



Masterplan for
Whitmore Community Food Hub Complex
for
State of Hawai'i Agribusiness Development Corporation
Wahiawa, Hawai'i
July, 2017

University of Arkansas Community Design Center
+
University of Arkansas Office for Sustainability / University of Arkansas Resiliency Center

be resilient: build community around food!

A local food system centered around local growers requires a missing middle scale of agricultural infrastructure for shared product aggregation and processing.



Introduction:

Supporting Locally Produced Food

Project Synopsis

Food hubs are re-emerging as community-based supply chain infrastructure to support the processing of locally produced food. Large and small cities alike were historically served by local food hubs before large-scale agriculture eclipsed the primacy of locally produced food in feeding cities. Remnants of urban food hubs include now popular tourist attractions like South Street Seaport and Chelsea Market in New York City, Pike Place Market in Seattle, Eastern Market in Detroit, Reading Terminal Market in Philadelphia, and Faneuil Hall Marketplace in Boston. Now that communities are incorporating resilience in their policy and planning—including reassessments of the current provisioning of food—we have come to better understand unforeseen risks in the continent-scale food supply chain. Chronic stresses from food insecurity that undermine community well-being have also become more visible. Cultivation of local substitutions for imported food as well as expansion of crops grown locally for export have become important risk mitigation strategies in achieving greater food security. However, locally produced food requires regional-scaled infrastructure for small growers who typically do not have access facilities to aggregate, process, and distribute products to local consumers. The challenge to small growers will be further complicated by stringent regulations proposed under the Food Safety Modernization Act (FSMA), jeopardizing the ongoing viability of many small growers due to the costs of compliance. The dominance of continent-scale agriculture over the last eighty years has almost supplanted locally oriented

food processing infrastructure, resulting in a “missing middle” agricultural infrastructure necessary to support local growers and legacy food systems. The lost knowledge and capacity from local models of fruit and vegetable processing is being recaptured with food hubs, loosely defined as regional aggregation, processing, and distribution centers for locally produced fruits and vegetables. The challenge in developing new food hubs, then, entails formulation of fitting business models and appropriate facility designs, all without comparable precedents and data to guide development decision making.

In Hawai'i additional challenges to small growers include high costs in land, labor, and energy, as well as limited access to water supply for irrigation. Even if there were robust interest in farming and an abundant agricultural workforce, public sector investment remains the best hope for developing the supply chain infrastructure necessary to overcome market and distribution chokeholds. While food hubs may sponsor a retail function, food hubs are not farmer's markets as commonly perceived. Rather, food hubs are front-end supply chain venues for building wholesale relationships between diversified growers and institutional consumers.¹ They are market makers for locally produced food, providing for-profit services as well as nonmarket public goods. Food hubs centralize post-harvest services that lower input costs associated with processing, storing, and marketing/distributing locally produced food. Cooperative arrangements also raise the likelihood of implementing sustainable waste management to recycle agricultural waste streams. As community clearinghouses, food hubs leverage their public

1 Barham, James, Debra Tropp, Kathleen Enterline, Jeff Farbman, John Fisk, and Stacia Kiraly. *Regional Food Hub Resource Guide*, U.S. Department of Agriculture, Agricultural Marketing Service, April 2012.

good when overlapped with other community-based systems like workforce education and training, housing, allied business incubation, cultural tourism, energy, and urban design.

The Whitmore Food Hub Complex is planned to initially serve the processing needs of the central plain agricultural community surrounding Wahiawa, and possibly a larger footprint encompassing greater O`ahu. The following concept vision and master plan resulted from collaborative planning efforts among State of Hawai`i agencies, local governments, and civic organizations led by the Agribusiness Development Corporation (ADC) of the Hawai`i Department of Agriculture with the University of Arkansas. The master plan is a concept approach only and, as with all plans, will certainly change with additional design development and stakeholder feedback. The urban design vision supports development of a business plan, definition of project scope, and organization of multiple stakeholder participation in the project. Design development toward construction of site and buildings requires further technical architectural and engineering design services beyond the scope of this contract.

Stakeholders each hold important and sometimes conflicting interests in the development of the Food Hub. Both agreements and contestations among them informed the project team's planning and design approaches. First and foremost, the central plain agricultural community between Ewa and Haleiwa on O`ahu requires a fruit and vegetable food hub—primarily a logistics-oriented space—to pool services for the aggregation, processing, storage, marketing, and distribution of locally produced foods by small growers. More than half of all diversified crops grown statewide for local consumption are grown on O`ahu. Most of it is fresh produce encompassing 9,850 acres, according to the *Statewide Agricultural Land Use Baseline 2015*, released by the Hawai`i Department of Agriculture.² Area residents hold equally important interests in greater job creation, sustained economic development, and provision of affordable workforce housing. Still others in Wahiawa view the Food Hub Complex as an opportunity to create a mixed-use walkable neighborhood compelling to both tourists and local residents seeking engagement in food-related cultural activities. Accordingly, the Whitmore Food Hub Complex plan provides synergistic solutions responsive to these multivariate forces, integrating utility with culture and place.

2 Melrose, Jeffrey, Ryan Peroy, and Sylvana Cares. *Statewide Agricultural Land Use Baseline 2015*, University of Hawai`i at Hilo Spatial Data Analysis & Visualization Research Lab and Hawai`i, Department of Agriculture, 2016.

3 Page, Christina, Lionel Bony, and Laura Schewel. *Island of Hawai`i Whole System Project Phase I Report*, Rocky Mountain Institute, March 2007.

The Whitmore Food Hub Complex

In their 2007 report, *Island of Hawai`i Whole System Project Phase I Report*, Rocky Mountain Institute authors Christina Page, Lionel Bony, and Laura Schewel outline three primary business opportunities for improving Hawai`i's agriculture and locally produced food consumption: "increasing production, developing support infrastructure, and expanding markets."³ Food hubs fulfill the second category of developing support infrastructure, without which the other two recommendations could not succeed. Locally produced food and diversified agriculture are strategic risk mitigation strategies, cornerstone to community resilience that has become important among statewide policymakers. Resilience is the capacity of a system to thrive through disruptions and shocks exerted upon a system. Critical statewide, since 93 percent of Hawai`i's food is imported from global supply chains. Hawai`i's vulnerability is compounded by its situation as the remotest landmass on Earth. Not too long ago, Hawai`i's diverse landscape once fed a nation. It is the only state in the US covering all seven of Earth's terrestrial biomes—coastal strand, dry woodlands, tropical rainforest, mesic forests, deserts, subalpine grassland/shrubland, and alpine desert. Island ecosystems, however prolific, lack the network redundancy of continents. Therefore, the proposal recalls authors Jennifer Chirico and Gregory Farley appeal to once again "think like an island" in building statewide resilience, particularly through development of closed-loop systems.⁴ Food hubs are necessary components in closing the loop on food since they incubate diversified food supply chains and a skilled agricultural workforce where neither existed before.

Keeping in mind that the Food Hub is essentially a large post-harvest facility—a big box warehouse—four principles guide the planning and design of the 34-acre Whitmore Food Hub Complex. **Logistics:** provide a Food Hub that meets the requirements of the Food Safety Modernization Act (FSMA). **Placemaking:** integrate logistical spaces of the Food Hub with surrounding neighborhoods through serial public spaces that sponsor multiple uses. **Connectivity:** connect the Food Hub and Whitmore Village to downtown Wahiawa. **Anchoring:** socialize the Food Hub's big boxes and tilt wall concrete construction through mixed uses and civic frontages. Ideally, the Food Hub will service all stages of the local food supply chain. The cooperative nature of food hubs encourages integrated resource management among tenants.

4 Chirico, Jennifer, and Gregory S. Farley. *Thinking Like an Island: Navigating a Sustainable Future in Hawai`i*, University Of Hawai`i Press, 2015.

This involves the *upcycling* of tenant waste streams as inputs to feed another tenant's production processes, akin to the "green" economies of integrated energy districts.⁵ The ideal food hub eliminates the concept of waste, otherwise difficult when tenants are scattered in separate facilities. Food hubs' aggregated economy of agricultural services and producers hold greater opportunity for implementing sustainable agricultural practices, otherwise untenable in a conventional market primarily focused on export commodity crops.

1 Logistics

Provide a Food Hub that meets the requirements of the Food Safety Modernization Act (FSMA).

The Whitmore Food Hub is designed to meet the science-based protocols of FSMA, a preemptive set of regulations elevating safety measures throughout the food system. FSMA elevates hazard analysis, preventive control throughout growing and production processes from farm to table, and health and safety controls in facility design and operations. Facility construction should be smooth with minimal articulation and joinery that prevents water and pest intrusions; resists mold, mildew and bacterial growth; and clad with an exterior skin resistant to the corrosive effects of salt. The facility should be durable and easy to clean through power washing. Therefore, we recommend tilt wall concrete construction, an investment-grade construction system common among large-scale facilities, reaching economy of scale after 5,000 sq ft. The flat site is amenable to this *in situ* construction system. We recommend an insulated panel sandwich to achieve the thermal performance necessary for food hubs. Tilt wall concrete systems optimize food safety in the context of local environmental stresses, including severe weather, earthquakes, high humidity, and corrosive conditions.

Tilt wall concrete construction—a low-tech *in situ* process—provides flexibility and modularity, allowing for systemic growth as processing/storage protocols and tenant needs change. Some tenants will likely require warehouse stacking rack systems, requiring high building eave heights of approximately

23 feet, while others will need cold storage. Tilt wall construction is affordable and expedient compared to other construction systems since it relies on poured walls leaned into place on their foundations, rather than a layered wall assemblage involving multiple trades. Tilt wall involves low-skilled labor, modulated formwork, and basic joinery without the need for premium finishes. Concrete walls are both exterior skin and load-bearing structure, which makes the system durable and easily compatible with steel frame structural systems that may be used for the interior support of roofs. Tilt wall construction is one of the most commonly used building systems worldwide, especially for high-performance logistics support functions throughout global supply chains.

Preliminary determinations show that 75,000 sq ft is the minimum operating size to create a self-sufficient Phase I central Food Hub, including Visitor Center/Retail that can be programmed independently of the operations wing. To prevent contamination or to contain its spread, FSMA necessitates the sorting of food product between incoming and outgoing streams with protected areas in between for washing/sorting, and processing/packaging. Visitor access to operations space is limited. Additional regulations may apply depending upon standards governing high risk foods and processing protocols. Build-out of the centralized facility can accommodate a maximum 375,000 sq ft with an additional 60,000 sq ft in satellite Tenant Food Producer Commercial Facilities.

The master plan stratifies circulation between spaces for the public and shipping/logistical functions. Public areas of Food Hub buildings front a signature Neighborhood Lawn designated for the center of the site, much like a village green. Public building frontages line the Neighborhood Lawn with porches, shade canopies, visitor centers, public gardens, and a proposed Retail Arcade/Market that screen large processing facilities. Opposite the Lawn, continuous Logistics Yards for trucks are tucked along the eastern and western edges of the site away from public view. These Yards for product handling and shipping, water treatment/storage, and waste management are accessed at discrete entrances from Whitmore Avenue. Food Hub structures then are the pivot points between public space and logistics space.

The Food Hub Complex serves a variety of business models. A centralized

5 McDonough, William, and Michael Braungart. *The Upcycle: Beyond Sustainability--Designing for Abundance*, North Point Press, 2013.

Food Hub facility for shared processing among small growers (perhaps a cooperative) is supplemented by satellite speculative Tenant Food Producer Commercial Facilities for specialty tenants. Prospective tenants include coffee roasters, breweries/distilleries, juicing plants, taro producers, and other heritage food producers who desire their own freestanding structures (and identity) to support proprietary operations and expand upon existing customer bases. Perhaps consider developing a local seed bank to ensure preservation of legacy plant species. The design challenge involves deriving a civic architectural expression from an industrial building technology like tilt wall construction that lacks an architectural and placemaking pedigree.

2 Placemaking

Integrate logistical spaces of the Food Hub with surrounding neighborhoods through serial public spaces that sponsor multiple uses.

Besides providing processing and distribution support for small growers, the Whitmore Food Hub Complex serves additional community needs in agricultural workforce housing, business and technology incubation, and cultural tourism. A major planning objective is to provide a distinctive public setting for these community systems reflective of Wahiawa's rural historic character. The success of these community systems' will be rooted in place-oriented development; places that will have to appeal to Wahiawa residents, entrepreneurs, and North Shore tourists alike, despite that 80 percent of the complex is devoted to logistical functions.

