

# BEST PRACTICES IN TRIBAL HOUSING: CASE STUDIES 2013

A REPORT BY THE SUSTAINABLE NATIVE COMMUNITIES COLLABORATIVE,  
AN INITIATIVE OF ENTERPRISE COMMUNITY PARTNERS



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A REPORT BY THE SUSTAINABLE NATIVE COMMUNITIES COLLABORATIVE,  
AN INITIATIVE OF ENTERPRISE COMMUNITY PARTNERS

Prepared for:  
U.S. Department of Housing and Urban Development  
Office of Policy Development & Research (PD&R)

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October 2014



# ACKNOWLEDGMENTS

**Enterprise Community Partners** is a leading provider of the development capital and expertise it takes to create decent, affordable homes and rebuild communities. For nearly 30 years, Enterprise has introduced neighborhood solutions through public-private partnerships with financial institutions, governments, community organizations and others that share our vision. Enterprise has raised and invested \$10.6 billion in equity, grants and loans to help build or preserve more than 270,000 affordable rental and for-sale homes to create vital communities.

The **Sustainable Native Communities Collaborative** (SNCC), an Enterprise Community Partners initiative, is a group of architects, community designers, development leaders, and sustainability advocates committed to affordable and healthy housing in Native American communities. The SNCC grew from tribal housing experience and a collective belief that each community must determine its own path toward sustainability. We listen to the vision and goals of tribal leaders, planners, and housing providers to help understand the challenges and opportunities facing tribes in providing environmentally responsible and culturally appropriate housing for their community members.

**Case Studies 2013** is made possible by generous support from the U.S. Department of Housing and Urban Development Office of Policy Development and Research (PD&R), support from Enterprise Community Partners, and the generous donation of time from our Collaborative volunteers.

Thank you to all the case study teams participating in the CASE STUDIES 2013, and special thanks to:

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Nathaniel Corum, SNCC; Architect, Head of Education Outreach, Architecture for Humanity

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Atkin Olshin Schade Architects

Adventure Pictures

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# FOREWORD

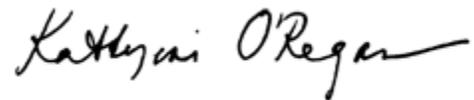
The U.S. Department of Housing and Urban Development presents this report on 17 projects that highlight a variety of unique features of sustainable construction within Native American settings. When sustainable housing is implemented within Native American communities, the result can be healthier, more energy-efficient, and climatically appropriate housing stock that often incorporates strong cultural and historic tribal design elements.

The 17 projects featured in this effort from HUD's Sustainable Construction in Indian Country initiative exemplify this emerging transformation in tribal housing. They not only employ sustainable technologies and materials—low-flow plumbing fixtures, photovoltaic panels, structurally insulated panels, stormwater retention, and clustered housing plans—but also establish abiding connections to heritage, culture, and the natural world.

The best practices that emerge from these case studies point to innovative ways that tribal housing providers are using housing improvement, including green housing, to overcome challenges related to funding, infrastructure capacity, loss of cultural traditions, and economic development. Many project teams featured in the report approached housing development holistically—incorporating meaningful community engagement during the design process, reaching out to establish partnerships and collaborations that later proved critical to project success, and solving complex challenges ranging from site planning to financing and tribal employment.

There is a cautionary tale to be told as well. Early adopters of sustainable building practices or builders reintroducing much older cultural approaches to home construction take on a certain level of risk that must be balanced with thorough pre-construction planning, meticulous construction, and post-construction monitoring and maintenance.

It is our hope that, by disseminating these case studies, more tribal communities will be encouraged to create their own culturally appropriate and environmentally responsible housing. These fine examples set by the tribes and their partners demonstrate what is possible when cultural traditions are honored while being interwoven with modern, sustainable design and construction strategies that look to the future.



Katherine O'Regan, Ph.D.  
Assistant Secretary for  
Policy Development and Research

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It is with great enthusiasm that we present the exemplary tribal housing documented here, as part of the Case Studies 2013 project by the Sustainable Native Communities Collaborative. These case studies are foundational to our multiyear effort to research and share the exciting work that tribes are undertaking across the country. The 17 projects featured are not intended to represent all of the green building occurring across Indian Country, but rather to exemplify an emerging transformation in tribal housing. Once again, tribal housing projects are increasingly connected to heritage, culture, and nature.

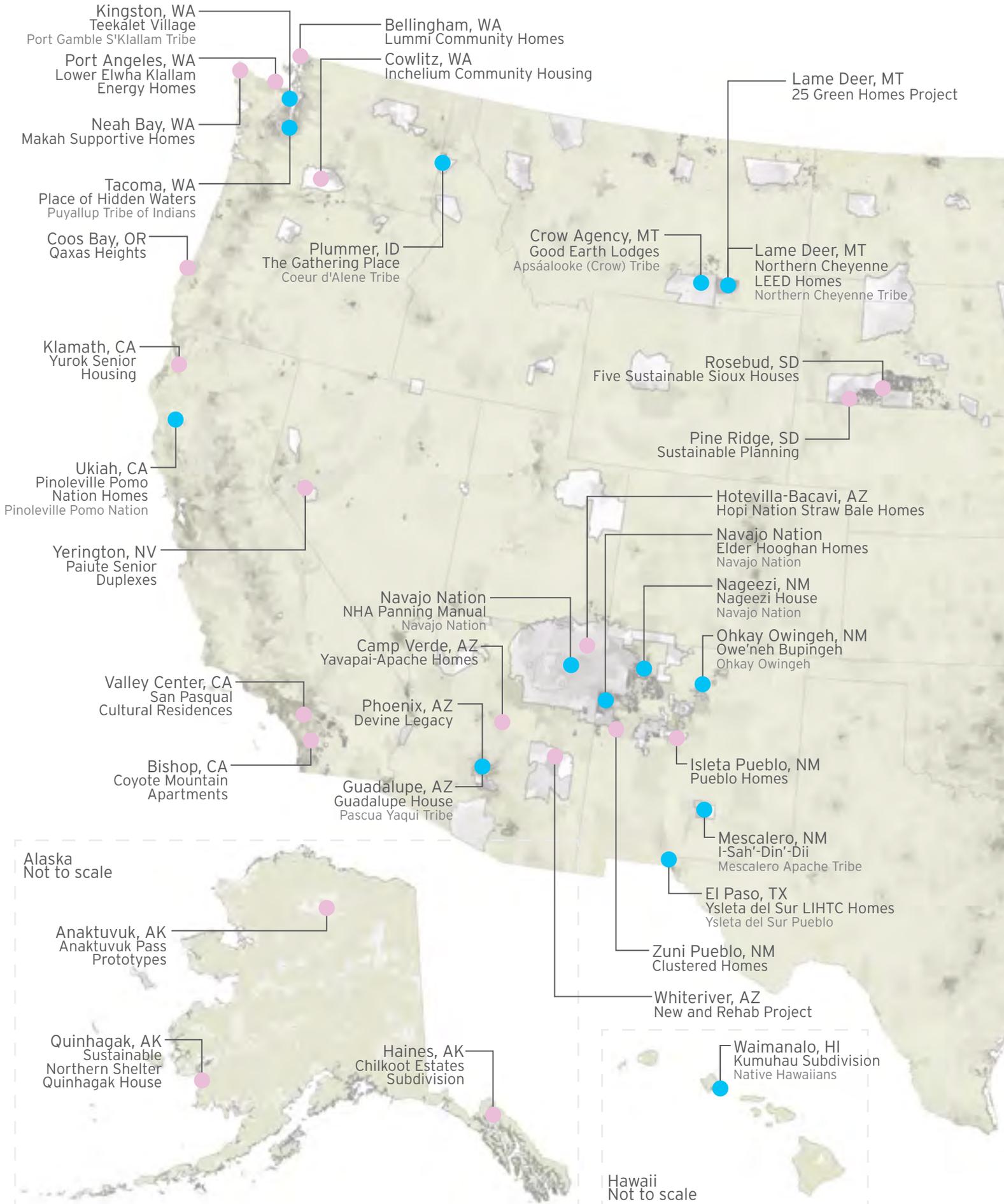
Many best practices are emerging from this research, helping to clarify the innovative ways that tribal housing providers are overcoming challenges including funding, infrastructure capacity, loss of cultural traditions, and economic development. In particular, many featured teams approached housing development in a holistic manner—incorporating meaningful community engagement during the design process, reaching out to establish partnerships and collaborations that later proved critical for success, and solving complex challenges, from site planning to financing and tribal employment. Four of these projects were documented through video to better tell their stories.

These 17 projects, selected from a group of diverse projects nationwide, are all recently built works with the exception of one long-term sustainable housing plan. They were reviewed for their replicability and applicability to other communities, and for their expression of green building features, community engagement processes, design excellence, cultural sensitivity, and for addressing broader community needs, such as training and employment. The projects were selected to show a range of project types, including rental and homeownership projects; and multifamily, single-family, and prototype demonstration projects. Importantly, each project was reviewed for its comprehensive approach and its potential to educate and inspire other communities. A breakdown of the projects is shown below.

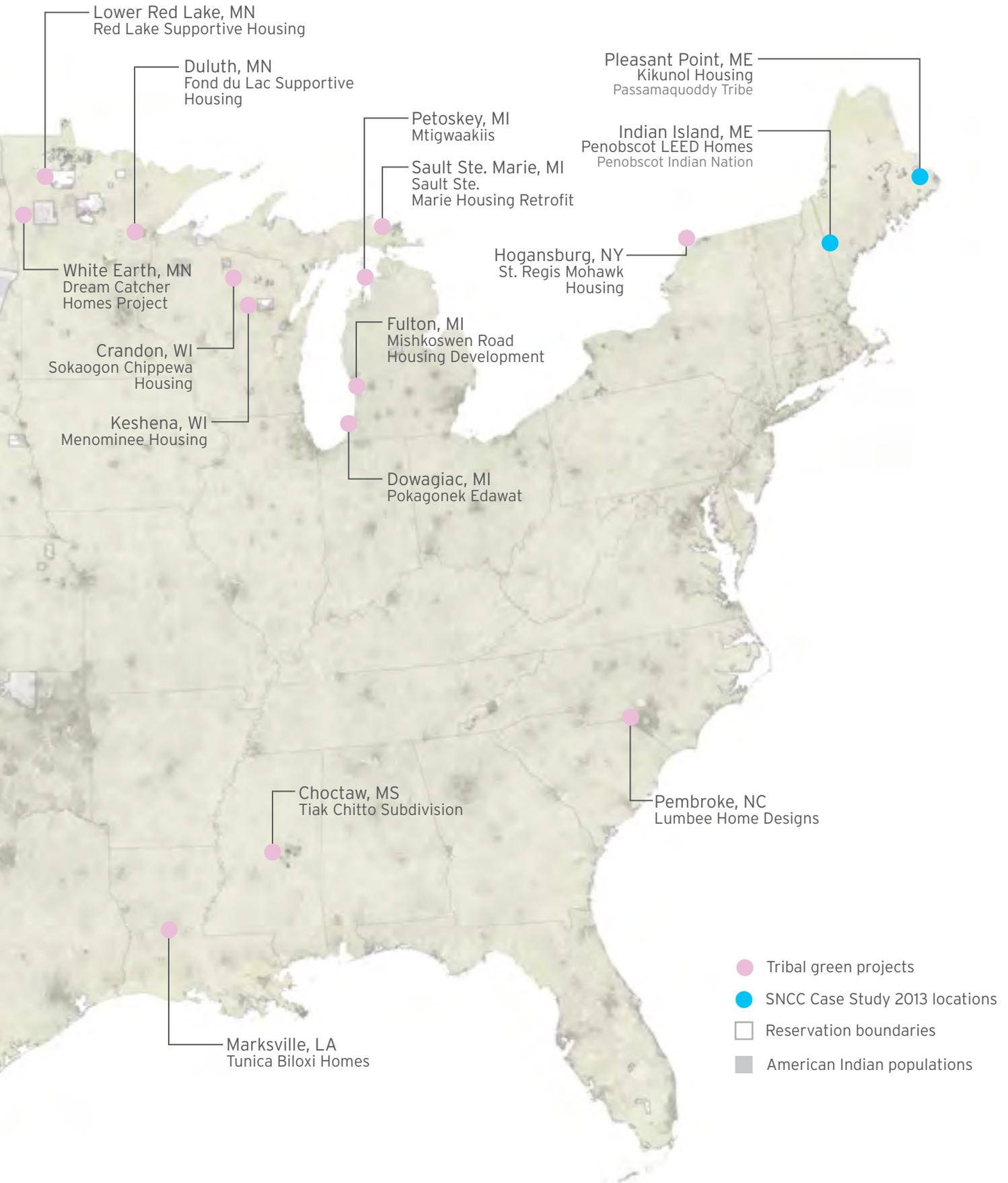
- 347 HOMES**
- 38% MULTIFAMILY**
- 56% HOMEOWNERSHIP**
- 44% SINGLE FAMILY**
- 44% RENTAL**
- 18% DEMONSTRATION PROJECT**
- 40% TRAINING IMPLEMENTED PROGRAMS**
- 25% LIHTC PROJECT**
- 38% TRAINING EMPLOYMENT PROGRAMS**
- \$142 AVERAGE COST PER SF**

The projects showcased here demonstrate that high-quality housing from within tribal communities can be a catalytic force—providing hope and strength in sometimes desperate conditions. It is hoped that through the dissemination of this case study research, technical assistance collaborations, and funding focused on sustainable construction, more tribal communities will gain access to the means of creating their own culturally appropriate and environmentally responsible housing. This Case Study 2013 research exists with the support of the Department of Housing and Urban Development’s Policy Development and Research Office (PD&R), through the Sustainable Construction in Indian Country Small Grant Program.

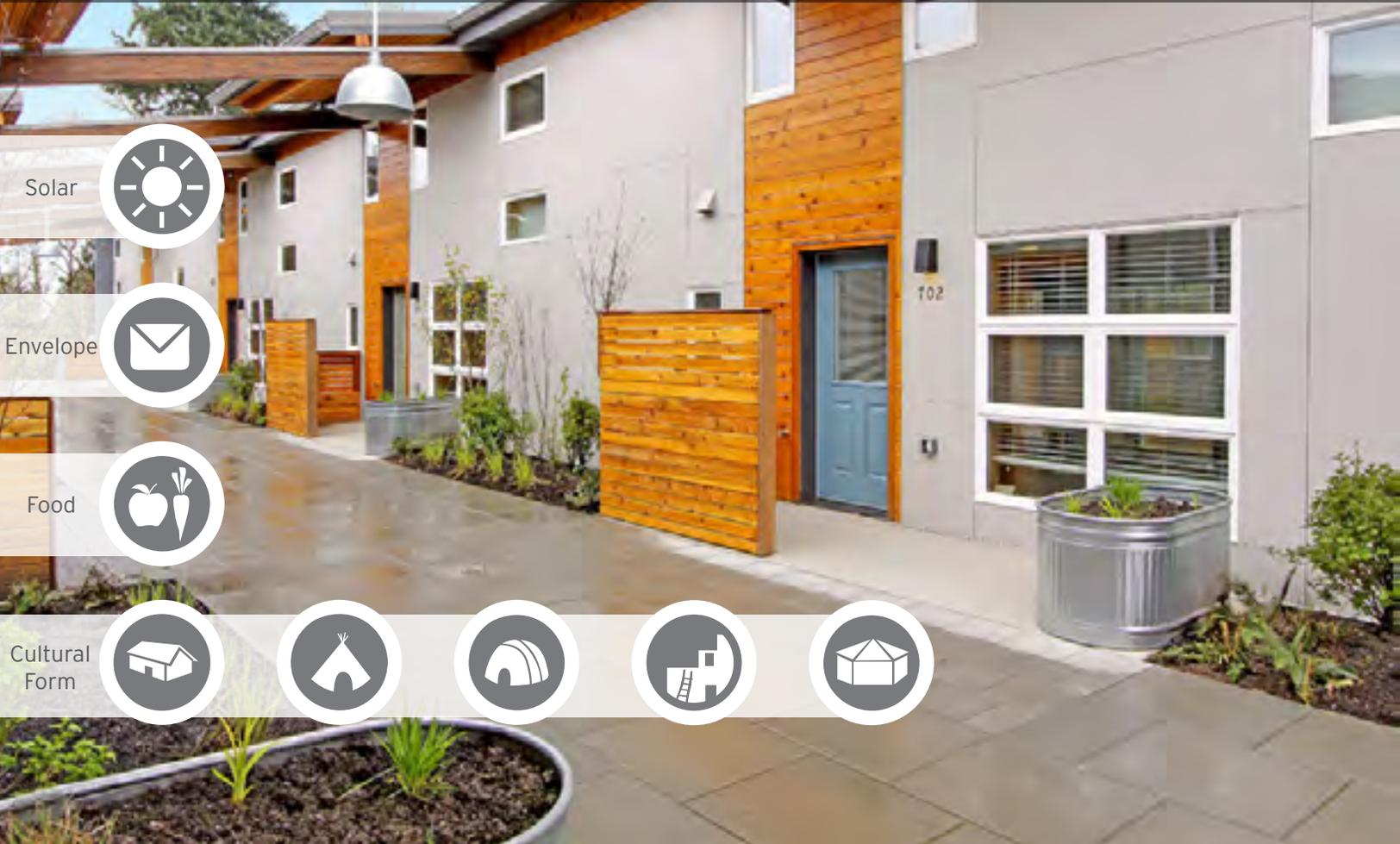
# SUSTAINABLE NATIVE COMMUNITIES COLLABORATIVE



# CASE STUDY LOCATIONS



# How does the community help to guide the design?



Good design is the cornerstone of the highlighted projects presented here. They bear witness to a transformation of tribal housing around the country through community engagement, innovative thinking, thoughtful design, creative financing, partnership-building, and a connection to heritage, culture, and nature. Because many of them have incorporated various checklists, rating systems, internal reviews, and building commissioning through the green building process, their design and construction have been tested for appropriateness and durability. For instance, tight building envelopes, properly installed flashing so water sheds properly, appropriate R-values based on the climate, and properly sized and installed heating, ventilation, and air conditioning systems. Many of these projects incorporated a dialogue with the community to discuss specific family, cultural, and heritage needs that housing can and should address. The most successful projects involved a high level of collaboration among many different partners, including housing authorities, architects and engineers, community members, tribal leaders, funding agencies, and contractors. This type of collaborative effort, known as “integrated design,” ensures that long-term goals and the project vision are established collectively at the onset and can be tested through many lenses. This effort results in more thoughtfully designed and built projects, which typically have fewer change orders during construction. Because of the integrated design approach, each project is uniquely realized and built specifically for its community and place. For example, it is clear from the photographs that the Kumuhau Subdivision is in Hawaii, the Place of Hidden Waters is in the Northwest, the Guadalupe and Nageezi homes are located in the Southwest desert, and the Ysleta del Sur and Owe’neh Bupingeh homes are in Pueblo communities. Many of these projects are also beautiful, serving as beacons of community hope and pride.



Client/Developer: Native American Connections  
 Architect: Perlman Architects of Arizona  
 Design Architect: Pyatok Architects  
 Contractor: Adolfson & Peterson Construction

Syndicator: National Equity Fund  
 Financing Partners: City of Phoenix, Arizona Department of Housing, Federal Home Loan Bank, U.S. Department of Housing and Urban Development  
 Partners: Arizona State University Stardust Center, Daniel Glenn



COMMUNITY ACCESS

Devine Legacy is a mixed-income, transit-oriented development along the north-south light-rail line of central Phoenix. Developed by Native American Connections, a nonprofit corporation to serve the urban Indian population of Phoenix, it contains seven different unit types, including townhomes, lofts, and flats, with no differentiation between the 90 percent affordable and 10 percent market-rate units. The site is strategically located for residents to gain access to work and school, with a light-rail station located one-half block away and downtown less than 3 miles to the south.

Photo: Perlman Architects of Arizona

CORE PROJECT EMPHASES:



LESSONS LEARNED

- Transit-oriented, high-density design makes it easier to live affordably without having to own a car.
- Cultural elements were designed to be somewhat universal, because families from many different traditions live here.
- Excellent outdoor common spaces are important with high-density living.

BEST PRACTICES

- Transit-oriented development can be a focus for the needs of urban Indians.
- Access to an outdoor community space formed a cohesive traditional atmosphere.
- LEED certification was a top priority.
- The project is directly adjacent to many health and social services to meet the needs of working families.

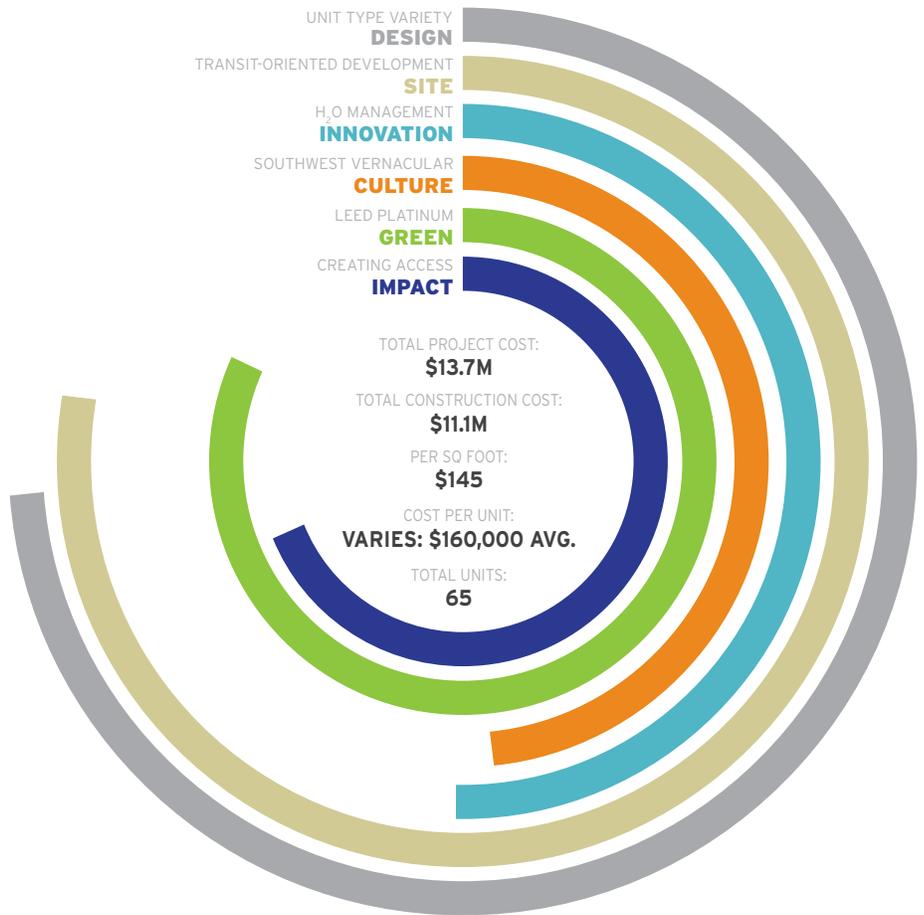


Photo: Perlman Architects of Arizona



Multifamily



Southwest

2007 Concept design/Visioning  
 OCT 2008 Development plan approved  
 SEPT 2009 Received LIHTC allocation  
 AUG 2010 Closed on financing  
 NOV 2011 Construction complete  
 JAN 2012 Converted permanent loan



# DEVINE LEGACY

## CONTEXT

This affordable housing community was the first to open along the Phoenix Metro light-rail line at the Campbell & Central Light Rail Station. Native American Connections developed the site selected for the project, which included a blighted building that had been vacant since 2006 and posed a threat to the neighborhood for loitering, vandalism, and graffiti, and which caused concerns of increased crime at other neighborhood properties. The redevelopment of the project site remedied all these issues. The project contains a wide range of housing types, including townhomes, lofts, and flats, with 90 percent affordable and 10 percent market-rate units. The site is strategically located for residents to gain access to work and school, with a light-rail station located one half block away and downtown less than 3 miles to the south. The city’s main public high school is located directly across the street from the development. The building just to the development’s south contains the offices of the developer and the many social services, health, and cultural organizations that cater to the needs of Native Americans in Phoenix.



Photo: Perlman Architects of Arizona



Photo: Perlman Architects of Arizona

## SITE

The primary site feature is the courtyard on the second level that is open to the sky. The courtyard provides a protected common space for tenants and is a contextual element of the Southwest vernacular. It has a playground for children and sitting areas for adults. Common barbecue grills are in the courtyard and at outdoor common areas on each floor. Parking, which was reduced because of access to the adjacent rail line, is provided in a parking garage at the ground floor, along with bicycle racks. A new community room on the property, which faces the street, is designed for many purposes, including a meeting space for the residents’ association, tutoring, training classes, and family events.



Photo: Perlman Architects of Arizona

DESIGN

This mixed-income housing project was designed as a culturally appropriate urban Indian community. The project’s design excellence was a top priority of Native American Connections. To effectively accomplish its goals, the developer decided it was necessary to engage in the design process. Arizona State University Stardust and Pyatok Associates worked with the project team at the onset to provide design visioning and cultural insights. The result is a contemporary southwestern vernacular building that embodies the project’s highest priorities, including a high-density, transit-oriented development program, comfortable outdoor communal space, high green performance standards, and cultural design elements.

Because one size does not fit all, the development has a variety of unit types—seven total. To effectively blend market-rate units with affordable housing units, the project team realized that some market-rate amenities must be made available to everyone, such as high ceilings and an urban “loft” look for some of the units. The two-story apartments, with double-height living spaces, have vertical stack ventilation, reducing dependence on air conditioning during the transitional seasons. The courtyard open to the east and west acts as a breezeway, bringing air through the building mass.



Drawing courtesy of Pueblo Grande Museum Archeological Park

GREEN

The sustainable, affordable housing development is a Leadership in Energy and Environmental Design (LEED) for Homes Multifamily Platinum project, making it the most sustainable housing community in Arizona. The project team’s initial goal was to achieve LEED Silver certification. After completion of the energy modeling and consultation with the LEED for Homes provider, the team decided to try for Gold certification. As the project progressed, even Platinum certification became a possibility. The entire project team worked during the process to incorporate additional green measures.

As a result, the project achieved 26 percent energy savings and diverted 58 percent of its construction waste from the landfill. ENERGY STAR appliances were installed; all HVAC equipment is high efficiency, and no HCFC refrigerants were used. Wall insulation is higher than required by code in the Phoenix area, and windows have U-values of 0.42 and a solar heat gain coefficient of 0.32. All plumbing fixtures are low flow. The project received exemplary LEED points because of the close proximity to light-rail, which allows for 373 riders per day. These design solutions allow for a significant reduction in the challenging southern Arizona climate.



Photo: Perlman Architects of Arizona

CULTURE

The project was oriented toward Native American working families in Phoenix, and the design is based on the culture of the ancient Hohokam, who were one of the original people of the Phoenix Valley and lived in compact, pueblo-style, earthen, multistory structures. There are numerous health and social services provided in the Native American Connections building just next door, which is important to the families living here. The development team hosted focus groups through architectural programming sessions on unit amenities, features, and design. Eco-traditional designs such as east-facing entrance, courtyard, and gathering spaces for residents, perform to provide effective cross ventilation and bring in eastern light. Units were designed with open kitchen and living environments for family gatherings. The project has become part of a larger Native American community center for the surrounding urban area.



