



NEVADA STATE COLLEGE **CAMPUS MASTER PLAN**





NEVADA STATE
COLLEGE

January 2010

To Friends of Nevada State College:

Due to the foresight of the City of Henderson and the support of the Board of Regents, Nevada State College (NSC) is fortunate to possess a 509 acre site for campus development. Given this valuable resource, Nevada State has embarked on a thorough planning process to ensure that the physical facilities of the campus match the academic mission of the institution. The NSC students, faculty, staff and administration have worked closely with the BMS planning team, the City of Henderson leadership, and the members of the community to produce a plan for the development of the physical campus in both the near and long term. As you will see, the plan blends the academic and student support facilities with the natural features of the southern Nevada landscape.

A critical element of any facilities plan in this decade is an emphasis on sustainability. A major component of the NSC campus master plan focuses on this important issue. This attention to sustainability matches the College's emerging green curriculum. The plan sets the lofty goal of carbon neutrality for the campus at full build-out. While such a goal is most ambitious, it is the only proper path to pursue.

Nevada State College has made rapid progress since its founding in 2002 with enrollment currently topping 2,500. It is providing access to bachelor's degrees to the citizens of Nevada, especially low income, first generation students. The campus plan before you will ensure that Nevada State College continues to fulfill its mission well into the future. Sincerely,

Fred J. Maryanski
President

OFFICE OF THE PRESIDENT

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NEVADA STATE COLLEGE **CAMPUS MASTER PLAN**



MARCH 2010

PREPARED BY
NEVADA STATE COLLEGE

WITH THE ASSISTANCE OF
BMS DESIGN GROUP

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Executive Summary

The Nevada State College Campus Master Plan will guide the growth and development of this new institution. The vision articulated here is comprehensive and ambitious, reflecting the goals and mission of this young college. Building from the current operations located in leased facilities and the first campus building, Liberal Arts and Sciences, the plan will guide growth on Nevada State College's 509-acre site from its current enrollment of about 2,500 students to its long term projection of 25,000 students (headcount).

The process of preparing this plan has been one involving a high degree of collaboration and consultation with the City of Henderson, local residents and neighbors, students, faculty and staff. Various committees met regularly and many campus and local community meetings were held to review the progress of the planning effort.

The development of Nevada State College (NSC) will ultimately involve construction of some 6,000,000 square feet of facilities, acres of open spaces, recreation fields and supporting infrastructure. At the same time the land adjoining the college controlled by the City of Henderson will develop into what the City and the College expect will be a highly supportive "town center" that can provide the services and amenities crucial to a successful and active campus environment.

THE CARBON NEUTRAL CAMPUS

As part of this master planning process, the College administration embraced the opportunity to be a model of efficient and sustainable development and operations. Through discussions with faculty, staff, and students the following vision statement was crafted:

"The Nevada State College community will become an exemplary and highly visible model for sustainability in higher education that demonstrates how a college campus achieves carbon neutrality and self-sufficiency through education, practice, and partnership. The campus will embrace technology and improve our relationship to our region; designed and intended to teach and aid in teaching, the campus will inspire faculty, staff, students, and visitors to take the next steps toward a sustainable future. As such, it must blend the best of the past, the proven innovation of the present, and the needs of our future."

Key components of sustainable development are green infrastructure and green building design. Green infrastructure includes elements such as district energy, renewable energy, energy efficient lighting, transit, recycled water and stormwater treatment and management systems that service the entire campus. Such infrastructure promotes maximum efficiency of resources and minimum generation of carbon emissions, while enabling projects to receive the benefits associated with economies of scale.

(Opposite)
Figure ES.01: Illustrative Plan

EXECUTIVE SUMMARY

Buildings also play a key role in the achievement of sustainability goals. Building designs that promote energy and water efficiency are designed to generate and use renewable energy, accept energy from district systems, and utilize recycled water. These sustainable elements of building design are essential in order for NSC to meet its carbon and overall sustainability goals.

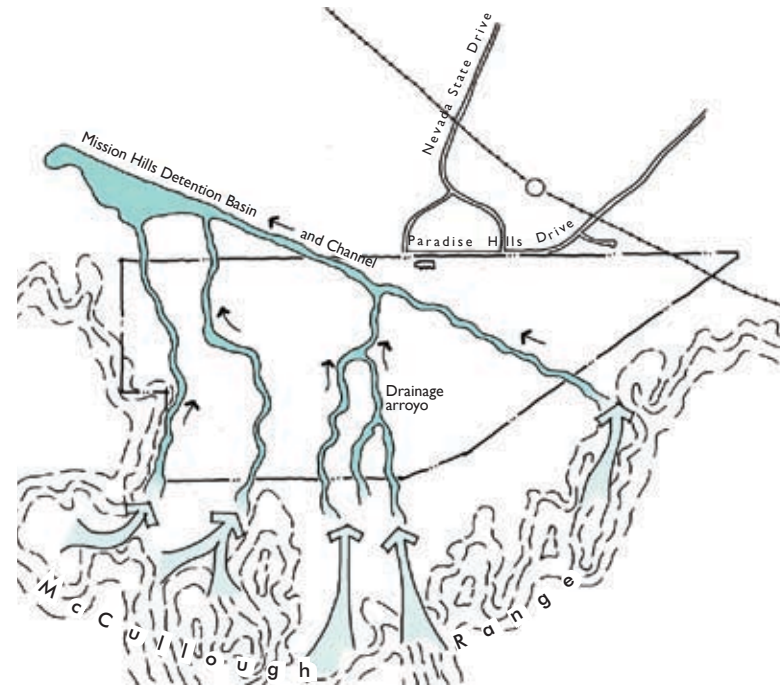
The NSC Campus Master Plan has specific targets for each resource use that will enable the College to meet its overarching goals. Third party certification is an important part of this process for confirmation of green strategies, ongoing measurement and verification, and publicity and student recruitment. It is recommended that NSC participate in three different third-party verification programs: LEED, STARS and the President's Climate Commitment.

SITE PLANNING

The goal of the Master Plan is to work with the natural character of the desert site to create a unique, memorable, flexible and highly functional campus layout that is climate appropriate and promotes efficiency and sustainability. The intent is to create a highly walkable, comfortable campus that is appropriate to the desert environment of high temperature summers and cold, often windy winters. In addition, the stunning natural environment of mountains and arroyos that descend to the gently sloping campus site can be retained as a means of highlighting the beautiful desert.

The Illustrative Plan (Figure ES.01) illustrates how the building program of academic, student housing, recreation fields, parking and other uses can be arranged on the campus, fol-

Figure ES.02: Natural Drainages



lowing the concepts set forth in this master plan. Buildings are aligned along an east/west axis, facing major open space, linear malls or smaller shared spaces. Spacing of buildings is consistent with the goal of achieving a walkable, compact academic core and campus, while framing image-making, usable outdoor spaces for special events. The plan incorporates the drainage arroyos and other open spaces.

Key concepts that have shaped this plan layout are summarized below.

Figure ES.03: Concept 2 - Compact Academic Core

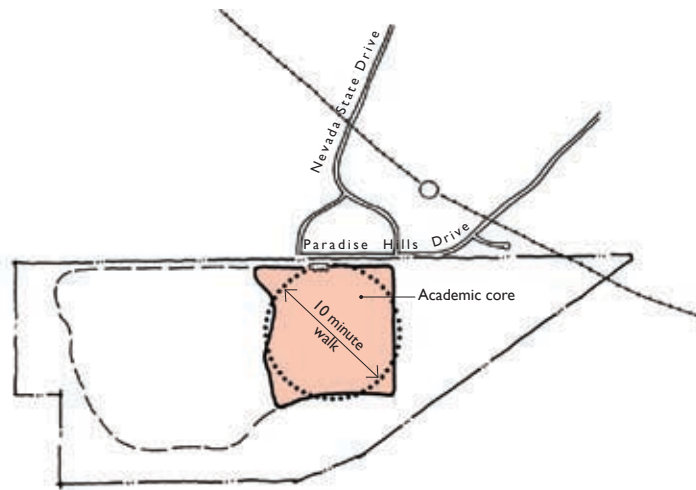
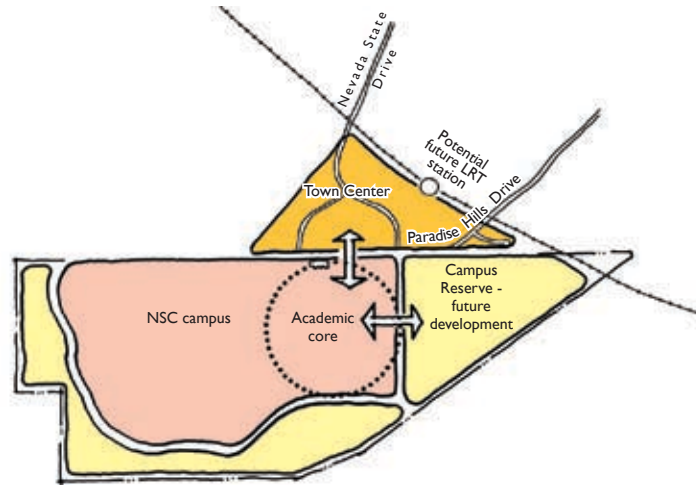


Figure ES.04: Concept 3 - Relationship to Town Center



Natural Drainages

The NSC site lies at the base of the McCullough Range. Stormwater runoff from adjoining hills runs through the campus, is captured by the engineered drainage channel, and is diverted to an off-site detention basin. As the campus develops, natural arroyos will be created to channel stormwater and the drainage channel will be redesigned as a naturalized element so that these infrastructure elements can be campus amenities as well (Figure ES.02).

Compact Academic Core

The heart of the campus is the academic zone (Figure ES.03), where the highest levels of activity will occur throughout the day. The academic core will accommodate a wide range of uses: classrooms and lecture halls, faculty and staff offices, library, student union, and performance facilities. In order to ensure efficient operations, the academic core is arranged in a compact and highly walkable pattern. Uses are in proximity to one another, linked by walkways, multi-use trails, and routes for bicycles and transit. Virtually all of the academic uses lie within a 10-minute walking diameter, which will provide convenient access during class changes.

Relationship to Town Center

The NSC campus has been planned specifically to create a close relationship between the campus and the adjoining City of Henderson development (Figure ES.04). It has been envisioned for some time that the city property would ultimately be developed in a higher density, mixed use configuration with campus-serving uses (retail, cafes, etc.) near the academic core. For this reason, the city's area has been termed the Town Center in this document.

EXECUTIVE SUMMARY

An area representing approximately $\frac{1}{4}$ of the entire campus is identified as a campus reserve which will lend a degree of flexibility for the long-term operations of NSC and will provide site opportunities for complementary uses such as a K-8 school, green technology companies, or additional housing.

Major Campus Entries

The site access concept (Figure ES.05) shows how the campus can be accessed from the regional network and from the adjoining town center. In the short term, a primary entry to the campus will be from Paradise Hills Drive. In the longer term, additional entries will be added around the periphery of the campus on the perimeter loop road, and from the east where it is anticipated that a third major access route to the campus will be needed. A transit network supporting the campus and the adjoining town center will provide service that brings students, faculty, staff and visitors to and from campus and shuttles users around the campus core.

Open Space and Pedestrian Circulation

Pedestrian circulation follows the primary open spaces of the campus (Figure ES.06). Two major north-south malls lead up the hill through the campus. Additional north-south routes are located along the edges of the arroyos, providing a more informal path, and between buildings throughout the site. Major open spaces - quads or plazas - are located throughout the campus and will serve as spaces for gathering and events as well as informal socializing.

INFRASTRUCTURE

A significant effort has been made to plan, evaluate and design specific infrastructure elements for the campus that will

Figure ES.05: Major Campus Entries

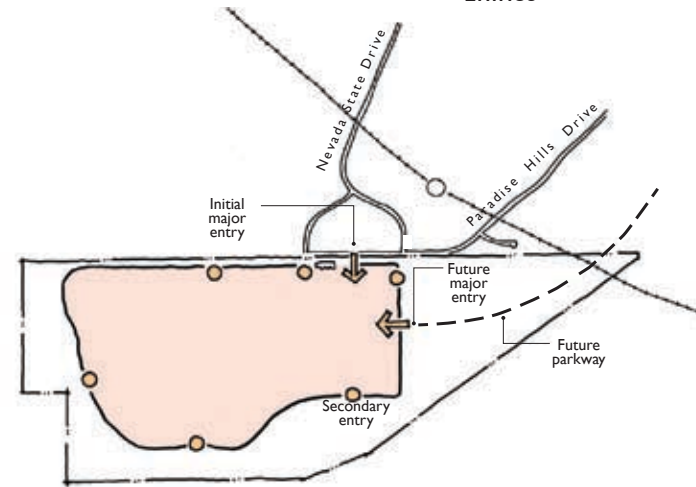


Figure ES.06: Open Space and Pedestrian Circulation

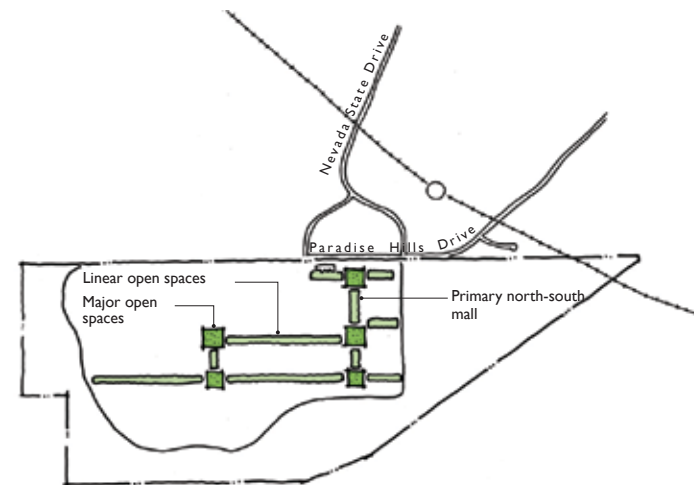
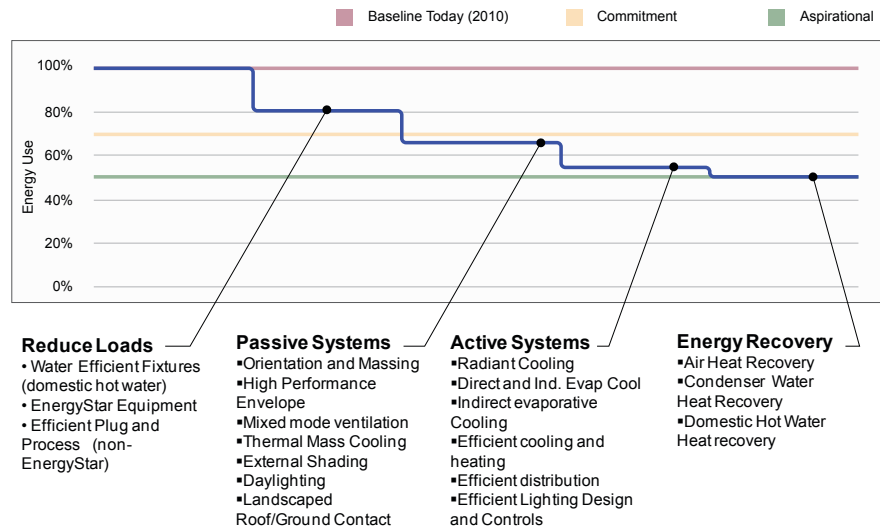


Figure ES.07: Steps to Reduce Energy Use



be both cost effective and will lead to a high degree of sustainability. Among the most important of these are energy, water and waste.

Energy

The development and implementation of an energy strategy that is, in and of itself, carbon neutral (also known as “zero energy”) is key for the NSC campus to reach its overall goal of carbon neutrality. The strategy to minimize energy use includes:

- Reducing energy loads
- Using passive systems
- Using efficient active systems
- Recovering energy.

Figure ES.07 illustrates how these four strategies and specific measures associated with them will reduce overall energy use. If all efficiency measures are adopted, the campus will achieve its “aspirational target” of 50% less energy use than the baseline or current code requirements. At a minimum, the more conservative, “commitment-level” energy efficiency target is 25% below current code levels.

Water

Water savings are of critical importance to NSC, both because water is scarce in the region and because of the cost, energy use and carbon emissions associated with extracting, distributing, treating and heating water. Therefore, reducing water use is essential to serve the long-term needs of the campus and to reduce the College’s overall carbon footprint. The plan includes specific targets for reducing potable water use and recommends connecting to and utilizing the City’s recycled water system.

Solid Waste

The impact on the environment can be greatly reduced with effective reduction, reuse and recycling programs to reduce the generation of waste and divert it from landfills.

DESIGN GUIDELINES

Design guidelines are presented to complement the master planning strategies and express intentions for the design of buildings, open spaces and landscape. Concepts build on the special desert environment of the site as well as the first campus building to establish a palette of colors, materials and textures.



THE NSC CAMPUS MASTER PLAN

Nevada State College (NSC) is one of eight institutions of the Nevada System of Higher Education (NSHE). The Nevada State Legislature in 1997 found that southern Nevada required supplemental educational opportunities. In 2002, Nevada State College admitted its first class of students in leased facilities located in Henderson. In 2007, the College received a land transfer of 509 acres for the permanent campus. This site lies in the southeast corner and at the edge of the City of Henderson, on sloping desert lands at the foot of the McCullough mountain range.

Nevada State College is a comprehensive baccalaureate institution of higher learning. In its short life, NSC has grown in enrollment and is poised to fulfill its role in meeting the increasing demand for higher education to address the state's need for an educated and skilled workforce.

PURPOSE OF THE DOCUMENT

This master plan has been prepared in order to plan for the orderly and efficient growth of the NSC cam-

1 Introduction

pus. The campus master planning process provides an opportunity for the institution to consider its roots, assess its current condition, and articulate a vision for its future. The process and resulting plan also support future decision-making by identifying the physical resources that will be needed to further the College's mission and goals, and providing the framework to guide facilities and resources decisions. This is particularly important in the case of a new campus, where the significant investment needed to establish and grow the institution must be managed in a timely but careful manner.

This document addresses the campus site, anticipated program, projected facility needs, and the supporting infrastructure that will be needed to take the campus from its current enrollment to a projected long term enrollment of approximately 25,000 students (headcount).

ORGANIZATION OF THIS DOCUMENT

This NSC Master Plan is organized to clearly present information regarding the existing site and context for the campus and planned programs and facilities to guide campus development. It is organized into the following chapters:

- History of Planning for Nevada State College
- The Vision for Nevada State College
- Planning Context
- The Master Plan
- Design Guidelines.

PLANNING PROCESS AND PARTICIPANTS

This master plan has been prepared by Nevada State College in close cooperation with the City of Henderson, which has been a highly supportive partner in the endeavor. Campus administrators, faculty, staff and students have invested considerable time and energy in meetings to review data, concepts and plans and have provided essential input and feedback. City of Henderson staff, the City Council, and Planning Commission have also provided background information, mapping data, ideas and feedback.

As described in Chapter 2, the planning process resulting in this document began with the transfer of land in 2002 from the Federal Bureau of Land Management to the City of Henderson, for the purpose of establishing a new higher education campus. From that time forward, the City and NSC worked closely together to execute the necessary actions to finalize transfer of the land to the College and to coordinate the many related issues associated with land use and development decisions.

NSC, for its part, worked simultaneously on two efforts. First, it began planning by evaluating the suitability of the site for various campus uses and the acreage requirements of projected enrollment and facilities while also exploring the cost and financing issues associated with the long term implementation

of the campus site. At the same time, NSC undertook the design of the first permanent campus building, the Liberal Arts and Sciences Building, which was opened in the fall of 2008.

Meanwhile, the City of Henderson prepared a study of the area immediately surrounding the future campus. This resulted in the College Area Plan which established a basic land use framework for a town center and supporting uses to adjoin the campus.

Master planning for the campus site began in earnest in the fall of 2008. At this time, concurrent with the hiring of a multi-disciplinary planning team, NSC established several committees to review the progress of the work. These committees included representatives from the College, the City, and the community and were organized to address land use, finance, infrastructure and sustainability. These committees met frequently during a period of over one year. In addition, a core steering committee, consisting of senior NSC administrators and senior city staff directed and reviewed the technical work on an ongoing basis. The membership of each of these committees is listed in Appendix A of this document.



DETERMINATION OF NEED FOR NSC

In 1997, as a result of Nevada's explosive population growth, the Nevada Legislature created the Southern Nevada Strategic Planning Authority to study Nevada's infrastructure needs. The authority's findings clearly demonstrated that the state's higher education sector required additional facilities.

As a result of the authority's findings, the Nevada Legislature in 1999 appropriated \$500,000 to conduct a feasibility study to determine whether a four-year state college in Southern Nevada warranted further consideration. The committee tasked with this study conducted extensive market research and outreach in examining the feasibility of establishing a new state college.

The committee's findings articulated, in no uncertain terms, the degree to which Nevada's public higher education system was unable to keep pace with rising demand for higher education opportunities. Some of the committee's findings included the following statistics:

2 history of planning for nevada state college

- Out of 280 metropolitan areas, Las Vegas ranked first in the percentage of population change (83.3 percent increase) between 1990 and 2000.
- Out of those same 280 metropolitan areas, Las Vegas ranked 32 in population size with a population of nearly 1.6 million residents.
- Of the 40 largest metropolitan areas, 38 had three-tier higher education systems. Three-tier systems have at least one institution that emphasizes associate's degrees (community or junior college); one institution that emphasizes bachelor's degrees (state college); and one institution that emphasizes graduate degrees (university).
- Las Vegas was one of two metropolitan areas that did not have a three tier system and it was the only area that did not have a separate baccalaureate institution.
- From 1991-1992 to 1996-1997, the number of public high school graduates in Nevada increased by 28.2 percent, compared to the national median of 5.6 percent.
- Clark County has added an average of 1.5 high schools per year between 1989 and 2001.
- Nevada high school graduates are projected to increase by 41 percent from 2000 to 2010.
- Nevada has the lowest percentage in the nation of high school graduates going on to college. In 1996, the national average for the high school to college continuation rate was 59 percent. Nevada's average was 39 percent.
- Of the 15 Western Interstate Commission for Higher Education (WICHE) states, Nevada ranks last in the number of residents (25 and older) who hold a bachelor's degree as their highest degree.

Following the completion of the committee's study, the Nevada Board of Regents, in December 1999, accepted the recommendations of the committee to begin planning for a state college in the City of Henderson.

In May 2001, the Nevada Legislature supported the Nevada Board of Regents' decision to establish a new state college by approving approximately \$13 million in capital expenditures and \$4.4 million (\$3.75 million in state general funds and \$650,000 from student registration fees) for operations for the College's inaugural class in the fall of 2002.

View from the Liberal Arts and Sciences Building looking south.





(above)
The NSC site with Black Mountain
in the distance.



(right)
Sunset over the McCullough Range.

PARTNERSHIP WITH THE CITY OF HENDERSON

One of the NSC's greatest assets is its strong partnership with the City of Henderson. This partnership began as a result of the city's active participation with the Nevada System of Higher Education Board of Regents in securing a physical site for the College.

In 2003, the City of Henderson and the Nevada System Higher Education (NSHE) entered into an agreement whereby they would implement the Clark County Conservation of Public Land and Natural Resources Act of 2002 of the United States Congress that provided for the conveyance of land for the purpose of developing the College's physical campus. In 2007, the City of Henderson, NSC, and the NSHE entered into a revised interlocal agreement in preparation for the complete conveyance of the 509-acre campus site from the City's holdings to NSHE control.

In essence, the 2007 interlocal agreement ensures a continuing partnership between the College and the City. Both parties agreed to collaborate on the development of the college master plan which would contain design and development standards in sufficient detail to insure quality campus development and a seamless interface with the city's neighboring parcels, particularly the proposed commercial, mixed-use, and transit-oriented developments directly adjacent to the north side of campus as identified in the city's College Area Plan. In addition, campus design standards would reflect the "Guiding Principles" associated with the College Area Plan.

2 history of planning for nevada state college

MILESTONES

Within the space of seven years since accepting its first class, Nevada State College has experienced significant growth and has solidified itself as an integral member of the Nevada System of Higher Education.

1997

In June, the Nevada Legislature commissions a study to assess the educational needs of Southern Nevada's population.

1999

In December, the Nevada System of Higher Education Board of Regents, acting upon the recommendations of the feasibility study, appoints Dr. Richard Moore as the Founding President of Nevada State College.

2000

In February, the Board of Regents and officials from the City of Henderson propose a college site in Henderson, Nevada. The Board of Regents also approve the University of Nevada, Reno as NSC's sponsoring institution in May. Towards the close of 2000, the Board of Regents creates three community task forces to aid in the planning and development of the College.

2001

In April, the Board of Regents accepts the task forces' recommendations, which include the mission of



The first Nevada State College graduating class in 2004.



Nevada State College. In June, the Legislature funds NSC for the 2002-2003 fiscal year, and the NSC Foundation raises funds for the ongoing operational costs of the College through July 1, 2002.

2002

Dr. Christine Chairsell becomes the College's acting president following President Moore's decision to return to the classroom. In September, NSC opens its doors for the first time to 177 students for the start of fall semester. In October, Kerry Romesburg becomes NSC's second president.

2003

In June, NSC begins its initial campus master planning and programming efforts.

2004

May heralds a momentous occasion for NSC, as the College celebrates its first commencement ceremony with a class of 13 graduates. NSC begins its self-study for candidacy status under the auspices of the Northwest Commission of Colleges and Universities. As 2004 comes to a close, the Board of Regents select Dr. Fred Maryanski as NSC's third president. Under the leadership of President Maryanski, the College further solidifies its standing as Nevada's first four-year college.

2 history of planning for nevada state college

2005

In June, the Nevada Legislature appropriates approximately \$22 million in operating funds to Nevada State College, as well as \$9 million in capital funding for the Liberal Arts and Sciences building, the College's first permanent building. In September, NSC's enrollment climbs to 1,557 students for the fall semester.

2006

The Northwest Commission on Colleges and Universities grants NSC candidacy for accreditation status in July. NSC's enrollment continues to rise with nearly 2,000 students enrolled for classes for fall semester.

2007

As NSC experiences rapid growth, the NSC campus community and state and local dignitaries in May gather for the groundbreaking ceremony of the Liberal Arts and Sciences building, the College's first permanent facility to be located on the College's 509-acre site.

In July, NSC welcomes Dr. Lesley DiMare as Provost. Dr. DiMare begins work to the development of the College's undergraduate curriculum.

With an eye towards Nevada's nursing shortage, the Nevada State Legislature appropriates \$3.5 million in August to NSC to begin design of a Nursing and Science building, a 60,000 sq. ft. facility designed to increase the number of nurses in Nevada.



The May 2007 groundbreaking for the Liberal Arts & Sciences Building.



In 2008, the Liberal Arts & Sciences Building opens.

President Maryanski's vision for the College's campus master plan comes closer to reality with the completion and approval of conceptual drawings that lay out the framework for a campus that supports 25,000 students.

2008

On March 4th, NSC celebrates its 5th anniversary as the state's first four-year public college. More than 250 community leaders and College faculty and staff gather at the Green Valley Ranch Resort & Spa to honor this historic occasion.

Students of NSC's Class of '08 receive their degrees at May's commencement ceremony. The Class of '08 eclipses NSC's first graduating class by graduating more than 170 students.

As the fall semester begins, NSC ushers in a new era with the opening of the Liberal Arts and Sciences building. The opening of the building signifies an important milestone in NSC's young history.

In the Fall of 2008, a comprehensive master plan process commences, resulting in this document.

2009

In September, NSC experiences a 20% increase in student enrollment, which pushes campus enrollment to over 2,500 students.

In December, the Nevada System of Higher Education Board of Regents approve the College's institutional strategic plan, which outlines the institution's strategic objectives through 2014.



VISION

Nevada State College is in the desirable position of developing a completely new physical campus on a 509-acre site in Henderson, Nevada. It is anticipated that NSC will develop approximately six million square feet of academic and campus support space (residential, commercial and cultural), as well as open space by the time it reaches its projected full enrollment of 25,000 - 30,000 students.

The College has a unique opportunity to create a truly sustainable campus community from the ground up. This campus master plan addresses sustainability in areas including: carbon, energy, water, waste, materials, transportation, and landscape and has been prepared in cooperation with the City of Henderson. As a consequence, the campus has the opportunity to be a model of sustainable development that can educate through its very design and operations, as well as its curriculum.

Unlike the majority of established college and university campuses, Nevada State College has the opportunity to not simply rethink the design of one

3 the vision for nevada state college

building, but rather to undertake the design and development of a whole community. Notwithstanding academia's early embrace and adoption of "green" thinking and practices, it is a rarity to have such a unique opportunity (and challenge) to create an institution in which sustainability will be practiced and demonstrated at every level - outside the classroom as well as within. By broadly embracing a culture of sustainability, Nevada State College will better prepare its graduates, faculty and regional business partners for the energy challenges that are confronting the global community.

Of particular importance is Nevada State College's intent to demonstrate how carbon neutrality can be achieved at a community or campus scale. The College plans to serve as a model for the city, region and country of how integrated planning, architecture and infrastructure can result in a net zero carbon footprint for a large development.

PLANNING PRINCIPLES

Through the discussions and interchange associated with the preparation of this master plan, principles have emerged that embody a vision for the future character of the campus and institution. While over time these concepts will evolve, they should be constantly revisited so they can remain clear and consistent as the campus grows to realize its mission to educate the next generation of students. The key elements of the vision for the NSC campus include:

- Sustainability and Carbon Neutrality
- Vital Living and Learning Environment
- Campus / Town Integration
- Respect for the Desert Environment
- Campus as Educational Laboratory.

SUSTAINABILITY AND CARBON NEUTRALITY

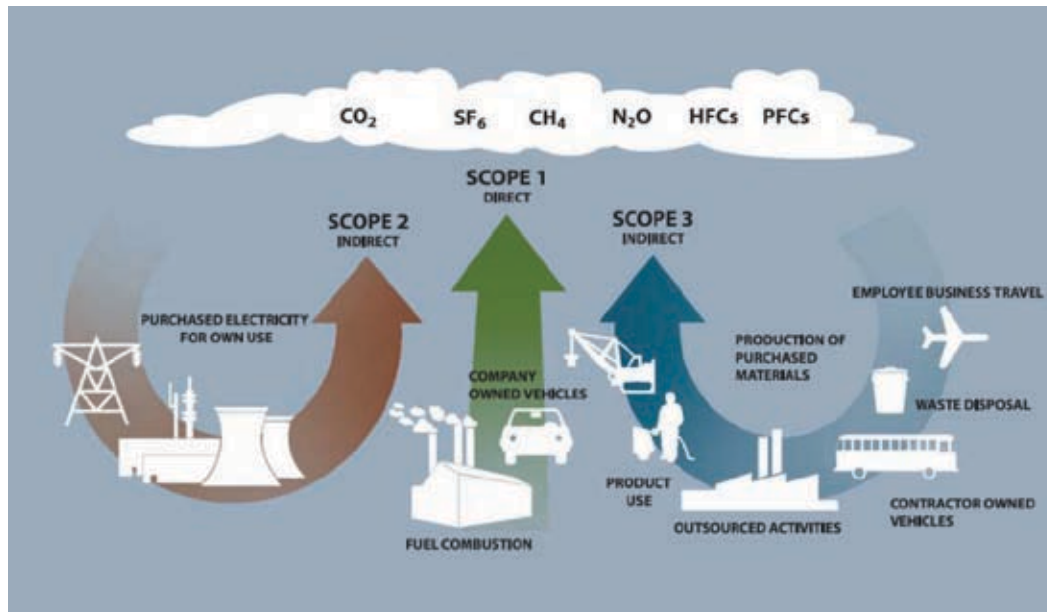
An overarching principle of this master plan is to develop the campus in accordance with sustainability best practices and to achieve carbon neutrality. For the purposes of this master plan, sustainability is defined as the campus' ability to minimize its impact on the environment and serve as social and cultural resource, while minimizing capital requirements and ongoing costs of operation.

Nevada State College has set a goal of achieving “carbon neutrality.” NSC defines carbon neutrality to be the generation of zero net carbon or carbon equivalent emissions from direct campus operations. “Zero net emissions” in this case means that the actual conversion of fuel to energy will not generate emissions, or that NSC will offset emissions from fuel or energy use through the on-campus generation of renewable energy or off-site generation of renewable energy.

Campus emissions that will either be eliminated or offset include Scope 1 and Scope 2 emissions as identified by the Climate Registry. The Climate Registry is a nonprofit collaboration among North American states, provinces, territories and Native Sovereign Nations that sets consistent and transparent standards to calculate, verify and publicly report greenhouse gas emissions into a single registry. As shown in Figure 3.1, Scope 1 and 2 emissions defined by The Climate Registry include:

- Direct emissions from all NSC-owned vehicles
- Direct emissions from fuel combusted on site for energy
- Indirect emissions through the use of purchased electricity.

Figure 3.1: Emissions as Defined by the Climate Registry



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VITAL LIVING AND LEARNING ENVIRONMENT

The academic mission of Nevada State College is the overriding consideration of this master plan and all the improvements that will follow. Providing the appropriate facilities to support interaction between staff, faculty and students in and out of class is essential. Facilities must be designed to provide flexible learning environments for the 21st century; outdoor environments will also be the locations of activities and interactions that support the learning environment.

In addition to the academic and support facilities housing classrooms, offices, libraries, laboratories and study spaces, facilities to support campus life are also important. Student housing, geared toward the wide range of potential students that will attend NSC, and athletics and recreation buildings and fields will be provided. Food service, lounges and other activity spaces will be important elements to complement the academic mission.

The campus site is adequately sized to accommodate the planned enrollment and population of Nevada State College with flexibility for unforeseen needs or growth.



(both)
Well designed buildings and interior spaces contribute to a healthy and effective environment for learning and collaboration.



(above)
The adjacent town center can provide retail and services used by residents and the campus community.

(left)
An integrated town center will provide lively places for college students, staff and faculty and neighborhood residents alike.



CAMPUS / TOWN INTEGRATION

In the initial planning for Nevada State College, the City of Henderson made it clear that its desire was not just to have the College located within the city, but for the College to be an integrated and vital element of the city. As the City noted, the College can provide learning opportunities for residents of all ages, can be a place for special events and for special facilities such as a library, theater or museum.

The City has been highly receptive to the idea of having the town and college located immediately adjacent to one another, with a nearly invisible boundary between the two. This integration would help avoid a problem which often plagues new colleges of an unnecessary separation between town and campus, resulting in long commutes which discourage walking or bicycling to campus, and where amenities and services needed by the campus population are at a significant distance.

The plan for Nevada State College therefore provides for a closely intertwined pattern of campus and town development, with shared amenities in a walkable environment. In addition the plan for the campus protects the natural features of this location that are highly valued by local residents including views of and access to the natural desert environment.

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RESPECT FOR THE DESERT ENVIRONMENT

Nevada State College occupies a spectacular desert site at the edge of the City of Henderson. The ecological, cultural and social values associated with this site will be protected through the layout, configuration and treatment of campus site and facilities.

Consistent with the goal of sustainability and carbon neutrality, the campus will retain its desert character, utilizing native vegetation wherever possible, which by definition will require little water and will remain a habitat for relevant species.

In addition, connections to the adjoining natural lands will be provided. Currently the natural lands beyond the campus are a utilized by the larger Henderson community for recreation including hiking, bicycling and horseback riding. Connections around and through the campus will be retained to provide access to this magnificent desert resource to the campus and adjoining communities.



(above)
The desert environment of the site will be protected; campus buildings and site improvements will fit appropriately.

(left)
Hiking, bicycling and equestrian trails will be provided around and through campus.



(above)
The campus will be integrated with the desert environment; buildings, landscaping and other site improvements will be designed to educate students and the public about this environment and how to sustain it.

(right)
Students can participate in climate change and green technology research in Nevada State College's state of the art laboratories.



CAMPUS AS EDUCATIONAL LABORATORY

The NSC site offers tremendous opportunities for the campus to serve as a living laboratory for learning. The desert environment itself and the way the campus will sit lightly on the land, becoming integrated with it, will hold many lessons for students as to appropriate ways of living in this environment.

If uses such as a “health campus” or green technology businesses grow nearby, there will be opportunities for internships and job training.

Perhaps most importantly, the commitment of the College to be sustainable and carbon neutral presents a profound opportunity to be a model of appropriate development in Clark County and the southern Nevada region, providing examples of energy-efficient and zero emissions buildings, climate appropriate landscapes, and infrastructure systems designed to address Nevada’s and the nation’s challenges in energy, greenhouse gas emissions and water conservation.



MISSION DRIVE

SAN BRUNO

SAN EDUARDO

SAN GABRIEL

SANTA HELENA

SANTA YNEZ

SAN MIGUEL

SAN ANDREAS

NEVADA STATE DR.

CONESTOGA WAY

BOULDER HIGHWAY

FOOTHILLS DR.

Dawson Building

Liberal Arts & Sciences Building

PARADISE HILLS DRIVE

UPRR TRACK

College Site

515

COLLEGE MISSION

Nevada State College is a comprehensive baccalaureate institution of higher learning. A member college of the Nevada System of Higher Education, Nevada State College is dedicated to providing quality educational, social, cultural, economic, and civic advancement for the citizens of Nevada. Through student-centered learning, Nevada State College emphasizes and values: exceptional teaching, mentoring, and advisement; scholarship; career and personal advancement; continuing education; and service to the community. The College helps address Nevada's need for increased access to higher education for students entering the system and for students transferring from the state's community colleges.

The College offers a wide range of baccalaureate programs and selected masters programs designed to meet the general needs of the State of Nevada and the specific needs of the southern region of the state. Special emphasis is placed on addressing the state's need for effective, highly educated, and skilled teachers and nurses, and commitment is made to developing and promoting partnerships with Nevada's public

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school system, the state's health care providers, and Nevada's colleges and universities. The curriculum of Nevada State College is based upon the community's needs, the needs of business and industry, and the desires and demands of the students.

STATE AND REGIONAL ROLE

Nevada State College provides:

- Its students with a remarkable education as they prepare to enter their chosen profession and make immediate contributions to society.
- The community with a resource in its students and faculty who apply their expertise, energy, and enthusiasm to practical problems, producing civic, social, and cultural benefits.
- The public and private sectors with a rich pool of intelligent, articulate, and technically savvy professionals.
- The state with the professional infrastructure for stable economic development and with support for essential social services such as education and health.
- Its faculty with a unique opportunity to create an academic environment nationally recognized for its instructional quality and innovation.
- Its staff with opportunities for professional growth and development as they create an outstanding student and business service environment.
- Its administration with the challenge to continue to re-invent the institution in response to the changing needs of the citizens of Nevada. By accomplishing the above, Nevada State College will be recognized as one of the nation's best 4-year institutions of higher education.

EDUCATIONAL PROGRAMS

The goals of the educational programs are consistent with the College's mission. In line with the College's assessment program, each major has established program and student learning outcomes that are published in the College Catalog.

Nevada State College's degree programs are consistent with the entire Nevada System of Higher Education in terms of college core curriculum requirements, major core requirements, upper division electives, and uniform course numbering. NSC has concurred with the system-wide judgment related to appropriate breadth, depth, and sequencing of courses in order to guide students progressively through attainment of competency within the various degree programs.

NSC has defined three general education learning outcomes (communication, critical thinking, and effective citizenship) which are embedded within all NSC academic degree programs.

The College uses degree designators consistent with program content. Degree objectives are clear and are provided to students via the catalog and online and reflect course content. Each educational program provides its mission statement and learning outcomes. The catalog clearly defines the degree objectives and explains what the student is expected to learn throughout the course of the program. Each



outcome also clearly sets the parameters for what the student will learn and experience in order to meet the desired outcome within the three learning outcome areas: communication, critical thinking, and effective citizenship.

SCHOOL OF NURSING

The School of Nursing is committed to preparing students for professional nursing practice. The School assists students to develop and express caring as a fundamental human characteristic essential for professional nursing. Behaviors such as critical thinking, nursing process and reflection on experience are integral parts of the mission and form the basis for professional nursing practice and leadership in all areas and settings of health care. The School is also committed to serving Southern Nevada, the State of Nevada, and the larger community in meeting health care needs.

The School offers several educational tracks for students who are new to the profession as well as for students who already hold Registered Nurse (RN) degrees. These degree tracks include:

- Nursing Degree Tracks
- Nursing- Regular Track (B.S.)
- Nursing - Part-Time Track (B.S.)
- Nursing - Accelerated Track (B.S.)
- Nursing - RN to BSN Track
- Occupational Science (B.S.)

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SCHOOL OF EDUCATION

The School of Education is committed to preparing highly qualified educators for the State of Nevada who will respond to the needs of all learners and educate students to reach their highest potential. The School provides the human element that creates a truly worthwhile and life changing experience. In this age of technology, now more than ever before, a quality, personal connection is what creates meaning both in the classroom and in life. The School provides a unique educational opportunity by offering small class sizes, mentorship, hands on field experiences, discussions, and meaningful course content that directly relates to the education field and teaching.

The School of Education offers a variety of degrees, certifications, endorsements, and programs to help students achieve their educational goals. These degree programs include:

- Education of Deaf & Hard of Hearing (B.S.)
- Elementary Education (B.A.)
- Elementary Education with a Concentration in Bilingual Education (B.A.)
- Elementary Education with a Concentration in Special Education (B.A.)
- Management (Bachelor of Applied Science)
- Secondary Education with a Concentration in Biology (B.S.)
- Secondary Education with a Concentration in English (B.A.)
- Secondary Education with a Concentration in Environmental & Resource Science (B.S.)





- Secondary Education with a Concentration in History (B.A.)
- Secondary Education with a Concentration in Mathematics (B.S.)
- Speech Pathology (B.A.)

SCHOOL OF LIBERAL ARTS AND SCIENCES

The School of Liberal Arts and Sciences is committed to providing an outcomes-based education rooted in the humanities, physical sciences, and social sciences. The School is also committed to providing a strong liberal arts foundation for NSC's programs that reflects the College's mission of a four-year comprehensive state institution. The School emphasizes quality learning experiences that enable students to become independent thinkers and lifelong learners who can express themselves and solve problems in effective and creative ways. Degree programs encourage students to apply their knowledge in a variety of scholarly contexts while developing their communication, citizenship, and critical thinking skills.

The School of Liberal Arts and Sciences offers a variety of exciting degree programs in the humanities, physical sciences, and social sciences. These degree programs include:

- Biology (B.S.)
- Biology with a Concentration in Graduate School (B.S.)
- Biology with a Concentration in Integrated Health Promotion (B.S.)
- Business Administration (B.S.)
- Criminal Justice (Bachelor of Applied Science)

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- English (B.A.)
- Environmental and Resource Science (B.S.)
- Environmental and Resource Science with a Concentration in Graduate School (B.S.)
- History (B.A.)
- Integrated Studies (B.A.)
- Integrated Studies (B.S.)
- Law Enforcement (Bachelor of Public Administration)
- Psychology (B.A.)
- Psychology (B.S.)
- Visual Media with an emphasis in Interactive Media (B.S.)

UNDERGRADUATE PROGRAM

The development of the general education requirements, or core curriculum, at Nevada State College began in 2001. Future plans for the general education component are currently being discussed.

The core curriculum includes program offerings in the humanities and fine arts, the natural sciences, mathematics and the social sciences.

NSC is committed to strengthening its partnerships with other NSHE institutions. To further this goal, the College has developed transfer agreements with the College of Southern Nevada (CSN), Great Basin College (GBC), Truckee Meadows Community College (TMCC), and Western Nevada College (WNC).

The agreements:

- allow students to be jointly admitted to and to enroll

- concurrently at both institutions
- coordinate financial aid opportunities
- improve program articulation
- improve student retention, persistence, and graduation at both institutions
- use resources at both institutions more effectively and efficiently.

ADDITIONAL EDUCATIONAL OPPORTUNITIES

NSC has a Dual Credit Program with the Clark County School District which allows current junior and senior high school students to take certain NSC classes on their high school campuses. NSC works with 3-5 high schools a year to offer this program.

Nevada State College has developed a 2+2 Memorandum of Understanding with Western Nevada College (WNC). The basic premise of this memorandum is to increase the opportunities for students to receive a baccalaureate degree in teaching while maintaining their employment and residency in the northern Nevada area. Students who have completed an associate degree at WNC may then complete their baccalaureate degree on WNC's campus. The School of Education has been providing this opportunity since fall 2002. The upper division courses taken at WNC are offered by NSC faculty. Admission into the program follows the same parameters and standards as those expected at NSC. At the conclusion of the summer 2008 semester, 23 students had graduated from this program.

ONLINE LEARNING

Online courses make up 38% of the total course offerings at NSC. The large non-traditional student population has necessitated the expansion of online offerings and this population has responded well to the increased accessibility these courses provide. The nature of courses offered has been determined by the curricular needs of the degree. Core courses may have two or three sections online to accommodate the number of NSC students.

All courses are compatible with the institution’s mission and goals, and are designed, approved, administered, and periodically evaluated under established institutional procedures. WebCampus is the software used to design and administer online courses. Every course contains an online (WebCampus) component so all students, even those taking in-person classes, gain experience with online learning.

Online courses are assessed in the same manner as in-person courses. In fall 2007 an online task force was created to identify the retention and persistence rates for students who enroll in online classes as well as to review existing online courses to determine the quality and necessity of those courses.

POST-BACCALAUREATE OPPORTUNITIES

NSC offers post-baccalaureate students opportunities to earn state certification in elementary education, secondary education and speech pathology. Students attending NSC to earn state certification in these areas are held to all NSC academic policies and procedures.

Table 4.1: Increase in Online Courses Annually

Date	Fl 04	Sp 05	Fl 05	Sp 06	Fl 06	Sp 07	Fl 07	Sp 08	Fl 08
# Online Courses	47	55	84	106	101	116	103	125	93

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FACULTY

Nevada State College employs professionally qualified faculty in representative programs. Faculty are distinguished award winners in their discipline, holders of patents, and members of national foundation review committees. Faculty at NSC have been recruited and hired depending on the needs of the particular program and based on the funding available for faculty salaries. Table 4-2 lists faculty according to academic program as of fall 2008.

NSC full-time faculty participate in academic planning, curriculum development and review, academic advising, and institutional governance. Course development takes place at the school or department level, with proposals by individual professors presented and approved by the Dean, Senate Curriculum Committee and the Faculty Senate. All full-time faculty serve on multiple committees, including at least one college-wide assessment committee. Each academic unit has representation in Faculty Senate. Documentation of the overall faculty's role in institutional governance can be found on the Faculty Senate website.



School	Full Time	Part Time
Liberal Arts	31	51
Nursing	19	3
Education	9	27

(Fall 2008; Excludes Deans)

Table 4.2: Faculty in Each Academic Program

LIBRARY AND INFORMATION RESOURCES

The Library and the Office of Information Technology (OIT) provide the infrastructure for teaching and learning at Nevada State College. Faculty, staff, and students rely upon these departments to introduce and support technology and instructional resources. Both emphasize customer service to students, faculty, and staff and support the NSC mission of quality teaching and service.

LIBRARY

The NSC Library exists to serve students, faculty, and staff. For students, the library provides monographs, serials, online resources, and bibliographic instruction as they relate to the curriculum. Services are available to both on-campus and off-campus students. For staff, library personnel also performs research tasks and instructs classes about library use and research upon request. It is also the library's goal to develop collections in areas in which new and expanded responsibilities of Nevada State College are anticipated, such as health sciences, education, and speech pathology.

Initial library holdings were acquired during the first year of operation, fall 2002-spring 2003. Faculty from all instructional areas made recommendations on books, audiovisuals, periodicals, and online databases while utilizing national guidelines. Today the collection has over 8,000 monographs. For journal

collections, the emphasis has always been on electronic resources, due to limited physical space and the demand for electronic resources. Agreements with the University of Nevada, Las Vegas and the College of Southern Nevada allow NSC students and faculty to have access to their library collections.

When the Director of Library Services was hired in January 2003, reassessment was made of the initial collection, plans were made for ongoing development, and the library was reorganized to accommodate for student growth. Changes initiated in summer 2005 included the addition of several specialized databases, an electronic document delivery program, an Interlibrary Loan program, and an electronic reserves program. In the summer of 2006, the library acquired over 2,000 electronic books, a database link resolver, and an RFID system for collection management. In 2007 the library installed CONTENTdm for the development of a digital repository.

The library maintains a collection of holdings as well as adequate equipment and personnel to accomplish the NSC mission and goals. NSC is a teaching institution, and the library provides strong support for that mission.

The collection emphasizes library resources which directly relate to the programs of study being offered. Major emphasis has been placed on building the collections in nursing, teacher education, science, and liberal arts. Needs of all degree programs have been

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considered in building the collection. Librarians, outside bibliographers, and teaching faculty collaborate to build and sustain collections, and secure new resources that support the curriculum.

OFFICE OF INFORMATION TECHNOLOGY

The Office of Information Technology (OIT) is committed to providing faculty, staff, and students with technological resources necessary to foster an environment of learning and collaboration. The overall objective is to provide a technological infrastructure of resources necessary to support NSC's mission of quality teaching and service. OIT's objective is the creation of a computing support organization that is recognized for technical skills and delivers high-quality computing services.



STRATEGIC PLANNING

FRAMEWORK FOR THE FUTURE

Nevada State College was established in 2002 as Nevada's first and only mid-tier institution in the Nevada System of Higher Education. As the first four-year comprehensive college in the state, NSC is dedicated to providing quality education, social, cultural, economic and civic advancement to the citizens of Nevada. The College also addresses Nevada's need for increased access to higher education.

Nevada State College began a strategic planning initiative in Fall 2008 with a campus retreat. The major focus of the retreat was to envision the College's future.

STRATEGIC PLAN, FALL 2008

In response to the retreat, the Provost appointed an Institutional Strategic Planning Committee to address the mandated objectives of the College. The committee was charged with creating a strategic plan that reflects the goals, objectives, and mission of the College.

The committee reviewed the strategic plans from individual units and included important themes and goals from each in the College's Strategic Plan. The plan identifies six goals and includes strategies and tactics for accomplishing these goals during the next five years.

The goals are overarching and flexible to allow the College to evolve while remaining committed to its values.

- Advance academic programs
- Increase retention, persistence, and graduation
- Competitively position NSC within the local, state and regional market
- Build a culture of community
- Encourage and support an institutional and individual entrepreneurial spirit
- Enhance technology and information literacy to educate faculty, staff and students in the use of print and electronic resources.

The final draft of the Institutional Strategic Plan was distributed to the NSC community for review and feedback. The final version was approved by the Institutional Strategic Planning Committee in August 2009 and was submitted to the Nevada System of Higher Education Board of Regents for review and received approval in June 2010.

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ENROLLMENT PROJECTIONS 2002 – 2025

Nevada State College's enrollment projections for 2002 - 2025 are based on the College's ability to successfully respond to issues and concerns that may dramatically impact institutional growth and stability.

CHALLENGES

Some of the challenges for NSC are as follows:

- The continual global financial crisis and its dramatic impact of the State of Nevada.
- Reduced state funding for higher education.
- NSC's historical low retention rate for new freshmen & transfer students (i.e., approx. 53% for the time period 2005-2007
- Clark County School District graduation rate for 2006 has been listed as high as 63.5% and as low as 44.5%.
- It is crucial that the main NSC campus facilities be completed within the very near future (i.e., new School of Nursing, Education, Business, in addition to a Student Union, Student Wellness Center, library, physical plant, etc.).

OPPORTUNITIES

In terms of opportunities, NSC must:

- Increase its fund raising activities/campaigns to secure crucially needed external funding to successfully phase in the institution's master plan in a timely and consistent manner

- Develop and implement a successful institutional retention plan to increase our retention, persistence and graduation rates
- Continue to develop and implement a strategically aggressive marketing campaign that clearly articulates the various "benefits and opportunities" available to students that attend Nevada State College
- Increase the number of scholarships to be offered to new, transfer and continuing students
- Increase student co-op and internship opportunities
- Improve and enhance the academic advising process for all students attending NSC
- Continue to enhance all processes and procedures for collecting and assessing student data to make "data driven" decisions
- Document and assess why our students officially withdraw, stop-out and/or leave NSC
- Utilize mid-term academic progress reports as an advising/counseling opportunity.

Table 4.3 shows NSC's enrollment history, from 2002 to Fall 2009, and projected enrollment growth to 2015.

Table 4.3: Enrollment History and Projections

Actual Enrollment Year 1 Fall 2002	Actual Enrollment Year 2 Fall 2003	Actual Enrollment Year 3 Fall 2004	Actual Enrollment Year 4 Fall 2005	Actual Enrollment Year 5 Fall 2006	Actual Enrollment Year 6 Fall 2007	Actual Enrollment Year 7 Fall 2008	Actual Enrollment Year 8 Fall 2009
<i>Actual Enrollment (+/-%)</i>							
176	531	1,272	1,562	1,957	2,196	2,126	2,517
(+/-%)	+355	+741	+290	+395	+293	-70	+391
	(+201%)	(+140%)	(+22.8%)	(+25.3%)	(+15.0%)	(+/-3.2%)	(+18.4%)

Projected Enrollment Year 9 Fall 2010	Projected Enrollment Year 10 Fall 2011	Projected Enrollment Year 11 Fall 2012	Projected Enrollment Year 12 Fall 2013	Projected Enrollment Year 13 Fall 2014	Projected Enrollment Year 14 Fall 2015
<i>Projected Enrollment (+/-%)</i>					
2,711	2,901	3,104	3,352	3,620	3,910
+194	+190	+203	+248	+268	+290
(+7.7%)	(+7.0%)	(+7.0%)	(+8.0%)	(+8.0%)	(+8.0%)

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PROJECTED FACILITIES NEEDS

The enrollment estimates in the preceding section drive the need for facilities. Two types of facilities must be planned for at NSC:

- Facilities that house the academic curriculum, including classrooms, labs and lecture halls, and
- Facilities that enhance student life and aid in attracting and retaining students.

The following table provides a prototype or example program for the interim and long term facility requirements for the campus. It is based on space criteria and actual programs from several similar institutions. While the specific space needs for NSC's facilities will ultimately emerge as academic and student life programs evolve, this table is useful in understanding the range of uses that will ultimately be needed and in ensuring that this master plan can accommodate them appropriately.

In the table the estimated 2,350,000 gross square feet of overall space need is distributed into two categories – state funded and non-state funded (typically student fee based). The phases shown are useful primarily in showing how space will need to track population growth. The breakdown of space into the four phases is a strictly arithmetic calculation; in some cases a facility will require two or more phases before adequate size or demand materializes to warrant building an appropriately sized building.

Population	Phase I	Phase II	Phase III	Phase IV
Fall Student Head-count	4,176	7,163	13,550	26,080
FTEs				
Percent of Total	16	27	52	100
Faculty	150	260	500	900
Staff	325	540	1,000	1,870
Total	4,651	7,963	15,050	28,850

Building Space	Phase I	Phase II	Phase III	Phase IV
<i>State Funded (ASF)</i>				
Laboratory	35,250	58,812	111,176	217,993
Instructional Support	40,389	67,385	127,383	249,771
Offices (Academic)	25,414	42,401	80,154	157,165
Lecture	14,929	24,908	47,086	92,326
Library	40,862	68,175	128,876	252,698
Media	4,449	7,423	14,033	27,516
Administrative Space	23,577	39,336	74,360	145,804
Plant Operations	6,283	10,483	19,818	38,858
Total State Funding	191,153	318,924	602,886	1,182,130
<i>Non-State Funded (ASF)</i>				
Student Union	19,567	32,645	61,712	121,004
Food Service	10,520	17,552	33,180	65,060
Bookstore	7,161	11,947	22,585	44,285
Student Health Center	4,755	7,934	14,998	29,407
Alumni Center	195	325	615	1,206
Buildings & Grounds	7,158	11,942	22,575	44,266
Parking Services / Police	2,051	3,422	6,469	12,684
Recreation & Athletics	10,520	17,552	33,180	65,060
Performing Arts	0	0	0	0
Total Non-State Funding	61,927	103,320	195,315	382,970
Total	253,080	422,244	798,201	1,565,100
<i>Total Building Space (GSF)</i>				
State Funded	287,016	478,864	905,235	1,774,970
Non-State Funded	92,984	155,136	293,265	575,030
Total	380,000	634,000	1,198,500	2,350,000

Table 4.4: Example Future NSC Facilities Program

Table 4.5: Example Future NSC Facilities Program (cont.)

