HOPE Liberia

Project Brief

Advanced thinking for
health care delivery
with net-zero impact

Achieving excellence in neurosurgical outcomes and patient experiences for all people as goals may be the method to solving socio-economic and healthcare disparities in Liberia, Africa.

Cover Credit: Deloitte - Smart Cities

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Foreword

The initiative described here is a result of request from the Liberian Minister of Health (2023). After years of striving to improve health care in Liberia, Korle-Bu Neuroscience Foundation (KBNF) was asked to develop a novel plan to correct the extensive deficiencies in health services in Liberia, and indeed, West Africa. KBNF sought help from ***Quiet Water Resource Recovery Inc.*** for design guidance.

The guiding principles of this project are to inspire hope, promote purpose, well-being, innovation, financial independence and excellence in the Liberian and West African community and beyond through health care delivery, education, research, medical tourism and medical product development.

KBNF was proud to present HOPE LIBERIA; a master planned smart city focused on advancing leading-edge learning and outcomes in medical care.

The Hospital-city Of Premier Excellence (HOPE Liberia) will be the provider of choice and setter of standards for innovative, cutting-edge clinical services of neurosciences and tertiary medical care, wellness, education, healthcare training, employment, and research for the people of Liberia, West Africa, and beyond.

These goals are impossible without highly trained doctors, nurses and biomechanical engineers. A world-class university is required and will be delivered. Its name: The Premier Education Accelerator of Knowledge (PEAK) University.

HOPE Liberia will ingrain the principles, mission, and vision of KBNF throughout the emerging medical community while providing heart-power care, leadership, integrity, innovation, and stewardship in the governing corporation and the subsidiary corporations.

HOPE Liberia is to be a self-sufficient net-zero city able to help, regardless of capacity to pay for the costs involved but rather, based on the need.

Executive Summary

Living and Health

Green Planning of Public Spaces

While cities are traditionally characterized by a high density of population and buildings, the designers of HOPE Liberia are rethinking structure and functions of our city plan to achieve ecosystem resilience, human well-being, and sustainable urban living.

HOPE Liberia is a city existing for the purposes of developing health care learning and community infrastructure ecosystems that are not only focused on diagnosing and treating sickness but also on supporting well-being through early intervention and prevention, leveraging digital technologies and restorative green spaces. HOPE Liberia will be populated by health care centric people who are focused on prevention, with surgical intervention to meet need, arrest imbalances and address accidental trauma. The social determinants of health will be better understood through fused learning of health education and treatment.

Education & Practice

Learning without practice through residency results in failure

HOPE Liberia is a continuum of neurosciences, healthcare, education, wellness, research and product development. The master plan includes a medical university with US accreditation. Learning is combined with opportunity to practice new skills amongst practiced professionals in the HOPE Hospitals advanced medical - surgery training program.

Our city will be a destination: A destination designed to facilitate collaboration through inviting spaces fused with virtual meeting capabilities where your Norwegian friend's avatar is welcome.

A smart and sustainable city is one created by and for its citizens: In our case, health-centric citizens in a collaborative ecosystem involving academia, businesses, NGOs and the public sector, with technology leveraging using the principals of circular engineering as a powerful enabler.

Economy

Exports to Generate Hard Currency

HOPE Liberia sees balanced nutrition exclusive of hormones, antibiotics and genetic modifiers as fundamental to health. HOPE Liberia has engaged PEACE Inc. to establish high yield, self-sustainable / net-zero land-based seafood production in combination with vertical farms to meet local needs and for export to markets paying in hard currency. Net earnings are impressive and used to offset all hospital operating costs, allowing treatment and surgeries on a 'needs' basis regardless of ability to provide hospital compensation.

The HOPE Liberia Master Plan relies on circular engineering principals to drive exceptional economic performance by tapping the abundance of nature. We are striking out the word '~~waste~~' and inserting 'resource': Resources in the HOPE Liberia Master Plan are useful inputs for inter-connected critical functions. This is one of the principles behind circular engineering provided by Quiet Water.

Energy and Environment

Circular Economy and Producing Locally

HOPE Liberia has adopted circular resource use models throughout our Master Plan. Solar thermal fields connected to municipal waste recycling and energy harvesting systems yield frim power, space cooling and energy to freeze seafood and vegetables for export. Energy efficiency of 75% is our design basis. Circular economies act as catalysts for efficiency and innovation, with an intentional decoupling of economic activity from the consumption of finite resources.

Smart and Sustainable Buildings and Infrastructure

Our buildings leverage data to optimise energy consumption and the use and management of resources in buildings and utilities: waste, water and energy. Digital technologies used enable HOPE designed buildings to become interactive elements in the energy system by optimizing energy consumption, distributed generation and storage. Vertical and rooftop gardens are to be commonplace.

Mobility and Residences

15-Minute City

HOPE Liberia is designed so that amenities using a flexible concept of compact planning to ensure all amenities are within a 15-minute access by speed rated directional corridors designed for personal transport vehicles.

We have incorporated digital, clean, intelligent, autonomous and intermodal mobility options, with more walking and cycling spaces, where transport is commonly provided as a service. Transformation in urban mobility dynamics is primarily focused on user convenience and efficiency.

Affordable Living

The HOPE Liberia plan includes different types and prices of housing in each neighbourhood, all inclusive of green permaculture spaces to promote fresh food abundance at each residence.

Modular construction allows expansion modules and the addition of new residences without traditional construction noise and disruption.

Safety and Security

Cybersecurity and Privacy Awareness

Cities tend to promote awareness of the importance of data privacy and to get prepared for the impact of cyberattacks, since data will be an important city commodity. To cope with rising cyber risks and privacy issues, HOPE Liberia is integrating robust cybersecurity strategies and policies able to effectively respond to any cyber failure, data loss, or major service disruption.

Cities are leveraging artificial intelligence (AI) to ensure safety and security for their citizens while safeguarding privacy and fundamental human rights. HOPE Liberia will be using smart solutions such as biometrics, facial recognition, smart cameras at ingress and regress points to secure spaces in the medical and governance areas. Application of these protocols while respecting privacy and liberties is central to our implementation plan.

This is a living document that will mature as we continue to refine the ultimate vision for this property.

1. Introduction

Process

Background

Vision and Principles

Credit: FleishmanGarciaMaslowski

Credit: MZ Architects

Highly experienced doctors, nurses and technicians teaching and training young adults in modern medicine at an integrated university / teaching hospital.

Process

Two important inputs are guiding the HOPE Liberia Master Plan development process; i) technical planning focused on site design, and ii) engineering effort focused on functional programming. Design and engineering relied on community engagement with highly experienced neurosurgeons, anesthesiologists, radiologists, neuro-nurses and biomechanical engineers; all with experience in Liberia through multiple medical missions. This is a *living document* that will mature as we continue to refine the ultimate vision for this property.

Technical Planning

The technical planning work was centered around a series of work sessions with urban designers, planners, engineers and landscape architects when considering a West African development. All this prior work was adapted to the HOPE Liberia Master Plan. During these work sessions the site design work was closely coordinated with engineering needs for site infrastructure. Engineering consideration for all utilities (storm water, steam, electric, fresh water, fiber, etc.) based on the development program and site layout were reviewed. In addition to the utility work, the street layout and specifications were designed to support the urban features and a range of mobility options relevant to the emergence of small light weight e-powered personal mobility wheels.

North American Standards Transfer

Hospital Design

Detailed Functional Programs have been completed for all major building components required to achieve Phase 1 objectives. This information establishes the basis for the floor plans to date.

All construction practices, mechanical systems, ventilation, space conditioning systems and data interlinks will be based on the highest LEED standards from the outset.

High level discussions with HDR, an architectural firm, verified our design group leaning toward modular buildings completely prebuilt in controlled conditions for rapid on-site assembly.

Extensive discussion regarding vertical expansion in the initial design resulted in the decision to include 30% additional free-form space over space defined by way of the original Functional Program .

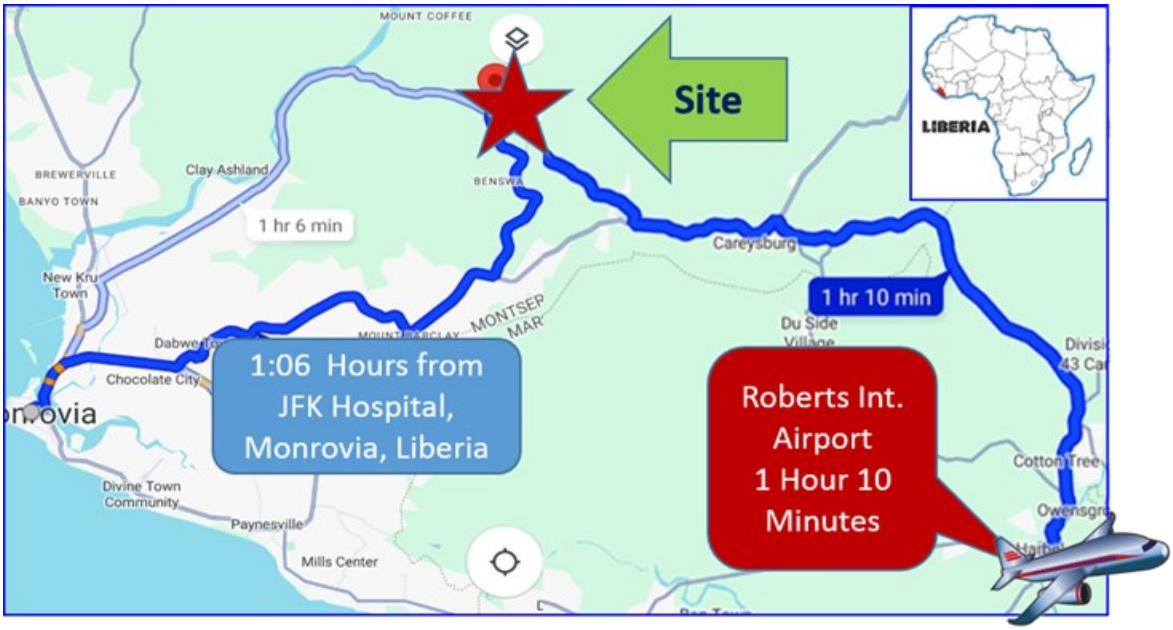
In addition to free-form space inclusion is the intention in design to set up space for re-purposing to other functions. In other words administrative space is designed to allow conversion to ward space at a future date as new facilities are added.

