Water Audit

Water Channel

Storm Play

Storm Play

Fountain

PLAZA LANDSCAPES

Character: The plaza is primarily made up of hardscape with a regular pattern of shade created through the use of shade trees. The trees should be of one species derived from southwestern or arid lands origins to create a sense of place derived from the plazas found in the villages and towns of New Mexico historically. There may also be shrub beds or grass beds in the plaza which will be used to help define the space and provide a softer realm for users. Water will be harvested from the surrounding buildings and reused within the landscapes. This structure could be accomplished in a series of collection wet spots or in a rain water feature or through flood irrigation.

Plaza

recommended plant palette

Trees: Trees of grand character and the ability to grow to great age should be used on the plaza to convey to the user the message of sustainability, longevity and permanence. For this reason we have chosen

Oaks

Common Name	Botanical Name
Live Oak	Quercus turbinella
Gambel Oak	Quercus gambelii

Shrub and Grass Beds: The shrubs selected for the Plaza on the Mall should also convey permanence and stateliness. We recommend that they be chosen from the many evergreens available in the high desert to provide a warmly landscaped environment winter and summer. The grasses, if used, should act as a contrast to the permanence of the shrubs and trees and offer more seasonal interest. Gravels from various sustainably oriented local mines (within 50 miles) will predominate the ground plain under shrub and grass beds.

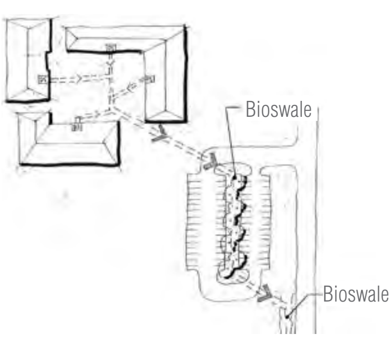
Shrubs

Common Name	Botanical Name
Curleaf Mountain Mahogany	Cercocarpus ledifolius
Manzanita Spp.	Arctostaphylos sp.
Arizona Rosewood	Vauguelinia californica
Sotol Spp.	Dasylirion wheeleri

Grasses and Grass-Like Plants

Common Name	Botanical Name
Deer Grass	Muhlenbergia rigens
Beargrass	Nolina microcarpa and N. texana

Irrigation, Water Harvesting and Hydro-zoning: The plazas would be fully irrigated with potable water during drought months, but could also gain some of the water from harvested areas. Water harvested from surrounding buildings could be stored in cisterns and then reused within other landscapes.



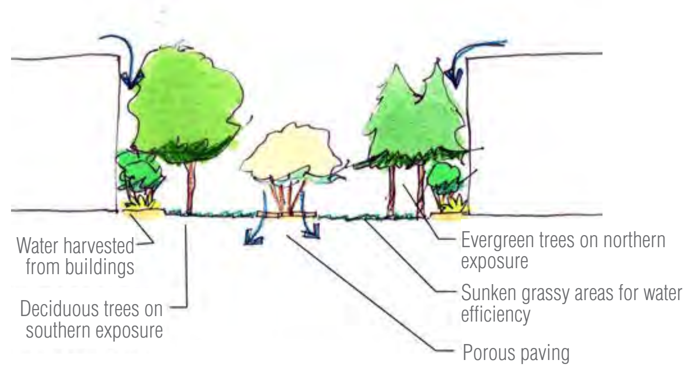
Plaza Harvesting

Manzanita

Beargrass

QUADRANGLES + COURTYARDS

Character: Quadrangles and Courtyards at UNM West are more difficult to describe as a consistent landscape typology because they provide both functionality and beauty to any given site. In terms of functionality they offer a place for studying and socializing as well as providing the softness of grass for relaxation. The aesthetic character of this landscape is harder to describe because the landscape's character is so heavily attached to the building's character and use. In general however the landscape should be easy to use in all seasons, it should be both evergreen and deciduous with the exception of turf areas, it should provide shade along south exposures and sun on the northern exposures and it should offer seasonal interest to spur the imagination, this might mean flowering qualities and color and interesting branching structure or leaf color. The environmental factors which aid in the creation of pedestrian-appropriate micro climates should be explored in the courtyard designs. Trees, armadas, and arcades should be strategically placed to reduce the impact of hot sun and to modify the flow of winter winds. The courtyards should open on the east and west to afford views to the Sandia Mountains and the western mesa. These large geographical markers provide constant orientation.



Quad Section

Courtyard

recommended plant palette

Turfgrass: Turfgrasses in quadrangles should be tough yet drought tolerant. If possible native turf grasses should be considered because of their drought tolerance.

Common Name	Botanical Name
Fescue Spp.	Festuca cultivars
Bluegrass Spp.	Poa sp.
Buffalograss	Buchloe dactyloides
Blue Grama Grass	Bouteloua gracilis

Trees: For the most part trees in Quadrangles and Courtyards at UNM West will be smaller in scale in keeping with the buildings that they will serve. Dependent on the space within the Quad however there may be room for a larger signature tree. Trees in general should offer a dappled canopy because of the shade influence of adjacent buildings, which could provide the user with more comfort. Because UNM West will use more native high desert plant palettes than the main campus, trees should be primarily those native to the region (New Mexico).

Low Canopy

Common Name	Botanical Name
Western or Oklahoma Redbuds	Cercis occidentalis
New Mexico Olives	Forestiera neomexicana
Mexican Elders	

High Canopy

Common Name	Botanical Name
Hackberry	Celtis occidentalis
Chinquapin Oak	Quercus muehlenbergii
Southwestern White Pine	Pinus strobiformis
Rocky Mountain Juniper	Juniperus scopulorum cultivars- Blue Heaven, Co (except residential village)
New Mexico Sequoia	Sequoiadendron giganteum


Buffalograss


Blue Grama Grass


Western Redbuds


Chinquapin Oak

Shrubs, Herbaceous Perennials and Ornamental Grasses: Shrubs, herbaceous perennials and Ornamental Grasses in Quadrangles and Courtyards at UNM West will be both formal and informal in arrangement dependent on building type or contractor and university desire. They are perhaps spaces that should intermix both evergreen and deciduous shrubs. Gravels, organic shards and chips from various sustainably based forest and orchard products will predominate the ground plain where turfgrass has not been employed.

Shrub Types

Common Name	Botanical Name
Three-Leaf Sumac	Rhus trilobata
Fernbush	Chamaebatiaria
Golden Currants	Ribes aureum
Cherry Sage & other Salvia Sp.	Salvia greggii
Desert Broom	Baccharis sarothroides
Cinquefoil	Potentilla fruiticosa
Western Sandcherry	Prunus besseyi
Oregon Grape Holly	Mahonia aquifolium
Apache Plume	Fallugia paradoxa
Curleaf Mountain Mahogany	Cercocarpus ledifolius
Red/Yellow Yucca	Hesperaloe parviflora

Ground Covers and Perennial Selections

Common Name	Botanical Name
Penstemon Spp.	Penstemon linaroid
Yarrow	Achillea lanulosa
Aster	Aster Spp.
Kinnikinnick	Artostaphylos uva-ursi

Ornamental Grasses

Common Name	Botanical Name
Muhlenbergia Spp.	Muhlenbergia capillaris
Blue Avena Grass	Helictotrichon semperviren
Blue Fescue	Festuca ovina glauc.
Mexican Threadgrass	Stipa tenuissima

Golden Currants

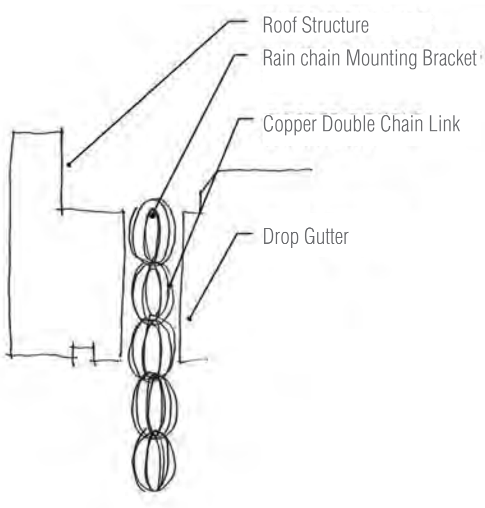
Cherry Sage

Yarrow

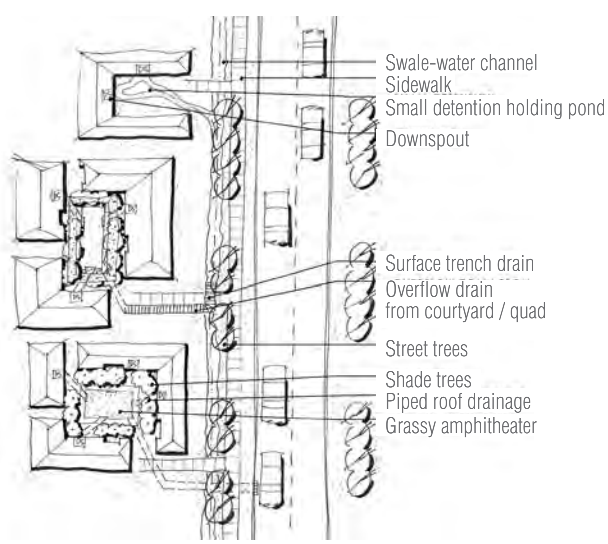
Mexican Threadgrass

Irrigation, Water Harvesting and Hydro-zoning: Water harvested from the surrounding building rooftops will be captured and used for surrounding landscape irrigation. Potable water will provide supplemental irrigation. Rainchains are a great tool to direct water from building rooftops down to the ground level.

Harvesting excess water from quadrangle landscape could be piped underground and directed toward the stormwater collection channel that would later be used for other areas of landscape. Courtyards are an example of a unique microclimate that should be zoned separately from other areas within the landscape irrigation system. Courtyards may be sheltered by large surrounding buildings, or may be susceptible to wind tunnel affects.



Rain Chain



Quad Harvesting

PASEOS

Character: The Paseo is somewhat transient in nature in that it is a series of pedestrian thoroughfares that connect the campus together, it is generally not a place that the user is intended to stay for longer periods of time. Paseos can also become learning centers through integrating artwork, tree arboretums and interpretive signage along the walkways. The landscape character of each of the Paseos should be comfortable for walking both in summer and winter so generally north/south Paseos should be designed with small or columnar deciduous and evergreen trees due to space concerns interspersed with small short-term sitting areas accommodating larger shade trees. East/west Paseos should maintain views towards the Sandia's as was previously mentioned utilizing trees that are again small or columnar. Tree types might vary based on building adjacency or specific Paseo location. Trees should be used as markers to help users identify specific paths with specific species predominating specific Paseo. Shrubs, grasses and ground covers should be relatively open in structure and low in density. No turfgrass should be used. Gravels, organic shards and chips from various sustainably based forest and orchard products will predominate the ground plain in lieu of turfgrass grass. All vegetation should emphasize plants from a native palette.

Gilo Central Park Jerusalem

interpretive signage

recommended plant palette

Trees: For the most part trees along Paseos will be small in scale with the exception of the larger signature trees. Trees in Paseos should also plan for dappled shade because of the shade influence of adjacent buildings. All trees should be derived from a native or regional palette of plants.

Low Canopy Trees

Common Name	Botanical Name
Western Redbuds	Cercis occidentalis
Desert Willows	Chilopsis linearis and cultivars
Net Leaf Hackberry	Celtis reticulata
Smoketree	Cotinus coggygria

High Canopy Signature Trees

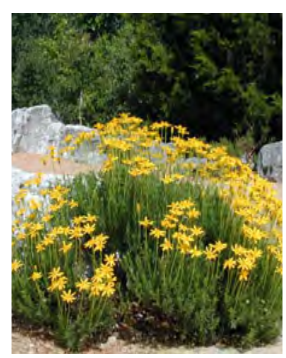
Common Name	Botanical Name
Hackberry	Celtis occidentalis
Chinquapin Oak	Quercus muehlenbergii
Southwestern White Pine	Pinus strobiformis
Rocky Mountain Juniper	Juniperus scopulorum cultivars- Blue Heaven, Co
New Mexico Sequoia	Sequoiadendron giganteum

Shrubs, Ground Covers and Ornamental Grass Beds: Shrubs, ground covers and Ornamental Grasses in Paseos will be both densely planted and informally and less densely arranged dependent on building adjacency or sun/shade condition. Paseos also intermix both evergreen and deciduous shrubs. And all plants are derived from native or endemic palettes.

Desert Willow

Smoketree

Hackberry



Damianita

Shrub Types

Common Name	Botanical Name
Damianita	Chrysactinia mexicana
Beavertail Opuntia Spp.	Opuntia basilaris
Salvia Spp.	Chilopsis linearis and cultivars
Desert Broom	Baccharis sarothroides
Globemallow Spp.	Sphaeralcea grossul.
Broom Dalea	Psorothamnus scoparia

Ground Covers and Perennial Selections

Common Name	Botanical Name
Penstemon Spp.	Penstemon linaroid
Fringed Sage	Artemisia frigida
Blanket Flower aka Firewheel	Gaillardia aristata and cultivars
Sunflower Spp.	Helianthus annuus
Four-O-Clock	Mirabilis multiflora
Mexican Evening Primrose	Oenothera berlandiera or speciosa
Mexican Hat	Ratibida columinfera
Paperflower	Psilostrophe tagetina
Mexican Blue Sage	Salvia chamaedryoides

Ornamental Grasses

Common Name	Botanical Name
Mexican Threadgrass	Stipa tenuissima
Deer Grass	Muhlenbergia rigens
Indian Ricegrass	Oryzopsis hymenoides

Irrigation, Water Harvesting and Hydro-zoning: Water should be harvested from surrounding building tops, sidewalks and other impervious surfaces

Broom Dalea

Blanket Flower

Mexican Evening Primrose

Mexican Blue Sage

ATHLETICS + RECREATION

Character: Recreational and athletic fields will be dominated by the use of turfgrasses identified for sports related uses. If sustainably based alternatives to the standard bluegrass and fescue blends are discovered over time they may also be employed for use at UNM West but the use of synthetic turfs is discouraged. If room allows along the edge of sports fields, shade trees will be used to create shade and lessen water dependency turfgrass.

Greenway

recommended plant palette

Trees: For the most part trees in athletic areas will be chosen from larger species that can support the large amounts of shade needed for student and faculty use.

Common Name	Botanical Name
Hackberry	Celtis occidentalis
Arizona Ash	Fraxinus velutina
Arizona Sycamores	Platanus wrightii
Chinquapin Oak	Quercus muehlenbergii
Southwestern White Pine	Pinus strobiformis

Turfgrass: Turfgrass areas will include fescues and blends for sports related activities.

Common Name	Botanical Name
Bluegrass Poa sp.	
Fescue Spp.	Festuca cultivars

Irrigation: The irrigation for these areas can be accomplished in numerous ways. Sunken sports fields could act as dual use facilities and used for recreation and to collect stormwater runoff and slowly let it infiltrate the soil. This may cause turfgrass around the perimeter to receive more moisture than the grass in the center, resulting in boggy areas.

The turfgrass areas are also a good location for a campus weather station. Located in the turfgrass, the weather station would more accurately read the humidity levels when determining the ET rate.

Water Harvesting and Hydro-zoning: Water harvested would be stored in a cistern and re-used at a controlled rate with optimum distribution uniformity. A small drainage channel will be utilized and integrated into the Mall. This small channel will collect runoff water from the campus and be able to use it throughout the Mall to supplement irrigation for the turf, shrubs and trees. It may also be featured as a small water feature for user interaction/ interpretation when there is a large water event.

Water Feature

Small Channel

EDGES + GATEWAYS

Character: The Edges and Gateways of UNM West are the first glimpse of the campus that the passerby or city dweller will see and each of these special places should give an indication of what lies beyond in the campus. For the most part from a landscape perspective these areas should imitate the high desert landscape in which the campus will be built. The Edges along Paseo Del Vulcan, 30th Street and the Las Barancas Arroyo will offer a desert style landscape emphasizing plants of the high desert native to Central New Mexico. This can be done by preserving and protecting the existing native landscape. The ground plain will be made up of primarily reseeded landscape with the exception of more formalized landscapes and entries. Gravels, organic shards and chips from various sustainably based forest and orchard products will make up some of the ground plain where the existing native landscape does not exist.

recommended plant palette

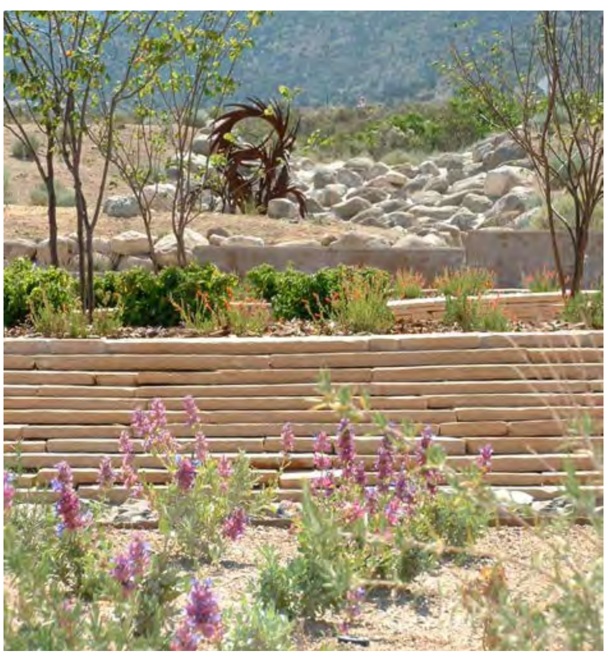
Trees: For the most part trees along Edges and Gateways will be small in scale and derived from a native palette. Gateways, roundabouts and entryways with signage will also include flowering trees and those with statuesque features.

Low Canopy Trees

Common Name	Botanical Name
Western Redbuds	Cercis occidentalis
Desert Willow	Chilopsis linearis and cultivars
Mesquite Spp.	Prosopis juliflora
Chitalpa	X chitalpa tashkentensis and cultivars
Chokecherry	Prunus virginiana
Chaste Tree	Vitex agnus-castus
Smoketree	Cotinus coggygria

Evergreen Trees

Common Name	Botanical Name
Turbinella Live Oak	Quercus turbinella
Pinon Pine	Pinus edulis
Southwestern White Pine	Pinus strobiformis
Rocky Mountain Juniper	Juniperus scopulorum cultivars- Blue Heaven, Co
Alligator Juniper	Juniperus deppeana
One-Seed Juniper	Juniperus monosperma



Edge

Gateway

Shrubs, Ground Covers and Ornamental Grass Beds: Shrubs, Ground covers and Ornamental Grasses at Edges and Gateways will be densely planted at entries and gateways but when used along edges will be less formally or densely planted dependent on need for screening and buffering. These areas will also intermix evergreen and deciduous shrubs and all plants will be derived from native or endemic palettes

Shrub Types

Common Name	Botanical Name
Damianita	Chrysactinia mexicana
Beavertail Opuntia Spp.	Opuntia basilaris
Salvia Spp.	Chilopsis linearis and cultivars
Desert Broom	Baccharis sarothroides
Desert Honeysuckle	Anisacanthus thurberii
Mountain Mahogany Spp.	Cercocarpus ledifolius
Globemallow Spp.	Sphaeralcea grossul.
Fernbush	Chamaebatiaria
Chamisa	Chrysothamnus nauseosus
Feather Dalea	Dalea formosa
Cliff Fendlerbush	Fendlera rupicola
Dunebroom	Parryella filifolia
Broom Dalea	Psorothamnus scoparia
Sumac Spp.	Rhus virens
Woods Rose	Rosa woodsii
Cherry Sage	Salvia greggii
Artemisia	Artemisia Spp.
Fourwing Saltbush	Atriplex canescens
Cliffrose	Cowania mexicana
Turpentine Bush	Ericameria laricifolia
Common Name	Botanical Name
Winterfat	Ceratoides lanata
Apache Plume	Fallugia paradoxa
Creosote Bush	Larrea tridentate
Luecophylum Spp.	
Mariola	Parthenium incanum
Arizona Rosewood	Vauguelinia californica

Mesquite

Chitalpa

Pinon Pine

Desert Honeysuckle

Ground Covers and Perennial Selections

Common Name	Botanical Name
Penstemon Spp.	Penstemon linaroid
Fringed Sage	Artemisia frigida
Blanket Flower aka Firewheel	Gaillardia aristata and cultivars
Sunflower Spp.	Helianthus annuus
Four-O-Clock	Mirabilis multiflora
Mexican Evening Primrose	Oenothera berlandiera or speciosa
Mexican Hat	Ratibida columinfera
Paperflower	Psilostrophe tagetina
Mexican Blue Sage	Salvia chamaedryoides

Ornamental Grasses

Common Name	Botanical Name
Mexican Threadgrass	Stipa tenuissima
Deer Grass	Muhlenbergia rigens
Indian Ricegrass	Oryzopsis hymenoides
Blue Grama Grass	Bouteloua gracilis
Sideoats Grama Grass	Bouteloua curtipendula
Little Bluestem	Schizachyrium syn. Andropogon scoparium
Sacaton Spp.	Sporobolus wrightii

Irrigation, Water Harvesting and Hydro-zoning: All edge landscapes should be irrigated for establishment with temporary irrigation or water collected from nearby streets and sidewalks. Curbless streets would also provide supplemental water to edge landscapes.

Gateway landscapes may require permanent irrigation systems. For remote areas, dri-water packs may be used to get more drought tolerant plant material established.

Artemisia

Winterfat

Four-O-Clock

Sacaton

ENHANCED NATIVE LANDSCAPES (arroyo & ridgeline)

Character: The native high desert landscape surrounding the UNM West campus will be enhanced in this landscape typology by species similar to those existing there.

These are areas that have been protected during early stages of construction. These areas will also be enhanced with new native plant material and provided with temporary irrigation for plant establishment. Enhanced native areas help to manage the intense pedestrian uses of campus, while augmenting native landscapes using plants from precipitation districts. Within both arroyo and ridgeline areas enhancements may include soft surface trails, hard surface linkages, native seeding and temporary irrigation methods.

Enhancements will be dependent on available water harvested from nearby buildings and drainage ways and will include native species that might be found on site now as well as those found in adjacent arroyos and those found an ecotone up in elevation (pinion/juniper level with rainfalls in the 10-12" range). This will be done to provide a landscape condition that is relevant to the landscape vernacular of this part of New Mexico. We should also note that the Barranca Arroyo and the Ridgeline Open Space Park are part of the Enhanced Native System as well as the Protected Native Landscapes (next section) typologies.

There are two natural arroyos on the UNM West site. Arroyos are usually dry creek beds or gulches that can temporarily fill with water during large rain events or during seasonal monsoons.

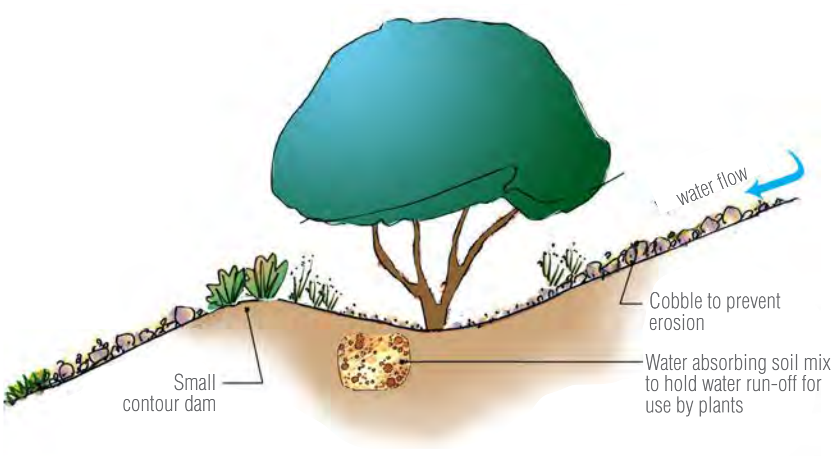
The key arroyo areas on UNM West's site should consist of the existing native landscape, enhanced with plant material to create small Oasis' with shade trees. These areas would occur around check dams and infiltration zones. Within these oasis' areas, engineered check dams could be created as bridge connections for pedestrians and potentially for wildlife. Wildlife drinkers are an excellent method for creating a safe place for wildlife to hydrate by using collected rainwater. By connecting the drinker to an irrigation line, the pond can always be filled to the appropriate levels.

Native plant material enhancements (A)

Native plant material enhancements (B)

Soft surface trail

Wildlife Drinker



Wicking

Within UNM West's arroyo areas many educational, interpretive, social and other uses could include; passive walking, jogging, running and biking. Due to the varied activities, along the arroyo soft surface trails and/or hard surface linkages would be evident. These trail connections would be able to connect wildlife, bikes and pedestrians to all of Rio Rancho and the City Centre, as well as to the Rio Grande River and Albuquerque through the Bosque trail.

The Ridgeline area offers great views and is the high point of the UNM West campus. This area is at least partially protected native landscape but because of it's campus prominence is further enhanced with native seeding, native shrub planting and some irrigation (active or passive through water harvesting) in specific areas. Enhanced zones are primarily small oasis niches that would be located near dorms, academic buildings and other important crossroads.

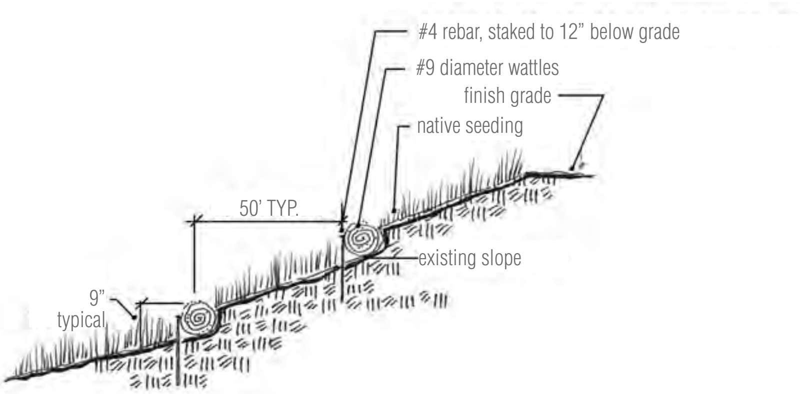
In terms of water harvesting, runoff from planned adjacent building's streets and parking lots could be collected for supplemental plant needs. This could be passively applied to landscape or collected in cisterns and other devices for reuse. Using porous paving could also be utilized to lessen the impact of runoff water for the landscape and sustains plant materials through precipitation application.

