8 | Infrastructure and Utilities Framework

This section of the California State University East Bay, Hayward Campus Master Plan identifies the campus infrastructure and utility systems needed to accommodate the projected future growth of the campus. The Infrastructure and Utilities Framework is organized according to the following systems:

- Renewable Energy
- Central Utility Plant
- Electrical System
- Natural Gas
- Potable Water
- Sanitary Sewer
- Storm Drainage
- Communications.

Several overarching guiding principles apply to the framework and have been detailed below.

- A campus-wide commitment to sustainable design extends to the utilities and infrastructure framework. Sustainable strategies have been proposed throughout the framework and include renewable and emerging technology energy systems, energy monitoring systems, and recycled water use for landscape irrigation and other non-potable campus water needs.

- The underground utility systems will be designed for long-term use with capacity and service lives of 20 to 50 years. Major underground utilities result in significant surface disruptions during their construction and repair. These disruptions should be minimized to reduce costs, maintain accessibility, and reduce safety hazards.
- Life-cycle costing will be used in lieu of initial costs in the planning and design of utility systems for specific projects. Life-cycle costing adds the original cost of a piece of equipment to its operating cost over the equipment's lifetime. This gives an accurate analysis of the real overall cost of a purchase and makes for more accurate and informed comparisons.
- To avoid the costly relocation of major utility systems in the future, utility corridors will be identified and utilized throughout the future development of the campus. In planning for new underground utility corridors, consideration will be given to locating them where they will have the least disruptive impact if and when they are accessed in the future.
- The planning and design of all campus facilities will be coordinated with the Facilities Management Staff responsible for the supporting utility infrastructure systems. The coordination will start at the planning stage and a formal review process will be implemented to allow utility and other maintenance related issues to be addressed throughout the course of the project's design and construction.

The existing utility diagrams are based on available information provided in 2007 and 2008; a new utility survey should be completed in 2009.

Renewable Energy

A realistic goal for the University is to maintain a 10% renewable energy portfolio throughout its lifetime.

Photovoltaic installations (PVs) are projected to comprise the majority of the campus renewable energy portfolio. To provide approximately 7% of the required energy at full build-out, the photovoltaic contribution will have to grow from 1,200 MWh to approximately 2,000 MWh, requiring estimated total roof coverage of 100,000 square feet (Figure 46). PVs can be installed on existing or future buildings. They may also be installed on the top floor of parking structures and in parking lots as shade devices.

The remaining 3% of the renewable energy portfolio is projected to be provided by wind energy. The Hayward campus is well-suited to this technology due to the frequent strong winds that affect the campus nearly year-round. It is estimated that wind turbines could contributed an estimated 800 MWh annually, as summarized in Figure 47.

Both building-integrated vertical and horizontal axis turbines as well as free standing (mast / pole mounted) vertical and horizontal axis turbines could be used. These wind turbines typically generate 2 kW to 10 kW and have typical dimensions as follows:

- Vertical Axis Turbines
    - Cage height: 4 – 15 feet
    - Cage diameter: 5 – 20 feet
    - Mounting height: Minimum 10 feet for roof mounted and 30 feet for free standing.

Figure 46
Roof Area Required for Photovoltaics at Campus Build-out

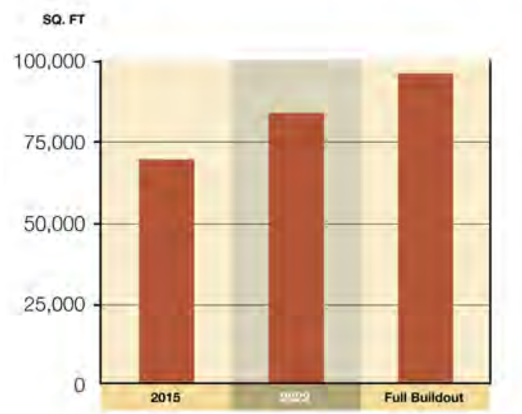
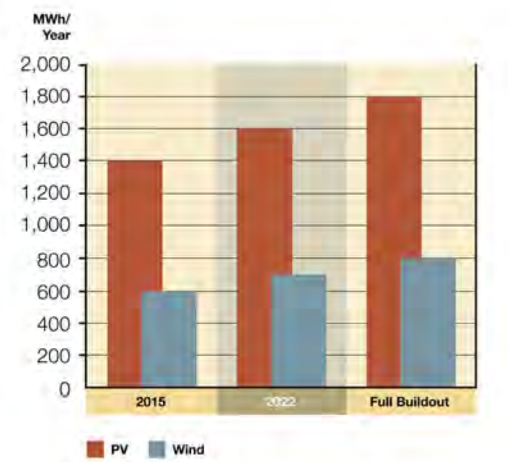


Figure 47
Renewable Energy Generation at Campus Build-out



- Horizontal Axis Turbines
    - Rotor diameter: 5 – 30 feet
    - Mounting height: Minimum 10 feet for roof mounted and 30 feet for free standing.