University Design

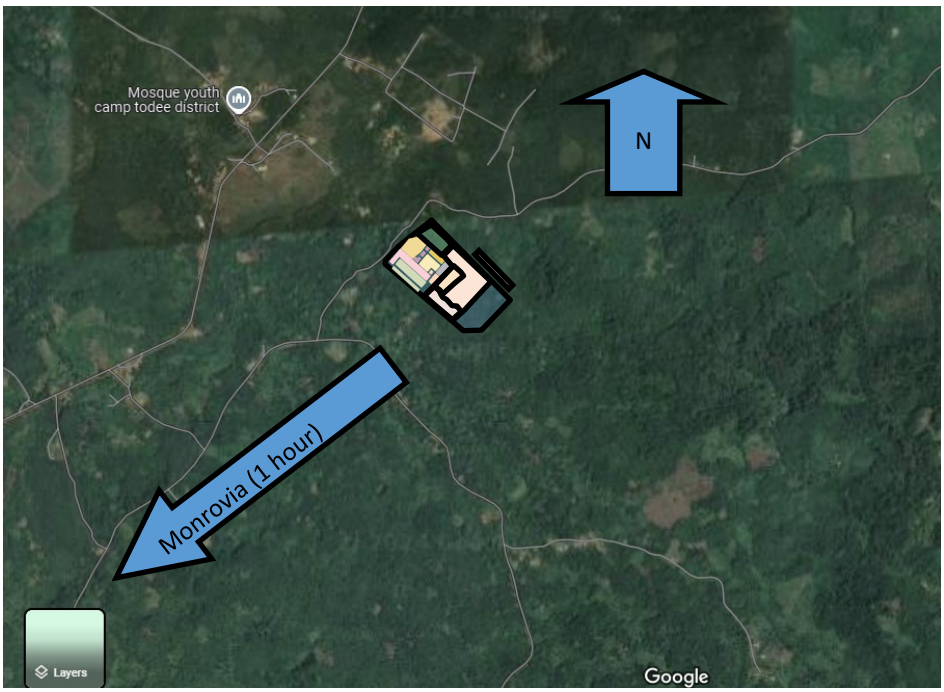
Led by our esteemed university scholars, existing Functional Program data was used as the basis for preliminary design for the PEAK University. Known space allocations used in new university designs in process in Southern California where Dr. Dan Miulli DO MS, FACOS serves as University Director were relied on to ensure correct massing and preliminary costing.

Site Selection

In a flurry of activity after June 19th 2023, spear-headed by Dr. Benedict Kolee, KBNF Liberia Director, a suitable site was identified for further study during the next stage of planning and development. Alternate sites are available in the event the Salala site proves to be disqualified for some reason.



1. Education
2. 80 Bed (P1)
3. Teaching
4. Residential
5. VIP Hotel
6. Commercial
7. Site Services
8. Gardens
9. Food Packing



Principles

Twelve principle statements describe the intended characteristics of development of the site.

DEVELOPMENT POLICIES ARE INTENDED TO PROMOTE...

1. Sustainable values

Development of the site will reflect HOPE Liberia's values for holistic sustainability: environmental, economic, social and emotional. This means: respect for nature and environmental systems; commitment to realizing financial benefit for the investors, community and individuals; inclusion of community spaces and housing choices for a range of community members; and fostering affection for the community.

2. Advanced and integrated technology

The site and its structures will reflect creative thinking for energy use, data analytics and sensor technology. Our team has a powerful history of invention and innovation. This site represents the future for these same attributes.

3. Flexibility (adaptable) over time

The site is large at 1,000 acres. It also exists in a real estate market with less than a robust demand. Planning to make strategic off-site acquisitions is part of our adaptive principle set. Build-out of development will take several decades and there is a need for flexibility and adaptability over time.

4. Healthy living choices

The layout of the site will be thoughtful in supporting the wellness of its employees and residents. This includes an attractive and safe public realm for walking, biking and other recreation. Large outdoor holding spaces will allow families to wait in comfort during assessments and registration. It will also be a place that minimizes unhealthy emissions.

5. A distinct but integrated "place"

Living, working, learning and playing will be possible throughout the site. It will be a place that is occupied 24-hours a day, seven days a week. It will become an integrated, mixed use neighborhood in the truest sense, distinct from conventional development.

6. A high-quality public realm

A great neighborhood must have high-quality, carefully-designed streets and public spaces and this site will have them. This also means strong "edges" of the development where buildings are built to the street, framing the public place for people to move (walk, bike and drive) as well as congregate.

PHYSICAL DESIGN IS INTENDED TO FEATURE....

7. Unique amenities to enliven streets and common spaces

The site development will create a vibrant neighborhood where the streets, sidewalks, plazas and parks are well-designed. Opportunities to animate the streets and ground-level activity of buildings will be maximized.

8. Regard for natural fauna & birds

Plants native to the area of beneficial use and yielding locally known fruit or vegetables as well as non-native vegetables will be integrated into green space designs. Likewise, recognition of local birds and other small creatures to cohabitate in preserved areas is of high value to the local ecosystems and should be encouraged.

9. Respect for the site's history

Future development will respect the site's—and adjacent area's— history. This can be large gestures, like the goal of maintaining respect for the original plantation, or small gestures, like public art.

10. Connection to anchors and larger community

The site will be not be an "island." It will have connections—physical and visual—to adjacent neighborhoods by use of secure portals linked to approved ID Cards. A trail system for bike and other personal transport will be developed.

11. Concentrated mass in initial phase

The initial development activity will be concentrated in a way that creates a density of activity and interest. This will be linked to Development Phases as the scope increases.

12. Development progressing from the edges inward

To create a positive tone for initial development, the initial projects should be constructed along the main highway. This will signal progress (while deeper parcels take longer to develop) and build recognition in the

2. Site Overview

Site Plan

Development Program

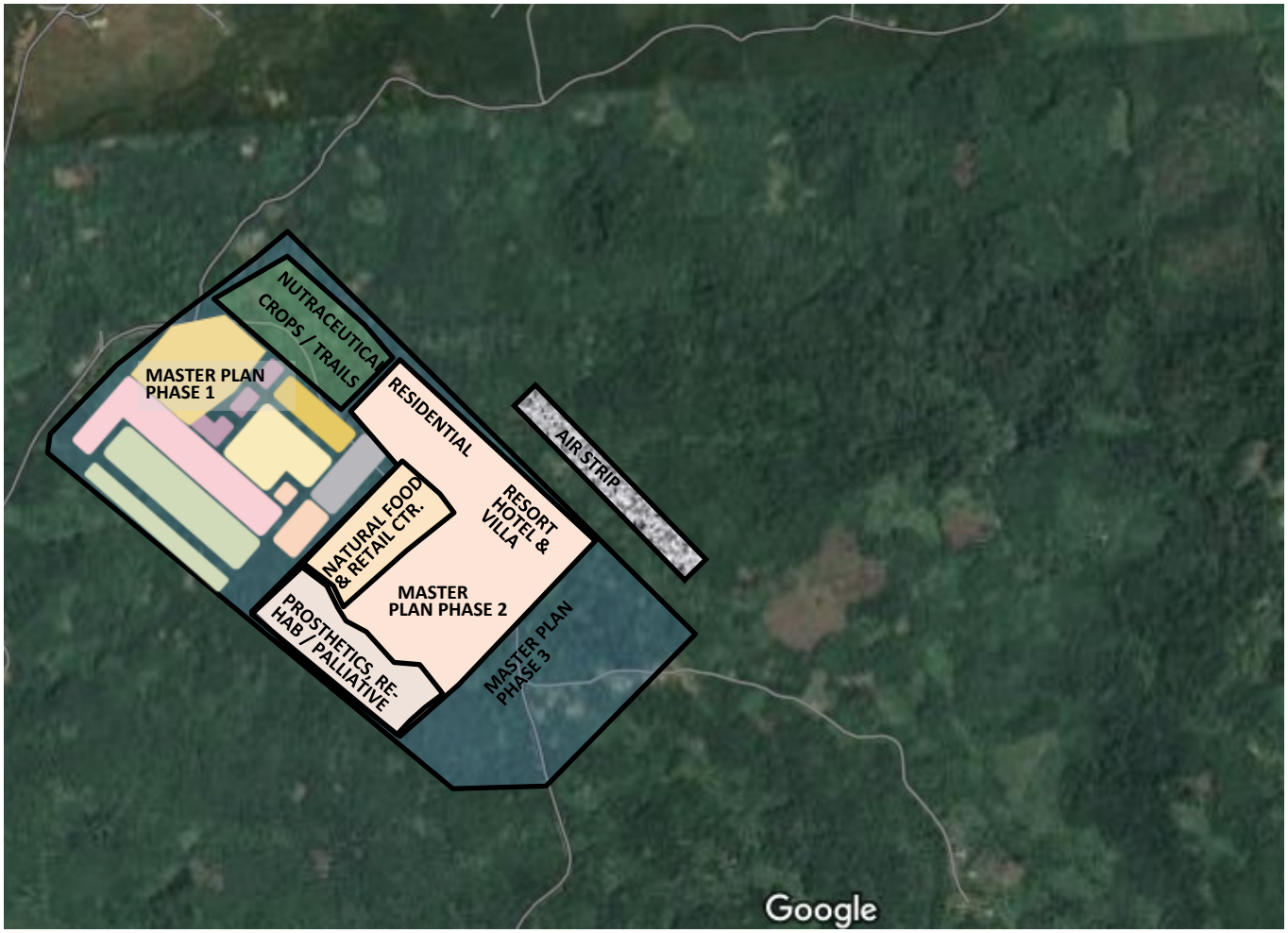
Site Plan

The site offered will be legally transferred in Q4 of 2024 to KBNF. It is a concession by the Government directly to KBNF.