Accordingly, our urban design recommendation adopts a campus planning approach animated by a succession of various public landscapes linking the site's northern edge at Whitmore Avenue to the Kaukonahua Stream along the site's southern edge. Four primary spaces anchor Whitmore Village's new public concourse: the transformation of Whitmore Avenue into a multi-way street, a central Neighborhood Lawn, a Food Forest, and the Bridge over Kaukonahua Stream to downtown Wahiawa (Food Forest and Bridge discussed under Principle 3: Connectivity). This pedestrian/bicycle concourse

connecting Whitmore Avenue to downtown Wahiawa is more than one-half mile in length. However, this is not the classic early 20th century main street development. Main streets are beloved spaces marking the center (and usually the founding space) of town. Understandably, some want to reproduce the iconicity of main street in new development. However, main streets were based on a small-scale retail economy, developed incrementally with fee simple small-lot commercial structures for individual merchants. Ground-level stores (typically 2,500-10,000 sq ft) supported equally modest residential and offices uses above, creating compact multiple-story streets. This vertical, and particularly urban, integration of uses served cities well before the adoption of single-use zoning rendered main street illegal—especially the universal house-over-shop formula that made downtowns livable and affordable. Conversely, the food hub is a warehouse economy needing the large-scale horizontal format of industrial processing and storage environments to support wholesale exchanges. Hence, the campus approach allows us to coherently negotiate large and uneven differences: big scale with small scale, residential functions with large assembly functions, and civic space with logistical space, through a diverse set of urban landscapes. The four landscapes of this public concourse sponsor their own compatible forms of civic expression equally as memorable and human-scaled as main street.

Whitmore Avenue as Multi-Way Street

Whitmore Avenue should be designed as a destination environment to serve the interests of both the community and the Food Hub Complex. Inspired by context-sensitive streets like Kamehameha Highway—particularly at Hale'iwa, the hub community of the North Shore tourist area—we recommend the existing Whitmore Avenue right-of-way along the Food Hub be reconfigured into a multi-way street. Multi-way streetscapes are laminated (layered) corridors, serving a range of travel speeds and modes in the same space. Designed more like gardenized corridors or boulevards, multi-way streets accommodate slow automobile travel, bicycles, and pedestrian modes of movement without sacrificing commuter traffic-carrying capacity in the full right-of-way. The multi-way street recommendation entails integration of the public right-of-way with that of the Food Hub's property frontage to create a destination public space. Tree-lined lanes for slow trav-

el accommodate on-street parking, eliminating large and unsightly parking lots in favor of more town-oriented parking formats. Whitmore Avenue currently lacks basic pedestrian facilities like sidewalks despite the presence of neighborhoods. The corridor is an auto-dominant environment unsupportive of non-traffic uses like shopping, strolling, meeting, and dining that all great streets support. Multi-way streets allow pedestrians to claim the street space with the same authority as motorists through street design that compels motorists to slow down and behave socially. The proposed design favors more a series of landscaped rooms or plazas than a smooth corridor, the latter promotes high travel speeds regardless of posted limits. Thus, to change travel behavior and attendant perceptions of safety in a street: change its level of service.

Neighborhood Lawn

The Neighborhood Lawn is the heart of the Food Hub Complex and a civic anchor for Whitmore Village. While communities like Whitmore Village separate land uses through single-use zoning, the Neighborhood Lawn aggregates the Food Hub Complex's different land uses around its edges. Much in the spirit of a village green (commonly used in plantation planning among other planning traditions). The Lawn—the grand room comprising Whitmore Avenue's proposed series of rooms—couples Whitmore Avenue with the Food Forest and Bridge to downtown Wahiawa. The Lawn's central space overcomes limitations in traditional front-to-back urban orientations of main streets, since it accommodates public entrances from opposite sides—north and south—much like a campus. A receptive space by definition, the Neighborhood Lawn encourages the intensification of public uses, including arrival and orientation, housing, water treatment and storage, and formal as well as informal economies involving food trucks and produce stands. Akin to village greens and town squares, the Neighborhood Lawn typologically negotiates differences in scale, use, and architectural expression through shared building frontages (see more on this in Principle 4: Anchoring). Regardless of land use, we recommend that all buildings fronting the Neighborhood Lawn, even the Machine Shop and Food Hub structures, provide public frontages like canopies, porches, loggias, arcades, and courts compatible with great public spaces. Agnostic to use, such form-based coding requires the princi-

pal elevation of all buildings to qualitatively define public space, a criterion which single-use zoning fails to address.

Workforce Micro-Housing

What is good for the agricultural workforce in Hawai'i is good for agriculture. Whereas the production chokepoint for meat statewide is the cost of feed, for fruits and vegetables it is the cost and availability of labor.⁶ Hawai'i is the most expensive housing market among all 50 states and suffers the highest rate of homelessness, particularly among low-income workers in the agricultural workforce. In 2015, Hawai'i Governor David Ige declared a state of emergency around homelessness in Hawaii. According to the USDA, in 2013, farm operators in Hawai'i paid their workers an annualized rate of almost \$24,000⁷ in a state where the average household income was \$69,213.⁸ The intent of the workforce micro-housing is to improve the quality of life for agricultural workers through the provision of affordable and creative housing environments for single occupancy residents.

The housing complex fronts the eastern edge of the central Neighborhood Lawn, close to available water supply and sewer services. Consisting of a five-story loft structure and one-story patio housing sandwiching a recreation park, the housing complex extends off-site residential land uses into the Food Hub Complex. In the five-story loft building, one hundred single occupancy dwelling units, 250-300 sf, surround an exterior elevated lawn on the second floor, the heart of the loft housing. Some penthouse units are two story lofts combining two sleeping areas, while several ground and second floor units have patios. Courts, patios, screened porches, arcades, and a Recreation Park offer "third places" that socially channel time outside of work. The third place concept was coined by sociologist Ray Oldenburg in his book, *The Great Good Place: Cafes, Coffee Shops, Bookstores, Bars, Hair Salons, and Other Hangouts at the Heart of a Community*, to examine social capital produced in neighborhood institutions.⁹ Accordingly, we can apply this thinking to the layers of public space that should be present in multi-family housing complexes. Third spaces underpin and likely predict the advancement of social capital among residents, including the forging of close ties in support networks that supplement those of family.

6 Page, Christina, Lionel Bony, and Laura Schewel. *Island of Hawai'i Whole System Project Phase I Report*, Rocky Mountain Institute, March 2007.

7 National Agricultural Statistics Service. *Hawai'i Agricultural Labor*, United States Department of Agriculture, May 28, 2013, https://www.nass.usda.gov/Statistics_by_State/Hawaii/Publications/Miscellaneous/aglaborFF.pdf.

8 Department of Numbers. *Hawaii Household Income*, 2015, <http://www.deptofnumbers.com/income/hawaii/>.

9 Oldenburg, Ray. *The Great Good Place: Cafes, Coffee Shops, Bookstores, Bars, Hair Salons, and Other Hangouts at the Heart of a Community*, Da Capo Press, 1999.

Neither home nor work, third places are communal spaces where the rules of good conversation and conviviality govern social interaction, important in creating a healthy and robust civil sphere. Third places also extend the modest living spaces of single occupancy units to create an expanded living transect that includes public amenities and services. Bordering the south edge of the Recreation Park, a refurbished exterior shed—a community Super Roof—houses a basketball court, social services offices, and indoor gathering space completing the shared housing landscape that compensates for the small space of the dwelling unit. The secret of good multi-family housing lies in the design of the shared landscape. More than individual units, the public and semi-public spaces derived from porches, stairways, corridors, and green spaces that connect units are the key factors in deriving quality residential environments.

Agricultural Research and Innovation Hub

Located on the ground floor of the Workforce Micro-Housing loft structure, fronting the Neighborhood Lawn and Whitmore Avenue, the Innovation Hub recalls the frugality of main street's house-over-shop formula. This starter space is 8,600 sq ft. Future expansion can be accommodated in adjacent Tenant Food Producer Commercial Facilities to be developed per tenant needs. Integrating the Innovation Hub with the housing structure serves several interests. First, the Innovation Hub can hedge its investments without having to build a freestanding structure among uncertainty over space needs and patronage. Second, housing on the ground floor of the Neighborhood Lawn is not an appropriate use for a highly visible public space, though vertical mixing of residential and commercial uses is very desirable. Since the Innovation Hub is intended to support speculative activities, the space has 14-foot high ceilings with garage doors for vehicular and robotic equipment access from side elevations. Floating wet cores related to kitchen and bathrooms support both an open floor plan and legible subdivision of the plan into designated areas.

Machine Shop

The existing Machine Shop fronts Whitmore Avenue and occupies a central position at the edge of the Neighborhood Lawn. The shop is an important

repair and fabrication facility, servicing farm vehicles and fabricating agricultural tools and parts for the region. While the metal building skins have experienced extensive corrosion from salt, visual inspection suggests that the structure appears to be salvageable. However, final determination of structural integrity is beyond the scope of this contract and requires confirmation from a licensed engineer. If the structure is salvageable, we recommend recladding the exterior with a panelized cementitious fiber board system as illustrated in the report. Cement fiber board offers superior resistance to water and mold/mildew at a favorable cost compared to other cladding systems. The Machine Shop holds the potential to become a unique landmark in the overall development plan, combining utility with a pageantry from color combinations in exterior panel systems.

Water Harvesting System

The Food Hub Complex at build-out requires approximately two million gallons of potable water daily. Since local water supply is questionable in meeting this requirement during peak demand, site design incorporates a supplemental water harvesting and storage landscape. While the Harvesting System recycles and even upcycles water for ancillary uses through grey water treatment, the key objective is provision of potable water upon demand (aim of the Food Hub is to support a three-shift operation). While a Potable Water Storage Tank located in the Logistics Yard sustains local water supply, it also provides additional on-site fire suppression capacity and maintains constant pressurization. Reclaimed Water Storage Tanks located on the Neighborhood Lawn redistribute post-treatment storage for site irrigation needs and other conforming grey water building uses within the Workforce Housing and Food Hub buildings.

More than simply infrastructure, water curates spaces in the Food Forest and Taro Demonstration Garden, a wetland food production landscape. Water Storage Towers on the Neighborhood Lawn's pond are landmarks celebrating local agricultural heritage. The Towers project archival images from plantation era life on the central plain (ideally changeable with representations from the era of the ahupua`a), providing historic context for visitors. Here, water systems are used to construct the physical site while memorializing the area's agricultural heritage in shaping culture.

3 Connectivity

Connect the Food Hub and Whitmore Village to downtown Wahiawa.

The site of a former high-security Dole Food Company operations facility, the Whitmore Food Hub Complex connects an isolated Whitmore Village to downtown Wahiawa across the canyon. Similar to post-WWII *first ring suburbs*, Whitmore Village evolved into a bedroom community for a workforce supporting a military base and nearby plantation-based food production operations. While first ring communities characteristically enjoy moderate housing densities and sufficient utilities to accommodate expansion, they lack mixed uses and neighborhood identity. Indeed, Whitmore Village's Walk Score is 28 out of 100, "Car-dependent", where access to essential services requires a car.¹⁰ Meanwhile, nearby downtown Wahiawa's Walk Score ranges up to admirable 79, indicating walkable, mixed-use neighborhoods where zero-car households can thrive without the use of an automobile.

The Food Hub's public space system features a foot-bicycle Bridge and Zip Line (optional) spanning the Kaukonahua Stream, connecting Whitmore Village to downtown Wahiawa's Community Center. The Bridge improves access from Wahiawa's residential areas to the Food Hub Complex as a new employment center, especially among zero-car households residing in Wahiawa. The master plan harnesses the civic potential in logistics/transportation investments to solve for larger connectivity gaps—also economic and equity gaps—in the town's urban fabric. Such synergistic solutions provide several public goods at once, only possible through public sector leadership.

The footbridge features signature gateways. The "Nest", a botanical pavilion with hanging gardens on the Wahiawa side, negotiates the 15-foot elevation difference between the two canyon edges by way of a compact spiral ramp. The spiral avoids having to ramp the bridge across its approximate 1,000-foot span, which would be fatiguing and unrewarding to walk. In the tradition of civic-oriented transportation infrastructure, the Nest provides Wahiawa with a memorable postcard-quality civic landmark celebrating arrival and departure. The Bridge and its gateways articulate neighborhood edges between Wahiawa and Whitmore Village, important for structuring neigh-

borhood identity and improving wayfinding through town.

Opposite the Nest, the Zip Line Tower and Food Forest welcome visitors to the Food Hub Complex anchoring Whitmore Village. The Food Forest and adjacent Taro Demonstration Garden, a terraced wetland landscape, offer important education spaces exhibiting heritage food production. Food forests are vertically layered agricultural landscapes with seven stacked growing zones, ranging from overhead fruit tree canopies to roots and tubers underground. Sometimes referred to as "multistrata agroforestry", food forests mimic the regenerative structure of natural forests. Following permaculture principles of plant companioning, food forests were first cultivated in the fecund landscapes of tropical climates based on deep symbiotic relationships and hierarchies of access to sunlight among plants. Their morphology (structural form) is defined by plant guilds that optimize nutrient exchange—including healthy soil formation—for high-yield food production. Food forests are low-tech/high concept foraging landscapes, offering yet another public-sector strategy for streamlining edible landscapes and food literacy. The Whitmore Food Hub Complex could become the frontlines in promoting public fruit parks throughout Hawai'i, and the US for that matter.

