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Costa Rica Notebook



*... a site for the expansion of the San Miguel Biological Station Cabo
Blanco Absolute Reserve, Nicoya Peninsula, C.R.*

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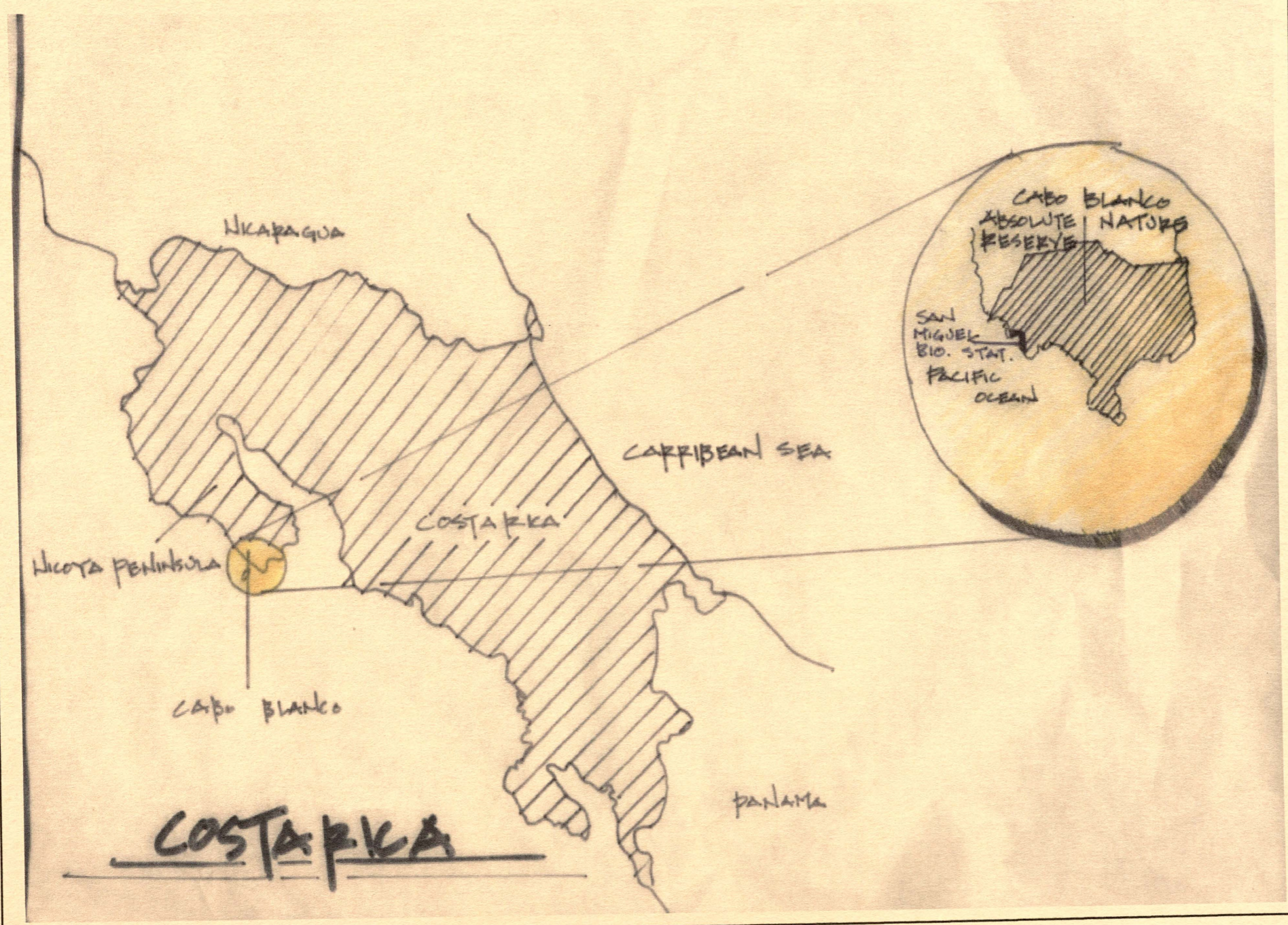
Location

The San Miguel Biological Station is located within the Cabo Blanco Absolute Nature Reserve at the southern tip of the Nicoya Peninsula on the Pacific Coast. The reserve was established in 1963 making it the oldest protected area in Costa Rica among the country's list of 67 parks and protected areas today.

The reserve covers some 1250 hectares of tropical forest, primarily old secondary forest, and a shoreline of over 10-km. The protected area also includes a marine zone of 1700 hectares, as well as Cabo Blanco Island.

Public access to the reserve is available at the Park Headquarters area just inside the NE corner of the park where trail maps may be purchased for day hikes. The San Miguel Biological Station, located near the SW corner of the park, however, is not open to the general public but welcomes students, researchers, and groups interested in learning about the diverse and increasingly threatened eco-systems found here. Access to the Station is by a walking trail some 2-km. in length from the village of Mal Pais, or by boat during calm weather at high tide.



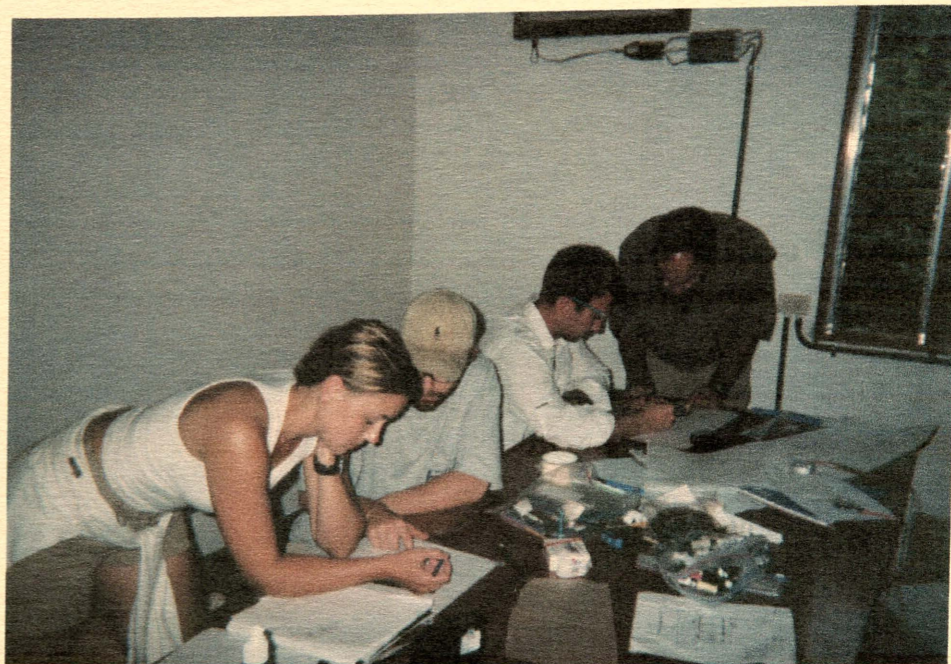


Study Background

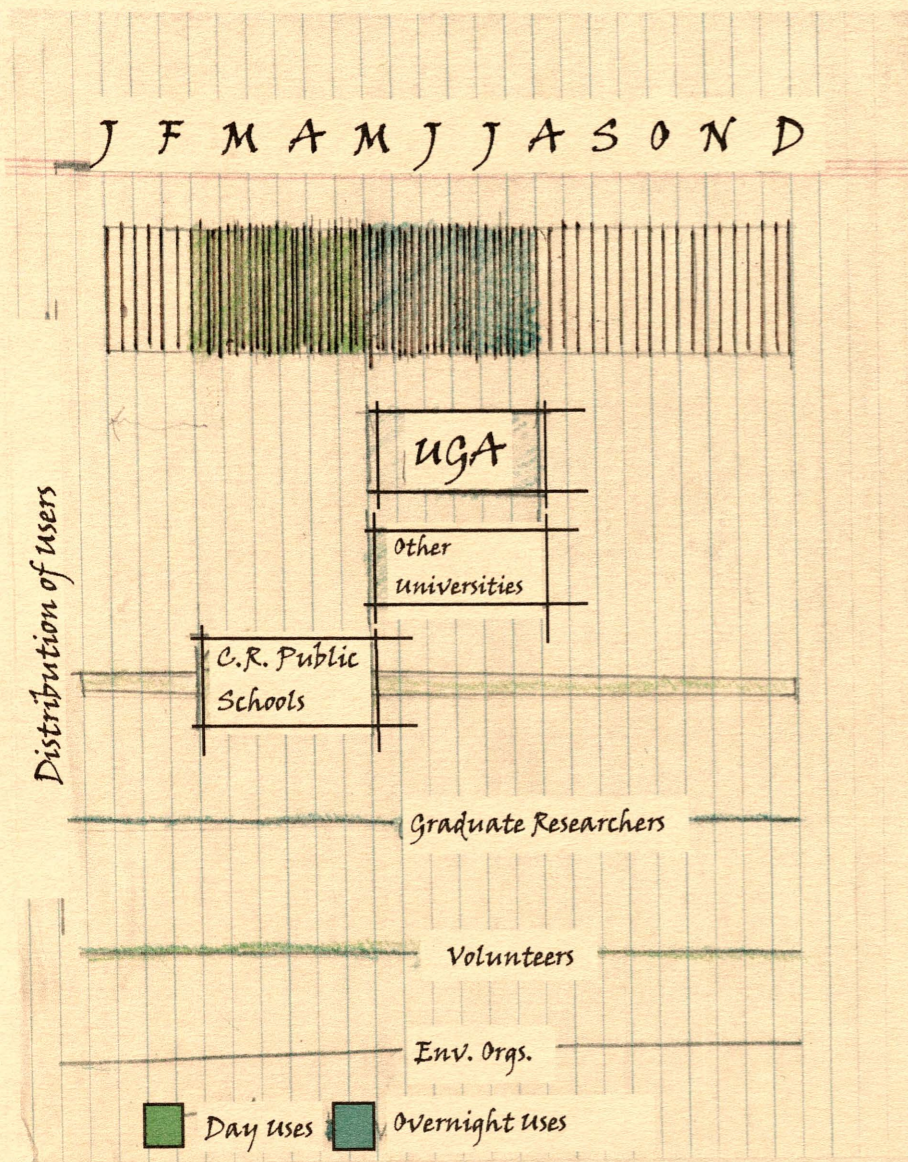
Four University of Georgia landscape architecture students – Ashley Cramer, Zac Adams, Jason McCord, and Richie Jones – undertook this study as a 2-week summer field study course under the direction of Professor Allen Stovall.