Preliminary Plan

The site is serviced by a main arterial road that runs inland from the Capital City of Monrovia. This roadway is an extension of the route through University of Liberia—Fendell Campus just west of Bensonvillle. This area is home to a number of new medical facilities being initiated by the Government

Access to the site by highway will be by controlled intersection along with overpass or underpass.

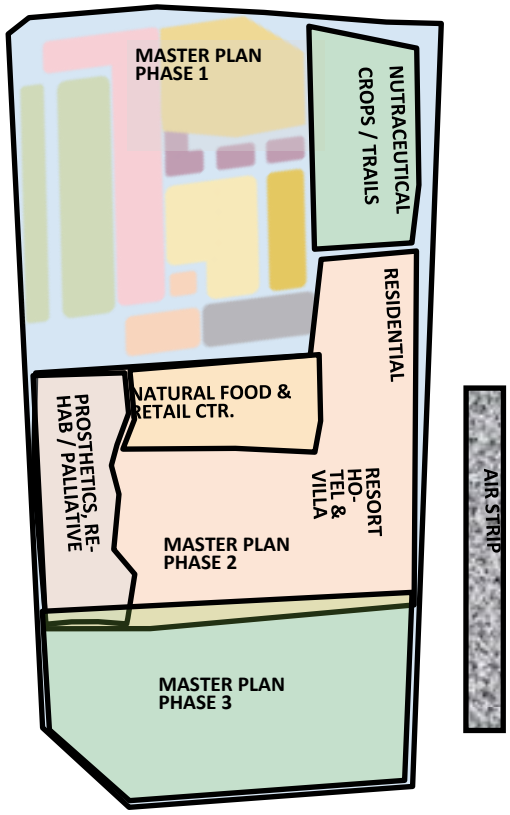


Development Program

The city, HOPE Liberia, will contain a mix of hospital, community, rehabilitative / long term care and residential uses. The uses planned for the development are generally described below.

- Hospital uses include general and specialized buildings with specific focus. Emergency care is included and vertical take-off and landing aircraft will be facilitated.
- University campus and residential buildings will be developed as additional hospital development phases are undertaken. Specialization themes will allow campus design to reflect that focus. Research and development centric building clusters associated with medical product development are expected to overlap with functional buildings.
- Innovation uses includes additional non-residential uses associated with innovation including fabrication and assembly, laboratories, manufacturing of prototypes, incubator spaces for start-up and mid-level businesses, and construction innovation in the modular and low-cost residences sector.
- Community uses include community facilities / institutions, educational facilities, recreation, sport, open spaces, community gardens and high yield commercial greenhouse / aquaculture facilities.
- Biogenic energy systems to provide energy independence sized to each phase will be integrated into each development phase ensuring energy independence and zero waste.

Mix of Uses		
Total Site Area	500 acres	100%
Streets and Building Area	450 acres	90%
Common Open / Transport	50 acres	10%



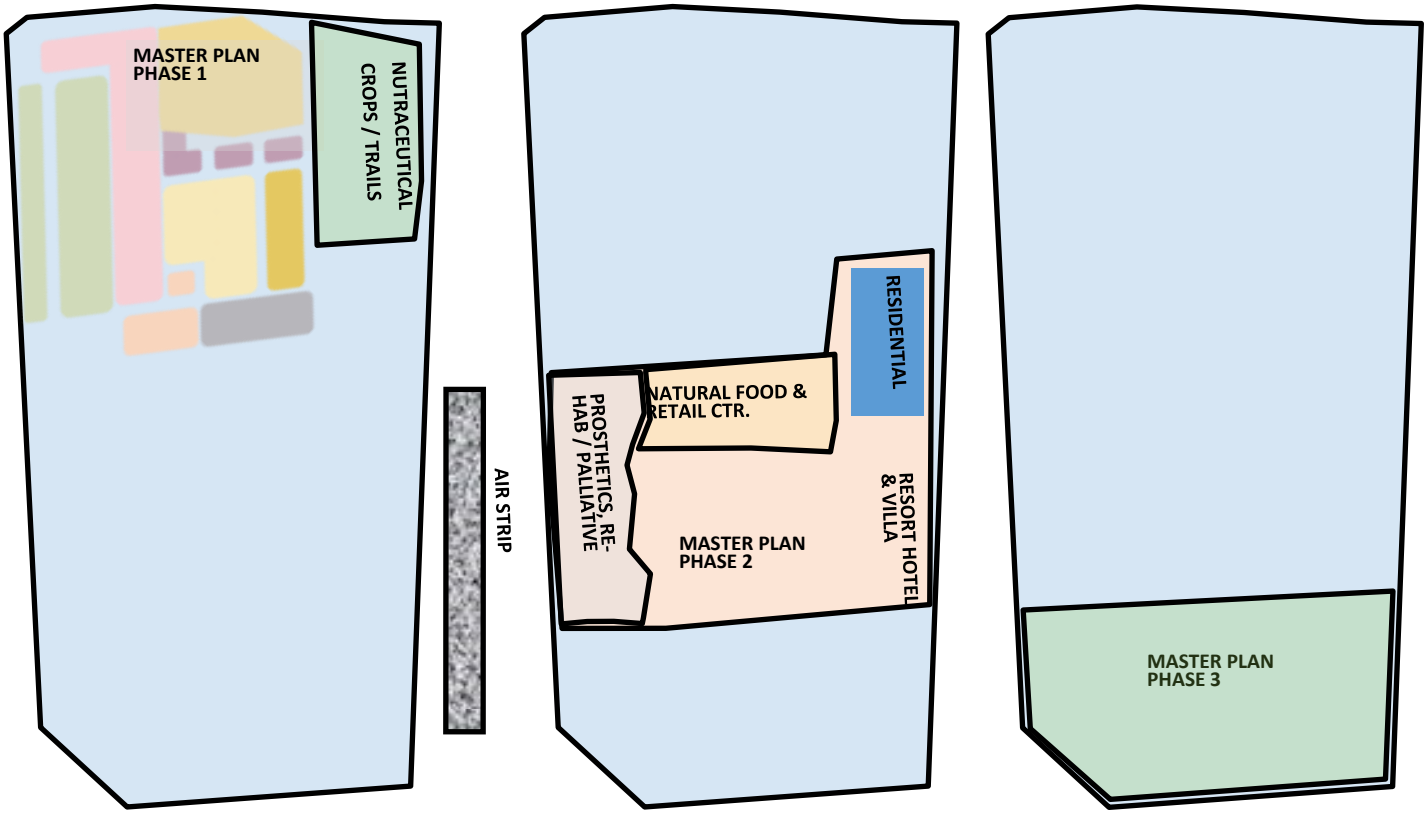
Spaces		
Hospital Use	150 acres	30%
University / Innovation Use	100 acres	20%
Recovery / Rehabilitation	50 acres	10%
Residential (mixed types)	100 acres	20%
Commercial	50 acres	10%