On-Campus Housing	Phase I	Phase II	Phase III	Phase IV
Student Housing (beds)	0	700	4,500	5,200
GSF at 375/bed	0	262,500	1,687,500	1,950,000

Parking	Phase I	Phase II	Phase III	Phase IV
Commuter Parking	1,336	2,292	4,336	8,346
Resident Parking	418	716	1,355	2,608
Faculty Parking	114	198	380	684
Staff Parking	247	410	760	1,421
Subtotal	2,115	3,616	6,831	13,059
TDM Reduction	0%	5%	7.5%	10%
Total	2,115	3,436	6,319	11,753

Table 4.6: Existing Leased and Owned Space

Address	Building Name	Square Footage
<i>Leased Space</i>		
1125 Nevada State Drive	Dawson	34,120
303 S. Water Street	BWI	11,313
311 S. Water Street	BWII	29,674
Total Lease		75,107
<i>Owned Space</i>		
1021 E. Paradise Hills	LAS	42,587
1121-A Nevada State Drive	Modular	1,440
1121-B Nevada State Drive	Modular	1,440
Total Owned		45,467

Table 4.7: Near Term Building Program

Facility	Size (GSF)
Liberal Arts & Sciences (existing)	40,000
Nursing	60,000
Student Services and Activities Center	80,000
Education	80,000
Business	80,000
Recreation	40,000
Total	380,000

Table 4.6 shows the facilities currently occupied by NSC. Nevada State College’s first permanent building – Liberal Arts and Sciences - opened in August 2008. The 42,000-square-foot building has faculty offices, labs and seven classrooms. The only other space owned by NSC are in several modular units; the remainder of space being used for offices and classrooms lies in the leased buildings in downtown Henderson or in the Dawson Building near the campus site.

As of the fall of 2008, six buildings and assorted support facilities have been identified as critical to allow NSC to continue to attract students and grow. It is estimated that the next scheduled facility, the Nursing Building, which is ready to be bid for construction but for which construction funding has not been allocated, will not be ready for occupancy before 2013.

Two of the facilities noted, the Student Services and Activities Center and a recreation facility are not usually state funded but rather are financed through student fees. While these facilities play a crucial role in providing activities and opportunities for interaction that aid in attracting and retaining students, typically there are not sufficient fees generated until 6,000 or 8,000 students are enrolled to support financing these facilities. If possible, NSC must find alternate sources of funds to implement these important uses as early as possible.

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CAMPUS LAND AREA REQUIREMENTS

The enrollment and facilities projections used in this master plan represent the current understanding of the demand for particular degrees and expertise. It is also based on an understanding of the effects of technology on education as we know it today. Both of these measures are likely to change over the years, but a college campus will endure many years. Thus, it is important to build in a high degree of flexibility in site planning for a college campus in order to accommodate the many unforeseen global, regional and local changes, as well as pedagogical and student life requirements that may evolve.

Table 4.8 indicates the land area requirements for the primary campus land uses. Some may be minimized over time; for instance if efforts to reduce drive-alone commuting are successful, less parking area may be needed, while others may increase if, for instance, a robust intercollegiate athletics program is ultimately developed.

As discussed further in the Building Guidelines section of this plan, land areas have been calculated in part with an understanding of the density of facilities to be built. It is anticipated that academic buildings at NSC will average three floors in height. There will be some that may be higher, while there will also be some that will consist of only one or two floors. Attaining this average density of development will be important so that the campus does not consume its land resource inefficiently and so that the academic core can remain a compact, walkable zone.

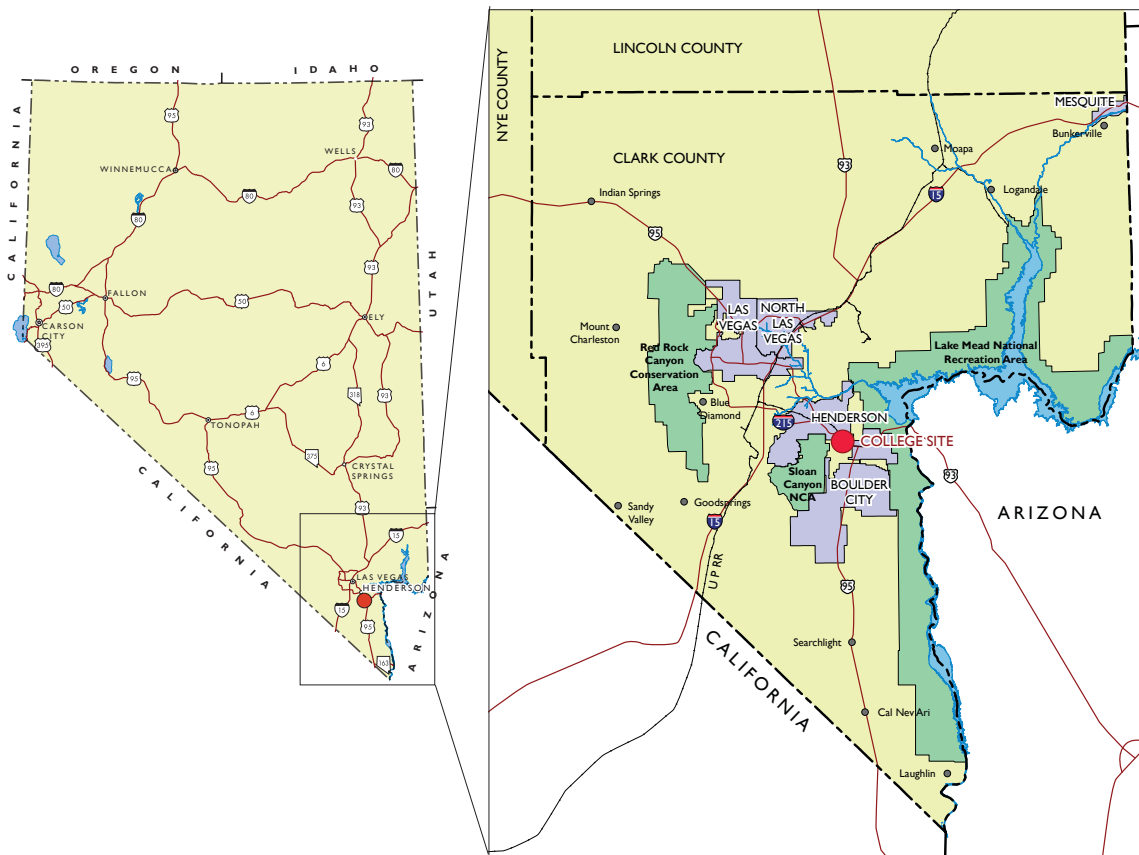
Land Areas	Quantity	Acres
<i>Land Uses - College</i>		
Academic & Support	2,350,000	48.0
Student Housing	5,200	46.3
Athletic & Recreation Fields		44.6
Parking	11,753	53.4
<i>College Land Uses Subtotal</i>		<i>192.3</i>
<i>Land Uses - Open Spaces</i>		
Campus Open Space		34.4
Natural Open Space / Arroyos		41.7
<i>Open Space Subtotal</i>		<i>76.1</i>
<i>Land Uses - Related</i>		
Campus Reserve		173.0
K-8 School		10.0
<i>Related Uses Subtotal</i>		<i>183.0</i>
Roads		57.6
Total Land Use Acreage		509
Total Site Acreage		509

Table 4.8: Campus Land Area Requirements

A significant land area is set aside as Campus Reserve. This designation is intended to include a range of possible uses that cannot be predicted at this time. Those uses include program increases in the areas already identified, such as athletics, as well as programs not yet predicted or for which demand cannot yet be determined. These may include:

- K-8 School
- Medical-related facilities
- Green technology park
- Faculty and staff housing
- Retail
- NSC/City of Henderson shared cultural facilities.

Figure 4.1: NSC Location in City of Henderson



PHYSICAL SETTING

SITE LOCATION

The NSC campus site is 509 acres in size and lies in Clark County near the southern tip of the State of Nevada. Situated at the southeastern edge of the Las Vegas Valley in the City of Henderson, the site is located just west of Railroad Pass, the dramatic entry into the Las Vegas Valley from the southeast. Beyond the pass to the east and south lie the intersection of U.S. Highways 95 and 93, Hoover Dam, Lake Mead, the Lake Mead National Recreation Area and Boulder City. Entering through the pass from the southeast, the campus site is clearly visible on the left as views of Las Vegas, the Strip and the mountains beyond can also be seen.

Incorporated in 1953 the City of Henderson had its origins during World War II when housing was built to support the Basic Magnesium Plant which opened in 1941. Although it remained a small town for a number of years, as the greater Las Vegas valley grew explosively through the 1990s, Henderson experienced significant household growth. Since then the City has grown to a population of 252,064 (2008 estimate by the U.S. Census Bureau) and is the second largest city in Nevada. Growth in Henderson was particularly strong in the late 20th century, with an average of 12,000 new residents added every year between 1990 and 2005. From a small peripheral community, Henderson has evolved into a traditional suburban community, with large master planned housing developments and supporting services.

4 planning context

The Las Vegas region has been and is expected to continue to be one of the fastest growing metropolitan regions in the country. Clark County's population grew 140 percent from 1990 to 2006; population is expected to increase another 94 percent by 2030.

SURROUNDING LAND USES

The college site is surrounded by a variety of land uses (see Figure 4.2). To the south and east the property adjoins U.S. Bureau of Land Management (BLM) lands which remain in a natural condition of a dry desert landscape sloping up to Black Mountain and the McCullough Range. To the northwest lies Mission Hills, a Rural Neighborhood Preservation District, which consists of single-family homes built on large lots; the area began developing in the 1960s and is not yet entirely built out. A flood control detention lagoon lies just north and west of the campus, between the Mission Hills and Paradise Hills neighborhoods. The dry lagoon retains storm water directed to it by a raised dike that runs diagonally through the campus site and which captures drainage from higher elevations. Multi-use trails extend into the BLM lands from Mission and Paradise Hills neighborhoods.













The strip of land lying immediately to the east of the Mission Hills neighborhood, within which the Dawson Building is located, was designated in the 2004 College Area Plan as office, research and development, and public space. In 2009 an adult daycare facility was completed in this area. Currently, several

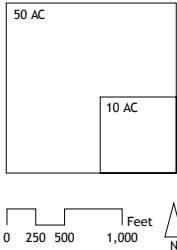
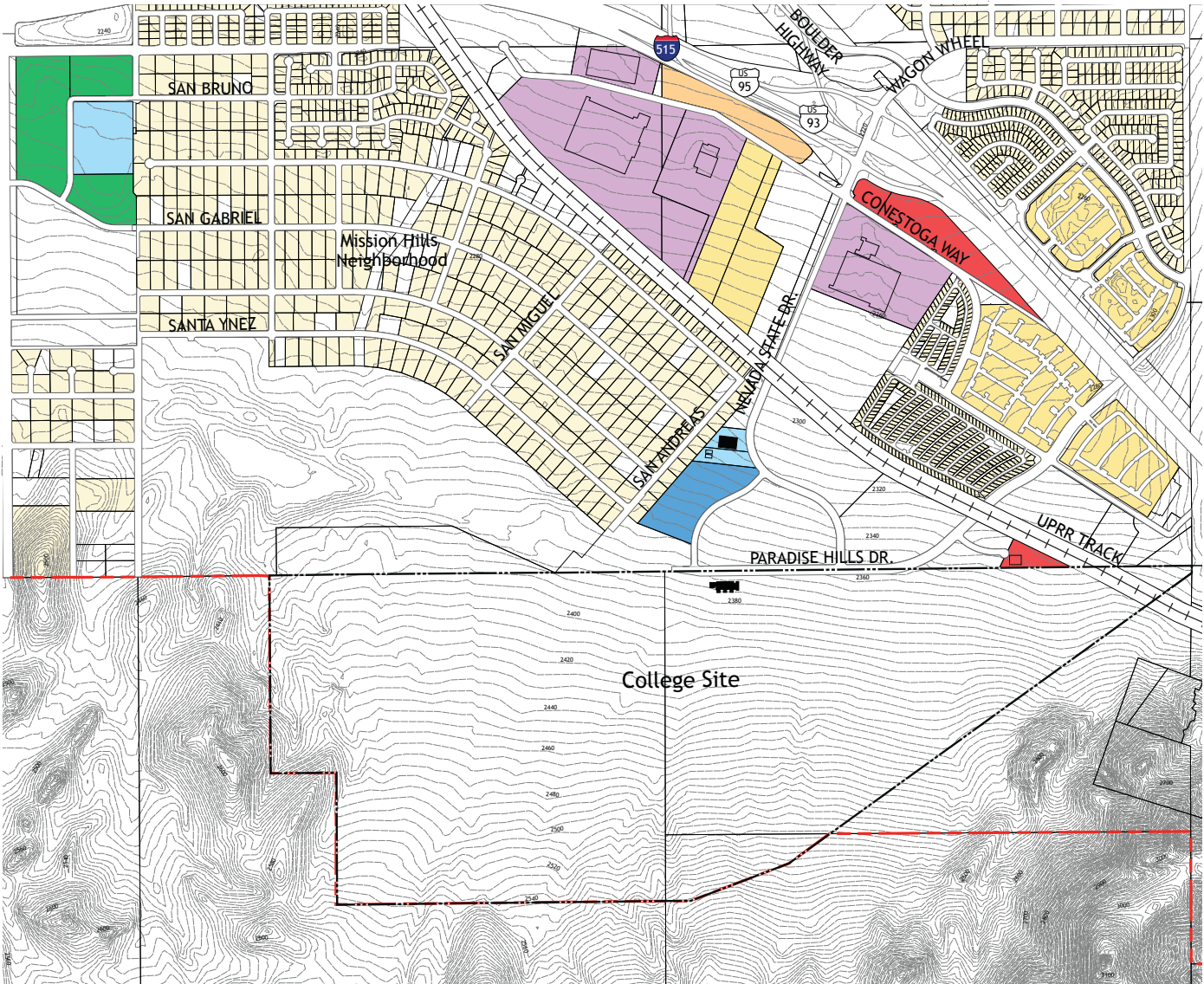
other hospice, clinical or extended care facilities are being discussed for this area, with a concept of creating a "health care campus" that could have good synergies with the College's nursing program.

A major residential project known as Jericho Heights is planned directly east of the campus. This project would consist of multi-family housing, a small amount of retail/service use, and on-site recreation uses. A primary point of coordination with planning for Nevada State College involves vehicular access to the Jericho Heights project. The City of Henderson and Nevada Department of Transportation have discussed implementation of a frontage road paralleling I-515 / U.S. 93/95 on its southern edge which will provide access to the residential project from the east, connecting to the interchange of U.S. 95 and 93. From the west, a connector/frontage road will also be required. It will be important to ensure that access to Jericho Heights or any other future development does not cut through the college campus as this could result in unacceptable levels of additional traffic at peak travel times (see Transportation section for more information).

Recently several multi-family housing projects have been completed between the railroad tracks and the freeway as have several highway-oriented retail projects, joining the existing residential and industrial uses in this area.

Figure 4.2: Surrounding Land Uses

- LEGEND
-  College Site
 -  City Limits
 -  UPRR Rail Line
 -  Single Family Residential
 -  Townhome Residential
 -  Multi-Family Residential
 -  Commercial
 -  Industrial
 -  Educational
 -  Health Care
 -  Parks
 -  Utility



4 planning context

A proposed equestrian park would be located adjacent to the detention lagoon; equestrian trails would connect the equestrian park, the Mission Hills neighborhood, and the foothills to the south.

A rail line owned and operated by Union Pacific Railroad (UPRR) serves industrial uses in the area although it is lightly used. A multi-use trail follows its alignment.

A major transmission line runs along the eastern border of the campus. A small site is leased to Univision in the southwest corner of the site and includes radio transmission towers.

REGULATORY CONTEXT

Per the Interlocal Agreement executed between Nevada State College and the City of Henderson, this master plan and accompanying guidelines will be reviewed and accepted by the Planning Commission and City Council. From that point on, planning and construction of campus projects will be at the discretion of the College and Nevada State Public Works. There will be ongoing coordination between the City and College on issues of mutual concern such as fire and police services. Any development lying outside of the campus proper, such as any areas occupied by college-related but not directly academic or academic support uses (such as student, faculty or staff housing) will be reviewed by the City according to its typical project review process.

However, many other plans and policies pertaining

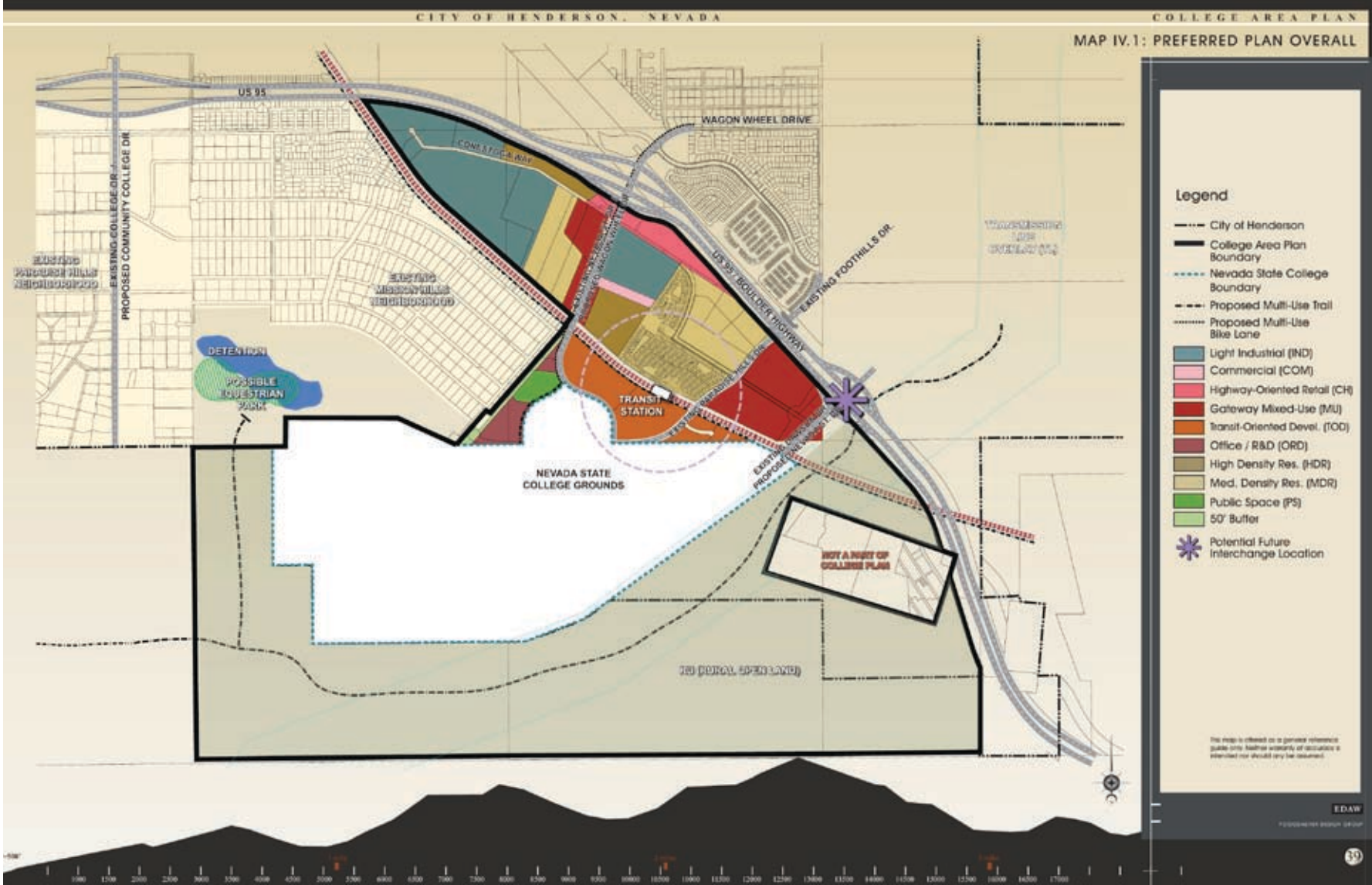
to the nearby communities, city and region are relevant to the campus plan and are described below.

City of Henderson College Area Plan (2004)

Following site selection of the NSC campus, in 2004 the City prepared a College Area Plan, addressing the future of an area of 1,400 acres that includes and extends beyond the boundaries of the 520 acres then identified for Nevada State College (which was subsequently reduced to 509 acres). With a planning horizon of 2020, the College Area Plan was intended to define the land uses and desired character of the area that would be established concurrent with the College. The study area was bounded on the north and east by I-515 / U.S. 93/95 and South Boulder Highway; on the north by the existing Mission Hills neighborhood, and on the west and south by land controlled by BLM.

The plan was shaped in a significant way by discussions regarding the long term opportunity for light rail service along the existing rail line, which cuts through the center of the College Area Plan study area. In response the land immediately adjoining the rail line between Nevada State Drive/Wagon Wheel Drive and to the east of Paradise Hills Drive was designated as high density residential, mixed use, or transit-oriented development, with an area of transit-oriented development immediately adjoining the college campus site. Other uses within the college area included gateway mixed use, highway-oriented retail, and light industrial. The BLM lands adjoining

Figure 4.3: City of Henderson College Area Plan (2004)



4 planning context

the campus to the east, south and west were assumed to remain undeveloped.

City of Henderson Comprehensive Plan (2006)

The City of Henderson's Comprehensive Plan (2006) provides overall guidance throughout the City on matters associated with land use, transportation and development patterns. The plan incorporates the College Area Plan and college site. Its themes include: 1. Balanced Land Uses, 2. Quality Development, 3. Integrated Desert Environment, 4. Connected Places, and 5. Arts and Culture.

The Comprehensive Plan includes elements that can inform the layout and configuration of the campus and adjoining community. Of particular importance is the Master Bicycle and Pedestrian Facilities Plan. This plan addresses the City's trails, pathways, and walking corridors and comprehensively addresses 1) local trails around neighborhoods and community parks, 2) urban off-street trails, 3) bike lanes and paths in the street system, and 4) natural resource trails, with a goal of providing a system that can connect neighborhoods and regional open space. The College's location at the edge between city neighborhoods and the undeveloped BLM lands offers opportunities for the college site to facilitate recreation and multi-modal access.

City of Henderson Sustainability Action Plan (2009)

The Sustainability Action Plan was prepared in 2009 and incorporates seven themes: energy, water, recycling and waste reduction, transportation, urban design, urban nature, and environmental health. Each theme has goals and objectives. The emphasis of the plan is on personal responsibility within the Henderson community and leadership by the City in operating and maintaining facilities in a sustainable manner. Given the College's commitment to sustainability and carbon neutrality, coordination between the two will be essential as both the College and the surrounding community are developed.

View from the campus site looking toward the McCullough Range. The campus site slopes up toward the foothills.



SITE CONDITIONS

Topography and Slope

The 509-acre site sits at an elevation of about 2,400 feet, at the base of the foothills of the McCullough Range. These mountains and adjoining foothills border the site around the southwest, south and southeast edges. The site rises from north to south at a largely consistent 4-5% slope; at and beyond the campus site boundary the site quickly rises in elevation with significantly greater slopes. The mountains to the south of the site including Black Mountain rise to heights of about 4,000 feet.

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Views

Since the site sits about 400 feet above the Las Vegas Valley floor, there are views north across the valley to nearby communities, the Strip, downtown Las Vegas, and the Frenchman and River Mountains beyond. To the south and southeast and southwest, the nearby mountains form a dramatic backdrop with views to mountain peaks.

Views of the site are dramatic owing to the mountainous backdrop. The site is easily seen from I-515 north- or southbound. Adjoining residential neighborhoods have partial views of the site.

Figure 4.4: Aerial View of Campus and Surrounding Mountains Looking South



(below)
View from campus looking toward Las Vegas



(below, both)

Sparse vegetation grows on the site at the lower elevations.



Vegetation

The site falls within the Mojave desert scrub ecosystem. On lower elevations, near the northern edge of the site, the natural desert environment has been disturbed by construction and maintenance of the storm water diversion channel, construction of nearby roads, and by construction of the Liberal Arts and Sciences building, associated parking, and site improvements. Native site vegetation is therefore more sparse in lower elevations with more variety found upland in the arroyos that channel storm water from the mountains. Lower elevations are dominated by a sand and gravel ground plane with little vegetation.

Climate

Sitting at a latitude of 35.6 within the Mojave Desert, the Las Vegas / Henderson area enjoys a variable climate. The Las Vegas area receives 4-5 inches of rain per year, which occurs steadily throughout the year, but which tends to occur in short, intense rainfalls. Daily and seasonal temperature swings are fairly large and the average temperature – 68° F - is misleading as the area experiences both extremely hot and cold conditions. Maximum temperatures in the summer will exceed 110° F; minimum winter temperatures can fall below freezing. In the region, 80% of winds are at speeds of 15 miles per hour or below, while only 1% are 30 miles per hour or above. In the fall, winds primary are from the north, while in winter and spring, winds also come from the south and southwest.

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Site Drainage

The NSC site lies at the foot of the McCullough Range. Through a variety of canyons and arroyos, rainwater falling at higher elevations drains toward the NSC site (see Figure 4.5). Smaller drainage swales or arroyos enter the site and gently dissipate into the gently sloping site topography. A drainage channel or dike was constructed on the site a number of years ago to capture and channel much of this runoff into the Mission Hills Detention Basin. The channel or dike, which cuts across the site diagonally from southeast to northwest, is designed to convey 100-year maximum flood water and sediment flow and protects neighborhoods to the north from flooding. The storm water management function of this channel will continue to be met within the campus site boundaries; its appearance can be altered however, as discussed in various sections that follow in this document.

Drainage from the northeastern portion of the site is not captured by the drainage channel and instead sheet flows north across the site toward an off-site drainage culvert.

Other Site Considerations

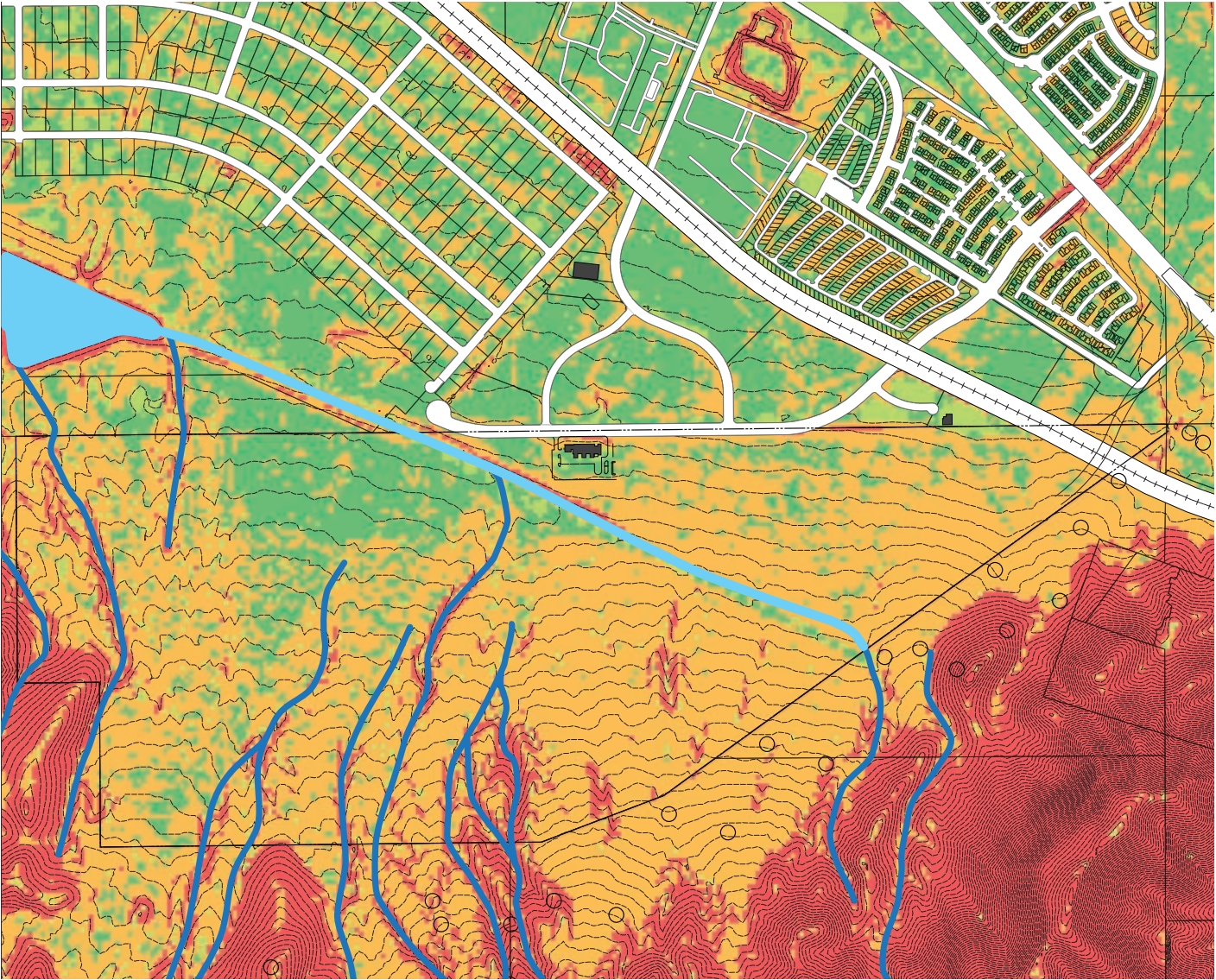
Several electrical transmission lines pass along the southeasterly side of the site. A small site approximately at the southwest corner of the NSC site is leased to Univision and accommodates Univision transmission towers.

A drainage channel handles stormwater runoff from the college site. This channel has a direct view of Black Mountain, the highest point in Henderson.



Figure 4.5: Site Slope and Drainage

- LEGEND
- College Site
 - Slope
 - 0% - 2%
 - 2% - 5%
 - 5% - 15%
 - 15%+
 - Natural Drainage Swales
 - Mission Hills Detention Basin (MHDB) and Channel





The Master Plan for Nevada State College comprises the physical layout of the campus along with the supporting infrastructure that will ultimately be needed to serve it. It has been developed based on an understanding of the projected enrollment and program of the campus as well as the site constraints and desired relationship to existing and planned neighboring development.

This master plan section includes the following topics:

- The Carbon Neutral Campus
- Land Use and Site Planning
- Transportation
- Energy
- Water
- Storm Water
- Waste
- Information Communication Technologies.

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THE CARBON NEUTRAL CAMPUS

The Carbon Neutral Campus element of this master plan sets forth the rationale, strategy and analysis for achieving carbon neutrality. This section includes the following topics:

- Overall Goals
- Background
- Economic Considerations
- Focus Areas
- Metrics and Targets
- Sustainability Strategies
- Carbon Analysis
- Third Party Certification.

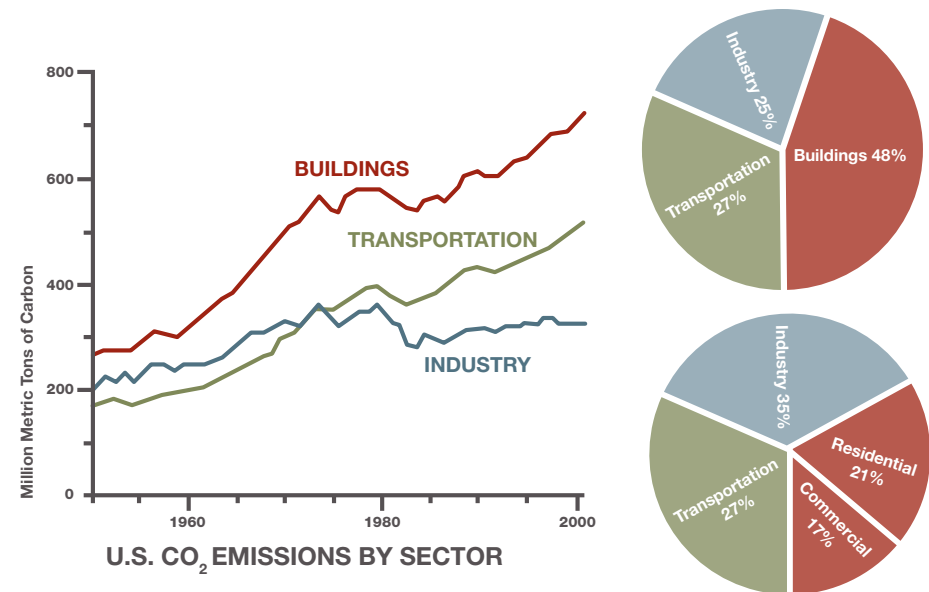
OVERALL GOALS

In order to promote sustainable planning and design, the master plan has the following overarching goals:

- Achieve operational carbon neutrality. Key to achieving this goal is the conservation of natural resources and the efficient use of resources, such as energy and water
- Become a model of sustainable development for the city, county and region
- Enable the campus to serve as a learning and training tool for topics related to sustainable development. Key topics include: transit-oriented development, energy and water conservation and efficiency, renewable energy generation, water recycling, and waste recycling and reuse.

Key components of sustainable development are green infrastructure and green building design. Green infrastructure includes elements such as

Figure 5.1: Carbon Emissions by Sector



district energy, renewable energy, energy efficient lighting, transit, recycled water and stormwater treatment and management systems that service the entire campus. Such infrastructure enables projects to maximize resource efficiency and minimize carbon emissions. For example, as described later in this section, distributed energy generation from an on-campus plant will enable NSC to generate cleaner electricity than that which is generated from a utility power plant. In addition, distributed heating and cooling from this on-campus plant is more efficient than heating and cooling from equipment installed in individual buildings.

Likewise, installing recycled water or “purple pipe” from the City of Henderson’s wastewater treatment and recycled water facility will enable the project to access non-potable water for non-potable uses, such as irrigation and potentially toilet flushing. Such infrastructure will enable NSC to draw less water from Lake Mead and, as a result, reduce the embodied energy requirements to convey water to the campus to meet all demands.

Buildings also play a key role in the achievement of sustainability goals. As shown in Figure 5.1, buildings contribute more metric tons of carbon to the atmosphere in the United States than any other sector (48% of total emissions in 2000). Building designs that promote energy and water efficiency, generate and use renewable energy, accept energy from district systems and utilize recycled water are essential in order for NSC to meet its carbon and

overall sustainability goals. (See Chapter 6 for building design standards).

BACKGROUND

As part of this master planning process, the College administration embraced the opportunity to be a model of efficient and sustainable development and operations. Through discussions with faculty, staff, and students the following vision statement was crafted:

“The Nevada State College community will become an exemplary and highly visible model for sustainability in higher education that demonstrates how a college campus achieves carbon neutrality and self-sufficiency through education, practice, and partnership. The campus will embrace technology and improve our relationship to our region; designed and intended to teach and aid in teaching, the campus will inspire faculty, staff, students, and visitors to take the next steps toward a sustainable future. As such, it must blend the best of the past, the proven innovation of the present, and the needs of our future.”

Nevada has adopted statewide sustainability goals and targets. Senate Bill 395 (SB 395) has mandated that 20% of the state’s electricity be generated by renewable sources by 2020. The state is also an “Observer” of the Western Climate Initiative (WCI), which was started by states and provinces along the western rim of North America to combat climate change. The WCI has set a goal to reduce carbon emissions by 15% from 2005 levels by 2020.

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At colleges and universities throughout Nevada, sustainability is playing an increasing role in all campus planning and operations. The Nevada System of Higher Education's (NSHE) Energy and Sustainability Policy states that the Board of Regents is committed to protecting the environment, reducing the education system's dependence on non-renewable energy resources and promoting the construction, maintenance and renovation of buildings that are environmentally responsible, economically feasible and healthy spaces to work and live. Therefore, the policy states that the Chancellor shall develop procedures and guidelines applicable to NSHE institutions that will address matters including, but not limited to:

- Leadership in Energy and Environmental Design (LEED) Green building rating system or an equivalent standard adopted by the Director of the Office of Energy
- Energy and water conservation including the minimized use of non-renewable energy sources and the use of local renewable energy sources
- Alternative methods of transportation.

Following NSHE's lead, the University of Nevada Las Vegas (UNLV) has launched a Sustainability Initiative that is enabling the university to play a major role in achieving a sustainable Las Vegas community. The initiative is supporting various research efforts in the areas of sustainability, including research into topics that address critical regional needs, such as energy, water, transportation, health and the built environment. The initiative advocates incorporating sustainability into the academic curriculum, as well

as hosting events and conferences on topics related to sustainability, energy and climate change. In 2007, the President appointed an eleven-person Task Force that is empowered to promote environmental management and sustainability at UNLV. As a result, the university campus had made efforts to become a model of sustainability for the community through such efforts as recycling, construction of energy-efficient buildings, xeriscaping, and retrofitting facilities.

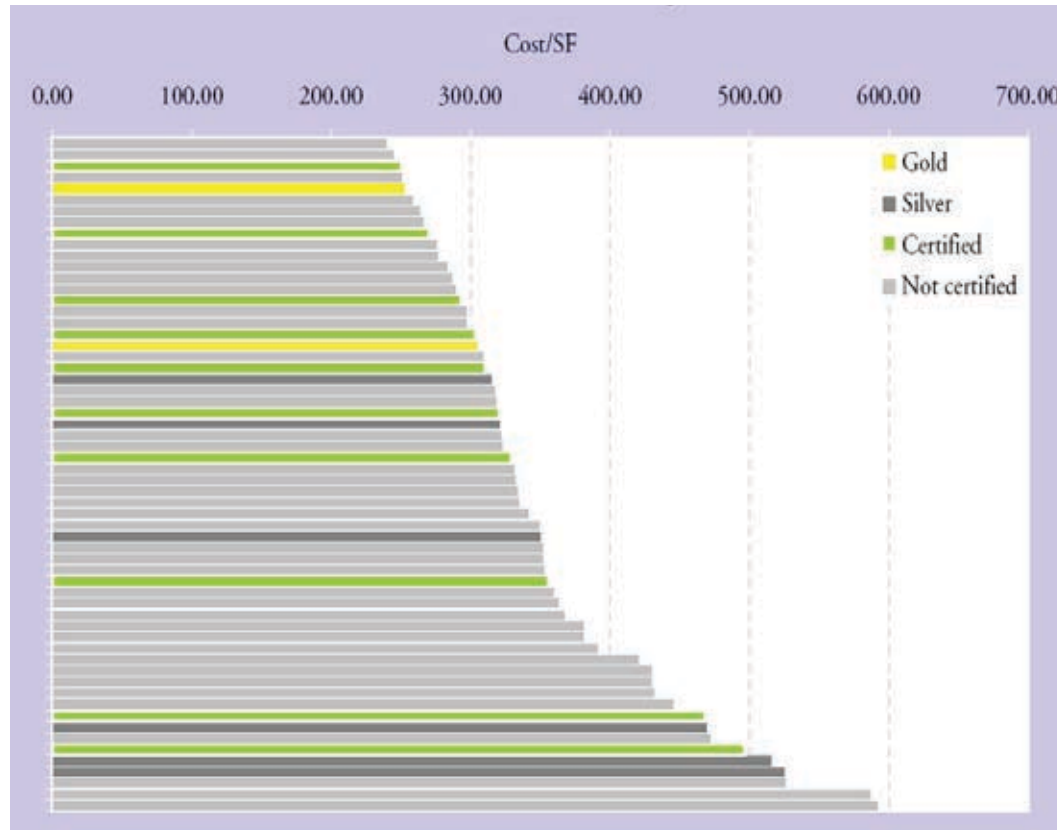
ECONOMIC CONSIDERATIONS

The recommended strategies that will characterize a carbon neutral campus will not place a large cost burden on the College, Nevada taxpayers or its students. In fact, the sustainable vision for NSC is to design infrastructure and buildings that will limit required up-front capital costs and generate significant operational savings over the life of the College. It is also envisioned that by achieving carbon neutrality, NSC will increase the value of the property and attract the best and brightest students from the region.

The economic argument for carbon neutrality, and sustainability in general, is based on four major premises.

- There is no significant cost premium for building green buildings
- Many green building and infrastructure elements that do have an associated cost premium generate savings that yield returns on the initial investment
- A carbon neutral campus will serve as a powerful marketing tool to attract students, and increase revenues

Figure 5.2: Cost Comparisons of LEED and Non-LEED Academic Buildings



Source: Davis Langdon - Cost of Green Revisited: Reexamining the Feasibility and Cost Impact of Sustainable Design in the Light of Increased Market Adoption July 2007

- Big ticket infrastructure items (e.g. energy, transportation) present attractive business opportunities to third party developers/owners/operators. These companies, in turn, sell resources at or below the cost from traditional sources (e.g. energy from the grid).

Regarding initial cost, evidence is mounting that, despite the perception that green building costs significantly more than traditional building methods, actual cost premiums for green buildings are minimal – and perhaps nonexistent. Figure 5.2 shows that, of a total of 60 academic buildings surveyed in 2007 - 17 LEED-seeking and 43 non-LEED – there was no significant difference between average costs of LEED-seeking and non-LEED seeking buildings. These buildings are located on college and university campuses across the country, and include a range of architectural forms and styles.

In regards to the second premise, recommended building efficiency technologies that do have an associated cost premium versus older technologies often generate increased savings that will translate into significant returns on investment (ROI). For example, as described in the Water Section of this plan, many of the water fixtures recommended as part of the sustainable building guidelines have paybacks of less than one year. Likewise, depending on the full infrastructure costs associated with connecting to the City of Henderson's recycled water system, recycled water - typically less expensive than potable water - will justify the investment over time. Savings generated

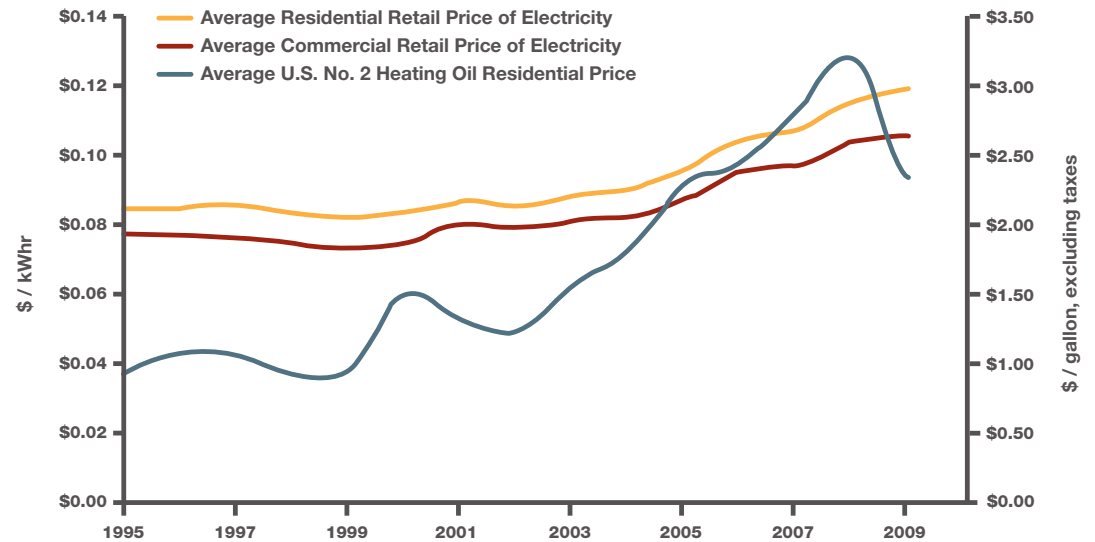
5 the master plan

by resource efficient building measures will likely increase over time, increasing ROI on installed technologies. Figure 5.3 illustrates how energy prices in particular have trended upward over the past decade. Many analysts predict these increases to continue.

The third premise is that a carbon neutral development will yield other benefits, such as increased enrollment. Many college and university rating publications are now evaluating institutions on their green credentials. Likewise, students are increasingly making decisions on which colleges to attend based on these credentials. Research is showing that green buildings have measurable, positive productivity and health impacts, which is attractive to prospective students and faculty.

Finally, the business cases for the big ticket green infrastructure items (such as shuttle systems, district energy and renewable energy systems and waste handling systems) are strong enough to attract third party financiers/owners/operators. For example, the district energy/combined heating and power plant (CHP) described later in this chapter has the potential to be owned, operated and maintained by a third party. In this scenario, an energy service company (ESCO) would fund much of the necessary infrastructure for a central plant and energy distribution system. In order to attract this type of investment, NSC would enter into a long-term contract with the ESCo to purchase the hot water, chilled water and electricity that the central plant provides. NSC

Figure 5.3: Trends in Average U.S. Energy Prices to End Consumers



Source: DOE EIA, 2009 data through August 2009.

would benefit from this arrangement by avoiding the need to raise the capital required for the central plant and would lock in a source of clean, reliable energy at a competitive, fixed price over an extended period.

Similarly, NSC could negotiate power purchase agreements (PPAs) for renewable energy, such as solar electricity or photovoltaics (PV). Many companies offer college and university customers the following arrangements:

- Renewable energy company makes investment in rooftop and/or ground mounted PV system
- NSC and the renewable energy company enter into a long term (typically 10-year) agreement, whereby NSC would purchase the electricity generated by the PV system
- Alternatively, NSC could lease land to the renewable energy company and the company could enter into a contractual arrangement directly with the utility (NV Energy)
- Prices for generated electricity are typically guaranteed to be at or below utility rates.

Like the district energy/CHP deal with an ESCo, a PPA contract would allow NSC to avoid up-front costs for a PV system. This arrangement would also enable NSC to lock in long term, clean electricity supply at attractive rates.

In summary, NSC's effort to plan a new college using the most efficient designs and technologies does not present a challenge in the form of costs as much as a challenge to conventional building methods and practices. However, with a well designed master plan

that is executed by skilled and experienced planners, architects, engineers and contractors – in combination with partnerships with third parties that could provide attractive financing arrangements for key sustainable systems - a carbon neutral campus will not cost significantly more than a conventional college and will yield significant long-term benefits.

FOCUS AREAS & GOALS

In order for NSC to achieve its sustainability vision, this master plan includes several key sustainability focus areas and establishes corresponding goals for each of these areas. These focus areas and their associated goals are listed below:

Carbon Neutrality

Achieve carbon neutral operation attributable to on-site combustion, purchased utilities, and campus-owned vehicles, through a combination of energy efficiency, alternative energy production, and offset purchasing strategies. Mitigate indirect emissions, such as emissions from commuters, as much as possible. Strive for certification using a nationally recognized rating system.

Land Use and Site Planning

Harmonize with existing site elements through appropriate use of land to create a compact, sustainable and vibrant campus.

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Transportation

Plan for access to a wide range of efficient environmentally sensitive and convenient means of transportation.

Energy

Utilize passive design strategies, design for energy efficiency, reduce energy consumption and demand, and generate energy from renewable resources.

Water

Reduce overall potable water consumption, control quantity and quality of storm water, utilize recycled water for non-potable demand.

Waste

Appropriately reduce, reuse and recycle materials, minimize generation of solid waste and divert waste away from landfills. Where possible, convert organic waste to useful products.

Information & Communication Technologies

Incorporate smart grid, smart metering and other information technologies to improve efficiencies and reduce resource consumption.

SUSTAINABILITY METRICS AND TARGETS

The NSC Campus Master Plan has specific targets for each focus area that will enable the College to meet its overarching goals. The process of determining targets for each focus area and a summary of these targets are provided in this section.

Methodology

The relevance, robustness and resilience of the sustainability framework for NSC hinges on setting targets for the focus areas that will enable NSC to become a leading operationally carbon neutral institution. The targets must be specific, measurable, attainable, realistic and timely.

In order to achieve set appropriate targets for each Focus Area, thorough analysis has been conducted which included:

- A review of the policy context at state, regional and national levels, ensuring that NSC targets are in line with these policies
- A review of the project vision and goals, ensuring that they are met by all targets
- A review of campus building and site sustainability ranking and rating systems, and institutional commitments, ensuring that NSC is positioned to be a sustainability leader among colleges and universities
- Modeling and analyses of recommended infrastructure and building systems to assess their practicality and effectiveness.

National and Regional Policy

The NSC Master Plan sustainability targets and strategies are in line with relevant state, regional and federal policies, programs and pending legislation. Key existing and potential policies are discussed below. Please note that the policy landscape related to climate change is evolving rapidly, therefore NSC will keep close track of all policy-related developments and adjusts the targets accordingly.

Nevada SB395

In June 2009, the Nevada Senate signed the SB395 bill, which includes the following:

- A Renewable Portfolio Standard (RPS) that requires that 25% of the state's total electric supply be from renewable energy by 2025. For the grid portfolio, 6% needs to come from solar resources by 2016.
- A Mandate that 25% of the total RPS portfolio standard should come from energy efficiency
- An expedited renewable energy permitting system
- Efficiency standards for state agencies
- Adoption of green building standards in new and renovated state buildings
- Requires the transparency of CO2 emissions by new vehicles starting 2012.

Of particular interest in this piece of legislation is the 25% RPS. This will influence NSC's long-term energy supply strategy as the college aims to maximize the use of renewable energy.

Western Region Climate Initiative (WCI)

Started in 2007, WCI is an initiative aimed at identifying, evaluating and implementing GHG reduction strategies across various Western States including California, Arizona, Washington, Oregon and New Mexico. The regional goal established by WCI is to reduce emissions 15% below 2005 levels by 2020 as well as to design a regional-market-based multi-sector cap-and-trade mechanism. The initiative also calls for significant GHG reduction goals for any state or province wishing to become a partner as well as adopting clean tailpipe standards for passenger vehicles. Though Nevada is currently an "Official Observer," it is likely that Nevada will join this coalition if a federal standard is not established in the near future. Therefore, as with carbon goals set by California's AB 32, the NSC Campus Master Plan contains targets that are in line with this initiative.

California Assembly Bill 32 (AB 32)

It is anticipated that California carbon regulations will gradually be adopted by the rest of the country. Therefore, it is important to benchmark NSC's performance against these goals. As shown in the carbon analysis later in the chapter, proposals in this master plan would result in NSC exceeding the AB 32 targets.

California demonstrated national and international leadership in climate policy by passing AB 32 in 2006. Through AB 32, California aims to bring over-all emissions to 1990 levels by 2020. AB 32 implies

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a target of a 42% carbon emissions reduction from 2005 to 2030.

In order to meet these targets, the California Air Resources Board (CARB) issued a Scoping Plan in 2008 that outlines how each sector should contribute to meeting these targets. A number of these suggested measures have informed the NSC plan, such as: energy efficiency, regional targets, low carbon fuels, energy efficiency, renewable energy portfolio standard (RPS) and vehicle efficiency.

Waxman-Markey Bill (U.S. House of Representatives)

Following in the footsteps of California's AB 32 with the potential of scaling up similar targets nationwide, the Waxman-Markey bill was passed in the House of Representatives on June 26 2009. This bill, also referred to as the "American Clean Energy and Security Act of 2009", includes the following measures (not exhaustive):

- Establish a renewable portfolio standard that begins at 6% in 2012 and gradually rises to 25% in 2025
- Establish new low-carbon transportation fuel standard
- Establish advanced building efficiency codes
- Codify efficiency standards for lighting and appliances
- Incorporate California's fuel economy standards
- Allow EPA to set efficiency standards for other mobile sources
- Enlist utilities to implement efficiency
- Set allowances for cap and trade
- Allow EPA to set emission standards on sources not covered by allowance program.

Kerrey-Boxer Bill (U.S. Senate)

This bill, currently before the Senate, tightens the emissions targets a bit beyond the House bill, aiming for a 20% reduction below 2005 levels by 2020 and a roughly 83% reduction by 2050.

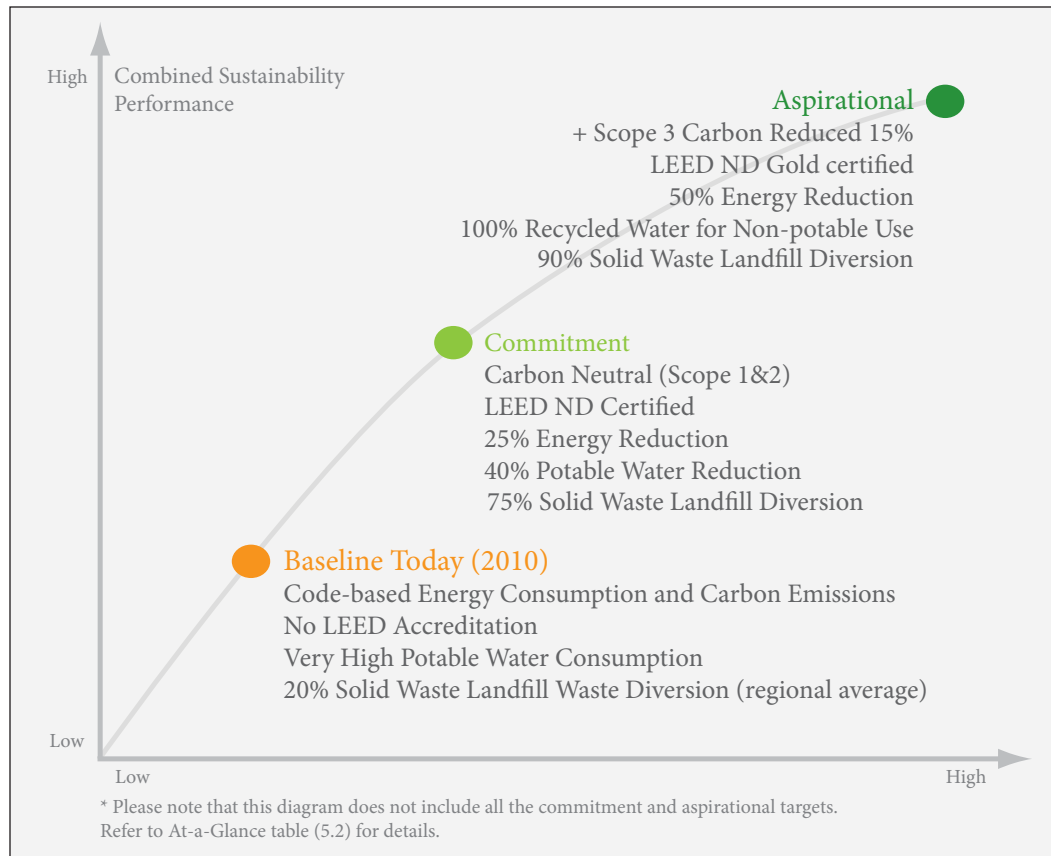
It is anticipated that a bill that reflects a majority of the measures in the Waxman-Markey Bill and the Kerrey-Boxer Bill will be passed by Congress within the next year. Therefore, NSC's targets are informed by this legislation.

TARGET SUMMARY

Based on the aforementioned national and regional policies, information regarding the goals and targets of other colleges and universities, and an understanding of emerging best practices in the wide range of systems that will be required at NSC, the campus has established two categories of carbon reduction targets (see Figure 5.4):

- Commitment targets that will enable the master plan to achieve operational carbon neutrality and reach a desired minimum level of overall sustainability
- Aspirational targets that will allow the master plan to achieve maximum sustainability and minimize both direct and indirect carbon emissions from all campus-related activities. By meeting aspirational targets, NSC will have the greatest effect on mitigating the effects of climate change and serve as an exemplary model for sustainable campus development.

Figure 5.4: Carbon Reduction Targets

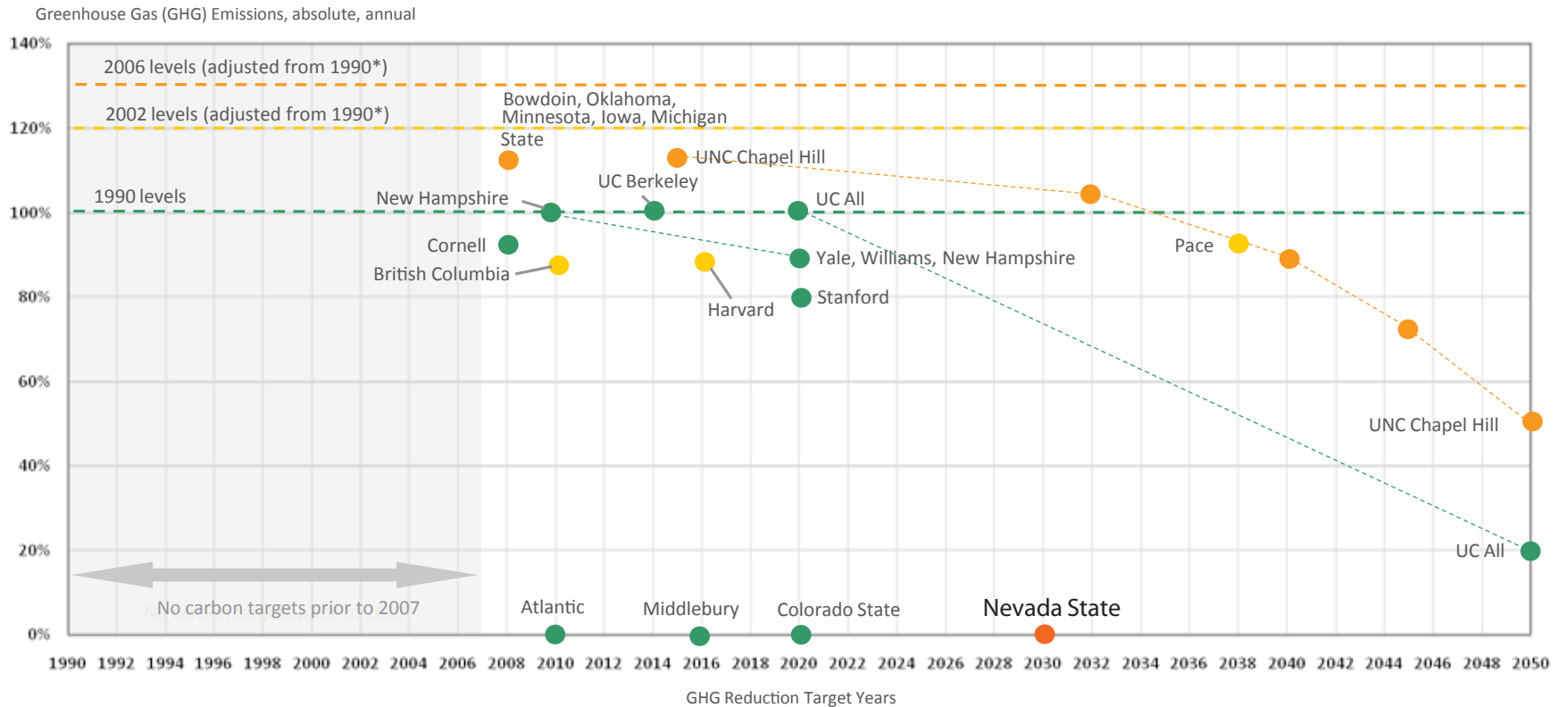


The targets provide a quantitative platform to track the performance of NSC throughout its lifecycle: planning, design, construction and operations. The targets are designed to be flexible and should be adjusted based on policy changes, NSC’s development pattern, and the growing body of technological innovation and experience. The targets have been established as corresponding to the ultimate build-out of the campus; interim targets and timelines should be set as well. See Table 5.1: Sustainability At-A-Glance for a complete listing of NSC’s commitment and aspiration goals.

