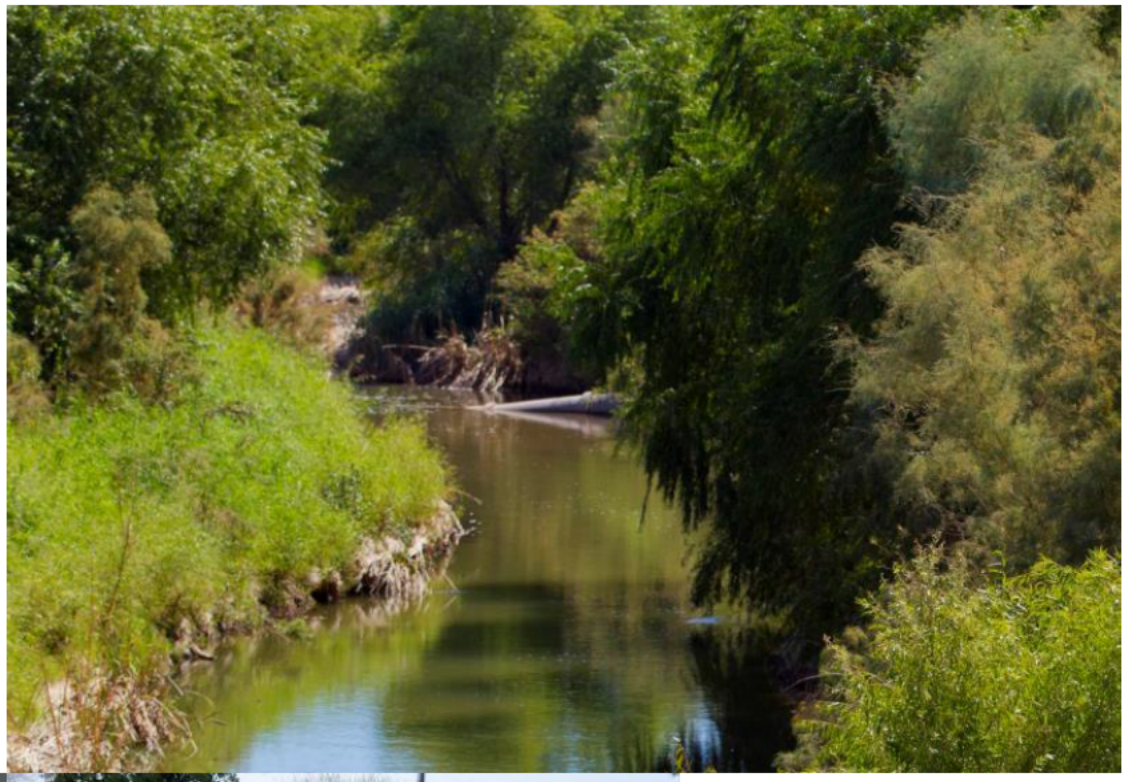

Green Stormwater Infrastructure Fund Proposal

City of Tucson, Arizona

August 2019

Prepared by Tucson Water Department, HDR, HELM, and Greeley and Hansen

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Contents

Tables

Executive Summary

This document provides an analysis and proposal for developing a Green Stormwater Infrastructure (GSI) Program and supportive funding for the City of Tucson. The vision for GSI is consistent with a policy approach known as “One Water,” embraced by the City, to manage all water resources in an integrated and holistic way. A key component of the GSI program could allow the City to leverage already planned investments ranging from parks enhancements to bicycle boulevards. Additional benefits could include improving sustainable stormwater management, addressing urban heat island effects among vulnerable communities, and the economic improvement of neighborhoods. Advancing the City’s holistic management of stormwater through the establishment of a GSI Fund would create a reliable and dedicated funding source for planning, implementing, and maintaining GSI projects city-wide.

The main challenges the City has faced with GSI include shared responsibility amongst multiple departments, sustainable funding, and maintenance of City-owned GSI features on neighborhood streets. GSI provides benefits that fall under the purview of multiple City and County functions, including transportation, water, planning, and flood control. To effectively provide these benefits, GSI should be planned and managed in an integrative and systemic way. The GSI fund is proposed to centralize planning, installation, maintenance, and management of GSI within a new office at the City of Tucson. This office would be charged with ensuring that GSI is complementary to, not duplicative of or competitive with, the efforts of other agencies and stakeholders, and begin to provide co-benefits through leveraged planning and investments.

This document outlines an example GSI implementation schedule for 15 years, which includes an equitable distribution of projects across City wards; and which is prioritized based on impact to heat-vulnerable populations, flood reduction in priority watersheds, expansion of tree canopy in the City’s least vegetated areas, and cost-effectiveness based on the ability to leverage existing CIP projects (particularly those identified in the Proposition 407 Parks and Connections Bond).

There are multiple benefits of a GSI program. These co-benefits range from capturing rainwater resources for beneficial reuse, flood protection, re-greening and beautifying neighborhoods, improving air and water quality, and mitigating urban heat island effects. Secondary benefits realized from other communities with successful GSI programs include pedestrian safety, public education, and job creation. Based on other successful GSI programs, key implementation components include public outreach programs that promote stakeholder and public involvement, and developing design standards and specifications.

GSI unit maintenance costs were estimated from published studies and applied to GSI assets inventoried for this study. Administrative costs were also estimated based on similar programs in other cities. The recommended GSI Program Annual Budget and associated staffing is shown in Table ES-1. Note: the proposed budget is based on revenues of $3 million annually.

Table ES-1. Recommended GSI Program Annual Budget

Category	Staffing	Annual Budget
Administrative	1 GSI manager	80,000
Technical staff	0.5 senior project engineer	140,000
	0.5 urban landscape manager	
	1 junior project engineer	
Public outreach and education	1 outreach coordinator	60,000
Direct expenses		40,000
	Subtotal Program Administration	**$320,000**
Maintenance	1 maintenance manager	80,000
	Contract maintenance	300,000
	Subtotal Maintenance	**$380,000**
Capital Improvement Program		$2,300,000
	Subtotal Capital	**$2,300,000**
	TOTAL	**$3,000,000**

Various funding options outside of fee revenue exist to support sustainability efforts, such as grants, loans, and Public-Private Partnerships (PPPs, P3s) which may provide the seed money for GSI programs. For long-term sustainable revenue, there are multiple fee options discussed in this proposal, generating estimated annual revenues of approximately $3 million to $5 million.

The document also includes a proposed annual measurement and reporting program to track number of projects, costs, number of trees planted, stormwater capture volumes, and changes in impervious area. A key metric that other communities have used to report progress is the concept of “Greened Acres.” This metric can be derived from the collected data and accounts for the conversion of a highly impervious urban landscape through the implementation of projects that capture rainwater for beneficial use.

Introduction and Background

Previous Mayor and Council Actions/Direction

This document provides an analysis and proposal for developing a Green Stormwater Infrastructure (GSI)Fee, Fund, and Program for the City of Tucson. Most immediately, this is pursuant to the direction of Mayor and Council on January 23, 2018. However, it emerges from—and seeks to build on—many years of vision, planning, policy, and practice already enacted by the City, its partners, and residents.

The GSI Fund would create a reliable and dedicated funding source for planning, implementing, and maintaining GSI projects city-wide. Existing City practices and programs (for example, the Water Conservation Fee and Neighborhood-Scale Stormwater Harvesting Program) provide precedents for managing a GSI Fund and selecting and implementing projects.

Definition of Green Stormwater Infrastructure

Green Stormwater Infrastructure (GSI) is an adaptable term used to describe an array of products, technologies, and practices that use natural systems—or engineered systems that mimic natural processes—to enhance overall environmental quality and provide utility services including capturing, cleaning, and infiltrating stormwater; creating wildlife habitat; shading and cooling streets and buildings; and calming traffic. As a general principle, GSI techniques use soils and vegetation to infiltrate, evapotranspire, and/or recycle stormwater runoff. (Note: these definitions are primarily drawn from the *Pima County-City of Tucson Low Impact Development and Green Infrastructure Guidance Manual* (2015).

Common GSI terminology applicable to the Tucson area includes the following:

- Basin: An earthen depression designed to collect and infiltrate stormwater.
- Best management practices (BMPs): Activities, practices, or prohibitions of practices designed to prevent or reduce pollution.
- Bioretention: Also known as a rain garden, bio-filter, or BMP. A GSI practice consisting of vegetated depressions engineered to collect, store, and infiltrate runoff.
- Chicane: A traffic calming measure that is comprised of curb extensions or road narrowing structures.
- Curb cut: A break in the curb to allow for the passage of stormwater flow from impervious surfaces (e.g., streets) to pervious surfaces (e.g., rain garden).
- Dry well: a shaft or chamber constructed in the ground in order to drain and infiltrate stormwater
- Gray Infrastructure: Human-engineered infrastructure for stormwater management such as storm sewers, channels, and treatment plants that is designed to move stormwater away from the built environment as quickly and efficiently as possible.

- Low impact development (LID): LID is an approach to land development that works with nature to manage stormwater as close to its source as possible. LID employs principles such as preserving and recreating natural landscape features and minimizing effective imperviousness to create functional and appealing site drainage that treats stormwater as a resource rather than a waste product.
- Right-of-way (ROW): The area along a street between the curb and property lines.
- Swale: An open drainage channel designed to convey or infiltrate stormwater runoff.
- Traffic calming: The practice of slowing traffic through the use of roadway construction, vegetation, or other features.
- Urban Heat Island (UHI) Effect: The phenomenon in which urban areas are warmer than other areas due to absorption and retention of heat by buildings and paved surfaces in the built environment.
- Rainwater harvesting: The process of intercepting stormwater from a surface such as a roof, parking area, or land surface, and putting it to beneficial use. Practices include active harvesting (capturing and storing water in tanks, cisterns, or rain barrels) and passive harvesting (infiltrating water in the landscape, a.k.a. bioretention, rain gardens, BMPs)

Policy Vision

A vision of what can be accomplished with GSI in Tucson is twofold: (1) maximizing the community's beneficial use of its stormwater resources in a cost-effective way, and (2) transforming the urban watershed over time to reduce flood risk, improve water quality, and sustainably increase urban tree and vegetation canopy (with attendant benefits in air quality, reduced UHI effects, and improved public health and quality of life).

Plan Tucson Long-term Community Sustainability Outcome, Green Infrastructure:

"There is a strategically planned and managed green infrastructure network that emphasizes the protection and use of native plants and trees, conserves ecosystem values and functions, and provides associated benefits to human populations such as urban heat island mitigation, stormwater management, and air quality benefits." – *Plan Tucson Sustainability Indicators Matrix, p. 4.16*

This vision has been fostered for a long time by Tucson's grassroots—its residents, neighborhoods, nonprofits, and community groups. The City of Tucson Mayor and Council have championed GSI in various forms for over a decade, enacting the nation's first Commercial Water Harvesting Ordinance, establishing a residential rainwater harvesting rebate program for Tucson Water customers, and instituting the Tucson Department of Transportation's (TDOT's) Green Streets Active Practice Guidelines. At the heart of all of these efforts has been the vision of making use of rainwater resources to grow and sustain Tucson's urban forest.

The City's and the community's vision for GSI was detailed extensively in the voter-approved *Plan Tucson: City of Tucson General and Sustainability Plan 2013* (Plan Tucson). Table 1 lists the policies in Plan Tucson that a GSI fund seeks to directly address or implement.

Table 1. Plan Tucson Policies Addressed by Green Stormwater Infrastructure

Policy	Description
	Public Safety (PS)
PS3	Reduce potential harm to life and property in natural hazard areas and from hazards resulting from human activities and development through preventive measures.
	Public Health (PH)
PH8	Support streetscape and roadway design that incorporates features that provide healthy, attractive environments to encourage more physical activity.
	Water Resources (WR)
WR2	Expand the use of alternative sources of water for potable and non-potable uses, including rainwater, gray water, reclaimed water, effluent, and stormwater.
WR4	Ensure an adequate amount of water to meet the needs of riparian ecosystems.
WR5	Protect groundwater, surface water, and stormwater from contamination.
WR8	Integrate the use of green infrastructure and low impact development for stormwater management in public and private development and redevelopment projects.
WR11	Conduct ongoing drought and climate variability planning.
	Energy and Climate Readiness (EC)
EC3	Reduce the urban heat island effect by minimizing heat generation and retention from the built environment using a range of strategies.
EC9	Assess and address the vulnerability of the community's health and safety, economy, and natural resources to climate change, and develop assurances that vulnerable and disadvantaged populations are not disproportionately impacted by climate change.
	Green Infrastructure (GI)
GI1	Encourage green infrastructure and low impact development techniques for stormwater management in public and private new development and redevelopment, and in roadway projects.
GI2	Rehabilitate and enhance natural drainage systems, water detention and retention basins, and other infiltration areas for multiple benefits, such as recreation, wildlife habitat, and stormwater management.
GI4	Expand and maintain a healthy, drought-tolerant, low-water use tree canopy and urban forest to provide ecosystem services, mitigate the urban heat island, and improve the attractiveness of neighborhoods and the city as a whole.
GI5	Create, preserve, and manage biologically rich, connected open space; wildlife and plant habitat; and wildlife corridors, including natural washes and pockets of native vegetation, while working to eradicate invasive species.
GI6	Protect, restore, enhance, and manage trees for their long-term health, including providing guidance on proper planting, care, and maintenance.
	Land Use, Transportation, and Urban Design (LT)
LT10	Support urban agriculture and green infrastructure opportunities in new development or redevelopment when appropriate.
LT12	Design and retrofit streets and other rights-of-way to include green infrastructure and water harvesting, complement the surrounding context, and offer multi-modal transportation choices that are convenient, attractive, safe, and healthy.

Finally, the City's vision for GSI is consistent with a policy approach known as "One Water," embraced by the Tucson Water Department, to manage all water resources (surface water, groundwater, reclaimed/recycled water, rain/stormwater) in an integrated and holistic way. A key tenet of this approach is applying different water resources to their most appropriate and efficient uses, such as using reclaimed water for irrigating parks and golf courses. Another important aspect of the integrative One Water approach is that what is seen as a liability or waste in one part of the system can serve as a resource in another part of the system.

One Water works to:

Integrate and optimize urban water systems within the larger context of a City.