4 Anchoring

Socialize the Food Hub's big boxes and tilt wall concrete construction through mixed uses and civic frontages.

While tilt wall concrete construction provides a clean industrial environment toward minimizing food contamination, its construction lacks an architectural pedigree with aesthetic or urban value. To address this challenge, we have shaped the frontages of Food Hub buildings through a "shade economy" to establish a welcoming sense of place for receiving visitors. A signature feature of the Neighborhood Lawn is the canopy system of circular metal sun shades that frame entry to the Visitor Center and the Food Hub Market at the centralized facility. The canopy system also grows with each successive phase of the Food Hub, visually linking buildings as they are added to the complex—akin to a mall. Multiple functions from education tours

¹⁰ Walk Score, 2017, <https://www.walkscore.com/score/>.

to dining and shopping at the Food Hub market can be accommodated under the canopies. The canopy system can be accessorized with lighting and signage systems as tenant needs require.

The canopy system leads to the Visitor Center (one primary and a secondary one to be added in a later phase) organized around exterior entry courts with gardens. The tilt wall system at public entries celebrate both civility and the technology of the continuous load-bearing mass through large-scale inverted arches. The scale of the inverted arches and their various patterns of openings are in harmony with the intrinsic “bigness” in warehouse design. The large arches operate at the scale of the site to celebrate entry in an otherwise inexpressive building technology. Pasting historical motifs on big box construction never leads to a satisfactory urban design or architectural design outcome. We recommend that concrete walls be tinted with color admixtures in concrete pours, providing a warmer and deeper dimension to concrete walls. Concrete does not have to look like concrete.

Smaller and freestanding Tenant Food Producer Commercial Facilities project civic frontage through arcades and porches/breezeways that wrap courtyards connecting to Food Hub buildings. Courtyard building typologies provide great flexibility, capable of multiple configurations per tenant needs. Courtyards are ideal couplers of difference, pivoting between large-scale production spaces and smaller scaled porches responsive to the human dimensions intrinsic to retail and housing development for the eastern portion of the site. Porches complement public visitor functions that may be designated within Commercial Food Hub buildings. Both contemporary and modern landmark buildings in O`ahu are courtyard buildings, a surprisingly underutilized building type nationally. Notwithstanding their scale differences, frontages of Tenant Food Producer Commercial Facilities complement the canopy system of the centralized Food Hub facility.

Influences throughout the proposed plan include traditional Hawaiian pavilion-and-court design, vernacular agriculture building types, and signature street environments, as they all produce high-quality urban places of dignity and generosity. Through pitch-and-roll roof forms, public canopy systems, and a signature bridge with landmark gateways, the architectural approach creates an iconic skyline from pragmatic building solutions. Urban design

solutions have sought to uphold Wahiawa’s Urban Design Plan and advance its image, particularly in the development of the community’s “role as a ‘gateway’ between town and country”,¹¹ where this project resides. The project also celebrates Wahiawa’s “plantation heritage and rural, small-town atmosphere”¹² through proposal of unique urban agricultural landscapes that would be unfeasible to develop in the town core. Yet, these landscapes bring the vitality and refinement of the town core to a working country landscape, precisely what the plantations did.

11 Wilson Okamoto & Associates Inc. *Wahiawa Urban Design Plan*, City and County of Honolulu Planning Department, January 1998, available at <https://sites.google.com/a/wahiawacbd.org/public-site/downloads/wahiawa-information/1998-wahiawa-urban-design-plan-1>.

12 Ibid.



Principles of Food Hub Plan

- 1 **Logistics:** Provide a Food Hub that meets the requirements of the Food Safety Modernization Act.
- 2 **Placemaking:** Integrate logistical spaces of the hub with surrounding neighborhoods through serial public spaces.
- 3 **Connectivity:** Connect the Food Hub and Whitmore Village to downtown Wahiawa.
- 4 **Anchoring:** Socialize the hub's big boxes and tilt wall concrete construction through mixed uses and civic frontages.

the project challenge ?

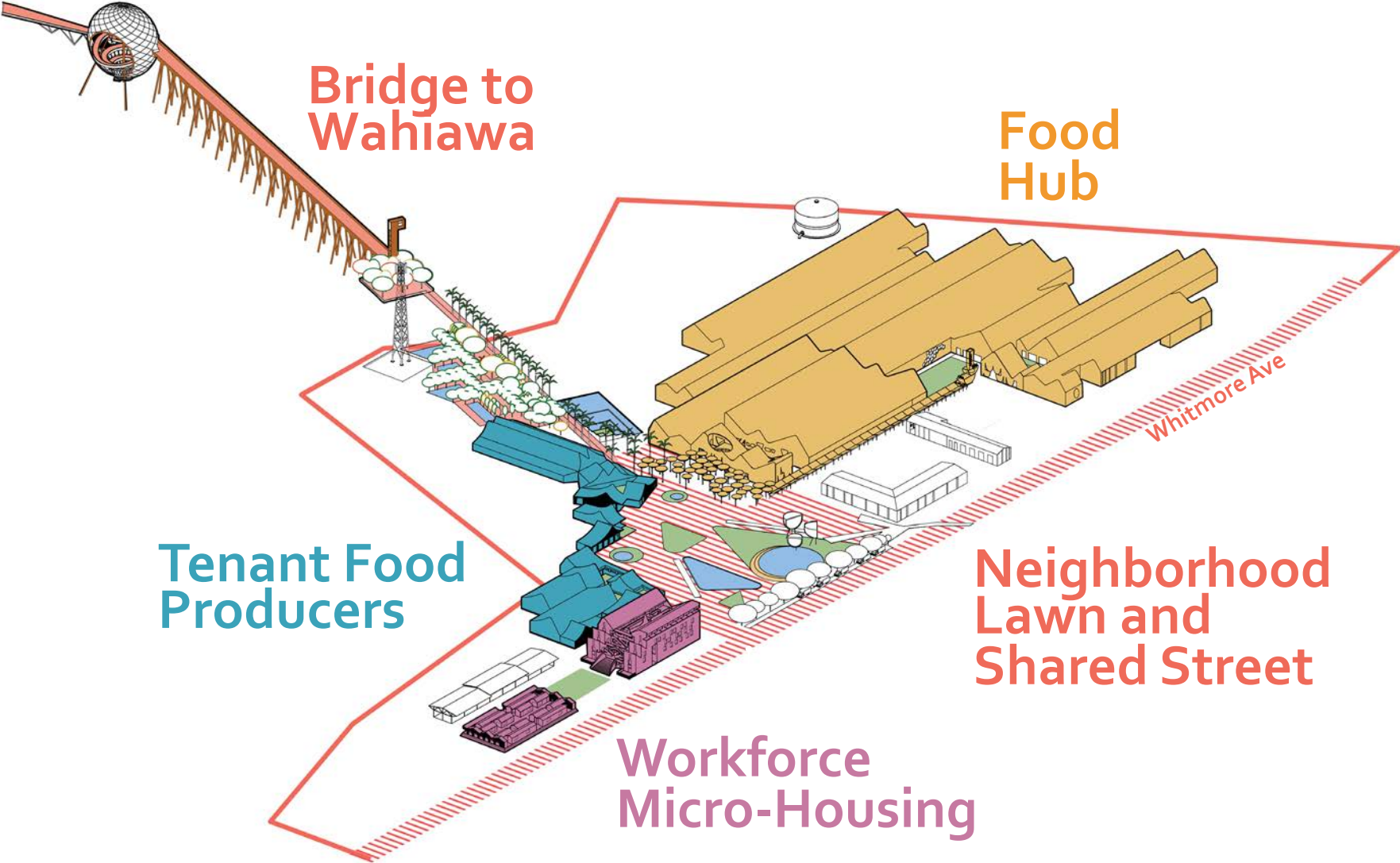
Make car-dependent Whitmore Village a walkable, mixed-use neighborhood through development of the Food Hub as a community anchor.



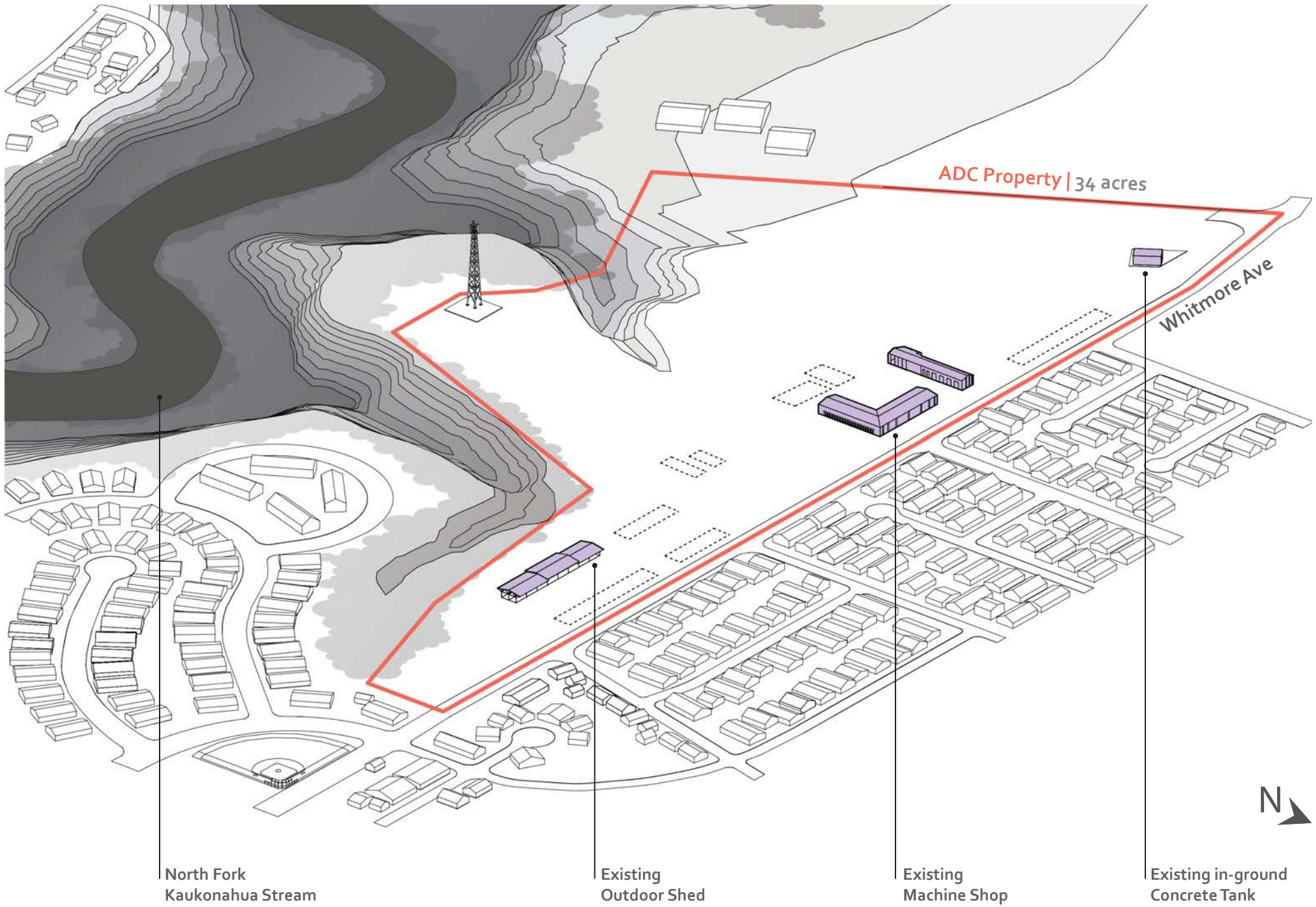
gateway to the north shore agriculture communities

The Food Hub serves local growers' processing needs while value-adding housing, retail, technology incubation, and cultural tourism functions that complement downtown Wahiawa.





