A Guide for Retrofitting Historic Homes

SUSTAINABLE HISTORIC HOMES

Sustainable
Environmental
Energy Conscious

TUCSON, ARIZONA

Office of Integrated Planning
Historic Preservation
and Sustainability Programs
tucsonaz.gov/oip

Why Are Green Retrofits of Historic Homes Important?

"The greenest building is the one already built" because adapting an existing building to extend its use recycles its materials and embodied energy. Also, historic buildings often have inherently sustainable characteristics. Unlike many contemporary buildings, historic buildings were often designed with materials and features that optimized natural lighting, thermal properties, venting, and site use in response to climate and site. When effectively restored and reused, these materials and features can bring about substantial energy savings and water conservation. Today's sustainable technologies can supplement these inherently sustainable features without compromising unique historic character.

This guide provides illustrations and instructions on how to make your historic home more sustainable, while at the same time respecting its character-defining historic features.

Tucson's *National Register* Historic Neighborhoods:

-Aldea Linda
-Armory Park
-Barrio Anita
-Barrio El Hoyo
-Barrio El Membrillo
-Barrio Libre/Viejo
-Barrio Santa Rosa
-Blenman-Elm
-Catalina Vista
-Colonia Solana
-Dunbar Spring
-El Encanto Estates
-El Montevideo
-El Presidio
-Feldmans
-Fort Lowell
-Harold Bell Wright
-Indian House
-Iron Horse
-Jefferson Park
-John Spring
-Menlo Park
-Pie Allen
-Rincon Heights
-Sam Hughes
-San Clemente
-San Rafael Estates
-West University
-Winterhaven

Design *Guidelines* in City Historic Preservation Zones:

There are six historic preservation zones in Tucson, which require compliance with specific development standards and design guidelines for exterior alterations to existing historic and non-historic buildings and for new construction, including work that does not require a building permit. These guidelines help homeowners within these historic zones understand what kinds of changes or retrofits are appropriate for their historic homes. To learn more about local HPZ design guidelines go to: www.tucsonaz.gov-/preservation/historicpreservationzones

Common Historic *Architectural Styles* in Tucson:

-American Territorial
-Art Deco
-Bungalow
-Classical Revival
-Craftsman Bungalow
-International
-Mediterranean Revival
-Mid-Century Modern
-Minimal Traditional
-Mission Revival
-Monterey Revival
-National Folk
-Post-war Pueblo
-Post-war Territorial
-Prairie/Wrightian
-Pueblo Revival
-Queen Anne
-Ranch
-Sonoran
-Spanish Eclectic
-Streamline Moderne
-Transformed Sonoran
-Transitional (Territorial)
-Tudor Revival

Sustainability Lessons from Tucson's Indigenous Architecture:

