PUD ZONING CASE NO. 63-18

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COUNCIL APPROVED

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Banner
University Medical Center
Phoenix Campus

PLANNED UNIT DEVELOPMENT

HKS

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BANNER UNIVERSITY MEDICAL CENTER PHOENIX
PLANNED UNIT DEVELOPMENT

A. PURPOSE AND INTENT

1. Project Overview and Goals

The purpose of the proposed PUD is to create a framework within which the Banner University Medical Center Phoenix ("BUMC") can adapt and respond to changing market and healthcare delivery trends for the next 40 years. The specific development standards and guidelines in this PUD will implement the master plan for the future long-term development of the Banner University Medical Center Phoenix. The goal is to replace numerous zoning stipulations that have been approved over the last 40 years, with a vision for the next 40 years, and a comprehensive set of standards and guidelines to implement that vision.

This PUD is intended to be a stand-alone document of zoning regulations for this particular project. Provisions not specifically regulated by the PUD are governed by the Phoenix Zoning Ordinance. If there are conflicts between specific provisions of this PUD, and the Phoenix Ordinance or design guidelines, the terms of this PUD shall apply. The PUD only modifies the zoning ordinance regulations and does not modify other City Codes or requirements. The purpose and intent statements are not requirements that will be enforced by the City of Phoenix.

With national headquarters based in Phoenix, Banner Health is a non-profit health system operating 28 hospitals and numerous specialized facilities across six western states including Arizona, California, Colorado, Nebraska, Nevada and Wyoming. It is the largest private employer in Arizona and one of the largest in the United States with over 50,000 employees.

As a leading non-profit employer, Banner Health provides emergency and hospital care, hospice, long-term/home care, outpatient surgery, labs, rehabilitation services, pharmacies, and primary care. Banner Research conducts high-quality clinical trials and other medical research, turning discoveries into new diagnoses, treatments and prevention methods for diseases such as Alzheimer's, Parkinson's, cardiovascular disease, fibromyalgia, arthritis and cancer.

The Mission:
Banner Health's mission is *"making health care easier, so life can be better".* As a nonprofit, Banner Health exists to provide health care services rather than to generate profits. That means that every dollar earned is reinvested into:

- New hospital beds
- New or expanding patient care services
- New physician services

- New technologies
- Maintaining existing equipment and facilities
- Paying employees' salaries.

Banner also provides more than $153 million annually in charity care through its Financial Assistance Program and subsidizes the medical education costs for hundreds of medical residents (physicians in training), the majority of whom will stay in Arizona and Colorado, where they trained.

Banner provides critical, free services such as the Banner Poison and Drug Information Center Hotline, health information provided by registered nurses through Banner Health Call Center, and school-based health centers for kids in economically challenged areas. Clinics throughout the Banner Health system also help the working uninsured or under-insured by providing care at a reduced or sliding-fee basis.

Banner Health and Academic Medicine

In 2016, the Arizona Board of Regents approved a merger between Banner Health and the University of Arizona Health Network. This new Banner division brought Banner Health into the forefront of academic medicine. Banner Good Samaritan hospital in Phoenix was renamed to Banner University Medical Center Phoenix to reflect its new designation as the primary teaching hospital of the University of Arizona College of Medicine Phoenix. Located immediately northeast of downtown Phoenix, Banner University Medical Center Phoenix is one of the flagship facilities of Banner Health.

Banner University Medical Center Phoenix hosts third- and fourth-year medical students from its major affiliated medical school, the University of Arizona College of Medicine Phoenix and is home to numerous residency training programs sponsored by the College of Medicine, including: Obstetrics and Gynecology, Internal Medicine, General Surgery, Psychiatry, Orthopedic Surgery, Neurology, Family Medicine/Pediatrics, and Oral Maxillofacial Surgery. A number of fellowship programs are also sponsored. In total, over 300 residents and fellows are based at the facility.

Banner University Medical Center Phoenix was recently ranked by U.S. News & World Report in the top 50 hospitals nationally for specialty care areas including Geriatrics, Nephrology and Urology. Moms-to-be choose to deliver babies at Banner University Medical Center Phoenix because of the facility's proven expertise in high-risk obstetrics care. Over 5,000 babies are delivered each year at Banner University Medical Center Phoenix. This site is also home to the renown Cavanagh Heart Center and the Banner Alzheimer's Institute. Other recognized specialty medical services include treatment for advanced lung diseases, organ transplantation, orthopedics, rehabilitation and concussion care. Banner University Medical Center is a Level I Trauma Center, with approximately 65,000 emergency visits annually, prior to the Emergency Department expansion in 2017.

Investing in Meeting Patient Needs

Banner Health is dedicated to strengthening patient care by:

- Continuous focus on improving patient outcomes and service

- Development and training of an engaged workforce
- Use of innovative technologies
- Expansion of facilities and services to meet community needs.

Banner Health has and will invest nearly $1 billion in new clinics and hospital towers in Tucson and Phoenix to upgrade the aging infrastructure of these facilities. Projects at the Banner University Medical Center Phoenix include a $179 million Emergency Department expansion that opened in June 2017, increasing capacity to serve approximately 90,000 patients a year. A $239 million 13-story patient tower opened in November 2018 and houses 256 patient beds. The main entry and lobby portions of the tower along McDowell Road will be completed in December 2020. The 80,000 SF M.D. Anderson Cancer Center recently opened in May 2019. A $50 million clinical space is also planned near the existing Banner University Medical Center Phoenix facility.

The Banner University Medical Center Phoenix has a long history at this site. The McDowell Road and 10th Street land was acquired in 1917 and the hospital opened to the public in 1923. It became Good Samaritan Hospital in 1928. The hospital continued to grow, and old facilities gave way to larger, modern ones, capable of handling advancing medical technology and the increasing volume of patients. In 1982, Good Samaritan Hospital opened a patient tower designed by Chicago architect, Bertrand Goldberg. While the building functioned well at the time, it is unfortunately ill-adapted to meet modern healthcare needs. The facility does not meet current building codes and does not meet ADA standards. It has insufficient storage space, and the patient rooms and elevators are too small for modern healthcare equipment. Due to the building's complex structural construction, renovating the interior to meet modern needs is not possible. As it sits at a critical spot on the hospital campus, the patient tower constructed in 1982 will eventually give way to a new facility which will continue the tradition of superior patient care in Phoenix.

2. Overall Design Concept

The overall design concept for Banner University Medical Center Phoenix is to plan a health care campus that has the ability to expand and adjust to health care delivery and at the same time, optimally manage the "Flows of Medicine", briefly described below and illustrated in Exhibit 6. A health care campus is not a college campus. One of the many differences is that college campuses are designed to promote walking, as students move from class to class in various buildings that may be spread out over a large area. Additionally, college campus planning design typically features large parking facilities in locations that serve quadrants of a campus. Health care campuses are designed to minimize the need for walking and to maximize parking accessibility to individual buildings. A pedestrian employee pathway exists to easily accommodate staff from parking on either end of the campus to the central buildings along shaded walkways.

Much of the provider pedestrian traffic is designed to occur interior to the building along a central corridor. A shaded pedestrian pathway is provided from the bus stops to the main lobby entry and the large entry off of 12th Street. Some areas of Willetta Street serve as pedestrian pathways as movement occurs from parking lots on the west and east to the Ancillary building. Existing standards for shrubs and trees for a 75% shading are continued along these pedestrian walkways. A bridge across Willetta Street connects the infrastructure

and support areas of the Central Plant, Support Services, and Helipad to the main hospital while pedestrian and vehicle traffic remain separate and unimpeded below.

Flow of Patients – Serving patients is the focus of a health care campus. Plans are conceived with the notions that: (1) no patient waits; (2) patient walking is minimized; and (3) services are brought to the patient. Consequently, the flow of patients informs design decisions, including site plan elements such as driveway and entry locations to each of the buildings on campus.

Flow of Family Members – Family members are visitors who are not merely there to accompany a patient to their medical appointments. Family is a respected part of the patient care team and a good source of information about the patient. Therefore, health care campus planning must consider the needs of the family in a number of ways: (1) way-finding signage for specific buildings and parking options; (2) vehicular access to the campus; (3) well-lit and comfortable walkways; (4) outdoor areas for visiting with patients; and (5) on-campus food and beverage options.

Flow of Providers – The flow of health care providers between the clinic, the hospital, and other patient-care delivery centers should be quick, easy, and stress-free. Proper site planning can increase productivity and decrease stress by locating instruments and materials as close to the provider as possible. Other considerations in maximizing provider productivity and quality health care delivery include pedestrian connectivity to parking garages and shuttle service from parking areas to and from various buildings within the campus.

Flow of Medications, Supplies, and Equipment – The goal of this flow is to create systems that bring medications, supplies and equipment into the medical center and distribute them in quick and efficient ways. Well-designed circulation, parking, loading/unloading, and emergency vehicle access plans are critical to the efficient flow of these essential elements of health care. These should be distinct and apart from the three flows of medicine described above to improve safety and efficiency.

Flow of Neighborhood Pedestrian Traffic – While the campus is designed to minimize the need for walking from parking areas to individual buildings, pedestrian pathways are provided throughout the campus, as depicted in Exhibit 23. Local neighborhood pedestrian traffic through the campus is possible via these pathways; however, pedestrian through-traffic is not promoted on the internal private streets of Willetta and Culver due to the inherent limitations of a medical campus. These private internal streets are frequently traveled by emergency response vehicles, delivery trucks, and semi-tractor trailers. Therefore, the walkways along public streets are better suited for neighborhood pedestrian cross-campus travel.

B. LAND USE PLAN

The campus is bounded by 13th Street at the east, 8th Street on the west, McDowell Road on the north, and I-10 on the south. The campus has three major sections. The center of campus is dedicated to Inpatient Care. The East and West sides are predominately Outpatient Care, and the South side is comprised of infrastructure and support for the whole campus, as illustrated on Exhibit 18, titled the General Layout of the Campus. As the campus grows, outpatient functions will be added to the perimeter reserving Inpatient space at the center of campus. The Proposed Land Use Plan, Exhibit 8, illustrates the existing buildings in grey and future

development in blue.

1. Land Use

The campus is an academic medical center mainly dedicated to the hospital and medical office uses. This comprises treatment facilities across a broad range of services. Specialty services include advanced heart care, treatment for advanced lung diseases, organ transplantation, orthopedics, rehabilitation, and concussion care. It is a Level I Trauma Center necessitating an ambulance service. As a leader in patient care, the hospital contains biomedical and medical research offices and laboratories with advanced testing and research facilities to allow for medical discoveries and training of future medical professionals through the collaboration with the University of Arizona College of Medicine. An onsite pharmacy provides convenient services for patients. Residential uses may be necessary in the future to accommodate families of patients, to house students or long-term care patients. It will also be necessary to provide some commercial and retail uses to support the medical campus.

2. Site Plan

The Existing/Approved Site Plan, Exhibit 7, illustrates the campus as it currently exists in May 2019. The future site plan has been divided into 6 Block areas as illustrated in Exhibit 9 in order to facilitate tracking of the future development on this 66-acre campus. The Overall Site Plan shows the location and configuration of each block while the Site Plans by Block Area, provide greater details for each block including dimensions and setbacks.

C. LIST OF USES

1. Permitted Uses

Hospital/Medical Office Uses.
Ambulance Service Office.
Biomedical and Medical Research Office and/or Laboratory.
Dental Laboratories.
Hospital.
Hospital Service Organizations.
Laboratories, Clinical, Dental, Testing and Research.
Pharmacy.

Commercial Office/Retail Uses.
Artificial Limbs, Braces, Sales.
Bakers and Baked Goods, Retail Sales.
Barbers.
Beauty Shops.
Bookstore.
Braces, Orthopedic, Sales Retail.
Charitable Institutions, Offices.
Clothing, Retail Sales.

Convenience Market.
Delicatessens.
Delivery Service Office.
Dental Supplies, Retail and Wholesale.
Drugs, Retail Sales, Wholesale Storage and Distribution.
Express Companies, Offices
Farmers Market.
Finance Companies and Loan Offices.
Florists, Retail Sales.
Gift Shops.
Groceries, Retail Sales.
Health Food Products, Retail Sales.
Health/Recreation Facility.
Magazines, Retail Sales.
Medical Supplies, Retail Sales and Rentals.
Notions and Novelties, Retail Sales.
Offices.
Optical Goods, Manufacturing and Sales.
Orthopedic Appliances, Manufacturing and Sales.
Parking Lot, Customer or Commercial.
Physical Therapy Equipment, Retail and Wholesale.
Restaurants, Bars and Cocktail Lounges
Surgical Supplies, Retail Sales and Wholesale.
Variety Stores, Retail.

Residential Uses and Care Services.
Adult Day Care Home and Center.
Community Residence Center.
Hospice.
Hotel or Motel.
Multifamily Residential.
Nursing Homes.

Service Uses.
Copying and Reproduction Center.
Laundries.
Linen Supply Landry Service.
Massage Therapy.
Office services.
Precision Instruments, Custom Repair.
Towels, Supply Service.

Assembly Uses.
Church or place of worship.
Community Center.
Conference and Reception Center.
Lunch Rooms.
Lodges and Community Organizations.
Theatres.

Education Uses.
Libraries.
Nursery Schools.
Schools.
School for Mentally or Physically Handicapped.
Special School or Training Institution not offering curriculum of general instruction comparable to public schools.

Agricultural Uses.
Community Garden with accessory sales of products cultivated on-site.

Accessory Uses
Assembly Halls, Auditoriums and Banquet Halls.[1]
Blood Banks and Blood Plasma Centers as accessory to a hospital.
Contractor's Office.
Recreational vehicle parking.
Outdoor dining as amenities for employees and visitors.
Outside retail food sales.
Promotional events, including events outside a closed building, subject to obtaining a promotional event permit from the Planning and Development Department.
Parking lot or parking structures.
Helistop, subject to the following regulations and conditions:

1. The hospital shall be licensed by the State of Arizona either as a "general hospital" or as a "specialty hospital – children's" and for a minimum of 50 beds.
2. A letter from the Phoenix Aviation Department that articulates concurrence that the following items have been addressed:
    a. Compliance with the Federal Aviation Administration Advisory Circular No. 150/5390-2C "Helistop and Heliport Design" or subsequent revisions to the advisory circular.

[1] The assembly hall, auditorium and banquet hall uses shall not be subject to additional restrictions or a use permit requirement. These uses will be provided in a large campus setting bounded by streets, resulting in no negative impact to adjacent properties. As a teaching facility, this campus needs the flexibility to provide assembly rooms and teaching halls as part of the campus.

b. Submission of the "Notice of Landing Area Proposal" Federal Aviation Form 7480-1 and a letter of determination with no objection from the FAA.

3. A helicopter sitting on the touchdown pad of a helistop or heliport shall emit a maximum noise level of no greater than 90 dB(A) at the boundaries of the lot or parcel containing the nearest residential use. Noise will be measured with an IEC (International Electrotechnical Commission) or ANSI S1.4-1971 (American Standards Institute) Type 1 sound level meter with A-weighted impulse response.

Temporary Uses

All temporary uses shall be permitted as set forth in Section 623 of the Zoning Ordinance - C-2 Intermediate Commercial Zoning District.

Definitions

Unless otherwise specified in this PUD, all uses shall be defined as set forth in Section 202 of the City of Phoenix Zoning Ordinance effective May 19, 2018 and in subsequent updates.

Conflict

In the event of a conflict between the requirements of the City of Phoenix Zoning Ordinance and the PUD for the BUMC Campus, the requirements of the PUD shall prevail.

D. DEVELOPMENT STANDARDS

1. Table 1 - Development Standards

Development Standard	Block 1	Block 2	Block 3	Block 4	Block 5	Block 6
Building Height+	80' Max Height within area lying between 12th Street and 225' west of 13th Street sidewalk 70' Max Height within area lying 225' west of 13th Street sidewalk	80' Max Height within area lying between 12th Street and 225' west of 13th Street sidewalk 70' Max Height within area lying 225' west of 13th Street sidewalk	250' Max	250' Max	250' Max	250' Max

Development Standard	Block 1	Block 2	Block 3	Block 4	Block 5	Block 6
Dwelling Unit Density++	45.68 d.u./acre max	45.68 d.u./acre max	45.68 d.u./acre max	45.68 d.u./acre max	45.68 d.u./acre max	45.68 d.u./acre max
Lot coverage	Maximum 55% of the total sum of all parcels					

\+ *See Exhibit 19 - Building Height Standards for graphical clarification of building height limits.*

++ Maximum residential unit count for BUMC Campus shall be 3,321 dwelling units.

Development Standard	McDowell	13th Street	12th Street	Internal Drives
Building Setbacks*	16' min	20' min	10' min	0'
Landscape Setbacks**	16' min	10' min	10' min	0' or as stipulated by the PUE***

* *See Exhibit 19 - Building Setbacks for graphical clarification of building setbacks.*

** *See Exhibit 25 - Future Landscaped Pedestrian Walkways for graphical clarification of landscape setbacks.*

*** *See Exhibit 25 - Future Landscaped Pedestrian Walkways for graphical locations of pedestrian landscaping along Brill, Willetta, 9th Street and 10th Street. Internal walkways encouraged for pedestrian use have 6' landscaping for shading purposes.*

The tables above provide a summary of the PUD development standards applicable to specific blocks and streets throughout the campus. While there is currently no residential development on the site, it is anticipated that there could be residential development to accommodate students, families of patients or others with business related to the medical campus. For instance, medical student housing may develop as part of the teaching aspect of the hospital to support the merger of Banner Health and the University of Arizona Health Network and the hosted third and fourth-year students from the University of Arizona College of Medicine. The development density presented in the table above relates to the potential for such residential uses in each Block.

All internal Banner-owned streets (Brill, Willetta, Culver, 9th Street, 10th Street) will be maintained as access drives for the campus. There are no landscape setbacks on these streets other than the ones stipulated by the PUE for the area. Landscape standards for shading internal streets will occur along the pedestrian walkways indicated on Exhibit 25 – Landscaped Pedestrian Flows. Improvements to the landscaping along internal streets will be made as development occurs.

2. Parking Standards

Table 2 - Required Vehicular Parking

Hospital	1 SPACE / 2 PATIENT BEDS 1 SPACE / 3 EMPLOYEES 1 SPACE / PHYSICIAN
Medical Office Building	1 SPACE / 200 SF
Business	1 SPACE / 300 SF
Multifamily	1 SPACE / 1 OR 2 BEDROOM UNITS

Exhibits 8 and 9 depict the locations of parking spaces throughout the BUMC Campus. Ten percent of the parking area is to be landscaped evenly throughout the parking area with minimum landscaped areas measuring 5 feet in width to provide sufficient size for plant survivability. Parking structure exteriors shall be finished with architectural features and detailing to create visual interest. Any portion of a parking garage visible from the public right-of-way or an off-site building should be screened with materials and a design consistent with the primary buildings as well as the following design guidelines and exhibits: *See* Table 3 - Design Guidelines Architectural Design; *see also* Exhibit 10 – Banner Color and Material Architectural Language; *see also* Exhibit 11 – Banner Architectural Design Guidelines; *see also* Exhibit 15 – Banner Color Palette. The lighting within the parking structures will provide safety and security and be integrated into the architectural character both in terms of illumination and fixtures. Rooftop lighting should be set back a minimum of 25 feet from the perimeter of the rooftop parking structure and shall be a maximum of 12 feet in height. Appropriate visibility triangles and pedestrian crossings at exits and entrances should be provided for parking structures.

Required Bicycle Parking

Bicycle parking shall occur at a ratio of 1 space per 50 parking spaces. Bicycle parking is to be provided near parking garages and at strategic areas throughout the BUMC Campus, which are identified on Exhibit 28. Bike racks will allow for bikes to be securely locked. The bike parking will feature independent loops with a classic profile to be spaced no closer than 3’ on center to allow for bikes to be parked on either side and will meet APBP (Association of Pedestrian and Bicycle Professionals) guidelines to:

1) Support bikes upright without putting stress on wheels.
2) Accommodate a variety of bicycles and attachments.
3) Allow for locking of frame and at least one wheel with a U-lock.
4) Provide security and longevity features appropriate for the intended location.
5) Ensure rack use is intuitive.

The racks have concealed hardware and are a coordinating color and finish to the architectural language of the BUMCP campus, as depicted in the illustration below.

E. DESIGN GUIDELINES

1. Architectural Design

Elevations found in Exhibit 10, illustrate the Banner Health Branded Architecture. The Banner University Medical Center Design Guidelines, Exhibit 11, provide further examples of the design language and guidelines developed by the teams at Banner University Medical Center Phoenix and Tucson. These guidelines will be applied to all future buildings as shown on Exhibit 8 and are already in use on many of the existing buildings. The elements of Banner's design language include: "Banner Block" masonry use, patterning and color variation; glazed "waterfall wall" features and details; the use of metals and colors; punched openings; use of large glazed surfaces and tower articulation. Building materials, finishes and colors are further illustrated in Exhibit 15, the Banner Color Palette. The Banner Branded Architecture is described in the chart below.

Table 3 – Architectural Design Guidelines

Material	Description	Placement
Masonry	"Banner Block" masonry to be used as variation in hue within the same color family. Has texture and size variation to include blasted face, 4" and 8" heights, in varied running bond pattern.	Used in planes and bypassing masses. Planes typically extend past volumes beyond and can be free-standing and used in landscape/garden areas.
Glazed Waterfalls	Translucent, spandrel, and clear glass in varied widths and heights of mullion spacing. Occasional glass fins may be used. Contains structural silicone glazing.	A "waterfall" and wayfinding element located at canyon spaces, it defines public circulation, to optimize visibility from exterior and optimize interior views. This vertical element acts as a defining feature of a public entrance façade.

Material	Description	Placement
Brown Hue Metal	Metal planes in varied widths and heights in various natural brown hues to coordinate with existing buildings/natural landscape.	Bent planar elements at entrances, canopies, and pavilion locations. It also serves as vertical infill and transition between different materials. Occasionally occurs as miscellaneous elements in landscaped courtyards.
Zinc Hue Metal	Metal planes in standardized widths in the standard gray/silver color tone of zinc metal.	Used on fascia elements at canopies, vertical infill and transition areas, at louvers and miscellaneous metal trims. It is also used in mass elements and planar elements.
EIFS	EIFS finish used in coordinating colors to the "Banner Block" masonry as well as color values in harmony with the existing buildings/natural landscape. Occasional accent colors used in grouping with punched openings within a larger façade.	Used in infill, transition, and large planes. Also utilized in areas identified for expansion to enable easy connections. The openings in the EIFS tend to be a randomized repeatable pattern to break up large facades.
Punched Openings	May be aligned and orderly and may be elongated either horizontally or vertically in Block walls. In EIFS or Metal, may be randomized repeatable pattern, frequently grouped with an accent material/color. Exterior shading elements and glazing treatments used to minimize solar heat gain/glare.	Openings at the ends of corridors or at staff break areas shall be provided whenever possible.
Glazed Surfaces	Clear and tinted glass to visually connect areas. Can be elongated horizontally or vertically. Used in conjunction with bird proof shading elements and glazing treatments to minimize solar heat gain/glare.	Used to visually connect public areas to exterior landscaped areas. Also used at public connections and corridors and other public areas such as waiting areas, dining, and lobbies.

All public facing buildings shall use a mix of at least three of the design materials mentioned in the table above and may mix architectural elements. Interior, non-public facing buildings for infrastructure, support, warehouses, mechanical uses, etc. may be of a lesser design aesthetic, but shall comply with Section 507 Tab A of the Zoning Ordinance.

2. Open Space, Shade, and Landscaping

Open Space

The Banner University Medical Center Phoenix campus recognizes the importance of open space for social gathering areas and as areas of respite. The need for and use of open space in a healthcare campus is fundamentally different from most other public areas due to the inherent limitations of an evolving urban healthcare campus. As such, the PUD proposes a practical approach to open space. As the campus evolves, interior gathering spaces, healing gardens, exterior courtyards and landscaped building entries will continue to be integrated and serve a valuable purpose; they provide exceptional attractive, peaceful settings for both patients, visitors, and staff. Although the locations and configurations of the open space areas will fluctuate with campus growth and redevelopment, open space will continue to be provided throughout the campus (Exhibit 22 illustrates Existing Open Spaces/Healing Gardens). The current percentage of open space on the campus is 8%. However, open space will be a non-regulatory feature in this PUD as the percentage of open

space will continue to adapt with the addition of each new building or phase of development and thus cannot be tied to the current percentage. All new and existing open spaces are to be located within 1,000 feet of a pedestrian entrance or a pedestrian walkway and/or the landscaped pedestrian flows on campus (shown on Exhibit 25 – Landscaped Pedestrian Flows).

A park will be located adjacent to the new west entry and lobby, as illustrated in detail in Exhibit 21, the Banner Park Detail Plan. The park will feature a walking/exercise path for patients and staff, seating walls and public art. The park will also provide a large area for media events, blood drives and other hospital gatherings. Exhibits of the hospital's history will be featured within the main lobby of the hospital, serving as a link between the past, present and future. The size of the park shall be a minimum of 11,600 square feet.

Landscaping

Landscaping along McDowell Road is used as a buffer between pedestrians and traffic on McDowell as shown on Exhibit 20 – McDowell Landscape Buffer. This separation is for safety and comfort as well as the improved aesthetics of the plantings. Specifics of the planting can be seen on Exhibit 12 – C.O.P. Shade Tree Planting Plan. Landscape buffers are also provided along pedestrian walkways throughout the BUMC Campus at locations depicted on Exhibit 25 - Future Landscaped Pedestrian Walkways.

Designs for the campus recognize both limitations in water availability, as well as legitimate needs to use landscaping for shade, cooling, and visual relief. To these purposes, these standards distinguish between landscaped areas oriented to public streets and the exterior of projects from those areas more internally oriented and for the use of pedestrians. They provide for landscaping at the perimeter to include waterless features and drought resistant plant materials. Active and passive leisure and outdoor recreation areas are to be provided and maintained in central locations for use by pedestrians. The following standards will apply to Open Space within the PUD:

2.1. Improved open spaces, plazas and courtyards shall be functional in terms of area, dimensions, location and amenities to promote safe human interaction and ADA accessibility.

Rationale: Pedestrian amenities help to encourage the use of public spaces. With respect to open space, bigger is not necessarily better. A series of small areas, each provided with amenities, may foster more human interaction than a large monolithic space.

2.2. Usable public space shall incorporate shading through the use of structures that provide shading, landscaping or a combination of the two unless otherwise prohibited by site visibility triangles or other technical constraints.

2.3 The following elements are to be provided in these Open Space areas:

2.3.1 Break areas for employees.

2.3.2 Public seating areas.

Rationale: People are attracted to public areas with shade during large portions of the year in Phoenix.

Banner's landscape architecture and plant materials, maintenance, hardscape, art/water elements, and surface parking design on the campus will comply with Section 507 Tab A of the Zoning Ordinance in effect

as of October 2019.

Responding to concepts and policies, the purpose of the Landscape Standards section is to outline the baseline requirements for landscape improvements and establish a common landscape theme for the PUD which meet the C-2 requirements and provide long term benefit to the community. The intent is to provide a naturalistic appearance suitable to the Sonoran Desert with a distinctive aesthetic that is unique to the Subject Property and sensitive to the surrounding community. Providing a mix of tree maturities creates a more mature and natural look.

The plant palette referenced and plant material images shown on the attached Tree Inventory Plan (Exhibit 13) and C.O.P. Shade Tree Planting Plan (Exhibit 12) will not be limited to those lists, but will primarily be composed of drought tolerant and regionally adapted trees, shrubs, accents, and groundcovers to be located internally and along the linear property lines. All plant material shall be in compliance with the Department of Water Resources low water use plant list as approved by the City of Phoenix Planning and Development Department.

Pedestrian Landscaping standards shall be consistent with the C-2 standards and Staff shall have the discretion and flexibility to administratively consider and approve modified landscape standards on a case by case basis in the event of utility conflicts or unforeseen circumstances which would reasonably prevent compliance with the C-2 landscape standards.

All landscaping shall adhere to the standards outlined in the Landscape Standards Table below.

Table 4 - Landscape Standards Table

LANDSCAPE STANDARD CATEGORY	PUD LANDSCAPE STANDARDS*
Landscape Setbacks:	As stated in Section D.1 - Development Standards Table
General Landscape Requirements: All Plant Material for Landscape Areas	Per Arizona Nursery Association Standards
Plant Materials	50% live coverage at maturity for living trees, shrubs, accent plantings and vegetated ground cover
Decomposed Granite	5/8” to 3/4“size min. two-inches (2”) depth Rip-Rap size (4”-6”) size color to match D.G.

LANDSCAPE STANDARD CATEGORY	PUD LANDSCAPE STANDARDS*
Perimeter Property Lines: (Not adjacent to a street) Plant Type Trees Shrubs	Tree placement min. 20-foot on center or equivalent groupings. Plant materials installed/maintained min. five-foot (5') wide landscape area with decomposed granite for dust control (Minimum Planting Size) Min. 2-inch caliper (60% of required trees) Min. 1-inch caliper (40% of required trees) Min. (1) 5-gal shrub/ground cover for each 5' of linear distance
Street Frontage and Pedestrian Walkways (per Exhibit 25): Plant Type Trees Shrubs	Tree placement min. 20-foot on center or equivalent groupings, except for specific gaps in the planting canopy will to allow for visibility to the hospital entrance from the road to allow for bus patrons to know which stop to use by having a direct visual to the hospital entrance. (Minimum Planting Size) Min. 2-inch caliper (50% of required trees) Min. 3-inch caliper (25% of required trees) Min 4-inch caliper (25% of required trees) Min. (1) 5-gal shrub/ground cover for each 5' of linear distance
Adjacent to Building: Building facades within 100' of the public right-of-way or adjacent to public entries to the building (excluding alleys) Plant Type Trees Shrubs	Min. 25% of the exterior wall length shall be treated with either a landscape planter a min. five (5) feet in width or an arcade of equivalent (Minimum Planting Size) Min. 2-inch caliper (60% of required trees) Min. 1-inch caliper (40% of required trees) Min. (1) 5-gal shrub/ground cover/each 5' of linear distance
Parking Area Landscape Area: Plant Type Trees	10% of total parking area evenly distributed throughout the entire parking lot. Min. interior dimension five-foot (5'). (Minimum Planting Size) Min. 2-inch caliper (60% of required trees) Min. 1-inch caliper (40% of required trees)

LANDSCAPE STANDARD CATEGORY	PUD LANDSCAPE STANDARDS*
Shrubs	Min. (5) 5-gal shrub/ground cover per tree
Planting Screening and Clearances:	
Mechanical/Utility devices and cabinets	Plantings or screen wall 3' clear around all edges of pad
Fire Hydrant Clearance	Mature plant material min. five-foot (5')
Electrical Transformers	Mature plant material min. five-foot (5') around all edges of pad and maintain 12' clear operational immediately in front of all transformers
Sidewalk Tree clearance	Eight-foot (8') height clearance Seven-foot (7') clearance to tree trunk Tree guards required within (7') clearance.

** The BUMC PUD landscape standards are consistent with the C-2 zoning district landscape standards. Staff shall have the discretion and flexibility to administratively consider and approve modified landscape standards on a case by case basis throughout the BUMC campus in the event of utility conflicts or unforeseen circumstances which would reasonably prevent compliance with the C-2 landscape standards.*

The property owner shall be responsible for maintaining all trees in a healthy, living condition and replacing any trees that are not maintained in a healthy, living condition.

Irrigation Systems

All plant materials shall be irrigated by an appropriate automatic underground irrigation system.
All irrigation systems shall be designed, constructed and maintained to promote water conservation and prevent water overflow or spray onto streets, sidewalks or parking areas.

Landscape irrigation and domestic water services shall be metered separately and located by dimension on the irrigation plan. Each irrigation service point of connection shall have a reduced pressure back flow prevention device installed and maintained in accordance with the requirements of the City of Phoenix or approved equivalents.

Shade

The campus will have a 75% shade standard for future landscaping along Pedestrian Sidewalks as depicted on Exhibit 25 – Future Landscaped Pedestrian Walkways. The minimum of 75% shall be provided along pedestrian sidewalks, allowed by a mixture of planting material maturities and initial caliper sizes. Mixing maturities creates a more mature-looking landscape at installation and promotes greater plant survival.

Main Pedestrian Corridors	75% shading achieved through plantings, canopies, or additional methods*
Pedestrian Pathways to Public Transportation	75% shading achieved through plantings, canopies, or additional methods*
Public Entry Vestibules	Shaded entrances

** Specific gaps in the planting canopy will occur to allow for visibility to the hospital entrance from the road*

to allow for bus patrons to know which stop to use by having a direct visual to the hospital entrance.

Careful consideration is given to maximize shade in exterior spaces. Shade is especially important to the pedestrian movement throughout the campus. Appropriate landscaping provides shade along main pedestrian corridors within the campus, as well as shading along sidewalks to public transportation. The height and orientation of the buildings also is considered to maximize the shade available on campus. Major pedestrian pathways are shaded by three means: trees/landscaping, canopies, and inside the buildings. See Exhibit 12 – Shade Tree Planting/Landscape Plan.

With new development of the campus, a 3-foot landscape buffer will be provided along the south side of McDowell Road, separating pedestrians using the 6-foot sidewalk from traffic along McDowell (illustrated in Exhibit 20, McDowell Road Pedestrian Shade and Landscape Buffer). Furthermore, a 12-foot landscape buffer will be provided, separating the sidewalk from the medical campus's internal ring road. This 12-foot landscape buffer, located on the south side of the sidewalk, will provide maximum shade for pedestrians. Placement of similar shading trees on the north side of the sidewalk would shade the street, not the sidewalk, and would interfere with a public utility easement under the sidewalk.

3. Fences/Walls

Fences and walls are used on the campus as screening elements and are to have a finished appearance in public and highly visible areas. Care is given to prevent walls that could be used as loitering areas or providing abduction spots or hiding places that may endanger passing pedestrians. For parking, 3-foot high hedges or walls are used. For screening equipment, a masonry or metal wall ranging from 5 to 7.5 foot or more will be used and will match the buildings in the Banner architectural vocabulary. The standards that apply to fences and walls are presented in the table below.

Public Facing/Highly Travelled Streets	Use of "Banner Block," EIFS, metal wall, or other material matching the Banner architectural vocabulary used to have a "finished" appearance. Wall lengths exceeding 50 ft adjacent to public facing streets should be articulated or contain substantial landscaping to break the continuous wall surface and create varying patterns.
Infrastructure/Support Areas	5'-7.5' or more as needed to screen equipment. Can be a lesser designed aesthetic within the Banner architectural vocabulary.
Equipment	5'-7.5' or more as needed to screen equipment. Masonry or metal wall that can be a lesser designed aesthetic within the Banner architectural vocabulary.
Parking	3' high hedges or walls matching the Banner architectural vocabulary to have a "finished" appearance. Wall lengths exceeding 50 ft adjacent to public facing streets should be articulated or contain substantial landscaping to break the continuous wall surface and create varying patterns.

4. Lighting Plan

Any lighting shall be placed so as to reflect the light away from adjacent residential districts. The Lighting Plan is attached as Exhibit 16 – Photometric Site Plan.

Lights are to be round arm mount cutoff area luminaries with a warm white 3000K, 80 CRI color temperature. The fixture finish is a natural aluminum paint with a cylindrical appearance with a flat top, and they are to

have thermal management technology and offer an energy savings of 50% when compared to HID systems. Service areas and other screened areas shall have proper security lighting. Site lighting shall be provided to ensure personal safety at building entrance/exits and in public assembly and parking areas.

Height Parking Area Lighting	25 feet to bottom of fixture
Height Vehicular and pedestrian circulation lighting	25 feet to bottom of fixture
Distance Exterior Building Lighting	Shall occur every 125 feet min.

5. Project Amenities

As one of the premier hospitals in Arizona, BUMC routinely serves the most extreme and delicate cases, caring for patients that most other hospitals cannot. The addition of the educational aspect of the hospital further strengthens its position with respect to retaining the best students as permanent employees.

Currently, the hospital maintains two separate helipads. The first has a capacity to serve a Marine One helicopter or two standard size helicopters simultaneously. The second serves two standard-sized helicopters simultaneously.

Parks and open space provide attractive landscaped moments of respite. Shaded walkways to the bus stops are provided. The central pedestrian east-west spine across campus is shaded by buildings, canopies, or landscaping. A dedicated bike lane also serves as a connection along 10th Street.

6. Circulation and Safety

The campus layout, including both current and anticipated future buildings, is shown on Exhibit 8 – Proposed Land Use. The campus is designed to function in three major sections, as illustrated on Exhibit 18, the General Campus Layout. The center of campus is dedicated to Inpatient Care, with the east and west sides predominately dedicated to Outpatient Care, and the south side providing infrastructure and support for the whole campus. As the campus grows, Outpatient functions will be added to the perimeter reserving Inpatient space at the center of campus. An internal ring road has been designed to keep the internal traffic within the campus and off the adjoining City arterial streets. Special consideration is given to landscape and shading for pedestrian circulation as well as for healing gardens utilized by patients and staff.

Attention is given to the transitions and intersections of pedestrians and vehicular traffic. A study of the current crosswalk placement was considered and is shown on Exhibit 14 – Existing Intersections and Crosswalks. Their placement in relation to the path of travel by different uses was further compared with the Flows of Medicine (Exhibit 6) and pedestrian use of the campus occurring on the pedestrian access flows (Exhibit 23). A comprehensive analysis of the traffic contained in Exhibit 17 also addresses the need for crosswalks. The use of unique design and a change in paving materials is utilized at the 10th Street crosswalk and at the 12th Street crosswalk (subject to City of Phoenix Street Transportation Department approval), as provided in the examples set forth in Exhibit 24. The crosswalks' inclusion of lights are important additions to allow for high visibility of pedestrians at all times. All interior campus upgrades at crosswalks are to incorporate these elements to create safe intersections.

Crosswalks require specialized attention at each occurrence to ensure the safe transition and intersection of pedestrians and vehicular traffic. Crosswalks which are located within the public right-of-way (streets owned

and maintained by the City) will be considered and coordinated with City of Phoenix Street Transportation Department staff. Future new crosswalks and crosswalk upgrades located across Banner's internal private streets will be installed as construction occurs in the area of said crosswalk improvements. Crosswalk standards will be adhered to, including, but not limited to, the use of unique designs and a change in paving materials, such as occurs at the 10th Street crosswalk and as depicted in Exhibit 24 – Crosswalk Design Materials. Transitions from the asphalt road to acceptable crosswalk materials and methods shall be utilized, such as finished concrete, stamped concrete, colored concrete, decorative pavers, imprinted asphalt, or lithocrete paving. Accent colors shall be complimentary of the Banner Branded palate and architectural design. High contrast paint is to be used for painting crosswalk stripes. Bricks, cobblestone, and slate pavers are not acceptable materials due to their uneven nature that could present a tripping hazard to individuals with reduced mobility. Overly slick materials such as travertine, granite, and marble are also to be avoided as they do not provide appropriate levels of friction when wet.

The inclusion of crosswalk lighting is an important addition to ensure high visibility of pedestrians at all times. A minimum vertical illuminance level of 1-foot-candle ("fc") and an average of 2-fc (measured at the walking surface) is required in the crosswalk in order to provide adequate detection of pedestrians.

A shared bike lane along 10th Street encourages alternative transportation methods and provides a connection to the bridge across I-10 for both hospital users and the surrounding community. The separation of the bike lane from vehicular traffic increases the safety of both groups.

F. SIGNS

1. Character

As described in the Banner Health Design Standards for Interior and Exterior Signage (on-file with the City of Phoenix), signage is a critical element of the Banner Health Medical Campus. In order to provide the maximum required wayfinding clarity for a wide variety of pedestrians and vehicular traffic, Banner Health has developed a standard Comprehensive Signage Package which includes: sign locations, designs, material and color specifications. The Design Standards provide clear specifications for the entire hierarchy of signage types.

2. Location

The Sign Plan specific to the Banner University Medical Center Phoenix Campus (on-file with the City of Phoenix) is a comprehensive document which identifies sign locations, as well as the sign types. Fabrication dimensioned drawings, font color, design and size, signage materials and text details are provided for each sign type and location. Amendments to the Sign Plan must follow the requirements of Section 705.E.2 of the Phoenix Zoning Ordinance.

G. SUSTAINABILITY

1. Measurable Standards

1.1 All public building entrances will be shaded vestibules to save energy.

1.2 Practice xeriscaping with drought tolerant plants for 75% or higher on all landscaped areas.

1.3 Provide bike racks at all parking garages at a ratio of 1:50 spaces to employees during any one shift, to encourage alternate forms of transportation.

1.4 Have 75% shading on all major pedestrian sidewalks, except where gaps occur to provide bus patron visibility to hospital entrance.

2. Sustainable Practices

2.1 Where appropriate use the building's orientation to maximize shaded facades.

2.2 Wherever suitable, use shading for glazed surfaces within 15 degrees of west.

2.3 Utilize energy efficient equipment throughout the building.

2.4 Provide clear route to public transportation to encourage its use.

2.5 Ensure that public sidewalks and walkways have shading by means of vegetation or other shading methods.

2.6 Utilize light colored and/or high albedo materials for low slope roofs wherever workable.

2.7 Maximize usage of recycled and low VOC materials when possible.

2.8 Ensure that at least one LEED-Accredited Associate or above is on the architecture project team.

Ensure that at least 20% of building materials be manufactured within a 500-mile radius of the site.

H. INFRASTRUCTURE

1. Grading and Drainage

The Banner University Medical Center is not within a designated floodplain as illustrated on FIRM panel 04013C2205L effective 10/16/2013. The west half of the Campus falls within the City of Phoenix designated Infill Incentive Area, the east half does not. Approval of this PUD by the City of Phoenix will extend the Infill Incentive Area limits to 13th Street between McDowell and I-10, the east limit of the Campus. Retention requirements for an Infill Incentive Area is the greater of Pre vs Post or First Flush, this requirement will be maintained for all development on the Campus. The minimum standard First Flush consists of retaining or treating the first 0.5 inch of direct runoff from a storm event. Discharges into a structure owned or operated by the City must comply with the First Flush Policy providing storm water runoff control. The First Flush requirement can be addressed by retaining the required minimum First Flush volume, treating the First Flush

discharge, or utilizing a combination of both.

Storm water retention related to the redevelopment of the Campus may be provided in phases specific to each development, a Campus-wide analysis is not necessary with each phase of development. Stormwater storage may occur in surface retention, underground retention or a combination of the two. Stormwater retained must be drained within 36-hours using either surface percolation for shallow basins, less than 12-inches in depth or drywells. Retention will be incompliance with the City of Phoenix Storm Water Policies and Standards Section 6.8, April 2011.

2. Water and Wastewater Services

Public water mains exist on the Campus and are connected to the public water mains within both 7th Street and McDowell Road. Fire hydrants shall be located so that there is a fire hydrant within 350-feet of any point on the building. Fire flow tests will be performed to assure code requirements are met for building fire flow, number of hydrants serving building, as well as fire hydrant pressure and flow.

Public sewer mains exist on the Campus and are connected to the public sewer mains within both 7th Street and McDowell Road. The demand of each new building will be presented to the City of Phoenix water services department for confirmation that sufficient capacity is available within the public system.

3. Circulation Systems

The Intersection and Crosswalk map, Exhibit 14, illustrates various circulation routes for users, including: ambulance, pedestrian walkways, pedestrian routes, construction deliveries, visitor and employees.

3.1 Pedestrian

Pedestrian crosswalks are located throughout the Campus to connect visitors and employees from parking lots to their destination on campus. Crosswalk locations are discussed in the Traffic Impact Analysis for the Campus. Condensing the number of pedestrian crossing locations will help to eliminate the number of vehicle pedestrian conflict points and therefore increase pedestrian safety. The improvements will also help increase the flow of vehicular traffic along the major collectors, 10th Street and 12th Street. 10th and 12th Street are also the access roads for emergency vehicles that will enter the hospital from the port located on Willetta Street.

The recommended main pedestrian crossing location for 10th Street is on the south leg of the 10th Street and Brill Street intersection. Condensing the number of crosswalks along 10th Street will increase the pedestrian crossings at this location. The increase in pedestrians during the peak hours will meet the *Manual on Uniform Traffic Control Devices* ("MUTCD") pedestrian signal warrant in accordance with Figure 4f-1 of the MUTCD. Due to the continuous relocation and addition of medical facilities and parking, a follow-up pedestrian analysis is recommended to determine if a pedestrian signal will continue to be warranted at this location.

A main pedestrian crossing location for 12th Street is on the south leg of the 12th Street and Brill Street intersection. The crosswalk is at the threshold for warranting a pedestrian signal in accordance with Figure 4f-1 of the MUTCD. Per the Traffic Impact Analysis, a pedestrian signal would be beneficial at this location. Due to the continuous relocation and addition of medical facilities and parking, a follow-up pedestrian analysis is recommended to determine if a pedestrian signal will continue to be warranted at this location.

One alternative investigated was to accommodate pedestrian crossing time per the MUTCD Section 4E.06,

as well as vehicular traffic for all approaches, and emergency vehicle traffic. This alternative included the removal of the pedestrian crosswalk on the west leg to allow for sufficient signal timing and keep the intersection coordinated with the 7th Street and 12th Street intersections. The removal of the crosswalk would also remove a potential emergency vehicle and pedestrian conflict point. If the crosswalk is removed, all pedestrians would cross McDowell Road on the east leg.

East/west pedestrian connectivity by surrounding residents and community members is encouraged along McDowell Road and certain segments of Willetta Street as shown on Exhibit 23 – Pedestrian Access Flows and Exhibit 25 – Future Landscaped Pedestrian Walkways. Due to the significant landscaping and sidewalk improvements along both McDowell Road and Willetta Street and the future plan of development for the BUMC Campus, cross-campus connectivity is encouraged along these two pedestrian walkways as opposed to Brill Street.

3.2 Vehicular

The major campus facilities and entrances are being relocated to the west side of campus, therefore the main campus access road will be shifting from 12th Street to 10th Street. The existing 10th Street roadway and intersection configuration with McDowell Road is not equipped to handle the increase in traffic on 10th Street. Improvements are recommended to help improve the traffic flow along 10th Street.

There will be an increased number of westbound left-turning vehicles entering the campus at the intersection of 10th Street and McDowell Road during the morning peak hour. Providing Protected/Permissive left turn phasing for the turning movement is recommended to reduce delay and vehicle queue on McDowell Road.

There will be an increased number of northbound left and right turning vehicles during the afternoon peak hour from 10th Street onto McDowell Road. The increase in northbound left turning traffic will increase the delay as well as the vehicle queue and exceeds the acceptable volume to capacity ratio as described in the traffic report. The vehicle queue can extend south to Brill Street with the existing conditions, blocking a number of driveways as well as the through and right turning traffic lanes. The Traffic Impact Analysis investigated a few alternatives to decrease the delay and queue. The approved alternative eliminates through movements and converts the through lane to a left turn lane creating two left turn lanes to handle the volumes. The configuration also requires an additional storage lane to be added for the northbound right turning vehicles. A storage lane of 90-feet or less is recommended to accommodate the right turning traffic and avoid the removal of parking for the emergency room parking lot. The ultimate recommended configuration for the northbound traffic includes dual left turn lanes and a dedicated right turn lane.

3.3 Bicycle Corridor

A pedestrian bridge located at the south end of 10th Street on the Campus, connects pedestrian and bicycle traffic from the south side of the I-10 to the north side of the I-10. To provide a continuous bicycle corridor along 10th Street per the site plan amendments, bike lanes along 10th Street between McDowell Road and the Pedestrian Bridge are recommended where possible. A 10-foot multiuse path can also be used where necessary for pedestrian and bicycle use.

3.4 Service

The new travel corridor for delivery vehicles to reach the campus service dock will be along 12th Street and

Culver Street. Driveway improvements are proposed for Culver Street at the 12th Street intersection.

3.5 Fire/Emergency Access

Meet emergency vehicle fire department requirements. The emergency vehicles will access the hospital through a port located on the north side of Willetta Street between 10th Street and 12th Street. Emergency vehicles will access the Campus using McDowell Road. Emergency vehicles arriving from the west will turn right onto 10th Street to get to Willetta Street. Emergency vehicles arriving from the east will turn left onto 12th Street to get to Willetta Street. Improvements to the curb radius on the southwest corner of 10th Street and McDowell Road shall be constructed to allow emergency vehicles to make the right turn at a greater speed.

I. LEGAL DESCRIPTION

Legal descriptions are found in Exhibit 1 for Assessor Parcel Numbers 116-30-156, 116-29-085C and 116-30-150, and for the right of way abandonment area of a portion of Willetta Street.

EXHIBIT 1

BANNER UNIVERSITY MEDICAL CENTER PUD - LEGAL DESCRIPTION

LEGAL DESCRIPTION FOR APN 116-30-156

A PARCEL OF LAND SITUATED IN A PORTION OF THE NORTHWEST QUARTER OF SECTION 4, TOWNSHIP 1 NORTH, RANGE 3 EAST OF THE GILA AND SALT RIVER MERIDIAN, MARICOPA COUNTY, ARIZONA, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEING ALL OF LOT 1 OF BANNER UNIVERSITY MEDICAL CENTER AS RECORDED IN BOOK 1271 OF MAPS ON PAGE 15, OFFICIAL RECORDS OF MARICOPA COUNTY, ARIZONA, AND CONTAINING A COMPUTED AREA OF 2,107,046 SQUARE FEET OR 48.371 ACRES OF LAND, MORE OF LESS.

LEGAL DESCRIPTION FOR APN 116-29-085C

A PARCEL OF LAND SITUATED IN A PORTION OF THE NORTHEAST QUARTER OF SECTION 4, TOWNSHIP 1 NORTH, RANGE 3 EAST OF THE GILA AND SALT RIVER MERIDIAN, MARICOPA COUNTY, ARIZONA, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEING ALL OF LOT 2 OF SAMARITAN CAMPUS AS RECORDED IN BOOK 472 OF MAPS ON PAGE 50, OFFICIAL RECORDS OF MARICOPA COUNTY, ARIZONA, AND CONTAINING A COMPUTED AREA OF 664,870 SQUARE FEET OR 15.263 ACRES OF LAND, MORE OF LESS.

LEGAL DESCRIPTION FOR APN 116-30-150

A PARCEL OF LAND SITUATED IN A PORTION OF THE NORTHWEST QUARTER OF SECTION 4, TOWNSHIP 1 NORTH, RANGE 3 EAST OF THE GILA AND SALT RIVER MERIDIAN, MARICOPA COUNTY, ARIZONA, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEING ALL OF LOT 1 OF Y.W.C.A. AS RECORDED IN BOOK 295 OF MAPS ON PAGE 24, OFFICIAL RECORDS OF MARICOPA COUNTY, ARIZONA, AND CONTAINING A COMPUTED AREA OF 86,581 SQUARE FEET OR 1.988 ACRES OF LAND, MORE OF LESS.

LEGAL DESCRIPTION FOR RIGHT OF WAY ABANDONMENT WILLETTA STREET (first parcel)

A PARCEL OF LAND SITUATED IN A PORTION OF THE NORTHWEST QUARTER OF SECTION 4, TOWNSHIP 1 NORTH, RANGE 3 EAST OF THE GILA AND SALT RIVER MERIDIAN, MARICOPA COUNTY, ARIZONA, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHEAST CORNER OF LOT 1 OF Y.M.C.A. RECORDED IN BOOK 295, PAGE 24, RECORDS OF MARICOPA COUNTY, ARIZONA;

THENCE UPON AND WITH THE NORTH LINE OF SAID LOT 1, SAME BEING THE SOUTH RIGHT OF WAY LINE OF WILLETTA STREET, NORTH 89 DEGREES 46 MINUTES 29 SECONDS WEST, A DISTANCE OF 358.15 FEET TO THE NORTHWEST CORNER OF SAID LOT 1;

THENCE DEPARTING SAID LINE, NORTH 00 DEGREES 21 MINUTES 14 SECONDS EAST, A DISTANCE OF 66.03 FEET TO THE CENTERLINE OF SAID WILLETTA STREET;

THENCE SOUTH 68 DEGREES 18 MINUTES 25 SECONDS EAST, A DISTANCE OF 1.95 FEET TO THE BEGINNING OF A CURVE TO THE LEFT HAVING A RADIUS OF 435.23 FEET;

THENCE CONTINUING ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 21 DEGREES 36 MINUTES 29 SECONDS, AN ARC LENGTH OF 164.14 FEET TO A POINT OF TANGENCY;

THENCE SOUTH 89 DEGREES 46 MINUTES 29 SECONDS EAST, A DISTANCE OF 195.94 FEET;

THENCE SOUTH 00 DEGREES 21 MINUTES 24 SECONDS WEST, A DISTANCE OF 35.00 FEET TO THE POINT OF BEGINNING AND CONTAINING A COMPUTED AREA OF 14,182 SQUARE FEET OR 0.326 ACRES OF LAND, MORE OF LESS.

LEGAL DESCRIPTION FOR RIGHT OF WAY ABANDONMENT WILLETTA STREET (second parcel)

A PARCEL OF LAND SITUATED IN A PORTION OF THE NORTHWEST QUARTER OF SECTION 4, TOWNSHIP 1 NORTH, RANGE 3 EAST OF THE GILA AND SALT RIVER MERIDIAN, MARICOPA COUNTY, ARIZONA, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF WILLETTA STREET AS SHOWN ON THE FINAL PLAT OF BANNER UNIVERSITY MEDICAL CENTER RECORDED IN BOOK 1271, PAGE 15, RECORDS OF MARICOPA COUNTY, ARIZONA;

THENCE UPON AND WITH THE WEST LINE OF SAID BANNER UNIVERSITY MEDICAL CENTER, NORTH 00 DEGREES 19 MINUTES 08 SECONDS WEST, A DISTANCE OF 21.68 FEET TO THE NORTHWEST CORNER THEREOF;

THENCE DEPARTING SAID WEST LINE, UPON AND WITH THE NORTH RIGHT OF WAY LINE OF SAID WILLETTA STREET, SOUTH 89 DEGREES 46 MINUTES 29 SECONDS EAST, A DISTANCE OF 250.33 FEET TO THE NORTHEAST CORNER THEREOF;

THENCE SOUTH 00 DEGREES 21 MINUTES 24 SECONDS WEST, A DISTANCE OF 25.00 FEET TO THE SOUTHEAST CORNER THEREOF, SAME BEING THE NORTHEAST CORNER OF WILLETTA STREET OF Y.M.C.A. RECORDED IN BOOK 295, PAGE 24, RECORDS OF MARICOPA COUNTY, ARIZONA;

THENCE NORTH 89 DEGREES 46 MINUTES 29 SECONDS WEST, A DISTANCE OF 195.94 FEET TO THE BEGINNING OF A CURVE TO THE LEFT HAVING A RADIUS OF 435.23 FEET;

THENCE CONTINUING ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 07 DEGREES 10 MINUTES 27 SECONDS, AN ARC LENGTH OF 54.50 FEET TO THE POINT OF BEGINNING AND CONTAINING A COMPUTED AREA OF 6,199 SQUARE FEET OR 0.142 ACRES OF LAND, MORE OF LESS.

EXHIBIT 2

Banner
University Medical Center
Phoenix Campus

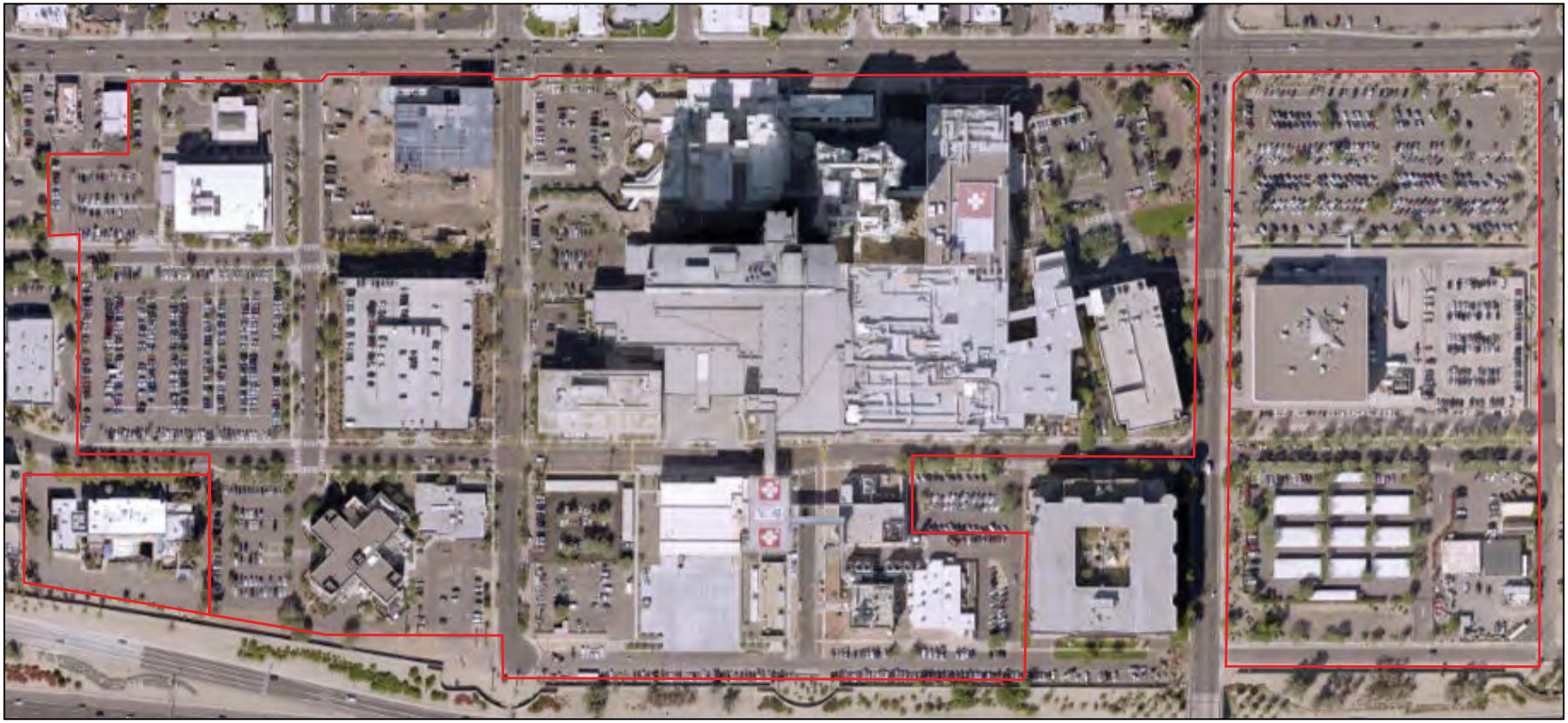
AREA VICINITY MAP

PLANNED UNIT DEVELOPMENT

LSB

HKS

EXHIBIT 3



Banner
University Medical Center
Phoenix Campus

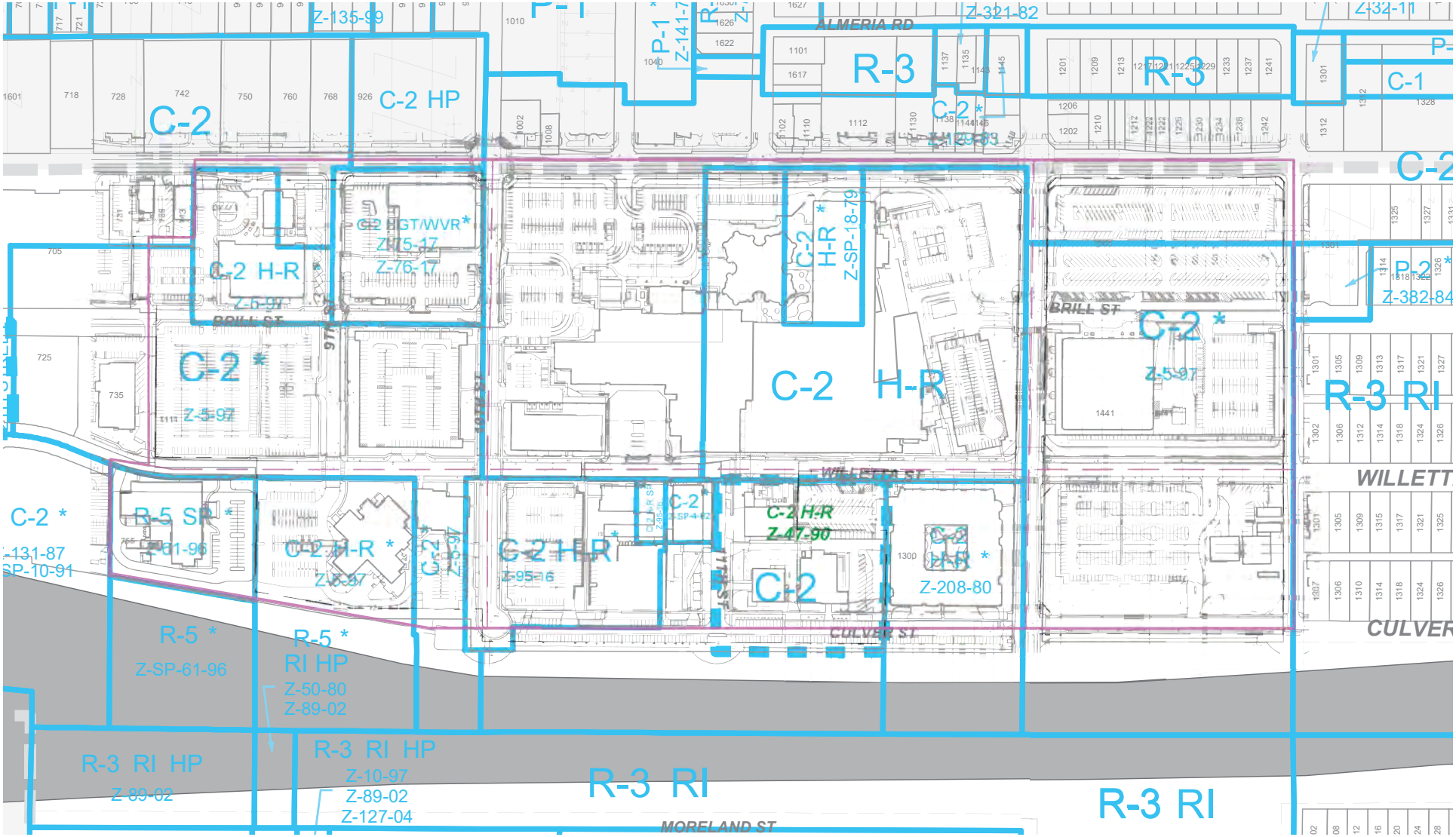
AERIAL MAP AS OF OCT 2018

0 150 300 FT

PLANNED UNIT DEVELOPMENT

LSB HKS

EXHIBIT 4



Banner University Medical Center
Phoenix Campus

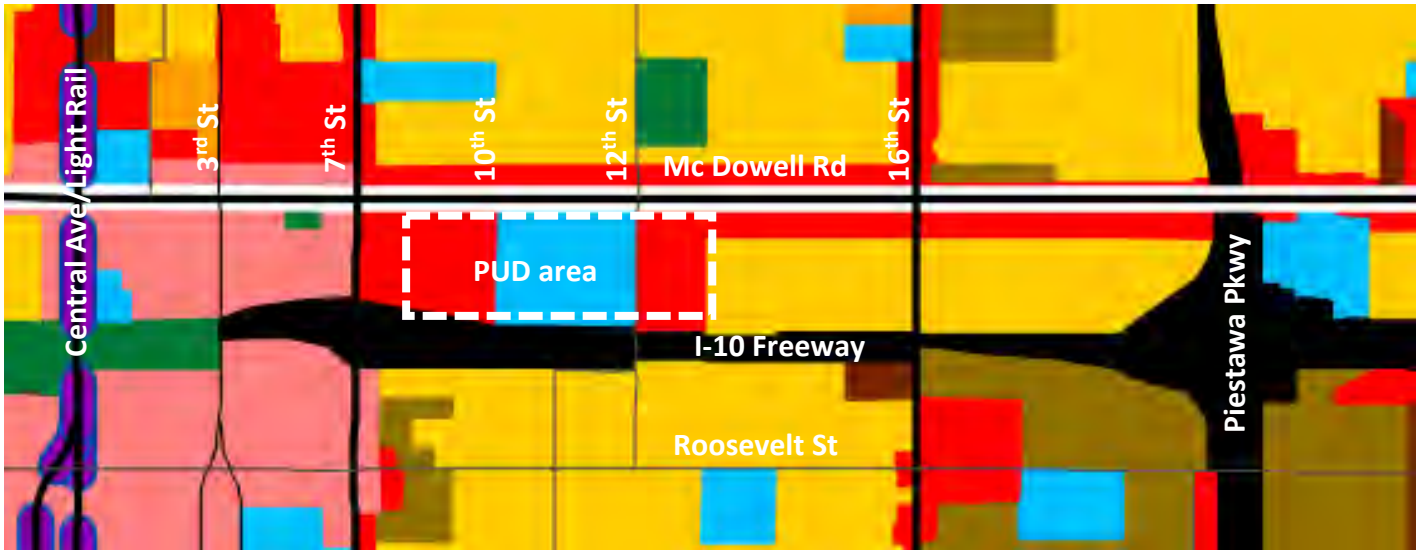
EXISTING ZONING PLAN

PLANNED UNIT DEVELOPMENT

LSB HKS

EXHIBIT 5

Phoenix General Plan 2015
Land Use Map



Commercial

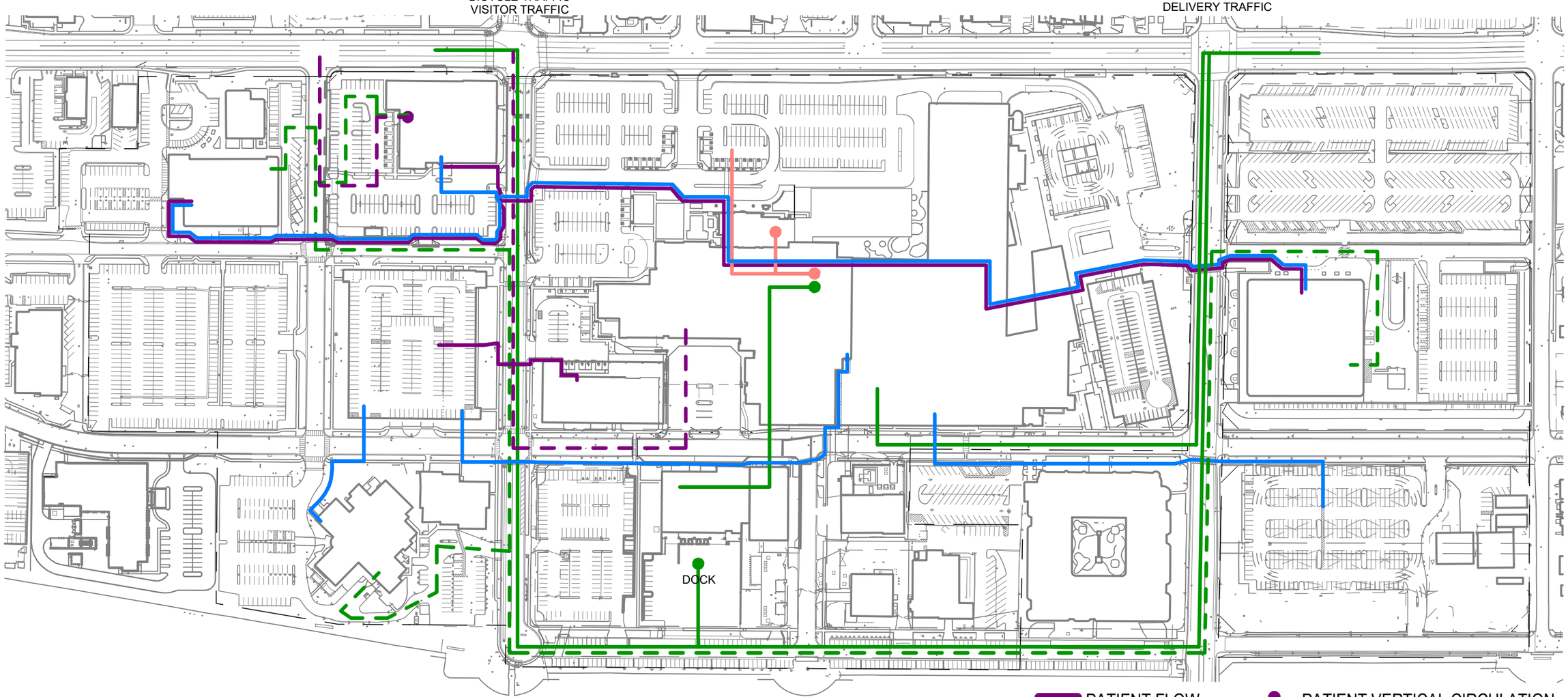
Public/Quasi-public

5 to 10 Dwelling units per acre

EXHIBIT 6

10th ST USAGE:
PATIENT AND STAFF VEHICLE TRAFFIC
AMBULANCE TRAFFIC
DELIVERY TRAFFIC
BICYCLE TRAFFIC
VISITOR TRAFFIC

12th ST USAGE:
COMMUNITY VEHICLE TRAFFIC
PATIENT AND STAFF VEHICLE
AMBULANCE TRAFFIC
DELIVERY TRAFFIC



PATIENT FLOW
AMBULANCE FLOW
VISITOR FLOW
STAFF FLOW
EQUIPMENT/SUPPLIES FLOW
DOCK TO OUTPATIENT BUILDINGS

PATIENT VERTICAL CIRCULATION
VISITOR VERTICAL CIRCULATION
EQUIPMENT VERTICAL CIRCULATION

Banner University Medical Center
Phoenix Campus

PLANNED UNIT DEVELOPMENT

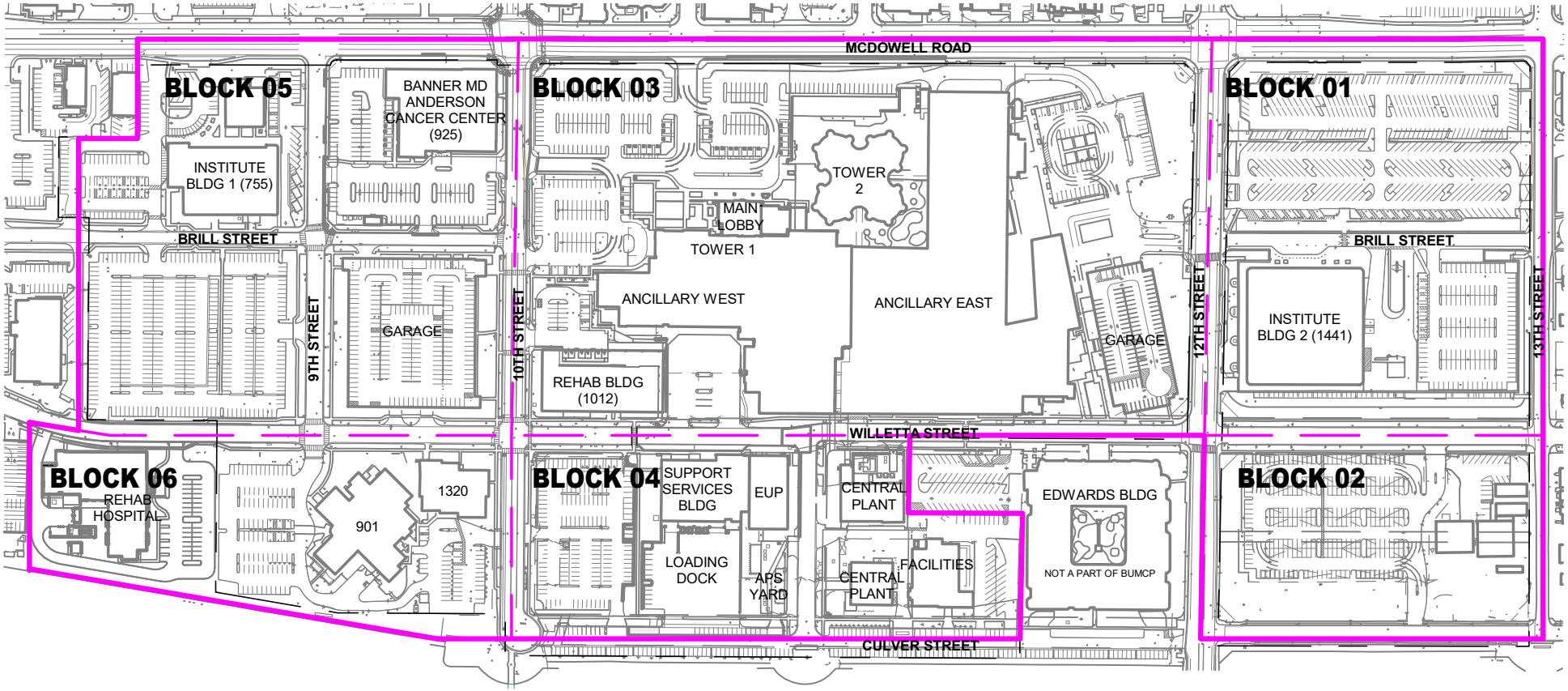
FLOWS OF MEDICINE - COMBINED

0 100 200 FT

A0.13

LSB HKS

EXHIBIT 7



Banner University Medical Center
Phoenix Campus

EXISTING/APPROVED SITE PLAN AS OF MAY 2019

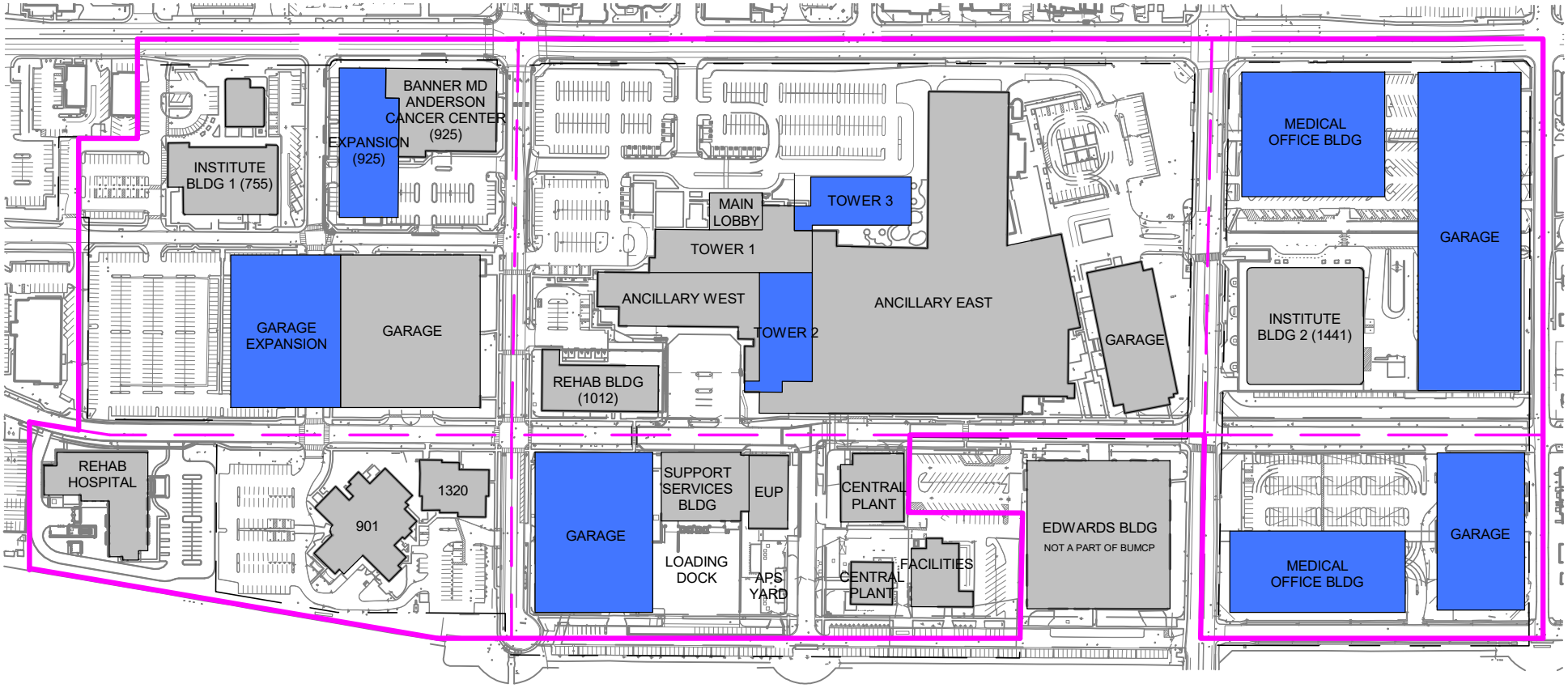
0 150 300 FT

A1.09

PLANNED UNIT DEVELOPMENT

LSB HKS

EXHIBIT 8



Banner University Medical Center
Phoenix Campus

PROPOSED LAND USE PLAN

0 150 300 FT

A0.20

PLANNED UNIT DEVELOPMENT

LSB HKS

EXHIBIT 9

CURRENT REQUIRED PARKING

	CAMPUS BUILDING	BEDS/EMPLOYEES/RESIDENT PHYSICIANS					AREA	PARKING REQUIREMENT RATIO	REQUIRED SPACES	REQUIRED ADA SPACES
LOT 1 BLOCKS 3-6	HOSPITAL - PATIENT BED TOWERS AND ANCILLARY BUILDING									
		BED COUNT	TOWER 1	TOWER 2	ANCILLARY	REHAB	Total			
		ICU		32			32			
		POST PARTUM		82			82			
		LDRP			12		12			
		MED SURG/TELE	168	220			388			
		PSYCH					0			
		REHAB				68	68			
		MOSU (Adult)	88				88			
		MOSU (Neonatal)			65		65			
		Total	256	334	77	68	735	1 SPACE/2 PATIENT BEDS	368	
		NUMBER OF EMPLOYEES = 3,926						1 SPACE / 3 EMPLOYEES	1309	
		NUMBER OF RESIDENT PHYSICIANS = 190						1 SPACE / PHYSICIAN	190	
	TOTAL FOR HOSPITAL								1867	29
	REHABILITATION BLDG	68 BEDS						1 SPACE / 2 PATIENT BED	34	
		(1ST FLOOR)					31,200 SF	1 SPACE / 200SF GFA	156	
	SUPPORT SERVICES	SUPPORT TO HOSPITAL INCLUDED IN ABOVE HOSPITAL EMPLOYEE CALC						1 SPACE / 3 EMPLOYEES		
	CENTRAL PLANT	10 EMPLOYEES						1 SPACE / 3 EMPLOYEES	4	1
	SHOPS	15 EMPLOYEES						1 SPACE / 3 EMPLOYEES	5	1
	TOTAL FOR MD ANDERSON CANCER CENTER								141	5
	755 BUILDING - 1 STORY	(MEDICAL BUILDING)					6,400 SF	1 SPACE / 200SF FA	32	2
	755 BUILDING - 4 STORY	(MEDICAL BUILDING)					90,550 SF	1 SPACE / 200SF FA	453	9
	ALZHEIMERS INSTITUTE 901 E WILLETTA ST.									
		(RESEARCH - 44 EMPLOYEES)					12,575 SF	1 SPACE / 3 STAFF	15	
		(GENERAL OFFICE)					37,630 SF	1 SPACE / 300SF FA	125	
	TOTAL FOR ALZHEIMERS INSTITUTE								140	5
	CONCUSSION CENTER 1320 N. 10TH ST.	(GENERAL OFFICE)					10,171 SF	1 SPACE / 300SF FA	34	2
	LEASED SPACE:									
	SELECT MEDICAL	35 BEDS, 15 EMPLOYEES, 2 RESIDENT PHYSICIANS							26	2
	BANNER PHYSICAL REHAB HOSPITAL	60 BEDS						1 SPACE/2 PATIENT BEDS	30	
		80 EMPLOYEES						1 SPACE / 3 EMPLOYEES	27	
		4 RESIDENT PHYSICIANS						1 SPACE / PHYSICIAN	4	
	TOTAL FOR BANNER PHYSICAL REHAB HOSPITAL								61	
	TOTAL LOT 1								**3154**	**56**

	CAMPUS BUILDING	BEDS/EMPLOYEES/RESIDENT PHYSICIANS	AREA	PARKING REQUIREMENT RATIO	REQUIRED SPACES	REQUIRED ADA SPACES
LOT 2 BLOCKS 1-2	CLINIC BUILDING 1441 E. MCDOWELL RD.					
		(MEDICAL BUILDING)	98,212 SF	1 SPACE / 200SF GFA	492	
		(OFFICE BUILDING)	44,263 SF	1 SPACE / 300SF FA	148	
	TOTAL FOR CLINIC BUILDING				640	13
	TOTAL LOT 2				**640**	**13**

CURRENT PROVIDED PARKING

	BLOCK	LOT	TYPE OF PARKING SPACE						
			Parking	Handicap	Reserved	Covered	Employee	Visitor	REMARKS
LOT 1 BLOCKS 3-6	03	OLD ED	42	2	0	42	40	0	Currently used for Security, Dialysis.....
	03	LOT B	45	7	45	0	0	0	Reserved by Valet
	03	LOT C	481	13	34	365	0	447	Paid Visitor Parking. Reserved Dr. and specialty spaces
	03	ED	61	5	2	0	0	61	2 reserved for PD parking
	03	REHAB	20	10	10	0	0	0	Reserved by Valet
	03	LOT K	175	23	0	0	0	152	Visitor parking at new west entrance
	04	LOT F	164	0	TBD	0	164	0	Some spaces currently being used by Contractors/ Construction
	04	LOT H	169	6		21	169		Now open with support services bldg
	04	10TH WILLETA	9	0	0	0	9	9	Street Parking
	05	LOT P	367	0	0	0	367	367	Used by employees and few visitors.
	05	EMPLOYEE GARAGE	506	0	0	367	506	0	950 Willetta St. Garage Employee Garage
	05	DR. GARAGE	431	15	6	366	0	0	950 Willetta St. Garage Dr / Management Parking
	05	VISITOR GARAGE	123	10	5	123	0	121	950 Willetta St. Garage Visitor Parking
	05	755 BACK	22	3	0	0	22	0	Employees of 755
	05	755 FRONT	85	14	5	0	0	66	Visitors of 755
	05	MD ANDERSON CC	126	6				120	Will be on line May of 2019
	06	LOT Q	40	5	35	0	0	35	Reserved for Concussion
	06	LOT N	109	6	32	0	60	60	32 Reserved for Alzheimer's Patients
	TOTAL		2975	125	174	1288	1337	1439	

	BLOCK	LOT						
			Parking	Handicap	Reserved	Covered	Employee	Visitor	REMARKS
LOT 2 BLOCKS 1-2	01	LOT A	385	14	0	0	0	385	Free Visitor Lot for hospital/1441 building
	01	LOT R	137	11	15	0	122	122	For visitors/ Employees + 15 for valet
	01	LOT S	391	7	42	391	349	0	For Employees mainly of 1441 & 40 spaces for Valet+ 2 spaces for golf carts + 6 motorcycle
	02	LOT D	231	3	8	181	231	0	Employee parking, Reserved D&C spaces
	02	WILLETA 12-13	55	0	0	0	55	55	Employee and Visitor Street parking.
	02	CULVER 12-13	72	0	0	0	72	0	Employee Street Parking
	TOTAL		1271	35	65	572	829	562	

	TOTAL PARKING SPACES...	**4236**	**160**	**239**	**1856**	**2166**	**2000**	

PARKING REQUIRED:
LOT 1: 3098 REGULAR SPACES 56 ADA SPACES 3154 TOTAL SPACES
LOT 2: 627 REGULAR SPACES 13 ADA SPACES 640 TOTAL SPACES

PARKING PROVIDED:
LOT 1: 2975 TOTAL SPACES
LOT 2: 1271 TOTAL SPACES

CURRENT LOT COVERAGE

LOT COVERAGE TABLE: LOT 1

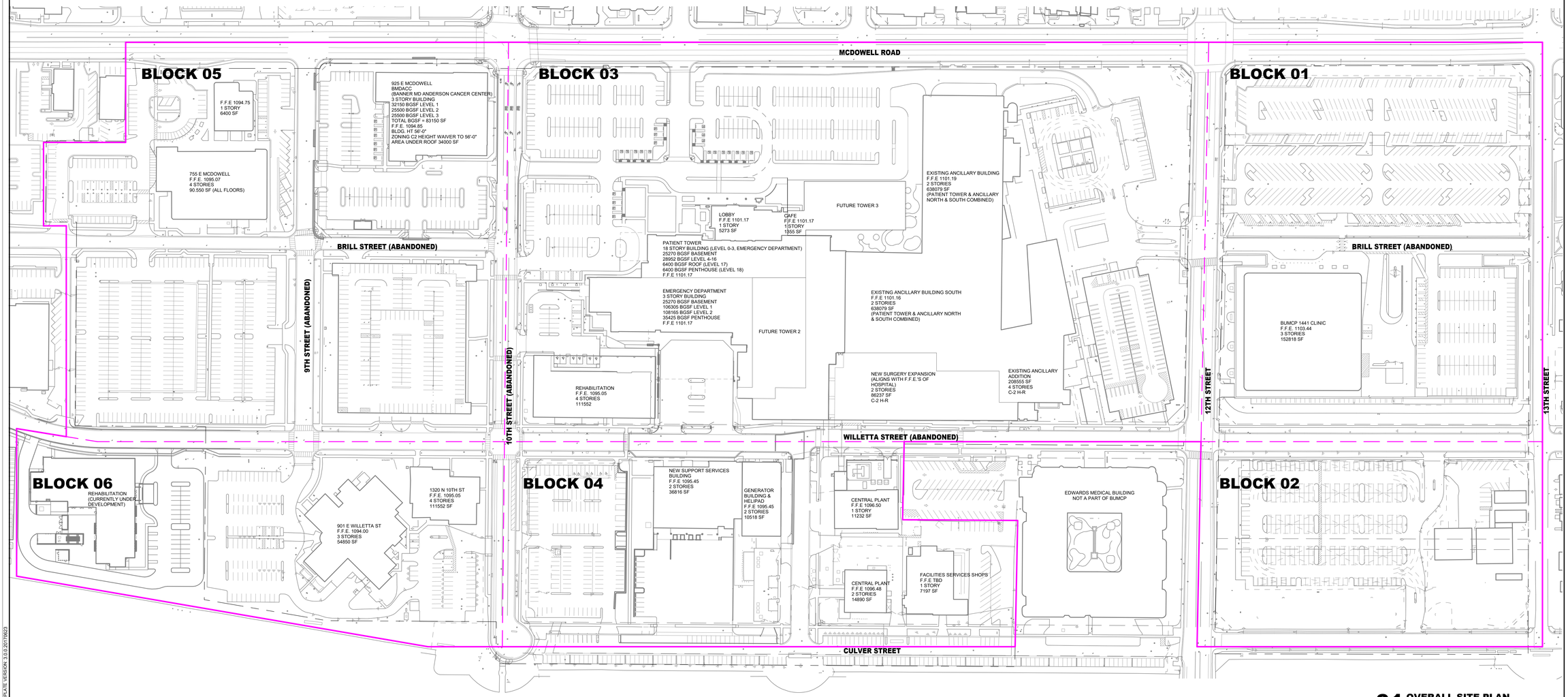
NAME	AREA UNDE...
755 BUILDINGS	41900 SF
MD ANDERSON CANDER CENTER	34000 SF
901 E WILLETTA ST	29000 SF
1320 N 10TH ST	14000 SF
REHABILITATION	27500 SF
EMERGENCY DEPT & PATIENT...	127000 SF
NEW WEST ENTRY & LOBBY	5273 SF
NEW CAFÉ	1355 SF
PATIENT BED TOWER & MAIN...	119178 SF
ANCILLARY BUILDING SURGERY EXP.	35000 SF
HOSPITAL ADDITION	43000 SF
SUPPORT SERVICES	22500 SF
GENERATOR BUILDING & HELIPAD	12000 SF
CENTRAL PLANT NORTH	11500 SF
CENTRAL PLANT SOUTH	7000 SF
FACILITY SHOPS	12500 SF
COVERED PARKIGN BLOCK 04	5000 SF
PARKING GARAGE BLOCK 05	72000 SF
PARKING GARAGE BLOCK 03	35000 SF
TOTAL LOT 1 AREA UNDER ROOF	654706 SF

LOT 1 SUMMARY
TOTAL LOT 1 AREA = 2106747 SF
TOTAL LOT 1 AREA UNDER ROOF =...
LOT 1 COVERAGE = 31.1%

LOT COVERAGE TABLE: LOT 2

NAME	AREA...
1441 CLINIC	56500 SF
COVERED PARKING BLOCK 02	38626 SF
TOTAL LOT 2 AREA UNDER ROOF	95126 SF

LOT 2 SUMMARY
TOTAL LOT 2 AREA = 666338 SF
TOTAL LOT 2 AREA UNDER ROOF =...
LOT 2 COVERAGE = 14.3%



01 OVERALL SITE PLAN
1" = 80'-0"

PLOT DATE: 8/1/2019 4:26:01 PM TEMPLATE VERSION: 3.0.0.20170623

HKS

OWNER
BANNER HEALTH
1441 NORTH 12TH STREET
PHOENIX, AZ 85006

ARCHITECT
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DIBBLE ENGINEERING
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LAND-USE ATTORNEY
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BANNER UNIVERSITY MEDICAL CENTER PHOENIX CAMPUS
PLANNED UNIT DEVELOPMENT

EXPIRES: 06/30/2022

KEY PLAN

REVISION

NO.	DESCRIPTION	DATE

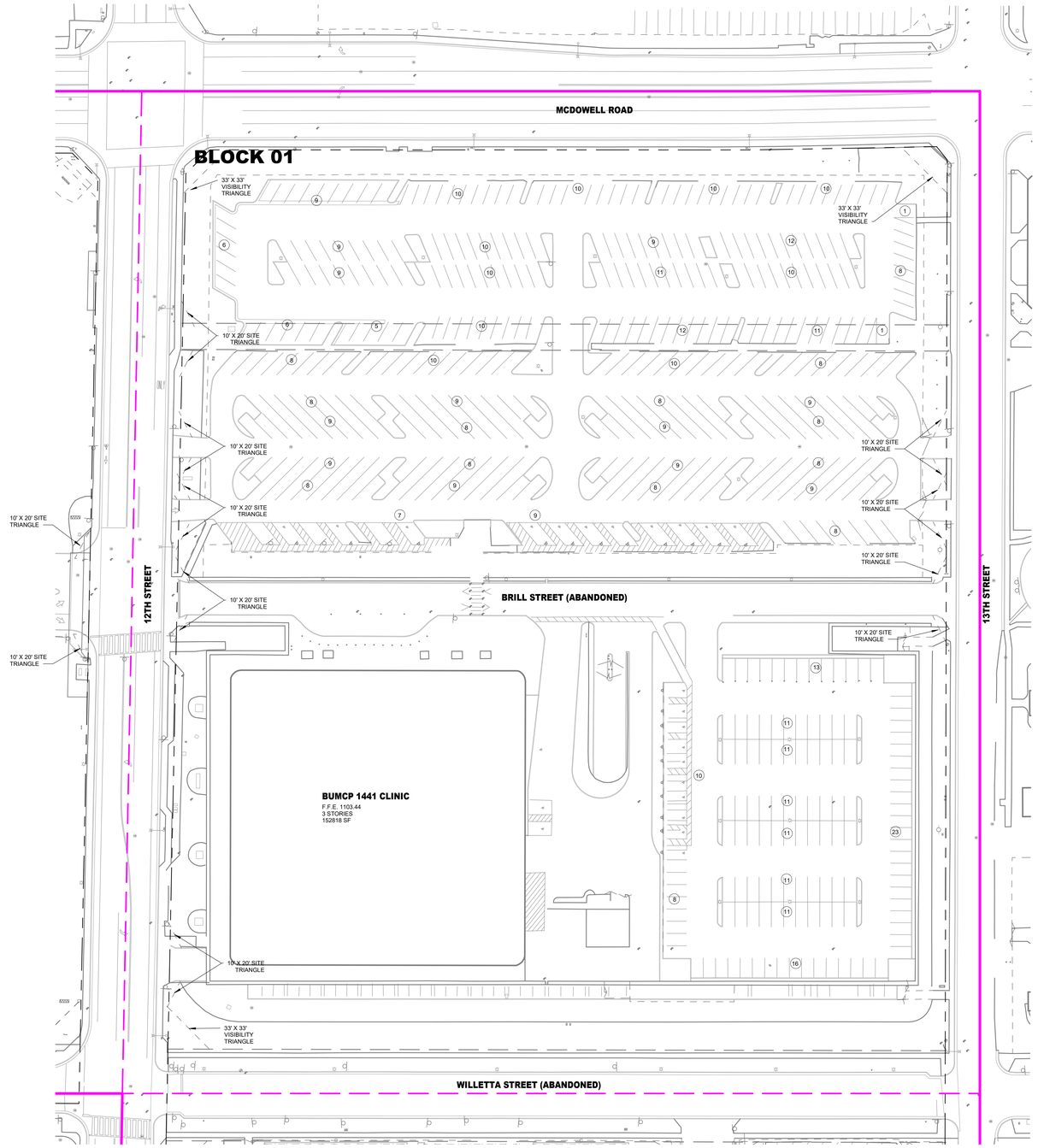
HKS PROJECT NUMBER
16626.319

DATE
06/14/2019

ISSUE

SHEET TITLE
OVERALL SITE PLAN

SHEET NO.
A1.00



01 **SITE PLAN - BLOCK 01**
1" = 40'-0"

HKS

OWNER

BANNER HEALTH
1441 NORTH 12TH STREET
PHOENIX, AZ 85006

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BANNER UNIVERSITY MEDICAL CENTER

PHOENIX CAMPUS

PLANNED UNIT DEVELOPMENT

Registered Architect
CERTIFICATE NO.
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JOHN J.
NIZIOLEK
Date Signed 6-3-19
ARIZONA, U.S.A.

