Napa Valley College

Facilities Master Plan

Volume 2 - Engineering Reports

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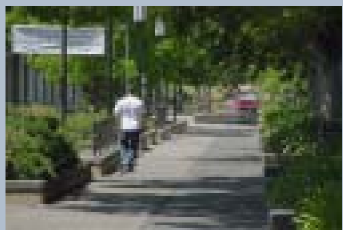
Contents



Introduction

As part of the Long Range Facilities Master Plan process, four engineering disciplines – transportation, civil, mechanical and electrical – provided review, analysis, and recommendations related to the Napa campus. Transportation and civil engineering issues affected the Facilities Master Plan, especially proposed access points, on site circulation and parking. These recommendations will be further tested during the environmental review process when more detailed studies will occur.

The mechanical and electrical engineering report affected primarily the location of the central plant, but will act as the basis for the Utilities and Infrastructure Plan proposed as a next step in the planning process.

Transportation Report

Purpose

This report provides an overview of existing transportation conditions at Napa Valley College and key recommendations for consideration during future development and growth of the campus.

Existing Conditions

The overview of existing conditions serves to inform future transportation and general planning recommendations. Observations conducted in April and May 2003, an inventory of parking occupancy conducted over a two-day period in early May, traffic counts taken at key points for the 24-hour period of May 7, 2003, and interviews of Napa Valley College staff and other local officials form the basis of the analysis.

Access to Campus

Access to Napa Valley College is provided for automobiles, bicycles, buses, and pedestrians by State Route (SR) 221, which intersects with State Route (SR) 121 just north of the campus *(Figure A, Regional/site map)*. These transportation facilities serve local and regional traffic and are often impacted by the multiple demands placed upon them. The campus is well placed, given the dispersion of the student body within Napa County, as well as those traveling from Solano and Sonoma counties *(Figure B).* The key roads providing access to campus are described below:

State Route 221. SR 221 forms the eastern boundary of Napa Valley College. Direct access to Napa Valley College is provided at two driveway locations (one-way in and one-way out) at the east edge of campus. Additional access is provided from SR 221 by Streblow Drive (described below) at the south edge of campus. SR 221 is a major north-south four-lane highway beginning at its junction with SR 29 / SR 12 in southern Napa and continuing north to the intersection of Kansas Avenue, where it becomes Soscol Avenue. It serves as one of two southern entries to the city of Napa.

Fehr & Peers

Napa Valley College

PROJECT STUDY AREA

FIGURE A

Napa Valley College Students Residence by Zip Code

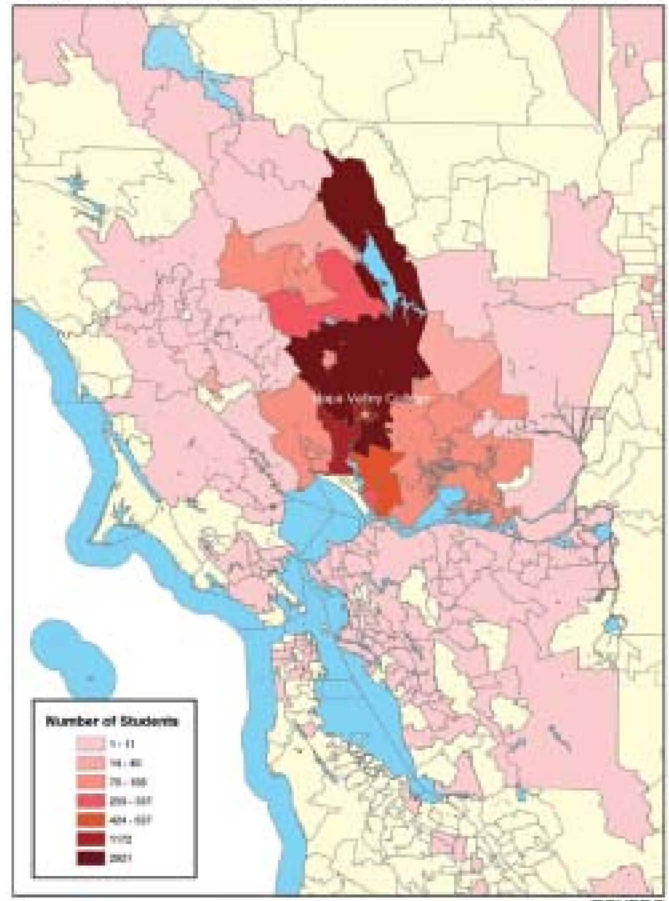


FIGURE B

Access to Campus (continued)

State Route 121. SR 121 forms the northern boundary of Napa Valley College but with no direct access to campus. SR 121 is a major two-to-four lane facility beginning near Sears Point Raceway in Sonoma County and continuing north through the city of Napa before terminating at SR 129, near Lake Berryessa. SR 121 serves as a key recreational route through Napa and Sonoma counties. SR 121 has four lanes along the northern boundary of Napa Valley College, and work is underway to widen SR 121 across the Napa River to four lanes within vicinity of the college. SR 121 intersects SR 221 at a signalized intersection at the northeast corner of campus.

Streblow Drive. The southern edge of campus is accessed from Streblow Road off of SR 221. In addition to providing access to the college, this two-lane road provides access to JFK Regional Park and the Municipal Golf Course along the Napa River. There is a bicycle path along Streblow between SR 221 and the regional park.

Automobile Circulation

Students and faculty commute to Napa Valley College from locations throughout Napa and surrounding counties. The vast majority travel to the campus by automobile, accessing the campus from SR 221 and Streblow Road. James Diemer Drive serves as the main campus circulator along the east side of campus, feeding the parking lots and connecting to the service road that serves the western and northern sides of the campus buildings. *(Figure C, Existing Transportation Facilities).*

Key constraints to improved vehicle access and circulation are as follows:

- Lack of direct access to and from SR 121, which results in increased travel time for vehicles traveling to and from campus through the intersection of SR 221/ SR 121, which operates at congested conditions during peak periods.[1]

- Lengthy vehicle queuing for vehicles exiting campus from James Diemer Drive to SR 221 during peak periods. Currently, just one lane is provided for vehicles marking this left turn. Approximately 273 vehicles made a left turn during the peak hour of 11:45 am to 12:45 pm. During the highest quarter hour period of 11:45 am to 12:00 noon, approximately 112 vehicles made a left-turn.[2]

Campus Entrances

Traffic volume counts were conducted on May 7, 2003, to measure the number of vehicles entering and exiting the roadways serving Napa Valley College. However, it should be noted that proximity of the campus to JFK Regional Park and the Municipal Golf Course makes a precise determination of campus-bound trips difficult, particularly for traffic entering from the south, since a portion of that traffic also accesses adjacent facilities, and traffic exiting the college accesses those facilities as well.

Over 7,000 vehicles enter campus daily. Approximately 4,300 vehicles enter campus from the east through the inbound driveway/exit ramp off of SR 221, while 2,300 vehicles enter James Diemer Drive northbound from Steblow Drive. (A much smaller number of additional vehicles enter the southeast parking lots directly from Streblow Drive; however, precise traffic counts are not available for that entrance).

Footnotes

[1] Intersection was rated at LOS of F (indicating congested conditions) during October 1997 Napa State Hospital Traffic Study by Fehr & Peers Associates.

[2] Volume numbers provided by hose counts on May 7, 2003. Turn ratios obtained from 1997 Napa State Hospital Traffic Study conducted by Fehr & Peers Associates.

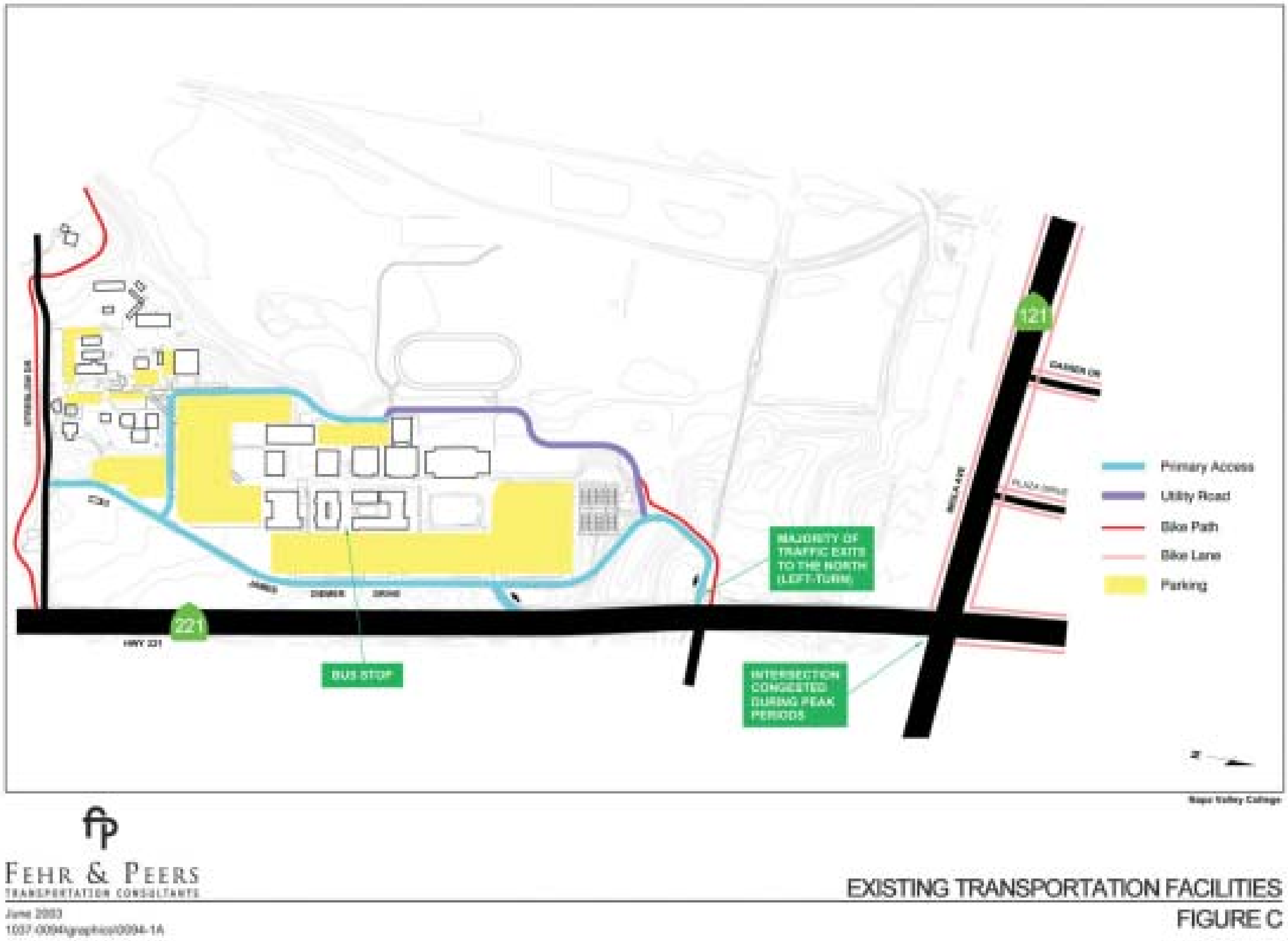
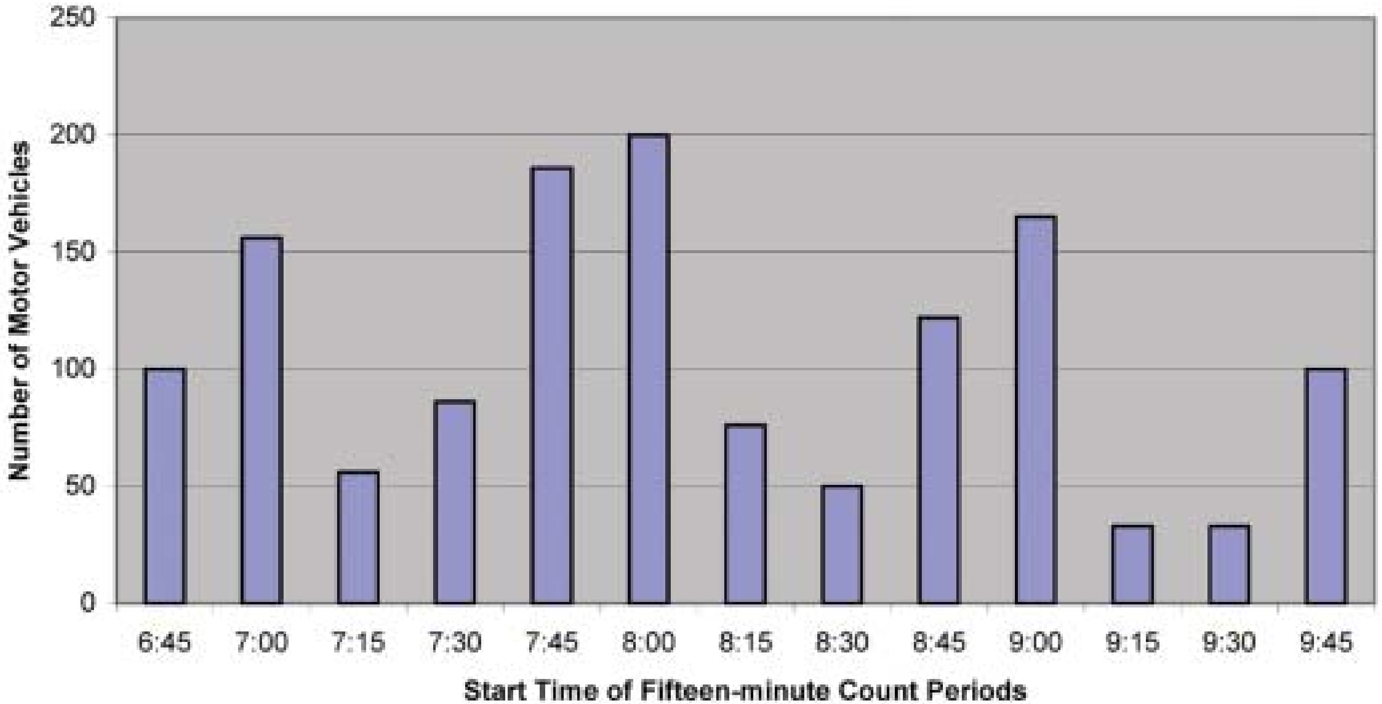