Based on the grades along the ridgeline, straw wattles could also be used for erosion control methods. Straw wattles are made up of biodegradable materials and are staked with rebar spikes to stabilize. Wattles allows for plant materials to grow in and assist with stabilization of steep slopes.
Because UNM West's ridgeline is very large and runs a long distance, numerous functions and activities could take place along it. Passive walking, jogging, running and biking, as well as seating nodes near buildings are all possible uses for the Ridgeline. With those activities soft surface trails and/or hard surface linkages and seating are all approaches that we would use and that are present on site.

Bike Connection

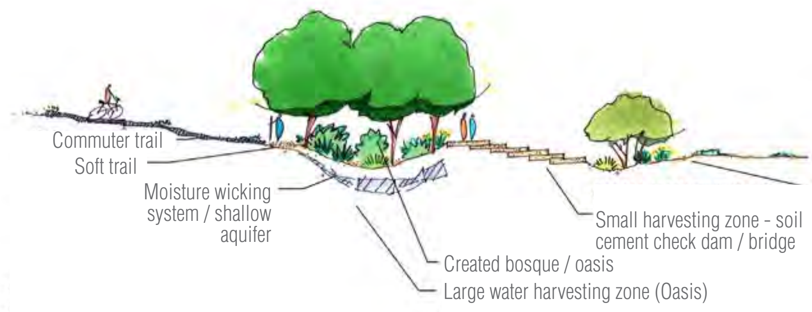
Wattle

Existing Arroyo

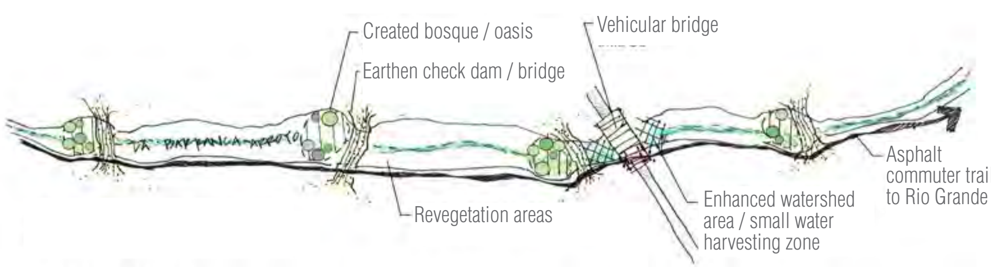


Wattle detail graphic

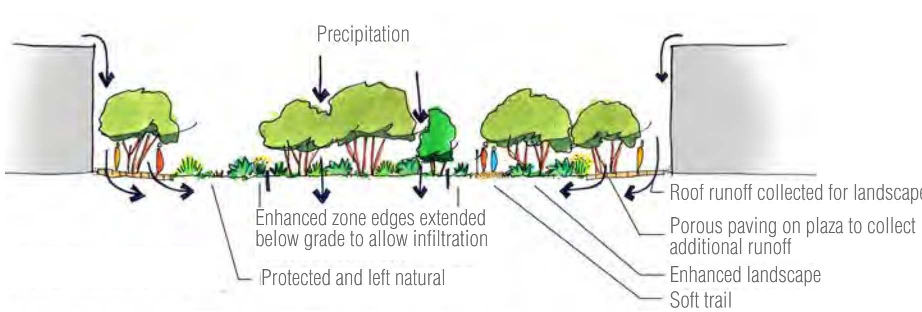
Arroyo



Connections graphic
(enhanced native landscape section along arroyo)



Oasis graphic
(enhanced native landscape plan along arroyo)



Ridgeline

recommended plant palette for arroyo & ridgeline

Trees: Trees will be selected based on their connection to those found in New Mexico of the central Rio Grande valley and the states Pinon/ Juniper forests.

Common Name	Botanical Name
Cottonwood (in arroyo area)	Populus acuminata
One Seed Juniper	Juniperus monosperma
Pinon Pine	Pinus edulis
Live Oak	Quercus turbinella
Gambel Oak	Quercus gambelii
Desert Willow	Chilopsis linearis and cultivars
Net Leaf Hackberry	Celtis reticulata

Shrub and Ornamental Grasses: Shrubs and ornamental grasses will be selected based on their connection to those found in New Mexico of the central Rio Grande valley and the states Pinon/Juniper forests.

Shrubs

Common Name	Botanical Name
Broom Baccharis	Baccharis emoryi
Beargrass	Nolina microcarpa and N. texana
Silver Buffaloberry	Shepherdia argentea
Three Leaf Sumac	Rhus trilobata
Curleaf Mountain Mahogany	Cercocarpus ledifolius
Damianita	Chrysactinia mexicana
Beavertail Opuntia Spp.	Opuntia basilaris
Salvia Spp.	Chilopsis linearis and cultivars
Desert Broom	Baccharis sarothroides
Globemallow Spp.	Sphaeralcea grossul.
Broom Dalea	Psorothamnus scoparia
Fernbush	Chamaebatiaria
Artemisia	Artemisia Spp.
Common Name	Botanical Name


One Seed Juniper


Net Leaf Hackberry


Silver Buffaloberry


Beavertail Opuntia

Fourwing Saltbush	Atriplex canescens
Cliffrose	Cowania mexicana
Turpentine Bush	Ericameria laricifolia
Winterfat	Ceratoides lanata
Chamisa	Chrysothamnus nauseosus
Feather Dalea	Dalea formosa
Cliff Fendlerbush	Fendlera rupicola
Creosote Bush	Larrea tridentate
Mariola	Parthenium incanum
Dunebroom	Parryella filifolia
Apache Plume	Fallugia paradoxa

Ground Covers and Perennial Selections

Common Name	Botanical Name
Penstemon Spp.	Penstemon linaroid
Blanket Flower aka Firewheel	Gaillardia aristata and cultivars
Sunflower Spp.	Helianthus annuus
Mexican Hat	Ratibida columinfera
Paperflower	Psilostrophe tagetina

Grasses

Common Name	Botanical Name
Deer Grass	Muhlenbergia rigens
Indian Ricegrass	Oryzopsis hymenoides
Blue Grama Grass	Bouteloua gracilis
Sideoats Grama Grass	Bouteloua curtipendula
Little Bluestem	Schizachyrium syn. Andropogon scoparium
Sacaton Spp.	Sporobolus wrightii

Fourwing Saltbush

Sunflower

Mexican Hat

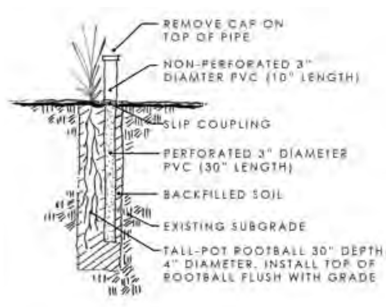
Chamisa

Irrigation: One method for temporary irrigation in enhanced native landscapes could be using dri-water packs. Dri-water packs, or Irrigation Supplements consist of a hydro-gel. Micro-organisms found in the soils break down the gel into liquid water and make it slowly available to the plant. Dri-water packs are easy to use and require very little maintenance. By cutting off the end of the pack and adding water, the device can retain moisture for up to three months. After the initial establishment period, the plants would survive on natural rainfall alone. Plant materials that are good candidates for use with Dri-water include tube packs, tall pots and pole plantings.

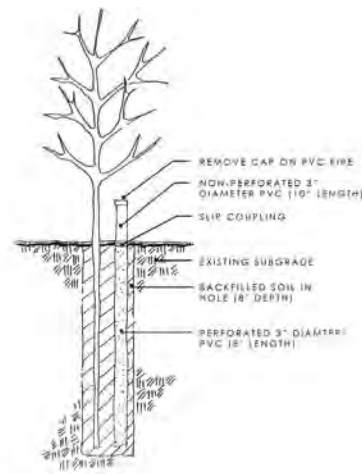
Water Harvesting and Hydro-zoning: Techniques for harvesting water along enhanced native landscape could be numerous. In some areas the use of a check dam along sloped land could help to slow down the flow of water, as well as allow a holding place for water to infiltrate. Wicking systems are another great tool for holding water and slowly allowing the surrounding root systems to absorb and use the water.

In terms of water harvesting, runoff from planned adjacent building's streets and parking lots could be collected for supplemental plant needs. This could be passively applied to landscape or collected in cisterns and other devices for reuse. Using porous paving could also be utilized to lessen the impact of runoff water for the landscape and sustains plant materials through precipitation application.

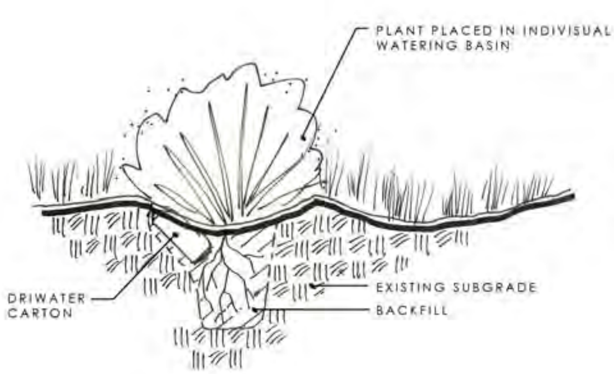
Driwater



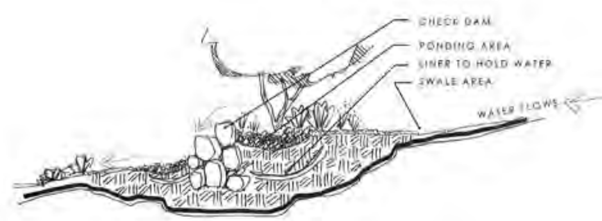
Tall Pots Detail



Pole Planting Detail



Driwater Detail



Check dam

STREETSCAPES + ROUNDABOUTS

Character: Streetscapes within and outside of the UNM West Campus will be simple and straightforward using a palette of the plants that conveys the high desert location of the campus with regular, more formalized arrangements than that of the Paseos and Edges. Vehicular traffic can also take cues from the landscape aesthetics as to the overall feel a street should have while traveling through particular corridors. By creating streetscapes with street trees and earth tone plant colors, this will cue the vehicles to slow down. The main program for streetscapes and roundabouts would be circulation in the form of walking and biking. Thus, the landscape and irrigation should work to further enhance the experience.

The streetscape landscapes should provide a feeling of safety and buffer to the pedestrian user, while not becoming so overgrown that plant materials start to impede the walking spaces along sidewalks. Landscape could also be used as a way-finding measure. If a typical plant palette hierarchy is used on arterial, corridor and residential/campus streets no matter where a pedestrian or vehicular user is located, they would know their general location.

Roundabout landscapes should be used as a focal element. Roundabouts can be used as a traffic calming measure and the landscape within them should reflect that.

Vegetation will be selected from a list of long lived more architecturally structural plant materials than other landscape topologies. Shade will be created with the awnings and portals articulating buildings but also through the use of large shade trees. Structural soils and large expanses of permeable pavement will set the ground for tree health and sustainability. Gravels, organic shards and chips from various sustainably based forest and orchard products will predominate the ground plain in lieu of turfgrass grass.

recommended plant palette for streetscape and roundabouts

Trees: For the most part trees along Streetscapes will be large in scale to help conjoin with the scale of buildings. Trees in streetscapes should also plan for dappled shade because of the shade influence of adjacent buildings.

Street Trees

Common Name	Botanical Name
Arizona Ash	Fraxinus velutina
Arizona Sycamores	Platanus wrightii
Purple Robe Locust	Robinia pseudoacacia
Hackberry Spp.	Celtis occidentalis
Chinquapin Oak	Quercus muehlenbergii

Shrubs, Ground Covers and Ornamental Grass Beds: Shrubs, Groundcovers and Ornamental Grasses along streetscapes will be densely planted in linear formal arrangements as much as possible given building adjacency or sun/shade condition. Streetscapes will intermix both evergreen and deciduous shrubs and all plants will be derived from native or endemic palettes.

Shrub Types

Common Name	Botanical Name
Damianita	Chrysactinia mexicana
Three-Leaf Sumac	Rhus trilobata
Apache Plume	Fallugia paradoxa
Red Yucca	Hesperaloe parviflora
Beargrass	Nolina microcarpa and N. texana
Curleaf Mountain Mahogany	Cercocarpus ledifolius
Manzanita Spp.	Arctostaphylos sp.
Arizona Rosewood	Vauguelinia californica
Cherry Sage	Salvia greggii
Sotol Spp.	Dasylirion wheeleri

Ornamental Grasses

Common Name	Botanical Name
Mexican Threadgrass	Stipa tenuissima
Deer Grass	Muhlenbergia rigens
Sideoats Grama Grass	Bouteloua curtipendula

Irrigation, Water Harvesting and Hydro-zoning: Irrigating along the edges of the street, next to the sidewalks, within the street medians and the interior of the roundabouts would include some areas receiving irrigation temporarily until establishment and other areas receiving water harvested from the streets and sidewalks. Designing inverted medians and curb cuts or curbless streets that direct water to landscapes, not only greatly reduced stormwater run off, but it also beneficial to the landscape.

Purple Robe Locust

Three-Leaf Sumac

Sotol

Sideoats Grama Grass

LANDSCAPE ANGLES

Acute angles in landscapes increase maintenance requirements. Wide sweeping curves and straight lines are more energy efficient to maintain, although sweeping curves decrease irrigation efficiency.

Where two different types of landscapes meet, they should be separated by a mow strip.

PLACING OBJECTS

Objects placed in turf areas should be placed on underlayments or maintenance pads, preferably concrete.

PLANT DIVERSITY

Diversity of plant materials for a sustainable landscape should consist of no more than 30% of any one family, 20% of any one genus or 10% of any one species.

Landscape plants should be planted in mass plantings. Individual trees suffer more equipment damage, competition from turf and are more expensive to maintain.

TURF AREAS

Turf areas require more maintenance inputs per sq. ft. than any other type of landscapes. Turf areas should be large enough to be environmentally sound and cost effective maintenance wise to provide the most functional benefits. It should not be used as fill-in landscapes.

Cool-season grasses should be planted where the morning sun is not obstructed. Cool-season grasses depend on morning sun for successful growth and maintenance.

location of plantings

Planting sites should be sufficiently large enough to support the mature size of the tree. In general, the smaller the planting site, the shorter the life of the tree and the less environmental benefits are realized, and maintenance costs are higher.

Sidewalk damage is the 2nd most common reason street and park trees are removed. Tree plantings should be as far away from sidewalks as possible to prevent concrete damage.

energy benefits via trees

Evergreen trees and deciduous trees that do not drop their leaves upon desiccation (cottonwoods and London planes) that shade south and east facing walls in winter increase heating costs.

Average net energy benefits are highest for deciduous trees planted on the west side of buildings. The second highest net energy benefits are for deciduous trees planted on the east side of buildings. The least amount of net energy benefits are for trees planted on the south side (provides the least benefit during the summer).

Perimeter tree plantings around parking lots provide the greatest benefit for reducing heat island effect and VOC's.

Small trees in public spaces provide no environmental benefits due to increased costs associated with maintenance for public safety. They should only be used when necessary for architectural design purposes.

GROUNDS + LANDSCAPING

Other sustainable practices for Grounds and Landscaping include the following:

1. Roof drains shall not drain out onto walkways or the North side of the buildings. Water should be harvested if possible, if not, roof drains direct to the sewer line.
2. Outside ledges, rails and planters should have skateboard deterrent installed.
3. Loading dock should be oriented so it is not visible to passing traffic.
4. Landscape plans should recognize utility corridors. No trees planted above or below utility lines.
5. Landscape/Grounds areas should be designed to accommodate bicycle-parking areas. These should include concrete pads with installed racks so all sides of the rack can be used without entering into the landscape.
6. Buildings should have mow strips (maintenance pad) around the perimeter to prevent equipment damage to exterior walls.
7. Landscape protection should include protecting existing landscape (i.e. use of tunneling vs. trenching, no contractor parking, temporary water supplies, etc.).
8. Turf should be planted on the south sides of buildings to maximize environmental benefits.
9. Drainage patterns need to be located before construction for landscape and building protection (no berms or slopes to occur next to streets or walkways).
10. Use of pavers and bricks should be eliminated where we cannot guarantee vehicles will not drive over them.
11. Adequate parking for service vehicles and vendor parking should be provided.
12. Walkways should be positioned so pedestrians use them and don't take a route through the landscape (where adequate and convenient pedestrian routes are not utilized, people will make their own).
13. All buildings should have adequate water sources on the exterior of all sides of the building installed in vandal proof enclosures.
14. The installation of bollards shall be included to deter unauthorized vehicle access.
15. Electrical outlets on the outside of the building should be available on all sides.
16. Use of existing tree planting, irrigation, and soil preparation specifications.

INTRODUCTION

The Architecture Guidelines give an overview of elements that are important in creating a consistent approach to implementing the campus plan. As described in the chapter introduction, an understanding of the assets of a particular building site and that site's role within the overall plan is critical from the outset. In each case of building design, an understanding of appropriate regional response to climatic conditions is also necessary. This includes studying the physical and symbolic attributes of historic Native American and colonial architecture. UNM West buildings should be recognizable within the family of arid American southwest building traditions. Utilizing historic concepts of climatic response in the building form is economical and sustainable; it also creates that recognition with other relevant regional architecture.

New technologies augment the ability for achieving sustainability. These technologies and their tectonic form can help develop a transformational architecture that bridges the past with the future. For example, additive covered porches are prominent architectural elements of both Native American and Southwest architectural styles. This element may easily translate from wood construction to steel with photovoltaic panels serving as shade devices. The function is the same as it's always been. Productivity of the devices will increase. Stylistically the form relates to historic structures, however it is thoroughly contemporary.

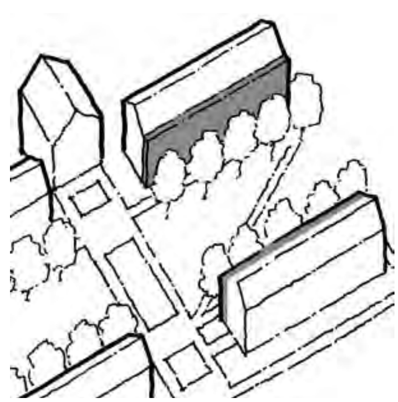
These Guidelines seek to describe an architectural approach that preserves, enhances and capitalizes on natural systems and amenities; looks to the past for guidance, but is firmly rooted in our time and place.

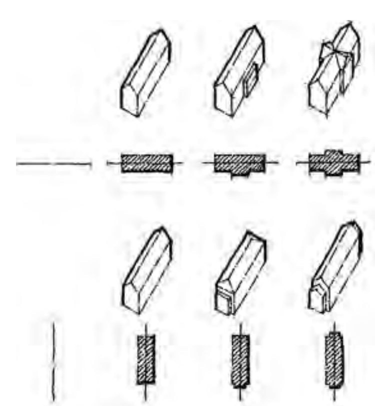
TYPOLOGY

The shape and massing of campus buildings play an important role in campus hierarchy. A building's basic form reinforces the program housed within; it also works with other buildings to provide a clearly identifiable campus structure. These basic types represent the building blocks of campus architecture. Though simple in nature, their composition across campus can create a rich fabric of interwoven buildings and open space.

bar buildings

Bar Buildings are elongated and rectangular volumes. This is the basic building block of campus architecture. The entry is generally at the center of the long façade, but can also be located on the short face. The buildings define and reinforce the geometry of open spaces. The building type accommodates a variety of functions, such as housing, classrooms, labs and offices. The buildings typically are 45-90 feet wide, and 120-300 feet long. The edge defining qualities of the bar buildings, along with the centralized type, form the essential building blocks of campus architecture.





Bar Buildings

centralized buildings

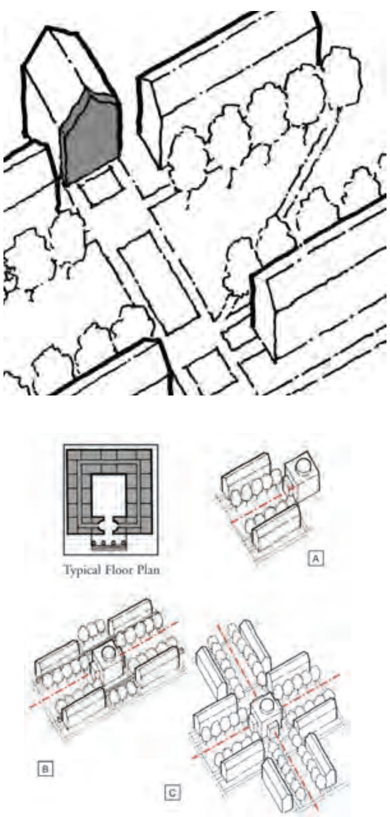
Centralized Buildings are usually sited predominantly within a space. They are often an important or historic building on campus such as an original campus building.
The building is formed using circles, squares and rectangles. They have a predominant entry at the center of the main façade that leads to a public lobby. A typical floor plan has small, cellular rooms wrapping around a large public room in the middle of the building. There are also predominant architectural elements often associated with the entry. When combined with the bar building type, an unlimited variety of building forms can be created.

letter buildings

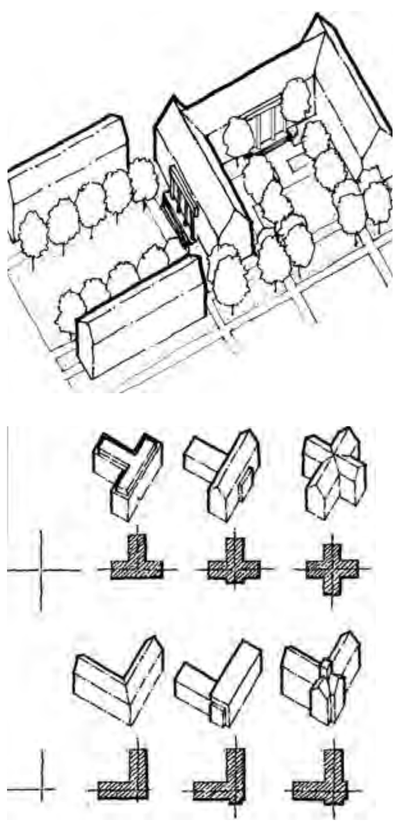
Letter Buildings are formed through a combination of bar types and centralized buildings. They most often form an outdoor open space associated with the building. The footprint of the building allows for stepped massing of the building. This building type can accommodate central corridors for classrooms or residence halls where ample interior natural light is critical. The courtyard side of the building can be the front with an entry court or the solid side can be the front with a more private courtyard.

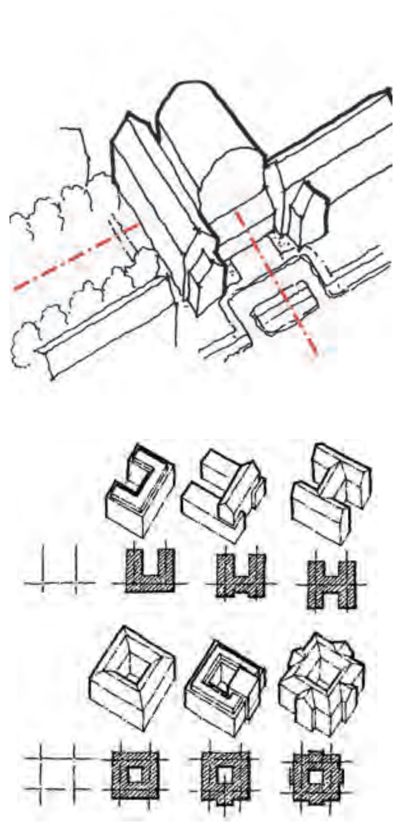
composite buildings

Composite Buildings are created through a combination of building types. The composition of parts define outdoor courtyards. The buildings may be sited to define space or more prominently as a terminus to an axis. The larger footprint allows for a greater mass and therefore complex and diverse programs. This type allows many activities to be located near one another for maximum efficiency. The height of each component may vary as appropriate.



Centralized Buildings


Letter Buildings


Composite Buildings

"…emphasis should now also be made on the placement of buildings and establishing more appropriate, useful and well-tempered outdoor spaces at the edges of and between those buildings. The origins of the Spanish-Pueblo style had its beginnings in the arid regions of the American southwest and had as much to do with correct and proper placement of buildings as with the style of those buildings (the style having been based on climatically appropriate use of locally available materials in support of the unique social structures of the communities)."

As described in the University of New Mexico, Albuquerque Campus Development Plan Fall 1996 in relation to the Spanish Pueblo style.

SITE

building siting

The siting of buildings is integral to the creation of open space. Buildings form edges to open space as well as create focal points throughout the campus.

Buildings should also be utilized to frame views along corridors within and outside of the campus. Architectural elements should be sited to provide intermediate visual orientation. These include towers, fountains, sculpture, entries, etc. Specific siting of buildings should minimally affect natural systems, valued landscape and existing site context.

Siting of the building should conceal as much mass as possible. Entries should front on major open space.

Bar and letter buildings usually fall into the space-forming "soldier" building category. Centralized building types often house public programs and spaces and may be referred to as "hero" buildings.

build-to-lines + setbacks

Highly successful outdoor rooms that generate an identifiable campus structure can be formed through the use of build-to-lines. These lines identify where building edges should be constructed so as to define the edges of the space or front of a street. Build-to-lines for buildings should be followed in order to ensure clear formation of overall campus structure.

Inconsistency in the use of setbacks or build-to-lines in the siting of buildings can lead to unusable outdoor spaces or "dead zones" on campus. These can easily be resolved through implementation and adherence to policies on building location.

Standard setbacks for streets and paseos is 10-15' north-south and 15-20' east-west from the curb or walk for 75% of the building frontage.

solar orientation

Building orientation should encourage "daylighting" within buildings. That is, design for use of indirect exterior daylight to provide most ambient lighting within the building through selected apertures which do not allow excessive heat gain. In addition to health, morale and proven productivity benefits of this approach, significant energy savings can be had due both to reduced use of artificial light as well as to reduced cooling loads.

ventilation

During the summer, Rio Rancho is overheated and arid while most of the academic year is quite pleasant. Buildings should be designed to take advantage of prevailing winds and natural ventilation through operable openings, courtyards, and cooling towers.

campus grid

Building design should reinforce the proposed campus grid and major axes in order to clarify orientation and hierarchy of uses. Recognizing microclimatic differences on each building side is also important. For instance, the south facing side of buildings lining the Mall should account for solar exposure differently than those with north faces along the Mall.

SCALE + MASSING

scale

Buildings on campus should articulate the relationship to the human body. Fenestration, materiality, and datum lines are used to create a comfortable relationship between man and building.

The role of scale and proportion in defining architectural character is a significant one in that each provide a consistent modulation on a single building and groups of buildings that is appropriate to the place.