One Water is defined as an approach "that considers the urban water cycle as a single integrated system, in which all urban water flows are recognized as potential resources, and the interconnectedness of water supply, groundwater, stormwater, and wastewater is optimized, and their combined impact on flooding, water quality, wetlands, watercourses, estuaries, and coastal waters is recognized." – *Water Environment & Reuse Foundation*

Rain and stormwater represent the community's least-developed water resource, and one that has commonly been seen and managed as a liability, or something to be channeled out of the community as quickly as possible. The most cost-effective way of putting this resource to use involves directing it into vegetated basins, swales, etc. for passive landscape irrigation. The safest and most efficient location to make use of rain and stormwater is as close to where it falls as possible. An urban watershed where stormwater is captured close to where it falls in a distributed network of vegetated features is the vision of GSI.

Need for a GSI Fund

Issues/problems to be addressed by GSI Fund

Issue: inadequate maintenance of existing City-owned GSI features in neighborhoods

Over many years, the City has used a number of internal and external funding sources (e.g., Pima County Community Reinvestment funds, City of Tucson Back to Basics grants, Tucson Water Conservation Fee funds) to install hundreds of GSI features in streets, rights-of-way, and public properties. Most are the responsibility of the Tucson Department of Transportation (TDOT), which must use the bulk of its maintenance resources on roadway (asphalt) maintenance because of funding constraints. The City (both TDOT and Tucson Water) has generally required neighborhoods where these features are installed to assume responsibility for maintenance. However, experience has shown that even the most well-organized neighborhoods struggle to meet this responsibility. The result is often that GSI features become clogged with sediment, weeds, and trash, and much of their intended benefit is lost. When GSI is not maintained, it is not just an aesthetic issue—it can impede stormwater flows and create localized flood hazards, or present a risk to users of the roadway or sidewalks. Also, requiring neighborhoods to take on maintenance of GSI projects creates a barrier for those in disadvantaged/stressed areas, who may not have the capacity to take this on. In some

cases, City-constructed GSI features have been removed or altered at the request of neighborhoods because of a lack of maintenance.

- ***How GSI fund addresses issue:*** *A GSI fund would establish a sustainable funding source for maintaining City-owned GSI features to appropriate standards for public infrastructure. This would improve their appearance and function and extend their useful life. It would facilitate more equitable distribution of new GSI features throughout the City, and allow the City to increase its return on GSI capital investments it has already made.*

Issue: inefficient, dis-integrated GSI planning and management

GSI provides benefits that fall under the purview of multiple City and County functions, including transportation, water, planning, and flood control (these will be addressed in detail in Gap Analysis section below). To effectively provide these benefits, GSI should be planned and managed in a proactive, integrative, and holistic way. To date, the City has implemented GSI reactively, in response to requests from individual neighborhoods. As a result, its benefits are usually quite limited. For instance, GSI has not yet been strategically deployed to address localized flooding issues (which would require a watershed-based analysis of opportunities), or to address known gaps in the urban tree canopy, which occur in some of Tucson's most vulnerable neighborhoods.

- ***How GSI fund addresses issue****: The GSI fund is proposed to centralize planning, installation, maintenance, and management of GSI within a new office at the City of Tucson. This office would be responsible for addressing these responsibilities in an integrated and collaborative way with other City departments, government agencies, and partners in the community. This office would be charged with ensuring that GSI is complementary to, not duplicative of or competitive with, the efforts of other agencies and stakeholders.*

Issue: expanding Tucson's urban forest without significantly increasing potable water use

Urban trees and vegetation are one of the community's most effective resources for improving the quality of life and adapting to a warming climate. Trees and plants measurably and meaningfully improve air and water quality, increase property values and retail sales, support bicycling and walking, and improve residents' physical and mental health[1]. However, significantly expanding Tucson's urban forest and maintaining its health will require deploying considerable water resources for irrigation that are not used today. For long-term water supply sustainability and economic efficiency, the primary source of this irrigation should not be the potable (drinking) water system. Tucson Water operates a reclaimed water system that provides recycled wastewater for irrigation purposes; however, expanding and maintaining this system would be prohibitively expensive solely for the purpose of irrigating a distributed network of urban vegetation. TDOT's Green Streets Active Practice Guidelines mandates the implementation of GSI/passive water harvesting practices to support landscape irrigation

[1] Marshall L., Reich S., and Buckley M., ECONorthwest (2018). *Economic benefits of green stormwater infrastructure (GSI) investments in Tucson, Arizona.* Prepared for American Rivers.

in new transportation projects; however, these guidelines only apply to a tiny fraction of the land owned and managed by the City of Tucson.

- ***How GSI fund addresses issue:*** *A GSI fund would support significant, sustainable expansion and maintenance of the City's urban forest, by deploying the community's most underutilized water resource—rain/stormwater— for passive irrigation of drought-tolerant vegetation throughout streets and public properties. This investment that the GSI fund makes on public property would complement the incentives the City/Tucson Water already provides to homeowners for installing GSI and rainwater harvesting systems on their own properties.*

Gap Analysis

This section identifies the roles that various agencies and groups in the region play in GSI installation, maintenance, and/or outreach. Gaps within this framework are identified, and the role that the GSI fund would play in addressing these gaps is discussed.

Pima County Regional Flood Control District

This agency is responsible for flood control and monitoring activities throughout Pima County. Within the City of Tucson limits (and within other municipalities), the Pima County Regional Flood Control District (the District):

- Manages large watercourses such as the Santa Cruz River, Rillito River, and Pantano Wash, and some of their larger tributaries such as Arroyo Chico (projects include bank protection and habitat and ecosystem restoration);
- Develops and maintains recreational facilities (e.g., Chuck Huckelberry Loop) adjacent to the large watercourses;
- Conducts floodplain studies that catalogue and prioritize flood control projects; and
- Provides limited capital funding and technical assistance to assist the City with flood control projects affecting smaller watercourses.

Outside of City or Town limits, the District is the regulatory agency responsible for all floodplain management activities.

GSI Projects and Programs

The District has installed and maintains some of the city's largest GSI features, including:

- Kino Environmental Restoration Project: captures and directs stormwater from 17.7 square miles of urban watershed in a 121-acre network of streams, ponds, wetlands, and vegetated uplands with recreational paths; actively retains up to 114 million gallons of stormwater that is used for landscape irrigation at adjacent sports complex. It was completed in 2001 at a cost of $11 million, with $6 million in local funds and $5 million from the U.S. Army Corps of Engineers.
- Rillito River-Swan Wetlands Ecosystem Restoration: 60 acres at three sites along the southern bank of the Rillito River were graded and vegetated to encourage passive rainwater harvesting, slow and infiltrate stormwater runoff from adjacent neighborhoods, restore some floodplain function of previously concreted drainage channels, and continue to provide flood conveyance capacity. It was completed

in 2008 at a cost of $4 million, with $1 million in local funds and $3 million from the U.S. Army Corps of Engineers.

The District has included GSI features in its regulatory *Design Standards for Stormwater Detention and Retention*, and led the development of the Pima County-City of Tucson *Low Impact Development and Green Infrastructure Guidance Manual*.

Identified Gaps or Issues

All Pima County residents, including those inside incorporated areas, pay property taxes to the District. How much investment the agency makes within incorporated areas is sometimes a point of contention. Both City staff and District staff have worked to achieve better coordination and collaboration between the agencies in recent years.

- ***How GSI fund addresses gaps/issues:***
    - *GSI funds would allow the City to leverage additional value out of District projects by adding GSI elements within larger flood control plans. One example would be adding a water-harvesting, vegetated median to a neighborhood street that the District is reconstructing for flood water conveyance.*
    - *The GSI fund would also help to leverage additional District investment in the City by providing a source of matching funds for projects, as well as staff support and resources for planning, communication, and collaboration around GSI and flood control.*

Tucson Department of Transportation

TDOT manages the City's compliance with portions of the national Clean Water Act that pertain to stormwater quality, including the Municipal Separate Storm Sewer System (MS4) Permit and Stormwater Management Program. It also implements and enforces the City's Stormwater Quality Ordinance (No. 10209). These responsibilities include:

- Responding to reports of illicit discharges to the public storm drain system. This includes inspecting properties and working with property owners to correct violations.
- Conducting public outreach and education regarding stormwater quality.
- Coordinating with the Planning and Development Services Department for private developer compliance with MS4 regulations.
- Reporting the City's compliance with MS4 regulations for public projects within TDOT and other departments.
- Ensuring City staff have adequate training in stormwater compliance and enforcement.
- Reporting to and coordinating with the Arizona Department of Environmental Quality (ADEQ) and U.S. Environmental Protection Agency (EPA).

TDOT also manages the City's public stormwater drainage system, which includes:

- Maintaining storm drain assets including pipes, culverts, bridges, and wash crossings.
- Maintaining improved and unimproved washes not maintained by the District.

- Inspecting private storm drainage assets in coordination with Planning and Development Services.

GSI Projects and Programs

TDOT has implemented, facilitated, and/or permitted most of the City's public GSI features, including stormwater harvesting chicanes, medians, traffic circles, street-side rights-of-way, and property remnants. These features generally fall into one of two categories:

1. Neighborhood-scale GSI: These have often been initiated by neighborhoods, sometimes in partnership with nonprofit organizations, and have been funded through a variety of sources such as Pima County Community Reinvestment Grants and federal Transportation Enhancements/Alternatives funds. A well-known example is the dozens of water harvesting chicanes on 9th and 10th Streets in the Rincon Heights Neighborhood.
2. Arterial street GSI: These are GSI features that have primarily been installed as part of a larger project such as Downtown Links, Grant Road Phases I and II, and Houghton Road. In recent years, these projects and the associated GSI have been paid for primarily by Regional Transportation Authority sales tax funds.

TDOT has opportunistically included GSI features in the design of a variety of other projects as well. TDOT oversees the Green Streets Active Practice Guidelines that require the inclusion of GSI in publicly-funded road reconstruction projects. It contributed to the Pima County-City of Tucson *Low Impact Development and Green Infrastructure Guidance Manual*, and has developed a number of standard engineering details for GSI features that are available on its website.

Identified Gaps or Issues

Maintenance of neighborhood-scale GSI has been an ongoing issue. For years, TDOT has attempted to facilitate neighborhoods' maintaining their own GSI. While this has been successful in a few areas, in general it has not proven to be a sustainable model as attrition, turnover, and changing priorities occur in neighborhoods. As a result, many neighborhood-scale GSI features have fallen into disrepair with weed growth, sediment accumulation, and plant loss. In most cases, TDOT has not identified funding for its own contractors to maintain these facilities. In contrast, arterial street GSI is generally addressed by TDOT under its current maintenance contracts. Notably, TDOT has not maintained a complete inventory of GSI features at either the neighborhood or arterial street scale.

- ***How GSI fund addresses gaps/issues:*** *the fund would pay for maintenance of City-installed, neighborhood-scale GSI. GSI program staff would enact a full-scale asset management approach to managing GSI in order to properly and efficiently maintain the assets and maximize return on capital investment.*

In the 1990s, TDOT developed a list of capital projects (the Tucson Stormwater Management System, or TSMS) to reduce localized flooding and generally improve stormwater drainage throughout the city. This list of projects totaled over $100 million at the time, and very few of the projects have been implemented in the 20+ years since. A few are currently being studied and re-scoped with assistance from the Pima County

Regional Flood Control District; however, no substantial funding has been identified to implement the TSMS.

- ***How GSI fund addresses gaps/issues:*** *the TSMS as it currently exists is a "gray infrastructure" capital program of culverts, channels, and drains. The size and scope of the TSMS is not something that will be meaningfully addressed by a GSI Fund as currently proposed. To fund something of this size would require establishing something more akin to a traditional stormwater utility with average customer fees in the range of $10 to $15 per month. However, there are opportunities to address many of the TSMS' stormwater management goals through implementation of surface-level GSI approaches within TSMS priority watersheds. This approach is detailed in the proposed GSI capital plan below.*

Funding for TDOT's MS4 stormwater/water quality programs has decreased over the past decade as the Department and the City have faced significant budget challenges.

- ***How GSI fund addresses gaps/issues:*** *the GSI fund as proposed would not provide additional funding for administration of the City's MS4 program.*

Pima Association of Governments

The Pima Association of Governments (PAG) is a federally designated metropolitan planning organization whose primary responsibility is regional transportation planning. As the designated regional water quality planning agency under Section 208 of the federal Clean Water Act, PAG also works to ensure proper planning of wastewater treatment facilities throughout Pima County and assists local municipalities with stormwater regulatory compliance.

PAG operates transportation and sustainable environment planning divisions, as well as a technical services division that supports PAG and member jurisdiction planning efforts through research, reporting, and data modeling (transportation, watershed, impervious surfaces), and other services. The agency also provides public education and outreach materials, and acts as an information clearinghouse for regional data and reports that fall under its areas of expertise.

GSI Projects and Programs

PAG's stormwater and watershed planning activities affecting the City include:

- Identifying water pollution issues and regionally developing resolutions or coordinating actions between member jurisdictions. The agency also tracks regulatory and local policies to share regionally as updates or models for adoption. An annual budget of about $170,000 supports two full-time staff. In addition, the program receives geographic information system (GIS), administrative, and communications support within PAG. A key example is that PAG pools funds regionally to leverage investments in remotely sensed GIS datasets analyzed to create tree canopy, impervious classification, and stormflow analysis. PAG's GI Prioritization Webmap has additional value including data acquisition, processing, analysis, program management, and support/maintenance.
- PAG maintains and updates the Areawide Water Quality Management Plan (208 Plan) for the region. Under state and federal regulations, all new or significantly

changed wastewater treatment facilities must gain consistency with the 208 Plan before permits may be issued. Annual funding for these activities varies as needed and as available.

Identified Gaps or Issues

- PAG funding is prioritized for transportation projects and for staff time required to support the agency's Section 208 duties. Funding and resources are not regularly available for GSI and stormwater planning and implementation. This work is conducted when part of regional priorities, as resources allow, or through partnership agreement.
- Outreach and education efforts related to GSI have been curtailed in recent years, and participation in regional advisory activities is minimized because of redirection of funding priorities.
- Prior City of Tucson funding has been eliminated for PAG stormwater-specific projects such as detention/retention mapping, field screening outfall monitoring, and MS4 report writing. PAG GSI work has been limited in the last few years to funded grant opportunities.
- ***How GSI fund addresses gaps/issues:*** *the GSI fund would support the City's implementation of its own GSI planning, outreach, monitoring, and education projects.*

Tucson Water

Tucson Water, as a department of the City of Tucson, has been investing in parcel-scale water harvesting since 2012 when the Residential Rainwater Harvesting Rebate Program was launched. Funding for this program, and other water conservation programs, is collected as a volumetric fee on all potable water sales, currently at the rate of 10 cents per hundred cubic feet (as of July 2, 2018). In 2015, this program was expanded to include small commercial customers (based on meter size), and in 2017 a limited-income grant and loan component was added to the rebate program. Also in 2017, at the behest of the City of Tucson Mayor and Council, Tucson Water launched a neighborhood-scale stormwater grant program to provide funding for street-scale stormwater harvesting projects. In addition to this programmatic role, Tucson Water has a code enforcement role pertaining to the Commercial Rainwater Harvesting Ordinance as a component of the city's Water Waste Ordinance (see the following section, *Private Sector*).

