

January 15, 2020

Dennis Todd, PhD
Land Use Management Planning Committee
Oregon Country Fair
442 Lawrence Street
Eugene, OR 97401

RE: Comparative Analysis of Greywater Systems RFQ

Hello Dennis, we are pleased to present to you our Qualifications for the Oregon Country Fair Greywater Recycling Project. We have been researching, engineering, permitting, building and advocating for innovative integrated water treatment systems at many scales, for approximately 20 years. Our water infrastructure work has included greywater, rainwater, drinking water and wastewater system for residences, multifamily projects, universities, office buildings, villages, resorts and retreat centers throughout the west coast and internationally.

We particularly thrive at projects with unique challenges, that require unique thinking and this is why we are particularly intrigued by your project. We are interested in the temporality of the event and the best water reuse solution from those conditions. We are also interested in the the unique site conditions and bring experience on a number of projects that relate closely to some of the challenges including a school in the Bay Delta floodplains of California, the renovation of Two Bunch Palms, a historic hot springs in Southern California that is archaeologically significant as both an outpost for Camel Corp of Engineers, as well as spiritual site for the Cahuilla as well as former tribes. For the project with renovated the resorts entire infrastructure, with ecological excavation mechanisms and nontoxic plumbing and developed a system to recycle half a million gallons per day for various site uses.

We also feel like we are well suited for your project feasibility analysis because we explicitly do not have any association with any specific system manufacturer, but have had a wide range of experience from more custom, site-built solutions to packaged systems from providers like Orenco.

If selected to advance to the next phase, we will ultimately need to create a more detailed proposal, but we look forward to hopefully getting the opportunity either meet or to talk more about the project, discuss unique solutions we have developed on other projects and potential technologies we see viable, and We take pride in developing innovative, but also appropriate technology, that responds to extremely unique site circumstances, subject matter and specific partnerships.



hyphae design laboratory

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Through our experience, the best solutions emerge from experiencing the place, the people and the operating processes by immersing ourselves in the community and the place, meeting with everyone from the event managers, to the guests, technicians, custodians, volunteers.

For this project, we are interested in utilizing low tech, passive strategies that also utilize renewable energy such as solar. We would likely promote a combination of smaller decentralized biofiltration systems where possible, in combination with innovative and potentially portable sterilization, oxidation and treatment systems in order to protect the public health for applications such as road spraying.

We have included a list of References below, as well as Bios, and project portfolios Feel free to contact our references as well as us with any questions at all!

Sincerely,



Hyphae Design Laboratory
Eric F. Olson, P.E.

References:

Jeremy Fisher is the Project Manager for the Belcampo Resort and Belcampo Distillery projects. Our work included masterplanning, rainwater drinking water systems and various waste and greywater treatment systems. jeremyosiris@gmail.com, 510-499-5011

Kevin Rowell collaborated with us and served as our project manager through the International Organization for Migration for the Kutupalong Bamboo Treatment Facility in Cox's Bazaar, Bangladesh. krowell@iom.int kevin@thenaturalbuilders.com, 510-325-4277

Ed Krebs is Principal with K. Norman Berry Architects and has worked with us on Environmental Learning Center in Louisville, KY, where we amongst many other scopes, we conducted a feasibility study evaluating different water reuse systems. ekrebs@knbarch.com 502-582-2500



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Hyphae Firm Profile

Hyphae is an ecological engineering and design firm dedicated to creating innovative green infrastructure. Hyphae's multidisciplinary team blends landscape architecture and civil engineering, turning multi-faceted engineering challenges into elegantly designed ecosystem solutions. Hyphae has designed ecological landscapes, living roofs, and complex mechanical as well as biological treatment systems for rainwater, greywater, wastewater and even public art pieces. The firm has worked in a diversity of design fields and scales from residential and commercial to institutional, hospitality, and municipal design. Hyphae's clients include local and national architects, landscape architects, engineers, private companies and city agencies. Relevant project examples have been included in this RFQ submittal, but additional projects can be found online at www.hyphae.net.

Project Team Bios

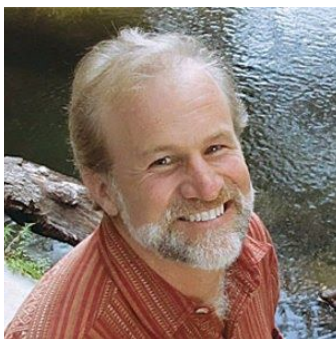
Brent Bucknum



Brent Bucknum, is the Founder and Principal of Hyphae Design Laboratory. Brent serves as the lead ecologist and designer, for green infrastructure and ecology projects within the Hyphae Design Lab. Before founding Hyphae in 2008, Brent served as Design Director at Rana Creek, an ecological restoration and design firm based in Carmel Valley, California, where he helped launch their Living Architecture Department. Also in 2008, Brent co-founded Urban Biofilter, Hyphae's sister non-profit, which is focused on designing and advocating for innovative approaches to bioremediation of air, water and soil in communities with severe environmental injustice issues. Trained in restoration ecology and environmental policy, Brent has designed and overseen the construction of over 30 green roofs in California alone, including Los Angeles City Hall and the California Academy of Sciences.

Brent has developed innovative green infrastructure and sustainable stormwater and water reuse master plans for projects ranging from a 3000-unit residential community in Tustin, CA, to the Transbay Terminal in San Francisco.

Art Ludwig



Art Ludwig is an ecological systems designer with 35 years full-time experience in water, wastewater systems, energy, shelter and human powered transport. He is the founder of Oasis Design and author of a number of significant books on greywater treatment and reuse. His specialty is complex, integrated "systems of systems." He has consulted for the states of New York, California, and New Mexico on water reuse policy and building codes, and given dozens of lectures and workshops. He has developed numerous innovations which have been adopted worldwide, incorporated in building codes, etc., all of which he has published into the public domain. These include the Laundry to Landscape and Branched Drain greywater systems. He designed his own education in Ecological Systems Design, graduating from UC Berkeley. At Berkeley,

he developed the first cleaners specifically designed to be biocompatible with plants and soil, and



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founded a successful business to manufacture and distribute them. Art has authored numerous articles as well as the books "Water Storage" "Principles of Ecological Design," and "Create an Oasis with Greywater." Many examples of his work can be found at www.oasisdesign.net.