Figure 5.5 illustrates how NSC’s overall carbon reduction commitments compare to other universities that have responded to a survey administered by the American Association of Sustainability in Higher Education (AASHE). Of the 60 colleges and universities surveyed, three have already established the goal of achieving carbon neutrality (for Scope 1 and 2 emissions). Other universities are trending toward carbon neutrality over time. In addition to those shown in the diagram, 30% of U.S. colleges and universities have committed to “carbon neutrality” (without specific target years) by signing on to the American College and University President’s Climate Commitment.

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Figure 5.5: Comparison of Greenhouse Gas Reduction Commitments



Baseline Years

- 1990
- 2000 - 2005
- 2005+

* based on http://www.aashe.org/resources/gw_commitments.php, Stanford Energy and Climate Action Plan

** 2002 and 2006 baseline adjustment based on linear interpolation of the 1990-2010 absolute GHG Emissions Trajectory figures in the California Air Resources Board Climate Change Proposed Scoping Plan, October, 2008.

Note: 30% of campuses in US have committed to "carbon neutrality" in the long term with the Presidents Climate Commitment (without specific target years).

SUSTAINABILITY STRATEGIES

An exhaustive list of sustainability strategies that will allow NSC to achieve its sustainability and carbon reduction goals and targets have been developed through the following activities:

- Technical workshops and brainstorming sessions (consulting team)
- Stakeholder engagement, presentations and feedback (including a workshop in Henderson on May 21, 2009)
- Climatic and contextual analysis of the project site and conditions.

In addition to the strategies presented by the design team, over one hundred ideas were generated by NSC and City of Henderson staff, local utilities, and other stakeholders. The complete list of potential strategies was analyzed and prioritized by scoring the ideas on their ability to help NSC:

- Achieve its goal of carbon neutrality
- Achieve secondary goals such as being a model of sustainable development for the region
- Meet acceptable levels of technical, financial and contextual feasibility.

At-a-Glance Table

Table 5.1 lists the top strategies along with their associated focus areas, goals and targets. The table also describes the associated benefits with these strategies and the sustainability framework, if any, that support these strategies. For example, select strategies may be recommended in a Leadership in Environment and Energy Design (LEED) program (NC or ND), or the Sustainability Tracking Assessment and Rating System (STARS), which provides sustainability targets and guidelines for colleges and universities. These third party certification programs are explained in more detail on page 5.18.

The strategies listed in the At-A-Glance table are discussed in more detail throughout this chapter.

Table 5.1: Sustainability At-a-Glance

Strategies	Commitment Goal	Aspirational Goal	Benefits	Frameworks Supported
Site Planning and Land Use				
Goal: Harmonize with existing site elements through appropriate use of land to create a compact, sustainable and vibrant campus.				
LU1: Compact Development	Average building heights of 3 floors or more; 75% of academic core within 10 minute walk radius	Average building heights of 3 floors or more; 75% of academic core within 10 minute walk radius	Improve land use efficiency; reduce building footprint; increase open space conservation; incentivize walking and biking	LEED ND
LU2: On-Site Student Housing	House up to 5,000 students (20% of headcount, 30% of FTE)	House up to 5,000 students (20% of headcount, 30% of FTE)	Improve land use efficiency; create mix of uses on campus; reduce VMT; reduce carbon emissions	
LU3: Recreation Access	1/4 mile or less walking distance to recreation for all on-site residents	1/4 mile or less walking distance to recreation for all on-site residents	Improve university health; reduce obesity and associated diseases; improve social atmosphere	LEED ND
LU4: Solar Orientation	Orient all buildings with long axis no more than 15 degrees off E/W	Orient all buildings with long axis no more than 15 degrees off E/W	Improve energy efficiency; reduce carbon emissions; improve indoor environmental quality	LEED NC, LEED ND
Transportation				
Goal: Plan access to a wide range of efficient environmentally sensitive and convenient means of transportation.				
T1: Promote Walking & Biking	Provide Travel Demand Management Program	35% Non-Auto mode share	Improve university health; reduce obesity and associated diseases; improve social atmosphere; reduce carbon emissions; reduce demand on parking, road, and transit infrastructure; reduce VMT	LEED-NC, LEED-ND, PCC, STARS, HSAP
T2: Promote the Use of Transit	Provide campus shuttle bus	25% Auto trip reduction	Reduce carbon emissions; reduce VMT; reduce demand on parking and road infrastructure	LEED-NC, LEED-NC, PCC, STARS, HSAP
T3: Promote the Use of Car Sharing & Alternative Fuel Vehicles	100% Electric/Biodiesel campus fleet	100% Electric/Biodiesel campus fleet; three electric vehicle stations	Reduce carbon emissions; reduce VMT; useful as educational tools	LEED-NC, PCC, STARS, HSAP
T4: Make Efficient Use of Parking	15% Parking demand reduction	25% Parking demand reduction	Increase land available for other uses; reduce heat island effect; reduce stormwater runoff; reduce pollutant runoff; increase groundwater recharge; reduce parking construction costs	LEED-ND
Energy				
Goal: Utilize passive design strategies, increase design for energy efficiency, reduce energy consumption and demand, and generate energy from renewable resources.				
E1: Minimize Energy Usage	25% less energy than Baseline Today (2010)	50% less energy than Baseline Today (2010)	Reduce operating cost; reduce carbon emissions; reduce demands on public infrastructure; reduce need for energy generation	LEED-NC, PCC, STARS, HSAP
E2: Employ District Energy/Combined Heat and Power (CHP) Systems	Implement district energy/CHP strategy (condenser water loop)	Implement district energy/CHP strategy (with alternative fuel)	Reduce waste heat drastically; improve overall system efficiency; reduce carbon emissions	LEED-ND, PCC
E3: Maximize on-campus renewable energy reneration	Offset all grid and natural gas emissions with rewable energy (minimum 10% on-campus renewable energy)	Offset all grid and natural gas emissions with rewable energy (100% on-campus)	Reduce operating costs; reduce energy transmission distance; reduce greenhouse gases; improve public image and awareness; useful as educational tools	LEED-NC, LEED-ND, PCC, STARS, HSAP
E4: Purchase RECs (only if necessary)	Able to use for up to 90% of renewable energy commitment	None	Increase feasibility and cost-competitiveness of renewable energy locally and nationally	LEED-NC, PCC, STARS
Water				
Goal: Reduce overall potable water consumption, control quantity and quality of storm water, utilize recycled water for non-potable demand				
W1: Minimize Potable Water Use	40% reduced potable water than Baseline Today (2010)	40% reduced potable water than Baseline Today (2010)	Reduce demand on public water supplies; reduce demand on public infrastructure such as treatment plants and waterways; reduce operating costs	LEED-NC, LEED-ND, STARS, HSAP
W2: Utilize Recycled Water for Non-Potable Use	40% of non-potable water demand met with recycled water	100% of non-potable water demand met with recycled water	Avoid use of potable water where it is not required; reduce demand on public water supplies; reduce quantity of water needing full treatment	LEED-NC
W3: Treat Wastewater Using Sustainable Methods and Explore Resource Recovery Options	Send wastewater to COH recycled water plant	Send wastewater to COH recycled water plant	Minimize use of chemical- or energy-intensive treatment methods; improve resource efficiency	LEED-NC

Strategies	Commitment Goal	Aspirational Goal	Benefits	Frameworks Supported
Stormwater				
Utilize passive stormwater treatment strategies and appropriately manage run-off from high intensity rainfall events.				
SW1: Create naturalized channels to convey run-on and site run-off through the campus.	Post-project peak stormwater discharge not to exceed pre-project conditions	Reduce post-project peak stormwater discharge compared to the pre-project conditions	Preserve natural watershed routes; slow and detain stormwater run-off.	LEED-NC, LEED-ND, STARS, HSAP
SW2: Utilize climate appropriate, low impact storm drainage techniques in streetscapes and parking lots	Post-project loading for pollutants of concern not to exceed pre-project conditions	Reduce post-project loading for pollutants of concern compared to pre-project conditions	Reduce demand on existing, downstream stormwater infrastructure, treating stormwater at source and reducing peak flows.	LEED-NC, LEED-ND, STARS, HSAP
SW3: Utilize climate appropriate, low-impact storm drainage techniques at the parcel level	Utilize some recommended naturalized BMPs to treat and attenuate stormwater on site	Utilize all recommended naturalized BMPs where appropriate to treat and attenuate stormwater on site	Reduce demand on existing, downstream stormwater infrastructure, treating stormwater at source and reducing peak flows.	LEED-NC, LEED-ND, STARS, HSAP
SW4: Install construction site best management practices (BMPs) during construction to control surface water quality.	Follow Las Vegas Construction Site BMP Guidance Manual (2009) during all construction activities	Follow Las Vegas Construction Site BMP Guidance Manual (2009) during all construction activities	Limiting conveyance of construction associated pollutants and sediment. Preserving disrupted top soils.	LEED-NC, LEED-ND, STARS, HSAP
Waste				
Goal: Appropriately reduce, reuse and recycle materials, minimize generation of solid waste and divert waste away from landfills. Where possible, convert organic waste to useful products				
WS1: Maximize Diversion of Construction Waste	85% construction waste diversion from landfill	95% construction waste diversion from landfill	Reduce tipping fees; reduce demand for virgin materials; reduce environmental impact associated with resource extraction; reduce methane emissions from landfills	LEED-NC, STARS, PCC, STARS
WS2: Employ Preferred Purchasing Programs	75% materials obtained through preferred purchasing programs	100% materials obtained through preferred purchasing programs	Reduce environmental impacts associated with production; reduce exposure to toxic materials; increase use of recycled and recyclable materials; support local economies; support green producers and suppliers	LEED-NC, STARS, HSAP
WS3: Maximize Diversion of Municipal Solid Waste (MSW)	75% MSW diversion from landfill	90% MSW diversion from landfill	Reduce disposal fees; reduce demand for virgin materials; reduce environmental impact associated with resource extraction; reduce methane emissions from landfills	LEED-NC, STARS, PCC, STARS, HSAP
WS4: Utilize On-Campus Composting and Anaerobic Digestion (AD) Technologies	Develop on-site composting system for Phase 2	Develop anaerobic digestion plant by full build-out	Generate biogas usable for energy generation; reduce methane emissions from landfills; reduce tipping fees; reduce energy/fuel required to transport waste; useful as educational tools	
ICT				
Goal: Incorporate smart grid, smart metering and other information technologies to improve efficiencies and reduce resource consumption				
ICT1: Utilize Smart Grid Technologies	75% of homes and academic buildings with smart meters	100% of homes and academic buildings with smart meters	Greatly improve understanding of energy use trends; achieve efficiency gains through energy analysis; improve overall system efficiency; useful as educational tools; improve public image	LEED NC, STARS
ICT2: Utilize Smart Transit Technologies	50% of transit facilities are ICT-integrated	100% of transit facilities are ICT-integrated	Encourage use of transit; reduce VMT; reduce carbon emissions; improve transportation efficiency	
ICT3: Maximize Energy Efficiency of Central Server	Target a Power Use Efficiency of 1.1-1.4 for power-intensive computing facilities	Target a Power Use Efficiency of 1.1-1.4 for power-intensive computing facilities	Reduce operating cost; reduce carbon emissions; reduce demands on public infrastructure; reduce need for energy generation	
ICT4: Develop Web Home Pages for Students	Yes	Yes	Improve understanding of energy use trends; achieve efficiency gains through energy analysis; useful as educational tools; improve public image	

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CARBON ANALYSIS

The NSC Master Plan is committed to attaining net carbon neutrality for campus operations (Scope 1 and 2 emissions) as defined by the Climate Registry. As stated in Chapter 4 of this document, Scope 1 emissions include those associated with direct campus operations, such as those activities that involve the combustion of fuel on-site and the operation of the campus vehicle fleet. Scope 2 emissions include those associated with purchased electricity.

In addition to achieving carbon neutrality for campus operations, the master plan has a commitment of achieving 2.3 tons CO₂(e)/capita for Scopes 1, 2 and 3, and an aspirational target of achieving a 0 tons CO₂(e)/capita target for all scopes. Scope 3 emissions include those that are indirectly associated with campus activity, such as student and faculty commuting to and from campus.

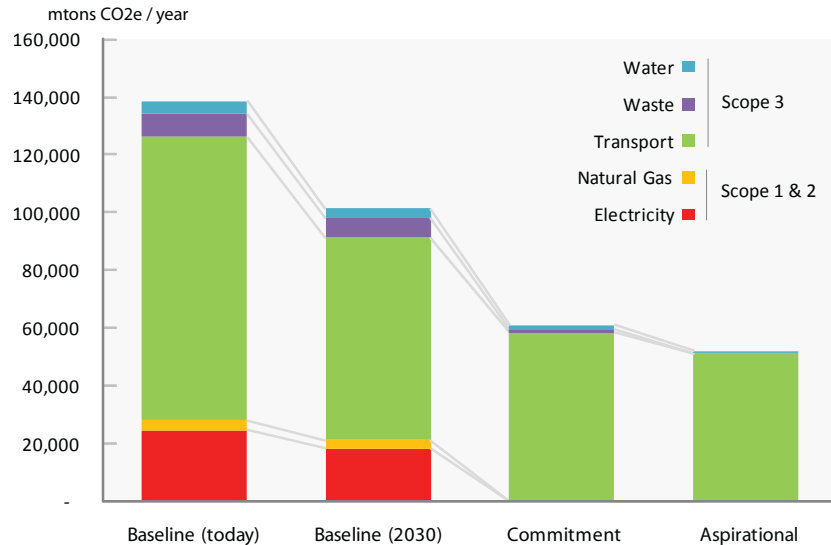
IRM Modeling Process

An integrated resource model (IRM) has been run in order to determine the feasibility of achieving the commitment and aspirational targets for Scope 1 through 3 emissions. IRM is a quantitative model used to determine the carbon footprint of master planned communities. It is designed to identify the characteristics of current conditions (baseline) and proposed scenarios, ensure consistent assumptions across analyses, and capture the synergies and feedback loops across technical focus areas.

The model has been used to determine the carbon emissions total for four different scenarios:

- **Baseline Today (2010):** This scenario refers to current design and construction practice using the most recent code requirements in terms of energy and water consumption. It also uses recent statistics regarding waste generation, landfill diversion in Henderson and auto mode share.
- **Baseline 2030:** This scenario expands on the previous baseline by accounting for policy changes likely in the next 20 years that will affect renewables in the NV Energy grid mix due to the Renewable Portfolio Standards (RPS), vehicle fuel efficiency or permitted carbon content of fuels. It also makes conservative estimates regarding the projected results of a widespread shift to sustainable technologies, such as reduced auto mode share and increased efficiency standards for energy and water consumption.
- **Commitment Targets 2030:** This scenario incorporates the commitment targets for NSC, including 25% energy efficiency savings, enough on-site renewable energy or RECs (with 10% on-site renewable) to achieve a carbon neutral energy strategy, 40% water savings, auto mode share reduced by 15% and 75% landfill waste diversion, among others. Please refer to the At-A-Glance table (Table 5.1) for detailed commitment target listing.
- **Aspirational Targets 2030:** This scenario ratchets up the project performance to the highest level and incorporates all aspirational targets, such as 50% energy efficiency savings, enough renewable energy to offset all energy-related carbon emissions), 60% water savings, auto mode share reduced by 30% and 90% landfill waste diversion, among others. Please refer to the At-a-Glance Table for detailed aspirational target listing.

Figure 5.6: Combined Annual Carbon Dioxide Equivalent Emissions

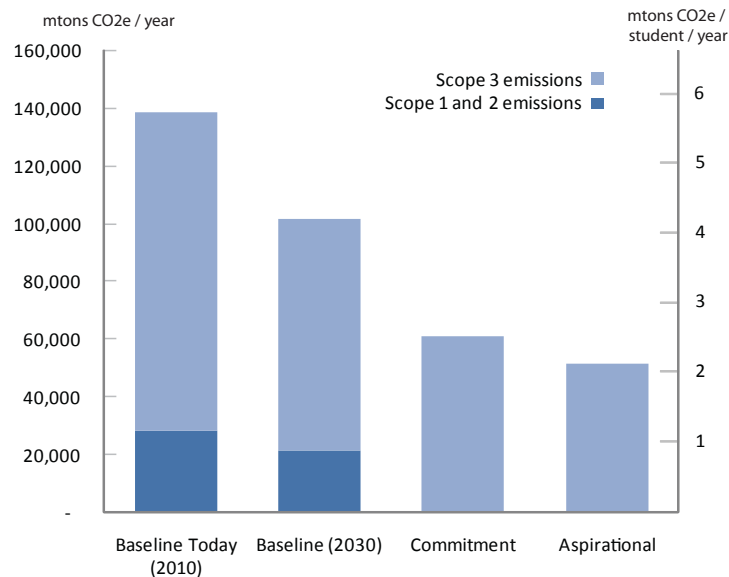


IRM Results

The results of the IRM process, illustrated in Figure 5.6, reveal that the majority of emissions come from commuter transportation emissions in all four scenarios. However, since commuter emissions are considered Scope 3 type of emissions, it does not directly affect the “operational carbon neutrality” goal of NSC.

From the Scope 1 & 2 emissions, the most significant contributor is building electricity consumption. Through a combination of renewable energy certificates (REC) and on-site renewables, the project achieves its operational carbon neutrality goal both in commitment and aspirational scenarios. Looking at Scope 3 emissions, the project succeeds in reducing them even further in the aspirational case.

Figure 5.7: Combined and Per Capita Annual Carbon Dioxide Equivalent Emissions



While Figure 5.6 shows the emissions across all technical streams, Figure 5.7 combines the various categories together under the Scope 1 & 2 and Scope 3 emissions and illustrates them both in terms of absolute and per student emissions. These graphics highlight that the campus achieves the operational carbon neutrality goal both in Commitment and Aspirational scenarios from Scope 1 & 2 energy standpoints, and Scope 3 emissions are reduced significantly.

If NSC would like to achieve carbon neutrality for Scopes 1, 2 and 3 emissions, it is recommended that the College explore ways to reduce commuter emis-

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sions as much as possible. For more information, please see the Transportation Section.

Beyond transportation strategies, it is still possible to use voluntary certified emissions reductions (CER) to offset the non-energy-related carbon emissions. CERs are carbon credits issued by the Clean Development Mechanism (CDM) for emission reductions achieved by well-monitored and verified projects from around the world. These projects take various scales and types, ranging from deforestation prevention to waste to energy systems installation, from landfill gas systems to small hydropower installation. For NSC, these CERs provide a viable alternative to offset the commuter emissions.

Conclusion

In conclusion, the following items are key strategies in order for NSC to achieve its carbon goals:

- Adopt a carbon neutral energy strategy (combination of efficiency, on-site renewable energy and renewable energy certificates (REC))
- Minimize water use and use of recycled water from the local City of Henderson Plan
- Maximize landfill diversion and use on-site composting and anaerobic digestion technologies if possible
- Implement transportation strategies that both minimize emissions from campus vehicles and reduce the need for commute via automobiles.

Other findings:

- On-campus transit and maintenance carbon

emissions are insignificant compared to other sources of emissions. However, it should be noted that campus transit network strategy may reduce the commuter trips.

- Water's role in carbon is relatively low compared to transport and energy.

THIRD PARTY CERTIFICATION

Third party certification is an important element of the NSC Master Plan for a number of reasons. Most importantly, third party certification provides proof and verification that the campus's sustainability strategies are being implemented according to the goals of the master plan and NSC policy. Similarly, the third party certification system provides a mechanism for on-going evaluation of these goals, whether for new construction or operations and maintenance of existing facilities. Finally, certification provides validation of the College's commitment to sustainability, which can be a useful tool for recruitment and retention of students, faculty and staff for whom sustainability is a priority.

NSC will participate in three different third-party verification programs: LEED, STARS and the President's Climate Commitment. The respective targets for NSC are described below.

LEED

The Leadership in Energy and Environmental Design (LEED) rating system developed by the US Green Building Council (USGBC) provides a widely accepted benchmark for measuring sustainability

performance in the built environment. Based on the current guidelines of USGBC's new initiative, LEED for Neighborhood Development (LEED ND) is a system that could be applied at a campus-wide level, including the residential component of the program. In addition, the LEED New Construction (NC) system applies to all buildings on campus and has requirements and benchmarks that can be used for the design, construction and operation process.

It is envisioned that at a commitment level, the campus will achieve LEED ND Certified level. At the buildings-scale, 100% of buildings will be designed with standards that are LEED Silver equivalent and 25% of buildings will achieve LEED Silver certification.

At an aspirational level, the campus will achieve LEED ND Gold and 100% of buildings will be designed to NC Platinum standards, whereas 25% of them will seek NC Platinum certification.

STARS

Developed by the Association for the Advancement of Sustainability in Higher Education (AASHE) beginning in 2006, this rating system is a voluntary framework for enabling unbiased comparisons of college and university sustainability progress over time and across institutions. The program was officially launched in October 2009. More than 90 institutions are participating in the pilot project, though none of them are based in Nevada.

This rating system has two types of credits: performance (quantitative, e.g. % buildings with LEED silver) and strategy (qualitative, e.g. adopting a green building policy). The credits are categorized under three major titles with approximately equal weighting:

- **Education and Research:** covers the institution's emphasis on sustainability in the curriculum breakdown (e.g. % of sustainability-focused courses), faculty development (e.g. incentives for developing sustainability courses), research emphasis (e.g. expenditures for sustainability research) and co-curricular peer-to-peer education (e.g. number of sustainability related student competitions).
- **Operations:** covers various issues such as combined building performance (e.g. LEED), dining services (e.g. local food), energy and climate (e.g. renewable electricity), grounds (e.g. irrigation water consumption), materials & waste (e.g. waste diversion), purchasing policy (e.g. Energy Star purchasing), transport (e.g. commute mode split)
- **Administration and Finance:** covers various issues such as investment (e.g. transparency), planning (e.g. sustainability plan), sustainability infrastructure (e.g. officers, inter-campus collaborations), community relations (e.g. student participation in community service), diversity, access and affordability (e.g. diversity officer), human resources (e.g. faculty and staff benefits) and trademark licensing (e.g. independent monitoring of logo apparel).

From this wide range of categories, metrics and tar-

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gets (mostly from operations category) are immediately relevant to the sustainability plan of NSC (see Table 5.2).

Considering that STARS is both an industry-accepted and technically rigorous rating system, NSC will participate in further development, refinement and application of this system. At a commitment level, NSC's target is to achieve Bronze certification with 25 successful credits, whereas the aspiration is to achieve 65 points and thus the Gold certification. In all cases, NSC aims to play a critical role in advocating the testing and adoption of rating system across Nevada.

President's Climate Commitment

The American College and University Presidents Climate Commitment (ACUPCC) provides a framework and support for America's colleges and universities to go "climate neutral". Climate neutral is defined by the ACUPCC as having no net greenhouse gas (GHG) emissions. While it is unclear what scopes of emissions this includes or by what year these targets should be met, most participating universities have interpreted this to include only Scope 1 and 2 emissions as defined in Chapter 4 of this document. The ACUPCC allows for the use of any methodology and emission calculator that is compliant with the Greenhouse Gas Protocol (GHG Protocol) of the World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI).

The ACUPCC commitment allows colleges and universities to achieve carbon neutrality by either of the following methods:

- Eliminating GHG emissions (Scope 1 and 2)
- Minimizing GHG emissions (Scope 1 and 2) as much as possible and using carbon offsets or other measures to mitigate the remaining emissions.

The path that ACUPCC recommends that colleges and universities take in order to achieve climate neutrality involves:

1. Initiate the development of a comprehensive plan to achieve climate neutrality as soon as possible.
 - Within two months of signing this document, create institutional structures to guide the development and implementation of the plan.
 - Within one year of signing this document, complete a comprehensive inventory of all greenhouse gas emissions (including emissions from electricity, heating, commuting, and air travel) and update the inventory every other year thereafter.
 - Within two years of signing this document, develop an institutional action plan for becoming climate neutral.
2. Initiate two or more tangible actions to reduce greenhouse gases while the more comprehensive plan is being developed.
3. Make the action plan, inventory, and periodic progress reports publicly available by providing them to the Association for the Advancement of Sustainability in Higher Education (AASHE) for posting and dissemination.

Table 5.2: Metrics and Targets Related to NSC from the STARS Rating System

Category	Metric	Minimum requirement (1 point)	Best Practice (Maximum points)
Education	% courses sustainability-focused	0% – 0.1%	4%
	% courses sustainability-related	1% - 5%	25%
	% departments with sustainability courses	5% - 10%	30%
Operations	% new buildings LEED NC certified	25% Certified	25% Platinum
	% new buildings LEED EB certified	1 building certified	20% Platinum
	% “institution-catalyzed” renewables electricity supply (consumption kWh based)	5%	100%
	% off-site renewables electricity supply (consumption kWh based)	15%	0% (since it is all on-site)
	% on-site combustion with renewable fuel (e.g. biomass, renewably derived hydrogen)	15%	100%
	% Greenhouse Gas (GHG) emissions reduction	5%	100%
	% carbon offsets allowed (compared to total emissions)	50%	15%
	% potable water reduction (non-irrigation) per building square foot	10%	50%
	% non-potable water usage for irrigation	50%	100%
	% landfill waste diversion (via recycling, reusing, composting, donating)	15%	50%
	% construction and demolition waste diversion	75%	75%
	Fleet GHG emissions (CO ₂ e per passenger mile)	0.5	0
% commute mode split (non single occupancy vehicle)	25%	95%	
Administration and Finance	% institutional investment in sustainability-related industries (e.g. renewables, community development financial institution socially responsible fund)	5%	30%

Thus far, 30%, or 659 institutions, have signed this commitment. In the future, it is recommended that NSC register for this commitment, as it is consistent with both the commitment and aspirational carbon targets set forth in the master plan.

LAND USE AND SITE PLANNING

Land use and site planning encompasses the plans that will guide placement of buildings, open space, and the connective elements that will support program and enrollment growth. The site planning and land use element includes:

- Land use goals and strategies
- Development pattern
- Grading plan
- Land use plan
- Parcel plan
- Illustrative plans
- Development densities
- Building siting and configuration.

LAND USE GOALS AND STRATEGIES

Goals

Work with the natural character of the desert site to create a unique, memorable, flexible and highly functional campus layout that is climate appropriate and promotes efficiencies and sustainability.

Strategies

- Work with natural site characteristics to retain desert character
- Create a compact, walkable campus environment by building at average heights or three floors or more
- Arrange a compact academic core with 75% of facilities within a 10 minute walking radius
- House up to 5,000 students or 20% of headcount/30% of FTE on campus
- Provide convenient access to recreation for on-

site residents at a distance of 1/4 mile or less from residences

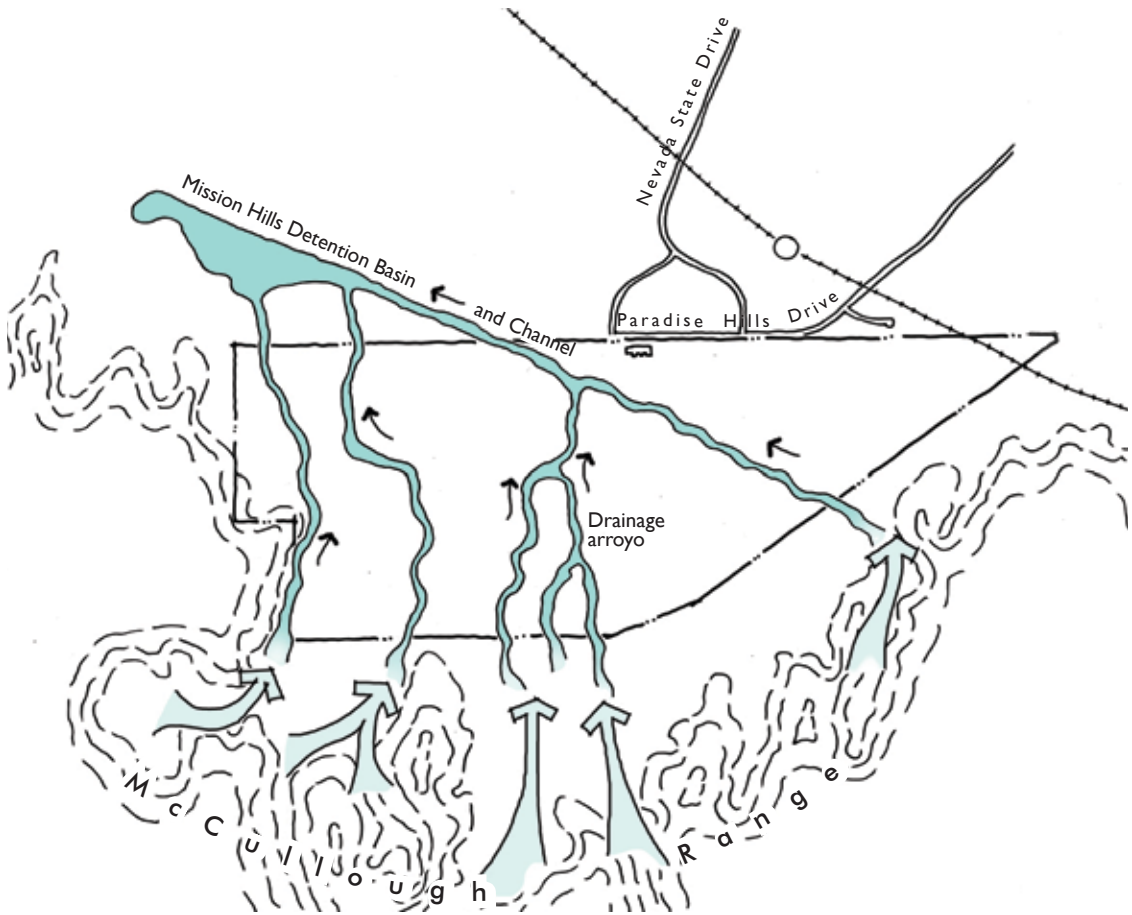
- Orient buildings with long axis no more than 15 degrees off east/west to maximize passive solar performance
- Provide convenient access to campus with entries directly adjoining town center
- Provide parking around periphery to create an auto-free, pedestrian and bicycle-oriented campus
- Locate paths, open spaces and key uses to create a vibrant, living learning environment.

DEVELOPMENT PATTERN

As noted in the strategies the intent is to create a highly walkable, comfortable campus that is appropriate to the desert environment of high temperature summers and cold, often windy winters. In addition, the stunning natural environment of mountains and arroyos that descend to the gently sloping campus site can be retained a focus for demonstrating the beautiful desert environment in which the campus is located.

The following concepts are the ideas regarding how the campus will fit and be organized on its site.

Figure 5.8: Concept 1 - Natural Drainages



Natural Drainages Shape Campus Layout

As noted in the Planning Context section, the McCullough Range lies directly south of the campus and stormwater drains south toward and through the campus site. To mitigate potential flooding the drainage channel was constructed to divert storm water to a detention basin northwest of the campus site. The arroyos lying south of the campus are steeply incised at higher elevations; as they descend they flatten out until only remnants remain on the campus site itself. These drainages are clear expressions of the dynamics of water and mountains. Rather than resorting to underground piping to direct storm water, the campus will be built around a system of four enhanced arroyos and a naturalized drainage berm. Each will channel storm water runoff through the campus toward the detention basis. In addition, each will provide a location for natural vegetation, as well as walkways and multi-use trails that traverse the campus and also lead into the higher elevations of this desert site. By treating the arroyos as both infrastructure and amenity, the campus will have a distinctive image and will fit well into the surrounding natural environment.

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Compact Academic Core

The heart of the campus is the academic zone, where the highest levels of activity occur throughout the day. The academic core will accommodate a wide range of uses: classrooms and lecture halls, faculty and staff offices, library, student union, and performance facilities. In order to ensure efficient operations, the academic core is arranged in a compact and highly walkable pattern. Uses are in proximity to one another, linked by walkways, multi-use trails, and routes for bicycles and transit.

Virtually all of the academic uses lie within an area falling within a 10-minute walking diameter, which will provide convenient access during class changes for students and faculty.

The academic core is enhanced through the placement of buildings and walkways. The compact size of the area and appropriate arrangement of buildings will provide an abundance of shaded walkways to access areas of the campus even in the hottest times of the day.

The compact academic core is located in close proximity to student housing areas and to other campus uses such as athletics and parking.

Figure 5.9: Concept 2 - Compact Academic Core

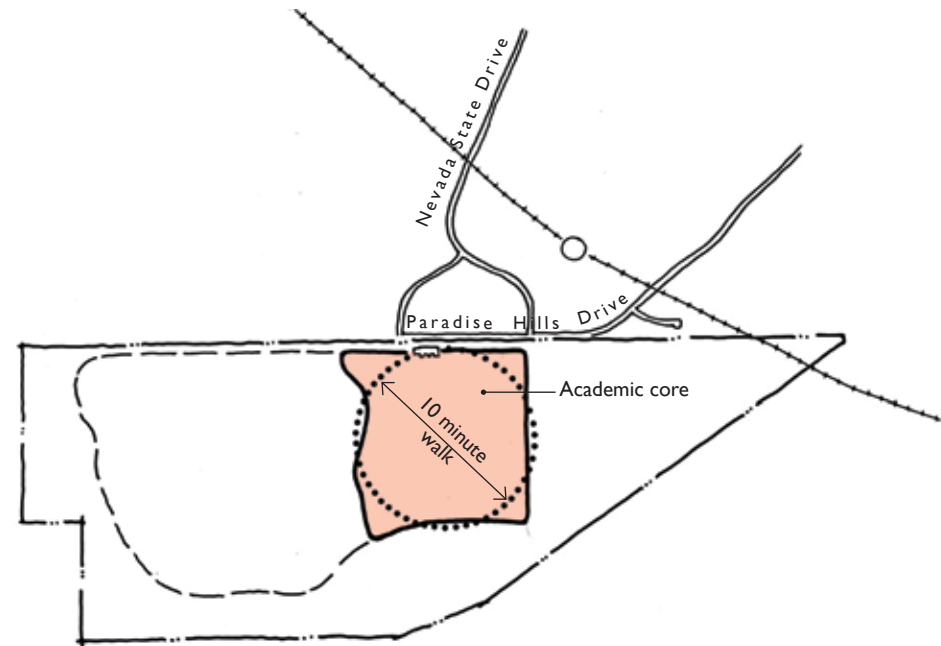
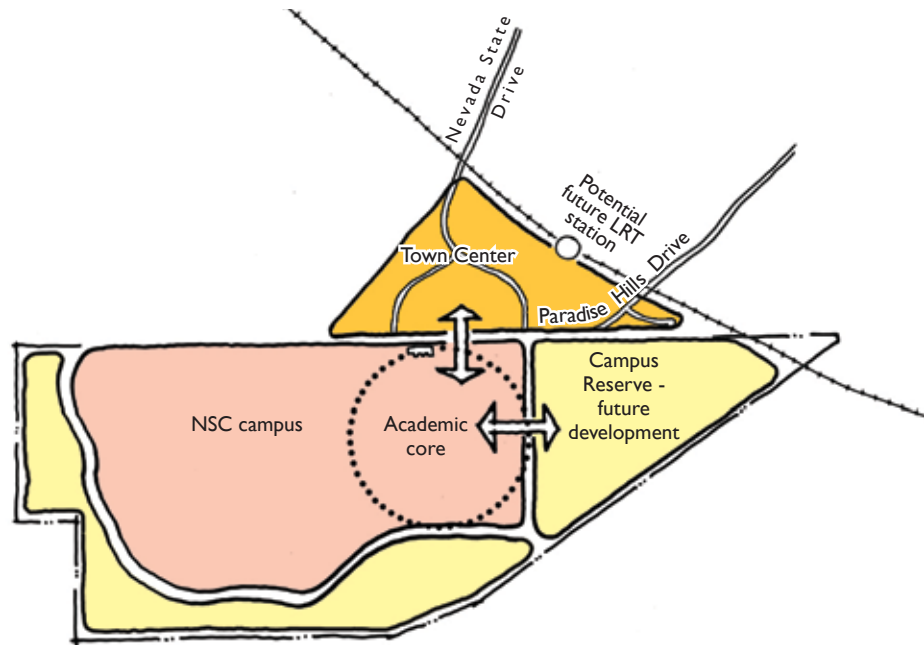


Figure 5.10: Concept 3 - Relationship to Town Center



Relationship to “Town Center” and Adjoining Land Uses

The NSC campus has been planned specifically to create a close relationship between the campus and the adjoining City of Henderson development. It has been envisioned for some time that the city property would ultimately be developed in a higher density, mixed use configuration with campus-serving uses (retail, cafes, etc.); for this reason the City’s area has been termed the “Town Center” in this document.

The location of the campus academic core in close proximity to the town center will provide excellent easy accessibility for the education program and the K-8 school, and for the nursing program and the health care uses planned nearby.

Opportunities to share transit and to ultimately create a true transit-oriented neighborhood with bus rapid transit in the short run and light rail service in the long run are increased by the close proximity of the campus and town. In addition, faculty and staff may choose to live near the campus in town as may older residents of Henderson who will value the advantages of a campus town environment.

The NSC campus will grow from its northern edge adjoining the City. An important campus entry will therefore be located at this edge.

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Create Defining Open Spaces

The open spaces of the campus provide the venues for special events and are the locations where interaction among students, faculty and staff occur in serendipitous, informal ways. Open spaces range from major malls, quads or plazas, to small building courtyards, building entries and walkways.

The open spaces for the NSC campus are configured to provide a memorable campus environment that feels “campus-like” while celebrating and respecting the desert environment. Linear spaces oriented east-west will allow one side to be shaded for comfortable walking at all times of the day and year. Several major open spaces are provided; one occurs within the first phasing of buildings and will be the event and identity space for the campus for many years, a second is located in the center of the academic core and will emerge as a primary gathering space where large, intensive use facilities such as a student union or library might be located.

Figure 5.11: Concept 4 - Create Defining Open Spaces

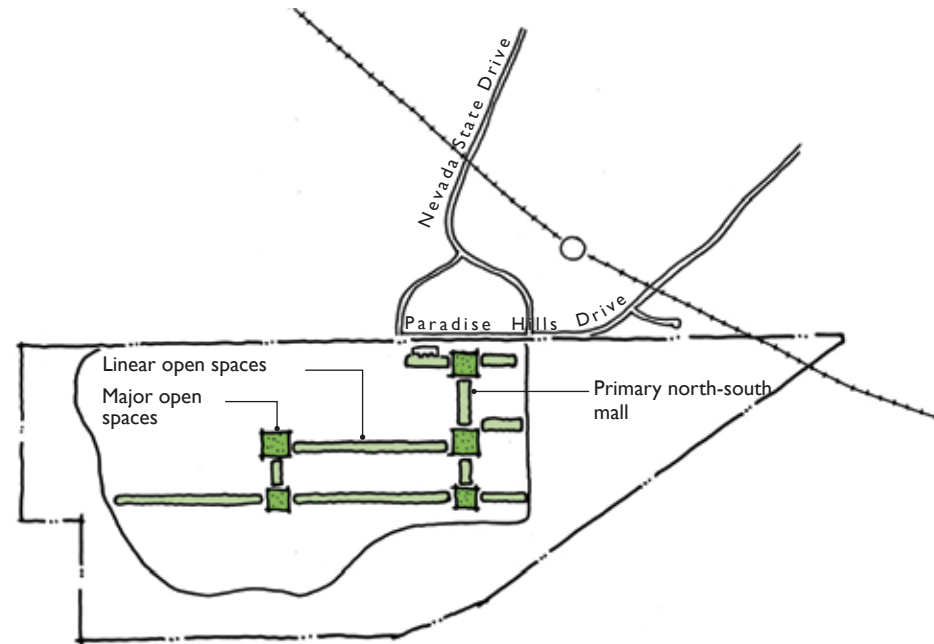
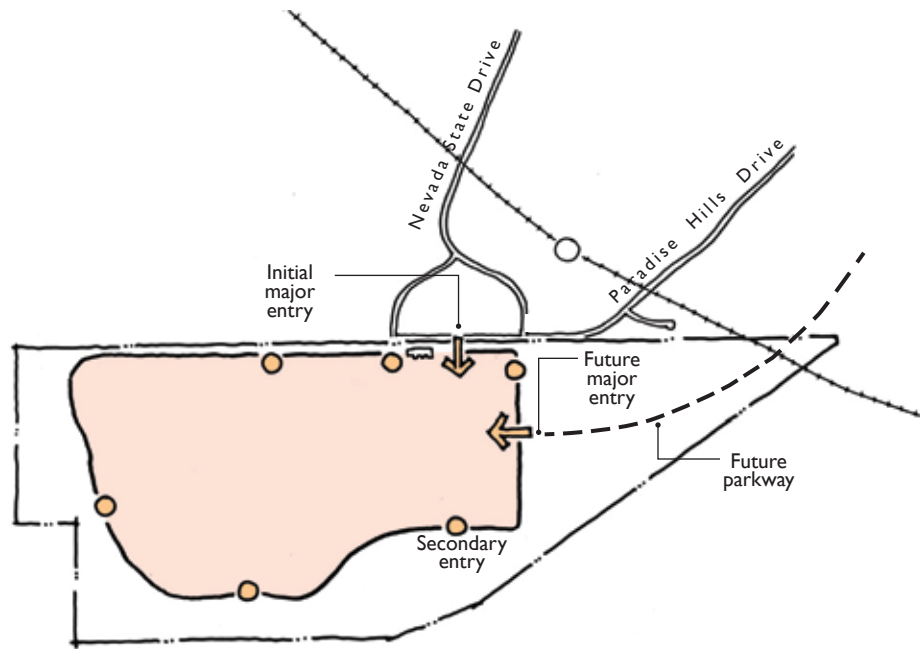


Figure 5.12: Concept 5 - Major Campus Entries



Major Campus Entries

Creating a memorable arrival experience is an important component of campus design. In the near term, access to the NSC campus will be, as it is today, from Paradise Hills Drive. A more formal entry is proposed centering on this edge of the campus directly adjoining the town center.

Additional entries will ultimately be needed as the campus grows. A second major entry is located centered on the eastern edge of the campus and would be accessed via a new parkway that would also serve the campus reserve area uses. Smaller, secondary entries would be located at various locations around the periphery of the campus, providing access to parking, transit stops, and drop-off areas.

All important entries will be enhanced with signage, campus information and short term parking. Since these are where the public often gets its first impression of the campus, a distinctive landscape treatment is also desirable. Facilities that will attract the public, such as performance halls or the library should be located nearby.



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GRADING PLAN

In order to minimize site development costs and to create a compact, walkable campus environment, the campus site is proposed to be shaped into a series of terraces, rising gently from the first phase of development along Paradise Hills Drive to the highest, southern extent of the site (see Figure 5.13). These terraces create large building pads to accommodate multiple buildings and their associated open spaces. The terraces also serve to provide level crossings of the campus to the east and west, thus creating level routes of travel from housing to academic, academic to recreation and so on. The grade transitions between terraces, ranging generally from five to 10 feet in height, can be taken up with ramps, stairs and with the buildings themselves. Access for the handicapped will be provided through the use of ramps or by means of elevators within adjoining buildings.

Flat portions of the terraces provide spaces for special events, gatherings, and building entries. The sloped transition areas between terraces provide locations for seat walls to view activity. The terraced nature of the campus will allow virtually all buildings to enjoy north views to the valley beyond.

Figure 5.13: Grading Plan

- LEGEND
-  College Site
 -  Graded Terrace
 - 2380' Approximate Elevation



LAND USE PLAN

Future land uses are illustrated in the Land Use Plan, Figure 5.14, and are discussed in the section that follows. Land uses illustrated in the plan include:

- Academic and academic-support
- Student housing and affiliated uses
- Athletics and recreation
- Major campus open spaces
- Campus operations and support
- Parking
- Campus reserve areas
- K-8 school
- Natural open space and arroyos.

Academic and Academic Support

As illustrated, academic uses are concentrated in a compact zone in the eastern portion of the site. Arranged along linear open spaces or malls, the academic uses are readily accessible from student housing as well as from parking and transit routes that surround the academic zone. Uses will include classrooms, faculty offices, administrative offices, student services centers, student organization offices, library, learning centers, primary food service and student lounges oriented toward commuting students and residents.

Major facilities, such as a library, administration building, student union or performance hall, should be located in one of two high activity areas adjoining major campus entries: near the initial campus entry and first phase of development, adjoining Paradise Hills Drive, or at the second primary entry, at the junction of the major campus arroyo, primary north-

south pedestrian spine, and adjoining open spaces. Either of these locations will be high activity locations and suitable for major campus destinations.

Student Housing and Dining Services











The campus plan provides the capacity to house up to 5,000 students in four residential neighborhoods. These neighborhoods have been defined as clusters of housing units with supportive services such as dining, lounges, laundry, study areas, and indoor recreation rooms. In addition, outdoor recreation facilities such as basketball or volleyball courts, and non-regulation, small fields suitable for soccer or other field sports are provided within the neighborhoods.

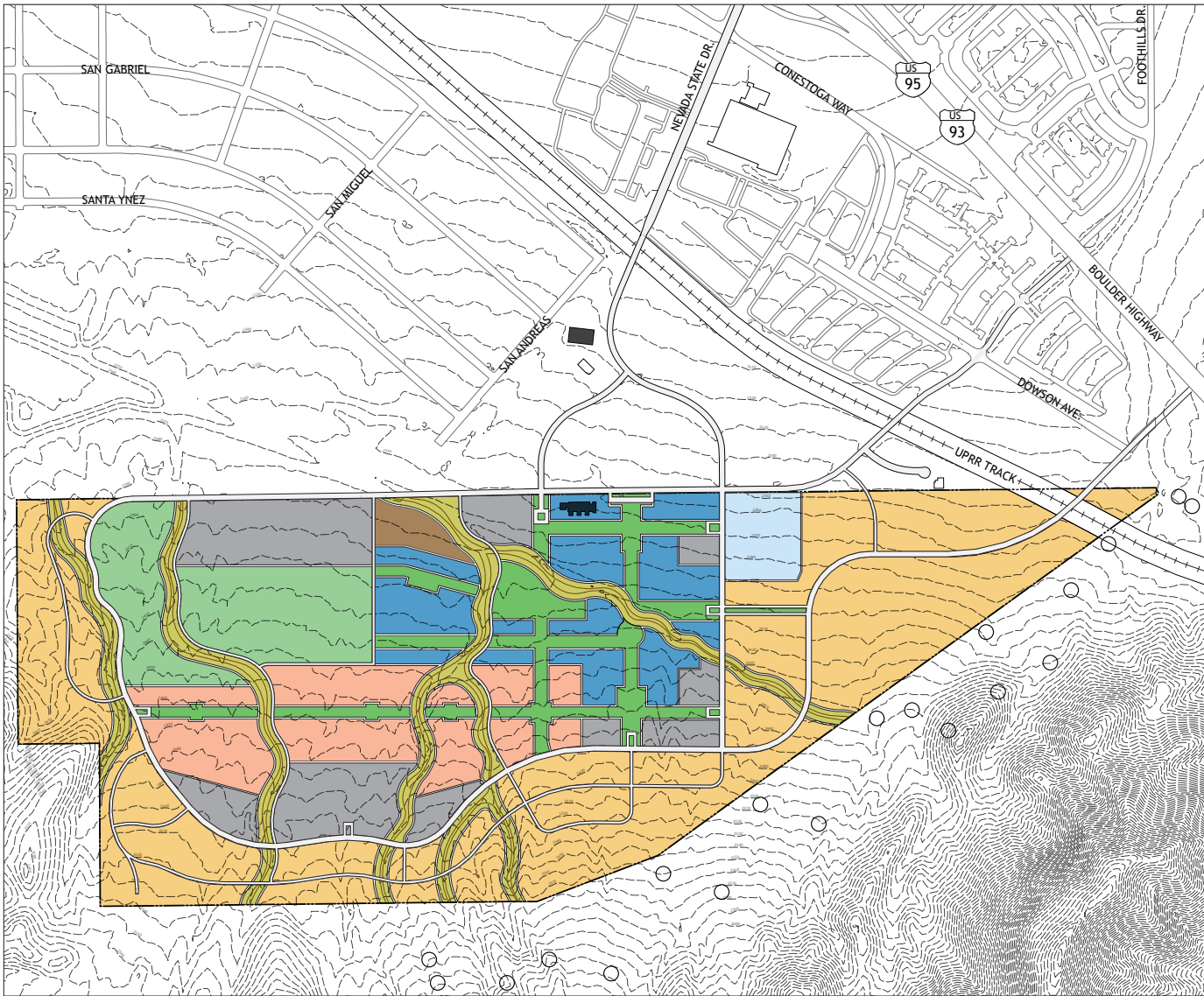
Clustering student housing into distinct neighborhoods, creating a smaller grouping of students aids in socialization and integration into the campus environment, especially for younger students. Housing types can range from traditional dormitories to suites or apartments, depending on market demand and pricing constraints over time.

The first housing neighborhood to be developed will be located adjoining the academic core at the southern edge of the campus. Since the housing demand may lag somewhat behind enrollment growth, by the time this housing is constructed, nearly half of the academic zone may be complete, providing good adjacencies for these residences to all activities of the campus. Later phases of housing extend west, adjoining athletics and recreation facilities as the campus grows in this direction from its initial phase.

Figure 5.14: Land Use Plan

LEGEND

-  College Site
-  Academic & Support
-  Student Residential
-  Athletics & Recreation
-  Campus Open Space
-  Parking
-  Campus Support
-  Campus Reserve
-  K-8 School
-  Natural Open Space / Arroyos



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Food service can be accomplished on campus in several ways. Dining halls associated with the student housing areas are highly desirable and should be implemented with the first phase of housing development, with expansion possible as the on campus population grows. Food service should also be provided in the campus academic core, associated with the student union or other centers of activity. Unlike in the past, today a wide variety of food and beverage choices are available to students in mixed use buildings and in proximity to study areas such as the library.

In addition, as the campus population grows, smaller distributed food service locations may be provided throughout campus, utilizing a flexible vendor kiosk or moveable cart model.

Student Services

Student-oriented facilities are critically important to the daily life of the campus. In early years in particular, providing amenities for students will have a significant effect on attracting and retaining students and in their academic success.

Student services or amenities must include facilities for both resident and commuting students and can include counseling and career offices, lounges, lockers, study areas, food vendors, child care and other uses that will keep commuters on campus and encourage interaction of all students with one another and with faculty.

Athletics and Recreation

This master plan provides ample room for a robust recreation and athletics program for NSC. The plan illustrates a layout that could accommodate a large track and field / soccer field with spectator stands, as well as additional soccer fields, softball and baseball fields. In addition, sites for a gymnasium, natatorium and other buildings are noted.

It will be important to ensure that the fields and athletic facilities enjoy good access from student housing, from the academic core and that they have convenient parking nearby for events and daily use.

Informal trails are provided throughout the site, generally along the arroyos and at the edges of campus. These can be used for walking, running, bicycling and by neighboring equestrians for recreation and for access to the desert and mountains to the south.

Open Space

The campus land use plan illustrates the locations of two primary open space types: the arroyos, which also have a stormwater management role in the system of infrastructure serving the campus; and the system of developed, intensive use spaces such as the primary malls and quads or plazas.

Major open spaces contribute enormously to the character and image of the campus and play an important role in the decisions of students and parents in college selection. These spaces need, therefore, to be considered as major capital projects, implemented early in the growth of the campus, to as high a level

of quality as possible. Campus open space, and guidelines for its planning and design, is described in detail in Chapter 6.

Parking

A vital college campus is built around an active, auto-free zone where large numbers of students faculty and staff can freely circulate. The land use plan, therefore, provides for parking lots and structures that are arranged around the academic core, lying generally outboard of all major land uses. They are, however, conveniently located at the primary campus entries to allow visitors to easily find and access destinations on campus. While in initial phases surface parking lots will be used to provide convenient access, in the longer term these surface lots will become building sites and parking will move to the periphery. As funding allows, when the campus nears its full build out parking structures will be needed in order to effect an efficient utilization of land. Structures are primarily located around the academic core.

Managing the supply of parking will be a critical component of the transportation demand management (TDM) strategy, which is discussed further in the Transportation section that follows.

Campus Support

A variety of support buildings and areas are required for campus operation. These include facilities for offices, shops, materials storage (interior and exterior), fleet (shuttle, campus vehicles) storage and maintenance, and facilities associated with central

energy, water and waste generation, conveyance and disposal. Most of these uses have been centrally located along the northern edge of the campus near the primary drainage arroyo, east of the existing Liberal Arts and Sciences building. This location is easily accessible from Paradise Hills Drive and should provide adequate space for long term growth. Other smaller distributed locations may also be added as the campus grows.

Campus Reserve

An area representing approximately $\frac{1}{4}$ of the entire campus is identified as a campus reserve. Virtually all universities and colleges find that over time their projections of enrollment, programs and facilities change significantly, so this acreage provides a degree of flexibility for the long term operations of NSC. In addition, it provides acreage for related and complementary uses that will advance the mission of the college. Thus approximately 10 acres has been identified for a K-8 school of the Clark County School District. This school will provide student teaching opportunities for the NSC School of Education. Other uses might include faculty / staff housing, additional student housing, medical facilities that can partner with the School of Nursing, or green technology businesses that can accept student interns and that will advance the college's commitment to carbon neutrality and sustainability.

The largest portion of this acreage lies immediately to the east of the campus academic core. Additional acreage lies along the south and east edges of the campus.

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DEVELOPMENT FRAMEWORK

The Development Framework Plan (Figure 5.15) establishes critical relationships and dimensions among key elements of the campus. While the details of academic program and facility requirements will evolve over time, the campus itself needs a clear organization to guide facility siting decisions.

The framework defines the alignment of spaces and buildings throughout the campus. This will ensure that the site can:

- Accommodate the projected building program
- Develop an attractive and usable open space system
- Optimize adjacencies and density to create a compact environment that is also responsive to the dramatic climate of the area.

The Development Framework Plan shows key dimensions and alignments of major open spaces and malls in order to define the sites on which facilities should be built. The edges defined by the dimensions indicate the build-to lines for the majority of building facades that line the space. Building entries will also locate along these key open spaces, thus generating activity and interactions.

The Development Framework does not define alignments or building footprints through most of the campus, allowing flexibility to respond to programmatic requirements. However, the Illustrative Plan that follows demonstrates how the land uses and buildings may be sited, following this Development

Framework, to create a cohesive and pleasing campus environment.

DENSITY OF DEVELOPMENT




While it is hard to predict the ultimate programs and budgets that will define the size of future buildings, a number of assumptions can be made to understand the likely nature of future facilities. Typical of a college campus of its type, NSC is not likely to build many large buildings of the type found on many research university campuses – tall buildings with programs exceeding 150,000 gross square feet. Instead, NSC buildings are likely to fall in the range of 50,000 – 125,000. Similarly, for cost, code and efficiency reasons, buildings are unlikely to be designed to be more than four to five stories maximum while many buildings such as student union, performance or large classrooms, may only be one or two floors in height.