Against a program list provided by Drs. Milton and Dianna Lieberman, the Station's directors, the task was to document and assess the site conditions found here and develop plan concepts that could serve to guide the Station's expansion over time.

Work accomplished on-site led to the development of three alternate concepts, which were presented to the Liebermans for feedback and comment just prior to departing the Station. Those comments and suggestions have been incorporated into this study report, which was completed during fall semester 2000 back at the University of Georgia campus.



Park Mission and Use



Quoting from the director's information brochure, The San Miguel Biological Station "was developed to promote and support conservation, teaching, research, and environmental education, taking advantage of the well-protected tropical marine and forest habitats present on the site. Facilities and support staffs are available for courses, workshops, conferences, seminars, research, and educational programs of all kinds and for all ages."

Greatest use occurs during the period May through August when groups from the university of Georgia and other universities and schools bring both domestic and international students to the station for various field study experiences. These typically involve several days of residency. From January through May, student groups visit the station from area public schools. On Average, 15 school groups of approximately 40 children from grades K—8 visit the station. Spread out over the year in smaller numbers are individuals and groups involved in research, educational and various volunteer activities.

During the past three years, the numbers of overnight occupants has risen from approximately 1,000 to 1,300 a year. With construction of additional facilities, this total is projected to go upward to 1,500 to 2,000 (maximum) for the station.

User/Activity Matrix

Based upon the Station's mission, the accompanying matrix further identifies conservation, teaching, research, and environmental education headings into specific activities across the top of the chart against a list of current/potential user groups in the vertical column. The matrix does not claim to be complete, rather it gives a glimpse of user groups against activity types with the results plotted as to use potential - high, moderate, and rare.

The matrix tends to reinforce the continued high potential for teaching and environmental education amongst multiple audiences. Understandably, and fewer in total numbers, research activities will be highest among universities while park service interests and activities, in association with others, have the potential to span the spectrum of site use opportunities found here throughout the year.

USERS	CONSERVATION					Teaching				Research			ENVIRON. EDUC.			
	(Specific Activities: water quality, mgt vegetation mgt wildlife mgt spawning recycling)					Marine ecology	Terrestrial ecology	Flora	Fauna	Marine ecology	Terrestrial ecology	Built environment	Birdwatching	Wildlife observation	Snorkeling	Hiking
USA	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Other UNIVS.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
H.S. students (internat.)	○	○	○	○	○	●	●	●	●	●	●	●	●	●	●	●
CR. schools	○	○	○	○	○	●	●	●	●	○	○	○	●	●	●	●
Scouts	●	●	●	●	●	●	●	●	●	○	○	○	●	●	●	●
Environment. Orgs.	●	●	●	○	○	●	●	●	●	○	○	○	●	●	●	●
Park Service	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Other govt. agencies	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Volunteers	●	●	●	●	●	●	●	●	●	○	○	○	●	○	○	○

● high potential
 ◐ moderate potential
 ○ rare potential

USER/ACTIVITY MATRIX

Study Process:



The study began with a "wish list" of facility needs provided by the station's directors, Drs. Milton and Diana Lieberman, prior to our arrival in Costa Rica.

The second step involved the completion of user questionnaires by spring 2000 Maymester participants and staff during the week-long San Miguel field session. Those responses were tallied, summarized, and included in the development of study objectives.

Against these objectives and a preliminary program list, the third step centered on the documentation of environmental site conditions. This step focused on how the site offered opportunities for program/facility expansion based upon environmental opportunities and constraints documented in the field.



From these findings, the final step focused on conceptually organizing the site into designated use zones, including proposed building locations and a system of connecting walks. Three alternative concepts are presented at the end of the report.

Program

After several meetings with park officials, initial program elements were defined and prioritized. Two main use areas of need were identified—
Residential and Research/Program support

- Residential:
- One 12-person dormitory with bathhouse
 - Three bachelor quarters (BOQs) and appropriate bath facilities
 - Three family apartments
 - One staff apartment
 - One outdoor shower in front of lagoon

- Research/
Program
Support
- One air-conditioned lab
 - One wash house
 - One boat launch
 - One outdoor classroom



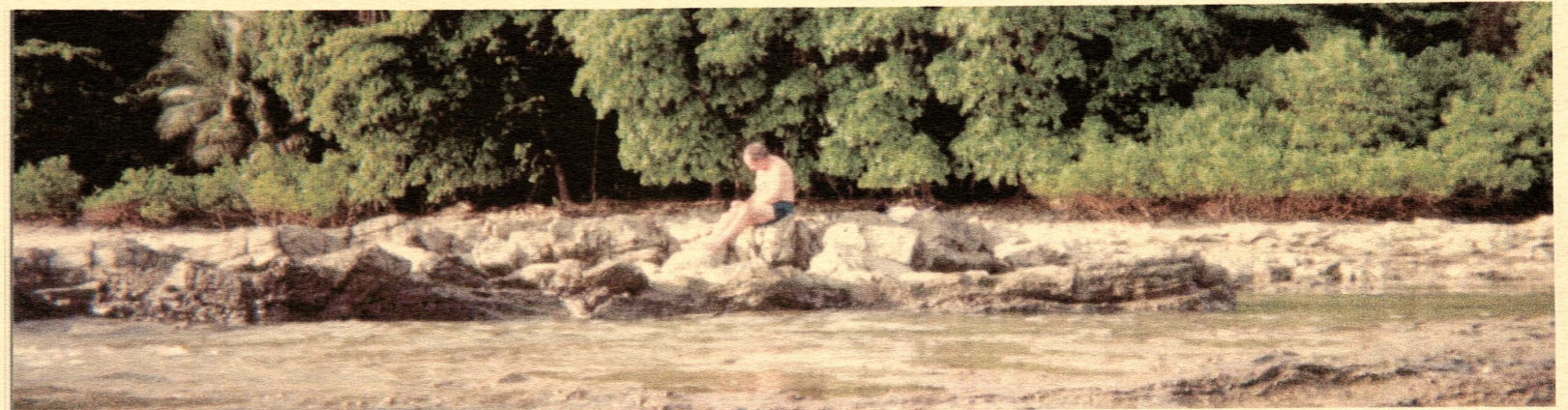
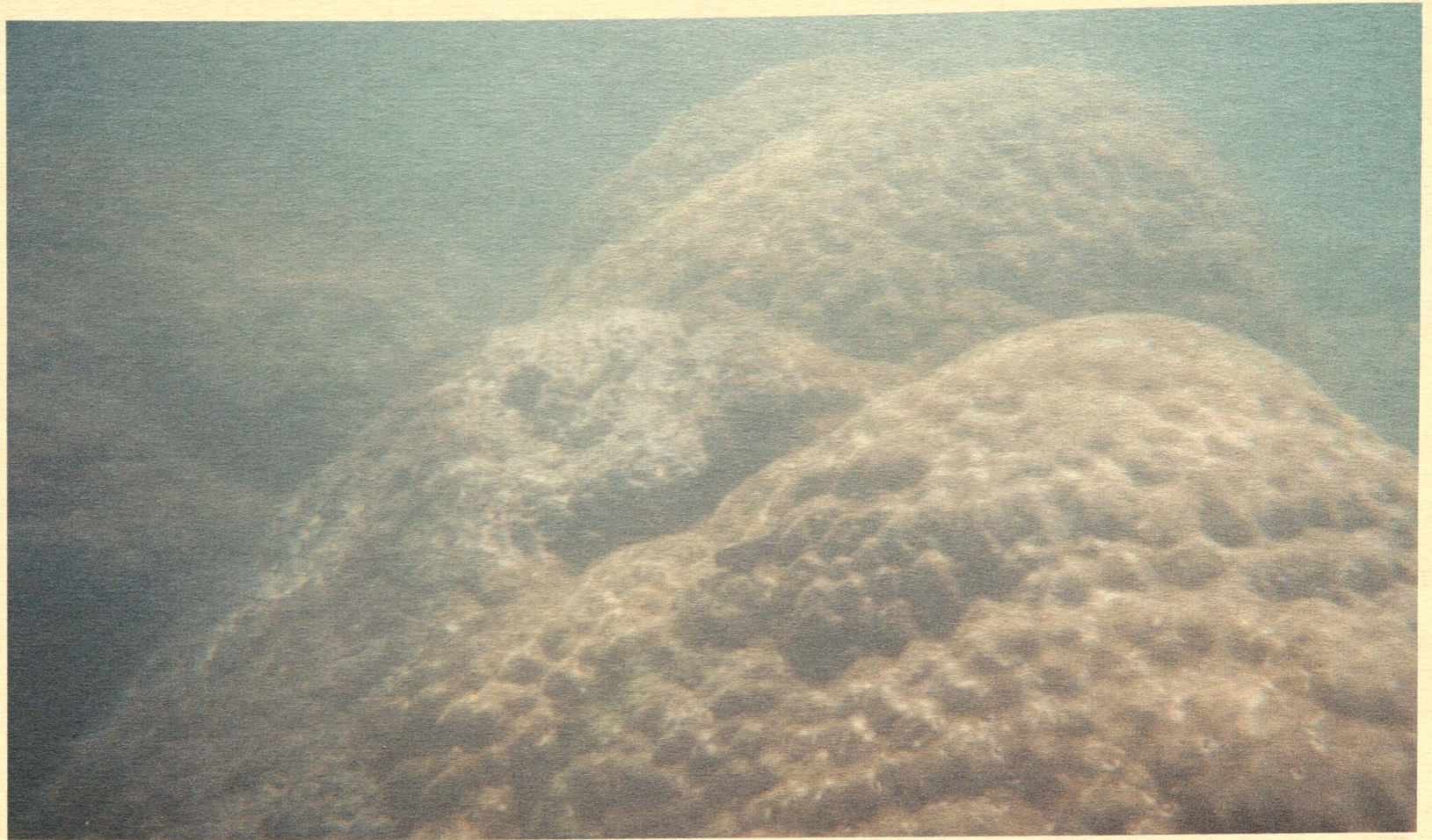
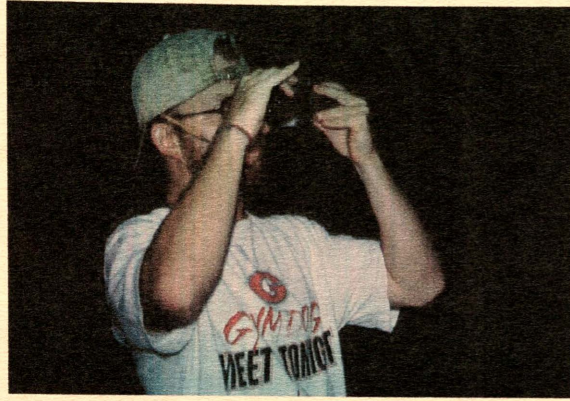


Study Purpose and Objectives

The study purpose is to document existing conditions and features of the San Miguel site and, against the proposed program of new facilities, develop alternatives for the station's expansion, over time.