Eric Olson



Eric F. Olson, P.E., Civil Engineer, has 20 years of experience in civil and environmental engineering consulting including soil and groundwater investigation and remediation and the design of Low Impact Development infrastructure. At Hyphae, Mr. Olson specializes in the design of rainwater and greywater reuse systems, green streets, sustainable stormwater detention systems, bioswales, and water efficiency studies. Mr. Olson, is a certified Green Roof Professional (GRP), and certified American Rainwater Catchment Association (ARCSA) professional. Mr. Olson has worked as an environmental engineer with E2 Consulting Engineers and Ch2MHill, directing sanitary sewer infiltration studies and soil and groundwater sampling. He directed field crews in the installation and operation monitoring equipment and structural inspection of storm drain infrastructure.

Daniel Fleischer



Daniel Fleischer is the Chief Science Officer at Hyphae Design Laboratory. Trained as a scientist and engineer, he is responsible for developing functional infrastructure and verifying that it works, thereby establishing new technologies to integrate sustainability and health at multiple spatial and temporal scales. During his time at Hyphae he has developed municipal-scale plans to deploy biological systems to measurably improve human health & enhance urban resiliency, and performed a smaller pilot project quantifying the ability of roadside vegetation barriers to remediate air pollution. Prior to working at Hyphae, Daniel developed novel systems for the economic and sustainable production of large amounts of food and fuel by cultivating marine algae. Before that he performed basic neurochemistry research on the molecular mechanisms of consciousness.

Ivan Heitmann



Ivan Heitmann is trained as a landscape architect but has skill sets in a wide variety of technical realms. His particular interests are in landscape systems and the people that inhabit them. His experience extends to hands-on work in construction and vernacular landscapes such as urban agriculture. Ivan has a 3-year Master's degree in Landscape Architecture from the University of Washington with a background in the humanities. Over three years in practice, his attention has been drawn to a design process with technical performance in mind. Digital design and traditional approaches alike have served in detailing designs for a broad portfolio of projects. These include recreational and school landscapes, large scale urban revegetation designs, and iteration on materials cross-sections. Ivan takes satisfaction in seeing an idea made solid.



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KUTUPALONG BAMBOO TREATMENT FACILITY

Location | Cox's Bazar District, Bangladesh

Client | International Organization for Migration

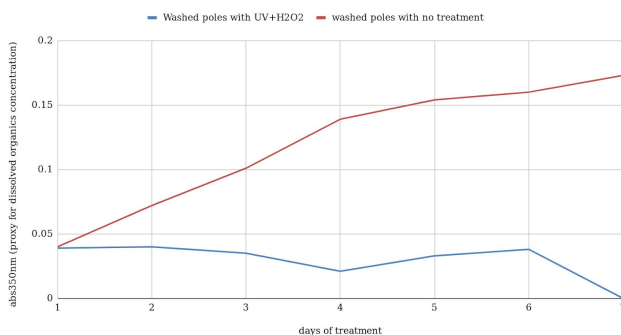
Project Completion Date | 2019

Description | Since the genocide of the Rohingya in Myanmar began in 2016, more than 1 million Rohingya refugees have fled to Bangladesh. By September 2019, the Kutupalong refugee camp had become the largest refugee camp in the world, housing over 600,000 people. To create housing in the camp complex, millions of poles of bamboo have been harvested as a sustainable building material. To make the poles resistant to local pole-borer beetles and fungus, the bamboo must be soaked in borate water prior to being used in construction. The IOM team at Kutupalong worked with Wicked Ops, Hyphae Design Laboratory, and dozens of refugees to design, build, commission and operate the world's largest bamboo pole treatment facility. Hyphae developed a water treatment system to remove the buildup of bamboo sap in the borate solution, enabling the borates to be recycled indefinitely. Hyphae first tested numerous

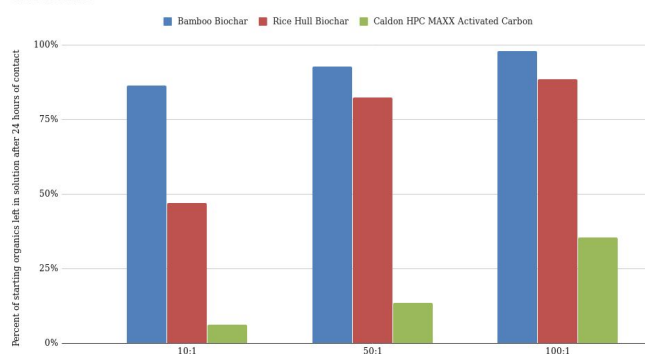


treatment strategies, such as coagulation, oxidation, adsorption and filtration to determine possible methods to do pilot testing on. The most promising strategies, oxidation and adsorption, were scaled up to pilot size with Hyphae providing guidance documentation on full scale implementation strategies.

The effect of UV+H₂O₂ on organics buildup in orthoborate pole treatment solution (UV 0.8W/L)



Removal of bamboo organic leachate from 7% orthoborate solution using carbonaceous adsorbents



