5 Water

This chapter provides sustainable design strategies and implementing actions to enhance water and wastewater efficiency and to protect water quality. Preliminary water, sewer and drainage infrastructure plans for the Nishi development project are briefly summarized, along with implementing actions and design strategies that address efficient water use and wastewater reduction, and systems and strategies to enable the reuse of non-potable water on site (e.g., graywater). Stormwater management and low-impact development practices are also identified, and integrated with landscaping and open space strategies noted in the Open Space and Parks chapter of this plan.

Background technical studies and information related to the proposed site water, wastewater, and stormwater systems may be found in the *Nishi-Gateway – Preliminary Site Water, Sewer and Drainage Infrastructure Concepts* Technical Memorandum (Cunningham Engineering Corporation), which can be found in Appendix D.

5.1 Goals and Objectives

The following goals and objectives are a subset of those identified in Chapter 1, and are intended to guide the Nishi development plan and design towards sustainable water, wastewater, and stormwater management. The implementing actions that follow in Section 5.2 will help the project in achieving these goals and objectives.

- **Goal 1:** Serve as a model for low-carbon, climate-resilient development that also enhances the fiscal and equitable sustainability of the broader community.
    - **Objective 1.2:** Encourage innovative site and building design that encourages a healthy and interconnected natural and built environment, conserves natural resources, and promotes equitable and efficient communities.
    - **Objective 1.4:** Promote and demonstrate resiliency to the effects of climate change and other challenges through project design.
- **Goal 4:** Maximize water and wastewater efficiency and protect water quality through the use of water conservation, water reuse, and integrated landscaping and stormwater management strategies.

- **Objective 4.1:** Meet or exceed 2013 CALGreen Tier 1 water use efficiency requirements for indoor water use.
- **Objective 4.2:** Minimize use of potable water in outdoor landscaping and maximize the use of non-potable water.
- **Objective 4.3:** Work towards achieving zero net water usage through use of best management practices and innovative technologies.
- **Objective 4.4:** Incorporate creative low-impact development (LID) solutions to meet stormwater treatment and water quality requirements.

5.2 Implementing Actions

This section summarizes the preliminary infrastructure plans for the project, along with design strategies and implementing actions that will help the Nishi development meet the sustainability goal and objectives for water and wastewater efficiency, and stormwater management and water quality, noted in Section 5.1.

5.2.1 Water

Service Provider and System Tie-Ins

The Nishi property is currently not served by a public water system. For the development of the site, connection to either to the City water system or the University of California Davis (UC Davis) water system will be required. Figures 5-1 and 5-2 depict two options for developing a domestic water system for the project.

Existing City water facilities in the vicinity include 6-inch and 10-inch mains located in West Olive Drive. If the Nishi development connects to the City's water system, pipeline improvements will be needed along Olive Drive, with the replacement of approximately 3,000 linear feet of existing 6-inch and 10-inch pipeline from the proposed points of connection at Nishi extending east.

UC Davis has recently begun an evaluation of its domestic water distribution system's capability to serve the project. Existing UC Davis water facilities in the vicinity include a 10-inch main in Old Davis Road and a 6-inch main south of Solano Park. The City, UC Davis, and the property owner may explore connecting the Nishi property to UC Davis systems once the evaluation is completed. The actions in this chapter will apply, regardless of which connection options are implemented.

Development of the Nishi property will require new public water mains on-site that will be primarily located within or adjacent to roadway corridors, but also probably traversing non-roadway areas in some locations. The proposed loop system shown in Figures 5-1 and 5-2 will provide the site's inside-use service connections for the planned residential/office/R&D uses, building fire-service connections, and site fire hydrant connections. While potable water may also be used for irrigation service connections, the project intends to minimize use of potable supplies for irrigation purposes.