- Building facades should be modulated by a tripartite composition – base, middle and top.
- Vertical rhythms of façade hierarchy (bay systems), shade structures and fenestration also modulate scale.

Scale governs the relationship between groups of buildings and the outdoor rooms that they create. Proportion relates a building's parts to its whole. Where masonry is used in new buildings it is appropriate to express the weight of the building.

massing

Proper massing allows today's campus buildings that have larger and larger program requirements to conceal their bulk through a composition of smaller building parts. Greater height and massing should occur, where possible, toward the center of campus or academic village. Campus edges should step down in massing and height to compliment adjacent structures. Similarly within a singular structure, its massing should generally remain in the middle of the plan so as to appear to less bulky. On large building elements, utilizing appropriate scale and proportion of windows, arcades, entries and details is critical for retaining human scale.

As per the Design Concepts and Directives of the University of New Mexico, Albuquerque Campus Development Plan;

- The principle of ascending mass with wall-dominated structures built of masonry where possible (or, at a minimum, with the appearance of masonry) should continue to be encouraged.
- Mass-dominated traditional and contemporary expressions of southwest regional building styles should also be encouraged.

Other considerations:

- Massing should reflect the building's status as a landmark, gateway or space-defining building.
- Building corners are important massing elements in the southwest regional style. They imply strength and connection to the ground plane.

Santa Fe building - massing

Contemporary massing

Traditional forms are often battered or tapered.

- Juxtaposing strong corners with an open, arcaded post and beam public entry is common. A contemporary version is encouraged.
- The overall mass of the building should appear lighter nearer the top. The top level may be considered an "attic level" and therefore recessed from the face of the base of the building. The recommended use of photovoltaic roof structures is an ideal means of achieving this effect.

height

The intent is for the Rio Rancho City Center and UNM West Campus to be urban in nature. This approach will help to maximize limited land resources. Buildings will be sited close to the street in a dense manner. For academic portions of campus, buildings should be 3-5 levels. Higher buildings may front University Boulevard or be located in center campus. Health Sciences buildings should likewise be 3-5 levels. Hospitals are usually the tallest building in this category. University housing should be 3-4 levels. Housing as part of a mixed use project may be taller.

flat + pitched roofs

A standard for roofs should be established campus-wide for continuity in design. The roof design should be appropriate to the southwestern style; most likely a flat parapeted roof line. Certain exceptions should be made for "heroic" buildings on campus. These exceptions should be few and be implemented to achieve a specific purpose that could not otherwise be achieved through the standard design.

The flat roof should be a light colored surface to reflect heat gain. The use of photovoltaic panels is highly encouraged either on the flat roof or used as a shade device for an outdoor terrace.
It is recommended that any pitched roofs also implement PV's where possible. The predominant pitched roof material will be metal.

ARCHITECTURAL ELEMENTS

building entries

- Building entry should front major open space. This will reinforce the hierarchy of the open space network.
- Entry should be clearly identifiable to aid in wayfinding.
- Entry size and scale should be appropriate to the program housed within the building.
- Front entries should have covered "porch" and clear threshold.
- Main entries should always be ADA compliant.

fenestration

- Composition is used to relate the image of the building to other buildings on campus. Relating materials, details or building elements to a common palette is critical to the continuity of the campus character. Evolving typical campus conditions through the filter of technological advancements is important to the advancement of the campus character over time.
- Building fenestration should generally be subordinate to wall-dominated facades.
- Increased glazing is encouraged on public elevations, at building entries or for views.

porches + arcades

Historically used for mitigating solar heat gain, these elements are easily translated from historic construction methods to more contemporary methods and forms. They

Kimo Theater - Entry

continue to be important elements for basic building sustainability. They will relate new construction to the architectural language of the region and are almost always highly regarded for their function and character.

Other elements, such as towers, large glazed openings and roof forms serve to mark important campus nodes or terminate campus views. These used in conjunction with porches and arcades reinforce the overall campus hierarchy while creating architectural richness.

shading devices

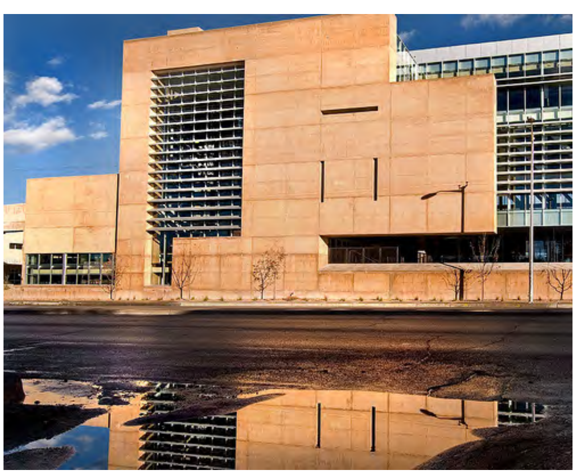
Shade for functional areas is critical in a desert climate. The use of shade devices can reduce energy costs and increase worker comfort levels and therefore productivity. These elements can also add scale to building facades and mitigate the mass of large buildings. They can define building and open space boundaries as well as pedestrian routes.

Freestanding devices, such as arcades, provide shaded cover between buildings. Attached devices shade the building interior and can shade the exterior perimeter as well. The play of light and shadow rendered from shade devices provides inspiring temporal sculpture on building and ground surfaces. It is a source for invention in creating a realm that transitions between indoors and out. Shading strategies for exterior building surfaces are exposure specific and can vary on each building. For southern exposures, horizontal shelves, louvers, or screens, brise soleil, exterior walkways, etc. are appropriate. East & West exposures should include vertical or brise soleil to reduce low and high angle solar angles. Northern exposures should include primarily vertical openings to reduce low angle solar gain. Daylighting can be taken advantage of by incorporating light shelves into the building envelope which allows natural light to penetrate deep into a building by reflecting light off the ceiling. Light may be bounced off a south-facing wall into a north-facing exposure; however, care must be taken to reduce highly reflective surfaces which can cause glare.

materials + colors

The exterior of the buildings should be textured and colored sympathetically to include the range of natural earth colors found in New Mexico. They should also provide a consistent look and feel to the campus.

1. Distinctive material palettes may be used by campus zone.
2. Brick.
3. Traditional stucco or cement plaster or metal should be used as primary building materials.
4. Concrete/stone.
5. Metal accents and ornaments juxtapose well with monolithic masonry construction.
6. Glass.

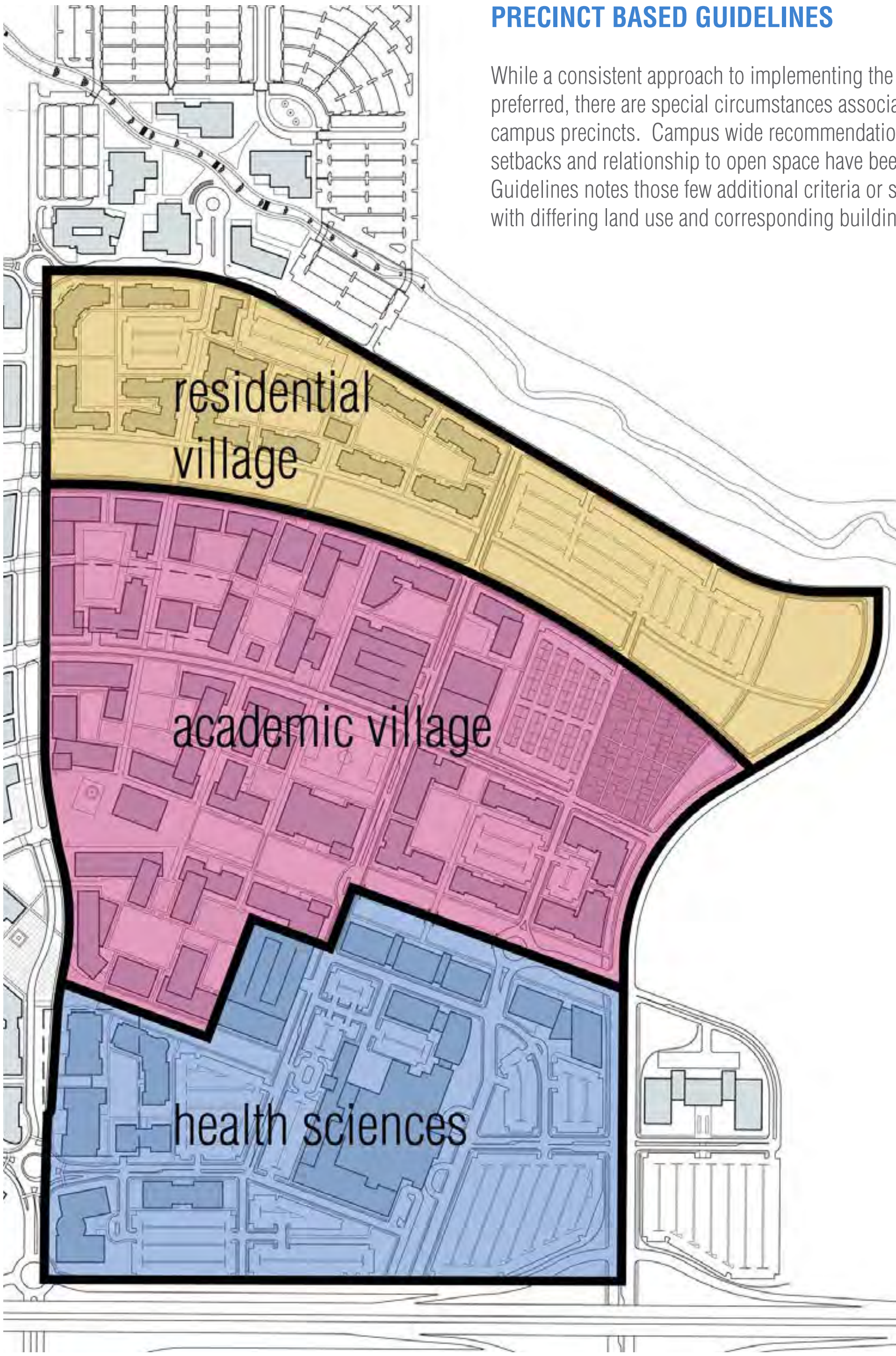


UNM School of Architecture - fenestration

UNLV - porches + arcades

PRECINCT BASED GUIDELINES

While a consistent approach to implementing the overall campus framework is preferred, there are special circumstances associated with each of the three major campus precincts. Campus wide recommendations for building character, height, setbacks and relationship to open space have been articulated. This section of the Guidelines notes those few additional criteria or special circumstances associated with differing land use and corresponding building types in each precinct.



academic village

The Academic Village contains the heart of the overall Campus Plan; the Plaza and its connection to the city side and Mall with its iconic mountain view. As proposed by the Implementation and Phasing schedules, defining this core from the outset of campus development is essential. This space will define the identity of UNM West. The first campus building now under construction will form the north edge of the Plaza. Subsequent development will occur on a block by block basis to infill the precinct, form the edges of the mall and create the fabric of quadrangles and courtyards that distinguish this part of campus.

plaza - The Plaza's form is dictated by the geometries of the view corridor and University Boulevard and Crescent Drive. The first building mitigates the geometric shift between being perpendicular to University Boulevard and parallel to the View Corridor. The building forming the south edge of the Plaza is perpendicular to University Boulevard and south of the intersection with Crescent Drive. This allows views into the Plaza from the intersection and city side. The Plaza should in fact be designed to visually connect across University Boulevard to connect town and gown. A future landmark building will form the east edge of the Plaza and terminate the west end of the Mall axis. A large covered "front porch" creates a campus hub from which to enjoy the iconic mountain view.

mall - Subsequent buildings along the north side of the Mall will be parallel to the view and spaced 200 feet from those lining the south side. Where the Mall intersects Cross Campus Boulevard, to the east, the spacing between buildings will increase to 240 feet. Two tower elements on the west side of this intersection mark the shift in width and will serve to frame the view from the Plaza. The main vehicular entrance to the campus is marked by a gateway at the east end of the Mall. This entry drive will provide added visual exposure to the major iconic elements of the campus. A traffic circle with a ceremonial fountain will disperse traffic to the north and south and act as a campus threshold.

quadrangles + courtyards - Within the Academic Village, the open space network is composed of connected quadrangles and courtyards. The intent is to provide a variety of sizes, shapes and sectional qualities. Quads are the larger of the two types; they work at the scale of the block, and are generally composed of soft-scape elements. They vary in dimension from 150 feet to 250 feet. They may be terraced to accommodate topographic shifts and are mostly contained by surrounding buildings. They may have a formal tree alignment around the perimeter or a more informal spacing of trees throughout the quad.

Courtyards are smaller, contained largely in half blocks or less. These are characterized by more hardscape, but retain an oasis quality. Generally more formal in their composition than quads, they also should contain fountains or other sculpture as focal points. They vary from 100 feet to 200 feet in dimension.

Academic building type

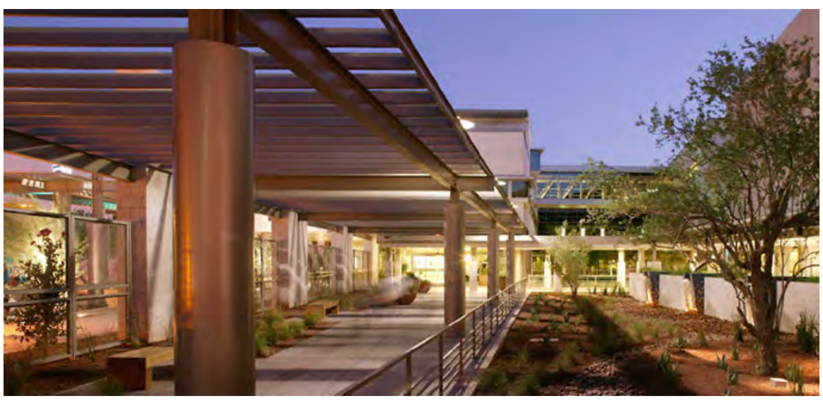
Academic Village

Academic building type

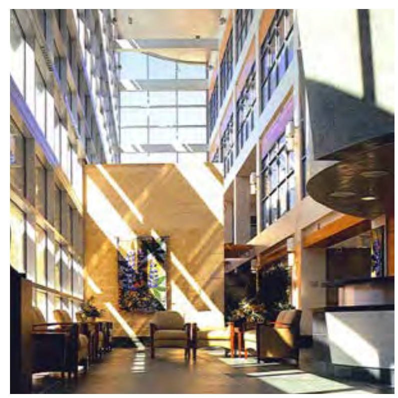
health sciences precinct

Due to the need for large expanses of surface parking associated with the hospital and medical office buildings; a clear, compact and connected open space framework is less possible. Pedestrian connections within the precinct, to the City Center and to the academic campus however should be legible. Clear and shaded pedestrian connections through the surface parking lots to building entries are critical in this zone. Mitigating storm water runoff due to so much surface parking will be necessary via rain gardens between parking bays, pervious lots where possible and in some retention areas.

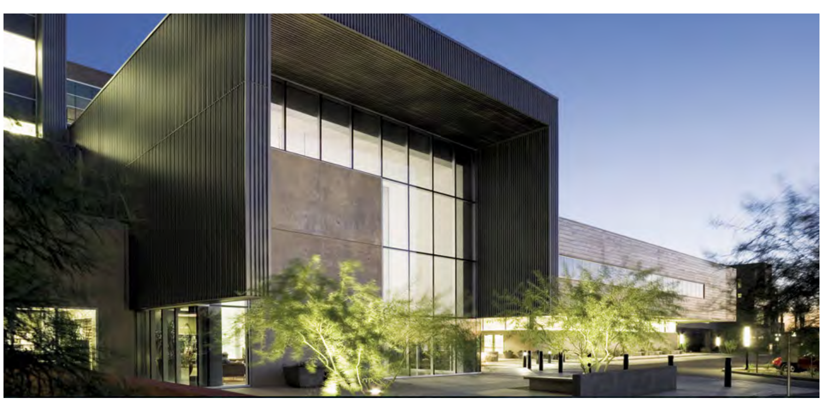
Massing of the hospital is another issue for this precinct. The complexity and size of a hospital can be overwhelming. The recommendation is to break down the mass of the hospital to the extent possible as the building parts correspond to different departments. Giving form and identity to the different departments will greatly aid in wayfinding and ease some of the stress involved with a hospital visit. Each entry, especially the main entry and emergency entry should have an architectural feature and be clearly identifiable; relying less on signage. Interior wayfinding is always an important issue as well and may be clarified with a memorable central lobby space that serves to orient visitors.



Banner Good Samaritan, Phoenix, Arizona



Crozer Cancer Center, Philadelphia



Banner Estrella, Phoenix, Arizona

Baptist Medical Center, Little Rock, Arkansas

residential village

Scale and proportion are particular factors to be considered when designing residential structures. The recognition of human scale is even more critical than in other building types. Residential courtyards are more intimate than those of the Academic Village. These spaces should be flexible in that they feel intimate enough for students to study independently as well as work well for hall parties and outdoor games. They should therefore be relatively flat and can help mitigate changes in slope. The courtyards depicted are relatively long and thin; with dimensions of roughly 120 feet by 350 – 400 feet.

Public program areas and entries should be clearly identifiable. These areas should be located along primary pedestrian paths or other public areas. Private areas and living units must be secure. Buildings should be 3 – 4 levels.

Since the majority of the Residential Village will be located on a north-facing slope, a greater percentage of glazing to solid wall is appropriate to allow more solar penetration.

Safe and well-lit pedestrian paths will connect to surface parking locations.

Hillside housing

Albuquerque courtyard housing

Residential Village

CAMPUS MAINTENANCE

pest management

1. Ductwork and photovoltaic systems on roofs should include deterrents (such as screening) to prevent nuisance bird roosting sites.
2. All window ledges and roof edges should be sloped a minimum of 45 degrees or other deterrents to discourage feral bird roosting.
3. All utility and pipe penetrations through walls or floors shall be sealed to deter rodent and insect access. This is a component of Passive Fire Protection requirements which should be adhered to.
4. All outside doors, trash room doors, custodial closets, food service doors, mechanical room doors, electrical room doors, telecom room doors and storage room doors shall have door sweeps installed to deter rodent and insect entry.
5. Cross-hatch drain covers in floor drains to reduce pest access.
6. All exterior vents shall have mesh screen installed to deter rodent and insect access.

trash rooms

1. For every 1,000 sq. ft. of gross building space, 1.5 sq. ft. is required for refuse storage, with a minimum size of 120 sq. ft.
2. State Health Department regulations require an enclosed facility for trash. Trash must be protected from the elements and free of rodent and insect harborage.
3. Trash rooms shall not have any utility, roof access or storage components incorporated into them. Additionally, recycling and hazardous waste shall be stored in other locations, not as part of the trash room or enclosure.
4. Trash room should have double doors from the outside loading area and either single or double (preferred) doors from the corridor into the trash room. All doors to have drop down door stops installed as well as door sweeps to deter rodent and insect intrusion. A roll type curb or reasonable street access should also be provided.
5. Since refuse is placed and removed during dark hours, all exterior doors shall have a light installed above the door that is on a sensor for darkness.
6. Trash rooms shall have a separate power outlet.
7. Trash rooms shall have a floor drain directed to the sanitary sewer.
8. Trash rooms shall have sealed non skid concrete floors only, heavily sloped towards floor drain.
9. Trash rooms shall have motion activated interior lighting or light switch located outside of both entries.
10. Trash rooms shall be ventilated.
11. Trash rooms shall have a fire extinguisher at both door-ways.
12. Walls of the trash rooms shall have 16 gauge stainless steel installed on all walls a minimum of thirty-six (36) inches off the floor to protect walls from damage and to deter rodent and insect activity. The stainless steel shall be caulked along all edges. (Stainless steel is the most cost-effective, but concrete or block walls are acceptable).
13. Interior trash rooms shall have both a hot and cold water supply available for cleaning purposes.
14. Trash enclosures located on the exterior of the building shall be located within twenty-five (25) of a doorway, have adequate lighting and have both a hot and cold water supply within fifty (50) feet for cleaning purposes.

loading dock

1. Loading dock needs an exterior hot and cold water source.
2. Loading dock shall have a drain to sanitary sewer.
3. Rubber bumpers should be installed on all docks to deter damage to the facility and vehicles.
4. Adequate lighting shall be installed since dock areas are heavily used at night and early mornings.
5. Loading docks shall be constructed of non skid concrete floors only.

custodial services main storage

1. Storage room shall be 225 sq. ft.
2. Storage room should be adjacent to the Trash Room, near loading dock.
3. Double door entry from corridor.
4. Storage room shall have a hot and cold water source.
5. Storage room shall have power receptacles for recharging electric powered equipment.
6. Should have adequate shelving for storage of 5 days worth of supplies.
7. Top shelves should not be higher than five feet from the floor and be at least 2 ft. deep.

custodial services closet

1. Standard size for custodial closet is 80 sq. ft.
2. Custodial Closets are located on each floor.
3. Custodial Closets should have a floor mounted mop sink with a 2” drain.
4. Custodial Closets shall have power receptacles.

custodial services building cleaning

1. Restrooms shall have hot and cold water outlets in vandal proof enclosures, and floor drains.
2. Restroom design should have the trash located next to the sinks. It is desirable to have 'under-the-counter' trash receptacles between lavatories to prevent water spotting and reduce slip and fall incidents.
3. Restrooms should have ceiling mounted partitions and wall mounted fixtures.
4. Paper towel dispensers or air blowers should be located as close to the sinks as possible to prevent water spillage and trash on the floor.
5. Custodial areas and mechanical rooms should have a sealable concrete floor only.
6. Areas with tile and grout should use gray (gray is a typical color for on-the-job mixes for large jobs) or beige grout, and light colored tile to lessen water spots. Grout eventually turns gray with time and cleaning chemicals anyway. Areas required to have white grout in high use areas should consider epoxy grout.
7. No carpets should be installed in food service areas. Chairs should be plastic.
8. Electrical outlets should be located in all hallways, rooms, closets, stairwells and classrooms.
9. Whiteboards are preferable to chalkboards.
10. Roof supports should be provided as tie-offs for window washing crews for buildings above 2 stories.
11. All bathroom dispensers such as for soap, toilet paper and towels, will be owner supplied and installed.
12. Building project to supply all interior trash receptacles and walk off mats.
13. Bathroom doors shall be push types with no doorknobs or handles for sanitary purposes.
14. The use of carpet squares is preferable. Rolled goods have a minimum of 13% waste and cannot be properly stored or transported by maintenance personnel.

PARKING

parking structures

Parking structures provide a higher density in specific locations around the campus, free up land used by surface parking for either new buildings or open space, and are convenient locations for accessing the University shuttle system, which would serve the campus and surrounding communities. Structures are generally a costly solution to the parking problems on campus but should be considered as a component of a well thought out transportation demand management plan.

Minimum parking standards for student housing will be one space per unit for family housing and one space per four bedrooms for single students. Parking lots and garages may contain standard and small vehicle spaces. No minimum parking stall size is established. The standard size to use in design planning for standard vehicle space may be approximately 8.5 feet in width and 19 feet in length.

on street parking

On street parking should accent the streetscape, but not impede pedestrian movement. It should assist in using and accessing businesses and buildings, but not slow down the intended traffic flow.

temporary parking lots

While temporary facilities are discouraged, due to the need for temporal parking lots during the establishment of the university, temporary lots may represent the only viable alternative for short-term occupancy. Temporary parking should be designated for a specific length of time and the need and time frame should be evaluated.

INTRODUCTION

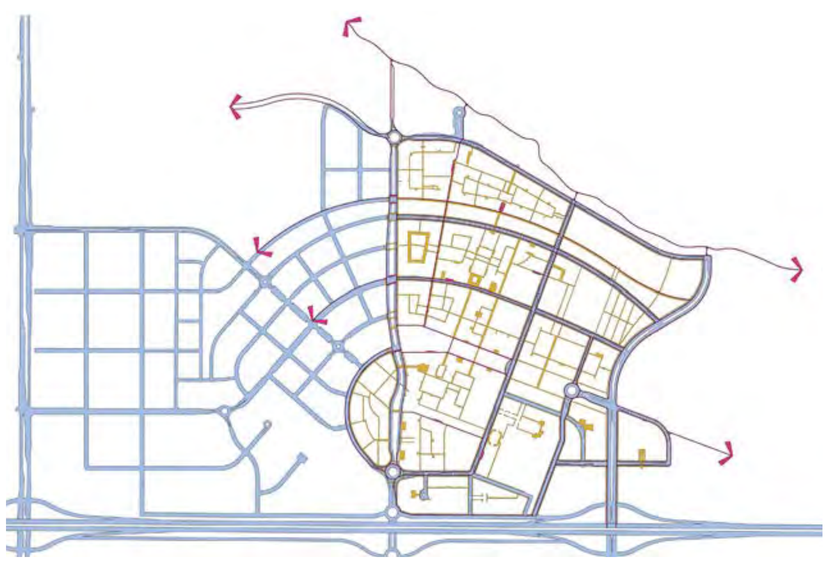
In the tradition of the southwest, the primary campus circulation routes for pedestrians will be composed of walkways, paseos, plazas and courtyards. Within this system, the pedestrian can move throughout the campus in a relatively structured and sheltered manner protected from both sun and wind. The UNM West in Rio Rancho campus is first and foremost designed to be walkable and pedestrian friendly. Pedestrian paths are laid out on a modified 200' grid. Major and minor campus open spaces are seamlessly connected through pedestrian walkways. Connections to town, to CNM, to the hospital and throughout campus are many, providing clear orientation and navigation for cars, bikes and pedestrians. Careful consideration has been given to the street layout and its ability to efficiently move campus users to their destination without creating traffic congestion or conversely, dangerous cut-throughs. Major pedestrian pathways are independent from the street network so as to minimize pedestrian/auto conflict.

Access to the Rio Rancho City Center and UNM West Campus is currently quite limited and will remain so in the medium term. Paseo Del Volcan is expected to become a state highway at some point in that timeframe, therefore limiting opportunities for multiple entries to the overall site (see transportation report for more detailed description). The 30th Street/ Paseo Del Volcan intersection will be the main access point into campus. The preferred access to City Center will be off of Unser Boulevard north of Paseo Del Volcan. This planning process proposes a third access point at **University Boulevard** and Paseo Del Volcan which would add much needed capacity and greater efficiency for accessing the future hospital in particular.

The Circulation Network exhibits the hierarchy necessary to move large numbers of people from place to place. From **primary** roads to natural trails, this variety of streets and paths will provide future campus users with many options for efficient travel in an elegant, stimulating environment.