# DEVINE LEGACY

## INNOVATION

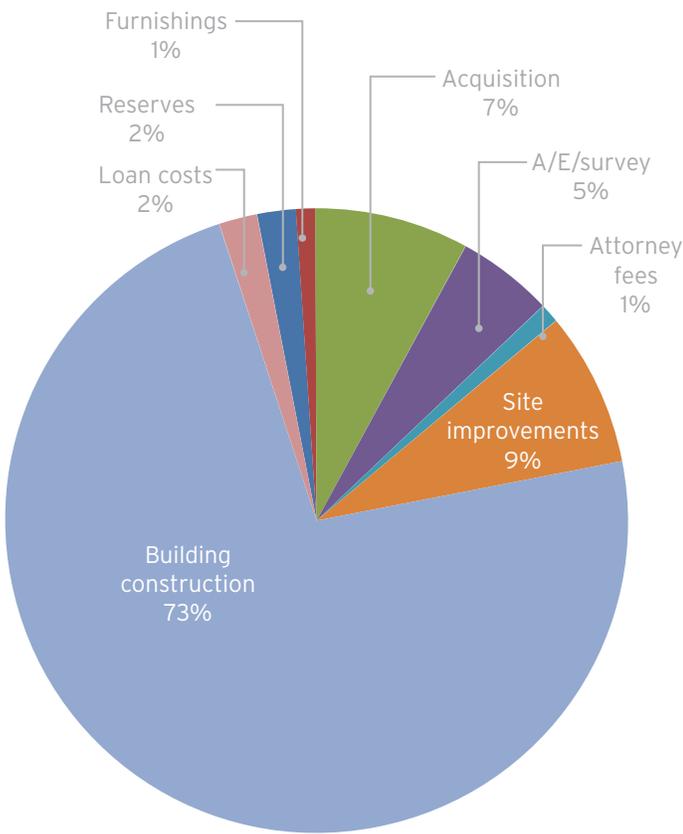
Started as a vision five years ago, Devine Legacy, located on Central, is the first mixed-income transit-oriented development (TOD) housing community to open along the Phoenix Metro light-rail line.

## FINANCING

Trying to secure funding for the project in late 2009 and early 2010 was very challenging in the capital markets. A great deal of patience and time was spent with each funding source to address any concerns regarding the financial viability of the project given the economic climate of that time. After completion of the project, in 2011, Native American Connections converted its permanent financing in the fall of 2012.



Photo: Perlman Architects of Arizona



Project cost breakdown



Photo: Perlman Architects of Arizona

## LESSONS LEARNED/CONCLUSION

The project takes advantage of the benefits of a very urban location to meet the transit and supportive services needs of urban Indians in Phoenix. The transit-oriented, high-density design makes it easier for working families to live affordably without having to own a car—a significant paradigm shift in a very car-oriented, western city. Through the design process and community meetings, the project team realized that any cultural design elements incorporated into the project would need to be somewhat universal, because families from many different traditions would be living in the community here. In addition, it was determined that, because of the high density of the project, excellent outdoor common space areas designed to be comfortable in all seasons were critical. The development team’s green design objectives were clear from the outset, but it was not originally anticipated that the project would obtain LEED Platinum certification, which was met because of the comprehensive approach to all site and building elements.



Photo: Perlman Architects of Arizona

Client/Developer: Department of Hawaiian Home Lands  
 Architect: Armstrong Design, LTD  
 Contractor: Armstrong Builders, LLC  
 Engineers: BASE + Akinaka Associates

Sustainability Consultant: Green Sand, Inc.  
 HERS Rater: Green Building, LLC  
 Landscape Architect: PBR Hawaii  
 Other Partners: HUD, USDA Rural Development, Veterans Affairs, FHA, Home Street Bank, Office of Hawaiian Affairs



CLIMATE-RESPONSIVE

The Kumuhau Subdivision provided eco-friendly and climate-responsive home ownership opportunities to 45 Native Hawaiian families in Waimanalo, on the island of Oahu, Hawaii. After developing the site, the Department of Hawaiian Home Lands (DHHL) competitively selected Armstrong Development to design and build the project. The climate-responsive and cost-effective designs include social elements, such as carports that act as outdoor shaded rooms and considerations for future expansion. The homes were so popular and demand so great that all the homes were sold in one day.

Photo: David Franzen

CORE PROJECT EMPHASES:

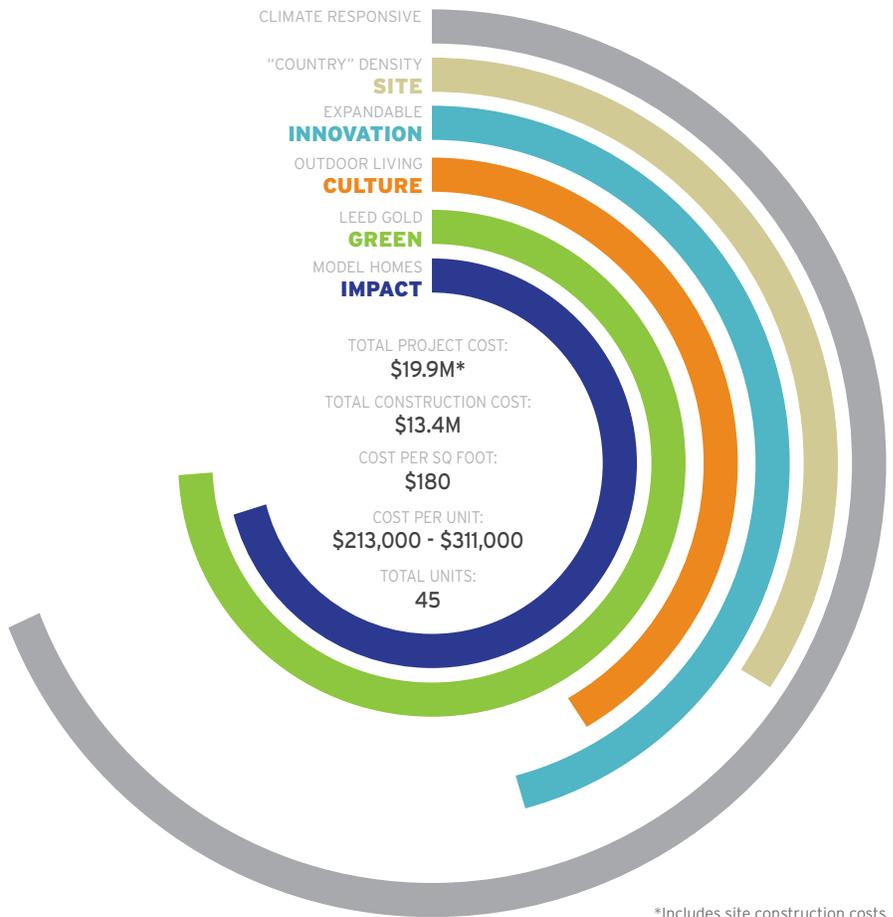


LESSONS LEARNED

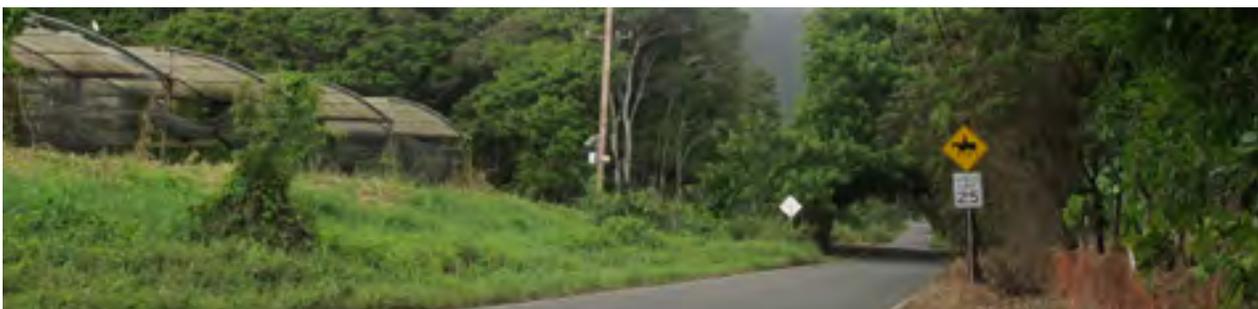
- Site planning and home design may be more cost effective when integrated.
- Well-designed homes that also reduce energy costs to homeowners will be in high demand, even during a recession.
- Proper ventilation, shading, and site orientation can mitigate the need for mechanical cooling in a tropical climate.

BEST PRACTICES

- Outdoor living features provide a connection to the outdoors and a sense of community.
- An innovative approach to high wind code requirements reduced costs by providing bracing for storm events.
- A comprehensive approach to design and building provides multiple benefits: comfort, flexibility, long-term durability, and reduction in costs to the residents.



\*Includes site construction costs



OCT 2007: Stipwork and design  
 JUNE 2008: Site construction starts  
 OCT 2009: Design and builder selected  
 JUNE 2010: Site construction complete  
 JULY 2010: Start construction  
 JAN-JUNE 2011: Closing on homes and move-in



# KUMUHAU SUBDIVISION

## CONTEXT

The project is located approximately 1 mile from the eastern, windward coast of Oahu and the Waimanalo Bay State Recreation Area. Only 15 miles and a 30-minute drive from Honolulu, Waimanalo has one of the highest concentrations of Native Hawaiians on Oahu—almost 25 percent of the town is made up of Pacific Islanders. Waimanalo means “potable water,” apparently named for the many ponds in the area and its agricultural history. Today, there is an interest to revitalize Waimanalo’s agricultural traditions through projects such as the 21st Century Ahupua’a.

## AHUPUA'A

Kānewai, or the “rule of the water,” helped to inform the development of the covenants, codes, and restrictions for Kumuhau’s homeowner association. Kanewai is also the basis of the ahupua’a, which is the traditional Hawaiian land ownership and management system. The ahupua’a extends from the mountaintop to the coral reefs in the sea, with specific rights and responsibilities for everyone helping to sustainably manage this very interrelated ecosystem. The ahupua’a system in Hawaii was mostly destroyed by modern development and economic systems. However, today there is an interest to reactivate the concept as a local form of sustainability, and the town of Waimanalo is on the forefront of this with the 21st Century Ahupua’a, including the Living Laboratory and Sweet Home Waimanalo Market Cafe. It is hoped that future housing development in Waimanalo ties into the exciting sustainability work and reinvigoration of agriculture by local groups.



Photo: SNCC



Painting by Marilyn Kahalewae



Drawing: Armstrong Design, LTD



Photo: SNCC

## CULTURE

The homes were designed to evoke the colorful plantation style homes of Hawaii, with both one- and two-story homes. Careful attention was paid to a connection between the indoor and outdoor and to taking advantage of the temperate Hawaiian climate to allow for more outdoor living. Each home has a “lanai,” or veranda, and the parking was designed so that two cars can fit in the driveway, allowing the carport to be used as an outdoor living room. Each carport has a screen, providing extra privacy between neighbors.

The homes were also designed to be easily expandable, an important consideration, given that many Native Hawaiian families are large. Extra plumbing stub outs allow for eventual build-out of an additional bathroom and bedroom.



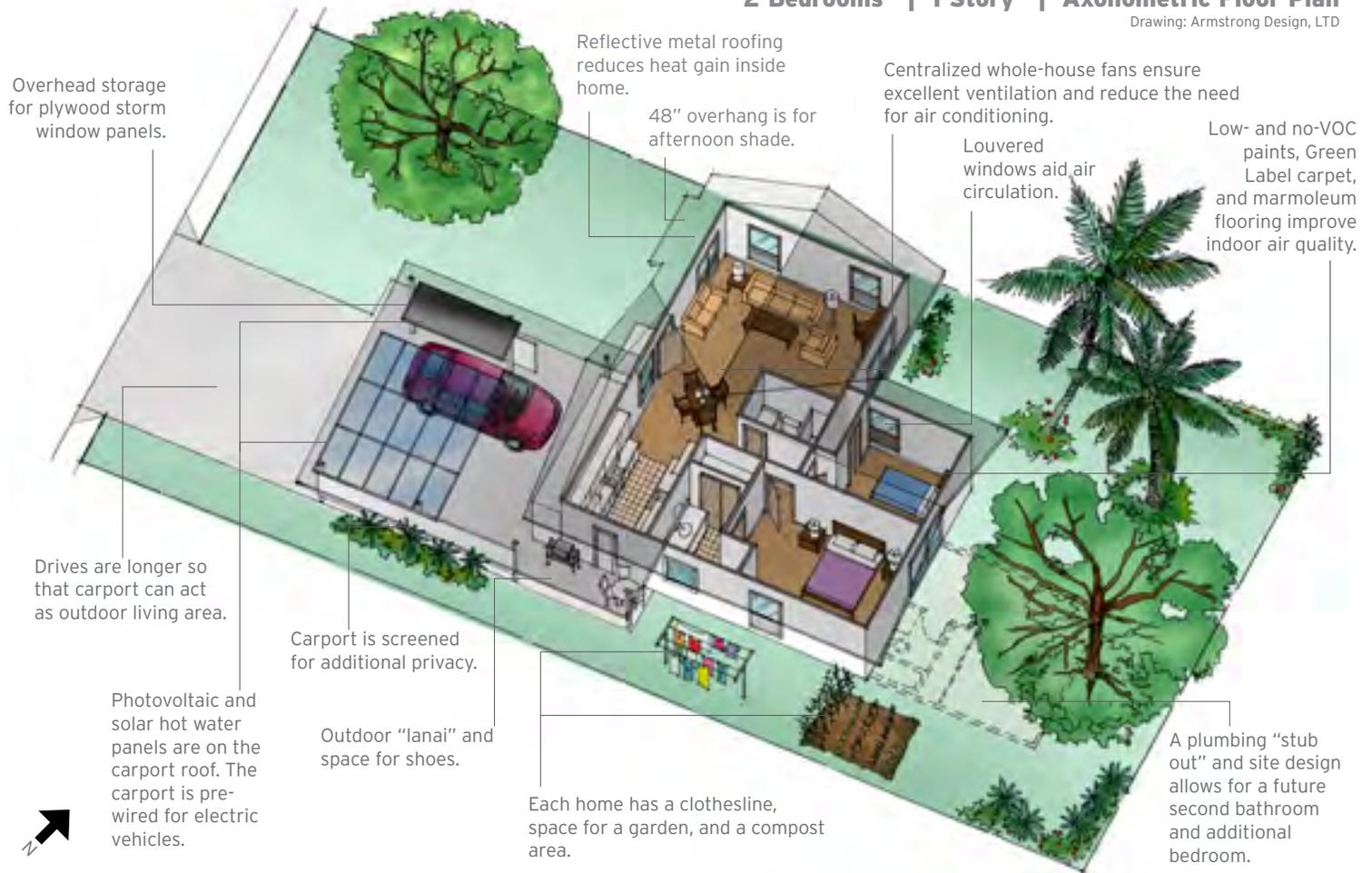
Photo: SNCC

GREEN

Electricity in Hawaii is extremely expensive, at more than 25 cents per kilowatt hour. The many green features are therefore specifically targeted to resident health and energy efficiency. The homes have solar hot water, net-metered 2.5kW photovoltaic (PV) panels, low-emittance window glazing, above-code wall insulation, compact fluorescent lightbulbs, and “solar clothes dryers” (otherwise known as outdoor clotheslines). The homeowners received both federal and state tax credits totaling 65 percent of installed cost for the PV and solar hot water systems, and many report they now pay only the minimum \$16.85 monthly electrical hookup fees.

**2 Bedrooms | 1 Story | Axonometric Floor Plan**

Drawing: Armstrong Design, LTD



Kohila fan closed



Kohila fan open

GREEN

The homes were designed to be LEED Silver under the LEED for Homes rating system but have since achieved LEED Gold certification. The homes were designed to be energy efficient, with a tight building envelope, good air circulation, and ventilation. The homes feature a whole-house Airscape fan, which was customized to be much quieter by making changes to the motor and location and is now called the Kohila fan, which means “gentle breeze.” It is located centrally in each home and sits on the roof. In addition to the home having a whole-house fan, each bedroom and bathroom have Whispergreen exhaust fans, which are very quiet.



# KUMUHAU SUBDIVISION

## INNOVATION

Because this was a design/build process, the design was tested against costs at every step along the way. This allowed for innovative measures to be incorporated, such as the solution to the high wind design load requirement per building code. Instead of stiffening the entire house frame at the exterior walls or installing expensive storm windows, Armstrong designed custom, predrilled plywood panels that can be easily installed over the windows before a large storm event, when the high winds occur, that serve to stiffen the entire frame of each home. The plywood panels are stored in custom-made racks located overhead in each carport.

“ I have seen the aloha from the many people....I have met through this process, how much care and pride they have in their work. That is important to me as a Hawaiian, because it has always been about partnership and those that come to provide helping hands and their hands mana’o. So this house represents me everything as a Hawaiian, and it’s beautiful, beautiful, beautiful. - Raenani, Laiopus homeowner ”

## IMPACT

More than 55 percent of Native Hawaiians pay more than 30 percent of their income for housing, and only 57 percent own their homes. The cost of living in Hawaii is very expensive and Native Hawaiians do not have the same access to tribal trust land as many tribes on the mainland, requiring them to qualify for conventional mortgages or wait to be assigned a home through the DHHL wait list. In order to qualify, families must have at least 50 percent blood quantum, must qualify for a mortgage, and then may eventually receive a home based on a lottery system.

DHHL recognizes the dire need for more high quality housing and is developing property throughout Hawaii. DHHL began developing the Waimanalo site before hiring Armstrong through a competitive bid process. Armstrong won the bid in part because of their commitment to LEED certification. Armstrong acted as the designer and builder. Armstrong and DHHL worked with Home Street Bank to help interested Native Hawaiian families qualify for home mortgages. Because of the green design features, the hard work of families to qualify for mortgages, and the need for housing, the homes all sold within one day.



Photo: David Franzen

## LESSONS LEARNED

This process helped to demonstrate that affordable housing can be cost-effectively built to LEED standards and can have a high market demand even in a difficult economic recession. It has also helped to modify DHHL’s development process, so that with new projects, site planning occurs simultaneously with building design. This helps to avoid coordination pitfalls. There are also exciting new partnerships to ensure that future projects are developed in an integrated and sustainable manner and that they are climatically and culturally appropriate. Recently, the Office of Hawaiian Affairs, which is focused on reducing the amount that Native Hawaiians pay for housing and on increasing home ownership, partnered with DHHL to help pay for infrastructure costs through paying the debt service on \$90 million of DHHL bonds. These critical partnerships, along with the success of the Kumuhau Subdivision, are leading to exciting new projects including new homes in Kona on the Big Island of Hawaii and on the island of Maui.



Photo: Yumeko Tochiko  
Left-to-right: Kahu Kordell, Anita Seyer-Wong, and Daniel Sandomire

Client: Pleasant Point Housing Authority  
 Developer: Passamaquoddy Tribal Government  
 Architect: Design Group Collaborative  
 Contractor: Blaine Casey Contractor and Coastline Homes

Project Engineer: James W. Sewall Company  
 Project Engineer: Hedefine Engineering & Design  
 Development Partner: U.S. Department of Housing and Urban Development



LOCAL VERNACULAR

The Kikunol housing project is located in Pleasant Point at the north-eastern tip of the United States. The Passamaquoddy people have inhabited this historic area for thousands of years. In the form of a semicircle, the site plan references traditional gathering protocols. The 17 multifamily homes were designed to blend with a wooded landscape and to honor symbols and shapes that are part of the Passamaquoddy heritage.

Photo: Design Group Collaborative

CORE PROJECT EMPHASES:

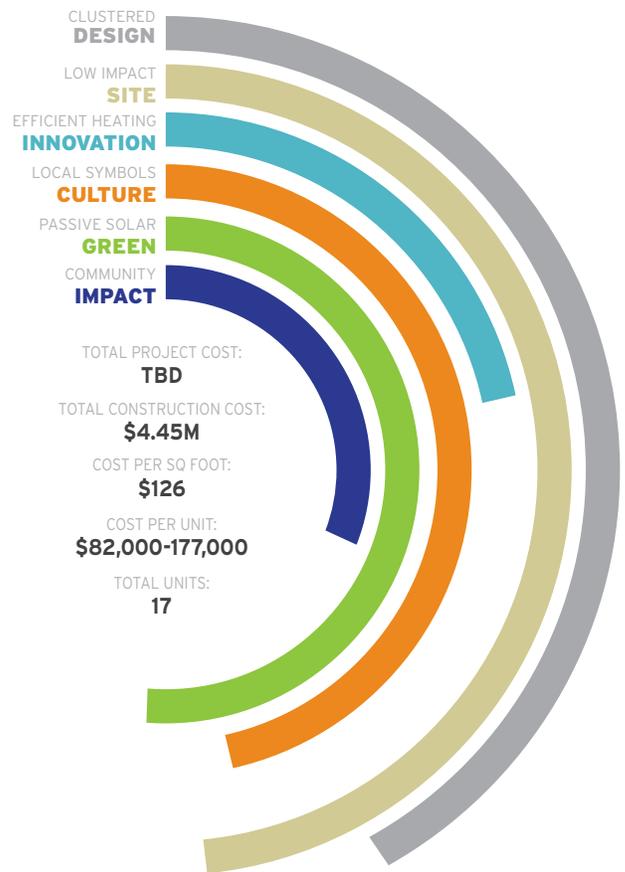


LESSONS LEARNED

- Site analysis early in the project leads to a better alignment with environmental goals.
- Close collaboration between the housing authority and contractors leads to a more successful process.

BEST PRACTICES

- The buildings are oriented for maximum solar gain and exposure.
- Clustered massing minimizes the impact on the site, including lessened impact on the surrounding wetlands.
- A solar hot water system together teamed with a high-efficiency system comprise an efficient heating system.



Drawing: Design Group Collaborative

# KIKUNOL HOUSING

## CONTEXT

Today, Pleasant Point is a small reservation of about 2,000 residents. The Pleasant Point Housing Authority (PPHA) owns most of the housing on the reservation. The community is very close and committed to its tribal history and roots. The project site is in a wooded area that is slightly elevated from the rest of the housing development. It is developed in the form of a semicircle, which references the form of traditional tribal gatherings.

## CULTURE

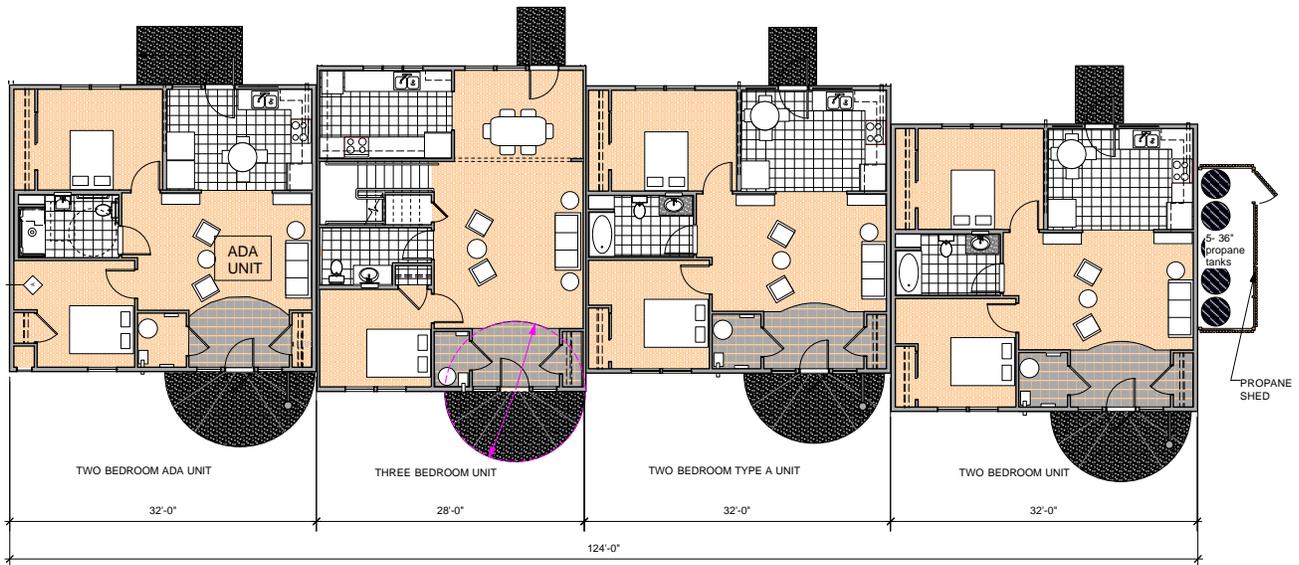
Kikunol Housing was designed with respect for Passamaquoddy heritage. Passamaquoddy winter structures, such as wigwams, were built with local materials, with their openings facing to the east—welcoming the morning sun. A decorated pole was used to prop open a traditional entry. Designed to blend with the wooded landscape, natural tones and curved forms mimic the bark of trees. The common area, entrances, and building designs incorporate symbols and shapes that express Passamaquoddy heritage and history.

## GREEN

The buildings are oriented for maximum solar gain and exposure, similar to Passamaquoddy traditional structures, which took advantage of maximum solar exposure. The design includes large overhangs and large south-facing windows in each home to provide natural daylight and help reduce the heat load in the winter. The homes also have high-efficiency heating systems and airtight construction methods.



Photo: SNCC



**Typical Building Floor Plan**

Drawing: Design Group Collaborative

## DESIGN | LESSONS LEARNED

The homes are grouped four units to a building, minimizing impact on the site. The staggered pattern allows for private entrances and backyard areas. Each building includes a combination of one-, two-, and three-bedroom units. A lesson learned was to coordinate the impact of the development on the neighboring wetlands earlier in the process. The landscape design had to be modified so as not to impact wetlands, which was a good environmental move, but it required the circular layout of the housing units to be altered and the tribal gathering area eliminated. If this impact had been realized earlier in the project, the design could have been better coordinated with the wetlands.



Photo: Design Group Collaborative

Client/Developer: Coeur d'Alene Tribal Housing Authority  
 Architect: Thomas W. Angell, AIA  
 Contractor: MDM Construction Inc.  
 Engineer: Taylor Engineering Inc.

Sustainability Contractor: Pura Vida Homes LLC (Straw Bale Installation)  
 Site Design: Taylor Engineering Inc.  
 Research + Collaborators: University of Idaho's Bioregional Planning & Community Design Program

FEB 2010  
 Start of design process



SUPER-INSULATED

This 18-unit multifamily housing project was constructed using environmentally friendly natural building techniques. These straw bale buildings were designed in collaboration with the Coeur d'Alene Tribal Housing Authority (CDATHA) and tribal members, with initial research and engagement by the University of Idaho's Bioregional Planning & Community Design Program. Prior to construction the CDATHA demolished 12 existing lead and asbestos structures, and salvaged a majority of timber for future reuse.

Photo: Tomas W. Angell

CORE PROJECT EMPHASES:

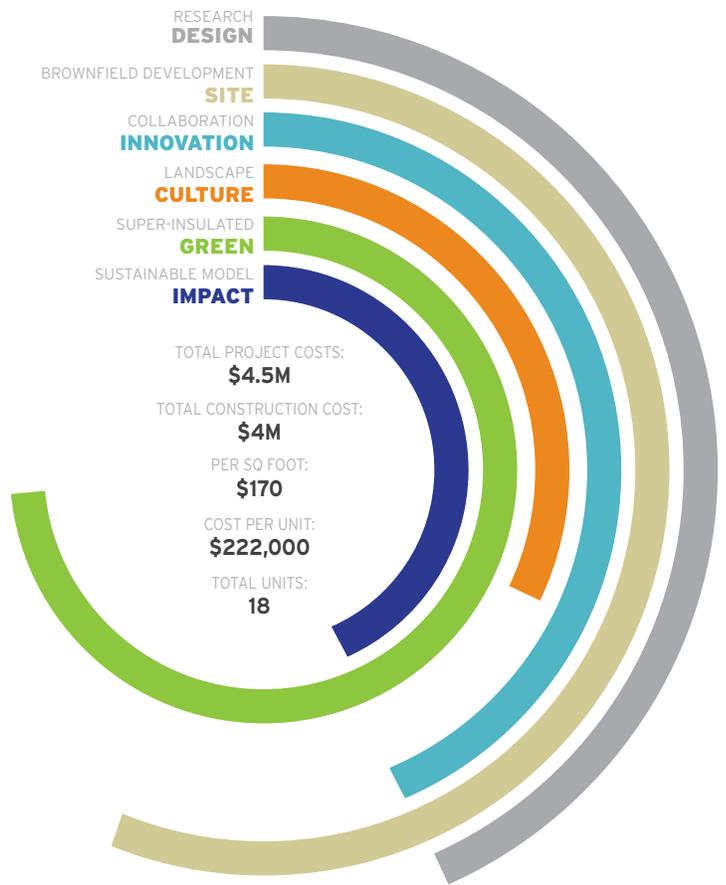


LESSONS LEARNED

- The ability to be flexible and the involvement of a good collaborator help the overall design and building process.
- High-quality housing projects can foster a sense of pride in everyday living.