Development Phases

Phase 1

Phase 2

Phase 3

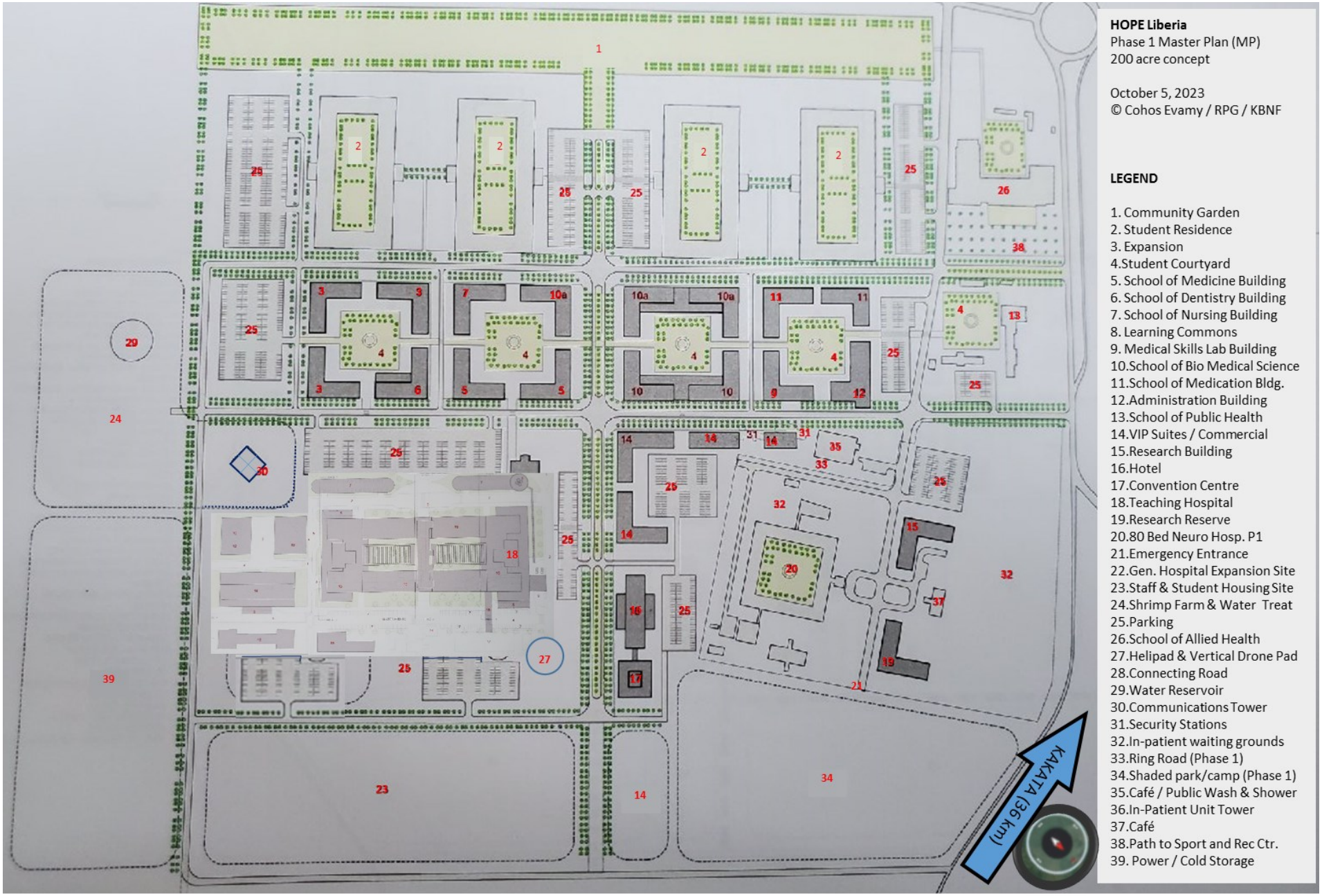


Phase 1 / Purpose	Area
Hospital / University and Residences	200 acres
Nutra/Crops/Trails	50 acres
Public	
Airstrip	20 acres

Phase 2 / Purpose	Area
MP Phase 2: Hospital / University and Residences	110 acres
Health Destination	50 acres
Commercial	40 acres

Phase 3 / Purpose	Area
Hospital / University and Residences	100 acres

Site Plan: Phase 1 200 Acres



HOPE Liberia
Phase 1 Master Plan (MP)
200 acre concept

October 5, 2023
© Cohos Evamy / RPG / KBNF

LEGEND

1. Community Garden
2. Student Residence
3. Expansion
4. Student Courtyard
5. School of Medicine Building
6. School of Dentistry Building
7. School of Nursing Building
8. Learning Commons
9. Medical Skills Lab Building
10. School of Bio Medical Science
11. School of Medication Bldg.
12. Administration Building
13. School of Public Health
14. VIP Suites / Commercial
15. Research Building
16. Hotel
17. Convention Centre
18. Teaching Hospital
19. Research Reserve
20. 80 Bed Neuro Hosp. P1
21. Emergency Entrance
22. Gen. Hospital Expansion Site
23. Staff & Student Housing Site
24. Shrimp Farm & Water Treat
25. Parking
26. School of Allied Health
27. Helipad & Vertical Drone Pad
28. Connecting Road
29. Water Reservoir
30. Communications Tower
31. Security Stations
32. In-patient waiting grounds
33. Ring Road (Phase 1)
34. Shaded park/camp (Phase 1)
35. Café / Public Wash & Shower
36. In-Patient Unit Tower
37. Café
38. Path to Sport and Rec Ctr.
39. Power / Cold Storage

3. Phase 1

COMPONENTS

Step 1: Definition

80 Bed Neuro-hospital with ER

PEAK University & Student Housing

Advanced Farms w/ Biogenic Energy

Green space & Permaculture (everywhere)

KBNF General Hospital (Step 2)

Definition: **Step 1** of Phase 1

Step 1

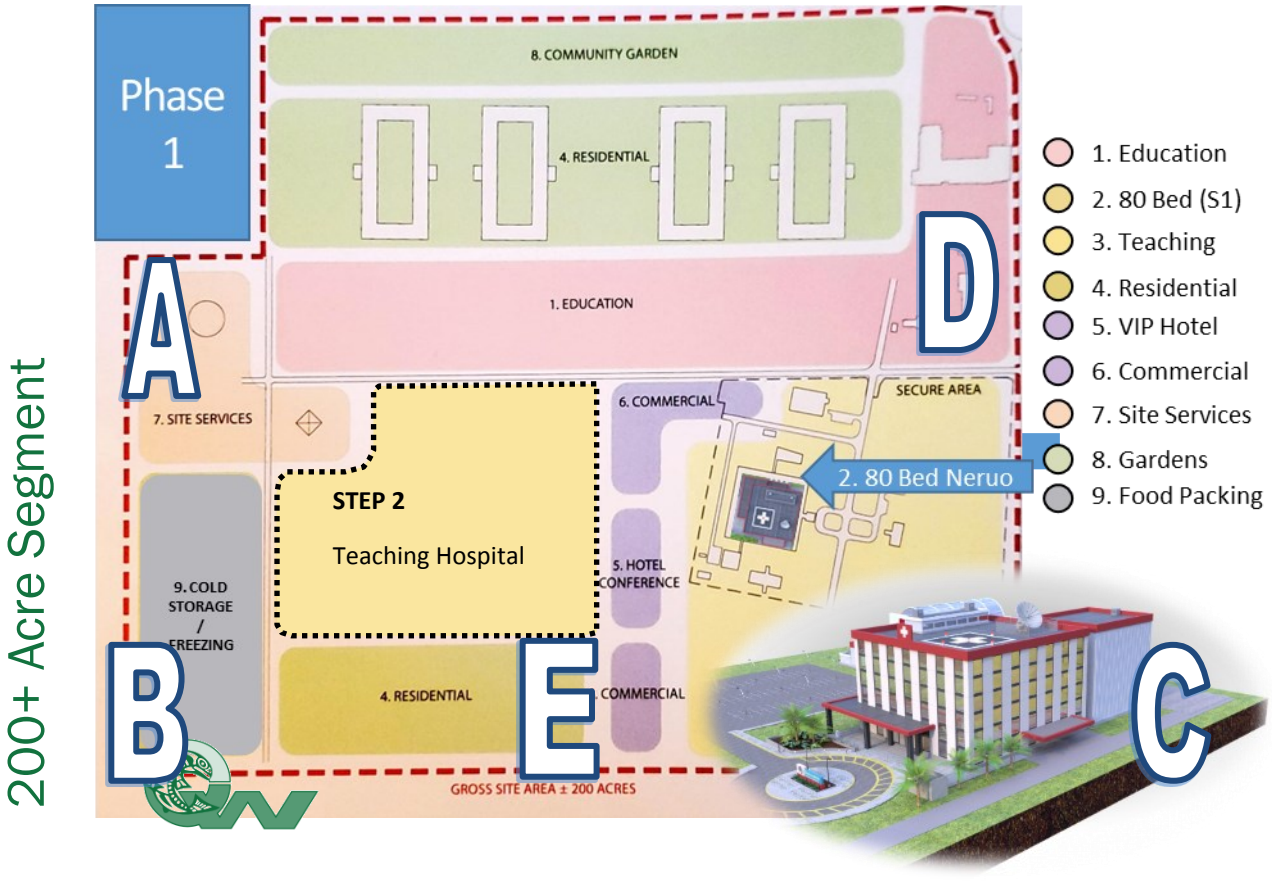
A. Establish biogenic firm energy and sell power under contract;

B. Grow shrimp / fish and earn hard currency from exports; and

C. 80 Bed Neuro-hospital;

D. University Campus with Student housing; and

E. VIP residences / Commercial & Gardens.



80 Bed Neuro-Hospital

Basis

a. Sustainability Study: Resource Planning Group Inc.

b. Functional Program: Resource Planning Group Inc.

c. Architectural designs: Hughes Condon Marler (HCM)

d. Modular adaptation with vertical expansion: In House

HCM was engaged by KBNF to provide detailed building design and layouts for an 80 bed, three story hospital structure encompassing the massing requirements set out in the Functional Program.

Shown here, the first floor (right) demonstrates an arrangement done by HCM that the internal KBNF design team used as the basis for a layout that would work in a modular building with six stories. (Next page.)

6 Story Modular

Features

a. Modular, pre-built in controlled space, shipped, assembled with skilled international team on pre-built foundations in 90 days;
b. Includes radiant cooling with atmospheric conditioning in each room using biogenic energy;
c. 2 extra stories (unfinished) are delivered for future use (level 5 and 6);
d. Includes VIP suites for visiting surgeons, nurses, biomedical engineers, etc. as well as luxury suites for people of means who wish private pre and post-operative care; and
e. nursing staff delivering 4 day / night shift cycles with daycare facilities provided for their infant nursing children.