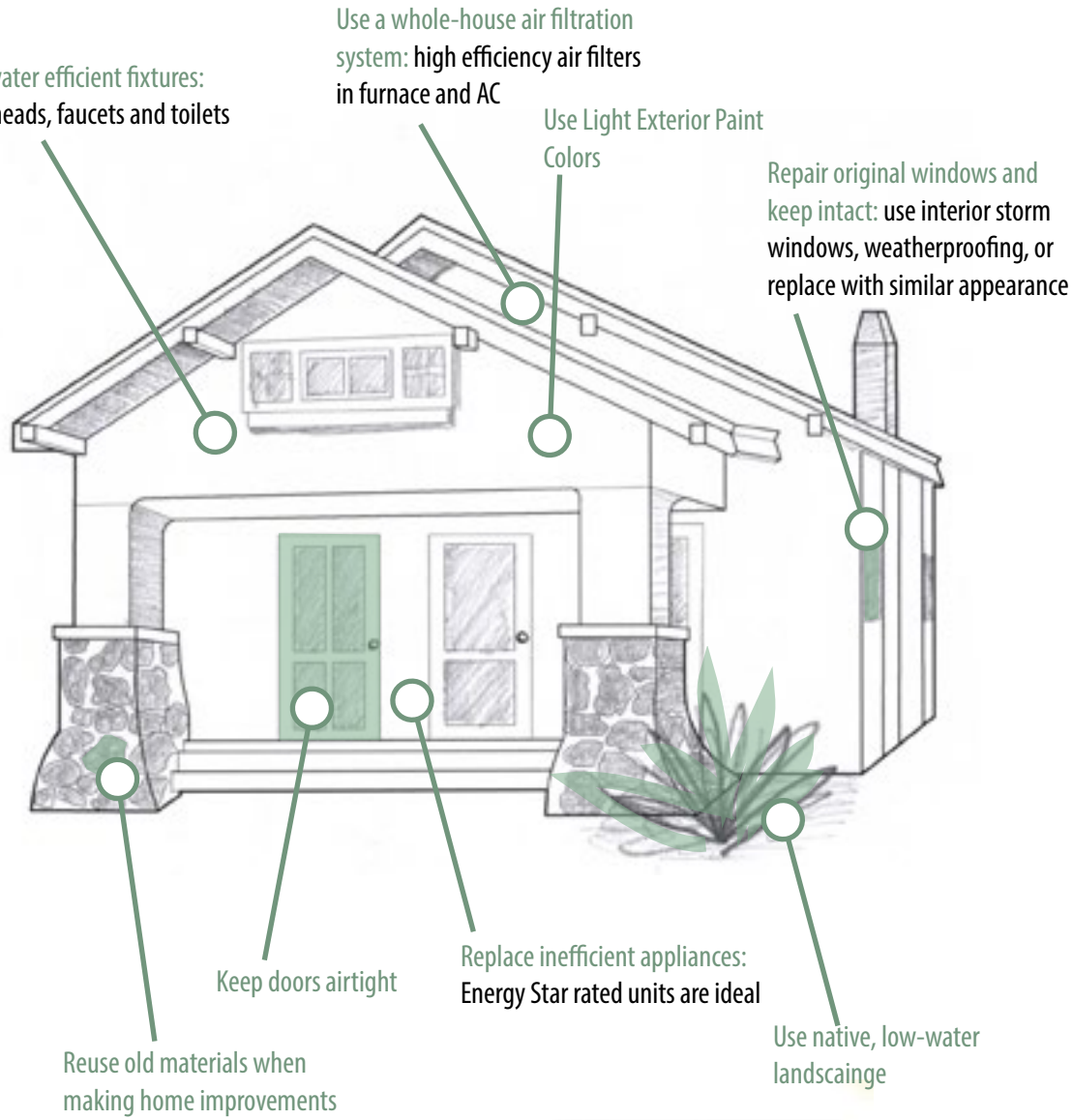
Tucson's early Sonoran style architecture was inherently sustainable. Thick adobe walls and narrow window openings allowed for less solar heat gain and created a thermal lag, keeping the house cool during the day and warm at night. Through bare walls, or walls covered with stucco finishes that "breathed," heat dissipated through transpiration of moisture in the adobe walls. Roofs composed of multiple layers of different materials also created insulating high thermal masses, and tall ceilings allowed hot air to rise above the living space. Central hallways drew cooler air through the houses from rear patios or yards planted with lush gardens. In the typical rowhouse configuration, shared walls reduced exposure to climate extremes, and the zero-setback always provide shade for one side of the street for pedestrians. Use of solely local materials and landscape plants also minimized construction costs.

How to 'Green' Your Historic Home:

-Use light exterior paint colors
-Insulate attic, basement, and crawl space
-Repair original windows
  -Use interior storm windows, weather-proofing, or replace "like for like"
-Inspect, maintain, and repair existing roof
-Keep doors airtight
-Install fireplace draft stopper
-Use native, low-water landscaping
-Reuse old materials when making home improvements
-Install water efficient fixtures (shower-heads, faucets, toilets)
-Utilize harvested rainwater, gray water, overflow bleed-off from evaporative coolers, and AC condensate for irrigation
-Replace inefficient appliances (Energy Star rated units are ideal)
-Use whole-house air filtration systems
-Use High Efficiency air filters in furnace and AC