GSI Projects and Programs

Rainwater Harvesting Rebate Program

The Rainwater Harvesting Rebate Program provides residential and small commercial customers with rebates of up to $2,000 for installing rainwater harvesting systems; of this $2,000, up to $500 can be used to cover expenses for passive systems. To date, the utility has invested $2.4 million in rebates for systems installed by over 2,000 customers (approximately 320 passive systems and 1,680 active systems), offsetting nearly 38,000,000 gallons of potable water.

Neighborhood-scale Stormwater Grant Program

The Neighborhood-scale Stormwater Grant Program was launched in 2017 and provides funding for neighborhoods and community organizations to install green infrastructure in public spaces across the city. Program funding is currently $350,000 annually, to be distributed equally among the city's six wards. In the program's first year, 18 applications were received. As of August 2019, nine projects have been completed and 19 more are in the design, bidding, or permitting process. The program does not include funding for maintenance, so neighborhoods that apply are currently required to assume this responsibility.

Identified Gaps or Issues

- Affordability of rainwater harvesting systems was a major program gap that is now closing because of the establishment of the limited-income program.
- Based on input from stakeholders, customers, and program partners, Tucson Water is developing proposed changes to the passive rainwater harvesting rebate, including increasing the rebate level and improving the program's educational, engagement, and oversight efforts. The intent of these changes is that more "true" GSI (i.e., passive systems of vegetated earthworks, as differentiated from cisterns/active systems) will be installed on private properties through this program.
    - ***How GSI program addresses gaps/issues:*** *Tucson Water's rainwater harvesting programs will benefit from significant synergies with the proposed GSI program such as shared development of design standards, outreach and education efforts, and inspections of installed systems.*
- The majority of applications received for the Neighborhood-scale Stormwater Grant Program have come from only three of the city's six wards. City staff and ward offices have worked to outreach proactively to neighborhoods with some success. This citizen-led model in which the neighborhood must lead the application process and provide ongoing maintenance for GSI projects tends to favor those neighborhoods that are already well-organized and well-resourced.
    - ***How GSI program addresses gaps/issues:*** *The proposed GSI Fund would allow the City to take the lead in developing and maintaining projects more equitably across the community. City staff/partners would lead a collaborative process with the involved neighborhoods, and provide the means for ongoing management and maintenance of the GSI features.*

Private Sector

In 2010, the City of Tucson implemented the nation's first Commercial Rain Water Harvesting Ordinance, which effectively mandates the installation of GSI in new commercial developments and large redevelopment projects. The ordinance requires that new commercial development landscape irrigation needs be met with 50% harvested rainwater, which is almost always achieved through passive water harvesting methods—that is, directing runoff into vegetated basins and swales for infiltration. Since 2010, approximately 200 commercial development projects have been subject to this ordinance. In 2018, City staff conducted an audit of some properties subject to the

ordinance and found that in most cases the 50% water savings goal was not being met. The review identified issues in water harvesting/GSI design, construction, and management that contribute to the properties' not meeting the standard. City staff is already taking steps to address some of these issues; however, there are several issues that have not yet been resolved.

- ***How GSI fund addresses gaps/issues:*** *GSI program staff supported by a GSI fund would work with the City's Planning and Development Services Department and Tucson Water to establish professional design, construction, and maintenance standards specifically for implementing and maintaining cost-effective GSI on private property. GSI program staff would also create educational materials and programs to improve the private sector's ability to comply with the ordinance.*

In 2018, City of Tucson implemented a Water Infrastructure Incentive program, which offers financial incentives to employers that create new high wage jobs within the City and meet rigorous sustainability criteria. This program incentivizes private adoption of GSI practices via aggressive targets for water harvesting (meeting 100% of estimated yearly landscape water needs) and mature tree canopy (25% of non-rooftop areas).

Many private property owners and developers have voluntarily implemented GSI on their properties, often without assistance from the City. In early 2018, City staff took some preliminary steps to facilitate and encourage private projects that capture, retain, and infiltrate stormwater from public rights-of-way in GSI features.

- ***How GSI fund addresses gaps/issues:*** *The GSI fund would bolster GSI implementation on commercial properties by providing staff support, technical resources, and assistance to commercial property owners and developers.*

Nonprofit Organizations, Neighborhoods, and Individuals

Individuals, neighborhoods, and nonprofits have led the way in implementing and advocating for green stormwater infrastructure in Tucson for the last 20 years. Over that time period, dozens of organizations, neighborhoods, churches, schools, and private developments have implemented GSI at dozens of sites through a wide range of funding sources including foundation grants, grants from all levels of government, and private contributions. The vast majority of these projects have implemented curb cuts and basins in the right-of-way to capture and infiltrate stormwater runoff from public streets.

Two obstacles, or gaps, have been commonly identified by those implementing these projects. The first is cost: getting the permits, traffic control measures, and professional contractors required for cutting curbs can be quite expensive for a community-led effort. The second is maintenance: even though the GSI is commonly implemented in public rights-of-way, the City holds the adjacent property owner responsible for maintenance. Together, these factors have limited the extent of implementation of community-led GSI.

- ***How GSI fund addresses gaps/issues:*** *By providing a funding source for both construction and maintenance, the GSI fund would help to address cost and resource barriers for neighborhoods. Having a professional staff dedicated to GSI planning, implementation, and outreach (including one full-time Outreach Coordinator) will allow the City to leverage even more support and participation from neighborhoods, nonprofits, and community groups.*

Alternative Financing and Funding Options

Various funding options outside of fee revenue exist to support sustainability efforts, which may apply to GSI programs. However, none of these options would serve as a primary or even a major funding source for a municipal GSI program. External funding is generally offered to provide technical assistance, assist with education and outreach efforts, and support development of innovative partnerships. Loans are also available, but must be repaid through rates or fees.

Benefits of a GSI Program

The community benefits that can be provided by a GSI program will vary from program to program based on geography, climate, hydrology and hydrogeology, natural environment, and extent of urbanization. Based on benefits realized by other programs across the country, the City of Tucson is expected to realize primary and secondary benefits from a GSI program.

Primary benefits relate to the vision objectives for the GSI program. First, GSI would capture the currently unused rainwater/stormwater resource and make it available for direct use on new landscaping and trees that can be supported by the captured water, thus replacing potable water that otherwise would have to be used. Stormwater that is not directly used would also be cleaned and recharged throughout the watershed and used to replenish the aquifer. Second, by capturing and reusing stormwater at its source, GSI would allow the City to re-green and increase the vegetative canopy throughout the watershed, particularly in economically distressed, least vegetated neighborhoods, and ultimately mitigate some of the heat island effects of dense urban areas.

As in other cities across the country, a GSI program within the City would provide multiple secondary environmental, economic, and community benefits:

- Stormwater flows would be directed away from natural water courses, which would reduce localized flooding, improve emergency vehicle access, and reduce property damage.
- The quality of water that is collected and conveyed in the stormwater system would be improved (water quality BMPs can be incorporated into GSI design).
- Increased vegetation and tree canopy would improve air quality removing pollutants from the air.
- Increased vegetation and tree canopy would also provide more shade and reduce building energy demands, particularly during the summer.
- Urban communities would be revitalized by providing neighborhood beautification and much-needed green space for recreation, increasing the value of adjacent properties, and providing wildlife habitat.
- GSI could be designed to improve pedestrian safety through traffic calming.
- GSI could also be designed to contribute to the revitalization of historic streets, and strengthen the community by providing jobs and training to residents (for example, construction, nurseries, maintenance).

- The increased vegetation and neighborhood beautification would help promote and support biking, walking, and transit initiatives.
- Public education opportunities would be increased.
- Implementation of GSI has the potential to create new job opportunities or sustain existing jobs, especially in the operation and maintenance fields for workers who may otherwise be unemployed or underemployed. This could be particularly important for socially and economically disadvantaged neighborhoods within the City.
- The natural hydrologic function of urban areas would be restored, urban watershed management will be improved, and precipitation can be treated as a resource rather than waste, especially in shallow groundwater areas.

Activities of a GSI Program

GSI Maintenance

One of the key activities to be performed with the GSI Fund is the maintenance of City-owned GSI that is not currently being effectively maintained by one of the City departments. As discussed in the Gap Analysis, the area of greatest need is in GSI features that have been installed on neighborhood streets. In addition, the GSI fund would be used to maintain any new GSI assets that are installed as part of the GSI capital improvement program (below).

Maintenance Requirements for GSI

Maintenance requirements will vary by the type of GSI implemented, size, and location. Maintenance requirements will be greater within the first few years of installation because GSI elements need to be inspected more frequently to ensure plants are taking root and to identify any potential problems early. Inspections after rain events will also be important to ensure the system is operating as designed.

When discussing the actual activities necessary to maintain a GSI project, activities are generally divided into routine maintenance and non-routine maintenance. Routine maintenance includes the activities associated with preventative maintenance that should be conducted at regular intervals. Although routine maintenance items vary according to each GSI technology, activities for vegetated practices tend to include weeding and removing trash and sediment, while activities for pervious pavement include sediment removal. Not all routine activities are required to be performed on the same schedule, and schedules can range from weekly to annually. Non-routine maintenance activities can be defined as the activities that are performed as a reaction to a particular performance issue such as repairing damage from unexpected events (residents sometimes mow GSI projects or replace plants), replacing a sign or traffic delineator that has been damaged, or irrigating a project during an exceptionally dry period. Although more difficult to predict, some part of the maintenance program cost estimate should consider the costs associated with these non-routine maintenance items.

In addition to the tasks necessary to maintain a GSI project, a maintenance program should establish frequencies for inspecting the site and performing maintenance

activities. The following elements are considered when establishing maintenance and inspection frequencies:

- GSI practice type (for example, bioretention, and pervious pavement).
- Site-specific factors (dependent on actual site conditions such as runoff volume, traffic loading, sediment loading, litter/debris loading).
- Seasonal variations (for example, seasonal leaf/seed drop, summer heat impacts).
- Temporary adjacent site activities (for example, construction).
- Irregular weather events (for example, monsoon, wind storms).

Because these factors differ from site to site, the necessary maintenance frequency for each site is likely to vary geographically and could vary throughout the year. Existing GSI programs have established maintenance frequencies ranging from weekly during wet periods and for GSI elements with lush vegetation, to annually for GSI elements that are subsurface. Site visits could include both site inspections and maintenance activities.

In developing the maintenance protocols, it is necessary to consider the potential equipment and resources required. For most vegetated practices, these resources will include the equipment necessary for landscaping maintenance, such as shovels and trash bags. Depending on the project, earth moving equipment may be necessary. This equipment is costly and should be considered when a program is selecting its maintenance entity. For these reasons, consideration of the materials and resources necessary to perform maintenance may dictate whether or not maintenance can be performed in-house.

Estimated Maintenance Costs for City-owned GSI

In order to accurately estimate maintenance costs, Tucson Water staff conducted a field inventory of all known traffic circles, medians, and chicanes on neighborhood streets within City limits. Each asset was mapped, photographed, and catalogued in a GIS database including information on size, design, vegetation, and maintenance needs (weeds, erosion/sedimentation, etc.). 317 of these assets were determined to be GSI in that they collect and infiltrate stormwater runoff from adjacent surfaces into vegetated areas (or have the capacity to do so with maintenance or modifications).

Staff documented both functional and maintenance deficiencies at these in-street GSI sites, which were used to create maintenance cost estimates. Functional deficiencies can be mitigated with one-time improvements, such as curb cuts or digging a basin at the site so that it can collect runoff. Maintenance deficiencies can be more easily remedied through annual scheduled cleaning, weeding, planting, and sediment removal. Unit costs to mitigate functional and maintenance deficiencies were based on local resources and cost tables. These unit costs were then applied to each GSI site's asset inventory data to estimate a one-time improvement cost as well as a recurring annual maintenance cost.

The asset inventory included 317 GSI locations, of which 31 were found to be in good conditions with no deficiencies noted. Of the remaining 286 assets, 75% had both functional and maintenance deficiencies. The total one-time fix up cost is estimated to be $380,000, and the recurring annual maintenance cost is estimated to be $296,000. The

mean maintenance cost for existing GSI assets is estimated to be $2.84 per square-foot per year. For the purposes of this report, it was conservatively assumed that the annual maintenance cost for the existing GSI assets would be the same each year. In reality, once regularly maintained, it can be expected the annual maintenance needs will decline in subsequent years.

For national data comparison purposes, research from the American Society of Civil Engineers (ASCE) was used. One study (ASCE, Cost of Maintaining Green Infrastructure, 2015), which focused on small-scale, distributed GSI technologies, indicated that maintenance cost data were so limited that they presented results only for bioretention facilities. The ASCE results included costs for Portland, Oregon and Seattle, Washington of $1.68 and $2.30 per square-foot per year, respectively, which are slightly lower but comparable to the maintenance costs derived in this report.

It is recommended that a maintenance cost of $2.84 per square-foot of GSI element per year be used to estimate annual maintenance costs for existing GSI assets.

It is proposed that the GSI program would fund one in-house maintenance supervisor and one outreach coordinator, who would manage contracts associated with maintenance of GSI features, as well as volunteer maintenance efforts. The cost of these staff members is included in the proposed budget at the end of this section. Staff would seek to develop maintenance program partnerships that create job and training opportunities for disadvantaged populations such as veterans, those re-entering the workforce after prison, and those living in poverty.

GSI Capital Improvements

The GSI Fund would establish a reliable and dedicated funding source for the planning, implementation, and maintenance of GSI projects throughout the City to transform the watershed and support the City's "One Water" vision. The resulting projects will use stormwater as a managed resource and help reduce potable water demand, help meet MS4 requirements for water quality, reduce flooding, mitigate heat island effects, and achieve a wide variety of other economic, environmental, and social goals in Tucson. Where practicable, these projects will expand and leverage ongoing efforts by other local agencies and stakeholders.