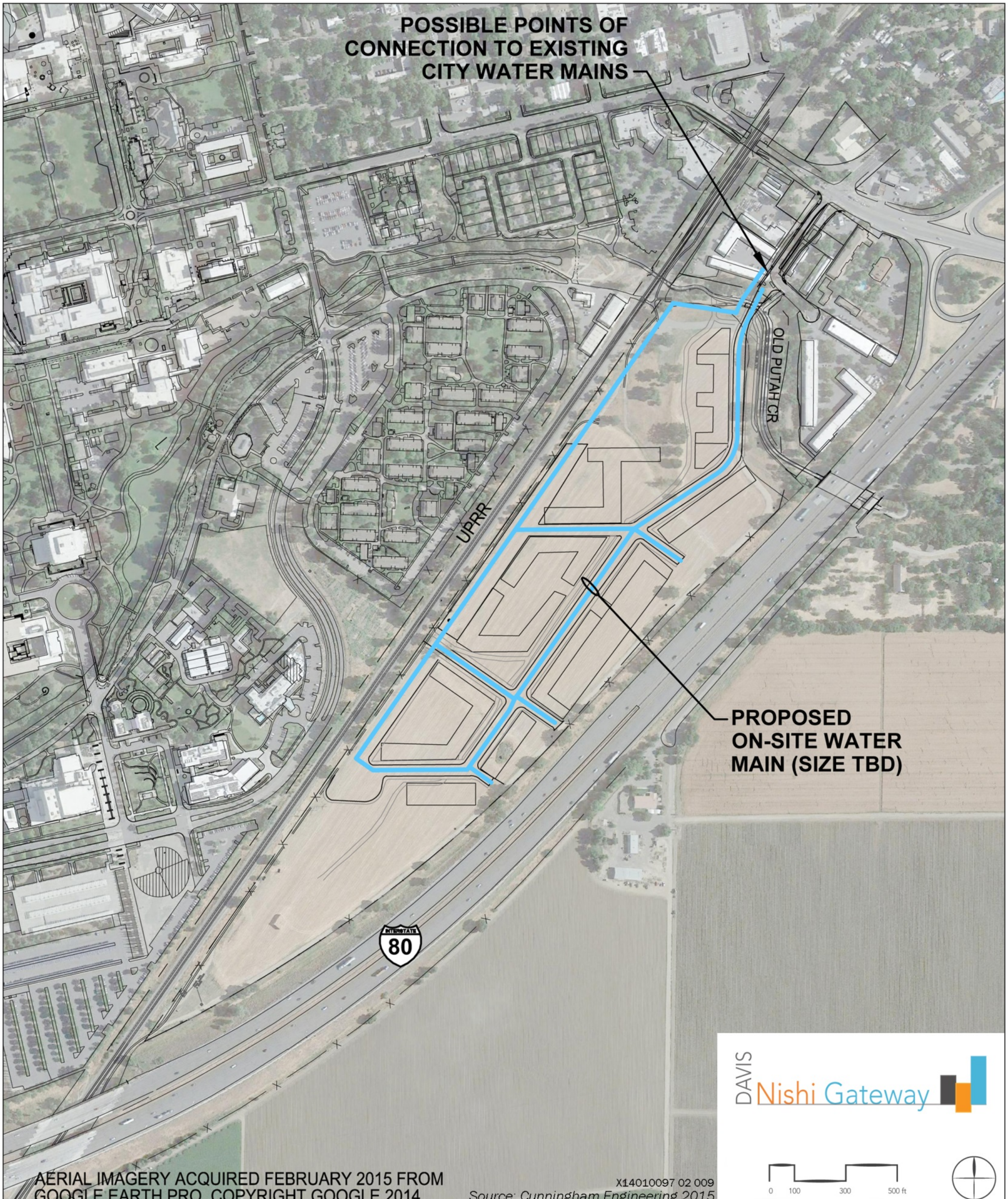

Figure 5-1 Conceptual Domestic Water System, Option A

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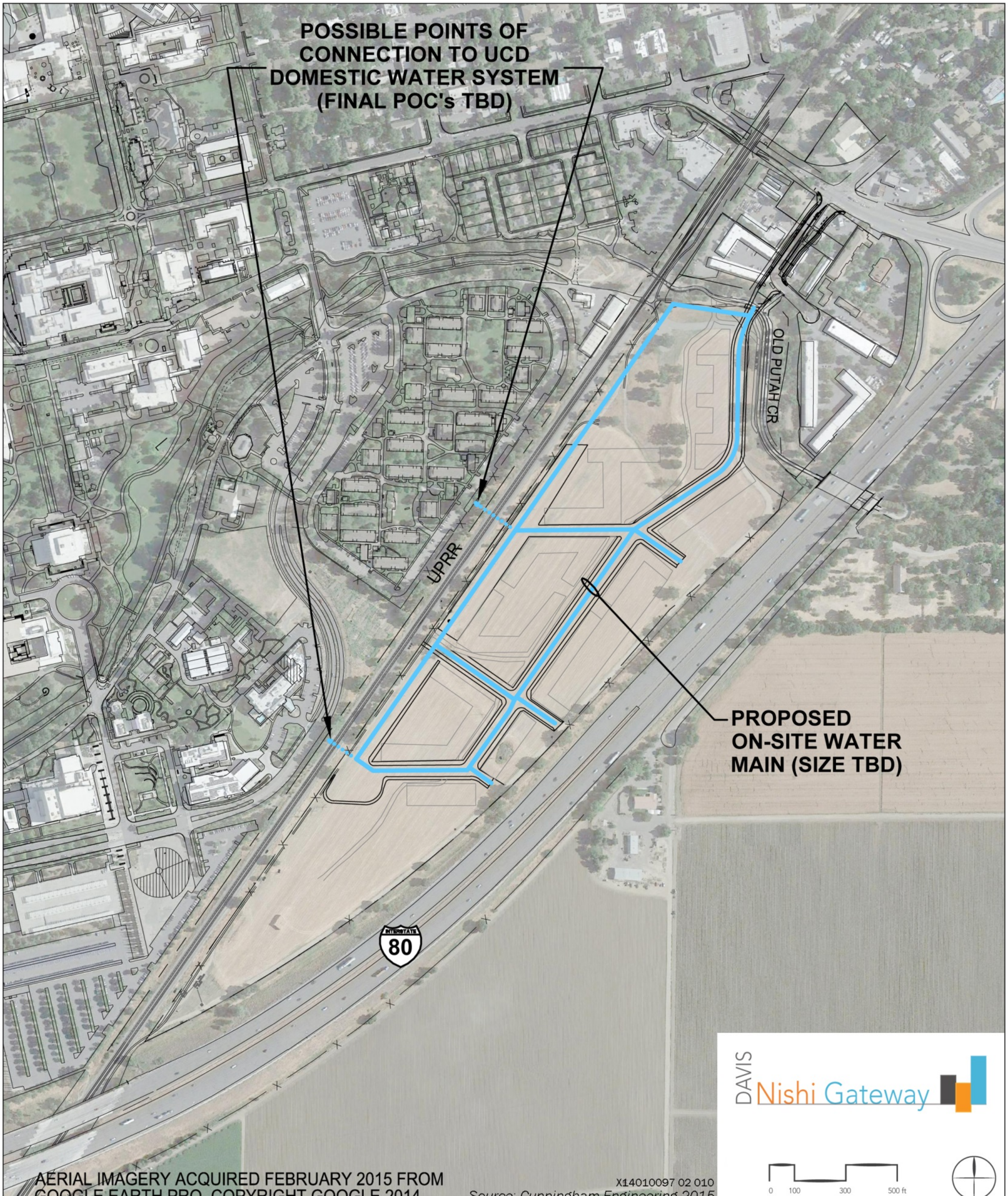

Figure 5-2 Conceptual Domestic Water System, Option B

Properties within the West Olive Drive (WOD) subarea currently receive water via service connections to the existing City distribution system, and will continue to do so as the area redevelops. The Nishi development incorporates provisions to realign and reconstruct the segment of Olive Drive from Richards Boulevard to the edge of the Nishi property, and this street reconstruction work will be accompanied by modifications to the existing City water distribution facilities and service lines within that corridor.

Water Demand

Preliminary water demand estimates for the Nishi development are based on per-capita usage, type of land use, and expected building occupancy numbers, as shown in Table 5-1.

Table 5-1 Nishi Development: Daily Water Demand by Land Use

Land Use	Average Day Demand (gpd)	Peak Day Demand (gpd)*	Peak Hour Demand (gpm)**
R&D/Office	21,180	27,534	34
R&D/Non-office	7,941	7,941	10
Retail	1,440	1,872	2
Retail (business use)	5,115	5,115	6
Residential	100,035	110,039	138
Subtotal	135,711	152,501	221
Open Space and Parks ***	13,560	25,798	107
Total	**149,271**	**178,299**	**-**

Notes: gpd = gallons per day, gpm = gallons per minute
* Inside use peak day/average day factor = 1.0 to 1.3, depending on use
** Inside use peak hour/peak day factor = 1.8
***Open Space and Parks irrigation based on the following:
- Irrigated acreage = 6.5 acres, per preliminary Nishi development program, January 2015 (see below for current acreage).
- Peak day based on peak application rate of approx. 0.19 inch/day (70 percent of $ET_{0\ max}$)
- Peak hour based on an 8-hour watering window and peak-hour factor of 2.0

Source: Water Supply Assessment for Nishi Project, prepared by Brown and Caldwell 2015; adapted by Cunningham Engineering.