Building-integrated turbines should be located on those buildings that are determined to have the best exposure to wind. Free standing turbines should be located on the slopes in the open space areas along the western edge of campus, where the winds are strongest and where they produce the least disturbance to campus activities.

Depending on location, wind turbines can provide a strong statement, and can act as landmarks for the Hayward campus.

Central Utility Plant

Of the 23 California State University Campuses, 20 currently operate centralized cooling and heating plants; only Channel Islands, Monterey and East Bay do not. The Hayward campus master planning process presented an opportunity to assess and potentially improve systems and operational efficiency by exploring the feasibility of a new central utility plant.

Existing Conditions

Currently, the Hayward campus operates independent cooling and heating plants located at and serving the following buildings:

- University Library / Warren Hall
- Meiklejohn Hall
- Student Health Center
- Physical Education and Gym
- Music Building
- Art and Education.

Several of these existing plants are approaching the end of their useful lives and will require replacement and / or upgrade over the course of the master planning horizon. The remaining buildings on campus currently have limited or no cooling and heating capacity at all.

Proposed Central Utilty Plant Design and Phasing

The equipment capacity at the new central utility plant will be sized to serve new non-residential campus buildings being designed after the adoption of this master plan. The plant, eventually covering an area of approximately 30,000 square feet, will house centralized chillers, cooling towers, boilers, pumps, and associated electrical and control systems. It will serve the campus buildings through a buried utility network (conceptually illustrated in Figure 48).

The central utility plant is anticipated to grow to the following size at full build-out:

- Heating: 33,000 MBH
- Cooling: 2,250 Tons.

The plant capacity will grow in parallel with the phasing of the new construction on campus. The plant is located in close proximity to the majority of buildings to be constructed in the near term. This will limit the trenching and piping required for the distribution of cooling and heating energy. It is recommended that the budget for each upcoming building accommodate an appropriate expansion of the plant and associated piping costs.

The trenching of utilities from the central utility plant will serve new construction and will also tap into existing building plants forming a system of "satellite plants." The intent is to eventually develop a common piping system being served by the central utility plant and distributed building plants combined. This will allow for improved operational diversity and efficiency of scale.

The growth of the central utility plant (in equipment size) will depend on the requirements of the new construction being built. For instance, when a new building is constructed, the central utility plant capacity

Figure 48
Central Utility Plant Distribution
at Full Build-out

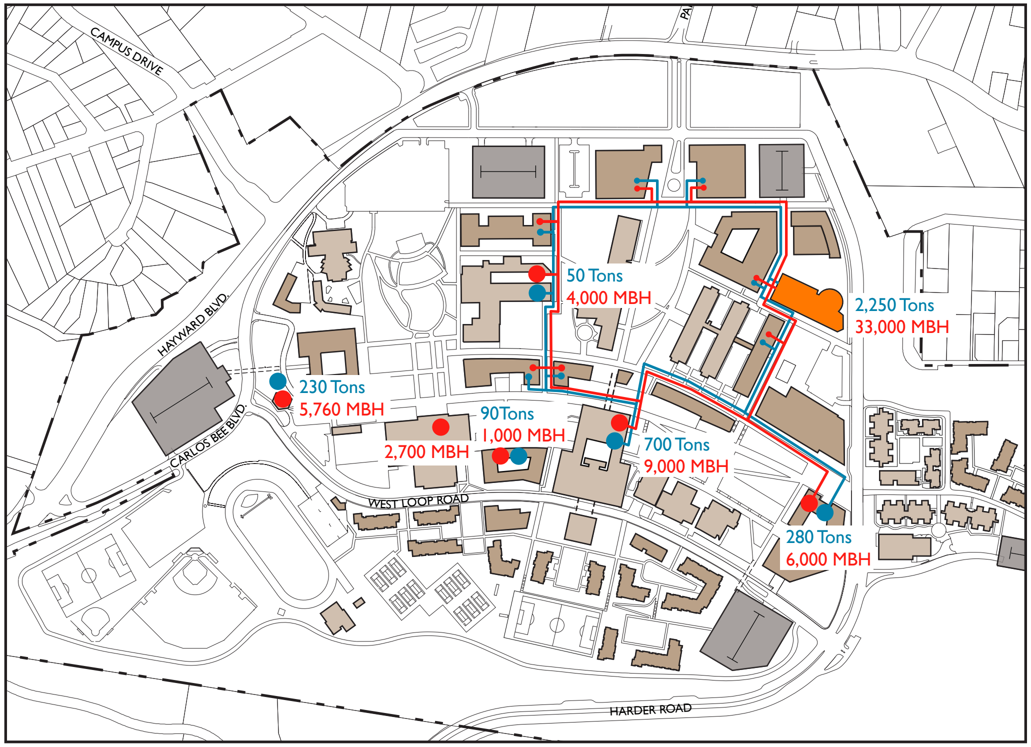
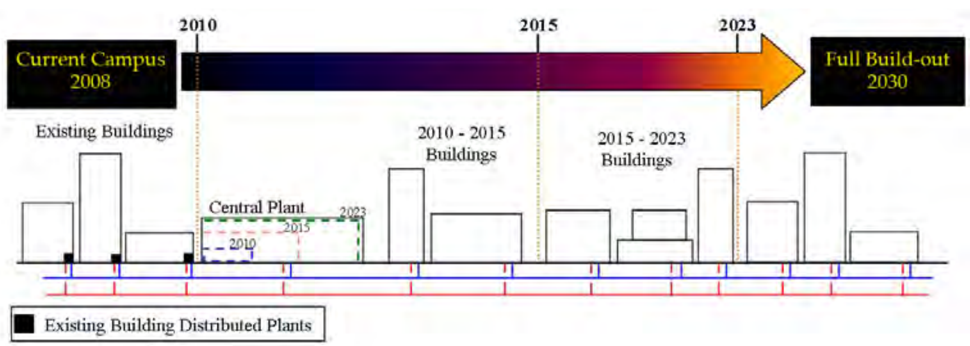