EXPIRES: 06/30/2022

KEY PLAN

REVISION

NO.	DESCRIPTION	DATE

HKS PROJECT NUMBER
16626.319

DATE
06/14/2019

ISSUE

SHEET TITLE
BLOCK 01

SHEET NO.
A1.01

PLOT DATE:
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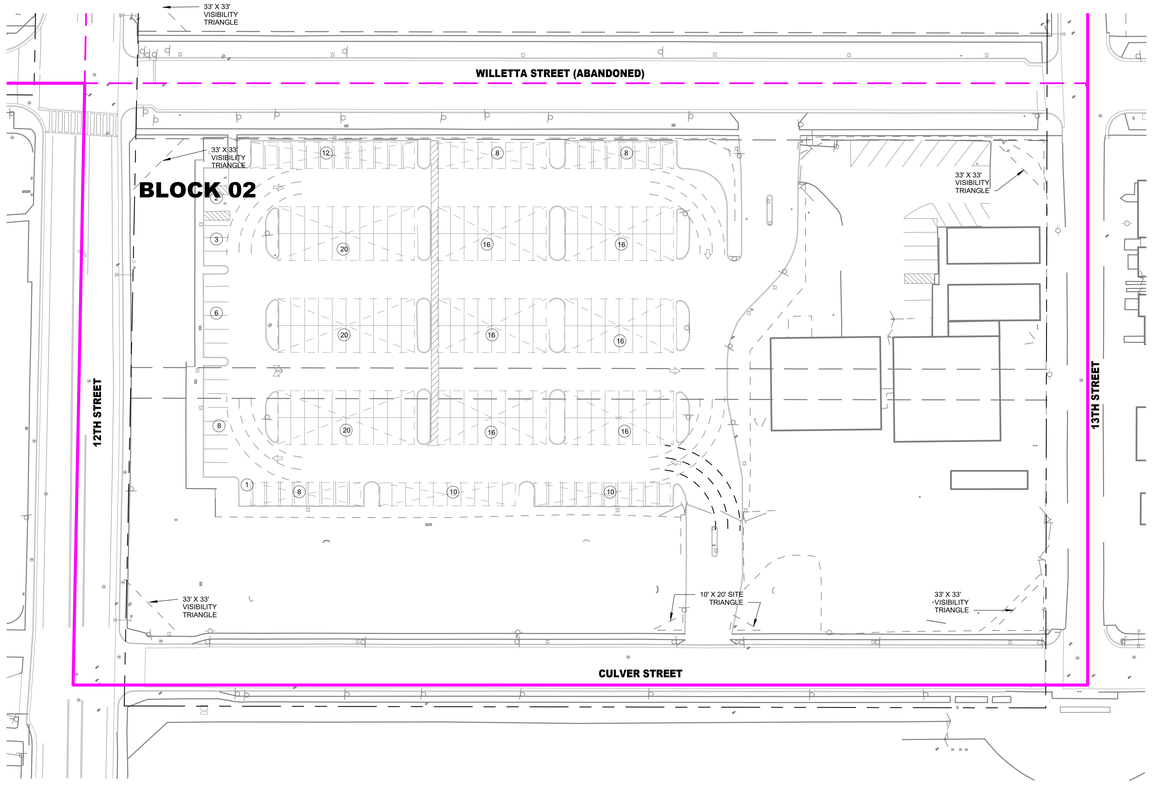

01 **SITE PLAN - BLOCK 02**
1" = 40'-0"

PLOT DATE:
6/7/2019 4:20:03 PM TEMPLATE VERSION: 3.0.0.20170623

HKS

OWNER

BANNER HEALTH
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BANNER UNIVERSITY MEDICAL CENTER
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Registered Architect
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Date Signed 6-30-19
ARIZONA, U.S.A.

EXPIRES: 06/30/2022

KEY PLAN

REVISION
NO. DESCRIPTION DATE

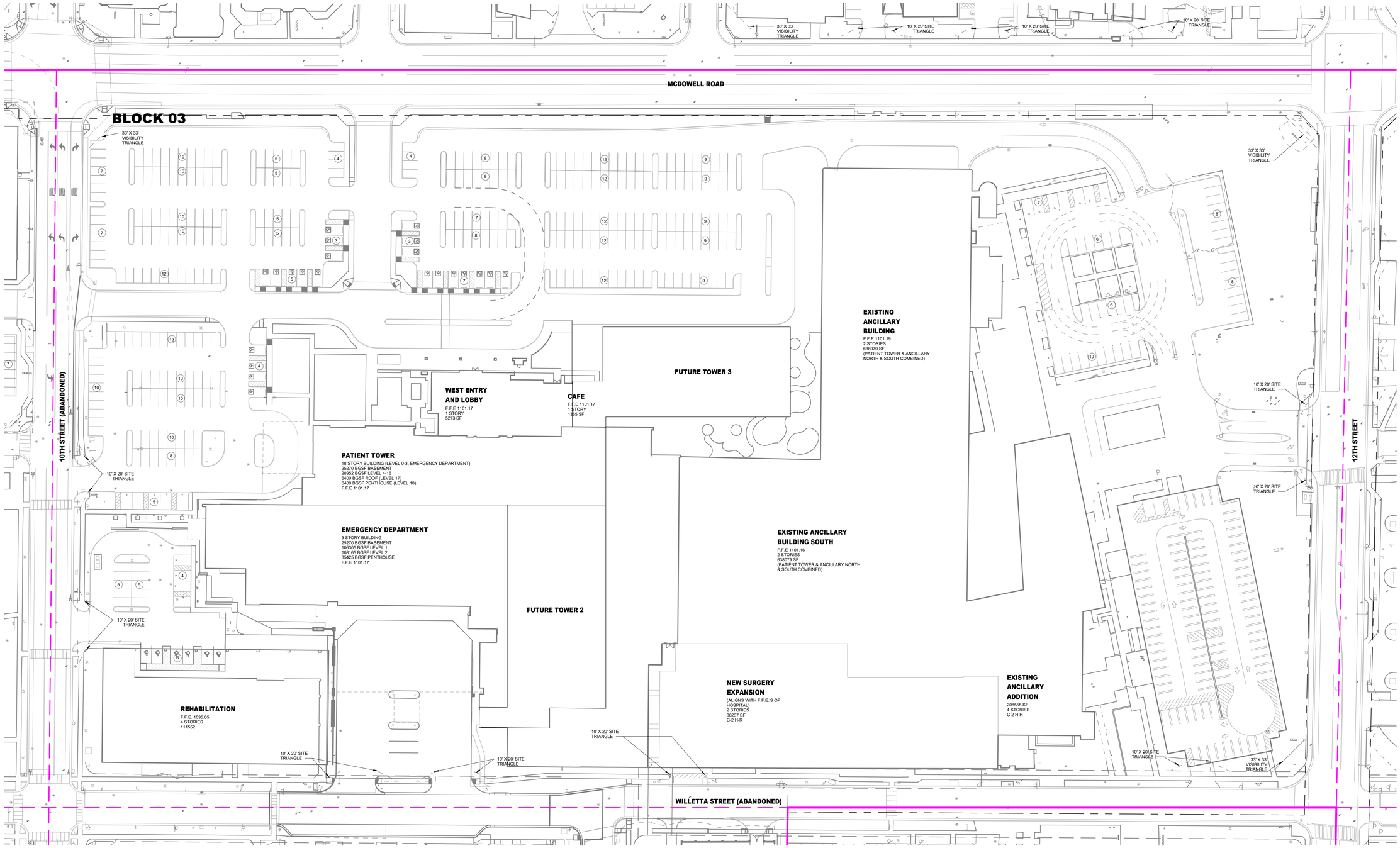
HKS PROJECT NUMBER
16626.319

DATE
06/14/2019

ISSUE

SHEET TITLE
BLOCK 02

SHEET NO.
A1.02



01 SITE PLAN - BLOCK 03
1" = 40'-0"

HKS

OWNER
BANNER HEALTH
1441 NORTH 12TH STREET
PHOENIX, AZ 85006

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PHOENIX CAMPUS
PLANNED UNIT DEVELOPMENT

Registered Architect
CERTIFICATE NO.
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STATE OF ARIZONA, U.S.A.
EXPIRES: 06/30/2022

KEY PLAN

REVISION
NO. DESCRIPTION DATE

HKS PROJECT NUMBER
16626.319
DATE
06/14/2019
ISSUE

SHEET TITLE
BLOCK 03

SHEET NO.
A1.03

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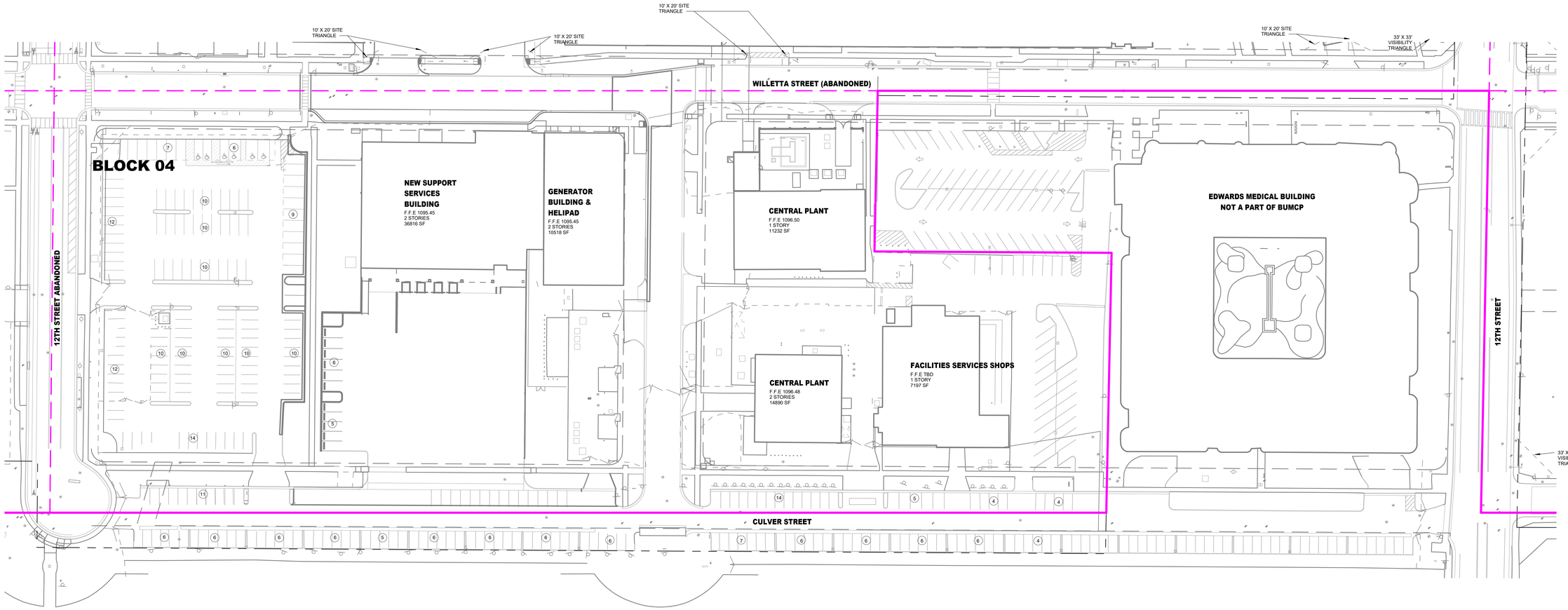

01 **SITE PLAN - BLOCK 04**
1" = 40'-0"

HKS

OWNER

BANNER HEALTH
1441 NORTH 12TH STREET
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BANNER UNIVERSITY MEDICAL CENTER

PHOENIX CAMPUS

PLANNED UNIT DEVELOPMENT

Registered Architect
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ARIZONA, U.S.A.

EXPIRES: 06/30/2022

KEY PLAN

REVISION

NO.	DESCRIPTION	DATE

HKS PROJECT NUMBER
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DATE
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ISSUE

SHEET TITLE
BLOCK 04

SHEET NO.
A1.04

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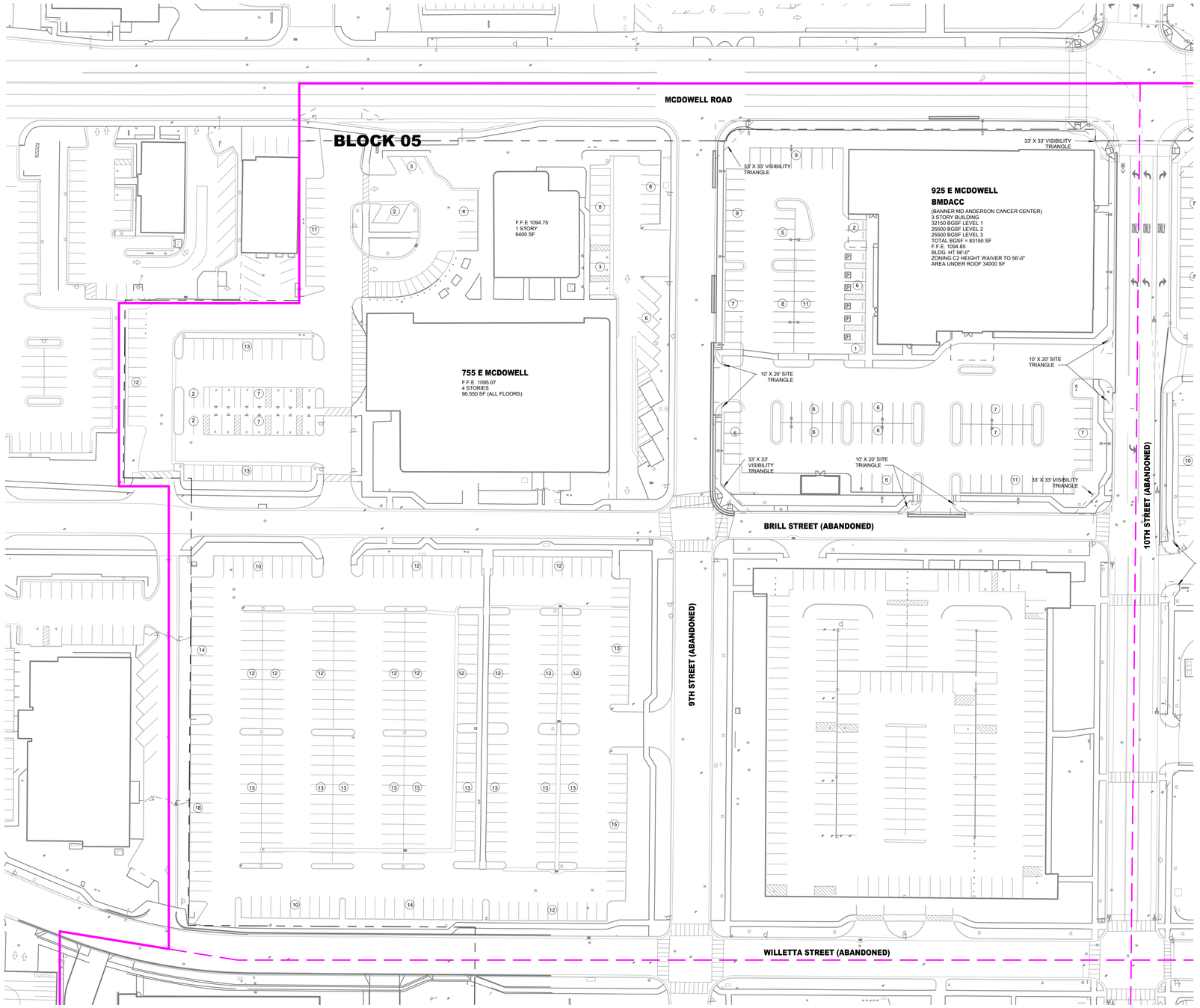

14

01 **SITE PLAN - BLOCK 05**
1" = 40'-0"

PLOT DATE:
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HKS

OWNER

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BANNER UNIVERSITY MEDICAL CENTER

PHOENIX CAMPUS

PLANNED UNIT DEVELOPMENT

Registered Architect
CERTIFICATE NO.
32504
JOHN J.
NIZIOLEK
Date signed 8-1-19
ARIZONA, U.S.A.
EXPIRES: 06/30/2022

KEY PLAN

5

REVISION

NO.	DESCRIPTION	DATE

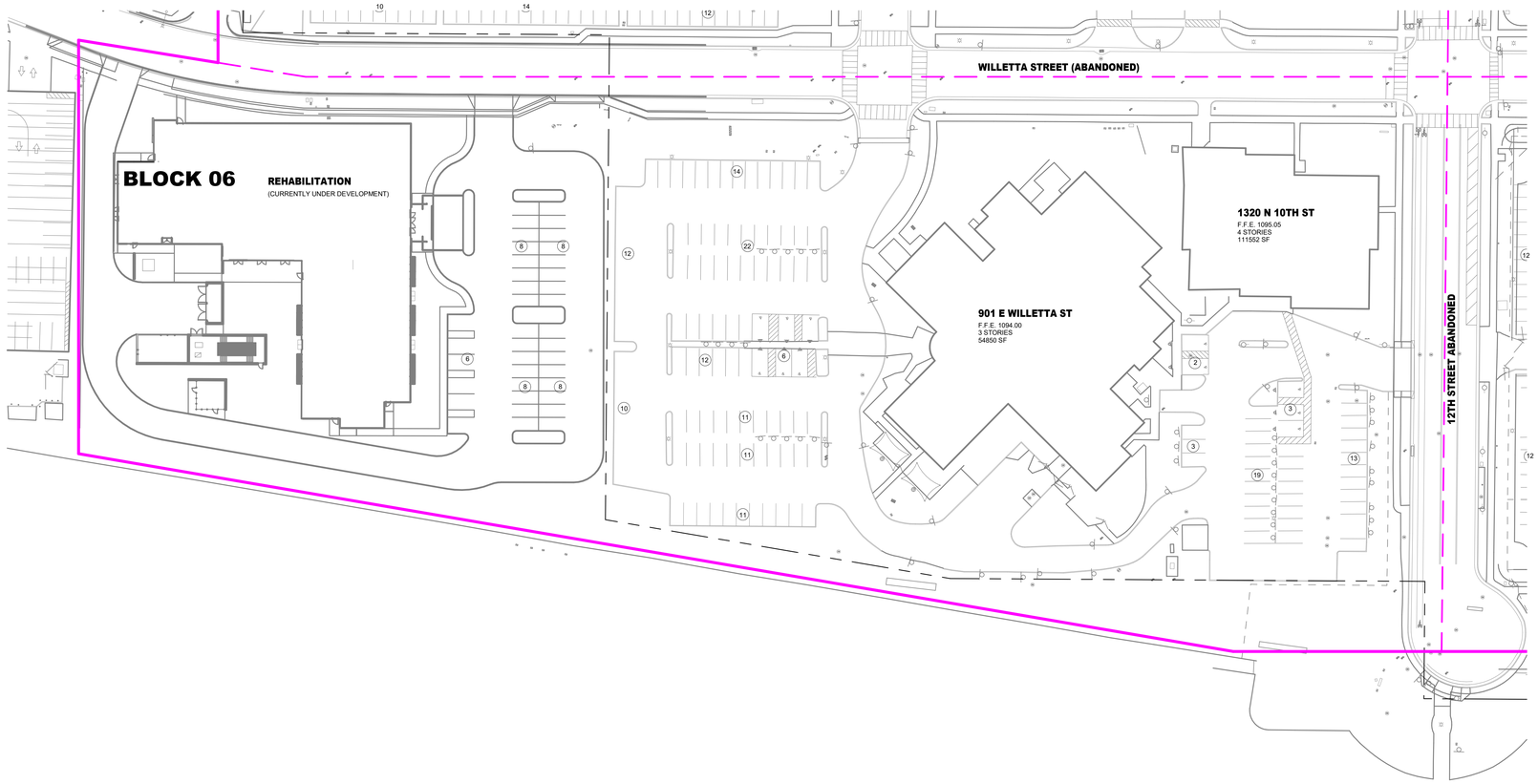
HKS PROJECT NUMBER
16626.319

DATE
06/14/2019

ISSUE

SHEET TITLE
BLOCK 05

SHEET NO.
A1.05



01 **SITE PLAN - BLOCK 06**
1" = 40'-0"

HKS

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PHOENIX, AZ 85006

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BANNER UNIVERSITY MEDICAL CENTER

PHOENIX CAMPUS

PLANNED UNIT DEVELOPMENT

Registered Architect
CERTIFICATE NO.
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Date Signed 6/6/19
ARIZONA, U.S.A.

EXPIRES: 06/30/2022

KEY PLAN

REVISION

NO.	DESCRIPTION	DATE

HKS PROJECT NUMBER
16626.319

DATE
06/14/2019

ISSUE

SHEET TITLE
BLOCK 06

SHEET NO.
A1.06

PLOT DATE:
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TEMPLATE VERSION: 3.0.0.20170623

EXHIBIT 10

Banner Health
Branded Architecture

1. BANNER BLOCK used in PLANES bypassing masses
2. WATERFALL used for WAYFINDING
3. METALS used in INFILL/STAIR ENCLOSURE/CANOPY
4. PUNCHED/RIBBON OPENINGS used in a RIGID pattern in Banner Block and in a pattern with MOVEMENT in EIFS.
5. Large GLAZED SURFACES used in PUBLIC areas.

Banner MD Anderson
Branded Architecture

1. BANNER BLOCK used in PLANES bypassing masses. **Light and Dark Block allowed to STACK**
2. WATERFALL used for **ARTICULATION**
3. **ZINC** METAL used in CANOPY and **PLANES announcing ENTRY**
4. PUNCHED/RIBBON OPENINGS used in a **pattern with MOVEMENT in both Banner Block and EIFS.**
5. Large GLAZED SURFACES used in PUBLIC areas.
6. **LANTERN used as WAYFINDING**

Banner University Medical Center
Phoenix Campus

COLOR AND MATERIAL ARCHITECTURAL LANGUAGE

LSB HKS

EXHIBIT 11

DESIGN GUIDELINES

The following design language and guidelines were developed by the Banner UMC Phoenix + Tucson teams and are intended to inform Banner Health projects comprised of vertical patient towers stacked on top of D&T or otherwise base podium structures at infill and/or urban sites.

BANNER DESIGN LANGUAGE

Exterior design materials are driven by precedents at Banner Gateway Hospital and Banner Ironwood Hospital. These elements include:

- 'Banner Block' masonry use, patterning and color variation
- Glazed 'waterfall wall' feature and details
- Metal use, colors and locations
- EIFS use, color values and locations
- Punched Openings arrangement and location
- Use of larger glazed surfaces
- Tower Articulation

DESIGN GUIDELINES

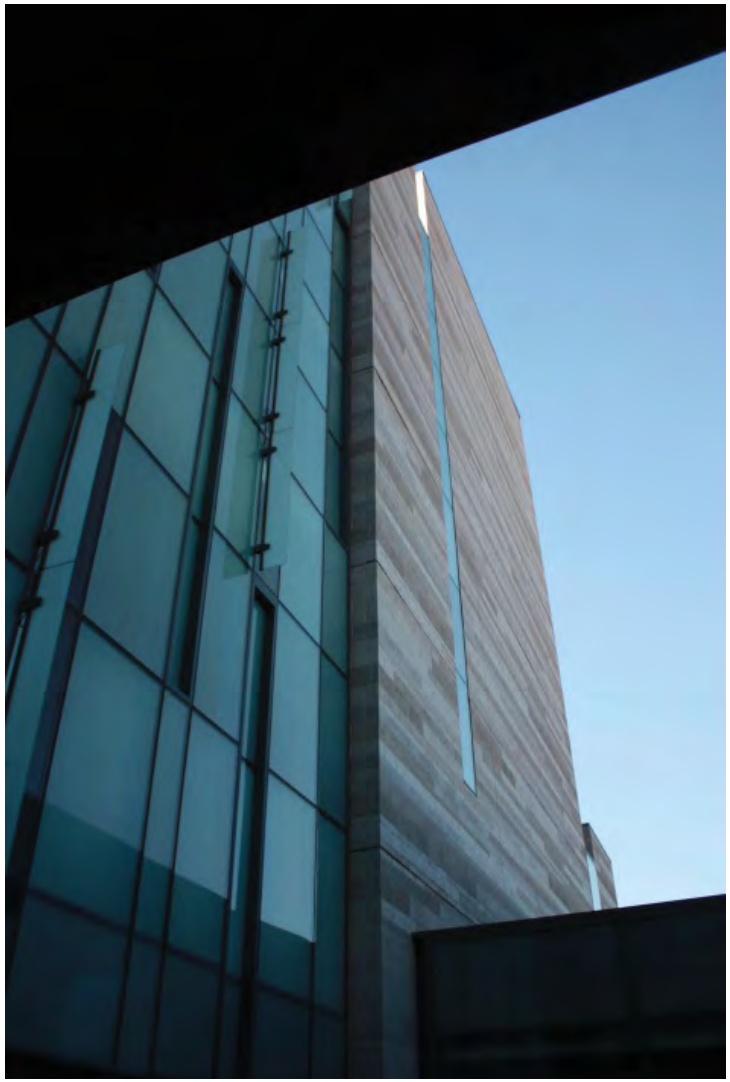
BANNER BLOCK

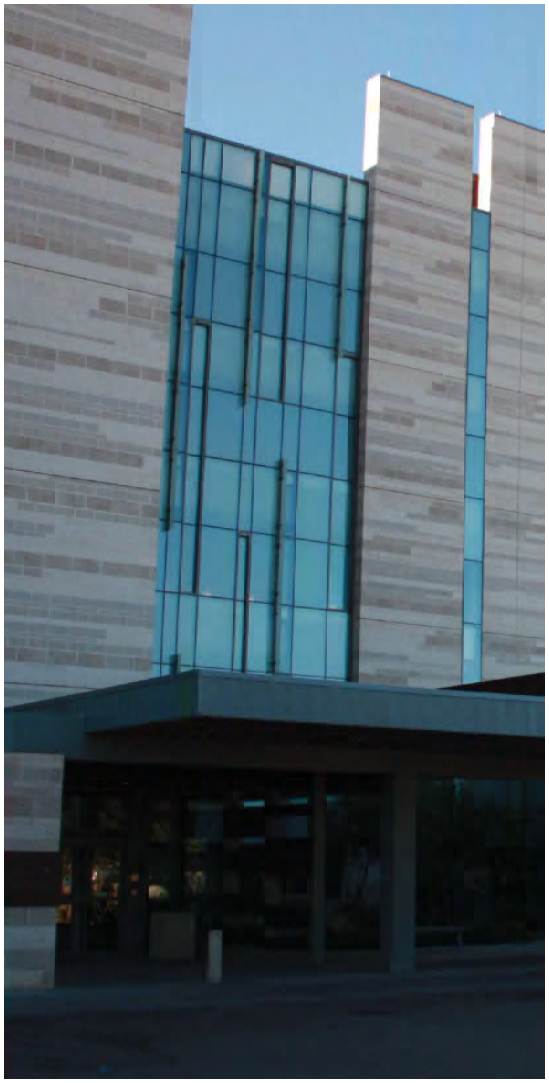
- Large planes
- Color variation- light and dark – the same mix with variation in hue
- Texture and size variation - for example, including blasted face and ground face, 4” and 8” heights, in varied running bond pattern
- Planes typically extend past volumes beyond
- Planes can be free-standing and used in the landscape/garden areas
- Openings may be carved out of the planes
- Planes can break apart
- Planes do not turn corners

When considering the use of Banner Block as an identity piece for structures taller than 6 stories, alternate materials and methods for achieving the same look and quality are to be explored for constructability reasons. Prefabricated, modular systems should be explored to ease constructability.

Signature Banner signage is typically included on the Banner Block planes for visibility from a distance.

Colors of Banner Block will be selected for each campus, as informed by the contextual colors and landscape.



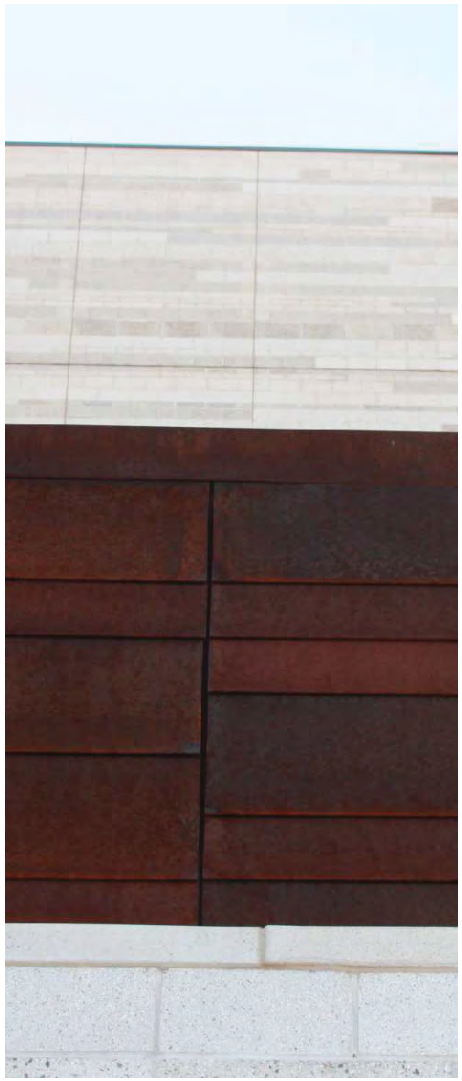


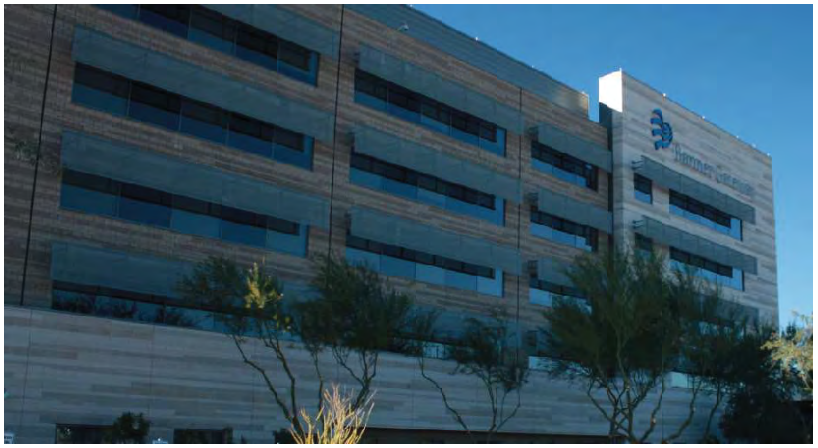
DESIGN GUIDELINES

THE WATERFALL

- Translucent, spandrel and clear glass
- Glass fins may be used
- Structural silicone glazing
- Varied widths and heights of mullion spacing

Originally conceived as a 'waterfall' and wayfinding element located at canyon spaces, the waterfall feature defines public circulation and is an identity element in the Banner facilities. The feature should be located at public circulation, to optimize visibility from the exterior and to optimize interior views to the exterior. This vertical element is the primary defining vertical element of the entrance façade. The element may touch the ground and serve as a backdrop for an exterior landscaped area.





DESIGN GUIDELINES

METALS

Metals are used at infill and vertical transition areas, at horizontal canopy and shading elements, and to highlight special public uses.

Brown hue metal is used in the following manner:

- Bent planar elements at entrances, canopies and pavilion locations
- Vertical at infill and transition between different materials
- Miscellaneous metal elements in landscaped courtyards

Zinc hue metal is used in the following manner:

- Fascia elements at canopies
- Vertical at infill and transition areas, at louvers and miscellaneous metal trims.
- Mass elements or planar elements.

DESIGN GUIDELINES

PUNCHED OPENINGS

- Openings in Block walls are aligned and orderly and may be elongated either horizontally or vertically.
- Openings in EIFS or Metal are not regular, but instead consist of a randomized repeatable pattern to break up large facades.
- Glazing units within the punched openings may be grouped with an accent material that may include a different color EIFS, metal or composite material panel.
- Openings at the ends of corridors or at staff break areas should be provided whenever possible.
- Appropriate, bird proof exterior shading elements and glazing treatments are encouraged to minimize solar heat gain and glare.

DESIGN GUIDELINES

LARGE GLAZED SURFACES

Large areas of glazing are used at public connections and corridors and public uses, such as waiting areas, dining, and lobby areas. Public areas, whenever feasible, are to be connected visually and physically to landscaped exterior areas, where appropriate. Appropriate, bird proof exterior shading elements and glazing treatments are encouraged to minimize solar heat gain and glare.

DESIGN GUIDELINES

SITE CONTEXTUAL INTEGRATION

Within the context of medical planning drivers, the siting of the building should be located for maximum solar orientation benefits, to take advantage of views and to connect to the existing site and/or building as necessary.

Specific color values should be derived from the surrounding contexts to integrate harmoniously with existing buildings and/or the natural landscape. Additional materials may be used to accommodate this and mitigate specific context issues.

INPATIENT TOWER ARTICULATION

The siting of the tower will be dependent upon contextual constraints and medical planning needs, but will be driven by the Banner patient floor templates. As much as possible, the tower should be entered through a more human scaled structure with emphasis placed on the landscape design.

The majority of the materials used at the tower should be efficient and cost effective, while vertical elements and transitions may be expressed with signature Banner materials:

- The waterfall feature at the public vertical circulation core is expressed on the exterior elevation. The vertical circulation configuration should inform the expression of the exterior waterfall feature at the tower.
- EIFS may be used at infill, transition and large planes. It should be used at areas identified for expansion.
- Zinc-colored metal may be used at vertical elements and infill.
- Banner block (or alternative material) is used at defining elevations in planar ways as described above.
- Punched openings for patient rooms shall comply with the pattering described above.

EXHIBIT 12

McDOWELL STREET PLANTING- UPDATED PER CITY OF PHOENIX COMMENTS

EAST BRILL STREET / WEST CAMPUS END PLANTING

12TH STREET PLANTING

PLANT LEGEND

BRILL STREET PLANTING

TREES	SPECIES	QTY/SIZE
	PROSOPIS CHILENSIS CHILEAN MESQUITE	8 / 2" CAL. 6 / 1" CAL.

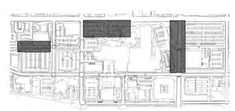
12 STREET PLANTING

TREES	SPECIES	QTY/SIZE
	PROSOPIS CHILENSIS CHILEAN MESQUITE	4 / 4" CAL. 4 / 3" CAL. 9 / 2" CAL.

EXISTING TREES

NEW TREES

C.O.P. SHADE TREE PLANTING PLAN SCALE 1" = 40'



KEY MAP

SITE DESIGN
6939 E. Chaparral Road
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Phone 480-219-4559
mail@sitedesignla.com

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PHOENIX, AZ 85006

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HKS INC.
821 NORTH CENTRAL AVENUE
PHOENIX, AZ 85004-2004
602.462.0966

CIVIL ENGINEER
DIBBLE ENGINEERING
7500 NORTH DREAMY DRAW DRIVE, #200
PHOENIX, AZ 85020
602.957.1155

LANDSCAPE ARCHITECT
SITE DESIGN, LLC
6939 EAST CHAPARRAL ROAD
PARADISE VALLEY, AZ 85253-7000
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LAND-USE ATTORNEY
LAZARUS, SILVYN, & BANGS, P.C.
420 WEST ROOSEVELT STREET
PHOENIX, AZ 85003
602.340.0900

BANNER UNIVERSITY MEDICAL CENTER
PHOENIX CAMPUS
PLANNED UNIT DEVELOPMENT

REGISTERED LANDSCAPE ARCHITECT
32932
DREW AGUILINA
CERTIFICATE NO.
EXPIRES 9/30/2019

KEY PLAN

REVISION

HKS PROJECT NUMBER
16626.319
DATE
08/03/18
ISSUE

SHEET TITLE
SHADE TREE PLANTING PLAN

SHEET NO.
L01.1

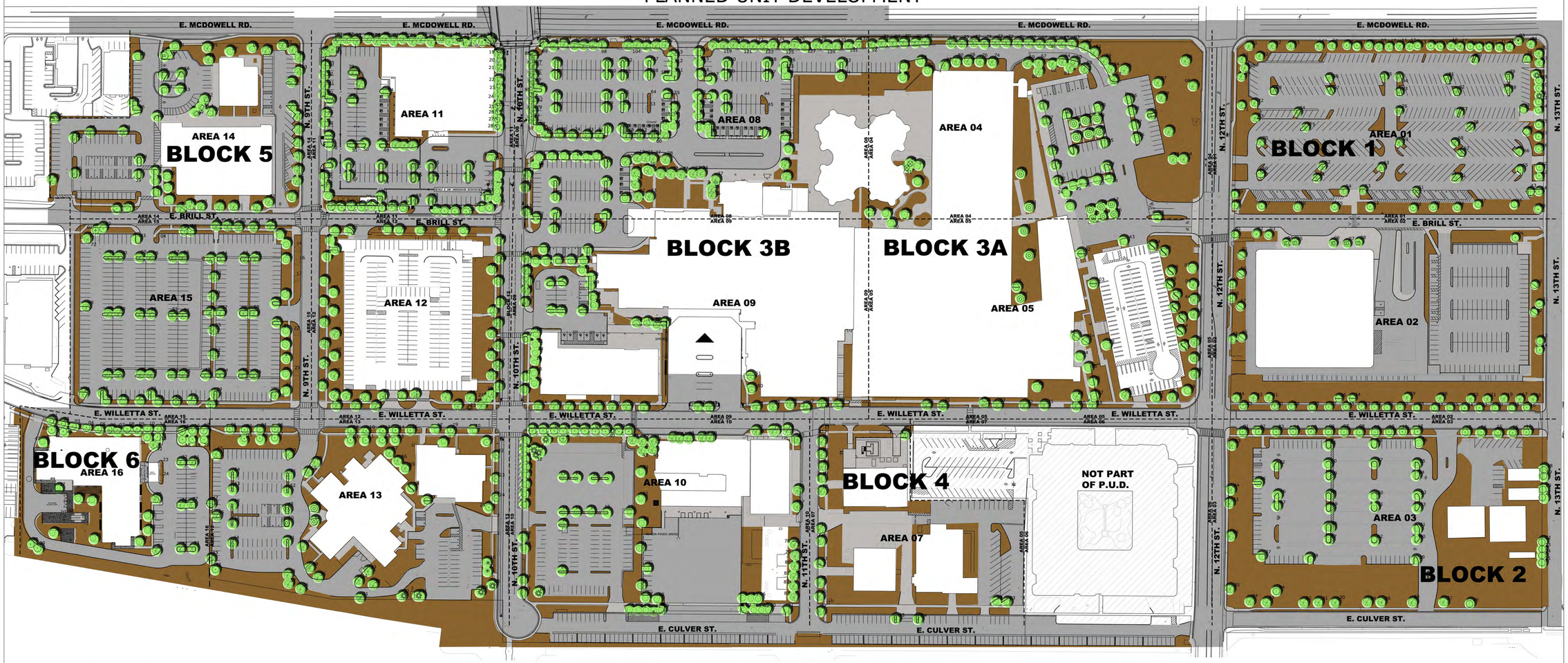
PLOT DATE
7/10/2018 3:16:00 PM
TEMPLATE VERSION 3.0.20170623

EXHIBIT 13

BANNER UNIVERSITY MEDICAL CENTER

PHOENIX CAMPUS

PLANNED UNIT DEVELOPMENT



INVENTORY LEGEND

TREES

SPECIES
ACACIA ANEURA MULGA
ACACIA SALICINA WILLOW ACACIA
BRACHYCHITON POPULNEUS BOTTLE TREE
CAESALPINIA GILLIESII YELLOW BIRD OF PARADISE
CERCIDIUM FLORIDUM DM PALO VERDE DESERT MUSEUM
CERCIDIUM PRAECOX PALO BREA
CHAMAEROPS HUMILIS MEDITERRANEAN FAN PALM
CHILIOPSIS LINEARIS DESERT WILLOW
DALBERGIA SISSOO SISSOO
EUCALYPTUS MICROTHECA EUCALYPTUS
FOUQUIERIA SPLENDENS OCOTILLO
GLEDITSIA TRIACANTHOS HONEY LOCUST
LYSILOMA WATSONII DESERT FERN
OLNEYA TESOTA IRONWOOD
PROSOPIS CHILENSIS CHILEAN MESQUITE
SCHINUS MOLLE PEPPER
TIPUANA TIPU TIPU TREE
ULMUS PARVIFLORA CHINESE ELM
WASHINGTON ROBUSTA MEXICAN FAN PALM

BANNER CAMPUS TREE INVENTORY PLAN SCALE 1"= 80'


ACACIA SALICINIA


ACACIA ANEURA


BRACHYCHITON POPULINEUS


CAESALPINIA GILLIESII


CERCIDIUM FLORIDUM DM


CECIDIUM PRAECOX


CHAMAEROPS HUMILIS


CHILIOPSIS LINEARIS


DALBERGIA SISSOO


EUCALYPTUS MICROTHECA


FOUQUIERIA SPLENDENS


GLEDITSIA TRIACANTHOS


LYSILOMA WATSONII


OLNEYA TESOTA

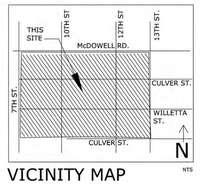

PROSOPIS CHILENSIS


SCHINUS MOLLE


TIPUANA TIPU


ULMUS PARVIFLORA


WASHINGTON ROBUSTA



VICINITY MAP

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BANNER UNIVERSITY MEDICAL CENTER
PHOENIX CAMPUS
PLANNED UNIT DEVELOPMENT

REGISTERED LANDSCAPE ARCHITECT
CERTIFICATE NO.
32932
DREW AQUILINA
STATE OF ARIZONA
EXPIRES 9/30/2019

KEY PLAN

REVISION

HKS PROJECT NUMBER
16626.319

DATE
08/03/18

ISSUE

SHEET TITLE
COVER SHEET

SHEET NO.
L01.8
1 OF 8

AREA 1 INVENTORY LEGEND

TREE NUMBER	SPECIES	CALIPER / HEIGHT x WIDTH
01	PROSOPIS CHILENSIS	8" / 18' x 18'
02	PROSOPIS CHILENSIS	4" / 8' x 12'
03	PROSOPIS CHILENSIS	5" / 16' x 12'
04	PROSOPIS CHILENSIS	4" / 12' x 12'
05	PROSOPIS CHILENSIS	4" / 16' x 12'
07	CERCIDIUM PRAECOX	6" / 12' x 12'
08	CERCIDIUM PRAECOX	3" / 14' x 12'
09	PROSOPIS CHILENSIS	3" / 12' x 12'
10	PROSOPIS CHILENSIS	3" / 14' x 12'
11	PROSOPIS CHILENSIS	3" / 12' x 12'
12	PROSOPIS CHILENSIS	4" / 14' x 14'
13	CERCIDIUM PRAECOX	3" / 8' x 6'
14	CERCIDIUM PRAECOX	5" / 16' x 16'
15	CERCIDIUM PRAECOX	3" / 8' x 6'
16	PROSOPIS CHILENSIS	4" / 14' x 12'
17	PROSOPIS CHILENSIS	4" / 14' x 12'
18	CERCIDIUM PRAECOX	3" / 8' x 6'
19	CERCIDIUM PRAECOX	4" / 16' x 14'
20	CERCIDIUM PRAECOX	2" / 6' x 6'
21	PROSOPIS CHILENSIS	3" / 14' x 12'
22	PROSOPIS CHILENSIS	4" / 14' x 8'
23	ULMUS PARVIFLORA	18" / 40' X 50'
24	PROSOPIS CHILENSIS	3" / 14' x 12'
25	PROSOPIS CHILENSIS	4" / 14' x 8'
26	PROSOPIS CHILENSIS	4" / 16' x 14'
27	PROSOPIS CHILENSIS	3" / 14' x 12'
28	WASHINGTON ROBUSTA	50' H
29	CERCIDIUM PRAECOX	3" / 12' x 8'
30	CERCIDIUM PRAECOX	3" / 12' x 8'
31	WASHINGTON ROBUSTA	40' H
32	CERCIDIUM PRAECOX	3" / 8' x 8'
33	LYSILOMA WATSONIIML	3" / 16' X 20'
34	CERCIDIUM PRAECOX	3" / 8' x 8'
35	CERCIDIUM PRAECOX	3" / 12' x 8'
36	LYSILOMA WATSONII	3" / 16' X 20'
37	CERCIDIUM PRAECOX	3" / 12' x 8'
38	CERCIDIUM PRAECOX	3" / 12' x 10'
39	NOT USED n/a	
40	CERCIDIUM PRAECOX	3" / 12' x 10'
41	NOT USED n/a	
42	CERCIDIUM PRAECOX	3" / 10' x 10'
43	EUCALYPTUS MICROTHECA	18' / 30' X 20'
44	CERCIDIUM PRAECOX	3" / 12' x 12'
45	GLEDITSIA TRIACANTHOS	12" / 20' x 20'
46	LYSILOMA WATSONII	2" / 14' X 14'
47	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
48	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
49	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
50	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
51	PROSOPIS CHILENSIS	12" / 24' x 30'
52	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
53	PROSOPIS CHILENSIS	18" / 30' x 55'
54	PROSOPIS CHILENSIS	6" / 16' x 16'
55	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
56	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
57	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
58	GLEDITSIA TRIACANTHOS ML	3" / 16' x 12'
59	GLEDITSIA TRIACANTHOS	12" / 25' x 20'
60	EUCALYPTUS MICROTHECA	20' / 35' X 20'
61	PROSOPIS CHILENSIS	10" / 24' x 20'
62	PROSOPIS CHILENSIS	8" / 18' x 16'
63	PROSOPIS CHILENSIS	18" / 30' x 55'
64	PROSOPIS CHILENSIS	12" / 24' x 30'
65	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
66	PROSOPIS CHILENSIS	12" / 24' x 24'
67	PROSOPIS CHILENSIS	10" / 22' x 22'
68	PROSOPIS CHILENSIS ML	6" / 18' x 16'
69	PROSOPIS CHILENSIS	10" / 20' x 20'
70	PROSOPIS CHILENSIS	12" / 24' x 30'
71	PROSOPIS CHILENSIS	6" / 16' x 16'
72	PROSOPIS CHILENSIS	4" / 8' x 8'
73	PROSOPIS CHILENSIS	4" / 14' x 12'
74	PROSOPIS CHILENSIS	3" / 8' x 8'
75	PROSOPIS CHILENSIS	10" / 22' x 24'
76	PROSOPIS CHILENSIS	6" / 14' x 10'
77	PROSOPIS CHILENSIS	10" / 20' x 20'
78	PROSOPIS CHILENSIS	10" / 18' x 16'
79	PROSOPIS CHILENSIS	4" / 14' x 10'
80	PROSOPIS CHILENSIS	12" / 20' x 24'
81	PROSOPIS CHILENSIS	12" / 20' x 20'
82	PROSOPIS CHILENSIS	12" / 20' x 20'
83	PROSOPIS CHILENSIS	10" / 18' x 18'
84	PROSOPIS CHILENSIS	8" / 16' x 12'
85	PROSOPIS CHILENSIS	8" / 18' x 18'
86	PROSOPIS CHILENSIS	10" / 22' x 22'
87	PROSOPIS CHILENSIS	12" / 20' x 24'
88	PROSOPIS CHILENSIS	4" / 14' x 14'
89	PROSOPIS CHILENSIS	4" / 15' x 15'
90	PROSOPIS CHILENSIS	6" / 16' x 16'
91	PROSOPIS CHILENSIS	8" / 18' x 18'
92	PROSOPIS CHILENSIS	8" / 18' x 16'

BLOCK 1 SCALE 1" = 40'

AREA 2 INVENTORY LEGEND

TREE NUMBER	SPECIES	CALIPER / HEIGHT x WIDTH
01	GLEDITSIA TRIACANTHOS	11" / 24' x 20'
02	GLEDITSIA TRIACANTHOS	4" / 16' x 16'
03	GLEDITSIA TRIACANTHOS	10" / 25' x 20'
04	PROSOPIS CHILENSIS	4" / 12' x 14'
05	ROSOPIS CHILENSIS	4" / 12' x 14'
06	PROSOPIS CHILENSIS	4" / 12' x 14'
07	PROSOPIS CHILENSIS	4" / 12' x 14'
08	PROSOPIS CHILENSIS	4" / 12' x 14'
09	GLEDITSIA TRIACANTHOS	12" / 28' x 20'
10	SCHINUS MOLLE	4" / 12' x 12'
11	GLEDITSIA TRIACANTHOS	10" / 18' x 18'
12	SCHINUS MOLLE	4" / 12' x 12'
13	GLEDITSIA TRIACANTHOS	9" / 18' x 18'
14	GLEDITSIA TRIACANTHOS	12" / 18' x 25'
15	PROSOPIS CHILENSIS	12" / 22' x 20'
16	CERCIDIUM PRAECOX	10" / 25' x 25'
17	ROSOPIS CHILENSIS	16" / 30' x 40'
18	CERCIDIUM PRAECOX	8" / 25' x 18'
19	PROSOPIS CHILENSIS	10" / 20' x 20'
20	CERCIDIUM PRAECOX	10" / 25' x 30'
21	PROSOPIS CHILENSIS	6" / 25' x 40'
22	CERCIDIUM PRAECOX	12" / 25' x 25'
23	PROSOPIS CHILENSIS	8" / 18' x 18'
24	CERCIDIUM PRAECOX	12" / 25' x 25'
25	CERCIDIUM PRAECOX	12" / 25' x 25'
26	PROSOPIS CHILENSIS	8" / 16' x 16'
27	CERCIDIUM PRAECOX	10" / 25' x 25'
28	CERCIDIUM PRAECOX	12" / 25' x 25'
29	PROSOPIS CHILENSIS	10" / 25' x 25'
30	CERCIDIUM PRAECOX	12" / 25' x 25'
31	CERCIDIUM PRAECOX	12" / 25' x 35'
32	CERCIDIUM PRAECOX	12" / 25' x 30'
33	CERCIDIUM PRAECOX	12" / 25' x 30'
34	CHILIOPSIS LINEARIS	4" / 14' x 4'
35	CERCIDIUM PRAECOX	12" / 25' x 25'
36	CHILIOPSIS LINEARIS	5" / 16' x 16'
37	CERCIDIUM PRAECOX	10" / 24' x 20'
38	CERCIDIUM PRAECOX	12" / 25' x 25'
39	CERCIDIUM PRAECOX	9" / 20' x 20'
40	CERCIDIUM PRAECOX	12" / 24' x 30'
41	PROSOPIS CHILENSIS	10" / 12' x 18'
42	PROSOPIS CHILENSIS	10" / 22' x 16'
43	CERCIDIUM PRAECOX	9" / 24' x 20'
44	PROSOPIS CHILENSIS	18" / 30' x 30'
45	GLEDITSIA TRIACANTHOS	16" / 30' x 20'
46	SCHINUS MOLLE ML	4" / 25' x 40'
47	SCHINUS MOLLE	9" / 18' x 16'
48	GLEDITSIA TRIACANTHOS	9" / 25' x 20'
49	GLEDITSIA TRIACANTHOS	12" / 30' x 30'
50	SCHINUS MOLLE	9" / 20' x 20'
51	SCHINUS MOLLE	9" / 20' x 20'

KEY MAP

SITE DESIGN
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PARADISE VALLEY, AZ 85253-7000
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LAND-USE ATTORNEY
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PHOENIX, AZ 85003
602.340.0900

BANNER UNIVERSITY MEDICAL CENTER
PHOENIX CAMPUS
PLANNED UNIT DEVELOPMENT

REGISTERED LANDSCAPE ARCHITECT
CERTIFICATE NO.
32932
DREW AQUILINA
ARIZONA, U.S.A.
8/1/2018
EXPIRES 9/30/2019

KEY PLAN

REVISION

HKS PROJECT NUMBER
16626.319
DATE
08/03/18
ISSUE

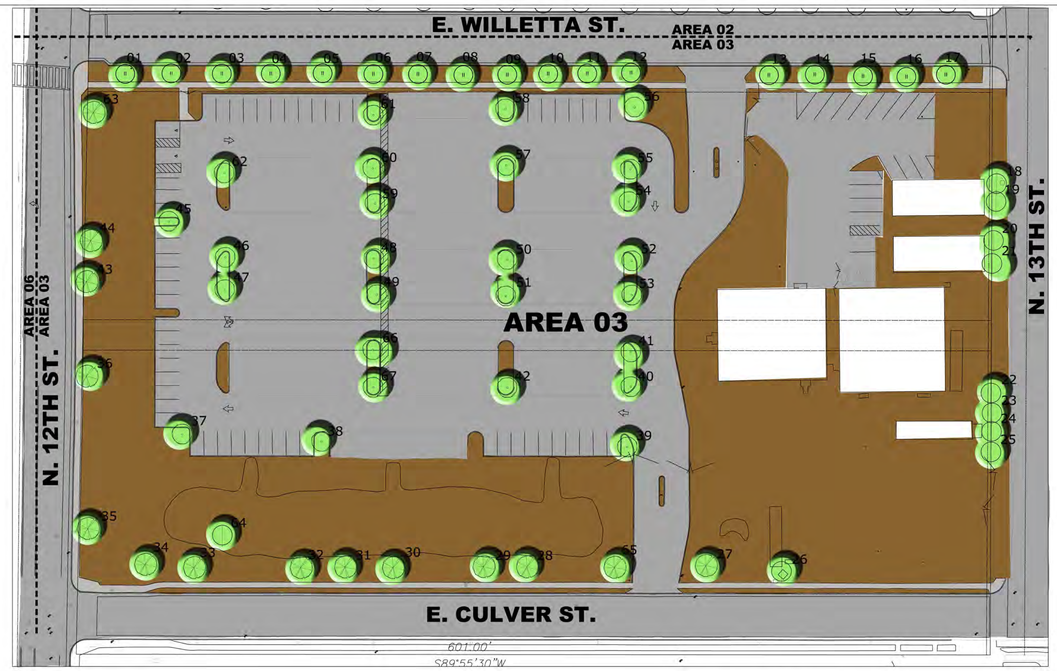
SHEET TITLE
BLOCK 1 PLAN

SHEET NO.
L02.8
2 OF 8

PLOT DATE
7/12/2018 5:18:00 PM
TEMPLATE VERSION 3.0.0.20170620

AREA 3 INVENTORY LEGEND

TREE NUMBER	SPECIES	CALIPER / HEIGHT x WIDTH
01	CERCIDIUM PRAECOX	12" / 30' x 40'
02	CERCIDIUM PRAECOX	12" / 30' x 25'
03	CERCIDIUM PRAECOX	10" / 30' x 25'
04	CERCIDIUM PRAECOX	10" / 30' x 25'
05	CERCIDIUM PRAECOX	10" / 25' x 30'
06	CERCIDIUM PRAECOX	10" / 22' x 22'
07	CERCIDIUM PRAECOX	9" / 30' x 25'
08	CERCIDIUM PRAECOX	9" / 22' x 25'
09	CERCIDIUM PRAECOX	10" / 26' x 24'
10	CERCIDIUM PRAECOX	10" / 26' x 24'
11	CERCIDIUM PRAECOX	9" / 24' x 24'
12	CERCIDIUM PRAECOX	12" / 25' x 25'
13	CERCIDIUM PRAECOX	12" / 24' x 24'
14	CERCIDIUM PRAECOX	10" / 24' x 24'
15	CERCIDIUM PRAECOX	12" / 24' x 24'
16	CERCIDIUM PRAECOX	10" / 24' x 24'
17	CERCIDIUM PRAECOX	12" / 24' x 24'
18	LYSILOMA WATSONI	15" / 20' x 12'
19	LYSILOMA WATSONII ML	6" / 25' x 20'
20	LYSILOMA WATSONII	2" / 10' x 8'
21	LYSILOMA WATSONII	2" / 10' x 8'
22	LYSILOMA WATSONII	2" / 15' x 10'
23	LYSILOMA WATSONII	2" / 15' x 10'
24	LYSILOMA WATSONI I	2" / 15' x 10'
25	LYSILOMA WATSONII	2" / 15' x 10'
26	LYSILOMA WATSONII ML	5" / 20' x 16'
27	PROSOPIS CHILENSIS	10" / 22' x 24'
28	PROSOPIS CHILENSIS	8" / 20' x 18'
29	PROSOPIS CHILENSIS	8" / 20' x 20'
30	PROSOPIS CHILENSIS	10" / 25' x 25'
31	PROSOPIS CHILENSIS	8" / 18' x 20'
32	PROSOPIS CHILENSIS	10" / 25' x 30'
33	PROSOPIS CHILENSIS	16" / 25' x 25'
34	PROSOPIS CHILENSIS	12" / 22' x 30'
35	PROSOPIS CHILENSIS	12" / 30' x 25'
36	PROSOPIS CHILENSIS	8" / 20' x 20'
37	CERCIDIUM FLORIDUM DM	18" / 25' x 25'
38	CERCIDIUM FLORIDUM DM	24" / 35' x 40'
39	CERCIDIUM FLORIDUM DM	20" / 30' x 40'
40	CERCIDIUM FLORIDUM DM	12" / 25' x 25'
41	CERCIDIUM FLORIDUM DM	10" / 25' x 25'
42	CERCIDIUM FLORIDUM DM	12" / 30' x 20'
43	PROSOPIS CHILENSIS	10" / 25' x 25'
44	PROSOPIS CHILENSIS	7" / 20' x 18'
45	CERCIDIUM FLORIDUM DM	18" / 30' x 40'
46	CERCIDIUM FLORIDUM DM	9" / 25' x 20'
47	CERCIDIUM FLORIDUM DM	9" / 25' x 25'
48	CERCIDIUM FLORIDUM DM ML	8" / 25' x 30'
49	CERCIDIUM FLORIDUM DM	9" / 25' x 25'
50	CERCIDIUM FLORIDUM DM	10" / 35' x 25'
51	CERCIDIUM FLORIDUM DM	8" / 25' x 25'
52	CERCIDIUM FLORIDUM DM	6" / 16' x 16'
53	CERCIDIUM FLORIDUM DM	12" / 30' x 25'
54	CERCIDIUM FLORIDUM DM	12" / 30' x 25'
55	CERCIDIUM FLORIDUM DM	12" / 30' x 25'
56	CERCIDIUM FLORIDUM DM ML	7" / 25' x 30'
57	CERCIDIUM FLORIDUM DM	12" / 25' x 25'
58	CERCIDIUM FLORIDUM DM	12" / 32' x 25'
59	CERCIDIUM FLORIDUM DM ML	8" / 25' x 30'
60	CERCIDIUM FLORIDUM DM ML	9" / 25' x 25'
61	CERCIDIUM FLORIDUM DM ML	10" / 30' x 40'
62	CERCIDIUM FLORIDUM DM	12" / 25' x 25'
63	PROSOPIS CHILENSIS	12" / 25' X 40'
64	LYSILOMA WATSONII	10" / 40' X 50'
65	PROSOPIS CHILENSIS	10" / 24' X 16'
66	CERCIDIUM FLORIDUM DM	12" / 25' x 25'
67	CERCIDIUM FLORIDUM DM	12" / 25' x 25'



BLOCK 2 SCALE 1" = 40'

KEY MAP

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BANNER UNIVERSITY MEDICAL CENTER
PHOENIX CAMPUS
PLANNED UNIT DEVELOPMENT

REGISTERED LANDSCAPE ARCHITECT
32932
DREW AGUILINA
ARIZONA U.S.A.
EXPIRES 9/30/2019

KEY PLAN

REVISION

HKS PROJECT NUMBER
16626.319
DATE
08/03/18
ISSUE

SHEET TITLE
BLOCK 2 PLAN

SHEET NO.
L03.8
3 OF 8

PLOT DATE:
7/12/2019 3:18:00 PM TEMPLATE VERSION 3.0 20170620

BLOCK 3-A SCALE 1" = 40'

AREA 4 INVENTORY LEGEND

TREE NUMBER	SPECIES	CALIPER / HEIGHT x WIDTH
01	PROSOPIS CHILENSIS	2" / 6' x 6'
02	PROSOPIS CHILENSIS	7" / 20' x 16'
03	PROSOPIS CHILENSIS	16" / 40' x 40'
04	PROSOPIS CHILENSIS	9" / 25' x 25'
05	PROSOPIS CHILENSIS	24" / 40' x 60'
06	PROSOPIS CHILENSIS	2" / 8' x 6'
07	PROSOPIS CHILENSIS	16" / 30' x 40'
08	PROSOPIS CHILENSIS	16" / 28' x 20'
09	PROSOPIS CHILENSIS	24" / 40' x 30'
10	PROSOPIS CHILENSIS	6" / 18' x 12'
11	PROSOPIS CHILENSIS	18" / 30' x 30'
12	ROSOPIS CHILENSIS	24" / 40' x 30'
13	PROSOPIS CHILENSIS	2" / 8' x 8'
14	PROSOPIS CHILENSIS	2" / 8' x 8'
15	CERCIDIUM FLORIDUM DM	12" / 30' x 30'
16	OLNEYA TESOTA	24" / 30' x 40'
17	OLNEYA TESOTA	24" / 30' x 30'
18	OLNEYA TESOTA	14" / 30' x 30'
19	OLNEYA TESOTA	14" / 30' x 30'
20	OLNEYA TESOTA	24" / 30' x 6\30'
21	OLNEYA TESOTA	12" / 30' x 30'
22	CERCIDIUM FLORIDUM DM	3" / 20' x 15'
23	CERCIDIUM FLORIDUM DM	10" / 25' X 40'
24	CERCIDIUM FLORIDUM DM	16" / 40' x 35'
25	CERCIDIUM FLORIDUM DM	8" / 30' x 25'
26	CERCIDIUM FLORIDUM DM	10" / 25' x 30'
27	CERCIDIUM FLORIDUM DM	8" / 30' x 20'
28	CERCIDIUM FLORIDUM DM	2" / 8' x 8'
29	CERCIDIUM FLORIDUM DM	2" / 6' x 6'
30	CERCIDIUM FLORIDUM DM	8" / 20' x 20'
31	CERCIDIUM FLORIDUM DM	10" / 25' X 40'
32	CERCIDIUM FLORIDUM DM	16" / 30' x 30'
33	CERCIDIUM FLORIDUM DM	16" / 30' X 30'
34	CERCIDIUM FLORIDUM DM	8" / 30' x 25'
35	CERCIDIUM FLORIDUM DM	9" / 20' x 20'
36	CERCIDIUM FLORIDUM DM	" / 20' X 20'
37	CERCIDIUM FLORIDUM DM	6" / 18' x 16'
38	CERCIDIUM FLORIDUM DM	10" / 30' x 30'
39	OLNEYA TESOTA	24" / 25' x 25'
40	OLNEYA TESOTA	8" / 25' x 25'
41	OLNEYA TESOTA	24" / 25' x 25'
42	OLNEYA TESOTA	24" / 25' x 25'
43	OLNEYA TESOTA	16' / 25' X 25'
44	OLNEYA TESOTA	10" / 25' x 25'
45	CERCIDIUM FLORIDUM DM	2" / 8' x 8'
46	CERCIDIUM FLORIDUM DM	8" / 25' x 25'
47	CERCIDIUM FLORIDUM DM	8" / 30' x 30'
48	CERCIDIUM FLORIDUM DM	2" / 8' x 6'
49	CAESALPINIA GILLIESIISS	6" / 25' x 14'
50	CERCIDIUM FLORIDUM DM	16" / 30' x 30'
51	CAESALPINIA GILLIESII ML	3" / 20' x 14'
52	CERCIDIUM FLORIDUM DM	16" / 25' x 30'
53	CERCIDIUM FLORIDUM DM	18" / 25' x 35'
54	CERCIDIUM FLORIDUM DM	24" / 25' x 30'
55	CERCIDIUM FLORIDUM DM	24" / 25' x 40'
56	CERCIDIUM FLORIDUM DM	8" / 25' x 20'
57	PROSOPIS CHILENSIS	2" / 9' x 7'
58	PROSOPIS CHILENSIS	2" / 9' x 7'
59	PROSOPIS CHILENSIS	2" / 9' x 7'
60	PROSOPIS CHILENSIS	2" / 9' x 7'
61	PROSOPIS CHILENSIS	2" / 9' x 7'
62	PROSOPIS CHILENSIS	2" / 9' x 7'
63	PROSOPIS CHILENSIS	2" / 9' x 7'
64	PROSOPIS CHILENSIS	2" / 9' x 7'
65	PROSOPIS CHILENSIS	2" / 9' x 7'
66	PROSOPIS CHILENSIS	2" / 9' x 7'
67	PROSOPIS CHILENSIS	2" / 9' x 7'
68	PROSOPIS CHILENSIS	2" / 9' x 7'
69	PROSOPIS CHILENSIS	2" / 9' x 7'
70	PROSOPIS CHILENSIS	2" / 9' x 7'
71	PROSOPIS CHILENSIS	2" / 9' x 7'
72	PROSOPIS CHILENSIS	2" / 9' x 7'
73	PROSOPIS CHILENSIS	2" / 9' x 7'
74	PROSOPIS CHILENSIS	2" / 9' x 7'
75	PROSOPIS CHILENSIS	2" / 9' x 7'
76	PROSOPIS CHILENSIS	2" / 9' x 7'
77	PROSOPIS CHILENSIS	2" / 9' x 7'
78	PROSOPIS CHILENSIS	2" / 9' x 7'
79	PROSOPIS CHILENSIS	2" / 9' x 7'
80	PROSOPIS CHILENSIS	2" / 9' x 7'
81	PROSOPIS CHILENSIS	2" / 9' x 7'
82	PROSOPIS CHILENSIS	2" / 9' x 7'
83	PROSOPIS CHILENSIS	2" / 9' x 7'
84	PROSOPIS CHILENSIS	2" / 9' x 7'
85	PROSOPIS CHILENSIS	2" / 9' x 7'
86	PROSOPIS CHILENSIS	2" / 9' x 7'
87	PROSOPIS CHILENSIS	2" / 9' x 7'
88	PROSOPIS CHILENSIS	2" / 9' x 7'
89	PROSOPIS CHILENSIS	2" / 9' x 7'
90	PROSOPIS CHILENSIS	2" / 9' x 7'
91	PROSOPIS CHILENSIS	2" / 9' x 7'
92	PROSOPIS CHILENSIS	2" / 9' x 7'

AREA 5 INVENTORY LEGEND

TREE NUMBER	SPECIES	CALIPER / HEIGHT x WIDTH
01	OLNEYA TESOTA	4" / 16' x 10'
02	CHILIOPSIS LINEARIS	3" / 20' x 15'
03	CHILIOPSIS LINEARIS	2" / 10' x 6'
04	DALBERGIA SISSOO	9" / 25' x 25'
05	DALBERGIA SISSOO	14" / 35' x 35'
06	DALBERGIA SISSOO	12" / 30' x 25'
07	CERCIDIUM FLORIDUM DM	2" / 14' x 12'
08	DALBERGIA SISSOO	10" / 25' x 25'
09	PROSOPIS CHILENSIS	16" / 25' x 35'
10	DALBERGIA SISSOO	10" / 25' x 25'
11	DALBERGIA SISSOO	10" / 30' x 20'
12	PROSOPIS CHILENSIS	12" / 35' x 35'
13	DALBERGIA SISSOO	9" / 25' x 25'
14	DALBERGIA SISSOO	10" / 30' x 20'
15	PROSOPIS CHILENSIS	8" / 24' x 30'
16	DALBERGIA SISSOO	10" / 30' x 30'
17	PROSOPIS CHILENSIS	8" / 24' x 30'
18	PROSOPIS CHILENSIS	8" / 24' x 30'
19	CERCIDIUM FLORIDUM DM	14" / 20' x 20'
20	PROSOPIS CHILENSIS	16" / 30' x 30'
21	PROSOPIS CHILENSIS	16" / 25' x 40'
22	PROSOPIS CHILENSIS	18" / 40' x 35'
23	CERCIDIUM FLORIDUM DM	12" / 30' X 30'
24	CERCIDIUM FLORIDUM DM	16" / 35' x 30'
25	CERCIDIUM FLORIDUM DM	12" / 25' x 25'
26	CERCIDIUM FLORIDUM DM	16" / 35' x 35'
27	CERCIDIUM FLORIDUM DM	16" / 35' x 35'
28	PROSOPIS CHILENSIS	14" / 35' x 35'
29	PROSOPIS CHILENSIS	2" / 6' x 6'
30	PROSOPIS CHILENSIS	2" / 6' x 6'
31	PROSOPIS CHILENSIS	14" / 18' x 18'
32	PROSOPIS CHILENSIS	5" / 16' x 16'
33	PROSOPIS CHILENSIS	9" / 16' X 20'
34	PROSOPIS CHILENSIS	9" / 18' x 18'
35	PROSOPIS CHILENSIS	2" / 8' x 8'
36	PROSOPIS CHILENSIS	9" / 18' X 18'
37	OLNEYA TESOTA	12" / 16' x 18'
38	CHILIOPSIS LINEARIS	4" / 16' x 10'
39	OLNEYA TESOTA	12" / 16' x 18'
40	CERCIDIUM FLORIDUM DM	3" / 12' x 10'
41	SCHINUS MOLLE	6" / 20' x 15'
42	OLNEYA TESOTA	24" / 25' x 25'
43	OLNEYA TESOTA	16' / 25' X 25'
44	OLNEYA TESOTA	10" / 25' x 25'
45	CERCIDIUM FLORIDUM DM	2" / 8' x 8'
46	CERCIDIUM FLORIDUM DM	8" / 25' x 25'
47	CERCIDIUM FLORIDUM DM	8" / 30' x 30'
48	CERCIDIUM FLORIDUM DM	2" / 8' x 6'
49	CAESALPINIA GILLIESIISS	6" / 25' x 14'
50	CERCIDIUM FLORIDUM DM	16" / 30' x 30'
51	CAESALPINIA GILLIESII ML	3" / 20' x 14'
52	CERCIDIUM FLORIDUM DM	16" / 25' x 30'
53	CERCIDIUM FLORIDUM DM	18" / 25' x 35'
54	CERCIDIUM FLORIDUM DM	24" / 25' x 30'
55	CERCIDIUM FLORIDUM DM	24" / 25' x 40'
56	CERCIDIUM FLORIDUM DM	8" / 25' x 20'

HKS

OWNER
BANNER HEALTH
1441 NORTH 12TH STREET
PHOENIX, AZ 85006

ARCHITECT
HKS INC.
821 NORTH CENTRAL AVENUE
PHOENIX, AZ 85004-2004
602.462.0966

CIVIL ENGINEER
DIBBLE ENGINEERING
7500 NORTH DREAMY DRAW DRIVE, #200
PHOENIX, AZ 85020
602.957.1155

LANDSCAPE ARCHITECT
SITE DESIGN, LLC
6939 EAST CHAPARRAL ROAD
PARADISE VALLEY, AZ 85253-7000
480.219.4559

LAND-USE ATTORNEY
LAZARUS, SILVYN, & BANGS, P.C.
420 WEST ROOSEVELT STREET
PHOENIX, AZ 85003
602.340.0900

BANNER UNIVERSITY MEDICAL CENTER

PHOENIX CAMPUS

PLANNED UNIT DEVELOPMENT

REGISTERED LANDSCAPE ARCHITECT
CERTIFICATE NO.
32932
DREW AQUILINA
ARIZONA U.S.A.
EXPIRES 9/30/2019

KEY PLAN

REVISION

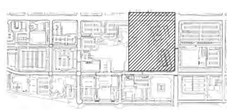
HKS PROJECT NUMBER
16626.319

DATE
08/03/18

ISSUE

SHEET TITLE
BLOCK 3A PLAN

SHEET NO.
L04.8
4 OF 8



KEY MAP

SITE DESIGN
6939 E. Chaparral Road
Scottsdale, Arizona 85253
Phone 480-219-4559
mail@sitedesignla.com

CALL TWO WORKING DAYS BEFORE YOU DIG
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

NORTH
0 20 40 80

PLOT DATE: 7/10/2018 5:16:00 PM TEMPLATE VERSION: 3.0.0.20170920

BLOCK 3-B SCALE 1" = 40'

AREA 8 INVENTORY LEGEND

TREE NUMBER	SPECIES	CALIPER / HEIGHT x WIDTH
01	CERCIDIUM PRAECOX	5" / 16' x 16'
02	CERCIDIUM FLORIDUM DM	5" / 14' x 14'
03	CERCIDIUM FLORIDUM DM	4" / 14' x 14'
04	CERCIDIUM FLORIDUM DM	4" / 14' x 14'
05	CERCIDIUM FLORIDUM DM	4" / 14' x 14'
06	CERCIDIUM FLORIDUM DM	4" / 16' x 14'
07	CERCIDIUM FLORIDUM DM	3" / 14 x 14'
08	CERCIDIUM FLORIDUM DM	4" / 14' x 14'
09	CERCIDIUM FLORIDUM DM	4" / 14' x 16'
10	CERCIDIUM FLORIDUM DM	2" / 12' x 10'
11	CERCIDIUM FLORIDUM DM	3" / 14' x 14'
12	CERCIDIUM FLORIDUM DM	6" / 16' x 20'
13	PROSOPIS CHILENSIS	3" / 14' x 14'
14	CERCIDIUM FLORIDUM DM	3" / 12' x 12'
15	CERCIDIUM FLORIDUM DM	3" / 16' x 16'
16	PROSOPIS CHILENSIS	4" / 14' x 14'
17	PROSOPIS CHILENSIS	4" / 14' x 14'
18	CERCIDIUM FLORIDUM DM	5" / 16' x 16'
19	PROSOPIS CHILENSIS	2" / 9' x 7'
20	PROSOPIS CHILENSIS	2" / 9' x 7'
21	PROSOPIS CHILENSIS	2" / 9' x 7'
22	PROSOPIS CHILENSIS	2" / 9' x 7'
23	PROSOPIS CHILENSIS	2" / 9' x 7'
24	PROSOPIS CHILENSIS	2" / 9' x 7'
25	PROSOPIS CHILENSIS	2" / 9' x 7'
26	PROSOPIS CHILENSIS	2" / 9' x 7'
27	PROSOPIS CHILENSIS	2" / 9' x 7'
28	PROSOPIS CHILENSIS	2" / 9' x 7'
29	PROSOPIS CHILENSIS	2" / 9' x 7'
30	PROSOPIS CHILENSIS	2" / 9' x 7'
31	PROSOPIS CHILENSIS	2" / 9' x 7'
32	PROSOPIS CHILENSIS	2" / 9' x 7'
33	PROSOPIS CHILENSIS	2" / 9' x 7'
34	PROSOPIS CHILENSIS	2" / 9' x 7'
35	PROSOPIS CHILENSIS	2" / 9' x 7'
36	PROSOPIS CHILENSIS	2" / 9' x 7'
37	PROSOPIS CHILENSIS	2" / 9' x 7'
38	PROSOPIS CHILENSIS	2" / 9' x 7'
39	PROSOPIS CHILENSIS	2" / 9' x 7'
40	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
41	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
42	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
43	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
44	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
45	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
46	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
47	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
48	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
49	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
50	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
51	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
52	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
53	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
54	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
55	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
56	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
57	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
58	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
59	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
60	PROSOPIS CHILENSIS	2" / 9' x 7'
61	PROSOPIS CHILENSIS	2" / 9' x 7'
62	PROSOPIS CHILENSIS	2" / 9' x 7'
63	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
64	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
65	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
66	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
67	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
68	PROSOPIS CHILENSIS	2" / 9' x 7'
69	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
70	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
71	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
72	PROSOPIS CHILENSIS	2" / 9' x 7'
73	PROSOPIS CHILENSIS	2" / 9' x 7'
74	PROSOPIS CHILENSIS	2" / 9' x 7'
75	PROSOPIS CHILENSIS	2" / 9' x 7'
76	PROSOPIS CHILENSIS	2" / 9' x 7'
77	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
78	PROSOPIS CHILENSIS	2" / 9' x 7'
79	PROSOPIS CHILENSIS	2" / 9' x 7'
80	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
81	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
82	PROSOPIS CHILENSIS	2" / 9' x 7'
83	PROSOPIS CHILENSIS	2" / 9' x 7'
84	CERCIDIUM FLORIDUM DM	5" / 16' x 16'
85	PROSOPIS CHILENSIS	2" / 9' x 7'
86	PROSOPIS CHILENSIS	2" / 9' x 7'
87	PROSOPIS CHILENSIS	2" / 9' x 7'
88	PROSOPIS CHILENSIS	2" / 9' x 7'
89	CERCIDIUM FLORIDUM DM	5" / 16' x 16'
90	PROSOPIS CHILENSIS	2" / 9' x 7'
91	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
92	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
93	PROSOPIS CHILENSIS	2" / 9' x 7'
94	PROSOPIS CHILENSIS	2" / 9' x 7'
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97	PROSOPIS CHILENSIS	2" / 9' x 7'
98	PROSOPIS CHILENSIS	2" / 9' x 7'
99	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
100	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
101	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
102	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
103	PROSOPIS CHILENSIS	2" / 9' x 7'
104	PROSOPIS CHILENSIS	2" / 9' x 7'
105	PROSOPIS CHILENSIS	2" / 9' x 7'
106	PROSOPIS CHILENSIS	2" / 9' x 7'
107	PROSOPIS CHILENSIS	2" / 9' x 7'
108	PROSOPIS CHILENSIS	2" / 9' x 7'
109	PROSOPIS CHILENSIS	2" / 9' x 7'
110	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
111	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
112	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
113	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
114	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
115	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
116	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
117	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
118	PROSOPIS CHILENSIS	2" / 9' x 7'
119	PROSOPIS CHILENSIS	2" / 9' x 7'
120	PROSOPIS CHILENSIS	2" / 9' x 7'
121	PROSOPIS CHILENSIS	2" / 9' x 7'
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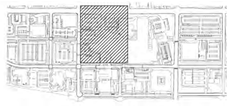
128	PROSOPIS CHILENSIS	2" / 9' x 7'
129	PROSOPIS CHILENSIS	2" / 9' x 7'
130	PROSOPIS CHILENSIS	2" / 9' x 7'
131	PROSOPIS CHILENSIS	2" / 9' x 7'
132	PROSOPIS CHILENSIS	2" / 9' x 7'
133	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
134	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
135	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
136	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
137	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
138	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
139	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
140	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'

AREA 9 INVENTORY LEGEND

TREE NUMBER	SPECIES	CALIPER / HEIGHT x WIDTH
01	CERCIDIUM FLORIDUM DM	4" / 14' x 16'
02	CERCIDIUM FLORIDUM DM	2" / 12' x 10'
03	TIPUANA TIPU	3" / 12' x 10'
04	TIPUANA TIPU	2" / 12' x 10'
05	TIPUANA TIPU	3" / 12' x 10'
06	TIPUANA TIPU	2" / 12' x 10'
07	PROSOPIS CHILENSIS	4" / 14' x 16'
08	PROSOPIS CHILENSIS	4" / 12' x 12'
09	PROSOPIS CHILENSIS	4" / 14' x 14'
10	PROSOPIS CHILENSIS	4" / 12' x 14'
11	PROSOPIS CHILENSIS	4" / 12 x 14'
12	PROSOPIS CHILENSIS	4" / 12' x 14'
13	PROSOPIS CHILENSIS	5" / 14' x 16'
14	PROSOPIS CHILENSIS	6" / 14' x 18'
15	CERCIDIUM FLORIDUM DM	3" / 12' x 10'
16	CERCIDIUM FLORIDUM DM	3" / 12' x 14'
17	CERCIDIUM FLORIDUM DM	3" / 14' x 12'
18	CERCIDIUM FLORIDUM DM	3" / 14' x 12'
19	CERCIDIUM FLORIDUM DM	3" / 12' x 12'
20	CERCIDIUM FLORIDUM DM	3" / 12' x 12'
21	CERCIDIUM FLORIDUM DM	3" / 14' x 14'
22	CERCIDIUM FLORIDUM DM	4" / 14' x 14'
23	CERCIDIUM FLORIDUM DM	3" / 14' x 12'
24	CERCIDIUM FLORIDUM DM	3" / 18' x 12'
25	CERCIDIUM FLORIDUM DM	3" / 14' x 14'
26	CERCIDIUM FLORIDUM DM	3" / 12' x 14'
27	CERCIDIUM FLORIDUM DM	4" / 15' x 14'
28	CERCIDIUM FLORIDUM DM	4" / 15' x 14'
29	CERCIDIUM FLORIDUM DM	3" / 12' x 10'
30	CERCIDIUM FLORIDUM DM	2" / 12' x 10'
31	CERCIDIUM FLORIDUM DM	4" / 16' x 18'
32	CERCIDIUM FLORIDUM DM	2" / 10' x 10'
33	CERCIDIUM FLORIDUM DM	2" / 10' x 10'
34	CERCIDIUM FLORIDUM DM	2" / 10' x 10'
35	CERCIDIUM FLORIDUM DM	2" / 10' x 10'
36	CERCIDIUM FLORIDUM DM	3" / 12' x 14'
37	PROSOPIS CHILENSIS	4" / 14' x 14'
38	PROSOPIS CHILENSIS	4" / 14' x 12'
39	PROSOPIS CHILENSIS	3" / 12' x 12'
40	PROSOPIS CHILENSIS	3" / 14' x 14'
41	PROSOPIS CHILENSIS	3" / 14' x 12'



KEY MAP

SITE DESIGN
6939 E. Chaparral Road
Scottsdale, Arizona 85253
Phone 480-219-4559
mail@sitedesignla.com

CALL TWO WORKING DAYS BEFORE YOU DIG
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1-800-STAKE-IT
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PHOENIX, AZ 85006

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821 NORTH CENTRAL AVENUE
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CIVIL ENGINEER
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7500 NORTH DREAMY DRAW DRIVE, #200
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SITE DESIGN, LLC
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LAZARUS, SILVYN, & BANGS, P.C.
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PHOENIX, AZ 85003
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BANNER UNIVERSITY MEDICAL CENTER
PHOENIX CAMPUS
PLANNED UNIT DEVELOPMENT

REGISTERED LANDSCAPE ARCHITECT
CERTIFICATE NO.
32932
DREW AGUILINA
ARIZONA
EXPIRES 9/30/2019

KEY PLAN

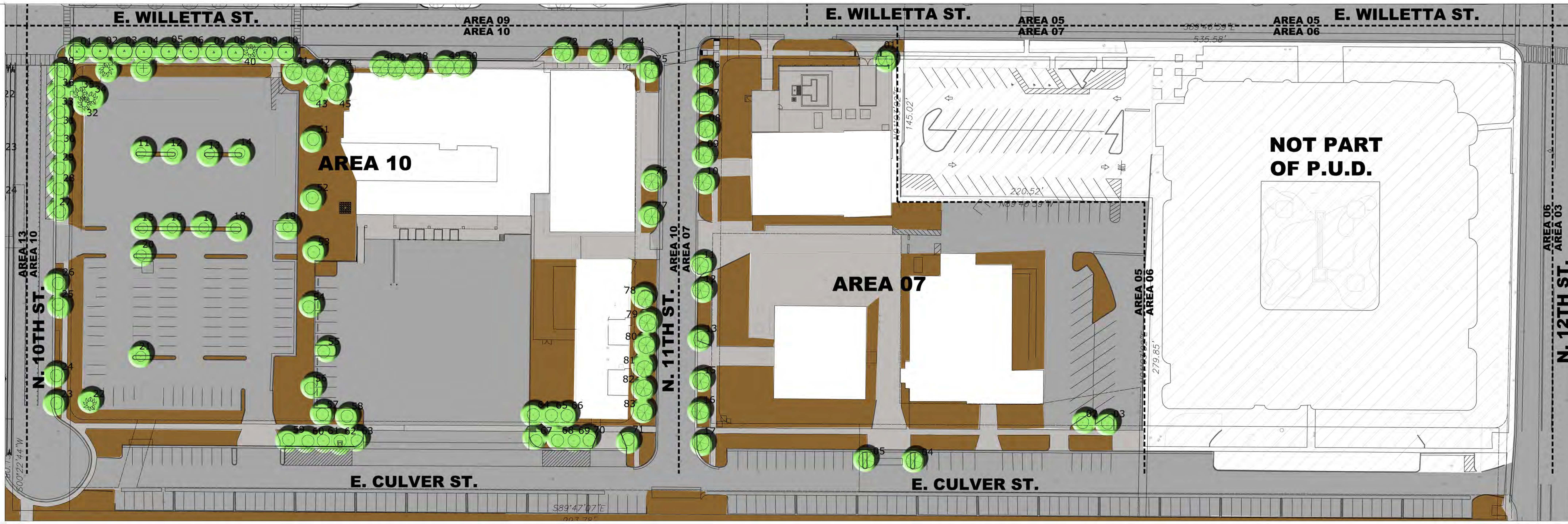
REVISION

HKS PROJECT NUMBER
16626.319
DATE
08/03/18
ISSUE

SHEET TITLE
BLOCK 3B PLAN

SHEET NO.
L05.8
5 OF 8

PLOT DATE
7/12/2018 3:16:00 PM
TEMPLATE VERSION: 3.0.0.20170803



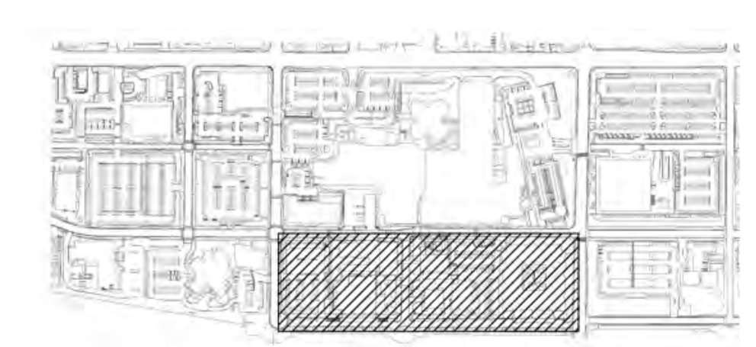
BLOCK 4 SCALE 1" = 40'

AREA 7 INVENTORY LEGEND

TREE NUMBER	SPECIES	CALIPER / HEIGHT x WIDTH
01	PROSOPIS CHILENSIS	14" / 30' x 40'
02	CERCIDIUM FLORIDUM DM	12" / 25' x 35'
03	CERCIDIUM FLORIDUM DM	10" / 25' x 30'
04	PROSOPIS CHILENSIS	14" / 20' x 26'
05	PROSOPIS CHILENSIS	5" / 14' x 14'
06	PROSOPIS CHILENSIS	2" / 9' x 7'
07	PROSOPIS CHILENSIS	2" / 9' x 7'
08	PROSOPIS CHILENSIS	2" / 9' x 7'
09	PROSOPIS CHILENSIS	2" / 9' x 7'
10	PROSOPIS CHILENSIS	2" / 9' x 7'
11	PROSOPIS CHILENSIS	2" / 9' x 7'
12	PROSOPIS CHILENSIS	2" / 9' x 7'
13	PROSOPIS CHILENSIS	2" / 9' x 7'
14	PROSOPIS CHILENSIS	2" / 9' x 7'
15	PROSOPIS CHILENSIS	2" / 9' x 7'
16	PROSOPIS CHILENSIS	2" / 9' x 7'

AREA 10 INVENTORY LEGEND

TREE NUMBER	SPECIES	CALIPER / HEIGHT x WIDTH
01	GLEDITSIA TRIACANTHOS	12" / 24' x 24'
02	GLEDITSIA TRIACANTHOS	14" / 24' x 24'
03	GLEDITSIA TRIACANTHOS	12" / 24' x 24'
04	GLEDITSIA TRIACANTHOS	14" / 24' x 24'
05	GLEDITSIA TRIACANTHOS	14" / 24' x 24'
06	GLEDITSIA TRIACANTHOS	12" / 24' x 24'
07	GLEDITSIA TRIACANTHOS	14" / 24' x 24'
08	GLEDITSIA TRIACANTHOS	9" / 24' x 24'
09	GLEDITSIA TRIACANTHOS	10" / 24' x 24'
10	GLEDITSIA TRIACANTHOS	12" / 24' x 24'
11	CERCIDIUM FLORIDUM DM	10" / 20' x 18'
12	CERCIDIUM FLORIDUM DM	9" / 24' x 24'
13	CERCIDIUM FLORIDUM DM	9" / 20' x 20'
14	CERCIDIUM FLORIDUM DM	16" / 24' x 24'
15	CERCIDIUM FLORIDUM DM	12" / 25' x 30'
16	CERCIDIUM FLORIDUM DM	12" / 25' x 20'
17	CERCIDIUM FLORIDUM DM	16" / 30' x 25'
18	CERCIDIUM FLORIDUM DM	18" / 30' x 30'
19	CERCIDIUM FLORIDUM DM	13" / 20' x 20'
20	CERCIDIUM FLORIDUM DM ML	8" / 30' x 30'
21	CERCIDIUM FLORIDUM DM	18" / 35' x 30'
22	WASHINGTON ROBUSTA	40'H
23	CERCIDIUM FLORIDUM DM	8" / 24' x 30'
24	CERCIDIUM FLORIDUM DM	6" / 24' x 20'
25	CERCIDIUM FLORIDUM DM	8" / 24' x 24'
26	CERCIDIUM FLORIDUM DM	6" / 20' x 18'
27	CERCIDIUM FLORIDUM DM	10" / 24' x 24'
28	CERCIDIUM FLORIDUM DM	8" / 20' x 20'
29	CERCIDIUM FLORIDUM DM	6" / 20' x 20'
30	CERCIDIUM FLORIDUM DM	6" / 20' x 20'
31	CERCIDIUM FLORIDUM DM	5" / 20' x 18'
32	WASHINGTON ROBUSTA	30'H
33	CERCIDIUM FLORIDUM DM	5" / 18' x 16'
34	WASHINGTON ROBUSTA	25'H
35	WASHINGTON ROBUSTA	20'H
36	CERCIDIUM FLORIDUM DM	3" / 12' x 10'
37	BRACHYCHITON POPULNEUS	18" / 25' x 20'
38	WASHINGTON ROBUSTA	25'H
39	CERCIDIUM FLORIDUM DM	7" / 24" x 24"
40	WASHINGTON ROBUSTA	35'H
41	PROSOPIS CHILENSIS	2" / 9' x 7'
42	PROSOPIS CHILENSIS	2" / 9' x 7'
43	PROSOPIS CHILENSIS	2" / 9' x 7'
44	PROSOPIS CHILENSIS	2" / 9' x 7'
45	PROSOPIS CHILENSIS	2" / 9' x 7'
46	PROSOPIS CHILENSIS	2" / 9' x 7'
47	PROSOPIS CHILENSIS	2" / 9' x 7'
48	PROSOPIS CHILENSIS	2" / 9' x 7'
49	PROSOPIS CHILENSIS	2" / 9' x 7'
50	PROSOPIS CHILENSIS	2" / 9' x 7'
51	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
52	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
53	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
54	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
55	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
56	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
57	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
58	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
59	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
60	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
61	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
62	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
63	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
64	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
65	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
66	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
67	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
68	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
69	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
70	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
71	CERCIDIUM FLORIDUM AZT	2" / 8' x 6'
72	PROSOPIS CHILENSIS	2" / 9' x 7'
73	PROSOPIS CHILENSIS	2" / 9' x 7'
74	PROSOPIS CHILENSIS	2" / 9' x 7'
75	PROSOPIS CHILENSIS	2" / 9' x 7'
76	PROSOPIS CHILENSIS	2" / 9' x 7'
77	PROSOPIS CHILENSIS	2" / 9' x 7'
78	PROSOPIS CHILENSIS	2" / 9' x 7'
79	PROSOPIS CHILENSIS	2" / 9' x 7'
80	PROSOPIS CHILENSIS	2" / 9' x 7'
81	PROSOPIS CHILENSIS	2" / 9' x 7'
82	PROSOPIS CHILENSIS	2" / 9' x 7'
83	PROSOPIS CHILENSIS	2" / 9' x 7'



KEY MAP

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PHOENIX CAMPUS
PLANNED UNIT DEVELOPMENT

EXPIRES 9/30/2019

KEY PLAN

REVISION

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HKS PROJECT NUMBER
16626.319
DATE
08/03/18
ISSUE