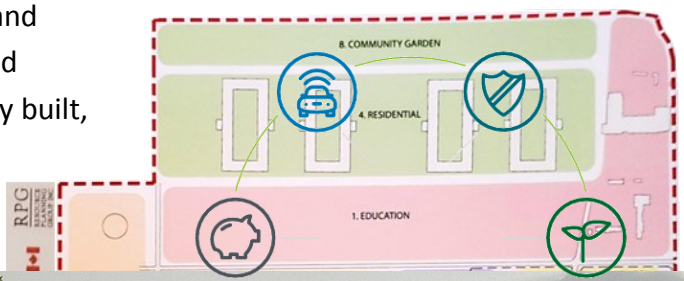
PEAK University

Basis

Functional Program: Dr. Dan Miulli

Five Goals of the Premier Education Accelerator of Knowledge (PEAK University) of HOPE Liberia will be to:

- Provide an innovative cutting-edge complete continuum of education from day care to technical and professional education in one setting at PEAK within a compassionate heart-powered self-sustained ecological environment.
- Develop, promote, and provide excellence for the culture of life-long learning, teamwork, ecological sustainability, and fiducial responsibility in the individual, Liberian, and society.
- Provide leadership and integrity in universal education utilizing the best people from Liberia, West Africa, and internationally.
- Retain the PEAK educated individuals to provide future PEAK excellence, heart-power, leadership, integrity, innovation, and stewardship in education.
- Encourage, educate, and provide innovative research and product and service development that fosters advanced learning, healthcare, and wellness in one contemporary built, self-sustained community.



PEAK University

Phase 1 includes a medical school, nursing school, pharmacy school, biomedical school, day care, primary school, secondary school, and support services as well as the medical manufacturing complex. This phase will employ about 400 total personnel for 900 students not including children in day care, primary and secondary school. Providing daycare, primary and secondary schools for PEAK University personnel is necessary to attract the best talent from across Liberia and West Africa. Spaces will be shared to promote teamwork and still meet the US Standards. PEAK University schools will be highly integrated with the West Africa Medical Center of Excellence (WAMCE) to provide clinical experiences during the 3rd and 4th years of schooling not available in other countries. This will allow PEAK University healthcare students to be highly sought for healthcare jobs all over the world.

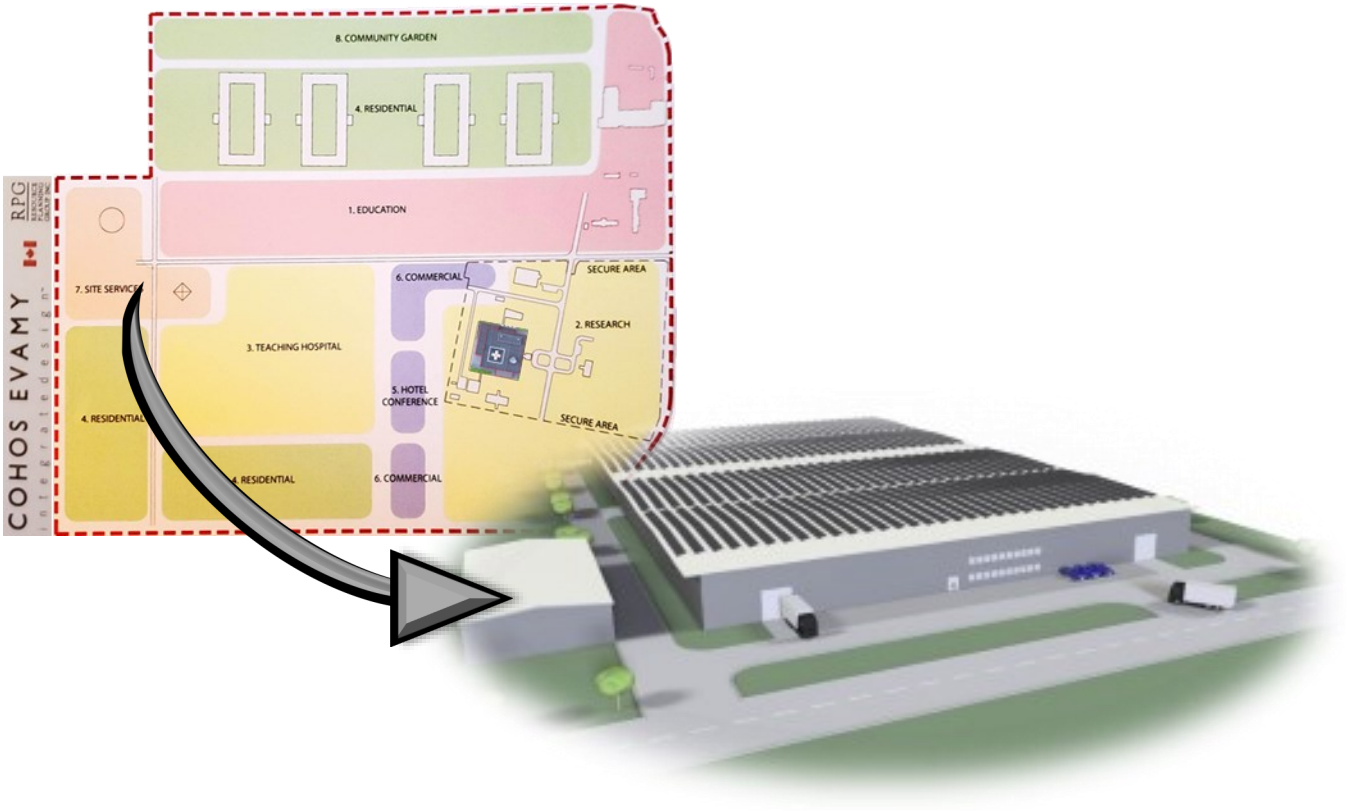
Development Plan Areas from Legon Campus Plan, page 14

COHOS EVAMY integratedesign | RPG Resource Planning Group Inc

	CGSM (m2)	BGSM (m2)		Needed for P1 / Step 1
School of Biomedical Sciences	16,605	22,860	55%	9,133
School of Pharmacy	9,915	12,405	78%	7,719
School of Nursing	4,695	6,060	100%	4,695
School of Medicine	10,000	12,700	100%	10,000
	41,215			31,546

School and Class size	Phase 1 SF	Phase 2 SF	Phase 3 SF
daycare 20,000 SF (1,858 SM), up to 370	5,000	5,000	10,000
primary school 60,000 SF (5,574 SM), up to 1000	15,000	15,000	30,000
secondary school 60,000 SF (5,574 SM), up to 800	10,000	15,000	35,000
medical school 120,000 SF (1,858 SM), 60-120/class 240-480 total	60,000	20,000	40,000
nursing school 60,000 SF (5,574 SM), 40-60/class 160-240 total	20,000	20,000	20,000
pharmacy school 60,000 SF (5,574 SM), 40-60/class 120-180 total	20,000	20,000	20,000
biomedical school 60,000 SF (5,574 SM), 40-60/class 120-180 total	10,000	20,000	30,000
physical therapy school 60,000 SF (5,574 SM), 40-60/class 160-240 total	10,000	20,000	30,000
EMS school 60,000 SF (5,574 SM), 40-60/class 80-120 total	5,000	5,000	50,000
radiology school 60,000 SF (5,574 SM), 40-60/class 80-120 total	5,000	5,000	50,000
medical assistant school 60,000 SF (5,574 SM), 40-60/class 80-120 total	5,000	5,000	50,000
medical informatics 30,000 SF (2,787 SM), 40-60/class 80-120 total	5,000	5,000	20,000
nutrition school 30,000 SF (2,787 SM), 40-60/class 80-120 total	2,000	10,000	18,000
transcription school 30,000 SF (2,787 SM), 40-60/class 40-60 total X2	2,000	10,000	18,000
social worker school 30,000 SF (2,787 SM), 40-60/class 160-240 total	5,000	5,000	20,000
public health, health care administration 30,000 SF (2,787 SM), 40-60/class 80-120 total	5,000	5,000	20,000
dental school 90,000 SF (8,361 SM), 60-120/class 240-480 total		30,000	60,000
cadaver lab 10,000 SF (929 SM), 4 people	5,000	5,000	
simulation center 20,000 SF (1,858 SM), 10 people	5,000	10,000	5,000
classrooms in medical center complex 20,000 SF (1,858 SM),			
graduate medical education facilities 2,000 SF (186 SM), 16 people	2,000		
research department, statistics, databases, grants, 60,000 SF (5,574 SM) 16 people	5,000	30,000	25,000
Medical manufacturing 60-100 people	40,000	40,000	20,000

Advanced Farm



Basis

Require hard currency to cover hospital operating costs and service debt

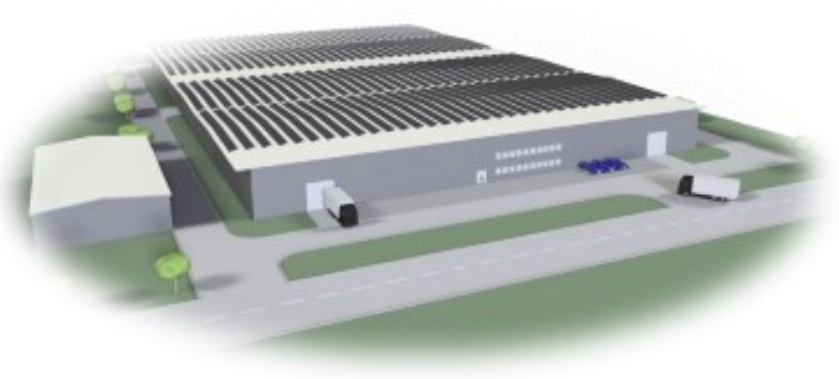
Features

a. Energy for powering water circulation, food processing and cold storage is provided without cost as a byproduct of producing firm (24/7/365) power from biogenic sources we control.

b. Firm power is delivered to HOPE Liberia in priority to any exports to the National Grid. This arrangement will create energy independence.

c. Provides local farmers Cold Storage facilities to avoid spoilage losses.