Description: treatment results from our inhouse laboratory



ESALEN LODGE

Location | Big Sur, CA

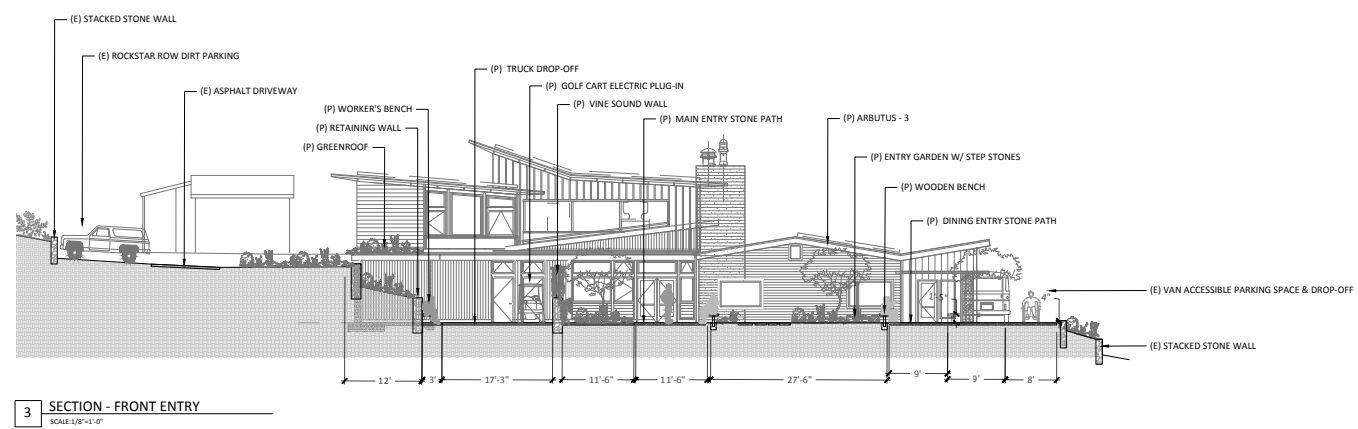
Client | Esalen Institute: Lodge

Architect | Arkin Tilit Architects

Projected Completion Date | 2015

Description | Hyphae is serving as civil engineer and landscape architect for two Esalen Projects, first is the renovation and remodel of the Main Lodge & Restaurant. The steep cliffs of Big Sur provide dramatic landscape and grading integration opportunities, while 50-year-old facilities, infrastructure and parking, make utility coordination, a great challenge. The landscape renovations make subtle and conscious incisions into the historic Big Sur artisan crafted landscape features, while balances public and private community needs of Esalen and reinforcing the coastal chaparral ecology.







TWO BUNCH PALMS RESORT RENOVATION

Location | Desert Hot Springs, CA

Client | Two Bunch Palms Resort

Project Completion Date | 2019

Description | Two Bunch Palms is a historic hot springs in Southern California. Hyphae was hired to develop a Masterplan to renovate and significantly expand the aging resort and infrastructure. We developed a cutting edge system that harvested heat from the thermal springs to heat showers and the spa building, as well as, tripled the amount of soaking pools. We also engineered a 300,000 gpd greywater reuse system that treats hot spring pool water for fountains, irrigation and dust control.

The project required us to engineer and build the project very quickly (during off seasons) while still coordinating permits, overseeing contractors and not compromising on integrating ecological innovations like non-toxic pool sterilization systems wetlands, heat exchangers, non-toxic polypropylene piping and custom concrete prefab pools.



BELCAMPO LODGE & AGRO-TOURISM RESORT

Location | Punta Gorda, Belize

Client | Belcampo Belize

Design | Hyphae

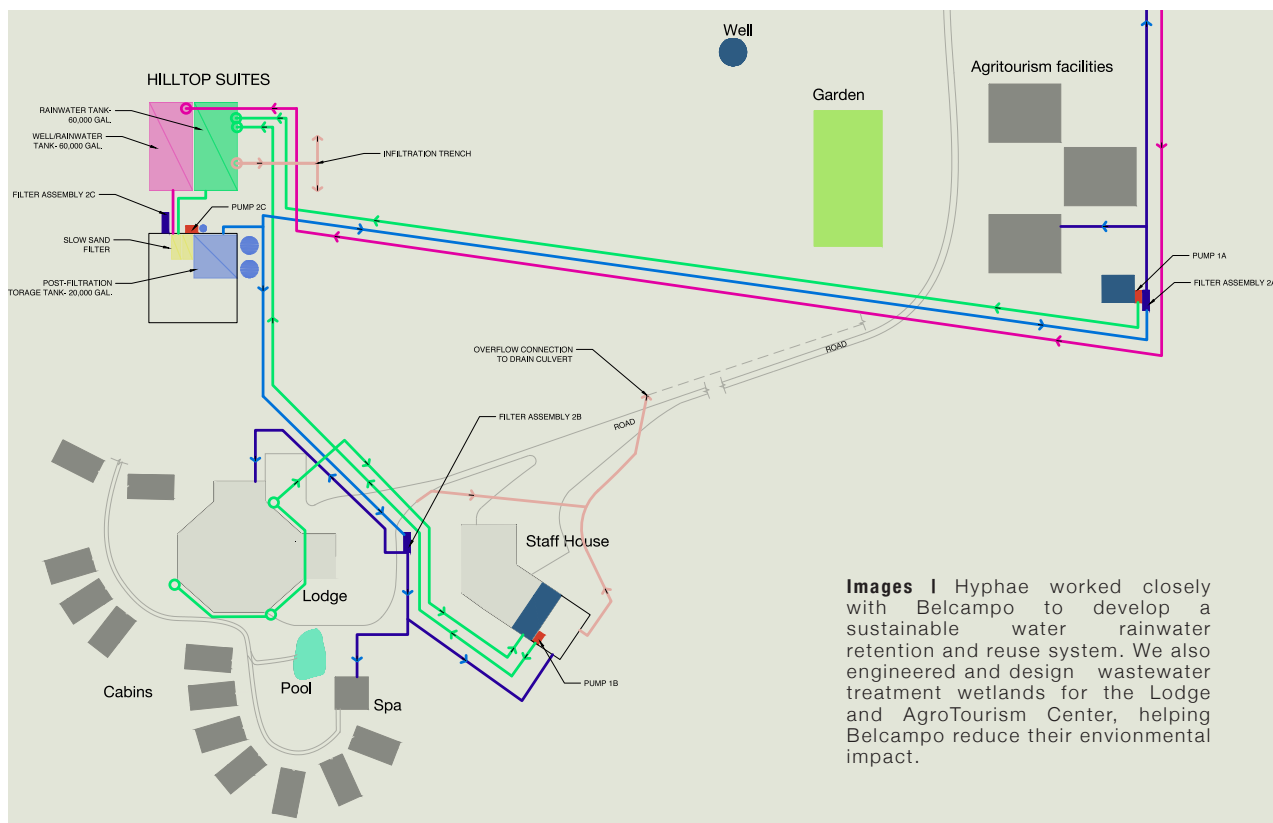
Projected Completion Date | 2014

Description | Belcampo is a California-based food company that focuses on vertically integrated sustainable food production. Their Ranch, Slaughterhouse and Meat Stores, have launched to wild success. We are in the process of

developing an Agro-tourism Center for Belcampo that will be focused on showcasing vertical integration of the products being produced there: Chocolate, Coffee and Rum. Surrounded by abundant tropical rainforest, the Resort is intended to be both a functional processing facility, as well as a retreat.

