
Echoing Hope

ACKNOWLEDGEMENTS

The experience of working with Echoing Hope Ranch's (EHR) Board of Directors and in particular Marla Guerrero has allowed us to grow in unexpected ways. The unique nature of this project broadened our horizons as fellow humans perhaps more than as designers, although we will be better designers for the lessons. As many dreams as EHR's advocates have, through this process have come to dream of EHR too, and synthesize these visions into possible realities. We are incredibly thankful for having been a part of the visioning process and hope that this document will serve to assist in seeing EHR's dreams come true.

Tejido would also like to sincerely thank Sherry Ahrentzen and Kim Steele for their wonderful research report: ***Advancing Full Spectrum Housing: Designing for Adults with Autism Spectrum Disorders: Arizona Board of Regents, 2007***. This report had a critical role in informing many of our core design and planning decisions.

Thanks to Cochise County's planners, ADEQ, Rusty's Morningstar Ranch staff and residents and Dennis Rogers of Safe Haven Farms for ensuring we were on the right track.

Special thanks to the University of Arizona Departments of Agriculture; Environmental Engineering and Speech and Hearing as well as to Cochise College Sierra Vista Campus Departments of Nursing and Education who all provided invaluable advice.

Finally, thanks to Dean Jan Cervelli and the University of Arizona College of Architecture, Landscape Architecture and Planning for supporting Tejido.

. . . within the collaboration of client and designer an interweaving occurs, thus the tapestry of the garden is created . . .

TEJIDO

For the last 20 years, the Tejido Group, headed by Dr. Mark Frederickson, has been dedicated to research, design, planning, and most importantly, the needs of the community. This innovative group is based in the University of Arizona College of Architecture, Landscape Architecture and Planning. Our primary focus is the generation of conceptual alternatives for our clients. Concentration of our efforts is on developing innovative concepts through the application of research initiatives. We believe designers gain insight and inspiration from a variety of sources, which are reviewed in depth and incorporated into the design intentions of our teams of landscape architecture and architecture students.

Tejido selects projects in which it wishes to participate based on several criteria including project uniqueness and pedagogic value, client need, and the project's potential impact on society and the environment.

THE TEAM LEFT TO RIGHT:

BACK : Dr. Mark Frederickson (professor), Ayman Al Hajji, Helen Erickson, Becky Blacher, Beth Johannessen, Maria Voris and Alison Furuto

MIDDLE: Autumn Ela, Fernando Chiquette, Chris O'Brien and Justin Fritch

FRONT: Lana Idriss, , Ashley Loberg, Jim Sauer and Mark de la Torre (assistant professor)

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"A place where they can manage their own lives." - Norm smith

Introduction

"Lifelong growth in a safe and respectful home and community"

-eChoing hope's mission statement

ECHOING HOPE BOARD MEMBERS, LEFT TO RIGHT: Shirley Kenan (former member), Della Thompson, Marla Guerrero (president), Norm Smith (vice president), Glen Kreider and Tina Friel (secretary)

Not pictured: Lynn Ewan (treasurer), Harlie Garcia and Ken Jacowsky

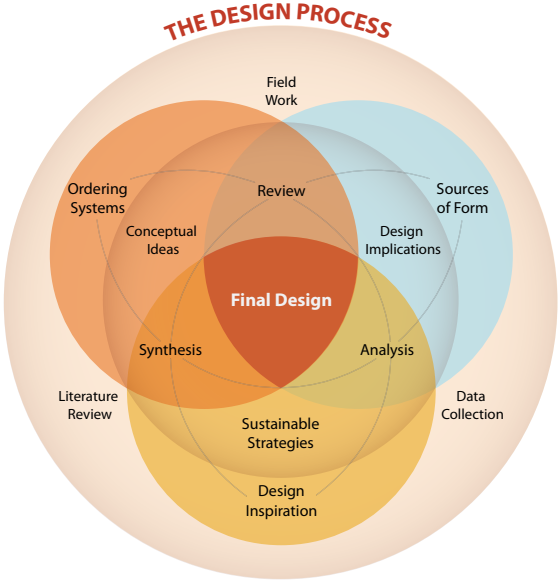
WHAT IS ECHOING HOPE RANCH?

Echoing Hope Ranch (EHR) will provide opportunities not only for adolescents and young adults who access the ranch, but for our residents throughout their entire lives. We never stop learning and changing. EHR will offer opportunities for people with autism to discover new things, to continuously expand their range of skills and to experiment with new interests and independence. EHR employees and families will also experience growth as they learn through interaction and life with people on the spectrum. No growth will occur without safety. In addition to physical safety, EHR will provide an emotionally safe environment to encourage client and employee growth. Respect for all people at EHR will ensure a happy, productive working and learning atmosphere. EHR will thrive on a climate of acceptance, individuality and choice. First and foremost, EHR is home to a unique group of people. Home is a safe harbor, a place to be loved and have fun, and a place to be comfortable and accepted. Community is built by creating a "home" for all people that set foot on EHR. This idea is premier in all we do.

PROJECT DETAILS AND PROCESS

EHR's board approached Dr. Mark Frederickson after having been informed of his work with Tejido via Cochise County. EHR asked for assistance in turning their vision of a sustainable residential "ranch" for adults and teens with autism into a reality. A book incorporating initial concepts and a master plan were decided upon as the deliverables to allow EHR to approach future fundraising with a breadth of ideas.

The diagram on the following page outlines the Tejido design process. The circular nature of this process allows for built in checks and balances to ensure the end product has been thought through and challenged over and over again. The outer ring depicts the three main techniques for gaining a base of knowledge for the



project, these three components inform each other and continue to be revised as more information is needed and discovered. Literature review involves extensive theory based research from books and journals, coupled with data gathering. Data collection involves interviews of similar project managers as well as research on similar projects. Field work includes site analysis to understand how the physical site functions.

The three interior circles represent the primary design processes undertaken for any project. They again inform one another and further refine the outer ring. They are directly influenced by the literature review, data collection and field work. The design process is categorized by the employment of the applicable analysis in order to arrive at a series of design alternatives. Design reviews are used in order to identify positive design feedback in order to consolidate design solutions into a single master plan. The master plan is then subject to magnification of detail deemed appropriate to fully achieve the project's scope.

SUSTAINABILITY PRINCIPLES

What really constitutes sustainability? Tejido Group uses the ordering systems at right to achieve sustainable design. When designs account for not one but all of them and designers return to them frequently throughout the process—the goal of sustainability is achievable.

For EHR, a sixth design aspect was added, therapeutic, because it is at the heart of EHR's success. The following gives a brief introduction to the ordering systems and how we apply them in iterative questioning.

Aesthetic: has the design identified and created an aesthetic appropriate to the history and culture of the region and its vision of the future?

Economic: is the design economically sustainable? Does it create jobs and income sources for the community?

Environmental: is the design environmentally sensitive? Does it connect and enhance existing ecosystems? Does it reduce our carbon footprint?

Socio-cultural: does the design create opportunities for meaningful social exchange and learning?

Function: does the design circulate effectively? Is it safe? Is it easily maintained?

Therapeutic: unique to EHR is that a therapeutic component to every aspect of EHR must be accounted for. Does the design provide spaces for skill development, safe socialization and physical healing?

RIGHT: Program diagram showing relationships between the program elements in this project

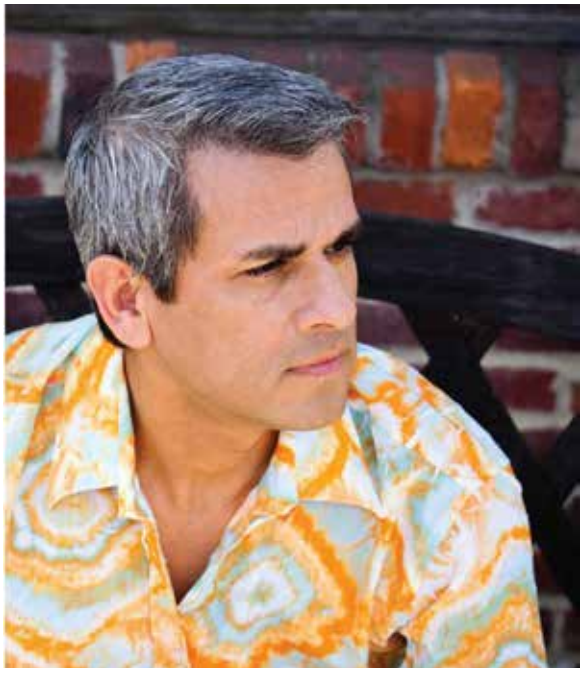
ECHOING HOPE'S PROGRAM

EHR will create an agricultural community where teens and adults with autism can participate in ranching and farming activities while contributing to the adjoining community. An emphasis on building with alternative energy techniques, rainwater harvesting and producing food will help create a healthy and self-sufficient home. EHR is conceived not as an island that isolates people with autism, but as a bridge to the community. Ranchers will participate in the surrounding community and invite community members to help with ranching and farming activities. People living and working at the ranch will have the benefit of organized daily transitions which can be beneficial for people with autism, and will help in enjoying a productive natural lifestyle.

In addition to adults living at the ranch, teens can attend after-school programs and summer camps to get the ranch experience. Teens and adults not living at the ranch can still get a taste of ranch life by staying for a couple of days in our respite home. Parents have access to a guest house so they can also take a few days to experience the ranch or visit nearby attractions knowing their loved one will be safe and productive during their time at EHR.

TEJIDO GOALS

- To support lifelong growth in a safe and respectful community
- To provide outstanding residential and day services for those with autism
- To ensure a safe and supportive working environment for staff
- To facilitate appropriate interaction with surrounding communities, by providing service-based programs for residents as well as for neighbors
- To achieve economic and environmental self-sufficiency
- To enhance the quality of the existing landscape through preservation and restoration
- To develop opportunities for autism research
- To offer a model for future autism-care centers



LEFT and RIGHT: Autism disorders manifest in many levels of function as well as in many different ways, thus affecting a large percentage of the world population.

WHAT IS AUTISM?

Autism spectrum disorder (ASD) is the most common of the Pervasive Developmental Disorders, affecting an estimated 1 in 110 births. This means as many as 1.5 million Americans today are believed to have some form of autism. It is estimated that by the year 2023, there will be 380,000 adults with autism in need of extensive services in the United States.

The disorder affects individuals differently and to varying degrees. It is characterized by social impairments, communication difficulties, and restricted, repetitive, and stereotyped patterns of behavior. There is no known single cause for autism, but it is likely that both genetics and environment play a role. There is no cure for ASD, however, therapies and behavioral interventions are designed to remedy specific symptoms and can bring about substantial improvement. The ideal treatment plan coordinates therapies and interventions that meet the specific needs of the individual.

"How can we help them live in the present?" - Marla Guerrero

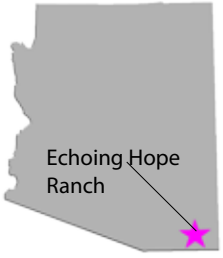
Analysis

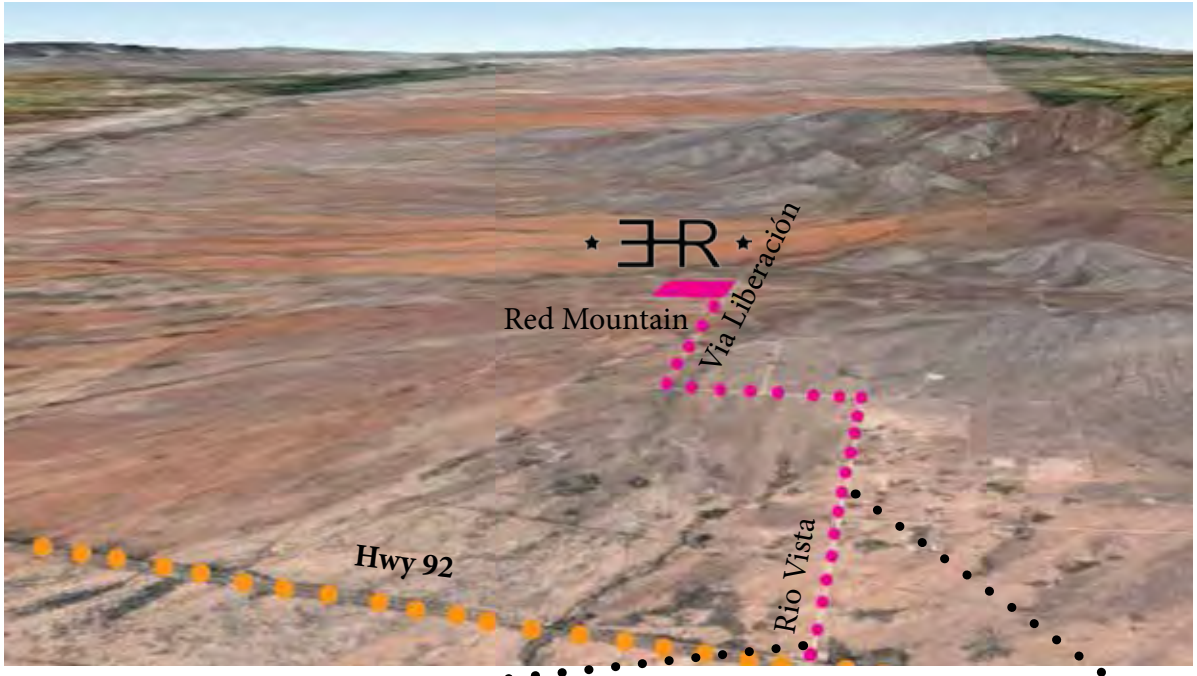
RIGHT: Pink star locates EHR within southeastern Arizona

LOCATION

EHR is located in southeastern Arizona in Cochise County, approximately 100 miles or a 2 hour drive from Tucson, Arizona. Bisbee lies 5 miles east of the site. Mexico, 15 miles south, is visible from the site, surrounded by the Sierra de San Jose mountain range. The Huachuca Mountains wrap around the city of Sierra Vista to the west while the site itself is nestled into the rolling hills of the Mule Mountains, covered by grasslands and speckled with ocotillo.

EHR is accessible via Highway 92, which connects Bisbee to Sierra Vista. To access the site, head north from 92 onto S. Rio Vista Road a well maintained dirt road, taking a left at S. Calle 5 and a right onto Via Liberación. The ranch site is bordered by private land to the north, S. Via Liberación to the east, W. Red Mountain Road to the south and a small service road to the west. Private land maintained by the Bureau of Land Management and Arizona State of Trust Land surround the site. The drive from Rio Vista into the ranch is lined with iconic ranch entrances, perhaps a sighting of roaming cattle, and views of the open desert. Just north of the intersection of Via Liberación and Red Mountain is a wash feeding into the San Pedro River, while the road continues to climbs higher into the Mule Mountains and sweeping fields of yellow grasslands.





LEFT: Vehicular circulation route to EHR

BELOW LEFT: Vehicular view as one turns off Highway 92 onto Rio Vista Rd.

BELOW RIGHT: Vehicular view on the dirt road, Rio Vista while heading north

Entrance of Highway 92, Driving North

Rio Vista Driving North

Design Implications

- Proximity to grocery stores and amenities in nearby Bisbee, Sierra Vista and Tucson
- Opportunity to experience desert flora and fauna that isn't found anywhere else in the world
- Old West history is the biggest draw to this part of Arizona

RIGHT: Downtown Bisbee

BELOW TOP: The Dragoon Mountains

BELOW BOTTOM: Chiricahua National Monument

Design Implications

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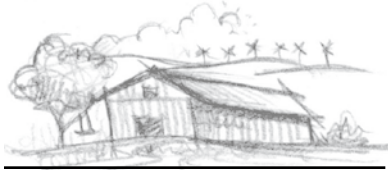


NEARBY AMENITIES

Southern Arizona is a distinctive mix of historic towns and scenic recreation. From Tucson to EHR you can travel through mining boom towns, such as Tombstone (home of the OK Corral gunfight) that continue to tell the story of western living and celebrate the large community of artists in the area.

Bisbee (15 mi from EHR) was founded in 1880 and was named after Judge Dewitt Bisbee, a financial backer of the Copper Queen Mine. This picturesque mining town is nestled in the Mule Mountains and is one of the richest mineral sites in the world. It has produced nearly three million ounces of gold, and eight billion pounds of copper. In 1975 the mining operations slowed beginning a rebirth of Bisbee as an artist's colony and retirement community. Still, original buildings and structures from the mining days remain giving Bisbee a unique charm. Dozens of annual events attract tourists and travelers from all over the world such as the Bisbee Blues Fest, Stair Run, Brewery Daze, and Southwest Wings Birding Festival.

Sierra Vista (30 mi from EHR) nicknamed "the Hummingbird Capital of the United States" was founded in 1956. This fast growing city owes much of its population to the Army's Fort Huachuca. Major events in

town include the Cochise Cowboy Poetry Festival, Southwest Wings Festival, and the Sierra Vista Symphony Orchestra. Sierra Vista is also home to a host of commercial amenities including a shopping mall, over 70 restaurants, and a Wal-Mart.

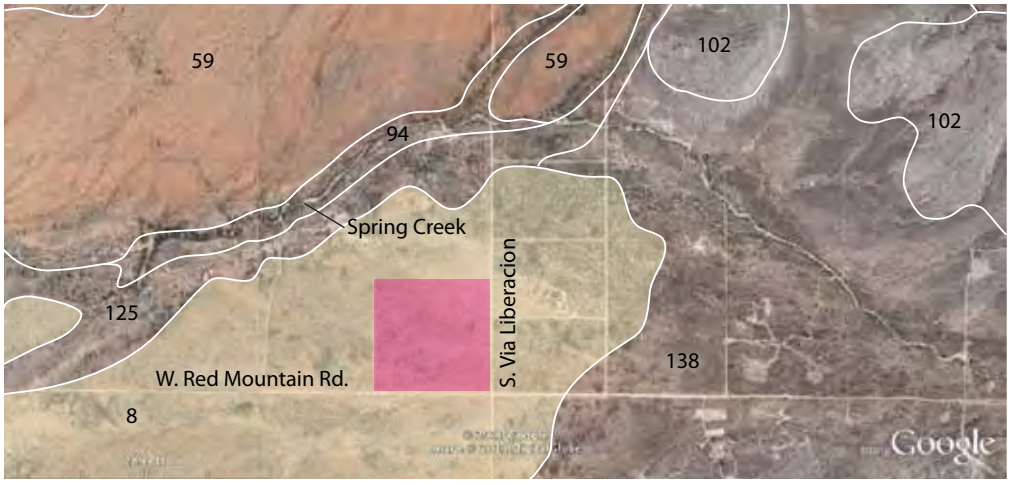
Naco (13 mi from EHR) is a small town spanning the Mexican Border and was established in the early 1900s after the original settlement of the Nahua and Opata Indians. It is home to the Turquoise Valley Golf Course, which is one of the oldest courses in Arizona and has a clubhouse dating back to the 1930s. Naco is a small residential community with very little commercial activity. It is also one of the two Arizona Gateways into the Rio Sonora region and is the Sister city to Naco Sonora.

Tombstone (38 mi from EHR) is one of Arizona's most renowned mining camps and tourist attractions. It is known as "the town too tough to die." The majority of the town's original architecture, dating back to the 1880s, still exists and gives tombstone its unique charm and feel. Legendary western figures such as Wyatt Earp and Doc Holiday once roamed the streets of this town. Reenactments of these historical characters and events, such as the gunfight at the OK corral, draw in millions of tourists every year.

Douglas (35 mi from EHR) was founded in 1901, as an American smelter town to process ore from the nearby town of Bisbee. It is situated along the Mexican border opposite the Mexican city of Agua Prieta. Douglas is home to several historic sites such as the Slaughter Ranch, Gadsden Hotel, and The El Paso and Southwestern Railroad Depot. The train depot is an important site because it transported copper to large manufacturers in the east. Today the depot houses the Douglas Police Department a great example of historic building reuse. Douglas's history also includes stories of cattle ranching and agriculture dating back to the 1800s. The more than a hundred year old Slaughter ranch was once over a thousand acres, spanning the Mexican border in the Douglas area.

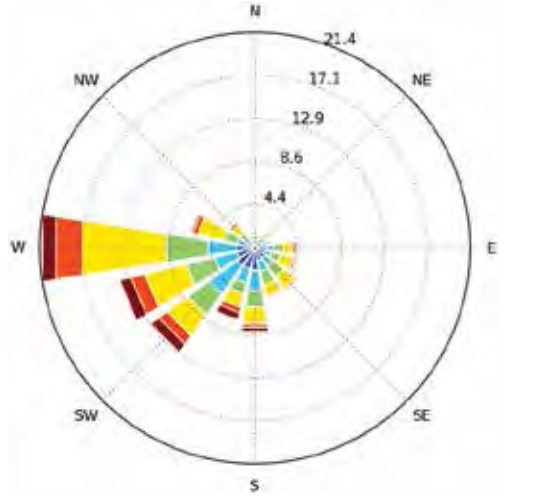
Whitewater Draw, attracts tourists and birders from around the world, who come to see the large number of migrating bird species, including Sandhill cranes. Hiking, wildlife and unique geological features in nearby Chiricahua National Monument, the Dragoon Mountains, Bureau of Land Management parcels, United States Forest Service land and Arizona State Trust land, all offer ample recreational opportunities for both EHR residents and staff as well as tourists who could serve as economic resources for EHR.

TOP TO BOTTOM: Naco, Tombstone, Fort Huachuca and Douglas



Composition of the Blakeney-Luckyhills complex (soil on the site) is Blakeney and similar soils: 65%, Luckyhills and similar soils: 25% and contrasting inclusions: 10 %. More information on soils may be found in the *Soil Survey of Cochise County, Arizona.*

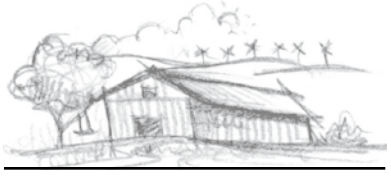
8	Blakeney-Luckyhills complex
59	Eloma sandy loam
94	Keysto-Riverwash complex
102	Mabray-Rock outcrop complex
125	Riveroad and Ubik soils
138	Swisshelm sandy loam, salinesodic



A wind diagram from the Libby airfield in Fort Huachuca shows the yearly wind patterns. Predominant winds are from the west and southwest.

Design Implications

- Analyze soils to identify areas that are best suited for building and plants., existing soil types can be difficult to excavate
- Architectural and planted wind blocks will be needed on the southwest side
- Barn and pastures should be located upwind



SOIL

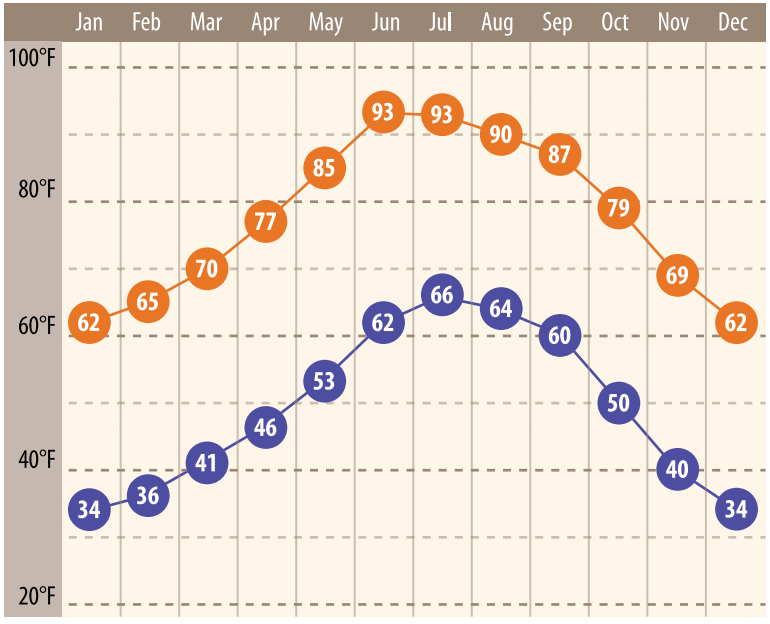
The soil on site is a Blakeney-Luckyhills complex, a sandy loam with a high content of calcium carbonate that is well drained to the hardpan. The hardpan can be quite shallow in the Blakeney soils making excavation difficult. Luckyhills soils are deeper with a potential rooting depth of 60 inches or more. Wind erosion is high and the runoff rate is medium to high. Currently the site is being grazed by cattle increasing the likelihood of erosion.

Soils in the greater Bisbee area are currently being tested for metals that were emitted by a smelter in operation prior to 1908. It is unlikely that the soil on site is contaminated, however it is advised that it be tested to determined suitability for agriculture. (See *Bisbee Soil Program* for soil information and testing, located on page 116).

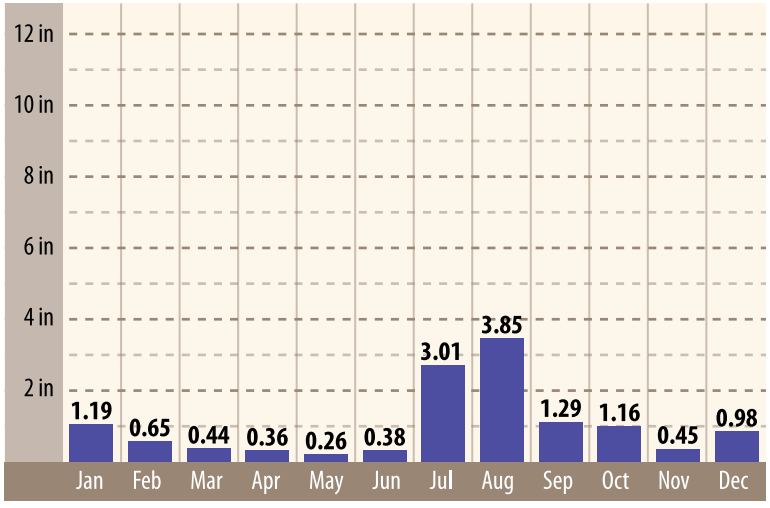
WIND

Fort Huachuca wind data from Libby Airfield—approximately 25 miles northeast of the site—indicate that prevailing winds are from the west and southwest. Anecdotal information and on site observations support that wind speed and direction follow patterns found at the airfield. It will be important to place structures and plantings to help block wind and dust.

Sierra Vista Temperatures



Sierra Vista Precipitation



As shown in these graphs, Sierra Vista's climate is relatively mild, though summer temperatures can reach into the 90s. The Echoing Hope site will have similar weather conditions.

TEMPERATURE

Climate information is based on Sierra Vista which is approximately 30 miles northwest of the site at an elevation of 4,633 ft. The site for EHR is at an elevation of 4653 ft.. and Bisbee to the east is 5566 ft.

As can be seen in the graph above summer temperatures range from lows in the 60s to highs in the mid-90s. Winter temperatures are relatively mild with temperatures ranging from the mid-30s through the 60s. The warmest month of the year is June showing an average maximum temperature of 93°F. while the coldest month is January with an average minimum temperature of 34°F.

