An Opportunity for Healthcare Change:

Through Satellite Medical Facilities and Mobile Units

A Thesis

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By

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Thesis Paper

An Opportunity for Healthcare Change: Through Satellite Facilities and Mobile Units

Miami University

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Introduction:

The design of a mobile medical unit made specifically for a certain environment can have a greater impact than a fixed facility. This thesis examines how a mobile unit could change the way that medicine reaches those in three different areas of Cambodia. It will also look at the current ailments and what is readily available to mitigate them. The health system in Cambodia is much different than that experienced in the United States. The current state of the health system can be traced back to one major event in the country's history, the civil war in 1975. It wasn't until 1979 that aid could begin to come back to the country. However, it wasn't until the 1990's that a healthcare system began to emerge again. Before then, most of the countries aid came from Non-government organizations. An article from the World Health Organization explains that the first health strategic plan wasn't implemented until 2002 and that the current plan (2008-2015) is geared toward improving access to services and social protection. However, the countries Ministry of Health(MOH) finances public health care and delivers services. The slow emergence of a health care system is due to the fact that by the end of the 1975-1979 Khmer Regime; hospitals and health centers were destroyed or abandoned. The lack of health centers began the unhygienic health practices that they are trying to recover from. The country had 25 medical doctors that survived, causing them to initially focus on quantity of medical staff. There was a total of 1225 healthcare posts throughout the country that increased to 1616 post without an increase in staff. Also, dealing with the fact that there was very limited humanitarian aid in the 1980s. From then to 2001 non-governmental organizations supplemented their aid. With over 160 NGOs in the country, that period of "Aid" was described as uncoordinated and pulling in different directions. Their most recent push for quality healthcare was in 2008 with their second health strategic plan. This plan is geared more toward quality healthcare for the poor and the areas with the greatest need. However, when I was there in 2010, there seemed to be no effort to get quality healthcare to the rural areas.[1]

Medical care is scarce once outside the major cities in Cambodia. Some solutions for rurally accessible care has been explored in other countries by different companies and groups. MASS Design Group has designed and built numerous medical facilities in developing countries in areas that are difficult to reach. They build them from the ground up, employing the surrounding community and requiring little help from the developed world. They employ local craftsmen to build the facility while teaching them new techniques so that they mesh the new with the traditional. This meshing can be seen in the roof structures used as well as the building shapes chosen (Figure 1).

[1] Annear, Peter Leslie, Bart Jacobs, and Matthias Nachtnebel. The Kingdom of Cambodia health system review. Geneva: World Health Organization, on behalf of the Asia Pacific Observatory on Health Systems and Policies, 2015.

Examples of this is the work that they are doing in the Butaro District of Africa with a hospital and a series of doctors' houses. On the opposite side of that, Clinic in a Can is a foundation that has developed a unit made from a shipping container designed to be placed anywhere and function with power and water for a limited amount of time (Figure 2). Currently these are

being used for disaster relief and minor medical missions. Both design strategies have strengths that can be utilized. By combining aspects from both, one can reap the benefits from each while supporting local doctors and communities. Cambodia for example has just two functional hospitals for the entire country. Both of which are in the large city hubs which are a few days travel for those in the outermost parts of the country. I chose Cambodia for my site because in 2010 I went there on a medical mission with my church. I got a small glimpse of how much the country needed basic medical care. After that trip, I have always had an interest in helping those in need in developing countries. It is the reason that I have centered my thesis around mobile medical care. There is no definitive research that lays out the need for medical care in developing countries. There are small articles on the separate parts needed for a mobile self-sufficient medical unit but there is no book or resource that connects all the pieces. This thesis will explore the combination of mobility and functionality in a medical unit so that it can overcome the challenges associated with treacherous, off grid work. There is a great need for transportable medical care in a wide range of climates across the world. By designing a unit that can be dropped anywhere and be successful, there is a certain inclusiveness to the design.

While in Cambodia, I had the opportunity to travel to the poorest parts of the country. It took us nearly six hours to get to our destination by van, while only being able to take a limited amount of resources with us. Once on site, we had no physical structure to work within or access to any type of electricity or clean running water. We soon realized that many of the medical issues requiring care were little things that Americans could walk down the street to get something to fix. There is the occasional exception that may need serious medical attention, but it is a rare occurrence. Much of the care needed can be cured with simple medication or vaccination. However, many of the people who live out in the far reaches of the country cannot travel to the city for medical treatment or afford it. They also do not have the knowledge to know what can or cannot be fixed with modern medicine. They are rice farmers who are used to living off the land and fixing things themselves. My trip to Cambodia sparked my interest in medical aid. It raised some questions for mobile medical care. What caused the country to neglect the outermost parts of the country? What would be the easiest way to transport a medical facility to a remote area? How will the facility or unit be transported to the site? Will it be able to function without power or would it require some power source and access to water? Will it be a permanent fixture or will it leave after some time? Does it leave an impression in the area it resided?

When looking at the obstacles that the Cambodian health system has had to overcome, it is remarkable that they have a health system at all. To somewhat recover from no hospitals and just a hand full of doctors is a great achievement. One of the issues is that there are only two functioning hospitals in the country which are in major cities. The reasoning behind that is clear, with a limited infrastructure and a growing system it would be hard to reach every part of the country with quality medical care. By placing the hospitals in the major cities, it allows for the maximum number of people to be reach with quality health care. The fact that once a mile outside of the city, there is no utilities to connect to, no clean water, electricity, or vicinity to resources. The country didn't choose to

neglect the rural impoverished areas, it just hasn't found a way to reach those places yet.

The way we traveled to our medical site was by an off road capable van that could traverse the rough terrain. Many of the roads are poorly maintained and barely big enough for one vehicle. Some have been washed out by rain and others have been only traveled by moped, which is the vehicle of choice for many of the agricultural community. There is no other mode of ground transportation into those areas other than walking. This makes getting to any site to build extremely difficult. The question is what kind of vehicle can handle this terrain and carry an adequate amount of medical supplies. How much supplies does it need to carry and what kind of medicine is required?

The mobile units would have to overcome numerous obstacles as well as be fully functional. Clinic-in-a-Can currently has a modular unit that can be temporary for disaster relief or a permanent structure. It's called Clinic-in-a-Can because the unit is retrofitted into a redesigned shipping container[2]. These units are designed to function from solar energy and water provided within the container. When placed in a permanent setting however they seem foreign to the area. They have no connection with the surrounding context. The sole purpose of these units is to provide medical care in one location. The units that I am proposing would be a combination of the clinic in a can and a mobile vehicle that could reach a greater area. These units will have water treatment, single doctor housing, and medical resources all in one vehicle. It will provide the ability to function as a temporary structure or facilitate the beginning of a permanent community centered structure.

One solution for mobile medical care is a vehicle that can traverse the rough terrain and carry an adequate amount of medical supplies. This vehicle can be a several things but for this region there are three logical vehicle types. The first is a general purpose vehicle designed for the rural roads of Cambodia. This couldn't be any ordinary vehicle you just go buy. It would have to have some off road capability and be able to house a doctor for extended stays in rural areas. The second would be a more robust off road vehicle with a tow behind camper. This would be for reaching the more "off the beaten path" areas of Cambodia. The last vehicle would be a boat to navigate the water ways of Cambodia and better reach the river villages more efficiently. However, providing a solution for access isn't the only problem that needs to be faced. The other issue is the way in care is provided. The way in which medical care is structured helps make sure that it reaches the maximum number of people.

The community centered design concept comes from the ideology that MASS Design Group implements in their designs. They look at the problems that they need to address and then design a facility that solves those problems while including the community. The employ local works to cut cost and involve the community as much as possible. They also take this opportunity to teach the local craftsmen new building techniques and practices for more efficient building.[3] By involving the community and designing the building around the needs of the community, the build is ensured a long and effective life span.

There would also need to be a point at which members of the community could be educated on basic medical knowledge. This would ensure that there would always be someone within the community that could recognize and differentiate between medical issues. This would have made a big difference in the village that we visited on my trip to Cambodia. Many of the ailments we saw were minor and could have been fixed be a trip into town. They were simply things that the villagers had no knowledge of fixing. The ability to teach basic medical knowledge has its own challenges, what knowledge is essential and what techniques should be demonstrated?

[2] "Home." Clinic in A Can. Accessed March 03, 2017. http://www.clinicinacan.org/?gclid=CM3O2LehwdICFQm1wAodhHcDcA.

[3] "Mission." Home. Accessed March 03, 2017. https://massdesigngroup.org/about.

Though there are several obstacles that would have to be addressed and thought-out, this solution for transient medical care can be a difference in rural medical aid. It could be mobile, efficient, and community enriching. It would become more than just a medical aid, it could become part of the community. The doctors no longer have to be an unknown face placed in an area providing a service, they can be a destination for those seeking aid and those wanting to learn a new rewarding trade. Their mobile medical units could be a symbol for relief and health.

First Semester Research

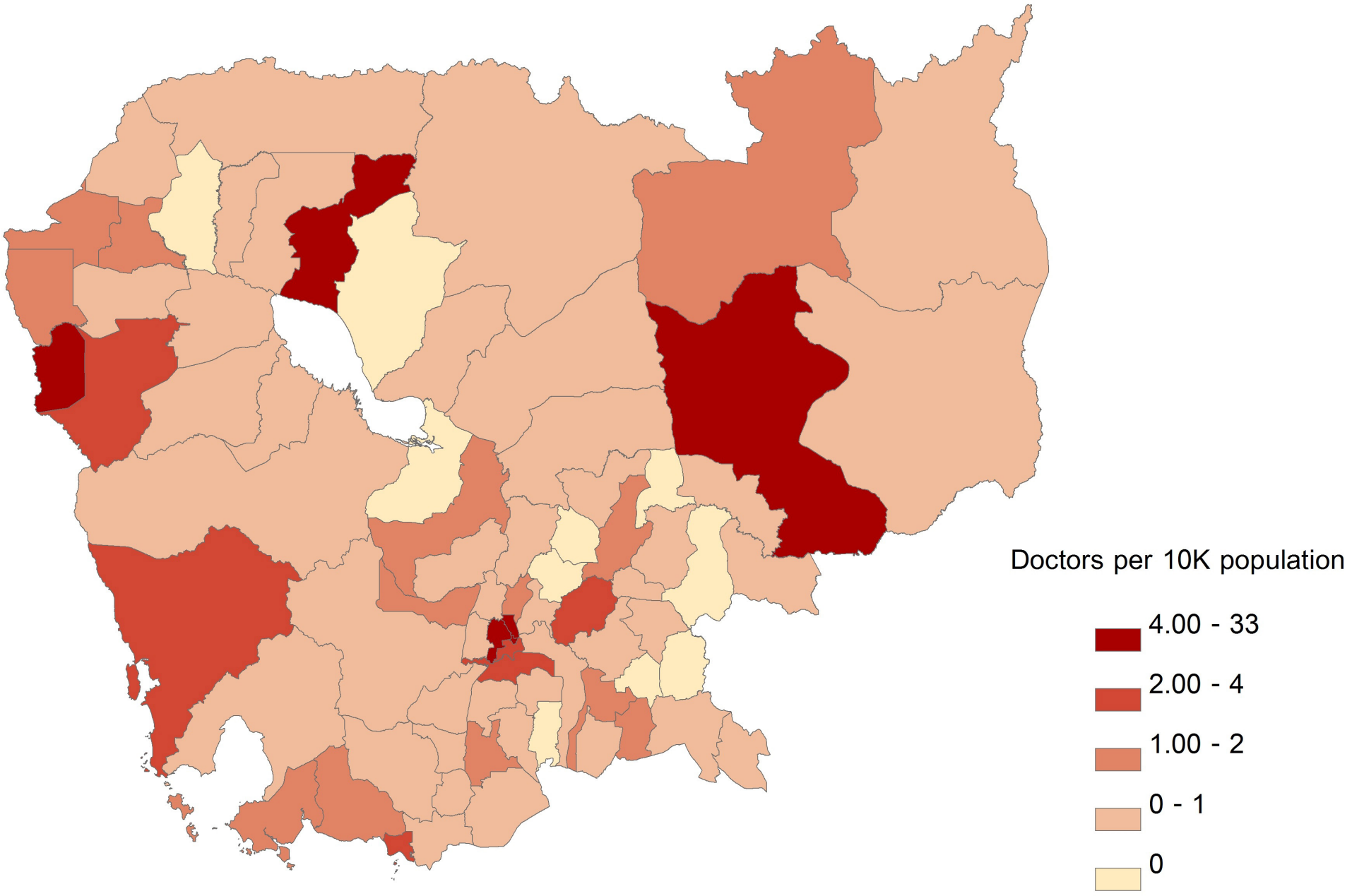
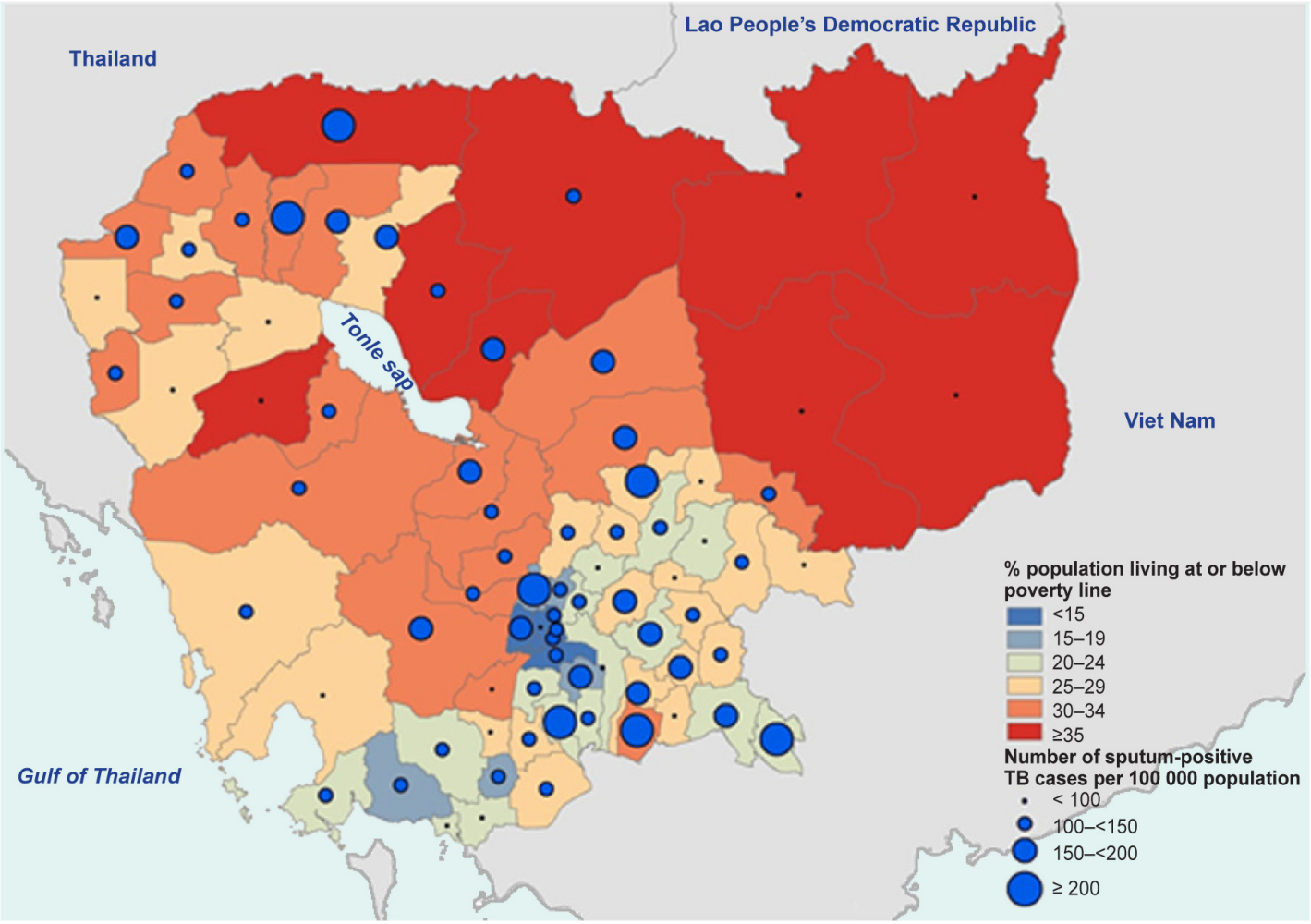
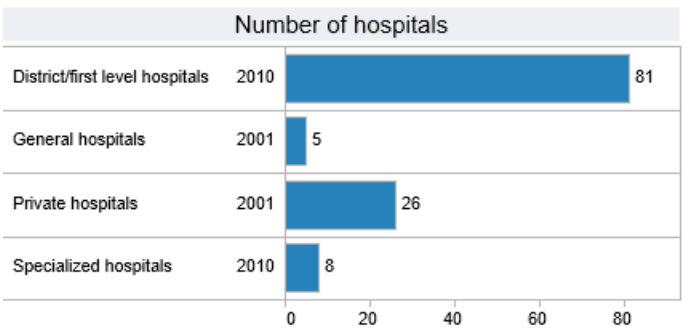

Doctors per 10K population
4.00 - 33
2.00 - 4
1.00 - 2
0 - 1
0

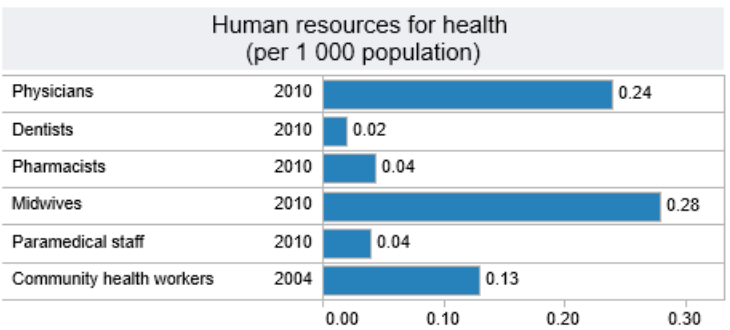
Figure 3. **Map of smear-positive tuberculosis case notification rates with operational districts household poverty levels, Cambodia, 2010**



Source: Data from the National Committee for SubNational Democratic Development, World Food Programme, National Institute of Statisitics and National Centre for Tuberculosis and Leprosy Council, Cambodia

Health systems

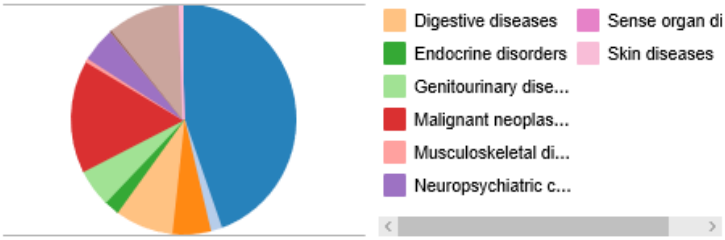




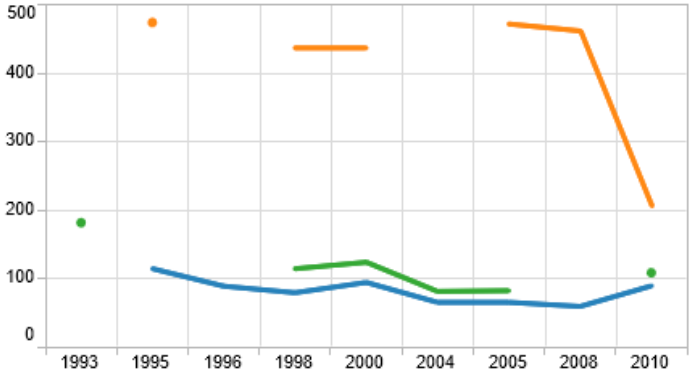
HIV, Malaria and TB

Estimated HIV prevalence rate in adults (%)	Total	2010	0.7
HIV prevalence in adult incident TB cases (%)	Total	2009	6.4
HIV prevalence rate in adults (%)	Total	2007	0.8
Malaria incidence rate (per 100 000 population)	Total	2011	432.0
Malaria mortality rate (per 100 000 population)	Total	2011	0.7
Malaria prevalence rate (per 100 000 population)	Total	2006	554.0
Tuberculosis mortality rate (per 100 000 populati..	Total	2009	71.0
Tuberculosis prevalence rate (per 100 000 popul..	Total	2009	693.0
Tuberculosis success rate	Total	2008	95.0