Over time, traffic demand reduction strategies should enhance the pedestrian feel of the campus through more transit opportunities, regional bike routes, more on campus housing and parking concentrated at the perimeter in decks instead of in large surface lots.

Site Access



Circulation Network

ROADS

The campus road network is comprised of three basic functional types: primary, secondary and service roads.

Primary roads form the general boundaries on each side of the UNM West campus. Paseo Del Volcan on the south is a major regional connector for the site. 30th Street and University Boulevard will provide access to campus from the east and west respectively. 34th Avenue will eventually become an important east-west cross street on the northern edge of campus. University and 30th are both designed with a central median, however the intent for that median is very different between the two. The 30th Street median will help to create an aesthetically pleasing canopied boulevard, but it will also serve to restrict left hand turn operations into campus. The 30th Street median will be consistent in its 10' width and can be used as a small to moderate area of refuge for pedestrians crossing the street.

University Boulevard on the other hand is designed as a generous linear park that will connect CNM to UNM and beyond, to the south edge of our site. Its broad central green will also attract activities and people across from campus to town and visa versa. Its width will vary from a minimum of 20' up to a maximum of 80'. Its widest locations will occur along the four blocks north of City Hall up to the site's ridgeline and along the block south of City Hall down to the south crescent intersection. These areas will be usable parks with various user amenities contained within. They will serve to create an identifiable place beyond that of just a linear street. Well-formed town and campus edges will create an appropriate streetscape enclosure to these spaces distinct from the civic plaza area around City Hall and the UNM West Campus West Gate Plaza. (see 3.3 Precincts and Key Elements)

Secondary roads are important connectors between parts of campus, CNM, town and hospital. They are designed for local traffic moving within the town and gown boundary. Despite a rather dense campus and town plan where walking should be easy and efficient, there will be some need to drive between districts. These will be two lane roads with a the need for an occasional left turn lane.

Service roads will be treated to appear as pedestrian areas, however they will be properly sized and appointed for loading docks, waste removal and emergency vehicles. Removable bollards may be used in order to limit access for real campus need only. Indeed some pedestrian pathways will need to fulfill some service requirements. Maximum width for service roads should be 16'.

road sections

university boulevard

“University Boulevard” is one of the most important elements of the UNM West campus. It runs north/south on the west side of campus and it is the common border of both City Center and Campus. It will be a major access point into the city as well as the main route to the Central New Mexico Community College.

The Boulevard is the transitional zone or “zipper” between the campus and the city. It will act as a link between the two places. It will illuminate the differences of each place, as well as attract and direct people to appropriate gateways and entries.

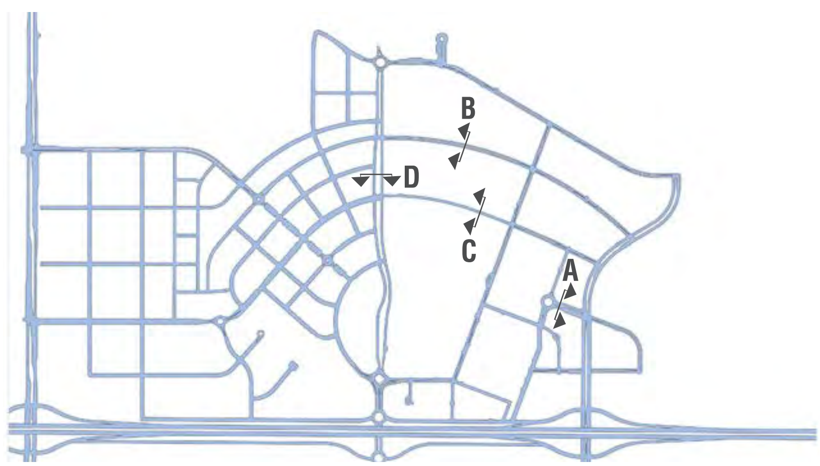
Ground floor uses along this space should be pedestrian oriented; buildings should be mixed use.

streetscapes

Streetscape landscaping includes areas along the edges of the street, next to the sidewalk, within the street median, and including the interiors of the roundabouts.

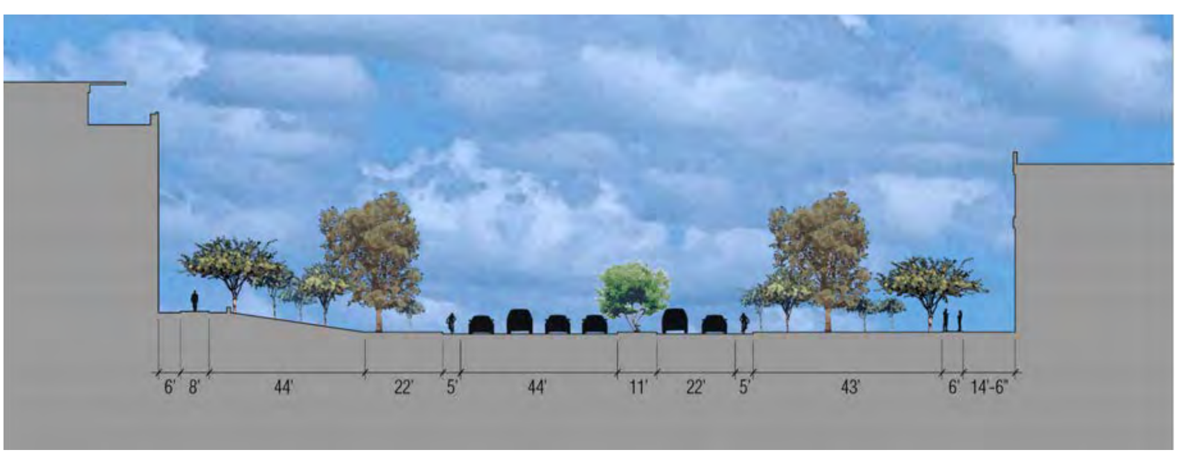
Water should be harvested from the streets into the medians. Vehicular traffic can be directed by the landscape aesthetic and landscape identity.

The plant palette is a native high desert grasslands planted with native seeding and enhanced by some shrubs. This would include low growing street trees both deciduous and evergreen. There would be shade trees used to punctuate specific areas. All should be irrigated for establishment with temporary irrigation.



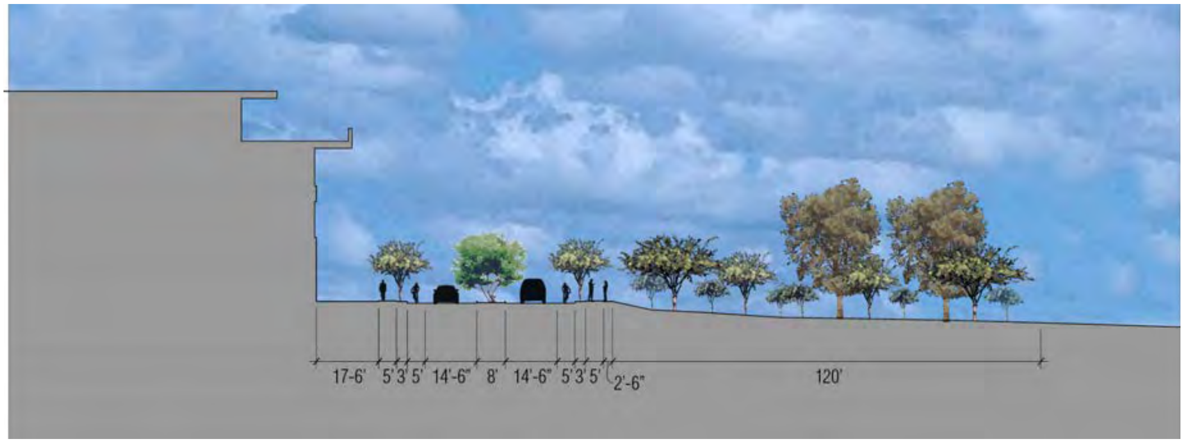
Street Network

Street Section A



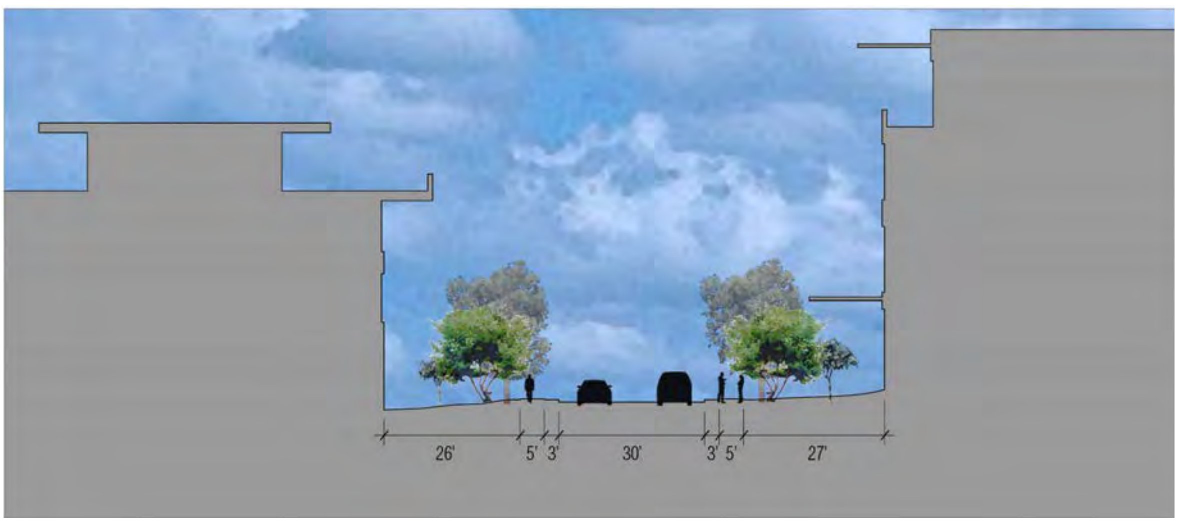
Entry drive looking east

Street Section B



Ridgeline looking west and typical minor arterial

Street Section C



Typical local street

Street Section D

Center boulevard

PARKING

Early and mid-phase campus build-out will be supported mostly by surface parking. The immediate access to available land makes surface parking the fastest and least expensive choice.

However, proper foresight will dictate the understanding that current and short term surface parking lots are the building sites of the future. With long term planning in mind, it is imperative to site buildings and associated parking lots such that future growth will be accommodated. It is important to understand the dimensional needs of future buildings and parking decks when laying out the site plan for a new building in the short term. Do not site a new building surrounded by surface parking lots such that the dimension between roads providing access to the building and the building itself is not wide enough to accommodate a future building or parking deck with minimal setbacks.

Surface parking lots should be designed to maximize utilization while working to minimize stormwater runoff and heat island effects. The use of shade trees and rain gardens between parking bays and potentially between stalls is recommended. Pedestrian circulation routes should be clearly identifiable and work with landscape elements. Parking berms should be used at surface lot perimeters. They provide a pleasant landscaped street edge while masking parked cars beyond. The use of pervious material for parking lots should be considered where possible (see recommended plan and section for surface parking next page).

If and when parking decks are implemented on the UNM in Rio Rancho campus, several issues should be considered:

Photovoltaic shade structure.

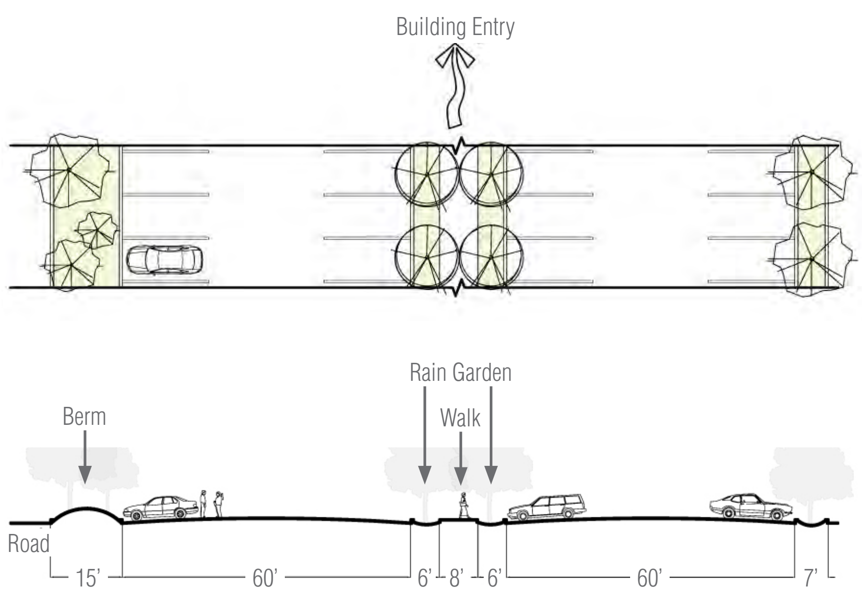
Shaded surface parking.

Rain garden.

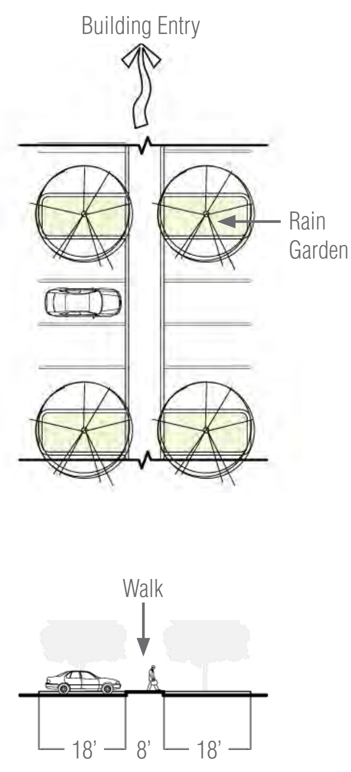
1. Location and size. Site parking decks predominantly at the perimeter of campus. This will reinforce the pedestrian oriented emphasis to campus by getting users out of their cars at the edges, leaving the campus core car free. Site decks along major campus access routes to facilitate ease of traffic movement. Space decks throughout campus to promote an even distribution of traffic and ease of access from the east, west and north (see parking map next page). Size decks appropriately to balance maximum capacity with need, road capacity and cost.

2. Existing topography. Utilize the existing slopes of the site in order to minimize the visual impact of parking decks on the landscape. Partially burying decks into the natural slope will significantly reduce their perceived mass. The specific campus area immediately east of the City Hall parking lot is 25'-30' lower than the lot. This area presents a prime opportunity to build a large capacity deck at the lower grade and architecturally connect both sides (see prototypical garage sections next page). Accessibility issues related to existing slope conditions may be architecturally mitigated using buildings' and parking decks' vertical circulation to connect varying site elevations.

3. Usable roof deck or PV sun-shading devices at top level. Partially burying a parking deck as discussed in the previous point can create the opportunity for a usable open space on the roof. These plazas would have a mix of soft and hardscape. Larger trees and vegetation are also possible with proper engineering. This parking type clearly pushes cost considerations into forefront, but where possible has the ability to create a self-sufficiently built-out block with great amenities.



Recommended plan and section for surface parking.



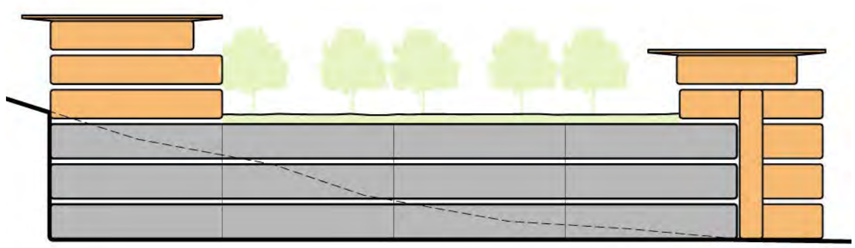
Alternate plan and section for surface parking.

4. Another parking deck rooftop option is to outfit the upper level with photovoltaic sunshades (see prototypical garage section - rooftop photovoltaic shade and ASU image). This alternative is being widely applied across the southwest. The surface area of a parking deck rooftop provides the ideal location for PV's.

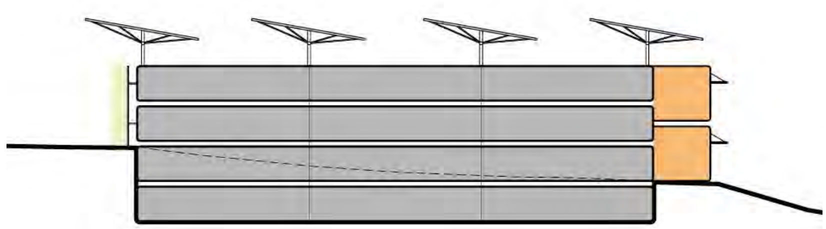
5. Parking deck wrapper. A number of methods exist to mask the potentially undesirable parking deck elevation. These range from using architectural materials and composition to make the deck appear more like a building to totally wrapping the deck with a building. Venting requirements need to be considered when wrapping with a building. Green walls, scrim walls and art installations among many others are compelling and less expensive devices for screening a deck (see wrapped parking deck and green roof image).

Wrapped parking deck and green roof.

Solar rooftop panels @ ASU..



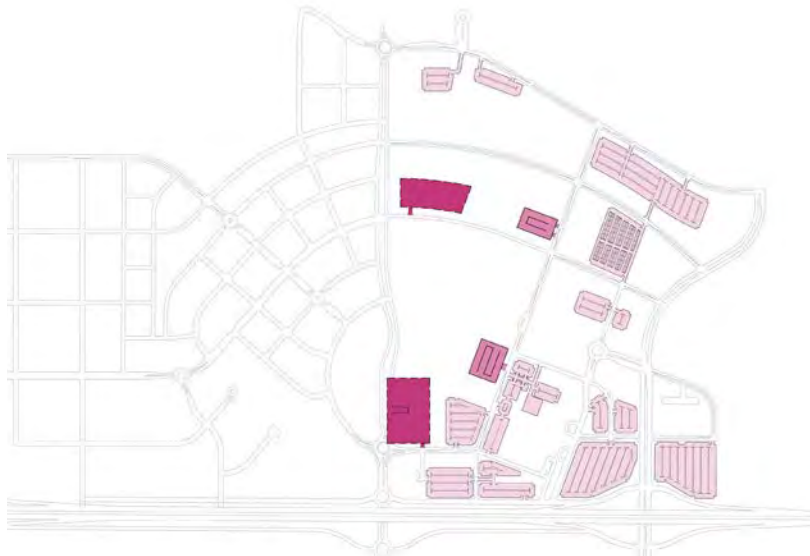
Prototypical garage section - Rooftop green space.



Prototypical garage section - Rooftop photovoltaic shade.

parking plan layout

The diagram at right illustrates partially underground decks (darkest color), above grade decks (medium color) and surface parking lots. As the intent of the overall density of Rio Rancho City Center and UNM West is to be urban in character, parking decks will become a necessity closer to the core as shown. Partially underground decks take advantage of sloping topography as previously described. The diagram also illustrates the desire to keep the academic core car free. A "park once" atmosphere is desired, even when spending time in town as well as in City Center.



Parking plan

TRANSIT

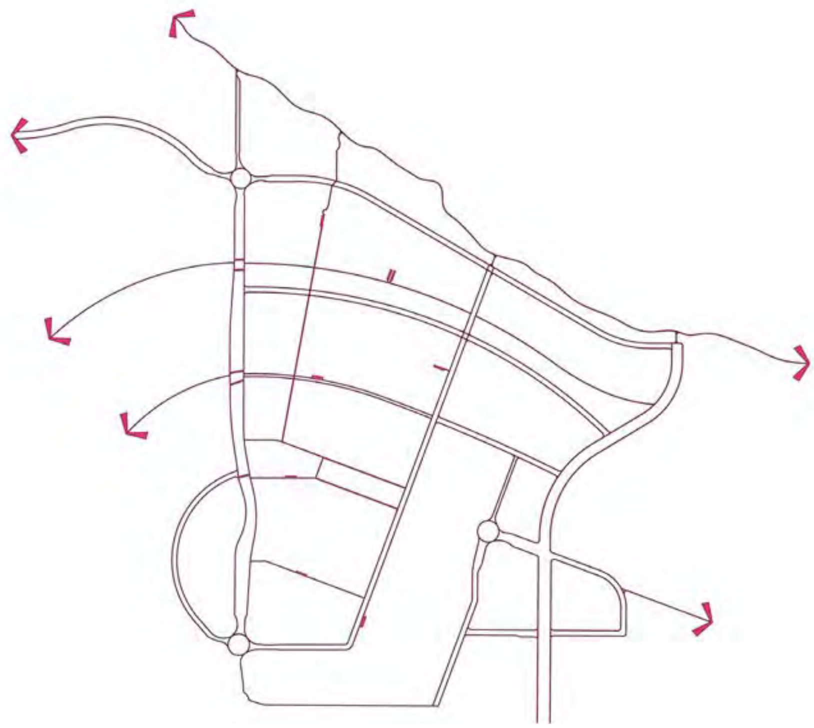
The plan advocates for a dual-direction loop campus shuttle system that would connect to regional bus service. The hope is eventually for a spur from the Rail Runner in Bernalillo to the Rio Rancho Town Center as well with a new rail station just north of the Paseo Del Vocan right of way. The proposed ten stop shuttle transit loop would travel along University Boulevard, east to the main entry of the hospital, north through the academic village, over the ridge into the residential village, west, along the southern edge of CNM's campus and south again on University Boulevard.

Size and frequency of the shuttles will need to be determined in a separate study. Implementation will undoubtedly not occur until a critical mass of students, staff and faculty are on site to demand such service. Buses will burn clean energy and be ADA compliant. Transit stops should be similarly accessible, provide seating and protect users from rain and sun. A student pass program should be implemented that would provide free access to campus shuttles as well as regional transit.

Transit loop map

BICYCLES

It is expected that bicycle use will greatly increase on the campus as academic, research facilities and student housing outpace the growth of on-campus parking. Bicycle traffic should be primarily carried in dedicated bikeways or in lanes adjacent to auto traffic lanes. To develop a clear system that works for cyclists and pedestrians and minimizes conflicts, the Guidelines require that pedestrian corridors be visually distinct and physically separate from bicycle, auto and transit corridors. Bicycle, auto and transit corridors should be paved and separated from sidewalks and open spaces by curbs, landscape buffers and bollards. Pedestrians should cross bike routes at clearly designated, labeled crossings with pedestrian paving and yield signs for bikers.



Bicycle Paths

PEDESTRIAN

The Academic Village is largely road free except for the north-south street connecting the hospital with 34th Avenue and the minor east-west service road. This zone will see the most foot traffic, so efficient connections are vital.

The pedestrian circulation network is a modified grid system. Major paths clearly connect north-south and east-west and are often marked with architectural features that aid in orientation. They occur along and through major campus spaces. Major circulation emphasis will be around the UNM Plaza and Mall, as this will be the heart of campus. Secondary pedestrian routes are part of the open space network as well. Walks are designed to link campus to CNM, City Center and to a regional trail system.

Pedestrian Paths

INFRASTRUCTURE

The principle objective of the campus utility system should be to provide the necessary services in an energy-efficient and cost-effective manner. The location and design of above ground facilities should consider aesthetic impacts. Use of landscaping and wall screening, and rooftop and basement locations out of sight from major open spaces and pathways is encouraged.

The following infrastructure and utility systems may be needed for the UNM Rio Rancho Campus immediately or into the future:

WATER

supply and distribution

The use of groundwater to supply the campus water needs is considered viable from either on campus wells or from the City of Rio Rancho. This source may be supplemented in the future by use of recycled water generated on campus or supplied by a municipal/regional water reclamation facility. These supplemental water supplies would be used for non-potable water uses such as toilet flushing, cooling tower use or landscape irrigation. The sources of groundwater will either be from the City's municipal system or from new wells developed, likely owned and operated by the City or UNM Rio Rancho. The development of the groundwater supply should be phased to meet the needs of the developing campus. Adequate lead-time in its development should be provided to ensure that this source would only be available when needed by the campus. If the campus does not develop its own groundwater supply, then it would require coordination with the groundwater management plans for the City of Rio Rancho.

potable water

The campus should have a municipal type potable water distribution system. It should consist of an interconnected network of underground potable water mains fed from one or more of the water supply sources discussed above. It should be sized to provide the expected domestic and fire flows of the campus with the high degree of reliability expected at a major research university.

Service to all facilities should be metered to help manage campus supplies and inform the design of future facilities. Metering should augment the energy performance monitoring system in making the campus physical facilities a "living laboratory" for study of engineering and resource conservation.

wastewater collection and treatment

The campus wastewater should initially be conveyed to and treated by the City of Rio Rancho's Wastewater Treatment Facility. A long-term agreement should be considered between the University and the City in regard to wastewater treatment.

This treatment option may be modified in the future by the addition of an-site or off-site recycled water treatment facility that benefits both the campus and University Community. It is anticipated that this facility would become necessary if the campus needs a source of recycled water to augment its other water supplies or if it needs a source of recycled water in future environmental science and engineering research programs. The size, siting, and

process design for this facility would be determined as part of a future phase of campus development.

The campus should have a gravity sewer wastewater collection system. It should consist of a branched network of underground gravity flow sewer laterals on the secondary streets of the campus that discharge into a main gravity sewer on one of the main streets of campus.

Wastewater flows should also be monitored to help manage campus operations, and inform the design of future facilities. Metering could augment the energy and water supply level monitoring in making the campus physical facilities a "living laboratory" for the study of engineering and resource conservation.
Recycled Water Supply; there may be significant water demands for interior irrigation uses on the campus. This and other non-potable water demands may be met by the addition of an on-site recycled water treatment facility. Recycled water mains and laterals should be installed concurrently with other underground utility systems to distribute recycled water throughout the campus.

Storage facilities may be located in conjunction with stormwater detention facilities. The recycled water distribution system's development should be phased to meet the needs of the developing campus.

stormwater management

The stormwater management system should be designated to mimic the natural hydrologic regime to the extent practical. It should consist of a branched network of underground gravity flow drain lines on secondary streets that discharge to one of the detention basins located throughout the campus. Wherever possible, swales, filter strips and other Best Management Practices should be used upstream or in conjunction with the gravity drain lines to reduce times of concentration and to improve stormwater quality. The storage and non-potable reuse or water should also be considered a high priority.

Stormwater conveyance and detention facilities should be designed based on post-development runoff from a 10-year, 24 hour storm event. Stormwater treatment methodologies should be employed to satisfy local, state and federal water quality requirements.

