T e c h n i c a l M e m o r a n d u m

Date	October 2008
Project	Tennessee State University Campus Master Plan
Subject	6. Physical Master Plan 6.5 Utility Infrastructure
From	Barge Cauthen / I.C. Thomasson Associates
To	Tennessee State University

The proposed Master Plan values are broken up into two planning periods (Short Range and Long Range). As such, the Short Range Planning Period will include the Brown-Daniel Library Expansion. The Long Range Planning Period will include the remaining proposed buildings.

1. DOMESTIC & FIRE PROTECTION WATER

Recommendations

- a19 & a20 (Long Range Planning Period) – The 33rd Avenue corridor from Albion Street to John A. Merritt Boulevard and projected north to Dr. Walter S. Davis Boulevard is a major utility passage. One of these utilities is an 8-inch water main that could be rerouted, but rerouting the existing sanitary and storm sewers would be a large scale project. If buildings are constructed in these areas, it is recommended that open air courtyards are developed to work around this utility corridor.

2. ELECTRIC

The substation capacity of 10,000 kVA will be exceeded with an additional ~4000 kW load. Therefore, the existing distribution system cannot accommodate the total projected new building demand. There are no improvements that can be made to the existing system once this demand is exceeded without replacing both substations with larger transformers and replacing all the underground 5kV cable with larger 5kV cable. This would be a major project and could cost as much as $20,000,000 to complete.

The projected Northeast Housing & Support expansions are located very far from the underground distribution system. Therefore, it is recommend to have a separate service from the Utility for this area and not feed these buildings from the existing underground distribution system

New buildings can be fed from the following methods of distribution:

1. Use existing padmount switches that have spares switch compartments or that become available due to buildings that are demolished.

2. Install new padmount switches into the existing underground loop system by splicing into existing manholes and extending the underground loop. Use the new padmount switches to feed the new buildings.

3. SANITARY SEWER

Recommendations

- a1-a4 Development Zone (Long Range Planning Period) – Given the overall lack of sanitary sewer mains in the Love Learning Resource Center Loop area, a new sanitary sewer main will be needed. The proposed sanitary sewer system improvements shown on the generalized Proposed Sanitary Sewer Plan (VI.E.3 figure 1) will total approximately:
- 600 L.F. of 8" PVC, SDR-35 pipe
- a13 & a14 Development Zone (Long Range Planning Period) – Given the lack of sanitary sewer mains in 36th Avenue North between Albion Street and Alameda Street, a new sanitary sewer main will be needed. The proposed sanitary sewer system improvements shown on the generalized Proposed Sanitary Sewer Plan (VI.E.3 figure 1) will total approximately:
- 300 L.F. of 8" PVC, SDR 35 pipe
- a19 & a20 (Long Range Planning Period) – The 33rd Avenue corridor from Albion Street to John A. Merritt Boulevard and projected north to Dr. Walter S. Davis Boulevard is a major utility passage. One of these utilities is an 8-inch water main that could be rerouted, but rerouting the existing sanitary and storm sewers would be a large scale project. If buildings are constructed in these areas, it is recommended that open air courtyards are developed to work around this utility corridor.

4. STORM SEWER

Recommendations

- Stormwater quality and quantity regulations. Given the current stormwater regulations as outlined in the Metropolitan Nashville – Davidson County Stormwater Management Manual, stormwater quality and quantity must be addressed for any improvements that require a Grading Permit. The proximity of the TSU campus to the Cumberland River may negate the need for stormwater quantity detention if the corresponding storm sewer infrastructure is of a size to adequately convey the developed stormwater to the River. Stormwater quality may be best addressed on an individual project basis, thus creating unique opportunities to implement a variety of sustainable stormwater quality measures that may actually link well with various college and school curriculums. These stormwater quality measures would be best handled as standard building improvements associated with individual projects, instead of Master Plan entities.
- a19 & a20 (Long Range Planning Period) – The 33rd Avenue corridor from Albion Street to John A. Merritt Boulevard and projected north to Dr. Walter S. Davis Boulevard is a major utility passage. One of these utilities is an 8-inch water main that could be rerouted, but rerouting the existing sanitary and storm sewers would be a large scale project. If buildings are constructed in these areas, it is recommended that open air courtyards are developed to work around this utility corridor.