Figure 49
Central Utility Plant Phasing Diagram



will be increased to support additional demand based on:

- The combined capacities of the central plant and satellite plants
- An appropriate increment in equipment size for efficient operation.

When existing buildings with satellite plants are replaced in the future, the satellite plants will also be replaced to keep the system intact.

It is anticipated that by incorporating the capacities at existing building plants, the cooling capacity required at the central utility plant is reduced by approximately 250 tons at full build-out.

Such an approach of integrating a central utility plant with existing satellite plants has the following benefits:

- Improved diversity captured from buildings with varying program, function and occupancy
- Centralized location, operation and maintenance for future buildings
- Increased system efficiency
- Lower overall installed capacity
- Adaptability to self-generation: technologies such as co-generation or waste-to-energy, rely heavily on economy of scale. A central utility plant provides an opportunity for future exploration and integration of such applications.

Utility Systems

Electrical System

Existing Facilities

Power for the Hayward campus is purchased from Arizona Power (APS) and is brought to campus via Pacific Gas & Electric lines. The main electrical feed is at the Switch Gear House northeast of Carlos Bee Boulevard. The switch gear is 12,000 kV. A main electrical line runs from the Switch Gear House to Manhole 1 and on through the main part of campus southeast to Harder Road at Pioneer Heights. There are five branch electrical lines (see Figure 50):

- From Manhole 2 and west of the soccer field to the Field House
- From Manhole 2 northeast to Manhole 3B northeast of the University Theater
- From Manhole 7A to the Student Health Center
- From Manhole 7B past the Science Building to the American Language Program building
- From Manhole 7B to the University Union and Meiklejohn Hall.

There are also several lateral duct banks

- Manhole 4 to the Music Building
- Manhole 5 to the Physical Education and Gym building
- Manhole 6 to the Art and Education building.

Pioneer Heights is fed from a separate feed located east of campus along Grand View Avenue.

There are three electrical loops: A, B, and C. Most buildings are fed from loops B and C, but the Data Center is fed from loops A and B. Several electrical manholes are starting to fail and are currently being rebuilt. The electrical distribution system is starting to reach the end of its design life.

Existing electrical demand is approximately 6,500 kW or 20,000 MWh per year. Electricity is provided to all buildings at 240/480 volt, except for the Art and Education Buildings which has 120 volt service.

Future Development

In the future, a few existing electrical duct banks may need to be relocated from under future building sites. Duct banks affected may include:

- The main campus feed through Manhole 1.
- The electrical line from Manhole 6 to the Art and Education building.
- The electrical line between Manholes 7B and 8A.

Cal State East Bay is in the process of replacing the electrical distribution system throughout campus. This plan should be implemented in order to provide more reliable electrical service. In addition, the following electrical duct banks should be installed to provide for a looped system:

- From Manhole 3B along Old Hillary Road to near the American Language Program Building.
- From Manhole 2 along West Loop Road and southwest of Parking Lots A and B to Manhole 7.

Figure 50
Existing and Proposed
Electrical System

Natural Gas

Existing Facilities

The campus natural gas system is fed from the Pacific Gas & Electric system at Carlos Bee Boulevard. The main meter is at the old boiler plant in the corporation yard, with a second meter near the Music Building. The distribution system is not looped. The main gas line is a 4-inch diameter line running along Carlos Bee Boulevard and Old Hillary Road to the site of the former central utility plant at the corporation yard. There are five branch lines within the campus (see Figure 51):

- A 2-inch gas line which connects to the 4-inch main line at Carlos Bee Boulevard and runs to the Field House
- A 3-inch to 2.5-inch line which runs from the corporation yard to the Arts and Education Building
- A 3-inch line which runs from the corporation yard to Pioneer Heights and Meiklejohn Hall
- A 3-inch line which runs from the Science Building to the Library
- A 2-inch line which runs from the Support Temporary Offices to the Music Building
- The available natural gas maps do not show how Pioneer Heights is fed
- The natural gas pressure is 10 psi. There have not been any significant problems with meeting natural gas demands on campus. However, there have been some gas leaks in the past, and the University would like to reduce the overall system pressure.