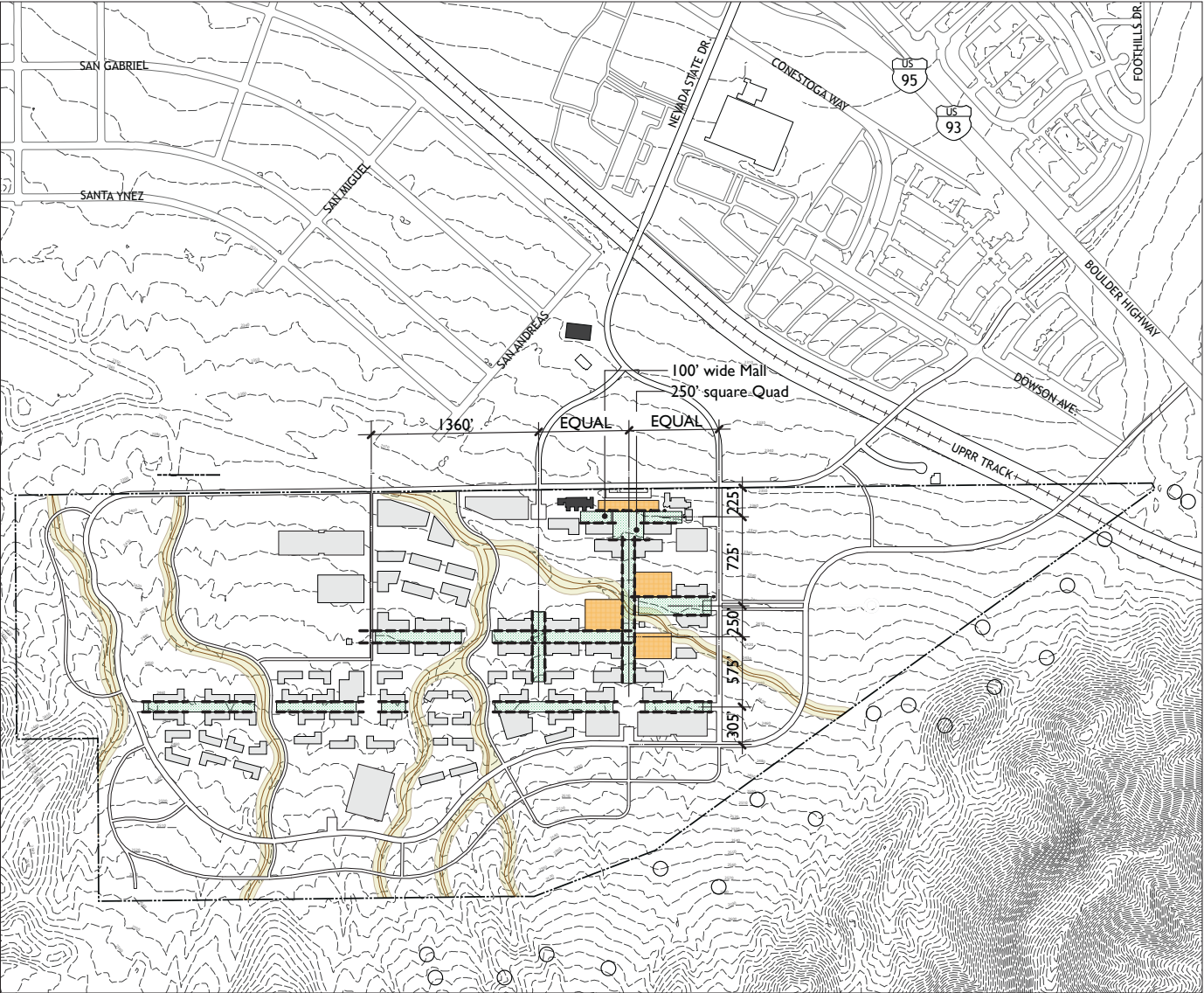
As a consequence, it is assumed for purposes of this master plan that the average building height will be three floors. Variations in building height would be welcomed to add interest and variation to the campus roof line. In no instances it is anticipated that any building would exceed 75 feet in height.

Whenever programs allow, buildings should be three floors or more. This will ensure an adequate density of development so that the site can accommodate the projected enrollment and program while retaining some flexibility to allow for unexpected program variations or additions.

Figure 5.15: Development Framework

LEGEND

-  College Site
-  Major Campus Open Space or Circulation Corridor
-  Landmark Building Site



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ILLUSTRATIVE PLAN

The Illustrative Plan illustrates how the building program of academic, student housing, recreation fields, parking and other uses can be arranged on the campus, following the concepts set forth in this master plan. As shown in Figure 5.18, buildings are aligned along an east/west axis, facing major open space, linear malls or smaller shared spaces. Spacing of buildings is consistent with the goal of achieving a walkable, compact academic core and campus, while framing image-making, usable outdoor spaces for special events.

The plan also illustrates road and parking layouts, indicating how the campus can be accessed from the regional network and from the adjoining town center. The plan illustrates the drainage arroyos and other open spaces.

The buildings illustrated in this plan are described further in the Building Guidelines section of this document. Guidelines for the design of open spaces and their landscaping are found in the Landscape Guidelines section.

Figure 5.16: Illustration of the Phase I Main Quad



Figure 5.17: Illustration of the Phase I Central Open Space



Figure 5.18: Illustrative Plan



Figure 5.19: Illustration of the Campus Entry



Figure 5.20: Birds-eye View of the Phase I Campus Development



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TRANSPORTATION

The implementation of sustainable transportation strategies presented in this section will lower the levels of traffic growth, lessen traffic impacts, create a safe and pedestrian friendly environment, and minimize the transportation-related carbon footprint for the campus.

TRANSPORTATION GOALS AND STRATEGIES

Goals

Plan access to a wide range of efficient, environmentally-sensitive, and convenient means of transportation.

Strategies

- Promote Walking & Biking
- Promote the Use of Transit
- Promote the Use of Car Sharing & Alternative Fuel Vehicles
- Make Efficient Use of Parking.

Commitments

- 15% Parking Supply Reduction compared to business-as-usual
- 100% Electric/Biodiesel Campus Fleet
- Provide Campus Shuttle Bus
- Provide Travel Demand Management Program.

Aspirational Targets

- 25% Auto Trip Reduction
- 25% Parking Demand Reduction
- 35% Non-Auto Mode Share.

The key factor defining transportation on the Nevada State College campus is accessibility. The campus's location on the edge of the City of Henderson's urban area limits the practicality of bicycling or walking to campus. Transit usage is also limited due to the distance from the campus to the City Center and the lack of robust transit service provided to the area. As a result, student, faculty, staff and visitor trips to campus occur largely by car.

The transportation plan is designed to move NSC toward a more sustainable transportation system - one that will provide commuters and visitors multiple and convenient modes of transportation to and from the campus, and where future campus residents have little need to maintain a personal automobile on campus.

Table 5.3: Transportation Program Assumptions

Types	Number of Vehicles	Vehicle Type	Number of trips (per day)	Average Trip Length (miles)	VMT per day (calculated)	Days in operation	VMT per year
Transit	2	CNG in baseline, biodiesel in commitment, biodiesel in aspiration	51	2.5	255	227	57,885
Maintenance	20	Electric golf carts in all cases	10	0.5	100	211	21,100

Types	Trip rate per student	Average Trip Length (miles)	VMT per day	Auto Trip Reduction Factor	Days in operation	VMT per year
Commuter Auto Trips (3)	2.38 / day	20	1,241,400	0% (baseline), 0% (commitment), 25% aspirational	227	281,800,000 (baseline)

(3) Preliminary estimate based on ITE rates

DEMAND AND USAGE ASSUMPTIONS

In order to calculate a base transportation scenario that represents the goals and strategies presented in this section, a number of key assumptions have been made to understand the implications of the amount of carbon emissions expected to be generated based on the program elements. These assumptions represent the college when it is operating at full build out.

Table 5.3 shows the key assumptions behind the overall NSC transportation program.

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EXISTING ROADWAY NETWORK

Regional Accessibility

Interstate 515/U.S. 93/95 is a north-south connector that provides freeway access to the Nevada State College campus. The highway provides access to downtown Las Vegas and the City of Henderson beyond. Access to the campus is provided via two freeway exits from the interstate, Wagon Wheel Drive and Paradise Hills Drive. Wagon Wheel Drive is the northern exit which provides vehicular access to the campus from the north. Paradise Hills Drive is approximately 2/3 mile south of Wagon Wheel and provides vehicular access to the campus from the east.

Boulder Highway is a parallel north-south highway that also provides connections to downtown Las Vegas and beyond. Boulder Highway ends at Wagon Wheel Drive, and continues as an arterial street for another 2/3 mile to Paradise Hills Drive.

Local Accessibility

The local roadway network that will serve the campus is only partially in place at this time. From the existing I-515 / U.S. 93/95 interchange, Nevada State Drive serves the Dawson Building, then swings east and ends at Paradise Hills Drive at the campus edge. Compassion Drive leads from Nevada State Drive past the existing day care center to Paradise Hills Drive to the west. Other than Paradise Hills Drive, which enters from the east and runs along the northern edge of the site, no other roads currently serve the campus.

Transit

Currently Nevada State College is served by Regional Transportation Commission of Southern Nevada (RTC) Line 402. Line 402 operates the Crosstown Connector/Boulder City route, which directly serves the campus. The service operates daily from 5:40AM to 10:23PM, with 35 total trips in both directions on approximately 60 minute headway.

Bicycle Circulation

On roads that directly serve the campus, Wagon Wheel Drive/Dawson Avenue currently has a designated bicycle lane. The bicycle lane extends beyond Wagon Wheel Drive as the street merges into Apaloosa Road. Paradise Hills Drive is also signed as a shared bicycle route. In the nearby area, a dedicated off street bicycle path runs between Wagon Wheel Drive and Paradise Hills Drive east of I-95. West of I-95 and east of the railroad tracks, a dedicated off street bicycle path runs north-south from Foothills Drive, crossing Dawson Avenue and west across the railroad tracks, and continues along parallel to residences along San Eduardo Avenue.

Pedestrian Circulation

Pedestrian circulation is limited by the lack of sidewalks to, from and within the campus site. Sidewalks along Dawson Avenue currently end approximately 1/3 mile beyond the Wagon Wheel Interchange. On campus, sidewalks provide access between the parking lots and the buildings.



Many times of the year, the climate in Henderson is conducive to bicycle riding. Appropriate facilities should be provided.

SUSTAINABILITY STRATEGIES

When the college is fully built out, the campus will have approximately 25,000 students with over 2,000 faculty and staff and 5,000 residential housing units. In order to achieve a street network that efficiently conveys students, faculty and staff to campus destinations, the strategies proposed in this section will reduce the number of vehicles that will be traveling to and through the area.

The sustainability strategies listed below are intended to be a general overview of strategies that are similar in intent to transportation demand management (TDM) strategies. While the proposed strategies aim to reduce transportation demand, they also aim to reduce the campus's carbon footprint through the use of alternative technologies and systems.

The detailed strategies listed below are organized into various categories that are intended to be implemented in conjunction with each other. All of the strategies combined will help to reduce overall vehicular travel to campus.

Promote Walking & Biking

In order to promote walking and biking, the master plan includes the following recommendations:

- Put pedestrians first
- Provide attractive, comfortable, and safe pedestrian paths
- Provide well-designed, shaded walkways
- Maximize pedestrian and bicycle connectivity

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- Establish on-campus bike shops and maintenance facilities
- Provide free access to showers and lockers
- Include well-designed and secure bicycle parking
- Expand the existing City of Henderson bike-share program to serve the campus.

Promote the Use of Transit

In order to promote the use of public transit, the master plan includes the following recommendations:

- Optimize transit network, operations, and access
- Establish a Transportation Coordinator
- Develop a website with real time transit information
- Work with the local transit agency to provide discounted transit passes
- Provide ride-matching services for carpool and vanpool programs
- Institute a campus shuttle service.

Promote the Use of Car Sharing & Alternative Fuel Vehicles

In order to promote the use of car sharing and alternative fuel vehicles, the master plan includes the following recommendations:

- Capture trips on-site by modes other than the car
- Partner with companies like Zipcar to promote car sharing
- Run the following fleet vehicles on alternative fuels or electricity:
 - Shuttle service
 - Service vehicles
 - Parking enforcement and police vehicles
- Partner with companies like BetterPlace that own and operate electric vehicle infrastructure.

Make Efficient Use of Parking

In order to minimize and make the most efficient use of parking, the master plan includes the following recommendations:

- Provide a price appropriate parking program
- Give preferential parking for carpool/vanpool, and electric/biofuel vehicles
- Incorporate a shared parking program
- Offer incentives for people to forego campus parking.



Sustainable transportation strategies include providing a campus shuttle, and using alternative fuel vehicles for the campus fleet.



CIRCULATION PLAN

The proposed circulation plan described below highlights the development intentions as the campus grows over time. As the existing roadway network currently provides minimal access, the campus has an opportunity to shape and implement a circulation system that will reflect the goals and design objectives sponsored by the College and put forth in the master plan.

Street Network

The campus will be served by a variety of roads, varying in size depending on projected traffic volumes. As illustrated in Figure 5.21, roads serving the campus will range in size from six lanes to two lanes. In the long run it is anticipated that a major new entry will be required from the east. This entry will pass through the Campus Reserve and ultimately create a major campus entry along the eastern edge of the academic core area. With the two existing routes from the I-515 / U.S. 93/95 corridor, Nevada State Drive and Paradise Hills Drive, adequate traffic capacity should be provided to serve the college and surrounding development.

In and around the campus a variety of vehicular routes will be provided. A publicly-accessible peripheral loop road will form the edge of the campus site, minimizing the number of vehicles needing to enter the campus, and thus mitigating potential conflicts with pedestrians and bicyclists. This peripheral loop road, Campus Drive, will vary in size depending

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on location, ranging from four to two lanes, typically with left turn pockets. Parking lots and structures will be conveniently located adjacent to Campus Drive.

Inside the campus, several publicly-accessible routes will lead into special campus destinations: on the north edge a road will allow access to the major recreation facilities and fields for athletic events.

In the near term a road adjoining the middle arroyo will provide full access around the academic core of the campus. As the campus grows, however, this road will be converted to a limited access road to minimize traffic within the campus. Other routes are provided throughout the campus for limited access for service and emergency vehicles; these are illustrated on the Service Plan.








Figures 5.22 - 5.29 illustrate typical roadway configurations for campus streets. The street section designation (A, B, C, etc.) and location is shown on Figure 5.21 with the letter designation and an indication of the orientation or direction of the view in the cross section.

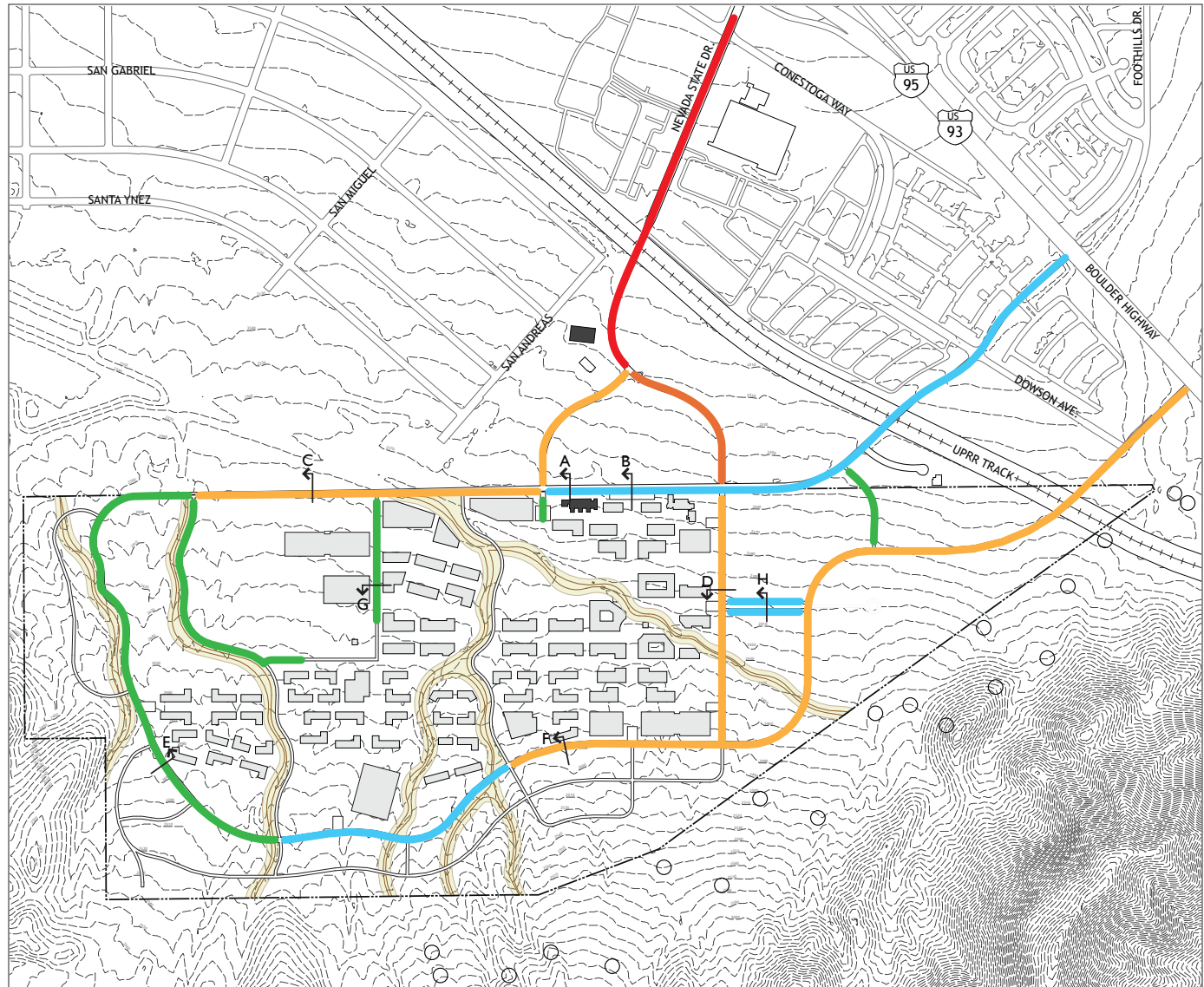
Transit Network

The transit network supporting the campus will be comprised of service that brings students, faculty and staff to and from campus and service that shuttles users around the campus core. Over time, transit service provided by RTC is expected to increase as the campus grows and demand increases. A future Bus Rapid Transit (BRT) line along Boulder Highway, while not currently planned to service the campus, has the potential to extend its current planned terminus to the college when there is sufficient demand to support it. This BRT service would provide a transit link between the campus and greater Clark County, including downtown Las Vegas.

In addition to the potential growth in transit services to campus, a shuttle service within the interior limits of campus will foster greater alternative transportation mobility. The strategic locations of parking lots, further described in the following sections, will allow users to park once and utilize pedestrian paths, bicycling, and/or the shuttle service to reach multiple destinations on campus. The shuttle would use the loop road as its main route in order to service the main parts of campus.

Figure 5.21: Street Network

- LEGEND
-  College Site
 -  Six Lane
 -  Four Lane + Median / Turn Lane
 -  Four Lane
 -  Two Lane + Median / Turn Lane
 -  Two Lane
 -  Cross Section Location



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Figure 5.22: Street Section A

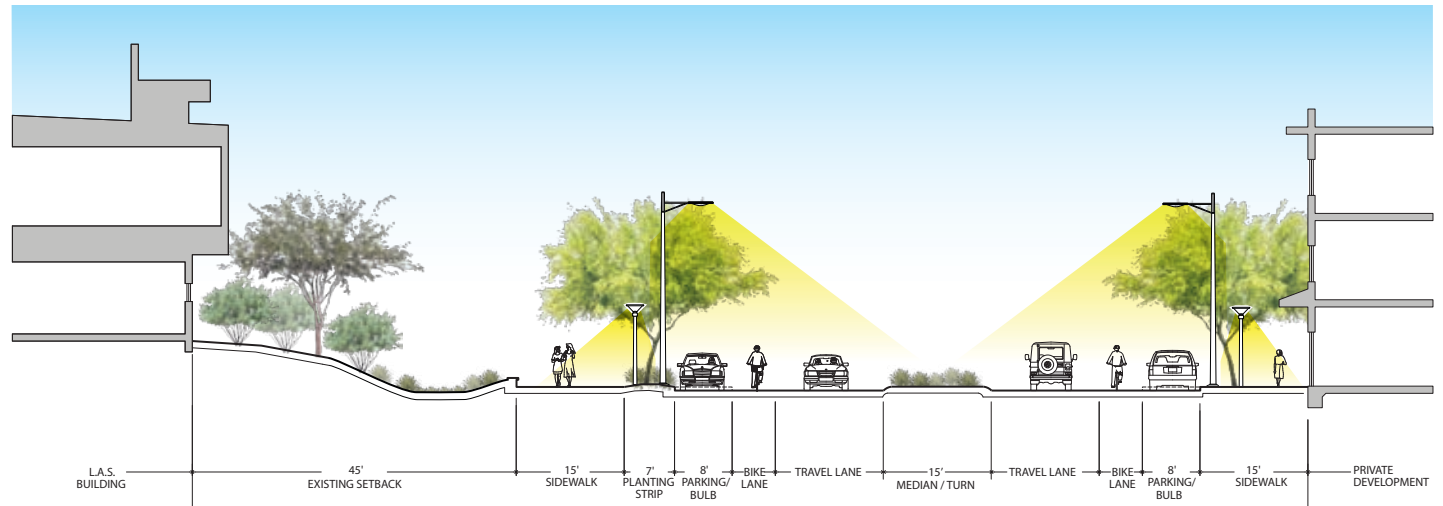


Figure 5.23: Street Section B

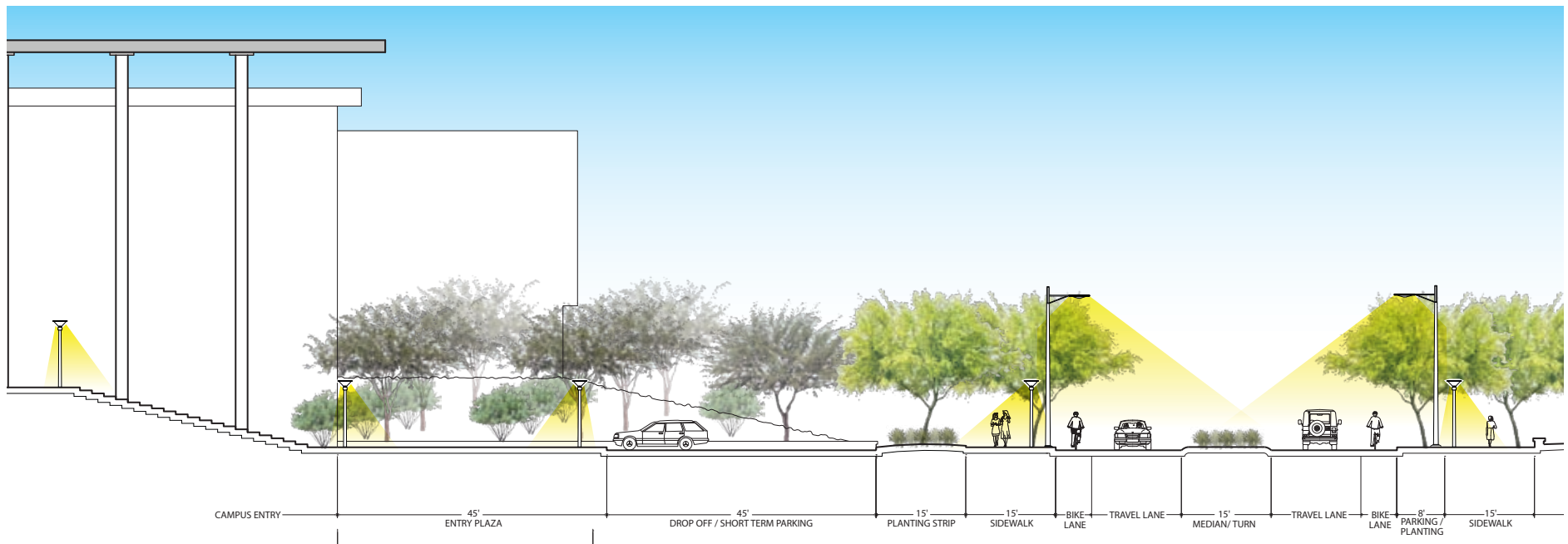


Figure 5.24: Street Section C

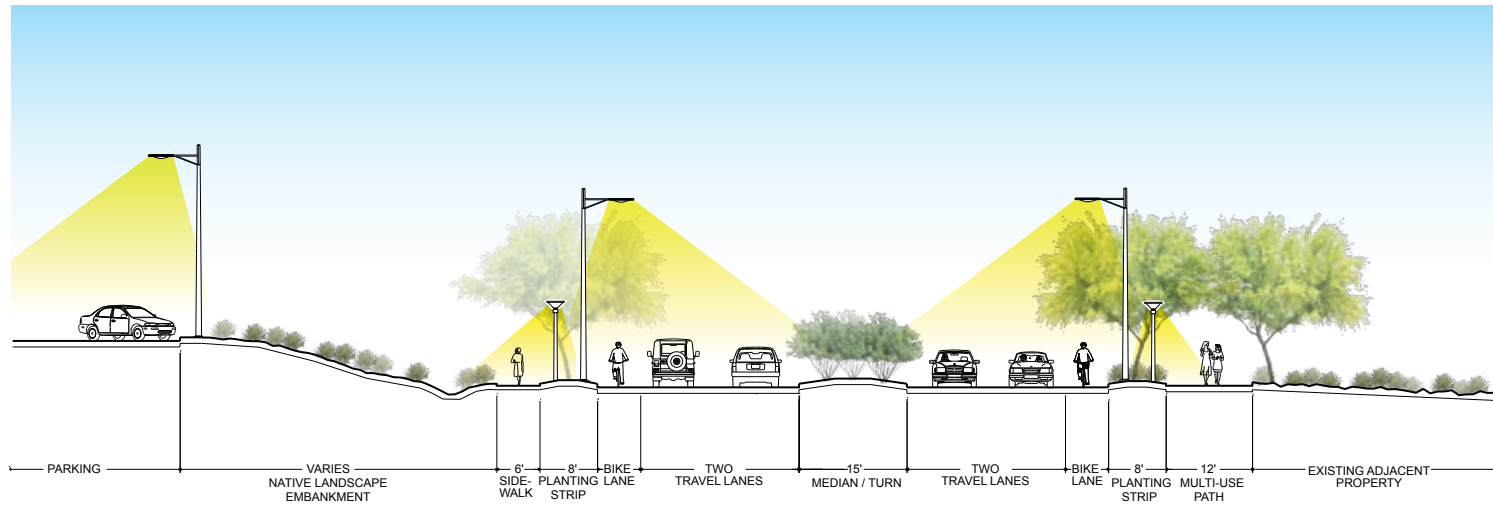


Figure 5.25: Street Section D

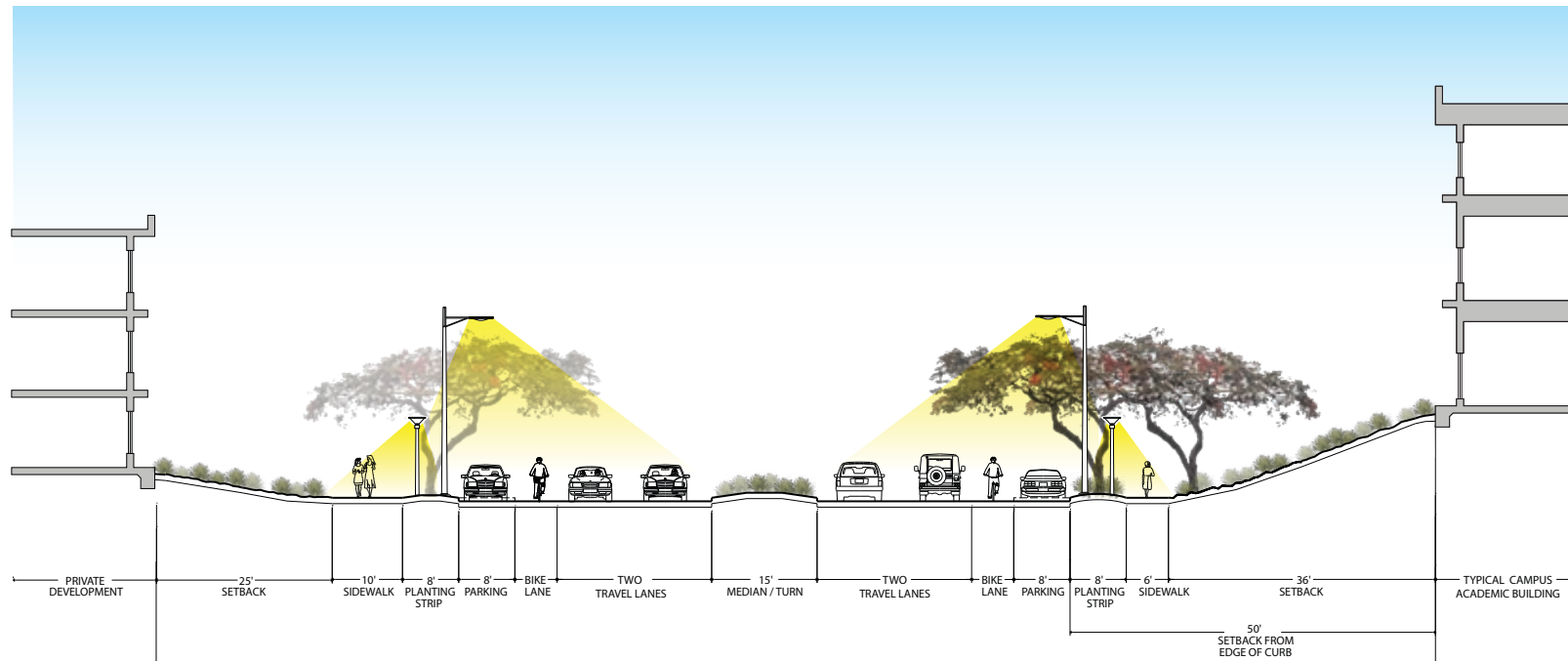


Figure 5.26: Street Section E

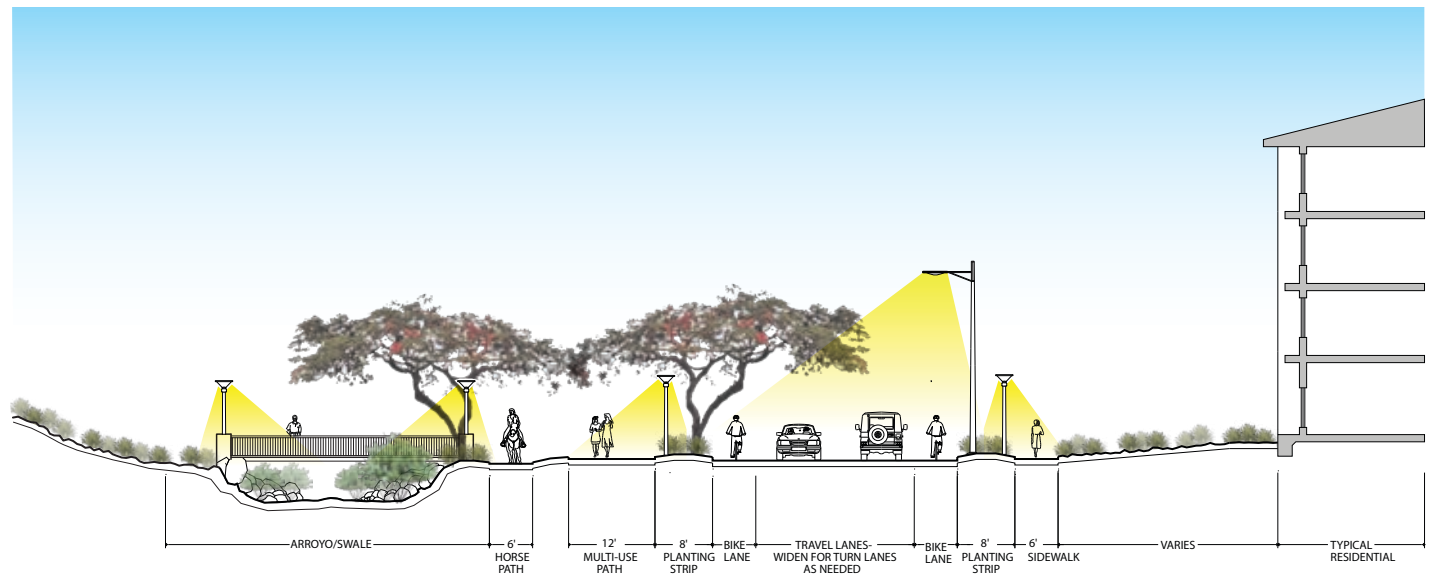


Figure 5.27: Street Section F

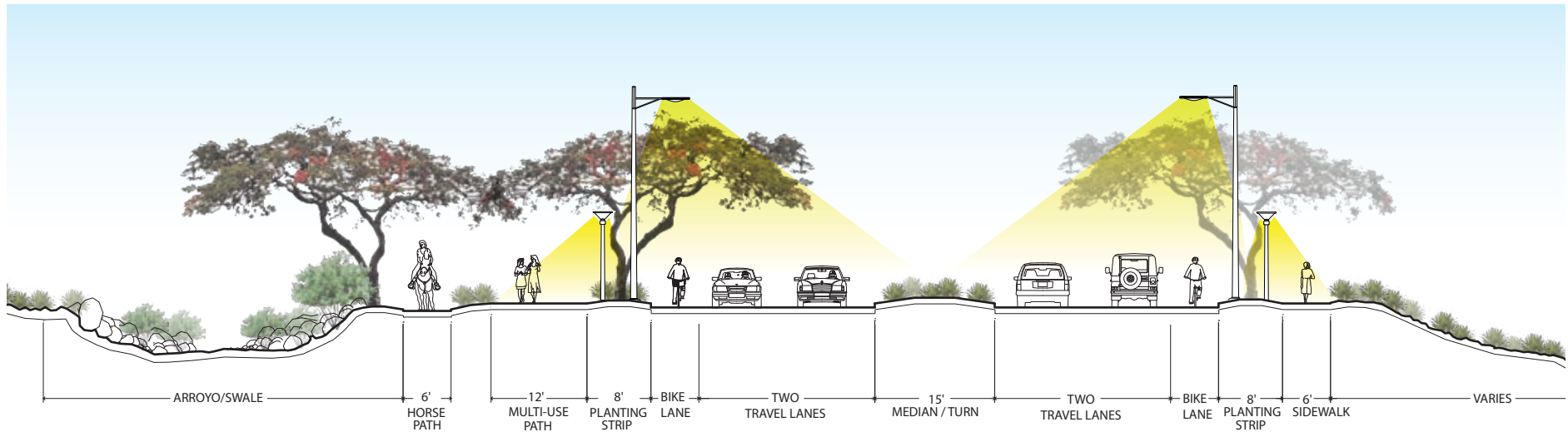


Figure 5.28: Street Section G

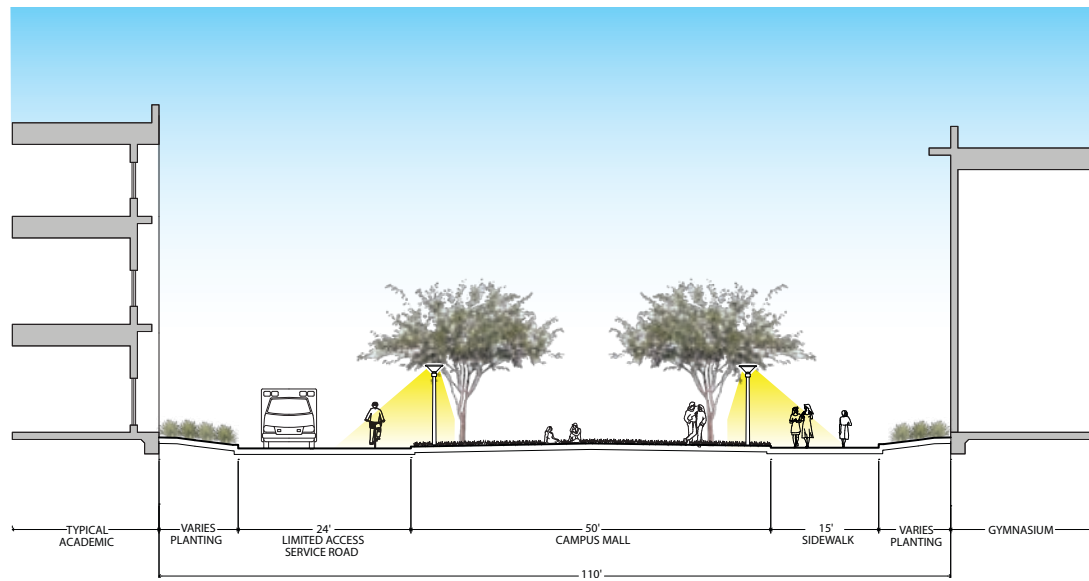
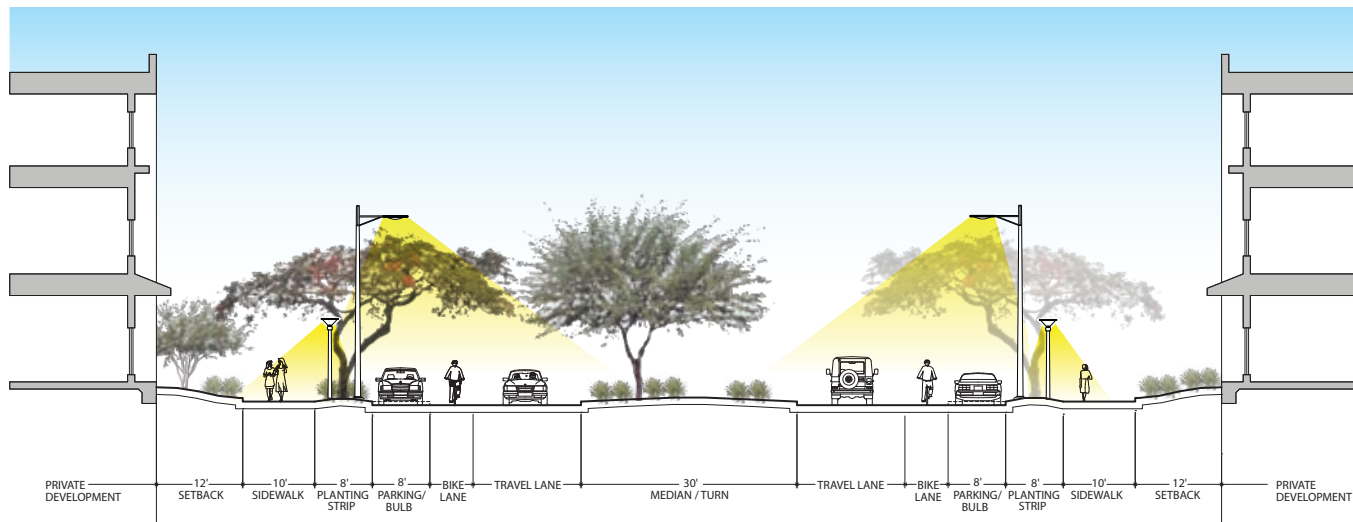


Figure 5.29: Street Section H



5 the master plan

Pedestrian Circulation Plan

Pedestrian circulation follows the primary open spaces of the campus (see Figure 5.30). Two major north-south malls lead up the hill through the campus; the spine leading from the first phase of the campus is the more important mall that leads through the academic core. Additional north-south routes are located along the edges of the arroyos, providing a more informal path, and between buildings throughout the site.

East-west routes are typically flat, following the graded terraces of the site and linking residential neighborhoods or the recreation areas with the academic core. These pedestrian malls will be designed to have weather protection and a variety of amenities and site furnishings. Major building entries will be located on these malls.

The periphery of the campus will be linked in with the regional multi-use trail system identified in the City of Henderson Comprehensive Plan.

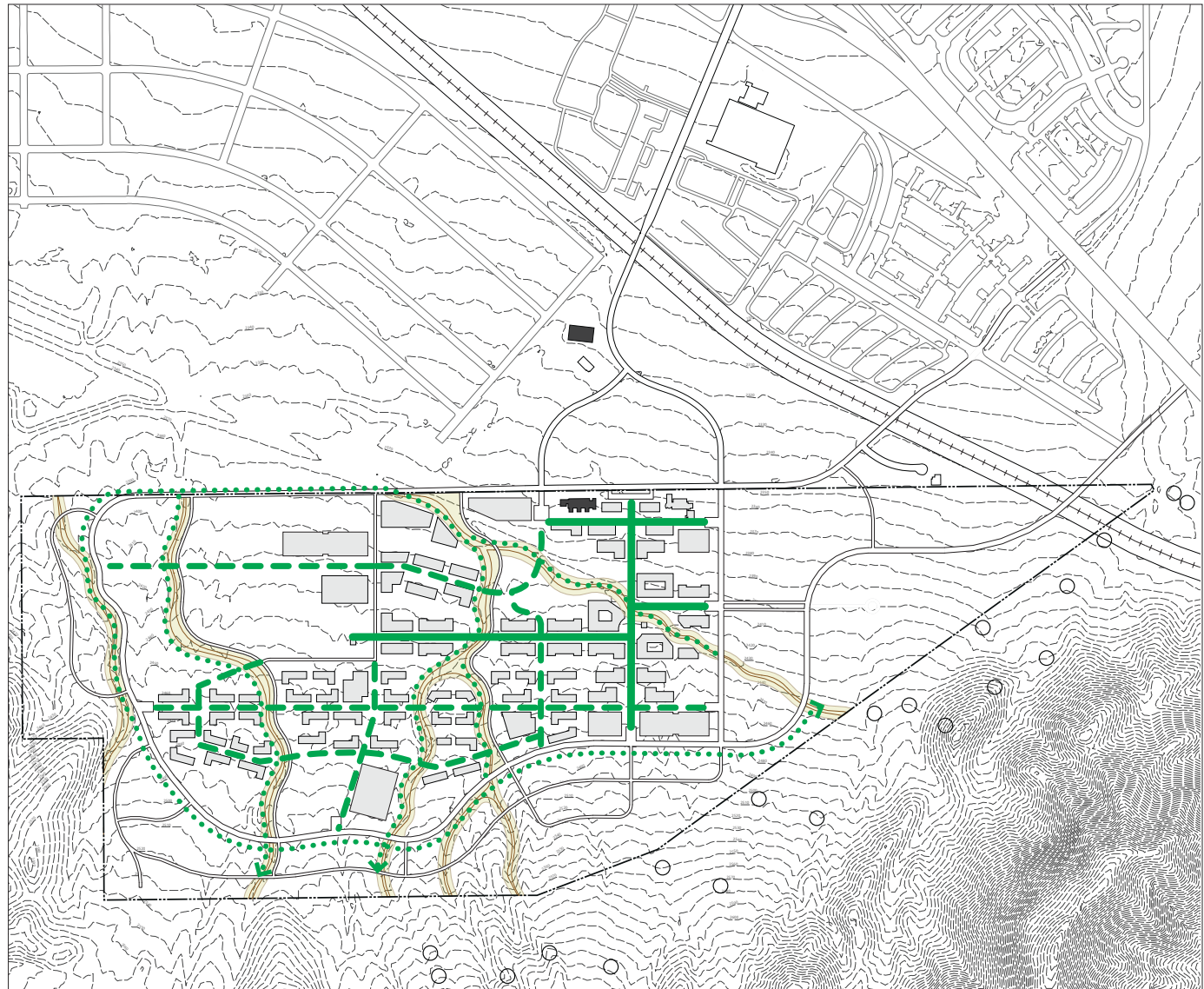


Shade trees arch over pedestrian walkways to provide comfort in all seasons.

Figure 5.30: Pedestrian Circulation Plan

LEGEND

- College Site
- Major Malls and Walks
- Secondary Walks
- Multi-Use Paths



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Bicycle Circulation Plan

The campus will have a clear bicycle circulation plan (Figure 5.31) to encourage commuters to ride or bring bicycles to campus. All major access routes will be designed to include bicycle lanes. The campus peripheral loop road, Campus Drive will also include bicycle lanes. Within the campus, bicycle routes will follow the arroyos to achieve north-south circulation. Additional routes will run east-west, but will remain separate from pedestrian malls. Those routes will provide good access while helping to avoid pedestrian/bicycle conflicts.

Bicycle facilities will be provided throughout campus, including bicycle storage lockers and bicycle racks located near building entrances. It is recommended that campus buildings, including student housing, the gymnasium, the student center and other appropriate facilities, provide showers for bicyclists.

The 'Freewheelin' bike-share program in Henderson, sponsored by Humana, offers free access to 18 bikes for members of the Henderson community. A version of this program could be developed and expanded to fit the NSC campus environment and encourage bicycling for on-campus and off-campus trips.









Bicycle racks should be provided throughout campus.

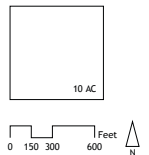
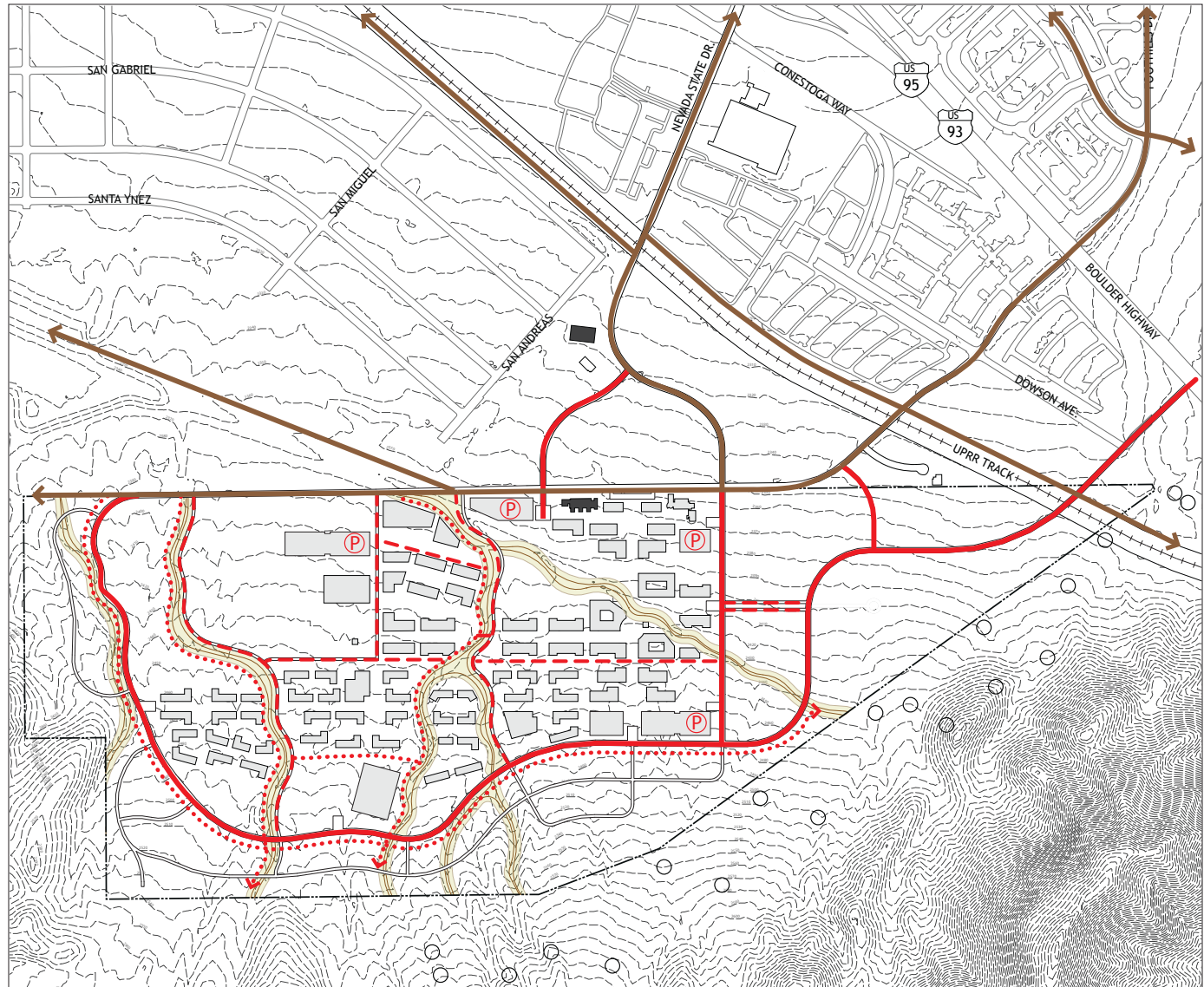


Figure 5.31: Bicycle Circulation Plan

LEGEND

-  College Site

- Bicycle Circulation Elements**
-  City of Henderson Bicycle Facility
-  Proposed Class 1 Multi-Use Path
-  Proposed Class 2 Lane
-  Proposed Class 3 Route
-  Proposed Bicycle Parking
(additional bicycle parking will also be provided throughout campus)



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Parking Plan

Parking must be provided to accommodate commuters to the campus. As noted in the discussion of sustainable strategies, NSC will develop programs to encourage carpooling, bicycling and transit use, but a significant demand for parking will still exist. Proper parking planning requires short and long-term solutions. The goal is to provide sufficient parking while maintaining a pedestrian-oriented campus where there are few vehicle/pedestrian conflicts.

Fully built out the campus will have between 10,000 and 12,000 parking spaces. This parking total covers both parking for staff and faculty, students, and on-campus residents.

In the long term, as illustrated in Figure 5.32, parking will be located at the periphery of the campus, accessed via the campus loop road. When the campus reaches its full enrollment, it is estimated that two-thirds of the parking will likely be located in parking structures, in order to minimize land use and ensure easy access to campus destinations. Four structures are shown to serve the academic core, with additional structures and lots serving the residential neighborhoods and the athletics and recreation facilities.

In the short term, parking will be provided in surface lots in good proximity to buildings. However, rather than providing parking immediately adjacent to each building, as has been implemented with the Liberal

Arts and Sciences building, larger surface lots should be developed at a reasonable distance from destinations, but out of the core of the campus. If too many surface lots are constructed in the core of the campus, they either will be hard to remove or if moved, will represent a waste of limited resources.

The implementation of a parking pricing program will help manage demand as well as provide funds for continual maintenance and future development of parking structures. It is recommended that the College develop a short and long-term parking pricing strategy.

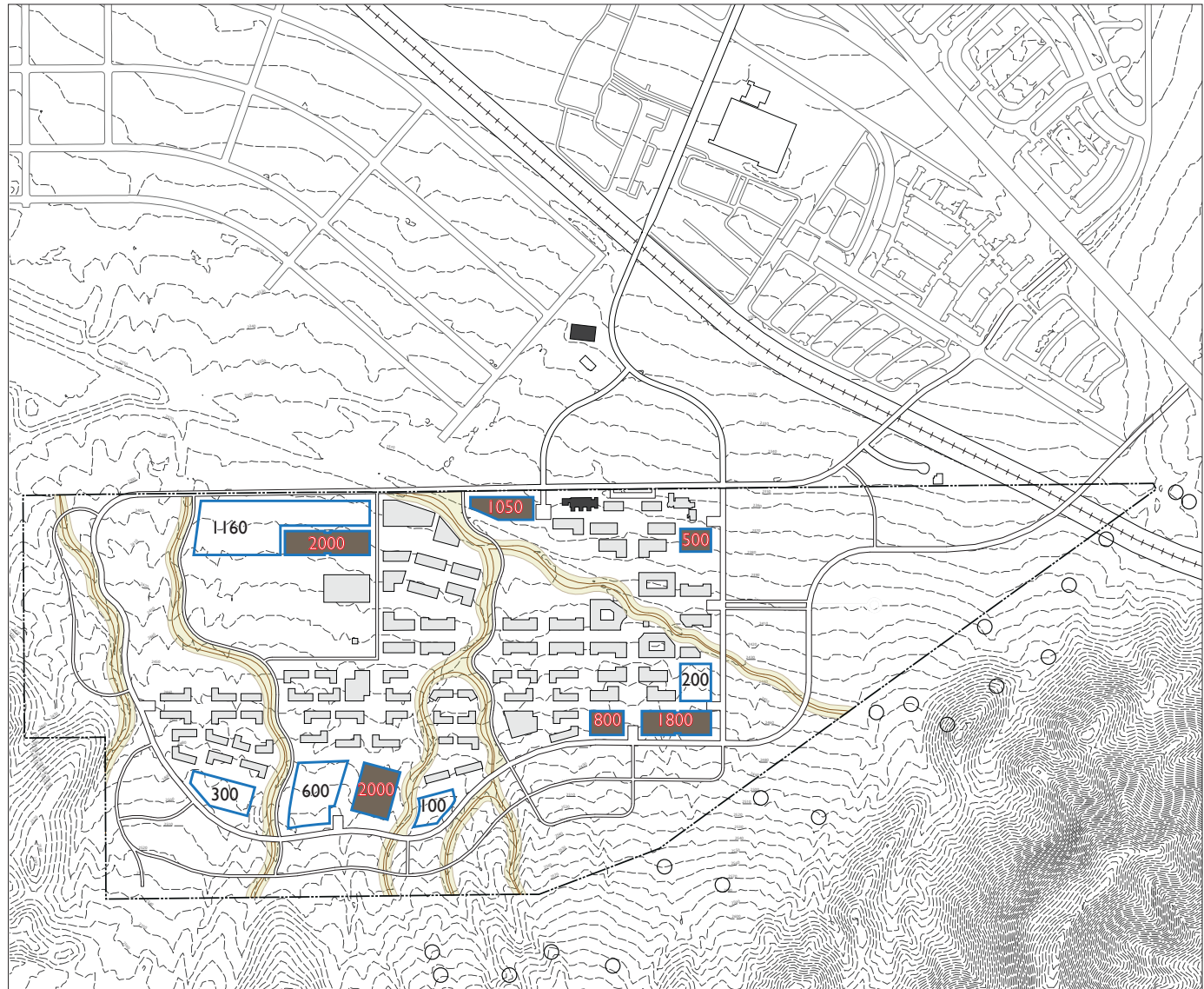
	Surface/ Structure	# Parking Spaces
1	Surface	200
2	Surface	300
3	Surface	600
4	Surface	1,160
<i>Surface Parking Spaces</i>		<i>2,260</i>
1	Structure	500
2	Structure	800
3	Structure	1,050
4	Structure	1,800
5	Structure	2,000
6	Structure	2,000
<i>Structured Parking Spaces</i>		<i>8,150</i>
Total Parking Spaces		10,410

Table 5.4: Parking Counts

Figure 5.32: Parking Plan

LEGEND

- College Site
- Surface Parking
- Structured Parking



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Service Access

The Service Plan, Figure 5.33, illustrates routes for service vehicles. The plan also indicates the most appropriate locations for service bays and other “back of the house” components of future buildings.

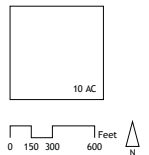
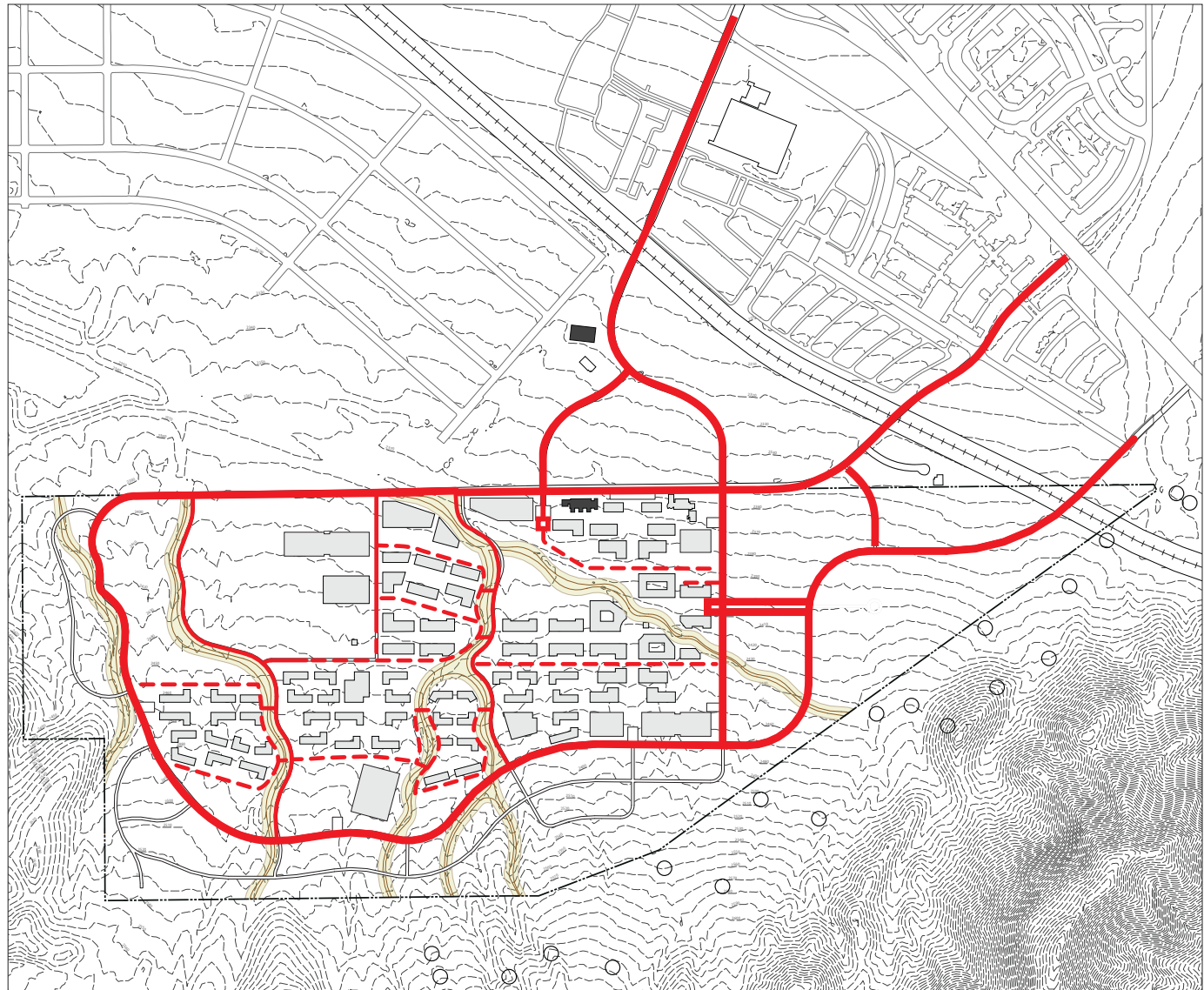
Service vehicles are allowed throughout the campus loop road and are provided with a variety of intermediate routes through campus, such as along the arroyos. When accessing individual buildings, however, there is the potential of conflicts with pedestrians. Service and loading docks will generally be located not on pedestrian walkways, but on the opposite sides of buildings, away from pedestrian activity.