An important GSI Fund component will be further refining a process to identify potential projects and prioritize which projects to fund to best meet the City's goals. Projects were initially prioritized in the preparation of this report, and the following sections summarize the procedure used for leveraging other planned capital programs, developing program targets and project evaluation strategies, evaluating and prioritizing potential projects, and setting up the framework for program implementation.

Potential GSI Projects

GSI implementation opportunities will come from one of two primary sources: integration with planned CIP projects or identification of separate, targeted implementation projects and programs.

Integration with Planned CIP Projects

Integration with existing and planned CIP projects provides the most cost effective opportunity for new GSI projects, allowing for efficiencies in construction and material quantities. Planned CIP projects that are most relevant include public park improvements, bicycle and pedestrian facilities, and flood control projects, all of which can be modified to include GSI components.

For the purposes of developing a preliminary list of GSI projects to leverage planned CIP projects, the following sources were used:

1) Proposition 407 (2018 parks and connections bond) includes approximately 150 miles of linear connections and 3,100 acres of park improvements.
2) Integration of new GSI projects within existing park spaces is an additional incentive for reducing the unit cost of implementation. Many parks in Tucson, while providing green space, have a limited GSI function that could be enhanced by installing GSI features. The transition of existing green space to GSI is significantly cheaper than converting hardscape, and is just as effective on a watershed scale for reducing runoff.

Figure A-1 (Appendix A) provides a map of Proposition 407 projects, TSMS targeted washes, and existing park spaces that were used for the preliminary evaluation.

Once the GSI Fund is established, GSI staff will support the City in developing formal processes for integrating GSI into capital projects across multiple agencies as they are conceived. A coalition of local government agencies created through interagency outreach, coordination, and agreements would promote GSI integration. For such a coalition to be successful, an executive directive or policy direction may be needed and clear roles, responsibilities, and procedures should be defined. Development of a coalition charter with this information will reduce overlap of services and competition for funding across stakeholder agencies, and could also promote interagency support for the development of design standards. It is anticipated that this effort will also identify areas of significant future development and redevelopment to assist in high-level GSI master planning across agencies.

Targeted Implementation Projects

GSI projects provide economic, environmental, and social benefits and should be targeted in areas where they would have the greatest impact. The preliminary metrics used to identify targeted GSI implementation projects include:

1) Reduced flooding, such as areas identified in the Tucson Stormwater Management Study (TSMS) which targeted nine washes (Alvernon, El Vado, Rodeo, Alamo, Tucson Arroyo, Christmas, Flowing Wells, Bronx, and Silvercroft) for flood mitigation, including strategies such as runoff reduction through GSI.
2) Populations vulnerable to extreme heat events[2], as identified by the Arizona Department of Health Services (based on age and economic factors), with an emphasis on “Upper-Moderate” and “High Vulnerability” areas.

[2] https://www.azdhs.gov/documents/preparedness/epidemiology-disease-control/extreme-weather/heat/index-heat-vulnerable-populations.pdf

3) Mitigation of heat island effects, with an emphasis on areas with less than 10% vegetation canopy.

Figure A-2 provides a map of TSMS targeted watersheds, vulnerable populations, and areas within the City that have less than 10% vegetation canopy.

As part of a long-term GSI Fund, GSI staff will create a baseline understanding of current conditions and program drivers to refine opportunities for GSI projects outside of planned capital improvements. This includes creating and maintaining a reference library of relevant datasets, including socio-economic and stormwater maps which continue to evolve.

Identification of Preliminary GSI Projects

City consultants identified 86 viable GSI projects that were equitably distributed across the City Wards on a cost basis. The preliminary GSI projects included linear improvements, such as bike boulevards, and site specific GSI improvements at individual City-owned lots and parks. Preliminary costs were estimated based on GSI infrastructure cost tables that are specific to Tucson, drawn from previously completed neighborhood GSI projects. As a preliminary step in identifying GSI projects, many of the candidate sites were initially identified based on prior evaluations conducted by others, such as PAG, TDOT, PCRFCD, and University of Arizona College of Architecture, Planning, and Landscape Architecture (CAPLA).

Figure A-3 provides a map showing the locations of the 86 potential GSI projects. Appendix B provides examples of three proposed types of GSI projects with supporting graphics, highlighting example improvements for the following types of projects:

- Bike boulevard GSI project, i.e. linear project.
- Existing regional park retrofit.
- Retrofit of existing vacant lot.

Prioritization of GSI Projects

Initial prioritization of the GSI projects was performed using the following weighting criteria:

1) Located in upper-moderate to highly vulnerable population areas: 35%
2) Leverages planned CIP projects, i.e. cost effectiveness: 25%
3) Located within TSMS priority areas: 25%
4) Located in heat island areas, i.e. <10% canopy: 15%

Each of the 86 potential GSI projects was scored and ranked within each Ward, with the highest ranking projects being tentatively identified as projects to be completed first under the GSI Fund. The prioritization of the GSI projects is shown in Figures A-4 thru A-9, showing the proposed GSI locations in each Ward, prioritized from highest to lowest. The total cost of the 86 projects has been estimated to be $31.7 million which, with an annual GSI Fund capital improvement budget of $2.3 million, would represent approximately 14 years of GSI projects. A summary of the proposed GSI projects is provided in Table 2, and a tabulation of the individual projects is provided in Appendix C.

Table 2. Proposed GSI Projects

Ward	# of GSI Projects	GSI Square Footage	# of New Trees	Total Cost
1	17	2,320,000	960	$5,300,000
2	14	1,620,000	1,200	$5,280,000
3	17	1,620,000	750	$5,380,000
4	10	1,390,000	720	$5,190,000
5	16	1,910,000	860	$5,250,000
6	12	1,432,000	770	$5,280,000
Totals	**86**	**10,290,000**	**5,270**	**$31,690,000**

The preliminary prioritization and ranking demonstrates an example process that can be implemented with additional data and criteria that will continue to evolve with the GSI Fund. However, the preliminary identification of projects does show viable project locations that are equitably distributed between the Wards, and prioritized based on economic, social, and environmental criteria from established local data sources.

GSI Project Evaluation Tool

To assess and quantify the benefits of future potential projects under the GSI Fund, GSI staff will develop an Excel-based GSI Project Evaluation Tool. This tool will accept user-defined inputs such as project location, size, and design characteristics and will calculate a score for each potential GSI project opportunity. Once evaluation results are available, stakeholders will be engaged to review resulting scores and proposed project prioritization, confirm implementation requirements, and explore partnerships and collaborations for project implementation.

To evaluate costs, GSI staff will reference a growing database of cost data for design, construction, and maintenance from ongoing City projects. For performance evaluations, GSI staff will evaluate existing watershed-based hydrology and hydraulic models for representative GSI applications and to quantify water quantity or quality benefits.

Results from cost and performance analyses will be used to develop a proposed 5-year GSI program schedule with specific project opportunities and associated cost estimates embedded into the implementation schedule. The schedule, developed with Microsoft Project, will include proposed durations for project development (planning, design, and bidding) and construction, and reference CIP projects for which GSI integration is feasible. This 5-year GSI program schedule would be updated regularly and used as the first iteration of a project implementation tracking tool in conjunction with a GSI project map.

GSI Planning, Outreach, and Stakeholder and Public Involvement

The success of GSI programs nationwide has depended a great deal on the level of outreach that cities implement to create awareness and educate the public about GSI, identify key partners and build long-term collaborative relationships with them, generate support and engage the public to actively participate during the decision-making process of GSI implementation, and create the sense of personal responsibility to implement GSI on their properties.

The objectives for public outreach and engagement for GSI programs are based on the following guiding principles:

- Public outreach is an early and integral part of opportunities and potential issues identification, concept development, and design.
- Public outreach processes invest in and foster long-term collaborative working relationships and learning opportunities with community partners and stakeholders.
- Public dialogue and decision-making processes identify and encourage participation across a diverse community of stakeholders.
- Public involvement processes and techniques are well-designed to appropriately fit the scope, character, and goals of each GSI project.
- Public decision-making processes are accessible, open, honest, and understandable. Members of the public receive the information they need, with enough lead time to participate effectively.

The purpose of the City's GSI public outreach and engagement efforts will be to provide a forum for creating awareness, addressing concerns, and educating the public about GSI—creating goodwill and generating support for the successful implementation of the program and its specific projects. Program-wide public outreach and engagement efforts will in some cases coincide with project-specific public outreach efforts; however, they will be of a broader nature. The following strategies are proposed to meet the goals of the City of Tucson GSI program:

- Engage the public early and often: Use community-based participatory planning by keeping community members and stakeholders well-informed, engaged, and regularly participating throughout the entire program:
    - Get to know each neighborhood, define the best way to communicate with members of each community, and identify community leaders through local organizations.
    - Develop consistent talking points to communicate with the public, keeping in mind the need to adapt the message while addressing different audiences.
    - Identify barriers to success and develop mechanisms to handle conflicts and mitigate barriers.
- Establish purpose and need: Outline the purpose and need of GSI with triple-bottom line benefits (financial, environmental, and social) of the project to help the public identify a reason to actively respond to the City GSI program's call to action.

- Track and use public opinion: Track it, use it, report back, and use feedback for successful implementation of current and future GSI projects.
- Establish mechanisms to report progress: Develop a City of Tucson GSI website to disseminate information about GSI technologies, program updates, and what the public can do to help. An interesting tool used by other communities to report progress is an interactive online map that shows GSI at both public and private sites and the individual GSI systems found across the city. This tool shares information about upcoming projects in design, and describes the different GSI elements used at existing sites.
- Leverage relationships: Build on existing relationships developed during previous community engagement activities conducted by the City:
    - Learn from local partners who represent members of the community that participate the least and reach out to them in an effective manner.
    - Follow advice from the local partners/leaders on how to communicate with the community and stakeholders.
- Coordinate outreach and engagement efforts: Given that City's GSI program will be an integral part of regional water supply and stormwater management, all involved communications teams need to coordinate to ensure a consistent city-wide message.
- Create synergistic partnerships: Coordinate communication and project implementation efforts with local and regional agencies and organizations to establish one community, one goal, and one voice to ensure successful GSI management:
    - Identify synergistic projects/opportunities to support and assist with public outreach efforts.
    - Identify synergies across projects to expand opportunities for implementation of GSI within other regional agencies projects.
- Create a GSI advisory committee: Create a joint subcommittee of existing City advisory committees (proposed to have representatives from the Commission on Climate, Energy, and Sustainability; Citizens' Transportation Advisory Committee; Landscape Advisory Committee; and Citizens' Water Advisory Committee) to meet quarterly to provide input on program priorities, oversight of program expenditures, and advise Mayor and Council on related policy matters.
- Enlist media as partners: Coordinate efforts with other regional agencies and leverage their existing media relationships to include city-wide publications and community specific media outlets.

Development of Design Standards

Developing standard designs and procedures is an efficient way to promote high-quality GSI projects and achieve a standard of practice among design professionals. Standard designs, specifications, planting palettes, and maintenance plans reduce the demand on agency resources and make GSI design, construction, and asset management easier for different parties.

GSI staff will assist the development of design standards for specific GSI types by leveraging the existing designs in the *Low Impact Development and Green Infrastructure Guidance Manual* (2015) and the *Design Standards for Stormwater Detention and Retention* (2014). GSI staff will investigate GSI designs from nearby municipalities and the University of Arizona for comparisons to local precedents. In Maricopa County, the City of Scottsdale has been a leader in adopting GSI, using grant funding from ADEQ and WIFA to develop their *Low Impact Development and Green Infrastructure Standards* (2018). Staff can draw on design guidance from arid regions such as Eastern Washington and water-conserving communities such as San Diego and Los Angeles.

GSI staff will identify the local stakeholders and partners necessary to conduct this effort. During this task, necessary updates to existing guidance documents will be identified including new or updated State and City requirements (such as roadway geometry design requirements) that affect GSI implementation.

GSI Program Budget

Revenues: Fee Options

This section discusses three options for assessing a fee on the utility bill based on water consumption, customer type, or water meter size. For each option a proposed fee level is given, with estimated revenues based on assessing those fees either to all Tucson Water customers, or only to those Tucson Water customers within City limits. Per previous Mayor and Council guidance, the target revenues were established between $2 and $5 million.

There are a number of approaches that can be used to structure a GSI rate. While all of these approaches could be used regardless of the billing mechanism chosen by the City, some of the benefits and/or ease of implementation and update will vary based on the desired billing methodology.

A rate established on the basis by which the revenue requirement of the entire program is allocated to individual customers can be equitably based on either the type of customer, residential versus non-residential, or presumed usage consumption based on water meter size feeding the parcel property.

When choosing the appropriate cost allocation method, it is important to note that similar to other water or sewer rate structures, an increase in equity of the charge for each customer is generally obtained with a tiered rate structure. Simpler rate structures generally do not integrate some of the customer or parcel size or usage elements, resulting in a charge that is not viewed as equitable. In contrast, however, simple structures generally are easier to understand, which may improve overall community acceptance. A rate may be found legally valid if the funded services generally benefit those who pay the fee. There need not be a property specific link between the fee paid and the level of service delivered.

Fee options were evaluated based on goals of ensuring that the new GSI fee would be:

a) Tied to volume of water used

b) Simple to understand by the customer

c) Affordable to all types of customers

d) Easily administrated with the least amount of administrative cost

Fee based on Water Consumption

A fee could be charged that mirrors Tucson Water's Water Conservation Fee, which charges customers based on their water usage. In FY 2019, the Water Conservation Fee is 10 cents per Ccf (100 cubic feet, or 748 gallons), is charged to all Tucson Water customers, and is expected to raise $3,794,000 in revenues. A slightly higher fee of 13 cents per Ccf would yield revenues within the target of $3-$5 million, depending on whether it was charged to all Tucson Water customers or just those within City limits.

One benefit of this approach is that the fee is tied directly to water use; thus the cost of developing the rain/stormwater resource would be borne by those using the most water. This approach would be more progressive than a flat fee; however, water consumption is

not a perfect proxy for income level. Table 3 shows the rates and revenues associated with a 13 cents per Ccf fee for GSI.