Future Development

Depending on the ultimate location and configuration of new buildings, several gas lines night need to be relocated:

- A 3-inch gas line northeast of the Science Building
- A 2-inch gas line / water line southeast of the Corporation Yard.

Future natural gas demands are not anticipated to have a significant impact on the distribution system which has excess capacity. However, the natural gas distribution system is approaching the end of its design life, potentially resulting in more frequent gas leaks. The University will consider replacing the natural gas distribution system over the next 10 to 15 years, especially if the number of leaks increases significantly.

Steam

Existing Facilities

CSUEB previously had a central utility plant facility located near the corporation yard area. This system was taken out of service over 10 years ago, but most of the steam distribution system is still in place. There are four branch steam lines (see Figure 51):

- From the corporation yard to the Art and Education building and then to Steam Manhole 10 near the Student Health Center
- From Steam Manhole 10 to the Music Building
- From Steam Manhole 10 to Meiklejohn Hall and the bookstore
- From the corporation yard to the Support Temporary Offices.

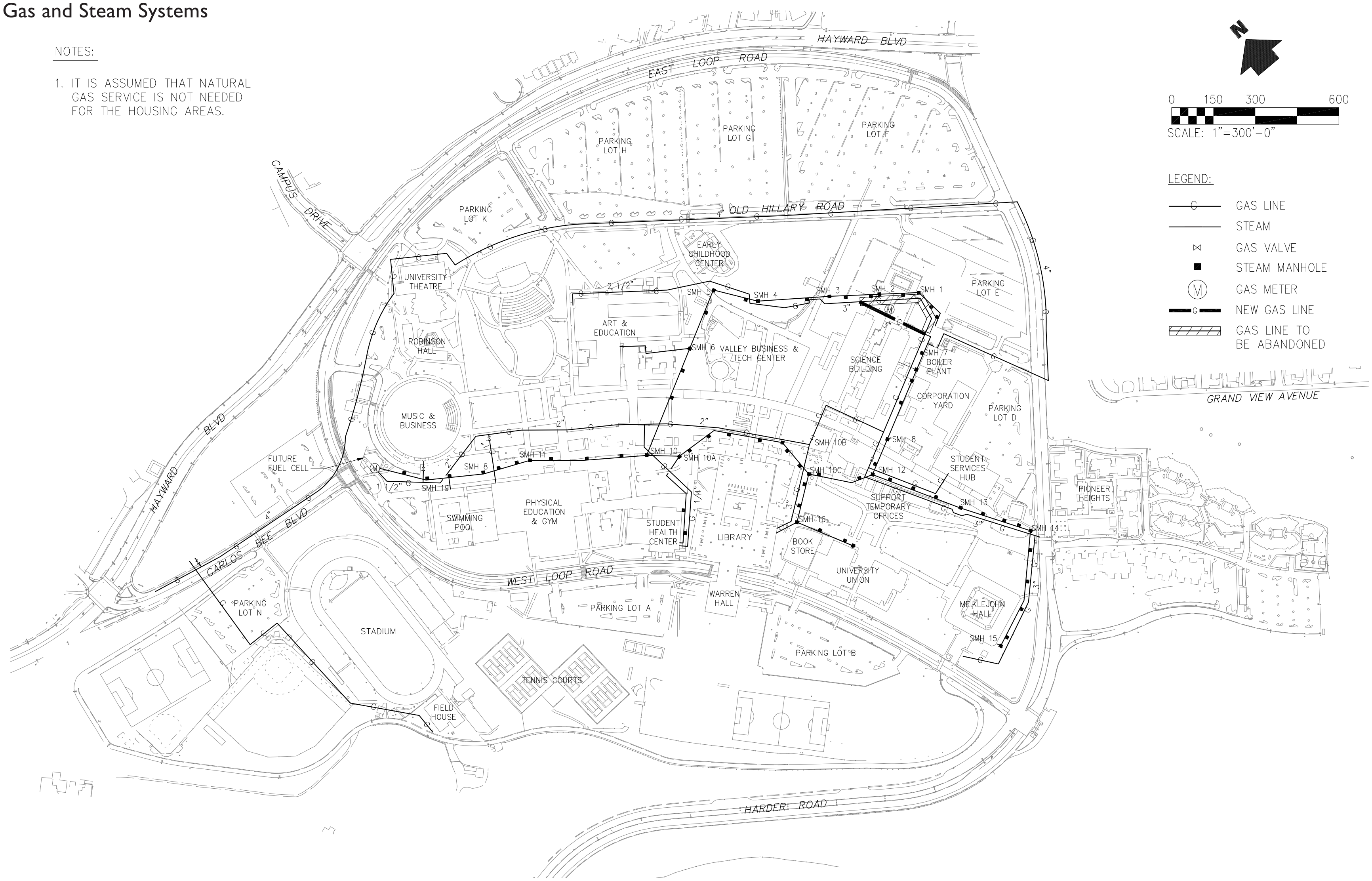
Future Facilities

Since the steam lines have not been used for over 10 years, many of the lines are no longer usable. Therefore, a new distribution system from the new central utility plant will be implemented, distributing both hot and chilled water. See Figure 48.