Emergency vehicles will be allowed on all service and public roads. In addition, pedestrian malls and major walkways will be designed to have adequate drivable surface to allow emergency vehicles to enter and gain access to all buildings on site. Small campus service vehicles will also be allowed to occasionally traverse a pedestrian mall, but generally these will be protected via bollards or other barriers to general traffic.

Figure 5.33: Service Access Plan

LEGEND

- College Site
- Public Street
- Limited Access Campus Road
- Service Access



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ENERGY

The development and implementation of an energy strategy that is, in and of itself, carbon neutral (also known as “zero energy”) is key for the NSC to campus to reach its overall goal of self-sufficiency. This section provides an overview of the strategies in the master plan such as energy efficiency, district energy and renewable energy that will enable NSC to generate zero net (energy-related) carbon emissions.

ENERGY GOALS AND STRATEGIES

Goals

Reduce energy consumption, increase system efficiency and utilize renewable resources.

Strategies

- Minimize energy usage
- Deploy district energy/combined heat and power (CHP)
- Maximize on-campus renewable energy generation
- Purchase renewable energy credits (RECs) only if necessary.

Commitments

- Achieve 25% less energy use than Baseline Today (2010), which is based on current code requirements
- Use combination of on-campus renewable energy (minimum 10%) and RECs to offset all energy related emissions use.

Aspirational Targets

- 50% less energy use than Baseline Today (2010), which is based on current code requirements
- Use enough on-campus renewable energy on campus to achieve a carbon neutral energy strategy.

DEMAND AND USAGE ASSUMPTIONS

The following maximum overall energy demand and usage projections for the campus are based on current code requirements:

- Electric Demand: 8 MW peak (3 MW base)
- Electricity Usage: 42,000 MWh/yr (145,000 MBtu/yr)
- Natural Gas Usage: 110,000 MBtu/yr
- Total Energy: 235,000 Mbtu/yr.

The percentage of projected energy use by building type is shown in Figure 5.34.

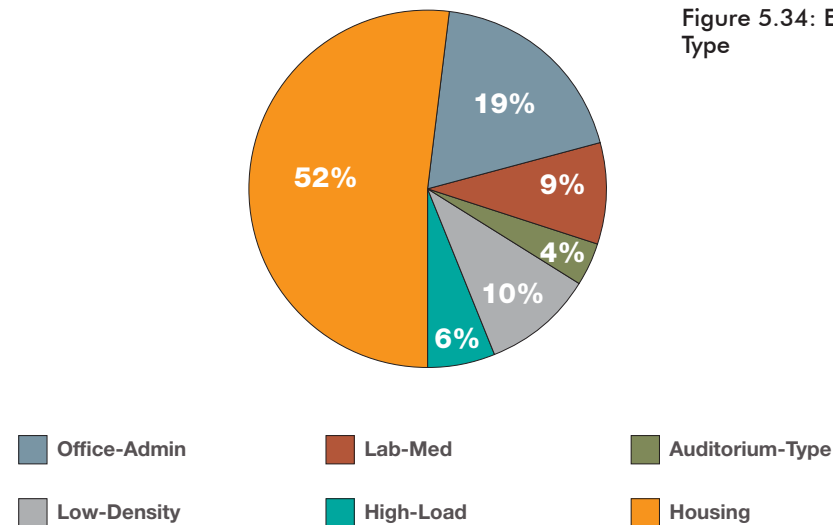


Figure 5.34: Energy Use by Building Type

Figure 5.35: Steps to Reduce Energy Use

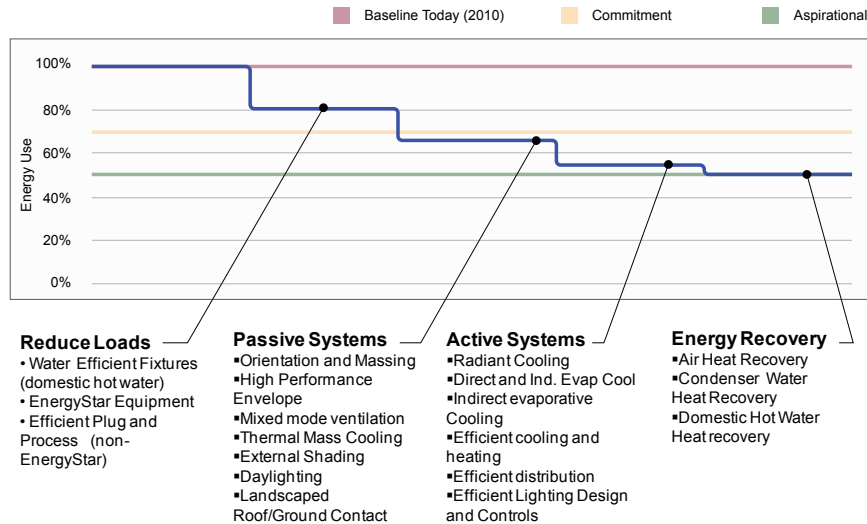
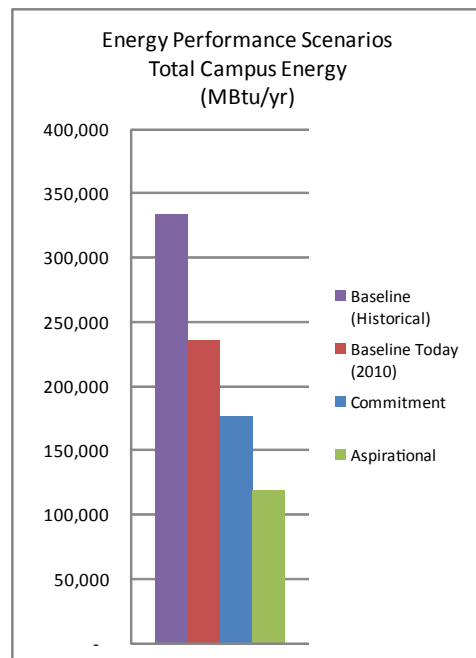


Figure 5.36: Energy Performance Scenarios



SUSTAINABILITY STRATEGIES

Minimize Energy Use

The strategy to minimize energy use includes the following components:

- Reduce energy loads
- Use passive systems
- Use active efficiency systems
- Recover energy.

Figure 5.35 illustrates how these four strategies and the specific measures associated with them will reduce overall energy use. If all proposed efficiency measures are adopted, the campus will achieve the aspirational target of 50% less energy use than “Baseline Today (2010),” based on current code requirements. By adopting a majority of the proposed efficiency measures, the campus will achieve a commitment-level energy efficiency target of 25% below current code levels. These projected reductions are illustrated in Figure 5.36.

The design guidelines in Chapter 6 provide a more detailed discussion of how careful building design can enable the campus to reach its energy efficiency targets. It is important to note that a less aggressive energy efficiency target means NSC would have to generate or purchase more renewable energy and/or purchase offsets in order to achieve its carbon neutrality goal. Efficiency measures are generally be more cost effective strategies to reduce the campus’s carbon footprint than renewable energy, renewable energy credits or carbon offsets.

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Deploy an Efficient Campus Energy System: District Energy with Combined Heat and Power (CHP)

District energy systems are on-site systems that generate energy at a central plant and distribute heating, cooling and power to buildings throughout the campus.

The major advantages of a district energy system with combined heat and power (CHP) include the following:

- Provides stable and reliable source of base load heating, cooling and power.
- Eliminates the need for some amount of building level energy generation equipment
- Allows for centralized maintenance, reducing costs and manpower requirements.
- Allows for campus-wide plug-in of energy using systems (buildings) and energy generation systems (plants) into a shared network.
- Can provide greater redundancy than building level plant systems as a result of greater system diversities, leading to reduced overall equipment size.
- Allows for fuel flexibility, including the use of renewable fuels such as biogas from anaerobic digestion of organic waste.
- Production of power that is more efficient than the typical power plant and has less carbon content than NV Energy grid (due to use of waste heat).
- NV Energy considers waste heat capture a renewable energy source.
- Power generated from waste heat in a CHP system is more cost effective than solar electric systems (photovoltaic or PV), or other forms of renewable electricity.

Table 5.5: Phasing for a District Energy/CHP System

	Central Heating and Cooling Plant				Combined Heat and Power Plant	
	Boilers	Cooling Towers	Building	Plot Area (Reserve)	CHP	Plot Area (Reserve)
	MMBH (sq-ft)	Tons (sq-ft)	sq-ft (Final sq-ft)	Acres	MW (sq-ft)	Acres
Phase 1	4 (1,400)	600 (1,000)	2,400 (18,000)	0.6	0	1
Phase 2	9 (3,100)	910 (1,500)	4,600 (18,000)		0.25	
Phase 3	27 (8,700)	2,500 (2,000)	10,700 (18,000)		0.50	
Phase 4	44 (14,500)	4,150 (3,300)	18,000 (18,000)		0.75	

Note: Values are cumulative.

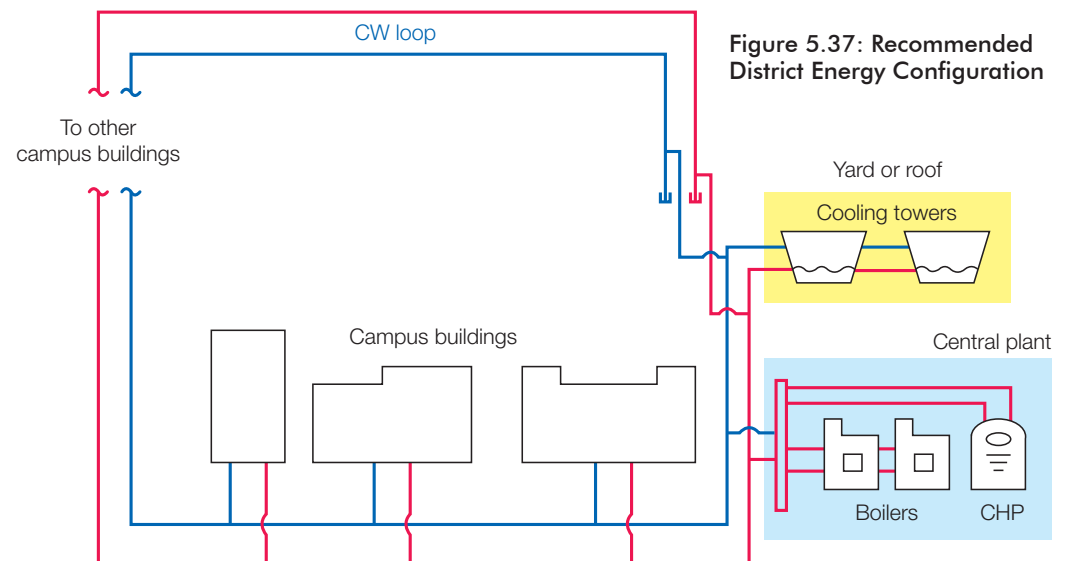


Figure 5.37: Recommended District Energy Configuration

Figure 5.38: District Energy System Layout – Phase 1

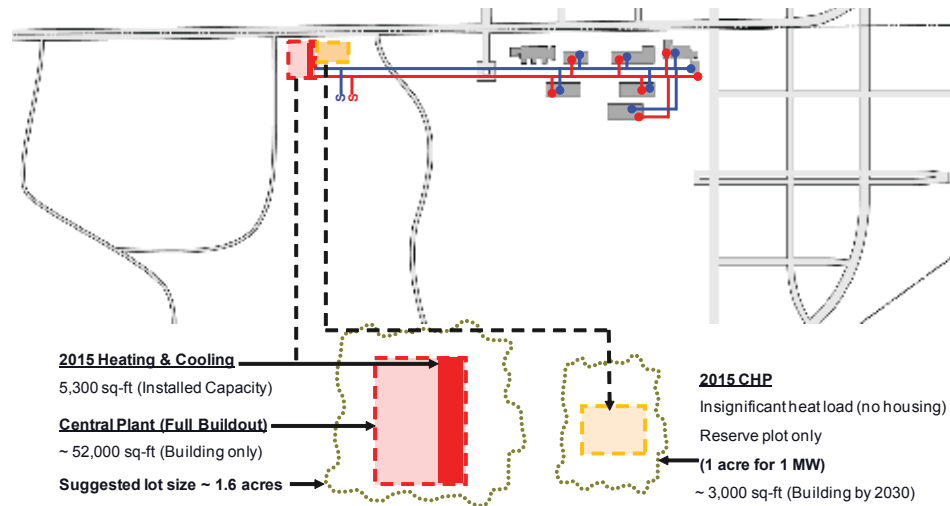
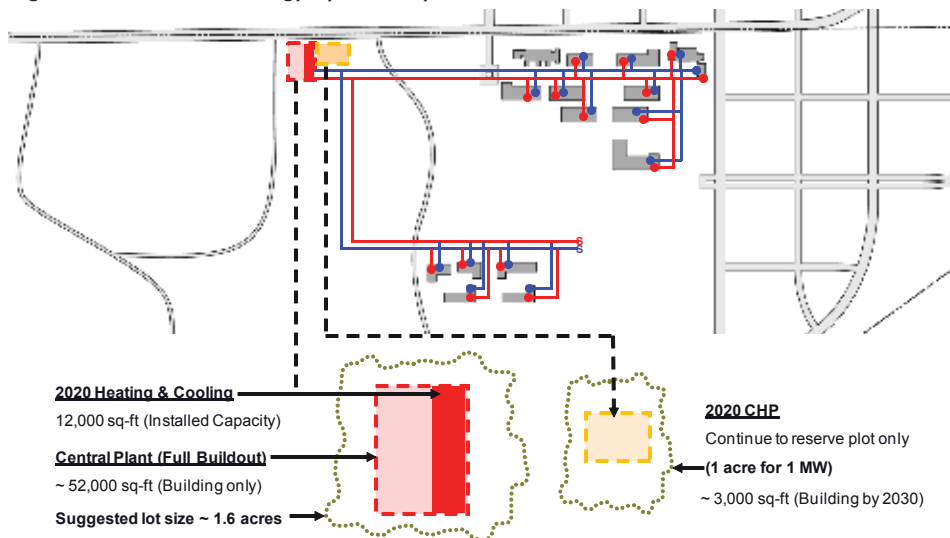


Figure 5.39: District Energy System Layout – Phase 2



The major disadvantages of district energy are the large space requirement for the central plant and the high cost for infrastructure, including capital and maintenance. However, the infrastructure cost could be mitigated by shifting the responsibility of building, financing and operating the district energy system away from NSC to a third-party provider that would function much like a typical utility.

The recommended district energy system configuration is illustrated in Figure 5.37. This system would consist of natural gas or alternative fuel boilers and cooling towers that would respectively add or remove heat from a campus level “thermal reservoir” in the form of a buried, large diameter condenser water pipe loop. Distributed reversible heat pumps located in campus buildings would draw or reject heat to or from this condenser water loop, resulting in energy sharing across campus. This would negate the need for net heat addition or rejection to/from the loop at the central plant during a significant period of the year. The electric heat pump systems can also be utilized to generate hot water for domestic purposes or for other systems requiring high grade heat.

Since it will take time for a critical mass of buildings to be constructed, and in order to avoid making large initial investments in equipment and infrastructure that would not be utilized efficiently, it will be necessary to develop an effective phasing strategy. Table 5.5 illustrates a potential phasing scenario for the central plant that would correspond to the campus

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growth and facilities development phases described in Chapter 4.

Figures 5.38 and 5.39 illustrate the potential layout for the NSC district energy system for initial phases of campus growth.

If buildings cannot be constructed to create a critical mass of energy demand, NSC should consider a more distributed system, relying on a more decentralized plant approach that can be interconnected via a campus loop as buildings are brought on-line. While some of the advantages of district energy would be lost under this scenario a conventional central plant would not make practical or financial sense without an initial critical mass of facilities.

Figure 5.40: Direct Solar Insolation

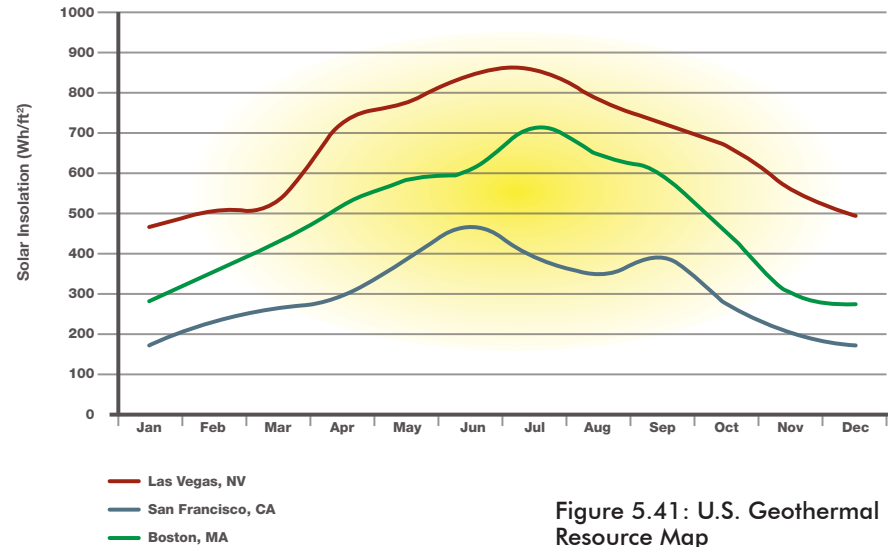
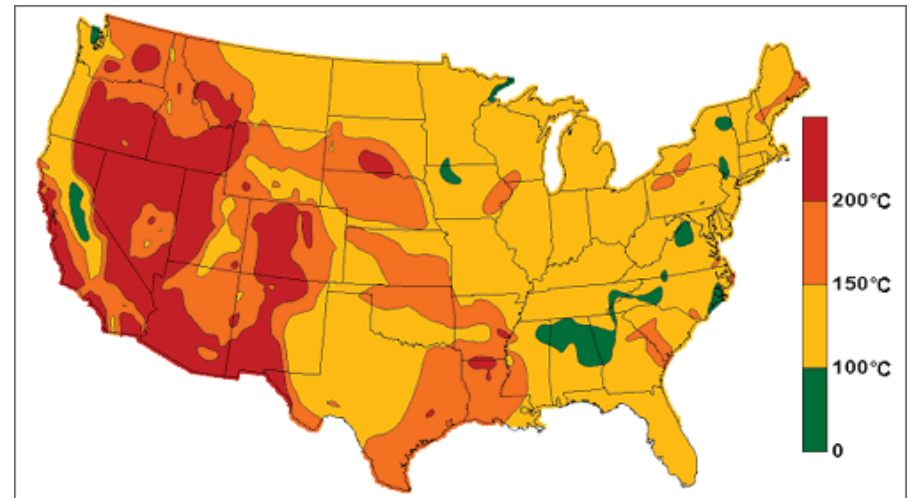


Figure 5.41: U.S. Geothermal Resource Map



Maximize On-Campus Renewable Energy Generation

NSC has a variety of options to generate renewable energy on-campus. Options include solar electric or photovoltaics (PV), solar thermal, geothermal and biogas/biomass. Waste heat recovery can also be considered as a renewable energy source.

Solar Energy

The greatest and most appropriate opportunities are to produce energy from solar energy technologies, in the form of photovoltaics (PV) or solar thermal. If used directly, solar energy used to generate electricity can reduce the need for grid electricity and eliminate the associated emissions from generation at a power plant. This electricity can also be used to offset the amount of grid energy that NSC uses if all energy produced is sold directly to the utility. Solar heat energy can also be used to offset on-site gas or electric energy use for heating.

Figure 5.40 illustrates that strong potential for solar energy at the NSC campus. Compared to most other locations, the potential in the Las Vegas/Henderson area is very high.

Since the college is not able to take advantage of the tax credits that accompany solar power systems, it is recommended that NSC purchase solar power through a Power Purchase Agreement (PPA). The options for structuring and financing a PV facility include the following:

- PPA directly with Nevada Energy (NV Energy to purchase electricity)
- PPA with a developer, private owner/operator (NSC to purchase electricity).

For the purposes of this master plan, the two PPA options are assumed to be equivalent from an energy generation and carbon emissions standpoint.

The potential capacity from building integrated PV is approximately 5 MW. This amount of installed capacity would generate roughly 7,500 MWh/year, which is equivalent to approximately 10-15% of the total projected energy use for NSC at full build-out. As described later in this section, if NSC decided to offset all energy-related carbon emissions from energy use (assuming the aspirational energy efficiency targets are achieved and the recommended district energy/CHP option is adopted) with PV, NSC would need to develop an additional 12 MW ground-mounted PV farm. Such a farm would require approximately 45 acres of land.

Solar thermal can be used to replace natural gas for heating and cooling. Solar energy would be captured via solar collectors and stored and distributed through a hot water system. Solar thermal collectors could be building-integrated, on roofs, canopies or facades. They could also be ground mounted and connected directly to buildings or directly to a campus hot water loop. In order to offset all natural gas use completely, 50,000 Mbtu can be generated from

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about 15 acres dedicated to solar thermal energy production. This strategy tends to be more cost effective than PV if it can be used on-site. Site use of solar thermal energy can be increased via thermal storage, providing a greater solar fraction of heating energy use. Solar thermal energy would compete with the ability to utilize waste heat from the cogeneration process. Therefore, it is likely that the solar thermal energy system could reduce or replace the CHP system.

Geothermal Energy

Geothermal resources (see Figure 5.41 to see the high temperature resource in Nevada) include both deep geothermal (several kilometers deep in some cases) and shallow geothermal, most commonly referred to as ground-source or geo-exchange energy.

Ground source or geo-exchange energy has potential at NSC. It can be deployed at the building level or tied into a larger district energy system. The Heritage Park Senior Facility in Henderson, which opened in 2009, utilizes a ground source geothermal system. It includes 190 wells that meet much of the facility's demand. Further analysis is required to determine the feasibility of either deep geothermal or ground source energy strategies.

Wind Energy

Winds in Henderson seldom rise above 10 MPH. These conditions are not suitable for the develop-

ment of wind power. However, NSC may consider small scale wind energy generation for aesthetic and demonstration purposes as part of the energy mix.

Anaerobic Digestion

Anaerobic digestion is a mechanical-biological-treatment process in which anaerobic bacteria convert organic matter into a methane rich biogas at controlled temperatures and pH levels in the absence of oxygen. In addition to food waste, materials such as biodegradable waste paper and grass clippings can be converted to biogas through anaerobic digestion.

A campus-wide organics separation and collection system would therefore create a suitable feedstock for this process, which would generate a renewable fuel which can be used in the district energy system described earlier in this section. This waste-to-energy strategy is described in more detail in the Solid Waste section. Note: Sewage conversion to biogas was discussed at workshops and was generally unaccepted due to permitting of discharge requiring a private wastewater collection and treatment facility, and a need for a licensed operator, among other limitations. It also involved high risk and capital investments with a relatively low reward potential.

Renewable Energy Certificates (REC)

The NSC commitment target for renewable energy is to utilize 10% on-site renewables. Combining this with the state-wide Renewable Portfolio Standard target of 25% by 2025, it is evident that in the base

commitment case only 35% of the campus annual energy consumption would be supplied by on-site and grid renewables. This is not enough to achieve carbon neutrality, since the remaining energy would be supplied by NV Energy's relatively dirty grid mix including coal and natural gas.

If higher levels of self-sufficiency are not achieved, the campus will need to utilize other mechanisms such as Renewable Energy Certificates (REC) to offset its energy-related carbon emissions. RECs represent non-tangible, tradable environmental attributes of the energy generated from renewable projects and are sold separately from commodity electricity. Most RECs support wind farms or large-scale PV installations.

Summary: Achieving a Carbon Neutral Energy Strategy

In order to achieve its goal of net zero energy (aspirational goal), the energy plan includes the following elements:

- Reduce energy use through efficiency measures - commitment-level energy efficiency target of 25%, aspirational target of 50% less energy use than the Baseline Today (2010) scenario.
- Utilize district energy strategy that includes a central campus heat rejection loop combined heat and power (CHP). This would provide an efficient method for generating heating and cooling at the campus scale, including the potential for heat recovery for simultaneous heating and cooling needs. The CHP component would provide a heat and electric generation base load that has fewer per unit carbon emissions than the equivalent grid supplied electricity and natural gas supplied heating. Figure 5.42 illustrates the amount of energy use and corresponding emissions result from a combination of achieving the aspirational energy target and employing district energy/CHP system.
- Maximize renewable energy – the goal of the renewable energy strategy is to generate at least enough renewable energy to offset the carbon emissions resulting from the use of grid electricity and natural gas. As shown in Figure 5.42, for the recommended energy efficiency and renewable energy combination, the NSC renewable energy strategy would have to offset approximately 7,000 tons CO₂/year in order to achieve an energy-related carbon neutral, or “net zero” energy strategy. At a minimum, this renewable energy strategy would

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include the use solar electric (PV) systems, however other renewable technologies will be considered.

A brief summary of the capacities and land areas required to offset the emissions for each energy strategy scenario is provided in Table 5.6.

These PV offset requirements would decrease if other renewable energy technologies are incorporated into the overall mix. For example, as described earlier in this section, the natural gas requirement and resulting emissions, can be offset through solar thermal, geothermal, biogas or other technologies (for the purposes of this master plan, all renewable fuel sources are assumed to be by an equivalent thermal energy source). As described earlier in the report, if all natural gas use was to be offset through solar thermal energy production, NSC would have to dedicate approximately 15 acres to this plant. An integrated heat storage system would also be required.

Figure 5.43 compares each component (building efficiency, central energy with CHP, and photovoltaic offsets) that can be used to achieve energy-related carbon neutrality. It is important to note that achieving the aspirational energy targets is likely to provide the most cost effective means of achieving this goal. Building energy efficiency and performance measures are generally less expensive than renewable energy or other purchased offsets. While these strategies represent likely scenarios at NSC, other renewable energy strategies could be incorporated in order to achieve the same result.

Figure 5.42: Energy Use and Resulting Emissions from Potential Energy Efficiency and District Energy Scenarios

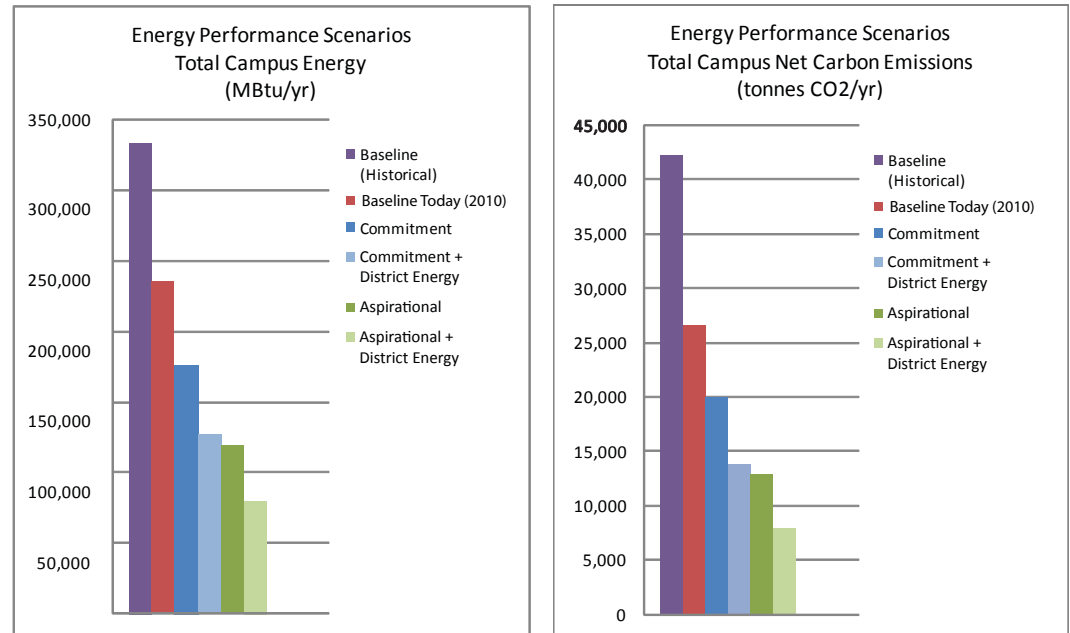
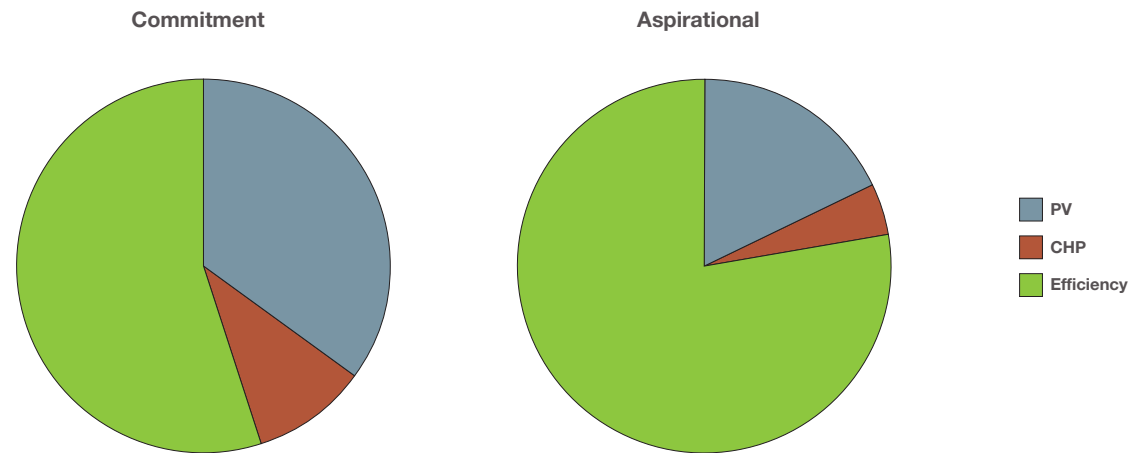


Table 5.6: Amount of PV Required to Offset Emissions from Each Energy Strategy Scenario

Scenario	PV Capacity	
	MW	Land Area
	MW	acres
Baseline (Historical)	50	200
Baseline Today (2010)	35	130
Commitment	25	100
Commitment + District Energy	18	70
Aspirational	16	65
Aspirational + District Energy	10	40

Figure 5.43: Energy Strategy Combinations to Achieve Carbon Neutrality



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ENERGY UTILITY CONNECTIONS/ INTERCONNECTION AND LAYOUTS

Figure 5.44 illustrates the ultimate electrical, gas and hot and chilled water network for the campus.

Electrical

The grid-fed electrical supply at Nevada State College will most likely be provided by NV Energy. The need for a local, on-campus substation can be avoided if a direct connection to the 12 kV NV Energy distribution can be established, however a substation may be needed.

Power will be distributed at 12 kV through the campus via an underground distribution network. The distribution network will have one of the following configurations:

- A “linear” distribution where incremental extensions are added as the campus grows
- A “star” type distribution with a central node(s) from which power is distribution to building and site loads.

NV Energy will likely own and maintain the campus electrical distribution up to the campus boundary, as well as installing and maintaining the on-site electrical distribution network.

The initial utility feed(s) will enter the campus via Nevada State Drive and Paradise Hills Drive to the central plant. From there, electrical power will be distributed throughout the campus.

The central plant just off Paradise Hills Drive is the appropriate main point of entrance for the electrical distribution as it will centralize maintenance and monitoring efforts for campus facilities and improve accessibility for NV Energy staff due to its location at the edge of the campus.

The proposed central plant location just off Paradise Hills Drive is the appropriate main point of entrance for the electrical distribution as it will centralize maintenance and monitoring efforts for campus facilities and improve accessibility for NV Energy staff due to its location at the edge of the campus.

Natural Gas






Southwest Gas Corporation (SWG) is the local natural gas provider. SWG has indicated that there is adequate supply to feed NSC. The central plant will have a dedicated 3-inch supply line running from Nevada State Drive down Paradise Hills Drive to the central plant. The remainder of the campus will be supplied by a 2-inch supply line, also running down Nevada State Drive.

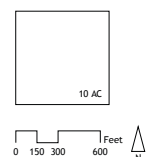
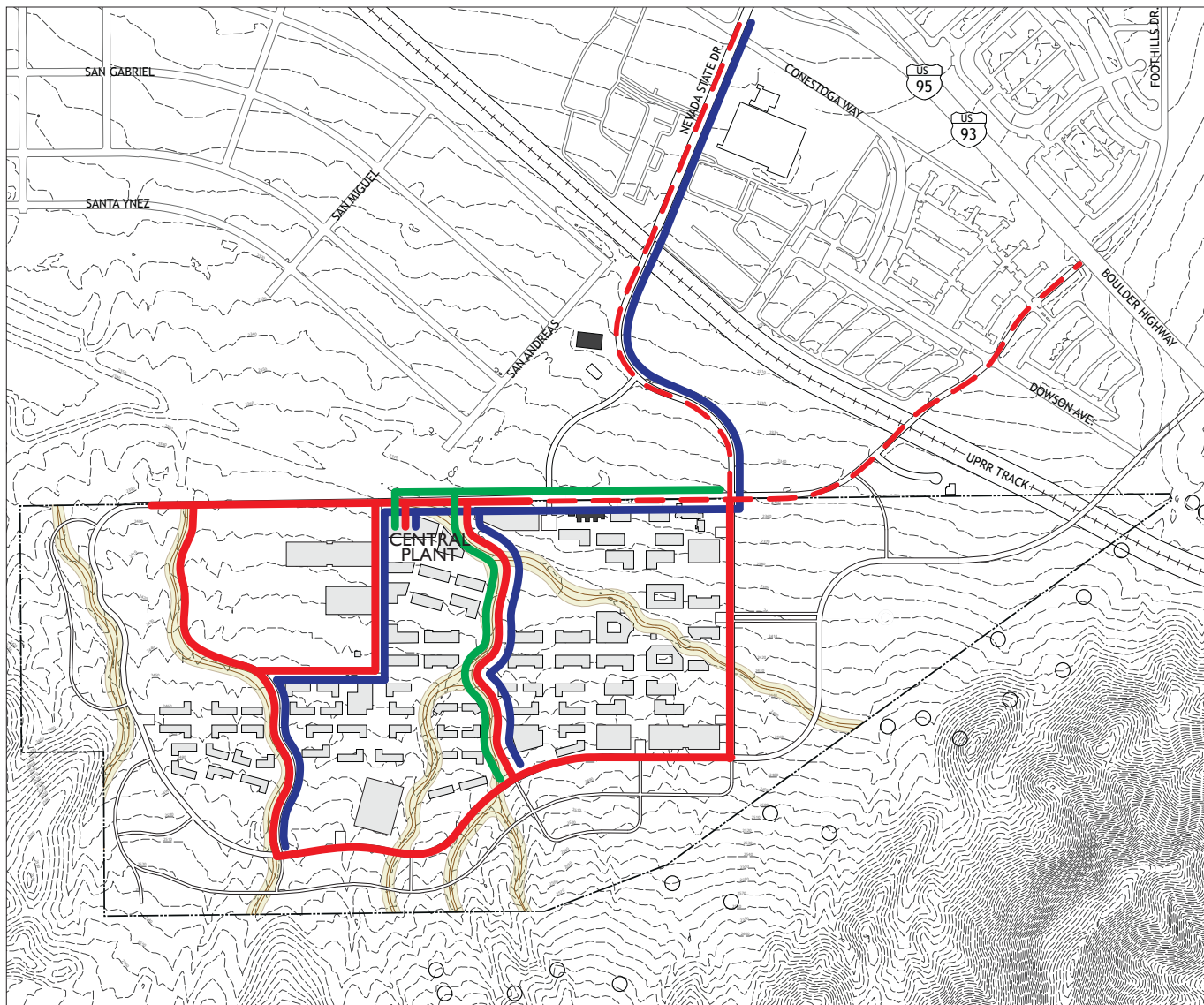
Hot and Chilled Water

The central plant will be used to supply hot and chilled water mainly to the academic buildings.. Natural gas will be used to supply the boilers and chillers.

Figure 5.44: Electrical, Natural Gas, and Hot and Chilled Water Systems

LEGEND

-  College Site
-  Hot & Chilled Water
-  Electricity
-  Gas
-  Existing Electricity



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WATER

Water savings are of critical importance to NSC, both because water is scarce in the region and because of the cost, energy use and carbon emissions associated with extracting, distributing, treating and heating water. Therefore, reducing water use is essential to serve the long-term needs of the campus and to reduce the College’s overall carbon footprint.

WATER GOALS AND STRATEGIES

Goals

Reduce overall water consumption.

Strategies

- Minimize potable water use
- Utilize recycled water for non-potable use
- Treat wastewater using sustainable methods and explore use of wastewater sludge as fuel for energy.

Commitments

- 40% reduced water usage vs. code minimum requirements (Baseline Today (2010))
- 40% of non-potable water demand met with recycled water (irrigation only).

Aspirational Targets

- 100% of non-potable water demand met with recycled water.

DEMAND AND USAGE ASSUMPTIONS

The estimated total water demand (potable and non-potable) baseline if built to current code is 2.0 million GPD at full build out (730 M gal/year). This demand and usage is summarized in Table 5.7.

NSC is committed to reducing the overall demand to 1.3 million GPD (460 M gal/year).

The breakdowns of demand by end-use under the “Baseline Today (2010)” and anticipated reduction scenarios are shown in Figure 5.45.

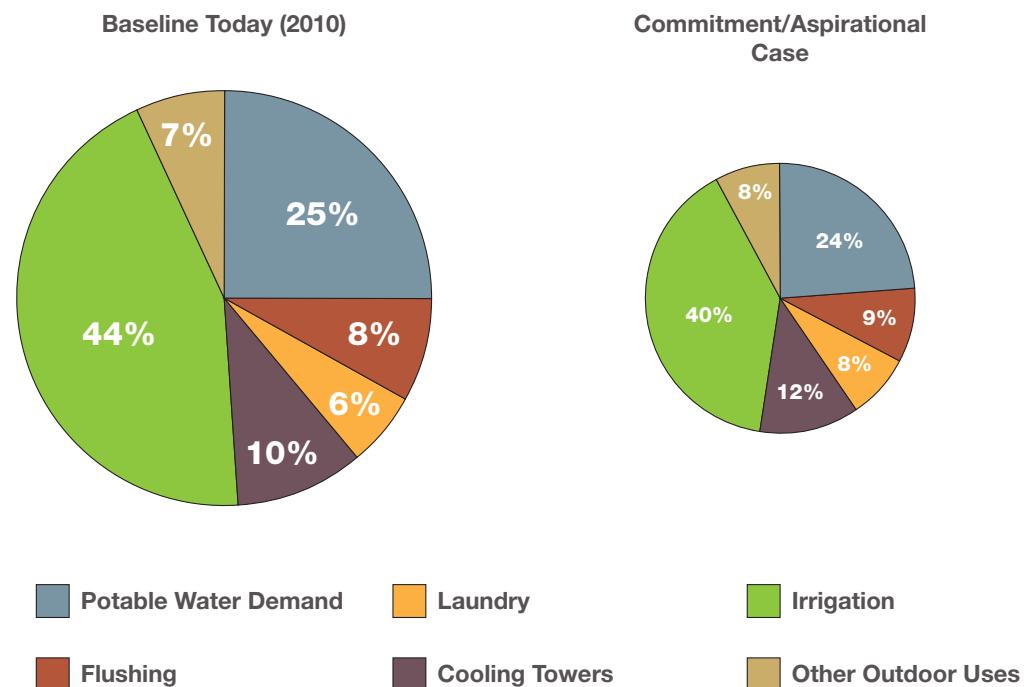


Figure 5.45: Water End Use Breakdown - Estimated Water End Uses

Table 5.7: Water Demand and Usage Assumptions

Item	Unit	Criteria
Potable Water		
Average potable water demand	gpd	510,000
Peaking factor	-	2.5
Peak water demand	gpm	1,000
Fire Flow	gpm	1,500 to 4,500
Design velocity	fps	5 to 8
Maximum fire hydrant spacing	feet	1,000
Recycled Water		
Average recycled water demand		
Irrigation	gpd	900,000
Other Outdoor Uses	gpd	140,000
Flushing	gpd	170,000
Laundry	gpd	120,000
Cooling/Process	gpd	210,000
TOTAL	gpd	1,540,000
Peaking factor		3
Peak recycled water demand	gpm	3,200
Design velocity	fps	5 to 8
Sanitary Sewer		
Sewer flow (90% of potable water demand, 90% of flushing and laundry recycled water demand)	gpd	720,000
Peaking factor	-	2.5
Peak sanitary sewer flow	gpm	1,250

Notes:

fps = feet per second

gpd = gallons per day

gpd/sf = gallons per day per square foot of development

gpm = gallons per minute

sf = square feet

SUSTAINABILITY STRATEGIES

The sustainable approach to waster use on campus focuses on the efficient use of water and the use of recycled water to reduce potable water demand.

Minimize Potable Water Use

The first priority is to conserve water through efficiency and demand reduction measures. This results in both environmentally preferable and cost-effective outcomes. Recommended measures to reduce potable water use are described below.

Fixture Efficiency

High efficiency fixtures and appliances will be included in all buildings. Table 5.8 shows proposed maximum flow rates for fixtures and appliances. These flow rates are achievable with currently available technology, and meet or exceed guidelines set by Watersense and the Southern Nevada Water Authority.

Most of the proposed fixtures can be purchased with little to no price premium as compared with code baseline fixtures. Once installed, fixture water savings provide yield ongoing operational cost savings.

Site Water Efficiency

Water-wise landscapes will be used throughout the campus (see Chapter 6: Design Guidelines) with a goal of exceeding local requirements, which are quite stringent. Proposed measures include:

- Avoid planting lawns in non-recreational areas. Use

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artificial turf if appropriate, where overheating is not an issue.

- Plant native and climate-adapted plants as the primary planting material on the campus.
- Limit or eliminate watering of native and adapted plants.
- Use high-efficiency irrigation methods.
- Avoid use of decorative water features.
- Place swimming pools indoors or under shade to reduce evaporation losses.

Mechanical Water Efficiency

Proposed mechanical water efficiency measures include:

- Reduce cooling demand in buildings (to reduce both water use from cooling tower operation at the central plant and offsite water use in the region from energy production).
- Use the most water-efficient cooling system technology that meets energy objectives.
- Operate cooling towers efficiently.
- Provide separate non-billing meters for indoor, site and mechanical water use (to facilitate tracking of water conservation efforts.) Note: The City of Henderson does not recognize submeters. Therefore these submeters are proposed not for official billing purposes, but solely to keep the college community informed about usage and help identify savings opportunities.

Table 5.8: Maximum Flow Rates for Fixtures and Appliances

Plumbing Fixture	Value		Unit
	Baseline Today (2010)	Proposed	
Lavatory faucet, private	2.2	1.5	gpm at 60 psi
Lavatory faucet, public (metering)	0.25	0.2	gallon per metering cycle
Lavatory faucet, public (not metered)	2.2	0.5	gpm at 60 psi
Shower head	2.5	1.75	gpm at 80 psi
Kitchen sink faucet	2.2	1.5	gpm at 60 psi
Urinal	1	0.125	gallon per flushing cycle
Water closet (Toilet)	1.6	1.28	avg. gallon per flush cycle
Other Appliances			
Dishwasher (Residential)	6	4	gallons/cy capacity
Dishwasher (Commercial)	1.46	0.92	gallons per rack
Laundry	9.5	4.5	gal/load-ft ³ (water factor)

Utilize Recycled Water for Non-potable Uses

The City of Henderson has a recycled water plant located in the north of the city (approximately 7 miles away, with the nearest connection point at about 3 miles away) and another plant under construction, as discussed in the Wastewater Strategy section below. It is recommended that NSC send all wastewater to one of these treatment plants and use recycled water generated by that plant for all uses not requiring potable water, including irrigation, toilet flushing and cooling tower make-up water. It is understood that characteristics of recycled water, including hardness, will make it necessary to operate towers at a lower number of cycles than would be possible with

potable water, using slightly more water overall. It is expected that it is still preferable from a cost and potable conservation standpoint to use the recycled water, but further study is needed to confirm which source is best for cooling towers. Although recycled water is currently only being used for irrigation in Henderson, indoor use is not prohibited.

Technically, water received from Lake Mead includes some recycled water, as treated wastewater is sent to Lake Mead, recharged, and pumped back to the City to meet all potable water supply demands. Like the rest of the region, the City of Henderson can earn return flow credits for treated wastewater that it discharges to Lake Mead, permitting the withdrawal of more than this amount. However, using the recycled water directly from the treatment plant, rather than returning it to Lake Mead, provides several environmental and financial benefits, as described later in this section. Recycled water is already used at several sites for irrigation in Henderson (totaling over 8,000 afy), and the City is interested in expanding its use.

The City of Henderson is capable of treating all of NSC's wastewater (the current wastewater facility has a capacity of 32 MGD) and sending the treated water to Lake Mead. However, the City also supports NSC's connection to the City's recycled water system. Either method reduces the strain on a limited potable water supply. However, the City does not allow the use of on-site greywater recycling systems. Reasons for the preference for municipal water recycling include

economies of scale, ability to regulate and ensure proper operation by certified staff, and reduced risk under the discharge permit filed with the state.

The recommendation to utilize the City's local recycled water plant for all non-potable uses, as opposed to using the potable water that comes primarily from Lake Mead, is due to the following factors:

- Energy/carbon savings
- Cost savings
- Ecological and water quality benefits.
- Benefits of supply diversification.

Regarding the diversification benefit, the region has a stated goal of reducing dependence on the Colorado River. Figure 5.46 illustrates the implications of this goal. Diversification is important because the region must have alternative sources in case of reduced Colorado River flows accompanying drought. The use of recycled water from the City of Henderson plant consumes much less energy than drawing water from Lake Mead. Figure 5.47 illustrates that recycled water typically requires approximately 75% less energy than potable water because of savings in distribution and treatment.

Although it is difficult to calculate the exact embodied energy difference between recycled water and potable water in Henderson, a minimum cost savings can be established; namely, the saved energy that would be required to pump treated wastewater sent to Lake Mead back to the SNWA service territory. This minimum energy savings is approximately 1,230

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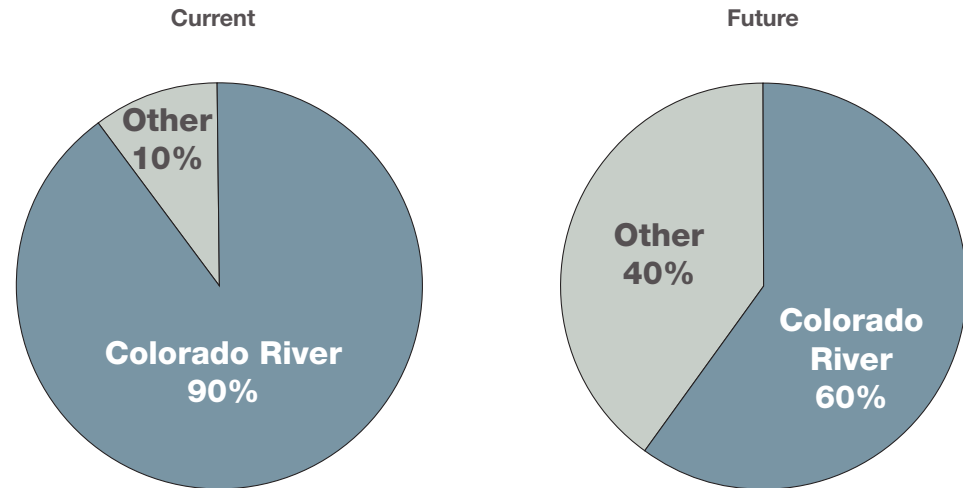
kWh/acre-foot of recycled water used (energy required to lift water 900' vertical). This equals roughly \$80,000/year in energy savings for NSC's estimated non-potable demand. This savings is presumably one of the main reasons that recycled water costs less than potable water (\$1.20/1000gal in Henderson as of 2009).

Finally, the use of local recycled water is preferred over drawing water from Lake Mead due to local ecological and water quality concerns. The Las Vegas Wash receives most of the treated wastewater and stormwater runoff that flows to Lake Mead. Higher wastewater flows mean both erosion and reduced water quality for the Wash, its wetlands, and ultimately Lake Mead, where it can cause sedimentation. An incremental increase in direct local water recycling will relieve some of the stress on these water bodies without overly limiting flows and concentrating other pollutants.

The following issues must be considered for the proper design and operations of a campus recycled water system (that taps into the City system):

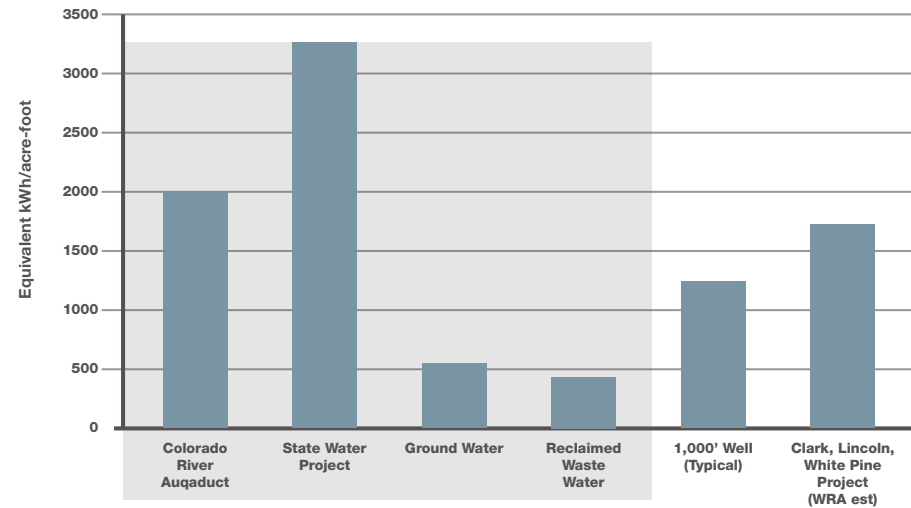
- All irrigation distribution must be installed in purple pipe to indicate a non-potable water supply. This should be done even if the recycled water system cannot be connected during the early phases of development. Purple pipe can be charged with potable water temporarily, but not the reverse.
- Dual plumbing: all buildings will require dual supply plumbing (one potable pipe for sinks and showers and one purple recycled water pipe for toilets and urinals). This is permitted by the 2006 Uniform Plumbing Code with Southern Nevada

Figure 5.46: Regional Water Resource Diversification Goal



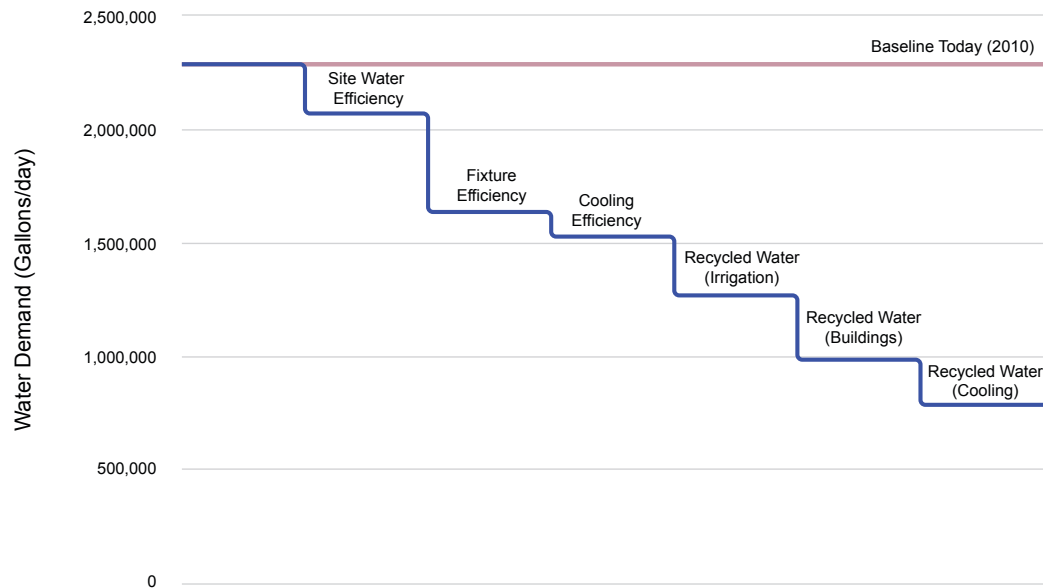
Source: Southern Nevada Water Authority (SNWA)

Figure 5.47: Typical Embodied Energy of Various Water Supplies in California and Nevada



Source: Pacific Institute, Wolfe et al., 2004

Figure 5.48: Reduction of Potable Water Demand Through Efficiency and Recycled Water Strategies



amendments for non-residential buildings. Dual plumbing is also proposed for residential campus buildings, subject to the City's approval. Dual sewage plumbing is not required since on-site greywater treatment is not proposed.

- Investigate operating cooling towers with recycled water.

Figure 5.48 shows expected potable water use reductions resulting from recommended water efficiency and recycled water strategies.

Treat Wastewater Using Sustainable Methods and Explore Resource Recovery Options

It is recommended that NSC send all wastewater to the City of Henderson's Kurt R. Segler Water Reclamation Facility (WRF) located in the north part of the city, and obtain recycled water from the WRF. The details of connection are still being determined in collaboration with the City, and current assumptions are discussed further in the Water Utility Connections and Layout section.

Although on-site wastewater treatment options have been considered for this master plan, the use of a city facility is recommended due to the following factors:

- The City of Henderson favors the use of the existing facilities.
- Existing facilities have sufficient capacity to treat projected NSC wastewater flows (32 MGD at WRF).
- Utilizing an existing plant is expected to be more resource efficient than building a new plant, as fewer materials would be required and operational energy per gallon treated is expected to be lower in a larger

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plant.

- Initial capital costs would be less than for constructing a new on-site system.

Although it is recommended that NSC send all wastewater to a Henderson facility, it is also recommended that NSC consider working with the City of Henderson to recover energy from wastewater sludge via anaerobic digestion. Sludge can be combined with other organic waste and placed in a digester to produce methane, or biogas, in a controlled environment. This renewable fuel will help reduce the amount of carbon emissions from the district energy plant.

Currently, the City's WRF and water recycling facilities are not equipped with digesters and treated sludge is sent to landfill. NSC could work with the City of Henderson to recover the energy generated from the college's sludge in one of two ways:

- Option 1: NSC can partner with the City to add an anaerobic digestion facility to the existing wastewater treatment plant, and obtain the renewable energy produced, or
- Option 2: NSC can site an anaerobic digestion facility on campus to produce renewable energy.

A facility located on or off campus could take in sludge in addition to food scraps and landscape waste. In addition to biogas energy, the anaerobic digestion facility can also produce compost that can be applied as a natural fertilizer to (generally non-food) planting areas.

WATER UTILITY CONNECTIONS AND LAYOUT

Water Supply

NSC is served by City of Henderson water system, which in turn purchases water from the Southern Nevada Water Authority (SNWA) and The Basic Water Company. Water is pumped from Lake Mead to the City water treatment facility. It is then distributed to supply reservoirs located throughout the City.

The City's water distribution system operates on a pressure zone system. The pressure zones are based on water elevations representing the maximum hydraulic grade line at 0 pressure and 0 flow (i.e., the maximum water elevation within that zone if there were no water demand and thus no hydraulic losses). NSC is located near three pressure zones: 2500, 2610, and 2720. NSC could be assigned to one or more zone.