SHEET TITLE
BLOCK 4
PLAN

SHEET NO.
L06.8
6 OF 8

AREA 11 INVENTORY LEGEND

TREE NUMBER	SPECIES	CALIPER / HEIGHT x WIDTH
01	PROSOPIS CHILENSIS	8" / 18' x 18'
02	PROSOPIS CHILENSIS	4" / 8' x 12'
03	PROSOPIS CHILENSIS	5" / 16' x 12'
04	PROSOPIS CHILENSIS	4" / 12' x 12'
05	PROSOPIS CHILENSIS	4" / 16' x 12'
07	PROSOPIS CHILENSIS	4" / 16' x 12'
08	PROSOPIS CHILENSIS	4" / 16' x 12'
09	PROSOPIS CHILENSIS	3" / 12' x 12'
10	PROSOPIS CHILENSIS	3" / 14' x 12'
11	PROSOPIS CHILENSIS	3" / 12' x 12'
12	PROSOPIS CHILENSIS	4" / 14' x 14'
13	PROSOPIS CHILENSIS	4" / 16' x 12'
14	PROSOPIS CHILENSIS	4" / 16' x 12'
15	PROSOPIS CHILENSIS	4" / 16' x 12'
16	PROSOPIS CHILENSIS	4" / 16' x 12'
17	PROSOPIS CHILENSIS	4" / 14' x 12'
18	PROSOPIS CHILENSIS	4" / 16' x 12'
19	PROSOPIS CHILENSIS	4" / 16' x 12''
20	PROSOPIS CHILENSIS	4" / 16' x 12'
21	PROSOPIS CHILENSIS	3" / 14' x 12'
22	PROSOPIS CHILENSIS	4" / 14' x 8'
23	PROSOPIS CHILENSIS	4" / 16' x 12'
24	PROSOPIS CHILENSIS	3" / 14' x 12'
25	ACACIA MULGA	4" / 14' x 8'
26	ACACIA MULGA	4" / 14' x 8'
27	ACACIA MULGA	4" / 14' x 8'
28	ACACIA MULGA	4" / 14' x 8'
29	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
30	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
31	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
32	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
33	PROSOPIS CHILENSIS	3" / 14' x 12'
34	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
35	GLEDITSIA TRIACANTHOS	12" / 20' x 20'
36	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
37	CERCIDIUM FLORIDUM DM	4" / 14' x 8
38	CERCIDIUM FLORIDUM DM	4" / 14' x 8
39	GLEDITSIA TRIACANTHOS	12" / 20' x 20'
40	GLEDITSIA TRIACANTHOS	12" / 20' x 20'
41	GLEDITSIA TRIACANTHOS	12" / 20' x 20'
42	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
43	PROSOPIS CHILENSIS	4" / 16' x 12'
44	PROSOPIS CHILENSIS	4" / 16' x 12'
45	PROSOPIS CHILENSIS	4" / 16' x 12'
46	PROSOPIS CHILENSIS	4" / 16' x 12'
47	PROSOPIS CHILENSIS	4" / 16' x 12'
48	PROSOPIS CHILENSIS	4" / 16' x 12'
49	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
50	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
51	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
52	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
53	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
54	PROSOPIS CHILENSIS	6" / 16' x 16'
55	PROSOPIS CHILENSIS	4" / 16' x 12'
56	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
57	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
58	PROSOPIS CHILENSIS	4" / 16' x 12'
59	GLEDITSIA TRIACANTHOS	12" / 20' x 20'
60	GLEDITSIA TRIACANTHOS	12" / 20' x 20'
61	PROSOPIS CHILENSIS	10" / 24' x 20'
62	GLEDITSIA TRIACANTHOS	12" / 20' x 20'
63	GLEDITSIA TRIACANTHOS	12" / 20' x 20'
64	GLEDITSIA TRIACANTHOS	12" / 20' x 20'
65	GLEDITSIA TRIACANTHOS	12" / 20' x 20'
66	GLEDITSIA TRIACANTHOS	12" / 20' x 20'
67	GLEDITSIA TRIACANTHOS	12" / 20' x 20'
68	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
69	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
70	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
71	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
72	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
73	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
74	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
75	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
76	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
77	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
78	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
79	PROSOPIS CHILENSIS	4" / 14' x 10'
80	PROSOPIS CHILENSIS	12" / 20' x 24'
81	PROSOPIS CHILENSIS	12" / 20' x 20'
82	PROSOPIS CHILENSIS	12" / 20' x 20'
83	PROSOPIS CHILENSIS	10" / 18' x 18'
84	CERCIDIUM FLORIDUM DM	4" / 14' x 8'
85	PROSOPIS CHILENSIS	8" / 18' x 18'
86	PROSOPIS CHILENSIS	10" / 22' x 22'

AREA 12 INVENTORY LEGEND

TREE NUMBER	SPECIES	CALIPER / HEIGHT x WIDTH
01	CERCIDIUM FLORIDUM DM	5" / 18' x 18'
02	CERCIDIUM FLORIDUM DM	2" / 6' x 6'
03	CERCIDIUM FLORIDUM DM	2" / 6' x 6'
04	CERCIDIUM FLORIDUM DM	6" / 24' x 30'
05	CERCIDIUM FLORIDUM DM	2" / 6' x 6'
06	CERCIDIUM FLORIDUM DM	5" / 24' x 24'
07	CERCIDIUM FLORIDUM DM	2" / 8' x 8'
08	CERCIDIUM FLORIDUM DM	9" / 20' x 20'
09	CERCIDIUM FLORIDUM DM	8" / 18' x 24'
10	CERCIDIUM FLORIDUM DM	7" / 20' x 20'
11	CERCIDIUM FLORIDUM DM	8" / 18' x 24'
12	CERCIDIUM FLORIDUM DM	8" / 20' x 24'
13	PROSOPIS CHILENSIS	1" / 6' x 16'
14	PROSOPIS CHILENSIS	1" / 10' x 6'
15	PROSOPIS CHILENSIS	4" / 14' x 16'
16	PROSOPIS CHILENSIS	6" / 14' x 18'
17	PROSOPIS CHILENSIS	5" / 14' x 16'
18	PROSOPIS CHILENSIS	6" / 14' x 12'
19	PROSOPIS CHILENSIS	4" / 12' x 14'
20	PROSOPIS CHILENSIS	4" / 14' x 14'
21	PROSOPIS CHILENSIS	7" / 14' x 14'
22	PROSOPIS CHILENSIS	4" / 14' x 14'
23	WASHINGTON ROBUSTA	35'H
24	PROSOPIS CHILENSIS	3" / 14' x 14'
25	PROSOPIS CHILENSISML	4" / 14' x 12'
26	PROSOPIS CHILENSIS ML	4" / 16' x 14'
27	PROSOPIS CHILENSIS	7" / 16' x 18'
28	PROSOPIS CHILENSIS	7" / 16' x 16'
29	PROSOPIS CHILENSIS	6" / 18' x 18'
30	PROSOPIS CHILENSIS	4" / 14' x 16'
31	PROSOPIS CHILENSIS	4" / 14' x 18'
32	PROSOPIS CHILENSIS	2" / 8' x 6'
33	PROSOPIS CHILENSIS	2" / 8' x 6'
34	PROSOPIS CHILENSIS	6" / 16' x 18'
35	PROSOPIS CHILENSIS	6" / 14' x 14'
36	PROSOPIS CHILENSIS	6" / 14' x 18'
37	PROSOPIS CHILENSIS	2" / 8' x 8'
38	PROSOPIS CHILENSIS	5" / 14' x 14'
39	PROSOPIS CHILENSIS	5" / 16' x 22'
40	PROSOPIS CHILENSIS	6" / 18' x 20'
41	PROSOPIS CHILENSIS	6" / 20' x 24'
42	PROSOPIS CHILENSIS	6" / 16' x 20'
43	CERCIDIUM FLORIDUM DM ML	8" / 24' x 35'
44	CERCIDIUM FLORIDUM DM ML	6" / 24' x 20'
45	CERCIDIUM FLORIDUM DM ML	7" / 24' x 35'
46	CERCIDIUM FLORIDUM DM	2" / 8' x 6'
47	CERCIDIUM FLORIDUM DM	8" / 24' x 30'
48	CERCIDIUM FLORIDUM DM	8" / 24' x 30'
49	CERCIDIUM FLORIDUM DM	2" / 8' x 6'
50	CERCIDIUM FLORIDUM DM ML	6" / 18' x 28'

AREA 14 INVENTORY LEGEND

TREE NUMBER	SPECIES	CALIPER / HEIGHT x WIDTH
01	CERCIDIUM PRAECOX	5" / 12' x 12'
02	CHAMAEROPS HUMILIS ML	10" / 10' x 10'
03	CERCIDIUM FLORIDUM DM	6" / 16' x 16'
04	CERCIDIUM FLORIDUM DM	5" / 12' x 14'
05	PROSOPIS CHILENSIS	4" / 12' x 12'
06	PROSOPIS CHILENSIS	6" / 12' x 16'
07	CERCIDIUM FLORIDUM DM	5" / 12' x 12'
08	CERCIDIUM FLORIDUM DM	8" / 15' x 15'
09	PROSOPIS CHILENSIS	6" / 12' x 18'
10	PROSOPIS CHILENSIS	6 / 16' x 16'
11	PROSOPIS CHILENSIS	6" / 15' x 15'
12	PROSOPIS CHILENSIS	4" / 16' x 12'
13	PROSOPIS CHILENSIS	4" / 16' x 15'
14	PROSOPIS CHILENSIS	8" / 15' x 20'
15	PROSOPIS CHILENSIS	8" / 15' x 20'
16	PROSOPIS CHILENSIS	8" / 16' x 25'
17	PROSOPIS CHILENSIS	8" / 16' x 20'
18	PROSOPIS CHILENSIS	8" / 16' x 20'
19	PROSOPIS CHILENSIS	8" / 16' x 20'
20	PROSOPIS CHILENSIS	8" / 16' x 18'
21	PROSOPIS CHILENSIS	8" / 16' x 20'
22	PROSOPIS CHILENSIS	7" / 15' x 15'
23	PROSOPIS CHILENSIS ML	4" / 12' X 12'
24	PROSOPIS CHILENSIS	6" / 14' x 16'
25	PROSOPIS CHILENSIS	7" / 16' x 18'
26	PROSOPIS CHILENSIS	7" / 16' x 18'
27	PROSOPIS CHILENSIS	6" / 16' x 18'
28	PROSOPIS CHILENSIS	6" / 16' x 18'
29	PROSOPIS CHILENSIS	4" / 14' x 14'
30	GLEDITSIA TRIACANTHOS	11" / 24' x 18'
31	GLEDITSIA TRIACANTHOS	12" / 24' x 16'
32	CERCIDIUM FLORIDUM DM	4" / 14' x 14'
33	CERCIDIUM FLORIDUM DM	3" / 12' X 12'
34	CERCIDIUM FLORIDUM DM	6" / 16' x 15'
35	CERCIDIUM FLORIDUM DM	4" / 14' x 16'
36	CERCIDIUM FLORIDUM DM	3" / 12' X 12'
37	CERCIDIUM FLORIDUM DM	4" / 14' x 14'
38	CERCIDIUM FLORIDUM DM	4" / 16' x 18'
39	CERCIDIUM FLORIDUM DM	3" / 12' x 10'
40	PROSOPIS CHILENSIS	5" / 16' x 16'
41	PROSOPIS CHILENSIS	4" / 14' x 14'
42	PROSOPIS CHILENSIS	4" / 12' x 14'
43	PROSOPIS CHILENSIS	3" / 12' x 12'
44	PROSOPIS CHILENSIS	4" / 10' x 10'
45	PROSOPIS CHILENSIS	3" / 8' x 10'
46	CERCIDIUM FLORIDUM DM	6" / 18' x 18'
47	CERCIDIUM FLORIDUM DM	6" / 16' X 16'
48	CERCIDIUM FLORIDUM DM	6" / 18' x 20'
49	CERCIDIUM FLORIDUM DM	4" / 12' x 16'
50	CERCIDIUM FLORIDUM DM	4" / 12' X 14'
51	CERCIDIUM FLORIDUM DM	3" / 12' x 10'
52	CERCIDIUM FLORIDUM DM	4" / 14' x 14'
53	CERCIDIUM FLORIDUM DM	7" / 18' x 18'
54	CERCIDIUM FLORIDUM DM	4" / 14' x 14'
55	CERCIDIUM FLORIDUM DM	5" / 16' x 16'
56	CERCIDIUM FLORIDUM DM	7" / 18' x 16'

AREA 15 INVENTORY LEGEND

TREE NUMBER	SPECIES	CALIPER / HEIGHT x WIDTH
01	BRACHYCHITON POPULNEUS	16" / 30' x 25'
02	GLEDITSIA TRIACANTHOS	18" /30' x 30'
03	CERCIDIUM FLORIDUM DM	4" / 14' x 14'
04	CERCIDIUM FLORIDUM DM	4" / 14' x 14'
05	GLEDITSIA TRIACANTHOS	16" / 18' x 18'
06	GLEDITSIA TRIACANTHOS	16" / 30' x 25'
07	PROSOPIS CHILENSIS	4" / 12' x 14'
08	PROSOPIS CHILENSIS	7" / 14' x 14'
09	PROSOPIS CHILENSIS	6" / 14' x 12'
10	PROSOPIS CHILENSIS	6" / 14' x 16'
11	DALBERGIA SISSOO	5" / 14' x 17'
12	CERCIDIUM FLORIDUM DM	7" / 18' x 18'
13	CERCIDIUM FLORIDUM DM	7" / 18' x 18'
14	CERCIDIUM FLORIDUM DM	6" / 16' x 14'
15	CERCIDIUM FLORIDUM DM	4" / 16' x 16'
16	CERCIDIUM FLORIDUM DM	6" / 18' x 18'
17	CERCIDIUM FLORIDUM DM	4" / 16' x 14'
18	CERCIDIUM FLORIDUM DM	5" / 18' x 16'
19	CERCIDIUM FLORIDUM DM	4" / 14' x 14'
20	CERCIDIUM FLORIDUM DM	4" / 14' x 14'
21	CERCIDIUM FLORIDUM DM	4" / 14' x 12'
22	CERCIDIUM FLORIDUM DM	5" / 16' x 14'
23	CERCIDIUM FLORIDUM DM	3" / 14' X 12'
24	CERCIDIUM FLORIDUM DM	4" / 14' x 12'
25	CERCIDIUM FLORIDUM DM	4" / 14' x 12'
26	CERCIDIUM FLORIDUM DM	4" / 14' x 12'
27	CERCIDIUM FLORIDUM DM	4" / 14' x 12'
28	PROSOPIS CHILENSIS	4" / 14' x 12'
29	PROSOPIS CHILENSIS	4" / 14' x 12'
30	CERCIDIUM FLORIDUM DM	4" / 14' x 14'
31	CERCIDIUM FLORIDUM DM	3" / 12' x 12'
32	CERCIDIUM FLORIDUM DM	3" / 12' x 10'
33	CERCIDIUM FLORIDUM DM	3" / 14' X 10'
34	CERCIDIUM FLORIDUM DM	3" / 12' x 8'
35	CERCIDIUM FLORIDUM DM	3" / 12' x 10'
36	CERCIDIUM FLORIDUM DM	3" / 12' X 10'
37	PROSOPIS CHILENSIS	4" / 14' x 12'
38	PROSOPIS CHILENSIS	3" / 12' x 10'
39	PROSOPIS CHILENSIS	3" / 12' x 10'
40	PROSOPIS CHILENSIS	3" / 12' x 8'
41	PROSOPIS CHILENSIS	3" / 12' x 8'
42	PROSOPIS CHILENSIS	2" / 8' x 8'
43	PROSOPIS CHILENSIS	3" / 8' x 8'
44	PROSOPIS CHILENSIS	3" / 12 x 12'
45	PROSOPIS CHILENSIS	4" / 12' x 12'
46	PROSOPIS CHILENSIS	4" / 12' x 8'
47	PROSOPIS CHILENSIS	6" / 14' x 12'
48	PROSOPIS CHILENSIS	3" / 12' x 10'
49	PROSOPIS CHILENSIS	4" / 14' x 12'
50	PROSOPIS CHILENSIS	4" / 12' x 10'
51	PROSOPIS CHILENSIS	3" / 12' x 8'
52	PROSOPIS CHILENSIS	3" / 12' x 12'
53	PROSOPIS CHILENSIS	4" / 14' x 10'
54	ROSOPIS CHILENSIS	4" / 14' x 12'
55	PROSOPIS CHILENSIS	6" / 14' x 12'
56	PROSOPIS CHILENSIS	6" / 14' x 12'
57	PROSOPIS CHILENSIS	5" / 14' x 12'
58	PROSOPIS CHILENSIS	4" / 14' x 10'
59	PROSOPIS CHILENSIS	2" / 6' x 6'
60	PROSOPIS CHILENSIS	6" / 12' x 14'
61	PROSOPIS CHILENSIS	8" / 14' x 14'
62	PROSOPIS CHILENSIS	4" / 14' x 14'
63	PROSOPIS CHILENSIS	4" / 14' x 12'
64	PROSOPIS CHILENSIS	4" / 12' x 12'
65	PROSOPIS CHILENSIS	4" / 14' X 12'
66	PROSOPIS CHILENSIS	4" / 16' x 14'
67	PROSOPIS CHILENSIS	3" / 16' x 12'
68	PROSOPIS CHILENSIS	4" / 12' x 12'
69	PROSOPIS CHILENSIS	5" / 14' x 10'
70	PROSOPIS CHILENSIS	3" / 12' x 10'
71	PROSOPIS CHILENSIS	3" / 12' x 10'
72	PROSOPIS CHILENSIS	4" / 14' x 12'
73	PROSOPIS CHILENSIS	4" / 14' x 12'
74	PROSOPIS CHILENSIS	3" / 12' x 10'
75	PROSOPIS CHILENSIS	2" / 8' x 6'

BLOCK 5 SCALE 1" = 40'

OWNER
BANNER HEALTH
1441 NORTH 12TH STREET
PHOENIX, AZ 85006

ARCHITECT
HKS INC
821 NORTH CENTRAL AVENUE
PHOENIX, AZ 85004-2004
602.462.0966

CIVIL ENGINEER
DIBBLE ENGINEERING
7500 NORTH DREAMY DRAW DRIVE, #200
PHOENIX, AZ 85020
602.957.1155

LANDSCAPE ARCHITECT
SITE DESIGN, LLC
6939 EAST CHAPARRAL ROAD
PARADISE VALLEY, AZ 85253-7000
480.219.4559

LAND-USE ATTORNEY
LAZARUS, SILVYN, & BANGS, P.C.
420 WEST ROOSEVELT STREET
PHOENIX, AZ 85003
602.340.0900

BANNER UNIVERSITY MEDICAL CENTER
PHOENIX CAMPUS
PLANNED UNIT DEVELOPMENT

REGISTERED LANDSCAPE ARCHITECT CERTIFICATE NO. 32932 DREW AGUILINA ARIZONA U.S.A. EXPIRES: 9/30/2019 09/18

KEY PLAN

REVISION

HKS PROJECT NUMBER
16626.319
DATE
08/03/18
ISSUE

SHEET TITLE
BLOCK 5 PLAN

SHEET NO.
L07.8
7 OF 8

KEY MAP

SITE DESIGN
6939 E. Chaparral Road
Scottsdale, Arizona 85253
Phone 480-219-4559
mail@sitedesignla.com

CALL TWO WORKING DAYS BEFORE YOU DIG
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

NORTH
0 20 40 80

PLOT DATE
7/12/2018 3:16:00 PM TEMPLATE VERSION 3.0.20170803

AREA 16 INVENTORY LEGEND

TREE NUMBER	SPECIES	CALIPER / HEIGHT x WIDTH
01	GLEDITSIA TRIACANTHOS	10" / 24' x 24'
02	GLEDITSIA TRIACANTHOS	12" / 24' x 24'
03	GLEDITSIA TRIACANTHOS	14" / 24' x 24'
04	GLEDITSIA TRIACANTHOS	14" / 24' x 24'
05	GLEDITSIA TRIACANTHOS	12" / 24' x 24'
06	GLEDITSIA TRIACANTHOS	10" / 24' x 24'
07	GLEDITSIA TRIACANTHOS	14" / 24' x 24'
08	GLEDITSIA TRIACANTHOS	10" / 24' x 24'
09	GLEDITSIA TRIACANTHOS	12" / 24' x 24'
10	GLEDITSIA TRIACANTHOS	14" / 24' x 24'
11	GLEDITSIA TRIACANTHOS	10" / 24' x 24'
12	PROSOPIS CHILENSIS	4" / 14' x 14'
13	GLEDITSIA TRIACANTHOS	14" / 24' x 24'
14	GLEDITSIA TRIACANTHOS	14" / 24' x 24'
15	GLEDITSIA TRIACANTHOS	14" / 24' x 24'
16	GLEDITSIA TRIACANTHOS	10" / 24' x 24'
17	GLEDITSIA TRIACANTHOS	12" / 24' x 24'
18	GLEDITSIA TRIACANTHOS	12" / 24' x 24'
19	GLEDITSIA TRIACANTHOS	12" / 24' x 24'
20	GLEDITSIA TRIACANTHOS	12" / 24' x 24'
21	PROSOPIS CHILENSIS	2" / 9' x 7'
22	PROSOPIS CHILENSIS	2" / 9' x 7'
23	CERCIDIUM FLORIDUM DM	2" / 8' x 6'
24	CERCIDIUM FLORIDUM DM	2" / 8' x 6'
25	PROSOPIS CHILENSIS	2" / 9' x 7'
26	PROSOPIS CHILENSIS	2" / 9' x 7'
27	PROSOPIS CHILENSIS	2" / 9' x 7'
28	CERCIDIUM FLORIDUM DM	2" / 8' x 6'
29	CERCIDIUM FLORIDUM DM	2" / 8' x 6'
30	CERCIDIUM FLORIDUM DM	2" / 8' x 6'
31	PROSOPIS CHILENSIS	2" / 9' x 7'
32	PROSOPIS CHILENSIS	2" / 9' x 7'
33	PROSOPIS CHILENSIS	2" / 9' x 7'
34	CERCIDIUM FLORIDUM DM	2" / 8' x 6'
35	CERCIDIUM FLORIDUM DM	2" / 8' x 6'
36	CERCIDIUM FLORIDUM DM	2" / 8' x 6'
37	CERCIDIUM FLORIDUM DM	2" / 8' x 6'
38	CERCIDIUM FLORIDUM DM	2" / 8' x 6'
39	CERCIDIUM FLORIDUM DM	2" / 8' x 6'
40	CERCIDIUM FLORIDUM DM	2" / 8' x 6'
41	CERCIDIUM FLORIDUM DM	2" / 8' x 6'
42	CERCIDIUM FLORIDUM DM	2" / 8' x 6'
43	CERCIDIUM FLORIDUM DM	2" / 8' x 6''

BLOCK 6 SCALE 1" = 40'

AREA 13 INVENTORY LEGEND

TREE NUMBER	SPECIES	CALIPER / HEIGHT x WIDTH
01	CERCIDIUM PRAECOX	7" / 24' x 18'
02	CERCIDIUM PRAECOX	8" / 20' x 20'
03	CERCIDIUM PRAECOX	8" / 24' x 24'
04	CERCIDIUM PRAECOX	8" / 16' x 16'
05	CERCIDIUM PRAECOX	8" / 24' x 24'
06	CERCIDIUM PRAECOX	12" / 24' x 30'
07	CERCIDIUM PRAECOX	9" / 24' x 30'
08	CERCIDIUM PRAECOX	9" / 20' x 24'
09	CERCIDIUM PRAECOX	8" / 20' x 24'
10	CERCIDIUM PRAECOX	8" / 20' x 24'
11	CERCIDIUM PRAECOX	8" / 20' x 30'
12	CERCIDIUM PRAECOX	8" / 24' x 20'
13	CERCIDIUM PRAECOX	9" / 24' x 20'
14	CERCIDIUM PRAECOX	8" / 24' x 24'
15	CERCIDIUM PRAECOX	9" / 24' x 30'
16	CERCIDIUM PRAECOX	8" / 24' x 24'
17	CERCIDIUM FLORIDUM DM	6" / 18' x 16'
18	CERCIDIUM FLORIDUM DM ML	5" / 18' x 8'
19	CERCIDIUM PRAECOX	8" / 24' x 24'
20	CERCIDIUM FLORIDUM DM	6" / 24' x 20'
21	CERCIDIUM PRAECOX	7" / 18' x 18'
22	CERCIDIUM PRAECOX	8" / 24' x 24'
23	CERCIDIUM PRAECOX	8" / 20' x 24'
24	CERCIDIUM PRAECOX	6" / 20' x 20'
25	CERCIDIUM PRAECOX	7" / 24' x 24'
26	FOUQUIERIA SPLENDENS	15'H
27	FOUQUIERIA SPLENDENS	15'H
28	WASHINGTON ROBUSTA	20H
29	WASHINGTON ROBUSTA	50'H
30	WASHINGTON ROBUSTA	40'H
31	PROSOPIS CHILENSIS	24" / 30' x 30'
32	PROSOPIS CHILENSIS	8" / 16' x 20'
33	PROSOPIS CHILENSIS	8" / 20' x 24'
34	PROSOPIS CHILENSIS	3" / 12' x 16'
35	PROSOPIS CHILENSIS	6" / 16' x 18'
36	PROSOPIS CHILENSIS ML	18" / 30' x 60'
37	PROSOPIS CHILENSIS	30" / 30' x 70'
38	PROSOPIS CHILENSIS	24" / 30' x 35'
39	PROSOPIS CHILENSIS	5" / 16' x 16'
40	PROSOPIS CHILENSIS	4" / 18' x 18'
41	PROSOPIS CHILENSIS	5" / 16' x 16'
42	ACACIA SALICINA	16" / 35' x 20'
43	ACACIA SALICINA	10" / 24' x 20'
44	PROSOPIS CHILENSIS	6" / 20' x 18'
45	PROSOPIS CHILENSIS	6" / 16' x 16'
46	PROSOPIS CHILENSIS	6" / 16' x 16'
47	EUCALYPTUS MICROTHECA	16" / 45' x 25'
48	PROSOPIS CHILENSIS	5" / 15' x 18'
49	OLNEYA TESOTAML	6" / 18' x 18'
50	OLNEYA TESOTA	6" / 18' x 18'
51	OLNEYA TESOTA	9" / 24' x 30'
52	OLNEYA TESOTA	8" / 24' x 24'
53	CHILIOPSIS LINEARIS	2" / 12' x 10'
54	DALBERGIA SISSOO	12" / 36' x 30'
55	PROSOPIS CHILENSIS	4" / 16' x 16'
56	PROSOPIS CHILENSIS	9" / 24' x 24'
57	PROSOPIS CHILENSIS	6" / 24' x 20'
58	PROSOPIS CHILENSIS	8" / 24' x 20'
59	PROSOPIS CHILENSIS ML	6" / 18' x 20'
60	PROSOPIS CHILENSIS	8" / 16' x 24'
61	PROSOPIS CHILENSIS	6" / 18' x 24'
62	PROSOPIS CHILENSIS	6" / 18' x 18'
63	PROSOPIS CHILENSIS	8" / 24' x 24'
64	PROSOPIS CHILENSIS	8" / 16' x 20'
65	PROSOPIS CHILENSIS	3" / 14' x 14'
66	WASHINGTON ROBUSTA	30'H

KEY MAP

SITE DESIGN
6939 E. Chaparral Road
Scottsdale, Arizona 85253
Phone 480-219-4559
mail@sitedesignla.com

CALL TWO WORKING DAYS BEFORE YOU DIG
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

NORTH
0 20 40 80

HKS

OWNER
BANNER HEALTH
1441 NORTH 12TH STREET
PHOENIX, AZ 85006

ARCHITECT
HKS INC
821 NORTH CENTRAL AVENUE
PHOENIX, AZ 85004-2004
602.462.0966

CIVIL ENGINEER
DIBBLE ENGINEERING
7500 NORTH DREAMY DRAW DRIVE, #200
PHOENIX, AZ 85020
602.957.1155

LANDSCAPE ARCHITECT
SITE DESIGN, LLC
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PARADISE VALLEY, AZ 85253-7000
480.219.4559

LAND-USE ATTORNEY
LAZARUS, SILVYN, & BANGS, P.C.
420 WEST ROOSEVELT STREET
PHOENIX, AZ 85003
602.340.0900

BANNER UNIVERSITY MEDICAL CENTER
PHOENIX CAMPUS
PLANNED UNIT DEVELOPMENT

REGISTERED LANDSCAPE ARCHITECT
CERTIFICATE NO.
32932
DREW AGUILINA
ARIZONA, U.S.A.
EXPIRES 9/30/2019

KEY PLAN

REVISION

HKS PROJECT NUMBER
16626.319
DATE
08/03/18
ISSUE

SHEET TITLE
BLOCK 6 PLAN

SHEET NO.
L08.8
8 OF 8

PLOT DATE
7/12/2018 5:18:00 PM TEMPLATE VERSION 3.0.D.20170620

EXHIBIT 14

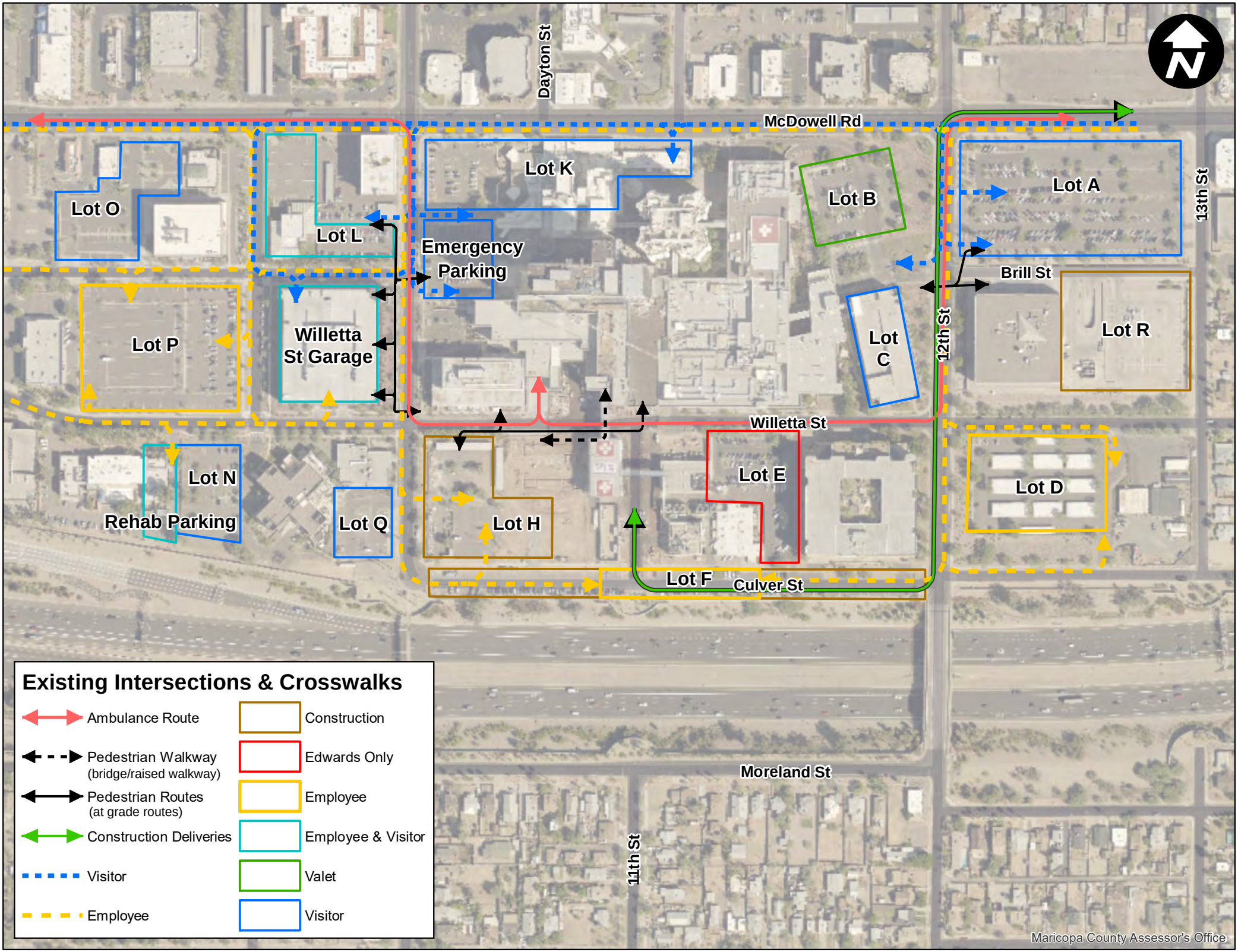
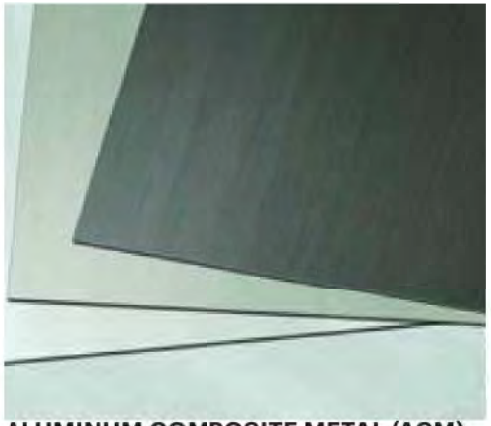

Dayton St
McDowell Rd
Lot K
Lot B
Lot A
13th St
Lot O
Lot L
Emergency Parking
Brill St
Lot P
Willetta St Garage
Lot C
12th St
Lot R
Willetta St
Lot E
Lot D
Lot N
Rehab Parking
Lot Q
Lot H
Lot F
Culver St
Moreland St
11th St
Maricopa County Assessor's Office
Existing Intersections & Crosswalks
Ambulance Route
Pedestrian Walkway (bridge/raised walkway)
Pedestrian Routes (at grade routes)
Construction Deliveries
Visitor
Employee
Construction
Edwards Only
Employee
Employee & Visitor
Valet
Visitor

EXHIBIT 15

IU BLOCK (BANNER BLOCK)
LIGHT MASONRY
DARK MASONRY



ALUMINUM COMPOSITE METAL (ACM) PANELS
FASCIA / CANOPIES

FINISHED METAL
ALUMINUM LASER CUT PANELS
METAL AT WINDOWS

FINISHED METAL
DOOR AND WINDOW FRAMES

ONCRETE
SPECIALTY CONCRETE FINISH

EXTERIOR INSULATED FINISH SYSTEM (EIFS)
EIFS LIGHT

GLASS
VISION
SPANDREL

GLASS
ACCENT GLAZING (VISION)
ACCENT GLAZING (SPANDREL)

Banner University Medical Center
Phoenix Campus

COLOR AND MATERIAL ARCHITECTURAL LANGUAGE

PLANNED UNIT DEVELOPMENT

LSB HKS

EXHIBIT 16

LEGEND

- APS Fixture -(APS)
- Old Style - Shoe Box/Drop Lens -(OB, LAT,PL)
- Roof Mounted Flood -(ROOF)
- New Good Sam Standard -(NB)

01 PHOTOMETRIC SITE PLAN - ELECTRICAL
SCALE: 1/64" = 1'-0"

PROJECT NUMBER:
714400

wsp
1737 E. Washington Street
Suite B
Phoenix, AZ 85034
phone: 602.254.0561
fax: 602.254.0574

Banner Good Samaritan Medical Center

OWNER
BANNER HEALTH
1441 NORTH 12TH STREET
PHOENIX, AZ 85006

FACILITY ADDRESS
BANNER GOOD SAMARITAN MEDICAL CENTER
1111 E. MCDOWELL RD.
PHOENIX, AZ 85006

EXHIBIT 17

10th Street Reconfiguration

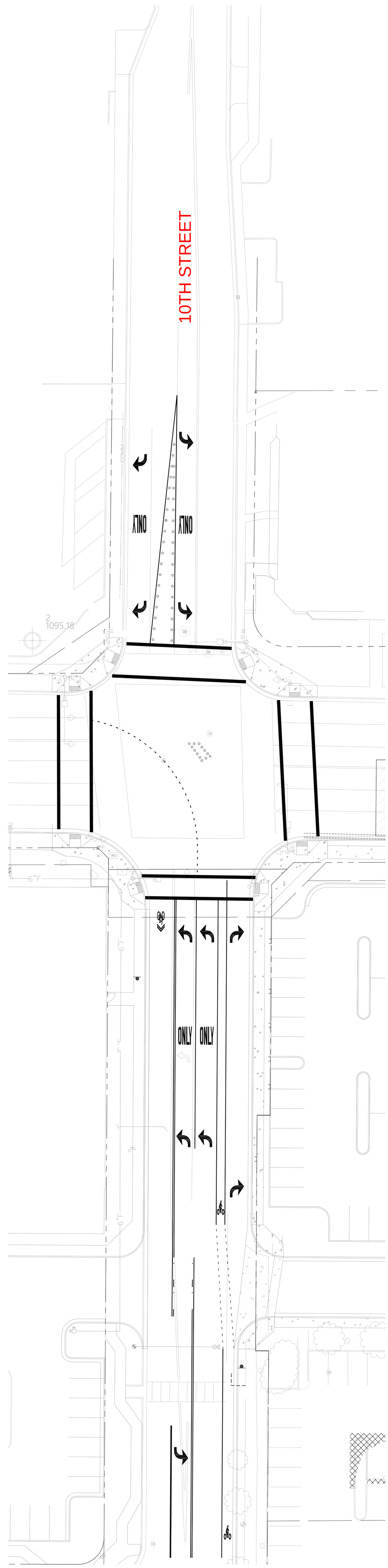
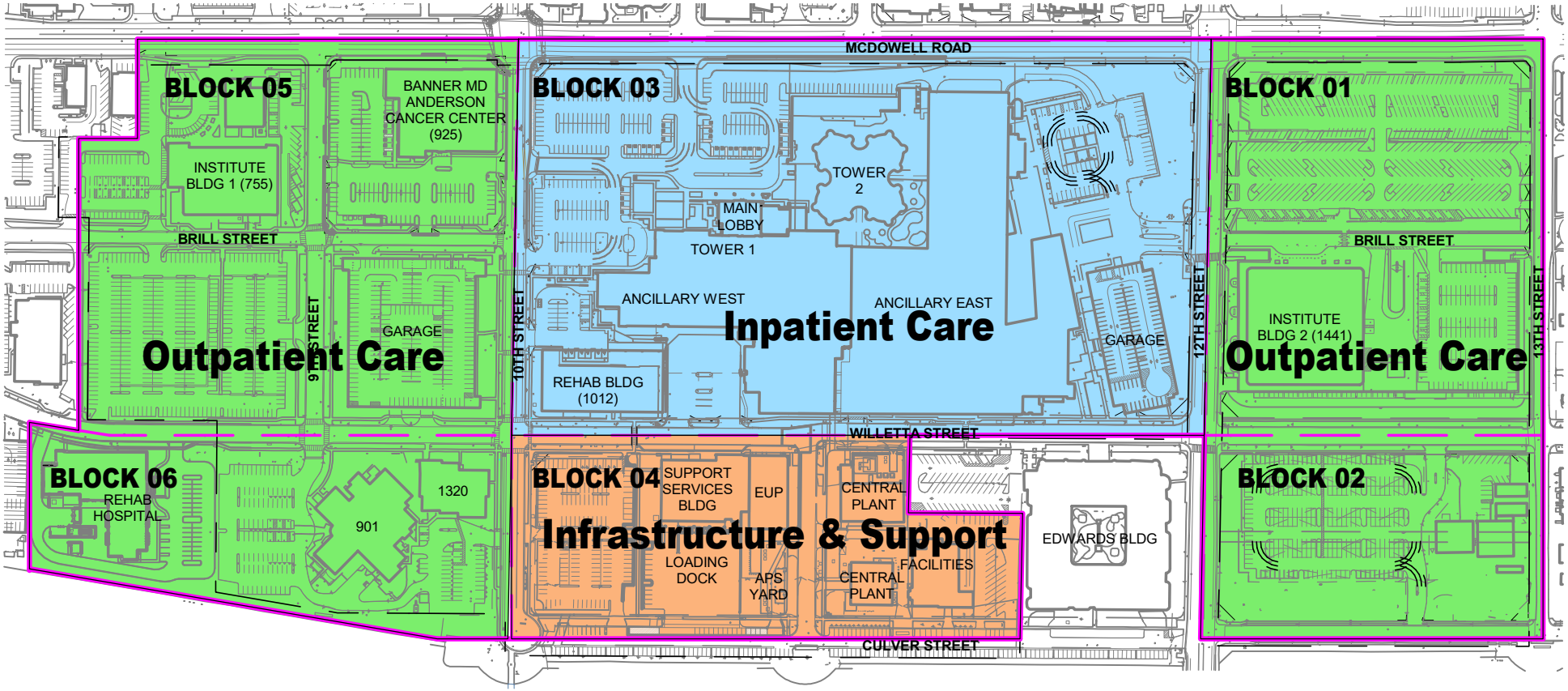


EXHIBIT 18



Banner University Medical Center
Phoenix Campus

GENERAL LAYOUT OF CAMPUS

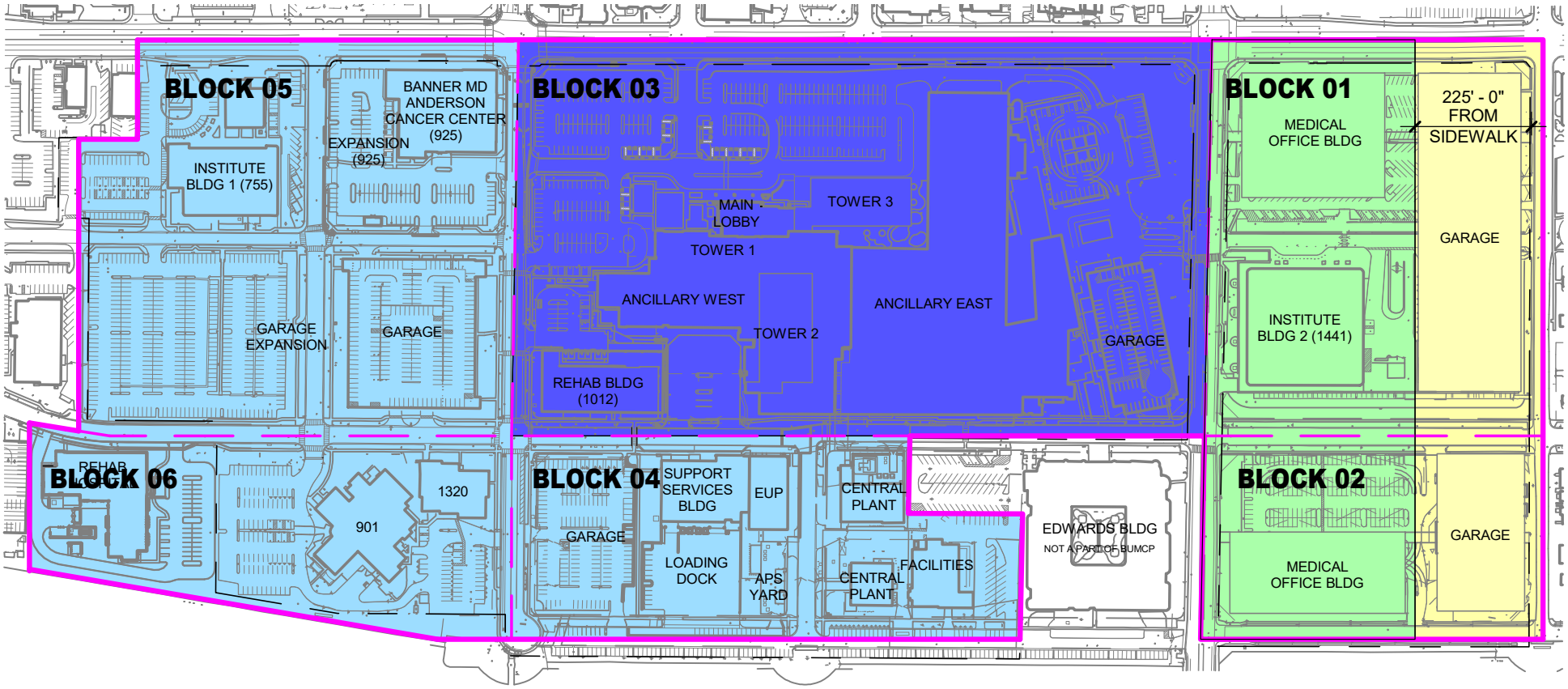
0 150 300 FT

A1.10

PLANNED UNIT DEVELOPMENT

LSB HKS

EXHIBIT 19



Banner University Medical Center
Phoenix Campus

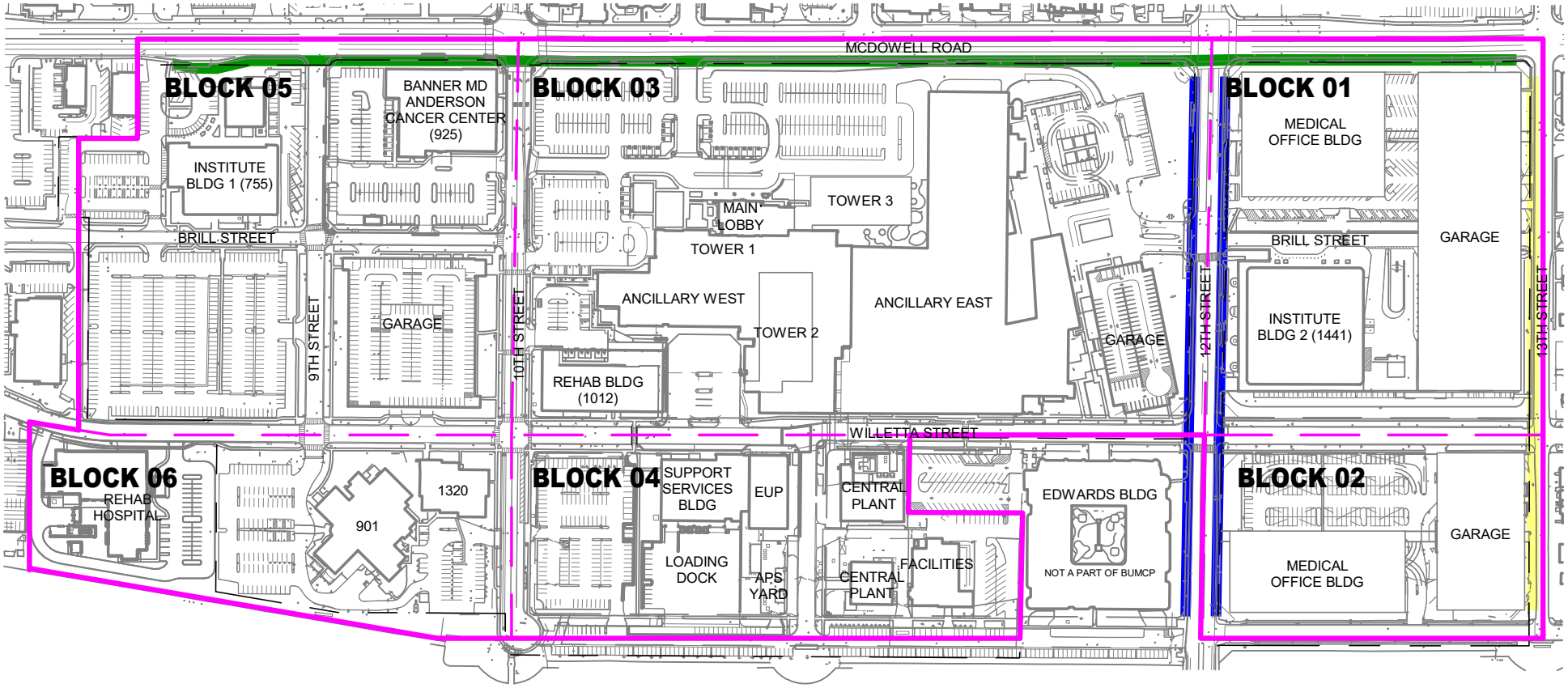
BUILDING HEIGHT STANDARDS

0 150 300 FT

A1.07

PLANNED UNIT DEVELOPMENT

LSB HKS



16' MIN SETBACK
10' MIN SETBACK
20' MIN SETBACK

Banner University Medical Center
Phoenix Campus

BUILDING SETBACKS

0 150 300 FT

A1.13

PLANNED UNIT DEVELOPMENT

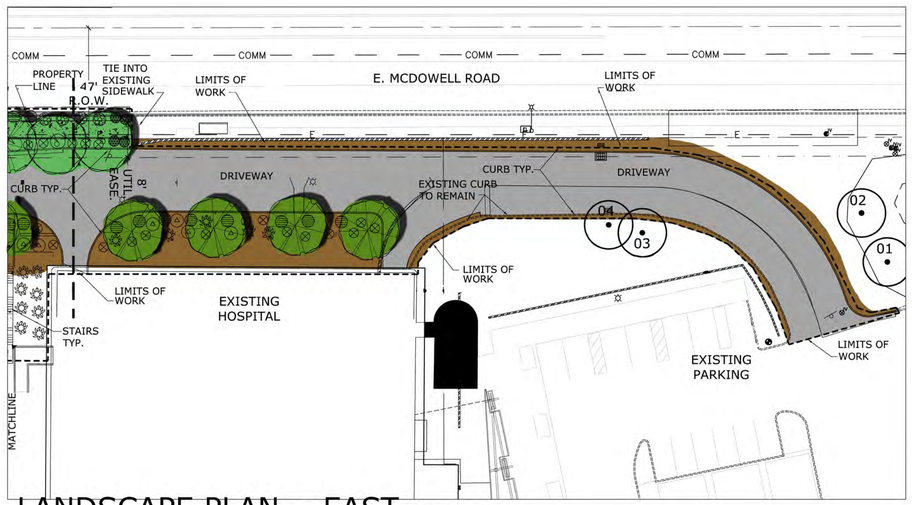
LSB HKS

EXHIBIT 20

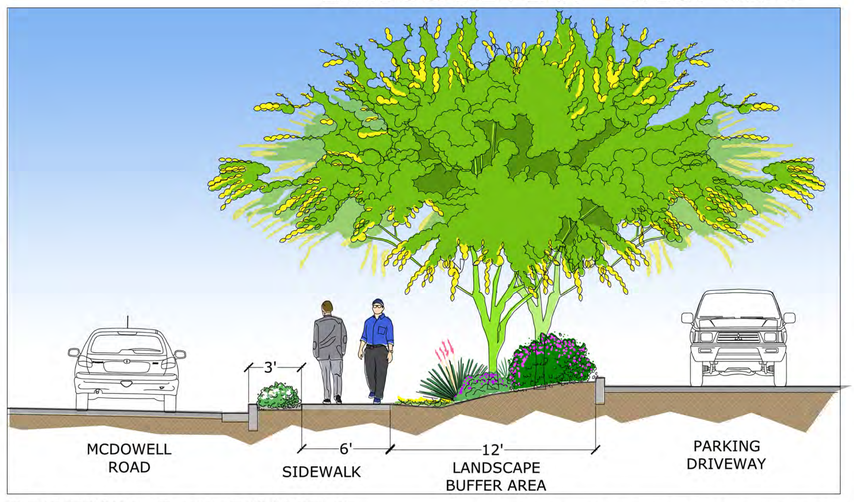
PLOT DATE:

TEMPLATE VERSION:

LANDSCAPE PLAN - WEST SCALE 1" = 30'



LANDSCAPE PLAN - EAST SCALE 1" = 30'



SECTION @ McDOWELL SCALE 1" = 4'

LANDSCAPE - PARKING LOT AND RING ROAD

PLANT LEGEND

TREES	SPECIES	SIZE/QTY
	TREES MIN. 10' FROM PIPES & POLE LIGHTS - FIELD VERIFY	
	CERCIDIUM HYBRID AZT THORNLESS PALO BREA	4"CAL./7 3"CAL./10 2"CAL./38 1"CAL/20
	PROSOPIS THORNLESS HYBRID AZT THORNLESS MESQUITE	4"CAL./2 2"CAL./37 1"CAL./14
	OLNEYA TESOTA IRONWOOD	4"CAL./4
	EXISTING TREES TO REMAIN	13

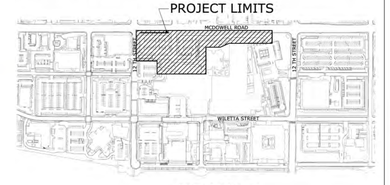
SHRUBS	QTY/SIZE
ALOE FEROX CAPE ALOE	52/5 GAL.
EMEROPHILA MACULATA VALENTINE BUSH	25/5 GAL.
FEIJOA SELLOWIANA	6/ 5 GAL.
PINEAPPLE GUAVA HESPERALOE PARVIFLORA	114/ 5 GAL.
RED YUCCA (HESPERALOE PLANTED MIN 4' FROM SIDEWALK)	
LEUCOPHYLLUM FRUTESCENS 'GREEN CLOUD'	28/5 GAL.
LEUCOPHYLLUM LAEVIGATUM CHIHUAHUAN SAGE	136/ 5 GAL.
MUHLENBERGIA CAPILARIS REGAL MIST	26/ 5 GAL.
NERIUM OLEANDER HYBRIDS DWARF OLEANDER	233/ 5 GAL.
PHOENIX ROEBELENII PYGMY PALM	18/ 5 GAL.
PLUMBAGO AURICULATA CAPE PLUMBAGO	27/ 5 GAL.
PORTULACARIA AFRA ELEPHANT BUSH	22/ 5 GAL.
ROSMARINUS OFFICINALIS BUSH ROSEMARY	84/ 5 GAL.
RUELLIA BRITTONIANA RUELLIA	90/ 5 GAL.
SANSEVIERIA TRIFASCIATA SNAKE PLANT	48/ 5 GAL.

GROUNDCOVERS & VINES	
CONVOLVULUS CNOREM BUSH MORNING GLORY	84/ 5 GAL.
LANTANA SPECIES GOLD LANTANA	210/ 5 GAL.
LANTANA SPECIES PURPLE LANTANA	93/ 5 GAL.
LANTANA SPECIES PURPLE/WHITE (2 OF EACH)	150(4)-1 GAL.
WEDELIA TRILOBATA YELLOW DOT	55/ 5 GAL.

LANDSCAPE MATERIALS

3/4" SCREENED MOUNTAIN VISTA BROWN
2" DEPTH, DECOMPOSED GRANITE
IN NON-PAVED AREAS

PROJECT LIMITS



KEY MAP

NORTH

0 15 30 60

HKS

ARCHITECT
HKS, INC.
821 NORTH CENTRAL AVENUE
PHOENIX, AZ 85004

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DIBBLE ENGINEERING
ADRIAN CARVAJAL
ADRIAN.CARVAJAL@DIBBLECORP.COM
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PHOENIX, AZ 85020

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602.219.4559 MAIL@SITEDESIGNLA.COM

STRUCTURAL ENGINEER
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PHOENIX, AZ 85004

MEP ENGINEER
CCRD PARTNERS
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602.254.0561

Banner University Medical Center
Phoenix Campus

LOBBY EXPANSION

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STEVE.EISS@BANNERHEALTH.COM

FACILITY ADDRESS
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1111 EAST MCDOWELL ROAD
PHOENIX, AZ 85006

REGISTERED LANDSCAPE ARCHITECT
CERTIFICATE NO. 32932
DREW AGUILINA
Date Signed
ARIZONA, U.S.A.
EXPIRES 9/30/2019

REVISION NO. | DESCRIPTION | DATE
DELTA 2

HKS PROJECT NUMBER
16626.303
DATE
07/31/19
ISSUE
ISSUE FOR CONSTRUCTION
SHEET TITLE
McDOWELL LANDSCAPE BUFFER
SHEET NO.
L1.3

SITE DESIGN
6939 E. Chaparral Road
Scottsdale, Arizona 85253
Phone 480-219-4559
mail@sitedesignla.com

Plant Image Board for Banner Tower and Lobby Parking

THORNLESS MESQUITE

PALO BREA

IRONWOOD

CHIHUAHUAN SAGE

GREEN CLOUD SAGE

DWARF OLEANDER

PROSTRATE ROSEMARY

WHITE LANTANA

PURPLE LANTANA

GOLD LANTANA

HESPERALOE

ALOE FEROX

VALENTINE BUSH

RUELLIA

PINEAPPLE GUAVA

BUSH MORNING GLORY

PYGMY PALM

REGAL MIST

SNAKE PLANT

ELEPHANT BUSH

YELLOW DOT

Date: Feb 17, 2019 - 4:22pm User:dagulina Drawing File: C:\Users\dagulina\Documents\SITE DESIGN\2018-Job Master\18-126 BUMCP TOWER\SHEET-L3-3 PLANT IMAGE BOARD.dwg

PLOT DATE:

TEMPLATE VERSION:

HKS

ARCHITECT
HKS, INC.
821 NORTH CENTRAL AVENUE
PHOENIX, AZ 85004

CIVIL ENGINEER
LITTLEJOHN ENGINEERING ASSOCIATES
7227 NORTH 16TH ST., , SUITE 140
PHOENIX, AZ 85020
602.241.0782

LANDSCAPE ARCHITECT
SITE DESIGN, L.L.C.
6939 EAST CHAPARRAL RD.
PARADISE VALLEY, AZ 85253
602.219.4559

STRUCTURAL ENGINEER
HKS, INC.
821 NORTH CENTRAL AVENUE
PHOENIX, AZ 85004

MEP ENGINEER
CCRD PARTNERS
1737 E. WASHINGTON ST, SUITE B
PHOENIX, AZ 85034
602.254.0561

Banner University Medical Center Phoenix Campus

OWNER
BANNER HEALTH
1441 NORTH 12TH STREET
PHOENIX, AZ 85006

FACILITY ADDRESS
BANNER GOOD SAMARITAN MEDICAL CENTER
1111 EAST MCDOWELL ROAD
PHOENIX, AZ 85006

REGISTERED LANDSCAPE ARCHITECT
CERTIFICATE NO.
32932
DREW AGUILINA
Date Signed
ARIZONA, U.S.A.
EXPIRES 9/30/2019

REVISION NO. | DESCRIPTION | DATE

HKS PROJECT NUMBER
16626.300

DATE
FEBRUARY 20, 2019

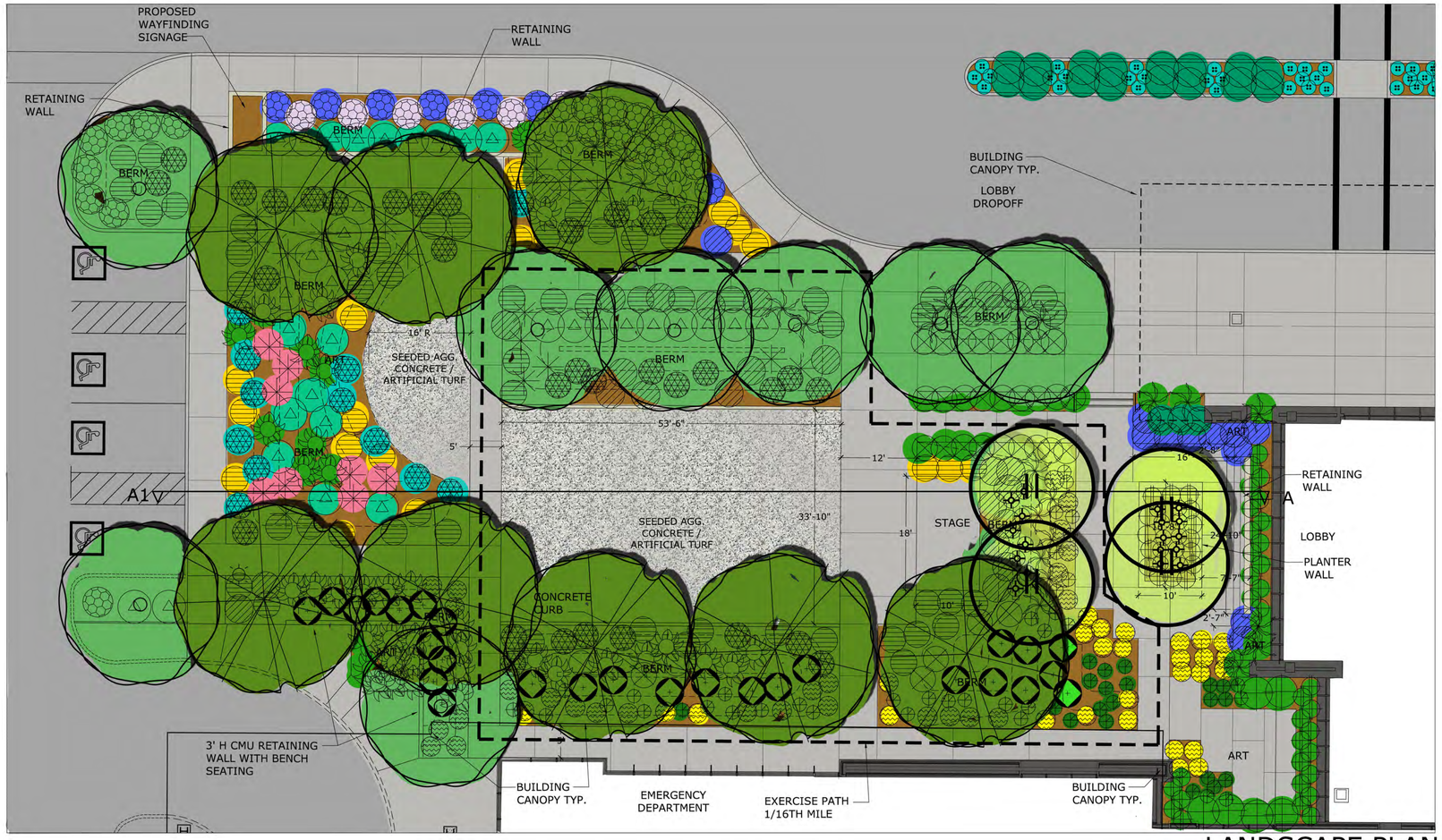
ISSUE
OWNER REVIEW

SHEET TITLE
PLANT IMAGE BOARD

SHEET NO.
L3.3

SITE DESIGN
6939 E. Chaparral Road
Scottsdale, Arizona 85253
Phone 480-219-4559
Fax 480-718-9073
mail@sitedesignla.com

EXHIBIT 21



PLOT DATE:

TEMPLATE VERSION:

SCALE 1" = 10'

LANDSCAPE PLAN

PLANT LEGEND

TREES

SPECIES	SIZE/QTY
CERCIDIUM HYBRID AZT THORNLESS PALO BREA	2"CAL./56 1"CAL./36
PROSOPIS THORNLESS HYBRID AZT THORNLESS MESQUITE	2"CAL./34 1"CAL./23
OLNEYA TESOTA IRONWOOD	3"CAL./4

SHRUBS

	QTY/SIZE
ALOE FEROX CAPE ALOE	52/5 GAL.
EMEROPHILA MACULATA VALENTINE BUSH	43/5 GAL.
FEIJOA SELLOWIANA PINEAPPLE GUAVA	6/ 5 GAL.
HESPERALOE PARVIFLORA RED YUCCA	121/ 5 GAL.
LEUCOPHYLLUM FRUTESCENS 'GREEN CLOUD'	28/5 GAL.
LEUCOPHYLLUM LAEVIGATUM CHIHUAHUAN SAGE	151/ 5 GAL.
MUHLENBERGIA CAPILARIS REGAL MIST	26/ 5 GAL.
NERIUM OLEANDER HYBRIDS DWARF OLEANDER	243/ 5 GAL.
PHOENIX ROEBELENII PYGMY PALM	18/ 5 GAL.
PLUMBAGO AURICULATA CAPE PLUMBAGO	27/ 5 GAL.
PORTULACARIA AFRA ELEPHANT BUSH	22/ 5 GAL.
ROSMARINUS OFFICINALIS BUSH ROSEMARY	84/ 5 GAL.
RUELLIA BRITTONIANA RUELLIA	90/ 5 GAL.
SANSEVIERIA TRIFASCIATA SNAKE PLANT	48/ 5 GAL.

GROUNDCOVERS & VINES

CONVOLVULUS CNOREM BUSH MORNING GLORY	84/ 5 GAL.
LANTANA SPECIES GOLD LANTANA	222/ 5 GAL.
LANTANA SPECIES PURPLE LANTANA	113/ 5 GAL.
LANTANA SPECIES PURPLE/WHITE (2 OF EACH)	153/ (4)-1 GAL.
WEDELIA TRILOBATA YELLOW DOT	55/ 5 GAL.

LANDSCAPE MATERIALS

🟫	3/4" SCREENED MOUNTAIN VISTA BROWN 2" DEPTH, DECOMPOSED GRANITE IN NON-PAVED AREAS

SCALE 1" = 20'

HARDSCAPE PLAN

SECTION /ELEVATION A-A1 (View South)

SCALE 1" = 10'

NOTE: DRIP IRRIGATION ADJUSTABLE PER SEASONAL PLANT MATERIAL

SEAT WALL WITH LIGHTED FRACTURED GLASS MULCH AT LOBBY WINDOW

KEY MAP

SITE DESIGN
6939 E. Chaparral Road
Scottsdale, Arizona 85253
Phone 480-219-4559
Fax 480-718-9073
mail@sitedesignla.com

HKS

ARCHITECT
HKS, INC.
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CIVIL ENGINEER
LITTLEJOHN ENGINEERING ASSOCIATES
7227 NORTH 16TH ST. , SUITE 140
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MEP ENGINEER
CCRD PARTNERS
1737 E. WASHINGTON ST, SUITE B
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BANNER GOOD SAMARITAN MEDICAL CENTER
1111 EAST MCDOWELL ROAD
PHOENIX, AZ 85006

32932
DREW
AQUILINA
Date Signed
EXPIRES 9/30/2019

REVISION NO.	DESCRIPTION	DATE

HKS PROJECT NUMBER
16626.300

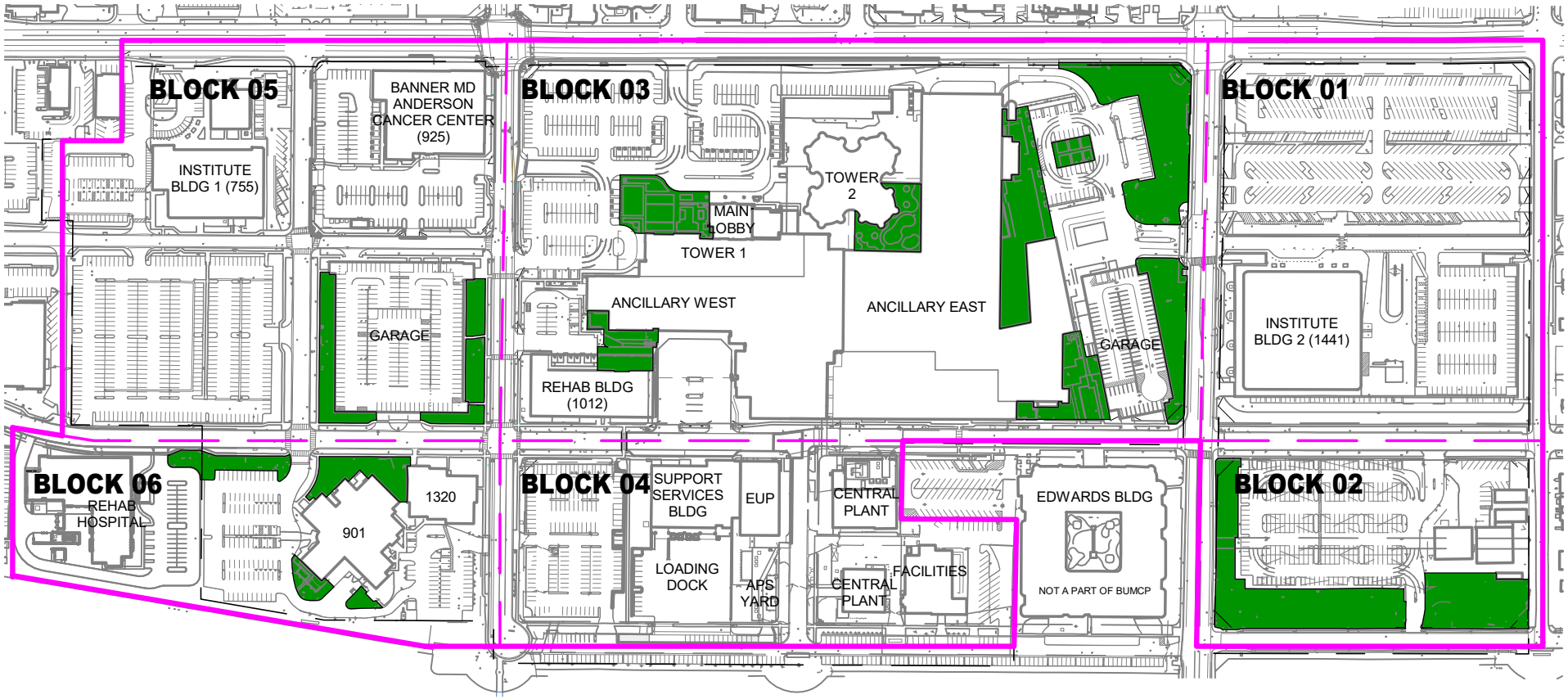
DATE
FEBRUARY 20, 2019

ISSUE
OWNER REVIEW

SHEET TITLE
BANNER PARK DETAIL PLAN

SHEET NO.
L2.3

EXHIBIT 22



Banner University Medical Center
Phoenix Campus

EXISTING OPEN SPACE/HEALING GARDENS AS OF MAY 2019

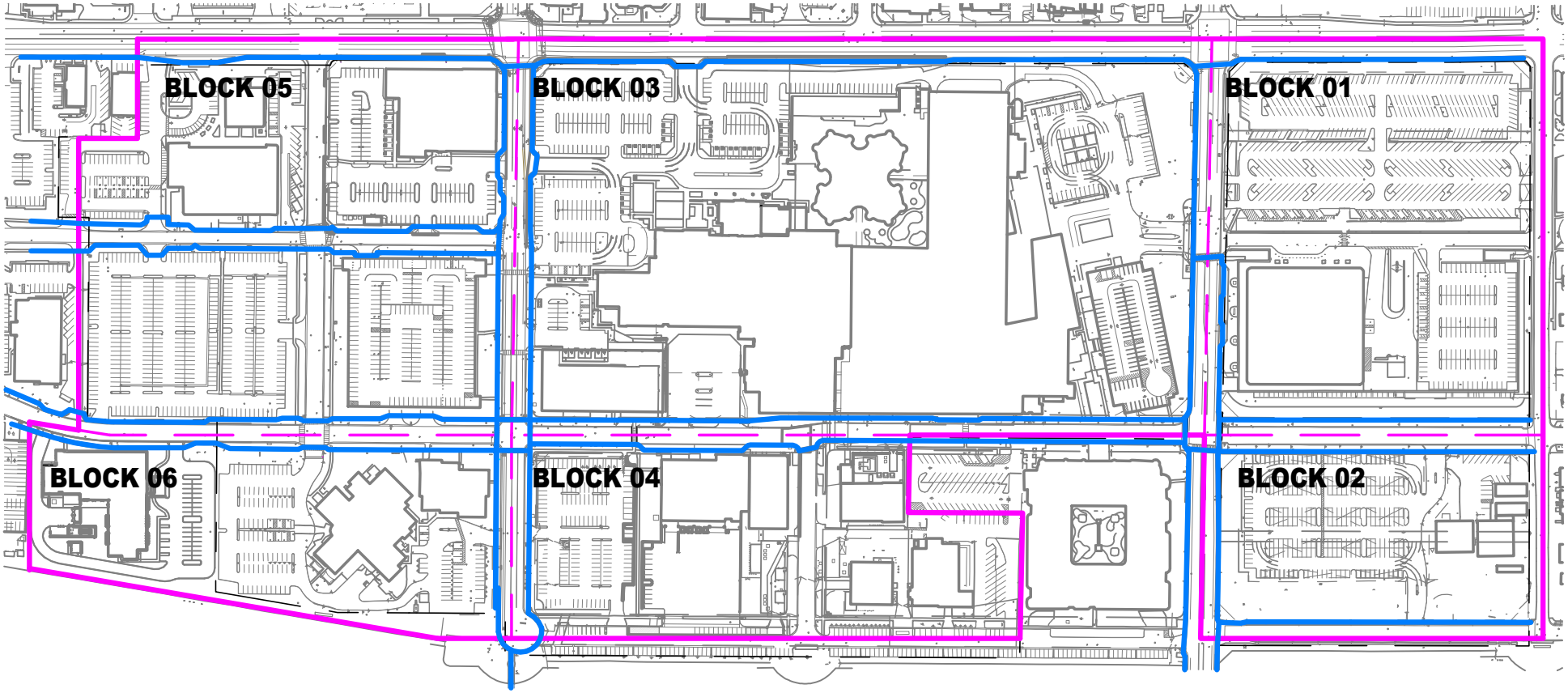
0 150 300 FT

A1.08

PLANNED UNIT DEVELOPMENT

LSB HKS

EXHIBIT 23



Banner University Medical Center
Phoenix Campus

PEDESTRIAN ACCESS FLOWS

0 150 300 FT

A1.11

PLANNED UNIT DEVELOPMENT

LSB HKS

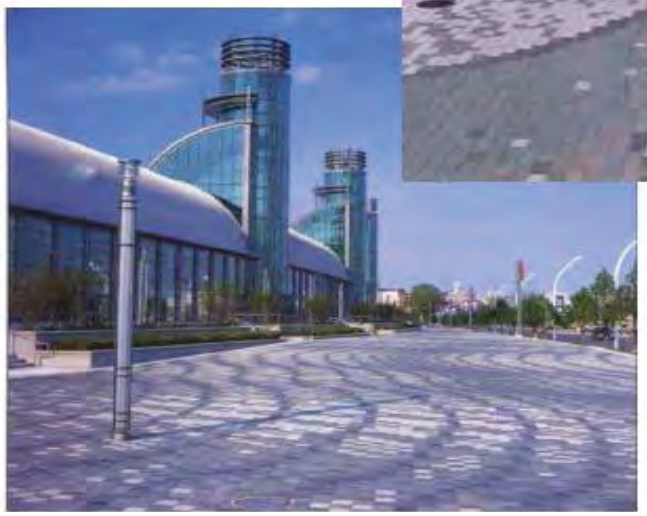
EXHIBIT 24

Banner University Medical Center
Phoenix Campus

CROSSWALK DESIGN MATERIALS - CONCRETE PAVING

PLANNED UNIT DEVELOPMENT

LSB HKS



Banner University Medical Center
Phoenix Campus

CROSSWALK DESIGN MATERIALS - CONCRETE PAVERS

PLANNED UNIT DEVELOPMENT

LSB HKS

Banner University Medical Center
Phoenix Campus

CROSSWALK DESIGN MATERIALS - LITHOCRETE PAVING

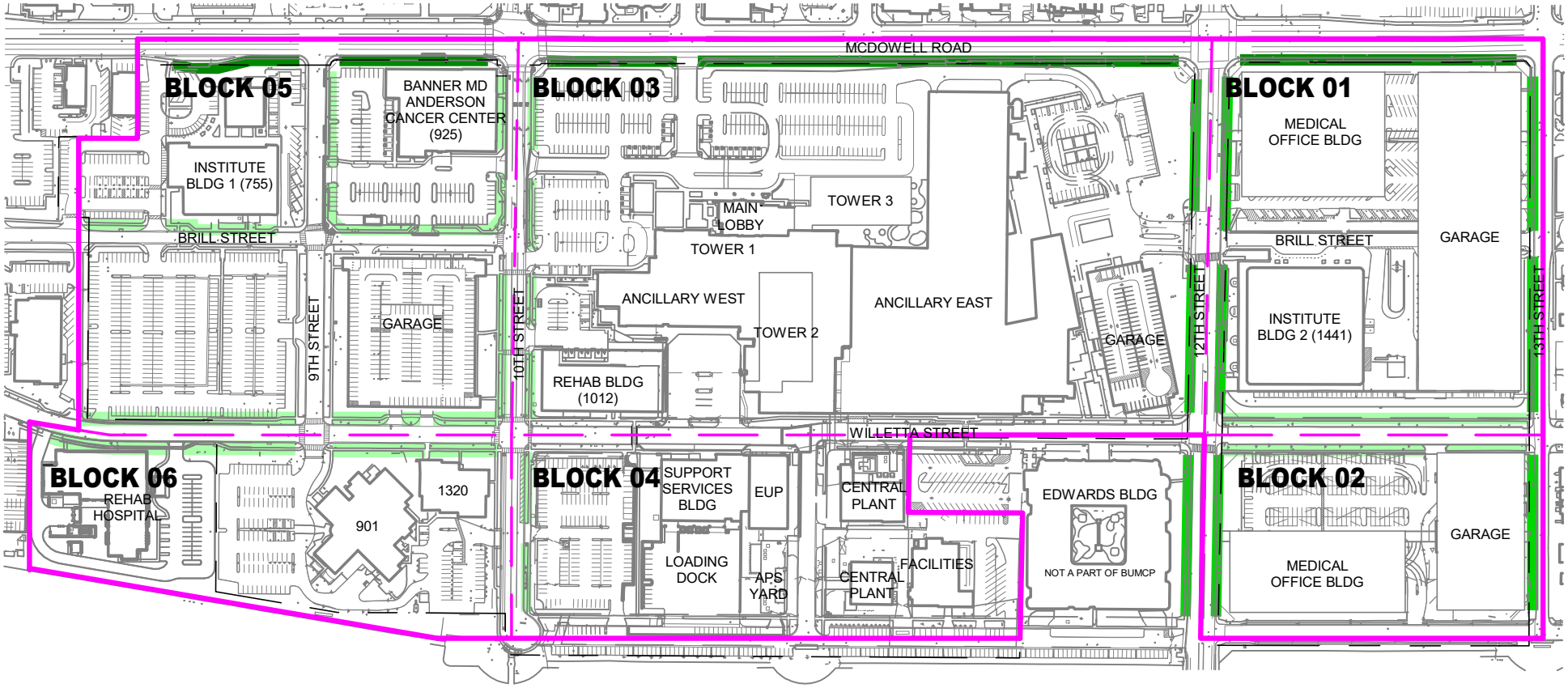
PLANNED UNIT DEVELOPMENT

LSB HKS

Banner University Medical Center
Phoenix Campus

CROSSWALK DESIGN MATERIALS - IMPRINTED ASPHALT

EXHIBIT 25



6' PEDESTRIAN LANDSCAPING
10' LANDSCAPE SETBACK
16' LANDSCAPE SETBACK

Banner University Medical Center
Phoenix Campus

FUTURE LANDSCAPED PEDESTRIAN WALKWAYS

0 150 300 FT

A1.12

PLANNED UNIT DEVELOPMENT

LSB HKS

EXHIBIT 26

City of Phoenix
STREET TRANSPORTATION DEPARTMENT

July 17, 2019

Mr. Seth Chalmers, PE
Dibble Engineering
7878 N 16th St., #300
Phoenix, AZ 85020

RE: Banner University Medical Center Phoenix – PUD Zoning Traffic Impact Analysis

Mr. Chalmers,

The City of Phoenix has received and reviewed the June 2019 submittal of the Traffic Impact Analysis for the Banner medical facility south of McDowell Road between 10th and 12th Streets. This letter will serve as **approval** of the TIA as associated with the Planned Unit Development zoning application.

This TIA is a comprehensive evaluation of the several projects that will proceed under this umbrella zoning action. As individual site plans are received at the City of Phoenix, staff will review the applicability of TIA recommendations and discuss those items with the development team as part of the normal site development review process. Street Transportation will propose a zoning stipulation to this effect.

The development team has proposed restriction of northbound and southbound through movement of traffic at the 10th Street and McDowell intersection. This concept was presented to the Coronado neighborhood on July 11, 2019 and by all accounts was well-received. Street Transportation will consider the public consultation on this item complete, barring significant indication from the neighborhood that restriction of this travel movement is of concern. Northbound and southbound bicycle movements will remain, and the signal modification design will consider the appropriate manner of operations to preserve and enhance this movement.

Please let me know if you have any questions. I can be reached at (602) 262-7580.

Best Regards,

Matthew Wilson, PE
Traffic Engineer III
City of Phoenix
Street Transportation Department
Office of the City Engineer

CC: Samantha Keating, Planning and Development Department
Steve Bunyard, Planning and Development Department
Derek Fancon, Planning and Development Department

Banner University Medical Center Phoenix (BUMCP)
BBWMC – 15-0484 ED Relocation/New Construction
Traffic Impact Study (TIS)
Revised Final Report

Project No.:
1117122

June 2019

Prepared For:
HKS Architects and Banner Health

Banner Health®

Dibble Engineering®
7878 North 16th Street
Suite 300
Phoenix, Arizona 85020
P. 602.957.1155
F. 602.957.2838
www.dibblecorp.com

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Appendices

I. Project Area Description

Banner – University Medical Center Phoenix (BUMCP) is a centralized medical care Campus with over 44 types of medical services including an Emergency Department and Academic Medicine which is done in partnership with the University of Arizona. The campus is located within the City of Phoenix southeast of 7th street and McDowell Road as shown in **Figure 1**.

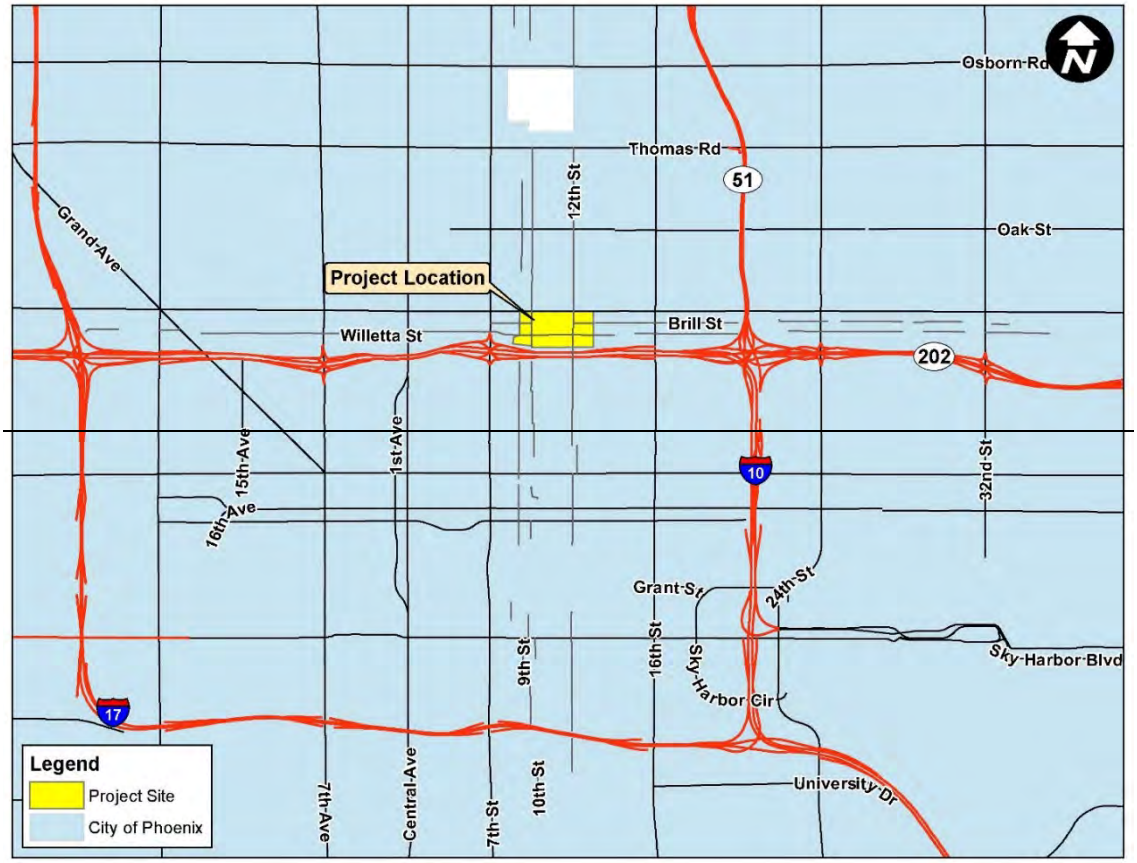


Figure 1 – Vicinity Map

The Campus spans an area which is bordered on the north by McDowell Road, on south by I-10, 9th Street on the west and east of 12th Street. In this area there are over 16 buildings, two space helipad, four parking garages and over 20 surface parking lots or areas. There are over 4,000 parking spaces, with around 2,100 reserved for employees and workers and 2,000 for visitors and patients. The main street address of the campus is 1111 East McDowell Road.

Banner – University Medical Center Phoenix (BUMCP) is currently entering the final phases of a major program of improvement projects that spans almost the entire campus. Projects that have been completed under this program include a new emergency department (ED); a new Highrise Hospital Tower and support services building which were opened and completed in 2018 and the expansion of the new main lobby which will start construction shortly and be open sometime mid to late 2020. Additionally, the new Highrise Hospital tower will eventually displace the existing West Tower which is located directly to the north.

The West Tower also currently houses the existing cancer center. The cancer center will be relocated to its new MD Anderson Cancer Center building which is on the southwest corner of McDowell Road and 10th Street by the end of 2019. The existing medical office building located on this corner was demolished in order to make way for the new Cancer Center.

The existing West Tower is also scheduled to be demolished shortly. The building will be replaced by an additional parking lot and an internal connection road between parking lots located on 10th Street and 12th Street. A midblock driveway will also be added to McDowell Road with ¾ access capabilities that will allow access to this connector road. All of these improvements will be accomplished by mid to late 2020.

Additional parking has been added at numerous locations. A new and larger surface lot has been constructed as a part of the new Cancer Center as shown in the Site Plan in **Figure 2**. Lot H located on the southeast corner of 10th Street and Willetta Street will eventually be demolished and replaced by a parking structure sometime after 2021. Finally, the Willetta Street Parking Garage located on the west side of 10th Street has the potential to be expanded if the additional parking is warranted in the future.

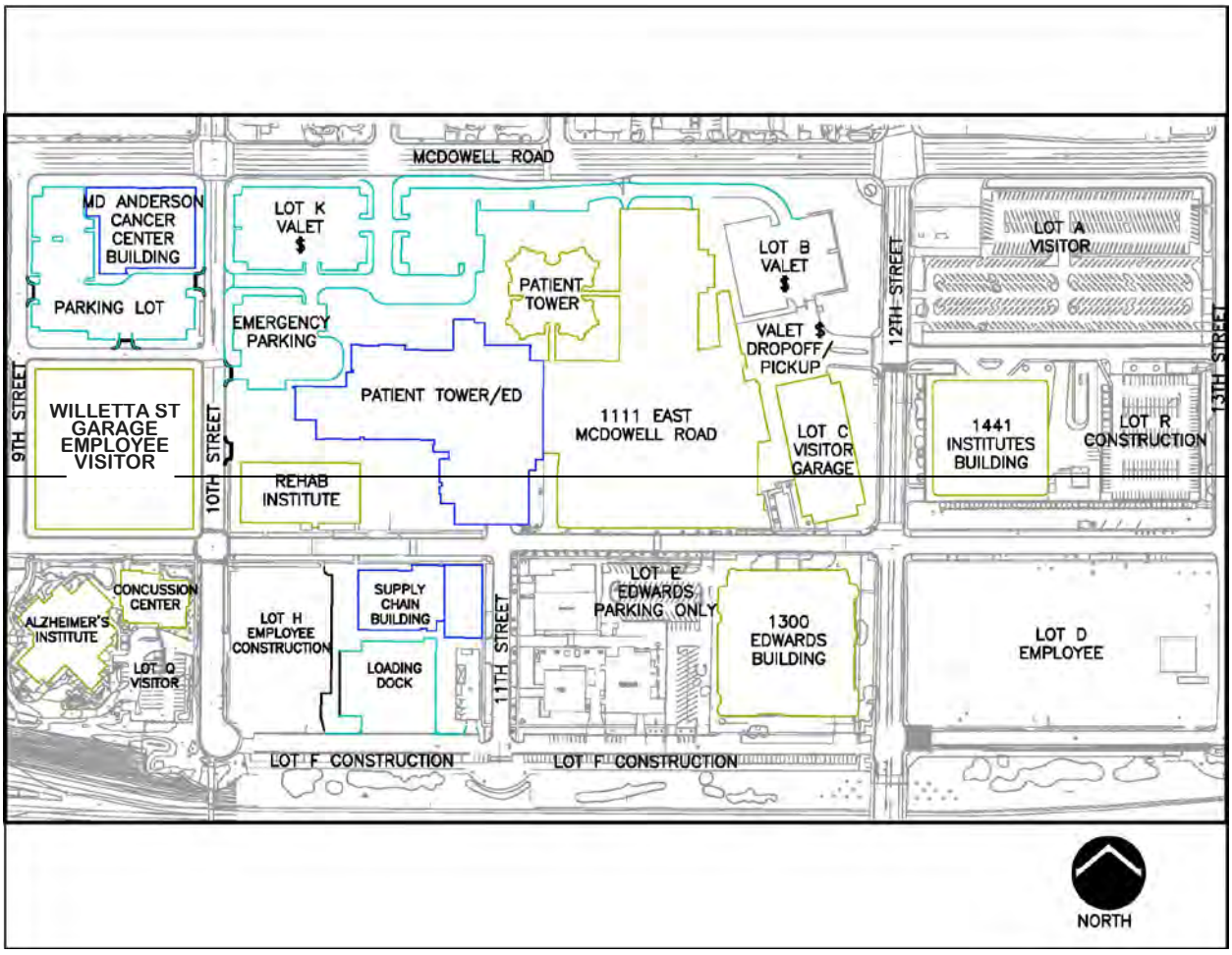


Figure 2 – Site Map

The major issues to be explored in this traffic impact analysis is to determine what will be the impacts of BUMCP improvement program on pedestrian, bicycle and vehicular access, mobility, demand, distribution, and service. Not only on the campus itself, but pedestrian and bike pass-through along 10th Street. Of interest is the impact to the existing traffic signal at 10th Street and McDowell Road and what will need to be done to accommodate the additional vehicles anticipated here. This report presents the analyses and findings and then provides recommendations on mitigations that need to be made to maintain reasonable access, mobility and service.

It is important to note that the BUMCP Campus has four City of Phoenix designated historic neighborhoods within its vicinity. There is the Coronado neighborhood north of McDowell Road. The North Garfield neighborhood south of I-10. The Brentwood neighborhood west of 16th Street and then East Evergreen east of 7th Street.

II. Study Methodology

To gain a reasonable understanding of what the BUMCP campus pedestrian, bicycle, and vehicular traffic is, Dibble Engineering (DE) worked with the BUMCP Team (HKS and Banner) to identify the following traffic issues and considerations to be explored:

- Pedestrians and Bike use on site and pass-through to surrounding neighborhoods
- Circulation and pedestrian crossings
- Surface and Street Parking
- Garage Parking
- Ingress Traffic
- Egress Traffic

In order to analyze and evaluate the development's potential traffic impacts, the following tasks were undertaken:

- Field Observation of the existing site.
- Field traffic counts taken in November of 2017 for pedestrians and vehicles.
- Site traffic volumes of the proposed development were generated using the Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th edition, Online Access.
- The existing traffic at the two main signalized intersections were analyzed using Synchro 9 software using the 2010 Highway Capacity Manual (HCM).
- Existing crosswalk locations were reviewed based on the addition and removal of surrounding facilities and access changes.
- Analyzing and reanalyzing opportunities for improving pedestrian and vehicular traffic mobility and access.
- Development of concepts and ideas regarding potential solutions to issues observed and identified through analysis.
- Extensive coordination with BUMCP Team and City of Phoenix to work out details on how to approach issues and potential solutions.

III. Analysis of Existing and Current Conditions

The existing transportation network that supports the BUMCP Campus is discussed below.

A. Roadways

1. McDowell Road

McDowell Road is a City of Phoenix asymmetrical 6-lane arterial roadway with a center two-way left-turn lane, two westbound and three eastbound lanes, and is designated as a limited commercial access roadway in the City of Phoenix Street Classification Map. The posted speed limit for this road is 35 MPH.

2. Brill Street

Brill Street is a private, non-striped, local road within the BUMCP Campus. There are sidewalks along both sides of the street, but there are no bike lanes along the street.

3. Willetta Street

Willetta Street is a private, non-striped, local road within the BUMCP Campus. There are sidewalks along both sides of the street, but there are no bike lanes along the street.

4. 7th Street

7th Street is a City of Phoenix 6-lane, major arterial with a raised median designated as a limited commercial access in the City of Phoenix Street Classification Map. The Speed limit is 35 MPH. There are sidewalks along both sides of the street and there are no bike lanes on this roadway.

5. 9th Street

9th Street is a private, non-striped, local road within the BUMCP Campus. There are sidewalks along both sides of the street, but there are no bike lanes along the street. The speed limit for this roadway is 25 MPH.

6. 10th Street

10th Street is a private local road that is striped from McDowell Road to Brill Street. The roadway dead ends south of Willetta Street before the I-10. A pedestrian bridge extends over the I-10 from the end of the street connecting 10th Street to the south side of the I-10. The posted speed limit for this street is 25 MPH. 10th Street is a City of Phoenix local road north of McDowell. This section of 10th provides access to a residential neighborhood which is directly west of North High School.

7. 12th Street

12th Street is a City of Phoenix, striped, 2-lane collector road with a center two-way left-turn lane south of McDowell Road to Culvert Street. The road passes over the I-10, connected the residential areas south of the I-10 to the hospital as well as North High School at 12th Street and Thomas Road. 12th has an all-way stop with Roosevelt Street. 12th Street has a traffic signal with Thomas Road. There are sidewalks and bike lanes along both sides of the street. The speed limit for this road is 30 MPH.

8. 13th Street

13th Street is a City of Phoenix, non-striped, local road within the BUMCP Campus. There are sidewalks along both sides of the street until the east sidewalk ends at the residential alley between Brill Street and Willetta Street. The west sidewalk continues to Willetta Street. There are no bike lanes along the street.

B. Intersections and Traffic Control

1. 7th Street & McDowell Road

The intersection of 7th Street & McDowell Road is a four-leg signalized intersection with three through lane approaches in all directions. The northbound approach has a 250-foot dual left turn lane and a 200-foot right turn lane. The southbound approach has a single left turn lane with a storage length of about 170 feet. The eastbound approach has 240-foot left turn lane with a 190-foot right turn lane. The westbound approach has a 235-foot left turn lane.

2. 7th Street & Brill Street

7th Street & Brill Street is a three-leg, non-signalized intersection. The intersection does not provide full access to Brill Street. It is a right-in and right-out only intersection. There are two northbound through lanes with one shared through/right turn lane. There are three through lanes for the southbound approach. The westbound approach has a single right turn lane.

3. 7th Street & Willetta Street

7th Street and Willetta Street is a four-leg, non-signalized intersection that does not provide full access. The east leg allows for ¾ access while the west leg is a right-in right-out access to Willetta. The northbound approach consists of three through lanes and a shared through/right acceleration lane that merges with the third through lane north of Willetta Street. The southbound approach has a 140-foot left turn lane with two through lanes and a shared through/right turn lane. The eastbound and westbound approaches have a single right turn lane.

4. 9th Street & McDowell Road

9th Street and McDowell Road is a three-leg, non-signalized intersection with full access. There are two through lanes with a shared through right in the eastbound direction. The westbound direction has two through lanes. McDowell Road has a center two-way left turn lane. The northbound approach is stop controlled with a shared left and right turn lane.

5. 10th Street & McDowell Road

10th Street and McDowell Road is a four-leg, signalized intersection. The east and westbound approaches have single left turn lanes with a storage lane of roughly 115 feet. The westbound approach has a through lane and a shared through/right turn lane. The westbound approach has two through lanes and a shared through/right turn lane. The northbound approach has a 150-foot left turn lane with a shared through/right turn lane. The southbound approach also has a 150-foot left turn lane as well as a through lane and a 100-foot right turn lane. All approaches accommodate permissive left turns.