First, we preserve the machine shop and one shed | Asset Retention Strategy



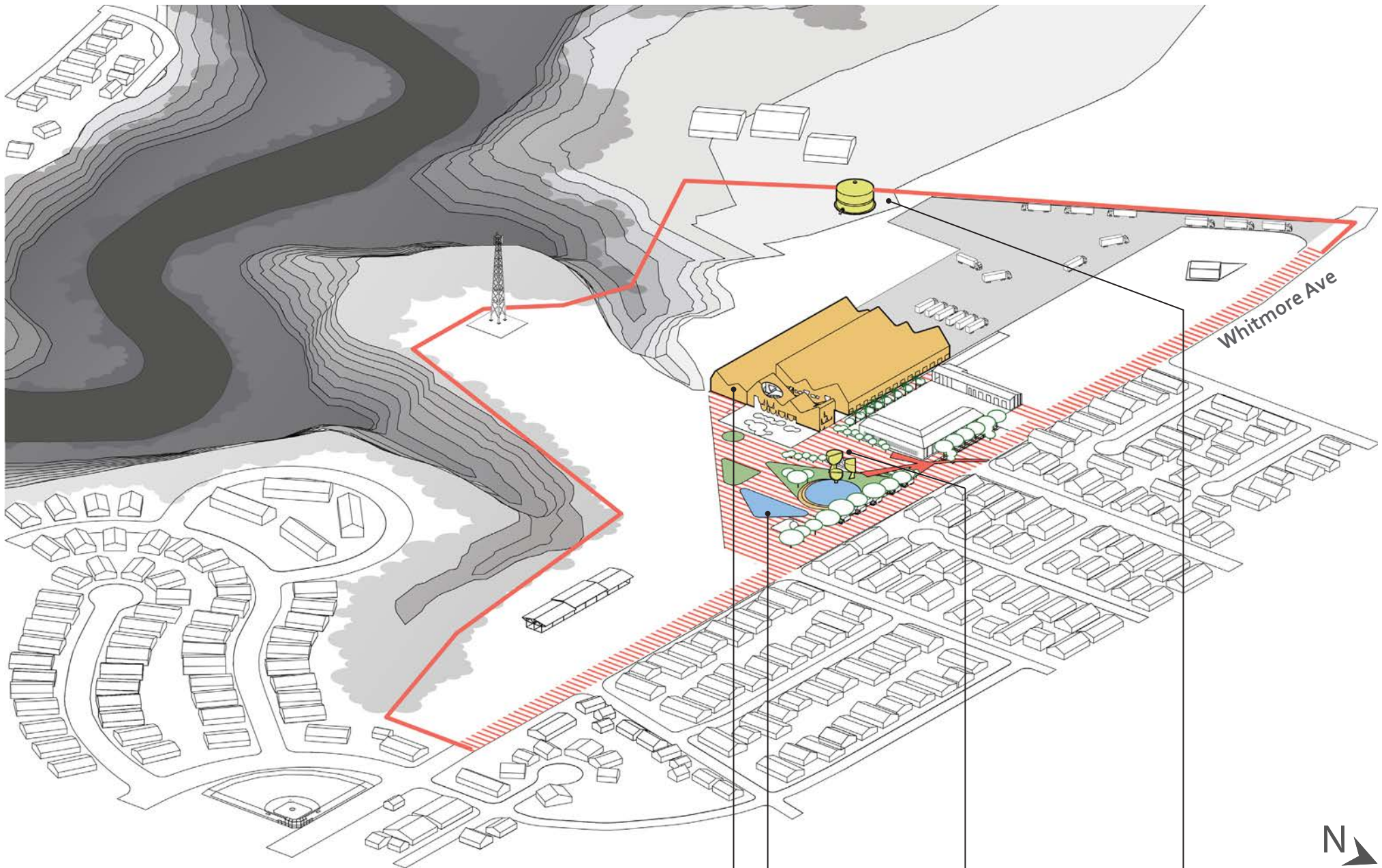
North Fork
Kaukonahua Stream

Existing
Outdoor Shed

Existing
Machine Shop

Existing in-ground
Concrete Tank

Then, we build a Food Hub | Pioneer Investment



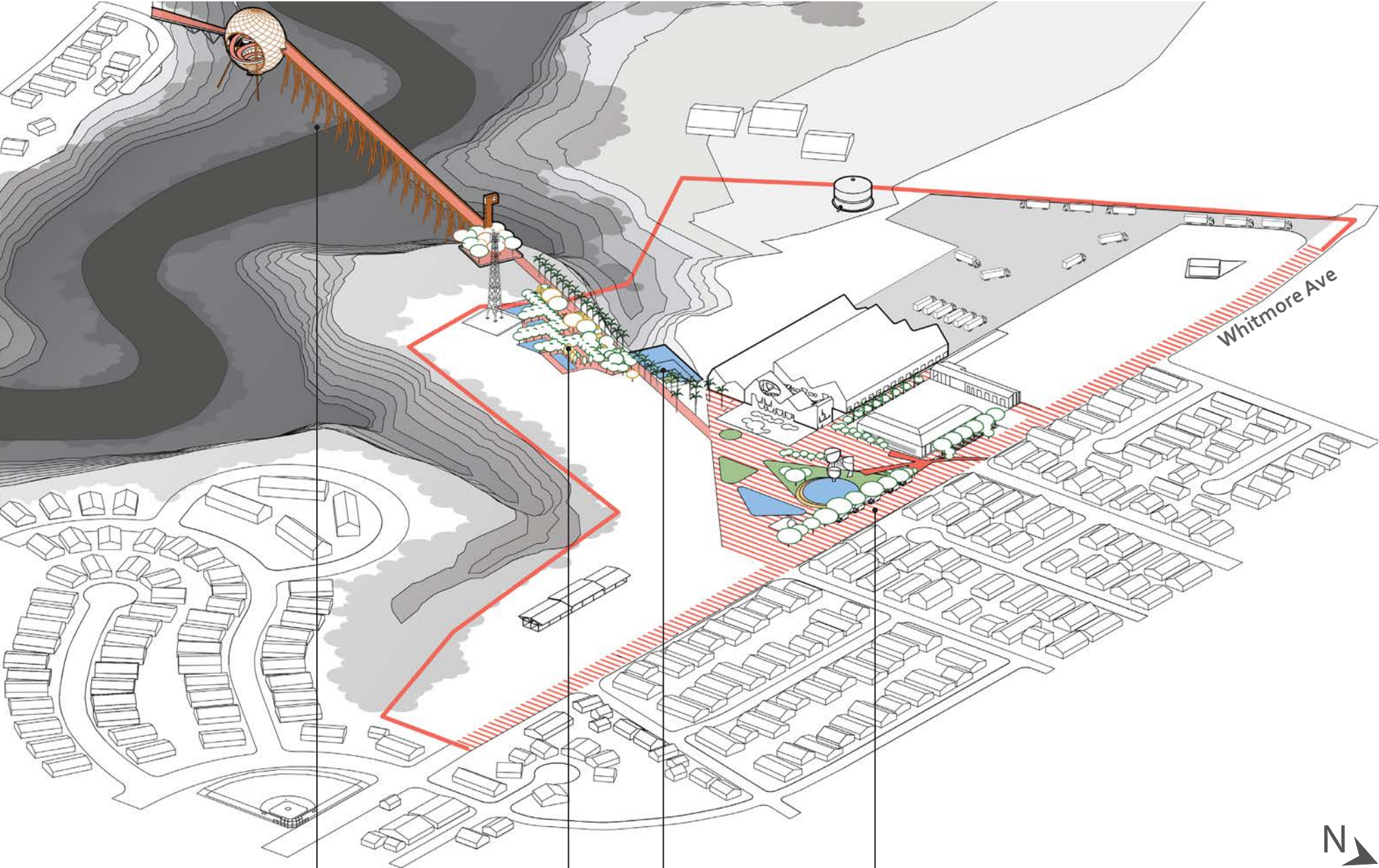
Food Hub, Warehouse and Retail
75,000 sqft