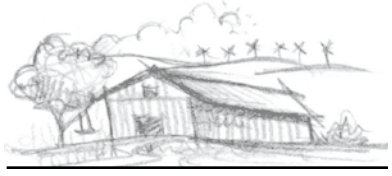
PRECIPITATION

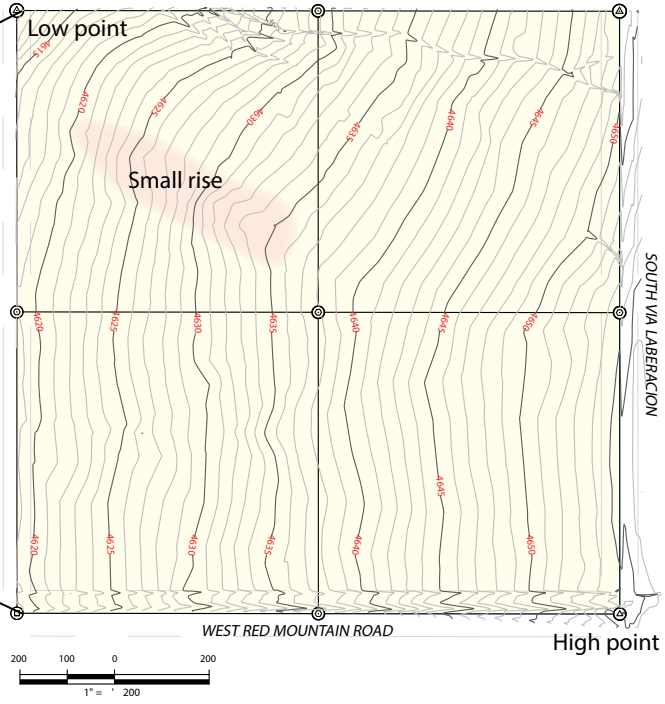
Precipitation follows typical Arizona monsoon rain patterns producing the heaviest rains in July and August with another rainy period occurring in December and January. August receives the most rain with an average of 4 inches per year, while June is the driest month with an average of .4 inches. Average yearly precipitation is 14 inches per year. There are few frost days or days with snow.

During a site visit on January 31, 2011 there was storm activity in the Huachuca Mountains to the west moving east towards the site producing spectacular views.

Design Implications

- Provide ample shade through architecture and plant materials
- Orient buildings for solar gain and maximum air circulation
- Capture rainwater and use gray water for irrigation and sewage treatment
- Detain water on-site for irrigation through gabions, small drainages and basins
- Preserve views towards mountain ranges





The site for EHR lies at the base of the Mule Mountains, topography on site it relatively flat at 2%

TOPOGRAPHY

The site lies at the base of the Mule Mountains, a small range whose highest point, Mount Ballard is 7,500 ft.

Being east of the Mule range, the EHR site slopes down to the west at approximately 2%. In the northwest corner the slope is slightly lower as it moves towards Spring Creek, a dry wash. In the northwest corner is the lowest point at 4611 ft. A small rise in the northwest quadrant reduces visibility across the site when looking from the northwest to southeast. Clear wayfinding will need to be employed to prevent ranchers from getting lost and to provide staff with clear views.

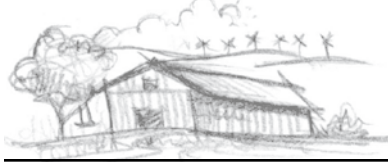
The highest area of the site is in the southeast quadrant along S. Via Liberación Road where the elevation is 4619 ft.

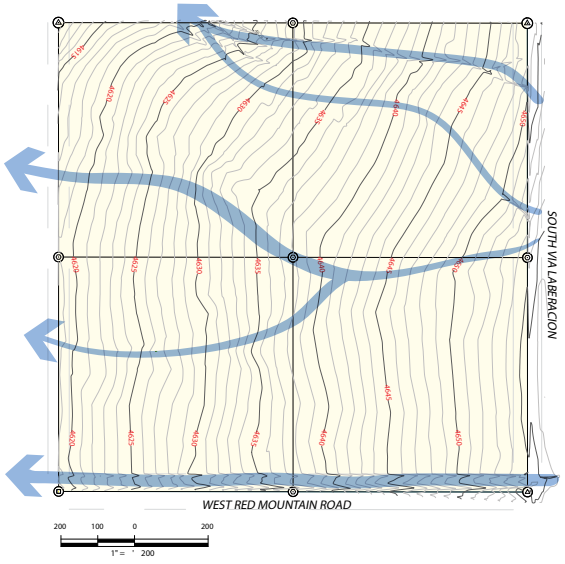
The relatively flat slope provides less visual interest on site but affords uninterrupted views of the surrounding mountain ranges. Approximately 17 miles to the east are the Huachuca Mountains reaching a height of 9,466 ft. at Miller Peak. Thirty miles south in Mexico the Sierra San Jose Mountains rise several thousand feet.

In addition to framing this views for aesthetic purposes, surrounding mountain ranges may provide wayfinding opportunities for Echoing Hope.

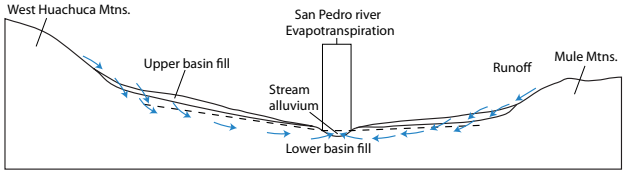
Design Implications

- Flat topography allows for easier building
- Areas that need irrigations need to work with water flow
- Expansive, uninterrupted views can be framed and used for wayfinding
- Place well at high end of the site

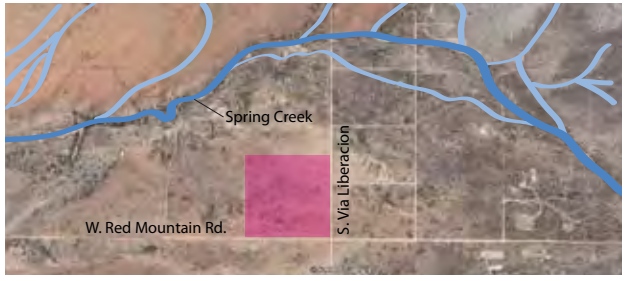




The map above shows the site, small drainages are intermittent and sheet flow is predominant on-site, drainage channels in the north are better defined



Water running from the Mule mountains feeds into local washes that recharge the San Pedro river, and sensitive surrounding ecosystem



Spring Creek is a larger wash to the north of the site

The site is within the Sierra Vista Subwatershed as indicated in the map above

HYDROLOGY

Water on-site follows topography moving in a general east to west direction. Small drainages leading into the site quickly fan out into sheet flow. To control flooding on-site, natural drainages may be enhanced and directed into areas that need irrigation for agriculture or other vegetation—for example shaded areas providing human comfort.

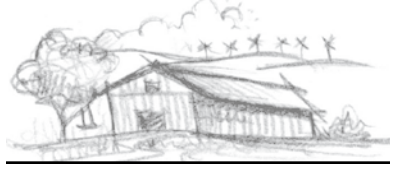
Larger drainages lie to the north where they work their way towards Spring Creek 1000 ft. away at its nearest point. Spring Creek and other major drainages provide intermittent recharge to the San Pedro River one of the last riparian habitats in the southwest United States. In an effort to protect the river and its unique surrounding habitat from increasing human demands it has been named the San Pedro Riparian National Conservation Area—a riparian preserve.

Echoing Hope is within the Sierra Vista Sub-Watershed that includes Bisbee, Huachuca City, Sierra Vista, Tombstone, and surrounding areas of Cochise County. All depend entirely on groundwater, of which pumping exceeds natural recharge. The Arizona Water Company does not serve the site making a well necessary.

It will be important to conserve and harvest water from road runoff, building roofs and water that falls on-site.

Design Implications

- Designed water channels and basins will create areas where shade giving trees may be planted
- Greenhouses and edible gardens will use water harvesting from building roofs
- Water conservation and harvesting techniques should be employed
- Nearby washes may provide walking and educational experiences



ON-SITE VEGETATION


Acacia vernicosa


Condalia sp.


Ephedra sp.


Flourensia cernua


Larrea tridentata


Parthenium incanum


Prosopis juliflora


Rhus microphylla


Acourtia nana


Zinnia acerosa

ACROSS SPREAD: Plants on-site include from left to right, viscid acacia, condalia sp., mormon tea, tarbush, creosote bush, ocotillo, purple prickly pear, walking stick cholla, mariola, velvet mesquite, littleleaf sumac, desert holly, and desert zinnia., banna yucca, soaptree yucca, and numerous grass sp. Latin names are shown under images.

ON-SITE VEGETATION

Plant species on the EHR site indicate that it lies within the plant community known as Chihuahuan Desert scrub.

Chihuahuan Desertscrub is found in southeastern Arizona and characterized by tarbush, creosote, and viscid acacia. These indicator species were found on site along with native grasses commonly found within the Desertscrub habitat.

Cattle grazing has denuded areas of a healthy plant community which is especially apparent on the east side of the site. Several stands of ocotillo and a smattering of yucca species were also observed.

The site presents the opportunities for revegetation that may be performed by EHR residents when led by an expert. Revegetation efforts will restore a healthy plant community, improve soil conditions and possibly provide an economic opportunity through a native plant nursery.

Desert Survivors plant nursery in Tucson employs people with disabilities at their Sonoran Desert nursery and could be used as a model. Plants from the Chihuahuan Desertscrub and adjacent communities offer abundant choices for plants that may be used on the site.


Fouquieria splendens


Opuntia macrocentra


Cylindopuntia spinosior


Yucca baccata


Yucca elata


At least 10 grass species

OFF-SITE VEGETATION

ABOVE: The two images above show plants communities to the north of the site. The top image is looking east into Spring Creek. The lower image is just north of Spring Creek in an area of ocotillo, palmer's agave and native grasses.

OFF-SITE VEGETATION

There are a variety of Chihuahuan plant communities within the Mule Mountains due in part to the journey from low to higher elevations. Plants range from juniper and oaks at the higher elevations to Desert Scrub plants found on site in the lower elevations.

Just north of Spring Creek the plant community transitions into Semi-desert Grasslands. Here there is an expanse of native grasses dotted with ocotillo and agave. This lovely area is visible from on-site and views should be preserved and celebrated.

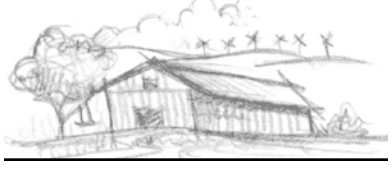
Spring Creek itself supports larger, shade giving trees and less drought tolerant plants. Its proximity to the site will offer a shady destination for morning and evening hikes as well as opportunities to observe running water during monsoons when washes fill with water.

WILDLIFE

Several bird species were observed on site including black throated sparrow, brewer's sparrow and loggerhead shrike. Thoughtful addition of plants on site will provide habitat for a variety of birds and other small animals such as desert cottontail and black-tailed jackrabbit. Wildlife will provide enjoyment and education opportunities for both residents and visitors.

Design Implications

- The Chihuahuan Desert's large plant palette provides opportunities to design aesthetic spaces that are low maintenance, provide wildlife habitat and are restorative to both the land and people.



OFF-SITE VIEWS

WEST
HUACHUCA MOUNTAINS
SAN PEDRO RIVER

NORTH
TOMBSTONE HILLS
SIERRA VISTA (NW)
NEIGHBORING RANCHES

EAST
MULE MOUNTAINS
BISBEE

SOUTH
NACO
MEXICO

W

NW

N

"When we see land as a community to which we belong we may begin to use it with love and respect." -Aldo Leopold

ON-SITE VIEWS


W


SW


C


N


SW

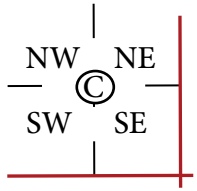

SW


SW


NW


C

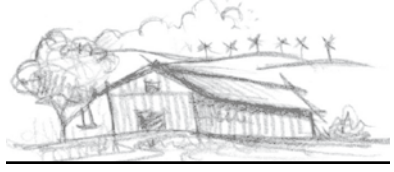

NE




NE

Design Implications

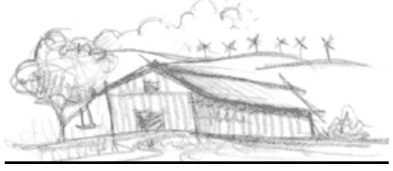
- Preserve views of mountains
- Distinct mountain views could be used for wayfinding
- Incorporate nearby grassland and riparian landscapes
- Respect open space aesthetic with low profile buildings



Dennis Rogers is the executive director of Safe Haven Farms located in Ohio. Safe Haven Farms is a model of what EHR aspires to be. A non-profit organization that offers individuals on the autism spectrum residential, day and community services in a safe and accepting farm environment. Safe Haven completed phase one of its construction and rehabilitation project to convert a historic farm into a therapeutic setting. In December 2010. Phase two is scheduled to be completed in the next few years. Thus, Safe Haven Farms offers a insights into the entire process of establishing a residential autism program and farm.

Design Implications

- Provide rentable spaces for services offered by the ranch
- Create opportunities for community activities for parents and surrounding neighbors on the ranch
- Provide 1 staff for each residence
- Provide independent bathrooms with built in furniture



INTERVIEWS

To better prepare for designing EHR, a number of parties were interviewed. These included such topics as other autism therapy farms, potential research interests and permitting agencies. Included here are some of the highlights of these efforts.

DENNIS ROGERS

- Maximum of 24 residents living on the farm along with 8-10 staff people overnight, the ratio of staff to residents is 1:4 (1 staff -in each house) On the weekends, 2:4, From 3pm-7pm, 3:4, On average, it is 1:2.5
- Independent bedroom, bathroom and the staff has a powder room in each house.
- The house is 2800 sq. ft. with built in furniture. The bedrooms are 13'x18' and are design like a hotel room.
- Indoor swimming pool is very therapeutic, but it is important to have only 5 or 6 in the pool at a time.
- They have a day services building where they have a learning center (equipped with computers, iPads, etc).

Economic:

- 3 main funding streams: building facilities, staffing/transportation, and room/board costs
- Medicaid funding for residence which provides the costs for the staffing and transportation: 60% from federal and state (Medicaid) and 40% from local levies/ bonds, etc.
- Since these are adults, they qualify for 'supplemental security income' and food stamps.
- Funding for the cost of building comes 100% from private donations.
- Some problems with neighbors mainly because of ignorance and fear of being held liable
- They are also looking into charging rent to service providers for office space.

Staff:

- No one on the staff lives on the site only the residents, but there are always caregivers on-site who work different shifts and other staff members are on call throughout the day.
- There are layers of managers (i.e. farm manager, maintenance manager, residential manager, etc.) who train the staff.
- These managers having regular day jobs (8am-5pm) on the site, but they are also on call after hours.

Community:

- To give back to the surrounding community, they plan on 10% of what they produce in their gardens to local food pantries and similar types of organizations. They also plan to donate 10% of their flowers to nursing homes, etc.
- Community rooms are designated on-site

for parent meetings and birthday parties, etc.

Research/Extension facilities on-site for colleges/universities:

- Intention to incorporate a program that required a year or two in training for a curriculum in autism (a sort of practicum for graduate students)
- Student teaching would be available. Students would also be able to live a semester on the farm and volunteer on the farm to fulfill community service requirements
- Lower rent chance for college student interested in learning about autism.

MARLA GUERRERO

Structures:

- Small, separated buildings, and rooms must have 2 escape routes (door and window)
- All rooms with their own bathroom, may share toilets.
- 1 story buildings, though 2 story buildings can help separate space
- Common kitchen area in a multipurpose area, nooks, mudroom, weight room, porches and/or Arizona room
- Long term and temporary residents need to be separated.
- Area for weekly staff meeting and weekly house meetings. Lockers, showers, rest rooms at pool.
- Step down house: as indestructible as possible.
- Possible drains in floors, fewer doors, wrap around wall, for example in bathrooms
- Consider 'L' shape for IDLA (apartments)
- Lots of storage for food, laundry, staff supplies, and space for kitchen appliances, coffee makers, large pots and pans.
- Locking dumpster and maintenance space

Landscape:

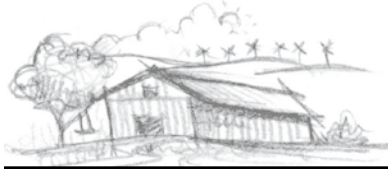
- Visual barriers—through topography—out of sight, out of mind
- Well lit paths for nighttime
- Penetrable fence, different types of fences for different areas could be helpful
- Several different access roads for public and private
- Buffers along public access
- Parking should be close for parents
- Animals: goats, chickens, sheep, horses. Rusty's has 20-30 chickens and a duck.
- Some residents like to walk dogs, but don't interact with them that often.
- Small to medium size garden. The largest plot at Rusty's was about 50 sq. ft.
- Consider shade, water and toilet (composting?) near gardens
- Indoor and outdoor garden plots with gardens between houses,
- Spaces between or behind buildings can be used for relaxing/escape or break time.

Other interviews were conducted with Cochise College's Ben Berry and Jennifer Lakosil.

Marla Guerrero is the executive director of Rusty's Morningstar Ranch located in Arizona. Rusty's Morningstar Ranch is a local, southwestern US, example of what EHR envisions itself being. Rusty's Morningstar Ranch opened its doors as a safe, secure and loving environment for adults with autism in 1985. It's local location and its time in existence provide EHR with a great deal of information and examples of the good and the bad in a time tested manner.

Design Implications

- Provide common kitchen in a small separated building
- Separate long term and temporary residences
- Provide staff meeting and training areas
- Incorporate lots of storage space
- Create relaxing areas lit at night
- Utilize visual barriers to differentiate spaces



RIGHT: Taking a moment to enjoy the natural world and its therapeutic benefits

QUESTIONNAIRE

EHR's board members were asked about their goals for this project. Some of their answers appear here.

How do you see EHR as a unique autism residential program?

- Multiple points of entry for services, agriculturally based, rural community.
- I hope it is not an "institution."

What physical features of the EHR is the most appealing to you?

- Open space and distance from neighbors.

What are your short term and long term goals for the residents?

- In a short term: To feel safe and accepted so they can learn and quality of life.
- In a long term: residents working/ volunteering in the community, residents delivering produce through a CSA program to community members, staffing farmers markets, selling crafts to community. At the ranch, volunteering community members at the ranch to help with gardening, crafts, landscaping projects, repairs, teaching a craft, etc. Some volunteers may be solicited to work directly with residents on certain projects.

How do you envision EHR sustaining itself economically?

- Sustainable funding will come mainly from the Division of Developmental Disabilities which is ultimately a Medicaid funding source. It will be supplemented by farmers' markets, CSA (community supported agriculture), fundraising events, grants, and training & consulting line of business (in the very distant future).
- On-site and autistic operated for profit businesses.

Are there safety concerns you have for EHR, if so what are they?

- Border security. Many people with autism can wander and may want to "visit" neighbors, most people with autism are very vulnerable so have no stranger danger, many people with autism may also have epilepsy so have a fall risk, many people with autism have aggressive and/or self-abusive behaviors so there is a need for spaces to have multiple points of exit to protect staff and others, the Step Down House will have incredible behavioral challenges including loud noises (yelling) so should be somewhat isolated from others.

When you see EHR as a sustainable ranch, what is this vision?

- Long-term viable ranch - financially, ability to produce/use its own energy (solar, wind, etc), ability to produce its own food, ability to store produce water, etc.
- Fiscal self support, careful environmental.

What particular styles of architecture would you to see on EHR?

- Ranch style and durable.
- Probably southwest, this would fit area and also is low maintenance.

If a person were to visit EHR, what image/ memory/message would you like them to walk away with?

- Peace, productivity, and hope

Is there anything else you would like us to be particularly aware of as we proceed?

- People with autism have such sensory challenges. Please keep sensory systems in mind as you develop your ideas. Use multiple types of sensory stimulation to create a space that is more inviting or less inviting. Use textures, colors, smells, noise masking, etc.

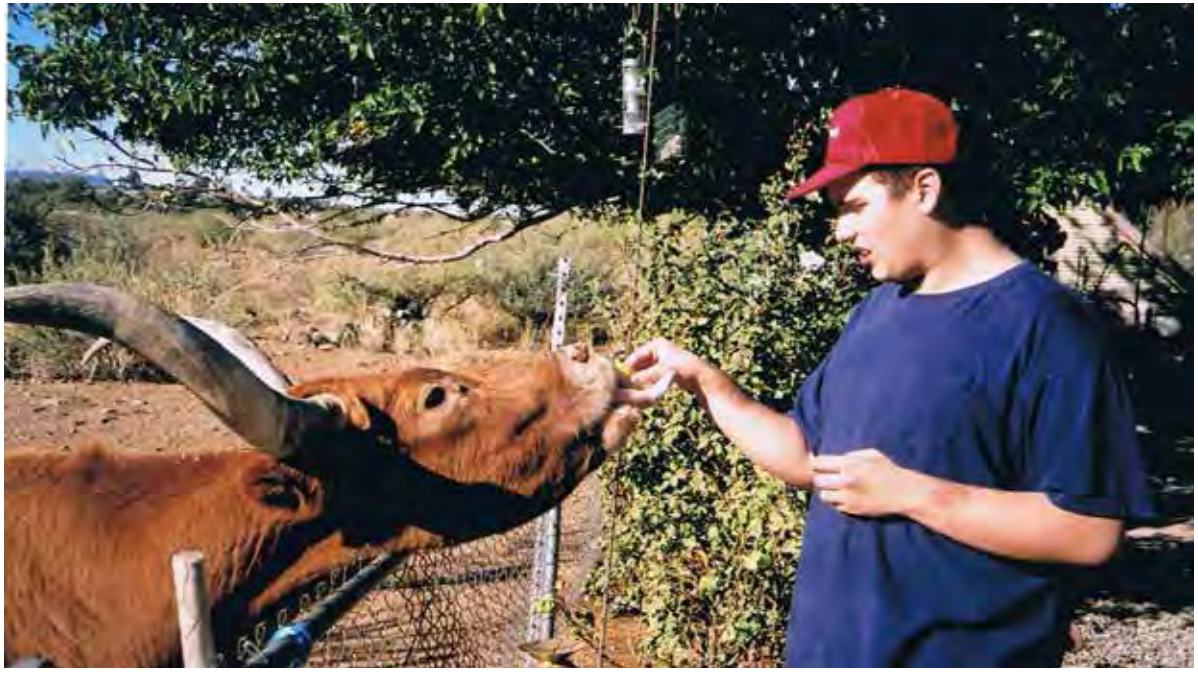
Design Implications

- Create an agriculturally based community with multiple service roads
- Establish a safe sustainable environment for learning and working
- Protect staff by providing multiple exits from all common spaces in residences
- Incorporate lots of storage space
- Separate noisy buildings from others to reduce anxious behaviors
- Incorporate iconic elements of ranches
- Construct with the goal of durability

"We're always asking them to go just a little further." - Marla Guerrero

Program

RIGHT: One of the many forms therapy can take on a ranch



THERAPEUTIC STRATEGIES

As an integral component of EHR, the element of therapy holds equal if not greater weight than all other design considerations. Our research included review of several different therapeutic strategies. Design implication were identified and concepts developed for optimal implementation within the program at the ranch. While not every therapeutic strategy outlined here may make it into the final master plan, we intend to identify the most effective strategies based on proven research and case studies. In our effort to find the strategies most suitable for Echoing Hope, Tejido has studied a range of therapies including horticultural, equine and other animal, water, music, art, recreational, and wellness therapies. Synthesizing this research with the findings of the Arizona State University report, "Advancing Full Spectrum Housing: Designing for Adults with Autism Spectrum Disorders", we hope to be able to select the appropriate therapeutic strategies for EHR given its location, anticipated residential mix, and overall program.

LEFT: Flowers and hanging plants grown in a greenhouse at Bittersweet Farms in Northeast Ohio. Bittersweet Farms is the first farm model for adults with autism in the US.

RIGHT: Farmer watering squash at Full Spectrum Farms. Located in North Carolina, full Spectrum Farms serves teens and adults with autism.

HORTICULTURAL THERAPY

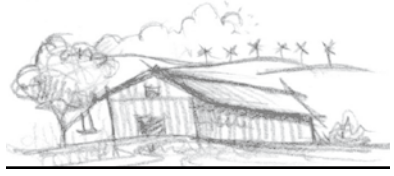
Horticulture has been used as a therapeutic strategy to provide healing, rehabilitation, and training. For people with autism, the benefits of gardening are well documented by researchers. Horticultural therapists suggest that there are four main benefits to gardening:

- Cognitive Benefits: Gardening increases the attention span and sharpens one's ability to follow instruction. Furthermore, horticulture teaches about living things and the life-cycle of plants which may help in understanding abstract concepts such as time, change, growth, and death.
- Physical Benefits: Gardening is good exercise because the gardener needs to walk, stoop, bend, reach, and maintain balance. Sensory stimulation is provided by touching, feeling, and smelling
- Social Benefits: Gardening stimulates social interaction, improves self-esteem, confidence, and social skills
- Psychological Benefits: Gardening provides opportunities for creative self-expression and for relieving tension, aggression, and frustration.

In addition, to providing healthy food, relaxation, education, esteem building and sensory experiences for those with autism, gardens can also be a source of stress relief and "escape" for care-givers.

Design Implications

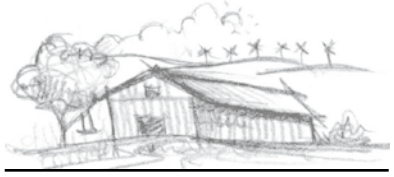
- Create therapeutic and sensory specific gardens
- Smaller plots are more manageable
- Mix designed planting areas with resident created and tended areas
- Offer a variety of small individual spaces and experiences along with larger more social spaces for diverse opportunities.



RIGHT: Riding or even just petting a horse can be enjoyable as well as therapeutic

Design Implications

- Using horses and other animals at EHR can provide a therapeutic option, as well as provide a task based responsibility for residents
- Horses are proven to interact with autistic individuals in a special way, giving a calming effect and a positive experience
- The movement of the horse is great for improving circulation, muscle control, and coordination
- Horses are companion animals and create a bond with their riders, looking to them for direction and love
- The act of collecting eggs and brushing a horse are examples of beneficial skills that work well with the completion of a familiar and repetitive task, a common symptom of autism



ANIMAL AND EQUINE THERAPY

Animal assisted therapy is a strong element incorporated at EHR, with an emphasis on equine therapy. Many kinds of animals are used in therapy, generally considered to bring comfort to an individual and a sense of well-being. Animal assisted therapy is known to help individuals with autism spectrum symptoms improve behavioral problems and overall emotional health. Many of the benefits include, improving communication skills, developing recreation skills, learning to trust, reduction of anxiety, creating a sense of empowerment, and the ability to have self-directed exploration. Horses at EHR allow for a hands-on experience without any need for previous experience of horses.