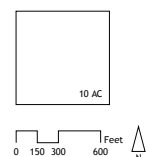
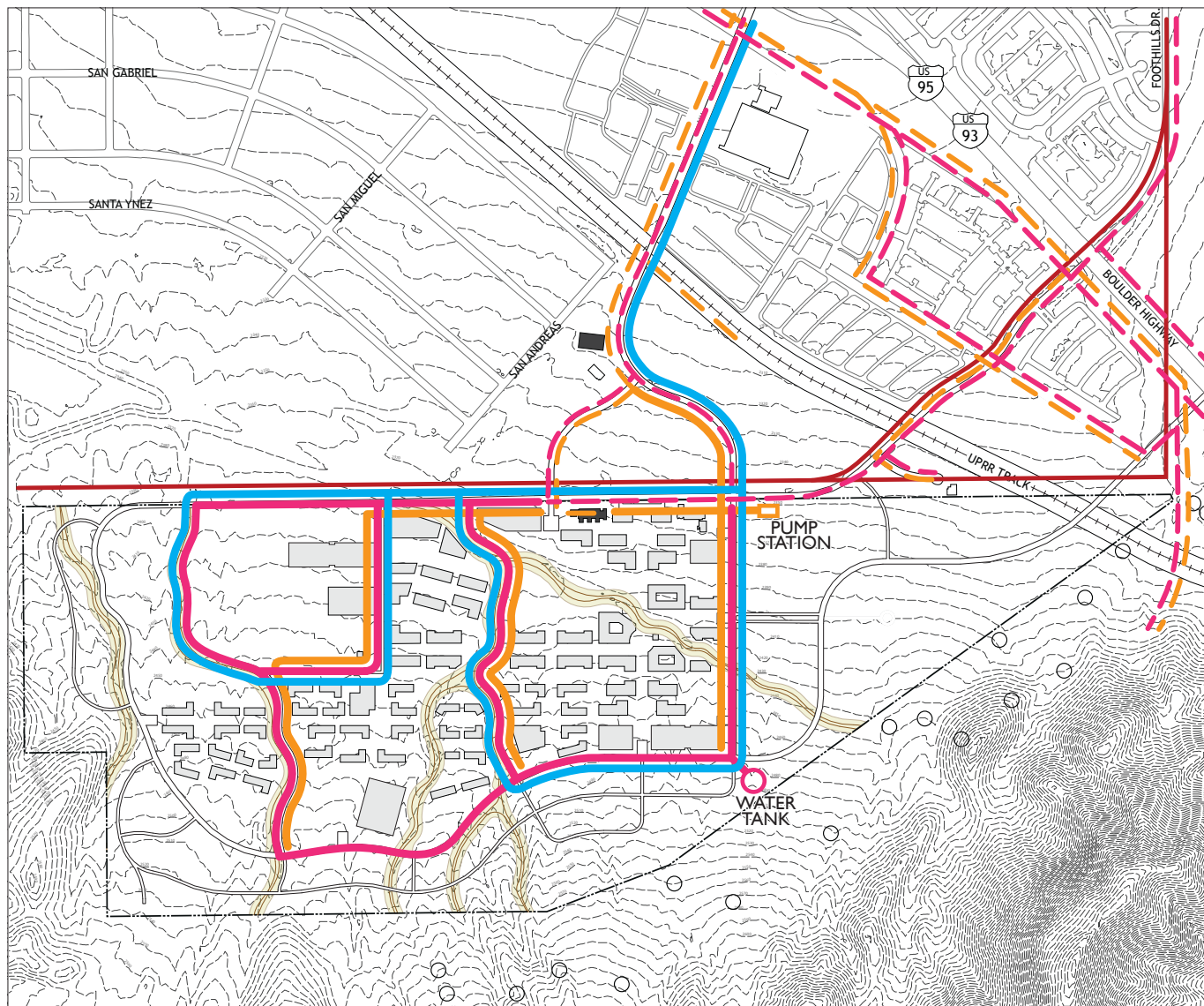
A hydraulic model was not developed as part of the master plan, so it is not possible to determine the pressure zone(s) that will be assigned to NSC. The 2500 pressure zone serves the existing NSC building and has adequate infrastructure in the area, and there is available capacity in the 2500 pressure zone reservoir.

In the best case the maximum top floor elevation allowed within the 2500 pressure zone would be 2,396 feet at 45 psi, which assuming a four story building would result in a maximum bottom floor elevation of 2,420 feet without booster pumping. Most of the campus is located above 2,420 feet, so most likely NSC will need to be served from the 2610 or 2720

Figure 5.49: Water Systems

LEGEND

-  College Site
-  Recycled Water
-  Potable Water
-  Sanitary Sewer
-  Potential SVFE Conveyance
-  Existing Potable Water
-  Existing Sanitary Sewer



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pressure zones. The 2610 and 2720 pressure zones do not have infrastructure in the NSC area and so would require significant infrastructure upgrades. An adjacent planned development, Jericho Heights, will also need to be served by pressure zone 2720.

The border between the 2500 and 2610 pressure zones will need to be determined by the City depending upon the modeling results, but generally it would be close to the 2,400 elevation. It appears that this would be approximately parallel to and a bit south of Paradise Hills Drive. The area north of there (i.e., the wishbone area along Nevada State College Drive) should be in the 2500 zone.

As discussed previously, recycled water will be used in appropriate applications, such as irrigation, so were not included in the water demands.

Fire Flow Demands

The required fire flow for the site is set as the required fire flow for the one worst case building (e.g., the building with the greatest square footage and/or the building constructed with the most flammable materials). The fire flow elevation is set at the worst case fire hydrant elevation (typically the fire hydrant at the highest elevation). Typical fire flow requirements are 1,500 gallons per minute (gpm) to 4,500 gpm, but can be higher. For example, the fire flow at the Nursing Building is expected to be 3,950 gpm.

General practice is to feed fire hydrants from pipes with minimum diameters of 6-inch laterals and 8-inch mains, in order to be able to provide 1,500

gpm at less than 20 feet per second. Therefore, all distribution pipelines should have a minimum diameter of 6-inches. The fire hydrants should be spaced approximately 1,000 feet apart, subject to review by the City of Henderson Fire Marshall.

Transmission and Storage

For planning purposes, it should be assumed that a new potable water storage tank will be required. The actual sizing will be determined as part of the hydraulic modeling, but assuming that an average day demand of 553,500 gpd then a 1,000,000 gallon storage tank would provide between 1.5 and 2.0 days of storage. The storage tank should be installed in a central location with a relatively high elevation, such as at the south end of the Nevada State Drive extension. A tank for the 2,610 zone would require a base elevation of 2,580 feet and a below-grade tank would require a top elevation of 2,610 feet.

Depending upon the required fire flow, the water transmission pipeline would likely be 10-inch diameter. The City will expect NSC to cover the cost of installing this transmission pipeline and between the City and SNWA will charge applicable connection fees.

Distribution

As shown in Figure 5.49, the 10-inch transmission pipeline to the storage tank and the storage tank itself would need to be constructed soon, depending on the phasing of the next few buildings. A looped system of 8-inch diameter pipelines would also be constructed in the central part of campus, along

Paradise Hills Drive, the perimeter road, and surrounding the campus core area development. Later, the distribution system would be expanded to the east on both sides of the playing fields using 6-inch and 8-inch pipelines.

Recycled Water Supply

The City has a centralized recycled water treatment and distribution system. The closest potential connection point for NSC is at the Boulder Highway Pump Station located along Boulder Highway near Heritage Park. There is currently not much recycled water demand near NSC, so the City does not anticipate a capacity issue. Further details on the connection strategy, including air gap and potential on-site storage requirements, are being identified in discussion with the City.

Transmission and Storage

A transmission pipeline would be required to bring recycled water from the Boulder Highway Pump Station to NSC and would likely be 8-inch diameter. Because recycled water is not planned to be used for fire fighting, and because it is not a critical utility, a storage tank should not be required.

Distribution

The recycled water transmission pipelines would be constructed as early as feasible. Initially, a looped system of 6-inch and 8-inch diameter pipelines would also be constructed in the central part of campus, along Paradise Hills Drive and the perimeter road. Later, the distribution system would be expanded to the east on both sides of the playing fields using 6-inch pipelines.

Sanitary Sewer Collection

Initially, two main trunk sewers would be constructed; the first will be a 15-inch diameter trunk sewer along Paradise Hills Drive, from the playing fields to Nevada State Drive, and the second would be a 10-inch diameter sewer along the east edge of campus. A 10-inch sanitary sewer would also extend along the east side of the playing fields. Later, the western sanitary sewer would be extended to the perimeter road with 8-inch and 10-inch pipelines, and the eastern trunk sewer will also be extended to the perimeter road with an 8-inch pipeline. A third 10-inch north-south sanitary sewer would also be constructed along the amphitheater road.

Pumping and Transmission

The City of Henderson is planning to install the East Side Interceptor Project in the next few years. This interceptor is planned to handle flows from NSC and would be much closer to NSC than the existing 42-inch intersector located at Lake Mead Parkway. Depending upon the timing, it may be possible to discharge to the existing City sewers until the East Side Interceptor is constructed. The City is planning to set up a refunding district for this interceptor, and NSC would be part of this district.

Treatment

NSC sanitary sewers will discharge to the City collection system and be treated at the Henderson Water Reclamation Facility (WRF). The WRF has adequate capacity to treat NSC flows.

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STORMWATER MANAGEMENT

The average annual precipitation level in Las Vegas, Nevada between 1971 and 2000 was 4.49 inches/year, with approximately 42% of rainfall usually occurring between January and March.

STORMWATER GOALS AND STRATEGIES

Goals

Utilize passive stormwater treatment strategies and appropriately manage run-off from high intensity rainfall events.

Strategies

- Create naturalized channels to convey run-on and site run-off through the campus.
- Utilize climate appropriate, low-impact storm drainage techniques in streetscapes and parking lots
- Utilize climate appropriate, low-impact storm drainage techniques at the parcel level
- Install construction site best management practices (BMPs) during construction to control surface water quality.

Commitments

- Post-project peak stormwater discharge not to exceed pre-project conditions.
- Post-project loading for pollutants of concern not to exceed pre-project conditions.

Aspirational Targets

- Utilize naturalized BMPs to treat and attenuate stormwater on site.
- Reduce post-project peak stormwater discharge compared to the pre-project conditions.
- Reduce post-project loading for pollutants of concern compared to pre-project conditions.



EXISTING FACILITIES

The NSC site generally slopes from south to north at approximately 4-5%. The McCullough Range, which lies above the site to the south, drains into the existing NSC site via a series of natural canyons and arroyos that fan out across the site. The existing Mission Hills Detention Basin (MHDB) drainage channel, crossing the site in a north-westerly manner, catches most of the run-off on the proposed NSC campus site as well as run-off from the McCullough Range. The MHDB channel carries the storm drainage to the existing basin located northwest of the NSC campus. This channel is a major drainage facility and therefore, it has been assumed that it must be accommodated in the future development of the campus. However, it is also planned that its configuration and design will be modified to better fit into the aesthetics and function of the campus.

The existing drainage channel has a bottom width of approximately 50 feet, a slope of approximately 1.7%, and is constructed of a rip-rap reinforced earthen berm located on the south side of the channel. The channel has an assumed capacity of 1,450 cubic feet per second (cfs) and is designed to convey the 100-year storm with 2 to 3 feet of water depth and 3 feet of freeboard. There has not been much rain in the area since the 1990's, but the last large storm event reportedly deposited a significant amount of debris in the MHDB channel.

The area north of the MHDB channel drains north-

ward towards an off-site drainage culvert located adjacent to the railroad tracks. This channel slopes toward the west, with flow eventually discharging into the Boulder Highway C1 channel and then into Las Vegas Wash. There have not been any major flooding issues in this area, although the existing culverts at Nevada State Drive and Conestoga Way may be undersized.

CAPACITY OF CITY SYSTEM

The MHDB, railroad track channel and Boulder Highway C1 channel generally have capacity to handle stormwater flows from Nevada State College, although culverts at Nevada State Drive and Conestoga Way may need to be upsized. Further analysis is required to determine capacity requirements.

CONSTRAINTS

From the initial geotechnical observations, the site has been found to contain caliche, sands and silty sand material, and residual clay materials. The existing on-site soils are relatively impermeable and sensitive to excess water being added over the long term. However, site grading will modify the existing condition and further study and analysis will be necessary to determine soil permeability. Stormwater infiltration techniques should not be used within the project site in locations where they could negatively impact soil conditions.

The region tends to experience short, intense rainfall events, resulting in erosion and high sediment loads

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in the stormwater run-off. Turbidity and Total Suspended Solid (TSS) loads have been found to be very high in wet weather flows at other sites within the Las Vegas Valley. At post-development the project site should not experience high sediment loads due to the proposed perimeter road drain system that will prevent the McCullough Range run-off from entering the site.

In accordance with the City of Henderson National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit (No. NV0021911) and Title 13 of the City of Henderson Municipal Code, stormwater flows resulting from the short, intense rainfall events that occur in the region will be detained on-site and treated. The site will also treat stormwater run-off to ensure that discharges do not negatively contribute to listed impaired waters under the Clean Water Act (CWA) §303(d). The MHDB is a tributary to the Las Vegas Wash, portions of which are listed as impaired waters which triggers a monitoring of Total Maximum Daily Loads for molybdenum, total dissolved solids (TDS), selenium, iron, and pH.

Site grading will be designed to minimize the risk to people and building structures in the event that the design storm is exceeded and the drainage system overtops. Additionally, post-development peak discharge rates will not exceed pre-development peak discharge rates to ensure that the MHDB is not overloaded.

Item	Unit	Criteria
Storm Water		
C in developed areas	-	0.9
C in open space areas	-	0.5
25-year storm	in/hr	1.22
100-year storm	in/hr	1.7
Pipeline slope assumed	feet/feet	0.005
Pipeline friction factor assumed	-	0.014

Notes:

C = runoff coefficient – based on land use

i = rainfall intensity for a 24-hour storm with a 10-year return period

in/hr = inches per hour

Table 5.9: General Assumptions

Name	Drainage Area acres	100-year Flow cfs	Channel Slope feet per feet	Channel Size feet*
Arroyo A	70	63	0.045	5 bw x 6 d x 30 tw
Arroyo B	590	534	0.038	5 bw x 6 d x 30 tw
Arroyo C	360	336	0.046	5 bw x 6 d x 30 tw
Arroyo C1	180	84	0.042	5 bw x 6 d x 30 tw
Arroyo C2	180	84	0.051	5 bw x 6 d x 30 tw
Channel D1	140	120	0.02	10 bw x 6 d x 34 tw
Channel D2	670	616	0.02	10 bw x 6 d x 34 tw
MHDB Channel	1,250	616	0.02	50 bw x 6 d x tw
North of MHDB Channel	130	155	n/a	n/a

Notes:

bw = bottom width (width of channel at bottom)

cfs = cubic feet per second

d = depth of channel

tw = top width (width of channel at top) (does not include access road, pathway, or other adjacent facilities)

* = sized according to Mannings equation with roughness coefficient of 0.030

Table 5.10: Estimated 100-Year Stormwater Flows

Stormwater Flows Summary

Table 5.10 presents a summary of the estimated 100-year stormwater flows and the recommended configuration of site drainage infrastructure at the campus site (see also figure 5.50)

SUSTAINABILITY STRATEGIES

At campus build-out, as well as during each incremental phase of development, stormwater run-off from the McCullough Range will be transported through the site within naturalized channels (arroyos), thereby retaining the natural drainage characteristics of the site, while providing some limited attenuation and treatment as well as an aesthetic feature. Within the NSC site, aligned with the City of Henderson Municipal Code, low impact stormwater Best Management Practices (BMPs) and sustainable methods will be used to detain and treat stormwater run-off before discharging to the naturalized channels crossing the site. These BMPs have been identified within the Clark County Regional Flood Control District (CCRFC) Hydrologic Criteria and Drainage Design Manual (HCDDM) as being effective and appropriate for this site and will serve as the primary mechanism to ensure that discharge does not exceed pre-project conditions, while also eliminating the need for pumping stormwater to treatment areas and the need for extensive storm drains. The stormwater quality design will also comply with requirements of the City of Henderson National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit (No. NV0021911)

and the City of Henderson Municipal Code.

The effectiveness of the naturalized channels, BMPs and sustainable measures in their ability to attenuate and treat stormwater run-off in a dry climate is dependent on the design and construction of the management devices and techniques. Soils, slope and vegetation all play critical roles in collecting and managing stormwater appropriately. Further study and research of existing site drainage, adjacent water sources and city infrastructure capacities is required to evaluate and design the stormwater system for the campus.

See Landscape Design Guidelines Section for sustainable stormwater management measures.

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PROPOSED DRAINAGE FACILITIES

The preliminary stormwater design calls for run-off from the McCullough range, south of the site perimeter, to be collected using a perimeter arroyo located south of the campus peripheral road. Future development south of the campus peripheral road will be responsible for providing drainage for this area as well as for a portion of the McCullough Range run-off. The perimeter road arroyo will then discharge to the natural arroyo system that crosses the site. The layout for this system is illustrated in Figure 5.50.

In this system, Arroyos A and B discharge to the existing MHDB channel north of the site. Arroyo C will discharge to arroyo D, a naturalized arroyo constructed to replace the current MHDB engineered channel located within the campus site.

For the area north of the existing MHDB channel, storm drains will be required. Two 16-inch diameter, PVC storm drains will be constructed during Phase 1 in two locations:







- Along Foothills Drive, from the MHDB east to Nevada State Drive
- Along the east side of campus, from the MHDB south to Foothills Drive.

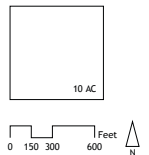
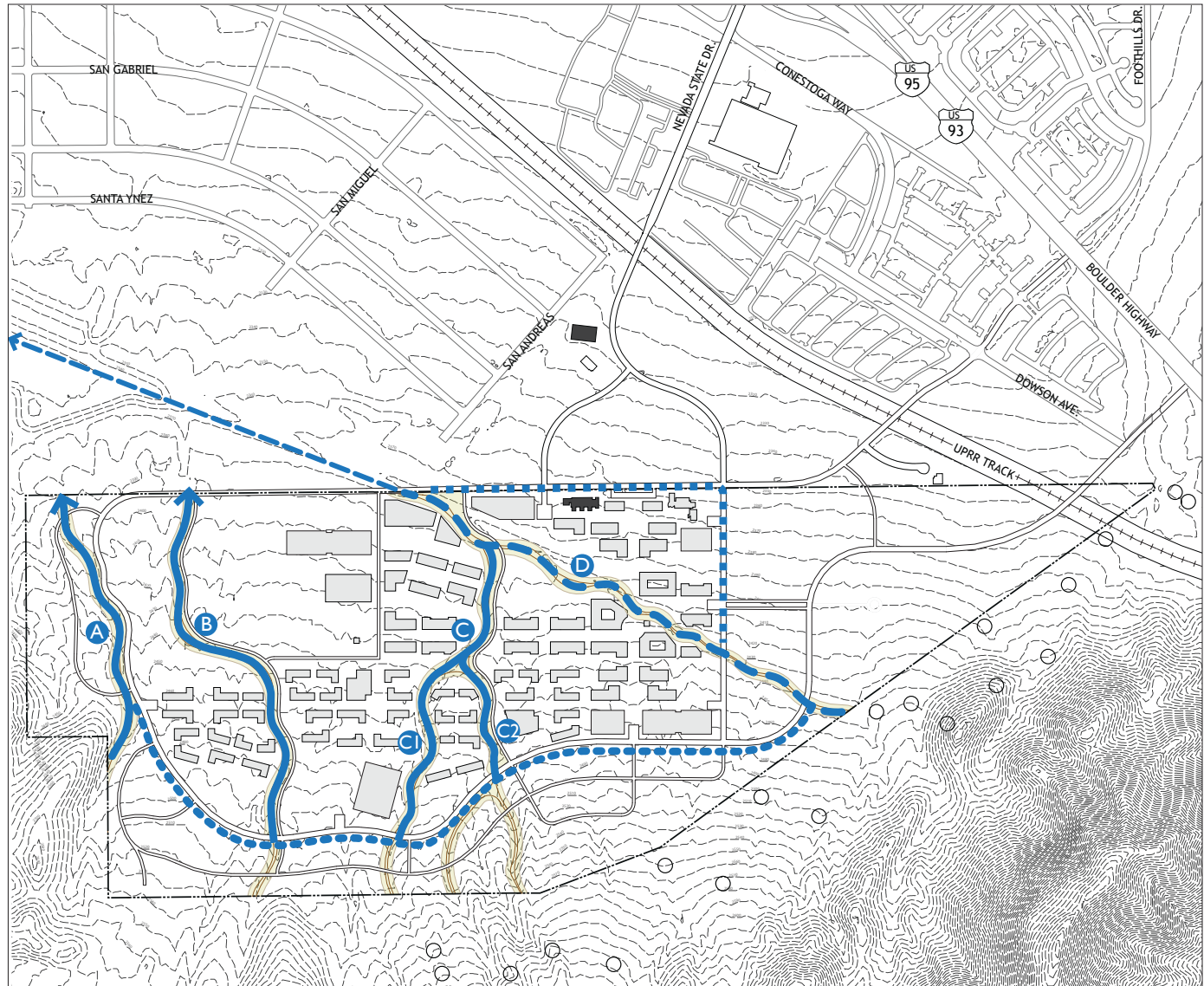
The NSC site will generally be graded to promote sheet flow or overland flow into the channels and will include stormwater BMPs (discussed in the Landscape Design Guidelines section). By employing these BMPs, the use of storm drains will be minimized.



Figure 5.50: Storm Drainage System

LEGEND

-  College Site
-  Primary Arroyo
-  Perimeter Road Arroyo
-  16" Storm Drain
-  Existing Mission Hills Detention Basin Channel
-  Reconfigured Mission Hills Detention Basin Channel



SOLID WASTE

The total solid waste projected for a project of this size and type is 20,103 tons/year. The impact on the environment can be greatly reduced with effective reduction, reuse and recycling program to reduce the generation of waste and divert it from landfills.

SOLID WASTE GOALS AND STRATEGIES

Goals

Appropriately reduce, reuse and recycle materials, minimize generation of solid waste and divert waste away from landfills. Where possible, convert organic waste to useful products

Strategies

- Maximize diversion of construction waste
- Employ preferred purchasing programs
- Maximize diversion of municipal solid waste (MSW)
- Utilize on-campus and/or off-campus composting and anaerobic digestion technologies if feasible.

Commitments

- 85% construction waste diversion from landfill
- 75% MSW diversion from landfill
- 75% materials obtain through preferred purchasing programs.

Aspirational Targets

- 95% construction waste diversion from landfill
- 90% MSW diversion from landfill
- 100% materials obtain through preferred purchasing programs.

	2006	2007
Tons Recycled	719,223	894,652
Tons Disposed	3,463,395	3,245,596
Recycling Rate	17.2%	21.6%

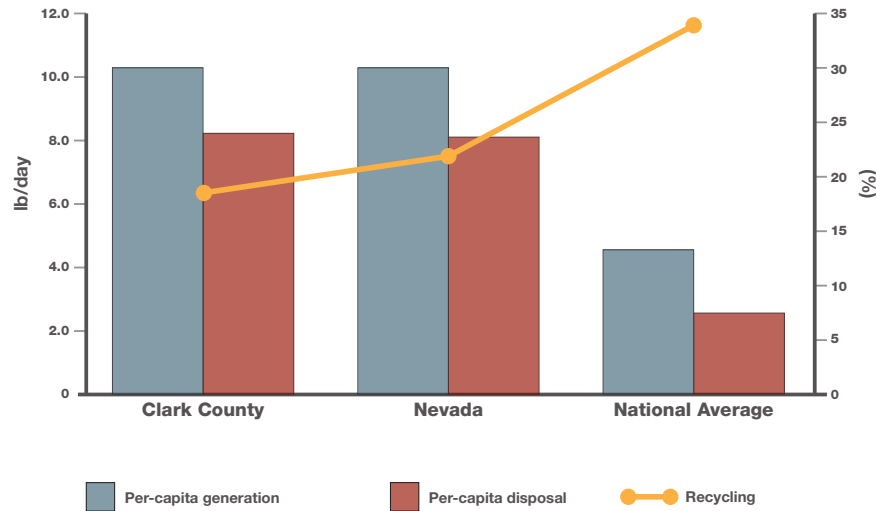
Table 5.11: Nevada Recycling Rates

Nevada is not advanced in terms of solid waste management relative to other states. While a 25% recycling goal was adopted by the State of Nevada in 1991 as part of Assembly Bill (AB) 320, the latest statewide waste audit conducted in 2007 and reported in 2009 concluded that though steady progress was being made, this goal remains unmet. The reported recycling rates for 2006 and 2007 are summarized in Table 5.11.

Clark County has reported a recycling rate of 19.4%, which is approximately 40% below the national average. Bi-weekly recyclables pick up is currently offered in the City of Henderson, with a few weekly pick-up pilot projects gaining momentum. Per capita waste generation and disposal estimates for Nevada and Clark County are also reported as being over twice the national average as shown in Figure 5.51.

Figure 5.52 shows major solid waste facilities in the vicinity of Henderson.

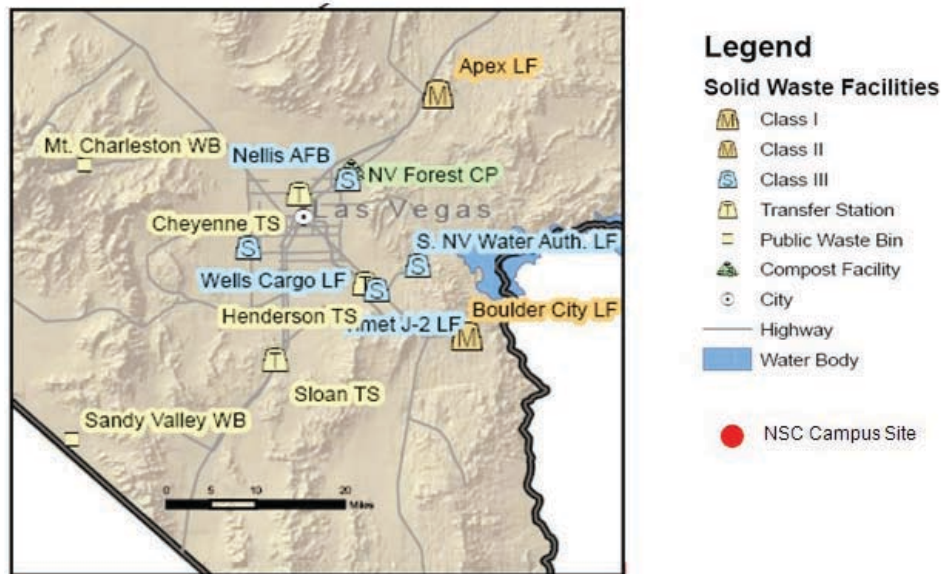
Figure 5.51: Nevada and Clark County Waste Performance



Clark County has two permitted composting facilities. One is located near Nellis Air Force Base, approximately 25 miles from the campus site. Other major solid waste facilities in the region are mainly class I, II and III landfills and associated transfer stations. Republic Services has indicated that a composting collection service could be offered in the City of Henderson as soon as January 2010.

Therefore, Nevada State College is in position to serve as a model in the County and State for waste and resource management. A low or zero waste campus with an internal collection system and composting biogas generation facility would provide such a model.

Figure 5.52: Henderson Area Solid Waste Facilities



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GENERAL ASSUMPTIONS

The total annual solid waste generation at each phase is summarized in Table 5.12 assuming a significant summer program (approximately a 315 day/year equivalent).

Similar estimates are shown in Table 5.13 for reduced summer (approximately a 270 day/year equivalent) and no summer program (approximately a 225 day/year equivalent) scenarios.

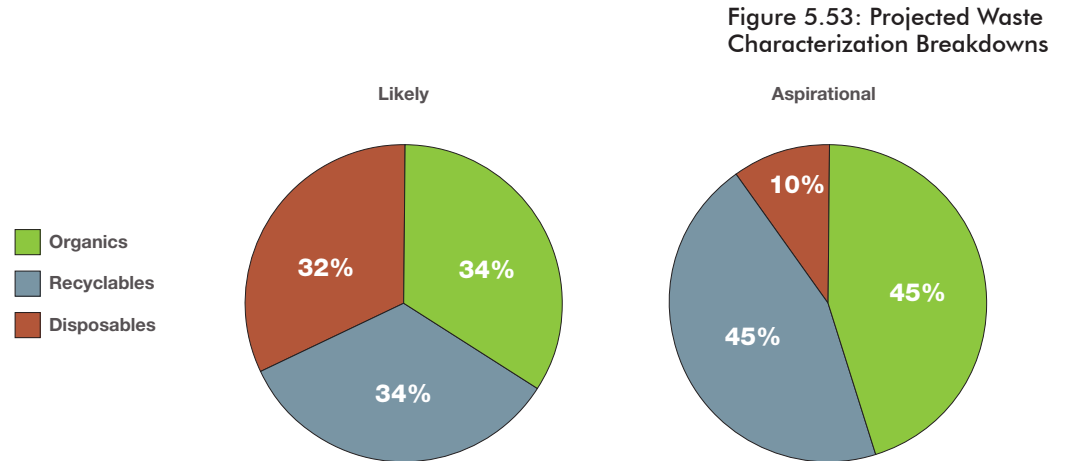
Of the total projected waste generated, the stream characterization breakdown is shown in Figure 5.53.

Total Solid Waste (Tons/Year)	Phase I	Phase II	Phase III	Phase IV
Students Living On-Campus	0	1,000	3,900	7,400
Students Living Off-Campus	1,900	3,000	5,000	9,500
Faculty	100	200	300	500
Staff	200	300	500	900
Program Total	2,200	4,500	9,700	18,300
Operational Total	2,420	4,950	10,670	20,130

Table 5.12: Projected Waste Generation

Operational Total (Tons/Year)	Phase I	Phase II	Phase III	Phase IV
~ 225 d/y	1,870	3,520	7,700	14,410
~ 270 d/y	2,200	4,400	9,020	17,270

Table 5.13: Projected Waste Generation Under Reduced Summer Program and No Summer Program Scenarios



SUSTAINABILITY STRATEGIES

The waste strategy for NSC is motivated by the campus's overarching carbon neutrality goal. In addition to causing direct green house gas emissions in the form of landfill methane, waste disposal implies that valuable resources cannot be reused and new resources must be harvested. The resulting flow of materials between extraction and disposal causes indirect emissions due to a number of activities including but not limited to:

- Transportation activities between each of the material extraction, manufacturing, retail, end-use and disposal stages
- Energy consumption during the material extraction and manufacturing processes
- Fugitive emissions during each of the phases between extraction and disposal.

Therefore, in addition to reducing, re-using and recycling materials in order to avoid landfill emissions, the waste strategy pursues opportunities to convert organics into renewable fuels, offsetting energy requirements and associated emissions. Minimization of transportation emissions are also targeted through on-campus organics treatment and locally sourced materials wherever appropriate.

The following sections describe the waste strategy in detail.

Maximize Diversion of Construction and Demolition (C&D) Waste

The generation estimates and stream characterization discussed in the previous section are for municipal solid waste (MSW) and can be considered operational campus waste generation. This waste stream excludes construction and demolition (C&D) waste that is generated prior to the completion and occupancy of campus buildings and landscape. C&D waste typically comprises of heavy, bulky materials including:

- Concrete
- Wood
- Metals
- Glass
- Salvaged building components
- Spoils from site grading.

The master plan deals primarily with the construction of new buildings and site grading and, as a result, there will be limited opportunities for material reuse and resource sharing across campus. Nevertheless, it is recommended that all tools, machinery and materials generated as a result of construction activities be re-used wherever possible. This will help divert waste from landfill and eliminate the need for duplicate materials.

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Employ Preferred Purchasing Policies

First and foremost, minimizing the generation of disposables will be targeted through purchasing policies. Takeout food containers and coffee cups, for example, make up a significant fraction of campus waste streams going to landfills and a simple switch to organic take out containers and a “Bring-your-own-mug” policy can either help increase the percentage of the waste stream that can be recycled or composted, or eliminate the generation of waste.

Strong preferred purchasing programs are a common theme at peer institutes that achieved high recycling and/or diversion rates. The preferred purchasing program at NSC will build on, and improve upon, such successful programs by incorporating the goals listed in Table 5.14 into the master plan.

Maximize Diversion of Municipal Solid Waste (MSW)

The maximization of municipal solid waste diversion from landfill can be achieved through a series of programs, partnerships and strategies. These include:

- Source separation of waste
- Consolidated central collection point
- Outreach and education.

An extensive and easy to use system that would separate recyclables, organics and trash (MSW) into separate streams would help facilitate proper waste handling and maximize the amount of materials that are recycled or composted. A “three bin” system

Table 5.14: Purchasing Program Goals

Goal	Example Strategy
Maximize life of materials coming to campus	Electronics with longer warranty and/or service life to be given preference
	Product replacement policy and purchasing cycle duration to be reviewed every two years
	Purchasing to be informed by product durability and re-usability
Maximize recycled content in new materials	Vendors offering high pre and post-consumer recycled content to be given preference
Maximize recyclable and organic fractions of waste stream	All take out containers and beverage cups to be compostable
	Create partnerships with vendors that develop recyclable products
	Appropriate pricing for disposable waste collections services at student housing

that provides ample, clearly marked receptacles for the different waste streams is becoming standard throughout the country.

A robust and systematic internal collection and consolidation system would also help maximize landfill diversion and reduce transportation-related emissions. NSC could operate a fleet of electric vehicles, similar to golf carts, that would collect each waste stream from distributed bins, or central building facilities, and consolidate the waste at a central point on campus for pickup or on/off campus treatment. Partnerships with waste and recycling haulers would help to ensure effective and efficient pickup from these central nodes on campus. Efficient pick-up translates into fewer waste truck vehicles miles and reduced corresponding emissions.

The engagement and involvement of students will also play an important role in the success of the NSC waste strategy. Outreach and educational programs for students, faculty and the general community would help solicit buy-in and participation in recycling programs and proper use of source separation mechanisms. Partnerships with the biology and environmental sciences departments would also help to NSC to convert organics to an energy or soil enhancement resource directly on-site (see following section). Finally, waste minimization challenges and competitions such as “Recyclemania” have been highly successful at several peer institutes could be considered by NSC.

Utilize On-Campus Composting and Anaerobic Digestion Technologies

The organics separated on campus will consist primarily of food (cafeteria leftovers and food scraps), soiled paper and napkins, compostable takeout containers, and coffee cups. While proper source separation and collection of organics would facilitate the transport of organics to existing compost facilities in Henderson, NSC has the opportunity to operate on-campus facilities that convert organics to compost that could, in turn, be used as a soil enhancer for campus landscaping. This strategy would not only convert organic waste directly to a valuable resource, but would eliminate both the need for organic waste transportation and resulting emissions. A controlled and odor free rotating drum system is the recommended composting technology.

As described and illustrated in the Energy Strategy section of this master plan, another option for NSC is to convert organic waste to biogas which can then be used as an alternative to natural gas and fuel the district energy system. Following the third phase of development (when there is a significant on-campus student population and a corresponding, significant waste stream), the organic waste had been fed to the rotating drum compost could be redirected to an anaerobic digestion facility. This anaerobic digestion facility would be co-located with the district energy plant.

There is potential to combine NSC’s organic waste with other organic waste from the region. For example, the City of Henderson wastewater treatment plant currently sends its treatment sludge to landfill. NSC could potentially partner with the City to have that waste send to the proposed digestion plant and converted to a renewable fuel.

INFORMATION COMMUNICATION TECHNOLOGIES (ICT)

Information and Communication Technology (ICT) in development projects is typically focused on data distribution. While this infrastructure aspect is critical, it should be seen as the just the framework for an information platform that enables the campus to be better managed and more resource efficient, promoting a higher quality of life.

Goals

Provide an information system that improves operational efficiencies and reduces resource consumption.

Strategies

- Utilize smart grid technologies
- Utilize smart transit technologies
- Maximize energy efficiency of central server
- Develop web home pages for students.

Commitments

- Equip 75% of academic buildings and residences with smart meters
- Integrate 50% of transit facilities with ICT.

Aspirational Targets

- Equip all academic buildings and residences with smart meters
- Integrate all transit facilities with ICT.

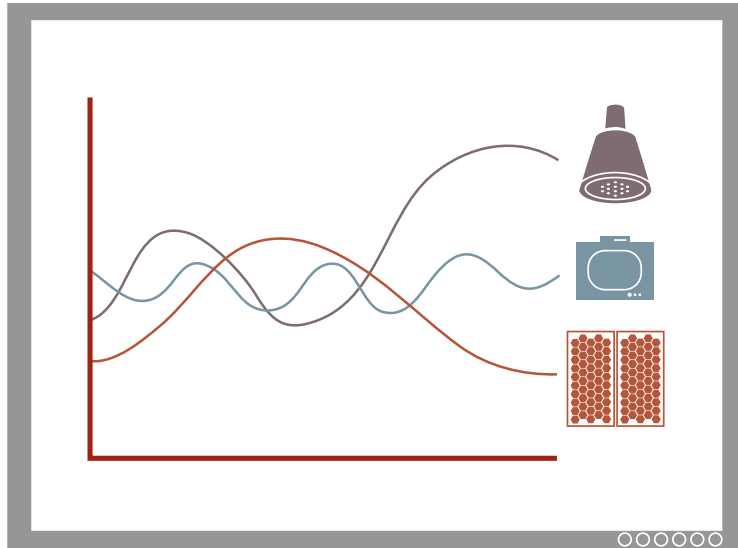
ROLE OF ICT IN EMISSIONS REDUCTION

Between 2007 and 2020, the share of U.S. carbon Emissions attributable to ICT is expected to rise from 2.5% to 2.8%—an annual growth rate of 1.4% that is nearly triple the projected growth rate of total U.S. emissions. This figure already assumes the technology sector will continue to innovate and increase the amount of computing power it can provide per watt.

Although equipment is becoming increasingly energy efficient, carbon savings derived from this efficiency are absorbed and exceeded by the increase in demand for technology. Nonetheless, the overall reduction in carbon emissions that are enabled by the better use of technology have the potential to deliver reductions of up to five times ICT's direct footprint.

A number of strategies to facilitate technology-enabled carbon reduction are described in this section. However it is important to note that technology changes rapidly, and it is likely that there will be several transformations of technology within the lifetime of the development. Therefore the recommended strategies are focused on providing a platform for future strategies and services rather than concentrating on specific near-term applications.

Figure 5.54: Mock-up of a Smart Meter Panel



SUSTAINABILITY STRATEGIES

Utilize Smart Meter Technologies

'Smart Meter' technologies refer to customer-interface devices that put energy consumption information in the hands of the consumer at the point of consumption (see Figure 5.54). They typically perform the following functions:

- Real-time wired or wireless transmission of data to the utility.
- Creation of differential and time-based tariffs
- Facilitation of net-metering (selling renewable energy back to the grid)
- Grid control/management by the Utility (e.g. for

INFORMATION COMMUNICATION TECHNOLOGIES

- cycling of Air Conditioning circuits during periods of high demand)
- Open (but secure) information interface, providing the customer with easy access to the metering and tariff data.

Smart Meters are emerging technology, and there are several vendors, integrators and suppliers pursuing different business models. The lack of standards and the speed of development in the smart meter and home automation sector makes it difficult (and imprudent) to endorse a specific technology or vendor at this stage.

Smart Meter deployment has not been as fast as many consumers and advocates would like, but it is an expensive and logistically challenging exercise. The first step would be for NSC and developers to partner with NV Energy, or the owner/operator of the proposed district energy system to develop a smart-meter strategy that would provide the functionality described above.

Utilize Smart Transit Technologies

Transit is historically underutilized in this region. However the project goals call for increased and integrated transit within and connecting to the campus. Transit vehicles are now usually equipped with location data systems connected to control and dispatch centers. While the intent of these technologies is operational efficiency for the agency, they are usually layered with customer-interface systems that provide

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timetable and wait time information to transit users, allowing them to make informed decisions. Such systems can enhance customer satisfaction and ultimately lead to increased utilization of public transit, with a corresponding reduction in carbon emissions associated with automobile trips.

Customers prefer not to wait longer than necessary. Therefore, multiple information delivery mechanisms should be considered. Traditional variable message signs at stops and interchanges require the rider to be in the vicinity of the sign. However, timely transit information can also be delivered via existing mobile devices (i.e. cell-phones). There is a trend toward the separation of transit information delivery systems from the transit agency itself; which allows the agency to retain ownership of its own data for operational purposes, while providing the appropriate data to a third party who integrates it with other traffic data and formats the content for delivery.

Maximize Energy Efficiency of ICT Equipment

As noted above, the efficiency of ICT equipment has increased significantly in recent years, and this trend is anticipated to continue. NSC will seek to procure the most efficient equipment available. Third party ratings systems that rate products on energy efficiency are available for desktop equipment.

Such systems include Energy Star (from the U.S. Department of Energy) and EPEAT (from the Green Electronics Council). Both organizations are con-

stantly revising their criteria and are expected to be releasing standards for server equipment.

Power-intensive computing facilities, such as data centers should be aggressively target a Power Use Efficiency of between 1.1 and 1.4 - which will require diligent planning and design of supporting mechanical and electrical services.

In addition to equipment selection, NSC should implement policies regarding equipment, including mandating the use of 'powersave' functions and reducing the use of energy intensive peripherals. For example: using fewer shared larger printers, rather than a many personal printers.

Develop Web Home Pages for Students

Achieving NSC's carbon neutrality goal cannot be guaranteed by the design of the campus alone. The conservation and efficient use of resources is, to a large extent, dependent on the will of the end-user. Although the ongoing footprint of the campus' individual users cannot be completely controlled, it is important to use technology to help influence demand-side behavior.

Many colleges provide student web-pages to provide access to academic resources (see Figure 5.55). As these pages frequently become the student's portal to the school, they present opportunities to take some of the data gathered by granular smart metering on individual resource use and relate it back to the student.

Figure 5.55: Example Student Web Home Page



INFORMATION COMMUNICATION TECHNOLOGIES

ICT UTILITY CONNECTIONS & LAYOUT

Telecommunications infrastructure provides the physical pathway and media on which to layer technology services; infrastructure requirements at the campus inter and intra-building level are described below.

Campus

At the campus level, telecommunications infrastructure provides connection to the outside world, specifically service providers in the area. The developer is required to provide a Minimum Point Of Entry (MPOE) to which telecommunication providers (Telcos) can connect.

It is the responsibility of the Telcos to connect the MPOE to their infrastructure. The major service providers in the area have main fiber and copper routes along the highway to the east of the development; they have minor copper and fiber routes to the existing building on the site (they also have copper distribution in the existing residential neighborhoods to the north east of the development).

Depending on the phasing of the development, it is recommended that the MPOE be located in the proposed central utility location (see Energy section) and that communications are routed along Nevada State Drive and Foothills Drive to the central plant. The MPOE shall be the central distribution point for inter-building cabling around the campus.

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A potential first phasing scenario is as follows:

- The main communication system feed(s) to the central plant would be constructed. From the central plant, the distribution system along Paradise Hills Drive and on the east side of campus would also be constructed.
- Next, the central section of the communication system will be constructed.
- Finally, the western portion will be constructed.

The MPOE should be sized sufficiently to accommodate three carriers (two carriers and a spare). The MPOE should be fitted out in accordance with the BICSI Customer Owned Outside Plant (OSP) guidelines in force at the time of construction. Transition from Telco to campus infrastructure should be demarked appropriately with separate feeds or vaults.

Quantities and types of cabling should be determined by the services identified in each building by the Telcos and NSC. It is typically the responsibility of the Telcos and owner organizations (e.g. NSC, the City of Henderson, transit agencies) to provide and install this cabling. However, critical services that support adopted sustainability strategies (e.g. Transit signage) should be identified and installed as part of the campus build out. The communication system should be installed in concrete encased ducts.

Inter-Building

Connectivity from the between buildings shall follow the route of the multi-utility joint trench, Four 4” conduits or ducts is the minimum space allocation

for telecommunications within the joint-trench, one each for the three Telcos accommodated in the MPOE and one for use by NSC.

Transition from the joint trench to each building should be by vault or hand hold from the joint trench to the Entrance Facility (EF) within the building (or building complex)




Quantities and types of cabling should be determined by the services identified in each building by Telcos, service providers and owner organizations. Infrastructure and cabling should be designed in accordance with the BICSI Customer Owned Outside Plant (OSP) guidelines in force at the time of construction.

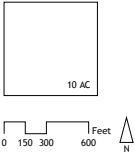
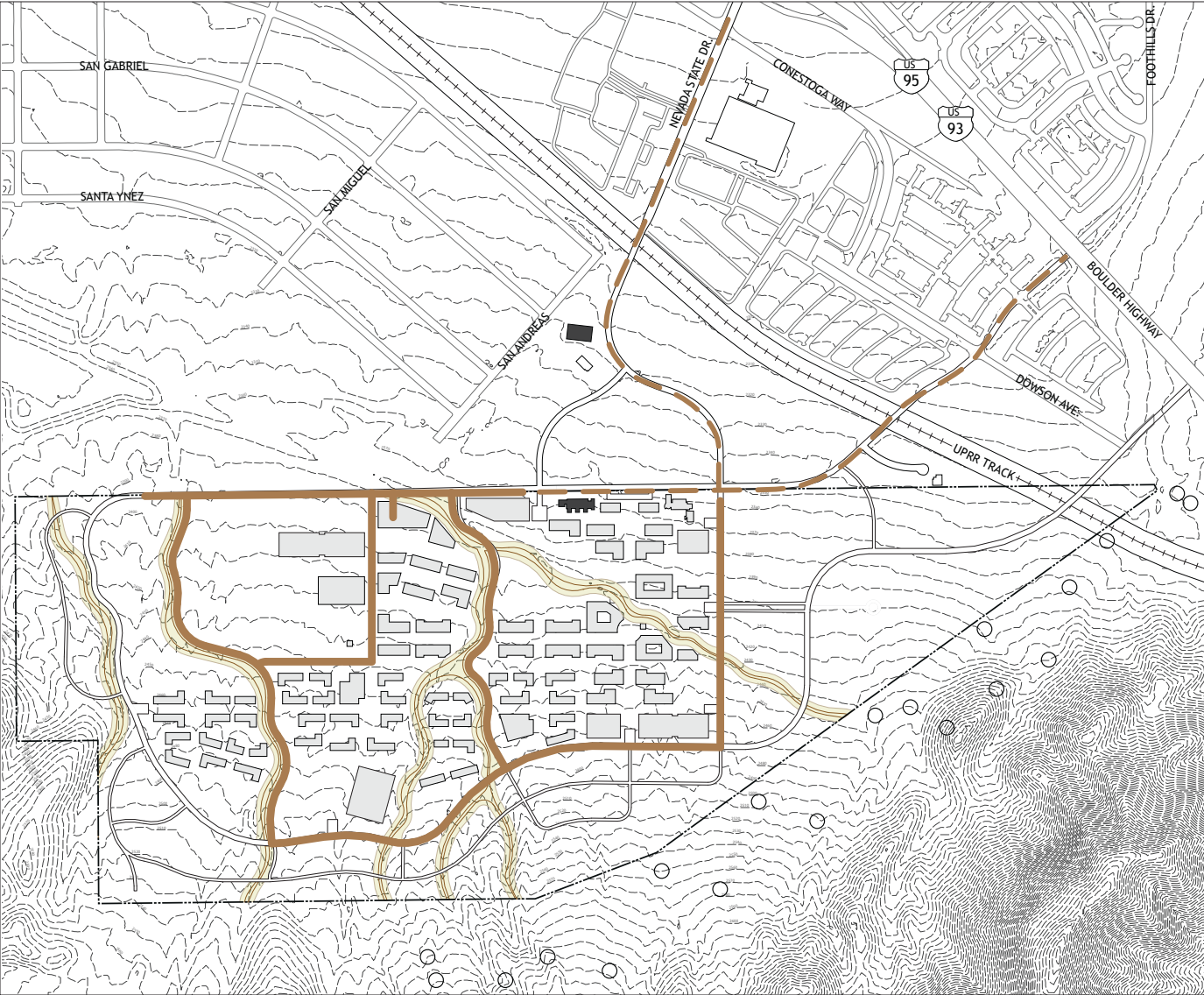
Intra-building

Cabling backbones and distribution within buildings, from the Entrance Facility through to the voice/data outlets shall be part of the building design and shall be designed in accordance with the BICSI Telecom Distribution methods manual (TDMM) in force at the time of construction.

Figure 5.56: Communications System

LEGEND

-  College Site
-  Proposed
-  Existing





These design guidelines are presented to accompany the Land Use Plan, Development Framework, Illustrative Plan, and other plans previously presented in this document. The design guidelines express the intentions for the design of buildings, open spaces and landscapes that will occur on the NSC campus.

The guidelines reflect dual objectives:

- to have the campus reflect and fit into the unique desert environment of its site, and
- to allow NSC to achieve the ambitious goal of being a truly sustainable institution.

The guidelines will inform future design consultants as well as the College's representatives - administration, building committees, and facilities staff - who will be charged with implementing this master plan.

Included in the pages that follow are:

- Building Design Guidelines
- Landscape Design Guidelines.

6 design guidelines

BUILDING DESIGN GUIDELINES

This section addresses the design of campus buildings to ensure a consistent architectural character and compliance with principles of sustainable planning and building design. In general these guidelines do not prescribe a certain architectural style or specific design strategies. Instead they describe a set of shared principles and characteristics that provide a framework for design appropriate for this site, this climate, and the mission of the College.

The guidelines described below cover the four primary building types on campus: academic, residential, infrastructure, and parking. While most of the discussion applies to all of these building types, distinctions are clearly made where specific features apply to specific types only.

The building design guidelines section is organized as follows:

- *Context* discusses the rich history of desert architecture and other precedents for the design of the Nevada State College campus
- *Guiding Principles* communicate the values which should guide building development.
- *Passive and Climate Responsive Design* describes the a cost effective approach to designing carbon neutral buildings.
- *Detailed Guidelines* apply aesthetic and sustainability principles to significant building attributes and provides specific guidance to future designers.



(above)
The indigenous dwellings at Pueblo Acoma were zoned so that spatial use varied with the seasons.

CONTEXT

The indigenous architecture of hot and dry regions of the world share many common characteristics borne out of their ecological constraints and opportunities. Earthen architecture dominates due to the lack

of other suitable building materials and the inherent durability and thermal mass of earth and stone buildings. The peak heat of summer is extreme and tends to be addressed directly through basic planning features. For example at Pueblo Acoma, near Albuquerque, New Mexico, interior spaces were used during the summer day and outdoor terraces and night, while in the winter the opposite use pattern occurred.

More recently, Springs Preserve in Las Vegas demonstrates how modern understanding of sustainability and the LEED certification process can meld with traditional materials and practices to yield a built environment that feels at home both in time and place.

The current campus context is not a blank slate. The Liberal Arts and Sciences building currently stands alone, successfully balancing the need to stake a claim to this vast landscape with the desire to blend in. Its use of earth-colored masonry walls and carefully planned outdoor spaces are valuable precedents build upon.

The Nevada State College campus will carve out a place not only on its site but within the context of this tradition of desert architecture and planning. The Guidelines draw heavily from the lessons from the past, the current features of the site, and the rapidly evolving world of high performance buildings to guide the development of the future campus.

(right, above)

The LEED Platinum buildings at Springs Preserve in Las Vegas meld contemporary building science with traditional, southwestern building materials and passive strategies



(right, below)

The Liberal Arts and Sciences building serves as an effective bridge between a beautiful but rugged natural site and a future campus built environment



6 design guidelines

GUIDING PRINCIPLES

The following principles shall guide future development of campus buildings:

1. Building designs shall be **appropriate to the desert site and the local climate**. Architectural character is not something applied to buildings but derives from climate responsive design strategies and sensitivity to the color, materials and forms that resonate with the site.
2. The campus architecture shall be **legible from two primary scales**: the distant view of the campus as a whole and the pedestrian eye-level view. The larger scale suggests a formal presence that resonates with the elemental and rugged desert topography while the smaller scale requires human-scaled detail and emphasis on elements such as building entries and key intersections.
3. Buildings should **employ passive design measures to reduce heating and cooling loads**. Designs will make use of the available resources on site to their advantage while tempering forces that can send a building system out of balance. This is particularly critical for this project with its climatic extremes and ambitious carbon reduction goals.
4. The outdoor spaces formed by buildings are as important as the enclosed spaces serving direct program needs. **Create outdoor “rooms”** that are protected or exposed to sun and breezes as appropriate for the

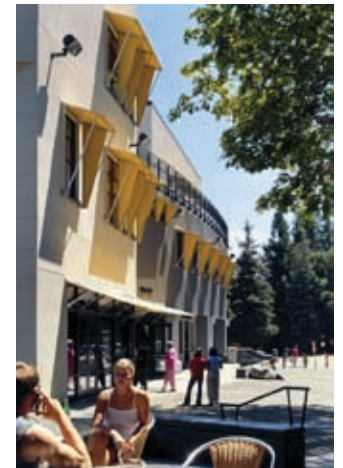


(left)

The overall form of campus should resonate with the desert landscape from a distance allowing buildings to blend into the site context.

(right)

Building spaces at ground level, of a pedestrian, eye-level scale, should be animated with social spaces and architectural detail.





(upper left and right)
Shaded outdoor courtyards attract activity in summer.



(below)
Building transparency in selected locations such as building entries contributes to a more lively nighttime environment.



(below)
Indoor environmental quality is critical for learning environments.



season and use. A strategic use of building elements is critical in a climate with such hot summers and cool winters, so that outdoor spaces remain active. Shading elements of various types and scales can help create positive microclimates.

5. Colors and materials should exhibit **integrity and directness** and demonstrate responsiveness to the character and forces of the site. This includes durability to weathering forces unique to this climate as well as a color palette that derives from the desert landscape.

6. All materials and building elements need to be **justified on a life-cycle cost basis** in addition to demonstrating first cost-effectiveness. The long term costs of maintenance and operations must guide material selection and overall building design decisions.

7. A selective use of transparency at key locations such as ground floor and entries creates a **welcoming and legible built environment**. People and activity are what animate spaces and they need to be made visible.

8. **Water shall be treated as a precious resource** and all efforts to reduce water use, and especially potable water use, are strongly encouraged.

9. Indoor environmental quality has direct impacts on **occupant satisfaction and productivity**. Integrated building designs shall strive to provide quality day-

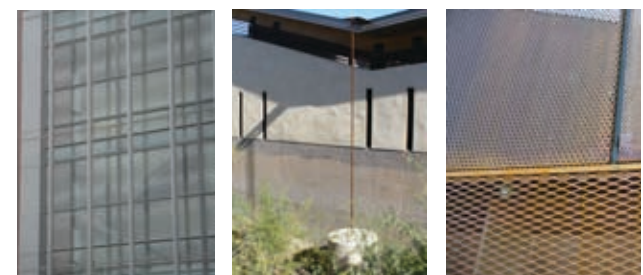
6 design guidelines

light to all occupied spaces and views to the exterior from as large a percentage of floor area as possible.

10. In general, **building designs should be appropriate to the climate, the site, the era, and the programs for which they are intended. They should continue the tradition of other fine examples of contemporary desert-appropriate buildings completed recently in the southwest.**



The buildings pictured are examples of contemporary buildings in southwest desert environments that fit well in their contexts due to the appropriate use of material and color and sensitive placement on their sites.



6 design guidelines

PASSIVE AND CLIMATE RESPONSIVE DESIGN

The high level goal of all campus building designs should be to design buildings that use passive strategies to create comfortable, efficient environments for learning.

A carbon neutral campus plan starts with energy efficient buildings. 80% of the carbon emissions on this campus derive from energy use in buildings.

As discussed earlier in this document, NSC's carbon neutral plan aspires to a 50% reduction in building related carbon emissions. This section outlines the steps required to achieve this level of emissions reductions in the most cost-effective manner. In simple terms this means integrating sustainability deeply at the earliest stages of planning and design to capitalize on “free” strategies, such as building orientation, and to avoid costly add-ons at later stages needed to compensate for bad early decisions. When “passive design principles” are established correctly the need for lighting, cooling and heating is reduced, which allows the use of smaller and more efficient building systems and technologies.

The recommendations outlined below derive from testing of best-practice assumptions using the specific conditions found in this climate. The planning team ran energy simulations to determine the building attributes most effective at reducing energy use. Based on this analysis, 40% reductions in carbon emission will be achieved through passive design

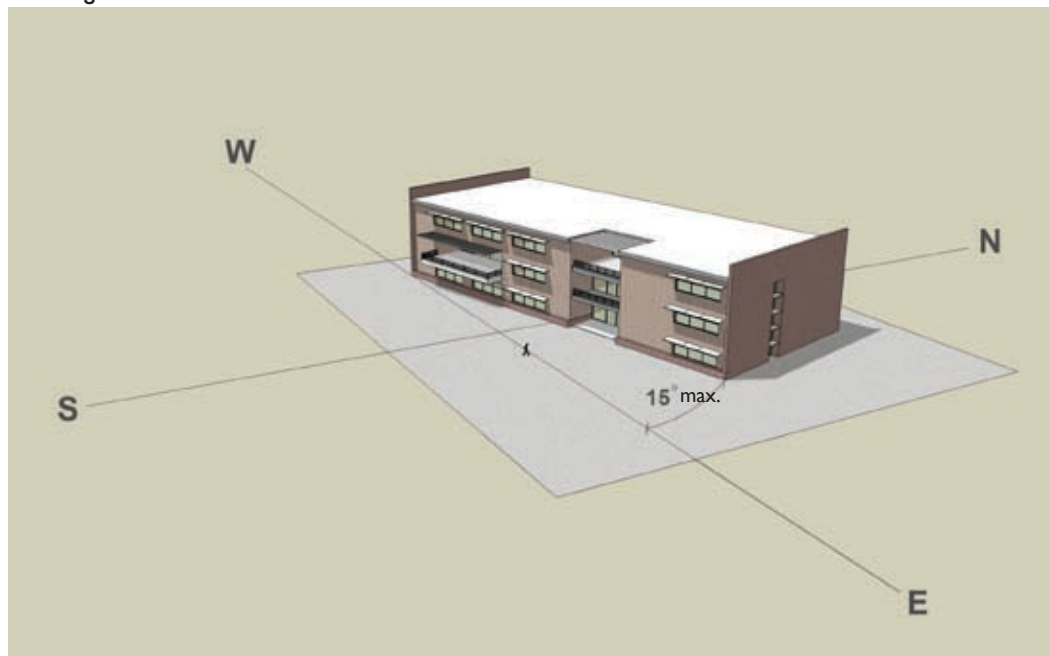


(left and lower)
Well designed and oriented natural daylighting can significantly reduce lighting requirements and energy use



measures with an additional 10% reductions gained through “active” design measures. Each strategy described below is responsible for a portion of the 40% total savings. The savings noted are additive and sequential, therefore if “sunshading” was analyzed prior to window-to-wall area ratios (WWR) reduction, the savings percentage would have been higher. The referenced percentages should therefore be viewed as a general guide and not as absolute measures of the value of each strategy.