Treatment Ponds

Water Storage Tanks
500,000 gallons

Potable Water Storage
250,000 gallons

We add public spaces to connect the Food Hub and downtown | Public Spaces



Bridge to Wahiawa

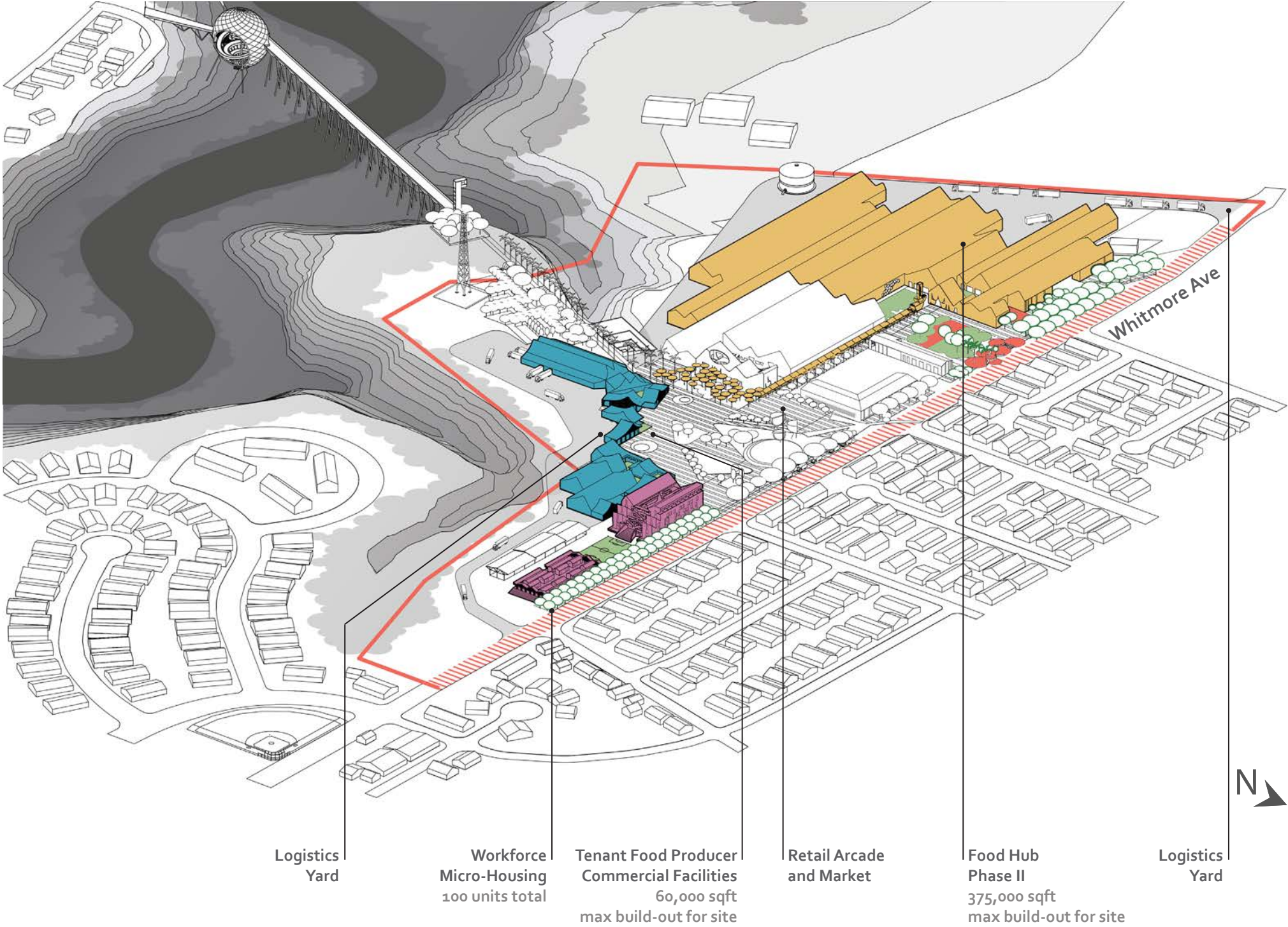
Food Forest

Taro Garden

Neighborhood Lawn and Shared Street



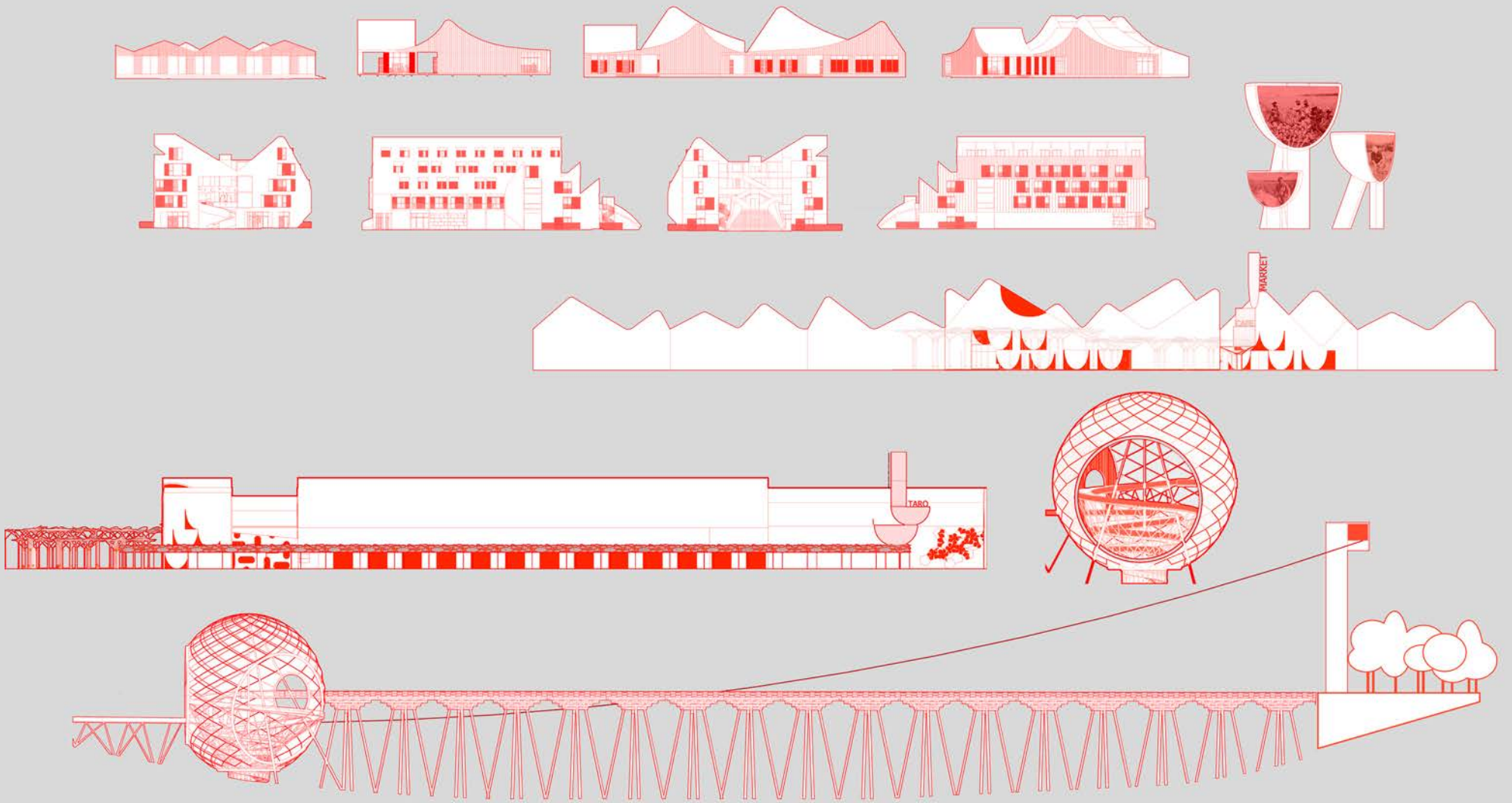
Then we develop other services as we build out the Food Hub | Food City

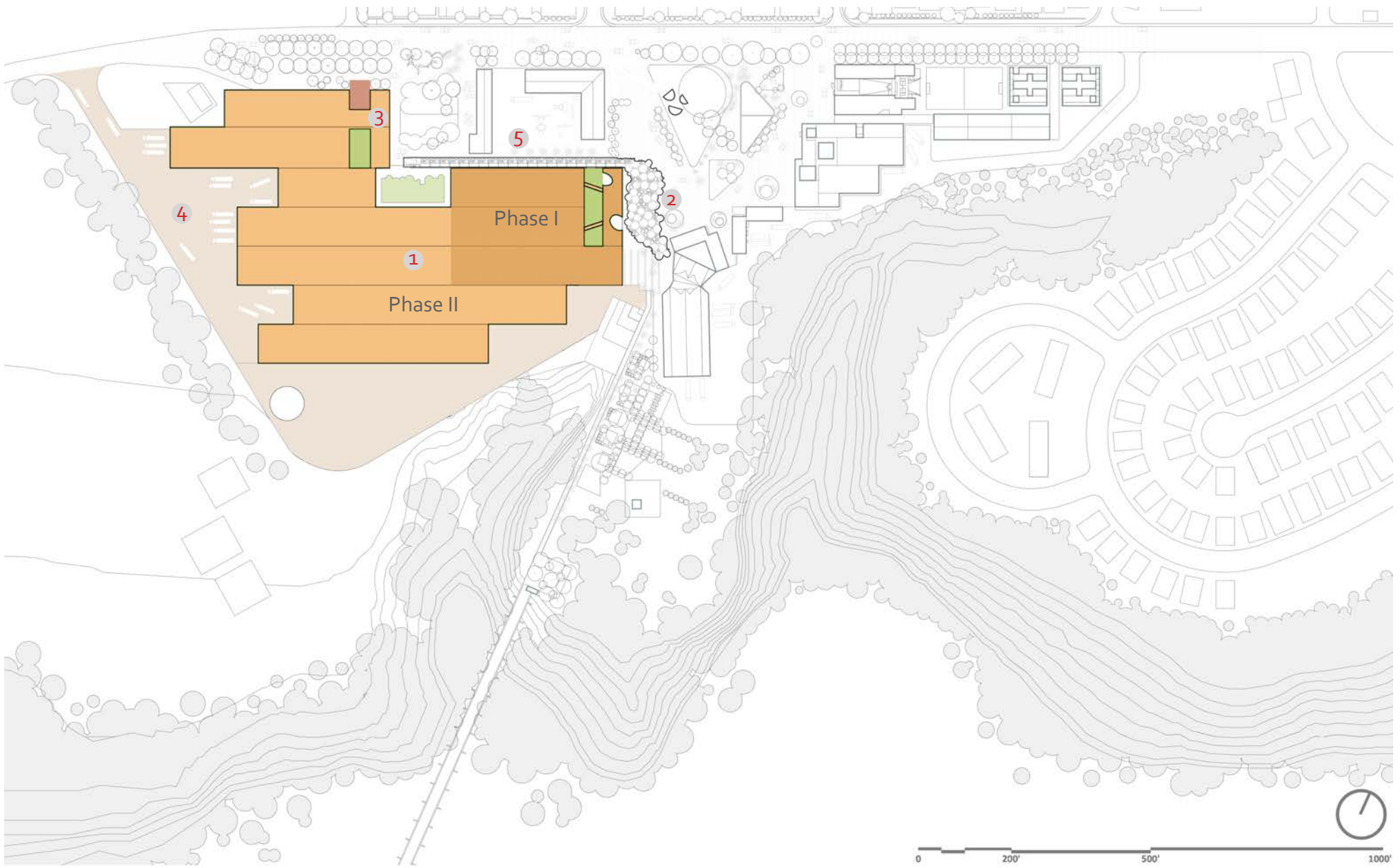




Whitmore Food Hub Complex Plan

- | | | |
|--|--|---|
| Food Hub and Warehouse ① | Tenant Food Producer Commercial Facilities ⑥ | Water Storage Tanks and Treatment Ponds ⑪ |
| Food Hub Retail and Visitor Center ② | Taro Garden ⑦ | Hawaiian Sandalwood Grove ⑫ |
| Anchor Tenant Food Processing and Retail ③ | Food Forest ⑧ | Bridge to Wahiawa ⑬ |
| Logistics Yard ④ | Neighborhood Lawn/Visitor Parking ⑨ | Existing Machine Shop - Renovated ⑭ |
| Research and Innovation Hub ⑤ | Workforce Micro-Housing ⑩ | Existing Outdoor Shed - Renovated ⑮ |





Food Hub Facility

75,000 sqft Pioneer Investment - 375,000 sqft Full Build-out

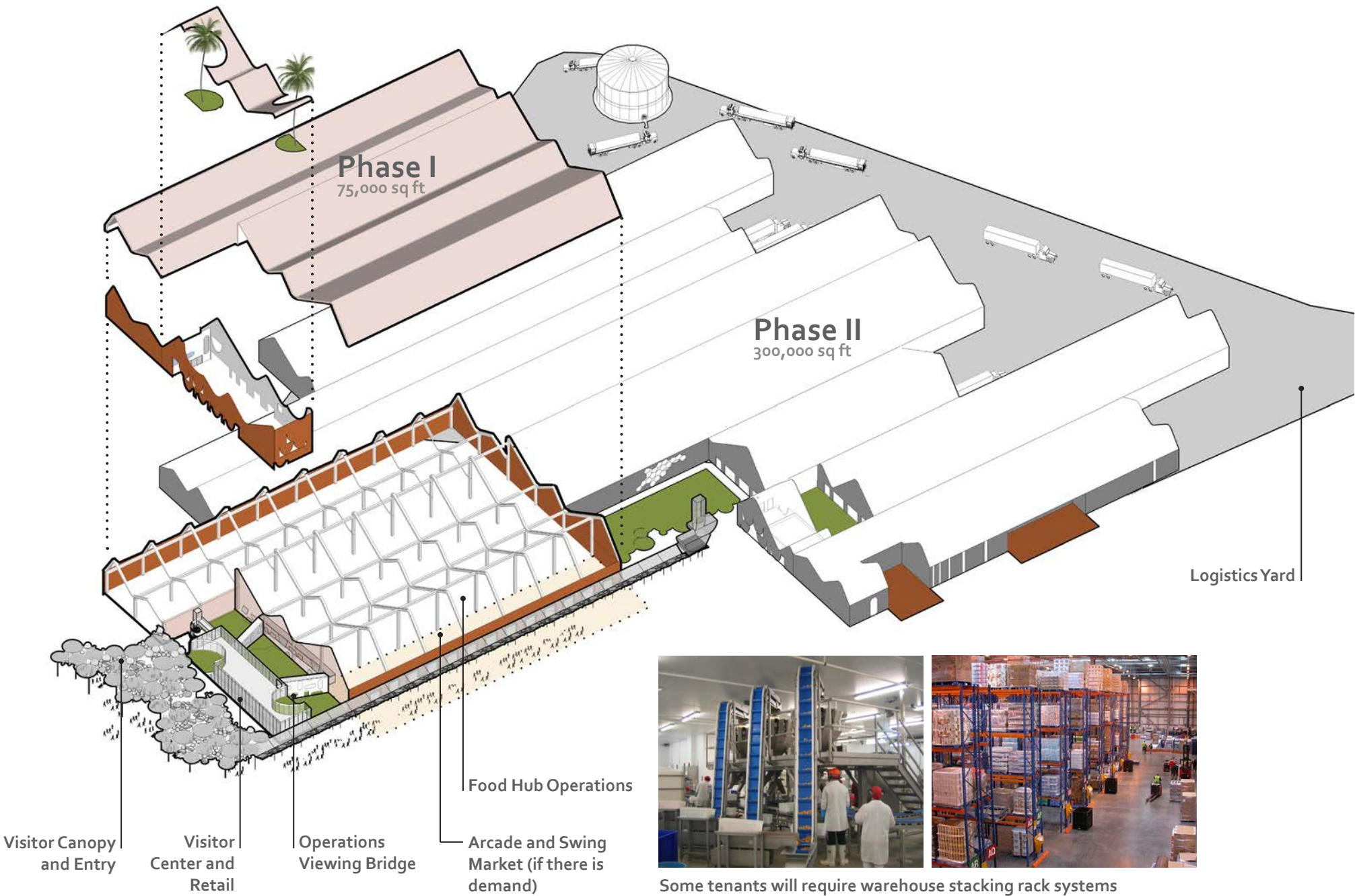
- Food Hub and Warehouse ①
- Water Storage Tank and Logistics Yard ④
- Food Hub Retail and Visitor ②
- Retail Arcade and Market ⑤
- Anchor Tenant Food Processing and Retail ③