Table 3. Estimated Annual Revenue – Fee Based on Water Consumption

Cost per Ccf	Monthly Rate (average residential customer, 8 Ccf)	Annual Revenue – TW Customers Inside City Only	Annual Revenue – All Tucson Water Customers
13 cents	$1.04	3,142,000	4,932,000
	Total annual revenue	**$3,142,000**	**$4,932,000**

Flat Fee by Customer Type or Meter Size

The simplest fee system to implement would involve charging a flat fee for each customer class. Table 4 shows estimated revenues for a monthly charge of $1.50 for all customers in the Residential rate class (single-family residential), and $3.00 for Commercial and Multi-family customers.

Table 4. Estimated Annual Revenue – Fee Based on Customer Class

		Tucson Water Customers - Inside City Only		Tucson Water Customers – All	
Customer Class	Monthly Rate	# of Customers	Annual Revenue	# of Customers	Annual Revenue
Residential	$1.50	131,407	2,365,000	208,428	3,752,000
Commercial & Multi-family	$3.00	20,498	738,000	25,579	921,000
		Total annual revenue	$3,103,000		$4,673,000

Assessing a fee by meter size could accomplish similar results. Establishing 5/8-inch and 3/4-inch meters as one class of user with a fee levied at a flat rate of $1.50 a month, and all larger meter sizes levied at a flat rate of $3 a month, the City could expect estimated annual revenue of approximately $3 million to $4.6 million (Table 5).

Table 5. Estimated Annual Revenue – Fee Based on Meter Size

		Tucson Water Customers - Inside City Only		Tucson Water Customers – All	
Meter Size	Monthly Rate	# of Customers	Annual Revenue	# of Customers	Annual Revenue
5/8 and .75"	$1.50	137,204	2,470,000	210,850	3,795,000
1" and up	$3.00	14,701	529,000	23,157	834,000
		Total annual revenue	$2,999,000		$4,629,000

Depending on the direction given by Mayor and Council and the City Manager, a number of refinements could be made to these scenarios, such as not charging in other incorporated jurisdictions, adjusting fee levels and customer/meter groupings, etc.

Expenses: GSI Program Budget

National information on staffing and budgeting for GSI programs is limited and very inconsistent because GSI programs are typically embedded in overall stormwater management programs.

During the initial stages of many GSI programs, a strong technical staff is crucial to establish program standards, typical details, etc. Programs also have experienced public outreach staff to introduce and market the program to the general public and to rate payers who fund the program. Significant coordination with public agencies, utility companies, and other third parties are required during the initial phases; therefore, senior staff and project managers familiar with the area's existing regulations and implementation practices also make up the staffing of GSI programs.

GSI programs can differ significantly around the country. Some cities like Philadelphia propose large-scale LID implementation and rely primarily on re-development credits. Others like New York City are more selective with the facility types chosen and their implementation requirements. Given the differences among the more established GSI programs, budgets can range considerably depending on the type of program, their location, and the program's goal/purpose. A similarity among GSI program budgets is that they acknowledge the initial stages of the program will require staffing to set up a strong foundation for a successful program. During the initial years, proposed projects are generally small-scale, limiting the cost for construction and allocating most of the cost for technical staff to develop materials that will be used moving forward in the program, such as technical guidelines, specifications, and typical details and design standards. Budgets also allocate funds for maintenance of facilities. Because maintenance is important to maintain the performance of GSI, it is imperative to have a capable maintenance and asset management program to achieve a successful GSI program.

Table 6 presents the recommended GSI Program Annual Budget based on available information from existing successful GSI programs. The budgets in Table 6 include staff costs and estimated expenses. This budget would apply for the early stages of the

Program and would be adjusted as the Program expands. Note that the GSI Program Annual Budget does not include MS4 costs, which would be budgeted outside the GSI program using available funding mechanisms.

Table 6. Recommended GSI Program Annual Budget

Category	Staffing	Annual Budget
Administrative	1 GSI manager	80,000
Technical staff	0.5 senior project engineer	140,000
	0.5 urban landscape manager	
	1 junior project engineer	
Public outreach and education	1 outreach coordinator	60,000
Direct expenses		40,000
	Subtotal Program Administration	**$320,000**
Maintenance	1 maintenance manager	80,000
	Contract maintenance	300,000
	Subtotal Maintenance	**$380,000**
Capital Improvement Program	(range based on total GSI program revenues/budget of $3-$5 million)	$2,300,000
	Subtotal Capital	**$2,300,000**
	TOTAL	**$3,000,000**

Evaluation, Measurement, and Reporting

Many of the existing GSI programs around the country are tied to overall combined sewer overflow reduction programs and are regulated as part of federal consent decrees, required long-term control plans, etc. Those regulations include specific evaluation, measurement, and reporting requirements. Since the goals of the City's GSI program are not tied to reduction of stormwater discharges, but rather to accruing the water supply and environmental benefits of capturing stormwater, reporting should focus on demonstrating progress to City management, the Mayor and Council, and to the public.

Based on the experience of successful GSI programs across the country, the following should be included in the annual measurement and reporting program:

- Watershed total impervious area (as the program develops, the GSI assets should be tied to specific drainage areas or districts)
- Projects in planning, design, and construction
- Locations, number, technology types, design details, and estimated capture volumes of each asset

- Impervious acres managed by each asset
- Number of trees planted
- Construction costs for each asset
- Annual operation and maintenance budget expended for GSI assets on public properties maintained by the City

One metric that other communities have used to report progress is the concept of "Greened Acres." This metric can be derived from the collected data and accounts for the conversion of a highly impervious urban landscape through the implementation of projects that reduce stormwater runoff. A Greened Acre is described as an acre of impervious cover reconfigured to use GSI to manage a specified amount of stormwater runoff (½ inch, 1 inch, etc.) from that acre. A Greened Acre is an expression of the volume of stormwater managed by GSI, based on the design for the project, and is conditional on the proper operation and maintenance of the project. As an example, one Greened Acre would be equivalent to 1 inch of managed stormwater from 1 acre of drainage area, or 27,158 gallons of managed stormwater. These volumes can be tracked as Greened Acres (GA) using the equation:

GA = IC x Wd

The impervious cover (IC) is the impervious cover area that drains to GSI feature, including the area of the GSI feature, and the depth of water (Wd) is that depth that can be physically controlled by the GSI feature design. As the GSI program develops, targets for future performance can be established based on the Green Acres that should be established and by the specific amount of rainwater that should be managed.

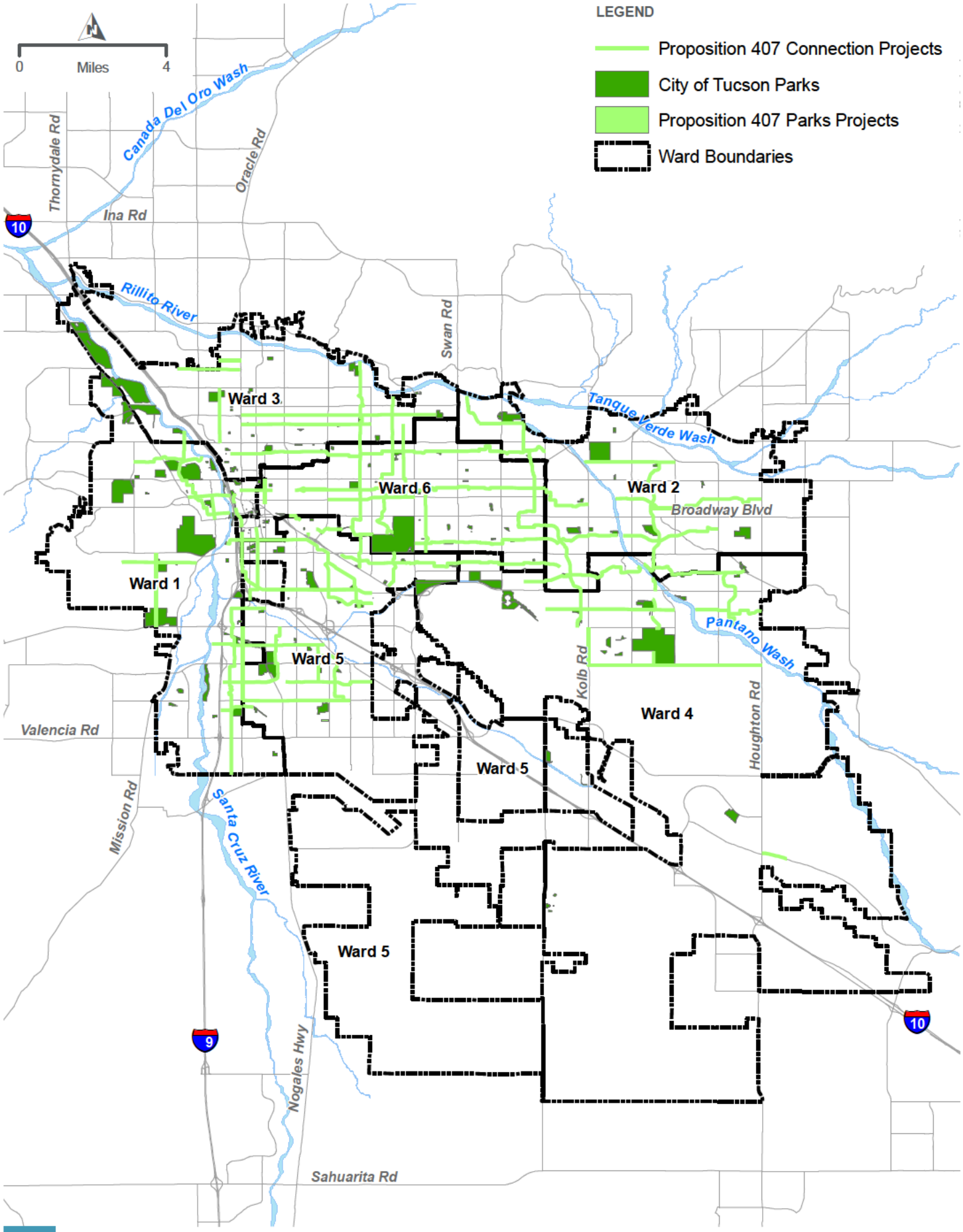
As the program develops, the amount of GSI information may become unwieldy. Other GSI programs have initiated database tracking systems based on GIS. This database can be used to develop a "Big Green Map" that shows GSI projects across the city. It can also share information about upcoming projects in design, and describes the different GSI elements used at existing sites.

Once established, all of the evaluation, measurement, and reporting information can be shared with the public on the City's GSI website.

Conclusion

The City of Tucson and the community it serves have been leaders for decades in implementing green stormwater infrastructure features to develop rain/stormwater resources, reduce flooding, green the city, and improve environmental and social health and quality of life. Establishing a dedicated funding source—a Green Stormwater Infrastructure Fund—for this service presents a significant opportunity to improve planning, implementation, and maintenance of the community's GSI. Ultimately, it would allow the City to leverage more community benefits out of these innovative low-impact GSI practices, and to move toward its vision for sustainable desert living.

Appendix A.
Report Figures



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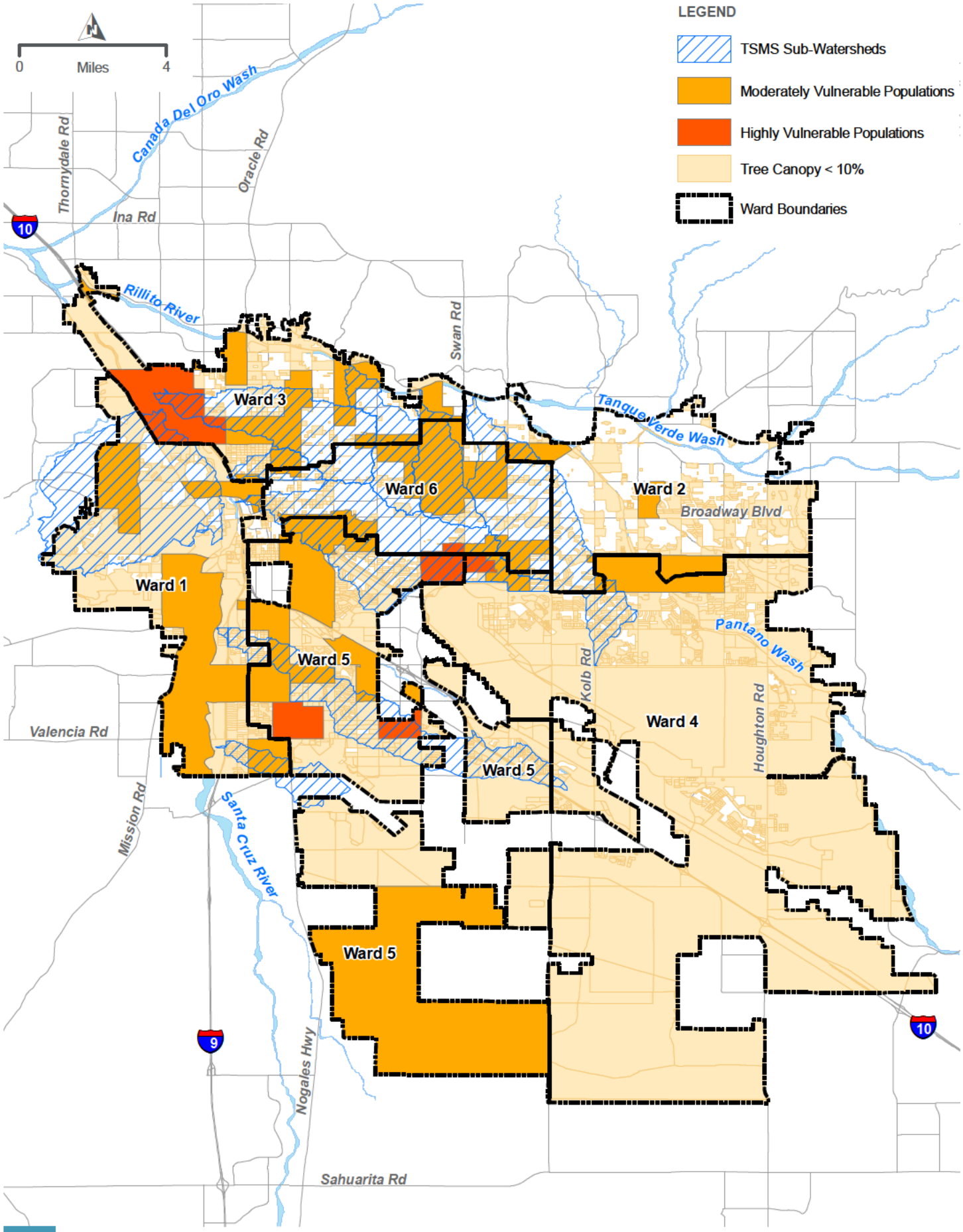
INTEGRATION WITH PLANNED CIP PROJECTS