BEST PRACTICES

- Wood was salvaged from old structures for creative reuse in future projects.
- Recovery ventilation combined with a super-insulated, straw bale wall system lowers energy costs significantly.
- Low-flow faucets, combined with ENERGY STAR appliances and no- to low-volatile organic compound materials, contribute to the greening of a healthy living environment.



AUG 2010  
 Start of construction



APRIL 2011  
 Substantial completion

Photos: Tomas W. Angell

# How can thoughtful site planning sustain cultural heritage and natural habitat?



Density



Habitat



Community



Proximity



## SITE

Native American communities have long sustained a strong sense of place, identity, and community, even through major social and geographic upheavals. A native sense of place links the natural, physical world to cultural values, a strong cosmology, and an understanding that everything is interconnected. These core values help to link cultural sustainability with ecological sustainability. Many of these projects exemplify place-based solutions, such as project locations and site planning that consider infrastructure, density, habitat protection, and affordability. In the tribal tradition, homes were typically rural, although due to many factors, tribes often gathered within a defined community commons area. The small land base of many reservations, combined with the high cost of infrastructure, is leading to a return to traditional arrangements of homes and community services in ways that are appropriate to each community. For example, Owe'neh Bupingeh is based on a long-term master land use plan, promoting compact development in the historic Pueblo core. Located in a high-altitude ponderosa forest, the I-Sah'-Din'-Dii Housing Project at Mescalero Apache exhibits a low-impact design that maintains a rural feel but places the homes closer together to reduce infrastructure costs and protect the natural habitat. The Navajo Housing Authority Planning Manual establishes standards for maintaining sustainability and affordability in appropriately planned developments across the Navajo Nation. Access to healthy food is an important aspect of site planning, and the Place of Hidden Waters is beginning to reap the rewards of onsite community gardens. Managing and protecting water through rain gardens and rainwater harvesting help conserve a precious resource for the future. The Place of Hidden Waters, Teekalet Village Housing, and Penobscot Leadership in Energy and Environmental Design (LEED) Homes are creatively sited housing that protects and celebrates natural habitats central to their respective lifeways and heritage.

Client: Mary and Kee Augustine  
 Architect/Developer: Arizona State University (ASU) Stardust Center  
 Development Partner: Navajo Housing Authority

Design/Build Team: Daniel Glenn, Design Director  
 Ernesto Fonseca, Construction/Energy Modeling  
 ASU Students of Architecture: Christopher Billey, Tanya Yellowhair, and Jason Croxton

FEB 2005 Design process begins  
 MAY 2005 Design/build begins  
 AUG 2005 Substantial completion  
 OCT 2005 Occupied and monitoring begins  
 OCT 2006 Monitoring complete



TRIBAL ENTERPRISE

The Nageezi House is a sustainable and affordable design/build project of the Arizona State University (ASU) Stardust Center. It was the first home to be built using Navajo FlexCrete, a subsidiary of the Navajo Housing Authority. The home was designed and built with a Navajo elder family in Nageezi, NM with a team of professionals and students from ASU's department of Architecture. The project was a collaboration with the Navajo Housing Authority.

Photo: Daniel Glenn

CORE PROJECT EMPHASES:

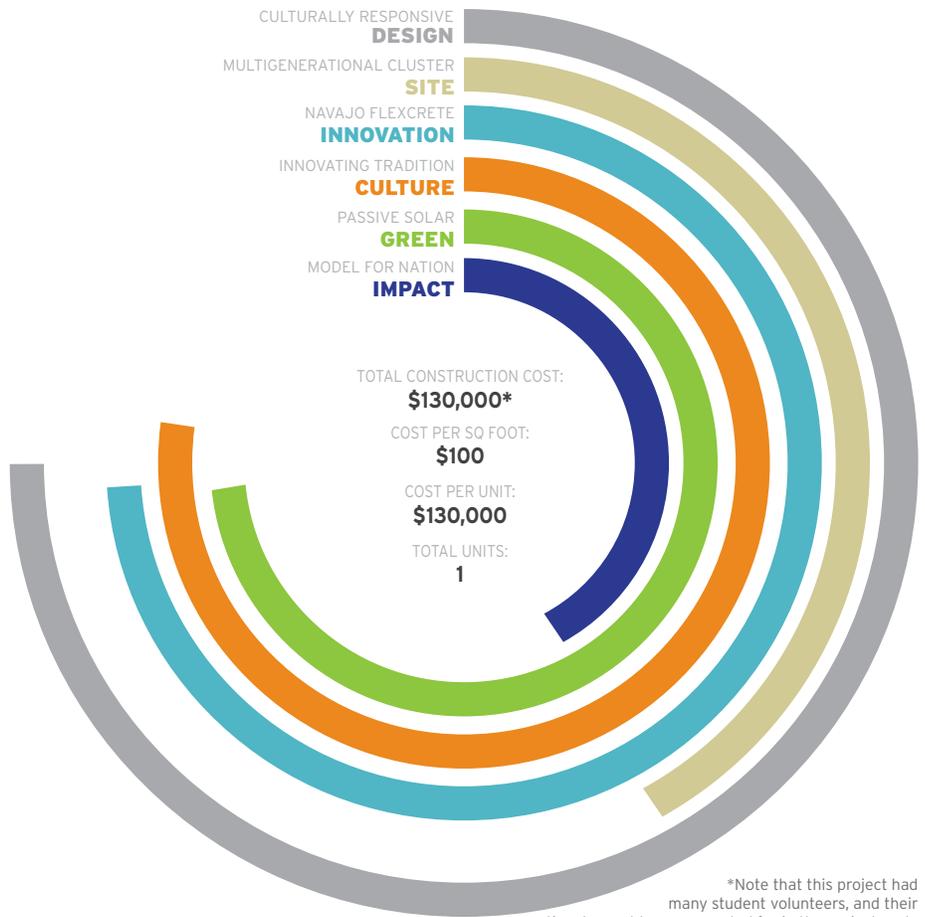


LESSONS LEARNED

- The collaboration between a tribal housing authority and a university can help to provide new models for housing.
- Culturally relevant, sustainable housing can be adopted on a larger scale for new housing developments.

BEST PRACTICES

- The project incorporated passive cooling ventilation and passive solar heating.
- Rainwater is harvested with a 1,200 gallon underground cistern.
- The house is designed to reflect and celebrate traditional Navajo culture.
- The project used tribal materials for construction—Navajo FlexCrete.



\*Note that this project had many student volunteers, and their time has not been accounted for in the project costs



Photo: Daniel Glenn



Single Family



Southwest

# NAGEEZI HOUSE

## CULTURE

The house is designed to reflect and celebrate traditional Navajo culture. The home's innovative design reflects the traditional structures of the Navajo, including the hooghan (home) and the chahash'oh (shade structure). Both Mary and Kee Augustine grew up in traditional Navajo hooghans. For the past 40 years, however, they had been living in a conventional western home and had grown accustomed to that lifestyle. In consultation with Mary and Kee, a design was developed that honored and reflected Navajo traditions but provides the size, privacy, and compartmentalization of conventional housing. Like a hooghan, the doorway faces east, and circulation through the home is in a clockwise flow, from the more public areas (living/kitchen/dining) toward the private rooms (bathroom and bedrooms). These rooms wrap around an octagonal courtyard, designed to reflect the Navajo hooghan in form and in the materials. Living, kitchen, and dining spaces are combined into one large, south-facing room to allow for larger family gatherings and to reflect the shared space of the hooghan. A shade structure on the south face protects the southern windows and deck from the summer sun and is designed to reflect the traditional chahash'oh that the Navajo use as a summer shade structure and cooking area. At the center of the east-facing courtyard, an outdoor fire pit represents the fire at the heart of the hooghan. Windows are placed to provide views through the house to all four cardinal directions from the courtyard.



Photo: Daniel Glenn

## GREEN

The Nageezi House was designed as a Leadership in Energy and Environmental Design (LEED) for Homes project during the pilot phase of the program, although it was never certified as a LEED Homes project. In the building of this affordable and sustainable demonstration home, several of the green strategies were intended to be replicable and low-cost approaches, including building orientation, passive cooling/ventilation, and passive solar heating. Following construction, the home was monitored for a full year to evaluate its performance with embedded temperature sensors in the walls and on the interior and exterior of the home, which demonstrated that overall energy use in the home is reduced 50 percent from a conventional home. The site is not irrigated; a gravelled surface surrounds the home.



Model by Daniel Glenn

Client: Port Gamble S'Klallam Tribe  
 Developer: Port Gamble S'Klallam Tribe Housing Authority  
 Architect: Roy Hellwig, Tormod Hellwig, LLC  
 Contractor: Jack Grinnell, JM Grinnell Contracting Inc.

Landscape Architect: Brian McCormack, ASLA  
 Civil Engineer: Ahmis Loving, Loving Engineering & Consulting, P.S. Inc.  
 Partners: Common Ground



Photo: Nathaniel Corum

HERITAGE PROTECTION

The Port Gamble S'Klallam Tribal (PGST) Housing Authority designed and built the Teekalet Village at a key location adjacent to historic salmon fishing grounds on the Puget Sound. Site features include a community building, a playground, and connections to walking/hiking trails. This housing was built to replace asbestos-contaminated houses on the same site. The site was carefully designed to protect a salmon spawning creek, a tribal hatchery, and the historic waterfront at Point Julia.

CORE PROJECT EMPHASES:

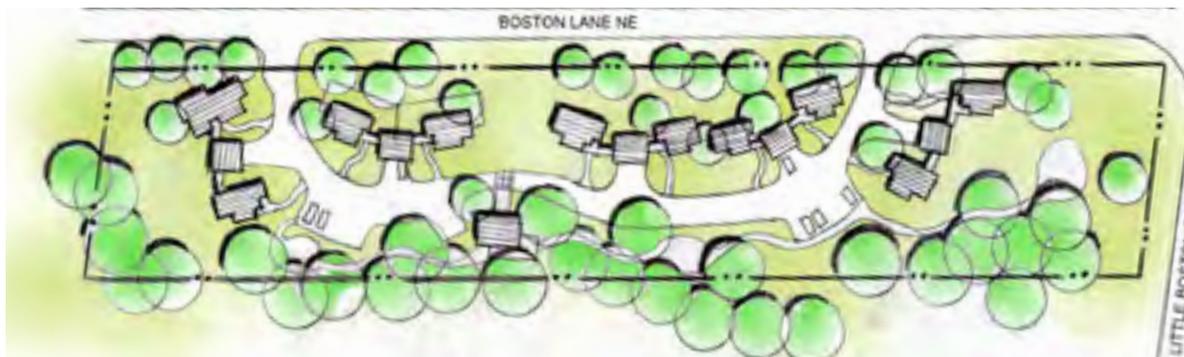
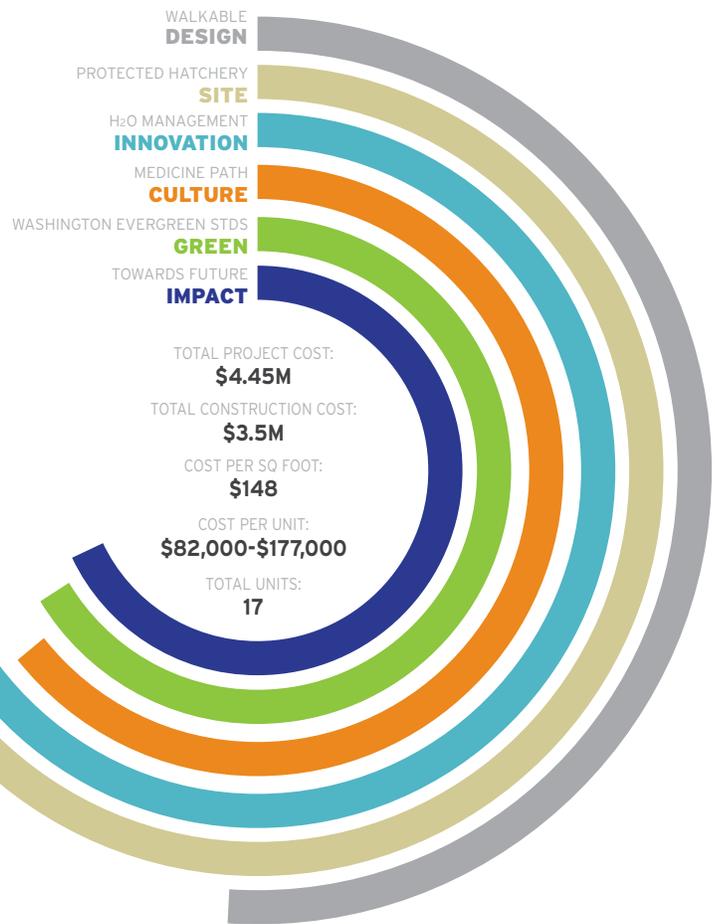


LESSONS LEARNED

- Good design can achieve appropriate density in communities with histories of sparse settlement.
- Walkable communities can be anchored with access to key recreational, cultural, and historic sites.
- New housing projects can help preserve traditional heritage.

BEST PRACTICES

- The design/build team included a S'Klallam tribal member contractor and a local architect.
- A playground, pathways, native plants, and porches help to form a cohesive community atmosphere.
- Landscape and water flow management protect an adjacent salmon creek and hatchery.



Single Family



Northwest

Drawing: Tormod Hellwig, LLC



# TEEKALET VILLAGE

## CONTEXT

Many of the approximately 1,300 tribal members of the Port Gamble S’Klallam Tribe (PGST) live on the shores of Port Gamble Bay on the Kitsap Peninsula. A ferry and short drive from Seattle, these 2 miles of waterfront are part of the reservation. Although historically a Salish-speaking people, the PGST were well established in the Puget Sound basin by 1400 BCE. Today, the S’Klallam people continue to practice the traditions that shaped their culture and lives, including fishing, hunting, singing, and dancing. The tribal website makes it clear that the PGST are working hard to build a better community for future generations.

## DESIGN

A pleasing cluster of homes in a variety of layouts and colors is anchored by a community center and an access loop. Project materials include cement fibre board sheathing, composition shingle roofing, and timber porches.

## COMMUNITY

Several tribal offices and businesses are within walking distance of the site and an exemplary community center, composed of a culturally appropriate longhouse, library, housing authority, other tribal offices, and new school.

## DAY LIGHTING

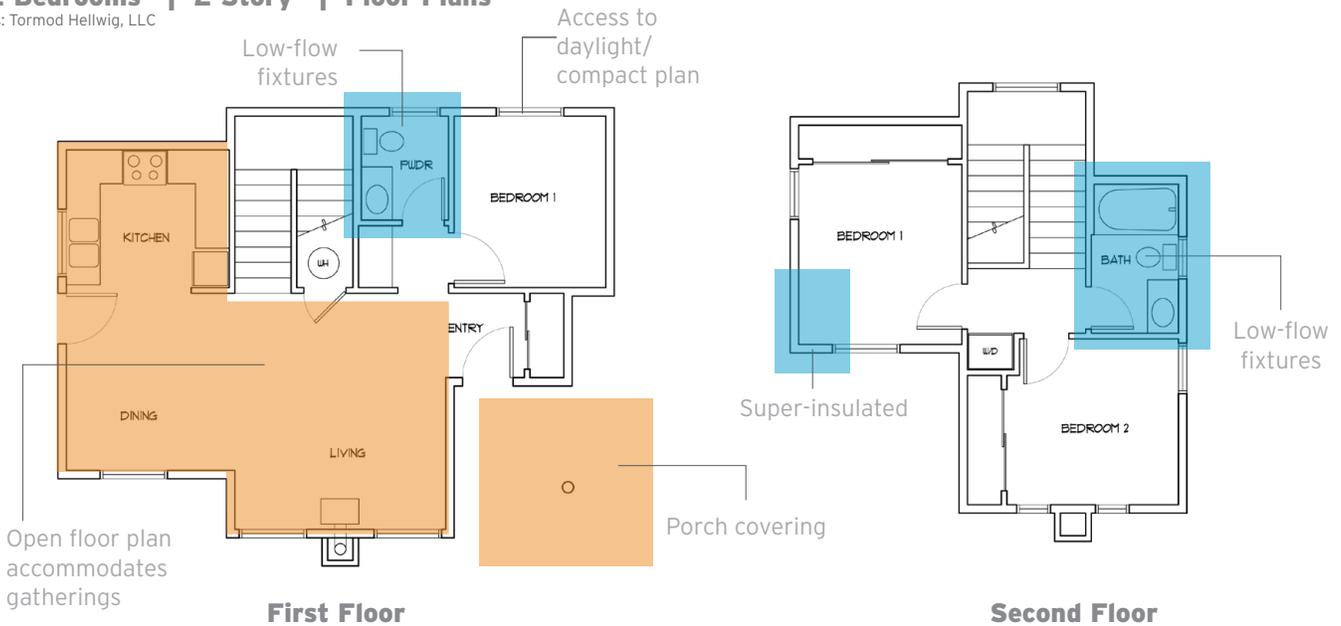
Because sunlight is scarce in the Pacific Northwest, during the winter, architects designed the houses with smaller building envelopes to allow light to enter from two sides. The porches were also equipped with transparent roofing allowing more light through. On the south side of the homes, shading elements keep the homes from overheating.

“From my house, I can walk right down to the beach. I can walk to the tribal administration; we have an exercise room that we can all walk to, right by the health clinic and the dental offices. We’re pretty much close to everything, except the store, which is a bit of a walk.”

- Joanne DeCoteau, resident tribal member

## 2 1/2 Bedrooms | 2 Story | Floor Plans

Drawings: Tormod Hellwig, LLC



## SITE

A beautiful bluff above a fragile salmon creek, the site was previously developed in the 1970s with five buildings containing asbestos, all of which were in various states of disrepair. After evaluation, it was determined these structures had served their functional lives and it would be cost prohibitive to renovate them, so they were abated and demolished. The Teekalet project is considered an infill development because it increased the density of the site, with 17 units and a community center in the same footprint area. To protect the stream from runoff, landscape features include a comprehensive system of rain gardens, permeable paving, swales, and native plants. A path network, water access, and a playground connect to community facilities and shoreline hiking.





DESIGN

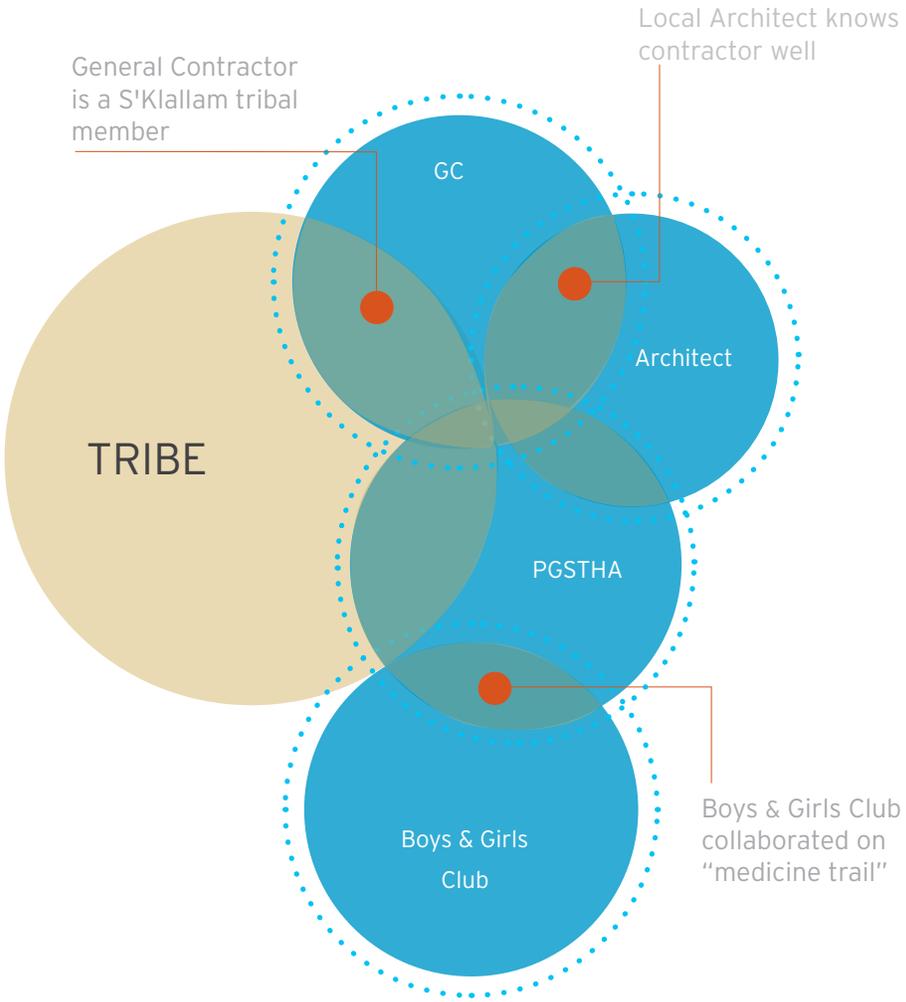
Well-proportioned homes are in a colorful and cozy circle that features central access, a community center, and walkable paths to community services and natural resources. Pathways, native plants, and a playground form a cohesive community atmosphere, and landscape and waterflow management protects an adjacent salmon creek and hatchery from negative impacts of the development.

GREEN

The homes feature low-to-no-volatile organic compound (VOC) products, low-flow fixtures, and ENERGY STAR appliances. Energy efficient features are extensive, including being photovoltaic (PV) ready, incorporating passive solar and heat-recovery ventilation, as well as instant hot water, and programmable thermostats. The owners were all provided with a manual and orientation to the green features.



Photo: Nathaniel Corum



Project relationships diagram

PROCESS

Through a process centered on a series of community meetings, the design/build team worked with the Port Gamble S'Klallam Tribe (PGST) Housing Authority, tribal members, and the PGST Tribal Council to arrive at a design approach and construction imperatives. The architectural program stemmed from community input and tribal members' needs and preferences, including large kitchens, ample storage, multilevel designs, and "half-rooms" that could alternatively serve as an office or nursery.

CULTURE

According to S'Klallam oral tradition, the level sandy spit chosen for the mill site was the ancestral village known as "Teekalet," which is a Klallam/Chimakum word that describes "the shining sand in full sunlight." Fireplaces are important to tribal members, as are places to store firewood for backup heating and ceremonial use. The site is just upstream of a tribal salmon hatchery and adjacent to historic sites, including Point Julia on the Puget Sound.



# TEEKALET VILLAGE

## INNOVATION

A dynamic site water system protects the salmon creek, hatchery, and Puget Sound waters below. The site design by civil engineer Ahmis Loving and Nez Perce tribal member and landscape architect Brian McCormack features water management, pervious paving, swales, and rain gardens to arrive at a resilient habitat for newly introduced native plants that protect the nearby creek shed and allow for access to community services, fishing, recreation, and play.

## VISION

Common Ground performed a study and determined a clear need for affordable housing, confirming the tribe's recognition that there was not enough housing for low-income community members, and that a priority was healthy homes in a dense configuration close to community facilities. The Tribal Council tasked the Port Gamble S'Klallam Tribe (PGST) Housing Authority with developing the project.

## ITERATION

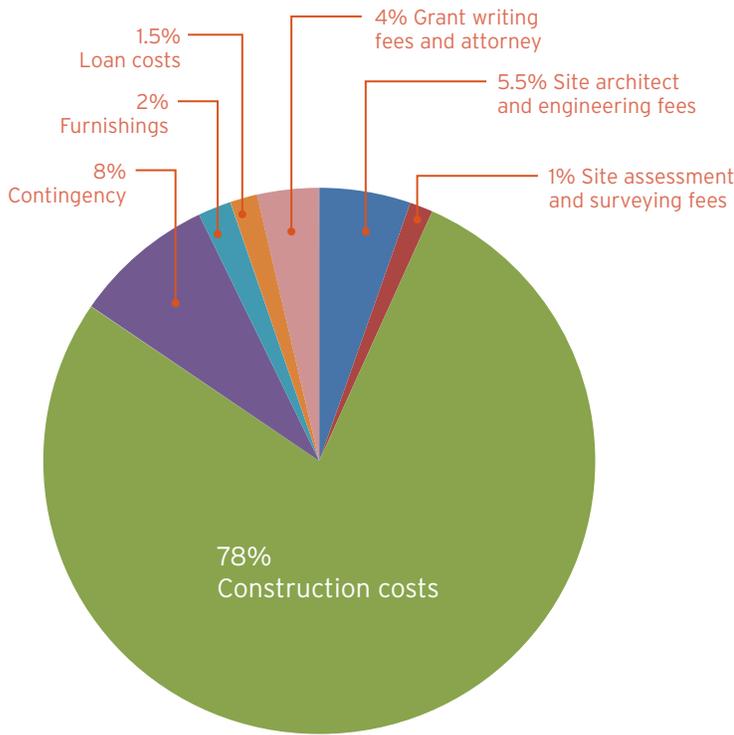
The design team was provided with information from community meetings, where tribal members communicated the need for a large gathering areas. This was provided through the inclusion of a community center, indoor/outdoor social spaces, open floor plans for kitchen, living, dining, and porches.



Photo: Roy Hellwig



Photo: Roy Hellwig



“ We’ve learned from this project that we have to make better use of the land. We have to increase density in order to meet current and future needs for housing, and of course we have to continue to develop projects that are environmentally friendly, energy-efficient and have durable materials. -Chris Placentia ”

### Project cost breakdown

## LESSONS LEARNED/CONCLUSION

As a result of the Teekalet project process, the Port Gamble S'Klallam Tribe and housing authority are now knowledgeable about providing high-quality, green housing at a higher density. The standards for housing and the ability to produce it have been raised in the community, and many tribal members have become more comfortable with denser housing, especially when it is within close proximity to key services and activities. The sense in the course of interviews is that when future residents and other tribal members are consulted on design elements, a better product results. The close-knit, local design/build team also assured close community contact throughout the process, addressing concerns as they arose before problems became entrenched. There is now great confidence in the community's ability to provide for its own housing needs, paving the way to more successful projects in the future.

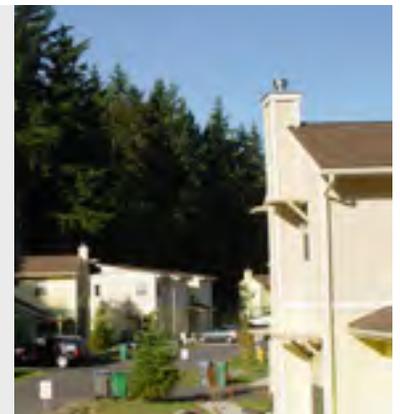


Photo: Nathaniel Corum

Client: Pinoleville Pomo Nation  
 Contractor: Pinoleville Pomo Nation Housing Authority  
 Consulting Engineer: Laco Associates

Partners: Community Assessment of Renewable Energy & Sustainability (CARES)  
 University of California, Berkeley (UCB)  
 Development Center for Appropriate Technology (DCAT), Vital Systems (Natural Building)



TECHNOLOGY TRANSFER

In collaboration with Pinoleville Pomo Nation (PPN), the Community Assessment of Renewable Energy & Sustainability (CARES) and the Departments of Mechanical Engineering and Architecture at the University of California, Berkeley (UCB) created ambitious, culturally inspired, efficient model homes featuring natural materials and integrated renewable energy systems. As the tribe continues working toward culturally appropriate housing and facilities, these homes demonstrate ways to provide for future needs.