Advanced Farm Components



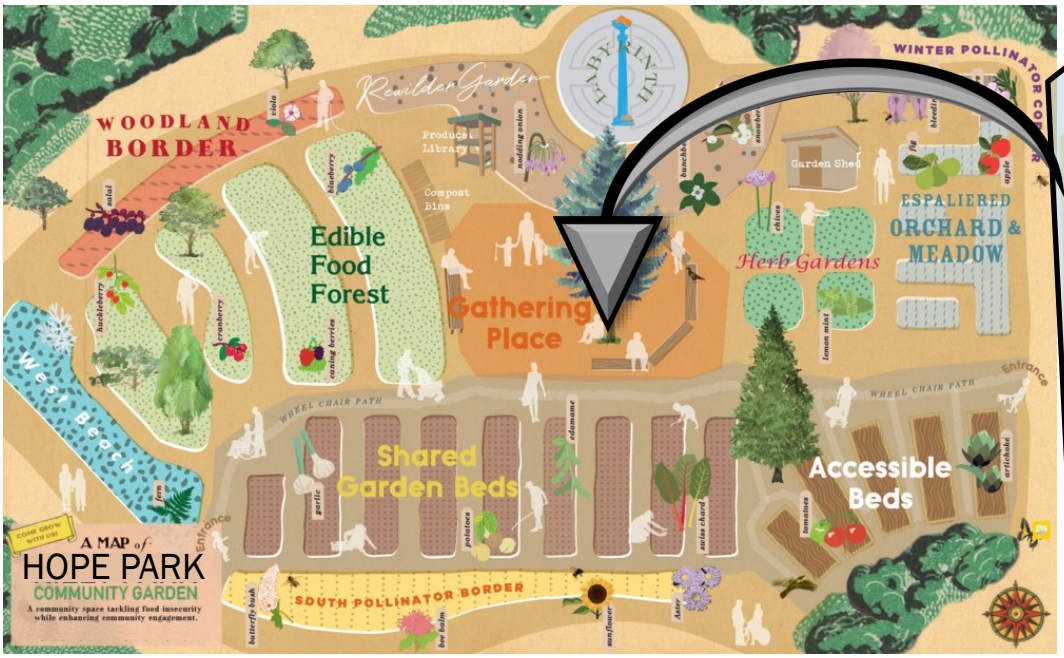
Vertical Shrimp

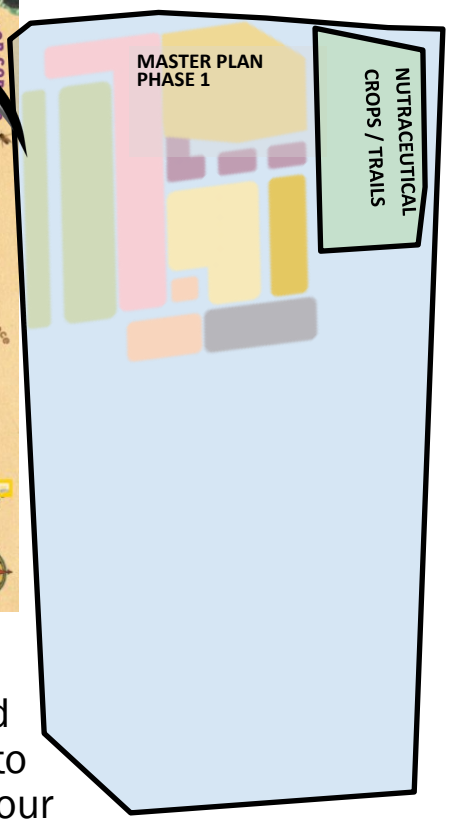
- Controlled Environment
- AI Monitoring
- Power independent
- Business to Business contract sales in USD
- Fed with food grown on site

Power

- Fuel supply owned by KBNF under contract with Liberian Gov.
- Proven technology (Toronto—30 yrs.)
- Zero Waste output
- 65% to 75% efficient
- 5 day fuel reserve on site

Green Space & Permaculture





Basis

Provision of open space to complement natural areas and to provide opportunities for individuals and small groups to relax between classes is a planning value established by our architectural design team. Permaculture garden plans create food abundance for the community and functional space where post-surgery recovery, palliative and daily restorative walks are encouraged and or provided.

Features

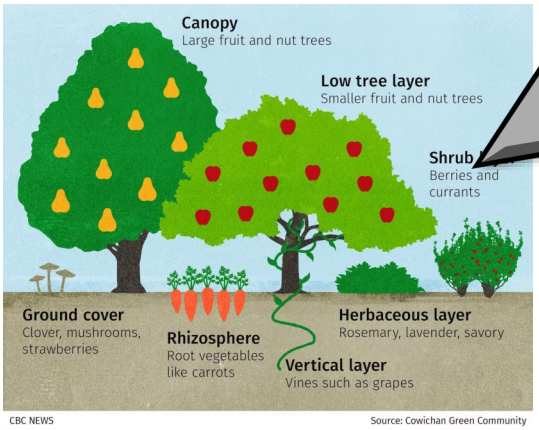
a. Wheelchair accessible gathering places designed to allow visitors access to edible food for enjoyment or collection and use at their residence.

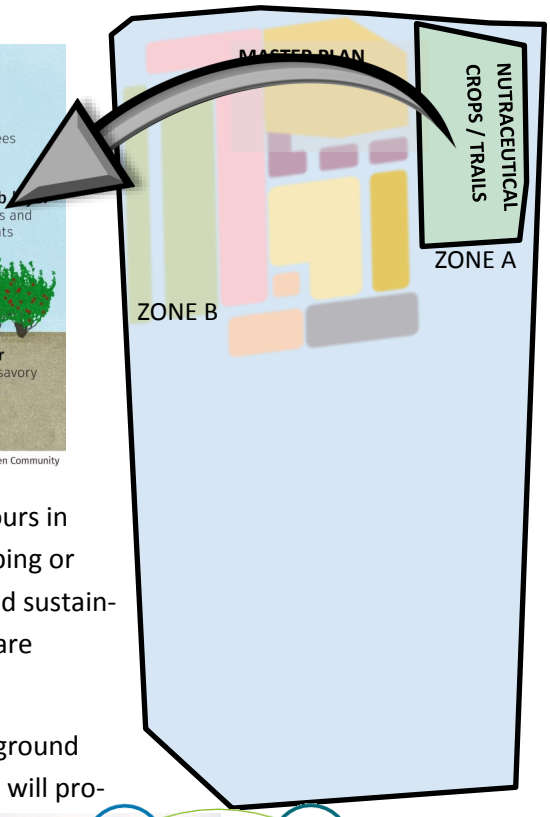
b. Accessible garden beds for physically challenged and those in recovery from procedures limiting movement or in learning how to utilize new prosthetics

c. Shared garden beds and resources to build community around food abundance.

City agriculture

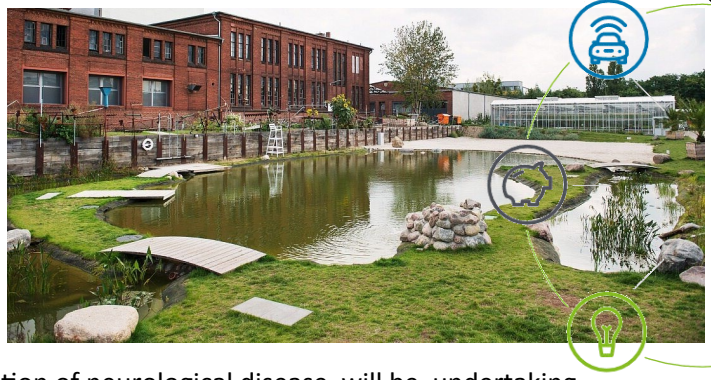
Allocation for permaculture farming (ZONE A) at commercial level with an aim to overall community sustainability has been allocated at either end of the airfield.





Commercial zoning designates areas where restricted access is implemented. These zones will be accessible to the residences and their guests via pre-arranged tours in order to preserve bio-security and limit liability or interference to cropping or harvesting activities. Food security for HOPE is achieved, as well as feed sustainability for the seafood operations. In addition local currency revenues are earned with surplus feed.

ZONE B is zoned for commercial tilapia and catfish production using in-ground ponds. Protein from this source is important for food security. ZONE A will produce a significant part of the dietary base for the aquaculture operations. Offal from aquaculture forms a significant source of nutrition in soil building in ZONE A.



Medical students studying the impacts of good gut biome as it relates to the prevention of neurological disease will be undertaking to gain proficiency in aquaculture in general as part of their education.