Caring for a horse has many additional benefits including the skills to brush, feed, and complete the task of putting away tack (neck strap or reins). The emotional bond between a person and a horse is established by this type of one on one care, hugging the mane or patting the horse to let them know they are doing a good job. Ultimately this interaction with a horse, goat, chicken or dog will help in developing social and communication skills in all areas of life, as well as being incredibly fun.

There are many resources for information about Animal-assisted therapy

TOP LEFT: Image from the movie, *The Horse Boy* depicting the Isaacson family's journey to discover more about how horses play a role in the life of their son with autism

BOTTOM LEFT: Collecting freshly laid eggs is a fun way to interact with chickens and to feel a warm egg in your hand

RIGHT: A lively chicken coop at Rusty's Morningstar Ranch in Cornville, Arizona

(AAT) and Equine therapy for autism, notably the founders of The Horse Boy Foundation in Austin, Texas have explored the benefits in depth in the film *The Horse Boy*. Their son Rowan, who was diagnosed with autism in 2004 showed a strong connection with horses, "One day, Rowan ran away from his dad and got through the fence into their neighbor's property and in among his horse herd. Rupert, his dad and a lifelong horseman, and an ex-professional horse trainer had been keeping his son away from horses. Instead of trampling this squirming, babbling little child lying on his back among their hooves, the horses backed off gently. Then the boss of the herd, a mare called Betsy, came over and began to lower her head in front of Rowan, to lick and chew with her lips. This is the sign of equine submission. Rowan's dad had never seen a horse voluntarily make this submission gesture to a human being before. Riding Betsy daily with his father led Rowan to begin to talk and engage with his environment and other people.

Other residential ranch communities such as Safe Haven Farms, Bittersweet Farms in Ohio, Rusty's Morningstar Ranch in Arizona are using animal and horse therapy be a part of the everyday lives of autistic individuals in a farm setting.

RIGHT: Enjoying the pool at Rusty's Morning Star Ranch in Cornville, AZ

WATER THERAPY

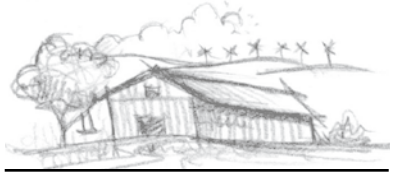
Children and adults with sensory processing issues and autism can benefit greatly from aquatic therapy. According to the Aquatic Therapy and Rehabilitation Institute, aquatic therapy is the use of water and specifically designed activity by qualified personnel to aid in the restoration, extension, maintenance and quality of function for persons with acute, transient, or chronic disabilities, syndromes or diseases (ATRA website).

For children and adults with autism aquatic therapy can focus on therapeutic play-based functional movement, improving range of motion, helping to facilitate neurodevelopmental growth, improved body awareness, increased balance, sensory integration, and mobility skills.

Water activities provide autistic children with proprioceptive and tactile input. The warm water provides a safe and supported environment, which not only supports the children, but also provides them with hydrostatic pressure that surrounds their body in the water. This pressure actually soothes and calms the children, providing the necessary sensory input they crave. Water provides an environment, which reduces body weight by 90%, decreasing stress or impact on the body. Warm water also reduces spasticity and relaxes muscles.

Design Implications

- Rainwater collection could be used for the pool
- Outdoor pool could be a pond or have a natural setting
- Indoor pool could be integrated with vegetation which could harness pool humidity
- Use evaporation processes to cool indoor spaces
- Pool will become a summertime haven, plan for it



ABOVE: Dancing is fun and therapeutic

LEFT: Listening to music and playing music both provide benefits therapeutically

MUSIC THERAPY

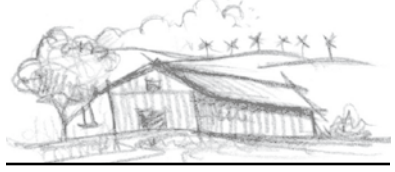
Music therapy can enable those without language to communicate and participate in non-verbal ways, while at the same time provide remediation of language skills. The rhythmic timing and reciprocity of musical performance permits individuals with autism to practice an external structure for communication and socialization, facilitating positive changes in behavior. (American Music Therapy Association).

Dance therapy and autism movement therapy emphasize sensory integration strategies to develop a connection between the left and right hemispheres of the brain. (AMT) Repetition of movement patterns reinforces the development of neural pathways to link information, which in turn supports the development of more efficient and effective ways to process, store and retrieve information.

Drama therapy provides an opportunity for verbal individuals with autism to build on their imitative strengths by learning, practicing and perfecting a script in a supportive setting. It also allows participants to work on social improvisation and to practice social skills, invent body language and work on improvisational speaking.

Design Implications

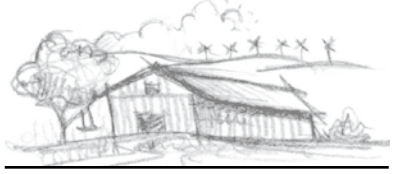
- Provide both small instructional spaces and larger performance spaces
- Ensure sound insulation is provided around "music rooms"



RIGHT: The possibilities for art therapy are endless, from traditional arts and crafts to seasonal fun like pumpkin carving

Design Implications

- Provide well lit areas with plenty of storage
- Create an exhibition space, for residents, family and the public. Use space as an educational opportunity for all involved
- Provide a large open space for multiple individuals to move freely and dance
- A wooden floor with dance mats and plenty of overhead space are good architectural choices for dance and movement therapy



ART THERAPY

Arts therapies have been shown to be exceptionally effective in supporting people with autism. Four main areas are

- visual arts therapy (painting, drawing, sculpture, weaving and pottery);
- music therapy;
- dance and movement therapy; and
- drama therapy.

Specialized professional training is required to become an arts therapist.

Visual arts therapies address many of the characteristic imaginative and abstract thinking differences found in autism. Through a range of media it is possible to design therapies tailored to the individual (American Art Therapy Association). The tactile experience of pottery has been found to be productive with some (Autism Treatment Center). Weaving has been found to be calming with others. Drawing is a useful tool for diagnosing and remedying visual-spatial deficits. Finally, the visual arts can provide vital leisure-time skills (Art Therapy and Autism).

EHR presents an array of opportunities for outdoor recreation including running, walking, and hiking

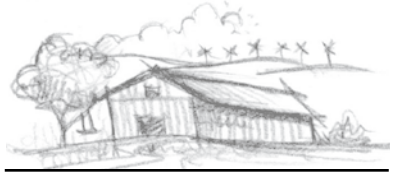
RECREATIONAL THERAPY

There are many beneficial therapeutic methods to help autistic children that do not involve taking drugs. One of the most important therapeutic methods is exercise therapy. Daily routine exercise can help children with autism by increasing their attention span, on-task behavior, and level of correct responding (Rosenthal-Malek & Mitchell, 1997). A daily exercise routine can be easily implemented but must be catered to the individual's special needs.

A more specific method is the Integrated Movement Therapy. This method combines yoga with mental health counseling, and speech-language pathology. The method consists of six core principles: structure and continuity, social interaction, language stimulation, self-calming, physical stimulation, and direct self esteem building (Kenny, 2002). Yoga also helps autistic individuals by increasing their attention/ concentration and enhancing their mood. Some autistic individuals do not feel comfortable in competitive situations but yoga presents a way to get physical exercise without the competition. This site presents extensive opportunities for recreational therapy, and should definitely be utilized.

Design Implications

- Provide multi-use paths to run, walk and bicycle
- Include opportunities for formal and informal recreational opportunities throughout the site
- Incorporate exercise stations throughout the site and adjacent to trails



RIGHT: Yoga and acupuncture are excellent forms of therapy

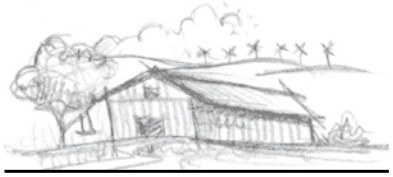
WELLNESS THERAPY

Other exercise opportunities that can be accommodated include bike riding, hiking, running, and swimming. All of these activities represent ways for autistic individuals to live an active and healthy lifestyle.

Another kind of helpful therapy is acupuncture. The benefits of acupuncture among autistic individuals is well documented in the research. Some research has shown that acupuncture can cause significant improvements in social initiation, receptive language, motor skills, coordination, and attention span. Acupuncture along with massage treatments could easily be integrated into a typical day at EHR.

Design Implications

- Incorporate open undefined spaces for meditation and other peaceful individual activities along walking and biking trails
- Provide quiet nodes for individuals to escape when needed with calming views and shade
- Allow access to water and potential wildlife habitat



ECONOMIC POSSIBILITIES

The potential for economic sustainability at EHR is very promising. Additional revenue streams could be nurtured through such endeavors as a native plant nursery, craft sales, or a bakery.

NATIVE PLANT NURSERY

With ample open space on the EHR site, there exists the opportunity to not only restore the landscape to its natural condition, but to cultivate native plant species for sale to the surrounding community. Offering a therapeutic strategy in addition to an economic strategy, native high desert plants could be grown and cultivated to meet a potentially large market demand for landscaping and garden plant species that are indigenous to the region.

The Desert Survivors Native Plant Nursery in Tucson is one example of a nursery that successfully grows and sells native desert plant species while providing employment to people with disabilities (desertsurvivors.org 2011). We believe a program similar to this would be well suited to South-Eastern Arizona in general and the EHR site specifically.

BAKERY

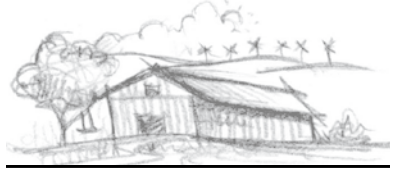
Another economic possibility lies in the creation of a bakery outlet that serves baked goods produced by the residents of the Ranch. Whether sold on site or at outlets in local communities such as Bisbee or Sierra Vista, EHR can leverage its on-site commercial kitchen facilities for baking, and possibly grow ingredients on site. Such an endeavor could not only provide additional income, but participation opportunities for residents across the autistic spectrum. For example, higher-functioning residents could, if they desired, interact with the public at the sales counter while lower-functioning residents could produce baked goods in a kitchen setting with less interaction.

In lieu of, or in addition to, a bakery, any type of craft produced by the residents could also be sold in any such retail outlet, whether on site or in surrounding communities.

LEFT: Desert Survivors Nursery, Tucson, Arizona

Design Implications

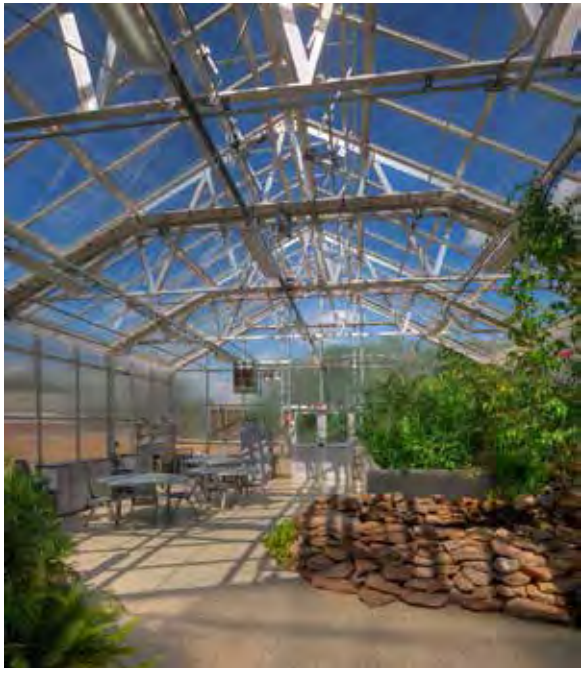
- Minimum one acre should be designated for outdoor growing area
- Nursery could become entry feature near perimeter of site to contribute to "restorative" ambience of site upon arrival
- Nursery could be integrated throughout the site rather than enclosed or segregated from other programmatic elements
- Commercial kitchen facilities should be located in a common area such as admin/therapy commons
- Bakery retail outlet, if located on site, should be at perimeter of site near parking and public interface facilities buffered from residential units



LEFT: A Living Machine™ functioning inside a greenhouse which also serves as a small picnic area

TOP RIGHT: El Monte Sagrado Resort in New Mexico which operates a Living Machine™ to purify its waste water

BOTTOM RIGHT: Guilford County School using it's Living Machine™ as an educational tool



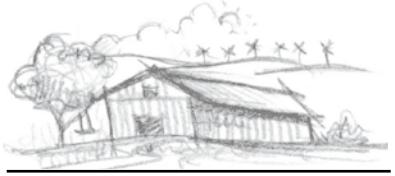
TIDAL WETLAND SYSTEM

A tidal wetland system similar to the manufactured Living Machine™ is a system for processing black water. Once cleaned the water can be used to irrigate any non-edible vegetation, including riparian restoration. This water source can also be used to water and bathe livestock. The system utilizes aquatic plants as well as microbes to filter and purify the water while simultaneously providing an aesthetically beautiful and ecologically restorative system to be enjoyed by all EHR visitors and residents.

Such a system could save EHR in terms of energy and water usage, as well as provide economic generation in two ways, by providing a water source for a revegetation nursery and secondly as a model of sustainability. Care for the specific plants associated with the system such as common horsetail *Equisetum arvense* and scouring rush, *Equisetum hyemale* (both Chihuahuan native riparian species) could provide therapeutic benefits as could the resulting habitat restoration. This system could be implemented within a greenhouse and/or operating within planters outside. In the later case the water would have to remain enclosed where it can not be accessed by humans or air. This would inhibit odors and ensure the system adheres to health standards.

Design Implications

- Can be placed inside or outside
- Most efficient to work with gravity, placing appropriate buildings up/ downslope of one another
- Create a riparian, water cleansing plant palette
- Provides a reliable and consistent water source for irrigation and habitat restoration
- Create EHR as a model of sustainability



WATER HARVESTING

Harvesting water involves the capture, diversion, and/or storage of rainwater, gray water and potentially black water for irrigation and other uses. The following are some benefits to harvesting water:

- Conserve groundwater
- Reduces water costs while providing excellent water quality
- Reduce storm water runoff problems,
- Restore riparian ecosystem
- Flush salt buildup in soil
- Decrease landscaping and property maintenance needs/costs

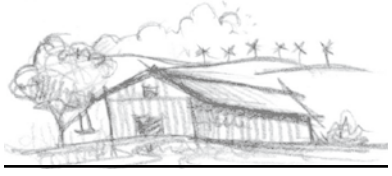
There are many ways to collect and store water including:

- Swales: Created by digging a basin on a contour and piling the remaining dirt on the downside of the basin to build a berm. Swales are designed to slow water and spread it horizontally across the landscape. They allow water to soak into the ground, supplying vegetation with extra water and inhibiting soil erosion. Swales can be used in planting areas or on roadsides to help with erosion. The berm can become a multi-use space for pathways and plant material. This coupled with gabions would be a perfect solution parallel to Via Liberación and Red Mountain.
- Gabions: Rocks bound in wire mesh are placed in drainages to slow erosion. The sides are keyed into the wash banks to hold them in place. In this way, extra water is provided to vegetation both in and beside the wash. Typically, they should be included on a smaller scale to avoid any problems.
- Cisterns: Receptacles for holding rainwater that is typically collected from rooftops of buildings. Cisterns can sit on top of houses, on the ground, or can be buried below ground. They should include a filter or screen to keep mosquitoes and debris out. Water collected can be used for irrigation purposes.
- Permeable Surfaces: Pervious materials such as granite, gravel, and open paving blocks allow water to soak into the soil. Using pervious materials for parking areas, plazas, pathways, and even roads would allow water to penetrate back into the ground, which will soften the landscape, and potentially contribute to aquifer recharge.

LEFT: Swale with check dams to slow the water. This creates a pleasant and aesthetically appealing ecologically sound space.

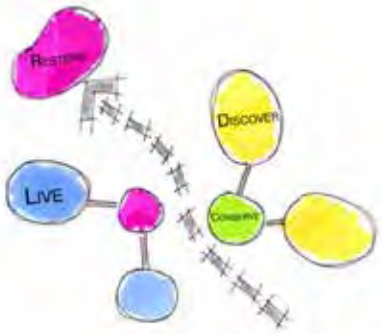
Design Implications

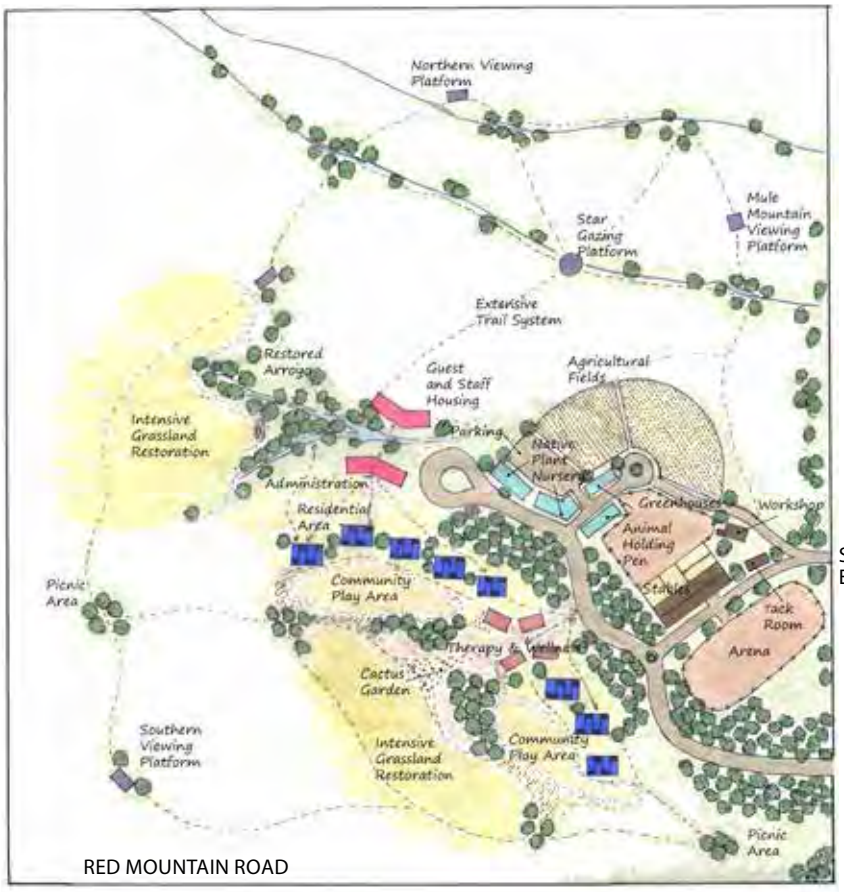
- Incorporation of water harvesting will reduce the need to pump as much well water
- Harvested water will allow a large scope of vegetation to survive and be maintained



"How do you provide spaces for ranchers to be themselves?" - harlie garcia

Concepts





Program

- Residential
- Guest and staff
- Administration
- Therapy and wellness
- Greenhouses
- Agriculture fields
- Stables
- Tack room
- Animal holding pen
- Workshop
- Arena
- Native plant nursery
- Community play areas
- Restored arroyo
- Intensive grassland restoration
- Cactus garden
- Picnic areas
- Extensive trail system
- Star gazing platform
- Viewing platforms

As part of the holistic approach to living, the programmatic elements are organized into the four main components of restoration, conservation, discovery, and living.

MIDDLE**:** Living and activity nodes are connected by an interior road

BOTTOM**:** Ranchers can choose their level of interaction with the public and modify their routine

LIFE IN BALANCE: A HOLISTIC APPROACH TO RANCH LIVING

The programmatic elements of this site plan are organized around a central circulatory spine evoking the image of a tree. Moving in an outward direction from this spine, the built environment slowly dissolves into the natural landscape.

Discovering new tasks and talents, ranchers are encouraged to choose their level of interaction with the public and modify their daily routine.

Restoration of the landscape comes in the form of large revegtation areas that serve as buffers to the noise and bustle of more public spaces. restoration of the spirit comes in the form of programmed therapy and secluded nooks for ranchers to getaway, yet still feel part of it all.

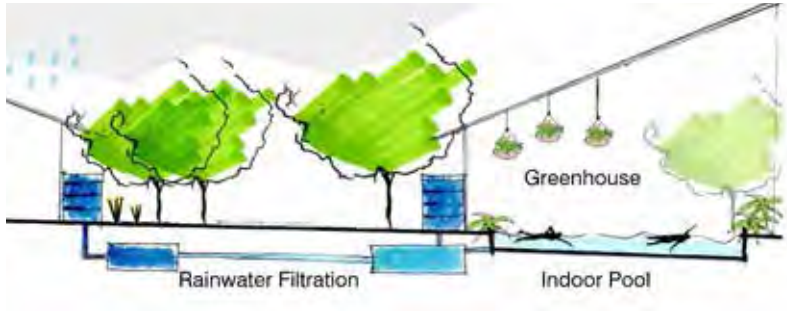
Not only is Echoing Hope a ranch, but it is a home with independent residences offering a quiet place to call their own.

Entrance showing pasture and stables

Section of the proposed arroyo restoration

Administration building looking toward grassland restoration environment

The structure acts as a shelter for residents, and a steward of the environment by collecting rainwater, balancing the sunlight, welcoming cross-ventilation, and occupying a small footprint.



TOP: Wind turbine at Empire Ranch

MIDDLE: Warm earthen materials provide solace and durability

BOTTOM: Breezeways offer shade and ventilation while framing views

Opportunities

- Consideration is given to living, working, therapy and play
- Transition zones buffer public from private, work from play
- A created wash provides an interior axis for the site
- A multi-use trail links the focus areas of the inner campus

ABOVE: Bubble diagram showing the arrangement of different programmatic spaces
RIGHT: Arroyo concept plan

KEY

1. Grove
2. Rock Wall
3. Bridge
4. Main Drive
5. Fountain
6. Entry Gardens
7. Water Tower
8. Main Bldg.
9. Marla's House
10. Service Entrance
11. Maintenance Shop
12. Production Bldg.
13. Barn/Chicken Coop
14. Horse Corral
15. Parking
16. Buffer
17. Staff Facility
18. Activities
19. Step Down
20. Respite/Visitor/Home

RED MOUNTAIN ROAD

KEY (cont.)

21. Group Homes
22. Pool/Recreation
23. Vegetable Garden
24. Greenhouse
25. Potting Shed/ Bathroom
26. Multi-use Trail
27. Trail Stops
28. Ocotillo Preserve
29. Restored Pasture
30. Restored Chihuahuan Vegetation
31. Bosque
32. Wash

ARROYO: A MEANIINGFUL TRANSITION

The entrance grove of pecans at the intersection of West Red Mountain Road and South Via Liberación signals an oasis. Set off from the road by a stone wall– perhaps built by the residents themselves– the grove is pierced by rivulets collecting water runoff from the roads into a central wash which then disappears under the central administration building. This created wash leads through the site and provides a central axis for the design, eventually spreading out into a drainage basin in the northwest corner of the property. Although this wash will be dry during the greater part of the year, it will always be attractive with desert vegetation.

The residential and work areas are buffered from the public entrance by the administrative building, which also serves as a reception area for visitors. Housing for residents, staff and guests is located south of the wash while the greenhouses, gardens and

A sketch of the main entrance with the wash running through the building

A proposed residential plan emphasizing shared courtyard space in between

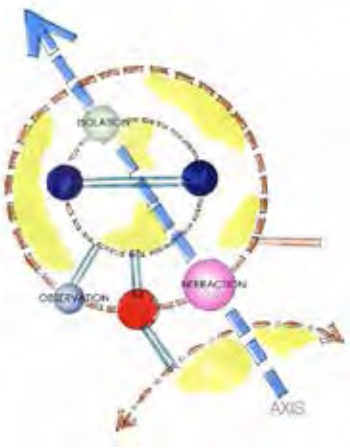
The Arizona Cancer Center in Tucson, AZ by Ten Eyck Landscape Architects

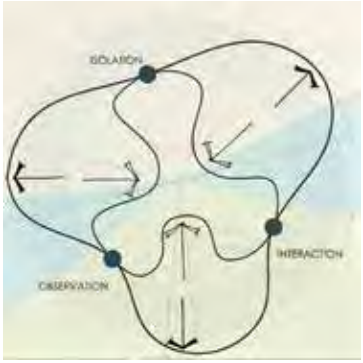
Andy Goldsworthy's Storm King Wall

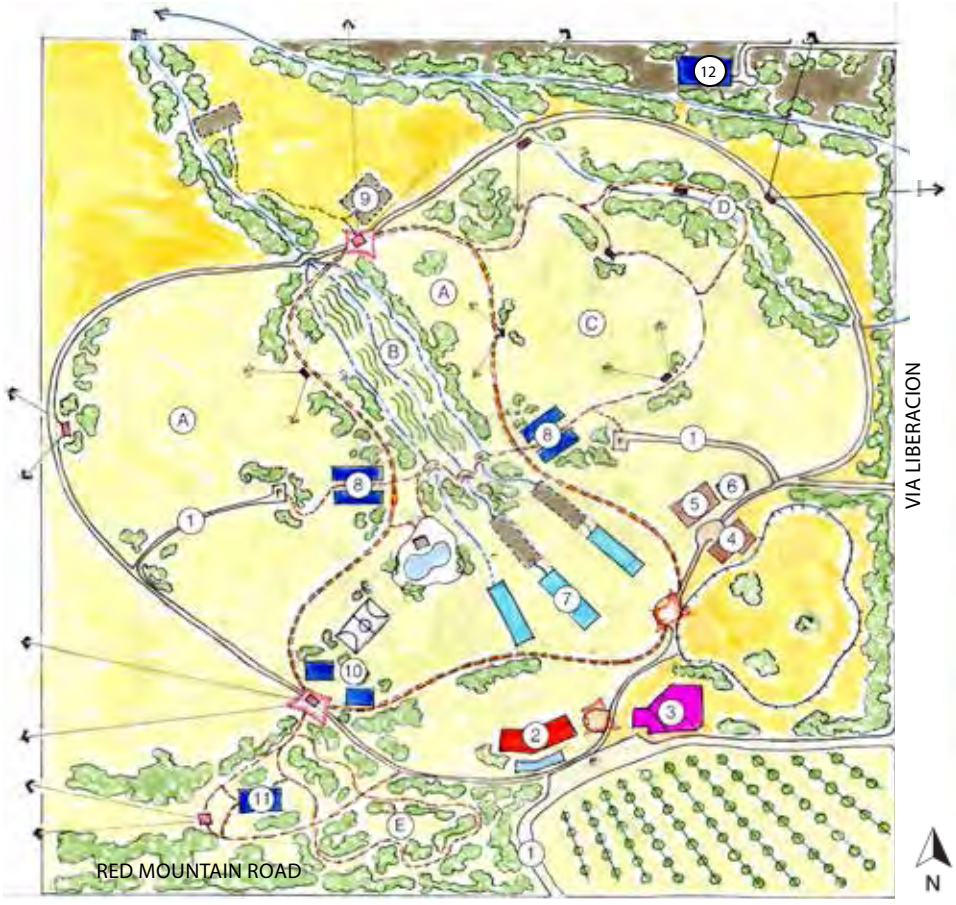
barn are located to the north, appropriately separating home and work, yet linking them by means of bridges. Staff housing and the activities/therapy building are conveniently located on the main entrance road, yet through their orientation they also offer a direct connection to the ranchers' central living and working areas. A network of all-purpose trails minimizes roadways within the site while providing essential access for emergency and service vehicles. Near the group homes, a pool, a barbeque and a one-on-one basketball hoop afford recreational opportunities, and a trail system enhanced with bridges traversing the wash encircles the ranch, providing open-air exercise punctuated with shaded activity or reflection nodes. Restored areas of native vegetation buffer ranch activities from the surrounding roads and mountains.