6. 10th Street & Brill Street

10th Street and Brill Street is a three-leg intersection with two-way stop control. The eastbound approach is stop controlled while the north and southbound traffic is free moving, only yielding to pedestrians in the crosswalk on the south leg. All approaches have a singled shared through/turn lane.

7. 12th Street & McDowell Road

12th Street and McDowell Road is a four-leg, signalized intersection. The east and westbound approaches have single left turn lanes with a storage lane of roughly 160 feet. The westbound approach has two through lane and a right turn lane of approximately 160 feet. The westbound approach has two through lanes and a shared through/right turn lane. The north and southbound approaches have a 145-foot left turn lane. The northbound approach has a through lane with a 200-foot right turn lane while the southbound approach has a shared through/right turn lane. The north, south and eastbound approaches accommodate permissive left turns. The westbound approach accommodates protective/permissive left turns.

8. 12th Street & Brill Street

12th Street and Brill Street is a four-leg intersection with two-way stop control. The east and westbound approaches are stop controlled while the north and southbound traffic is free moving, only yielding to pedestrians in the crosswalk on the south leg. The westbound and southbound approaches have a shared all-way turn lane. The northbound approach has a 100-foot left turn lane and a shared through/right turn lane. The eastbound approach has a single left turn lane as well as a single right turn lane.

9. 13th Street & McDowell Road

13th Street and McDowell Road is a four-leg, two-way stop controlled intersection. The north and southbound approaches are stop controlled while the east and westbound approaches are free moving. The north and southbound approaches have a single all-way shared lane. The eastbound approach has two through lanes and a shared through/right turn lane. The westbound approach has a through lane and a shared through/right turn lane. McDowell Road has a center two-way left turn lane.

The basic configuration of the BUMCP Campus and adjacent street existing traffic control and pedestrian crosswalks are shown in a visual representation in **Figure 3**.

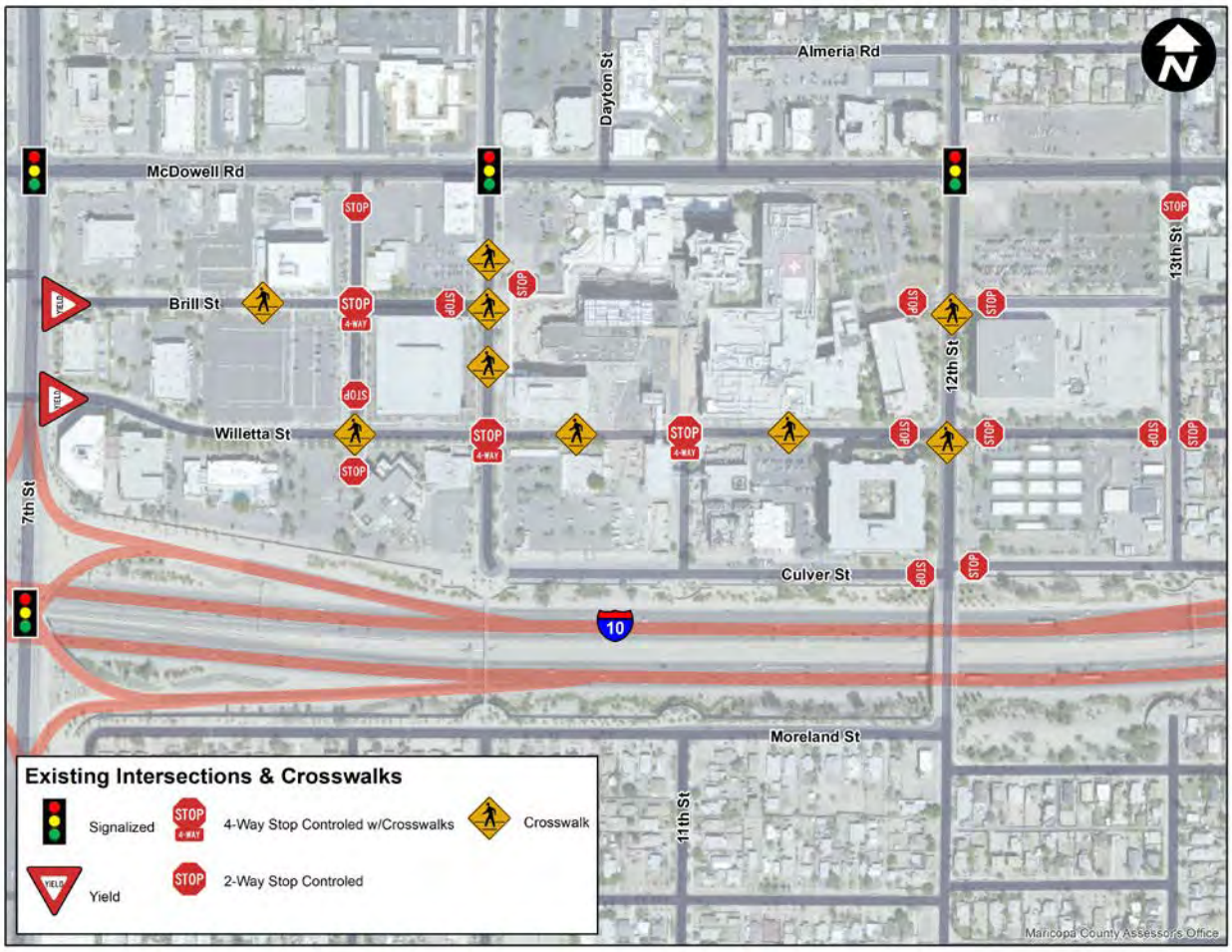


Figure 3 – Existing Intersections and Crosswalks

C. Traffic Data

Table 1 presents the traffic data available from City of Phoenix and ADOT.

Table 1 – City of Phoenix & ADOT Traffic Data

Street	Location	ADT	EB/NB	WB/SB	Date	Source
7th Street	North of McDowell	37,156	18,921	18,235	Sept-2016	City of Phoenix
7th Street	South of McDowell	49,029	24,707	24,276	2016	ADOT
McDowell Road	West of 7th Street	31,332	14,117	17,214	2014	ADOT
McDowell Road	East of 7th Street	29,999	14,391	15,608	Aug-2016	City of Phoenix
McDowell Road	East of 12th Street	25,577	13,348	12,229	2011	ADOT
10th Street	South of McDowell	3,114			Nov- 2017	Field Data Services
12th Street	South of McDowell	4,490	1,885	2,605	Nov-2017	Field Data Services

Traffic counts were also collected by Field Data Services (as a subcontractor to Dibble Engineering) to use for traffic evaluation in November of 2017. **Figure 4** provides a visual representation of the existing turning movement counts and 24-hour traffic counts collected by Field Data Services. The intersection traffic represents a two-hour time frame.

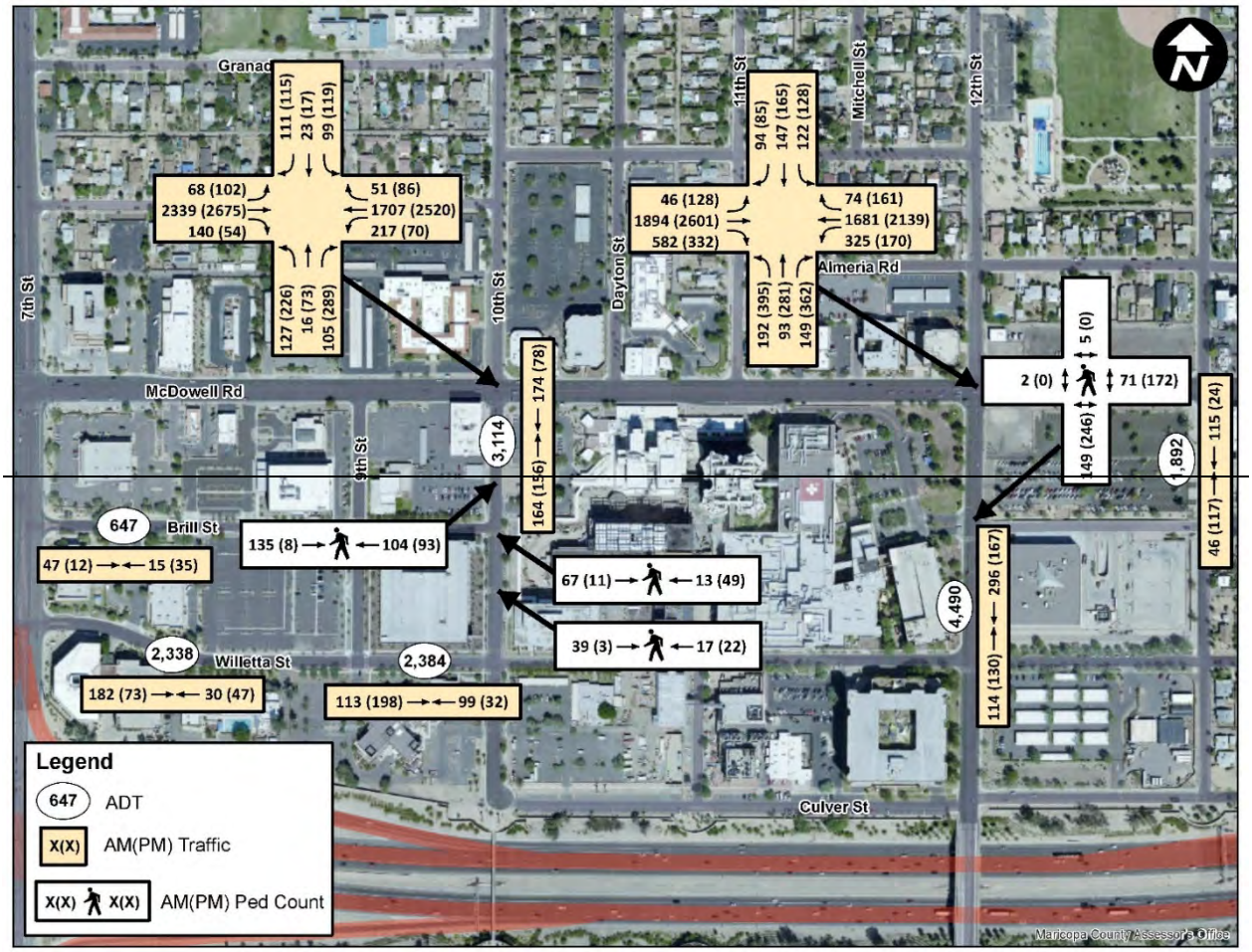


Figure 4 – Existing Peak Hour Pedestrian and Vehicular Traffic

Traffic counts were also collected on 10th Street between McDowell Road and Brill Street for 7 consecutive days. The 24-hour counts for the 7 days were then averaged to determine the average morning and afternoon peak hours. The northbound and southbound peak hours were also determined at this location. The peak hour between the two directions differ from one another on a daily basis. The following was determined from this data sample:

The southbound (ingress) morning peak on average is around 6:15 AM every day and the afternoon ingress peak is around 6:00 PM every day.

The northbound (egress) peak is around 7:30 AM and again around 4:15 PM in the afternoon.

The varying peak times are surmised to be due largely to the hospital shift changes as well as the start and end of business for the surrounding businesses and medical offices. Another temporary contributor to the campus traffic is the construction crew traffic. The construction traffic will remain until the campus construction is complete.

Based on the analysis of this count, there are clearly two peak time frames for the medical campus as it relates to the ingress and egress traffic. There is a peak hour that aligns with the hospital peak (generator peak) and another morning and afternoon peak hour that aligns with the adjacent street traffic peak. Overall, the average morning peak is around 7:15 AM and the average afternoon peak begins around 6:00 PM.

It is noted that this determination is based on one-week of data out of 52 possible weeks. Consequently, there is a chance that this sample could vary significantly to what the prevailing traffic is. On the other hand it could be very close. Nevertheless, it is important to state this possible error because these counts are used as the primary data to conduct capacity analysis. The error being that the ADT is either too high or low and does not predict the actual average and peak times. However, it is thought this possibility is fairly low, as the count was taken in November. Typically counts that are taken in October and November (when all schools are in full session) are fairly representative of average traffic as these months are neither the low or peak of the year. The same can be said about counts taken in March and April. But it is important to mention this because the actual traffic at this intersection at different times of the year could vary significantly.

D. Access

BUMCP Campus can be accessed by vehicles, pedestrians and bicyclist from the adjacent arterial streets from many streets and driveways. Additionally, it has an exclusive multi-use path overpass structure that crosses I-10 at 10th Street.

The arterial network around the Campus is particularly strong and well suited to support this type of land use as it is now and into the future. With 7th Street on the west, McDowell Road on the north, 16th Street on the east and I-10 to the south. Combined with a well-developed internal local street grid that consists of Willetta Street, Culver Street and Brill Street for the east-west connections and 9th Street, 10th Street, 12th Street and 13th Street for the north-south connections.

All of these streets, along with multiple driveway connections to them, support vehicular and bicycle access very well. Additionally, all these streets have sidewalks or are of the low speed nature to support pedestrians walking within them. Hence the Campus provides good network access to all modes of travel within itself. Certainly, there are some interruptions to this caused by buildings, however many of these buildings feature pedestrian passage through corridors that help support this network of streets. For example, there is a corridor within the main hospital building complex which will allow you to enter on the 12th Street side and walk indoors all the way to the 10th Street side and vice versa. Additionally, these arterial streets and the freeway provide excellent short-distance and long-distance trip access to BUMCP.

The only concerns regarding the existing access which have been expressed by Banner and HKS representatives is the perception of BUMCP traffic intrusion into neighborhoods both north and south of the campus. The primary streets of concern are 10th Street and 12th Street. The 10th Street concern relates to how this street projects into the Coronado Neighborhood to the north. Coronado Neighborhood concerns are more related to the potential for cut through vehicle traffic. The 12th Street Garfield Neighborhood concerns relate to more to maintaining continued access on this street in a

character that is appropriate for the neighborhood. Speed and unwelcome cut through traffic appears to be two of the main issues. In fact, 12th Street south of I-10 north there are speed humps. Also, at the intersection of 12th Street and Moreland Street there is a guide sign directing traffic to 11th Street to access Van Buren Street. Additionally, there is a regulatory sign which prohibits commercial trucks ("NO Thru Trucks"). Both neighborhoods appear to support enhance access for pedestrians and bicyclist.

It is important to point out that the main arterial access to the BUMCP Campus are off and to 7th Street (east then west) and off and to McDowell Road (south then north). The street connecting directly to these two main streets handle the majority of traffic. Certainly both 10th Street and 12th Street are a part of this. However, their importance for campus access diminishes north of McDowell Road and south of I-10. It is not that campus traffic is not using these streets. It is the fact there are plenty of other opportunities for alternative access to be achieved. This is especially true for 10th Street north of McDowell Road.

Twelfth Street provides a more continuous connection between Thomas Road in the North where there is a traffic signal and Roosevelt in the South where there is an all-way stop. Tenth Street dead ends with a cul-de-sac for vehicles at I-10 on the south and it has no signal at Thomas Road on the north. These possibilities will be discussed in more detail later in this report.

E. Parking

There are many surface parking lots, parking structures (or garages), and combination surface lots and garages located throughout the BUMCP campus. All of which provide multiple parking opportunities. There are also some private business parking areas and street parking which are within a reasonable walking distance from the campus as well. Details on these parking opportunities are not included in this study.

Many of the BUMCP campus-based parking areas are designated for employee or visitor only and some are designated for both. **Figure 5** shows the locations of the BUMCP campus parking as of the end of 2018. Again, as discussed in the opening of this report BUMCP improvement program has made and will be making some additional significant changes to parking in the coming years. The net change will be adding available parking to account for the shift in the location of service buildings and add spaces to account for increased use.

Parking garages provide many benefits. They also can result in more concentrated traffic flows in certain areas and at access points. However, they can also help divide traffic flows more evenly between different streets too if they are provided with multiple access driveways on more than one side. This is certainly the case with the Willetta Street Garage.

The Willetta Street Garage is a main parking location for both employees and visitors to the hospital and the new Cancer Center to the north. There are three separate entrances/exits to the garage. The uncontrolled patient and visitor entrance/exit driveway is located on the north side of the structure on Brill Street. The employee parking has gate controlled two entrances/exit driveways on the south side of the structure along Willetta Street. One entrance/exit is restricted to Decal Parking only. The other controlled driveway is for employee parking.

Lot C is a four-level garage. Its entrance/exit driveway is off the same driveway that serves Lot B.

Lot K will expand significantly once the West Tower is torn down.

It is important to note that the current Surface Lot H is planned to become a garage in the future.

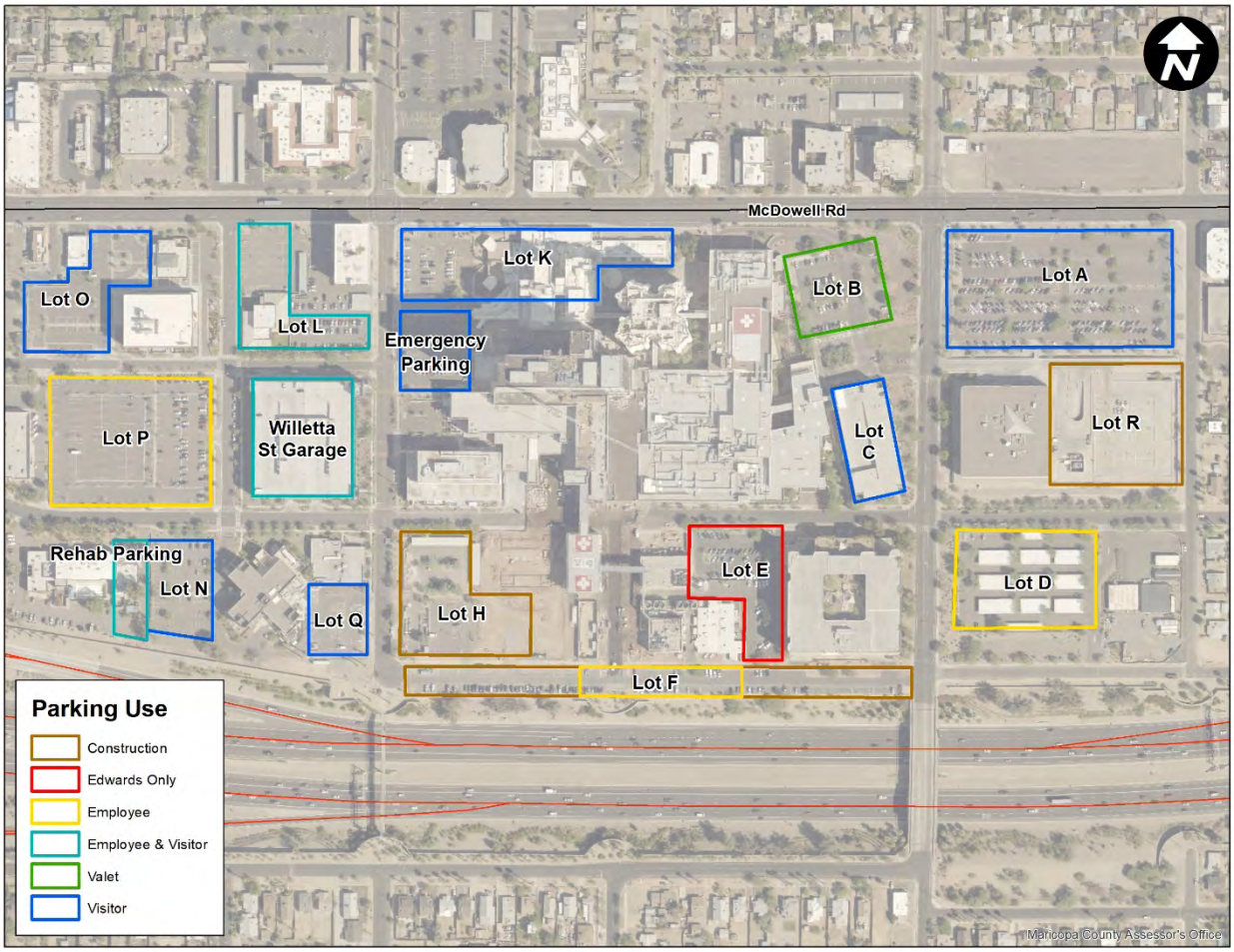


Figure 5 – BUMCP Campus Parking

Lot E, which is connected to the Edwards Medial Plaza, also has a three-level parking garage which has its entrance/exit driveway off Willetta Street

Lots P and H are the other main parking lots for employees working at the hospital. Therefore, the majority of the employee parking for the campus will go to the Willetta St Garage, Lot P and Lot H.

Lot R is mostly a two-level garage with only one sub-terrain level on its westside that includes a 3 story office building.

IV. Proposed Development

Many improvements are underway at the BUMCP campus and more improvements are planned. In some cases, new facilities are replacing the old facilities. Some of the new facilities include the following:

- New Hospital Tower
  - 302 Beds
  - Opened in late 2018
- New MD Anderson Cancer Center
  - 70,000 SF
  - New Lot L
  - Opened mid 2019
- New Lobby Expansion
  - 6,600 SF
  - Open mid 2020
- 2nd New Hospital Tower
  - 302 Beds
  - Opening date not set
- New Rehabilitation Center
  - 71,000 SF
  - Opening Date not set
- Existing Trauma Center Refurbished to outpatient clinic
- New Parking Locations
  - Expansion of Lot K
  - New parking structure at Lot H
    - Planned for future
  - Expansion of Willetta Street Garage
    - Planned for future

The facilities will displace the existing facilities and, in some cases, increase their capacity. The existing beds are currently two beds per room and the new beds configuration will be one bed per room. Although there will be more hospital rooms in the new tower, the number of beds will remain about the same and will not increase the hospital capacity.

The following facilities will be demolished in the future:

- West Tower
  - After New Tower and Cancer Center are Complete
  - Includes a 7,500 SF Oncology Center
- Existing Rehabilitation Center on northeast corner of 10th Street & Willetta Street
- Existing Community Center at New Rehabilitation Center Location

V. Internal Circulation Issue Identification

After establishing the existing roadway conditions as well as the planned future buildings and parking locations and discussing conditions with HKS and BUMCP, the internal circulation issues were identified. Once identified, opportunities to possibly mitigate those issues were analyzed.

A. Pedestrians

1. Observations

The BUMCP campus is a pedestrian busy area. This is due to the layout of the campus and the areas that are available for parking. The character of the streets are pedestrian "friendly." What this means is that there are sidewalks on all sides of each street, all sidewalk ramps appear to be consistent with American with Disability Act (ADA) requirements, speed limits are low and pedestrian use is high. Hence when vehicles use campus area streets they know they are in a pedestrian area, that is the driver expectancy.

All the streets only have one lane in each direction, continuous street lighting, and some of them have offset sidewalks that include landscaping in between the sidewalk and the street. There are numerous designated marked crosswalks (or organized crossings) throughout the campus.

Additionally, the use of high visibility pavement marking crosswalks along with yield to pedestrian signs in the road at the mid-block crosswalks reinforce the reasonableness of this. These are all good measures to make drivers of vehicles and pedestrian themselves aware of where designated crossings are both night and day. This is important as there are a number of crossings where vehicle sight distance for turning vehicles may be limited and emergency vehicle may be traveling at a speed higher than the limit.

For the internal campus streets, the pedestrian character is further presented by: the narrow width of the street, a speed limit is 25 mph, and a number of all-way stop intersections. In many ways the campus reflects what has been recently termed "complete streets." Complete streets is a technique to set parameters for street designs and treatments to make them accepting and supportive of the modes of travel that use those streets. No one mode is favored over the other. Having as many pedestrian crossings on these streets is very reflective and supportive of the high use of pedestrian crosswalks on this campus.

Similarly, 12 Street has been narrowed to accommodate marked 6 foot-wide bike paths on both sides of the road. The speed limit is 30 mph and there is advance side mount and overhead mount pedestrian crossing warning signs. For the southbound direction there is a stop bar 60 to 80 feet in advance of the crosswalk at Brill Street that includes a "Stop Here for Peds" regulatory sign. There are also regulatory signs and fencing in lot A that help direct pedestrian to the crossing at Brill Street.

Pedestrian and vehicular traffic peak during the same time of day for an hour in the morning and an hour in the afternoon during the hospital shift changes. The high pedestrian and vehicle demand during these times can be counter-productive in providing service for both these modes of travel.

The crosswalks that have the main impacts are those three crosswalks located along 10th Street between McDowell Road and Willetta Street as well as the crosswalk on 12th Street crossing the south leg of the 12th Street and Brill Street intersection.

See **Figure 4** again for the count volumes for both pedestrians and vehicle volume counts for the peak traffic times on these streets. But the summary of the peak time total volumes (both directions) is as follows.

On 10th Street during the AM peak time there are 375 pedestrian crossings (for three of the marked crosswalks) and 338 vehicles. For the PM peak there are 93 pedestrian crossings and 234 vehicles. The pedestrian volumes given are for all three marked crosswalks between Willetta Street and McDowell Road. This does not include the crossing at 10th Street and Willetta Street.

For the 12th Street and Brill Street driveway there are 149 pedestrian crossings and 410 vehicles in the AM peak and 246 pedestrian crossings and 297 vehicles in the PM peak.

These should be considered significant pedestrian volumes that do interrupt significant two-lane street vehicle traffic flow volumes. A rule-of-thumb for a local residential street volume is 400 vehicles per day (24 hours). Hence 10th Street's volume is coming to that volume in its two peak hours. Therefore, in this area it is really functioning as a minor collector street. For 12th Street, which is already a minor collector street, having this volume of pedestrians crossing is quite unique.

None of the other marked crosswalks were counted.

2. *Opportunities*

There are a number of alternatives that offer opportunities to mitigate interruptions of traffic flows due to designated pedestrian crossings.

First, is to reduce the number of crosswalks if possible and to funnel pedestrians to the remaining crosswalks. Additionally, marked crosswalks that are seldom used should be removed. Given the current layout of the campus this may be a challenge in some locations. But for the long term this should always be considered. The ultimate, but very expensive, pedestrian crossing is the grade separation. Offset sidewalks offer the opportunity to create physical and landscape features that then channel pedestrian to the designated crosswalks.

Second, is to only place pedestrian crosswalks at intersections of designated streets. Willetta Street and 9th Street is a good example of this. This is a particularly effective approach if the intersection is an all-way stop intersection. Good examples of this are at 9th Street and Brill Street and along Willetta Street at both 10th Street and 11th Street.

Thirdly, would be to beacon or signalize the crosswalks with a HAWK or a Rapid Flashing Beacon (RFB), HAWK, or a standard vehicle Traffic Signal at the Brill Driveway. Either one of these

treatments would not apply well for the internal streets. But they are within the universe of alternatives for 12th Street.

The issue with RFBs are they are more a warning device. Given there are already advance warning signs, high visibility pavement markings, street lighting and yield signs in the street, this would not add much value. Additionally, the RFB does not organize the traffic flow interruption. So, for an application like this, it really offers no benefit.

A HAWK on the other hand does offer the pedestrian a clear signalized right-of-way that organizes the interruption of traffic in a predictable and timed way. However, HAWKs typically apply to streets that have at least two through lanes in each direction. The HAWK mitigates the multiple threat potential on streets like this. Twelfth street does not have the same exact condition with one through lane in each direction. However, the dedicated left turn lane from northbound 12th Street to westbound Brill Street does presents a modified version of the multiple threat.

The City of Phoenix has many pending locations where HAWKs are needed. Many of these locations are on arterials that have more that 2 through lanes in each direction. It is at these locations that HAWKs have the highest potential to reduce pedestrian vehicle crash risk. Therefore, when taken to a City-wide need basis a HAWK at this location might not be a priority for the City.

Placing a traffic signal at this location would also be problematic due to its closeness to the 12th Street and McDowell Road Signal. Typical spacing for a signal is at least 1/8 to ¼ mile. The spacing of the driveway is around 250 feet from McDowell Road. Therefore, based on typical spacing criteria it is too close. However, the advantage is that it could help serve the left turn out of this driveway at the same time it provided for pedestrian crossings.

Fourth, would be to consider a more physically active pedestrian crossing treatment like platform intersections, raised crosswalks and/or off-set or two stage crosswalks. Speed humps are also a possibility, however there are concerns what the impact of this more “physical” approach to speed mitigation would have on emergency vehicles. Especially, one’s carrying injured persons. Platform intersections or raised crosswalks are much more “gentle” in this regard.

Therefore, platform intersections and raised crossings could be considered for some of the internal streets. Both treatments could be considered for 12th Street. The benefit is they help delineate pedestrian crossing areas and reinforce the lower speed limits. The treatments are also appropriate for streets with posted speed limits 35 mph and under. One downfall to consider is that They can result in drainage issues for a roadway.

Fifth, would be to enhance the existing crossings with some additional signing, marking or street lighting treatments. For example, for northbound 12th Street at the Brill Street the use of advance stop line, similar to the treatment for the southbound direction, should be considered.

This would help mitigate the potential of multiple threat confusion that a vehicle waiting to make a left turn might pose for a northbound through lane vehicle

Figure 6 shows the recommended pedestrian crosswalk locations along 10th Street, 12th Street and Willetta Street.

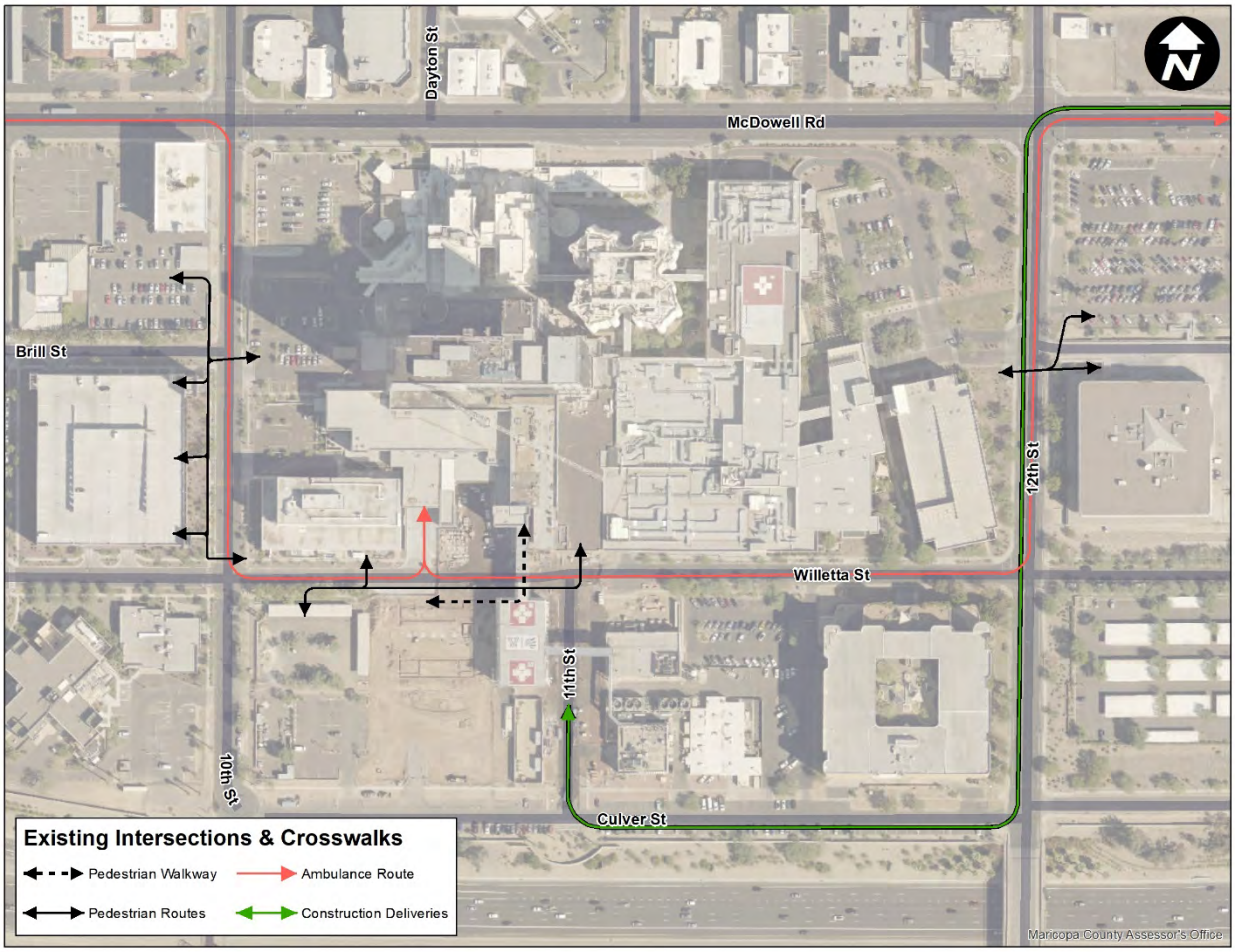


Figure 6 – Pedestrian Crossings

B. Parking

1. Observations

The relocation and addition of BUMCP facilities in the new buildings has and will cause a shift of traffic and parking to the west side of the campus, therefore, additional accommodations should be considered for this area.

2. Opportunities

A few opportunities are already planned to accommodate the parking. There will be a new parking structure built on the southeast corner of 10th Street & Willetta Street (current lot H). The west tower

will be temporarily replaced by a surface parking lot (expansion of Lot K), until construction of the second tower begins.

Finally, the Willetta Street Garage will be expanded to the west if needed. The garage will cut off access along 9th Street from Brill Street to Willetta. This would not necessarily be the best for the internal vehicle circulations for this side of the campus. This would force traffic either over to 10th Street or even over to 7th Street. A possible way to mitigate this loss of north/south internal connectivity would be to provide a new 8th Street connection at the far west end of the new expanded garage.

C. Ingress (Accessing the Campus)

1. Observations

Ingress vehicles, including emergency vehicles, can be impacted by pedestrian crossings. Especially, one's that might have high concentration of crossers during peak times. That is why trying to reduce the number of designated crossings can be advantageous. Hence, eliminating at least one crossing on 10th Street needs to be done.

2. Opportunities

There are a few opportunities to help with some of the ingress traffic concerns. Providing strategic locations for visitor and employee access points and internal circulation, can help to remove some of the potential interruptions.

The visitor and employee circulation can be encouraged by using way finders along McDowell Road, 10th Street, 12th Street, Willetta Street and Brill Street, as well as 7th Street. **Figure 7** provides a visual representation of some potential recommended vehicular routes for both visitor and employee parking as it relates to pedestrian and emergency vehicle traffic as well as suggested way finder locations to encourage drivers to use those access routes.

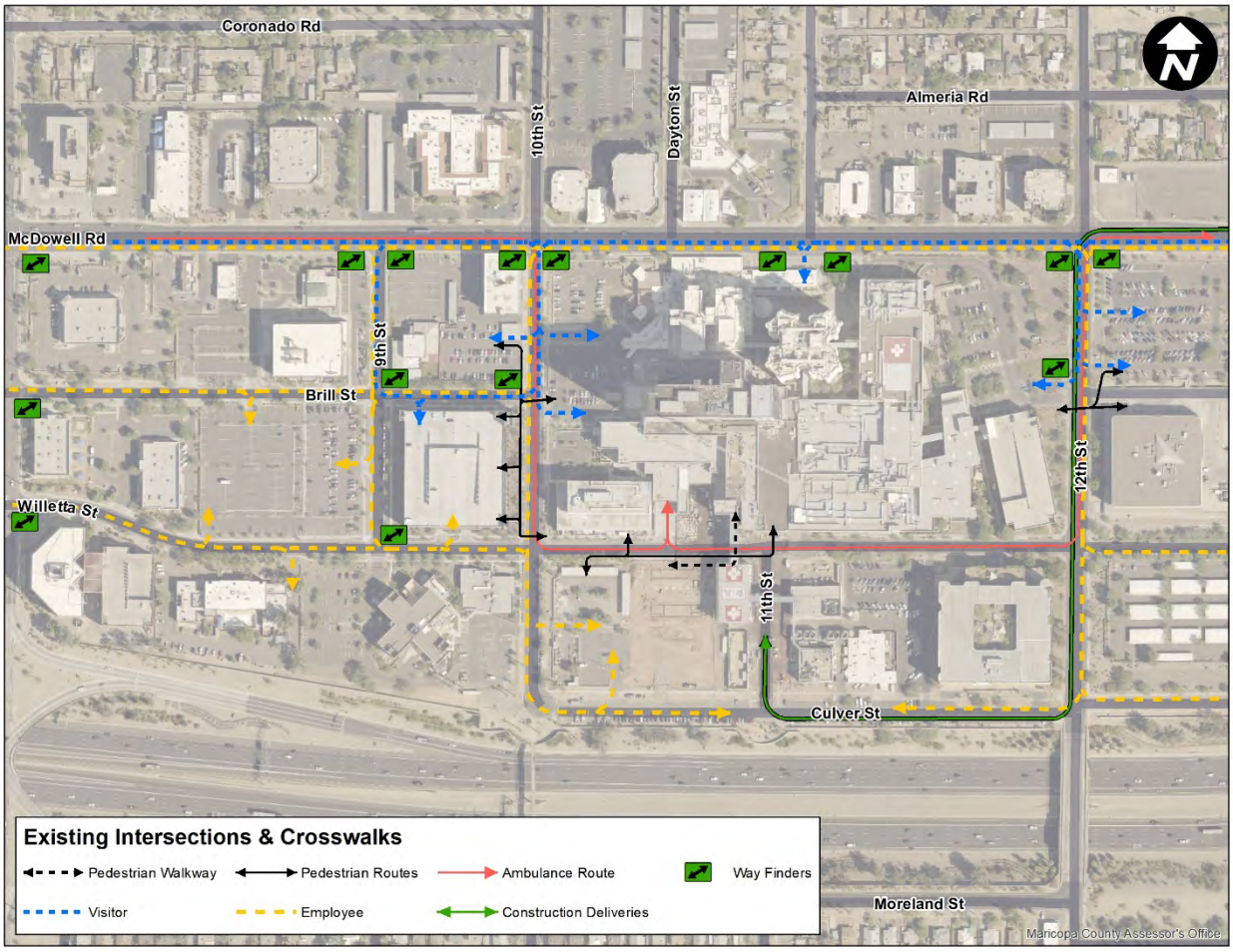


Figure 7 – Suggested Ingress Traffic Routes and Way Finders

It was recognized that many visitors and employees would prefer to turn left at a signalized intersection, therefore, a smaller number of vehicles are expected to turn left at the non-signalized intersections. Focusing on the promotion of employee use of the minor local roads for right turn ingress traffic can help to remove some of the traffic on the more critical roadways used by emergency vehicles, pedestrians, and visitor traffic.

The roadways include, Brill Street, Willetta Street, 9th Street, and 13th Street. Encouraging visitor use of the midblock entrance on McDowell Road between 10th Street and 12th Street, can also help to relocate some of the ingress traffic and avoid pedestrian and emergency vehicle routes as well as the 10th Street and 12th Street intersections with McDowell Road.

To help with routing traffic, adding new or updating the hospital way finders can be implemented. The way finders can help direct visitors to some of the preferred access points. Although employees are familiar with the campus traffic and are likely to take the faster and less trafficked routes, providing them with an updated circulation map for all the new facilities and parking could be useful.

D. Egress (Exiting the Campus)

1. Observations

There are a few concerns for the egress traffic, especially in the afternoon peak hour. Based on the observations from HKS and BUMCP employees, the vehicles exiting the campus typically use McDowell Road and 10th Street as well as McDowell Road and 12th Street intersections. This can lead to large queue lengths and delay times for vehicles trying to turn left and right. Once queues develop and split failures happen then it takes a long time for these intersections to recover.

2. Opportunities

Encouraging ingress traffic to use 7th Street and Willetta Street and Brill Street intersections as well as the McDowell Road and 9th Street intersection is desirable. This will remove some of the ingress traffic conflicts with the egress traffic as well as pedestrian traffic.

Again, promoting the use of the minor local roads with the campus for right turn egress traffic can help to remove some of the traffic on the more critical roadways used by emergency vehicles, pedestrians, and visitor traffic. These roadways include, Brill Street, Willetta Street, 9th Street and potentially 13th Street.

Visitor egress traffic can also use the midblock entrance to turn right onto McDowell Road (east of 10th Street instead of at 10th Street) allows them to avoid emergency vehicle pathways and a left turn from 10th Street that could be congested.

It was also recognized for egress traffic that many visitors and employees would prefer to turn left at a signalized intersection, therefore, a smaller number of vehicles are expected to turn left at the non-signalized intersections. Routing egress traffic to have more opportunities to turn right out of the site is beneficial for the overall circulation of the pedestrian, visitor, employee and emergency traffic. Right turns also involve less risk for crash and severity of crash potential.

Increasing the use of the additional access points discussed, will also help with the queuing of vehicles at the 10th Street and 12th Street intersections with McDowell Road.

VI. Proposed Traffic Impacts

The trip generation for the site, includes the addition of newly located traffic and subtraction of existing traffic that will be removed when buildings are demolished and added with the new facilities. The trip generation was calculated using the ITE Trip Generation Manual, 10th Edition.

As discussed in the Existing Traffic Data section, there are several weekday peak traffic time periods to consider for the BUMCP campus. These are as follows:

Peak Traffic Hours Number 1 (No 1) - The first peak hour considered was the adjacent arterial and collector street traffic morning and afternoon peak hours.

Peak Traffic Hours Number 2 (No 2) - The next crucial peak hour to consider is the BUMCP hospital peak hour which is earlier than the adjacent arterial and collector street peak hours.

Peak Traffic Hours Number 3 (No 3) - Adjacent clinics and medical office buildings.

During Peak Traffic Hours Number 2, the pedestrian traffic also peaks on the campus as the employees walk to and from their parked vehicles. This peak usually takes place around shift change at about 7:00 AM and again around 4:00 PM. The typical peak hour for clinics and medical office buildings (No 3) is later around 10:00 AM and 3:00 PM when the adjacent street traffic (No 1) and BUMCP traffic (No 2) is not as critical.

Since the morning peak hour for the hospital does not crossover with the morning peak hour for a clinic, the generator peak for the clinic was not used in conjunction with the hospital generator peak traffic. The adjacent street peak hour is closer in time to the hospital morning peak, therefore, when considering the hospital morning peak, a conservative approach was taken and the adjacent street peak hour traffic for the clinics were added to the generator peak for the hospital.

Table 2 shows the trip generation calculations. The first trip generation calculations in the table are for the facilities that will be removed; therefore, their trip generation is negative (shown in parentheses) to show the trips will be subtracted. The trips were then calculated for the new or repurposed facilities. After calculating all the trips to be removed and added, the total number of trips were calculated to determine the net number of vehicles to be generated.

Table 2 –Trip Generation

					Weekday	Generator	
Parcel	Land Use	Description	Qnty	Units	Weekday	AM Peak	PM Peak
1	720	Medical-Dental Office Building	(46)	1,000 SF	(1,601)	(162)	(189)
2	720	Medical-Dental Office Building	(13)	1,000 SF	(449)	(46)	(53)
3	610	Existing Hospital	(604)	Beds	(12,482)	(1,142)	(1,262)
4	610	New Hospital Tower	604	Beds	12,482	1,142	1,262
5	630	Clinic	70	1,000 SF	2,113	258	230
6	630	Clinic	(95)	1,000 SF	(2,867)	(351)	(312)
7	630	Clinic	95	1,000 SF	2,867	351	312
8	630	Clinic	71	1,000 SF	2,143	262	233
9	630	Rec Center	(35)	1,000 SF	(1,009)	(62)	(81)
Total	**-**	-	1,197	-	1,197	546	318

A. Mode Split

There are multiple bus stops that serve the BUMCP campus. Valley Metro Light Rail also has a stop located south of McDowell Road on Central Avenue. Local Bus Route 17, runs along McDowell Road from Estrella Parkway and Pima Road. There are five stops between 7th Street and 13th Street. Two bus stops are located on the north and south side of McDowell between 10th Street and 12th Street.

Route 7 also has stops located near the campus on 7th Street. Route 7 starts at 19th Avenue and Deer Valley Road and cuts over to 7th Street along Deer Valley and runs along 7th Street to Dobbins Road. The bus route has stops on 7th Street on the north and south sides of McDowell Road.

Route 12 also provides bus stops along the campus. The route runs along 12 Street from Hatcher Road & 12th Street to Jefferson Street. There are stops located on 12th Street between McDowell Road & Brill Street, between Brill Street and Willetta Street and between Willetta Street and Culver Street.

Along with the Valley Metro transit options, a shuttle service is also provided for people traveling from the U of A campus downtown as well as the Light Rail stop.

The multitude of transit options allows many alternative options for visitors and employees to reach the BUMCP campus. With all the transit options, the number of vehicle trips is expected to be reduced by about 10%. The 10% reduction was therefore applied to the existing facility trip generation and the new facility trip generation. **Table 3** shows the resulting trip generation with the mode split applied.

Table 3 –Trip Generation with Mode Split

					Weekday	Generator	
Parcel	Land Use	Description	1,000 SF	Units	Weekday	AM Peak	PM Peak
1	720	Medical-Dental Office Building	(46)	1000 SF	(1,441)	(146)	(170)
2	720	Medical-Dental Office Building	(13)	1000 SF	(404)	(41)	(48)
3	610	Existing Hospital	(302)	Beds	(6,067)	(514)	(568)
4	610	New Hospital Tower	302	Beds	6,067	514	568
5	630	Clinic	70	1,000 SF	1,901	232	207
6	630	Clinic	(95)	1,000 SF	(2,580)	(315)	(280)
7	630	Clinic	95	1,000 SF	2,580	315	280
8	630	Clinic	71	1,000 SF	1,929	236	210
9	630	Rec Center	(35)	1000 SF	(908)	(55)	(73)
Total	**715**		**-**	**-**	**1,077**	**226**	**126**

Along with the addition of new traffic, some of the existing hospital traffic that is being displaced by the new tower, will be rerouted to access the new lobby. Some of the 12th Street ingress and egress traffic is, therefore expected to be relocated to 10th Street where the new lobby will be located.

The outpatient facilities will remain on 12th Street, so that traffic will remain there, however, about 25-30% of the traffic is expected to relocate. The traffic turning movements are expected to remain the same when moved to 10th Street and McDowell. The relocation of the traffic will be analyzed in the Trip Assignment Section.

B. Pass-By Traffic

This site is a destination and should not generate any pass-by trips.

C. Trip Distribution

The trip distribution was assessed based on the existing turning movements for campus ingress and egress as well as using population density for surrounding areas. Surrounding hospitals were also located to determine how much traffic from each region would drive to BUMCP or to another medical campus.

When reviewing the surrounding street network the main arterial streets used to access the campus are 7th Street and McDowell Road. The major highways (or freeways) used to reach the site include the I-10, I-17, SR 51 and Loop 202. The trip distribution was broken up into seven portions within a 5 to 10-mile radius based on the main access corridors of arterial streets and freeways. **Figure 8** shows the different regions assessed for Trip Distribution.

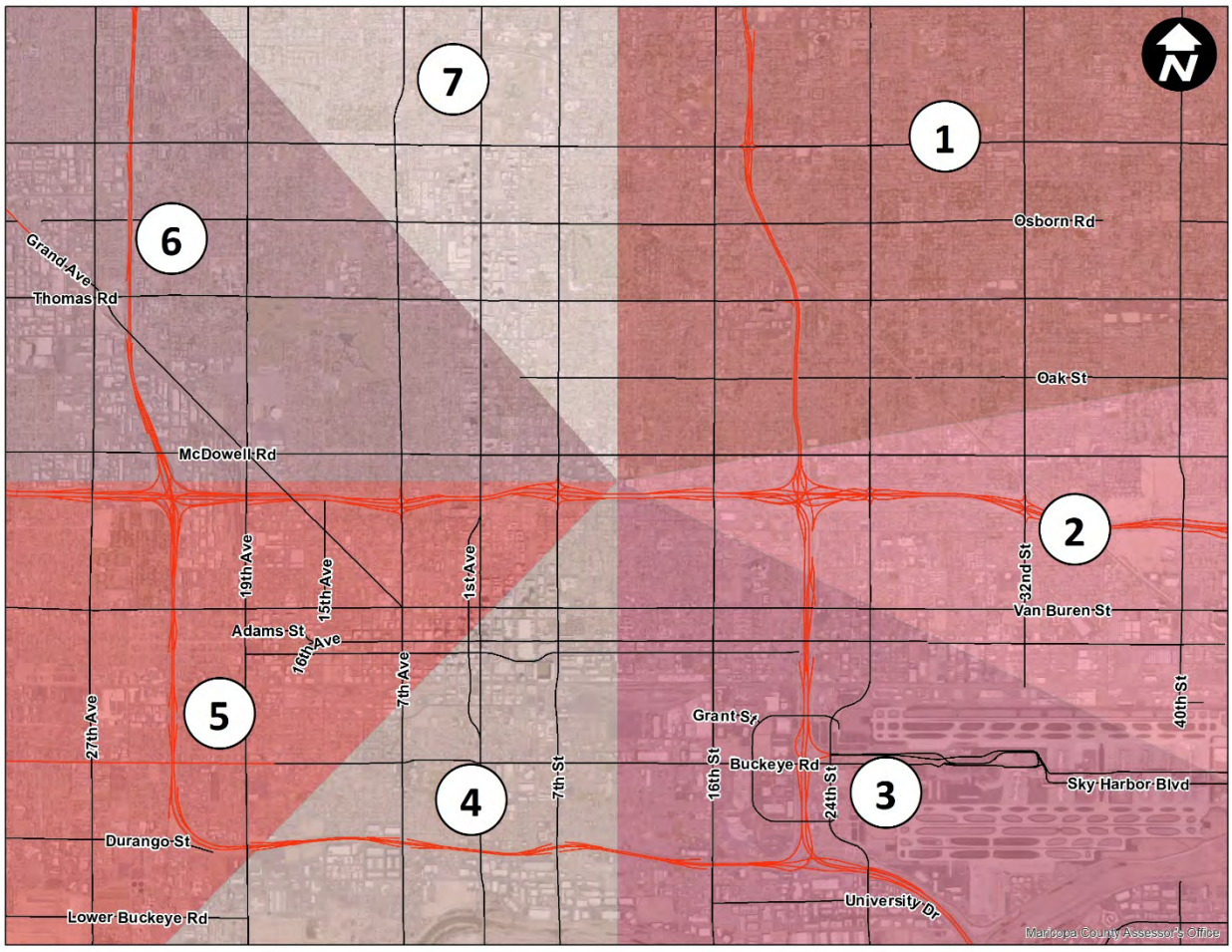


Figure 8 –Trip Distribution Regions

To help develop a method to determine where the existing hospital traffic is coming from, the inbound and outbound traffic was analyzed for the major access points of the BUMCP campus.

Currently, about 85% of the inbound and outbound hospital traffic accesses the campus from McDowell Road or 7th St during the morning and afternoon peak hours. Roughly 75% of the traffic accesses the campus from McDowell Road using 9th Street, 10th Street, and 12th Street. Some hospital traffic uses 13th Street as well, however, the inbound and outbound traffic at 13th Street & McDowell Road is a mix of hospital and residential traffic. The remaining 15% of the traffic comes from 10th Street and 12th Street North of McDowell Road.

The 12th Street traffic is also not all hospital traffic. It is a collector street that is anchored in the north at Thomas Road and is anchored in the South by Roosevelt Street after it crosses over the I-10. A major generator on the north end is North High School. Thus, 12th Street connects the residential neighborhoods south of the I-10 to the residential neighborhoods and North High School to the north. North High School starts at 7:00 AM and releases at 4:00 PM, therefore any high school traffic using 12th Street would be driving along 12th Street about the same time as the hospital peak times. The hospital traffic is expected to make up closer to 5% of the traffic coming from 12th Street.

A larger portion of the inbound traffic along McDowell Road is coming from the West, but only by about 10% more than the traffic traveling from the east. Some of the traffic from the west consists of people traveling from the northwest region, the southwest region and even some traffic traveling from the east on the I-10.

Seventh Street is the first exit on the I-10 after the I-10, State Route 51 and Loop 202 interchange, therefore, traffic traveling westbound on the I-10 will access the site by using the 7th Street exit. The I-10 eastbound hospital traffic will also use the 7th Street exit to arrive at the site as it is the first eastbound exit after the I-10 Deck Tunnel. Northeast traffic is more likely to use McDowell Road to arrive at the site. The northwest traffic is expected to do the same.

The new facilities are expected to have a very similar trip distribution since they will cater to the same population. **Figure 9** shows the expected trip distribution based on the analysis of existing traffic and the population density map from Arizona Council of Governments (COG) & Metropolitan Planning Organizations (MPO) State Demographic Map of total population.

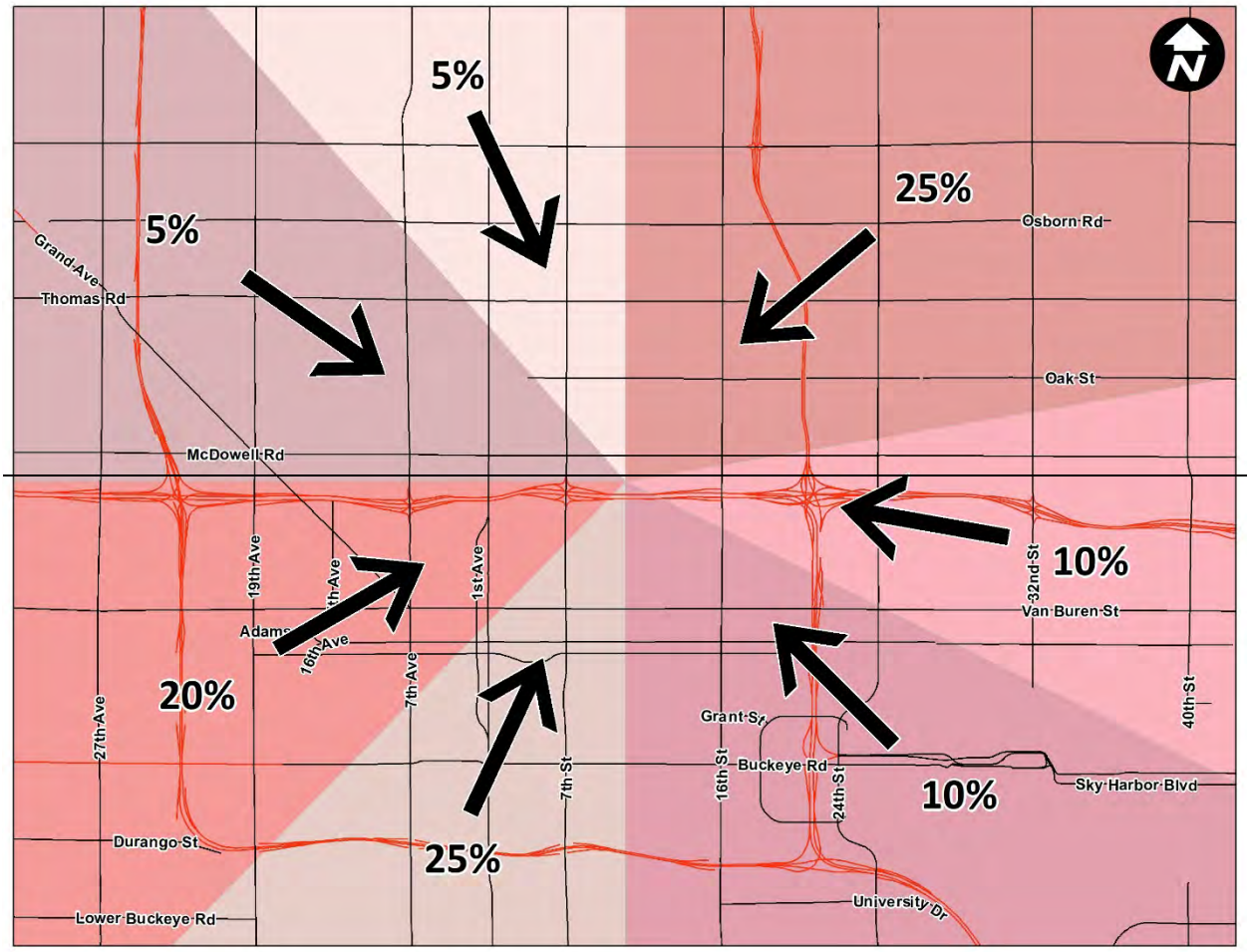


Figure 9 –Trip Distribution

D. Trip Assignment

Before assigning the new traffic to the campus, some of the existing traffic needed to be rerouted to reflect the new main hospital lobby location and the opening of the new hospital tower.

It was assumed that about 30% of the existing ingress and egress traffic at 12th Street and McDowell Road, would be relocated to the intersection of 10th Street and McDowell Road using the same turning movements. **Table 4** reflects the updated existing counts with the rerouted trips for the two signalized intersections.

Table 4 – Rerouted Existing Traffic

Intersection	Peak Hour	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Total
10th St &	AM	36	1,028	155	166	971	37	113	12	96	68	9	65	2,756
McDowell Rd	PM	56	1,332	78	70	1,154	51	169	47	209	47	10	66	3,289
12th St &	AM	26	955	214	135	1,028	59	80	68	66	78	97	53	2,859
McDowell Rd	PM	74	1,388	112	64	1,076	97	144	160	134	59	91	38	3,437

After establishing the trip distribution and rerouting the existing traffic, the trip assignment was determined. All the inbound and outbound traffic is expected to use 7th Street and McDowell Road to reach the site. The traffic will then have to use one of the following intersections or driveway:

- 7th Street & Willetta Street
- 7th Street & Brill Street
- McDowell Road & 9th Street
- McDowell Road & 10th Street
- McDowell Road & 12th Street
- McDowell Road & 13th Street
- McDowell Road Midblock ¾ Entrance driveway

During the peak hours, the majority of the trips are generated by the employees since the peak hours are during the shift change time frame. Based on the location of the employee lots, vehicle trips are expected to use the 7th Street intersections for ingress traffic, 10th Street and McDowell Road as well as 12th Street and McDowell the most. The egress traffic is more likely to use 10th Street and 12th Street because the intersections with McDowell Road are signalized.

The trip assignments were determined based mainly on the suggested employee and visitor routes promoted by the recommended way finders. Not every visitor or employee is expected to follow the suggested route, which was considered when conducting the trip assignment. The resulting trip assignment is summarized in **Table 5**.

Table 5 –Trip Assignment

Intersection	Peak	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Total
10th St &	AM	0	21	35	29	3	0	26	0	10	0	0	0	124
McDowell Rd	PM	0	3	7	6	8	0	46	0	11	0	0	0	81
12th St &	AM	0	16	8	18	37	0	3	0	6	0	2	0	90
McDowell Rd	PM	0	19	1	4	7	0	8	0	9	0	0	0	48
7th St &	AM	0	0	0	0	0	0	0	77	31	0	30	0	138
Willetta St	PM	0	0	0	0	0	0	0	15	5	0	55	0	75
7th St &	AM	0	0	0	0	0	0	0	54	24	0	30	0	108
Brill St	PM	0	0	0	0	0	2	0	10	3	0	55	0	70

VII. Traffic & Improvements Analysis

A. Level of Service Analysis

The level of service (LOS) analysis was conducted using the Synchro 9 and 10 software. When determining the LOS, there was one set of criteria followed, based on the Highway Capacity Manual 2010. For a signalized intersection, the criteria established in Exhibit 18-4 was followed as shown in **Table 6** from HCM 2010 Chapter 18.

Table 6 – Signalized Intersection LOS Criteria

Control Delay (s/veh)	LOS by Volume-to-Capacity Ratio[a]	
	≤1.0	>1.0
≤10	A	F
>10–20	B	F
>20–35	C	F
>35–55	D	F
>55–80	E	F
>80	F	F

Note: [a] For approach-based and intersectionwide assessments, LOS is defined solely by control delay.

1. *Without Project*

Using the existing TMC and ADT counts, the existing LOS and delay was determined for each intersection as summarized in **Table 7** for the two signalized intersections.

Table 7 – Existing LOS and Delay

		Existing	
Intersection	**Peak Hour**	**Delay**	**LOS**
10th St & McDowell Rd	AM	19.4	B
	PM	16.4	B
12th St & McDowell Rd	AM	20.4	C
	PM	17.9	B

2. *With Project*

The LOS and delay was calculated for the existing traffic with the addition of site traffic. **Table 8** summarizes the resulting LOS and delay.

Table 8 –With Projects LOS and Delay

		Existing + Site	
Intersection	**Peak Hour**	**Delay**	**LOS**
10th St & McDowell Rd	AM	12.7	B
	PM	14.8	B
12th St & McDowell Rd	AM	14.0	B
	PM	14.3	B

Figure 10 provides a visual representation of the intersection traffic.

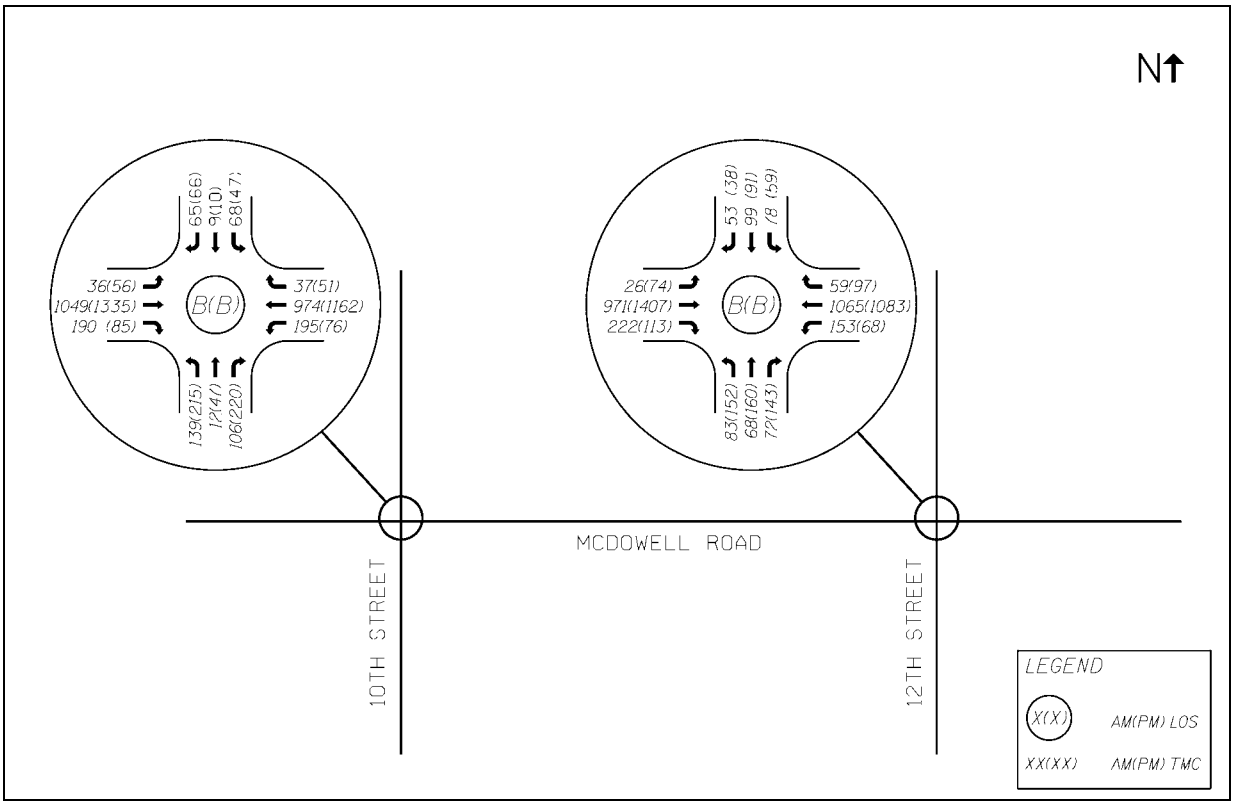


Figure 10 – Existing + Site Traffic

B. Queuing Analysis

After calculating the LOS and delay for each intersection, a queuing analysis was conducted to determine if the queue length for the egress traffic at the two intersections exceeds the lane capacity. **Table 9** shows the comparison of the existing queue lengths and existing with site queue lengths for the northbound left and right turns as well as the westbound left turns for the two signalized intersections.

Table 9 – Calculated Queue Length

		Existing Queue (ft)			Existing + Site Queue (ft)		
Intersection	**Peak Hour**	**WBL**	**NBL**	**NBR**	**WBL**	**NBL**	**NBR**
10th St & McDowell Rd	AM	53	106	52	318	175	60
	PM	25	131	175	41	301	262
12th St & McDowell Rd	AM	172	135	42	59	116	41
	PM	59	303	96	29	224	86

Due to the relocation of hospital facilities to the west, the queue lengths are reduced on 12th Street, however, the queue lengths are increased for 10th Street. The westbound left turn and northbound left turn queues increase significantly. The maximum northbound left turn queue extends southbound to Brill Street, blocking a few driveways as well as access to the shared through/right turn lane. One driveway of concern is the emergency room parking lot entrance, which is an important entrance to provide quick access to.

So, the conclusion from this analysis is needed at the existing 10th Street and McDowell Road intersection to account for the impact of the new traffic (site traffic) that will be using it.

C. Roadway Improvements

1. Improvements Programmed to Accommodate Non-Site Traffic

There are no planned improvements for the roadways to accommodate non-site traffic.

2. Improvements Programmed to Accommodate Site Traffic

In order to accommodate site traffic, an additional access point (or driveway) at the midblock between 10th Street and 12th Street is planned once the west tower is demolished. As it is now there the existing West Tower is in the way.

The new additional driveway will connect with an internal campus road that connects the north parking lots on 10th Street and 12th Street. The new access point will allow for ¾ access with a right-in, right-out, left-in turning movement allowance.

This new additional driveway will provide additional visitor access to the site, which will reduce the number of ingress trips from the east and west and reverse the egress trips to the east. Westbound egress traffic (or left out to McDowell Road) will still need to use 10th or 12th Street.

IMPORTANT NOTE: The existing traffic and the trip assignment reflects the current closure of Willetta Street. This was done because the building of the new hospital towers requires Willetta Street between 10th Street to approximately 11th Street to be closed to accommodate construction. Excluding Willetta Street contribution to the circulation potential to the campus presents the worst-case scenario. With Willetta Street open, the traffic circulation is improved as there will be a way around on the south side of the campus for internal circulation. More trips can be moved to Willetta Street and avoid some of the heavier trafficked areas. Additionally, another factor that makes this assumption even more conservative is the fact that Culver Street has not be included at all. Culver Street's connection between 10th Street all the way over to 12th Street and beyond does offer an alternative route to Willetta when it is closed and when it is open as well.

Also, based on the traffic analysis of 10th Street and McDowell Road, it will be necessary to increase both northbound left turn and right turn capacity at this intersection. Ideally a dedicated right turn lane combined with a dual left would be highly desirable. This is discussed in more detail later in this report.

VIII. Future Traffic Operations

A. Considerations for Potential Pedestrian Improvements

As stated earlier in the report there are a variety of alternatives to be considered regarding pedestrian treatments. This includes observations on the treatments that are already in-place.

The basic conclusion can be that the provisions for pedestrians crossing streets is operating reasonably well. According to Banner personnel there have been no pedestrian serious crashes or accidents on BUMCP streets, parking lots or driveways over the past five-years. A similar effort to determine the

crash history along McDowell Road and 12th Street within the area of the BUMCP campus will be requested. However, was not available for this version of the report.

Therefore, based on this information there does not appear to be a reported crash or accident issue. Thus, it is determined that the main issues to be addressed if measures need to be considered to enhance what already exists (baseline treatments like low speed limits, high visibility crosswalks, street lighting, in street signing, etc.) that could enhance the opportunities for substantive improvements. This is of particular interest is on 10th Street and 12th Street.

Previously in this Report under **V. Internal Circulation Issue Identification** under **A. Pedestrians** under **2. Opportunities** five main areas of alternatives were presented regarding potential improvements related to pedestrians. See this section for a more complete discussion of these, however a summary of those areas are as follows:

> **Alterative 1 -** Reduce the number of crosswalks if possible and to funnel pedestrians to the remaining crosswalks.
> **Alternative 2** - Only place pedestrian crosswalks at intersections of designated streets that are stop controlled either on the cross street or all way.
> **Alternative 3** – Signalize the crosswalks in some manner (RFB, HAWK or standard).
> **Alternative 4** – Use a physically active pedestrian crosswalks treatment like platform intersections, raised crossing, off-set or two stage crossing or speed humps.
> **Alternative 5** - Enhance the existing crosswalks with some additional signing, marking or street lighting treatments.

Chances are that a combination of some of these alternatives are advisable to add to the baseline treatments that already exist. The recommendations on these will be presented later in this report.

However, at this point it is important to note that HKS and Banner specifically requested that Dibble Engineering make an effort to explore developing a possible approach to signalize certain pedestrian crossings on both 10th Street and 12th Street. The thinking behind this exercise is that these signals might help organize the assignment of right-of-way between pedestrian crossers, vehicles and emergency vehicles better than other approaches.

In reviewing the traffic data, it is apparent that the number of pedestrian crossings at some of the marked crosswalks are at the threshold demands that bring in the possibility of signalization. This is made very apparent through field observations of the traffic at some of the locations on any weekday during peak traffic times. Also, the addition of parking garages on the campus will result in added and more concentrated pedestrian crossing volumes. Then there is the pending recommendation to remove one of the marked crossings on 10th Street nearest McDowell Road. Therefore, based on these reasons a review of the **Manual on Uniform Traffic Control Devices** (MUTCD) signal warrants was conducted.

Based on the MUTCD **Part 4 Highway Traffic Signals** there are two methods to evaluate whether or not a pedestrian crossing might be considered for signalization. The first is to approach with the standard nine traffic signal warrants that are presented in **Chapter 4C Traffic Control Signal Needs Studies**. The

other is to review **Chapter 4F Pedestrian Hybrid Beacons** application criteria as presented in **Section 4F.01 Application of Pedestrian Hybrid Beacons** (PHB). Note that PHB is a term designation that FHWA came up with to replace HAWK, therefore, PHB means the same thing as HAWK. Since the concept and approach was developed in Tucson, Arizona, HAWK is the preferred name here.

For this report it was decided to go with the Section 4F.01 approach. With the existing pedestrian and vehicle counts, any single crosswalk on 10th or 12th Street do not meet a pedestrian signal warrant according to the MUTCD. The 12th Street and Brill Street crossing is relatively close to meeting **the Figure 4C-6 Warrant 4 Pedestrian Four-Hour Volume (70%)** in the afternoon with 246 pedestrian crossing volume and a 297 vehicle volume. The same goes for the first crossing on 10th Street south of McDowell Road in the morning with 239 pedestrian crossing volume and a 338 vehicle volume. Figure 4C (4C Warrant) presents a graph that relates a threshold relationship between the total volume of pedestrian crossers to number of vehicles.

Therefore, any growth or variation in the counts could place either of these crossings above the threshold set in the MUTCD. Additionally, with closing one of the busiest 10th Street marked crossings there will be a re-allocation of pedestrian crossers to either the crosswalks further south at Brill Street or up to the signal at McDowell road. The Brill Street crossing already has an morning peak hour pedestrian crossing volume of 116 and an afternoon pedestrian crossing volume of 60. Hence, if it is assumed that all the pedestrians will come down to the Brill Street crossing the 4C Warrant will be met.

However, just because one of these crossings goes above the threshold (or line) does not in itself justify a signal as the required solution. Warrants in the MUTCD are criteria to be used on which to consider a signal. Meeting a warrant does not trump all other alternatives or options, including the existing conditions. In fact, under **Section 4C.01 Studies and Factors for Justifying Traffic Control Signals** in the MUTCD the standard statement is: "**The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal."**
Since the 4C Warrant is met for the 10th Street and Brill Street crossing, the option for a signal will be explored at this location. There are two possible concepts for signalizing the crosswalk. The first would go with the HAWK (PHB) approach. The second would be to use a more standard or conventional traffic signal approach.

The HAWK signal will be explored first. The standard sequence with a HAWK, upon activation by a pedestrian, is a flashing yellow indication, then a steady yellow indication, followed by a steady red and then a wig wag flashing red. The idea is that pedestrians (or crosser) have the complete right-of-way on the steady red (vehicles must stop) and then conditional right-of-way on the wig wag flashing red. What is meant by conditional right of way is that vehicles must stop and yield to a crosser who is still in the crosswalk. However, if there is no crosser in the crosswalk the vehicle simply has to stop to check for pedestrians crossing and then can proceed if the crosswalk is clear. The wig wag flashing sequence really presents the advantage a HAWK has over a conventional signal. It allows a vehicle to proceed if no one is there. Then when the HAWK is dark vehicles can proceed without interruption.

Again, the advantage of the HAWK is vehicles can stop and then proceed on the flashing red if no one is crossing. When the signal is dark vehicles can proceed uninhibited.

Figure 11 demonstrates the vehicle and pedestrian movements for 10th Street that would be possible with a HAWK.

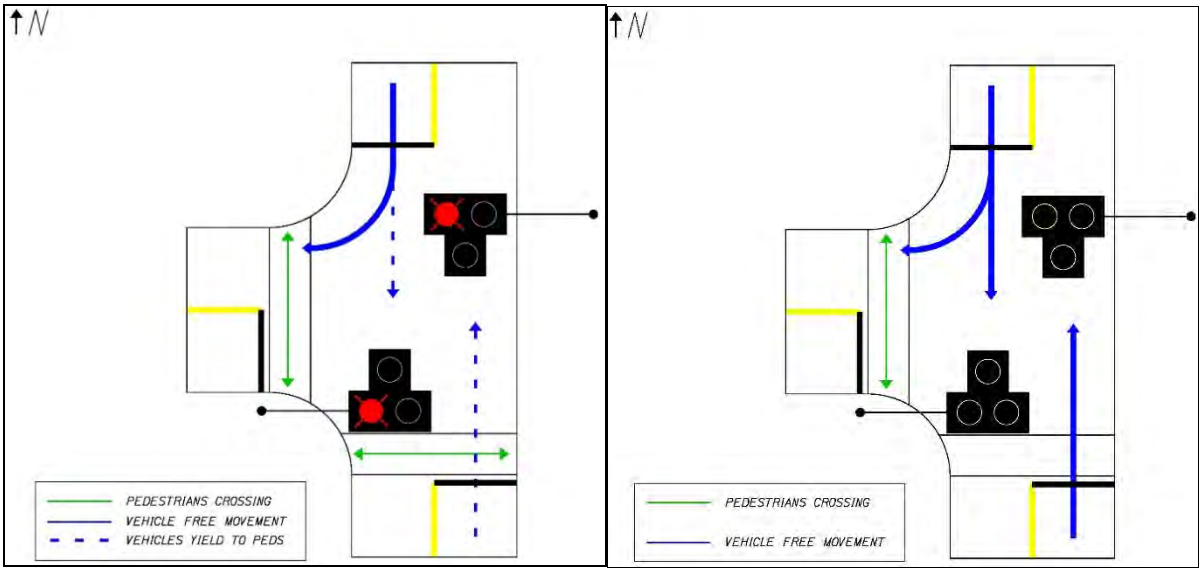


Figure 11 – 10th Street Hawk Signal at Brill Street

There is a complication in trying to signalize 10th Street in the Brill Street area. Unfortunately, the new driveway into the new emergency room is offset from the existing Brill Street alignment on the west side of 10th Street. This makes it more difficult to locate the signal poles. One solution would be to move the physical location of the crosswalk further to the south.

This offset intersection also places the eastbound right turns into an odd conflict with the westbound left turns out of the emergency room driveway. The main issue is once the right turner is making their turn or has made their turn they typically are not expecting a conflict to their left. There are most like focused on the street in front of them, not to their left side out of that driveway.

A HAWK at 12th Street would have a similar setup. However, it would have a full cross intersection.

The second pedestrian signal option is to implement a regular traffic signal that remains red for the north and southbound traffic on 10th Street allowing pedestrians to freely cross. When vehicles begin to queue, the signal will stop the east and westbound pedestrians crossing 10th Street and allow the north and southbound vehicles to move freely as well as the north and southbound pedestrians crossing Brill Street.

This option will help increase pedestrian crossing convenience and enhance vehicular flow. It can also help to break up the traffic arriving at the intersection of 10th Street and McDowell Road, thus helping with the longer left turn lane queue length.

Figure 12 shows the vehicle and pedestrian movements for the signal alternative.

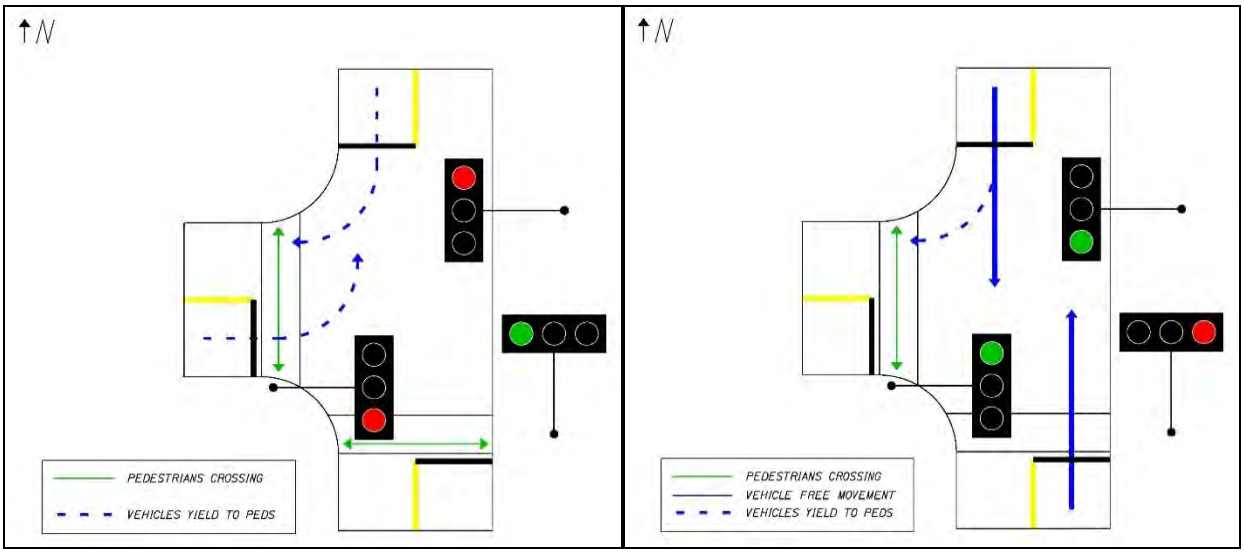


Figure 12 – 10th Street Signal at Brill Street

Again, the offset emergency room driveway with Brill Street presents a complication to this approach. The offset brings up the question: Is this whole area signalized or just the emergency room driveway portion of it? The problem with this approach is the right turn will be turning into the signal and it might be more difficult for drivers to see the signal let alone know that there is one there.

The 12th Street signal could be signalized in a similar fashion, except it would be a full four-legged signalized intersection.

To summarize, the signal analysis reveals that the signal alternatives for both 10th Street and Brill Street and 12th Street and Brill Street are difficult solutions. Either a HAWK or regular signal adds complications to these streets that may result in undesirable consequences and considerable expense in initial costs and in operating costs. Possible traffic operational negative consequences include more stop delay and additional congestion and queues.

The other alternative would be to make either or both 10th Street and Brill Street and 12th Street and Brill Street all-way stops. This would increase stop delay, but it would help better define and allocate right of way assignment between vehicles and pedestrians without the complication of a traffic signal.

B. Considerations for Bicycle Improvements

Currently, according to the City of Phoenix "**Bicycle Map & Phoenix Historic Neighborhoods**" only 12th Street has a bike lane. Twelfth Street has this designation from Thomas Road all the way down to Moreland Street. Moreland Street is just south of I-10. At this intersection this "Bike Lane" turns to a "Bikeable Route" as it turns to the east on Moreland Street where this designation continues until the intersection with 11th Street. North of Moreland the 12th Street "Bike Lane" intersects three "Bikeable Route" designated streets at Palm Lane, Oak Street and Virginia Avenue.

The "Bikeable Route" then goes south on 11th Street all the way down to Jefferson Street. Along this way it also intersects a "Bike Blvd" at Fillmore Street, another "Bikeable Route" at Monroe Street and then "Bike Lanes" at both Washington Street and Jefferson Street.

There certainly is an opportunity to try and provide for bike access to the BUMCP off of 12th Street. This street has good east and west connection into the campus at Willetta Street and a reasonable connection at Culver Street. Tenth Street also offers an opportunity. The overpass at I-10 provides it the opportunity to connect directly into the Moreland Street "Bikeable Route."

Discussions with the City of Phoenix have revealed their requirement that 10th Street would need to be configured so it would achieve official bike route designation through the Planned Unit Development (PUD) process the BUMCP campus is currently in. Hence Dibble Engineering developed a separate 10th Street bike plan and has included this as an action item in the recommendation section of this report.

IX. Traffic Mitigation Analysis 10th Street and McDowell Road

A. Summary of Traffic Mitigation Determination

The BUMCP campus improvements previously discussed, help to provide some circulation improvements to the site and alleviate some of the traffic on 10th Street and 12th Street, however, the improvements do not account for the fact that significant left and right turn demand will be shifting from 12th Street to 10th Street. Therefore, to mitigate this shift in demand and to allow for future growth it is highly desirable to increase the capacity and capacity utilization at the 10th Street and McDowell Road intersection.

Without these improvements there will be significant delay for northbound vehicles trying to turn left and right during the peak traffic times. Additionally, vehicles waiting in queues would more than likely hinder access to key driveways along 10th Street, including the driveway for the Emergency Entrance.

The question then becomes what can be done at 10th Street and McDowell Road to mitigate the traffic demand? To try and answer this question an extensive alternative (or options) analysis was developed and conducted. The effort to conducted all of this work happened over a period of time. These waves of effort occurred generally in mid to late 2018 (contained later in this section of the report), March of 2019 and again in May and June of 2019.

Throughout the process of the traffic study in 2018, analysis was conducted to determine the effects of additional outpatient facilities and parking structures.

Then in early 2019, building upon this previous work, a new six option analysis was done (March of 2019) and now with this report a new seven option analysis is offered. All of these analyses had similarities, however each one of these waves (or intervals) required significant work to update as new or better information was achieved or obtained through discussions with the Banner team and City of Phoenix. For example, this report continues a complete update to all of options since the City of

Phoenix updated the timing of the 10th street traffic signal at McDowell Road during the analysis conducted in this report. These new timing plans were not obtained until May 2019.

The main goal of this extraordinary level of analysis was to determine which improvements could be achieved that would be acceptable to both the BUMCP project team (HKS & Banner) and the City of Phoenix. This was necessary due to issues arising over what the BUMCP team thought was the most desirable verse what could actually work and what the City of Phoenix would accept. Also due to initial cost considerations, there was a reluctance by the BUMCP project team on widening 10th Street to add a dedicated right turn lane.

Therefore, to help both the City of Phoenix and BUMCP project team better weigh the possible options, an in-depth study of 10th Street and McDowell Road was necessary. This process of development, analysis, review, resolution, and re-analysis involved many months of effort and many meetings with the BUMCP project team and City of Phoenix. Eventually seven different options were developed and analyzed. It is important to note that the seventh option was brainstormed out during a meeting with the BUMCP project team in late April 2019 during a meeting that was being held to discuss and review the first 6 options (version 1.0, see appendix).

The reason the late April meeting was being held with BUMCP team was because the dual left option and the single left options were still not providing the most desirable approach for the left turn demand. Granted, all the options that included the dedicated right turn lane showed significant improvement. However, the dual left turn lane option that required the split phasing would not be something that the City of Phoenix would allow due to its negative impact on McDowell Road and the fact in would cause some failing level of service ratings. Hence at this meeting the possibility of eliminating both the through northbound and southbound through movements was first suggested by Dibble.

This idea was presented to the BUMCP Team as a possibility due to City of Phoenix having previously eliminated through movements at signalized intersections for two distinctly different reasons. The first reason is to prevent cut through traffic in neighborhoods. The other is to account for high turning vehicle demand when there is light or hardly no demand for through movements. An example of the cut though neighborhood application is at 48th Street (Arcadia Lane) and Indian School intersection. An example of the turning lane demand is at 38th Street and Bell Road.

Interestingly enough, both of these conditions exist at 10th Street and McDowell Road. The BUMCP Team stated that they have received some complaints regarding a perception of cut through traffic. As shown in Figure 4, the turning movements for northbound 10th Street are the dominate movements at this intersection. Hence this intersection is a good candidate to eliminate the through movements. Therefore, based on this finding Option 7 was added to the analysis (version 2.0, see appendix).

The results of the now seven Options were reviewed and submitted to the City of Phoenix on May 25, 2019. Based on this meeting it was decided that Option 7 was the best solution of both BUMCP and the City of Phoenix. However, the City of Phoenix placed the following stipulations on Option 7 being fully approved. Those stipulations were as follows:

(1) Coronado Neighborhood will support it.
(2) The intersection can be modified so a dual left turn movement can be received by the two westbound through lanes on McDowell Rd.
(3) The bus stop (west of 10th Street on the northside of McDowell) can be relocated to get it out of the way of the dual left turn outside lane.

As of this version of the report, stipulations 2 and 3 have been met. Dibble conducted a geometric analysis that included a variety of design vehicles (using Autoturn) that indicated that the 10th Street dual left can be accepted by the two westbound McDowell Road lanes. Then on May 31, 2019 the City of Phoenix verified that their Transit Department approved moving the existing bus stop east of 10th Street.

Additionally, at the meeting, the City of Phoenix requested an updated traffic analysis of Option 7 to reflect the exact phase sequencing they will be asking for. The City also requested the Synchro files so they could review and provide the input. They also requested that all the analysis should be updated based on their new timing plans for 10th Street in combination with the timing for 7th Street and 12th Street. They also directed that the lagging left option will be eliminated. All these City of Phoenix requirements have been completed and are contained in the appendix of this report, Version 3.

More discussion on what precipitated the arrival at Option 7 is presented later in this section.

B. Mid to Late 2018 Traffic Mitigation Determination Efforts

In mid to late 2018 the following initial group of scenarios were analyzed and assessed for feasibility:

1. Adding protected phase to the permissive westbound left turning movement
2. Making the westbound left turning movement a lagging, protected-permissive left
3. Providing northbound dual left turn lanes
4. Providing a northbound right turn lane
5. Providing a northbound dual left turn lane with a shared through/right turn lane
6. Providing northbound dual left turns, a shared through/right turn lane
7. Providing northbound dual lefts turn lanes, a shared through/right turn lane, and a westbound protected-permissive left turn
8. Providing northbound dual lefts with one lane as a shared through/left turn lane and a single right turn lane with split phasing for north and southbound traffic

Eventually these 8 scenarios were boiled down to three options that appeared to be feasible. The discussion on these three options is as follows.

The first feasible scenario, Option 1, included a single northbound left turn lane, a single through lane and a single left turn lane with a protected/permissive phase for the westbound left turn. The overall intersection level of service and delay were acceptable and the westbound left turn queue and delay is significantly reduced during the morning hospital peak. The northbound left turn queue still extends

south to Brill Street blocking driveways and access to the northbound through and right turn lanes in the afternoon hospital peak.

After running the analysis for Option 1, it was determined that dual left turn lanes could have the greatest positive impact for the northbound traffic. Providing dual left turn lanes would help to flush out more northbound left turning vehicles and would also provide additional storage for the vehicle queue. In order to provide dual left turn lanes, however, a protected phase would need to be added for the northbound left turning movement.

Due to site distance issues, the southbound left turn lane would also need a protected phase. Providing a protected phase for the north and southbound left turns would significantly reduce the amount of time allotted for the eastbound and westbound traffic in order to make the dual left turn lanes effective and allow for enough time for pedestrians to cross McDowell Road. In order to maximize the amount of time for the northbound left turning vehicles, split phasing was proposed for the north and southbound traffic and found to be the most effective approach in decreasing the LOS, delay and queue for the northbound traffic.

The split-phasing, however, requires more time from the eastbound and westbound phase. In order to accommodate the required pedestrian crossing time per the MUTCD **Section 4E.06 Pedestrian Intervals and Signal Phases** (27-28 seconds), the eastbound and westbound phases would lose a significant amount of time (at least 25 seconds). Due to the minimal number of pedestrians crossing McDowell Road on the west leg of the intersection and the small amount of southbound traffic, one option would be to route pedestrians to cross McDowell Road on the east leg of McDowell Road, allowing for a reduction of the time needed for the southbound phase.

Based on the analysis, Option 2 includes northbound dual lefts with one lane as a shared through/left turn lane as well as a northbound right turn lane. The westbound protected/permissive phase was also included for this option. This option significantly reduces the queue for the northbound left turning traffic as well as the westbound left turning traffic. The northbound left turning vehicles no longer block access to the northbound through and right turn lanes.

Although the delay and queue length are decreased for the northbound traffic with Option 2, the amount of additional required time to accommodate split phasing as well as minimum pedestrian crossing time would cause a significant impact to the eastbound and westbound phases. The signal coordination along McDowell Road would be impacted. The City of Phoenix would oppose this impact on McDowell Road. Additionally, the priority with a traffic impact analysis is to mitigate potential negative impacts on the adjacent arterial system, not cause them. Split-phasing would cause a negative impact to McDowell Road.

One additional option was investigated that would have less of an impact on the eastbound and westbound traffic. Option 3 includes a single northbound left turn lane, a single northbound through lane, and a single northbound right turn lane. The northbound left is run with protected/permissive phasing as well as the westbound left turn lane.

For Option 3 in the morning, more time is needed for the protected westbound left phase and less or no time is needed for the northbound left protected phase. In the afternoon, less time is needed for the protected westbound left turn phase while at least 10 seconds would be beneficial for the northbound left turn phase. Providing the protected northbound left turn phase with a minimum of 10 seconds, only requires the addition of about 8 seconds from the eastbound/westbound approaches from the current condition to accommodate the vehicle phases as well as the minimum pedestrian crossing time.

After running analysis in synchro the overall intersection level of service and delay for the three options are summarized in **Table 10**, followed by **Table 12** summarizing the delay and queue lengths for the critical turning movements.

Note that the two tables depict a protected/permissive phase for the northbound left turns with Option 3 for the 10th Street intersection for both the morning and afternoon. The protected/permissive phasing does not provide a benefit to the morning traffic, therefore, the morning peak could operate without using the protected northbound left turn phase and would therefore operate the same as Option 1 in the morning. Synchro reports for the analysis can be found in **Appendix C**.

Table 10 – Overall LOS & Delay for Mitigation Options

		Option 1		Option 2		Option 3	
Intersection	**Peak Hour**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
10th St & McDowell Rd	AM	15.7	B	32.2	C	22	C
	PM	15.1	B	18.2	B	17.1	B
12th St & McDowell Rd	AM	14.3	B	15.0	B	14.6	B
	PM	13.3	B	15.8	B	12.4	B

Table 11 – Turning Movement Delays (s) for Mitigation Options

		Option 1 Delay (s)			Option 2 Delay (s)			Option 3 Delay (s)		
Intersection	**Peak Hour**	**WBL**	**NBL**	**NBR**	**WBL**	**NBL**	**NBR**	**WBL**	**NBL**	**NBR**
10th St & McDowell Rd	AM	24.2	48.6	8.7	44.4	43.2	9.2	31.9	38.8	7
	PM	10.4	64.7	26	12.6	47	8.7	16.3	47.3	21.5
12th St & McDowell Rd	AM	11.5	48.8	9.7	11.5	48.8	9.7	11.5	48.8	9.7
	PM	9.7	61.1	14.6	9.7	61.1	14.6	9.7	61.1	14.6

Table 12 – Calculated Queue Length (ft) for Mitigation Options

		Option 1 Queue (ft)			Option 2 Queue (ft)			Option 3 Queue (ft)		
Intersection	**Peak Hour**	**WBL**	**NBL**	**NBR**	**WBL**	**NBL**	**NBR**	**WBL**	**NBL**	**NBR**
10th St & McDowell Rd	AM	143	175	49	210	107	50	162	152	45
	PM	32	301	166	43	169	69	48	231	156
12th St & McDowell Rd	AM	59	116	41	59	116	41	59	116	41
	PM	29	210	83	29	210	83	29	210	83

C. 2019 Traffic Mitigation Determination Efforts

In 2019 the approach to 10th Street and McDowell Road intersection became the main focus of this study. As already stated herein there was a divergence on what was an acceptable mitigation to the BUMCP Team and the City of Phoenix. The 2018 analysis efforts had led to some progress, however there were still issues on what the best approach to minimize the potential adverse impacts that left turn queueing could have.

Therefore, in order to facilitate substantive discussions a renewed, but fully separate supplemental study of the 10th Street and McDowell Road intersection was conducted. This effort built on the previous work done but expanded the scope of analysis to compare the no build alternative with six potential mitigation Options. The results of the analysis were documented in a memorandum format entitled BUMCP 10th Street Mitigation Options. Three versions of this memorandum along with all its attachments were produced. All three version are in the appendix of this report.

The content of the memorandum itself contained a discussion of the overall issues regarding the operations of 10th Street and McDowell Road intersection, a glossary of traffic signal operation terms, and a summary of traffic signal timing guidelines. Attached to the memorandum where graphics depicting the calculated queue lengths for the critical or key turning movements (northbound 10th Street right and left turns and westbound McDowell Road left turn to 10th Street), a detailed discussion of each option along with a listing of the quantitative and qualitative Pros and Cons of each one, a summary table of the level-of-service (LOS) of each option, a summary of the calculated queue lengths for the key turning movements and then a Decision Table that allowed a one page comparison of the key information to help enable decisions.

The first version of the memorandum was produced on May 3, 2019. Then based on input and new ideas version 2 was produced on May 23, 2019. This version was used to help facilitate the determination of the preferred mitigation alternative (Option 7) during a meeting between Dibble Engineering, BUMCP Team and the City of Phoenix. Then based on the results of that meeting and subsequent developments version 3 was produced June 7, 2019.

The summary of why Option 7 was decided as the preferred mitigation alternative is as follows. It is important to note that three different alternatives of Option 7 were analysis. This was done to explore some different signal operational strategies that could be done or might be done by the City of Phoenix. The important aspect of Option 7 is to design the intersection's geometry and traffic signal that enables all of these alternatives.