Figure 6.1: Strategy #1 - Optimal Building Orientation



Passive Design Strategies

Strategy #1: Orient long dimension of building within 15 degrees of north and south orientations = 10% savings

The master plan organizes site and building parcels to encourage building orientations that comply with this strategy. This allows a reduction of wall area with east and west orientations and greater north and south exposure. Since the summer sun hits south facades from a high sun angle, simple horizontal overhangs can keep out unwanted summer heat. In contrast, low angled sun on east and west facades is much harder to control with cost effective sunshading.

Strategy #2: Increase width of academic buildings to reduce skin-to-volume ratio = 3% savings

While narrow buildings with abundant access to views and daylight may be more pleasant to live, work and learn in, a wider building reduces skin-to-volume ratio. In Henderson’s climate with extreme hot summers this increase in building width results in a slightly more energy efficient building overall. Building designs should balance the desire for access to views and light with the benefits associated with bulkier buildings with less heat gain and loss through the building envelope.

6 design guidelines



South-facing Facade: 25-35% WWR

Strategy #3: Optimize window-to-wall (WWR) area ratios per solar orientation to maximize daylighting and winter passive heating gain and minimize summer heat gain and winter heat loss through glass: 7% savings

Provide total glazing areas per elevation within the following optimum percentages :

- South orientation = 25-35% WWR
- North orientation = 35-45% WWR
- East orientation = 5-15% WWR
- West orientation = 0-10% WWR.



North-facing Facade: 35-45% WWR



East-facing Facade: 5-15% WWR
West-facing Facade: 0-10% WWR



(above, all)
Shade devices reduce heat gain and cooling loads. They also reduce glare, thereby improving the quality of light in the interior.

Strategy #4: Provide properly-sized sunshading on south and west facades to keep out all direct sun during cooling seasons = 3% savings

Horizontal overhangs on south-facing windows are a critical component of the passive cooling strategy. Windows are to be avoided on the west elevations but any windows that exist shall be shaded with horizontal overhangs and vertical fins. East-facing windows can be left unshaded as most the year morning warming from sun is desirable from an energy perspective. North-facing windows do not require external sunshades. Internal blinds should be used to control glare on all elevations.

Since window sizing has already been optimized, energy savings for this strategy appear somewhat modest. This is also due to the winter heating benefits of solar gain through south-facing windows offsetting the summer cooling benefits of well-shaded windows.

Strategy #5: Design effective daylighting for all spaces within 20' of exterior walls and integrate daylight sensors and controls into all electric lighting in daylit zones to reduce daytime electric light usage = 12% savings

Daylight-responsive lighting controls switch off or dim electric lighting when daylight levels in a space reach a specified level. Very often well-daylit spaces do not see an energy use reduction when design relies on occupants to manually switch off lights. Many lighting manufacturer now offer integral daylight sensors in their lights, which drastically reduces the cost and complexity of installing these systems.

6 design guidelines

Strategy #6: Specify windows systems with lower U-values (insulation values) than code minimum to reduce heat loss through envelope = 5% savings

High-performance glazing proves to be a cost-effective way to reduce carbon emissions and increase thermal comfort by means of upgraded technology, such as low-e coatings, gas fills, and “heat mirror” films, without impacting installation costs. Upgrade code compliant glazing (SHGC = 0.49, SC = 0.56, U = 0.6) to high-performance glazing (SHGC = 0.35, SC = 0.4, U = 0.13). One manufacturer with a product that meets this specification at this time is Serious Windows.

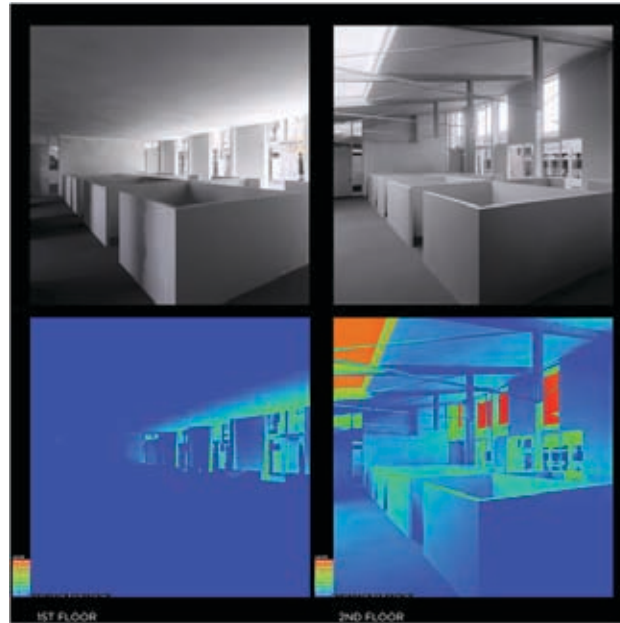
Note: Carbon emissions savings are not equivalent to energy savings. While carbon emissions and energy use are directly linked, gas use and electricity use have varying carbon intensities. In simple terms, using a carbon emissions metric favors gas use over electricity use due to the carbon intensity of grid electricity.

Additional Strategies

The following strategies were not tested for potential savings but should be considered:

Thermal Mass

Exposed thermal mass can be an effective component in an integrated building strategy aimed at making use of nighttime temperature inversions to level out indoor temperatures over the course of a 24-hour period. Options include exposed concrete floors,

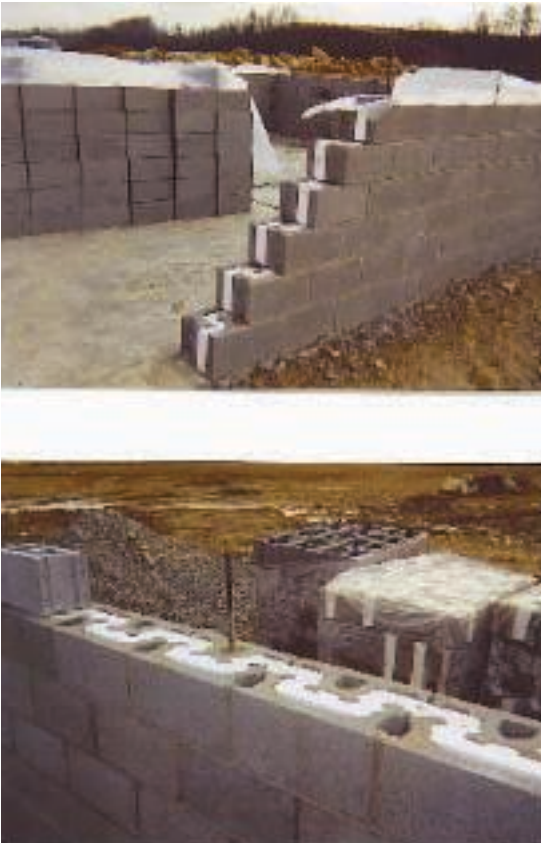


(upper)
Lighting modeling studies are used to ensure effective light levels and to reduce energy use.

(left)
This example of a triple-element glazing system is highly insulative.



Integrally-insulated concrete block is an economical way to improve thermal performance of the building envelope by combining exposed thermal mass to the interior and insulation in one wall assembly.



exposed concrete or concrete-filled metal deck floor-ceilings, or exposed concrete block walls. CMU with integral insulation is a cost effective way to achieve decent insulation values and exposed thermal mass on the interior while providing a finished interior and exterior surface. Compliance with project seismic requirements shall be confirmed on a case by case basis

Increased Roof and Wall Insulation

Upgrading from R-20 to R-30 roofs and R-14 to R-19 walls has a significant impact on winter gas energy use but overall a modest impact on carbon emissions.

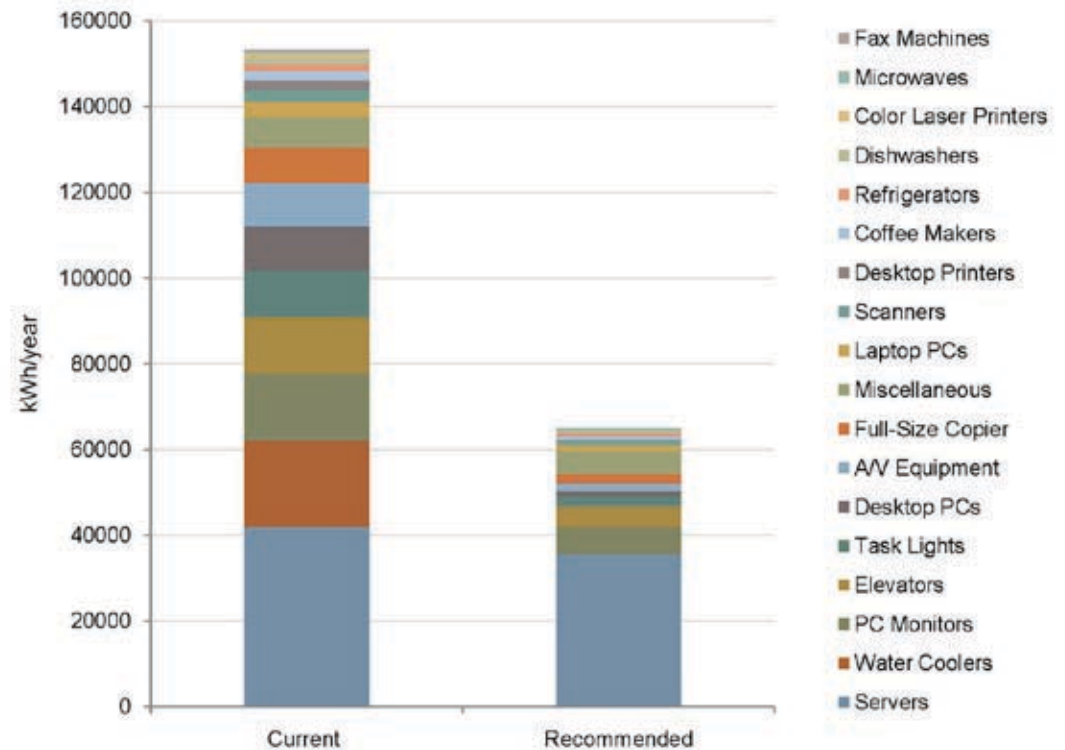
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Building Systems & Equipment

The last 10% of savings will be achieved through “active strategies” for energy efficiency. These include heating, ventilation and air-conditioning systems, electric lighting design, and heat recovery. Clever mechanical designs that take advantage of “free energy” available on site and in this climate, for example economizer modes and natural ventilation in the shoulder seasons, can radically reduce energy use and increase thermal comfort. They are a crucial part of sustainable building design and the carbon neutral campus plan and require a knowledgeable and integrated design team working together from the earliest stages of a project.

Another significant area is “plug loads,” which includes all equipment that are plugged into wall outlets. This includes servers, desktop computers, projectors, copiers, iPhone chargers, and so on. In a typical office building, lighting, HVAC and plug loads each account for around 1/3 of the energy use. Once lighting and HVAC loads are reduced by 50% through measures described above, the plug loads account for half or 2/3 of the total building energy. By developing (1) a rigorous campus purchasing policy that requires all equipment to be in the top 10% of Energy Star-rated products and (2) energy-efficient computing standards such as server virtualization, plug loads can be drastically reduced. In a carbon-neutral campus where all energy use is being offset through renewable energy generation, this is the most effective way to reduce costs.

Figure 6.2 is an example of how plug loads can be reduced in a typical office building.



Energy Use Profiles by Building Type

Despite the universality of the above recommendation, design responses should always be tailored to the specifics of each individual project. Each building type in a particular climate has a unique energy use profile. In order to make the biggest impact for the least cost, designers should address the largest sectors for their building type first.

In academic classroom buildings, lighting and cooling energy are most significant, therefore attention should be paid to balancing effective daylighting with protecting interior spaces from direct solar gain through careful window placement and sunshading. A good building envelope and exposed thermal mass

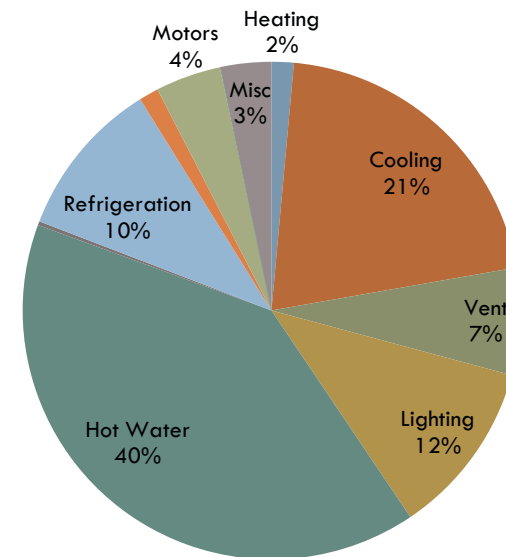
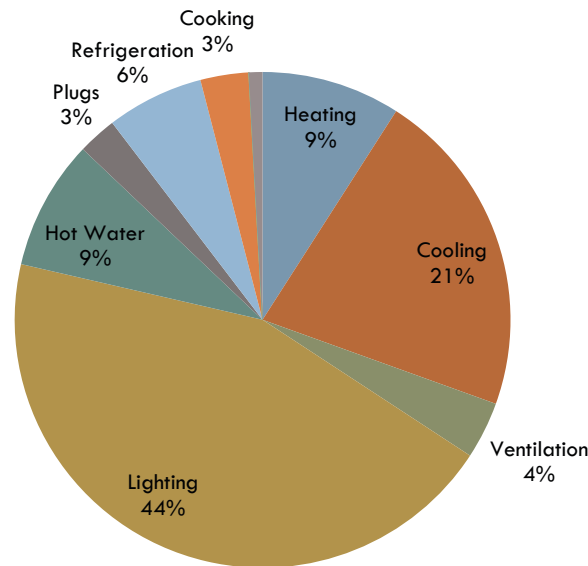
can help keep down internal temperatures as well.

Administrative and other office uses are similar to academic classroom buildings except ventilation and office equipment (plug loads) form a bigger piece of the pie. Note that once lighting, cooling, ventilation and heating loads are reduced, the plug load component takes on up to 40% of the overall pie unless adequately addressed.

In student housing, the density of water use means that heating hot water for showers and laundry is the biggest energy user. Passive cooling and efficient lighting strategies are significant in student housing as well.

Figure 6.3: Academic Building Energy Use Profile in Desert Climate Zones

Figure 6.4: Residential Building Energy Use Profile in Desert Climate Zones



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MASSING AND BUILDING ELEMENTS

Height and Bulk

Academic Buildings

Based on anticipated enrollment and academic programs at NSC, it is expected that academic buildings will average three stories in height. Key intersections may be highlighted through vertical elements such as towers or additional floor levels

Variation in height is encouraged among groupings of buildings with taller buildings preferred on the south side of east-west circulation spaces to increase shading of outdoor space. Building mass shall be used strategically in this manner to create beneficial microclimates in adjacent outdoor spaces. This includes shading adjacent walkways and courtyards, and protecting gathering spaces from strong winds. Southwest winds are particularly problematic, especially in the winter season. Therefore building mass should be used when possible to buffer wind from the southwest, creating protected space on the northeast.

Semi-enclosed balconies and terraces are encouraged to break up the mass of buildings and provide shaded and protected exterior spaces. In general these spaces should face outdoor public spaces and thereby help animate the spaces below.

Building width needs to be carefully considered. Narrow buildings allow for good cross-ventilation

and daylighting whereas wider buildings reduce skin area and therefore passively reduce heating and cooling loads. See page 6.7 - Strategy #2 for discussion.

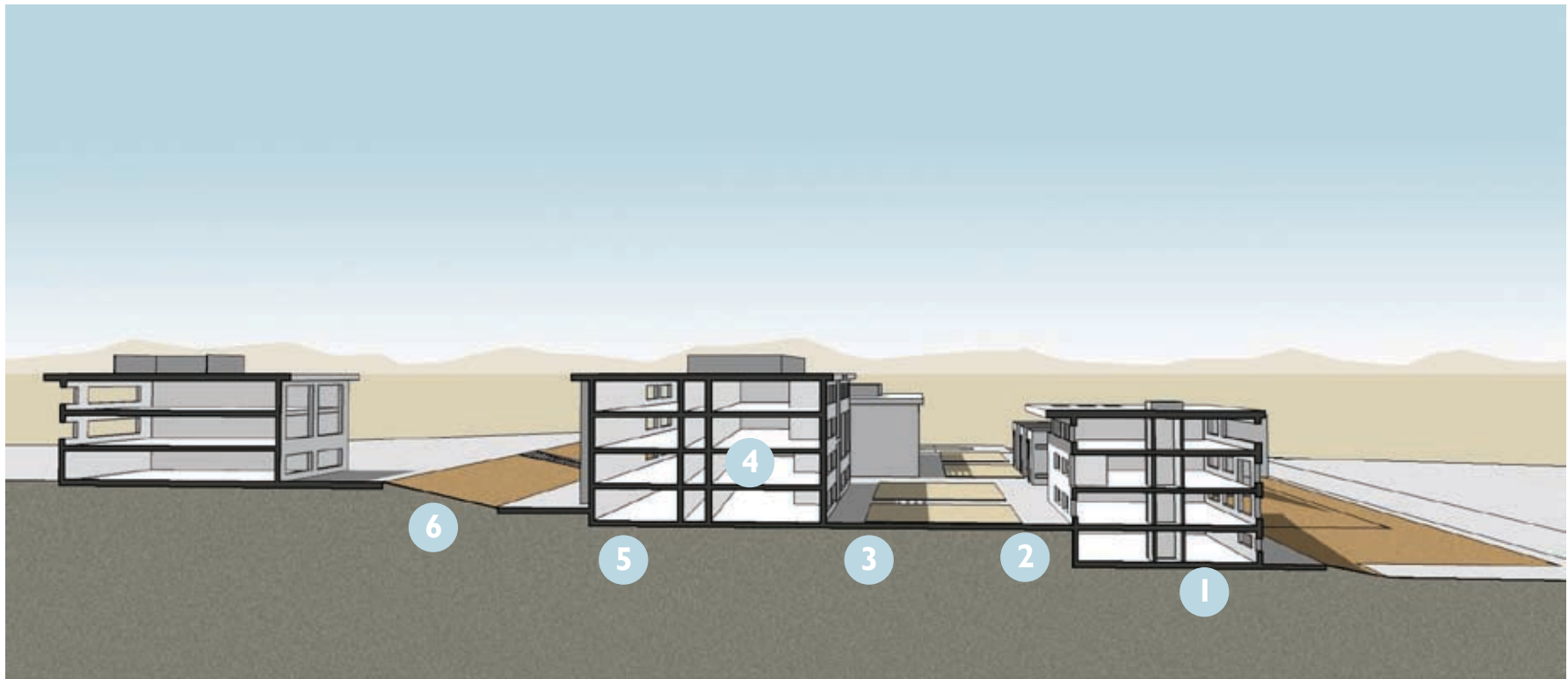
Residential Buildings

Residential buildings should be oriented around usable open spaces of various sizes and configurations, some of which can be used for informal outdoor recreation and others for informal gatherings. Additional, formalized recreational features should be provided in student housing neighborhoods. Seasonal wind patterns should be studied on a project by project basis and building massing used to create outdoor spaces with beneficial breezes in summer and wind protection in all seasons. Balconies and terraces are encouraged to break up the mass of buildings and provide shaded and protected exterior spaces. Carefully planned outdoor circulation is an appropriate way to reduce building costs while animating the exterior elevations.

Residential buildings should have a more varied form, massing, and articulation than academic facilities that breaks down the scale of buildings. Student housing designs should encourage use of stairs and thereby be limited to four stories in general.

Infrastructure Facilities

Major elements of the central plant and other infrastructure may take on a different architectural form to differentiate these buildings from others on campus and add an elements of visual interest.



Massing Cross-Section Diagram

- 1 Ground floor partially set into hillside, providing accessibility to all levels and upper site via building elevator
- 2 Sunny south side of street ideal for winter pedestrian use
- 3 Shady north side of street ideal for summer pedestrian use
- 4 Buildings may step in height from four story down to three story to increase shaded site area and provide dynamic massing
- 5 Slab-on-grade building is most economical way to build individual buildings, though requires additional site costs to provide accessibility across site slope
- 6 Landscaped berms can be utilized to transition between grades when building pads are built at grade

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(upper)
Balconies and rooftop terraces lend interest to the building form.



(above)
Infrastructure facilities present opportunities for unique articulation and visual interest on the campus.



(below, all)
Parking structures should be articulated with form or texture to temper visual impact.

Where small support structures are required throughout campus, they should be designed for minimal visual impact and be sited away from major pedestrian routes. Planting should be used where possible to screen utility structures and equipment.

Parking Structures

Massing should be articulated to address scales of adjacent buildings or pedestrian walkways. Vertical components such as stairs and elevators should be articulated to lend scale to the building mass. Structures should be open to air or as transparent as possible to provide mandatory visibility and help prevent security concerns. Any enclosed stairwell must be properly conditioned or ventilated to prevent overheating during the summer months.

Structures should be designed to avoid expressing sloping floors on major facades. Given the slope of the site, using the grading to help de-emphasize the height of parking structures is encouraged. Refer to the Landscape Guidelines for buffering of parking structures from walkways.

Building Siting

Building Placement and Accessibility

A distinguishing feature of the campus site is the relatively consistent 5% slope from north to south. This is both an opportunity for a unique, dynamic character and a challenge to accessibility. According to the latest building codes, all entries and exits from the ground floor must meet ADA accessibility requirements. One way to accommodate building access and general site movement is to use the step up from first to second floors as a means to move up the site. Internal building elevators thereby become part of the accessible route and must remain open at all times. Where elevators and other vertical circulation elements within buildings are included as part of the campus circulation system, they would need to be available 24 hours a day and 7 days a week. Alternatively, buildings can be built as slab-on-grade with berms with accessible ramps and/or exterior elevators accommodating the change in grade between site terraces.

The complexities to this choice demand deeper investigations during site development phases. The tradeoffs are multiple, including potentially higher building costs due to the construction of partial basements vs. the avoidance of berms or site retaining walls. Nonetheless this is a critical issue that will impact the character of the campus.

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Building Entries

Strategic placement of building entries reinforces the active nature of major open spaces and corridors, directing pedestrian traffic and providing places for waiting and socializing between classes. Entries shall be clearly visible from these spaces and accented through architectural features such as enlarged glazing areas, overhead canopies, good lighting. Placing primary building entries at grade level or at the level of an accessible adjacent plaza or courtyard will accentuate the building as a component of the campus-wide circulation system.

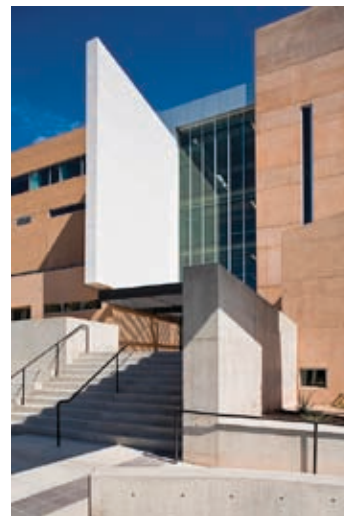
Building entries shall be located on north and south façades. This will ease building accessibility as overall site grading provides relatively shallow slopes along these façades. It will also encourage larger glazing areas on north and south facades where sun control is feasible. Specific locations shall be determined by the building program and architecture as well as by the context of surrounding or facing buildings and adjoining open spaces.

A selective and strategic use of transparency at key locations such as ground floor and entries is critically important to create a welcoming and legible built environment. People and activity are what animate spaces and therefore they need to be visible.

Stairs should be located in lobbies and designed to be visible from the exterior and attractive alternatives to elevators.



(left)
A protruding canopy marks the building entry and provides weather protection.



(left)
Vertical panel protects building entry from sun while dramatically marking the location.

(top)

Flat roofs are flexible, accommodating a range of equipment and features such as skylights and photovoltaics. White, reflective coatings help limit heat gain.



(bottom)

Rooftop mechanical equipment will be located and designed to minimize visual impact and blend with the roof and building form.



Roofs

(See “Colors and Materials” section for discussion of roofing materials.)

Academic Buildings

“Flat” roofs are preferred due to economy of construction, flexibility for equipment (including both mechanical units and photovoltaic installations), and for the sustainability benefits of a white roof. Flat roofs should incorporate a minimum $\frac{1}{4}$ ” per foot slope and utilize the highest-albedo, white roofing materials as possible to reduce heat island effect and heat transfer through the roof construction. Sloped roof elements are allowable and encouraged at key locations for emphasis and variety.

Since rooftops may be visible from higher buildings and higher grade, they must always be treated as an extension of the overall building design. Rooftop equipment should be clustered and placed behind screens set back from the roof edge. Similarly, communications equipment should be organized near the center of roof areas. Guard rails for terraces or maintenance access should be set back from the roof edge. Rooftop terraces are acceptable where applicable.

Residential Buildings

Sloped roofs are encouraged for differentiation from academic buildings. Where possible, slopes should face south to accommodate immediate or future installation of photovoltaic or solar hot water panels. Standing seam metal roofs are ideal for such instal-

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lations as they allow simple, non-destructive attachment of panels. Asphalt shingles are discouraged except in non-visible applications. Flat roof buildings are acceptable where a component of an integrated design concept.

Infrastructure Buildings and Parking Facilities

Roof level sunshading structures, including photovoltaic canopies, are encouraged.



(upper left and right)
Residential buildings can have varied roof shapes to distinguish them from academic buildings

(lower left)
Rooftop terraces provide views and outdoor activity areas

The service bays for this campus bookstore and academic building are integrated into the building and are located off major roadways, minimizing the impact of loading and service activities on surrounding uses.



Service Bays and Docks

Service spaces and loading areas need to be carefully planned and supplied to meet the demands of each building use. However, they are not desirable to be seen, heard or encountered by most members of the campus community. Therefore:

- Service bays, docks and storage must be located as far as possible from quads, courtyards and pedestrian walkways
- Wherever possible, service bays and docks should be located within the building envelope and placed behind doors integrated with the façade design
- Service areas should be screened from view and noise mitigated as much as possible
- Noise-generating equipment at grade should be studied for acoustic impacts and appropriate measures taken to control spreading of noise within the building and into adjacent spaces.



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COLORS AND MATERIALS

A strong Colors and Materials guideline ensures the campus fits with its natural surroundings and remains coherent as buildings and spaces develop. A continuity of design intent will ensure that open spaces feel intentional and unified rather than haphazard. The concepts that follow will therefore serve as the backbone of all future color and material selections. The authors are aware that overly restrictive design guideline requirements can stifle creativity and result in lackluster campuses. With this in mind these guidelines strive for a balance of unity and diversity, for legibility without uniformity.

Color

Effective use of color can support the overall goal of a campus that feels at home in the mountainous high desert context of Black Mountain and the McCullough Range while still asserting its own presence. The site context includes the colors found in soil, vegetation, and mountains but also the unique quality of light and heat in the desert environment. White and light colors will reflect heat away from outdoor spaces and interiors – thereby supporting carbon neutral goals -- but could potentially create excessive glare. Colors selection shall therefore balance the desire for both visual and thermal comfort.

The campus Color Palette is formulated by taking direct cues from the existing natural context. Site photos are indexed and translated into an appropriate range of color options.

Primary colors are based in earth tones that blend in with the desert context. They apply to primary walls, roofs, paving, and other large surfaces, especially ones that are visible from public spaces and from a distance. They are colors that can be achieved in masonry and other integrally-finished materials without the need for paint.

Secondary or accent colors take their cues from the fleeting colors of desert flowers that animate the otherwise muted landscape. They signal the excitement and creativity of this new, manmade campus. These accent colors should introduce brightness, surprise, and delight into the manmade environment. They may be applied to window and door frames, doors, metal trim, paving at entries, sunshades, railings and other metalwork. In some cases, exterior walls that face interior courts or key entries could utilize accent colors to distinguish them from the overall public face of the campus.

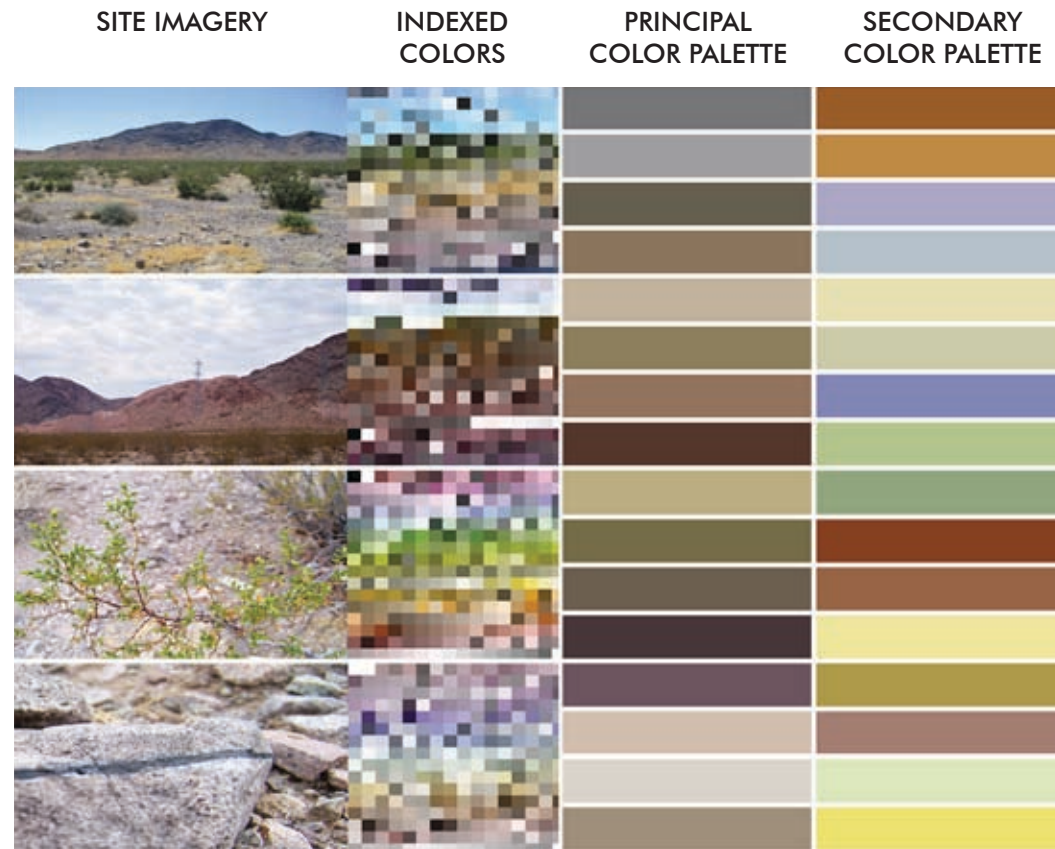
Materials

The following principles shall guide future material selections on the campus:

Durability

Materials and finishes shall be selected to limit maintenance requirements. In some cases materials can take advantage of natural weathering processes to improve their character over time. One example is Cor-Ten steel which invites rust formation as a protective coating and a rich coloration that feels at home in the desert landscape.

Figure 6.5: Color Palette



Examples of use of bright accent colors to complement muted primary, masonry-based colors. The blue wall picture and the yellow courtyard picture are examples of dramatic, surprising, delightful color within more private, exterior spaces.

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Honesty and directness

Materials whose true properties are expressed are preferred for their honesty and directness of character. Faux reproductions of stone, for example, are discouraged.

Fit with color palette

Materials need to work with the Campus Color Palette

Low carbon materials

Materials fabricated through energy-intensive processes are discouraged. Concrete with reduced cement content and high recycled content metals are preferred, for example. In addition, materials that improve building envelope performance through insulation values and thermal mass are encouraged.

Locally available

Material selection should favor locally and regionally available products to reduce transportation-related carbon impacts as well as supporting local economies

Wall Materials

Primary materials

Concrete masonry, brick, cement plaster (residential only), precast concrete panels

Secondary and accent materials

Brick, terra cotta, natural stone, weathering steel, painted metal, unfinished copper, zinc

Prohibited materials

Exterior Insulation Finishing System (EIFS), Cement Plaster (on Academic buildings), wood or cement board siding, dry stack stone

Materials Information

Concrete Masonry Unit (CMU)

This is an appropriate and cost-effective primary material. It shall be integrally-finished and must comply with the color palette. Finishes such as ground face and sandblasted which expose the inherent visual texture of the material are encouraged. Use of CMU with replacement of cement by fly ash or slag will reduce embodied carbon and should be pursued. Consistency of finish on building walls is important, especially in CMU construction. Exposed grey block stem walls at grade are not acceptable.

Concrete

Cast-in-place concrete (CIP) is not economical as a primary exterior finish but is encouraged as a secondary or accent material with a natural finish or integral color complying with the Color Palette. Tilt-up concrete is discouraged for non-utilitarian buildings. Painted concrete is not permitted.

Brick

Larger dimension brick is preferred over standard brick for non-residential buildings.

Cast-in-place concrete with integral color



Concrete masonry units in varying colors and textures



Natural stone



Rammed earth



Stone

Regionally-sourced stone is appropriate as an accent material. Stone type should be coordinated with adjacent site walls and site paving.

Rammed Earth

Rammed earth is an attractive accent wall material that provides good texture and contrast with factory-produced materials such as CMU and metals. Careful selection of the base soil material is required so that it harmonizes with the native landscape and campus color palette.

Weathering Steel

“Cor-ten” or weathering steel is encouraged on campus. The patina or rust that runs from this material should be accounted for in design to plan for intentional staining of adjacent areas or to design to avoid staining.

Finished Metal

Metal shall be factory finished and comply with the color palette. Exterior doors and frames, railings and miscellaneous similar fabrications may be site painted. All metals become hot and should be buffered away from the public.

Perforated Metal

Perforated metal or metal mesh is allowed for sunshading or to clad open air structures such as parking garages and infrastructure facilities. Screening materials may be metal fabric, perforated metal or

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other permanent and durable material that allows ventilation and visual screening. Such panels are encouraged on parking garages and infrastructure facilities where more liberty can be taken with expressive wall panels of varying transparencies and texture in order to add visual interest.

Alternative materials that comply with the color palette and spirit of these guidelines should be proposed if appropriate.

Fenestration

Glazing should be as clear as possible and non-reflective to promote transparency and visibility while meeting the performance specifications above. Some green tint (not blue-green) is acceptable to reduce heat gain while allowing in natural daylight. This green can also help balance the earth-toned color palette. Window frame material must be durable with an integrated factory finish. Frames can have an anodized finish or factory applied paint such as a Kynar process.

Glazing shall meet the following performance criteria to balance daylight harvesting and controlling heating and cooling loads:

Minimum SHGC and U-Value: 10% below adopted code maximum at time of building construction

Preferred SHGC and U-Value: 30% below adopted code maximum at time of building construction.

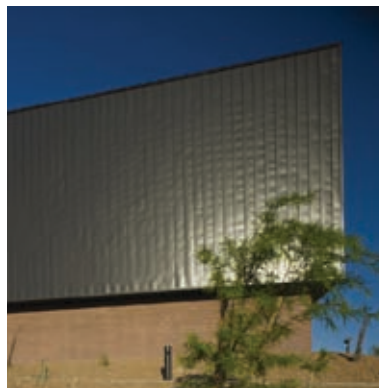
Concrete masonry units (CMU)



Cast-in-place concrete with weathering steel accent at window boxes



Painted metal panel over CMU at Liberal Arts and Sciences building on campus



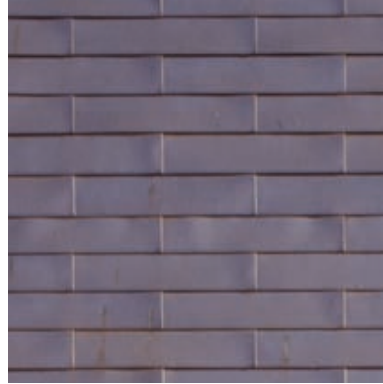
Cor-ten steel panels



Painted metal panel



Naturally-weathered copper shingles



Triple element windows – which include two air gaps separated by a low-emissivity, solar-reflective film – can provide exceptional insulation value and therefore allow reductions in active heating systems and, ultimately, renewable energy systems as part of an integrated zero energy design. These high-performance window systems should always be evaluated early in a building design process to reap the greatest cost and energy benefits

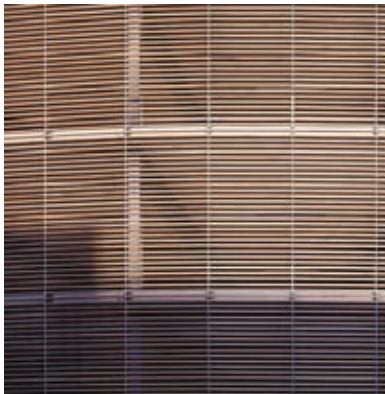
See Passive Design section for specific window-to-wall ratios by façade orientation.

Windows and doors shall be scaled according to internal programmatic needs, thereby communicating building type and use. Windows shall be set back as far in the wall plane as possible to promote a sense of wall depth and solidity and increase use of jambs and heads for shading.

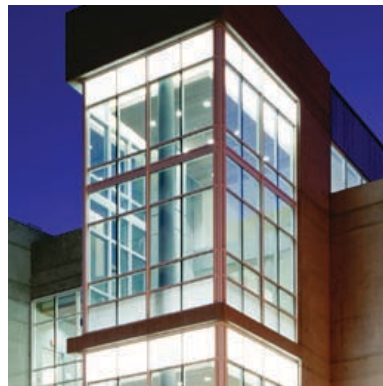
Structural Systems and Embodied Energy

Concrete offers many advantages, including potential thermal mass benefits and lower floor-to-floor heights. However, cement production accounts for roughly 8% of global CO₂ production. Therefore all concrete shall be produced using at least 25% and optimally 50% or more replacement of cement with fly ash, slag or other suitable replacement. Steel is increasingly produced with a large percentage of recycled content and therefore is relatively low in embodied energy. For appropriate building types and scale, wood is an attractive structural system due to its low cost, low embodied energy to produce, and ability to sequester carbon.

Metal screen at a parking garage



Clear glazing illuminated from within at night



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SIGNAGE

A comprehensive signage plan will provide identification, improve circulation and enhance area-wide connectivity for the Nevada State College campus. The signage program should have a unique and consistent image that reflects the environmental themes of the campus and contributes to the attractiveness of the site, in addition to providing useful information.

The following types of signage are recommended as part of the identification and wayfinding systems:

Monument Signs

Monument signs that include the Nevada State College name and NSC logotype should be located at major entrances.

Building Identification Signs

Signage should be mounted on all buildings adjacent to major entrances. The building name, and a subscript indicating building use should be visible from major pedestrian and vehicular circulation routes. Font and letter size should be consistent across the campus.

Wayfinding Signs

Wayfinding signs should be provided for pedestrians, bicyclists and vehicles at the appropriate scales and locations. The wayfinding system should include pedestal-mounted campus plans for pedestrian orientation.

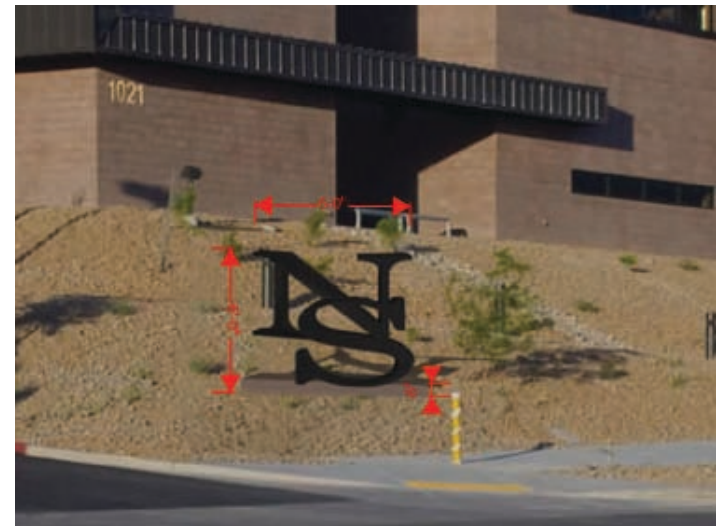
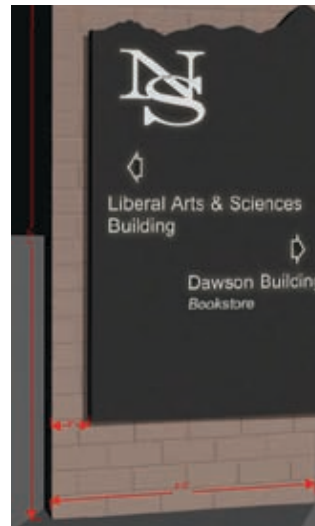
Banners

Mounting stanchions for standard size banners should be provided on lightpoles. Banners could enhance site identity in the arid and undeveloped setting and provide information on seasonal campus activities.

Regulatory Signs

Most regulatory signs have a standard design (such as the red octagon stop sign). These should remain stock, off the shelf products, but the mounting poles should be of a color and material that relates to the other signage or streetscape components of the campus.

Signage used at the Liberal Arts and Sciences building provides a starting point for a campus-wide comprehensive signage plan.



LANDSCAPE DESIGN GUIDELINES

CONTEXT

Mojave Desert

The City of Henderson is situated in Clark County and lies within the Mojave Desert, the smallest of the warm deserts of the Southwestern United States. The Mojave Desert covers over 22,000 square miles in southeastern California, Nevada and Utah and portions of northwestern Arizona. The Mojave Desert is the most arid desert in North America and receives less than ten inches of rain annually with temperatures and precipitation varying wildly in all seasons across the region. Elevation differences within the desert are extreme with the highest peak at 11,918 feet and the lowest area at 282 feet below sea level. Three fourths of the desert lies between 2,000 and 4,000 feet in elevation.

Landforms in and around Henderson consists of gentle slopes, alluvial fans, steep hills and mountain ranges. Alluvial fans are common in the Mojave Desert and are formed by arroyos traveling through the mountains and depositing detritus in a fan shape at the canyon's mouth. A bajada is formed by lateral merging and blending of alluvial fans that extend from the base of the mountain out onto the floodplain. Bajadas with finer texture downslope blend and form playas in the lowest part of the basin.

Desert soils contain a biological soil crust layer that is full of living organisms that are vital to the desert ecosystem. The crust's organisms live in the top four to six inches of soil and reduce erosion, increase water retention and increase soil fertility. The soil crust is sensitive to disturbance and human activities have harmful impacts on the biological crusts. The top 1/8th inch of the soil contains a concentration of the living biomass and once compacted the organisms can no longer encourage soil fertility and plant growth. During development of any site, the biological soil crust should be protected whenever possible.

The Mojave Desert is home to unique plants and animals that have adapted to lack of water, temperature extremes, wind and elevation. The boundaries of the Mojave Desert are delineated by the distinctive Joshua Tree, *Yucca brevifolia*, with other desert vegetation consisting of primarily low, widely-spaced shrubs such as Creosote Bush, *Larrea tridentata*, White Bursage, *Ambrosia dumosa* and low-growing cacti, Prickly-pear and Cholla, *Opuntia species*. The Mojave Desert receives most of its rainfall between November and March when moisture travels from the Pacific Ocean traveling from west to east, decreasing as it travels. When enough rainfall occurs in the winter months, the desert comes alive in spring with short-lived annual wildflowers.

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Regional Landscape

McCullough Range

The City of Henderson is approximately 94.5 square miles and is surrounded by the McCullough Range. Most of the mountains in this range are volcanic in origin and lava flows, ash falls and glassy zones are visible. Peaks are generally flat-topped with steep eastern escarpments and gentle western slopes. The Range combines plants from Mojave and Sonoran deserts with primary vegetation including Creosote Bush with Barrel Cactus, Joshua Trees, Cholla and Prickly Pear. The North McCullough Wilderness Area is within the Sloan Canyon Conservation Area. The Mojave Desert wildlife consists of Desert Tortoise, Nelson Bighorn Sheep, Chuckwalla Lizard, Gambel's Quail and Chukar.

Sloan Canyon National Conservation Area (SCNCA)

SCNCA is a National Conservation Area administered by the US Bureau of Land Management (BLM) and consists of over 48,400 acres of land with unique geologic features and remarkable cultural resources. The northern portion of SCNCA is located three miles due west of NSC campus and the main entrance to the area is off of Interstate 15 on Sloan Canyon Access Road. Sloan Canyon contains more than 300 petroglyphs with 1,700 individual design elements created by native cultures. Hiking, biking and horseback riding are welcomed on existing roads and trails. SCNCA lies west of the Nevada State College site and extends south to include the northern portion of the McCullough Range.



Figure 6.6: Warm Deserts of the Southwestern United States

LEGEND

-  Mojave Desert
-  Sonoran Desert
-  Chihuahuan Desert



(lower)
Desert tortoise.

Multi-Species Habitat Conservation Plan (MSHCP)

Nearly 89 percent of land in Clark County is owned by the United States and managed by seven Federal agencies: Bureau of Land Management (BLM), National Park Service (NPS), U.S. Fish and Wildlife Service (USFWS), U.S. Air Force, U.S. Forest Service (USFS), Bureau of Indian Affairs and the Federal Aviation Administration (FAA). The remaining eleven percent is owned by the State of Nevada, local government and private parties.

MSHCP is an extension of the Clark County Desert Conservation Plan (DCP), which focuses primarily on the conservation of the desert tortoise, a federally designated threatened species. The MSHCP expands the scope of conservation to include a wide range of biological resources. The key purpose of the MSHCP is to achieve balance between conservation and recovery of natural habitat and native species, and beneficial land use that supports a vibrant, economically sound and culturally rich community.

There are four basic conservation management categories in the MSHCP and they are as follows:

- IMAs: Intensively Managed Areas
- LIMAs: Less Intensively Managed Areas
- MUMAs: Multiple Use Managed Areas
- UMAs: Unmanaged Areas.

Most of the City of Henderson falls within an Unmanaged Area, yet the BLM land surrounding the City is designated as Multiple Use Managed Area

and Intensively Managed Area. Although the City is considered an Unmanaged Area, the NSC campus has established sustainability goals, benchmarks and aspirations that will exceed the conservation category requirements. These goals encourage sensitively designed and managed spaces that respond to the climate and environment and will also encourage, enhance and improve spaces for wildlife and humans to cohabitate.

Open Space and Trails

Nevada State College's site is cradled on the south, east and west by open space which provides immediate access to the mountains and trails. In December 2005 the City of Henderson adopted an Open Space and Trails Plan to protect special places, provide accessible trails and conserve natural resources. This plan was incorporated in the City's Comprehensive Plan and follows the guiding principles of developing open space adopted by the City in February 2004. The City has the beginnings of a network of open space and trails but the system is somewhat disconnected. A primary goal for the Open Space and Trails Plan is to provide connectivity through protected areas and the built environment to provide users with complete trails that offer areas for recreation and enjoyment of the natural environment. The NSC campus, with its network of pedestrian pathways and multi-use trails, can be an important linkage in this system.

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GUIDING PRINCIPLES

The following principles shall guide future development of campus landscape design:

1. Site and landscape design shall be **appropriate to the local desert climate**. Outdoor spaces shall be designed to ameliorate the climate by providing shade and by capturing breezes.
2. Site, landscape and building design shall **create a sense of place that is of the desert**. Materials, colors and design implementation shall respond to the site and the region.
3. Outdoor spaces shall **respond to the architecture** and provide an extension of indoor spaces. The desert climate provides opportunities to socialize, gather and learn outdoors and the design of outdoor spaces shall provide comfort and protection.
4. The planning and design of the campus shall **protect, preserve and celebrate the desert environment**. Choosing native materials wherever feasible provides desert color and texture that blends seamlessly with the adjacent natural environment. Preserving and enhancing existing drainageways provides open space corridors that support wildlife habitat.
5. **Water shall be treated as a precious resource** and native and drought-tolerant planting that minimizes water usage shall be implemented throughout cam-



(upper)
Existing mountains and campus landscape provide color and texture to emulate.

(lower)
Outdoor rooms provide areas to gather, study or socialize.



(upper)
Shaded seating areas provide protection from the desert sun and climate.

(lower)
Courtyards respond to architecture and provide outdoor rooms.

pus. The design of irrigation systems shall be effective, efficient and connected to local weather stations to respond to current conditions.

6. **Local and regional materials shall be used** to reinforce sense of place, minimize transportation costs and environmental impacts of acquiring materials from outside of Nevada, and support the local economy.

7. Landscape and site design **shall employ design measures and materials that support integrated stormwater management.** Porous paving materials in courtyards, pedestrian circulation paths and parking lots allow water to infiltrate and recharge the groundwater system. Vegetated swales and stormwater planters shall be integrated into designed spaces and the open space framework

8. Utilizing local plant materials that grow naturally in the Mojave Desert will **minimize water and chemical use and will lower maintenance.** The campus landscape should be resilient to heavy use, respond to climate extremes and require cost effective maintenance.

6 design guidelines

CAMPUS OPEN SPACE

Introduction

The desert landscape provides a unique environment for the Nevada State College campus where natural features are celebrated and enhanced throughout the site. Existing arroyos are integrated features that weave through the campus connecting adjacent open spaces and providing wildlife corridors. The informal edges of the natural landscape juxtapose the formal alignment of buildings and the regular terracing of the landscape up the hill. The mountain ranges to the south and east cradle the site and connect the campus to the larger regional open space network, thus providing continuous refuge and habitat for wildlife while connecting users to the desert landscape.

Role of Open Space and Landscape

The Open Space Framework for the campus provides a variety of spaces to meet the immediate needs of campus life while anticipating and planning for future growth and expansion. A network of spaces and promenades accommodate special functions, informal events, pedestrian movement, studying, recreation, casual sports and socializing. The Open Space Framework not only supports residential and academic life, but it also connects to and celebrates the natural environment. Sustainability plays a key role in the design of open spaces and will be discussed further in the landscape concepts and guidelines section.



(left)
Pedestrian malls are part of the major campus-wide open space and provide circulation routes throughout campus.



(lower)
Courtyards are part of the major campus-wide open space and provide areas to gather, study or socialize.

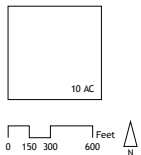
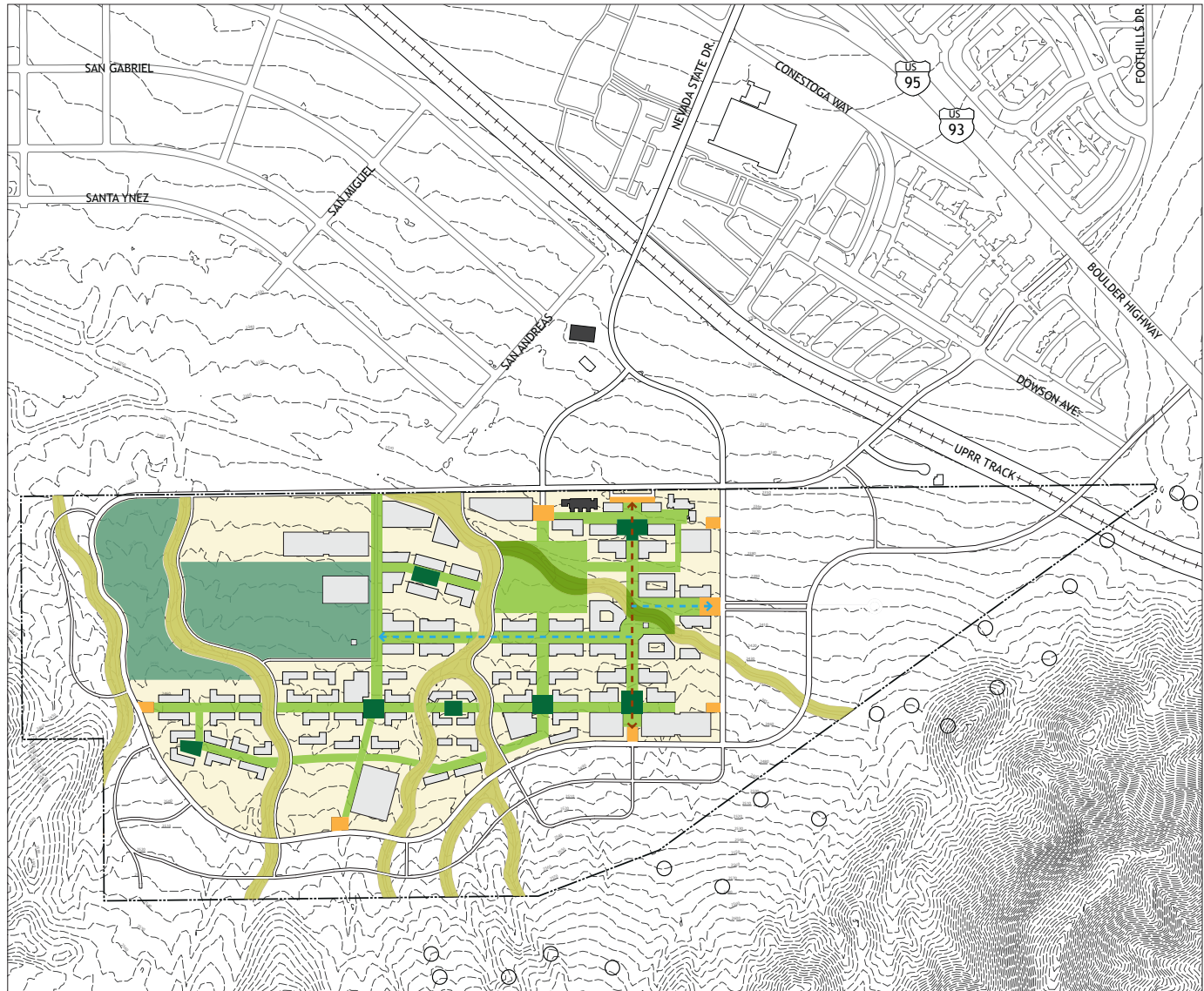
Figure 6.7: Open Space Framework Plan

LEGEND

- College Site

- Open Space
- Desert
- Arroyo
- Major Campus-wide Open Space
- Major Quads
- Entry Plazas
- Recreation Fields

- Major North/South Axis
- Major East/West Axis



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Characteristics of Open Space

Campus open space is defined by: existing conditions and natural environment, building layout and use, pedestrian movement and distance, and potential program. A hierarchy of spaces caters to a wide variety of uses and creates diversity on campus, while promenades and circulation paths create linkages that enhance the pedestrian experience. Quads, central gathering spaces and courtyards provide places that support the social aspects of the campus and provide areas for campus events, casual sports, lounging and socializing. Landscaped spaces and places create respites from the classroom and dormitory and provide comfort in the desert climate.

Open Space Framework Plan

The open space framework plan, shown in Figure 6.7, is defined by five major open space types and pedestrian circulation. The types of open space are as follows:

- Arroyos
- Major Campus-wide Open Spaces
- Quads
- Entry Plazas
- Recreation Fields.

The following section describes in more detail the characteristics of each open space type and the potential uses.



(left)
Enhanced arroyos with desert trees, shrubs and rocky groundplane.

(lower left) Natural arroyo with spring bloom.

(lower right) Arroyo enhanced with shrubs and trees.





(upper)
Courtyard space defined by building facade. Shade structure and seating provide areas to gather.



(lower)
Promenades with shade trees, pedestrian lighting and seating provide comfortable circulation routes within campus.

Desert

The existing desert landscape is the backdrop and canvas from which enhanced open spaces and buildings emerge. The existing site slopes up to the adjacent mountains at a 5% grade with sparse vegetation of creosote bush and intermittent yucca. The warm tones of the desert soil and vegetation coupled with the rich colors of sky and mountain provide a palette to compliment and enhance. In some areas of campus where proposed buildings and spaces meet the existing landscape, the natural condition should be preserved. Allowing the desert landscape to frame buildings and spaces creates a seamless transition from the developed site to the natural landscape. The desert landscape covers sloped terraces, spaces between buildings or spaces adjacent to enhanced open spaces. The desert palette establishes a baseline landscape treatment to build upon.