Opportunities

- Consideration is given to living, working, therapy and play
- Transition zones buffer public from private, work from play
- A created wash provides an interior axis for the site
- A multi-use trail links the focus areas of the inner campus







KEY

1. Entrance
2. Admin
3. Multipurpose Building
4. Corrals
5. Barn
6. Shops
7. Greenhouses
8. Permanent Residences
9. Future Expansion
10. Temporary Residences
11. Guest House
12. Marla's House

A. Vegetation
B. Nursery
C. Ocotillo/Yucca/ Grassland
D. Riparian Bosque
E. Solace Garden Bosque

TOP: This concept diagram arises from the creation of an axis off of the Living Machine™ which bisects the exterior public axis and interior private residence sphere.

BOTTOM**:** This diagram indicates how the masterplan form was derived based on off-site views. Pulling the public circulation towards the exterior and on-site views pushing the private circulation towards the interior creating distinct paths with distinct purposes.

NUCLEUS

EHR's residents are the central focus of this concept, they are the hub around which everything else revolves. Therefore enhancing the lives of the residents is the primary goal, and achieved through the creation of three distinct areas of space:

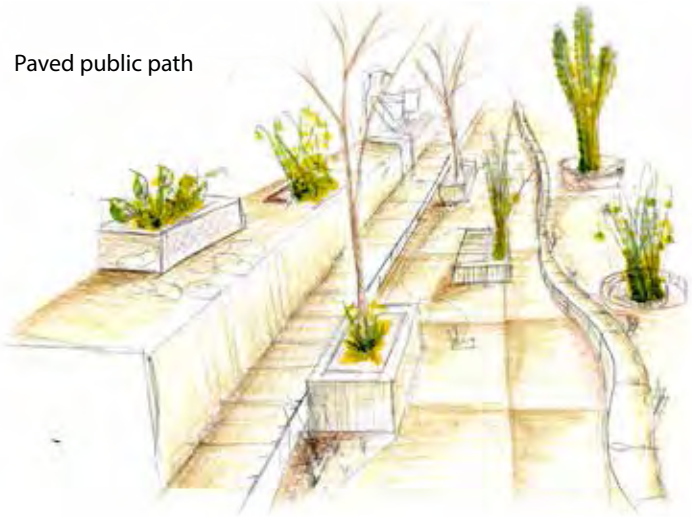
Observation zone:

This public zone, hosts guests and is in proximity to the Step Down House, where parental care and behavioral observation can occur.

Interaction zone:

The public and the residents mingle with the working components of the ranch. The barn, shops and commercial kitchen provide therapeutic work for residents while also allowing a safe space for an exchange of experience and learning.

Residence gathering space between IDLA residences



Paved public path

LEFT: Tensile structure next to the administration building

RIGHT**:** Tensile structure over the residence gathering space

Isolation zone:

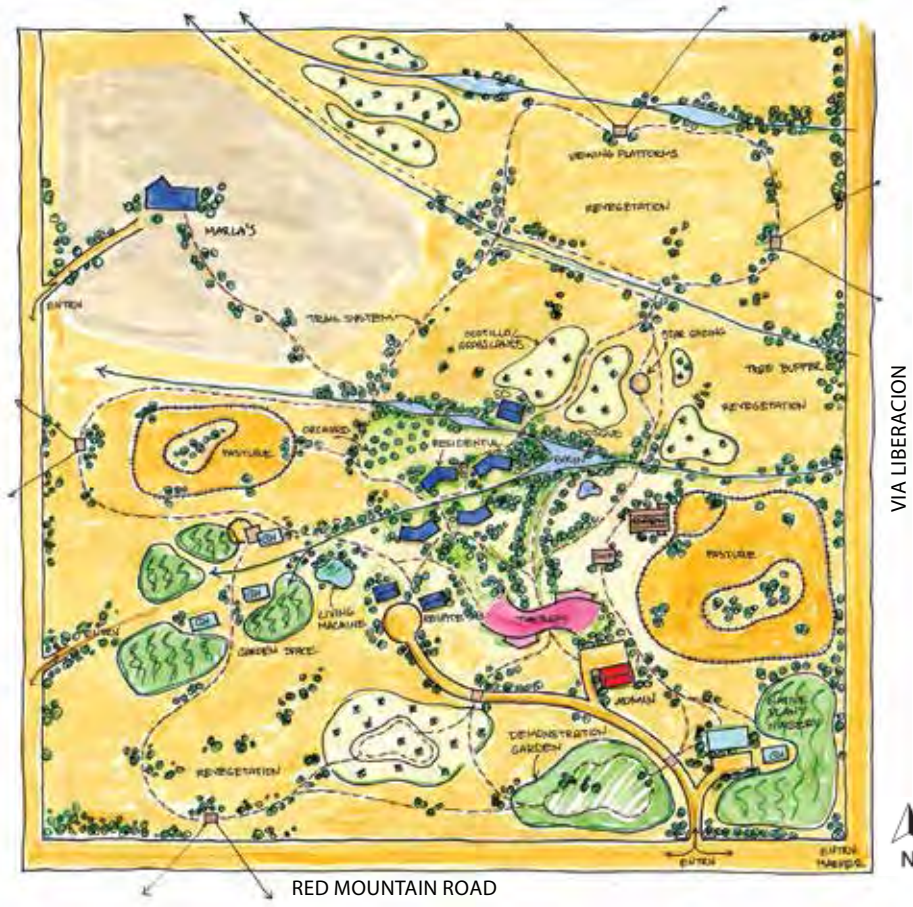
This is designated as a peaceful natural environment for the residents to release stress and escape their daily routines. Different activities ranging from nighttime stories to art performances can occur in this space.

EHR welcomes two other groups of people, the public and employees, who's spheres revolve around the central nucleus of the residents. The nucleus ensures that transitions between public and private and active and passive spaces are seamless and comfortable.

Opportunities

- Easy way-finding, distinct areas of activities, and system integrated architecture spaces
- Encourage isolation and others for socialization, variety recreation opportunity, and skill development station.
- Rent-able community garden space, food production and commercial kitchen, and native plant nursery.
- Landscape restoration, water conservation and treatment, and habitat restoration.
- Public interaction performance spaces, and behavior observation classrooms

ABOVE: Diagram showing strategic zoning and circulation strategy



Program

Residential
Step down
Respite
Administration
Therapy
Greenhouses
Garden space
Native plant nursery
Demonstration garden
Barn
Shop
Pastures
Living machine
Orchard
Revegetation
Bosque
Basin
Ocotillo grasslands
Star gazing
Trail system
Viewing platforms

GIVING & GROWING:
SEASON TO SEASON

This design concept starts with a protected central core for the residents with autism. This central core is a pedestrian friendly zone protected by housing and therapy opportunities that contain native, drought-tolerant plantings, including trees. This central core uses rainwater collected from the site and surrounding roadways along with rainwater from roofs and gray water from structures. A small area is set aside near the main entrance to the site for a retail opportunity, perhaps a native plant nursery, along with demonstration gardens. Walking paths criss-cross the site, providing opportunities to appreciate views.

Perspective drawing of entry sequence showing glimpses of barn and administration building, evoking southwest ranch cultural/aesthetic

Perspective drawing of private wooded area with wash for use by residents

Section drawing of residential units and earth-sheltered therapy building

Historic Old Main on the UA campus keeps cool with a wrap around porch, thick stone walls and high ceilings

A bosque provides shade, habitat and sensory experience

Opportunities

- Dual pastures provide respond to seasonal changes
- Housing can be spread out more, providing even more opportunities for indoor/outdoor living
- Smaller modules of development, especially in therapy building
- Programmed events on walking trails, including star gazing
- Options for shared and private spaces are appreciated in residential area

RIGHT: EHR Board discussing their vision at the EHR site "camp-out"

INTERIM REVIEW FEEDBACK

Echoing Hope Board members attended a presentation and charette in March 2011 to review our initial concepts. A compilation of greatly appreciated feedback is included below.

General needs:

- Half of the ~40 acres will be donated to EHR, thus all the buildings should be located on about 18+ acres. The other half is open to trails (with viewing platforms), restorations, corrals, etc, but should not have buildings. This is especially important if a portion of the land is sold in the future.
- 30-50 parking spots for employees plus space for students, guests and volunteers

Housing needs:

- IDLA and group homes can be grouped together
- IDLA must have a street entrance (HUD housing requirements)
- Guest, respite, and Step Down homes should be close to staff house and administration
- 2 IDLA buildings with 8 apartments in each building
- Common areas for kitchen, dining, living
- 1 group home with 4 bedrooms

- 1 Step Down house with 3 bedrooms placed near a road for emergency access
- 1 respite home with 4 bedrooms and 2 bathrooms. It should be its own building.
- 1 guest house with 4 bedrooms and 2 baths.
- 1 staff house with a large bunkhouse room, common kitchen, dining and living areas as well as 2 restrooms (male and female)

Likes:

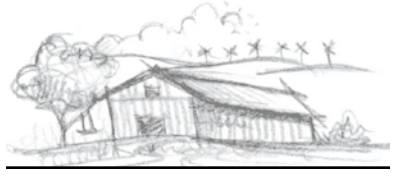
- Buildings close without feeling congested with public buildings first.
- Close but separate buildings for wellness/ therapy
- Earth integration, with consideration to natural light and fresh air in buildings
- Raised patio and shade structures
- Residents in interior of facility
- Step Down house removed from other homes
- Woodshop (may be in the barn)
- Separation of work spaces
- Restrooms near major work/play areas (gardens, greenhouses, pool)
- Rentable greenhouse space and chickens/ greenhouse
- Living machine (need to provide cost and maintenance information)
- Draining water on site into planted areas, greenhouses, or natural drainage areas
- Fewer roads
- Water collection and conservation (combined with pool)
- Geothermal heating and cooling
- Trees around perimeter and at entrance

Concerns:

- One building containing many functions
- Control of 'washes' near and through buildings
- People driving to location for retail trade
- Emergency access
- Access to barn and greenhouses
- Patterns of light
- Noises
- Length of time it will take trees to grow in internal spaces
- Durability of tensile shade structures
- Fountains

Design Implications

- Provide service roads closer to housing and emergency roads
- Need 50 parking spaces dispersed on the site
- Use only 18 acres for the buildings and the rest for trails only
- Staff housing should be located close to the Step Down house, the Guest house and the Respite house and away from the IDLA and Group homes
- Shaded patios and clear stories should be incorporated for the quality of light they provide and the transition zone they create



Ride the horse

Herd the sheep

Clean the wool

Feed the chickens

Collect the eggs

Build a fence

Water the vegetables

Plant the seeds

Harvest the crops

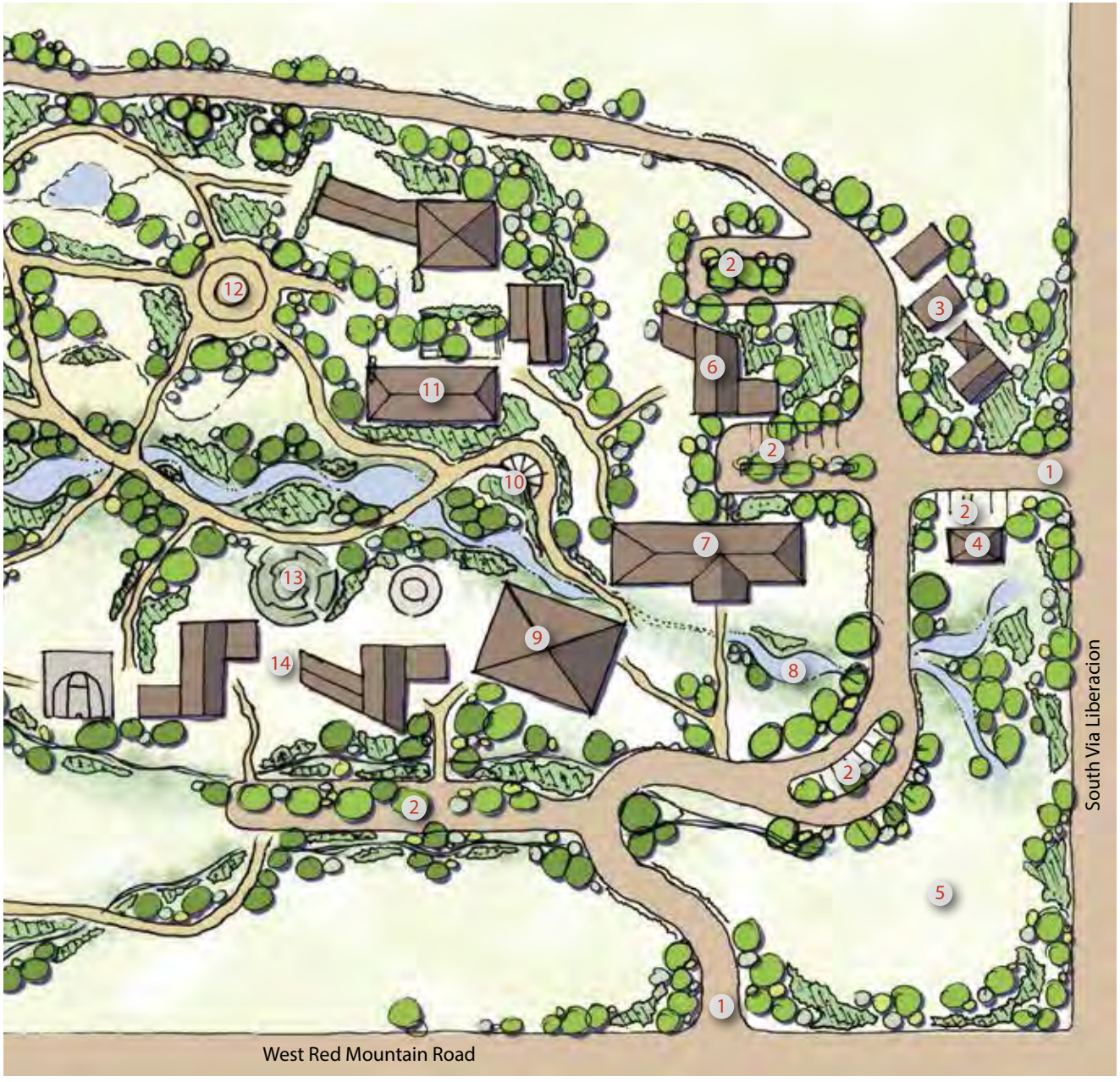
Cook your favorite meal

-Beth Johannessen

Masterplan

ECHOING HOPE MASTER PLAN

1. Entry
2. Parking
3. Nursery and public greenhouses
4. Retail space
5. Well
6. Staff housing
7. Administration
8. Seasonal wash
9. Great room
10. Amphitheater
11. Therapy buidings
12. Outdoor therapy garden
13. Central courtyard
14. Guest and respite
15. Group homes
16. Step down house
17. Independent living arrangements
18. Barn
19. Chicken coop
20. Pasture
21. Greenhouses
22. Revegetation throughout site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South Via Liberacion
West Red Mountain Road

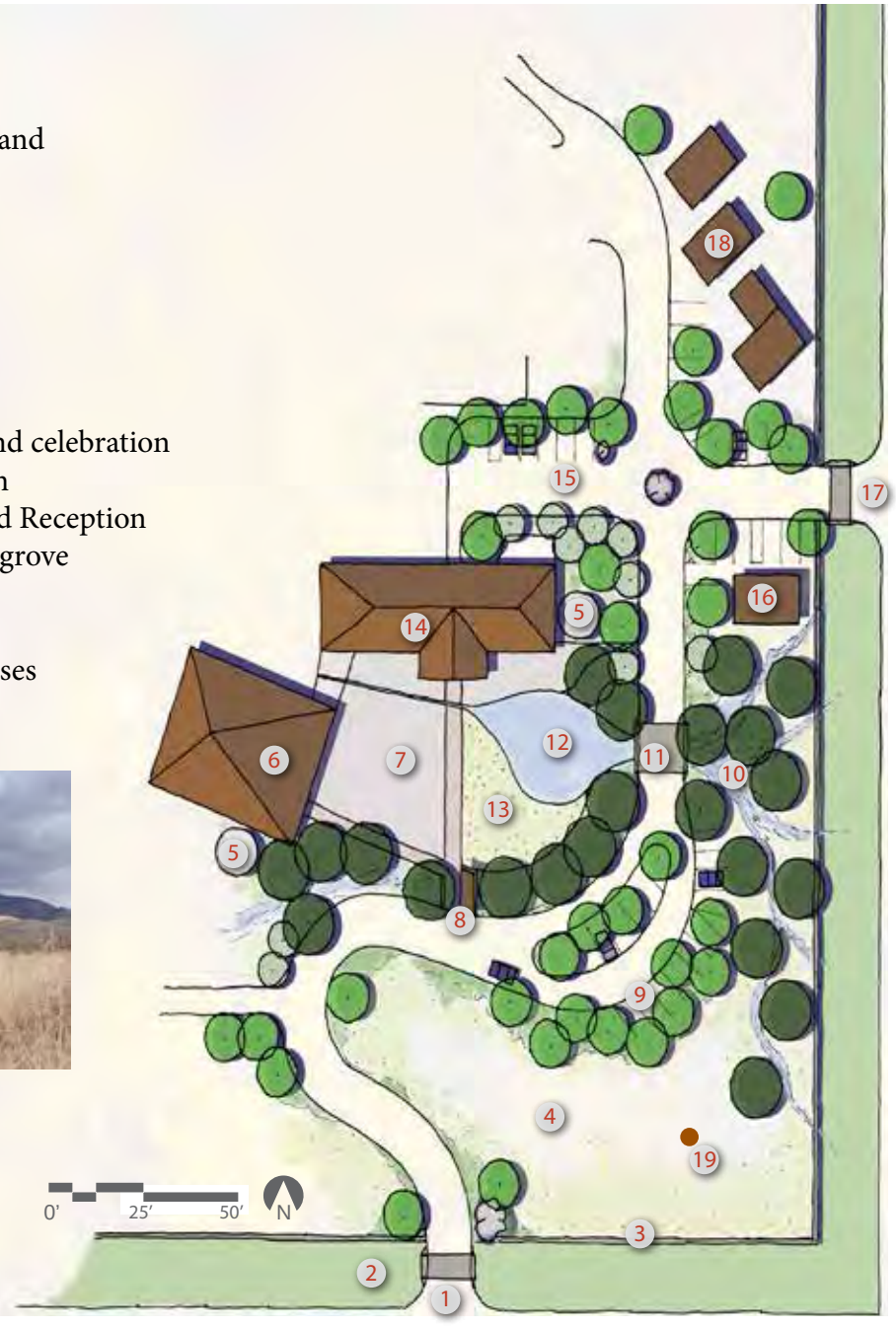
ENTRANCE AREA

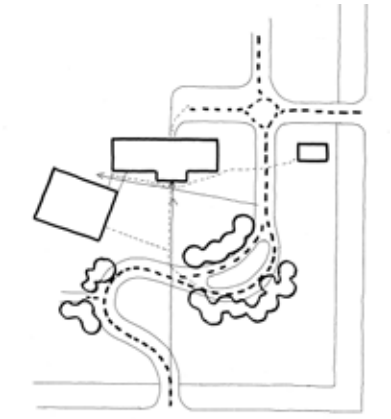
Just as water meanders across desert land, the entrance road leads the visitor through a regenerated grassland to the welcoming central plaza. From the east a wash leads through the space, collecting water when it rains, but also serving as a celebration space for art, plants or other displays during drier seasons. Shaded parking is available in a grove near the plaza, but the view from the buildings is of desert trees and shrubs.

Past the plaza are employee parking and sites for a future sales area and rentable greenhouses. A service drive links this area directly to W. Via Liberación. A narrower road continues to the therapy commons and residences.

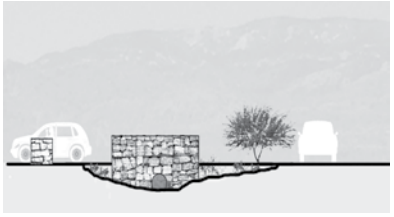
View of Entry from S. Red Mountain Road

1 Main entrance
2 Vegetation buffer
3 Stone wall
4 Regenerated grassland
5 Cistern
6 Great room
7 Flagstone patio
8 Drop-off
9 Parking grove
10 Wash
11 Gabion bridge
12 Water collection and celebration
13 Native grass garden
14 Administration and Reception
15 Employee parking grove
16 Retail
17 Utility entrance
18 Rentable greenhouses
19 Well

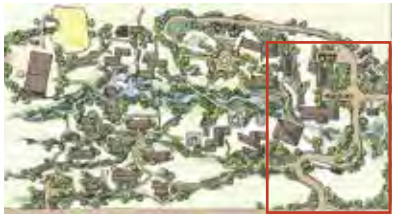




The central plaza is visible from the entrance, while at the same time it is buffered by the indirect approach of the road. The wash provides an internal view through the ranch.



A gabion bridge crosses the swale which collects runoff from the road to maintain the vegetative buffer surrounding the ranch.



ABOVE: This bird's eye view shows the guest drop-off along the entrance road, paths to the administration complex, plaza, grassland, wrap-around porches and cisterns. Native, drought-tolerant plants are used throughout.

The entry node is the beginning of a conceptual axis that orders and organizes the entire site. At this, the most public end of the axis, man-made, formal and linear elements are used to match the context of the roads that bound the site, and deal with the most public functions'. Organic and natural forms are found here, to start the transition to the more private zones.

All of the ordering systems were used to inform design decisions in this node. Aesthetic, economic, environmental, functional, social and therapeutic considerations played a major role in shaping the building forms and outdoor spaces.

As the road winds around the entry plaza, opportunities are provided for drop-off and parking. Considerations are made for people of all physical abilities. Brick paths connect plazas and porches composed of flagstone and concrete.

The two major buildings in this node

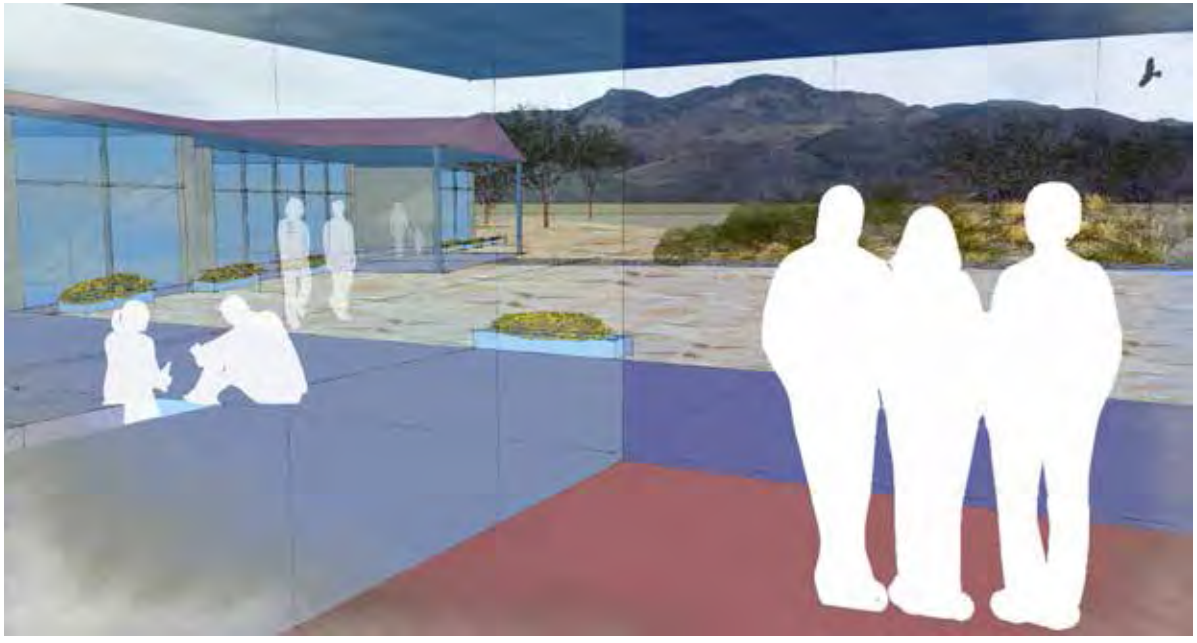
frame and celebrate the central axis through the site, providing a gate keeping function to separate the most public part of the site from the more private and protected nodes to the north and west.

Inspired equally by vernacular buildings from the American West and modern sustainable principles, these two major structures house reception and administration functions along with providing a Great room for celebrations and gatherings of all kinds.

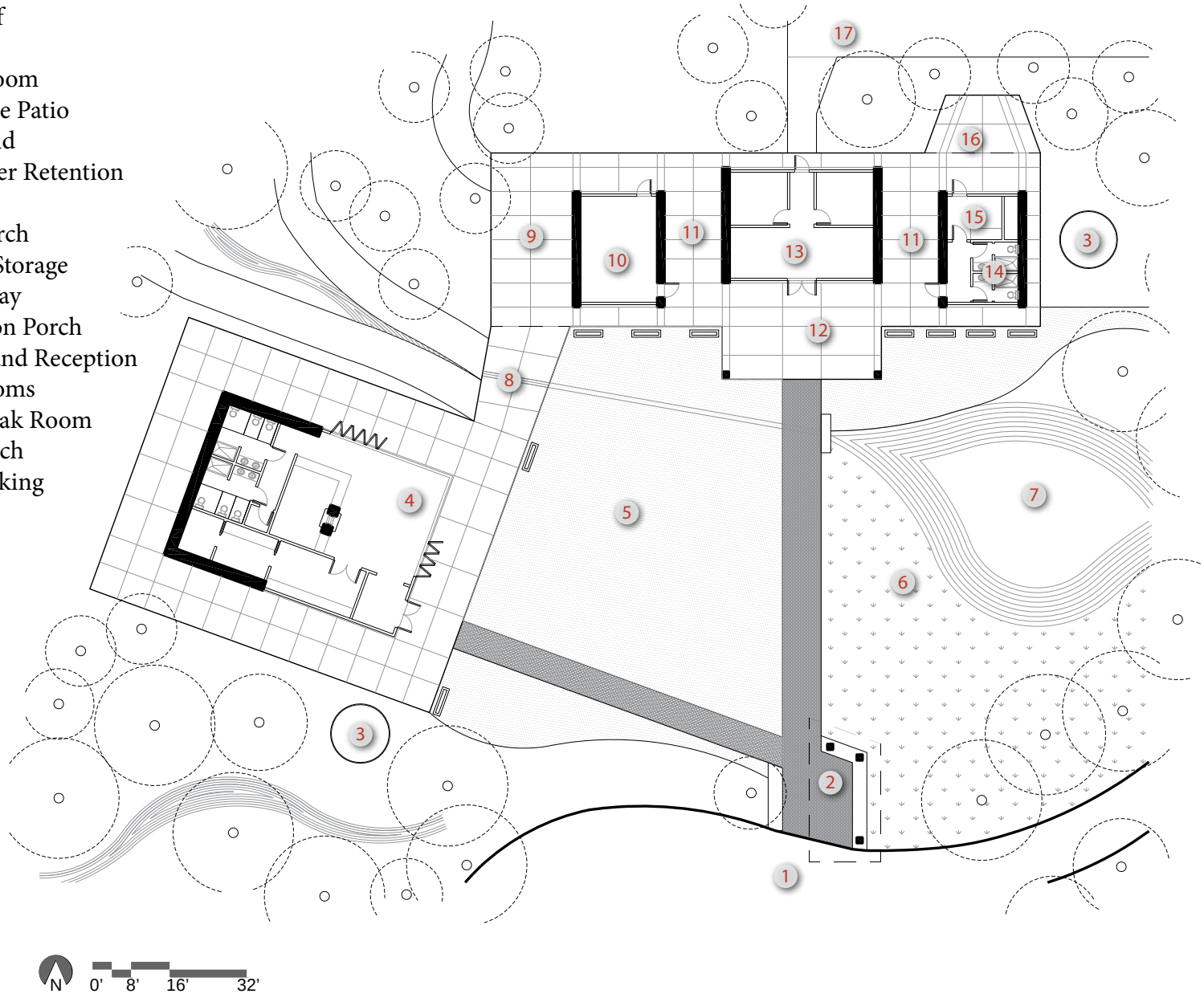
The Great room can be used equally by residents and visitors to the site. Donor parties can spill out onto the entry plaza. Large staff meetings can be held here. Residents can spend time here with their families. Resident holiday parties can be held here. Even within the largest room of this building, a protected alcove provides a safe retreat.