This key element of Option 7 is to eliminate the 10th Street northbound and southbound throughput traffic for the intersection. The option also includes a dual northbound left turn lane and a northbound dedicated right turn lane; however, the phasing is protected for the northbound left turns or it could be protected/permissive. Both of these possibilities offer good advantage. The southbound left turn has protected/permissive phasing. All the pedestrian crosswalks remain open for this option.

The key advantages of Option 7 (The Pros) are:

- Decreases westbound left turn delay by over 60 seconds in the morning
- Decreases westbound left turn queue by about 172 feet (9 vehicles) in the morning
- Decreases the northbound left turn queue by about 76 feet per lane (4 vehicles/lane) in the afternoon
- Decreases the northbound right turn delay by at least 7 seconds in the afternoon
- Decreases the northbound right turn queue by over 100 feet (5-6 vehicles) in the afternoon
- Residential neighbors who are critics of the traffic impacts of the Banner development may regard this as a substantive jester of good will. It is a way to help mitigate traffic impacts to a surrounding neighborhood by reducing cut thru potential at a major neighborhood entry point.
- Eliminates the conflict and potential crash risk of through movements with left turning movements.
- If all the left turners and there are no pedestrian calls the signal can cycle back to McDowell and right turners can turn when they have gaps.
- Has the highest capacity configuration of any of the options analyzed. Presents a safety margin if traffic volumes increase.
- Queues waiting on 10th Street northbound are much less likely to interfere with driveways on 10th and left turn lane into emergency room area.
- The northbound left turn queues are not likely to block right turning traffic from accessing the right turn lane.

The disadvantages of this option (or Cons) are:

- There is no longer the ability to travel through at the intersection in the northbound and southbound direction.
- Will require drivers to pay attention, a diverting island will be necessary also additional pavement markings and signing to explain the inability to go through at the intersection.
- May require periodic enforcement by City of Phoenix PD.
- Increases the northbound left turn delay by about 21 seconds in the afternoon. Adding a permissive left feature to the double left could mitigate this delay. However, there are reluctance by many jurisdictions to allow double left protected permissive movements.

See the appendix for more information and details for Option 7.

D. Traffic Management Mitigations

The BUMCP team have reported that they have received some complaints from some individuals who live in the surrounding neighborhoods regarding what they perceive as “hospital worker” cut through traffic. While the BUMCP team does not necessarily agree or disagree with that inference, they do acknowledge that this has been a perception over the years. Therefore, anything that can be done to help reinforce the fact that BUMCP wishes to be a good neighbor will be considered.

This is one of the reasons that BUMCP is willing to go with cutting off the through movements for both north and southbound 10th Street. This will prevent any cut through vehicular traffic from hospital. Also, due to multiple other access opportunities for employees, visitors and emergency vehicles, this does not impact access at all to the campus. Thus, BUMCP is all for this. Plus, as already stated herein cutting off the through movements presents some great traffic operational advantages to the signal.

Cutting off 10th Street through movements is also consistent with the City of Phoenix neighborhood Traffic Management programs. In the **City of Phoenix Street Planning and Design Guidelines dated December 1, 2009** there is **Chapter 7 Traffic Management**. This chapter sets forth the goals, policies, guidelines, and techniques to help mitigate negative traffic issues in neighborhoods. It states that all of this was endorsed by the Surface Transportation Advisory Committee and adopted by the City Council on September 26, 1989.

Under item 3 in the **7.1.1 Goals** it states: "**The intensity of land development and the travel demand produced by it must be in balance with the planned capacity of the transportation system. If this balance is not maintained the inevitable result is traffic intrusion into residential local and collector streets."**

Under item 9 under **7.1.2 Policies** it states: **"Continued efforts to design new residential local and collector street networks to discourage unnecessary non-local traffic through the use of loop streets, cul-de-sacs, T-type intersections and discontinuous alignments, while providing adequate access for residents, visitors, emergency and service vehicles."** Also, later in Chapter 7 there is mention of intersection mitigations that include diverter islands.

The northside of McDowell Road is for commercial land use (e.g. C-2). However, north of the strip of commercial land use that has a lot of parking lots, it is all residential. So, other than serving a couple of commercial driveways 10th Street is all residential north of McDowell Road.

All of the land south of McDowell Road that has frontage on 10th Street is currently zoned C-2 and its land use can be defined as commercial to the west and public/quasi-public to the east. In **7.1.3 Guidelines** item 1 it states: "A residential local or collector street is defined as one whose abutting land use is at least 85% residential when considered in segments of one-quarter mile." Additionally, under item 2 it states that a local street should have a average daily traffic of 2,000 or less vehicles.

All of the land use on 10th Street between McDowell Road and I-10 is 100% commercial.
The average daily traffic along 10th Street south of McDowell Road is 3,114 vehicle per day.

Thus, in summary, cutting off the southbound and northbound through movements at 10th Street and McDowell Road is consistent with the City of Phoenix goals and policies for Traffic Management. Tenth Street north of McDowell Road is a residential local street. Tenth Street south of McDowell Road is a commercial local or collector street. Making 10th a discontinuous through street at McDowell Road appears to be appropriate.

E. Geometric Evaluation of 10th Street & McDowell Road

As stated earlier one of the stipulations the City of Phoenix set for allowing the double northbound 10th Street to westbound McDowell Road left turn movement was to make sure it can function properly. Meaning can two vehicles actually turn simultaneously all the way through the intersection and enter McDowell Road's two westbound lanes without conflict.

Using AutoCAD with Autoturn a geometric analysis was conducted to determine which changes would be needed to the intersection to allow this. The main changes that had to be done was pulling the sidewalk ramps back so the stop bars and crosswalks could be moved back from the intersection to allow enough room so vehicles could turn together. See the appendix for the results of this study.

The design vehicles (as designated in the AASHTO Greenbook) used for this evaluation included passage vehicle, passenger vehicle with a trailer, Single Unit (SU)-30, SU-40, Conventional School Bus, Large School Bus, WB-40 and WB-62. All of these vehicles up to the SU-30 had no issues. Slight out tracking occurred with the SU-40 and Conventional School Bus. Significant out tracking occurred with the Large School Bus and the WB-40. However, even with this out tracking, the proposed geometric design supported the dual turning vehicles. A WB-62 and larger vehicle or truck would have to take up both turn lanes. It is important to note that larger delivery vehicles will use 12th Street to access and exit the campus when making deliveries.

The conclusion was that the dual left turn is reasonably possible with most vehicles if the needed modifications to the intersection are implemented.

X. Conclusions

The increase in traffic with the expansion of the Banner University Medical Center Phoenix is largely offset by both the removal of major existing building such as the West Tower and the change from higher density hospital bed usage at 2 beds per room to a lower density at 1 bed per room.

Pedestrian paths and internal traffic circulation will change and shift significantly from the 12th Street side to the 10th Street side. However, the site and building plans provide multiple potential access options for both visitor vehicle, employee vehicles, emergency vehicles, and pedestrians that should result in reasonable operations and traffic flows. Even if Willetta Street is closed again for construction of a second hospital tower (as assumed for this traffic study).

There will be times of congestion and queues. However, if the recommendations presented in the next section of this report are implemented it is reasonable to expect the length of time of these occurrences will be reduced in the near term. However, the expectation, at least at this time, is use of the BUMCP campus will grow, not only in the services it provides, but the capacity to provide those services. As this happens it is important that building plans for the future be developed with pedestrian grade crossings in mind. This is the ultimate best solution for preventing pedestrians interrupting traffic flows on the main access roads.

Pedestrian crossings are expected to remain the same for a while and eventually decrease for the main crosswalk on 12th Street.

Pedestrian crossings are expected to increase on 10th Street due to the westward expansion of the campus.

The number of crosswalks on 10th Street should be condensed based on the addition, relocation and removal of some facilities. Reducing the number of crosswalks will also help to reduce the number of locations vehicular traffic may need to stop to let pedestrians cross the road.

Adding new wayfinding signage around the campus can help to navigate both employees and visitors in a way that will reduce the number of pedestrian and vehicle conflicts as well as help alleviate some of the demands placed at 10th Street and McDowell Road as well as 12th Street and McDowell Road.

Pedestrian signals could provide benefits in clear delineation of right of way, however application of either HAWKs or standard traffic signals bring a level of complexity and other potential risks that might outweigh any of their advantages. The reality is, campus works reasonably well with the way things are. The only potential changes to make would be to build on what is working by enhancing it. Recommendations are offered on some of these potential ideas (e.g. raised crossings, additional street lighting, etc.).

For 10th Street and McDowell Road split phasing for the northbound and southbound traffic was determined to be infeasible due to the required timing for pedestrian crossings on the west leg. The signal timing would need to be significantly modified to allow for nearly double the existing northbound/southbound phasing times. Modifying would in turn affect the coordination with the adjacent signalized intersections. Removing the crosswalk on the west leg is not a feasible option either due to the location of the westbound bus stop near the intersection. This is why Option 7 was arrived at. This option made the double left feasible because it allows the 10th Street left turns to run concurrently. Hence the existing 10th Street and McDowell Road intersection needs to be reconfigured to reflect what is needed to enable Option 7 assuming all the City of Phoenix stipulations are met.

After investigating several northbound lane configurations for the 10th Street intersection and meeting with the City of Phoenix, the optimum option is to widen 10th Street to the east on the south leg for the addition of a right turn lane. This dedicated right turn lane results in a tremendous improvement.

After discussion with the City on July 24th, 2018, the City assessed the intersection timing for the 10th Street signal and determined the signal was not receiving the proper amount of green time for the north/south approaches due to complications with the detection loops. The signal timing has since been rectified providing additional time to the north/south phases.

The 10th Street intersection as shown in **Figure 6** will be a main access point for eastbound ambulances entering the BUMCP campus. Providing a larger curb radius on the southwest corner would allow emergency vehicles to maintain their speed when turning onto 10th Street.

Bicycle and pedestrian traffic were an additional concern for 10th Street due to the pedestrian bridge in alignment with 10th Street that crosses over the I-10. Although 10th Street south of McDowell Road is a private road, it is still a viable bicycle and pedestrian corridor for the surrounding neighborhoods. Bicycle lanes or a wide multiuse path would be needed for 10th Street from the bridge up to McDowell Road. With the queue of traffic and lane configuration for 10th Street, a new approach is needed for locating the bike lanes to provide ease of access to the pedestrian bridge. One viable option is to start out the

northbound and southbound bike lanes on the same side of 10th Street (west side) from the bridge up to Willetta Street. From there the bike lines can be separated at Willetta Street to the standard bike lane and vehicle travel lane configuration with the north and southbound bike lanes on their corresponding sides of the street up to connect with McDowell Road.

Due to right angle crash risk potential, a left-turn out of the midblock entrance on McDowell Road between 10th Street and 12th Street is not recommended due to a higher crash risk for higher severity crashes from such a turning movement.

Tenth Street south of McDowell Road is a commercial local or collector street. Tenth Street north of McDowell Road is a residential local or collector street. Making 10th a discontinuous through street at McDowell Road appears to be appropriate and in line with applicable City of Phoenix neighborhood goals and policies.

XI. Recommendations

The following traffic improvements are recommended on and adjacent to the BUMCP campus to accommodate traffic issues which were revealed during this study. The number assigned to these recommendations is not intended to present priority, simply to provide reference.

1. A right turn lane is not needed at the midblock entrance from McDowell Road between 10th Street and 12th Street.
2. The midblock entrance should not allow for left turns out. Vehicles should only be able to make right turns in, left turns in, and right turns out. Traffic control, such as a pork chop should be constructed to prohibit left turns out of the driveway onto McDowell Road.
3. Continue use of high visibility crosswalks and in street yield to pedestrian crossing signs on the busier streets (10th Street, Willetta Street, and 12th Street). Suggest using a higher durability pavement marking material like preformed tape or extruded thermoplastic. Pavement marking coloring should be white.
4. Conduct a study to evaluate adopting a raised pedestrian crossing standard (e.g. speed tables) for all mid-block crosswalks including those on 10th Street and 12th Street. Also, review feasibility of raised intersections on internal campus streets.
5. Review street lighting levels at each crosswalk that does not have an existing streetlight in close proximity on either side.
6. Remove the furthest north existing crosswalk on 10th Street that is in between McDowell Road and Brill Street. Place signs directing potential crossers to north to the McDowell Road signal or south to the Brill Street crosswalk
7. Provide bikes lanes along 10th Street when and where possible. From the pedestrian bridge up to Willetta Street, the bike lanes should both be located on the west side of the road to better align with the bridge up to the Willetta Street all-way stop intersection. From there, the northbound bike lane should continue on the east side of the road with the standard lane roadway lane configuration with bike lanes.
8. Widen 10th Street to the east on the south leg for the addition of a northbound right turn lane. Provide a transition back as far to the south for this new lane as possible. This is to help right turners access the lane.

9. Consider increasing the curb return radius for the southwest corner of 10th Street and McDowell Road to at least 35-feet or more if it is less than that now. This will help facilitate emergency vehicles turning right at this corner.
10. Eliminate the north and southbound through movements at the 10th Street and McDowell Road signalized intersection. Reconfigure the intersection curb returns, sidewalk ramps, diverter islands, and crosswalks to allow for a northbound 10th Street to westbound McDowell Road dual left turn. Included the necessary signing and marking to reinforce this.
11. Relocate the existing bus stop at the northwest corner of 10th Street and McDowell Road to east of 10th Street. This in turn allows for a dual northbound 10th Street left turn movement to both westbound McDowell Road through lanes. This will also help shift the demand for pedestrians crossing McDowell Road from the west side of 10th Street to the east side of 10th Street.
12. Rebuild the traffic signal at 10th Street and McDowell Road to provide dual lefts for northbound 10th Street, an overlap phase for the northbound 10th Street right turn, Southbound right and left turns only, a protected permissive westbound left turn, as well as the through movements on McDowell Road. Design is to be prepared to the City of Phoenix standards.
13. Consider additional way finding signing and mapping to help visitor use alternative access points to the campus. See **Figure 7** in the report for presented ideas.
14. Further architectural planning should include evaluation of including either grade separation (either above ground or below ground) pedestrian paths between parking garages and main buildings. This is especially important on 10th Street in between McDowell Road and Willetta Street and at 12th Street at Brill Street. Such features like this will reduce pedestrian interruption of traffic flows.

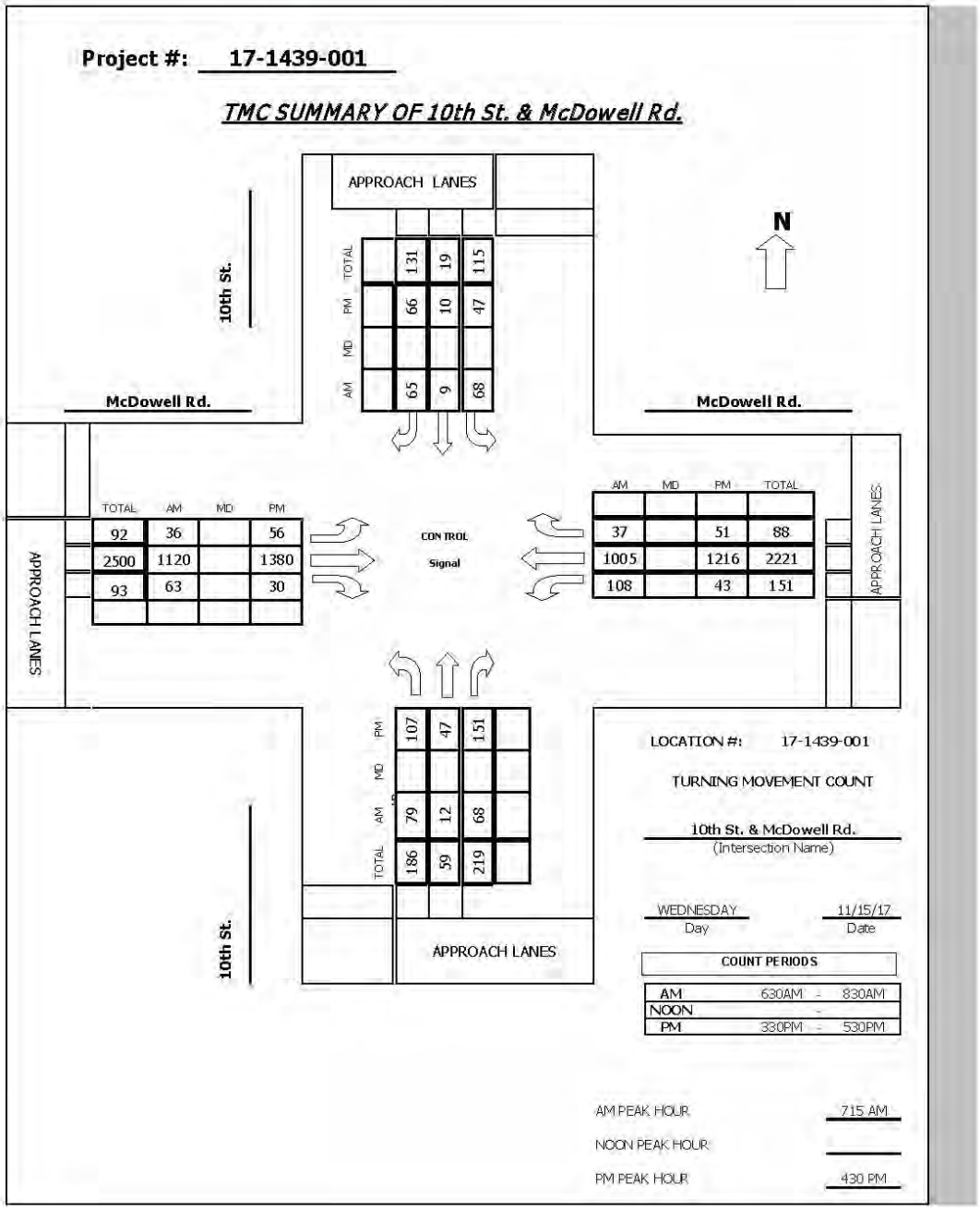
Appendix A – Existing Traffic Counts

Intersection Turning Movement
Prepared by:

FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745

Project #: 17-1439-001

TMC SUMMARY OF 10th St. & McDowell Rd.



Intersection Turning Movement
Prepared by:

FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745

veracitytrafficgroup

N-S STREET:	10th St.	DATE:	11/15/17	LOCATION:	Phoenix
E-W STREET:	McDowell Rd.	DAY:	WEDNESDAY	PROJECT#	17-1439-001

	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	1	1	0	1	1	1	1	3	0	1	2	0	
6:00 AM													
6:15 AM													
6:30 AM	8	1	8	3	5	9	4	335	31	43	136	1	584
6:45 AM	15	2	10	2	4	8	8	300	21	30	160	0	560
7:00 AM	12	0	9	9	1	13	11	296	17	23	191	3	585
7:15 AM	20	2	15	13	2	17	9	254	9	22	246	8	617
7:30 AM	26	3	23	15	3	17	9	288	16	37	220	6	663
7:45 AM	13	4	12	26	1	18	6	264	22	26	282	12	686
8:00 AM	20	3	18	14	3	13	12	314	16	23	257	11	704
8:15 AM	13	1	10	17	4	16	9	288	8	13	215	10	604
8:30 AM													
8:45 AM													
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													
10:45 AM													
11:00 AM													
11:15 AM													
11:30 AM													
11:45 AM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	127	16	105	99	23	111	68	2339	140	217	1707	51	5003
Approach %	51.21	6.45	42.34	42.49	9.87	47.64	2.67	91.83	5.50	10.99	86.43	2.58	
App/Depart	248	/	135	233	/	380	2547	/	2543	1975	/	1945	

AM Peak Hr Begins at: 715 AM

PEAK													
Volumes	79	12	68	68	9	65	36	1120	63	108	1005	37	2670
Approach %	49.69	7.55	42.77	47.89	6.34	45.77	2.95	91.88	5.17	9.39	87.39	3.22	
PEAK HR. FACTOR:		0.764			0.789			0.891			0.898		0.948

CONTROL: Signal
COMMENT 1:
GPS: 33.465732, -112.060762

Intersection Turning Movement

FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745

veracitytrafficgroup

N-S STREET:	10th St. 0	DATE:	11/15/17	LOCATION:	Phoenix
E-W STREET:	McDowell Rd.	DAY:	WEDNESDAY	PROJECT#	17-1439-001

	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	1	1	0	1	1	1	1	3	0	1	2	0	
1:00 PM													
1:15 PM													
1:30 PM													
1:45 PM													
2:00 PM													
2:15 PM													
2:30 PM													
2:45 PM													
3:00 PM													
3:15 PM													
3:30 PM	45	5	24	28	4	14	12	338	11	5	331	10	827
3:45 PM	27	3	47	14	0	14	12	283	7	8	321	5	741
4:00 PM	26	8	40	20	2	10	13	365	2	5	309	10	810
4:15 PM	21	10	27	10	1	11	9	309	4	9	343	10	764
4:30 PM	27	16	47	15	2	18	12	368	6	11	295	17	834
4:45 PM	19	13	36	12	2	15	17	314	7	10	318	17	780
5:00 PM	36	11	37	10	3	15	19	358	7	14	291	14	815
5:15 PM	25	7	31	10	3	18	8	340	10	8	312	3	775
5:30 PM													
5:45 PM													
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	226	73	289	119	17	115	102	2675	54	70	2520	86	6346
Approach %	38.44	12.41	49.15	47.41	6.77	45.82	3.60	94.49	1.91	2.62	94.17	3.21	
App/Depart	588	/	261	251	/	141	2831	/	3083	2676	/	2861	

PM Peak Hr Begins at: 430 PM

PEAK													
Volumes	107	47	151	47	10	66	56	1380	30	43	1216	51	3204
Approach %	35.08	15.41	49.51	38.21	8.13	53.66	3.82	94.13	2.05	3.28	92.82	3.89	
PEAK HR. FACTOR:		0.847			0.879			0.949			0.949		0.960

CONTROL: Signal
COMMENT 1: 0
GPS: 33.465732, -112.060762

FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745

veracitytrafficgroup

Pedestrian & Bicycle Study

N-S STREET: 10th St.
E-W STREET: McDowell Rd.

Date: 11/15/17
Day: WEDNESDAY

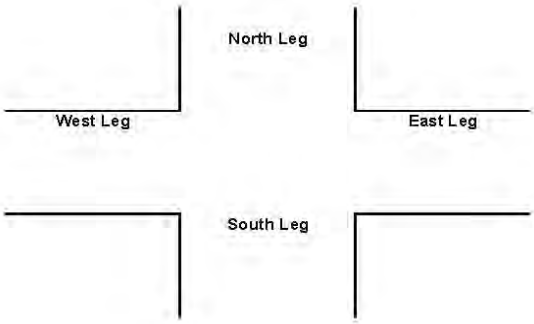
City: Phoenix
Project #: 17-1439-001

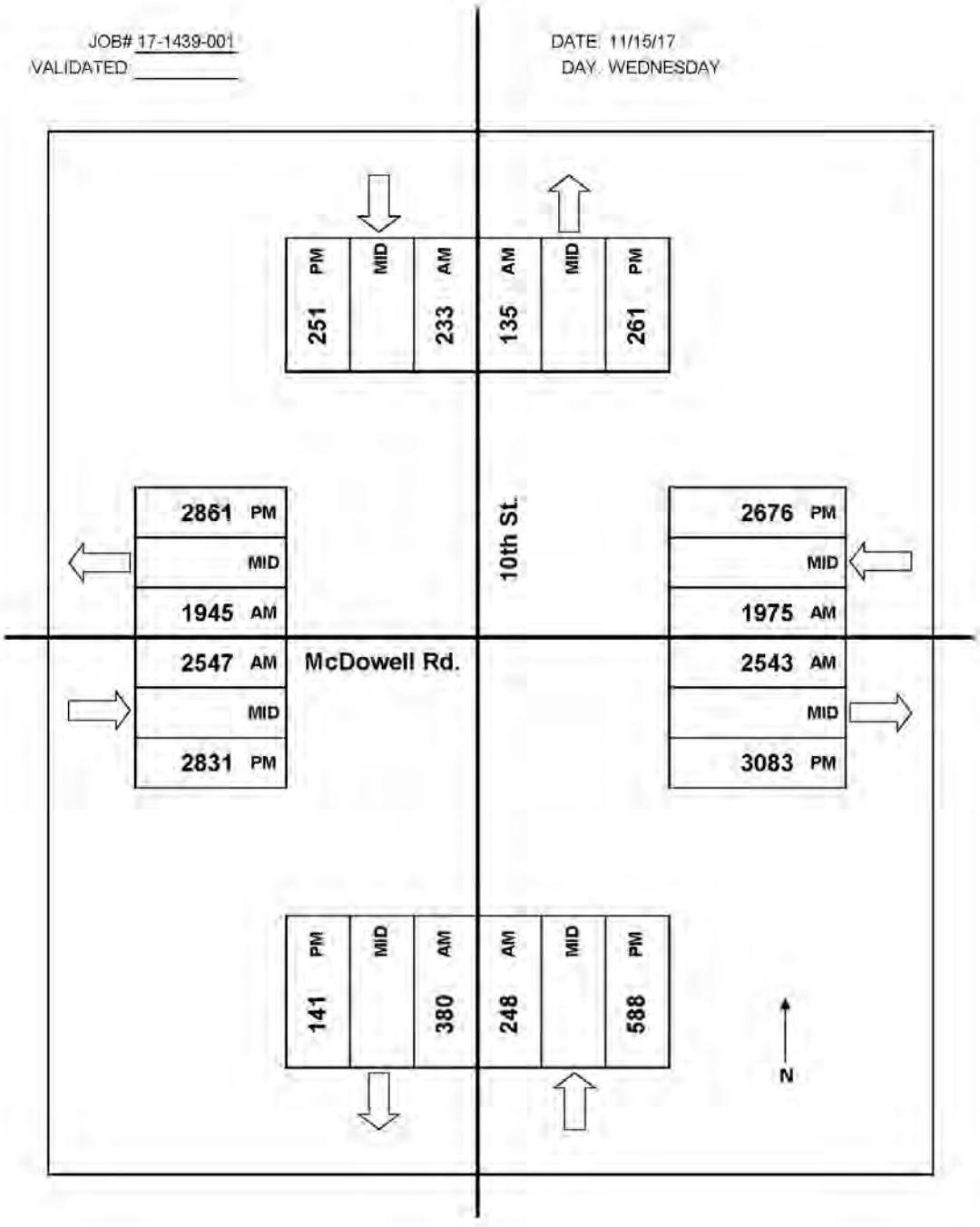
	PEDESTRIANS			
	N-LEG	S-LEG	E-LEG	W-LEG
6:30 AM	0	1	0	0
6:45 AM	0	1	0	0
7:00 AM	2	1	2	1
7:15 AM	7	1	2	0
7:30 AM	3	1	1	2
7:45 AM	0	1	3	0
8:00 AM	2	1	0	1
8:15 AM	0	2	0	0
TOTAL	14	9	8	4

	BICYCLES			
	N-LEG	S-LEG	E-LEG	W-LEG
6:30 AM	0	0	0	0
6:45 AM	1	1	0	0
7:00 AM	0	0	0	0
7:15 AM	0	0	0	0
7:30 AM	0	2	0	0
7:45 AM	1	0	0	0
8:00 AM	0	1	0	0
8:15 AM	0	0	0	0
TOTAL	2	4	0	0

	PEDESTRIANS			
	N-LEG	S-LEG	E-LEG	W-LEG
3:30 PM	0	8	0	1
3:45 PM	3	6	1	0
4:00 PM	0	2	3	2
4:15 PM	1	2	0	1
4:30 PM	2	5	1	0
4:45 PM	3	2	1	0
5:00 PM	2	1	2	0
5:15 PM	3	4	1	2
TOTAL	14	30	9	6

	BICYCLES			
	N-LEG	S-LEG	E-LEG	W-LEG
3:30 PM	1	4	0	0
3:45 PM	2	0	0	0
4:00 PM	1	0	1	0
4:15 PM	1	1	0	0
4:30 PM	1	1	0	0
4:45 PM	1	0	1	0
5:00 PM	0	0	0	0
5:15 PM	1	1	0	0
TOTAL	8	7	2	0




JOB# 17-1439-001
VALIDATED:
DATE: 11/15/17
DAY: WEDNESDAY
PM 251
MID
AM 233
AM 135
MID
PM 261
2861 PM
MID
1945 AM
2547 AM
MID
2831 PM
10th St.
2676 PM
MID
1975 AM
2543 AM
MID
3083 PM
McDowell Rd.
PM 141
MID
AM 380
AM 248
MID
PM 588
N

Prepared by: Field Data Services of Arizona/Veracity Traffic Group (520) 316-6745

Volumes for: Wednesday, November 15, 2017 **City:** Phoenix **Project#** 17-1439-004

Location : 10th St. btwn. McDowell Rd. & Brill St.

DAY 1

AM Period	NB		SB		EB	WB		PM Period	NB		SB		EB	WB	
00:00	11		4					12:00	33		25				
00:15	8		5					12:15	29		18				
00:30	5		6					12:30	23		27				
00:45	4	28	7	22			50	12:45	26	111	23	93			204
01:00	9		1					13:00	44		18				
01:15	5		3					13:15	34		20				
01:30	5		4					13:30	29		28				
01:45	5	24	4	12			36	13:45	30	137	25	91			228
02:00	4		2					14:00	46		25				
02:15	3		4					14:15	**68**		23				
02:30	3		1					14:30	**77**		26				
02:45	3	13	1	8			21	14:45	**60**	251	15	89			340
03:00	3		3					15:00	45		19				
03:15	7		2					15:15	**71**		20				
03:30	1		2					15:30	**62**		23				
03:45	2	13	4	11			24	15:45	46	224	21	83			307
04:00	5		2					16:00	74		16				
04:15	1		5					16:15	64		16				
04:30	1		6					16:30	87		18				
04:45	2	9	11	24			33	16:45	66	291	19	69			360
05:00	3		11					17:00	70		18				
05:15	7		21					17:15	71		19				
05:30	17		30					17:30	78		20				
05:45	13	40	36	98			138	17:45	66	285	28	85			370
06:00	14		25					18:00	67		15				
06:15	**26**		**48**					18:15	70		35				
06:30	**24**		**73**					18:30	64		52				
06:45	16	80	53	199			279	18:45	66	267	24	126			393
07:00	14		37					19:00	46		11				
07:15	24		41					19:15	50		11				
07:30	**59**		**35**					19:30	50		9				
07:45	**50**	147	**49**	162			309	19:45	28	174	5	36			210
08:00	34		49					20:00	23		8				
08:15	22		34					20:15	21		11				
08:30	26		34					20:30	12		12				
08:45	16	98	28	145			243	20:45	9	65	14	45			110
09:00	25		34					21:00	15		2				
09:15	26		20					21:15	12		3				
09:30	22		22					21:30	12		9				
09:45	21	94	20	96			190	21:45	18	57	7	21			78
10:00	20		18					22:00	9		13				
10:15	19		14					22:15	9		8				
10:30	14		13					22:30	24		9				
10:45	21	74	16	61			135	22:45	7	49	2	32			81
11:00	20		19					23:00	15		3				
11:15	16		14					23:15	7		1				
11:30	28		37					23:30	10		1				
11:45	23	87	24	94			181	23:45	8	40	2	7			47
Total Vol.		707		932			1639			1951		777			2728

GPS Coordinates: 33.465456, -112.060800

Daily Totals	NB	SB	EB	WB	Combined
	2658	1709			4367

	AM			PM		
Split %	43.1%	56.9%	**37.5%**	71.5%	28.5%	**62.5%**
Peak Hour	07:15	06:15	**07:15**	16:30	17:45	**17:45**
Volume	167	211	**341**	294	130	**397**
P.H.F.	0.71	0.72	**0.86**	0.84	0.63	**0.86**

Prepared by: Field Data Services of Arizona/Veracity Traffic Group (520) 316-6745

Volumes for: Thursday, November 16, 2017 **City:** Phoenix **Project#** 17-1439-004

Location : 10th St. btwn. McDowell Rd. & Brill St.

DAY 2

AM Period	NB		SB		EB	WB		PM Period	NB		SB		EB	WB	
00:00	7		3					12:00	43		23				
00:15	8		0					12:15	17		26				
00:30	5		0					12:30	8		28				
00:45	2	22	1	4			26	12:45	18	86	28	105			191
01:00	5		3					13:00	26		18				
01:15	8		4					13:15	19		20				
01:30	6		3					13:30	14		29				
01:45	5	24	2	12			36	13:45	12	71	23	90			161
02:00	7		3					14:00	16		26				
02:15	4		1					14:15	38		21				
02:30	2		1					14:30	52		23				
02:45	2	15	2	7			22	14:45	21	127	25	95			222
03:00	2		1					15:00	60		19				
03:15	1		2					15:15	37		16				
03:30	1		2					15:30	58		17				
03:45	2	6	0	5			11	15:45	64	219	24	76			295
04:00	2		5					16:00	80		15				
04:15	4		5					16:15	41		22				
04:30	1		8					16:30	69		19				
04:45	2	9	4	22			31	16:45	50	240	24	80			320
05:00	8		6					17:00	59		14				
05:15	8		19					17:15	25		22				
05:30	15		29					17:30	31		27				
05:45	14	45	34	88			133	17:45	41	156	34	97			253
06:00	12		31					18:00	43		23				
06:15	19		35					18:15	33		23				
06:30	22		56					18:30	44		43				
06:45	18	71	52	174			245	18:45	27	147	30	119			266
07:00	17		33					19:00	42		17				
07:15	23		35					19:15	23		11				
07:30	45		46					19:30	38		2				
07:45	35	120	55	169			289	19:45	39	142	13	43			185
08:00	49		44					20:00	15		12				
08:15	26		33					20:15	16		11				
08:30	21		28					20:30	33		8				
08:45	26	122	40	145			267	20:45	16	80	8	39			119
09:00	28		23					21:00	12		7				
09:15	27		30					21:15	12		8				
09:30	21		25					21:30	15		3				
09:45	15	91	27	105			196	21:45	12	51	2	20			71
10:00	12		14					22:00	7		13				
10:15	14		21					22:15	12		6				
10:30	12		29					22:30	20		7				
10:45	13	51	30	94			145	22:45	2	41	7	33			74
11:00	13		28					23:00	13		7				
11:15	34		27					23:15	7		3				
11:30	16		29					23:30	5		1				
11:45	15	78	24	108			186	23:45	8	33	0	11			44
Total Vol.		654		933			1587			1393		808			2201

GPS Coordinates: 33.465456, -112.060800

Daily Totals	NB	SB	EB	WB	Combined
	2047	1741			3788

	AM			PM		
Split %	41.2%	58.8%	**41.9%**	63.3%	36.7%	**58.1%**
Peak Hour	07:30	07:15	**07:30**	15:45	17:45	**15:45**
Volume	155	180	**333**	254	123	**334**
P.H.F.	0.79	0.82	**0.90**	0.79	0.72	**0.88**

Prepared by: Field Data Services of Arizona/Veracity Traffic Group (520) 316-6745

Volumes for: Friday, November 17, 2017 **City:** Phoenix **Project#** 17-1439-004

Location : 10th St. btwn. McDowell Rd. & Brill St.

DAY 3

AM Period	NB		SB		EB	WB		PM Period	NB		SB		EB	WB	
00:00	5		2					12:00	5		27				
00:15	8		6					12:15	10		26				
00:30	11		5					12:30	13		16				
00:45	6	30	1	14			44	12:45	17	45	15	84			129
01:00	1		0					13:00	26		19				
01:15	5		1					13:15	36		28				
01:30	2		1					13:30	47		28				
01:45	6	14	3	5			19	13:45	32	141	25	100			241
02:00	5		1					14:00	47		13				
02:15	4		1					14:15	41		16				
02:30	5		1					14:30	66		16				
02:45	3	17	0	3			20	14:45	39	193	16	61			254
03:00	2		1					15:00	48		18				
03:15	1		3					15:15	41		27				
03:30	3		1					15:30	64		17				
03:45	3	9	2	7			16	15:45	39	192	23	85			277
04:00	3		2					16:00	59		13				
04:15	7		8					16:15	61		20				
04:30	2		5					16:30	56		18				
04:45	3	15	5	20			35	16:45	56	232	19	70			302
05:00	5		5					17:00	48		16				
05:15	10		20					17:15	42		17				
05:30	12		33					17:30	50		22				
05:45	11	38	48	106			144	17:45	32	172	22	77			249
06:00	11		19					18:00	39		15				
06:15	26		26					18:15	31		30				
06:30	19		55					18:30	34		33				
06:45	21	77	59	159			236	18:45	31	135	27	105			240
07:00	18		22					19:00	22		8				
07:15	20		30					19:15	23		9				
07:30	52		48					19:30	37		7				
07:45	29	119	58	158			277	19:45	38	120	3	27			147
08:00	40		40					20:00	22		8				
08:15	27		25					20:15	19		6				
08:30	25		30					20:30	17		7				
08:45	21	113	31	126			239	20:45	22	80	15	36			116
09:00	25		26					21:00	15		7				
09:15	18		14					21:15	17		7				
09:30	33		21					21:30	12		8				
09:45	26	102	30	91			193	21:45	12	56	3	25			81
10:00	20		12					22:00	10		6				
10:15	18		17					22:15	11		8				
10:30	13		20					22:30	27		7				
10:45	23	74	24	73			147	22:45	7	55	8	29			84
11:00	33		12					23:00	11		2				
11:15	26		26					23:15	6		6				
11:30	28		28					23:30	10		2				
11:45	7	94	32	98			192	23:45	2	29	0	10			39
Total Vol.		702		860			1562			1450		709			2159

GPS Coordinates: 33.485456, -112.080800

Daily Totals	NB	SB	EB	WB	Combined
	2152	1569			3721

	AM			PM		
Split %	44.9%	55.1%	**42.0%**	67.2%	32.8%	**58.0%**
Peak Hour	07:30	07:15	**07:30**	16:00	18:00	**16:00**
Volume	148	176	**319**	232	105	**302**
P.H.F.	0.71	0.76	**0.80**	0.95	0.80	**0.93**

Prepared by: Field Data Services of Arizona/Veracity Traffic Group (520) 316-6745

Volumes for: Saturday, November 18, 2017 **City:** Phoenix **Project#** 17-1439-004

Location : 10th St. btwn. McDowell Rd. & Brill St.

DAY 4

AM Period	NB		SB		EB	WB		PM Period	NB		SB		EB	WB	
00:00	4		3					12:00	4		6				
00:15	4		2					12:15	5		8				
00:30	5		0					12:30	4		5				
00:45	4	17	5	10			27	12:45	4	17	10	29			46
01:00	3		3					13:00	7		4				
01:15	9		5					13:15	2		9				
01:30	5		1					13:30	16		16				
01:45	4	21	3	12			33	13:45	4	29	10	39			68
02:00	8		3					14:00	10		9				
02:15	5		2					14:15	9		16				
02:30	4		1					14:30	27		11				
02:45	6	23	3	9			32	14:45	9	55	4	40			95
03:00	4		3					15:00	6		4				
03:15	3		2					15:15	13		7				
03:30	3		5					15:30	23		13				
03:45	1	11	3	13			24	15:45	7	49	3	27			76
04:00	2		1					16:00	16		8				
04:15	1		0					16:15	23		11				
04:30	0		2					16:30	10		11				
04:45	3	6	6	9			15	16:45	10	59	8	38			97
05:00	3		9					17:00	23		10				
05:15	2		11					17:15	13		12				
05:30	12		28					17:30	22		23				
05:45	5	22	17	65			87	17:45	17	75	12	57			132
06:00	7		13					18:00	12		7				
06:15	16		26					18:15	30		19				
06:30	17		32					18:30	24		27				
06:45	17	57	21	92			149	18:45	19	85	23	76			161
07:00	21		14					19:00	20		8				
07:15	9		9					19:15	23		6				
07:30	31		13					19:30	40		7				
07:45	32	93	8	44			137	19:45	23	106	8	29			135
08:00	18		7					20:00	23		4				
08:15	15		7					20:15	17		5				
08:30	10		3					20:30	11		5				
08:45	8	51	11	28			79	20:45	9	60	5	19			79
09:00	4		8					21:00	6		7				
09:15	8		6					21:15	8		6				
09:30	6		8					21:30	1		5				
09:45	9	27	9	31			58	21:45	14	29	9	27			56
10:00	10		6					22:00	12		2				
10:15	6		7					22:15	8		8				
10:30	8		14					22:30	15		1				
10:45	2	26	15	42			68	22:45	4	39	6	17			56
11:00	4		4					23:00	5		2				
11:15	0		13					23:15	3		3				
11:30	4		6					23:30	3		2				
11:45	5	13	6	29			42	23:45	3	14	2	9			23
Total Vol.		367		384			751			617		407			1024

GPS Coordinates: 33.465456, -112.060800

Daily Totals

NB	SB	EB	WB	Combined
984	791			1775

	AM			PM		
Split %	48.9%	51.1%	42.3%	60.3%	39.7%	57.7%
Peak Hour	07:30	06:15	06:15	19:15	18:15	18:15
Volume	96	93	164	109	77	170
P.H.F.	0.75	0.73	0.84	0.68	0.71	0.83

Prepared by: Field Data Services of Arizona/Veracity Traffic Group (520) 316-6745

Volumes for: Sunday, November 19, 2017 **City:** Phoenix **Project#** 17-1439-004

Location : 10th St. btwn. McDowell Rd. & Brill St.

DAY 5

AM Period	NB		SB		EB	WB		PM Period	NB		SB		EB	WB	
00:00	2		3					12:00	4		10				
00:15	4		4					12:15	6		13				
00:30	4		0					12:30	1		11				
00:45	3	13	1	8			21	12:45	3	14	9	43			57
01:00	5		2					13:00	3		15				
01:15	1		4					13:15	5		13				
01:30	3		2					13:30	6		11				
01:45	6	15	3	11			26	13:45	4	18	11	50			68
02:00	6		3					14:00	6		8				
02:15	3		1					14:15	4		10				
02:30	3		2					14:30	10		13				
02:45	2	14	2	8			22	14:45	7	27	13	44			71
03:00	1		2					15:00	2		5				
03:15	3		3					15:15	8		9				
03:30	3		1					15:30	22		10				
03:45	2	9	2	8			17	15:45	11	43	7	31			74
04:00	6		1					16:00	22		9				
04:15	1		3					16:15	12		4				
04:30	4		0					16:30	21		12				
04:45	4	15	5	9			24	16:45	12	67	5	30			97
05:00	6		6					17:00	15		11				
05:15	3		10					17:15	14		10				
05:30	5		11					17:30	16		13				
05:45	9	23	25	52			75	17:45	22	67	13	47			114
06:00	12		10					18:00	13		13				
06:15	11		20					18:15	26		27				
06:30	22		38					18:30	26		33				
06:45	12	57	29	97			154	18:45	11	76	15	88			164
07:00	12		8					19:00	12		10				
07:15	14		11					19:15	18		7				
07:30	32		8					19:30	40		4				
07:45	33	91	9	36			127	19:45	38	108	8	29			137
08:00	18		4					20:00	17		9				
08:15	10		4					20:15	19		7				
08:30	5		8					20:30	13		4				
08:45	3	36	7	23			59	20:45	14	63	10	30			93
09:00	10		9					21:00	10		3				
09:15	7		6					21:15	9		3				
09:30	4		8					21:30	12		7				
09:45	3	24	9	32			56	21:45	6	37	4	17			54
10:00	1		7					22:00	9		5				
10:15	4		7					22:15	9		8				
10:30	4		6					22:30	19		6				
10:45	6	15	6	26			41	22:45	4	41	2	21			62
11:00	9		6					23:00	5		1				
11:15	3		5					23:15	8		2				
11:30	3		14					23:30	5		2				
11:45	1	16	8	33			49	23:45	4	22	5	10			32
Total Vol.		328		343			671			583		440			1023

GPS Coordinates: 33.485456, -112.060800

Daily Totals				
NB	SB	EB	WB	Combined
911	783			1694

	AM			PM		
Split %	48.9%	51.1%	**39.6%**	57.0%	43.0%	**60.4%**
Peak Hour	07:15	06:00	**06:00**	19:30	18:00	**17:45**
Volume	97	97	**154**	114	88	**173**
P.H.F.	0.73	0.64	**0.64**	0.71	0.67	**0.73**

Prepared by: Field Data Services of Arizona/Veracity Traffic Group (520) 316-6745

Volumes for: Monday, November 20, 2017 **City:** Phoenix **Project#** 17-1439-004

Location : 10th St. btwn. McDowell Rd. & Brill St.

DAY 6

AM Period	NB		SB		EB	WB		PM Period	NB		SB		EB	WB	
00:00	5		3					12:00	11		19				
00:15	2		2					12:15	13		16				
00:30	4		2					12:30	6		23				
00:45	6	17	3	10			27	12:45	5	35	35	93			128
01:00	5		3					13:00	8		27				
01:15	6		4					13:15	12		27				
01:30	3		2					13:30	12		34				
01:45	1	15	1	10			25	13:45	11	43	29	117			160
02:00	2		1					14:00	15		16				
02:15	2		1					14:15	15		19				
02:30	4		1					14:30	7		27				
02:45	2	10	1	4			14	14:45	14	51	21	83			134
03:00	7		4					15:00	15		19				
03:15	6		3					15:15	9		27				
03:30	3		0					15:30	15		25				
03:45	4	20	1	8			28	15:45	13	52	32	103			155
04:00	2		3					16:00	21		20				
04:15	3		3					16:15	20		13				
04:30	0		0					16:30	28		22				
04:45	3	8	8	14			22	16:45	32	101	19	74			175
05:00	4		6					17:00	38		19				
05:15	9		15					17:15	29		28				
05:30	14		29					17:30	40		19				
05:45	11	38	52	102			140	17:45	12	119	19	85			204
06:00	9		24					18:00	35		19				
06:15	29		44					18:15	37		26				
06:30	24		59					18:30	42		46				
06:45	19	81	43	170			251	18:45	39	153	23	114			267
07:00	13		28					19:00	23		7				
07:15	25		27					19:15	22		8				
07:30	42		40					19:30	43		10				
07:45	27	107	59	154			261	19:45	35	123	5	30			153
08:00	41		41					20:00	37		12				
08:15	29		33					20:15	18		12				
08:30	19		30					20:30	23		14				
08:45	14	103	32	136			239	20:45	16	94	7	45			139
09:00	20		21					21:00	14		3				
09:15	20		24					21:15	17		8				
09:30	25		21					21:30	13		7				
09:45	13	78	18	84			162	21:45	14	58	7	25			83
10:00	8		18					22:00	13		7				
10:15	4		24					22:15	10		12				
10:30	10		25					22:30	10		2				
10:45	9	31	19	86			117	22:45	11	44	6	27			71
11:00	8		23					23:00	6		6				
11:15	5		17					23:15	8		6				
11:30	9		28					23:30	5		2				
11:45	6	28	29	97			125	23:45	10	29	3	17			46
Total Vol.		536		875			1411			902		813			1715

GPS Coordinates: 33.465456, -112.060800

	Daily Totals NB	SB	EB	WB	Combined
	1438	1688			3126

	AM			PM		
Split %	38.0%	62.0%	45.1%	52.6%	47.4%	54.9%
Peak Hour	07:30	05:45	07:30	18:00	12:45	18:00
Volume	139	179	312	153	123	267
P.H.F.	0.83	0.76	0.91	0.91	0.88	0.76

Prepared by: Field Data Services of Arizona/Veracity Traffic Group (520) 316-6745

Volumes for: Tuesday, November 21, 2017 **City:** Phoenix **Project#** 17-1439-004

Location : 10th St. btwn. McDowell Rd. & Brill St.

DAY 7

AM Period	NB		SB		EB	WB		PM Period	NB		SB		EB	WB	
00:00	6		7					12:00	10		17				
00:15	7		6					12:15	6		27				
00:30	6		1					12:30	6		30				
00:45	9	28	3	17			45	12:45	12	34	19	93			127
01:00	2		3					13:00	10		14				
01:15	5		6					13:15	4		18				
01:30	5		4					13:30	12		27				
01:45	2	14	2	15			29	13:45	9	35	28	87			122
02:00	4		1					14:00	12		19				
02:15	9		1					14:15	17		15				
02:30	2		4					14:30	13		16				
02:45	4	19	0	6			25	14:45	18	60	17	67			127
03:00	7		3					15:00	15		20				
03:15	4		4					15:15	14		23				
03:30	2		4					15:30	28		19				
03:45	2	15	2	13			28	15:45	16	73	23	85			158
04:00	5		5					16:00	23		22				
04:15	3		3					16:15	13		15				
04:30	1		3					16:30	44		30				
04:45	5	14	5	16			30	16:45	40	120	17	84			204
05:00	3		8					17:00	45		14				
05:15	8		21					17:15	38		17				
05:30	15		34					17:30	41		28				
05:45	12	38	37	100			138	17:45	21	145	21	80			225
06:00	14		27					18:00	19		13				
06:15	22		36					18:15	27		25				
06:30	19		55					18:30	39		45				
06:45	22	77	58	176			253	18:45	26	111	31	114			225
07:00	24		34					19:00	25		10				
07:15	21		46					19:15	30		16				
07:30	39		47					19:30	46		17				
07:45	41	125	67	194			319	19:45	27	128	6	49			177
08:00	33		37					20:00	29		13				
08:15	29		32					20:15	22		15				
08:30	28		26					20:30	29		12				
08:45	15	105	32	127			232	20:45	20	100	11	51			151
09:00	30		37					21:00	11		10				
09:15	39		34					21:15	5		7				
09:30	25		21					21:30	13		6				
09:45	29	123	18	110			233	21:45	7	36	6	29			65
10:00	20		24					22:00	13		8				
10:15	13		17					22:15	10		9				
10:30	5		19					22:30	20		5				
10:45	15	53	32	92			145	22:45	10	53	10	32			85
11:00	13		14					23:00	8		3				
11:15	8		29					23:15	12		7				
11:30	5		21					23:30	11		8				
11:45	7	33	24	88			121	23:45	10	41	3	21			62
Total Vol.		644		954			1598			936		792			1728

GPS Coordinates: 33.465456, -112.080800

Daily Totals	NB	SB	EB	WB	Combined
	1580	1746			3326

	AM			PM		
Split %	40.3%	59.7%	**48.0%**	54.2%	45.8%	**52.0%**
Peak Hour	07:30	07:15	**07:15**	16:30	18:00	**16:30**
Volume	142	197	**331**	167	114	**245**
P.H.F.	0.87	0.74	**0.77**	0.93	0.63	**0.83**

Prepared by: Field Data Services of Arizona/Veracity Traffic Group (520) 316-6745

Volumes for: Wednesday, November 15, 2017 - Tuesday, November 21, 2017 **City:** Phoenix **Project#** 17-1439-004

Location : 10th St. btwn. McDowell Rd. & Brill St.

7-DAY AVERAGE

AM Period	NB		SB		EB		WB			PM Period	NB		SB		EB		WB		
00:00	6		4		0		0			12:00	16		18		0		0		
00:15	6		4		0		0			12:15	12		19		0		0		
00:30	6		2		0		0			12:30	9		20		0		0		
00:45	5	22	3	12	0	0	0	0	34	12:45	12	49	20	77	0	0	0	0	126
01:00	4		2		0		0			13:00	18		16		0		0		
01:15	6		4		0		0			13:15	16		19		0		0		
01:30	4		2		0		0			13:30	19		25		0		0		
01:45	4	18	3	11	0	0	0	0	29	13:45	15	68	22	82	0	0	0	0	150
02:00	5		2		0		0			14:00	22		17		0		0		
02:15	4		2		0		0			14:15	27		17		0		0		
02:30	3		2		0		0			14:30	36		19		0		0		
02:45	3	16	1	6	0	0	0	0	22	14:45	24	109	16	68	0	0	0	0	178
03:00	4		2		0		0			15:00	27		15		0		0		
03:15	4		3		0		0			15:15	28		18		0		0		
03:30	2		2		0		0			15:30	39		18		0		0		
03:45	2	12	2	9	0	0	0	0	21	15:45	28	122	19	70	0	0	0	0	192
04:00	4		3		0		0			16:00	42		15		0		0		
04:15	3		4		0		0			16:15	33		14		0		0		
04:30	1		3		0		0			16:30	45		19		0		0		
04:45	3	11	6	16	0	0	0	0	27	16:45	38	159	16	64	0	0	0	0	222
05:00	5		7		0		0			17:00	43		15		0		0		
05:15	7		17		0		0			17:15	33		18		0		0		
05:30	13		28		0		0			17:30	40		22		0		0		
05:45	11	35	36	87	0	0	0	0	122	17:45	30	146	21	75	0	0	0	0	221
06:00	11		21		0		0			18:00	33		15		0		0		
06:15	21		34		0		0			18:15	36		26		0		0		
06:30	21		53		0		0			18:30	39		40		0		0		
06:45	18	71	45	152	0	0	0	0	224	18:45	31	139	25	106	0	0	0	0	245
07:00	17		25		0		0			19:00	27		10		0		0		
07:15	19		28		0		0			19:15	27		10		0		0		
07:30	43		34		0		0			19:30	42		8		0		0		
07:45	35	115	44	131	0	0	0	0	246	19:45	33	129	7	35	0	0	0	0	163
08:00	33		32		0		0			20:00	24		9		0		0		
08:15	23		24		0		0			20:15	19		10		0		0		
08:30	19		23		0		0			20:30	20		9		0		0		
08:45	15	90	26	104	0	0	0	0	194	20:45	15	77	10	38	0	0	0	0	115
09:00	20		23		0		0			21:00	12		6		0		0		
09:15	21		19		0		0			21:15	11		6		0		0		
09:30	19		18		0		0			21:30	11		6		0		0		
09:45	17	77	19	78	0	0	0	0	155	21:45	12	46	5	23	0	0	0	0	70
10:00	13		14		0		0			22:00	10		8		0		0		
10:15	11		15		0		0			22:15	10		8		0		0		
10:30	9		18		0		0			22:30	19		5		0		0		
10:45	13	46	20	68	0	0	0	0	114	22:45	6	46	6	27	0	0	0	0	73
11:00	14		15		0		0			23:00	9		3		0		0		
11:15	13		19		0		0			23:15	7		4		0		0		
11:30	13		23		0		0			23:30	7		3		0		0		
11:45	9	50	21	78	0	0	0	0	128	23:45	6	30	2	12	0	0	0	0	42
Total Vol.		563		754					1317			1119		678					1797
GPS Coordinates:			33.465456, -112.080800																

Daily Totals

NB	SB	Combined
1681	1432	3114

	AM			PM		
Split %	42.7%	57.3%	**42.3%**	62.3%	37.7%	**57.7%**
Peak Hour	07:30	08:15	07:15	16:45	18:00	18:00
Volume	134	156	268	190	109	245
P.H.F.	0.78	0.74	0.85	0.88	0.60	0.78

FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745

veracitytrafficgroup

Pedestrian & Bicycle Study

N-S STREET: 12th St.
E-W STREET: Brill St.

Date: 11/15/17
Day: Wednesday

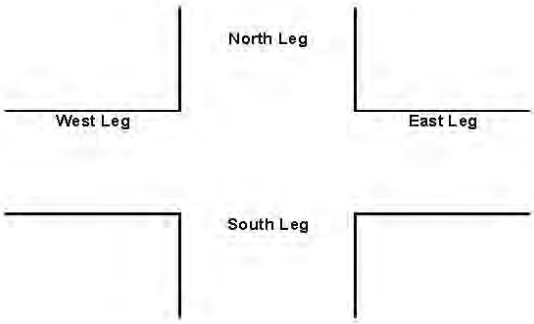
City: Phoenix
Project #: 17-1439-003

	PEDESTRIANS			
	N-LEG	S-LEG	E-LEG	W-LEG
6:30 AM	0	47	11	0
6:45 AM	0	**70**	**23**	0
7:00 AM	2	42	12	0
7:15 AM	3	29	8	0
7:30 AM	0	**53**	**25**	0
7:45 AM	0	22	8	2
8:00 AM	0	39	20	0
8:15 AM	0	35	18	0
TOTAL	**5**	**337**	**125**	**2**

	BICYCLES			
	N-LEG	S-LEG	E-LEG	W-LEG
6:30 AM	0	0	0	0
6:45 AM	0	0	0	0
7:00 AM	0	0	0	0
7:15 AM	0	0	0	0
7:30 AM	0	0	0	0
7:45 AM	0	0	0	0
8:00 AM	0	0	0	0
8:15 AM	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**

	PEDESTRIANS			
	N-LEG	S-LEG	E-LEG	W-LEG
3:30 PM	0	51	35	0
3:45 PM	0	44	41	2
4:00 PM	0	46	34	0
4:15 PM	0	53	35	0
4:30 PM	0	**65**	**51**	0
4:45 PM	0	**70**	**50**	0
5:00 PM	0	55	35	0
5:15 PM	0	56	36	0
TOTAL	**0**	**440**	**317**	**2**

	BICYCLES			
	N-LEG	S-LEG	E-LEG	W-LEG
3:30 PM	0	0	0	0
3:45 PM	0	0	0	0
4:00 PM	0	0	0	0
4:15 PM	0	0	0	0
4:30 PM	0	0	0	0
4:45 PM	0	0	0	0
5:00 PM	0	0	0	0
5:15 PM	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**

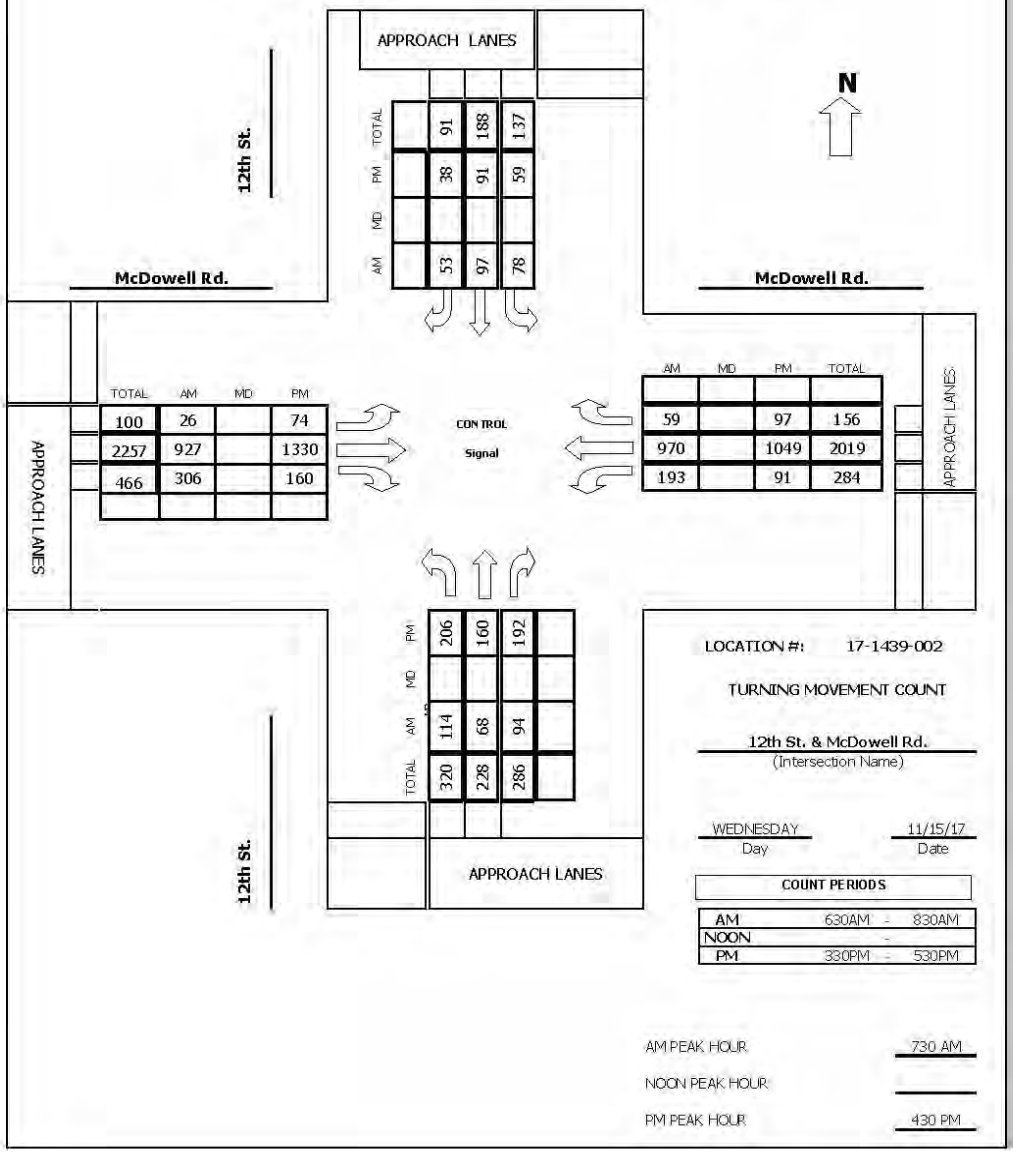


Intersection Turning Movement
Prepared by:

FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745

Project #: 17-1439-002

TMC SUMMARY OF 12th St. & McDowell Rd.



Intersection Turning Movement
Prepared by:

FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745

veracitytrafficgroup

N-S STREET:	12th St.	DATE:	11/15/17	LOCATION:	Phoenix
E-W STREET:	McDowell Rd.	DAY:	WEDNESDAY	PROJECT#	17-1439-002

	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	1	1	1	1	1	0	1	3	0	1	2	1	
6:00 AM													
6:15 AM													
6:30 AM	15	9	7	7	9	1	4	254	72	36	161	2	577
6:45 AM	17	4	15	10	6	9	5	265	75	35	153	4	598
7:00 AM	23	6	14	9	19	13	2	217	69	23	174	6	575
7:15 AM	23	6	19	18	16	18	9	231	60	38	223	3	664
7:30 AM	34	18	37	18	23	10	4	225	60	54	230	16	729
7:45 AM	27	16	16	21	22	19	11	234	88	50	249	19	772
8:00 AM	26	14	30	22	33	13	6	219	71	51	250	11	746
8:15 AM	27	20	11	17	19	11	5	249	87	38	241	13	738
8:30 AM													
8:45 AM													
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													
10:45 AM													
11:00 AM													
11:15 AM													
11:30 AM													
11:45 AM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	192	93	149	122	147	94	46	1894	582	325	1681	74	5399
Approach %	44.24	21.43	34.33	33.61	40.50	25.90	1.82	75.10	23.08	15.63	80.82	3.56	
App/Depart	434	/	213	363	/	1054	2522	/	2165	2080	/	1967	

AM Peak Hr Begins at: 730 AM

PEAK													
Volumes	114	68	94	78	97	53	26	927	306	193	970	59	2985
Approach %	41.30	24.64	34.06	34.21	42.54	23.25	2.07	73.63	24.31	15.79	79.38	4.83	
PEAK HR. FACTOR:		0.775			0.838			0.923			0.961		0.967

CONTROL: Signal
COMMENT 1:
GPS: 33.465750, -112.056358

Intersection Turning Movement

FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745

veracitytrafficgroup

N-S STREET:	12th St. 0	DATE:	11/15/17	LOCATION:	Phoenix
E-W STREET:	McDowell Rd.	DAY:	WEDNESDAY	PROJECT#	17-1439-002

	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	1	1	1	1	1	0	1	3	0	1	2	1	
1:00 PM													
1:15 PM													
1:30 PM													
1:45 PM													
2:00 PM													
2:15 PM													
2:30 PM													
2:45 PM													
3:00 PM													
3:15 PM													
3:30 PM	55	31	43	19	19	12	17	257	52	26	254	16	801
3:45 PM	35	28	46	17	19	14	15	343	49	15	297	19	897
4:00 PM	51	38	41	22	22	14	10	313	35	20	249	14	829
4:15 PM	48	24	40	11	14	7	12	358	36	18	290	15	873
4:30 PM	63	45	59	14	24	12	14	325	55	18	275	19	923
4:45 PM	38	29	52	10	24	7	20	332	36	30	262	26	866
5:00 PM	63	56	44	20	17	10	19	313	35	22	243	22	864
5:15 PM	42	30	37	15	26	9	21	360	34	21	269	30	894
5:30 PM													
5:45 PM													
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	395	281	362	128	165	85	128	2601	332	170	2139	161	6947
Approach %	38.05	27.07	34.87	33.86	43.65	22.49	4.18	84.97	10.85	6.88	86.60	6.52	
App/Depart	1038	/	570	378	/	667	3061	/	3091	2470	/	2619	

PM Peak Hr Begins at: 430 PM

PEAK													
Volumes	206	160	192	59	91	38	74	1330	160	91	1049	97	3547
Approach %	36.92	28.67	34.41	31.38	48.40	20.21	4.73	85.04	10.23	7.36	84.80	7.84	
PEAK HR. FACTOR:		0.835			0.940			0.942			0.966		0.961

CONTROL:	Signal
COMMENT 1:	0
GPS:	33.465750, -112.056358

FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745

veracitytrafficgroup

Pedestrian & Bicycle Study

N-S STREET: 12th St.
E-W STREET: McDowell Rd.

Date: 11/15/17
Day: WEDNESDAY

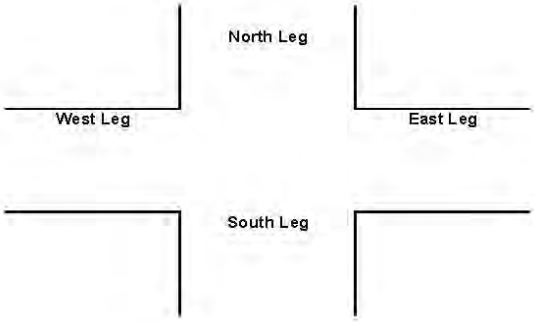
City: Phoenix
Project #: 17-1439-002

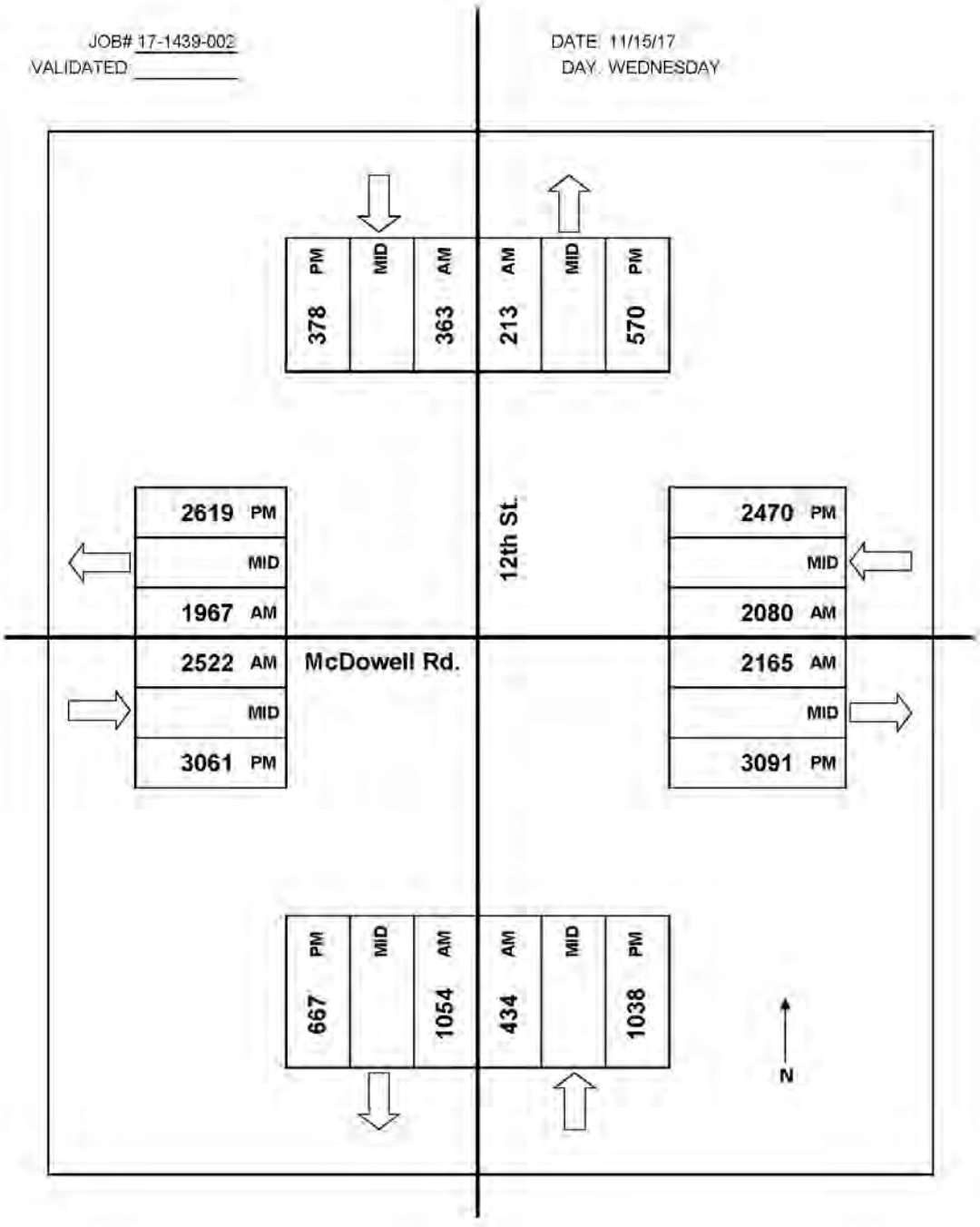
	PEDESTRIANS			
	N-LEG	S-LEG	E-LEG	W-LEG
6:30 AM	0	1	1	0
6:45 AM	0	2	0	1
7:00 AM	0	1	1	1
7:15 AM	5	0	3	0
7:30 AM	3	0	0	6
7:45 AM	1	0	6	1
8:00 AM	2	3	4	3
8:15 AM	1	0	1	1
TOTAL	12	7	16	13

	BICYCLES			
	N-LEG	S-LEG	E-LEG	W-LEG
6:30 AM	0	1	0	3
6:45 AM	0	0	0	0
7:00 AM	0	0	0	1
7:15 AM	0	0	0	2
7:30 AM	0	0	0	3
7:45 AM	0	0	1	2
8:00 AM	0	0	0	0
8:15 AM	0	0	0	1
TOTAL	0	1	1	12

	PEDESTRIANS			
	N-LEG	S-LEG	E-LEG	W-LEG
3:30 PM	1	5	14	8
3:45 PM	2	0	9	4
4:00 PM	1	8	3	2
4:15 PM	2	1	6	3
4:30 PM	4	5	4	5
4:45 PM	0	0	2	2
5:00 PM	2	0	1	1
5:15 PM	3	1	2	1
TOTAL	15	20	41	26

	BICYCLES			
	N-LEG	S-LEG	E-LEG	W-LEG
3:30 PM	1	2	0	1
3:45 PM	0	1	0	1
4:00 PM	2	0	1	0
4:15 PM	1	1	0	0
4:30 PM	1	0	0	0
4:45 PM	1	0	0	1
5:00 PM	0	0	1	3
5:15 PM	0	1	0	2
TOTAL	6	5	2	8




JOB# 17-1439-002
VALIDATED:
DATE: 11/15/17
DAY: WEDNESDAY
PM 378
MID
AM 363
AM 213
MID
PM 570
2619 PM
MID
1967 AM
12th St.
2470 PM
MID
2080 AM
2522 AM
MID
3061 PM
McDowell Rd.
2165 AM
MID
3091 PM
PM 667
MID
AM 1054
AM 434
MID
PM 1038
N

Prepared by: Field Data Services of Arizona/Veracity Traffic Group (520) 316-6745

Volumes for: Wednesday, November 15, 2017 City: Phoenix Project #: 17-1439-006

Location: 12th St. btwn. Brill St. & Willetta St.

AM Period	NB		SB		EB	WB		PM Period	NB		SB		EB	WB	
00:00	4		7					12:00	41		45				
00:15	7		4					12:15	30		31				
00:30	4		5					12:30	31		36				
00:45	2	17	2	18			35	12:45	26	128	40	152			280
01:00	5		7					13:00	31		49				
01:15	2		2					13:15	31		32				
01:30	3		5					13:30	29		62				
01:45	6	16	2	16			32	13:45	22	113	39	182			295
02:00	9		4					14:00	35		49				
02:15	5		4					14:15	25		36				
02:30	8		3					14:30	36		46				
02:45	2	24	4	15			39	14:45	39	135	49	180			315
03:00	5		4					15:00	34		37				
03:15	1		2					15:15	32		73				
03:30	4		2					15:30	39		62				
03:45	1	11	1	9			20	15:45	32	137	45	217			354
04:00	0		5					16:00	38		39				
04:15	1		6					16:15	25		36				
04:30	2		7					16:30	32		42				
04:45	1	4	8	26			30	16:45	35	130	52	169			299
05:00	0		7					17:00	31		37				
05:15	1		9					17:15	32		36				
05:30	2		19					17:30	25		37				
05:45	3	6	17	52			58	17:45	28	116	35	145			261
06:00	11		23					18:00	25		34				
06:15	13		34					18:15	25		37				
06:30	14		31					18:30	26		32				
06:45	28	66	31	119			185	18:45	19	95	29	132			227
07:00	26		37					19:00	21		18				
07:15	33		42					19:15	25		8				
07:30	30		43					19:30	26		9				
07:45	32	121	89	211			332	19:45	19	91	14	49			140
08:00	28		89					20:00	23		10				
08:15	24		75					20:15	21		10				
08:30	41		53					20:30	18		20				
08:45	45	138	45	262			400	20:45	16	78	18	58			136
09:00	50		52					21:00	15		16				
09:15	27		51					21:15	13		13				
09:30	34		35					21:30	10		16				
09:45	38	149	41	179			328	21:45	14	52	13	58			110
10:00	32		35					22:00	6		10				
10:15	39		41					22:15	3		17				
10:30	31		34					22:30	2		10				
10:45	31	133	36	146			279	22:45	5	16	11	48			64
11:00	23		37					23:00	4		7				
11:15	28		36					23:15	4		9				
11:30	23		25					23:30	2		9				
11:45	24	98	32	130			228	23:45	1	11	7	32			43
Total Vol.		783		1183			**1966**			1102		1422			**2524**
GPS Coordinates:				33.484208, -112.056423									**Daily Totals**		
										NB		SB	EB	WB	**Combined**
										1885		2605			**4490**
			AM								**PM**				
Split %		39.8%		60.2%			**43.8%**			43.7%		56.3%			**56.2%**
Peak Hour		08:30		07:45			**07:45**			14:45		14:45			**14:45**
Volume		163		306			**431**			144		221			**365**
P.H.F.		0.82		0.86			**0.89**			0.92		0.76			**0.87**

Prepared by: Field Data Services of Arizona/Veracity Traffic Group (520) 316-6745

Volumes for: Wednesday, November 15, 2017 City: Phoenix Project #: 17-1439-005

Location: 13th St. btwn. McDowell Rd. & Brill St.

AM Period	NB		SB		EB	WB		PM Period	NB		SB		EB	WB	
00:00	1		0					12:00	7		8				
00:15	3		0					12:15	10		7				
00:30	0		0					12:30	16		10				
00:45	0	4	0	0			4	12:45	18	51	17	42			93
01:00	0		2					13:00	13		13				
01:15	0		1					13:15	15		16				
01:30	2		1					13:30	9		13				
01:45	1	3	2	6			9	13:45	12	49	13	55			104
02:00	2		0					14:00	14		12				
02:15	0		2					14:15	25		5				
02:30	0		0					14:30	42		10				
02:45	0	2	0	2			4	14:45	19	100	10	37			137
03:00	1		0					15:00	35		11				
03:15	0		0					15:15	19		9				
03:30	0		0					15:30	29		11				
03:45	3	4	3	3			7	15:45	22	105	7	38			143
04:00	2		2					16:00	27		9				
04:15	0		0					16:15	23		6				
04:30	0		4					16:30	33		6				
04:45	1	3	3	9			12	16:45	29	112	8	29			141
05:00	2		6					17:00	31		6				
05:15	0		14					17:15	24		4				
05:30	2		23					17:30	28		3				
05:45	1	5	41	84			89	17:45	15	98	8	21			119
06:00	1		25					18:00	20		3				
06:15	2		25					18:15	14		6				
06:30	3		26					18:30	14		26				
06:45	4	10	39	115			125	18:45	8	56	8	43			99
07:00	9		29					19:00	6		4				
07:15	10		27					19:15	16		0				
07:30	14		24					19:30	16		5				
07:45	12	45	36	116			161	19:45	8	46	3	12			58
08:00	15		31					20:00	7		3				
08:15	5		24					20:15	4		3				
08:30	12		24					20:30	5		4				
08:45	13	45	25	104			149	20:45	5	21	3	13			34
09:00	14		21					21:00	5		0				
09:15	15		18					21:15	6		2				
09:30	13		18					21:30	4		0				
09:45	9	51	10	67			118	21:45	2	17	0	2			19
10:00	17		22					22:00	3		1				
10:15	18		23					22:15	2		3				
10:30	13		14					22:30	1		0				
10:45	14	62	9	68			130	22:45	0	6	0	4			10
11:00	15		10					23:00	3		0				
11:15	14		17					23:15	2		1				
11:30	16		12					23:30	1		0				
11:45	25	70	8	47			117	23:45	1	7	2	3			10
Total Vol.		304		621			**925**			668		299			**967**
GPS Coordinates:				33.465367, -112.054210											

Daily Totals	NB	SB	EB	WB	**Combined**
	972	920			**1892**

	AM			**PM**		
Split %	32.9%	67.1%	**48.9%**	69.1%	30.9%	**51.1%**
Peak Hour	11:00	06:30	**07:15**	14:15	12:45	**14:15**
Volume	70	121	**169**	121	59	**157**
P.H.F.	0.70	0.78	**0.88**	0.72	0.87	**0.75**

Prepared by: Field Data Services of Arizona/Veracity Traffic Group (520) 316-6745

Volumes for: Wednesday, November 15, 2017 City: Phoenix Project #: 17-1439-001

Location: Brill St. btwn. 7th St. & 9th St.

AM Period	NB	SB	EB		WB			PM Period	NB	SB	EB		WB		
00:00			0		0			12:00			6		6		
00:15			0		0			12:15			9		5		
00:30			0		0			12:30			6		8		
00:45			1	1	0	0	1	12:45			10	31	4	23	54
01:00			0		0			13:00			4		4		
01:15			1		2			13:15			7		4		
01:30			0		0			13:30			7		3		
01:45			1	2	0	2	4	13:45			7	25	4	15	40
02:00			0		0			14:00			7		5		
02:15			0		0			14:15			9		10		
02:30			0		0			14:30			8		10		
02:45			0	0	0	0		14:45			5	29	11	36	65
03:00			0		1			15:00			4		7		
03:15			0		0			15:15			4		3		
03:30			1		0			15:30			4		6		
03:45			0	1	0	1	2	15:45			1	13	5	21	34
04:00			0		0			16:00			2		7		
04:15			0		0			16:15			5		7		
04:30			1		0			16:30			3		11		
04:45			1	2	1	1	3	16:45			1	11	11	36	47
05:00			0		0			17:00			7		10		
05:15			4		0			17:15			1		3		
05:30			2		1			17:30			2		7		
05:45			6	12	0	1	13	17:45			9	19	5	25	44
06:00			4		1			18:00			2		2		
06:15			2		2			18:15			1		2		
06:30			9		2			18:30			3		3		
06:45			9	24	0	5	29	18:45			3	9	0	7	16
07:00			11		0			19:00			0		1		
07:15			5		1			19:15			1		1		
07:30			5		2			19:30			0		6		
07:45			12	33	5	8	41	19:45			1	2	2	10	12
08:00			15		6			20:00			1		1		
08:15			15		2			20:15			3		0		
08:30			17		2			20:30			1		1		
08:45			8	55	3	13	68	20:45			1	6	2	4	10
09:00			7		4			21:00			0		1		
09:15			6		5			21:15			2		0		
09:30			4		6			21:30			0		1		
09:45			9	26	7	22	48	21:45			1	3	0	2	5
10:00			3		8			22:00			2		0		
10:15			5		10			22:15			0		0		
10:30			7		9			22:30			1		2		
10:45			4	19	6	33	52	22:45			0	3	0	2	5
11:00			4		11			23:00			0		0		
11:15			2		7			23:15			0		1		
11:30			3		10			23:30			0		1		
11:45			7	16	8	36	52	23:45			0	0	0	2	2
Total Vol.				191		122	**313**					151		183	**334**

GPS Coordinates: 33.464732, -112.063880

	NB	SB	**Daily Totals** EB	WB	**Combined**
			342	305	**647**

	AM			**PM**		
Split %	61.0%	39.0%	**48.4%**	45.2%	54.8%	**51.6%**
Peak Hour	07:45	10:15	**07:45**	12:00	16:15	**14:00**
Volume	59	36	**74**	31	39	**65**
P.H.F.	0.87	0.82	**0.88**	0.78	0.89	**0.86**

FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745

veracitytrafficgroup

Pedestrian Study

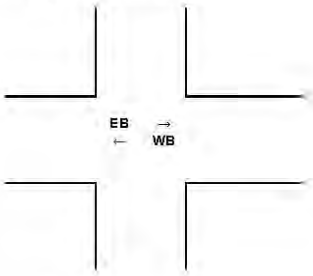
Location: 10th St. (Northern site)

Date: 11/15/17
Day: WEDNESDAY

City: PHOENIX
Project #: 17-1439-007

	PEDESTRIANS	
	EB	WB
7:00 AM	38	7
7:15 AM	18	24
7:30 AM	27	39
7:45 AM	52	34
TOTAL	135	104

	PEDESTRIANS	
	EB	WB
4:00 PM	2	33
4:15 PM	3	26
4:30 PM	3	18
4:45 PM	0	16
TOTAL	8	93



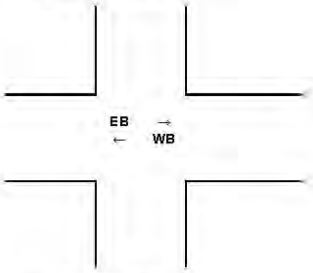
Location: 10th St. & Brill St.

Date: 11/15/17
Day: WEDNESDAY

City: PHOENIX
Project #: 17-1439-007

	PEDESTRIANS	
	EB	WB
7:00 AM	26	1
7:15 AM	19	4
7:30 AM	10	7
7:45 AM	12	1
TOTAL	67	13

	PEDESTRIANS	
	EB	WB
4:00 PM	2	9
4:15 PM	1	8
4:30 PM	4	18
4:45 PM	4	14
TOTAL	11	49



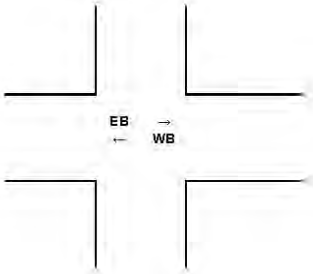
Location: 10th St. (Southern site)

Date: 11/15/17
Day: WEDNESDAY

City: PHOENIX
Project #: 17-1439-007

	PEDESTRIANS	
	EB	WB
7:00 AM	8	1
7:15 AM	13	5
7:30 AM	7	8
7:45 AM	11	3
TOTAL	39	17

	PEDESTRIANS	
	EB	WB
4:00 PM	1	7
4:15 PM	2	5
4:30 PM	0	2
4:45 PM	0	8
TOTAL	3	22



Prepared by: Field Data Services of Arizona/Veracity Traffic Group (520) 316-6745

Volumes for: Wednesday, November 15, 2017 City: Phoenix Project #: 17-1439-003

Location: Willetta St. btwn. 7th St. & 9th St.

AM Period	NB	SB	EB		WB			PM Period	NB	SB	EB		WB		
00:00			1		0			12:00			27		12		
00:15			0		0			12:15			23		11		
00:30			0		0			12:30			26		3		
00:45			1	2	1	1	3	12:45			24	100	14	40	140
01:00			0		0			13:00			20		13		
01:15			2		0			13:15			25		9		
01:30			1		0			13:30			24		8		
01:45			3	6	0	0	6	13:45			32	101	9	39	140
02:00			1		0			14:00			18		9		
02:15			1		1			14:15			22		15		
02:30			2		1			14:30			14		18		
02:45			5	9	1	3	12	14:45			14	68	7	49	117
03:00			2		0			15:00			13		10		
03:15			2		0			15:15			14		6		
03:30			4		0			15:30			4		5		
03:45			5	13	0	0	13	15:45			14	45	8	29	74
04:00			6		0			16:00			15		9		
04:15			14		1			16:15			12		11		
04:30			11		1			16:30			20		13		
04:45			27	58	0	2	60	16:45			19	66	13	46	112
05:00			23		1			17:00			19		11		
05:15			34		1			17:15			15		10		
05:30			54		0			17:30			19		8		
05:45			83	194	2	4	198	17:45			26	79	8	37	116
06:00			60		1			18:00			15		8		
06:15			63		1			18:15			27		5		
06:30			80		2			18:30			40		3		
06:45			74	277	4	8	285	18:45			23	105	2	18	123
07:00			39		1			19:00			5		1		
07:15			50		4			19:15			7		4		
07:30			43		7			19:30			5		4		
07:45			68	200	6	18	218	19:45			3	20	5	14	34
08:00			35		8			20:00			9		1		
08:15			36		9			20:15			3		2		
08:30			39		9			20:30			6		5		
08:45			41	151	7	33	184	20:45			10	28	1	9	37
09:00			40		9			21:00			1		2		
09:15			31		13			21:15			1		0		
09:30			25		3			21:30			1		6		
09:45			33	129	4	29	158	21:45			1	4	0	8	12
10:00			37		13			22:00			1		2		
10:15			20		10			22:15			4		2		
10:30			27		16			22:30			1		1		
10:45			20	104	12	51	155	22:45			7	13	1	6	19
11:00			20		4			23:00			1		1		
11:15			20		7			23:15			0		1		
11:30			16		7			23:30			0		2		
11:45			30	86	9	27	113	23:45			2	3	2	6	9
Total Vol.				1229		176	**1405**					632		301	**933**

GPS Coordinates: 33.463676, -112.063389

Daily Totals

NB	SB	EB	WB	Combined
		1861	477	**2338**

	AM			PM		
Split %	87.5%	12.5%	**60.1%**	67.7%	32.3%	**39.9%**
Peak Hour	05:45	10:00	**05:45**	17:45	13:45	**12:00**
Volume	286	51	**292**	108	51	**140**
P.H.F.	0.86	0.80	**0.86**	0.68	0.71	**0.90**

Prepared by: Field Data Services of Arizona/Veracity Traffic Group (520) 316-6745

Volumes for: Wednesday, November 15, 2017 City: Phoenix Project #: 17-1439-002

Location: Willetta St. btwn. 9th St. & 10th St.