Mortality due to noncommunicable diseases, 2008



Infant mortality rate, under-5 mortality rate and maternal mortality ratio



Prevalence of risk factors for noncommunicable diseases (% population)

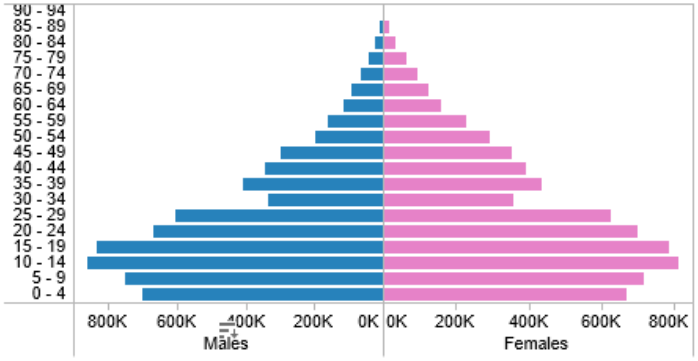
Current drinkers	Male	2010	76.30
	Female	2010	31.90
	Total	2010	53.50
Daily smokers	Male	2010	49.30
	Female	2010	4.80
	Total	2010	26.40
Low fruit and vegetable consumption	Male	2010	83.30
	Female	2010	85.30
	Total	2010	84.30
Physically inactive	Male	2010	10.90
	Female	2010	10.30
	Total	2010	10.60
Raised blood cholesterol / lipids	Male	2010	17.00
	Female	2010	24.20
	Total	2010	20.70
Raised blood glucose	Male	2010	2.50
	Female	2010	3.30
	Total	2010	2.90
Raised blood pressure	Male	2010	12.80
	Female	2010	9.60
	Total	2010	11.20

Demographic and socio-economic situation

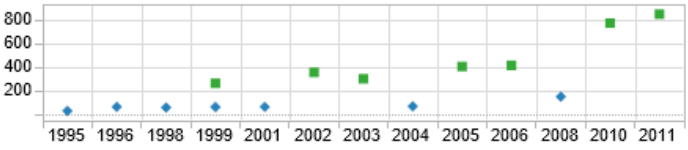
Demographic indicators

Annual population growth rate (%)	Total	2008	2
Area (1000 km^2)	Total	2008	181
Crude birth rate (per 1000 population)	Total	2004	25
Crude death rate (per 1000 population)	Total	2004	7
Dependency ratio	Total	2008	61
Estimated population ('000s)	Female	2008	6,880
	Male	2008	6,516
	Total	2008	13,396
Healthy life expectancy (HALE) at 60 (years)	Female	2002	11
	Male	2002	10
Life expectancy at birth (years)	Female	2008	64
	Male	2008	61
Percentage of population 0-4 years old	Female	2008	10
	Male	2008	11
	Total	2008	10
Percentage of population 5-14 years old	Female	2008	22
	Male	2008	25
	Total	2008	23
Percentage of population 65+ years old	Female	2008	5
	Male	2008	4
	Total	2008	4
Population density (per sq km)	Total	2008	74
Rate of natural increase of population (% per a..	Total	2005	2
Total fertility rate (women aged 15-49 years)	Total	2010	3
Urban population (%)	Total	2010	20

Population by age and sex, 2008



Adult literacy rate and per capita GDP



Health situation and trends

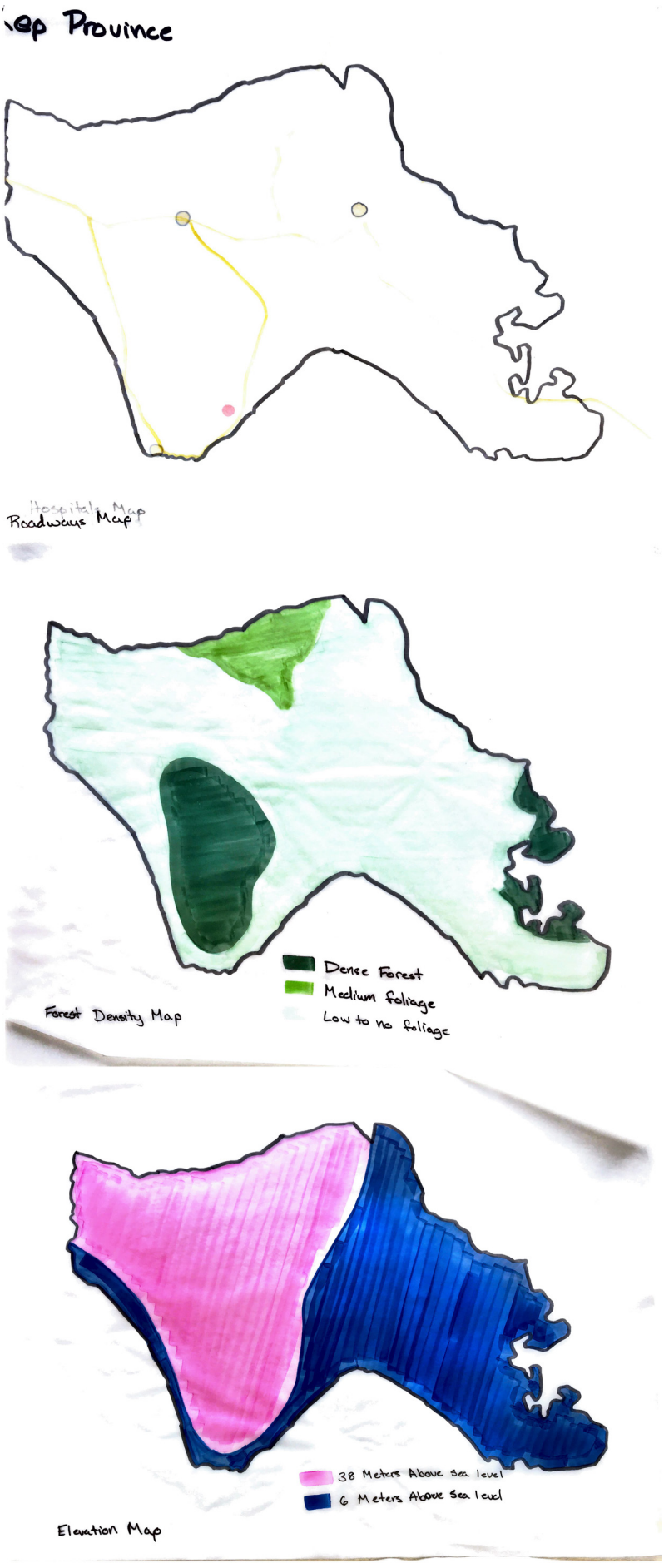
Leading causes of mortality (per 100 000 population), 2010

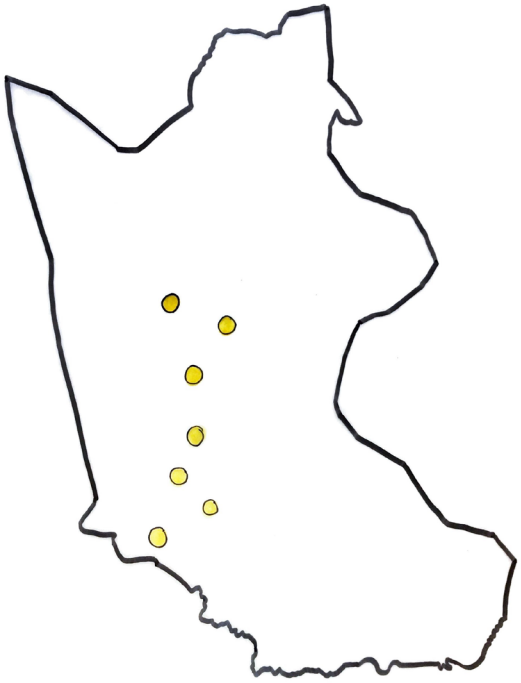
1	Acute respiratory infections	8.050
2	Traffic accident	3.511
3	High blood pressure	3.319
4	AIDS	1.986
5	Tuberculosis	1.851
6	Cardiopath	1.816
7	Meningitis	1.390
8	Dengue	0.300
9	Other tetanus	0.227
10	Liver cancer	0.121

Leading causes of morbidity (per 100 000 population), 2010

1	Acute respiratory infections	555.2
2	Diarrhoea	350.0
3	Tuberculosis	201.3
4	Typhoid fever	108.2
5	Dengue	89.1
6	Genecological Pathology	79.4
7	Traffic accident	75.1
8	High blood pressure	71.2
9	Cataract	43.2
10	AIDS	35.7

Location of sites
in Cambodia


ep Province
Hospital Map
Roadways Map
Dense Forest
Medium foliage
Low to no foliage
Forest Density Map
38 Meters Above Sea level
6 Meters Above Sea level
Elevation Map

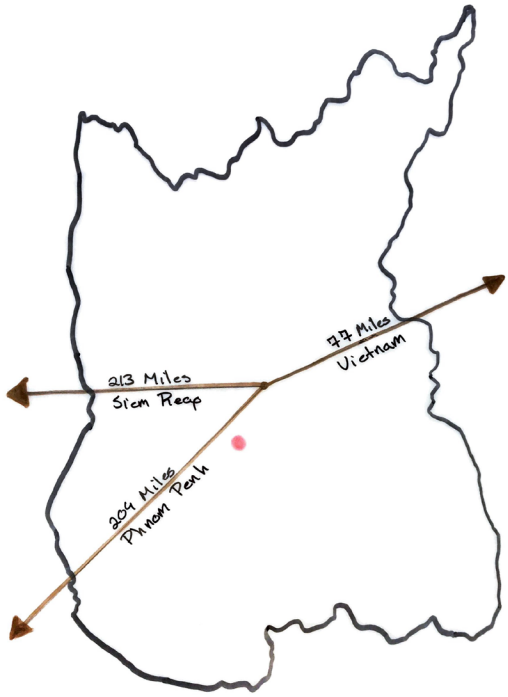


Known Villages Map

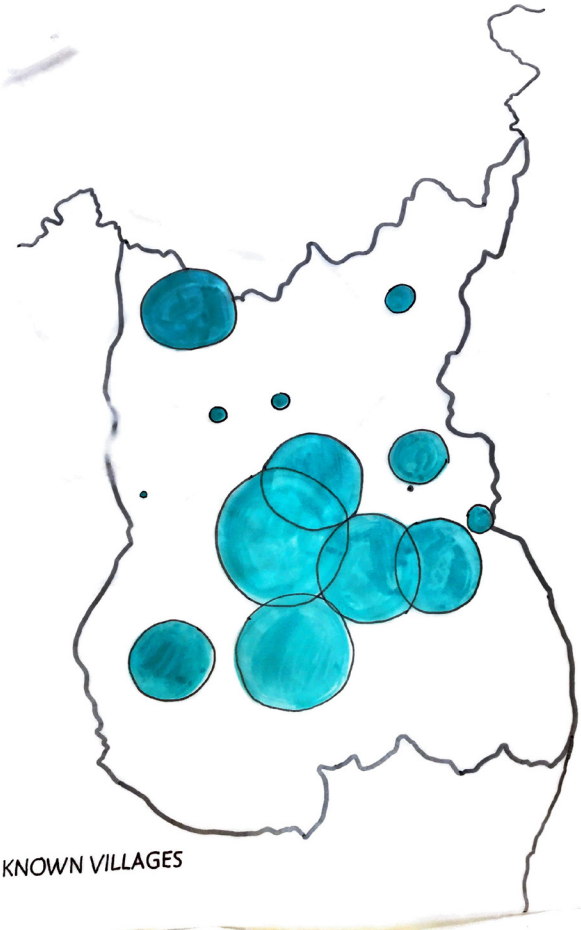
Elevations Map

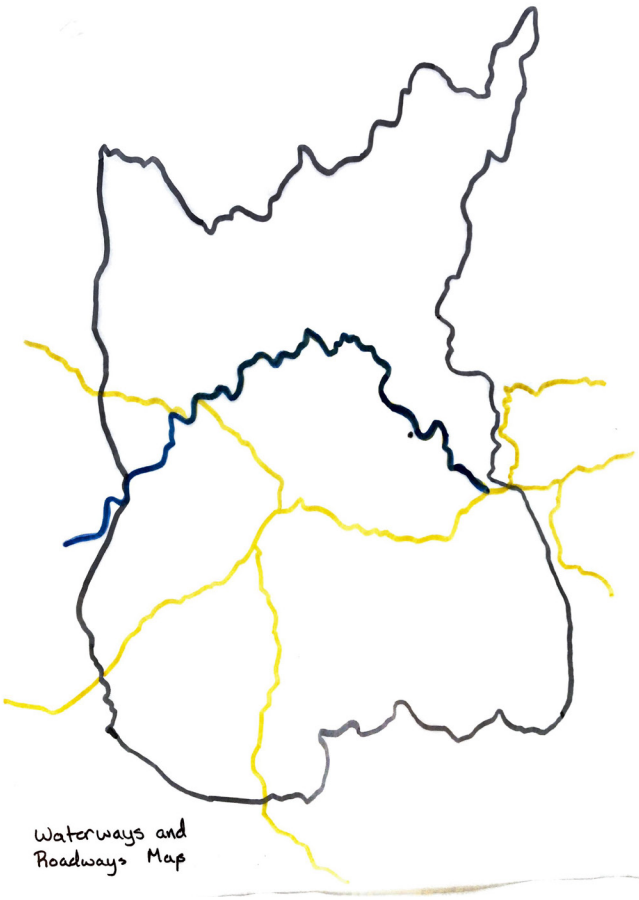
Forest Density Map

Ratana Kiri Province



Distances to Major Cities





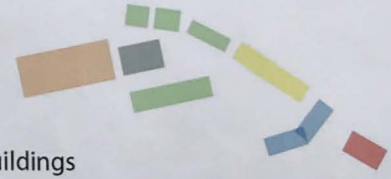
Waterways and Roadways Map

Butaro Distric Hospital

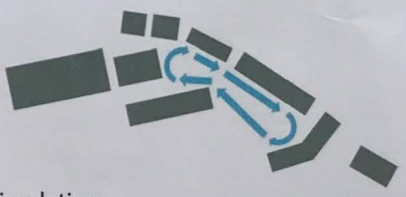
MASS Design Group

The new facility, which opened in January 2011, is designed to mitigate and reduce the transmission of airborne disease through various innovative systems, including overall layout, patient and staff flow, and natural cross-ventilation. Local materials—such as the volcanic rock from the Virunga mountain chain—and local labor-intensive practices delivered site-appropriate, sustainable design, and stimulated the local economy. The careful coordination of design and construction held the budget of the hospital to two-thirds of comparable projects elsewhere in Rwanda.

Site Plan

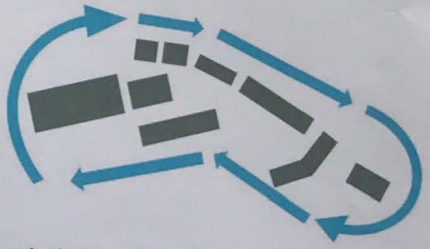


Related Buildings



Patient Circulation

Separation of Spaces



Staff Circulation

Ambulatory Surgical Facility

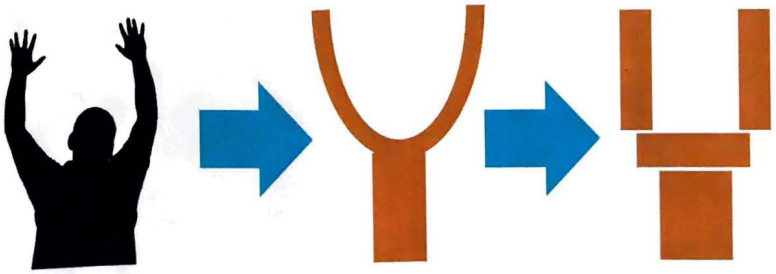
Off-Grid Prototype Kyabira

The design for the first of these facilities takes inspiration from the stand of banana plants adjoining the Soft Power Health Clinic in Kyabirwa, Uganda. The solar panels collect sun and provide shade, much like the surrounding banana plants. The solar array shelters and powers the simple modular brick facility beneath. The building is composed of three functional elements: a reception pavilion and a courtyard waiting area for patients' families, an intermediate pavilion for pre-op and post-op activities, and a sterile pavilion with two operating rooms and related support spaces. The facility will provide access to surgical treatments not available to this community before, as well as training for nurses and surgeons on quality surgical care. The medical staff will also be supported by telemedicine links to Mount Sinai Hospital in New York, with real-time operating room video conferencing.

Section through waiting area

Sense of protection and embrace

Inspiration for solar panel design



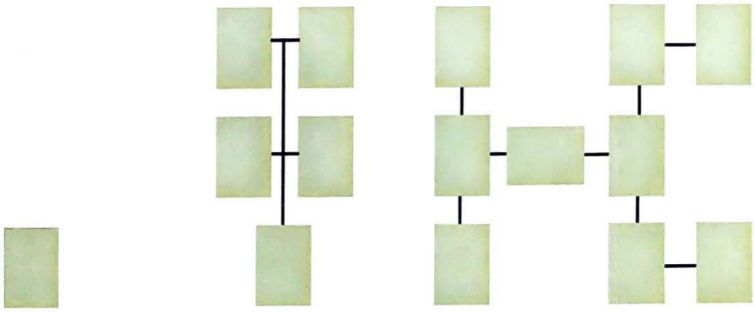
Parti

Correlation with nature

Air Beam Shelter

US Army Field Hospital choice
HBT Global

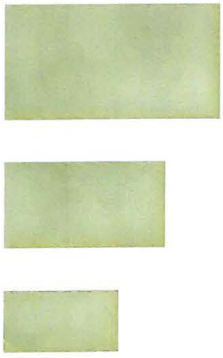
AirBeam Shelters are made primarily of non-rigid, fabric elements. Permanent doors can be blast-resistant for sites with inherent hazards, or fabric-covered frames in less-threatened environments. The structures can be closed or open to the elements at one or several locations without any loss of structural integrity. The structures can include electrical, lighting, HVAC, insulation, air filtration systems, and other additional features to suit specific needs. They can be used for vehicle storage, field hospitals, sleeping baracks, or a command center.



Modularity: one unit can be paired with other units to make a larger more intracate structure.

Simplicity: one structure shape used throughout the shelter.

Scalable: for almost anything that the shelter may need to be used for. Can be built into just about any size, even large enough to house a few aircraft.



Portability: Easily moved into place and erected within a few hours. If needed can be moved once inflated with ease.