5. STEAM

As discussed in Section 3, there is currently adequate capacity in the central plant and in the distribution system with some room for expansion. The installed capacity of all the boilers adds up to a total of 226,000 pounds per hour (pph) of steam output, which is well above the current campus peak load of 61,106 pph. However, the peak capacity of the central steam plant is limited by several factors. The coal-fired boiler requires major renovation before it can be functional, which reduces the useable capacity to 151,000 pph. The 10" plant header has a capacity of only 105,000 pph. The most severe limitation is the current deaerator (DA), which is sized for 90,000 pph. However, this limit is still significantly more than the peak campus consumption, and it allows for some growth on campus.

There is capacity for the addition of a number of buildings on the TSU campus. The distribution system is ample in all directions so that there are no restrictions on where those buildings can be added. Before the last third of the proposed buildings could be added, a renovation of the boiler house to replace or enlarge the DA would be necessary. Furthermore, if the university determines that it requires back-up capacity, an additional boiler of at least 48,000 pph capacity would be needed. This could be provided by renovating the existing coal fired boiler or by installing another gas fired package boiler.

As discussed in Section 3, the coal-fired boiler renovation has been estimated to have a probable cost of approximately $1,650,000. According to TSU personnel the permit for the facility has been kept current.

6. CHILLED WATER

The recommended long term solution to the increased chilled water load is installing a second chiller plant on the opposite end of the system from the existing plant. This chiller plant should have two chillers sized at 1000 tons each. This chiller plant could be stand-alone or it could be housed in proposed Building a20 or a21. Based on similar sized chiller plants on other college campuses, the anticipated probably cost of installing a second chiller plant would be on the order of $4,000,000. If the current building plans cannot support the installation of a new chiller plant, then a compromise would be to install a 500 ton chiller in the new library and tie in to the chilled water distribution system so that this new chiller could off load capacity, making it available to other new buildings.

7. COMMUNICATIONS

Currently, the existing computer server room is at capacity and would require additional space to accommodate any growth. This would include the distance learning initiatives. With this in mind, the additional space needed would be approximately 2000 square feet. The space will accommodate any new requirements including the Title III fiber optic project, listed below, additional servers required for distance learning along with the relocation of the existing network server infrastructure. As identified in previous comments, the current phone system is at capacity and its replacement would likely reside in the same location as the other network equipment based on previous recommendations. It is imperative the proposed server room be in proximity to the CIT Staff. A computer lab in the basement of the Humanities building has been identified as a possible location for this room. This location will maximize the potential of the space as well as keep the server room

in close proximity to the CIT staff. This space should be constructed using current "Data Center" technology and practices to maximize the use of the space. Estimated cost for the new server room is $360,000.

The CIT Dept has received Title III funding to upgrade the fiber optic cable plant for the computer networks. During this project TSU will be installing a new single-mode fiber optic infrastructure to most major buildings on campus. All computer network function will be transferred to this infrastructure. Based on current capacity of the existing duct leading into this building, a new duct bank shall be required. Current funding in the amount of $1.2M.

The PBX Switch will not handle much more growth. It is at capacity and cannot handle more than a 5% increase in demand on the switch. This equates to approximately 50 phones in any capacity whether staff, faculty, or student life. In order to minimize the replacement cost of the entire phone system at this time, it is recommended that the University research a Voice over Internet Protocol (VoIP) Phone solution. The VoIP system can be used for the administrative/faculty function of the campus and the existing analog PBX will remain for student needs however, it will eventually need to be phased out. By doing so the University can distribute the budget impact over several years. The VoIP system is completely scalable and has the ability to grow infinitely as the school grows. This system shall have distinct advantages when considering the Avon Williams campus and the potential cost savings by converting to an IP solution. Estimate for to add a VoIP solution is $700,000. Estimate for a new PBX Switch is $2M. VoIP Solution is recommended.

It is the engineer's opinion that each of these items should receive serious consideration as they are the backbone of the next generation of learning. Each of these items are support structures to the University. Each has a unique impact if left unmanaged or neglected.