121
221
HWY 221
BUS STOP
MAJORITY OF TRAFFIC EXITS TO THE NORTH (LEFT-TURN)
INTERSECTION CONGESTED DURING PEAK PERIODS
Primary Access
Utility Road
Bike Path
Bike Lane
Parking
FEHR & PEERS
TRANSPORTATION CONSULTANTS
June 2003
EXISTING TRANSPORTATION FACILITIES
FIGURE C

Chart 1. Motor Vehicles Entering Campus from Southbound SR 221 into James Diemer Drive



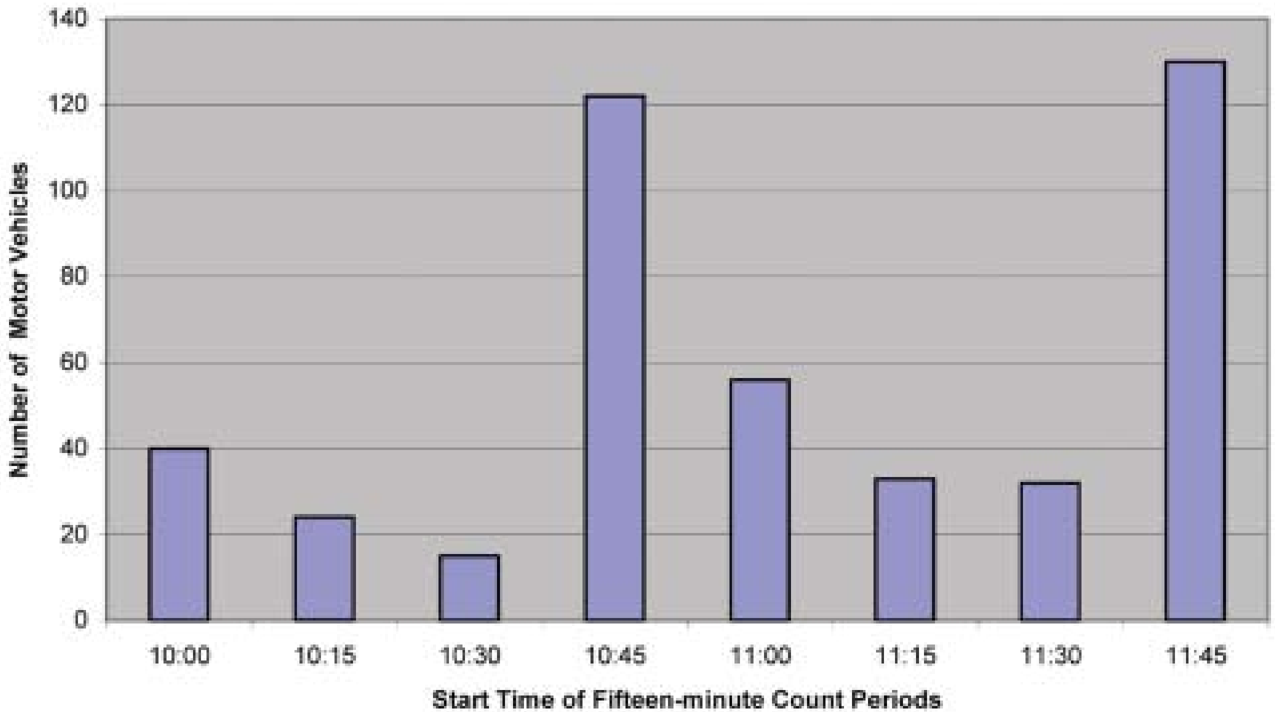
Over 900 vehicles entered the campus during the morning peak hour of 7:30 am to 8:30 am; this includes 548 vehicles entering from the campus driveway/exit ramp from SR 221 southbound to the campus parking lots and 376 vehicles entering northbound James Diemer Drive from Streblow Drive. Some additional campus-bound vehicles may access campus from Streblow Drive by entering the parking lots at the southwest corner of campus.

At the SR 221 driveway, nearly 200 vehicles entered campus during fifteen-minute periods *(chart 1 above)*. The vehicles leaving the ramp empty directly into the main parking aisles adjacent to James Diemer Drive. This could potentially create a hazardous situation or impact internal circulation, with cars observed exiting SR 221 at higher speeds and no traffic control until in the middle of the parking lot past James Diemer Drive.

Internal Circulation

Vehicle circulation and parking occupancies tend to be highest in the east and south parking lots, as those are closest to the campus buildings. The lack of signs to direct vehicles may confuse visitors in some cases. Additionally, creation of a continuous ring road around the rear (north and west) of campus buildings (on the current utility road) could allow for improved circulation to campus buildings and future parking facilities; however, a ring road would not provide access to a significant supply of on-campus parking. It would be desirable to designate a centralized receiving location for campus deliveries, preferably on the north or west side of campus, to avoid impacts to parking and circulation on the east and south sides of campus.

Chart 2. Motor Vehicles Exiting Campus at Intersection of James Diemer Drive and SR 221



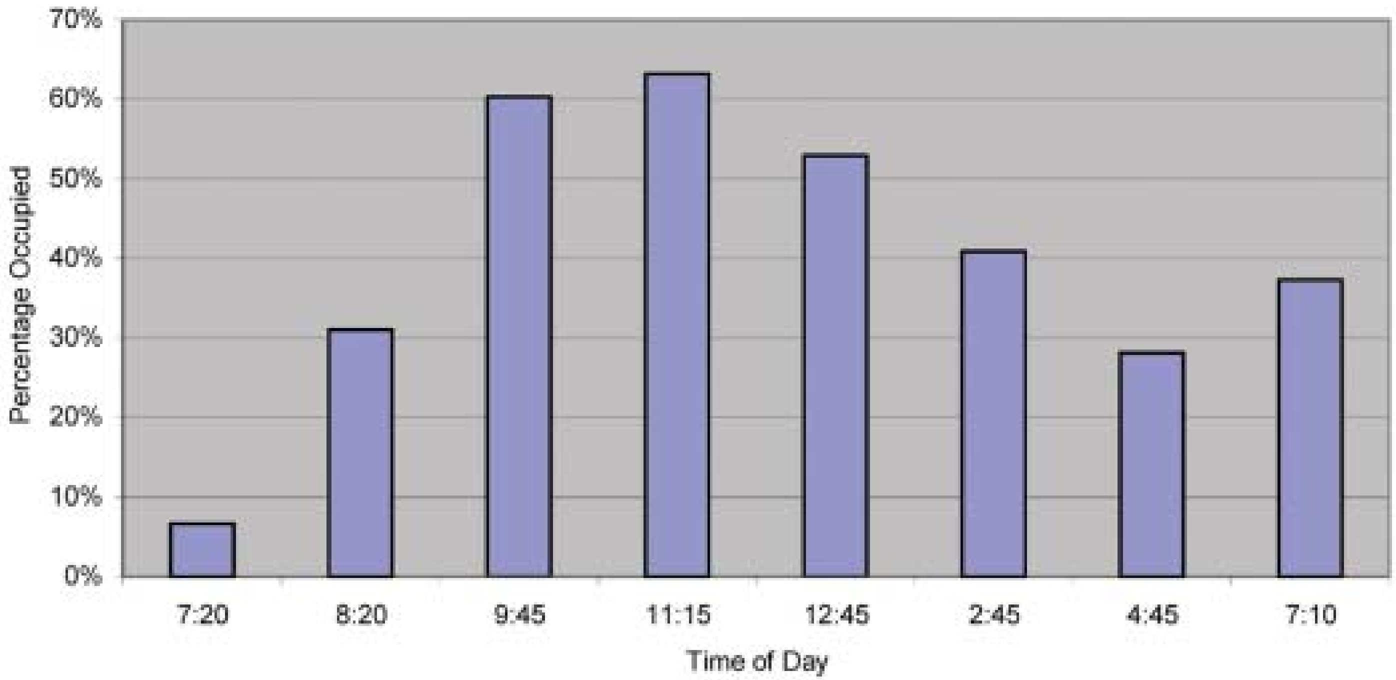
Campus Exits

The campus exit through James Diemer Drive to SR 221 has capacity constraints during peak periods. There are two lanes at this exit: a left-turn lane and a through/right-turn lane. The vast majority of vehicles (approximately 86 percent) are turning left at this intersection[1], resulting in queuing during peak periods. Conventional standards generally indicate the need for two left turn lanes when left-turn usage exceeds 250 vehicles per hour. Currently, approximately 273 vehicles were making a left-turn out of a total of 314 vehicles exiting during the peak hour at this location (11:45 am to 12:45 pm). Additionally, during individual peak fifteen-minute periods, up to 132 vehicles were measured for that intersection approach, with approximately 114 of those vehicles making a left turn. The chart above portrays the peak 15-minute periods for vehicles exiting at this location (*chart 2)*.