AM Period	NB	SB	EB		WB			PM Period	NB	SB	EB		WB		
00:00			1		0			12:00			15		10		
00:15			0		0			12:15			17		8		
00:30			0		0			12:30			30		10		
00:45			1	2	1	1	3	12:45			18	80	8	36	116
01:00			0		0			13:00			21		10		
01:15			3		1			13:15			19		4		
01:30			1		0			13:30			19		14		
01:45			2	6	0	1	7	13:45			24	83	7	35	118
02:00			1		0			14:00			24		10		
02:15			1		1			14:15			32		4		
02:30			1		0			14:30			29		17		
02:45			4	7	1	2	9	14:45			30	115	7	38	153
03:00			1		0			15:00			25		7		
03:15			1		0			15:15			29		7		
03:30			3		0			15:30			25		3		
03:45			2	7	0	0	7	15:45			45	124	8	25	149
04:00			5		0			16:00			57		5		
04:15			6		1			16:15			36		3		
04:30			7		5			16:30			64		10		
04:45			15	33	0	6	39	16:45			42	199	7	25	224
05:00			10		5			17:00			47		8		
05:15			17		2			17:15			45		7		
05:30			24		9			17:30			37		6		
05:45			38	89	11	27	116	17:45			31	160	6	27	187
06:00			27		15			18:00			30		8		
06:15			22		18			18:15			26		12		
06:30			16		23			18:30			29		23		
06:45			14	79	36	92	171	18:45			23	108	3	46	154
07:00			10		19			19:00			12		3		
07:15			14		26			19:15			14		2		
07:30			29		27			19:30			29		2		
07:45			31	84	30	102	186	19:45			17	72	0	7	79
08:00			31		19			20:00			17		0		
08:15			22		23			20:15			12		1		
08:30			22		21			20:30			6		4		
08:45			22	97	18	81	178	20:45			9	44	1	6	50
09:00			29		9			21:00			3		2		
09:15			18		16			21:15			4		0		
09:30			22		10			21:30			4		3		
09:45			16	85	13	48	133	21:45			6	17	0	5	22
10:00			29		14			22:00			3		1		
10:15			23		6			22:15			6		3		
10:30			14		13			22:30			7		1		
10:45			20	86	11	44	130	22:45			7	23	1	6	29
11:00			16		9			23:00			1		1		
11:15			26		5			23:15			1		1		
11:30			17		7			23:30			1		2		
11:45			19	78	16	37	115	23:45			1	4	1	5	9
Total Vol.				653		441	**1094**					1029		261	**1290**

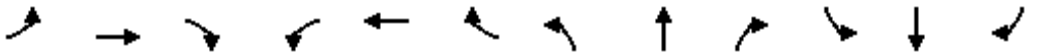
GPS Coordinates: 33.484732, -112.063890

	NB	SB	EB	WB	Combined
Daily Totals			1682	702	**2384**

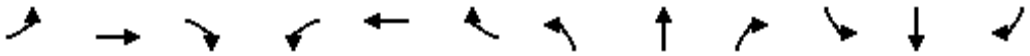
	AM			PM		
Split %	59.7%	40.3%	**45.9%**	79.8%	20.2%	**54.1%**
Peak Hour	07:30	06:45	**07:30**	15:45	17:45	**16:30**
Volume	113	108	**212**	202	49	**230**
P.H.F.	0.91	0.75	**0.87**	0.79	0.53	**0.78**

Appendix B – Existing Conditions Synchro Reports

AM Existing Traffic Reports



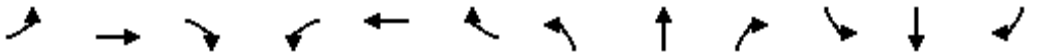
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	1120	63	108	1005	37	79	12	68	68	9	65
Future Volume (vph)	36	1120	63	108	1005	37	79	12	68	68	9	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	115		0	150		0	145		100
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.992			0.995			0.872				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5045	0	1770	3522	0	1770	1624	0	1770	1863	1583
Flt Permitted	0.156			0.153			0.751			0.701		
Satd. Flow (perm)	291	5045	0	285	3522	0	1399	1624	0	1306	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		18			8			74				71
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		400			670			291			426	
Travel Time (s)		9.1			15.2			6.6			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1217	68	117	1092	40	86	13	74	74	10	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	39	1285	0	117	1132	0	86	87	0	74	10	71
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6



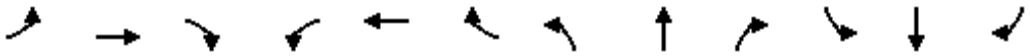
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		8	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	22.5
Total Split (s)	90.0	90.0		90.0	90.0		30.0	30.0		30.0	30.0	30.0
Total Split (%)	75.0%	75.0%		75.0%	75.0%		25.0%	25.0%		25.0%	25.0%	25.0%
Maximum Green (s)	85.5	85.5		85.5	85.5		25.5	25.5		25.5	25.5	25.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effct Green (s)	62.9	62.9		62.9	62.9		48.1	48.1		48.1	48.1	48.1
Actuated g/C Ratio	0.52	0.52		0.52	0.52		0.40	0.40		0.40	0.40	0.40
v/c Ratio	0.26	0.48		0.79	0.61		0.15	0.13		0.14	0.01	0.11
Control Delay	15.6	18.3		48.2	17.5		30.5	10.8		30.8	32.1	8.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	15.6	18.3		48.2	17.5		30.5	10.8		30.8	32.1	8.8
LOS	B	B		D	B		C	B		C	C	A
Approach Delay		18.2			20.4			20.6			20.8	
Approach LOS		B			C			C			C	
Queue Length 50th (ft)	17	234		38	186		40	6		34	4	0
Queue Length 95th (ft)	24	145		53	143		106	52		94	21	39
Internal Link Dist (ft)		320			590			211			346	
Turn Bay Length (ft)	110			115			150			145		100
Base Capacity (vph)	207	3599		203	2511		560	695		523	746	676
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.19	0.36		0.58	0.45		0.15	0.13		0.14	0.01	0.11

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.79			
Intersection Signal Delay: 19.4		Intersection LOS: B	
Intersection Capacity Utilization 55.4%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 10: 10th St & McDowell Rd



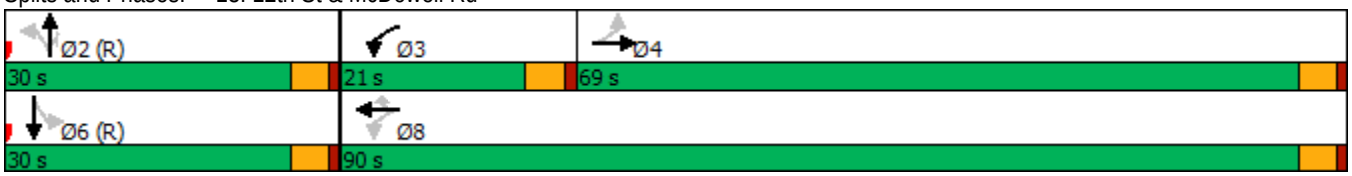
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	927	306	193	970	59	114	68	94	78	97	53
Future Volume (vph)	26	927	306	193	970	59	114	68	94	78	97	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	160		0	160		160	145		200	140		0
Storage Lanes	1		0	1		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.963				0.850			0.850		0.947	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	4897	0	1770	3539	1583	1770	1863	1583	1770	1764	0
Flt Permitted	0.263			0.085			0.615			0.709		
Satd. Flow (perm)	490	4897	0	158	3539	1583	1146	1863	1583	1321	1764	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		107				64			102		21	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		669			638			385			377	
Travel Time (s)		15.2			14.5			8.8			8.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	28	1008	333	210	1054	64	124	74	102	85	105	58
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	1341	0	210	1054	64	124	74	102	85	163	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		



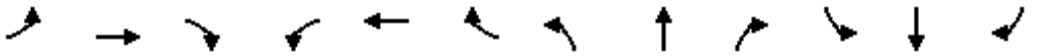
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	
Total Split (s)	69.0	69.0		21.0	90.0	90.0	30.0	30.0	30.0	30.0	30.0	
Total Split (%)	57.5%	57.5%		17.5%	75.0%	75.0%	25.0%	25.0%	25.0%	25.0%	25.0%	
Maximum Green (s)	64.5	64.5		16.5	85.5	85.5	25.5	25.5	25.5	25.5	25.5	
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None		None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max	
Walk Time (s)	7.0	7.0			7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0			11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0			0	0	0	0	0	0	0	
Act Effct Green (s)	45.5	45.5		64.3	64.3	64.3	46.7	46.7	46.7	46.7	46.7	
Actuated g/C Ratio	0.38	0.38		0.54	0.54	0.54	0.39	0.39	0.39	0.39	0.39	
v/c Ratio	0.15	0.70		0.76	0.56	0.07	0.28	0.10	0.15	0.17	0.23	
Control Delay	18.0	17.5		43.1	19.1	2.4	30.5	27.4	6.4	28.6	25.1	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	18.0	17.5		43.1	19.1	2.4	30.5	27.4	6.4	28.6	25.1	
LOS	B	B		D	B	A	C	C	A	C	C	
Approach Delay		17.5			22.1			21.6			26.3	
Approach LOS		B			C			C			C	
Queue Length 50th (ft)	7	95		102	269	0	66	36	0	43	73	
Queue Length 95th (ft)	22	164		172	254	16	135	81	42	94	146	
Internal Link Dist (ft)		589			558			305			297	
Turn Bay Length (ft)	160			160		160	145		200	140		
Base Capacity (vph)	263	2681		306	2521	1146	445	725	678	514	699	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.11	0.50		0.69	0.42	0.06	0.28	0.10	0.15	0.17	0.23	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 55			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.76			
Intersection Signal Delay: 20.4		Intersection LOS: C	
Intersection Capacity Utilization 65.1%		ICU Level of Service C	
Analysis Period (min) 15			

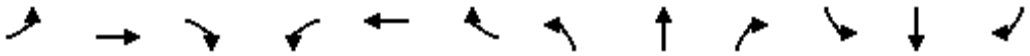
Splits and Phases: 13: 12th St & McDowell Rd



PM Existing Traffic Reports



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	1380	30	43	1216	51	107	47	151	47	10	66
Future Volume (vph)	56	1380	30	43	1216	51	107	47	151	47	10	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	200		0	150		0	145		100
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.994			0.886				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5070	0	1770	3518	0	1770	1650	0	1770	1863	1583
Flt Permitted	0.110			0.114			0.750			0.535		
Satd. Flow (perm)	205	5070	0	212	3518	0	1397	1650	0	997	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7			9			66				72
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		400			670			291			426	
Travel Time (s)		9.1			15.2			6.6			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	61	1500	33	47	1322	55	116	51	164	51	11	72
Shared Lane Traffic (%)												
Lane Group Flow (vph)	61	1533	0	47	1377	0	116	215	0	51	11	72
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6

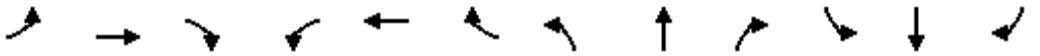


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		8	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	22.5
Total Split (s)	90.0	90.0		90.0	90.0		30.0	30.0		30.0	30.0	30.0
Total Split (%)	75.0%	75.0%		75.0%	75.0%		25.0%	25.0%		25.0%	25.0%	25.0%
Maximum Green (s)	85.5	85.5		85.5	85.5		25.5	25.5		25.5	25.5	25.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effct Green (s)	68.6	68.6		68.6	68.6		42.4	42.4		42.4	42.4	42.4
Actuated g/C Ratio	0.57	0.57		0.57	0.57		0.35	0.35		0.35	0.35	0.35
v/c Ratio	0.52	0.53		0.39	0.68		0.23	0.34		0.14	0.02	0.12
Control Delay	30.6	16.1		17.4	13.3		32.5	23.8		32.8	31.4	8.3
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	30.6	16.1		17.4	13.3		32.5	23.8		32.8	31.4	8.3
LOS	C	B		B	B		C	C		C	C	A
Approach Delay		16.6			13.4			26.9			19.5	
Approach LOS		B			B			C			B	
Queue Length 50th (ft)	27	249		15	235		63	83		27	6	0
Queue Length 95th (ft)	63	209		m25	211		131	175		68	22	37
Internal Link Dist (ft)		320			590			211			346	
Turn Bay Length (ft)	110			200			150			145		100
Base Capacity (vph)	146	3614		151	2509		494	626		352	658	606
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.42	0.42		0.31	0.55		0.23	0.34		0.14	0.02	0.12

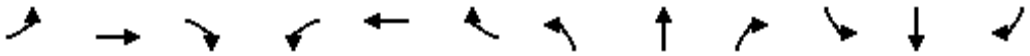
Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.68			
Intersection Signal Delay: 16.4		Intersection LOS: B	
Intersection Capacity Utilization 70.3%		ICU Level of Service C	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: 10th St & McDowell Rd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	74	1330	160	91	1049	97	206	160	192	59	91	38
Future Volume (vph)	74	1330	160	91	1049	97	206	160	192	59	91	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	160		0	160		160	145		200	140		0
Storage Lanes	1		0	1		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.984				0.850			0.850		0.956	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5004	0	1770	3539	1583	1770	1863	1583	1770	1781	0
Flt Permitted	0.220			0.073			0.630			0.581		
Satd. Flow (perm)	410	5004	0	136	3539	1583	1174	1863	1583	1082	1781	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		31				105			165		16	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		669			638			385			377	
Travel Time (s)		15.2			14.5			8.8			8.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	80	1446	174	99	1140	105	224	174	209	64	99	41
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	1620	0	99	1140	105	224	174	209	64	140	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	
Total Split (s)	76.0	76.0		14.0	90.0	90.0	30.0	30.0	30.0	30.0	30.0	
Total Split (%)	63.3%	63.3%		11.7%	75.0%	75.0%	25.0%	25.0%	25.0%	25.0%	25.0%	
Maximum Green (s)	71.5	71.5		9.5	85.5	85.5	25.5	25.5	25.5	25.5	25.5	
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None		None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max	
Walk Time (s)	7.0	7.0			7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0			11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0			0	0	0	0	0	0	0	
Act Effct Green (s)	58.0	58.0		71.1	71.1	71.1	39.9	39.9	39.9	39.9	39.9	
Actuated g/C Ratio	0.48	0.48		0.59	0.59	0.59	0.33	0.33	0.33	0.33	0.33	
v/c Ratio	0.40	0.67		0.50	0.54	0.11	0.57	0.28	0.33	0.18	0.23	
Control Delay	18.1	14.7		21.1	15.3	1.5	43.2	34.0	10.8	34.5	29.9	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	18.1	14.7		21.1	15.3	1.5	43.2	34.0	10.8	34.5	29.9	
LOS	B	B		C	B	A	D	C	B	C	C	
Approach Delay		14.8			14.6			29.4			31.3	
Approach LOS		B			B			C			C	
Queue Length 50th (ft)	20	149		31	260	0	144	100	24	35	69	
Queue Length 95th (ft)	39	170		59	230	16	#303	185	96	82	141	
Internal Link Dist (ft)		589			558			305			297	
Turn Bay Length (ft)	160			160		160	145		200	140		
Base Capacity (vph)	244	2994		209	2521	1158	390	619	636	359	602	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.33	0.54		0.47	0.45	0.09	0.57	0.28	0.33	0.18	0.23	

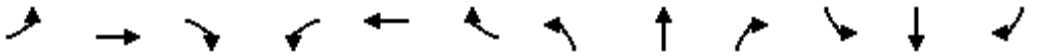
Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.67			
Intersection Signal Delay: 17.9		Intersection LOS: B	
Intersection Capacity Utilization 67.8%		ICU Level of Service C	
Analysis Period (min) 15			

95th percentile volume exceeds capacity, queue may be longer.

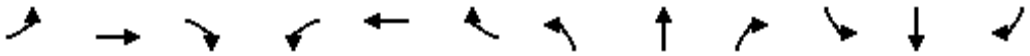
Queue shown is maximum after two cycles.

Splits and Phases: 13: 12th St & McDowell Rd

AM Existing + Site Traffic Reports



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	1049	190	195	974	37	139	12	106	68	9	65
Future Volume (vph)	36	1049	190	195	974	37	139	12	106	68	9	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	115		0	150		0	145		100
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.977			0.995			0.865				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	4968	0	1770	3522	0	1770	1611	0	1770	1863	1583
Flt Permitted	0.224			0.172			0.751			0.603		
Satd. Flow (perm)	417	4968	0	320	3522	0	1399	1611	0	1123	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		76			8			115				71
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		400			670			291			426	
Travel Time (s)		9.1			15.2			6.6			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1140	207	212	1059	40	151	13	115	74	10	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	39	1347	0	212	1099	0	151	128	0	74	10	71
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		8	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	22.5
Total Split (s)	90.0	90.0		90.0	90.0		30.0	30.0		30.0	30.0	30.0
Total Split (%)	75.0%	75.0%		75.0%	75.0%		25.0%	25.0%		25.0%	25.0%	25.0%
Maximum Green (s)	85.5	85.5		85.5	85.5		25.5	25.5		25.5	25.5	25.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Max	C-Max		None	None		Max	Max		Max	Max	Max
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effct Green (s)	85.5	85.5		85.5	85.5		25.5	25.5		25.5	25.5	25.5
Actuated g/C Ratio	0.71	0.71		0.71	0.71		0.21	0.21		0.21	0.21	0.21
v/c Ratio	0.13	0.38		0.93	0.44		0.51	0.30		0.31	0.03	0.18
Control Delay	6.7	6.7		57.9	4.8		48.6	11.0		44.1	37.8	10.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	6.7	6.7		57.9	4.8		48.6	11.0		44.1	37.8	10.0
LOS	A	A		E	A		D	B		D	D	A
Approach Delay		6.7			13.4			31.4			28.1	
Approach LOS		A			B			C			C	
Queue Length 50th (ft)	9	125		139	87		104	8		49	6	0
Queue Length 95th (ft)	21	147		#318	101		175	60		96	21	39
Internal Link Dist (ft)		320			590			211			346	
Turn Bay Length (ft)	110			115			150			145		100
Base Capacity (vph)	297	3561		228	2511		297	432		238	395	392
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.13	0.38		0.93	0.44		0.51	0.30		0.31	0.03	0.18

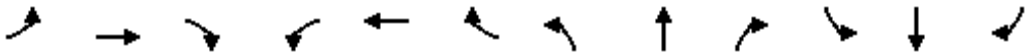
Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 50 (42%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.93			
Intersection Signal Delay: 12.7		Intersection LOS: B	
Intersection Capacity Utilization 60.9%		ICU Level of Service B	
Analysis Period (min) 15			

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 10: 10th St & McDowell Rd

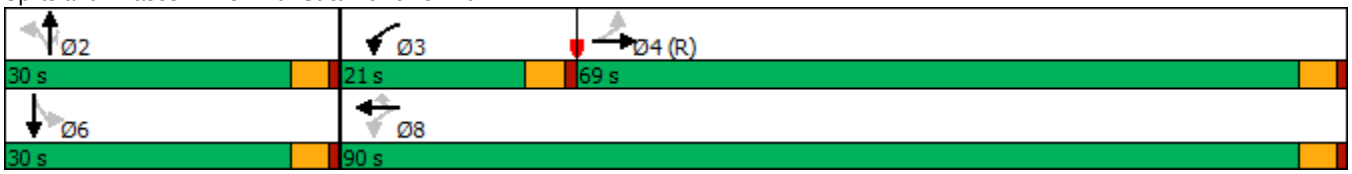
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	971	222	153	1065	59	83	68	72	78	99	53
Future Volume (vph)	26	971	222	153	1065	59	83	68	72	78	99	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	160		0	160		160	145		200	140		0
Storage Lanes	1		0	1		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.972				0.850			0.850		0.948	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	4943	0	1770	3539	1583	1770	1863	1583	1770	1766	0
Flt Permitted	0.245			0.156			0.522			0.709		
Satd. Flow (perm)	456	4943	0	291	3539	1583	972	1863	1583	1321	1766	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		67				64			78		20	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		669			638			385			377	
Travel Time (s)		15.2			14.5			8.8			8.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	28	1055	241	166	1158	64	90	74	78	85	108	58
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	1296	0	166	1158	64	90	74	78	85	166	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		



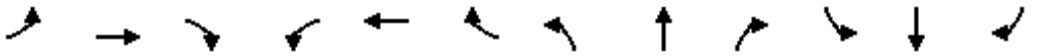
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	
Total Split (s)	69.0	69.0		21.0	90.0	90.0	30.0	30.0	30.0	30.0	30.0	
Total Split (%)	57.5%	57.5%		17.5%	75.0%	75.0%	25.0%	25.0%	25.0%	25.0%	25.0%	
Maximum Green (s)	64.5	64.5		16.5	85.5	85.5	25.5	25.5	25.5	25.5	25.5	
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	C-Max	C-Max		None	None	None	Max	Max	Max	Max	Max	
Walk Time (s)	7.0	7.0			7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0			11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0			0	0	0	0	0	0	0	
Act Effct Green (s)	71.9	71.9		85.5	85.5	85.5	25.5	25.5	25.5	25.5	25.5	
Actuated g/C Ratio	0.60	0.60		0.71	0.71	0.71	0.21	0.21	0.21	0.21	0.21	
v/c Ratio	0.10	0.43		0.52	0.46	0.06	0.44	0.19	0.20	0.30	0.42	
Control Delay	11.0	11.4		11.5	8.1	1.4	48.8	40.3	9.7	43.3	39.7	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	11.0	11.4		11.5	8.1	1.4	48.8	40.3	9.7	43.3	39.7	
LOS	B	B		B	A	A	D	D	A	D	D	
Approach Delay		11.4			8.2			33.6			40.9	
Approach LOS		B			A			C			D	
Queue Length 50th (ft)	8	149		36	179	0	61	47	0	56	98	
Queue Length 95th (ft)	21	178		59	218	12	116	91	41	105	167	
Internal Link Dist (ft)		589			558			305			297	
Turn Bay Length (ft)	160			160		160	145		200	140		
Base Capacity (vph)	273	2989		410	2521	1146	206	395	397	280	391	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.10	0.43		0.40	0.46	0.06	0.44	0.19	0.20	0.30	0.42	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 51 (43%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.52			
Intersection Signal Delay: 14.0		Intersection LOS: B	
Intersection Capacity Utilization 61.6%		ICU Level of Service B	
Analysis Period (min) 15			

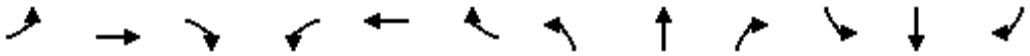
Splits and Phases: 13: 12th St & McDowell Rd



PM Existing + Site Traffic Reports



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	1335	85	76	1162	51	215	47	220	47	10	66
Future Volume (vph)	56	1335	85	76	1162	51	215	47	220	47	10	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	115		0	150		0	145		100
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.991			0.994			0.876				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5040	0	1770	3518	0	1770	1632	0	1770	1863	1583
Flt Permitted	0.167			0.134			0.750			0.271		
Satd. Flow (perm)	311	5040	0	250	3518	0	1397	1632	0	505	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		20			9			72				72
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		400			670			382			426	
Travel Time (s)		9.1			15.2			8.7			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	61	1451	92	83	1263	55	234	51	239	51	11	72
Shared Lane Traffic (%)												
Lane Group Flow (vph)	61	1543	0	83	1318	0	234	290	0	51	11	72
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		8	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	22.5
Total Split (s)	90.0	90.0		90.0	90.0		30.0	30.0		30.0	30.0	30.0
Total Split (%)	75.0%	75.0%		75.0%	75.0%		25.0%	25.0%		25.0%	25.0%	25.0%
Maximum Green (s)	85.5	85.5		85.5	85.5		25.5	25.5		25.5	25.5	25.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Max	C-Max		None	None		Max	Max		Max	Max	Max
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effct Green (s)	85.5	85.5		85.5	85.5		25.5	25.5		25.5	25.5	25.5
Actuated g/C Ratio	0.71	0.71		0.71	0.71		0.21	0.21		0.21	0.21	0.21
v/c Ratio	0.28	0.43		0.47	0.53		0.79	0.72		0.48	0.03	0.18
Control Delay	10.0	7.5		14.6	6.7		64.7	44.0		58.2	37.8	10.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	10.0	7.5		14.6	6.7		64.7	44.0		58.2	37.8	10.0
LOS	A	A		B	A		E	D		E	D	A
Approach Delay		7.6			7.2			53.2			30.6	
Approach LOS		A			A			D			C	
Queue Length 50th (ft)	15	158		20	165		173	159		35	7	0
Queue Length 95th (ft)	38	184		m41	186		#301	262		81	23	39
Internal Link Dist (ft)		320			590			302			346	
Turn Bay Length (ft)	110			115			150			145		100
Base Capacity (vph)	221	3596		178	2509		296	403		107	395	393
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.28	0.43		0.47	0.53		0.79	0.72		0.48	0.03	0.18

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.79			
Intersection Signal Delay: 14.8		Intersection LOS: B	
Intersection Capacity Utilization 73.1%		ICU Level of Service D	
Analysis Period (min) 15			

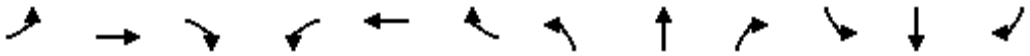
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: 10th St & McDowell Rd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	74	1407	113	68	1083	97	152	160	143	59	91	38
Future Volume (vph)	74	1407	113	68	1083	97	152	160	143	59	91	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	160		0	160		160	145		200	140		0
Storage Lanes	1		0	1		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.989				0.850			0.850		0.956	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5029	0	1770	3539	1583	1770	1863	1583	1770	1781	0
Flt Permitted	0.225			0.101			0.577			0.505		
Satd. Flow (perm)	419	5029	0	188	3539	1583	1075	1863	1583	941	1781	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		21				105			113		16	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		669			638			385			377	
Travel Time (s)		15.2			14.5			8.8			8.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	80	1529	123	74	1177	105	165	174	155	64	99	41
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	1652	0	74	1177	105	165	174	155	64	140	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	
Total Split (s)	80.0	80.0		10.0	90.0	90.0	30.0	30.0	30.0	30.0	30.0	
Total Split (%)	66.7%	66.7%		8.3%	75.0%	75.0%	25.0%	25.0%	25.0%	25.0%	25.0%	
Maximum Green (s)	75.5	75.5		5.5	85.5	85.5	25.5	25.5	25.5	25.5	25.5	
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	C-Max	C-Max		None	None	None	Max	Max	Max	Max	Max	
Walk Time (s)	7.0	7.0			7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0			11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0			0	0	0	0	0	0	0	
Act Effct Green (s)	77.5	77.5		85.5	85.5	85.5	25.5	25.5	25.5	25.5	25.5	
Actuated g/C Ratio	0.65	0.65		0.71	0.71	0.71	0.21	0.21	0.21	0.21	0.21	
v/c Ratio	0.30	0.51		0.36	0.47	0.09	0.72	0.44	0.36	0.32	0.36	
Control Delay	10.2	8.5		10.1	8.2	1.1	63.2	45.2	15.5	45.3	38.6	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	10.2	8.5		10.1	8.2	1.1	63.2	45.2	15.5	45.3	38.6	
LOS	B	A		B	A	A	E	D	B	D	D	
Approach Delay		8.5			7.7			41.9			40.7	
Approach LOS		A			A			D			D	
Queue Length 50th (ft)	19	144		15	183	0	120	118	27	42	82	
Queue Length 95th (ft)	m35	162		29	224	15	#224	189	86	86	144	
Internal Link Dist (ft)		589			558			305			297	
Turn Bay Length (ft)	160			160		160	145		200	140		
Base Capacity (vph)	270	3255		206	2521	1158	228	395	425	199	391	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.30	0.51		0.36	0.47	0.09	0.72	0.44	0.36	0.32	0.36	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 20 (17%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.72			
Intersection Signal Delay: 14.3		Intersection LOS: B	
Intersection Capacity Utilization 64.6%		ICU Level of Service C	
Analysis Period (min) 15			

95th percentile volume exceeds capacity, queue may be longer.

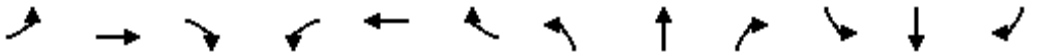
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

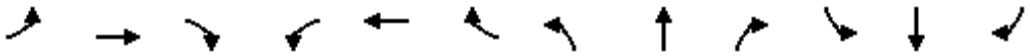
Splits and Phases: 13: 12th St & McDowell Rd

Appendix C – Mitigation Options Synchro Reports

AM Option 1



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	1049	190	195	974	37	139	12	106	68	9	65
Future Volume (vph)	36	1049	190	195	974	37	139	12	106	68	9	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	220		0	150		90	152		265
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.977			0.995				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950	*0.950	
Satd. Flow (prot)	1770	4968	0	1770	3522	0	1770	1863	1583	1770	1770	1583
Flt Permitted	0.260			0.143			0.751			0.749		
Satd. Flow (perm)	484	4968	0	266	3522	0	1399	1863	1583	1395	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		50			8				115			71
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		400			330			382			426	
Travel Time (s)		7.8			6.4			10.4			11.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1140	207	212	1059	40	151	13	115	74	10	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	39	1347	0	212	1099	0	151	13	115	74	10	71
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4		3	8			6			2	
Permitted Phases	4			8			6		6	2		2

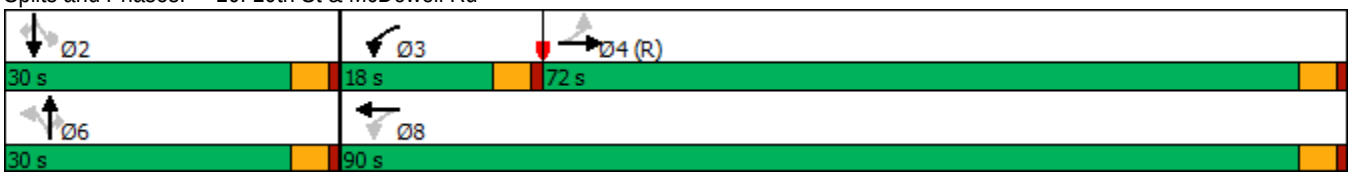


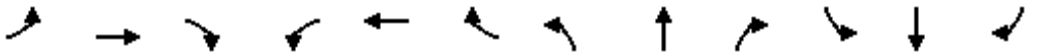
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8		6	6	6	2	2	2
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	1.0	1.0	1.0
Minimum Split (s)	26.0	26.0		10.5	26.0		29.0	29.0	29.0	29.0	29.0	29.0
Total Split (s)	72.0	72.0		18.0	90.0		30.0	30.0	30.0	30.0	30.0	30.0
Total Split (%)	60.0%	60.0%		15.0%	75.0%		25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Maximum Green (s)	67.5	67.5		13.5	85.5		25.5	25.5	25.5	25.5	25.5	25.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max		None	None		Max	Max	Max	Max	Max	Max
Walk Time (s)	7.0	7.0			7.0		7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	14.5	14.5			12.0		17.5	17.5	17.5	17.5	17.5	17.5
Pedestrian Calls (#/hr)	4	4			18		4	4	4	0	0	0
Act Effct Green (s)	70.7	70.7		85.5	85.5		25.5	25.5	25.5	25.5	25.5	25.5
Actuated g/C Ratio	0.59	0.59		0.71	0.71		0.21	0.21	0.21	0.21	0.21	0.21
v/c Ratio	0.14	0.46		0.67	0.44		0.51	0.03	0.27	0.25	0.03	0.18
Control Delay	13.3	14.1		24.2	10.5		48.6	37.9	8.7	42.0	37.8	10.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.3	14.1		24.2	10.5		48.6	37.9	8.7	42.0	37.8	10.0
LOS	B	B		C	B		D	D	A	D	D	A
Approach Delay		14.1			12.7			31.7			27.1	
Approach LOS		B			B			C			C	
Queue Length 50th (ft)	13	194		85	193		104	8	0	48	6	0
Queue Length 95th (ft)	34	246		143	270		175	26	49	93	21	39
Internal Link Dist (ft)		320			250			302			346	
Turn Bay Length (ft)	110			220			150		90	152		265
Base Capacity (vph)	284	2946		358	2511		297	395	426	296	376	392
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.46		0.59	0.44		0.51	0.03	0.27	0.25	0.03	0.18

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.67			
Intersection Signal Delay: 15.7		Intersection LOS: B	
Intersection Capacity Utilization 60.9%		ICU Level of Service B	
Analysis Period (min) 15			

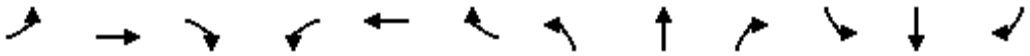
* User Entered Value

Splits and Phases: 10: 10th St & McDowell Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	971	222	153	1065	59	83	68	72	78	99	53
Future Volume (vph)	26	971	222	153	1065	59	83	68	72	78	99	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	160		0	160		160	145		200	140		0
Storage Lanes	1		0	1		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.972				0.850			0.850		0.948	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	4943	0	1770	3539	1583	1770	1863	1583	1770	1766	0
Flt Permitted	0.245			0.156			0.522			0.709		
Satd. Flow (perm)	456	4943	0	291	3539	1583	972	1863	1583	1321	1766	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		67				64			78		20	
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		669			638			385			377	
Travel Time (s)		13.0			12.4			10.5			10.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	28	1055	241	166	1158	64	90	74	78	85	108	58
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	1296	0	166	1158	64	90	74	78	85	166	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		

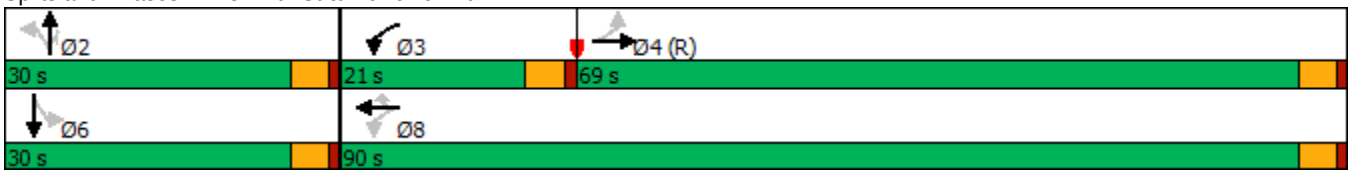


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	
Total Split (s)	69.0	69.0		21.0	90.0	90.0	30.0	30.0	30.0	30.0	30.0	
Total Split (%)	57.5%	57.5%		17.5%	75.0%	75.0%	25.0%	25.0%	25.0%	25.0%	25.0%	
Maximum Green (s)	64.5	64.5		16.5	85.5	85.5	25.5	25.5	25.5	25.5	25.5	
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	C-Max	C-Max		None	None	None	Max	Max	Max	Max	Max	
Walk Time (s)	7.0	7.0			7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0			11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0			0	0	0	0	0	0	0	
Act Effct Green (s)	71.9	71.9		85.5	85.5	85.5	25.5	25.5	25.5	25.5	25.5	
Actuated g/C Ratio	0.60	0.60		0.71	0.71	0.71	0.21	0.21	0.21	0.21	0.21	
v/c Ratio	0.10	0.43		0.52	0.46	0.06	0.44	0.19	0.20	0.30	0.42	
Control Delay	8.9	12.1		11.5	8.1	1.4	48.8	40.3	9.7	43.3	39.7	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	8.9	12.1		11.5	8.1	1.4	48.8	40.3	9.7	43.3	39.7	
LOS	A	B		B	A	A	D	D	A	D	D	
Approach Delay		12.0			8.2			33.6			40.9	
Approach LOS		B			A			C			D	
Queue Length 50th (ft)	12	243		36	179	0	61	47	0	56	98	
Queue Length 95th (ft)	m29	288		59	218	12	116	91	41	105	167	
Internal Link Dist (ft)		589			558			305			297	
Turn Bay Length (ft)	160			160		160	145		200	140		
Base Capacity (vph)	273	2989		410	2521	1146	206	395	397	280	391	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.10	0.43		0.40	0.46	0.06	0.44	0.19	0.20	0.30	0.42	

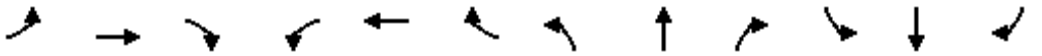
Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 51 (43%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.52			
Intersection Signal Delay: 14.3		Intersection LOS: B	
Intersection Capacity Utilization 61.6%		ICU Level of Service B	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

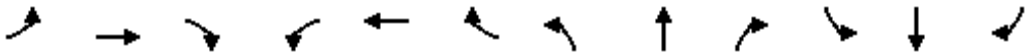
Splits and Phases: 13: 12th St & McDowell Rd



PM Option 1



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	1335	85	76	1162	51	215	47	220	47	10	66
Future Volume (vph)	56	1335	85	76	1162	51	215	47	220	47	10	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	115		0	150		90	145		100
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.991			0.994				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5040	0	1770	3518	0	1770	1863	1583	1770	1863	1583
Flt Permitted	0.186			0.117			0.750			0.724		
Satd. Flow (perm)	346	5040	0	218	3518	0	1397	1863	1583	1349	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16			9				120			72
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		400			670			382			426	
Travel Time (s)		9.1			15.2			8.7			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	61	1451	92	83	1263	55	234	51	239	51	11	72
Shared Lane Traffic (%)												
Lane Group Flow (vph)	61	1543	0	83	1318	0	234	51	239	51	11	72
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2		2	6		6



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	26.0	26.0		9.5	23.5		29.0	29.0	29.0	29.0	29.0	29.0
Total Split (s)	80.0	80.0		10.0	90.0		30.0	30.0	30.0	30.0	30.0	30.0
Total Split (%)	66.7%	66.7%		8.3%	75.0%		25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Maximum Green (s)	75.5	75.5		5.5	85.5		25.5	25.5	25.5	25.5	25.5	25.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max		None	Max		Max	Max	Max	Min	Min	Min
Walk Time (s)	7.0	7.0			7.0		7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	14.5	14.5			12.0		17.5	17.5	17.5	17.5	17.5	17.5
Pedestrian Calls (#/hr)	4	4			18		4	4	4	4	4	4
Act Effct Green (s)	77.5	77.5		85.5	85.5		25.5	25.5	25.5	25.5	25.5	25.5
Actuated g/C Ratio	0.65	0.65		0.71	0.71		0.21	0.21	0.21	0.21	0.21	0.21
v/c Ratio	0.27	0.47		0.37	0.53		0.79	0.13	0.56	0.18	0.03	0.18
Control Delay	14.0	11.6		10.4	7.0		64.7	39.4	26.0	40.7	37.8	10.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.0	11.6		10.4	7.0		64.7	39.4	26.0	40.7	37.8	10.0
LOS	B	B		B	A		E	D	C	D	D	A
Approach Delay		11.7			7.2			44.6			24.0	
Approach LOS		B			A			D			C	
Queue Length 50th (ft)	20	215		15	173		173	32	80	33	7	0
Queue Length 95th (ft)	48	250		m32	207		#301	68	166	69	23	39
Internal Link Dist (ft)		320			590			302			346	
Turn Bay Length (ft)	110			115			150		90	145		100
Base Capacity (vph)	223	3260		226	2509		296	395	430	286	395	393
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.47		0.37	0.53		0.79	0.13	0.56	0.18	0.03	0.18

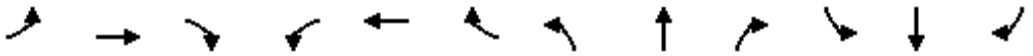
Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 65			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.79			
Intersection Signal Delay: 15.1		Intersection LOS: B	
Intersection Capacity Utilization 67.7%		ICU Level of Service C	
Analysis Period (min) 15			

95th percentile volume exceeds capacity, queue may be longer.

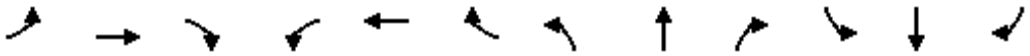
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: 10th St & McDowell Rd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	74	1388	112	67	1077	97	145	162	140	59	92	38
Future Volume (vph)	74	1388	112	67	1077	97	145	162	140	59	92	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	160		0	160		160	145		200	140		0
Storage Lanes	1		0	1		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.989				0.850			0.850		0.956	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5029	0	1770	3539	1583	1770	1863	1583	1770	1781	0
Flt Permitted	0.227			0.104			0.575			0.501		
Satd. Flow (perm)	423	5029	0	194	3539	1583	1071	1863	1583	933	1781	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		21				105			115		16	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		669			638			385			377	
Travel Time (s)		15.2			14.5			8.8			8.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	80	1509	122	73	1171	105	158	176	152	64	100	41
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	1631	0	73	1171	105	158	176	152	64	141	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	
Total Split (s)	80.0	80.0		10.0	90.0	90.0	30.0	30.0	30.0	30.0	30.0	
Total Split (%)	66.7%	66.7%		8.3%	75.0%	75.0%	25.0%	25.0%	25.0%	25.0%	25.0%	
Maximum Green (s)	75.5	75.5		5.5	85.5	85.5	25.5	25.5	25.5	25.5	25.5	
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	C-Max	C-Max		None	None	None	Max	Max	Max	Max	Max	
Walk Time (s)	7.0	7.0			7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0			11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0			0	0	0	0	0	0	0	
Act Effct Green (s)	77.5	77.5		85.5	85.5	85.5	25.5	25.5	25.5	25.5	25.5	
Actuated g/C Ratio	0.65	0.65		0.71	0.71	0.71	0.21	0.21	0.21	0.21	0.21	
v/c Ratio	0.29	0.50		0.35	0.46	0.09	0.70	0.45	0.36	0.32	0.36	
Control Delay	8.8	6.5		9.7	8.1	1.1	61.1	45.3	14.6	45.4	38.7	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	8.8	6.5		9.7	8.1	1.1	61.1	45.3	14.6	45.4	38.7	
LOS	A	A		A	A	A	E	D	B	D	D	
Approach Delay		6.6			7.7			40.8			40.8	
Approach LOS		A			A			D			D	
Queue Length 50th (ft)	13	97		15	182	0	114	119	23	42	83	
Queue Length 95th (ft)	m26	114		29	222	15	#210	191	83	86	145	
Internal Link Dist (ft)		589			558			305			297	
Turn Bay Length (ft)	160			160		160	145		200	140		
Base Capacity (vph)	273	3255		210	2521	1158	227	395	426	198	391	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.29	0.50		0.35	0.46	0.09	0.70	0.45	0.36	0.32	0.36	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 20 (17%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.70			
Intersection Signal Delay: 13.3		Intersection LOS: B	
Intersection Capacity Utilization 64.1%		ICU Level of Service C	
Analysis Period (min) 15			

95th percentile volume exceeds capacity, queue may be longer.

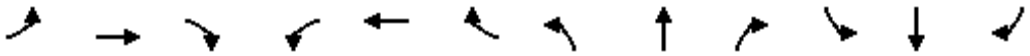
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 13: 12th St & McDowell Rd

AM Option 2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	1049	190	195	974	37	139	12	106	68	9	65
Future Volume (vph)	36	1049	190	195	974	37	139	12	106	68	9	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	220		0	150		90	152		265
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Frt		0.977			0.995				0.850			0.850
Flt Protected	0.950			0.950			0.950	0.960		0.950	*0.950	
Satd. Flow (prot)	1770	4968	0	1770	3522	0	1681	1699	1583	1770	1770	1583
Flt Permitted	0.220			0.084			0.950	0.960		0.950		
Satd. Flow (perm)	410	4968	0	156	3522	0	1681	1699	1583	1770	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		33			5				115			71
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		400			330			382			426	
Travel Time (s)		7.8			6.4			10.4			11.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1140	207	212	1059	40	151	13	115	74	10	71
Shared Lane Traffic (%)							46%					
Lane Group Flow (vph)	39	1347	0	212	1099	0	82	82	115	74	10	71
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA		Split	NA	Perm	Split	NA	Perm
Protected Phases		4		3	8		2	2		6	6	
Permitted Phases	4			8					2			6



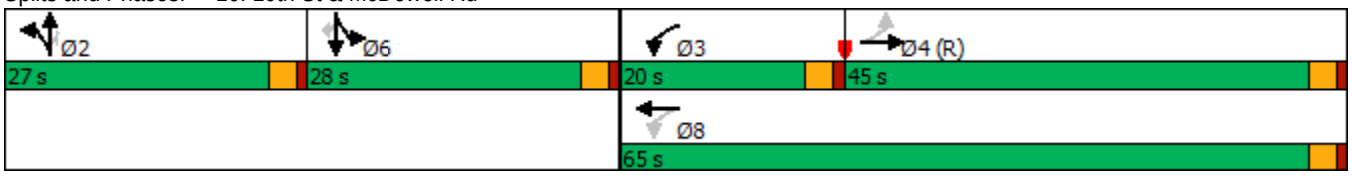
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		1.0	5.0		1.0	1.0	1.0	1.0	1.0	1.0
Minimum Split (s)	60.0	60.0		5.0	60.0		29.0	29.0	29.0	5.0	5.0	5.0
Total Split (s)	45.0	45.0		20.0	65.0		27.0	27.0	27.0	28.0	28.0	28.0
Total Split (%)	37.5%	37.5%		16.7%	54.2%		22.5%	22.5%	22.5%	23.3%	23.3%	23.3%
Maximum Green (s)	41.5	41.5		16.5	61.5		23.5	23.5	23.5	24.5	24.5	24.5
Yellow Time (s)	2.5	2.5		2.5	2.5		2.5	2.5	2.5	2.5	2.5	2.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max		None	None		Max	Max	Max	Max	Max	Max
Walk Time (s)	7.0	7.0			7.0		7.0	7.0	7.0			
Flash Dont Walk (s)	14.5	14.5			12.0		17.5	17.5	17.5			
Pedestrian Calls (#/hr)	4	4			18		0	0	0			
Act Effct Green (s)	44.1	44.1		61.5	61.5		23.5	23.5	23.5	24.5	24.5	24.5
Actuated g/C Ratio	0.37	0.37		0.51	0.51		0.20	0.20	0.20	0.20	0.20	0.20
v/c Ratio	0.26	0.73		0.80	0.61		0.25	0.25	0.29	0.20	0.03	0.19
Control Delay	33.9	35.2		44.4	27.5		43.2	43.1	9.2	41.5	38.7	10.3
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.9	35.2		44.4	27.5		43.2	43.1	9.2	41.5	38.7	10.3
LOS	C	D		D	C		D	D	A	D	D	B
Approach Delay		35.2			30.3			29.2			27.0	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)	21	324		110	363		56	56	0	48	6	0
Queue Length 95th (ft)	55	390		#210	446		107	107	50	92	22	39
Internal Link Dist (ft)		320			250			302			346	
Turn Bay Length (ft)	110			220			150		90	152		265
Base Capacity (vph)	150	1846		301	1807		329	332	402	361	361	379
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.73		0.70	0.61		0.25	0.25	0.29	0.20	0.03	0.19

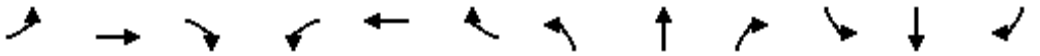
Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 100			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 32.2		Intersection LOS: C	
Intersection Capacity Utilization 56.1%		ICU Level of Service B	
Analysis Period (min) 15			

* User Entered Value

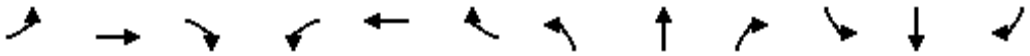
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 10: 10th St & McDowell Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	971	222	153	1065	59	83	68	72	78	99	53
Future Volume (vph)	26	971	222	153	1065	59	83	68	72	78	99	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	160		0	160		160	145		200	140		0
Storage Lanes	1		0	1		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.972				0.850			0.850		0.948	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	4943	0	1770	3539	1583	1770	1863	1583	1770	1766	0
Flt Permitted	0.245			0.156			0.522			0.709		
Satd. Flow (perm)	456	4943	0	291	3539	1583	972	1863	1583	1321	1766	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		67				64			78		20	
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		669			638			385			377	
Travel Time (s)		13.0			12.4			10.5			10.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	28	1055	241	166	1158	64	90	74	78	85	108	58
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	1296	0	166	1158	64	90	74	78	85	166	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		

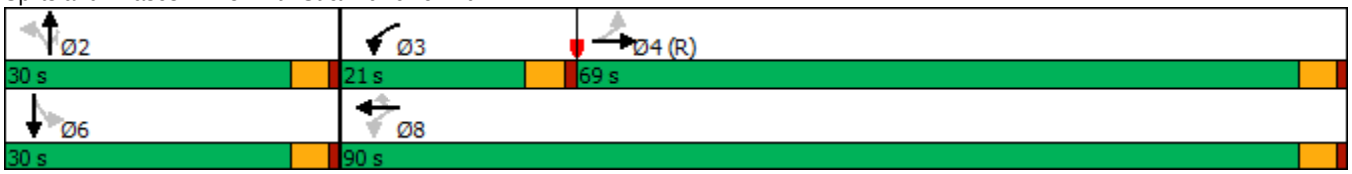


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	
Total Split (s)	69.0	69.0		21.0	90.0	90.0	30.0	30.0	30.0	30.0	30.0	
Total Split (%)	57.5%	57.5%		17.5%	75.0%	75.0%	25.0%	25.0%	25.0%	25.0%	25.0%	
Maximum Green (s)	64.5	64.5		16.5	85.5	85.5	25.5	25.5	25.5	25.5	25.5	
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	C-Max	C-Max		None	None	None	Max	Max	Max	Max	Max	
Walk Time (s)	7.0	7.0			7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0			11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0			0	0	0	0	0	0	0	
Act Effct Green (s)	71.9	71.9		85.5	85.5	85.5	25.5	25.5	25.5	25.5	25.5	
Actuated g/C Ratio	0.60	0.60		0.71	0.71	0.71	0.21	0.21	0.21	0.21	0.21	
v/c Ratio	0.10	0.43		0.52	0.46	0.06	0.44	0.19	0.20	0.30	0.42	
Control Delay	8.4	15.4		11.5	8.1	1.4	48.8	40.3	9.7	43.3	39.7	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	8.4	15.4		11.5	8.1	1.4	48.8	40.3	9.7	43.3	39.7	
LOS	A	B		B	A	A	D	D	A	D	D	
Approach Delay		15.2			8.2			33.6			40.9	
Approach LOS		B			A			C			D	
Queue Length 50th (ft)	11	339		36	179	0	61	47	0	56	98	
Queue Length 95th (ft)	m17	385		59	218	12	116	91	41	105	167	
Internal Link Dist (ft)		589			558			305			297	
Turn Bay Length (ft)	160			160		160	145		200	140		
Base Capacity (vph)	273	2989		410	2521	1146	206	395	397	280	391	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.10	0.43		0.40	0.46	0.06	0.44	0.19	0.20	0.30	0.42	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 51 (43%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.52			
Intersection Signal Delay: 15.6		Intersection LOS: B	
Intersection Capacity Utilization 61.6%		ICU Level of Service B	
Analysis Period (min) 15			

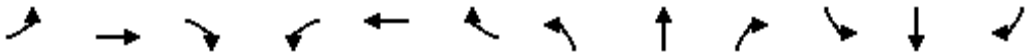
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 13: 12th St & McDowell Rd



PM Option 2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	1335	85	76	1162	51	215	47	220	47	10	66
Future Volume (vph)	56	1335	85	76	1162	51	215	47	220	47	10	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	220		0	150		90	155		265
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	0.95	0.95	1.00	0.95	0.95	1.00
Ped Bike Factor	1.00	1.00			1.00				0.98	1.00	1.00	
Frt		0.991			0.994				0.850			0.850
Flt Protected	0.950			0.950			0.950	0.969		0.950	0.969	
Satd. Flow (prot)	1770	5019	0	1770	3513	0	1681	1715	1583	1681	1715	1583
Flt Permitted	0.170			0.104			0.950	0.969		0.950	0.969	
Satd. Flow (perm)	316	5019	0	194	3513	0	1681	1715	1555	1673	1709	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9			5				239			72
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		400			390			382			426	
Travel Time (s)		7.8			7.6			10.4			11.6	
Confl. Peds. (#/hr)	4		18	18		4			4	4		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	61	1451	92	83	1263	55	234	51	239	51	11	72
Shared Lane Traffic (%)							40%			40%		
Lane Group Flow (vph)	61	1543	0	83	1318	0	140	145	239	31	31	72
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA		Split	NA	Perm	Split	NA	Perm

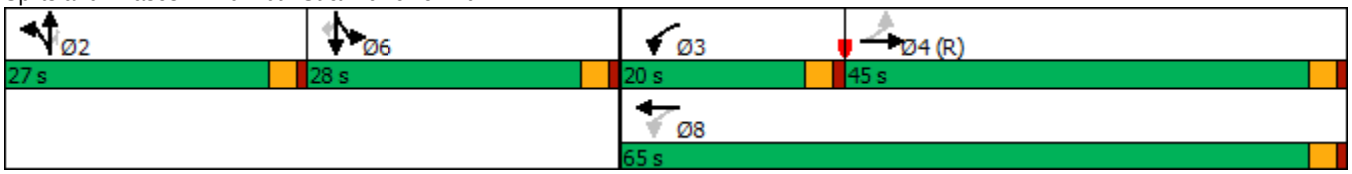


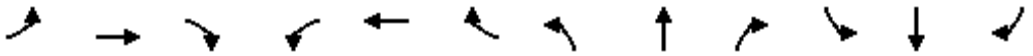
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases		4		3	8		2	2		6	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		3	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		1.5	5.0		5.0	5.0	5.0	1.5	1.5	1.5
Minimum Split (s)	60.0	60.0		5.0	60.0		29.0	29.0	29.0	5.0	5.0	5.0
Total Split (s)	45.0	45.0		20.0	65.0		27.0	27.0	27.0	28.0	28.0	28.0
Total Split (%)	37.5%	37.5%		16.7%	54.2%		22.5%	22.5%	22.5%	23.3%	23.3%	23.3%
Maximum Green (s)	41.5	41.5		16.5	61.5		23.5	23.5	23.5	24.5	24.5	24.5
Yellow Time (s)	2.5	2.5		2.5	2.5		2.5	2.5	2.5	2.5	2.5	2.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max		None	Max		Max	Max	Max	Min	Min	Min
Walk Time (s)	7.0	7.0			7.0		7.0	7.0	7.0			
Flash Dont Walk (s)	14.5	14.5			12.0		17.5	17.5	17.5			
Pedestrian Calls (#/hr)	4	4			18		4	4	4			
Act Effct Green (s)	69.0	69.0		78.3	78.3		23.5	23.5	23.5	7.7	7.7	7.7
Actuated g/C Ratio	0.58	0.58		0.65	0.65		0.20	0.20	0.20	0.06	0.06	0.06
v/c Ratio	0.34	0.53		0.37	0.58		0.43	0.43	0.48	0.29	0.28	0.43
Control Delay	22.3	17.2		12.6	13.0		47.0	47.1	8.7	59.5	59.2	19.9
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.3	17.2		12.6	13.0		47.0	47.1	8.7	59.5	59.2	19.9
LOS	C	B		B	B		D	D	A	E	E	B
Approach Delay		17.4			13.0			29.5			38.1	
Approach LOS		B			B			C			D	
Queue Length 50th (ft)	25	262		22	273		101	105	0	24	24	0
Queue Length 95th (ft)	67	336		43	358		169	173	69	57	57	46
Internal Link Dist (ft)		320			310			302			346	
Turn Bay Length (ft)	110			220			150		90	155		265
Base Capacity (vph)	181	2891		343	2292		329	335	496	343	350	380
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.53		0.24	0.58		0.43	0.43	0.48	0.09	0.09	0.19

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 100			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.58			
Intersection Signal Delay: 18.2		Intersection LOS: B	
Intersection Capacity Utilization 68.3%		ICU Level of Service C	

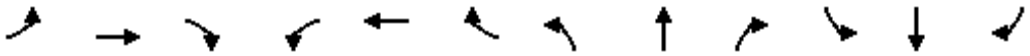
Analysis Period (min) 15

Splits and Phases: 10: 10th St & McDowell Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	74	1388	112	67	1077	97	145	162	140	59	92	38
Future Volume (vph)	74	1388	112	67	1077	97	145	162	140	59	92	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	160		0	160		160	145		200	140		0
Storage Lanes	1		0	1		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.989				0.850			0.850		0.956	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5029	0	1770	3539	1583	1770	1863	1583	1770	1781	0
Flt Permitted	0.227			0.104			0.575			0.501		
Satd. Flow (perm)	423	5029	0	194	3539	1583	1071	1863	1583	933	1781	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		21				105			115		16	
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		669			638			385			377	
Travel Time (s)		13.0			12.4			10.5			10.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	80	1509	122	73	1171	105	158	176	152	64	100	41
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	1631	0	73	1171	105	158	176	152	64	141	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	
Total Split (s)	80.0	80.0		10.0	90.0	90.0	30.0	30.0	30.0	30.0	30.0	
Total Split (%)	66.7%	66.7%		8.3%	75.0%	75.0%	25.0%	25.0%	25.0%	25.0%	25.0%	
Maximum Green (s)	75.5	75.5		5.5	85.5	85.5	25.5	25.5	25.5	25.5	25.5	
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	C-Max	C-Max		None	None	None	Max	Max	Max	Max	Max	
Walk Time (s)	7.0	7.0			7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0			11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0			0	0	0	0	0	0	0	
Act Effct Green (s)	77.5	77.5		85.5	85.5	85.5	25.5	25.5	25.5	25.5	25.5	
Actuated g/C Ratio	0.65	0.65		0.71	0.71	0.71	0.21	0.21	0.21	0.21	0.21	
v/c Ratio	0.29	0.50		0.35	0.46	0.09	0.70	0.45	0.36	0.32	0.36	
Control Delay	13.6	11.9		9.7	8.1	1.1	61.1	45.3	14.6	45.4	38.7	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	13.6	11.9		9.7	8.1	1.1	61.1	45.3	14.6	45.4	38.7	
LOS	B	B		A	A	A	E	D	B	D	D	
Approach Delay		12.0			7.7			40.8			40.8	
Approach LOS		B			A			D			D	
Queue Length 50th (ft)	26	232		15	182	0	114	119	23	42	83	
Queue Length 95th (ft)	59	269		29	222	15	#210	191	83	86	145	
Internal Link Dist (ft)		589			558			305			297	
Turn Bay Length (ft)	160			160		160	145		200	140		
Base Capacity (vph)	273	3255		210	2521	1158	227	395	426	198	391	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.29	0.50		0.35	0.46	0.09	0.70	0.45	0.36	0.32	0.36	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 20 (17%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.70			
Intersection Signal Delay: 15.8		Intersection LOS: B	
Intersection Capacity Utilization 64.1%		ICU Level of Service C	
Analysis Period (min) 15			

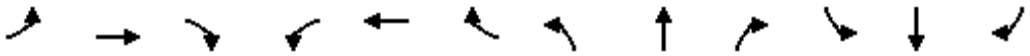
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 13: 12th St & McDowell Rd

AM Option 3

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	1049	190	195	974	37	139	12	106	68	9	65
Future Volume (vph)	36	1049	190	195	974	37	139	12	106	68	9	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	220		0	150		90	152		265
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.977			0.995				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950	*0.950	
Satd. Flow (prot)	1770	4968	0	1770	3522	0	1770	1863	1583	1770	1770	1583
Flt Permitted	0.260			0.127			0.630			0.749		
Satd. Flow (perm)	484	4968	0	237	3522	0	1174	1863	1583	1395	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		43			6				115			95
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		400			330			382			426	
Travel Time (s)		7.8			6.4			10.4			11.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1140	207	212	1059	40	151	13	115	74	10	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	39	1347	0	212	1099	0	151	13	115	74	10	71
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4		3	8		1	6			2	
Permitted Phases	4			8			6		6	2		2

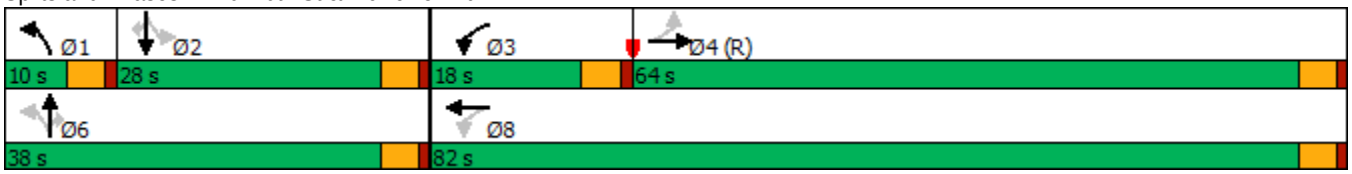


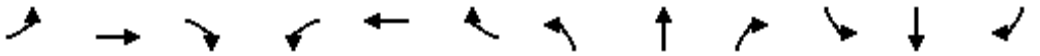
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8		1	6	6	2	2	2
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	1.0	1.0	1.0
Minimum Split (s)	26.0	26.0		10.5	26.0		9.5	29.0	29.0	29.0	29.0	29.0
Total Split (s)	64.0	64.0		18.0	82.0		10.0	38.0	38.0	28.0	28.0	28.0
Total Split (%)	53.3%	53.3%		15.0%	68.3%		8.3%	31.7%	31.7%	23.3%	23.3%	23.3%
Maximum Green (s)	59.5	59.5		13.5	77.5		5.5	33.5	33.5	23.5	23.5	23.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lag	Lag		Lead			Lead			Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes			Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max		None	None		None	Max	Max	Max	Max	Max
Walk Time (s)	7.0	7.0			7.0			7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	14.5	14.5			12.0			17.5	17.5	17.5	17.5	17.5
Pedestrian Calls (#/hr)	4	4			18			4	4	0	0	0
Act Effct Green (s)	61.7	61.7		77.5	77.5		33.5	33.5	33.5	23.5	23.5	23.5
Actuated g/C Ratio	0.51	0.51		0.65	0.65		0.28	0.28	0.28	0.20	0.20	0.20
v/c Ratio	0.16	0.52		0.71	0.48		0.43	0.03	0.22	0.27	0.03	0.18
Control Delay	18.4	19.8		31.9	21.6		38.8	31.8	7.0	44.1	39.4	5.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.4	19.8		31.9	21.6		38.8	31.8	7.0	44.1	39.4	5.0
LOS	B	B		C	C		D	C	A	D	D	A
Approach Delay		19.8			23.3			25.3			25.9	
Approach LOS		B			C			C			C	
Queue Length 50th (ft)	15	236		102	313		92	7	0	49	6	0
Queue Length 95th (ft)	40	291		162	390		152	23	45	96	22	24
Internal Link Dist (ft)		320			250			302			346	
Turn Bay Length (ft)	110			220			150		90	152		265
Base Capacity (vph)	248	2575		325	2276		355	520	524	273	346	386
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.52		0.65	0.48		0.43	0.03	0.22	0.27	0.03	0.18

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.71			
Intersection Signal Delay: 22.0		Intersection LOS: C	
Intersection Capacity Utilization 60.9%		ICU Level of Service B	
Analysis Period (min) 15			

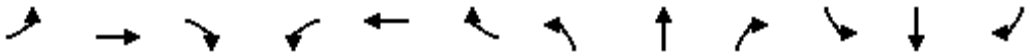
* User Entered Value

Splits and Phases: 10: 10th St & McDowell Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	971	222	153	1065	59	83	68	72	78	99	53
Future Volume (vph)	26	971	222	153	1065	59	83	68	72	78	99	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	160		0	160		160	145		200	140		0
Storage Lanes	1		0	1		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.972				0.850			0.850		0.948	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	4943	0	1770	3539	1583	1770	1863	1583	1770	1766	0
Flt Permitted	0.245			0.156			0.522			0.709		
Satd. Flow (perm)	456	4943	0	291	3539	1583	972	1863	1583	1321	1766	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		67				64			78		20	
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		669			638			385			377	
Travel Time (s)		13.0			12.4			10.5			10.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	28	1055	241	166	1158	64	90	74	78	85	108	58
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	1296	0	166	1158	64	90	74	78	85	166	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		

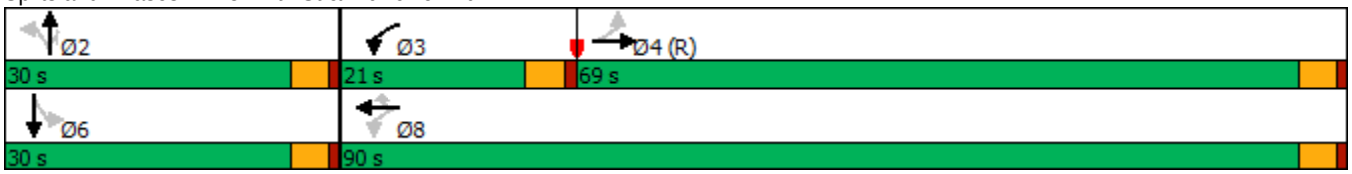


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	
Total Split (s)	69.0	69.0		21.0	90.0	90.0	30.0	30.0	30.0	30.0	30.0	
Total Split (%)	57.5%	57.5%		17.5%	75.0%	75.0%	25.0%	25.0%	25.0%	25.0%	25.0%	
Maximum Green (s)	64.5	64.5		16.5	85.5	85.5	25.5	25.5	25.5	25.5	25.5	
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	C-Max	C-Max		None	None	None	Max	Max	Max	Max	Max	
Walk Time (s)	7.0	7.0			7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0			11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0			0	0	0	0	0	0	0	
Act Effct Green (s)	71.9	71.9		85.5	85.5	85.5	25.5	25.5	25.5	25.5	25.5	
Actuated g/C Ratio	0.60	0.60		0.71	0.71	0.71	0.21	0.21	0.21	0.21	0.21	
v/c Ratio	0.10	0.43		0.52	0.46	0.06	0.44	0.19	0.20	0.30	0.42	
Control Delay	8.7	12.9		11.5	8.1	1.4	48.8	40.3	9.7	43.3	39.7	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	8.7	12.9		11.5	8.1	1.4	48.8	40.3	9.7	43.3	39.7	
LOS	A	B		B	A	A	D	D	A	D	D	
Approach Delay		12.8			8.2			33.6			40.9	
Approach LOS		B			A			C			D	
Queue Length 50th (ft)	12	272		36	179	0	61	47	0	56	98	
Queue Length 95th (ft)	m24	322		59	218	12	116	91	41	105	167	
Internal Link Dist (ft)		589			558			305			297	
Turn Bay Length (ft)	160			160		160	145		200	140		
Base Capacity (vph)	273	2989		410	2521	1146	206	395	397	280	391	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.10	0.43		0.40	0.46	0.06	0.44	0.19	0.20	0.30	0.42	

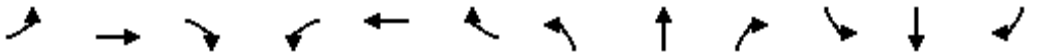
Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 51 (43%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.52			
Intersection Signal Delay: 14.6		Intersection LOS: B	
Intersection Capacity Utilization 61.6%		ICU Level of Service B	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

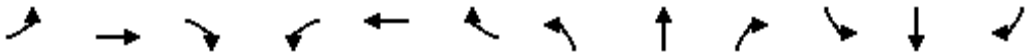
Splits and Phases: 13: 12th St & McDowell Rd



PM Option 3



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	1335	85	76	1162	51	215	47	220	47	10	66
Future Volume (vph)	56	1335	85	76	1162	51	215	47	220	47	10	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	115		0	150		90	145		100
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.991			0.994				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5040	0	1770	3518	0	1770	1863	1583	1770	1863	1583
Flt Permitted	0.168			0.105			0.630			0.724		
Satd. Flow (perm)	313	5040	0	196	3518	0	1174	1863	1583	1349	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			7				113			95
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		400			670			382			426	
Travel Time (s)		9.1			15.2			8.7			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	61	1451	92	83	1263	55	234	51	239	51	11	72
Shared Lane Traffic (%)												
Lane Group Flow (vph)	61	1543	0	83	1318	0	234	51	239	51	11	72
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4			8			2		2	6		6

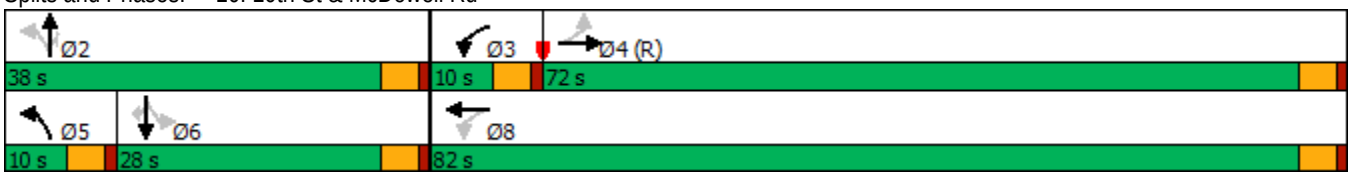


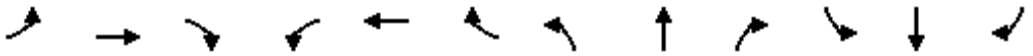
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	26.0	26.0		9.5	23.5		9.5	29.0	29.0	29.0	29.0	29.0
Total Split (s)	72.0	72.0		10.0	82.0		10.0	38.0	38.0	28.0	28.0	28.0
Total Split (%)	60.0%	60.0%		8.3%	68.3%		8.3%	31.7%	31.7%	23.3%	23.3%	23.3%
Maximum Green (s)	67.5	67.5		5.5	77.5		5.5	33.5	33.5	23.5	23.5	23.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lag	Lag		Lead			Lead			Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes			Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max		None	Max		None	Max	Max	Min	Min	Min
Walk Time (s)	7.0	7.0			7.0			7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	14.5	14.5			12.0			17.5	17.5	17.5	17.5	17.5
Pedestrian Calls (#/hr)	4	4			18			4	4	4	4	4
Act Effct Green (s)	69.5	69.5		77.5	77.5		33.5	33.5	33.5	23.5	23.5	23.5
Actuated g/C Ratio	0.58	0.58		0.65	0.65		0.28	0.28	0.28	0.20	0.20	0.20
v/c Ratio	0.34	0.53		0.42	0.58		0.66	0.10	0.46	0.19	0.03	0.19
Control Delay	20.8	16.3		16.3	10.5		47.3	32.8	21.5	42.7	39.5	5.3
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.8	16.3		16.3	10.5		47.3	32.8	21.5	42.7	39.5	5.3
LOS	C	B		B	B		D	C	C	D	D	A
Approach Delay		16.5			10.9			34.1			22.3	
Approach LOS		B			B			C			C	
Queue Length 50th (ft)	25	260		19	222		151	29	77	33	7	0
Queue Length 95th (ft)	61	302		m48	265		231	62	156	71	24	25
Internal Link Dist (ft)		320			590			302			346	
Turn Bay Length (ft)	110			115			150		90	145		100
Base Capacity (vph)	181	2924		198	2274		355	520	523	264	364	386
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.53		0.42	0.58		0.66	0.10	0.46	0.19	0.03	0.19

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.66			
Intersection Signal Delay: 17.1		Intersection LOS: B	
Intersection Capacity Utilization 67.7%		ICU Level of Service C	
Analysis Period (min) 15			

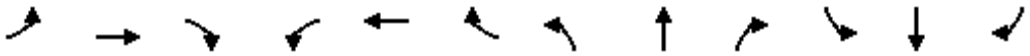
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: 10th St & McDowell Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	74	1388	112	67	1077	97	145	162	140	59	92	38
Future Volume (vph)	74	1388	112	67	1077	97	145	162	140	59	92	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	160		0	160		160	145		200	140		0
Storage Lanes	1		0	1		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.989				0.850			0.850		0.956	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5029	0	1770	3539	1583	1770	1863	1583	1770	1781	0
Flt Permitted	0.227			0.104			0.575			0.501		
Satd. Flow (perm)	423	5029	0	194	3539	1583	1071	1863	1583	933	1781	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		21				105			115		16	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		669			638			385			377	
Travel Time (s)		15.2			14.5			8.8			8.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	80	1509	122	73	1171	105	158	176	152	64	100	41
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	1631	0	73	1171	105	158	176	152	64	141	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	
Total Split (s)	80.0	80.0		10.0	90.0	90.0	30.0	30.0	30.0	30.0	30.0	
Total Split (%)	66.7%	66.7%		8.3%	75.0%	75.0%	25.0%	25.0%	25.0%	25.0%	25.0%	
Maximum Green (s)	75.5	75.5		5.5	85.5	85.5	25.5	25.5	25.5	25.5	25.5	
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	C-Max	C-Max		None	None	None	Max	Max	Max	Max	Max	
Walk Time (s)	7.0	7.0			7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0			11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0			0	0	0	0	0	0	0	
Act Effct Green (s)	77.5	77.5		85.5	85.5	85.5	25.5	25.5	25.5	25.5	25.5	
Actuated g/C Ratio	0.65	0.65		0.71	0.71	0.71	0.21	0.21	0.21	0.21	0.21	
v/c Ratio	0.29	0.50		0.35	0.46	0.09	0.70	0.45	0.36	0.32	0.36	
Control Delay	6.9	4.6		9.7	8.1	1.1	61.1	45.3	14.6	45.4	38.7	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	6.9	4.6		9.7	8.1	1.1	61.1	45.3	14.6	45.4	38.7	
LOS	A	A		A	A	A	E	D	B	D	D	
Approach Delay		4.7			7.7			40.8			40.8	
Approach LOS		A			A			D			D	
Queue Length 50th (ft)	10	69		15	182	0	114	119	23	42	83	
Queue Length 95th (ft)	19	84		29	222	15	#210	191	83	86	145	
Internal Link Dist (ft)		589			558			305			297	
Turn Bay Length (ft)	160			160		160	145		200	140		
Base Capacity (vph)	273	3255		210	2521	1158	227	395	426	198	391	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.29	0.50		0.35	0.46	0.09	0.70	0.45	0.36	0.32	0.36	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 20 (17%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.70			
Intersection Signal Delay: 12.4		Intersection LOS: B	
Intersection Capacity Utilization 64.1%		ICU Level of Service C	
Analysis Period (min) 15			

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 13: 12th St & McDowell Rd

Appendix D – Additional Mitigation Analysis Memorandums

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Memorandum

To:	Banner University Medical Center Phoenix	**Date:**	5/3/2019
Copy:	HKS Architects		
From:	Dibble Engineering	**Project No:**	1117122
Subject:	BUMCP 10th Street Mitigation Options		

10th Street & McDowell Road Intersection
Issues and Considerations

This analysis looks at the pros and cons of 6 options for the configuration and traffic signal phasing and sequencing for the 10th Street and McDowell Road intersection and how they might perform with anticipated traffic demand. One important thing to consider is that the overall intersection delay and level of service is a weighted calculation, therefore, the approaches with the most vehicle volume are therefore proportionally more represented in the weighted average.
Hence while level of service is a performance measure, this disparity (or bias) needs to be kept in mind when comparing a major arterial with a collector intersection, like 10th Street and McDowell. The mission of such intersection is not so much about volume as it is about providing reasonable access to that arterial, especially for left turning vehicles coming out of that collector onto the arterial. This is particularly important if the collector street services a commercial or institutional property that has distinctive and somewhat predictable high peak traffic periods.

For this intersection, the eastbound and westbound approaches account for 86% of the intersection in the morning and 82% in the afternoon. The northbound approach (Banner traffic) accounts for 9% in the morning and 14% in the afternoon of the total intersection traffic. Then the southbound approach accounts for 5% in the morning and 4% in the afternoon of the total intersection traffic. This division of traffic between the more residential neighborhood to the north and Banner health complex to south is telling. It quantifies the point that is made in the previous paragraph that northbound traffic on 10th Street is not ordinary and is actually quite high.

Since the eastbound and westbound approaches account for the majority of the traffic at the intersection, the overall level of service and delay are more of a reflection of how those approaches are operating. Since this is the case, this analysis also looks at the key (NBL, NBR, WBL) individual turning movements for the more minor turning movements related to Banner traffic. There are summary tables provided at the end of the write up for turning movement delays, levels of service and queues.
Important traffic terms to understand for this write up are as follows:

- Protected Phases: the turning movement receives a green arrow during that time
- Permissive Phases: the turning movement can make a turn, but must yield to other oncoming vehicle, bicycle and pedestrian traffic first and proceed when safe
- Protected/Permissive: the turning movement receives the green arrow first and then switches to permissive phasing after and then vehicles have to yield to oncoming traffic.
- Overlap Phases: the northbound right turn has protected phasing at the same time as the westbound left turn

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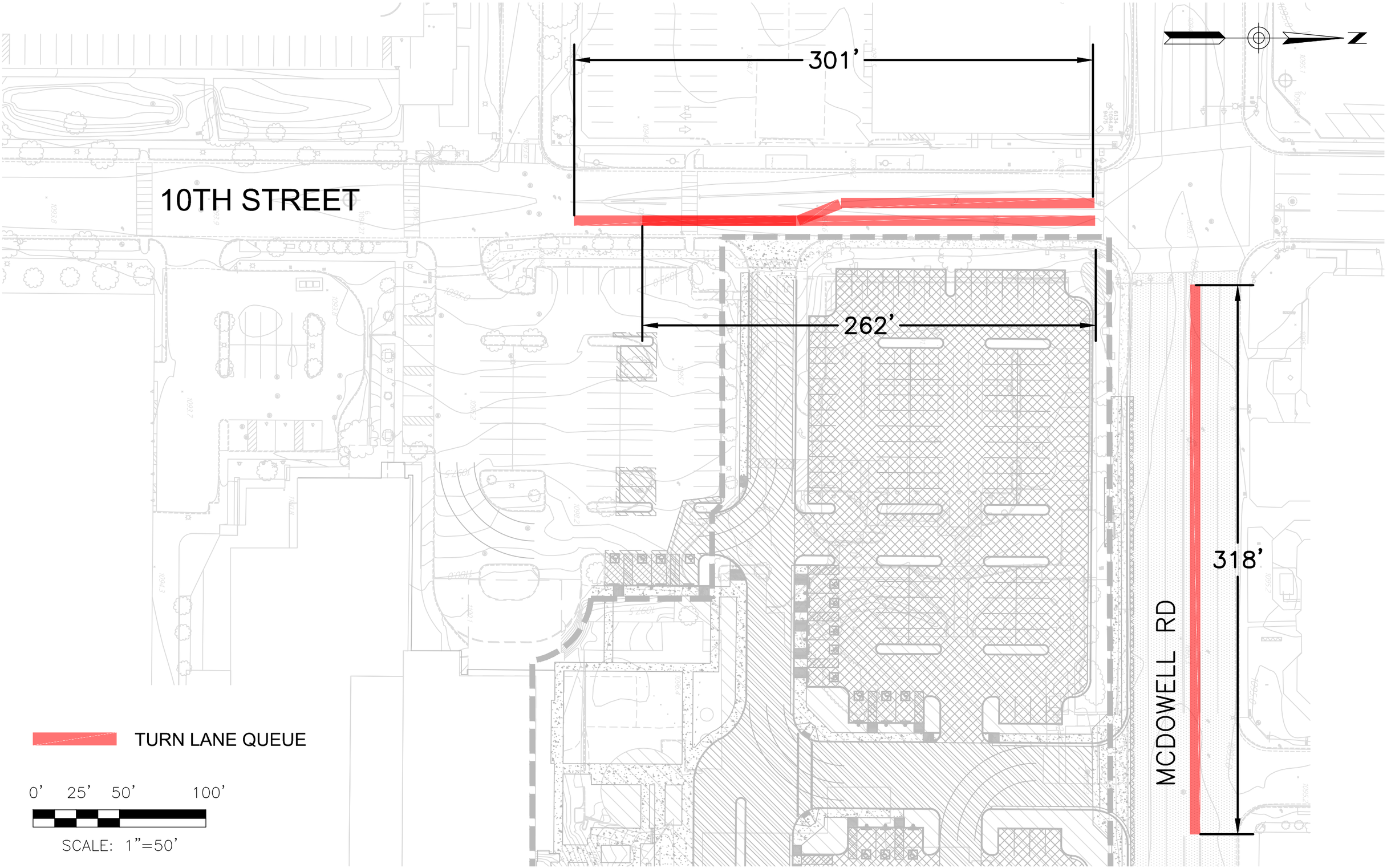
- Lagging Left: the left turn receives the protected phasing after permissive phasing for that approach (green arrow comes last). Very common in Cities of Scottsdale and Tucson.
- Split-Phasing – Is a signal control technique that serves one side of a street at a time. It is often used to make up for a road deficiency (a lack of a dedicated turn lane or not enough storage length for example) or when traffic demand is significantly unbalanced. Split-phasing while viable is typically regarded as very inefficient and is only used when no other alternative is possible.
- Double-Pump – is a term used to describe when a left turn lane is assigned both a leading and lagging protected phase. Often the double pump is used to address high left turn demand that exceeds capacity and a conventional approach. The City of Tucson uses double-pumps at a number of locations. They use double pump when turn lanes are too short and turning volumes are high and only a single lane is available. They have also used when there is large disparity in turning volumes (e.g. 300 vs 50). However, they advise caution when using double pump. The question to ask and answer is does this additional phase and clearance make things worse or better? It is not known if the City of Phoenix has done a double pump. Additionally, due to its uniqueness it is not even known if the City of Phoenix would accept this as a viable opinion to be considered. The City of Peoria has one double pump at 83rd Avenue and Thunderbird. The City Traffic Engineer Chris Lemka, PE reports: "***We do double pump for the EB /WB left turn during our time of day protected left turn phase. After 7:00pm, we change the left turns to protected/permissive. It works great and the public loves it. We have received more compliments from the public than any other location***."

Important signal timing guide lines to keep in mind:

- There are only 60 seconds in a minute and there are numerous prescriptive allocations of those seconds to simply achieve minimal traffic signal control phasing, sequencing, and cycling to achieve service for all allowed movements.
- Total cycle lengths of around 90 to 120 seconds are common. Cycle length is the amount of time that will lapse from a movement being stopped (red light) to the time it will be allowed to go again (green light).
- After vehicles are stopped and waiting in a queue it typically takes the first couple vehicles between 3 to 4 seconds to get going again. After that it typically takes other vehicles 2 seconds.
- Minimum green time for a left turn phase is 8 to 10 seconds. This typically relates to only 3 to 4 vehicles achieving service.
- Minimum green time for a thru movement is typically from 10 to 15 seconds. This relates to 4 to 6 vehicles achieving service.
- Walking person time for a pedestrian crossing is typically 4 to 7 seconds and then the clearance interval (flashing hand with count down) is based on the width of the street and a 3.5 feet per second walking speed.
- Yellow clearance interval ranges from 3 to 5 seconds, sometimes more if the intersection is wider than typical.
- All red interval ranges from .5 seconds to 1.5 seconds. The yellow + red = the total clearance interval for the signal. The yellow clearance interval can be used as a part of the pedestrian clearance interval.

The time guidelines are not absolute, they are provided to help give perspective on the timing constraints telling us what can and cannot be done with a traffic signal based on time, lanes, and movements that are allowed.


N
301’
262’
318’
10TH STREET
MCDOWELL RD
TURN LANE QUEUE
0’ 25’ 50’ 100’
SCALE: 1”=50’

EXISTING

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Option 1 – Single Permissive Left

Description

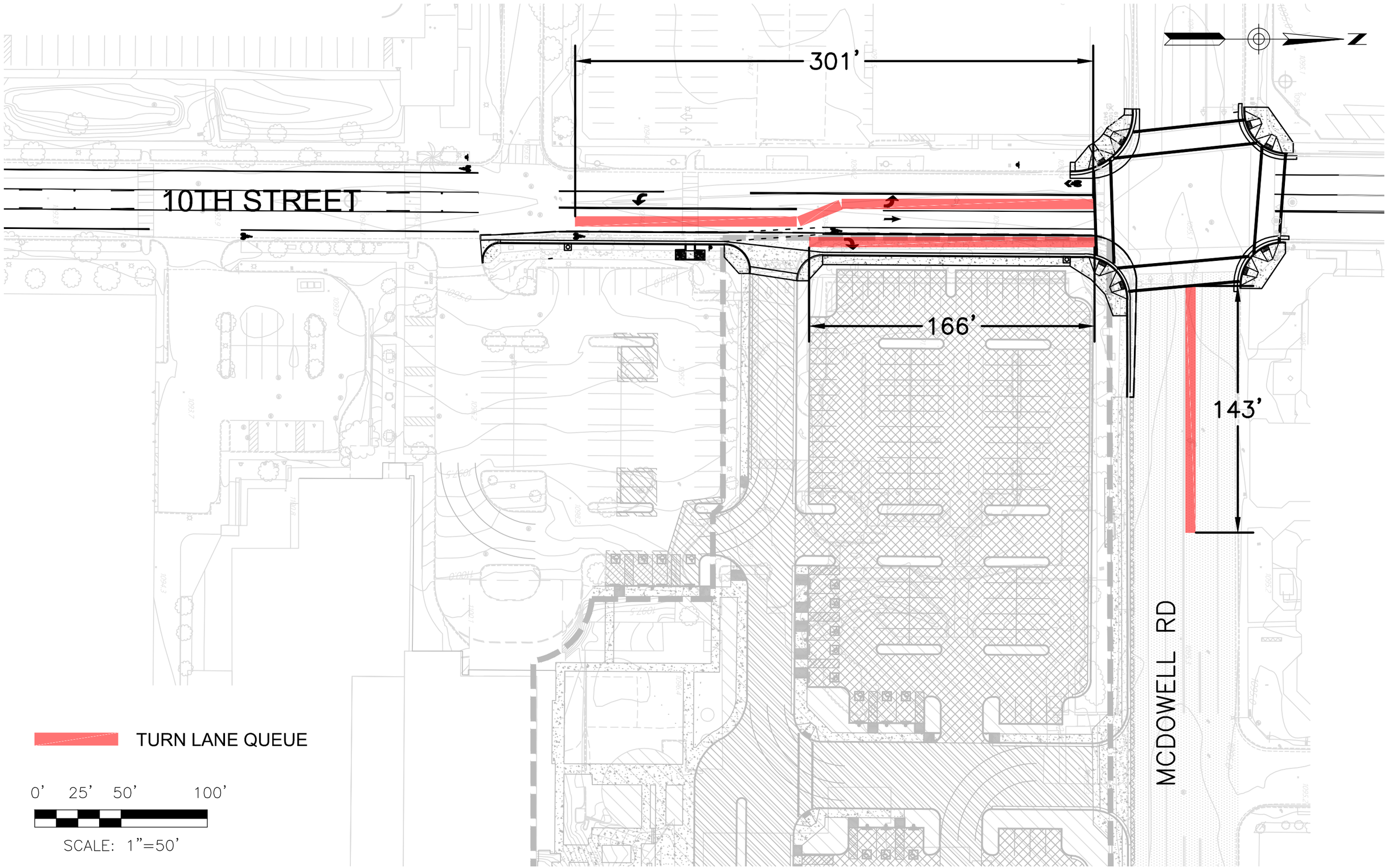
Option 1 provides a single permissive left turn, a through lane, the addition of a right turn lane for the northbound approach. The option also includes protected/permissive left turns for the westbound approach. This option assumes all 4 crosswalks remain open at the intersection.

Pros

- Eliminates about 100 feet of vehicle queue (5 vehicles) for the northbound right turning vehicles in the afternoon without requiring any signal timing changes
- Assuming sufficient gaps in opposing traffic (vehicles, pedestrians and bicyclist) can decreases the morning westbound left turn delay by over 30 seconds and reduces the vehicle queue by about 175 feet (9 vehicles)
- The WBL protected phase can be combined with a NBR overlap phasing (protected phasing when WBL is protected and permissive all other times) to make the NBR turning movement more efficient and predictable
- Decreases the northbound right turn delay by about 20 seconds in the morning
- Decreases the northbound right turn queue by about 100 feet (5 vehicles) in the morning

Cons

- Requires the subtraction of some phasing time from the eastbound approach
- Does not benefit the northbound left turning movement
- Service can be less predictable when opposing traffic prevents permissive left turn movements, this can be especially frustrating if queues develop and folks have to wait two to three cycles to turn. If that happens the intersection can break down during peak times. In turn this can cause drivers to push the yellow and red clearance interval to 3 and 4 left turn vehicles. This can increase risk for more right-angle crashes. Acceptable norm is 2 vehicles per clearance interval.


301’
166’
143’
10TH STREET
MCDOWELL RD
TURN LANE QUEUE
0’ 25’ 50’ 100’
SCALE: 1”=50’

OPTION 1

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Option 2- Protected Dual Lefts with Split-Phasing

Description

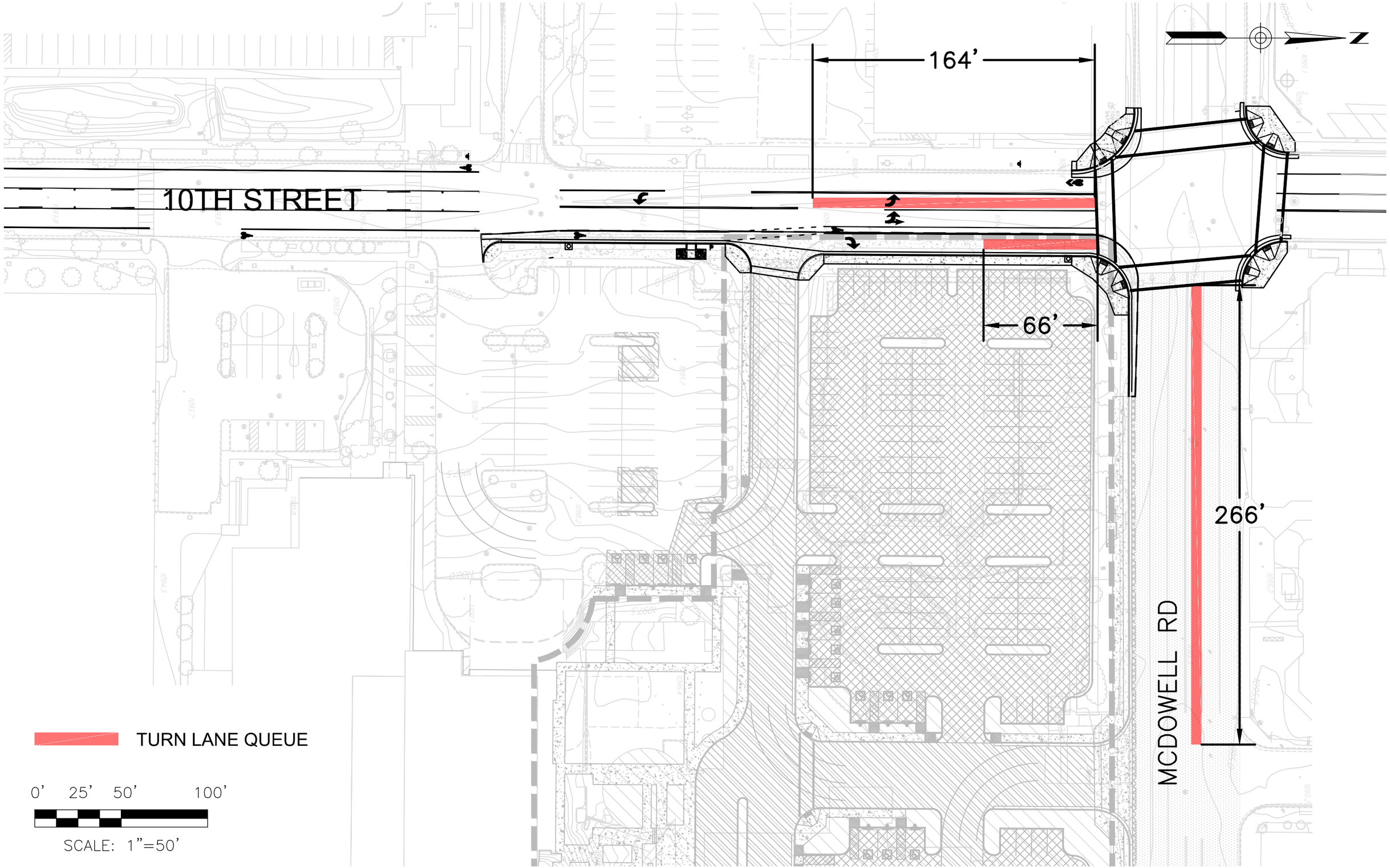
This option provides dual left turn lanes with one of the lanes as a shared through/left turn lane with split phasing for the northbound/southbound approaches. The option also includes the addition of a northbound right turn lane, and the westbound left turn protected/permissive phasing. The option also keeps all pedestrian crosswalks open at the intersection, which requires about 30 seconds of signal time for both northbound and southbound signal timing to allow sufficient time for pedestrians to cross.

Pros

- Decreases the northbound left turn queue by about 70 feet (about 3-4 vehicles) in the morning and about 140 feet (7 vehicles) in the afternoon
- Decreases the northbound left turn delay by about 7 seconds in the morning and 20 seconds in the afternoon
- Decreases the northbound right turn queue by about 10 feet (half a vehicle) in the morning and 200 feet (10 vehicles) in the afternoon
- Decreases the westbound left turn queue by about 52 feet (2 vehicles)
- Provides predictable amount of time for the left turn
- Reduces right angle crash risk
- Time of day and time of week signal timing plans can be combined with detection to make the signal more demand responsive during off peak times (minimum green and unit extension) and when there are no pedestrian calls more green time can be allocated to the left turn.

Cons

- Requires a large amount of time to be subtracted from the major eastbound/westbound turning movements
- Increases the overall intersection level of services from a B to a C in the morning and afternoon and more than doubles the overall intersection delay in the morning and afternoon.
- Significantly impacts the eastbound/westbound delays and queues, which is a major downfall for this option
- Despite the protected/permissive phasing for the westbound left turn approach, the delay is increased for the turning movement due to the decreased time for the east/west throughput traffic, which decreases the gaps for left turning vehicles to make a turn.


164’
66’
266’
10TH STREET
MCDOWELL RD
TURN LANE QUEUE
0’ 25’ 50’ 100’
SCALE: 1”=50’

OPTION 2

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Option 3 – Single Protected/Permissive Left – Leading

Description

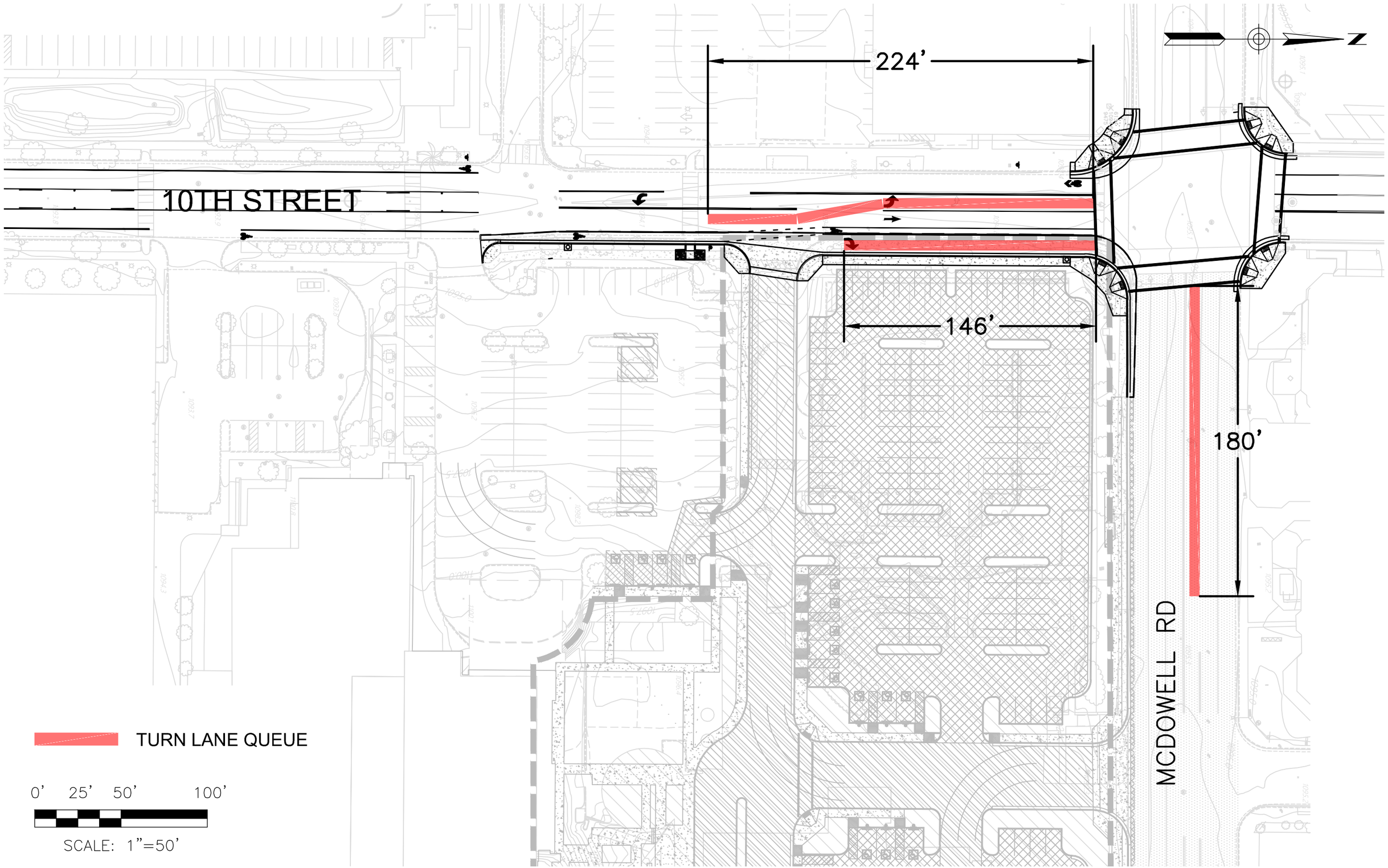
This option includes a single protected/permissive northbound left turn, the addition of a right turn lane and protected/permissive phasing for the westbound left turn. This option assumes that all 4 pedestrian crosswalks remain open.

Pros

- Decreases the westbound left turn queue by about 140 feet (7 vehicles) in the morning and 10 feet (half a vehicle) in the afternoon
- Decreases the westbound left turn queue by about 20 seconds in the morning
- Decreases the northbound left turn queue by about 26 feet (1 vehicle) in the morning and 77 feet (3-4 vehicles) in the afternoon
- Decreases the northbound left turn delay by about 10 seconds in the morning and over 20 seconds in the afternoon
- Decreases the northbound right turn queue by about 116 feet (5-6 vehicles) in the afternoon
- Decreases the northbound right turn delay by about 25 seconds in the afternoon
- Requires less time from the eastbound/westbound phases than Option 2.
- Provides predictable amount of time for the left turn
- Reduces right angle crash risk for left turners some, but not as much as fully protected lefts do
- Time of day and time of week signal timing plans can be combined with detection to make the signal more demand responsive during off peak times (minimum green and unit extension) and when there are no pedestrian calls more green time can be allocated to the left turn.

Cons

- Lowers the overall level of services from a B to a C in the morning
- Requires more time from the east/west phases than Option 1


224’
146’
180’
10TH STREET
MCDOWELL RD
TURN LANE QUEUE
0’ 25’ 50’ 100’
SCALE: 1”=50’

OPTION 3

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Option 4 – Option 2 Split Phasing without Opposing Crosswalk

Description

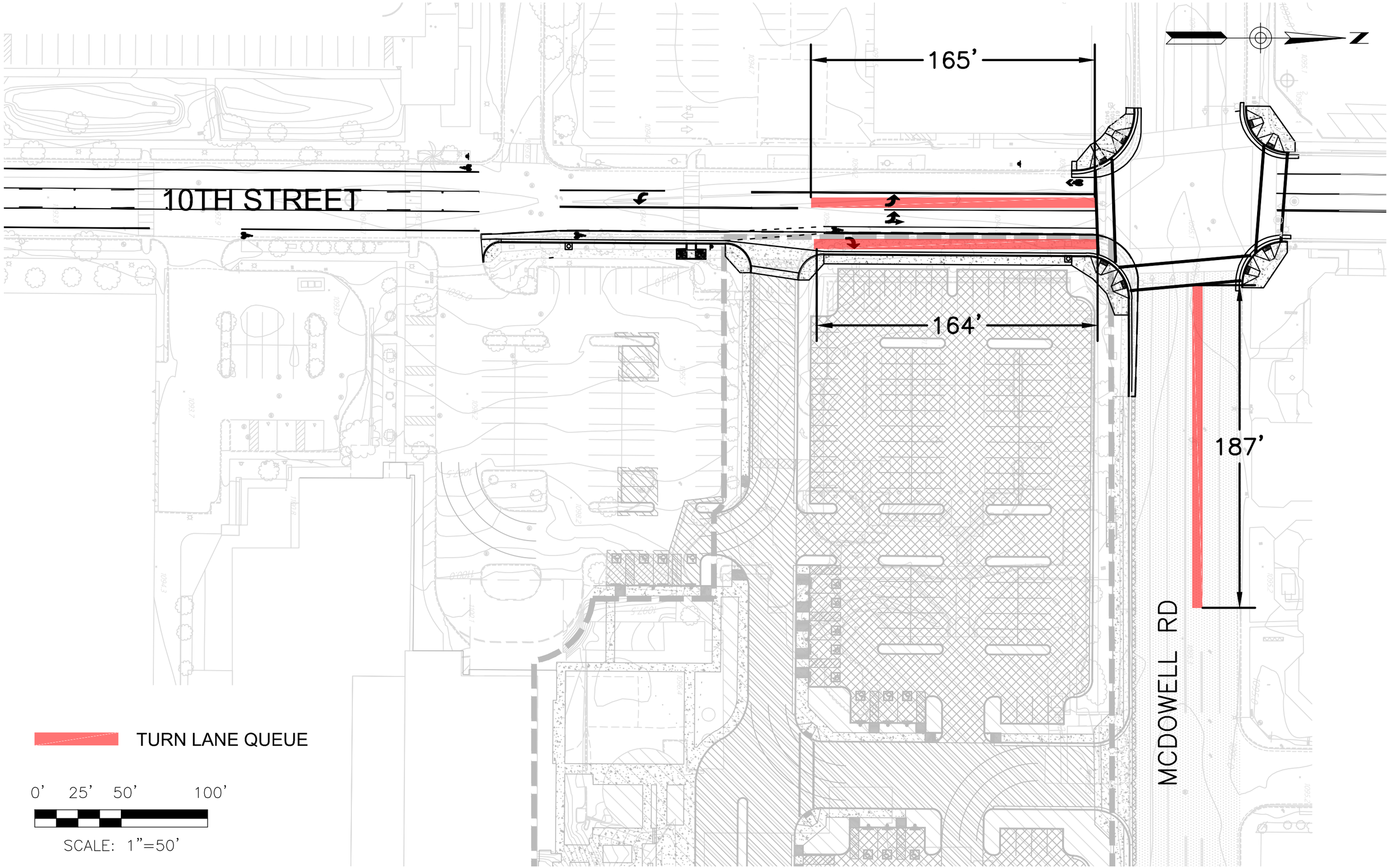
This option is similar to Option 2, however, the crosswalk on the west leg of the intersection was removed, therefore, the split phasing time can be significantly reduced since adequate pedestrian crossing time during the southbound split phase is no longer needed. This option provides dual left turn lanes with one of the lanes as a shared through/left turn lane with split phasing for the northbound/southbound approaches. The option also includes the addition of a northbound right turn lane, and the westbound left turn protected/permissive phasing.