Figure 51
Existing and Proposed
Gas and Steam Systems

NOTES:

1. IT IS ASSUMED THAT NATURAL GAS SERVICE IS NOT NEEDED FOR THE HOUSING AREAS.



Potable Water

Existing Conditions

The campus is served by City of Hayward water system, which in turn purchases water from the San Francisco Hetch Hetchy Water System. There are two feed points from the City's system, each marked by a water meter in a vault, at the following locations:

- Campus Drive between Hayward Boulevard and Highland Boulevard (northeast side of campus). This connection feeds into a 10-inch diameter pipeline which connects to the main campus distribution system near the Theater. A 10-inch pipeline can provide up to 2,000 gpm.
- East Loop Road near Lot F (southeast side of campus). This connection feeds into a 10-inch diameter pipeline which connects to the main campus distribution system at two points: the intersection of Old Hillary Road and East Loop Road, and near the Corporation Yard.

The distribution system consists of 6-inch and 8-inch diameter pipelines running northwest-southeast along the stadium access road, West Loop Road, northeast of the University Library, and northeast of the Science Building (see Figure 52). These pipelines are looped via pipelines along Carlos Bee Boulevard, East Loop Road, and four pipelines in the campus interior. It appears that Pioneer Heights is fed via an 8-inch pipeline near Parking Lot D, but maps were unavailable to determine the routing of the water distribution system within Pioneer Heights.

Current water demand ranges from approximately 100,000 gallons per day in the winter to 300,000 gallons per day in the summer. This variation is mainly due to increased irrigation demands in the summer, which account for over 75% of the water used then.

The water flow into each building is metered. The largest water user is the swimming pool.

Irrigation system backflow preventers are currently being installed.

There is one pressure zone on campus, which ranges from 125 to 150 psi. More control over system pressure is desired and could be accomplished by installing pressure regulating valves at building connections.

Fire Flow Demands

There are approximately 23 fire hydrants located within the campus. These fire hydrants are connected directly to the water distribution system. They all appear to be served by 6-inch diameter or larger pipelines. General practice is to feed fire hydrants from pipes with minimum diameters of 6-inch, in order to be able to provide 1,500 gpm at less than 20 feet per second. The actual fire flow requirement depends upon building height and type.

The Hayward Fire Department provides fire protection for the campus. They check the fire hydrants on a regular basis, and have not expressed any concerns to date. The locations and spacing of future fire hydrants should be determined by the City of Hayward Fire Marshall, however, based on a review of Figure 52, it appears that the following areas are under served by fire hydrants:

- Near the Valley Business & Tech Center
- Near the Music Building
- The area between Parking Lot B and Harder Road

Figure 52
Existing and Proposed
Potable Water System

- Pioneer Heights
- The baseball field area.

Future Development

Some planned buildings may be constructed on top of existing water pipelines, requiring them to be relocated. These pipelines include a 6-inch water line southeast of the Science Building, and a 6-inch water line southeast of the Corporation Yard as shown on Figure 52.

As discussed in the Sustainable Campus Framework section, Cal State East Bay has set a goal to reduce water consumption by 35% to 60% as compared to a business as usual scenario. If Cal State East Bay were to continue the current rate of water consumption, the average water demand would increase to 528,000 gallons per day (gpd) at build-out (assuming only compliance with current building codes), with maximum (peak) water demand at 865,000 gpd. The conservation goal of 35% reduction is achievable through implementation of xeriscaping, irrigation controls, artificial turf, and building fixture retrofit strategies. The higher target of 60% includes the introduction of a recycled water program.

Even in the worst case, with the business-as-usual maximum flow rate, it does not appear that new pipelines will be required to handle water demand at build-out.

Sanitary Sewer

Existing Facilities

The campus sanitary sewer system discharges to the City of Hayward's system via an 8-inch diameter sewer line along Carlos Bee Boulevard. There are four main branches discharging into that sanitary sewer (see Figure 53):

- An 8-inch diameter sanitary sewer running from the Theater to Carlos Bee Boulevard
- A 15-inch to 18-inch diameter sanitary sewer running from Pioneer Heights southwest of West Loop Road to Carlos Bee Boulevard
- An 8-inch to 12-inch diameter sanitary sewer running from the Science Building to the West Loop Road sanitary sewer near the Tennis Courts
- A 6-inch to 8-inch diameter sanitary sewer running from the Art and Education Building to the Science Building sanitary sewer.

All of the sanitary sewers are gravity flow, except near the Field House where a lift station is located.