Footnotes

[1] Based on turning movement observations conducted for 1997 Napa State Hospital Traffic Study, Fehr & Peers

Chart 3. Observed Occupancy of Parking Lots



Parking

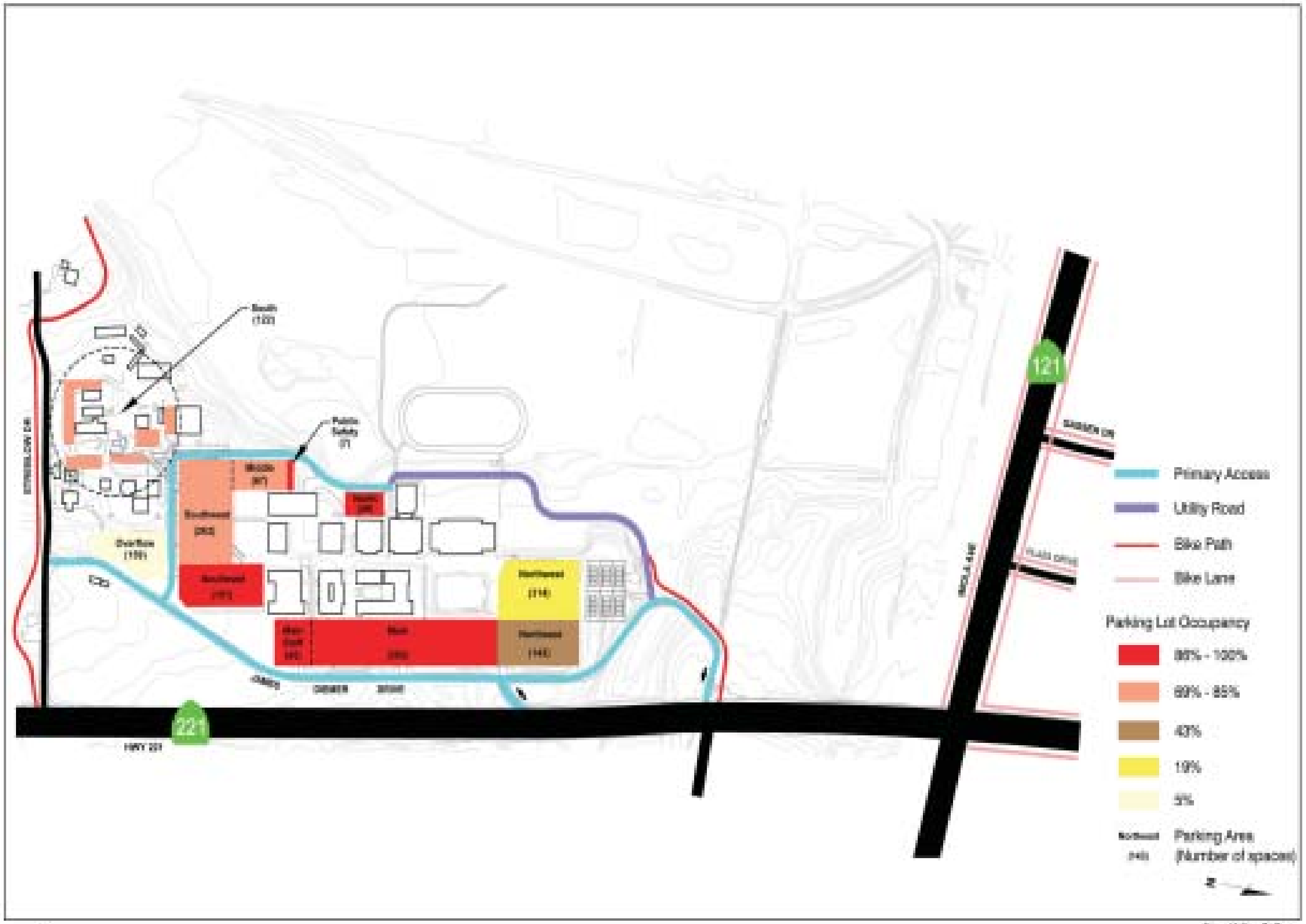
Observations of parking lot occupancy were conducted over a two-day period in early May. Overall averages of parking lot occupancy were calculated, based on visual drive-through counts conducted every few hours. The total number of parking spaces on campus is 1,732. Results indicated that, even during peak periods, overall occupancy did not exceed 1,266 vehicles parked on campus, indicating 63 percent occupancy, well below the 85 to 90 percent level at which parking lots are considered to be essentially full *(Chart 3 above)*. Given current enrollment of 7,500 students, this equates to a parking demand of one parking space per 5.9 students.

The main parking lot to the east of the college was approximately 90 percent occupied from 9:00 am to noon; however, additional capacity was available in other lots, and few vehicles were observed using the overflow parking lot. Anecdotal information from staff, as well as aerial photography, indicates much higher parking occupancy throughout campus during the first several weeks of each semester.

Table A: Parking Occupancy Counts

Parking Lot	South	Middle	Public Safety	North	South-east	South-west	Over-flow	Main Staff	Main	North-west	North-east	Total
	122	67	7	49	151	263	159	65	392	314	143	**1732**
Time of Day	**South**	**Middle**	**Public Safety**	**North**	**South-east**	**South-west**	**Over-flow**	**Main Staff**	**Main**	**North-west**	**North-east**	**Total**
7:20 AM	5	10	1	13	3	6	0	13	32	41	0	**124**
8:20 AM	36	48	3	42	49	96	0	48	236	101	9	**668**
9:45 AM	100	69	3	50	131	219	4	73	420	163	28	**1258**
11:15 AM	106	69	6	51	120	259	5	65	408	145	31	**1266**
12:45 PM	106	66	3	51	85	171	6	68	362	131	21	**1069**
2:45 PM	80	55	4	46	48	127	3	64	294	106	15	**841**
4:45 PM	22	29	2	32	30	44	1	43	251	118	14	**586**
7:10 PM	126	39	1	30	85	120	10	20	276	99	3	**809**

Source: parking occupancy counts conducted by Fehr & Peers, May 2003



Napa Valley College

PEAK DAILY PARKING LOT OCCUPANCY

FIGURE D

Early Semester Parking Occupancy

Interviews conducted with college staff indicate that parking occupancy is highest during the beginning of each semester. By comparing the enrollment for early May with that at the beginning of the semester (late January) an estimate of early semester parking occupancy was derived. Based on this comparison, it is estimated that peak parking occupancy during the early semester is approximately 73 percent, which still indicates a great amount of overall available parking. However, anecdotal evidence suggests that early semester parking occupancy is approaching capacity, suggesting that rates of driving to campus may decline as the semester progresses. One possible explanation for the drop in occupancy during the late semester, beyond the normal student drop rate, could be that casual carpooling develops as the semester progresses, reducing the number of vehicles traveling to and from campus. Although extreme semester peaks were apparently not captured by this analysis, it is inadvisable to design campus parking facilities to meet this infrequent demand, even if it were observed.

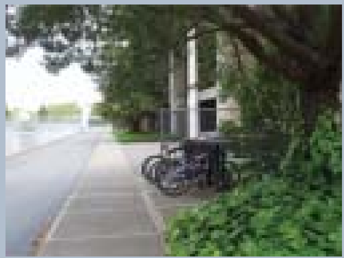
Public Transit

The VINE, the local Napa valley transit service, provides two routes serving Napa Valley College. A new schedule went into effect May 5, 2003. The current schedule is similar to the previous one. The campus continues to be served by Route 10, the major north/south line for the VINE, but frequency has been upgraded and made more consistent. The local route was also enhanced from a single direction loop to a more functional bi-directional route, with service from approximately 7:00 am to 7:00 pm; the college is the terminus for this route.

All transit service appears to be underutilized although observations took place during the transition of the route and schedule change. Greatest observed usage takes place around noon, when approximately 10 students were waiting to board the bus. The current transit stop, while circuitous for northbound buses to reach, is nonetheless sited in a central location and has no vehicle conflicts for pedestrians waiting and boarding.

The Marketplace Shopping Center is a major transfer point for the VINE, and access to the campus could be greatly enhanced by the extension of at least one additional route to the campus, rather than the current terminus at the shopping center. This improvement could also provide more access to the shopping center and, among other things, the various dining choices there for students.

Conceptual plans are currently being considered for possible implementation of a commuter rail line which would serve Napa and Solano counties using current “wine train” tracks located to the west of campus. A Napa Valley College stop would be located just north of SR 121 between the Napa River and SR 221. This project is still under consideration, but it would likely be many years before implementation. Anticipated schedules would likely be programmed to generally serve commuters. Further revision would most likely be required for this to be a viable transit option for students and part-time faculty.



Safe and secure bicycle parking should be located in visible locations, preferably near key campus entrances and buildings.

Bicycle Access, Circulation, and Parking

Bike Lanes/Access

The only bike lane through campus is a small segment extending into the campus adjacent to James Diemer Drive exiting to SR 221. SR 221 to the east of campus is a designated bike route north of Imola until it becomes Soscol Avenue, although it is not clearly marked, and the intersection is extremely busy and difficult for bicyclists. An alternate route could possibly be implemented from SR 121 via the proposed entrance across from Marketplace Shopping Center at Plaza Drive. A $50,000 grant has been awarded to the college to study this extension of bike lanes into campus.

Although there are bike lanes along Imola and the Napa River Bridge, the bridge approaches are dangerous as the traffic lanes merge prior to crossing the bridge. There is an ongoing construction project to improve the crossing by doubling the number of lanes crossing to four, eliminating the approach issue and improving access.

Bicycle Storage Facilities

Three small wave racks for bicycle parking are provided on campus, located at the pool, the criminal justice area, and the library. A short row of plastic bike lockers is adjacent to the wave rack in front of the library. These facilities are listed on campus maps as an additional facility towards the south end of campus that appears to have been removed or relocated.

Current administration of bike lockers is handled by Special Services. This information is not widely disseminated, diminishing access. Other issues include difficulty in obtaining return of bike locker keys, since no security deposit is collected. This results in added downtime of the facility while awaiting new keys, as well as increased operating expenses.

Pavement improvements and ADA upgrades (such as permanent ramps) are recommended for the pedestrian network.

Pedestrian Access and Circulation

The intra-campus pedestrian network functions fairly well. Wide pathways in a grid within the main campus access all areas. Areas of concern are cracked and aging pavement, lack of easily visible internal directional signs, and the need for full and permanent implementation of ADA standard facilities throughout the campus. (Temporary ADA ramps have been installed in some locations.)

Pedestrian linkages connecting Napa Valley College to adjacent areas are lacking, with the only options entailing walking along the shoulder of SR 221 or crossing from sidwalks leading to the state hospital, and then entering the campus through the east campus entrance/exit of James Diemer Drive or the bike path adjacent to the James Diemer Drive exit.