Outdoor (irrigation) usage estimates were based on an original, preliminary estimate of Open Space and Parks area of 6.5 acres that was made at the time that a water supply assessment (WSA) was prepared for the project in early 2015. However, since the preparation of the WSA, the Nishi site plan has been revised, with the proposed Open Space and Parks area increased to 19.2 acres. Approximately 16.4 acres in the Open Space and Parks land use category will require irrigation. Assuming an equivalent per-acre irrigation usage rate, 16.4-acres of irrigated Open Space and Parks area will consume about 12.4 million gallons per year (mgy) (±38 acre-feet/year [afy]).

For the Nishi development's indoor uses, the average daily demands estimated by the WSA translate to an estimated annual usage of 49.5 mgy. With the Open Space and Parks irrigation usage adjusted to 16.4 acres, the total (inside + outside) annual use will be 61.9 mgy (±190 afy), with combined inside uses accounting for around 80 percent of that total. Of the inside uses, residential use will account for about 74 percent, with the remaining 26 percent attributed to R&D/Retail.

The above demand estimates per the WSA are largely based on historical usage data and on standard unit demand factors in the literature, and are thought to be consistent with conventional existing developments in this locale. As such, the WSA demands represent a suitably conservative estimate of annual usage for the purposes of evaluating the water provider's capacity to produce sufficient water to serve the project.

Given that the WSA numbers may not reflect CALGreen building code requirements that will be in force at the time of the design and permitting of facilities within the Nishi development, CALGreen Tier 1 is considered the baseline for the water use reduction measures contained herein. As noted below, efforts will be made to reduce outdoor use demand by prioritizing availability of a non-potable water source.

Water-Use Reduction Strategies

This Implementation Plan proposes a goal of maximizing water and wastewater efficiency for the project, through the use of conservation, reuse and integrated landscaping and stormwater management strategies. The objectives include meeting or exceeding CALGreen Tier 1 water use efficiency requirements for indoor water use and for substantially reducing the use of potable water in outdoor landscaping.

Outdoor-Use Demand Reduction

Action 5.1: Low-Water Landscape Planting

Develop a landscape planting plan whose irrigation budget is at least 10 to 15 percent less than that allowed under CALGreen Tier 1. The project will make extensive use of low-water, drought-tolerant landscaping, combined with smart irrigation controls and high-efficiency irrigation delivery systems throughout the project.

The landscape design will comprise a variety of plant types and densities that will have a range of water uses. For example, an overall mix of 55 percent low-water, 25 percent medium-water, and 20 percent high-water use plantings, a viable combination for the Nishi development, translates to an overall estimated water use of around 55 percent of reference evapotranspiration (ET_0) (i.e., in the range of 10 to 15 percent less than CALGreen Tier 1)[1]. It is recognized that in certain areas a desired aesthetic or functional use within landscaped areas (e.g., edible landscaping for on-site food production) may lend itself to higher water use plantings, subject to City approval. Also, plantings within LID stormwater features will include

[1] Evapotranspiration is the loss of water to the atmosphere by the combined processes of evaporation and transpiration. It is an indicator of how much water crops, lawn, garden, and trees need for healthy growth and productivity. Reference evapotranspiration (ETo) is the industry standard for determining irrigation requirements. ETo is an estimate of the evapotranspiration of a large field of four- to seven-inch tall, cool-season grass that is well watered.

plants that can tolerate extended periods of inundation – such varieties may not always be the most drought-tolerant or low water use.

Indoor-Use Demand Reduction

Action 5.2: High-efficiency Fixtures

At a minimum, install high-efficiency fixtures (HEFs) that conform to the design fixture flows defined in CALGreen Tier 1. Throughout the project, install standard HEFs (low-flow showerheads, bathroom/kitchen faucets and toilets) and low-water/Energy Star appliances such as clothes washers and dishwashers.

Action 5.3: Ultra-high-efficiency Fixtures

Substitute standard HEFs with ultra-high-efficiency fixtures (UHEFs) to the maximum extent practicable. UHEF's include showerheads, bathroom faucets and toilets that are designed for even lower flows than the standard HEFs required for CALGreen Tier 1. UHEFs typically represent the most water-conserving water fixtures that are widely commercially available. It is recommended that they be considered for installation in all for-rent residential units and in the R&D/Office buildings.

UHEFs will also be considered for the for-sale residential units, to the extent that this aligns with user/market preferences. If economic or user-preference considerations preclude or limit the application of UHEF's, then it is recommended that very-high-efficiency fixtures (VHEFs) be considered as an alternative to the standard HEFs. VHEF's comprise the same types of fixtures as UHEF's, but whose design flow rates lie between HEFs and UHEFs.

Action 5.4: Water Usage Study

Consider sub-metering individual dwelling units (or clusters of dwelling units) and implementing a usage study whereby 'packages' of different efficiency-level water fixtures are installed in selected groups of dwelling units, for comparing per-dwelling-unit usage data over time. Measure and compare ongoing annual usage patterns on a per-dwelling unit basis. This will yield usage data that reflects differing levels of fixture efficiency (but will not separately account for factors relating to the user behavior).

Action 5.5: Individual Water Usage Study

As an extension of the usage study in Action 5.4 above, consider inviting a subset of the project residents to participate in monitoring their usage behavior (duration and frequency of fixture use) for some defined period of time. For instance, one user group will comprise residents in apartments with fixtures and appliances meeting minimum code requirements; another user group will live in units with a specified suite of more efficient fixtures and appliances installed. Measure and compare ongoing annual usage patterns on per-dwelling unit basis that will yield usage data that reflects not only differing levels of fixture efficiency, but also user behavior.

Non-Potable Water Supply System

Action 5.6: Non-potable Water Supply

Pursue and implement one or more sources of non-potable water supply for use in site-wide irrigation, and potentially for some inside uses, such as toilet flushing. The primary non-potable source will be either tertiary disinfected effluent piped from the UC Davis wastewater treatment plant (WWTP), or a dedicated on-site irrigation well. Conduct a comparative study (detailed planning level/preliminary design) of the primary non-potable sources' potential, including operational and cost considerations.

- Tertiary disinfected effluent: Work with UC Davis to conduct an evaluation of the production, transmission, storage and distribution considerations.