FIGURE A-1



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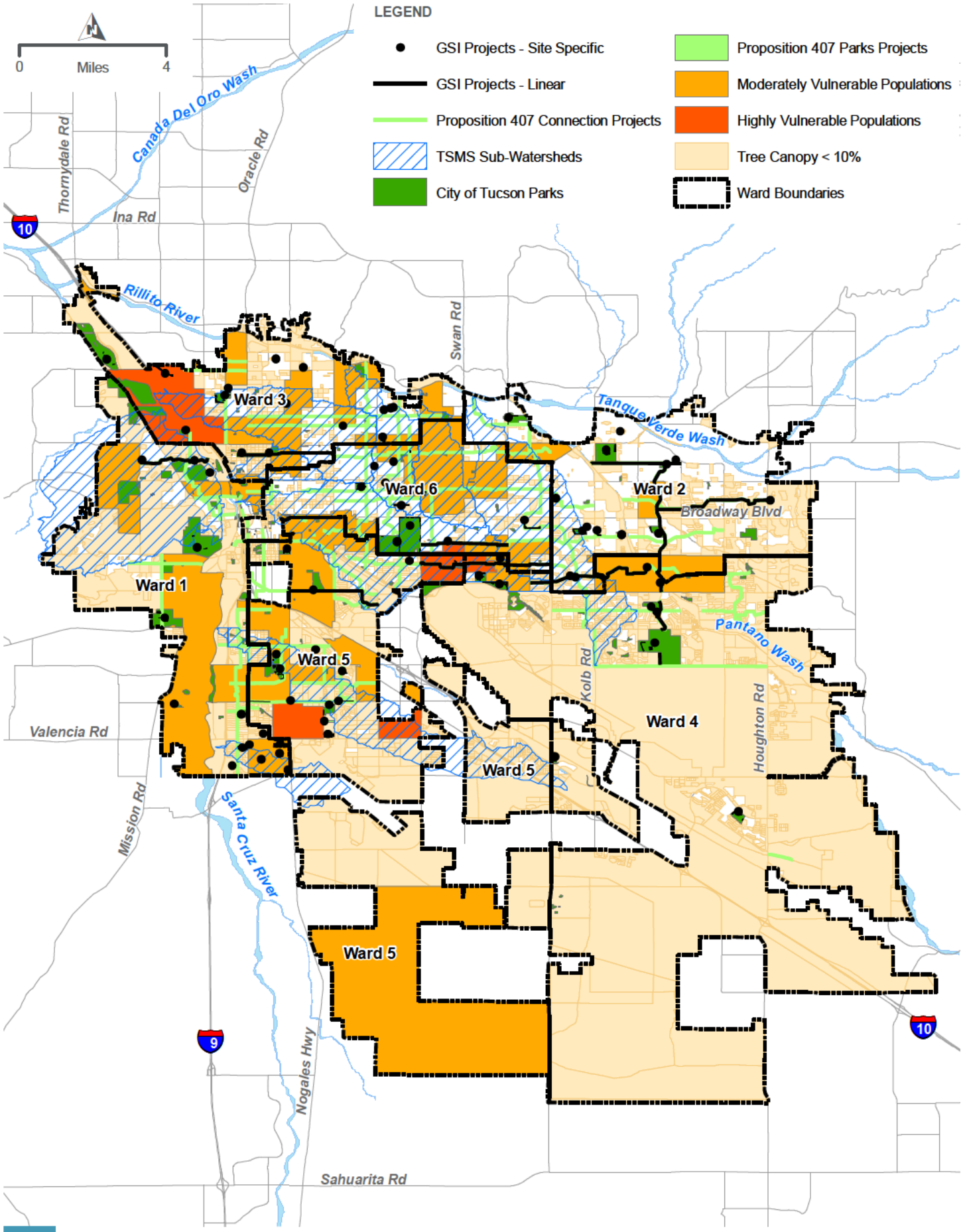
INTEGRATION WITH PLANNED CIP PROJECTS

FIGURE A-2



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PRELIMINARY GSI PROJECT LOCATIONS

FIGURE A-3

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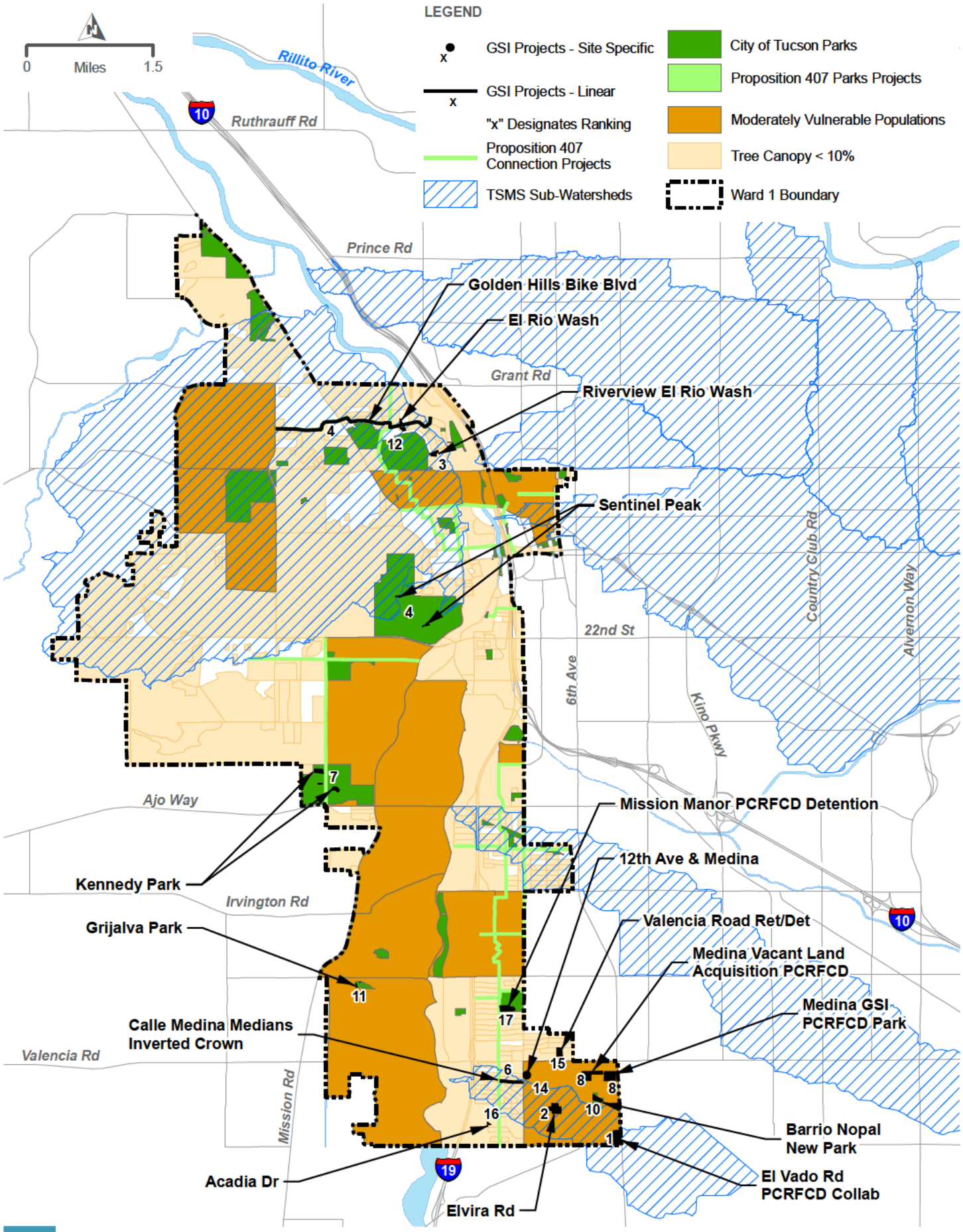

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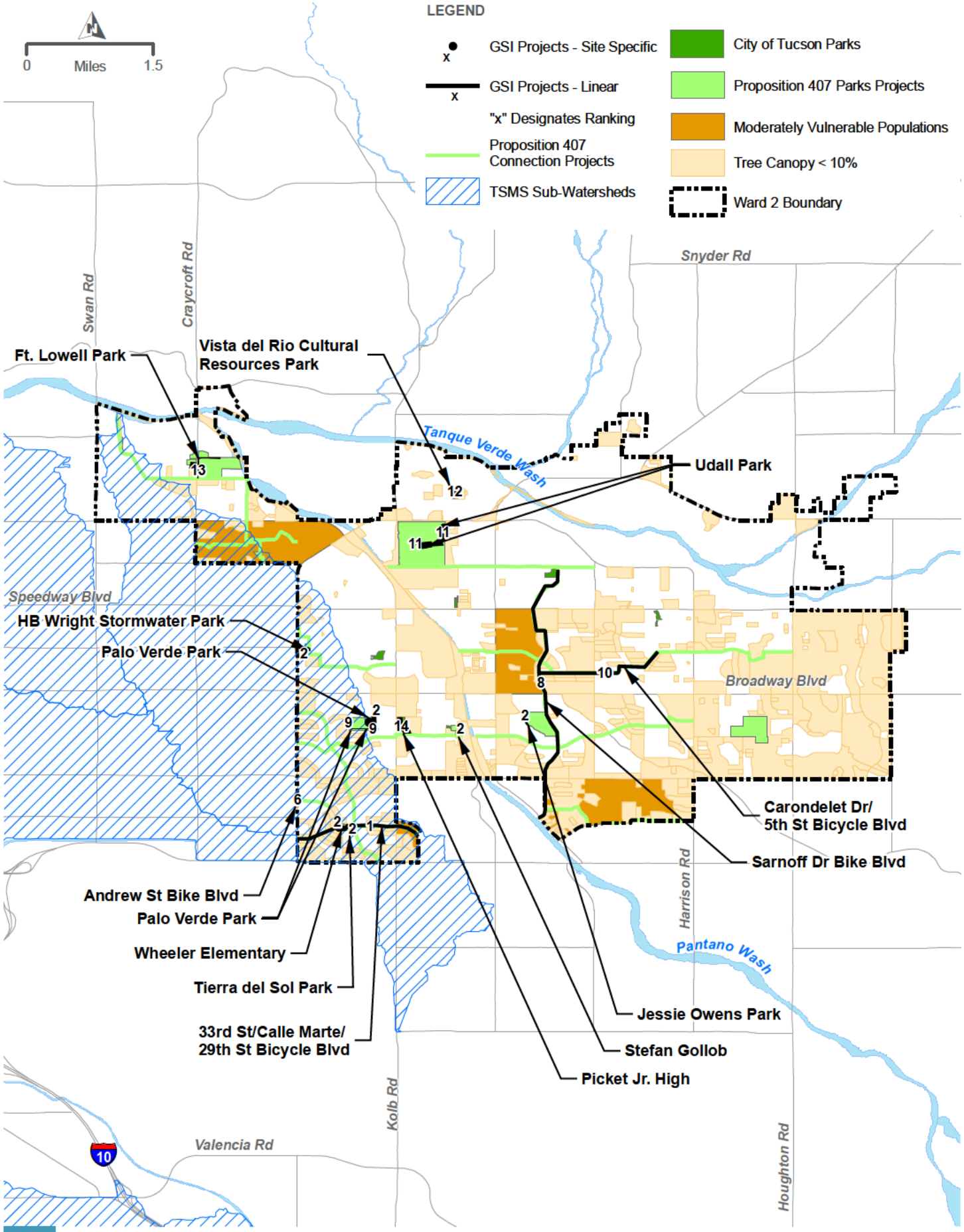
PRELIMINARY GSI PROJECTS WARD 1

FIGURE A-4



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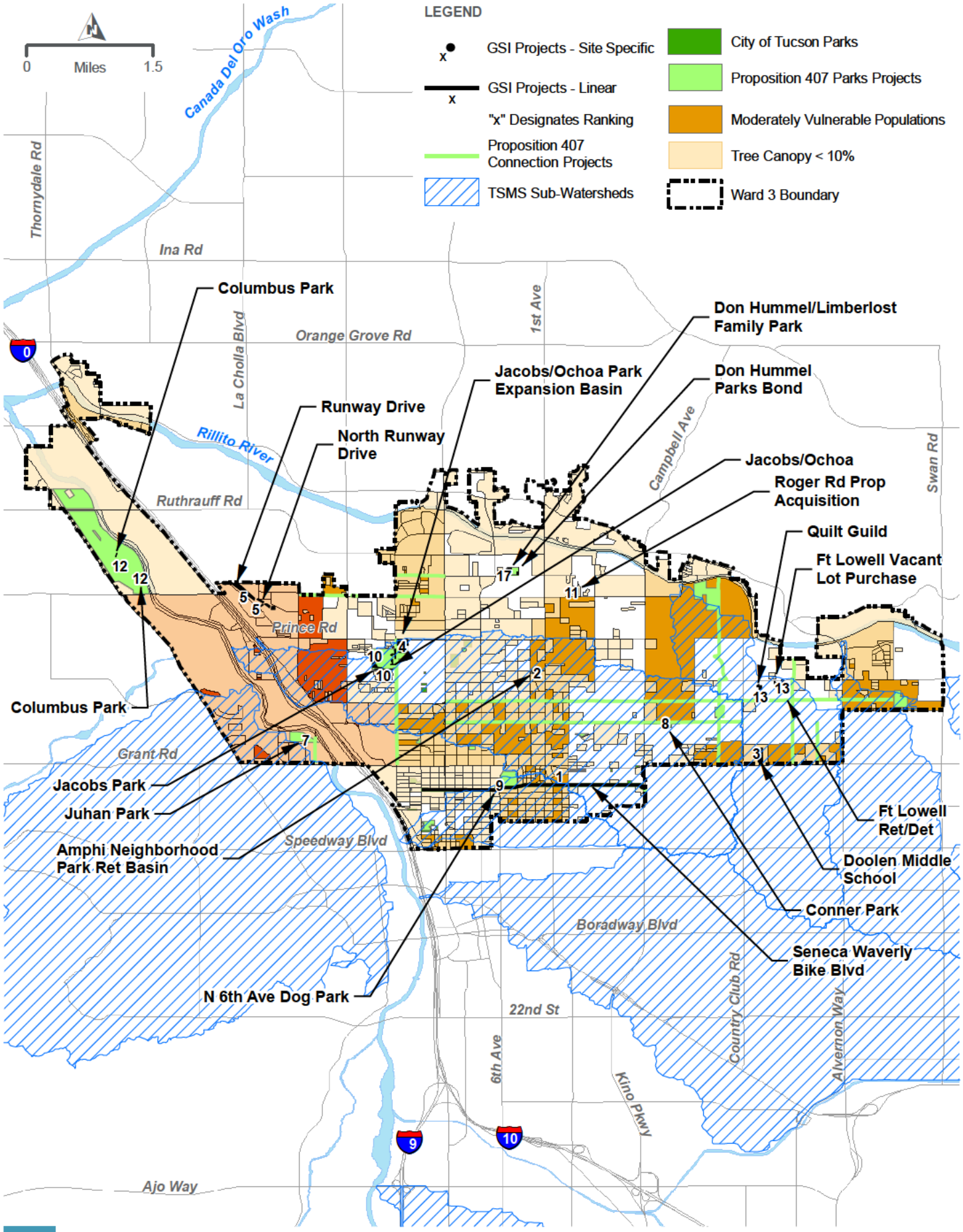
PRELIMINARY GSI PROJECTS WARD 2