Administration functions are broken into three distinct volumes under a single roof. The central volume houses reception and several offices. A staff kitchen, breakroom and patio share space with rest rooms. The wrap-around porch for this building is expanded to the west to celebrate the views and create connections to the rest of the site.

Looking out from Great Room



1. Road
2. Drop-off
3. Cistern
4. Great Room
5. Flagstone Patio
6. Grassland
7. Rainwater Retention
8. Ramps
9. West Porch
10. Offices/Storage
11. Breezeway
12. Reception Porch
13. Offices and Reception
14. Rest Rooms
15. Staff Break Room
16. Staff Porch
17. Staff Parking



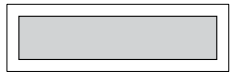
Environmental, economic and aesthetic pressures worked together to shape these buildings. Long, relatively narrow buildings accommodate passive solar design, daylighting and natural ventilation strategies. Exposed concrete slab foundations are left exposed on the interior as an economical flooring choice that allows for easy clean-up and offering the potential for radiant heating.

Peaked roofs provide a familiar and comforting form while simultaneously echoing the mountain forms that surround the site and facilitating rainwater collection. An open gable faces south to indicate the reception area. All other roofs are closed off in hips to help lower and elongate the impression they create. Asymmetry is used in the roof forms to peak over the most enclosed spaces with eaves stretched out over open porches and glass enclosed regions.

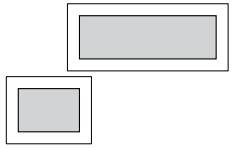
Wrap-around porches, a shared patio, operable glass windows and doors all combine to facilitate and celebrate indoor/outdoor living.

Vernacular architecture comes from an era with limited access to energy and imported materials, coming into total synchronicity with responsible environmental design. This overlap also leads to less energy and cost associated with transporting materials costs and ultimately reduced operating costs and increased human comfort.

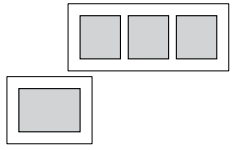
Looking along the wash



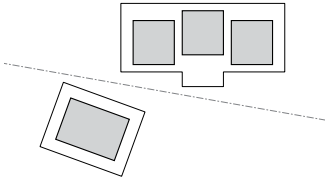
Initial Concept
Single structure, aligned east-west for optimal solar response, narrow north-to-south for daylighting and ventilation. Wrap-around porch to create shaded outdoor space.



Second Iteration
Separation of great room functions from administration functions, framing open space to southeast and northwest.



Third Iteration
Creating breezeways and separation in administrative areas.



Final Iteration
Great Room twisted to frame conceptual axis and block summer afternoon sun.

CENTRAL COURTYARD

The central courtyard serves two purposes, as a large gathering space for public and private events and as a buffer between the public and private portions of EHR. Every space within the courtyard aims to be therapeutic to its users, whether they be residents, staff or guests. Porches, patios and small outdoor spaces around the buildings provide transition zones from private to public. Vegetation screening further defines spaces as well as serves as wayfinding. Dense canyon hackberry trees line the wash and designate the primary circulation path from the administration building to the interior of EHR. Desert willows and mesquites designate secondary paths and a grove of pomegranates surround the fire ring signaling the start of the most public space, the administration area.

CENTRAL COURTYARD PROGRAM

1. Administration Building with wrap around porch and views to courtyard
2. Great Room Building which shares a large outdoor patio, fire ring and BBQ space with the guest house
3. Guest House (see Living Room)
4. Respite House with personal patio and secondary therapy space for specific use of these residents
5. Staff Housing with private patio space
6. Half-court basketball court is a portion of the secondary therapy space
7. Public Ampitheater with Tidal Wetland Planters ringing it. Once purified through these planters, the water would be divided with some feeding into the wash #10 and the rest piped to the barn for use by livestock and agriculture fields. Explanation of this fascinating process is inscribed in the rusted metal planters, so the process is visually linked to your physical movement from the administration building down the ramp to the amphitheater.
8. Concrete ramp to Ampitheater
9. Concrete to Courtyard and the rest of EHR
10. Wash with Tidal Wetland System reclaimed water and gray water from bordering buildings
11. Fire ring and nighttime gathering space
12. Strolling Solace Garden primarily for family and friends seeking respite
13. SecondaryTherapy Commons
14. Time-Out Quiet Gazebo and Wash access for use by residents seeking a respite from the rest of the central courtyard and the therapy gardens to the north
15. Personal Patios with trellises of vines
16. Secondary Wash
17. Parking Groves with permeable decomposed granite surfaces
18. Bridges over dry/wet washes
19. Permeable dirt pathways
20. Grassland and natural areas

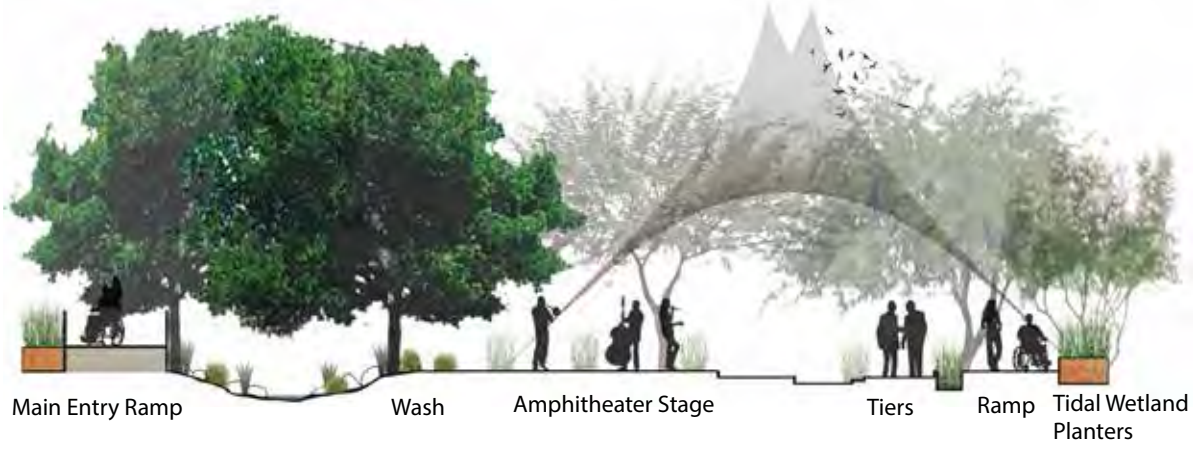
TOP TWO: Both of these images depict landscape architect Christy Ten Eyck's use of dry and wet washes and serve as inspiration for the EHR wash.

ABOVE LOWER: Corten steel planters with reeds for the tidal wetland planters.

LEFT: Time-out gazebo with access to the wash. This space provides a naturalistic quiet area.

ABOVE: Amphitheater bird's eye view

RIGHT: Amphitheater section



BELOW TOP: The Cuyamaca Water Conservation Garden, with vegetation lined tiers inspired the amphitheater

BELOW BOTTOM: Open shade structure

Tidal wetland planters full of water purifying reeds line the ramp into and surround the amphitheater. This formal entry marks this as a public space. An open shade structure overhead frames views of the mountains while creating a comfortable space in the hottest part of the day. Openness defines the space without creating a harsh sun/shade contrast, reducing the possibility of alarm upon entering.

The importance of providing respite to not only the residents but staff and guests is incorporated in the strolling garden. A simple labyrinth allows one to find comfort and peace by methodically moving through a maze. A gazebo with a swing in the center of the labyrinth provides space for one person or a small group of people to enjoy seclusion, away from the rest of the world. The section at the top depicts the strolling garden on the left and the fire ring and living room/guest house patio on the right, where storytelling, stargazing, dancing take place by night; picnics and BBQs by day.

ABOVE: Inspiration for these spaces comes from landscape architect, Andrea Cochrain's orchard surrounding a fire pit and picnic area

LEFT: Perspective of strolling garden

BELOW: Section of strolling garden and living room/guest house patio

THERAPY COMMONS

Therapy is an important part of Echoing Hope Ranch and therapy buildings provide indoor therapy opportunities while the outdoor garden space provides a variety of outdoor activities for exercise, sensory experience and relaxation for both hyper- and hypo- sensitive residents.

While there is a wealth of information on outdoor spaces for autistic children, information specific to outdoor spaces for autistic adults is harder to come by. Therefore, this garden takes its direction from literature reviews of therapy and healing gardens in general, gardens for autistic children, natural playgrounds and information gathered from Marla Guerrero.

Following is the program for this space.

1 Indoor/outdoor pool near the therapy building for year round swimming.

2 Recessed outdoor classroom near therapy buildings provides space for outdoor classes and projects.

3 A central sundial with small turf area serves as a central meeting place. Alternating paving textures provide wayfinding with water runoff being directed into turf area. Perimeter seating is available with views towards the therapy courtyard. This space may be used as a stargazing area at night.

4 A sensory garden provides plants and materials of differing colors, textures and fragrances. Plants may include: screwbean mesquite (see, touch), velvet mesquite (taste), desert willow (see), Aloysia sp. (smell), sandpaper bush (touch), chocolate flower (see, smell), creosote (touch, smell), Opuntia sp. (see, don't touch!), Agave sp. (see, touch), and grasses (see, touch).

5 A ramada for potted plants will have watering cans available for unscheduled use. Water is available from a cistern that collects water from the ramada roof. Lighting may be generated by wind or solar.

6 The boulder garden is for climbing and hiding. Rock paths help with coordination and balance.

7 A shallow duck pond has a gazebo and platform that extends slightly over the pond.

8 An alleé of trees leading from the sundial provides a safe, cave-like feeling.

9 A 'playground' offers swings, culverts for privacy, a merry-go-round, slide and climbing wall.

10 The terrain park is an area of varying inclines, surface materials and levels of difficulty with seating available, and enhanced with plant materials.

11 Shaded, curved seating provides privacy and views to the north and south.

12 A perimeter trail for walking and/or exercise has surface texture changes, stair climbing, balance beams and monkey bars.

Masterplan

Level changes offer exercise opportunities for residents and serve as buffers from public spaces.

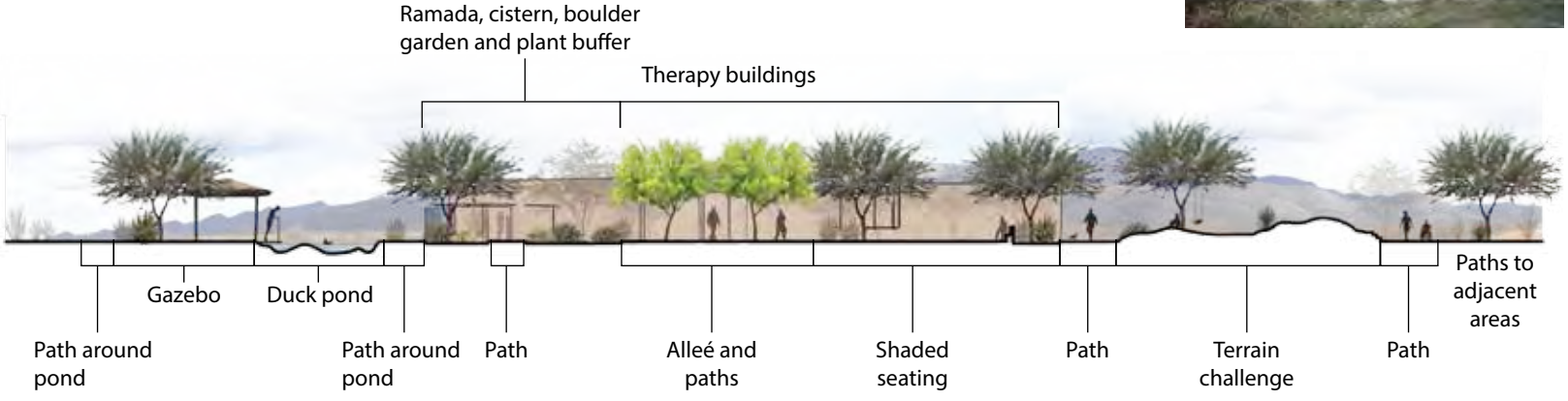
The above illustrations give a closer look at the therapy garden. The Terrain park can be seen on the right with the therapy buildings in the background. As mentioned earlier, this area will have levels of difficulty and should have shaded areas for sitting and resting. The hills will also provide a visual buffer from the more public buildings and spaces to the east. At left is an area of shaded seating with the sundial further beyond. The predominant trees in this space are velvet mesquite. Secondary trees are desert willow and canyon hackberry.

The central sundial image on the following page (top) has a path of pavers ringing it. Pavers of varying textures and patterns will be used as a wayfinding strategy directing residents to different areas of the site.

Visible in this image is the ramada with cistern, the sensory garden, boulder garden, alleé and shaded seating.

The section (bottom right) shows the therapy garden looking towards the buildings. The right side shows the terrain challenge and the level changes.

A sundial serves as a meeting place. From here distinct paths lead to various areas of the therapy garden.



The Therapy Commons serves as a place for residents to engage in indoor and outdoor activities where they have the opportunity to participate in activities that foster mental and physical health and wellness. For staff members and potential students and researchers, this serves as a place to encourage, inspire, teach and learn in a comforting, calming and relaxing environment.

The differing lifestyles of the residents are integrated into this space as each resident has control and choice in their therapy activities. Each can control and manage a number of factors including the amount of interaction they have with other residents, whether they would like to do their activity indoors or outdoors and environmental factors such as the amount of sunlight or ventilation entering their space.

THERAPY BUILDING PROGRAM

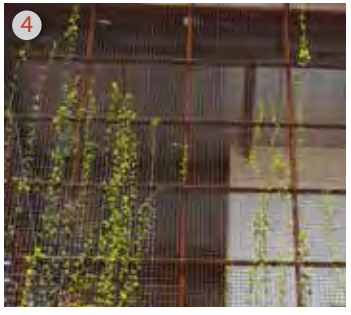
1. Classrooms for training and research
2. Main activity building with exercise, activity and meeting rooms
3. Opportunity to bring activities outdoors
4. Outdoor pool for water therapy
5. Outdoor classroom space
6. Smaller activity building with meeting spaces for phasing purposes
7. Outdoor therapy garden and relaxation

SUSTAINABLE STRATEGIES

- Rainwater collection system
- Operable windows
- Operable shading screens
- Thermal rammed earth wall
- Indoor and outdoor therapeutic activities
- Landscape irrigation collection system
- Natural ventilation
- Daylighting strategies

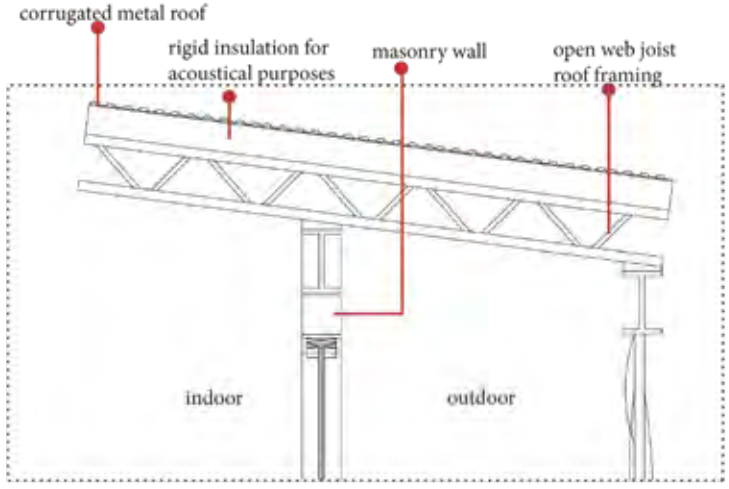
DESIGN CONSIDERATIONS

1. Rammed earth wall construction for low construction costs as soil can be obtained on site creating a harmonious relationship with the desert environment
2. Frosted glass sliding doors on the interior to allow for flexible spaces and privacy dependent on the needs of the residents
3. Masonry walls for low maintenance and construction will create a clear visual relationship with other materials on site
4. Operable rusted metal screens on the building facades to respond to climatic conditions and privacy needs



FLOOR PLAN KEY

1. Classrooms
2. Activity rooms
3. Outdoor activity Spaces
4. Indoor/outdoor pool
5. Outdoor classroom
6. Bathroom
7. Meeting spaces
8. Multi-purpose room
9. Locker room
10. Fitness room



By offering both indoor and outdoor spaces for different activities, each resident is given a choice, promoting a healthy and independent lifestyle. Residents have the ability to control and manage their environment.

Operable rusted metal shading screens shown here offer flexibility and privacy for residents. By limiting visual connections to adjacent areas on the site, residents are not subjected to sensory overload and can focus on their activities.

AESTHETIC

- Operable and flexible spaces provide adequate ventilation and are able to accommodate different lifestyles and preferences.
- Natural light is available in all rooms through the use of indirect lighting and clerestory windows to reduce glare.
- The design has a sense of clarity and order to provide a calming effect for residents.

ECONOMIC

- Constructability can be done by the residents themselves.
- Low-maintenance materials and systems
- Use of on-site dirt for construction of rammed earth wall.

ENVIRONMENTAL

- Rainwater collection from the roofs for landscape restoration and irrigation.
- Grey water collection for non-potable uses back into the building.

FUNCTION

- Supervision and ease of observation are elements of managing the environment to ensure safety.
- Operable building components give residents the ability to adjust climatic elements such as sunlight, temperature and natural ventilation.
- Connection of learning and teaching with activity room and adjacencies.
- Buildings surround a central courtyard for safety and security
- Indoor and outdoor activity spaces.

SOCIO-CULTURAL

- Spaces designated for outreach from community and research initiatives
- Indoor and outdoor multi-purpose spaces that can be used for a variety of different users

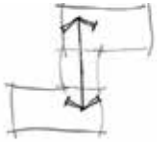
THERAPEUTIC

- Simple building strategies and materials to minimize sensory overload
- Provides adequate choice and independence while ensuring safety with internal courtyard/patio spaces
- Provides an area on site away from living and working
- Design of all spaces accommodate and encourage physical movement.

FORM EVOLUTION

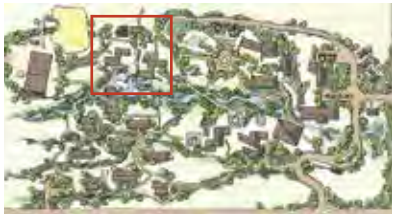
The building is oriented East-West to minimize extreme sun exposure thus reducing cooling costs.

Splitting will create two common areas for interaction.



Separating the building creates air flow which encourages outdoor activities.

Northeast and west views break the rigidity of the building exposing views to the mountains to provide a calm interior space.

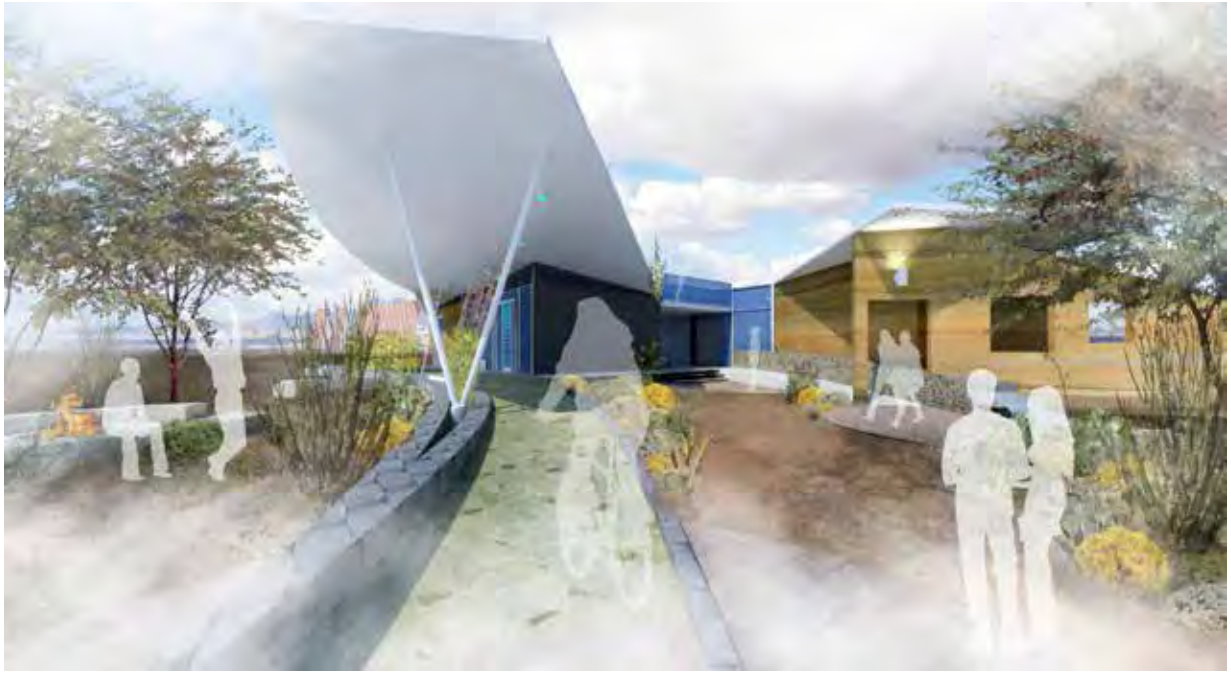


N 0′ 15′ 30′ 60′

GROUP HOME CONCEPT

The group homes and step down housing are nestled in the heart of Echoing Hope Ranch and offer residents access to the surrounding amenities through a series of natural trails. The architecture was designed to celebrate views of the beautiful mountains surrounding the site, bringing comfort and a feeling of peace to the residents. A sequence of gardens, courtyards, and a seasonal wash create a seamless line between outdoor and the interior spaces. Water harvesting techniques provide therapeutic opportunities for residents as they construct and grow their own gardens.

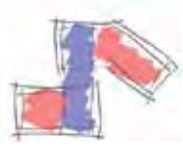
GROUP RESIDENCE



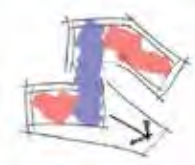
RESIDENTIAL PROGRAM

1. Parking
2. Group homes
3. Water harvesting plaza
4. Step down housing
5. Edible gardens, gabion canals
6. Shade ramada
7. Fire pit and seating
8. Island with swings
9. Gabion walls, slow water
10. Seasonal wash

ROOF EVOLUTION

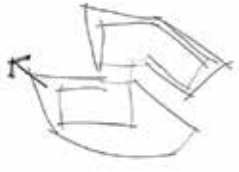


The blue is the interaction zone where living room, kitchen, and dining are located, whereas the red indicates private rooms. The roof is extended to protect the building from rain water.



To indicate the main entrance, the roof reaches over public circulation shading the south facade from the summer sun.

The public north/south axes of the building form the extensions of the roof creating the main entrance.



Water shed is a therapeutic and sustainable strategy which is celebrated in the roof.

Privacy. Interaction. living.

AESTHETIC

- Natural light in all rooms
- Acoustic insulation to contain noise
- Reduced glare through clerestory
- Easy texture materials with soft color finishes
- Use on-site stone and soils for gabion walls, rammed earth for walls
- Natural wash changes with the seasons and offers therapeutic value as a place to escape

ENVIRONMENTAL

- Exposed roof and landscape water harvesting system for therapeutic and sustainable strategies
- Gray water use for irrigation and landscape restoration

FUNCTION

- All exterior doors are accessible through a ramp.
- Seating in landscape to provide socialization
- Exterior and motion activated lighting
- Outdoor dining area can be open to both living room and kitchen to create flexible space for bigger activities
- Operable windows in all living areas
- Open, shared courtyard allows for cross ventilation and natural light.
- Shade control outdoors and on windows and doors.
- Private places, opportunities for social exchange, accessible, and areas for activities

SOCIO-CULTURAL

- Edible gardens that residents will take care of
- Connected living areas provide opportunities for interaction.
- Construction of gabion walls and canals for garden beds provides the opportunity to learn a trade.