POWER + FUEL

Electric power should be supplied from both off-site and on-site sources. On-site power sources should be developed when prudent in consideration of several issues. To augment power reliability, on-site power must have stand-alone capability and the campus must have good control over the electric distribution system and/or good load management capability. On-site power must have low pollutant emissions. The existence of significant cogeneration opportunities is desirable for gas-fired systems to achieve a net environmental benefit. It is undesirable to install systems that will preclude the adoption of more efficient or lower pollution technologies as they become available during later stages of campus development. Potential systems must be manageable with respect to economic risk associated with volatility in fuel or electricity prices or regulatory hurdles.

Opportunities to develop appropriate on-site renewable forms of power should be explored. This could include photovoltaic (PV) systems installed on campus buildings or other structures. Low-emission and high-efficiency gas-fired cogeneration systems including fuel cells should also be continuously evaluated for application on campus. It is also anticipated that certain specialized research facilities and critical communication systems as well as the hospital may be provided with their own source of emergency back-up power in the form of local, engine-driven generator sets.

The campus should be fed power by means of an underground system of power cables installed in a network of underground duct banks, utility tunnels, electric manholes, and possibly a substation. This duct bank network should be located under roadways and pedestrian paths.

Power consumption in each building should be monitored as a part of the extensive energy performance monitoring system. This monitoring system would allow optimization and continuous improvement in campus operations and provide better information that is normally available for the design of future laboratories and other facilities. The energy performance monitoring system should play a key role in the campus efforts to continuously evaluate and enhance environmental stewardship efforts.

1. Electric Power Supply, Control and Distribution
2. Natural Gas Supply, Control and Distribution
3. Emergency Power Systems
4. Photovoltaic Systems

CENTRAL CHILLER PLANT

The development of a centralized chilled water generation concept requires selection of an optimum plant site, determination of the buildings to be connected, establishment of the aggregate cooling load, consideration of the plant capacity, and identification of potential distribution piping routes.

The chilled water load associated with the central chiller plant option should be developed by combining the cooling loads of the facilities connected. Because of building variances in occupancy, function, and campus shading, facilities will not experience simultaneous peak load requirements. The difference in the occurrence of individual peak cooling requirements is considered the system diversity. The more buildings connected to a central system, the greater the diversity of the load.

The peak load of the central chiller plant can be established by summing the individual peak cooling load of each building connected and multiplying by a diversity factor. The total cooling requirement (ton-hours) is calculated by adding together the total cooling usage of each building on the system. With the establishment of the monthly peak load and the total cooling usage for each month, the central chiller plant load profile can be developed. Based upon the projected load requirements the plant chiller capacity can be established.

Annual electric cost projections can be calculated by applying the chiller efficiency and utility rate structure to the load profile. Significantly lower maintenance and labor costs can be realized with a central system, because the equipment is centrally located, comprised of fewer units and can be more easily maintained.

The capital expenditure associated with a central plant consists of the cost to construct the plant, install the distribution piping, and connect the buildings.

PLANT NODES

1. Central Heating and Cooling Systems
2. Underground Utility Tunnels
3. Chilled Water Supply and Distribution
4. Hot Water Supply and Distribution
5. Laboratory Gases Supply and Distribution
6. Chilled Water Thermal Energy Storage
7. Low-Emission Cogeneration Systems

COMMUNICATION + INFORMATION SYSTEMS (IT)

Campus communication and information services could include infrastructure support for:

1. Data Networking Systems
2. Telephony
3. Cable and Satellite Systems
4. Distributed Learning Systems
5. Energy Management Systems
6. Supervisory Control and Data Acquisition
7. Public Safety Radio
8. Public Safety/911 Dispatch
9. Security and Access Control Systems
10. Irrigation Control Systems

Central Chiller Plant - Phase 1 + 2.

The technologies employed in these services are changing rapidly. The selection and design of equipment for communication and information services should be performed towards the end of the construction phase for each phase of campus development. This could allow the campus to select the most up-to-date equipment and benefit from the most recent advances in technology.

Each campus structure should have sufficient equipment rooms, closets and/or cable pathways to meet its existing and future communication needs.

The development of the underground communication duct bank system should be coordinated with the development of the other underground utility systems so that planned utility corridors are established throughout the campus. The development of this system would be phased to meet the needs of the developing campus.

EMERGENCY SERVICES

1. Fire Alarm Systems for Campus and Buildings
2. Security Alarm Systems for Campus and Buildings
3. Fire Suppression Services
4. Police Services

Stay bench by Landscapeforms
www.landscapeforms.com

- backed
- embedded
- powdercoat finish

Petoskey trash, litter, and recycle containers by Landscapeforms
www.landscapeforms.com

- silver powdercoat finish

Ring bike rack by Landscapeforms
www.landscapeforms.com

- stainless steel finish
- Ring bike rack is 100% recyclable.

site furniture

Great care and thought must be taken when selecting site furniture, such as seating, tables, trash receptacles, bicycle racks, bollards and other elements that support and improve pedestrian comfort. If appropriately selected and placed, furnishings can add to campus coherence, legibility, way finding, and sense of place.

To unify the campus and develop environmental identity, furnishings should be limited to a kit of parts, a series of coordinated pieces of like materials, forms and colors. Furnishings should be selected for their proven durability, sustainable use of materials and relative simplicity (lessening the probability that the style becomes dated).

The guidelines provided below describe the furniture, then address their use and application. Site furniture may be allowed variation on a case-by-case basis if artist-designed or if a significantly unique option is sought.

seating

Campuses are social spaces. They are most successful and memorable when their design affords opportunity for a wide range of social interaction ranging from formal gatherings to chance encounters and quiet retreats.

Intimate seating niches throughout the campus can encourage informal encounters between students, the faculty and staff.

Seating opportunities at important campus gateways, building entries and intersections of walkways should be provided to encourage social interaction. Seating within plazas and other open spaces should afford a variety of exposures, orientations, and views. Benches should be located in conjunction with the landscape masterplan and should be anchored to a foundation pad.

Protect seating areas from winds and uncomfortable drafts. Locate seating in sun traps that enable greater use of outdoor areas in the fall and spring.

Seating walls are important design components within social spaces. Although somewhat expensive, their use should be encouraged to define the edges of spaces and to provide informal seating. Seat walls should ideally be 17-19 inches in height and should be slightly sloped at top to shed water.

The Edge Round Luminaire by Beta LED
www.betaled.com

- silver powdercoat finish
- approved fixture by the International Dark Sky Association.

Discera Solar by Se'Lux
www.selux.com

- metal halide bulb
- silver powdercoat finish

Linear element 8999P by Bega
www.bega-us.com

- #4 brushed stainless steel

Locate campus seating near areas where food is served. Make provision in selected seating areas for food carts and other vendors.

The recommended bench, Stay, has a recycled material content of 63% or greater of which 38% is post consumer and 25% is post industrial. Stay is 100% recyclable.

trash receptacles

There should be trash and recycling containers that are clearly labeled to distinguish them from each other. The recommended containers distinguish the two by their lids and signage.

Recycling in Rio Rancho is single source, so one container may be used for plastics, aluminum, newspapers, and other recyclables.

The recommended Petoskey Litter Receptacle has a recycled material content of 86% or greater. The post consumer content of the litter is 56% or greater and the post industrial content is 30% or greater. Petoskey Ash Urn has a recycled material content of 90% or greater. The post consumer content of the ash is 59% or greater and the post industrial content is 31% or greater. All litters and ash urns are 100% recyclable. Landscape Forms Panguard II (R) Powdercoat finish contains no heavy metals, is HAPS-free and has Extremely low VOCs.

bicycle racks

Concentrate bicycle parking in larger areas rather than dispersing parking at every building entrance. Locate bicycle parking to minimize visual impact, while still encouraging use and maintaining visibility (for personal safety and theft protection). Bicycle racks should be anchored to a foundation pad.

lighting

Lighting serves many roles at the university campus. It provides a safe and secure environment by illuminating areas used at dawn, dusk, and dark. Lighting emphasizes way finding signs and signals, and is used to accent and embellish buildings, greenery and related landscape elements. It is important that lighting be appropriate to its use, preserve dark skies and general night sky viewing, and comply with the university's design standards.

Lighting design (poles, fixtures, arrangement, and spacing) will vary with the application and light source. Each lighting component contains unique

Bollards
4229P, 8376P, 4230P, 8378P by Bega
www.bega-us.com

- #4 brushed stainless steel
- multiple height options available

Surface Wall lights
4090P, 4095P, 4096P by Bega
www.bega-us.com

- #4 brushed stainless steel
- multiple sizes available

In-grade fixture
8703P, 8708P, 8711MH, 8711P by Bega
www.bega-us.com

- #4 brushed stainless steel
- multiple sizes available
- suitable for wet locations

characteristics that can be used to obtain a desired outcome. Applications can convey hierarchy of significance and denote the clues as to desired behavior and the appropriate activity: *stay out, danger, enter, welcome, stay, use*. Aside from the appearance of the fixtures themselves, patterns and distribution of light can contribute to the ambiance of the campus environment.

The following general guidelines apply to the selection, design, and placement of all campus lighting:

1. Adequately address the personal safety requirements of students, faculty, staff and campus visitors.
2. Maximize energy conservation.
3. Restrict light trespass. All light sources must be fully shielded with no light emitted above horizontal and with hard cutoffs to limit light pollution.
4. Ensure that main entrances, major walkways and adjacent spaces are well lit. Avoid deliberate lighting of open lawn expanses between paths.
5. Minimize the difference between lighting levels in adjacent areas to prevent strong contrasts and shadows.
6. Eliminate glare to the greatest extent possible.
7. Recognize the relationship between lighting and other landscape features. The placement and design of outdoor lighting needs to be carefully coordinated with management of campus vegetation.
8. Recognize that uniform lighting is often more important than the amount of lighting when establishing the sense of a safe, well-lit area.
9. Lighting should serve as an architectural design element in the landscape setting in addition to its functional qualities.

Lighting types are described below as a function of their height and purpose:

uniform lighting

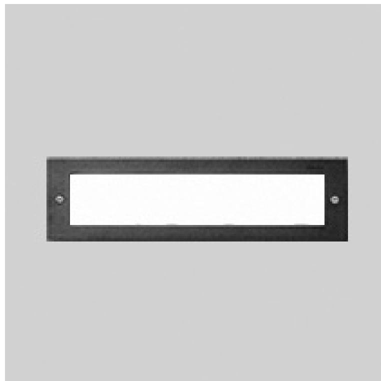
In order to make the campus a comfortable and safe place to be, provide uniform light levels for streets and sidewalks. Some areas may require several heights of lighting in order to evenly distribute light.

High-mount fixtures should uniformly illuminate large areas, whether it's a roadway, sports field, or parking lot. Heights range from 20-40 ft. and should blend in with the background. The maximum average-to-minimum light level ration is 3:1 to 4:1, providing uniform

Recessed wall fixtures 2804, 2804LED, 2814, 2814LED, 2815P by Bega

www.bega-us.com

- #4 brushed stainless steel
- multiple sizes available
- suitable for wet locations



Recessed wall fixtures 2284, 2284LED, 2289LED, 2289P, 2287LED, 2287P by Bega

www.bega-us.com

- #4 brushed stainless steel
- multiple sizes available
- suitable for wet locations

Lithonia Lighting KADT

www.lithonia.com

This alternative fixture has been proposed by UNM for use at the first building on the UNM West campus.

lighting across the street.

landscape lighting

Illuminating landscape vegetation, sculpture, and other significant features can enhance the ambiance on campus. Lit features should be located near pathways, walkways, and roadways.

pedestrian lighting

Pedestrian lighting includes all exterior lighting applications where people travel by foot or on bike along pathways, walkways, bikeways and roadways. Lighting systems must enable pedestrians to navigate paths as safely and securely as possible. Light levels on both the horizontal and vertical planes should provide uniformity to ensure visual comfort, visibility and safety. Medium-mount fixtures are used to provide additional lighting to sidewalk areas. Lower light output and height require they be located closer together to ensure uniformity of light distribution. Because they are closer to pedestrians these fixtures should be designed to fit the image of the campus.

bollard lighting

Bollards can provide safety, lighting, and reinforce the edge of a path or roadway. Bollards designed for emergency use and seldom used access lanes should be removable, allowing for easy removal by authorized personnel. Consistency throughout campus can enhance way finding and legibility.
Low-mount bollard fixtures illuminate items of interest on the street, such as signage or areas of caution. Bollards can be multifunctional, acting as a safety measure as well as illuminating paths and defining edges.

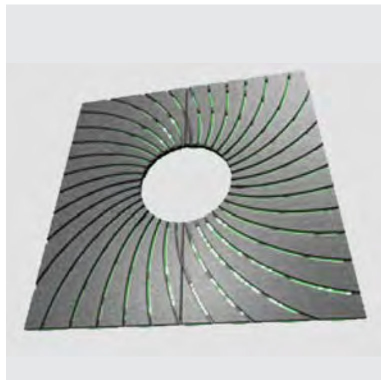
surface mounted lighting

Surface mounted fixtures are used to express building entries, accent architectural features and materials, and illuminate the area around a building.

Lighting can be recessed in stairways and walkways as a safety measure. These fixtures should not emit light above the horizontal, unless aimed at specific features.

Tree Grates
Viper by Urban Accessories
www.urbanaccessories.com

- 5' square or 6' square



Tree Grates
Bond Street by Ironsmith
www.urbanaccessories.com

- Iron
- 16" & 36" standard openings

tree grates

In an urban environment, street trees are subjected to much abuse. Tree grates protect roots of trees from walkers and also protect walkers from tripping over tree roots. The openness of tree grate allows stormwater runoff to hydrate the tree, but it does not allow much trash to fall inside. There are numerous kinds of grates from circular to rectangular. These square grates work well with landscaped edges and walks. Two varieties can be use to create some visual interest.

signage

Signs serve to identify facilities and other destinations, to provide direction to visitors and daily users, and to highlight special events. They supplement and add detail to campus way finding, ideally to confirm that the user is proceeding to the intended destination. The university should adopt standard facility identification signs, signs identifying departments within facilities, and campus map kiosks.

It is important that all signs function as part of the campus way finding system, beginning with directional signs along interstate routes and city streets, and continuing with campus maps in all parking structures, malls and quadrangles.

Information kiosks for daily users will be located in malls and quadrangles and at public information facilities (e.g. student union, bookstore, visitor center, ticket offices). Provide conduits for electrical power and telecommunication links to kiosks.

Facility design may include support for temporary signs and announcements (e.g. free standing, banners, electronic marquees).

paving

Open space paving includes sidewalk, roadway, and other corridor materials, as well as the surfaces of plazas, paths, and paseos. Pavement materials and patterns should be consistent along malls and within quadrangles.

A wide variety of materials, colors and finishes will be proposed for campus development in the future. One of the most important aspects to consider is the reflective quality of the paving surfaces. Surface finishes for concrete pavements should be matte finishes such as sandblasted, acid etched, broom finish, or exposed aggregate (1/4" – 3/8" aggregates). All of these methods will reduce the reflectivity of the material, regardless of color. Light integral color paving will reduce heat absorption more than darker colors. Cost effective, non-reflecting paving materials must be matched with aesthetically pleasing accents to identify primary circulation systems from secondary & tertiary walkways. A variety of alternatives in both pattern and finish are available to explore.

The use of pervious pavement (e.g. special mixes of concrete and asphalt, masonry units, and structurally reinforced soil and gravel) and sloping pavement to drain to landscaped elements is encouraged where appropriate to storm water management systems. Decomposed granite and other inert earth and stone materials may be utilized as pavement or planting material. However, the pavement structure must be fully ADA accessible. Pedestrian malls must include methods to guide visually impaired users.

Paving patterns may vary according to the location and use, such as:

1. Streets
2. Plazas
3. Sidewalks
4. Paths
5. Crosswalks

4.3 SPECIAL CONSIDERATIONS

unm sustainability initiatives

The University of New Mexico encourages a diverse campus culture that harmonizes UNM's sustainable goals of environmental protection, social equity, and economic opportunity within the context of its education, research, and public service missions.

The intention of UNM Rio Rancho's sustainability policy is to maintain healthy relationships throughout the network of interactions that satisfy the basic needs of health, shelter, food, and transportation.

american college + university presidents climate commitment

As a demonstration of this commitment, the University is an active member of the Association for the Advancement of Sustainability in Higher Education (AASHE) and the American College and University Presidents Climate Commitment. Presidents signing the American College & University Presidents Climate Commitment are pledging to eliminate their campuses' greenhouse gas emissions over time. This involves:

1. Completing an emissions inventory
2. Within two years, setting a target date and interim milestones for becoming climate neutral.
3. Taking immediate steps to reduce greenhouse gas emissions by choosing from a list of short-term actions.
4. Integrating sustainability into the curriculum and making it part of the educational experience.
5. Making the action plan, inventory and progress reports publicly available.

energy efficiency + conservation

1. Conduct building energy conservation retrofits
2. Incorporate energy efficiency goals in master planning
3. Fossil Fuel Choice
4. Switch or convert to natural gas
5. Renewable Energy
6. Install wind, solar, geothermal power
7. Use biofuels for fleet, heating, and other needs
8. Purchase renewable energy credits or directly
9. Carbon Offsets
10. Purchase or create carbon offsets

transportation

1. Use alternative fuels for fleet
2. Create walkable and bike friendly campuses
3. Provide incentives to use local transit systems
4. Provide education and incentives to students, staff, and faculty to drive less and use fuel efficient vehicles

water

1. Irrigation
2. Use water efficient landscaping
3. Domestic Water/Buildings
4. Innovative wastewater technologies
5. Water use reduction
6. Maximize efficiency within buildings to reduce burden on municipal water supply and wastewater systems
7. Reduce generation of wastewater and potable water demand, while increasing the local aquifer recharge

purchasing

1. Buy products with lower carbon footprints
2. Buy recycled products

campus food systems

1. Buy local, sustainably grown food
2. Encourage foods with lower carbon footprints

waste management

1. Reduce waste
2. Compost food waste
3. Recycle solid waste

education

1. Teach climate science and policy
2. Educate campus and wider community about climate solutions
3. Partner with communities and businesses to share climate expertise

outreach

1. Educate campus & community about climate solutions
2. Partner with communities and businesses to share climate expertise

research + development

1. Research climate protection policies and programs
2. Develop new energy and carbon capture and sequestration technologies
3. Research sustainable system design in buildings, vehicles, products, and industrial processes

Investment

1. Set up dedicated funds for sustainability
2. Use endowment to support innovation and discourage negative impacts

Sustainability and high performance buildings are no longer conceptual ideas on the fringe of constructing our built environment. Increasingly, the benefits of building in this way are being realized through real economic, public health, cultural and environmental gains.

Students coming to the University of New Mexico Rio Rancho will increasingly demand sustainable practices from the university. States and cities around the country are adopting policies that require new construction projects to meet minimum sustainable guidelines. University neighbors and the City of Rio Rancho will rely on the university for leadership in policy, research, and education.

LEED

The state of New Mexico by way of Executive Order 2006-001 “State of New Mexico Energy Efficient Green Building Standards for State Buildings”, issued by Governor Bill Richardson declares that all state agencies adopt standards to implement the use of high performance energy efficient green building practices for all state funded buildings throughout the state.

The order includes adoption of the USGBC’s LEED rating system and achievement of a minimum rating of “Silver” for new construction.

The US Green Building Council’s Leadership in Energy and Environmental Design (LEED) program is generally accepted as the benchmark for sustainable building. The LEED rating system guides the process through a thorough and understandable checklist.
LEED is also an objective performance-based gauge of environmental attributes of commercial and institutional buildings. While the cost of designing and constructing high performance green buildings may be higher, the operating costs will be lower.

The following sections focus on some of the sustainable practices covered in the LEED Handbook, including:

1. Sustainable Sites
2. Water Efficiency
3. Energy & Emissions

sustainable sites initiative

The Sustainable Sites Initiative is an effort independent from LEED, that stems from the desire to protect and enhance the ability of landscapes to provide services such as climate regulation, clean air and water, and improved quality of life. Sustainable Sites™ is a cooperative effort with the intention of supplementing existing green building and landscape guidelines as well as becoming a stand-alone tool for site sustainability.

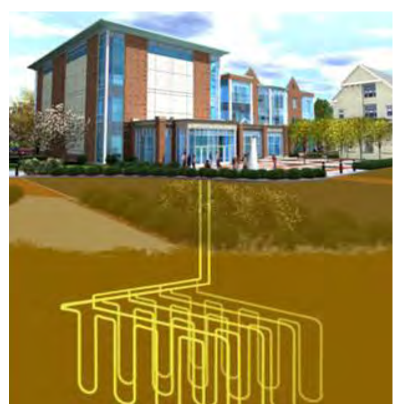
The Sustainable Sites Initiative is a five-year project that will include pilot projects and develop three products: Standards and Guidelines, Rating System and Reference Guide. The initiative provides Case Studies as well as education information regarding hydrology, soils, vegetation, materials, and human well being. It is an excellent reference for new construction.

site preservation

The overall approach to how one sustainably addresses the land is to design with the natural slope of the land in order to minimize additional grading. Another approach is to preserve and protect the existing vegetation and topsoil. This

Wind energy

Solar energy



Geothermal energy

is done by fencing off existing native landscape so it will not be disturbed during construction. In doing this mass grading on the site is minimized. This technique should be used along Ridgeline Park, the Natural Arroyo watershed, and major entrances to the campus.

In areas that need to be graded it is imperative to collect the existing topsoil and store it for reuse on the site. Topsoil is rich in nutrients and minerals necessary for plant growth. Topsoil also contains native seeds that when redistributed will root and grow.

One challenge on the UNM West site is the amount of wind erosion on the site. All construction areas shall be protected from erosion by providing silt fences all around the area. This is one way to collect the sand and prevent the sand from damaging landscape areas. Because of all the sand found on this site, there may be ways to celebrate the wind and sand by providing wind and sand catchments. These could be used to create sand paintings, and rammed earth structures.

Wherever possible, site development shall strive to reduce the water quantity and rate of flow at or below the original natural condition of the site through the use of landscape swales and water harvesting.

construction guidelines

Construction teams should take preventative measures when doing construction on a new site, including:

1. Create and implement an Erosion and Sedimentation Control Plan for all construction activities associated with the project.
2. Prevent sedimentation of storm sewer or receiving streams.
3. Prevent polluting the air with dust and particulate matter.

Sensitivity to the site during development, especially the soil, will be very beneficial for the growth of the campus landscapes.

Be careful of compaction, which degrades soil structure and reduces infiltration rates, increases the runoff volume and flooding potential. Compressed soil reduces root growth and access to water and nutrients. Disturbing and removing vegetation, which commonly occurs during site development, can damage soil structure and increase erosion and sedimentation. Plants need adequate amounts of soil to be healthy.

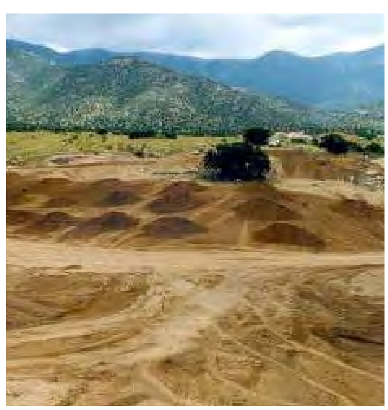
Protection of existing native soils and vegetation is important to reduce invasion of noxious weeds. Removing topsoil before or during construction destroys soil horizons and hinders reestablishment of healthy soils. It also disturbs soil structure and profile on-site even if the original topsoil is returned to the site after construction or fill material is imported from an off-site location to serve as topsoil.

site policy recommendations

The following are policy recommendations pertaining to the site:

1. Buildings should be closely packed for self shading; have relatively narrow pedestrian paths for shade and induced ventilation.
2. Water usage and intense planting should be utilized sparingly.
3. Plants needing little maintenance and no pesticides should be used.
4. Storm water harvesting should be required.
5. Campus should be designed for pedestrian not car.
6. Bioswales, arroyo restoration and

LEED certification



Prevent compressed soil

Prevent air pollution

drought-resistant landscaping should be utilized to reduce water use.

7. Utilities should be planned in a manner to reduce the need for relocations at a later time.
8. 3D modeling should be required to reduce rework and construction waste.

protected + native landscapes

Landscape in protected native areas should be preserved and protected during the construction phases of work. There should be minimal site disturbance so as to maintain as much existing plant material and wildlife as possible.

protected + native landscapes recommendations

UNM West covers a large area of Rio Rancho's desert landscape. During the construction phases of work, huge strides should be taken to preserve and protect native and existing landscape, but it is inevitable that portions will be disturbed in the process. Areas that have been disturbed will be the focus of reclaiming and revegetating.

Based on the location of the site, extreme winds and dry conditions can cause blow sand to quickly become a problem if not properly handled. Due to the blow sand issues, and stockpiling coordination, it will be important to plan out the sequencing of the clearing and grubbing and mass grading to minimize graded areas during construction process.

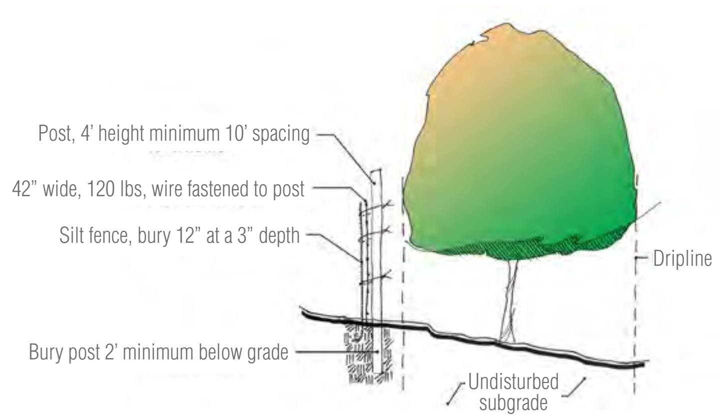
One key step that could be taken would include either a horticulturalist or landscape architect walking the site and determining which existing trees could possibly be disturbed once construction begins. At that time, protective fencing should be installed around each tree. Common injury due to skipping this step could be damage to the tree's branches, trunk and suffocation to the root system from compaction or from differing soil types being placed overtop the roots (see protective fencing image below).

When the land is disturbed from its natural state, it only magnifies the disturbances to the site but also becomes a nuisance to surrounding communities. Using silt fences around the perimeter of disturbed areas will help in greatly reducing the effects of blow sand (see silt fence graphic).