Key Recommendations

General Policy Recommendations

A key element affecting the current circulation and parking conditions on campus is the class schedule, which results in higher parking occupancies during the late-morning hours and heavier outbound travel from 11:45 am to 12:45 pm. Future campus scheduling could avoid or mitigate the need for the costly expansion of transportation facilities through policy changes intended to reduce the "peaking" characteristic of campus activities by spreading classes and other events throughout the day and evening hours, and the week and weekend. Key policy recommendations are to:

- Revise the class schedule to spread classes throughout the day and evening to minimize extreme peaking of parking and traffic during the late morning to afternoon period
- Offset start and finish times for other programs, such as the Criminal Justice Program, from regular classes to further spread peak usage of the campus.

Motor Vehicle Circulation

The key issues for improving circulation are the provision of direct access to the north campus from SR 121 and the provision of additional left-turn capacity for vehicles exiting campus at SR 221 (although this may be less necessary if direct access to provided to SR 121).

Campus Entrances and Exits

Campus access would be improved by extending Plaza Drive into the campus from SR 121, providing direct access to and from the north campus from SR 121 and eliminating the need for many vehicles to travel through the SR 221/ SR 121 intersection. This extension would follow the corridor soon to be studied for bike lanes. Environmental concerns would need to be studied in detail *(Figure E)*.

Provision of an additional entrance point from the north would provide a connection to existing commercial establishments and services along SR 121 and improve access for future development considered for the northwest corner of the site. It is recommended that this roadway intersect SR 121 perpendicularly.

Campus Entrances and Exits (continued)

Additional left-turn capacity for traffic exiting campus from James Diemer Drive into SR 221 (across from the Magnolia Street entrance to the Napa State Hospital) could be added through either reconfiguring the current right-turn lane to allow left-turn movements, or through the addition of a lane dedicated to left-turn movements. Key issues to be studied include the following:

- Appropriate design, either reconfiguring current right-turn lane to allow left-turn movements or adding another dedicated left-turn lane
- Possible conflicts resulting from changes in lane geometries
- Possible reduction of the need for enhanced left-turn capacity by implementation of previous recommendations (i.e. direct connection to SR 121 via new roadway described above and a new ring road)

Internal Circulation

Internal campus circulation could be improved by the creation of a ring road through an upgrade of the service road leading from James Diemer Drive to north and west of the tennis courts and criminal justice training area and integrating it into James Diemer Drive. Other positive impacts of this implementation would include improved circulation, enhanced access to the western side of campus, and reduction of traffic on James Diemer Drive, particularly when implemented in conjunction with the Plaza Drive extension. However, creation of a ring road would be constrained because of the location of existing buildings and would not provide access to a significant supply of parking, either existing or proposed. Given this constraint and a desire to avoid traffic impacts to the west side of campus, the creation of ring road is not included as a recommendation of the Facilities Master Plan.

An additional recommendation is to designate a “central receiving station” in a centralized location for deliveries and pick-up of goods on campus, using the existing service road.

Parking

As noted earlier in this report, the current supply of parking is adequate to serve existing campus uses, based on observations conducted in early May. At peak occupancy, 1,266 vehicles were parked on campus. Given current enrollment of 7,500 students, this equates to a parking demand of one parking space per 5.9 students. The current supply of parking is 1,732 spaces.

Anecdotal evidence suggests that the need for parking is heavy during the first weeks of each semester. In addition, future campus growth may result in the need to relocate existing parking lots or provide additional spaces to serve campus growth. Key recommendations for the replacement or expansion of future parking facilities are provided below:

- Provide a supply of parking equivalent to one parking space per five students to ensure adequate vacancy rates (approximately 80 percent occupancy); the current supply of 1,732 parking spaces is adequate to serve a student population of up to 8,500 students. A supply of 1,500 parking spaces would be adequate to serve the current enrollment (7,500 students).
- To replace existing parking displaced by building construction or add parking spaces to serve an expanded student and faculty population, explore expansion of parking lots to the north of the existing campus lots, near the current inbound and outbound lanes to and from SR 221. Access to these parking facilities would also be provided by the proposed new entrance from Plaza Drive / SR 121. This would provide additional parking capacity where it is most needed, adjacent to the fully utilized main east parking lots *(Figure E)*.
- Explore the possibility of providing additional parking between James Diemer Drive and SR 221 east of the central campus. Key issues include the following:
    - Ownership or easement rights for property between campus and SR 221 (may be subject to the ownership or control of Caltrans)
    - Aesthetics of removing foliage currently screening the campus from SR 221.
- The Facilities Master Plan would eliminate parking lots immediately south of the main campus buildings removing as many as 250 spaces, resulting in heavier usage of the currently unpaved overflow parking lot.

Public Transit

Given the low-density land use patterns in Napa County, public transit is unlikely to play a key role in providing access to and from campus. However, efforts to improve transit service and to better understand student needs may produce marginal increases in transit usage, thereby reducing automobile trips to campus. Key recommendations are as follows:

- Student transportation use and needs should be surveyed in order to ascertain support for enhanced transit service.
- VINE officials have indicated a willingness to provide greater service, given demonstrated need by college. One possibility would be the extension of at least one additional route to the campus from the Marketplace Shopping Center, the current terminus. This improvement would increase the frequency of service to campus and could also provide more access to the services available at the shopping center.

Bicycle Access, Circulation and Parking

Key recommendations for improving bicycle access, circulation and parking are as follows:

- Support efforts to install bicycle lanes along SR 221.
- Implement a bicycle path to link with the growing bicycle network along SR 121 at Plaza Drive. Napa Valley College has a $50,000 grant to study this path *(Figure E)*.
- Implement a bicycle path connecting the current path from SR 221 at James Diemer Drive to the soon-to-be constructed River Bike Path *(Figure E)*.
- Develop a bicycle path from Streblow Drive bike path into campus *(Figure E)*.
- Construct intra-campus linkages between north and south campus bike paths.
- Increase access to bicycle parking facilities.

Bicycle Access, Circulation and Parking (continued)

- Develop policies to ensure adequate location, care, and administration of bicycle racks and lockers. Key issues include the following:

  - Increase the number of bike lockers to meet the needs of staff and students initially to numbers and locations similar to current bike racks. Track usage to determine the need for additional lockers.

  - Determine the following for rental of lockers:

    i. Select an office to administer the program.

    ii. Establish a place to inform possible users of locker availability.

    iii. Develop guidelines for priority use of lockers.

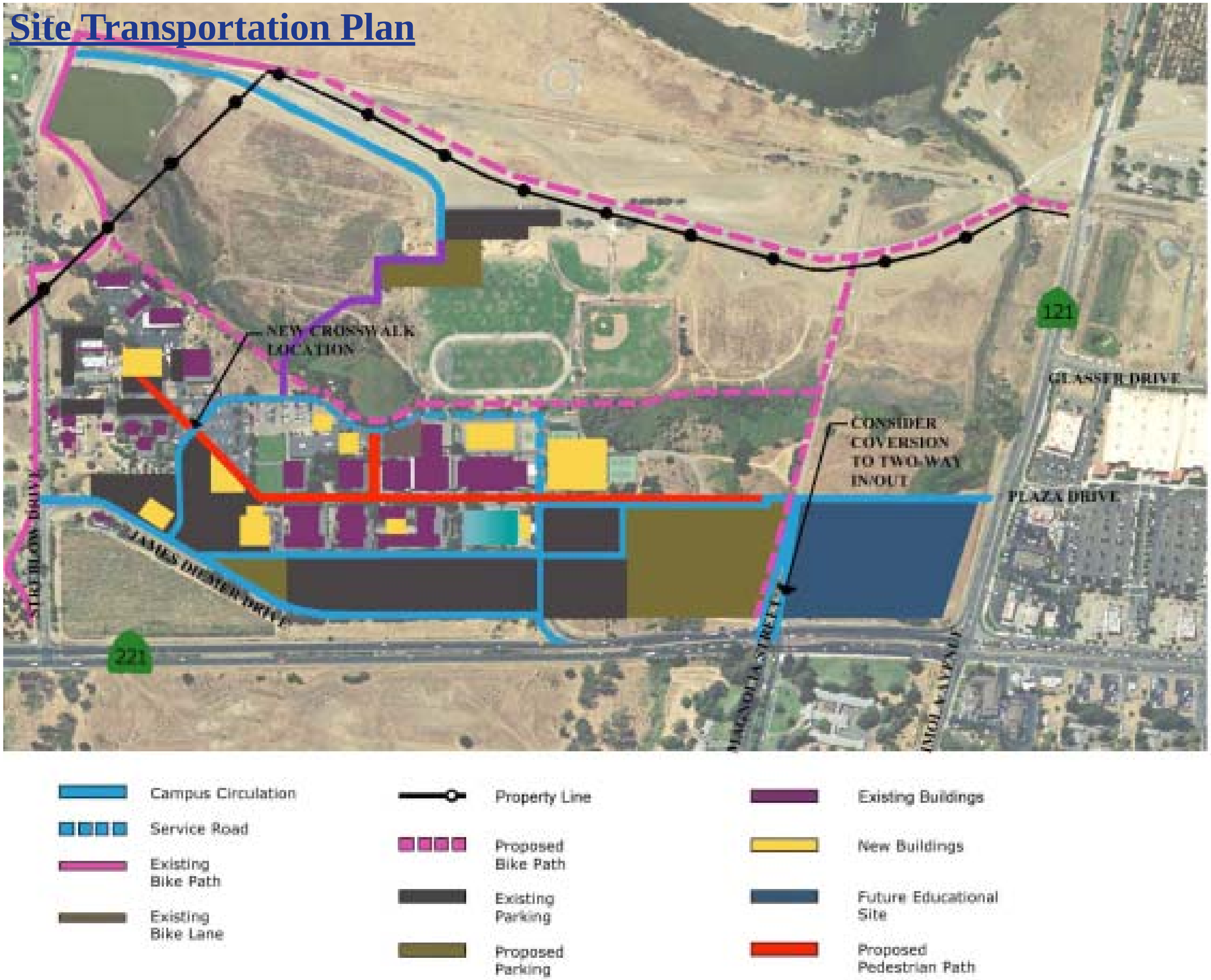
    iv. Institute a security deposit for keys to ensure return.

Pedestrian Circulation

Key recommendations for improving pedestrian circulation are the following:

- Complete and upgrade ADA facilities throughout the campus.
- Improve wayfinding signs.
- Develop a program for pavement restoration throughout the campus pedestrian network.
- Create pedestrian linkages to off-campus destinations through sidewalks along the proposed Plaza Drive connection to SR 121.
- Provide traffic calming measure at locations of potential pedestrian / vehicle conflict.

Site Transportation Plan



Civil Engineering - Introduction

This report provides an overview of existing civil engineering issues at the Napa campus and key issues for consideration during the development of the Facilities Master Plan. It is recommended that a comprehensive utility and infrastructure plan and parking plan study be completed to determine costs and environmental impact on the proposed building program.

Access / Site Circulation

Currently the college has two main points of ingress and egress, both on State Route 221. The southerly access is a signalized T intersection at Streblow Drive. This is the only ingress point for northbound 221 traffic. The north access point consists of a four-way signalized intersection across from the Napa State Hospital. Suggested upgrades to this intersection include dual left turn lanes out of the campus to northbound Route 221. Westbound traffic from the state hospital will require signs to prohibit right turns on a red light for the campus exit to be two lanes. Any modifications to these intersections will require Caltrans and the City of Napa involvement in the approval process. Caltrans will require, among other things, a detailed traffic report and environmental document for any improvements to the intersections. The bus shelter on northwest corner of the exit may have some historical significance.