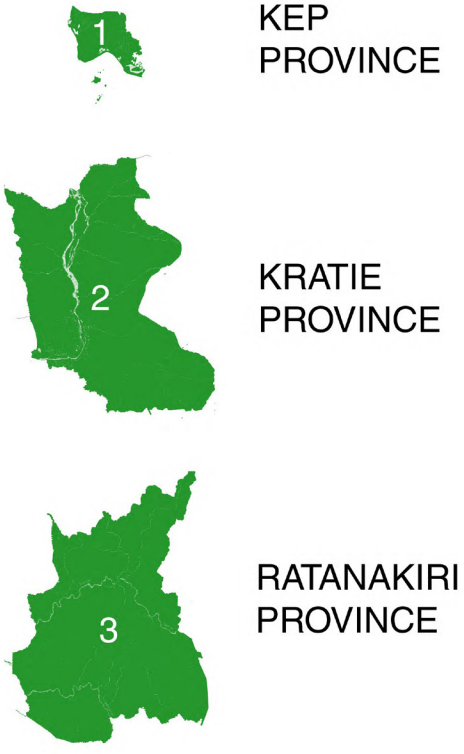
Final Pin-up

MOBILE MEDICAL CARE FOR THIRD WORLD COUNTRIES

LOCATION

MACRO

MESO 1

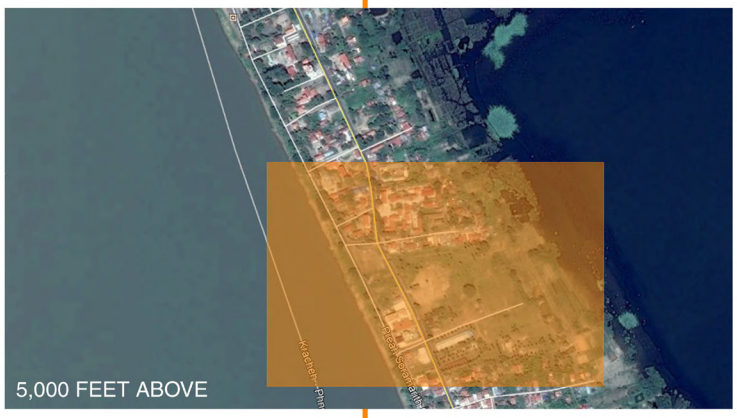


KEP
PROVINCE

KRATIE
PROVINCE

RATANAKIRI
PROVINCE

SITE LOCATION



KRATIE PROVINCE

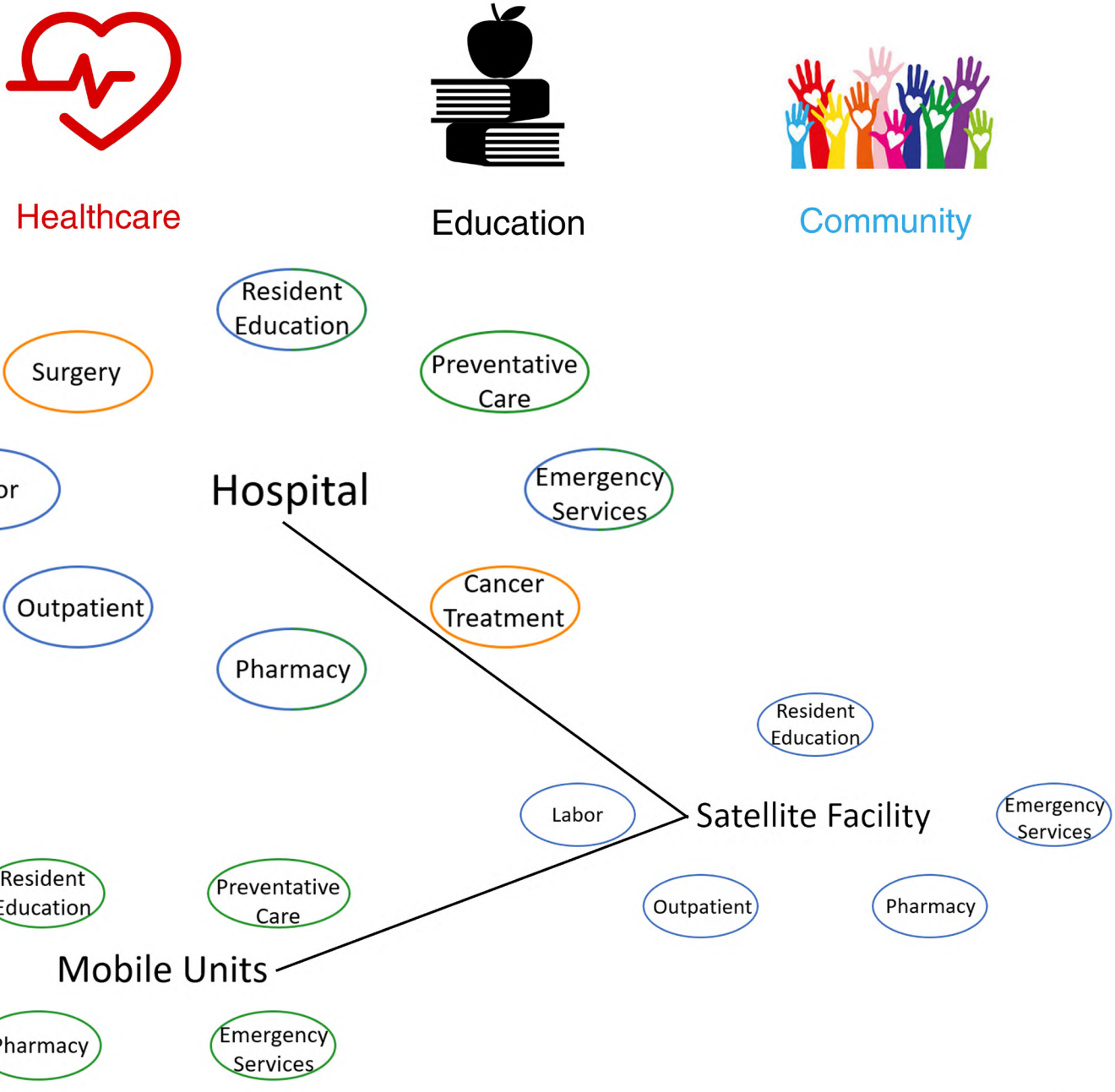
POPULATION: 320,000
70% LIVE ALONG THE RIVER
SIZE: 4,200 mi²

KRONG KRACHEN

POPULATION: 38,000
BUILDING TYPOLOGY: FRENCH COLONIAL
LOCATED ON MEKONG RIVER

Thesis Statement

Satellite facilities create a connection to healthcare from birth by offering labor/delievery and outpatient services to rural and urban areas. They not only create a connection to healthcare they provide an opportunity to further the healthcare system through education of community and future medical professionals.

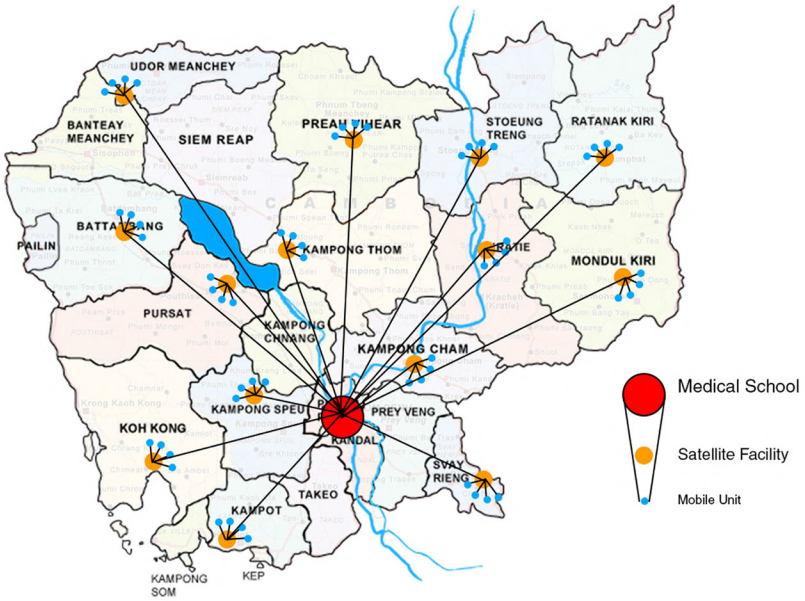


MY PROPOSAL

សាកលវិទ្យាល័យ អន្តរជាតិ
INTERNATIONAL UNIVERSITY

Satellite Facility

Mobile Units



Site Info

+15 minutes to nearest airport
+adjacent to referral hospital
+5 hours from Capital by car
+Located on the Mekong River and major road that connects to other provinces
+2.3 hours from furthest edge of province
+Access to power and two modes of transportation

Referral Hospital

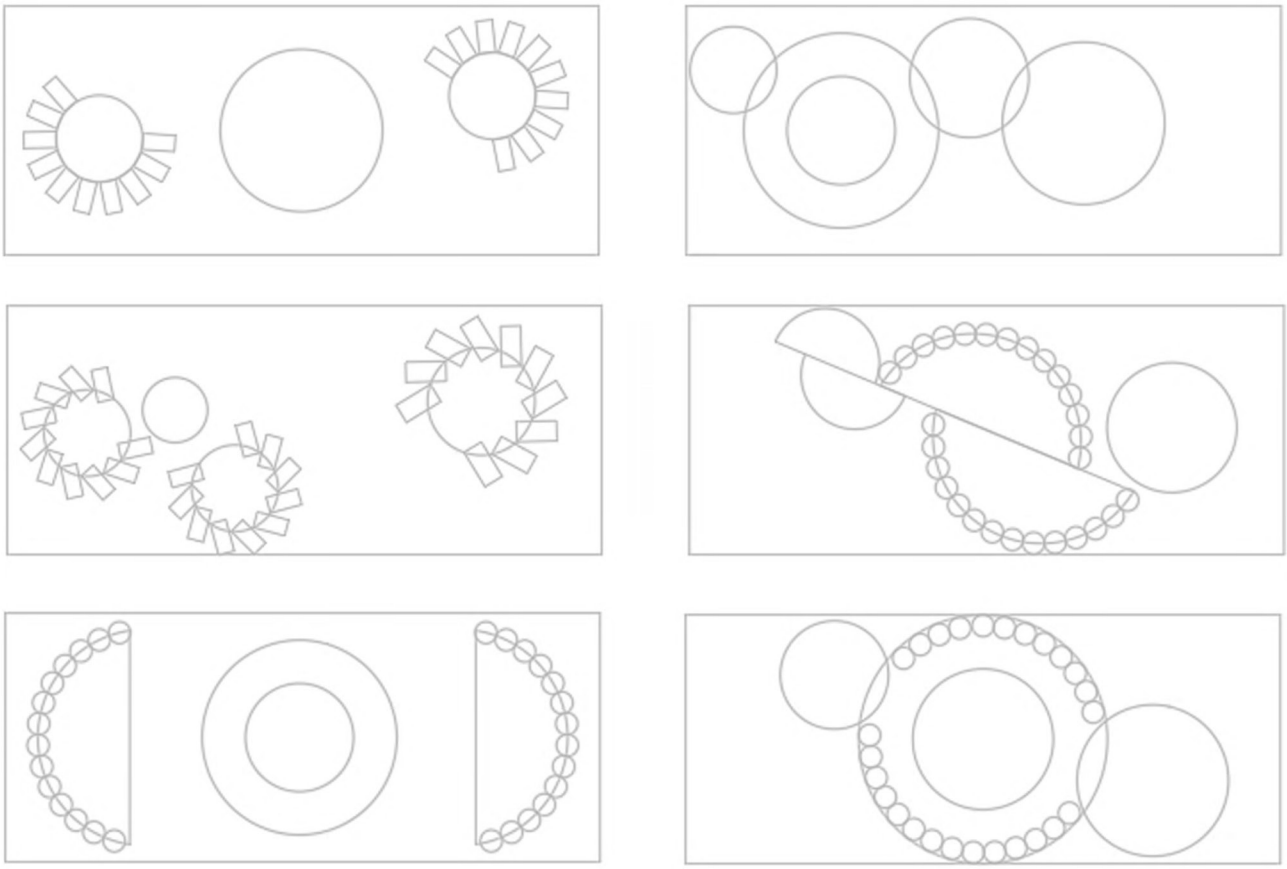
Lite Moped Traffic

Heavy Car and Moped Traffic

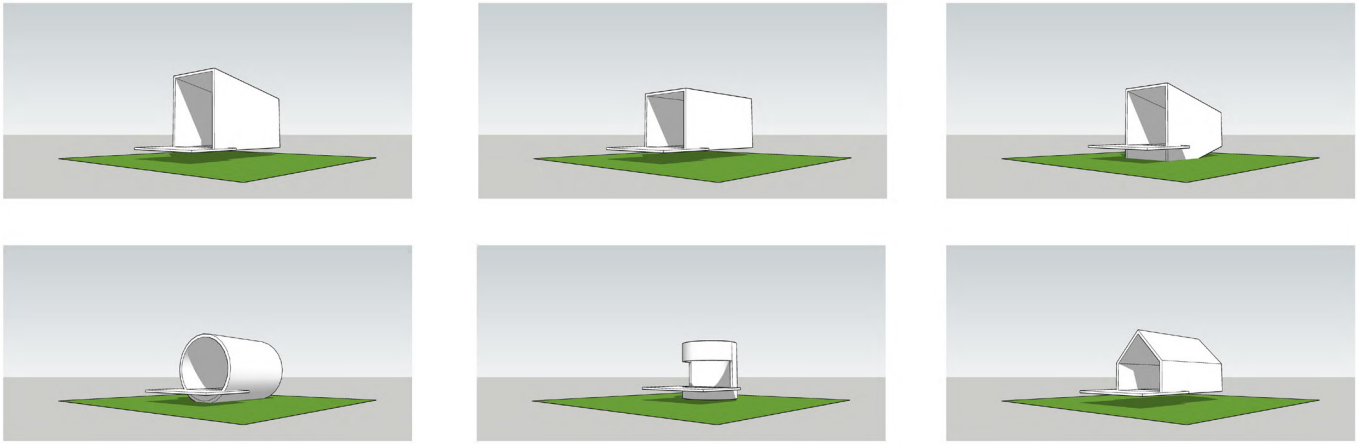
Site Area

DESIGN CONCEPTS

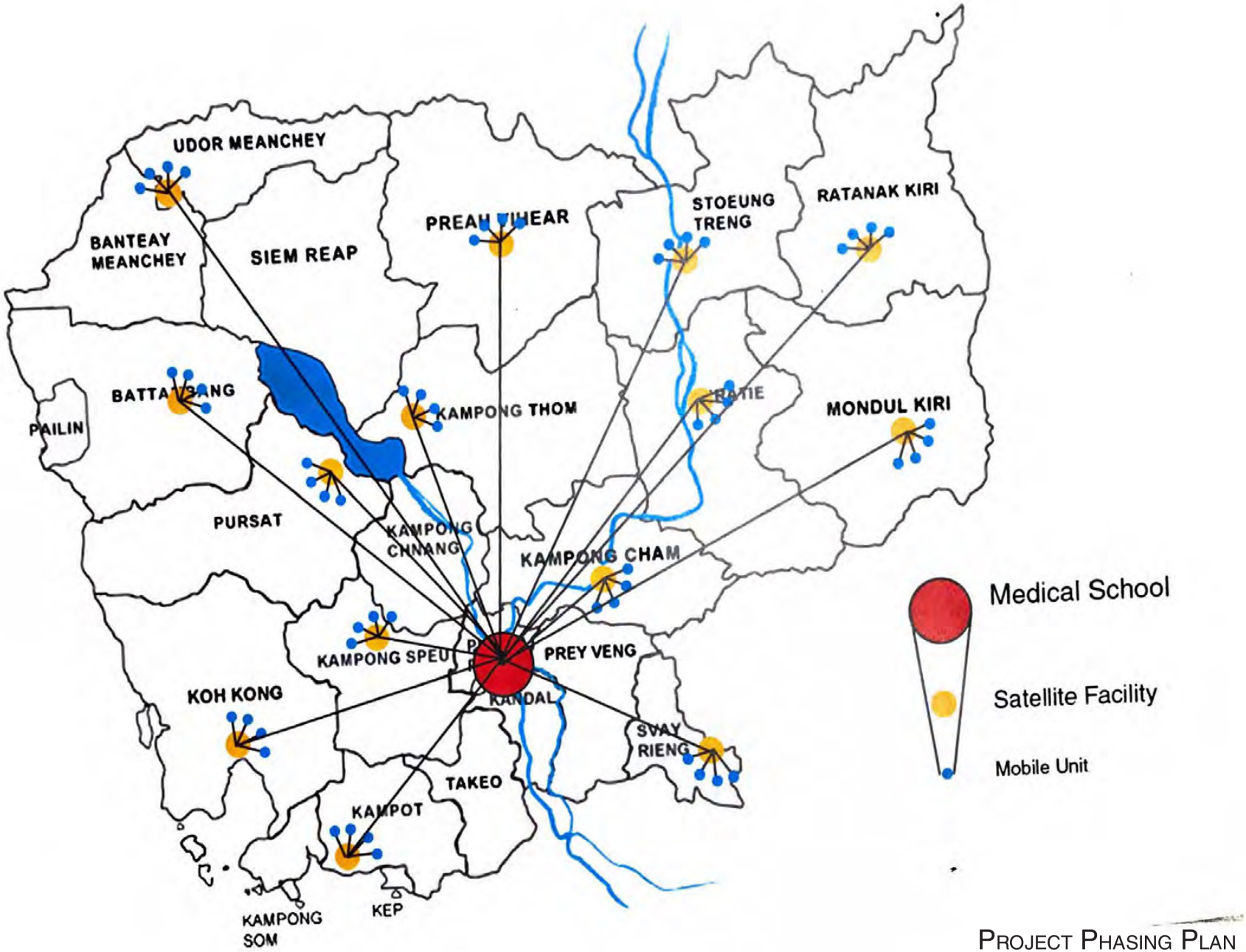
SITE LAYOUT CONCEPTS



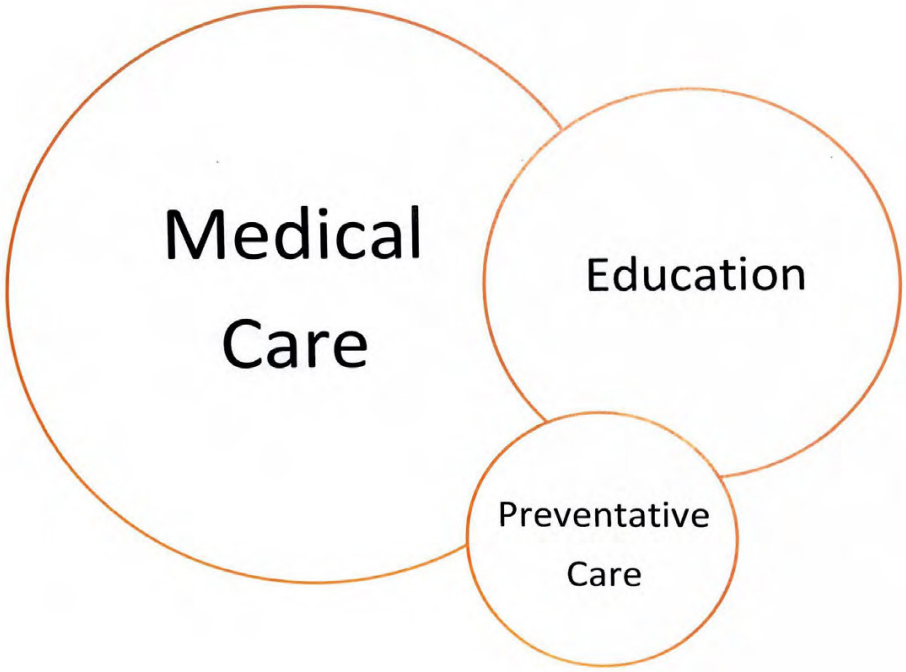
EXAM ROOM SHAPES



Final Semester Work



PROJECT PHASING PLAN



Facilitating Education

Improving Healthcare

Enriching the community

Creating interest in Healthcare

Multiple Medical Disciplines

Independent of Hospital

Doctors with Greater Reach

More Proactive Healthcare

Mobile Medical Units

Hospital Care

- Major Surgery
- Inpatient Care
- Cancer Treatment
- Intensive Care Unit
- Psychiatric Area
- Labor and Delivery
- Laboratory and Imaging (X-ray/MRI/CAT Scan)
- Pharmaceutical Services