Other important practices are saving any plant debris or other resources that are currently on the site. The existing plants contain seeds and organic material that can be used as natural nutrients. Furthermore, by reusing material on site, there is a lessened need for additional resources and energy to be brought to the site. One method for saving the plant debris and topsoil would be removing small shrub, cacti and grass materials by using a blade. The contractor would either chip or mulch the materials until they are broken up into smaller sized material. Although it may look unsightly when first applied, it is rich in nutrients and ideal for stabilizing steep slopes. Stockpiling material goods like existing boulders and cobble is another way of reducing energy and resources used in bringing new materials (see steep slope treatment image).

Another action to remember is the saving of topsoil from a site. This step usually happens during the mass grading stage. By reusing this material, there is a lessened need for amending the soils, less revegetation will be required and there is more of an opportunity for the native plants to revegetate the disturbed areas faster. The contractor can scrape the top 4" to 6" of soil and stockpile in an easily accessible location for future use. This material could be reused around the edges of the project to revegetate the disturbed areas (see topsoil image).

The final action that may be taken is the continuation of watering during construction to existing landscape. This can be done using water trucks or with the use of temporary irrigation. Not only will this help with maintaining existing plant material, but it will also help cut down on dust blowing in the air.



Silt fence graphic

water efficiency

While developing the campus, the University should strive to recognize the long-term inherent value of water by conserving, harvesting, capturing, and reusing it.

water conservation

The Albuquerque area receives approximately 9.5 inches of rain per year annually. Combined with low humidity and high evaporation, this results in thin, poor quality soils. However the rainy season through late summer and early fall can create beautiful landscapes couples with water management challenges. Water management on the campus therefore will most likely deal with managing too much water during floods and too little the rest of the time. A goal of conserving water and reusing it locally to limit runoff and to supplement irrigation is important. All new construction should incorporate passive and active water management strategies as features in the landscape.

potable water

Potable water is used for many functions that do not require high-quality water such as toilet and urinal flushing, and landscape irrigation. By reducing potable water use, the local aquifer is conserved as a water resource for future generations. The greater amount of potable water saved often results in less blackwater generated. Potable water demand can be significantly reduced using rainwater and graywater systems.

water reuse

One necessary sustainable practice in New Mexico is water harvesting and water reuse. Rainwater systems provide non-potable water suitable for landscape irrigation, flushing toilets and urinals, and process water needs. This can be achieved in two forms. One of the more familiar forms is harvesting rainwater off all impermeable surfaces. For example, rooftops, parking lots, streets, and hardscape areas.

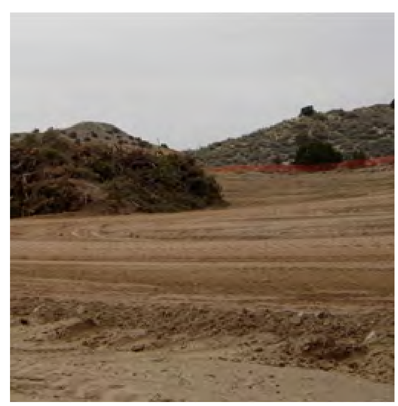
The overall goal at UNM West is to collect this rainwater and reuse it for irrigation for plant establishment on site. This will minimize the need for use of potable water for irrigation needs and will provide the necessary moisture needed for the native vegetation to grow and maintain itself. At a minimum, 100% of the 10 year storm falling on a new building's roof must be retained on-site (structurally stored or absorbed within the site landscape). Rainwater collected from impervious surfaces reduces rainwater runoff and control infrastructure requirements.

Rainwater in New Mexico does not come intermittently, instead it comes in large rain events. Due to this pattern it is necessary to store water onsite for future use. This can be done with above ground cisterns, underground storage tanks or surface ponding areas.

The second form of water harvesting and reuse is through the use of collecting graywater. Graywater is water collected from sinks, drinking fountains, and showers from a building. This water can be reused for irrigation purposes, for creating living systems and for use in recharging the aquifer. While graywater is currently approved for use in Residential applications it is not approved for use in public applications. However, this may change in upcoming years as our need for water increases. These guidelines will provide direction in anticipation of that change.


Protective fencing


Steep slope treatment


Topsoil

Graywater systems reuse the wastewater collected from sinks, showers and other sources for the flushing of toilets, landscape irrigation, and other functions that do not require potable water. Collecting graywater should be used where applicable and if it is likely to be used in the future, install dual plumbing lines during the initial construction to avoid the substantial costs and difficulty in adding them later.

Within a project's design process, surface water should be an influence on integrated site design and proactive solutions that are consistent with or exceed regulatory standards.

water harvesting

The following are policy recommendations pertaining to water harvesting:

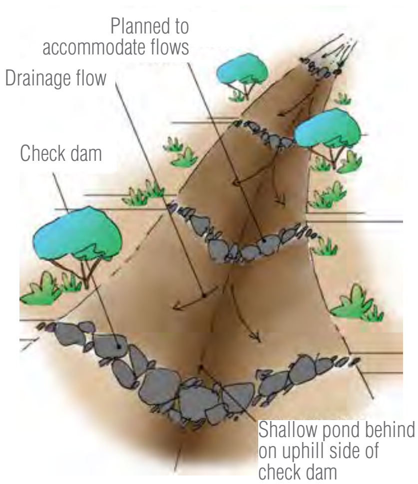
- Collection from building roofs using an above ground cistern
- Collection from building roofs using rain chains, canals and barrels
- Use of swales and berms to direct and hold the water
- Use of pervious materials and nearby non-pervious materials
- Use of French drains
- Use of check dams along slopes
- Use of waffle gardens to hold water and slowly release
- Use of small storm water ponds
- Use of xeric plant material
- Hydro-zoning plant material
- Sunken sports fields…The Mall

The main objective of water harvesting is to collect stormwater and reuse it in a way that is both beneficial and responsible. All the water that falls onto the site should be allowed to infiltrate the soil where it falls or be directed to an area where it can be utilized later.

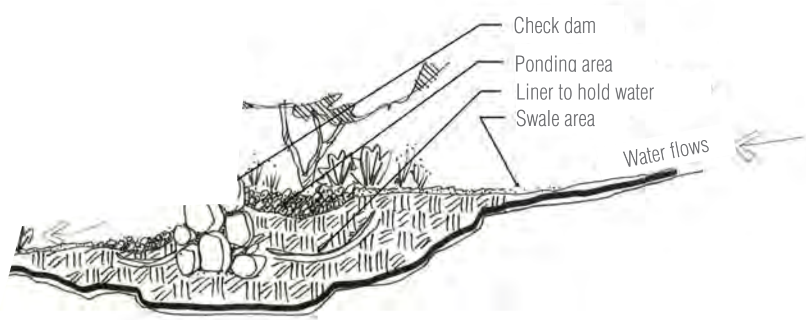
Using the surrounding buildings as rooftop catchment is a great source of water collection. There are numerous ways of directing water to landscaped or ponding areas. One way is with the use of rain chains and open canals. A rain chain directs the water from the roof down to the ground level. Rain chains and rain barrels are best suited for smaller amounts of water. When there are greater levels present, ground storage systems like water tanks or cisterns are used to store rooftop water until it can be used later (see rain chain graphic).

Once the water has reached the ground level, the options are endless for diverting the water to landscaped areas or storage systems. The simplest method would be using swales, berms and check dams to direct or slow down the water. This method consists of grading the earth to form either mounded areas or small dam like forms. Swales and berms are created to slow down water so it can infiltrate the soil. It is best to construct these forms at least 10' away and down-slope from a building foundation. This is probably the least costly method (see check dam and check dam2 graphics).

Another option for water harvesting would be through the use of waffle gardens, a dry farming technique. Waffle gardens are an ancient method used by the Zuni to contain water. By forming sunken beds sometimes



Check dam graphic



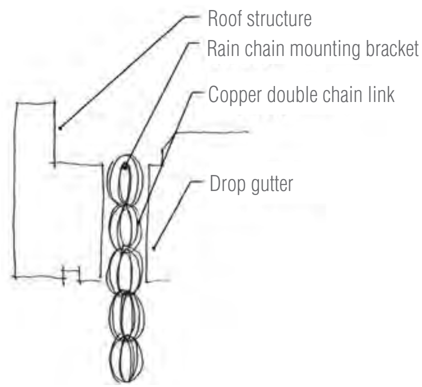
Check dam graphic (2)

filled with gravel, water could be held in the soil longer. It helped to slow down evaporation and increased the chance for crops to succeed. These same techniques can be used today by creating sunken two square foot planting areas surrounded by ground level berms. The berms should be several inches high and made from unamended soil. Each depression in the waffle will then be able to catch rainfall and hold the water for a given amount of time (see waffle garden image & graphic).

An important technique to consider would be the use of pervious as well as non-pervious materials to catch and harvest water. Pervious materials could be anything from gravel and crusher fine mulches to paving stones and planting areas. Water will easily percolate into the soil through these types of materials. By using non-pervious materials, such as sidewalks, courtyards and parking lots water can easily be collected and diverted to storage or percolation areas (see pervious and impervious images). The use of French drains and small storm water ponds are also wonderful techniques of directing and storing stormwater runoff (see french drain image, next page).

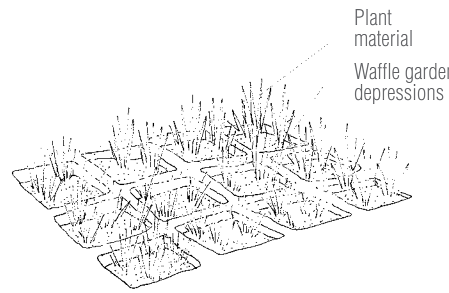
The use of xeric plant material is key in water harvesting and water saving. A xeric landscape does not have to be solely cacti and rocks; it can easily be full of color and life all year round. By using xeric plants, you are using plants that are native to the climate or that have adapted to the low amount of water and high amount of sun our environment receives. It is a good practice to place plants with plants of similar water requirements. This technique is called hydro-zoning (see hydro-zone graphic, next page).

A final concept for water harvesting opportunities could come from sunken



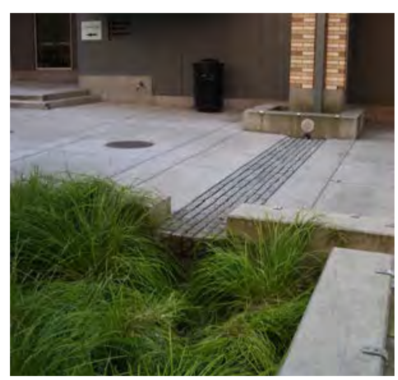
Rain chain


Waffle garden



Waffle garden graphic


Pervious paving


Impervious paving

sports fields. Sports fields are prevalent at University Campus' and they can easily become usable oasis' within our desert climate. By lowering the grade of the entire field as compared to the surrounding site, a field can become a huge stormwater collection area. Not only does this benefit the turf by giving it supplemental irrigation, but it also provides ample views onto the field.

storm water management

Small scale solutions should include directing water into landscaping, swales and other pervious locations. Water can also be utilized in cooling towers and water features. Campus wide solutions to limit runoff volume include directing it through vegetated swales, porous pavements and turf areas. The main mall should act as the major retention basin on campus to assist in stormwater management

water features

Water features can provide relief from the extreme desert temperatures, but should be used sparingly with every attempt made to limit the amount of water used. As a university within the Chihuahuan Desert, the campus should project an image of using its limited water resources as efficiently as possible for the benefit of the campus community. Water features, including fountains, should be sited to allow significant environmental enhancement primarily to campus common spaces.

energy

Buildings and their properly modulated adjacent outdoor spaces should be conceived of and should act as holistic "thermal systems", based on simple principles of convection, radiation, and evaporation. This energy conservation goal should employ strategies which minimize the use of non-renewable energy sources while at the same time providing thermal comfort.

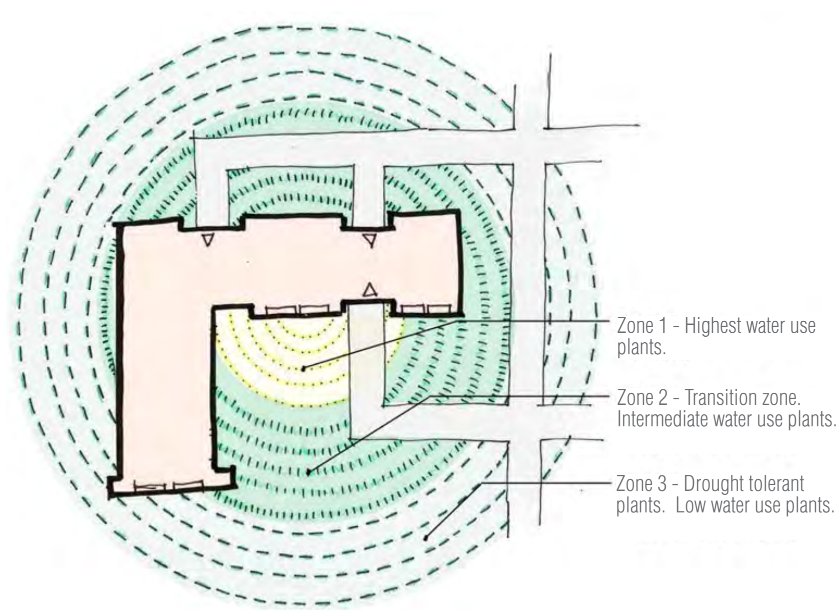
building technology

Building systems such as heating, ventilation, air-conditioning, electrical, lighting, plumbing, waste water management, energy generation, etc. should be designed to be monitored and to optimize building performance

Encourage the design of integral thermal storage in buildings for stabilization of the thermal environment – to prevent energy waste of constant mechanical system adjustment to an established standard "normal" temperature – as well for appropriate release of stored heat during cooler months.

Encouraging the design of real masonry/ mass buildings rather than imitation masonry is a logical means to begin to achieve this goal. A performance standard to help achieve this goal is the American

French drain



hydro-zone graphic

Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) 90.1-1989 Conservation Standards Requirement, particularly the available "thermal mass credits."

carbon neutrality

All buildings should seek to be carbon neutral (exceeding LEED standards). Dealing with climate change is an exemplary goal of any building design project. Maximize energy efficiency as a first step. Electricity is the most lucrative kind of energy to save. Saving electricity decreases pollution at the power plants, which is 1/3 of the United States carbon dioxide (CO2) emissions.

Eight important steps to producing a climate neutral building are:

1. Understand occupancy and sociology
2. Optimize the envelope
3. Avoid internal heat gains
4. Measure existing conditions
5. Shift air delivery
6. Specify a smaller and far more efficient HVAC system
7. Add renewable power generation
8. Offset or sequester remaining CO_2

energy policy recommendations

Campus energy policies play a critical role in seeing initiatives through. Establish and institutionalize energy goals in order to authorize action and programs to achieve compliance. A committee should be made up of representatives from the academic and business sides of the institution. A genuine commitment to address climate change by reducing greenhouse gas emissions should drive energy policies in a conserving, sustainable direction.

The following are policy recommendations pertaining to energy usage:

1. Local renewable energy such as geothermal, biomass and wind power should be utilized.
2. Natural lighting should be integrated with electrical lighting systems to provide the greatest benefit.
3. Photovoltaics should be integrated into overall design and not installed as an afterthought.
4. Natural shading and passive solar design should be utilized.
5. Operable solar shading should be utilized.
6. Night time cooling should be considered.
7. Radiant cooling should be explored as an alternative to conventional cooling.
8. Solar heating of domestic hot water should occur.
9. Water conservation goals should be formulated for campus buildings as guidance for design.

The following are policy recommendations pertaining to buildings:

1. Ventilation towers for cooling should be utilized wherever possible.
2. Buildings should be differentiated and take cues from biologic precedents; biomimicry.
3. Prefabrication and offsite work should occur to minimize embodied energy.
4. Buildings should be designed for "long life/loose fit."
5. Materials should be able to be recycled/reused/deconstructed and evaluated for sustainable attributes.
6. Buildings should optimize material use for long term performance and reduced maintenance.
7. University planning and design should include explicit consideration of lifecycle costs.
8. Under Floor Air Distribution systems should be utilized for better air quality and reduced life cycle costs.
9. All buildings should be well insulated (R-38 roofs, R-20 walls, R-10 slab edges, low-e windows with a light to solar gain ratio of 2.2 or higher).

Existing storm pipe drainage onto site

Drainage basins

5 INFRASTRUCTURE

5.1 CIVIL

A. GRADING AND DRAINAGE

existing topography

The site generally slopes from the northwest to the southeast with slopes that range between 1% to 10%. The majority of the site is undeveloped with native grasses and shrubs. The site ranges in elevation between 5600 feet to 5530 feet. In the southern portion of the site there is an unnamed arroyo that begins near the northern end of Civic Circle. This channel is a shallow, wide and not well defined. The northern portion of the site drains to the BAM tributary of the La Barranca watershed. Exhibit 1 shows the existing topography, drainage basins and peak flows in the undeveloped conditions.

existing drainage infrastructure

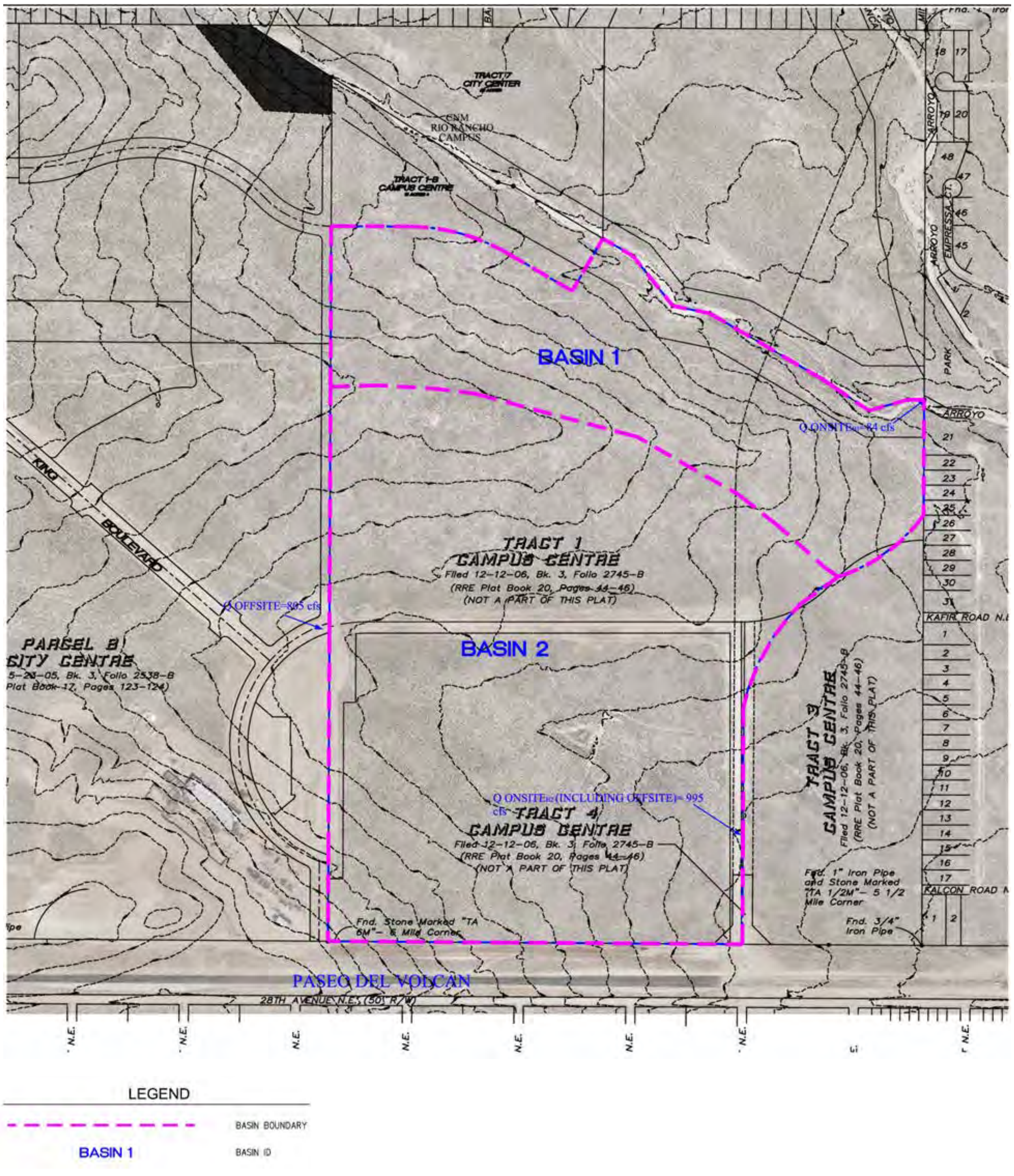
A Storm Water Management Plan was prepared by Parsons Brinckerhoff for City Center. This storm water management plan addressed developed flow that result from the development of City Center. This report addressed the storm drain network required to convey the drainage. At the north end of Civic Circle there is an existing 72" RCP storm drain that outfalls onto UNM property. Based on the information contained in the report prepared by Parsons Brinckerhoff the peak flow rate at the outfall is 805 cfs. As the campus develops drainage infrastructure will be required to convey this off site drainage through the site.

UNM Master Plan - Rio Rancho

Existing Conditions Basin Data Table

		This table is based on the DPM Section 22.2, Zone: 1					100 Year Storm Event			
BASIN	**Area**	**Area**	**Land Treatment Percentages**				**Q(100)**	**Q(100)**	**WT E**	**$V(100)_{360}$**
ID	**(SQ. FT)**	**(AC.)**	**A**	**B**	**C**	**D**	**(cfs/ac.)**	**(cfs)**	**(inches)**	**(CF)**
1	2695778	61.89	91.0%	9.0%	0.0%	0.0%	**1.36**	**83.96**	***0.46***	***103495***
2	6379861	146.46	99.0%	1.0%	0.0%	0.0%	**1.30**	**190.02**	***0.44***	***235151***
Total		**208.35**						**273.97**		

Exhibit 1 Existing Topography, Drainage Basins and peak flows
March 2009


BASIN 1
BASIN 2
TRACT 1
CAMPUS CENTRE
TRACT 3
CAMPUS CENTRE
TRACT 4
CAMPUS CENTRE
PARCEL B
CITY CENTRE
CNM
RIO RANCHO
CAMPUS
KING BOULEVARD
PASEO DEL VOLCAN
KAFIR ROAD
FALCON ROAD
ARROYO
EMPRESSA CT.
PARK
LEGEND
BASIN BOUNDARY
BASIN 1
BASIN ID

grading and drainage

A conceptual drainage management has been developed based on the campus master plan. This storm water management plan identifies peak flows from the onsite drainage basins and preliminary sizing of storm drain infrastructure, see exhibits 2 and 3. This is intended as a planning document and site specific drainage design will need to be addressed as the campus develops.

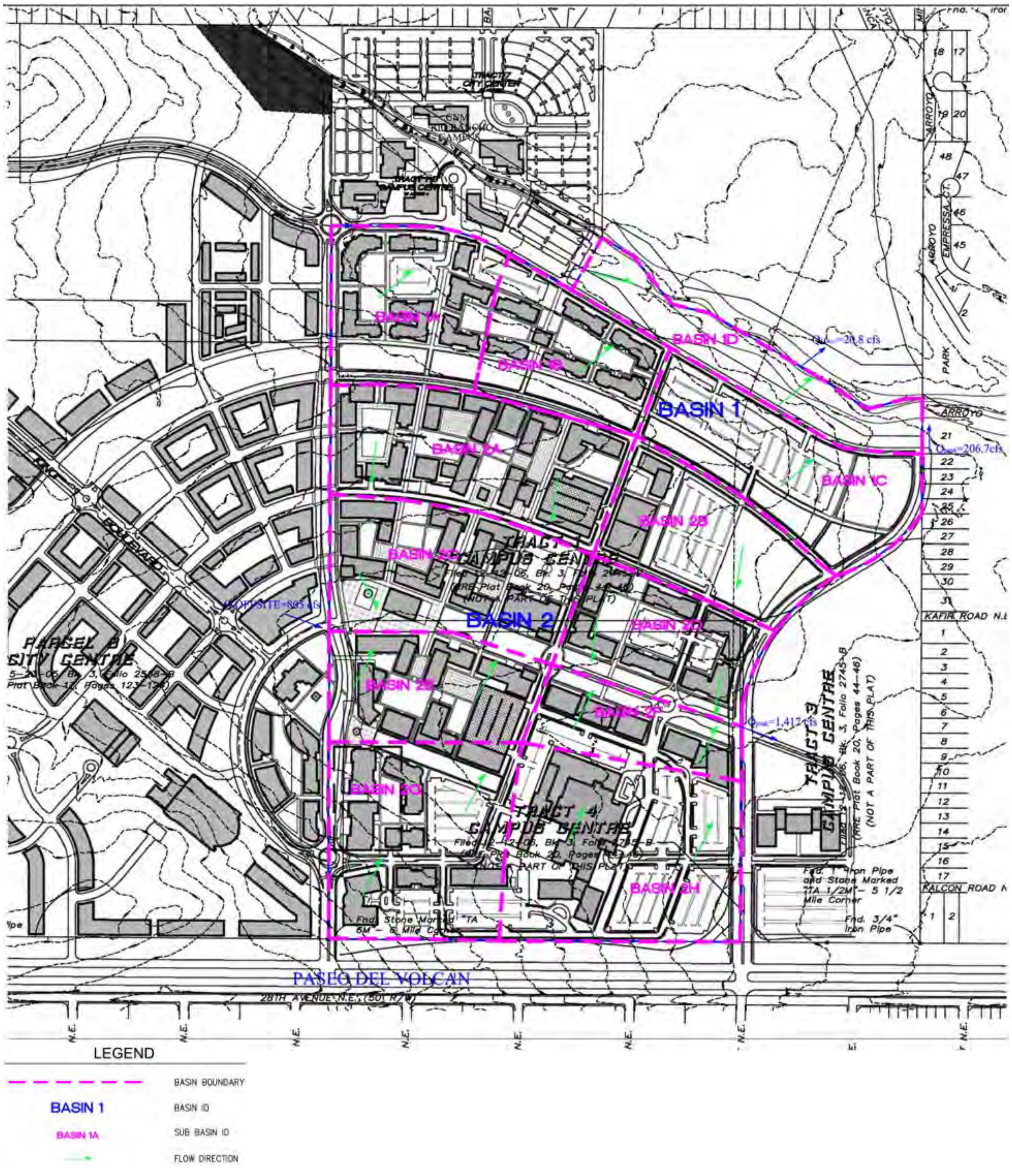
The hydrology methodology is based on Section 22.2 of the City of Albuquerque Development Process Manual. Estimated peak flows are based on the 100 year, 6 hour storm event. The campus is located within precipitation zone 1. Land treatments within the campus were assumed to be comprised of 90% D, 5% C and 5% B with the exception of the drainage basin north of 34th Avenue. This portion of the campus will remain undeveloped at full build out of the campus. The site was divided into 12 drainage basins, see exhibit 2. This was done in order to estimate the sizes of the main storm drains within the campus. This evaluation does not consider smaller secondary storm drains that will be necessary to serve parking lots, roof drains, courtyards etc. Exhibit 3 shows the proposed storm drain layout and estimated pipe sizes. Off site drainage from City Center will be conveyed through the campus in the storm drain located within the open space corridor that runs southeast to 30th Street. The outfall of the campus storm drain system is proposed to be near 30th Street and Paseo del Volcan. Conveyance of this drainage through properties to the east is not addressed within this master plan.