Recommendations for alternative access include the construction of an additional campus road that would connect to either Gasser Drive or the Market Place signalized intersections on Imola Avenue. Both alignment alternatives have wetlands/environmental issues and require the involvement of Caltrans and the City of Napa. The Gasser Drive extension would, in addition, require fill of the floodplain. Wetland and stream bed disturbance will trigger the need for an Army Corps of Engineers 404 permit and Department of Fish and Game 1601 streambed alteration permit. Both alignments assume a two-lane roadway with shoulders, curb, gutters, sidewalks, and signal improvements would be required.

Additional considerations for the Connection to Imola Avenue are the following:

- The Imola Avenue Bridge over the Napa River is currently two lanes. This structure is planned to be upgraded to a four-lane facility by 2005.
- The Napa Valley Flood Control District is constructing levee improvements to the Napa River, which should reduce the flood plain area within the campus. These improvements are scheduled to be completed by 2005.

Parking Lot / Pavement Maintenance

Parking during the first few weeks of each semester can become severely impacted as students attempt to get class schedules in place. Expansion of the school with additional classrooms will only exacerbate this problem. Sites should be identified for new and or temporary parking.

Approximately 200,000 square feet of roadway and 525,000 square foot of parking lot within the campus are in need of replacement or maintenance. This assumes 40 percent of the pavement area is in need of replacement, and the remainder of the pavement is in need of maintenance. A maintenance program should evaluate pavement areas as to their serviceability.

Utility Infrastructure

The college was constructed in the 1960's. Utility information is generally based on an assortment of design plans. Storm and sewer lines should be positively located, and inverts must be measured before analysis of the existing facilities. For water and sanitary sewer, civil engineer will work with the architect and mechanical engineer to determine existing, proposed, and future design requirements. Analysis of the existing storm system will be based on the City of Napa's design guidelines.

Storm Water Detention Facilities/Flood Control Issue

The detention pond for the campus is over 40 years old and in need of maintenance. Siltation buildup over the years has reduced the capacity of this facility. Actual maintenance requirements will require further study. Maintenance and/or expansion of the pond may trigger the need for additional environmental permits.

ADA Compliance

Curb cuts for driveways and handicapped ramps throughout the campus do not meet current ADA standards. The civil engineer will need to work with the master architect to determine handicapped routes of travel. The routes will then need to be analyzed with detailed topographic survey information to determine the existing slopes and possible ADA compliance concerns. This information can then be used to analyze needed improvements.

Mechanical Systems - Introduction

The following report addresses the existing mechanical systems for each of the buildings, along with the current central plant.

The campus is located in Napa, California, at 2277 Napa-Vallejo Highway. Detailed site visits have been conducted on several occasions to investigate the heating, ventilating and air conditioning (HVAC) and plumbing systems for each of the buildings. Each system has been addressed by listing the existing conditions based on site analysis and on a review of existing documentation on each building. We have also completed load calculations on each building to estimate future cooling requirements from the new central plant, which will be further defined in the programming and schematic phase of the central plant project. The load calculations will be used to study the feasibility of using stratified chilled water and to provide a life-cycle cost analysis.

The report primarily focuses on the mechanical systems within the buildings and central steam systems. The plumbing systems have not been discussed on a building-by-building basis. When specific remodels occur on each building, the systems will be evaluated. The water and sewer have been reviewed based on plans only, and all the buildings have adequate systems based upon current loading. As mentioned in the report, natural gas is located in the existing steam tunnels. Consideration must be given regarding use of the tunnels if steam is not used in the future. The natural gas system, which serves the entire campus from the tunnel location, will remain in the present location.

Steam Distribution

Building 100

Building 100 consists of the bookstore, student lounge, financial aid, and Associated Student offices, classroom space, dining room, and cafeteria. The main boiler room, which houses the steam system for the campus, is also located in the basement area of this building. The building is divided into four systems. There are three penthouses and one separate fan room located on the ground level. This particular fan room serves the dining room of the building only. The penthouses and the areas served are as follows:

Penthouse "A"	Kitchen scullery area
Penthouse "B"	Bookstore and storage
Penthouse "C"	Student Lounge, conference, classroom, and office spaces

Penthouse "A" incorporates three exhaust fans and one makeup air unit which uses 100 percent OSA and a heating coil. The three exhaust fans handle the kitchen scullery hoods in the space. The heating coil is hydronic, with hot water generated by a steam-to-hot-water heat exchanger located in the boiler room. All of the equipment is original with a vintage of 1965 and has exceeded its useful life, based on ASHRAE standards.

Penthouse "A" consists of SF-1 supply fan approximately 12,000cfm, EF-1 4,600cfm, EF-2 3,800 cfm, and EF-3 1,000 cfm.

Penthouse "B" incorporates a supply fan and a return fan system with a heating coil and economizer. The system has been retrofitted with DX cooling using a Carrier 38BA008 condenser unit located outside the penthouse.

Penthouse "B" consists of SF-3 4,800cfm, RHF-2 3,100cfm, and EF-3 1,000cfm. In 1974 a bookstore addition occurred which connected to the existing duct system.

Penthouse "C" consists of a supply fan, SF-4 5,850cfm, a return fan RAF-3 4,250cfm, full economizers, a heating coil, and a DX coil. Outside the penthouse is located an air cooled Carrier #38AE014 condensing unit. All of the equipment with exception of the condensing unit is original equipment and should be replaced.

Penthouse "C" serves the student lounge, classroom, and office spaces and is basically a stand-alone building connected by a breezeway. The heating supply and return for this building run underground south from the boiler room to the building. It is likely this piping will have to be replaced.

The fan room for the dining area is located at grade level on the north end of the building and consists of an upflow supply fan and mixing box/economizer SF-1 at 900cfm. The unit incorporates a heating coil only and is also original equipment.

Building 200

Building 200 is the administration building housing counseling, Admissions and Records, the office of Instruction and the President's office, as well as other offices and a staff lounge area. The building incorporates four penthouses on the roof. Each of the penthouses incorporates a supply fan, return fan, and exhaust fan with a full economizer cycle.

Penthouse "A" incorporates a supply fan SF-1 5,200cfm, RAF-1 3,800cfm, and EF-1 900cfm. The supply fan/air handler originally incorporated a heating coil only, but was retrofitted in 1976 to incorporate D/X cooling. This is similar to the other penthouses.

Penthouse "B" incorporates SF-2 3,820cfm, RAF-2 2,900cfm, and EF-4 900cfm.

Penthouse "C" incorporates SF-3 3,500cfm, RAF-3 2,750cfm, and EF-1 900 cfm.

Penthouse "D" incorporates SF-3 5,700cfm, RAF-4 4,000cfm, and EF-1 900cfm. The mechanical room on the West End of the building has a 4" LPS and 1 ½" LPR line serving a steam-to-water heat exchanger. The heat exchanger produces 125gpm of 200º water, which is circulated throughout the building with a 1 ½" HP pump. The building zone control is accomplished by 19 reheat coils located throughout the spaces. The system should be converted to a single duct VAV system with hydronic reheat. All of the equipment has exceeded its useful life and should be replaced.

Building 300

Building 300 is the campus library building. The building is a two-story structure, with the lower level used for storage and Information Technology. The building incorporates the same penthouse scheme as the rest of the buildings. This particular building incorporates three penthouses on the roof and one fan room located in the basement. All of the fan systems have been retrofitted with DX cooling and condensing units.

Penthouse "A" incorporates SF-4 4050cfm, RF-4 3500cfm, a full economizer, and a heating coil. It has been retrofitted with a DX coil and condensing unit.

Penthouse "B" incorporates SF-3 4400cfm, RF-3 3800cfm, a full economizer, and a heating coil. It has also been retrofitted with a DX coil and condensing unit.

Penthouse "C" incorporates SF-2 7200cfm, RF-2 6000cfm, a full economizer, and a heating coil; it has been retrofitted with a DX coil and condensing unit. Zone control is accomplished similarly to the administration building, using 18 hot water reheat coils. The building is also a prime candidate for a single-duct hydronic reheat VAV conversion. All of the equipment has also passed its useful life and should be replaced.

The basement incorporates an air-handler room that houses SF-1 14,200cfm and RF-2 12,000cfm. The unit incorporates a heating coil and full economizer cycle, with zone control accomplished by reheat coils.

In the same room is also a stem-to-water heat exchanger that produces 200gpm of heating water, a condensate return system, an expansion tank, and a 3HP heating water circulation pump.

A 4" LPS and a 1 ½" LPR line enter into the basement through a trench located at the northwest end of the building.

Building 400

Building 400 is currently the art and photography center, with a lobby exhibit area. The building is not connected to the central steam system and primarily consists of evaporative coolers and unit heaters. Consideration should be given to stubbing chilled water and heating water to the building during the programming phase of the central plant design.

Building 500

Building 500 is composed of the machine tool and welding technology programs. The shop areas are heated using a CoRayVac or radiant tube heating system. The areas are exhausted by fans and welding hoods. The roof houses a typical penthouse unit with a makeup air and exhaust system. The unit has been retrofitted with a DX coil and a BDP 569CBX090 condensing unit located outside the pod. Classroom areas and some office areas are air conditioned. The makeup air units or blower furnace units, as listed on the documents, are basically gas-fired Reznor makeup air units. All of the areas have 100 percent exhausted air. Currently the majority of the mechanical equipment is original vintage and has exceeded its useful life. This particular building is not connected to the campus steam system.

Building 600

Building 600 is a standard classroom building consisting of seven classrooms. The building is very similar to the other buildings with a roof penthouse. The penthouse consists of the supply fan/heating coil, economizer, and return fan.

This particular building does not incorporate any DX cooling with which many of the other buildings have been retrofitted. The zone control is accomplished by reheat coils located in the ductwork. A heat exchanger, circulating pump, and condensate return pump are located in the janitor’s closet, with low-pressure steam to each of the buildings. All of the equipment is original vintage and should be replaced.

Building 700

Building 700 is the science building, which houses biology, botany, life sciences, chemistry, and earth science labs and classrooms, and the cadaver room with the MESA lab, NVC Police department, and health center downstairs in the basement. The building is very similar to the other classroom buildings, incorporating two penthouses for the upper floor and a fan room for the lower level.

Penthouse "A" incorporates a 100 percent supply fan/heating coil at 10,000cfm SF-2 and a main exhaust fan at 8,400cfm EF-2.

Penthouse "B" incorporates similar equipment: SF-2, which is also a 100 percent supply fan/heating coil at 10,000cfm and EF-2 at 8,400cfm. The lower area was retrofitted in 1965 to incorporate a 100 percent OSA 100 and exhaust fan system for ventilation. The main fan SF-1 is a 100 percent OSA upflow unit 9,500cfm with a heating coil. EF-1 is the main exhaust located at the other end of the building at 9,200cfm. Zone control throughout the building is accomplished with reheat coils. Hot water is generated at the basement level utilizing a steam/water heat exchanger, which produces 200gpm of heating water. Hot water is circulated to the coils by a 2HP water pump. Similar to the rest of the buildings, there is also a condensate return system located next to the heat exchanger. All of the equipment is original vintage, has exceeded its useful life, and is in need of replacement.