Photo: SNCC

**CORE PROJECT EMPHASES:**



Building Codes



Natural Building



Partnership



Engagement

**LESSONS LEARNED**

- Tribes with access to technical assistance and control over their funding can achieve green, culturally appropriate housing even after years of being marginalized.
- Building multiple prototype versions allows for side-by-side testing and research for future performance optimization.
- New housing projects can preserve cultural and traditional values.
- Developing a culturally informed community engagement process helped develop tribal green building codes.

**BEST PRACTICES**

- Renewable energy-efficient systems were co-designed and built by tribal citizens.
- Rainwater catchment and greywater systems reduce vulnerability to water shortages and support onsite plantings.

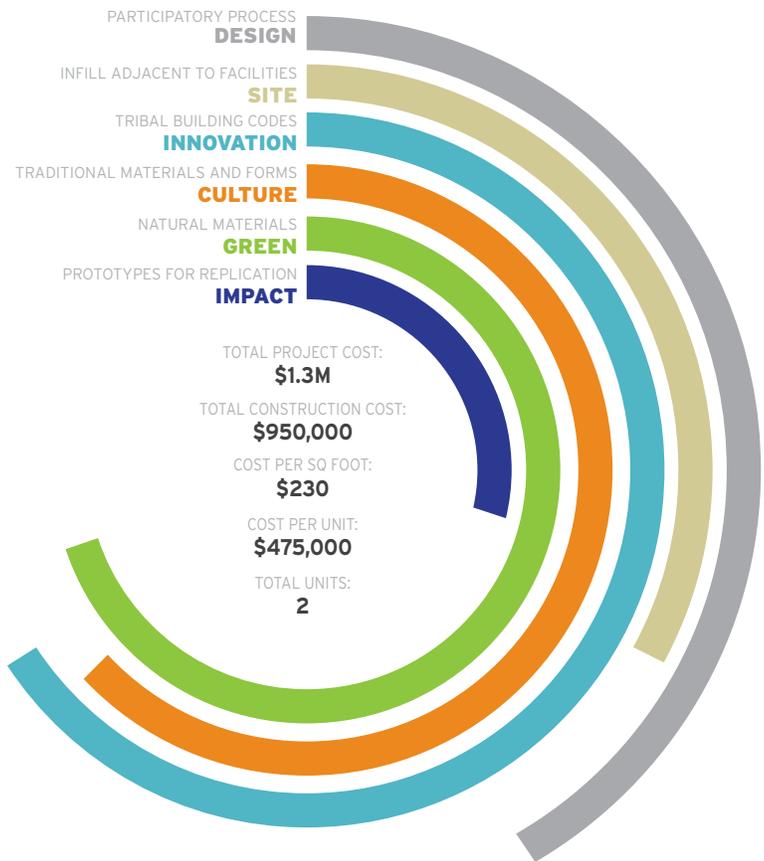


Photo: SNCC



Photo: SNCC



Single Family



Northwest

2008 Request for services  
 FALL 2008 UCB design collaboration  
 SPRING 2010 Design phase completed  
 SEPT 2012 Substantial completion  
 2013 Anticipated completion

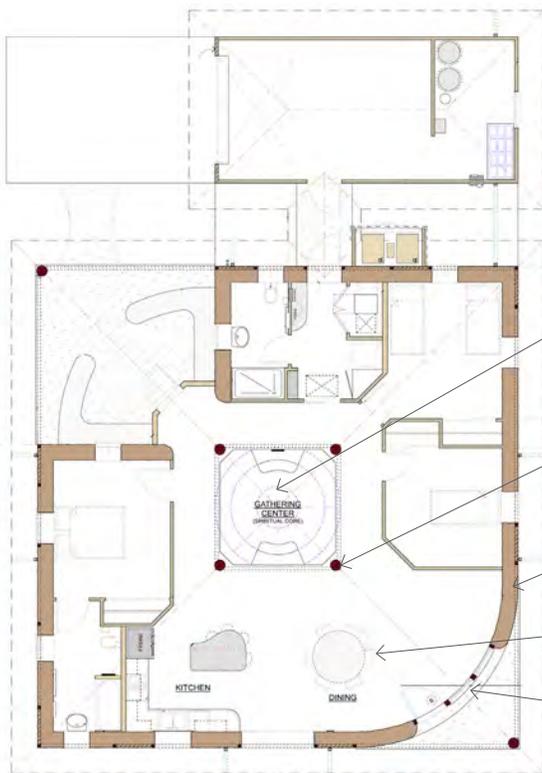
# PINOLEVILLE POMO NATION HOMES

## INNOVATION

Several key partnerships made this project unique and helped to assure its success. A collaborative design approach allowed for technology transfer in many areas: education about passive solar, water harvesting, cob, earth plasters, and stone masonry. The culturally informed design of the houses reflect a Pinoleville Pomo Nation (PPN) preference for traditional curving and non-linear forms in their structures. The use of straw bale and natural materials and finishes enhanced this preference. The design went through several phases of revision by local builders and natural-building facilitators. In a parallel process, the PPN collaborated with the Development Center for Appropriate Technology (DCAT) to produce a tribal green building code framework in 2011.

## PROCESS

Community engagement was important throughout the design/build process. The co-design approach developed after a request from PPN for University of California, Berkeley, technical assistance. PPN was most knowledgeable about their Nation and needs, and the University of California, Berkeley, had specific technical skills to add to achieve goals. One challenge in the process was to determine the tribe's goals. UCB/CARES researched methods of engagement to arrive at a framework for collaboration while helping to define what sustainability means to Pinoleville Pomo Nation community citizens. Working with the DCAT and others, the tribe has developed a framework of tribal green building codes to assert cultural sovereignty, address tribal priorities, and build capacity.



“ Putting in the straw bale brought a lot of people together: tribal, nation, university. People coming together to build homes. ”  
 - Nathan Rich, PPN resident

- A lowered floor area centers each traditional home and allows for ceremony.
- Four wood columns support a clerestory vault and emphasize the importance of the cardinal directions.
- Natural materials stand out, including: earth plaster, straw bales, stone, and abalone shell.
- Open plan allows for diverse gatherings and flexible use.
- Curved walls reference traditional Pomo architecture.

### 3 Bedrooms | 1 Story | Floor Plan

Drawing: Pinoleville Pomo Nation Housing Authority

## GREEN

These unique houses feature energy-efficient systems, straw bale walls, earthen plasters, no-to-low volatile organic compound paints and stains, ground-source heat pumps, solar photovoltaic arrays, solar hot water collectors, greywater irrigation, composting toilets, and rain-catchment systems. Efficient and renewable energy systems reduce dependence on outside service providers and demonstrate a tribal preference for clean energy. These homes are designed to conserve resources with passive heating and cooling considerations, mold- and pest-resistant wall sections, and emissions-free heating and cooling system. Rainwater-catchment and greywater systems reduce vulnerability to water shortages and support onsite gardens and landscaping.



Photo: SNCC

Client: Penobscot Indian Nation  
 Developer: Penobscot Indian Nation Housing Authority  
 Architect of Record: Dan Miller, AIA  
 Architecture Firm: WBRC Architects Engineers

Contractor Phase I: DP Porter Contractors, Inc.  
 Contractor Phase II: Penobscot Indian Nation Housing Authority

2007  
 Community design process



REUNITING HERITAGE

Through collaboration with local lenders and the U.S. government, tribal member home ownership is on the rise. The Penobscot Indian Nation Housing Authority (PINHA) built 12 Leadership in Energy and Environmental Design (LEED) Gold single-family homes. The project has helped bring young, low-income families back to the community, reuniting them with a strong cultural and traditional heritage. The project features a nature path, native plants, a boardwalk network connecting to community facilities, sweat lodges, and a ceremonial multi-use space.

Photo: SNCC

CORE PROJECT EMPHASES:

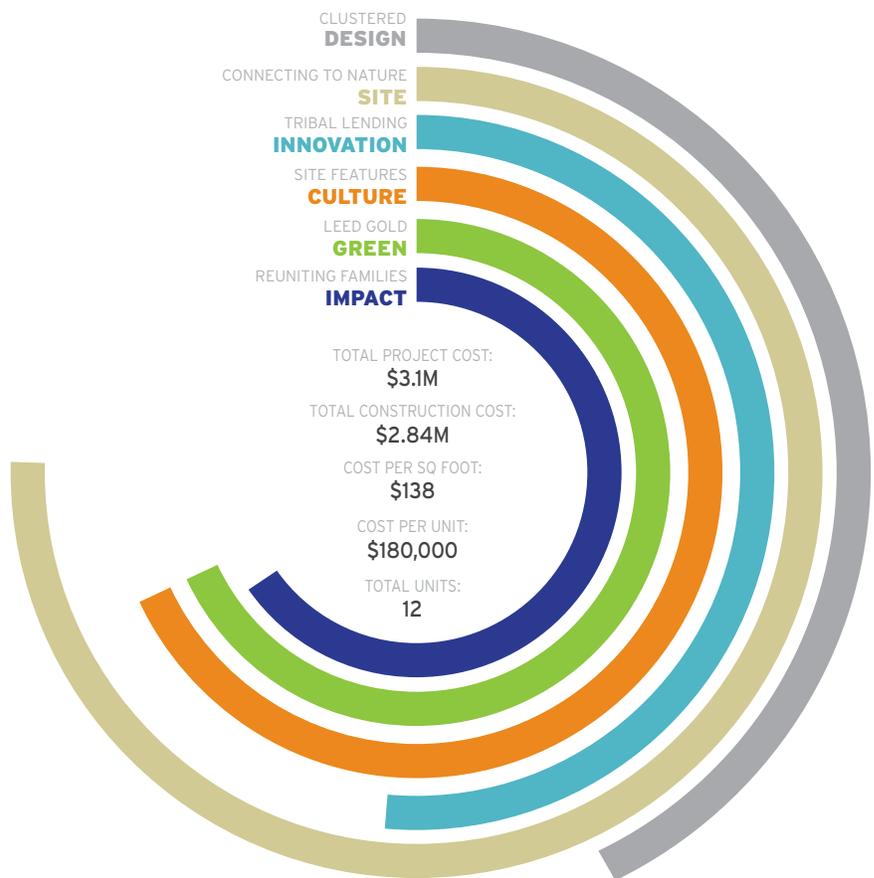


LESSONS LEARNED

- Working in a collaborative process helped to identify the power of partnerships and come up with creative solutions beyond providing housing.
- Incorporating cultural elements and natural resources in the site design helped to create a beautiful environment and educate families about the tribe's heritage.

BEST PRACTICES

- Tailored model lending policies that were adopted by the tribe helped families to return and live on tribal trust land.
- Comprehensive site planning met community goals for enhanced green space, outdoor use, and an integrated trail system.
- Tribal members led the project, chose the team, and helped to determine home designs and cultural features.



JULY 2008  
 Construction starts

2009  
 Substantial completion



Single Family



Northeast

2010  
 Occupied

Photo: SNCC



# PENOBSCOT LEED HOMES

## CONTEXT

The Penobscot Indian Nation Housing Authority (PINHA) project is located on Indian Island in the Penobscot River. Indian Island is the traditional center of a group of clans who lived along the river, and is connected by a single bridge to Old Town, Maine. The homes are framed by woods, with strong connections to cultural and historic locations, and by the cultural focus of the river, boating, and recreation activities.

## CULTURE

The homes bridge nature and community, with pathways to ceremonial sites and access to river and woods. Tribal designs are cut into local woodwork on homes of natural and earth tones, while trails link to town, to nature, and to a ceremonial area that is a circle of standing stones and sweat lodges. Tribal artists created stone monuments along trails, and the Tribal Cultural & Natural Resources team worked with the Boys and Girls Club to locate and illustrate indigenous medicinal plants.



Photo: Richard Neill

“ The people that own these homes are young families with children, they are people who live alone, there’s one woman that’s in the medical field, there’s an elder who has older children, there are elder couples. You know, it has served the need of quite a variety of families. I think that’s really good... a lot of families are reunited.

-Cynthia LeMay, Penobscot Indian Nation Housing Authority

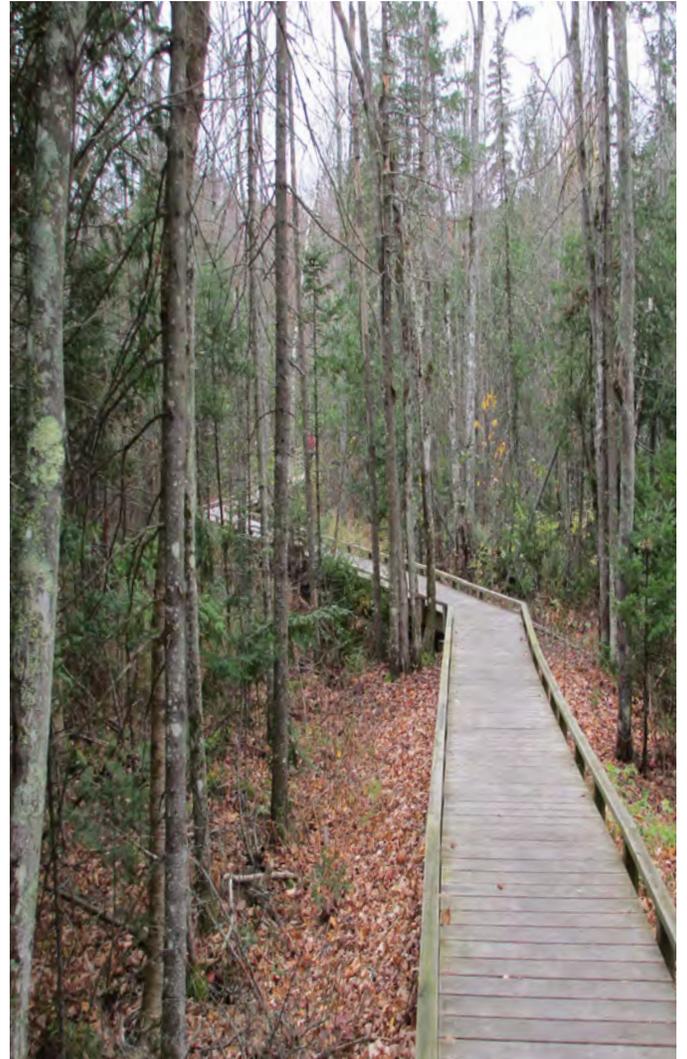


Photo: SNCC

## SITE

The site sits on a rocky ledge forming the heart of the island and is located conveniently between tribal services and community facilities. The 12-acre site exemplifies a tribal conservation strategy to place 12 homes on 1/4 acre lots and leave 75 percent protected as green open space for community use and for cultural education. There is now a short walk to the school, elder center, tribal offices, cultural and ceremonial areas, and water. An accessible, raised boardwalk protects habitat and acts as a nature trail to celebrate and conserve natural resources. It is said that this is a special place, where the diversity of plants live together with areas for ceremonies and gatherings.



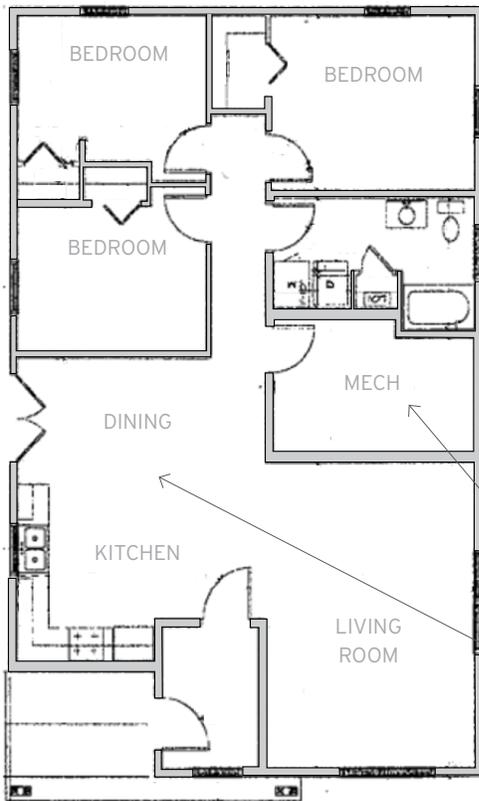
Photo: SNCC

DESIGN

The development consists of 11 three-bedroom homes at 1,265 sq ft and one four-bedroom home at 1,478 sq ft. Compact one-story homes line an access road and then transition to a trail network leading to a ceremonial circle. The homes feature inset porches for some relief from the basic rectangular footprint. Their siting amidst the Maine woods and dramatic topography make the setting special.

GREEN

The LEED Gold housing includes radiant hydronic floors, solar hot water systems, blown-in insulation, and efficient framing. The many regional materials (within 500 miles) featured include local wood such as cherry cabinets and maple flooring. Native, ceremonial, useful, and edible plants are cultivated along a "medicine trail" network that supports circulation, education, and recreation.



3 Bedrooms | 1 Story | Floor Plan



Photo: SNCC

Compact, insulated, and tight envelope emphasizes energy economy.

Solar hot water heaters add to home efficiency.

Open plan living and dining allows for gatherings and cultural events.

Eagle symbolized in rafter tail detail.



Photo: Richard Neill



Photo: Richard Neill

PROCESS

Tribal members were responsible for the vision of the project, and participatory design was a primary directive. Multiple public hearings and design charrettes included homeowners who met with the design team several times for 1-day workshops. According to architect Daniel Miller, the community was focused on LEED certification and on developing an efficient floor plan that was "sustainable and also met the needs of the families."

IMPACT

The original goal was to provide affordable housing in a challenging financial and environmental climate. A small community came together to cooperate and innovate to meet the housing needs. Ultimately, the project's impact went beyond housing to include infrastructure and community service improvements, and cultural and environmental linkages. A growing network of collaborators pulled in unison to achieve meaningful and effective use of the core of the islet.

# PENOBSCOT LEED HOMES

## VISION

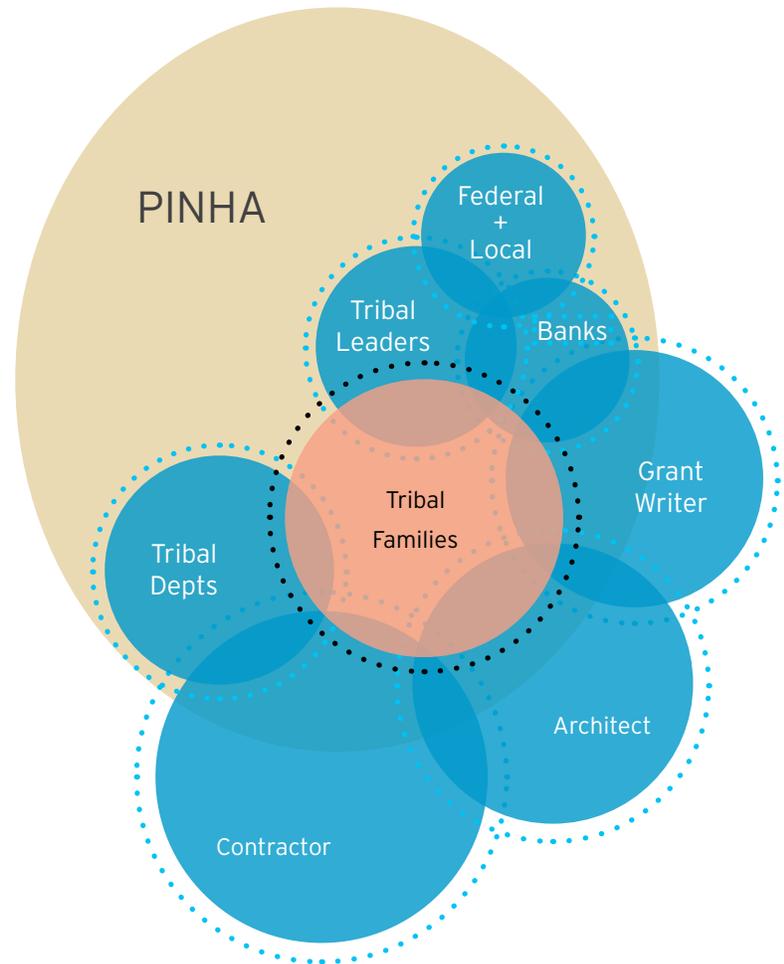
The Penobscot Indian Nation Housing Authority (PINHA), with tribal project lead Craig Sanborn, brought together elders, children, future homeowners, tribal agencies, and banks to create a common vision. A primary focus was bringing young tribal members back to live on Indian Island through the provision of high-quality, affordable homes. A dedicated internal team formed of PINHA staff, a grant writer, and an architect set a goal to create a credible and attractive vision for the community. Through this committed partnership, they obtained commitments from tribal leadership, departmental directors, and local and federal agencies.

## PARTICIPATION

A tribal committee was created to help address the development of more financing choices for tribal members. They worked with leaders in the tribal community to negotiate with federal agencies, resulting in tailored model lending documents that were acceptable and adopted by the Tribe through tribal legislation. The PINHA worked with lenders to conduct tribal mortgage and home buyer workshops. New financial frameworks were created and cultural pathways were re-established.

“ No area on the island was available for traditional tribal ceremony. Our tribe was the center of an inter-tribal alliance, in existence for thousands of years. There are stories about where the community meeting area was. The ceremonial grounds, as a result of initiating the trail, are restored to be a gathering spot. You’ll see that there are 23 stones, which represent the original clans. Every clan has a presence. It’s an area that’s available to anyone: the Native American Church, there’s a site for women, there’s a site for men. Those are being used much more frequently now and continue to grow. That’s opened up a whole new aspect of wellness in the community that feeds the whole person. ”

- Craig Sanborn, Project Leader



## LESSONS LEARNED/CONCLUSION

What really stands out on Penobscot Indian Island is that a community was able to take bold and creative steps to ensure their future resilience. Cultural, social, economic, and traditional values were layered over the land with a deep historic reverence for the tribal members of the Penobscot Indian Nation. Persistent collaboration among community members of all ages, from within tribal government and local informal groups, arrived at a shared vision; cultural protocols were valued alongside a range of financial and design efficiencies. Lessons learned include the importance of developing model documents, including construction contracts with consequences for delays. It was also important to phase future developments to allow for flexibility and infrastructure placement. Although for this project, the initial cost of “going green” was more expensive, the integrated design process allowed for incorporation of traditional values and is more attractive to funders and community members.



Photo: Richard Neill

Client/Developer:	Mescalero Apache Housing Authority	Syndicator:	Raymond James Financial, Inc.
Architect:	Atkin Olshin Schade Architects	Partnering Agencies:	New Mexico Mortgage Finance Authority, U.S. Department of Housing and Urban Development, Bureau of Indian Affairs, Indian Health Services
Contractor:	Pavilion Construction		
Development Consultant:	Concept Consulting, Inc.		



LOW IMPACT DESIGN

The I-Sah'-Din'-Dii Housing Project, Phase I, is a rural development of 30 low-income housing tax credit (LIHTC) units and a community center that are located within a beautiful, high-altitude ponderosa pine forest in southern New Mexico. Energy savings, occupant health, and reduced impact on the surrounding forest were primary goals of the project. The project team also compared different wall systems to determine the most cost-effective approach to a tight building envelope for use in future projects. I-Sah'-Din'-Dii is a model for green, context-appropriate tribal housing.

Photo: Atkin Olshin Shade Architects

CORE PROJECT EMPHASES:

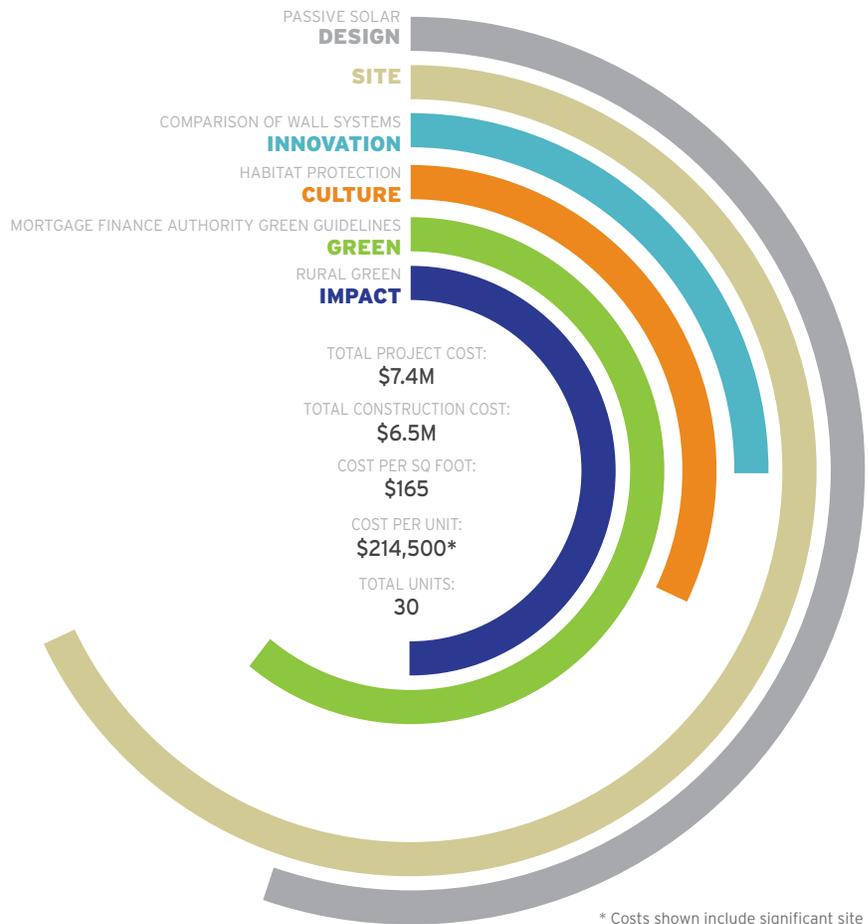


LESSONS LEARNED

- A rural atmosphere can be maintained through thoughtful site planning.
- Good design can help reduce construction and energy costs.
- Engaging all project partners at the outset of a project enhances collaborative performance.
- Structural insulated panels (SIPs) for wall construction are a cost-effective, green alternate to wood stud wall construction.

BEST PRACTICES

- The site plan was developed using low-impact development principles. For example, compact housing allowed for significant protection of adjacent habitat.
- Construction followed the New Mexico Mortgage Finance Authority Green Guidelines.
- All of the homes are oriented for passive solar, with large windows and appropriately sized overhangs on the south.



\* Costs shown include significant site improvements for future phases, including a new lift station.



Photo: Atkin Olshin Shade Architects



Single Family



Southwest

NOV 2006 Development team  
 JAN 2007 Submit LIHTC application  
 MAY 2007 LIHTC award | Design process  
 MARCH 2008 Syndicator closing | Construction begins  
 MAY 2009 Substantial completion  
 JUNE 2009 Ribbon cutting

# I-SAH'-DIN'-DII, PHASE I

## SITE

The site was designed using a combination of strategies to incorporate walkability, low-impact development, and passive solar design. Low-impact development principles are based on minimizing impact on the natural environment, such as siting roads and building pads according to existing terrain and topography, limiting the area of disturbance around construction, clustering development, and designing roads and walkways that limit the velocity of runoff and offsite erosion.

“I've seen a lot of affordable housing developments over the years, but this one was almost overwhelming in its beauty, the location, and the amount of work that went into the project.”