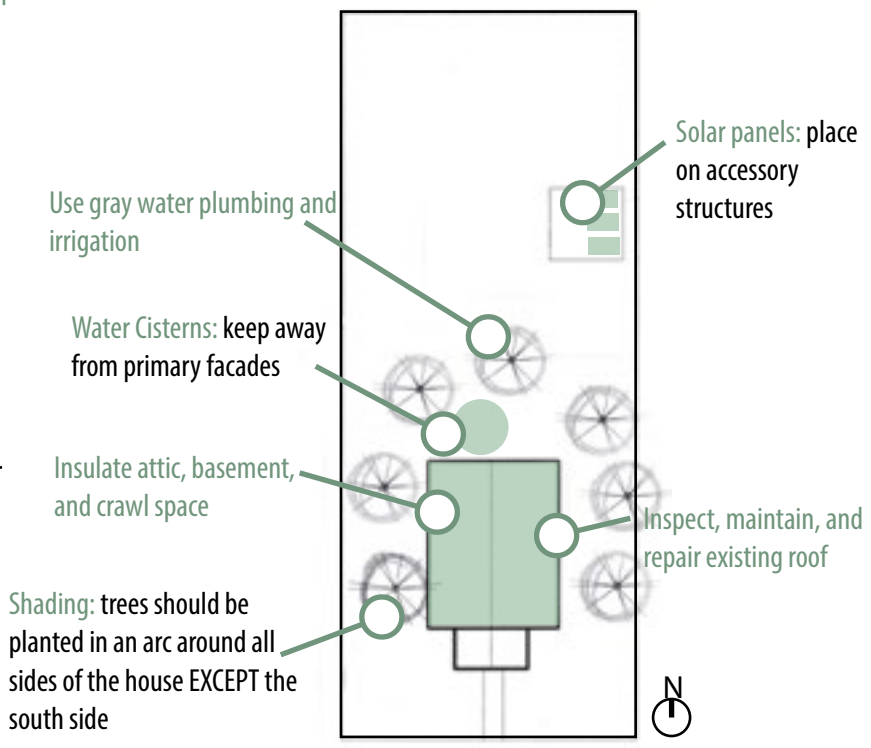
The Secretary of the Interior's *Standards for Rehabilitation:*

1. New uses shall make minimal changes to character-defining features
2. Removal of historic features or changes to spaces that characterize a property should be avoided
3. Changes that create a false sense of history should be avoided
4. Changes that have acquired their own historic significance shall be retained
5. Distinctive features, finishes, and construction techniques shall be retained
6. Deteriorated features shall be repaired rather than replaced
7. Chemical or physical treatments that can cause damage shall not be used
8. Significant archaeological resources shall be preserved or threats mitigated
9. Additions or alterations shall not destroy historic fabric, and shall be compatible but different
10. New additions or alterations should be removable, without damaging original fabric



Bungalow

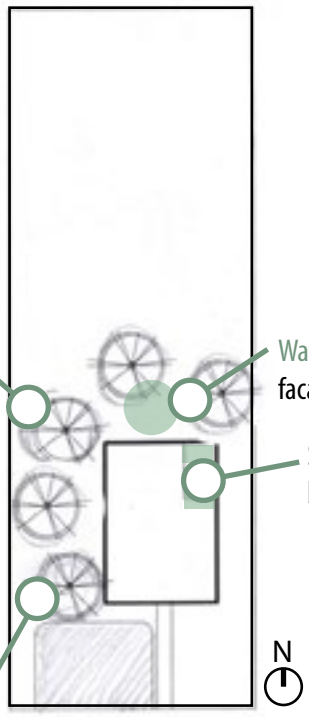
-1905-1930
-Craftsman style
-Gable roofs
-Simplicity of form
-Local, natural materials



Site Plan

Spanish Eclectic

-1915-1945
-Red-tile clay roofs with rounded parapets
-Asymmetrical facades
-Arched windows and openings