We do not have any drawings on the cadaver room located at the basement level, but it was noted that the area is cooled using a split system DX unit, with the condensing unit on the ground and the fan coil below the soffit ducting into the space.

Building 800

Building 800 is very similar to building 600, which consists of a supply fan/heating coil, return fan, and full economizer. The penthouse has been retrofitted with a DX cooling system consisting of DX coils and a Carrier 38AE01260 condensing unit located on the roof. The heating water is also produced by a steam-to-water heat exchanger located in the janitor's room. All of the equipment is original vintage and should be replaced.

Building 900

The theater building incorporates an upper mechanical room, which houses two multizone units and two return/exhaust fans. The units provide seven individual zones for control throughout the building. Each multizone unit consists of a hot deck, which uses heating water and a cold deck, which uses chilled water. Each unit has a full economizer cycle. Heating water is produced by a steam-to-hot water heat exchanger located in the upper mechanical room. The heat exchanger produces 200gpm from 180º – 200º water. The multizone SF-1 produces 14,000cfm while SF-2, the other multizone, produces 11,000cfm. The chilled water originally was produced by a chiller located on the west side of the building, which was an old Chrysler machine, but the system has since been connected to the ice storage system. We do not have any documentation on the ice storage system, nor do we have any documentation on the equipment serving the system.

Building 1000A and 1000B

Buildings 1000A and 1000B consist of Health Occupation classrooms, general classrooms, Learning Skills Center, faculty offices, and Criminal Justice Building. Building 1000B is a two-story structure while Building 1000A is three stories.

Building 1000B is served by four air handlers located on the second floor of the building. Zone control is accomplished two ways. The first is by sectional heating and cooling coils located in the ductwork and the second by VAV boxes located in sub zones of the coil zones. The air handlers are provided by heating water and chilled water from a steam-to-water heat exchanger and chiller.

Building 1000A is similar in nature, with one main air handler located on the first floor and a separate air handler located on the third floor. Zone control is accomplished by cooling coils and heating coils, with further zoning by variable air volume boxes. Heating water is produced by a steam/water heat exchanger while chilled water is produced by a chiller. We do not have any documentation to verify the size of the heat exchanger or the chiller at this time. Further investigation will be required to validate all capacities. The equipment is all original and has exceeded its useful life.

Building 1100 Gymnasium

The gymnasium is composed of two levels: the lower and the upper. The lower level is served by two main air handlers located at the ends of the building. The units (AHH-1, AHH-2, EFU-1, and EFU-2) are 100 percent outside air/ exhaust systems with the exhaust exiting in the planter. AHH-1 has the capability of 12,400cfm, EFU-1 11,000cfm, AHH-2 9,200cfm, and EFU-2 8,200cfm. Zone control for each of the units is accomplished by reheat coils located in the ductwork. Two portions of the lower level are presently air-conditioned, the classroom, faculty/reception office area, and the seminar room. Originally a separate cooling coil was located in the ductwork serving the conditioned areas. In 1975 a separate air handler was installed to condition the faculty office areas.

The upper floor is heated/ventilated by several air handlers located in the north and south penthouse. AHH-3, AHH-5, and AHH-7 serve the upper floor with the associated EFT-1, EFT-2, EFT-3, and EFT-4. AHH-4 serves the southwest area of the first floor. The 6” LPS and 2” LPR service heat exchangers and domestic hot water are located in the mechanical room. Heating water is distributed throughout the building for reheat and heating coils. The equipment is all original equipment and has exceeded its useful life.

Building 1500 A, B, C

Building 1500 consists of four separate buildings, A, B, C, and D, which are utilized for child care.

Building “A” is served by two packaged AC units, a make up air unit, and exhaust for a kitchen hood. The AC units are nominal 4-ton units for building A.

Building “B” is also served with similar equipment packaged roof top AC units. The building does not incorporate kiloton exhaust hoods and utilizes nominal 5-ton packaged gas/electric units.

Building “C” is similar to building “B,” incorporating two gas/electric rooftop units. Both units are also nominal 5-ton packaged gas/electric units.

All of the systems are currently operational and have not exceeded the useful life of the equipment, but the buildings are now 13 years old. The useful life of this type of equipment is 15 to 18 years. Consideration should be given to replacing these units in the near future. The buildings are not connected to the central steam system.

No information is available for building “D.”

Building 1600A

Building 1600A is a student services building. The building is a basic office building and is served by two packaged gas/electric units. Both units are of equal size, nominally 4 tons each. The building is relatively new, built in 1998, and is in good shape. The building is not currently connected to the main steam system. The building appears to be modular construction and will be relocated as part of the proposed master plan.

Ag Lab and Teaching Winery

The Ag Lab 1700B, is a historic wood frame building over fifty years old. The Viticulture lab, 1700A, is a modular building similar to student services, 1600A. Teacher Winery, 1700C, is a building served by two packaged gas/electric rooftop units nominally 5 ton and 3 ½ ton. This building is only four years old and the equipment is in good shape. The building is not connected to the central steam system.

Modular Building 1200 A & B

Buildings 1200A & B have not been addressed in the report because they will be demolished.

The Boiler Room

The boiler room, as previously stated, is located in the lower level of Building 100 at the north end of the building. The room consists of three low-pressure steam boilers approximately 9,000 lbs./hour 15psi each, a condensate return tank, three boiler feed pumps, and blow-down systems.

The boilers provide steam throughout the campus, with heat exchangers providing hot water at each of the buildings. The master plan will eliminate the steam from the boiler room and incorporate heating water/chilled water from a central plant.

Domestic Cold Water

The domestic cold water for the site is a looped system with an 8” line from the east side of the campus, which splits into a 6” traveling north to the pool area. The 8” line continues west down to building 600 remaining at 8” to Building 1100 then connecting back to the 6” line between the pool area and building 100. The 8” line is for both domestic and fire protection.

Fire Protection

The domestic cold water and fire protection lines are a contained system, as previously discussed. The distribution of the fire system has been discussed previously under domestic water. Currently, buildings 200, 300, 700, 1500A/B/C and the kitchen hoods at building 100 are the only buildings sprinklered or partially sprinklered. The fire protection system will be analyzed for capacity to determine the flow requirements for each of the buildings. During the remodel of each building, a complete wet pipe sprinkler system will be added to the structure. The capacity of the system was discussed under the civil engineering section of the report.

Sanitary Sewer (SS)

The system appears, based upon drawings only, to consist of 6” lines accessed throughout the site by a network of manholes. Current drawings indicate a 6” SS exiting the campus by building 1000 B. A complete analysis of the demand on the sewer should be done to determine the maximum capacity of the 6” line if additional structures are added to the system.

Steam Distribution Campus Wide

The steam distribution system runs primarily north and south throughout the main plaza of the campus in an accessible trench. The steam originates in building 100, the cafeteria building. The boiler room is located in the lower level of building 100 in the main boiler room, as previously described. The 8" LPS and 4" LPR leave building 100 at the southwest corner and split into the 8" LPS and 3" LPR running north and south. The following represents the buildings that are currently served by the central steam plant and the corresponding sizes of lines:

- Building 100 — Origination point of steam 8" LPS, 4" LPR
- Building 200 — 4" LPS, 1 ½" LPR
- Building 300 — 4" LPS, 1 ½" LPR
- Building 600 — 2 ½" LPS, 1 ¼" LPR
- Building 800 — 2 ½" LPS, 1 ¼" LPR
- Building 900 — 4" LPS, 2" LPR
- Building 1000A — 4" LPS, 2" LPR
- Building 1000B — Served by 1000A
- Building 1100 — 6" LPS, 2' LPR
- Pool Equip. Bldg. — 6" LPS, 2" LPR

The distribution system is the original equipment and currently has many leaks throughout.

Also located in the main distribution trench is natural gas, along with compressed air for controls.

Recommendation/Summation

The majority of the mechanical/air handling systems have exceeded their useful life and are in need of replacement. Each building should be analyzed during an upgrade and be converted to a single duct VAV hydronic reheat system where applicable. The air handlers on all buildings should incorporate variable frequency drives for additional energy savings. The existing boilers will be replaced, incorporating a new heating water system. The new heating system will consist of hot water heating boilers, campus heating distribution pipes, primary / secondary variable speed distribution pumps, and DDC controls. All of the steam/water heat exchangers will be removed at that time, along with any circulating pumps in the building. The chilled water system will consist of four high-efficiency centrifugal chillers and associated cooling towers, campus chilled water distribution system, primary/secondary variable speed distribution pumps, and DDC controls. The proposed location of the new central plant will be behind building 700. The distribution system will be located on the backside of the campus, avoiding extensive demolition of the main plaza areas. The next phase of the project will provide detailed load calculations on each of the buildings, as well as life-cycle cost analysis on a variety of proposed chillers and boilers to be used for the new central plant. The central plant will be analyzed for the most energy efficient equipment available, and. a computer model to possibly obtain rebates from the P G & E program "Savings by Design." The use of stratified chilled water will also be investigated for energy savings, potential rebate, and first cost.

Electrical Systems - Introduction

This report addresses the existing electrical systems at the Napa Valley College campus, located at 2277 Napa-Vallejo Highway in Napa, California. The purpose of the report is to evaluate the condition and flexibility of each system's infrastructure with respect to campus master planning for future growth and building expansion. The electrical systems include power distribution, lighting, fire alarm, master clock, and telecommunication's pathways. Each system is addressed by stating the existing conditions discovered from review of existing documentation, site examination, and discussions with facilities personnel, followed by an analysis of the system and its associated equipment and then recommendations for improving capacity, flexibility, and reliability.

Site Electrical Plan

Power Systems

Existing Conditions

Electrical power is distributed throughout the campus by a 12KV, 3-phase, primary loop system, which was upgraded in about 1994. The primary loop system and its equipment consist of a 12KV main electric service switchboard with utility metering and primary loop switches, underground feeders, primary switches, and step-down service transformers that serve electrical service panels at each campus building.

The 12KV main electric service switchboard is located within a walk-in type weatherproof enclosure at the south end of the east parking lot. The switchboard is rated for 12,000 V, 3-phase, 3-wire; contains primary metering; and is served with power from PG& E. The switchgear is metalclad and contains a 600A/3P main draw-out circuit breaker and two three-pole primary load interrupter switches. The load interrupter switches feed the campus's main primary loop system. The primary loop system consists of insulated conductors installed underground in conduit and routed through a series of primary vaults and primary loop switches to serve the building transformers. Each primary loop switch feeds one of eleven existing pad-mounted service transformers. Sizes, loads, and ratings are as follows:

Desig.	KVA	Voltage, Phase & Wire	Load served
T-1	225	12KV to 277/480V-3P-4W	Student Center Bldg. 100
T-2	300	12KV to 277/480V-3P-4W	Theater Bldg. 900
T-3	150	12KV to 120/208V-3P-4W	Theater Bldg. 900
T-4	225	12KV to 277/480V-3P-4W	Admin. Bldg. 200
T-5	225	12KV to 277/480V-3P-4W	Science Bldg. 700
T-6	150	12KV to 277/480V-3P-4W	Classroom Bldg. 800
T-7	225	12KV to 277/480V-3P-4W	Library Bldg. 300
T-8	1000	12KV to 277/480V-3P-4W	Voc.\Tech. Bldg. 500
T-9	750	12KV to 277/480V-3P-4W	Gym/Pool Bldg. 1100
T-10	750	12KV to 277/480V-3P-4W	Health Occupations Bldg. 1000
T-11	150	12KV to 277/480V-3P-4W	Child Care Bldg. 1500

Each building served from the primary loop system contains a main service panel located on either inside of an interior room or located in a weatherproof enclosure directly outside of the building served. The main service and distribution equipment data for each of the buildings served from the primary loop are as follows:

Existing Conditions (continued)

Cafeteria & Student Services Building 100

The cafeteria and student services building has a 400A main service panel located in storage/custodial room C23 and rated for 277/480V-3P-4W. The service panel is manufactured by Westinghouse and is 1964 vintage equipment. The main electric panel feeds HVAC equipment, two additional 277/480V-3P-4W subpanels, and a 150 KVA, 480V to 120/208V-3P-4W step-down transformer. The step-down transformer feeds six low-voltage subpanels.