Objectives of any plan for expansion are to:

1. Protect the water quality of the lagoon
2. Provide for the safety and comfort of various user groups
3. Protect and ensure wildlife movement corridors
4. Preserve the integrity of the forest structure
5. Provide for gathering areas
6. Promote maximum use of existing facilities – limit new construction to that which is absolutely needed
7. Strive for aesthetic consistency with new park construction
8. Improve existing access to and from the station (boat and vehicular access)
9. Provide additional (loop) trails into the park to allow "safe" escape from the built environment.



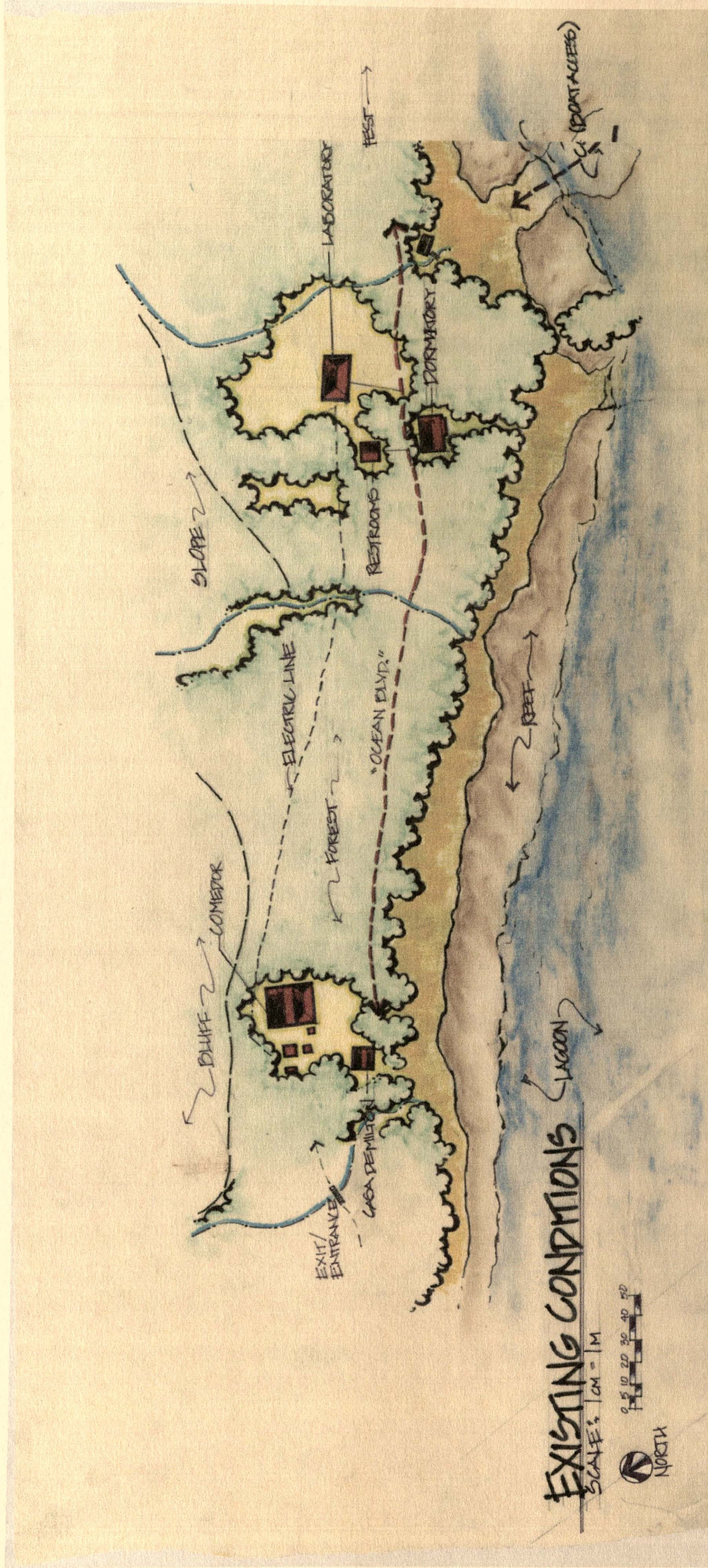


Introduction to San Miguel Site

The following pages document site information gathered in assessing the station's potential to accommodate expanded facilities while seeking to protect the fragile resources found here. In maps and text, site documentation addresses the following area of concern:

- Existing Site Conditions
- Topography
- Vegetation
- Hydrology
- Potential Building Zones

Existing Conditions





Existing Site Conditions

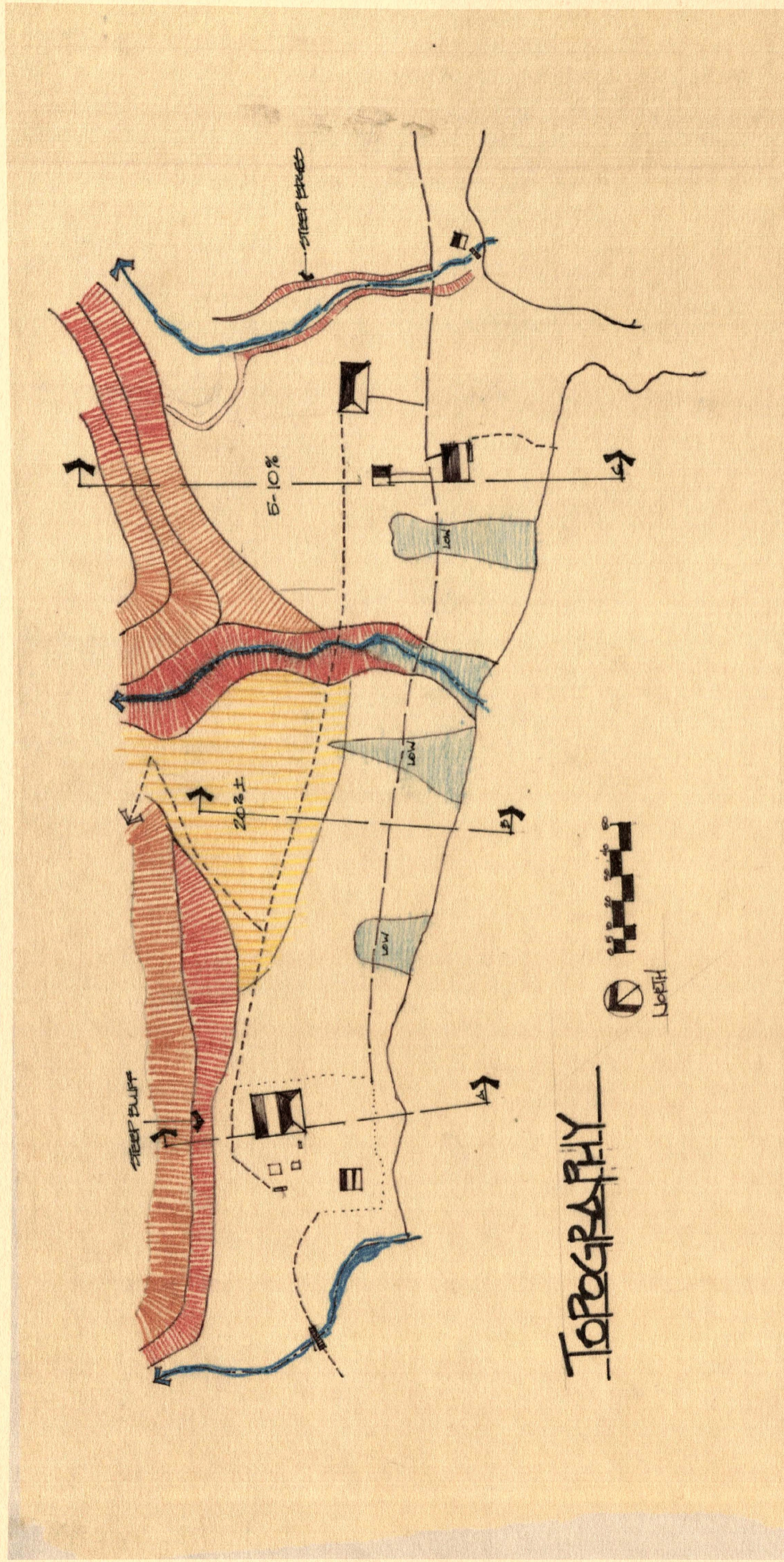
Within the total park, this study focuses on a land area of approximately 4 hectares, located near the SW corner of the reserve. The site is mostly forested and contains three streams – one at either end and one near the middle. The site stretches some 450 meters east-west and varies in usable land area from approximately 70 meters to 140 meters in its N-S direction.

Beyond the upland land area described, the Station's beach and barrier reef contains a large lagoon that is home to a multitude of marine plants and animals. It is the only one found along this coastal area, and, therefore, its long-term protection must be a continual priority with any plans for the future here.