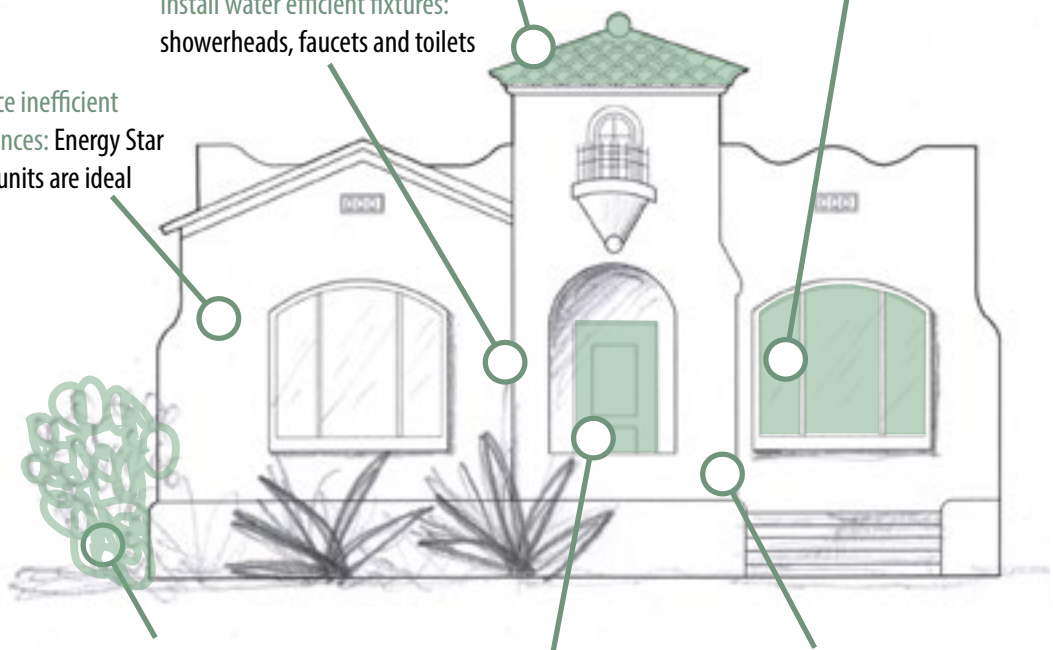
Site Plan

Use gray water plumbing and irrigation

Water Cisterns: keep away from primary facades

Solar panels: hidden by parapets

Shading: trees should be planted in an arc around all sides of the house EXCEPT the south side



Inspect, maintain, and repair existing roof

Repair original windows and keep intact: use interior storm windows, weatherproofing, or replace with similar appearance

Install water efficient fixtures: showerheads, faucets and toilets

Replace inefficient appliances: Energy Star rated units are ideal

Use native, low-water landscaping

Keep doors airtight

Use a whole-house air filtration system: high efficiency air filters in furnace and AC

Rooftop *Equipment:*

Solar panels can make a historic home more energy efficient, but they should not distract from the historic appearance. Placing solar panels behind parapets on a flat roof, on the rear of a gable roof, or on an accessory structure (i.e. garage or shed), will allow a home-owner to take advantage of the energy benefits of solar power without diminishing the visual integrity of their historic home and neighboring properties.

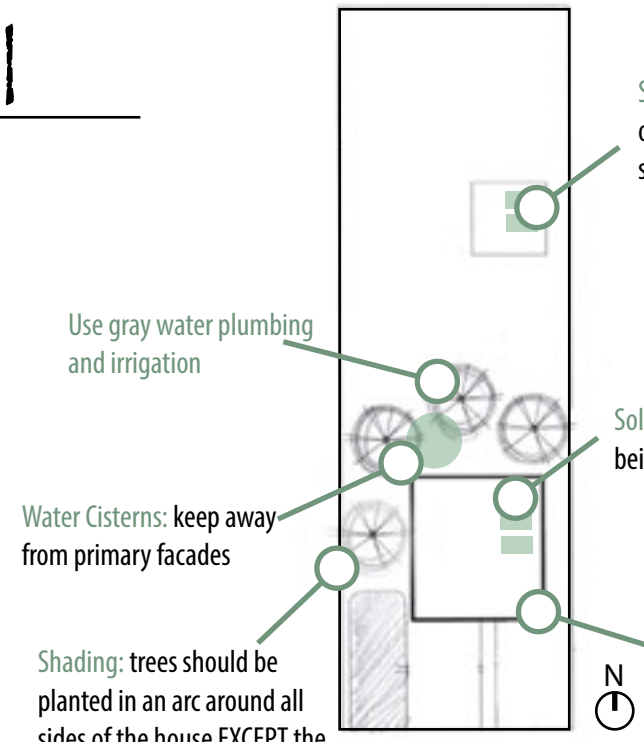
Heating, ventilation, and air conditioning units should not be placed on rooftops. Not only do these units detract from a home's visible historic character, their exposure to full sunlight causes them to work harder, lessening their efficiency and reducing their lifespan. If they are placed on rooftops, they should be in locations that minimize visibility from street-facing sides of the property.

