APPENDIX E:
Electrical Engineering Reconnaissance

I. EXISTING CONDITIONS

A. Electrical Power:

The Waimano Home Training School (WHTS) site is served by a single 11.5 KV radial circuit belonging to and maintained by Hawaiian Electric Company (HECo). This circuit is a solidly grounded 3-phase circuit designated as Waimano #6 from HECo's Waimano #3 Substation. The circuit is not a dedicated circuit because it has many single phase taps prior to its entrance to and termination at the top of the Waimano site. The Waimano site has 12 different load centers which are metered by HECo. Many of these meters serve several buildings. Under HECo's tariff all distribution of electrical power shall ordinarily be aerial. Customers are required to pay additional cost for underground service.

Originally, WHTS had its own 4.16 KV primary power distribution system with a single meter. Recently, this system has been replaced by a HECo System utilizing a multiplicity of meters; the advantage of which is that HECo will accomplish all maintenance up to the point of the meter at no cost to WHTS.

The HECo feed to WHTS is a simple single radial feed. Under the terms of HECo's tariff they (HECo) will be required to provide adequate power to any site presently served by them. Extensions to new buildings would be constructed by them and

billed to WHTS according to their "Extension Rule."

B. Telephone Communications:

The WHTS is served by Aerial telephone cables owned and maintained by Hawaiian Telephone Company (HTCo). The administration building contains the main distribution frame and switching equipment room. The site is presently served with 350 telephone pairs with another 300 to be added soon. The switching equipment is the antiquated step by step type which is scheduled to be removed in October 1990. At that time the site will be served by HTCo's Selex electronic service. The existing telephone equipment room will then just be used as a telephone cross connect room. Telephone cabling up into the WHTS campus is relatively new because of expanded need and the new electrical poles installed under the "Conversion to HECo power project" which allows for joint use of the poles by HECo and HTCo. Some of the existing "old" poles are still, however, being used by HTCo. The responsibility of bringing enough telephone pairs to the buildings belongs to HTCo and there is thus no need to be concerned about a shortage of aerial telephone pairs. Under HTCo's tariff, telephone cabling within a building belongs to the customer (user).

C. Cable TV:

According to Oceanic Cable TV, their cable TV service ends about 1-1/2 miles below the Waimano Site at Pearl City High School. Off the air video and in-house video are the only

video presently at the site.

D. Site Lighting:

The City and County street lighting system extends only up to the gatehouse. From that point on up the site no regular means of road illumination is used. There are nonfunctional remnants of earlier systems in the form of poles with broken and abandoned lights, but exterior lighting is provided only at building exterior points lighted from fixtures mounted on the buildings.

E. Life Safety:

A central fire alarm annunciator is located in the Hale Ola. This system receives sprinkler flow alarm signals from other inpatient buildings and zone alarms from Hale Ola, itself. A 24-hour alarm answering service is utilized to send an alarm to the fire department. Response to alarms comes from both Waiau and Newtown fire units.

1) Emergency Generation:

An emergency generator rated 45 KW serves the main hospital building to provide minimal lighting and emergency communication power.

II. PRELIMINARY ASSESSMENT

A. Power Distribution:

The power distribution system having recently been upgraded by HECo is in excellent condition up to and including the building service entrance. New poles and transformers are in excellent

condition. However, no attemp was made in the recent electrical upgrade to address the old systems within the buildings. Many of the buildings are still served by antiquated single phase 120/240 volts and could not accommodate increased load. The use of 240 volt delta power at the hospital suggests vintage electrical systems within the buildings, whereas, modern structures would typically use 277/480 volt power and 120/208 volt step down transformers. The present recorded total demand of all 12 meter locations is only slightly more than 500 KVA. A substantial portion of which is due to Waimano's well and booster pumps from its own water system. The future development of the site will likely increase the electrical demand substantially, especially if modern ventilation and air conditioning and lighting criteria are applied to the newly developed building area.

B. Telephone:

The exterior aerial telephone distribution system is generally the same condition as the power system. When the electrical power system was reconfigured, telephone cables were replaced and rerouted. No upgrading was done within the buildings themselves. In several cases the telephone system still uses poles from the old power system. We think that with the planned development of the site a joint telephone/power pole will be a very cluttered and unsightly pole. Relocation of such a pole for future construction purposes will become a problem which will involve lengthy outages of both

telephone and power.

C. Cable TV:

No system existing.

D. Site Lighting:

No system existing.

E. Life Safety:

The present fire alarm system conforms to minimum code. The use of fire alarm and security systems will become more important with development of the site. The use of a master security and fire alarm center may be appropriate. Consideration of the overall life safety aspect in terms of future development is in the following section.

III. ELEMENTS OF A MODERN ELECTRICAL SITE PLAN

A. Underground Distribution:

We feel that although the present aerial distribution system is extremely functional and maintainable that the overall site, when improved, would be better served by a totally underground system employing pad mounted transformers similar to those one would find in a normal residental neighborhood. Thus we have developed all systems using the concept of underground distribution of power and signal wiring.