- On-site irrigation well: Investigate the potential for such a well to deliver a firm yield that meets the projected peak demand for irrigation or other non-potable water uses on site. This will reduce the supply of treated potable water needed for the project, thereby making more efficient use of potable water supplies in Davis. Further evaluation will need to be undertaken by a well design/installation specialist, and might include a general review of the local hydrogeology, as well as review and possibly testing of existing agricultural well installations nearby. The suitability of using non-potable well water well for certain indoor applications, such as toilet flushing, will need to be explored with the City. Water quality considerations, including those related to WWTP discharge permit compliance, may be a factor in the applicability of on-site well water for inside uses. Figure 5-3 depicts the potential location of a potential on-site irrigation well.

Action 5.7: Greywater/harvested Rainwater

In addition to the primary source, consider implementing one or more secondary sources of supplemental non-potable water, comprising graywater and/or harvested rainwater. This may be implemented at a demonstration-scale, or applied more extensively throughout the site. Conduct a comparative study (detailed planning/preliminary design-level) of the economic and technical feasibility of graywater and harvested rainwater.

- Graywater: Develop a prototypical plan for collecting, treating/disinfecting, storing and distributing graywater within the buildings.

- Harvested rainwater: Develop a prototypical plan for collecting, storing and distributing harvested rainwater.

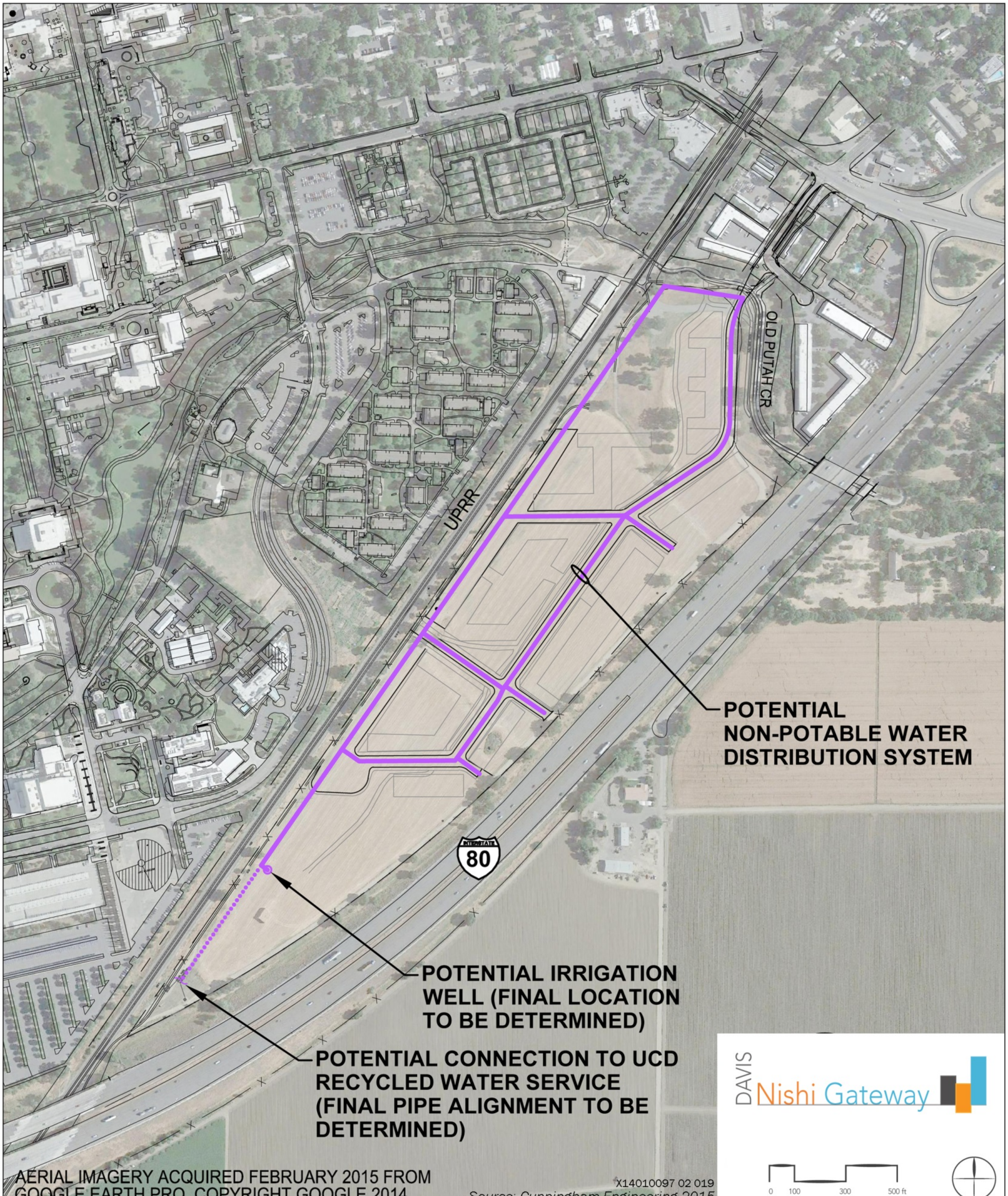

Figure 5-3 Conceptual Non-Potable Water System

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Action 5.8: Non-potable Water Distribution

Based on the outcomes of Actions 5.6 and 5.7, implement a site-wide non-potable (purple pipe) water distribution system, to be incorporated into the project site design, and possibly within some or all buildings.

The distribution system will comprise a looped network of mains, primarily located within or adjacent to roadway corridors, but also probably traversing non-roadway areas in some locations. The loop will provide irrigation service connections throughout the site, and possibly building connections. Figure 5-3 provides a conceptual layout plan for a non-potable water distribution ("purple pipe") system.

Summary of Water Conservation Initiatives and Alternative Water Sources

The potential of various means to reduce indoor water use is summarized in Tables 5-2A and 5-2B below. The purpose of the tabulation is to gain a sense of the general extent of the potential reductions, rather than to propose absolute volumetric reduction targets. The estimates are based on referencing CALGreen Tier 1 as the baseline, and include all of the Residential, R&D (office) and Retail uses for the Nishi development.

Table 5-2A Inside-Use Reduction (percent of baseline, approx.)

Use Category	Code Baseline	Very High Eff. Fixtures	Ultra High Eff. fixtures	UHEF + Non-potable*
Inside Use	CALGreen T1	6 percent	16 percent	22 percent

* For toilet flushing (reclaimed water, non-potable well water or graywater)

Table 5-2B Inside-Use Volume Reduction (MGY, approx.)