- Julie Gunter, Federal Reserve Bank of Dallas

## DESIGN

The homes incorporate passive solar design and orientation to reduce energy costs. The annual sun angles for Mescalero, New Mexico, were analyzed and appropriately sized overhangs were built. This design approach allows the lower winter sun to radiate into the home and the higher summer sun to be blocked out. The combination of overhangs, concrete floor slab, and large southern windows, along with other design strategies such as a well-insulated building envelope and wood stoves, helps reduce winter heating bills.

Summer Sun



Winter Sun



Drawings: Atkin Olshin Shade Architects



Photo: Atkin Olshin Shade Architects

## GREEN

To protect resident health, no carpets were installed, and low-volatile organic compound paints, sealants, and adhesives, as well as non-urea-formaldehyde cabinets were specified. Structural insulated panels (SIPs) were appropriately specified to ensure that non-toxic, urea-formaldehyde-free adhesives were used in the sheathing. ENERGY STAR appliances, passive solar design, and a tight building envelope were addressed for energy efficiency, with R-26 wall insulation and R-40 roof insulation. Passive ventilation helps maintain thermal comfort in the summer by bringing air in through low windows and releasing warm air in high clerestory windows. Water conservation includes low-flow fixtures and rain barrels to capture roof water. Half of the homes were built with SIPs and the other half with conventional wood frame construction. Post-occupancy utility data shows that the SIP walls are not only cost competitive, but they also provide a tighter building envelope. Site disturbance was limited to 25 feet from homes.

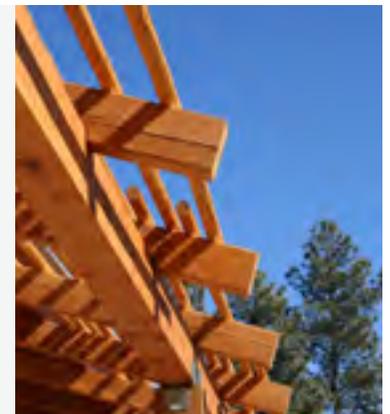


Photo: Atkin Olshin Shade Architects

Client:	Northern Cheyenne elders and tribal members	Design Collaborators:	Community members and homeowners
Developer:	Red Feather Development Group	Systems Engineer:	Art Fust, P.E., Energy A.D.
Design + Build:	Nathaniel Corum, Mark Jensen, Sergio Palleroni	Other Partners:	U.S. Department of Agriculture Rural Development, Indian Health Services, Enterprise Rose Architectural Fellowship
Contractor:	Red Feather Development Group + volunteers		

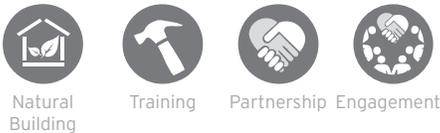


VOLUNTEER BUILD

Working with Northern Cheyenne tribal members, Red Feather Development Group (RFDG) has developed a cooperative design/build. The homes are designed in collaboration with low-income first-time homeowners and built through donations and volunteer efforts. Typically building one house each year, RFDG has created homes with several Northern Cheyenne families and initiated a similar program with the Hopi in Arizona. These load-bearing straw bale homes represent a climate-appropriate, super-insulated response to the Northern Plains' winter conditions.

Photo: Michael Rosenberg

CORE PROJECT EMPHASES:



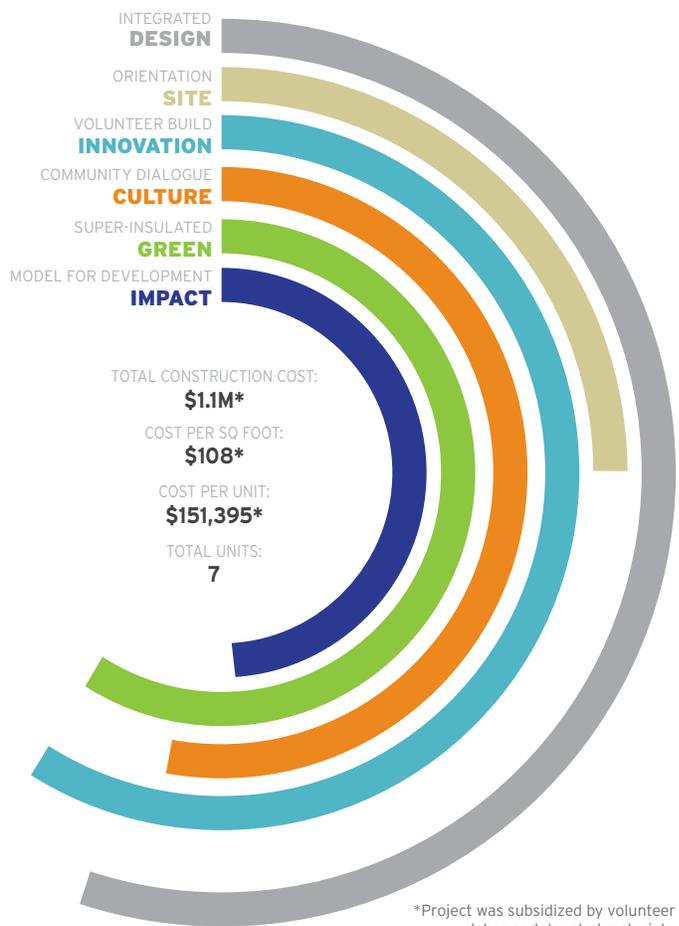
Natural Building    Training    Partnership    Engagement

LESSONS LEARNED

- Culturally appropriate features can be easily incorporated into new housing through dialogue with residents.
- Innovative and climate-appropriate heating systems result from working closely with project engineers.
- Volunteer-built projects need to be well coordinated but provide savings on labor.

BEST PRACTICES

- Cultural elements include east-facing doors, large kitchens for gatherings, locating windows for key views and privacy concerns, and designing accents specific to each family.
- Radiant heat and heat-recovery ventilation combined with a super-insulated straw bale wall system lowers energy costs significantly.
- Community outreach is key, especially when combined with volunteer labor.



\*Project was subsidized by volunteer labor and donated materials.



Single Family



Northern Plains

Photo: Skip Baumhower

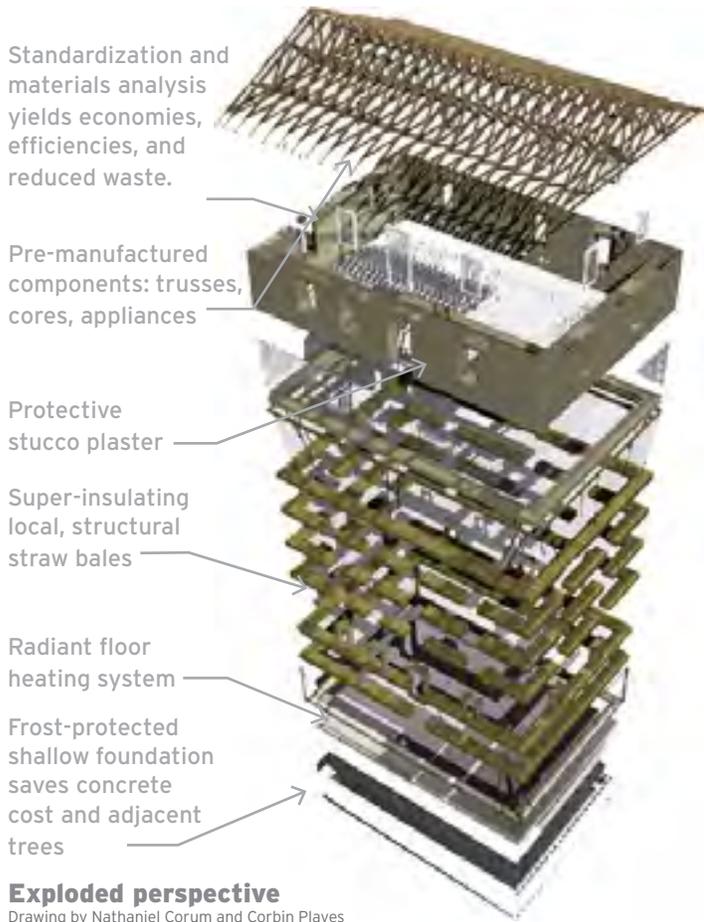
# STRAW BALE HOMES

## INNOVATION

The Straw Bale Construction Internship (SBCI) provides paid training for tribal members to learn and utilize construction and project management skills. SBCI equips tribal members with the necessary skills to address long-term housing needs in their communities. Equally important, the vocational skills participants learned to help pave the way for future employment opportunities. The SBCI program addresses the need for safe and affordable tribal housing by combining sustainable home construction technology with hands-on, paid construction training. The program equips tribal members with the skills to address long-term housing needs in their communities while strengthening future employment opportunities.

## GREEN

The Red Feather Development Group (RFDG) employs green approaches where possible without sacrificing efficiency, cost-effectiveness, or ease of construction/maintenance. Straw bale is suited well to the community/volunteer build approach and represents a local, renewable, non-toxic and carbon-sequestering material. RFDG typically builds a super-insulated, load-bearing straw bale envelope atop a thickened-edge high-volume fly ash concrete foundation. Stained concrete floors avoid many interior pollution issues and typically contain radiant floor systems. Other green features include: solar PV and/or hot water, post-consumer attic insulation (newspaper), rainwater harvesting, efficient fixtures and appliances, local wood, and low/no VOC paints and stains



## CULTURE

Culturally appropriate features connected with these Northern Cheyenne homes include east-facing doors to face the rising sun, large kitchens open to living areas for celebrations and gatherings, and design accents preferred by individual tribal member families. Cultural features include site orientation and location adjustments, location of windows to control key views and privacy concerns, shade structures and covered entries, building portions made of salvage materials, live-edge wood porch columns and tribal and family designs such as rafter profile details. Such features reflect respect for native-to-place materials.



## IMPACT

Though the number of homes needed on the Northern Plains is very high, the Red Feather process has been an effective and scalable path to incremental development. The impact of this work goes far beyond the seven houses constructed. Red Feather shows that continuing to work with the same community yields results over time. The cultural bridges built between volunteers, students, RFDG staff, and tribal members are lasting and have incredible value. Also, producing publications, curricula, and workshops alongside homes has had wide-ranging effects. In one case a group of tribal members in Yakima, Washington, used the construction handbook to create a house for themselves without RFDG assistance.



# What innovative thinking is needed to help build sustainable and healthy neighborhoods?

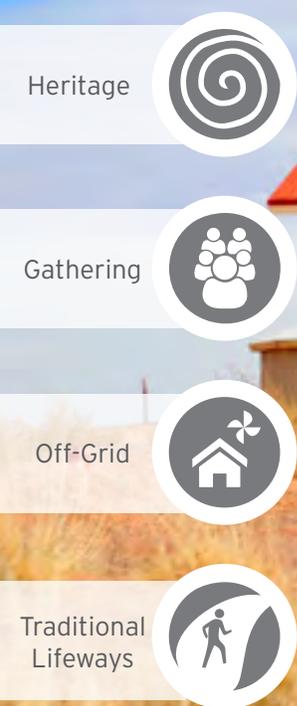


-  Partnership
-  Training
-  Enterprise
-  Material

INNOVATION

Many of the project teams featured here were clearly determined to build new models of housing specific to their communities, exhibiting a high degree of innovation demonstrated in various ways, including new partnerships, innovative technologies, research, and creative financing. Some development teams reached out to establish partnerships and collaborations that became critical for their success. The Apsáalooke (Crow) Tribe partnered with the University of Colorado Boulder to develop and test an earth block house made with native earth and built by a tribal workforce. The Pinoleville Pomo Nation collaborated with many partners to achieve a prototype home and develop tribally based building codes. The Nageezi and Guadalupe homes, which the Arizona State University Stardust Center helped to design and build, are desert-appropriate homes using Navajo FlexCrete, a Navajo tribal enterprise. Many of these partnerships included a high level of analysis and research on new and appropriate materials. Straw bale homes at Northern Cheyenne are part of a larger Red Feather Development Group initiative, building super-insulated housing through all volunteer builds. The Owe'neh Bupingeh Rehabilitation Project incorporates new technologies to preserve and stabilize ancient adobe homes, with an education and research component informed by cultural leaders and homeowners. Many of these projects were built using multiple funding sources—some as many as 13. They often utilized the Native American Housing Assistance and Self Determination Act (NAHASDA) funding to creatively leverage additional resources. The Ysleta del Sur Low-Income Housing Tax Credit (LIHTC) Pueblo Homes project was the first tribal LIHTC project in Texas, which required a high degree of partnership-building and tenacity. Penobscot succeeded in its goal to design new financing products so young families could move back to tribal land and participate in their cultural heritage.

# How do culture and heritage impact the way we build housing?



CULTURE

These featured projects demonstrate that affordable, cost-effective, and healthy housing can be specific to each culture, place, and climate. Most of the projects that incorporated culturally based design strategies did so through a strong community-engagement process, meeting with various user groups, including potential residents, community members, elders, youth, and cultural leaders. In the Penobscot Nation, such meetings helped define not just the tribe's housing needs but also its health and wellness needs, together with a stronger connection to cultural heritage. The Penobscot decided to incorporate a trails network and cultural elements as part of the site planning for their homes, to honor their river and community connections to it and to provide health benefits by encouraging walking. The Puyallup Tribe returned to its cultural housing form, the longhouse, which was reinterpreted in a contemporary context and is helping rebuild a sense of community. A primary goal of the Teekalet Village Housing project was to protect the salmon hatchery near the project, which was accomplished by specifically designing watershed protection systems from the housing site downstream. Because the project team for Owe'neh Bupingeh worked closely with many different project stakeholders, more than half the homes in the sacred and cultural core of Ohkay Owingeh have been rehabilitated by tribal members using indigenous methods and materials. The project team for Devine Legacy, which is oriented toward urban Indians in Phoenix, needed a universal approach to incorporating cultural elements, because families of many traditions would live there. To meet these challenges, the project team based its design on the ancient Hohokam culture, one of the first settled people in this area. Many project teams, such as the Diné who worked with Indigenous Community Enterprises (ICE) to develop Elder Hooghan Homes, worked directly with the homeowners to ensure the project met their needs and incorporated traditional elements, such as east-facing entries.



Client: Navajo Housing Authority (NHA)  
Architect/Planners: Swaback Partners, pllc

Partners: Enterprise Community Partners, Inc  
Sustainable Native Communities Collaborative (SNCC)  
U.S. Department of Housing and Urban Development, Sustainable  
Construction in Indian Country Initiative (SCInC)

JAN 2011  
Need Identified

JULY 2011  
SNCC green planning workshop

DEC 2011  
Enterprise Green Communities Charrette

JAN 2012  
HUD SCInC technical assistance begins

FEB 2012  
Request for proposal

JULY 2012  
Planning charrettes

FEB 2013  
Completion



SUSTAINABLE PLANNING

The Navajo Housing Authority (NHA) undertook the ambitious task of creating a sustainable planning framework for the Navajo Nation, the largest tribal membership and land base in the United States, that includes 5 agencies, 24 regions, and 110 chapters. The goal was to lay out a framework for 34,000 housing units that will satisfy the need for sustainable and cultural housing on the Navajo Nation. This effort included site planning meetings with each agency, followed by planning sessions with each region and its respective chapters.

Drawing by Swaback Partners, pllc

CORE PROJECT EMPHASES:



Tribal Codes



Engagement



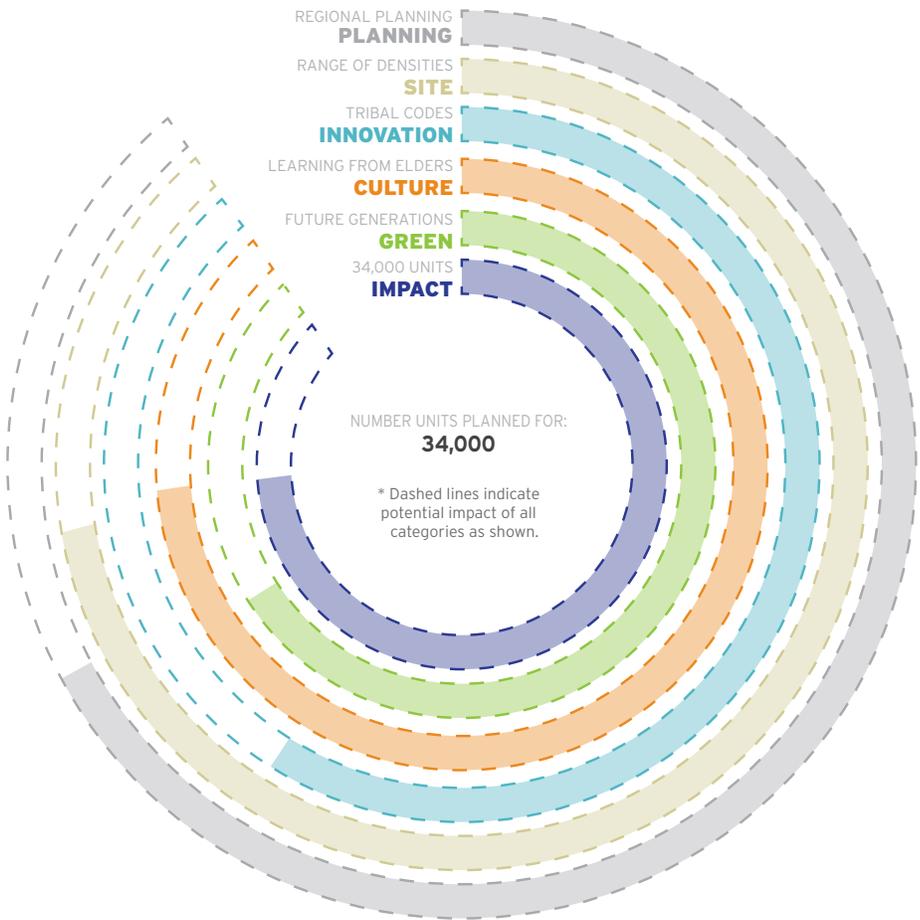
Partnerships

LESSONS LEARNED

- Understanding the importance of directly engaging the community at the grassroots level can help gain insight into a community's needs and culture.
- Using "smart growth" planning strategies must be modified for a rural context with limited infrastructure, remote sites, and a traditional rural culture that values very low densities.

BEST PRACTICES

- Community-based planning methodologies were developed to directly engage the community through onsite workshops and charrettes.
- Tribal professionals, housing authority staff, and students were all involved in the engagement process.
- Regional planning must achieve sustainable goals that are specific to culture and climate.



Density



Southwest

Drawing by Swaback Partners, pllc



## CONTEXT

Relative to the United States overall, housing on the Navajo Nation is generally are smaller and in very poor condition, with overcrowding and limited access to utilities. The Navajo Nation population is relatively young, poor, and underemployed. A number of factors affect housing needs on the Navajo Nation, including geographic dispersal across the reservation, affordability of housing, existing housing conditions, and inventory. The 2009 Navajo Housing Authority (NHA) Housing Needs Assessment estimates a total need for 34,000 new and replacement units of housing and a need to expand 8,500 existing homes to accommodate growing families. Some 60 percent of Navajo Nation housing structures are single-family homes, 17 percent are mobile homes, and 11 percent are traditional hooghan. The remaining 12 percent are made up of multifamily attached housing units and a variety of other unit types. It is estimated that 5 percent of all children on the reservation live in housing classified simply as “available shelter,” which is defined as non-standard housing of the lowest quality. Because available shelter is comparable to tents or shacks and is not suitable shelter in extreme weather, this situation indicates a dire housing need.



Photo: Daniel Glenn



Photo: Daniel Glenn



Photo: Swaback Partners, pllc



Photo: Daniel Glenn



Photo: Swaback Partners, pllc

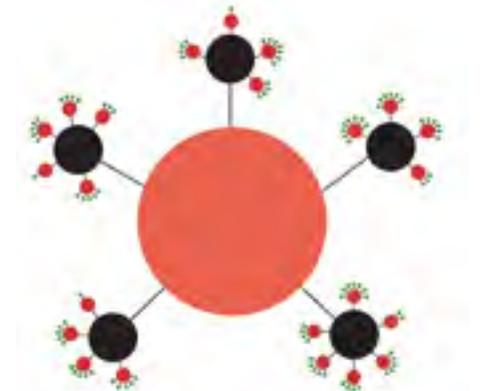


Photo: Daniel Glenn

Many community meetings were held during the planning process.

## COMMUNITY

The Navajo Nation has the largest land area of any tribe in the United States: more than 24 million square miles in four states—Arizona, Utah, Colorado, and New Mexico—and a population of approximately 300,000 tribal members. A major goal was to help the Navajo Housing Authority (NHA) identify appropriate land for new housing while offering sustainable planning approaches for housing patterns and designs that would align with Navajo culture, regional climate, and community needs. Each chapter is required to have Chapter Land Use Plans (CLUPs) identifying land for various uses. Through the planning process, the planning team determined that these CLUPs do not identify enough land to accommodate a projected need of 34,000 new housing units.



Symbol of Navajo Nation with 5 Agencies, 24 Regions, and 110 Chapters

**CULTURE**

In the Navajo (Diné) way of life, the concept of “hózhóogo naasháa doo,” “walking in beauty,” is an ancient term describing a sustainable way of life, “steeped in the land, water, air, sun, and seasons.” As described in the NHA Planning Manual, “the Diné are meant to live off the land in beauty, harmony, happiness, and in the “hózhó” way of life, in balance with the natural environment.” The planning effort sought to bring this way of thinking into dialogue with tribal members in the development of a sustainable framework for designing new communities on Navajo land. There was a challenge in this process, however, given the history of the Navajo as rural people living as shepherders in small, remote, multigenerational family clusters. Although this rural lifestyle remains the preferred way of life for many Navajo, it can conflict with other sustainability goals, such as walkable, more compact communities, less reliance on automobiles, and mitigating costly infrastructure and services to remote communities. Many Navajo now live in highly urbanized contexts, either in communities on the Navajo Nation, or off reservation in urban areas. To reach this Diné diaspora, planners will have to address both the traditional and the urban Navajo.

Different Patterns of Rural Development



Drawings: Swaback Partners, pllc

Housing generously spaced and oriented around native open space.



Housing close together, with large, surrounding lots for farming and animal pens.



Housing connected by pedestrian networks to community amenities beyond.

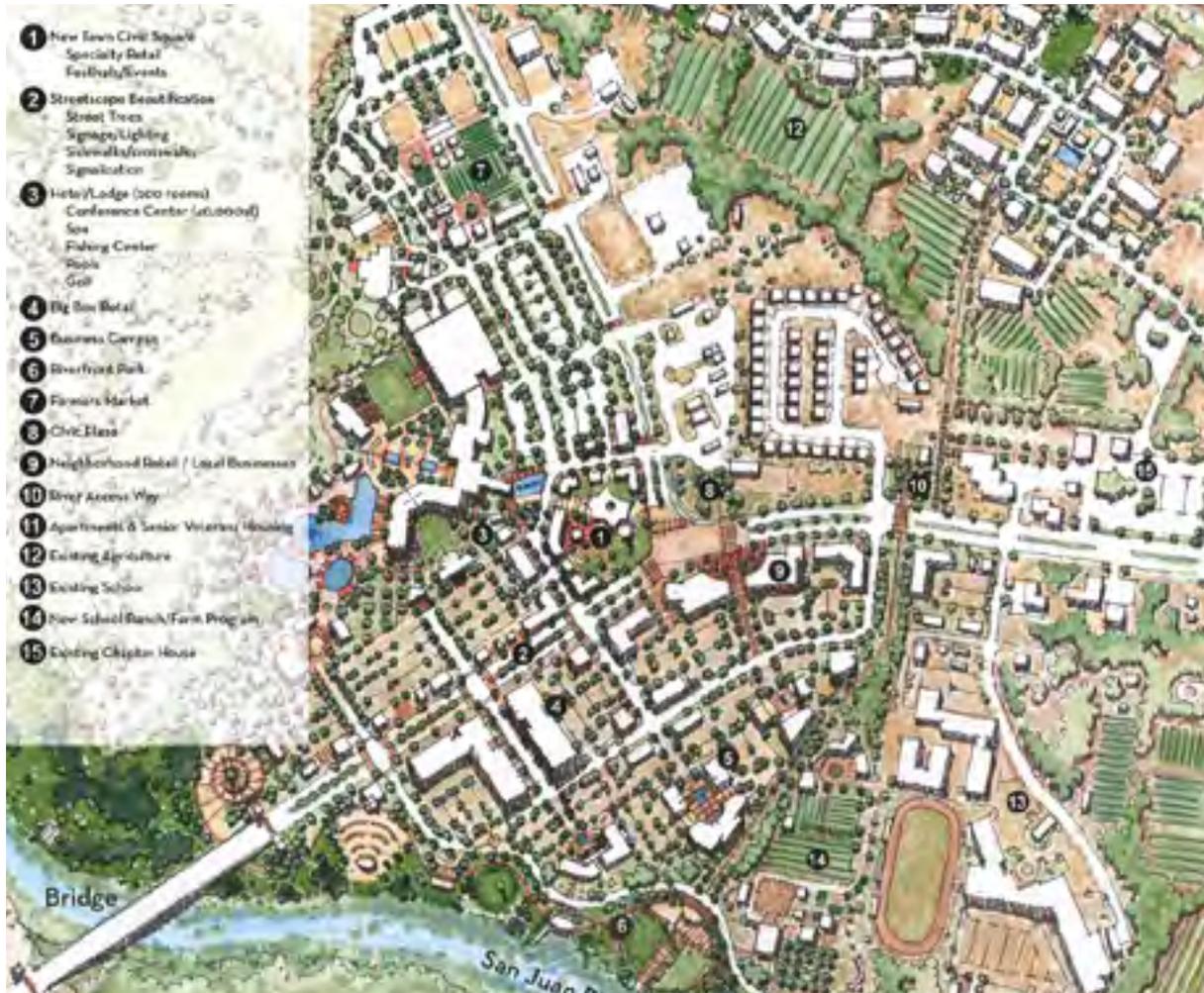
**PROCESS**

The master planning effort began in January 2011 at a meeting of NHA leadership, led by Chief Executive Officer Aneva Yazzie and was further developed in a visioning workshop led by the Sustainable Native Communities Collaborative (SNCC) in the summer of 2011. In December 2011, SNCC led an Enterprise Green Communities Charrette with NHA leadership to begin work on a sustainability standard for new housing developments. In 2012, with technical support from the U.S. Housing and Urban Development (HUD), Sustainable Construction in Indian Country (SCinC) Initiative, a request for proposal was issued to develop a planning manual. Swaback Partners, pllc, was selected for the project, which was completed in the spring of 2013.

The planning process was organized in three phases.

- Phase one: Site reconnaissance and evaluation.
- Phase two: Programming confirmation and refinement.
- Phase three: Prototypical plans and sustainable community master plans.

The planning team engaged the community representatives at each phase. Extensive planning workshops and site visits took place across the entire Navajo Nation, with daylong charrettes in each of the 24 regions. These planning meetings were instrumental in getting direct, hands-on input from tribal members. Following these planning meetings, NHA requested individual meetings with each of the 110 chapters to understand its individual community needs. The process was also an opportunity to gain a better understanding of specific regional needs across Navajo Nation and how new developments across the reservation could be better coordinated and better linked to serve the communities.



Drawing: Swaback Partners, pllc

Vision for the downtown core of Shiprock, New Mexico, can help set in motion a range of possibilities for future community needs.

### Definition of Appropriate Housing Typologies:

The planning process identified five different types of housing: (1) single-family detached, (2) single-family attached, (3) multigenerational homes, (4) apartments, and (5) senior living. Concepts for these building types will be developed as potential prototypes for development.

### Design of Demonstration Projects:

The NHA is now planning to develop a series of demonstration projects on a larger scale to test the larger planning goals and sustainability strategies for implementation across the nation, in the build-out of a projected need for 34,000 homes.