Pros

- Decreases the westbound left turn delay by about 20 seconds in the morning
- Decreases westbound left turn queue by about 130 feet (6-7 vehicles) in the morning
- Decreases the northbound left turn delay by about 20 seconds in the afternoon
- Decreases the northbound left turn queue by about 136 feet (6-7 vehicles) in the afternoon
- Decreases the northbound right turn delay by about 20 seconds in the afternoon
- Decreases the northbound right turn queue by about 100 feet (5 vehicles) in the afternoon

Cons

- Increases the southbound left turn delay by about 45 seconds in the morning and 30 seconds in the afternoon
- Increases the southbound through traffic by about 20 seconds in the morning and afternoon
- Increases the westbound approach to a level of service C in the morning
- Lowers the overall intersection level of service to a C in the morning
- Pedestrians on the north west corner have to cross the street 3 times to get to the southwest corner. Hence the pedestrians may choose to cross at the prohibited crossing anyway.
- Not consistent with what is normally provided at a four-legged intersection.


N
165’
164’
187’
10TH STREET
MCDOWELL RD
TURN LANE QUEUE
0’ 25’ 50’ 100’
SCALE: 1”=50’

OPTION 4

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Option 5 – Single Protected/Permissive Left – Lagging

Description

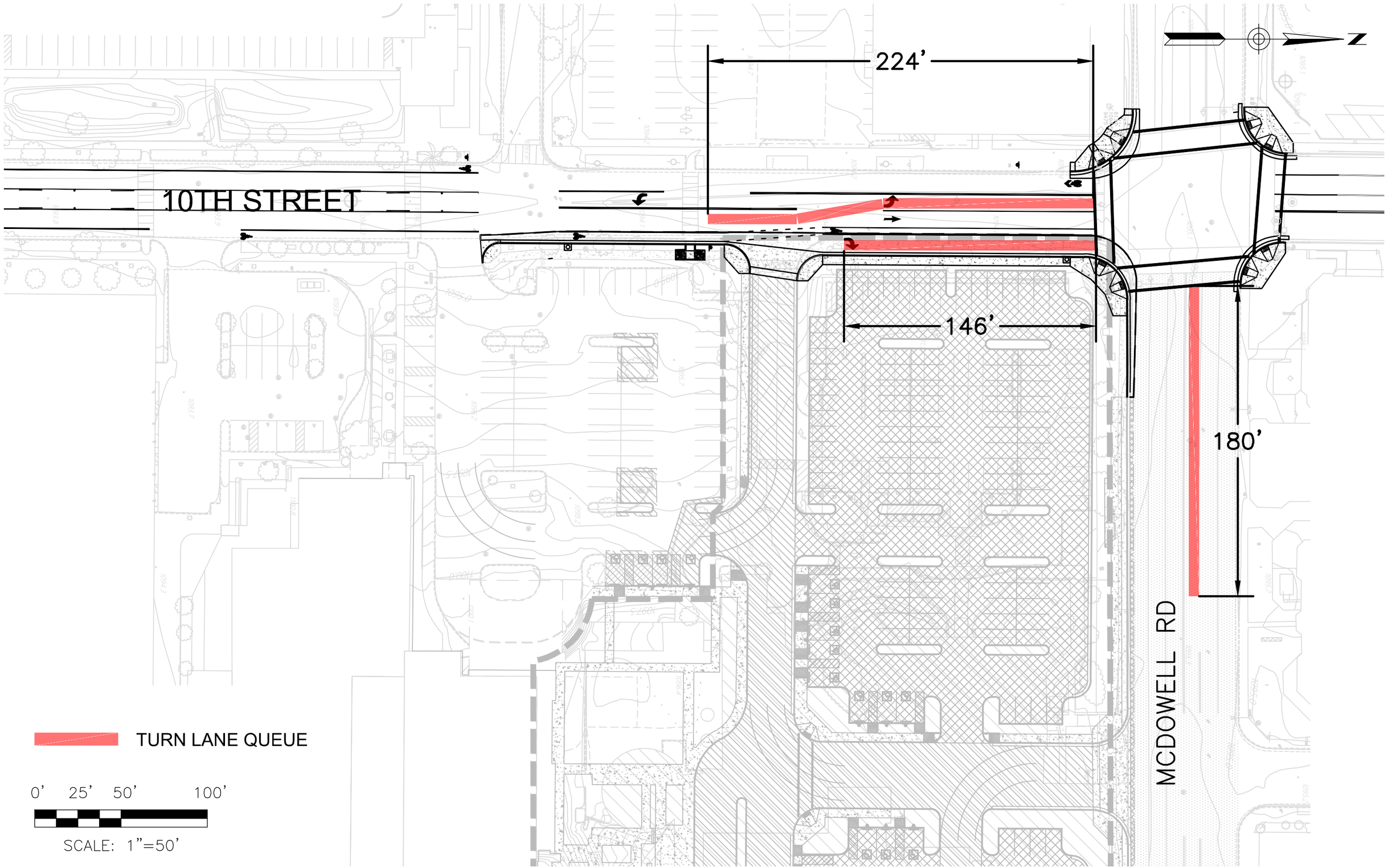
This option is similar to Option 3, however the protected phasing for the northbound left turn becomes a lagging protected left turn phase. The option includes a single northbound left turn lane with permissive phasing and lagging protected phasing, the addition of a northbound right turn lane and norming protected/permissive phasing for the westbound left turn. All the pedestrian crosswalks remain open for this option.

Pros

- Decreases westbound left turn delay by over 20 seconds in the morning
- Decreases westbound left turn queue by about 140 feet (7 vehicles) in the morning
- Decreases the northbound left turn delay by about 25 seconds in the afternoon
- Decreases the northbound left turn queue by about 77 feet (4 vehicles) in the afternoon
- Decreases the northbound right turn delay by about 25 seconds in the afternoon
- Decreases the northbound right turn queue by about 116 feet (5-6 vehicles) in the afternoon
- Provides predictable amount of green time for the left turn
- Somewhat decrease right angle crash risk for left turners, but not as much as fully protected left turns do.
- If there is no pedestrian call on opposing west, leg crosswalk then this time could be allocated to service the left turn.
- If the permissive left movement clears all the left turners and there are no pedestrian calls the signal can cycle back to McDowell.

Cons

- Lowers the overall level of services in the morning to a C.
- Will require drivers to pay attention, additional signing to explain lagging left to drivers help mitigate this.
- Pedestrians might still attempt to cross without activating their crossing phase overlap.


224’
146’
180’
10TH STREET
MCDOWELL RD
TURN LANE QUEUE
0’ 25’ 50’ 100’
SCALE: 1”=50’

OPTION 5

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Option 6 – Single Protected/Permissive Left – Leading and Lagging (Double-Pump Concept for Consideration, Not Analyzed)

Description

This option is a combination of options 3 and 5 and is known as the double pump concept. For this option, the northbound left turn phase would start as protected and then change to permissive to allow southbound vehicles to go. Then if the southbound demand clears and there is extra time for the north/south phases remaining, the northbound left turn can transition back to protected left and use the remaining time before transitioning to the east/west phases. The option could provide some advantage if there is little to no opposing thru traffic and no opposing pedestrian crossing call. It would allow the left turn to get more left turn green arrow that might yield 1 to 2 more vehicles being serviced per cycle. Hence in a way this concept would be a reflection of Options 3 and 5 when they are in the permissive sequence. Permissive lefts, without opposing traffic, can result in a vehicle turning every 2 to 3 seconds or so. But the amount of potential additional green arrow time the double pump my present may only be around 6 to 8 seconds. However, additional research on how to analyze the double pump is needed before any definitive statement on this option can be made. Hence the double pump is simply brought up as a possibility at this point and has not been analyzed.

10th Street & McDowell Traffic Signal - Alternative Comparison - Decision Table -May 2, 2019 Version 1.0

No	Alternative	# of Pros	# of Cons	Overall Level of Service (LOS)		Level of Service Cumulative Score All Movements	Level of Service Cum Score NB & WB to SB Only	Total Queue Lengths NB & WB to SB Only
0	**No Build or Existing (left turn lane & thru lane)**	1	3	AM	B	36	20	553 ft
				PM	B			604 ft **Total 1,157 ft**
1	**Single Permissive Left (with a dedicated right turn lane)**	5	3	AM	B	38	18	367 ft
				PM	B			499 ft **Total 866 ft**
2	**Protected Dual Lefts with Split Phasing (with a dedicated right turn lane)**	6	4	AM	C	56 **EBL is at F in PM**	19	420 ft
				PM	C			297 ft **Total 717 ft**
3	**Single Protected/Permissive Left Leading (with a dedicated right turn lane)**	10	2	AM	C	38	15	373 ft
				PM	B			421 ft **Total 794 ft**
4	**Protected Dual Lefts with Split Phasing without Opposing Crosswalk (with a dedicated right turn lane)**	5	5	AM	C	51 **SBL goes to F in AM & PM**	18	405 ft.
				PM	B			381 ft **Total 786 ft**
5	**Single Protected/Permissive Left Lagging (with a dedicated right turn lane)**	10	3	AM	C	40	15	373 ft
				PM	B			421 ft **Total 794 ft**
6	**Single Protected/Permissive Left Leading and Lagging (double -pump Concept for Consideration, Not Analyzed (with a dedicated right turn lane)**	Expected to be 10 at least	Expected to be 3	AM	Expected C	-----	----	---
				PM	Expected B			---

Level of Service Cumulative Score: A = 0, B=1, C=2, D=3, F=4 – higher number means "bad"

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Figure 1 – Summary of Level of Service and Delay for all Options

Improvement	Peak Time	Int LOS	Int Delay (s)	Delay (s) EBL	LOS EBL	Delay (s) EBT	LOS EBT	Delay (s) EBR	LOS EBR	Delay (s) WBL	LOS WBL	Delay (s) WBT	LOS WBT	Delay (s) WBR	LOS WBR	Delay (s) NBL	LOS NBL	Delay (s) NBT	LOS NBT	Delay (s) NBR	LOS NBR	Delay (s) SBL	LOS SBL	Delay (s) SBT	LOS SBT	Delay (s) SBR	LOS SBR
Existing Configuration	AM	B	12.7	6.7	A	6.7	A	6.7	A	57.9	E	48	D	4.8	A	48.6	D	11	B	11	B	44.1	D	37.8	D	10	A
	PM	B	14.8	10	A	7.5	A	7.5	A	14.6	B	6.7	A	6.7	A	64.7	E	44	D	44	D	58.2	E	37.8	D	10	A
Option 1	AM	B	15.7	13.3	B	14.1	B	14.1	B	24.2	C	10.5	B	10.5	B	48.6	D	37.9	D	8.7	A	42	D	37.8	D	10	A
	PM	B	15.1	14	B	11.6	B	11.6	B	10.4	B	7	A	7	A	64.7	E	39.4	D	26	C	40.7	D	37.8	D	10	A
Option 2	AM	C	35	34.7	C	35.2	D	35.2	D	66.3	E	31.7	C	31.7	C	41.3	D	41.2	D	8.7	A	40.6	D	37.9	D	10	A
	PM	C	32.4	111.6	F	33.4	C	33.4	C	31.8	C	30.5	C	30.5	C	43.9	D	43.9	D	7.9	A	39.3	D	39.3	D	7.9	A
Option 3	AM	C	21.2	17.5	B	19	B	19	B	35.9	D	19.8	B	19.8	B	36.9	D	30.7	C	6.7	A	42.5	D	38.2	D	7.6	A
	PM	B	17.3	22.6	C	17.3	B	17.3	B	17.4	B	11.3	B	11.3	B	41.8	D	30.9	C	19.1	B	41.2	D	38.2	D	7.9	A
Option 4	AM	C	24.1	18.1	B	19.8	B	19.8	B	37.5	D	21.4	C	21.4	C	45.2	D	38.4	D	8.9	A	90	F	55.7	E	16.8	B
	PM	B	19.2	23.1	C	17.7	B	17.7	B	18.3	B	11.5	B	11.5	B	44.4	D	44.5	D	25.6	C	88.7	F	58.5	E	14.4	B
Option 5	AM	C	21.2	17.5	B	19	B	19	B	35.9	D	19.8	B	19.8	B	36.7	D	30.7	C	6.7	A	42.5	D	38.2	D	7.6	A
	PM	B	17.4	22.6	C	17.3	B	17.3	B	17.4	B	11.3	B	11.3	B	39.6	D	30.9	C	19.1	B	55.6	E	44.7	D	10.8	B

Figure 2 – Summary of Queue Lengths for Key Turning Movements

Intersection	Peak Hour	Exist Config Queue (ft)			Option 1 Queue (ft)			Option 2 Queue (ft)			Option 3 Queue (ft)			Option 4 Queue (ft)			Option 5 Queue (ft)		
		WBL	NBL	NBR	WBL	NBL	NBR	WBL	NBL	NBR	WBL	NBL	NBR	WBL	NBL	NBR	WBL	NBL	NBR
10th St & McDowell Rd	AM	318	175	60	143	175	49	266	105	49	180	149	44	187	169	49	180	149	44
	PM	41	301	262	32	301	166	67	164	66	51	224	146	52	165	164	51	224	146

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Memorandum

To:	Banner University Medical Center Phoenix	**Date:**	5/23/2019 Version 2.0
Copy:	HKS		
From:	Dibble Engineering	**Project No:**	1117122
Subject:	BUMCP 10th Street Mitigation Options		

10th Street & McDowell Road Intersection
Issues and Considerations

This analysis looks at the pros and cons of 8 options for the configuration and traffic signal phasing and sequencing for the 10th Street and McDowell Road intersection and how they might perform with anticipated traffic demand. One important thing to consider is that the overall intersection delay and level of service is a weighted calculation, therefore, the approaches with the most vehicle volume are therefore proportionally more represented in the weighted average.

Hence while level of service is a performance measure, this disparity (or bias) needs to be kept in mind when comparing a major arterial with a collector intersection, like 10th Street and McDowell. The mission of such intersection is not so much about volume as it is about providing reasonable access to the arterial, especially for left turning vehicles coming out of that collector onto the arterial. This is particularly important if the collector street services a commercial or institutional property that has distinctive and somewhat predictable high peak traffic periods.

For this intersection, the eastbound and westbound approaches account for 86% of the intersection in the morning and 82% in the afternoon. The northbound approach (Banner traffic) accounts for 9% in the morning and 14% in the afternoon of the total intersection traffic. Then the southbound approach accounts for 5% in the morning and 4% in the afternoon of the total intersection traffic. This division of traffic between the more residential neighborhood to the north and Banner health complex to south is telling. It quantifies the point that is made in the previous paragraph that northbound traffic on 10th Street is not ordinary and is actually quite high.

Since the eastbound and westbound approaches account for the majority of the traffic at the intersection, the overall level of service and delay are more of a reflection of how those approaches are operating. Since this is the case, this analysis also looks at the key (NBL, NBR, WBL) individual turning movements for the more minor turning movements related to Banner traffic. There are summary tables provided at the end of this memorandum for each individual movement delay, levels of service and calculated queue lengths.

Important traffic terms to understand for this write up are as follows:

- Protected Phases: the turning movement receives a green arrow during that time
- Permissive Phases: the turning movement can make a turn, but must yield to other oncoming vehicle, bicycle and pedestrian traffic first and proceed when safe
- Protected/Permissive: the turning movement receives the green arrow first and then switches to permissive phasing after and then vehicles have to yield to oncoming traffic.

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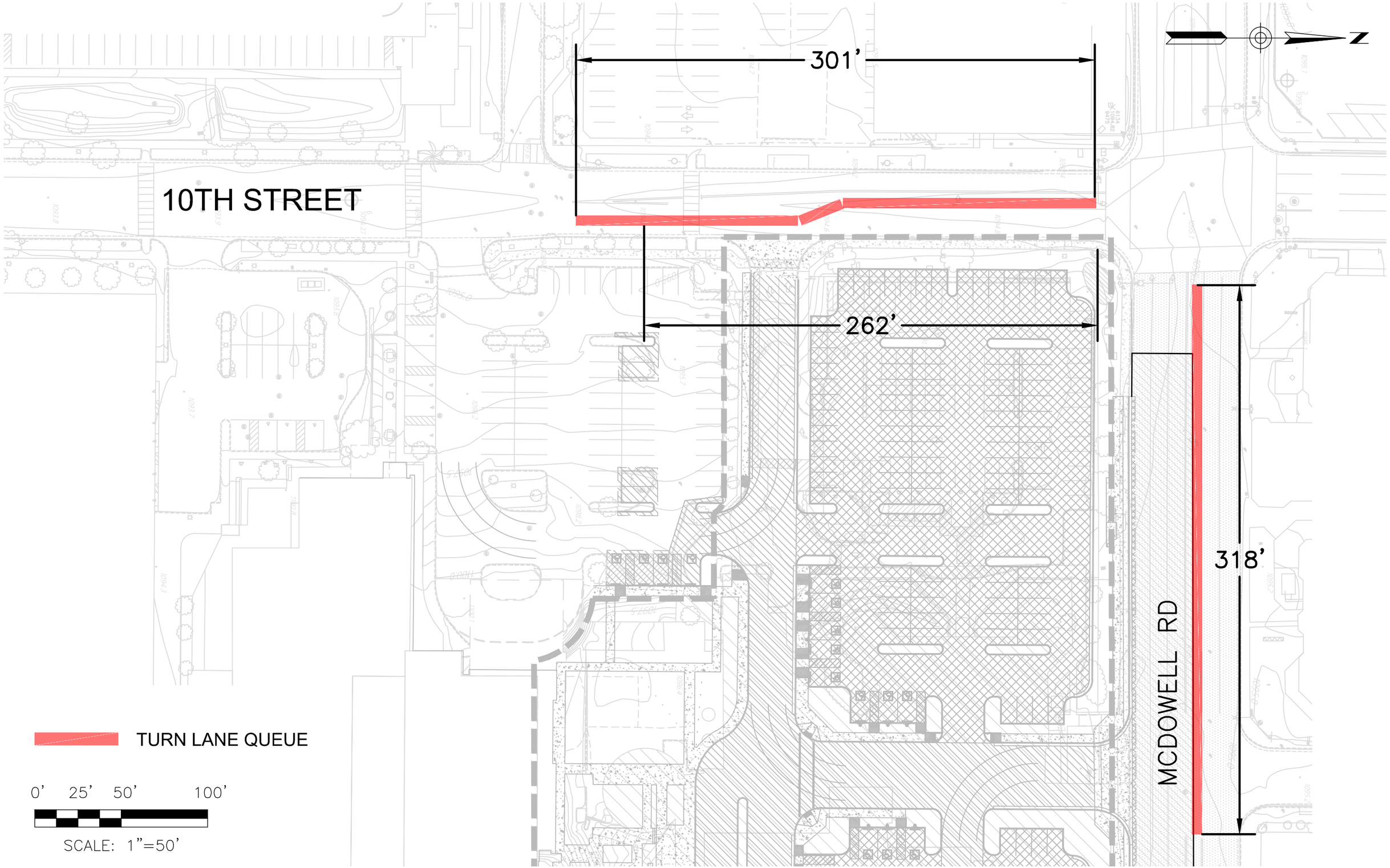
- Overlap Phases: the northbound right turn has protected phasing at the same time as the westbound left turn
- Lagging Left: the left turn receives the protected phasing after permissive phasing for that approach (green arrow comes last). Very common in Cities of Scottsdale and Tucson.
- Split-Phasing – Is a signal control technique that serves one side of a street at a time. It is often used to make up for a road deficiency (a lack of a dedicated turn lane or not enough storage length for example) or when traffic demand is significantly unbalanced. Split-phasing while viable is typically regarded as very inefficient and is only used when no other alternative is possible.
- Double-Pump (DP) – is a term used to describe when a left turn lane is assigned both a leading and lagging protected phase. Often the DP is used to address high left turn demand that exceeds capacity and a conventional approach. The DP can be used when turn lanes are too short and turning demand is high. They have also used when there is large disparity in left turning volumes (e.g. 300 vs 50). The City of Tucson uses DP at a number of locations with reported success. The City of Peoria has one double pump at 83rd Avenue and Thunderbird. The City Traffic Engineer Chris Lemka, PE reports: "***We do double pump for the EB /WB left turn during our time of day protected left turn phase. After 7:00pm, we change the left turns to protected/permissive. It works great and the public loves it. We have received more compliments from the public than any other location***."

Important signal timing and phasing guidelines to keep in mind:

- There are only 60 seconds in a minute and there are numerous prescriptive allocations of those seconds to simply achieve minimal traffic signal control phasing, sequencing, and cycling to achieve service for all allowed movements.
- Total cycle lengths of around 90 to 120 seconds are common. Cycle length is the amount of time that will lapse from a movement being stopped (red light) to the time it will be allowed to go again (green light).
- After vehicles are stopped and waiting in a queue it typically takes the first couple vehicles between 3 to 4 seconds to get going again. After that it typically takes other vehicles 2 seconds.
- Minimum green time for a left turn phase is 8 to 10 seconds. This typically relates to only 3 to 4 vehicles achieving service.
- Minimum green time for a thru movement is typically from 10 to 15 seconds. This relates to 4 to 6 vehicles achieving service.
- Walking person time for a pedestrian crossing is typically 4 to 7 seconds and then the clearance interval (flashing hand with count down) is based on the width of the street and a 3.5 feet per second walking speed.
- Yellow clearance interval ranges from 3 to 5 seconds, sometimes more if the intersection is wider than typical.
- All red interval ranges from .5 seconds to 1.5 seconds. The yellow + red = the total clearance interval for the signal. The yellow clearance interval can be used as a part of the pedestrian clearance interval.
- Two phase signals (one phase for east-west traffic and one phase for north-south traffic) are simpler to time than signals that add phases for left turn movements.
- Adding left turn phasing requires time to be taken away from the opposing through movement as well as can introduce additional clearance time that takes seconds away from the time available for all movements. It reduces the efficiency of the cycle length.

The time guidelines are not absolute, they are provided to help give perspective on the timing constraints telling us what can and cannot be done with a traffic signal based on time, lanes, and movements that are allowed.


N
301’
262’
318’
10TH STREET
MCDOWELL RD
TURN LANE QUEUE
0’ 25’ 50’ 100’
SCALE: 1”=50’

NO BUILD

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Option 1 – Single Permissive Left

Description

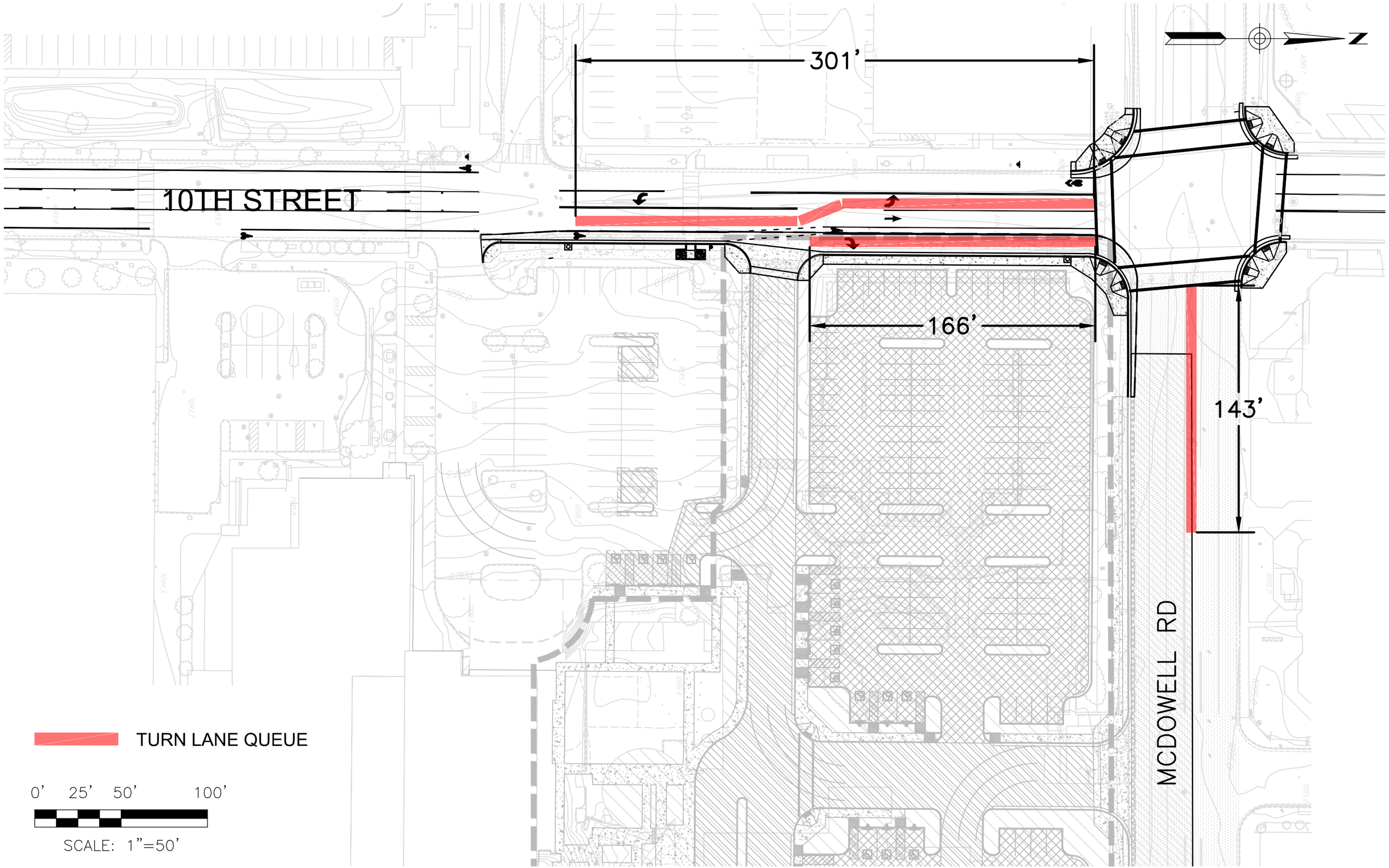
Option 1 provides a single permissive left turn, a through lane, the addition of a right turn lane for the northbound approach. The option also includes protected/permissive left turns for the westbound approach. This option assumes all crosswalks remain open at the intersection.

Pros

- Eliminates about 100 feet of vehicle queue (5 vehicles) for the northbound right turning vehicles in the afternoon without requiring any signal timing changes
- Assuming sufficient gaps in opposing traffic (vehicles, pedestrians and bicyclist) can decreases the morning westbound left turn delay by over 30 seconds and reduces the vehicle queue by about 175 feet (9 vehicles)
- The WBL protected phase can be combined with a NBR overlap phasing (protected phasing when WBL is protected and permissive all other times) to make the NBR turning movement more efficient and predictable
- Decreases the northbound right turn delay by about 20 seconds in the morning
- Decreases the northbound right turn queue by about 100 feet (5 vehicles) in the morning

Cons

- Requires the subtraction of some phasing time from the eastbound approach
- Does not benefit the northbound left turning movement
- Service can be less predictable when opposing traffic prevents permissive left turn movements, this can be especially frustrating if queues develop and folks have to wait two to three cycles to turn. If that happens the intersection can break down during peak times. In turn this can cause drivers to push the yellow and red clearance interval to 3 and 4 left turn vehicles. This can increase risk for more right-angle crashes. Acceptable norm is 2 vehicles per clearance interval.


301’
166’
143’
10TH STREET
MCDOWELL RD
N
TURN LANE QUEUE
0’ 25’ 50’ 100’
SCALE: 1”=50’

OPTION 1

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Option 2- Protected Dual Lefts with Split-Phasing

Description

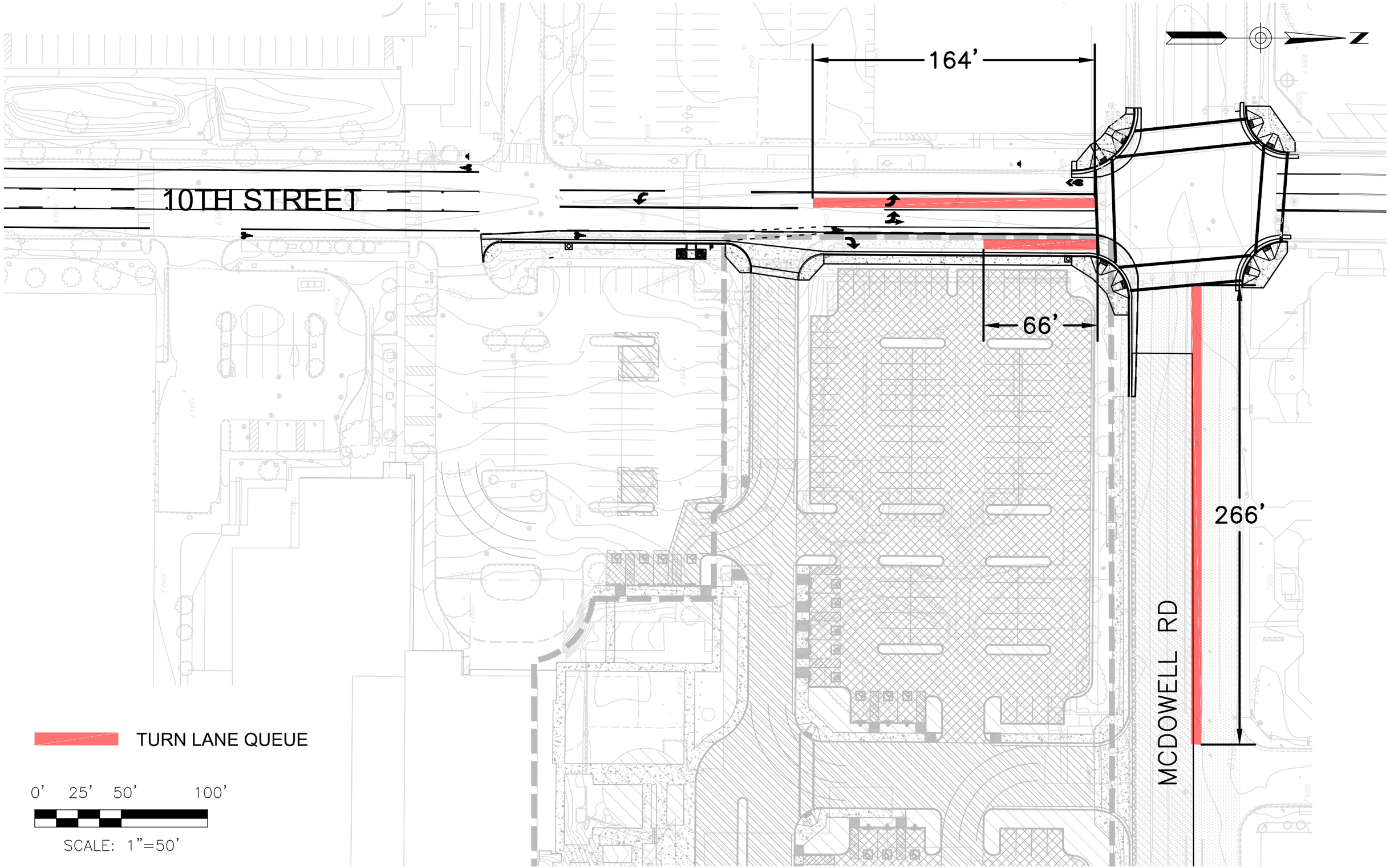
This option provides dual left turn lanes with one of the lanes as a shared through/left turn lane with split phasing for the northbound/southbound approaches. The option also includes the addition of a northbound right turn lane, and the westbound left turn protected/permissive phasing. The option also keeps all pedestrian crosswalks open at the intersection, which requires about 30 seconds of signal time for both northbound and southbound signal timing to allow sufficient time for pedestrians to cross.

Pros

- Decreases the northbound left turn queue by about 70 feet (about 3-4 vehicles) in the morning and about 140 feet (7 vehicles) in the afternoon
- Decreases the northbound left turn delay by about 7 seconds in the morning and 20 seconds in the afternoon
- Decreases the northbound right turn queue by about 10 feet (half a vehicle) in the morning and 200 feet (10 vehicles) in the afternoon
- Decreases the westbound left turn queue by about 52 feet (2 vehicles)
- Provides predictable amount of time for the left turn
- Reduces right angle crash risk
- Time of day and time of week signal timing plans can be combined with detection to make the signal more demand responsive during off peak times (minimum green and unit extension) and when there are no pedestrian calls more green time can be allocated to the left turn.

Cons

- Requires a large amount of time to be subtracted from the major eastbound/westbound turning movements
- Increases the overall intersection level of services from a B to a C in the morning and afternoon and more than doubles the overall intersection delay in the morning and afternoon.
- Significantly impacts the eastbound/westbound delays and queues, which is a major downfall for this option
- Despite the protected/permissive phasing for the westbound left turn approach, the delay is increased for the turning movement due to the decreased time for the east/west throughput traffic, which decreases the gaps for left turning vehicles to make a turn.


N
164’
66’
266’
10TH STREET
MCDOWELL RD
TURN LANE QUEUE
0’ 25’ 50’ 100’
SCALE: 1”=50’

OPTION 2

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Option 3 – Single Protected/Permissive Left – Leading

Description

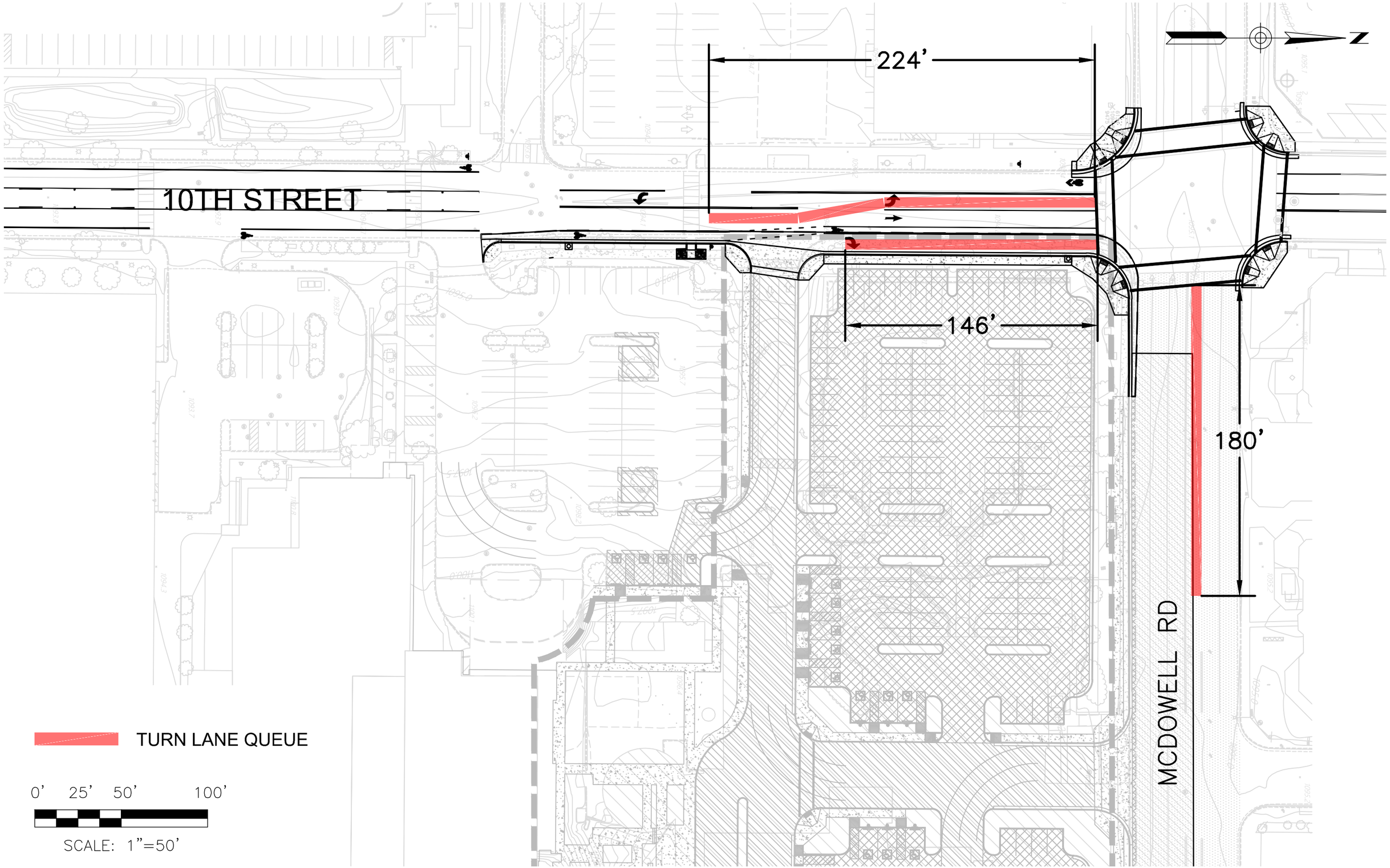
This option includes a single protected/permissive northbound left turn, the addition of a dedicated right turn lane and protected/permissive phasing for the westbound left turn. This option assumes that all pedestrian crosswalks remain open.

Pros

- Decreases the westbound left turn queue by about 140 feet (7 vehicles) in the morning and 10 feet (half a vehicle) in the afternoon
- Decreases the westbound left turn queue by about 20 seconds in the morning
- Decreases the northbound left turn queue by about 26 feet (1 vehicle) in the morning and 77 feet (3-4 vehicles) in the afternoon
- Decreases the northbound left turn delay by about 10 seconds in the morning and over 20 seconds in the afternoon
- Decreases the northbound right turn queue by about 116 feet (5-6 vehicles) in the afternoon
- Decreases the northbound right turn delay by about 25 seconds in the afternoon
- Requires less time from the eastbound/westbound phases than Option 2.
- Provides predictable amount of time for the left turn
- Reduces right angle crash risk for left turners some, but not as much as fully protected lefts do
- Time of day and time of week signal timing plans can be combined with detection to make the signal more demand responsive during off peak times (minimum green and unit extension) and when there are no pedestrian calls more green time can be allocated to the left turn.

Cons

- Lowers the overall level of services from a B to a C in the morning
- Requires more time from the east/west phases than Option 1


224’
146’
180’
10TH STREET
MCDOWELL RD
TURN LANE QUEUE
0’ 25’ 50’ 100’
SCALE: 1”=50’

OPTION 3

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Option 4 – Option 2 Split Phasing without Opposing Crosswalk

Description

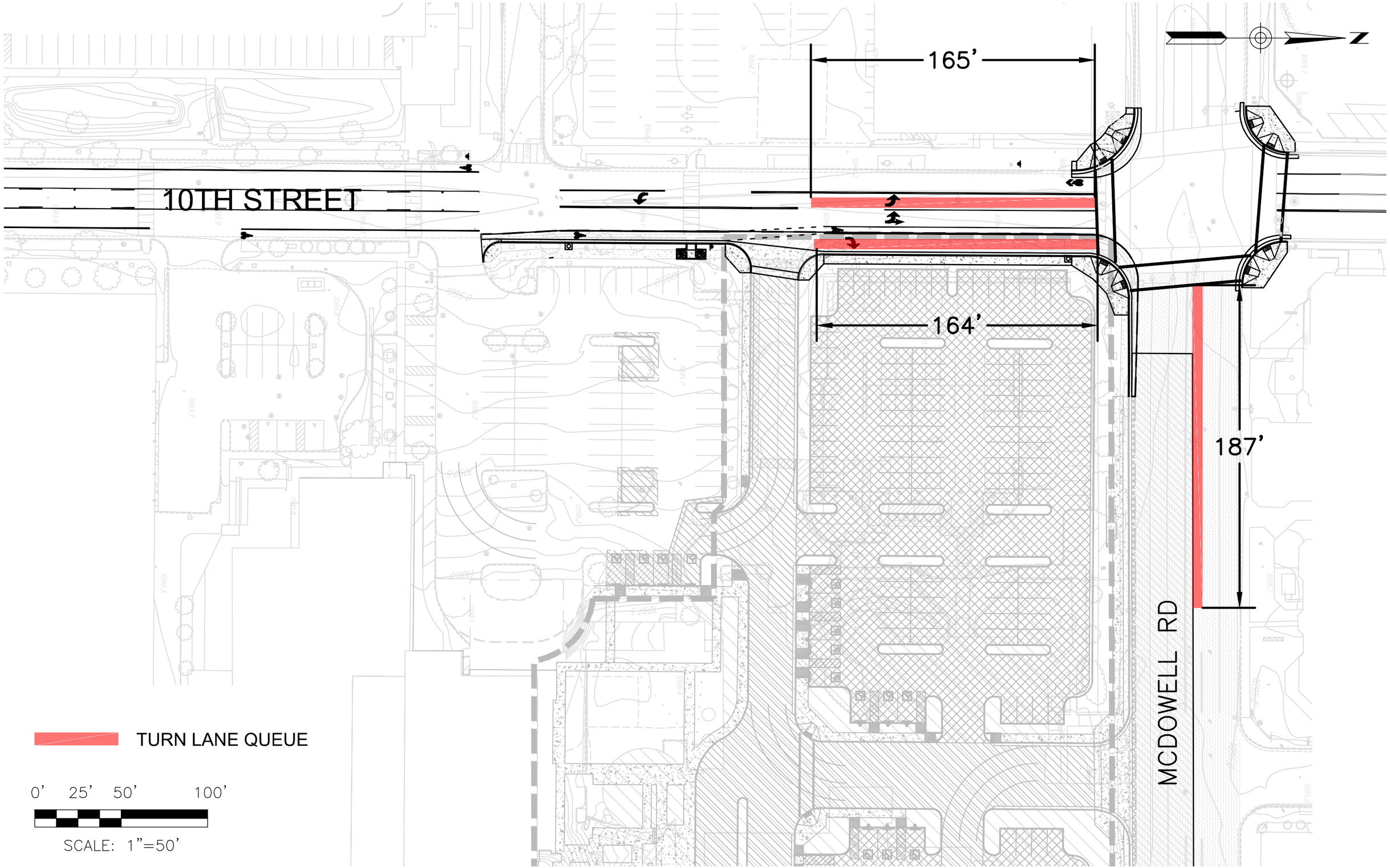
This option is similar to Option 2, however, the crosswalk on the west leg of the intersection is removed, therefore, the split phasing time can be significantly reduced since adequate pedestrian crossing time during the southbound split phase is no longer needed. This option provides dual left turn lanes with one of the lanes as a shared through/left turn lane with split phasing for the northbound/southbound approaches. The option also includes the addition of a northbound dedicated right turn lane, and the westbound left turn protected/permissive phasing.

Pros

- Decreases the westbound left turn delay by about 20 seconds in the morning
- Decreases westbound left turn queue by about 130 feet (6-7 vehicles) in the morning
- Decreases the northbound left turn delay by about 20 seconds in the afternoon
- Decreases the northbound left turn queue by about 136 feet (6-7 vehicles) in the afternoon
- Decreases the northbound right turn delay by about 20 seconds in the afternoon
- Decreases the northbound right turn queue by about 100 feet (5 vehicles) in the afternoon
- Provides predictable amount of time for the left turn.
- Reduces right angle crash risk.
- Time of day and time of week signal timing plans can be combined with detection to make the signal more demand responsive during off peak times (minimum green and unit extension).

Cons

- Increases the southbound left turn delay by about 45 seconds in the morning and 30 seconds in the afternoon
- Increases the southbound through traffic by about 20 seconds in the morning and afternoon
- Increases the westbound approach to a level of service C in the morning
- Lowers the overall intersection level of service to a C in the morning
- Pedestrians on the north west corner have to cross the street 3 times to get to the southwest corner. Hence the pedestrians may choose to cross at the prohibited crossing anyway.
- Not consistent with what is normally provided at a four-legged intersection.


10TH STREET
165’
164’
187’
MCDOWELL RD
TURN LANE QUEUE
0’ 25’ 50’ 100’
SCALE: 1”=50’

OPTION 4

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Option 5 – Single Protected/Permissive Left – Lagging

Description

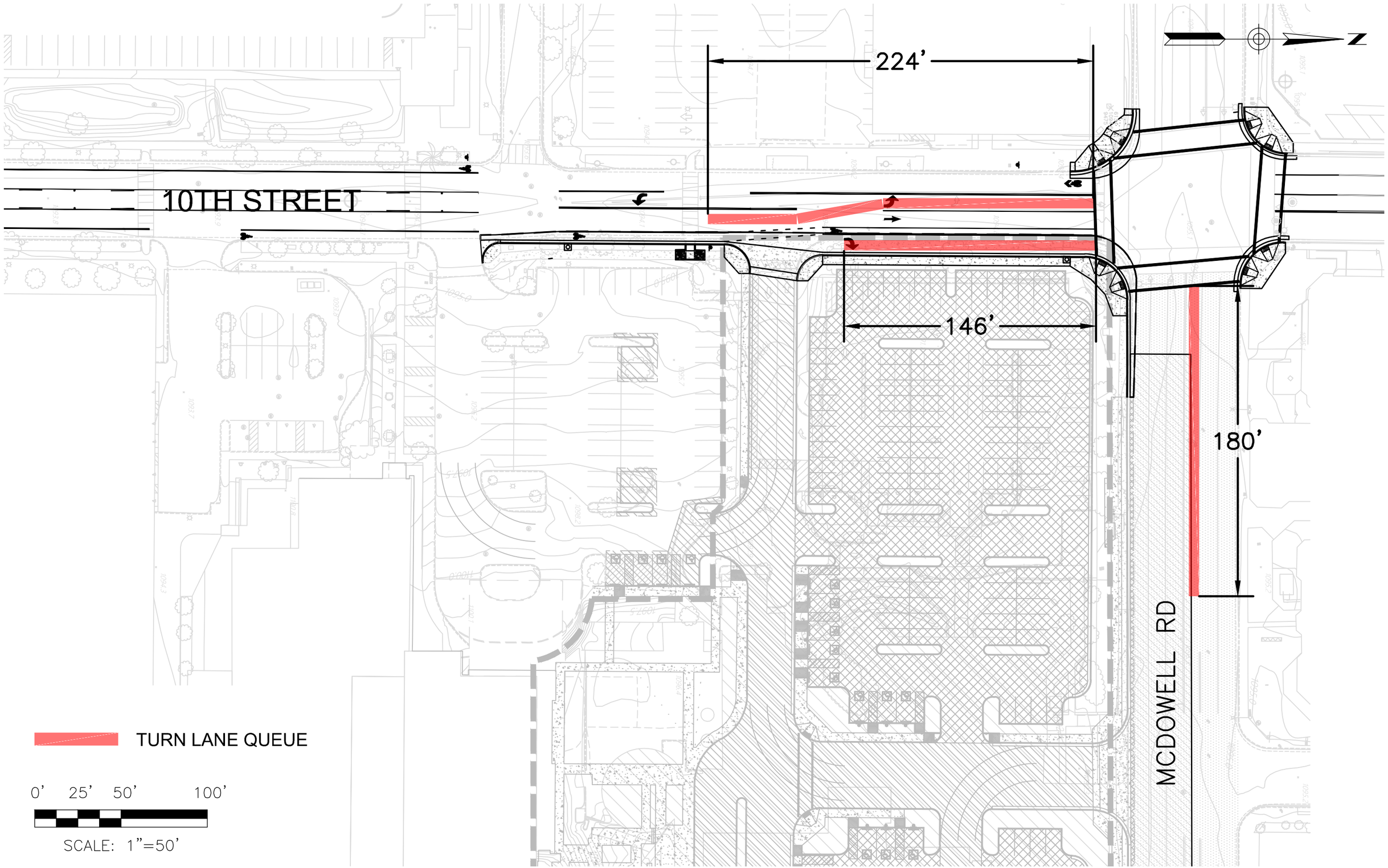
This option is similar to Option 3, however the protected phasing for the northbound left turn becomes a lagging protected left turn phase. The option includes a single northbound left turn lane with permissive phasing and lagging protected phasing, the addition of a northbound dedicated right turn lane. All the pedestrian crosswalks remain open for this option.

Pros

- Decreases westbound left turn delay by over 20 seconds in the morning
- Decreases westbound left turn queue by about 140 feet (7 vehicles) in the morning
- Decreases the northbound left turn delay by about 25 seconds in the afternoon
- Decreases the northbound left turn queue by about 77 feet (4 vehicles) in the afternoon
- Decreases the northbound right turn delay by about 25 seconds in the afternoon
- Decreases the northbound right turn queue by about 116 feet (5-6 vehicles) in the afternoon
- Provides predictable amount of green time for the left turn
- Somewhat decrease right angle crash risk for left turners, but not as much as fully protected left turns do.
- If there is no pedestrian call on opposing west leg crosswalk then this time could be allocated to service the left turn.
- If the permissive left movement clears all the left turners and there are no pedestrian calls the signal can cycle back to McDowell.

Cons

- Lowers the overall level of services in the morning to a C.
- Will require drivers to pay attention, additional signing to explain lagging left to drivers help mitigate this.
- Pedestrians might still attempt to cross without activating their crossing phase overlap.


224’
146’
180’
10TH STREET
MCDOWELL RD
TURN LANE QUEUE
0’ 25’ 50’ 100’
SCALE: 1”=50’

OPTION 5

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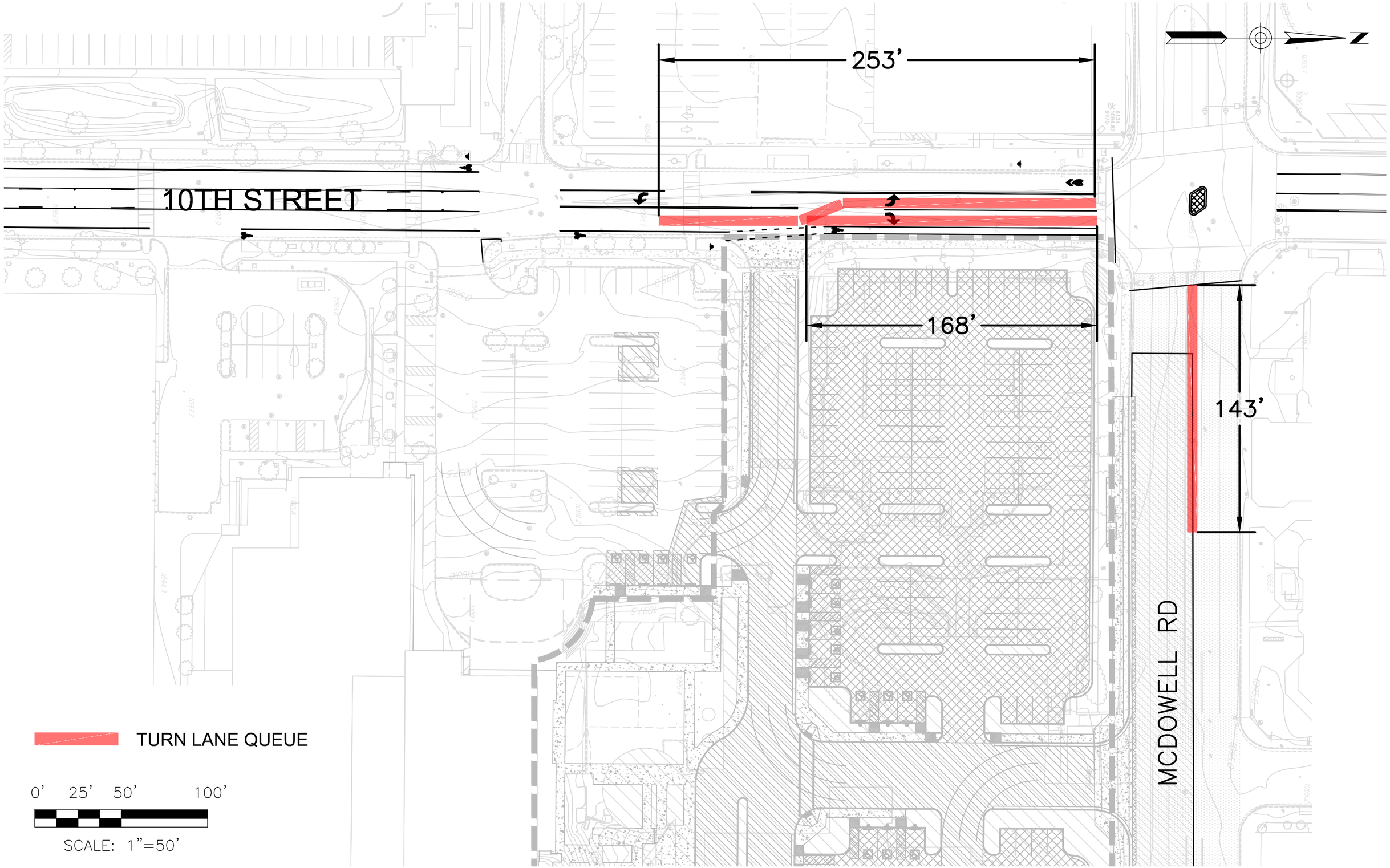
Option 6 – Single Left & Single Right Turn Lanes without NB/SB Through Lane Travel

Description
This option eliminates the northbound and southbound throughput traffic for the intersection. A physical channelizing island along with appropriate regulatory signing would be placed to prohibit these movements. The option includes a single northbound left turn lane with permissive phasing then the conversion of the northbound through lane to a dedicated right turn lane. All the pedestrian crosswalks remain open for this option.

Pros
- Decreases westbound left turn delay by over 30 seconds in the morning
- Decreases westbound left turn queue by about 175 feet (9 vehicles) in the morning
- Decreases the northbound left turn delay by about 20 seconds in the afternoon
- Decreases the northbound left turn queue by about 66 feet (3 vehicles) in the afternoon
- Decreases the northbound right turn delay by about 20 seconds in the afternoon
- Decreases the northbound right turn queue by about 94 feet (4-5 vehicles) in the afternoon
- Does not require an additional lane to be constructed for the right turn lane. Only re-configuration of pavement marking, and signing would be required.
- Residential neighbors who are critics of the traffic impacts of the Banner development may regard this as a substantive jester of good will. It is a way to help mitigate traffic impacts to a surrounding neighborhood by reducing cut thru potential at a major neighborhood entry point.
- Eliminates the conflict and potential crash risk of through movements with left turning movements.
- If there is no pedestrian call or pedestrian crossing on opposing west leg crosswalk then left turners can go unimpeded.
- If all the left turners and there are no pedestrian calls the signal can cycle back to McDowell and right turners can turn when they have gaps.
- Fits within existing street width.

Cons
- There is no longer the ability to travel through at the intersection in the northbound and southbound direction. Business interests on the northside of McDowell Road may object to this.
- Will require drivers to pay attention, additional signing to explain the inability to go through at the intersection. Driver expectance is for all normal movements to be allowed at a signalized intersection. Some drivers may ignore this restriction.
- The northbound left turn queue is still relatively high and could start to block right turning vehicles as well as other 10th Street driveways including the tail end of the left turn bay into the emergency area.
- Could require periodic enforcement by City of Phoenix PD.


253’
168’
143’
10TH STREET
MCDOWELL RD
N
TURN LANE QUEUE
0’ 25’ 50’ 100’
SCALE: 1”=50’

OPTION 6

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Option 7 – Dual Left Lanes & Single Dedicated Right Turn Lane without NB/SB Through Lane Travel

Description

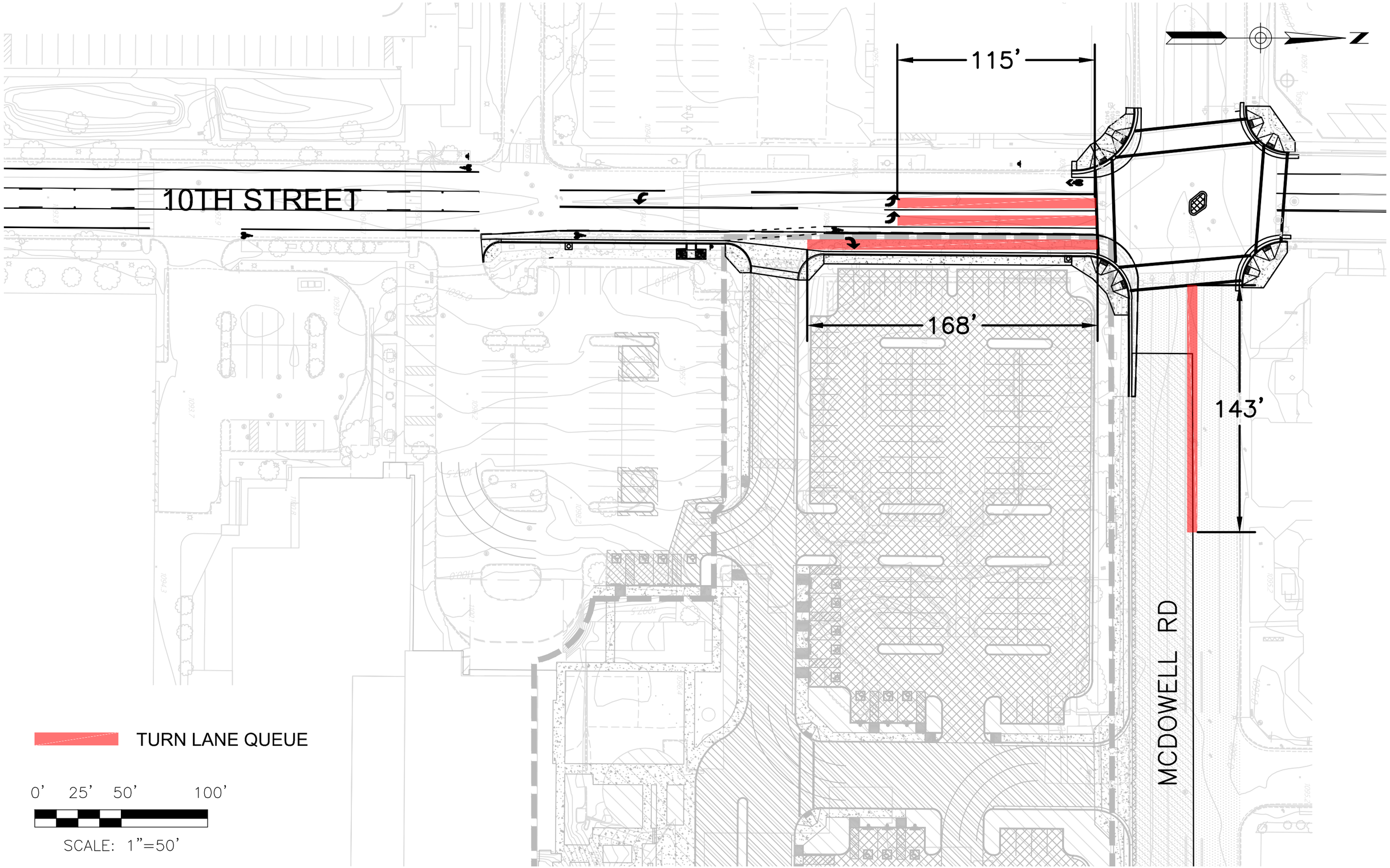
This option eliminates the northbound and southbound throughput traffic for the intersection. The option includes a dual northbound left turn lane with permissive phasing the conversion of the northbound through lane to a dedicated right turn lane. All the pedestrian crosswalks remain open for this option.

Pros

- Decreases westbound left turn delay by over 30 seconds in the morning
- Decreases westbound left turn queue by about 175 feet (9 vehicles) in the morning
- Decreases the northbound left turn delay by about 30 seconds in the afternoon
- Decreases the northbound left turn queue by about 186 feet (9-10 vehicles) in the afternoon
- Decreases the northbound right turn delay by about 20 seconds in the afternoon
- Decreases the northbound right turn queue by about 94 feet (4-5 vehicles) in the afternoon
- Residential neighbors who are critics of the traffic impacts of the Banner development may regard this as a substantive jester of good will. It is a way to help mitigate traffic impacts to a surrounding neighborhood by reducing cut thru potential at a major neighborhood entry point.
- Eliminates the conflict and potential crash risk of through movements with left turning movements.
- If there is no pedestrian call or pedestrian crossing on opposing west leg crosswalk then left turners can go unimpeded.
- If all the left turners and there are no pedestrian calls the signal can cycle back to McDowell and right turners can turn when they have gaps.
- Has the highest capacity configuration of any of the options analyzed. Presents a safety margin if traffic volumes increase.
- Queues waiting on 10th Street northbound much less likely to infer with driveways on 10th and left turn lane into emergency room area.

Cons

- There is no longer the ability to travel through at the intersection in the northbound and southbound direction.
- Will require drivers to pay attention, additional pavement markings and signing to explain the inability to go through at the intersection.
- May require periodic enforcement by City of Phoenix PD.


115’
168’
143’
10TH STREET
MCDOWELL RD
TURN LANE QUEUE
0’ 25’ 50’ 100’
SCALE: 1”=50’

OPTION 7

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Option 8 – Single Protected/Permissive Left – Leading and Lagging (Double-Pump Concept for Consideration, Not Analyzed)

Description

This option is a combination of options 3 and 5 and is known as the double pump concept. For this option, the northbound left turn phase would start as protected and then change to permissive to allow southbound vehicles to go. Then if the southbound demand clears and there is extra time for the north/south phases remaining, the northbound left turn can transition back to protected left and use the remaining time before transitioning to the east/west phases. The option could provide some advantage if there is little to no opposing thru traffic and no opposing pedestrian crossing call. It would allow the left turn to get more left turn green arrow that might yield 1 to 2 more vehicles being serviced per cycle. Hence in a way this concept would be a reflection of Options 3 and 5 when they are in the permissive sequence. Permissive lefts, without opposing traffic, can result in a vehicle turning every 2 to 3 seconds or so. But the amount of potential additional green arrow time the double pump my present may only be around 6 to 8 seconds. However, additional research on how to analyze the double pump is needed before any definitive statement on this option can be made. Hence the double pump is simply brought up as a possibility at this point and has not been analyzed.

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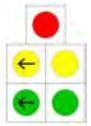
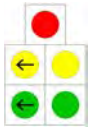
Figure 1 – Summary of Level of Service and Delay for all Options

Improvement	Peak Time	Intersection LOS	Intersection Delay (s)	Delay (s) EBL	LOS EBL	Delay (s) EBT	LOS EBT	Delay (s) EBR	LOS EBR	Delay (s) WBL	LOS WBL	Delay (s) WBT	LOS WBT	Delay (s) WBR	LOS WBR	Delay (s) NBL	LOS NBL	Delay (s) NBT	LOS NBT	Delay (s) NBR	LOS NBR	Delay (s) SBL	LOS SBL	Delay (s) SBT	LOS SBT	Delay (s) SBR	LOS SBR
Existing Configuration	AM	B	12.7	6.7	A	6.7	A	6.7	A	57.9	E	48	D	4.8	A	48.6	D	11	B	11	B	44.1	D	37.8	D	10	A
	PM	B	14.8	10	A	7.5	A	7.5	A	14.6	B	6.7	A	6.7	A	64.7	E	44	D	44	D	58.2	E	37.8	D	10	A
Option 1	AM	B	15.7	13.3	B	14.1	B	14.1	B	24.2	C	10.5	B	10.5	B	48.6	D	37.9	D	8.7	A	42	D	37.8	D	10	A
	PM	B	15.1	14	B	11.6	B	11.6	B	10.4	B	7	A	7	A	64.7	E	39.4	D	26	C	40.7	D	37.8	D	10	A
Option 2	AM	C	35	34.7	C	35.2	D	35.2	D	66.3	E	31.7	C	31.7	C	41.3	D	41.2	D	8.7	A	40.6	D	37.9	D	10	A
	PM	C	32.4	111.6	F	33.4	C	33.4	C	31.8	C	30.5	C	30.5	C	43.9	D	43.9	D	7.9	A	39.3	D	39.3	D	7.9	A
Option 3	AM	C	21.2	17.5	B	19	B	19	B	35.9	D	19.8	B	19.8	B	36.9	D	30.7	C	6.7	A	42.5	D	38.2	D	7.6	A
	PM	B	17.3	22.6	C	17.3	B	17.3	B	17.4	B	11.3	B	11.3	B	41.8	D	30.9	C	19.1	B	41.2	D	38.2	D	7.9	A
Option 4	AM	C	24.1	18.1	B	19.8	B	19.8	B	37.5	D	21.4	C	21.4	C	45.2	D	38.4	D	8.9	A	90	F	55.7	E	16.8	B
	PM	B	19.2	23.1	C	17.7	B	17.7	B	18.3	B	11.5	B	11.5	B	44.4	D	44.5	D	25.6	C	88.7	F	58.5	E	14.4	B
Option 5	AM	C	21.2	17.5	B	19	B	19	B	35.9	D	19.8	B	19.8	B	36.7	D	30.7	C	6.7	A	42.5	D	38.2	D	7.6	A
	PM	B	17.4	22.6	C	17.3	B	17.3	B	17.4	B	11.3	B	11.3	B	39.6	D	30.9	C	19.1	B	55.6	E	44.7	D	10.8	B
Option 6	AM	B	15.4	13.3	B	14.1	B	14.1	B	24.2	C	10.5	B	10.5	B	44.9	D	0	NA	8.7	A	40.8	D	0	NA	9.9	A
	PM	B	14.7	15.4	B	12.4	B	12.4	B	10	A	9.3	A	9.3	A	45	D	0	NA	23.5	C	34.3	C	0	NA	8.7	A
Option 7	AM	B	15.2	13.3	B	14.1	B	14.1	B	24.2	C	10.5	B	10.5	B	39.9	D	0	NA	8.7	A	40.8	D	0	NA	9.9	A
	PM	B	14	15.4	B	12.4	B	12.4	B	10	A	9.3	A	9.3	A	36	D	0	NA	23.5	C	34.3	C	0	NA	8.7	A

Figure 2 – Summary of Queue Lengths for Key Turning Movements

Intersection	Peak Hour	Exist Config Queue (ft)			Option 1 Queue (ft)			Option 2 Queue (ft)			Option 3 Queue (ft)			Option 4 Queue (ft)			Option 5 Queue (ft)			Option 6 Queue (ft)			Option 7 Queue (ft)		
		WBL	NBL	NBR	WBL	NBL	NBR	WBL	NBL	NBR	WBL	NBL	NBR	WBL	NBL	NBR	WBL	NBL	NBR	WBL	NBL	NBR	WBL	NBL	NBR
10th St & McDowell Rd	AM	318	175	60	143	175	49	266	105	49	180	149	44	187	169	49	180	149	44	143	174	50	143	83	50
	PM	41	301	262	32	301	166	67	164	66	51	224	146	52	165	164	51	224	146	32	253	168	32	115	168

10th Street & McDowell Traffic Signal – Alternative (or Option) Comparison - **Decision Table** -May 23, 2019 Version 2.0

No	Alternative	NBL Signal Type	# of Pros	# of Cons	Overall Level of Service (LOS)		Level of Service Cumulative Score All Movements	Level of Service Cum Score NBL+NBT+NBL + SBL Only	Total Calculated Queue Lengths NBL+ NBL + SBL Only
0	**No Build or Existing (left turn lane & thru lane)**		1	3	AM	B	36	20	553 ft
					PM	B			604 ft **Total 1,157 ft**
1	**Single Permissive Left (with a dedicated right turn lane)**		5	3	AM	B	38	18	367 ft
					PM	B			499 ft **Total 866 ft**
2	**Protected Dual Lefts with Split Phasing (with a dedicated right turn lane)**		7	4	AM	C	56 **EBL is at F in PM**	19	420 ft
					PM	C			297 ft **Total 717 ft**
3	**Single Protected/Permissive Left Leading (with a dedicated right turn lane)**		10	2	AM	C	38	15	373 ft
					PM	B			421 ft **Total 794 ft**
4	**Protected Dual Lefts with Split Phasing without Opposing Crosswalk (with a dedicated right turn lane)**		9	6	AM	C	51 **SBL goes to F in AM & PM**	18	405 ft.
					PM	B			381 ft **Total 786 ft**
5	**Single Protected/Permissive Left Lagging (with a dedicated right turn lane)**		10	3	AM	C	40	15	373 ft
					PM	B			421 ft **Total 794 ft**
6	**Single Left and Single Right without NB/SB Through Lanes (Existing Street Width)**		12	4	AM	B	23*	12*	367 ft
					PM	B			453 ft **Total 820 ft**
7	**Dual Lefts without NB/SB Through Lanes (with a dedicated right turn lane)**		12	3	AM	B	23*	12*	276 ft
					PM	B			315 ft **Total 591ft**

Level of Service Cumulative Score: A = 0, B=1, C=2, D=3, E=4,& F=5 – higher number means not as good.

* - NBT & SBT through movements are prohibited.

Option 8 was not analyzed.

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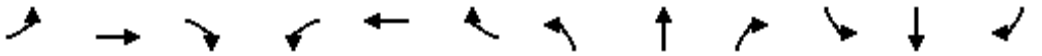
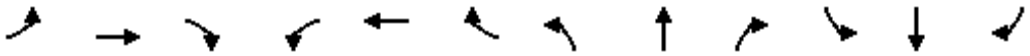


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	1049	190	195	974	37	139	12	106	68	9	65
Future Volume (vph)	36	1049	190	195	974	37	139	12	106	68	9	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	220		0	150		90	152		265
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.977			0.995				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950	*0.950	
Satd. Flow (prot)	1770	4968	0	1770	3522	0	1770	1863	1583	1770	1770	1583
Flt Permitted	0.260			0.143			0.751			0.749		
Satd. Flow (perm)	484	4968	0	266	3522	0	1399	1863	1583	1395	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		50			8				115			71
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		1330			670			724			426	
Travel Time (s)		25.9			13.1			19.7			11.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1140	207	212	1059	40	151	13	115	74	10	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	39	1347	0	212	1099	0	151	13	115	74	10	71
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4		3	8			6			2	
Permitted Phases	4			8			6		6	2		2

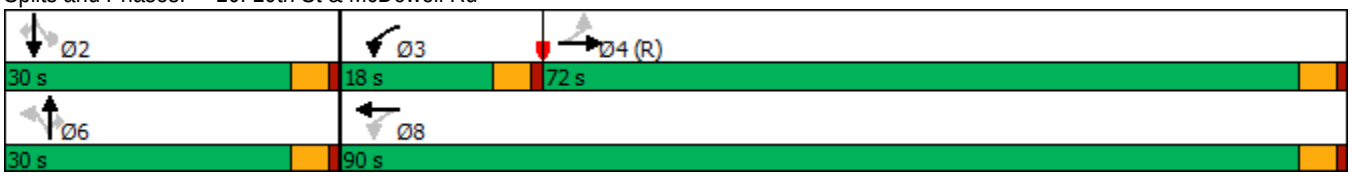


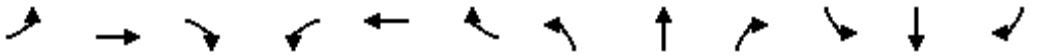
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8		6	6	6	2	2	2
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	1.0	1.0	1.0
Minimum Split (s)	26.0	26.0		10.5	26.0		29.0	29.0	29.0	29.0	29.0	29.0
Total Split (s)	72.0	72.0		18.0	90.0		30.0	30.0	30.0	30.0	30.0	30.0
Total Split (%)	60.0%	60.0%		15.0%	75.0%		25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Maximum Green (s)	67.5	67.5		13.5	85.5		25.5	25.5	25.5	25.5	25.5	25.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max		None	None		Max	Max	Max	Max	Max	Max
Walk Time (s)	7.0	7.0			7.0		7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	14.5	14.5			12.0		17.5	17.5	17.5	17.5	17.5	17.5
Pedestrian Calls (#/hr)	4	4			18		4	4	4	0	0	0
Act Effct Green (s)	70.7	70.7		85.5	85.5		25.5	25.5	25.5	25.5	25.5	25.5
Actuated g/C Ratio	0.59	0.59		0.71	0.71		0.21	0.21	0.21	0.21	0.21	0.21
v/c Ratio	0.14	0.46		0.67	0.44		0.51	0.03	0.27	0.25	0.03	0.18
Control Delay	13.3	14.1		24.2	10.6		48.6	37.9	8.7	42.0	37.8	10.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.3	14.1		24.2	10.6		48.6	37.9	8.7	42.0	37.8	10.0
LOS	B	B		C	B		D	D	A	D	D	A
Approach Delay		14.1			12.8			31.7			27.1	
Approach LOS		B			B			C			C	
Queue Length 50th (ft)	13	194		85	194		104	8	0	48	6	0
Queue Length 95th (ft)	34	246		143	271		175	26	49	93	21	39
Internal Link Dist (ft)		1250			590			644			346	
Turn Bay Length (ft)	110			220			150		90	152		265
Base Capacity (vph)	284	2946		358	2511		297	395	426	296	376	392
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.46		0.59	0.44		0.51	0.03	0.27	0.25	0.03	0.18

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.67			
Intersection Signal Delay: 15.7		Intersection LOS: B	
Intersection Capacity Utilization 60.9%		ICU Level of Service B	
Analysis Period (min) 15			

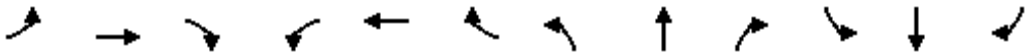
* User Entered Value

Splits and Phases: 10: 10th St & McDowell Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	1335	85	76	1162	51	215	47	220	47	10	66
Future Volume (vph)	56	1335	85	76	1162	51	215	47	220	47	10	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	115		0	150		90	145		100
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.991			0.994				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5040	0	1770	3518	0	1770	1863	1583	1770	1863	1583
Flt Permitted	0.186			0.117			0.750			0.724		
Satd. Flow (perm)	346	5040	0	218	3518	0	1397	1863	1583	1349	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16			9				120			72
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1330			670			723			426	
Travel Time (s)		30.2			15.2			16.4			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	61	1451	92	83	1263	55	234	51	239	51	11	72
Shared Lane Traffic (%)												
Lane Group Flow (vph)	61	1543	0	83	1318	0	234	51	239	51	11	72
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2		2	6		6



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	26.0	26.0		9.5	23.5		29.0	29.0	29.0	29.0	29.0	29.0
Total Split (s)	80.0	80.0		10.0	90.0		30.0	30.0	30.0	30.0	30.0	30.0
Total Split (%)	66.7%	66.7%		8.3%	75.0%		25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Maximum Green (s)	75.5	75.5		5.5	85.5		25.5	25.5	25.5	25.5	25.5	25.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max		None	Max		Max	Max	Max	Min	Min	Min
Walk Time (s)	7.0	7.0			7.0		7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	14.5	14.5			12.0		17.5	17.5	17.5	17.5	17.5	17.5
Pedestrian Calls (#/hr)	4	4			18		4	4	4	4	4	4
Act Effct Green (s)	77.5	77.5		85.5	85.5		25.5	25.5	25.5	25.5	25.5	25.5
Actuated g/C Ratio	0.65	0.65		0.71	0.71		0.21	0.21	0.21	0.21	0.21	0.21
v/c Ratio	0.27	0.47		0.37	0.53		0.79	0.13	0.56	0.18	0.03	0.18
Control Delay	14.0	11.6		10.4	7.0		64.7	39.4	26.0	40.7	37.8	10.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.0	11.6		10.4	7.0		64.7	39.4	26.0	40.7	37.8	10.0
LOS	B	B		B	A		E	D	C	D	D	A
Approach Delay		11.7			7.2			44.6			24.0	
Approach LOS		B			A			D			C	
Queue Length 50th (ft)	20	215		15	173		173	32	80	33	7	0
Queue Length 95th (ft)	48	250		m32	207		#301	68	166	69	23	39
Internal Link Dist (ft)		1250			590			643			346	
Turn Bay Length (ft)	110			115			150		90	145		100
Base Capacity (vph)	223	3260		226	2509		296	395	430	286	395	393
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.47		0.37	0.53		0.79	0.13	0.56	0.18	0.03	0.18

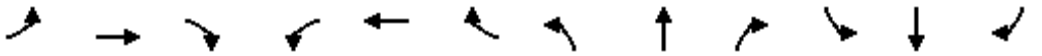
Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 65			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.79			
Intersection Signal Delay: 15.1		Intersection LOS: B	
Intersection Capacity Utilization 67.7%		ICU Level of Service C	
Analysis Period (min) 15			

95th percentile volume exceeds capacity, queue may be longer.

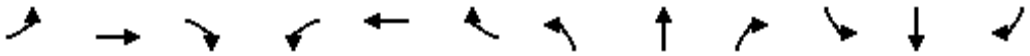
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: 10th St & McDowell Rd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	1049	190	195	974	37	139	12	106	68	9	65
Future Volume (vph)	36	1049	190	195	974	37	139	12	106	68	9	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	220		0	150		90	152		265
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Frt		0.977			0.995				0.850			0.850
Flt Protected	0.950			0.950			0.950	0.960		0.950	*0.950	
Satd. Flow (prot)	1770	4968	0	1770	3522	0	1681	1699	1583	1770	1770	1583
Flt Permitted	0.197			0.085			0.950	0.960		0.950		
Satd. Flow (perm)	367	4968	0	158	3522	0	1681	1699	1583	1770	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		34			4				115			71
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		1330			670			735			426	
Travel Time (s)		25.9			13.1			20.0			11.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1140	207	212	1059	40	151	13	115	74	10	71
Shared Lane Traffic (%)							46%					
Lane Group Flow (vph)	39	1347	0	212	1099	0	82	82	115	74	10	71
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA		Split	NA	Perm	Split	NA	Perm
Protected Phases		4		3	8		2	2		6	6	
Permitted Phases	4			8					2			6



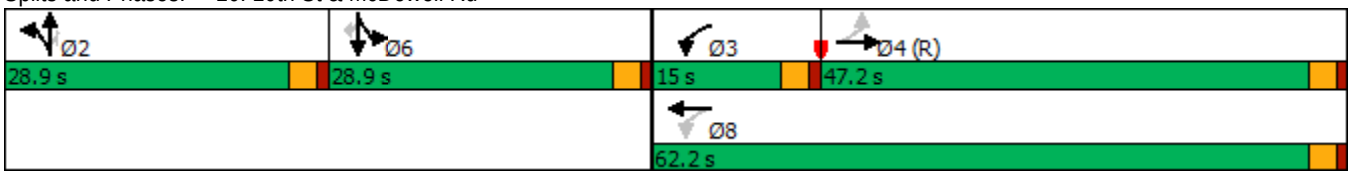
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		1.0	1.0	1.0	5.0	5.0	5.0
Minimum Split (s)	30.0	30.0		10.0	60.0		28.9	28.9	28.9	28.9	28.9	28.9
Total Split (s)	47.2	47.2		15.0	62.2		28.9	28.9	28.9	28.9	28.9	28.9
Total Split (%)	39.3%	39.3%		12.5%	51.8%		24.1%	24.1%	24.1%	24.1%	24.1%	24.1%
Maximum Green (s)	43.7	43.7		11.5	58.7		25.4	25.4	25.4	25.4	25.4	25.4
Yellow Time (s)	2.5	2.5		2.5	2.5		2.5	2.5	2.5	2.5	2.5	2.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max		None	None		Max	Max	Max	Max	Max	Max
Walk Time (s)	7.0	7.0			7.0		7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	14.5	14.5			12.0		17.9	17.9	17.9	17.9	17.9	17.9
Pedestrian Calls (#/hr)	4	4			18		0	0	0	4	4	4
Act Effct Green (s)	43.7	43.7		58.7	58.7		25.4	25.4	25.4	25.4	25.4	25.4
Actuated g/C Ratio	0.36	0.36		0.49	0.49		0.21	0.21	0.21	0.21	0.21	0.21
v/c Ratio	0.29	0.74		0.92	0.64		0.23	0.23	0.27	0.20	0.03	0.18
Control Delay	34.7	35.2		66.2	31.7		41.3	41.2	8.7	40.6	37.9	10.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.7	35.2		66.2	31.7		41.3	41.2	8.7	40.6	37.9	10.0
LOS	C	D		E	C		D	D	A	D	D	B
Approach Delay		35.2			37.3			27.9			26.4	
Approach LOS		D			D			C			C	
Queue Length 50th (ft)	21	321		115	386		55	55	0	48	6	0
Queue Length 95th (ft)	55	378		#263	470		105	105	49	91	21	39
Internal Link Dist (ft)		1250			590			655			346	
Turn Bay Length (ft)	110			220			150		90	152		265
Base Capacity (vph)	133	1830		231	1724		355	359	425	374	374	391
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.74		0.92	0.64		0.23	0.23	0.27	0.20	0.03	0.18

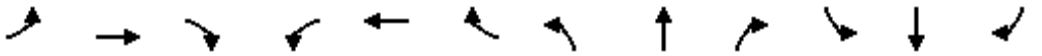
Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 120			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.92			
Intersection Signal Delay: 35.0		Intersection LOS: C	
Intersection Capacity Utilization 56.1%		ICU Level of Service B	
Analysis Period (min) 15			

* User Entered Value

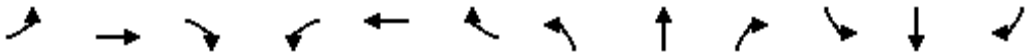
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 10: 10th St & McDowell Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	1335	85	76	1162	51	215	47	220	47	10	66
Future Volume (vph)	56	1335	85	76	1162	51	215	47	220	47	10	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	220		0	150		90	155		265
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	0.95	0.95	1.00	0.95	0.95	1.00
Ped Bike Factor		1.00			1.00				0.98	1.00	1.00	
Frt		0.991			0.994				0.850			0.850
Flt Protected	0.950			0.950			0.950	0.969		0.950	0.969	
Satd. Flow (prot)	1770	5019	0	1770	3513	0	1681	1715	1583	1681	1715	1583
Flt Permitted	0.094			0.077			0.950	0.969		0.950	0.969	
Satd. Flow (perm)	175	5019	0	143	3513	0	1681	1715	1555	1673	1710	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10			5				239			82
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		1330			1339			802			426	
Travel Time (s)		25.9			26.1			21.9			11.6	
Confl. Peds. (#/hr)	4		18	18		4			4	4		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	61	1451	92	83	1263	55	234	51	239	51	11	72
Shared Lane Traffic (%)							40%			40%		
Lane Group Flow (vph)	61	1543	0	83	1318	0	140	145	239	31	31	72
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA		Split	NA	Perm	Split	NA	Perm



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases		4		3	8		2	2		6	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		3	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	50.0	50.0		9.5	60.0		29.4	29.4	29.4	28.9	28.9	28.9
Total Split (s)	51.0	51.0		10.0	61.0		30.0	30.0	30.0	29.0	29.0	29.0
Total Split (%)	42.5%	42.5%		8.3%	50.8%		25.0%	25.0%	25.0%	24.2%	24.2%	24.2%
Maximum Green (s)	47.0	47.0		6.0	57.0		26.0	26.0	26.0	25.0	25.0	25.0
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max		None	Max		Max	Max	Max	Min	Min	Min
Walk Time (s)	7.0	7.0			7.0		7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	14.5	14.5			12.0		17.9	17.9	17.9	17.9	17.9	17.9
Pedestrian Calls (#/hr)	4	4			18		4	4	4	500	500	500
Act Effct Green (s)	49.0	49.0		57.1	57.1		26.0	26.0	26.0	24.9	24.9	24.9
Actuated g/C Ratio	0.41	0.41		0.48	0.48		0.22	0.22	0.22	0.21	0.21	0.21
v/c Ratio	0.86	0.75		0.55	0.79		0.38	0.39	0.46	0.09	0.09	0.18
Control Delay	111.6	33.4		40.5	32.2		43.9	43.9	7.9	39.3	39.3	7.9
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	111.6	33.4		40.5	32.2		43.9	43.9	7.9	39.3	39.3	7.9
LOS	F	C		D	C		D	D	A	D	D	A
Approach Delay		36.4			32.6			27.5			22.4	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)	44	377		41	409		97	102	0	21	21	0
Queue Length 95th (ft)	#135	438		m82	494		164	169	66	49	49	33
Internal Link Dist (ft)		1250			1259			722			346	
Turn Bay Length (ft)	110			220			150		90	155		265
Base Capacity (vph)	71	2055		150	1674		364	371	524	350	357	394
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.86	0.75		0.55	0.79		0.38	0.39	0.46	0.09	0.09	0.18

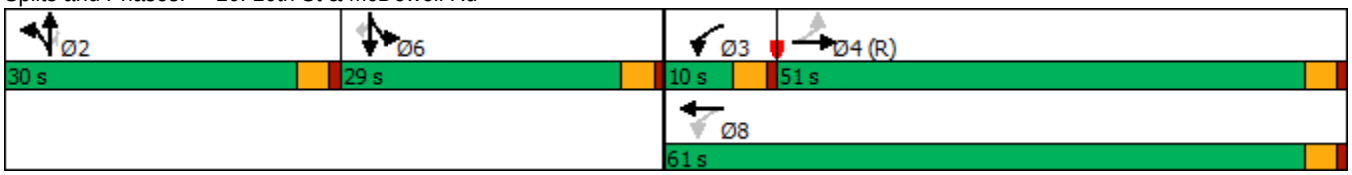
Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 120			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.86			
Intersection Signal Delay: 33.2		Intersection LOS: C	
Intersection Capacity Utilization 68.7%		ICU Level of Service C	

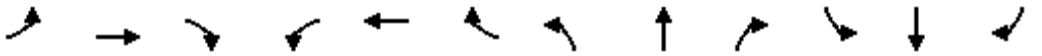
Analysis Period (min) 15

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

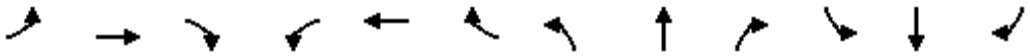
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: 10th St & McDowell Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	1049	190	195	974	37	139	12	106	68	9	65
Future Volume (vph)	36	1049	190	195	974	37	139	12	106	68	9	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	220		0	150		90	152		265
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.977			0.995				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950	*0.950	
Satd. Flow (prot)	1770	4968	0	1770	3522	0	1770	1863	1583	1770	1770	1583
Flt Permitted	0.252			0.129			0.647			0.749		
Satd. Flow (perm)	469	4968	0	240	3522	0	1205	1863	1583	1395	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		45			6				115			82
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		1330			1339			718			426	
Travel Time (s)		25.9			26.1			19.6			11.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1140	207	212	1059	40	151	13	115	74	10	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	39	1347	0	212	1099	0	151	13	115	74	10	71
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4			8			2		2	6		6



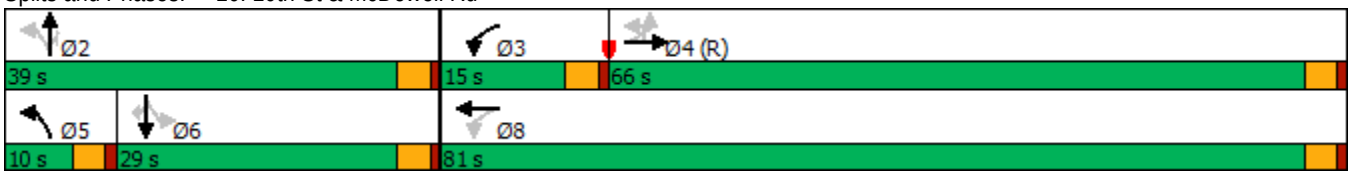
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	29.4	29.4		10.0	26.0		10.0	29.4	29.4	29.0	29.0	29.0
Total Split (s)	66.0	66.0		15.0	81.0		10.0	39.0	39.0	29.0	29.0	29.0
Total Split (%)	55.0%	55.0%		12.5%	67.5%		8.3%	32.5%	32.5%	24.2%	24.2%	24.2%
Maximum Green (s)	62.0	62.0		11.0	77.0		6.0	35.0	35.0	25.0	25.0	25.0
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lag		Lead			Lead			Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes			Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max		None	None		None	Max	Max	Max	Max	Max
Walk Time (s)	7.0	7.0			7.0			7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	17.9	17.9			12.0			17.9	17.9	17.9	17.9	17.9
Pedestrian Calls (#/hr)	4	4			18			0	0	4	4	4
Act Effct Green (s)	62.6	62.6		77.0	77.0		35.0	35.0	35.0	25.0	25.0	25.0
Actuated g/C Ratio	0.52	0.52		0.64	0.64		0.29	0.29	0.29	0.21	0.21	0.21
v/c Ratio	0.16	0.52		0.74	0.49		0.40	0.02	0.21	0.26	0.03	0.18
Control Delay	17.5	19.0		36.0	20.0		36.9	30.7	6.7	42.5	38.2	7.6
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.5	19.0		36.0	20.0		36.9	30.7	6.7	42.5	38.2	7.6
LOS	B	B		D	B		D	C	A	D	D	A
Approach Delay		19.0			22.6			24.1			26.3	
Approach LOS		B			C			C			C	
Queue Length 50th (ft)	15	235		102	292		91	7	0	48	6	0
Queue Length 95th (ft)	38	277		#178	372		149	23	44	94	21	32
Internal Link Dist (ft)		1250			1259			638			346	
Turn Bay Length (ft)	110			220			150		90	152		265
Base Capacity (vph)	244	2612		294	2262		379	543	543	290	368	394
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.52		0.72	0.49		0.40	0.02	0.21	0.26	0.03	0.18

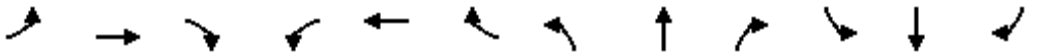
Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.74			
Intersection Signal Delay: 21.3		Intersection LOS: C	
Intersection Capacity Utilization 59.7%		ICU Level of Service B	
Analysis Period (min) 15			

* User Entered Value

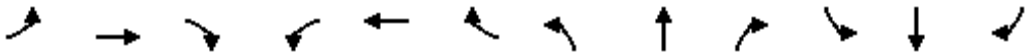
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 10: 10th St & McDowell Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	1335	85	76	1162	51	215	47	220	47	10	66
Future Volume (vph)	56	1335	85	76	1162	51	215	47	220	47	10	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	115		0	150		90	145		100
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.991			0.994				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5040	0	1770	3518	0	1770	1863	1583	1770	1863	1583
Flt Permitted	0.163			0.102			0.647			0.724		
Satd. Flow (perm)	304	5040	0	190	3518	0	1205	1863	1583	1349	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			7				119			82
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1330			670			889			426	
Travel Time (s)		30.2			15.2			20.2			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	61	1451	92	83	1263	55	234	51	239	51	11	72
Shared Lane Traffic (%)												
Lane Group Flow (vph)	61	1543	0	83	1318	0	234	51	239	51	11	72
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4			8			2		2	6		6

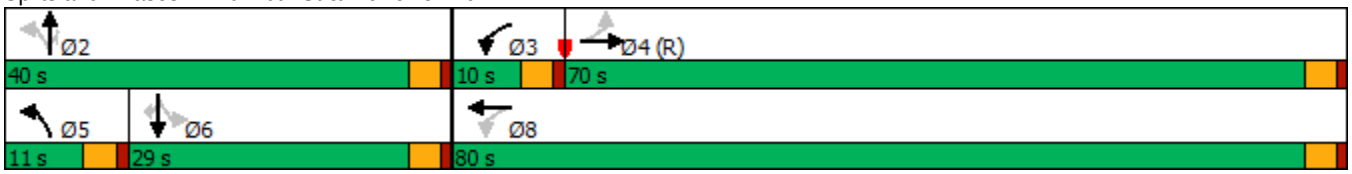


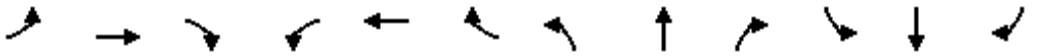
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	26.0	26.0		9.5	26.0		11.0	29.4	29.4	29.0	29.0	29.0
Total Split (s)	70.0	70.0		10.0	80.0		11.0	40.0	40.0	29.0	29.0	29.0
Total Split (%)	58.3%	58.3%		8.3%	66.7%		9.2%	33.3%	33.3%	24.2%	24.2%	24.2%
Maximum Green (s)	66.0	66.0		6.0	76.0		7.0	36.0	36.0	25.0	25.0	25.0
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lag		Lead			Lead			Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes			Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max		None	Max		None	Max	Max	Min	Min	Min
Walk Time (s)	7.0	7.0			7.0			7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	14.5	14.5			12.0			17.9	17.9	17.9	17.9	17.9
Pedestrian Calls (#/hr)	4	4			18			4	4	4	4	4
Act Effct Green (s)	68.0	68.0		76.0	76.0		36.0	36.0	36.0	25.0	25.0	25.0
Actuated g/C Ratio	0.57	0.57		0.63	0.63		0.30	0.30	0.30	0.21	0.21	0.21
v/c Ratio	0.35	0.54		0.42	0.59		0.59	0.09	0.43	0.18	0.03	0.18
Control Delay	22.6	17.3		17.4	11.3		41.8	30.9	19.1	41.2	38.2	7.9
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.6	17.3		17.4	11.3		41.8	30.9	19.1	41.2	38.2	7.9
LOS	C	B		B	B		D	C	B	D	D	A
Approach Delay		17.5			11.6			30.4			23.1	
Approach LOS		B			B			C			C	
Queue Length 50th (ft)	25	269		20	231		146	28	71	33	7	0
Queue Length 95th (ft)	64	312		m51	276		224	60	146	70	23	33
Internal Link Dist (ft)		1250			590			809			346	
Turn Bay Length (ft)	110			115			150		90	145		100
Base Capacity (vph)	172	2861		199	2230		394	558	558	281	388	394
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.54		0.42	0.59		0.59	0.09	0.43	0.18	0.03	0.18