ZONE B will include completely controlled dynamic shield growing environments that will allow production of plants designed to become the basis for which to produce nutraceuticals. Organics also are to be used as feedstock for black solider fly larvae production, a vital component of fish feed recipes to be employed.

ZONE B is adjacent to the primary biogenic energy plant where low grade hot water is used in absorption chillers to generate COLD to support cold storage ZONE C. Energy is also used for fish processing. The plan depicted here minimizes movement of harvested fish to the processing plant.

The circular use of waste from one operation to become a technical nutrient for another process is a value of this Master Plan that is embedded into all levels of design.

Housing

Basis

HOPE will establish a modern on-site home manufacturing facility able to meet the demand of HOPE Liberia, and also new construction throughout Liberia. Homes will be modular with 4 to 5 segments that assemble on-site. Galvanized steel studs formed on site from imported roles will form the frames. Building panels made of components that do not decay, rust, are fire resistant and not edible by insects are the basis of design. Rainscreens will be standard.

Features

a. Designed to integrate with district energy system to allow advanced radiant cooling and dehumidification systems to function at peak efficiency
b. Equipped with solar collectors and storage capacitors
c. Comfortable, spacious, family friendly with permaculture gardens, living walls and living fruit fences.
d. EM shielding , personal grounding floors for direct earth connections, therapeutic water baths, etc.
e. Low water waste, linked to zero sewage process.

Car-less Sub-Division Design

Planning for HOPE Liberia is not car centric. Personal transportation requirements are shifting. Residents of HOPE will work within a healthy walk, ride or roll to work. Food will be in abundance in each back yard and local fish pond or chicken coop.

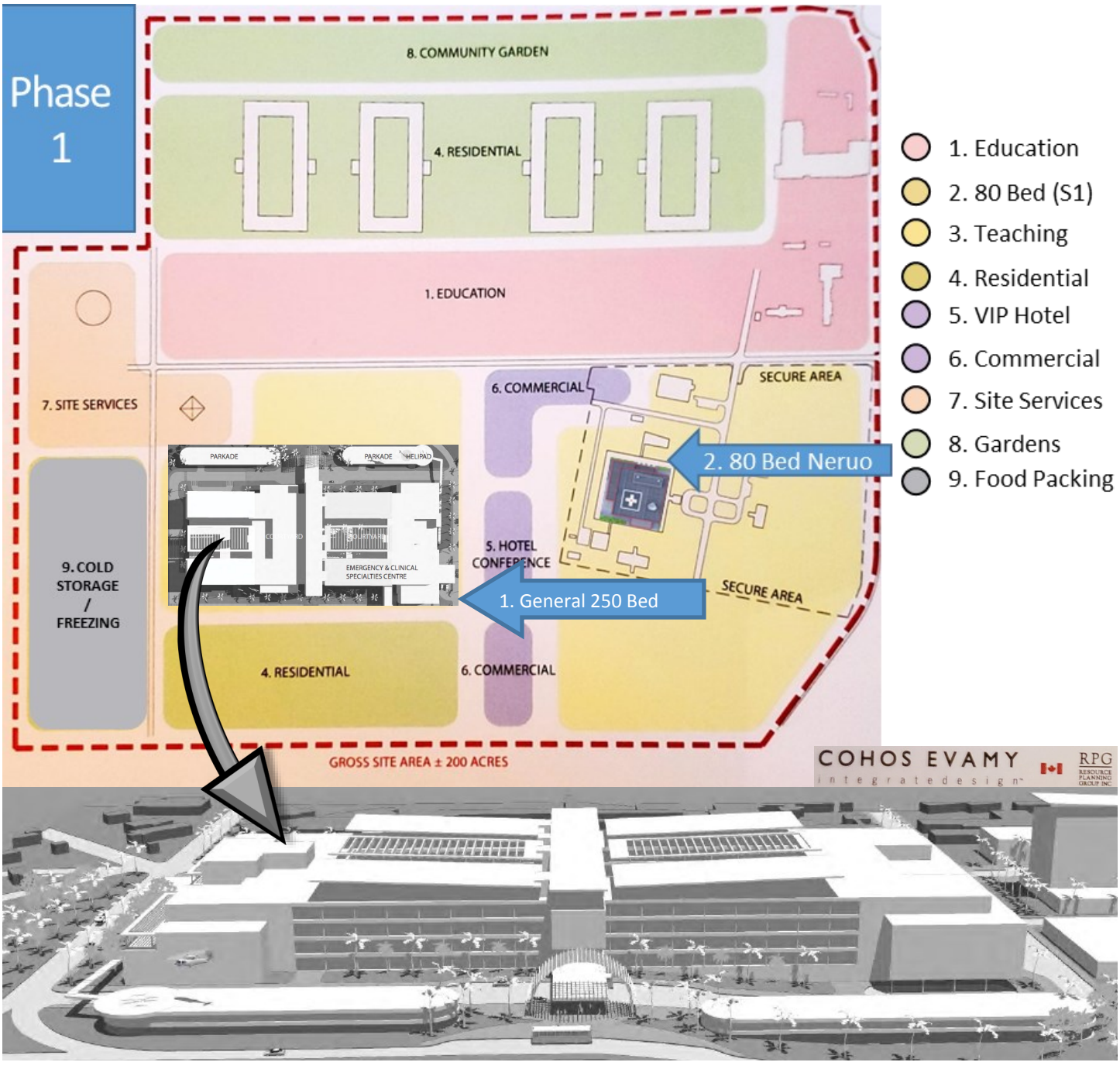
Day to day necessity to travel in this model is dramatically reduced. Personal vehicles designed for long distance travel are the exception, and if needed, are parked in community parking pods, not in each house. Shared or individually owned vehicles may be securely housed in these parking pods, accessed by paved multi-use walking/ biking and robotic carrier carts when needed. Such a community design eliminates the need for a road network to access every house making room for common fields, permaculture, water course, etc. Communities redeemed from car centric planning create community design opportunities of un-paralleled scope.

Definition: **Step 2** of Phase 1

Step 2

a. Initiate expansion of KBNF Africa Centre of Excellence (ACE)

b. Expand PEAK University



ACE Medical Centre of Excellence

Basis

Emergency & Clinical Specialties Centre, Master Plan, Cohos Evamy Integrated Design and Resource Planning Group Inc.

Expansion of hospital services in this step at HOPE Liberia includes:

- 175 acute care beds,
- 16 surgical suites
- 20 high acuity beds
- 80 bed rehabilitation centre
- pain management centre
- neurophysiology centre
- psychology counseling centre
- 8 bed drug substance abuse centre
- 48 bed long term care facility
- biomed repair and manufacturing centre
- main concourse that includes post disaster areas for mass casualties
- public areas, coffee shop, fast food, library learning centre, educational space
- administrative and faculty offices

	Area Requirements			
COMPONENT	NSM	Grossing Factor	CGSM	Remarks
Emergency Centre				
Emergency	1,877.0	1.45	2,720.0	
Morgue	48.0	1.45	65.0	Located on Basement Level
Post Disaster Areas	0	0	0	Added as part of Common Areas
Radiology	619.5	1.45	900.0	
Surgical Suite	1,513.0	1.45	2,195.0	
Central Sterile Services	274.0	1.45	400.0	Located on Basement Level.
ICU	746.0	1.45	1,080.0	Neuroscience and Emerg. ICU
Emergency Inpatient Units	1,221.0	varies	1,720.0	
Neuroscience Centre of Excellence	2,252.0	varies	3,140.0	
Subtotal	**8,550.5**		**12,220.0**	
Urology and Eye Centre				
Common Areas	1,298.0	1.30	1,690.0	
Post Disaster Areas	870.0	1.10	960.0	Part of Emergency Centre
Urology Centre	2,507.0	varies	3,525.0	
Eye Centre	2,006.0	varies	2,765.0	
Subtotal	**6,681.0**		**8,940.0**	
TOTAL AREA EMERGENCY AND CLINICAL SPECIALTIES CENTRE	**15,231.5 nsm**		**21,160 cgsm**	

Features

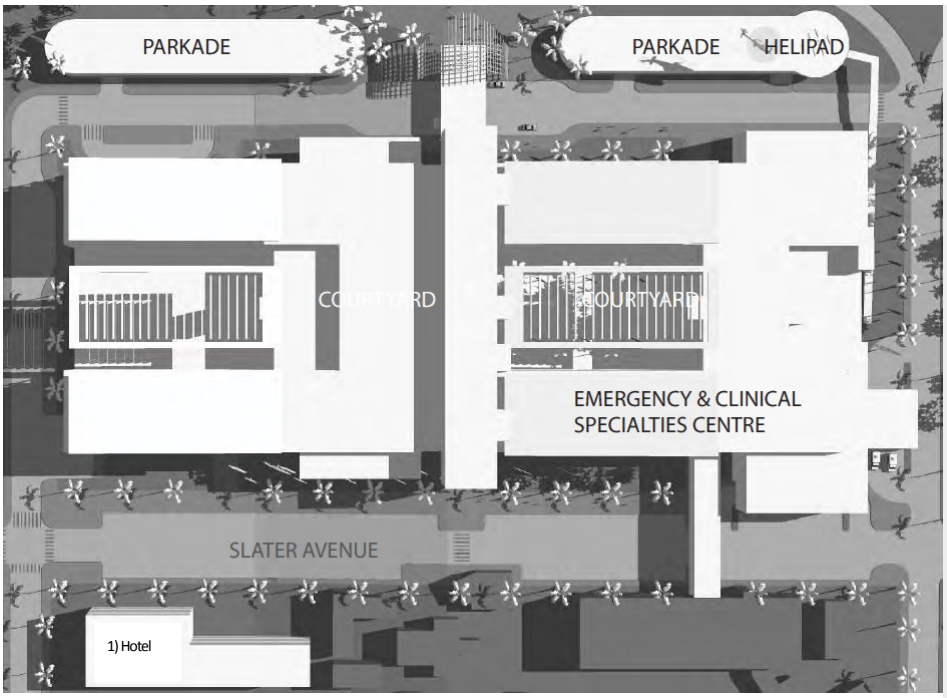
a. Every operating room theater will be equipped with advanced networking capabilities in order to facilitate virtual reality (VR) interface between surgeons and staff physically conducting procedures and experts from around the world. Where appropriate, VR may be used by PEAK students as observers.

b. Each team leader and head nurse will wear chest mounted cameras with ongoing audio and video recording during shifts. The system will enable VR in real-time with others from the international team joining in rounds and to review shift activities as part of ongoing review and skills enablement.