Working with the client both on-site and back in the US, we were able to design, engineer and implement a range of sustainable water retention/ filtration and waste treatment solutions. We developed a 100,000 gallon rainwater catchment system with a biological filter and constructed wetlands for wastewater treatment. Additionally we've been able to address landscape circulation and process engineering workflows; ensuring a balance between project resources.

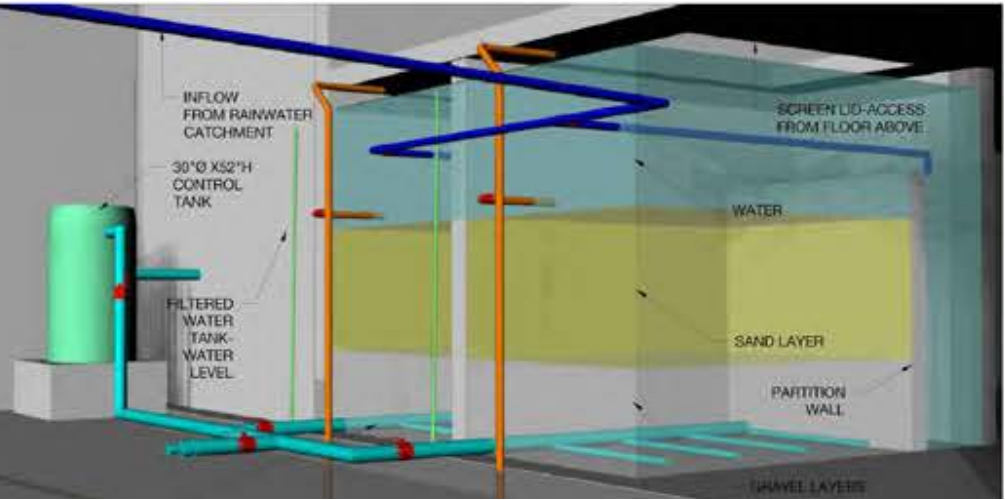
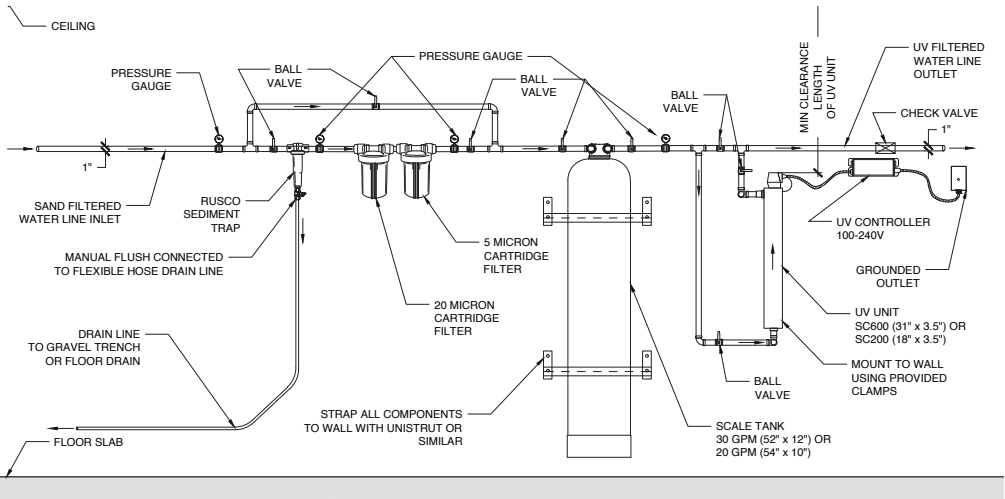




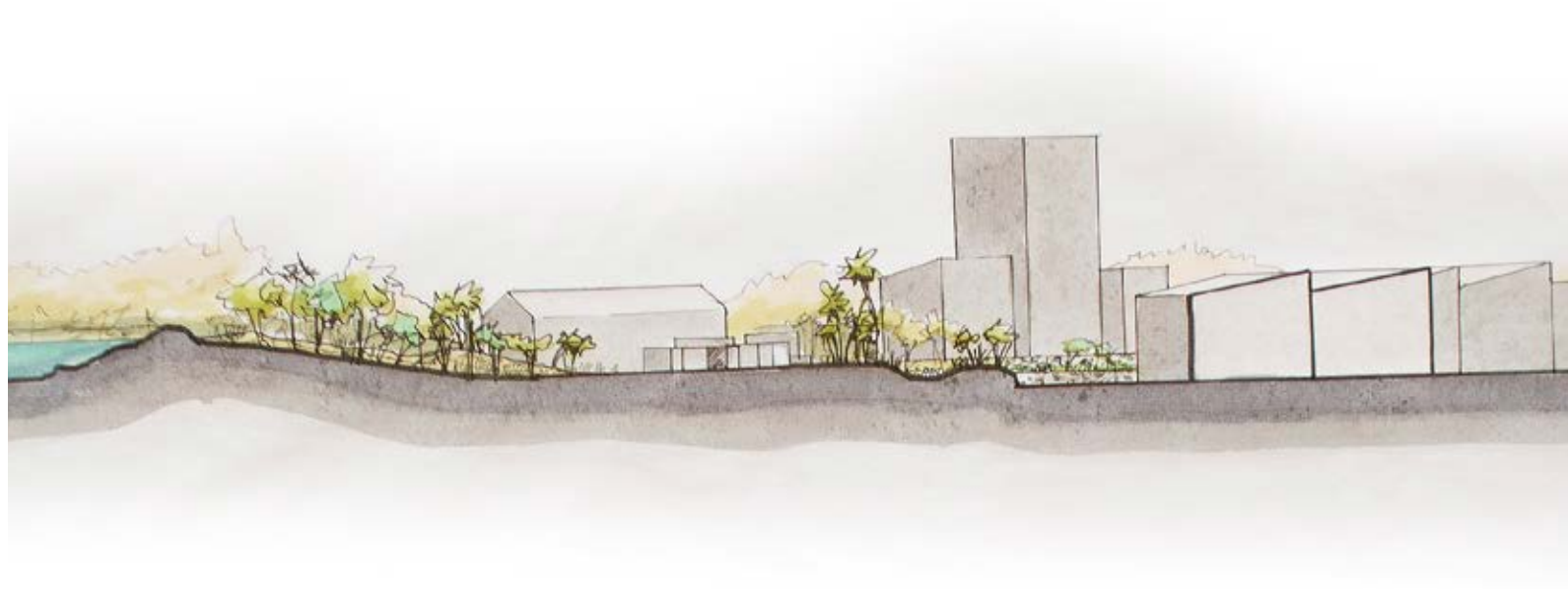
Images 1 Hyphae worked closely with Belcampo to develop a sustainable water rainwater retention and reuse system. We also engineered and design wastewater treatment wetlands for the Lodge and AgroTourism Center, helping Belcampo reduce their environmental impact.