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.59			
Intersection Signal Delay: 17.3		Intersection LOS: B	
Intersection Capacity Utilization 66.5%		ICU Level of Service C	
Analysis Period (min) 15			

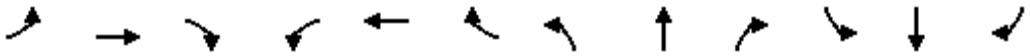
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: 10th St & McDowell Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	1049	190	195	974	37	139	12	106	68	9	65
Future Volume (vph)	36	1049	190	195	974	37	139	12	106	68	9	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	220		0	150		90	152		265
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.977			0.995				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950	*0.950	
Satd. Flow (prot)	1770	4968	0	1770	3522	0	1770	1863	1583	1770	1770	1583
Flt Permitted	0.250			0.126			0.950			0.950		
Satd. Flow (perm)	466	4968	0	235	3522	0	1770	1863	1583	1770	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		44			6				115			82
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		1330			1339			723			426	
Travel Time (s)		25.9			26.1			19.7			11.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1140	207	212	1059	40	151	13	115	74	10	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	39	1347	0	212	1099	0	151	13	115	74	10	71
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA		Split	NA	Perm	Split	NA	Perm
Protected Phases		4		3	8		2	2		6	6	
Permitted Phases	4			8					2			6



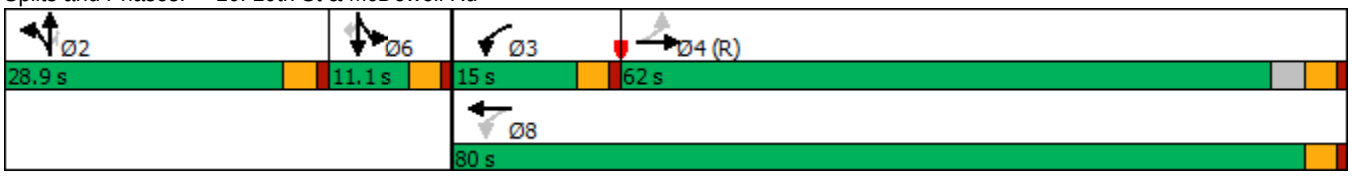
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		1.0	1.0	1.0	5.0	5.0	5.0
Minimum Split (s)	26.0	26.0		10.0	26.0		28.9	28.9	28.9	9.0	9.0	9.0
Total Split (s)	62.0	62.0		15.0	80.0		28.9	28.9	28.9	11.1	11.1	11.1
Total Split (%)	51.7%	51.7%		12.5%	66.7%		24.1%	24.1%	24.1%	9.3%	9.3%	9.3%
Maximum Green (s)	58.0	58.0		11.0	76.0		24.9	24.9	24.9	7.1	7.1	7.1
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max		None	None		Max	Max	Max	Max	Max	Max
Walk Time (s)	7.0	7.0			7.0		7.0	7.0	7.0			
Flash Dont Walk (s)	14.5	14.5			12.0		17.9	17.9	17.9			
Pedestrian Calls (#/hr)	4	4			18		0	0	0			
Act Effct Green (s)	61.5	61.5		76.0	76.0		24.9	24.9	24.9	7.1	7.1	7.1
Actuated g/C Ratio	0.51	0.51		0.63	0.63		0.21	0.21	0.21	0.06	0.06	0.06
v/c Ratio	0.16	0.52		0.75	0.49		0.41	0.03	0.27	0.71	0.10	0.42
Control Delay	18.1	19.8		37.6	21.6		45.2	38.4	8.9	90.0	55.7	16.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.1	19.8		37.6	21.6		45.2	38.4	8.9	90.0	55.7	16.8
LOS	B	B		D	C		D	D	A	F	E	B
Approach Delay		19.7			24.2			29.9			54.2	
Approach LOS		B			C			C			D	
Queue Length 50th (ft)	16	240		105	307		102	8	0	57	8	0
Queue Length 95th (ft)	39	283		#184	387		169	26	49	#136	26	38
Internal Link Dist (ft)		1250			1259			643			346	
Turn Bay Length (ft)	110			220			150		90	152		265
Base Capacity (vph)	238	2568		289	2232		367	386	419	104	104	170
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.52		0.73	0.49		0.41	0.03	0.27	0.71	0.10	0.42

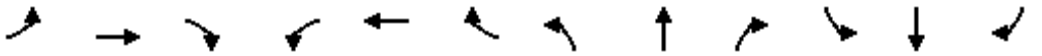
Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 75			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.75			
Intersection Signal Delay: 24.2		Intersection LOS: C	
Intersection Capacity Utilization 59.7%		ICU Level of Service B	
Analysis Period (min) 15			

* User Entered Value

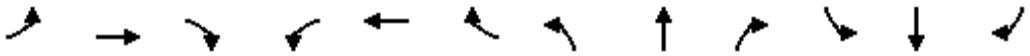
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 10: 10th St & McDowell Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	1335	85	76	1162	51	215	47	220	47	10	66
Future Volume (vph)	56	1335	85	76	1162	51	215	47	220	47	10	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	115		0	150		90	145		100
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Frt		0.991			0.994				0.850			0.850
Flt Protected	0.950			0.950			0.950	0.969		0.950		
Satd. Flow (prot)	1770	5040	0	1770	3518	0	1681	1715	1583	1770	1863	1583
Flt Permitted	0.163			0.102			0.950	0.969		0.950		
Satd. Flow (perm)	304	5040	0	190	3518	0	1681	1715	1583	1770	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			7				122			95
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1330			670			686			426	
Travel Time (s)		30.2			15.2			15.6			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	61	1451	92	83	1263	55	234	51	239	51	11	72
Shared Lane Traffic (%)							40%					
Lane Group Flow (vph)	61	1543	0	83	1318	0	140	145	239	51	11	72
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA		Split	NA	Perm	Split	NA	Perm
Protected Phases		4		3	8		2	2		6	6	
Permitted Phases	4			8					2			6



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	26.0	26.0		9.5	26.0		29.4	29.4	29.4	9.5	9.5	9.5
Total Split (s)	70.0	70.0		10.0	80.0		30.0	30.0	30.0	10.0	10.0	10.0
Total Split (%)	58.3%	58.3%		8.3%	66.7%		25.0%	25.0%	25.0%	8.3%	8.3%	8.3%
Maximum Green (s)	65.5	65.5		5.5	75.5		25.5	25.5	25.5	5.5	5.5	5.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max		None	Max		Max	Max	Max	Min	Min	Min
Walk Time (s)	7.0	7.0			7.0		7.0	7.0	7.0			
Flash Dont Walk (s)	14.5	14.5			12.0		17.9	17.9	17.9			
Pedestrian Calls (#/hr)	4	4			18		4	4	4			
Act Effct Green (s)	67.5	67.5		75.5	75.5		25.5	25.5	25.5	5.5	5.5	5.5
Actuated g/C Ratio	0.56	0.56		0.63	0.63		0.21	0.21	0.21	0.05	0.05	0.05
v/c Ratio	0.36	0.54		0.43	0.59		0.39	0.40	0.55	0.63	0.13	0.44
Control Delay	23.1	17.7		18.3	11.5		44.4	44.5	25.6	88.7	58.5	14.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.1	17.7		18.3	11.5		44.4	44.5	25.6	88.7	58.5	14.4
LOS	C	B		B	B		D	D	C	F	E	B
Approach Delay		17.9			11.9			35.9			46.3	
Approach LOS		B			B			D			D	
Queue Length 50th (ft)	26	271		20	234		98	102	79	40	8	0
Queue Length 95th (ft)	65	315		m52	280		165	170	164	#102	28	29
Internal Link Dist (ft)		1250			590			606			346	
Turn Bay Length (ft)	110			115			150		90	145		100
Base Capacity (vph)	170	2840		191	2216		357	364	432	81	85	163
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.54		0.43	0.59		0.39	0.40	0.55	0.63	0.13	0.44

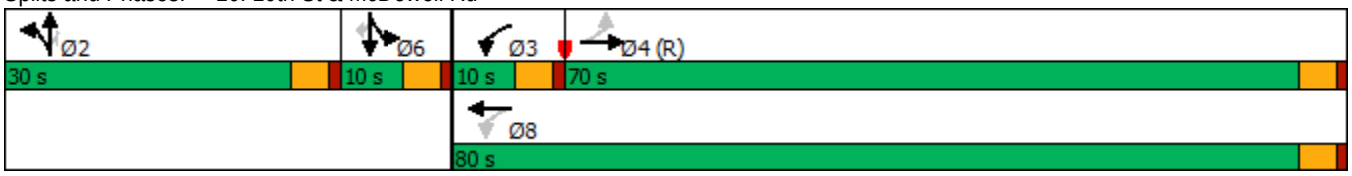
Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.63			
Intersection Signal Delay: 19.2		Intersection LOS: B	
Intersection Capacity Utilization 63.0%		ICU Level of Service B	
Analysis Period (min) 15			

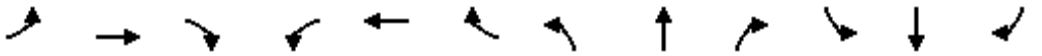
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

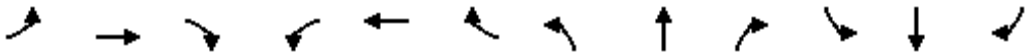
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: 10th St & McDowell Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	1049	190	195	974	37	139	12	106	68	9	65
Future Volume (vph)	36	1049	190	195	974	37	139	12	106	68	9	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	220		0	150		90	152		265
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.977			0.995				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950	*0.950	
Satd. Flow (prot)	1770	4968	0	1770	3522	0	1770	1863	1583	1770	1770	1583
Flt Permitted	0.252			0.129			0.751			0.749		
Satd. Flow (perm)	469	4968	0	240	3522	0	1399	1863	1583	1395	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		45			6				115			82
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		1330			1339			736			426	
Travel Time (s)		25.9			26.1			20.1			11.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1140	207	212	1059	40	151	13	115	74	10	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	39	1347	0	212	1099	0	151	13	115	74	10	71
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4			8			2		2	6		6



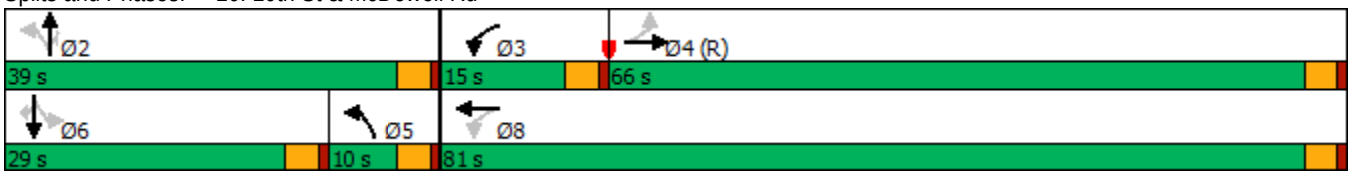
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	26.0	26.0		10.0	26.0		10.0	28.9	28.9	29.0	29.0	29.0
Total Split (s)	66.0	66.0		15.0	81.0		10.0	39.0	39.0	29.0	29.0	29.0
Total Split (%)	55.0%	55.0%		12.5%	67.5%		8.3%	32.5%	32.5%	24.2%	24.2%	24.2%
Maximum Green (s)	62.0	62.0		11.0	77.0		6.0	35.0	35.0	25.0	25.0	25.0
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lag		Lead			Lag			Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes		Yes			Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max		None	None		Max	Max	Max	Max	Max	Max
Walk Time (s)	7.0	7.0			7.0			7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	14.5	14.5			12.0			17.9	17.9	17.9	17.9	17.9
Pedestrian Calls (#/hr)	4	4			18			0	0	4	4	4
Act Effct Green (s)	62.6	62.6		77.0	77.0		35.0	35.0	35.0	25.0	25.0	25.0
Actuated g/C Ratio	0.52	0.52		0.64	0.64		0.29	0.29	0.29	0.21	0.21	0.21
v/c Ratio	0.16	0.52		0.74	0.49		0.35	0.02	0.21	0.26	0.03	0.18
Control Delay	17.5	19.0		36.0	20.0		36.7	30.7	6.7	42.5	38.2	7.6
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.5	19.0		36.0	20.0		36.7	30.7	6.7	42.5	38.2	7.6
LOS	B	B		D	B		D	C	A	D	D	A
Approach Delay		19.0			22.6			24.1			26.3	
Approach LOS		B			C			C			C	
Queue Length 50th (ft)	15	235		102	292		91	7	0	48	6	0
Queue Length 95th (ft)	38	277		#178	372		149	23	44	94	21	32
Internal Link Dist (ft)		1250			1259			656			346	
Turn Bay Length (ft)	110			220			150		90	152		265
Base Capacity (vph)	244	2612		294	2262		426	543	543	290	368	394
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.52		0.72	0.49		0.35	0.02	0.21	0.26	0.03	0.18

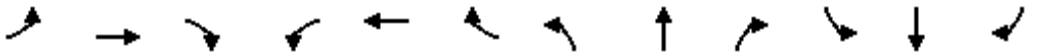
Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 75			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.74			
Intersection Signal Delay: 21.3		Intersection LOS: C	
Intersection Capacity Utilization 59.7%		ICU Level of Service B	
Analysis Period (min) 15			

* User Entered Value

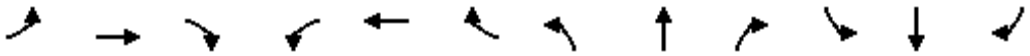
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 10: 10th St & McDowell Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	1335	85	76	1162	51	215	47	220	47	10	66
Future Volume (vph)	56	1335	85	76	1162	51	215	47	220	47	10	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	115		0	150		90	145		100
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.991			0.994				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5040	0	1770	3518	0	1770	1863	1583	1770	1863	1583
Flt Permitted	0.163			0.102			0.750			0.724		
Satd. Flow (perm)	304	5040	0	190	3518	0	1397	1863	1583	1349	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			7				119			82
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1330			670			802			426	
Travel Time (s)		30.2			15.2			18.2			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	61	1451	92	83	1263	55	234	51	239	51	11	72
Shared Lane Traffic (%)												
Lane Group Flow (vph)	61	1543	0	83	1318	0	234	51	239	51	11	72
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4			8			2		2	6		6

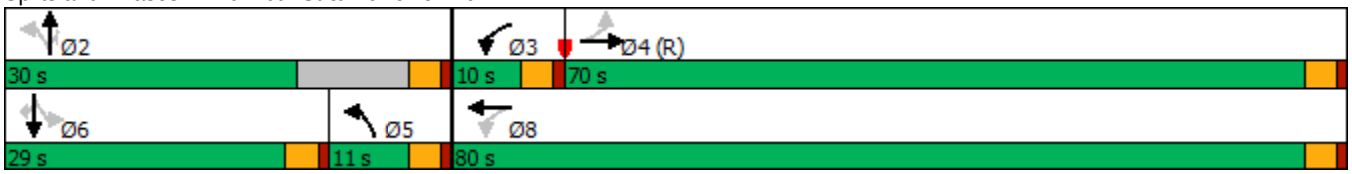


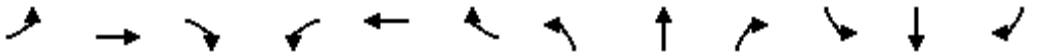
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	26.0	26.0		9.5	26.0		11.0	29.4	29.4	29.0	29.0	29.0
Total Split (s)	70.0	70.0		10.0	80.0		11.0	30.0	30.0	29.0	29.0	29.0
Total Split (%)	58.3%	58.3%		8.3%	66.7%		9.2%	25.0%	25.0%	24.2%	24.2%	24.2%
Maximum Green (s)	66.0	66.0		6.0	76.0		7.0	26.0	26.0	25.0	25.0	25.0
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lag		Lead			Lag			Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes		Yes			Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max		None	Max		Max	Max	Max	Min	Min	Min
Walk Time (s)	7.0	7.0			7.0			7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	14.5	14.5			12.0			17.9	17.9	17.9	17.9	17.9
Pedestrian Calls (#/hr)	4	4			18			4	4	4	4	4
Act Effct Green (s)	68.0	68.0		76.0	76.0		36.0	36.0	36.0	12.0	12.0	12.0
Actuated g/C Ratio	0.57	0.57		0.63	0.63		0.30	0.30	0.30	0.10	0.10	0.10
v/c Ratio	0.35	0.54		0.42	0.59		0.49	0.09	0.43	0.38	0.06	0.31
Control Delay	22.6	17.3		17.4	11.3		39.6	30.9	19.1	55.6	44.7	10.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.6	17.3		17.4	11.3		39.6	30.9	19.1	55.6	44.7	10.8
LOS	C	B		B	B		D	C	B	E	D	B
Approach Delay		17.5			11.6			29.4			30.6	
Approach LOS		B			B			C			C	
Queue Length 50th (ft)	25	269		20	231		146	28	71	38	8	0
Queue Length 95th (ft)	64	312		m51	276		224	60	146	70	23	33
Internal Link Dist (ft)		1250			590			722			346	
Turn Bay Length (ft)	110			115			150		90	145		100
Base Capacity (vph)	172	2861		199	2230		481	558	558	281	388	394
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.54		0.42	0.59		0.49	0.09	0.43	0.18	0.03	0.18

Intersection Summary

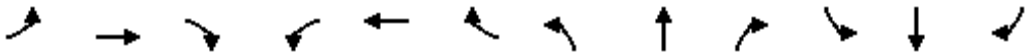
Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.59
Intersection Signal Delay: 17.4 Intersection LOS: B
Intersection Capacity Utilization 66.5% ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: 10th St & McDowell Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	1049	190	195	974	37	145	0	112	73	0	69
Future Volume (vph)	36	1049	190	195	974	37	145	0	112	73	0	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	220		0	150		90	152		265
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.977			0.995				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950	*0.950	
Satd. Flow (prot)	1770	4968	0	1770	3522	0	1770	0	1583	1770	0	1583
Flt Permitted	0.260			0.143			0.950			0.950		
Satd. Flow (perm)	484	4968	0	266	3522	0	1770	0	1583	1770	0	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		50			8				122			75
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		1330			1339			743			426	
Travel Time (s)		25.9			26.1			20.3			11.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1140	207	212	1059	40	158	0	122	79	0	75
Shared Lane Traffic (%)												
Lane Group Flow (vph)	39	1347	0	212	1099	0	158	0	122	79	0	75
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1		1	1		1
Detector Template	Left	Thru		Left	Thru		Left		Right	Left		Right
Leading Detector (ft)	20	100		20	100		20		20	20		20
Trailing Detector (ft)	0	0		0	0		0		0	0		0
Detector 1 Position(ft)	0	0		0	0		0		0	0		0
Detector 1 Size(ft)	20	6		20	6		20		20	20		20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Detector 2 Position(ft)		94			94							
Detector 2 Size(ft)		6			6							
Detector 2 Type		Cl+Ex			Cl+Ex							
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0							
Turn Type	Perm	NA		pm+pt	NA		Perm		Perm	Perm		Perm
Protected Phases		4		3	8							
Permitted Phases	4			8			6		6	2		2

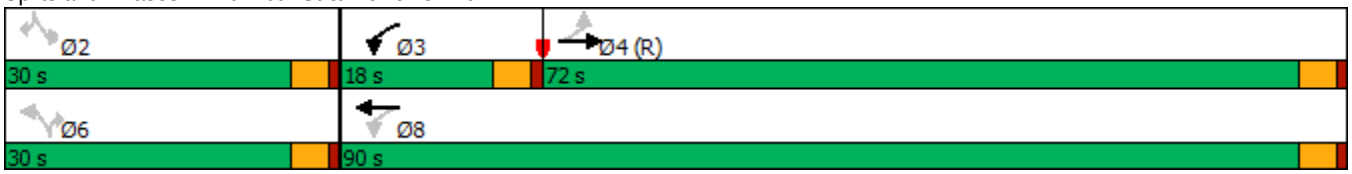


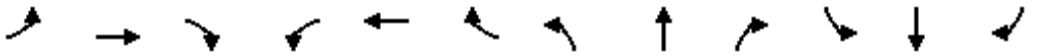
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8		6		6	2		2
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0		5.0	1.0		1.0
Minimum Split (s)	26.0	26.0		10.5	26.0		29.0		29.0	29.0		29.0
Total Split (s)	72.0	72.0		18.0	90.0		30.0		30.0	30.0		30.0
Total Split (%)	60.0%	60.0%		15.0%	75.0%		25.0%		25.0%	25.0%		25.0%
Maximum Green (s)	67.5	67.5		13.5	85.5		25.5		25.5	25.5		25.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5		3.5	3.5		3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0		1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5		4.5	4.5		4.5
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0		3.0	3.0		3.0
Recall Mode	C-Max	C-Max		None	None		Max		Max	Max		Max
Walk Time (s)	7.0	7.0			7.0		7.0		7.0	7.0		7.0
Flash Dont Walk (s)	14.5	14.5			12.0		17.5		17.5	17.5		17.5
Pedestrian Calls (#/hr)	4	4			18		4		4	0		0
Act Effct Green (s)	70.7	70.7		85.5	85.5		25.5		25.5	25.5		25.5
Actuated g/C Ratio	0.59	0.59		0.71	0.71		0.21		0.21	0.21		0.21
v/c Ratio	0.14	0.46		0.67	0.44		0.42		0.28	0.21		0.19
Control Delay	13.3	14.1		24.2	10.6		44.9		8.7	40.8		9.9
Queue Delay	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Total Delay	13.3	14.1		24.2	10.6		44.9		8.7	40.8		9.9
LOS	B	B		C	B		D		A	D		A
Approach Delay		14.1			12.8			29.1			25.7	
Approach LOS		B			B			C			C	
Queue Length 50th (ft)	13	194		85	194		107		0	51		0
Queue Length 95th (ft)	34	246		143	271		174		50	96		40
Internal Link Dist (ft)		1250			1259			663			346	
Turn Bay Length (ft)	110			220			150		90	152		265
Base Capacity (vph)	284	2946		358	2511		376		432	376		395
Starvation Cap Reductn	0	0		0	0		0		0	0		0
Spillback Cap Reductn	0	0		0	0		0		0	0		0
Storage Cap Reductn	0	0		0	0		0		0	0		0
Reduced v/c Ratio	0.14	0.46		0.59	0.44		0.42		0.28	0.21		0.19

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.67			
Intersection Signal Delay: 15.5		Intersection LOS: B	
Intersection Capacity Utilization 54.6%		ICU Level of Service A	
Analysis Period (min) 15			

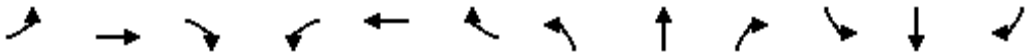
* User Entered Value

Splits and Phases: 10: 10th St & McDowell Rd





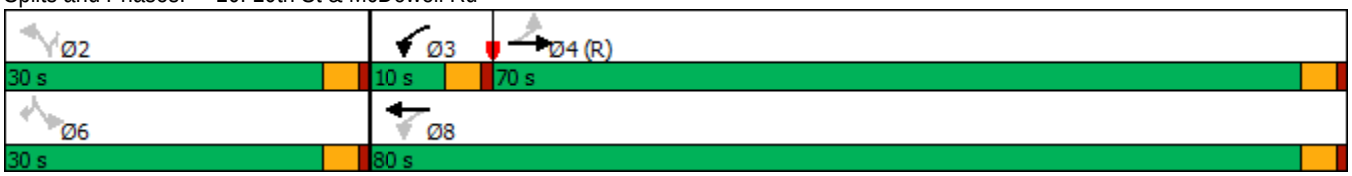
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	1335	85	76	1162	51	238	0	244	52	0	71
Future Volume (vph)	56	1335	85	76	1162	51	238	0	244	52	0	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	115		0	150		90	145		100
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.991			0.994				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5040	0	1770	3518	0	1770	0	1583	1770	0	1583
Flt Permitted	0.182			0.112			0.950			0.950		
Satd. Flow (perm)	339	5040	0	209	3518	0	1770	0	1583	1770	0	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16			9				130			77
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1330			670			715			426	
Travel Time (s)		30.2			15.2			16.3			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	61	1451	92	83	1263	55	259	0	265	57	0	77
Shared Lane Traffic (%)												
Lane Group Flow (vph)	61	1543	0	83	1318	0	259	0	265	57	0	77
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1		1	1		1
Detector Template	Left	Thru		Left	Thru		Left		Right	Left		Right
Leading Detector (ft)	20	100		20	100		20		20	20		20
Trailing Detector (ft)	0	0		0	0		0		0	0		0
Detector 1 Position(ft)	0	0		0	0		0		0	0		0
Detector 1 Size(ft)	20	6		20	6		20		20	20		20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Detector 2 Position(ft)		94			94							
Detector 2 Size(ft)		6			6							
Detector 2 Type		Cl+Ex			Cl+Ex							
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0							
Turn Type	Perm	NA		pm+pt	NA		Perm		Perm	Perm		Perm
Protected Phases		4		3	8							
Permitted Phases	4			8			2		2	6		6

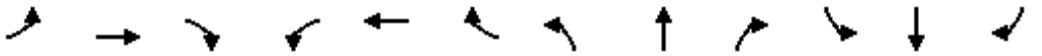


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8		2		2	6		6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0		5.0	5.0		5.0
Minimum Split (s)	26.0	26.0		9.5	26.0		29.4		29.4	29.0		29.0
Total Split (s)	70.0	70.0		10.0	80.0		30.0		30.0	30.0		30.0
Total Split (%)	63.6%	63.6%		9.1%	72.7%		27.3%		27.3%	27.3%		27.3%
Maximum Green (s)	66.0	66.0		6.0	76.0		26.0		26.0	26.0		26.0
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0		3.0	3.0		3.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0		1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0		4.0
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0		3.0	3.0		3.0
Recall Mode	C-Max	C-Max		None	Max		Max		Max	Min		Min
Walk Time (s)	7.0	7.0			7.0		7.0		7.0	7.0		7.0
Flash Dont Walk (s)	14.5	14.5			12.0		17.9		17.9	17.9		17.9
Pedestrian Calls (#/hr)	4	4			18		4		4	4		4
Act Effct Green (s)	68.0	68.0		76.0	76.0		26.0		26.0	26.0		26.0
Actuated g/C Ratio	0.62	0.62		0.69	0.69		0.24		0.24	0.24		0.24
v/c Ratio	0.29	0.49		0.36	0.54		0.62		0.56	0.14		0.18
Control Delay	15.4	12.4		10.0	9.3		45.0		23.5	34.3		8.7
Queue Delay	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Total Delay	15.4	12.4		10.0	9.3		45.0		23.5	34.3		8.7
LOS	B	B		B	A		D		C	C		A
Approach Delay		12.6			9.4			34.1			19.6	
Approach LOS		B			A			C			B	
Queue Length 50th (ft)	20	212		17	214		164		81	32		0
Queue Length 95th (ft)	50	250		32	264		253		168	67		38
Internal Link Dist (ft)		1250			590			635			346	
Turn Bay Length (ft)	110			115			150		90	145		100
Base Capacity (vph)	209	3121		229	2433		418		473	418		432
Starvation Cap Reductn	0	0		0	0		0		0	0		0
Spillback Cap Reductn	0	0		0	0		0		0	0		0
Storage Cap Reductn	0	0		0	0		0		0	0		0
Reduced v/c Ratio	0.29	0.49		0.36	0.54		0.62		0.56	0.14		0.18

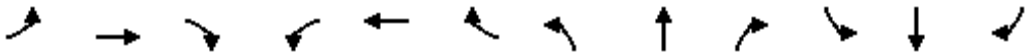
Intersection Summary			
Area Type:	Other		
Cycle Length: 110			
Actuated Cycle Length: 110			
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 65			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.62			
Intersection Signal Delay: 14.7		Intersection LOS: B	
Intersection Capacity Utilization 61.3%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 10: 10th St & McDowell Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	1049	190	195	974	37	145	0	112	73	0	69
Future Volume (vph)	36	1049	190	195	974	37	145	0	112	73	0	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	220		0	150		90	152		265
Storage Lanes	1		0	1		0	2		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	0.97	1.00	1.00	1.00	1.00	1.00
Frt		0.977			0.995				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950	*0.950	
Satd. Flow (prot)	1770	4968	0	1770	3522	0	3433	0	1583	1770	0	1583
Flt Permitted	0.260			0.143			0.950			0.950		
Satd. Flow (perm)	484	4968	0	266	3522	0	3433	0	1583	1770	0	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		50			8				122			75
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		1330			1339			736			426	
Travel Time (s)		25.9			26.1			20.1			11.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1140	207	212	1059	40	158	0	122	79	0	75
Shared Lane Traffic (%)												
Lane Group Flow (vph)	39	1347	0	212	1099	0	158	0	122	79	0	75
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1		1	1		1
Detector Template	Left	Thru		Left	Thru		Left		Right	Left		Right
Leading Detector (ft)	20	100		20	100		20		20	20		20
Trailing Detector (ft)	0	0		0	0		0		0	0		0
Detector 1 Position(ft)	0	0		0	0		0		0	0		0
Detector 1 Size(ft)	20	6		20	6		20		20	20		20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Detector 2 Position(ft)		94			94							
Detector 2 Size(ft)		6			6							
Detector 2 Type		Cl+Ex			Cl+Ex							
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0							
Turn Type	Perm	NA		pm+pt	NA		Perm		Perm	Perm		Perm
Protected Phases		4		3	8							
Permitted Phases	4			8			6		6	2		2

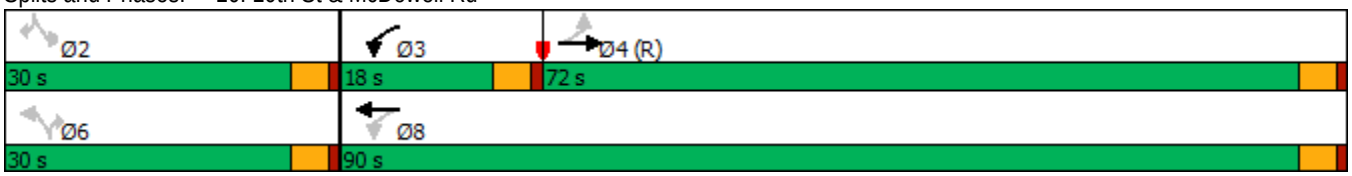


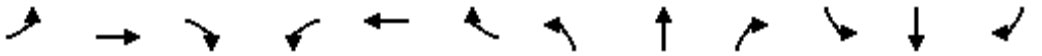
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8		6		6	2		2
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0		5.0	1.0		1.0
Minimum Split (s)	26.0	26.0		10.5	26.0		29.0		29.0	29.0		29.0
Total Split (s)	72.0	72.0		18.0	90.0		30.0		30.0	30.0		30.0
Total Split (%)	60.0%	60.0%		15.0%	75.0%		25.0%		25.0%	25.0%		25.0%
Maximum Green (s)	67.5	67.5		13.5	85.5		25.5		25.5	25.5		25.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5		3.5	3.5		3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0		1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5		4.5	4.5		4.5
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0		3.0	3.0		3.0
Recall Mode	C-Max	C-Max		None	None		Max		Max	Max		Max
Walk Time (s)	7.0	7.0			7.0		7.0		7.0	7.0		7.0
Flash Dont Walk (s)	14.5	14.5			12.0		17.5		17.5	17.5		17.5
Pedestrian Calls (#/hr)	4	4			18		4		4	0		0
Act Effct Green (s)	70.7	70.7		85.5	85.5		25.5		25.5	25.5		25.5
Actuated g/C Ratio	0.59	0.59		0.71	0.71		0.21		0.21	0.21		0.21
v/c Ratio	0.14	0.46		0.67	0.44		0.22		0.28	0.21		0.19
Control Delay	13.3	14.1		24.2	10.6		39.9		8.7	40.8		9.9
Queue Delay	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Total Delay	13.3	14.1		24.2	10.6		39.9		8.7	40.8		9.9
LOS	B	B		C	B		D		A	D		A
Approach Delay		14.1			12.8			26.3			25.7	
Approach LOS		B			B			C			C	
Queue Length 50th (ft)	13	194		85	194		52		0	51		0
Queue Length 95th (ft)	34	246		143	271		83		50	96		40
Internal Link Dist (ft)		1250			1259			656			346	
Turn Bay Length (ft)	110			220			150		90	152		265
Base Capacity (vph)	284	2946		358	2511		729		432	376		395
Starvation Cap Reductn	0	0		0	0		0		0	0		0
Spillback Cap Reductn	0	0		0	0		0		0	0		0
Storage Cap Reductn	0	0		0	0		0		0	0		0
Reduced v/c Ratio	0.14	0.46		0.59	0.44		0.22		0.28	0.21		0.19

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.67			
Intersection Signal Delay: 15.2		Intersection LOS: B	
Intersection Capacity Utilization 50.7%		ICU Level of Service A	
Analysis Period (min) 15			

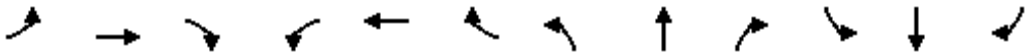
* User Entered Value

Splits and Phases: 10: 10th St & McDowell Rd





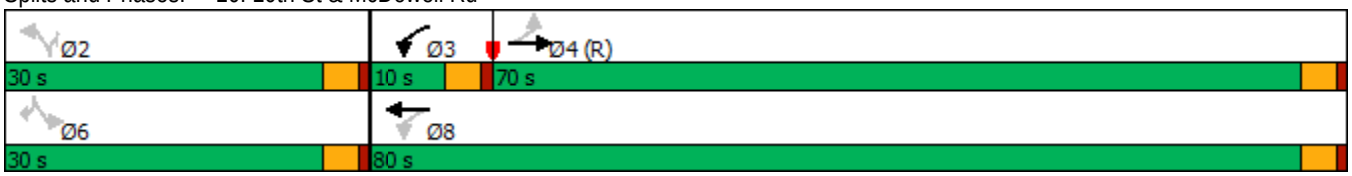
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	1335	85	76	1162	51	238	0	244	52	0	71
Future Volume (vph)	56	1335	85	76	1162	51	238	0	244	52	0	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	115		0	150		90	145		100
Storage Lanes	1		0	1		0	2		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	0.97	1.00	1.00	1.00	1.00	1.00
Frt		0.991			0.994				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5040	0	1770	3518	0	3433	0	1583	1770	0	1583
Flt Permitted	0.182			0.112			0.950			0.950		
Satd. Flow (perm)	339	5040	0	209	3518	0	3433	0	1583	1770	0	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16			9				130			77
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1330			670			805			426	
Travel Time (s)		30.2			15.2			18.3			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	61	1451	92	83	1263	55	259	0	265	57	0	77
Shared Lane Traffic (%)												
Lane Group Flow (vph)	61	1543	0	83	1318	0	259	0	265	57	0	77
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1		1	1		1
Detector Template	Left	Thru		Left	Thru		Left		Right	Left		Right
Leading Detector (ft)	20	100		20	100		20		20	20		20
Trailing Detector (ft)	0	0		0	0		0		0	0		0
Detector 1 Position(ft)	0	0		0	0		0		0	0		0
Detector 1 Size(ft)	20	6		20	6		20		20	20		20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Detector 2 Position(ft)		94			94							
Detector 2 Size(ft)		6			6							
Detector 2 Type		Cl+Ex			Cl+Ex							
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0							
Turn Type	Perm	NA		pm+pt	NA		Perm		Perm	Perm		Perm
Protected Phases		4		3	8							
Permitted Phases	4			8			2		2	6		6



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		3	8		2		2	6		6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0		5.0	5.0		5.0
Minimum Split (s)	26.0	26.0		9.5	26.0		29.4		29.4	29.0		29.0
Total Split (s)	70.0	70.0		10.0	80.0		30.0		30.0	30.0		30.0
Total Split (%)	63.6%	63.6%		9.1%	72.7%		27.3%		27.3%	27.3%		27.3%
Maximum Green (s)	66.0	66.0		6.0	76.0		26.0		26.0	26.0		26.0
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0		3.0	3.0		3.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0		1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0		4.0
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0		3.0	3.0		3.0
Recall Mode	C-Max	C-Max		None	Max		Max		Max	Min		Min
Walk Time (s)	7.0	7.0			7.0		7.0		7.0	7.0		7.0
Flash Dont Walk (s)	14.5	14.5			12.0		17.9		17.9	17.9		17.9
Pedestrian Calls (#/hr)	4	4			18		4		4	4		4
Act Effct Green (s)	68.0	68.0		76.0	76.0		26.0		26.0	26.0		26.0
Actuated g/C Ratio	0.62	0.62		0.69	0.69		0.24		0.24	0.24		0.24
v/c Ratio	0.29	0.49		0.36	0.54		0.32		0.56	0.14		0.18
Control Delay	15.4	12.4		10.0	9.3		36.0		23.5	34.3		8.7
Queue Delay	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Total Delay	15.4	12.4		10.0	9.3		36.0		23.5	34.3		8.7
LOS	B	B		B	A		D		C	C		A
Approach Delay		12.6			9.4			29.7			19.6	
Approach LOS		B			A			C			B	
Queue Length 50th (ft)	20	212		17	214		78		81	32		0
Queue Length 95th (ft)	50	250		32	264		115		168	67		38
Internal Link Dist (ft)		1250			590			725			346	
Turn Bay Length (ft)	110			115			150		90	145		100
Base Capacity (vph)	209	3121		229	2433		811		473	418		432
Starvation Cap Reductn	0	0		0	0		0		0	0		0
Spillback Cap Reductn	0	0		0	0		0		0	0		0
Storage Cap Reductn	0	0		0	0		0		0	0		0
Reduced v/c Ratio	0.29	0.49		0.36	0.54		0.32		0.56	0.14		0.18

Intersection Summary			
Area Type:	Other		
Cycle Length: 110			
Actuated Cycle Length: 110			
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green			
Natural Cycle: 65			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.56			
Intersection Signal Delay: 14.0		Intersection LOS: B	
Intersection Capacity Utilization 56.1%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 10: 10th St & McDowell Rd



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Memorandum

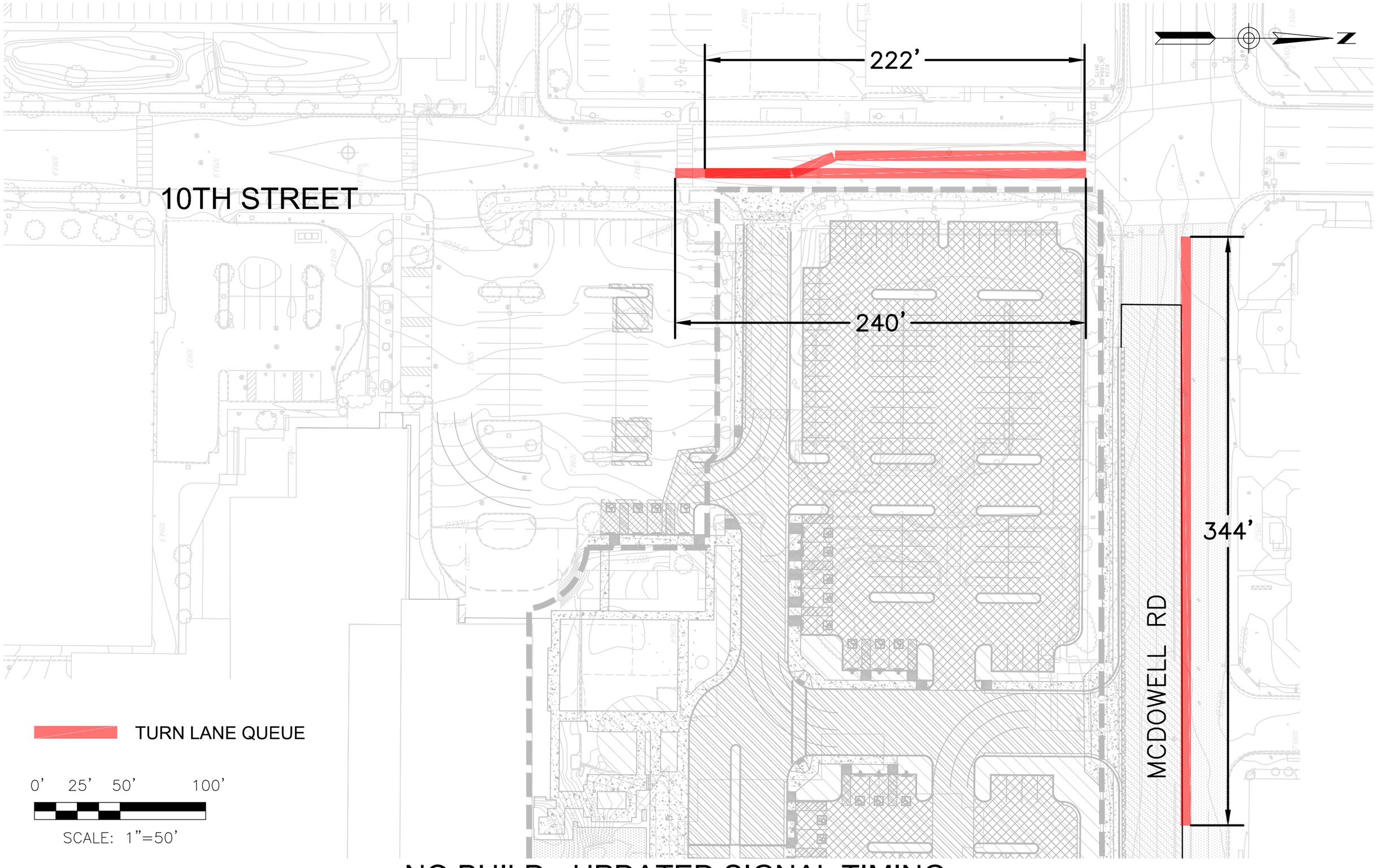
To:	Banner University Medical Center Phoenix	**Date:**	6/6/2019 Version 3.0
Copy:	HKS		
From:	Dibble Engineering	**Project No:**	1117122
Subject:	BUMCP 10th Street Mitigation Options, Version 3		

10th Street & McDowell Road Intersection
Issues and Considerations

This is a supplemental memorandum to two previous version of the memorandum. The analysis in this memorandum looks at the effects of the signal timing update for the intersection of 10th Street and McDowell Road. The analysis then looks at the pros and cons of 2 options for the configuration and traffic signal phasing and sequencing for the 10th Street and McDowell Road intersection and how they might perform with anticipated traffic demand. The mitigation options stem from Option 7 analyzed in Version 2 of the BUMCP 10th Street Mitigation Options memorandum. The intersection footprint remains the same as Option 7, however, the signal timing and phasing changes for the two additional options.

Existing Updated – Updated Signal Timing for 10th Street with 7th St & 12th Street Offsets Included

Description
The signal timing was updated for the intersection since the analysis of this intersection was first conducted. The signal timing was adjusted for the No Build scenario to see the effects on the traffic delays and queues without any changes being made to the infrastructure. After the adjustments were made, more time was given to the northbound and southbound traffic, which did help the traffic. This was especially the case for the northbound left turning traffic in the afternoon. The remaining mitigation analysis is compared to the results of this existing infrastructure, updated signal timing



NO BUILD - UPDATED SIGNAL TIMING

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Option 7b – Dual Left Lanes (Prot) & Single Dedicated Right Turn Lane without NB/SB Through Lane Travel

Description

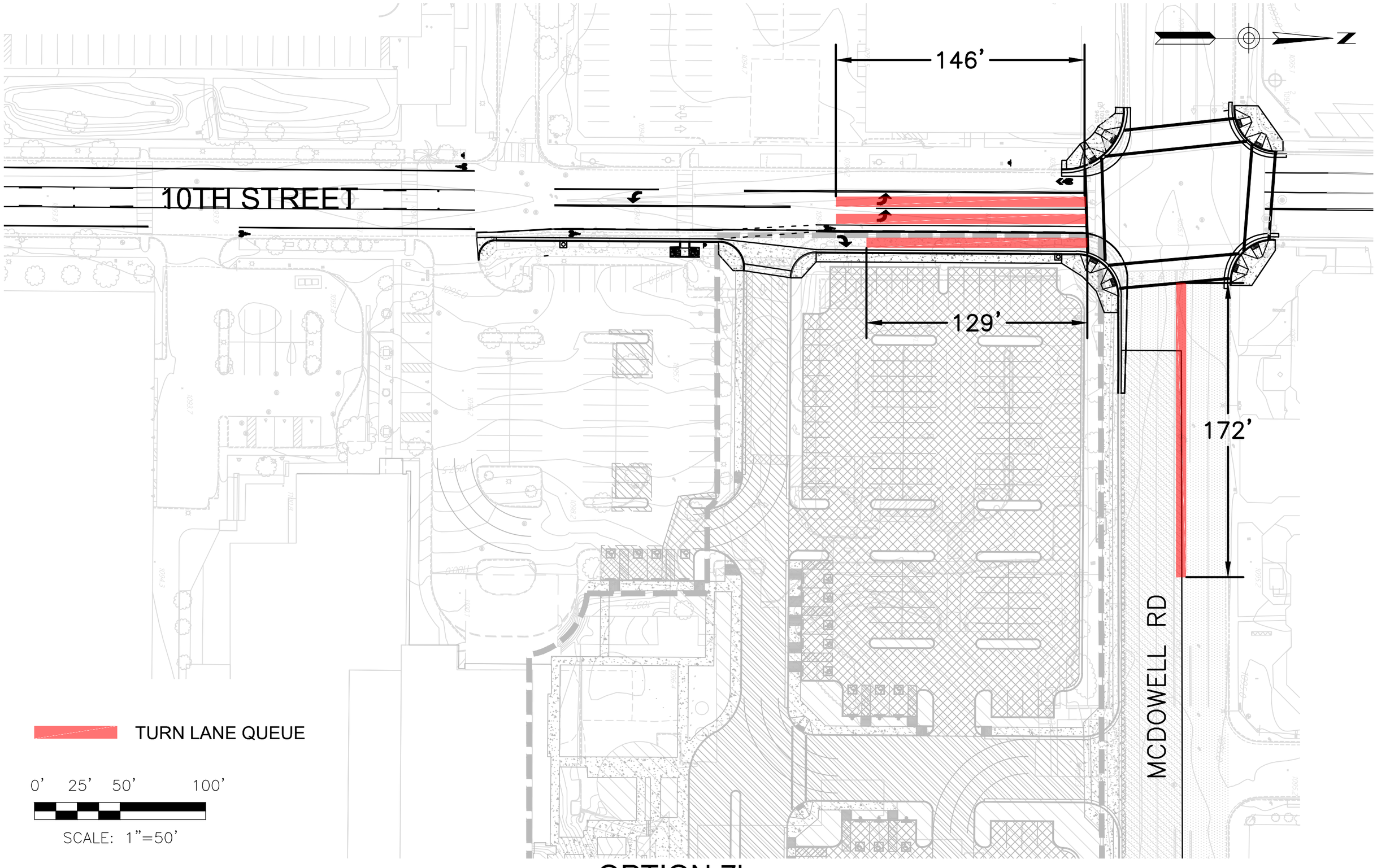
This option stems from Option 7 and therefore eliminates the northbound and southbound throughput traffic for the intersection. The option also includes a dual northbound left turn lane and a northbound dedicated right turn lane; however, the phasing is protected for the northbound left turns. The southbound left turn has protected/permissive phasing. All the pedestrian crosswalks remain open for this option.

Pros

- Decreases westbound left turn delay by over 63.3 seconds in the morning
- Decreases westbound left turn queue by about 172 feet (9 vehicles) in the morning
- Decreases the northbound left turn queue by about 76 feet per lane (4 vehicles/lane) in the afternoon
- Decreases the northbound right turn delay by about 15 seconds in the afternoon
- Decreases the northbound right turn queue by about 111 feet (5-6 vehicles) in the afternoon
- Residential neighbors who are critics of the traffic impacts of the Banner development may regard this as a substantive jester of good will. It is a way to help mitigate traffic impacts to a surrounding neighborhood by reducing cut thru potential at a major neighborhood entry point.
- Eliminates the conflict and potential crash risk of through movements with left turning movements.
- If all the left turners and there are no pedestrian calls the signal can cycle back to McDowell and right turners can turn when they have gaps.
- Has the highest capacity configuration of any of the analyzed options. Presents a safety margin if traffic volumes increase.
- Queues waiting on 10th Street northbound are much less likely to interfere with driveways on 10th and left turn lane into emergency room area.
- The northbound left turn queues are not likely to block right turning traffic from accessing the right turn lane.

Cons

- There is no longer the ability to travel through at the intersection in the northbound and southbound direction.
- Will require drivers to pay attention, additional pavement markings and signing to explain the inability to go through at the intersection.
- May require periodic enforcement by City of Phoenix PD.
- Increases the northbound left turn delay by about 21 seconds in the afternoon


10TH STREET
146’
129’
172’
MCDOWELL RD
TURN LANE QUEUE
0’ 25’ 50’ 100’
SCALE: 1”=50’

OPTION 7b

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Option 7c – Dual Left Lanes (Prot/Perm) & Single Dedicated Right Turn Lane without NB/SB Through Lane Travel

Description

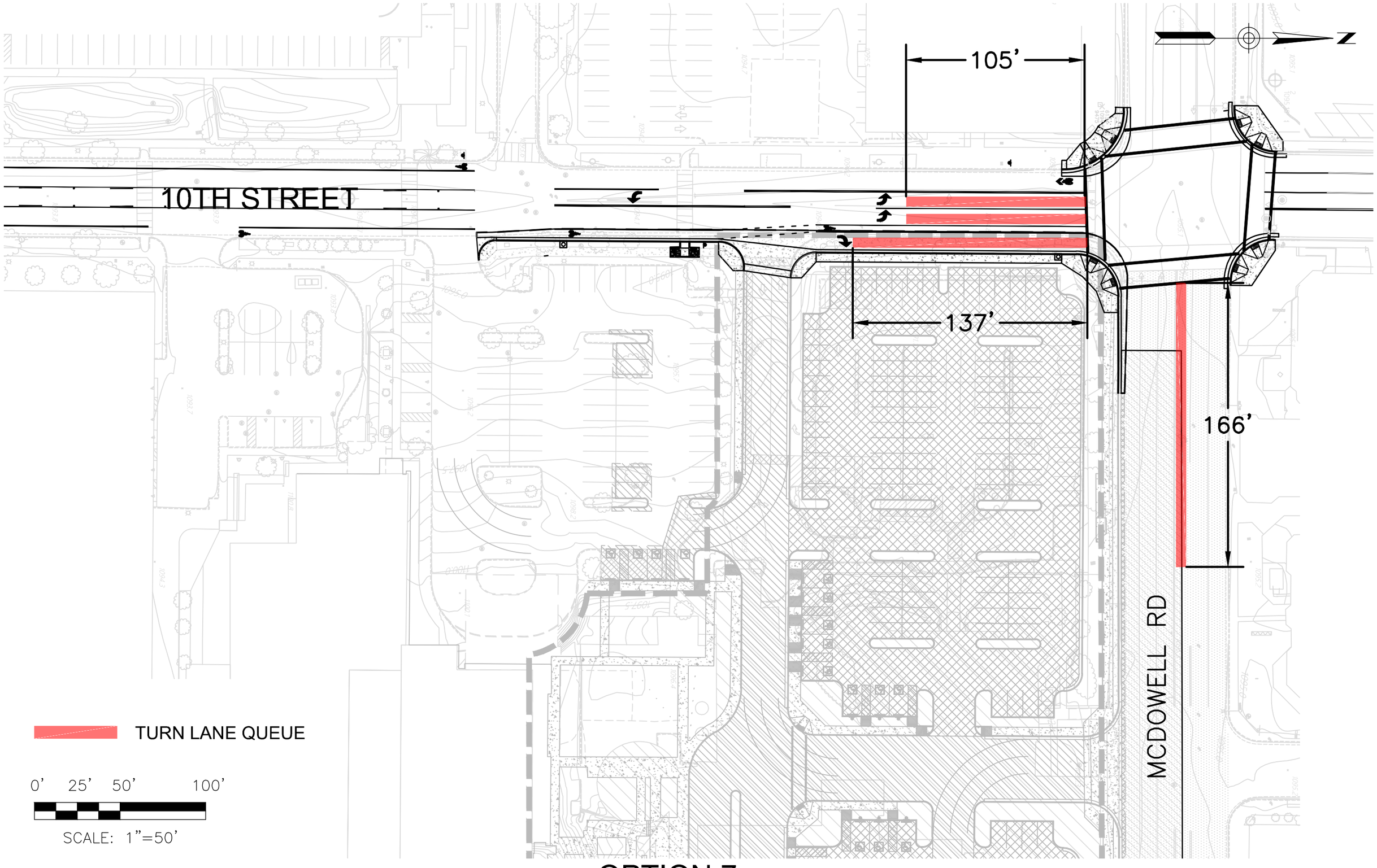
This option stems from Option 7b by adding a permissive phase to the northbound dual left turn. The northbound and southbound through lanes are still eliminated and the addition of the northbound right turn lane remains. and therefore, eliminates the northbound and southbound throughput traffic for the intersection. The southbound left turn has protected/permissive phasing. All the pedestrian crosswalks remain open for this option.

Pros

- Decreases westbound left turn delay by over 66 seconds in the morning
- Decreases westbound left turn queue by about 178 feet (9 vehicles) in the morning
- Decreases the northbound left turn delay by about 7 seconds in the afternoon
- Decreases the northbound left turn queue by about 117 feet per lane (6 vehicles/lane) in the afternoon
- Decreases the northbound right turn delay by about 15 seconds in the afternoon
- Decreases the northbound right turn queue by about 103 feet (5-6 vehicles) in the afternoon
- Residential neighbors who are critics of the traffic impacts of the Banner development may regard this as a substantive jester of good will. It is a way to help mitigate traffic impacts to a surrounding neighborhood by reducing cut thru potential at a major neighborhood entry point.
- Eliminates the conflict and potential crash risk of through movements with left turning movements.
- If all the left turners and there are no pedestrian calls the signal can cycle back to McDowell and right turners can turn when they have gaps.
- Queues waiting on 10th Street northbound are much less likely to interfere with driveways on 10th and left turn lane into emergency room area.
- The northbound left turn queues are not likely to block right turning traffic from accessing the right turn lane.

Cons

- There is no longer the ability to travel through at the intersection in the northbound and southbound direction.
- Will require drivers to pay attention, additional pavement markings and signing to explain the inability to go through at the intersection.
- May require periodic enforcement by City of Phoenix PD.


10TH STREET
105’
137’
166’
MCDOWELL RD
TURN LANE QUEUE
0’ 25’ 50’ 100’
SCALE: 1”=50’

OPTION 7c

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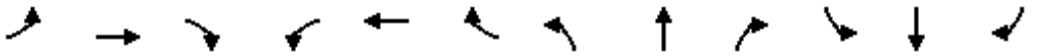
Figure 1 – Summary of Level of Service and Delay for all Options

Improvement	Peak Time	Intersection LOS	Intersection Delay (s)	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
				EBL	EBL	EBT	EBT	EBR	EBR	WBL	WBL	WBT	WBT	WBR	WBR	NBL	NBL	NBT	NBT	NBR	NBR	SBL	SBL	SBT	SBT	SBR	SBR
Existing Configuration	AM	B	12.7	6.7	A	6.7	A	6.7	A	57.9	E	48	D	4.8	A	48.6	D	11	B	11	B	44.1	D	37.8	D	10	A
	PM	B	14.8	10	A	7.5	A	7.5	A	14.6	B	6.7	A	6.7	A	64.7	E	44	D	44	D	58.2	E	37.8	D	10	A
Updated Existing	AM	B	14	4	A	3.4	A	3.4	A	106.4	F	5.2	A	5.2	A	38.7	D	10.6	B	10.6	B	35.7	D	31.8	NA	8.2	A
	PM	C	26.9	40.6	D	31	C	31	C	45.7	D	18.9	B	18.9	B	35.2	D	30.3	C	30.3	C	29.9	C	26.3	NA	9.8	A
Option 7b	AM	B	16	10.2	B	10.9	B	10.9	B	43.1	D	8.8	A	8.8	A	75.9	E	0	NA	9.2	A	32.2	C	0	NA	5.4	A
	PM	C	25.7	39.3	D	33.7	C	33.7	C	13.4	B	13.7	B	13.7	B	56	E	0	NA	15.2	B	27.6	C	0	NA	6.3	A
Option 7c	AM	B	13.1	9.6	A	10.3	B	10.3	B	40.4	D	8	A	8	A	33.3	C	0	NA	9.2	A	33.8	C	0	NA	5.4	A
	PM	C	23.7	39.3	D	33.7	C	33.7	C	13.4	B	13.7	B	13.7	B	28.4	C	0	NA	15.2	B	27.6	C	0	NA	6.3	A

Figure 2 – Summary of Queue Lengths for Key Turning Movements

Intersection	Peak Hour	Exist Config Queue (ft)			Updated Existing Queue (ft)			7b Queue (ft)			7c Queue (ft)		
		WBL	NBL	NBR	WBL	NBL	NBR	WBL	NBL	NBR	WBL	NBL	NBR
10th St & McDowell Rd	AM	318	175	60	344	159	62	172	113	52	166	75	52
	PM	41	301	262	121	222	240	33	146	129	30	105	137

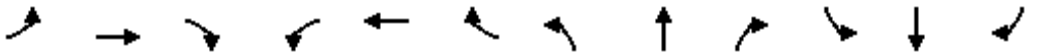


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	1049	190	195	974	37	139	12	106	68	9	65
Future Volume (vph)	36	1049	190	195	974	37	139	12	106	68	9	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	115		0	150		0	145		100
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.977			0.995			0.865				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	4968	0	1770	3522	0	1770	1611	0	1770	1863	1583
Flt Permitted	0.208			0.163			0.751			0.636		
Satd. Flow (perm)	387	4968	0	304	3522	0	1399	1611	0	1185	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		61			6			104				71
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1330			670			291			426	
Travel Time (s)		30.2			15.2			6.6			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1140	207	212	1059	40	151	13	115	74	10	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	39	1347	0	212	1099	0	151	128	0	74	10	71
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		4
Minimum Split (s)	30.0	30.0		30.0	30.0		30.0	30.0		30.0	30.0	30.0
Total Split (s)	82.0	82.0		82.0	82.0		38.0	38.0		38.0	38.0	38.0
Total Split (%)	68.3%	68.3%		68.3%	68.3%		31.7%	31.7%		31.7%	31.7%	31.7%
Maximum Green (s)	77.2	77.2		77.2	77.2		33.3	33.3		33.3	33.3	33.3
Yellow Time (s)	3.0	3.0		3.0	3.0		3.6	3.6		3.6	3.6	3.6
All-Red Time (s)	1.8	1.8		1.8	1.8		1.1	1.1		1.1	1.1	1.1
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.8	4.8		4.8	4.8		4.7	4.7		4.7	4.7	4.7
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	8.0	8.0		8.0	8.0		8.0	8.0		8.0	8.0	8.0
Flash Dont Walk (s)	14.0	14.0		14.0	14.0		10.0	10.0		10.0	10.0	10.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effct Green (s)	77.2	77.2		77.2	77.2		33.3	33.3		33.3	33.3	33.3
Actuated g/C Ratio	0.64	0.64		0.64	0.64		0.28	0.28		0.28	0.28	0.28
v/c Ratio	0.16	0.42		1.09	0.48		0.39	0.25		0.23	0.02	0.14

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	4.0	3.4		106.4	5.2		38.7	10.6		35.7	31.8	8.2
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	4.0	3.4		106.4	5.2		38.7	10.6		35.7	31.8	8.2
LOS	A	A		F	A		D	B		D	C	A
Approach Delay		3.4			21.6			25.8			22.9	
Approach LOS		A			C			C			C	
Queue Length 50th (ft)	3	35		~186	64		95	14		44	6	0
Queue Length 95th (ft)	m5	41		#344	75		159	62		87	19	36
Internal Link Dist (ft)		1250			590			211			346	
Turn Bay Length (ft)	110			115			150			145		100
Base Capacity (vph)	248	3217		195	2267		388	522		328	516	490
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.16	0.42		1.09	0.48		0.39	0.25		0.23	0.02	0.14

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 14 (12%), Referenced to phase 2:EBWB, Start of Green	
Natural Cycle: 100	
Control Type: Pretimed	
Maximum v/c Ratio: 1.09	
Intersection Signal Delay: 14.0	Intersection LOS: B
Intersection Capacity Utilization 66.9%	ICU Level of Service C
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 10: 10th St & McDowell Rd



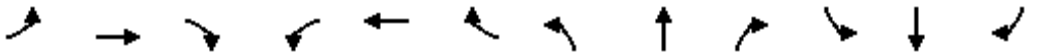
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	1335	85	76	1162	51	215	47	220	47	10	66
Future Volume (vph)	56	1335	85	76	1162	51	215	47	220	47	10	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	115		0	175		0	145		100
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.991			0.994			0.876				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5042	0	1787	3518	0	1787	1648	0	1770	1863	1583
Flt Permitted	0.127			0.114			0.750			0.436		
Satd. Flow (perm)	237	5042	0	214	3518	0	1411	1648	0	812	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		14			6			37				58
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1330			670			382			426	
Travel Time (s)		30.2			15.2			8.7			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	1%	1%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	61	1451	92	83	1263	55	234	51	239	51	11	72
Shared Lane Traffic (%)												
Lane Group Flow (vph)	61	1543	0	83	1318	0	234	290	0	51	11	72
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		4
Minimum Split (s)	22.7	22.7		22.7	22.7		26.8	26.8		26.8	26.8	26.8
Total Split (s)	74.0	74.0		74.0	74.0		46.0	46.0		46.0	46.0	46.0
Total Split (%)	61.7%	61.7%		61.7%	61.7%		38.3%	38.3%		38.3%	38.3%	38.3%
Maximum Green (s)	69.3	69.3		69.3	69.3		41.2	41.2		41.2	41.2	41.2
Yellow Time (s)	3.6	3.6		3.6	3.6		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	1.1	1.1		1.1	1.1		1.8	1.8		1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.7	4.7		4.7	4.7		4.8	4.8		4.8	4.8	4.8
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	8.0	8.0		8.0	8.0		8.0	8.0		8.0	8.0	8.0
Flash Dont Walk (s)	10.0	10.0		10.0	10.0		14.0	14.0		14.0	14.0	14.0
Pedestrian Calls (#/hr)	59	59		59	59		17	17		17	17	17
Act Effct Green (s)	69.3	69.3		69.3	69.3		41.2	41.2		41.2	41.2	41.2
Actuated g/C Ratio	0.58	0.58		0.58	0.58		0.34	0.34		0.34	0.34	0.34

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.45	0.53		0.67	0.65		0.48	0.49		0.18	0.02	0.12
Control Delay	40.6	31.0		45.7	18.9		35.2	30.3		29.9	26.3	9.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	40.6	31.0		45.7	18.9		35.2	30.3		29.9	26.3	9.8
LOS	D	C		D	B		D	C		C	C	A
Approach Delay		31.4			20.5			32.5			18.8	
Approach LOS		C			C			C			B	
Queue Length 50th (ft)	43	410		53	433		142	153		28	6	7
Queue Length 95th (ft)	m70	463		m#121	525		222	240		60	19	40
Internal Link Dist (ft)		1250			590			302			346	
Turn Bay Length (ft)	110			115			175			145		100
Base Capacity (vph)	136	2917		123	2034		484	590		278	639	581
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.45	0.53		0.67	0.65		0.48	0.49		0.18	0.02	0.12

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 58 (48%), Referenced to phase 2:EBWB, Start of Green
Natural Cycle: 70
Control Type: Pretimed
Maximum v/c Ratio: 0.67
Intersection Signal Delay: 26.9 Intersection LOS: C
Intersection Capacity Utilization 90.6% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: 10th St & McDowell Rd

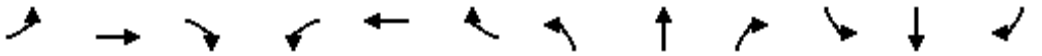


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	1049	190	195	974	37	145	0	112	73	0	69
Future Volume (vph)	36	1049	190	195	974	37	145	0	112	73	0	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	200		0	175		175	250		250
Storage Lanes	1		0	1		0	1		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	0.97	1.00	1.00	1.00	1.00	1.00
Frt		0.977			0.995				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	4968	0	1770	3522	0	3433	0	1583	1770	0	1583
Flt Permitted	0.260			0.119			0.950			0.950		
Satd. Flow (perm)	484	4968	0	222	3522	0	3433	0	1583	1770	0	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		41			6				122			98
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1330			670			382			426	
Travel Time (s)		30.2			15.2			8.7			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1140	207	212	1059	40	158	0	122	79	0	75
Shared Lane Traffic (%)												
Lane Group Flow (vph)	39	1347	0	212	1099	0	158	0	122	79	0	75
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		pm+pt	NA		Prot		Perm	pm+pt		Perm
Protected Phases		2		1	6		3			7		
Permitted Phases	2			6					8	4		4
Minimum Split (s)	26.8	26.8		9.5	26.5		9.5		28.0	9.5		28.0
Total Split (s)	62.0	62.0		18.0	80.0		12.0		28.0	12.0		28.0
Total Split (%)	51.7%	51.7%		15.0%	66.7%		10.0%		23.3%	10.0%		23.3%
Maximum Green (s)	57.2	57.2		13.5	75.5		7.5		23.4	7.5		23.4
Yellow Time (s)	3.0	3.0		3.5	3.5		3.5		3.5	3.5		3.5
All-Red Time (s)	1.8	1.8		1.0	1.0		1.0		1.1	1.0		1.1
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Total Lost Time (s)	4.8	4.8		4.5	4.5		4.5		4.6	4.5		4.6
Lead/Lag	Lag	Lag		Lead			Lead		Lag	Lead		Lag
Lead-Lag Optimize?	Yes	Yes		Yes			Yes		Yes	Yes		Yes
Walk Time (s)	8.0	8.0			8.0				8.0			8.0
Flash Dont Walk (s)	10.0	10.0			10.0				14.0			14.0
Pedestrian Calls (#/hr)	0	0			0				0			0
Act Effct Green (s)	57.2	57.2		75.5	75.5		7.5		23.4	35.5		23.4
Actuated g/C Ratio	0.48	0.48		0.63	0.63		0.06		0.20	0.30		0.20
v/c Ratio	0.17	0.56		0.68	0.50		0.74		0.30	0.15		0.19

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	10.2	10.9		43.1	8.8		75.9		9.2	32.2		5.4
Queue Delay	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Total Delay	10.2	10.9		43.1	8.8		75.9		9.2	32.2		5.4
LOS	B	B		D	A		E		A	C		A
Approach Delay		10.9			14.4			46.8			19.1	
Approach LOS		B			B			D			B	
Queue Length 50th (ft)	6	76		91	130		63		0	45		0
Queue Length 95th (ft)	m11	95		172	150		#113		52	85		26
Internal Link Dist (ft)		1250			590			302			346	
Turn Bay Length (ft)	110			200			175		175	250		250
Base Capacity (vph)	230	2389		313	2218		214		406	523		387
Starvation Cap Reductn	0	0		0	0		0		0	0		0
Spillback Cap Reductn	0	0		0	0		0		0	0		0
Storage Cap Reductn	0	0		0	0		0		0	0		0
Reduced v/c Ratio	0.17	0.56		0.68	0.50		0.74		0.30	0.15		0.19

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 14 (12%), Referenced to phase 2:EBTL, Start of Green			
Natural Cycle: 80			
Control Type: Pretimed			
Maximum v/c Ratio: 0.74			
Intersection Signal Delay: 16.0		Intersection LOS: B	
Intersection Capacity Utilization 56.3%		ICU Level of Service B	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 10: 10th St & McDowell Rd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	1335	85	76	1162	51	238	0	244	52	0	71
Future Volume (vph)	56	1335	85	76	1162	51	238	0	244	52	0	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	115		0	175		175	145		100
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	0.97	1.00	1.00	1.00	1.00	1.00
Frt		0.991			0.994				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5042	0	1787	3518	0	3467	0	1599	1770	0	1583
Flt Permitted	0.154			0.083			0.950			0.950		
Satd. Flow (perm)	287	5042	0	156	3518	0	3467	0	1599	1770	0	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11			6				161			97
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1330			670			382			426	
Travel Time (s)		30.2			15.2			8.7			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	1%	1%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	61	1451	92	83	1263	55	259	0	265	57	0	77
Shared Lane Traffic (%)												
Lane Group Flow (vph)	61	1543	0	83	1318	0	259	0	265	57	0	77
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		pm+pt	NA		Prot		pm+ov	pm+pt		Perm
Protected Phases		2		1	6		3		1	7		
Permitted Phases	2			6			3		8	4		4
Minimum Split (s)	22.7	22.7		9.5	22.7		15.0		9.5	15.0		26.5
Total Split (s)	62.0	62.0		12.0	74.0		19.5		12.0	16.5		26.5
Total Split (%)	51.7%	51.7%		10.0%	61.7%		16.3%		10.0%	13.8%		22.1%
Maximum Green (s)	57.3	57.3		7.5	69.3		15.0		7.5	12.0		22.0
Yellow Time (s)	3.6	3.6		3.5	3.6		3.5		3.5	3.5		3.5
All-Red Time (s)	1.1	1.1		1.0	1.1		1.0		1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Total Lost Time (s)	4.7	4.7		4.5	4.7		4.5		4.5	4.5		4.5
Lead/Lag	Lag	Lag		Lead			Lead		Lead	Lead		Lag
Lead-Lag Optimize?	Yes	Yes		Yes			Yes		Yes	Yes		Yes
Walk Time (s)	8.0	8.0			8.0							8.0
Flash Dont Walk (s)	10.0	10.0			10.0							14.0
Pedestrian Calls (#/hr)	37	37			22							6
Act Effct Green (s)	57.3	57.3		69.5	69.3		15.0		37.0	34.0		22.0
Actuated g/C Ratio	0.48	0.48		0.58	0.58		0.12		0.31	0.28		0.18

Lane Group	Ø8
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Turn Type	
Protected Phases	8
Permitted Phases	
Minimum Split (s)	26.5
Total Split (s)	29.5
Total Split (%)	25%
Maximum Green (s)	25.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Walk Time (s)	8.0
Flash Dont Walk (s)	14.0
Pedestrian Calls (#/hr)	11
Act Effct Green (s)	
Actuated g/C Ratio	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.45	0.64		0.43	0.65		0.60		0.44	0.11		0.21
Control Delay	39.3	33.7		13.4	13.7		56.0		15.2	27.6		6.3
Queue Delay	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Total Delay	39.3	33.7		13.4	13.7		56.0		15.2	27.6		6.3
LOS	D	C		B	B		E		B	C		A
Approach Delay		33.9			13.7			35.4			15.4	
Approach LOS		C			B			D			B	
Queue Length 50th (ft)	42	423		15	404		98		60	30		0
Queue Length 95th (ft)	m69	477		m30	504		144		137	61		28
Internal Link Dist (ft)		1250			590			302			346	
Turn Bay Length (ft)	110			115			175		175	145		100
Base Capacity (vph)	137	2413		192	2034		433		604	501		369
Starvation Cap Reductn	0	0		0	0		0		0	0		0
Spillback Cap Reductn	0	0		0	0		0		0	0		0
Storage Cap Reductn	0	0		0	0		0		0	0		0
Reduced v/c Ratio	0.45	0.64		0.43	0.65		0.60		0.44	0.11		0.21

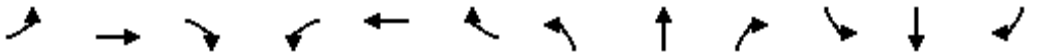
Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 58 (48%), Referenced to phase 2:EBTL, Start of Green
Natural Cycle: 90
Control Type: Pretimed
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 25.7 Intersection LOS: C
Intersection Capacity Utilization 64.6% ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: 10th St & McDowell Rd

Lane Group	Ø8
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

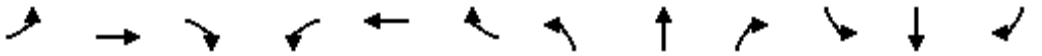


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	1049	190	195	974	37	145	0	112	73	0	69
Future Volume (vph)	36	1049	190	195	974	37	145	0	112	73	0	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	200		0	175		175	250		250
Storage Lanes	1		0	1		0	1		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	0.97	1.00	1.00	1.00	1.00	1.00
Frt		0.977			0.995				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	4968	0	1770	3522	0	3433	0	1583	1770	0	1583
Flt Permitted	0.260			0.123			0.950			0.950		
Satd. Flow (perm)	484	4968	0	229	3522	0	3433	0	1583	1770	0	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		43			6				122			98
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1330			670			382			426	
Travel Time (s)		30.2			15.2			8.7			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1140	207	212	1059	40	158	0	122	79	0	75
Shared Lane Traffic (%)												
Lane Group Flow (vph)	39	1347	0	212	1099	0	158	0	122	79	0	75
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		pm+pt	NA		pm+pt		Perm	pm+pt		Perm
Protected Phases		2		1	6		3			7		
Permitted Phases	2			6			8		8	4		4
Minimum Split (s)	26.8	26.8		9.5	26.5		9.5		28.0	9.5		28.0
Total Split (s)	64.0	64.0		18.0	82.0		10.0		28.0	10.0		28.0
Total Split (%)	53.3%	53.3%		15.0%	68.3%		8.3%		23.3%	8.3%		23.3%
Maximum Green (s)	59.2	59.2		13.5	77.5		5.5		23.4	5.5		23.4
Yellow Time (s)	3.0	3.0		3.5	3.5		3.5		3.5	3.5		3.5
All-Red Time (s)	1.8	1.8		1.0	1.0		1.0		1.1	1.0		1.1
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Total Lost Time (s)	4.8	4.8		4.5	4.5		4.5		4.6	4.5		4.6
Lead/Lag	Lag	Lag		Lead			Lead		Lag	Lead		Lag
Lead-Lag Optimize?	Yes	Yes		Yes			Yes		Yes	Yes		Yes
Walk Time (s)	8.0	8.0			8.0				8.0			8.0
Flash Dont Walk (s)	10.0	10.0			10.0				14.0			14.0
Pedestrian Calls (#/hr)	0	0			0				0			0
Act Effct Green (s)	59.2	59.2		77.5	77.5		33.5		23.4	33.5		23.4
Actuated g/C Ratio	0.49	0.49		0.65	0.65		0.28		0.20	0.28		0.20
v/c Ratio	0.16	0.54		0.66	0.48		0.16		0.30	0.16		0.19

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	9.6	10.3		40.4	8.0		33.3		9.2	33.8		5.4
Queue Delay	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Total Delay	9.6	10.3		40.4	8.0		33.3		9.2	33.8		5.4
LOS	A	B		D	A		C		A	C		A
Approach Delay		10.3			13.2			22.8			19.9	
Approach LOS		B			B			C			B	
Queue Length 50th (ft)	6	75		85	122		47		0	46		0
Queue Length 95th (ft)	m11	91		166	141		75		52	87		26
Internal Link Dist (ft)		1250			590			302			346	
Turn Bay Length (ft)	110			200			175		175	250		250
Base Capacity (vph)	238	2472		321	2276		958		406	494		387
Starvation Cap Reductn	0	0		0	0		0		0	0		0
Spillback Cap Reductn	0	0		0	0		0		0	0		0
Storage Cap Reductn	0	0		0	0		0		0	0		0
Reduced v/c Ratio	0.16	0.54		0.66	0.48		0.16		0.30	0.16		0.19

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 14 (12%), Referenced to phase 2:EBTL, Start of Green			
Natural Cycle: 80			
Control Type: Pretimed			
Maximum v/c Ratio: 0.66			
Intersection Signal Delay: 13.1		Intersection LOS: B	
Intersection Capacity Utilization 56.3%		ICU Level of Service B	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 10: 10th St & McDowell Rd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	1335	85	76	1162	51	238	0	244	52	0	71
Future Volume (vph)	56	1335	85	76	1162	51	238	0	244	52	0	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		0	115		0	175		175	145		100
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	0.97	1.00	1.00	1.00	1.00	1.00
Frt		0.991			0.994				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5042	0	1787	3518	0	3467	0	1599	1770	0	1583
Flt Permitted	0.154			0.083			0.950			0.950		
Satd. Flow (perm)	287	5042	0	156	3518	0	3467	0	1599	1770	0	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11			6				161			97
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1330			670			382			426	
Travel Time (s)		30.2			15.2			8.7			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	1%	1%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	61	1451	92	83	1263	55	259	0	265	57	0	77
Shared Lane Traffic (%)												
Lane Group Flow (vph)	61	1543	0	83	1318	0	259	0	265	57	0	77
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		pm+pt	NA		pm+pt		pm+ov	pm+pt		Perm
Protected Phases		2		1	6		3		1	7		
Permitted Phases	2			6			8		8	4		4
Minimum Split (s)	22.7	22.7		9.5	22.7		15.0		9.5	15.0		26.5
Total Split (s)	62.0	62.0		12.0	74.0		19.5		12.0	16.5		26.5
Total Split (%)	51.7%	51.7%		10.0%	61.7%		16.3%		10.0%	13.8%		22.1%
Maximum Green (s)	57.3	57.3		7.5	69.3		15.0		7.5	12.0		22.0
Yellow Time (s)	3.6	3.6		3.5	3.6		3.5		3.5	3.5		3.5
All-Red Time (s)	1.1	1.1		1.0	1.1		1.0		1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Total Lost Time (s)	4.7	4.7		4.5	4.7		4.5		4.5	4.5		4.5
Lead/Lag	Lag	Lag		Lead			Lead		Lead	Lead		Lag
Lead-Lag Optimize?	Yes	Yes		Yes			Yes		Yes	Yes		Yes
Walk Time (s)	8.0	8.0			8.0							8.0
Flash Dont Walk (s)	10.0	10.0			10.0							14.0
Pedestrian Calls (#/hr)	37	37			22							6
Act Effct Green (s)	57.3	57.3		69.5	69.3		40.0		37.0	34.0		22.0
Actuated g/C Ratio	0.48	0.48		0.58	0.58		0.33		0.31	0.28		0.18

Lane Group	Ø8
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Turn Type	
Protected Phases	8
Permitted Phases	
Minimum Split (s)	26.5
Total Split (s)	29.5
Total Split (%)	25%
Maximum Green (s)	25.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Walk Time (s)	8.0
Flash Dont Walk (s)	14.0
Pedestrian Calls (#/hr)	11
Act Effct Green (s)	
Actuated g/C Ratio	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.45	0.64		0.43	0.65		0.22		0.44	0.11		0.21
Control Delay	39.3	33.7		13.4	13.7		28.4		15.2	27.6		6.3
Queue Delay	0.0	0.0		0.0	0.0		0.0		0.0	0.0		0.0
Total Delay	39.3	33.7		13.4	13.7		28.4		15.2	27.6		6.3
LOS	D	C		B	B		C		B	C		A
Approach Delay		33.9			13.7			21.7			15.4	
Approach LOS		C			B			C			B	
Queue Length 50th (ft)	42	423		15	404		72		60	30		0
Queue Length 95th (ft)	m69	477		m30	504		105		137	61		28
Internal Link Dist (ft)		1250			590			302			346	
Turn Bay Length (ft)	110			115			175		175	145		100
Base Capacity (vph)	137	2413		192	2034		1155		604	501		369
Starvation Cap Reductn	0	0		0	0		0		0	0		0
Spillback Cap Reductn	0	0		0	0		0		0	0		0
Storage Cap Reductn	0	0		0	0		0		0	0		0
Reduced v/c Ratio	0.45	0.64		0.43	0.65		0.22		0.44	0.11		0.21

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 58 (48%), Referenced to phase 2:EBTL, Start of Green			
Natural Cycle: 90			
Control Type: Pretimed			
Maximum v/c Ratio: 0.65			
Intersection Signal Delay: 23.7		Intersection LOS: C	
Intersection Capacity Utilization 64.6%		ICU Level of Service C	
Analysis Period (min) 15			

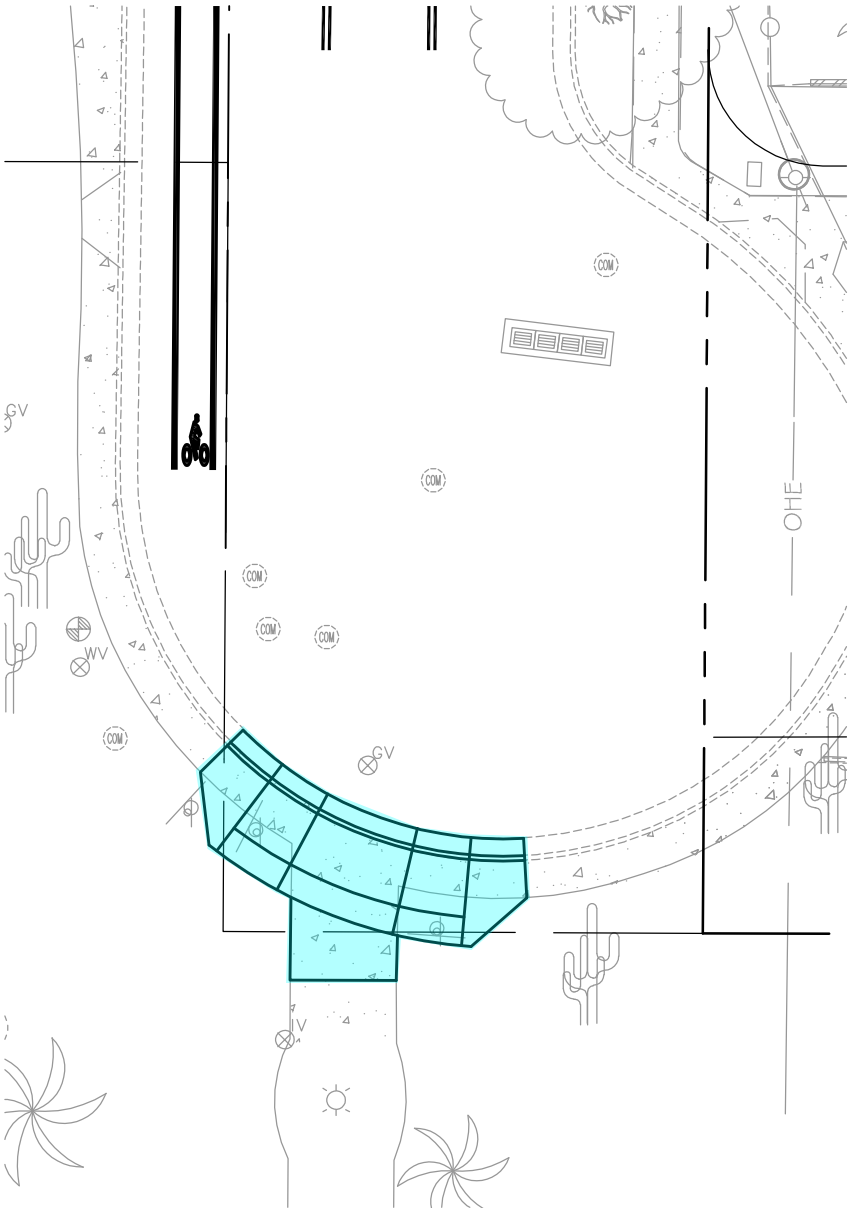
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: 10th St & McDowell Rd

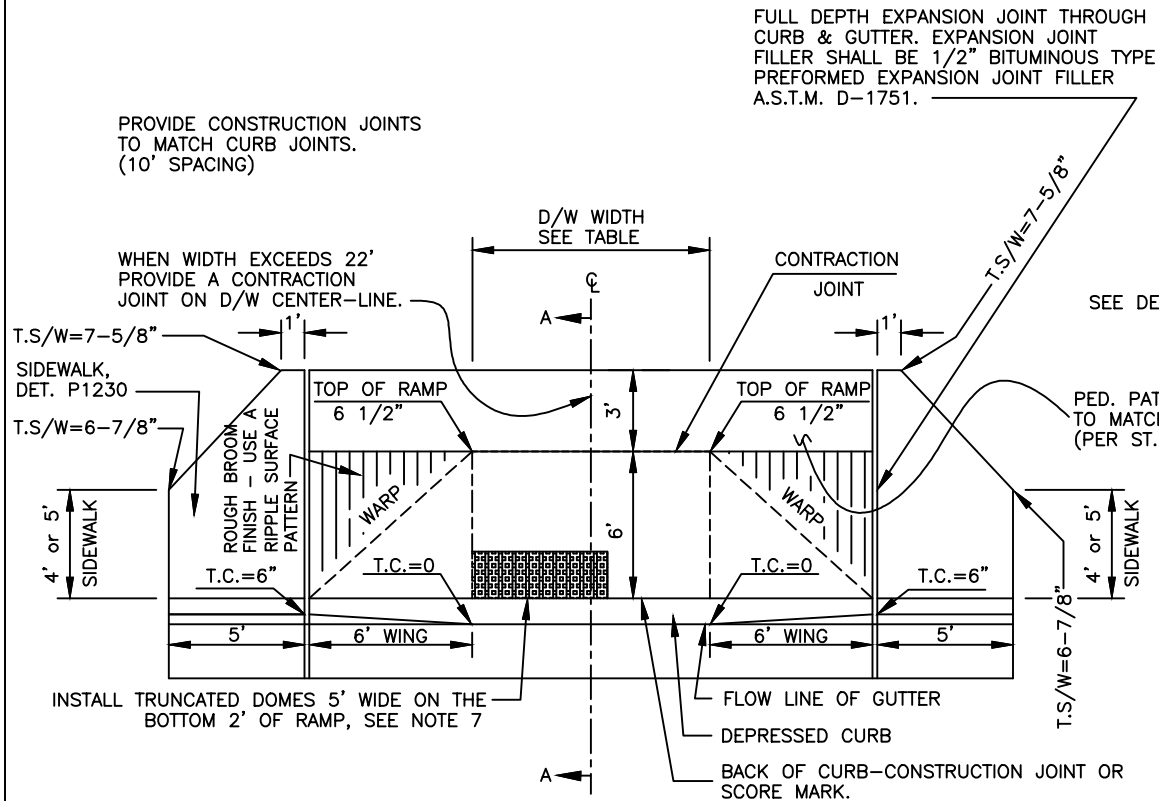
Lane Group	Ø8
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

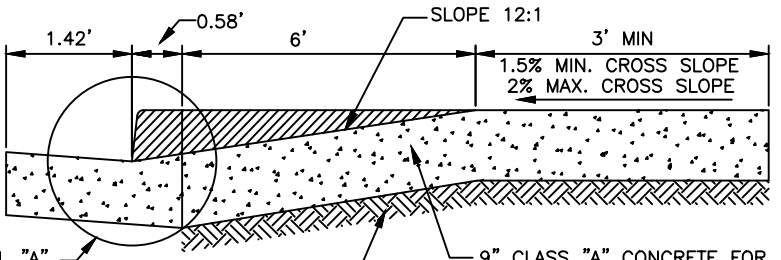
Intersection Summary

EXHIBIT 27

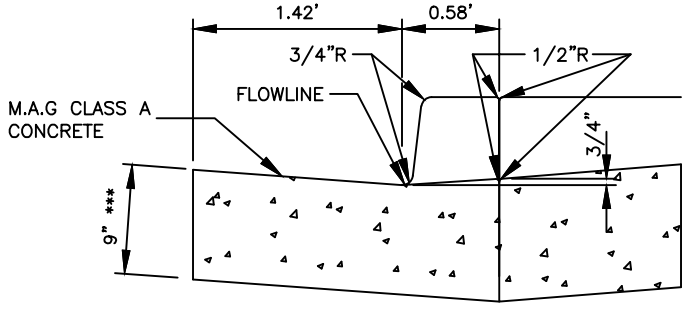


OPTION 1 - COP DETAIL 1244





SECTION A-A



DETAIL "A"

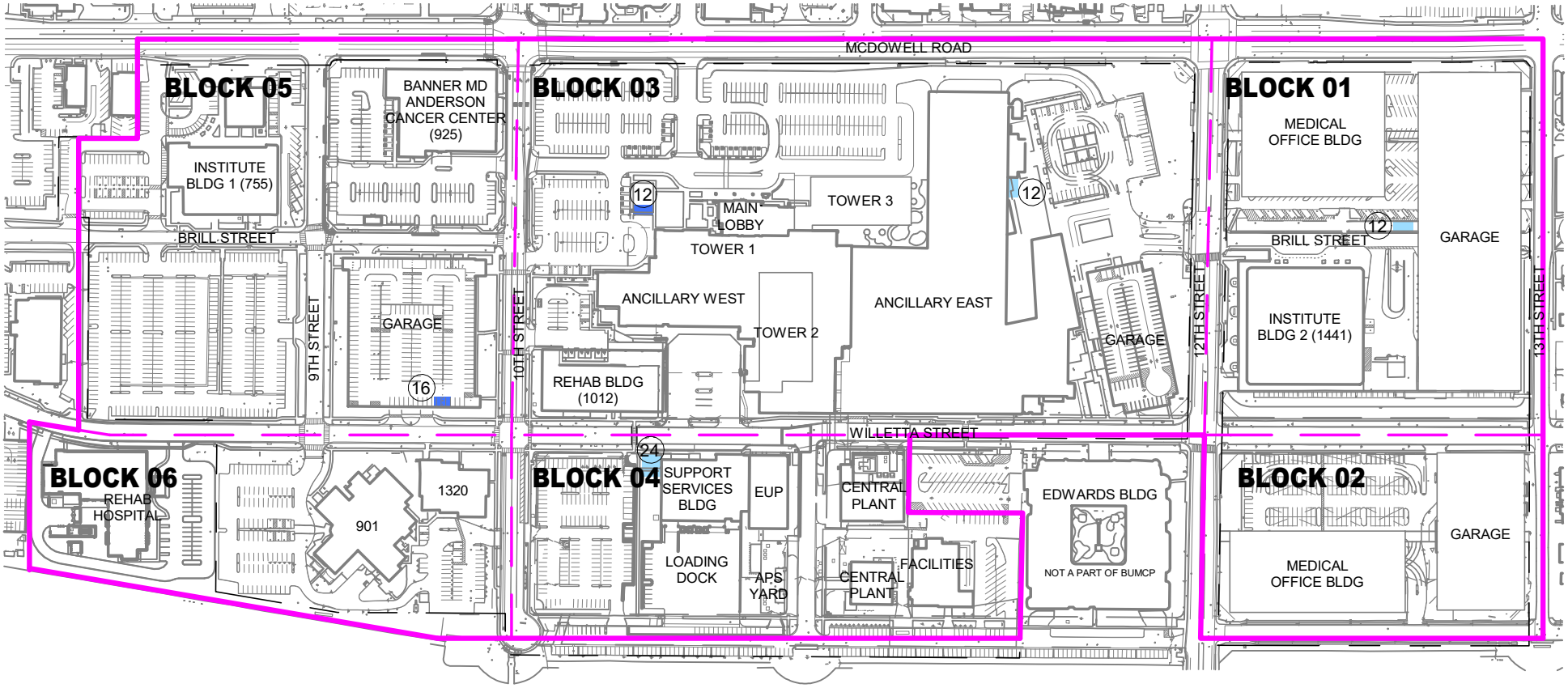
NOTES:

1. THIS DETAIL IS ONLY TO BE USED WHEN APPROVED BY THE CITY.
2. DEPRESSED CURB SHALL BE PAID FOR AS COMBINED CURB AND GUTTER.
3. CONCRETE CURB & GUTTER SHALL BE M.A.G. CLASS A; TOP OF WING TO TOP OF WING.
4. PAYMENT FOR DRIVEWAY SHALL BE ON A SQUARE FOOT BASIS.
5. EXPANSION JOINT MATERIAL SHALL BE SECURED IN PLACE PRIOR TO POURING CONCRETE AND SHALL COMPLETELY SEPARATE THE DRIVEWAY SLAB FROM THE SIDEWALK, EXTENDING FROM THE SURFACE TO THE SUBGRADE.
6. CONTROL ELEVATIONS SHOWN ARE IN RELATION TO GUTTER. GUTTER ELEVATION = 0
7. TRUNCATED DOMES SHALL BE INSTALLED AT THE BACK OF CURB IN A 2-FT DEEP BY 5-FT WIDE AREA LOCATED AT EITHER THE RIGHT OR LEFT END OF THE DRIVEWAY ENTRANCE, WHICHEVER WILL PROVIDE THE MOST DIRECT ALIGNMENT WITH THE RECEIVER CURB RAMP ON THE OPPOSITE CURB. TRUNCATED DOMES TO BE IN ACCORDANCE WITH DETAIL P1232.

Refer to P1255-4 for Driveway Widths Policy

DETAIL NO.	City of Phoenix STANDARD DETAIL	DRIVEWAY - PEDESTRIAN RAMP COMBINATION (FOR USE AT T TYPE INTERSECTIONS)	APPROVED ACTING CITY ENGINEER 7/31/08 DATE	DETAIL NO.
P1244				P1244

EXHIBIT 28



Banner University Medical Center
Phoenix Campus

BICYCLE PARKING

0 150 300 FT

A1.14

PLANNED UNIT DEVELOPMENT

LSB HKS