B. Power Distribution:

Underground power distribution should start at the Hale complex and extend up the ridge to the furthermost building. This

study, however, envisions a scheme in which the last WTC facility is Building No. 14. Our pricing only extends up the ridge to that point. HECo offers underground service under Rule 13 where the agency wishing underground service must pay for all costs over and above the cost of an equivalent aerial system. Presently HECo's standards for underground service require dual radial circuitry (see the electrical single line diagram) at 11.5KV. Also inherant in their design are low profile pad mount transformers. All high voltage cables will be HECo owned and operated and a single pad mount transformer may be used to serve several buildings.

C. Modern site lighting:

Site lighting should satisfy the needs for both security in driving and walking and should provide an overall pleasing enhancement to both buildings and landscape. To effect this, a variety of light sources and shapes are available. For example; numerous new light sources offer the color temperature that is flattering to foliage at night and yet offer a natural feeling to the viewer instead of an unearthly blue or a yellow haze. Low level pathway and landscape lighting keeps the light source away from the eyes and yet provides adequate illumination of the path itself. A good example of the "institution feeling" is when you see a carefully demarcated parking lot, lit with 30 ft. high poles in a regular, square pattern. This feeling can be mitigated by lowering the light sources and

shielding their horizontal beam components and using light focusing techniques to "throw" light instead of providing a forest of blazing poles. The main roadways should be lit with a luminaire utilizing sharp cutoff on the "house" side and should have side shielding which effectively cuts off direct vision of the source. To lend a pleasing non-institutional appearance to the street lights, fiberglass poles can be used with matching luminaire color. Moreover, maintenance and installation costs would be minimized by using a direct burial pole. Fiberglass poles are non conducting which totally eliminate the possibility of shock hazard.

Lower profile lights at, say, 16' should be used in the inner roadways of the project. These will provide sufficient lighting for both drivers and security while avoiding the intimidating appearance of a higher pole. These luminaires should also be well shielded from the eye and may contain decorative styling or surfaces. Pathway lighting at 12' high or bollards at 42" high may be used for pedestrian traffic areas. By varying heights and spacing monotony can be reduced. Landscape lighting utilizing low voltage lamps allows foliage to be accentuated and brightens what might be an otherwise dull scene. This type of lighting is intrinsically safe due to the low (12 volt) operational voltage.

D. Telephone and TV System:

Placing of the telephone plant underground will, besides making the site less cluttered, enhance

the reliability of service. The placement of TV ducts within the complex will allow the entry of a cable TV service if desired by the school.

E. Fire Safety and Security Systems:

1. Fire Safety: The most recent developments in the continually evolving fire safety industry place emphasis on a strategy of fire management as opposed to immediate alarm and evacuation. The technlogies available make it possible to precisely identify the location and nature of alarm and trouble signals, to respond by verifying alarms, and by selectively evacuating specific areas through fireman's phone and voice evacuation/public address systems. Additionally, smoke dampers, stair pressurization fans and other mechanical means of fire and smoke control can be controlled directly or indirectly by the fire management system.

2. Physical Security: This is another area in which recent industry developments have altered institutional strategies on meeting reqirements. It is no longer necessary to create as many physical barriers as before, or to require insertion of magnetic cards or keys into readers. Devices can be placed unobtrusively to monitor and record activities in selected areas. Positive identification of individuals and control of

access to areas can be achieved by various methods such as proximity readers, and voice prints or other biometric means. Central security systems can monitor and record areas, incidents and the locations of personnel. These systems using a distributed database architecture, require less wiring and provide faster, more reliable response than systems in the past.

3. Proposed Concept: We propose that the Fire Safety and Security systems be centralized via a common network. Individual, Intelligent Fire Controllers (IFC) and Intelligent Security Controllers (ISC) can be networked on communications lines to Network Control Units, which in turn are linked on a Local Area Network to other Network Control Units and Operator Workstations. Each IFC and ISC functions as a complete, stand-alone system incorporating all functions described above. Network Control Units and Operator Workstations permit access to each of these systems, and provide monitoring and control of the entire campus as well, from a single point. Building automation controllers for air conditioning and lighting can be included into the same network. This large integrated system is expandable in increments, is capable of decentralized operation, and can be reprogrammed or reconfigured in the field. These systems have modest first costs, can

tolerate portions of the system being down for repair, and can be maintained and operated with a minimum of expertise.

IV. COSTS

A. Duct and Manhole Systems:

The following represent approximate costs based on the general size of the site and costs normal to similar developed areas.

Demolition	$ 15,000
Manhole Complexes	1,198,500
Switch & Transformer Pads	25,000
Concrete Encased Ducts	1,493,900
Secondary Duct Lines	330,000
Utility Co. Contribution Charges	380,000
Total	$3,442,400

B. Site Lighting:

Street Path and Landscape Lighting: Costs are approximate and are based on a campus-like environment with good quality landscaping.

Street and Parking Lights, including Ductwork	$ 306,000
Pathway Lighting	159,000
Landscape Lighting	240,000
Total	$ 705,000

C. Centralized Life Safety and

Security Systems:

Costs are order of magnitude and are based on approximately 20 buildings in a campus type setting and conform to the life safety code where required.

Fire Alarm System Component	$ 350,000
Security System Component	450,000
Total	$ 800,000
GRAND TOTAL	$4,947,400