Images 1. Typical engineered a number of water filtration systems, including a slow sand filter that uses biological processes to filter 99.9% of contaminants to produce water that meets stringent consumable standards. We've also invested time on site; working with contractors to ensure that the installation of our systems meets our engineering specification.



tools, such as the section below, to help develop the best site design. This allows us to work with existing topography, define buffer zones and preserve important ecosystems.



AGRO- PRODUCTION FACILITY

Location | Punta Gorda, Belize

Client | Belcampo Belize

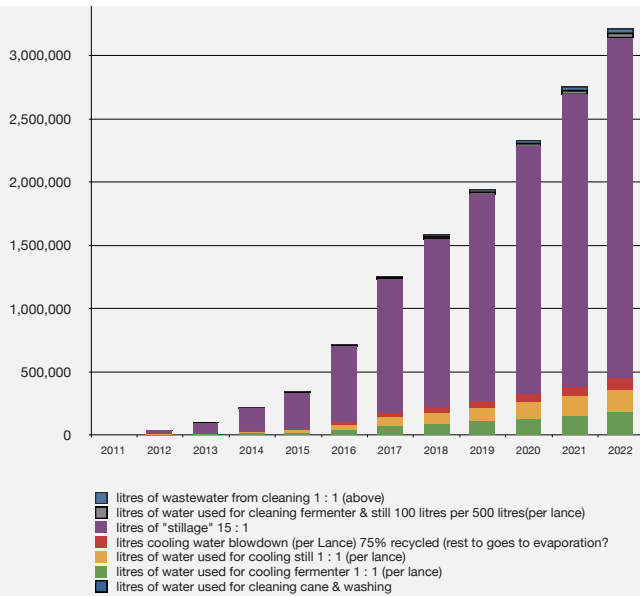
Design | Hyphae

Projected Completion Date | 2015

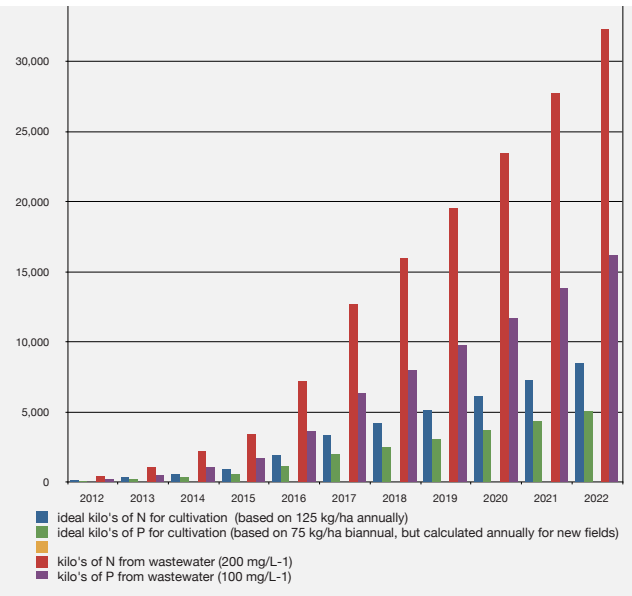
Description | Belcampo Belize recently acquired existing farmlands near Big Falls, Belize; investing in organic sugar cultivation to produce its own

line of organic rum. Environmental and social responsibilities are key drivers of the company and the motivation behind their desire to create one of the cleanest and greenest distilleries in the world. We are in the process of designing this organic closed-loop rum distillery, which will have 100% onsite bio-based power, water supply and ecological waste treatment.

Hyphae was asked to join an international team of consultants to develop water, waste and process flows for the rum distillery, cane and biomass production. Coordinating these overlapping scopes with a multi-disciplinary team proved invaluable in developing solutions that were both cost effective and environmental sustainable.