Use Category	Code Baseline	Very High Eff. fixtures	Ultra High Eff. fixtures	UHEF + Non-potable
Inside Use	CALGreen T1	1.6	4.5	6.2

At this juncture, the Nishi development R&D (non-office) water uses have not been factored in, as insufficient information exists about the specifics of those potential uses to be able to quantify what reductions might be effected. Also not included in this preliminary reduction estimate are projected changes in usage associated with the WOD redevelopment area, because the specifics of that programmed commercial space are undefined at this time. As more information becomes available, this can be included.

The potential of various measures to reduce potable water for outdoor-use (irrigation) is summarized in Tables 5-3A and 5-3B below. As with the inside-use reduction estimates summarized above, the volumetric numbers are not intended as absolute reduction targets. These initial estimates were based on referencing 65 percent of ET_0 (CALGreen Tier 1 Residential) as the baseline irrigation demand.

Table 5-3A Outside-Use Potable Water Reduction (percent of baseline, approx.)				
Use Category	Code Baseline	Recycled Water or Irrig. Well*	Rainwater Harvesting**	Graywater Use***
Open Space (16.4ac)	65 percent ET_0	Up to 100 percent	Up to 20 percent	Up to 60 percent
OS (16.4ac) + 4ac	65 percent ET_0	Up to 100 percent	Up to 15 percent	Up to 50 percent
OS (16.4ac) + 11ac	65 percent ET_0	Up to 100 percent	Up to 10 percent	Up to 40 percent

* Assuming available recycled water capacity at WWTP, or sufficient irrigation well yield (both TBD)
** Roof catchment area of ±325,000 sf and ±2 MG of rainwater storage tank capacity
*** Graywater collection from 650 du's (100 percent occupied) w UHEFs in all units and zero indoor re-use.

Table 5-3B Outside-Use Potable Water Volume Reduction (MGY, approx.)				
Use Category	Code Baseline	Recycled Water or Irrig. Well	Rainwater Harvesting	Graywater Use
Open Space (16.4ac)	65 percent ET_0	Up to 11.1	Up to 2.3	Up to 6.8
OS (16.4ac) + 4ac	65 percent ET_0	Up to 13.9	Up to 2.3	Up to 7.1
OS (16.4ac) + 11ac	65 percent ET_0	Up to 18.9	Up to 2.3	Up to 7.4

In Tables 5-3A and 5-3B above, the initial estimated reductions in outdoor potable use are based on the current programmed Open Space acreage (16.4 acres) for the Nishi property. There will also be some additions to the total irrigated landscape areas associated with the various buildings, roadways and parking areas. The precise extent and nature of such additional landscaping is not currently known. However, for illustrative purposes, it is estimated that this will translate to ±4 additional landscape acres. In addition, the detention and creek areas together have the potential to add another ±7 acres of landscaping.

As with the inside uses, landscape usage associated with the WOD redevelopment has not been included in these preliminary volume reduction estimates, but it is expected to be a minor component of the Nishi development as a whole.

5.2.2 Sewer

Service Provider and System Tie-Ins

For the Nishi property, connection to either to the existing City sewer collection system or to the existing UC Davis sewer collection system will be required. The West Olive Drive area currently drains to the existing City sewer system, and will continue to do so upon redevelopment, via modified and/or new service connections.

If the Nishi development connects to the City sewer system, then the proposed point of connection will likely be to the existing 8" line in West Olive Drive. If the Nishi development connects to the UC Davis sewer collection system, then the proposed point of connection may be to a UC Davis sewer main within the Hotel/Conference district, or via a new sewer outfall pipe from the Nishi property along the UPRR ROW, to a UC Davis point of connection that is closer to the UC Davis WWTP. A sewer lift station will likely be required under either scenario. Figures 5-4 through Figure 5-6 depict several options for potential points of connection to either the City or UC Davis systems, and on-site sanitary sewer collection system concept plans related to the same. Off-site sewer main upsizing may be required, possibly extending downstream to L Street or beyond. At the time of writing, UC Davis has not yet completed an evaluation of its downstream conveyance capacity.

Sewer Demand

Potential reductions in sewer flows (relative to CALGreen Tier 1 Code Baseline) will generally be consistent with the indoor water use reductions outlined in Section 5.2.1. Assuming that wastewater flows are roughly equal to inside domestic water use, implementation of Actions 5.2 or 5.3 will result in reduced sewer flows of up to 4.5 mgy (or up to 6.2 mgy if graywater is used for all toilet flushing).

5.2.3 Stormwater and Low Impact Development Strategies

A fundamental stormwater management requirement for the development of the Nishi property is that it not result in new impacts to abutting properties, or to upstream/downstream properties.

For the Nishi property, the change from agricultural to urban land use will be accompanied by an increase in peak discharge on the site. In light of this, it is expected that a means to attenuate the developed site's peak flows will be provided via on-site runoff reduction measures, including stormwater detention storage basin to be located on the Nishi site. The preliminary Nishi site plan reserves a ±4-acre area near the southwest end of the site to accommodate a centralized stormwater detention basin.

Low impact development techniques include vegetated swales, like this one outside of Tercero 2 Student Housing.