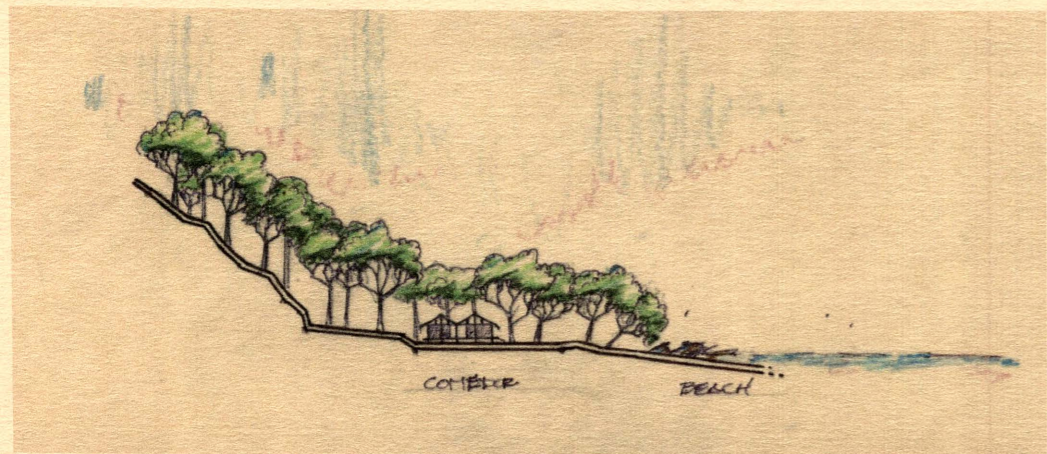
Current buildings of the Station occur in two clustered locations, approximately 300 meters apart, linked by footpath. The "comedor," constructed in the early 90's, provides kitchen and dining for all guests, two toilets and two showers, cooking staff quarters, and sleeping space for 12 additional people. Several small buildings occur nearby, including a small residence structure used by the director, and occasionally, by park personnel.

The other (east) end of the study area contains more recently constructed facilities – a dormitory that sleeps 18 guests, shower and restroom building, and a laboratory facility containing large tables, storage space, and two air-conditioned office labs. A small boathouse where supplies are brought in and emergency items are kept is located nearby. All major buildings are served by electricity and water, which is provided by pipe from upland springs in the reserve. These springs also serve the nearby village of Mal Pais.

Topography



TOPOGRAPHY

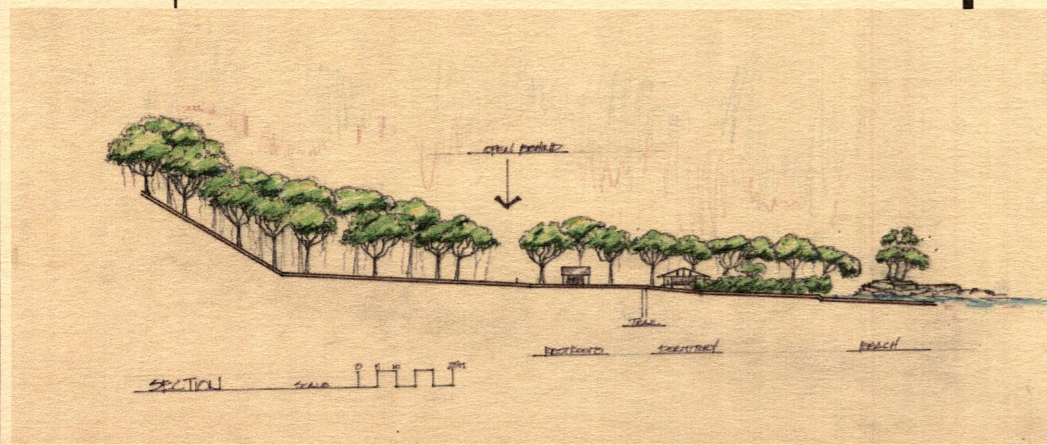


Topography

The topographic map organizes the study area into units of relative slope zones. The map was produced from field work utilizing combined methods of hand-held measuring tape, compass, range finding instrument and metric field rod. The resulting map offers a glimpse of the study area relative to stated flatness and steepness. The resulting slope gradients are estimates based upon this method.

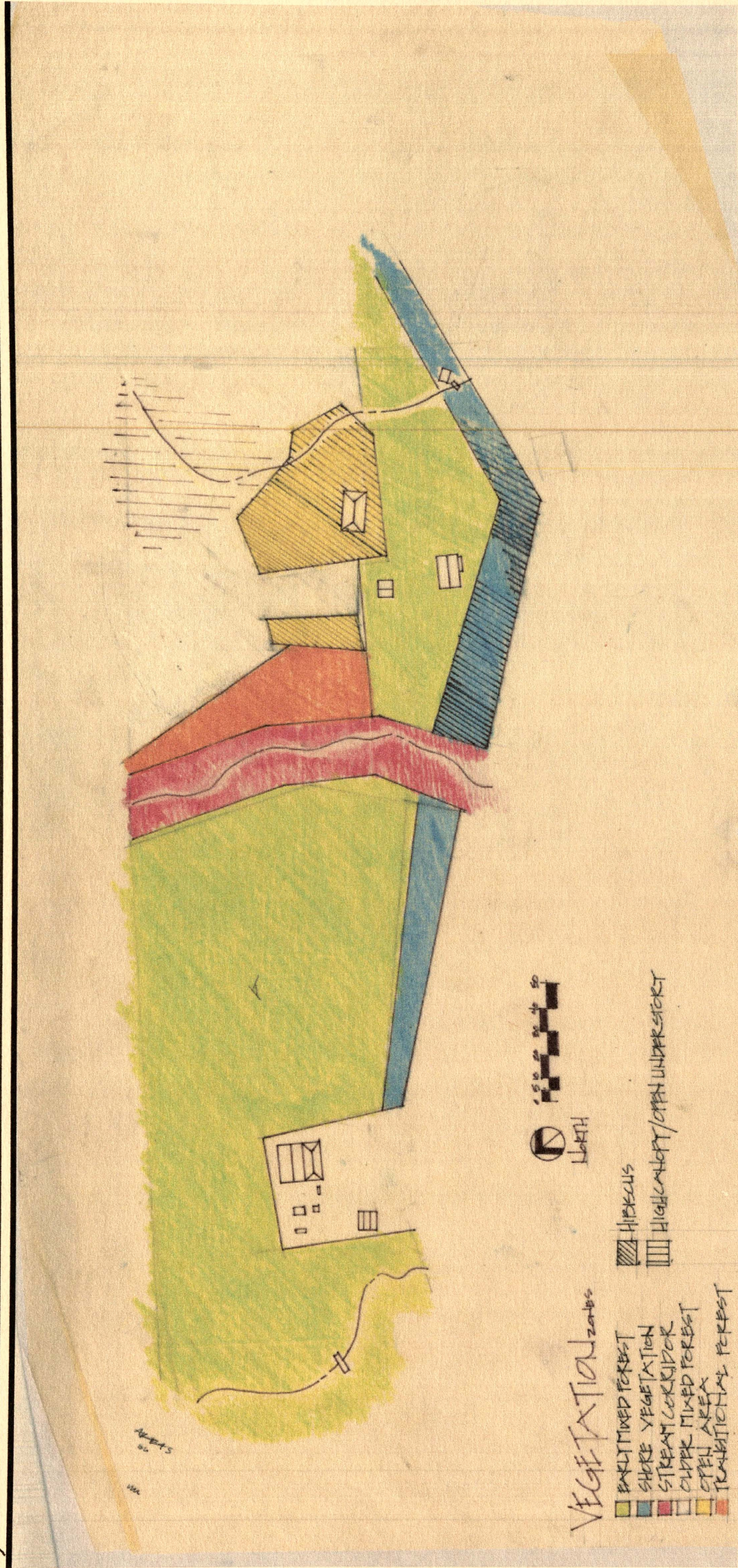
The site slope ranges vary as follows:

- Clear - 5-10% offers maximum use potential based upon slope restrictions
- Yellow - 20%± offers limited use potential
- Red/Orange - steep/bluff-like rocky areas - essentially prohibitive zones with red as most prohibitive

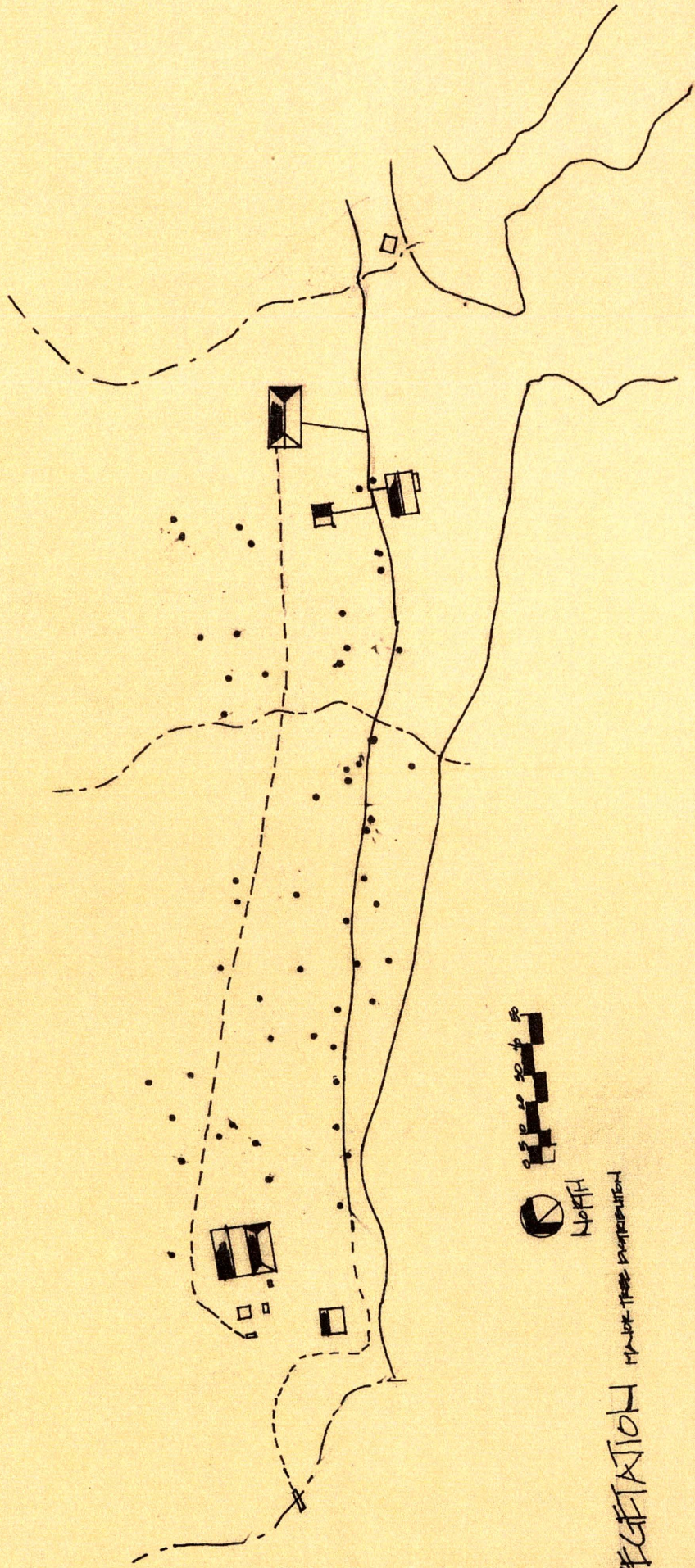


Based upon topography, the resulting conclusion is that all future expansion take place with the flatter 5-10% zones.