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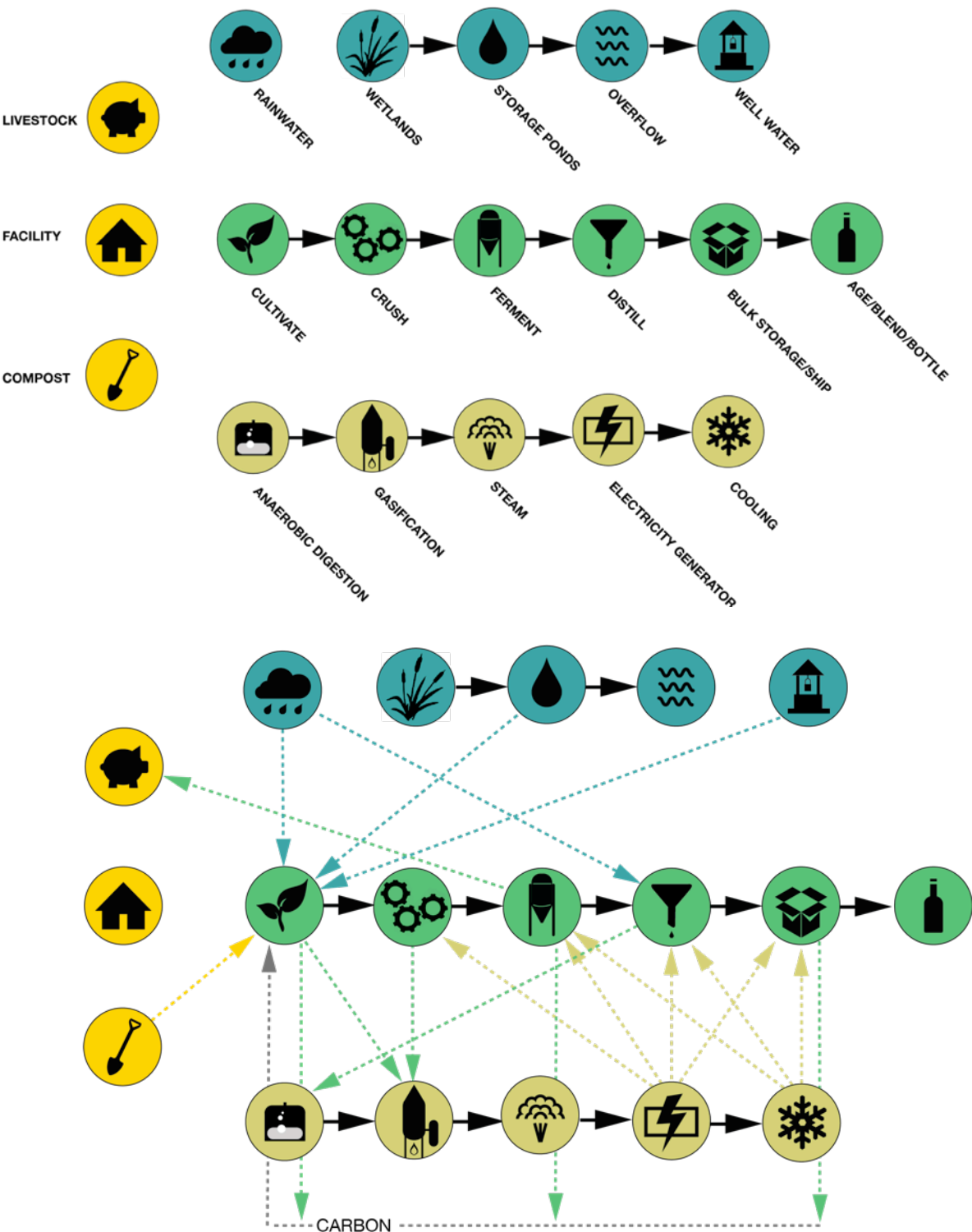


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Images | After initially outlining system components and process flows, we perform and visualize complex calculations, which allow us to engineer optimal systems.



Image 1 At the initial stages of a project we typically break down all of the systems and components that we envision in the project and start to explore the relationships between them. This strategy helps us to define and control system flows and processes in a clear and efficient way.