Arroyo

Existing arroyos provide natural fingers that penetrate the campus and embrace the more formal spaces. These natural drainageways are integral to mountainous desert landscapes and their existence on site is celebrated and protected. The arroyos become linear parks that connect campus spaces, provide pedestrian and vehicular access and create areas of respite and connection to open space. The arroyos are also important wildlife habitats that provide desert wildlife with shelter and food along uninterrupted corridors. Preserving the arroyos as they enter the campus site allows for critical connec-

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tions to be made to the natural landscape beyond the campus property.

Major Campus-wide Open Space

Major Campus-wide Open Space defines the academic core and provides access to adjacent open spaces and buildings. The north/south axis, which leads into the campus from the main entry, provides a central spine to connect buildings with spaces and to form larger public open spaces by responding to building alignments. Formal walkways and grand stairways present iconic entries and provide circulation through the academic core. As the central spine traverses the terraced graded site, views are directed to adjacent mountains and to the future town center. An east/west axis provides outdoor rooms and spaces within the academic core and connects to the central arroyo on the site and to the recreation fields. Other secondary axes form the connective fabric on campus from the academic core to residential areas, open spaces and recreation fields.

A variety of design treatments are anticipated within the major campus-wide open space category that depend on program, adjacent building use and overall campus open space design. Within the campus wide open space are courtyards, promenades, pedestrian walks and features such as the amphitheater.

Major Quads

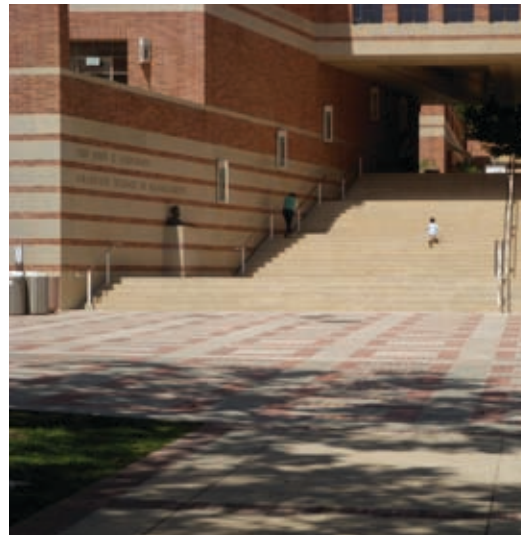
A collection of quads are planned for the campus to provide variety of scale for different uses. Centrally



(upper)
Formal entry plazas allow space for public art.

(lower left)
Grand staircase creates prominent entry to campus.

(lower right)
Open quads provide areas for respite or casual play.





(clockwise from upper left) low concrete seatwall forms gathering space, outdoor dining spills out onto the plaza, quads provide open space for events and socializing, courtyards respond to building entries and create shaded outdoor spaces.

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located quads within the academic core are larger, social spaces that can accommodate campus-wide events such as orientation, graduation and fairs. The smaller quads are in the residential villages and are formed by building edges. These social gathering spaces provide ample room for casual recreation and socializing.

There will be one primary quad within the academic core of phase one and it will be the prominent open space for the campus in the early years of development. The space will be versatile with the ability to accommodate a variety of events and uses. Due to its central location and proximity to the main campus entry, the main quad will create a sense of arrival and place. Its role as an iconic place should inform its design and relationship to buildings and main pedestrian promenades.

Entry Plazas

The prominent entry to the campus will be on the north side of campus on Paradise Hills Drive. Distinguished buildings anchor the space, define edges and welcome visitors to campus. A grand staircase rises from the entry and leads to the primary quad in the central core. This entry will be more formal and grand in design and due to its role in providing the initial impression of campus, the design should respond with place making elements that evoke the desert community and landscape. This entry is also important because it is a link to the town center and thus the design should be open and inclusive and

should not turn its back on the wider community.

As the campus and the surrounding areas develop an additional prominent entry will occur on the east side of campus. Direct access to the site will be available off the freeway and the roadway will culminate at an entry to campus. This entry will lead visitors and the campus community to the nexus of campus where the existing arroyo meets the built environment. The open space at the center is a central focal space as well as a crossroads of main pedestrian promenades.

Secondary entries are planned on the perimeter of the campus to accommodate students, staff and regular visitors. They provide access to academic areas, residential villages and parking. Although these entries are less formal than the main entries their design should include consistent place making elements, arrival amenities and wayfinding.

Recreation Fields

Open athletic fields and courts are located on the north west side of campus and provide areas of active, collegiate sports.

LANDSCAPE CONCEPTS

Overall Concept

The vision for the Nevada State College campus is to create a place that is “of the desert.” The landscape will embrace the existing desert setting and allow it

Figure 6.8: Landscape Concept Plan

LEGEND

--- College Site

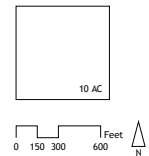
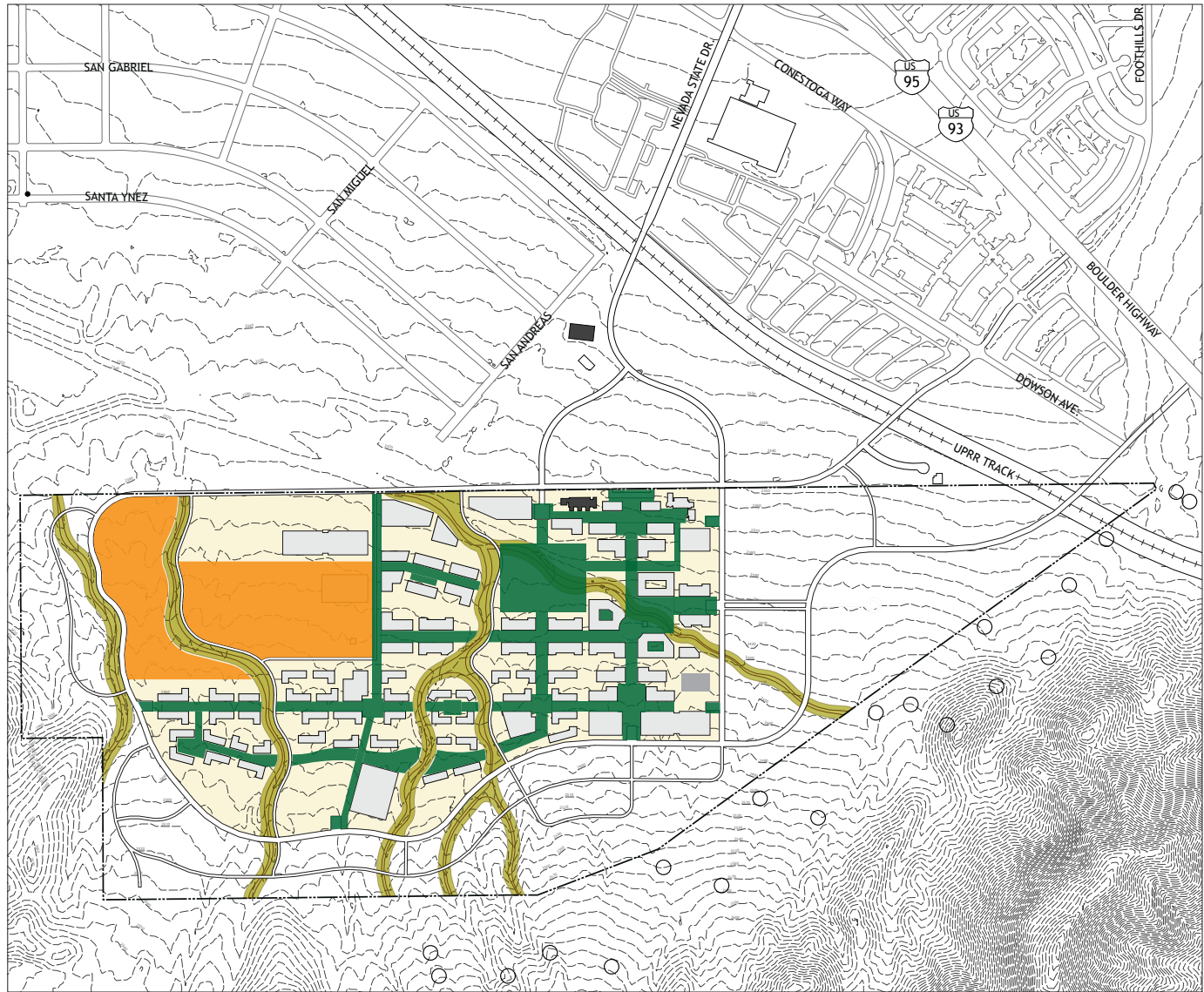
Landscape Concepts

Desert

Arroyo

Intense

Recreation



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to inform design decisions, materials and plant palettes. The drainageways that are indicative of mountainous desert landscapes weave through campus providing interesting existing patterns and defining edges and spaces.

Climate plays a key role in the distinct ecosystem of the Mojave Desert and is integral to the planning and design of campus open spaces and their relationship to buildings and the natural environment. During the winter warm days are followed by cool evenings and the landscape can help celebrate warm days and mitigate temperature extremes. Site and landscape design objectives preserve, protect and enhance the existing desert landscape where possible and outdoor spaces should be designed to ameliorate the climate by providing shade, shadow, texture, and by capturing breezes. The recommended plant palette draws from the native desert landscape, responds to the unique climate and setting and is sensitive to water conservation.

There are four landscape typologies that are tailored to specific areas on site, to the relationship to indoor / outdoor spaces, and to program and building location. A consistent desert plant palette is planned throughout campus to unify the site, connect it to the desert landscape and provide a sense of place. Areas of intense planting is planned for entries, courtyards, quads and portions of the pedestrian promenades. Accent planting within these areas will provide seasonal color, focal points and protection from the desert climate. The arroyos are prominent existing features that weave through campus softening the



(upper)
Existing desert
landscape.

(lower left)
Sunlit Cholla.

(lower right)
Enhanced desert
landscape.



edges of development. The four landscape typologies are as follows:

- Desert
- Arroyo
- Intense
- Recreation.

Landscape Concept Elements

Desert

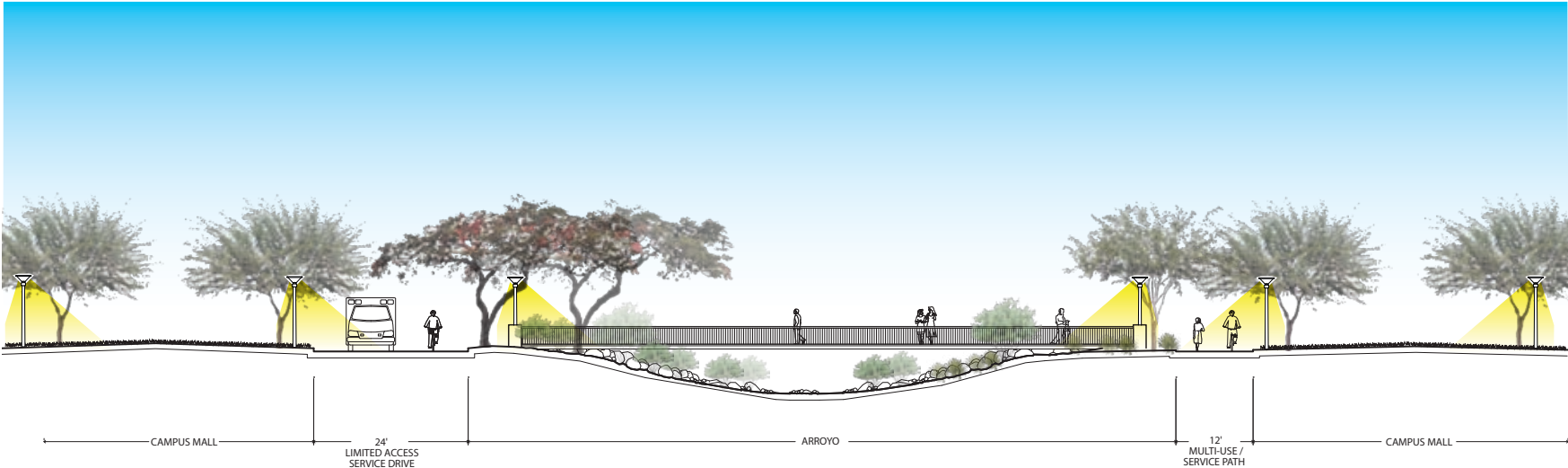
The desert landscape, as mentioned in the open space section, is the baseline canvas of landscape treatment. The existing site consists primarily of Creosote Bush, White Bursage and an occasional Yucca. The desert landscape as applied in the land-

scape concept plan shall consist of vegetation and groundplane treatment that can be found in the Las Vegas Valley which will add more diversity to the existing desert landscape on site. An approved plant list is included in this document. The desert landscape is the dominant landscape on campus with native and drought-tolerant plants spaced informally to soften edges of buildings and outdoor rooms and to blend with the existing adjacent desert.

Arroyo

Existing arroyos provide natural fingers that penetrate the campus and embrace the more formal spaces. Existing arroyos are enhanced and enlarged

Figure 6.9: Landscape Section at Arroyo



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to become linear parks that provide gathering spaces, nodes and areas of respite. Design of these spaces should be informed by climate, views and connectivity. Roadways, service roads and multi-use trails line the edges of the arroyo and provide circulation routes through and around campus. Additional native trees and shrubs found in natural washes are planted informally at the middle and top of slope. Dry, desert groundplane, consisting of rocks of varying sizes and desert soil, low shrubs and groundcover stabilize banks and blend seamlessly with existing arroyo.

Intense

Spaces that accommodate a higher intensity of use shall be designed appropriately to the program and use of the space. Throughout campus there will be a variety of outdoor spaces which be treated with varying degrees of intense planting, hardscape materials, site furnishings and lighting. Major campus-wide open spaces, quads, courtyards and entry plazas all fall within the intense landscape treatment category. There are varying levels of intensity dependant on the design goals of the space. The intense landscape creates formal allees, frames larger public spaces, lines grand stairways, shades courtyard gardens and consists of plants that provide shade, accent color, form and texture. Due to the influence of climate on outdoor spaces the landscape will have a key role in making comfortable places. Within the intense landscape there is a wide range of design possibilities to allow flexibility in future design work and to create unique, special places on campus. The ornamental



(upper)
Ornamental desert planting defines walkways and provides accent color.



(lower left)
Desert trees provide a shaded canopy in a plaza.

(lower right) Shaded courtyard with seatwalls and raised planters.



Figure 6.10: Landscape Section at Phase One Promenade

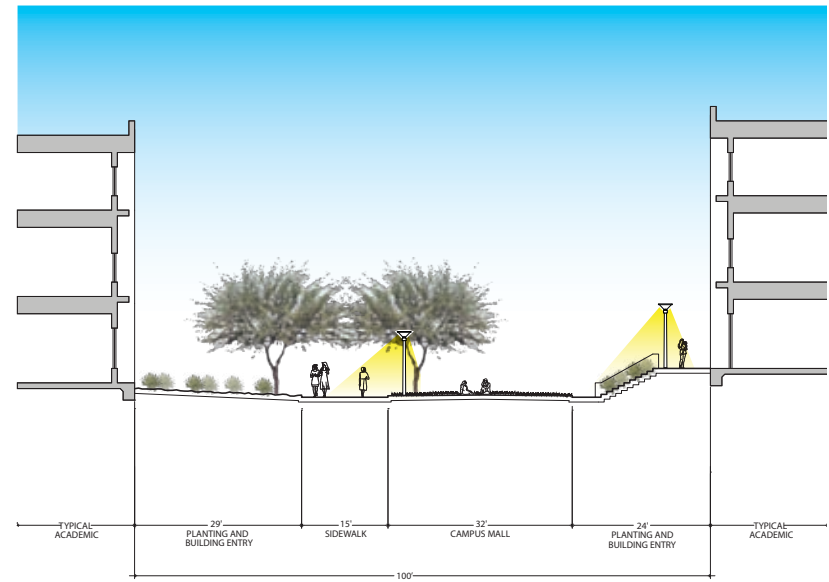
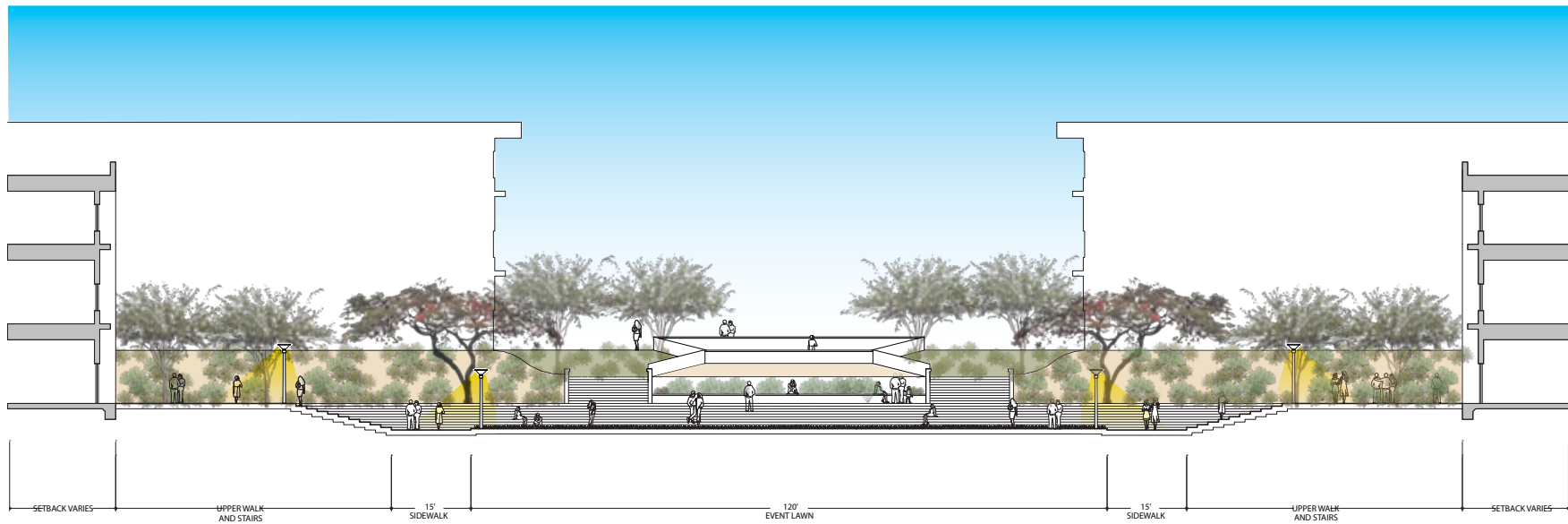


Figure 6.11: Landscape Section at Phase One Main Quad



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planting on one end of the intense spectrum consists of desert flowering trees, shrubs and groundcover and is planted in regular alignments with a simple plant palette and close spacing. Spaces using highly intensive landscape may include accent paving, a water feature, art or sculpture. The plants used in these spaces may require more water for irrigation but should still adhere to the sustainability goals and water budget established for the campus and specific areas. On the opposite end of the spectrum are spaces that are informal and create natural outdoor spaces and rooms. Natural materials blend with desert plant material which is spaced informally and further apart with loose, low shrubs and groundcover. Desert rocks and soil weave through groundplane planting and blend with the adjacent desert landscape.

Courtyards fall within the intense category and provide appropriately scaled spaces that connect indoor / outdoor uses by creating more intimate, shaded areas to gather, socialize and learn. Courtyards respond to building facades, entries and solar orientation. Courtyards will vary throughout campus and the diverse plant palette and hardscape materials recommendations help inform design decisions while offering flexibility to create unique spaces. Refer to Building guidelines for additional courtyard design parameters and landscape design guidelines for materials and color selection.

Pedestrian promenades usher students, staff and visitors through campus and provide a pleasant experi-

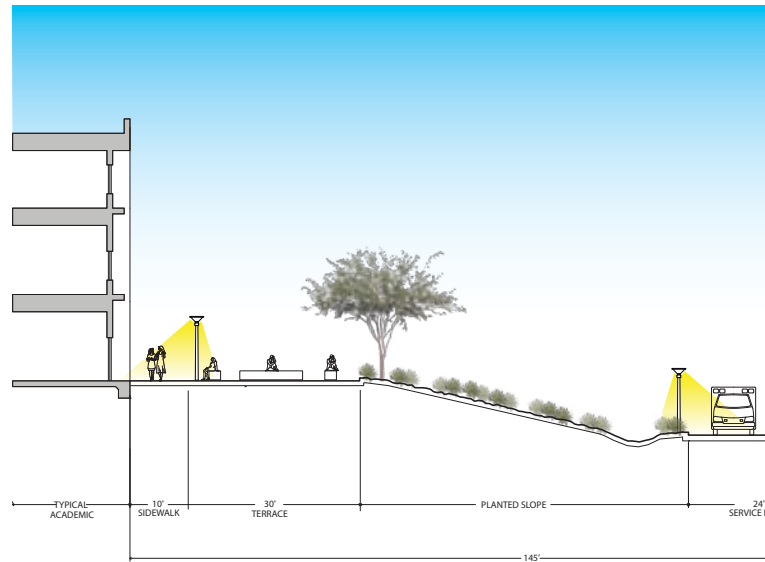


Figure 6.12: Landscape Section between Academic Buildings with Graded Terrace and Service Road



(lower)
Ornamental desert plants make good accents in courtyard planting.

(clockwise from upper left)
Vibrant spring blossoms on Globemallow, existing desert landscape provides color palette inspiration, desert sky lends blues and purples to the palette while vegetation adds warm tones of brown, green and yellow.



ence that varies between campus areas and creates focal points and linkages to major open spaces, academic buildings and residential villages. Informal pedestrian bridges are the connective fabric on campus, providing pedestrian access across arroyos and directing views to the mountains or to architectural elements on campus. The bridges respond to the existing landscape and become focal points that provide a change in the pedestrian experience.

An amphitheater is centrally located in the academic core and is a featured open space on campus. It is on axis with a secondary entry and provides a focal point to the south. Seating is terraced with the grade and the lowest area of the amphitheater blends with the existing arroyo, thus merging and expressing the natural with the built environment.

Throughout campus there are opportunities to implement accent landscapes that provide a contrast between the open desert and the campus landscape. A desert grove could be implemented in areas to provide a canopy of shade that integrates building masses into the landscape. A wildflower meadow along the south edge of campus could create a spring feature when dormant seeds bloom vibrant colors after a winter rain.

Recreation Fields

Active recreation and sports fields are open spaces with appropriate planting or hardscape for chosen athletic program.

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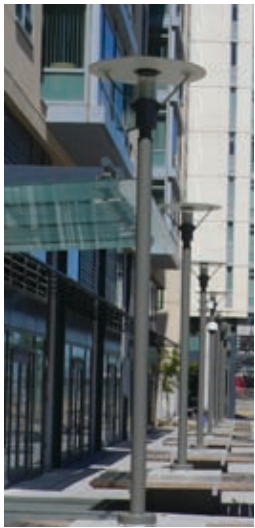
COLORS AND MATERIALS

In creating a campus of the desert, the colors and materials used in the design of outdoor spaces should respond to and complement the existing physical setting and be in harmony with the architecture to create a cohesive place. A warm, muted toned color palette should inform design decisions and material choices. Locally found, desert tones with occasional, restrained accent color are encouraged. Color should come from the inherent natural color of a material. The colors of the desert vary depending on time of day and season and can provide a change in quality throughout the year. See Building Guidelines, Campus Color Palette.

Local and regional materials should be implemented whenever feasible to reinforce the desert environment, reduce costs and environmental impacts on transporting goods and to support the local economy. Porous pavement is encouraged to allow for infiltration during the infrequent rains and for possible excess irrigation runoff. A hierarchy of paving material is anticipated throughout campus to provide consistency along promenades and pedestrian walks, while allowing flexibility to implement accent paving in special places. It is recommended that a few materials be chosen and implemented throughout the campus site to unify the campus. Such an example would be integral colored concrete walkways and paths with an accent paving along the edge. These paths would weave throughout campus and reinforce a sense of place. The following material options and



(clockwise from upper left)
Decomposed granite paving, accent stone paving, exposed aggregate paving with concrete bands, concrete pavers with band pattern, concrete landscape walls.



(clockwise from upper left)
Discrete lighting located in concrete bench wall,
contemporary fixture, bollard lighting, contemporary
fixtures with partial cut-off.

locations are encouraged:

- **Stabilized decomposed granite:** informal walkways, multi-use trails, courtyards, residential quads, under benches along promenades and in service areas.
- **Porous concrete:** parking lots, service roads and pedestrian walks.
- **Interlocking pavers:** entry drives or access roads of significance, plazas and courtyards.
- **Concrete pavers:** plazas and courtyards.
- **Concrete with integral color or exposed aggregate:** pedestrian walkways, entry plazas, promenades, quads and courtyards. Integral color and aggregate shall adhere to color guidelines.
- **Concrete:** walls, benches and signage.
- **Gravel:** informal walkways, courtyard gardens and residential quads.
- **Stone:** plazas, accent areas, building entries and courtyards.
- **Accent bands:** accent paving is encouraged in main promenades to provide consistency of material to create a uniform thread throughout campus.
- **Benches:** one type of bench along main promenades, malls and main quads is encouraged to provide consistency, while a diversity of benches and tables is recommended in courtyards, terraces, residential quads and along arroyos to help create unique spaces. Flexible seating is encouraged in select quads, courtyards and residential areas.
- **Metal:** signage, railings, benches. Corten, weath-

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ering steel, powder coated metal in muted colors, naturally weathered copper is encouraged. Shiny metals are discouraged. See Building Guidelines for metals as well.

LIGHTING

The lighting design objectives are to:

- Preserve the dark sky by minimizing the amount of exterior lighting without compromising safety
- Utilize light fixtures that complement the architecture
- Provide pedestrian-scaled lighting in the interior campus and vehicular-scaled lighting along roadways and access drives
- Provide safety
- Minimize impact on wildlife habitats.

Guidelines:

- Exterior building lighting shall be the minimum needed to provide general illumination and security at entries, courtyards and other outdoor spaces.
- Exterior site lighting shall have partial cut-off and be directed onto pedestrian walkways and provide ample security lighting in parking lots and surrounding residential buildings.
- Uplighting is discouraged to preserve the dark sky.
- Light fixtures shall complement the architecture and be contemporary in design. A consistent fixture is encouraged for pedestrian use and a similar fixture that complements the pedestrian



(upper)
Shade structure with photovoltaic panels provide shade for cars and collect energy for use.

(lower left)
Shade structure materials complement architecture and provide pedestrian comfort.

(lower right)
Planted wood trellis provides informal shade.





fixtures should be used for roadway / service areas.

- Specialized lighting is encouraged in courtyards and garden spaces to create unique places.

SHADE STRUCTURES

The shade structures design objectives are to:

- Incorporate landscape structures which help ameliorate the climate
- Design landscape structures that are extensions of the architecture and complement architectural style
- Design shade structures that can support photovoltaic panels where feasible
- Design shade structures that reduce albedo effect at parking lots and curtail glare from car windows
- Design shade structures that create spaces and enhance pedestrian experience.

Guidelines:

- Color and materials shall be consistent with building materials guidelines.
- Scale and height of landscape structures shall complement the architecture and provide ample shade for pedestrians.
- Shade structures locations on site shall be informed by solar orientation and building design.



(upper)
Enhanced desert planting adds accents such as prickly pear and cactus.

(lower)
Trees provide ample shade along pedestrian promenades.

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PLANTING

The planting design **objectives** are to:

- Utilize plant communities that reflect and blend with the existing desert environment
- Utilize plant materials to frame views, create outdoor spaces and ameliorate the climate
- Utilize plant materials to create sense of place and unique spaces
- Revegetate disturbed desert landscape with native plants.

Guidelines:

- Plant materials should be used to provide shade, texture, color and interest in the landscape.
- Shrubs should be used to define edges and spaces and can be used as low walls.
- Trees should be used to frame views or soften building edges.
- Native vegetation: areas of disturbance due to development or site grading that are to be returned to the natural desert landscape shall implement the native revegetation plant palette (see list).

Plant lists have been established for Nevada State College: an Approved Plant List, a Prohibited Plant List and a Revegetation List (see Tables 6.1-6.5). The approved plant list is provided to ensure the existing desert landscape character is maintained and enhanced appropriately. The list includes plants that thrive in the desert environment with little to no water usage, as well as more ornamental plants that require low to medium water usage. High water use



(upper)
Native trees provide dappled shade and texture.

(lower)
Shade trees and ornamental grasses soften building edges.

plants are discouraged because they do not support the campus place making goals nor do they adhere to the sustainability mission.

The prohibited plant list is provided to discourage use of invasive plants that compete with native, drought-tolerant desert plants.

IRRIGATION

Irrigation objectives are to:

- Utilize irrigation systems that provide efficient water coverage and minimize water usage and runoff
- Ensure irrigation systems that have low maintenance and are easy to service
- Utilize automated systems that respond to plant types and hydrozoning.

Guidelines:

- Temporary irrigation may be used in areas that are being revegetated or have native desert plants.
- Irrigation to have programmable zones to encourage efficiency and allow for hydrozoning.
- Irrigation system to be designed effectively and not cause overspray onto paving or cause excess runoff.

STORMWATER MANAGEMENT

Managing stormwater in an arid climate is challenging due to the infrequency of rainfall and the intensity of rainfall events. An integrated approach to stormwater management will respond to the climate and existing site, implement aesthetically pleasing control measures that benefit the overall ecosystem, enhance campus design and manage water quality and quantity. This section discusses sustainable stormwater management practices through three control measures: source control, runoff reduction and treatment control. Whenever feasible, the solution with the least impact should be implemented to ensure sustainability goals of the campus are being met and exceeded, where possible. Based on stormwater capacities and collection requirements a variety of solutions should be evaluated to ensure flood requirements are being met with sustainable goals and methods in mind.

The stormwater management **objectives** are to:

- Implement an integrated approach to stormwater management that provides aesthetically pleasing control measures, manages water quality and quantity, improves drainage patterns and creates wildlife habitat and natural features
- Implement source control measures to stop pollution at its source
- Reduce runoff close to the source by promoting infiltration, minimizing impervious sources and separating impervious sources.
- Implement smaller treatment control measures throughout the site to integrate sustainable practices

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throughout campus.

- Install construction site Best Management Practices (BMPs) during construction to control surface water quality.
- Adhere to regulatory requirements at the State and Federal levels.

Existing Drainageways

The existing site contains natural drainageways that enter the site on the south side of campus and traverse the site to the northwest. These arroyos are natural features indicative of mountainous desert landscapes and provide a depressed area where water can flow during heavy rains and flash floods. Since the arroyos are natural features to be utilized and celebrated, the stormwater management plan should maintain, enhance and replicate the existing drainage characteristics. An integrated approach to stormwater management benefits campus life, provides environmental benefits and connects the campus to the larger regional context.

Utilizing existing site features creates a sense of place that marries stormwater management with campus recreational use and wildlife habitat. The arroyos and naturalized drainage patterns provide opportunities for trails and circulation systems and create continuous wildlife corridors. The environmental benefits of preserving and enhancing natural features allows stormwater quality features to be integrated into the site design and will help maintain and improve pre-development drainage patterns. Allowing stormwater



(upper)
Water travels in existing arroyos from mountain range to the south.

(lower)
Proposed drainageways can be integral landscape elements while providing natural open spaces.



(upper left)
Signage helps inform the campus community that inlets drain to creeks and other water bodies.



(upper right)
Stormwater can be directed from parking lots into vegetated swales for pollutant filtration and water infiltration.



(lower)
Rocky swales can be integral parts of the landscape.

management techniques to be expressed above grade, instead of channeled in below grade structures, provides the campus community with educational opportunities to promote sustainable practices.

Source Control

Source control measures are employed to prevent pollutants from coming in contact with site runoff and entering the storm drain system. Controlling pollution at its source minimizes mitigation needed downstream to treat and cleanse water. The areas of concern on campus where design measures should be implemented to control pollutants are maintenance facilities, service and loading areas and waste management areas.

Guidelines:

- Install appropriate paving material that doesn't allow pollutants to infiltrate the groundwater supply
- Grade paving with little to no slope so minor spills can be contained
- Provide signage at maintenance facilities, loading areas and waste management areas
- Provide storm inlet markings and signage to inform and educate campus community.

Runoff Reduction

The principles of reducing runoff is to decrease the amount of water runoff due to development and the increase in impervious surfaces. Runoff can be reduced through design techniques that infiltrate, filter, store, evaporate, and detain runoff close to its source.

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Runoff reduction measures can be implemented throughout campus in many locations rather than designing one large detention or retention basin. Runoff controls can be integrated into site landscaping including: paved areas, planting beds, along streetscapes, adjacent to parking lots and in parking lot planters. By reducing the volume of runoff, potential downstream degradation and erosion can be minimized and mitigated.

Guidelines

- replace conventional impervious surfaces with pervious surfaces such as: porous pavement, pavers, gravel and decomposed granite
- implement vegetative roofs instead of traditional impervious materials
- separate impervious surfaces from storm drain inlets with planting to redirect water through vegetation before entering the system
- roof drains can be disconnected from the storm drain system and directed across vegetation or into surface infiltration devices

Treatment Controls

Treatment controls are engineered devices and landscape elements that remove pollutants from site runoff prior to entering the storm drain system. Directing water towards these devices and landscaped areas slows the velocity of water allowing pollutants to settle, minimizes sediment accumulation and encourages infiltration and recharge of the groundwater supply. Encouraged treatment devices include: detention basins, infiltration basins, stormwater



(upper and lower)
Arroyos provide drainageways through campus and create open space amenity.



(upper)
Infiltration trench can line roadways as natural planting buffer to blend with existing environment.

(lower)
Stormwater planters provide areas for excess water to collect, filter and infiltrate.



planters, swales and vegetated filter strips.

Guidelines

Detention Basin

A detention basin is designed to hold stormwater runoff from small storms and release runoff slowly after filtration has occurred.

- Implement dry storm water detention basins to temporarily detain water during heavy rains or flash flood events
- Design detention basins to be aesthetically-pleasing landscape elements with natural forms
- Allow joint uses, such as passive recreation, open space and wildlife habitat in detention basins so they become an integral part of the campus
- Plant detention basin with native, drought-tolerant plant material to blend with existing desert landscape and college campus.

Infiltration Basin

An infiltration basin is a shallow basin designed with naturally pervious soils.

- Design infiltration basin to be a shallow earthen basin with planted vegetative edges and appropriate infiltration rate and permeability
- Integrate infiltration basins into open spaces, planting buffers and natural areas
- Infiltration basins should not be used for recreation or active park area
- Follow design standards for infiltration basins to ensure permeability.

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Infiltration Trench

An infiltration trench is a narrow, linear basin designed with naturally pervious soils.

- Locate infiltration trenches along roadways, trails or paths
- Direct runoff from impervious surfaces into infiltration trench
- Design trench edges with natural lines to blend with landscape and to respond to existing desert landscape.

Stormwater Planter

A stormwater planter is a low-lying vegetated planter that receives runoff from adjoining paved areas or roof drains.

- Implement stormwater planters near buildings and paved areas to assist in managing runoff from roof drains and paved surfaces
- Integrate planter into the design of landscaped spaces and outdoor rooms
- Utilize hardscape materials that compliment adjacent spaces and buildings
- Utilize appropriate plant materials that can withstand periods of drought and sudden rain events
- Locate planters in parking lot medians.

Vegetated Swale

A vegetated swale is a wide, shallow, depressed area that is planted with vegetation that can assist in filtering runoff from adjacent surfaces. A swale collects stormwater along the ground surface to slow the velocity of water which improves water quality through



(left)
Stormwater management that expresses itself above grade offers opportunities for community education.

(lower)
Stormwater planters provide areas for excess water to collect, filter and infiltrate.





(upper)
Water from disconnected roof leader enters pervious surface and filters water before discharge to porous pavement.



(lower)
Stormwater planters provide areas for excess water to collect, filter and infiltrate.

filtration and recharges the groundwater supply through infiltration.

- Direct runoff from impervious surfaces into graded swale
- Select areas on site where topography has a shallow slope
- Integrate swales into landscaped buffer areas, along parking lots, along recreation fields, roadways, trails and paths
- Design swale with an informal alignment to blend with topography and existing desert landscape
- Utilize appropriate plant materials that can withstand periods of drought and sudden rain events
- Utilize temporary irrigation to establish plant material, if necessary
- Integrate swale into landscape design as an amenity or design feature
- Select plant material that is low-maintenance and has qualities necessary to remove pollutants from runoff and allow infiltration to occur
- Gently slope sides of swales to reduce erosion
- Slope parking lot pavement towards swale
- Slope pedestrian walkways towards planting areas
- Avoid soil compaction to allow for proper infiltration

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Clockwise from upper left: Acacia in bloom, flowering Creosote Bush, Beavertail Prickly Pear, Ocotillo, Yucca, Globemallow, White Bursage, Creosote Bush, Cholla, Desert Marigold and Hedgehog Cactus.

Table 6.1: Approved Plant List: Trees

APPROVED PLANT LIST

TREES

LEGEND

- AR Arroyo
- IN Intense
- DES Desert
- NAT Native

Botanical Name	Common Name	AR	IN	DES	NAT
<i>Acacia greggii</i>	Cat's Claw	•	•		•
<i>Acacia smallii</i>	Sweet Acacia		•	•	
<i>Acacia stenophylla</i>	Shoestring Acacia		•		
<i>Arbutus unedo</i>	Strawberry Tree		•		
<i>Celtis pallida</i>	Desert Hackberry	•	•		
<i>Cercidium floridum</i>	Blue Palo Verde		•	•	
<i>Cercis occidentalis</i>	Western Redbud	•	•	•	
<i>Cercocarpus ledifolius</i>	Mountain Mahogany		•		
<i>Chilopsis linearis</i>	Desert Willow	•			•
<i>Fraxinus anomala</i>	Singleleaf Ash		•		•
<i>Fraxinus velutina</i>	Arizona Ash		•		
<i>Gleditsia triacanthos</i>	Honey Locust		•		
<i>Juniperus californica</i>	California Juniper		•		
<i>Juniperus osteosperma</i>	Utah Juniper		•		•
<i>Koelreuteria paniculata</i>	Goldenrain Tree		•		
<i>Laurus nobilis</i>	Sweet Bay		•		
<i>Olea europaea</i> 'Swan Hill'	Swan Hill Olive (fruitless)	•	•		
<i>Parkinsonia microphylla</i>	Foothill Palo Verde		•		
<i>Pinus eldarica</i>	Afghan Pine	•	•		
<i>Pinus halepensis</i>	Aleppo Pine	•	•		
<i>Pinus monophylla</i>	Singleleaf Pinon Pine		•	•	•
<i>Pinus pinea</i>	Stone Pine		•		
<i>Pistacia chinensis</i>	Chinese Pistache		•		
<i>Prosopis alba</i>	Argentine Mesquite		•		
<i>Prosopis chilensis</i>	Chilean Mesquite		•		
<i>Prosopis glandulosa</i>	Texas Honey Mesquite		•		

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Table 6.1: Approved Plant List (continued)

TREES (continued)

Botanical Name	Common Name	AR	IN	DES	NAT
<i>Prosopis juliflora</i>	Native Mesquite	●	●	●	●
<i>Prosopis pubescens</i>	Screwbean Mesquite		●		
<i>Prosopis velutina</i>	Velvet Mesquite		●		
<i>Prunus fremontii</i>	Desert Apricot		●		●
<i>Quercus gambelii</i>	Gambel Oak		●		●
<i>Quercus turbinella</i>	Canyon Oak		●		●
<i>Rhus lancea</i>	African Sumac		●		
<i>Salix gooddingii</i>	Goodding Willow	●			●
<i>Salix lasiolepis</i>	Arroyo Willow	●			●
<i>Sambucus nigra ssp. cerulea</i>	Mexican Elderberry		●		
<i>Ulmus parvifolia</i>	Chinese Elm		●		
<i>Vitex agnus-castus</i>	Chaste Tree		●		

LEGEND

AR Arroyo
 IN Intense
 DES Desert
 NAT Native

Table 6.2: Approved Plant List: Shrubs

SHRUBS, GROUNDCOVERS & VINES

LEGEND

- AR Arroyo
- IN Intense
- DES Desert
- NAT Native

Botanical Name	Common Name	AR	IN	DES	NAT
<i>Abronia villosa</i>	Sand Verbena		•		
<i>Acacia redolens</i>	Creeping Acacia		•		
<i>Acacia redolens</i> 'Desert Carpet'	Desert Carpet Acacia		•		
<i>Aloe</i> spp.	Aloe		•		
<i>Ambrosia dumosa</i>	White Bursage	•		•	•
<i>Baccharis pilularis</i>	Dwarf Coyote Bush		•		
<i>Baccharis pilularis</i> 'Centennial'	Centennial Coyote Bush		•		
<i>Baileya multiradiata</i>	Desert-marigold	•	•	•	•
<i>Buddleia davidii</i>	Butterfly Bush		•		
<i>Buxus microphylla japonica</i>	Japanese Boxwood		•		
<i>Calliandra californica</i>	Baja Red Fairy Duster		•		
<i>Calliandra eriophylla</i>	Fairy Duster		•		
<i>Campsis radicans</i>	Trumpet Creeper		•		
<i>Cotoneaster</i> spp	Cotoneaster		•		
<i>Dalea capitata</i> 'Sierra Gold'	Sierra Gold Dalea		•		
<i>Dalea greggii</i>	Trailing Indigo Bush		•		
<i>Dalea pulchra</i>	Pink Indigo Bush		•		
<i>Elaeagnus ebbingei</i>	Ebbing Silverberry		•		
<i>Encelia farinosa</i>	Desert Encelia		•	•	•
<i>Gazania</i> sp	Gazania		•		
<i>Hemerocallis</i> hybrids	Day Lily		•		
<i>Justicia spicigera</i>	Mexican Honeysuckle		•		
<i>Lantana</i> spp	Lantana		•		
<i>Larrea tridentata</i>	Creosote Bush	•	•	•	•
<i>Leucophyllum frutescens</i>	Texas Sage		•		

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Table 6.2: Approved Plant List: Shrubs (continued)

SHRUBS, GROUNDCOVERS & VINES (continued)

Botanical Name	Common Name	AR	IN	DES	NAT
<i>Leucophyllum laevigatum</i>	Chihuahuan Sage		●		
<i>Lippia repens</i>	Lippia		●		
<i>Lonicera japonica</i> 'Halliana'	Hall's Honeysuckle		●		
<i>Lotus rigidus</i>	Deer Vetch	●	●	●	●
<i>Lycium torreyi</i>	Torrey Thornbush	●	●	●	●
<i>Macfadyena unguis-cati</i>	Cat's Claw Vine		●		
<i>Mimosa biuncifera</i>	Catclaw Mimosa	●			●
<i>Myoporum parvifolium</i>	Myoporum		●		
<i>Penstemon eatonii</i>	Firecracker Penstemon		●		●
<i>Penstemon</i> spp.	Penstemon				
<i>Punica granatum</i>	Pomegranate		●		
<i>Raphiolepis</i> sp	Indian Hawthorn		●		
<i>Rhus ovata</i>	Sugar Bush		●		
<i>Rosmarinus</i> sp.	Rosemary		●		
<i>Salvia</i> spp.	Sage		●		
<i>Santolina chamaecyparisses</i>	Lavender Cotton		●		
<i>Santolina virens</i>	Green Lavender Cotton		●		
<i>Simmondsia chinensis</i>	Jojoba		●		
<i>Tecomaria capensis</i>	Cape Honeysuckle		●		
<i>Teucrium chamaedrys</i>	Germander		●		
<i>Trachelospermum jasminoides</i>	Star Jasmine		●		
<i>Vauquelinia californiica</i>	Arizona Rosewood		●		
<i>Verbena peruviana</i>	Peruvian Verbena		●		
<i>Verbena rigida</i>	Sandpaper Verbena		●		

LEGEND

AR	Arroyo
IN	Intense
DES	Desert
NAT	Native

Table 6.3: Approved Plant List: Succulents and Cacti

SUCCULENTS AND CACTI

LEGEND

- AR Arroyo
- IN Intense
- DES Desert
- NAT Native

Botanical Name	Common Name	AR	IN	DES	NAT
Agave sp.	Century Plant		●		
Aloe barbadensis	Aloe Vera		●		
Aloe saponaria	African Aloe		●		
Dasyliirion acrotriche	Green Desert Spoon		●	●	●
Dasyliirion longissimum	Stick Palm		●		●
Dasyliirion wheeleri	Desert Spoon		●	●	●
Echinocactus grusonii	Golden Barrel		●		
Echinocereus sp.	Hedgehog Cactus		●	●	●
Echinocactus polycephalus	Cottontop Cactus		●		
Echinocereus triglochidiatus	Mojave Mound Cactus		●		
Escobaria vivipara	Foxtail Cactus		●		
Ferocactus acanthodes	Barrel Cactus		●		
Ferocactus wislizenii	Fishhook Barrel Cactus		●		
Fouquieria splendens	Ocotillo		●		
Hesperaloe parviflora	Red Yucca		●		
Opuntia basilaris	Beavertail Cactus		●	●	●
Opuntia echinocarpa	Silver Cholla		●	●	●
Opuntia erinacea	Old Man Cactus	●	●	●	●
Opuntia ficus-indica	Indian Fig Cactus		●		
Opuntia microdasys	Bunny Ears		●		
Opuntia phaeacantha	Engelmann Prickly Pear		●		
Opuntia ramosissima	Pencil Cholla	●	●		
Opuntia santa rita tubac	Purple Prickly Pear		●		
Trichocereus pachanoi	San Pedro		●		
Yucca aloifolia	Spanish Bayonet		●		
Yucca baccata	Datil Yucca	●	●	●	●
Yucca brevifolia	Joshua Tree	●	●	●	●
Yucca elata	Soap-Tree Yucca		●		
Yucca recurvifolia	Pendulous Yucca		●		
Yucca rigida	Blue Yucca		●		
Yucca rupicola	Twisted Yucca		●		
Yucca schidigera	Mojave Yucca	●	●	●	●

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Table 6.4: Approved Plant List: Grasses

GRASSES

Botanical Name	Common Name	AR	IN	DES	NAT
<i>Festuca ovina</i> 'Glauca'	Blue Fescue		●		
<i>Muhlenbergia dumosa</i> 'Regal Mist'	Regal Mist Muhly Grass		●		
<i>Muhlenbergia rigens</i>	Deer Grass		●		
<i>Nolina biglovii</i>	Bear Grass		●		
<i>Ophiopogon japonicus</i>	Mondo Grass		●		
<i>Phormium tenax</i> 'Compacta'	Dwarf New Zealand Grass		●		

LEGEND

AR Arroyo
 IN Intense
 DES Desert
 NAT Native

Table 6.5: Native Revegetation Plant Palette

NATIVE REVEGETATION PLANT PALETTE

Botanical Name	Common Name
<i>Ambrosia Dumosa</i>	White Bursage
<i>Echinocereus triglochidiatus</i>	Hedgehog Cactus
<i>Encelia farinosa</i>	Brittlebush
<i>Larrea tridentata</i>	Creosote Bush
<i>Opuntia basilaris</i>	Beavertail
<i>Opuntia erinacea</i>	Old Man Cactus
<i>Yucca schidigera</i>	Mojave Yucca

Table 6.6: Prohibited Plant List

PROHIBITED PLANT LIST
TREES, SHRUBS AND GROUND COVER

Botanical Name	Common Name
<i>Acroptilon repens</i>	Russian Knapweed
<i>Alhagi maurorum</i>	Camelthorn
<i>Anthemis cotula</i> L.	Stinking Chamomile
<i>Arundo donax</i> L.	Giant Reed
<i>Brassica tournefortii</i> Gouan	African Mustard
<i>Cardaria draba</i> (L.) Desv	Hoary Cress
<i>Carduus nutans</i> L.	Musk Thistle
<i>Centaurea calcitrapa</i> L.	Purple Starthistle
<i>Centaurea diffusa</i> Lam.	Diffuse Knapweed
<i>Centaurea iberica</i> Trev. ex Spreng	Iberian Starthistle
<i>Centaurea melitensis</i> L.	Malta Starthistle
<i>Centaurea solstitialis</i> L.A	Yellow Starthistle
<i>Centaurea stoebe</i> ssp. micranthos (Gugler) Hayek	Spotted Knapweed
<i>Centaurea virgata</i> Lam.	Squarrose Knapweed
<i>Chondrilla juncea</i> L.	Rush Skeletonweed
<i>Cicuta maculata</i> L.	Spotted Waterhemlock
<i>Conium maculatum</i> L.	Poison-Hemlock
<i>Crupina vulgaris</i> Cass.	Common Crupina
<i>Cynoglossum officinale</i> L.	Houndstongue
<i>Eleaegnus angustifolia</i>	Russian Olive
<i>Euphorbia esula</i> L.	Leafy Spurge
<i>Galega officinalis</i> L.	Goatsrue
<i>Hydrilla verticillata</i> L. f.	Hydrilla
<i>Hyoscyamus niger</i> L.	Black Henbane
<i>Hypericum perforatum</i> L.	Common St. Johnswort
<i>Isatis tinctoria</i> L.	Dyer's woad

Botanical Name	Common Name
<i>Lepidium latifolium</i> L.	Perennial Pepperweed
<i>Linaria dalmatica</i> L.	Dalmatian Toadflax
<i>Linaria vulgaris</i> P.Mill.	Yellow Toadflax
<i>Lythrum salicaria</i> L.	Purple Loosestrife
<i>Lythrum virgatum</i> L.	European Wand Loosestrife
<i>Morus alba</i>	Fruitless Mulberry
<i>Myriophyllum spicatum</i> Linnaeus	Eurasian Watermilfoil
<i>Olea europaea</i>	European Olive cultivars 'Swan Hill' and 'Wilson' are okay.
<i>Onopordum acanthium</i> L.	Scotch thistle
<i>Peganum harmala</i> L.	African Rue
<i>Pennisetum setaceum</i> (Forsk.) Chiov.	Crimson Fountaingrass
<i>Populus angustifolia</i>	Narrowleaf Poplar
<i>Populus fremontii</i>	Fremont Cottonwood
<i>Potentilla recta</i> L.	Sulfur Cinquefoil
<i>Rorippa austriaca</i> (Crantz) Bess.	Austrian Fieldcress
<i>Salvia aethiopsis</i> L.	Mediterranean sage
<i>Salvinia molesta</i> D. S. Mitchell	Giant Salvinia
<i>Solanum carolinense</i> L.	Horsenettle
<i>Solanum elaeagnifolium</i> Cavanaugh	Silverleaf Nightshade
<i>Sonchus arvensis</i> L.	Perennial Sowthistle
<i>Sorghum halepense</i> (L.) Pers	Johnsongrass
<i>Sphaerophysa salsula</i> (Pallas) DC.	Swainsonpea
<i>Taeniatherum caput-medusae</i> (L.)	Medusahead
<i>Tamarix</i> species	Tamarisk, Salt Cedar
<i>Tribulus terrestris</i> L.	Puncturevine
<i>Zygophyllum fabago</i> L.	Syrian Beancaper

Sources for all Plant Lists: Native Plants for Southwestern Landscapes, Judy Mielke. Sunset Western Garden Book. Recommended Plant List, City of Henderson website. Nevada Noxious Weeds, www.invasive.org. Trees for Tomorrow, www.lvsnag.org. Mojave Desert Plants, www.mojavedesert.net/plants. Native Revegetation Plant Materials, Southwick LA.



Appendix

APPENDIX A: PROJECT PARTICIPATION

PROJECT SPONSOR

Buster Neel Nevada State College

PROJECT LEAD

Annie Macias Nevada State College

ADVISORY COMMITTEE

Don Andress	Andress Enterprises
Mark Calhoun	City of Henderson
Bob Cooper	COH-Economic Dev.
Bruce Deifik	American Nevada Co.
David Diffley	Lewis Operating Corp.
Thalia Dondero	Former NSHE Regent
Bristol Ellington	City of Henderson
Mark Fine	Mark Fine Associates
Ed Goedhart	Assemblyman
Somer Hollingsworth	NV Development Authority
Randy Innis	Innis Enterprises LLC
Richard Lee	First American Title Co.
Rob Martin	NSC Foundation

Appendix

Alice Martz	Henderson Chamber
Chris Miller	Senator Reid's Rep
Richard Myers	Thomas & Mack
Marcel Parent	Springs Preserve
Mark Paris	Landwell Co
Mary Kay Peck	Past City Manager (COH)
Phillip Peckman	The Peckman Company
Roland Sansone	Sansone Companies
Stephen Schmidt	Steelhead Development
Dan Shaw	NSC Foundation
Michael Wixom	Regent, NSHE

STEERING COMMITTEE

Glenn Christenson	NSC Foundation
Lesley DiMare	NSC Provost
Stephanie Garcia-Vause	COH Community Development
Amsala Alemu-Johnson	NSC NSSA President - Student
Steve Lake	Community Representative
Buster Neel	NSC Finance and Adm.
Sean Robertson	COH Community Development
Gregory Robinson	NSC Faculty Senate
Spencer Stewart	NSC College Relations

INFRASTRUCTURE SUB-COMMITTEE

Brian Chongtai	NSC IT
Lesley Di Mare, Chair	NSC Provost
Robert Herr	COH Utilities
Gena Kendall	COH Public Works
Imad Mehana	NSC Facilities
Nichole Miller	NSC Pres. Office
Donald Pelissier	COH Utilities
John Penuelas	COH Traffic
Jonna Sansom	COH Public Works

Anthony Ventimiglia	COH Utilities
Christi Wells	NSC NSSA VP Student
Robert Woodson	COH Utilities

SUSTAINABILITY GROUP

Sharon Allen	NSC President's Council
Paul Andricopulos	COH
Danielle Ball	COH
Bud Cranor	COH
Michael Genseal	SAIC
Paul Gerner	CCSD Facilities
John Holman	SW Gas
Tibor Jozsa	
Arnold Lopez, III	NV Energy
Ed Price	NSC Faculty
Dudley Sondeno	SW Gas
Spencer Stewart, Chair	NSC College Relations
Ned Thomas	COH
John J. Warwick	DRI

FINANCE & LAND USE SUB-COMMITTEE

Sharon Allen	NSC President's Council
Patricia Ayala	COH Parks and Recreation
Steve Hanson	COH Finance
Bob Kasner	NSC Foundation
Andy Kuniyuki	NSC Faculty
Scott Nash	JNA Consulting
Annie Macias	NSC Finance & Adm.
Laura Martin	COH Development
Buster Neel, Chair	NSC Finance and Adm.
Sean Robertson	COH Development
Spencer Stewart	NSC College Relations
Hank Stone	NSHE Legal Counsel

CONSULTANT TEAM

BMS Design Group

Barbara Maloney
Michael Smiley
Joy Glasier
Tim Honeck
Tim Hurley
Paige Martin

ARUP

Grant McInnes
Cole Roberts
Brian Renehan
Will Baumgardner
Lauren Dong
Afaan Naqvi
Engin Ayaz
Grant Schlareth
Kirstin Weeks

EHDD Architecture

Brad Jacobson
Scott Shell

Carpenter Sellers Architects

Michael Del Gatto
Robert Gurdison

Kennedy Jenks

Gregg Cummings
Fred Neal

Economic and Planning Systems

James Musbach

Barnes and Company

Andy Barnes

Appendix

APPENDIX B: LIST OF ACRONYMS

AASHE	Association for the Advancement of Sustainability in Higher Education
ACUPCC	American College and University Presidents Climate Commitment
AD	Anaerobic digestion
AFY	Acre-feet per year
ASHRAE	American Society for Heating, Refrigeration and Air-Conditioning Engineers
BAU	Business-as-usual
BMP	Best management practice
BRT	Bus Rapid Transit
C&D	Construction and demolition
CARB	California Air Resources Board
CCAR	California Climate Action Registry
CDM	Clean Development Mechanism
CER	Certified emissions reductions
CFS	Cubic feet per second
CHP	Combined heat and power
CNG	Compressed natural gas
COH	City of Henderson
ESCO	Energy service company
FPS	Feet per second
FTE	Full-time equivalent
GHG	Greenhouse gas
GPD	Gallons per day
GPF	Gallons per flush
GPM	Gallons per minute
HCDDM	Hydrologic Criteria and Drainage Design Manual
HSAP	Henderson Sustainability Action Plan
ICT	Information and Communications Technologies

LEED	Leadership in Energy and Environmental Design
LEED-NC	LEED for New Construction
LEED-ND	LEED for Neighborhood Development
MGD	Million gallons per day
MHDB	Mission Hills Detention Basin
MMTCO _{2e}	Million metric tons carbon dioxide equivalent
MPOE	Minimum Point Of Entry
MS4	Municipal Separate Storm Sewer System
MSW	Municipal solid waste
NPDES	National Pollutant Discharge Elimination System
NSHE	Nevada System of Higher Education
PPA	Power Purchase Agreement
PSI	Pounds per square inch
PV	Photovoltaics
REC	Renewable Energy Certificate
ROI	Returns on Investment
RPS	Renewable Portfolio Standard
RTC	Regional Transportation Commission of Southern Nevada
STARS	Sustainability Tracking, Assessment and Rating System
SWG	Southwest Gas Corporation
SWRF	Southwest Water Reclamation Facility
TDM	Transportation demand management
TDS	Total dissolved solids
USGBC	United States Green Building Council
WCI	Western Climate Initiative
WWTF	Wastewater treatment facility