### HUD Sustainable Construction in Indian Country Initiative (SCinIC):

The HUD SCinIC technical assistance team was part of the planning process, which led to new policy recommendations that the NHA will use to carry out the goals of the master plan as well as the larger goals of fostering more sustainable communities on the Navajo Nation. The following recommendations were approved by the NHA board and are being implemented as policy:

- Develop an interdisciplinary NHA design review committee to develop a Navajo sustainability standard and guide the design/planning process.
- Base the Navajo sustainability standard on the national Enterprise Green Communities Criteria and implement a modified version of this standard immediately on all planned projects.
- Revise the NHA request for proposal/request for qualifications selection process for design professionals to reflect sustainable/cultural goals.
- Adopt a community-based design/planning process for all new development and new housing types.

Client: Bejarano Family  
 Architect/Developer: Arizona State University (ASU) Stardust Center  
 Design/Build Team: Daniel Glenn, Design Director  
 Ernesto Fonseca, Construction/Energy Modeling, Partners:  
 Design/Build Team: Hoopa Valley Tribal Community Conservation Corp,  
 Valley of the Sun Habitat for Humanity, and  
 Americorps  
 Town of Guadalupe, Navajo FlexCrete

NOV 2005  
Community design  
 MAY 2006  
Construction design/build  
 OCT 2006  
Substantial completion  
 DEC 2006  
Completion of construction  
 JAN 2007  
Occupied



DESERT DESIGNED

The Guadalupe House is a low-cost home designed for the harsh desert climate of the Valley of the Sun, and reflects the unique cultures of the Latino and Yaqui communities of Guadalupe. It is a multigenerational house, designed to be expanded over time and accommodate several generations living in one household. With a passive solar design, photovoltaic panels, water-cooled solar-powered air conditioning, and aerated concrete walls of Navajo FlexCrete, it requires minimal external energy to operate.

Photo: Michael Pyatok

**CORE PROJECT EMPHASES:**



**LESSONS LEARNED**

- There is value in a community working together with universities in the development of new designs and materials for new housing.
- Culturally relevant, sustainable housing can be adopted on a larger scale for new housing developments.

**BEST PRACTICES**

- Passive cooling ventilation, passive solar heating, and photovoltaic solar panels were incorporated.
- Greywater reuse and rainwater harvesting, together with a series of cisterns, are featured.
- The house is designed to reflect and celebrate traditional Mexican culture.
- The project makes use of Navajo FlexCrete, a lightweight highly insulated and tribally produced material.

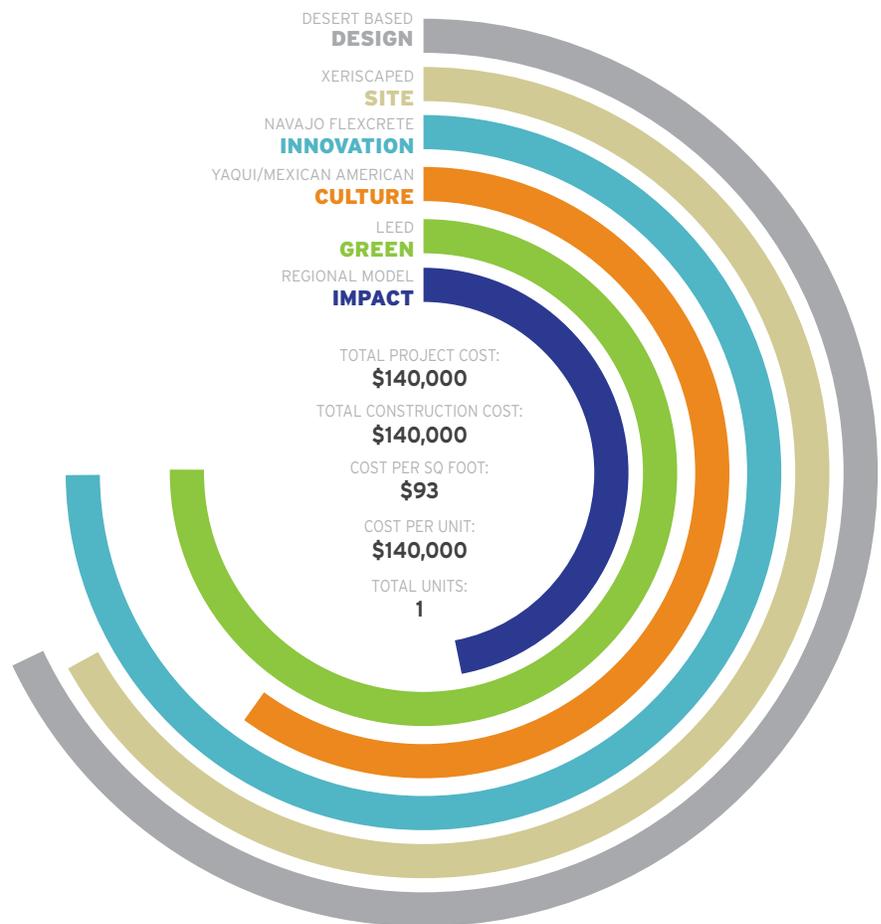


Photo: Michael Pyatok



Photo: Michael Pyatok



Single Family



Southwest

# ● ● GUADALUPE HOUSE

## CULTURE

Guadalupe is a predominantly Pascua Yaqui and Mexican-American community between Phoenix and Tempe. Its residents have preserved a degree of cultural and geographic uniqueness while participating in the economic and political structures of Phoenix's society. Many components of the home are designed to meet the standards for minimal energy usage. The outside courtyard is equipped with a shaded trellis and water fountain to keep it cool and comfortable. The courtyard additionally serves as a place for traditional large family gatherings. The carport serves as an outdoor ramada. Other cultural elements include a combined kitchen/dining/living area, making the kitchen the heart of the home. As a multigenerational household, a separate casita serves as a room for a young adult or child. On the porch there is a specially designed niche for the Virgin of Guadalupe.

## PROCESS

Public meetings were held to develop the design of the home, with the participation and support of the city council and mayor. Meetings were held in the town hall, which included design workshops and presentations/discussions of the design concepts. Educational presentations included information on regional and Yaqui traditions, design techniques, and case studies to respond to the desert climate.

## DESIGN

This home was designed as a prototype for the town of Guadalupe, its climate, and its culture. The design was developed in a "kit-of-parts" workshop process with community members and the homeowners, the Bejarano family. Several key elements came out of this process, including a courtyard-style design for cross ventilation; the creation of a large shaded outdoor space for large family gatherings; the separation of the master bedroom for the elder homeowners from the bedrooms for their adult children; the inclusion of a "casita," a small, separate guest room for visiting family members or adult children; the capacity to expand the home upward, to add additional rooms or an apartment for the expanding family; the incorporation of a carport, both for cars and as a outdoor "ramada," a shade structure to use for large family gatherings; and the centrality of the kitchen opening directly to the living/dining areas.



Drawing by ASU Star Dust

“ This project is helping us build a dream home, but in an affordable way. We love the design of our new home and look forward to living in it as a family. - Olivia Bejarano, homeowner ”

## GREEN

This Leadership in Energy and Environmental Design (LEED) for Homes Gold project focuses on utility reduction and low-maintenance core design principles, with a minimal cooling need and reducing heating. Sunlight is largely used in place of artificial lighting, and proper shading and orientation protect the home during summer months. Thick walls made of Navajo FlexCrete provide an insulation that maintains a balanced temperature within the home year round, reducing heating and cooling requirements. Rooftop solar panels donated by ASU's Photovoltaic Energy Lab are expected to provide 90 percent of the home's electrical energy needs. Other green features include a tankless water heating system, ENERGY STAR windows, and highly insulated rooftop structural panels with a non-toxic coating that reflects solar heat. The roof is also a rainwater-harvesting system that collects water for future use, with a potential savings of 5,000 gallons per year. A greywater collection system was integrated into the design for the dual-flush toilets and irrigation of the courtyard.



Photo: Michael Pyatok

Client: Apsáalooke Nation Housing Authority  
 Developer: Good Earth Lodges  
 Designers: Tom Bowen, Matthew Jelacic, Rob Pyatt  
 Design Team: University of Colorado Boulder

Engineering: University of Colorado Boulder  
 Engineering Research: Mortenson Center in Engineering for Developing Communities (MCEDC)



EARTH BLOCK HOMES

The Apsáalooke Nation Housing Authority's Good Earth Lodges project is the culmination of a research and development project funded by the Office of Indian Energy and Economic Development. It has three objectives: to determine if the raw materials needed for compressed earth blocks could be found on the Crow Indian Reservation, if the blocks could withstand Montana's extreme climate, and if a tribal workforce could be put in place to carry out the program. With technical assistance from the University of Colorado Boulder's Mortenson Center in Engineering for Developing Communities (MCEDC), the project is meeting these goals. Seven homes have been completed and six more are nearing completion.

Photo: Richard Neill

CORE PROJECT EMPHASES:



LESSONS LEARNED

- The material and human resources for developing climate-appropriate new housing exist on the Crow Indian Reservation.
- In the future the community would prefer site and unit planning based on Crow traditions, such as positioning buildings in a circle.
- Critical partnerships can help to realize local capacity.

BEST PRACTICES

- Affordable housing can both help to alleviate homelessness and provide a pathway to skills building and tribal employment.
- Passive solar orientation and design, combined with compressed earth block construction, provides excellent passive heating during harsh Montana winters.
- Each home has space for large family gatherings.

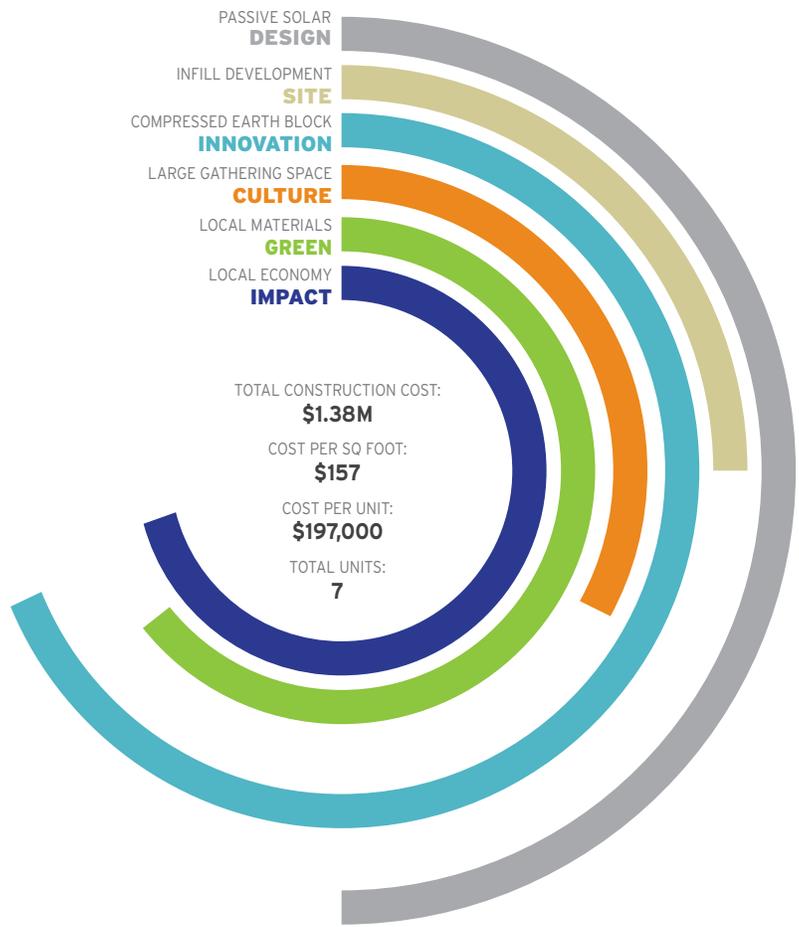


Photo: Richard Neill

Single Family

Northern Plains



## GOOD EARTH LODGES

### CONTEXT

The Apsáalooke Crow Tribe is located in south-central Montana and is the largest American Indian reservation in the state. Like many American Indian tribes, the Crow are a proud people with strong cultural traditions, but they are plagued with high unemployment, high poverty rates, and a shortage of adequate housing. Few opportunities are available for private enterprise or jobs on the reservation; this lack coincides with a lack of skilled workers. Problems are exacerbated by the reservation's extreme climate, with temperatures as low as -40°F in the winter and as high as 110°F in the summer. Many tribal members live in houses that are poorly suited to the climate, racking up extremely high utility bills, as much as \$500 per month in the winter. (From *Crow Tribe/Good Earth Lodges* by Tim Sullivan.)

### COMMUNITY

On the Crow Indian Reservation, most of the existing houses are aged stick-frame and trailer homes. Approximately 8,000 tribal members live on the Crow Reservation. In 1997, the Bureau of Indian Affairs (BIA) identified a need for 1,040 new housing units. This need has increased to approximately 1,500 units. The BIA recorded that 370 (48 percent) of the reservation's 1,130 housing units are in substandard condition. Although a large population of homeless people live on the reservation, they are mostly unseen because families take in members, which leads to overcrowding.



Photo: Richard Neill

### SITE

Seven completed homes are on scattered sites in two communities, Crow Agency and Lodge Grass. Another six homes are under construction in a new subdivision located in Crow Agency, on the western side of the community and on a high windswept plateau overlooking the Little Bighorn Valley where most of the homes are located.

“ We needed land for more housing, and started to identify property throughout the reservation based on factors like water, sewer, and infrastructure. - Michael Stewart, ANHA ”



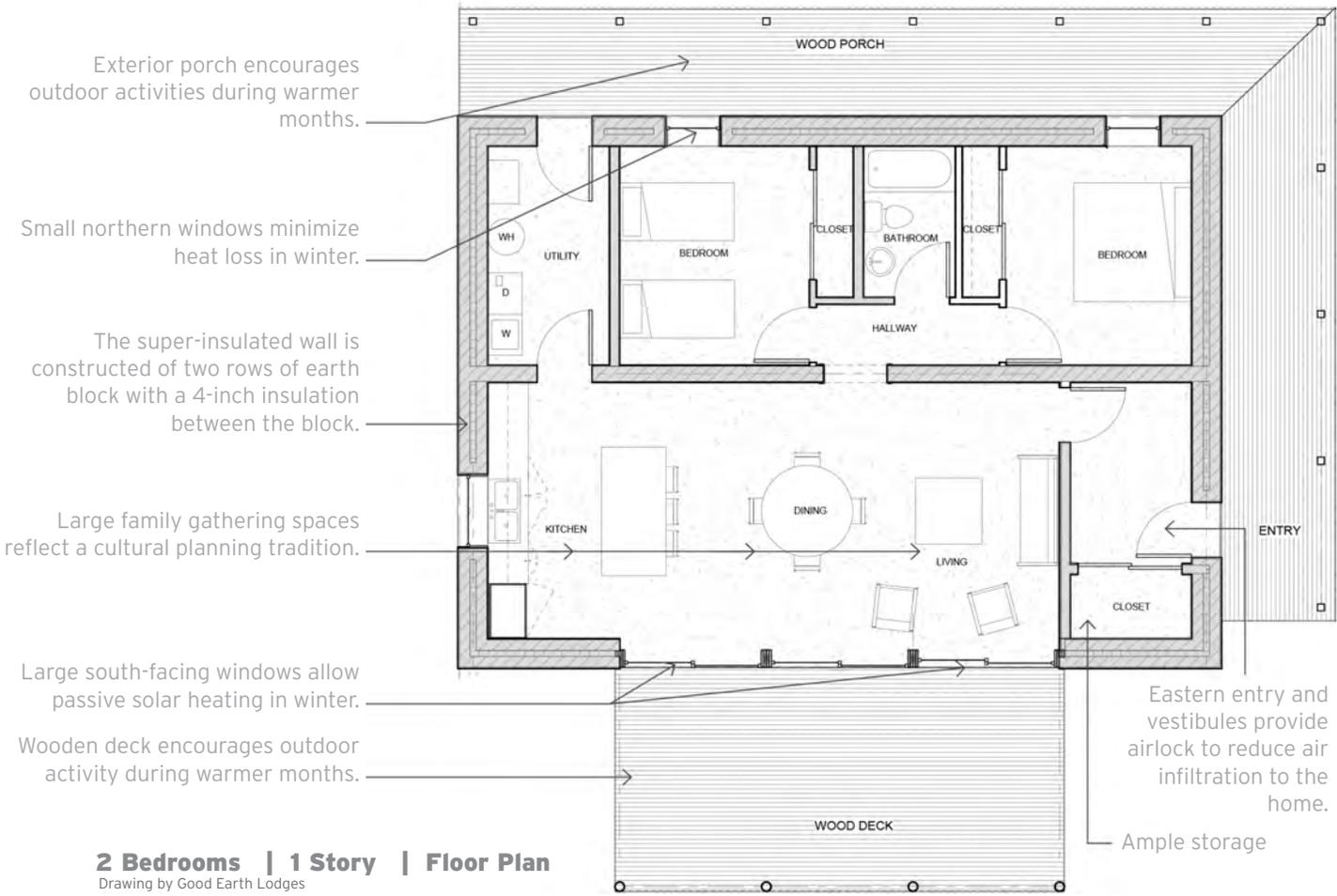
DESIGN

The single-family homes were designed with participation from community members who wanted a large, shared open space that combines kitchen, living, and dining into a single space, and a vaulted ceiling that would open up to the south, allowing the warm winter sun in and blocking the summer sun. This responds to the need for a large interior space for family gatherings and to the centrality of food in the Crow culture. Bedrooms are relatively small to maximize the large shared space and to provide space for storage. The homes are built using a double-wythe earth block construction technique. Each compressed earth block weighs 28 pounds. The walls of the houses are built with two rows of the 7-inch blocks, with the 4-inch space in between filled with insulation, creating an 18-inch total wall thickness. The roofs on the first seven homes were built using structural insulated panels. This technique was modified to trusses and spray-on insulation in later designs to reduce costs and simplify construction.

GREEN

The houses feature a passive solar design, with south-facing facades containing a trio of sliding glass doors and high windows. No windows are on the east side of the house to protect from the summer's harsh sun. The exterior shell is primarily compressed earth block construction made of locally sourced materials and labor. Vaulted ceilings provide natural light and improve ventilation through the structure. The first seven homes have ground-source heat pumps. The current designs use standard heat pumps to reduce the cost and simplify construction.

“ We would rather utilize the heat on the southern facing wall during the winter and then block that sun during the summer months. ”  
- Larry Falls Down



CULTURE

The design of the Crow Good Earth Lodges is in response to the needs of the larger, multigenerational families typical of the Crow community. The intent, however, is to build more houses to lessen the demand for housing, so that the need for more than one generation to share a single house is reduced. Multigenerational families living under one roof is not a cultural preference but a forced condition based on limited availability of housing. The large gathering space is important for large family gatherings and a relatively communal lifestyle.



# GOOD EARTH LODGES

## INNOVATION

Creating a new material and a new production process while training workers in both the production of the material and its use in construction was challenging, but there is great pride in the project and the way in which Crow resources and Crow tribal members were used to construct these homes. The external collaboration between the University of Colorado Boulder and the Apsáalooke Nation Housing Authority has been embraced by all who have participated in the projects. Involvement of the university in the project has been instrumental both in providing technical and management support and also in providing continuity, as the staffing within the housing authority has continued to change due to internal challenges and changes in government during the life of the project.

## VISION

The long-term vision in collaboration with the Division of Energy and Mineral Development is to continue to develop and enhance the tribe's ability to identify resources that enhance its economic stability. The Good Earth Lodges project starts to achieve that vision. Historically, the focus was to extract resources on tribal lands. This project, although challenging, identifies a series of solutions for issues on the Crow Reservation, such as addressing unemployment and the need for job training, addressing the critical need for housing, and identifying resources on tribal lands that can be used in construction and tribal enterprise.

“ The Crow people believe that they have three mothers. The first is the woman who gives birth to the child. The last is Mother Earth, who the people go back to when they die. And then the home, the lodge is our mother, it protects us as we are being raised, coming up in this world. ”  
- Cedric Black Eagle



Photo: Apsáalooke Nation Housing Authority



Photo: Apsáalooke Nation Housing Authority

## LESSONS LEARNED/CONCLUSION

The Good Earth Lodges project explores the potential for sovereign nations to produce their own building materials and use their own labor to create more sustainable, locally based economies. It is an excellent example of how universities can collaborate with tribal communities to develop projects that fit the needs and achieve the vision of the community. The project also provides lessons about the challenges of achieving locally produced, locally sourced, and locally built houses. Moving outside of conventional construction practices and materials presents significant challenges, but it also allows for creative solutions. It allows tribes to work outside the conventional marketplace to provide innovative products and approaches to achieve many additional benefits beyond the provision of housing.



Photo: Richard Neill

Client/Developer: Puyallup Nation Housing Authority  
 Design Architect: Daniel Glenn, AIA, NCARB  
 Architecture Firm: Environmental Works  
 Contractor: Puyallup Nation Housing Authority and Marpac

Civil Engineer:  
 Structural Engineer:  
 Landscape Architect:  
 Partner:

Haozous Engineering  
 Malsam Tsang Engineering Corporation  
 Thomas Rengstorf and Associates  
 Ecotope



CULTURAL FORM

Place of Hidden Waters represents culturally and environmentally responsive new housing for the Puyallup Tribe in the Pacific Northwest, one that achieved Leadership in Energy and Environmental Design (LEED) for Homes Platinum certification. The project is located on traditional Puyallup tribal lands on a hill overlooking the Puget Sound tidal flats. The design emulates the rectangular, shed-roofed form of a traditional Coast Salish longhouse, using a variation of the modern townhouse courtyard.

Photo: Tucker English

CORE PROJECT EMPHASES:

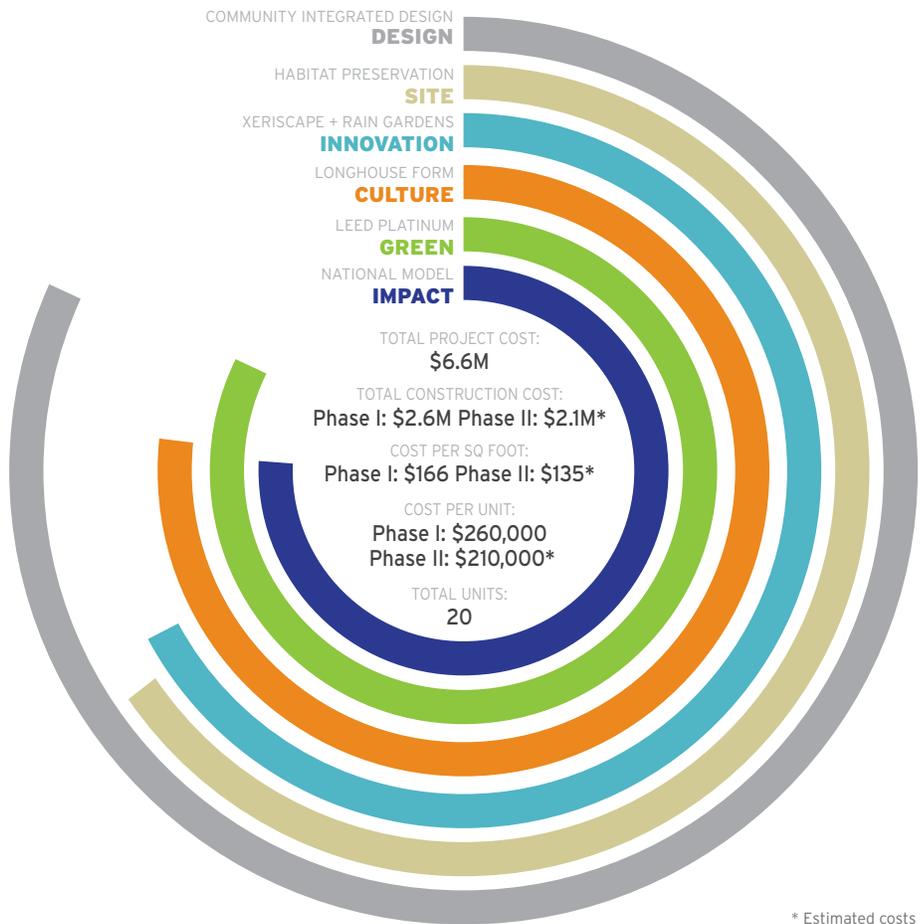


LESSONS LEARNED

- Affordable tribal housing can achieve LEED Platinum certification and be a national housing model.
- Resident and staff participation in the design process was a critical ingredient to the project's success.
- Careful study of historic precedents can provide inspiration for modern living.

BEST PRACTICES

- An integrative process was key to the design from the beginning, following the requirements for LEED for Homes.
- The vision for the project came from engagement among the housing authority, community, and architect. The project was developed through careful site evaluation, historic precedents, and green building goals.
- Consistent project leadership by housing staff allowed for continuity.



\* Estimated costs



Photo: Tucker English



Multifamily



Northwest



# PLACE OF HIDDEN WATERS

## CONTEXT

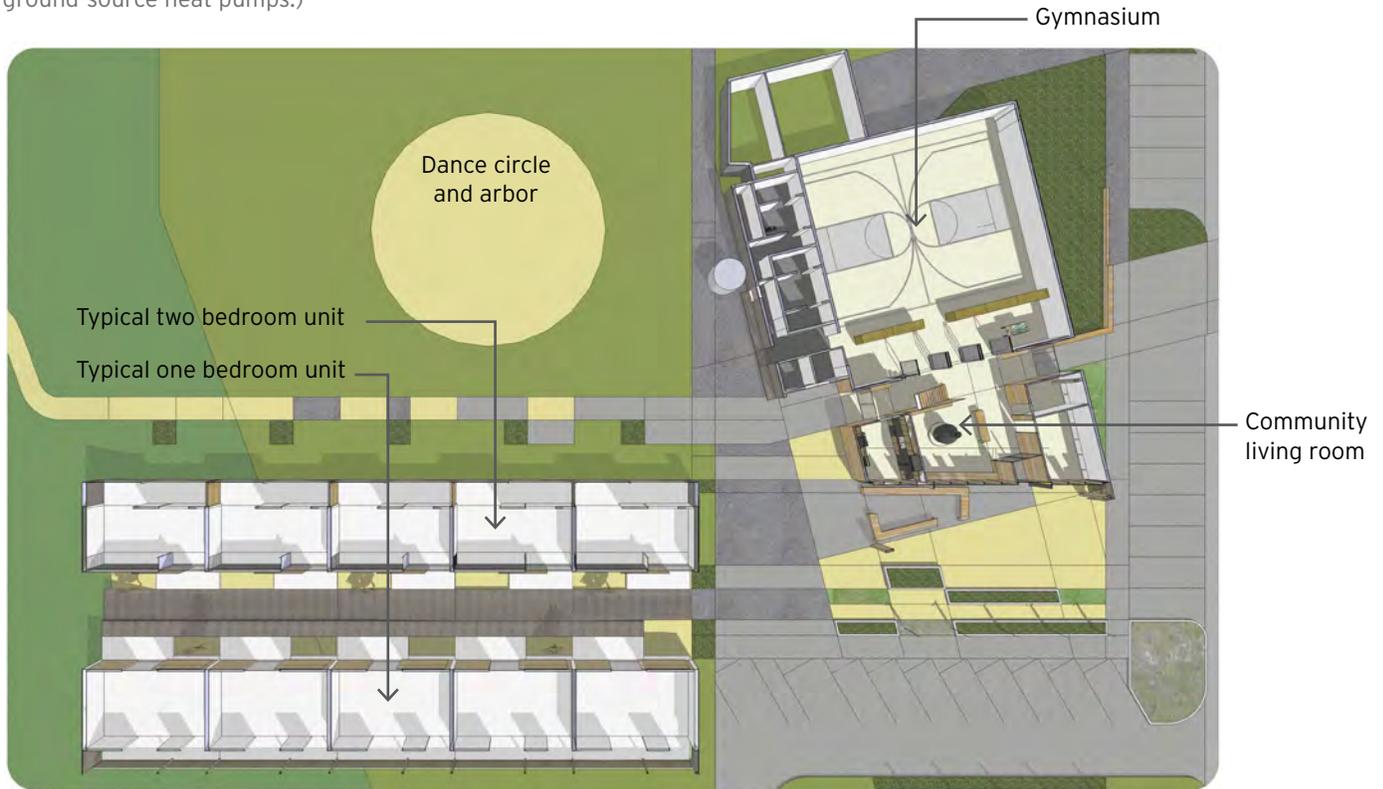
Located near the city of Tacoma, the project lies between a midcentury, single-family development and a forested habitat corridor. The site is 75 percent flat, giving way to a gently sloping, big leaf maple forest and dropping steeply toward the west into a seasonal creek called Julia's Gulch. The gulch feeds into Commencement Bay via the Hylebos Waterway, which historically is one of the most productive salmon runs in the state of Washington. It was critical that the project have no negative impact on this important habitat.