SFMOMA EXPANSION LIVING WALL

Location | San Francisco

Client | SFMOMA

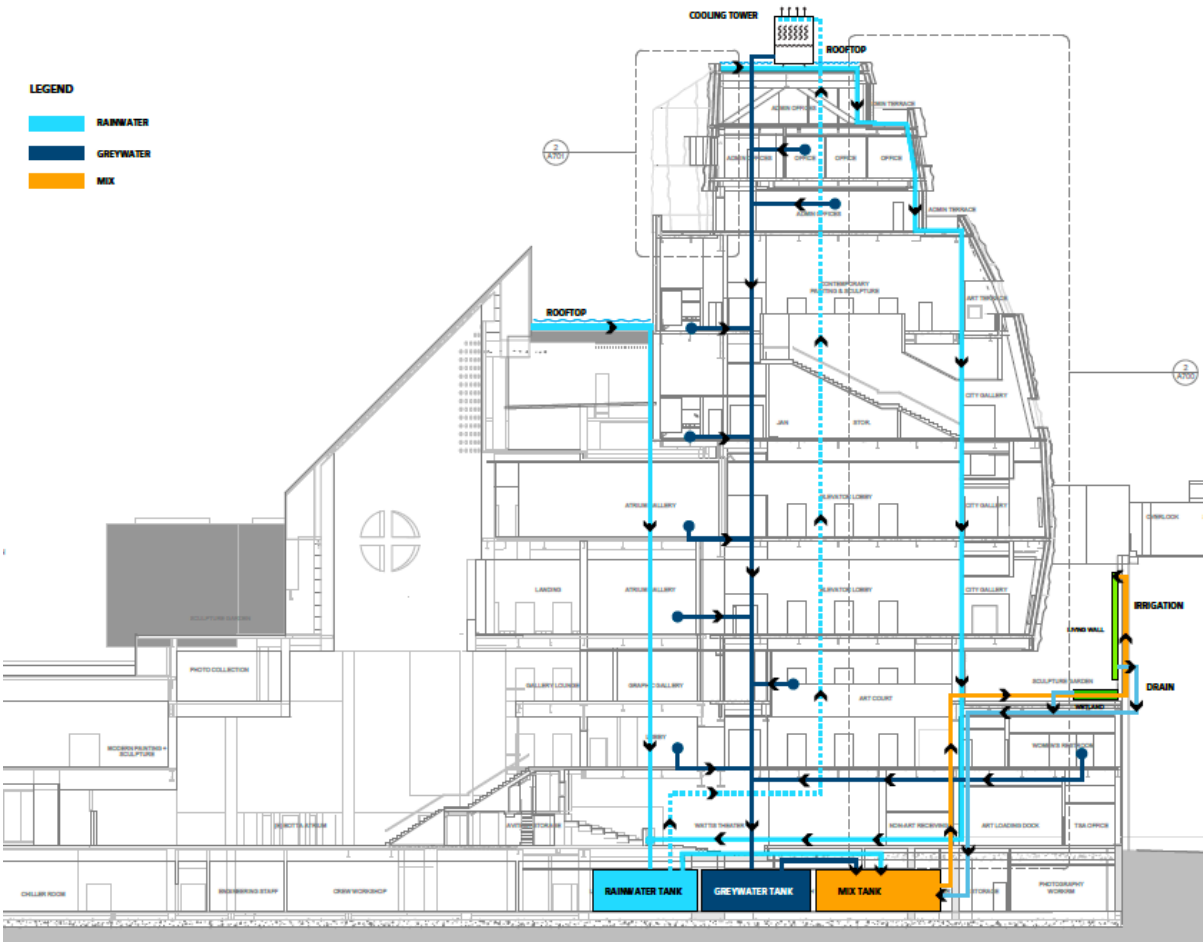
Architect | Snohetta

Projected Completion Date | 2015

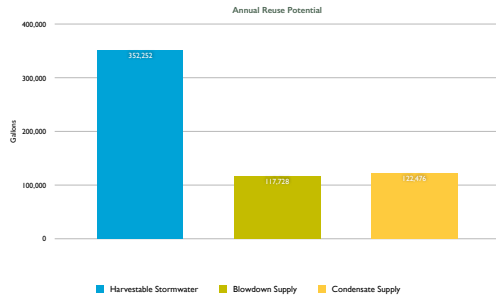
Description | Hyphae Design Laboratory in collaboration with Habitat Horticulture are designing a 5000 s.f. living wall for the new SFMOMA expansion being designed by Snohetta. The living walls will be 30' high by 100 feet long and the fern covered north-facing slopes of SF's maritime mountains, will serve as its ecological reference or analog. The wall will be one of the first ever to feature fungus, lichens, and species found in our complex ecosystems. Most notably, the living wall have an innovative 100% non-potable irrigation system that recycles museums air conditioning condensate, aka the humidity captured from all the visitors sweat! Additionally, the living wall will recycle water and nutrients, like a hydroponics system, further reducing environmental impact and water use by 60%. The living wall has an expected construction cost of \$1,800,000. The total project cost is 190 million.



Reuse Opportunities

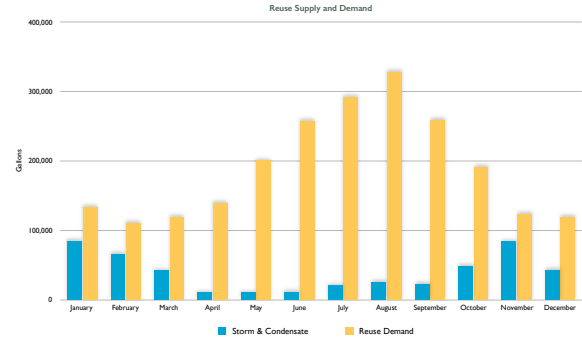


Water Supply: Reuse Supply



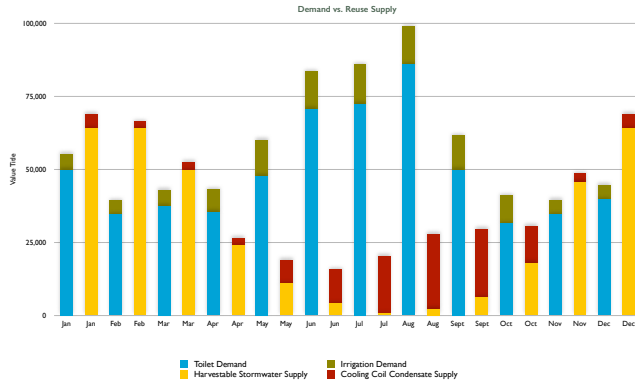
- This graph shows the available water reuse sources on an annual basis
- The stormwater resource is potentially the most abundant and available mostly in the winter
- Condensate is a clean source and is the most abundant in the summer
- Blowdown could be a good source of water, but it is highly mineralized and not good for plants or for the cooling tower.

Water Reuse: Supply and Demand



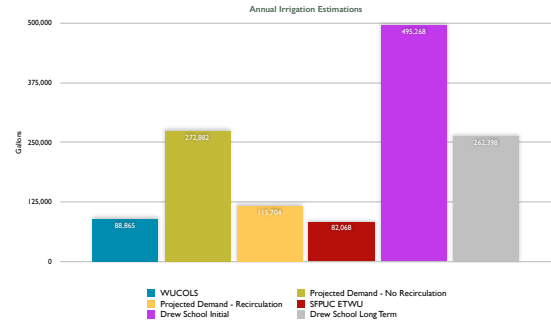
- This graph shows the combined reuse supply (stormwater & condensate) vs. the combined potential reuse demand (cooling tower, toilets and irrigation).
- Condensate and harvested stormwater can utilize the same storage tank.
- The combined reuse supply will offset 470,000 gallons of potable water, which is 21% of the combined potential reuse demand (2.3 million gallons).
- In order to allow full stormwater detention capacity in the storage tank, condensate could be redirected to the sewer during winter months

Overall Water Demand vs. Reuse Supply



- This graph shows the annual irrigation estimates vs. the available reuse supplies
- The two supplies have been combined in one vertical column and the two demands have been combined in the other vertical column for each month

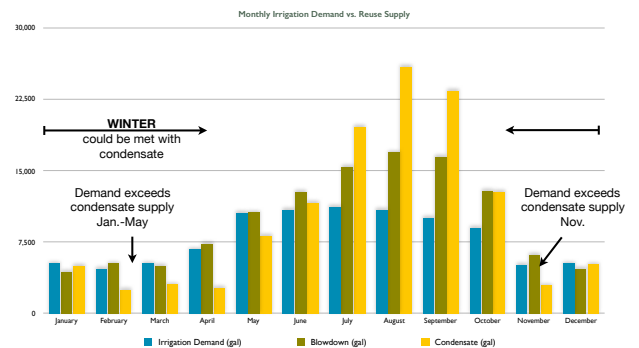
Irrigation Calculations: Various Methodologies



- This graph shows the annual irrigation estimates from three different methodologies
- The annual numbers are important, but analysis of the monthly numbers will give a more accurate representation
- Irrigation numbers for the Drew School were calculated on a per square foot basis and applied to the SFMOMA wall for comparison
- SFMOMA wall estimates without recirculation are approximately the same as the Drew School long term rate
- Recirculation will reduce irrigation demand by roughly half