UNM Master Plan - Rio Rancho

Proposed Conditions Basin Data Table

		This table is based on the DPM Section 22.2, Zone: 1					100 Year Storm Event			
BASIN	**Area**	**Area**	**Land Treatment Percentages**				**Q(100)**	**Q(100)**	**WT E**	**$V(100)_{360}$**
ID	**(SQ. FT)**	**(AC.)**	**A**	**B**	**C**	**D**	**(cfs/ac.)**	**(cfs)**	**(inches)**	**(CF)**
1A	720609	16.54	0.0%	5.0%	5.0%	90.0%	**4.18**	**69.12**	***1.86***	***111454***
1B	599060	13.75	0.0%	5.0%	5.0%	90.0%	**4.18**	**57.46**	***1.86***	***92655***
1C	835199	19.17	0.0%	5.0%	5.0%	90.0%	**4.18**	**80.11**	***1.86***	***129177***
1D	540911	12.42	85.0%	0.0%	5.0%	10.0%	**1.68**	**20.82**	***0.62***	***27970***
2A	972399	22.32	0.0%	5.0%	5.0%	90.0%	**4.18**	**93.27**	***1.86***	***150398***
2B	661266	15.18	0.0%	5.0%	5.0%	90.0%	**4.18**	**63.42**	***1.86***	***102276***
2C	895407	20.56	0.0%	5.0%	5.0%	90.0%	**4.18**	**85.88**	***1.86***	***138490***
2D	606710	13.93	0.0%	5.0%	5.0%	90.0%	**4.18**	**58.19**	***1.86***	***93838***
2E	622924	14.30	0.0%	5.0%	5.0%	90.0%	**4.18**	**59.75**	***1.86***	***96346***
2F	410167	9.42	0.0%	5.0%	5.0%	90.0%	**4.18**	**39.34**	***1.86***	***63439***
2G	1010282	23.19	0.0%	5.0%	5.0%	90.0%	**4.18**	**96.90**	***1.86***	***156257***
2H	1200707	27.56	0.0%	5.0%	5.0%	90.0%	**4.18**	**115.16**	***1.86***	***185709***
Total		**208.35**						**839.42**		

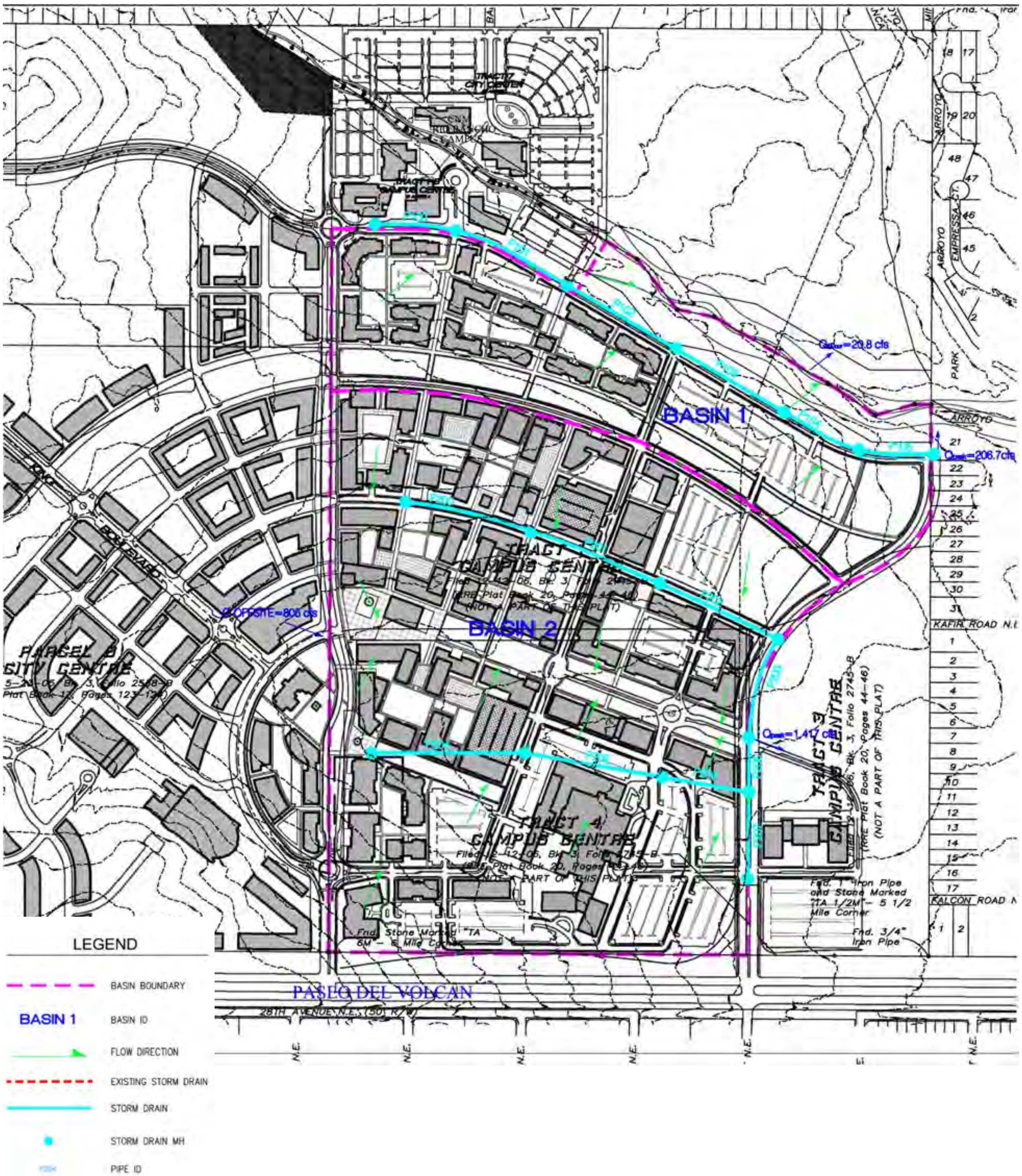
Exhibit 2 Proposed Conditions Drainage Management Plan
March 2009


BASIN 1
BASIN 1A
BASIN 1B
BASIN 1C
BASIN 1D
BASIN 2
BASIN 2A
BASIN 2B
BASIN 2C
BASIN 2D
BASIN 2E
BASIN 2F
BASIN 2G
BASIN 2H
PASEO DEL VOLCAN
28TH AVENUE N.E.
PARCEL B CITY CENTRE
TRACT 3 CAMPUS CENTRE
TRACT 4 CAMPUS CENTRE
ARROYO
KAFIR ROAD
FALCON ROAD
LEGEND
BASIN BOUNDARY
BASIN 1
BASIN ID
BASIN 1A
SUB BASIN ID
FLOW DIRECTION

UNM Master Plan - Rio Rancho Storm Drain Pipe Table				
PIPE #	Size in.	Slope*	Capacity** cfs	ESTIMATED FLOW cfs
STORM DRAIN PIPE				
Basin 1				
P100	30	1.20%	45.00	41.00
P101	36	2.00%	95.00	91.00
P102	42	3.00%	174.26	91.00
P103	36	1.00%	67.00	64.00
P104	36	1.70%	86.96	64.00
P105	30	2.80%	68.00	52.00
P105	30	5.00%	68.00	52.00
Basin 2				
P200	36	1.00%	67.00	67.00
P201	36	1.75%	88.23	90.00
P202	78	3.00%	908.07	879.00
P203	84	2.50%	1010.08	916.00
P204	36	2.50%	105.46	77.00
P205	42	1.80%	134.98	116.00
P206	42	1.30%	114.71	97.00
P207	90	2.50%	1214.11	1181.00
P208	90	3.50%	1436.56	1222.00
P209	36	2.00%	94.33	63.00
P210	42	2.00%	142.28	120.00
P211	36	2.00%	94.33	67.00
P212	96	2.00%	1289.87	1292.00
P213	96	2.50%	1442.12	1415.00
P214	96	2.50%	1442.12	1417.00
P215	96	2.50%	1442.12	1417.00

***SLOPES ARE ESTIMATED BASED ON THE EXISTING TOPOGRAPHY**
****CAPACITY IS BASED ON GRAVITY FLOW, USING MANNING'S EQUATION WITH n=0.013**

Exhibit 3 Conceptual Storm Drain Plan
March 2009


BASIN 1
BASIN 2
PASEO DEL VOLCAN
ARROYO
KAFIR ROAD N.E.
PARCEL B CITY CENTRE
LEGEND
BASIN BOUNDARY
BASIN 1
BASIN ID
FLOW DIRECTION
EXISTING STORM DRAIN
STORM DRAIN
STORM DRAIN MH
PIPE ID

An analysis of the City of Rio Rancho (CoRR) water system was performed by Bohannan Huston, Inc. to assess the water system infrastructure improvements that will be required with the development of the UNM Rio Rancho Campus. The campus is located within pressure zone 4 of the CoRR water system. 26th Street is the boundary between pressure zones 4 and 5. The City Center Tank is the primary source of water for the proposed development and established the hydraulic grade line of 5860 feet above sea level. The site slopes from the northwest to the southeast. Elevations range from approximately 5600 feet to 5530 feet at the southeast corner. Due to the elevation of the City Center Tank, the static pressure at the site ranges between 112 psi to 143 psi. At the point of connection to the existing water distribution system pressure reducing valves will be required to maintain the system pressure in the range of 50 psi to 100 psi.

Proposed land use includes student housing education and research facilities. A hospital and accompanying medical office space is proposed in the southeast portion of the site. The total site area is approximately 205 acres.

water demands

Water demands for the property were projected based on CoRR Water and Wastewater Design Criteria, chapter 3, and projections established for the proposed Presbyterian Hospital, also located in Rio Rancho. The average day water demand for the property, based on CoRR standards was calculated using a unit demand of 1,750 gallons per acre per day. This equates to 296 gallons per minute. The average day demand for the hospital was estimated at 2,000 gpm. A diurnal pattern of water use was used that assumes peak hour occurs at 8 a.m. and is equivalent to 1.43 X average day.

design criteria

In addition to the above, the following CoRR design criteria were applied to the analysis.

- Minimum pipe size is 8-inch diameter.
- Velocities shall not exceed three (3) fps for peak day flow, or ten (10) fps for fire flow under average day conditions.
- Required fire flow is 3,000 gpm at all locations within the site under peak hour conditions.
- Land use is light commercial with a unit demand of 1,750 gallons per acre per day, or 1.21 gallons per minute per acre.
- The hospital average day demand is 2,000 gpm.
- The water use pattern for the hospital is the same as that of the surrounding development.
- A roughness coefficient of 130 was used for all pipes as required in the CoRR design criteria.

water distribution system and phasing

The size of the water distribution lines are based on the design criteria outline above and the system demand. Construction of the distribution system will be phased according to the planned build out of the campus. The initial phase includes the hospital and the first academic building north of Civic Circle. The build-out of the first phase of the campus is located east of Center Drive and north of Civic Circle. As demand on the water supply increases with the development of the UNM campus and surrounding development additional water storage will be necessary. It is anticipated that during Phase 1a new water line will need to be extended from the 18" water line in Center Drive to a future storage tank currently designated as the Paseo Gateway Tank. Exhibit 4 shows the existing utilities adjacent to and within UNM property. Exhibits 5, 6 and 7 show the water line sizes and alignment in the initial phase, first phase and full build out.

analysis and limitations

A 24 hour peak day and fire flow analysis was run for the above criteria, under year 2008 conditions. This analysis did not include an evaluation of the adequacy of supply. The analysis did not consider the impacts of future development in the City of Rio Rancho on the proposed infrastructure.

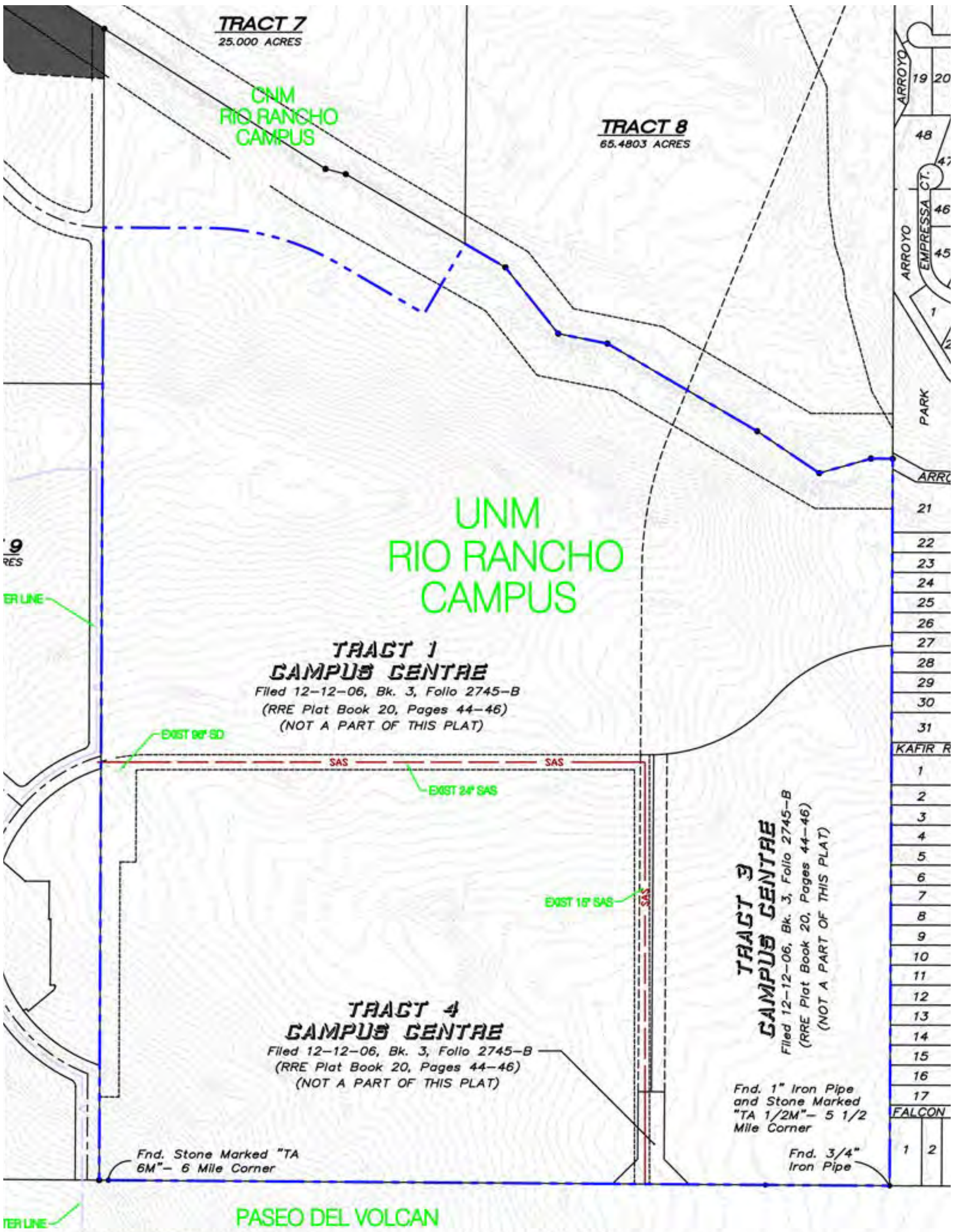


Exhibit 4 Existing Utilities
March 2009

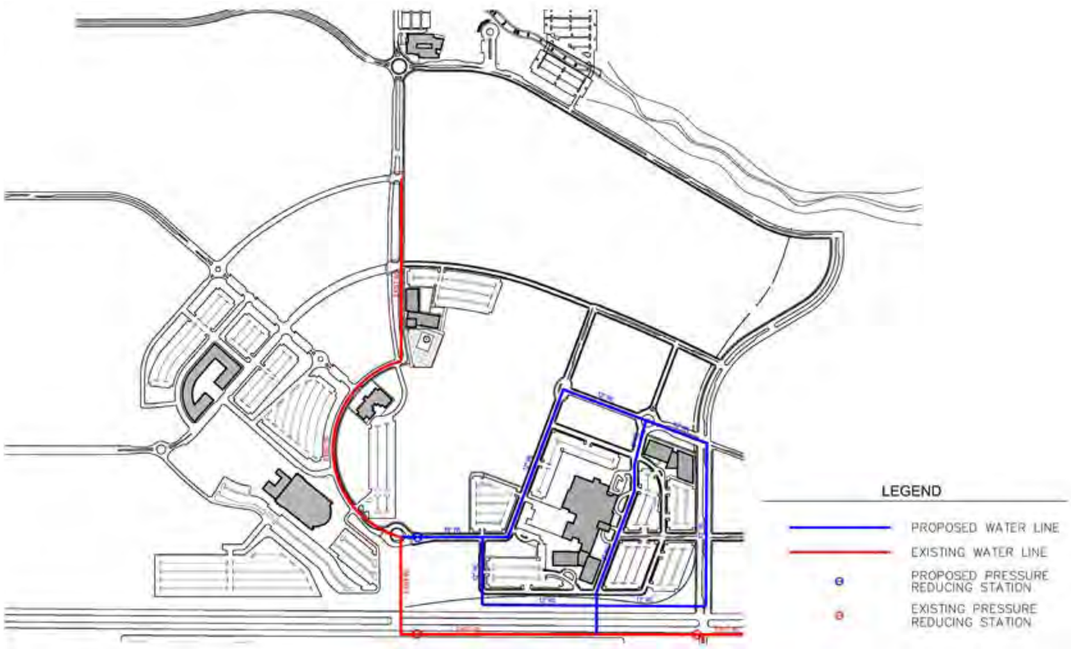


Exhibit 5 Water Initial Phase
March 2009

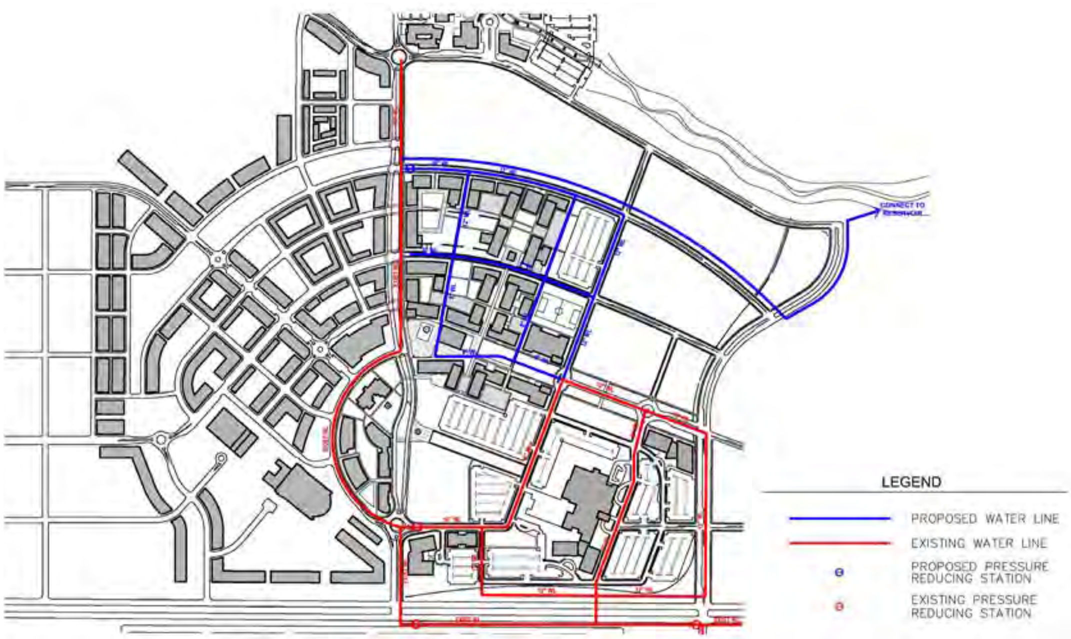


Exhibit 6 Water Phase 1
March 2009

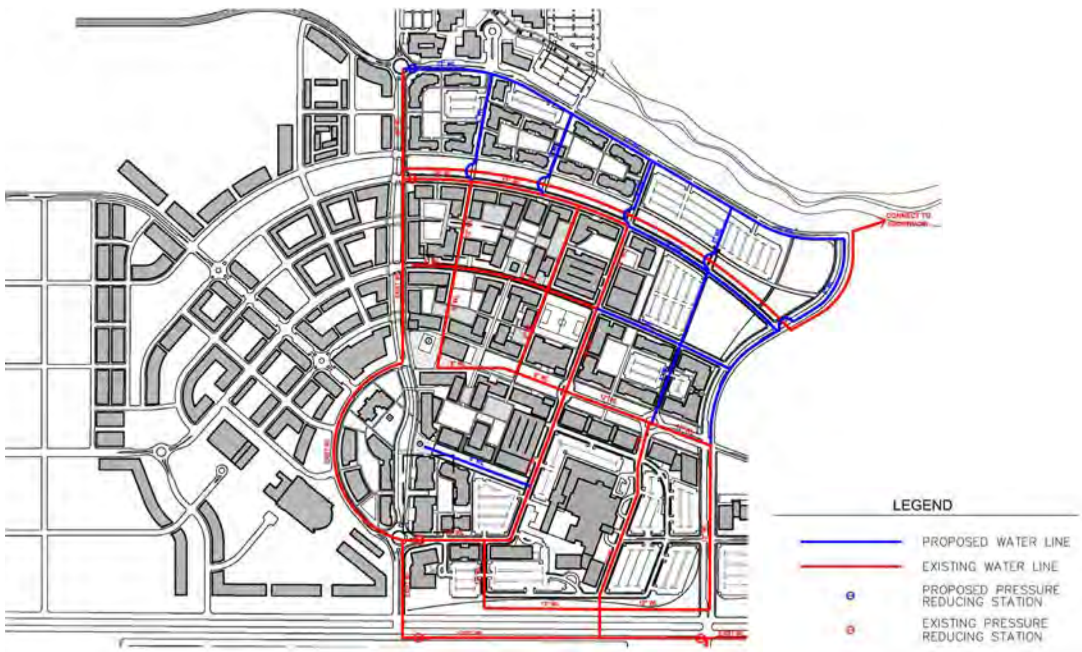


Exhibit 7 Water Full Build-out
March 2009

C. SANITARY SEWER COLLECTION SYSTEM

An existing 24” sanitary sewer line extends east across UNM property from the north end of Civic Circle Drive. The line turns to the south in the alignment of 30th Street. This sewer line serves City Hall and planned development within City Center. This line will also serve the majority of the UNM Campus. A ridge crosses the site near the northern limits of Phase 1. This ridge is the northern limits of the service area for the existing 24” sewer line. A sanitary sewer line is planned for the area north of the ridge. This sewer line will serve the northern portion of the campus as well as undeveloped State Land Office property and the CNM campus. Based on the site topography we anticipate that the entire campus will be served by a gravity collection system. The service area for the individual segments of sewer lines is relatively small and 8” diameter lines will adequate throughout the campus.

Two separate sanitary sewer lines will need to be constructed to serve the initial phase of the campus. The hospital campus will be served by a collection system within the hospital road network. This will connect to the existing 24” sewer line in the 30th Street alignment, approximately 500 feet north of Paseo del Volcan. The first academic building located north of City hall will be served by a new sewer line in Center Drive. CNM is currently planning to construct their first building of the new Rio Rancho Campus, located north of the UNM campus. The CNM project will design and construct the east half of Center Drive and the sanitary sewer extension to the north. This gravity sewer line will end near the top of the ridge approximately 1300 feet north of Civic Circle.

With the build out of the first phase, the sewer collection network will be extended as this portion of the campus expands. The layout of the campus will require the relocation of a section of the existing 24” sewer line. The new alignment will be within the planned open space corridor that crosses the campus. Exhibits 8, 9 and 10 shows the sanitary sewer system with the initial phase, phase 1 and full build out.

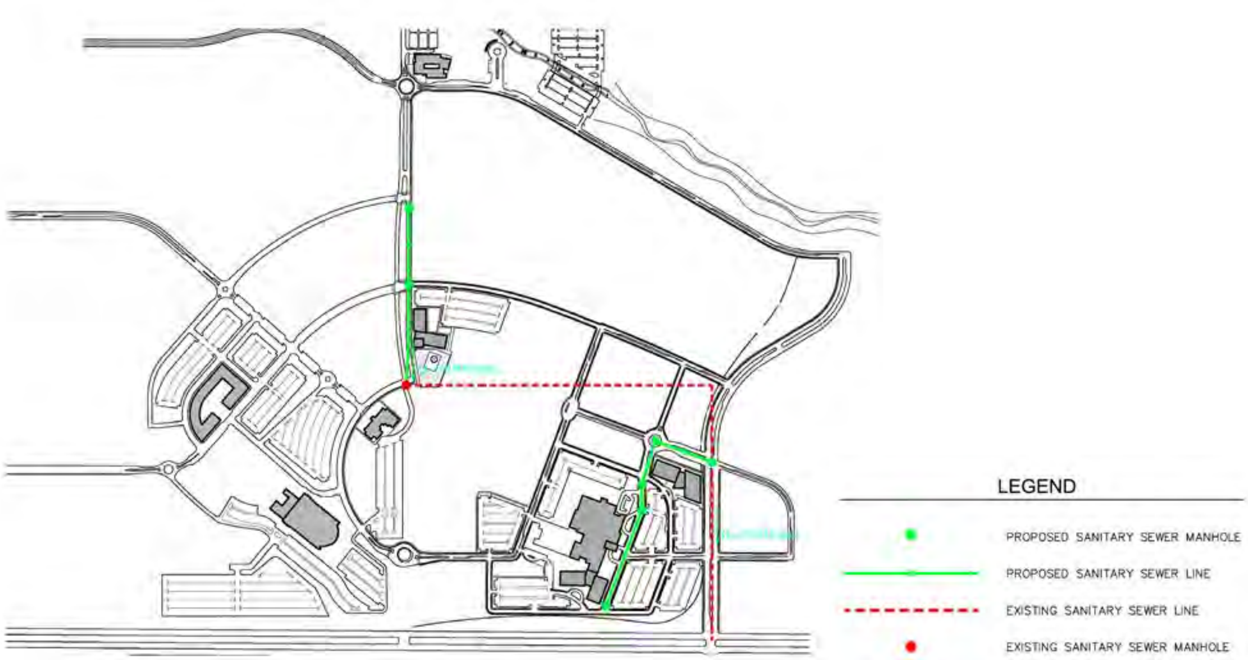


Exhibit 8 Sanitary Sewer Initial Phase
March 2009

Exhibit 9 Sanitary Sewer Full Phase 1
March 2009

Exhibit 10 Sanitary Sewer Full Build-out
March 2009

5.2 MECHANICAL + ELECTRICAL

introduction

Creating proper environments for learning, research and campus life will require systems for heating, cooling, electrical power and IT/Data (M&E systems). This section discusses approaches to provide M&E services for the buildings and the campus. These M&E systems must:

- Produce environments which will support the educational, research and quality of life needs of the campus and its occupants
- Provide reliable and predictable service
- Be configured to grow logically and cost effectively to support campus development over time
- Be substantially more sustainable than UNM's main campus, and encourage the occupants to act sustainably
- Allow UNM to control activities on campus
- Provide information that will allow the facility staff to monitor system performance and efficiently operate and maintain the systems
- Provide information to allow management to efficiently and cost effectively manage these assets
- Be readily maintainable by the anticipated staff and outside contractors
- Be adaptable to respond to changing conditions

By meeting these goals the mechanical/electrical infrastructure will support the overall success of the campus.

summary

UNM's Facilities Design Guide gives minimum design standards for buildings on its main campus. A design guide with more aggressive sustainability criteria should be developed for the Rio Rancho Campus. This would better align with the goal of climate neutrality as per the President's Climate Commitment which was recently signed by the UNM President. The design community presently does not know how to fully achieve climate neutrality in buildings, but several suggestions given below represent improvements over UNM's current Facilities Design Guide.