FIGURE A-5



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PRELIMINARY GSI PROJECTS WARD 3

FIGURE A-6

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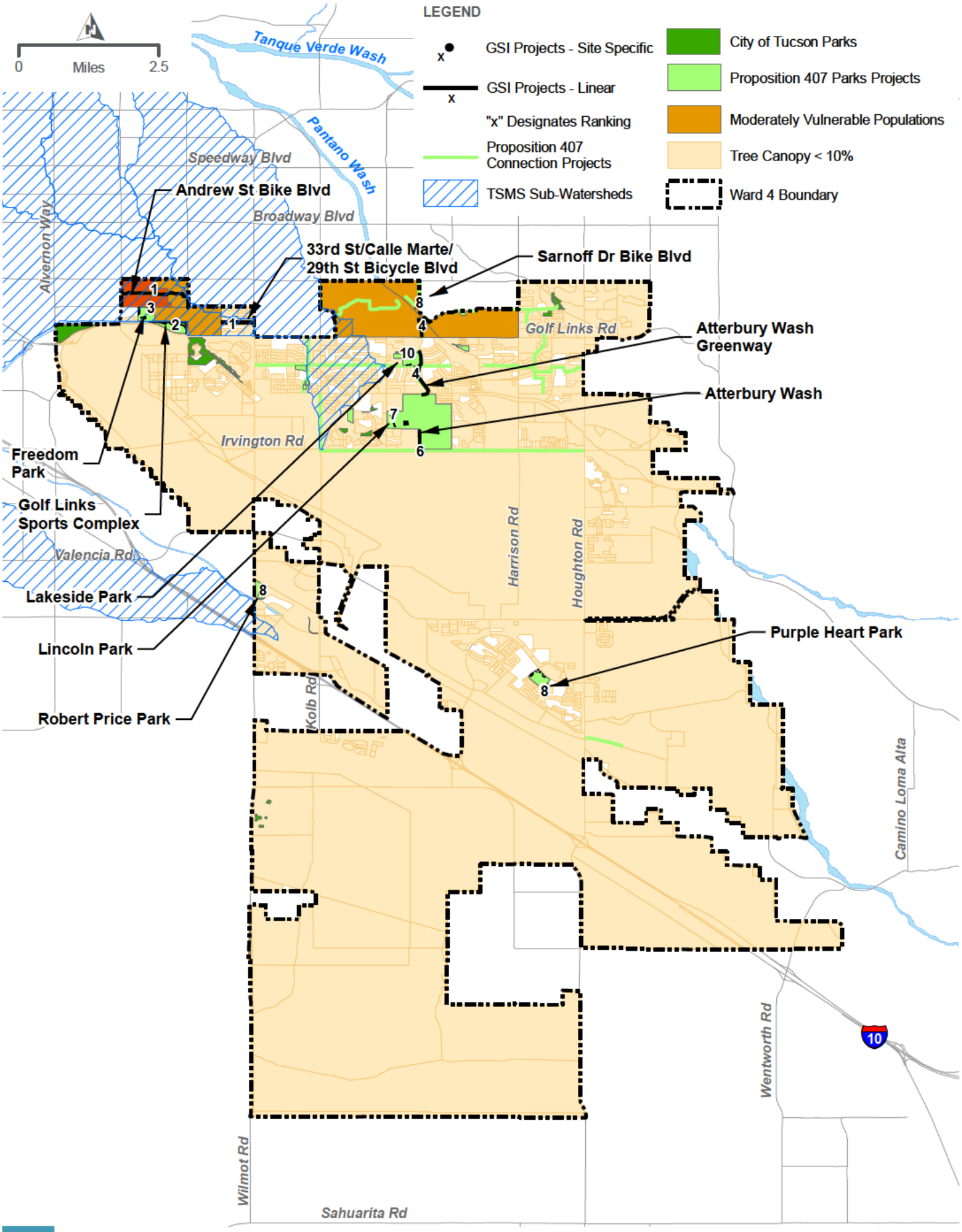

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PRELIMINARY GSI PROJECTS WARD 4

FIGURE A-7

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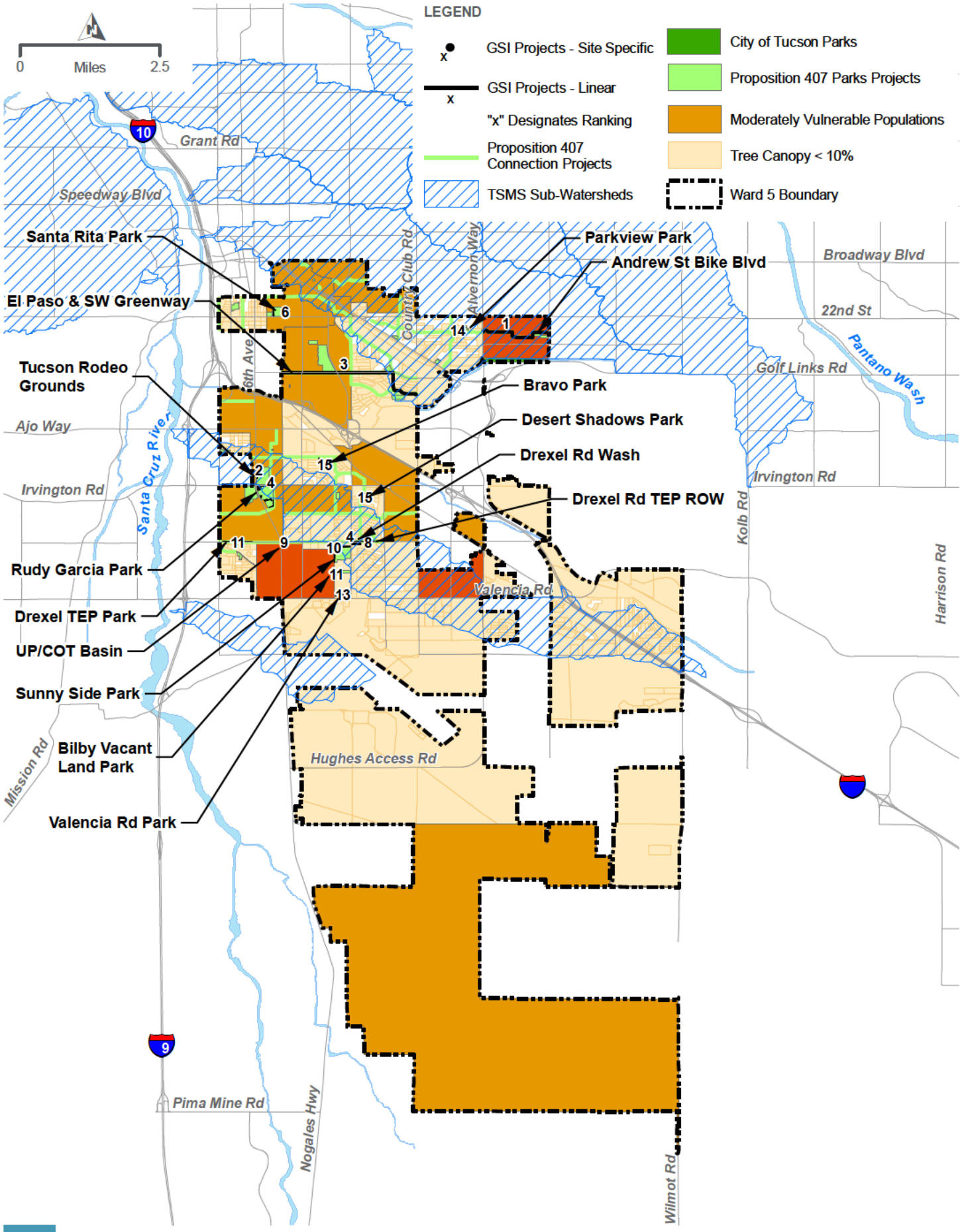

PRELIMINARY GSI PROJECTS WARD 5

FIGURE A-8

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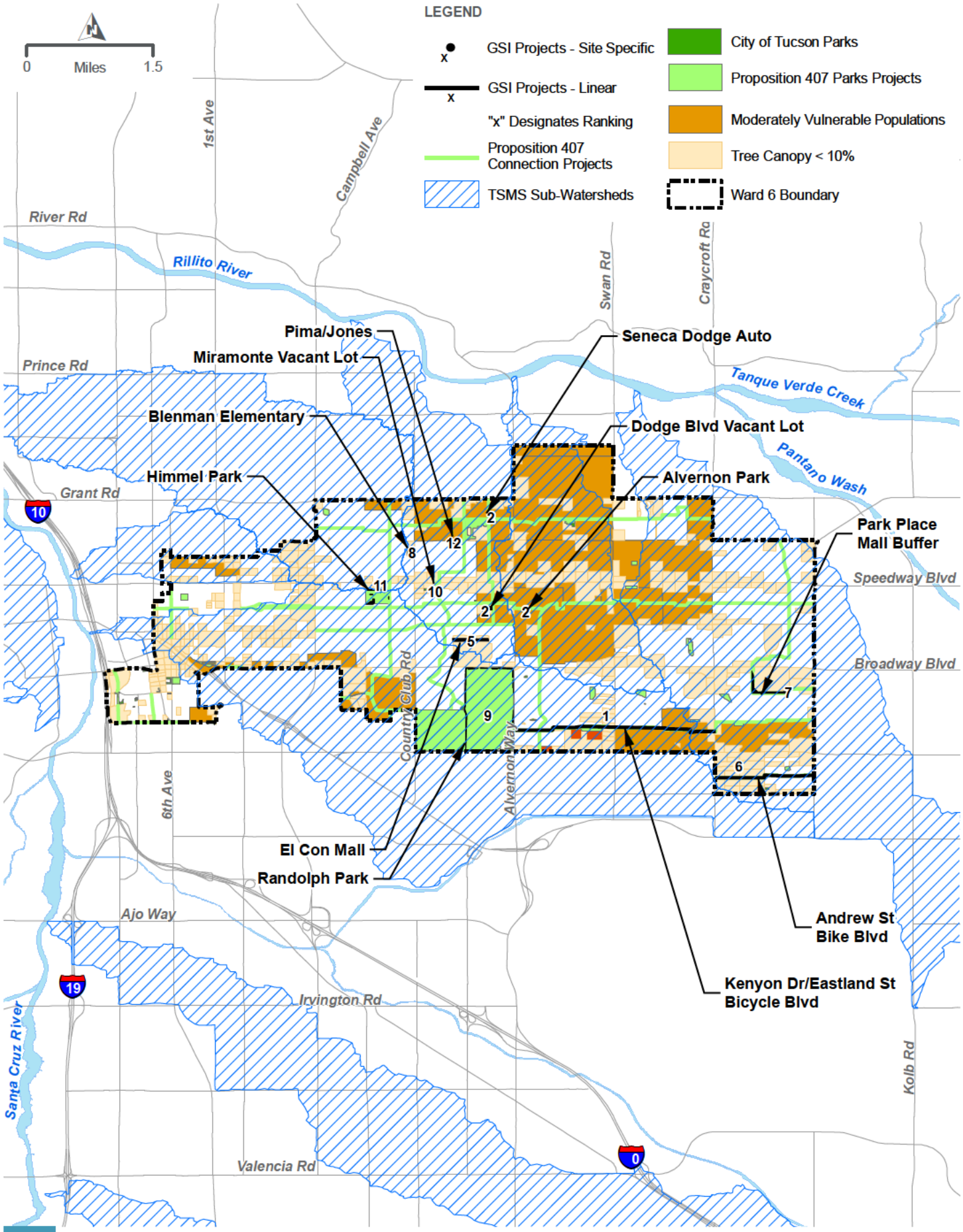

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PRELIMINARY GSI PROJECTS WARD 6

FIGURE A-9

Appendix B.
GSI Project Examples

Prop 407 Connection Leverage Example: Calle Marte between Wilmot and Kolb

Aerial overview of Bike Boulevard GSI project including two separate park basin projects:

The current view of the bike boulevard (left) and potential areas for GSI treatments (right)

A view of N 5th Ave as an example of the GSI proposed bike boulevard projects:

Ward 2
Cost: $357,000
GSI Basin area: 71,500 square feet
Cost effectiveness: $5 per square foot GSI
TSMS Watershed: Alamo Wash
Vulnerable Population: Upper-Moderate
Canopy Data: 5-10%
Length: 1.8 miles

This project includes curb cuts and basins in the Right of Way and in-street projects like traffic circles and chicanes to enhance the Prop 407 Connections activities. This section passes by a school and park both with proposed GSI features. The GSI fund will ensure effective GSI will be implemented and appropriately maintained.

Prop 407 Park Leverage Example: Lincoln Park Parking Lot + Rain Garden Retrofits

Aerial view of parking lot retrofit areas as well as two locations to address erosion and ponding.

Examples of parking lot retrofits and rain gardens (far right)

Ward 4
Cost: $900,000
GSI Basin area: 300,000 square feet
Cost effectiveness: $3 per square foot GSI
Adjacent area canopy: 1-5%
Watershed: Atterbury Wash

The Parks Bond includes funding to renovate existing parking lots. The GSI fund can be utilized to enhance those renovations to direct stormwater to green infrastructure facilities to improve water quality, reduce ponding and create more shaded parking. Additional rain garden/retention areas are proposed to address drainage and erosion challenges near city buildings.