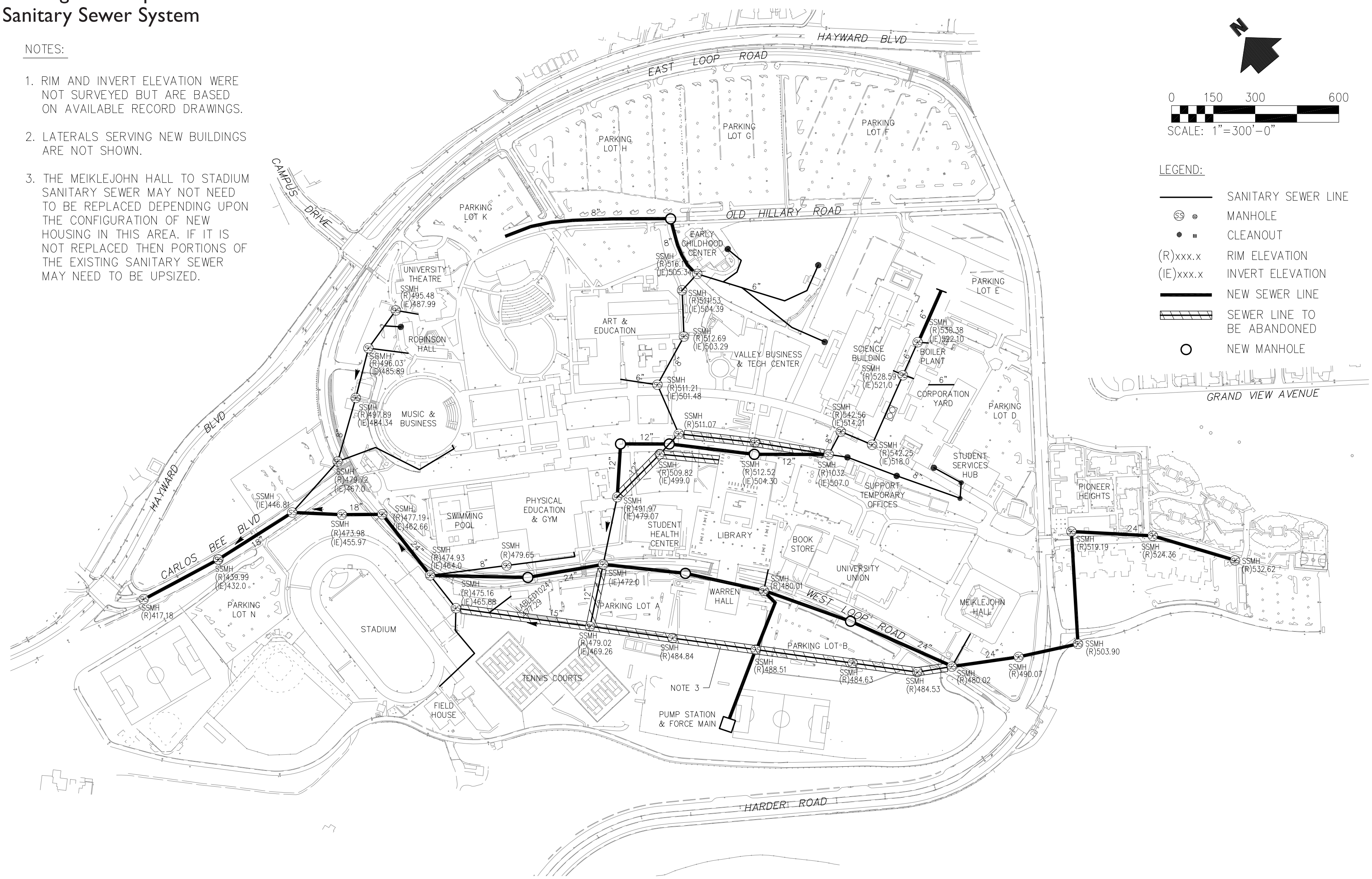
Existing sanitary sewer flows can be estimated based on water demand. Assuming that 0% of irrigation water flows into the sanitary sewer, and assuming that 100% of water demand at student housing and academic buildings flows into the sanitary sewer, then existing average sanitary sewer flows are approximately 143,000 gpd.

Much of the sanitary sewer system piping is clay and was constructed in the 1960s. There have been some backup problems near Robinson Hall and near the Student Services Hub. An infiltration / inflow study

Figure 53
Existing and Proposed Sanitary Sewer System

NOTES:

1. RIM AND INVERT ELEVATION WERE NOT SURVEYED BUT ARE BASED ON AVAILABLE RECORD DRAWINGS.
2. LATERALS SERVING NEW BUILDINGS ARE NOT SHOWN.
3. THE MEIKLEJOHN HALL TO STADIUM SANITARY SEWER MAY NOT NEED TO BE REPLACED DEPENDING UPON THE CONFIGURATION OF NEW HOUSING IN THIS AREA. IF IT IS NOT REPLACED THEN PORTIONS OF THE EXISTING SANITARY SEWER MAY NEED TO BE UPSIZED.



has not been conducted but going to low flow fixtures could increase plugging in the sanitary sewers.