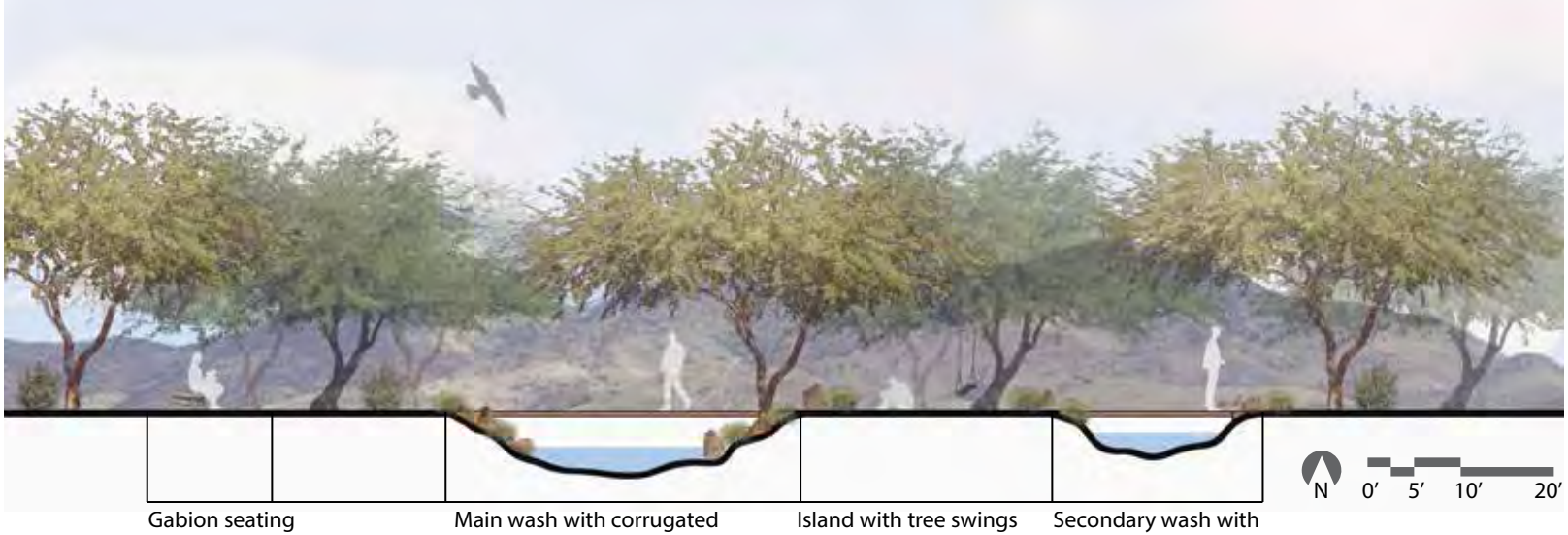
FLOOR PLAN KEY

1. Living room
2. Bedroom
3. Bathroom
4. Kitchen
5. Dining room
6. Laundry closet
7. Mud room

ABOVE: Bedrooms areas are surrounded by rammed earth walls that might be built by the residents once the slab is poured under supervision. The walls would be divided into equal zones for use of same form work. Glass facades would then be applied.

SUSTAINABLE STRATEGIES

- Rammed earth thermal mass wall
- Shading roof and screen
- Rain water collection system
- Private and public outdoor living
- Evaporative cooling

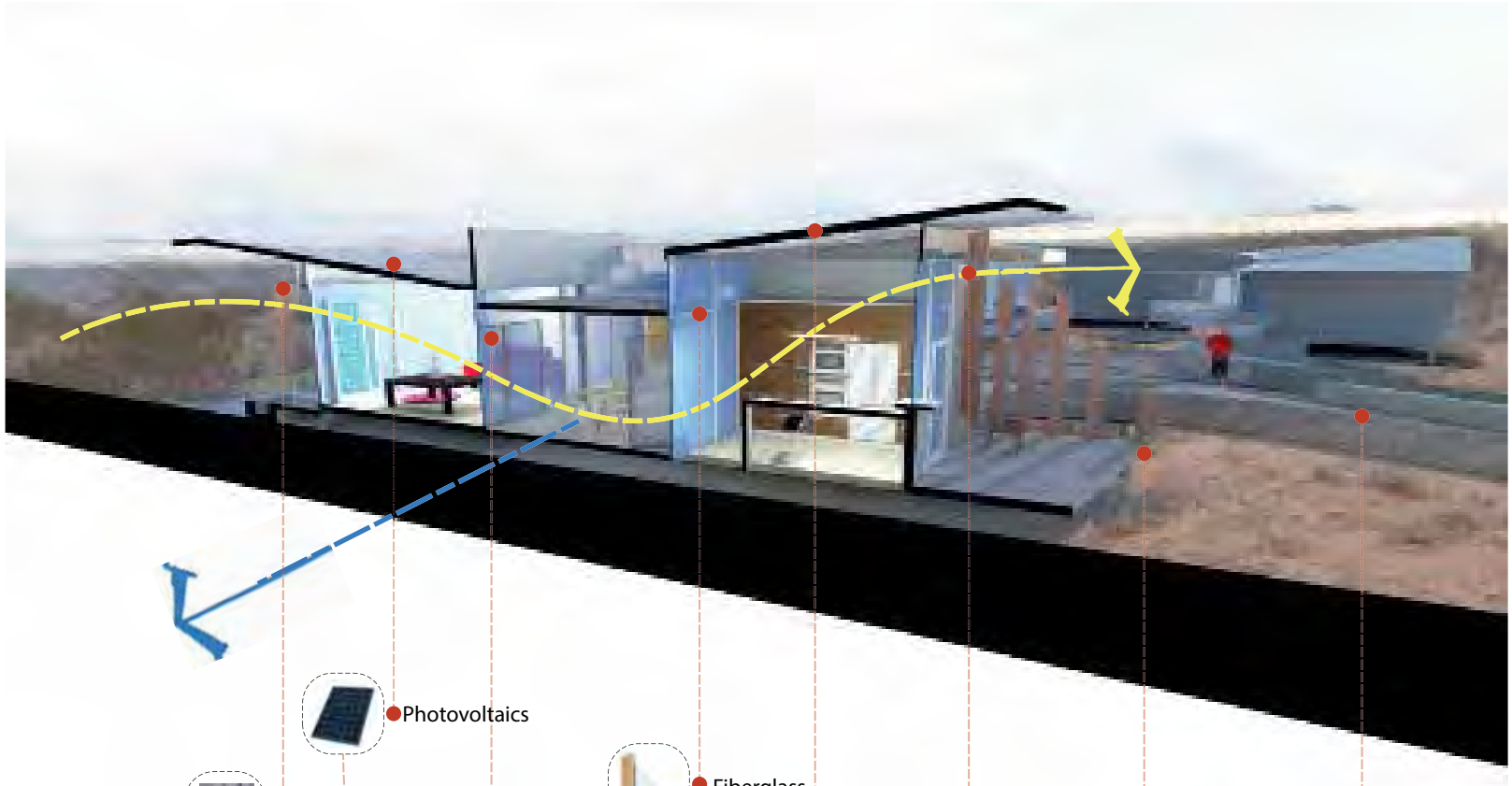


Gabion seating and fire pit

Main wash with corrugated metal bridge

Island with tree swings

Secondary wash with corrugated metal bridge



Photovoltaics

Screening strategy

Insulated glass

Fiberglass mullion

Cross ventilation

Water shed

Existing site materials

Sheet flow

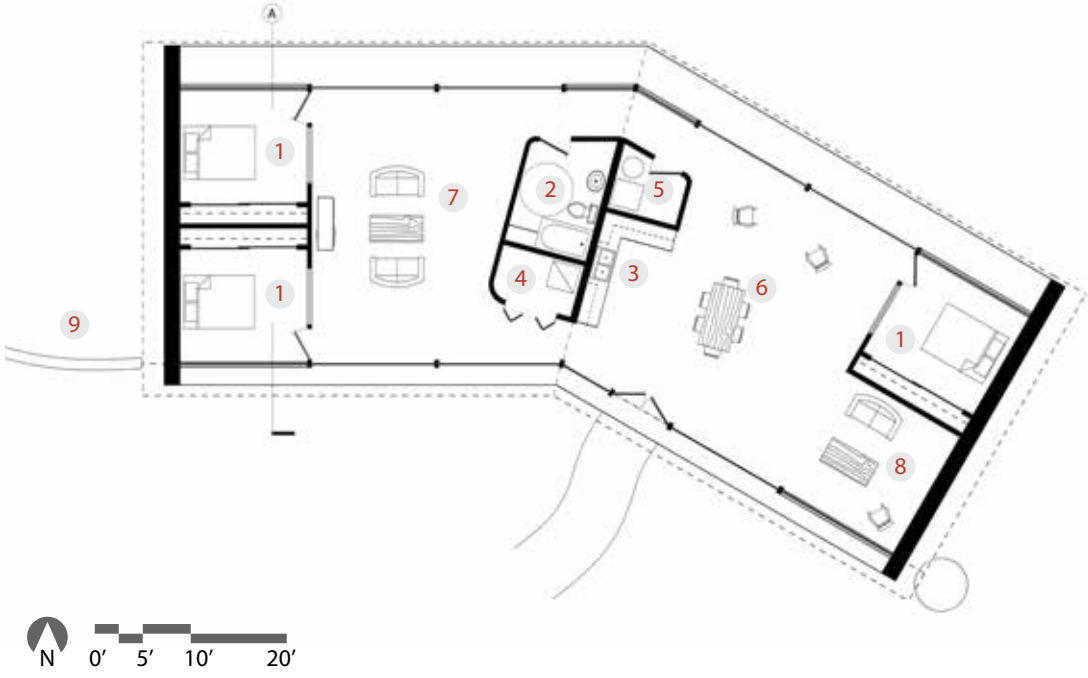
Insulated glazing minimizes noise and heat flow to the building. Screen built by residents filter views to entryway.

Natural air flow is maximized to eliminate use of air conditioning. Sun energy is introduced to reduce electricity costs.

Rain water collected from roof is directed through gabion walls built with local stones, to edible gardens.

FLOOR PLAN KEY

1. Bedroom
2. Bathroom
3. Kitchen
4. Laundry/Storage
5. Mechanical
6. Dining
7. TV Lounge
8. Reading/Relaxing
9. Gabion water canals



STEP DOWN HOUSING CONCEPT

As the residential focus for those on the lower-functioning end of the autistic spectrum, the Step-Down house is located at the perimeter of the development, yet close to staff and amenities. Providing housing for three residents and room for attending staff, the step down house has three bedrooms, one accessible bathroom, a kitchen, and ample spaces for sitting and storage. Wherever possible, reclaimed materials can be used and, if practicable, constructed by residents. Rammed earth is one material that can be sourced on site and constructed by residents while providing beneficial therapeutic, tactile, visual, and acoustic properties. With visual access to and from the resident spaces as a driving factor, translucent and transparent surfaces are used whenever possible; for example, between the bedrooms and the sitting area. Providing an economic, environmental, functional, aesthetic, and therapeutic benefit, the roof collects rainwater and channels it into a cistern on the east and a gabion wall water feature on the west, where edible gardens can be planted.

LEFT: Stone gabion canals can be constructed by residents and used to harvest water for edible gardens.

RIGHT: As a model for future development, the building draws its inspiration from, and responds to, its immediate environment much like the work of Glen Murcutt.

Shows the transparency of the step down housing. An entire wall of windows allows the residents scenic views of the Mule Mountains from the lounge and dining areas. The stone gabion wall to the west harvests water from the roof and pulls it into edible gardens.

Tempered glass openings in bedroom walls and long corridors within the building provide visual access between caregivers and residents. Fewer walls within the building allow for a sense of openness and uninhibited movement while still maintaining a degree of privacy and opportunity for escape for residents.

TOP: Casa Jax, Rick Joy Architects. Dwellings clad in plate steel with a ventilated air space, allowing heat to be exhausted via natural convection currents.

MIDDLE LEFT: Underwood Garden, Ten Eyck Landscape Architects. Dry wash seasonally conveys harvested rain water.

MIDDLE RIGHT: Existing wash reveals landscape function.

BOTTOM: Desert Broom Library, Richard+Baur. Steel bridge spans dry wash.

IDLA NEIGHBORHOOD

After a full day of riding horses or tending seedlings at the native plant nursery its finally time to come home and unwind. Private indoor and outdoor spaces welcome residents that need a moment alone while the Common House offers connections with friends when the feeling strikes.

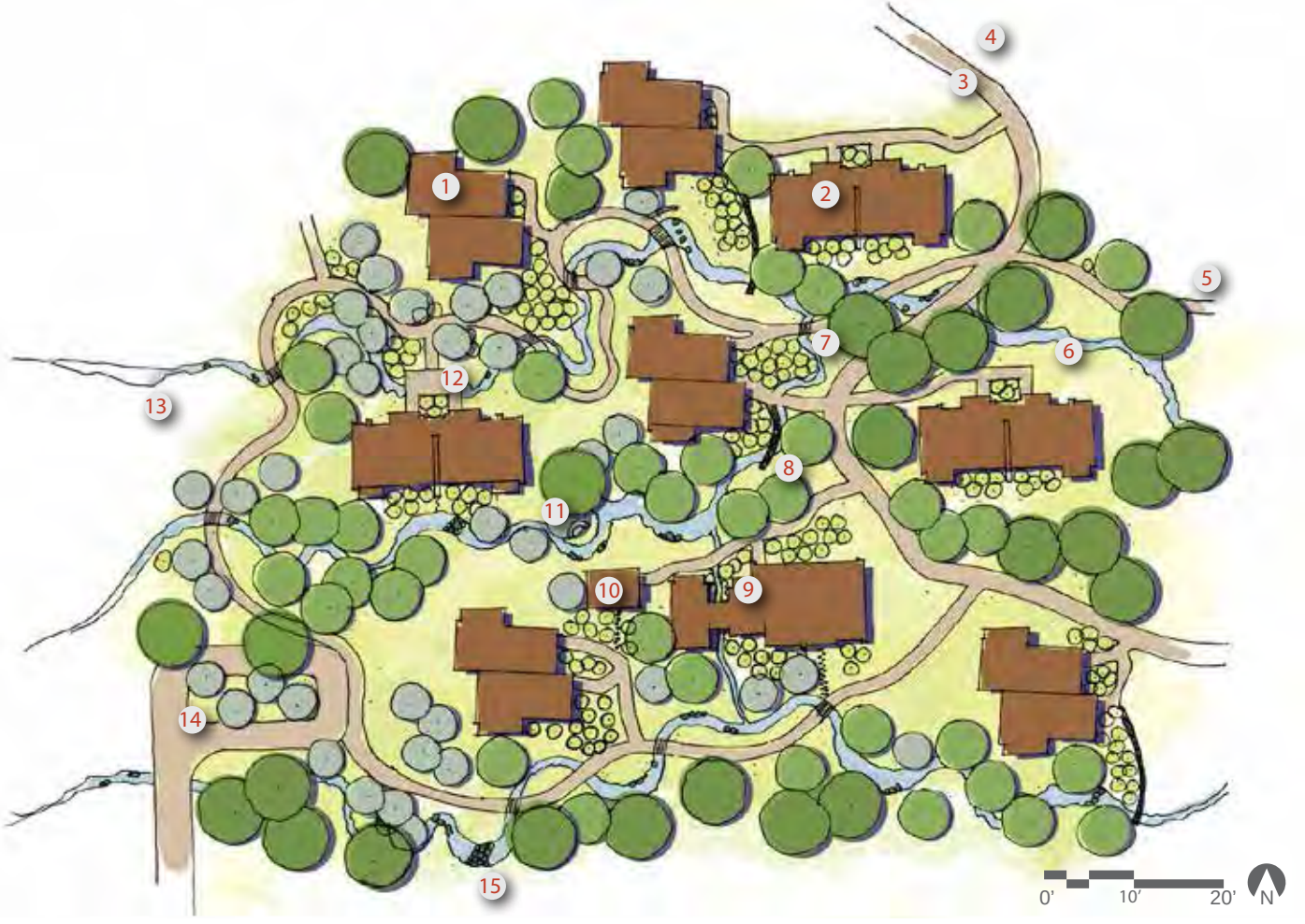
The neighborhood consists of 16 residences in 8 duplexes and a Common House with a shared kitchen and gathering space. Attention is paid to economic and environmental constraints. Rammed earth walls provide thermal mass minimizing differences in temperature while windows are placed to enhance views and maintain consistent quality and quantity of light throughout the day.

Each residence is equipped with its own bedroom, living/dining area, small kitchen, private bathroom and patio. Inside the Common House, residents share indoor and outdoor cooking areas, dining and living areas, laundry facility areas and cozy nooks for staff.

Integrated into each building rooftop is rainwater catchment that feeds the meandering wash and rain water gardens outside. Graywater also feeds into the washes providing consistent irrigatiotn for the desert landscaping lining them. Inspired by the ribbons of washes that flow to the San Pedro River, the wash and trail system connects people, water, and buildings to the land.

IDLA PROGRAM

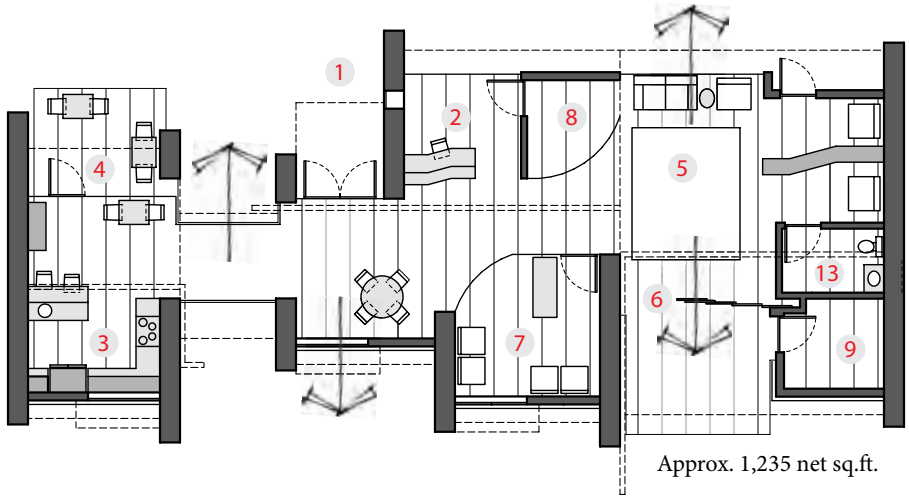
1. West view oriented residence duplex
2. North/South view oriented residence duplex
3. 8' wide multi-use trail with permeable pavers
4. Trail connection to Main Wash
5. Trail connection to Central Courtyard
6. Wash and gully system fed by graywater and rainwater collected from building roofs
7. Rusted metal bridges over dry/wet washes
8. Gabion wall
9. Common house with rain garden
10. Ramada with picnic tables and barbeque
11. Shaded seating area
12. Shared deck extending over wash
13. Wash system extends into revegetation and existing vegetation areas
14. Parking groves with permeable decomposed granite surfaces direct road access to major roadway (West Red Mountain Road)
15. One rock dam erosion control



IDLA PROGRAM

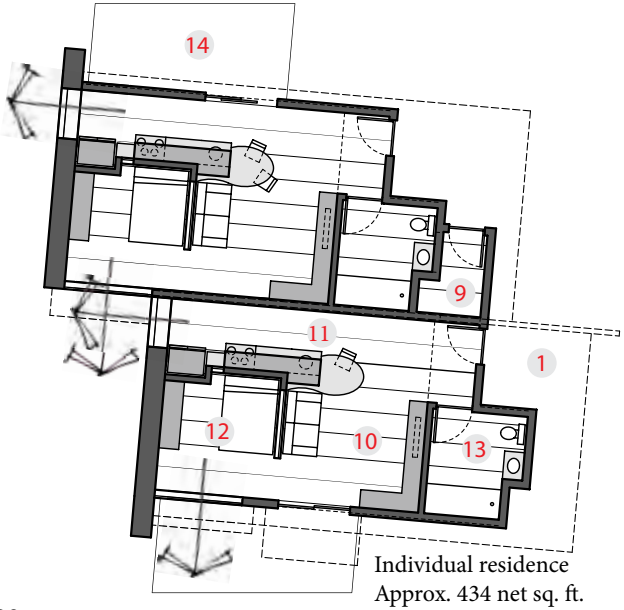
1. Entry patio
2. Staff area
3. Common kitchen
4. Dining areas
5. Common gathering space
6. Indoor/outdoor patio space
7. Laundry room
8. Storage closet
9. Mechanical closet
10. Living area
11. Kitchen/dining area
12. Bedroom
13. Bathroom
14. Private outdoor patio space

Floor Plan–IDLA
Common house



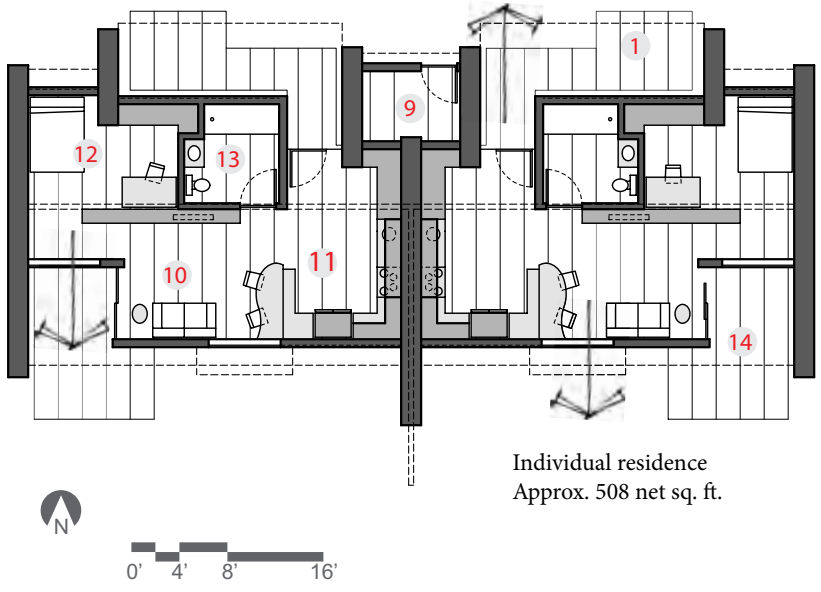
Approx. 1,235 net sq.ft.

Typical Floor Plan–IDLA
West view oriented residences

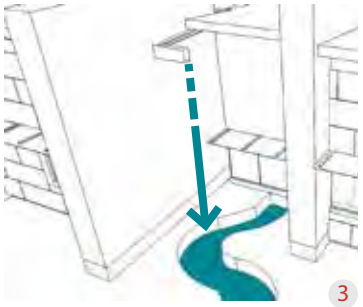


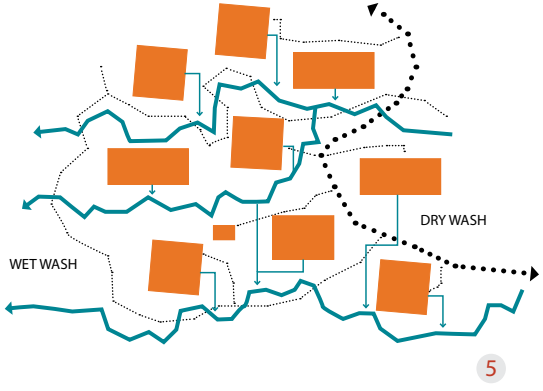
Individual residence
Approx. 434 net sq. ft.

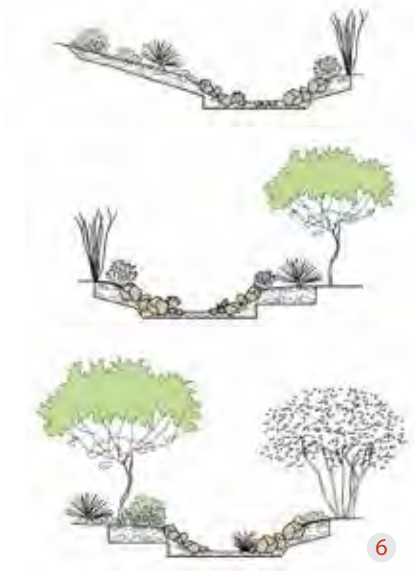
Typical Floor Plan–IDLA
North/south view oriented residences



Individual residence
Approx. 508 net sq. ft.







MAKING CONNECTIONS

1 2 Wash and trail system connects people to each other, their workplaces, and seasonal climatic variations

3 A simple downspout pours rooftop rainwater into rain gardens

4 Rain gardens slow down the water that will eventually flow into the washes

5 Inspired by natural processes gardens, trails and washes work as a system to connect people, water, buildings and the landscape

6 Wash vegetation responds to access to water telling the story of how water moves across the landscape, creating microclimates and biological adaptation

TOP: Tucson Mountain House, Rick Joy Architects. Butterfly roof form creates a dynamic interior space.

MIDDLE LEFT: Water channel at ostdamer Platz, Atelier Dreiseitl The water channel collects rainwater from surrounding building rooftops.

MIDDLE RIGHT: Garcia Residence, Ibarra Rosano Design Architects. Window opening frames a view of the surrounding desert landscape.

BOTTOM: Alluvial fan inspires function and layout of wash and gully system.

AESTHETIC

- Materials harmonize with local ranch and historical buildings
- Homes oriented to accent mountain views

ECONOMIC

- Ranch residents can construct elements such as gabion and rammed earth walls
- Cut from wash areas can be used for rammed earth walls

ENVIRONMENTAL

- Roof forms intended to maximize catchment of rainfall
- Meandering wash ribbons retain gray water and harvested rainwater to irrigate revegetation areas and vegetation
- Trees provide shade and protect housing walls from intense summer sun

FUNCTIONAL

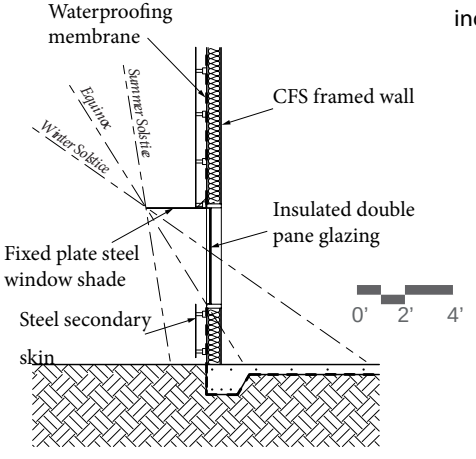
- Orientation for passive solar strategies
- Buildings contributing to windbreak strategies
- Multi-use trail connects residents to work and play

SOCIO-CULTURAL

- Small neighborhood arrangement

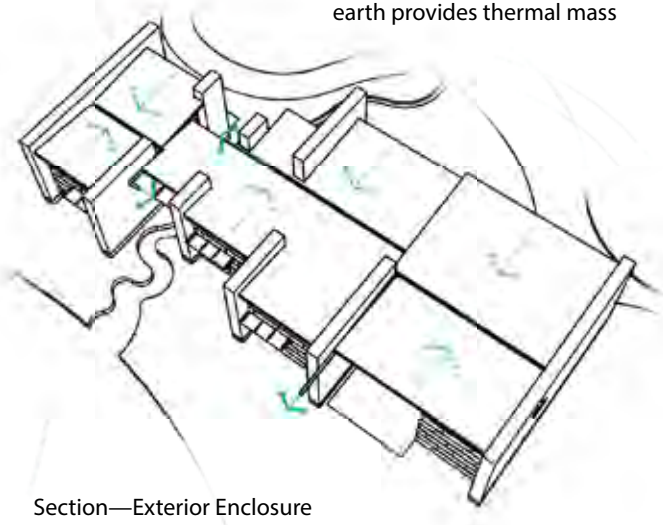
THERAPEUTIC

- Independent living, varied floor plans, and proximity to varied amenities offer flexibility and choice
- Minimized “blind” corners specifically
- Secluded indoor and outdoor spaces for private moments through curved walls in common areas
- The sounds of wind in trees and running water buffer road noise



Roof Slope and Drainage Diagram
Slope of 1" in 12"

Convent Avenue Studios, Rick Joy Architects. Roof structure detail; wood beams delicately rest within rammed earth wall.