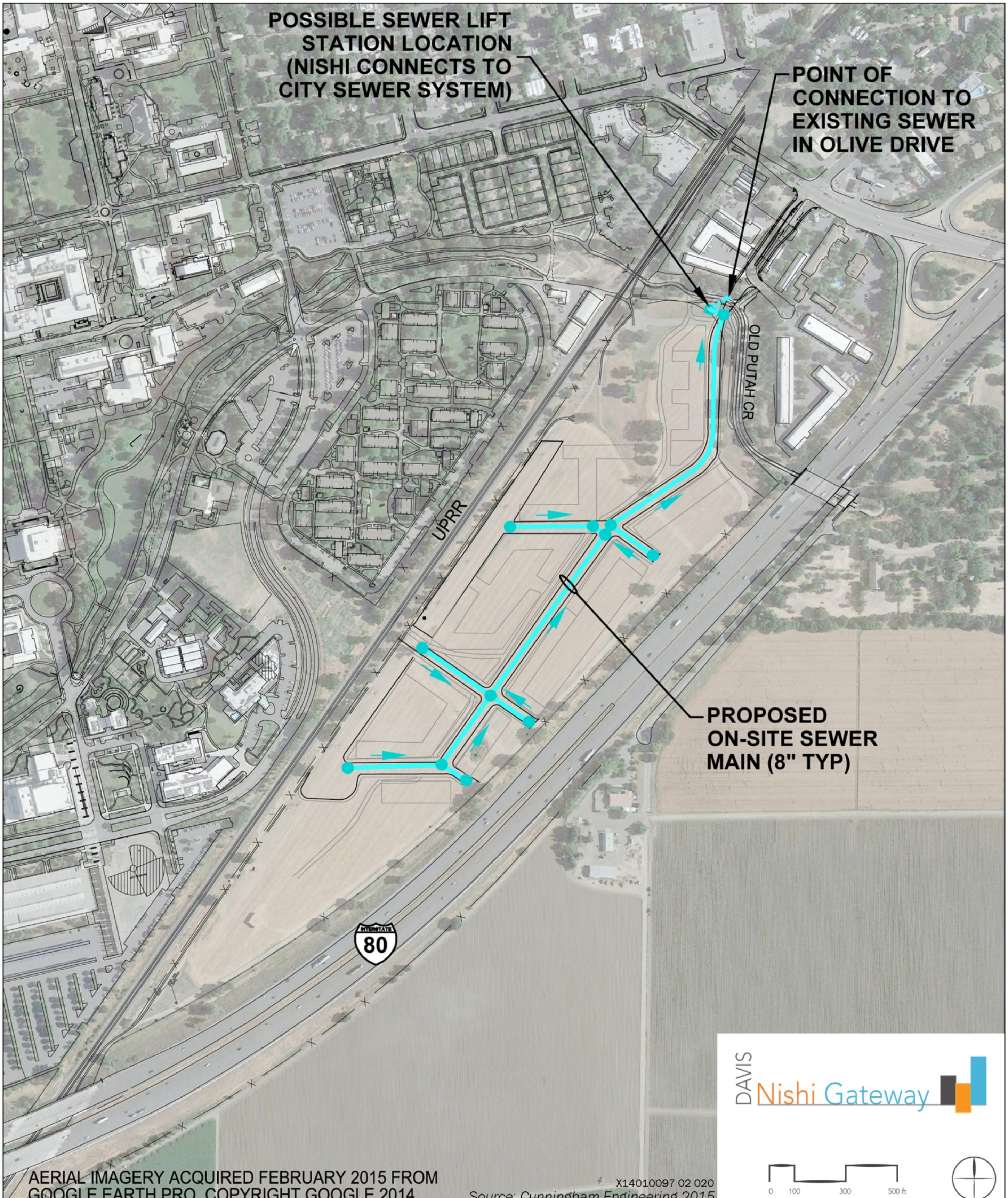

Figure 5-4 Sanitary Sewer Collection System Concept, Option A

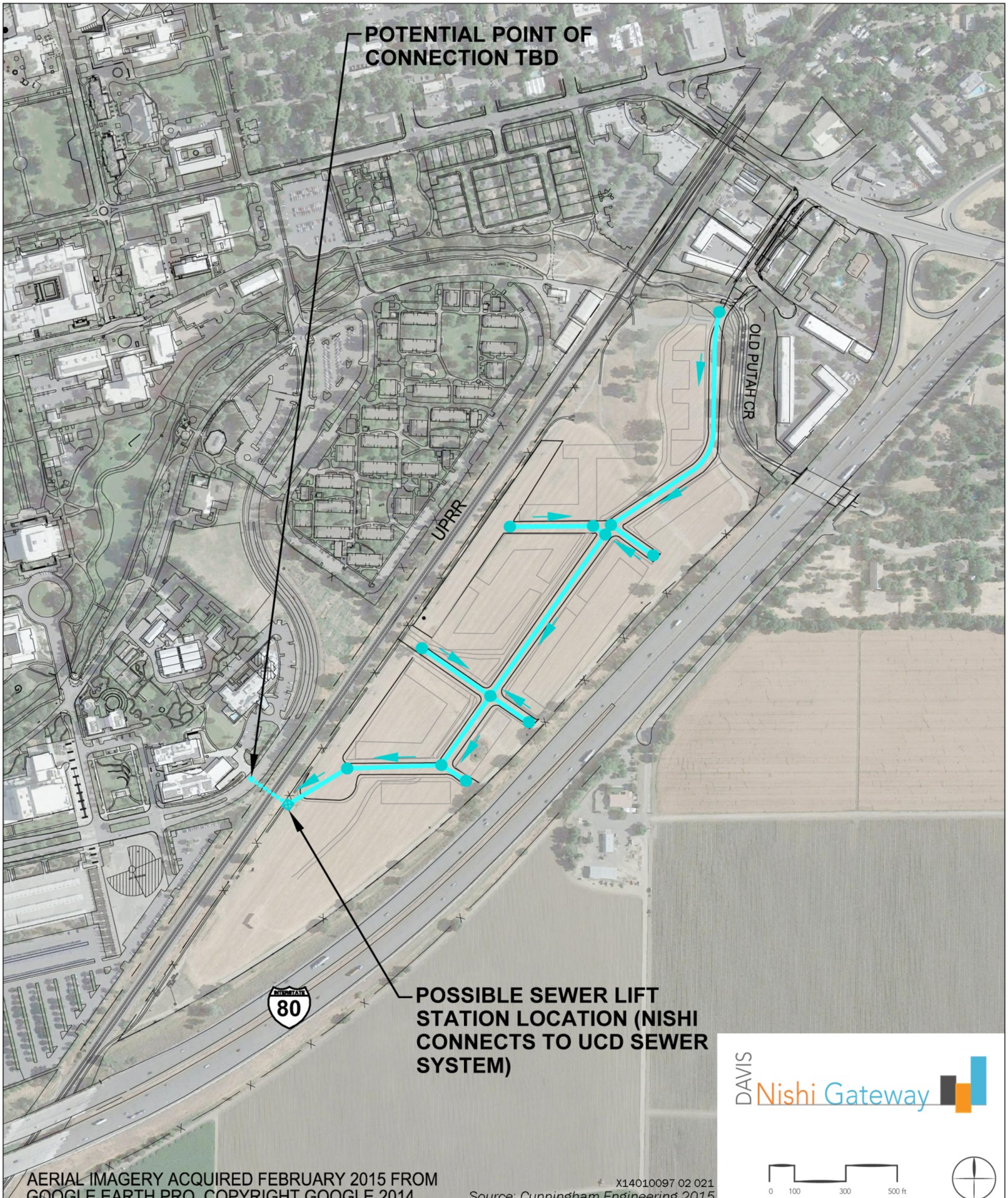

Figure 5-5 Sanitary Sewer Collection System Concept, Option B1

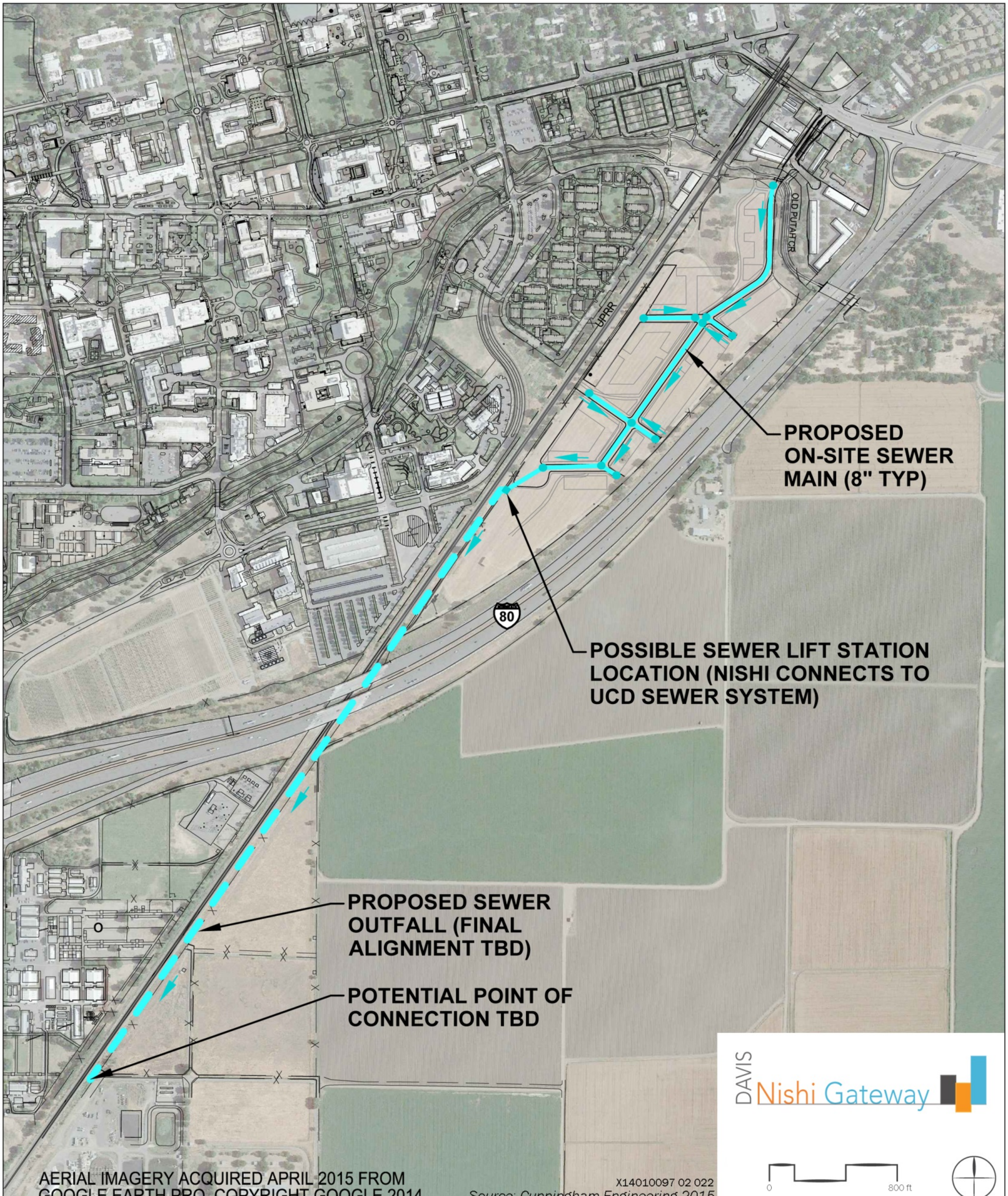

Figure 5-6 Sanitary Sewer Collection System Concept, Option B2

Because the existing WOD area is largely developed and has a relatively high level of impervious cover, peak flows are not expected to substantially increase as a result of redevelopment. It is expected that redeveloped sites within the WOD area will either need to generally maintain exiting drainage patterns and outlets, or provide an evaluation of the possible impacts of any changes in site drainage.

For stormwater quality, new construction within the Nishi Gateway project will be designed at a minimum with reference to City and state requirements. It is intended that LID measures be integrated throughout new construction to provide stormwater quality treatment, and to provide at-source runoff reduction where feasible. Additional benefits of infiltration-based LID features will include long-term recharge of the local shallow-to-intermediate depth aquifer. LID measures that increase site permeability and the presence of "green" infrastructure can also have an added co-benefit of reducing the urban heat island effect and thus improving the longer-term resilience of the project under generally hotter and more extreme conditions under a changing climate. LID stormwater treatment conforming with current standards would be required with any future WOD redevelopment.

Action 5.9: Minimize Impervious Areas

Minimize new impervious areas in the final project design and detailed plans. During final project design and detailed site planning, consider compact building footprints, alternative driveway layouts and/or materials, narrower roadway cross-sections (as appropriate), pervious pavement and efficient parking layouts. For example, in parking lots, the following elements can help reduce impervious areas:

- Efficient layouts that seek to minimize the overall area of the lot on a per-parking-space basis.
- Re-examination of conventional parking minimums and maximums, with the intention of not 'overparking' site designs (see also Parking Pricing and Management actions in Chapter 3).
- Construction of overflow (infrequent-use) parking areas from pervious materials.
- Exploration of shared parking opportunities for adjacent non-concurrent uses.

Action 5.10: Disconnect Impervious Areas

Configure the detailed site layout plan so as to disconnect impervious areas. This can be accomplished through judicious site design that seeks to place pervious areas (landscaping and/or pervious pavement) downstream of a site's impervious surfaces (roofs and conventional pavement), with site grading/landscaping designs that provide for sheetflow from those impervious surfaces onto the pervious surface areas. It is recommended that the detailed site design explore and, where appropriate, implement drainage design solutions that avoid direct connection of roof downspouts to the receiving storm drain pipe system, and seek to provide landscape areas immediately upstream of proposed drain inlets that will receive runoff from new pavement areas.

Action 5.11: "At-source" Drainage Management

Incorporate 'at-source' drainage management features in the grading and drainage design. Integrate small-scale distributed drainage management features such as shallow, decentralized surface ponding areas and/or rain gardens that are consciously designed into streetscapes and individual site landscapes throughout the project area. For example, it is recommended that the project consider - to the extent feasible - incorporating stormwater planters at regular intervals into the landscape parkway strips of proposed street sections. An at-source drainage management approach encourages the use of drainage as a design element, rather than solely as a functional requirement. To implement this, the project's landscape designs and engineering designs will be developed in an integrated, fully collaborative effort.