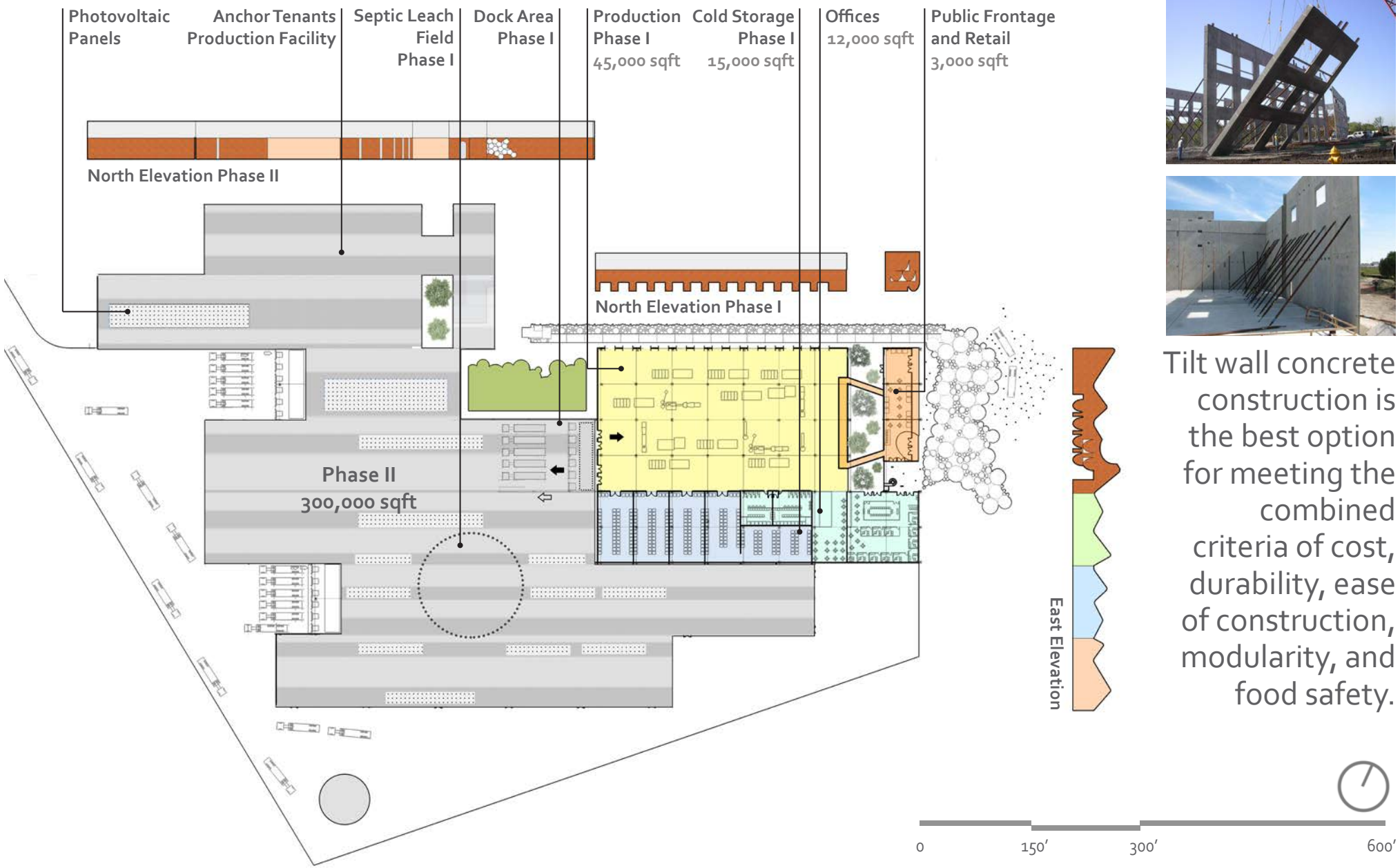
add canopies as umbrellas for visitors

We develop a SHADE ECONOMY around the Food Hub using canopies, trees, hanging gardens, and public frontages to welcome patrons. Consider fabricating canopies in the Machine Shop.

Develop the Food Hub incrementally as demand arises | Phasing



Some tenants will require warehouse stacking rack systems



Tilt wall concrete construction is the best option for meeting the combined criteria of cost, durability, ease of construction, modularity, and food safety.

the Food Safety Modernization Act (FSMA) changes agriculture

FSMA presents exacting regulations that challenge the business model of current food production practices, particularly hub facility design and scale.



Food Hub Operations

Operations Viewing Bridge

Visitor Center

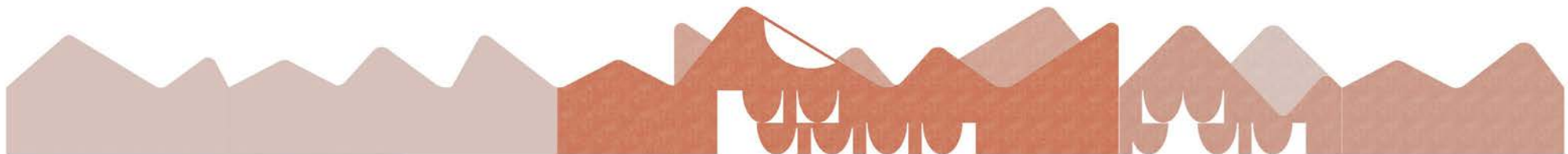
Visitor Canopy and Entry

let's tour the Phase I Food Hub

... Phase I VISITOR CENTER AND RETAIL with Viewing Bridge to Food Hub Operations. Rooftop gardens and hall accent the visitor experience.

the hub also offers heritage and food literacy experiences

Therefore, the ORDINARY TILT CONCRETE WALL SYSTEM for large-scale logistics facilities is shaped for public entry and programs.





Inside the **Visitor Center entrance**, a café in the arcade with hanging garden above.



Visitor Canopy weaves scattered site programs as the hub grows

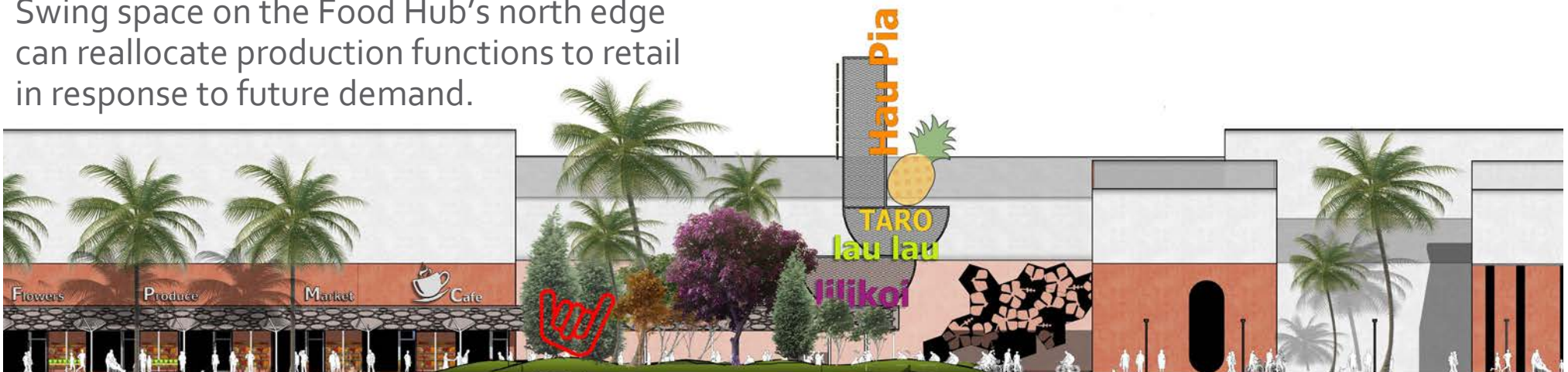
Besides entry to the Visitor Center, the canopy wraps the Food Hub to become a linear market with views into the newly renovated Machine Shop.

Reclad Machine Shop with colored fiber board panels to create a landmark.



a farmer's market and shops?

Swing space on the Food Hub's north edge can reallocate production functions to retail in response to future demand.





the built-out Food Hub works like a mall

Visitor Canopy connects Phase I to Phase II Anchor Tenant Food Processing and Retail at courtyard.





"The Nest" |
Botanical Pavilion

Bridge to Wahiawa

Food Forest

Public Space System

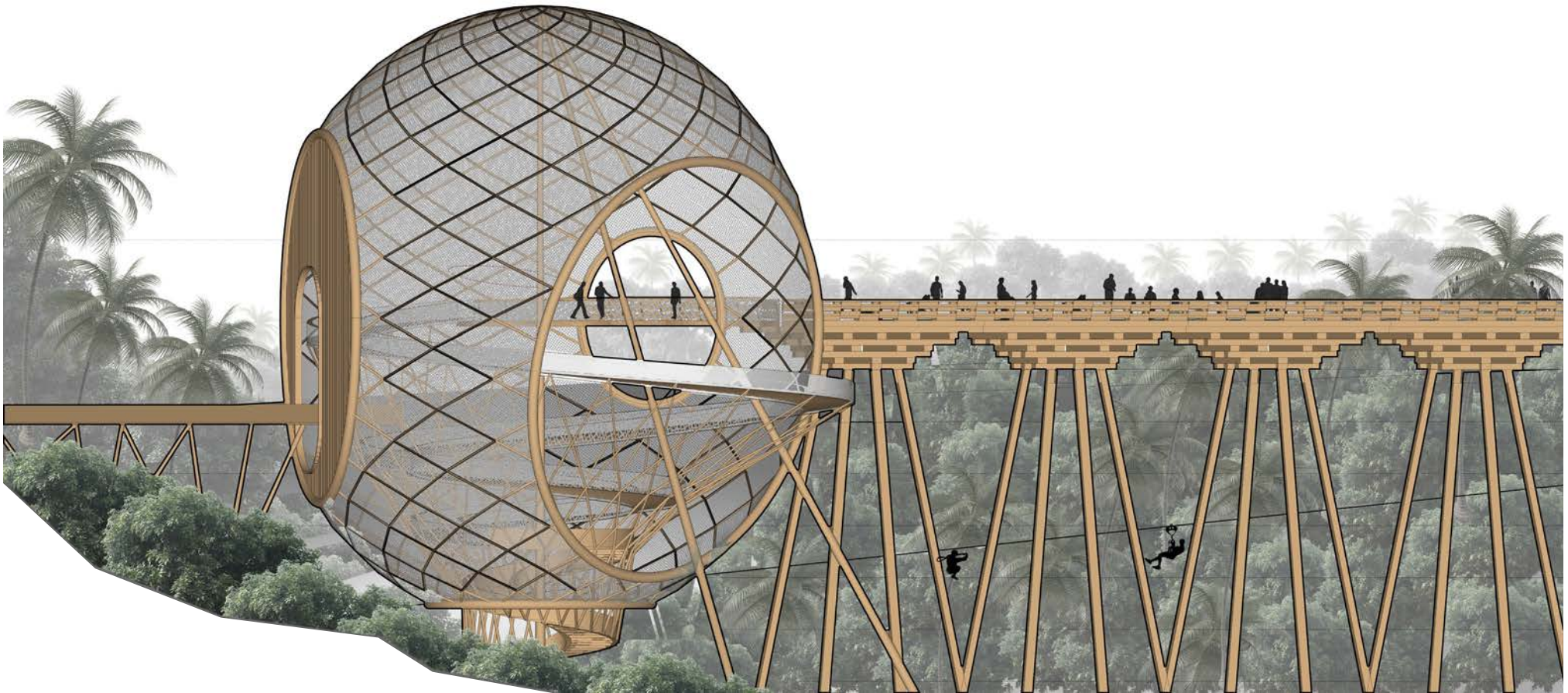
Water Tower





a new Wahiawa icon?

The NEST, a Botanical Pavilion with hanging gardens anchors nearby downtown Wahiawa to the Food Hub. The new Bridge includes a Zip Line over the Kaukonahua Stream.



the essence of bridges are the two points they connect

The FOOD FOREST opposite the Nest on the Wahiawa side welcomes visitors into the Food Hub Complex.





a spiral ramp negotiates the height difference between stream banks

Since the Wahiawa side is fifteen feet lower than the Food Hub Complex, the Nest creates a unique space for transition. Otherwise, the bridge as a ramp would be fatiguing and unrewarding to walk.



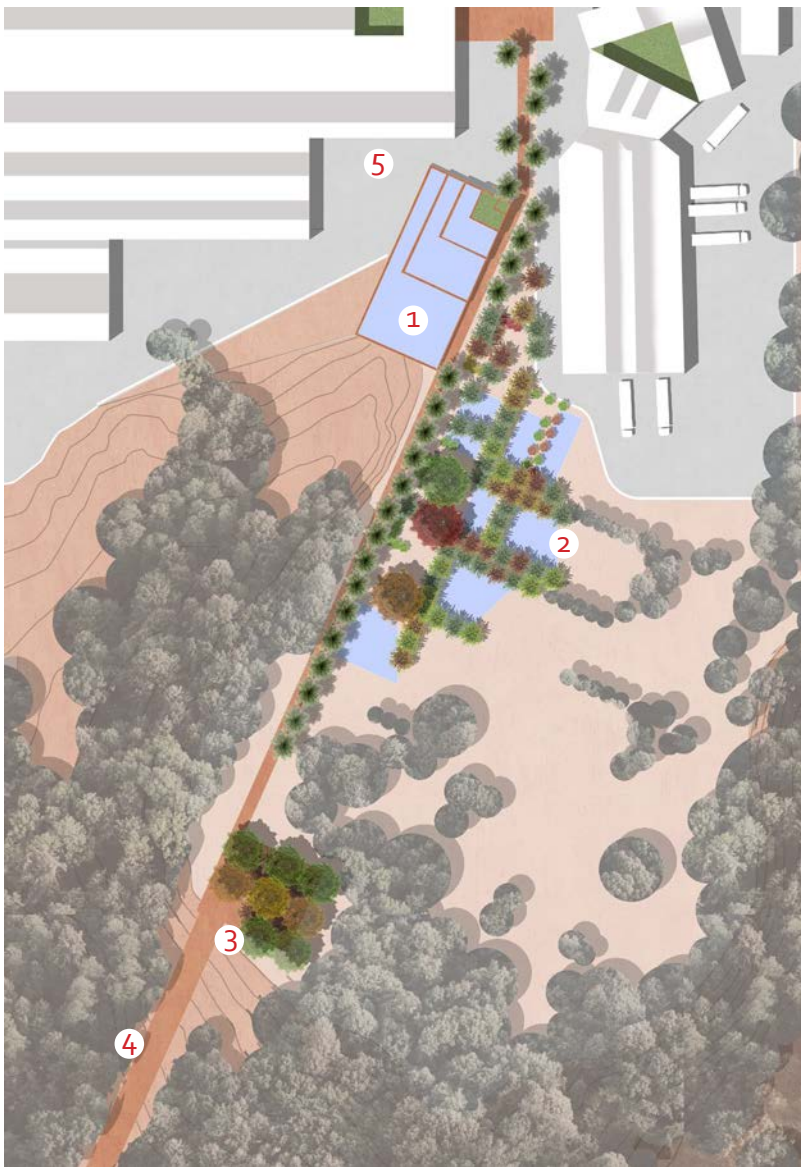
mural of the nearby Kukaniloko Birthing Stones welcomes visitors from Wahiawa

The mural is foregrounded by a demonstration wet Taro Garden and Food Forest.



build the USA's first public Food Forest demonstrating Permaculture principles

A tropical invention, the Food Forest optimizes natural food production through plant companioning and other principles of ecosystem-based farming.