Administration Building 200

The administration building has a 350A main service panel located in mechanical/custodial room 51 and rated for 277/480V-3P-4W. The service panel is manufactured by Westinghouse and is 1964 vintage equipment. The main electric panel feeds HVAC equipment, two additional 277/480V-3P-4W subpanels, and two 15 KVA, 480 to 120/240V-1P-3W step-down transformers. The step-down transformers feed two low-voltage subpanels.

Library Building 300

The library building has a 350A main service panel located in the basement storage room B4 and rated for 277/480V-3P-4W. The service panel is manufactured by Westinghouse and is 1964 vintage equipment. The main electric panel feeds HVAC equipment, building elevator, three additional 277/480V-3P-4W subpanels, and a 75 KVA, 480 to 120/208V-3P-4W step-down transformer. The step-down transformer feeds four low-voltage subpanels.

The library building is provided with a small 5 KW, 120/240V-1P-3W, natural gas-powered emergency generator and an auto-transfer switch located outdoors in a weatherproof enclosure. The emergency generator feeds a single emergency power subpanel located within the building, which provides emergency power for the egress and exit lighting systems.

Existing Conditions (continued)

Vocational Technical Building 500

The vocational/technical building has a 1600A main service switchboard located in welding shop 4 and rated for 480V-3P-3W. The service panel is manufactured by General Electric Company and is 1968 vintage equipment. The main switchboard feeds HVAC equipment, welding shop equipment, two 480V-3P-3W subpanels, and a 75 KVA step-down transformer. The step-down transformer feeds two low-voltage subpanels.

Classroom Building 600

The classroom building has a 225A main electric service panel located in custodial room B8 and rated for 277/480V-3P-4W. The service panel is manufactured by Westinghouse and is 1964 vintage equipment. The main electric panel feeds HVAC equipment, one additional 277/480V-3P-4W subpanel, and one 15 KVA step-down transformer. The step-down transformer feeds one low-voltage subpanel.

Science Building 700

The science building has a 300A main electric service panel located in basement storage room B2 and rated for 277/480V-3P-4W. The service panel is manufactured by Westinghouse and is 1964 vintage equipment. The main electric panel feeds HVAC equipment, two additional 277/480V-3P-4W subpanels, and two 480V to 120/240V-1P-3W step-down transformers. One transformer is rated for 15 KVA and feeds one low-voltage subpanel. The second transformer is rated for 25 KVA and feeds two low-voltage subpanels.

Classroom Building 800

This classroom building has a 225A main electric service panel located in custodial room G10 and rated for 277/480V-3P-4W. The service panel is manufactured by Westinghouse and is 1964 vintage equipment. The main electric service panel feeds HVAC equipment, one additional 277/480V-3P-4W subpanel, and one 15 KVA step-down transformer. The step-down transformer feeds one low-voltage subpanel.

Existing Conditions (continued)

Theater Building 900

The theater building has two main electric service panels. One of the main electric service panels is located outdoors in a weatherproof enclosure and rated for 400A at 277/480V-3P-4W. The service panel is manufactured by Westinghouse and is 1970 vintage equipment. This service panel feeds the HVAC equipment for the building. The second electric service panel is located in electrical room 13 and rated for 600A at 120/208V-3P-4W. This low-voltage service panel feeds stage lighting and 120/208V-3P-4W subpanels.

The theater building is provided with a back-up natural gas-powered emergency generator located outdoors in a weatherproof enclosure. This generator operates at a voltage of 120/208V-3P-4W and serves emergency exit and egress lighting for the theater.

Buildings 1000A and 1000B

The health occupations building consists of two buildings, A and B, both of which are served from a single main electric service switchboard located outdoor in a weatherproof enclosure at the north side of building B. The switchboard is rated for 1200A at 277/480V-3P-4W and is 1974 vintage equipment. The switchboard feeds a 480V-3P-3W distribution board, also located outdoors in a weatherproof enclosure, which is used to serve mechanical equipment for both buildings. The main switchboard also contains circuit breakers, which feed the building panels as follows:

Building A: Contains an 800A, 277/480V-3P-4W main distribution panel located in mechanical room 149. This distribution panel feeds three additional 277/480V-3P-4W subpanels and a 300 KVA step-down transformer. The transformer feeds a 120/208V-3P-4W, distribution panel and nine low-voltage subpanels.

Building B: Contains a 400A, 277/480V-3P-4W, distribution panel located in electrical room 403. This distribution panel feeds one additional 277/480V-3P-4W subpanel and a 75 KVA step-down transformer. The step-down transformer feeds a single low-voltage subpanel.

The buildings are provided with a back-up natural gas-powered 15 KW generator, located in a weatherproof enclosure adjacent to the outdoor main distribution switchboard. This generator is rated for 277/480V-3P-4W and feeds one emergency power panel in each of the two buildings.

Existing Conditions (continued)

Gymnasium Building 1100

The gymnasium building has a 1000A, 277/480V-3P-4W, main distribution panel located in upper floor custodial room 206. This main panel feeds a 277/480V-3P-4W distribution panel, five 277/480V-3P-4W subpanels, and a 112.5 KVA step-down transformer. The step-down transformer feeds a low-voltage distribution panel and two low-voltage subpanels. The 277/480V-3P-4W distribution panel feeds HVAC equipment, two 277/480V-3P-4W subpanels, and a second 75 KVA step-down transformer. The step-down transformer feeds a second low-voltage distribution panel and three low-voltage subpanels.

The gymnasium is provided with a natural gas-powered emergency generator, located in a weatherproof enclosure, at the northwest corner of the building. The generator is rated for 30 KW at 277/480V-3P-4W and feeds a single emergency power panel within the building.

Child Care Building 1500

The child care facility consists of four separate buildings, all served from one of the loop service transformers. The main electric service panel is located in an electrical room within building A and is rated for 350A at 277/480V-3P-4W. This main electric service panel feeds a 277/480V-3P-4W subpanel, in each of the other two buildings, B and C, and a single 112.5 KVA step-down transformer, also located within the building A electrical room. The step-down transformer feeds a low-voltage distribution panel at building A, which in turn feeds three low-voltage subpanels, one at each of the three buildings.

Other remaining buildings on the campus which are not served from the campus primary electrical system have separate utility services. These buildings may be added to the campus primary electrical system during building renovation projects. This will consolidate utility metering and lower charges.

Analysis

The existing 12KV primary loop system, with the exception of four distribution transformers, is fairly new and is in good condition. The main switchgear is bussed for 600A and, based on utility company peak demand information, has a highest peak demand load of 861 KW for the past twelve-month period. The total existing connected transformer capacity on the 12KV loop system is 4,150 KVA. Using the peak demand from the utility company billing information and applying the appropriate load factor in accordance with NEC 220-35, the total existing campus load is calculated as follows:

861KW x 1.25 = 1,076.25KW (NEC 220-35)

1,076.25KW ÷ .8 = 1,345.31KVA

The total existing load current on the existing 12KV primary system is then calculated as follows:

1,345.31KVA ÷ 12.4KV x “3 = 62.6 amps

Existing drawings show the existing 12KV loop conductors are #4/0 copper with an ampacity of 295 amps. Applying the appropriate derating factor, the system spare capacity is calculated:

(295 amps) x .8 = 236 amps

100% - [(62.6 ÷ 236) x 100] = 73%

The analysis shows a generous allowance in the existing electrical system for future campus electrical growth.

Seven of the existing eleven exterior pad mounted step-down transformers are approximately seven to ten years old and are in good condition. The remaining four transformers (T8, T9, T10 and T11) are approximately 25 to 30 years old and are in fair condition. These transformers serve buildings 500, 1100, 1000 and 1500, respectively.

The existing building panelboards with few exceptions are old and in fair to good condition. Most of these existing panelboards are obsolete and no longer manufactured. The existing panelboards are located in inaccessible locations and are generally not provided with the required code working clearances.

Building interior step-down transformers are old and in fair to poor condition. Most transformers are small, single phase, wall-mounted types with very limited capacity.

Power Systems

Recommendations

Maintain the existing 12KV primary loop system, associated switchgear, and site distribution transformers. Replace aged transformers T8, T9, T10 and T11 with new loop feed-type transformers and provide connections to the existing 12KV primary loop system. Expand the primary loop feeder system with new pullboxes and conduit infrastructure to accommodate connections for new proposed buildings and central plant facility.

The building electrical service panels, step-down transformers, and subpanels at each of the buildings are safe and functional at the present time. Replacement of the distribution equipment at each of the existing buildings should occur as the buildings are renovated.

The current campus electrical system is 100 percent dependent on utility power, with the exception of small standby power, engine-driven generators for minimal emergency lighting and life safety systems. Alternate power generating sources, such as solar voltaic cells, gas turbines, and cogeneration, may provide viable options for reducing utility dependence and energy costs while increasing overall campus energy efficiency and reliability. These options should be evaluated for feasibility and cost effectiveness in the development of the design for a new central plant and each new educational building.

Lighting Systems

Existing Conditions

Campus exterior lighting systems include pole-mounted, building-mounted, and column-mounted luminaries. The pole lights consist of single post top-mounted 175 W mercury vapor luminaries on a 10-foot pole with concrete base. Most of the wall- and column-mounted luminaries are similar to the pole lights, but with a wall bracket mounting assembly. Some wallpack-type luminaries are used in utility and warehousing areas and contain mercury vapor, metal halide, or high pressure sodium lamps. All exterior lighting appears to be automatically controlled through the campus energy management system or individual photocells.

Building interior lighting throughout the campus is predominantly fluorescent in classrooms, labs, offices, and utility areas. Most light fixtures are recessed and equipped with energy efficient T8 lamps and electronic ballasts. Some incandescent lighting is used in conference rooms and display-type track mounted lighting but only in limited amounts. The theater building has a significant load of incandescent lighting with dimming controls for stage and theater lighting, but most utility areas of the theater contain energy-efficient fluorescent lighting.

Analysis

The existing campus exterior pole lighting fixtures appear to add an architectural feature to the campus but do not appear to have good photometry. The short, 10-foot pole 175 W mercury vapor lamp and the milk white translucent lens greatly reduce the overall efficiency and performance of the luminaries. Based on existing pole light fixture spacing in the parking areas, it appears that illumination levels may be less than standard levels for safety and security.

The existing interior fluorescent lighting within each of the buildings is energy efficient and appears to provide the correct levels of illumination for each task performed. Some of the areas appear to have higher power density (watts per square foot) than allowed by current State of California Title 24 regulations but notably were in compliance at the time of installation.