Section—Exterior Enclosure
South wall of common house

Masterplan

ABOVE: Landscape Design Edinburgh, Andrea Cochran, Sean Godsell

BARN CONCEPT

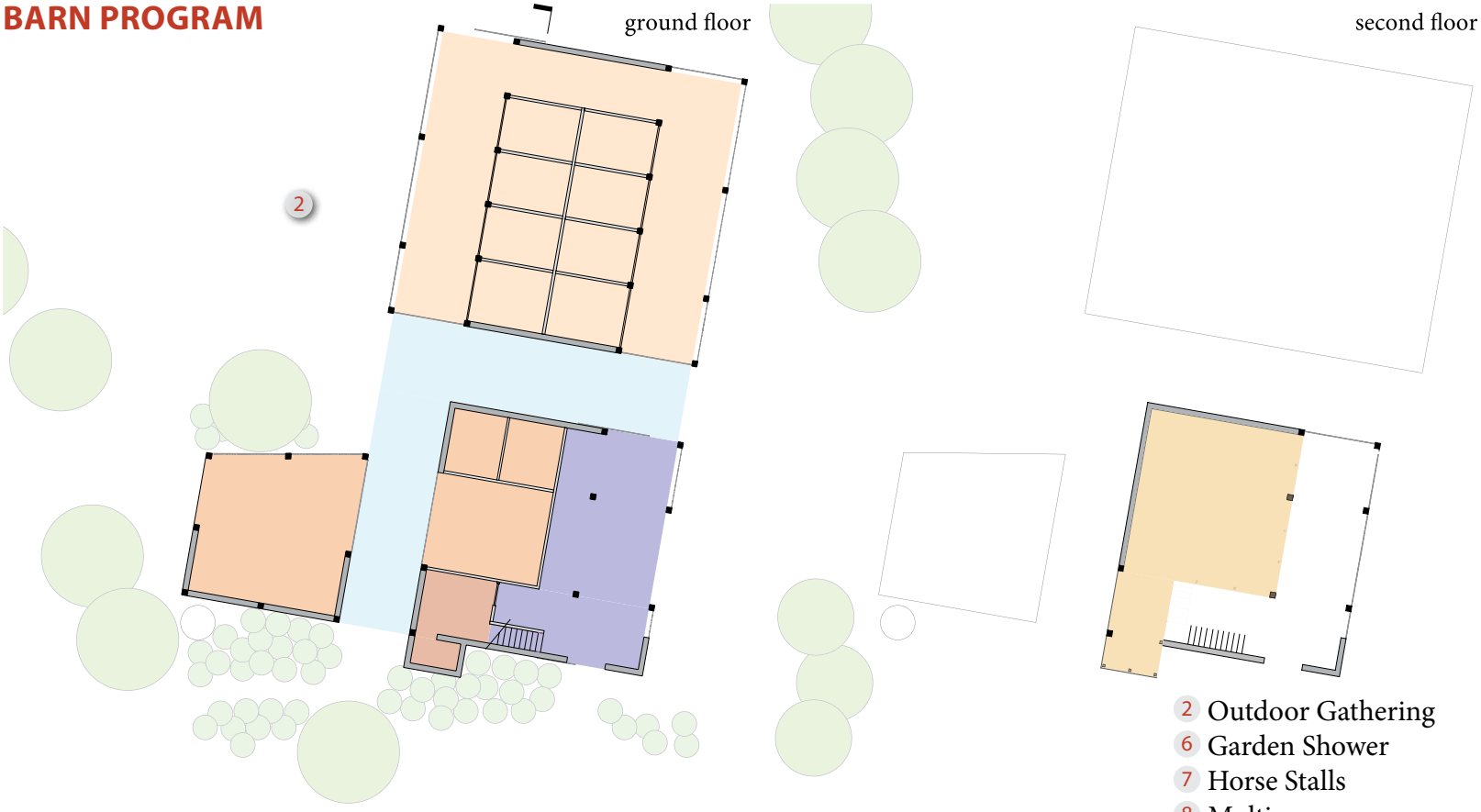
The barn serves as a multi-faceted facility; bringing together the Echoing Hope Ranch community and providing options to suit diverse lifestyles. Each resident is a rancher, farmer, builder, student and teacher. The idea of opportunity manifests here; welcoming in the community; bringing residents together; allowing animals to live happily; and letting the environment benefit from Echoing Hope's presence.

Natural resources are celebrated in a space that is designed to encourage various forms of activity. The barn represents the termination point of the living machine system, and the beginning of a new biologic and ecologic cycles.

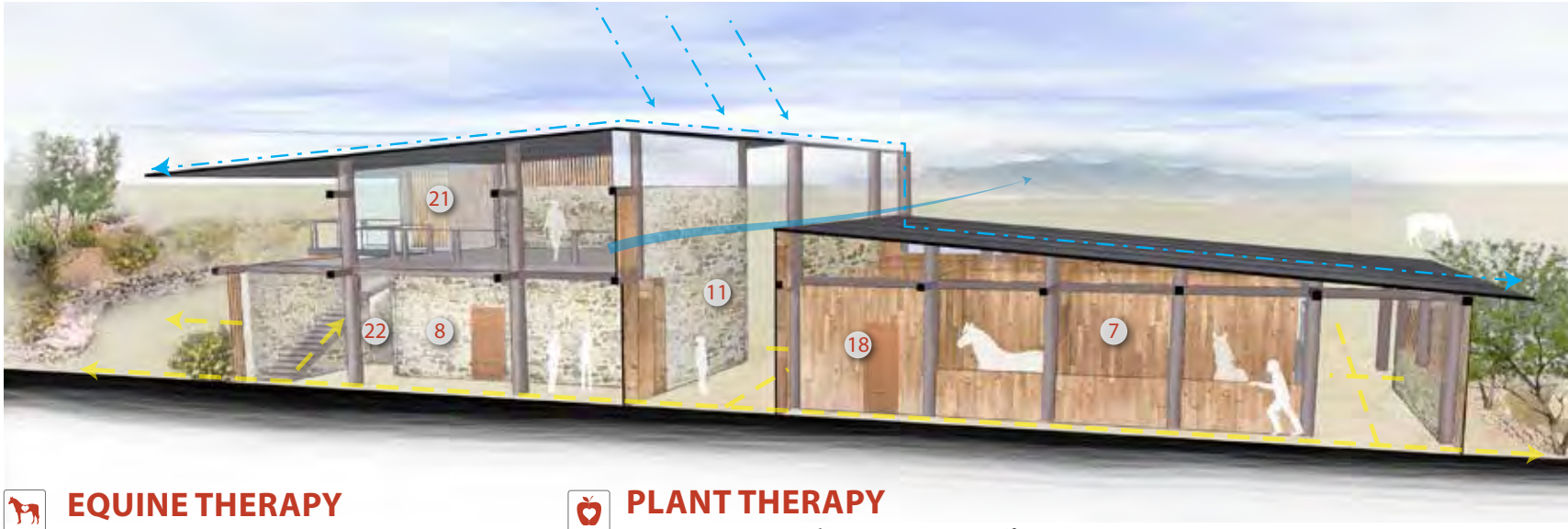
BARN PROGRAM

1. Pedestrian pathways
2. Outdoor gathering
3. Isolation vista
4. Meandering wash
5. Grasslands
6. Garden shower
7. Horse stalls
8. Multi-purpose
9. Shop
10. Materials storage
11. Covered breezeway
12. Chicken coop
13. Composting bins
14. Arena
15. Grazing pastures
16. Access road
17. Rainwater collection

BARN PROGRAM



2 Outdoor Gathering
6 Garden Shower
7 Horse Stalls
8 Multi-purpose
9 Fabrication Shop
10 Materials Storage Barn
11 Covered Breezeway
17 Rainwater Collection
18 Tack Room
19 Wash Room
20 Feed + Bedding Storage
21 Loft Studio
22 Restroom
23 Tool Storage



EQUINE THERAPY

Equine Assisted Therapy uses horses for emotional growth. Participants in therapy use feelings, behaviors, and patterns to better understand the horse and themselves. Much of the equine therapy is facilitated by non-verbal communication skills. Horses communicate by use of body language and often mirror the emotions and behaviors of those that surround them. Equine Therapy is effective in building confidence, improving communication and giving personal insights to involved participants.

This therapy focuses on learning to manage a horse psychologically, not just skills testing. Students of equine therapy first learn to simply groom a horse. Step by step they gain confidence in themselves and the trust of the horses. They move through various stages in equine therapy to eventually riding through canyon trails.

PLANT THERAPY

Revegetation and Preservation efforts are incorporated into the barn planning strategy in both passive and active applications.

Seasonally rotating pastures give a chance for heavily compacted, grazed land to revitalize. Revegetation efforts in a pasture's 'off-season' can serve a greater economic purpose by converting to a pumpkin patch during the Fall season or any of several potential crop or plant types suited for the site soil conditions.

Chickens peck and scratch at the land to prepare the soil for cultivation. Compost from horse and chicken manure are used as fertilizer in such restoration and growing efforts across the site.

Grey water from barn facilities, as well as collected rainwater from roof runoff, is reused in landscape irrigation.

TOP: Cirque Lodge Rehab

BOTTOM: Chickens feeding

TOP to BOTTOM: cistern, dividable space, pumpkins as seasonal crops

AESTHETIC

- Divisible spaces can adjust to accommodate resident social sensitivity as well as thermal comfort.
- Iconic barn elements and form
- Water collection and irrigation strategies highlighted in landscape

ECONOMIC

- Egg production
- Seasonal crop cultivation in rotation pastures
- Shop area for project fabrication on-site or use for sale. Potential community source
- Constructability by unskilled laborers
- On-site maintenance and construction shop as resource. Fabrication and assembly by residents and staff.

ENVIRONMENTAL

- Rainwater collection into cisterns
- Grey water returned to adjacent gardens
- Seasonal rotation pastures reduce wear on the land and allow for restoration
- Chicken and horse waste composted and used as fertilizer in restoration/ preservation areas

- Utilization of permaculture guilds as complimentary plants in growing process

FUNCTION

- Pasture areas wrap programmatic space to create secure borders
- vegetative security and wind buffer

- Operable building elements allow for climate adaptation, reducing need for mechanical air and lighting
- Divisible interior space allows for variety of user groups and functions

SOCIO-CULTURAL

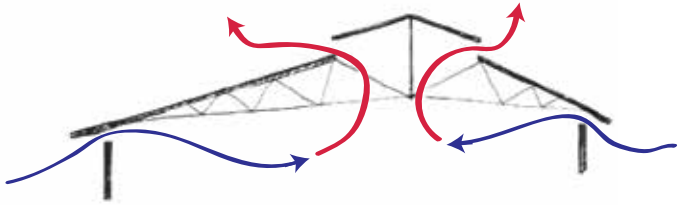
- Community members can outsource small shop projects, or resident created projects for on-site use or retail sale.
- Studio loft for overnight visitors or as staff accommodation
- Indoor and outdoor multi-purpose spaces able to accommodate ranges of users for different activities including social gatherings, such as barn dances

SUSTAINABLE STRATEGIES

Natural Ventilation

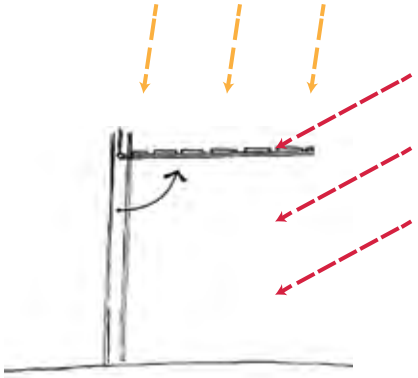
Air enters the building through slatted panels on the ground floor and exits from operable roof vents in the roof structure.

Transitional covered breezeways connect programmatic spaces and frame views of surrounding environment.



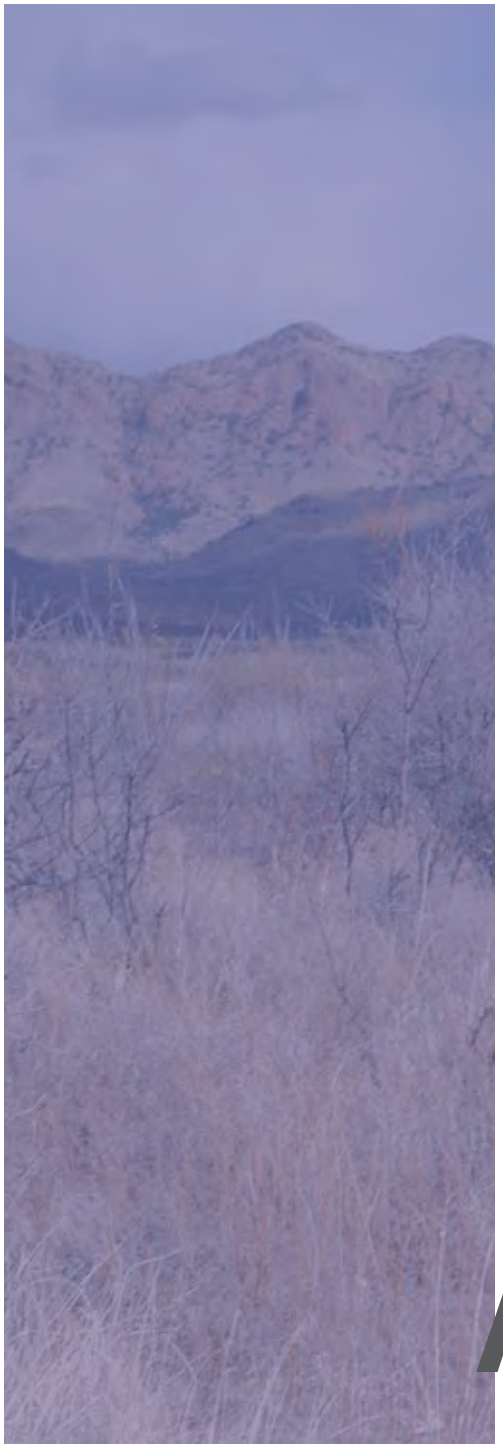
Operable Facade

Slatted wall panels fold upward to transform interior space to covered patios. In a closed condition, panels allow for passive ventilation and natural light to enter the space.



Thermal Mass Wall System

Stone walls enable building to absorb, store, and later release significant amounts of heat collected throughout the day. The material also allows for low acoustic transmission.



Appendices

ARCHITECTURE AND AUTISM

Floor Plan Strategies:

Space planning should encourage choice, autonomy and independence for residents. Attention to connectivity within the floor plan and its impact on wayfinding will lead to a more effective use of all household spaces.

- Predictability in the environment, demonstrated through transparency in spatial sequencing, smooth transitions between rooms and uses, and the potential to establish routines, assists in keeping arousal levels low and minimizing resident stress.
- Design of all spaces should accommodate and encourage physical movement. Spontaneous gross motor activity is common among people with autism and the living environment must support that.

Outdoor Spaces:

Secure, shaded outdoor areas offer opportunities for residents to tend gardens and socialize.

- Include a covered walkway or porch at unit entrance to shield residents from inclement weather and to offer opportunity for neighborhood interaction.
- Install low maintenance landscaping that offers residents the opportunity to care for it.

Living/Community Rooms:

Living rooms should provide residents with a variety of options.

- Provide a range of communal areas for different types of interaction.
- Provide space for residents to meet with their family that is separate from central living area: the presence of unfamiliar people may inhibit other residents.

Kitchens:

Providing ample counter space to accommodate multiple users and independent living aides (e.g. computers) facilitates residents success and satisfaction.

- Kitchen countertops need to be extremely durable, fire and heat resistant, and easily cleaned and disinfected.
- Solid surface countertops with an integral backsplash such as Silestone, Corian, granite, or concrete are durable choices for kitchen and bath.

Bedrooms:

Individual bedrooms with en-suite bathrooms, adequate storage, and a desk provide residents with privacy and dignity.

- Each bedroom should have individual climate control and a ventilation fan.

Sensory Rooms:

Providing a separate room that allows residents to control the atmosphere leads to decreased stress and anxiety.

- A room that allows residents to modify the sensory inputs such as lighting and music helps people with autism relax, process the larger environment, and modify behaviors.
- Sensory rooms should be painted white or soft colors to produce a calming effect.

Technology:

Technology should be unobtrusive, easy to use and modify, and fail-safe; it should enhance resident independence and support staff. Privacy issues must be considered before selecting any monitoring technology.

- Appropriate fire safety systems should be installed: select alarms with visual explanations and talking alarms for smoke detectors.
- Provide a "Staff Attack" alarm system to allow staff members to call for assistance in the event of an emergency.

Appliances and Fixtures:

Safety controls on appliances are essential since people with autism often experience inattentiveness, high pain thresholds, and the inability to recognize problems. Durability, quietness, and ease of use also are important.

Visual Cues:

Individuals with ASDs often experience attention difficulties and stimulus over-selectivity. Improve this by keeping visually distracting elements to a minimum. Opt instead to employ appropriate visual cues that assist residents with daily activities.

- Minimize detail since visual clutter may lead to stimulus overselectivity causing an individual to fixate on a particular object or aspect in the environment.

Ventilation:

Adequate ventilation reduces unwanted smells that can negatively affect individuals with hyperreactive (extremely sensitive) sensory processing.

- Use silent, ducted exhaust fans in bathroom and kitchen such as Ultra Silent NuTone ventilation fans.

Lighting:

People with autism often experience visual perceptual problems that are exacerbated by lighting conditions. A range of lighting options should be provided with the optimal environment featuring non-glare surfaces, no-flicker bulbs, and lots of natural light controlled by window blinds or other coverings.

- Natural light should be available in all rooms.
- Provide opportunity to maintain even lighting levels through dimmer switches, easy-to-adjust window blinds, etc.
- Reduce glare through use of indirect lighting, clerestory windows, and awnings.

Acoustics:

To accommodate rural sensitiveness, ambient noise levels should be reduced as much as possible. Building systems and appliances designed for quietness should be selected and sound-proofing insulation in ceiling and walls should be increased.

- Choose quiet systems to minimize ambient noise: HVAC, ventilation, appliances.

Materials:

People with autism often have underlying health issues that are exacerbated by environmental chemicals. Prevent chronic exposure to indoor air pollutants by selecting durable, nontoxic building materials and finishes. Durability is also a concern.

- Install nonslip flooring in bathrooms, kitchens, and laundry rooms, such as textured ceramic tile.
- Avoid carpet with strong weave or pile as it may be a trip hazard.
- Create smooth, flush flooring transitions between rooms.
- Avoid materials and finishes with distracting patterns or excessive embellishing: for people coping with stimulus overselectivity, patterns and embellishes may cause them to fixate unnecessarily.
- Choose paint in soft colors rather than bright, primary colors.
- Use contrast (tonal value vs. bright color) to indicate light switches, electrical outlets, and other pertinent features.
- Select materials that create a warm home environment rather than an institutional atmosphere.
- Select hard, continuous surface flooring such as bamboo, wood, tile, or natural linoleum.
- Use carpet tiles rather than rolled carpet for easy replacement. Carpet is not as durable as other flooring options and is best restricted to use as area rugs or runners.

WHY IS RESOURCE USE IMPORTANT?

According to the U.S. Energy Information Administration (EIA), the Building Sector consumes nearly half (49%) of all energy produced in the United States. 77% of all the electricity produced in the U.S. is used just to operate buildings. Globally, these percentages are even greater. Therefore anything EHR can do to reduce it's energy use helps not only the economic viability of EHR but serves as model to other builders and designers.

There are a number of organizations and efforts occurring to reduce energy use which could be investigated further for refinement of EHR designs. They all seek to primarily raise awareness but also to incentivise appropriate resource use behaviors and penalize inappropriate behaviors. They include:

- LEED
- Living Building Challenge
- Passive House
- Net Zero
- Carbon Neutral
- Local regulation
- Transit oriented development

For EHR, the following are the most likely candidate resources for use reductions and reuses:

- Water (potable, rainwater, gray water and black water) (See Appendix)
- Tidal Wetlands Systems (See Appendix)
- Energy (in all forms)
- Composting Toilets
- Land (especially undeveloped "green fields")
- Material consumption (recognizing a range of embodied energy and impacts in the creation of building materials and the potential for reuse)

Several efforts concern themselves with resource use beyond the immediate realm of the buildings themselves, considering the indirect resource implications of building decisions on issues of transportation for example.

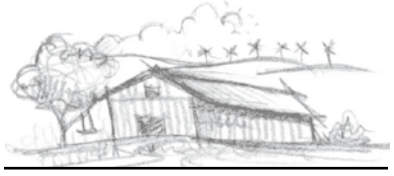
In order for EHR to achieve some of these resource use reductions, they could practice some of the following strategies.

- Daylighting – design that allows interior spaces to receive natural daylight, minimizing or eliminating the need for artificial lighting and the associated energy and material.
- Passive solar design – using the sun to warm building interiors in cold weather while not allowing it to warm building in hot weather.
- Passive ventilation
- Cool towers
- Chimney effect
- Insulation and infiltration
- Thermal Mass
- Effectively moderating the high and low temperatures in the diurnal temperature swings in the desert

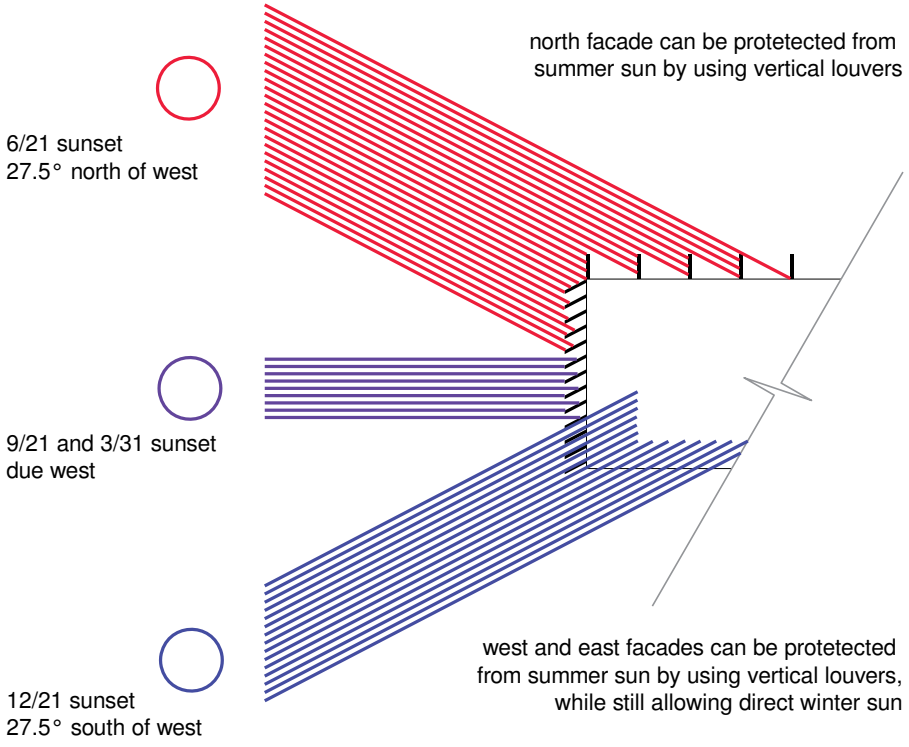
Other more specific details of strategies can be found in appendices that follow.

Design Implications

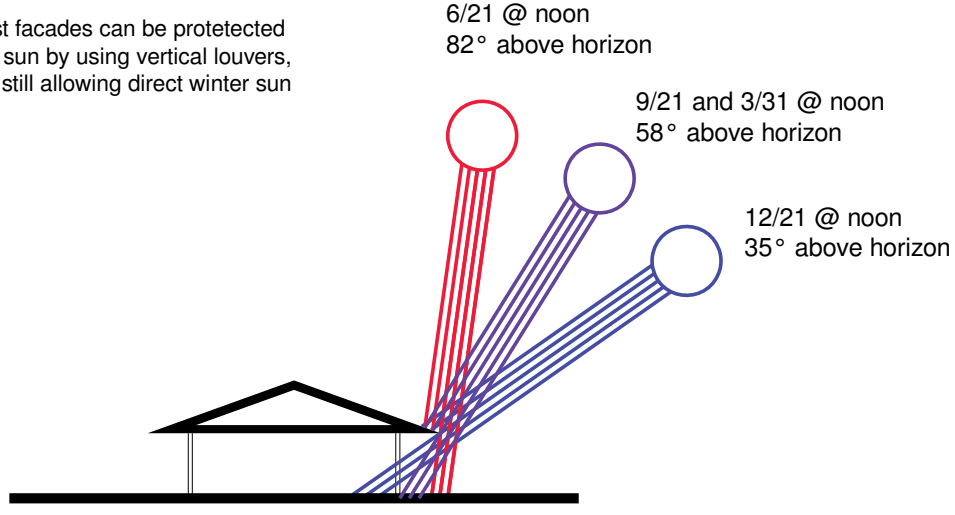
- East-west orientation in the desert
- Minimize windows and opening on east and west walls
- Operable windows on north and south walls
- Roof overhangs to the south
- Vertical shading devices to north, east and west
- Local materials
- Reusable materials
- Recycled materials and structures
- Design for long terms of service
- Native and drought tolerant plants to reduce or eliminate irrigation needs
- Deciduous plants to shade south-facing openings



SOLAR AND WIND



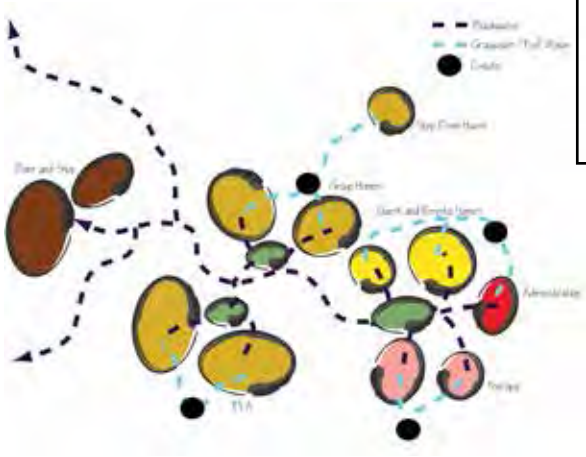
operable windows on both sides of narrow structures can take advantage of hot air rising to draw air through open interiors



south facade can be protetected from summer sun by using horizontal overhangs while allowing winter sun

RIGHT: This table illustrates the water harvesting potential of the EHR site.

BELOW: This diagram indicates sources and destinations of the different types of water which can be collected on EHR. A well to bring potable water to the site would still be necessary, but the quantity of water being pumped from the well would be significantly decreased by collecting and reusing as much water as possible on-site.