Satellite Facilities

- Minor Surgery
- Emergency Care
- Laboratory and Imaging
- Pharmaceutical Services
- Outpatient Services

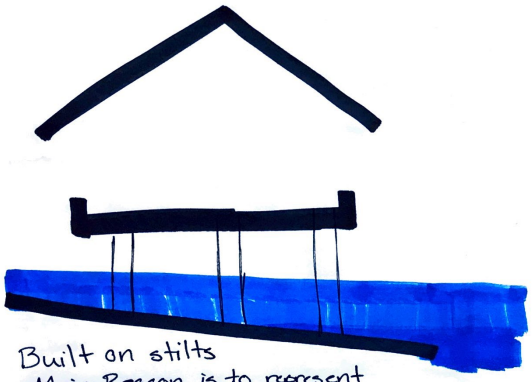
Mobile Medical Units

- Pharmaceutical Services
- Outpatient Services
- Check-ups
- Preventative Care

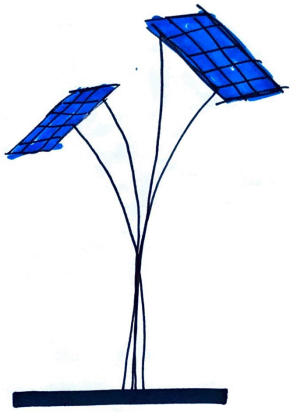
What I Am Proposing To Design

Satellite Facility Obstacles

- Flood Plain (In Some Areas)
- Off-Grid Function (In Some Areas)
- Program Layout for Medical Units
- Coordination with Medical School



Built on stilts
- Main Reason is to represent Mount Meru (Religious)



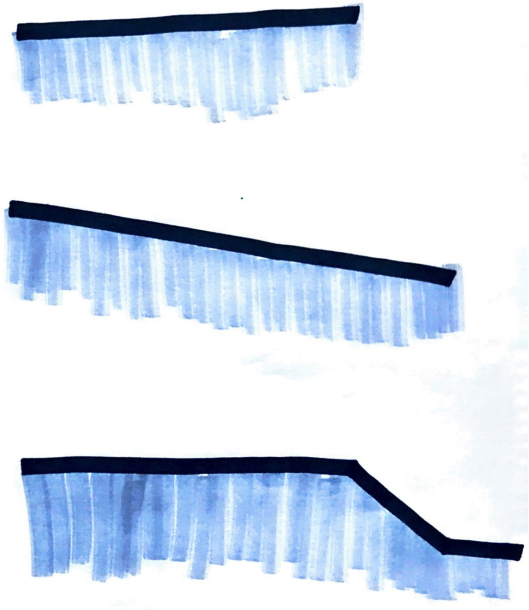
Solar Panels that Mimic Trees (Shade + Power)

Satellite Facility Terrain

Low to Level Terrain

Long Low Flood Plain

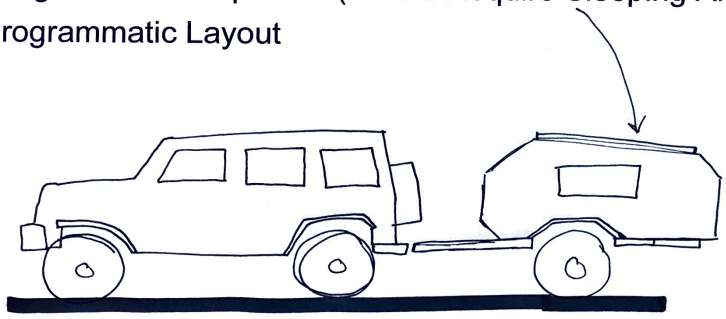
Most Sites will be Relatively Flat



Terrain Types

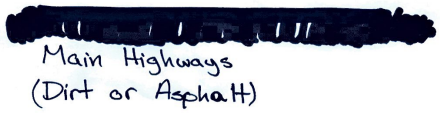
Medical Unit Obstacles

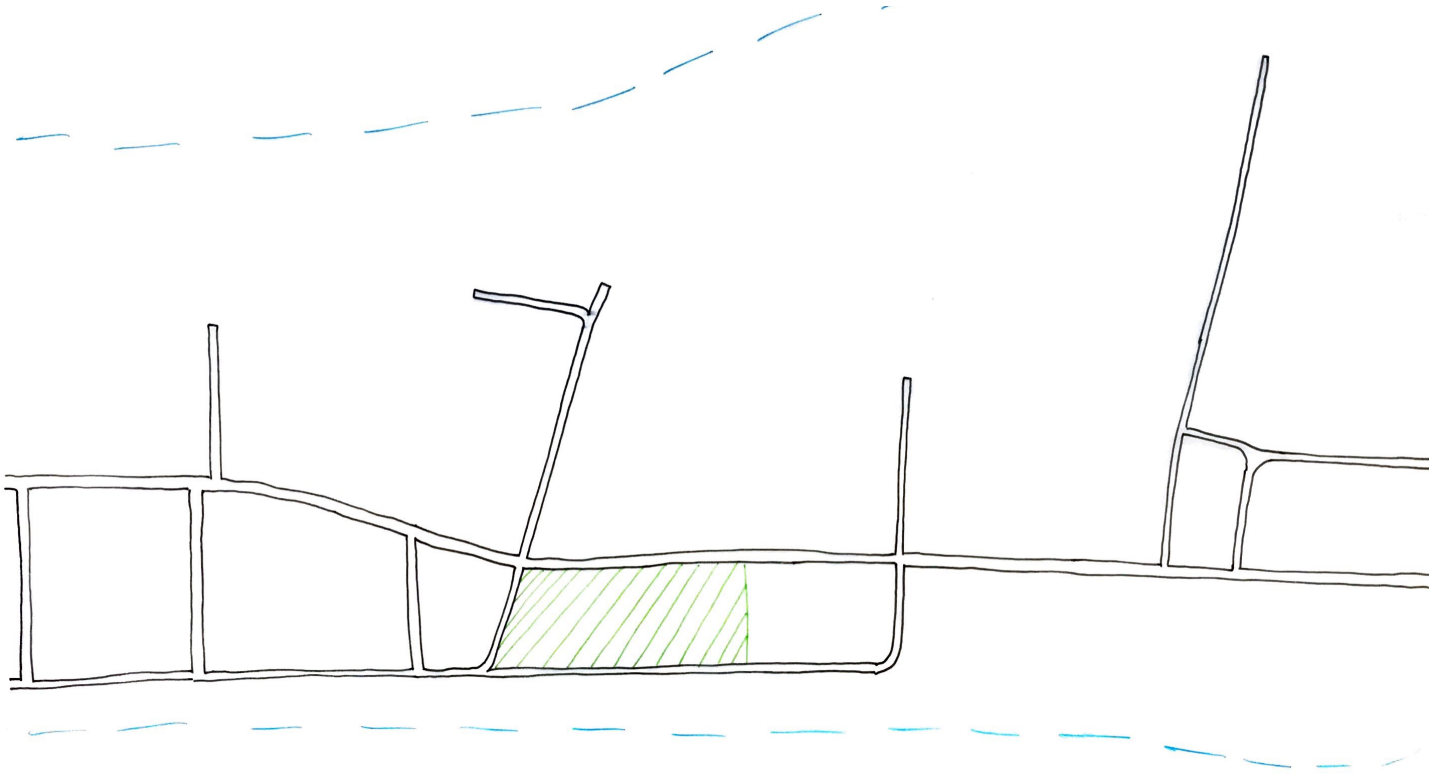
Pharmaceutical Storage (Lockable and Refrigerated)
File Storage
Collapsible Exam Room
Long Distance Capable? (Would Require Sleeping Area)
Programmatic Layout

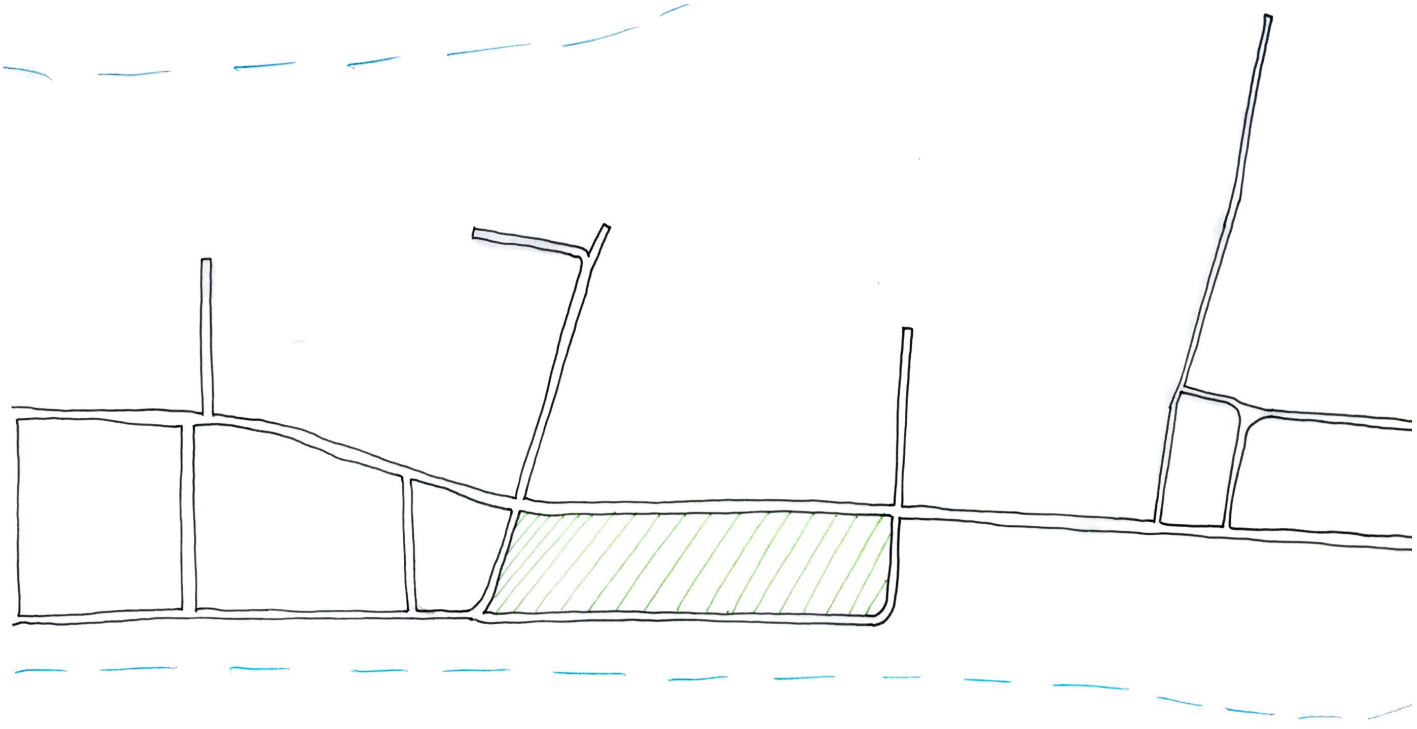


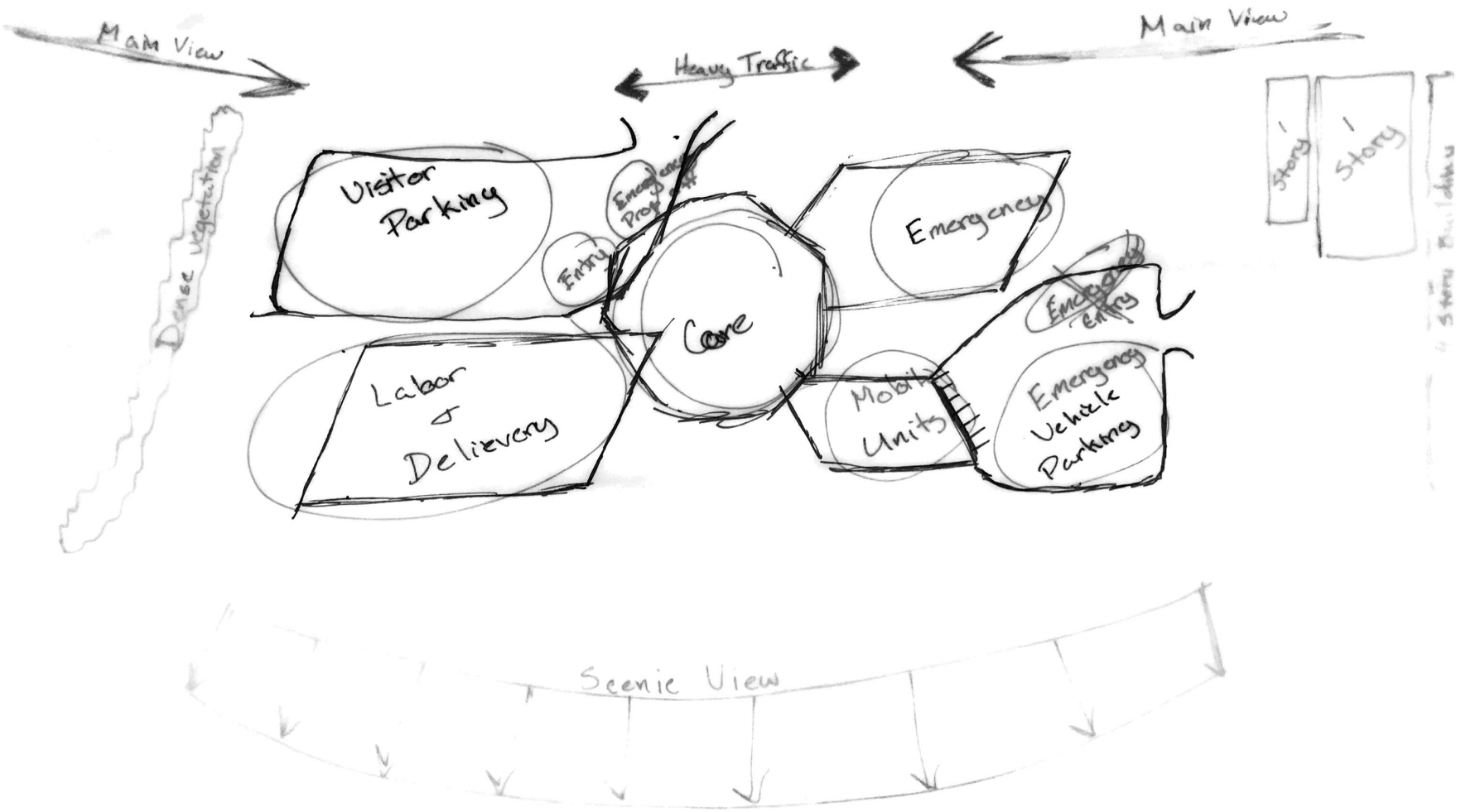
Medical Unit Terrain

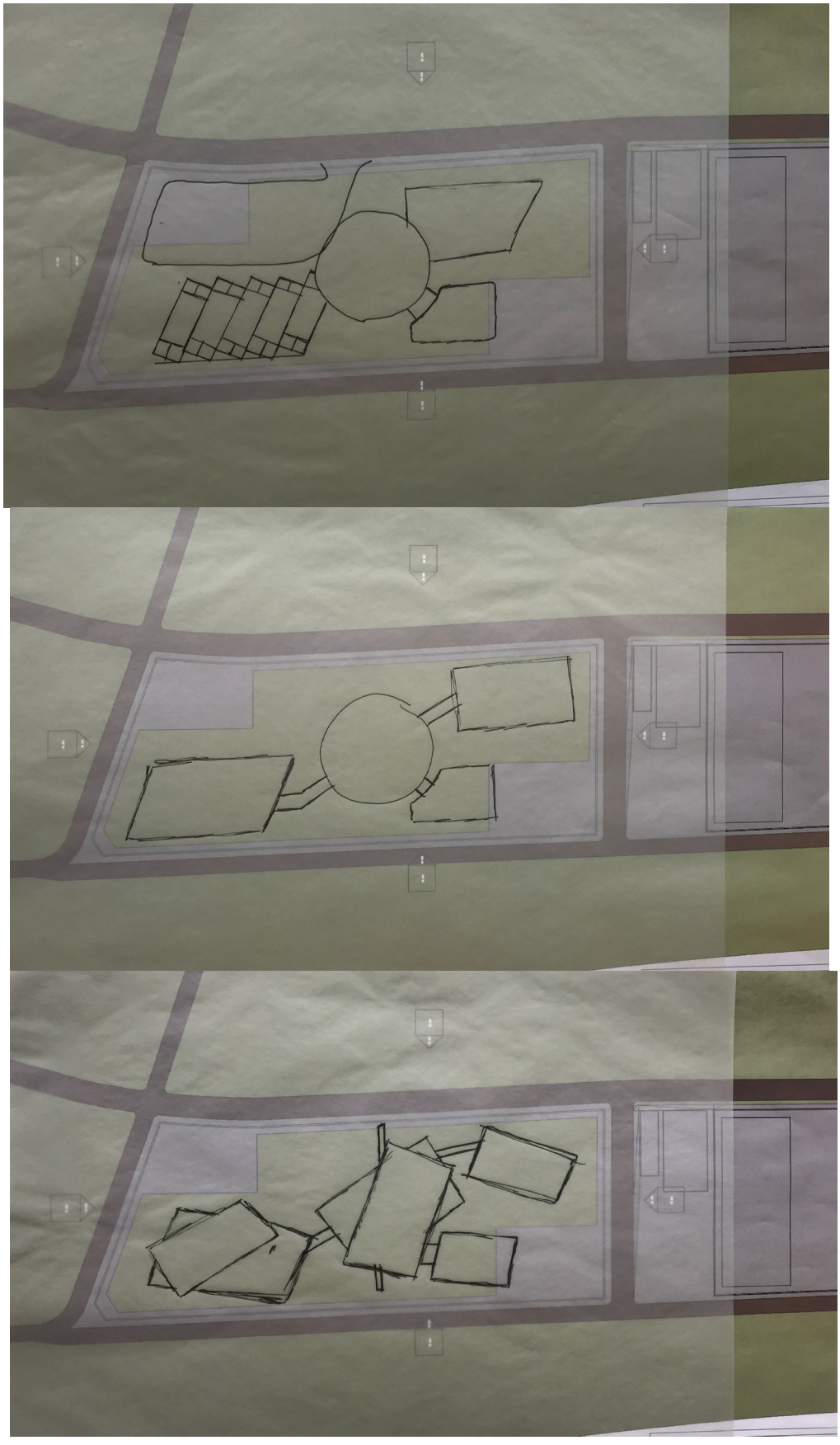
Rough Unkept Roads
Dense Ground Foliage
Shallow Flood Water