Lighting Systems

Recommendations

A photometric study and analysis is recommended for the present parking lot and exterior walkway areas to ensure that the present lighting levels provide adequate illumination for both safety and security. Standard illumination levels for parking areas is one foot-candle and for walkways and drive ways one quarter foot-candle.

There are no specific recommendations for the interior lighting systems for the existing buildings at the present time; however, new, more efficient fluorescent lighting fixtures and lower power density should be incorporated into the designs for future renovation projects. The use of occupancy sensors is recommended for all private offices, storage rooms, and general utility areas as a part of future building renovation. These recommendations will ensure State Energy Code compliance and also assist in the reduction of overall campus energy costs.

Fire Alarm System

Existing Conditions

The existing campus fire alarm system consists of the following: main fire alarm control panels and remote annunciator located at the administration building 200, terminal cabinets at each building, interconnecting wiring in conduit, manual pull stations, smoke and heat detectors, water flow switches, fire alarm horns, and door hold-open devices.

The main fire alarm control panels are manufactured by ADT and are located above counter at the reception area of room 202A. The control panels are ADT Unimode model #4520 non-addressable-type panels with integral battery backup. The fire alarm system contains a Gamewell 12-lamp-type PCFA-12 pedestal remote annunciator located at the west end of building 200 for remote fire zone annunciation. A Napco model MFA 6000 digital communicator transmitter is used to monitor both of the ADT 4520 fire alarm control panels and transmits a common alarm and trouble signal to an offsite monitoring agency via telephone lines.

Each building contains a fire alarm terminal cabinet located in the same room as the main electric service panel, which is used to terminate the fire alarm wiring from the devices at each building. The fire alarm wiring is then routed though a network of underground conduits and pull boxes back to the fire alarm control panels at building 200. The underground conduits and pull boxes do not appear to be dedicated to fire alarm wiring but rather contain low-voltage wiring from other systems, such as telephone and controls.

Most buildings are equipped with manual fire alarm pull stations and alarm horns only. Fire sprinkler systems have been provided in buildings with basements to provide limited fire protection for the basement areas. Where fire sprinkler systems have been provided, they are monitored by the fire alarm system using water flow and valve tamper switches. Smoke and heat detectors were found in buildings 1000A and B only, and it appears that is true also with door hold-open devices and ADA-compliant visual alarm indicator strobes.

The campus fire system is zoned to provide alarm and trouble signals by building and by floor for each type of alarm initiating device.

Fire Alarm System

Analysis

The existing fire alarm control panels are outdated and do not have the capacity for future growth. They are hard-wired-type alarm panels, which do not have the ability to monitor individual devices for pinpointing the exact location and source of the alarm or trouble signal. Zones of devices must be monitored as a group to report the building and floor of the alarm or trouble signal source to the fire alarm control panels.

With the exception of buildings 1000A and B, the buildings do not provide visual fire alarm indicator devices required for the hearing impaired and do not meet the requirements of the Americans with Disabilities Act (ADA).

The interconnecting fire alarm wiring from building to fire alarm control panels has been routed in conduits and though pull boxes with other low voltage systems wiring, which is no longer permitted by current fire alarm codes.

Recommendations

The existing fire alarm system is obsolete and inadequate to provide for future campus growth and building upgrades. The main fire alarm control panels do not have the capacity to connect the needed fire alarm zones for future growth and cannot support the quantities of visual alarm devices needed for ADA compliance throughout the campus. The outdated technology of hard wiring from the fire alarm control panel out to the campus building devices greatly limits the ability to install new wiring through the existing conduits when new devices are added, whether to existing or new buildings. The sharing of site conduits between fire alarm wiring and wiring of other low-voltage systems is no longer permitted and necessitates the installation of new dedicated fire alarm conduits for any new fire alarm wiring where the condition exists.

Fire Alarm System

Recommendations (continued)

The recommendation for the campus fire alarm system is to replace the existing hard-wired system with a new modular design, programmable, addressable system. This new system would provide a new addressable main fire alarm control panel at a location to be determined by the campus and a mini addressable fire alarm panel or transponder panel at each of the existing and new buildings. All of the transponder panels would communicate with the new main fire alarm panel through a single twisted shielded pair of wires routed in dedicated conduit from building to building, creating a fire alarm loop network. This method would eliminate the need to provide additional wires from the main fire alarm control out to new devices or transponders. The communication loop could then be extended from the nearest building to new buildings with no or minimal disruption to service and operations. All existing building fire alarm-initiating devices, such as manual pull stations, smoke and heat detectors, and water-flow switches, could then be replaced with new addressable devices. These devices would then be connected to the respective local transponder with a data loop cable in lieu of multiple conductor zone wiring. This new installation would allow for reporting of each individual alarm-initiating device as a separate entity to the main fire alarm panel, pinpointing its exact location and condition.

Telecommunications Infrastructure

Existing Conditions

Existing telephone service is provided to the campus by Pacific Bell, with the point of connection in a pullbox located at the east portion of the campus site near James Diemer Drive. The service is routed underground in conduit from the service pullbox to the main telephone room and MPOE located within building 300. From the telephone room conduits are provided into the steam tunnel, where cables are then distributed out to other buildings.

Data cabling originates at the existing data processing room located in building 200. From building 200, conduits to the steam tunnel serve the northeast buildings and extend out to pull boxes to serve the southwest portion of the campus.

Telephone and data communications are distributed throughout the campus using both copper and fiber optic cabling. Pathways provided to interconnect the buildings consist of conduit routed through a steam tunnel, buried conduit, and aerial cable. The existing steam tunnel, which is primarily used for routing of mechanical heating and cooling system piping, is also used for routing of telecom conduits between buildings. The steam tunnel provides interconnections between buildings 100, 200, 300, 600, 700, 800, 900,1000A, 1000B, and 1100 at the northeast portion of the campus but does not extend to buildings 400, 500, 1200E, 1200W, 1400, 1500, 1600, and the agricultural lab, teaching winery, carpenter’s shop, and maintenance shop at the southwest portion of the site. The buildings at the southwest portion of the campus are connected to the northeast portion through conduits from a pullbox to the west of building 200 and terminate at a pullbox east of building 500. From building 500, conduits are provided to buildings 400, 1200E, 1200W, 1400, 1500, 1600, and the agricultural lab. The existing carpenter’s shop and maintenance buildings are served by aerial from buildings 1400 and 1200W.

Analysis

Each building on the campus is provided with telecommunications cabling, which is routed either underground, in conduit through the steam tunnel or by aerial cable with service drops at the building. The existing steam tunnel provides the most direct pathway to the majority of the classroom buildings but has limited space for installing new conduits or cables. The steam tunnel pathway is further restricted by the existing mechanical heating and cooling systems piping, making it impossible to enter the tunnel for the purpose of securing conduit to the masonry walls and ceilings. The existing conduits to the southeast portion of the campus are adequate to serve the existing campus telecommunications requirements but contain minimal capacity to provide for future expansion.

Telecommunications Infrastructure

Recommendations

Maintain all of the existing telecommunications pathways and provide additional conduits from the steam tunnel to new and existing buildings as needed. With the advent of a new central plant and subsequent removal of the mechanical heating and cooling system piping from the steam tunnel, the steam tunnel will then provide a very viable solution for routing of new telecommunications system cabling north and south to serve the northeast portion of the campus. Install cable tray along the length of the steam tunnel to provide for easy access to and installation of new cabling.

Install new underground conduits from the underground steam tunnel to the northeast and southwest portions of the campus, terminating in a series of pullboxes for extension to future buildings.

Master Clock

Existing Conditions

The campus has a digital master clock, manufactured by Simplex, located in building 200. The master clock was upgraded approximately 10 years ago and is in good condition. It is connected to analog clocks by a three-wire clock circuit, which is distributed to a portion of the existing buildings on the campus by underground conduits. Clock signal boosters have been added to buildings where needed.

Analysis

The existing master clock system is functional and in good condition. The distribution of clock signal wiring is not campus wide; therefore, clocks cannot be connected to the system in all buildings. Because of the incomplete clock wiring distribution, the master clock system can not be used for time consistency throughout the campus.

Recommendations

Relocate the master clock to a central location to be determined by the campus, extend the master clock system wiring to all existing buildings, and install system clocks to replace all existing non-system wall clocks. Utilize the steam tunnel for pathways and provide new conduit, wiring, and signal boosters at buildings as needed. Provide new underground conduits from the steam tunnel through a series of pull boxes to the northeast and southwest portions of the campus for extension to future buildings. Install in the same trench with telecommunications conduits.

Summary

The existing electrical systems were examined to evaluate their condition and usefulness for serving future campus building expansion. The systems addressed were the power distribution, lighting, fire alarm, master clock, and telecommunications pathway infrastructure.

The power distribution system includes the site primary distribution equipment and the building distribution equipment. The site primary distribution system and equipment were found to be in good condition and to contain adequate spare capacity to serve the anticipated future buildings. This primary loop system can be extended relatively easily to future buildings by providing new underground conduit and cable from the nearest primary vault to the location of the new building. New primary loop switches and outdoor pad-mounted transformers can be added to serve the new buildings in a fashion similar to the existing configurations.

The existing building electrical distribution equipment is generally in fair to good condition but contains components which are obsolete and no longer manufactured. Existing electric service capacity at each building is adequate to serve the existing loads but should be reevaluated and upgraded as necessary during future building renovation projects.

Existing lighting systems include both interior and exterior lighting. The exterior lighting does not appear to provide adequate illumination levels in some areas, and a photometric study is recommended to further evaluate these levels, particularly in the parking and walkway areas. Interior lighting systems and equipment seem to be in good condition and consist of primarily energy-efficient fluorescent fixtures, which apparently have been upgraded in recent years. Lighting controls generally meet California State Title 24 requirements, but further automatic controls are recommended for future improvements. Future buildings and renovation projects will require tighter power density levels than the existing systems, necessitating the use of higher efficiency light fixtures with more selective lighting controls.

The existing fire alarm system is functional but obsolete; it does not have the capacity to meet the growth demands of the campus. This system should be replaced with a more modern, programmable fire alarm system with addressable-type devices for greater safety, reliability, and system flexibility. The fire alarm system replacement can occur in phases as buildings are renovated.

Summary

The existing master clock system is functional and in good condition. The system wiring does not extend to all buildings, providing coverage only for a portion of the campus. The master clock system should be extended to cover both existing and future buildings and should provide for time consistency throughout the campus.

Telecommunications system pathways are adequate for the existing campus telephone and data cabling and are generally provided to all campus buildings. These pathways should be maintained with additional conduits added as needed for future building additions. The new conduits should terminate in the existing steam tunnel, which is to be used as the major pathway for cable routing and distribution. Removal of the existing mechanical heating and cooling systems piping from the steam tunnel will permit a new cable tray installation in the tunnel.

The fire alarm control panel, master clock, and data systems equipment should be consolidated at one single location to be determined by the campus to facilitate common cable routing paths for the signal systems.

Overall the campus electrical systems are in good condition, have sufficient capacities, and are expandable to accommodate future building expansion, with the exception of the fire alarm system. The fire alarm system can be replaced using most of the existing conduit and outlets but will require new addressable devices. This fire alarm system replacement can occur in phases to follow the expansion and renovation, as outlined in the Facilities Master Plan.

Alternate energy sources should be considered in the design of all new facilities. The incorporation of solar voltaic cells into the design of future buildings will provide an environmentally friendly method of reducing energy costs and increasing the reliability of the campus electrical system.