Data Source:				average rainfall		collected water	water used	calculated storage	actual storage	cistern
Bisbee Historic Rainfall				inches	feet	cu ft	cu ft	cu ft	inches	status
12/1/1892 to 2/28/1985										
Western Regional Climate Center			Jan	1.18	0.098	442.5	580.0	(137.5)	-	dry
http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?az0768			Feb	1.20	0.100	450.0	580.0	(130.0)	-	dry
			Mar	1.01	0.084	378.8	580.0	(201.3)	-	dry
			Apr	0.46	0.038	172.5	580.0	(407.5)	-	dry
Example Roof Area	4,500	square feet	May	0.22	0.018	82.5	580.0	(497.5)	-	dry
Cistern Capacity	2,250	cu ft	Jun	0.70	0.058	262.5	580.0	(317.5)	-	dry
Average Monthly Collection	582	cu ft	Jul	4.03	0.336	1,511.3	580.0	931.3	931	
Monthly Use	580	cu ft	Aug	4.64	0.387	1,740.0	580.0	2,091.3	2,091	
Monthly Use	4,339	gallons	Sep	1.98	0.165	742.5	580.0	2,253.8	2,250	full
			Oct	1.05	0.088	393.8	580.0	2,063.8	2,064	
Cistern Height	5		Nov	0.82	0.068	307.5	580.0	1,791.3	1,791	
Cistern Diameter	12		Dec	1.34	0.112	502.5	580.0	1,713.8	1,714	
			Jan	1.18	0.098	442.5	580.0	1,576.3	1,576	
			Feb	1.20	0.100	450.0	580.0	1,446.3	1,446	
			Mar	1.01	0.084	378.8	580.0	1,245.0	1,245	
			Apr	0.46	0.038	172.5	580.0	837.5	838	
			May	0.22	0.018	82.5	580.0	340.0	340	
			Jun	0.70	0.058	262.5	580.0	22.5	23	
			Jul	4.03	0.336	1,511.3	580.0	953.8	954	
			Aug	4.64	0.387	1,740.0	580.0	2,113.8	2,114	
			Sep	1.98	0.165	742.5	580.0	2,276.3	2,250	full
			Oct	1.05	0.088	393.8	580.0	2,063.8	2,064	
			Nov	0.82	0.068	307.5	580.0	1,791.3	1,791	
			Dec	1.34	0.112	502.5	580.0	1,713.8	1,714	

WATER HARVESTING/REUSE

Water collection is often most effective when managed locally, near its point of origin. Therefore, in order to establish EHR as an environmentally responsible site, collecting, retaining and using as much water as possible from on-site stands as a goal. Components of water collection include rain water harvesting as well as reusing water from components of everyday living, such as graywater and blackwater. Each of the three water sources can be used for specific purposes on-site, creating an integrated system of water collection, use and reuse in an efficient and sustainable manner.

The first water source is rainwater collected from all building rooftops. This water is safe enough to be used to water gardens of both edible and non-edible plants. The water collected from the administration, therapy, retail rooftops could serve as an irrigation source for both the rentable greenhouse as well as the hydroponics greenhouse. Moreover, the harvested water can easily be mixed with a fertilizer recipe for production of food crops. Collecting this water during rain events and then storing it in above ground tanks or below ground cisterns for use in dry months would make this a viable option.

The second water source is harvesting graywater* which includes lavatory sinks, showers and washing machines. This source of water can be directly applied to non-edible vegetation or added to the blackwater system where it will be filtered and purified for use in other capacities.

The third water source is blackwater which is water collected from toilets and kitchen sinks/dishwashers. This water can be purified through a Living Machine™ style wetland remediation system as discussed on the following page, thus reclaiming and using as much water on-site as possible.

TIDAL WETLAND SYSTEM

Further consultation with ADEQ (see contact list) will need to be undertaken as this project progresses. ADEQ will require a review of all drawings and environmental and chemical engineering solutions to the health and environmental processes in order to permit this as an alternative sewage treatment system. Working with the University of Arizona Environmental Engineering Department will allow this project to not only be produced at a lower up front cost but also link EHR to research, further establishing it as a model of sustainability.

The Tidal Wetland system reduces well water and pump use to allow for more gardens without adding more water than that which is already on site.

The following charts indicate cost comparisons at initial (left) and full (right) capacities for EHR's population. These estimates were taken from internet research on septic system costs but may actually be higher or lower, based on factors such as soil, topography, climate, location, materials and contractors. The cost estimate for the Tidal Wetland system is based on Living Machine™ website, but if EHR were to work with the University of Arizona Department of Environmental Engineering, the initial as well as the maintenance costs may go down. Grants specifically for alternative systems such as this one may also be available to help mitigate the cost.

GRAVITY FED SEPTIC		
	Initial Capacity	**Full Capacity**
Installation $	1,000-5,000	1,000-5,000
Permitting $	200-1,000	200-1,000
Maintenance $	30-500/yr.	30-500/yr.
Life Span	20-40 yr.	20-40 yr.
Quantity	3	5
Initial Total $	15,000	25,000
20 yrs. $	45,000	75,000

PRESSURIZED SEPTIC		
	Initial Capacity	**Full Capacity**
Installation $	5,000-10,000	5,000-10,000
Permitting $	200-1,000	200-1,000
Maintenance $	50-1,000/yr	50-1,000/yr.
Life Span	20-40 yr.	20-40 yr.
Quantity	3	5
Initial Total $	30,000	50,000
20 yrs. $	60,000	100,000

TIDAL WETLAND SYSTEM		
	Initial Capacity	**Full Capacity**
Installation $	10,000-20,000	10,000-20,000
Permitting $	200-1,000	200-1,000
Maintenance $	50-1,000/yr.	50-1,000/yr/
Life Span	Indefinitely	Indefinitely
Quantity	2	3
Initial Total $	40,000	60,000
20 yrs. $	60,000	90,000

It is worth noting that the cost of installing the Tidal Wetland System and maintaining it could be reduced if a collaborative project with the University of Arizona Environmental Engineering Program were undertaken.

HYDROPONICS

Hydroponics literally means "working with water", which is exactly what this unique system of agriculture does. Plants are grown in a nutrient rich water bath sallowing absorption of nutrients effortlessly. Studies that compare hydroponics versus soil based agriculture indicate that plants grow faster and produce greater yields with hydroponic systems. Hydroponics are also more efficient in terms of space requirements. For example, hydroponics can be practiced in greenhouses, multi-level buildings, rooftops and underground locations.

Hydroponics Techniques

Static Aerated (SAT)
- Growth in static nutrient solution
- Aerated by air pumped into the nutrient solution in tank
- Passive: Simplest hydroponic method

Ebb and Flow (EFT)
- Plants are grown as in SAT, but nutrient solution is drained off 3-4 times a day for roots to breathe.

Flood and Drain
- Good for home gardens and nurseries

Deep Flow (DFT)
- Several inch depth of nutrient solution circulated around roots by a pump and gravity drain.

Dynamic Root Flotation
- Ideal for leafy vegetables

Aerated Flow (AFT)
- A modified version of DFT
- Nurtient solution is profusely aerated by special mechanisms.
- Similar to Japanese "Kyowa Hyponicxa Technique"
- Excellent for growing both leafy and fruit crops.

Nutrient Film (NFT)
- Thin film of nutrient solution always in contact with roots.
- While the nutrient solutions circulated, the root surface is exposed to air. (helps the roots to breathe)
- Very good for producing fruits and vegetables.

Drip Irrigation (DIT)
- Plants grown in inert or organic substrates.
- The nutrient solution is fed closely around the roots 6-7 times a day in drops or trickles.
- Deserts in the Middle East are exporting crop produce because of this technique.
- Also suitable for plantation, orchard and landscaping industries.

Root Mist (RMT)
- Mist of nurtient solution is sprayed constantly onto the roots of plants suspended from a frame in the top.
- "Aeroponic" technique.
- Good for initiating rooting of cuttings and for extracting (milking) phyotochemicals from the roots for medical purposes

Fog Feed (FFT)
- Similar to RMT but the droplet size is so very minute that the nutrient solution can barely moisten your hand.
- This technique has yet to be perfected.
- Good for plants with aerial roots e.i. orchids, anthuriums, etc.

Plant growth is affected by the interaction of the dissolved chemical elements in the water supply, the chemical properties of the growing medium to which the water is applied, and the fertility program employed. The cleaner the water, the greater the opportunity to achieve maximum yields. The water designated for use in a greenhouse must be analyzed for agricultural suitability.

The following are chemical properties to consider: pH, alkalinity, soluble salts, calcium, magnesium, boron, fluoride, chloride, sulfates, sodium, carbonate, iron.

ABOVE: Lettuce being grown in a greenhouse via a hydroponic bath.

PERMACULTURE

Permaculture design is a system that assembles conceptual, material and strategic components as a holistic system that benefits life in all its forms. The philosophy behind permaculture is one of working with nature; observations of systems in all their functions and in their ecological wholeness; and of allowing systems to demonstrate their own evolutions. The ethics of permaculture are summarized as:

Earthcare – recognizing that the Earth is the source of all life and respecting the environment accordingly.

Peoplecare – supporting and helping each other to change to ways of living that are not harming ourselves or the planet.

Fairshares - or placing limits to consumption, ensuring that the Earth's limited resources are utilized in ways that are equitable and wise.

The ethical and design related ideals of Permaculture can be described through 12 principles:

1. Observe and Interact
2. Catch and Store Energy
3. Obtain a Yield
4. Apply Self-regulation & Accept Feedback
5. Use & Value Renewable Resources & Services
6. Produce No Waste
7. Design From Patterns to Details
8. Integrate Rather Than Segregate
9. Use Small and Slow Solutions
10. Use and Value Diversity
11. Use Edges and Value the Marginal
12. Creatively Use and Respond to Change

The components of permaculture are based on how ecosystems interact as web of intricate symbiotic relationships between animal and plantlife. "Permaculture Guilds" are groups of plants which work particularly well together as an extension of companion planting.

Many permaculture designs involve animals. In traditional farming, animals are used inefficiently, as they are poor converters of energy, require large land areas and large amounts of water for a given amount of food produced. Chicken coop greenhouses can reduce the need to heat the greenhouse by fossil fuels, as the chicken's bodies heat the area. The chickens scratching and pecking can clear new land for crops and weed control, manure as fertilizer, feathers used in compost or as a mulch, and meat for food. All the energy is then focused on egg production.

Permaculture is in part an attempt to create a renewable system of food production that relies upon minimal amounts of energy by focusing on maximizing the use of trees (agroforestry) and perennial food crops because they make a more efficient and long term use of energy then traditional seasonal crops. Permaculture is an attempt to work smarter, not harder; and when possible the energy used should come from renewable sources such as wind power or passive solar designs.

TOP: A workshop in Oklahoma teaches participants how to build a hoop house.

BOTTOM: Dr. Patricia Rorabaugh leading a tour explaining hydroponics.

CONTROLLED ENVIRONMENT AGRICULTURE

One of the goals of EHR is production of their own food in an effort to live a healthier lifestyle and to be as self-sufficient as possible. Several food producing options are available. Before beginning any type of agriculture it is recommended that the soil and water quality be tested. Contact information regarding testing may be found on page 118.

With controlled environment agriculture food producing plants are grown inside greenhouses or other structures providing the possibility for year round cultivation. Hydroponic crop production is a controlled environment method (CEA) that grows plants in a nutrient and water solution. The roots of the plants may be directly in the solution or may be supported by a non-soil or artificial medium such as sand, vermiculite or sawdust.

Nutrient delivery in hydroponics may be either open or closed system. In an open system nutrients are not reused once the nutrient solution is given to the plants, while in a closed system, surplus nutrients are replenished and recycled for use. Water from adjacent building roofs may be used for irrigation.

The University of Arizona's Controlled Environment Agriculture Center (CEAC) is involved in hydroponics and holds classes and gives tours on the subject. Hydroponics can be expensive to set up, but is less water intensive that irrigating plants in soil.

Hoop houses (also called high tunnels) are simple structures used to house plants. They can be purchased as kits or built by hand as shown in the image above right. Advantages of hoop houses are that they take up less land than if crops were grown in open fields, they are USDA supported, relatively easy to install and inexpensive—$3 per square foot without heating or cooling while regular greenhouses can cost $20 per square foot. For a higher crop yield hoop houses should be heated and cooled. Using an agricultural grade plastic of 4–6 millimeters to cover the hoop house will extend the life to about 4 years.

Design Implications

- Passive solar techniques can help heat greenhouses, lowering costs
- Hoop houses built by residents will provide routine and education
- Place fields lower than and in proximity to buildings to use graywater and harvested water from building roofs

Conversations with Dr. Gene Giacomelli, professor and Director of the CEAC and Dr. Patricia Rorabaugh, lecturer in Controlled Environment Agriculture provided the following information regarding plant yields using a hydroponic system in a hoop house with some climate control. Vegetables are easier to grow than fruiting plants and therefore are the focus.

CROP TYPE AND YIELD	
cucumbers	16 lbs./ft^2
cluster tomatoes	5–10 lbs./ft^2
sweet pepper	6 lbs./ft^2
lettuce	1 head per 7″/ft^2

Other crops that might be investigated are micro-greens and herbs, heirloom varieties and specialty varieties such as multi-colored carrots. If a commercial component is sought these specialty crops may be desirable to the public. Interviews with nearby food co-ops will reveal what produce is needed and how much they will pay for it. It is interesting to note that the Bisbee Food Co-op may sell produce that is grown within the Bisbee city limits, most likely due to possible soil contamination. EHR is outside of the city limits and may be a resource for Bisbee grocers and residents.

A disadvantage of controlled environments is that while they provide favorable conditions for plants they may also create these conditions for pests. To help with this, a trap plant—plants that isolate certain pests—or a companion plants—plants that turn insects away or attract beneficial insects—may be used.

Sunnizona, a farm in Wilcox, Arizona is a farm using greenhouses to grow tomatoes, greens and herbs. They strive to use local products in their farming practices and have been successful in selling 95% of their produce locally. In addition to greenhouse plants they also have field crops.

FIELD CROPS

Field crops grown at EHR could make use of water harvesting from adjacent roofs and water that falls on site that can be directed into planted areas.

The Arizona Master Gardener Manual was used as a reference for the following field plants. Sunizona field crops include summer squash, winter squash, pumpkins, melons, potatoes and sweet potatoes.

WARM-SEASON (PLANT AFTER DANGER OF FROST)	COOL-SEASON (PLANT IN WINTER OR EARLY SPRING)
pepper	beet
pumpkin	broccoli
squash	onion
sweet corn	potato

Both controlled environment crops and field crops may provide therapeutic, self sustaining and economic benefits for EHR.

REVEGETATION

Revegetation is the act of establishing desirable plants in a disturbed area. Analyzing soil conditions will often determine the best processes for reseeding. In every case, moisture is vital for successful plant establishment. There are many reasons for revegetating degraded lands, such as those at EHR. The overgrazing of EHR's site has left it in need of some maintenance to return it to a healthier state. The following are a list of reasons revegetation will improve EHR for the ecosystem as well as the residents.

- Erosion control
- Weed prevention
- Wildlife habitat
- Aesthetics
- Dust abatement

The process of revegetating a landscape includes many steps. Before the ground is prepared it a soil test should be conducted. Next prepare the ground by breaking up the compacted soil (a process that maybe more difficult if caliche is present). Rip and rake the ground perpendicular to the runoff direction and rocks should be left in place to reduce water runoff speed.

After the soil is prepared, the seeding step can be undertaken via three different methods. The first two are active methods, in which physical seeding occurs, the third is passive in which natural processes are allowed to run their course in order to seed.

1. Hand seeding: done on smaller areas or situations where there is effort to add species to an existing patch of vegetation.

2. Hydroseeding: mechanical, hydraulic mulch seeding process
3. Passive revegetation is replanting by wind, rain, and high stream flows carrying seeds, plants, and sediment downstream, where they will settle on the lower banks naturally. Passive revegetation requires the least effort and expertise to restore native riparian vegetation. This form of revegetation may take an extended period of time but it is an unintrusive method with fewer disturbances which may result in less erosion.

Use active revegetation when:

- Planting by hand is reasonable
- Irrigation is available and feasible
- Weed management scheduling is possible
- Site is downstream of invasive species
- High probability of invasives, which can be mitigated by seeding native species
- The soil or stream bank is unstable or at high risk of erosion

Use passive revegetation when:

- Native plants established on or upstream of the site, that provide seeds
- Few non-natives on-site and upstream
- Little open, sunny ground with potential as a magnet for non-native pest plants
- Soils are stable and at low risk of erosion
- Site tendency to flood each year, allowing plant material to settle and cultivate

Revegetate the higher, drier areas adjacent to streams unaffected by frequent flooding. Postpone active revegetation until most invasive pest plants under control. Adequate control can take 1+ season(s).

Land Imprinting:

Imprinting is a simple technique for revegetating degraded land. The process imitates the effect of natural impressions left by hoofed herd animals. Troughs left by the imprinting machine concentrate water and nutrients to help germinate and support seedlings. The technique is particularly suited for the establishment of perennial plants.

ABOVE: Land imprinting troughs created by an imprinting roller attached to a tractor.

REVEGETATION PALETTE

Acacia constricta, whitethorn acacia
Acacia vernicosa, viscid acacia
Acer grandidentatum, big tooth maple
Agave lechuguilla, shindagger
Aristida glauca, threeawn
Bahia absinthifolia, hairyseed bahia
Bouteloua curtipendula, sideoats grama
Bouteloua eriopoda, black grama
Bouteloua hirsuta, hairy grama
Brickellia laciniata, cutleaf brickellia
Dasylirion leiophyllum, desert candle
Fallugia paradoxa, Apache plume
Flourensia cernua, tarbush
Gutierrezia sarothrae, broomweed
Gutierrezia lucida, threadleaf snakeweed
Juglans microcarpa, Texas walnut
Juniperus deppeana, alligator juniper
Juniperus pinchotii,* red-berry juniper
Larrea tridentata, creosote
Lesquerella fendlerii, Fendler's bladderpod
Mimosa biuncifera, catclaw mimosa
Muhlenbergia porteri, bush muhly
Muhlenbergia setifolia, curlyleaf muhly
Nolina microcarpa, beargrass
Opuntia englemannii, Engelmann's prickly pear
Opuntia imbricata, cane cholla
Opuntia phaeacantha, tulip prickly pear
Parthenium incanum, mariola
Perezia nana, desert holly
Prosopis juliflora, velvet mesquite
Quercus grisea, gray oak
Rhus microphylla, littleleaf sumac
Rhus trilobata, aromatic sumac
Senna bauhinioides, twinleaf senna
Tridens muticus, slim tridens
Tridens pulchellus, low woollygrass
Viguiera stenoloba, skeletonleaf goldeneye
Yucca baccata, banana yucca
Yucca elata, soaptree yucca

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PREFACE

All images from Tejido Group

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Courtesy of Marla Guerrero

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Bisbee:

- Bisbee Soil Program, Stacy Mueller, Community Outreach Coordinator, Office: 520.432.5418, Toll free: 1-866-930-3244
- Bisbee Food Co-op, 520-432-4011
- Bisbee Farmer's Market (seasonal), Laura Smith, Market Manager, at 520-236-8409
- Bisbee Wellness Initiative, Cheyenne McMasters, 520-227-7181
- Border Animal Rescue, pet fostering, Dee Jordan 520-432-7214
- Ecoasis Organic Café and Gardens, Serena Sullivan, 520-981-3739 http://www.ecoasiscafe.com/
- Central School Project, visiting artist outreach, 520-432-4866
- World Wide small motors business, George Pettenger, 520-432-4146, or 4746. Interest in employment opportunities for autistic people
- Recycling Service, City of Bisbee Public Works Department, 520-432-6002
- Bisbee Community Development, John Charley Community Development Director, 118 Arizona Street, Bisbee, AZ 520- 432-6269, jcharley@cityofbisbee.com

Sierra Vista:

- Sierra Vista Natural Foods Cooperative, Inc., 520-508-7201
- Sierra Vista Farmer's Market, Diane Jones, www.sierravistafarmersmarket.com
- CANTER, Equine Therapy, Sierra Vista, Peter Kelly–President, 520-366-0112
- Mary's Mission and Development Center, a Level II Therapeutic Treatment Center, 345 Taylor Dr. Sierra Vista, AZ 85635, 520-417-2115
- Sierra Vista Community Development, Don Brush, 1011 N Coronado Drive, Sierra Vista, AZ, (520) 458-3315 planning@sierravistaaz.gov

Cochise County:

- Cochise County Planning and Zoning, Keith Dennis, 520-432-9244 , kdennis@cochise.az.gov
- Cochise County Association for the Handicapped, Louis Ruiz, 1556 Naco Highway Bisbee, AZ http://www.ccahbisbee.org
- Cochise County Health Department, Vaira Harik, 520-432-9400

Nogales:

- South East Arizona Area Health Education Center, Nogales AZ, 520-287-4722

Tucson:

- Yoga Movement Therapy, Donna Goodhart, Blue Lotus Good Heart Yoga

Phoenix:

- Arizona Center for Children with Disabilities, pro bono lawyers, 5025 E. Washington Street, Suite 202, Phoenix, AZ, 85034, 602-274-6287, 800-927-2260
- Stardust Center for Affordable Homes and the Family, Dr. Sherry Ahrentzen 602-496-1460

Outside Arizona:

- Water testing for agriculture, Micro Macro Labs, 183 Paradise Boulevard, Suite 108, Athens, GA 30607, 706-548-4557
- A&L Analytical Laboratories, Inc., 2790 Whitten Road, Memphis, TN 38133, 800-264-4522

University of Arizona:

- University of Arizona Cochise County Cooperative Extension Waterwise Program, Cado Daily Program Coordinator Senior, Water Wise Program, 1140 N. Colombo Ave Sierra Vista, AZ 85635, 520-458-8278 x 2139
- University of Arizona Controlled Environment Agriculture Program, Department of Agriculture, Gene A. Giacomelli, PhD Professor Ag & Biosystems Engineering and Director CEAC, 520-626-9566, giacomel@ag.arizona.edu; http://ag.arizona.edu/ceac
- University of Arizona Department of Chemical and Environmental Engineering, Wendell Ela, PhD Professor Environmental Engineering, 520-626-9323, wela@engr.arizona.edu
- University of Arizona School of Plant Sciences-RES, Patricia Rorabaugh, PhD Assistant Professor of Practice, Plant Sciences, 520-626-9953, patrora@ag.arizona.edu
- University of Arizona Campus Agriculture Center, Arturo Baez, Senior Farm Supervisor, greenhouse specialist, 520-237-0720, abaez@ag.arizona.edu
- University of Arizona South, Sierra Vista, J.C. Mutchler and Lissa Howe, goat aquisition assistance, 520-458-8278, mutchler@email.arizona.edu

Cochise College Sierra Vista Campus:

- Jennifer Lakosil, Director of Nursing, 1-800-966-7943, lakosilj@cochise.edu
- Ben Berry, Director of Education, says Fort Huachuca has a community service requirement, 520-515-5363, berrybe@cochise.edu

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- Autism One, http://www.autismone.org http://growgardensforautism.blogspot.com/
- Design Guidelines of a Therapeutic garden for Autistic Children - Masters Thesis by Bonnie Herbert, http://etd.lsu.edu/docs/available/etd-0127103-211300/unrestricted/Hebert_thesis.pdf
- American Horticultural Therapy Association, http://www.ahta.org/

Aquatic Therapy:

- Aquatic Therapy & Rehab Insititute, http://www.atri.org/
- Therapeutic Recreation Directory, http://www.recreationtherapy.com
- Aquatic Therapy and Rehabilitation Institute, www.atra-tr.org
- Healing Thresholds - research and aqautic programs http://autism.healingthresholds.com/
- Aquatic Resources Network, www.aquaticnet.com

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FUNDING OPPORTUNITIES

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Provides grants to programs that enrich the lives of adolescents and adults with Autistic Spectrum Disorder (ASD). They also provide grants to programs that address these challenges as they relate to adolescents and adults with ASD. The organization also provides community outreach and education regarding the life-span issues associated with ASD and this is accomplished through the Foundation's involvement in community- based events http://www.djfiddlefoundation.org/

Autism Partnership:

Gives aid to parents of autistic children by funding research. They offer grants to researchers who conduct studies to test the effectiveness of various breakthrough behavioral teaching procedures and behavioral intervention strategies to help further the evolution of ASD treatment. http://autismpartnership.com/supportfamfound.html

National Autism Association:

Provides families with financial assistance in getting necessary therapy services for their autistic child. http://www.nationalautismassociation.org/helpinghand.php

Global Autism Collaboration:

Collaborates with the Autism Research Center in San Diego to conduct research on various therapeutic methods. They then use this research to provide information for parents and caregivers of children with autism, as well as other professionals in the field. http://www.autism.org/

Doug Flutie Jr. Foundation:

Provides funding to programs that address autism, and scholarships to families who have children with autism. http://www.dougflutiejrfoundation.org/

U.S. Department of Health and Human Services:

Offers a variety of grants for a wide variety of research and program initiatives. http://grants.nih.gov/grants/funding/funding_program.htm

Bamford-Lahey Children's Foundation:

Funds and supports projects which have broad implications for the learning and use of spoken language for parents with children who have developmental language disorders. http://bamford-lahey.org/guidelines.html

NIH-Eunice Kennedy Shriver National Institute of Child Health and Human Development:

Offers a variety of funding resources for research, autism programs and grant forms and applications. http://www.nichd.nih.gov/funding/research.cfm

The Golden Fund for Autism:

Raises funds for children diagnosed with ASD and their families to assist them in obtaining various health, wellness, and therapeutic treatments not otherwise covered by health insurance or other financial means. http://www.goldenfundautism.org/

TERMINOLOGY

Design:

- **ordering systems**: key general goals that guide and should be incorporated into all designs
- **design concept:** cohesive group of ideas within which there are:
- **master plan:** a plan providing overall guidance for designing EHR
- **components**: specific ingredients that are mixed to create a concept
- **details:** how components will actually be executed

Water Systems:

- **run-off:** rain water which has fallen and is following the path of least resistance (can be collected for use)
- **water harvesting:** collecting water for reuse from human sources and natural sources divided into:
- **gray water:** water from showers, lavatory sinks and washing machines
- **black water:** water from toilet flushing, kitchen sinks and dishwashers
- **rain water:** water collected from buildings, roads, paths and other hard surfaces when it rains
- **passive water harvesting:** using topography and gravity to collect rain water and irrigate vegetation
- **active water harvesting:** pumping collected water to irrigate vegetation

Revegetation and Restoration:

- **restoration/revegetation:** returning compromised lands to a healthy ecosystem
- **native species:** species that naturally occurs in a finite area
- **invasive species:** species that does not naturally occur in a finite area whose establishment and spread modifies ecosystems, habitats, or species.
- **bosque:** small wooded area
- **riparian:** living in or associated with a watercourse and its banks

Agricultural Systems:

- greenhouse: enclosed structure with or without supplied heat used to cultivate plants
- hoophouse: inverted U shaped greenhouse with portable structure (less durable, but typically cheaper up front costs)
- permaculture: integration of human systems and natural systems to create a self-sustaining agricultural system
- hydroponics: growing of plants in a nutrient solution with or without soil
- community supported agriculture: community of individuals who support a small local farming operation. Growers typically deliver or prepare pick-up boxes of some assortment of currently harvestable vegetables, fruit, dairy products and crafts etc. for the consumers at a fixed 1-season rate.