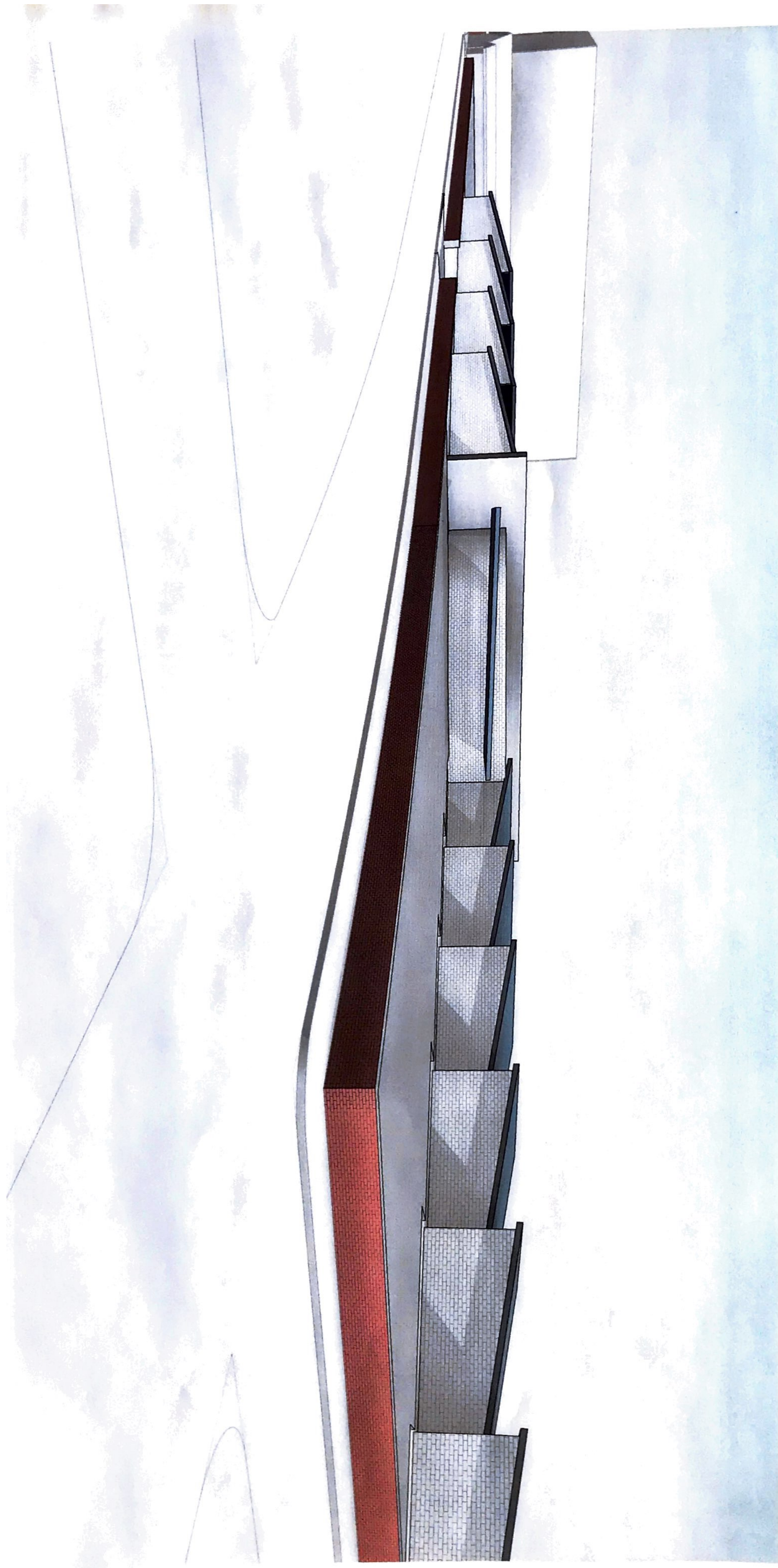


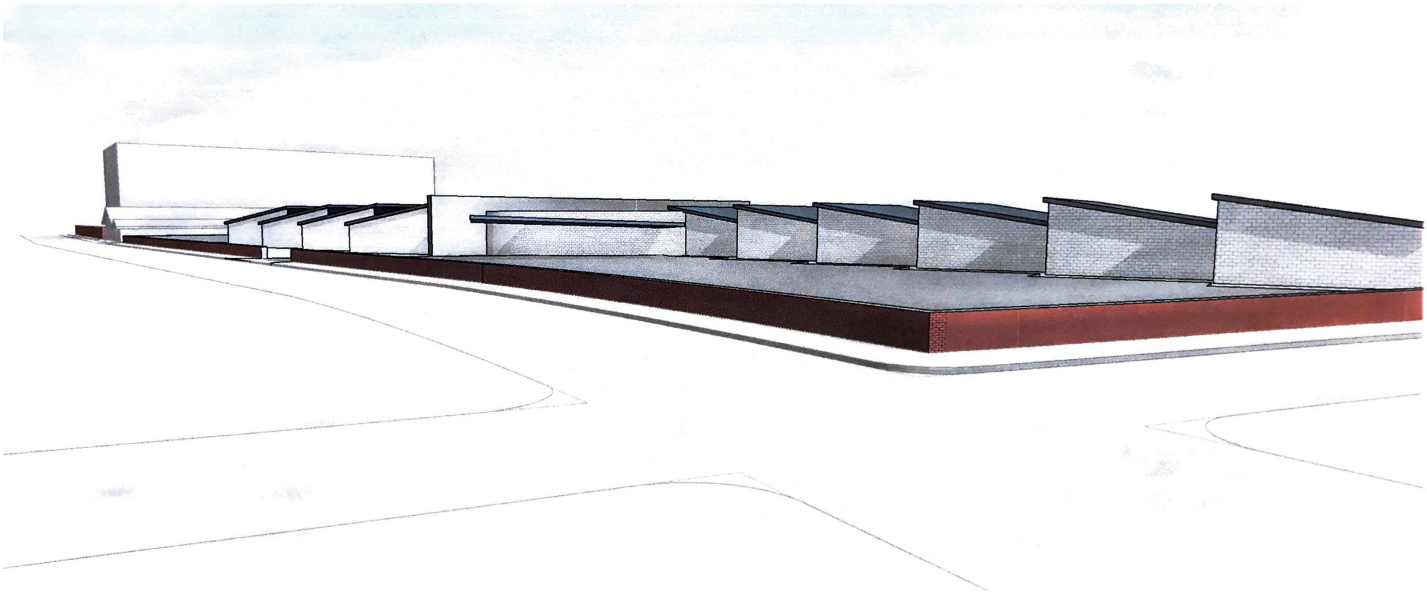


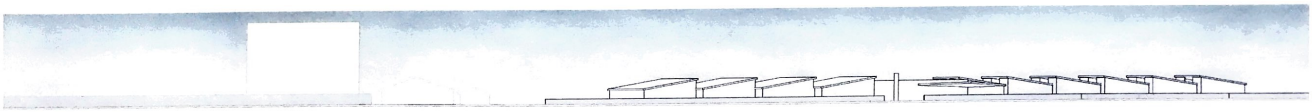

Main View
Heavy Traffic
Main View
Dense Vegetation
Visitor Parking
Entry
Core
Emergency
Labor & Delievery
Mobile Units
Emergency Vehicle Parking
1 Story
1 Story
Scenic View



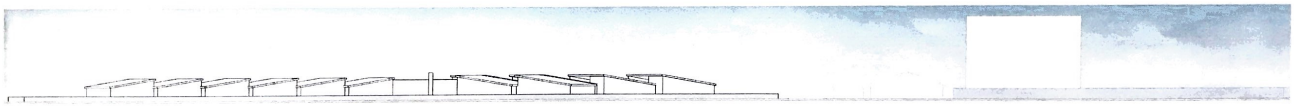
BUILDING ITERATIONS
N.T.S.



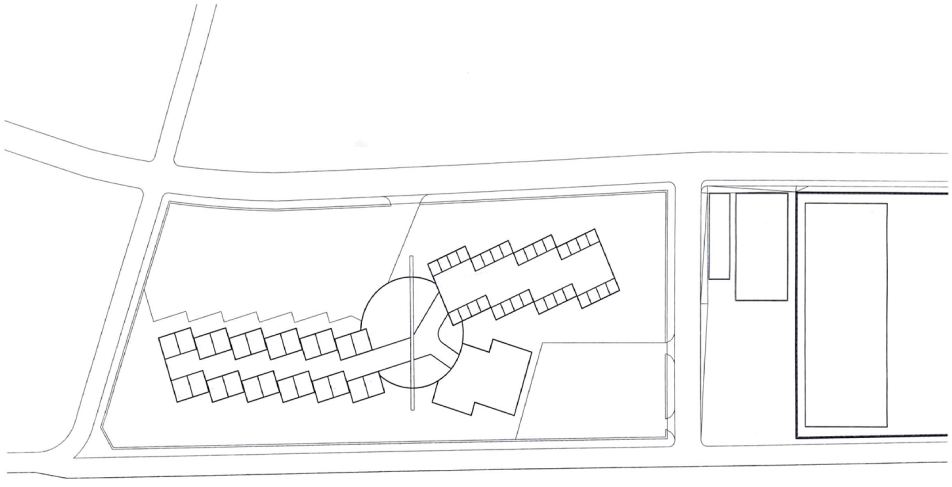


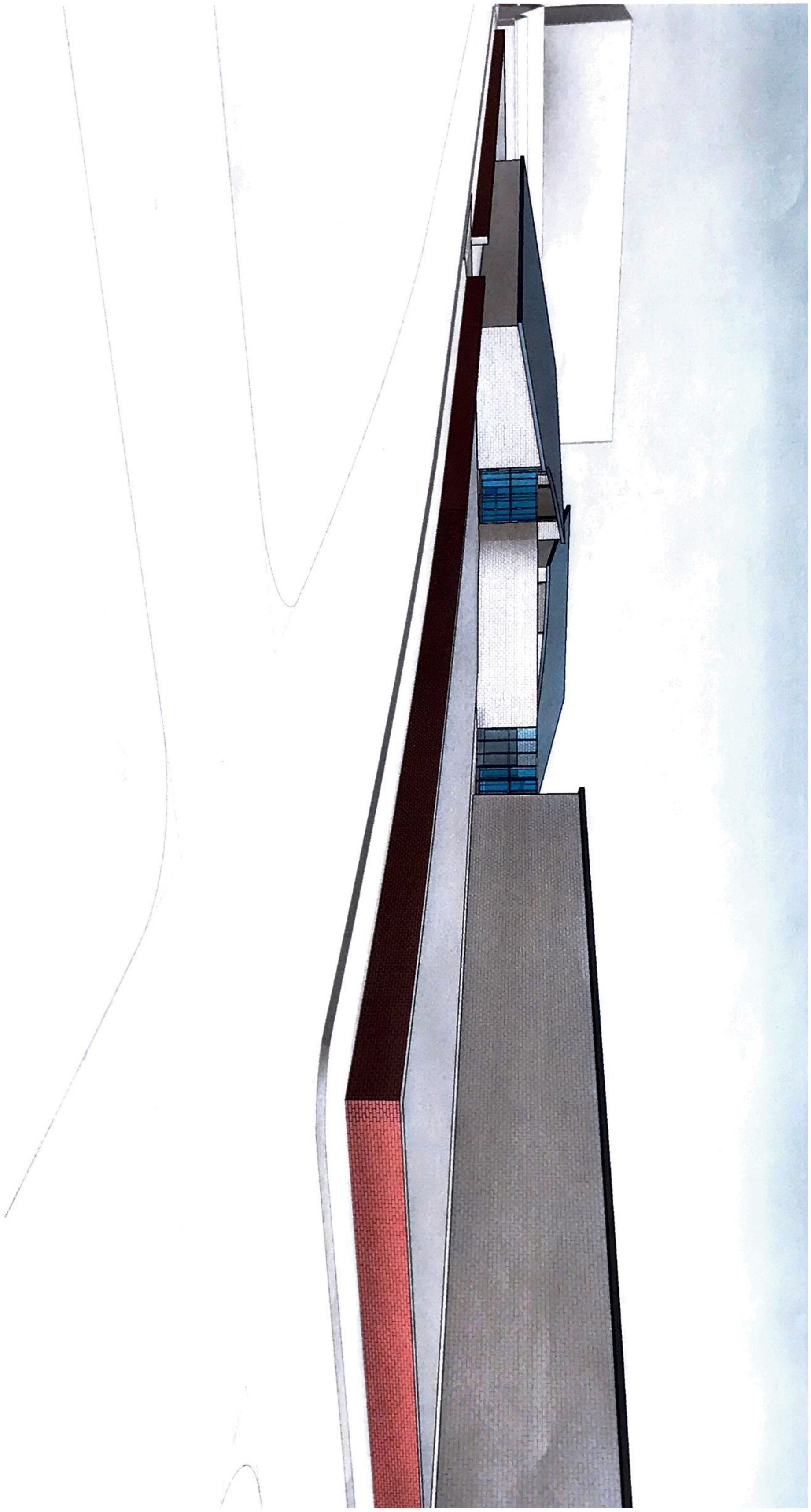


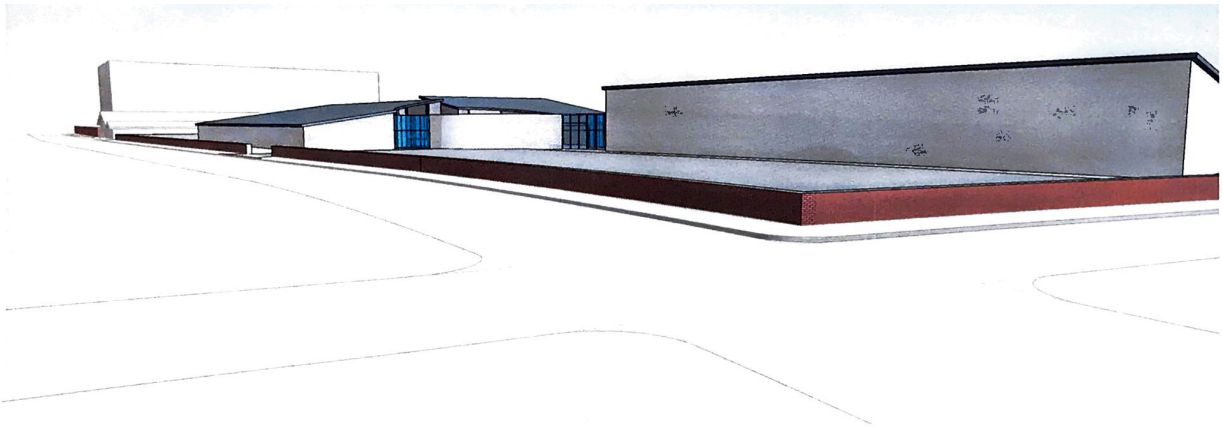
① North
1" = 60'-0"

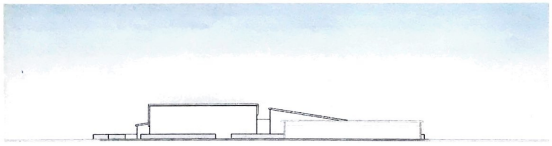


② South
1" = 60'-0"

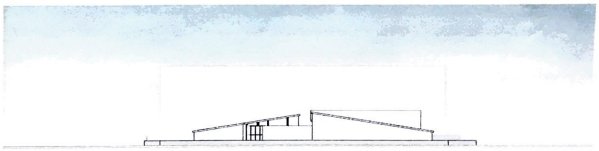




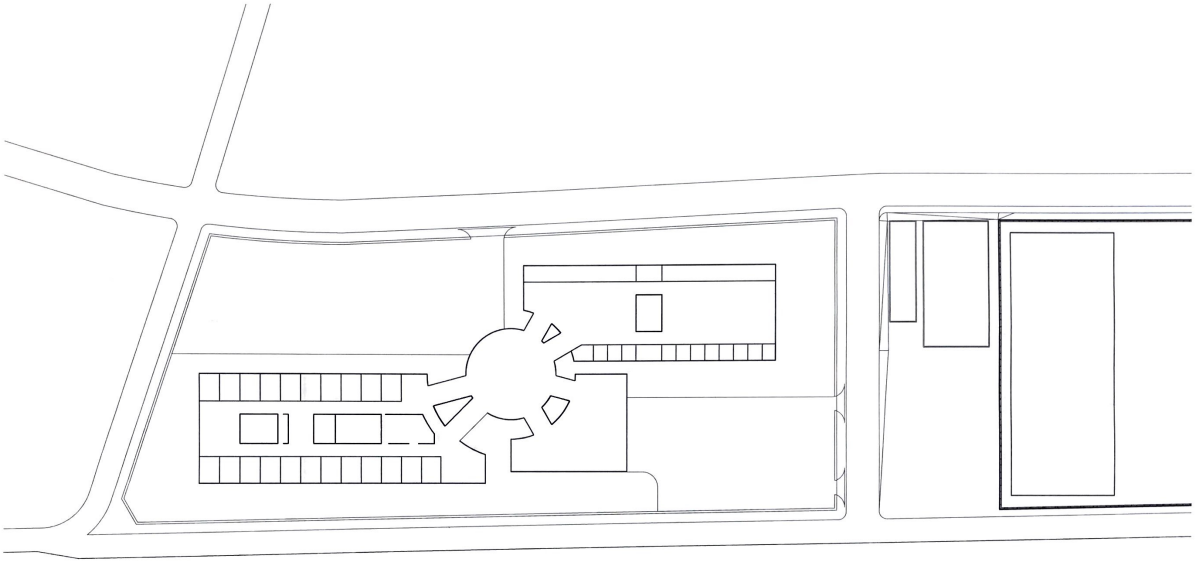


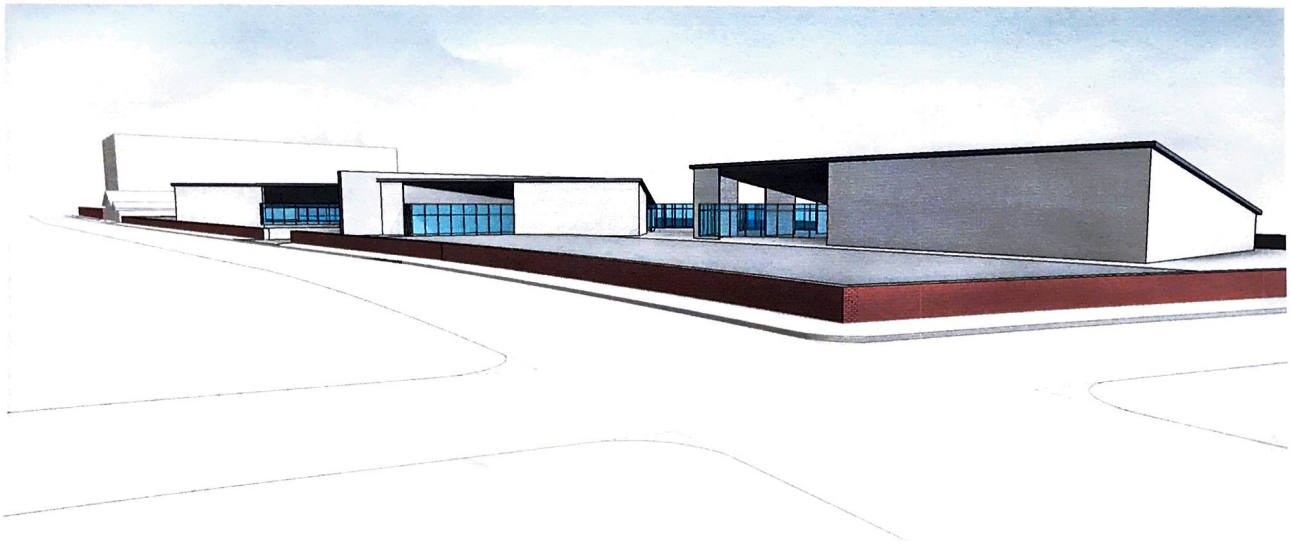


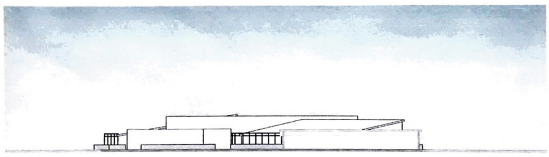
① East
1" = 60'-0"



