stadiums and practice fields are projected for development of UTSA Park West during Phases 1 and 2. The mechanical will serve supporting facilities such as press offices, locker rooms, bathrooms, etc. The cooling load for these two phases is projected at 110 tons refrigeration and 21 boiler horsepower (bhp) of hot water demand. A new thermal energy plant can be constructed at this time to serve the facilities with space for future growth. An alternative is to provide an air-cooled chiller for cooling water and natural-gas-fired boiler for heating water during these first two phases.

Growth during Phases 3 and 4 will increase the demand for chilled water to 1275 tons refrigeration and 215 bhp of hot water. If a thermal energy plant was not constructed previously, one should be constructed during Phase 3 to maximize energy savings from a water-cooled chiller and larger boilers. Additional information about the anticipated loads and proposed distribution can be found in the Appendix.