Vegetation



Vegetation (trees over 18" diameter)



VEGETATION MAP OF TREE DISTRIBUTION



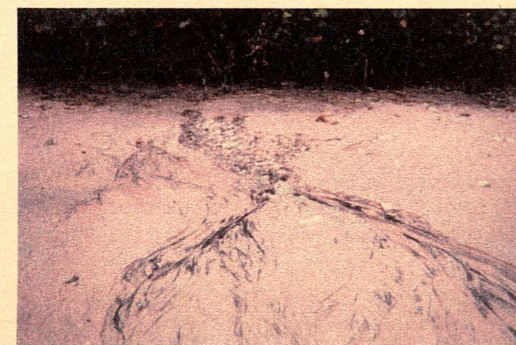
Vegetation

Located in an area described as a tropical dry forest, the vegetation of most of the San Miguel site represents an early successional forest stage of around 35 years. Prior to its designation as an Absolute Reserve, local farmers had used the land, primarily as pastureland. With the halt in grazing, the forest emerged from wind dispersed seeds – particularly the Pachote tree. At a more detailed level, variances in forest composition and character do occur on the site. The following colored map expresses each vegetation type in the following lettered zones:

- A. Early Mixed Forest - Zone makes up the largest part of site, dominated by high Pachote tree, a wind dispersed early successional tree. The under-story is dominated by a small, dense liana vine.
- B. Shore Vegetation - Dominated by bromeliad species with areas overtaken by an invasive species of Hibiscus.
- C. Stream Corridor - An older forest, more diverse in age and species. Under-story dominated by dense climbing vines.
- D. Transitional Forest - Transition between stream corridor and older successional forest.
- E. Older Mixed Forest - An area further along in succession not as heavily pastured, more diverse in vegetation age and species.
- F. Open Area - Zone overtaken by a species of invasive Hibiscus whose density inhibits normal succession from occurring.

A second vegetation map is a recording of existing trees, 30 cm (12") and larger, occurring in the primary site area where expansion is most likely to occur. Tree locations were determined by field method, utilizing a compass, range finder, and measuring tape. The purpose of this survey was to record those trees to be most avoided in the layout and construction of new facilities.





Hydrology

Annual precipitation for this area of the Nicoya Peninsula is 2500-3000 centimeters per year with the rainy period being between June to November. Three freshwater streams pass through the San Miguel study site, emptying southward into the lagoon. Likewise, during the wet season (the time of this study), water travels down-slope and beneath the shallow soils to enter these streams directly or to surface along the beach to enter the lagoon, itself.

With any continued or expanded use of this site, protection of the water quality of the lagoon is essential.

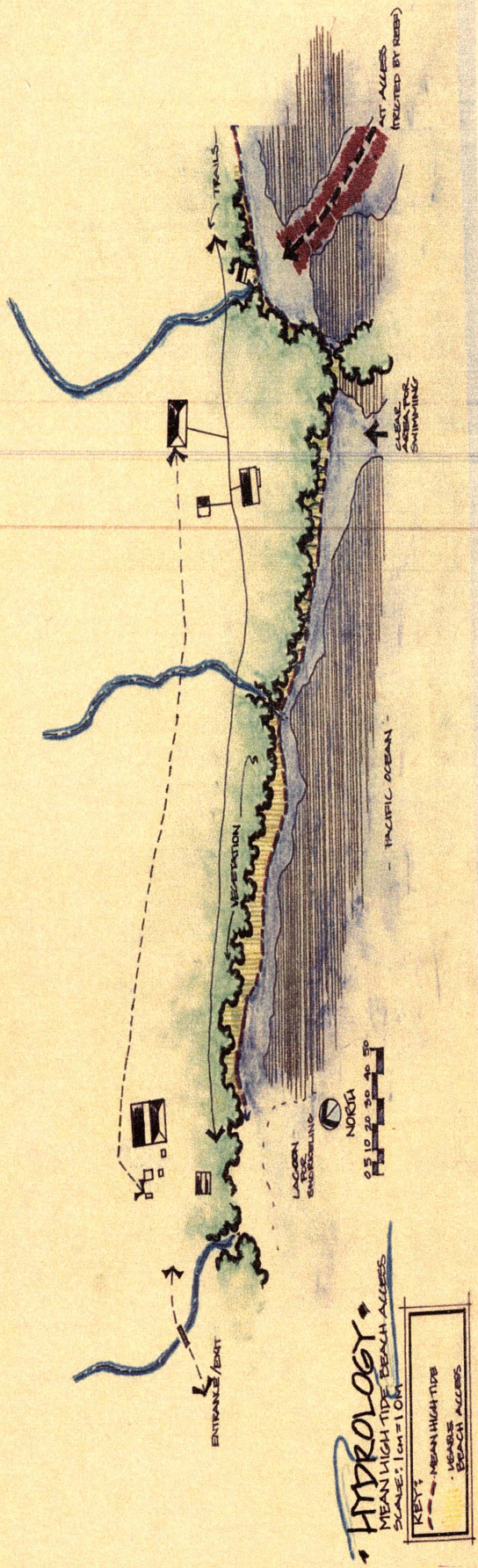
Three maps document conditions related to surface water features and tidal zone activities during the two week study period.

All three maps locate the three freshwater streams. Map 1 identifies the general location of mean high tide, plotted as an average of high tide levels observed during the study period. (As the high tide line is dynamic throughout the year, a more accurate account of actual levels can be better understood with a local tide table.)

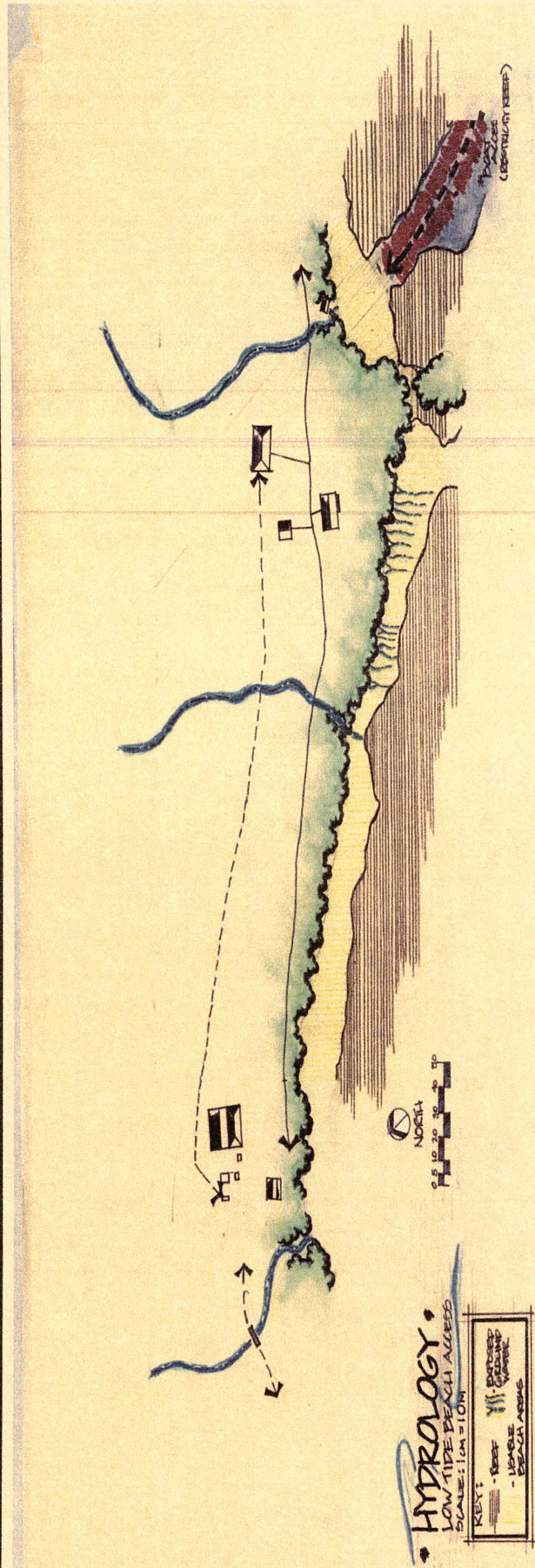
Map 1 also identifies areas clear for swimming and free of the rocky reef during high tide. Both Maps 1 and 2 identify the narrow zone through the reef where boat passage to the beach landing-boat house area is possible. Map 2 reveals usable sandy beach areas available during low tide and, from field observations, approximates the edge of the rocky reef that extends southward into the lagoon. Finally, this map locates areas of observed groundwater seepage where it surfaces and enters the lagoon.

The third map delineates the estimated mean high tide level and establishes buffer zones to remain free of septic drain fields and other sources of potential pollution. These are: a 50 meter buffer distance from mean high tide and a 30 meter width on either side of the three stream tributaries. These undisturbed zones will serve as wastewater filters where dissolved nutrients may be utilized by vegetation prior to entering the lagoon. Another benefit of the buffers is to provide for wildlife corridors within the developed site area.