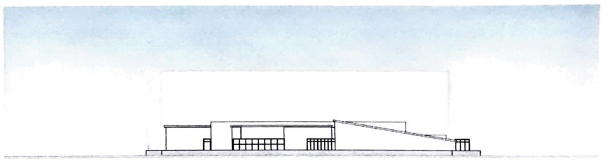
② West
1" = 60'-0"



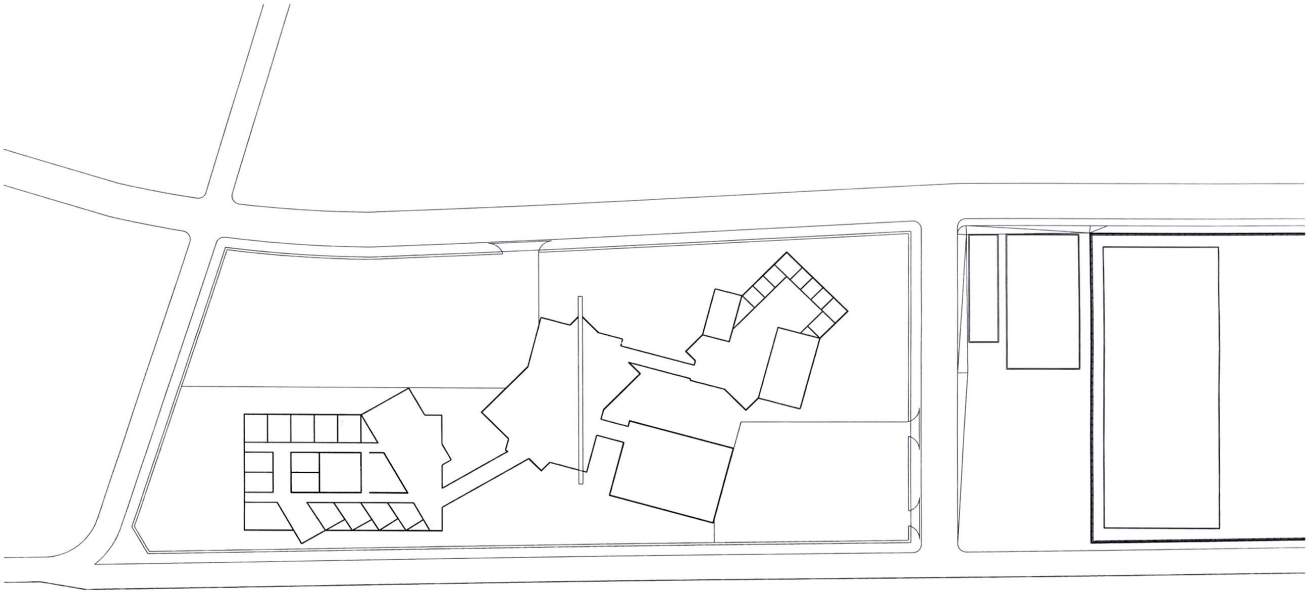


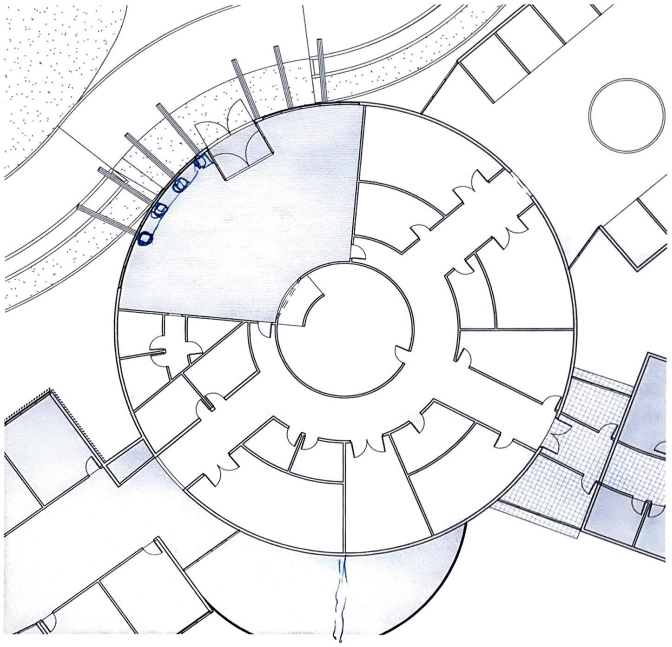


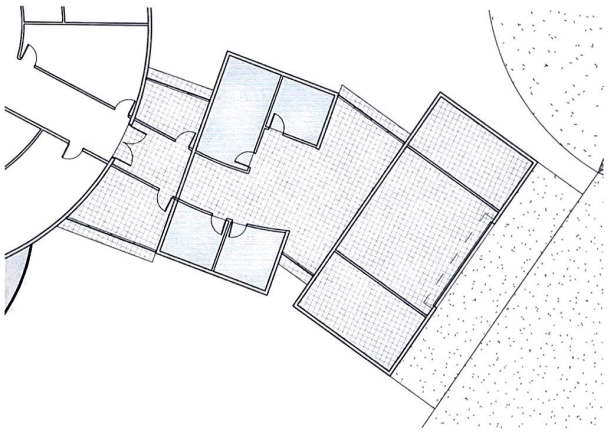
East

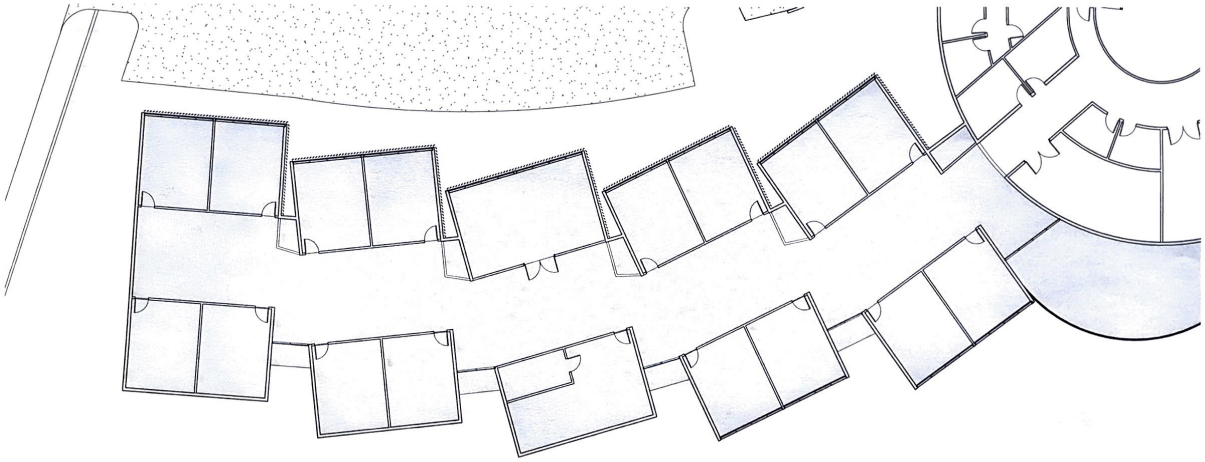


West










1
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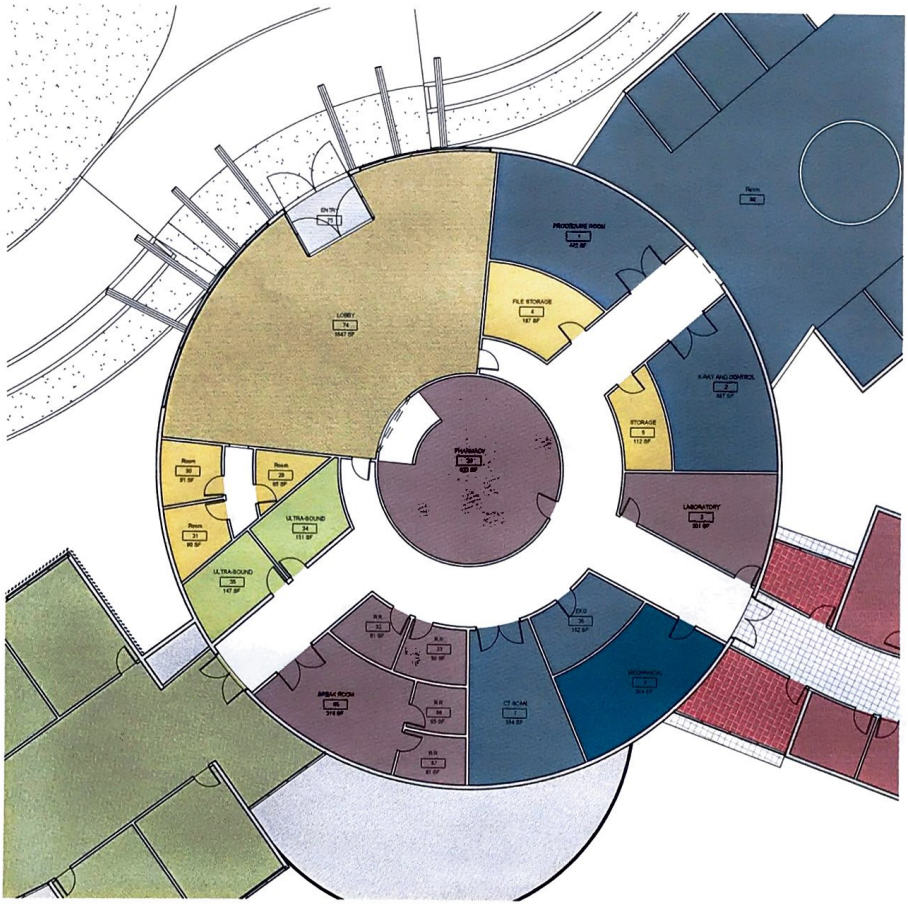


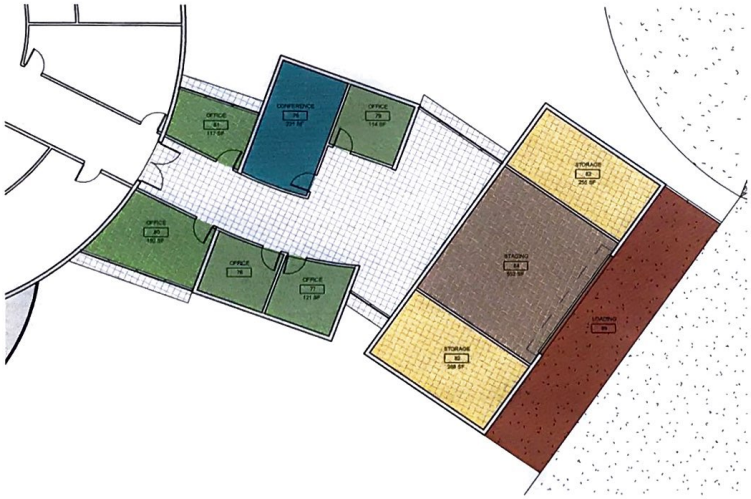
Department Legend

- Admin
- ED
- Facility
- Labor & Delivery
- Mobile Units
- Utilities

① Level 1 - Callout 3
1" = 20'-0"

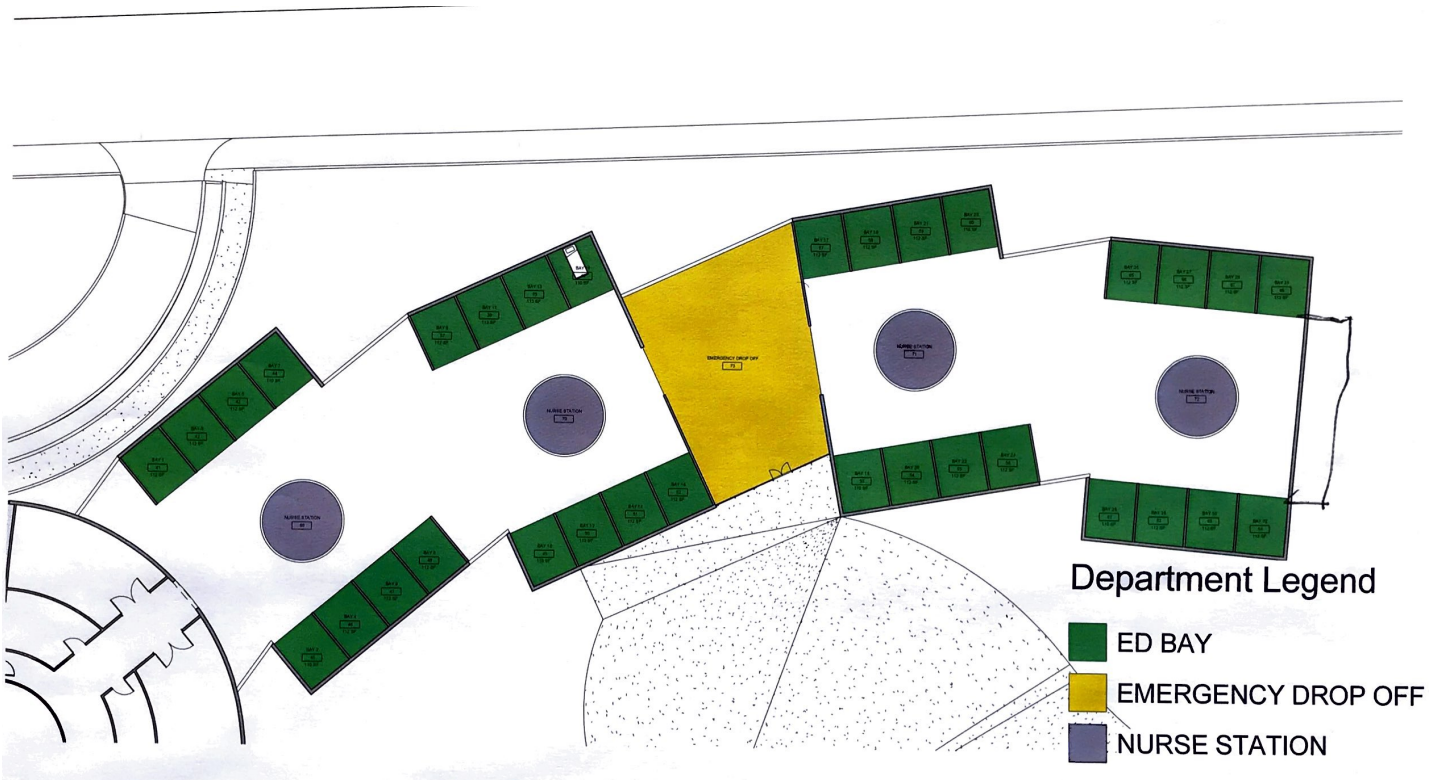
Department Legend

- Nurse Station
- Nursery
- Patient Room
- Procedure Room



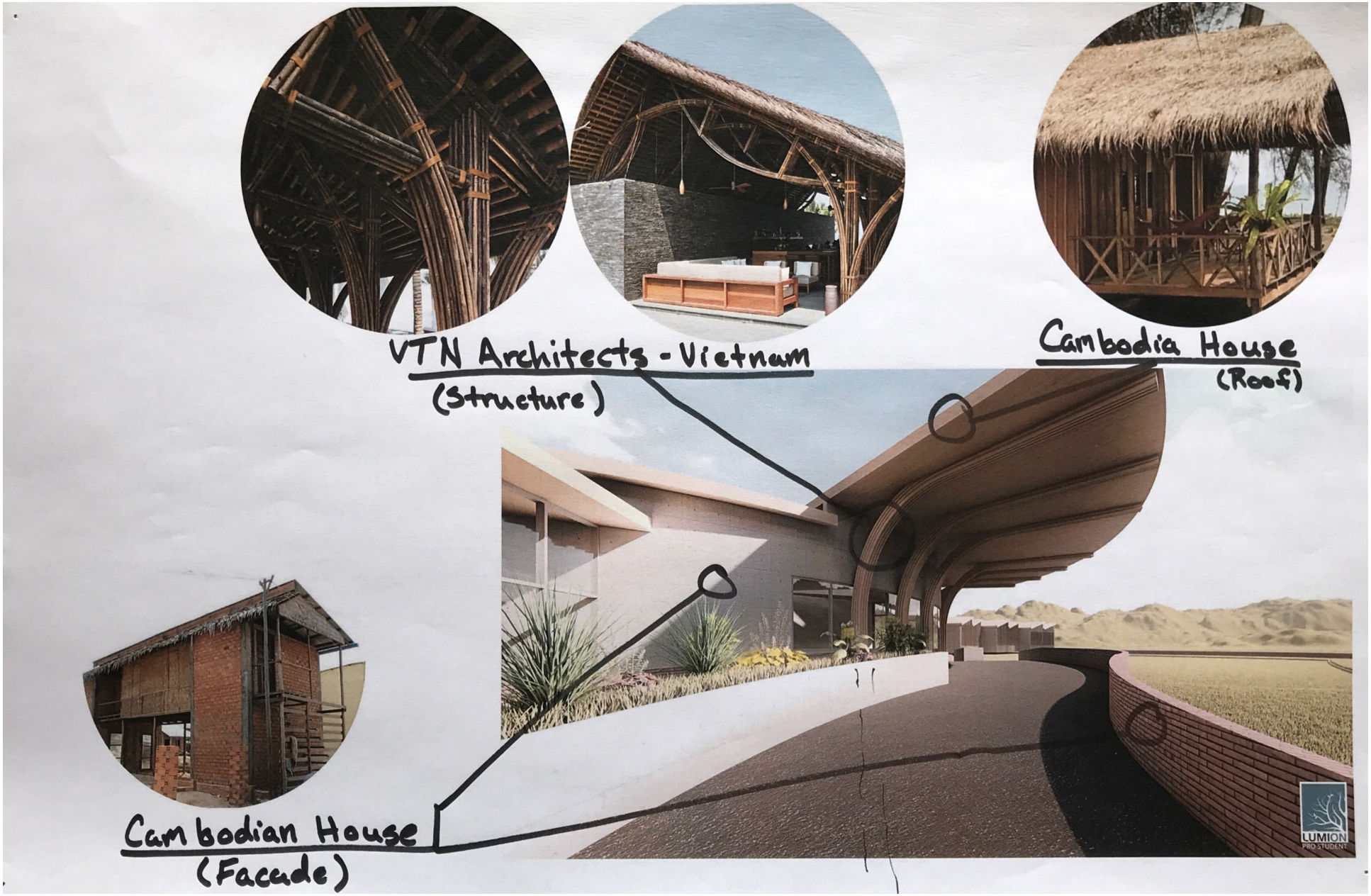
Department Legend

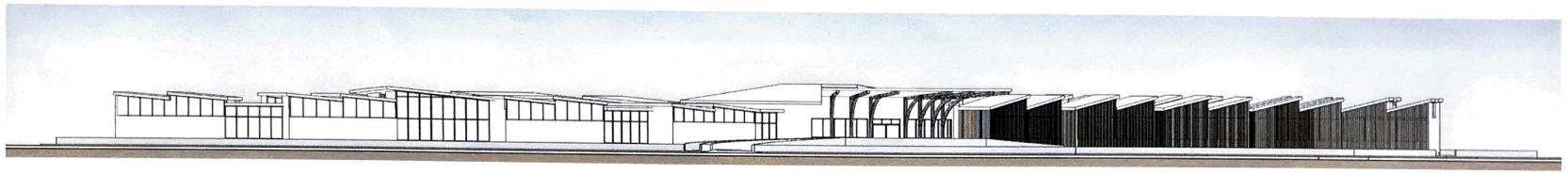
- CONFERENCE ROOM
- LOADING DOCK
- OFFICE
- STAGING
- STORAGE



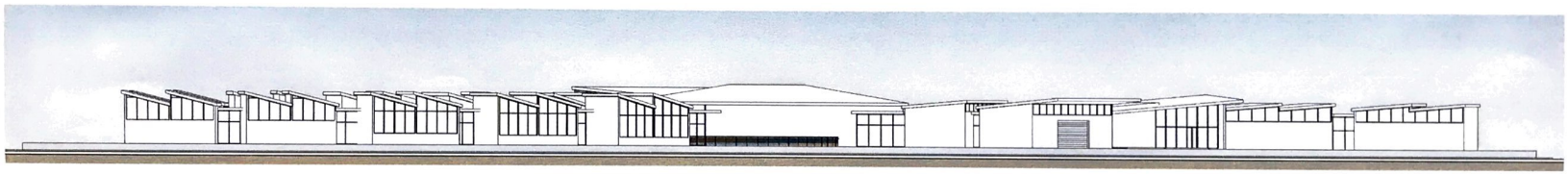
Department Legend

- ED BAY
- EMERGENCY DROP OFF
- NURSE STATION


VTN Architects - Vietnam
(Structure)
Cambodia House
(Roof)
Cambodian House
(Facade)
LUMION
PRO STUDENT