Food Forest and Taro Garden

- 1 Taro Garden
- 2 Food Forest
- 3 Zip Line Tower
- 4 Bridge to Wahiawa
- 5 Kukaniloko Birthing Stones Mural



Food Forest Section

SEVEN GROWING ZONES INVOLVING PLANT COMPANIONING

The Food Forest includes

that cooperatively provide necessary ecosystem services. These plant guilds optimize healthy soil and nutrient exchange necessary for high-yield, natural food production.



CANOPY

Host trees that provide structural support to climbers seeking lights

Coconut Palm



Mango



Kou



CLIMBERS

Vines optimize food yield per unit of plant biomass

Argyreia Nervosa



Artabotrys



Ficus Pumila



SHRUB

Staples, legumes, fruits, vegetables, and fats

Avocado



Banana



Papaya



PROTECTORS

Protection for others in the system (repellents, attractors, live fencing, etc.)

Pineapple



Chinese Hibiscus



Tropical Ornamental



HERBS/HUMUS

Legumes and organic matter that provide nutrients to the soil

Snap Bean



Lentils



Snow Pea



GROUNDCOVERS

Protect soil, provide shade, hold moisture, and suppress weeds

Hawaiian Blueberry



White Ginger



Plumbago Zeylanica



MINERS OR DIGGERS

Deep roots and tubers open the soil and transport nutrients from subsurfaces

Sweet Potatoes



Carrots



Tomatoes





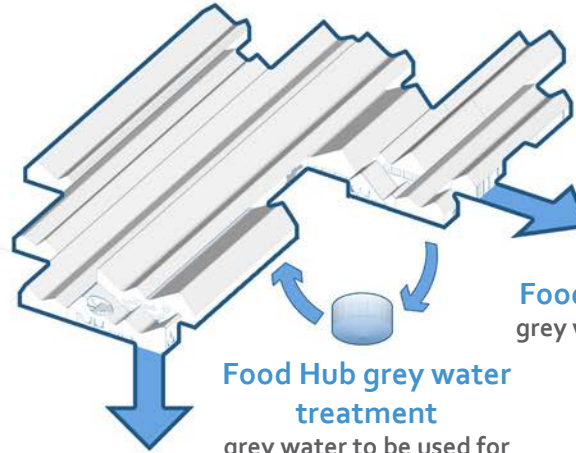
On the Neighborhood Lawn, WATER STORAGE TOWERS project images from plantation era life in the central plain surrounding Wahiawa.



Municipal Potable Water



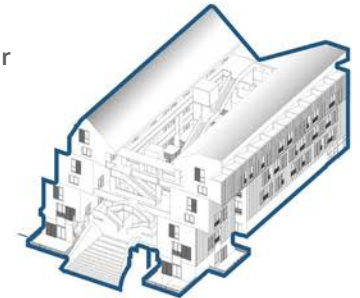
potable water storage tank provides fire protection and constant pressurization



Food Hub grey water treatment grey water to be used for the toilets

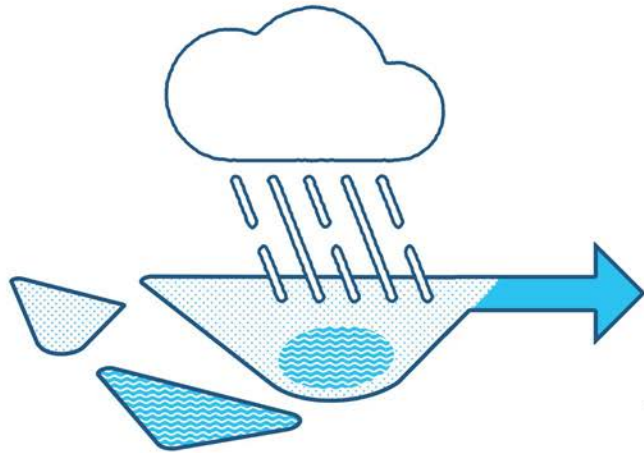
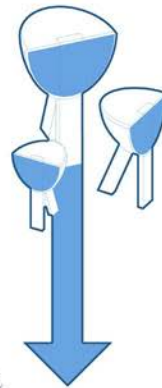


Food Hub cooling tower grey water for cooling towers

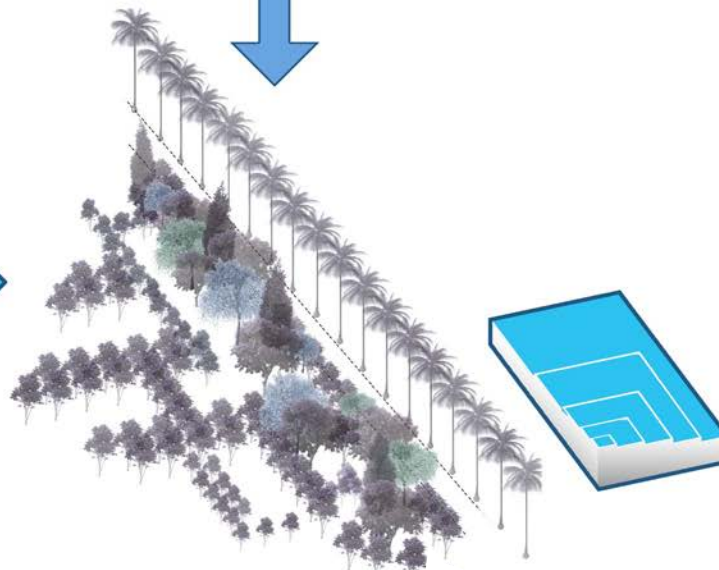


Micro-Housing grey water for toilets

reclaimed/treated water storage tank post-treatment storage for further distribution to landscape and other grey water uses



Non-Potable Water



Food Forest and Taro Garden rain water used for irrigation of taro garden, food forest, and other landscapes

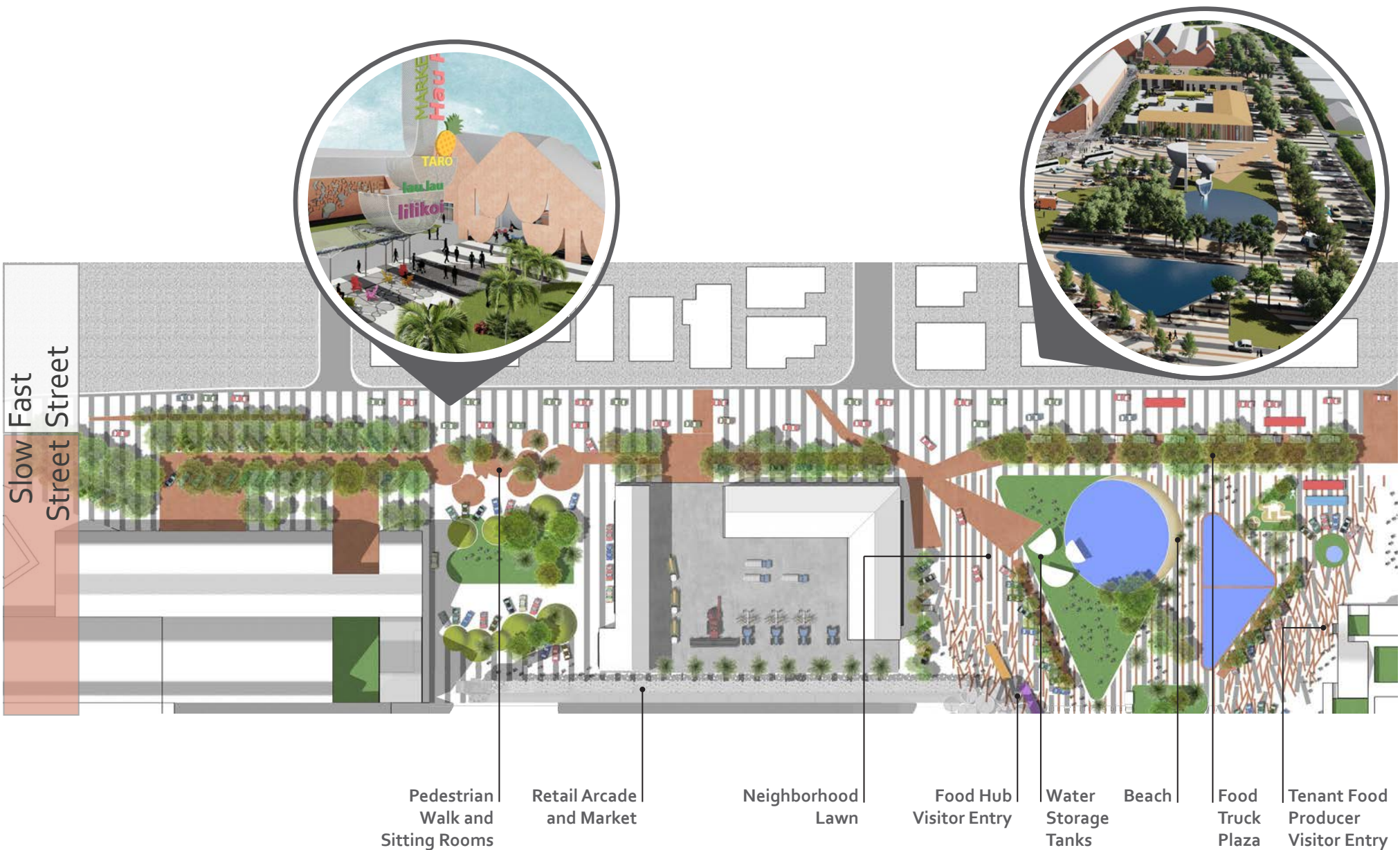


after

make a cool neighborhood . . .
retrofit Whitmore Avenue as a signature **multi-way street!**



before



Multi-way streets accomodate slow and fast traffic

Create inviting experiences for resident and visitor alike.

This "SHARED STREETSCAPE" serves traffic, parking, and non-traffic functions for dining, strolling, recreating, and shopping along the Food Hub Complex.



Tenant Food Producer Commercial Facilities

60,000 sqft Full Build-out

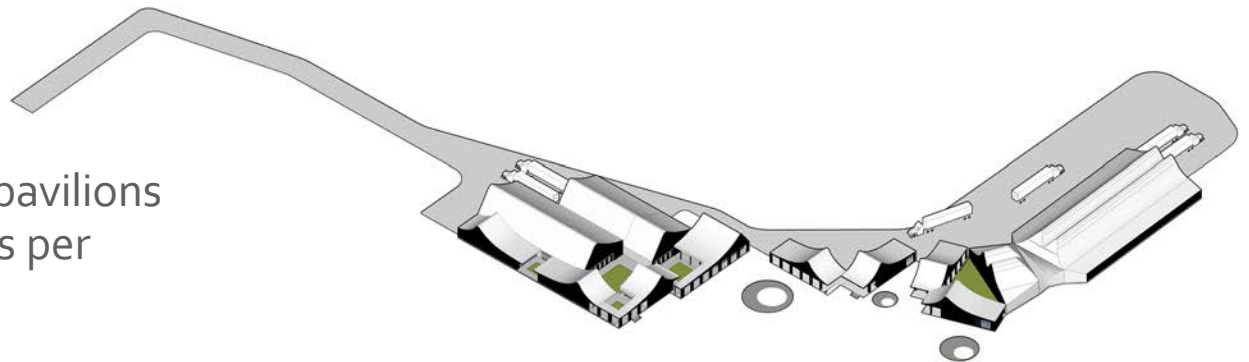
Tenant Food Producer Commercial Facilities 1

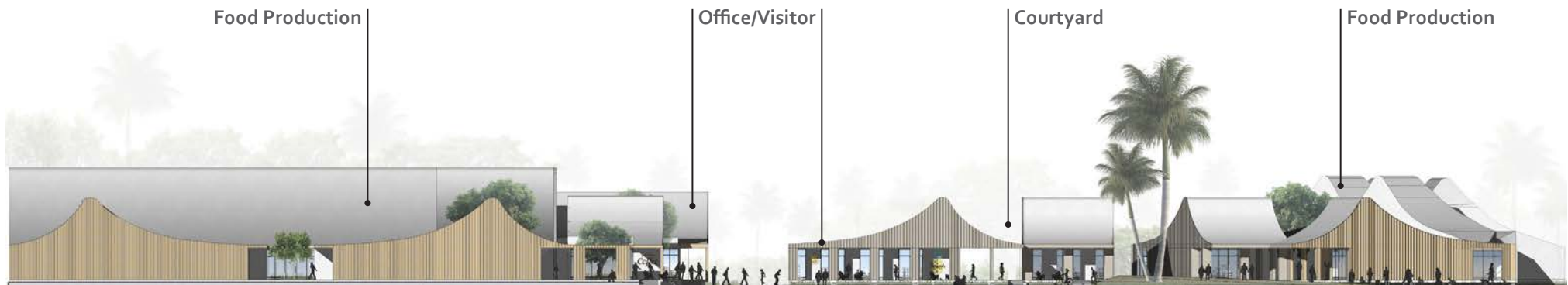
Logistics Yard 2



use the pragmatism and flexibility of vernacular building systems as inspiration

Tenant Commercial Facilities organize combined retail-food processing/production functions around courtyards, arcades, and pavilions capable of multiple configurations per individual needs.