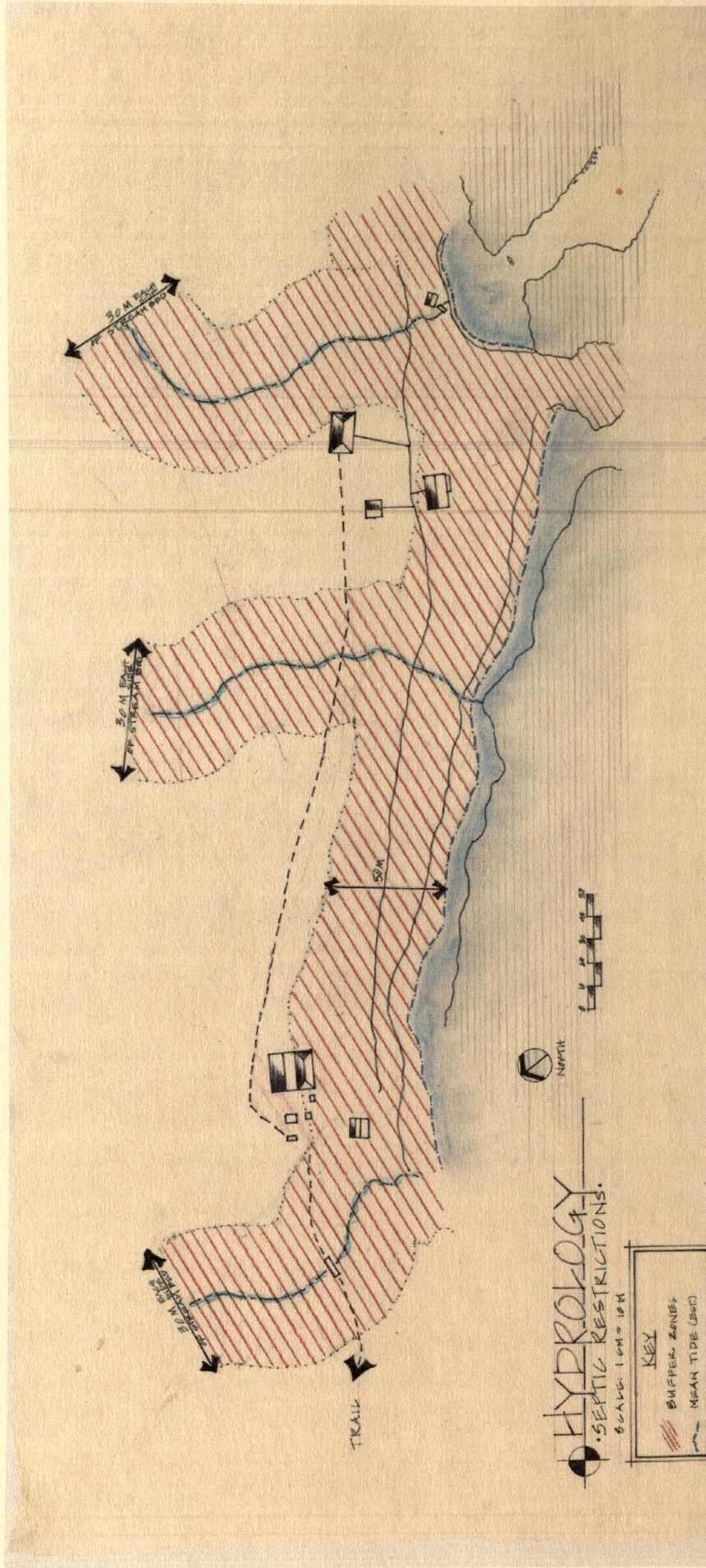
Hydrology (High Tide)



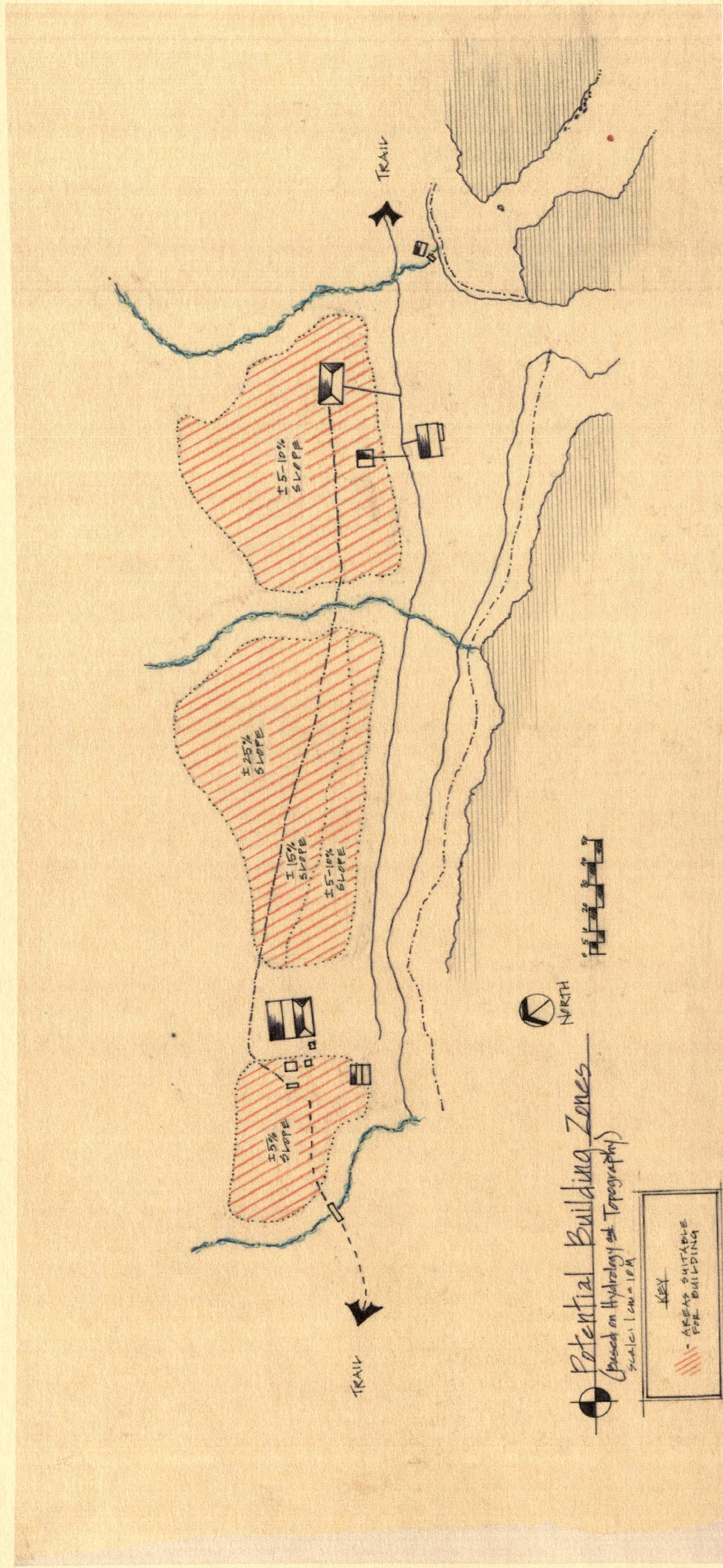
Hydrology (low tide)



Hydrology (Restrictions)