1 North
1" = 40'-0"



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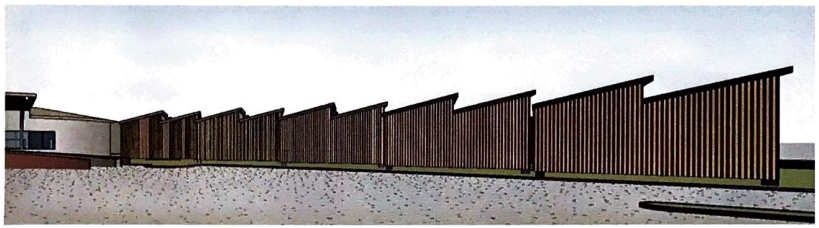


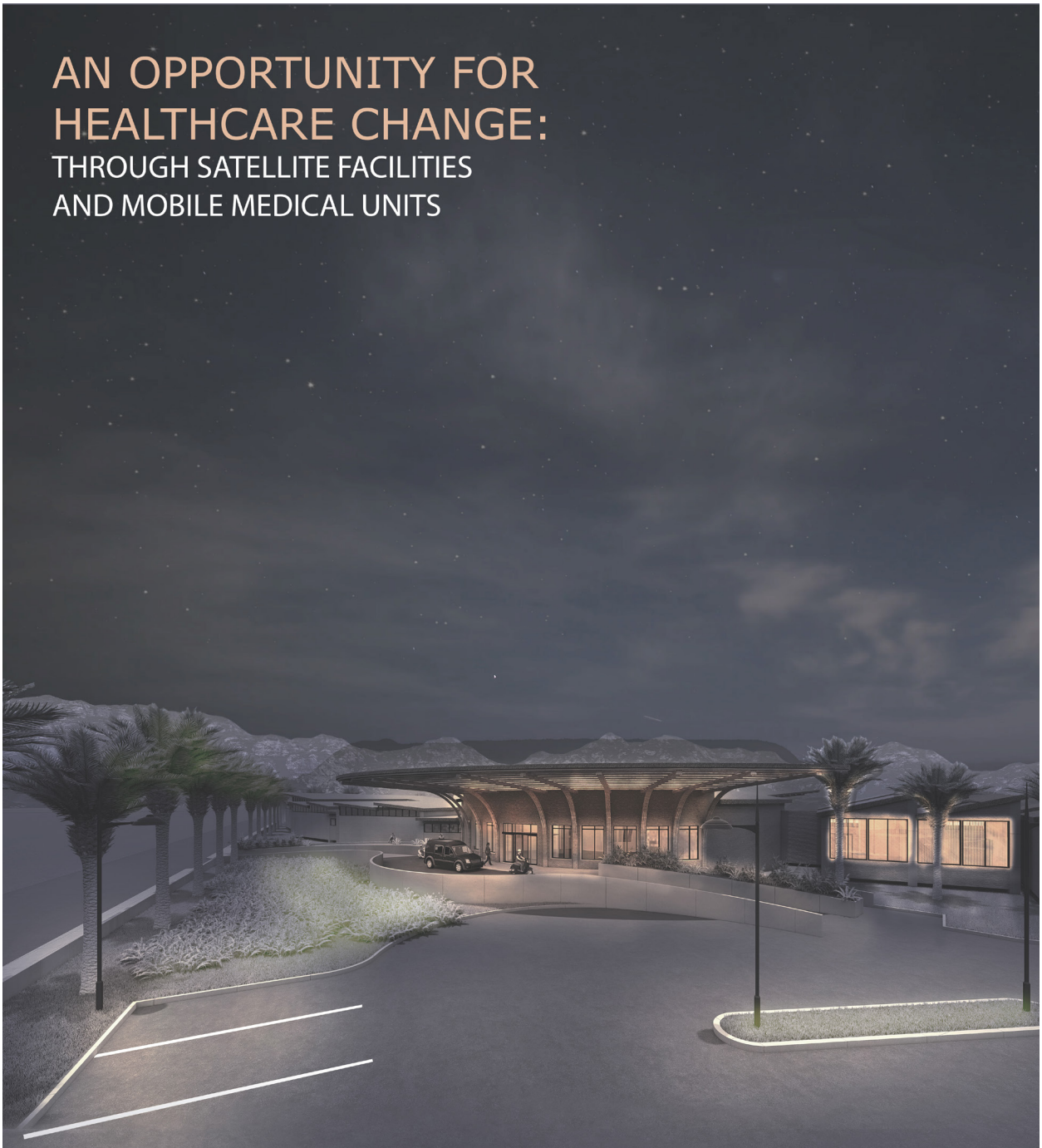
3 3D View 2

4 3D View 1

Thesis Presentation

AN OPPORTUNITY FOR HEALTHCARE CHANGE:

THROUGH SATELLITE FACILITIES AND MOBILE MEDICAL UNITS



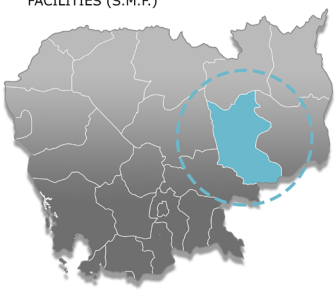
Medical Care

Education

Global Impact

THE PROJECT IS LOCATED IN THE KRATIE PROVINCE OF CAMBODIA ALONG THE MEKONG RIVER. THE KHMER SATELLITE MEDICAL FACILITY(K.S.M.F.) IS MEANT TO NOT ONLY CREATE AN ENVIRONMENT FOR MEDICAL STUDENTS TO RECEIVE FIRST HAND TRAINING, BUT TO ALSO CREATE A CONNECTION TO HEALTHCARE FROM BIRTH. THE FACILITY ACCOMPLISHES THIS BY ACCOMMODATING LABOR AND DELIVERY, EMERGENCY AND OUTPATIENT SERVICES, AND MEDICAL OUTREACH. THE FACILITY BECOMES A HUB FOR HEALTHCARE WITHIN THE COMMUNITY. THAT NOTION OF A HUB MENTALITY TRANSLATES INTO THE DESIGN OF THE BUILDING. THERE IS A CENTRAL CORE THAT HOUSES THE MAJOR AMENITIES OF A MEDICAL FACILITY; CT, X-RAY, LABORATORY, EKG, PROCEDURE ROOM, AND PHARMACY, ALLOWING ACCESS FROM EACH OF THE SEPARATE WINGS.

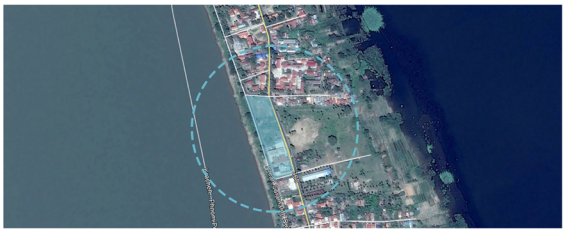
LOCATION WITHIN THE WORLD



LOCATION WITHIN COUNTRY

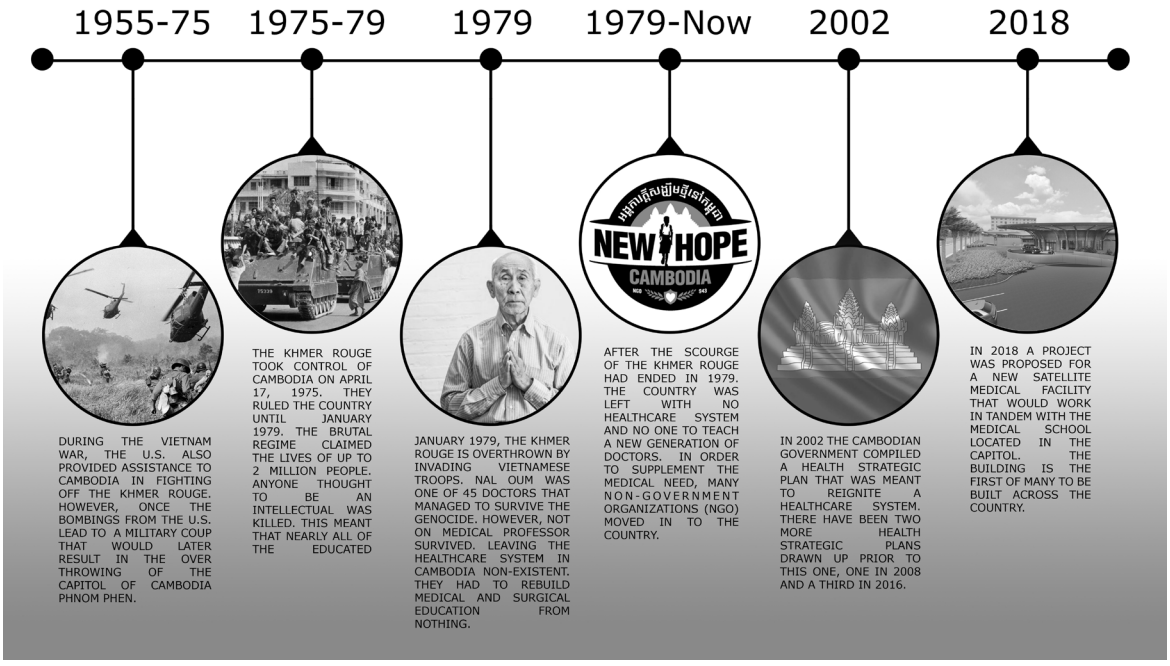
LOCATION WITHIN PROVINCE

LOCATION ALONG RIVER



SITE WITHIN CONTEXT

EXISTING SITE



DURING THE VIETNAM WAR, THE U.S. ALSO PROVIDED ASSISTANCE TO CAMBODIA IN FIGHTING OFF THE KHMER ROUGE. HOWEVER, ONCE THE BOMBINGS FROM THE U.S. LEAD TO A MILITARY COUP THAT WOULD LATER RESULT IN THE OVER THROWING OF THE CAPITOL OF CAMBODIA PHNOM PHEN.

THE KHMER ROUGE TOOK CONTROL OF CAMBODIA ON APRIL 17, 1975. THEY RULED THE COUNTRY UNTIL JANUARY 1979. THE BRUTAL REGIME CLAIMED THE LIVES OF UP TO 2 MILLION PEOPLE. ANYONE THOUGHT TO BE AN INTELLECTUAL WAS KILLED. THIS MEANT THAT NEARLY ALL OF THE EDUCATED

JANUARY 1979, THE KHMER ROUGE IS OVERTHROWN BY INVADING VIETNAMESE TROOPS. NAL OUM WAS ONE OF 45 DOCTORS THAT MANAGED TO SURVIVE THE GENOCIDE. HOWEVER, NOT ON MEDICAL PROFESSOR SURVIVED. LEAVING THE HEALTHCARE SYSTEM IN CAMBODIA NON-EXISTENT. THEY HAD TO REBUILD MEDICAL AND SURGICAL EDUCATION FROM NOTHING.

AFTER THE SCOURGE OF THE KHMER ROUGE HAD ENDED IN 1979. THE COUNTRY WAS LEFT WITH NO HEALTHCARE SYSTEM AND NO ONE TO TEACH A NEW GENERATION OF DOCTORS. IN ORDER TO SUPPLEMENT THE MEDICAL NEED, MANY NON-GOVERNMENT ORGANIZATIONS (NGO) MOVED IN TO THE COUNTRY.

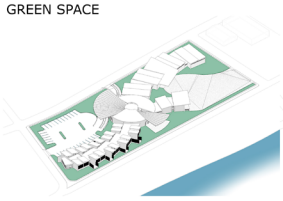
IN 2002 THE CAMBODIAN GOVERNMENT COMPILED A HEALTH STRATEGIC PLAN THAT WAS MEANT TO REIGNITE A HEALTHCARE SYSTEM. THERE HAVE BEEN TWO MORE HEALTH STRATEGIC PLANS DRAWN UP PRIOR TO THIS ONE, ONE IN 2008 AND A THIRD IN 2016.

IN 2018 A PROJECT WAS PROPOSED FOR A NEW SATELLITE MEDICAL FACILITY THAT WOULD WORK IN TANDEM WITH THE MEDICAL SCHOOL LOCATED IN THE CAPITOL. THE BUILDING IS THE FIRST OF MANY TO BE BUILT ACROSS THE COUNTRY.

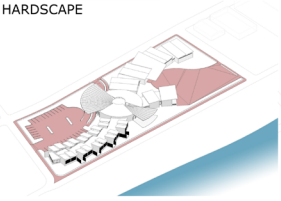
SITE PLAN

1" = 20'-0"

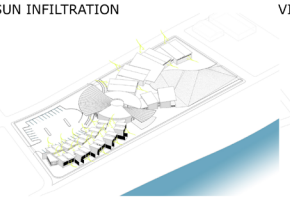
GREEN SPACE



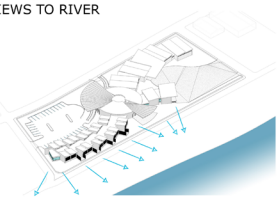
HARDSCAPE

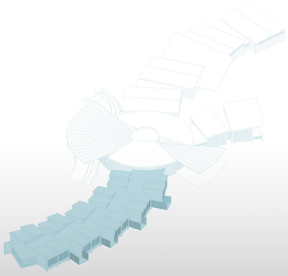


SUN INFILTRATION



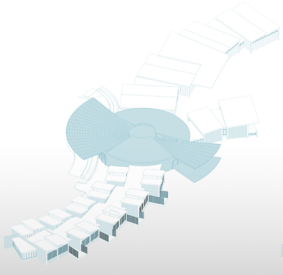
VIEWS TO RIVER





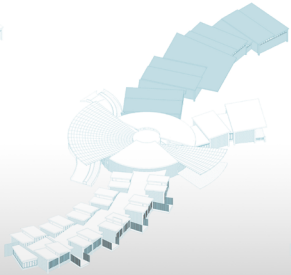
LABOR & DELIEVERY WING

- Procedure room
- Nursery with nurses station
- Labor, delievery, and recovery all in one room
- Views to river edge
- exterior patios



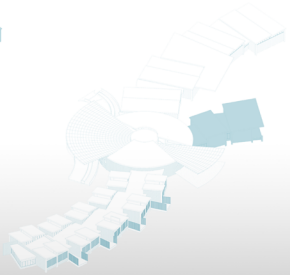
THE CENTRAL CORE

- Waiting room
- Procedure room
- EKG
- CT Scanner
- X-Ray with control room
- Laboratory
- Pharmacy
- File storage



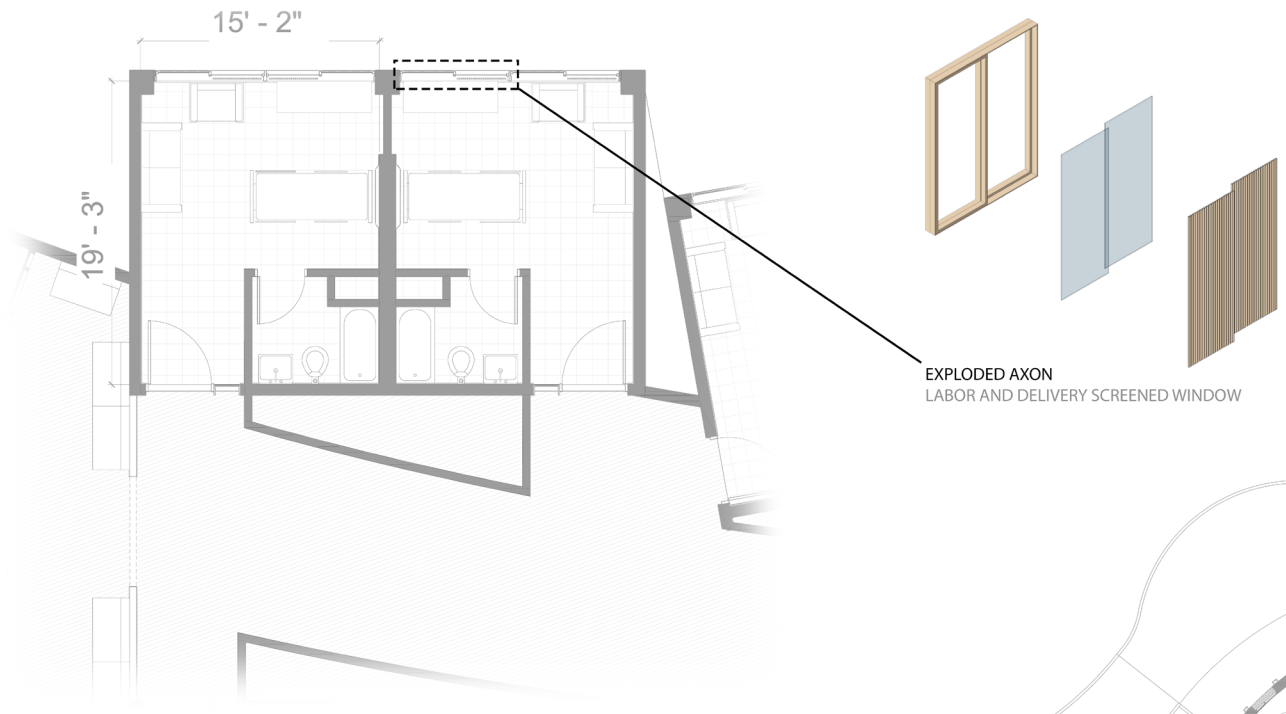
EMERGENCY DEPARTMENT WING

- Emergency bays
- Outpatient exam rooms
- Optometrology exam rooms
- Emergency entrance