Future Development

Future buildings may be constructed on top of existing sanitary sewers, requiring those sewers to be relocated. These pipelines include:

- A 12-inch to 15-inch sanitary sewer running between Meiklejohn Hall and the Stadium. It may be possible to leave this sewer in place, depending upon the configuration of the proposed housing in this area.
- A 12-inch sanitary sewer running between the Science Building and the Student Health Center.

At build-out, average sanitary sewer flows would increase to 406,000 gpd and maximum sanitary sewer flows would increase to 572,000 gpd if no efficiency measures are taken and if no buildings are retrofitted. Implementation of retrofits and efficiencies would reduce these numbers significantly. This maximum flow rate equates to about 397 gpm.

Most of the increased flows will come from new student housing. The sanitary sewers in these areas will therefore need to be replaced (see Figure 53). Specifically:

- The existing 18-inch diameter sanitary sewer from Pioneer Heights to Parking Lot B should be replaced with a 24-inch diameter sanitary sewer.
- A pump station and force main will be required to transport sanitary sewage from the housing proposed for the Tennis Courts area to the sanitary sewer along West Loop Road.
- The sanitary sewer from Parking Lot B to the Stadium should be replaced to accommodate new buildings. This sanitary sewer should also be upsized to 24-inch diameter to handle the increased flows from new and existing student housing areas.
- The sanitary sewer from the Stadium should be replaced with an 18-inch diameter sanitary sewer to handle the increased flows from the campus. It should be noted that this diameter is smaller than the pipelines upstream because the pipe slope here is fairly steep (i.e., greater than 0.5 foot per foot).

There is limited information available on the existing inverts, so conservative slopes were assummed. It may be possible to down size some of these new pipelines if the slopes available are greater than assumed.

Storm Drainage

Existing Facilities

Campus storm drains discharge to several drainages located northeast and southeast of campus. Other storm drains discharge to East Creek, which is carried under Lots F, G, H, and K through a 48-inch diameter pipeline. The creek flows from southeast to northwest. There are ten main storm drain branches (see Figure 54):

- The 48-inch East Creek storm drain, which runs east to west and discharges west of Hayward Boulevard near Campus Drive.
- A series of catch basins located along East Loop Road between Pioneer Heights and Parking Lot F, which discharge through an unknown outfall to East Creek.
- A 12-inch to 21-inch storm drain running from the Science Building area to Old Hillary Road, and then along Old Hillary Road to Hayward Boulevard where it discharges through Outfall A1 west of Hayward

Boulevard. Several catch basins around the University Theatre also discharge through Outfall A1.
- Two catch basins located west of the Music Building, which discharge through Outfall B1 west of Hayward Boulevard.
- An unknown size storm drain running from the Science Building area to the Music Building. It is not clear where this storm drain discharges to, but it may connect to the West Loop Road storm drain.
- An 8-inch diameter storm drain running along West Loop Road, which discharges through Outfall C1 west of Hayward Boulevard.
- A 15-inch to 18-inch diameter storm drain running from Pioneer Heights to the Tennis Courts, and then from there through a 36-inch diameter storm drain to Outfall 2A south of Harder Road. There may be environmental issues with this outfall as it discharges into an existing creek.
- Two catch basins located along Harder Road, which discharge through Outfall 2B south of Harder Road.
- A series of catch basins located south of the tennis courts, which discharge through Outfall 2C north of Harder Road.
- A 10-inch diameter storm drain running from the tennis courts to the soccer field. It appears that this storm drain discharges to grade near the Field House.

There have been some drainage problems along West Loop Road, including a main which backed up into an adjacent building.

A bioswale has been installed near the Valley Business and Technology Building.

Future Development

Several of the planned buildings may be constructed on top of existing storm drains, and so these storm drains may need to be relocated. These pipelines include:
- Three storm drain systems in the new student housing area southwest of Pioneer Heights, depending upon the configuration of the new housing buildings. The storm drains in this area include:
    - A 10-inch storm drain running from Pioneer Heights southwest to a 15-inch storm drain
    - An 8-inch storm draining running southeast of and parallel to the 8 to 10-inch storm drain
- A 21-inch storm drain running between Carlos Bee Boulevard and Hayward Boulevard
- A 15-inch to 36-inch storm drain running from Harder Road at West Loop Road southwest to Harder Road
- A series of catch basins and connecting storm drains in Parking Lot H within the footprint of the new parking structure
- Other smaller storm drain laterals as required by new building footprints.

It is anticipated that storm drainage flows will not increase significantly, as much of the future development is occurring in already developed areas.

Stormwater Management

In order to encourage sustainable stormwater design for CSUEB, each new building project will be required to develop a stormwater management plan that addresses both quantity and quality control, by reducing impervious cover, promoting infiltration, and capturing and treating the stormwater runoff.

Stormwater discharges in California are covered by National Pollution Discharge Elimination System (NPDES) regulations through the General Permit for Discharges of Stormwater from Small Municipal Storm Sewer Systems (General Permit). General Permits are issued by the California State Water Resources Control Board (SWRCB) and generally require dischargers to use best management practices (BMPs) wherever possible.