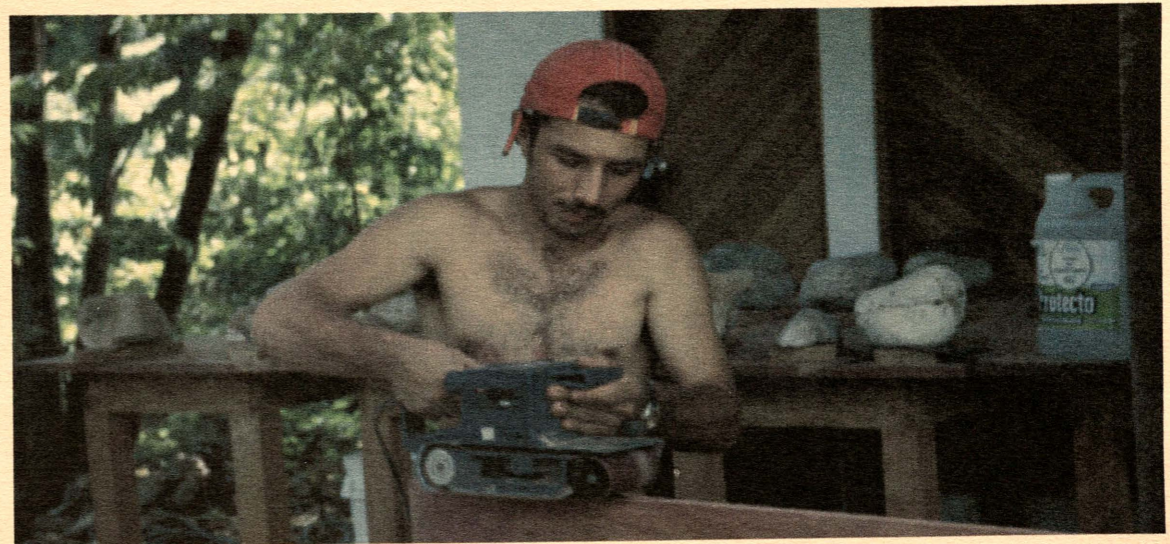
Potential Building Zones

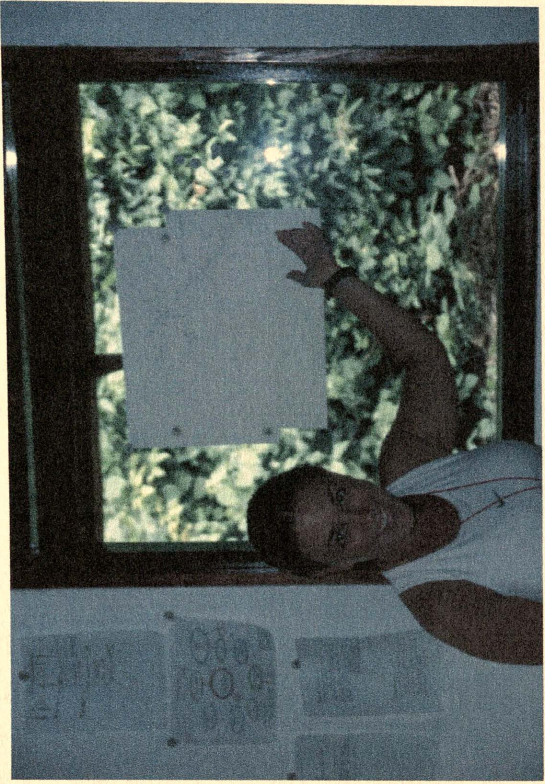




Potential Building Zones

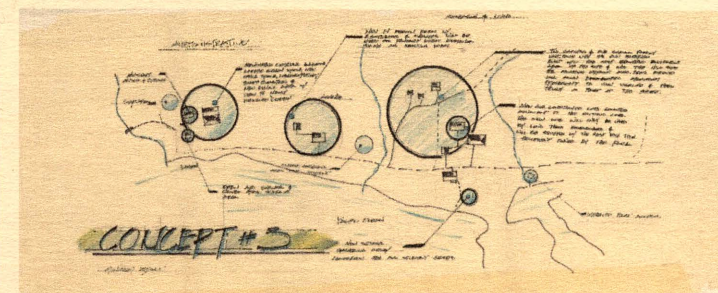
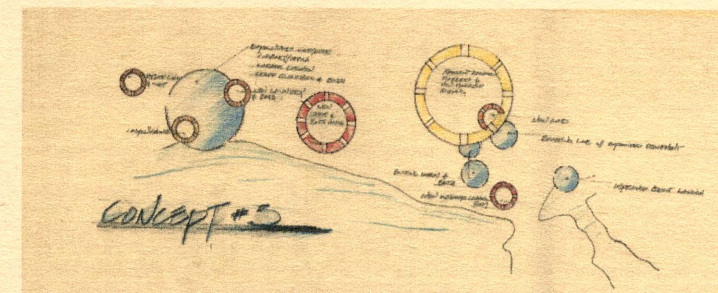
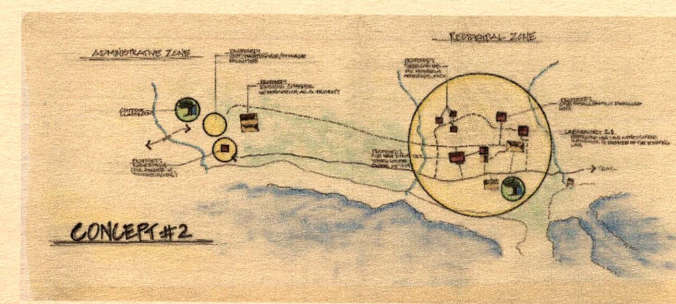
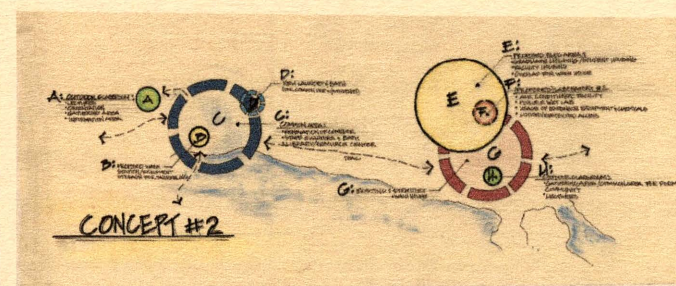
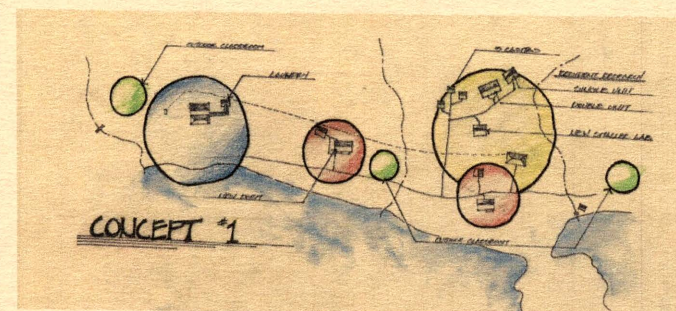
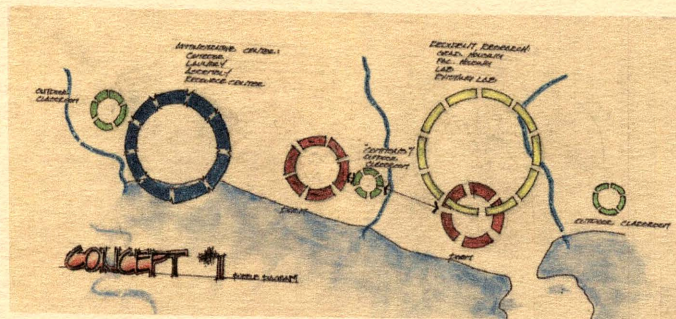
The potential building zones map identifies those site areas most suitable for developed use based upon studies of existing site conditions, topography, vegetation, and hydrology. The resulting zones, which form an essentially E-W pattern, identifies potential building areas totaling approximately 1.8 hectares within the San Miguel study site.





Introduction: Conceptual Plans

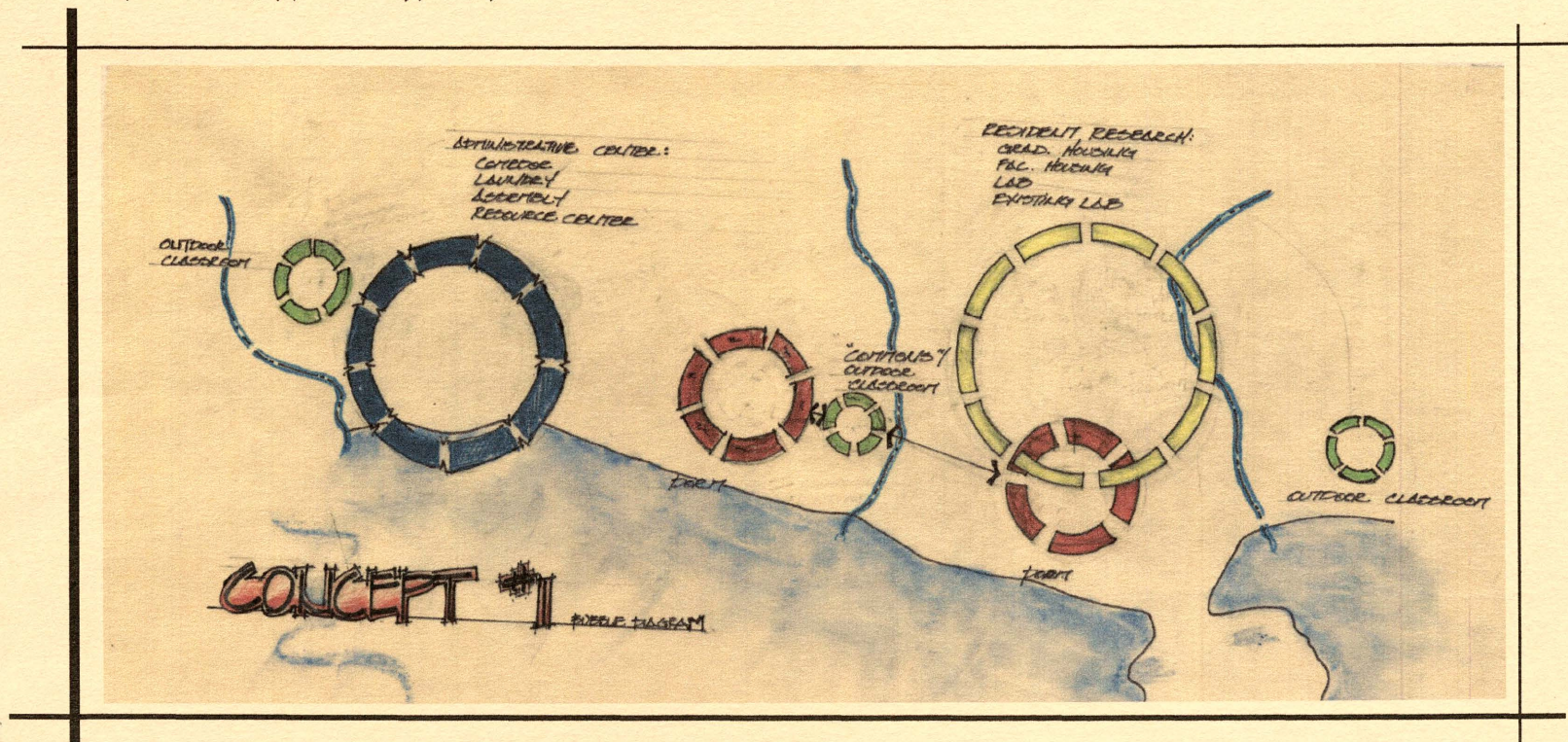
Based upon all previous information, the final step in the study focuses on developing concept plans that accommodate proposed expansion needs. For the purpose of this notebook, three alternatives are presented. They are fundamentally similar but differ related to the degree of proposed expansion. Likewise, none are mutually exclusive in that ideas from one may be combined with selected proposals from another. The three concepts are outlined in the following pages.



Concept One:

Concept One is what we consider to be the maximum usage concept. It contains four general areas including an administrative center or commons area, a residential/living area, a resident/research area, and areas designated for outdoor classroom use. Circulation flows in a linear pattern for this concept and generally disperses living quarters in many areas throughout the site. This concept demonstrates the area's capability to accommodate the maximum number of users without significantly altering the ecological balance that presently makes this site so unique. The major aspects of concept one include the following:

- Individual use areas can be closed, while maintaining access to others, for site control and regeneration
- Pedestrian movement is maximized
- Reflects Maximum Construction
- Provides open accessibility to natural habitats for education
- Expands the recreational use potential by providing for a general use area



Concept One - A

Concept One - B



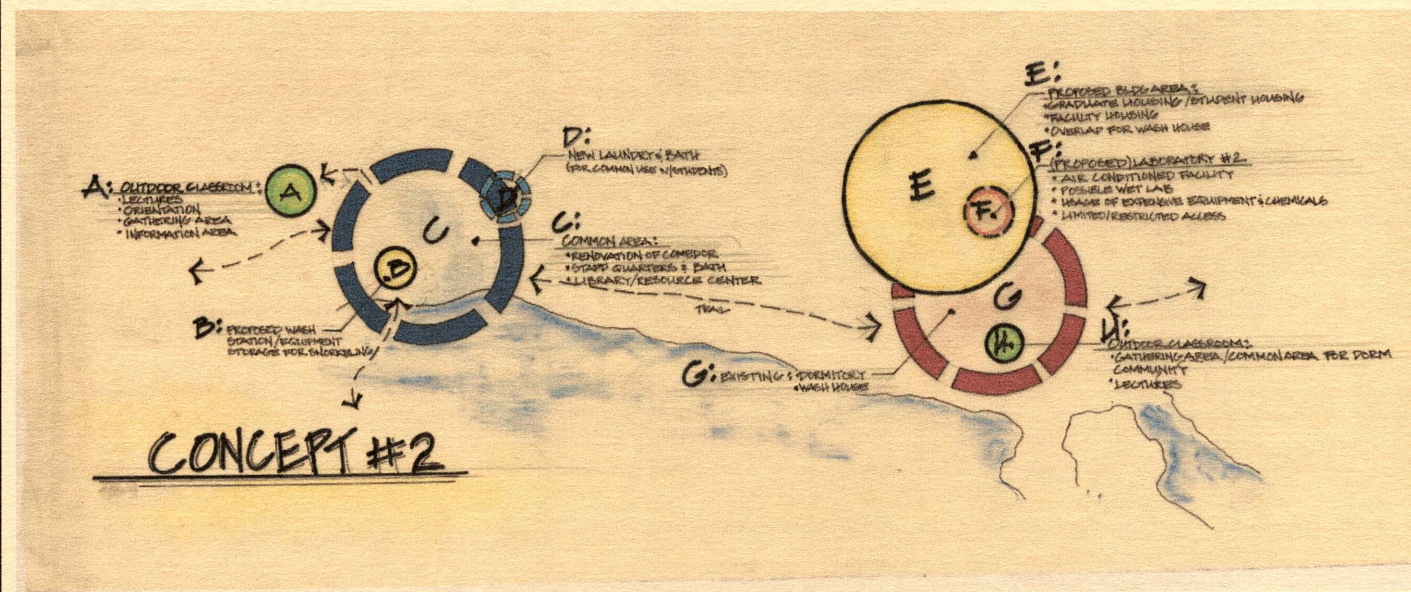
Concept Two:

Concept Two provides for three generalized zones, an administrative zone, a residential zone, and areas designated for outdoor classroom use. The main goal of this concept was to limit new construction to areas already disturbed. Thus, the majority of new construction is concentrated along the periphery of the site where previous development has taken place.

Several factors were considered when making the decision not to develop along the interior of the site:

- Limits unnecessary disturbance of undeveloped land
- Provides for central wildlife corridor from interior forest to Pacific Ocean
- Distributes circulation to either end of the site, with central walking trail connection the two
- Creates research village and living community

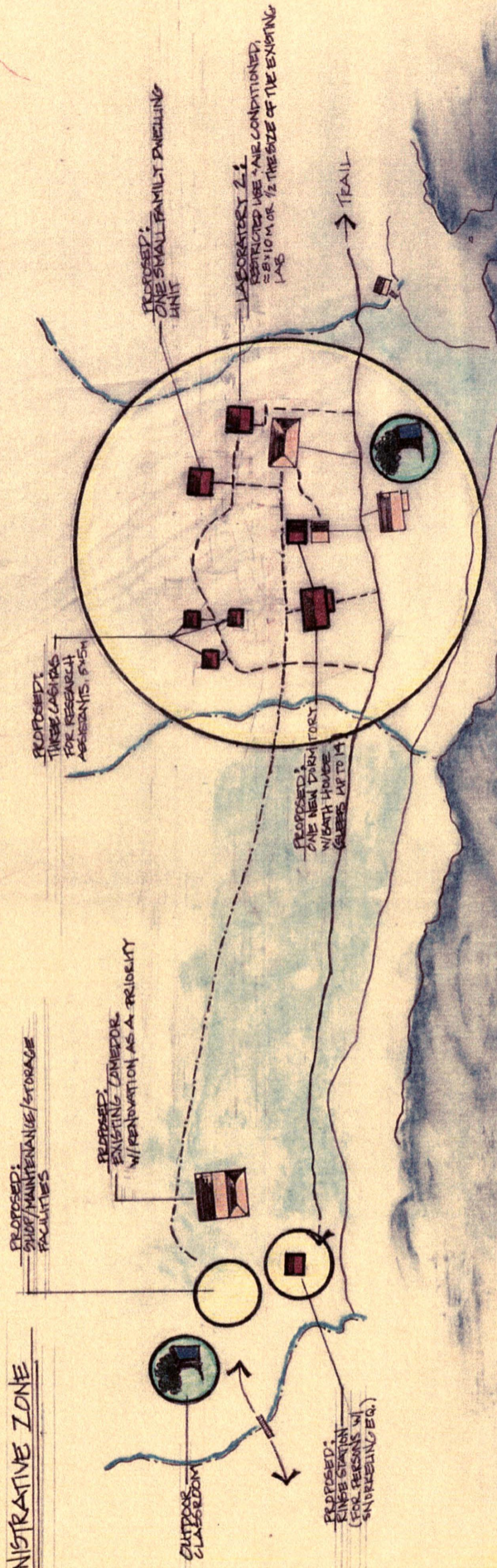
Concept Two-A



Concept Two-B

RESIDENTIAL ZONE

ADMINISTRATIVE ZONE



CONCEPT #2

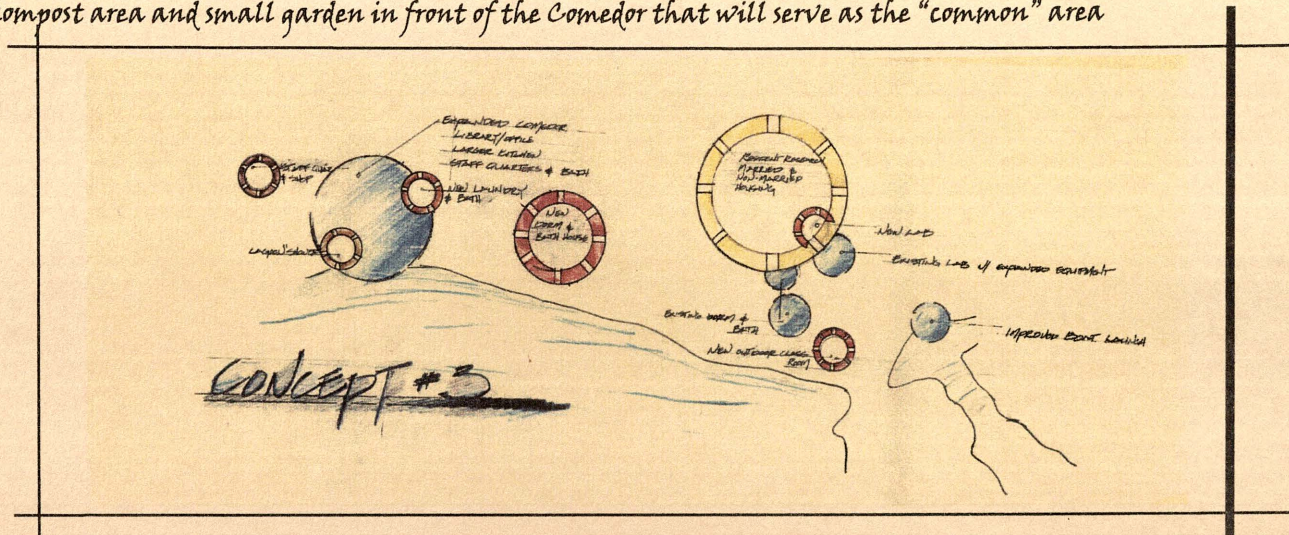
Concept Three:

Concept Three was born out of the desire to minimize human impact within San Miguel Biological Station.

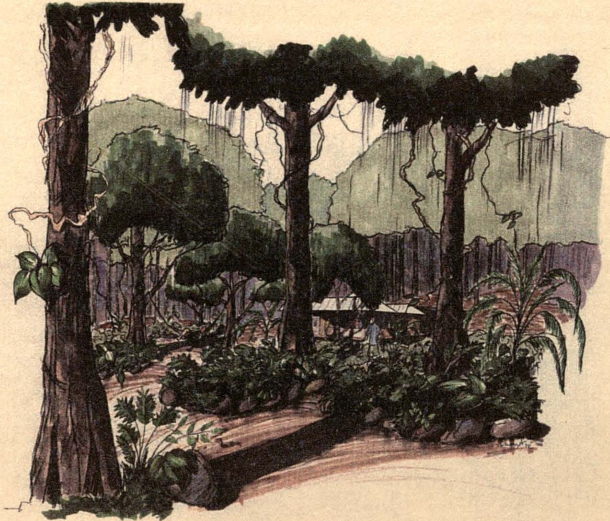
This concept calls for the least amount of new construction within the station while still meeting program requirements. The conceptual plan calls for:

- a continuation of the linear development established by the main trail connecting the "Comedor" with the existing dorm and lab facilities.
- a re-design of the "Comedor" to allow for more functional and practical uses
- the construction of open air showers and snorkel storage space in the area now occupied by the park administrator living quarters, directly in front of the lagoon
- the construction of staff quarters adjacent to the "Comedor" toward the entrance of the park
- the construction of a small shop area for the construction of any special research equipment needed for visiting researchers
- the construction of a new dorm, sited along the existing main path, that will serve as the primary living area for visiting students
- the construction of two small casitas and one family unit, each with own bath, sited into the slope behind the existing laboratory.
- the construction of a smaller, "high tech" lab adjacent to the existing lab - primarily used by long-term researchers
- the designation of several outdoor classroom interpretive areas
- improved boat access
- the creation of a longer loop trail through the area of primary forest behind the existing laboratory
- the design of a compost area and small garden in front of the Comedor that will serve as the "common" area

Concept Three - A



The drawings presented below are graphic representations of ideas presented in the concepts. To the upper left is a perspective of the façade of the redesigned comedor. Below that is a perspective of the "hammock" garden. Immediately below the text is a perspective of a proposed new Casita.



Summary, Recommendations, Acknowledgements

Two events during the summer of 2000 represented important beginnings toward the development of long term planning and management goals for the San Miguel Biological Station. One was the adoption of management zones for the total Cabo Blanco Absolute Reserve – and for the station itself. The other was the initiation of this study with its focus on how to provide for the careful expansion of the San Miguel Station, over time. We urge this process to continue.

In addition, we offer the following specific recommendations for the station's directors and other appropriate park officials:

- Evaluate the conceptual plans presented in this study, make refinements as needed, and develop priorities against an expansion timetable
- Adopt design criteria for all new structures (materials, construction methods, ventilation and cooling, etc.)
- Identify sources and secure funding for new construction in order of priority and need
- Address the problem of food and solid waste disposal and develop solutions that are creative, educational, environmentally responsible, and practical
- As a high priority, improve the condition of both road and boat access to the station

In conclusion, the study team wishes to thank Milton and Diana Lieberman, Erin Linguist, Carlos Castrillo, and our delightful park staff for an experience that was educational, enjoyable, and most memorable.

*Zac Adams
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Richie Jones
Jason McCord
Allen Stovall*