## INNOVATION

The residential buildings are sited along an east-west axis to allow for prevailing summer breezes and for passive solar heating/cooling. It was initially designed with a "solar-ready" roof design for future installment of a photovoltaic array (to be installed in phase two). This design, combined with the installation of ground-source heat pumps, is targeted to yield a zero-energy building. (Phase II does not use ground-source heat pumps.)

## DESIGN

Of the three buildings in the newly developed area, two are 10-unit townhouse clusters designed to emulate the traditional Coastal Salish "longhouse" in which multiple families shared a single long building and a shared linear gathering space. The one- and two-story townhomes face a central, partially covered courtyard, with an orientation that maximizes natural light, views, and cross ventilation in every room. On the south side are five one-story, one-bedroom homes, designed for seniors or disabled residents as fully accessible units. On the north side are two-story, two-bedroom homes for small families. The shed roof is partially open to the spaces below, adding height and daylight to the homes. The newly renovated and expanded gymnasium building is located between the two developments, with new community rooms, a kitchen, and office space. A "community living room" with a gas fireplace serves as an informal meeting space for storytelling and conversation.



**Site plan: Phase I**

Drawing: Environmental Works

## SITE

The project site is located in a wooded, suburban area adjacent to 27 units of Puyallup Nation Housing Authority (PNHA) rental townhouses built in the 1980s. The site originally included an abandoned youth home and a deteriorated gymnasium. The wooded area is sloped, overlooking the Puget Sound tidal flats, with a wildlife corridor on the lower slope, which has been redeveloped with a nature trail leading to a sweat lodge area. Rain gardens and native plants help to provide a natural setting, minimize irrigation, and protect the Puget Sound from runoff. The site amenities include a dance arbor, playground, salmon-bake pit, sweat lodge area, and walking trail.



Photo: Tucker English

Salmon-bake pit

## COMMUNITY PROCESS

Resident and staff participation in the design process was a critical ingredient in the project's success. Design workshops were held in the old gymnasium, and residents were invited to give input. Additional design meetings with maintenance and operations staff were held at the Puyallup Nation Housing Authority (PNHA) offices. Residents and staff also helped to deconstruct the abandoned youth home and clean the wooded site.

## LEED

An integrative design process was key to the design from the beginning and also met the LEED for Homes requirements. An interdisciplinary green charrette was held at the outset, which included the full design team and PNHA staff. Agreement was made to pursue a LEED for Homes Platinum certification, if it could be achieved within the budget. This early decision helped to guide the process from the beginning and brought the design team, contractors, construction manager, and staff together to achieve this goal.



Shed style frame, Lummi, Washington



Daylight from above, Chinook



Shed-style longhouse interior, Klallam Salish



Photo: Tucker English



Photo: Tucker English

## CULTURE

The housing and the community center designs emulate the traditional multifamily cedar plank longhouses of the Puyallup Tribe, a housing type common throughout Pacific Northwest Salish tribes. Multiple families were housed in linear shed- or gable-roofed structures sharing a long, central, linear gathering space with sleeping spaces on either side. This design was redefined in this project in contemporary terms as a linear courtyard, partially covered, with townhomes lining either side. The courtyard, like the longhouse, creates a shared common area and protected entry area, which is intended to encourage community interaction, provides safe play space for children, and ensures greater security for each family. Like the longhouse, Place of Hidden Waters is designed as a single, repeatable modular structure. The existing gable-roofed, cinder-block gymnasium was renovated and extended to the south, emulating the way longhouse structures were added onto for additional families. A community living room with its own fireplace, offices, kitchen, and activity rooms is housed in this two-story addition to the gym. A salmon-bake fire pit on the south-facing community front porch is used for traditional salmon bakes. A nature trail leads to a site for a sweat structure in a wooded park to the west.

# PLACE OF HIDDEN WATERS

## INNOVATION

The project was managed and built by tribal members—force-account labor crews from the Puyallup Nation Housing Authority (PNHA) combined with an experienced construction manager who developed training apprenticeships. The contract documents were divided into two separate bid packages to facilitate this training component, with the community center, gymnasium, site redevelopment, and infrastructure under one contract, and the vertical construction of the housing, built by the PTHA crews, under another contract. The housing features structural insulated panel (SIP) construction, which facilitated rapid construction and assured a very tight building envelope. Tribal workers were trained in SIP/ technology and installation. The modular design allowed for the crews to learn on the first units and speed up production on the rest of the development.



Photo: Tucker English

## VISION

The design evolved from concept through construction, integrating a community process in which the vision for the project came from engagement with the client and the community, with careful study of historic precedents and culture and with analysis of the site and its challenging opportunities.



Photo: Tucker English

“ This project is not only protecting Mother Earth, it is transforming lives. The design encourages community interaction. Our tenants are gardening, cooking, learning, praying, and living in concert together, like we have done for generations. - Annette Bryan, PNHA ”

## LESSONS LEARNED/CONCLUSION

This project provides a strong example of sustainable and culturally responsive housing. For centuries, the Coastal Salish people lived in cedar plank longhouses in the Pacific Northwest. Ideal for a rainy climate, this compact, multifamily dwelling type also reduces environmental impact. The project type also provides a highly communal environment, although there was concern that perhaps it was “too” communal for today’s tribal people, who are accustomed to a more individualized contemporary lifestyle. However, interviews with current residents demonstrated that the design has been well received by the residents. Place of Hidden Waters also proves that a tribal project can be a model for green housing nationwide, even beyond tribal housing. The project received the Project of the Year Award by LEED for Homes as well as recognition through the 2013 Social Economic Environmental Design (SEED) Awards, the 2011 Excellence in Affordable Housing Award, and locally through a Tacoma Pierce County Housing Consortium for Sustainability award.



Photo: Tucker English

Client: Ysleta del Sur Pueblo Housing Department  
Developer: Ysleta del Sur Pueblo  
Architect: CEA Group

Syndicator: Raymond James Financial, Inc  
Development Consultants: Travois, LIHTC consultant

2006  
Tax credit application



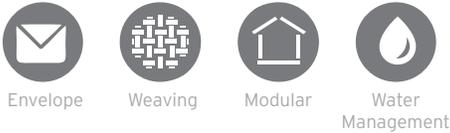
Photo: SNCC

ACCESS TO RESOURCES

Ysleta del Sur Pueblo is located within the cities of El Paso and Socorro, Texas. This Low-Income Housing Tax Credit (LIHTC) Pueblo Homes project is situated in a 66-acre master planned community called District II in Socorro. As a clustered multiuse project, this mix of single-family and multifamily homes is in a 60-unit development, with 30 duplexes and 30 single-family homes. Additional site elements include a playground/picnic area and community center/police substation. The project is the first Native American LIHTC project in Texas.

July 2008  
Tax credit awarded

CORE PROJECT EMPHASES:

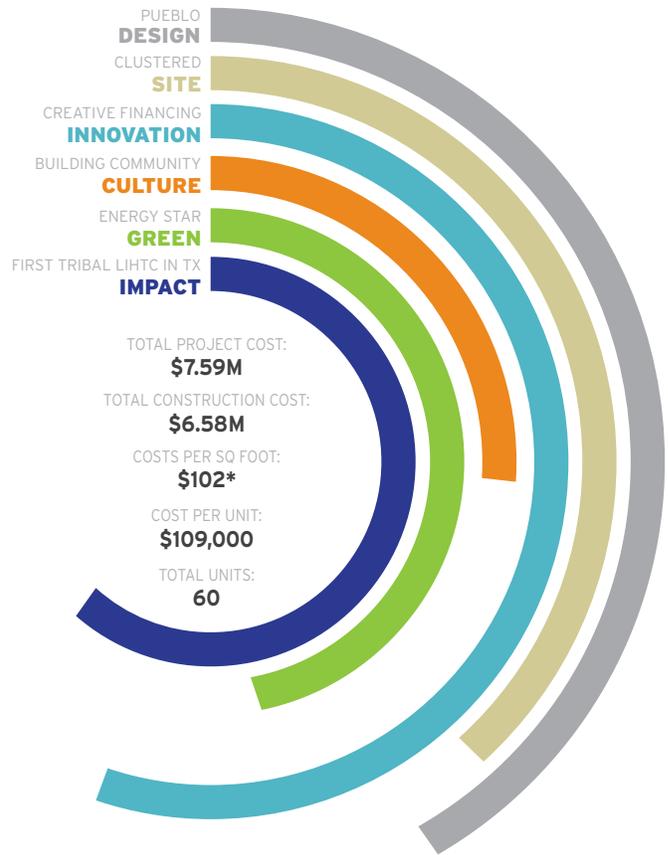


LESSONS LEARNED

- When tackling a complex tax credit project there are multiple obstacles to surmount, including understanding the application process, and structuring the project within the required scoring criteria and thresholds.
- Partnerships are critical to successful, first-time projects between a tribe and state.

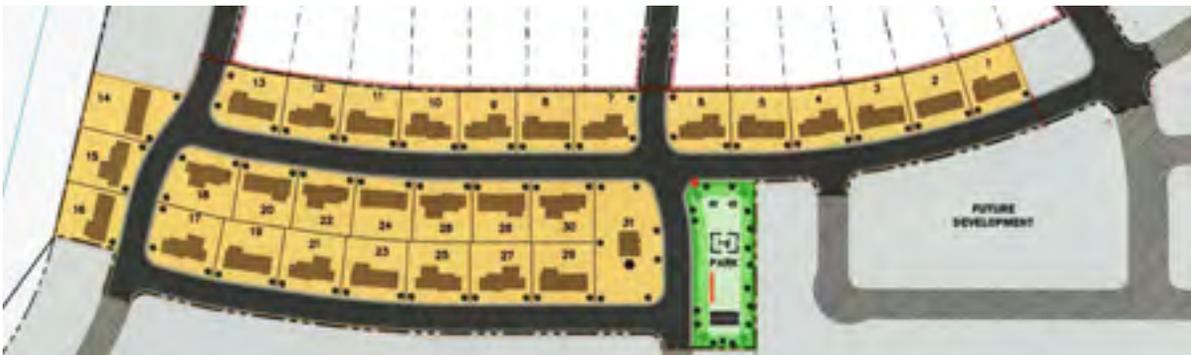
BEST PRACTICES

- Consultants were brought on early to design a master plan and to understand the market and the environmental impact.
- Though it took time, every available source of funding was used to raise the needed dollars, including leveraging loans and grants through regional, county, and state organizations.
- 100 percent of stormwater was retained on the site.



2009  
Construction starts

\*Estimated costs



FEB 2011  
Construction complete and project fully rented

# LIHTC PUEBLO HOMES

## GREEN

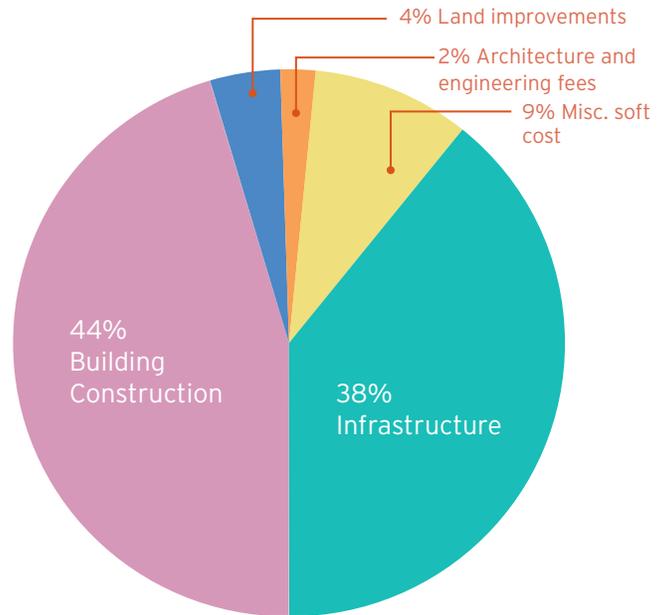
In addition to full stormwater runoff retention, structural insulated panels (SIPs) provide a continuous R-23 value for thermal resistance. Openings on the western facades are kept to a minimum to control heat gain, and all windows are equipped with double-pane low-emissivity glazing, with internal blinds for reduced thermal conductivity. Plumbing fixtures are low flow, and furnaces are ENERGY STAR rated. Native and drought-tolerant landscaping was planted, using xeriscape methods to minimize irrigation.



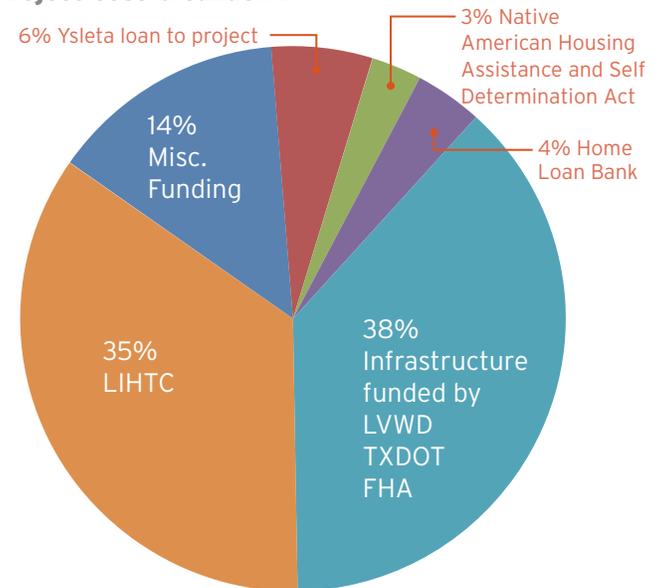
Photo: Ysleta del Sur Pueblo Housing Department

## CONTEXT

The Ysleta del Sur Pueblo is situated just north of Mexico along the Rio Grande. The primary reservation community is one mile northeast of the Zaragoza International border between the United States and Mexico. The land configuration is referred to as "checkerboard," with tribal trust land and non-tribal land pieced together with non-contiguous boundaries.



### Project cost breakdown



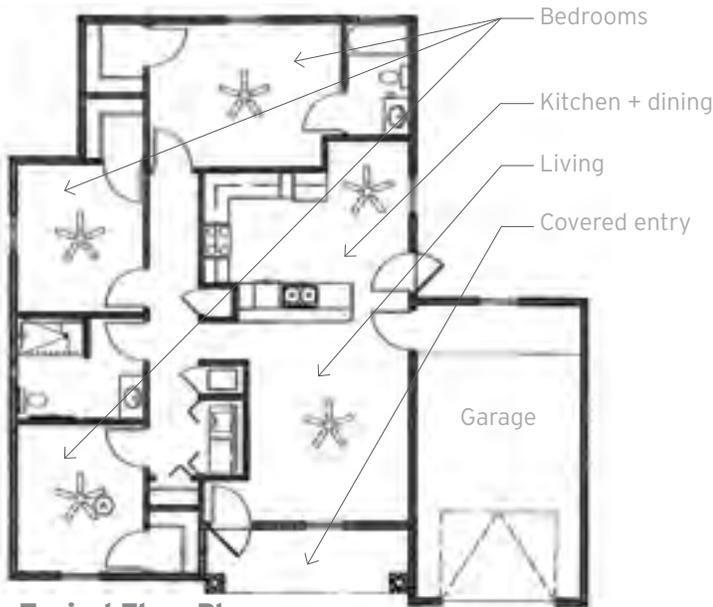
### Project funding sources

The Ysleta del Sur Pueblo Housing Department completed the first Native American Low-Income Housing Tax Credit (LIHTC) project in Texas, utilizing multiple sources of funding. This was accomplished by developing partnerships with tax credit consultants and investors who understood the project's scope and intent and who helped negotiate the multiple levels of compliance required by state funding agencies.

## INNOVATION-PARTNERS

## INNOVATION-FINANCING

The tribe partnered with local, state, and federal agencies to help fund \$6 million in infrastructure costs, such as a lift station that was partly funded by the Lower Valley Water District (LVWD), traffic lights that were funded by the Texas Department of Transportation (TXDOT), and roads that were partially funded by the Federal Highway Administration (FHA).



### Typical Floor Plan

Drawing: Ysleta del Sur Pueblo Housing Department



Client: Ohkay Owingeh  
 Developer: Ohkay Owingeh Housing Authority  
 Architect: Atkin Olshin Scade Architects  
 Contractor: Avanyu General Contracting, Inc.

Development Consultant: Concept Consulting Group  
 Partners: HUD Office of Native American Program, Chamiza Foundation, National Park Service, NM Mortgage Finance Authority, NM Historic Preservation Division, McCune Charitable Foundation, National Trust for Historic Preservation

2006 Preservation education program  
 2007 Oral histories + mapping  
 2008 Preservation plan + MOU  
 2010 Phase I begins construction  
 20 homes Phase I and Phase II  
 JULY 2013 Phase I-III complete  
 29 homes



TRIBAL PRESERVATION

Owe'neh Bupingeh, the traditional name for the Ohkay Owingeh village center, is believed to have been occupied for at least 700 years. Owe'neh Bupingeh is composed of four plazas, surrounded in the past by several hundred homes. Sixty of the homes remain, most of which had been abandoned by 2005 due to deterioration. This multiphased project balances rehabilitation with functional renovations of the homes, permitting contemporary life and cultural traditions to comfortably coexist and allowing families to return to the sacred core of the Pueblo. Approximately half of the construction crew were tribal members.

Photo: Kate Russell

CORE PROJECT EMPHASES:

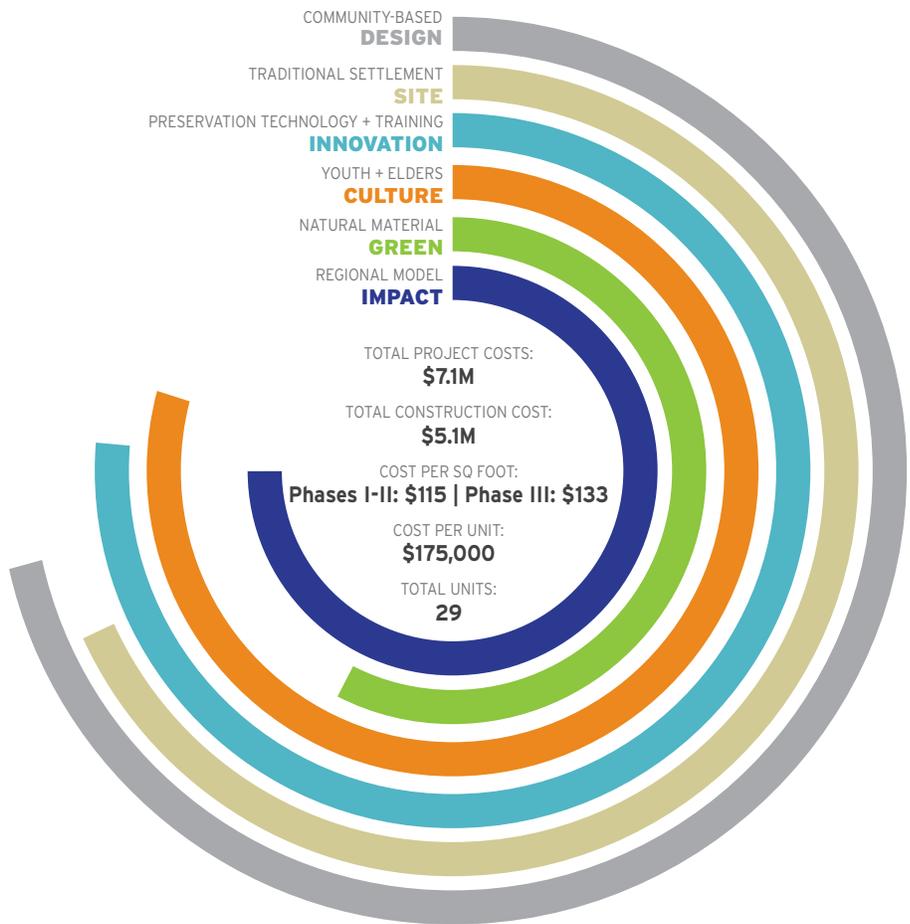


LESSONS LEARNED

- Involving many different community groups, including elders and youth, can provide a strong first step to define the vision and gain support.
- Developing partnerships with state and federal agencies can help define new pathways toward compliance and build enthusiasm.

BEST PRACTICES

- A strong preservation technology component combined with training and employment led to almost 50 percent employment by tribal members.
- Understanding the cultural resources philosophy of tribal leaders helped identify an alternative pathway to Section 106 (Historic Preservation) compliance.
- Being prepared through long-term planning can lead to "shovel-ready" funding to kick-start a project.



Multifamily



South West

Drawing: Atkin Olshin Shade Architects



# OWE'NEH BUPINGEH

## CONTEXT

In the past, the connected house blocks of this traditional village supported a social structure that knitted the families and clans together. Although U.S. Department of Housing and Urban Development (HUD) developments of the 1970s consist of suburban, single-family homes built at the outskirts of the pueblo and served a need for new housing at the time, they also contributed, with other societal changes, to a devastating decline in the language and lifeways of the people. The rehabilitation of Owe'neh Bupingeh is one strand of a broad tribal effort to rebuild the cultural traditions of the tribe by bringing families back to the historic and cultural core of the Pueblo.

## SITE

Owe'neh Bupingeh is the historic center of Ohkay Owingeh. Four traditional plazas are surrounded by 60 extant homes and at least 20 lots on which homes previously stood. Compared with the later Spanish plazas and American squares, which are landscaped, furnished, and ornamented, the traditional earthen pueblo plazas are very sparse. Yet Owe'neh Bupingeh is the setting for ritual observances and is the tribe's spiritual center. Several times a year, the plazas are filled with people. This project marks the start of a long process by which the traditional use and character of the historic Pueblo core will be restored through the form and appearance of the dwellings.



## CULTURE

The project began with tribal youth who were taught to document and research the existing buildings and perform research. Elders contributed recollections of buildings no longer present and stories of their lives on the plazas. Dozens of community meetings were held to gain feedback, and the preservation plan was developed through extensive discussions with the Tribal Council and a newly formed Cultural Advisory Team. The rehabilitation principles that evolved are sometimes in conflict with federal preservation standards. However, these principles are based on Ohkay Owingeh community and cultural values, and are being implemented by construction crew members and homeowners from the tribe who, through learning traditional methods of construction, ensure that the project is culturally appropriate.



Photo: Atkin Olshin Shade Architects

## GREEN

As a preservation project, Owe'neh Bupingeh is inherently sustainable. The entire project team (tribe, architect, and contractor) was committed to retaining as much of each existing building as possible. Constructed by their ancestors, the earthen walls contain the breath and sweat of the Ohkay Owingeh people. Where adobe walls were no longer structurally sound, they were taken down and ground up as the main ingredient of the new earthen plaster. In the initial phases, green design features include highly insulated roofs, insulated windows, and ENERGY STAR appliances. Phase III meets Enterprise Green Communities standards; however, it was determined that getting a HERS rating separately for each individual home would be cost prohibitive.

DESIGN

The design of the project is rooted in, but not restrained by, the past. The existing condition of the homes in 2005 was disappointing to tribal members. Owe'neh Bupingeh still functioned as the traditional center of the tribe, but appearances were marred by extensive deterioration and by the introduction of inappropriate modern details (doors, windows, gutters, cement plaster, etc.). An analysis of more than 400 historic photos was completed, with a clear understanding that only the last 140 years of this 700-year-old place had been documented. Great changes were observed in the photos found, and while it was necessary to understand the changes during the last 150 years, a strict restoration was neither possible nor desirable. The earliest images show the pueblo at its greatest density, with the dwellings, before doors were installed, still accessed via roof hatches. These historic photos provided the tribe with the ability to determine an authentic vocabulary, distinct from other pueblos and the pueblo revival style.



Photo: John Gaw Meen Collection



Photo: Atkin Olshin Shade Architects

INNOVATION

Ohkay Owingeh developed a comprehensive preservation plan to guide practical housing improvements according to cultural values. Planning costs were funded through traditional preservation sources, with construction funded primarily through various HUD programs, requiring a fine balance between regulatory standards in addition to the tribe's own perspectives. The project is rooted in the preservation philosophy of Ohkay Owingeh tribal leaders, which values the life of the Pueblo and inhabitation over material conservation. The preservation technology is highly innovative, utilizing many years of material sciences field research by specialists in adobe construction. For example, the repair and reconstruction of damaged *vigas* (round timber beams) included boring dowels into the viga and splicing on new extensions, in order to save as much of the existing material as possible. This was an important cultural factor, as many of the *vigas* were "gifted" from one family to another, with initials still visible.

CULTURE

Federal funding required meeting the Secretary of the Interior's Standards for the Treatment of Historic Places (Section 106). These standards are based on the notion that historic places have a "period of significance" that should guide preservation treatment. However, to Ohkay Owingeh, the present and the future are just as significant as the past, and "preservation" means sustaining an entire way of being, not just buildings. The federal standard needed to be reinterpreted in ways that afforded a meaningful discussion and prioritized local needs. Although the preservation philosophy developed by the tribe sometimes challenges federal preservation standards, these self-determined principles are culturally sustainable. Rather than return to a specific appearance from the past, the tribe has developed a process for balancing traditional building elements with contemporary amenities.

PROCESS

Community participation is the foundation of the project. Throughout the process, the project team worked with elders, cultural leaders, residents, and youth in defining their goals and vision. Construction and homeowner training was a high priority, resulting in 43 percent of the construction crew being from Ohkay Owingeh.