BMPs, as described in the California Stormwater Quality Association's Stormwater Best Management Practice Handbook (BMP Handbook), are defined as "any program, technology, process, siting criteria, operating method, measure, or device which controls, prevents, removes, or reduces pollution."[1] BMPs include detention ponds, infiltration trenches, and constructed wetlands. The BMP Handbook lists several BMPs that could be used at CSUEB. These are discussed below, along with some initial comments.

- Infiltration Trench
  An infiltration trench is a long, narrow rock-filled trench with no outlet that receives stormwater runoff. The runoff infiltrates through the rock into the soil. Infiltration trenches are often paired with vegetated swales so that sediments are removed upstream of the infiltration trench, which helps to reduce clogging. Infiltration trenches could be installed along walkways within the campus as new walkways are installed or existing walkways are renovated.
- Infiltration Basin
  An infiltration basin is a shallow impoundment designed to allow stormwater to infiltrate into the groundwater. Because these basins can be relatively large and are very dependent upon the permeability of the underlying soils, these may have limited applicability to CSUEB.
- Detention Pond
  A detention pond is a depressed area where stormwater runoff is detained. The main difference between a detention pond and an infiltration basin is that detention ponds are designed to hold the stormwater for a period of time prior to releasing it into the storm drainage system, while infiltration basins are designed to hold all of the stormwater until it infiltrates into the groundwater. As such, detention ponds can be smaller and so may be easier to incorporate into new building areas. Detention ponds would be easiest to incorporate into larger project areas such as Pioneer Heights.
- Vegetated Swale
  A vegetated swale is an open shallow channel with vegetation. Stormwater runoff flows into the swale, where it is filtered by the vegetation. Some of the runoff then infiltrates into the groundwater, while the remainder flows into catch basins and into the stormwater drainage system or into infiltration trenches. Vegetated swales require relatively long lengths of landscaped area and nearby stormwater drainage facilities, and as such would work best along the parking areas and adjacent to the walkways at CSUEB.
- Bioretention
  Bioretention consists of a landscaped area into which stormwater is directed and allowed to infiltrate or flow into catch basins. At CSUEB, bioretention could be incorporated into new building projects by directing

1 California Stormwater Quality Association (CASQA), *California Stormwater BMP Handbook*, January 2003.

Figure 54
Existing and Proposed Storm Drainage System

NOTES:

1. RIM AND INVERT ELEVATION WERE NOT SURVEYED BUT ARE BASED ON AVAILABLE RECORD DRAWINGS.
2. THESE TWO STORM DRAINS MAY BE CONNECTED.
3. THESE TWO STORM DRAINS MAY BE CONNECTED.

roof drains into landscaped areas away from buildings and then locating adjacent catch basins so that the runoff flows through the landscaped area prior to flowing into the catch basins. These landscaped areas could be above ground planters with underdrains to allow rainwater from the roof drains to flow through the planter into the groundwater below or into perforated pipes located at the bottom of the planter.

- Water Quality Inlet
  A water quality inlet is typically a catch basin which contains one or more chambers that promote sedimentation of coarse materials and separation of free oil from stormwater. It's easiest to install these with new developments rather than to retrofit existing catch basins.
- Wet Vault
  A wet vault is a permanent water pool or buried tank which stores rainwater for future use. Due to pest control concerns, it may not be feasible to use permanent water pools, but buried tanks could be installed to collect stormwater from new projects.

It may be possible to incorporate some of these BMPs, such as vegetated swales, into the existing campus, however, most are more applicable to new construction projects. Therefore, it is recommended that, for all new projects at CSUEB, these BMPs be evaluated and, where feasible, incorporated into projects.

Communications Infrastructure

Existing Facilities

The campus's communication system is connected to AT&T's system near the Switch Gear House and near the Early Childhood Education Center. There are four main branches (see Figure 55):

- From Carlos Bee Boulevard near East Loop Road to Old Hillary Road, along Old Hillary Road to the corporation yard area, and in two sub-branches along both sides of the Science Building to the Student Services Hub
- From the Music Building to the Support Temporary Offices
- Running along West Loop Road to the Bookstore
- Running along the soccer field to the Field House and then to Warren Hall.

The existing communication maps did not show how communications are fed to Pioneer Heights.

The telecommunications system was recently upgraded. Some of the telecommunications lines are very deep.

Future Development

Some future building sites may require relocation of communication lines. These lines are located:

- From near the Physical Education and Gym building to the Art and Education building
- From the Field House to Warren Hall
- From the Student Health Center around Warren Hall to the Science Building.

To serve the new housing at Pioneer Heights and near Parking Lot B, as well as new buildings in the center of campus, the following communication lines should be installed:

- From the Student Services Hub southeast around Pioneer Heights, and then northwest near Parking Lot B to the Tennis Courts
- From Old Hillary Road and east of the Valley Business and Tech Center to the Science Building.

Figure 55
Existing and Proposed
Telecommunication System