Action 5.12: Stormwater Drainage Treatment BMPs

Apply additional BMP treatment control measures as appropriate. The treatment control measures will likely include both flow-based BMPs (such as vegetated swales) and volume-based BMPs (such as bioretention planters, infiltration areas). The selection of LID measures will be a function of location and setting within the project. These LID measures will be designed in accordance with applicable City requirements. Location, sizing and configuration of these treatment measures will be determined with the future development of the tentative map and improvement plans for the project.

Vegetated swale outside of Tercero II Housing, UC Davis campus, promotes stormwater filtration and infiltration.

Action 5.13: On-site/Off-site Hydrology and Hydraulics Analysis

Develop a detailed On-site/Off-site Hydrology and Hydraulics (H&H) analysis during Tentative Map preparation. The detailed H&H analysis for the Tentative Map application will evaluate the flow characteristics of the existing Caltrans swale along Interstate 80 (I-80), to which the Nishi property will continue to drain. Such an analysis will require expansion of the preliminary site hydrology model to consider a potential off-site flow contribution to the swale from UC Davis lands upstream of the railway tracks, combined with a hydraulic analysis of the I-80 swale and its two bounding culverts. As such, the final H&H evaluation will provide a quantitative comparison of the total pre- and post-project flows (comprising on-site and off-site flow contributions) at the Nishi property's effective outlet to Old Putah Creek.

Many of the LID strategies outlined in this section are aligned with sustainable site design strategies in Chapter 6 (Open Space and Parks), which are focused on ensuring that pervious surfaces, biofiltration, catchment basins, planters, and other features are incorporated into final designs for the public realm and associated landscaping (see Actions 6.22 through 6.24).

Pervious pavement in a bike parking area allows for a solid surface while still allowing infiltration.

5.3 Evaluation and Monitoring

5.3.1 Evaluation

As noted above, this plan sets a goal of seeking to maximize water and wastewater efficiency through the use of conservation, reuse and integrated landscaping and stormwater management strategies, along with specific objectives relating to that goal. This section provides an evaluation of how the implementing actions will help the project achieve the objectives.

- **Objective 4.1:** Meet or exceed 2013 CALGreen Tier 1 water use efficiency requirements for indoor water use.

The CALGreen Tier 1 indoor water use efficiency requirements are expressed in terms of types of fixtures and appliances – more specifically by their nominal design flow rates under specified conditions. Implementation of Action 5.2 will fully meet (but not exceed) the Tier 1 requirements.

In addition, implementation of Actions 5.2 and 5.3 will exceed the Tier 1 requirements through the use of VHEFs or UHEFs, by up to 6 percent or 16 percent respectively. The types of VHEF or UHEF fixtures referenced in Action 5.3 are commercially available, but may carry a cost premium over more widely produced conventional fixtures. It is recommended that this be explored during the detailed design of the buildings themselves. Such design studies may result in different applications for different residential unit types and sizes, taking into consideration economics and the perceived preferences of prospective buyers and tenants.

- **Objective 4.2:** Minimize use of potable water in outdoor landscaping.

The project will make extensive use of low-water use landscaping. By implementing Action 5.1, an attractive, sustainable landscape can be designed with a site-wide water budget in the realm of 55 percent ET_0 (roughly 10 percent-15 percent below CALGreen Tier 1). This is a significant first step towards reducing use of potable water in landscaping. It is recommended that further reductions in landscape water budget be pursued during the detailed design of the landscaping.

In addition, with the implementation of a non-potable water source of sufficient capacity, (such as recycled water, or a dedicated irrigation well), then potable water could be eliminated for all routine irrigation.

- **Objective 4.3:** Work towards achieving zero net water usage through use of best management practices and innovative technologies.

For a given project site, one definition of zero net water is to use no more water annually than the equivalent long-term average annual volume of rain that falls on the site. Applying that definition to the Nishi development, this will equate to an annual water usage of 46.9 acres x ±18" = ±69 afy. By comparison, the usage estimates in the recent City of Davis WSA (with Open Space adjusted to 16.4 acres) translate to an annual usage of around 190 afy for the Nishi development. To achieve net zero water, the Nishi development's annual usage will need to be on the order of one-third of the WSA-estimated annual usage.

In the semi-arid Central Valley climate, attaining net zero water is a highly ambitious goal, and in the near term it may be limited to highly specialized building/development projects – those designed to a special set of expectations, and relying very extensively on state-of-the-art on-site water efficiency and re-use measures. As such, achieving zero net water may be beyond the current reach of more mainstream development projects, even those with fairly aggressive conservation measures. Nevertheless, it is good to keep the target of zero net water in mind, as it provides a compelling benchmark for long-term water sustainability.

Low impact development may also serve as community art or recreation areas, like this example from West Village.

It is expected that the Nishi development can make a significant step in the direction of net zero if UHEF's are utilized in most or all buildings, and if non-potable recycled water is used at a minimum for all site irrigation. It is recommended that once the development is constructed, ongoing annual usage numbers be compared with the net zero reference volume.

- **Objective 4.4:** Incorporate creative low-impact development (LID) solutions to meet stormwater treatment requirements.

It is proposed that LID measures be extensively applied throughout the site wherever feasible, and they will be designed to conform to City and State stormwater treatment requirements. The final locations, nature and extent of these measures are not currently known, and will be determined during site design. At that time, it will be possible to evaluate Objective 4.4 more fully.

5.3.2 Monitoring

Table 5-4 below identifies various measures and metrics the City of Davis can use to evaluate the extent to which the Nishi development achieves sustainability goals related to water use and stormwater facilities. Because wastewater is intrinsically tied to potable water use, there are no separate metrics.

Table 5-4 Water Performance Metrics

Measure/Metric	Timing	Desired Outcome
Total gallons of water used per day	Annually	Reduce average daily water usage to levels below expected water demands, in line with planned reductions shown in Table 5-2A and 5-2B, and 5-3A and 5-3B
Gallons of water used per each water service connection to the public distribution system.	Annually	Compare ongoing annual usage patterns on a per-building basis. Provide feedback to building managers/owners to engage users.
Gallons of water used per dwelling unit (average or exact, depending on whether submeters are installed)	Annually	Compare ongoing annual usage patterns on a per-lessee/per-dwelling unit basis. Provide feedback to engage users.
Gallons of water used in irrigation measured at each water service connection to the public distribution system.	Annually	Compare ongoing annual usage patterns on a per-connection basis. A meaningful comparison will typically span many irrigation seasons.
Periodic inspections of the constructed stormwater facilities. Such inspections will be typically be carried out by maintenance personnel.	As needed	Assurance that the condition/function of the constructed stormwater facilities does not materially degrade over time.