Irrigation: Demand v. Reuse Supplies



- Irrigation demand can be satisfied with a combination of blowdown, condensate, and potentially, stored rainwater
- Condensate supply is enough to satisfy monthly demand for 7 months of the year
- The condensate can provide at least 50% of the irrigation for all months of the year except for April (34%)
- Blowdown water can be mixed with the condensate to make up the difference
- A 1,500 gallon tank (max 3 day demand) should be sufficient to store condensate to store water in reserve for the living wall/roof



LITTLE HOUSE AT STATION A

Location | San Francisco

Client | NRG Energy

Architect | Vital INC

Projected Completion Date | 2015

Description | The Little House Project at NRG's Station A is experimental and progressive. Designed as a sustainable model home, The Little House's aim is to demonstrate how a building can function as a micro ecosystem by integrating water, energy, and nutrients. The Little House Project incorporates a composting toilet, rainwater collection and treatment for potable indoor use, and a constructed off-grid graywater wetland. On-site solar panels meet the building's water system and electricity demands, while co-functioning as an additional rainwater collection surface. The success of Station A's Little House collaborative design efforts, namely its close work with city officials, has catalyzed the development of composting toilet and rainwater-to-potable permits throughout the city of San Francisco.





BORR

Location | San Jose, CA

Client | UC Capital Projects

Architect | Arkin Tilt Architects

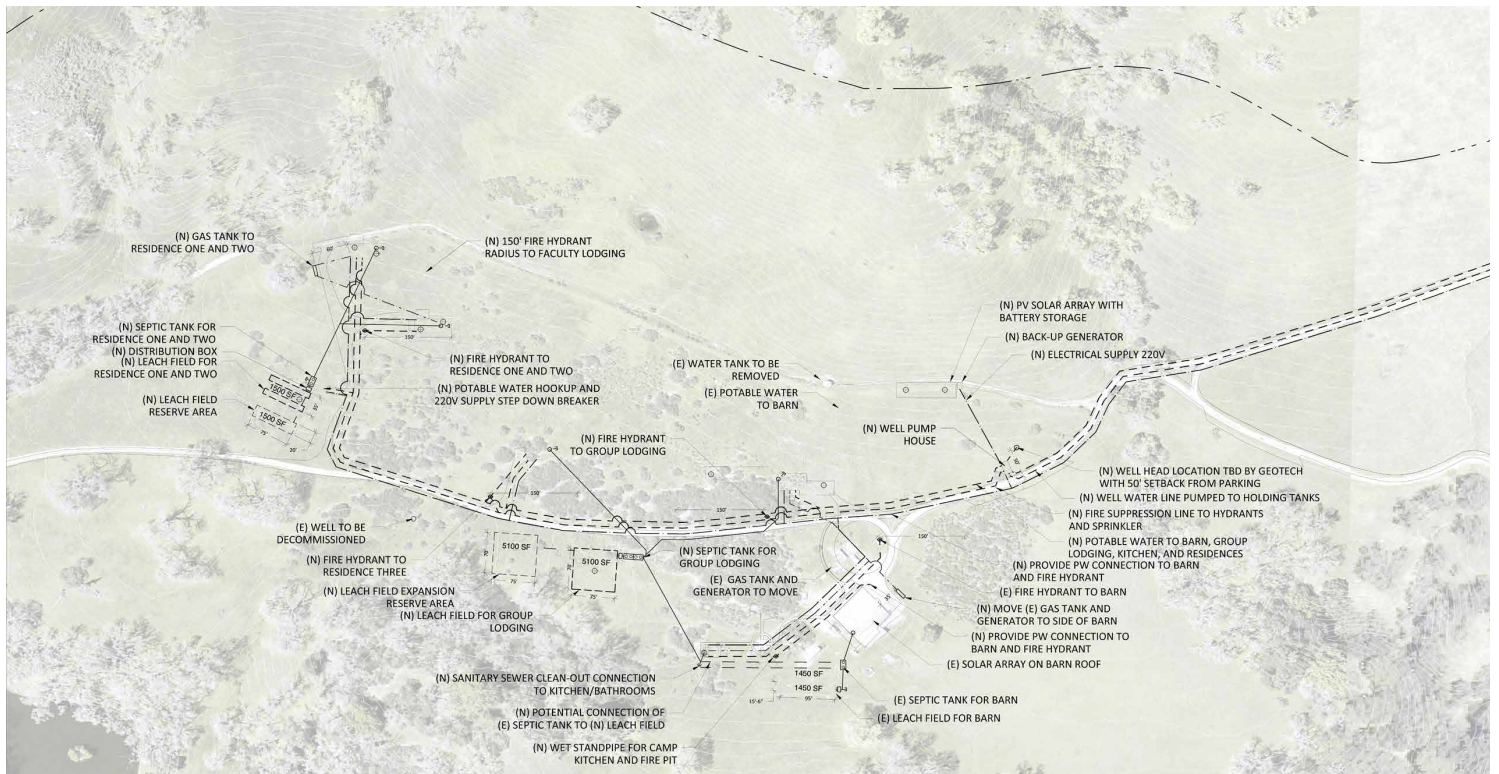
Design | Hyphae

Projected Completion Date | 2015

Description | Hyphae Design

Laboratory provided site planning and civil engineer work for the

UC-Berkeley owned Blue Oak Ranch Reserve is a 3,259 acre ecologically protected reserve located east of San Jose. BORR is the most recent living laboratory to join the UC Natural Reserve System. Resting in the tributary of Coyote Creek, this rolling oak woodland is off-grid project and access is only by a three mile dirt road. We developed low-impact conservation strategies to plan two residences for permanent staff and a 32 unit temporary student housing building that hosts scientists conducting field research. Roads, parking, and paths connect new buildings with well-water storage to supply, sanitary sewer to leach field, photovoltaic solar array to electrical distribution, and propane tanks to gas lines.





UC SAN DIEGO KEELING APARTMENTS

Location | San Diego, CA

Client | UC San Diego

Architect | Kieran Timberlake

Project Completion Date | 2011

Description | Working with the project architects, Hyphae designed grading and stormwater strategies to deal with both on-site water management, as well as a flashflood stormwater management basement to alleviate site-specific, upstream campus flooding issues. Hyphae also worked on the living roof waterproofing design, in addition to greywater reuse for landscape and interior toilet flushing.