Vacant Parcel Park Conversion Example: Drexel@ South Country Club – City Owned Parcel

Aerial overview of conceptual design for conversion of potential city owned parcel

Conceptual rendering of vacant lot conversion to GSI amenity

Conceptual renderings courtesy of University of Arizona's College of Architecture Planning and Landscape Architecture Studio Crosson

Ward 5
Cost: $216,000
GSI Basin area: 145,000 square feet
Cost effectiveness: $1.5/sq. ft. GSI
TSMS Watershed: Rodeo Wash
Vulnerable Population: Upper-Moderate
Canopy Data: 1-5%

The GSI fund could be used to convert a vacant lot with a wash flowing through the northern border to provide stormwater retention while incorporating natural park amenities to address the heat vulnerable population adjacent to the parcel as well as the low tree canopy. Larger retention/detention opportunities like this could be leveraged with Pima County Regional Flood Control District funding to further stretch the GSI Fund dollars to focus on multiple community benefits of GSI projects. Many vacant lots are present throughout priority TSMS watersheds.

Appendix C.
GSI Project Tabulation

Project Name	Ward	GSI opportunities	Est Cost	Basin Sq ft	# new trees	$/sq ft	Scoring	Rank	Implementation Timeline (years)
El Vado Rd	1	Airport Wash south area proposed basin	$ 412,500	275,000	92	$ 1.50	**87.50**	**1**	**1-5**
Elvira Rd	1	Street harvesting & small wash offline basins	$ 500,000	200,000	67	$ 2.50	**85.29**	**2**	**1-5**
Riverview Blvd upstream of golf course	1	El Rio wash offline basin vacant prop acquisition	$ 259,800	86,600	29	$ 3.00	**71.69**	**3**	**1-5**
Sentinel Peak	1	Parking lot bond leverage	$ 115,000	23,000	8	$ 5.00	**71.03**	**4**	**1-5**
Golden Hills Bike Blvd	1	Street harvesting bike shade	$ 365,025	73,005	195	$ 5.00	**71.03**	**4**	**6-10**
Calle Medina Medians	1	PCRFCD road reconstruction planned, leverage medians	$ 45,450	9,090	24	$ 5.00	**67.28**	**6**	**6-10**
Kennedy Park	1	Drainage improvements to fields & washes	$ 562,500	225,000	75	$ 2.50	**66.54**	**7**	**6-10**
Medina Detention parks	1	Airport Wash south area proposed basin	$ 506,742	337,828	113	$ 1.50	**65.00**	**8**	**6-10**
Medina Detention parks	1	Airport Wash south area proposed basin	$ 575,583	383,722	128	$ 1.50	**65.00**	**8**	**6-10**
Barrio Nopal Park	1	New park GSI	$ 200,000	100,000	33	$ 2.00	**63.90**	**10**	**11-15**
Grijalva Park	1	Street harvesting and parking lot retrofit	$ 69,600	11,600	4	$ 6.00	**58.82**	**11**	**11-15**
El Rio wash	1	Apt Complex Basin	$ 162,386	46,396	15	$ 3.50	**58.09**	**12**	**11-15**
El Rio wash	1	Vacant lot onsite and river	$ 123,568	35,305	12	$ 3.50	**58.09**	**12**	**11-15**
12th Ave & Medina	1	Vacant lot retention/detention	$ 396,410	113,260	38	$ 3.50	**55.59**	**14**	**11-15**
Valencia Rd Ret/Det	1	Valencia Rd stormdrain + local street harvesting	$ 600,000	150,000	50	$ 4.00	**50.74**	**15**	**11-15**
Acadia Dr Vacant Lot Park	1	Stormwater harvesting basins from existing flows	$ 52,500	15,000	5	$ 3.50	**46.84**	**16**	**>15**
Mission Manor Park	1	Airport Wash south area proposed basin	$ 353,607	235,738	79	$ 1.50	**43.75**	**17**	**>15**
33rd St/Calle Marte/ 29th St Bicycle Blvd	2	Street harvesting bike shade	$ 357,675	71,535	24	$ 5.00	**72.28**	**1**	**1-5**
HB Wright Park	2	Street harvesting basin	$ 124,502	35,572	12	$ 3.50	**58.09**	**2**	**1-5**
Jessie Owen	2	Retention basins	$ 187,250	53,500	18	$ 3.50	**58.09**	**2**	**1-5**
Palo Verde Park	2	Street + onsite basins + Alamo Wash offline basin	$ 469,000	134,000	45	$ 3.50	**58.09**	**2**	**1-5**
Stefan Gollob	2	Parking lot drainage improvement	$ 73,500	21,000	7	$ 3.50	**58.09**	**2**	**1-5**
Tierra del Sol Park	2	Street harvesting basin	$ 287,350	82,100	27	$ 3.50	**58.09**	**2**	**1-5**
Wheeler Elementary	2	Street harvesting basin	$ 232,750	66,500	22	$ 3.50	**58.09**	**2**	**6-10**
Sarnoff Dr Bike Blvd	2	Street harvesting bike shade	$ 637,500	127,500	340	$ 5.00	**57.28**	**8**	**6-10**
Palo Verde Park	2	Parking lot retrofits	$ 200,000	40,000	13	$ 5.00	**54.78**	**9**	**6-10**
Carondelet Dr/5th St Bicycle Blvd	2	Street harvesting bike shade	$ 562,500	112,500	400	$ 5.00	**53.53**	**10**	**6-10**
Morris Udall Park	2	Parking lot, GSI drainage for new facilities	$ 645,000	430,000	143	$ 1.50	**47.50**	**11**	**11-15**
Vista del Rio Cultural Res Park	2	On site passive basins	$ 47,279	31,519	11	$ 1.50	**43.75**	**12**	**11-15**
Ft Lowell Park	2	Street and park water harvesting	$ 651,000	186,000	62	$ 3.50	**43.09**	**13**	**11-15**
Pcket Jr High School Ret	2	Onsite and offline basins	$ 805,000	230,000	77	$ 3.50	**39.34**	**14**	**>15**
Seneca Waverly Bike Blvd	3	Street harvesting bike shade	$ 459,375	91,875	245	$ 5.00	**79.78**	**1**	**1-5**
Amphi Park	3	Navajo Wash offline basin	$ 112,000	32,000	11	$ 3.50	**79.34**	**2**	**1-5**
Doolen MS	3	Christmas wash offline basin	$ 1,099,557	314,159	105	$ 3.50	**75.59**	**3**	**1-5**
Ochoa Park expansion	3	Street harvesting basin	$ 300,000	200,000	67	$ 1.50	**75.00**	**4**	**6-10**
North Runway Drive	3	Offline GSI feature for COT owned property	$ 135,000	90,000	30	$ 1.50	**73.75**	**5**	**6-10**
North Runway Drive	3	Retention basins, prop acquisition not included	$ 412,500	275,000	92	$ 1.50	**73.75**	**5**	**6-10**
Juhan Park	3	Stormwater harvesting basins	$ 131,600	37,600	13	$ 3.50	**73.09**	**7**	**6-10**
Conner Park	3	Offline basin	$ 75,000	25,000	8	$ 3.00	**71.69**	**8**	**6-10**
N 6th Ave Dog Park	3	Parking lot bond leverage	$ 46,750	9,350	3	$ 5.00	**71.03**	**9**	**6-10**
Ochoa/Jacobs Park	3	GSI for paths, Parking lot retrofits	$ 913,750	215,000	72	$ 4.25	**56.43**	**10**	**11-15**
Roger Rd New Park	3	Ruthrauff basin area new park	$ 364,000	104,000	35	$ 3.50	**51.84**	**11**	**11-15**
Christopher Col Park	3	Parking lot bond leverage	$ 125,000	25,000	8	$ 5.00	**48.53**	**12**	**11-15**
Ft Lowell/CntyClb I	3	Vacant lot offline retention/detention	$ 320,000	32,000	11	$ 10.00	**43.75**	**13**	**11-15**
Quilt Guild bBasin	3	Vacant lot offline retention/detention	$ 401,000	40,100	13	$ 10.00	**43.75**	**13**	**11-15**

Project Name	Ward	GSI opportunities	Est Cost	Basin Sq ft	# new trees	$/sq ft	Scoring	Rank	Implementation Timeline (years)
Ft Lowell/CntyClb vacant II	3	Vacant lot offline retention/detention	$ 264,500	26,450	9	$ 10.00	**43.75**	**13**	**>15**
Don Hummel Park	3	Ruthrauff Area Retention Basin	$ 120,000	80,000	27	$ 1.50	**43.75**	**13**	**>15**
Don Hummel Park	3	Parking lot Parks Bond retrofit	$ 100,000	20,000	7	$ 5.00	**36.03**	**17**	**>15**
Andrew St Bike Blvd	4	Street harvesting bike shade	$ 217,050	43,410	116	$ 5.00	**88.53**	**1**	**1-5**
Golf Links Complex	4	Parkinglot retrofits and water harvesting basins	$ 1,099,557	314,159	105	$ 3.50	**70.59**	**2**	**1-5**
Freedom Park	4	Parkinglot retrofits and water harvesting basins	$ 820,000	205,000	68	$ 4.00	**65.74**	**3**	**6-10**
Atterbury Wash Greenway	4	Atterbury Wash greenway basins	$ 322,613	64,523	41	$ 5.00	**53.53**	**4**	**6-10**
33rd St/Calle Marte/ 29th St Bicycle Blvd	4	Street harvesting bike shade	$ 291,750	58,350	156	$ 5.00	**53.53**	**4**	**6-10**
Atterbury Wash	4	Floodplain restoration and capacity enhancement	$ 285,000	190,000	63	$ 1.50	**43.75**	**6**	**6-10**
Lincoln Regional Park	4	Rain garden retrofit, existing parking lot retrofit	$ 900,000	300,000	100	$ 3.00	**40.44**	**7**	**11-15**
Purple Heart Park	4	New parkinglot and existing parking lot retrofit	$ 325,000	65,000	22	$ 5.00	**39.78**	**8**	**11-15**
Robert A Price Park	4	New parkinglot	$ 371,500	74,300	25	$ 5.00	**39.78**	**8**	**11-15**
Lakeside Park	4	Parkinglot retrofits and water harvesting basins	$ 562,500	75,000	25	$ 7.50	**30.51**	**10**	**>15**
Andrew St Bike Blvd	5	Street harvesting bike shade	$ 253,613	50,723	17	$ 5.00	**88.53**	**1**	**1-5**
Rodeo grounds	5	Retention basins	$ 297,500	85,000	28	$ 3.50	**83.09**	**2**	**1-5**
El Paso & SW Greenway	5	Street harvesting bike shade	$ 475,500	95,100	254	$ 5.00	**79.78**	**3**	**1-5**
Rudy Garcia Park	5	Parkinglot retrofits and water harvesting basins	$ 862,500	230,000	77	$ 3.75	**78.79**	**4**	**1-5**
Drexel Rd Vacant Park	5	Rodeo Wash offline basin	$ 216,000	144,000	48	$ 1.50	**78.75**	**4**	**1-5**
Santa Rita Park	5	Parkinglot	$ 200,000	67,000	22	$ 5.00	**76.03**	**6**	**1-5**
Sunny Side park	5	Field retention basin	$ 81,345	54,230	18	$ 1.50	**75.00**	**7**	**1-5**
Drexel Rd East ROW	5	street harvesting basins	$ 297,500	85,000	28	$ 3.50	**74.34**	**8**	**6-10**
UP/COT Basin	5	Street and wash first flush basin	$ 77,000	22,000	7	$ 3.50	**70.59**	**9**	**6-10**
Sunny Side park	5	Parking lot parks leverage	$ 125,000	25,000	8	$ 5.00	**67.28**	**10**	**6-10**
TEP/Drexel Rd Park	5	Street harvesting basins	$ 315,000	90,000	30	$ 3.50	**64.34**	**11**	**6-10**
Bilby Lot Retention	5	Vacant lot retention/detention	$ 146,510	41,860	14	$ 3.50	**64.34**	**11**	**11-15**
Valencia Rd Ret/Det	5	Offline and street harvesting basin	$ 975,000	650,000	217	$ 1.50	**60.00**	**13**	**11-15**
Parkview Park	5	Offline basins from Citation wash and street harvesting basins	$ 102,760	29,360	10	$ 3.50	**58.09**	**14**	**11-15**
Bravo Park	5	Street harvesting basins	$ 196,000	56,000	19	$ 3.50	**39.34**	**15**	**11-15**
Desert Shadows park	5	Offline retention basins	$ 633,500	181,000	60	$ 3.50	**39.34**	**15**	**>15**
Kenyon Dr/Eastland St Bicycle Blvd	6	Street harvesting bike shade	$ 418,050	83,610	223	$ 5.00	**84.78**	**1**	**1-5**
Seneca/Dodge Autoshop	6	Vacant lot offline retention/detention	$ 140,000	40,000	13	$ 3.50	**75.59**	**2**	**1-5**
Alvernon Park	6	Alvernon wash offline basin	$ 136,500	39,000	13	$ 3.50	**75.59**	**2**	**1-5**
Dodge Vacant Lot	6	Vacant lot offline retention/detention	$ 397,250	113,500	38	$ 3.50	**75.59**	**2**	**1-5**
El Con Mall	6	Mega parkinglot park retrofit	$ 1,099,557	314,159	105	$ 3.50	**74.34**	**5**	**6-10**
Andrew St Bike Blvd	6	Street harvesting bike shade	$ 210,000	42,000	112	$ 5.00	**72.28**	**6**	**6-10**
Sears Park/Park Place Mall	6	Mall buffer and drainage retrofit	$ 825,650	330,260	110	$ 2.50	**67.79**	**7**	**6-10**
Blenman Elementary	6	Christmas wash offline basin	$ 104,790	29,940	10	$ 3.50	**66.84**	**8**	**11-15**
Randolph Park	6	Renovate multiuse path to include GSI	$ 983,150	280,900	94	$ 3.50	**61.84**	**9**	**11-15**
Miramonte Vacant lot	6	Vacant lot offline retention/detention	$ 190,200	38,040	13	$ 5.00	**58.53**	**10**	**11-15**
Himmel Park	6	Retention basins, parkinglot retrofit	$ 575,000	100,000	33	$ 5.75	**56.88**	**11**	**>15**
Pima & Jones	6	Vacant lot offline retention/detention	$ 200,000	21,000	7	$ 9.52	**53.55**	**12**	**>15**