ACE Medical Centre of Excellence

Development Plan

The development is envisioned in three Phases as shown from right to left in the development schematic / building layout below.



HOPE Liberia
Phase 1 Master Plan (MP)
Step 2

November, 2023
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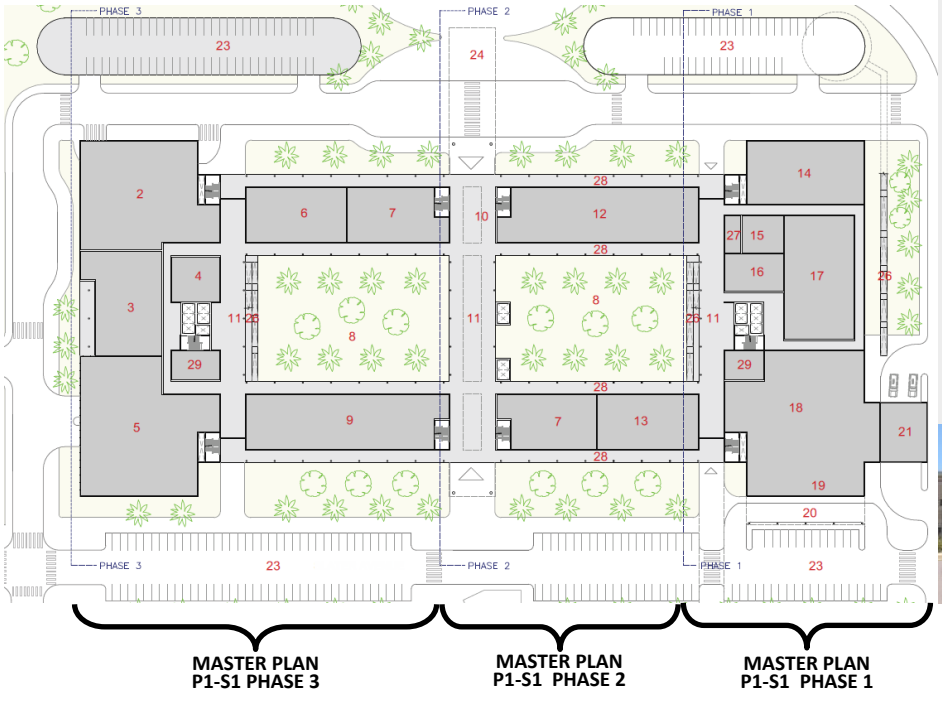
LEGEND

1. HOTEL
2. PEDIATRIC CLINIC
3. CAFETERIA
4. BLOOD COLLECTION
5. OBSTETRICS / GYNE. CLINIC
6. ENTOMOLOGY CLINIC
7. FAMILY PRACTICE CLINIC
8. COURTYARD
9. DENTAL CLINIC
10. RECEPTION / INFORMATION
11. PUBLIC CONCOURSE / RETAIL POST-DISATER TRIAGE
12. EYE CLINIC
13. G.U. CLINIC
14. NEUROLOGY CLINIC
15. SPECIMEN COLLECTION LAB
16. PHARMACY
17. RADIOLOGY
18. EMERGENCY
19. TRIAGE/RECEPTION
20. EMERGENCY WALK-IN
21. AMBULANCE BAY / DISASTER STORAGE
22. ROOF
23. PARKING
24. BUS / TAXI DROP-OFF
25. FUTURE PHASE
26. RAMP
27. ADMITTING
28. EXTERIOR CORRIDOR
29. MECHANICAL AND ELECTRICAL SERVICES

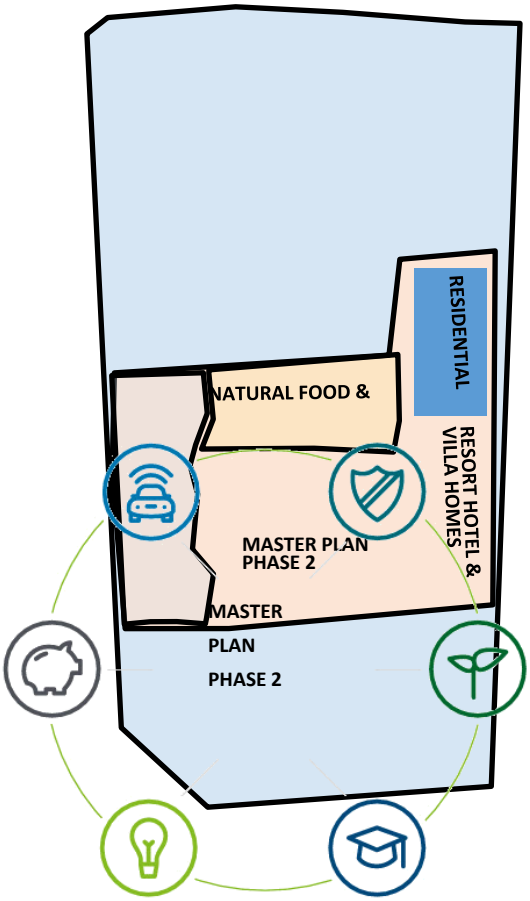


4. Phase 2

Elements

- Expanded hospital services
- Expanded education w/ AR & VR
- Building systems development
- Advanced healing & prevention
- R&D in remote care practices
- Robotic aided prosthetics

Phase 2



Development Plan

Projecting 5 to 10 years in advance it is clear that expansion of general and specialized services in tandem with the number of graduates from PEAK will lead to the development of additional services.

Our projection calls for a further 110 acres to support the expansion of the PEAK University, student residences and expansion of hospital services in specialized fields of medicine based on the needs in Liberia and West Africa.

Major expansion will require additional housing. Housing that will be constructed using advanced local materials in modular design, fabricated on site and applied to the needs of HOPE, and Liberia / West Africa as a whole. It is envisioned that good health begins in the home. We will extend and advance learning in wellness systems that may be practically incorporated into home designs.

Commercial space friendly to grass roots enterprise and people centric service providers such as accounting, insurance, grocery and general merchandizing will expand to suit.

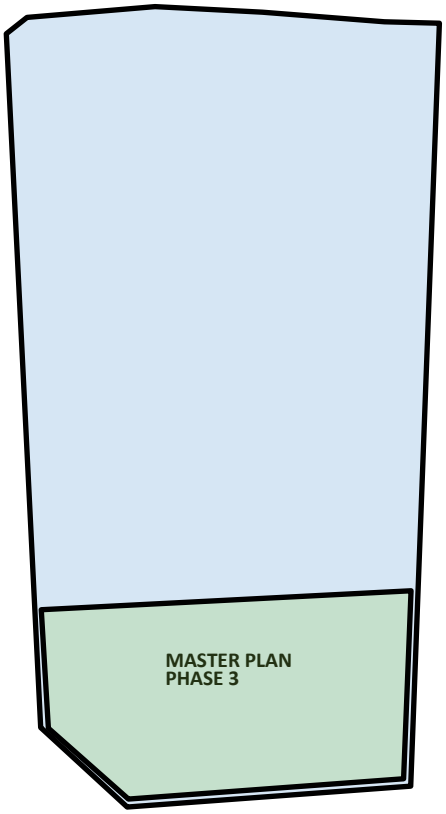
Phase 2 / Purpose	Area
MP Phase 2: Hospital / University and Residences	110 acres
Health Destination	50 acres
Commercial	40 acres

5. Phase 3

Elements

- Additional hospital services
- Expanded education w/ AR & VR
- Medical products centre
- Medical tourism centric facilities
- Remote training and support faculty
- Robotic aided surgery

Phase 3



Development Plan

Projecting 10 to 30 years in detail is impractical other than to address general known trends that are nearly certain to shape our future. In the mundane, we know there will be need for additional clinical space designed to facilitate rapid change in technologies and learning.

We expect that based on excellence in execution of our plans described in this document, a high demand for services from people around the world will be anxious to receive care. This will lead to a major expansion of our medical tourism sector. Our plan is to consciously focus on world-class delivery with attention to client services and un-matched experiences. With this we hope to impact the world by developing significant relationships with influential families we impact.

Sub-Sahara Africa encompasses many countries with widely distributed populations, many in isolated areas. We will focus on means and methods to deliver health care and health education remotely by utilizing leading-edge technologies to bridge physical and cultural gaps, be it through virtual reality based consultations or the use of robotics to aid in the delivery of remote surgery.

Phase 3 / Purpose	Area
Hospital / University and Residences	100 acres