Even with the recommendations listed below, the buildings on UNM's Rio Rancho campus will require heating, cooling and electrical systems. These should start as stand-alone systems serving individual buildings. But as the campus grows there will be advantages to serving the buildings with power and chilled water from centralized campus distribution systems.

Development of a definitive mechanical/electrical infrastructure master plan is beyond the scope of this project, but Table-A gives a guide for what might be a logical evolution of campus utilities. Once the campus grows to 150,000 – 400,000 SF UNM should commission a thorough mechanical/electrical master plan to definitively determine the most appropriate approach to serving the heating, cooling and electrical requirements of the buildings. Initial campus planning should preserve the option to develop centralized campus distribution systems in future, as this likely will be the most appropriate approach.

Figure 1 identifies corridors which could be used for centralized chilled water and electrical distribution to serve the campus. It also shows potential locations for a Central Plant which could be developed over time to serve the first to 3-4 million SF, a second Central Plant which could be developed over time to serve the remainder of the campus, an initial primary electrical service entrance which could serve up to approximately two million SF, and a substation that could serve the full ultimate campus build-out. There is considerable flexibility in the locations of the central plants and some flexibility in the locations of the electrical substations. The recommendations presented here address infrastructure needs on the main campus, independent of the Hospital.

A. BUILDING DESIGN GUIDELINES

- Achieve minimum 5 energy points per LEED 2.2 (24.5% improvement over the baseline per ASHRAE 90.1-2004) Final approaches would be left to the building design teams.
- Provide minimum 10% of building projected annual energy requirements through on-site renewable energy generation.
- Comply with UNM's Facilities Design Guide, except as follows: Provide broader indoor ranges (68 – 78oF with humidity uncontrolled) in spaces which are conditioned only for human comfort purposes (e.g., classrooms, most labs, offices, dormitories, dining, and most common spaces, etc).
- Locate mechanical/electrical equipment indoors to preserve good solar access for roof-mounted equipment requiring access to the sun (e.g., photovoltaic cells or solar thermal collectors). Exceptions will be made for flues, exhaust fans, small roof-mounted equipment, heat rejection equipment and telecommunications equipment.
- Configure buildings for service from campus utility distribution systems (natural gas, possible future CHW, 15 KV electrical, IT/data).
- UNM's President has signed the American College & University Presidents' Climate Commitment, which commits the University to achieving climate neutrality as soon as possible.

The buildings should be designed and operated to minimize heating and cooling loads. But even with very efficient buildings, mechanical heating and cooling will be required throughout much of the year. Ground-source heat pumps are not discussed here because the projected load density greatly exceeds the available land for bore holes, and the great number of heat pumps required would ultimately result in a maintenance issues which UNM would likely find to be burdensome.

The systems described here utilize mechanical cooling and gas heating. These systems are compatible with a great variety of building HVAC systems, including conventional single duct VAV reheat, hybrids incorporating evaporative cooling, under floor air conditioning, radiant heating and cooling, various heat recovery technologies, etc.

cooling systems

System Configuration: Mechanical cooling could be provided through any of the following system configurations:

Local Cooling: In this approach each building would generate its own cooling. Cooling would typically be electric driven, either at the AC unit or utilizing chillers.

Satellite Plants: In this approach several medium-sized chiller plants would serve groups of buildings, with 2 – 10 buildings per system. The chiller plants could be incorporated within academic, mixed use or dormitory buildings.

Central Plants: In this approach 1-3 main central plants would generate and distribute chilled water (CHW) to serve the entire campus.

Discussion: College campuses commonly start with local cooling systems serving individual buildings because that is initially cost effective, but evolve to centralized CHW generation as they grow. This change commonly provides improved reliability, reduces maintenance, allows the use of heavier duty and longer-life equipment, and concentrates maintenance activities and adverse environmental impact (noise and cooling tower plumes) in areas that are more tolerant of such impacts. It can also improve energy efficiency, though this is not assured. Centralized CHW generation requires allocating space for central plants and distribution systems.

Recommendation: The first few buildings should have local cooling systems. When the campus grows to somewhere between 150,000 and 400,000 SF, commission a mechanical/electrical infrastructure master plan to determine whether the outlook at that time justifies beginning a central CHW system. Initial campus planning should anticipate conversion to campus CHW distribution, and should be careful not to preclude such a conversion. Specifically, we recommend establishing a location for an initial central plant that could grow to serve 3-4 million SF, and a second central plant that could grow to serve 4-5 million SF. Characteristics of these plants might be:

Plant No.	1	2
Area Served	3-4 Mil SF	4-5 Mil SF
Ultimate Capacity	3000-5000 T	5000-7000 T
Lot Size	___' x ___'	___' x ___'
Distribution Mains*	20-inch	24-inch

*Typical of two mains leaving the plant in different directions.

Type of Chiller and Energy Source: Electric driven cooling is available, simple, and typically is efficient and cost effective for cooling loads of all size ranges. Other alternatives exist for the larger size ranges associated with satellite and central plants. These alternatives should be evaluated when the mechanical/electrical infrastructure master plan is developed.

Heat Rejection: The initial, local building cooling systems could use either air-cooled or water-cooled heat rejection. This decision should be made on a building-by-building basis. But when the campus grows to more than about 400 tons, heat rejection should be water-cooled. This will greatly improve energy efficiency, although at an increase in maintenance and water consumption.

Chilled Water Distribution:
General Arrangement: There is considerable flexibility in the configuration of chiller plant(s) and a piping distribution system to serve the campus. Figure 1 shows one such configuration with two central plants. This initial campus planning process should establish utility corridors for the distribution systems.

Tunnel vs. Direct Buried vs. Trenches: These are all technically viable alternatives, but they vary greatly in cost and functionality. Tunnels afford access to the pipe and can offer flexibility to add services at a later date, but they entail considerable capital cost premium when compared with direct buried piping. Direct buried piping has the lowest capital cost, but does not afford ready access to the pipe. Trenches offer capital costs and functionality that is intermediate between tunnels and direct buried piping.

During the last 20 years factory-fabricated pipe and insulation systems have been developed with improved jackets which greatly extend the life of direct-buried piping. Consequently, it is common these days for college campuses to use direct-buried piping to for CHW distribution. UNM's recent main campus infrastructure upgrades used direct-buried piping. This issue should be evaluated as part of the mechanical/electrical infrastructure master plan. Piping and insulation materials should also be evaluated as part of that study.

heating systems

Ford Utility Center generates and distributes steam to serve the space heating and domestic water heating requirements of buildings throughout UNM's main campus. Typically steam is converted to hot water at the building entrance, and local hot water systems serve the heating needs throughout each building. This is relatively capital intensive and energy inefficient. There is a trend these days toward using local, gas-fired hot water systems for both space and domestic water heating rather than central steam systems. We concur with this trend, but this should be confirmed as part of the mechanical/electrical infrastructure master plan.

The 2008 Annual Energy Outlook by the Energy Information Administration projects modest increases in natural gas through the year 2030. The outlook beyond that is less predictable. UNM's Rio Rancho Campus may exist long enough that natural gas becomes cost prohibitive. At that point alternatives might include manufactured gas or electric power. With either of these approaches it may still be appropriate to generate heat locally for space heating and domestic water heating as recommended above.

metering, monitoring & verification system

Each building should have a Building Management System as required to properly monitor, control and manage the building, including monitoring energy supplies to the building. Each building system should be interfaced into an overall campus Facility Management System. UNM presently has such systems on its main campus, and these should be used as a model for the Rio Rancho Campus.

campus power distribution

Primary power on campus will be distributed in underground duct banks most likely at 12.47 kV. The UNM preference is to use a 'dual-radial' primary distribution scheme similar to that used at the main UNM campus. The dual-radial system allows for redundancy and switching options to help minimize outages. Other distribution schemes such as 'loop primary' should be investigated prior to making a final decision on the primary distribution type.

The primary distribution system would incorporate underground duct banks and manholes, with above grade, pad-mounted switches and transformers. Typically a pad-mounted switch and transformer would be associated with each building. A key will be to identify utility corridors to route the power distribution system so to avoid future relocation work.

service

The initial campus buildings will be fed from a PNM source (as opposed to a UNM owned substation). PNM is currently planning an underground 15 kV circuit along the western border of the campus. This circuit could serve the first several buildings, via either a primary or secondary meter arrangement. The secondary meter arrangement would include a PNM standard primary distribution system onto the campus with secondary electric meters for each building. The primary meter arrangement includes taking power at 15 kV at a single primary meter/switchgear location and building a UNM standard distribution system onto the campus.

service metering configuration - phasing

It is envisioned that the power service/ metering configuration to the campus will be phased as load grows to take advantage of the PNM rate structure. PNM currently offers rate breaks for loads above 50kW (General Power), 500kW (Large Power) and 8,000kW (Public Universities). To take advantage of the Large Power rate, PNM requires that the owner buy power at 12.47 kV and furnish all distribution equipment. To take advantage of the next tier rate of Public Universities, PNM requires the owner buy power at 115 kV and furnish a substation and all distribution equipment. The campus will likely reach the 500 kW threshold at roughly 125,000 sf. The campus will likely reach the 8,000 kW threshold at roughly 2,000,000 sf. Note that a single PNM circuit/service can only supply up to ~ 10,000 kW, so as the campus grows beyond 2,000,000+ square feet, a second PNM primary circuit/service would be required. Refer to Table A for an illustration of this growth.

For preliminary planning purposes, the sequence may take this form:

1. Campus build-out to ~ 125,000 sf, or about 2 to 4 buildings: These buildings will be served directly from PNM and secondary metered and on the General Power rate. Limit PNM on-campus distribution.

2. Campus build-out from 125,000 sf to 2,000,000+ sf: Transition to a primary metered system soon in this growth phase to take advantage of PNM Large Power rate. Requires installation of primary meter and UNM owned distribution. The initial buildings in #1 above may require equipment modifications from PNM system to UNM standards.

3. Campus build-out beyond 2,000,000 sf: Transition in this phase to a UNM substation to take advantage

of PNM University Rate OR addition of a second PNM primary metered circuit/service Note that a single PNM primary service with a dedicated circuit can feed ~10,000 kW or 2,000,000 sf . Requires construction of 115kV – 12.47 kV substation, and extension of the 115 kV PNM transmission circuit to the on-campus substation location OR construction of a second PNM primary metered circuit/service.

At some point the initial PNM circuit will reach capacity due to load growth from the campus as well as from other PNM customers. PNM can accommodate this future load by either adding distribution circuits or adding substation capacity. PNM can perform a 5, 10, 15 year analysis to look at what infrastructure upgrades may be necessary based on load projections for this timeline.

substation

As described above, the campus build-out may require an electrical substation be constructed to either take advantage of PNM rates structure and/or due to load growth. The decision for UNM to own and operate a substation is likely based on a life-cycle cost analysis, which is beyond the scope of this narrative.

The campus master plan should allocate space for the substation. An approximate size of 200 ft x 200 ft would accommodate two transformers, with capacity to service the ultimate campus build-out. Location should be in the closest quadrant to the existing overhead 115 kV transmission line so that on-campus overhead 115 kV transmission lines can be avoided or minimized.

campus telecommunications distribution

Telecommunication cabling will be distributed throughout campus in underground duct banks. UNM's current practice is to use a joint primary power / telecommunications duct bank with separate telecommunication manholes. It is anticipated that this practice will be followed at the new campus. A key will be to identify utility corridors to route the telecommunications distribution system so to avoid future relocation work.

building electrical guidelines

In addition to the items listed above, the following should be considered:

4. Configure building electrical system to easily incorporate building-mounted renewable energy sources (such as PV & wind), by providing adequate space and pathways for future equipment and cabling.

5. Use high-efficiency lighting systems.

6. Utilize building lighting control systems, incorporating daylighting and occupancy controls to turn off and/or dim building lights. Use natural light in lieu of artificial light where practical. Building lighting control system to be capable of remote interface monitoring and control.

7. Configure building electrical distribution systems for energy efficiency, i.e. use higher voltage (277/480V) for loads, and higher efficiency equipment to minimize losses in the system.

8. Provide an electrical power monitoring system with remote access.

6 TRAFFIC

regional land use and circulation framework

The University of New Mexico campus will be located immediately to the east of the planned City Center development, and south of the Central New Mexico Community College (CNM) Rio Rancho Campus. Long term plans for City Center envision a high-density downtown that will include residential, retail, services, entertainment, employment and civic land uses. CNM will ultimately serve a population of 3,000 students. Considered as a whole, the University of New Mexico, City Center, and CNM will create a vibrant environment with considerable interaction among uses, much of it made by foot and by bicycle. Still, a substantial amount of vehicular traffic will be generated, which the circulation system must be designed to accommodate. The magnitude of the development potential and vehicular trip generation can be seen in the following tables.

In addition to traffic generated by the University of New Mexico and abutting areas, several existing and planned arterial roadways serving the area will experience traffic increases associated with regional growth in the Albuquerque area and the northward expansion of Rio Rancho. Such regional traffic projections were considered in the development of the UNM street network using projections obtained from the Mid-Region Council of Governments (MRCOG) year 2035 traffic model. Following is a summary of the key regional routes that will have an impact on circulation within and surrounding the UNM campus.

- *Paseo del Volcan* (28th Avenue) – This roadway runs east-west and forms the southern boundary of UNM. Paseo del Volcan is currently a two-lane highway that will provide primary access to UNM, City Center, V. Sue Cleveland High School (CHS) and residential development to the north and west of the City Center. Plans exist to extend Paseo del Volcan to

Land Use Summary

Area Land Use	**Units**
City Center Area	
Residential	1,533 units
Specialty Retail (Mixed Use)	665,000 SF
Shopping Center	860,000 SF
General Office Building	4,673,000 SF
Multiplex Movie Theater	16 screens
Hotel	300 rooms
CNM	
Junior / Community College	5,000 students
UNM	
University Students (Full Time Equivalent)	12,000 students
Student Housing Capacity	3,000 students
Hospital (250 beds)	855,000 SF
Medical Office Buildings	501,000 SF
Mixed Use - Retail	303,000 SF
Mixed Use - Office / Professional	505,000 SF
Mixed Use - Residential	1,010

Land Use Summary Table

US 550. The New Mexico Department of Transportation (NMDOT) has indicated that Paseo del Volcan may ultimately become a limited access freeway or expressway connecting Interstate 40 to Interstate 25, serving the entire northwest quadrant of the Albuquerque region.

- *30th Street* – This corridor generally forms the eastern boundary of the campus and will serve as the primary access road for most of the University's students, staff, and visitors. On the regional level the corridor will ultimately connect Progress Boulevard to Paseo del Volcan, then extend further south, connecting to Broadmoor Drive and the currently-urbanized areas of Rio Rancho. It is likely that this will be the primary route for people traveling to/from areas north of the campus. In addition to operating as a north-south corridor, 30th Street will also operate as an interface with future development to the east of UNM. It is likely that the corridor will ultimately be constructed to six-lane principal arterial standards between PDV and the hospital access intersections, and a four-lane principal arterial on sections to the north and south.

- *Center Boulevard* – The street forming the boundary between UNM and City Center is referred to as Center Boulevard. Current plans are for Center Boulevard to consist of one travel lane in each direction as well as bicycle facilities in the form of either on-street bicycle lanes or off-street bicycle paths. The signature street includes a wide median ranging in width between 50 to 100 feet that could be utilized for landscaping and passive recreation. The northern terminus of Center Boulevard will be a roundabout forming the main entrance to the CNM campus, just north of Progress Boulevard. Roundabouts would also be constructed at both ends of Civic Center Circle, the southernmost leg of which would also extend eastward into the medical campus area of UNM.

- *Unser Boulevard* – Aligned north-south and on the western boundary of City Center, Unser Boulevard is currently a two-lane road near City Center, which expands to four or more lanes south of City Center. Although Unser Boulevard does not directly connect to UNM, it is expected to be a major access corridor for the UNM as it connects major parts of the City to the south and connects to Northwest Loop, which ultimately connects to US 550 to the north. Unser Boulevard will ultimately be widened to become a continuous four to six lane major arterial linking Interstate 40 with US 550.

- *NM 528-Rio Rancho Boulevard Northeast* (Pat D'Arco Highway) – Located east of UNM, this route runs northeast-southwest through the City of Rio Rancho and is utilized as an arterial route for traffic within the City. Many drivers traveling to and from UNM would travel on the highway for a portion of their route as it connects Rio Rancho to US 550, as well as other key City roadways including Northern Boulevard and Iris Road.

The approximate daily traffic volumes on roadways within and surrounding the UNM campus are shown in Figure 1 (next page). To help visualize what a daily traffic volume might feel like during the busiest hour of the day, the daily volume can be divided by 600 to obtain a rough estimate of the number of cars per minute traveling on the street. For instance, an average daily traffic level of 6,000 vehicles would translate to about 10 cars per minute during the peak hour.

Trip Generation Summary

Area	**AM Trips**	**PM Trips**	**Daily Trips**
City Center Area	6,400	9,050	86,850
CNM	550	550	5,400
UNM Academic and Student Housing	2,200	2,350	25,450
UNM Hospital and Medical Offices	1,750	1,800	23,250
UNM Mixed Use	900	1,250	15,600
Total	**11,800**	**15,000**	**156,550**

Trip Generation Summary Table

Figure 1 - Average Daily Traffic Volumes at Build-out

circulation constraints

The Federal Highway Administration designates Paseo del Volcan as a future route on the National Highway System. MRCOG and the City of Rio Rancho also designate the corridor as a Limited Access Principal Arterial, limiting signalized access points to one mile apart. As indicated above, NMDOT has also expressed that the facility may some day become a freeway or expressway with minimum interchange spacing of one mile. All overseeing agencies envision grade-separated interchanges to exist on Paseo del Volcan at Unser Boulevard and 30th Street (which are 1.1 miles apart). For the UNM campus, this suggests that all access to PDV will ultimately need to occur via an interchange at 30th Street.

The City recognizes that a single access point onto PDV serving the combined traffic needs of City Center, UNM, and surrounding uses may be inadequate, particularly in the years (and possibly decades) before a freeway is constructed. Rio Rancho, MRCOG, and NMDOT shall conduct further analyses and determine if an additional access point at Center Boulevard is achievable in the near term and long-term, and how a future freeway and its affiliated ramps can adequately serve the area while maintaining acceptable operation and design standards. These decisions will clearly affect traffic flow within the UNM campus. Given the uncertainties about PDV, the campus plan has been designed to accommodate varying options ranging from signalized access points at Center Boulevard to a full split-diamond interchange with frontage roads between 30th Street and Center Boulevard.

onsite circulation

The circulation network within the UNM campus and hospital area will generally consist of streets having one through travel lane in each direction plus applicable turn lanes at intersections. Some streets would have continuous center turn lanes, sometimes referred to as “three lane streets,” with strategically-placed landscaped medians in locations where turn lanes are unneeded. Some street segments that are close to major arterials and major destinations would have wider street sections, including the hospital access roadways near 30th Street.

The most critical streets in terms of providing high capacity will be those on the southern end of UNM at the major access points for the hospital and associated medical facilities. To the north of PDV, 30th Street is recommended to be a six lane section with additional turn lanes at intersections. The first intersection along 30th Street north of PDV would be a ceremonial entrance to the hospital, though would remain unsignalized and restricted to right turns in and out, in addition to a possible inbound left turn into the hospital in the northbound direction. Signalization of this intersection is not possible because of potential adverse impacts to adjacent intersections and the 30th Street corridor. Outbound left turn movements onto 30th Street are also infeasible from a safety perspective.

Another key access point for the hospital and affiliated medical office and research facilities will be on 30th Street at the view corridor. This intersection will be signalized and will allow all turning movements. To the west of this primary access intersection will be a roundabout intersection that will distribute drivers to various destinations and parking lots. This intersection is designed as a roundabout primarily for operational purposes, but also minimizes the aesthetic impacts created by a large intersection on the view corridor. Roundabouts help maintain a smooth and low-speed flow of traffic while minimizing vehicle queuing, which is especially important on short blocks. Views of all proposed internal streets with recommended lane configurations and intersection control types are attached.

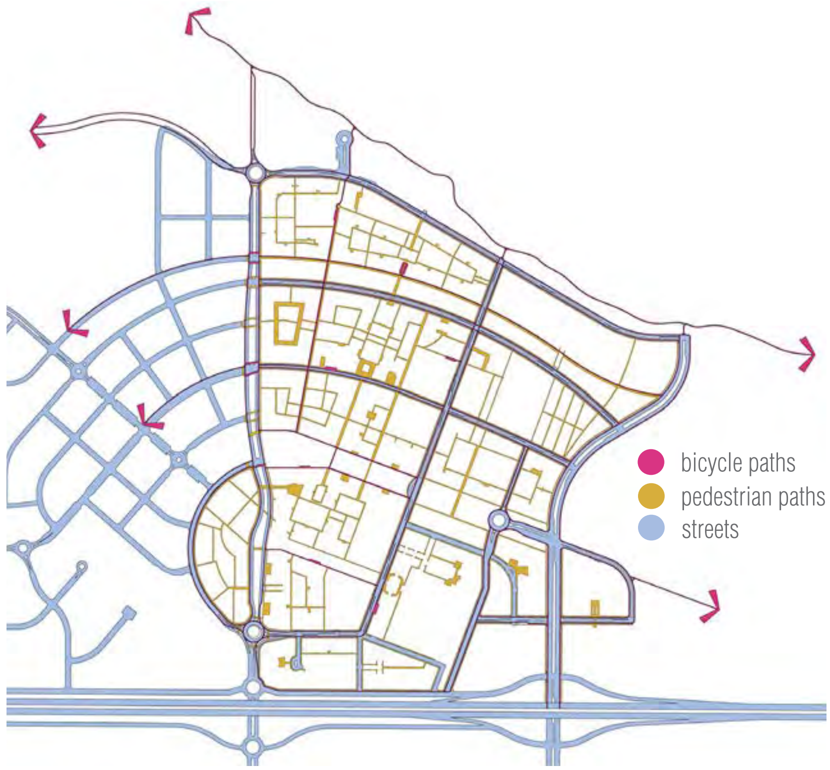
For the entire UNM site it is important that effective way-finding sings are installed to direct people to the appropriate parking facilities. This is especially important at the hospital and associated medical facilities as it is likely that visitors will not be familiar to the area. For the academic parts of campus, primarily the northern part of UNM, drivers are more likely to be “daily drivers” who will be familiar with their route.

Whenever possible, all street sections should match City of Rio Rancho street standards so that the streets will be consistent with the surrounding street network. Traffic signals should only be used when warranted by traffic conditions, with all other intersections controlled by side-street stop controls or roundabouts. Unnecessary use of traffic signals can have a negative effect on the flow of traffic.

bicycle and pedestrian circulation

UNM is envisioned to have a large portion or trips to be completed by walking and bicycling. The potential for non-automobile travel is particularly high at UNM West given the proximity of planned retail, housing, employment, and entertainment within City Center. The UNM Master Plan has been developed to include an extensive pedestrian and bicycle network that creates convenient and meaningful ties to City Center. These connections will be crucial for providing connectivity and minimizing the amount of vehicle trips as well as the number of parking spaces demanded in the area.

Streets within the campus have been designed to minimize overall widths, thereby minimizing pedestrian crossing distances. The minimized vehicle travel lanes and modified grid street system also reduce the ability for drivers to speed, making campus both safer and more comfortable for pedestrians. All intersections within the Plan area will include crosswalks. For signalized intersections, pedestrian indicator lights, push buttons and signal timing that allows for pedestrians to safely cross the street will also be provided. Pedestrian warning systems such as in-pavement crossing lights may be considered in the future to enhance pedestrian safety at high-volume crossings located at unsignalized or mid-block intersections.



Bicycle and pedestrian circulation

transit

Center Boulevard is envisioned to become a high-frequency north-south transit and shuttle spine that would provide access to various parts of the UNM campus as well as City Center and the CNM campus. Regional transit serving the Albuquerque region is likely to include stops near Civic Center, though some routes may ultimately extend along the length of Center Boulevard. The provision of shuttles on the street connecting the two campuses with City Center, as well as future regional transit facilities, will make transit a viable option for both students and staff.

The City Center Master Plan designates space for a potential Rail Runner commuter rail station to be located southwest of the UNM campus, near the foot of Center Boulevard. A rail station at this location would further improve accessibility to UNM and reduce reliance on private automobiles. While a rail station may be decades from coming to fruition, the provision of shuttle service to the Bernalillo Rail Runner station may be explored as an interim solution as the campus grows and demand for alternative transportation increases.

Traffic Simulation Campuswide

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