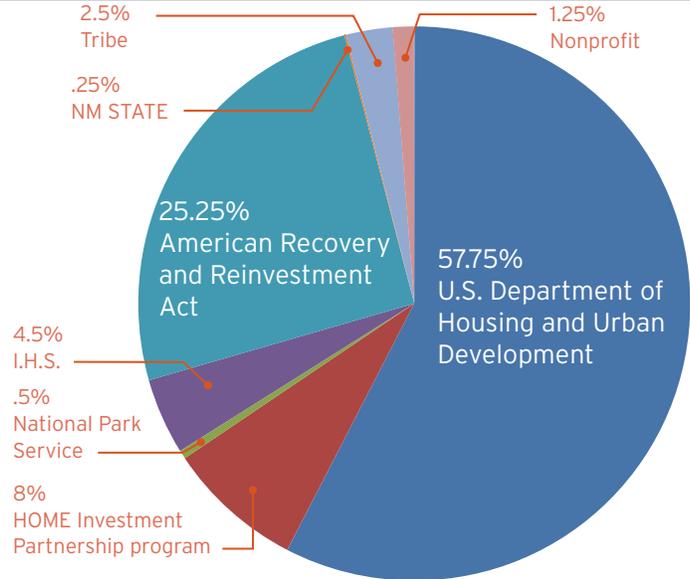
Photo: Avanyu, LLC



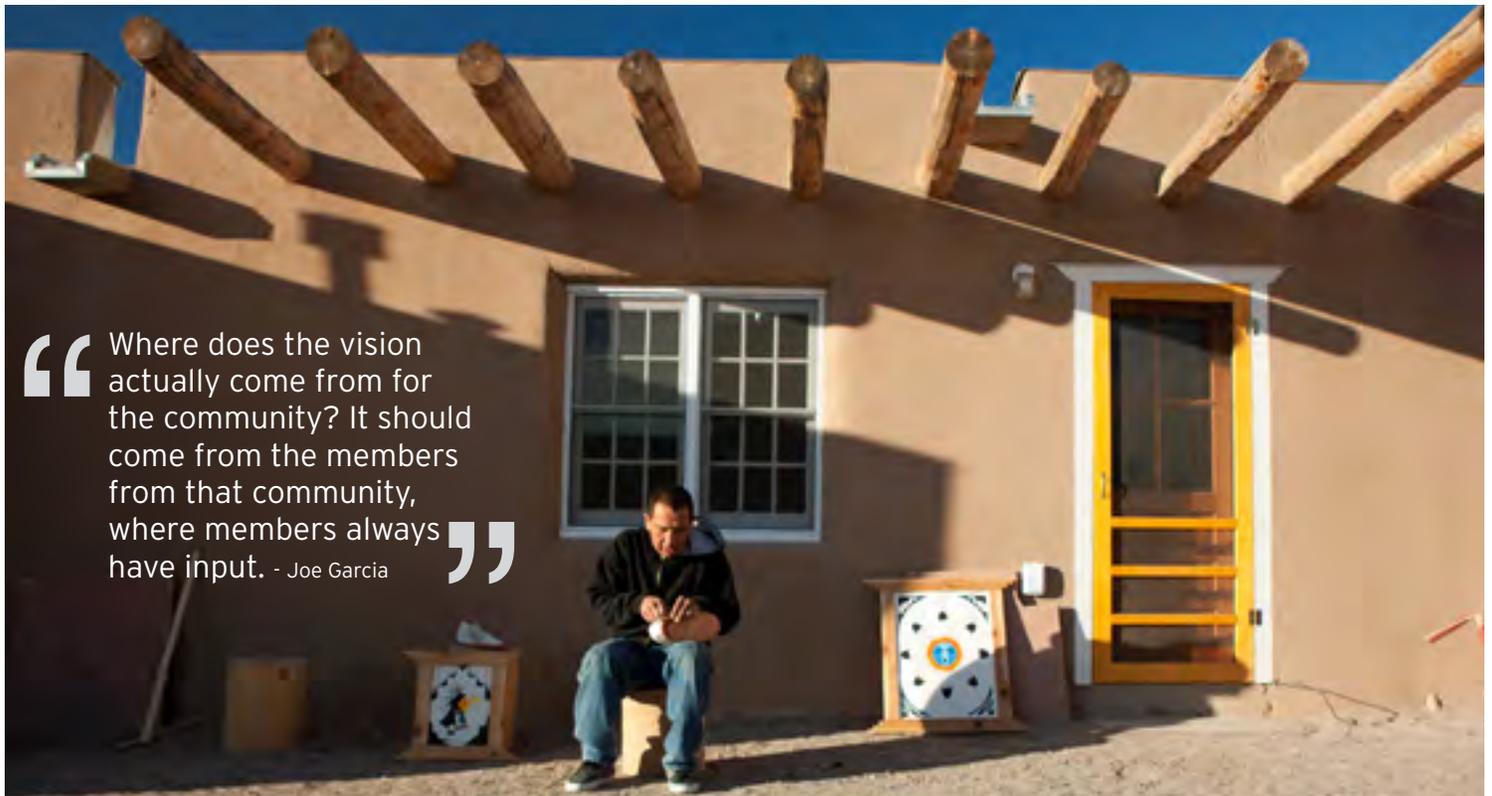
# OWE'NEH BUPINGEH

## VISION

This project has its roots in two previous projects at Ohkay Owingeh. Tsigo Bugeh Village is a 40-unit rental development completed in 2003 and financed with low-income housing tax credits (LIHTCs). It was the first modern project at the pueblo to incorporate substantial community participation, including storytelling about life in the plaza area. Immediately following was a comprehensive master plan in 2004, which won a Smart Growth Award for Small Communities and was also developed with community input. The success of these projects helped to develop capacity to rehabilitate the historic core. It also brought the community and cultural leaders to the table with the Ohkay Owingeh Housing Authority (OOHA) to realize their collective vision to bring elders and families back to live in the historic core.



Project funding sources



“ Where does the vision actually come from for the community? It should come from the members from that community, where members always have input. - Joe Garcia ”

Photo: Kate Russell

## LESSONS LEARNED/CONCLUSION

A significant portion of the funding for the next phase of rehabilitation has been secured and the qualification process has begun. Funding thus far has been limited to low-income families, leaving many families just above low-income thresholds out of the project. OOHA established Cha Piyeh, Inc., a community development finance institution (CDFI), to provide low-interest loans to families who do not income-qualify and have no other means of participating in the project. Parcels of land on the plazas that have long been vacant have had ownership confirmed, and future phases of the project will include new construction on these sites to fill in the gaps between house blocks. Many of the other Pueblo tribes have come to visit Owe'neh Bupingeh and meet with the project team. Other groups, including the World Monuments Fund, the Getty Conservation Institute, and a delegation from Morocco, have visited to learn how culturally appropriate housing can help rebuild the strength of a community.



Dancers, photo: Guy Ambrosino

Client: Navajo elders and tribal members  
 Developer/Builder: Indigenous Community Enterprises  
 Architect: Nathaniel Corum  
 Builders: Western Strawbale Builders, Matt Robinson, Jaime Ballesteros

Project Engineers: Bill Druc, P.E.; Art Fust, P.E.  
 Project Partners: Navajo Housing Authority, Navajo Tribal Utility Authority, U.S. Department of Agriculture Rural Development, Arizona Department of Commerce, Architecture for Humanity



OFF-GRID TRADITION

Indigenous Community Enterprises (ICE), one of the first green builders for the Navajo Housing Authority, providing culturally appropriate housing for low-income Navajo tribal members. The Elder Hooghan Homes initiative worked directly with Navajo elders who helped design floor plans that would support traditional lifeways while being efficient and low-impact. On off-grid sites, the homes often make use of traditional design knowledge, local skills, and materials from the Navajo Nation, including straw bales from Navajo Agricultural Products Industries (NAPI) and timber from tribal forests.

Photo: Harry Connoly

CORE PROJECT EMPHASES:

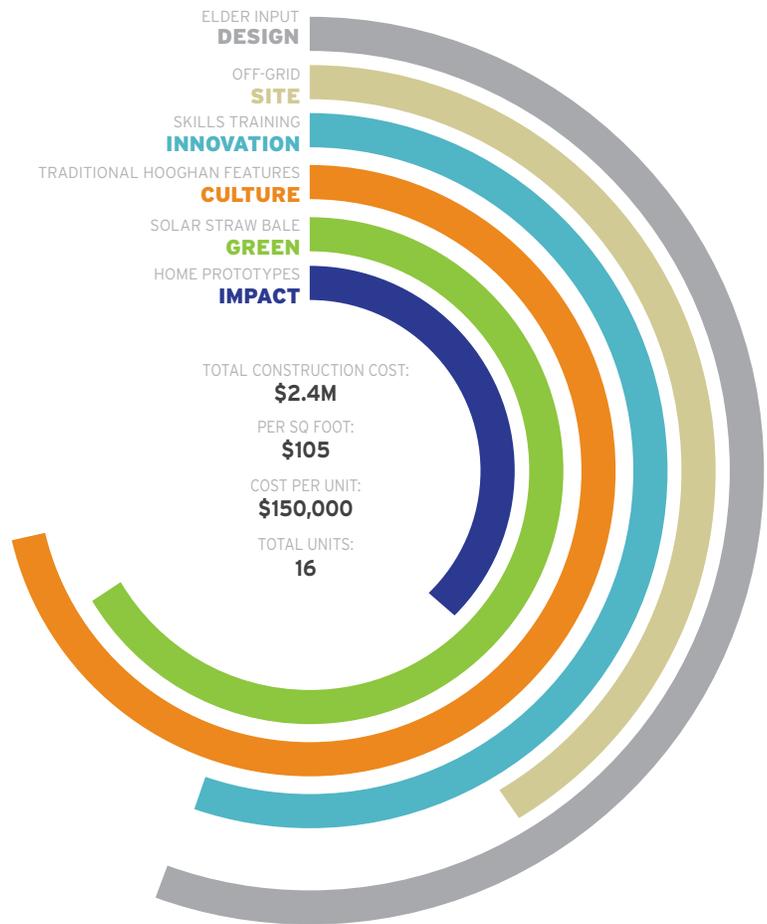


LESSONS LEARNED

- Good building envelopes reduce heating costs, which is extremely important in rural, off-grid homes.
- Low-tech alternative building materials can provide needed job skills to a community.
- New materials can be used to construct traditional housing types.

BEST PRACTICES

- The project benefited many communities by introducing Navajo workers to green building skills.
- Unique elder-approved designs included traditional hooghan designs built with new materials.
- Off-grid systems enable elders to live in their traditional lands, often far from paved roads and power lines.



Single Family



Southwest

Photo: Harry Connoly

2006 Community design  
 2007 Construction starts  
 2010 Substantial completion  
 2011 Occupied

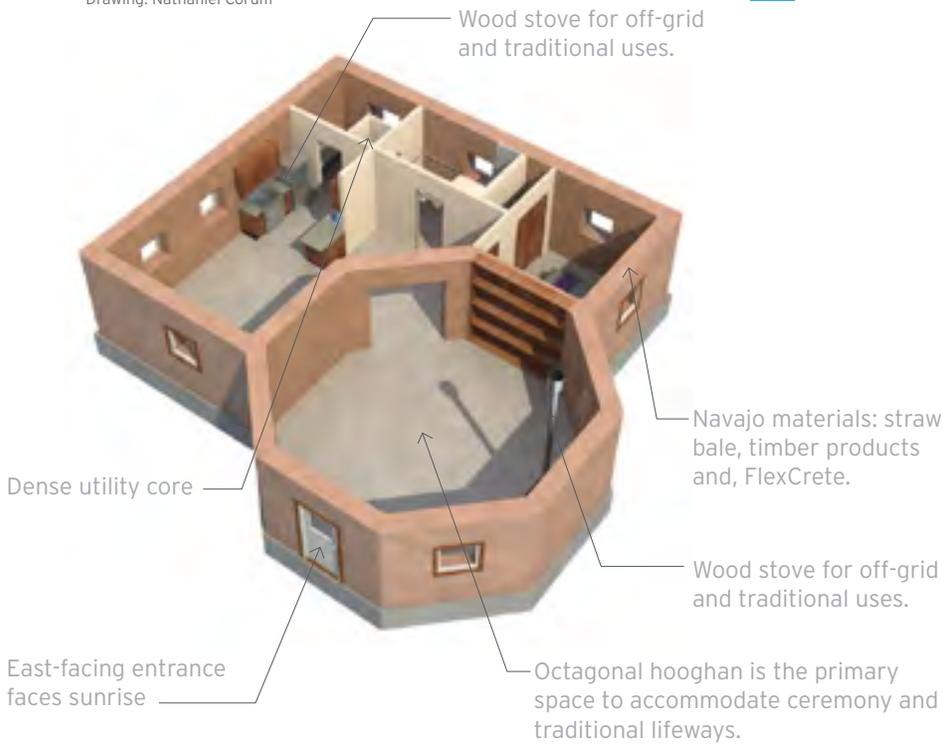
# ELDER HOOGHAN HOMES

## DESIGN

Indigenous Community Enterprises (ICE) expressed an interest in designing a straw bale home with a culturally relevant design. To this end and with technical assistance from the Enterprise Rose Architectural Fellowship to explore the possibilities of traditional forms built of Flex-Crete (a Navajo-owned, lightweight, energy-efficient tribal building material) and with straw bales sourced from NAPI and SIPs systems. Several rounds of workshops with future homeowners and elders were held to determine floor plan variations and how to integrate hooghan forms with other rooms and features. Three dimensional models were used so that elders could move walls and comment on their likes/dislikes among design options.

### Passive solar design | 1 bedroom | 1 story

Drawing: Nathaniel Corum



## CULTURE

The designs and materials support traditional life in several ways. It was clear that an east entry and approach to the hooghan was important for cultural reasons. Additionally, the octagonal primary space on the interior supports ceremonial use while providing a traditional space for gatherings and ceremonies that reference the four directions. A wood burning stove has traditional as well as practical uses.

## INNOVATION

This initiative represents a prime example of tribally staffed nonprofits producing culturally appropriate green home ownership opportunities. The Navajo hooghan, a traditional place-form, was designed and built with elder input and tribal workforce, with local and natural materials for the benefit of tribal families who wished to live in a more traditional manner. These traditional Diné hooghan plans utilized the off-grid systems, enabling elders to live in their traditional lands, even far from paved roads and power lines.

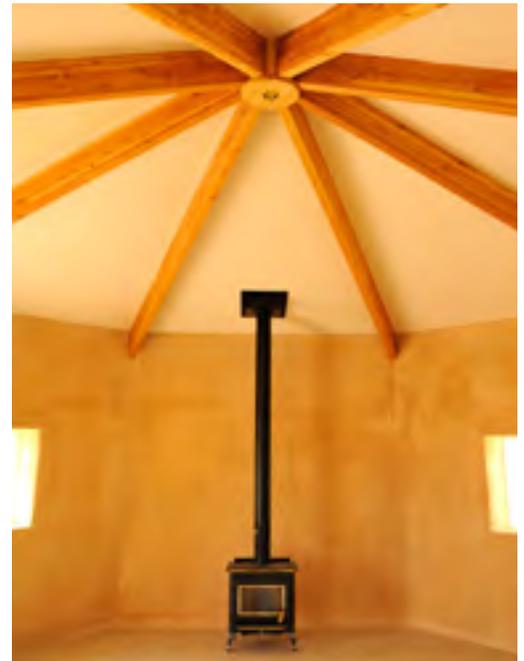


Photo: Harry Connolly

## GREEN

This Elder Hooghan Homes initiative features passive solar design, natural materials, day-lighting and efficient systems. In addition to solar-generated electricity, these off-grid homes use a cistern water system designed for native houses that are too remote to hook up to a community water system. Homes feature green and culturally appropriate features while focusing on efficiency, cost-effectiveness and ease of construction and maintenance. Tribal-member crews were trained in the "tilt-wall" erection process. Straw bale is a local, renewable, non-toxic and carbon-sequestering material. Stained concrete floors avoid many interior pollution issues. Other green features include: solar PV and/or hot water, post-consumer attic insulation (newspaper), rainwater harvesting, efficient fixtures and appliances, local wood and low/no VOC paints and stains, and structural insulated panel (SIP) systems.



Photo: Nathaniel Corum

# How does green building help achieve affordable, healthy housing?



## GREEN

The case studies profiled here are composed of many shades of green. Some, such as Puyallup Place of Hidden Waters, Devine Legacy, Kumuhau Subdivision, and Penobscot LEED Homes, sought Leadership in Energy and Environmental Design (LEED) certification to verify the green performance of their buildings. Others used the Enterprise Green Communities Criteria, developed specifically for affordable housing. All the projects exhibit comprehensive approaches to green building—looking at project location, site design, water conservation, energy efficiency, appropriate materials, healthy indoor air quality, and long-term operations and maintenance. In most cases, cultural and economic sustainability was as high a priority as environmental sustainability. Tribal enterprise and employment are crucial to economic sustainability, and many projects incorporated new materials such as Navajo FlexCrete, earth, straw, and structural insulated panels (SIPs). Coeur d'Alene and Northern Cheyenne feature super-insulated straw bale wall systems. Passive solar design strategies are found to be cost effective. The Mescalero Apache and the Apsáalooke (Crow) Tribe projects both optimize site orientation and design to allow for passive solar and ventilation to reduce heat load in the winter months and provide protection and airflow during hot summer months. Indoor air quality is critical to protect residents' health and can be incorporated with little additional cost. The project team for Kumuhau Subdivision worked to modify the Airscape whole house fan specifically for its project, to produce a quieter ventilation system called the Kohila fan. Many homes were built to be ready for renewable energy connections in the future. Penobscot, Kumuhau, Passamaquoddy, and Pinoleville Pomo all installed photovoltaic panels, and Puyallup installed ground source heat recovery. The Pinoleville Pomo Nation developed a tribal green building code as part of its two prototype homes project, which will positively affect future development.

# How do our actions impact future generations?



Future Generations



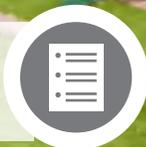
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Health



Tribal Codes



IMPACT

These exemplary projects serve to inspire and educate others even outside of the tribal housing sphere. Several, such as the Place of Hidden Waters, Devine Legacy, and Owe'neh Bupingeh have acted as catalysts for community revitalization projects. Many are considered national and regional models. For instance, both Place of Hidden Waters and Ohkay Owingeh received the international SEED award, and have received national awards for exemplary green design and planning. The Navajo Housing Authority Sustainable Master Planning Manual may have the most potential for influencing change, with a goal to lay out a framework for sustainable planning and development for 34,000 housing units. Each project involved many partnerships, and many projects are increasing their impact by connecting housing to long-term planning and other tribal initiatives. For instance, many have incorporated training and tribal employment, which not only helps address the challenge of economic development but also acts to maximize the investment by keeping dollars local. The Owe'neh Bupingeh Rehabilitation Project was possible because the housing authority and the community already had experience with community engagement processes and a master plan that addressed land use and smart growth. The 60-unit Ysleta del Sur LIHTC Homes project and the 65-unit Devine Legacy project, the two largest projects, will positively affect many families in need of housing. Each project is a game changer: Ysleta del Sur LIHTC Pueblo Homes is the first tribal tax credit project in Texas, and Devine Legacy is the first mixed-income, transit-oriented development along the Phoenix Metro light-rail line. Similarly, the Kumuhau Subdivision, by providing 45 LEED Gold Homes, has proven that houses appropriately designed for climate can be competitive in the marketplace while providing significant utility savings for homeowners. The projects with the most impact are typically those that leverage most or all of these best practices simultaneously: thoughtful design and site planning, green building, innovative approaches, cultural and community engagement, and consideration for the generations to come.

## Jamie Blosser

AIA, LEED AP, Founder, Sustainable Native Communities Collaborative  
Associate, Atkin Olshin Schade Architects

Jamie Blosser, AIA, LEED AP, is the founder of the Sustainable Native Communities Collaborative (SNCC), and is an associate at Atkin Olshin Schade Architects in Santa Fe, New Mexico. From 2000 to 2003, Jamie was an Enterprise Rose Architectural Fellow at the Ohkay Owingeh Housing Authority. Jamie has facilitated trainings throughout the country on the importance of cultural and environmental sustainability, including recent work with Public Interest Design Institutes around the country, and at Rocky Boy's Indian Reservation in Montana, Spirit Lake Nation in North Dakota, Fond du Lac Band and White Earth Nation in Minnesota, and Red Cliff Band in Wisconsin. Her work has been featured in *Architectural Record*, *Indian Country Today*, *Progressive Planning*, and will be included in *New Architecture on Indigenous Land*, a new book on contemporary Native American architecture. She has led the Case Studies 2013 project, researching and showcasing exemplary Native American housing nationwide. Jamie served on the Enterprise Green Communities technical advisory group for the 2011 Criteria, helping to develop a new tribal and rural pathway for compliance. She also has served in a number of volunteer capacities, including project reviewer for SEED certification through Design Corps, an advisory group member of the AIA Housing Knowledge Community, and a board member for the Housing Trust of Santa Fe. Jamie graduated with a Master of Architecture from the University of Pennsylvania.

## Nathaniel Corum

Architect, Head of Education Outreach  
Architecture for Humanity

Nathaniel Corum is an Architect and Head of Education Outreach with Architecture for Humanity (AfH). Nathaniel has worked with Indigenous Community Enterprises, Red Feather, and AfH on housing and community initiatives and to develop and research appropriate building prototypes and materials. His work has been featured in *Architecture*, *Dwell*, *Wired* and the *New York Times*. As a Senior Energy and Climate Partnership of the Americas (ECPA) Fellow, Nathaniel researches culturally appropriate development and regenerative land use. He is an integral member of the SNCC, most recently helping to provide outreach, site visits, research, and writing on exemplary Native American housing nationwide. Nathaniel runs the AfH Pac Rim Studio, involving students of architecture in regions stretching from California to Asia to develop holistic, sustainable design solutions that respond to global design challenges. He is the recipient of an Enterprise Rose Architectural Fellowship and is the author of *Building a Straw Bale House* from Princeton Architectural Press. Nathaniel holds an undergraduate degree from Stanford University. His Master of Architecture from the University of Texas at Austin culminated in a Fulbright Scholarship to study architectural preservation and urban poverty issues in North Africa.

## Daniel J. Glenn

AIA, NCARB  
Principal, 7 Directions Architects/Planners

Daniel Glenn is an architect from the Crow Nation and the principal of 7 Directions Architects, an Indian-owned design and planning firm based in Seattle. Daniel's design work has received national and regional recognition, including the Little Big Horn College Campus in Crow Agency, Montana; being featured in the documentary film, *Aboriginal Architecture: Living Architecture*; and the University of Montana's Payne Family Native American Center in Missoula, Montana, featured in *Indian Country Today Magazine*. He is on the Board of Directors of Navajo FlexCrete Building Systems, a subsidiary of the Navajo Housing Authority, and is a regularly invited speaker at professional and academic conferences, including HUD Office of Native American Program events across the country. An MIT-trained specialist in the design of green affordable housing, Daniel was the founding design director of the Arizona State University Stardust Center for Affordable Homes and the Family in Phoenix and executive director of Environmental Works Community Design Center in Seattle. He has taught architectural design at Arizona State University, the University of Washington, Montana State University, and the Boston Architectural Center. His work will be included in *New Architecture on Indigenous Land*, a new book on contemporary Native American architecture.

## Russell D. Kaney

Director of Programs, Rural and Native American Initiative  
Enterprise Community Partners

Russ Kaney is director of programs for the Enterprise Rural and Native American Initiative. Russ manages key developer relationships across the country on behalf of the organization. Formerly a senior project manager for the Enterprise Community Investment syndication unit, Russ was deeply involved with transactions involving the low-income housing tax credit. Prior to joining Enterprise, Russ was an underwriter and low-income housing tax credit allocator for the Wisconsin Housing and Economic Development Authority (WHEDA). Russ also worked for an agency of the United States Department of Agriculture (USDA) as an underwriter and asset manager. While there, he assisted with the massive effort to reconstruct the devastated housing areas of south Florida following the destruction left by Hurricane Andrew in 1992. Over the past 5 years, Russ has provided direct training and technical assistance to tribal housing organizations nationally, emphasizing the sourcing of capital and creation of housing units. Russ was a key partner in the Enterprise partnership with the American Indian Supportive Housing Initiative (AISHI). Russ is a graduate of the University of Wisconsin-Madison and has continued his real estate education at the University of Illinois and the University of Maryland. He also served as a U.S. Action/Peace Corps volunteer in South America.

## Joseph Kunkel

Enterprise Rose Architectural Fellow  
Santo Domingo Tribal Housing Authority (THA)/Sustainable Native Communities Collaborative

Joseph Kunkel is an Enterprise Rose Architectural Fellow currently working directly with the Sustainable Native Communities Collaborative (SNCC), and the Santo Domingo Tribal Housing Authority. His most recent focus with SNCC has been to help research and showcase exemplary Native American housing nationwide, and to build and develop emerging best practices. His professional career has centered on community-based educational design. His work ranges from material research and fabrication to community-based design and planning. Prior to the Rose Fellowship, Joseph co-led the design of two public First Nations schools in Regina, Saskatchewan, and White Horse, Yukon Territory. There, Joseph helped facilitate an integrated collaborative process where students, teachers, parents, and elders worked together to create an environment designed around culturally appropriate learning. Joseph has taught, lectured, and presented on the topics of land, culture, and place. His current work in southeast Montana on the Northern Cheyenne Reservation, where he is an enrolled member, focuses on the need for culturally relevant sustainable housing. This has led to the creation of the *HabLab* ([hablab.org](http://hablab.org)), partially funded by *Nike*, which ties sports and wellness to education and cultural heritage. This August, HabLab will hold its third annual basketball clinic, a week-long sports and education curriculum, at Northern Cheyenne. Joseph is also working on a cultural district plan at Santo Domingo Tribe, funded by a National Endowments for the Arts (NEA) Our Town grant. Joseph received his Master of Architecture from the University of Maryland.

## Ed Rosenthal

Vice President, Rural and Native American Initiative  
Enterprise Community Partner

Ed Rosenthal is vice president of the Enterprise Rural and Native American Initiative. Since 2008, he has directed all of Enterprise's rural housing development activities nationwide, with a focus on Native American and farmworker housing issues as well as rural multifamily and single-family housing preservation. Enterprise has developed more than 15,000 affordable homes in rural communities across the country with an investment of more than \$800 million dollars. Previously, Ed served as director of Enterprise's New Mexico office, where he provided a variety of financial and technical assistance tools to community development and local government organizations. Enterprise's New Mexico-based partners have created more than 1,500 affordable homes, many incorporating green building and planning concepts, and many specifically designed to address regional inequities in access to decent housing. Ed received his law degree from Catholic University in Washington, D.C., where he helped numerous tenant organizations convert their apartment buildings into affordable housing cooperatives.

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[www.huduser.org](http://www.huduser.org)

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Enterprise Green Communities

#### Rural and Native American Initiative [www.enterprisecommunity.org](http://www.enterprisecommunity.org)

Through its Enterprise Native American Program, Enterprise works with tribal and community partners to create healthy, safe, green affordable housing and to increase opportunities for economic advancement for individuals and families. Since 1997, Enterprise has invested more than \$100 million in grants, loans, and equity in Native American communities and has developed more than 1,700 homes in 20 states. Nationally, Enterprise has provided training to nearly 40 tribes and tribal housing entities in financial acquisition and has worked with tribal governments to help improve regulations for increased homeownership with mortgage lenders and financial institutions.

#### Enterprise Rose Architectural Fellowship [www.rosefellowship.org](http://www.rosefellowship.org)

Established in 2000, the Enterprise Rose Architectural Fellowship honors the late Frederick P. Rose, the prominent developer and philanthropist who believed strongly in the value of good design and the spirit of public service. Administered by Enterprise, the program has achieved dramatic results in more than 40 communities. The Fellows have contributed to more than 5,000 green affordable homes and more than 40 community facilities, living proof that the long-term financial and social viability of affordable housing depends on design excellence, sustainability, and community engagement in the development of neighborhoods. The Fellowship partners promising architects with local community development organizations for 3 years. To date, there have been three Fellowships focused in Native American communities.

#### Enterprise Green Communities [www.greencommunitiesonline.org](http://www.greencommunitiesonline.org)

Enterprise Green Communities is transforming the way America thinks about, designs, builds, and rehabilitates affordable housing. Enterprise Green Communities aligns affordable housing investment strategies with environmentally responsive building practices using the Green Communities Criteria, the first national framework for healthy, efficient, environmentally smart, affordable homes. Green Communities also assists state and local governments to ensure that their housing and economic development policies are smart and sustainable. The 2011 Criteria offers three pathways for projects, based on the location of the project and surrounding development patterns. The revised criteria allow more tribal communities to participate in Green Communities.

\*All information found in this document will be available on our website in a digital downloadable format.

[www.sustainablenativecommunities.org](http://www.sustainablenativecommunities.org)



[www.sustainablenativecommunities.org](http://www.sustainablenativecommunities.org)  
Sustainable Native Communities Collaborative



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