Pueblo Revival

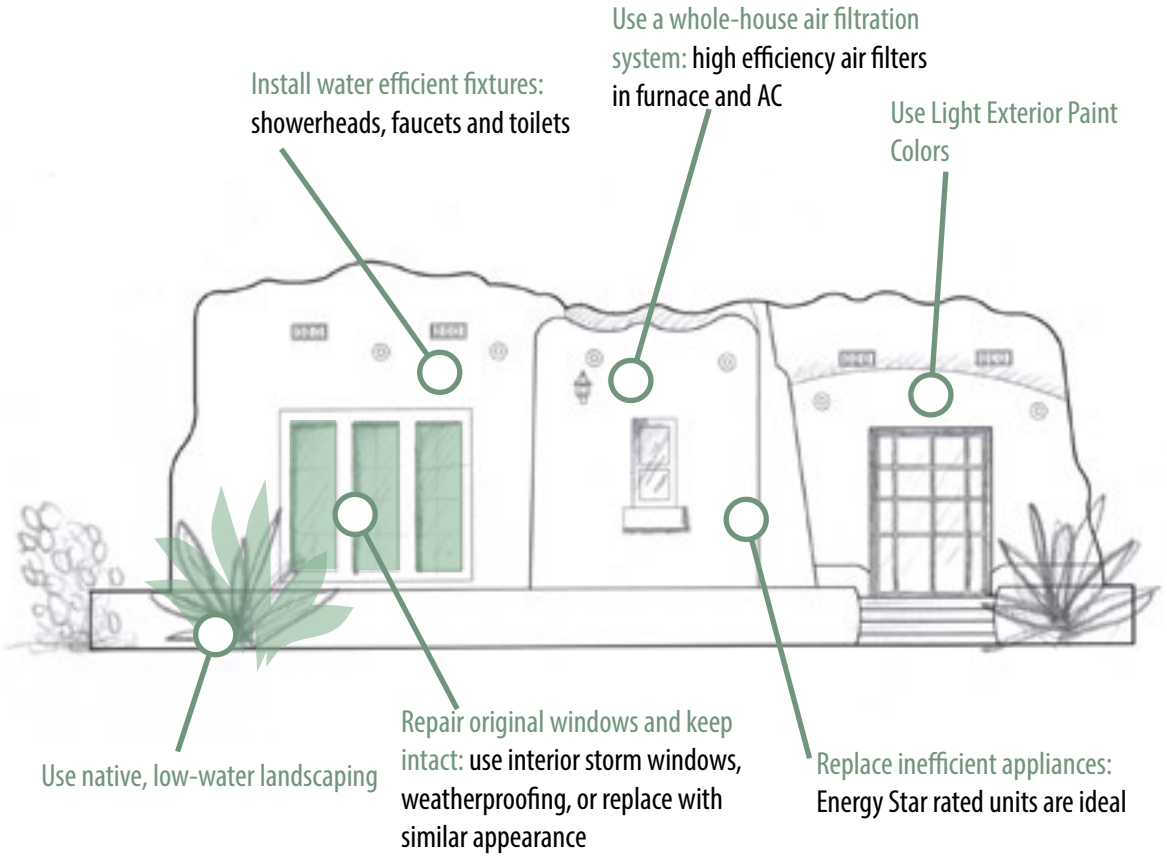
-1920-1950
-Earth-colored stucco on adobe brick or wood
-Flat roofs with rounded or stepped parapets
-Projecting round roof beams called vigas