Ordinary buildings can create place-based, climate-oriented spaces inviting to visitors. Functions could include a brewery, coffee roaster, juicery production, and an Island Seed Bank.



the three-sided courtyard—the ultimate flexible planning unit and always a pleasing space Courtyards connect large and small spaces, public and private functions, and production spaces with retail, while providing inviting experiences for tourists and workers alike.



the Neighborhood Lawn gives Whitmore Village an identity

In the tradition of a town square or village green, the Lawn anchors divergent mixed uses and scales, from micro-housing to big-box production facilities.



Workforce Micro-Housing

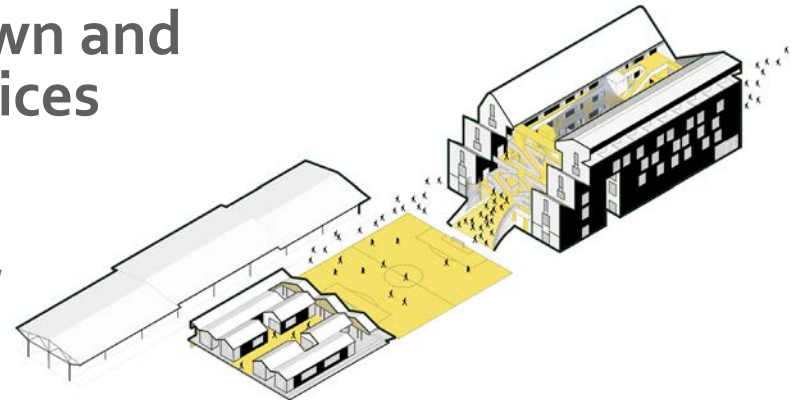
100 Units Total - 8,600 sqft Innovation Center

- | | |
|-------------------------------|--------------------|
| Workforce Micro-Housing ① | Maker Spaces ④ |
| Research and Innovation Hub ② | Basketball Court ⑤ |
| Recreational Park ③ | Social Services ⑥ |



Loft Micro-Housing units around elevated lawn and patios in the air; great living at affordable prices

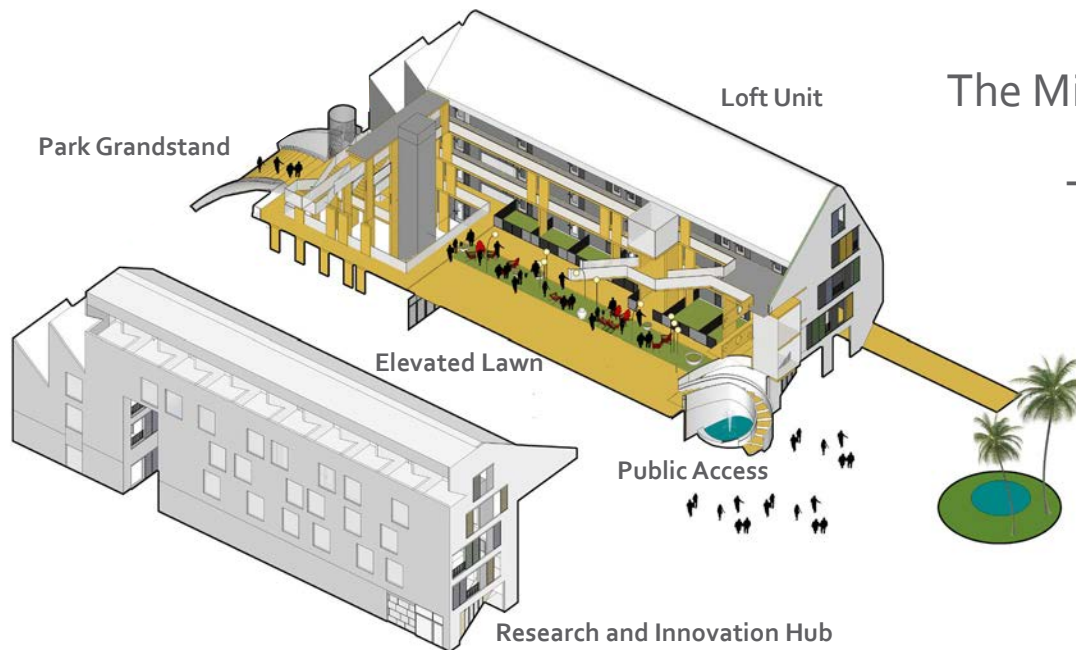
Micro-Housing serves an agricultural workforce through 250-300 sqft single occupancy units arrayed around an internal court. Courts, patios, screened porches, arcades, and a recreation park offer “third places” that socially channel time outside of work.





locate housing above the shop, just like Main Street

Dwelling units around patios and a shared court above the RESEARCH AND INNOVATION HUB replicate traditional Main Street strategies of placing residences above shops—the source of community vitality.



after work on the elevated lawn

The Micro-Housing Courtyard expands building circulation to create communal **THIRD PLACES** (neither home nor work) from stairs and corridors, enhancing sociability, livability, and overall sense of place.

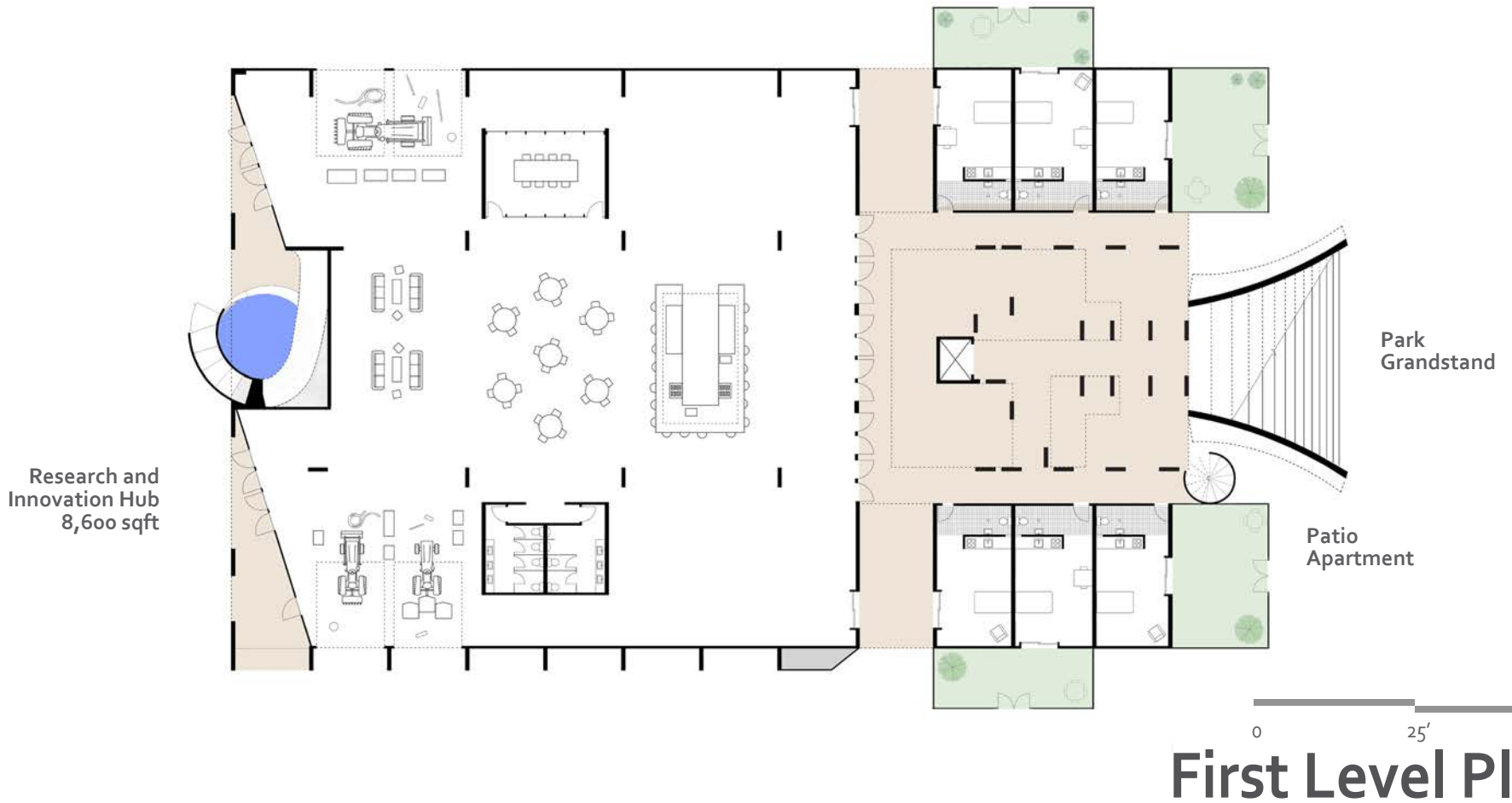
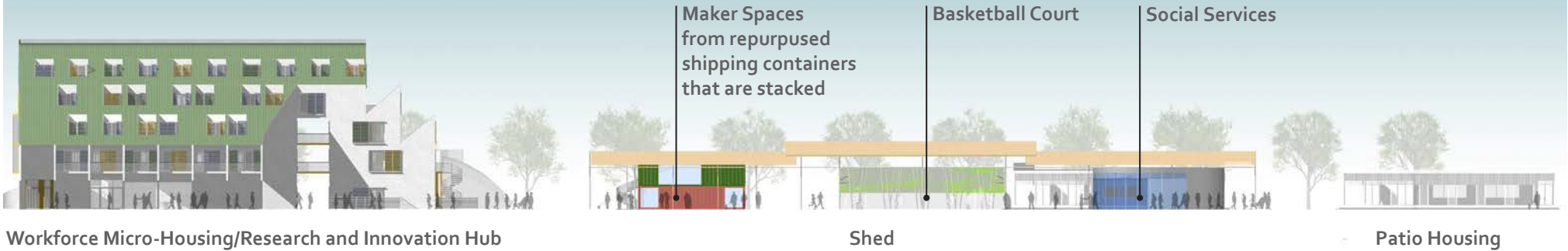


Section through Micro-Housing Courtyard/Elevated Lawn



Second Level Plan

Renovate the **Existing Shed** as a community **Super Roof** and add facilities underneath for recreational and social services, offices, and gathering.





Despite being the same size, affordable units can vary in type to create great public frontages.





**housing types for everybody . . . one-story Court and
Patio Housing with arcade faces Loft Housing
and Grandstand across the recreation park**

Existing farm shed is upgraded to accommodate recreation spaces and social services.



the Food Hub Complex is also a model affordable work-live environment

Despite perceived incongruities between Micro-Housing and Tenant Food Producer Commercial uses, courtyards allow all uses to maintain a public face compatible with the Neighborhood Lawn.



The traditional American Food Hub is a renewed public good for those communities seeking food security and local solutions.

At full build-out, the Food Hub Complex provides a “missing middle” agriculture processing infrastructure, key to building resilience. The hub complex supports robust community-based food production, while providing place-based economic and heritage development.

University of Arkansas Community Design Center

an outreach center of the Fay Jones School of Architecture and Design

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Dr. Francisco Mejias Villatoro, Project Architect, Clinical Associate Professor
Michela Cupello, Assoc. AIA, Project Designer
Raheel Ahmad, Project Designer
Jonathan Martinez, Assoc. AIA, Project Designer
Kenneth C. Hiley, Project Designer
Maranda Gerga, Intern
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Linda Komlos, Administrative Analyst

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Peter MacKeith, Dean and Professor

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Janice Takahashi, Chief Planner

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