MOBILE MEDICAL UNIT WING

- Offices
- Conferrence room
- Supply storage
- Staging area
- Loading dock



EXPLODED AXON
LABOR AND DELIVERY SCREENED WINDOW

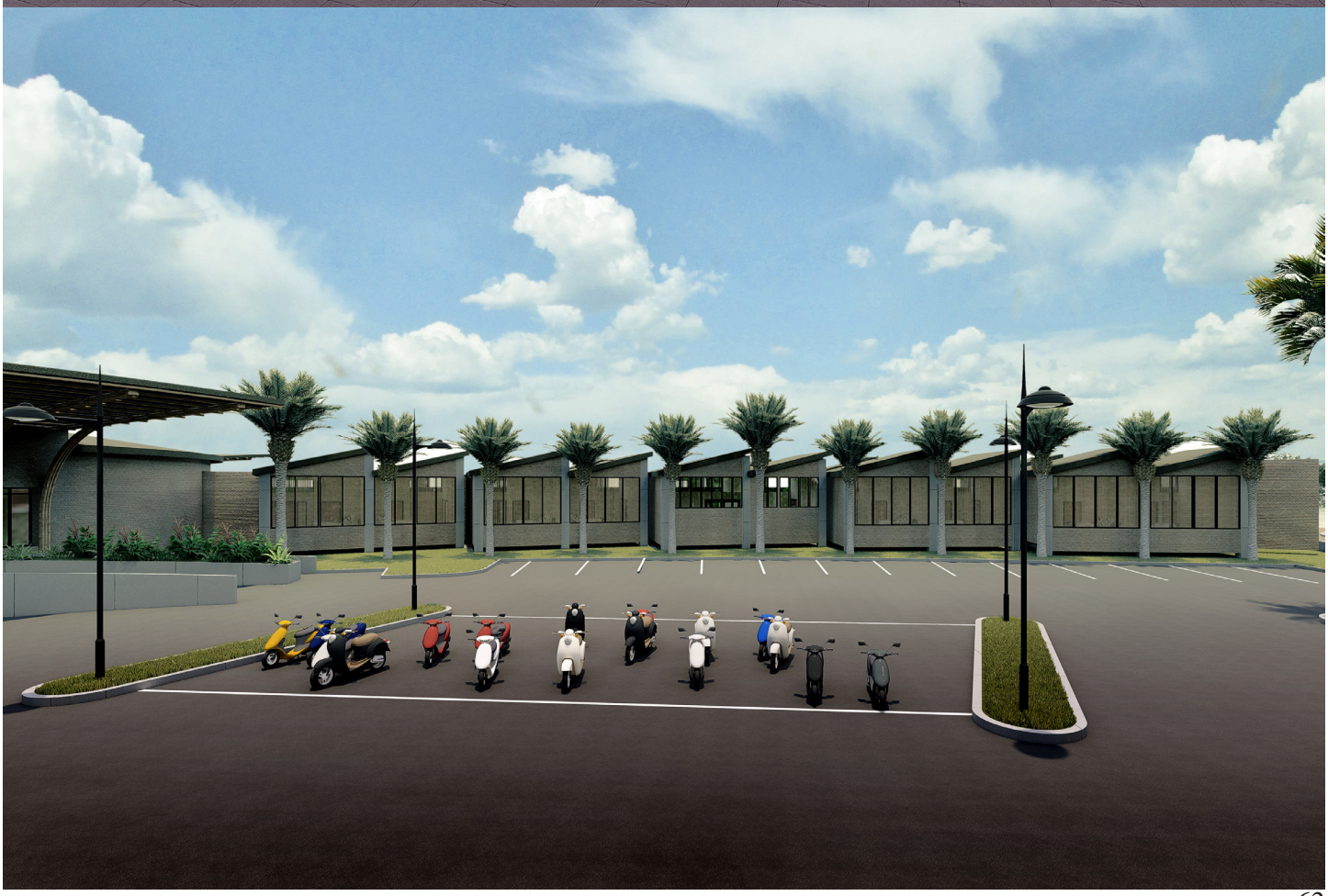
ENLARGED FLOOR PLAN: 3/8" = 1'-0"
LABOR AND DELIVERY ROOM LAYOUT

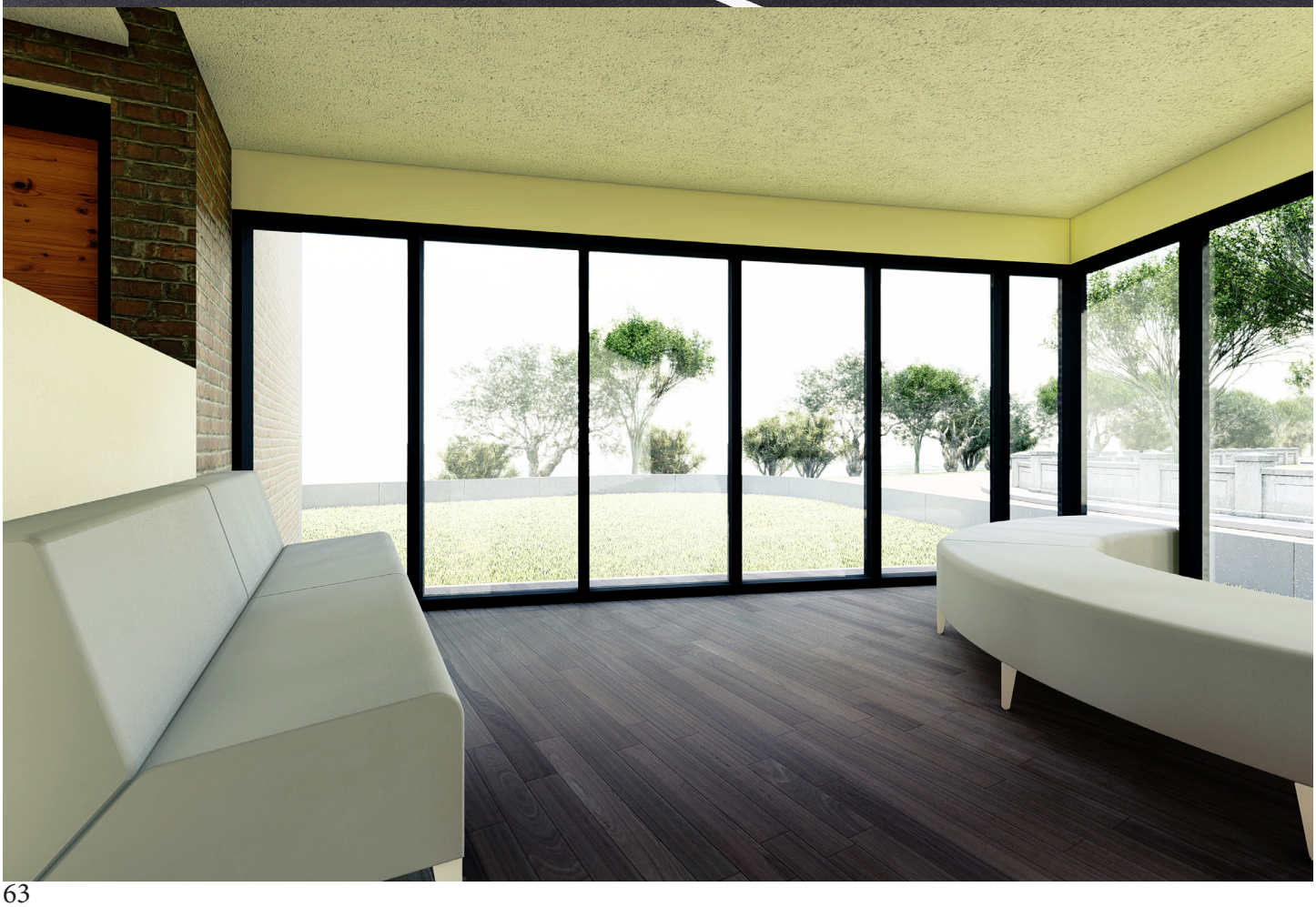
ENLARGED FLOOR PLAN 1/8" = 1'-0"

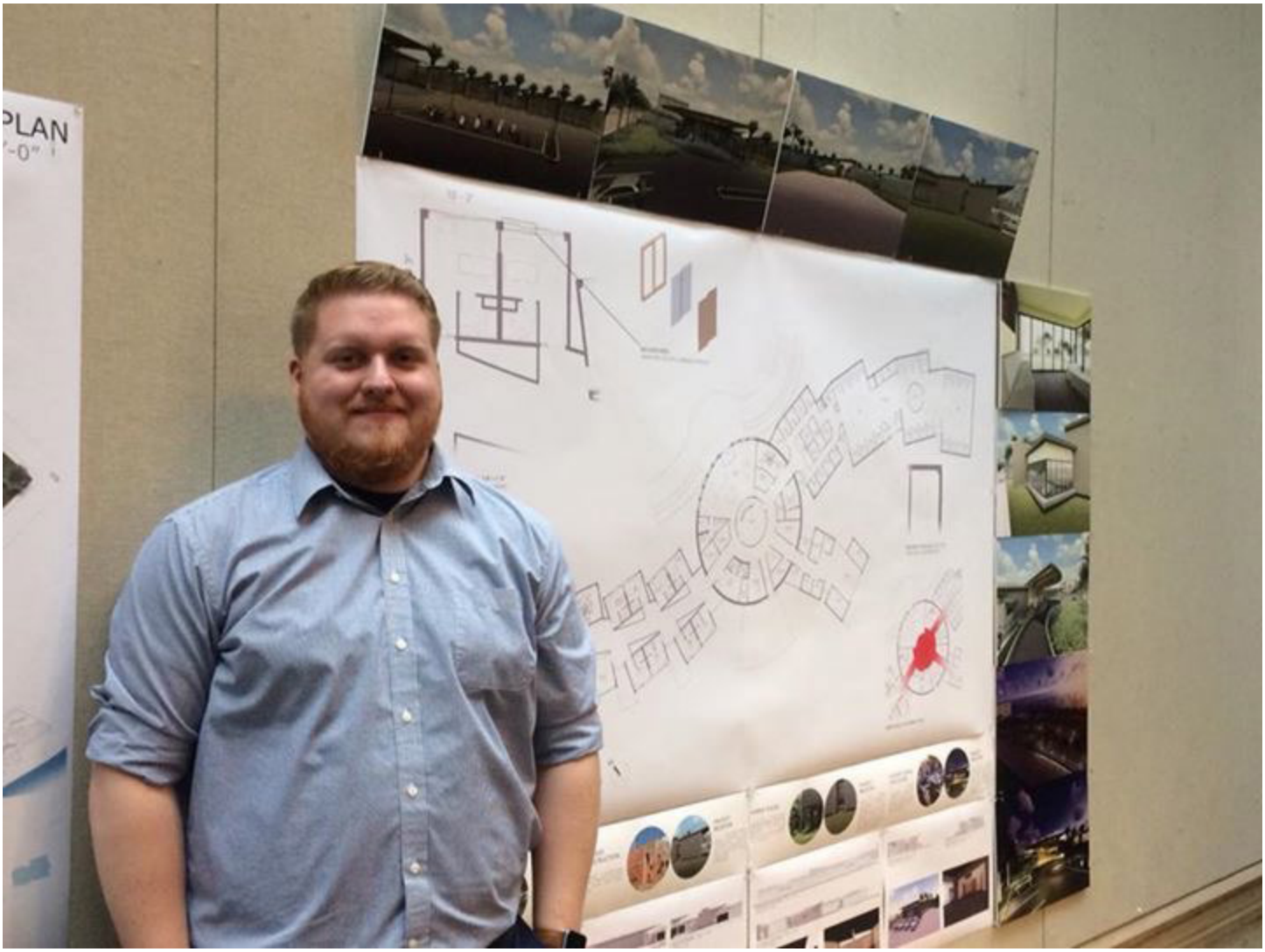
KHMER SATELLITE MEDICAL FACILITY

ENLARGED FLOOR PLAN: 1/2" = 1'-0"
EMERGENCY DEPARTMENT BAY

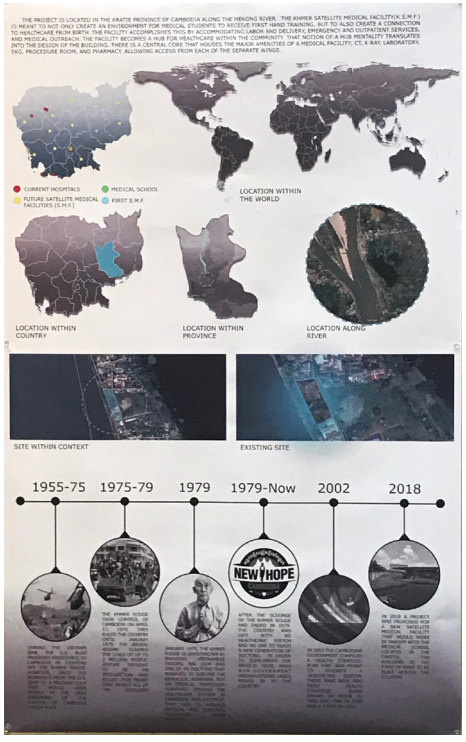
WING ACCESS TO CENTRAL CORE

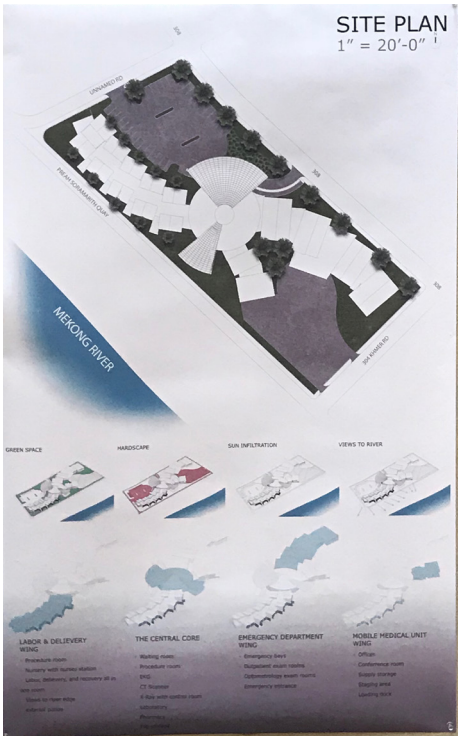





PLAN


AN OPPORTUNITY FOR
HEALTHCARE CHANGE:
THROUGH SATELLITE FACILITIES
AND MOBILE MEDICAL UNITS
Medical Care
Education
Global Impact


CURRENT HOSPITALS
MEDICAL SCHOOL
FUTURE SATELLITE MEDICAL FACILITIES (S.M.F.)
FIRST S.M.F.
LOCATION WITHIN THE WORLD
LOCATION WITHIN COUNTRY
LOCATION WITHIN PROVINCE
LOCATION ALONG RIVER
SITE WITHIN CONTEXT
EXISTING SITE
1955-75
1975-79
1979
1979-Now
2002
2018
NEW HOPE


SITE PLAN
1" = 20'-0"
MEKONG RIVER
GREEN SPACE
HARDSCAPE
SUN INFILTRATION
VIEWS TO RIVER
LABOR & DELIEVERY WING
THE CENTRAL CORE
EMERGENCY DEPARTMENT WING
MOBILE MEDICAL UNIT WING

Commentary

TYLER J CLEGG
Miami University

Written Thesis to Design Transition

This process began in the spring semester of 2017 with a basic concept of bringing medical supplies and knowledge to the rural areas of Cambodia. I chose Cambodia based on a trip I went on in fall 2009. The trip was a medical mission trip through rural Cambodia to supply aid to the more secluded areas of Cambodia. Many of the ailments we treated were easily treated with over the counter medicines. Some only needed glasses to fix what they believed to be an illness. Much of what we witnessed was simply a lack of medical knowledge. Taking that into account I started my thesis off as a mobile medical unit that could traverse the terrain of Cambodia and haul a reasonable amount of supplies. The original design was derived from a need for mobility and range.

Semester Reviews and Reflection

As the first thesis semester progressed the design began to morph into some larger than just a mobile unit that could visit a village every month or so. The first iteration was to design a medical facility that could change according to the need of the area it was situated within. Which entailed the exploration of foldable structures or the use of shipping containers brought in by truck or helicopter. However, the need for a large truck or helicopter to transport the node of the facility proved too expensive and cumbersome. The realization lead to the idea of a more fixed structure. Which was also derived from a need to be perceived as a permanent fixture rather than a temporary element that leaves once business is done. With the notion of having a permanent structure a new programming element was developed. One where the medical school in the capitol of the country would work in tandem with the medical facility to allow young medical students to do residency in the rural facilities. This would allow medical students to receive a more diverse training and possibly interest in moving to the area they received their residency upon graduation. As this idea developed into the second semester, the idea of adding a labor and delivery wing was proposed. This would ideally create a culture that is rooted to medical knowledge from birth. The idea of this becoming a type of urgent care for the region it resided in was what emerged as the design basis for the project. Once I had an idea of the program and what was needed in the building. I began writing out the necessary sizes of each of the program spaces. I then began hand sketching my ideas on trace overlay of the site I chose the summer before thesis year. The rough idea of the building was to have a central core that supplied the various wings of the building. This concept would create a sense of unity throughout the structure that would strengthen the idea of a greater whole. As I developed my various design concepts I landed on one that had a flowing curve to the various wings. This curve not

only allowed for a more organic feel to the building, it also created views to the river and an efficient use of the space on the site. This concept ended up becoming my design for my final thesis presentation. The final design had influential elements from various parts of Cambodia and neighboring Vietnam.

Thesis Final Review Reflection

There was several topics discussed during my final review. Much of what was discussed was based on the exploration of materials and placement of certain program elements within the building. One concern brought up was the fact that the pharmacy was placed at the center of the central core. The jury thought that this might be viewed as putting an emphasis on drugs rather than connectivity and education. However, putting it at the center allowed for all the wing to have easy access to the medicine. I believe that the jury may have been critiquing this with a western mindset. A majority of the “drugs” that would be in the “pharmacy” would be considered over-the-counter drugs here. Granted there would be a handful of stronger prescription drugs for the labor and delivery patients. The culture is also very different when compared to western culture. They would not see the drugs as being the focal point of the facility.

Another concern that was brought up was the design of certain buildings structure and how they would be structurally feasible. I took this notion into consideration and tried my best to accurately articulate the structure needed. Though not being a structural engineer or consulting one. I did not think this concern had much weight as some other concerns.

Conclusion

In conclusion this thesis process has shown me a lot about the necessity of going through different iterations of a project. During previous projects dur to time constraints and other limitations, I have not been able to explore different design concepts. Through this exploration I have also learned a lot about complex modeling systems and post processing of documents and images. It has allowed me to better develop my diagraming skills and how I present the important aspects of a project. Overall this thesis process has helped me improve many aspects of my design criteria, making me a more knowledgeable and well-rounded architecture graduate.

I would like to thank my thesis committee, Mary Rogero, John Blake, and Katherine Setser, for their continued support and input during this process. I would also like to thank the various faculty that have aided in the thesis process, Diane Fellows, John Becker, and Raffi Tomassian. Lastly, I would like to thank my friends and family for their continued support throughout this trying process.