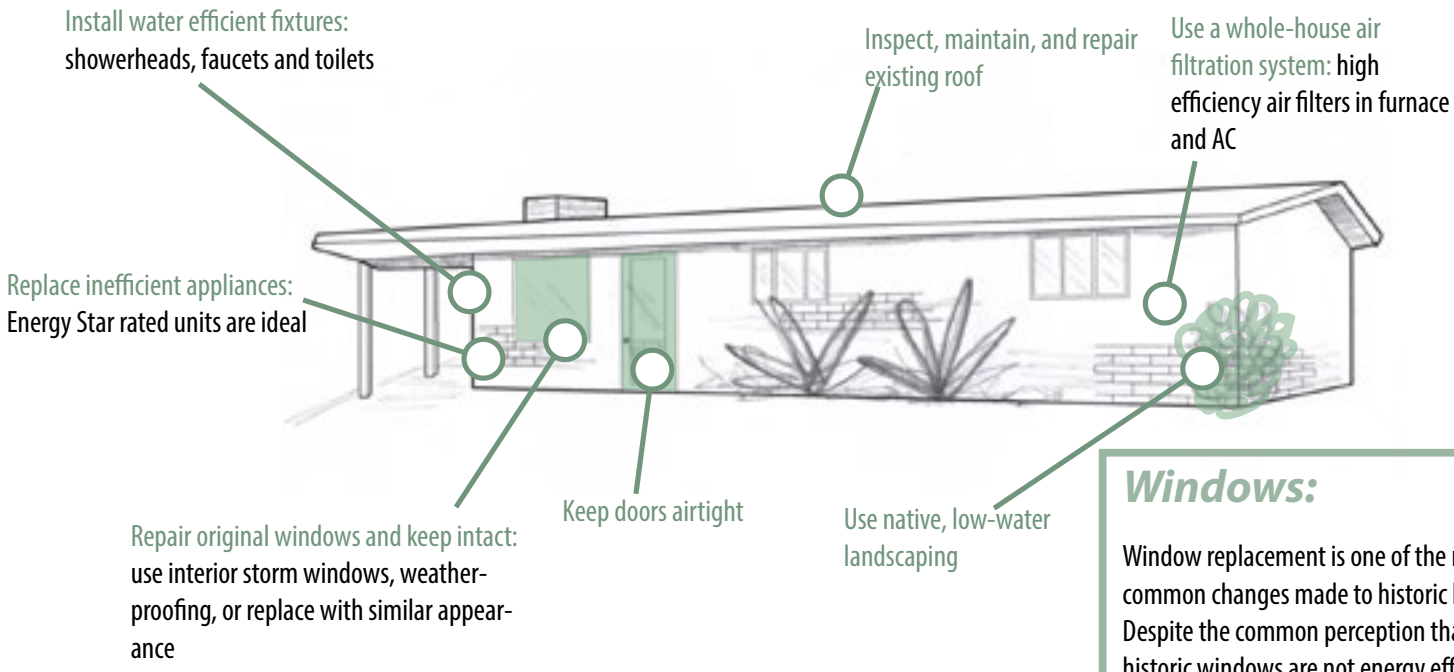
Landscaping:

Native plants are more suitable for sustainable landscaping because they are already adapted to our environment, they are non-invasive species, and they require less water and maintenance. Correct placement of landscaping can help regulate interior temperatures and provide ample natural lighting. At Tucson's latitude, desert trees and shrubs planted in an arc near the eastern, northern, and western exposures works with the changing angles of the sun's rays throughout the year. In summer, the arc shades the house from rising, mid-day, and setting sun. In winter, the arc retains full exposure to the winter sun for solar heating and light. Harvested rainwater, gray water, overflow bleed-off from evaporative coolers, and condensate from air conditioners can all be used for irrigation purposes instead of potable water. Lastly, for historic homes listed in the National Register of Historic Places, landscaping and water collection systems should never obscure the front façade or character-defining architectural elements visible on other façades.



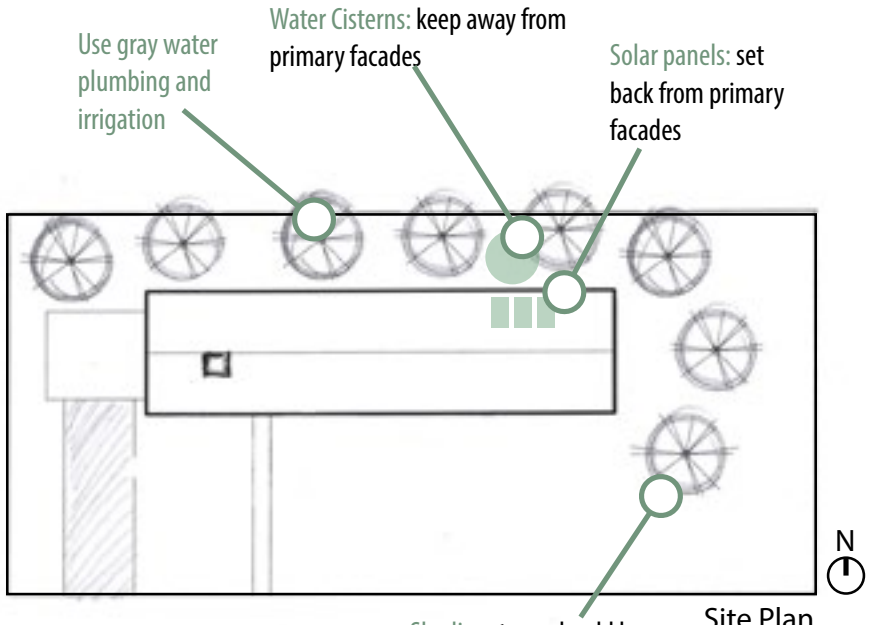
Site Plan





Ranch

-1935-1975
-Burnt adobe, brick, or concrete block
-Flat or low-slope gable roofs
-Carports



Site Plan

Windows:

Window replacement is one of the most common changes made to historic homes. Despite the common perception that historic windows are not energy efficient, if they are kept in good repair and properly sealed, they are reasonably efficient. They are definitely more cost-effective than newer windows over the long term.

Studies show that newer types of replacement windows with dual or triple panes have complex seal systems that wear out first and cannot be repaired, such that the costs of replacement windows cannot be recovered in energy savings within their lifespans. With minimal maintenance, historic wood windows last longer (they have already lasted 50 years or more!), and they can be made more energy efficient by adding weather stripping. Internal storm windows provide the same energy efficiency of dual-pane replacement windows without changing the exterior appearance. Historic steel casement windows can be made more energy efficient by reglazing with double panes. Because very few models of replacement windows accurately replicate the details of appearance of historic windows, repairing and maximizing the energy efficiency of historic windows is an important step in increasing the sustainability of your home, while retaining its historic integrity.

Additional Information, Efficiency Audits, and Rebate Programs:

Electricity

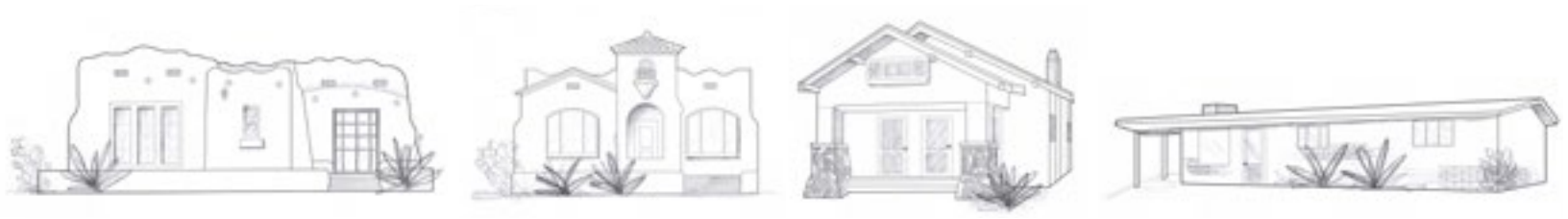
TEP Energy Efficiency Rebates: https://www.tep.com/efficiency/home/efficienthome/
TEP Time of Use Rates: https://www.tep.com/efficiency/home/timeofuse/
TEP Home Energy Report: https://www.tep.com/efficiency/home/reports/
TEP Bright Tucson Community Solar: https://www.tep.com/renewable/home/bright/

Water

Rainwater Harvesting Rebate: http://www.tucsonaz.gov/water/rwh-rebate
Gray Water Rebate: http://www.tucsonaz.gov/water/gray-water
High Efficiency Toilet Rebate: http://www.tucsonaz.gov/water/HET_residential
Zanjero Program: http://www.tucsonaz.gov/water/zanjero_program
Water Harvesting Information Resources: http://watershedmg.org/ed-materials

Native Trees and Recycling

Trees for Tucson: http://tucsoncleanandbeautiful.org/trees-for-tucson/
Recycling Directory: http://tucsoncleanandbeautiful.org/recycling-education/recycling-directory/



To learn more about green retrofitting your historic home,
visit the Tucson Historic Preservation Office,
or visit: http://www.tucsonaz.gov/preservation/greenretrofitting